3

Radio Regulations

Resolutions and Recommendations

Edition of 2016

3

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Note by the Secretariat

This revision of the Radio Regulations, complementing the Constitution and the Convention of the International Telecommunication Union, incorporates the decisions of the World Radiocommunication Conferences of 1995 (WRC-95), 1997 (WRC-97), 2000 (WRC-2000), 2003 (WRC-03), 2007 (WRC-07), 2012 (WRC-12) and 2015 (WRC-15). The majority of the provisions of these Regulations shall enter into force as from 1 January 2017; the remaining provisions shall apply as from the special dates of application indicated in Article **59** of the revised Radio Regulations.

In preparing the Radio Regulations, Edition of 2016, the Secretariat corrected the typographical errors that were drawn to the attention of WRC-15 and which were approved by WRC-15.

This edition uses the same numbering scheme as the 2001 edition of the Radio Regulations, notably:

With respect to *Article numbers*, this edition follows the standard sequential numbering. The Article numbers are not followed by any abbreviation (such as "(WRC-97)", "(WRC-2000)", "(WRC-03)", "(WRC-07)", "(WRC-12)" or "(WRC-15)"). Consequently, any reference to an Article, in any of the provisions of these Radio Regulations (e.g. in No. **13.1** of Article **13**), in the texts of the Appendices as contained in Volume 2 of this edition (e.g. in § 1 of Appendix **2**), in the texts of the Resolutions included in Volume 3 of this edition (e.g. in Resolution **1 (Rev.WRC-97)**), and in the texts of the Recommendations included in Volume 3 of this edition (e.g. in Recommendation **8**), is considered as a reference to the text of the concerned Article which appears in this edition, unless otherwise specified.

With respect to *provision numbers in Articles*, this edition continues to use composite numbers indicating the number of the Article and the provision number within that Article (e.g. No. 9.2B means provision No. 2B of Article **9**). The abbreviation "(WRC-15)" "(WRC-12)", "(WRC-07)", "(WRC-03)", "(WRC-2000)" or "(WRC-97)" at the end of such a provision means that the relevant provision was modified or added by WRC-15, by WRC-12, by WRC-07, by WRC-03, by WRC-2000 or by WRC-97, as applicable. The absence of an abbreviation at the end of the provision means that the provision is identical with the provision of the simplified Radio Regulations as approved by WRC-95, and whose complete text was contained in Document 2 of WRC-97.

With respect to *Appendix numbers*, this edition follows the standard sequential numbering, with the addition of the appropriate abbreviation after the Appendix number (such as "(WRC-97)", "(WRC-2000)", "(WRC-03)", "(WRC-07)" "(WRC-12)" or "(WRC-15)"), where applicable. As a rule, any reference to an Appendix, in any of the provisions of these Radio Regulations, in the texts of the Appendices as contained in Volume 2 of this edition, in the texts of the Resolutions and of the Recommendations included in Volume 3 of this edition, is presented in the standard manner (e.g. "Appendix **30 (Rev.WRC-15)**") if not explicitly described in the text (e.g. Appendix **4** as modified by WRC-15). In the texts of Appendices that were partially modified by WRC-15, the provisions that were modified by WRC-15 are indicated with the abbreviation "(WRC-15)" at the end of the concerned text. If an Appendix is referenced without any abbreviation after the Appendix number, in the texts of this edition (e.g., in No. **13.1**), or without other description, such reference is considered as a reference to the text of the concerned Appendix which appears in this edition.

Within the text of the Radio Regulations, the symbol, ↑, has been used to represent quantities associated with an uplink. Similarly, the symbol, ↓, has been used to represent quantities associated with a downlink.

Abbreviations have generally been used for the names of world administrative radio conferences and world radiocommunication conferences. These abbreviations are shown below.

Abbreviation	Conference
WARC Mar	World Administrative Radio Conference to Deal with Matters Relating to the Maritime Mobile Service (Geneva, 1967)
WARC-71	World Administrative Radio Conference for Space Telecommunications (Geneva, 1971)
WMARC-74	World Maritime Administrative Radio Conference (Geneva, 1974)
WARC SAT-77	World Broadcasting-Satellite Administrative Radio Conference (Geneva, 1977)
WARC-Aer2	World Administrative Radio Conference on the Aeronautical Mobile (R) Service (Geneva, 1978)
WARC-79	World Administrative Radio Conference (Geneva, 1979)
WARC Mob-83	World Administrative Radio Conference for the Mobile Services (Geneva, 1983)
WARC HFBC-84	World Administrative Radio Conference for the Planning of the HF Bands Allocated to the Broadcasting Service (Geneva, 1984)
WARC Orb-85	World Administrative Radio Conference on the Use of the Geostationary-Satellite Orbit and the Planning of Space Services Utilising It (First Session – Geneva, 1985)
WARC HFBC-87	World Administrative Radio Conference for the Planning of the HF Bands Allocated to the Broadcasting Service (Geneva, 1987)
WARC Mob-87	World Administrative Radio Conference for the Mobile Services (Geneva, 1987)
WARC Orb-88	World Administrative Radio Conference on the Use of the Geostationary-Satellite Orbit and the Planning of Space Services Utilising It (Second Session – Geneva, 1988)
WARC-92	World Administrative Radio Conference for Dealing with Frequency Allocations in Certain Parts of the Spectrum (Malaga-Torremolinos, 1992)
WRC-95	World Radiocommunication Conference (Geneva, 1995)
WRC-97	World Radiocommunication Conference (Geneva, 1997)
WRC-2000	World Radiocommunication Conference (Istanbul, 2000)
WRC-03	World Radiocommunication Conference (Geneva, 2003)
WRC-07	World Radiocommunication Conference (Geneva, 2007)
WRC-12	World Radiocommunication Conference (Geneva, 2012)
WRC-15	World Radiocommunication Conference (Geneva, 2015)
WRC-19	World Radiocommunication Conference, 2019[1]

[1] The date of this conference has not been finalized.

VOLUME 3

Resolutions – Recommendations

TABLE OF CONTENTS

Resolutions

Page

RESOLUTION 1 (Rev.WRC-97) Notification of frequency assignments 3

RESOLUTION 2 (Rev.WRC-03) Equitable use, by all countries, with equal rights, of the geostationary-satellite and other satellite orbits and of frequency bands for space radiocommunication services 5

RESOLUTION 4 (Rev.WRC-03) Period of validity of frequency assignments to space stations using the geostationary-satellite and other satellite orbits 7

RESOLUTION 5 (Rev.WRC-15) Technical cooperation with the developing countries in the study of propagation in tropical and similar areas 11

RESOLUTION 7 (Rev.WRC-03) Development of national radio-frequency management 13

RESOLUTION 10 (Rev.WRC-2000) Use of two-way wireless telecommunications by the International Red Cross and Red Crescent Movement 15

RESOLUTION 12 (Rev.WRC-15) Assistance and support to Palestine 17

RESOLUTION 13 (Rev.WRC-97) Formation of call signs and allocation of new international series 19

RESOLUTION 15 (Rev.WRC-03) International cooperation and technical assistance in the field of space radiocommunications 21

RESOLUTION 18 (Rev.WRC-15) Relating to the procedure for identifying and announcing the position of ships and aircraft of States not parties to an armed conflict 23

RESOLUTION 20 (Rev.WRC-03) Technical cooperation with developing countries in the field of aeronautical telecommunications 25

Page

RESOLUTION 25	(Rev.WRC-03) Operation of global satellite systems for personal communications	27
RESOLUTION 26	(Rev.WRC-07) Footnotes to the Table of Frequency Allocations in Article 5 of the Radio Regulations	29
RESOLUTION 27	(Rev.WRC-12) Use of incorporation by reference in the Radio Regulations	31
RESOLUTION 28	(Rev.WRC-15) Revision of references to the text of ITU-R Recommendations incorporated by reference in the Radio Regulations	35
RESOLUTION 31	(WRC-15) Transitional measures for the elimination of advance publication filings by administrations for frequency assignments to satellite networks and systems subject to Section II of Article 9	37
RESOLUTION 33	(Rev.WRC-15) Bringing into use of space stations in the broadcasting-satellite service, prior to the entry into force of agreements and associated plans for the broadcasting-satellite service	39
RESOLUTION 34	(Rev.WRC-15) Establishment of the broadcasting-satellite service in Region 3 in the 12.5-12.75 GHz frequency band and sharing with space and terrestrial services in Regions 1, 2 and 3..	45
RESOLUTION 40	(WRC-15) Use of one space station to bring frequency assignments to geostationary-satellite networks at different orbital locations into use within a short period of time	47
RESOLUTION 42	(Rev.WRC-15) Use of interim systems in Region 2 in the broadcasting-satellite and fixed-satellite (feeder-link) services in Region 2 for the frequency bands covered by Appendices 30 and 30A	49
RESOLUTION 49	(Rev.WRC-15) Administrative due diligence applicable to some satellite radiocommunication services	57
RESOLUTION 55	(Rev.WRC-15) Electronic submission of notice forms for satellite networks, earth stations and radio astronomy stations	63
RESOLUTION 63	(Rev.WRC-12) Protection of radiocommunication services against interference caused by radiation from industrial, scientific and medical (ISM) equipment	65

Page

RESOLUTION 72 (Rev.WRC-07) World and regional preparations for world radiocommunication conferences 67

RESOLUTION 74 (Rev.WRC-03) Process to keep the technical bases of Appendix 7 current 69

RESOLUTION 75 (Rev.WRC-12) Development of the technical basis for determining the coordination area for coordination of a receiving earth station in the space research service (deep space) with transmitting stations of high-density applications in the fixed service in the 31.8-32.3 GHz and 37-38 GHz bands 71

RESOLUTION 76 (Rev.WRC-15) Protection of geostationary fixed-satellite service and geostationary broadcasting-satellite service networks from the maximum aggregate equivalent power flux-density produced by multiple non-geostationary fixed-satellite service systems in frequency bands where equivalent power flux-density limits have been adopted 73

RESOLUTION 80 (Rev.WRC-07) Due diligence in applying the principles embodied in the Constitution 81

RESOLUTION 81 (Rev.WRC-15) Evaluation of the administrative due diligence procedure for satellite networks 85

RESOLUTION 85 (WRC-03) Application of Article 22 of the Radio Regulations to the protection of geostationary fixed-satellite service and broadcasting-satellite service networks from non-geostationary fixed-satellite service systems 87

RESOLUTION 86 (Rev.WRC-07) Implementation of Resolution 86 (Rev.Marrakesh, 2002) of the Plenipotentiary Conference 89

RESOLUTION 95 (Rev.WRC-07) General review of the Resolutions and Recommendations of world administrative radio conferences and world radiocommunication conferences 91

RESOLUTION 99 (WRC-15) Provisional application of certain provisions of the Radio Regulations as revised by the 2015 World Radiocommunication Conference and abrogation of certain Resolutions and Recommendations 93

RESOLUTION 111 (Orb-88) Planning of the fixed-satellite service in the bands 18.1-18.3 GHz, 18.3-20.2 GHz and 27-30 GHz 95

Page

RESOLUTION 114 (Rev.WRC-15) Compatibility between the aeronautical radionavigation service and the fixed-satellite service (Earth-to-space) (limited to feeder links of the non-geostationary mobile-satellite systems in the mobile-satellite service) in the frequency band 5 091-5 150 MHz 97

RESOLUTION 122 (Rev.WRC-07) Use of the bands 47.2-47.5 GHz and 47.9-48.2 GHz by high altitude platform stations in the fixed service and by other services 99

RESOLUTION 125 (Rev.WRC-12) Frequency sharing in the bands 1 610.6-1 613.8 MHz and 1 660-1 660.5 MHz between the mobile-satellite service and the radio astronomy service 103

RESOLUTION 140 (Rev.WRC-15) Measures and studies associated with the equivalent power flux-density (epfd) limits in the frequency band 19.7-20.2 GHz..... 105

RESOLUTION 143 (Rev.WRC-07) Guidelines for the implementation of high-density applications in the fixed-satellite service in frequency bands identified for these applications..... 107

RESOLUTION 144 (Rev.WRC-15) Special requirements of geographically small or narrow countries operating earth stations in the fixed-satellite service in the frequency band 13.75-14 GHz 111

RESOLUTION 145 (Rev.WRC-12) Use of the bands 27.9-28.2 GHz and 31-31.3 GHz by high altitude platform stations in the fixed service .. 113

RESOLUTION 147 (WRC-07) Power flux-density limits for certain systems in the fixed-satellite service using highly-inclined orbits having an apogee altitude greater than 18 000 km and an orbital inclination between 35° and 145° in the band 17.7-19.7 GHz 115

RESOLUTION 148 (Rev.WRC-15) Satellite systems formerly listed in Part B of the Plan of Appendix 30B (WARC Orb-88) 117

RESOLUTION 149 (Rev.WRC-12) Submissions from new Member States of the Union relating to Appendix 30B of the Radio Regulations..... 119

RESOLUTION 150 (WRC-12) Use of the bands 6 440-6 520 MHz and 6 560-6 640 MHz by gateway links for high-altitude platform stations in the fixed service..... 121

Page

RESOLUTION 154 (Rev.WRC-15) Consideration of technical and regulatory actions in order to support existing and future operation of fixed-satellite service earth stations within the frequency band 3 400-4 200 MHz, as an aid to the safe operation of aircraft and reliable distribution of meteorological information in some countries in Region 1 125

RESOLUTION 155 (WRC-15) Regulatory provisions related to earth stations on board unmanned aircraft which operate with geostationary-satellite networks in the fixed-satellite service in certain frequency bands not subject to a Plan of Appendices 30, 30A and 30B for the control and non-payload communications of unmanned aircraft systems in non-segregated airspaces 129

RESOLUTION 156 (WRC-15) Use of the frequency bands 19.7-20.2 GHz and 29.5-30.0 GHz by earth stations in motion communicating with geostationary space stations in the fixed-satellite service 135

RESOLUTION 157 (WRC-15) Study of technical and operational issues and regulatory provisions for new non-geostationary-satellite orbit systems in the 3 700-4 200 MHz, 4 500-4 800 MHz, 5 925-6 425 MHz and 6 725-7 025 MHz frequency bands allocated to the fixed-satellite service..... 141

RESOLUTION 158 (WRC-15) Use of the frequency bands 17.7-19.7 GHz (space-to-Earth) and 27.5-29.5 GHz (Earth-to-space) by earth stations in motion communicating with geostationary space stations in the fixed-satellite service 145

RESOLUTION 159 (WRC-15) Studies of technical, operational issues and regulatory provisions for non-geostationary fixed-satellite services satellite systems in the frequency bands 37.5-39.5 GHz (space-to-Earth), 39.5-42.5 GHz (space-to-Earth), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space)..... 149

RESOLUTION 160 (WRC-15) Facilitating access to broadband applications delivered by high-altitude platform stations 153

RESOLUTION 161 (WRC-15) Studies relating to spectrum needs and possible allocation of the frequency band 37.5-39.5 GHz to the fixed-satellite service..... 157

RESOLUTION 162 (WRC-15) Studies relating to spectrum needs and possible allocation of the frequency band 51.4-52.4 GHz to the fixed-satellite service (Earth-to-space)..... 159

Page

RESOLUTION 163 (WRC-15) Deployment of earth stations in some Regions 1 and 2 countries in the frequency band 14.5-14.75 GHz in the fixed-satellite service (Earth-to-space) not for feeder links for the broadcasting-satellite service 161

RESOLUTION 164 (WRC-15) Deployment of earth stations in some Region 3 countries in the frequency band 14.5-14.8 GHz in the fixed-satellite service (Earth-to-space) not for feeder links for the broadcasting-satellite service 163

RESOLUTION 205 (Rev.WRC-15) Protection of the systems operating in the mobile-satellite service in the frequency band 406-406.1 MHz 165

RESOLUTION 207 (Rev.WRC-15) Measures to address unauthorized use of and interference to frequencies in the frequency bands allocated to the maritime mobile service and to the aeronautical mobile (R) service 169

RESOLUTION 212 (Rev.WRC-15) Implementation of International Mobile Telecommunications in the frequency bands 1 885-2 025 MHz and 2 110-2 200 MHz 173

RESOLUTION 215 (Rev.WRC-12) Coordination process among mobile-satellite systems and efficient use of the allocations to the mobile-satellite service in the 1-3 GHz range 175

RESOLUTION 217 (WRC-97) Implementation of wind profiler radars 177

RESOLUTION 221 (Rev.WRC-07) Use of high altitude platform stations providing IMT in the bands 1 885-1 980 MHz, 2 010-2 025 MHz and 2 110-2 170 MHz in Regions 1 and 3 and 1 885-1 980 MHz and 2 110-2 160 MHz in Region 2 179

RESOLUTION 222 (Rev.WRC-12) Use of the frequency bands 1 525-1 559 MHz and 1 626.5-1 660.5 MHz by the mobile-satellite service, and procedures to ensure long-term spectrum access for the aeronautical mobile-satellite (R) service 185

RESOLUTION 223 (Rev.WRC-15) Additional frequency bands identified for International Mobile Telecommunications 191

RESOLUTION 224 (Rev.WRC-15) Frequency bands for the terrestrial component of International Mobile Telecommunications below 1 GHz..... 197

Page

RESOLUTION 225 (Rev.WRC-12) Use of additional frequency bands for the satellite component of IMT 201

RESOLUTION 229 (Rev.WRC-12) Use of the bands 5 150-5 250 MHz, 5 250-5 350 MHz and 5 470-5 725 MHz by the mobile service for the implementation of wireless access systems including radio local area networks 203

RESOLUTION 235 (WRC-15) Review of the spectrum use of the frequency band 470-960 MHz in Region 1 207

RESOLUTION 236 (WRC-15) Railway radiocommunication systems between train and trackside 211

RESOLUTION 237 (WRC-15) Intelligent Transport Systems applications 213

RESOLUTION 238 (WRC-15) Studies on frequency-related matters for International Mobile Telecommunications identification including possible additional allocations to the mobile services on a primary basis in portion(s) of the frequency range between 24.25 and 86 GHz for the future development of International Mobile Telecommunications for 2020 and beyond 215

RESOLUTION 239 (WRC-15) Studies concerning Wireless Access Systems including radio local area networks in the frequency bands between 5 150 MHz and 5 925 MHz 219

RESOLUTION 331 (Rev.WRC-12) Operation of the Global Maritime Distress and Safety System 223

RESOLUTION 339 (Rev.WRC-07) Coordination of NAVTEX services 227

RESOLUTION 343 (Rev.WRC-12) Maritime certification for personnel of ship stations and ship earth stations for which a radio installation is not compulsory 229

RESOLUTION 344 (Rev.WRC-12) Management of the maritime identity numbering resource 233

RESOLUTION 349 (Rev.WRC-12) Operational procedures for cancelling false distress alerts in the Global Maritime Distress and Safety System 235

RESOLUTION 352 (WRC-03) Use of the carrier frequencies 12 290 kHz and 16 420 kHz for safety-related calling to and from rescue coordination centres 239

Page

RESOLUTION 354 (WRC-07) Distress and safety radiotelephony procedures for 2 182 kHz 241

RESOLUTION 356 (WRC-07) ITU maritime service information registration 247

RESOLUTION 359 (Rev.WRC-15) Consideration of regulatory provisions for updating and modernization of the Global Maritime Distress and Safety System 249

RESOLUTION 360 (Rev.WRC-15) Consideration of regulatory provisions and spectrum allocations to the maritime mobile-satellite service to enable the satellite component of the VHF Data Exchange System and enhanced maritime radiocommunication 251

RESOLUTION 361 (WRC-15) Consideration of regulatory provisions for modernization of the Global Maritime Distress and Safety System and related to the implementation of e-navigation 255

RESOLUTION 362 (WRC-15) Autonomous maritime radio devices operating in the frequency band 156-162.05 MHz 257

RESOLUTION 405 Relating to the use of frequencies of the aeronautical mobile (R) service 261

RESOLUTION 413 (Rev.WRC-12) Use of the band 108-117.975 MHz by the aeronautical mobile (R) service 263

RESOLUTION 416 (WRC-07) Use of the bands 4 400-4 940 MHz and 5 925-6 700 MHz by an aeronautical mobile telemetry application in the mobile service 267

RESOLUTION 417 (Rev.WRC-15) Use of the frequency band 960-1 164 MHz by the aeronautical mobile (R) service 269

RESOLUTION 418 (Rev.WRC-15) Use of the frequency band 5 091-5 250 MHz by the aeronautical mobile service for telemetry applications 273

RESOLUTION 422 (WRC-12) Development of methodology to calculate aeronautical mobile-satellite (R) service spectrum requirements within the frequency bands 1 545-1 555 MHz (space-to-Earth) and 1 646.5-1 656.5 MHz (Earth-to-space) 277

RESOLUTION 424 (WRC-15) Use of Wireless Avionics Intra-Communications in the frequency band 4 200-4 400 MHz 279

Page

RESOLUTION 425 (WRC-15) Use of the frequency band 1 087.7-1 092.3 MHz by the aeronautical mobile-satellite (R) service (Earth-to-space) to facilitate global flight tracking for civil aviation 281

RESOLUTION 426 (WRC-15) Studies on spectrum needs and regulatory provisions for the introduction and use of the Global Aeronautical Distress and Safety System..... 283

RESOLUTION 506 (Rev.WRC-97) Use by space stations in the broadcasting-satellite service operating in the 12 GHz frequency bands allocated to the broadcasting-satellite service of the geostationary-satellite orbit and no other 285

RESOLUTION 507 (Rev.WRC-15) Establishment of agreements and associated plans for the broadcasting-satellite service 287

RESOLUTION 517 (Rev.WRC-15) Introduction of digitally modulated emissions in the high-frequency bands between 3 200 kHz and 26 100 kHz allocated to the broadcasting service 289

RESOLUTION 526 (Rev.WRC-12) Future adoption of procedures to ensure flexibility in the use of the frequency band allocated to the broadcasting-satellite service (BSS) for wide RF-band high-definition television (HDTV) and to the associated feeder links... 291

RESOLUTION 528 (Rev.WRC-15) Introduction of the broadcasting-satellite service (sound) systems and complementary terrestrial broadcasting in the frequency bands allocated to these services within the range 1-3 GHz..... 293

RESOLUTION 535 (Rev.WRC-15) Information needed for the application of Article 12 of the Radio Regulations 295

RESOLUTION 536 (WRC-97) Operation of broadcasting satellites serving other countries..... 305

RESOLUTION 539 (Rev.WRC-15) Use of the frequency band 2 605-2 655 MHz in certain Region 3 countries by non-geostationary satellite systems in the broadcasting-satellite service (sound)..... 307

RESOLUTION 543 (WRC-03) Provisional RF protection ratio values for analogue and digitally modulated emissions in the HF broadcasting service..... 311

Page

RESOLUTION 548 (Rev.WRC-12) Application of the grouping concept in Appendices 30 and 30A in Regions 1 and 3 315

RESOLUTION 549 (WRC-07) Use of the frequency band 620-790 MHz for existing assignments to stations of the broadcasting-satellite service 317

RESOLUTION 550 (WRC-07) Information relating to the high-frequency broadcasting service 319

RESOLUTION 552 (Rev.WRC-15) Long-term access to and development in the frequency band 21.4-22 GHz in Regions 1 and 3 321

RESOLUTION 553 (Rev.WRC-15) Additional regulatory measures for broadcasting-satellite networks in the frequency band and 21.4-22 GHz in Regions 1 and 3 for the enhancement of equitable access to this frequency band 325

RESOLUTION 554 (WRC-12) Application of pfd masks to coordination under No. 9.7 for broadcasting-satellite service networks in the band 21.4-22 GHz in Regions 1 and 3 333

RESOLUTION 555 (Rev.WRC-15) Additional regulatory provisions for broadcasting-satellite service networks in the frequency band 21.4-22 GHz in Regions 1 and 3 for the enhancement of equitable access to this frequency band 335

RESOLUTION 556 (WRC-15) Conversion of all analogue assignments in the Appendices 30 and 30A Regions 1 and 3 Plan and List into digital assignments 337

RESOLUTION 557 (WRC-15) Consideration of possible revision of Annex 7 to Appendix 30 of the Radio Regulations 339

RESOLUTION 608 (Rev.WRC-15) Use of the frequency band 1 215-1 300 MHz by systems of the radionavigation-satellite service (space-to-Earth) . 341

RESOLUTION 609 (Rev.WRC-07) Protection of aeronautical radionavigation service systems from the equivalent power flux-density produced by radionavigation-satellite service networks and systems in the 1 164-1 215 MHz frequency band 343

RESOLUTION 610 (WRC-03) Coordination and bilateral resolution of technical compatibility issues for radionavigation-satellite service networks and systems in the bands 1 164-1 300 MHz, 1 559-1 610 MHz and 5 010-5 030 MHz 347

Page

RESOLUTION 612 (Rev.WRC-12) Use of the radiolocation service between 3 and 50 MHz to support oceanographic radar operations 351

RESOLUTION 641 (Rev.HFBC-87) Use of the frequency band 7 000-7 100 kHz 353

RESOLUTION 642 Relating to the bringing into use of earth stations in the amateur-satellite service 355

RESOLUTION 646 (Rev.WRC-15) Public protection and disaster relief 357

RESOLUTION 647 (Rev.WRC-15) Radiocommunication aspects, including spectrum management guidelines, for early warning, disaster prediction, detection, mitigation and relief operations relating to emergencies and disasters 363

RESOLUTION 655 (WRC-15) Definition of time scale and dissemination of time signals via radiocommunication systems 369

RESOLUTION 656 (WRC-15) Possible allocation to the Earth exploration-satellite service (active) for spaceborne radar sounders in the range of frequencies around 45 MHz 373

RESOLUTION 657 (WRC-15) Spectrum needs and protection of space weather sensors 375

RESOLUTION 658 (WRC-15) Allocation of the frequency band 50-54 MHz to the amateur service in Region 1 377

RESOLUTION 659 (WRC-15) Studies to accommodate requirements in the space operation service for non-geostationary satellites with short duration missions 379

RESOLUTION 673 (Rev.WRC-12) The importance of Earth observation radiocommunication applications 381

RESOLUTION 703 (Rev.WRC-07) Calculation methods and interference criteria recommended by ITU-R for sharing frequency bands between space radiocommunication and terrestrial radiocommunication services or between space radiocommunication services 385

RESOLUTION 705 (Rev.WRC-15) Mutual protection of radio services operating in the frequency band 70-130 kHz 387

Page

RESOLUTION 716 (Rev.WRC-12) Use of the frequency bands 1 980-2 010 MHz and 2 170-2 200 MHz in all three Regions and 2 010-2 025 MHz and 2 160-2 170 MHz in Region 2 by the fixed and mobile-satellite services and associated transition arrangements 389

RESOLUTION 729 (Rev.WRC-07) Use of frequency adaptive systems in the MF and HF bands 393

RESOLUTION 731 (Rev.WRC-12) Consideration of sharing and adjacent-band compatibility between passive and active services above 71 GHz 395

RESOLUTION 732 (Rev.WRC-12) Consideration of sharing between active services above 71 GHz 397

RESOLUTION 739 (Rev.WRC-15) Compatibility between the radio astronomy service and the active space services in certain adjacent and nearby frequency bands 399

RESOLUTION 741 (Rev.WRC-15) Protection of the radio astronomy service in the frequency band 4 990-5 000 MHz from unwanted emissions of the radionavigation-satellite service (space-to-Earth) operating in the frequency band 5 010-5 030 MHz 405

RESOLUTION 743 (WRC-03) Protection of single-dish radio astronomy stations in Region 2 in the 42.5-43.5 GHz band 407

RESOLUTION 744 (Rev.WRC-07) Sharing between the mobile-satellite service (Earth-to-space) and the fixed and mobile services in the band 1 668.4-1 675 MHz 409

RESOLUTION 748 (Rev.WRC-15) Compatibility between the aeronautical mobile (R) service and the fixed-satellite service (Earth-to-space) in the frequency band 5 091-5 150 MHz 411

RESOLUTION 749 (Rev.WRC-15) Use of the frequency band 790-862 MHz in countries of Region 1 and the Islamic Republic of Iran by mobile applications and by other services 413

RESOLUTION 750 (Rev.WRC-15) Compatibility between the Earth exploration-satellite service (passive) and relevant active services 419

RESOLUTION 751 (WRC-07) Use of the frequency band 10.6-10.68 GHz 425

RESOLUTION 752 (WRC-07) Use of the frequency band 36-37 GHz 429

Page

RESOLUTION 759 (WRC-15) Technical studies on the coexistence of the radiolocation service and the amateur, amateur-satellite and radio astronomy services in the frequency band 76-81 GHz 433

RESOLUTION 760 (WRC-15) Provisions relating to the use of the frequency band 694-790 MHz in Region 1 by the mobile, except aeronautical mobile, service and by other services 435

RESOLUTION 761 (WRC-15) Compatibility of International Mobile Telecommunications and broadcasting-satellite service (sound) in the frequency band 1 452-1 492 MHz in Regions 1 and 3 441

RESOLUTION 762 (WRC-15) Application of power flux-density criteria to assess the potential for harmful interference under No. 11.32A for fixed-satellite and broadcasting-satellite service networks in the 6 GHz and 10/11/12/14 GHz frequency bands not subject to a Plan 443

RESOLUTION 763 (WRC-15) Stations on board sub-orbital vehicles 447

RESOLUTION 764 (WRC-15) Consideration of the technical and regulatory impacts of referencing Recommendations ITU-R M.1638-1 and ITU-R M.1849-1 in Nos. 5.447F and 5.450A of the Radio Regulations 449

RESOLUTION 765 (WRC-15) Establishment of in-band power limits for earth stations operating in mobile-satellite service, the meteorological-satellite service and the Earth exploration-satellite service in the frequency bands 401-403 MHz and 399.9-400.05 MHz 451

RESOLUTION 766 (WRC-15) Consideration of possible upgrading of the secondary allocation to the meteorological-satellite service (space-to-Earth) to primary status and a primary allocation to the Earth exploration-satellite service (space-to-Earth) in the frequency band 460-470 MHz 453

RESOLUTION 767 (WRC-15) Studies towards an identification for use by administrations for land-mobile and fixed services applications operating in the frequency range 275-450 GHz..... 457

RESOLUTION 804 (Rev.WRC-12) Principles for establishing agendas for world radiocommunication conferences 461

RESOLUTION 809 (WRC-15) Agenda for the 2019 World Radiocommunication Conference 465

Page

RESOLUTION 810	(WRC-15) Preliminary agenda for the 2023 World Radiocommunication Conference	469
RESOLUTION 901	(Rev.WRC-15) Determination of the orbital arc separation for which coordination would be required between two satellite networks operating in a space service not subject to a Plan	473
RESOLUTION 902	(WRC-03) Provisions relating to earth stations located on board vessels which operate in fixed-satellite service networks in the uplink bands 5 925-6 425 MHz and 14-14.5 GHz	475
RESOLUTION 903	(Rev.WRC-15) Transitional measures for certain broadcasting-satellite/fixed-satellite service systems in the frequency band 2 500-2 690 MHz	481
RESOLUTION 904	(WRC-07) Transitional measures for coordination between the mobile-satellite service (Earth-to-space) and the space research (passive) service in the band 1 668-1 668.4 MHz for a specific case	483
RESOLUTION 906	(Rev.WRC-15) Electronic submission of notices for terrestrial services to the Radiocommunication Bureau and exchange of data between administrations	485
RESOLUTION 907	(Rev.WRC-15) Use of modern electronic means of communication for administrative correspondence related to advance publication, coordination and notification of satellite networks including that related to Appendices 30, 30A and 30B, earth stations and radio astronomy stations	489
RESOLUTION 908	(Rev.WRC-15) Electronic submission and publication of satellite network filings	491
RESOLUTION 958	(WRC-15) Urgent studies required in preparation for the 2019 World Radiocommunication Conference	493

Recommendations

Page

RECOMMENDATION 7 (Rev.WRC-97) Adoption of standard forms for ship station and ship earth station licences and aircraft station and aircraft earth station licences 497

RECOMMENDATION 8 Relating to automatic identification of stations 501

RECOMMENDATION 9 Relating to the measures to be taken to prevent the operation of broadcasting stations on board ships or aircraft outside national territories 503

RECOMMENDATION 16 (WRC-12) Interference management for stations that may operate under more than one terrestrial radiocommunication service 505

RECOMMENDATION 34 (Rev.WRC-12) Principles for the allocation of frequency bands .. 507

RECOMMENDATION 36 (WRC-97) Role of international monitoring in reducing apparent congestion in the use of orbit and spectrum resources 509

RECOMMENDATION 37 (WRC-03) Operational procedures for earth stations on board vessels (ESVs) use 511

RECOMMENDATION 63 Relating to the provision of formulae and examples for the calculation of necessary bandwidths 513

RECOMMENDATION 71 Relating to the standardization of the technical and operational characteristics of radio equipment 515

RECOMMENDATION 75 (Rev.WRC-15) Study of the boundary between the out-of-band and spurious domains of primary radars using magnetrons 517

RECOMMENDATION 76 (WRC-12) Deployment and use of cognitive radio systems 519

RECOMMENDATION 100 (Rev.WRC-03) Preferred frequency bands for systems using tropospheric scatter 521

RECOMMENDATION 206 (Rev.WRC-12) Studies on the possible use of integrated mobile-satellite service and ground component systems in the bands 1 525-1 544 MHz, 1 545-1 559 MHz, 1 626.5-1 645.5 MHz and 1 646.5-1 660.5 MHz 523

Page

RECOMMENDATION 207 (Rev.WRC-15) Future IMT systems 525

RECOMMENDATION 316 (Rev.Mob-87) Use of ship earth stations within harbours and other waters under national jurisdiction..... 527

RECOMMENDATION 401 Relating to the efficient use of aeronautical mobile (R) worldwide frequencies 529

RECOMMENDATION 503 (Rev.WRC-2000) High-frequency broadcasting 531

RECOMMENDATION 506 Relating to the harmonics of the fundamental frequency of broadcasting-satellite stations 533

RECOMMENDATION 520 (WARC-92) Elimination of HF broadcasting on frequencies outside the HF bands allocated to the broadcasting service 535

RECOMMENDATION 522 (WRC-97) Coordination of high-frequency broadcasting schedules in the bands allocated to the broadcasting service between 5 900 kHz and 26 100 kHz 537

RECOMMENDATION 608 (Rev.WRC-07) Guidelines for consultation meetings established in Resolution 609 (Rev.WRC-07) 539

RECOMMENDATION 622 (WRC-97) Use of the frequency bands 2 025-2 110 MHz and 2 200-2 290 MHz by the space research, space operation, Earth exploration-satellite, fixed and mobile services 543

RECOMMENDATION 707 Relating to the use of the frequency band 32-33 GHz shared between the inter-satellite service and the radionavigation service 545

RECOMMENDATION 724 (WRC-07) Use by civil aviation of frequency allocations on a primary basis to the fixed-satellite service 547

RESOLUTIONS

RESOLUTION 1 (REV.WRC-97)

Notification of frequency assignments[1]

The World Radiocommunication Conference (Geneva, 1997),

referring to

– the Preamble of the Constitution,

– Article 42 of the Constitution (Special Arrangements),

– Article **6** of the Radio Regulations (Special agreements),

– Article **11** of the Radio Regulations (Notification and recording of frequency assignments),

– Article **12** of the Radio Regulations (Seasonal planning of the HF bands allocated to the broadcasting service between 5 900 kHz and 26 100 kHz),

resolves

that, unless specifically stipulated otherwise by special arrangements communicated to the Union by administrations, any notification of a frequency assignment to a station shall be made by the administration of the country on whose territory the station is located.

1 WRC-97 made editorial amendments to this Resolution.

RESOLUTION 2 (REV.WRC-03)

Equitable use, by all countries, with equal rights, of the geostationary-satellite and other satellite orbits and of frequency bands for space radiocommunication services

The World Radiocommunication Conference (Geneva, 2003),

considering

that all countries have equal rights in the use of both the radio frequencies allocated to various space radiocommunication services and the geostationary-satellite orbit and other satellite orbits for these services,

taking into account

that the radio-frequency spectrum and the geostationary-satellite orbit and other satellite orbits are limited natural resources and should be most effectively and economically used,

resolves

1 that the registration with the Radiocommunication Bureau of frequency assignments for space radiocommunication services and their use do not provide any permanent priority for any individual country or groups of countries and do not create an obstacle to the establishment of space systems by other countries;

2 that, accordingly, a country or a group of countries having registered with the Bureau frequencies for their space radiocommunication services need to take all practicable measures to facilitate the use of new space systems by other countries or groups of countries, in particular those of developing countries and least developed countries, so desiring;

3 that *resolves* 1 and 2 of this Resolution shall be taken into account by the administrations and the Bureau.

RESOLUTION 4 (REV.WRC-03)

Period of validity of frequency assignments to space stations using the geostationary-satellite and other satellite orbits[1]

The World Radiocommunication Conference (Geneva, 2003),

considering

a) that rational and efficient use must be made of the frequency spectrum and the geostationary-satellite orbit and that account should be taken of the provisions of Resolution **2 (Rev.WRC-03)** relating to the use by all countries, with equal rights and equitable access to the frequency bands and the associated satellite orbits for space radiocommunication services;

b) that limiting the period of validity of frequency assignments to space stations using the geostationary-satellite orbit and other satellite orbits is a concept which would promote the attainment of these objectives;

c) that amortizing the considerable investments made in connection with the development of space radiocommunications is a heavy burden for all administrations and that these investments should be spread over a predetermined and realistic period;

d) that every effort should be made to encourage administrations in a position to do so to develop techniques designed to improve the utilization of the frequency spectrum and the geostationary-satellite orbit and other satellite orbits with a view to increasing the total radiocommunication facilities available to the world community;

e) that an experimental procedure to gain experience from application of the new concept of notifying the period of validity of an assignment in space radiocommunication was introduced by WARC-79 and has been used by the Radiocommunication Bureau and administrations since then but that it is not possible to impose on administrations a statutory period identical in all cases;

f) that administrations should be left to propose the period of validity themselves in the light of their operational service requirements and of the common interest, however the period of validity shall take into account, *inter alia*, the operational lifetime of the satellite systems, including space and earth stations, and the type of service provided,

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1 This Resolution does not apply to the frequency bands covered by the Allotment Plan contained in Appendix **30B**.

resolves

1 that, until this Resolution is reviewed by the next competent world radiocommunication conference, frequency assignments to space radiocommunication stations located on the geostationary-satellite and other satellite orbits, noting *considering e)* and *f)*, shall not be considered perpetual and shall be dealt with as follows:

1.1 a frequency assignment to a space station[2] shall be deemed definitively discontinued after the expiry of the period of operation shown on the assignment notice, reckoned from the date on which the assignment was brought into service. This period shall be limited to that for which the satellite network was designed. The Bureau shall then invite the notifying administration to take steps to cancel the assignment. If the Bureau receives no reply within three months following the expiry of the period of operation, it shall insert a symbol in the Remarks Column of the Master Register to indicate that the assignment is not in conformity with this Resolution;

1.2 if a notifying administration which wishes to extend the period of operation originally shown on the assignment notice of a frequency assignment of an existing space station[2] informs the Bureau accordingly more than three years before the expiry of the period in question and if all other basic characteristics of that assignment remain unchanged, the Bureau shall amend as requested the period of operation originally recorded in the Master Register and publish that information in a special section of the Bureau's International Frequency Information Circular (BR IFIC);

1.3 if, at least three years before the expiry of the period of operation recorded in the Master Register of a frequency assignment to an existing space station[2], an administration initiates the coordination procedure specified in No. **9.7** to bring into service a new space station using the same assigned frequency and the same orbital position but with different technical characteristics, and if the Bureau finds after the notification that the new assignment conforms with the provisions of No. **11.31** and does not increase, in relation to the preceding assignment, the probability of interference to the detriment of a frequency assignment recorded in the Master Register or involved in the coordination procedure, the new assignment shall be given a favourable finding and shall be entered in the Master Register;

1.4 a notifying administration which wishes to modify a basic characteristic of a frequency assignment of a space station[2] recorded in the Master Register shall initiate, in any case other than those covered by *resolves* 1.2 and 1.3, the appropriate modification procedure in accordance with the provisions of Nos. **11.43A** to **11.46**;

2 that, for the application of the provisions of *resolves* 1.1 above, the information concerning the period of validity of frequency assignments to space stations shall be notified in addition to that contained in Appendix **4**;

3 that the application of this Resolution shall not prejudge in any way the decisions of future radiocommunication conferences,

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[2] The expression "space station" may apply to more than one satellite provided that only one satellite is in operation at any particular moment and that the stations installed on board successive satellites have identical basic characteristics.

invites ITU-R

to undertake studies with respect to the implementation of this Resolution,

invites the next competent world radiocommunication conference

to take cognizance of the results of ITU-R studies undertaken as a result of this Resolution and take action, as appropriate,

instructs the Secretary-General

to bring this Resolution to the attention of the Council.

RESOLUTION 5 (REV.WRC-15)

Technical cooperation with the developing countries in the study of propagation in tropical and similar areas

The World Radiocommunication Conference (Geneva, 2015),

having noted

that the assistance provided for the developing countries by the Union in the field of telecommunications in cooperation with other United Nations specialized agencies, such as the United Nations Development Programme (UNDP), augurs well for the future,

aware

a) of the fact that the developing countries, particularly those in tropical and similar areas, (including the area referred to as zone C in the Final Acts of the Regional Administrative Conference for the Planning of VHF/UHF Television Broadcasting in the African Broadcasting Area and Neighbouring Countries (Geneva, 1989 and Geneva, 2006), the Red Sea, East Mediterranean, etc.), require adequate knowledge of radio wave propagation in their territories in order to make rational and economical use of the radio-frequency spectrum;

b) of the importance of propagation in radiocommunications;

c) of the importance of the work of ITU-T and ITU-R Study Groups for the development of telecommunications in general and radiocommunications in particular,

considering

a) the need for the developing countries themselves to study telecommunications in general and propagation in particular in their territories, this being the best means of enabling them to acquire telecommunication techniques and to plan their systems effectively and in conformity with the special conditions in the tropical areas;

b) the scarcity of resources available in these countries,

resolves to instruct the Secretary-General

1 to offer the assistance of the Union to developing countries in the tropical areas which endeavour to carry out national propagation studies in order to improve and develop their radiocommunications;

2 to assist these countries, if necessary with the collaboration of international and regional organizations such as the Asia-Pacific Broadcasting Union (ABU), Arab States Broadcasting Union (ASBU), African Telecommunication Union (ATU) and the Union of National Radio and Television Organizations of Africa (URTNA)* which may be concerned, in carrying out national propagation measurement programmes, including collecting appropriate meteorological data, on the basis of ITU-R Recommendations and Questions in order to improve the use of the radio-frequency spectrum;

3 to arrange funds and resources for this purpose from the UNDP or other sources in order to enable the Union to provide the countries concerned with adequate and effective technical assistance for the purpose of this Resolution,

resolves to instruct the Director of the Radiocommunication Bureau

to include this activity in the operational plan, within existing budgetary resources of the Sector,

invites administrations

to submit the results of these propagation measurements to ITU-R for consideration in its studies,

invites the Council

to follow the progress made in carrying out programmes of propagation measurements and the results achieved, and to take any action that it considers necessary.

* *Note by the Secretariat*: In 2006, this Union was transformed into a new Union, under the name "The African Union of Broadcasting (AUB)".

RESOLUTION 7 (REV.WRC-03)

Development of national radio-frequency management

The World Radiocommunication Conference (Geneva, 2003),

considering

a) that the Radio Regulations contain, *inter alia*, procedures for the coordination, notification and registration of frequencies which specify the rights and obligations of Member States;

b) that the application of the above-mentioned procedures necessitates an appropriate radio-frequency management unit in each Member State;

c) that the existence of such a unit helps Member States to safeguard their rights and to discharge their obligations under the Radio Regulations;

d) that the application of the Radio Regulations through the agency of such units is in the interest of the international community as a whole,

noting

that such a unit requires an adequate number of suitably qualified staff,

noting further

that the administrations of many developing countries need to create or to strengthen such a unit, appropriate to their administrative structure, with responsibility for the application of the Radio Regulations at the national and international levels,

recommends

that the administrations of such countries take appropriate action,

resolves

1 that meetings shall be organized between representatives of the Radiocommunication Bureau and the personnel involved in frequency management matters from administrations of developing and developed countries;

2 that such meetings shall be aimed at designing standard structures suitable for administrations of developing countries and include discussions concerning the establishment and operation of radio-frequency management units;

3 that such meetings should also identify the particular needs of developing countries in establishing such units, and the means required to meet those needs,

recommends

that developing countries when planning the use of funds, particularly those received from international sources, make provision for participation in these meetings as well as for the introduction and development of such units,

invites the Council

to take the necessary measures for the organization of such meetings,

instructs the Secretary-General

1 to circulate this Resolution to all Member States, drawing their attention to its importance;

2 to circulate the results of such meetings, particularly to the developing countries;

3 to inform the developing countries of the types of assistance the ITU can provide in setting up the desired structure,

instructs the Director of the Radiocommunication Bureau

to include this activity in the Operational Plan, within existing budgetary resources of the Sector,

draws the attention of the next Plenipotentiary Conference to

1 the particular problems identified in this Resolution;

2 the need for prompt and effective action to resolve them;

3 the need to take all practicable measures to ensure that resources are made available for this purpose.

RESOLUTION 10 (REV.WRC-2000)

Use of two-way wireless telecommunications by the International Red Cross and Red Crescent Movement

The World Radiocommunication Conference (Istanbul, 2000),

considering

a) that the worldwide humanitarian operations carried out by the International Red Cross and Red Crescent Movement − composed of the International Committee of the Red Cross, the International Federation of Red Cross and Red Crescent Societies and national Red Cross and Red Crescent societies − are of great importance and often indispensable;

b) that in such circumstances normal communication facilities are frequently overloaded, damaged, completely interrupted or not available;

c) that it is necessary to facilitate by all possible measures the reliable intervention of these national and international organizations;

d) that rapid and independent contact is essential to the intervention of these organizations;

e) that for the efficient and safe conduct of their humanitarian operations, these organizations rely heavily on two-way wireless telecommunication facilities, and particularly on an extensive HF and VHF radio network,

resolves to urge administrations

1 to take account of the possible needs of the International Red Cross and Red Crescent Movement for two-way wireless telecommunication means when normal communication facilities are interrupted or not available;

2 to assign to these organizations the minimum number of necessary working frequencies in accordance with the Radio Regulations;

3 to take all practicable steps to protect such communications from harmful interference.

RESOLUTION 12 (REV.WRC-15)

Assistance and support to Palestine

The World Radiocommunication Conference (Geneva, 2015),

recalling

a) the Charter of the United Nations and the Universal Declaration of Human Rights;

b) the terms of Resolution 67/19 of the United Nations General Assembly (UNGA), which decides to accord to Palestine non-member observer State status in the United Nations;

c) Resolution 68/235 of the United Nations General Assembly, which recognizes the Palestinian people's right to permanent sovereignty over their natural resources, specifically land, water, energy and other natural resources, in the occupied Palestinian territory, including East Jerusalem;

d) Resolution 32 (Kyoto, 1994) of the ITU Plenipotentiary Conference, on technical assistance to Palestine for the development of telecommunications;

e) Resolution 125 (Rev. Busan, 2014), Resolution 125 (Rev. Guadalajara, 2010), Resolution 125 (Rev. Antalya, 2006) and Resolution 125 (Marrakesh, 2002) of the Plenipotentiary Conference, on assistance and support to Palestine for rebuilding its telecommunication networks;

f) Resolution 99 (Rev. Busan, 2014) and Resolution 99 (Rev. Guadalajara, 2010) of the Plenipotentiary Conference, on the Status of Palestine in ITU;

g) Resolution 18 (Rev. Dubai, 2014), Resolution 18 (Rev. Hyderabad, 2010) of the World Telecommunication Development Conference, on Special Technical Assistance to Palestine;

h) Resolution 9 (Rev. Dubai, 2014) of the World Telecommunication Development Conference, which recognizes that it is the sovereign right of every State to manage spectrum use within its territories;

i) Nos. 6 and 7 of the ITU Constitution indicating among the purposes of the Union "to promote the extension of the benefits of the new telecommunication technologies to all the world's inhabitants" and "to promote the use of telecommunication services with the objective of facilitating peaceful relations",

considering

a) that the ITU Constitution and Convention are designed to strengthen peace and security in the world for the development of international cooperation and better understanding among the peoples concerned;

b) Resolution 125 (Rev. Busan, 2014) of the Plenipotentiary Conference, which recognizes that ITU's policy of assistance to Palestine for the development of its telecommunication and ICT sector has been efficient;

c) the statement by the Chairman of WRC-07 relating to the procedure to be applied by Palestine to obtain for its exclusive use assignments/an allotment in the Appendix **30B** Plan, in accordance with the Interim Agreement and Resolution 99 (Rev. Busan, 2014) of the Plenipotentiary Conference,

mindful

of the fundamental principles contained in the ITU Constitution,

reaffirming

a) the acceptance of the requirements of Palestine under the digital broadcasting and television plan at the Regional Radiocommunication Conference (Geneva, 2006);

b) Palestine's right, pursuant to the Appendix **30B** Plan, to submit a request for assignments/an allotment intended for exclusive use by Palestine, in accordance with the Interim Agreement and Resolution 99 (Rev. Busan, 2014), without prejudging future agreements between the concerned parties,

welcomes

the bilateral agreement on principles for assignment of frequencies in the 2 100 MHz band for Palestinian cellular operators elaborated through the Joint Technical Committee and signed by concerned parties on 19 November 2015,

invites Member States

to support the timely implementation in 2016 in Palestine of new technologies in accordance with the bilateral agreement signed on 19 November 2015 and of 2G in accordance with previously agreed upon bilateral arrangements,

resolves

that assistance to Palestine, pursuant to the relevant ITU resolutions and decisions shall be continued, in particular through capacity building, with the view to enabling Palestine to obtain and manage the required radio spectrum in order to operate its telecommunication networks and wireless services,

instructs the Director of the Radiocommunication Bureau and the Director of the Telecommunication Development Bureau

to encourage all concerned parties in continuing bilateral negotiations and facilitate implementing the agreements and relevant resolutions, in order to undertake additional measures required for enhancing and developing the wireless telecommunication infrastructures, new technologies and services for Palestine,

further instructs the Director of the Radiocommunication Bureau

1 to continue providing specialized assistance and support, in particular in the field of spectrum management and frequency assignment, to Palestine in collaboration with ITU-D, pursuant to the relevant ITU resolutions;

2 to report to WRC-19 on the progress achieved in the implementation of this Resolution.

RESOLUTION 13 (REV.WRC-97)

Formation of call signs and allocation of new international series

The World Radiocommunication Conference (Geneva, 1997),

considering

the increasing demand for call signs justified by the increased number of Member States and by the increased requirements of countries which are already Member States,

believing

that call signs already in use should, as far as possible, not be changed,

noting

a) that the former call-sign series formed of three letters, or a figure and two letters, having been exhausted, a new series has been introduced formed of a letter, a figure and a letter; but in no case may the figure be 0 or 1;

b) that the method referred to in *noting a)* is not applicable to series beginning with one of the following letters: B, F, G, I, K, M, N, R, W,

resolves

1 that the Director of the Radiocommunication Bureau shall continue to urge administrations:

1.1 to make maximum use of the possibilities of the series at present allocated, in order to avoid, as far as possible, further requests;

1.2 to review the call-sign assignments they have already made from their present allocations, with a view to releasing any series and placing them at the disposal of the Union;

2 that the Director of the Radiocommunication Bureau shall, upon request, furnish advice to administrations on the means of effecting the greatest economy, which should be the rule, in the use of a series of call signs;

3 that if, nevertheless, before the next competent world radiocommunication conference, it appears that all the possibilities of the present system of forming call signs will be exhausted, the Director of the Radiocommunication Bureau shall:

3.1 explore the possibility of extending the present allocations of international call-sign series by lifting the limitation on use of the letter "Q" and the digits "0" and "1";

3.2 issue a circular-letter:

3.2.1 explaining the position;

3.2.2 urging administrations to send in their proposals for possible solutions;

4 that, from the information thus submitted, the Director of the Radiocommunication Bureau shall prepare a report, together with his comments and suggestions, for submission to the next competent world radiocommunication conference.

RESOLUTION 15 (REV.WRC-03)

International cooperation and technical assistance in the field of space radiocommunications

The World Radiocommunication Conference (Geneva, 2003),

considering

a) that a large number of Member States are not in a position to take immediate advantage of satellite techniques for the development of their telecommunication services;

b) that such Member States would benefit immensely through the technical assistance programmes sponsored by the Union,

recognizing

a) that international satellite-communication systems are subject to the Convention and Regulations of the Union and that they permit participation of all countries including, in particular, the developing countries, in space communication systems;

b) that a number of problems need to be solved in order that the developing countries may participate effectively in international space communication systems and integrate these systems with their national telecommunication networks,

resolves to instruct the Director of the Radiocommunication Bureau

to include this activity in the Operational Plan, within existing budgetary resources of the Sector,

invites the Council

1 to draw the attention of administrations to the means by which they may avail themselves of technical assistance in connection with the introduction of space communications;

2 to consider the most effective manner in which requests for such assistance by Member States may be formulated and presented in order to secure maximum financial and other assistance, including the allocation of the funds in the regular budget of ITU for implementing this Resolution, preferably within the budget of the Sector identified for the implementation of this Resolution;

3 to consider how best to make use of funds made available by the United Nations in accordance with its Resolution 1721 to give technical and other assistance to administrations of Member States to make effective use of space communications;

4 to consider in what way the work of the ITU-T, ITU-R and ITU-D and other organs of the Union may be utilized in the most effective way for the information and assistance of administrations of Member States in the development of space radiocommunications.

RESOLUTION 18 (REV.WRC-15)

Relating to the procedure for identifying and announcing the position of ships and aircraft of States not parties to an armed conflict

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that ships and aircraft encounter considerable risk in the vicinity of an area of armed conflict;

b) that for the safety of life and property it is desirable for ships and aircraft of States not parties to an armed conflict to be able to identify themselves and announce their position in such circumstances;

c) that radiocommunication offers such ships and aircraft a rapid means of self-identification and providing location information prior to their entering areas of armed conflict and during their passage through the areas;

d) that it is considered desirable to provide a supplementary signal and procedure for use, in accordance with customary practice, in the area of armed conflict by ships and aircraft of States representing themselves as not parties to an armed conflict,

noting

that Recommendations ITU-R M.493 and ITU-R M.1371 may include appropriate signals for the digital selective-calling systems and automatic identification systems in the maritime mobile service,

resolves

1 that the frequencies for urgency signal and messages specified in the Radio Regulations may be used by ships and aircraft of States not parties to an armed conflict for self-identification and establishing communications; the transmission will consist of the urgency or safety signals, as appropriate, described in Article **33** followed by the addition of the single word "NEUTRAL" pronounced as in French "neutral" in radiotelephony and, if available on board ships and aircraft, by the addition of the single group "NNN" in radiotelegraphy; as soon as practicable, communications shall be transferred to an appropriate working frequency;

2 that the use of the signal as described in the preceding paragraph indicates that the message which follows concerns a ship or aircraft of a State not party to an armed conflict. The message shall convey at least the following data:

a) call sign or other recognized means of identification of such ship or aircraft;

b) position of such ship or aircraft;

c) number and type of such ships or aircraft;

d) intended route;

e) estimated time en route and of departure and arrival, as appropriate;

f) any other information, such as flight altitude, radio frequencies guarded, languages and secondary surveillance radar modes and codes;

3 that the provisions of Article **33** relating to urgency and safety transmissions, and medical transports shall apply as appropriate to the use of the urgency and safety signals, respectively, by such ship or aircraft;

4 that the identification and location of ships of a State not party to an armed conflict may be effected by means of appropriate standard maritime radio equipment (for example automatic identification system (AIS) or long-range identification and tracking (LRIT)); the identification and location of aircraft of a State not party to an armed conflict may be effected by the use of the secondary surveillance radar (SSR) system in accordance with procedures to be recommended by the International Civil Aviation Organization (ICAO);

5 that the use of the signals described above would not confer or imply recognition of any rights or duties of a State not party to an armed conflict or a party to the conflict, except as may be recognized by common agreement between the parties to the conflict and a non-party;

6 to encourage parties to a conflict to enter into such agreements,

requests the Secretary-General

to communicate the contents of this Resolution to the International Maritime Organization, the International Civil Aviation Organization, the International Committee of the Red Cross, and the International Federation of Red Cross and Red Crescent Societies for such action as they may consider appropriate.

RESOLUTION 20 (REV.WRC-03)

Technical cooperation with developing countries in the field of aeronautical telecommunications

The World Radiocommunication Conference (Geneva, 2003),

considering

a) that the allocations of the frequency bands and the provisions concerning various aeronautical mobile services have been revised several times by recent conferences;

b) that some of these frequency bands and provisions support the worldwide implementation of new aeronautical telecommunication systems;

c) that on the other hand, some of these frequency bands and provisions support existing aeronautical systems that may be affected by the revision;

d) that, as a consequence of *a), b)* and *c),* technological modernization will be necessary in order to maintain and improve the safety and regularity of international civil aviation, the accuracy and security of aeronautical radionavigation and the efficiency of distress and rescue systems;

e) that the developing countries may require assistance in improving the training of technical staff, as well as in introducing new systems, in coping with technological modernization and enhancing the operation of aeronautical telecommunications,

recognizing

a) the value of the assistance which, in conjunction with other international organizations, the Union has provided and may continue to provide to developing countries in the field of telecommunications;

b) that the original version of Resolution **20 (Mob-87)** established a good basis for the technical cooperation with developing countries in the field of aeronautical telecommunications that has been undertaken by the International Civil Aviation Organization (ICAO),

resolves to instruct the Secretary-General

1 to encourage ICAO to continue its assistance to developing countries which are endeavouring to improve their aeronautical telecommunications, in particular by providing them with technical advice for the planning, establishment, operation and maintenance of equipment, as well as help with the training of staff, essentially in matters relating to the new technologies;

2 for this purpose, to seek the continued collaboration of ICAO, the United Nations Conference for Trade and Development (UNCTAD) and other specialized agencies of the United Nations, as appropriate;

3 to continue to give special attention to seeking the aid of the United Nations Development Programme (UNDP) and other sources of financial support, to enable the Union to render sufficient and effective technical assistance in the field of aeronautical telecommunications,

invites the developing countries

so far as possible, to give a high level of priority to and include in their national programmes of requests for technical assistance projects relating to aeronautical telecommunications and to support multinational projects in that field.

RESOLUTION 25 (REV.WRC-03)

Operation of global satellite systems for personal communications

The World Radiocommunication Conference (Geneva, 2003),

considering

a) that, in accordance with No. 6 of its Constitution (Geneva, 1992), one of the purposes of the Union is "to promote the extension of the benefits of the new telecommunication technologies to all the world's inhabitants";

b) that, to this end, the Union is fostering the use of new technologies in telecommunications and is studying questions relating to this use in the Radiocommunication and the Telecommunication Standardization Sectors;

c) that the Telecommunication Development Sector is studying questions aimed at identifying the benefits that developing countries may derive from using new technologies;

d) that, among these new technologies, some constellations of non-geostationary satellites may provide global coverage and facilitate low-cost communications;

e) that the theme "global mobile personal communications by satellite" (GMPCS) was discussed at the first World Telecommunication Policy Forum established by Resolution 2 (Kyoto, 1994) of the Plenipotentiary Conference;

f) that Council Resolution 1116 instructs the Secretary-General to act as depositary of the GMPCS Memorandum of Understanding (MoU) and its Arrangements, to act as the registry for type-approval procedures and terminal types and to authorize the use of the abbreviation "ITU" as part of the GMPCS-MoU mark;

g) Recommendations ITU-R M.1343 and ITU-R M.1480 on the essential technical requirements of GMPCS earth stations that should be used by administrations as a common technical basis facilitating the global circulation and use of such GMPCS terminals in conformity with these Recommendations,

recognizing

a) that the spectrum available to global satellite systems for personal communications is limited;

b) that successful coordination does not in any way imply licensing authorization to provide a service within the territory of a Member State,

considering further

that other countries intending to use these systems should be guaranteed that they will be operated in accordance with the Constitution, the Convention and the Administrative Regulations,

noting

a) that the Constitution recognizes the sovereign right of each State to regulate its telecommunications;

b) that the International Telecommunication Regulations "recognize the right of any Member, subject to national law and should it decide to do so, to require that administrations and private operating agencies, which operate in its territory and provide an international telecommunication service to the public, be authorized by that Member", and specifies that "within the framework of the present Regulations, the provision and operation of international telecommunication services in each relation is pursuant to mutual agreement between administrations";

c) that Article **18** specifies the authorities for licensing the operation of stations within any given territory;

d) the right of each Member State to decide on its participation in these systems, and the obligations for entities and organizations providing international or national telecommunication services by means of these systems to comply with the legal, financial and regulatory requirements of the administrations in whose territory these services are authorized,

resolves

that administrations licensing global satellite systems and stations intended to provide public personal communications by means of fixed, mobile or transportable terminals shall ensure, when licensing these systems and stations, that they can be operated only from the territory or territories of administrations having authorized such service and stations in compliance with Articles **17** and **18**, in particular No. **18.1**,

requests administrations

1 to continue cooperating with worldwide satellite system operators in improving the established arrangements for the provision of service within their territories and with the Secretary-General in implementing the GMPCS-MoU and its Arrangements;

2 to participate actively in ITU-R studies in developing and improving relevant Recommendations,

reminds operators of such systems

to take account, when contracting agreements on the operation of their systems from the territory of a country, of any potential loss of revenue that the country may suffer from a possible reduction of its international traffic existing at the time such agreements are executed.

RESOLUTION 26 (REV.WRC-07)

Footnotes to the Table of Frequency Allocations in Article 5 of the Radio Regulations

The World Radiocommunication Conference (Geneva, 2007),

considering

a) that footnotes are an integral part of the Table of Frequency Allocations in the Radio Regulations and, as such, form part of an international treaty text;

b) that footnotes to the Table of Frequency Allocations should be clear, concise and easy to understand;

c) that footnotes should relate directly to matters of frequency allocation;

d) that, in order to ensure that footnotes allow modification of the Table of Frequency Allocations without introducing unnecessary complications, principles relating to the use of footnotes are needed;

e) that, currently, footnotes are adopted by competent world radiocommunication conferences and any addition, modification or deletion of a footnote is considered and adopted by the competent conference;

f) that some problems concerning country footnotes may be resolved through the application of a special agreement envisaged by Article **6**;

g) that, in certain cases, administrations are confronted with major difficulties due to inconsistencies or omissions in footnotes;

h) that, in order to keep the footnotes to the Table of Frequency Allocations up to date, there should be clear and effective guidelines for additions, modifications and deletions of footnotes,

resolves

1 that, wherever possible, footnotes to the Table of Frequency Allocations should be confined to altering, limiting or otherwise changing the relevant allocations rather than dealing with the operation of stations, assignment of frequencies or other matters;

2 that the Table of Frequency Allocations should include only those footnotes which have international implications for the use of the radio-frequency spectrum;

3 that new footnotes to the Table of Frequency Allocations should only be adopted in order to:

a) achieve flexibility in the Table of Frequency Allocations;

b) protect the relevant allocations in the body of the Table and in other footnotes in accordance with Section II of Article **5**;

c) introduce either transitional or permanent restrictions on a new service to achieve compatibility; or

d) meet the specific requirements of a country or area when it is impracticable to satisfy such needs otherwise within the Table of Frequency Allocations;

4 that footnotes serving a common purpose should be in a common format, and, where possible, be grouped into a single footnote with appropriate references to the relevant frequency bands,

further resolves

1 that any addition of a new footnote or modification of an existing footnote should be considered by a world radiocommunication conference only when:

a) the agenda of that conference explicitly includes the frequency band to which the proposed additional or modified footnote relates; or

b) the frequency bands to which the desired additions or modifications of the footnote belong are considered during the conference and the conference decides to make a change in those bands; or

c) the addition or modification of footnotes is specifically included in the agenda of the conference as a result of the consideration of proposals submitted by one or more interested administration(s);

2 that recommended agendas for future world radiocommunication conferences should include a standing agenda item which would allow for the consideration of proposals by administrations for deletion of country footnotes, or country names in footnotes, if no longer required;

3 that in cases not covered by *further resolves* 1 and 2, proposals for new footnotes or modification of existing footnotes could exceptionally be considered by a world radiocommunication conference if they concern corrections of obvious omissions, inconsistencies, ambiguities or editorial errors and have been submitted to ITU as stipulated in No. 40 of the General Rules of Conferences, Assemblies and Meetings of the Union (Antalya, 2006),

urges administrations

1 to review footnotes periodically and to propose the deletion of their country footnotes or of their country names from footnotes, as appropriate;

2 to take account of the *further resolves* above in making proposals to world radiocommunication conferences.

RESOLUTION 27 (REV.WRC-12)

Use of incorporation by reference in the Radio Regulations

The World Radiocommunication Conference (Geneva, 2012),

considering

a) that the principles of incorporation by reference were adopted by WRC-95 and revised by subsequent conferences (see Annexes 1 and 2 to this Resolution);

b) that there are provisions in the Radio Regulations containing references which fail to distinguish adequately whether the status of the referenced text is mandatory or non-mandatory,

noting

that references to Resolutions or Recommendations of a world radiocommunication conference (WRC) require no special procedures, and are acceptable for consideration, since such texts will have been agreed by a WRC,

resolves

1 that for the purposes of the Radio Regulations, the term "incorporation by reference" shall only apply to those references intended to be mandatory;

2 that when considering the introduction of new cases of incorporation by reference, such incorporation shall be kept to a minimum and made by applying the following criteria:

– only texts which are relevant to a specific WRC agenda item may be considered;

– the correct method of reference shall be determined on the basis of the principles set out in Annex 1 to this Resolution;

– the guidance contained in Annex 2 to this Resolution shall be applied in order to ensure that the correct method of reference for the intended purpose is employed;

3 that the procedure described in Annex 3 to this Resolution shall be applied for approving the incorporation by reference of ITU-R Recommendations or parts thereof;

4 that existing references to ITU-R Recommendations shall be reviewed to clarify whether the reference is mandatory or non-mandatory in accordance with Annex 2 to this Resolution;

5 that ITU-R Recommendations, or parts thereof, incorporated by reference at the conclusion of each WRC, and a cross-reference list of the regulatory provisions, including footnotes and Resolutions, incorporating such ITU-R Recommendations by reference, shall be collated and published in a volume of the Radio Regulations (see Annex 3 to this Resolution),

instructs the Director of the Radiocommunication Bureau

1 to bring this Resolution to the attention of the Radiocommunication Assembly and the ITU-R Study Groups;

2 to identify the provisions and footnotes of the Radio Regulations containing references to ITU-R Recommendations and make suggestions on any further action to the second session of the Conference Preparatory Meeting (CPM) for its consideration, as well as for inclusion in the Director's Report to the next WRC;

3 to identify the provisions and footnotes of the Radio Regulations containing references to WRC Resolutions that contain references to ITU-R Recommendations, and make suggestions on any further action to the second session of the Conference Preparatory Meeting (CPM) for its consideration, as well as for inclusion in the Director's Report to the next WRC,

invites administrations

to submit proposals to future conferences, taking into account the CPM Report, in order to clarify the status of references, where ambiguities remain regarding the mandatory or non-mandatory status of the references in question, with a view to amending those references:

i) that appear to be of a mandatory nature, identifying such references as being incorporated by reference by using clear linking language in accordance with Annex 2;

ii) that are of a non-mandatory character, so as to refer to "the most recent version" of the Recommendations.

ANNEX 1 TO RESOLUTION 27 (REV.WRC-12)

Principles of incorporation by reference

1 For the purposes of the Radio Regulations, the term "incorporation by reference" shall apply only to those references intended to be mandatory.

2 Where the relevant texts are brief, the referenced material should be placed in the body of the Radio Regulations rather than using incorporation by reference.

3 Where a mandatory reference to an ITU-R Recommendation, or parts thereof, is included in the *resolves* of a WRC Resolution, which is itself cited in a provision or footnote of the Radio Regulations using mandatory language (i.e. "shall"), that ITU-R Recommendation or parts thereof shall also be considered as incorporated by reference.

4 Texts which are of a non-mandatory nature or which refer to other texts of a non-mandatory nature shall not be considered for incorporation by reference.

5 If, on a case-by-case basis, it is decided to incorporate material by reference on a mandatory basis, then the following provisions shall apply:

5.1 the text incorporated by reference shall have the same treaty status as the Radio Regulations themselves;

5.2 the reference must be explicit, specifying the specific part of the text (if appropriate) and the version or issue number;

5.3 the text incorporated by reference must be submitted for adoption by a competent WRC in accordance with *resolves* 3;

5.4 all texts incorporated by reference shall be published following a WRC, in accordance with *resolves* 5.

6 If, between WRCs, a text incorporated by reference (e.g. an ITU-R Recommendation) is updated, the reference in the Radio Regulations shall continue to apply to the earlier version incorporated by reference until such time as a competent WRC agrees to incorporate the new version. The mechanism for considering such a step is given in Resolution **28 (Rev.WRC-03)**[*].

ANNEX 2 TO RESOLUTION 27 (REV.WRC-12)

Application of incorporation by reference

When introducing new cases of incorporation by reference in the provisions of the Radio Regulations or reviewing existing cases of incorporation by reference, administrations and ITU-R should address the following factors in order to ensure that the correct method of reference is employed for the intended purpose, according to whether each reference is mandatory (i.e. incorporated by reference), or non-mandatory:

Mandatory references

1 mandatory references shall use clear linking language, i.e. "shall";

2 mandatory references shall be explicitly and specifically identified, e.g. "Recommendation ITU-R M.541-8";

3 if the intended reference material is, as a whole, unsuitable as treaty-status text, the reference shall be limited to just those portions of the material in question which are of a suitable nature, e.g. "Annex A to Recommendation ITU-R Z.123-4".

Non-mandatory references

4 Non-mandatory references or ambiguous references that are determined to be of a non-mandatory character (i.e. not incorporated by reference) shall use appropriate language, such as "should" or "may". This appropriate language may refer to "the most recent version" of a Recommendation. Any appropriate language may be changed at any future WRC.

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[*] *Note by the Secretariat:* This Resolution was revised by WRC-15.

ANNEX 3 TO RESOLUTION 27 (REV.WRC-12)

Procedures applicable by WRC for approving the incorporation by reference of ITU-R Recommendations or parts thereof

The referenced texts shall be made available to delegations in sufficient time for all administrations to consult them in the ITU languages. A single copy of the texts shall be made available to each administration as a conference document.

During the course of each WRC, a list of the texts incorporated by reference, and a cross-reference list of the regulatory provisions, including footnotes and Resolutions, incorporating such ITU-R Recommendations by reference, shall be developed and maintained by the committees. These lists shall be published as a conference document in line with developments during the conference.

Following the end of each WRC, the Bureau and General Secretariat will update the volume of the Radio Regulations which serves as the repository of texts incorporated by reference in line with developments at the conference as recorded in the above-mentioned document.

RESOLUTION 28 (REV.WRC-15)

Revision of references to the text of ITU-R Recommendations incorporated by reference in the Radio Regulations

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that the Voluntary Group of Experts (VGE) on simplification of the Radio Regulations proposed the transfer of certain texts of the Radio Regulations to other documents, especially to ITU-R Recommendations, using the incorporation by reference procedure;

b) that, in some cases, the provisions of the Radio Regulations imply an obligation on Member States to conform to the criteria or specifications incorporated by reference;

c) that references to incorporated texts shall be explicit and shall refer to a precisely identified provision (see Resolution **27 (Rev.WRC-12)**);

d) that all texts of ITU-R Recommendations incorporated by reference are published in a volume of the Radio Regulations;

e) that, taking into account the rapid evolution of technology, ITU-R may revise the ITU-R Recommendations containing text incorporated by reference at short intervals;

f) that, following revision of an ITU-R Recommendation containing text incorporated by reference, the reference in the Radio Regulations shall continue to apply to the earlier version until such time as a competent world radiocommunication conference (WRC) agrees to incorporate the new version;

g) that it would be desirable that texts incorporated by reference reflect the most recent technical developments,

noting

that administrations need sufficient time to examine the potential consequences of changes to ITU-R Recommendations containing text incorporated by reference and would therefore benefit greatly from being advised, as early as possible, of which ITU-R Recommendations have been revised and approved during the elapsed study period or at the Radiocommunication Assembly preceding the WRC,

resolves

1 that each radiocommunication assembly shall communicate to the following WRC a list of the ITU-R Recommendations containing text incorporated by reference in the Radio Regulations which have been revised and approved during the elapsed study period;

2 that, on this basis, WRC should examine those revised ITU-R Recommendations, and decide whether or not to update the corresponding references in the Radio Regulations;

3 that, if the WRC decides not to update the corresponding references, the currently referenced version shall be maintained in the Radio Regulations;

4 that WRCs shall place the examination of ITU-R Recommendations in conformity with *resolves* 1 and *resolves* 2 of this Resolution on the agenda of future WRCs,

instructs the Director of the Radiocommunication Bureau

to provide the CPM immediately preceding each WRC with a list, for inclusion in the CPM Report, of those ITU-R Recommendations containing texts incorporated by reference that have been revised or approved since the previous WRC, or that may be revised in time for the following WRC,

urges administrations

1 to participate actively in the work of the radiocommunication study groups and the radiocommunication assembly on revision of those Recommendations to which mandatory references are made in the Radio Regulations;

2 to examine any indicated revisions of ITU-R Recommendations containing text incorporated by reference and to prepare proposals on possible updating of relevant references in the Radio Regulations.

RESOLUTION 31 (WRC-15)

Transitional measures for the elimination of advance publication filings by administrations for frequency assignments to satellite networks and systems subject to Section II of Article 9

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that this conference has modified the advance publication procedure for satellite networks or systems subject to the coordination procedures in Section II of Article **9**;

b) that there are a number of changes to Articles **9** and **11** of the Radio Regulations that are consequential to the decisions of this conference referred to in *considering a)*;

c) that pursuant to Article **59**, as modified by this conference, the date of entry into force of the regulatory provisions referenced in *considering b)* above is 1 January 2017;

d) that a transitional arrangement is needed to address the treatment of advance publication information for a satellite network or system subject to the coordination procedures in Section II of Article **9** that is not associated with a coordination request on the date the regulatory provisions referenced in *considering b)* above enter into force,

resolves

1 that from 1 July 2016, No. **9.1** shall cease to be applied to satellite networks or systems subject to the coordination procedures in Section II of Article **9**;

2 that any advance publication information for a satellite network or system subject to the coordination procedures in Section II of Article **9** for which a coordination request has not been received by the Bureau under No. **9.30** up to 31 December 2016 shall be suppressed by the Bureau and no longer taken into account,

instructs the Radiocommunication Bureau

to take the necessary actions to implement *resolves* 1 and 2 above.

RESOLUTION 33 (REV.WRC-15)

Bringing into use of space stations in the broadcasting-satellite service, prior to the entry into force of agreements and associated plans for the broadcasting-satellite service

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that while Resolution **507 (Rev.WRC-15)** envisages plans for the broadcasting-satellite service (BSS), some administrations might nevertheless feel the need to bring stations in that service into use prior to such plans being established;

b) that administrations should, as far as possible, avoid proliferation of space stations in the BSS before such plans have been established;

c) that a space station in the BSS may cause harmful interference to terrestrial stations operating in the same frequency band, even if the latter are outside the service area of the space station;

d) that the procedures specified in Articles **9** to **14** and Appendix **5** contain provisions for coordination between stations in the BSS and terrestrial stations, between space systems in that service and space systems of other administrations;

e) that there are many existing and planned stations in the BSS not subject to agreements and associated plans that have submitted advance publication information (API) or a request for coordination under the existing Resolution **33** procedures and that some administrations are currently in coordination under these procedures,

resolves

1 that, except in those cases where agreements and associated plans for the BSS have been established and have entered into force, for satellite networks for which the API has been received following 1 January 1999, only the procedures of Articles **9** to **14**[*] shall be applied for the coordination and notification of stations in the BSS and coordination and notification of other services in respect of that service;

2 that, except in those cases where agreements and associated plans for the BSS have been established and have entered into force, for satellite networks for which the API has been received by the Radiocommunication Bureau prior to 1 January 1999, only the procedure in Sections A to C in this Resolution shall be applied;

3 that a future conference review the requirement for the procedures in this Resolution.

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[*] Or procedures contained in other provisions of these Regulations when they replace any of those in Articles **9** to **14** for the broadcasting-satellite service.

Section A − Coordination procedure between space stations in the broadcasting-satellite service and terrestrial stations

2.1 Before an administration notifies to the Bureau or brings into use any frequency assignment to a space station in the BSS in a frequency band where this frequency band is allocated, with equal rights, to the BSS and to a terrestrial radiocommunication service, either in the same Region or sub-Region or in different Regions or sub-Regions, it shall coordinate the use of this assignment with any other administration whose terrestrial radiocommunication services may be affected. For this purpose, it shall inform the Bureau of all the technical characteristics of the station, as listed in the relevant sections of Appendix **4**, which are necessary to assess the risk of interference to a terrestrial radiocommunication service[1].

2.2 The Bureau shall publish this information in a Special Section of its International Frequency Information Circular (BR IFIC) and shall also, when the BR IFIC contains such information, so advise all administrations by circular telegram.

2.3 Any administration which considers that its terrestrial radiocommunication services may be affected shall forward its comments to the administration seeking coordination and, in any case, to the Bureau. These comments must be forwarded within four months from the date of the relevant BR IFIC. It shall be deemed that any administration which has not forwarded comments within that period considers that its terrestrial radiocommunication services are unlikely to be affected.

2.4 Any administration which has forwarded comments on the projected station shall either give its agreement, with a copy to the Bureau, or, if this is not possible, send to the administration seeking coordination all the data on which its comments are based as well as any suggestions it may be able to offer with a view to a satisfactory solution of the problem.

2.5 The administration which plans to bring into use a space station in the BSS as well as any other administration which believes that its terrestrial radiocommunication services are likely to be affected by the station in question may request the assistance of the Bureau at any time during the coordination procedure.

2.6 In the event of continuing disagreement between an administration seeking to effect coordination and one with which coordination has been sought, the administration seeking coordination shall, except in the cases where the assistance of the Bureau has been requested, defer the submission of its notice concerning the proposed assignment by six months from the date of publication of the information according to § 2.2.

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[1] The calculation methods and the interference criteria to be employed in evaluating the interference should be based upon relevant ITU-R Recommendations agreed by the administrations concerned either as a result of Resolution **703 (Rev.WRC-07)** or otherwise. In the event of disagreement on an ITU-R Recommendation or in the absence of such Recommendations, the methods and criteria shall be agreed between the administrations concerned. Such agreements shall be concluded without prejudice to other administrations.

Section B − Coordination procedure between space stations in the BSS and space systems of other administrations

3 An administration intending to bring into use a space station in the BSS shall, for the purpose of coordination with space systems of other administrations, apply the following provisions of Article **11** of the Radio Regulations (edition of 1990, revised in 1994):

3.1 Nos. **1041** to **1058** inclusive.

3.2.1 Nos. **1060** to **1065**[2].

3.2.2 No coordination under § 3.2.1 is required when an administration proposes to change the characteristics of an existing assignment in such a way as not to increase the probability of harmful interference to stations in the space radiocommunication service of other administrations.

3.2.3 Nos. **1074** to **1105** inclusive.

Section C − Notification, examination and recording in the Master Register of assignments to space stations in the BSS dealt with under this Resolution

4.1 Any frequency assignment[3] to a space station in the BSS shall be notified to the Bureau. The notifying administration shall apply for this purpose the provisions of Nos. **1495** to **1497** of the Radio Regulations (edition of 1990, revised in 1994).

4.2 Notices made under § 4.1 shall initially be treated in accordance with No. **1498** of the Radio Regulations (edition of 1990, revised in 1994).

5.1 The Bureau shall examine each notice with respect to:

5.2 *a)* its conformity with the Convention, the Table of Frequency Allocations and the other provisions of the Radio Regulations, with the exception of those relating to the coordination procedures and to the probability of harmful interference, which are the subject of § 5.3, 5.4, and 5.5;

5.3 *b)* its conformity, where applicable, with the provisions of § 2.1 of Section A above, relating to coordination of the use of the frequency assignment with the other administrations concerned;

5.4 *c)* its conformity, where applicable, with the provisions of § 3.2.1 of Section B above, relating to coordination of the use of the frequency assignment with the other administrations concerned;

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2 See footnote 1.

3 The expression *frequency assignment*, wherever it appears in this Resolution, shall be understood to refer either to a new frequency assignment or to a change in an assignment already recorded in the Master International Frequency Register (hereinafter called the *Master Register*).

5.5 *d)* where appropriate, the probability of harmful interference to the service rendered by a station in a space or terrestrial radiocommunication service for which a frequency assignment has already been recorded in the Master Register in conformity with the provisions of No. **1240** or **1503** of the Radio Regulations (edition of 1990, revised in 1994), or No. **11.31**, as appropriate, if that assignment has not, in fact, caused harmful interference to the service rendered by a station for which an assignment has been previously recorded in the Master Register and which itself is in conformity with No. **1240** or **1503** of the Radio Regulations (edition of 1990, revised in 1994), or No. **11.31**, as appropriate.

6.1 Depending upon the findings of the Bureau subsequent to the examination prescribed in § 5.2, 5.3, 5.4 and 5.5, further action shall be as follows:

6.2 Where the Bureau reaches an unfavourable finding with respect to § 5.2, the notice shall be returned immediately by airmail to the notifying administration with the reasons of the Bureau for this finding together with such suggestions as the Bureau is able to offer with a view to a satisfactory solution of the problem.

6.3 Where the Bureau reaches a favourable finding with respect to § 5.2, or where it reaches the same finding after resubmission of the notice, it shall examine the notice with respect to the provisions of § 5.3 and 5.4.

6.4 Where the Bureau finds that the coordination procedures mentioned in § 5.3 and 5.4 have been successfully completed with all administrations whose services may be affected, the assignment shall be recorded in the Master Register. The date of receipt by the Bureau of the notice shall be entered in Column 2d of the Master Register with an entry in the Remarks Column indicating that such recording does not prejudge in any way the decisions to be included in the agreements and associated plans referred to in Resolution **507 (Rev.WRC-15)**.

6.5 Where the Bureau finds that the coordination procedures mentioned in § 5.3 or 5.4 have not, as appropriate, been applied or have been unsuccessfully applied, the notice shall be returned immediately by airmail to the notifying administration with the reason for its return together with such suggestions as the Bureau is able to offer with a view to a satisfactory solution of the problem.

6.6 Where the notifying administration resubmits the notice and states that it has been unsuccessful in endeavouring to effect the coordination, the notice shall be examined by the Bureau with respect to § 5.5.

6.7 Where the notifying administration resubmits the notice and the Bureau finds that the coordination procedures have been successfully completed with all administrations whose services may be affected, the assignment shall be treated as indicated in § 6.4.

6.8 Where the Bureau reaches a favourable finding with respect to § 5.5, the assignment shall be recorded in the Master Register. The appropriate symbol indicating the finding by the Bureau shall indicate that the coordination procedures, as appropriate, referred to in § 2.1 or 3.2.1 were not successfully completed. The date of receipt by the Bureau of the notice shall be entered in Column 2d of the Master Register, with the remark mentioned in § 6.4.

6.9 Where the Bureau reaches an unfavourable finding with respect to § 5.5, the notice shall be returned immediately by airmail to the notifying administration with the reasons for the Bureau's finding together with such suggestions as the Bureau is able to offer with a view to a satisfactory solution of the problem.

6.10 If the administration resubmits the notice unchanged with the insistence that it be reconsidered, but should the Bureau's unfavourable finding under § 5.5 remain unchanged, the assignment shall be recorded in the Master Register. However, this entry shall be made only if the notifying administration informs the Bureau that the assignment has been in use for at least four months without any complaint of harmful interference having been received. The date of receipt by the Bureau of the original notice shall be entered in Column 2d of the Master Register, with the remark mentioned in § 6.4. An appropriate remark shall be placed in Column 13 to indicate that the assignment is not in conformity with the provisions of § 5.3, 5.4 or 5.5, as appropriate. In the event that the administration concerned receives no complaint of harmful interference concerning the operation of the station in question for a period of one year from the commencement of operation, the Bureau shall review its finding.

6.11 If harmful interference is actually caused to the reception of any space station in the BSS whose frequency assignment has been recorded in the Master Register as a result of a favourable finding with respect to § 5.2, 5.3, 5.4 and 5.5 of this Resolution, as appropriate, by the use of a frequency assignment to a space station which has been subsequently recorded in the Master Register in accordance with the provisions of § 6.10 of this Resolution or of No. **1544** of the Radio Regulations (edition of 1990, revised in 1994), or No. **11.41**, as appropriate, the station using the latter frequency assignment must, upon receipt of advice thereof, immediately eliminate this harmful interference.

6.12 If harmful interference is actually caused to the reception of any space radiocommunication station using an assignment recorded in the Master Register as a result of a favourable finding with respect to Nos. **1503** to **1512** of the Radio Regulations (edition of 1990, revised in 1994), or Nos. **11.31** to **11.34**, as appropriate, by the use of an assignment to a space station in the BSS which has been subsequently recorded in the Master Register in accordance with the provisions of § 6.10 of this Resolution, the station using the latter assignment must, on receipt of advice thereof, immediately eliminate this harmful interference.

6.13 If harmful interference is actually caused to the reception of any terrestrial station using an assignment recorded in the Master Register as a result of a favourable finding with respect to No. **1240** of the Radio Regulations (edition of 1990, revised in 1994), or No. **11.31**, as appropriate, by the use of an assignment to a space station in the BSS which has been subsequently recorded in the Master Register in accordance with the provisions of § 6.10 of this Resolution, the station, using the latter assignment must, on receipt of advice thereof, immediately eliminate this harmful interference.

6.14 If harmful interference to the reception of any station whose assignment is in accordance with § 5.2 of this Resolution is actually caused by the use of a frequency assignment which is not in conformity with No. **1240**, **1352** or **1503** of the Radio Regulations (edition of 1990, revised in 1994), or No. **11.31**, as appropriate, the station using the latter frequency assignment must, upon receipt of advice thereof, immediately eliminate this harmful interference.

RESOLUTION 34 (REV.WRC-15)

Establishment of the broadcasting-satellite service in Region 3 in the 12.5-12.75 GHz frequency band and sharing with space and terrestrial services in Regions 1, 2 and 3

The World Radiocommunication Conference (Geneva, 2015),

considering

that the World Administrative Conference (Geneva, 1979) has allocated the frequency band 12.5-12.75 GHz to the broadcasting-satellite service for community reception in Region 3,

recognizing

that under Resolution **507 (Rev.WRC-15)** the Council may wish to empower a future competent radiocommunication conference to establish a plan for the broadcasting-satellite service in the frequency band 12.5-12.75 GHz in Region 3,

resolves

1 that, until such time as a plan may be established for the broadcasting-satellite service in the frequency band 12.5-12.75 GHz in Region 3, the relevant provisions of Sections A and B of Resolution **33 (Rev.WRC-15)** or of Article **9**, as appropriate (see Resolution **33 (Rev.WRC-15)**) shall continue to apply to the coordination between stations in the broadcasting-satellite service in Region 3 and:

a) space stations in the broadcasting-satellite and fixed-satellite services in Regions 1, 2 and 3;

b) terrestrial stations in Regions 1, 2 and 3;

2 that the ITU-R shall study urgently the technical provisions which may be appropriate for the sharing between stations in the broadcasting-satellite service in Region 3 and:

a) space stations in the broadcasting-satellite and fixed-satellite services in Regions 1 and 2;

b) terrestrial stations in Regions 1 and 2;

3 that, until such time as technical provisions are developed by the ITU-R and accepted by administrations concerned under Resolution **703 (Rev.WRC-07)** the sharing between space stations in the broadcasting-satellite service in Region 3 and terrestrial services in Regions 1, 2 and 3 shall be based on the following criteria as appropriate:

a) the power flux-density at the Earth's surface, produced by emissions from a space station in the broadcasting-satellite service in Region 3 for all conditions and for all methods of modulation shall not exceed the limits given in Annex 5 of Appendix **30**;

b) in addition to *resolves* 3 *a)* above, the provisions of Article **21** (Table **21-4**) shall apply in the countries mentioned in Nos. **5.494** and **5.496**;

c) the limits given in *resolves* 3 *a)* and *b)* above may be exceeded on the territory of any country provided the administration of that country has so agreed.

RESOLUTION 40 (WRC-15)

Use of one space station to bring frequency assignments to geostationary-satellite networks at different orbital locations into use within a short period of time

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that the use of the same space station to bring frequency assignments to geostationary-satellite networks located at different orbital locations into use within a short period of time could lead to inefficient use of spectrum/orbit resources;

b) that there are legitimate reasons why a notifying administration may need to move a space station from one orbital position to a new orbital position, and this should not be constrained,

noting

a) that WRC-12 recognized that the issue of using one space station to bring frequency assignments at different orbital locations into use within a short period of time was not the intent for its adoption of Nos. **11.44**, **11.44.1**, **11.44B** and **11.49**;

b) that, with respect to cases where an administration brings into use frequency assignments at a given orbital location using an already in-orbit satellite, and pending completion of ITU Radiocommunication Sector studies, WRC-12 requested the Radiocommunication Bureau to make an enquiry to that administration as to the last previous orbital location/frequency assignments brought into use with that satellite and make such information available;

c) that the procedures of Article **14** are available to administrations in cases where information required under *resolves* below may not be available to the notifying administration,

recognizing

a) that administrations may bring into use or bring back into use a frequency assignment to a geostationary-satellite network using one of its own space stations or a space station under the responsibility of another administration;

b) that the absence of a geostationary space station capable of transmitting and receiving the frequency assignments at a notified orbital position, due to the relocation of an in-orbit satellite to a new orbital position, can lead to either the suspension or the cancellation of those frequency assignments in some cases,

resolves

1 that, when informing the Bureau of the bringing into use, or bringing back into use after suspension, of a frequency assignment to a space station in a geostationary-satellite network, the notifying administration shall indicate to the Bureau whether or not this action has been accomplished with a space station that has previously been used to bring into use, or resume the use of, frequency assignments at a different orbital location within the three years prior to the date of submission of this information;

2 that, in cases where a notifying administration informs the Bureau, pursuant to *resolves* 1 above, that it has brought into use, or resumed the use after suspension of, a frequency assignment to a space station in a geostationary-satellite network with a space station that has previously been used to bring into use, or resume the use of, frequency assignments at a different orbital location within three years prior to the date of submission of this information, the notifying administration shall also indicate, for that same three-year period:

i) the last orbital location where the space station was used to bring into use, or resume the use of, frequency assignments;

ii) the satellite network(s) with which the frequency assignments in 2i) above were associated;

iii) the date on which the space station was no longer maintained at the orbital location in 2i) above;

3 that, if the information is not provided by the notifying administration under *resolves* 1 and 2 above, as appropriate, the Bureau shall consult the notifying administration requesting the missing information;

4 that, if the notifying administration fails to provide the missing information within 30 days from the Bureau's request under *resolves* 3 above, the Bureau shall immediately send a reminder requesting the missing information;

5 that, as of 1 January 2018, if the notifying administration fails to provide the missing information within 15 days after the Bureau's reminder under *resolves* 4 above, the Bureau shall consider that the frequency assignments to the geostationary-satellite network have not been brought into use, or brought back into use, and shall so inform the notifying administration,

instructs the Radiocommunication Bureau

to make available the information provided in *resolves* 1 and 2 on the ITU website within 30 days of its receipt.

RESOLUTION 42 (REV.WRC-15)

Use of interim systems in Region 2 in the broadcasting-satellite and fixed-satellite (feeder-link) services in Region 2 for the frequency bands covered by Appendices 30 and 30A

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that the Regional Administrative Conference for the Planning of the Broadcasting-Satellite Service in Region 2, Geneva, 1983, prepared a Plan for the broadcasting-satellite service in the frequency band 12.2-12.7 GHz and a Plan for the associated feeder links in the frequency band 17.3-17.8 GHz with provisions for implementing interim systems in accordance with Resolution 2 (Sat-R2);

b) that in the implementation of their assignments in the Plans, administrations of Region 2 may find it more appropriate to adopt a phased approach and initially use characteristics different from those appearing in the appropriate Region 2 Plan;

c) that some administrations of Region 2 may cooperate in the joint development of a space system with a view to covering two or more service areas from the same orbital position or to using a beam which would encompass two or more service areas;

d) that some administrations of Region 2 may cooperate in the joint development of a space system with a view to covering two or more feeder-link service areas from the same orbital position or to using a beam which encompasses two or more feeder-link service areas;

e) that interim systems shall not adversely affect the Plans nor hamper the implementation and evolution of the Plans;

f) that the number of assignments to be used in an interim system shall not in any case exceed the number of assignments appearing in the Region 2 Plan which are to be suspended;

g) that the interim systems shall not in any case use orbital positions that are not in the Region 2 Plan;

h) that an interim system shall not be introduced without the agreement of all administrations whose space and terrestrial services are considered to be affected;

i) that WRC-2000 revised Regions 1 and 3 downlink and feeder-link Plans and established Lists together with regulatory procedures, protection criteria and calculation methods for sharing between services in the frequency bands of Appendices **30** and **30A**;

j) that WRC-03 modified the regulatory procedures, protection criteria and calculation methods for sharing between services in the frequency bands of Appendices **30** and **30A**,

resolves

that administrations and the Radiocommunication Bureau shall apply the procedure contained in the Annex to this Resolution, so long as Appendices **30** and **30A** remain in force.

ANNEX TO RESOLUTION 42 (REV.WRC-15)

1 An administration or a group of administrations in Region 2 may, after successful application of the procedure contained in this Annex and with the agreement of the affected administrations, use an interim system during a specified period not exceeding ten years in order:

1.1 For an interim system in the broadcasting-satellite service

a) to use an increased e.i.r.p. in any direction relative to that appearing in the Region 2 Plan provided that the power flux-density does not exceed the limits given in Annex 5 to Appendix **30**;

b) to use modulation characteristics[1] different from those appearing in the Annexes to the Region 2 Plan and resulting in an increased probability of harmful interference or in a wider assigned bandwidth;

c) to change the coverage area by displacing boresight, or by increasing the major or minor axis, or by rotating them from an orbital position which shall be one of the corresponding orbital positions appearing in the Region 2 Plan;

d) to use a coverage area appearing in the Region 2 Plan or a coverage area encompassing two or more coverage areas appearing in the Region 2 Plan from an orbital position which shall be one of the corresponding positions appearing in the Region 2 Plan;

e) to use a polarization different from that in the Region 2 Plan.

[1] For example, modulation with sound channels frequency-multiplexed within the bandwidth of a television channel, digital modulation of sound and television signals, or other pre-emphasis characteristics.

1.2 For an interim feeder-link system

a) to use an increased e.i.r.p. in any direction relative to that appearing in the Region 2 feeder-link Plan;

b) to use modulation characteristics[1] different from those appearing in the Annexes to the Plan and resulting in an increased probability of harmful interference or in a wider assigned bandwidth;

c) to change the feeder-link beam area by displacing the boresight, or by increasing the major or minor axis, or by rotating them in relation to an orbital position which shall be one of the corresponding orbital positions appearing in the Region 2 feeder-link Plan;

d) to use a feeder-link beam area appearing in the Region 2 feeder-link Plan or a feeder-link beam area encompassing two or more feeder-link beam areas appearing in the Region 2 feeder-link Plan in relation to an orbital position which shall be one of the corresponding orbital positions appearing in the Region 2 feeder-link Plan;

e) to use a polarization different from that in the Region 2 feeder-link Plan.

2 In all cases, an interim system shall correspond to assignments in the appropriate Region 2 Plan; the number of assignments to be used in an interim system shall not in any case exceed the number of assignments appearing in the Region 2 Plan which are to be suspended. During the use of an interim system, the use of the corresponding assignments in the Region 2 Plan is suspended; they shall not be brought into use before the cessation of the use of the interim system. However, the suspended assignments, but not the interim system's assignments, of an administration shall be taken into account when other administrations apply the procedure of Article 4 of Appendix **30** or of Article 4 of Appendix **30A**, as appropriate, in order to modify the Region 2 Plan or to include new or modified assignments in the Regions 1 and 3 List, or the procedure of this Annex in order to bring an interim system into use. The assignments of interim systems shall not be taken into account in applying the procedure of Article 6 or Article 7 of Appendix **30** and the procedure of Article 6 or Article 7 of Appendix **30A**.

3 As a specific consequence of § 2 above, Region 2 interim system assignments shall not obtain protection from, or cause harmful interference to, new or modified assignments appearing in the Regions 1 and 3 List following the successful application of the procedure of Article 4 of Appendix **30** or of Article 4 of Appendix **30A**, as appropriate, even if the assignment modification procedure is concluded and the assignments become operational within the time-limits specified in § 4 *a)*.

4 When an administration proposes to use an assignment in accordance with § 1, it shall communicate to the Bureau the information listed in Appendix **4** not earlier than eight years but, preferably, not later than two years before the date of bringing into use. An assignment shall lapse if it is not brought into use by that date. The administration shall also indicate:

a) the maximum specified period during which the interim assignment is intended to remain in use;

b) the assignments in the Region 2 Plans the use of which will remain suspended for the duration of the use of the corresponding interim assignment;

c) the names of the administrations with which an agreement for the use of the interim assignment has been reached, together with any comment relating to the period of use so agreed and the names of administrations with which an agreement may be required but has not yet been reached.

5 Administrations are considered to be affected as follows:

5.1 For an interim system in the broadcasting-satellite service

a) an administration of Region 2 is considered to be affected if any overall equivalent protection margin of one of its assignments in the Region 2 Plan, calculated in accordance with Annex 5 to Appendix **30** including the cumulative effect of all interim uses during the maximum specified period of use of the interim system, but excluding the corresponding suspended assignments (§ 4 *b)*), becomes negative or a former negative value is made more negative;

b) an administration of Region 1 or 3 is considered to be affected if it has an assignment which is in conformity with the Regions 1 and 3 Plan contained in Appendix **30** or with the List or in respect of which proposed new or modified assignments have been received by the Bureau in accordance with the provisions of Article 4 of that Appendix with a necessary bandwidth which falls within the necessary bandwidth of the proposed interim assignment and the appropriate limits of § 3 of Annex 1 to Appendix **30** are exceeded;

c) an administration of Region 1 or 3 is considered to be affected if it has a frequency assignment in the fixed-satellite service which is recorded in the Master Register or which has been coordinated or is being coordinated under the provisions of No. **9.7** or under Article 7 of Appendix **30** or which has been published in accordance with No. **9.2B** and the appropriate limits of § 6 of Annex 1 to Appendix **30** are exceeded;

d) an administration of Region 1 or 3 is considered to be affected if, although having no frequency assignment in the appropriate Regions 1 and 3 Plan or List in the channel concerned, it nevertheless would receive on its territory a power flux-density value which exceeds the limits given in § 4 of Annex 1 to Appendix **30** as a result of the proposed interim assignment, or if it has such an assignment for which its associated service area does not cover the whole of the territory of the administration, and in its territory outside that service area the power flux-density from the interim system space station exceeds the above-mentioned limits;

e) an administration of Region 2 is considered to be affected if, although having no frequency assignment in the appropriate Region 2 Plan in the channel concerned, it nevertheless would receive on its territory a power flux-density value which exceeds the limits given in § 4 of Annex 1 to Appendix **30** as a result of the proposed interim assignment, or if it has such an assignment for which its associated service area does not cover the whole of the territory of the administration, and in its territory outside that service area the power flux-density from the interim system space station exceeds the above-mentioned limits;

f) an administration of Region 3 is considered to be affected if it has a frequency assignment to a space station in the broadcasting-satellite service in the frequency band 12.5-12.7 GHz with a necessary bandwidth any portion of which falls within the necessary bandwidth of the proposed assignment, and which:

– is recorded in the Master Register; *or*

– has been coordinated or is being coordinated under the provisions of Sections A and B of Resolution **33 (Rev.WRC-15)** or under the provisions of Articles **9** to **14**, as appropriate (see Resolution **33 (Rev.WRC-15)**); *or*

– appears in a Region 3 Plan to be adopted at a future radiocommunication conference, taking account of modifications which may be introduced subsequently in accordance with the Final Acts of that conference,

and the limits of § 3, Annex 1 to Appendix **30** are exceeded.

5.2 For interim feeder-link systems

a) an administration of Region 2 is considered to be affected if any overall equivalent protection margin of one of its assignments in the Plan, calculated in accordance with Annex 3 to Appendix **30A** including the cumulative effect of all interim uses during the maximum specified period of use of the interim system, but excluding the corresponding suspended assignment(s) (§ 4 *b)*), becomes negative or a former negative value is made more negative;

b) an administration in Region 1 or 3 is considered to be affected if it has an assignment for feeder links in the fixed-satellite service (Earth-to-space), any portion of the necessary bandwidth of which falls within the necessary bandwidth of the proposed assignment, which is in conformity with the feeder-link Plan or List for Regions 1 and 3, or in respect of which proposed new or modified assignments in the List have already been received by the Bureau in accordance with the provisions of Article 4 of Appendix **30A** and for which the limits set out in § 5 of Annex 1 to Appendix **30A** are exceeded.

6 The Bureau shall publish in a Special Section of its International Frequency Information Circular (BR IFIC) the information received under § 4, together with the names of the administrations which the Bureau has identified in applying § 5.

7 When the Bureau finds that the suspended assignment of an administration having an interim system is not affected, it shall examine the projected interim system with respect to the interim system of that administration and if there is an incompatibility, it shall request the two administrations concerned to adopt any measures that may enable the new interim system to be operated.

8 The Bureau shall send a telegram to the administrations listed in the Special Section of the BR IFIC, drawing their attention to the information it contains and shall send them the results of its calculations.

9 Any administration not listed in the special section which considers that its planned interim assignment may be affected shall so inform the administration responsible for the interim system and the Bureau, and the two administrations shall endeavour to resolve the difficulty before the proposed date of bringing the interim assignment into use.

10 An administration which has not sent its comments either to the administration seeking agreement or to the Bureau within a period of four months following the date of the BR IFIC referred to in § 6 shall be understood as having agreed to the proposed interim use.

11 On the expiry of four months following the date of publication of the BR IFIC referred to in § 6, the Bureau shall review the matter, and, depending on the results obtained, shall inform the administration proposing the interim assignment that:

a) it may notify its proposed use under Article 5 of Appendix **30** or Article 5 of Appendix **30A**, as appropriate, if no agreement is required or the required agreement has been obtained from the administrations concerned. In this case the Bureau shall update the Interim List;

b) it may not bring into use its interim system before having obtained the agreement of the administrations affected, either directly or by applying the procedure described in Article 4 of Appendix **30** or Article 4 of Appendix **30A**, as appropriate, as a means of obtaining that agreement.

12 The Bureau shall include all the interim assignments in an Interim List in two parts, one each for the broadcasting-satellite service and the feeder-link assignments, and shall update it in accordance with this Annex. The Interim List shall be published together with the Region 2 Plans but does not constitute part of them.

13 One year prior to the expiry of the interim period, the Bureau shall draw the attention of the administration concerned to this fact and request it to notify in due time the deletion of the assignment from the Master Register and the Interim List.

14 If, notwithstanding the reminders by the Bureau, an administration does not reply to its request sent in application of § 13, the Bureau shall, at the termination of the interim period:

a) enter a symbol in the Remarks Column of the Master Register to indicate the lack of response and that the entry is for information only;

b) not take that assignment into account in the Interim List;

c) inform the administrations concerned and affected of its action.

15 When an administration confirms the termination of the use of the interim assignment, the Bureau shall delete the assignment concerned from the Interim List and the Master Register. Any corresponding assignment in the Plan(s), suspended earlier, may then be brought into use.

16 An administration which considers that its interim system may continue to be used after the expiry of the interim period may extend it by not more than four years and to this effect shall apply the procedure described in this Annex.

17 When an administration applies the procedure in accordance with § 16, but is unable to obtain the agreement of one or more affected administrations, the Bureau shall indicate this situation by inserting an appropriate symbol in the Master Register. Upon receipt of a complaint of harmful interference, the administration shall immediately cease operation of the interim assignment.

18 When an administration, having been informed of a complaint of harmful interference, does not cease transmission within a period of thirty days after the receipt of complaint, the Bureau shall apply the provisions of § 14.

RESOLUTION 49[1] (REV.WRC-15)

Administrative due diligence applicable to some satellite radiocommunication services

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that Resolution 18 of the Plenipotentiary Conference (Kyoto, 1994) instructed the Director of the Radiocommunication Bureau to initiate a review of some important issues concerning international satellite network coordination and to make a preliminary report to WRC-95 and a final report to WRC-97;

b) that the Director of the Bureau provided a comprehensive report to WRC-97, including a number of recommendations for action as soon as possible and for identifying areas requiring further study;

c) that one of the recommendations in the Director's report to WRC-97 was that administrative due diligence should be adopted as a means of addressing the problem of reservation of orbit and spectrum capacity without actual use;

d) that experience may need to be gained in the application of the administrative due diligence procedures adopted by WRC-97, and that several years may be needed to see whether administrative due diligence measures produce satisfactory results;

e) that new regulatory approaches may need to be carefully considered in order to avoid adverse effects on networks already going through the different phases of the procedures;

f) that Article 44 of the Constitution sets out the basic principles for the use of the radio-frequency spectrum and the geostationary-satellite and other satellite orbits, taking into account the needs of developing countries,

considering further

a) that WRC-97 decided to reduce the regulatory time-frame for bringing a satellite network into use;

b) that WRC-2000 has considered the results of the implementation of the administrative due diligence procedures and prepared a report to the 2002 Plenipotentiary Conference in response to Resolution 85 (Minneapolis, 1998),

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[1] This Resolution does not apply to satellite networks or satellite systems of the broadcasting-satellite service in the frequency band 21.4-22 GHz in Regions 1 and 3.

resolves

1 that the administrative due diligence procedure contained in Annex 1 to this Resolution shall be applied as from 22 November 1997 for a satellite network or satellite system of the fixed-satellite service, mobile-satellite service or broadcasting-satellite service for which the advance publication information under No. **9.2B**, or for which the request for modifications of the Region 2 Plan under Article 4, § 4.2.1 *b)* of Appendices **30** and **30A** that involve the addition of new frequencies or orbit positions, or for which the request for modifications of the Region 2 Plan under Article 4, § 4.2.1 *a)* of Appendices **30** and **30A** that extend the service area to another country or countries in addition to the existing service area, or for which the request for additional uses in Regions 1 and 3 under § 4.1 of Article 4 of Appendices **30** and **30A**, or for which the submission of information under supplementary provisions applicable to additional uses in the planned bands as defined in Article 2 of Appendix **30B** (Section III of Article 6) has been received by the Bureau from 22 November 1997, or for which submission under Article 6 of Appendix **30B (Rev.WRC-07)** is received on or after 17 November 2007, with the exception of submissions of new Member States seeking the acquisition of their respective national allotments[2] for inclusion in the Appendix **30B** Plan;

2 that for a satellite network or satellite system within the scope of § 1 or 3 of Annex 1 to this Resolution not yet recorded in the Master International Frequency Register (MIFR) by 22 November 1997, for which the advance publication information under No. **1042** of the Radio Regulations (Edition of 1990, revised in 1994) or for the application of Section III of Article 6 of Appendix **30B** has been received by the Bureau before 22 November 1997, the responsible administration shall submit to the Bureau the complete due diligence information in accordance with Annex 2 to this Resolution not later than 21 November 2004, or before the expiry of the notified period for bringing the satellite network into use, plus any extension period which shall not exceed three years pursuant to the application of No. **1550** of the Radio Regulations (Edition of 1990, revised in 1994) or the dates specified in the relevant provisions Article 6 of Appendix **30B**, whichever date comes earlier. If the date of bringing into use, including extension specified above, is before 1 July 1998, the responsible administration shall submit to the Bureau the complete due diligence information in accordance with Annex 2 to this Resolution not later than 1 July 1998;

2*bis* that for a satellite network or satellite system within the scope of § 2 of Annex 1 to this Resolution not recorded in the MIFR by 22 November 1997, for which the request for a modification to the Plans of Appendices **30** and **30A** has been received by the Bureau before 22 November 1997, the responsible administration shall submit to the Bureau the complete due diligence information in accordance with Annex 2 to this Resolution as early as possible before the end of the period established as a limit to bringing into use in accordance with the relevant provisions of Article 4 of Appendix **30** and the relevant provisions of Article 4 of Appendix **30A**;

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[2] See § 2.3 of Appendix **30B (Rev.WRC-07)**.

3 that for a satellite network or satellite system within the scope of § 1, 2 or 3 of Annex 1 to this Resolution recorded in the MIFR by 22 November 1997, the responsible administration shall submit to the Bureau the complete due diligence information in accordance with Annex 2 to this Resolution not later than 21 November 2000, or before the notified date of bringing the satellite network into use (including any extension period), whichever date comes later;

4 that six months before the expiry date specified in *resolves* 2 or 2*bis* above, if the responsible administration has not submitted the due diligence information, the Bureau shall send a reminder to that administration;

5 that if the due diligence information is found to be incomplete, the Bureau shall immediately request the administration to submit the missing information. In any case, the complete due diligence information shall be received by the Bureau before the expiry date specified in *resolves* 2 or 2*bis* above, as appropriate, and shall be published by the Bureau in the International Frequency Information Circular (BR IFIC);

6 that if the complete due diligence information is not received by the Bureau before the expiry date specified in *resolves* 2, 2*bis* or 3 above, the request for coordination or request for a modification to the Plans of Appendices **30** and **30A** or for application of Section III of Article 6 of Appendix **30B** as covered by *resolves* 1 above submitted to the Bureau shall be cancelled. Any modifications of the Plans (Appendices **30** and **30A**) shall lapse and any recording in the MIFR as well as recordings in the Appendix **30B** List shall be deleted by the Bureau after it has informed the concerned administration. The Bureau shall publish this information in the BR IFIC,

further resolves

that the procedures in this Resolution are in addition to the provisions under Article **9** or **11** of the Radio Regulations or Appendices **30**, **30A** or **30B**, as applicable, and, in particular, do not affect the requirement to coordinate under those provisions (Appendices **30**, **30A**) in respect of extending the service area to another country or countries in addition to the existing service area,

instructs the Director of the Radiocommunication Bureau

to report to future competent world radiocommunication conferences on the results of the implementation of the administrative due diligence procedure.

ANNEX 1 TO RESOLUTION 49 (REV.WRC-15)

1 Any satellite network or satellite system of the fixed-satellite service, mobile-satellite service or broadcasting-satellite service with frequency assignments that are subject to coordination under Nos. **9.7**, **9.11**, **9.12**, **9.12A** and **9.13** and Resolution **33 (Rev.WRC-03)**[*] shall be subject to these procedures.

2 Any request for modifications of the Region 2 Plan under the relevant provisions of Article 4 of Appendices **30** and **30A** that involve the addition of new frequencies or orbit positions or for modifications of the Region 2 Plan under the relevant provisions of Article 4 of Appendices **30** and **30A** that extend the service area to another country or countries in addition to the existing service area or request for additional uses in Regions 1 and 3 under the relevant provisions of Article 4 of Appendices **30** and **30A** shall be subject to these procedures.

3 Any submission of information under Article 6 of Appendix **30B (Rev.WRC-07)**, with the exception of submissions of new Member States seeking the acquisition of their respective national allotments[3] for inclusion in the Appendix **30B** Plan, shall be subject to these procedures.

4 An administration requesting coordination for a satellite network under § 1 above shall send to the Bureau as early as possible before the end of the period established as a limit to bringing into use in No. **11.44**, the due diligence information relating to the identity of the satellite network and the spacecraft manufacturer specified in Annex 2 to this Resolution.

5 An administration requesting a modification of the Region 2 Plan or additional uses in Regions 1 and 3 under Appendices **30** and **30A** under § 2 above shall send to the Bureau as early as possible before the end of the period established as a limit to bringing into use in accordance with the relevant provisions of Article 4 of Appendix **30** and the relevant provisions of Article 4 of Appendix **30A**, the due diligence information relating to the identity of the satellite network and the spacecraft manufacturer specified in Annex 2 to this Resolution.

6 An administration applying Article 6 of Appendix **30B (Rev.WRC-07)** under § 3 above shall send to the Bureau as early as possible before the end of the period established as a limit to bringing into use in § 6.1 of that Article, the due diligence information relating to the identity of the satellite network and the spacecraft manufacturer specified in Annex 2 to this Resolution.

7 The information to be submitted in accordance with § 4, 5 or 6 above shall be signed by an authorized official of the notifying administration or of an administration that is acting on behalf of a group of named administrations.

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[*] *Note by the Secretariat:* This Resolution was revised by WRC-15.

[3] See § 2.3 of Appendix **30B (Rev.WRC-07)**.

8 On receipt of the due diligence information under § 4, 5 or 6 above, the Bureau shall promptly examine that information for completeness. If the information is found to be complete, the Bureau shall publish the complete information in a special section of the BR IFIC within 30 days.

9 If the information is found to be incomplete, the Bureau shall immediately request the administration to submit the missing information. In all cases, the complete due diligence information shall be received by the Bureau within the appropriate time period specified in § 4, 5 or 6 above, as the case may be, relating to the date of bringing the satellite network into use.

10 Six months before expiry of the period specified in § 4, 5 or 6 above and if the administration responsible for the satellite network has not submitted the due diligence information under § 4, 5 or 6 above, the Bureau shall send a reminder to the responsible administration.

11 If the complete due diligence information is not received by the Bureau within the time limits specified in this Resolution, the networks covered by § 1, 2 or 3 above shall be cancelled by the Bureau. The provisional recording in the MIFR shall be deleted by the Bureau after it has informed the concerned administration. The Bureau shall publish this information in the BR IFIC.

With respect to the request for modification of the Region 2 Plan or for additional uses in Regions 1 and 3 under Appendices **30** and **30A** under § 2 above, the modification shall lapse if the due diligence information is not submitted in accordance with this Resolution.

With respect to the request for application of Article 6 of Appendix **30B (Rev.WRC-07)** under § 3 above, the network shall also be deleted from the Appendix **30B** List. When an allotment under Appendix **30B** is converted into an assignment, the assignment shall be reinstated in the Plan in accordance with § 6.33 *c)* of Article 6 of Appendix **30B (Rev.WRC-07)**.

12 An administration notifying a satellite network under § 1, 2 or 3 above for recording in the MIFR shall send to the Bureau, as early as possible before the date of bringing into use, the due diligence information relating to the identity of the satellite network and the launch services provider specified in Annex 2 to this Resolution.

13 When an administration has completely fulfilled the due diligence procedure but has not completed coordination, this does not preclude the application of No. **11.41** by that administration.

ANNEX 2 TO RESOLUTION 49 (REV.WRC-15)

A Identity of the satellite network

a) Identity of the satellite network

b) Name of the administration

c) Country symbol

d) Reference to the advance publication information or to the request for modification of the Region 2 Plan or for additional uses in Regions 1 and 3 under Appendices **30** and **30A**; or reference to the information processed under Article 6 of Appendix **30B** **(Rev.WRC-07)**

e) Reference to the request for coordination (not applicable for Appendices **30**, **30A** and **30B**)

f) Frequency band(s)

g) Name of the operator

h) Name of the satellite

i) Orbital characteristics.

B Spacecraft manufacturer*

a) Name of the spacecraft manufacturer

b) Date of execution of the contract

c) Contractual "delivery window"

d) Number of satellites procured.

C Launch services provider

a) Name of the launch vehicle provider

b) Date of execution of the contract

c) Launch or in-orbit delivery window

d) Name of the launch vehicle

e) Name and location of the launch facility.

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* NOTE − In cases where a contract for satellite procurement covers more than one satellite, the relevant information shall be submitted for each satellite.

RESOLUTION 55 (REV.WRC-15)

Electronic submission of notice forms for satellite networks, earth stations and radio astronomy stations

The World Radiocommunication Conference (Geneva, 2015),

considering

that submission of notices for all satellite networks, earth stations and radio astronomy stations in electronic format would further facilitate the tasks of the Radiocommunication Bureau and of administrations, and would accelerate the processing of these notices,

recognizing

that, should the processing delays related to the coordination and notification procedures extend beyond the periods specified in Articles **9** and **11** as well as in Appendices **30**, **30A** and **30B**, administrations may be faced with a shortened time window in which to effect coordination,

resolves

1 that, as from 3 June 2000, all notices (AP4/II and AP4/III), radio astronomy notices (AP4/IV) and API (AP4/V and AP4/VI) and due diligence information (Resolution **49 (Rev.WRC-15)**) for satellite networks and earth stations submitted to the Radiocommunication Bureau pursuant to Articles **9** and **11** shall be submitted in electronic format compatible with the BR electronic notice form capture software (SpaceCap);

2 that, as from 17 November 2007, all notices for satellite networks, earth stations and radio astronomy stations submitted to the Radiocommunication Bureau pursuant to Articles **9** and **11**, as well as Appendices **30** and **30A** and Resolution **49 (Rev.WRC-15)**, shall be submitted in electronic format compatible with the BR electronic notice form capture software (SpaceCap and SpaceCom);

3 that, as from 1 June 2008, all notices for satellite networks and earth stations submitted to the Radiocommunication Bureau pursuant to Appendix **30B** shall be submitted in electronic format compatible with the BR electronic notice form capture software (SpaceCap);

4 that, as from 1 July 2009, comments/objections submitted to the Bureau in accordance with Nos. **9.3** and **9.52** with respect to Nos. **9.11** to **9.14** and **9.21** of Article **9**, or in accordance with § 4.1.7, 4.1.9, 4.1.10, 4.2.10, 4.2.13 or 4.2.14 of Appendices **30** and **30A** with respect to modification to the Region 2 Plan or to additional uses in Regions 1 and 3 under Article 4 and use of the guardbands under Article 2A of those Appendices, shall be submitted in electronic format compatible with the BR electronic notice form capture software (SpaceCom);

5 that, as from 18 February 2012, all requests for inclusion or exclusion submitted to the Bureau under No. **9.41** of Article **9** shall be submitted in electronic format compatible with the BR electronic notice form capture software (SpaceCom);

6 that, since 3 June 2000, all graphical data associated with the submissions addressed in *resolves* 1, 2 and 3 should be submitted in graphics data format compatible with the Bureau's data capture software (graphical interference management system (GIMS)); submission of graphics in paper form, however, continues to be accepted,

instructs the Radiocommunication Bureau

1 to make available coordination requests and notifications referred to in *resolves* 1 "as received" within 30 days of receipt on its website;

2 to provide administrations with the latest versions of the capture and validation software and any necessary technical means, training and manuals, along with any assistance requested by administrations to enable them to comply with *resolves* 1 to 4 above;

3 to integrate the validation software with the capture software to the extent practicable,

urges administrations

to submit, as soon as practicable, the graphical data relating to their notices in a format compatible with the Bureau's graphic data capture software.

RESOLUTION 63 (REV.WRC-12)

Protection of radiocommunication services against interference caused by radiation from industrial, scientific and medical (ISM) equipment

The World Radiocommunication Conference (Geneva, 2012),

considering

a) that ISM applications are defined under RR No. **1.15** as "operation of equipment or appliances designed to generate and use locally radio-frequency energy for industrial, scientific, medical, domestic or similar purposes, excluding applications in the field of *telecommunications*";

b) that ISM equipment may be situated in locations where outward radiation cannot always be avoided;

c) that there is an increasing amount of ISM equipment working on various frequencies throughout the spectrum;

d) that in some cases a considerable part of the energy may be radiated by ISM equipment outside its working frequency;

e) that Recommendation ITU-R SM.1056 recommends to administrations the use of International Special Committee on Radio Interference (CISPR) Publication 11 as a guide for ISM equipment to protect radiocommunication services, but that CISPR 11 does not yet fully specify radiation limits for all frequency bands;

f) that Report ITU-R SM.2180 introduces the interference analysis method and the radiation limits of ISM equipment developed by CISPR, and that the emission limits, which have been developed to protect analogue radiocommunication systems, may not provide protection to digital radiocommunication systems;

g) that certain digital radiocommunication systems use receivers that may be more sensitive to interference from ISM equipment;

h) that some radio systems, especially those using low field strengths, may suffer interference caused by radiation from ISM equipment, a risk which is unacceptable particularly in the case of systems belonging to radionavigation or other safety services;

i) that, in order to limit the risks of interference to specified parts of the spectrum:

– the preceding Radio Conferences of Atlantic City, 1947, and Geneva, 1959, designated some frequency bands within which the radiocommunication services must accept harmful interference produced by ISM equipment;

– WARC-79 accepted an increase in the number of bands to be designated for ISM equipment, but only on the condition that limits of radiation from such equipment be specified within the bands newly designated for worldwide use and outside all the bands designated for ISM equipment;

j) that the variety and evolution of digital technologies used in digital radiocommunication systems suggest a need for continuous review of CISPR Publication 11,

resolves

that, to ensure that radiocommunication services are adequately protected, studies are required on the limits to be imposed on the radiation from ISM equipment, within and outside the frequency bands designated in the Radio Regulations for this use,

invites ITU-R

1 to provide the necessary characteristics and protection criteria for relevant digital radiocommunication systems in order to enable CISPR to review and update, as needed, the limits on radiation from ISM equipment;

2 to continue, in collaboration with CISPR, its studies relating to radiation from ISM equipment, within and outside the frequency bands designated in the Radio Regulations for this use, in order to ensure adequate protection of radiocommunication services, including digital radiocommunication systems, with priority being given to the completion of studies which would permit CISPR to define limits in Publication CISPR 11 on radiation from ISM equipment inside all the bands designated in the Radio Regulations for the use of such equipment,

instructs the Director of the Radiocommunication Bureau

to bring this Resolution to the attention of CISPR.

RESOLUTION 72 (REV.WRC-07)

World and regional preparations for world radiocommunication conferences

The World Radiocommunication Conference (Geneva, 2007),

considering

a) that many regional telecommunication organizations continue to coordinate their preparations for WRCs;

b) that many common proposals have been submitted to this Conference from administrations participating in the preparations of regional telecommunication organizations;

c) that this consolidation of views at regional level, together with the opportunity for interregional discussions prior to the Conference, has eased the task of reaching a common understanding and saved time during past WRCs;

d) that the burden of preparation for future conferences is likely to increase;

e) that there is consequently great benefit to the Member States of coordination of preparations at world level and at regional level;

f) that the success of future conferences will depend on greater efficiency of regional coordination and interaction at interregional level prior to future conferences, including possible face-to-face meetings between regional groups;

g) that there is a need for overall coordination of the interregional consultations,

recognizing

a) *resolves* 2 of Resolution 80 (Rev. Marrakesh, 2002) of the Plenipotentiary Conference:

"to support the regional harmonization of common proposals, as stated in Resolution **72 (WRC-97)**, for submission to world radiocommunication conferences";

b) *resolves* 3 of Resolution 80 (Rev. Marrakesh, 2002) of the Plenipotentiary Conference:

"to encourage both formal and informal collaboration in the interval between conferences with a view to resolving differences on items already on the agenda of a conference or new items",

noting

that the plenipotentiary conferences have resolved that the Union should continue to develop stronger relations with regional telecommunication organizations,

resolves

to invite the regional groups to continue their preparations for WRCs, including the possible convening of joint meetings of regional groups formally and informally,

further resolves to instruct the Director of the Radiocommunication Bureau

1 to continue consulting the regional telecommunication organizations on the means by which assistance can be given to their preparations for future world radiocommunication conferences in the following areas:

– organization of regional preparatory meetings;

– organization of information sessions, preferably before and after the second session of the Conference Preparatory Meeting (CPM);

– identification of major issues to be resolved by the future world radiocommunication conference;

– facilitation of regional and interregional formal and informal meetings, with the objective of reaching a possible convergence of interregional views on major issues;

2 pursuant to Resolution ITU-R 2-5 of the Radiocommunication Assembly on the CPM, to assist in ensuring that overview presentations of the chapters of the CPM Report will be made by the CPM management at an early stage in the CPM session, as part of the regularly scheduled meetings, in order to help all participants understand the contents of the CPM Report;

3 to submit a report on the results of such consultations to the next WRC,

invites the Director of the Telecommunication Development Bureau

to collaborate with the Director of the Radiocommunication Bureau in implementing this Resolution.

RESOLUTION 74 (REV.WRC-03)

Process to keep the technical bases of Appendix 7 current

The World Radiocommunication Conference (Geneva, 2003),

considering

a) that Appendix **7** provides the method for the determination of the coordination area of an earth station, and the assumed technical coordination parameters for unknown terrestrial stations or earth stations;

b) that the technical coordination parameters are contained in Tables 7, 8 and 9 of Annex 7 to Appendix **7**;

c) that the technical coordination parameter tables are based on Recommendation ITU-R SM.1448;

d) that ITU-R studies on methods for the determination of the coordination area of an earth station are continuing, and the conclusions of these studies could lead to revision of Appendix **7**; these methods under study are:

– methods considering the cumulative impact in determining the coordination areas for high-density earth stations (fixed and mobile);

– methods to address the modelling of VHF/UHF frequencies for percentages of time less than 1%;

– methods to address propagation mode (1) water vapour density for both radio climatic Zones B and C;

– refinements to propagation mode (2) to address elevation angle dependency and the displacement of the centre of the propagation mode (2) contour from the coordinating earth station;

e) that the technical coordination parameter tables may also need to be modified when changes are made to the Table of Frequency Allocations at future world radiocommunication conferences (WRCs), or due to changes in technology or in applications;

f) that the technical coordination parameter tables do not include values for all the necessary parameters of certain space radiocommunication services and terrestrial radiocommunication services sharing frequency bands with equal rights,

recognizing

a) that Recommendation ITU-R SM.1448 was developed by ITU-R as a basis for the revision of Appendix **7**;

b) that there is a need for future WRCs to keep Appendix **7** current with the latest techniques and to ensure protection of other radiocommunication services sharing the same frequency bands with equal rights, particularly through revision of the tables of technical coordination parameters,

invites ITU-R

1 to continue its study, as required, of the technical bases used for determination of the coordination area of an earth station, including recommended values for the missing entries in the tables of technical coordination parameters (Annex 7 to Appendix **7**);

2 to maintain the relevant ITU-R texts in a format which would facilitate the future revision of Appendix **7**;

3 to assess the significance of changes to the technical bases,

resolves

1 that when ITU-R concludes, based on its studies of the methods in *considering d)* for determination of the coordination area of an earth station and/or the values of technical coordination parameters, that a revision of Appendix **7** is warranted, the matter shall be brought to the attention of the Radiocommunication Assembly;

2 that, if the Radiocommunication Assembly confirms the improvements of the methods in *considering d)* for determination of the coordination area of an earth station and/or the values of technical coordination parameters which have been presented by ITU-R, the Director of the Radiocommunication Bureau shall identify the matter in the Director's report to the following WRC,

invites

1 WRCs, when presented with any significant changes through the Director's report, to consider the revision of Appendix **7** in light of the recommendation of the Radiocommunication Assembly, pursuant to *resolves* 1 and 2 above;

2 each WRC, when modifying the Table of Frequency Allocations, to consider any consequential changes that may be required to the technical coordination parameters of Annex 7 to Appendix **7** and, if necessary, request ITU-R to study the matter.

RESOLUTION 75 (REV.WRC-12)

Development of the technical basis for determining the coordination area for coordination of a receiving earth station in the space research service (deep space) with transmitting stations of high-density applications in the fixed service in the 31.8-32.3 GHz and 37-38 GHz bands

The World Radiocommunication Conference (Geneva, 2012),

considering

a) that the band 31.8-32.3 GHz is allocated to the space research service for deep space operations only, the band 37-38 GHz is allocated to the space research service (space-to-Earth), and both bands are allocated to the fixed service for the use of high-density applications and to other services on a primary basis;

b) that the 31.8-32.3 GHz band offers unique advantages in support of deep-space missions;

c) that space research service earth stations operating in these bands employ very high-gain antennas and very low-noise amplifiers in order to receive weak signals from deep space;

d) that fixed-service stations in these bands are expected to be deployed in large numbers over urban areas of large geographical extent;

e) that studies are being initiated to characterize short-term (of the order of 0.001% of the time, commensurate with the protection criteria given in Recommendations ITU-R SA.1396 and ITU-R SA.1157) anomalous propagation from transmitting stations dispersed over a large geographical area to a single receiving earth station (area-to-point propagation);

f) that preliminary ITU-R studies have indicated that the coordination distance between a space research service (deep space) earth station and a single urban area may be of the order of 250 km;

g) that there are currently three space research service (deep space) earth stations in operation or planned for operation near Goldstone (United States of America), Madrid (Spain) and Canberra (Australia), and there are up to ten more earth stations planned in the future,

noting

a) that Resolution **74 (Rev.WRC-03)** provides a mechanism to update Appendix **7** as required;

b) that Recommendations ITU-R F.1760 and ITU-R F.1765 provide methodologies to derive the aggregate equivalent isotropically radiated power (a.e.i.r.p.) for transmitting stations of high-density applications in the fixed service in bands above 30 GHz, which may be used to assess the potential interference from these stations to other services,

resolves to invite ITU-R

to develop, as a matter of urgency, the technical basis for determining the coordination area for coordination of a receiving earth station in the space research service (deep space) with transmitting stations of high-density systems in the fixed service in the 31.8-32.3 GHz and 37-38 GHz bands,

urges administrations

to participate actively in the aforementioned studies by submitting contributions to ITU-R.

RESOLUTION 76 (REV.WRC-15)

Protection of geostationary fixed-satellite service and geostationary broadcasting-satellite service networks from the maximum aggregate equivalent power flux-density produced by multiple non-geostationary fixed-satellite service systems in frequency bands where equivalent power flux-density limits have been adopted

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that WRC-97 adopted, in Article **22**, provisional equivalent power flux-density (epfd) limits to be met by non-geostationary fixed-satellite service (non-GSO FSS) systems in order to protect GSO FSS and GSO broadcasting-satellite service (BSS) networks in parts of the frequency range 10.7-30 GHz;

b) that WRC-2000 revised Article **22** to ensure the limits contained therein provide adequate protection to GSO systems without placing undue constraints on any of the systems and services sharing these frequency bands;

c) that WRC-2000 decided that a combination of single-entry validation, single-entry operational and, for certain antenna sizes, single-entry additional operational epfd limits, contained in Article **22**, along with the aggregate limits in Tables 1A to 1D as contained in Annex 1 to this Resolution, which apply to non-GSO FSS systems, protects GSO networks in these frequency bands;

d) that these single-entry validation limits have been derived from aggregate epfd masks contained in Tables 1A to 1D, assuming a maximum effective number of non-GSO FSS systems of 3.5;

e) that the aggregate interference caused by all co-frequency non-GSO FSS systems in these frequency bands into GSO FSS systems should not exceed the aggregate epfd levels in Tables 1A to 1D;

f) that WRC-97 decided, and WRC-2000 confirmed, that non-GSO FSS systems in the frequency bands in question are to mutually coordinate the use of frequencies in these frequency bands under the provisions of No. **9.12**;

g) that the orbital characteristics of such systems are likely to be inhomogeneous;

h) that, as a result of this likely inhomogeneity, the aggregate epfd levels from multiple non-GSO FSS systems will not be directly related to the actual number of systems sharing a frequency band, and the number of such systems operating co-frequency is likely to be small;

i) that the possible misapplication of single-entry limits should be avoided,

recognizing

a) that non-GSO FSS systems are likely to need to implement interference mitigation techniques to mutually share frequencies;

b) that, on account of the use of such interference mitigation techniques, it is likely that the number of non-GSO systems will remain small, as will the aggregate interference caused by non-GSO FSS systems into GSO systems;

c) that, notwithstanding *considering d)* and *e)* and *recognizing b),* there may be instances where the aggregate interference from non-GSO systems could exceed the interference levels given in Tables 1A to 1D;

d) that administrations operating GSO systems may wish to ensure that the aggregate epfd produced by all operating co-frequency non-GSO FSS systems in the frequency bands referred to in *considering a)* above into GSO FSS and/or GSO BSS networks does not exceed the aggregate interference levels given in Tables 1A to 1D,

noting

Recommendation ITU-R S.1588 "Methodologies for calculating aggregate downlink equivalent power flux-density produced by multiple non-geostationary fixed-satellite service systems into a geostationary fixed-satellite service network",

resolves

1 that administrations operating or planning to operate non-GSO FSS systems, for which coordination or notification information, as appropriate, was received after 21 November 1997, in the frequency bands referred to in *considering a)* above, individually or in collaboration, shall take all possible steps, including, if necessary, by means of appropriate modifications to their systems, to ensure that the aggregate interference into GSO FSS and GSO BSS networks caused by such systems operating co-frequency in these frequency bands does not cause the aggregate power levels given in Tables 1A to 1D to be exceeded (see No. **22.5K**);

2 that, in the event that the aggregate interference levels in Tables 1A to 1D are exceeded, administrations operating non-GSO FSS systems in these frequency bands shall take all necessary measures expeditiously to reduce the aggregate epfd levels to those given in Tables 1A to 1D, or to higher levels where those levels are acceptable to the affected GSO administration (see No. **22.5K**),

invites the ITU Radiocommunication Sector

1 to continue its studies and to develop , as appropriate, a suitable methodology for calculating the aggregate epfd produced by all non-GSO FSS systems operating or planning to operate co-frequency in the frequency bands referred to in *considering a)* above into GSO FSS and GSO BSS networks, which may be used to determine whether the systems are in compliance with the aggregate power levels given in Tables 1A to 1D;

2 to continue its studies and to develop a Recommendation on the accurate modelling of interference from non-GSO FSS systems into GSO FSS and GSO BSS networks in the frequency bands referred to in *considering a)* above, in order to assist administrations planning or operating non-GSO FSS systems in their efforts to limit the aggregate epfd levels produced by their systems into GSO networks, and to provide guidance to GSO network designers on the maximum epfd↓ levels expected to be produced by all non-GSO FSS systems when accurate modelling assumptions are used;

3 to develop a Recommendation containing procedures to be used among administrations in order to ensure that the aggregate epfd limits given in Tables 1A to 1D are not exceeded by operators of non-GSO FSS systems;

4 to attempt to develop measurement techniques to identify the interference levels from non-GSO systems in excess of the aggregate limits given in Tables 1A to 1D, and to confirm compliance with these limits,

instructs the Director of the Radiocommunication Bureau

1 to assist in the development of the methodology referred to in *invites the ITU Radiocommunication Sector* 1 above;

2 to report to a future competent conference on the results of studies in *invites the ITU Radiocommunication Sector* 1 and 3 above.

ANNEX 1 TO RESOLUTION 76 (REV.WRC-15)

TABLE 1A[1, 2, 3]

Limits on aggregate epfd↓ radiated by non-GSO FSS systems in certain frequency bands

Frequency band (GHz)	epfd↓ (dB(W/m²))	Percentage of time during which epfd↓ may not be exceeded	Reference bandwidth (kHz)	Reference antenna diameter, and reference radiation pattern[4]
10.7-11.7 in all Regions 11.7-12.2 in Region 2 12.2-12.5 in Region 3 12.5-12.75 in Regions 1 and 3	−170 −168.6 −165.3 −160.4 −160 −160	0 90 99 99.97 99.99 100	40	60 cm Recommendation ITU-R S.1428
	−176.5 −173 −164 −161.6 −161.4 −160.8 −160.5 −160 −160	0 99.5 99.84 99.945 99.97 99.99 99.99 99.9975 100	40	1.2 m Recommendation ITU-R S.1428
	−185 −184 −182 −168 −164 −162 −160 −160	0 90 99.5 99.9 99.96 99.982 99.997 100	40	3 m [5] Recommendation ITU-R S.1428
	−190 −190 −166 −160 −160	0 99 99.99 99.998 100	40	10 m [5] Recommendation ITU-R S.1428

[1] For certain GSO FSS receive earth stations, see also Nos. **9.7A** and **9.7B**.

[2] In addition to the limits shown in Table 1A, the following aggregate epfd↓ limits apply to all antenna sizes greater than 60 cm in the frequency bands listed in Table 1A:

100% of the time epfd↓ (dB(W/(m² · 40 kHz)))	Latitude (North or South) (degrees)
−160	0 ≤ | Latitude | ≤ 57.5
−160 + 3.4(57.5 − | Latitude |)/4	57.5 < | Latitude | ≤ 63.75
−165.3	63.75 < | Latitude |

[3] For each reference antenna diameter, the limit consists of the complete curve on a plot which is linear in decibels for the epfd↓ levels and logarithmic for the time percentages, with straight lines joining the data points.

[4] For this Table, reference patterns in Recommendation ITU-R S.1428 shall be used only for the calculation of interference from non-GSO FSS systems into GSO FSS systems.

[5] The values for the 3 m and 10 m antennas are applicable only for the methodology referred to *invites the ITU Radiocommunication Sector* 1.

TABLE 1B[1, 2, 3]

Limits on aggregate epfd↓ radiated by non-GSO FSS systems in certain frequency bands

Frequency band (GHz)	epfd↓ (dB(W/m²))	Percentage of time during which epfd↓ may not be exceeded	Reference bandwidth (kHz)	Reference antenna diameter, and reference radiation pattern[4]
17.8-18.6	−170 −170 −164 −164	0 90 99.9 100	40	1 m Recommendation ITU-R S.1428
	−156 −156 −150 −150	0 90 99.9 100	1 000	
	−173 −173 −166 −164 −164	0 99.4 99.9 99.92 100	40	2 m Recommendation ITU-R S.1428
	−159 −159 −152 −150 −150	0 99.4 99.9 99.92 100	1 000	
	−180 −180 −172 −164 −164	0 99.8 99.8 99.992 100	40	5 m Recommendation ITU-R S.1428
	−166 −166 −158 −150 −150	0 99.8 99.8 99.992 100	1 000	

[1] For certain GSO FSS receive earth stations, see also Nos. **9.7A** and **9.7B**.

[2] For each reference antenna diameter, the limit consists of the complete curve on a plot which is linear in decibels for the epfd↓ levels and logarithmic for the time percentages, with straight lines joining the data points.

[3] A non-GSO system shall meet the limits of this Table in both the 40 kHz and the 1 MHz reference bandwidths.

[4] For this Table, reference patterns in Recommendation ITU-R S.1428 shall be used only for the calculation of interference from non-GSO FSS systems into GSO FSS systems.

TABLE 1C[1, 2, 3]

Limits on aggregate epfd↓ radiated by non-GSO FSS systems in certain frequency bands

Frequency band (GHz)	epfd↓ (dB(W/m²))	Percentage of time during which epfd↓ may not be exceeded	Reference bandwidth (kHz)	Reference antenna diameter, and reference radiation pattern[4]
19.7-20.2	−182 −172 −154 −154	0 90 99.94 100	40	70 cm Recommendation ITU-R S.1428
	−168 −158 −140 −140	0 90 99.94 100	1 000	
	−185 −176 −165 −160 −154 −154	0 91 99.8 99.8 99.99 100	40	90 cm Recommendation ITU-R S.1428
	−171 −162 −151 −146 −140 −140	0 91 99.8 99.8 99.99 100	1 000	
	−191 −162 −154 −154	0 99.933 99.998 100	40	2.5 m Recommendation ITU-R S.1428
	−177 −148 −140 −140	0 99.933 99.998 100	1 000	
	−195 −184 −175 −161 −154 −154	0 90 99.6 99.984 99.9992 100	40	5 m Recommendation ITU-R S.1428
	−181 −170 −161 −147 −140 −140	0 90 99.6 99.984 99.9992 100	1 000	

[1] For certain GSO FSS receive earth stations, see also Nos. **9.7A** and **9.7B**.

[2] For each reference antenna diameter, the limit consists of the complete curve on a plot which is linear in decibels for the epfd↓ levels and logarithmic for the time percentages, with straight lines joining the data points.

[3] A non-GSO system shall meet the limits of this Table in both the 40 kHz and the 1 MHz reference bandwidths.

[4] For this Table, reference patterns in Recommendation ITU-R S.1428 shall be used only for the calculation of interference from non-GSO FSS systems into GSO FSS systems.

TABLE 1D[1, 2]

Limits on aggregate epfd↓ radiated by non-GSO FSS systems in certain frequency bands into 30 cm, 45 cm, 60 cm, 90 cm, 120 cm, 180 cm, 240 cm and 300 cm BSS antennas

Frequency band (GHz)	epfd↓ (dB(W/m^2))	Percentage of time during which epfd↓ may not be exceeded	Reference bandwidth (kHz)	Reference antenna diameter, and reference radiation pattern[3]
11.7-12.5 in Region 1 11.7-12.2 and 12.5-12.75 in Region 3 12.2-12.7 in Region 2	−160.4 −160.1 −158.6 −158.6 −158.33 −158.33	0 25 96 98 98 100	40	30 cm Recommendation ITU-R BO.1443, Annex 1
	−170 −167 −164 −160.75 −160 −160	0 66 97.75 99.33 99.95 100	40	45 cm Recommendation ITU-R BO.1443, Annex 1
	−171 −168.75 −167.75 −162 −161 −160.2 −160 −160	0 90 97.8 99.6 99.8 99.9 99.99 100	40	60 cm Recommendation ITU-R BO.1443, Annex 1
	−173.75 −173 −171 −165.5 −163 −161 −160 −160	0 33 98 99.1 99.5 99.8 99.97 100	40	90 cm Recommendation ITU-R BO.1443, Annex 1
	−177 −175.25 −173.75 −173 −169.5 −167.8 −164 −161.9 −161 −160.4 −160	0 90 98.9 98.9 99.5 99.7 99.82 99.9 99.965 99.993 100	40	120 cm Recommendation ITU-R BO.1443, Annex 1

TABLE 1D[1, 2] (*end*)

Frequency band (GHz)	epfd↓ (dB(W/m^2))	Percentage of time during which epfd↓ may not be exceeded	Reference bandwidth (kHz)	Reference antenna diameter, and reference radiation pattern[3]
11.7-12.5 in Region 1 11.7-12.2 and 12.5-12.75 in Region 3 12.2-12.7 in Region 2	−179.5 −178.66 −176.25 −163.25 −161.5 −160.35 −160 −160	0 33 98.5 99.81 99.91 99.975 99.995 100	40	180 cm Recommendation ITU-R BO.1443, Annex 1
	−182 −180.9 −178 −164.4 −161.9 −160.5 −160 −160	0 33 99.25 99.85 99.94 99.98 99.995 100	40	240 cm Recommendation ITU-R BO.1443, Annex 1
	−186.5 −184 −180.5 −173 −167 −162 −160 −160	0 33 99.5 99.7 99.83 99.94 99.97 100	40	300 cm Recommendation ITU-R BO.1443, Annex 1

[1] For BSS antenna diameters of 180 cm, 240 cm and 300 cm, in addition to the aggregate limits shown in Table 1D, the following aggregate 100% of the time epfd↓ limits also apply:

100% of the time epfd↓ (dB(W/(m^2 · 40 kHz)))	Latitude (North or South) (degrees)
−160	0 ≤ | Latitude | ≤ 57.5
−160 + 3.4(57.5 − | Latitude |)/4	57.5 < | Latitude | ≤ 63.75
−165.3	63.75 < | Latitude |

[2] For each reference antenna diameter, the limit consists of the complete curve on a plot which is linear in decibels for the epfd↓ levels and logarithmic for the time percentages, with straight lines joining the data points. For BSS antenna of diameter 240 cm, in addition to the above aggregate 100% of the time epfd↓ limit, a −167 dB(W/(m^2 · 40 kHz)) aggregate 100% of the time operational epfd↓ limit also applies to receive antennas located in Region 2, west of 140° W, north of 60° N, pointing toward GSO BSS satellites at 91° W, 101° W, 110° W, 119° W and 148° W with elevation angles greater than 5°. This limit is implemented during a transition period of 15 years.

[3] For this Table, reference patterns in the Annex 1 to Recommendation ITU-R BO.1443 shall be used only for the calculation of interference from non-GSO FSS systems into GSO BSS systems.

RESOLUTION 80 (REV.WRC-07)

Due diligence in applying the principles embodied in the Constitution

The World Radiocommunication Conference (Geneva, 2007),

considering

a) that Articles 12 and 44 of the Constitution lay down the basic principles for the use of the radio-frequency spectrum and the geostationary-satellite and other satellite orbits;

b) that those principles have been included in the Radio Regulations;

c) that Article I of the Agreement between the United Nations and the International Telecommunication Union provides that "the United Nations recognizes the International Telecommunication Union (hereinafter called "the Union") as the specialized agency responsible for taking such action as may be appropriate under its basic instrument for the accomplishment of the purposes set forth therein";

d) that, in accordance with Nos. **11.30**, **11.31** and **11.31.2**, notices shall be examined with respect to the provisions of the Radio Regulations, including the provision relating to the basic principles, appropriate rules of procedure being developed for the purpose;

e) that WRC-97 instructed the Radio Regulations Board (RRB) to develop, within the framework of Nos. **11.30**, **11.31** and **11.31.2**, rules of procedure to be followed in order to be in compliance with the principles in No. **0.3** of the Preamble to the Radio Regulations;

f) that the Board, in accordance with Resolution **80 (WRC-97)**, submitted a report to WRC-2000 suggesting possible solutions and stating that, after examining the Radio Regulations, it had concluded that there are no provisions currently in the Radio Regulations that link the formal notification or coordination procedures with the principles stated in No. **0.3** of the Preamble to the Radio Regulations;

g) that the Legal Subcommittee of the Committee on the Peaceful Uses of Outer Space of the United Nations General Assembly has drawn up recommendations in this respect,

noting

a) that, in accordance with the provisions of No. 127 of the Convention, the Conference may give instructions to the Sectors of the Union;

b) that, according to No. 160C of the Convention, the Radiocommunication Advisory Group (RAG) shall review any matter as directed by a conference;

c) the RRB report to WRC-2000 (see Annex 1);

d) the RRB report to WRC-03 (see Annex 2);

e) that some of the issues identified in the report referred to in *noting c)* have been resolved before WRC-07,

resolves

1 to instruct the Radiocommunication Sector, in accordance with No. 1 of Article 12 of the Constitution, to carry out studies on procedures for measurement and analysis of the application of the basic principles contained in Article 44 of the Constitution;

2 to instruct the RRB to consider and review possible draft recommendations and draft provisions linking the formal notification, coordination and registration procedures with the principles contained in Article 44 of the Constitution and No. **0.3** of the Preamble to the Radio Regulations, and to report to each future World Radiocommunication Conference with regard to this Resolution;

3 to instruct the Director of the Radiocommunication Bureau to submit to each future World Radiocommunication Conference a detailed progress report on the action taken on this Resolution,

invites

1 the other organs of the Radiocommunication Sector, in particular the RAG, to make relevant contributions to the Director of the Radiocommunication Bureau for inclusion in his report to each future World Radiocommunication Conference;

2 administrations to contribute to the studies referred to in *resolves* 1 and to the work of the RRB as detailed in *resolves* 2.

ANNEX 1 TO RESOLUTION 80 (REV.WRC-07)

RRB Report to WRC-2000

In the RRB Report to WRC-2000[1], several members of the Board noted some difficulties likely to be experienced by administrations, particularly administrations of developing countries, as follows:

– the "first-come first-served" concept restricts and sometimes prevents access to and use of certain frequency bands and orbit positions;

– a relative disadvantage for developing countries in coordination negotiations due to various reasons such as a lack of resources and expertise;

– perceived differences in consistency of application of the Radio Regulations;

– the submitting of "paper" satellites that restricts access options;

– the growing use of the bands of the Plans of Appendices **30** and **30A** by regional, multichannel systems, which may modify the main purpose of these Plans to provide equitable access to all countries;

[1] This Report can be found in Document 29 to WRC-2000.

– the considerable processing delays in the Radiocommunication Bureau are due to the very complex procedures required and the large number of filings submitted; these delays contribute to a coordination backlog of 18 months which could extend to three years and creates uncertain regulatory situations, additional delay in the coordination process that cannot be overcome by administrations, and the possible loss of the assignment because the allotted time is exceeded;

– satellite systems may already be in orbit before completion of coordination;

– statutory time-frames, such as those in No. **11.48**, may often be insufficient for developing countries to be able to complete the regulatory requirements as well as the design, construction and launch of satellite systems;

– no provisions for international monitoring to confirm the bringing into use of satellite networks (assignments and orbits).

ANNEX 2 TO RESOLUTION 80 (REV.WRC-07)

RRB Report to WRC-03

In the RRB Report to WRC-03[2], concepts to satisfy *resolves* 2 of Resolution **80 (WRC-2000)** were provided, as follows:

– special measures for countries submitting their first satellite filing:

  – on an exceptional basis, special consideration could be given to countries submitting their first filing for a satellite system, taking into account the special needs of developing countries;

  – such consideration should take into account the following:

    – impact on other administrations;

    – satellite service of the system (i.e. FSS, MSS, BSS);

    – frequency band covered by the filing;

    – system is intended to meet the direct needs of the country(s) concerned;

– extension of the regulatory time-limit for bringing into use:

  – conditions could be specified under which extensions might be granted on an exceptional basis to developing countries when they are not able to complete the regulatory date requirements, so that sufficient time for design, construction and launch of satellite systems is made available;

  – the conditions created under the previous paragraph should be included in the Radio Regulations as provisions that would allow the Radiocommunication Bureau to grant the extension.

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2 This Report can be found in Addendum 5 to Document 4 to WRC-03.

RESOLUTION 81 (REV.WRC-15)

Evaluation of the administrative due diligence procedure for satellite networks

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that WRC-97 adopted Resolution **49 (WRC-97)**[*] establishing administrative due diligence procedure applicable to some satellite radiocommunication services with effect from 22 November 1997;

b) that the Plenipotentiary Conference adopted Resolution 85 (Minneapolis, 1998) on evaluation of the administrative due diligence procedure for satellite networks;

c) that Resolution 85 (Minneapolis, 1998) instructs the Director of the Radiocommunication Bureau to inform WRC-2000 about the effectiveness of the administrative due diligence procedure, in accordance with Resolution **49 (WRC-97)**[*];

d) that Resolution 85 (Minneapolis, 1998) resolves that WRC-2000 shall evaluate the results of the implementation of the administrative due diligence procedure and shall inform the next Plenipotentiary Conference, in 2002, of its conclusions in that regard;

e) the report of the Director of the Radiocommunication Bureau on the administrative due diligence procedure applicable to some satellite networks;

f) the proposals made to this Conference to strengthen the administrative due diligence procedure, and to adopt financial due diligence procedures,

noting

a) that the Bureau has not encountered any administrative difficulty in applying the provisions and in gathering and publishing information;

b) that the Bureau has taken action pursuant to *resolves* 6 of Resolution **49 (WRC-97)**[*] to cancel the submissions, and accordingly publish the related special sections, in respect of 36 satellite networks;

c) that, for all of these cancellations, the maximum (nine-year) period for bringing into use pursuant to *resolves* 1 and 2 of Resolution **51 (WRC-97)**[**] and No. **11.44** had been reached and hence the submissions would have been cancelled in any event;

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[*] *Note by the Secretariat:* This Resolution was revised by WRC-07, WRC-12 and WRC-15.

[**] *Note by the Secretariat:* This Resolution was abrogated by WRC-15.

d) that, when requested to provide due diligence information (triggered by the original date of bringing into use of their satellite networks), administrations have generally requested, wherever possible, extensions of the regulatory period for bringing into use up to the maximum limit authorized by the Radio Regulations;

e) that the effect of the administrative due diligence procedure may not, therefore, be fully apparent until at least 21 November 2003,

recognizing

that the administrative due diligence procedure has not yet had any impact on the problem of reservation of orbit and spectrum capacity without actual use,

resolves

1 that further experience is needed in the application of the administrative due diligence procedures adopted by WRC-97, and that several years may be needed to see whether the procedure produces satisfactory results;

2 that it is premature to consider the adoption, among other procedures, of any financial due diligence procedures.

RESOLUTION 85 (WRC-03)

Application of Article 22 of the Radio Regulations to the protection of geostationary fixed-satellite service and broadcasting-satellite service networks from non-geostationary fixed-satellite service systems

The World Radiocommunication Conference (Geneva, 2003),

considering

a) that WRC-2000 adopted, in Article **22**, single-entry limits applicable to non-geostationary (non-GSO) fixed-satellite service (FSS) systems in certain parts of the frequency range 10.7-30 GHz to protect geostationary-satellite (GSO) networks operating in the same frequency bands;

b) that, taking into account Nos. **22.5H** and **22.5I**, wherever the limits referred to in *considering a)* are exceeded by a non-GSO FSS system to which the limits apply without the agreement of the concerned administrations, this constitutes a violation of the obligations under No. **22.2**;

c) that ITU-R has developed Recommendation ITU-R S.1503 to provide a functional description to be used in developing software tools for determining the conformity of non-GSO FSS networks with limits contained in Article **22**;

d) that there is currently no software tool available to the Radiocommunication Bureau for epfd examinations;

e) that the Bureau has issued Circular Letters CR/176 and CR/182, which request additional information from non-GSO systems in order to examine them for compliance with the Article **22** epfd limits;

f) that, since no epfd validation software is available, the Bureau has requested commitments from the notifying administrations that they will meet the epfd limits in Tables **22-1A**, **22-1B**, **22-1C**, **22-1D**, **22-1E**, **22-2** and **22-3**, and that under these commitments the Bureau gives qualified favourable findings to their systems;

g) that the Bureau is not in a position to perform its duties in relation to Nos. **9.7A** and **9.7B** due to the lack of epfd validation software;

h) that during the examination under Nos. **9.35** and **11.31**, the Bureau examines non-GSO FSS systems to ensure their compliance with the single-entry epfd limits given in Tables **22-1A**, **22-1B**, **22-1C**, **22-1D**, **22-1E**, **22-2** and **22-3**,

resolves

1 that since the Bureau is unable to examine non-GSO FSS systems subject to Nos. **22.5C**, **22.5D** and **22.5F** under Nos. **9.35** and/or **11.31**, the notifying administration shall send to the Bureau a commitment that the non-GSO FSS system complies with the limits given in Tables **22-1A**, **22-1B**, **22-1C**, **22-1D**, **22-1E**, **22-2** and **22-3** in addition to the information submitted under Nos. **9.30** and **11.15**;

2 that the Bureau shall issue either a qualified favourable finding under No. **9.35** or a favourable finding with a date of review under No. **11.31** with respect to the limits contained in Tables **22-1A**, **22-1B**, **22-1C**, **22-1D**, **22-1E**, **22-2** and **22-3**, if *resolves* 1 is satisfied, otherwise the non-GSO FSS system will receive a definitive unfavourable finding;

3 that if an administration believes that a non-GSO FSS system, for which the commitment referred to in *resolves* 1 was sent, has the potential to exceed the limits given in Tables **22-1A**, **22-1B**, **22-1C**, **22-1D**, **22-1E**, **22-2** and **22-3**, it may request from the notifying administration additional information with regard to the compliance with the limits mentioned above. Both administrations shall cooperate to resolve any difficulties, with the assistance of the Bureau, if so requested by either of the parties, and may exchange any additional relevant information that may be available;

4 that the Bureau shall determine coordination requirements between GSO FSS earth stations and non-GSO FSS systems under Nos. **9.7A** and **9.7B** based on bandwidth overlap, and GSO FSS earth station antenna maximum isotropic gain, G/T and emission bandwidth;

5 that this Resolution shall no longer be applied after the Bureau has communicated to all administrations via a Circular Letter that the epfd validation software is available and the Bureau is able to verify compliance with the limits in Tables **22-1A**, **22-1B**, **22-1C**, **22-1D**, **22-1E**, **22-2** and **22-3** and to determine the coordination requirements under Nos. **9.7A** and **9.7B**,

further resolves

that those provisions of the Radio Regulations that have been amended by this Conference and that are referred to in *resolves* 5 shall provisionally apply as from 5 July 2003,

instructs the Director of the Radiocommunication Bureau

1 to encourage administrations to develop the epfd validation software;

2 to review, once the epfd validation software is available, its findings made in accordance with Nos. **9.35** and **11.31**;

3 to review, once the epfd validation software is available, the coordination requirements under Nos. **9.7A** and **9.7B**.

RESOLUTION 86 (REV.WRC-07)

Implementation of Resolution 86 (Rev. Marrakesh, 2002) of the Plenipotentiary Conference

The World Radiocommunication Conference (Geneva, 2007),

considering

a) that the Plenipotentiary Conference (Marrakesh, 2002) discussed the application of Resolution 86 (Minneapolis, 1998) and decided to request WRC-03 to determine the scope and criteria to be used by future world radiocommunication conferences (WRCs) in the application of Resolution 86 (Rev. Marrakesh, 2002);

b) that the Plenipotentiary Conference (Antalya, 2006) invited WRC-07 to consider Resolution 86 (Marrakesh, 2002) and to report the results to the 2010 Plenipotentiary Conference,

recognizing

that the Radio Regulations Board makes suggestions to transform the content of the Rules of Procedure into a regulatory text in accordance with Nos. **13.0.1** and **13.0.2** of Article **13** of the Radio Regulations,

noting

that administrations may also wish to make proposals to transform the content of the Rules of Procedure into a regulatory text for possible inclusion in the Radio Regulations,

resolves to invite future world radiocommunication conferences

1 to consider any proposals which deal with deficiencies and improvements in the advance publication, coordination, notification and recording procedures of the Radio Regulations for frequency assignments pertaining to space services which have either been identified by the Board and included in the Rules of Procedure or which have been identified by administrations or by the Radiocommunication Bureau, as appropriate;

2 to ensure that these procedures, and the related appendices of the Radio Regulations reflect the latest technologies, as far as possible,

invites administrations

to consider, in preparing for PP-10, appropriate action with regard to Resolution 86 (Rev. Marrakesh, 2002).

RESOLUTION 95 (REV.WRC-07)

General review of the Resolutions and Recommendations of world administrative radio conferences and world radiocommunication conferences

The World Radiocommunication Conference (Geneva, 2007),

considering

a) that it is important to keep the Resolutions and Recommendations of past world administrative radio conferences and world radiocommunication conferences under constant review, in order to keep them up to date;

b) that the reports of the Director of the Radiocommunication Bureau submitted to previous conferences provided a useful basis for a general review of the Resolutions and Recommendations of past conferences;

c) that some principles and guidelines are necessary for future conferences to treat the Resolutions and Recommendations of previous conferences which are not related to the agenda of the Conference,

resolves to invite future competent world radiocommunication conferences

1 to review the Resolutions and Recommendations of previous conferences that are related to the agenda of the Conference with a view to their possible revision, replacement or abrogation and to take appropriate action;

2 to review the Resolutions and Recommendations of previous conferences that are not related to any agenda item of the Conference with a view to:

– abrogating those Resolutions and Recommendations that have served their purpose or have become no longer necessary;

– reviewing the need for those Resolutions and Recommendations, or parts thereof, requesting ITU-R studies on which no progress has been made during the last two periods between conferences;

– updating and modifying Resolutions and Recommendations, or parts thereof that have become out of date, and to correct obvious omissions, inconsistencies, ambiguities or editorial errors and effect any necessary alignment;

3 at the beginning of the conference, to determine which committee within the conference has the primary responsibility to review each of the Resolutions and Recommendations referred to in *resolves* 1 and 2 above,

instructs the Director of the Radiocommunication Bureau

1 to conduct a general review of the Resolutions and Recommendations of previous conferences and, after consultation with the Radiocommunication Advisory Group and the Chairmen and Vice-Chairmen of the Radiocommunication Study Groups, submit a report to the second session of the Conference Preparatory Meeting (CPM) in respect of *resolves* 1 and *resolves* 2, including an indication of any associated agenda items;

2 to include in the above report, with the cooperation of the chairmen of the Radiocommunication Study Groups, the progress reports of ITU-R studies on the issues which have been requested by the Resolutions and Recommendations of previous conferences, but which are not placed on the agendas of the forthcoming two conferences,

invites administrations

to submit contributions on the implementation of this Resolution to CPM,

invites the Conference Preparatory Meeting

to include, in its Report, the results of the general review of the Resolutions and Recommendations of previous conferences, based on the contributions by administrations to CPM, in order to facilitate the follow-up by future WRCs.

RESOLUTION 99 (WRC-15)

Provisional application of certain provisions of the Radio Regulations as revised by the 2015 World Radiocommunication Conference and abrogation of certain Resolutions and Recommendations

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that this conference has, in accordance with its terms of reference, adopted a partial revision to the Radio Regulations (RR), which will enter into force on 1 January 2017;

b) that some of the provisions, as amended by this conference, need to apply provisionally before that date;

c) that, as a general rule, new and revised Resolutions and Recommendations enter into force at the time of the signing of the Final Acts of a conference;

d) that, as a general rule, Resolutions and Recommendations which a world radiocommunication conference has decided to suppress are abrogated at the time of the signing of the Final Acts of a conference,

resolves

that, as of 28 November 2015, the following provisions of the RR, as revised or established by this conference, shall provisionally apply: Table of Frequency Allocations 5 091-5 150 MHz, Nos. **5.444**, **5.444A**, **5.444B** and Table 10 of Annex 7 to Appendix **7**,

further resolves

to abrogate the following Resolutions as of 28 November 2015:

Resolution **11 (WRC-12)**
Resolution **51 (Rev.WRC-2000)**
Resolution **58 (WRC-2000)**
Resolution **67 (WRC-12)**
Resolution **73 (Rev.WRC-2000)**
Resolution **98 (WRC-12)**
Resolution **142 (WRC-03)**
Resolution **151 (WRC-12)**
Resolution **152 (WRC-12)**
Resolution **153 (WRC-12)**
Resolution **232 (WRC-12)**
Resolution **233 (WRC-12)**
Resolution **234 (WRC-12)**
Resolution **358 (WRC-12)**
Resolution **423 (WRC-12)**
Resolution **547 (Rev.WRC-07)**
Resolution **644 (Rev.WRC-12)**
Resolution **648 (WRC-12)**
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Resolution **755 (WRC-12)**
Resolution **756 (WRC-12)**
Resolution **757 (WRC-12)**
Resolution **758 (WRC-12)**
Resolution **806 (WRC-07)**
Resolution **807 (WRC-12)**
Resolution **808 (WRC-12)**
Resolution **900 (WRC-03)**
Resolution **909 (WRC-12)**
Resolution **957 (WRC-12)**

RESOLUTION 111 (ORB-88)

Planning of the fixed-satellite service in the bands 18.1-18.3 GHz, 18.3-20.2 GHz and 27-30 GHz[1]

The World Administrative Radio Conference on the Use of the Geostationary-Satellite Orbit and the Planning of Space Services Utilizing It (Second Session − Geneva, 1988),

considering

a) that WARC Orb-85 in its Report to WARC Orb-88, requested the ITU-R to study the technical characteristics of the fixed-satellite service in the bands 18.1-18.3 GHz, 18.3-20.2 GHz and 27-30 GHz with a view to a decision on the future planning of these bands for the fixed-satellite service being taken by a future competent conference;

b) that the ITU-R concluded that it would be extremely unwise for these bands to be subject to planning at this time and that further study would be necessary,

recognizing

1 that these bands have not been exploited extensively due to technical and economic reasons, although they potentially have great capacity;

2 that the required satellite orbital spacing may be reduced, thus resulting in easier coordination between satellite networks because narrower satellite antenna beamwidths can be achieved than in the lower frequency bands;

3 that different performance criteria may well be necessary from those which currently exist for frequency bands below 15 GHz, since the propagation characteristics are different,

resolves

that the bands 18.1-18.3 GHz, 18.3-20.2 GHz and 27-30 GHz shall not be included in frequency bands identified for planning at this time,

invites the ITU-R

to continue its studies into the technical characteristics of the bands 18.1-18.3 GHz, 18.3-20.2 GHz and 27-30 GHz until a decision is taken by a future competent conference.

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1 WRC-97 made editorial amendments to this Resolution.

RESOLUTION 114 (REV.WRC-15)

Compatibility between the aeronautical radionavigation service and the fixed-satellite service (Earth-to-space) (limited to feeder links of the non-geostationary mobile-satellite systems in the mobile-satellite service) in the frequency band 5 091-5 150 MHz

The World Radiocommunication Conference (Geneva, 2015),

considering

a) the current allocation of the frequency band 5 000-5 250 MHz to the aeronautical radionavigation service;

b) the requirements of both the aeronautical radionavigation and the fixed-satellite (FSS) (Earth-to-space) (limited to feeder links of non-geostationary satellite (non-GSO) systems in the mobile-satellite service (MSS)) services in the above-mentioned band,

recognizing

a) that priority must be given to the microwave landing system (MLS) in accordance with No. **5.444** and to other international standard systems of the aeronautical radionavigation service in the frequency band 5 030-5 091 MHz;

b) that, in accordance with Annex 10 of the Convention of the International Civil Aviation Organization (ICAO) on international civil aviation, it may be necessary to use the frequency band 5 091-5 150 MHz for the MLS if its requirements cannot be satisfied in the frequency band 5 030-5 091 MHz;

c) that the FSS providing feeder links for non-GSO systems in the MSS will need continuing access to the frequency band 5 091-5 150 MHz,

noting

a) that Recommendation ITU-R S.1342 describes a method for determining coordination distances between international standard MLS stations operating in the frequency band 5 030-5 091 MHz and FSS earth stations providing Earth-to-space feeder links in the frequency band 5 091-5 150 MHz;

b) the small number of FSS stations to be considered,

resolves

that administrations authorizing stations providing feeder links for non-GSO systems in the MSS in the frequency band 5 091-5 150 MHz shall ensure that they do not cause harmful interference to stations of the aeronautical radionavigation service,

invites administrations

when assigning frequencies in the frequency band 5 091-5 150 MHz to stations of the aeronautical radionavigation service or to earth stations of the FSS providing feeder links of the non-GSO systems in the MSS (Earth-to-space), to take all practicable steps to avoid mutual interference between them,

instructs the Secretary-General

to bring this Resolution to the attention of ICAO.

RESOLUTION 122 (REV.WRC-07)

Use of the bands 47.2-47.5 GHz and 47.9-48.2 GHz by high altitude platform stations in the fixed service and by other services

The World Radiocommunication Conference (Geneva, 2007),

considering

a) that the band 47.2-50.2 GHz is allocated to the fixed, mobile and fixed-satellite services on a co-primary basis;

b) that WRC-97 made provision for operation of high altitude platform stations (HAPS), also known as stratospheric repeaters, within the fixed service in the bands 47.2-47.5 GHz and 47.9-48.2 GHz;

c) that establishing a stable technical and regulatory environment will promote the use of all co-primary services in the band 47.2-47.5 GHz and 47.9-48.2 GHz;

d) that systems using HAPS are in an advanced stage of development and some countries have notified such systems to ITU in the bands 47.2-47.5 GHz and 47.9-48.2 GHz;

e) that Recommendation ITU-R F.1500 contains the characteristics of systems in the fixed service using HAPS in the bands 47.2-47.5 GHz and 47.9-48.2 GHz;

f) that while the decision to deploy HAPS can be taken on a national basis, such deployment may affect neighbouring administrations and operators of co-primary services;

g) that ITU-R has completed studies dealing with sharing between systems using HAPS in the fixed service and other types of systems in the fixed service in the bands 47.2-47.5 GHz and 47.9-48.2 GHz;

h) that ITU-R has completed studies on compatibility between HAPS systems in the 47.2-47.5 GHz and 47.9-48.2 GHz bands and the radio astronomy service in the 48.94-49.04 GHz band;

i) that No. **5.552** urges administrations to take all practicable steps to reserve fixed-satellite service (FSS) use of the band 47.2-49.2 GHz for feeder links for the broadcasting-satellite service (BSS) operating in the band 40.5-42.5 GHz, and that ITU-R studies indicate that HAPS in the fixed service may share with such feeder links;

j) that the technical characteristics of expected BSS feeder links and FSS gateway-type stations are similar;

k) that ITU-R has completed studies dealing with sharing between systems using HAPS in the fixed service and the fixed-satellite service,

recognizing

a) that, in the long term, the bands 47.2-47.5 GHz and 47.9-48.2 GHz are expected to be required for HAPS operations for both gateway and ubiquitous terminal applications, for which several administrations have already notified systems to the Radiocommunication Bureau;

b) that identification of common sub-bands for ubiquitous ground terminal applications in the use of the fixed service could facilitate HAPS deployment and sharing with other primary services in the 47.2-47.5 GHz and 47.9-48.2 GHz bands;

c) that Recommendation ITU-R SF.1481-1 and Recommendation ITU-R SF.1843 provide information on the feasibility of HAPS systems in the fixed service sharing with the FSS;

d) that ITU-R studies on HAPS operation in the bands 47.2-47.5 GHz and 47.9-48.2 GHz allocated to the fixed service have concluded that, in order to share with FSS (Earth-to-space), the maximum uplink transmit e.i.r.p. density of HAPS ground terminals in the bands should, in clear-sky conditions, be 6.4 dB(W/MHz) for Urban Area Coverage (UAC), 22.57 dB(W/MHz) for Suburban Area Coverage (SAC) and 28 dB(W/MHz) for Rural Area Coverage (RAC), and that these values can be increased by up to 5 dB during periods of rain;

e) that ITU-R studies have established specific power flux-density values to be met at international borders to facilitate bilateral agreement on sharing conditions for HAPS with other types of fixed service systems in a neighbouring country;

f) that FSS satellite networks and systems with earth station antenna diameters of 2.5 metres or larger operating as a gateway-type station are capable of sharing with ubiquitous HAPS terminals,

resolves

1 that to facilitate sharing with the FSS (Earth-to-space), the maximum transmit e.i.r.p. density of a ubiquitous HAPS ground terminal shall not exceed the following levels under clear-sky conditions:

6.4	dB(W/MHz)	for UAC	$(30° < \theta \leq 90°)$
22.57	dB(W/MHz)	for SAC	$(15° < \theta \leq 30°)$
28	dB(W/MHz)	for RAC	$(5° < \theta \leq 15°)$

where θ is the ground terminal elevation angle in degrees;

2 that the maximum transmit e.i.r.p. density levels specified in *resolves* 1 may be increased, using fading compensation techniques, by up to 5 dB during periods of rain;

3 that the ground terminal antenna patterns of HAPS operating in the bands 47.2-47.5 GHz and 47.9-48.2 GHz shall meet the following antenna beam patterns:

$$G(\varphi) = G_{max} - 2.5 \times 10^{-3} \left(\frac{D}{\lambda} \varphi \right)^2 \quad \text{for} \quad 0° < \varphi < \varphi_m$$

$$G(\varphi) = 39 - 5 \log (D/\lambda) - 25 \log \varphi \quad \text{for} \quad \varphi_m \leq \varphi < 48°$$

$$G(\varphi) = -3 - 5 \log (D/\lambda) \quad \text{for} \quad 48° \leq \varphi \leq 180°$$

where:

G_{max} : maximum antenna gain (dBi)

$G(\varphi)$: gain (dBi) relative to an isotropic antenna

φ : off-axis angle (degrees)

D: antennadiameter
λ: wavelength
} expressed in the same units

$$\varphi_m = \frac{20\,\lambda}{D}\sqrt{G_{max} - G_1} \quad \text{degrees}$$

G_1 : gain of the first side lobe

$= 2 + 15 \log (D/\lambda)$ (dBi);

4 that for the purpose of protecting fixed wireless systems in neighbouring administrations from co-channel interference, a HAPS system operating in the frequency bands 47.2-47.5 GHz and 47.9-48.2 GHz shall not exceed the following power flux-density values at the Earth's surface at an administration's border, unless explicit agreement of the affected administration is provided at the time of the notification of HAPS:

−141	dB(W/(m^2 · MHz))	for	0°	≤	δ	<	3°
−141 + 2(δ − 3)	dB(W/(m^2 · MHz))	for	3°	≤	δ	≤	13°
−121	dB(W/(m^2 · MHz))	for	13°	<	δ	≤	90°

where δ is the angle of the arrival above the horizontal plane in degrees;

5 that, to protect radio astronomy stations operating in the band 48.94-49.04 GHz from unwanted emissions of HAPS operating in the 47.2-47.5 GHz and 47.9-48.2 GHz bands, the separation distance between the radio astronomy station and the nadir of a HAPS platform shall exceed 50 km;

6 that administrations planning to implement a HAPS system in the 47.2-47.5 GHz and 47.9-48.2 GHz bands shall notify the frequency assignments by submitting all mandatory elements of Appendix **4** to the Bureau for the examination of compliance with respect to *resolves* 1, 2, 3, 4 and 5 above with a view to their registration in the Master International Frequency Register;

7 that administrations shall notify the new data elements for the notices referred to in *instructs the Director of the Radiocommunication Bureau* 1 in order to enable the Bureau to perform the examinations,

invites administrations

that intend to deploy HAPS systems in the fixed service in the bands 47.2-47.5 GHz and 47.9-48.2 GHz to consider specifying the use of the bands 47.2-47.35 GHz and 47.9-48.05 GHz for ubiquitous HAPS terminals,

instructs the Director of the Radiocommunication Bureau

1 to maintain and process notices concerning HAPS that were received by the Bureau prior to 20 October 2007 and provisionally recorded in the Master International Frequency Register, only until 1 January 2012, unless the notifying administration informs the Bureau before that date that a particular assignment has been brought into use and provides the complete set of data elements of Appendix **4**;

2 to examine all assignments to HAPS in the fixed service notified prior to 20 October 2007 and apply the provisions of *resolves* 1, 2, 3, 4 and 5 and the respective calculation methodologies included in Recommendation ITU-R F.1820 and Recommendation ITU-R SF.1843.

RESOLUTION 125 (REV.WRC-12)

Frequency sharing in the bands 1 610.6-1 613.8 MHz and 1 660-1 660.5 MHz between the mobile-satellite service and the radio astronomy service

The World Radiocommunication Conference (Geneva, 2012),

with a view

to enabling the mobile-satellite service (MSS) and the radio astronomy service to make the most efficient use of frequency bands allocated to them, having due regard to the other services to which those bands are also allocated,

considering

a) that the bands 1 610.6-1 613.8 MHz and 1 660-1 660.5 MHz are allocated to the radio astronomy service and the MSS (Earth-to-space) on a co-primary basis;

b) that No. **5.372** states that "Harmful interference shall not be caused to stations of the radio astronomy service using the band 1 610.6-1 613.8 MHz by stations of the radiodetermination-satellite and mobile-satellite services (No. **29.13** applies)"; and that Article **29** also points out that emissions from space or airborne stations can be particularly serious sources of interference to the radio astronomy service;

c) that the nature of objects studied by the radio astronomy service in the bands 1 610.6-1 613.8 MHz and 1 660-1 660.5 MHz demands maximum flexibility in the planning of observation frequencies;

d) that, in the bands 1 610.6-1 613.8 MHz and 1 660-1 660.5 MHz, which are shared between the radio astronomy service and the MSS, operational constraints are necessary for MSS mobile earth stations;

e) that a former ITU-R Recommendation relating to sharing between the MSS and the radio astronomy service in the band 1 660-1 660.5 MHz noted that further studies were required, particularly in the areas of propagation models and assumptions used for the determination of separation distances;

f) that Recommendation ITU-R M.1316 may be used in order to facilitate coordination between mobile earth stations and radio astronomy stations in the bands 1 610.6-1 613.8 MHz and 1 660-1 660.5 MHz;

g) that no experience has been gained up to now with the use of the Recommendation mentioned in *considering f)*;

h) that the threshold levels of interference detrimental to the radio astronomy service are given in Recommendation ITU-R RA.769,

resolves

that a future competent conference should evaluate frequency sharing in the bands 1 610.6-1 613.8 MHz and 1 660-1 660.5 MHz between the MSS and the radio astronomy service, based upon the experience gained with the use of ITU-R M.1316 and other relevant ITU-R Recommendations,

invites ITU-R

to continue studies to evaluate the effectiveness of Recommendations aiming to facilitate sharing between the MSS and the radio astronomy service,

instructs the Director of the Radiocommunication Bureau

to provide the results of the studies in the Report of the Director to a future competent conference,

urges administrations

to participate actively in this evaluation.

RESOLUTION 140 (REV.WRC-15)

Measures and studies associated with the equivalent power flux-density (epfd) limits in the frequency band 19.7-20.2 GHz

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that, after several years of study, WRC-2000 adopted epfd limits in a number of frequency bands to give practical effect to No. **22.2**, in order to facilitate non-geostationary-orbit (non-GSO) systems in the fixed-satellite service (FSS) to operate while still ensuring protection of GSO FSS networks from unacceptable interference;

b) that in Resolution **76 (WRC-2000)**[*], WRC-2000 also adopted aggregate epfd↓ limits in the same frequency bands for the protection of GSO FSS systems;

c) that a small number of systems based on constellations of satellites in highly elliptical orbits (HEOs), in certain FSS bands, have been operating for many years;

d) that since the late 1990s, especially after WRC-2000, there has been a growing interest in HEOs in a number of frequency bands and for several space services, predominantly in the FSS allocations below 30 GHz;

e) that ITU-R studies reported to WRC-03 considered HEO systems to be a sub-category of non-GSO systems and characterized their operational features;

f) that in the period between WRC-2000 and WRC-03, ITU-R developed Recommendations concerning frequency sharing between HEO FSS systems and other systems, including GSO, low Earth orbit (LEO), medium Earth orbit (MEO) and HEO systems;

g) that certain types of HEO system would have difficulty in meeting the long-term portion of epfd↓ limits in force in the frequency band 19.7-20.2 GHz,

noting

a) that, in the long-term portion, the epfd↓ limits in the frequency band 19.7-20.2 GHz are considerably more stringent than those in the 17.8-18.6 GHz frequency band;

b) that Nos. **9.7A** and **9.7B** apply in this frequency band;

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[*] *Note by the Secretariat:* This Resolution was revised by WRC-15.

c) that the frequency band 19.7-20.2 GHz is one of the few bands identified by WRC-03 on a global basis for high-density applications in the fixed-satellite service;

d) Recommendation ITU-R S.1715 "Guidelines developed in response to the studies requested in Resolution **140 (WRC-03)***",

resolves to invite administrations

to consider using the relevant ITU-R Recommendations regarding the protection of GSO FSS satellite networks from interference by non-GSO FSS systems as a guideline for consultation between administrations, to fulfil their obligations under No. **22.2** in the frequency band 19.7-20.2 GHz, and in the case where an administration responsible for a non-GSO FSS system requests the application of No. **22.5CA**,

instructs the Radiocommunication Bureau

in cases where an administration responsible for a non-GSO FSS system indicates in its coordination request its wish to apply No. **22.5CA** with respect to the epfd↓ limits in Table **22-1C** in the frequency band 19.7-20.2 GHz but has not yet reached the necessary agreements, to make a qualified favourable finding with respect to this provision. This provisional finding regarding compliance with epfd↓ limits shall be changed to a definitive favourable finding at the notification stage, only if all explicit agreements from administrations for which epfd limits are exceeded are obtained and an indication thereof is provided to the Bureau within two years from the date of receipt of the coordination request. Otherwise, this provisional finding shall be changed to a definitive unfavourable finding.

* *Note by the Secretariat:* This Resolution was revised by WRC-15.

RESOLUTION 143 (REV.WRC-07)

Guidelines for the implementation of high-density applications in the fixed-satellite service in frequency bands identified for these applications

The World Radiocommunication Conference (Geneva, 2007),

considering

a) that demand has been increasing steadily for global broadband communication services throughout the world, such as those provided by high-density applications in the fixed-satellite service (HDFSS);

b) that HDFSS systems are characterized by flexible, rapid and ubiquitous deployment of large numbers of cost-optimized earth stations employing small antennas and having common technical characteristics;

c) that HDFSS is an advanced broadband communication application concept that will provide access to a wide range of broadband telecommunication applications supported by fixed telecommunication networks (including the Internet), and thus will complement other telecommunication systems;

d) that, as with other FSS systems, HDFSS offers great potential to establish telecommunication infrastructure rapidly;

e) that HDFSS applications can be provided by satellites of any orbital type;

f) that interference mitigation techniques have been and continue to be studied in ITU-R to facilitate sharing between HDFSS earth stations and terrestrial services;

g) that to date, studies have not concluded on the practicability of implementation of interference mitigation techniques for all HDFSS earth stations,

noting

a) that No. **5.516B** identifies bands for HDFSS;

b) that, in some of these bands, the FSS allocations are co-primary with fixed and mobile service allocations as well as other services;

c) that this identification does not preclude the use of these bands by other services or by other FSS applications, and does not establish priority in these Radio Regulations among users of the bands;

d) that, in the band 18.6-18.8 GHz, the FSS allocation is co-primary with the Earth exploration-satellite service (EESS) (passive) with the restrictions of Nos. **5.522A** and **5.522B**;

e) that radio astronomy observations are carried out in the 48.94-49.04 GHz band, and that such observations require protection at notified radio astronomy stations;

f) that co-frequency sharing between transmitting HDFSS earth stations and terrestrial services is difficult in the same geographical area;

g) that co-frequency sharing between receiving HDFSS earth stations and terrestrial stations in the same geographical area may be facilitated through the implementation of interference mitigation techniques, if practicable;

h) that many FSS systems with other types of earth stations and characteristics have already been brought into use or are planned to be brought into use in some of the frequency bands identified for HDFSS in No. **5.516B**;

i) that HDFSS stations in these bands are expected to be deployed in large numbers over urban, suburban and rural areas of large geographical extent;

j) that the 50.2-50.4 GHz band, adjacent to the band 48.2-50.2 GHz (Earth-to-space) identified for HDFSS in Region 2, is allocated to the EESS (passive),

recognizing

a) that in cases where FSS earth stations use bands that are shared on a co-primary basis with terrestrial services, the Radio Regulations stipulate that earth stations of the FSS shall be individually notified to the Bureau when their coordination contours extend into the territory of another administration;

b) that, as a consequence of their general characteristics, it is expected that the coordination of HDFSS earth stations with fixed service stations on an individual site-by-site basis between administrations will be a difficult and long process;

c) that, to minimize the burden for administrations, simplified coordination procedures and provisions can be agreed by administrations for large numbers of similar HDFSS earth stations associated with a given satellite system;

d) that harmonized worldwide bands for HDFSS would facilitate the implementation of HDFSS, thereby helping to maximize global access and economies of scale,

recognizing further

that HDFSS applications implemented on FSS networks and systems are subject to all provisions of the Radio Regulations applicable to the FSS, such as coordination and notification pursuant to Articles **9** and **11**, including any requirements to coordinate with terrestrial services of other countries, and the provisions of Articles **21** and **22**,

resolves

that administrations which implement HDFSS should consider the following guidelines:

a) making some or all of the frequency bands identified in No. **5.516B** available for HDFSS applications;

b) in making frequency bands available under *resolves a)*, take into account:

– that HDFSS deployment will be simplified in bands that are not shared with terrestrial services;

– in bands shared with terrestrial services, the impact that the further deployment of terrestrial stations would have on the existing and future development of HDFSS, and the further deployment of HDFSS earth stations would have on the existing and future development of terrestrial services;

c) take into account the relevant technical characteristics applicable to HDFSS, as identified by ITU-R Recommendations (e.g. Recommendations ITU-R S.524-9, ITU-R S.1594 and ITU-R S.1783);

d) take into account other existing and planned FSS systems, having different characteristics, in frequency bands where HDFSS is implemented in accordance with *resolves a)* above and the conditions specified in No. **5.516B**,

invites administrations

1 to give due consideration to the benefits of harmonized utilization of the spectrum for HDFSS on a global basis, taking into account the use and planned use of these bands by all other services to which these bands are allocated, as well as other types of FSS applications;

2 to consider implementing simplified procedures and provisions that facilitate the deployment of HDFSS systems in some or all of the bands identified in No. **5.516B**;

3 when considering the deployment of HDFSS systems in the upper portion of the band 48.2-50.2 GHz, to take into account as appropriate the potential impact such deployment may have on the satellite passive services in the adjacent band 50.2-50.4 GHz, and to participate in ITU-R studies on the compatibility between these services, taking into account No. **5.340**;

4 to consider, given *invites administrations* 3 above, and where practicable, starting the deployment of HDFSS earth stations in the lower part of the band 48.2-50.2 GHz.

RESOLUTION 144 (REV.WRC-15)

Special requirements of geographically small or narrow countries operating earth stations in the fixed-satellite service in the frequency band 13.75-14 GHz

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that WARC-92 made an additional allocation to the fixed-satellite service (FSS) (Earth-to-space) in the frequency band 13.75-14 GHz;

b) that this frequency band is shared with the radiolocation and radionavigation services;

c) that, following a decision by WRC-2000 and the completion of ITU-R studies, WRC-03 reviewed and revised the sharing conditions for the services in this frequency band and adopted new regulations which govern sharing between the FSS, radiolocation and radionavigation services (see No. **5.502)**;

d) that these revised sharing conditions additionally permit the operation of geostationary FSS earth stations in the frequency band 13.75-14 GHz with antennas having diameters between 1.2 m and 4.5 m,

recognizing

a) that these sharing conditions of No. **5.502** will mean that countries which are geographically small or narrow will have significant difficulties deploying geostationary FSS earth stations in this frequency band with antennas having diameters between 1.2 m and 4.5 m;

b) that in order to further facilitate sharing between the FSS and the maritime radiolocation systems operating in the radiolocation service, there may be a need to develop technical and operational methods;

c) that these technical and operational methods may be used to allow a greater deployment of FSS earth stations in the frequency band 13.75-14 GHz in conformity with No. **5.502** while protecting the radiolocation service,

noting

Recommendation ITU-R S.1712 “Methodologies for determining whether an FSS earth station at a given location could transmit in the frequency band 13.75-14 GHz without exceeding the pfd limits in No. **5.502** of the Radio Regulations, and guidelines to mitigate excesses”,

resolves

that the administrations of geographically small or narrow countries may exceed the limitations on FSS earth station power flux-density at the low-water mark in No. **5.502** if such operation is in conformance with bilateral agreements with administrations deploying maritime radiolocation systems in the frequency band 13.75-14 GHz, this being in order to provide due consideration to administrations of geographically small or narrow countries,

encourages

administrations deploying maritime and land mobile radiolocation systems in the frequency band 13.75-14 GHz to rapidly reach bilateral agreements relating to the operation of FSS earth stations in this frequency band with administrations of those geographically small or narrow countries deploying these FSS earth stations, this being in order to provide due consideration to administrations of geographically small or narrow countries.

RESOLUTION 145 (REV.WRC-12)

Use of the bands 27.9-28.2 GHz and 31-31.3 GHz by high altitude platform stations in the fixed service

The World Radiocommunication Conference (Geneva, 2012),

considering

a) that WRC-97 made provision for the operation of high altitude platform stations (HAPS), also known as stratospheric repeaters, within a 2 × 300 MHz portion of the fixed-service allocation in the bands 47.2-47.5 GHz and 47.9-48.2 GHz;

b) that No. **4.23** specifies that transmissions to or from HAPS shall be limited to the bands specifically identified in Article **5**;

c) that at WRC-2000, several countries in Region 3 and one country in Region 1 expressed a need for a lower frequency band for HAPS due to the excessive rain attenuation that occurs at 47 GHz in these countries;

d) that some countries in Region 2 have also expressed an interest in using a frequency range lower than those referred to in *considering a)*;

e) that, in order to accommodate the need expressed by the countries referred to in *considering c)*, WRC-2000 adopted Nos. **5.537A** and **5.543A**, which were modified at WRC-03 and then again at WRC-07 to permit the use of HAPS in the fixed service in the band 27.9-28.2 GHz and in the band 31-31.3 GHz in certain Region 1 and 3 countries on a non-harmful interference, non-protection basis;

f) that the bands 27.9-28.2 GHz and 31-31.3 GHz are already heavily used or planned to be used by a number of different services and a number of other types of applications in the fixed service;

g) that while the decision to deploy HAPS can be taken on a national basis, such deployment may affect neighbouring administrations, particularly in small countries;

h) that the 31.3-31.8 GHz band is allocated to the radio astronomy, Earth exploration-satellite (passive) and space research (passive) services, and that WRC-03 amended No. **5.543A** to specify signal levels that would protect satellite passive services and radio astronomy stations;

i) that ITU-R has conducted studies dealing with sharing between systems using HAPS in the fixed service and other types of systems in the fixed service in the bands 27.9-28.2 GHz and 31-31.3 GHz leading to Recommendation ITU-R F.1609;

j) that results of some ITU-R studies indicate that, in the bands 27.9-28.2 GHz and 31-31.3 GHz, sharing between fixed-service systems using HAPS and other conventional fixed-service systems in the same area will require appropriate interference mitigation techniques to be developed and implemented;

k) that ITU-R has conducted studies dealing with compatibility between systems using HAPS and the passive services in the 31.3-31.8 GHz band leading to Recommendations ITU-R F.1570 and ITU-R F.1612;

l) that ITU-R has produced Recommendation ITU-R SF.1601 containing methodologies for evaluating interference from fixed-service systems using HAPS into GSO FSS systems in the band 27.9-28.2 GHz;

m) that HAPS technical issues could continue to be studied in order to determine appropriate measures for protecting the fixed service and other co-primary services in the band 27.9-28.2 GHz,

resolves

1 that, notwithstanding No. **4.23**, in Region 2 the use of HAPS within the fixed-service allocations within the 27.9-28.2 GHz and 31-31.3 GHz bands shall not cause harmful interference to, nor claim protection from, other stations of services operating in accordance with the Table of Frequency Allocations of Article **5**, and, further, that the development of these other services shall proceed without constraints by HAPS operating pursuant to this Resolution;

2 that any use by HAPS of the fixed-service allocation at 27.9-28.2 GHz pursuant to *resolves* 1 above shall be limited to operation in the HAPS-to-ground direction, and that any use by HAPS of the fixed-service allocation at 31-31.3 GHz shall be limited to operation in the ground-to-HAPS direction;

3 that systems using HAPS in the band 31-31.3 GHz, in accordance with *resolves* 1 above, shall not cause harmful interference to the radio astronomy service having a primary allocation in the band 31.3-31.8 GHz, taking into account the protection criterion given in the relevant ITU-R Recommendation in the RA series. In order to ensure the protection of satellite passive services, the level of unwanted power density into the HAPS ground station antenna in the band 31.3-31.8 GHz shall be limited to −106 dB(W/MHz) under clear-sky conditions and may be increased up to −100 dB(W/MHz) under rainy conditions to mitigate fading due to rain, provided that the effective impact on the passive satellite does not exceed the impact under clear-sky conditions;

4 that the administrations listed in Nos. **5.537A** and **5.543A** which intend to implement systems using HAPS in the fixed service in the bands 27.9-28.2 GHz and 31-31.3 GHz shall seek explicit agreement of concerned administrations with regard to their stations of primary services to ensure that the conditions in Nos. **5.537A** and **5.543A** are met, and those administrations in Region 2 which intend to implement systems using HAPS in the fixed service in these bands shall seek explicit agreement of concerned administrations with regard to their stations of services operating in accordance with the Table of Frequency Allocations of Article **5** to ensure that the conditions in *resolves* 1 and *resolves* 3 are met;

5 that administrations planning to implement a HAPS system pursuant to *resolves* 1 above shall notify the frequency assignment(s) by submitting all mandatory elements of Appendix **4** to the Radiocommunication Bureau for the examination of compliance with *resolves* 3 and 4 above,

invites ITU-R

1 to continue to carry out studies on the appropriate interference mitigation techniques for the situations referred to in *considering j)*;

2 to develop protection criteria for the mobile service having primary allocations in the frequency bands 27.9-28.2 GHz and 31-31.3 GHz from HAPS in the fixed service.

RESOLUTION 147 (WRC-07)

Power flux-density limits for certain systems in the fixed-satellite service using highly-inclined orbits having an apogee altitude greater than 18 000 km and an orbital inclination between 35° and 145° in the band 17.7-19.7 GHz

The World Radiocommunication Conference (Geneva, 2007),

considering

a) that the band 17.7-19.7 GHz is heavily used in many countries for fixed service (FS) applications including mobile communication network infrastructure;

b) that in the band 17.7-19.7 GHz, there are planned or existing non-geostationary (non-GSO) fixed-satellite service (FSS) systems using satellites with highly-inclined orbits having an apogee altitude greater than 18 000 km and an orbital inclination between 35° and 145°;

c) that in this frequency band, ITU-R has conducted studies of the impact on FS stations of the pfd produced or to be produced by non-GSO FSS systems of the types described in *considering b)*;

d) that one of the types of systems referred to in *considering b)* under the ITU filing name USCSID-P, was notified and brought into use under the applicable power flux-density (pfd) levels for the 17.7-19.7 GHz band in Table **21-4**:

-115	dB(W/(m^2 · MHz))	for	0°	≤	δ <	5°
$-115 + 0.5(\delta - 5)$	dB(W/(m^2 · MHz))	for	5°	≤	δ ≤	25°
-105	dB(W/(m^2 · MHz))	for	25°	<	δ ≤	90°

where δ is the angle of arrival above the horizontal plane in degrees,

recognizing

1 that studies carried out in ITU-R of the systems described in *considering b)*, demonstrated that the system described in *considering d)* did not cause harmful interference to the fixed service in the 17.7-19.7 GHz band;

2 that one FSS system of the type described in *considering d)* has been operating since 1995 at the −115/−105 dB(W/(m^2 · MHz)) levels and there has been no complaint of harmful interference to any station in the fixed service of any administration,

resolves

that in the band 17.7-19.7 GHz, FSS space stations currently operating in a system of the type described in *considering d)* and for which advance publication information was received by the Radiocommunication Bureau before 5 July 2003, as well as space stations with the same parameters in a future notice for a replacement system, shall continue to be subject to the power flux-density limits:

-115	dB(W/(m^2 · MHz))	for	0°	≤	δ <	5°
$-115 + 0.5(\delta - 5)$	dB(W/(m^2 · MHz))	for	5°	≤	δ ≤	25°
-105	dB(W/(m^2 · MHz))	for	25°	<	δ ≤	90°

where δ is the angle of arrival above the horizontal plane in degrees.

RESOLUTION 148 (REV.WRC-15)

Satellite systems formerly listed in Part B of the Plan of Appendix 30B (WARC Orb-88)

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that WARC Orb-88 adopted a Plan for the fixed-satellite service in the frequency bands 4 500-4 800 MHz, 6 725-7 025 MHz, 10.70-10.95 GHz, 11.20-11.45 GHz and 12.75-13.25 GHz contained in Appendix **30B (WARC Orb-88)**;

b) that, when the Plan was adopted, some satellite systems in the same frequency bands were under coordination or had been recorded in the Master International Frequency Register (MIFR), or had information relating to advance publication that was received by the Radiocommunication Bureau before 8 August 1985, and which in all cases were listed in Part B of the Plan at WARC Orb-88;

c) that in the original provisions of Appendix **30B (WARC Orb-88)**, the satellite systems mentioned in *considering b)* above were referred to as "existing systems";

d) that satellite systems identified in *considering b)* have either been included in the List of Appendix **30B** or cancelled, and thus Part B of the Plan is empty;

e) that, therefore, WRC-07 suppressed Part B of the Plan in Appendix **30B**,

recognizing

a) that § 9.2 of Appendix **30B (WARC Orb-88)** indicates that "The existing systems listed in Part B of the Plan may continue in operation for a maximum period of 20 years from the date of entry into force of this Appendix", and consequently the period of operation of satellite systems in Part B of the Plan expires after 16 March 2010;

b) that some administrations expressed their wish to continue operation of these systems after the deadline mentioned in *recognizing a)*;

c) that satellite systems referred to in *considering b)* are compatible with satellite networks in Appendix **30B**,

resolves

that an administration wishing to further extend the notified period of validity of assignments to "existing system(s)" as referred to in *considering c)* shall inform the Bureau accordingly more than three years before the expiry of the notified period of validity and, if the characteristics of that assignment remain unchanged, the Bureau shall amend, as requested, the notified period of validity and publish that information in a special section of the Bureau's International Frequency Information Circular (BR IFIC),

instructs the Radiocommunication Bureau

1 to cancel from the Master Register and the List assignments to "existing system(s)" as referred to in *considering c)* upon expiry of their notified period of validity;

2 to calculate aggregate *C*/*I* of the "existing systems" as referred to in *considering c)* without taking into account the interference between these systems;

3 to take the appropriate actions in accordance with *resolves* above.

RESOLUTION 149 (REV.WRC-12)

Submissions from new Member States of the Union relating to Appendix 30B of the Radio Regulations

The World Radiocommunication Conference (Geneva, 2012),

considering

a) that WARC Orb-88 adopted a Plan for the fixed-satellite service in the frequency bands 4 500-4 800 MHz, 6 725-7 025 MHz, 10.70-10.95 GHz, 11.20-11.45 GHz and 12.75-13.25 GHz as contained in Appendix **30B (WARC Orb-88)**;

b) that WRC-07 revised the Appendix **30B** Plan and the associated regulatory procedures;

c) that WRC-07 decided that the principle of guaranteed access to spectrum resources for all Members of the Union must be maintained and, as a consequence, the highest priority should be given to submissions from countries not having a national allotment in the Plan or an assignment in the List stemming from the conversion of an allotment;

d) that under the regulatory provisions adopted by WARC Orb-88 and revised by subsequent conferences, submissions from Member States not having a national allotment in the Plan or an assignment in the List stemming from the conversion of an allotment are processed in order of receipt together with other submissions,

recognizing

that some countries that have joined, or may join, the Union as a Member State do not have a national allotment or an assignment in the List stemming from the conversion of an allotment,

resolves

1 that an administration of a country which has joined the Union as a Member State and does not have a national allotment in the Plan or an assignment in the List stemming from the conversion of an allotment shall have the right to request the Bureau to exclude its territory from the service area of an allotment or an assignment, whereupon the Bureau shall exclude the territory accordingly without adversely affecting the rest of the service area and subsequently recalculate the new reference situation for the Appendix **30B** Plan and List;

2 to urge administrations[1] to make utmost efforts to accommodate submissions received from new Member States of ITU.

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[1] Those administrations which are the basis of unfavourable findings with respect to submissions from new Member States.

RESOLUTION 150 (WRC-12)

Use of the bands 6 440-6 520 MHz and 6 560-6 640 MHz by gateway links for high-altitude platform stations in the fixed service

The World Radiocommunication Conference (Geneva, 2012),

considering

a) that ITU has among its purposes "to promote the extension of the benefit of the new telecommunication technologies to all the world's inhabitants" (No. 6 of the Constitution);

b) that systems based on new technologies using high-altitude platform stations (HAPS) can potentially be used for various applications such as the provision of high-capacity services to urban and rural areas;

c) that provision has been made in the Radio Regulations for the deployment of HAPS in specific bands, including as base stations to serve IMT networks;

d) that at WRC-07, a need for provision for gateway links to serve HAPS operations was expressed;

e) that WRC-07 invited ITU-R to conduct sharing studies, with a view to identifying two channels of 80 MHz each for gateway links for HAPS in the range from 5 850 to 7 075 MHz, in bands already allocated to the fixed service, while ensuring the protection of existing services;

f) that for the purpose of protecting the operations of the Earth exploration-satellite service (EESS) (passive) in the band 6 425-7 075 MHz, No. **5.458** applies;

g) that for the purpose of protecting the radio astronomy service in the band 6 650-6 675.2 MHz, No. **5.149** applies;

h) that the range 5 850-7 075 MHz is already heavily used or planned to be used by a number of different services and a number of other types of applications in the fixed service;

i) that in order to accommodate the need stated in *considering d)*, WRC-12 adopted No. **5.457** to permit the use of HAPS gateway links in the fixed service in the bands 6 440-6 520 MHz and 6 560-6 640 MHz in the limited number of countries listed in the footnote;

j) that compatibility between HAPS and affected services will largely depend on the number of administrations deploying HAPS and the total number of such systems;

k) that while the deployment of HAPS gateway links in the bands 6 440-6 520 MHz and 6 560-6 640 MHz is taken on a national basis, such deployment would affect other administrations;

l) that Appendix **4** does not contain all the necessary data elements pertaining to HAPS gateway links,

recognizing

a) that ITU-R has studied technical and operational characteristics of HAPS gateway links in the fixed service in the range 5 850-7 075 MHz resulting in Recommendation ITU-R F.1891;

b) that Recommendation ITU-R F.2011 contains a methodology to evaluate interference from HAPS gateway downlinks in the fixed service to conventional fixed wireless systems in the range 5 850-7 075 MHz;

c) that Report ITU-R F.2240 contains the results of interference analyses between HAPS gateway links in the fixed service and other systems/services in the range 5 850-7 075 MHz;

d) that the World Summit on the Information Society has encouraged the development and application of emerging technologies to facilitate infrastructure and network development worldwide with special focus on under-served regions and areas,

resolves

1 that the antenna pattern for both the HAPS platform and the HAPS gateway station in the bands 6 440-6 520 MHz and 6 560-6 640 MHz shall meet the following antenna beam patterns:

$$G(\psi) = G_m - 3(\psi/\psi_b)^2 \quad \text{dBi} \quad \text{for} \quad 0° \le \psi \le \psi_1$$

$$G(\psi) = G_m + L_N \quad \text{dBi} \quad \text{for} \quad \psi_1 < \psi \le \psi_2$$

$$G(\psi) = X - 60 \log(\psi) \quad \text{dBi} \quad \text{for} \quad \psi_2 < \psi \le \psi_3$$

$$G(\psi) = L_F \quad \text{dBi} \quad \text{for} \quad \psi_3 < \psi \le 90°$$

where:

$G(\psi)$: gain at the angle ψ from the main beam direction (dBi)

G_m: maximum gain in the main lobe (dBi)

ψ_b: one-half of the 3 dB beamwidth in the plane considered (3 dB below G_m) (degrees)

L_N: near side-lobe level (dB) relative to the peak gain required by the system design, and has a maximum value of −25 dB

L_F: far side-lobe level, $G_m - 73$ dBi.

$$\psi_1 = \psi_b \sqrt{-L_N / 3} \quad \text{degrees}$$

$$\psi_2 = 3.745\ \psi_b \quad \text{degrees}$$

$$X = G_m + L_N + 60 \log(\psi_2) \quad \text{dBi}$$

$$\psi_3 = 10^{(X - L_F)/60} \quad \text{degrees}$$

$$\psi_b = \sqrt{7\ 442/(10^{0.1 G_m})} \quad \text{degrees;}$$

2 that the maximum angle of deviation of the HAPS airborne antenna from the nadir for gateway links shall be limited to 60 degrees corresponding to the urban area coverage of the HAPS; and the maximum number of gateway stations operating with a single platform shall not exceed 5;

3 that the minimum antenna elevation angle of HAPS gateway stations on the ground shall be 30 degrees;

4 that for the purpose of protecting the fixed satellite service (Earth-to-space), the aggregate pfd of HAPS uplinks shall be limited to a maximum of −183.9 dBW/m^2 in 4 kHz at any point in the geostationary arc. To meet this aggregate pfd criterion, the maximum e.i.r.p. value of a single HAPS gateway link towards the geostationary arc shall not exceed −59.9 dBW/4 kHz in any direction within ±5 degrees of the geostationary arc;

5 that for the purpose of protecting the fixed wireless systems in other administrations in the band 6 440-6 520 MHz, the e.i.r.p. of the HAPS downlink shall be limited to a maximum of −0.5 dBW/10 MHz for all off-axis angles from the nadir to 60 degrees from the nadir;

6 that for the purpose of protecting EESS passive operations over oceans, HAPS gateway stations shall maintain a minimum distance of 100 kilometres for a single HAPS gateway station and 150 kilometres for several HAPS gateway stations from coast lines;

7 that administrations planning to implement HAPS gateway links in the notification to the Bureau of the frequency assignment(s) shall submit all mandatory parameters for the examination by the Bureau for compliance with respect to *resolves* 1 to 6 above, and also the explicit agreement obtained pursuant to No. **5.457**,

invites

administrations to consult with the Director of the Radiocommunication Bureau to determine the data elements of HAPS gateway stations necessary for notification and examination of frequency assignments in accordance with the provisions of Article **11** and Appendix **4**,

instructs the Director of the Radiocommunication Bureau

to implement this Resolution.

RESOLUTION 154 (REV.WRC-15)

Consideration of technical and regulatory actions in order to support existing and future operation of fixed-satellite service earth stations within the frequency band 3 400-4 200 MHz, as an aid to the safe operation of aircraft and reliable distribution of meteorological information in some countries in Region 1

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that the frequency band 3 400-4 200 MHz is allocated worldwide to the fixed-satellite service (FSS) in the space-to-Earth direction and to the fixed service on a primary basis;

b) that the frequency band 3 400-3 600 MHz is allocated on a primary basis to the mobile, except aeronautical mobile, service and identified for International Mobile Telecommunications (IMT) in Region 1 countries as specified in Article **5** of the Radio Regulations;

c) that in Region 1, the allocation to the mobile, except aeronautical mobile, service in the frequency band 3 400-3 600 MHz is subject to technical and regulatory conditions aimed at ensuring compatibility with co-primary services of neighbouring countries;

d) that a number of developing countries rely, to a great extent, on FSS systems using very small aperture terminals (VSAT) in the frequency band 3 400-4 200 MHz for the provision of communications as an aid to safe operation of aircraft and reliable distribution of meteorological information;

e) that, in some cases, where an adequate terrestrial communication infrastructure is not available, VSAT networks referred to in *considering d)* above are the only viable option to augment the communication infrastructure in order to satisfy the overall communications infrastructure requirements of the International Civil Aviation Organization (ICAO) and to ensure distribution of meteorological information under the auspices of the World Meteorological Organization (WMO);

f) that the relevant ITU Radiocommunication Sector (ITU-R) studies showed a potential for interference from fixed wireless access and IMT stations into FSS receiving earth stations at distances from less than one kilometre up to hundreds of kilometres, depending on the parameters and deployment of stations of these services;

g) that WRC-12, taking into account the studies mentioned in *considering f)* above, decided to study technical and regulatory measures to support the FSS earth stations referred to in *considering e)* above,

noting

a) that, by the date of this conference, several cases of harmful interference to the FSS VSATs used for aeronautical safety communications from fixed wireless access or IMT stations were reported;

b) that these reported cases of interference indicated difficulties that some administrations have encountered in the coordination of frequencies between the fixed wireless access or IMT systems and frequency assignments for VSATs used for aeronautical and meteorological purposes;

c) that, in many countries, FSS VSAT earth stations are not subject to individual licensing and not registered as specific stations in their national frequency databases and in the ITU Master International Frequency Register (MIFR) due to the considerable administrative work involved;

d) that knowledge of the location and operational frequencies of VSAT stations used for communications as an aid to the safe operation of aircraft and/or distribution of meteorological information is critically important for ensuring compatibility with applications of other services,

recognizing

a) that ITU-R conducted comprehensive studies of compatibility between FSS on the one hand and fixed wireless access systems and IMT applications on the other hand in the frequency band 3 400-4 200 MHz, and summarized the results of the studies in Recommendation ITU-R SF.1486 as well as Reports ITU-R S.2199, ITU-R M.2109 and ITU-R S.2368;

b) that the Recommendation and Reports identified in *recognizing a)* offer a set of mitigation techniques that could be employed for international coordination and at a national level and to facilitate coexistence of FSS, fixed service and mobile service systems;

c) that Recommendation ITU-R S.1856 contains methodologies for verification of compliance with the relevant power flux-density (pfd) limit set forth in the Radio Regulations,

resolves

1 to recommend that administrations in countries where the frequency band 3 400-3 600 MHz is allocated on a primary basis to the mobile, except aeronautical mobile, service in Region 1 and identified for IMT in Region 1 ensure compliance of IMT stations with the relevant provisions set forth in the Radio Regulations and apply the relevant coordination procedures before bringing these applications into use;

2 to urge administrations in Region 1, when planning and/or licensing fixed point-to-point, fixed wireless access and IMT systems in frequency bands referred to in *considering b)* above, to take into account the protection needs of existing and planned FSS earth stations within the frequency band 3 400-4 200 MHz, as an aid to the safe operation of aircraft and reliable distribution of meteorological information in some countries in Region 1;

3 to invite administrations in Region 1, taking into account the number of earth stations involved for this particular type of usage, to consider the possibility of licensing the FSS earth stations used for communications as an aid to the safe operation of aircraft and/or distribution of meteorological information on an individual basis and registering them in the MIFR as specific earth stations;

4 to encourage administrations in Region 1 to employ the appropriate mitigation techniques described in the ITU-R publications referred to in *recognizing a)* above;

5 to invite administrations to ensure that the application of these technical and regulatory measures to FSS and the mobile service does not limit the use of the frequency band 3 400-4 200 MHz by other existing and planned systems and services in other countries,

instructs the Secretary-General

to bring this Resolution to the attention of ICAO and WMO.

RESOLUTION 155 (WRC-15)

Regulatory provisions related to earth stations on board unmanned aircraft which operate with geostationary-satellite networks in the fixed-satellite service in certain frequency bands not subject to a Plan of Appendices 30, 30A and 30B for the control and non-payload communications of unmanned aircraft systems in non-segregated airspaces*

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that the operation of unmanned aircraft systems (UAS) requires reliable control and non-payload communication (CNPC) links, in particular to relay air traffic control communications and for the remote pilot to control the flight;

b) that satellite networks may be used to provide CNPC links of UAS beyond the line-of-sight, as shown in Annex 1;

c) that CNPC links between space stations and stations on board unmanned aircraft (UA) are proposed to be operated under this Resolution in the primary fixed-satellite service (FSS) in frequency bands shared with other primary services, including terrestrial services, however that would not preclude the use of other available allocations to accommodate this application,

considering further

that UAS CNPC links relate to the safe operation of UAS and have to comply with certain technical, operational and regulatory requirements,

noting

a) that this conference has adopted Resolution **156** on the use of earth stations in motion communicating with geostationary FSS space stations in the frequency bands 19.7-20.2 GHz and 29.5-30.0 GHz;

b) that Report ITU-R M.2171 provides information on characteristics of UAS and spectrum requirements to support their safe operation in non-segregated airspace,

recognizing

a) that the UAS CNPC links will operate in accordance with international standards and recommended practices and procedures established in accordance with the Convention on International Civil Aviation;

b) that, in this Resolution, conditions are provided for operations of CNPC links without prejudging whether the International Civil Aviation Organization (ICAO) would be able to develop standards and recommended practices to ensure safe operation of UAS under these conditions,

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* May also be used consistent with international standards and practices approved by the responsible civil aviation authority.

resolves

1 that assignments to stations of geostationary FSS satellite networks operating in the frequency bands 10.95-11.2 GHz (space-to-Earth), 11.45-11.7 GHz (space-to-Earth), 11.7-12.2 GHz (space-to-Earth) in Region 2, 12.2-12.5 GHz (space-to-Earth) in Region 3, 12.5-12.75 GHz (space-to-Earth) in Regions 1 and 3 and 19.7-20.2 GHz (space-to-Earth), and in the frequency bands 14-14.47 GHz (Earth-to-space) and 29.5-30.0 GHz (Earth-to-space), may be used for UAS CNPC links in non-segregated airspace*, provided that the conditions specified in *resolves* below are met;

2 that earth stations in motion on board UA may communicate with the space station of a geostationary FSS satellite network operating in the frequency bands listed in *resolves* 1 above, provided that the class of the earth station in motion on board UA is matched with the class of the space station and that other conditions of this Resolution are met (see also *instructs the Director of the Radiocommunication Bureau* 3 below);

3 that the frequency bands specified in *resolves* 1 shall not be used for the UAS CNPC links before the adoption of the relevant international aeronautical standards and recommended practices (SARPs) consistent with Article 37 of the Convention on International Civil Aviation, taking into account *instructs the Director of the Radiocommunication Bureau* 4;

4 that administrations responsible for an FSS network providing UA CNPC links shall apply the relevant provisions of Articles **9** (necessary provisions need to be identified or developed) and **11** for the relevant assignments, including, as appropriate, assignments to the corresponding space station, specific and typical earth station and earth station in motion on board UA, including the request for publication in BR IFIC of items referred to in *resolves* 2 and the course of actions identified in that *resolves* in order to obtain international rights and recognition as specified in Article **8**;

5 that earth stations of UAS CNPC links shall operate within the notified and recorded technical parameters of the associated satellite network, including specific or typical earth stations of the geostationary FSS satellite network(s) as published by the Radiocommunication Bureau;

6 that earth stations of UAS CNPC links shall not cause more interference to, or claim more protection from, other satellite networks and systems than specific or typical earth stations as indicated in *resolves* 5 as published by the Bureau;

7 that, in order to apply *resolves* 6 above, administrations responsible for the FSS network to be used for UAS CNPC links shall provide the level of interference for the reference assignments of the network used for CNPC links upon request by an administration authorizing the use of UAS CNPC links within its territory;

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* May also be used consistent with international standards and practices approved by the responsible civil aviation authority.

8 that earth stations of UAS CNPC links of a particular FSS network shall not cause more interference to, or claim more protection from, stations of terrestrial services than specific or typical earth stations of that FSS network as indicated in *resolves* 5 that have been previously coordinated and/or notified under relevant provisions of Articles **9** and **11**;

9 that the use of assignments of a FSS satellite network for UAS CNPC links shall not constrain other FSS satellite networks during the application of the provisions of Articles **9** and **11**;

10 that the introduction of UAS CNPC links shall not result in additional coordination constraints on terrestrial services under Articles **9** and **11**;

11 that earth stations on board UA shall be designed and operated so as to be able to accept the interference caused by terrestrial services operating in conformity with the Radio Regulations in the frequency bands listed in *resolves* 1 without complaints under Article **15**;

12 that earth stations on board UA shall be designed and operated so as to be able to operate with interference caused by other satellite networks resulting from application of Articles **9** and **11**;

13 that, in order to ensure safety-of-flight operation of UAS, administrations responsible for operating UAS CNPC links shall:

– ensure that the use of UAS CNPC links be in accordance with the international standards and recommended practices (SARPs) consistent with Article 37 of the Convention on International Civil Aviation;

– take the required measures, consistent with No. **4.10**, to ensure freedom from harmful interference to earth stations on board UA operated in accordance with this Resolution;

– act immediately when their attention is drawn to any such harmful interference, as freedom from harmful interference to UAS CNPC links is imperative to ensure their safe operation, taking into account *resolves* 11;

– use assignments associated with the FSS networks for UAS CNPC links (see Figure 1 in Annex 1), including assignments to space stations, specific or typical earth stations and earth stations on board UA (see *resolves* 2), that have been successfully coordinated under Article **9** (including provisions identified in *resolves* 4) and recorded in the Master International Frequency Register (MIFR) with a favourable finding under Article **11**, including Nos. **11.31**, **11.32** or **11.32A** where applicable, and except those assignments that have not successfully completed coordination procedures under No. **11.32** by applying Appendix **5** § 6.d.i;

– ensure that real-time interference monitoring, estimation and prediction of interference risks and planning solutions for potential interference scenarios are addressed by FSS operators and UAS operators with guidance from aviation authorities;

14 that, unless otherwise agreed between the administrations concerned, UA CNPC earth stations shall not cause harmful interference to terrestrial services of other administrations (see also Annex 2);

15 that, in order to implement *resolves* 14 above, power flux-density hard limits need to be developed for UAS CNPC links; one possible example of such provisional limits to protect the fixed service is provided in Annex 2; subject to agreement between the administrations concerned, that annex may be used for the implementation of this Resolution;

16 that the power flux-density hard limits provided in Annex 2 shall be reviewed and, if necessary, revised by the next conference;

17 that, in order to protect the radio astronomy service in the frequency band 14.47-14.5 GHz, administrations operating UAS in accordance with this Resolution in the frequency band 14-14.47 GHz within line-of-sight of radio astronomy stations are urged to take all practicable steps to ensure that the emissions from the UA in the frequency band 14.47-14.5 GHz do not exceed the levels and percentage of data loss given in the most recent versions of Recommendations ITU-R RA.769 and ITU-R RA.1513;

18 to consider the progress obtained by ICAO in the process of preparation of SARPs for UAS CNPC links, to review this Resolution at WRC-23, taking into account the results of the implementation of Resolution **156 (WRC-15)**, and to take necessary actions as appropriate;

19 that ITU Radiocommunication Sector (ITU-R) studies on technical, operational and regulatory aspects in relation to the implementation of this Resolution shall be completed, together with the adoption of relevant ITU-R Recommendations defining the technical characteristics of CNPC links and conditions of sharing with other services,

resolves to encourage administrations

1 to provide the relevant information where available in order to facilitate the application of *resolves* 6;

2 to participate actively in the studies referred to in *invites ITU-R* by submitting contributions to ITU-R,

resolves further to invite the 2023 World Radiocommunication Conference

to consider the results of the above studies referred to in this Resolution with a view to reviewing and, if necessary, revising this Resolution, and take necessary actions, as appropriate,

invites ITU-R

to conduct, as a matter of urgency, relevant studies of technical, operational and regulatory aspects in relation to the implementation of this Resolution,

instructs the Director of the Radiocommunication Bureau

1 to examine the relevant part of this Resolution requiring actions to be taken by administrations to implement this Resolution, with a view to sending it to administrations and posting it on the ITU website;

2 to present to subsequent WRCs a progress report relating to the implementation of this Resolution;

3 to define a new class of station in order to be able to process satellite network filings submitted by administrations for earth stations providing UA CNPC links, after the Resolution is implemented, in accordance with this Resolution, and publish the information as referred in *resolves* 4;

4 not to process satellite network filing submissions by administrations with a new class of a station for earth stations providing UA CNPC links before *resolves* 1-12 and 14-19 of this Resolution are implemented;

5 to report to subsequent WRCs on the progress made by ICAO on the development of SARPs for UAS CNPC links,

instructs the Secretary-General

to bring this Resolution to the attention of the Secretary-General of ICAO,

invites the International Civil Aviation Organization

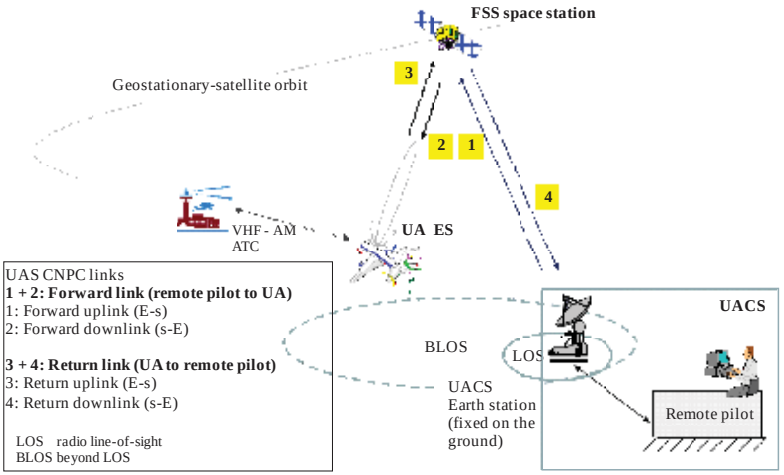
to provide to the Director of the Radiocommunication Bureau, in time for WRC-19 and WRC-23, information on ICAO efforts regarding implementation of UAS CNPC links, including the information related to the development of SARPs for UAS CNPC links.

ANNEX 1 TO RESOLUTION 155 (WRC-15)

UAS CNPC links

FIGURE 1

Elements of UAS architecture using the FSS



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ANNEX 2 TO RESOLUTION 155 (WRC-15)

Protection of the fixed service from UAS CNPC emissions

The fixed service is allocated by table entries and footnotes in several countries with co-primary status with FSS. Conditions of UA using CNPC shall be such that the fixed service is protected from any harmful interference as follows:

An earth station on board UA in the frequency band 14.0-14.47 GHz shall comply with provisional power flux-density (pfd) limits described below:

$-132 + 0.5 \cdot \theta$ dB(W/(m^2 · MHz)) for $\theta \leq 40°$

-112 dB(W/(m^2 · MHz)) for $40° < \theta \leq 90°$

where θ is the angle of arrival of the radio-frequency wave (degrees above the horizontal).

NOTE – The aforementioned limits relate to the pfd and angles of arrival that would be obtained under free-space propagation conditions.

RESOLUTION 156 (WRC-15)

Use of the frequency bands 19.7-20.2 GHz and 29.5-30.0 GHz by earth stations in motion communicating with geostationary space stations in the fixed-satellite service[1]

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that there is some regulatory ambiguity in the current No. **5.526** with respect to its scope of application;

b) that there is a need for global broadband mobile-satellite communications, and that some of this need could be met by allowing earth stations in motion to communicate with space stations of the fixed-satellite service (FSS);

c) that the ITU Radiocommunication Sector (ITU-R) has studied certain aspects of the technical and operational use of earth stations in motion and that the result of these studies is contained in Reports ITU-R S.2223 and ITU-R S.2357;

d) that appropriate technical, regulatory and operational procedures are required for earth stations in motion;

e) that current regulatory provisions and their associated Rules of Procedure provide the possibility that an earth station operate within the envelope of coordination agreements established for the corresponding satellite network;

f) that there may be a need to clarify that earth stations in motion as referred to in this Resolution are not intended to be used nor to be relied upon for the provision of safety-of-life applications,

recognizing

a) that the frequency bands 19.7-20.2 GHz and 29.5-30.0 GHz are globally allocated on a primary basis to the FSS and are used by geostationary-satellite orbit (GSO) FSS networks;

b) that, in the frequency band 29.5-30.0 GHz there is an allocation to the fixed and mobile services on a secondary basis in a number of countries (see No. **5.542**) and in the frequency band 19.7-20.2 GHz there is an allocation to the fixed and mobile services on a primary basis in a number of countries (see No. **5.524**);

c) that there is a need to take actions to eliminate harmful interference which may be caused to terrestrial services of those administrations listed in No. **5.542**;

d) that, currently, there is no specific regulatory procedure for the coordination of the earth stations in motion with regard to terrestrial services;

e) that the UC class of station is used for earth stations in motion communicating with the FSS when using the provisions of No. **5.526** for satellite network filings under Articles **9** and **11**;

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1 As referred to in the Table of Frequency Allocations.

f) that this conference has adopted No. **5.527A** to clarify that earth stations in motion can communicate with GSO FSS space stations in the frequency bands 19.7-20.2 GHz and 29.5-30.0 GHz under certain conditions specified in the *resolves* 1-4 below;

g) that successful coordination does not in any way imply licensing authorization to provide a service within the territory of a Member State (see also *recognizing b)* of Resolution **25 (Rev.WRC-03)**),

resolves

1 that earth stations in motion communicating with the GSO FSS shall operate under the following conditions:

1.1 with respect to satellite networks of other administrations, the earth station shall remain within the envelope of the coordination agreements of the satellite networks with which this earth station is associated or, in the absence of such agreements, comply with the off-axis e.i.r.p. density levels given in the Annex;

1.2 with respect to terrestrial services of other administrations mentioned in No. **5.524**, the earth station in motion shall not claim protection or impose constraints on the development of these services operating in the frequency band 19.7-20.1 GHz in Regions 1 and 3;

1.3 with respect to any terrestrial systems operating in the frequency band 29.5-29.9 GHz in Regions 1 and 3 in the countries listed in No. **5.542**, the notifying administrations operating maritime earth stations in motion operating in international waters and aeronautical earth stations in motion operating in international airspace shall ensure that such operations do not cause unacceptable interference;

1.4 in case of interference, the administration responsible for the satellite network shall, upon receipt of a report of harmful interference with respect to any terrestrial systems operating in the countries listed in No. **5.542**, immediately cease or reduce the interference to the acceptable level;

1.5 to this effect, that administration shall submit to the Bureau a commitment for implementation of *resolves* 1.4 above;

1.6 that these earth stations be subject to permanent monitoring and control by a Network Control and Monitoring Centre (NCMC) or equivalent facility and be capable of receiving and acting upon at least “enable transmission” and “disable transmission” commands from the NCMC;

1.7 that these earth stations not be used or relied upon for safety-of-life applications;

2 that the administration responsible for the satellite network shall ensure that the earth stations in motion employ techniques to track the associated GSO FSS satellite and that they are resistant to capturing and tracking adjacent GSO satellites;

3 that the notifying administration for the satellite network within which the earth stations in motion operate by means of fixed, mobile or transportable terminals shall ensure that they have the capability to limit operations of such earth stations to the territory or territories of administrations having authorized those earth stations and to comply with Article **18**;

4 that administrations authorizing earth stations in motion shall require the operators to provide a point of contact for the purpose of tracing any suspected cases of interference from earth stations in motion.

ANNEX TO RESOLUTION 156 (WRC-15)

Off axis e.i.r.p. density levels for earth stations in motion communicating with geostationary space stations of the fixed-satellite service in the frequency band 29.5-30.0 GHz[2]

This annex provides a set of off-axis e.i.r.p. levels for earth stations in motion operating in the frequency band 29.5-30.0 GHz.

Earth stations in motion operating and communicating with geostationary space stations in the fixed-satellite service transmitting in the frequency band 29.5-30.0 GHz shall be designed in such a manner that at any angle, θ, which is 2° or more from the vector from the earth station antenna to the associated satellite (see Figure 1 below for the reference geometry of an earth station in motion compared to an earth station at a fixed location), the e.i.r.p. density in any direction within 3° of the GSO, shall not exceed the following values:

Angle θ	Maximum e.i.r.p. per 40 kHz*
$2° \leq \theta \leq 7°$	$(19 - 25 \log \theta)$ dB(W/40 kHz)
$7° < \theta \leq 9.2°$	−2 dB(W/40 kHz)
$9.2° < \theta \leq 48°$	$(22 - 25 \log \theta)$ dB(W/40 kHz)
$48° < \theta \leq 180°$	−10 dB(W/40 kHz)

* Other levels may be coordinated and mutually agreed between affected administrations (see also *resolves* 1.1).

NOTE 1 – The values above are maximal values under clear-sky conditions. In the case of networks employing uplink power control, these levels should include any additional margins above the minimum clear-sky level necessary for the implementation of uplink power control. When attenuation by rain occurs and uplink power control is used, the levels stated above may be exceeded to compensate for that attenuation. When uplink power control is not used and the e.i.r.p. density levels given above are not met, different values could be used in compliance with the values agreed to through bilateral coordination of GSO FSS satellite networks.

NOTE 2 – The e.i.r.p. density levels for angles of θ less than 2° may be determined from GSO FSS coordination agreements taking into account the specific parameters of the two GSO FSS satellite networks.

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2 See also Report ITU-R S.2357 for ease of reference.

NOTE 3 – For geostationary space stations in the fixed-satellite service employing code division multiple access (CDMA) with which the earth stations in motion are expected to transmit simultaneously in the same 40 kHz band, the maximum e.i.r.p. density values should be decreased by 10 log(*N*) dB, where *N* is the number of earth stations in motion that are in the receive satellite beam of the associated satellite and that are expected to transmit simultaneously on the same frequency. Alternative methods may be used if agreed between affected administrations.

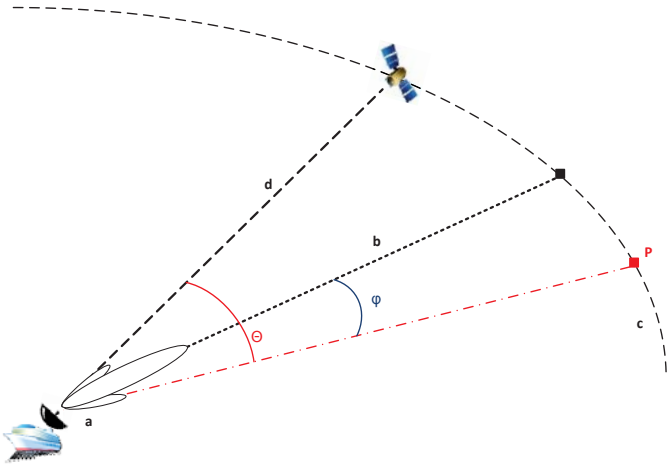
NOTE 4 – Potential aggregate interference from earth stations in motion operating within the fixed-satellite service using multi-spot frequency reuse technologies should be taken into account in coordination with respect to other GSO satellite networks.

NOTE 5 – Earth stations in motion operating in the frequency band 29.5-30.0 GHz with low elevation angles to the GSO will require higher e.i.r.p. levels relative to the same terminals at high elevation angles to achieve the same power flux-densities (pfd) at the GSO due to the combined effect of increased distance and atmospheric absorption. Earth stations with low elevation angles may exceed the above levels by the following amount:

Elevation angle to GSO (ε)	**Increase in e.i.r.p. spectral density (dB)**
$\varepsilon \leq 5°$	2.5
$5° < \varepsilon \leq 30°$	$3 - 0.1\ \varepsilon$

Figure 1 below illustrates the definition of angle θ[3].

FIGURE 1



3 In Figure 1 proportions are illustrative and not to scale.

where:

a represents the earth station in motion

b represents the boresight of the earth station antenna

c represents the geostationary-satellite orbit (GSO)

d represents the vector from the earth station in motion to the associated GSO FSS satellite

φ represents the angle between the boresight of the earth station antenna and a point P on the GSO arc

θ represents the angle between the vector d and point P on the GSO arc

P represents a generic point on the GSO arc which angles θ and φ are referred to.

RESOLUTION 157 (WRC-15)

Study of technical and operational issues and regulatory provisions for new non-geostationary-satellite orbit systems in the 3 700-4 200 MHz, 4 500-4 800 MHz, 5 925-6 425 MHz and 6 725-7 025 MHz frequency bands allocated to the fixed-satellite service

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that systems based on the use of new technologies associated with both geostationary-satellite orbit (GSO) and non-geostationary-satellite orbit (non-GSO) constellations are capable of providing high-capacity and low-cost means of communication even to the most isolated regions of the world;

b) that GSO and non-GSO satellite orbits and associated spectrum are valuable resources and equitable access to these resources should be protected for the benefit of all countries in the world;

c) that facilitating the use of new non-GSO systems has the potential to augment substantially the capacity, spectrum efficiency and benefits derived from GSO and non-GSO systems operating in the frequency bands: 3 700-4 200 MHz, 4 500-4 800 MHz, 5 925-6 425 MHz and 6 725-7 025 MHz,

noting

a) that the Article **21** power flux-density (pfd) limits and Article **22** equivalent power flux-density (epfd↓) limits in the frequency band 3 700-4 200 MHz (space-to-Earth) and the Article **22** epfd↑ limits in the frequency band 5 925-6 725 MHz (Earth-to-space) were developed under agenda item 1.37 at WRC-03 based on a particular highly-elliptical orbit (HEO) configuration, while new non-GSO systems that seek to operate in these frequency bands may utilize different types of orbits;

b) that Article **22** does not contain epfd↓ and epfd↑ limits for non-GSO systems in the frequency bands 4 500-4 800 MHz (space-to-Earth) and 6 725-7 025 MHz (Earth-to-space) allocated to the fixed-satellite service (FSS), the use of which is subject to the provisions of Appendix **30B**;

c) that the Report of the Director of the Radiocommunication Bureau to this conference acknowledges that there may be a need for "reviewing or confirming" assumptions that led to the current values of the Article **21** and Article **22** power limits, taking into account the characteristics of systems recently submitted "and the overall trend for a growing interest in operating non-GSO FSS systems, with the view to ensure that all existing services are adequately protected";

d) that specifically identified studies taking into account current technical and operational characteristics will help to determine appropriate Article **21** pfd limits and Article **22** epfd limits for the frequency bands 3 700-4 200 MHz, 4 500-4 800 MHz and 5 925-7 025 MHz for non-GSO systems,

recognizing

a) that enabling GSO networks and non-GSO systems to make the most efficient use of satellite orbits and frequency bands allocated to the FSS shall take into consideration the other services to which those frequency bands are also allocated on a primary basis;

b) that the frequency bands 3 700-4 200 MHz, 4 500-4 800 MHz and 5 925-7 025 MHz are also allocated in one or more Regions to the fixed and mobile services on a primary basis;

c) that in the frequency bands 3 700-4 200 MHz, 4 500-4 800 MHz and 5 925-7 025 MHz, non-GSO FSS systems are obligated by No. **22.2** not to cause unacceptable interference to or claim protection from GSO FSS networks;

d) that under No. **5.458B** the frequency band 6 700-7 025 MHz allocated to the FSS on a primary basis in the space-to-Earth direction is limited to feeder links for non-GSO systems of the mobile-satellite service (MSS);

e) that Nos. **5.440A** and **5.457C** were adopted to address the operation of aeronautical mobile telemetry (AMT) for flight testing by aircraft stations (see No. **1.83**) in the frequency bands 4 400-4 940 MHz and 5 925-6 700 MHz with respect to the FSS only using GSO networks;

f) that there are specific protection criteria, and protection levels defined in those criteria, for the FSS, the mobile service and the fixed service;

g) that new non-GSO systems with circular orbits shall ensure that existing non-GSO systems with highly-elliptical orbits should be protected,

resolves to invite the ITU Radiocommunication Sector

to study the following issues relating to non-GSO systems in the following frequency bands allocated to the FSS:

a) in the frequency band 3 700-4 200 MHz (space-to-Earth), identification of possible revision of Article **21**, Table 21-4 for non-GSO FSS satellites, with a view to enabling new non-GSO systems to operate in these FSS frequency bands, while ensuring that existing primary services, i.e. the mobile service and fixed service, are protected and maintaining the existing Article **21** pfd limits for GSO networks;

b) in the frequency bands 3 700-4 200 MHz (space-to-Earth) and 5 925-6 425 MHz (Earth-to-space), the Article **22** epfd↓ limits and epfd↑ limits applicable to non-GSO systems with a view to enabling additional non-GSO systems to operate in these frequency bands, while ensuring that GSO networks are protected from unacceptable interference pursuant to No. **22.2** and existing protection criteria;

c) in the frequency bands 4 500-4 800 MHz (space-to-Earth) and 6 725-7 025 MHz (Earth-to-space), the possible development of Article **22** epfd↓ and epfd↑ limits similar to those in other FSS frequency bands with a view to enabling non-GSO systems to operate in these frequency bands, while ensuring that GSO networks are protected from unacceptable interference pursuant to No. **22.2** and existing protection criteria taking into account *recognizing f)* above;

d) in the frequency band 6 700-7 025 MHz, the protection of feeder links for MSS systems operating in the space-to-Earth direction from unacceptable interference, pursuant to existing criteria, from non-GSO FSS system earth stations operating in the Earth-to-space direction;

e) in the frequency band 4 500-4 800 MHz (space-to-Earth), the development of appropriate regulatory provisions for non-GSO FSS systems to protect terrestrial services;

f) in the frequency bands 4 500-4 800 MHz (space-to-Earth) and 5 925-6 425 MHz (Earth-to-space), the development of regulatory provisions to clarify that Nos. **5.440A** and **5.457C** would apply in a manner to ensure that non-GSO FSS systems do not cause harmful interference to, or claim protection from, AMT for flight testing by aircraft stations,

further resolves

1 that the results of studies referred to in the *resolves* above shall:

– in no way change the protection criteria and protection levels defined in those criteria for the GSO FSS, the fixed service and the mobile service;

– ensure protection of the existing non-GSO FSS systems with highly-elliptical orbits,

2 that new non-GSO systems that operate in FSS bands subject to the provisions of Appendix **30B** shall ensure that the allotments appearing in the Plan and the assignments of the List of Appendix **30B** will be fully protected,

invites administrations

to participate in the studies by submitting contributions to the ITU Radiocommunication Sector,

instructs the Director of the Radiocommunication Bureau

to include in his report, for consideration by WRC-19, the results of the ITU-R studies referred to in *resolves to invite the ITU Radiocommunication Sector* above.

RESOLUTION 158 (WRC-15)

Use of the frequency bands 17.7-19.7 GHz (space-to-Earth) and 27.5-29.5 GHz (Earth-to-space) by earth stations in motion communicating with geostationary space stations in the fixed-satellite service

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that the frequency bands 17.7-19.7 GHz (space-to-Earth) and 27.5-29.5 GHz (Earth-to-space) are globally allocated on a primary basis to the fixed-satellite service (FSS) and that there are a large number of geostationary FSS satellite networks operating in these frequency bands, as well as non-geostationary FSS systems;

b) that in these frequency bands there are a large number of fixed-service stations, as well as mobile-service stations;

c) that regulatory and technical procedures exist in these frequency bands between geostationary FSS networks and non-geostationary FSS systems;

d) that there is an need for mobile communications, including global broadband satellite services, and that some of this need can be met by allowing earth stations in motion to communicate with space stations of the FSS operating in the frequency bands 17.7-19.7 GHz (space-to-Earth) and 27.5-29.5 GHz (Earth-to-space);

e) that some administrations have already deployed, and plan to expand their use of, earth stations in motion with operational and future geostationary FSS networks;

f) that geostationary FSS networks in the frequency bands 17.7-19.7 GHz (space-to-Earth) and 27.5-29.5 GHz (Earth-to-space) are required to be coordinated and notified in accordance with the provisions of Articles **9** and **11** of the Radio Regulations;

g) that the frequency bands 17.7-19.7 GHz (space-to-Earth) and 27.5-29.5 GHz (Earth-to-space) are also allocated to several other services on a primary basis, the allocated services are used by a variety of different systems in many administrations and these existing services and their future development should be protected without undue constraints;

h) that currently there is no specific regulatory procedure for the coordination of the earth stations in motion with regard to stations of terrestrial services,

considering further

a) that a consistent approach to deployment of these earth stations in motion will support these important and growing global communication requirements;

b) that the ITU Radiocommunication Sector (ITU-R) has adopted Reports ITU-R S.2223 and ITU-R S.2357;

c) that the technical characteristics of the earth stations in motion operating within a given geostationary-satellite network should be within the envelope of the coordination agreements reached between administrations,

recognizing

a) that Article **21** contains power flux-density (pfd) limits for geostationary fixed-satellite services;

b) that earth stations in motion addressed by this Resolution are not to be used for safety-of-life applications;

c) that this conference has adopted footnote No. **5.527A** and Resolution **156 (WRC-15)** related to earth stations in motion;

d) that advances in technology, including the use of tracking techniques, allow earth stations in motion to operate within the characteristics of fixed earth stations of the FSS;

e) that No. **1.21** defines the fixed-satellite service and No. **1.25** defines the mobile-satellite service (MSS);

f) that the use of earth stations in motion under the FSS regime is not much different from MSS applications, taking into account the definition of mobile-satellite service in No. **1.25**;

g) that the main difference between earth stations in motion and mobile earth stations is that earth stations in motion comply with the technical requirements of fixed-satellite earth stations,

recognizing further

a) that parts of the frequency band 17.7-18.1 GHz are used by feeder links for the broadcasting-satellite service, subject to Appendix **30A** (No. **5.516**);

b) that the frequency bands 18.3-19.3 GHz (Region 2), 27.5-27.82 GHz (Region 1), 28.35-28.45 GHz (Region 2), 28.45-28.94 GHz (all Regions), 28.94-29.1 GHz (Regions 2 and 3), 29.25-29.46 GHz (Region 2) and 29.46-29.5 GHz (all Regions) are identified for use by high-density applications in the fixed-satellite service (No. **5.516B**);

c) that use of the frequency band 18.1-18.4 GHz by the fixed-satellite service (Earth-to-space) is limited to feeder links of geostationary-satellite systems in the broadcasting-satellite service (No. **5.520**);

d) that use of the frequency band 18.6-18.8 GHz by the fixed-satellite service is limited to geostationary systems and systems with an orbit of apogee greater than 20 000 km (No. **5.522B**);

e) that the use of the frequency bands 17.8-18.6 GHz and 27.5-28.6 GHz by non-geostationary fixed-satellite service systems is subject to the application of the provisions of Nos. **5.484A**, **22.5C** and **22.5I**;

f) that use of the frequency bands 18.8-19.3 GHz and 28.6-29.1 GHz by geostationary and non-geostationary fixed-satellite service networks is subject to the application of the provisions of No. **9.11A**, and No. **22.2** does not apply (No. **5.523A**);

g) that use of the frequency band 19.3-19.7 GHz by geostationary fixed-satellite service systems and by feeder links for non-geostationary satellite systems in the mobile-satellite service is subject to the application of the provisions of No. **9.11A**, but not subject to the provisions of No. **22.2**, and that the use of this frequency band for other non-geostationary fixed-satellite service systems, or for the cases indicated in Nos. **5.523C** and **5.523E**, is not subject to the provisions of No. **9.11A** and shall continue to be subject to Articles **9** (except No. **9.11A**) and **11** procedures, and to the provisions of No. **22.2** (No. **5.523D**);

h) that use of the frequency band 29.1-29.5 GHz (Earth-to-space) by the fixed-satellite service is limited to geostationary-satellite systems and feeder links to non-geostationary satellite systems in the mobile-satellite service, and that such use is subject to the application of the provisions of No. **9.11A**, but not subject to the provisions of No. **22.2**, except as indicated in Nos. **5.523C** and **5.523E**, where such use is not subject to the provisions of No. **9.11A** and shall continue to be subject to Articles **9** (except No. **9.11A**) and **11** procedures, and to the provisions of No. **22.2** (No. **5.535A**);

i) that the frequency band 27.5-30 GHz may be used by the fixed-satellite service (Earth-to-space) for the provision of feeder links for the broadcasting-satellite service (No. **5.539**);

j) that feeder links of non-geostationary networks in the mobile-satellite service and geostationary networks in the fixed-satellite service operating in the frequency band 29.1-29.5 GHz (Earth-to-space) shall employ uplink adaptive power control or other methods of fade compensation, such that the earth station transmissions shall be conducted at the power level required to meet the desired link performance while reducing the level of mutual interference between both networks (No. **5.541A**);

k) that the fixed and mobile services are allocated on a primary basis in the frequency bands 27.5-29.5 GHz on a global basis;

l) that the frequency band 18.6-18.8 GHz is used by the Earth exploration-satellite service (EESS) (passive) in remote sensing by Earth exploration and meteorological satellites, and protection from interference is essential for passive sensing measurements and applications, especially for measurements of known spectral lines, which are of particular importance;

m) that the frequency bands 28.5-29.5 GHz (Earth-to-space) are also allocated to the Earth exploration-satellite service on a secondary basis, and no additional constraints should be imposed on the EESS;

n) that all allocated services in these frequency bands should be taken into account,

resolves to invite ITU-R

1 to study the technical and operational characteristics and user requirements of different types of earth stations in motion that operate or plan to operate within geostationary FSS allocations in the frequency bands 17.7-19.7 GHz and 27.5-29.5 GHz, including the use of spectrum to provide the envisioned services to various types of earth station in motion and the degree to which flexible access to spectrum can facilitate sharing with services identified in *recognizing further a)* to *n)*;

2 to study sharing and compatibility between earth stations in motion operating with geostationary FSS networks and current and planned stations of existing services allocated in the frequency bands 17.7-19.7 GHz and 27.5-29.5 GHz to ensure protection of, and not impose undue constraints on, services allocated in those frequency bands, and taking into account *recognizing further a)* to *n)*;

3 to develop, for different types of earth stations in motion and different portions of the frequency bands studied, technical conditions and regulatory provisions for their operation, taking into account the results of the studies above,

resolves

that these earth stations not be used or relied upon for safety-of-life applications,

resolves to further invite the 2019 World Radiocommunication Conference

to consider the results of the above studies and take necessary actions, as appropriate, provided that the results of the studies referred to in *resolves to invite ITU-R* are complete and agreed by ITU-R study groups.

RESOLUTION 159 (WRC-15)

Studies of technical, operational issues and regulatory provisions for non-geostationary fixed-satellite services satellite systems in the frequency bands 37.5-39.5 GHz (space-to-Earth), 39.5-42.5 GHz (space-to-Earth), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space)

The World Radiocommunication Conference (Geneva, 2015),

considering

a) the need to encourage the development and implementation of new technologies in the fixed-satellite service (FSS) at frequencies above 30 GHz;

b) that FSS systems based on the use of new technologies above 30 GHz and associated with both geostationary (GSO) and non-geostationary (non-GSO) satellite constellations are capable of providing high-capacity and low-cost means of communication even to the most isolated regions of the world;

c) that the Radio Regulations should enable the introduction of new applications of radiocommunication technology to ensure the operation of as many systems as possible in order to ensure efficient use of the spectrum;

d) that, in accordance with No. **22.2**, non-GSO systems shall not cause unacceptable interference to GSO FSS and broadcasting-satellite service (BSS) networks and, unless otherwise specified in the Radio Regulations, shall not claim protection from GSO FSS and BSS satellite networks;

e) that non-GSO FSS systems would benefit from the certainty that would result from the specification of measures required to protect GSO FSS and BSS satellite networks under No. **22.2**;

f) that in the FSS, there are GSO satellite networks and non-GSO satellite systems operating and/or planned for near-term operation in the frequency band allocated to the FSS in the range 37.5-51.4 GHz;

g) that technical studies are required in order to ascertain the feasibility of, and conditions for, non-GSO FSS satellite systems sharing the frequency bands 37.5-42.5 GHz (space-to-Earth) and 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space): 1) with GSO satellite networks (FSS, MSS and BSS, as appropriate to the band), and 2) with other non-GSO FSS satellite systems;

h) that review of Resolution **750 (Rev.WRC-15)** may be required to take into account new development of non-GSO satellites,

considering further

that Recommendations ITU-R S.1323, ITU-R S.1325, ITU-R S.1328, ITU-R S.1529 and ITU-R S.1557 provide information on system characteristics, operational requirements and protection criteria that may be used in sharing studies,

noting

a) that filing information for GSO FSS satellite networks in the frequency bands 37.5-42.5 GHz (space-to-Earth), 49.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space) has been communicated to the Radiocommunication Bureau;

b) that some of these GSO satellite networks are in operation and others will be operated in the near future;

c) that the frequency band 37.5-38 GHz is allocated to the space research service (deep space) in the space-to-Earth direction and the frequency band 40.0-40.5 GHz is allocated to the space research service and the Earth exploration-satellite service in the Earth-to-space direction on a primary basis;

d) that the frequency band 37.5-40.5 GHz is allocated to the Earth exploration-satellite service in the space-to-Earth direction on a secondary basis,

recognizing

a) that WRC-2000 adopted provisions, including epfd limits in Nos. **22.5C**, **22.5D** and **22.5F** to quantify No. **22.2**, in order to protect GSO FSS and BSS satellite networks from non-GSO FSS satellite systems in the 10-30 GHz frequency range;

b) that Resolution **76 (Rev.WRC-15)** contains aggregate power levels not to be exceeded by non-GSO FSS systems in order to protect against interference GSO FSS and GSO BSS networks in the 10-30 GHz frequency range;

c) that No. **5.552** urges administrations to take all practicable steps to reserve the frequency band 47.2-49.2 GHz for feeder links for the broadcasting-satellite service operating in the frequency band 40.5-42.5 GHz;

d) that No. **5.554A** limits the use of the frequency bands 47.5-47.9 GHz, 48.2-48.54 GHz and 49.44-50.2 GHz by the fixed-satellite service (space-to-Earth) to geostationary satellites;

e) that No. **21.16** contains power flux-density limits applicable to non-GSO satellite systems to protect fixed and mobile services with allocations in the frequency band 37.5-42.5 GHz;

f) that the frequency band 50.2-50.4 GHz is allocated on a primary basis to the EESS (passive) and space research (passive) services, which must be adequately protected;

g) that WRC-03, having considered the outcome of preliminary ITU-R studies, decided that further studies would be needed to determine the conditions for non-GSO FSS satellite systems to share the 37.5-50.2 GHz frequency range with GSO FSS satellite networks;

h) that No. **5.556** indicates that radio astronomy observations are carried out in the frequency band 51.4-54.25 GHz and that mitigation measures may have to be defined in this regard;

i) that any potential revisions to limitations for the protection of passive services or radio astronomy observations will necessarily be forward-looking, and will be impractical to apply to FSS networks and systems described in *considering f)* and *noting a)* and *b)*,

resolves to invite ITU-R

to conduct, and complete in time for WRC-19:

1 studies of technical and operational issues and regulatory provisions for the operation of non-GSO FSS satellite systems in the frequency bands 37.5-42.5 GHz (space-to-Earth) and 47.2-48.9 GHz (limited to feeder links only), 48.9-50.2 GHz and 50.4-51.4 GHz (all Earth-to-space), while ensuring protection of GSO satellite networks in the FSS, MSS and BSS, without limiting or unduly constraining the future development of GSO networks across those bands, and without modifying the provisions of Article **21**;

2 studies carried out under *resolves to invite ITU-R* 1 shall focus exclusively on the development of equivalent power flux-density limits produced at any point in the GSO by emissions from all the earth stations of a non-GSO system in the fixed-satellite service or into any geostationary FSS earth station, as appropriate;

3 studies and development of sharing conditions between non-GSO FSS systems operating in the frequency bands listed in *resolves to invite ITU-R* 1 above;

4 studies of possible necessary revisions to Resolution **750 (Rev.WRC-15)** to ensure protection of the EESS (passive) in the frequency bands 36-37 GHz and 50.2-50.4 GHz from non-GSO FSS transmission, taking into account *recognizing i)* above, including study of aggregate FSS interference effects from networks and systems operating or planned to operate in the frequency bands described in *resolves to invite ITU-R* 1 above;

5 studies towards ensuring protection of the radio astronomy frequency bands 42.5-43.5 GHz, 48.94-49.04 GHz and 51.4-54.25 GHz from non-GSO FSS transmissions, taking into account *recognizing i)* above, including study of aggregate FSS interference effects from networks and systems operating or planned to operate in the frequency bands described in *resolves to invite ITU-R* 1 above,

further resolves

to invite WRC-19 to consider the results of the above studies and take appropriate action,

invites administrations

to participate in the studies by submitting contributions to ITU-R.

RESOLUTION 160 (WRC-15)

Facilitating access to broadband applications delivered by high-altitude platform stations

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that there is a need for greater broadband connectivity and telecommunication services in underserved communities and in rural and remote areas;

b) that current technologies can be used for broadband applications delivered by base stations operating at high altitudes;

c) that high-altitude platform stations (HAPS) are one possible means for providing fixed broadband connectivity that would enable wireless broadband deployment in remote areas, including mountainous, coastal and sandy desert areas;

d) that HAPS using inter-HAPS links can provide broadband connectivity with minimal ground network infrastructure;

e) that HAPS may also be used for disaster recovery communications;

f) that some new entities are currently testing the delivery of broadband over lightweight, solar-powered aircraft and airships at an altitude of 20-50 kilometres for several months at a nominal fixed point relative to the ground below,

recognizing

a) that existing services and their applications shall be protected from HAPS applications, and no undue constraints shall be imposed on the future development of existing services by HAPS;

b) that HAPS is defined in No. **1.66A** of the Radio Regulations as a station located on an object at an altitude of 20-50 km and at a specified, nominal, fixed point relative to the Earth, and is subject to No. **4.23**;

c) that WRC-97 added a global identification for HAPS in the frequency bands 47.2-47.5 GHz and 47.9-48.2 GHz, that WRC-2000 agreed, because of concerns with rain fade in that frequency range, on a HAPS identification for the frequency band 27.9-28.2 GHz (fixed downlink), paired with the frequency band 31.0-31.3 GHz (fixed uplink), outside Region 2, and that at WRC-12 five countries joined footnote **5.457** for a HAPS designation in the fixed service for frequency bands 6 440-6 520 MHz (HAPS-to-ground) and 6 560-6 640 MHz (ground-to-HAPS);

d) that WRC-2000 decided on additional spectrum identifications for HAPS links under No. **5.388A** and No. **5.388B** in some countries;

e) that the existing HAPS identifications were established without reference to today's broadband capabilities;

f) that Recommendation **34 (Rev.WRC-12)** noted that the development of common worldwide allocations is desirable in order to improve and harmonize utilization of the radio-frequency spectrum;

g) that, since WRC-12, the evolution of technology through advances in solar panel efficiency, battery energy density, lightweight composite materials, autonomous avionics and antenna technology may improve HAPS viability;

h) that the allotments of the Appendix **30B** Plan, assignments in the Plans and the List subject to Appendix **30** and **30A** and assignments in the Appendix **30B** List shall be protected,

resolves to invite ITU-R

1 to study additional spectrum needs for gateway and fixed terminal links for HAPS to provide broadband connectivity in the fixed service taking into account:

– the existing identifications and deployments of HAPS systems;

– the deployment scenarios envisioned for HAPS broadband systems and related requirements such as in remote areas;

– the technical and operational characteristics of HAPS systems, including the evolution of HAPS through advances in technology and spectrally-efficient techniques, and their deployment;

2 to study the suitability of using the existing identifications in *recognizing c)*, on a global or regional level, taking into account the regulatory provisions, such as geographical and technical restrictions associated with existing HAPS identifications based on the study performed in *resolves to invite ITU-R* 1;

3 to study appropriate modifications to the existing footnotes and associated resolutions in the identifications in *recognizing c)* in order to facilitate the use of HAPS links on a global or regional level, limited to the currently identified frequency bands and, where the use of an identification is not technically feasible for HAPS use, the possible removal of the unsuitable identification;

4 to study, in order to meet any spectrum needs which could not be satisfied under *resolves to invite ITU-R* 2 and 3, for the use of gateway and fixed terminal links for HAPS, the following frequency bands already allocated to the fixed service on a primary basis, not subject to Appendices **30**, **30A**, and **30B** in any region:

– on a global level: 38-39.5 GHz, and

– on a regional level: in Region 2, 21.4-22 GHz and 24.25-27.5 GHz,

further resolves

1 that the studies referred to in *resolves to invite ITU-R* 3 and 4 include sharing and compatibility studies to ensure protection of existing services allocated in the frequency ranges identified and, as appropriate, adjacent band studies, taking into account studies already performed in ITU-R;

2 that modifications studied under *resolves to invite ITU-R* 3 shall not consider the use of HAPS links in the frequency bands subject to Appendix **30B**;

3 to develop ITU-R Recommendations and Reports, as appropriate, on the basis of the studies called for in *resolves to invite ITU-R* 1, 2, 3, and 4 above,

invites administrations

to participate in the studies and to provide input contributions,

resolves to invite the 2019 World Radiocommunication Conference

to consider the results of the above studies and take necessary regulatory actions, as appropriate, provided that the results referred to in *resolves to invite ITU-R* are complete and agreed by ITU-R study groups.

RESOLUTION 161 (WRC-15)

Studies relating to spectrum needs and possible allocation of the frequency band 37.5-39.5 GHz to the fixed-satellite service

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that satellite systems are increasingly being used to deliver broadband services and can help enable universal broadband access;

b) that next-generation fixed-satellite service technologies for broadband will increase speeds (45 Mbps is already available), with faster rates expected in the near future;

c) that technological developments such as advances in spot-beam technologies and frequency re-use are used by the fixed-satellite service (FSS) in spectrum above 30 GHz to increase the efficient use of spectrum;

d) that fixed-satellite applications in spectrum above 30 GHz, such as gateways, should be easier to share with other radiocommunication services than high-density fixed-satellite service (HDFSS) applications;

e) that FSS systems based on the use of new technologies above 30 GHz and associated with both geostationary (GSO) and non-geostationary (non-GSO) satellite constellations are capable of providing high-capacity and economically feasible communications even to the most isolated regions of the world;

f) that the frequency band 36-37 GHz is allocated on a primary basis to the Earth exploration-satellite service (EESS) (passive) and the space research service (SRS) (passive), which must be adequately protected,

considering further

a) that Recommendations ITU-R S.1323, S.1325, S.1328, S.1529 and S.1557 provide information on system characteristics, operational requirements and protection criteria to be used in sharing studies;

b) that it may be technically feasible to have a new FSS allocation in the frequency band 37.5-39.5 GHz (Earth-to-space) for operations of gateway earth stations, depending on the results of technical studies,

noting

a) that filing information for GSO satellite networks in the frequency band 37.5-42.5 GHz (space-to-Earth) has been communicated to the Radiocommunication Bureau;

b) that some of these GSO satellite networks are in operation and others will be operated in the near future;

c) that the frequency band 37.5-38 GHz is allocated to SRS on a primary basis in the space-to-Earth direction;

d) that the frequency band 37.5-39.5 GHz is allocated to EESS on a secondary basis in the space-to-Earth direction,

recognizing

the need to protect existing services when considering frequency bands for possible additional allocations to any service,

resolves to invite ITU-R

to conduct, and complete in time for WRC-23:

1 studies considering additional spectrum needs for development of the fixed-satellite service, taking into account the frequency bands currently allocated to FSS, the technical conditions of their use and the possibility of optimizing the use of these frequency bands with a view to increasing spectrum efficiency;

2 sharing and compatibility studies with existing services, on primary and secondary basis, including in adjacent bands as appropriate, to determine the suitability of new primary allocations to the FSS in the frequency band 37.5-39.5 GHz (Earth-to-space, limited to FSS feeder links only) for both GSO and non-GSO orbit use;

3 studies towards possible revision of Resolution **750 (Rev.WRC-15)** so that systems operating in the passive frequency band 36-37 GHz are protected,

further resolves

to invite WRC-23 to consider the results of the above studies and take appropriate actions,

invites administrations

to participate actively in these studies by submitting contributions to ITU-R.

RESOLUTION 162 (WRC-15)

Studies relating to spectrum needs and possible allocation of the frequency band 51.4-52.4 GHz to the fixed-satellite service (Earth-to-space)

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that satellite systems are increasingly being used to deliver broadband services and can help enable universal broadband access;

b) that next-generation fixed-satellite service technologies for broadband will increase speeds (45 Mbps is already available), with faster rates expected in the near future;

c) that technological developments such as advances in spot-beam technologies and frequency reuse are used by the fixed-satellite service in spectrum above 30 GHz to increase the efficient use of spectrum;

d) that fixed-satellite applications in spectrum above 30 GHz, such as feeder links, should be easier to share with other radiocommunication services than high-density fixed-satellite service (HDFSS) applications,

recognizing

a) the need to protect existing services when considering frequency bands for possible additional allocations to any service;

b) that the frequency band 51.4-52.4 GHz is allocated to fixed and mobile services, which will need to be protected, and is available for high-density applications in the fixed service as indicated in No. **5.547**;

c) that No. **5.556** indicates that radio astronomy observations are carried out in the frequency band 51.4-54.25 GHz and that appropriate measures may have to be defined to protect radio astronomy service,

resolves to invite ITU-R

to conduct, and complete in time for WRC-19:

1 studies considering additional spectrum needs for development of the fixed-satellite service, taking into account the frequency bands currently allocated to the fixed-satellite service, the technical conditions of their use, and the possibility of optimizing the use of these frequency bands with a view to increasing spectrum efficiency;

2 subject to justification resulting from studies conducted under *resolves to invite ITU-R* 1, sharing and compatibility studies with existing services, on a primary and secondary basis, including in adjacent bands as appropriate, to determine the suitability, including protection of fixed and mobile services, of new primary allocations to the FSS in the frequency band 51.4-52.4 GHz (Earth-to-space) limited to FSS feeder links for geostationary orbit use, and the possible associated regulatory actions;

3 studies towards possible revision of Resolution **750 (Rev.WRC-15)** so that systems operating in the passive frequency band 52.6-54.25 GHz are protected;

4 studies regarding the protection of radio astronomy, as described in *recognizing c)*, including regulatory measures, as appropriate,

instructs the Director of the Radiocommunication Bureau

to report on the results of the ITU-R studies to WRC-19,

invites administrations

to participate actively in these studies by submitting contributions to ITU-R.

RESOLUTION 163 (WRC-15)

Deployment of earth stations in some Regions 1 and 2 countries in the frequency band 14.5-14.75 GHz in the fixed-satellite service (Earth-to-space) not for feeder links for the broadcasting-satellite service

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that there is a demand for satellite communication services, particularly for the Earth-to-space direction in the frequency range 13-17 GHz;

b) that some of this demand may be met by earth stations operating in the frequency band 14.5-14.8 GHz without requiring this use to be subject to the Appendix **30A** Plan or List;

c) that certain conditions would be required in order to ensure the protection and future use of assignments subject to the Appendix **30A** Plan and List;

d) that, in order to ensure the protection of current and future use of other services to which this frequency band is allocated, earth stations would need to operate under certain technical and operational limitations (see Nos. **5.509B, 5.509C, 5.509D, 5.509E** and **5.509F**);

e) that some administrations may not be in a position to ascertain the potential future use of this frequency band in their territory,

resolves

that earth stations in Regions 1 and 2 in the frequency band 14.5-14.75 GHz in the fixed-satellite service (Earth-to-space) not for feeder links for the broadcasting-satellite service shall be operated only in the following countries: Algeria, Saudi Arabia, Argentina, Armenia, Azerbaijan, Bahrain, Belarus, Brazil, Bulgaria, Cuba, Egypt, El Salvador, the Russian Federation, Iraq, Jordan, Kazakhstan, Kuwait, Mauritania, Mexico, Morocco, Nicaragua, Norway, Oman, Uzbekistan, Qatar, Kyrgyzstan, Sudan, Turkey, Uruguay and Venezuela; such operation is subject to the technical and operational limitations contained in Nos. **5.509B, 5.509C, 5.509D, 5.509E** and **5.509F**.

RESOLUTION 164 (WRC-15)

Deployment of earth stations in some Region 3 countries in the frequency band 14.5-14.8 GHz in the fixed-satellite service (Earth-to-space) not for feeder links for the broadcasting-satellite service

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that there is a demand for satellite communication services, particularly for the Earth-to-space direction in the frequency range 13-17 GHz;

b) that some of this demand may be met by earth stations operating in the frequency band 14.5-14.8 GHz without requiring this use to be subject to the Appendix **30A** Plan or List;

c) that certain conditions would be required in order to ensure the protection and future use of assignments subject to the Appendix **30A** Plan and List;

d) that, in order to ensure the protection of current and future use of other services to which this frequency band is allocated, earth stations would need to operate under certain technical and operational limitations (see Nos. **5.509B, 5.509C, 5.509D, 5.509E** and **5.509F**);

e) that some administrations may not be in a position to ascertain the potential future use of this frequency band in their territory,

resolves

that earth stations in Region 3 in the frequency band 14.5-14.8 GHz in the fixed-satellite service (Earth-to-space) not for feeder links for the broadcasting-satellite service shall be operated only in the following countries: Australia, Cambodia, China, Japan, Lao P.D.R., Pakistan, Papua New Guinea, Thailand and Viet Nam; such operation is subject to the technical and operational limitations contained in Nos. **5.509B, 5.509C, 5.509D, 5.509E** and **5.509F**.

RESOLUTION 205 (REV.WRC-15)

Protection of the systems operating in the mobile-satellite service in the frequency band 406-406.1 MHz

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that WARC-79 allocated the frequency band 406-406.1 MHz to the mobile-satellite service (MSS) in the Earth-to-space direction;

b) that No. **5.266** limits the use of the frequency band 406-406.1 MHz to low-power satellite emergency position-indicating radiobeacons (EPIRBs);

c) that WARC Mob-83 made provision in the Radio Regulations for the introduction and development of a global distress and safety system;

d) that the use of satellite EPIRBs is an essential element of this system;

e) that, like any frequency band reserved for a distress and safety system, the frequency band 406-406.1 MHz is entitled to full protection against all harmful interference;

f) that Nos. **5.267** and **4.22** and Appendix **15** (Table **15-2**) require the protection of the MSS within the frequency band 406-406.1 MHz from all emissions of systems, including systems operating in the lower and upper adjacent frequency bands;

g) that Recommendation ITU-R M.1478 provides protection requirements for the various types of instruments mounted on board operational satellites receiving EPIRB signals in the frequency band 406-406.1 MHz against both broadband out-of-band emissions and narrowband spurious emissions;

h) that Report ITU-R M.2359 provides the results of studies covering various scenarios between the MSS and other relevant active services operating in the frequency bands 390-406 MHz and 406.1-420 MHz or in separate parts of these frequency bands;

i) that unwanted emissions from services outside the frequency band 406-406.1 MHz have the potential to cause interference to MSS receivers within 406-406.1 MHz;

j) that long-term protection against harmful interference of the Cospas-Sarsat satellite system operating in the MSS in the frequency band 406-406.1 MHz is vital to the response times of emergency services;

k) that, in most cases, the frequency bands adjacent or near to those used by Cospas-Sarsat will continue to be used for various applications in the services to which they are allocated,

considering further

a) that some administrations have initially developed and implemented an operational low-altitude, near-polar orbiting satellite system (Cospas-Sarsat) operating in the frequency band 406-406.1 MHz to provide alerting and to aid in the locating of distress incidents;

b) that thousands of human lives have been saved through the use of spaceborne distress-beacon detection instruments, initially on 121.5 MHz and 243 MHz, and subsequently in the frequency band 406-406.1 MHz;

c) that the 406 MHz distress transmissions are relayed through many instruments mounted on geostationary, low-Earth and medium-Earth satellite orbits;

d) that the digital processing of these emissions provides accurate, timely and reliable distress alert and location data to help search and rescue authorities assist persons in distress;

e) that the International Maritime Organization (IMO) has decided that satellite EPIRBs operating in the Cospas-Sarsat system form part of the Global Maritime Distress and Safety System (GMDSS);

f) that observations of the use of frequencies in the frequency band 406-406.1 MHz show that they are being used by stations other than those authorized by No. **5.266**, and that these stations have caused harmful interference to the MSS, and particularly to the reception of satellite EPIRB signals by the Cospas-Sarsat system;

g) that the results of spectrum monitoring and ITU-R studies contained in Report ITU-R M.2359 indicate that emissions from stations operating in the frequency bands 405.9-406 MHz and 406.1-406.2 MHz have the potential to severely impact the performance of MSS systems in the frequency band 406-406.1 MHz;

h) that the results of ITU-R studies indicate that increased deployment of land mobile systems operating in the vicinity of the 406-406.1 MHz frequency band may degrade the receiver performance of mobile-satellite systems operating in the frequency band 406-406.1 MHz;

i) that the maximum permissible level of interference to the MSS in the 406-406.1 MHz frequency band may be exceeded due to frequency drift of the radiosondes operating above 405 MHz,

recognizing

a) that it is essential for the protection of human life and property that frequency bands allocated exclusively to a service for distress and safety purposes be kept free from harmful interference;

b) that the deployment of mobile systems near the frequency band 406-406.1 MHz is ongoing and more such systems are envisaged;

c) that this increased deployment raises significant concerns on the reliability of future distress and safety communications due to the increases in the noise level measured in many areas of the world for the frequency band 406-406.1 MHz;

d) that it is essential to preserve the MSS frequency band 406-406.1 MHz free from out-of-band emissions that would degrade the operation of the 406 MHz satellite transponders and receivers, with the risk that satellite EPIRB signals would go undetected,

noting

a) that the 406 MHz search and rescue system will be enhanced by placing 406-406.1 MHz transponders on global navigation satellite systems such as Galileo, GLONASS and GPS, relaying search and rescue emissions at 406 MHz, in addition to already-operational and future low-Earth orbiting and geostationary satellites, thus providing a large constellation of satellites relaying search and rescue messages;

b) that this enhanced constellation of spaceborne search and rescue instruments was designed to improve geographic coverage and reduce distress-alert transmission delays by means of larger uplink footprints, an increased number of satellites and improvement in the accuracy of the location of the distress signal;

c) that the characteristics of these spacecraft with larger footprints, and the low power available from satellite EPIRB transmitters, means that aggregate levels of electromagnetic noise, including noise from transmissions in adjacent frequency bands, may present a risk of satellite EPIRB transmissions being undetected, or delayed in reception, or lead to reduced accuracy of the calculated locations, thereby putting lives at risk,

noting further

a) that the MSS systems contributing to the emergency location system "Cospas-Sarsat" provide a worldwide emergency location system to the benefit of all countries, even if those mobile-satellite systems are not operated by their country;

b) that many Cospas-Sarsat satellites implement efficient out-of-band filtering, which would be further improved in upcoming satellites,

resolves

1 to request administrations not to make new frequency assignments within the frequency bands 405.9-406.0 MHz and 406.1-406.2 MHz under the mobile and fixed services;

2 that administrations take into account frequency drift characteristics of radiosondes when selecting their operating frequencies above 405 MHz to avoid transmitting in the 406-406.1 MHz frequency band and take all practical steps to avoid frequency drifting close to 406 MHz,

instructs the Director of the Radiocommunication Bureau

1 to continue to organize monitoring programmes in the frequency band 406-406.1 MHz in order to identify the source of any unauthorized emission in that frequency band;

2 to organize monitoring programmes on the impact of unwanted emissions from systems operating in the frequency bands 405.9-406 MHz and 406.1-406.2 MHz on MSS reception in the frequency band 406-406.1 MHz in order to assess the effectiveness of this Resolution, and to report to subsequent world radiocommunication conferences,

encourages administrations

to take measures such as authorizing new assignments to stations in the fixed and mobile services with priority given to selecting channels with greater frequency separation from the 406 to 406.1 MHz frequency band and ensuring that the e.i.r.p. of new fixed and mobile systems at all but low elevation angles is kept to the minimum required level,

urges administrations

1 to take part in monitoring programmes referred to in *instructs the Director of the Radiocommunication Bureau* above;

2 to ensure that stations other than those operated under No. **5.266** abstain from using frequencies in the frequency band 406-406.1 MHz;

3 to take the appropriate measures to eliminate harmful interference caused to the distress and safety system;

4 when designing Cospas-Sarsat satellite receiver payloads in the 406-406.1 MHz frequency band, to improve, to the extent possible, out-of-band filtering of such receivers, in order to reduce constraints on adjacent services while preserving the ability of the Cospas-Sarsat system to detect all kinds of emergency beacons and to maintain an acceptable rate of detection, which is vital to search and rescue missions;

5 to take all practical steps to limit the levels of unwanted emissions of stations operating within the 403-406 MHz and 406.1-410 MHz frequency ranges in order not to cause harmful interference to mobile-satellite systems operating in the 406-406.1 MHz frequency band;

6 to actively cooperate with the administrations participating in the monitoring programme and the Bureau to resolve reported cases of interference to the Cospas-Sarsat system.

RESOLUTION 207 (REV.WRC-15)

Measures to address unauthorized use of and interference to frequencies in the frequency bands allocated to the maritime mobile service and to the aeronautical mobile (R) service

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that the HF frequencies currently used by the aeronautical and maritime mobile services for distress, safety and other communications, including allotted operational frequencies, suffer from harmful interference and are often subject to difficult propagation conditions;

b) that WRC-97 considered some aspects of the use of the HF bands for distress and safety communications in the context of the Global Maritime Distress and Safety System (GMDSS), especially with regard to regulatory measures;

c) that unauthorized operations using maritime and aeronautical frequencies in the HF bands are continuing to increase and are already a serious risk to HF distress, safety and other communications;

d) that some administrations have resorted to, for example, transmitting warning messages on operational HF channels as a means of deterring unauthorized users;

e) that provisions of the Radio Regulations prohibit the unauthorized use of certain safety frequencies for communications other than those related to safety;

f) that enforcing compliance with these regulatory provisions is becoming increasingly difficult with the availability of low-cost HF single side-band (SSB) transceivers;

g) that monitoring observations of the use of frequencies in the frequency band 2 170-2 194 kHz and in the frequency bands allocated exclusively to the maritime mobile service between 4 063 kHz and 27 500 kHz and to the aeronautical mobile (R) service between 2 850 kHz and 22 000 kHz show that a number of frequencies in these frequency bands are still being used by stations of other services, many of which are operating in contravention of No. **23.2**;

h) that, in certain situations, HF radio is the sole means of communication for the maritime mobile service and that certain frequencies in the frequency bands mentioned in *considering g)* are reserved for distress and safety purposes;

i) that, in certain situations, HF radio is the sole means of communication for the aeronautical mobile (R) service and that this is a safety service;

j) that WRC-2000 and subsequent conferences have reviewed the use of the HF bands by the aeronautical mobile (R) and maritime mobile services with a view to protecting operational, distress and safety communications;

k) that this Resolution identifies several interference mitigation techniques that can be employed by administrations on a non-mandatory basis,

considering in particular

a) that it is of paramount importance that the distress and safety channels of the maritime mobile service be kept free from harmful interference, since they are essential for the protection of the safety of life and property;

b) that it is also of paramount importance that channels directly concerned with the safe and regular conduct of aircraft operations be kept free from harmful interference, since they are essential for the safety of life and property,

resolves to invite ITU-R and ITU-D, as appropriate

to increase regional awareness of appropriate practices in order to help mitigate interference in the HF bands, especially on distress and safety channels,

invites administrations

1 to ensure that stations of services other than the maritime mobile service abstain from using frequencies in distress and safety channels and their guardbands and in the frequency bands allocated exclusively to that service, except under the conditions expressly specified in Nos. **4.4**, **5.128**, **5.137** and **4.13** to **4.15**; and to ensure that stations of services other than the aeronautical mobile (R) service abstain from using frequencies allocated to that service except under the conditions expressly specified in Nos. **4.4** and **4.13**;

2 to make every effort to identify and locate the source of any unauthorized emission capable of endangering human life or property and the safe and regular conduct of aircraft operations, and to communicate their findings to the Radiocommunication Bureau;

3 to participate, in accordance with item 4 in the Annex, in any monitoring programmes organized by the Bureau or administrations, if so agreed among those administrations, without adversely affecting the rights of other administrations or conflicting with any provisions of the Radio Regulations;

4 to make every effort to prevent unauthorized transmissions in frequency bands allocated to the maritime mobile service and the aeronautical mobile (R) service;

5 to request their competent authorities to take, within their respective jurisdiction, such legislative or regulatory measures which they consider necessary or appropriate in order to prevent stations from unauthorized use of distress and safety channels or from operating in contravention of No. **23.2**;

6 to take all necessary steps in such cases of contravention of No. **23.2** to ensure the cessation of any transmissions contravening the provisions of the Radio Regulations on the frequencies or in the frequency bands referred to in this Resolution;

7 to employ as many of the interference mitigation techniques referred to in the Annex as are appropriate for the maritime mobile and aeronautical mobile (R) services,

instructs the Radiocommunication Bureau

1 to seek the cooperation of administrations in identifying the sources of those emissions by all available means and in securing the cessation of those emissions;

2 when the station of another service transmitting in a frequency band allocated to the maritime mobile service or to the aeronautical mobile (R) service has been identified, to inform the administration concerned;

3 to include the problem of interference to maritime and aeronautical distress and safety channels on the agenda of relevant regional radiocommunication seminars,

instructs the Secretary-General

to bring this Resolution to the attention of the International Maritime Organization and the International Civil Aviation Organization for such actions as they may consider appropriate.

ANNEX TO RESOLUTION 207 (REV.WRC-15)

Interference mitigation techniques

This Annex lists several possible HF interference mitigation techniques that may be used, either in combination or singly, depending on the resources of administrations. Use of any or all of these techniques is not mandatory.

1 Alternative modulation methods

The use of digitally modulated emissions, such as QPSK, to replace or supplement analogue SSB voice (J3E) and data (J2B) emissions. This initiative would need to be adopted internationally to allow the interoperability of equipment. For example, ICAO has adopted an HF data-link standard to provide packet data communications using automated link establishment and adaptive frequency control techniques as a supplement to analogue SSB voice communications (see ICAO Convention, Annex 10).

2 Passive and active/adaptive antenna systems

Use of passive and active/adaptive antenna systems to reject unwanted signals.

3 Channel barring

Administrations should ensure through their licensing, equipment standardization and inspection arrangements that, in compliance with No. **43.1**, HF radio equipment cannot transmit on frequencies exclusively allocated to the aeronautical mobile (R) service, as detailed in Appendix **27**, except for frequencies allocated for worldwide use and shared with the aeronautical mobile (OR) service (see Appendix **26**/3.4).

4 Regional HF monitoring and direction-finding facilities

Collaboration and cooperation between regional administrations to coordinate the use of monitoring and direction-finding facilities.

5 Transmission of warning messages

Transmission of multilanguage warning messages on specific channels affected by strong or persistent interference. Such transmissions should be conducted after coordination with the users of the affected services and the administration(s) or competent authorities concerned.

6 Education and publicity initiatives

Administrations should provide education and publicity initiatives on the proper use of the radio-frequency spectrum in these frequency bands.

RESOLUTION 212 (REV.WRC-15)

Implementation of International Mobile Telecommunications in the frequency bands 1 885-2 025 MHz and 2 110-2 200 MHz

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that Resolution ITU-R 56 defines the naming for International Mobile Telecommunications (IMT);

b) that the ITU Radiocommunication Sector (ITU-R), for WRC-97, recommended approximately 230 MHz for use by the terrestrial and satellite components of IMT;

c) that ITU-R studies forecast that additional spectrum may be required to support the future services of IMT and to accommodate future user requirements and network deployments;

d) that ITU-R has recognized that space techniques are an integral part of IMT;

e) that, in No. **5.388**, WARC-92 identified frequency bands to accommodate certain mobile services, now called IMT,

noting

a) that the terrestrial component of IMT has already been deployed or is being considered for deployment in the frequency bands 1 885-1 980 MHz, 2 010-2 025 MHz and 2 110-2 170 MHz;

b) that both the terrestrial and satellite components of IMT have already been deployed or are being considered for deployment in the frequency bands 1 980-2 010 MHz and 2 170-2 200 MHz;

c) that the availability of the satellite component of IMT in the frequency bands 1 980-2 010 MHz and 2 170-2 200 MHz simultaneously with the terrestrial component of IMT in the frequency bands identified in No. **5.388** would improve the overall implementation and the attractiveness of IMT,

noting further

a) that co-coverage, co-frequency deployment of independent satellite and terrestrial IMT components is not feasible unless techniques, such as the use of an appropriate guardband or other mitigation techniques, are applied to ensure coexistence and compatibility between the terrestrial and satellite components of IMT;

b) that, when the satellite and terrestrial components of IMT are deployed in the frequency bands 1 980-2 010 MHz and 2 170-2 200 MHz in adjacent geographical areas, technical or operational measures may need to be implemented to avoid harmful interference, and further studies by ITU-R are required in this regard;

c) that some difficulties have been raised in addressing potential interference between the satellite and terrestrial components of IMT;

d) that Report ITU-R M.2041 addresses sharing and adjacent band compatibility in the 2.5 GHz band between the terrestrial and satellite components of IMT-2000,

resolves

that administrations which implement IMT:

a) should make the necessary frequencies available for system development;

b) should use those frequencies when IMT is implemented;

c) should use the relevant international technical characteristics, as identified by ITU-R and ITU-T Recommendations,

invites ITU-R

to study possible technical and operational measures to ensure coexistence and compatibility between the terrestrial component of IMT (in the mobile service) and the satellite component of IMT (in the mobile service and the mobile-satellite service) in the frequency bands 1 980-2 010 MHz and 2 170-2 200 MHz where those frequency bands are shared by the mobile service and the mobile-satellite service in different countries, in particular for the deployment of independent satellite and terrestrial components of IMT and to facilitate development of both the satellite and terrestrial components of IMT,

encourages administrations

1 to give due consideration to the accommodation of other services currently operating in these frequency bands when implementing IMT;

2 to participate actively in the ITU-R studies in accordance with *invites ITU-R* above,

instructs the Director of the Radiocommunication Bureau

to include in his report, for consideration by WRC-19, the results of the ITU-R studies referred to in *invites ITU-R* above,

further invites ITU-R

to continue its studies with a view to developing suitable and acceptable technical characteristics for IMT that will facilitate worldwide use and roaming, and ensure that IMT can also meet the telecommunication needs of the developing countries and rural areas.

RESOLUTION 215 (REV.WRC-12)

Coordination process among mobile-satellite systems and efficient use of the allocations to the mobile-satellite service in the 1-3 GHz range

The World Radiocommunication Conference (Geneva, 2012),

considering

a) that space-to-Earth transmissions of mobile-satellite systems are constrained to limit their power flux-density over areas where the frequency band is shared with terrestrial systems;

b) that a number of proposed mobile-satellite systems can provide a good service to users within the power flux-density limits given in Annex 1 to Appendix **5** to the Radio Regulations;

c) that when maximum communication capacity is achieved by systems in the mobile-satellite service (MSS) a major portion of the interference into each of these systems will come from the other mobile-satellite systems sharing the frequency band, and, consequently, if one system starts to transmit at higher power, all others need to do the same in order to overcome mutual interference;

d) that ITU-R is studying the efficient use of the radio spectrum and frequency sharing within the MSS, that Recommendations ITU-R M.1186 and ITU-R M.1187 are a basis for further study, and that additional preliminary texts are available or can be provided by administrations on this matter;

e) that, in a codirectional, co-frequency and co-coverage sharing environment, capacities of systems using spread-spectrum multiple-access techniques are affected by technical and operational characteristics of other MSS systems using similar multiple-access techniques;

f) that in many parts of the world and in certain frequency bands in the 1-3 GHz range, significant congestion already exists due to use by other terrestrial and space services;

g) the need to make most efficient use of frequencies in the MSS allocations,

recognizing

that, as a means to ensure that the frequency bands allocated to the MSS can be used in an efficient manner, there is an urgent demand for:

a) criteria to be established by ITU-R to be used in determining the need to coordinate between mobile-satellite systems; and

b) detailed methods of interference calculation to be used by administrations in the coordination process;

c) ITU-R studies which should not impede the timely deployment of any MSS systems,

resolves to invite ITU-R

1 to continue its studies on this subject and develop, as a matter of urgency, criteria for determining the need to coordinate and calculation methods for determining levels of interference, as well as the required protection ratios between MSS networks;

2 to study, as a matter of urgency, the use of technically and operationally feasible techniques to allow for improvements in spectrum efficiency in MSS systems,

further resolves

1 that ITU-R studies should be focused on the technical and operational characteristics of systems using spread-spectrum multiple-access techniques that can allow co-frequency, co-coverage, codirectional sharing but which involve cooperation among systems' operators to maximize the efficient use of spectrum by multiple MSS systems using such access techniques;

2 that administrations responsible for the introduction of mobile-satellite systems are urged to implement, as practicable, the latest available technologies to improve spectrum efficiency consistent with the requirement to offer viable MSS services;

3 to recommend that administrations be encouraged to use the most advanced technology available when preparing to implement their global MSS systems in the 1-3 GHz range so that they may operate, if necessary, in different frequency bands in different regions, in accordance with the MSS allocations in the 1-3 GHz range decided by WRC-97.

RESOLUTION 217 (WRC-97)

Implementation of wind profiler radars

The World Radiocommunication Conference (Geneva, 1997),

having noted

a request to ITU from the Secretary-General of the World Meteorological Organization (WMO), in May 1989, for advice and assistance in the identification of appropriate frequencies near 50 MHz, 400 MHz and 1 000 MHz in order to accommodate allocations and assignments for wind profiler radars,

considering

a) that wind profiler radars are vertically-directed Doppler radars exhibiting characteristics similar to radiolocation systems;

b) that wind profiler radars are important meteorological systems used to measure wind direction and speed as a function of altitude;

c) that it is necessary to use frequencies in different ranges in order to have options for different performance and technical characteristics;

d) that, in order to conduct measurements up to a height of 30 km, it is necessary to allocate frequency bands for these radars in the general vicinity of 50 MHz (3 to 30 km), 400 MHz (500 m to about 10 km) and 1 000 MHz (100 m to 3 km);

e) that some administrations have either already deployed, or plan to expand their use of, wind profiler radars in operational networks for studies of the atmosphere and to support weather monitoring, forecasting and warning programmes;

f) that the Radiocommunication Study Groups have studied the technical and sharing considerations between wind profiler radars and other services allocated in bands near 50 MHz, 400 MHz and 1 000 MHz,

considering further

a) that some administrations have addressed this matter nationally by assigning frequencies for use by wind profiler radars in existing radiolocation bands or on a non-interference basis in other bands;

b) the work of the Voluntary Group of Experts on the Allocation and Improved Use of the Radio-Frequency Spectrum and Simplification of the Radio Regulations supports increased flexibility in the allocation of frequency spectrum,

noting in particular

a) that wind profiler radars operating in the meteorological aids service in the band 400.15-406 MHz interfere with satellite emergency position-indicating radio beacons operating in the mobile-satellite service in the band 406-406.1 MHz under No. **5.266**;

b) that in accordance with No. **5.267**, any emission capable of causing harmful interference to the authorized uses of the band 406-406.1 MHz is prohibited,

resolves

1 to urge administrations to implement wind profiler radars as radiolocation service systems in the following bands, having due regard to the potential for incompatibility with other services and assignments to stations in these services, thereby taking due account of the principle of geographical separation, in particular with regard to neighbouring countries, and keeping in mind the category of service of each of these services:

46-68 MHz in accordance with No. **5.162A**

440-450 MHz

470-494 MHz in accordance with No. **5.291A**

904-928 MHz in Region 2 only

1 270-1 295 MHz

1 300-1 375 MHz;

2 that, in case compatibility between wind profiler radars and other radio applications operating in the band 440-450 MHz or 470-494 MHz cannot be achieved, the bands 420-435 MHz or 438-440 MHz could be considered for use;

3 to urge administrations to implement wind profiler radars in accordance with Recommendations ITU-R M.1226, ITU-R M.1085-1 and ITU-R M.1227 for the frequency bands around 50 MHz, 400 MHz and 1 000 MHz, respectively;

4 to urge administrations not to implement wind profiler radars in the band 400.15-406 MHz;

5 to urge administrations currently operating wind profiler radars in the band 400.15-406 MHz to discontinue them as soon as possible,

instructs the Secretary-General

to bring this Resolution to the attention of the International Civil Aviation Organization (ICAO), International Maritime Organization (IMO) and WMO.

RESOLUTION 221 (REV.WRC-07)

Use of high altitude platform stations providing IMT in the bands 1 885-1 980 MHz, 2 010-2 025 MHz and 2 110-2 170 MHz in Regions 1 and 3 and 1 885-1 980 MHz and 2 110-2 160 MHz in Region 2

The World Radiocommunication Conference (Geneva, 2007),

considering

a) that the bands 1 885-2 025 MHz and 2 110-2 200 MHz are identified in No. **5.388** as intended for use on a worldwide basis for IMT, including the bands 1 980-2 010 MHz and 2 170-2 200 MHz for the terrestrial and satellite components of IMT;

b) that a high altitude platform station (HAPS) is defined in No. **1.66A** as "a station located on an object at an altitude of 20 to 50 km and at a specified, nominal, fixed point relative to the Earth";

c) that HAPS may offer a new means of providing IMT services with minimal network infrastructure as they are capable of providing service to a large footprint together with a dense coverage;

d) that the use of HAPS as base stations within the terrestrial component of IMT is optional for administrations, and that such use should not have any priority over other terrestrial IMT use;

e) that, in accordance with No. **5.388** and Resolution **212 (Rev.WRC-07)**[*], administrations may use the bands identified for IMT, including the bands referred to in this Resolution, for stations of other primary services to which they are allocated;

f) that these bands are allocated to the fixed and mobile services on a co-primary basis;

g) that, in accordance with No. **5.388A**, HAPS may be used as base stations within the terrestrial component of IMT in the bands 1 885-1 980 MHz, 2 010-2 025 MHz and 2 110-2 170 MHz in Regions 1 and 3 and 1 885-1 980 MHz and 2 110-2 160 MHz in Region 2. Their use by IMT applications using HAPS as base stations does not preclude the use of these bands by any station in the services to which they are allocated and does not establish priority in the Radio Regulations;

h) that ITU-R has studied sharing and coordination between HAPS and other stations within IMT, has considered compatibility of HAPS within IMT with some services having allocations in the adjacent bands, and has approved Recommendation ITU-R M.1456;

i) that radio interfaces of IMT HAPS are compliant with Recommendation ITU-R M.1457;

j) that ITU-R has addressed sharing between systems using HAPS and some existing systems, particularly PCS (personal communications system), MMDS (multichannel multipoint distribution system) and systems in the fixed service, which are currently operating in some countries in the bands 1 885-2 025 MHz and 2 110-2 200 MHz;

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[*] *Note by the Secretariat:* This Resolution was revised by WRC-15.

k) that HAPS stations are intended to transmit in the band 2 110-2 170 MHz in Regions 1 and 3 and in the band 2 110-2 160 MHz in Region 2;

l) that administrations planning to implement a HAPS as an IMT base station may need to exchange information, on a bilateral basis, with other concerned administrations, including data items describing the HAPS characteristics in a more detailed manner than the data items currently included in Annex 1 of Appendix **4**, as indicated in the Annex to this Resolution,

resolves

1 that:

1.1 for the purpose of protecting IMT mobile stations in neighbouring countries from co-channel interference, a HAPS operating as an IMT base station shall not exceed a co-channel power flux-density (pfd) of −117 dB(W/(m^2 · MHz)) at the Earth's surface outside a country's borders unless explicit agreement of the affected administration is provided at the time of the notification of HAPS;

1.2 a HAPS operating as an IMT base station shall not transmit outside the frequency bands 2 110-2 170 MHz in Regions 1 and 3 and 2 110-2 160 MHz in Region 2;

1.3 in Region 2, for the purpose of protecting MMDS stations in some neighbouring countries in the band 2 150-2 160 MHz from co-channel interference, a HAPS operating as an IMT base station shall not exceed the following co-channel pfd at the Earth's surface outside a country's borders unless explicit agreement of the affected administration is provided at the time of the notification of the HAPS;

– −127 dB(W/(m^2 · MHz)) for angles of arrival (θ) less than 7° above the horizontal plane;

– −127 + 0.666 (θ − 7) dB(W/(m^2 · MHz)) for angles of arrival between 7° and 22° above the horizontal plane; and

– −117 dB(W/(m^2 · MHz)) for angles of arrival between 22° and 90° above the horizontal plane;

1.4 in some countries (see No. **5.388B**), for the purpose of protecting fixed and mobile services, including IMT mobile stations, in their territories from co-channel interference caused by a HAPS operating as an IMT base station in accordance with No. **5.388A** in neighbouring countries, the limits of **5.388B** shall apply;

2 that the limits referred to in this Resolution shall apply to all HAPS operating in accordance with No. **5.388A**;

3 that administrations wishing to implement HAPS within a terrestrial IMT system shall comply with the following:

3.1 for the purpose of protecting IMT stations operating in neighbouring countries from co-channel interference, a HAPS operating as a base station within IMT shall use antennas that comply with the following antenna pattern:

$G(\psi) = G_m - 3(\psi/\psi_b)^2$ dBi for $0° \le \psi \le \psi_1$

$G(\psi) = G_m + L_N$ dBi for $\psi_1 < \psi \le \psi_2$

$G(\psi) = X - 60 \log(\psi)$ dBi for $\psi_2 < \psi \le \psi_3$

$G(\psi) = L_F$ dBi for $\psi_3 < \psi \le 90°$

where:

$G(\psi)$: gain at the angle ψ from the main beam direction (dBi)

G_m : maximum gain in the main lobe (dBi)

ψ_b : one-half of the 3 dB beamwidth in the plane considered (3 dB below G_m) (degrees)

L_N : near side-lobe level (dB) relative to the peak gain required by the system design, and has a maximum value of −25 dB

L_F : far side-lobe level, G_m − 73 dBi

$$\psi_1 = \psi_b \sqrt{-L_N / 3} \quad \text{degrees}$$

$$\psi_2 = 3.745\ \psi_b \quad \text{degrees}$$

$$X = G_m + L_N + 60 \log (\psi_2) \quad \text{dBi}$$

$$\psi_3 = 10^{(X - L_F)/60} \quad \text{degrees}$$

The 3 dB beamwidth ($2\psi_b$) is estimated by:

$$(\psi_b)^2 = 7\ 442/(10^{0.1 G_m}) \quad \text{degrees}^2;$$

3.2 for the purpose of protecting mobile earth stations within the satellite component of IMT from interference, a HAPS operating as an IMT base station, shall not exceed an out-of-band pfd of −165 dB(W/(m^2 · 4 kHz)) at the Earth's surface in the bands 2 160-2 200 MHz in Region 2 and 2 170-2 200 MHz in Regions 1 and 3;

3.3 a HAPS operating as an IMT base station, in order to protect fixed stations from interference, shall not exceed the following limits of out-of-band power flux-density (pfd) at the Earth's surface in the bands 2 025-2 110 MHz:

– −165 dB(W/(m^2 · MHz)) for angles of arrival (θ) less than 5° above the horizontal plane;

– −165 + 1.75 (θ − 5) dB(W/(m^2 · MHz)) for angles of arrival between 5° and 25° above the horizontal plane; and

– −130 dB(W/(m^2 · MHz)) for angles of arrival between 25° and 90° above the horizontal plane;

4 that, for facilitating consultations between administrations, administrations planning to implement a HAPS as an IMT base station shall furnish to the concerned administrations the additional data elements listed in the Annex to this Resolution, if so requested;

5 that administrations planning to implement a HAPS as an IMT base station shall notify the frequency assignment(s) by submitting all mandatory elements of Appendix **4** to the Radiocommunication Bureau for the examination of compliance with *resolves* 1.1, 1.3 and 1.4 above;

6 that, since 5 July 2003, the Bureau and administrations provisionally apply Nos. **5.388A** and **5.388B** as revised by WRC-03 for the frequency assignments to HAPS referred to in this Resolution, including those received before this date but not yet processed by the Bureau,

invites ITU-R

to develop, as a matter of urgency, an ITU-R Recommendation providing technical guidance to facilitate consultations with neighbouring administrations.

ANNEX TO RESOLUTION 221 (REV.WRC-07)

Characteristics of a HAPS operating as an IMT base station in the frequency bands given in Resolution 221 (Rev.WRC-07)

A General characteristics to be provided for the station

A.1 Identity of the station

a) Identity of the station

b) Country

A.2 Date of bringing into use

The date (actual or foreseen, as appropriate) of bringing the frequency assignment (new or modified) into use.

A.3 Administration or operating agency

Symbols for the administration or operating agency and for the address of the administration to which communication should be sent on urgent matters regarding interference, quality of emissions and questions referring to the technical operation of the station (see Article **15**).

A.4 Position information of the HAPS

a) The nominal geographical longitude for the HAPS

b) The nominal geographical latitude for the HAPS

c) The nominal altitude for the HAPS

d) The planned longitudinal and latitudinal tolerance for the HAPS

e) The planned tolerance of altitude for the HAPS

A.5 Agreements

If appropriate, the country symbol of any administration or administration representing a group of administrations with which agreement has been reached, including where the agreement is to exceed the limits prescribed in Resolution **221 (Rev.WRC-07)**.

B Characteristics to be provided for each antenna beam

B.1 HAPS antenna characteristics

a) The maximum isotropic gain (dBi).

b) HAPS antenna gain contours plotted on a map of the Earth's surface.

C Characteristics to be provided for each frequency assignment for HAPS antenna beam

C.1 Frequency range

C.2 Power density characteristics of the transmission

The maximum value of the maximum power density (dB(W/MHz)), averaged over the worst 1 MHz supplied to the input of the antenna.

D Calculated pfd limit produced over any country in visibility of HAPS

The maximum pfd calculated at the Earth's surface within each administration's territory over which the HAPS may be visible and over which these calculated pfd levels exceed the limits indicated in *resolves* 1.1, 1.3 and 1.4 of Resolution **221 (Rev.WRC-07)**.

RESOLUTION 222 (REV.WRC-12)

Use of the frequency bands 1 525-1 559 MHz and 1 626.5-1 660.5 MHz by the mobile-satellite service, and procedures to ensure long-term spectrum access for the aeronautical mobile-satellite (R) service

The World Radiocommunication Conference (Geneva, 2012),

considering

a) that prior to WRC-97, the frequency bands 1 530-1 544 MHz (space-to-Earth) and 1 626.5-1 645.5 MHz (Earth-to-space) were allocated to the maritime mobile-satellite service and the frequency bands 1 545-1 555 MHz (space-to-Earth) and 1 646.5-1 656.5 MHz (Earth-to-space) were allocated on an exclusive basis to the aeronautical mobile-satellite (R) service (AMS(R)S) in most countries;

b) that WRC-97 allocated the frequency bands 1 525-1 559 MHz (space-to-Earth) and 1 626.5-1 660.5 MHz (Earth-to-space) to the mobile-satellite service (MSS) to facilitate the assignment of spectrum to multiple MSS systems in a flexible and efficient manner;

c) that WRC-97 adopted No. **5.353A** giving priority to accommodating spectrum requirements for, and protecting from unacceptable interference, distress, urgency and safety communications of the global maritime distress and safety system (GMDSS) in the frequency bands 1 530-1 544 MHz and 1 626.5-1 645.5 MHz and No. **5.357A** giving priority to accommodating spectrum requirements for, and protecting from unacceptable interference, AMS(R)S communications as defined within priority categories 1 to 6 in Article **44** for the frequency bands 1 545-1 555 MHz and 1 646.5-1 656.5 MHz;

d) that AMS(R)S systems are an essential element of the International Civil Aviation Organization (ICAO) standardized communication infrastructure used in air traffic management for the provision of safety and regularity of flight in civil aviation;

e) that currently some MSS systems provide distress, emergency and safety communications under the MSS allocations in the frequency bands 1 525-1 559 MHz (space-to-Earth) and 1 626.5-1 660.5 MHz (Earth-to-space);

f) that it is necessary to ensure the long-term availability of the spectrum for AMS(R)S;

g) that it is necessary to retain unchanged the generic allocation for the MSS in the frequency bands 1 525-1 559 MHz and 1 626.5-1 660.5 MHz without placing undue constraints on the existing systems operating in accordance with the Radio Regulations,

further considering

a) that frequency coordination between satellite networks is required on a bilateral basis in accordance with the Radio Regulations, and that, in the frequency bands 1 525-1 559 MHz (space-to-Earth) and 1 626.5-1 660.5 MHz (Earth-to-space), frequency coordination is partially assisted by regional multilateral meetings;

b) that, in these frequency bands, geostationary mobile-satellite system operators currently use a capacity-planning approach at frequency coordination meetings, with the guidance and support of their administrations, to periodically coordinate access to the spectrum needed to accommodate their requirements;

c) that spectrum requirements for MSS networks, including the GMDSS and AMS(R)S, are currently accommodated through the capacity-planning approach and that, in the frequency bands to which Nos. **5.353A** or **5.357A** apply, this approach, supplemented, in the case of AMS(R)S, by additional procedures contained in the Annex to this Resolution, may assist in accommodating the long-term spectrum requirements for GMDSS and AMS(R)S;

d) that Report ITU-R M.2073 has concluded that prioritization and inter-system pre-emption between different mobile-satellite systems is not practical and, without a significant advance in technology, is unlikely to be feasible for technical, operational and economic reasons;

e) that there is existing and increasing demand for spectrum for AMS(R)S and non-AMS(R)S by several mobile satellite systems in the frequency bands 1 525-1 559 MHz and 1 626.5-1 660.5 MHz, and that the application of this Resolution may impact the provision of services by non-AMS(R)S systems in the MSS;

f) that according to the ITU-R studies, the long-term AMS(R)S spectrum requirements for communications within priority categories 1 to 6 of Article **44** have been estimated, at the year 2025, to be less than the available 2 × 10 MHz identified by No. **5.357A**;

g) that future requirements for GMDSS spectrum may require additional allocations,

recognizing

a) that Article 40 of the ITU Constitution establishes the priority of telecommunications concerning safety of life;

b) that ICAO has adopted standards and recommended practices addressing satellite communications with aircraft in accordance with the Convention on International Civil Aviation;

c) that all air traffic communications as defined in Annex 10 to the Convention on International Civil Aviation fall within priority categories 1 to 6 of Article **44**;

d) that Table 15-2 of Appendix **15** identifies the frequency bands 1 530-1 544 MHz (space-to-Earth) and 1 626.5-1 645.5 MHz (Earth-to-space) for distress and safety purposes in the maritime mobile-satellite service as well as for routine non-safety purposes;

e) that any administration having difficulty in applying the procedures of Articles **9** and **11** with respect to No. **5.357A** and this Resolution may at any time request assistance from the Radiocommunication Bureau and the Board under the relevant provisions of the Radio Regulations, including Article **7**, the relevant provisions of Articles **9** and **11**, as well as Articles **13** and **14**;

f) that ICAO has knowledge of aviation communication requirements,

noting

that, since spectrum resources are limited, there is a need to use them in the most efficient manner within and amongst various MSS systems, including GMDSS and AMS(R)S,

resolves

1 that, in frequency coordination of MSS networks in the frequency bands 1 525-1 559 MHz and 1 626.5-1 660.5 MHz, the notifying administrations of mobile-satellite networks shall ensure that the spectrum needed for distress, urgency and safety communications of GMDSS, as elaborated in Articles **32** and **33**, in the frequency bands where No. **5.353A** applies, and for the AMS(R)S communications within priority categories 1 to 6 of Article **44** in the frequency bands where No. **5.357A** applies, is accommodated;

2 that notifying administrations of mobile-satellite networks shall ensure the use of the latest technical advances in their mobile-satellite systems, in order to achieve the most flexible, efficient and practical use of the generic allocations;

3 that the notifying administrations of mobile-satellite networks shall ensure that, in the event that the spectrum requirements of MSS, including AMS(R)S, networks are decreasing relative to the previous frequency coordination meeting, the corresponding unused spectrum resources shall be released to facilitate efficient use of spectrum;

4 that the notifying administrations of mobile-satellite networks shall ensure that MSS operators carrying non-safety-related traffic yield capacity, as and when necessary, to accommodate the spectrum requirements for distress, urgency and safety communication of GMDSS communications, as elaborated in Articles **32** and **33**, and for AMS(R)S communications within priority categories 1 to 6 of Article **44**; this could be achieved in advance through the coordination process in *resolves* 1, and in the case of AMS(R)S the procedures contained in the Annex to this Resolution shall apply,

invites

1 administrations, if they so desire, to have their AMS(R)S traffic requirements submitted to ICAO before the frequency coordination meeting;

2 ICAO to evaluate and, as appropriate, comment on the AMS(R)S traffic requirements received from individual administrations, on the basis of the known global and regional aviation traffic requirements, including the time-scale of regional and global communication requirements,

instructs the Secretary-General

to bring this Resolution to the attention of ICAO.

ANNEX TO RESOLUTION 222 (REV.WRC-12)

Procedures to implement No. 5.357A and Resolution 222 (Rev.WRC-12)

1 The notifying administrations of planned MSS, including AMS(R)S, networks shall submit to the Radiocommunication Bureau (BR) the required technical characteristics and other relevant information of their MSS networks in accordance with Appendix **4**. Coordination of these MSS networks with other affected satellite networks operating in the frequency bands 1 525-1 559 MHz and 1 626.5-1 660.5 MHz shall proceed in accordance with Articles **9** and **11** and other relevant provisions of the Radio Regulations, as appropriate.

2 To further facilitate coordination under Articles **9** and **11**, the notifying administrations of MSS, including AMS(R)S, networks may authorize their respective MSS satellite operators, including AMS(R)S satellite operators, to enter into bilateral and multilateral coordination processes to obtain operator agreements on access to spectrum for their satellite networks.

3 At frequency coordination meetings, including operator meetings as referred to in 2 above, the notifying administration of each AMS(R)S network claiming priority under No. **5.357A**, or its respective satellite operator, shall present the spectrum requirements of each AMS(R)S network translated from their traffic requirements in accordance with an agreed methodology until such time as an ITU-R Recommendation is available pursuant to Resolution **422 (WRC-12)** and accompanied with the information justifying such requirements.

The participants to the frequency coordination meeting then collectively validate the requirements.

The notifying administrations or their authorized MSS operators shall accommodate validated AMS(R)S spectrum requirements in accordance with No. **5.357A** without placing undue constraints on the existing systems operating in accordance with the Radio Regulations.

4 The notifying administrations of MSS networks, including AMS(R)S, have responsibility to ensure that their respective assignments are compatible in the relevant bilateral or multilateral frequency coordination meetings (in particular when those networks span various geographic area(s)).

5 The notifying administrations shall inform BR about the total amount of spectrum assigned to AMS(R)S systems after each coordination meeting where the total AMS(R)S assignments are affected.

6 If a notifying AMS(R)S administration is of the opinion that its spectrum requirements have not been met in the frequency coordination process as per No. **5.357A**, the notifying administration may notify the Director of BR of this and request that a Reassessment Meeting be called.

7 If the Bureau receives an announcement from an administration that their AMS(R)S spectrum requirements have not been met, the Director of the Bureau shall invite the notifying administrations of mobile-satellite networks involved in step 2 for a Reassessment Meeting to be held normally within three months. The Reassessment Meeting shall limit its task to consideration of the application of No. **5.357A** and shall not enter into specific coordination activities for the modification of the assignments to individual operators. The Reassessment Meeting shall be attended by the notifying administrations. These administrations may decide to invite other parties or BR in an advisory role if agreed by all notifying administrations.

8 If the Reassessment Meeting concludes that the AMS(R)S spectrum requirements of the concerned system have not been met, the Reassessment Meeting may call for an additional specific frequency coordination meeting of the notifying administrations of mobile-satellite networks involved in step 2 and their representative MSS operators, which is requested to adapt the coordination agreement, taking due account of the advice of the Reassessment Meeting. This frequency coordination meeting should take place as soon as possible and preferably immediately following the Reassessment Meeting.

9 At the conclusion of the Reassessment Meeting, a report containing information about the issue discussed and the conclusions shall be prepared by the participating notifying administrations and submitted to BR for publication.

10 If the matter remains unresolved at the administrations' frequency coordination meeting referred to in 8 above, the notifying AMS(R)S administration shall seek the assistance of the Radiocommunication Bureau pursuant to Articles **7** and **13** and notify the respective administrations indicating that its AMS(R)S requirements have not been satisfied. The Radiocommunication Bureau shall provide a report and assistance in accordance with No. **13.3**.

11 If the matter remains unresolved after the Bureau has communicated its conclusions to the notifying AMS(R)S administration involved, the notifying AMS(R)S administration may request review of the decision of the Bureau in accordance with Article **14**.

RESOLUTION 223 (REV.WRC-15)

Additional frequency bands identified for International Mobile Telecommunications

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that International Mobile Telecommunications (IMT), including IMT-2000 and IMT-Advanced, is the ITU vision of global mobile access;

b) that IMT systems provide telecommunication services on a worldwide scale regardless of location, network or terminal used;

c) that IMT provides access to a wide range of telecommunication services supported by fixed telecommunication networks (e.g. PSTN/ISDN, high bit rate Internet access), and to other services which are specific to mobile users;

d) that the technical characteristics of IMT are specified in ITU Radiocommunication Sector (ITU-R) and ITU Telecommunication Standardization Sector (ITU-T) Recommendations, including Recommendations ITU-R M.1457 and ITU-R M.2012, which contain the detailed specifications of the terrestrial radio interfaces of IMT;

e) that the evolution of IMT is being studied within ITU-R;

f) that the review of IMT-2000 spectrum requirements at WRC-2000 concentrated on the bands below 3 GHz;

g) that at WARC-92, 230 MHz of spectrum was identified for IMT-2000 in the frequency bands 1 885-2 025 MHz and 2 110-2 200 MHz, including the frequency bands 1 980-2 010 MHz and 2 170-2 200 MHz for the satellite component of IMT-2000, in No. **5.388** and under the provisions of Resolution **212 (Rev.WRC-15)**;

h) that since WARC-92 there has been a tremendous growth in mobile communications including an increasing demand for broadband multimedia capability;

i) that the frequency bands identified for IMT are currently used by mobile systems or applications of other radiocommunication services;

j) that Recommendation ITU-R M.1308 addresses the evolution of existing mobile communication systems to IMT-2000, and that Recommendation ITU-R M.1645 addresses the evolution of the IMT systems and maps out their future development;

k) that harmonized worldwide bands for IMT are desirable in order to achieve global roaming and the benefits of economies of scale;

l) that the frequency bands 1 710-1 885 MHz, 2 500-2 690 MHz and 3 300-3 400 MHz are allocated to a variety of services in accordance with the relevant provisions of the Radio Regulations;

m) that the frequency band 2 300-2 400 MHz is allocated to the mobile service on a co-primary basis in the three ITU Regions;

n) that the frequency band 2 300-2 400 MHz, or portions thereof, is used extensively in a number of administrations by other services including the aeronautical mobile service for telemetry in accordance with the relevant provisions in the Radio Regulations;

o) that IMT has already been deployed or is being considered for deployment in some countries in the frequency bands 1 710-1 885 MHz, 2 300-2 400 MHz and 2 500-2 690 MHz and equipment is readily available;

p) that the frequency bands 1 710-1 885 MHz, 2 300-2 400 MHz and 2 500-2 690 MHz, or parts thereof, are identified for use by administrations wishing to implement IMT;

q) that technological advancement and user needs will promote innovation and accelerate the delivery of advanced communication applications to consumers;

r) that changes in technology may lead to the further development of communication applications, including IMT;

s) that timely availability of spectrum is important to support future applications;

t) that IMT systems are envisaged to provide increased peak data rates and capacity that may require a larger bandwidth;

u) that ITU-R studies forecasted that additional spectrum may be required to support the future services of IMT and to accommodate future user requirements and network deployments;

v) that the frequency band 1 427-1 429 MHz is allocated to the mobile, except aeronautical mobile, service in all three Regions on a primary basis;

w) that the frequency band 1 429-1 525 MHz is allocated to the mobile service in Regions 2 and 3 and to the mobile, except aeronautical mobile, service in Region 1 on a primary basis;

x) that the frequency band 1 518-1 559 MHz is allocated in all three Regions to the mobile-satellite service (MSS) on a primary basis[1];

y) that this conference has identified the frequency band 1 427-1 518 MHz for use by administrations wishing to implement terrestrial IMT systems;

z) that there is a need to ensure the continued operations of the MSS in the frequency band 1 518-1 525 MHz;

aa) that appropriate technical measures to facilitate adjacent band compatibility between MSS in the frequency band 1 518-1 525 MHz and IMT in the frequency band 1 492-1 518 MHz need to be studied;

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[1] See Table **21-4** for applicable pfd limits.

ab) Report ITU-R RA.2332, on compatibility and sharing studies between the radio astronomy service and IMT systems in the frequency bands 608-614 MHz, 1 330-1 400 MHz, 1 400-1 427 MHz, 1 610.6-1 613.8 MHz, 1 660-1 670 MHz, 2 690-2 700 MHz, 4 800-4 990 MHz and 4 990-5 000 MHz;

ac) that this conference has identified the frequency band 3 300-3 400 MHz for use by administrations wishing to implement terrestrial IMT systems in Nos. **5.429B**, **5.429D** and **5.429F**;

ad) that the frequency band 3 300-3 400 MHz is allocated worldwide on a primary basis to the radiolocation service;

ae) that a number of administrations use the frequency band 3 300-3 400 MHz, or portions thereof, which is allocated to the fixed and mobile services on a primary basis in No. **5.429**;

af) that the frequency band 4 800-4 990 MHz is allocated worldwide to the mobile service on a primary basis;

ag) that this conference has identified the frequency band 4 800-4 990 MHz for use by administrations wishing to implement terrestrial IMT systems in No. **5.441A** for Region 2 and **5.441B** for Region 3;

ah) that appropriate technical measures may be considered by administrations at a national level to facilitate adjacent band compatibility between radio astronomy receivers in the frequency band 4 990-5 000 MHz and IMT systems in the frequency band 4 800-4 990 MHz,

emphasizing

a) that flexibility must be afforded to administrations:

– to determine, at a national level, how much spectrum to make available for IMT from within the identified frequency bands;

– to develop their own transition plans, if necessary, tailored to meet their specific deployment of existing systems;

– to have the ability for the identified frequency bands to be used by all services having allocations in those frequency bands;

– to determine the timing of availability and use of the frequency bands identified for IMT, in order to meet particular user demand and other national considerations;

b) that the particular needs of developing countries must be met;

c) that Recommendation ITU-R M.819 describes the objectives to be met by IMT-2000 in order to meet the needs of developing countries,

noting

a) Resolutions **224 (Rev.WRC-15)** and **225 (Rev.WRC-12)**, which also relate to IMT;

b) that the sharing implications between services sharing the frequency bands identified for IMT in No. **5.384A**, as relevant, will need further study in ITU-R;

c) that studies regarding the availability of the frequency band 2 300-2 400 MHz for IMT are being conducted in many countries, the results of which could have implications for the use of those frequency bands in those countries;

d) that, due to differing requirements, not all administrations may need all of the IMT frequency bands identified at WRC-07, or, due to the usage by and investment in existing services, may not be able to implement IMT in all of those frequency bands;

e) that the spectrum for IMT identified by WRC-07 may not completely satisfy the expected requirements of some administrations;

f) that currently operating mobile communication systems may evolve to IMT in their existing frequency bands;

g) that services such as fixed, mobile (second-generation systems), space operations, space research and aeronautical mobile are in operation or planned in the frequency band 1 710-1 885 MHz, or portions thereof;

h) that in the frequency band 2 300-2 400 MHz, or portions thereof, there are services such as fixed, mobile, amateur and radiolocation which are currently in operation or planned to be in operation in the future;

i) that services such as broadcasting-satellite, broadcasting-satellite (sound), mobile-satellite (in Region 3) and fixed (including multipoint distribution/communication systems) are in operation or planned in the frequency band 2 500-2 690 MHz, or portions thereof;

j) that the identification of several frequency bands for IMT allows administrations to choose the best frequency band or parts thereof for their circumstances;

k) that ITU-R has identified additional work to address further developments in IMT;

l) that the IMT terrestrial radio interfaces as defined in Recommendations ITU-R M.1457 and ITU-R M.2012 are expected to evolve within the framework of ITU-R beyond those initially specified, to provide enhanced services and services beyond those envisaged in the initial implementation;

m) that the identification of a frequency band for IMT does not establish priority in the Radio Regulations and does not preclude the use of the frequency band for any application of the services to which it is allocated;

n) that the provisions of Nos. **5.317A**, **5.384A**, **5.388**, **5.429B**, **5.429D** and **5.429F** do not prevent administrations from having the choice to implement other technologies in the frequency bands identified for IMT, based on national requirements,

recognizing

that for some administrations the only way of implementing IMT would be spectrum refarming, requiring significant financial investment,

resolves

1 to invite administrations planning to implement IMT to make available, based on user demand and other national considerations, additional frequency bands or portions of the frequency bands above 1 GHz identified in Nos. **5.341B**, **5.384A**, **5.429B**, **5.429D** and **5.429F** for the terrestrial component of IMT; due consideration should be given to the benefits of harmonized utilization of the spectrum for the terrestrial component of IMT, taking into account the services to which the frequency band is currently allocated;

2 to acknowledge that the differences in the texts of Nos. **5.341B**, **5.384A** and **5.388** do not confer differences in regulatory status,

invites ITU-R

1 to conduct compatibility studies in order to provide technical measures to ensure coexistence between MSS in the frequency band 1 518-1 525 MHz and IMT in the frequency band 1 492-1 518 MHz;

2 to develop harmonized frequency arrangements to facilitate IMT deployment in the frequency band 1 427-1 518 MHz, taking into account the results of sharing and compatibility studies;

3 to further study operational measures to enable the coexistence of IMT and radiolocation service in the frequency band 3 300-3 400 MHz;

4 to develop an ITU-R Recommendation providing technical and operational measures regarding adjacent band compatibility between IMT systems operating below 3 400 MHz and FSS earth stations operating above 3 400 MHz;

5 to further study adjacent band compatibility between IMT in the frequency band 3 300-3 400 MHz and radiolocation service below 3 300 MHz, in particular unwanted emissions of IMT systems in this frequency band;

6 to develop harmonized frequency arrangements for the frequency bands 3 300-3 400 MHz and 4 800-4 990 MHz for operation of the terrestrial component of IMT, taking into account the results of the sharing studies;

7 to study the technical and regulatory conditions for the use of IMT in the frequency band 4 800-4 990 MHz in order to protect the aeronautical mobile service;

8 to continue its studies on further enhancements of IMT, including the provision of Internet Protocol (IP)-based applications that may require unbalanced radio resources between the mobile and base stations;

9 to continue providing guidance to ensure that IMT can meet the telecommunication needs of the developing countries and rural areas in the context of the studies referred to above;

10 to include these frequency arrangements and the results of these studies in one or more ITU-R Recommendations.

RESOLUTION 224 (REV.WRC-15)

Frequency bands for the terrestrial component of International Mobile Telecommunications below 1 GHz

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that International Mobile Telecommunications (IMT) is the root name that encompasses IMT-2000, IMT-Advanced and IMT-2020 collectively (see Resolution ITU-R 56);

b) that IMT systems are intended to provide telecommunication services on a worldwide scale, regardless of location, network or terminal used;

c) that parts of the frequency band 790-960 MHz are extensively used in the three Regions by mobile systems;

d) that IMT systems have already been deployed in the frequency band 694/698-960 MHz in some countries of the three Regions;

e) that some administrations of Regions 2 and 3 are planning to use the frequency band 470-694/698 MHz, or part of that frequency band, for IMT;

f) that the frequency band 450-470 MHz is allocated to the mobile service on a primary basis in the three Regions and that IMT systems have already been deployed in some countries of the three Regions;

g) that results of the sharing studies for the frequency band 450-470 MHz are contained in Report ITU-R M.2110;

h) that cellular-mobile systems in the three Regions in the frequency bands below 1 GHz operate using various frequency arrangements;

i) that, where cost considerations warrant the installation of fewer base stations, such as in rural and/or sparsely populated areas, frequency bands below 1 GHz are generally suitable for implementing mobile systems, including IMT;

j) that frequency bands below 1 GHz are important, especially for some developing countries and countries with large areas where economic solutions for low population density areas are necessary;

k) that Recommendation ITU-R M.819 describes the objectives to be met by IMT-2000 in order to meet the needs of developing countries, and in order to assist them to "bridge the gap" between their communication capabilities and those of developed countries;

l) that Recommendation ITU-R M.1645 also describes the coverage objectives of IMT,

recognizing

a) that the evolution of cellular-based mobile networks to IMT can be facilitated if they are permitted to evolve within their current frequency bands;

b) that some of the frequency bands or parts of the frequency bands, identified for IMT below 1 GHz are used extensively in many countries by various other terrestrial mobile systems and applications, including public protection and disaster relief radiocommunications (see Resolution **646 (Rev.WRC-15)**);

c) that there is a need, in many developing countries and countries with large areas of low population density, for the cost-effective implementation of IMT, and that the propagation characteristics of frequency bands below 1 GHz identified in Nos. **5.286AA**, **5.295**, **5.308A** and **5.317A** result in larger cells;

d) that the frequency band 450-470 MHz, or parts thereof, is also allocated to services other than the mobile service;

e) that the frequency band 460-470 MHz is also allocated to the meteorological-satellite service in accordance with No. **5.290**;

f) that the frequency band 470-890 MHz, except the frequency band 608-614 MHz in Region 2, is allocated to the broadcasting service on a primary basis in all three Regions as contained in Article **5** of the Radio Regulations, and parts of this frequency band are used predominantly by this service;

g) that, in the frequency band 470-862 MHz, the GE06 Agreement applies in all Region 1 countries, except Mongolia, and in the Islamic Republic of Iran, and that this Agreement contains provisions for the terrestrial broadcasting service and other primary terrestrial services, a Plan for digital television, and a list of stations of other primary terrestrial services;

h) that the transition from analogue to digital television is expected to result in situations where the frequency band 470-806/862 MHz will be used extensively for both analogue and digital terrestrial transmission, and the demand for spectrum during the transition period may be even greater than the standalone usage of analogue broadcasting systems;

i) that the time-frame and transition period for analogue to digital television switchover may not be the same for all countries;

j) that, after analogue to digital television switchover, some administrations may decide to use all or parts of the frequency band 470-806/862 MHz for other services to which the frequency band is allocated on a primary basis, in particular the mobile service for the implementation of IMT, while in other countries the broadcasting service will continue to operate in that frequency band;

k) that in the frequency band 470-890 MHz, or parts thereof, there is an allocation on a primary basis for the fixed service;

l) that, in some countries, the frequency band 470-862 MHz, or parts thereof, for Regions 2 and 3 and the frequency band 694-862 MHz in Region 1 are allocated to the mobile service on a primary basis;

m) that the frequency band 645-862 MHz is allocated on a primary basis to the aeronautical radionavigation service in the countries listed in No. **5.312**;

n) that Recommendation ITU-R M.1036 provides frequency arrangements for implementation of the terrestrial component of IMT in the frequency bands identified for IMT in the Radio Regulations;

o) that Reports ITU-R M.2241, ITU-R BT.2215, ITU-R BT.2247, ITU-R BT.2248, ITU-R BT.2265, ITU-R BT.2301, ITU-R BT.2337 and ITU-R BT.2339 contain material relevant to compatibility studies between IMT and other services;

p) that Report ITU-R BT.2338 describes the implications of a co-primary allocation to the mobile service in the frequency band 694-790 MHz in Region 1 for the use of that frequency band by applications ancillary to broadcasting and programme-making,

emphasizing

a) that in all administrations terrestrial broadcasting is a vital part of the communication and information infrastructure;

b) that flexibility must be afforded to administrations:

– to determine, at a national level, how much spectrum to make available for IMT from within the identified frequency bands, taking into account current uses of the spectrum and the needs of other applications;

– to develop their own transition plans, if necessary, tailored to meet their specific deployment of existing systems;

– to have the ability for the identified frequency bands to be used by all services having allocations in those frequency bands;

– to determine the timing of availability and use of the frequency bands identified for IMT, in order to meet particular market demand and other national considerations;

c) that the particular needs and national conditions and circumstances of developing countries, including least-developed countries, highly-indebted poor countries with economies in transition, and countries with large territories and territories with a low-subscriber density, must be met;

d) that due consideration should be given to the benefits of harmonized utilization of the spectrum for the terrestrial component of IMT, taking into account the current and planned use of these frequency bands by all services to which these frequency bands are allocated;

e) that the use of frequency bands below 1 GHz for IMT also helps to “bridge the gap” between sparsely-populated areas and densely-populated areas in various countries;

f) that the identification of a frequency band for IMT does not preclude the use of this frequency band by other services or applications to which it is allocated;

g) that the use of the frequency band 470-862 MHz by the broadcasting service and other primary services is also covered by the GE06 Agreement;

h) that the requirements of the different services to which the frequency band is allocated, including the mobile and broadcasting services, need to be taken into account,

resolves

1 that administrations which are implementing or planning to implement IMT consider the use of frequency bands identified for IMT below 1 GHz and the possibility of cellular-based mobile network evolution to IMT, in the frequency band identified in Nos. **5.286AA**, **5.317A**, and in some countries of Regions 2 and 3, the frequency band(s) identified in Nos. **5.295**, **5.296A** and **5.308A**, based on user demand and other considerations;

2 to encourage administrations to take into account results of the existing relevant ITU-R studies, when implementing IMT applications/systems in the frequency bands 694-862 MHz in Region 1, in the frequency band 470-806 MHz in Region 2, in the frequency band 790-862 MHz in Region 3, in the frequency band 470-698 MHz, or portions thereof, for those administrations mentioned in No. **5.296A** and in the frequency band 698-790 MHz, or portions thereof, for those administrations mentioned in No. **5.313A**;

3 that administrations should take into account the need to protect the existing and future broadcasting stations, both analogue and digital, except analogue in the GE06 planning area, in the frequency band 470-806/862 MHz, as well as other primary terrestrial services;

4 that administrations planning to implement IMT in the bands mentioned in *resolves* 2 shall effect coordination, as required, with all neighbouring administrations prior to implementation;

5 that in Region 1 (excluding Mongolia) and in the Islamic Republic of Iran, the implementation of stations in the mobile service shall be subject to the applications of procedures contained in the GE06 Agreement; in so doing:

a) administrations which deploy stations in the mobile service for which coordination was not required, or without having obtained the prior consent of those administrations that may be affected, shall not cause unacceptable interference to, nor claim protection from, stations of the broadcasting service of administrations operating in conformity with the GE06 Agreement. This should include a signed commitment as required under § 5.2.6 of the GE06 Agreement;

b) administrations which deploy stations in the mobile service for which coordination was not required, or without having obtained the prior consent of those administrations that may be affected, shall not object nor prevent the entry into the GE06 plan or recording in the MIFR of additional future broadcasting allotments or assignments of any other administration in the GE06 Plan with reference to those stations;

6 that, in Region 2, implementation of IMT shall be subject to the decision of each administration on the transition from analogue to digital television,

invites the Director of the Telecommunication Development Bureau

to draw the attention of the ITU Telecommunication Development Sector to this Resolution.

RESOLUTION 225 (REV.WRC-12)

Use of additional frequency bands for the satellite component of IMT

The World Radiocommunication Conference (Geneva, 2012),

considering

a) that the bands 1 980-2 010 MHz and 2 170-2 200 MHz are identified for use by the satellite component of International Mobile Telecommunications (IMT) through No. **5.388** and Resolution **212 (Rev.WRC-07)**[*];

b) Resolutions **212 (Rev.WRC-07)**[*], **223 (Rev.WRC-12)**[*] and **224 (Rev.WRC-12)**[*] on the implementation of the terrestrial and satellite components of IMT;

c) that the bands 1 518-1 544 MHz, 1 545-1 559 MHz, 1 610-1 626.5 MHz, 1 626.5-1 645.5 MHz, 1 646.5-1 660.5 MHz, 1 668-1 675 MHz and 2 483.5-2 500 MHz are allocated on a co-primary basis to the mobile-satellite service and other services in accordance with the Radio Regulations;

d) that, in Region 3, the bands 2 500-2 520 MHz and 2 670-2 690 MHz are allocated on a co-primary basis to the mobile-satellite service and other services in accordance with the Radio Regulations;

e) that distress, urgency and safety communications of the Global Maritime Distress and Safety System and the aeronautical mobile-satellite (R) service have priority over all other mobile-satellite service communications in accordance with Nos. **5.353A** and **5.357A**,

recognizing

a) that services such as broadcasting-satellite, broadcasting-satellite (sound), mobile-satellite, fixed (including point-to-multipoint distribution/communication systems) and mobile are in operation or planned in the band 2 500-2 690 MHz, or in portions of that band;

b) that other services such as the mobile service, the radio astronomy service and radiodetermination-satellite service are in operation or planned, in accordance with the Table of Frequency Allocations, in the bands 1 518-1 559/1 626.5-1 660.5 MHz, 1 610-1 626.5/ 2 483.5-2 500 MHz and 1 668-1 670 MHz, or in portions of those bands, and that those bands, or portions thereof, are intensively used in some countries by applications other than the IMT satellite component, and the sharing studies within ITU-R are not finished;

c) that studies of potential sharing and coordination between the satellite component of IMT and the terrestrial component of IMT, mobile-satellite service applications and other high-density applications in other services such as point-to-multipoint communication/distribution systems in the bands 2 500-2 520 MHz and 2 670-2 690 MHz bands are not finished;

d) that the bands 2 520-2 535 MHz and 2 655-2 670 MHz are allocated to the mobile-satellite, except aeronautical mobile-satellite, service for operation limited to within national boundaries pursuant to Nos. **5.403** and **5.420**;

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[*] *Note by the Secretariat:* This Resolution was revised by WRC-15.

e) Resolution ITU-R 47 on studies under way on satellite radio transmission technologies for IMT,

resolves

1 that, in addition to the frequency bands indicated in *considering a)* and *resolves* 2, the frequency bands 1 518-1 544 MHz, 1 545-1 559 MHz, 1 610-1 626.5 MHz, 1 626.5-1 645.5 MHz, 1 646.5-1 660.5 MHz, 1 668-1 675 MHz and 2 483.5-2 500 MHz may be used by administrations wishing to implement the satellite component of IMT, subject to the regulatory provisions related to the mobile-satellite service in these frequency bands;

2 that the bands 2 500-2 520 MHz and 2 670-2 690 MHz as identified for IMT in No. **5.384A** and allocated to the mobile-satellite service in Region 3 may be used by administrations in that Region wishing to implement the satellite component of IMT; however, depending on user demand, it may be possible in the longer term that the administrations decide to use these bands for the terrestrial component of IMT (see the Preamble of the ITU Constitution);

3 that this identification of frequency bands for the satellite component of IMT does not preclude the use of these bands by any applications of the services to which they are allocated and does not establish priority in the Radio Regulations,

invites ITU-R

1 to study the sharing and coordination issues in the above bands related to use of the mobile-satellite service allocations for the satellite component of IMT and the use of this spectrum by the other allocated services, including the radiodetermination-satellite service;

2 to report the results of these studies to a future world radiocommunication conference,

invites the Director of the Telecommunication Development Bureau

to draw the attention of the Telecommunication Development Sector to this Resolution.

RESOLUTION 229 (REV.WRC-12)

Use of the bands 5 150-5 250 MHz, 5 250-5 350 MHz and 5 470-5 725 MHz by the mobile service for the implementation of wireless access systems including radio local area networks

The World Radiocommunication Conference (Geneva, 2012),

considering

a) that WRC-03 allocated the bands 5 150-5 350 MHz and 5 470-5 725 MHz on a primary basis to the mobile service for the implementation of wireless access systems (WAS), including radio local area networks (RLANs);

b) that WRC-03 decided to make an additional primary allocation for the Earth exploration-satellite service (EESS) (active) in the band 5 460-5 570 MHz and space research service (SRS) (active) in the band 5 350-5 570 MHz;

c) that WRC-03 decided to upgrade the radiolocation service to a primary status in the 5 350-5 650 MHz band;

d) that the band 5 150-5 250 MHz is allocated worldwide on a primary basis to the fixed-satellite service (FSS) (Earth-to-space), this allocation being limited to feeder links of non-geostationary-satellite systems in the mobile-satellite service (No. **5.447A**);

e) that the band 5 150-5 250 MHz is also allocated to the mobile service, on a primary basis, in some countries (No. **5.447**) subject to agreement obtained under No. **9.21**;

f) that the band 5 250-5 460 MHz is allocated to the EESS (active) and the band 5 250-5 350 MHz to the SRS (active) on a primary basis;

g) that the band 5 250-5 725 MHz is allocated on a primary basis to the radiodetermination service;

h) that there is a need to protect the existing primary services in the 5 150-5 350 MHz and 5 470-5 725 MHz bands;

i) that results of studies in ITU-R indicate that sharing in the band 5 150-5 250 MHz between WAS, including RLANs, and the FSS is feasible under specified conditions;

j) that studies have shown that sharing between the radiodetermination and mobile services in the bands 5 250-5 350 MHz and 5 470-5 725 MHz is only possible with the application of mitigation techniques such as dynamic frequency selection;

k) that there is a need to specify an appropriate e.i.r.p. limit and, where necessary, operational restrictions for WAS, including RLANs, in the mobile service in the bands 5 250-5 350 MHz and 5 470-5 570 MHz in order to protect systems in the EESS (active) and SRS (active);

l) that the deployment density of WAS, including RLANs, will depend on a number of factors including intrasystem interference and the availability of other competing technologies and services,

further considering

a) that the interference from a single WAS, including RLANs, complying with the operational restrictions under *resolves* 2 will not on its own cause any unacceptable interference to FSS receivers on board satellites in the band 5 150-5 250 MHz;

b) that such FSS satellite receivers may experience an unacceptable effect due to the aggregate interference from these WAS, including RLANs, especially in the case of a prolific growth in the number of these systems;

c) that the aggregate effect on FSS satellite receivers will be due to the global deployment of WAS, including RLANs, and it may not be possible for administrations to determine the location of the source of the interference and the number of WAS, including RLANs, in operation simultaneously,

noting

a) that, prior to WRC-03, a number of administrations have developed regulations to permit indoor and outdoor WAS, including RLANs, to operate in the various bands under consideration in this Resolution;

b) that, in response to Resolution **229 (WRC-03)**[*], ITU-R developed Report ITU-R M.2115, which provides testing procedures for implementation of dynamic frequency selection,

recognizing

a) that in the band 5 600-5 650 MHz, ground-based meteorological radars are extensively deployed and support critical national weather services, according to footnote No. **5.452**;

b) that the means to measure or calculate the aggregate pfd level at FSS satellite receivers specified in Recommendation ITU-R S.1426 are currently under study;

c) that certain parameters contained in Recommendation ITU-R M.1454 related to the calculation of the number of RLANs tolerable by FSS satellite receivers operating in the band 5 150-5 250 MHz require further study;

d) that the performance and interference criteria of spaceborne active sensors in the EESS (active) are given in Recommendation ITU-R RS.1166;

e) that a mitigation technique to protect radiodetermination systems is given in Recommendation ITU-R M.1652;

f) that an aggregate pfd level has been developed in Recommendation ITU-R S.1426 for the protection of FSS satellite receivers in the 5 150-5 250 MHz band;

g) that Recommendation ITU-R RS.1632 identifies a suitable set of constraints for WAS, including RLANs, in order to protect the EESS (active) in the 5 250-5 350 MHz band;

h) that Recommendation ITU-R M.1653 identifies the conditions for sharing between WAS, including RLANs, and the EESS (active) in the 5 470-5 570 MHz band;

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[*] *Note by the Secretariat:* This Resolution was revised by WRC-12.

i) that the stations in the mobile service should also be designed to provide, on average, a near-uniform spread of the loading of the spectrum used by stations across the band or bands in use to improve sharing with satellite services;

j) that WAS, including RLANs, provide effective broadband solutions;

k) that there is a need for administrations to ensure that WAS, including RLANs, meet the required mitigation techniques, for example, through equipment or standards compliance procedures,

resolves

1 that the use of these bands by the mobile service will be for the implementation of WAS, including RLANs, as described in the most recent version of Recommendation ITU-R M.1450;

2 that in the band 5 150-5 250 MHz, stations in the mobile service shall be restricted to indoor use with a maximum mean e.i.r.p.[1] of 200 mW and a maximum mean e.i.r.p. density of 10 mW/MHz in any 1 MHz band or equivalently 0.25 mW/25 kHz in any 25 kHz band;

3 that administrations may monitor whether the aggregate pfd levels given in Recommendation ITU-R S.1426[2] have been, or will be exceeded in the future, in order to enable a future competent conference to take appropriate action;

4 that in the band 5 250-5 350 MHz, stations in the mobile service shall be limited to a maximum mean e.i.r.p. of 200 mW and a maximum mean e.i.r.p. density of 10 mW/MHz in any 1 MHz band. Administrations are requested to take appropriate measures that will result in the predominant number of stations in the mobile service being operated in an indoor environment. Furthermore, stations in the mobile service that are permitted to be used either indoors or outdoors may operate up to a maximum mean e.i.r.p. of 1 W and a maximum mean e.i.r.p. density of 50 mW/MHz in any 1 MHz band, and, when operating above a mean e.i.r.p. of 200 mW, these stations shall comply with the following e.i.r.p. elevation angle mask where θ is the angle above the local horizontal plane (of the Earth):

-13 dB(W/MHz)	for	$0° \le \theta < 8°$
$-13 - 0.716(\theta - 8)$ dB(W/MHz)	for	$8° \le \theta < 40°$
$-35.9 - 1.22(\theta - 40)$ dB(W/MHz)	for	$40° \le \theta \le 45°$
-42 dB(W/MHz)	for	$45° < \theta$;

5 that administrations may exercise some flexibility in adopting other mitigation techniques, provided that they develop national regulations to meet their obligations to achieve an equivalent level of protection to the EESS (active) and the SRS (active) based on their system characteristics and interference criteria as stated in Recommendation ITU-R RS.1632;

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[1] In the context of this Resolution, "mean e.i.r.p." refers to the e.i.r.p. during the transmission burst which corresponds to the highest power, if power control is implemented.

[2] $-124 - 20 \log_{10} (h_{SAT}/1\,414)$ dB(W/(m^2 · 1 MHz)), or equivalently,
$-140 - 20 \log_{10} (h_{SAT}/1\,414)$ dB(W/(m^2 · 25 kHz)), at the FSS satellite orbit, where h_{SAT} is the altitude of the satellite (km).

6 that in the band 5 470-5 725 MHz, stations in the mobile service shall be restricted to a maximum transmitter power of 250 mW[3] with a maximum mean e.i.r.p. of 1 W and a maximum mean e.i.r.p. density of 50 mW/MHz in any 1 MHz band;

7 that in the bands 5 250-5 350 MHz and 5 470-5 725 MHz, systems in the mobile service shall either employ transmitter power control to provide, on average, a mitigation factor of at least 3 dB on the maximum average output power of the systems, or, if transmitter power control is not in use, then the maximum mean e.i.r.p. shall be reduced by 3 dB;

8 that, in the bands 5 250-5 350 MHz and 5 470-5 725 MHz, the mitigation measures found in Annex 1 to Recommendation ITU-R M.1652-1 shall be implemented by systems in the mobile service to ensure compatible operation with radiodetermination systems,

invites administrations

to adopt appropriate regulation if they intend to permit the operation of stations in the mobile service using the e.i.r.p. elevation angle mask in *resolves* 4, to ensure the equipment is operated in compliance with this mask,

invites ITU-R

1 to continue work on regulatory mechanisms and further mitigation techniques to avoid incompatibilities which may result from aggregate interference into the FSS in the band 5 150-5 250 MHz from a possible prolific growth in the number of WAS, including RLANs;

2 to continue studies on mitigation techniques to provide protection of EESS from stations in the mobile service,

3 to continue studies on suitable test methods and procedures for the implementation of dynamic frequency selection, taking into account practical experience.

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[3] Administrations with existing regulations prior to WRC-03 may exercise some flexibility in determining transmitter power limits.

RESOLUTION 235 (WRC-15)

Review of the spectrum use of the frequency band 470-960 MHz in Region 1

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that the favourable propagation characteristics in the frequency bands below 1 GHz are beneficial in providing cost-effective solutions for coverage;

b) that there is a need to continually take advantage of technological developments in order to increase the efficient use of the spectrum and facilitate spectrum access;

c) that the frequency band 470-862 MHz is a harmonized band used to provide terrestrial television broadcasting services on a worldwide scale;

d) that, in many countries, there is a sovereign obligation to provide broadcasting services;

e) that terrestrial broadcasting networks have a long life cycle, and a stable regulatory environment is necessary to provide protection of investment and future development;

f) that, in many countries, there is a need for investment in the next decade for the migration of broadcasting into the frequency band below 694 MHz and for the implementation of new-generation broadcasting technologies, in order to take advantage of technological developments to increase the efficient use of the spectrum;

g) that in many developing countries terrestrial broadcasting is the only viable means of delivery of broadcast services;

h) that the technology trend in digital terrestrial television (DTT) is towards high-definition television which requires a higher bit rate than standard-definition television;

i) that it is necessary to adequately protect all primary services in the frequency band 470-694 MHz and in adjacent frequency bands;

j) that International Mobile Telecommunications (IMT) systems, utilizing some parts of the frequency band 694/698-960 MHz, are intended to provide telecommunication services on a worldwide scale, regardless of location, network or terminal used;

k) that, for countries listed in No. **5.296**, an additional allocation to the land-mobile service on a secondary basis is in place, intended for applications ancillary to broadcasting and programme-making;

l) that the frequency band 645-862 MHz is allocated on a primary basis to the aeronautical radionavigation service (ARNS) in the countries listed in No. **5.312**;

m) that, in some countries, parts of the frequency band are also allocated to the radiolocation service on a secondary basis, limited to the operation of wind profiler radars (No. **5.291A**), and also to the radio astronomy service on a secondary basis (No. **5.306**), and, according to No. **5.149**, administrations are urged to take all practicable steps to protect the radio astronomy service from harmful interference when making assignments to stations of other services,

recognizing

a) that the GE06 Agreement applies in all Region 1 countries, except Mongolia, and in Iran (Islamic Republic of), in particular for the frequency band 470-862 MHz;

b) that the GE06 Agreement contains provisions for the terrestrial broadcasting service and other primary terrestrial services, a Plan for digital television and a list of stations of other primary terrestrial services;

c) that a digital entry in the GE06 Plan may also be used for transmissions in a service other than the broadcasting service under the conditions set out in § 5.1.3 of the GE06 Agreement and the provisions of No. **4.4** of the Radio Regulations;

d) that information on implementation of the digital dividend and on the transition to digital television and its technological evolution is needed and may not be available before 2019,

noting

the ongoing development of new applications and technologies of both the broadcasting and mobile services,

resolves to invite ITU-R, after the 2019 World Radiocommunication Conference and in time for the 2023 World Radiocommunication Conference

1 to review the spectrum use and study the spectrum needs of existing services within the frequency band 470-960 MHz in Region 1, in particular the spectrum requirements of the broadcasting and mobile, except aeronautical mobile, services, taking into account the relevant ITU Radiocommunication Sector (ITU-R) studies, Recommendations and Reports;

2 to carry out sharing and compatibility studies, as appropriate, in the frequency band 470-694 MHz in Region 1 between the broadcasting and mobile, except aeronautical mobile, services, taking into account relevant ITU-R studies, Recommendations and Reports;

3 to conduct sharing and compatibility studies, as appropriate, in order to provide relevant protection of systems of other existing services,

invites administrations

to participate actively in the studies by submitting contributions to ITU-R,

resolves to invite the 2023 World Radiocommunication Conference

to consider, based on the results of studies above, provided that these studies are completed and approved by ITU-R, possible regulatory actions in the frequency band 470-694 MHz in Region 1, as appropriate,

further invites ITU-R

to ensure intersectoral collaboration with the ITU Telecommunication Development Sector (ITU-D) in the implementation of this Resolution.

RESOLUTION 236 (WRC-15)

Railway radiocommunication systems between train and trackside

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that railway transportation systems are evolving;

b) that there is a need to integrate different technologies in order to facilitate various functions, for instance dispatching commands, operating control and data transmission, into railway train and trackside systems to meet the needs of a high-speed railway environment;

c) that the current railway radiocommunication systems supporting railway train and trackside are narrowband systems;

d) that the deployment of railway radiocommunication systems between train and trackside requires infrastructure investment,

recognizing

a) that information and radiocommunication technologies in railway radiocommunication systems between train and trackside provide improved railway traffic control, passenger safety and improved security for train operations;

b) that timely studies are required on technologies providing for railway radiocommunication;

c) that international standards and harmonized spectrum would facilitate worldwide deployment of railway radiocommunication systems between train and trackside and provide for economies of scale in railway transportation for the public;

d) that there is a need to benefit from the experiences in achieving compatibility between current railway radiocommunication systems between train and trackside and other radiocommunication systems,

noting

a) that railway transportation contributes to global economic and social development, especially for developing countries;

b) that some national and international railway organizations have begun investigations on new technologies for railway radiocommunication systems;

c) that ITU Radiocommunication Sector (ITU-R) Study Group 5 is studying relevant technical and operational characteristics for railway radiocommunication systems;

d) that, in some countries, railway radiocommunication systems may assist in providing passenger services,

emphasizing

a) that, in the frequency bands in which these current and future systems operate, railway radiocommunication systems between train and trackside should be compatible with a variety of other systems;

b) that the provisions of Nos. **1.59** and **4.10** do not apply for railway radiocommunication systems,

resolves to invite the 2019 World Radiocommunication Conference

based on the results of ITU-R studies, to take necessary actions, as appropriate, to facilitate global or regional harmonized frequency bands, to the extent possible, for the implementation of railway radiocommunication systems between train and trackside, within existing mobile-service allocations,

invites ITU-R

to study the spectrum needs, technical and operational characteristics and implementation of railway radiocommunication systems between train and trackside,

invites Member States, Sector Members, Associates and Academia

to participate actively in the study by submitting contributions to ITU-R,

instructs the Secretary-General

to bring this Resolution to the attention of International Union of Railways (UIC) and other relevant international and regional organizations.

RESOLUTION 237 (WRC-15)

Intelligent Transport Systems applications

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that information and communication technologies are integrated in a vehicle system to provide Intelligent Transport Systems (ITS) communication applications for the purpose of improving traffic management and assisting safe driving;

b) that there is a need for consideration of spectrum harmonization for ITS applications, which are being used globally or regionally;

c) that there is a need to integrate various technologies, including radiocommunications, into land transportation systems;

d) that many new connected vehicles use intelligent technologies in the vehicles' combined advanced traffic management, advanced traveller information, advanced public transportation management systems and/or advanced fleet management systems to improve traffic management;

e) that the International Organization for Standardization (ISO) is standardizing ITS (non-radio aspects) in ISO/TC204, including applications for "cooperative systems" which require vehicle-to-vehicle and vehicle-to-infrastructure radiocommunications;

f) that the 3rd Generation Partnership Project (3GPP) is standardizing radio interface, system architecture and service requirements of "LTE-based V2X Services" for ITS application;

g) that future vehicular radiocommunication technologies and ITS broadcast systems are emerging;

h) that some administrations have harmonized frequency bands for ITS radiocommunication applications,

recognizing

that harmonized spectrum and international standards would facilitate worldwide deployment of ITS radiocommunications and provide for economies of scale in bringing ITS equipment and services to the public,

noting

a) that the guidelines for radio interface requirements of ITS are described in Recommendation ITU-R M.1890;

b) that outlines of technologies and characteristics for dedicated short-range communications at 5.8 GHz are described in Recommendation ITU-R M.1453-2;

c) that some administrations in each of the three Regions have deployed radiocommunication local area networks in the frequency band 5 725-5 825 MHz, which is also identified for industrial, scientific and medical (ISM) applications;

d) that studies and feasibility tests on advanced ITS radiocommunications have been actively conducted towards the realization of traffic safety and a reduction of environmental impact as described in Report ITU-R M.2228;

e) that radio interface standards of vehicle-to-vehicle and vehicle-to-infrastructure communications for ITS applications are described in Recommendation ITU-R M.2084,

emphasizing

a) that ITS applications currently operate within frequency bands allocated to a number of radiocommunication services in accordance with the relevant provisions of the Radio Regulations;

b) that the provisions of Nos. **1.59** and **4.10** do not apply to ITS applications,

resolves to invite the 2019 World Radiocommunication Conference

taking into account the results of ITU Radiocommunication Sector (ITU-R) studies, to consider possible global or regional harmonized frequency bands for the implementation of evolving ITS under existing mobile-service allocations,

invites ITU-R

to carry out studies on technical and operational aspects of evolving ITS implementation using existing mobile-service allocations,

invites administrations

to contribute actively to the ITU-R studies on this issue.

RESOLUTION 238 (WRC-15)

Studies on frequency-related matters for International Mobile Telecommunications identification including possible additional allocations to the mobile services on a primary basis in portion(s) of the frequency range between 24.25 and 86 GHz for the future development of International Mobile Telecommunications for 2020 and beyond

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that International Mobile Telecommunications (IMT) is intended to provide telecommunication services on a worldwide scale, regardless of location and type of network or terminal;

b) that IMT systems have contributed to global economic and social development;

c) that IMT systems are now being evolved to provide diverse usage scenarios and applications such as enhanced mobile broadband, massive machine-type communications and ultra-reliable and low-latency communications;

d) that ultra-low latency and very high bit rate applications of IMT will require larger contiguous blocks of spectrum than those available in frequency bands that are currently identified for use by administrations wishing to implement IMT;

e) that it may be suitable to examine higher frequency bands for these larger blocks of spectrum;

f) that there is a need to continually take advantage of technological developments in order to increase the efficient use of spectrum and facilitate spectrum access;

g) that the properties of higher frequency bands, such as shorter wavelength, would better enable the use of advanced antenna systems including MIMO and beam-forming techniques in supporting enhanced broadband;

h) that ITU-T has initiated the study of network standardization for IMT for 2020 and beyond;

i) that adequate and timely availability of spectrum and supporting regulatory provisions is essential to realize the objectives in Recommendation ITU-R M.2083;

j) that harmonized worldwide bands and harmonized frequency arrangements for IMT are highly desirable in order to achieve global roaming and the benefits of economies of scale;

k) that identification of frequency bands allocated to mobile service for IMT may change the sharing situation regarding applications of services to which the frequency band is already allocated, and may require additional regulatory actions;

l) the need to protect existing services and to allow for their continued development when considering frequency bands for possible additional allocations to any service,

noting

a) that Resolution ITU-R 65 addresses the principles for the process of development of IMT for 2020 and beyond, and that Question ITU-R 77-7/5 considers the needs of developing countries in the development and implementation of IMT;

b) that Question ITU-R 229/5 seeks to address the further development of IMT;

c) that IMT encompasses both IMT-2000, IMT-Advanced, and IMT-2020 collectively, as described in Resolution ITU-R 56-2;

d) Recommendation ITU-R M.2083, on the framework and objectives of the future development of IMT for 2020 and beyond;

e) that Report ITU-R M.2320 addresses future technology trends of terrestrial IMT systems;

f) Report ITU-R M.2376, on technical feasibility of IMT in the frequency bands above 6 GHz;

g) that Report ITU-R M.2370 analyses trends impacting future IMT traffic growth beyond the year 2020 and estimates global traffic demands for the period 2020 to 2030;

h) that there are ongoing studies within ITU-R on the propagation characteristics for mobile systems in higher frequency bands;

i) the relevance of provisions in Nos. **5.340**, **5.516B**, **5.547** and **5.553**, which may need to be taken into account in studies;

j) that the FSS allocation in the frequency band 24.65-25.25 GHz was made by WRC-12,

recognizing

a) that there is a lead time between the allocation of frequency bands by world radiocommunication conferences and the deployment of systems in those bands, and that timely availability of wide and contiguous blocks of spectrum is therefore important to support the development of IMT;

b) that frequency bands allocated to passive services on an exclusive basis are not suitable for an allocation to the mobile service;

c) that any identification of frequency bands for IMT should take into account the use of the bands by other services and the evolving needs of these services;

d) that there should be no additional regulatory or technical constraints imposed to services to which the band is currently allocated on a primary basis,

resolves to invite ITU-R

1 to conduct and complete in time for WRC-19 the appropriate studies to determine the spectrum needs for the terrestrial component of IMT in the frequency range between 24.25 GHz and 86 GHz, taking into account:

– technical and operational characteristics of terrestrial IMT systems that would operate in this frequency range, including the evolution of IMT through advances in technology and spectrally efficient techniques;

– the deployment scenarios envisaged for IMT-2020 systems and the related requirements of high data traffic such as in dense urban areas and/or in peak times;

– the needs of developing countries;

– the time-frame in which spectrum would be needed;

2 to conduct and complete in time for WRC-19 the appropriate sharing and compatibility studies[1], taking into account the protection of services to which the band is allocated on a primary basis, for the frequency bands:

– 24.25-27.5 GHz[2], 37-40.5 GHz, 42.5-43.5 GHz, 45.5-47 GHz, 47.2-50.2 GHz, 50.4-52.6 GHz, 66-76 GHz and 81-86 GHz, which have allocations to the mobile service on a primary basis; and

– 31.8-33.4 GHz, 40.5-42.5 GHz and 47-47.2 GHz, which may require additional allocations to the mobile service on a primary basis,

further resolves

1 to invite CPM19-1 to define the date by which technical and operational characteristics needed for sharing and compatibility studies are to be available, to ensure that studies referred to in *resolves to invite ITU-R* can be completed in time for consideration at WRC-19;

2 to invite WRC-19 to consider, based on the results of the above studies, additional spectrum allocations to the mobile service on a primary basis and to consider identification of frequency bands for the terrestrial component of IMT; the bands to be considered being limited to part or all of the bands listed in *resolves to invite ITU-R* 2,

invites administrations

to participate actively in these studies by submitting contributions to ITU-R.

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1 Including studies with respect to services in adjacent bands, as appropriate.

2 When conducting studies in the band 24.5-27.5 GHz, to take into account the need to ensure the protection of existing earth stations and the deployment of future receiving earth stations under the EESS (space-to-Earth) and SRS (space-to-Earth) allocation in the frequency band 25.5-27 GHz.

RESOLUTION 239 (WRC-15)

Studies concerning Wireless Access Systems including radio local area networks in the frequency bands between 5 150 MHz and 5 925 MHz

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that there has been considerable growth in the demand for Wireless Access Systems including radio local area networks (WAS/RLAN) applications with multimedia capabilities;

b) that WAS/RLAN applications contribute to global economic and social development by providing a wide range of multimedia applications;

c) that there is a need to continually take advantage of technological developments in order to increase the efficient use of spectrum and facilitate spectrum access;

d) that as technology evolves to meet increasing performance demands and traffic on broadband WAS increases, the use of wider bandwidth channels in order to support high data rates creates a need for additional spectrum;

e) that the frequency band 5 350-5 460 MHz is allocated worldwide on a primary basis to the aeronautical radionavigation service (No. **5.449**);

f) that the frequency band 5 460-5 470 MHz is allocated worldwide on a primary basis to the radionavigation service (No. **5.449**);

g) that the frequency band 5 350 to 5 470 MHz is allocated worldwide on a co-primary basis to the Earth exploration-satellite service (active) (No. **5.448B**), the space research service (active) (No. **5.448C**) and the radiolocation service (No. **5.448D**);

h) that the frequency bands between 5 725 and 5 850 MHz are allocated worldwide on a primary basis to the radiolocation service and, in Region 1, to the fixed-satellite service;

i) that the frequency band 5 850-5 925 MHz is allocated worldwide on a primary basis to the mobile service, the fixed service and the fixed-satellite service;

j) that there is a need to protect the incumbent primary services including their current and planned use;

k) that there may be a need to specify potential technical and operational restrictions for WAS/RLAN operating in the mobile service within the 5 GHz frequency range to facilitate sharing with systems of incumbent services,

considering further

a) that adequate and timely availability of spectrum and supporting regulatory provisions are essential to support future growth of WAS/RLAN applications;

b) that harmonized worldwide bands that support future growth of WAS/RLAN applications are highly desirable in order to achieve the benefits of economies of scale,

noting

a) that the frequency bands 5 150-5 250 MHz, 5 250-5 350 MHz and 5 470-5 725 MHz are allocated to the mobile service on a primary basis for the implementation of WAS/RLAN applications in accordance with Resolution **229 (Rev.WRC-12)**;

b) that the frequency band 5 250-5 850 MHz is allocated worldwide on a primary basis to the radiolocation service;

c) that in the frequency bands 5 350 -5 470 MHz there are no primary mobile allocations;

d) that in the frequency band 5 725-5 850 MHz there is no primary mobile allocation, however, the band is allocated by footnote to the fixed and mobile service in some countries, and additionally WAS/RLAN use is already authorized in some countries situated in each of the ITU-R regions;

e) that the Earth exploration-satellite service (active) allocations in the frequency bands 5 350-5 460 MHz and 5 460-5 470 MHz are essential for Earth-observation programmes such as Copernicus (Sentinel-1 and Sentinel-3), Jason, Sentinel-6 and RADARSAT (RADARSAT-2 and RADARSAT-3) and that the data these provide is vital for reliable and up-to-date information on how our planet and its climate are changing;

f) that future Earth exploration-satellite service (active) systems are being planned to utilize up to 300 MHz of bandwidth within the 5 GHz EESS allocated frequency band to improve image resolution and provide improved applications to users;

g) that the frequency band 5 150-5 250 MHz is also allocated worldwide on a primary basis to the aeronautical radionavigation service and to the fixed-satellite service (No. **5.447A**);

h) that the frequency bands between 5 250 and 5 350 MHz are also allocated worldwide on a primary basis to the Earth exploration-satellite service (active), the space research service and the space research (active) service;

i) that protection and performance criteria for systems of incumbent services are available in ITU-R,

recognizing

a) that the compatibility studies performed by ITU-R in preparation for this conference indicate that when assuming the use of WAS/RLAN mitigation measures limited to the regulatory provisions of Resolution **229 (Rev.WRC-12)**, sharing between WAS/RLAN and the EESS (active) systems in the frequency bands 5 350 to 5 470 MHz would not be feasible, as well as being insufficient to ensure protection of certain radar types in this frequency band; for these cases, sharing may only be feasible if additional WAS/RLAN mitigation measures are implemented, however, no agreement was reached on the applicability of any additional WAS/RLAN mitigation techniques;

b) that the results of ITU-R studies indicate that the minimum spectrum need for WAS/RLAN in the 5 GHz frequency range in the year 2018 is estimated at 880 MHz; this figure includes 455-580 MHz already utilized by non-IMT mobile broadband applications operating within the 5 GHz range resulting in 300-425 MHz additional spectrum being required;

c) that WAS/RLAN devices utilize the following frequency bands in the 5 GHz frequency range: 5 150-5 250 MHz, 5 250-5 350 MHz, 5 470-5 725 MHz and, in some countries 5 725-5 850 MHz;

d) that the frequency band 5 850-5 925 MHz is extensively used in some countries by the fixed-satellite service;

e) that additional global allocations to the mobile service in the frequency bands 5 350-5 470 MHz and 5 725-5 850 MHz would facilitate contiguous spectrum for WAS/RLAN, thereby enabling the use of wider channel bandwidths to support higher data throughput;

f) that sharing studies should consider additional mitigation techniques to ensure that WAS/RLAN devices would not result in degradation of the performance for existing systems;

g) that the application of possible additional WAS/RLAN mitigation measures referred to in *recognizing a)* may also be relevant to enable WAS/RLAN outdoor operation in other frequency bands;

h) that the frequency band 5 725-5 875 MHz is also designated for industrial, scientific and medical (ISM) applications and that radiocommunication services operating within this frequency band must accept harmful interference which may be caused by these applications in accordance with No. **5.150**,

resolves to invite the 2019 World Radiocommunication Conference

to consider the results of the ITU-R studies and take appropriate actions,

invites ITU-R

to conduct and complete the following in time for WRC-19:

a) to study WAS/RLAN technical characteristics and operational requirements in the 5 GHz frequency range;

b) to conduct studies with a view to identify potential WAS/RLAN mitigation techniques to facilitate sharing with incumbent systems in the frequency bands 5 150-5 350 MHz, 5 350-5 470 MHz, 5 725-5 850 MHz and 5 850-5 925 MHz, while ensuring the protection of incumbent services including their current and planned use;

c) to perform sharing and compatibility studies between WAS/RLAN applications and incumbent services in the frequency band 5 150-5 350 MHz with the possibility of enabling outdoor WAS/RLAN operations including possible associated conditions;

d) to conduct further sharing and compatibility studies between WAS/RLAN applications and incumbent services addressing:

i) whether any additional mitigation techniques in the frequency band 5 350-5 470 MHz beyond those analysed in the studies referred to in *recognizing a)* would provide coexistence between WAS/RLAN systems and EESS (active) and SRS (active) systems;

ii) whether any mitigation techniques in the frequency band 5 350-5 470 MHz would provide compatibility between WAS/RLAN systems and radio determination systems;

iii) whether the results of studies under points i) and ii) would enable an allocation of the frequency band 5 350-5 470 MHz to the mobile service with a view to accommodating WAS/RLAN use;

e) to also conduct detailed sharing and compatibility studies, including mitigation techniques, between WAS/RLAN and incumbent services in the frequency band 5 725-5 850 MHz with a view to enabling a mobile service allocation to accommodate WAS/RLAN use;

f) to also conduct detailed sharing and compatibility studies, including mitigation techniques, between WAS/RLAN and incumbent services in the frequency band 5 850-5 925 MHz with a view to accommodating WAS/RLAN use under the existing primary mobile service allocation while not imposing any additional constraints on the existing services,

invites administrations

to participate in the studies by submitting contributions to ITU-R.

RESOLUTION 331 (REV.WRC-12)

Operation of the Global Maritime Distress and Safety System

The World Radiocommunication Conference (Geneva, 2012),

noting

that all ships subject to the International Convention for the Safety of Life at Sea (SOLAS), 1974, as amended, are required to be fitted for the Global Maritime Distress and Safety System (GMDSS),

noting further

a) that a number of administrations have taken steps to implement the GMDSS also for classes of vessels not subject to SOLAS, 1974, as amended;

b) that an increasing number of vessels not subject to SOLAS, 1974, as amended, are making use of the techniques and frequencies of the GMDSS prescribed in Chapter **VII**;

c) that Chapter **VII** provides for maintaining interoperability between ships fitted for GMDSS and ships not yet fully equipped for GMDSS;

d) that the International Maritime Organization (IMO) is of the view that SOLAS ships, while at sea, should be required to keep a listening watch on VHF channel 16, for the foreseeable future, with a view to providing:

– a distress alerting and communication channel for non-SOLAS ships; and

– bridge-to-bridge communications;

e) that IMO has urged administrations to require all seagoing vessels under national legislation, and encourage all vessels voluntarily carrying VHF radio equipment to be fitted with facilities for transmitting and receiving distress alerts by digital selective calling (DSC) on VHF channel 70;

f) that separate provisions in the existing Radio Regulations allow VHF channel 16 and 2 182 kHz to be used for general calling by radiotelephony;

g) that several administrations have established Vessel Traffic Service (VTS) systems and require their vessels to keep watch on local VTS channels;

h) that ships that are required by SOLAS to carry a radio station have been equipped with DSC, and many vessels subject to national carriage requirements are also being equipped with DSC, but the majority of vessels that carry a radio station on a voluntary basis might not yet have DSC equipment;

i) that many administrations have established distress and safety service based on DSC watchkeeping, but the majority of port stations, pilot stations and other operational coast stations might not yet have been equipped with DSC facilities;

j) that ships not required by international agreement to carry GMDSS equipment can do so for safety purposes,

recognizing

a) that stations in the maritime mobile service are increasingly making use of the frequencies and techniques of GMDSS;

b) that there may be a need to maintain existing shore-based distress and safety services for reception of distress, urgency and safety calling by voice on VHF channel 16 for some years after this Conference so that ships whose ability to participate in GMDSS is limited to VHF channel 16 will be able to attract attention and obtain assistance from these services,

resolves

1 to urge all administrations to assist in enhancing safety at sea by:

– encouraging, where appropriate, establishment of shore-based facilities for GMDSS, either on an individual basis or in cooperation with other relevant parties in the area;

– encouraging the implementation of GMDSS techniques and frequencies on non-SOLAS vessels including national ships;

– encouraging all vessels carrying maritime VHF equipment to be fitted with DSC on VHF channel 70 as soon as possible, taking into account the relevant decisions of IMO;

– encouraging vessels to limit their use of VHF channel 16 and the frequency 2 182 kHz for calling to the minimum necessary, noting the provisions of No. **52.239**;

2 that coast stations that form part of shore-based arrangements for reception of distress calling by radiotelephony on VHF channel 16 should maintain an efficient watch on VHF channel 16. Such watch shall be indicated in the List of Coast Stations and Special Service Stations;

3 that administrations may release their coast stations from the listening watch on VHF channel 16 in respect of distress, urgency and safety calling by voice, in accordance with relevant decisions of IMO and ITU on aural watch-keeping requirements on channel 16, taking into account the GMDSS radio systems available in the area concerned;

when doing so, administrations should:

– inform IMO of their decisions and submit to IMO details on the area concerned;

– inform the Secretary-General of the necessary details for inclusion in the List of Coast Stations and Special Service Stations,

resolves further

that the Secretary-General should ensure that such arrangements and details regarding the area concerned be indicated in relevant maritime publications,

invites ITU-R

to monitor the development of and changes to the GMDSS, and to continue to develop techniques and systems relevant for the GMDSS,

instructs the Secretary-General

to bring this Resolution to the attention of IMO, the International Civil Aviation Organization (ICAO) and the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA).

RESOLUTION 339 (REV.WRC-07)

Coordination of NAVTEX services

The World Radiocommunication Conference (Geneva, 2007),

considering

a) that the International Maritime Organization (IMO) has established a Coordinating Panel on NAVTEX to, *inter alia*, coordinate the operational aspects of NAVTEX services, such as allocation of transmitter identification character (B1) and time schedules, in the planning stages for transmissions on the frequencies 490 kHz, 518 kHz or 4 209.5 kHz;

b) that coordination in the frequencies 490 kHz, 518 kHz and 4 209.5 kHz is essentially operational;

c) that the frequency band around 518 kHz is also allocated to the aeronautical radionavigation service on a primary basis,

resolves

to invite administrations to apply the procedures established by IMO, taking into account the IMO NAVTEX Manual, for coordinating the use of the frequencies 490 kHz, 518 kHz and 4 209.5 kHz,

instructs the Secretary-General

to invite IMO to provide ITU with information on a regular basis on operational coordination for NAVTEX services on the frequencies 490 kHz, 518 kHz and 4 209.5 kHz,

instructs the Director of the Radiocommunication Bureau

to publish this information in the *List of Coast Stations and Special Service Stations* (List IV) (see No. **20.7**).

RESOLUTION 343 (REV.WRC-12)

Maritime certification for personnel of ship stations and ship earth stations for which a radio installation is not compulsory

The World Radiocommunication Conference (Geneva, 2012),

considering

a) that WRC-97 considered the question of certification for personnel of ship stations and ship earth stations within the Global Maritime Distress and Safety System (GMDSS);

b) that GMDSS was fully implemented on 1 February 1999 by vessels subject to an international agreement;

c) that vessels not subject to an international agreement have adopted GMDSS systems and techniques;

d) that use of GMDSS equipment should be accompanied by appropriate training and certification;

e) that the Radio Regulations stipulate that the service of every ship radio station working on frequencies assigned for international use shall be performed by operators holding a certificate;

f) that WRC-07 suppressed Appendix **13** to the Radio Regulations, which specified distress communications and operator's certificates by radiotelephones, and that, in order to incorporate provisions for non-GMDSS certificates, WRC-12 has further modified Article **47**,

noting

that a number of administrations currently issue radio operator certificates specially designed for the non-compulsory sector,

resolves

that administrations wishing to implement special certification for the non-compulsory sector should implement the certificates contained in the Annex to this Resolution,

invites ITU-R

to develop a Recommendation describing these certificates,

instructs the Secretary-General

to bring this Resolution to the attention of the International Maritime Organization (IMO).

ANNEX TO RESOLUTION 343 (REV.WRC-12)

Examination syllabus for radio operator's certificates appropriate to vessels using the frequencies and techniques of the Global Maritime Distress and Safety System on a non-compulsory basis

Introduction

The introduction of the Global Maritime Distress and Safety System (GMDSS) in February 1992 made it necessary to harmonize the examination requirements for certificates for professional radio operators. Harmonized examination procedures for the general operator's Certificate and restricted operator's Certificate, based on the syllabuses described in Article **47**, have already been introduced for maritime radio operators performing radiocommunication duties on board vessels subject to the International Convention for the Safety of Life at Sea (SOLAS), 1974, as amended. The GMDSS was fully implemented on 1 February 1999 for vessels subject to SOLAS, 1974, as amended.

For vessels not subject to SOLAS, 1974, as amended, and which install radiocommunication equipment on a voluntary basis, there are significant advantages to also using the GMDSS. However, it was foreseen by some administrations that such vessels would use some, but not all, of the frequencies and techniques of the GMDSS and that radio personnel on board such vessels would not need the same level of certification as radio personnel on board vessels which use all of the frequencies and techniques of the GMDSS on a compulsory basis. A syllabus has been developed which provides the flexibility for a depth of study, level of knowledge, and length of course appropriate to meet the certification requirements of radio personnel on board vessels which use some of the frequencies and techniques of the GMDSS on a non-compulsory basis. The syllabus also provides for certification in the use of satellite equipment where appropriate.

This Annex describes the syllabus developed to meet the certification requirements referred to above, and which are implemented in a number of countries under the title "Long Range Certificate" and "Short Range Certificate". The Short Range Certificate should at least contain those elements of the syllabus which are relevant to sea area A1.

Examination syllabus

The examination should consist of theoretical and practical tests and should include at least:

A **General knowledge of radiocommunications in the maritime mobile service**

A.1 The general principles and basic features of the maritime mobile service.

B **Detailed practical knowledge and ability to use radio equipment**

B.1 The VHF radio installation. Use of VHF equipment in practice.

B.2 The MF/HF radio installation. Use of MF/HF equipment in practice.

B.3 Purpose and use of digital selective calling facilities and techniques.

C **Operational procedures of the GMDSS and detailed practical operation of GMDSS subsystems and equipment**

C.1 Basic introduction to GMDSS procedures.

C.2 Distress, urgency and safety communication procedures in the GMDSS.

C.3 Distress, urgency and safety communication procedures by radiotelephony in the old distress and safety system.

C.4 Protection of distress frequencies.

C.5 Maritime safety information (MSI) systems in the GMDSS.

C.6 Alerting and locating signals in the GMDSS.

C.7 Procedures for cancelling an inadvertent false alert transmission.

D **Operational procedures and regulations for radiotelephone communications**

D.1 Ability to exchange communications relevant to the safety of life at sea.

D.2 Regulations, obligatory procedures and practices.

D.3 Practical and theoretical knowledge of radiotelephone procedures.

D.4 Use of the international phonetic alphabet and, where appropriate, parts of the IMO Standard Marine Communication Phrases.

E **Optional examination module for the maritime mobile-satellite service for vessels not subject to a compulsory fit**

E.1 The general principles and basic features of the maritime mobile-satellite service.

E.2 Operational procedures and detailed practical operation of ship earth stations in the GMDSS.

RESOLUTION 344 (REV.WRC-12)

Management of the maritime identity numbering resource

The World Radiocommunication Conference (Geneva, 2012),

noting

a) that the installation of digital selective calling equipment or Inmarsat B, C or M ship earth station equipment on ships participating in the Global Maritime Distress and Safety System (GMDSS) on a mandatory or voluntary basis requires the assignment of a unique nine-digit maritime mobile service identity (MMSI);

b) that such equipment offers the possibility to connect with public telecommunication networks;

c) that only mobile-satellite systems have been able to resolve the various billing, routeing, charging and signalling requirements needed to provide full two-way automatic connectivity between ships and the international public correspondence service;

d) that ships using the present generation of mobile-satellite ship earth stations have to be assigned an MMSI ending with three trailing zeros in order to support automatic access to public telecommunication networks through a diallable ship telephone number whose format is compliant with ITU-T Recommendation E.164 but can only accommodate the first six digits of the MMSI;

e) that the automatic identification system (AIS) and its related systems require MMSI or other maritime identities;

f) that radios capable of digital selective calling and intended to be used on non-SOLAS ships, require maritime identities;

g) that the first three digits of a ship station MMSI form the maritime identification digits (MID), which denote the ship's administration,

considering

a) that digital selective calling distress alerts require valid identities recognizable by search and rescue authorities in order to ensure a timely response;

b) that AIS and its related systems require valid identities recognizable by other ships and authorities for safety of navigation and search and rescue operations;

c) that Recommendation ITU-R M.585 contains guidance for the assignment and use of maritime identities, such as MMSIs and other maritime identities,

recognizing

a) that even domestic ships which install the present generation of ship earth stations operating to Inmarsat B, C or M standards will require the assignment of MMSI numbers from those numbers originally intended for ships communicating worldwide, further depleting the resource;

b) that future generations of mobile-satellite systems offering access to public telecommunication networks and participating in the GMDSS will employ a free-form numbering system that need not include any part of the MMSI;

c) that future growth of AIS and its related systems will require further resources of MMSI and other maritime identities,

noting further

a) that ITU-R is solely responsible for managing the MMSI and MID numbering resources;

b) that ITU-R can monitor the status of the MMSI resource, through regular reviews of the spare capacity available within the MIDs already in use, and the availability of spare MIDs, taking account of regional variations,

resolves to instruct the Director of the Radiocommunication Bureau

1 to manage the allotment and distribution of the MID resource within the MMSI and other maritime identity numbering formats, taking into account:

– Sections II, V and VI of Article **19**;

– regional variations in MMSI use;

– spare capacity within the MID resource; and

– the assignment, management and conservation of maritime identities contained in the most recent version of Recommendation ITU-R M.585, in particular as regards the reuse of MMSIs;

2 to report to each world radiocommunication conference on the use and status of the MMSI resource, noting in particular the anticipated reserve capacity and any indications of rapid exhaustion of the resource,

invites ITU-R

to keep under review the Recommendations for assigning MMSIs and other maritime identities, with a view to:

– improving the management of the MID, MMSI and other maritime identity resources; and

– identifying alternative resources if there is an indication of rapid exhaustion of these resources,

instructs the Secretary-General

to communicate this Resolution to the International Maritime Organization.

RESOLUTION 349 (REV.WRC-12)

Operational procedures for cancelling false distress alerts in the Global Maritime Distress and Safety System

The World Radiocommunication Conference (Geneva, 2012),

considering

a) that the 1974 International Convention for the Safety of Life at Sea (SOLAS), as amended, prescribes that ships subject to that Convention shall be fitted with Global Maritime Distress and Safety System (GMDSS) equipment as appropriate;

b) that non-SOLAS vessels are also being equipped with GMDSS equipment;

c) that the transmission and relay of false distress alerts is a significant problem within the GMDSS,

noting

that the International Maritime Organization (IMO) has developed similar operational procedures to cancel false distress alerts,

resolves

1 to urge administrations to take all necessary measures to avoid false distress alerts and to minimize the unnecessary burden on rescue organizations which occurs;

2 to urge administrations to encourage the correct use of GMDSS equipment, with particular attention to appropriate training;

3 to urge administrations to implement the operational procedures contained in the Annex to this Resolution;

4 that administrations should take any consequential appropriate action in this respect,

instructs the Secretary-General

to bring this Resolution to the attention of IMO.

ANNEX TO RESOLUTION 349 (REV.WRC-12)

Cancelling of false distress alerts

If a distress alert is inadvertently transmitted, the following steps shall be taken to cancel the distress alert.

1 VHF digital selective calling

1) Reset the equipment immediately;

2) If the DSC equipment is capable of cancellation, cancel the alert in accordance with the most recent version of Recommendation ITU-R M.493;

3) Set to channel 16; and

4) Transmit a broadcast message to "All Stations" giving the ship's name, call sign and maritime mobile service identity (MMSI), and cancel the false distress alert.

2 MF digital selective calling

1) Reset the equipment immediately;

2) If the DSC equipment is capable of cancellation, cancel the alert in accordance with the most recent version of Recommendation ITU-R M.493;

3) Tune for radiotelephony transmission on 2 182 kHz; and

4) Transmit a broadcast message to "All Stations" giving the ship's name, call sign and MMSI, and cancel the false alert.

3 HF digital selective calling

1) Reset the equipment immediately;

2) If the DSC equipment is capable of cancellation, cancel the alert in accordance with the most recent version of Recommendation ITU-R M.493;

3) Tune for radiotelephony on the distress and safety frequency in each band in which a false distress alert was transmitted (see Appendix **15**); and

4) Transmit a broadcast message to "All Stations" giving the ship's name, call sign and MMSI, and cancel the false alert on the distress and safety frequency in each band in which the false distress alert was transmitted.

4 Inmarsat ship earth station

Notify the appropriate rescue coordination centre that the alert is cancelled by sending a distress priority message by way of the same coast earth station through which the false distress alert was sent. Provide ship name, call sign and Inmarsat identity with the cancelled alert message.

5 Emergency position indicating radiobeacon (EPIRB)

If for any reason an EPIRB is activated inadvertently, immediately stop the inadvertent transmission and contact the appropriate rescue coordination centre through a coast station or land earth station and cancel the distress alert.

6 General

Notwithstanding the above, ships may use additional appropriate means available to them to inform the appropriate authorities that a false distress alert has been transmitted and should be cancelled.

RESOLUTION 352 (WRC-03)

Use of the carrier frequencies 12 290 kHz and 16 420 kHz for safety-related calling to and from rescue coordination centres

The World Radiocommunication Conference (Geneva, 2003),

considering

a) that this Conference modified No. **52.221A** to allow safety-related calling to and from rescue coordination centres on the carrier frequencies 12 290 kHz and 16 420 kHz;

b) that this limited safety-related calling function on these carrier frequencies will enhance the capability of those search and rescue organizations which maintain watch on these distress and safety frequencies to call vessels not utilizing the Global Maritime Distress and Safety System (GMDSS),

noting

a) that regulation IV/4.8 of the International Convention for the Safety of Life at Sea (SOLAS), 1974, as amended, requires that SOLAS ships, while at sea, be capable of transmitting and receiving general radiocommunications to and from shore-based radio systems or networks;

b) that general communications may include safety-related communications necessary for the safe operation of vessels,

further noting

that safety-related communications require adequate, effective and immediate access and protection,

recognizing

a) that the International Maritime Organization (IMO) notes that distress, urgency and safety radiocommunications include, but are not limited to:

– transmissions of maritime safety information;

– distress calls and traffic;

– acknowledgment and relaying of distress calls;

– search and rescue coordination communications;

– ship movement service communications;

– communications related to the safe operation of ships;

– communications related to navigation;

– meteorological warnings;

– meteorological observations;

– ship position reports; and

– medical emergencies (e.g. MEDICO/MEDIVAC);

b) that distress, urgency and safety communications are defined in Articles **32** and **33**,

resolves

1 that the carrier frequencies 12 290 kHz and 16 420 kHz be used only for distress, urgency and safety communications, and safety-related calling limited to that to and from rescue coordination centres;

2 that safety-related calling be initiated only after determination that other communications are not present on these frequencies;

3 that safety-related calling be minimized and not cause interference to distress, urgency and safety communications,

invites administrations

to encourage the coast and ship stations under their jurisdiction to use digital selective calling techniques,

instructs the Secretary-General

to bring this Resolution to the attention of the IMO.

RESOLUTION 354 (WRC-07)

Distress and safety radiotelephony procedures for 2 182 kHz

The World Radiocommunication Conference (Geneva, 2007),

noting

a) that all ships subject to the International Convention for the Safety of Life at Sea (SOLAS), 1974, as amended, are required to be fitted for the Global Maritime Distress and Safety System (GMDSS);

b) that some vessels not subject to SOLAS, 1974, as amended, may not be making use of the techniques and frequencies of GMDSS prescribed in Chapter **VII** and may wish to continue using radiotelephony procedures for distress and safety communications on 2 182 kHz until such time as they are able to participate in the GMDSS;

c) that some administrations may have a need to maintain shore-based radiotelephony distress and safety services on 2 182 kHz so that vessels not subject to SOLAS, 1974, as amended, and not yet using the techniques and frequencies of GMDSS will be able to obtain assistance from these services until such time as they are able to participate in GMDSS,

considering

that there needs to be some recognized guidance for the use of radiotelephony on 2 182 kHz for distress and safety communications,

resolves

1 that ships, when in distress or when engaged in urgency or safety-related communications on 2 182 kHz, use the radiotelephony procedures contained in the Annex to this Resolution;

2 that coast stations, in order to maintain communication with non-GMDSS ships that are in distress or engaged in urgency or safety related communications on 2 182 kHz, use the radiotelephony procedures contained in the Annex to this Resolution.

ANNEX TO RESOLUTION 354 (WRC-07)

Distress and safety radiotelephony procedures for 2 182 kHz*

PART A1 − GENERAL

§ 1 The frequencies and techniques specified in this Resolution may be used in the maritime mobile service for stations[1] not required by national or international regulation to fit GMDSS equipment and for communications between those stations and aircraft. However, stations of the maritime mobile service, when additionally fitted with any of the equipment used by stations operating in conformity with the provisions specified in Chapter **VII**, should, when using that equipment, comply with the appropriate provisions of that Chapter.

§ 2 1) No provision of this Resolution prevents the use by a mobile station or mobile earth station in distress of any means at its disposal to attract attention, make known its position, and obtain help.

2) No provision of this Resolution prevents the use by stations on board aircraft or ships engaged in search and rescue operations, in exceptional circumstances, of any means at their disposal to assist a mobile station or mobile earth station in distress.

3) No provision of this Resolution prevents the use by a land station or coast earth station, in exceptional circumstances, of any means at its disposal to assist a mobile station or mobile earth station in distress (see also No. **4.16**).

§ 3 In cases of distress, urgency or safety, communications by radiotelephony should be made slowly and distinctly, each word being clearly pronounced to facilitate transcription.

§ 4 The abbreviations and signals of Recommendation ITU-R M.1172 and the Phonetic Alphabet and Figure Code in Appendix **14** should be used where applicable[2].

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* Distress and safety communications include distress, urgency and safety calls and messages.

1 These stations may include rescue coordination centres. The term "Rescue Coordination Centre" as defined in the International Convention on Maritime Search and Rescue (1979) refers to a unit responsible for promoting the efficient organization of search and rescue services and for coordinating the conduct of search and rescue operations within a search and rescue region.

2 The use of the Standard Marine Communication Phrases and, where language difficulties exist, the International Code of Signals, both published by the International Maritime Organization, is also recommended.

§ 5 Distress, urgency and safety communications may also be made using digital selective calling and satellite techniques and/or direct-printing telegraphy, in accordance with the provisions specified in Chapter **VII** and relevant ITU-R Recommendations.

§ 6 Mobile stations[3] of the maritime mobile service may communicate for safety purposes with stations of the aeronautical mobile service. Such communications shall normally be made on the frequencies authorized, and under the conditions specified, in Section I of Part A2 (see also § 2 1)).

§ 7 Mobile stations of the aeronautical mobile service may communicate for distress and safety purposes with stations of the maritime mobile service in conformity with the provisions of this Resolution.

§ 8 Any aircraft required by national or international regulations to communicate for distress, urgency or safety purposes with stations of the maritime mobile service shall be capable of transmitting and receiving class J3E emissions when using the carrier frequency 2 182 kHz or the carrier frequency 4 125 kHz.

PART A2 − FREQUENCIES FOR DISTRESS AND SAFETY

Section I − Availability of frequencies

A − 2 182 kHz

§ 1 1) The carrier frequency 2 182 kHz is an international distress frequency for radiotelephony; it may be used by ship, aircraft and survival craft stations when requesting assistance from the maritime services. It is used for distress calls and distress traffic, for the urgency signal and urgency messages and for the safety signal. Safety messages should be transmitted, when practicable, on a working frequency, after a preliminary announcement on 2 182 kHz. The class of emission to be used for radiotelephony on the frequency 2 182 kHz shall be J3E. Distress traffic on 2 182 kHz following the reception of a distress call using digital selective calling should take into account that some shipping in the vicinity may not be able to receive this traffic.

2) If a distress message on the carrier frequency 2 182 kHz has not been acknowledged, the distress call and message may be transmitted again on a carrier frequency of 4 125 kHz or 6 215 kHz, as appropriate.

3) However, ship stations and aircraft which cannot transmit either on the carrier frequency 2 182 kHz or on the carrier frequencies 4 125 kHz or 6 215 kHz may use any other available frequency on which attention might be attracted.

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[3] Mobile stations communicating with the stations of the aeronautical mobile (R) service in bands allocated to the aeronautical mobile (R) service shall conform to the provisions of the Regulations which relate to that service and, as appropriate, any special arrangements between the governments concerned by which the aeronautical mobile (R) service is regulated.

4) Coast stations using the carrier frequency 2 182 kHz for distress purposes and to send navigational warnings may transmit an audible alarm signal[4] of short duration for the purpose of attracting attention to the message which follows.

B – 4 125 kHz

§ 2 1) The carrier frequency 4 125 kHz is used to supplement the carrier frequency 2 182 kHz for distress and safety purposes and for call and reply. This frequency is also used for distress and safety traffic by radiotelephony.

2) The carrier frequency 4 125 kHz may be used by aircraft to communicate with stations of the maritime mobile service for distress and safety purposes, including search and rescue.

C – 6 215 kHz

§ 3 The carrier frequency 6 215 kHz is used to supplement the carrier frequency 2 182 kHz for distress and safety purposes and for call and reply. This frequency is also used for distress and safety traffic by radiotelephony.

Section II – Protection of distress and safety frequencies

A – General

§ 4 Test transmissions on any of the distress and safety frequencies described above shall be kept to a minimum and, wherever practicable, be carried out on artificial antennas or with reduced power.

§ 5 Before transmitting on any of the frequencies identified for distress and safety communications, a station shall listen on the frequency concerned to make sure that no distress transmission is being sent (see Recommendation ITU-R M.1171). This does not apply to stations in distress.

B – 2 182 kHz

§ 6 1) Except for transmissions authorized on the carrier frequency 2 182 kHz and on the frequencies 2 174.5 kHz, 2 177 kHz, 2 187.5 kHz and 2 189.5 kHz, all transmissions on the frequencies between 2 173.5 kHz and 2 190.5 kHz are forbidden (see also Appendix **15**).

2) To facilitate the reception of distress calls, all transmissions on 2 182 kHz should be kept to a minimum.

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[4] Alarm signals may consist of transmissions of sinusoidal audio frequency tones 1 300 Hz, 2 200 Hz, or both. Different tone generation patterns may be used to signal the type of message which follows, and an alarm signal ending in a 10-second continuous tone could be used to identify a transmission by a coast station.

Section III − Watch on distress frequencies

A − 2 182 kHz

§ 7 1) Coast stations may maintain a watch on the carrier frequency 2 182 kHz if so directed by their Administration. Such assignments should be indicated in the List of Coast Stations and Special Service Stations.

2) Ship stations not fitted with equipment compatible with the GMDSS are encouraged to keep the maximum watch practicable on the carrier frequency 2 182 kHz.

B − 4 125 kHz, 6 215 kHz

§ 8 Coast stations may maintain additional watch, as permitted, on the carrier frequencies 4 125 kHz and 6 215 kHz. Such assignments should be indicated in the List of Coast Stations and Special Service Stations.

PART A3 − DISTRESS COMMUNICATIONS

Section I − General

§ 1 The general provisions for distress communications are found in Section I of Article **32** (see Nos. **32.1**, **32.3**, and **32.4**).

Section II − Distress signal, call and message

§ 2 The radiotelephone distress signal, call and message are described in Section II of Article **32** (see Nos. **32.13BA**, **32.9**, **32.13B**, **32.13C**, and **32.13D**).

Section III − Procedures

§ 3 After the transmission by radiotelephony of its distress message, the mobile station may be requested to transmit suitable signals, followed by its call sign or other identification, to permit direction-finding stations to determine its position. This request may be repeated at frequent intervals if necessary.

§ 4 1) The distress message, preceded by the distress call, shall be repeated at intervals until an answer is received.

2) The intervals shall be sufficiently long to allow time for replying stations, in their preparations, to start their sending apparatus.

§ 5 When the mobile station in distress receives no answer to a distress message sent on the distress frequency, the message may be repeated on any other available frequency on which attention might be attracted.

Section IV − Transmission of a distress relay message by a station not itself in distress

§ 6 The radiotelephone procedures for the transmission of a distress relay message by a station not itself in distress are found in Section II of Article **32** (see Nos. **32.16** to **32.19A** and **32.19D** to **32.19F**).

Section V − Receipt and acknowledgement of a distress message

§ 7 The procedures relating to the receipt and acknowledgement of a distress message are found in Section II of Article **32** (see Nos. **32.23**, **32.26**, **32.28**, **32.29**, **32.30** and **32.35**).

Section VI − Distress traffic

§ 8 The radiotelephone procedures relating to the distress traffic are found in Section III of Article **32** (see Nos. **32.39** to **32.42**, **32.45** to **32.47**, **32.49** to **32.52** and **32.54** to **32.59**).

§ 9 1) Every mobile station acknowledging receipt of a distress message shall, on the order of the person responsible for the ship, aircraft or other vehicle, transmit the following information in the order shown as soon as possible:

– its name;

– its position;

– the speed at which it is proceeding towards, and the approximate time it will take to reach, the mobile station in distress;

– additionally, if the position of the ship in distress appears doubtful, ship stations should also transmit, when available, the true bearing of the ship in distress.

2) Before transmitting the message specified in § 9 1), the station shall ensure that it will not interfere with the emissions of other stations better situated to render immediate assistance to the station in distress.

PART A4 − URGENCY AND SAFETY COMMUNICATIONS

Section I − Urgency communications

§ 1 The radiotelephone procedures for urgency communications are found in Sections I and II of Article **33** (see Nos. **33.1** to **33.7** and **33.8**, **33.8B** to **33.9A** and **33.11** to **33.16**).

Section II − Safety communications

§ 2 The radiotelephone procedures for safety communications are found in Sections I and IV of Article **33** (see Nos. **33.31**, **33.31C**, **33.32**, **33.34** to **33.35** and **33.38B**).

RESOLUTION 356 (WRC-07)

ITU maritime service information registration

The World Radiocommunication Conference (Geneva, 2007),

noting

a) that the provisions of No. **20.16** of Article **20** require administrations to notify the Radiocommunication Bureau of operational information contained in the List of Coast Stations and Special Service Stations (List IV) and List of Ship Stations and Maritime Mobile Service Identity Assignments (List V);

b) that this Conference has modified Article **19** to provide for the assignment of a maritime mobile service identity (MMSI) to search and rescue aircraft, automatic identification system (AIS) aids to navigation, and craft associated with a parent ship;

c) that the provisions of No. **20.15**, however, give the Radiocommunication Bureau authority to change the content and form of this information in consultation with administrations;

d) that the International Maritime Organization (IMO) has already identified, in Resolution A.887(21) adopted on 25 November 1999, information to be included in search and rescue databases, including:

– vessel identification number (IMO number or national registration number);

– Maritime mobile service identity (MMSI);

– radio call sign;

– name, address and telephone number and, if applicable, telefax number of emergency contact person ashore;

– alternative 24-hour emergency telephone number;

– capacity for persons on board (passengers and crew),

resolves to instruct the Director of the Radiocommunication Bureau

to maintain online information systems to allow rescue coordination centres to have immediate access to this information on a 24-hour per day, 7-day per week basis,

invites ITU-R

to consult with administrations, IMO, the International Civil Aviation Organization (ICAO), the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA), and the International Hydrographic Organization (IHO) to identify elements for incorporation in ITU online information systems,

instructs the Secretary-General

to communicate this Resolution to IMO, ICAO, IALA, and IHO.

RESOLUTION 359 (REV.WRC-15)

Consideration of regulatory provisions for updating and modernization of the Global Maritime Distress and Safety System

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that there is a continuing need in the Global Maritime Distress and Safety System (GMDSS), on a global basis, for improved communications to enhance maritime capabilities;

b) that the International Maritime Organization (IMO) is considering GMDSS modernization;

c) that advanced maritime MF/HF/VHF data systems and satellite communication systems may be used to deliver Maritime Safety Information (MSI) and other GMDSS communications;

d) that IMO is considering recognition of additional global and regional GMDSS satellite communication systems;

e) that GMDSS satellite systems need to provide protection of incumbent services in accordance with the Radio Regulations, including those in adjacent frequency bands, from harmful interference, and such GMDSS satellite systems should operate within the interference environment of existing systems,

noting

a) that WRC-12 reviewed Appendix **17** to improve efficiency and introduce bands for new digital technology;

b) that WRC-12 reviewed the regulatory provisions and spectrum allocations for use by maritime safety systems for ships and ports,

further noting

that WRC-12 and this conference have reviewed Appendix **18** to improve efficiency and introduce bands for new digital technology,

recognizing

a) that advanced maritime communication systems may support the implementation of GMDSS modernization;

b) that IMO efforts to implement GMDSS modernization may require modification of the Radio Regulations to accommodate advanced maritime communication systems;

c) that due to the importance of GMDSS communication systems in ensuring the safe operation of shipping and commerce and security at sea, they must be resilient to interference;

d) that IMO has received an application to recognize an existing satellite system as part of the GMDSS, and consequential regulatory actions may need to be considered;

e) that Nos. **4.6**, **5.369** and **5.372** provide information on the use of the frequency band 1 616-1 626.5 MHz, or parts thereof,

resolves to invite ITU-R

1 to conduct studies, taking into consideration the activities of IMO, as well as information and requirements provided by IMO, in order to determine the regulatory provisions to support GMDSS modernization;

2 to conduct studies, taking into consideration the activities of IMO and the recognition of additional satellite systems for use in the GMDSS, including consideration of the mobile-satellite service (MSS) allocations used and the potential impact of possible modifications to the provisions of the Radio Regulations on sharing and compatibility with other services and systems in the frequency band and adjacent frequency bands,

invites the 2019 World Radiocommunication Conference

1 to consider the result of ITU Radiocommunication Sector (ITU-R) studies and take necessary actions, as appropriate, to support GMDSS modernization;

2 to consider regulatory provisions, if appropriate, based on the ITU-R studies, and taking into consideration the activities of IMO, related to the introduction of additional satellite systems into the GMDSS, including consideration of the MSS allocations used, while ensuring the protection of all incumbent services, including those in adjacent frequency bands, from harmful interference, as stated in *recognizing e)*,

invites

1 IMO to actively participate in the studies by providing requirements and information that should be taken into account in ITU-R studies;

2 the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA), the International Electrotechnical Commission (IEC), the International Hydrographic Organization (IHO), the International Organization for Standardization (ISO) and the World Meteorological Organization (WMO) to contribute to these studies,

instructs the Secretary-General

to bring this Resolution to the attention of IMO and other international and regional organizations concerned.

RESOLUTION 360 (REV.WRC-15)

Consideration of regulatory provisions and spectrum allocations to the maritime mobile-satellite service to enable the satellite component of the VHF Data Exchange System and enhanced maritime radiocommunication

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that the ITU Radiocommunication Sector (ITU-R) has developed the technical characteristics of a VHF Data Exchange System (VDES) as described in Recommendation ITU-R M.2092;

b) that the Automatic Identification System (AIS) as described in Recommendation ITU-R M.1371 is an integral part of the VDES;

c) that VDES uses the timing and frame structure of AIS;

d) that AIS is used primarily for surveillance and safety of navigation purposes in ship-to-ship use, ship reporting and vessel traffic services applications;

e) that there is a growing need for the establishment of a future VDES satellite component which would offer potential enhancements to maritime safety;

f) that the VDES satellite component should not interfere with AIS, application specific messages (ASM) and the VDES terrestrial component, while making efficient use of the VHF maritime spectrum and accommodating all users;

g) that the VDES satellite component should not cause harmful interference to digital selective calling (DSC), AIS, voice distress, safety and calling channels;

h) that the VDES satellite component may operate in the relevant part of the VHF maritime frequency bands 156.0125-157.4375 MHz and 160.6125-162.0375 MHz,

noting

that the International Maritime Organization (IMO) has developed an international code for ships operating in polar waters (“Polar Code”),

recognizing

a) that a satellite component for VDES is necessary to expand the system from the coastal area to a global coverage;

b) that a satellite component of the VDES offers potential enhancement to VHF safety communication on a global basis to satisfy the increasing need for maritime communication for enhanced maritime safety;

c) that this satellite component should be capable of operating with the terrestrial VDES (AIS, ASM and VDE) and should not interfere with it, or block it;

d) that the satellite component should not cause harmful interference to incumbent services and those in adjacent frequency bands, which are defined for the lower adjacent frequency band from 154 MHz to 156 MHz and for the higher adjacent frequency band from 162 to 164 MHz, and to all other components of the existing VDES as described in Recommendation ITU-R M.2092, DSC, AIS and voice distress, safety and calling channels;

e) that the receiver on the satellite should be resilient to harmful interference from incumbent services and those services in adjacent bands, which are defined for the lower adjacent frequency band from 154 MHz to 156 MHz and for the higher adjacent frequency band from 162 MHz to 164 MHz;

f) that since the VDES as described in Recommendation ITU-R M.2092 uses the frequency bands of Appendix **18**, the implementation of the VDES satellite component would be more effective when using the frequency bands within Appendix **18**;

g) that studies should be carried out to identify spectrum needed for the VDES satellite component;

h) that some administrations have initiated testing of the satellite component for VDES which will continue,

resolves to invite the 2019 World Radiocommunication Conference

to consider, based on the results of ITU-R studies, modifications of the Radio Regulations, including new spectrum allocations to the maritime mobile-satellite service (MMSS) (Earth-to-space and space-to-Earth), preferably within the frequency bands 156.0125-157.4375 MHz and 160.6125-162.0375 MHz of Appendix **18**, to enable a new VDES satellite component, while ensuring that this component will not degrade the current terrestrial VDES components, ASM and AIS operations and not impose any additional constraints on existing services in these and adjacent frequency bands as stated in *recognizing d)* and *e)*,

invites ITU-R

to conduct, as a matter of urgency, and in time for WRC-19, sharing and compatibility studies between VDES satellite components and incumbent services in the same and adjacent frequency bands specified in *recognizing d)* and *e)* to determine potential regulatory actions, including spectrum allocations to the MMSS (Earth-to-space and space-to-Earth) for VDES applications,

further invites

all members of ITU-R, IMO, the World Meteorological Organization (WMO), the International Hydrographic Organization (IHO), the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA), the International Electrotechnical Commission (IEC) and the International Radio Maritime Committee (CIRM) to contribute to these studies,

invites administrations

to participate in, and support, field trials of the VDES satellite component,

instructs the Secretary-General

to bring this Resolution to the attention of IMO, WMO, IHO, IEC, IALA, CIRM and other international and regional organizations concerned.

RESOLUTION 361 (WRC-15)

Consideration of regulatory provisions for modernization of the Global Maritime Distress and Safety System and related to the implementation of e-navigation

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that there is a continuing need in the Global Maritime Distress and Safety System (GMDSS), on a global basis, for improved communications to enhance maritime capabilities;

b) that the International Maritime Organization (IMO) is considering GMDSS modernization;

c) that advanced maritime MF/HF/VHF data systems and satellite communication systems may be used to deliver Maritime Safety Information (MSI) and other GMDSS communications;

d) that IMO is considering additional global and regional GMDSS satellite service providers;

e) that WRC-19 will have commenced regulatory actions in regard to modernization of the GMDSS;

f) that IMO is in the process of implementing e-navigation, defined as the harmonized collection, integration, exchange, presentation and analysis of marine information on board and ashore by electronic means to enhance berth-to-berth navigation and related services for safety and security at sea and protection of the marine environment;

g) that GMDSS modernization may be influenced by the development of e-navigation,

noting

a) that WRC-12 reviewed Appendix **17** and Appendix **18** to improve efficiency and introduce frequency bands for new digital technology;

b) that WRC-12 has reviewed the regulatory provisions and spectrum allocations for use by maritime safety systems for ships and ports,

further noting

that WRC-12 and this conference have reviewed Appendix **18** to improve efficiency and introduce frequency bands for new digital technology,

recognizing

a) that advanced maritime communication systems may support the implementation of GMDSS modernization and e-navigation;

b) that IMO efforts to implement GMDSS modernization and e-navigation may require a review of the Radio Regulations to accommodate advanced maritime communication systems;

c) that, due to the importance of these radio links in ensuring the safe operation of shipping and commerce and security at sea, they must be resilient to interference,

resolves to invite the 2023 World Radiocommunication Conference

1 to take into consideration the activities of IMO, as well as information and requirements provided by IMO, in order to determine the regulatory actions to support GMDSS modernization;

2 to consider possible regulatory actions, including spectrum allocations based on the ITU Radiocommunication Sector (ITU-R) studies, for the maritime mobile service, supporting e-navigation,

invites ITU-R

to conduct studies taking into consideration the activities of IMO, in order to determine spectrum needs and regulatory actions to support GMDSS modernization and the implementation of e-navigation,

invites

1 IMO to actively participate in the studies by providing requirements and information that should be taken into account in ITU-R studies;

2 the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA), the International Civil Aviation Organization (ICAO), the International Electrotechnical Commission (IEC), the International Hydrographic Organization (IHO), the International Organization for Standardization (ISO) and the World Meteorological Organization (WMO) to contribute to these studies,

instructs the Secretary-General

to bring this Resolution to the attention of IMO and other international and regional organizations concerned.

RESOLUTION 362 (WRC-15)

Autonomous maritime radio devices operating in the frequency band 156-162.05 MHz

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that, in order to enhance safety of navigation, there is a need to identify and categorize maritime radio devices which operate autonomously in the maritime environment, including but not limited to: devices on towed unpowered ships and barges, derelict ships, floating ice and wave-gliders, "man overboard" devices, diver locating, alerting and radiotelephony devices, fishing net marker buoys, oil spill tracking buoys, oceanographic and other drifting buoys;

b) that such autonomous maritime radio devices are operating with automatic identification system (AIS) technology or digital selective calling (DSC) technology, or transmitting synthetic voice messages, or with a combination of those technologies, and have been developed for safety-related purposes, and their number is expected to increase;

c) that AIS is a proven technology for maritime safety applications, providing identification functions, safety of navigation functions, aids to navigation, locating signals and data communications;

d) that some of these autonomous maritime radio devices may need different maritime identifiers from those used for personal or shipborne equipment,

recognizing

a) that the integrity of AIS and the Global Maritime Distress and Safety System (GMDSS) should be protected;

b) that ships complying with the International Convention for the Safety of Life at Sea (SOLAS) 1974 (as amended) and other ships equipped with automated radiocommunication systems, including AIS, DSC and/or other GMDSS alerting devices should be assigned maritime mobile service identities (MMSIs) in accordance with Recommendation ITU-R M.585;

c) that the usage of frequencies of Appendix **18** to the Radio Regulations and maritime identities described in Recommendation ITU-R M.585 should be limited to devices which are identified as part of the maritime mobile service;

d) that these autonomous maritime radio devices, which do not fall under the definition of No. **1.28** and the ITU Radiocommunication Sector (ITU-R) Recommendations, require a new categorization,

further recognizing

a) that the majority of autonomous maritime radio devices using AIS technology are operating in AIS 1 and AIS 2 frequency bands, and, to some extent, occupying the resources of MMSIs for ship stations or aids to navigation;

b) that Recommendations ITU-R M.493, ITU-R M.1371 and ITU-R M.541 describe technical and operational characteristics for some relevant maritime radio devices;

c) that Report ITU-R M.2285 provides an overview of systems and their mode of operation for some maritime devices used as maritime survivor locating systems and devices (man overboard systems);

d) that an evaluation of the effects on the functioning of AIS used for the safety of navigation, and especially search and rescue activities implemented by AIS-search and rescue transmitters (AIS-SARTs), is required,

noting

a) that WRC-12 designated channels in Appendix **18** of the Radio Regulations for experiments and testing for the future new AIS applications or systems;

b) that ITU-R has been requested to study a future new maritime identification scheme,

resolves to invite the 2019 World Radiocommunication Conference

to consider the results of ITU-R studies and take appropriate actions,

invites ITU-R

1 to conduct the necessary studies in time for WRC-19 to determine the spectrum needs and technical and operational characteristics of autonomous maritime radio devices operating in the frequency band 156-162.05 MHz;

2 to conduct the necessary studies to categorize the various autonomous maritime radio devices;

3 to conduct sharing and compatibility studies, based on the results of *invites ITU-R* 1 and 2, to ensure that no undue constraints are placed on the GMDSS and AIS;

4 to conduct studies, taking into account the results of *invites ITU-R* 1 to 3, and existing maritime technology, to determine potential regulatory actions and appropriate frequencies for autonomous maritime radio devices within the frequency band 156-162.05 MHz,

further invites

the International Maritime Organization (IMO), the International Civil Aviation Organization (ICAO), the World Meteorological Organization (WMO), the International Hydrographic Organization (IHO), the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA), the International Electrotechnical Commission (IEC) and the International Radio Maritime Committee (CIRM) to contribute to these studies,

instructs the Secretary-General

to bring this Resolution to the attention of IMO, ICAO, WMO, IEC, IALA, IHO, CIRM and other international and regional organizations concerned.

RESOLUTION 405

Relating to the use of frequencies of the aeronautical mobile (R) service[1]

The World Administrative Radio Conference (Geneva, 1979),

considering

a) that WARC-Aer2 adopted and developed a new Frequency Allotment Plan for the use of HF channels for the aeronautical mobile (R) service (Appendix **27**);

b) that air operations are subject to continuous changes;

c) that these changes require attention by the administrations concerned; but

d) that, in seeking to satisfy new communication requirements, no decision should be taken that will prevent or handicap the coordinated utilization of those high frequency aeronautical mobile (R) band allotments as prescribed in the Plan;

e) that the families of frequencies allotted to the major world air route areas (MWARAs), regional and domestic air route areas (RDARAs) and sub-areas and VOLMET areas have been chosen considering propagation conditions which allow for the selection of the most suitable frequencies for the distances involved;

f) that specific steps should be taken to ensure that the correct order of frequency is used;

g) that it is essential to distribute the communication traffic load as uniformly as possible over the frequencies available;

h) that frequencies have been allotted for worldwide use,

resolves

that administrations, individually or in collaboration, take the necessary steps:

1 to make as great a use as possible of higher frequencies in order to lessen the load on the HF aeronautical mobile (R) bands;

2 to make as great a use as possible of antennas of appropriate directivity and efficiency in order to minimize the possibilities of mutual interference within an area or between areas;

3 to coordinate the use of families of frequencies necessary for a given route segment in accordance with the technical principles in Appendix **27** and in the light of the propagation data available, to ensure that the most appropriate frequencies are used with an aircraft at a given distance from the aeronautical station providing service over the route segment concerned;

4 to improve operating techniques and procedures and to use equipment which will make it possible to attain the highest possible efficiency in handling air-ground HF communications;

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1 WRC-97 made editorial amendments to this Resolution.

5 to collect precise data on the operation of their HF communication systems, particularly data having a bearing on technical and operating standards, so as to facilitate re-examination of the Plan;

6 to establish, through regional arrangements, the best method of providing the communications required for any new long-distance international or regional air operation which is not or cannot be accommodated within the system of MWARA and RDARA, in such a manner as not to cause harmful interference to the utilization of frequencies as prescribed in the Plan.

RESOLUTION 413 (REV.WRC-12)

Use of the band 108-117.975 MHz by the aeronautical mobile (R) service

The World Radiocommunication Conference (Geneva, 2012),

considering

a) the current allocation of the frequency band 108-117.975 MHz to the aeronautical radionavigation service (ARNS);

b) the current requirements of FM broadcasting systems operating in the frequency band 87-108 MHz;

c) that digital sound broadcasting systems are capable of operating in the frequency band at about 87-108 MHz as described in Recommendation ITU-R BS.1114;

d) the need for the aeronautical community to provide additional services by enhancing navigation systems through a radiocommunication data link;

e) the need for the broadcasting community to provide digital terrestrial sound broadcasting services;

f) that this allocation was made by WRC-07 in the knowledge that studies are ongoing with respect to the technical characteristics, sharing criteria and sharing capabilities;

g) the need for the aeronautical community to provide additional services for radiocommunications, relating to safety and regularity of flight, in the band 112-117.975 MHz;

h) that WRC-07 modified the allocation of the band 112-117.975 MHz to the aeronautical mobile (R) service (AM(R)S) in order to make available this frequency band for new AM(R)S systems, and in doing so enabled further technical developments, investments and deployment;

i) that the frequency band 117.975-137 MHz currently allocated to the AM(R)S is reaching saturation in certain areas of the world;

j) that this new allocation is intended to support the introduction of applications and concepts in air traffic management which are data intensive, and which could support data links that carry safety-critical aeronautical data;

k) that additional information is needed about the new technologies which will be used, the amount of spectrum required, the characteristics and sharing capabilities/conditions, and that therefore studies are urgently required on which AM(R)S systems will be used, the amount of spectrum required, the characteristics and the conditions for sharing with ARNS systems,

recognizing

a) that precedence must be given to the ARNS operating in the frequency band 108-117.975 MHz;

b) that, in accordance with Annex 10 to the Convention on International Civil Aviation, all aeronautical systems must meet standards and recommended practices (SARPs) requirements;

c) that within ITU-R, compatibility criteria between FM broadcasting systems operating in the frequency band 87-108 MHz and the ARNS operating in the frequency band 108-117.975 MHz already exist, as indicated in the most recent version of Recommendation ITU-R SM.1009;

d) that all compatibility issues between FM broadcasting systems and International Civil Aviation Organization (ICAO) standard ground-based systems for the transmission of radionavigation-satellite differential correction signals have been addressed,

noting

a) that aeronautical systems are converging towards a radiocommunication data link environment to support aeronautical navigation and surveillance functions, which need to be accommodated in existing radio spectrum;

b) that some administrations are planning to introduce digital sound broadcasting systems in the frequency band at about 87-108 MHz;

c) that no compatibility criteria currently exist between FM broadcasting systems operating in the frequency band 87-108 MHz and the planned additional aeronautical systems in the adjacent band 108-117.975 MHz using aircraft transmission;

d) that no compatibility criteria currently exist between digital sound broadcasting systems capable of operating in the frequency band at about 87-108 MHz and aeronautical services in the band 108-117.975 MHz,

resolves

1 that any aeronautical mobile (R) service systems operating in the band 108-117.975 MHz shall not cause harmful interference to, nor claim protection from ARNS systems operating in accordance with international aeronautical standards;

2 that any AM(R)S systems planned to operate in the frequency band 108-117.975 MHz shall, as a minimum, meet the FM broadcasting immunity requirements contained in Annex 10 to the Convention on International Civil Aviation for existing aeronautical radionavigation systems operating in this frequency band;

3 that AM(R)S systems operating in the band 108-117.975 MHz shall place no additional constraints on the broadcasting service or cause harmful interference to stations operating in the bands allocated to the broadcasting service in the frequency band 87-108 MHz and No. **5.43** does not apply to systems identified in *recognizing d)*;

4 that frequencies below 112 MHz shall not be used for AM(R)S systems excluding the ICAO systems identified in *recognizing d)*;

5 that any AM(R)S operating in the frequency band 108-117.975 MHz shall meet SARPs requirements published in Annex 10 to the Convention on International Civil Aviation,

invites ITU-R

to study any compatibility issues between the broadcasting service and AM(R)S in the band 108-117.975 MHz that may arise from the introduction of appropriate digital sound broadcasting systems, described in Recommendation ITU-R BS.1114, and to develop new or revised ITU-R Recommendations as appropriate,

instructs the Secretary-General

to bring this Resolution to the attention of ICAO.

RESOLUTION 416 (WRC-07)

Use of the bands 4 400-4 940 MHz and 5 925-6 700 MHz by an aeronautical mobile telemetry application in the mobile service

The World Radiocommunication Conference (Geneva, 2007),

considering

a) that there is a need to provide global spectrum to the mobile service for wideband aeronautical mobile telemetry (AMT) systems;

b) that studies have been conducted within ITU-R concerning the sharing and compatibility of AMT for flight testing with other services in the bands 4 400-4 940 MHz and 5 925-6 700 MHz;

c) that based on the results of these studies, in the bands 4 400-4 940 MHz and 5 925-6 700 MHz, technical and operational measures applied to AMT for flight testing purposes facilitate sharing with other services and applications in these bands;

d) that spectrum efficiency is enhanced in situations where new applications can be implemented compatibly in bands that are heavily occupied;

e) that there is extensive deployment of fixed-satellite service (FSS) earth stations in the band 5 925-6 425 MHz and to a lesser extent in the band 6 425-6 700 MHz;

f) that there is extensive deployment of fixed service stations in the bands 4 400-4 940 MHz and 5 925-6 700 MHz;

g) that in certain locations, availability of spectrum will be limited due to its extensive use by the various services while in other locations, this may not be the case;

h) that there are various techniques which can enhance sharing between co-primary services such as frequency or geographic separation;

i) that WRC-07 has adopted Nos. **5.440A** and **5.457C**,

recognizing

a) that the bands 4 400-4 500 MHz and 4 800-4 940 MHz are allocated to the fixed and mobile services on a primary basis;

b) that the band 4 500-4 800 MHz is allocated to the fixed, fixed-satellite (space-to-Earth), and mobile services on a co-primary basis;

c) that the band 4 800-4 990 MHz is allocated to the radio astronomy service on a secondary basis worldwide and that No. **5.149** applies;

d) that the band 4 825-4 835 MHz referred to in *recognizing c)* is allocated on a primary basis to radio astronomy in Argentina, Australia and Canada (see No. **5.443**);

e) that No. **5.442** applies to AMT for flight testing operations in the band 4 825-4 835 MHz;

f) that the band 5 925-6 700 MHz is allocated to the fixed, fixed-satellite (Earth-to-space), and mobile services on a co-primary basis;

g) that the use of the band 4 500-4 800 MHz (space-to-Earth) by the FSS shall be in accordance with the provisions of Appendix **30B (Rev.WRC-07)** (see No. **5.441**);

h) that provisions for the coordination of terrestrial and space services exist in the Radio Regulations,

resolves

1 that, in the bands 4 400-4 940 MHz and 5 925-6 700 MHz, administrations authorizing AMT for flight test purposes per Nos **5.440A**, **5.442** and **5.457C** shall utilize the criteria set forth below:

– emissions limited to transmission from aircraft stations only, see No. **1.83**;

– in these bands, AMT in the aeronautical mobile service is not considered an application of a safety service as per No. **1.59**;

– the peak e.i.r.p. density of a telemetry transmitter antenna shall not exceed −2.2 dB(W/MHz);

– transmissions limited to designated flight test areas, where flight test areas are airspace designated by administrations for flight testing;

– if operation of AMT aircraft stations is planned within 500 km of the territory of an administration in which the band 4 825-4 835 MHz is allocated to radio astronomy on a primary basis (see No. **5.443**), consult with that administration to determine whether any special measures are needed to prevent interference to their radio astronomy observations;

– in the bands 4 400-4 940 MHz and 5 925-6 700 MHz, bilateral coordination of transmitting AMT aircraft stations with respect to receiving fixed or mobile stations must be effected if the AMT aircraft station will operate within 450 km of the receiving fixed or mobile stations of another administration. The following procedure should be used to establish whether a fixed or mobile service receiver within 450 km of the flight test area will receive an acceptable level of interference:

  – determine if the receiving fixed or mobile station's antenna main-beam axis, out to a distance of 450 km, passes within 12 km of the designated area used by transmitting AMT aircraft stations, where this distance is measured orthogonally from the main-beam axis projection on the Earth's surface to the nearest boundary of the projection of the flight test area on the Earth's surface;

  – if the main-beam axis does not intersect the flight test area or any point within the 12 km offset, the interference could be accepted. Otherwise, further bilateral coordination discussions would be needed;

2 that administrations authorizing AMT per Nos **5.440A**, **5.442** and **5.457C** in the bands 4 400-4 940 MHz and 5 925-6 700 MHz require the use of technical and/or operational measures on AMT where appropriate to facilitate sharing with other services and applications in these bands.

RESOLUTION 417 (REV.WRC-15)

Use of the frequency band 960-1 164 MHz by the aeronautical mobile (R) service

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that WRC-07 allocated the frequency band 960-1 164 MHz to the aeronautical mobile (R) service (AM(R)S) in order to make available this frequency band for AM(R)S systems, and in doing so enabled further technical developments, investments and deployment;

b) that the frequency band 960-1 164 MHz is currently allocated to the aeronautical radionavigation service (ARNS);

c) that new technologies are being developed to support communications and air navigation, including airborne and ground surveillance applications;

d) that the allocation of the frequency band 960-1 164 MHz to the aeronautical mobile (R) service is intended to support the introduction of applications and concepts in air traffic management which are data intensive and which could support data links that carry safety critical aeronautical data;

e) that in Armenia, Azerbaijan, Belarus, Bulgaria, China, the Russian Federation, Kazakhstan, Mongolia, Uzbekistan, Kyrgyzstan, Tajikistan and Ukraine, the frequency band 960-1 164 MHz is also used by systems in the ARNS for which standards and recommended practices (SARPs) have not been developed nor published by the International Civil Aviation Organization (ICAO);

f) that, furthermore, the frequency band 960-1 164 MHz is also used by a non-ICAO system operating in the ARNS that has characteristics similar to those of ICAO standard distance measuring equipment,

recognizing

a) that Annex 10 to the Convention on International Civil Aviation contains SARPs for aeronautical radionavigation and radiocommunication systems used by international civil aviation;

b) that all compatibility issues between the ICAO Standard Universal Access Transceiver (UAT) operating under the AM(R)S allocation and other systems which operate in the same frequency range, excluding the system identified in *considering e)*, have been addressed;

c) that in the frequency band 1 024-1 164 MHz the sharing conditions are more complex than in the frequency band 960-1 024 MHz,

noting

a) that the development of compatibility criteria between AM(R)S systems proposed for operations in the frequency band 960-1 164 MHz and ICAO-standardized aeronautical systems in this frequency band is the responsibility of ICAO;

b) that the development of compatibility criteria between AM(R)S systems operating in the frequency band 960-1 164 MHz and radionavigation-satellite service (RNSS) receivers on the same aircraft is the responsibility of ICAO;

c) that practical operational measures should be developed to facilitate the coordination between AM(R)S systems and non-ICAO ARNS systems,

resolves

1 that any AM(R)S system operating in the frequency band 960-1 164 MHz shall meet SARPs requirements published in Annex 10 to the Convention on International Civil Aviation;

2 that, with the exception of the system described in *recognizing b)*, any operation of AM(R)S systems in the frequency band 960-1 164 MHz with aircraft stations operating within 934 km or/and ground stations operating within 465 km from the border of the territory of Armenia, Azerbaijan, Belarus, Bulgaria, China, the Russian Federation, Kazakhstan, Mongolia, Uzbekistan, Kyrgyzstan, Tajikistan and Ukraine is subject to coordination with the concerned administrations of the countries listed above for the protection of aeronautical radionavigation systems (see *considering e)*) operating in the same frequency band in these countries. An administration not responding within a four-month period after receiving a request to seek agreement shall be regarded as unaffected;

3 the system described in *recognizing b)* shall not cause harmful interference to, or claim protection from, the systems described in *considering e)*;

4 that administrations authorizing AM(R)S systems in the frequency band 960-1 164 MHz shall ensure compatibility with systems indicated under *considering f)* whose characteristics are described in Annex 1 of Recommendation ITU-R M.2013-0;

5 that such compatibility between any AM(R)S systems in the frequency band 960-1 164 MHz and systems in *considering f)* is a matter to be dealt with in ICAO;

6 that administrations intending to implement AM(R)S in the frequency band 960-1 164 MHz, in order not to cause harmful interference to the RNSS in the frequency band 1 164-1 215 MHz, shall utilize the criteria set forth below:

– any ground station operating under the AM(R)S allocation in the frequency band 960-1 164 MHz shall limit its maximum equivalent isotropically radiated power (e.i.r.p.) to the values presented in the following table:

Emissions in the frequency band 960-1 164 MHz (Maximum allowable e.i.r.p. in the frequency band 960-1 164 MHz as a function of the carrier central frequency) for non-pulsed AM(R)S ground station transmissions				**Emissions in the frequency band 1 164-1 215 MHz**	
AM(R)S centre frequency < 1 091 MHz	AM(R)S centre frequency 1 091-1 119 MHz	AM(R)S centre frequency 1 119-1 135 MHz	AM(R)S centre frequency 1 135-1 164 MHz	1 164-1 197.6 MHz	1 197.6-1 215 MHz
51.6 dBW	Linearly decreasing from 51.6 to 23.6 dBW	Linearly decreasing from 23.6 to −2.4 dBW	Linearly decreasing from −2.4 to −68.4 dBW	−90.8 dBW in any 1 MHz of the frequency band 1 164-1 197.6 MHz	−90.8 dBW in any 1 MHz of the frequency band 1 197.6-1 215 MHz

– any airborne station operating under the AM(R)S allocation in the frequency band 960-1 164 MHz shall limit its maximum e.i.r.p. to the values presented in the following table:

Emissions in the frequency band 960-1 164 MHz (Maximum allowable e.i.r.p. in the frequency band 960-1 164 MHz as a function of the carrier central frequency) for non-pulsed AM(R)S airborne station transmissions				**Emissions in the frequency band 1 164-1 215 MHz**	
AM(R)S centre frequency < 1 091 MHz	AM(R)S centre frequency 1 091-1 119 MHz	AM(R)S centre frequency 1 119-1 135 MHz	AM(R)S centre frequency 1 135-1 164 MHz	1 164-1 197.6 MHz	1 197.6-1 215 MHz
55.3 dBW	Linearly decreasing from 55.3 to 27.3 dBW	Linearly decreasing from 27.3 to −1.3 dBW	Linearly decreasing from −1.3 to −64.7 dBW	−84 dBW in any 1 MHz of the frequency band 1 164-1 197.6 MHz	−92.4 dBW in any 1 MHz of the frequency band 1 197.6-1 215 MHz

7 that future AM(R)S systems operating in the frequency band 960-1 164 MHz with pulsed emissions shall demonstrate that they limit AM(R)S ground and airborne station emission characteristics in order to provide protection to RNSS systems equivalent to the protection provided by non-pulsed emission AM(R)S ground and airborne stations operating in the 960-1 164 MHz frequency band at the maximum e.i.r.p. levels in *resolves* 6 above,

instructs the Secretary-General

to bring this Resolution to the attention of ICAO.

RESOLUTION 418 (REV.WRC-15)

Use of the frequency band 5 091-5 250 MHz by the aeronautical mobile service for telemetry applications

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that there is a need to provide global spectrum to the mobile service for wideband aeronautical telemetry systems;

b) that the operation of aircraft stations is subject to national and international rules and regulations;

c) that the frequency band 5 030-5 150 MHz is allocated to the aeronautical radionavigation service on a primary basis;

d) that the allocation of the frequency band 5 091-5 250 MHz to the fixed-satellite service (Earth-to-space) is limited to feeder links of non-geostationary satellite systems in the mobile-satellite service;

e) that the frequency band 5 091-5 150 MHz is also allocated to the aeronautical mobile-satellite (R) service on a primary basis, subject to agreement obtained under No. **9.21**;

f) that WRC-07 allocated the frequency band 5 091-5 150 MHz to the aeronautical mobile service on a primary basis subject to No. **5.444B**;

g) that the frequency band 5 150-5 250 MHz is also allocated to the mobile, except aeronautical mobile, service on a primary basis;

h) that WRC-07 additionally allocated the frequency band 5 150-5 250 MHz to the aeronautical mobile service on a primary basis, subject to No. **5.446C**;

i) that aeronautical mobile telemetry (AMT) in the aeronautical mobile service is not considered an application of a safety service as defined in No. **1.59**,

noting

a) that results of studies show the feasibility of using the frequency band 5 091-5 250 MHz for the aeronautical mobile service on a primary basis, limited to transmissions of telemetry for flight testing, under certain conditions and arrangements;

b) that the identification by ITU-R of technical and operational requirements for aircraft stations operating in the frequency band 5 091-5 250 MHz should prevent unacceptable interference to other services;

c) that the frequency band 5 091-5 150 MHz is to be used for the operation of the international standard microwave landing system (MLS) for precision approach and landing;

d) that MLS can be protected through the implementation of an adequate separation distance between an aeronautical mobile service transmitter to support telemetry and MLS receivers;

e) that ITU-R studies have generated methods, described in Report ITU-R M.2118, for ensuring compatibility and sharing between the aeronautical mobile service and the fixed-satellite service operating in the frequency band 5 091-5 250 MHz, which result in interference of no more than 1% $\Delta T_{satellite}/T_{satellite}$ from AMT aircraft station transmissions to fixed-satellite service spacecraft receivers;

f) that a method to facilitate sharing between MLS and aeronautical mobile service is contained in Recommendation ITU-R M.1829;

g) that Recommendation ITU-R M.1828 provides the technical and operational requirements for aircraft stations of the aeronautical mobile service, limited to transmissions of telemetry for flight testing;

h) that ITU-R compatibility studies have been performed for AMT, limited to flight testing; such application is for the testing of aircraft during non-commercial flights for the purpose of development, evaluation and/or certification of aircraft in airspace designated by administrations for this purpose,

recognizing

a) that priority is to be given to MLS in accordance with No. **5.444** in the frequency band 5 030-5 091 MHz;

b) that studies have been performed within ITU-R concerning the sharing and compatibility of AMT for flight testing with other services in the frequency band 5 091-5 250 MHz;

c) that Resolution **748 (Rev.WRC-15)** also provides guidance on the use of the frequency band 5 091-5 150 MHz by the aeronautical mobile service,

resolves

1 that administrations choosing to implement AMT shall limit AMT applications to those identified in *noting h)* in the frequency band 5 091-5 250 MHz, and shall utilize the criteria set forth in Annex 1 to this Resolution;

2 that the pfd limits in § 3 and 4 of Annex 1 to this Resolution which protect terrestrial services may be exceeded on the territory of any country whose administration has so agreed,

invites the ITU Radiocommunication Sector

to continue studying the conditions and arrangements stipulated in *noting a).*

ANNEX 1 TO RESOLUTION 418 (REV.WRC-15)

1 In implementing aeronautical mobile telemetry (AMT), administrations shall utilize the following criteria:

– limit transmissions to those from aircraft stations only (see No. **1.83**);

– the operation of aeronautical telemetry systems within the frequency band 5 091-5 150 MHz shall be coordinated with administrations operating microwave landing systems (MLS) and whose territory is located within a distance D of the AMT flight area, where D is determined by the following equation:

$$D = 43 + 10^{(127.55 - 20 \log(f) + E)/20}$$

where:

D : separation distance (km) triggering the coordination

f : minimum frequency (MHz) used by the AMT system

E : peak equivalent isotropically radiated power density (dBW in 150 kHz) of the aircraft transmitter.

2 For the protection of the fixed-satellite service (FSS), a telemetry aircraft station in the frequency band 5 091-5 250 MHz shall be operated in such a manner that one aircraft station transmitter power flux-density be limited to −198.9 dB(W/(m^2 · Hz)) at the FSS satellite orbit for spacecraft using Earth coverage receive antennas. Such pfd limit per aircraft transmitter has been derived under the assumptions that the FSS satellite orbit is at 1 414 km altitude and that a total of 21 co-frequency AMT transmitters operate concurrently within the field of view of the FSS satellite. In case of fewer than 21 AMT co-frequency transmitters operating simultaneously in view of the satellite, the transmitter power can be adjusted so as not to exceed an aggregate pfd at the satellite of −185.7 dB(W/(m^2 · Hz)), which corresponds to a $\Delta T_{satellite}/T_{satellite}$ of 1%.

3 For the protection of the mobile service in the frequency band 5 150-5 250 MHz, the maximum pfd produced at the surface of the Earth by emissions from an aircraft station of an aeronautical mobile service system, limited to transmissions of telemetry for flight testing, shall not exceed: −79.4 dB(W/(m^2 · 20 MHz)) − G_r (θ).

G_r(θ) represents the mobile service receiver antenna gain versus elevation angle θ and is defined as follows:

Wireless access system elevation antenna pattern

Elevation angle, θ (degrees)	**Gain G_r(θ) (dBi)**
45 < θ ≤ 90	−4
35 < θ ≤ 45	−3
0 < θ ≤ 35	0
−15 < θ ≤ 0	−1
−30 < θ ≤ −15	−4
−60 < θ ≤ −30	−6
−90 < θ ≤ −60	−5

4 For the protection of the aeronautical mobile (R) service (AM(R)S) in the frequency band 5 091-5 150 MHz, the maximum pfd produced at the surface of the Earth, where AM(R)S may be deployed in accordance with No. **5.444B**, by emissions from an aircraft station of an aeronautical mobile service system, limited to transmissions of telemetry for flight testing, shall not exceed: -89.4 dB(W/(m^2 · 20 MHz)) $-$ G_r (θ).

G_r (θ) represents the mobile service receiver antenna gain versus elevation angle θ and is defined as follows:

$$G_r(\theta) = \max\left[G_1(\theta), G_2(\theta)\right]$$

$$G_1(\theta) = 6 - 12\left(\frac{\theta}{27}\right)^2$$

$$G_2(\theta) = -6 + 10\log\left[\left(\max\left\{\frac{|\theta|}{27}.1\right\}\right)^{-1.5} + 0.7\right]$$

where:

$G(\theta)$: gain relative to an isotropic antenna (dBi)

(θ) : absolute value of the elevation angle relative to the angle of maximum gain (degrees).

RESOLUTION 422 (WRC-12)

Development of methodology to calculate aeronautical mobile-satellite (R) service spectrum requirements within the frequency bands 1 545-1 555 MHz (space-to-Earth) and 1 646.5-1 656.5 MHz (Earth-to-space)

The World Radiocommunication Conference (Geneva, 2012),

considering

a) that coordination between satellite networks is required on a bilateral basis in accordance with the Radio Regulations, and that, in the frequency bands 1 525-1 559 MHz (space-to-Earth) and 1 626.5-1 660.5 MHz (Earth-to-space), coordination is partially assisted by regional multilateral meetings;

b) that, in these frequency bands, geostationary mobile-satellite system operators currently use a capacity-planning approach at multilateral coordination meetings, with the guidance and support of their administrations, to periodically coordinate access to the spectrum needed to accommodate their requirements, including aeronautical mobile-satellite (R) service (AMS(R)S) spectrum requirements;

c) that within ITU-R, there is no agreed methodology for calculating AMS(R)S spectrum requirements related to the priority categories 1 to 6 of Article **44**;

d) that within ITU-R, some administrations have expressed a desire to develop an agreed methodology for calculating AMS(R)S spectrum requirements on an ongoing basis for purposes of bilateral and multilateral mobile-satellite service (MSS) coordinations conducted pursuant to Article **9** of the Radio Regulations;

e) that, since spectrum resources are limited, there is a need to use them in the most efficient manner within and amongst various MSS networks,

recognizing

a) that WRC-97 allocated the frequency bands 1 525-1 559 MHz (space-to-Earth) and 1 626.5-1 660.5 MHz (Earth-to-space) to the MSS to facilitate the assignment of spectrum to multiple MSS networks in a flexible and efficient manner;

b) that WRC-97 adopted No. **5.357A** giving priority to accommodating spectrum requirements for, and protecting from unacceptable interference, the AMS(R)S providing transmission of messages with priority categories 1 to 6 in Article **44** in the frequency bands 1 545-1 555 MHz and 1 646.5-1 656.5 MHz,

noting

that AMS(R)S systems are an essential element of the International Civil Aviation Organization (ICAO) standardized communications infrastructure used in air traffic management for the provision of safety and regularity of flight in civil aviation,

resolves to invite ITU-R

to conduct studies on, and develop in one or more ITU-R Recommendations, a methodology, including clear definitions of input parameters and assumptions to be used, to calculate spectrum requirements within the frequency bands 1 545-1 555 MHz (space-to-Earth) and 1 646.5-1 656.5 MHz (Earth-to-space) for AMS(R)S communications related to the priority categories 1 to 6 of Article **44**, and to take into account *considering b)* in conducting these studies,

invites

ICAO, the International Air Transport Association (IATA), administrations and other concerned organizations to participate in the studies identified in *resolves* above,

instructs the Secretary-General

to bring this Resolution to the attention of ICAO.

RESOLUTION 424 (WRC-15)

Use of Wireless Avionics Intra-Communications in the frequency band 4 200-4 400 MHz

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that aircraft are designed to enhance their efficiency, reliability and safety, as well as to be more environmentally friendly;

b) that Wireless Avionics Intra-Communications (WAIC) systems provide radiocommunications between two or more aircraft stations integrated into or installed on a single aircraft, supporting the safe operation of the aircraft;

c) that WAIC systems do not provide radiocommunications between an aircraft and the ground, another aircraft or a satellite;

d) that WAIC systems operate in a manner that ensures the safe operation of an aircraft;

e) that WAIC systems operate during all phases of flight, including on the ground;

f) that aircraft equipped with WAIC systems operate globally;

g) that WAIC systems operating inside an aircraft receive the benefits of fuselage attenuation to facilitate sharing with other services;

h) that Recommendation ITU-R M.2067 provides technical characteristics and operational objectives for WAIC systems,

recognizing

that Annex 10 to the International Civil Aviation Organization (ICAO) Convention on International Civil Aviation contains Standards and Recommended Practices (SARPs) for safety aeronautical radionavigation and radiocommunication systems used by international civil aviation,

resolves

1 that WAIC is defined as radiocommunication between two or more aircraft stations located on board a single aircraft, supporting the safe operation of the aircraft;

2 that WAIC systems operating in the frequency band 4 200-4 400 MHz shall not cause harmful interference to, nor claim protection from, systems of the aeronautical radionavigation service operating in this frequency band;

3 that WAIC systems operating in the frequency band 4 200-4 400 MHz shall comply with the Standards and Recommended Practices published in Annex 10 to the Convention on International Civil Aviation;

4 that No. **43.1** shall not apply for WAIC systems,

instructs the Secretary-General

to bring this Resolution to the attention of ICAO,

invites the International Civil Aviation Organization

to take into account Recommendation ITU-R M.2085 in the course of development of SARPs for WAIC systems.

RESOLUTION 425 (WRC-15)

Use of the frequency band 1 087.7-1 092.3 MHz by the aeronautical mobile-satellite (R) service (Earth-to-space) to facilitate global flight tracking for civil aviation

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that Resolution 185 (Busan, 2014) of the Plenipotentiary Conference instructed WRC-15, pursuant to No. 119 of the ITU Convention, to include in its agenda, as a matter of urgency, the consideration of global flight tracking, including, if appropriate, and consistent with ITU practices, various aspects of the matter, taking into account ITU-R studies;

b) that the frequency band 960-1 164 MHz is allocated to the aeronautical radionavigation service (ARNS) and the aeronautical mobile (R) service (AM(R)S);

c) that the frequency band 960-1 164 MHz is used by International Civil Aviation Organization (ICAO) standardized and non-ICAO systems, thus creating a complex interference environment;

d) that Automatic Dependent Surveillance-Broadcast (ADS-B) is defined by ICAO, and involves aircraft transmission of data such as identification and position;

e) that the frequency band 1 087.7-1 092.3 MHz is currently utilized for terrestrial transmission and reception of ADS-B signals in accordance with ICAO standards, involving transmissions from aircraft to terrestrial stations on the ground within line-of-sight;

f) that this conference allocated the frequency band 1 087.7-1 092.3 MHz to the aeronautical mobile-satellite (R) service (AMS(R)S) in the Earth-to-space direction, limited to the space station reception of ADS-B emissions from aircraft transmitters that operate in accordance with recognized international aeronautical standards;

g) that the allocation of the frequency band 1 087.7-1 092.3 MHz to AMS(R)S is to extend reception of currently transmitted ADS-B signals beyond terrestrial line-of-sight, to facilitate reporting the position of ADS-B equipped aircraft located anywhere in the world;

h) that, taking into account *considering c)*, use of the frequency band 1 087.7-1 092.3 MHz requires some administrations to control all users to ensure proper operation of all terrestrial systems,

recognizing

a) that ICAO develops Standards and Recommended Practices (SARPs) for systems enabling position determination and tracking of aircraft;

b) that Annex 10 to the Convention on International Civil Aviation contains SARPs for terrestrial ADS-B usage of the frequency band 1 087.7-1 092.3 MHz,

noting

that the development of performance criteria for space station reception of ADS-B operating under the provisions of No. **5.328AA**, including whether such criteria would require modifications to ICAO standard ADS-B equipment, is the responsibility of ICAO,

resolves

1 that the use of the frequency band 1 087.7-1 092.3 MHz by AMS(R)S systems shall be in accordance with recognized international aeronautical standards;

2 that AMS(R)S systems (Earth-to-space) in the frequency band 1 087.7-1 092.3 MHz shall be designed so that they can operate in the interference environment as described in *considering c)*;

3 that, taking into account *resolves* 2, AMS(R)S use of the frequency band 1 087.7-1 092.3 MHz shall not constrain administrations which have responsibilities as referred to in *considering h)*,

invites the ITU Radiocommunication Sector

to complete, as a matter of urgency, the studies related to the space station reception of ADS-B in the frequency band 1 087.7-1 092.3 MHz,

further invites the International Civil Aviation Organization

to continue to participate in the studies,

instructs the Secretary-General

to bring this Resolution to the attention of ICAO and communicate the results of the studies when available.

RESOLUTION 426 (WRC-15)

Studies on spectrum needs and regulatory provisions for the introduction and use of the Global Aeronautical Distress and Safety System

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that the International Civil Aviation Organization (ICAO) has developed the initial version of the concept of operations for the Global Aeronautical Distress and Safety System (GADSS);

b) that GADSS is intended to address the timely identification and location of an aircraft during all phases of flight as well as distress and emergency situations;

c) that GADSS is intended to use existing and new applications to support search and rescue (SAR) and flight data retrieval;

d) that GADSS is intended to include terrestrial and satellite components supporting different terrestrial and space applications;

e) that not all requirements in the concept of operation for GADSS are currently fulfilled by existing technologies;

f) that future systems based on new technologies are being developed to contribute to fully meeting the GADSS requirements;

g) that, as stated by ICAO, "the full GADSS concept can be realized in an evolutional manner", and some applications may be developed after 2019;

h) that the performance-based elements of the GADSS are still being defined by ICAO, and should be provided by ICAO in time to use them in ITU Radiocommunication Sector (ITU-R) studies;

i) that the introduction of the GADSS needs to ensure the protection of, and impose no additional constraints on, all existing services,

recognizing

a) that there are provisions in the Radio Regulations, including frequency band allocations, related to aeronautical services that support distress and safety systems;

b) that Annex 10 to the Convention on International Civil Aviation is a part of International Standards and Recommended Practices (SARPs) for aeronautical telecommunication systems used by international civil aviation,

noting

that the concept of operations and requirements for GADSS is general, its components and applications currently provide only scenarios, and it is being developed in an evolutionary manner in ICAO,

resolves to invite the 2019 World Radiocommunication Conference

1 to take appropriate actions, taking into account the results of ITU-R studies;

2 to analyse the necessity for further studies, and consider whether this matter should be brought to the attention of a future competent conference,

invites ITU-R

1 to conduct the relevant studies, taking into account information and requirements provided by ICAO for both the terrestrial and satellite components, including:

a) quantification and characterization of radiocommunication requirements related to GADSS, such as:

– data traffic requirements for different system components of GADSS (such as the aircraft tracking, autonomous distress and flight data recovery systems) and their terrestrial and satellite components at each phase of the operation;

– information on the radiocommunication requirement related to safety-of-life applications;

– performance criteria for terrestrial and satellite systems;

b) analysis of the existing allocations to the relevant aeronautical services and determining whether any additional spectrum is required;

c) studies on sharing and/or compatibility with the existing services;

2 to undertake studies of the existing regulatory provisions to determine whether it might be necessary to apply additional regulatory measures,

invites the International Civil Aviation Organization

to participate actively in the studies by providing requirements and information that should be taken into account in ITU-R studies, in particular those mentioned in *invites ITU-R* 1*a)*,

instructs the Secretary-General

to bring this Resolution to the attention of the ICAO, the International Air Transport Association (IATA) and the International Maritime Organization (IMO).

RESOLUTION 506 (REV.WRC-97)

Use by space stations in the broadcasting-satellite service operating in the 12 GHz frequency bands allocated to the broadcasting-satellite service of the geostationary-satellite orbit and no other

The World Radiocommunication Conference (Geneva, 1997),

considering

a) that a Plan designating frequency assignments in the above-mentioned frequency bands and positions in the geostationary-satellite orbit was adopted by WARC SAT-77 for Regions 1 and 3;

b) that a similar Plan for Region 2 was adopted by the Regional Administrative Conference for the Planning of the Broadcasting-Satellite Service in Region 2 (Geneva, 1983);

c) that the Plans referred to in *considering a)* and *b)* above were consolidated in Appendix **30** at WARC Orb-85;

d) that the Plans in Appendices **30** and **30A** for Regions 1 and 3 have been modified by this Conference;

e) that the operation of the broadcasting-satellite service in the frequency bands concerned in orbits other than the geostationary-satellite orbit might be incompatible with the Plans referred to in *considering a), b)* and *d)* above,

resolves

that administrations shall ensure that their space stations in the broadcasting-satellite service in these frequency bands are operated in the geostationary-satellite orbit and no other.

RESOLUTION 507 (REV.WRC-15)

Establishment of agreements and associated plans for the broadcasting-satellite service[1]

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that it is important to make the best possible use of the geostationary-satellite orbit and of the frequency bands allocated to the broadcasting-satellite service;

b) that the great number of receiving installations using such directional antennas as could be set up for a broadcasting-satellite service may be an obstacle to changing the location of space stations in that service on the geostationary-satellite orbit, as of the date of their being brought into use;

c) that satellite broadcasts may create harmful interference over a large area of the Earth's surface;

d) that the other services with allocations in the same frequency band need to use the frequency band before the broadcasting-satellite service is set up,

resolves

1 that stations in the broadcasting-satellite service shall be established and operated in accordance with agreements and associated plans adopted by world or regional radiocommunication conferences, as the case may be, in which all the administrations concerned and the administrations whose services are liable to be affected may participate;

2 that during the period before the entry into force of such agreements and associated plans the administrations and the Radiocommunication Bureau shall apply the procedure contained in Resolution **33 (Rev.WRC-15)**,

invites the Council

to keep under review the question of world radiocommunication conferences, and/or regional radiocommunication conferences, as required, with a view to fixing suitable dates, places and agenda.

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1 This Resolution does not apply to the frequency band 21.4-22 GHz.

RESOLUTION 517 (REV.WRC-15)

Introduction of digitally modulated emissions in the high-frequency bands between 3 200 kHz and 26 100 kHz allocated to the broadcasting service

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that digital techniques are being introduced into many existing services;

b) that digital techniques allow more effective utilization of the frequency spectrum than double-sideband (DSB) techniques;

c) that digital techniques enable reception quality to be improved;

d) the relevant parts of Appendix **11** concerning the digital system specification in the HF broadcasting services;

e) that ITU-R, in its Recommendation ITU-R BS.1514, has recommended system characteristics for digital sound broadcasts in the broadcast bands below 30 MHz;

f) that digital modulation techniques are expected to provide the means to achieve the optimum balance between sound quality, circuit reliability and bandwidth;

g) that digitally modulated emissions can, in general, provide more efficient coverage than amplitude-modulated transmissions by using fewer simultaneous frequencies and less power;

h) that it may be economically attractive, using current technology, to convert modern conventional DSB broadcasting systems to digital operation in accordance with *considering d)*;

i) that some DSB transmitters have been used with digital modulation techniques without transmitter modifications;

j) that ITU-R is carrying out further studies on the development of broadcasting using digitally modulated emissions in the frequency bands allocated to the broadcasting service below 30 MHz;

k) that a long period could be needed for the introduction of digital broadcasting, taking into account the cost impact of replacement of transmitters and receivers,

resolves

1 that the early introduction of digitally modulated emissions as recommended by ITU-R in the HF bands between 3 200 kHz and 26 100 kHz allocated to the broadcasting service is to be encouraged;

2 that digitally modulated emissions shall comply with the characteristics specified in the relevant parts of Appendix **11**;

3 that whenever an administration replaces a DSB emission by an emission using digital modulation techniques, it shall ensure that the level of interference is not greater than that caused by the original DSB emission, and shall use the RF protection values specified in Resolution **543 (WRC-03)**;

4 that the continued use of DSB emissions may be reviewed by a future competent world radiocommunication conference based on administrations' experience with the introduction of digital HF broadcasting services,

instructs the Director of the Radiocommunication Bureau

to compile and provide to the future competent world radiocommunication conference referred to in *resolves* 4 the latest available complete statistics on the worldwide distribution of digital HF broadcasting receivers and transmitters,

invites ITU-R

to continue its studies on digital techniques in HF broadcasting with a view to assisting in the development of this technology for future use,

invites administrations

to encourage the inclusion in all new HF broadcasting transmitters put into service after 1 January 2004 of the capability to offer digital modulation,

further invites administrations

1 to assist the Director of the Radiocommunication Bureau by providing the relevant statistical data and to participate in ITU-R studies on matters relating to the development and introduction of digitally modulated emissions in the HF bands between 3 200 kHz and 26 100 kHz allocated to the broadcasting service;

2 to bring to the notice of transmitter and receiver manufacturers the recent results of relevant ITU-R studies on spectrum-efficient modulation techniques suitable for use at HF as well as the information referred to in *considering d)* and *e)*, and encourage the availability of affordable low-cost digital receivers.

RESOLUTION 526 (REV.WRC-12)

Future adoption of procedures to ensure flexibility in the use of the frequency band allocated to the broadcasting-satellite service (BSS) for wide RF-band high-definition television (HDTV) and to the associated feeder links

The World Radiocommunication Conference (Geneva, 2012),

considering

a) that WARC-92 has added an allocation to the BSS in the band 17.3-17.8 GHz in Region 2 for use by wide RF-band HDTV;

b) that in the longer term regulatory provisions designed to ensure flexible and equitable use of the BSS (HDTV) and associated feeder-link allocations will be necessary,

resolves to invite ITU-R

to study the development of future regulatory provisions for BSS (HDTV) to ensure flexibility in the use of the band 17.3-17.8 GHz in Region 2, having regard to the interests of all countries and the state of technical development of this new service,

instructs the Secretary-General

to bring this Resolution to the attention of the Council with a view to placing an appropriate item on the agenda of a future world radiocommunication conference.

RESOLUTION 528 (REV.WRC-15)

Introduction of the broadcasting-satellite service (sound) systems and complementary terrestrial broadcasting in the frequency bands allocated to these services within the range 1-3 GHz

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that WARC-92 has made frequency allocations to the broadcasting-satellite service (sound) and complementary terrestrial broadcasting;

b) that it is necessary to ensure that the introduction of the broadcasting-satellite service (sound) and complementary terrestrial broadcasting proceeds in a flexible and equitable manner;

c) that efficient use of the spectrum will be enhanced by a worldwide allocation;

d) that a worldwide allocation may cause difficulties to some countries in relation to their existing services;

e) that future planning may limit the effect on other services,

resolves

1 that a competent conference should be convened for the planning of the broadcasting-satellite service (sound) in the frequency bands allocated to this service in the range 1-3 GHz; and the development of procedures for the coordinated use of complementary terrestrial broadcasting;

2 that this conference should review criteria for sharing with other services;

3 that in the interim period, broadcasting-satellite systems may only be introduced within the upper 25 MHz of the appropriate frequency band in accordance with the procedures contained in Sections A to C of Resolution **33 (Rev.WRC-15)**, or in Articles **9** to **14**, as appropriate (see *resolves* 1 and 2 of Resolution **33 (Rev.WRC-15)**). The complementary terrestrial service may be introduced during this interim period subject to coordination with administrations whose services may be affected;

4 that the calculation methods and the interference criteria to be employed in evaluating the interference should be based upon relevant ITU-R Recommendations agreed by the administrations concerned as a result of Resolution **703 (Rev.WRC-07)** or otherwise,

invites the ITU-R

to conduct the necessary studies prior to the conference,

instructs the Secretary-General

to bring this Resolution to the attention of the Council to consider including in the agenda of a radiocommunication conference the matters addressed above.

RESOLUTION 535 (REV.WRC-15)

Information needed for the application of Article 12 of the Radio Regulations

The World Radiocommunication Conference (Geneva, 2015),

considering

that WRC-97 adopted Article **12** as a simple and flexible seasonal planning procedure for high-frequency broadcasting (HFBC) based on coordination,

considering further

that appropriate Rules of Procedure are to be developed by the Radiocommunication Bureau and adopted by the Radio Regulations Board,

instructs the Director of the Radiocommunication Bureau

1 to consider the information contained in the Annex to this Resolution in developing the Rules of Procedure;

2 to consider improvements to the established arrangements for the preparation, publication and dissemination of the information relating to the application of Article **12**, in consultation with administrations and regional coordination groups,

invites administrations

1 to support the Director of the Radiocommunication Bureau in the preparation of these Rules of Procedure and in the development and testing of any accompanying computer software;

2 to submit their schedules in a common electronic format to be defined in the Rules of Procedure,

instructs the Secretary-General

to consider provision of the necessary funding to enable developing countries to participate fully in the application of Article **12** and relevant radiocommunications seminars.

ANNEX TO RESOLUTION 535 (REV.WRC-15)

This Annex responds to the need for information in the application of Article **12**; the flowchart in Description 2 provides an overview of the Procedure.

1 Software development

The Procedure will require a number of user-friendly software modules to be developed, tested and supplied to administrations by the Bureau. This will ensure that the same software modules are used by administrations and the Bureau for the analysis of the schedules.

The Bureau should:

– develop the aforementioned software with assistance from administrations;

– distribute the software, together with user instructions and relevant documentation;

– organize training in the use of the software;

– monitor the functional performance of the software and, if required, make necessary modifications.

2 Software modules

Data capture of requirements

A new module will be required that permits the capture of all data elements detailed in Description 3. This module should also contain validation routines that prevent inconsistent data being captured and sent to the Bureau for processing.

Propagation calculation

This new module should calculate the field strength and other necessary data at all relevant test points as described in Descriptions 1 and 4.

It should also include an option that allows administrations to select the optimum frequency bands for their requirements.

The output format of the data and the medium should be such as to allow easy publication and distribution of the results to all administrations.

The results of these calculations should be displayable in a graphical format.

Compatibility analysis

This module should use the output of the propagation calculation to provide a technical analysis of a requirement both alone and in the presence of other requirements as in Description 4. This analysis would be used in the coordination process.

The values for the parameters given in Description 4 should be user selectable, but in the absence of other values the recommended default values should be used.

The results of this analysis should be capable of being displayed in a graphical format for a defined service area as in Description 4.

Data query

This module should enable the user to perform typical data query functions.

DESCRIPTION 1

Selection of suitable frequency band(s)

General

In order to assist broadcasters and administrations in the preparation of their HF broadcasting requirements, the Bureau will prepare and distribute suitable computer software. This should be easy to use and the output should be easy to understand.

User input data

The user should be able to enter:

– the name of the transmitting station (for reference purposes);

– the geographic coordinates of the transmitting station;

– the transmitter power;

– the frequency bands which are available for use;

– hours of transmission;

– sunspot number;

– months during which a service is required;

– the available antenna types, together with the relevant directions of maximum radiation;

– the required coverage area specified as a set of CIRAF zones and quadrants (or by means of relevant geographic information).

It is desirable that the software should be able to store the above information, once it has been entered correctly, and provide the user with an easy means of recalling any previously entered information.

Methodology and data

The software should use:

– Recommendation ITU-R BS.705 for the calculation of antenna patterns;

– Recommendation ITU-R P.533 for the prediction of wanted field-strength values;

– Recommendation ITU-R P.842 for the calculation of reliability values.

The set of 911 test points (agreed at WARC HFBC-87) should be used, supplemented where necessary with test points based on a geographic grid.

The software should calculate the field-strength values and the fading margins at each test point inside the required service area for each of the frequency bands declared to be available, taking account of the relevant transmitting antenna characteristics for each frequency band. The desired RF signal-to-noise ratio should be user selectable with a default value of 34 dB in the case of double sideband (DSB) or as provided in the most recent version of Recommendation ITU-R BS.1615, as appropriate, in the case of digital emissions.

The dates for which calculations are made should be user selectable, the default values being:

– 0.5 month after the start of the season;

– mid-point of the season;

– 0.5 month before the end of the season.

The times for which calculations are made should be user selectable, the default values being:

– 30 min past the hour in which the requirement starts;

– 30 min past each successive hour until the hour in which the requirement stops.

Software output data

For rapid assessment of suitable frequency bands, the software should calculate:

– the basic service reliability for each available frequency band and for the relevant test points from the set of 911 test points;

– the basic area reliability for each available frequency band and for the relevant test points from the set of 911 test points.

In order to provide information about the geographic distribution of wanted signal values within the required service area, additional results should be available from the software:

– a listing should be available giving, for each of the available frequency bands, the basic circuit reliability (BCR) for each of the test points (from the set of 911 test points) inside the required service area.

In some cases, a graphical display of the BCR values throughout the required service area may be desirable. These values should be calculated at test points at 2° intervals of latitude and longitude throughout the required service area.

The BCR values should be displayed graphically as a set of coloured or hatched “pixels” scaled in steps of 10%. It should be noted that:

– reliability values relate to the use of a single frequency band;

– reliability values are a function of the desired RF signal-to-noise ratio (user selectable);

– the field-strength values should be calculated by the supplied software on the user’s own computer hardware. The software supplied should calculate the relevant reliability values based on these field-strength values and the user-supplied desired RF signal-to-noise values.

DESCRIPTION 2

Time sequence for the Procedure

In the sequence outlined below, the start date for a given schedule period is defined as D and the end date for the same schedule period is defined as E.

Date	Action
D − 4 months	Closing date for administrations to send their schedules[1] to the Radiocommunication Bureau (Bureau), preferably by electronic means. Schedule data will be made available via TIES as soon as it has been processed.
D − 2 months	Bureau to send to administrations a consolidated schedule (the first Tentative Schedule) together with a complete compatibility analysis[2].
D − 6 weeks	Closing date for receipt of amendments from administrations to correct errors and other changes resulting from the coordination process to ensure that this information appears in the second Tentative Schedule for D − 1 month.
D − 1 month	Bureau to send to administrations a consolidated schedule (the second Tentative Schedule) together with a complete compatibility analysis[2].
D − 2 weeks	Closing date for receipt of amendments from administrations to correct errors and other changes resulting from the coordination process to ensure that this information appears in the Schedule for date D.
D	Bureau to issue the High Frequency Broadcasting Schedule and compatibility analysis.
D to E − 3 months	Administrations to correct errors and coordinate in-season changes of requirements, sending information to the Bureau as it becomes available. Bureau to issue updates of the Schedule and compatibility analysis at intervals of two months.
E	Closing date for receipt of final operational schedules from administrations to Bureau. No input is needed if there have been no changes to the information previously sent.
E + 1 month	Bureau to send to administrations the final consolidated schedule (the Final Schedule) together with a compatibility analysis.

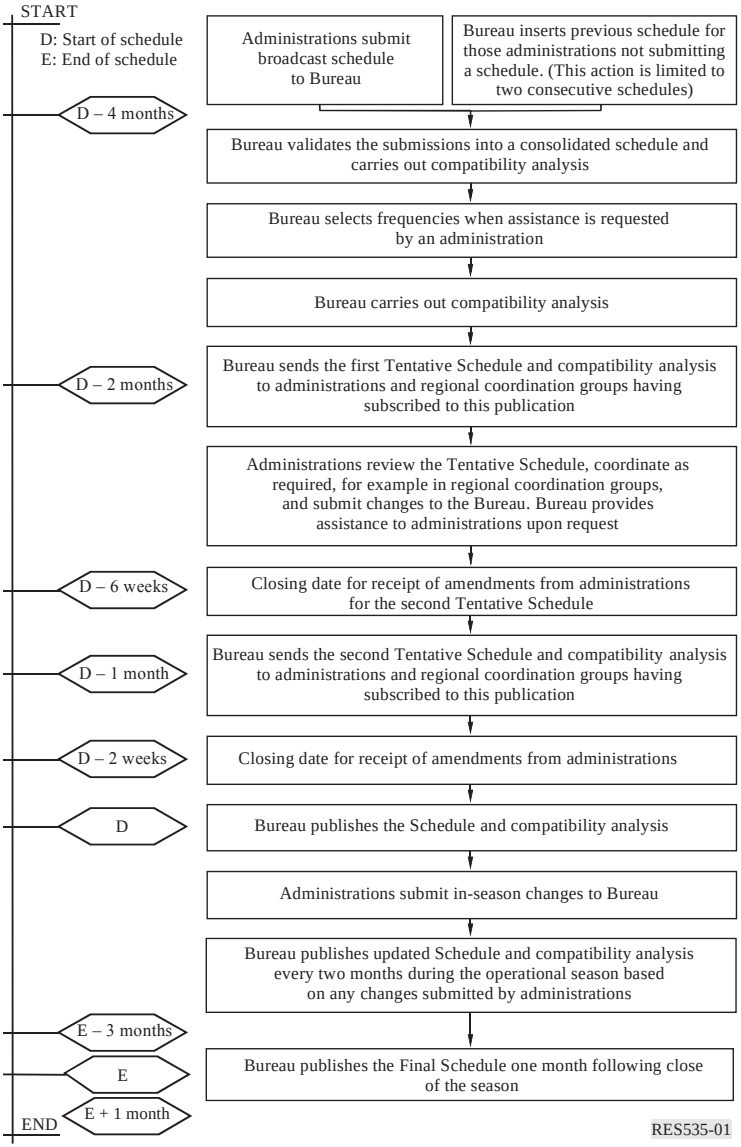
[1] See Description 3.

[2] See Description 4. The schedules and the results of the analyses should be available on CD-ROM and in TIES.

Figure 1 shows, in flow chart form, the time sequence for the Procedure.

FIGURE 1

Time sequence for the Procedure



DESCRIPTION 3

Specification of input data for a requirement

The fields needed for a given requirement and their specifications are:

– frequency in kHz, up to 5-digit integer;

– start time, as 4-digit integer;

– stop time, as 4-digit integer;

– target service area, as a set of up to 12 CIRAF zones and quadrants up to a maximum of 30 characters;

– site code, a 3-character code from a list of codes, or a site name and its geographic coordinates;

– power in kW, up to 4-digit integer;

– azimuth of maximum radiation;

– slew angle, up to 2-digit integer representing the difference between the azimuth of maximum radiation and the direction of unslewed radiation;

– antenna code, up to 3-digit integer from a list of values, or a full antenna description, as given in Recommendation ITU-R BS.705;

– days of operation;

– start date, in the case that the requirement starts after the start of the schedule;

– stop date, in the case that the requirement stops before the end of the schedule;

– modulation choice, to specify if the requirement is to use DSB, single-side band (SSB) (see Recommendation ITU-R BS.640) or digital emission (see Recommendation ITU-R BS.1514). This field may be used to identify any other type of modulation when this has been defined for use by HFBC in an ITU-R Recommendation;

– administration code;

– broadcasting organization code;

– identification number;

– identification of synchronization with other requirements.

DESCRIPTION 4

Compatibility analysis

General

In order to assess the performance of each requirement in the presence of noise and of the potential interference from other requirements using the same or adjacent channels, it is necessary to calculate the relevant reliability values. To this end, the Bureau will prepare suitable software, taking account of user requirements in terms of desired signal-to-noise and signal-to-interference ratios.

Input data

The schedule for a given season − this may be either an initial consolidated schedule (to permit assessment of those requirements which need coordination) or the High Frequency Broadcasting Schedule (to permit assessment of the likely performance of requirements during the relevant season).

Methodology and data

The software should use:

– Recommendation ITU-R BS.705 for the calculation of antenna patterns;

– Recommendation ITU-R P.533 for the prediction of the wanted field-strength values at each test point for each wanted requirement;

– Recommendation ITU-R P.533 for the prediction of the potentially interfering field-strength values from all other co-channel or adjacent channel requirements at each test point for each wanted requirement;

– Recommendation ITU-R BS.560 for adjacent channel RF protection ratios;

– Recommendation ITU-R P.842 for the calculation of reliability values.

The set of 911 test points (agreed at WARC HFBC-87) should be used, supplemented where necessary with test points based on a geographic grid.

The software should calculate the wanted and unwanted field-strength values and the fading margins at each test point inside the required service area.

The desired RF signal-to-noise and RF protection ratios should be user selectable, the default values being 34 dB and 17 dB (DSB-to-DSB co-channel case), respectively. In the case of digital emissions, the desired RF signal-to-noise ratios are as provided in the most recent version of Recommendation ITU-R BS.1615. The default values of RF protection ratio to be used by the Bureau for its compatibility analyses are given in Section 1 of the Annex to Resolution **543 (WRC-03)**.

The dates for which a compatibility analysis is made should be user selectable, the default values being:

– 0.5 month after the start of the season;

– mid-point of the season;

– 0.5 month before the end of the season.

These default values should be used by the Bureau for its compatibility analyses.

The times for which a compatibility analysis is made should be user selectable, the default values being:

– 30 min past the hour in which the requirement starts;

– 30 min past each successive hour until the hour in which the requirement ends.

These default values should be used by the Bureau for its compatibility analyses.

Software output data

For rapid assessment of the performance of a requirement, the software should calculate:

– the overall service reliability for the relevant test points from the set of 911 test points;

– the overall area reliability for the relevant test points from the set of 911 test points.

In order to provide information about the geographic distribution of wanted and unwanted signal values for a given requirement, additional results should be available from the software:

– a listing should be available giving the overall circuit reliability for each of the relevant test points from the set of 911 test points.

In some cases, a graphical display of the coverage achieved throughout a required service area may be desirable. These values will need to be calculated by the user (with the supplied software and on the user's own computer hardware) at test points at 2° intervals of latitude and longitude throughout the required service area. The values should be displayed graphically as a set of coloured or hatched pixels in steps of 10%. It should be noted that:

– reliability values relate to the use of a single frequency;

– reliability values are a function of the desired RF signal-to-noise and RF protection ratios (both user selectable);

– the field-strength values for the test points (from the set of 911 test points) inside the required service area should be calculated by the Bureau. The software supplied should calculate the relevant reliability values based on these pre-calculated field-strength values and the user-supplied desired signal-to-noise and signal-to-interference values;

– the field-strength values for the test points at 2° intervals should be calculated using the supplied software on the user's own computer hardware. The software supplied should calculate the relevant reliability values based on these field-strength values and the user-supplied desired signal-to-noise and signal-to-interference values.

RESOLUTION 536 (WRC-97)

Operation of broadcasting satellites serving other countries

The World Radiocommunication Conference (Geneva, 1997),

considering

a) the institutional nature of the ITU which is founded on an agreement between its Member States;

b) the treaty status of the Plans in Appendices **30** and **30A**;

c) that these Plans were established on the basis of planning principles which included, *inter alia*, that the Plans should be based mainly on national coverage;

d) the increasing number of applications under Article 4 of Appendices **30** and **30A** for modifications to the Plans, leading to many multinational systems;

e) that No. **23.13** requires that "In devising the characteristics of a space station in the broadcasting-satellite service, all technical means available shall be used to reduce, to the maximum, the radiation over the territory of other countries unless an agreement has been previously reached with such countries",

recognizing

a) that current technology provides opportunities to implement broadcasting-satellite systems with service areas that exceed national coverage;

b) that several such systems have been implemented and others are being planned;

c) that successful Appendices **30** and **30A** Article 4 coordination of such systems does not in any way imply licensing authorization to provide a service within the territory of a Member States,

resolves

that, in addition to observing No. **23.13**, and before providing satellite broadcasting services to other administrations, administrations originating the services should obtain the agreement of those other administrations.

RESOLUTION 539 (REV.WRC-15)

Use of the frequency band 2 605-2 655 MHz in certain Region 3 countries by non-geostationary satellite systems in the broadcasting-satellite service (sound)

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that the frequency band 2 535-2 655 MHz is allocated under No. **5.418** to the broadcasting-satellite service (BSS) (sound) in certain Region 3 countries;

b) that the provisions of Resolution **528 (Rev.WRC-15)** currently limit the use of this frequency band by systems in the BSS (sound) to the upper 25 MHz of the frequency band;

c) that, prior to WRC-2000, there were no coordination procedures applicable to non-geostationary (non-GSO) BSS (sound) systems in this frequency band in relation to other non-GSO or GSO satellite networks;

d) that satellite technology has now advanced to the stage where non-GSO systems in the BSS (sound) are technically and economically feasible when operated with high elevation angles and that there are practical designs available to ensure that the radiation of the non-GSO satellite in the BSS (sound) outside the main beam is kept at low levels;

e) that satellite systems in the BSS as described in *considering d)* can be used for the delivery of high-quality, spectrally efficient BSS (sound) to portable and mobile terminals;

f) that non-GSO systems in the BSS (sound) in the frequency band 2 630-2 655 MHz in Region 3 have been notified to ITU and are expected to be brought into use in the near future;

g) that, prior to WRC-2000, the protection of existing terrestrial services was addressed through the coordination procedures of No. **9.11**;

h) that the provision cited in *considering g)* may be inadequate to ensure the future deployment of terrestrial services in this frequency band;

i) that a regulatory procedure is required in order to meet the dual objectives of providing adequate long-term protection to existing and planned terrestrial services while not placing undue constraints on the development and implementation of the non-GSO BSS (sound) system;

j) that there are non-GSO systems being planned for operation in the BSS (sound) in the frequency band 2 605-2 655 MHz in Region 3 that have highly elliptical orbits;

k) that ITU-R has undertaken studies of the likely aggregate interference from a number of co-frequency broadcasting-satellite systems sharing with the terrestrial services on a co-primary basis;

l) that ITU-R has undertaken studies that assumed there is only one satellite active at any time in a non-GSO system operating in a highly elliptical orbit,

invites

1 administrations planning to operate non-GSO BSS (sound) systems in accordance with this Resolution, to take measures to design the system to minimize interference to terrestrial services outside the non-GSO BSS (sound) service area, for example as in *considering d)* above;

2 administrations, whose territory is geographically close to the territory of an administration planning to operate a non-GSO BSS (sound) system in accordance with this Resolution, and for which there is a correspondingly high elevation angle to the active satellite, to take measures to facilitate the operation of non-GSO BSS (sound) systems,

resolves

1 that any BSS (sound) system using non-geostationary orbits brought into operation in the frequency band 2 605-2 655 MHz in Region 3 shall be operated such that the minimum elevation angle over the service area is not less than 55°, for the purposes of sharing with terrestrial services;

2 that, before an administration notifies to the Radiocommunication Bureau or brings into use a frequency assignment for a BSS (sound) system using non-GSO satellites in the frequency band 2 630-2 655 MHz, for which complete Appendix **4** coordination information or notification information has been received after 2 June 2000, and in the frequency band 2 605-2 630 MHz for which complete Appendix **4** coordination information or notification information has been received after 4 July 2003, the following regulatory arrangements shall apply.

The following mask of power flux-density values at the Earth's surface produced by emissions from a space station for all conditions and for all methods of modulation shall be used as the basis of the regulatory procedures of this Resolution:

-130	dB(W/(m^2 · MHz))	for	$0° \le \theta \le 5°$
$-130 + 0.4\ (\theta - 5)$	dB(W/(m^2 · MHz))	for	$5° < \theta \le 25°$
-122	dB(W/(m^2 · MHz))	for	$25° < \theta \le 45°$
$-122 + 0.2\ (\theta - 45)$	dB(W/(m^2 · MHz))	for	$45° < \theta \le 65°$
$-118 + 0.09\ (\theta - 65)$	dB(W/(m^2 · MHz))	for	$65° < \theta \le 76°$
-117	dB(W/(m^2 · MHz))	for	$76° < \theta \le 90°$

where θ is the angle of arrival of the incident wave above the horizontal plane, in degrees.

These values relate to the power flux-density and angles of arrival which would be obtained under free-space propagation conditions.

Furthermore:

– for angles of arrival less than 76° in the power flux-density mask above, if the limits are exceeded, the notifying administration shall obtain the explicit agreement from any administration identified by the Bureau in its examination below;

– for angles of arrival from 76° to 90° in the power flux-density mask above, the coordination procedure with respect to those administrations identified by the Bureau in its examination below will be that of No. **9.11**;

3 that systems in the BSS (sound) using non-GSO satellites shall be limited to national services unless agreement has been reached to include the territories of other administrations in the service area;

4 that, within the context of this Resolution, an administration listed in No. **5.418** shall not have simultaneously two overlapping frequency assignments, one under that provision, and the other one under provision No. **5.416**;

5 that, as from 5 July 2003, the Bureau and administrations shall apply the provisions of Articles **9** and **11** taking into account Nos. **5.418**, **5.418A**, **5.418B**, **5.418C** and this Resolution, as revised by WRC-03,

instructs the Radiocommunication Bureau

1 when applying *resolves* 2, to use the power flux-density mask in *resolves* 2; and

– for angles of arrival less than 76°, identify the affected administrations which have a primary allocation to terrestrial services in the same frequency band and on whose territory the power flux-density is exceeded and inform both the notifying and the affected administrations. At the notification stage the lack of any necessary agreement is considered as non-conformity with No. **11.31**;

– for angles of arrival from 76° to 90°, identify the affected administrations which have a primary allocation to terrestrial services in the same frequency band and on whose territory the power flux-density is exceeded and inform both the notifying and the affected administrations. At the notification stage each notice shall be examined in the application of No. **11.32** and, if appropriate, under No. **11.32A** with respect to the probability of harmful interference that may be caused to assignments for which coordination could not be successfully completed;

2 as from 5 July 2003, to apply *resolves* 5 in its examination of requests for coordination and notifications for any BSS (sound) systems using non-GSO satellites in the frequency band 2 630-2 655 MHz for which complete Appendix **4** coordination information or notification information has been received after 2 June 2000.

RESOLUTION 543 (WRC-03)

Provisional RF protection ratio values for analogue and digitally modulated emissions in the HF broadcasting service

The World Radiocommunication Conference (Geneva, 2003),

considering

a) that this Conference has resolved to encourage the introduction of digitally modulated emissions in the high frequency broadcast bands allocated to the broadcasting service and has revised Resolution **517** accordingly;

b) that the current use of the spectrum is based on the use of double-sideband (DSB) emissions;

c) that Appendix **11** gives details of the system parameters and the emission characteristics of the digitally modulated emissions;

d) that ITU-R is carrying out further studies on the development of HF broadcasting using digitally modulated emissions in the bands allocated to the broadcasting service below 30 MHz;

e) that RF co-channel and adjacent channel protection ratios are among the fundamental parameters when determining compatibility;

f) that the currently available values of RF protection ratios may need to be updated in the light of future ITU-R studies;

g) that Annex 1 to Recommendation ITU-R BS.1514 describes a digital system suitable for broadcasting in the bands below 30 MHz;

h) that there is a need to compile and maintain statistics on administrations' capability to introduce digital modulation systems for their HF broadcasting services,

resolves

1 that digital modulation in accordance with Resolution **517 (Rev.WRC-03)*** may be used in any of the HF bands allocated to the broadcasting service; this accommodation has to be made with the appropriate amounts of protection given to both analogue and digital emissions as described in the Annex to this Resolution;

2 that the protection ratio values described in the Annex be used in the coordination process under Article **12** on a provisional basis;

3 to invite a future competent conference to revise these provisional protection ratio values, as appropriate,

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* *Note by the Secretariat:* This Resolution was revised by WRC-07 and WRC-15.

invites ITU-R

1 to continue studies on digital techniques in HF broadcasting with the purpose to revise the RF protection ratio values for analogue and digitally modulated emissions in the HF broadcasting service as described in the Annex to this Resolution;

2 to report the results of these studies to the World Radiocommunication Conference 2007.

ANNEX TO RESOLUTION 543 (WRC-03)

Section 1 − Standard RF protection ratio values

RF protection ratio values to be used for seasonal planning under the provisions of Article **12** are contained in Table 1 in this Section.

The values are consistent with those in Recommendation ITU-R BS.1615.

The characteristics of the digital emission are based on the 64-QAM modulation system, protection level No. 1, robustness mode B, spectrum occupancy type 3 (as contained in Recommendation ITU-R BS.1514), which will be used extensively for HF sky-wave broadcasting in 10 kHz channels.

The characteristics of the analogue emission are based on double-sideband modulation as summarized in Part A of Appendix **11**, with 53% modulation depth.

TABLE 1

Relative RF protection ratios (dB) associated with digitally modulated emissions in the HF bands allocated to the broadcasting service

Wanted signal	Unwanted signal	Frequency separation $f_{unwanted} - f_{wanted}$ (kHz)								
		−20	**−15**	**−10**	**−5**	**0**	**5**	**10**	**15**	**20**
Amplitude modulation	Digital	−47	−42	−32	3	6	3	−32	−42	−47
Digital	Amplitude modulation	−54	−48	−40	−3	0	−3	−40	−48	−54
Digital	Digital	−53	−47	−38	−3	0	−3	−38	−47	−53

In the case of an amplitude modulation (AM) signal interfered with by a digital signal, the protection ratios are determined by adding 17 dB (audio-frequency protection ratio) to the relative RF protection ratios in Table 1.

In the case of a digital signal interfered with by an AM signal, the protection ratios are determined by adding 7 dB (signal-to-interference ratio for a bit error ratio (BER) of 10^{-4}) to the relative RF protection ratios in Table 1.

In the case of a digital signal interfered with by a digital signal, the protection ratios are determined by adding 16 dB (signal-to-interference ratio for a BER of 10^{-4}) to the RF relative protection ratios in Table 1.

Section 2 − Correction values of RF protection ratios

Correction values of RF protection ratios for different wanted signal conditions such as AM modulation depths, AM quality grades and digital modulation modes are provided in this Section.

1 AM modulation depth

RF protection ratios for a wanted AM signal interfered with by a digital signal depend on the AM modulation depth. A modulation depth of 53% is used as a default value in this Annex. If a different modulation depth is used, a correction value for RF protection ratio is required. Table 2 provides correction values for typical modulation depths.

TABLE 2

Correction values (dB) to be used for other AM modulation depths in respect of wanted AM signal

Modulation depth (%)	30	38	53	*m*
Correction value (dB)	5	3	0	20 log (53/*m*)

2 AM audio quality

RF protection ratios for a wanted AM signal interfered with by a digital signal depend on the required audio quality grade. If another quality grade is used, correction values of RF protection ratios as in Table 3 shall be added.

TABLE 3

Correction values (dB) to be used for other audio quality grades in respect of wanted AM signal

Audio quality grade	3	3.5	4
Correction value (dB)	0	7	12

3 Digital modulation scheme, protection level number and robustness mode

RF protection ratios for a wanted digital signal interfered with by an analogue or digital signal depend on the digital modulation scheme and mode. If any combination different from the default value in Section 1 is used, correction values of RF protection ratios as in Table 4 shall be added.

TABLE 4

Correction values (dB) to be used for other combinations of digital modulation scheme, protection level number and robustness mode in respect of wanted digital signal

Modulation scheme	Protection level number	Robustness mode		
		B	C	D
16-QAM	0	−7	−6	−6
	1	−5	−4	−4
64-QAM	0	−1	−1	0
	1	0	0	1

NOTE − 10 kHz nominal bandwidth.

Protection levels Nos. 2 and 3 and robustness mode A are not recommended for use in HF and are therefore not described here.

Section 3 − Explanatory examples

a) In Table 1, first row <AM interfered with by Digital>: with the AF protection ratio = 17 dB, all values of relative protection ratios entered in that row of the Table must be increased by 17 dB in order to determine the absolute value of the RF protection ratio (RF PR). As examples:

– For co-channel interference (0 kHz separation) the RF PR would be 6 + 17 = 23 dB.

– For adjacent channel interference (±10 kHz separation) the RF PR would be −32 + 17 = −15 dB.

– For the case of modulation depth = 38% and audio quality grade = 4, a correction factor of 15 dB (= 3 + 12) is added to the RF PR values described above.

b) In Table 1, second row <Digital interfered with by AM>: all values of relative protection ratios entered in that row of the Table must be increased by 7 dB in order to determine the absolute value of the RF PR. As examples:

– For co-channel interference (0 kHz separation) the RF PR would be 0 + 7 = 7 dB.

– For adjacent channel interference (±10 kHz separation) the RF PR would be −40 + 7 = −33 dB.

c) In Table 1, third row <Digital interfered with by Digital>: all values of relative protection ratios entered in that row of the Table must be increased by 16 dB in order to determine the absolute value of the RF protection ratio. As examples:

– For co-channel interference (0 kHz separation) the RF PR would be 0 + 16 = 16 dB.

– For adjacent channel interference (±10 kHz separation) the RF PR would be −38 + 16 = −22 dB.

RESOLUTION 548 (REV.WRC-12)

Application of the grouping concept in Appendices 30 and 30A in Regions 1 and 3[1]

The World Radiocommunication Conference (Geneva, 2012),

considering

a) that the grouping concept as it is applied in Appendices **30** and **30A** with respect to Regions 1 and 3 was considered by WRC-03;

b) that the protection of assignments in the Plan and the List in Appendices **30** and **30A** is based upon an equivalent protection margin criterion;

c) that concerns have been raised that the use of the grouping concept by one administration may reduce access to spectrum resources by others;

d) that coordination of one network[2] in a group shall not lead to a reduction of coordination requirements for other networks in the same group;

e) that WRC-2000 accepted grouping in the Regions 1 and 3 List for some networks which are separated by up to 0.2° in the geostationary arc according to their respective nominal orbital locations,

noting

a) that the 2002 Conference Preparatory Meeting considered a proposed solution in which there is a limit to the number of assignments in a group or number of groups in one orbital location;

b) that the Radio Regulations Board has developed Rules of Procedure with respect to the application of the grouping concept,

resolves

1 that a grouping of networks with an overall separation of not more than 0.4° in the geostationary arc, in accordance with their respective nominal orbital locations, is regarded as a grouping at the same orbital location;

2 that the limitations referred to in *resolves* 4 do not apply to grouping of networks before the inclusion of the assignments in the List;

3 that the limitations in *resolves* 4 do not apply to grouping within one network;

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[1] It is noted that the application of the grouping concept in Region 2 does not require any change. Therefore, the Radiocommunication Bureau shall continue to apply the grouping concept in Region 2 as it has applied it prior to WRC-03.

[2] In the application of this Resolution, a network is understood as being a submission by one administration, or one administration acting on behalf of a group of administrations, to the Bureau of a set of assignments, received on the same date, with the same name for the satellite network and at the same orbital location.

4 that under Appendices **30** and **30A** in Regions 1 and 3 the following principles with respect to the application of the grouping concept between networks at the same orbital location shall apply:

a) these limitations apply for networks with overlapping frequency bands;

b) for networks for which a submission is received by the Bureau under § 4.1.3 of Appendix **30** or **30A** after 4 July 2003, not more than three networks within the same overlapping frequency bandwidth can be in a group in the List;

c) for networks for which a submission was received by the Bureau under § 4.1.3 of Appendix **30** or **30A** before 5 July 2003, not more than five networks within the same overlapping frequency bandwidth can be in a group in the List;

d) if the number of networks in a group in the List reaches the maximum limit specified above, no new networks can be entered into the List in this group without removal of another overlapping part of a network from the List;

5 that, as from 5 July 2003, in the processing and publication by the Bureau of submissions relating to Regions 1 and 3 under Article 4 of Appendix **30** or **30A** received after 2 June 2000 and the identification of affected administrations in accordance with § 4.1.5, each network in a group is examined separately, without taking into account the other networks in the group[3].

[3] In applying § 4.1.11, the application of the new methodology in this *resolves* to networks received before 3 June 2000 shall not result in additional coordination requirements for those networks.

RESOLUTION 549 (WRC-07)

Use of the frequency band 620-790 MHz for existing assignments to stations of the broadcasting-satellite service

The World Radiocommunication Conference (Geneva, 2007),

considering

a) that the Regional Radiocommunication Conference, (Geneva, 2006) (RRC-06) has adopted an Agreement and associated Plans for digital terrestrial broadcasting for Region 1, except Mongolia, and the Islamic Republic of Iran, in the frequency bands 174-230 MHz and 470-862 MHz;

b) that a number of notices have been submitted to the Radiocommunication Bureau for satellite systems and networks in the band 620-790 MHz under No. **5.311** of the Radio Regulations (Edition of 2004);

c) that many administrations have extensive infrastructure for the transmission and reception of analogue and digital television signals between 620 MHz and 790 MHz;

d) that it is necessary to protect terrestrial services such as terrestrial television broadcasting, fixed, mobile and aeronautical radionavigation services in the band 620-790 MHz (see also Nos. **5.293**, **5.300**, **5.309** and **5.312**);

e) that, as a result of the transition from analogue to digital terrestrial television broadcasting, some countries plan to make available part of that band for applications in the mobile service,

recognizing

a) that, in accordance with No. **5.311**, two frequency assignments to BSS stations, "STATSIONAR-T" and "STATSIONAR-T2", in the band 620-790 MHz were notified and brought into use and that their date of bringing into use was confirmed before 5 July 2003;

b) that this Conference has deleted No. **5.311**, in the light of the protection requirements of the terrestrial television systems and other terrestrial systems mentioned in *considering a)* to *e)* above;

c) that, according to the records of the Bureau, there has been no complaint of any harmful interference to or request for claiming protection for these two frequency assignments from the terrestrial television systems of any administration;

d) that, by Resolution 1 (RRC-06) on the broadcasting-satellite service in the band 620-790 MHz, RRC-06 *resolves to invite the 2007 World Radiocommunication Conference* "to take appropriate and necessary measures to effectively protect the broadcasting Plans adopted by RRC-06 and their subsequent evolution from the GSO-BSS and/or non-GSO BSS networks/systems which were not brought into use prior to 5 July 2003",

further recognizing

that there is a need to authorize these two frequency assignments to the BSS stations to continue their operation in providing the broadcasting-satellite service to their intended service area,

resolves

1 that the frequency assignments to the BSS stations, "STATSIONAR-T" and "STATSIONAR-T2", as described in *recognizing a)* and recorded in the Master International Frequency Register with a favourable finding, shall be allowed to continue to operate during the period of validity of the assignments in question if so decided by the notifying administration;

2 that any submission of a frequency assignment relating to the broadcasting-satellite service in the frequency band 620-790 MHz, received by the Radiocommunication Bureau under Articles **9** and/or **11**, as the case may be, other than those referred to in *resolves* 1, shall be returned to the submitting administration,

instructs the Director of the Radiocommunication Bureau

to implement this Resolution.

RESOLUTION 550 (WRC-07)

Information relating to the high-frequency broadcasting service

The World Radiocommunication Conference (Geneva, 2007),

considering

a) that this Conference reviewed the case for relieving congestion in certain of the HF bands allocated to the broadcasting service;

b) that this Conference decided to maintain the present Table of Frequency Allocations in the HF bands, in view of the rapid development and use of the bands by all services;

c) that, as part of a general transition away from analogue transmission systems, digital modulation is being introduced into the HF broadcasting bands;

d) that, in common with the other services using the HF bands, the broadcasting service has an ongoing need to review the effectiveness of its use of spectrum,

noting

that Resolution **517 (Rev.WRC-07)*** deals with the introduction of digitally modulated emissions in the HF bands allocated to the broadcasting service,

noting further

that ITU-R Study Group 6 has prepared a wide-ranging report, namely Report ITU-R BS.2105 "Information relating to the HF broadcasting service",

resolves to invite ITU-R

to continue studies on HF broadcasting taking into account:

– technical and operational factors,

– digital transmissions, including how the introduction of these emissions will affect HF broadcasting requirements and operations,

invites administrations and Sector Members

to participate actively in the aforementioned studies by submitting contributions to ITU-R.

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* *Note by the Secretariat:* This Resolution was revised by WRC-15.

RESOLUTION 552 (REV.WRC-15)

Long-term access to and development in the frequency band 21.4-22 GHz in Regions 1 and 3

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that WARC-92 allocated the frequency band 21.4-22 GHz in Regions 1 and 3 to the broadcasting-satellite service (BSS) to be implemented after 1 April 2007;

b) that the use of the frequency band since 1992 was subject to an interim procedure in accordance with Resolution **525 (WARC-92**, **Rev.WRC-03** and **Rev.WRC-07)**[*];

c) that Article 44 of the ITU Constitution sets out the basic principles for the use of the radio-frequency spectrum and the geostationary-satellite and other satellite orbits, taking into account the needs of developing countries;

d) that a due diligence process was first adopted by WRC-97 with a view to providing, as early as possible, information on the industrial project behind a satellite network submitted to ITU;

e) that providing information required under this due diligence process was a prerequisite to qualifying for a two-year extension of the regulatory period to bring into use a satellite network in non-planned bands;

f) that WRC-03 decided to remove the two-year extension by setting the regulatory period to bring into use a satellite network in non-planned bands to seven years;

g) that data concerning the manufacturer, launch service provider and launch date of a satellite will be more accurate and useful if submitted after the launch of the satellite,

resolves

1 that this Resolution applies to geostationary-satellite networks in the BSS in the frequency band 21.4-22 GHz;

2 that for frequency assignments to satellite networks as described in *resolves* 1 for which confirmation of the date of bringing into use under the provisions of Article **11** was not received by the Bureau before 18 February 2012 or which were suspended under No. **11.49** at that date, the procedure contained in Annex 1 to this Resolution shall be applied at the time of first bringing into use or when resuming use after a suspension, as appropriate;

3 that for frequency assignments to satellite networks as described in *resolves* 1 for which the confirmation of the date of bringing into use under the provisions of Article **11** was received by the Bureau before 18 February 2012, the provisions of § 5 to 8 of Annex 1 to this Resolution and the procedure contained in Annex 3 to this Resolution shall be applied, as appropriate,

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[*] *Note by the Secretariat*: This Resolution was abrogated by WRC-12.

further resolves

that the procedures in this Resolution are in addition to the provisions under Articles **9** and **11** of the Radio Regulations,

instructs the Director of the Radiocommunication Bureau

to include in his report to future competent world radiocommunication conferences the results of the implementation of this Resolution.

ANNEX 1 TO RESOLUTION 552 (REV.WRC-15)

1 Within 30 days after the actual commencement, or resumption, of use of the frequency assignments to a satellite network subject to these procedures, the notifying administration shall send to the Bureau the information specified in Annex 2 to this Resolution.

2 The information to be submitted in accordance with § 1 above shall be signed by an authorized official of the notifying administration.

3 If the spacecraft is used for the first time under this Resolution, the due diligence information to be submitted in accordance with § 1 above could be supplemented by a copy of the contract with the launch services provider.

4 On receipt of the information under § 1 above, the Bureau shall promptly examine its completeness. If the information is found to be complete, the Bureau shall publish the complete information in a special section of the BR IFIC within two months. If the information is found to be incomplete, the Bureau shall request the notifying administration to submit the missing information within 30 days.

5 The information submitted in accordance with § 1 above and § 1 of Annex 3 to this Resolution shall be updated and resubmitted to the Bureau by the notifying administration not later than 30 days after the end of life or the relocation of the spacecraft associated with the submission under § 1 above and § 1 of Annex 3 to this Resolution. In case of end of life of a spacecraft, the corresponding ITU ID number associated to such a spacecraft shall no longer be used.

6 On receipt of the information under § 5 above, the Bureau shall promptly examine its completeness. If the information is found to be complete, the Bureau shall publish the complete information in a special section of the BR IFIC within two months. If the information is found to be incomplete, the Bureau shall request the notifying administration to submit the missing information within 30 days.

7 If the complete information specified in § 1 and 5 above is not received by the Bureau within the time-limits specified in § 1, 4, 5 and 6 above, the Bureau shall immediately inform the notifying administration and take appropriate measures under § 8, if required.

8 Within 30 days after the end of the seven-year period following the date of receipt by the Bureau of the relevant complete information under Nos. **9.1A** or **9.2C**, as appropriate, and after the end of the three-year period following the date of suspension under No. **11.49**, if the complete information under this Resolution is not yet received by the Bureau, the corresponding frequency assignments shall be cancelled by the Bureau, which subsequently informs the administration accordingly.

ANNEX 2 TO RESOLUTION 552 (REV.WRC-15)

Information to be submitted

1 Identity of the satellite network

a) Identity of the satellite network

b) Name of the notifying administration

c) Orbital characteristics

d) Reference to the advance publication information

e) Reference to the request for coordination

f) Reference to the notification, when available

g) Frequency band(s) included in the relevant special sections of the satellite network

h) First date of bringing into use[1]

i) Regulatory status

– Satellite network under operation (only data listed in § 2 shall be provided), or

– Satellite network suspended (only data listed in § 3 shall be provided)

2 Identity of the spacecraft[2] (if satellite network filing is under operation)

a) ITU ID number, or

b) Spacecraft manufacturer

– Name of the spacecraft manufacturer

– Date of execution of the contract

– Delivery date

c) Launch services provider

– Name of the launch vehicle provider

– Date of execution of the contract

– Name of the launch vehicle

– Name and location of the launch facility

– Launch date

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[1] This information has already been provided by the administration under the provisions of Article **11** and will be inserted by the Bureau.

[2] If data about the spacecraft are submitted for the first time under this Resolution, items “Spacecraft manufacturer”, “Launch services provider” and “Frequency band(s) present on board the spacecraft” shall be provided. Otherwise, if data about the spacecraft were already submitted under this Resolution, the ID number (based on the ITU filing number) given by the Bureau to this spacecraft at that time shall be indicated.

d) Frequency band(s) present on board the spacecraft (i.e. frequency bands for each transponder that are able to be transmitted by a transponder located on board the spacecraft within the frequency band 21.4-22 GHz)

3 Suspension information (if satellite network filing is suspended)

a) Date of suspension[3]

b) Reason of suspension:

– Spacecraft moved to another orbital position, or

– In-orbit failure of the spacecraft, or

– Spacecraft de-orbited,

– Other reasons (to be specified).

ANNEX 3 TO RESOLUTION 552 (REV.WRC-15)

Transitional measures

1 For frequency assignments to satellite networks as described in *resolves* 3 to this Resolution, the notifying administration shall submit to the Bureau, not later than 17 August 2012, the complete information relevant to the operational situation as of 18 February 2012, in accordance with Annex 2 to this Resolution.

2 The information to be submitted in accordance with § 1 above could be supplemented by a copy of the contract with the spacecraft manufacturer and/or launch services provider.

3 On receipt of the information under § 1 above, the Bureau shall promptly examine its completeness. If the information is found to be complete, the Bureau shall publish the complete information in a special section of the BR IFIC within two months. If the information is found to be incomplete, the Bureau shall request the notifying administration to submit the missing information within 30 days.

4 If the complete information specified in § 1 above is not received by the Bureau before the expiry date specified in § 1 or 3 above, as appropriate, the frequency assignments of a satellite network in the broadcasting-satellite service in the frequency band 21.4-22 GHz shall be cancelled by the Bureau, if appropriate. The Bureau shall publish this information in the BR IFIC.

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[3] This information has already been provided by the administration under the provisions of Article **11** and will be inserted by the Bureau.

RESOLUTION 553 (REV.WRC-15)

Additional regulatory measures for broadcasting-satellite networks in the frequency band and 21.4-22 GHz in Regions 1 and 3 for the enhancement of equitable access to this frequency band

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that WARC-92 allocated the frequency band 21.4-22 GHz in Regions 1 and 3 to the broadcasting-satellite service (BSS) to be implemented after 1 April 2007;

b) that the use of the frequency band since 1992 was subject to an interim procedure in accordance with Resolution **525 (WARC-92**, **Rev.WRC-03** and **Rev.WRC-07)**[*];

c) that the frequency band 21.4-22 GHz in Regions 1 and 3 for the BSS was subject to Resolution **507 (Rev.WRC-12**)[**],

considering further

a) that *a priori* planning for BSS networks in the frequency band 21.4-22 GHz in Regions 1 and 3 is not necessary and should be avoided as it freezes access according to technological assumptions at the time of planning and then prevents flexible use taking account of real world demand and technical developments;

b) that WRC-12 established definitive arrangements for the use of the frequency band 21.4-22 GHz;

c) that Articles 12 and 44 of the ITU Constitution lay down the basic principles for the use of the radio-frequency spectrum and the geostationary-satellite and other satellite orbits, taking into account the needs of developing countries;

d) that those principles have been included in the Radio Regulations;

e) that all countries have equal rights in the use of both the radio frequencies allocated to various space radiocommunication services and geostationary-satellite orbit and other satellite orbits for these services;

f) that accordingly, a country or a group of countries having frequency assignments for the BSS in the frequency band 21.4-22 GHz need to take all practical measures to facilitate the use of new space systems by other countries or groups of countries;

g) that according to No. **23.13**, in devising the characteristics of a space station in the BSS, all technical means available shall be used to reduce, to the maximum, the radiation over the territory of other countries unless an agreement has been previously reached with such countries,

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[*] *Note by the Secretariat*: This Resolution was abrogated by WRC-12.

[**] *Note by the Secretariat:* This Resolution was revised by WRC-15.

recognizing

a) that the "first-come first-served" concept can restrict and sometimes prevents access to and use of certain frequency bands and orbit positions;

b) the relative disadvantage for developing countries in coordination negotiations due to various reasons such as a lack of resources and expertise;

c) the perceived differences in consistency of application of the Radio Regulations,

recognizing further

a) that WRC-12 received information provided by the Bureau or the various submissions received by the Bureau which include assignments in the BSS for Regions 1 or 3 in the frequency band 21.4-22 GHz up until December 2011 and that the table below summarizes the data provided by the Bureau and shows the variations for the number of networks at the various stages;

	Advance publication information	**Coordination request**	**Notification submission**	**Networks in MIFR**	**Resolution 49**	**Confirmed brought into use**
October 2008	605	115	21	2	18	
September 2009	599	158	24	9	22	18
March 2010	558	199	22	11	20	19
June 2010	664	229	22	12	23	19
January 2011	703	242	20	7	18	14
December 2011	890	291	13	8*	16	10*

* Clarification is awaited for one network. One network is suspended under No. **11.49**.

b) that the number of submissions made by some administrations as contained in the above table in this frequency band is large, which may not be realistic and may be difficult to implement within the regulatory time-limit under Article **11**;

c) that the number of submissions as shown in *recognizing further a)* above, is complicating coordination of BSS systems already submitted or planned to be submitted by other administrations,

resolves

that as of 18 February 2012, the special procedure outlined in the Attachment to this Resolution for processing of coordination requests for BSS frequency assignments in Regions 1 and 3 in the frequency band 21.4-22 GHz shall be applied in respect of submissions of administrations meeting the specified requirements in the Attachment.

ATTACHMENT TO RESOLUTION 553 (REV.WRC-15)

Special procedure to be applied for an assignment for a BSS system in the frequency band 21.4-22 GHz in Regions 1 and 3

1 The special procedure described in this attachment can only be applied once (except as described in § 3 below) by an administration or an administration acting on behalf of a group of named administrations when none of those administrations have a network in the MIFR, notified under Article **11** or successfully examined under No. **9.34** and published under No. **9.38** for the frequency band 21.4-22 GHz. In case of countries complying with § 3 below, the special procedures described in this attachment can also be applied[1] by an administration when this administration has networks in the MIFR, notified under Article **11** or successfully examined under No. **9.34** and published under No. **9.38** for the frequency band 21.4-22 GHz, but which, combined, do not include its entire territory in the service area. Each one of the administrations in a group will lose its right to apply this special procedures individually or as a member of another group.

2 In the case that an administration that has already made a submission under this special procedure, either individually or as a part of a group (except as described in § 3 below), at a later stage submits a new submission, this new submission cannot benefit from this special procedure.

3 In order to meet the concerns of some countries with a large territory or dispersed territories that cannot be covered from one orbital location, under this procedure the requirement of such countries having large territory would be met by allowing them to apply this special procedure for submissions to cover their territories from an absolute minimum number of orbital locations[2] that enable them to cover the entire territory in question.

4 Administrations seeking to apply this special procedure shall submit their request to the Bureau, with the following information:

a) the geographical coordinates of not more than 20 points for determining the minimal ellipse[3] to cover its/their national territory[4];

b) the height above sea level of each of its points;

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[1] The number of submissions shall not exceed the number of orbital locations for national assignments in the Appendix **30** Plan, reduced by the number of orbit locations of that administration for networks in the MIFR, submissions notified under Article **11** and submissions successfully examined under No. **9.34** and published under No. **9.38**.

[2] The number of orbital locations shall not exceed the number of orbital locations for national assignments in the Appendix **30** Plan.

[3] In some cases, use of composite beams may be necessary to provide required coverage while reducing undesired coverage of adjacent geographical areas.

[4] Countries requiring more than one orbital location to cover their national territory (see § 3 above) shall submit points for different orbital locations such that the polygons drawn between the points do not overlap with those from other orbital locations of the same administration.

c) any special requirement which is to be taken into account, to the extent practicable.

5 In submitting their request under § 4 above, administrations may seek the assistance of the Bureau to suggest candidate orbital locations for a submission.

6 Upon receipt of the complete information (mentioned in § 4 above) from an administration seeking the assistance of the Bureau under § 5, the Bureau shall expeditiously generate the minimum coverage ellipse and candidate orbital locations (if requested by the administration) for a prospective submission. The Bureau shall send this information to the requesting administration.

7 Before an administration notifies to the Bureau or brings into use a frequency assignment subject to this special procedure, it shall effect coordination with other administrations as required in § 10 below.

8 Upon receipt of the information under § 6 above, administrations seeking assistance in applying this special procedure shall submit advance publication information and a request for coordination together with the appropriate information listed in Appendix **4** to these Regulations[5].

9 Administrations not seeking the assistance of the Bureau may submit advance publication information and a request for coordination together with the appropriate information listed in Appendix **4** to these Regulations[5] at the same time as submitting the information under § 4.

10 On receipt of the complete information sent under § 8 or § 9 above, the Bureau shall, ahead of submissions not yet processed under No. **9.34**, promptly:

a) examine the information with respect to conformity with Annex 1 and § 1 to 3;

b) examine the information with respect to its conformity with No. **11.31**;

c) identify, in accordance with Annex 2 to this Attachment, any administration with which coordination may need to be effected[6];

d) include their names in the publication under *e)* below;

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[5] For submissions under this special procedure, the coordination information is receivable at the same date as that of the advance publication information.

[6] The Bureau shall also identify the specific satellite networks with which coordination needs to be effected.

e) publish[7], as appropriate, the complete information in the BR IFIC within four months. Where the Bureau is not in a position to comply with the time-limit referred to above, it shall periodically so inform the administrations, giving the reasons therefor;

f) inform the administrations concerned of its actions and communicate the results of its calculations, drawing attention to the relevant BR IFIC.

11 If the information is found to be incomplete, the Bureau shall immediately seek from the administration concerned any clarification required and information not provided.

12 The provisions in this Resolution are in addition to the provisions of Articles **9** and **11** of the Radio Regulations.

ANNEX 1

TO

ATTACHMENT TO RESOLUTION 553 (REV.WRC-15)

Technical parameters to be used for submissions for Regions 1 and 3 BSS networks under the special procedure of this Resolution

a) The receiving earth station antenna diameter should be in the range 45-120 cm. The radiation pattern of the receiving terminal antenna should comply with Recommendation ITU-R BO.1900.

b) The noise temperature of the receiving earth station should be in the range 145-200 K.

c) The transmitting e.i.r.p. of the space station shall be in the range from 43.2 dBW/MHz to 58.2 dBW/MHz[8].

d) The service area shall be limited by the national borders of the country and the minimum coverage ellipse generated by the Bureau.

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[7] If the payments are not received in accordance with the provisions of Council Decision 482, as amended, on the implementation of cost recovery for satellite network filings, the Bureau shall cancel the publication, after informing the administration concerned. The Bureau shall inform all administrations of such action and that the network specified in the publication in question no longer has to be taken into consideration by the Bureau and other administrations. The Bureau shall send a reminder to the notifying administration not later than two months prior to the deadline for the payment in accordance with the above-mentioned Council Decision 482 unless the payment has already been received. (WRC-12)

[8] The maximum pfd produced at high elevation angles at the Earth's surface under free-space conditions shall not exceed −105 dB(W/(m^2 · MHz)).

e) In the case of an administration with a large territory or dispersed territories, requiring more than one orbit location to cover the territory of their country, the polygons drawn between the points submitted under § 4 above for each submitted orbital location shall not overlap each other and shall not overlap with service areas of networks of this administration successfully examined under No. **9.34** and published under No. **9.38**.

f) The minimum coverage ellipse, generated from not more than 20 points with associated geographical coordinates[9].

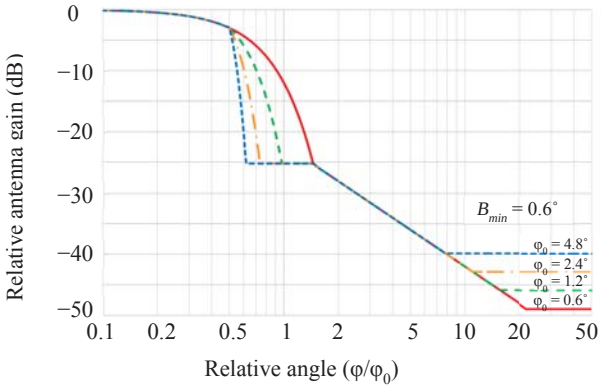
g) The reference pattern of the transmitting space station shall be in compliance with Figure 1 below.

h) The maximum pointing error of the transmitting space station antenna shall be 0.1° in any direction.

i) The maximum rotational error of the transmitting space station antenna shall be ±1°.

FIGURE 1* (WRC-12)

Reference patterns for satellite antennas with fast roll-off in the main beam



$$G_{max} = 44.45 - 10 \log (\varphi_{01} \cdot \varphi_{02}) \quad \text{dBi} \quad \text{(WRC-12)}$$

Curve A: dB relative to main beam gain

$-12\,(\varphi/\varphi_0)^2$ for $0 \le (\varphi/\varphi_0) \le 0.5$

$$-12\left[\frac{(\varphi/\varphi_0) - x}{B_{min}/\varphi_0}\right]^2 \quad \text{for } 0.5 < (\varphi/\varphi_0) \le \left(\frac{1.45 B_{min}}{\varphi_0} + x\right)$$

9 In some cases use of composite beams may be necessary to provide required coverage while reducing undesired coverage of adjacent geographical areas.

* Figure 1 represents patterns for some values of φ_0. (WRC-12)

-25.23 for $\left(\frac{1.45B_{min}}{\varphi_0} + x\right) < (\varphi/\varphi_0) \leq 1.45$

$-(22 + 20 \log (\varphi/\varphi_0))$ for $(\varphi/\varphi_0) > 1.45$

after intersection with Curve B: Curve B.

Curve B: Minus the on-axis gain (Curve B represents examples of four antennas having different values of φ_0 as labelled in Fig. 1. The on-axis gains of these antennas are approximately 39.9, 42.9, 45.9 and 48.9 dBi, respectively) (WRC-12)

where:

φ: off-axis angle (degrees)

φ_0: cross-sectional half-power beamwidth in the direction of interest (degrees)

φ_{01}, φ_{02}: major and minor axis half-power beamwidth, respectively, of elliptical beam (degrees) (WRC-12)

$$x = 0.5\left(1 - \frac{B_{min}}{\varphi_0}\right)$$

where:

$B_{min} = 0.6°$

ANNEX 2

TO

ATTACHMENT TO RESOLUTION 553 (REV.WRC-15)

Technical criteria to determine coordination requirements for submissions under the special procedure to be applied for an assignment for a broadcasting-satellite service system in the frequency band 21.4-22 GHz in Regions 1 and 3

Coordination of assignments for a BSS space station with respect to other BSS networks is not required if the pfd produced under assumed free space propagation conditions does not exceed the threshold values shown below, anywhere within the service area of the potentially affected assignment:

a) this mask shall be applied for frequency assignments subject to this Resolution with regard to frequency assignments not subject to this Resolution for which:

– notification is not submitted under Article **11**; and

– complete information under Resolution **552 (Rev.WRC-15)** is not received by the Bureau,

at the date of receipt of complete information under § 8 and 9 of the Attachment to this Resolution,

-146.88	dB(W/(m^2 · MHz))	for	$0° \leq \theta < 0.6°$
$-150.2 + 9.3\ \theta^2$	dB(W/(m^2 · MHz))	for	$0.6° \leq \theta < 1.05°$
$-140.5 + 27.2 \log \theta$	dB(W/(m^2 · MHz))	for	$1.05° \leq \theta < 2.65°$

$-138.1 + 1.3\ \theta^2$	dB(W/(m^2 · MHz))	for $2.65° \leq \theta < 4.35°$
$-130.2 + 26.1 \log \theta$	dB(W/(m^2 · MHz))	for $4.35° \leq \theta < 9.1°$
-105	dB(W/(m^2 · MHz))	for $9.1° \leq \theta$

where θ is the minimum nominal geocentric orbital separation, in degrees, between the wanted and interfering space stations, taking into account the respective East-West station-keeping accuracies;

b) this mask shall be applied for frequency assignment subject to this Resolution with regard to:

– frequency assignments subject to this Resolution; or

– frequency assignments not subject to this Resolution for which:

  – notification is submitted under Article **11**; or

  – complete information under Resolution **552 (Rev.WRC-15)** is received by the Bureau,

at the date of receipt of complete information under § 8 and 9 of the Attachment to this Resolution,

-149.88	dB(W/(m^2 · MHz))	for $0° \leq \theta < 0.6°$
$-153.2 + 9.3\ \theta^2$	dB(W/(m^2 · MHz))	for $0.6° \leq \theta < 1.05°$
$-143.5 + 27.2 \log \theta$	dB(W/(m^2 · MHz))	for $1.05° \leq \theta < 2.65°$
$-141.1 + 1.3\ \theta^2$	dB(W/(m^2 · MHz))	for $2.65° \leq \theta < 4.35°$
$-133.2 + 26.1 \log \theta$	dB(W/(m^2 · MHz))	for $4.35° \leq \theta < 12°$
-105	dB(W/(m^2 · MHz))	for $12° \leq \theta$

where θ is the minimum nominal geocentric orbital separation, in degrees, between the wanted and interfering space stations, taking into account the respective East-West station-keeping accuracies.

RESOLUTION 554 (WRC-12)

Application of pfd masks to coordination under No. 9.7 for broadcasting-satellite service networks in the band 21.4-22 GHz in Regions 1 and 3

The World Radiocommunication Conference (Geneva, 2012),

considering

a) that more precise criteria to apply No. **9.7** have the potential to reduce undue protection requirements for assignments in respect of incoming assignments in their vicinity;

b) that reduction of undue protection requirements will facilitate coordination of submissions of new networks;

c) that the use of pfd thresholds to identify coordination requirements will encourage use of more homogeneous technical parameters and support efficient spectrum usage,

resolves

1 that coordination of assignments for a broadcasting-satellite service (BSS) space station in Regions 1 and 3 in the 21.4-22 GHz band with respect to other BSS networks is not required if the pfd produced under assumed free space propagation conditions, does not exceed the threshold values shown below, anywhere within the service area of the potentially affected assignment:

-149.88	dB(W/(m^2 · MHz))	for	$0° \le \theta < 0.6°$
$-153.2 + 9.3\ \theta^2$	dB(W/(m^2 · MHz))	for	$0.6° \le \theta < 1.05°$
$-143.5 + 27.2 \log \theta$	dB(W/(m^2 · MHz))	for	$1.05° \le \theta < 2.65°$
$-141.1 + 1.3\ \theta^2$	dB(W/(m^2 · MHz))	for	$2.65° \le \theta < 4.35°$
$-133.2 + 26.1 \log \theta$	dB(W/(m^2 · MHz))	for	$4.35° \le \theta < 12°$
-105	dB(W/(m^2 · MHz))	for	$12° \le \theta$

where θ is the minimum nominal geocentric orbital separation, in degrees, between the wanted and interfering space stations, taking into account the respective East-West station-keeping accuracies;

2 that when the Bureau, under No. **11.32**, conducts its examination of notifications of satellite networks in respect of compliance with the coordination procedures, it shall base its findings on the coordination requirements set by No. **9.7** in Table **5-1** of Appendix **5** as revised by WRC-12 for those networks received under No. **9.30** before 18 February 2012.

RESOLUTION 555 (REV.WRC-15)

Additional regulatory provisions for broadcasting-satellite service networks in the frequency band 21.4-22 GHz in Regions 1 and 3 for the enhancement of equitable access to this frequency band

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that WARC-92 allocated the frequency band 21.4-22 GHz in Regions 1 and 3 to the broadcasting-satellite service (BSS) to be implemented after 1 April 2007;

b) that the use of the frequency band since 1992 was subject to an interim procedure in accordance with Resolution **525 (WARC-92**, **Rev.WRC-03** and **Rev.WRC-07)**[*];

c) that Article 44 of the ITU Constitution sets out the basic principles for the use of the radio-frequency spectrum and the geostationary-satellite and other satellite orbits, taking into account the needs of developing countries,

further considering

a) that *a priori* planning for BSS networks in the frequency band 21.4-22 GHz in Regions 1 and 3 is not necessary and should be avoided as it freezes access according to technological assumptions at the time of planning and then prevents flexible use taking account of real world demand and technical developments;

b) that interim arrangements for the use of the frequency bands were on a first-come first-served basis,

recognizing

a) that the number of filings made by some administrations in this frequency band is extremely large, which may not be realistic and may be difficult to implement within the regulatory time-limit under Article **11**;

b) that the number of filings (291 coordination requests received by the Bureau as at December 2011), including those referred to in *recognizing a)* above, is limiting the possibility of successful coordination of BSS systems already submitted or planned to be submitted by other administrations,

resolves

1 to urge administrations to make the utmost efforts to accommodate submissions received from other administrations with few filings, especially covering their own territories;

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[*] *Note by the Secretariat*: This Resolution was abrogated by WRC-12.

2 that, for submissions received before 18 February 2012 and processed by the Bureau, for which the regulatory validity period specified in No. **11.44** has not yet expired, the notifying administration may modify, without any change in their initial date of receipt, the characteristics within the ranges specified in Annex 1 to the Attachment to Resolution **553 (WRC-12)**[*] or Report ITU-R BO.2071, provided that such modifications do not cause more interference than the current submitted parameters.

invites the ITU Council

to consider modifying Decision 482 (modified 2008) to exempt submissions under *resolves* 3 and 4 above from cost-recovery charges.

[*] *Note by the Secretariat:* This Resolution was revised by WRC-15.

RESOLUTION 556 (WRC-15)

Conversion of all analogue assignments in the Appendices 30 and 30A Regions 1 and 3 Plan and List into digital assignments

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that this conference suppressed footnote 26 to Annex 1 of Appendix **30**, which expired on 1 January 2015 and contained power flux-density limits to be applied for the protection of analogue assignments brought in service before 17 October 1997;

b) that the analogue emissions concerned are obsolete and have not been in use in the broadcasting-satellite service (BSS) and in feeder links for the BSS in the bands subject to Appendix **30** and Appendix **30A**,

recognizing

a) that the integrity of the Region 2 Plan and its associated provisions must be preserved;

b) that compatibility between the BSS in Regions 1 and 3 and the other services in all three Regions must be ensured,

resolves

1 that, as from 1 January 2017:

1.1 all analogue (e.g. "27M0F8W") assignments included in Article 9A of Appendix **30A** and Article 11 of Appendix **30** and in the Regions 1 and 3 Lists shall be converted to digital assignments (e.g. "27M0G7W");

1.2 the Bureau shall update the reference situation (EPM) of the Regions 1 and 3 Plans and Lists and of other Article 4 submissions, which are still at the stage of application of that Article, as contained in the Appendices **30** and **30A** master database of 1 January 2017 without reviewing the past technical examination results;

2 that the Bureau shall continue to apply the current calculation method in regard of analogue assignments in the Region 2 Plan.

RESOLUTION 557 (WRC-15)

Consideration of possible revision of Annex 7 to Appendix 30 of the Radio Regulations

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that the provisions applying to the broadcasting-satellite service (BSS) in the frequency bands 11.7-12.5 GHz in Region 1, 12.2-12.7 GHz in Region 2 and 11.7-12.2 GHz in Region 3 are contained in Appendix **30**;

b) that fixed-satellite service (FSS) networks operate in the frequency bands 12.5-12.75 GHz in Region 1, 11.7-12.2 GHz in Region 2 and 12.2-12.75 GHz in Region 3;

c) that Annex 7 to Appendix **30 (Rev.WRC-15)** specifies limitations, including orbital position limitations,

noting

a) that the ITU Radiocommunication Sector (ITU-R) has carried out a significant amount of studies in preparation for conferences on BSS planning, and has developed a number of Reports and Recommendations;

b) that BSS and FSS networks from different Regions may coexist, operate simultaneously and share orbit resource in their respective Regions;

c) that special consideration needs to be given to operational networks implemented under the current Annex 7 to Appendix **30** regime;

d) that BSS is subject to orbital position limitations while FSS in the same frequency bands is not,

recognizing

a) that WRC-2000 developed new Plans for Regions 1 and 3 assuming digital BSS and feeder-link assignments;

b) that existing FSS networks operating in the frequency bands mentioned in *considering b)* and BSS networks implemented in accordance with the current provisions of Annex 7 to Appendix **30** shall continue to be protected;

c) that the frequency bands 11.7-12.2 GHz in Region 3, 11.7-12.5 GHz in Region 1 and 12.2-12.7 GHz in Region 2 are widely used by BSS networks, subject to the current provisions of Annex 7 to Appendix **30 (Rev.WRC-15)**;

d) that the frequency bands 12.5-12.75 GHz in Region 1, 11.7-12.2 GHz in Region 2 and 12.2-12.75 GHz in Region 3 are widely used by FSS networks,

resolves to invite the 2019 World Radiocommunication Conference

to consider the results of the ITU-R studies and take necessary actions, as appropriate,

invites ITU-R

to conduct studies on, review, and identify possible revisions to, if necessary, the limitations mentioned in Annex 7 to Appendix **30 (Rev.WRC-15)**, while ensuring the protection of, and without imposing additional constraints on, assignments in the Plan and in the List and the future of BSS networks mentioned in *recognizing c)* and existing and planned FSS networks mentioned in *recognizing d)*.

RESOLUTION 608 (REV.WRC-15)

Use of the frequency band 1 215-1 300 MHz by systems of the radionavigation-satellite service (space-to-Earth)

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that WRC-2000 introduced a new allocation for the radionavigation-satellite service (RNSS) in the frequency band 1 260-1 300 MHz;

b) that the frequency bands 1 215-1 240 MHz and 1 240-1 260 MHz were already allocated to the RNSS;

c) that, in the frequency band 1 215-1 260 MHz, RNSS (space-to-Earth) systems have been successfully operating for more than 20 years without any reports of interference to the radars which operate in this frequency band;

d) the importance of the continuing need for protection for the radiodetermination systems operating in the frequency band 1 215-1 300 MHz,

noting

a) Recommendation ITU-R M.1902 "Characteristics and protection criteria for receiving earth stations in the radionavigation-satellite service (space-to-Earth) operating in the frequency band 1 215-1 300 MHz";

b) Report ITU-R M.2284 "Compatibility of radionavigation-satellite service (space-to-Earth) systems and radars operating in the frequency band 1 215-1 300 MHz",

further noting

that the provisions of No. **5.329** as adopted by WRC-03, will provide for the operation of the RNSS (space-to-Earth) in the frequency band 1 215-1 300 MHz and will protect the radiolocation systems operating in that frequency band, in addition to the protection already provided to radionavigation service systems operating in the countries listed in No. **5.331**,

recognizing

a) that ITU-R carried out studies related to the protection of the radiodetermination systems operating in the frequency band 1 215-1 300 MHz and that these studies should continue pursuant to relevant ITU-R Questions, such as Questions ITU-R 62/5 and ITU-R 217/4, so as to prepare, as appropriate, ITU-R Recommendations;

b) that up to the end of WRC-2000, use of the RNSS in the frequency band 1 215-1 260 MHz was subject only to the constraint that no harmful interference was caused to the radionavigation service in Algeria, Germany, Austria, Bahrain, Belgium, Benin, Bosnia and Herzegovina, Burundi, Cameroon, China, Croatia, Denmark, United Arab Emirates, France, Greece, India, Iran (Islamic Republic of), Iraq, Kenya, The Former Yugoslav Rep. of Macedonia, Liechtenstein, Luxembourg, Mali, Mauritania, Norway, Oman, Pakistan, Netherlands, Portugal, Qatar, Serbia and Montenegro*, Senegal, Slovenia, Somalia, Sudan**, Sri Lanka, Sweden, Switzerland and Turkey, furthermore, that No. **5.43** was applied,

resolves

that no constraints in addition to those in place prior to WRC-2000 (see *recognizing b)*) shall be placed on the use of RNSS (space-to-Earth) frequency assignments in the frequency band 1 215-1 260 MHz brought into use until 2 June 2000,

instructs the Secretary-General

to communicate the contents of this Resolution to the International Civil Aviation Organization (ICAO) for such actions as it may consider appropriate, and to invite ICAO to participate actively in the study activity identified under *recognizing a).*

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* *Note by the Secretariat:* Serbia and Montenegro became independent States in 2006.

** *Note by the Secretariat:* Sudan was partitioned into two independent States in 2011 (Sudan and South Sudan).

RESOLUTION 609 (REV.WRC-07)

Protection of aeronautical radionavigation service systems from the equivalent power flux-density produced by radionavigation-satellite service networks and systems in the 1 164-1 215 MHz frequency band

The World Radiocommunication Conference (Geneva, 2007),

considering

a) that the band 960-1 215 MHz is allocated on a primary basis to the aeronautical radionavigation service (ARNS) in all Regions;

b) that the band 1 164-1 215 MHz is also allocated on a primary basis to the radionavigation-satellite service (RNSS), subject to the condition in No. **5.328A** that operation of RNSS systems shall be in accordance with this Resolution;

c) that WRC-2000 provided for implementation of a provisional aggregate power flux-density (pfd) limit during the period between WRC-2000 and WRC-03, and requested ITU-R studies on the need for an aggregate pfd limit, and revision, if necessary, of the provisional pfd limit given in No. **5.328A**;

d) that WRC-03 determined that protection of the ARNS from harmful interference can be achieved if the value of the equivalent pfd (epfd) produced by all the space stations of all RNSS (space-to-Earth) systems in the 1 164-1 215 MHz band does not exceed the level of −121.5 dB(W/m^2) in any 1 MHz band;

e) that only a limited number of RNSS systems are expected to be deployed in the 1 164-1 215 MHz band, and only a few of these systems at most would have overlapping frequencies;

f) that ARNS systems can be protected without placing undue constraints on the development and operation of RNSS systems in this band;

g) that to achieve the objectives in *considering f)*, administrations operating or planning to operate RNSS systems will need to agree cooperatively through consultation meetings to equitably share the aggregate epfd in a manner to achieve the level of protection for ARNS systems that is stated in *considering d)*;

h) that it may be appropriate for representatives of administrations operating or planning to operate ARNS systems to be involved in determinations made pursuant to *considering g)*;

i) that WRC-03 decided to apply the coordination provisions of Nos. **9.12**, **9.12A** and **9.13** to RNSS systems and networks for which complete coordination or notification information, as appropriate, is received by the Bureau after 1 January 2005,

noting

a) that WRC-2000 invited ITU-R to conduct the appropriate technical, operational and regulatory studies on the overall compatibility between the RNSS and the ARNS in the band 960-1 215 MHz;

b) that WRC-2000 resolved to recommend that WRC-03 review the results of the studies,

recognizing

that under No. **7.5**, interested administrations have the ability, at any time, to request the assistance of the Bureau with respect to Articles **9** and **11** and associated procedures,

resolves

1 that in order to protect ARNS systems, administrations shall ensure, pursuant to this Resolution, that the epfd level produced by all space stations of all RNSS systems does not exceed the level −121.5 dB(W/m^2) in any 1 MHz band;

2 that administrations operating or planning to operate in the 1 164-1 215 MHz frequency band RNSS systems or networks shall, in collaboration, take all necessary steps, including, if necessary, by means of appropriate modifications to their systems or networks, to ensure that the aggregate interference into ARNS systems caused by such RNSS systems or networks operating co-frequency in these frequency bands is shared equitably among the systems identified in *resolves* 3 and does not exceed the level of the aggregate protection criterion given in *resolves* 1 above;

3 that administrations, in carrying out their obligations under *resolves* 1 and 2 above, shall take into account only those RNSS systems with frequency assignments in the band 1 164-1 215 MHz that have met the criteria listed in the Annex to this Resolution through appropriate information provided to the consultation meetings referred to in *considering g)*;

4 that administrations, in developing agreements to carry out their obligations under *resolves* 1 and 2 above, shall establish mechanisms to ensure that all potential RNSS system operators and administrations are given full visibility of the process;

5 that in order to allow multiple RNSS systems to operate in the frequency band 1 164-1 215 MHz, no single RNSS system shall be permitted to use up the entire interference allowance specified in *resolves* 1 above in any 1 MHz of the 1 164-1 215 MHz band (see Recommendation **608 (Rev.WRC-07)**);

6 that to achieve the objectives in *resolves* 1 and 2 above, administrations operating or planning to operate RNSS systems will need to agree cooperatively through consultation meetings to achieve the level of protection for ARNS systems that is stated in *resolves* 1;

7 that administrations participating in this process of epfd calculation should hold consultation meetings on a regular basis (e.g. yearly);

8 the administrations participating in the consultation meeting shall designate one administration that shall communicate to the Bureau the results of any aggregate sharing determinations made in application of *resolves* 2 above, without regard to whether such determinations result in any modifications to the published characteristics of their respective systems or networks (see Recommendation **608 (Rev.WRC-07)**);

9 that administrations operating or planning to operate ARNS systems in the 1 164-1 215 MHz band should participate, as appropriate, in discussions and determinations relating to the *resolves* above;

10 that the methodology and the reference worst-case ARNS system antenna contained in Recommendation ITU-R M.1642-2 shall be used by administrations for calculating the aggregate epfd produced by all the space stations within all RNSS systems in the band 1 164-1 215 MHz,

instructs the Radiocommunication Bureau

1 to participate in consultation meetings mentioned under *resolves* 6 and to observe carefully results of the epfd calculation mentioned in *resolves* 1;

2 to determine whether the pfd level in *recommends* 1 of Recommendation **608 (Rev.WRC-07)** is exceeded by any subject space station, and to report the findings of this determination to the participants in the consultation meeting;

3 to publish in the International Frequency Information Circular (BR IFIC), the information referred to in *resolves* 8 and *instructs the Radiocommunication Bureau* 2,

invites the Radiocommunication Bureau

to examine the possibility, if needed, of developing software that can be used to calculate the epfd level mentioned under *resolves* 1,

invites administrations

1 to deal with RNSS intersystem matters, as required, as early as possible;

2 to provide the Bureau and all participants in the consultation meeting with access to appropriate software used to calculate the epfd level mentioned under *resolves* 1.

ANNEX TO RESOLUTION 609 (REV.WRC-07)

Criteria for application of Resolution 609 (Rev.WRC-07)

1 Submission of appropriate Advance Publication information.

2 Entry into satellite manufacturing or procurement agreement, and entry into satellite launch agreement.

The RNSS system or network operator should possess:

i) clear evidence of a binding agreement for the manufacture or procurement of its satellites; and

ii) clear evidence of a binding agreement to launch its satellites.

The manufacturing or procurement agreement should identify the contract milestones leading to the completion of manufacture or procurement of satellites required for the service provision, and the launch agreement should identify the launch date, launch site and launch service provider. The notifying administration is responsible for authenticating the evidence of agreement.

The information required under this criterion may be submitted in the form of a written commitment by the responsible administration.

3 As an alternative to satellite manufacturing or procurement and launch agreements, clear evidence of guaranteed funding arrangements for the implementation of the project would be accepted. The notifying administration is responsible for authenticating the evidence of these arrangements and for providing such evidence to other interested administrations in furtherance of its obligations under this Resolution.

RESOLUTION 610 (WRC-03)

Coordination and bilateral resolution of technical compatibility issues for radionavigation-satellite service networks and systems in the bands 1 164-1 300 MHz, 1 559-1 610 MHz and 5 010-5 030 MHz

The World Radiocommunication Conference (Geneva, 2003),

considering

a) that WRC-2000 decided to allocate the bands 1 164-1 215 MHz, 1 260-1 300 MHz and 5 010-5 030 MHz to the radionavigation-satellite service (RNSS) (space-to-Earth) (space-to-space) in addition to the bands 1 215-1 260 MHz and 1 559-1 610 MHz that have already been allocated to the RNSS;

b) that this Conference established conditions for the protection of the aeronautical radionavigation service from RNSS systems in the 1 164-1 215 MHz band, for the protection of radiodetermination services from RNSS systems in the 1 215-1 300 MHz band, and for the protection of the radio astronomy service in the band 4 990-5 000 MHz from RNSS systems in the 5 010-5 030 MHz band;

c) that to date, RNSS systems have been able to resolve intersystem technical compatibility issues on a bilateral basis under Section I of Article **9**, without the need for imposition of the coordination procedures of Section II of Article **9**, however, in recent years, there has been an increase in the number of RNSS systems and networks filed with the Radiocommunication Bureau;

d) that this Conference has decided to apply, in the bands mentioned in *considering a)*, the coordination provisions of Nos. **9.12**, **9.12A** and **9.13** to RNSS systems and networks for which complete coordination or notification information, as appropriate, is received by the Radiocommunication Bureau after 1 January 2005, and the provisions of No. **9.7** already apply to geostationary-satellite networks in the RNSS;

e) that it is necessary to have a basis for administrations with RNSS systems that are not subject to Nos. **9.12**, **9.12A** and **9.13** to engage in bilateral coordinations to resolve intersystem technical compatibility issues within the RNSS;

f) that it is desirable, in order to reduce burdens on administrations operating or planning RNSS systems or networks, to conduct bilateral coordinations between RNSS systems and networks that are either in operation or that are actually in the process of being implemented,

resolves

1 that for administrations planning to operate RNSS systems subject to coordination under Nos. **9.7**, **9.12**, **9.12A** and/or **9.13** in the bands mentioned in *considering a)*, if an administration with which coordination is requested responds to the request under No. **9.52**, the requesting administration shall, during the process of coordination and upon request by the responding administration, inform the responding administration (with a copy to the Bureau) whether it has met the criteria listed in the Annex to this Resolution with respect to the subject network or system;

2 that administrations responding under No. **9.52** to a request for coordination under Nos. **9.7**, **9.12**, **9.12A** and/or **9.13** in the bands mentioned in *considering a)*, shall, during the process of coordination mentioned in *resolves* 1 and upon request by the requesting administration, inform the requesting administration (with a copy to the Bureau) whether it has met the criteria listed in the Annex to this Resolution with respect to the subject network or system;

3 that administrations operating or planning to operate RNSS systems in the bands mentioned in *considering a)*, which systems are not subject to coordination under Section II of Article **9**, shall take all practicable steps to resolve issues of intersystem compatibility on a bilateral basis;

4 that in undertaking the obligations under *resolves* 3 above, administrations operating or planning to operate RNSS systems or networks should first address intersystem compatibility between RNSS systems or networks that are actually in operation or are in the process of being implemented;

5 that for application of *resolves* 4 above, an RNSS system or network that has satisfied the criteria listed in the Annex to this Resolution with respect to the subject network or system would be considered to be actually in the process of being implemented;

6 that when notifying the Bureau under No. **11.47** that a frequency assignment to station(s) in the RNSS in the bands mentioned in *considering a)* has been brought into use, the notifying administration, if it has not already done so, shall inform the Bureau whether it has met the criteria listed in the Annex to this Resolution;

7 that implementation of this Resolution shall be conducted in such a way as to promote the principle of equality and fairness in ensuring access for RNSS operators and planned RNSS systems in the above-referenced bands,

instructs the Radiocommunication Bureau

to provide, on request, assistance to administrations operating or planning to operate RNSS systems in the bands mentioned in *considering a)* above, which systems are not subject to coordination under Section II of Article **9**, in securing bilateral agreements with other RNSS systems as early as possible.

ANNEX TO RESOLUTION 610 (WRC-03)

Criteria for application of Resolution 610 (WRC-03)

1 Submission of appropriate Advance Publication information.

2 Entry into satellite manufacturing or procurement agreement, and entry into satellite launch agreement.

The RNSS system or network operator should possess:

i) clear evidence of a binding agreement for the manufacture or procurement of its satellites; and

ii) clear evidence of a binding agreement to launch its satellites.

The manufacturing or procurement agreement should identify the contract milestones leading to the completion of manufacture or procurement of satellites required for the service provision, and the launch agreement should identify the launch date, launch site and launch service provider. The notifying administration is responsible for authenticating the evidence of agreement.

The information required under this criterion may be submitted in the form of a written commitment by the responsible administration.

3 As an alternative to satellite manufacturing or procurement and launch agreements, clear evidence of guaranteed funding arrangements for the implementation of the project would be accepted. The notifying administration is responsible for authenticating the evidence of these arrangements.

RESOLUTION 612 (REV.WRC-12)

Use of the radiolocation service between 3 and 50 MHz to support oceanographic radar operations

The World Radiocommunication Conference (Geneva, 2012),

considering

a) that there is increasing interest, on a global basis, in the operation of oceanographic radars for measurement of coastal sea surface conditions to support environmental, oceanographic, meteorological, climatological, maritime and disaster mitigation operations;

b) that oceanographic radars are also known in parts of the world as HF ocean radars, HF wave height sensing radars or HF surface wave radars;

c) that oceanographic radars operate through the use of ground-waves intended to propagate over the sea;

d) that oceanographic radar technology has applications in global maritime domain awareness by allowing the long-range sensing of surface vessels, which provides a benefit to the global safety and security of shipping and ports;

e) that operation of oceanographic radars provides benefits to society through environmental protection, disaster preparedness, public health protection, improved meteorological operations, increased coastal and maritime safety and enhancement of national economies;

f) that oceanographic radars have been operated on an experimental basis around the world, providing an understanding of spectrum needs and spectrum sharing considerations, as well as an understanding of the benefits these systems provide;

g) that performance and data requirements dictate the regions of spectrum that can be used by oceanographic radar systems for ocean observations;

h) that below approximately 30 MHz, unintended skywave propagation from oceanographic radar may occur when appropriate propagation conditions exist,

recognizing

a) that oceanographic radars have been operated under provision No. **4.4** since the 1970s by several administrations;

b) that developers of the systems in *recognizing a)* have implemented techniques to make the most efficient use of the spectrum and mitigate interference to other radio services;

c) that protection of stations of existing services from interference caused by oceanographic radars could be ensured if the interfering signal at the receiving antenna location, assuming rural and quiet rural man-made and natural noise characteristics as defined in Recommendation ITU-R P.372-10, does not result in an I/N ratio of more than −6 dB, and if this value was used to calculate the minimum separation distances for coordination between an oceanographic radar and a potentially affected country;

d) that for the purpose of protecting existing services from harmful interference, the impact of oceanographic radars via ground-wave propagation can be checked by Report ITU-R M.2234, based on Recommendation ITU-R P.368-9,

resolves

1 that, when oceanographic radars are brought into use after 17 February 2012 and notified to the Bureau, the notification shall be in accordance with No. **11.2** of the Radio Regulations and shall contain the station identification (call sign);

2 that the peak e.i.r.p. of an oceanographic radar shall not exceed 25 dBW;

3 that each oceanographic radar station shall transmit a station identification (call sign) on the assigned frequency, in international Morse code at manual speed, at the end of each data acquisition cycle, but at an interval of no more than 20 minutes;

4 that oceanographic radars should, where applicable, use techniques that allow multiples of such radars to operate on the same frequency, reducing to a minimum the spectral occupancy of a regional or global deployment of radars;

5 that oceanographic radars should use directional antennas, where applicable and as required, to facilitate sharing, thereby reducing the e.i.r.p. in the direction of the transmit antenna backlobe;

6 that the separation distances between an oceanographic radar and the border of other countries shall be greater than the distances specified in the following table, unless prior explicit agreements from affected administrations are obtained:

Frequency (MHz)	Land path (km)		Sea or mixed path (km)	
	Rural	Quiet rural	Rural	Quiet rural
5 (± 1 MHz)	120	170	790	920
9 (± 1 MHz)	100	130	590	670
13 (± 1 MHz)	100	110	480	520
16 (± 1 MHz)	80	100	390	450
25 (± 3 MHz)	80	100	280	320
42 (± 3 MHz)	80	100	200	230

RESOLUTION 641 (REV.HFBC-87)

Use of the frequency band 7 000-7 100 kHz

The World Administrative Radio Conference for the Planning of the HF Bands Allocated to the Broadcasting Service (Geneva, 1987),

considering

a) that the sharing of frequency bands by the amateur and broadcasting services is undesirable and should be avoided;

b) that it is desirable to have world-wide exclusive allocations for these services in band 7;

c) that the band 7 000-7 100 kHz is allocated on a world-wide basis exclusively to the amateur service,

resolves

that the broadcasting service shall be prohibited in the band 7 000-7 100 kHz and that the broadcasting stations operating on frequencies in this band shall cease such operation,

urges

the administrations responsible for the broadcasting stations operating on frequencies in the band 7 000-7 100 kHz to take the necessary steps to ensure that such operation ceases immediately,

instructs the Secretary-General

to bring this Resolution to the attention of administrations.

RESOLUTION 642

Relating to the bringing into use of earth stations in the amateur-satellite service

The World Administrative Radio Conference (Geneva, 1979),

recognizing

that the procedures of Articles **9** and **11** are applicable to the amateur-satellite service,

recognizing further

a) that the characteristics of earth stations in the amateur-satellite service vary widely;

b) that space stations in the amateur-satellite service are intended for multiple access by amateur earth stations in all countries;

c) that coordination among stations in the amateur and amateur-satellite services is accomplished without the need for formal procedures;

d) that the burden of terminating any harmful interference is placed upon the administration authorizing a space station in the amateur-satellite service pursuant to the provisions of No. **25.11**,

notes

that certain information specified in Appendix **4** cannot reasonably be provided for earth stations in the amateur-satellite service,

resolves

1 that when an administration (or one acting on behalf of a group of named administrations) intends to establish a satellite system in the amateur-satellite service and wishes to publish information with respect to earth stations in that system it may:

1.1 communicate to the Radiocommunication Bureau all or part of the information listed in Appendix **4**; the Bureau shall publish such information in a Special Section of its BR IFIC requesting comments to be communicated within a period of four months after the date of publication;

1.2 notify under Nos. **11.2** to **11.8** all or part of the information listed in Appendix **4**; the Bureau shall record it in a special list;

2 that this information shall include at least the characteristics of a typical amateur earth station in the amateur-satellite service having the facility to transmit signals to the space station to initiate, modify, or terminate the functions of the space station.

RESOLUTION 646 (REV.WRC-15)

Public protection and disaster relief

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that the term "public protection radiocommunication" refers to radiocommunications used by agencies and organizations responsible for the maintenance of law and order, protection of life and property and emergency situations;

b) that the term "disaster relief radiocommunication" refers to radiocommunications used by agencies and organizations dealing with a serious disruption of the functioning of society, posing a significant widespread threat to human life, health, property or the environment, whether caused by accident, natural phenomena or human activity, and whether developing suddenly or as a result of complex, long-term processes;

c) the growing telecommunication and radiocommunication needs of public protection agencies and organizations, including those dealing with emergency situations and disaster relief, that are vital to the maintenance of law and order, protection of life and property, disaster relief and emergency response;

d) that many administrations wish to promote interoperability and interworking between systems used for public protection and disaster relief (PPDR), both nationally and for cross-border operations in emergency situations and for disaster relief;

e) that existing systems for PPDR applications mainly support narrowband/wideband voice and data applications;

f) that, although narrowband and wideband systems will continue to be used to meet PPDR requirements, there is a growing need for broadband applications to support improved data and multimedia capabilities, which require higher data rates and higher capacity, and appropriate spectrum may need to be made available on a national basis to meet these growing needs;

g) that new technologies for broadband PPDR applications are being developed in various standards organizations, e.g. International Mobile Telecommunications (IMT) technologies that support higher data rates and higher capacity for PPDR applications, and these technologies are also being used to meet the needs of PPDR agencies and organizations;

h) that continuing development of new technologies and systems, such as IMT and Intelligent Transportation Systems (ITS), may be able to further support or supplement advanced PPDR applications;

i) that some commercial terrestrial and satellite systems are complementing the dedicated systems in support of PPDR, and that the use of commercial solutions will be in response to technology development and market demands;

j) that administrations may have different operational needs and spectrum requirements for PPDR applications depending on the circumstances;

k) that an approach based on global and/or regional frequency ranges[1] may enable administrations to benefit from harmonization while continuing to meet national planning requirements,

recognizing

a) the benefits of spectrum harmonization such as:

– increased potential for interoperability;

– clear guidance for standardization;

– increased volume of equipment resulting in economies of scale, more cost-efficient equipment and expanded equipment availability;

– improved spectrum management and planning;

– more effective international aid during disasters and major events; and

– enhanced cross-border coordination and circulation of equipment;

b) that the organizational distinction between public protection activities and disaster relief activities are matters for administrations to determine at the national level;

c) that national spectrum planning for PPDR needs to have regard to cooperation and bilateral consultation with other concerned administrations, which should be facilitated by greater levels of spectrum harmonization;

d) that the Tampere Convention on the Provision of Telecommunications Resources for Disaster Mitigation and Relief Operations (Tampere, 1998), an international treaty deposited with the United Nations Secretary-General and related United Nations General Assembly resolutions and reports are also relevant in this regard;

e) that Resolution 36 (Rev. Guadalajara, 2010) of the Plenipotentiary Conference urges Member States Parties to the Tampere Convention to take all practical steps for the application of the Tampere Convention and to work closely with the operational coordinator as provided for therein;

f) that Recommendation ITU-R M.1637 offers guidance to facilitate the global cross-border circulation of radiocommunication equipment in emergency and disaster relief situations;

g) that Recommendation ITU R M.2009 identifies radio interface standards applicable to PPDR operations;

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[1] In the context of this Resolution, the term "frequency range" means a range of frequencies over which radio equipment is envisaged to be capable of operating but limited to specific frequency band(s) according to national conditions and requirements.

h) that Report ITU-R M.2291 provides details of the capabilities of IMT technologies to meet the requirements of applications supporting broadband PPDR operations;

i) that Report ITU-R M.2377 provides details of systems and applications supporting PPDR operations in narrowband, wideband and broadband use;

j) that PPDR agencies and organizations have an initial set of requirements, including but not limited to interoperability, secure and reliable communications, sufficient capacity to respond to emergencies, priority access in the use of non-dedicated systems, fast response times, ability to handle multiple group calls and the ability to cover large areas, as described in Reports ITU-R M.2377 and ITU-R M.2291;

k) that Report ITU-R BT.2299 provides a compilation of supporting evidence to the effect that terrestrial broadcasting plays an important role in disseminating information to the public in times of emergencies;

l) that Recommendation ITU-R M.2015 contains regionally harmonized PPDR frequency arrangements, as well as frequency arrangements of individual administrations[2];

m) that in times of disasters, if most terrestrial-based networks are destroyed or impaired, amateur, satellite and other non-ground-based networks may be available to provide communication services to assist in PPDR efforts;

n) that the amount of spectrum needed for public protection on a daily basis differs significantly between countries, and that certain amounts of spectrum are already in use in various countries for PPDR applications;

o) that in response to a disaster or emergency, access to additional spectrum on a temporary basis may be required for PPDR operations;

p) that not all frequencies within an identified common frequency range will be available for PPDR use within each country;

q) that the identification of common frequency ranges within which equipment could operate may ease interoperability and/or interworking, with mutual cooperation and consultation, especially in national, regional and cross-border emergency situations and disaster relief operations;

r) that when a disaster occurs, the PPDR agencies and organizations are usually the first responders on the scene using their day-to-day communication systems and, additionally, other agencies and organizations may also become involved in disaster relief operations;

s) that some countries in Region 1 have identified certain parts of the frequency range 694-791 MHz for broadband PPDR deployment;

t) that some countries in Region 1 have identified certain parts of the frequency range 790-862 MHz for broadband PPDR deployment;

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[2] For example, some countries in Region 3 have adopted parts of the frequency ranges 138-174 MHz, 351-370 MHz and 380-400 MHz for narrowband PPDR applications and the frequency ranges 174-205 MHz and 1 447-1 467 MHz for broadband PPDR applications.

u) the provisions contained in Nos. **5.266** and **5.267**, and Resolution **205 (Rev.WRC-15)**;

v) that Metaids and MetSat services operate on a globally harmonized basis in the frequency band 400.15-406 MHz;

w) that the radio astronomy service operates on a primary basis in the frequency band 406.1-410 MHz and there may be PPDR operations adjacent to that frequency band,

noting

a) that many administrations will continue to use different frequency bands below 1 GHz for narrowband systems and applications supporting PPDR and may decide to use the same range for future PPDR systems;

b) that some administrations also use certain frequency bands above 1 GHz for broadband PPDR applications;

c) that applications requiring large coverage areas and providing good signal availability would generally be accommodated in lower frequency bands;

d) that many administrations have made significant investments in PPDR systems;

e) that flexibility allows disaster relief agencies and organizations to use current and future radiocommunications, so as to facilitate their humanitarian operations;

f) that disasters and emergency events require response not only from PPDR agencies and organizations but also from humanitarian agencies and organizations;

g) that broadband PPDR can be realized and deployed in the frequency bands identified for IMT;

h) the benefits of cooperation between countries for the provision of effective and appropriate humanitarian assistance in case of disasters, particularly in view of the special operational requirements of such activities involving multinational response;

i) the needs of countries, particularly the developing countries[3], for cost-efficient communication equipment;

j) that the use of technologies based on Internet protocols is well established,

emphasizing

a) that the frequency ranges that are covered by the *resolves* part of this Resolution are allocated to a variety of services in accordance with the relevant provisions of the Radio Regulations and are currently used intensively by the fixed, mobile, mobile-satellite and broadcasting services;

b) that PPDR applications in the ranges listed in *resolves* 2 and 3 are intended to operate in the mobile service allocated on a primary basis according to the provisions of the Radio Regulations;

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3 Taking into account, for example, the latest version of the ITU-D Handbook on disaster relief.

c) that flexibility must be afforded to administrations to determine:

– how much spectrum to make available at a national level for PPDR from the ranges in the *resolve*s part of this Resolution in order to meet their particular national requirements;

– the need and timing of availability as well as the conditions of usage of the bands used for PPDR, including those covered in this Resolution and Recommendation ITU-R M.2015, in order to meet specific regional or national situations[4];

d) that the provisions of Nos. **1.59** and **4.10** of the Radio Regulations do not apply to PPDR;

e) that administrations can adopt their frequency arrangements for the terrestrial component of IMT, from those detailed in Recommendation ITU-R M.1036,

resolves

1 to encourage administrations to use harmonized frequency ranges for PPDR to the maximum extent possible, taking into account the national and regional requirements and also having regard to any needed consultation and cooperation with other concerned countries;

2 to encourage administrations to consider parts of the frequency range 694-894 MHz, as described in the most recent version of Recommendation ITU-R M.2015, when undertaking their national planning for their PPDR applications, in particular broadband, in order to achieve harmonization, taking into account *emphasizing c)* and *e)* above;

3 to further encourage administrations to also consider parts of the following regionally harmonized frequency ranges, for their PPDR applications:

– in Region 1: 380-470 MHz;

– in Region 3: 406.1-430 MHz, 440-470 MHz and 4 940-4 990 MHz;

4 that PPDR frequency arrangements within the frequency ranges specified in *resolves* 2 and 3, as well as countries' frequency arrangements for PPDR, should be included in Recommendation ITU-R M.2015;

5 that the use of the frequency ranges for PPDR in *resolves* 2 and 3 above, as well as the use of the countries' frequency arrangements for PPDR, as described in the most recent version of Recommendation ITU-R M.2015, must not cause unacceptable interference, nor constrain the use of these frequency ranges by applications of the services to which these ranges are allocated in the Radio Regulations;

6 to encourage administrations, in emergency and disaster relief situations, to satisfy temporary needs for frequencies in addition to what may be normally provided for in agreements with the concerned administrations;

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[4] For example, some countries in Region 1 have identified certain parts of the frequency range 694-862 MHz for broadband PPDR applications.

7 to encourage administrations to facilitate cross-border circulation of radiocommunication equipment intended for use in emergency and disaster relief situations through mutual cooperation and consultation without hindering national legislation;

8 that administrations encourage PPDR agencies and organizations to utilize relevant ITU-R Recommendations in planning spectrum use and implementing technology and systems supporting PPDR;

9 to encourage administrations to continue to work closely with their PPDR community to further refine the operational requirements for PPDR activities,

invites the ITU Radiocommunication Sector

1 to continue its technical studies and to make recommendations concerning technical and operational implementation, as necessary, to meet the needs of PPDR radiocommunication applications, taking into account the capabilities, evolution and any resulting transition requirements of the existing systems, particularly those of many developing countries, for national and international operations;

2 to review and revise Recommendation ITU-R M.2015 and other relevant ITU-R Recommendations and Reports, as appropriate.

RESOLUTION 647 (REV.WRC-15)

Radiocommunication aspects, including spectrum management guidelines, for early warning, disaster prediction, detection, mitigation and relief operations relating to emergencies and disasters

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that natural disasters have underscored the importance of utilizing effective measures to mitigate their effects, including prediction, detection and alerting through the coordinated and effective use of radio-frequency spectrum;

b) ITU's comprehensive role in emergency communications, not only in the field of radiocommunications, but also in the area of technical standards to facilitate interconnection and interoperability of networks for monitoring and management at the onset of and during emergency and disaster situations, and as an integral part of the telecommunication development agenda through the Hyderabad Action Plan;

c) that administrations have been urged to take all practical steps to facilitate the rapid deployment and effective use of telecommunication resources for early warning, emergency, disaster mitigation and relief operations by reducing and, where possible, removing regulatory barriers and strengthening global, regional and transborder cooperation between States;

d) that effective use of telecommunications/information and communication technologies (ICTs), at the onset of and during critical emergencies, is essential for disaster forecasting and prediction, timely detection, early warning, mitigation, management, relief strategies and operations, and plays a vital role in the safety and security of relief workers in the field;

e) the particular needs of developing countries and the special requirements of the inhabitants of high-risk areas exposed to disasters, as well as those living in remote areas;

f) the work carried out by the ITU Telecommunication Standardization Sector in standardizing the common alerting protocol (CAP), through the approval of the relevant CAP Recommendation,

recognizing

a) that the Tampere Convention on the Provision of Telecommunications Resources for Disaster Mitigation and Relief Operations (Tampere, 1998)[1], an international treaty deposited with the United Nations Secretary-General, calls on the States Parties, when possible, and in conformity with their national law, to develop and implement measures to facilitate the availability of telecommunication resources for such operations;

b) Article 40 of the ITU Constitution, on priority of telecommunications concerning safety of life;

c) Article 46 of the Constitution, on distress calls and messages;

d) Resolution 34 (Rev. Dubai, 2014) of the World Telecommunication Development Conference, on the role of telecommunications/ICTs in disaster preparedness, early warning, rescue, mitigation, relief and response, as well as ITU Telecommunication Development Sector Question 5/2 "Utilization of telecommunications/ICTs for disaster preparedness, mitigation and response";

e) Resolution 36 (Rev. Guadalajara, 2010) of the Plenipotentiary Conference, on telecommunications/ICTs in the service of humanitarian assistance;

f) Resolution 136 (Rev. Busan, 2014) of the Plenipotentiary Conference, on the use of telecommunications/ICTs for monitoring and management in emergency and disaster situations for early warning, prevention, mitigation and relief;

g) Resolution ITU-R 55, on the ITU Radiocommunication Sector (ITU-R) studies of disaster prediction, detection, mitigation and relief;

h) that Resolution **646 (Rev.WRC-15)** addresses the broader category of public protection and disaster relief (PPDR), as well as the harmonization of frequency bands/ranges for PPDR solutions[2];

i) that some administrations may have different operational needs and spectrum requirements for emergency and disaster-relief applications, depending on their circumstances;

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1 However, a number of countries have not ratified the Tampere Convention.

2 Resolution **646** (**Rev.WRC-15**) includes *considering* paragraphs to the effect that the term "public protection radiocommunication" refers to radiocommunications used by responsible agencies and organizations dealing with maintenance of law and order, protection of life and property and emergency situations, and that the term "disaster relief radiocommunication" refers to radiocommunications used by agencies and organizations dealing with a serious disruption of the functioning of society, posing a significant widespread threat to human life, health, property or the environment, whether caused by accident, natural phenomena or human activity, and whether developing suddenly or as a result of complex, long-term processes.

j) that the immediate availability of spectrum to support emergency radiocommunication equipment and administration contact information on disaster relief issues are important for successful telecommunications in the very early stages of humanitarian assistance intervention for disaster relief,

aware

of the progress made in regional organizations around the world, and in particular in regional telecommunication organizations, on matters related to emergency communications planning and response,

recognizing further

a) that ITU-R has developed a Handbook on Emergency and Disaster Relief as well as various Reports and Recommendations relating to emergency and disaster relief operations and radiocommunication resources;

b) that relevant provisions of Resolution **644 (Rev.WRC-12)*** were incorporated into this Resolution and Resolution **644 (Rev.WRC-12)*** was consequently suppressed at WRC-15; past versions of the Resolution will continue to be available on the ITU website for reference[3],

noting

a) the close relation of this Resolution with Resolution **646 (Rev.WRC-15)**, on public protection and disaster relief;

b) that when a disaster occurs, the disaster relief agencies are usually the first on the scene using their day-to-day communication systems, but that in most cases other agencies and organizations may also be involved in disaster relief operations;

c) that there is a critical requirement to perform immediate spectrum management actions, including frequency coordination, sharing and spectrum reuse, within a disaster area;

d) that national spectrum planning for emergency and disaster relief should take into account the need for cooperation and bilateral consultation with other concerned administrations, which can be facilitated by spectrum harmonization, as well as agreed spectrum management guidelines pertaining to disaster relief and emergency planning;

e) that in times of disasters, radiocommunication facilities may be destroyed or impaired and the national regulatory authorities may not be able to provide the necessary spectrum management services for the deployment of radio systems for relief operations;

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* *Note by the Secretariat:* This Resolution was abrogated by WRC-15.

3 http://itu.int/go/PPDR

f) that availability of information, such as the identification of administration disaster-relief contact information, frequency availability within individual administrations within which equipment could operate, and any relevant instructions or procedures may ease the interoperability and/or interworking, with mutual cooperation and consultation, especially in national, regional and cross-border emergency situations and disaster relief activities,

noting further

a) that flexibility must be afforded to disaster relief agencies and organizations to use current and future radiocommunications, so as to facilitate their humanitarian operations;

b) that it is in the interest of administrations and disaster relief agencies and organizations to have access to updated information on national spectrum planning for emergency and disaster relief,

taking into account

that the Radiocommunication Bureau (BR) has established and maintains a database[4] containing administration contact information, available frequencies/frequency bands for use by terrestrial and space services, and any additional information or instructions relevant to emergency situations within these administrations,

resolves

1 that ITU-R continue through its study groups to study those aspects of radiocommunication/ICTs that are relevant to early warning, disaster prediction, detection, mitigation and relief operations taking into account Resolution ITU-R 55;

2 to encourage administrations to communicate to BR the relevant up-to-date administration contact information and, where available, the frequencies or frequency bands for use in emergency and disaster relief operations;

3 to reiterate to administrations the importance of having up-to-date information referred to in *resolves* 2 above available for use in the very early stages of humanitarian assistance intervention for disaster relief,

instructs the Director of the Radiocommunication Bureau

1 to support administrations in their work towards the implementation of both Resolutions 36 (Rev. Guadalajara, 2010) and 136 (Rev. Busan, 2014), as well as the Tampere Convention;

2 to coordinate activities between this Resolution and Resolution **646 (Rev.WRC-15)** in order to minimize possible overlap;

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4 The database may be accessed at http://www.itu.int/ITU-R/go/res647.

3 to continue to assist Member States with their emergency communication preparedness activities by maintaining the database[5] of information from administrations for use in emergency situations, which includes contact information and optionally includes available frequencies;

4 to facilitate online access to the database by administrations, national regulatory authorities, disaster relief agencies and organizations, in particular the United Nations Emergency Relief Coordinator, in accordance with the operating procedures developed for disaster situations;

5 to collaborate with the United Nations Office for the Coordination of Humanitarian Affairs and other organizations, as appropriate, in the development and dissemination of standard operating procedures and relevant spectrum management practices for use in the event of a disaster situation;

6 to collaborate, as appropriate, with the United Nations Working Group on Emergency Telecommunications (WGET) and the radio frequency and radio standards group under the UN Emergency Telecommunications Cluster (ETC) for which the World Food Programme (WFP) is the cluster lead;

7 to take into consideration, and collaborate in, as appropriate, all relevant activities in ITU's other two Sectors and General Secretariat;

8 to report on the progress on this Resolution to subsequent world radiocommunication conferences,

invites the ITU Radiocommunication Sector

to continue conducting studies as necessary, in accordance with *resolves* 1 and in support of developing and maintaining appropriate spectrum management guidelines applicable in emergency and disaster relief operations,

invites the Director of the Telecommunication Standardization Bureau and the Director of the Telecommunication Development Bureau

to collaborate closely with the Director of BR to ensure that a consistent and coherent approach is adopted in the development of strategies in response to emergency and disaster situations,

urges administrations

to participate in the emergency communication preparedness activities described above and to provide to BR their information and, in particular, up-to-date contact information related to emergency and disaster relief radiocommunications for inclusion in the database, taking into account Resolution ITU-R 55.

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5 The database may be accessed at http://www.itu.int/ITU R/go/res647.

RESOLUTION 655 (WRC-15)

Definition of time scale and dissemination of time signals via radiocommunication systems

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that the ITU Radiocommunication Sector (ITU-R) is responsible for defining the standard frequency and time signal service and the standard frequency and time signal-satellite service for the dissemination of time signals via radiocommunication;

b) that the International Bureau of Weights and Measures (BIPM) is responsible for establishing and maintaining the second of the International System of Units (SI) and its dissemination through the reference time scale;

c) that the definition of reference time scale and dissemination of time signals via radiocommunication systems are important for applications and equipment that require a time traceable to the reference time,

considering further

a) that ITU-R is an organization member of the Consultative Committee for Time and Frequency (CCTF) and participates in the General Conference on Weights and Measures (CGPM) as an observer;

b) that BIPM is a Sector Member of ITU-R and participates in the relevant activities of ITU-R,

noting

a) that the international reference time scale is the legal basis for time-keeping for many countries, and *de facto* is the time scale used in the majority of countries;

b) that disseminated time signals are used not only in telecommunications but also in many industries and practically all areas of human activities;

c) that time signals are disseminated by both wired communications covered by Recommendations of the ITU Telecommunication Standardization Sector (ITU-T) and by systems of different radiocommunication services (space and terrestrial), including the standard frequency and time signal service for which ITU-R is responsible,

recognizing

a) that No. **26.1** states that: “Attention should be given to the extension of this service to those areas of the world not adequately served”;

b) that No. **26.6** states that: “In selecting the technical characteristics of standard frequency and time signal transmissions, administrations shall be guided by the relevant ITU-R Recommendations”;

c) that the current definition of the international reference time scale UTC resulted from work completed in 1970 by the International Radio Consultative Committee (CCIR) of ITU, in full cooperation with CGPM;

d) that the ITU World Administrative Radio Conference 1979 (WARC-79) included UTC in the Radio Regulations, and since then UTC, as "strongly endorsed" in Resolution 5 of CGPM (1975), has been used as the main time scale for telecommunication networks (wired and wireless) and for other time-related applications and equipment,

resolves to invite the ITU Radiocommunication Sector

1 to strengthen the cooperation between ITU-R and BIPM, the International Committee for Weights and Measures (CIPM), CGPM, as well as other relevant organizations, and to carry out a dialogue concerning the expertise of each organization;

2 to further and more widely study in cooperation with the relevant international organizations, concerned industries and user groups, through the participation of the membership, the various aspects of current and potential future reference time scales, including their impacts and applications;

3 to provide advice on the content and structure of time signals to be disseminated by radiocommunication systems, using the combined expertise of the relevant organizations;

4 to prepare one or more reports containing the results of studies that should include one or more proposals to determine the reference time scale and address other issues mentioned in 1, 2 and 3 above,

resolves

that until WRC-23, UTC as described in Recommendation ITU-R TF.460-6 shall continue to apply, and for most practical purposes associated with the Radio Regulations, UTC is equivalent to mean solar time at the prime meridian (0° longitude), formerly expressed in GMT,

instructs the Director of the Radiocommunication Bureau

1 to invite the relevant international organizations such as the International Maritime Organization (IMO), the International Civil Aviation Organization (ICAO), CGPM, CIPM, BIPM, the International Earth Rotation and Reference Systems Service (IERS), the International Union of Geodesy and Geophysics (IUGG), the International Union of Radio Science (URSI), the International Organization for Standardization (ISO), the World Meteorological Organization (WMO) and the International Astronomical Union (IAU) to participate in the work mentioned in *resolves to invite the ITU Radiocommunication Sector*;

2 to report on the progress of this Resolution to WRC-23,

invites the Director of the Telecommunication Development Bureau

to assist the participation of developing countries in meetings, within approved budgetary resources,

invites administrations

to participate in the studies by submitting contributions to ITU-R,

instructs the Secretary-General

to bring this Resolution to the attention of IMO, ICAO, CGPM, CIPM, BIPM, IERS, IUGG, URSI, ISO, WMO and IAU.

RESOLUTION 656 (WRC-15)

Possible allocation to the Earth exploration-satellite service (active) for spaceborne radar sounders in the range of frequencies around 45 MHz

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that the 40-50 MHz range is allocated to the fixed, mobile and broadcasting services on a primary basis;

b) that the uses of the 40.98 to 41.015 MHz frequency range by the space research service are on a secondary basis;

c) that country footnotes in the Table of Frequency Allocations for the 40-50 MHz frequency range provide primary allocations for the aeronautical radionavigation and radiolocation services in certain parts of the world;

d) that spaceborne radars are intended to be operated only in either uninhabited or sparsely populated areas of the globe, with particular focus on deserts and polar ice fields, and only at night-time from 3 a.m. to 6 a.m. locally;

e) that Recommendation ITU-R RS.2042-0 provides typical technical and operating characteristics for spaceborne radar sounder systems using the 40-50 MHz frequency range that should be used for interference and compatibility studies,

recognizing

a) that spaceborne active radio-frequency sensors can provide unique information on physical properties of the Earth and other planets;

b) that spaceborne active remote sensing requires specific frequency ranges depending on the physical phenomena to be observed;

c) that there is an interest in using active spaceborne sensors in the vicinity of the 40-50 MHz frequency range for measurements of the Earth's subsurface to provide radar maps of subsurface scattering layers with the intent to locate water/ice/deposits;

d) that worldwide, periodic measurements of subsurface water deposits require the use of spaceborne active sensors;

e) that the 40-50 MHz frequency range is preferable to satisfy all requirements for spaceborne radar sounders,

resolves to invite the 2023 World Radiocommunication Conference

to consider the results of studies on spectrum needs for a possible new allocation to the Earth exploration-satellite (active) service for spaceborne radar sounders within the range of frequencies around 45 MHz, taking into account the protection of incumbent services, and take appropriate action,

invites ITU-R

1 to conduct studies on spectrum needs and sharing studies between the Earth exploration-satellite (active) service and the radiolocation, fixed, mobile, broadcasting and space research services in the 40-50 MHz frequency range;

2 to complete the studies, taking into account the present use of the allocated band, with a view to presenting, at the appropriate time, the technical basis for the work of WRC-23,

invites administrations

to participate actively in the studies by submitting contributions to the ITU Radiocommunication Sector,

instructs the Secretary-General

to bring this Resolution to the attention of international and regional organizations concerned.

RESOLUTION 657 (WRC-15)

Spectrum needs and protection of space weather sensors

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that space weather observations are becoming increasingly important in detecting solar activity events that could impact on services critical to the economy, safety and security of administrations;

b) that these observations are also made from platforms that may be ground-based, airborne or space-based;

c) that some of the sensors operate by receiving low-level natural emissions of the Sun or the Earth's atmosphere, and therefore may suffer harmful interference at levels which could be tolerated by other radio systems;

d) that space weather sensor technology has been developed and operational systems have been deployed without much regard for domestic or international spectrum regulations, or for the potential need for protection from interference,

recognizing

a) that no frequency bands have been documented in any manner in the Radio Regulations for space weather sensor applications;

b) that the ITU Radiocommunication Sector (ITU-R) has a Study Question ITU-R 256/7 to study the technical and operational characteristics, frequency requirements and appropriate radio service designation for space weather sensors;

c) that any regulatory action associated with space weather sensor applications should take into account incumbent services that are already operating in the frequency bands of interest,

resolves to invite the 2023 World Radiocommunication Conference

while taking into account the results of ITU-R studies and without placing additional constraints on incumbent services, to consider regulatory provisions necessary to provide protection to space weather sensors operating in the appropriately designated radio service that is to be determined during ITU-R studies,

invites ITU-R

1 to document, in time for WRC-19, the technical and operational characteristics of space weather sensors;

2 to determine, in time for WRC-19, the appropriate radio service designations for space weather sensors;

3 to conduct, in time for WRC-23, any necessary sharing studies for incumbent systems operating in frequency bands used by space weather sensors, with the objective of determining regulatory protection that can be provided while not placing additional constraints on incumbent services,

invites administrations

to participate actively in the studies and provide the technical and operational characteristics of the systems involved by submitting contributions to ITU-R,

instructs the Secretary-General

to bring this Resolution to the attention of the World Meteorological Organization (WMO) and other international and regional organizations concerned.

RESOLUTION 658 (WRC-15)

Allocation of the frequency band 50-54 MHz to the amateur service in Region 1

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that fully or partially harmonized worldwide frequency bands for radiocommunication services are desirable in order to achieve international operability;

b) that there is a need to establish sharing conditions when considering frequency bands for possible additional allocations to any service,

noting

a) that the frequency band 50-54 MHz is allocated to the amateur service on a primary basis in Region 2 and Region 3;

b) that No. **5.169** of the Radio Regulations provides for an alternative allocation to the amateur service on a primary basis in a number of countries in Region 1;

c) that No. **5.162A** of the Radio Regulations provides for an additional allocation to the radiolocation service on a secondary basis in a number of countries, limited to the operation of wind profiler radars in accordance with Resolution **217 (WRC-97)**;

d) that the frequency band 47-68 MHz is allocated to the broadcasting service on a primary basis in Region 1, and this band, or part of it, is allocated to the mobile service on a primary basis in a number of countries in Region 1;

e) that No. **5.167** of the Radio Regulations and other relevant footnotes in this frequency band provide for alternative and additional allocations to the fixed, mobile and broadcasting services on a primary basis,

resolves to invite the 2019 World Radiocommunication Conference

to consider the results of the studies below and take appropriate actions, including spectrum allocation,

invites ITU-R

1 to study spectrum needs in Region 1 for the amateur service in the frequency band 50-54 MHz;

2 taking into account the results of the above studies, to study sharing between the amateur service and the mobile, fixed, radiolocation and broadcasting services, in order to ensure protection of these services.

RESOLUTION 659 (WRC-15)

Studies to accommodate requirements in the space operation service for non-geostationary satellites with short duration missions

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that the term "short duration mission" used in this Resolution refers to a mission having a limited period of validity of not more than typically three years;

b) that examples of such satellites are given in Report ITU-R SA.2312, which provides technical characteristics;

c) that Report ITU-R SA.2348 provides an overview of the current practice and procedures for notifying space networks currently applicable to these satellites;

d) that, since the number of these satellites is growing, the demand for suitable allocations to the space operation service may increase;

e) that it is important to ensure that any satellite radio-frequency operation avoids harmful interference to other systems and services;

f) that the frequency bands below 1 GHz are used for a wide variety of terrestrial and space applications, that some of these frequency bands are heavily used and new allocations to the space operation service in these frequency bands should not put undue constraints on incumbent services;

g) that some non-amateur satellites have used frequencies for telemetry, tracking and command in the frequency bands 144-146 MHz and 435-438 MHz which are allocated to the amateur-satellite service, and that such use is not in accordance with Nos. **1.56** and **1.57**;

h) that, according to No. **1.23**, telemetry, tracking and command functions for satellites will normally be provided within the service in which the space station is operating;

i) that these satellites are constrained in terms of low on-board power and low antenna gain as described in Report ITU-R SA.2312;

j) that the bandwidth currently used by these satellites for telemetry, tracking and command in frequency bands below 1 GHz, as described in Report ITU-R SA.2312, is generally 0.1 MHz or less,

further considering

a) that these satellites may provide an affordable means to access orbital resources (spectrum and orbit) for new entrants in space;

b) that the mass and dimensions of these satellites have been some of the major contributing factors to their success among new spacefaring nations;

c) that the reliable control and tracking of satellites is important for the management of space debris,

recognizing

a) that the existing allocations to the space operation service below 1 GHz, where No. **9.21** applies, are not suitable for the satellites referred to in *considering a)* and *b)*;

b) that there are other frequency bands already allocated to the space operation service below 1 GHz where No. **9.21** does not apply;

c) the provisions contained in No. **5.266** and No. **5.267** and Resolution **205 (Rev.WRC-15)**,

resolves to invite the 2019 World Radiocommunication Conference

to consider the results of ITU-R studies and take necessary action, as appropriate, provided that the results of the studies referred to in *invites ITU-R* below are complete and agreed by ITU-R study groups,

invites ITU-R

1 to study the spectrum requirements for telemetry, tracking and command in the space operation service for the growing number of non-GSO satellites with short duration missions, taking into account No. **1.23**;

2 to assess the suitability of existing allocations to the space operation service in the frequency range below 1 GHz, taking into account *recognizing a)* and current use;

3 if studies of the current allocations to the space operations service indicate that requirements cannot be met under *invites ITU-R* 1 and 2, to conduct sharing and compatibility studies, and study mitigation techniques to protect the incumbent services, both in-band as well as in adjacent bands, in order to consider possible new allocations or an upgrade of the existing allocations to the space operation service within the frequency ranges 150.05-174 MHz and 400.15-420 MHz,

invites Member States and ITU-R Sector Members, Associates and Academia

to participate in studies by submitting contributions to ITU-R.

RESOLUTION 673 (REV.WRC-12)

The importance of Earth observation radiocommunication applications

The World Radiocommunication Conference (Geneva, 2012),

considering

a) that the collection and exchange of Earth observation data are essential for maintaining and improving the accuracy of weather forecasts, which contribute to the protection of life and preservation of property throughout the world;

b) that Earth observation data are also essential for monitoring and predicting climate changes, for disaster prediction, monitoring and mitigation, for increasing the understanding, modelling and verification of all aspects of climate change, and for related policy-making;

c) that Earth observations are also used to obtain pertinent data regarding natural resources, this being particularly crucial for the benefit of developing countries;

d) that observations of the Earth's surface are also used for a large variety of other applications (e.g. urban developments, utilities deployments, agriculture, security);

e) that many observations are performed over the entire world which require spectrum-related issues to be considered on a worldwide basis;

f) that the importance of Earth observation radiocommunication applications has been stressed by a number of international bodies such as the World Meteorological Organization (WMO), the Intergovernmental Panel on Climate Change (IPCC) and the Group on Earth Observation (GEO), and that ITU-R collaboration with these bodies is essential;

g) that, although meteorological and Earth observation satellites are currently operated by only a limited number of countries, the data and/or related analyses resulting from their operation are distributed and used globally, in particular by national weather services in developed and developing countries and by climate change-related organizations;

h) that Earth observations are performed for the benefit of the whole international community and the data are generally made available at no cost,

recalling

a) the Plan of Action of the World Summit on the Information Society (Geneva, 2003), on e-environment, calling for the establishment of monitoring systems, using information and communication technologies (ICT), to forecast and monitor the impact of natural and man-made disasters, particularly in developing countries, least developed countries and small economies;

b) Resolution 136 (Rev. Guadalajara, 2010) of the Plenipotentiary Conference, on the use of telecommunications/information and communication technologies for monitoring and management in emergency and disaster situations for early warning, prevention, mitigation and relief;

c) Resolution 182 (Guadalajara, 2010) of the Plenipotentiary Conference, on the role of telecommunications/information and communication technologies on climate change and the protection of the environment,

recognizing

a) Recommendations ITU-R RS.1859 "Use of remote sensing systems for data collection to be used in the event of natural disasters and similar emergencies" and ITU-R RS.1883 "Use of remote sensing systems in the study of climate change and the effects thereof";

b) the Report on Question ITU-D 22/2 "Utilization of ICT for disaster management, resources and active and passive space-based sensing systems as they apply to disaster and emergency relief situations";

c) joint WMO-ITU Handbook on "Use of Radio Spectrum for Meteorology: Weather, Water and Climate Monitoring and Prediction" and ITU-R Handbook on "Earth exploration-satellite service",

further recognizing

Report ITU-R RS.2178 "The essential role and global importance of radio spectrum use for Earth observations and for related applications",

noting

a) that *in situ* and remote Earth observation capabilities depend on the availability of radio frequencies under a number of radio services, allowing for a wide range of passive and active applications on satellite- or ground-based platforms (see Report ITU-R RS.2178);

b) that, according to the United Nations Framework Convention on Climate Change (UNFCCC), more than 90 per cent of natural disasters are climate- or weather-related;

c) that for certain Earth observation applications, long-term consistency of measurements is essential (e.g. climate change);

d) that certain frequency bands used by Earth observation applications have unique physical characteristics (e.g. spectral lines), so that migration to alternative frequency bands is not possible;

e) that some essential passive frequency bands are covered by No. **5.340** of the Radio Regulations;

f) that some essential passive Earth observation sensors could suffer from interference resulting in erroneous data or even complete loss of data,

resolves

1 to continue to recognize that the use of spectrum by Earth observation applications has a considerable societal and economic value;

2 to urge administrations to take into account Earth observation radio-frequency requirements and in particular protection of the Earth observation systems in the related frequency bands;

3 to encourage administrations to consider the importance of the use and availability of spectrum for Earth observation applications prior to taking decisions that would negatively impact the operation of these applications.

RESOLUTION 703 (REV.WRC-07)

Calculation methods and interference criteria recommended by ITU-R for sharing frequency bands between space radiocommunication and terrestrial radiocommunication services or between space radiocommunication services

The World Radiocommunication Conference (Geneva, 2007),

considering

a) that, in frequency bands shared with equal rights by space radiocommunication and terrestrial radiocommunication services, it is necessary to impose certain technical limitations and coordination procedures on each of the sharing services for the purpose of limiting mutual interference;

b) that, in frequency bands shared by space stations located on geostationary satellites, it is necessary to impose coordination procedures for the purpose of limiting mutual interference;

c) that the calculation methods and interference criteria relating to coordination procedures referred to in *considering a)* and *b)* are based upon ITU-R Recommendations;

d) that, in recognition of the successful sharing of the frequency bands by space radiocommunication and terrestrial radiocommunication services, and the continuing improvements in space technology and that of the Earth segment, each Radiocommunication Assembly has improved upon some of the technical criteria recommended by the preceding Assembly;

e) that the ITU Radiocommunication Assembly has approved a procedure for approving Recommendations between Radiocommunication Assemblies;

f) that the Constitution recognizes the right of Member States to make special arrangements on telecommunication matters; however, such arrangements shall not be in conflict with the terms of the Constitution, Convention or of the Regulations annexed thereto as far as harmful interference to the radio services of other countries is concerned;

g) that the use of this Resolution may reduce the need for incorporation by reference of some ITU-R Recommendations,

is of the opinion

a) that future decisions of ITU-R are likely to make further changes in the recommended calculation methods and interference criteria;

b) that the administrations should whenever possible apply the current ITU-R Recommendations on sharing criteria when planning systems for use in frequency bands shared with equal rights between space radiocommunication and terrestrial radiocommunication services, or between space radiocommunication services,

invites administrations

to submit contributions to the Radiocommunication Study Groups, providing information on practical results and experience of sharing between terrestrial and space radiocommunication services or between space services, which help to bring about significant improvements in coordination procedures, calculation methods and harmful interference thresholds, and thereby to optimize the available orbit/spectrum resources,

resolves

1 that the Director of the Radiocommunication Bureau, in consultation with Study Group Chairmen, shall annually prepare a list identifying the relevant newly approved ITU-R Recommendations relating to sharing between space radiocommunication and terrestrial radiocommunication services, or between space radiocommunication services;

2 that the Director of the Radiocommunication Bureau shall, once a year, publish this list electronically for the information of all administrations.

RESOLUTION 705 (REV.WRC-15)

Mutual protection of radio services operating in the frequency band 70-130 kHz

The World Radiocommunication Conference (Geneva,2015),

considering

a) that various radio services, including radionavigation systems used by maritime and aeronautical services, operate in frequency bands between 70 and 130 kHz;

b) that, radionavigation being a safety service, all practical steps consistent with the Radio Regulations should be taken to prevent harmful interference to any radionavigation system;

c) that the ITU-R has noted that users of phased pulse radionavigation systems in the frequency band 90-110 kHz receive no protection outside the frequency band, yet may receive benefit from their signals outside the occupied bandwidth,

noting

that ITU-R studies show:

– that for continuous wave radionavigation systems in the frequency bands 70-90 kHz and 110-130 kHz, the protection ratio should be 15 dB within the receiver passband of ±7 Hz at 3 dB;

– that phased pulse radionavigation systems require a 15 dB protection ratio within the frequency band 90-110 kHz;

– that these pulse radionavigation systems would be aided by protection ratios of 5 dB and 0 dB for frequency separations between wanted and interfering signal of 10-15 kHz and 15-20 kHz, respectively,

further noting

that the ITU-R has recommended the exchange of information between authorities operating radionavigation systems in the frequency band 90-110 kHz and those operating other systems in the frequency band 70-130 kHz employing emissions of very high stability,

recognizing

a) that radio services other than radionavigation operating in the frequency bands 70-90 kHz and 110-130 kHz fulfil essential functions that may be affected;

b) the provisions of Nos. **4.5**, **4.10**, **5.60** and **5.62**,

resolves that administrations

1 in assigning frequencies to services in the frequency bands 70-90 kHz, 90-110 kHz and 110-130 kHz, consider the potential mutual impairment to other stations operating in accordance with the Table of Frequency Allocations and apply protective measures;

2 use the relevant ITU-R Recommendations and encourage the exchange of information between authorities operating radionavigation systems in the frequency band 90-110 kHz and those operating other systems in the frequency band 70-130 kHz employing emissions of very high stability, to assist in preventing potential interference problems;

3 encourage consultation, both nationally and internationally, between operators of radionavigation systems using the frequency band 90-110 kHz and of other systems using the frequency band 70-130 kHz,

requests the ITU-R

to continue studies in this matter, particularly the development of technical criteria and standards to permit compatible operations within the allocated frequency bands.

RESOLUTION 716 (REV.WRC-12)

Use of the frequency bands 1 980-2 010 MHz and 2 170-2 200 MHz in all three Regions and 2 010-2 025 MHz and 2 160-2 170 MHz in Region 2 by the fixed and mobile-satellite services and associated transition arrangements

The World Radiocommunication Conference (Geneva, 2012),

considering

a) that WARC-92 allocated the bands 1 980-2 010 MHz and 2 170-2 200 MHz for the mobile-satellite service (MSS) with a date of entry into force of 1 January 2005, these allocations being co-primary with fixed and mobile service allocations;

b) that the use of the frequency bands 1 980-2 010 MHz and 2 170-2 200 MHz in all three Regions and 2 010-2 025 MHz and 2 160-2 170 MHz in Region 2 by the MSS, in accordance with the provisions of Nos. **5.389A** and **5.389C** of the Radio Regulations, as adopted by WRC-95 and WRC-97, is subject to a date of entry into force of 1 January 2000, 1 January 2002 (for Region 2) or 1 January 2005;

c) that these bands are shared with the fixed and mobile[1] services on a primary basis and that they are widely used by the fixed service in many countries;

d) that the studies made have shown that, while sharing of the MSS with the fixed service in the short to medium term would be generally feasible, in the long term sharing will be complex and difficult in both bands, so that it would be advisable to transfer the fixed service stations operating in the bands in question to other segments of the spectrum;

e) that for many developing countries, the use of the 2 GHz band offers a substantial advantage for their radiocommunication networks and that it is not attractive to transfer these systems to higher frequency bands because of the economic consequences that this would entail;

f) that ITU-R has developed a new frequency plan for the fixed service in the 2 GHz band, set out in Recommendation ITU-R F.1098 which will facilitate the introduction of new fixed service systems in band segments that do not overlap with the above-mentioned MSS allocations at 2 GHz;

g) that sharing between fixed service systems using tropospheric scatter and Earth-to-space links in the MSS in the same frequency band segments is generally not feasible;

h) that some countries utilize these bands in application of Article 48 of the Constitution (Geneva, 1992),

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[1] This Resolution does not apply to the mobile service. In this respect, the use of these bands by the MSS is subject to coordination with the mobile service under the provisions of No. **9.11A**, where applicable.

recognizing

a) that the bands 1 885-2 025 MHz and 2 110-2 200 MHz have been identified for worldwide use by International Mobile Telecommunications (IMT), the satellite component being limited to the bands 1 980-2 010 MHz and 2 170-2 200 MHz, and that the development of IMT can offer great potential in helping the developing countries develop more rapidly their telecommunication infrastructure;

b) that WARC-92 resolved to request the Telecommunication Development Bureau, when formulating its immediate plans for assistance to the developing countries, to consider the introduction of specific modifications in the radiocommunication networks of the developing countries and that a future world development conference should examine the needs of developing countries and should assist them with the resources needed to implement the required modifications to their radiocommunication networks,

noting

that in response to Resolution **716 (WRC-95)**, ITU-R developed Recommendation ITU-R F.1335, which provides planning tools necessary to assist those administrations considering replanning of their terrestrial networks to accommodate the MSS in the 2 GHz bands,

resolves

1 to request administrations to notify to the Radiocommunication Bureau the basic characteristics of frequency assignments to existing or planned fixed stations requiring protection, or those typical[2] of existing and planned fixed stations brought into use before 1 January 2000 in the frequency bands 1 980-2 010 MHz and 2 170-2 200 MHz in all three Regions and 2 010-2 025 MHz and 2 160-2 170 MHz in Region 2;

2 that administrations proposing to bring an MSS system into service must take account of the fact that, when coordinating their system with administrations having terrestrial services, such administrations may have existing or planned installations covered by Article 48 of the Constitution;

3 that in respect of stations of the fixed service taken into account in the application of No. **9.11A**, administrations responsible for MSS networks operating in the bands 1 980-2 010 MHz and 2 170-2 200 MHz in all three Regions and 2 010-2 025 MHz and 2 160-2 170 MHz in Region 2 shall ensure that unacceptable interference is not caused to fixed service stations notified and brought into use before 1 January 2000;

4 that to facilitate the introduction and future use of the 2 GHz bands by the MSS:

4.1 administrations are urged to ensure that frequency assignments to new fixed service systems, to be brought into operation after 1 January 2000, do not overlap with the 1 980-2 010 MHz and 2 170-2 200 MHz in all three Regions and 2 010-2 025 MHz and 2 160-2 170 MHz in Region 2 MSS allocations, for example by using the channel plans of Recommendation ITU-R F.1098;

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[2] With respect to the notification of frequency assignments to stations in the fixed and mobile services, it was possible to notify the characteristics of typical stations in the fixed service in accordance with No. **11.17** without restriction up until 1 January 2000.

4.2 administrations are urged to take all practicable steps to phase out troposcatter systems operating in the band 1 980-2 010 MHz in all three Regions and 2 010-2 025 MHz in Region 2 by 1 January 2000. New troposcatter systems shall not be brought into operation in these bands;

4.3 administrations are encouraged, where practicable, to draw up plans for the gradual transfer of the frequency assignments to their fixed service stations in the bands 1 980-2 010 MHz and 2 170-2 200 MHz in all three Regions and 2 010-2 025 MHz and 2 160-2 170 MHz in Region 2 to non-overlapping bands, giving priority to the transfer of their frequency assignments in the band 1 980-2 010 MHz in all three Regions and 2 010-2 025 MHz in Region 2, considering the technical, operational and economical aspects;

5 that administrations responsible for the introduction of mobile-satellite systems should take into account and address the concerns of affected countries, especially developing countries, to minimize the possible economic impact of transition measures in respect to existing systems;

6 to invite the Telecommunication Development Bureau to provide assistance to developing countries requesting it for the introduction of specific modifications to their radiocommunication networks that will facilitate their access to the new technologies being developed in the 2 GHz band as well as in all coordination activities;

7 that administrations responsible for the introduction of mobile-satellite systems urge their mobile-satellite system operators to participate in the protection of terrestrial fixed services especially in the least developed countries,

invites ITU-R

to conduct, as a matter of urgency, further studies, in conjunction with the Bureau, to develop and provide to administrations the necessary tools in a timely manner to assess the impact of interference in the detailed coordination of mobile-satellite systems,

invites ITU-D

to evaluate, as a matter of urgency, the financial and economic impact on the developing countries of the transfer of fixed services, and to present its results to a future competent world radiocommunication conference and/or world telecommunication development conference,

invites the Director of the Telecommunication Development Bureau

to implement *invites ITU-D* by encouraging joint activities between the relevant study groups of both ITU-D and ITU-R,

instructs the Director of the Radiocommunication Bureau

to submit a report on the implementation of this Resolution to world radiocommunication conferences.

RESOLUTION 729 (REV.WRC-07)

Use of frequency adaptive systems in the MF and HF bands*

The World Radiocommunication Conference (Geneva, 2007),

considering

a) that the efficiency of spectrum use will be improved by the use of frequency adaptive systems in the MF and HF bands shared by the fixed and the mobile services;

b) that trials and deployment of frequency adaptive systems have been under way during the past 30 years and have demonstrated the effectiveness of such systems and improved spectrum efficiency;

c) that such improved efficiency is attained through:

– shorter call set-up and improved transmission quality by selection of the most suitable assigned channels;

– reduced channel occupancy, permitting the same channels to be used by different networks, yet decreasing the probability of harmful interference;

– minimization of the transmitter power required for each transmission;

– continued optimization of the emissions owing to the sophistication of the systems;

– simple operation by the use of intelligent peripheral equipment;

– reduced need for skilled radio operators;

d) that following WRC-95, the Radiocommunication Bureau no longer undertakes examination with respect to the probability of harmful interference caused by new assignments recorded in the Master International Frequency Register (MIFR) in the non-planned bands below 28 MHz;

e) that WRC-97 introduced a means for notification of block assignments;

f) that frequency adaptive systems will actively contribute to the avoidance of interference since, when other signals are observed on the channel, the frequency adaptive system will move to another frequency,

resolves

1 that, in authorizing the operation of frequency adaptive systems in the fixed and mobile services for the MF and HF bands, administrations shall:

1.1 not make assignments in those bands:

– governed by the Appendix **25** frequency allotment Plan for the maritime mobile service or the Appendix **27** frequency allotment Plan for the aeronautical mobile (R) service;

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* This Resolution should be brought to the attention of ITU-D Study Group 2.

– shared on a co-primary basis with the broadcasting service, radiodetermination service or the amateur services;

– allocated to the radio astronomy service;

1.2 avoid use which may affect frequency assignments involving safety services made in accordance with Nos. **5.155**, **5.155A** and **5.155B**;

1.3 take into account any footnotes applicable to the proposed bands and the implications regarding compatibility;

2 that frequency adaptive systems shall automatically limit simultaneous use of frequencies to the minimum necessary for communication requirements;

3 that, with a view to avoiding harmful interference, frequency adaptive systems should evaluate the channel occupancy prior to and during operation;

4 that assignments for frequency adaptive systems shall be notified to the Bureau in accordance with the provisions of Article **11** and Appendix **4**.

RESOLUTION 731 (REV.WRC-12)

Consideration of sharing and adjacent-band compatibility between passive and active services above 71 GHz

The World Radiocommunication Conference (Geneva, 2012),

considering

a) that the changes made to the Table of Frequency Allocations by the World Radiocommunication Conference (Istanbul, 2000) in bands above 71 GHz were based on the requirements known at the time of that Conference;

b) that the passive service spectrum requirements above 71 GHz are based on physical phenomena and therefore are well known, and are reflected in the changes made to the Table of Frequency Allocations by that Conference;

c) that several bands above 71 GHz are already used by Earth exploration-satellite service (passive) and space research service (passive) because they are unique bands for the measurement of specific atmospheric parameters;

d) that there is currently only limited knowledge of requirements and implementation plans for the active services that will operate in bands above 71 GHz;

e) that, in the past, technological developments have led to viable communication systems operating at increasingly higher frequencies, and that this can be expected to continue so as to make communication technology available in the future in the frequency bands above 71 GHz;

f) that, in the future, alternative spectrum needs for the active and passive services should be accommodated when the new technologies become available;

g) that, following the revisions to the Table of Frequency Allocations by the World Radiocommunication Conference (Istanbul, 2000), sharing studies may still be required for services in some bands above 71 GHz;

h) that interference criteria for passive sensors have been developed and are given in Recommendation ITU-R RS.1029;

i) that protection criteria for radio astronomy have been developed and are given in Recommendation ITU-R RA.769;

j) that several satellite downlink allocations have been made in bands adjacent to those allocated to the radio astronomy service;

k) that, sharing criteria for active and passive services in bands above 71 GHz have not yet been fully developed within ITU-R;

l) that, in order to ensure protection of passive services above 71 GHz, the World Radiocommunication Conference (Istanbul, 2000) avoided making allocations to both active and passive services in some bands such as 100-102 GHz, 148.5-151.5 GHz and 226-231.5 GHz, so as to prevent potential sharing problems,

recognizing

that, to the extent practicable, the burden of sharing among active and passive services should be equitably distributed among the services to which allocations are made,

resolves

to invite a future competent world radiocommunication conference to consider the results of ITU-R studies referred to in *invites ITU-R* below with a view to taking the necessary action, as appropriate, in order to accommodate the emerging requirements of active services, taking into account the requirements of the passive services, in bands above 71 GHz,

urges administrations

to note the possibility of changes to Article **5** to accommodate emerging requirements for active services, as indicated in this Resolution, and to take this into account in the development of national policies and regulations,

invites ITU-R

1 to continue its studies to determine if and under what conditions sharing is possible between active and passive services in the bands above 71 GHz, such as, but not limited to, 100-102 GHz, 116-122.25 GHz, 148.5-151.5 GHz, 174.8-191.8 GHz, 226-231.5 GHz and 235-238 GHz;

2 to study means of avoiding adjacent-band interference from space services (downlinks) into radio astronomy bands above 71 GHz;

3 to take into account the principles of burden-sharing to the extent practicable in their studies;

4 to complete the necessary studies when the technical characteristics of the active services in these bands are known;

5 to develop Recommendations specifying sharing criteria for those bands where sharing is feasible,

instructs the Secretary-General

to bring this Resolution to the attention of the international and regional organizations concerned.

RESOLUTION 732 (REV.WRC-12)

Consideration of sharing between active services above 71 GHz

The World Radiocommunication Conference (Geneva, 2012),

considering

a) that the World Radiocommunication Conference (Istanbul, 2000) has made changes to the Table of Frequency Allocations above 71 GHz, following consideration of science service issues;

b) that there are several co-primary active services in some bands above 71 GHz in the Table of Frequency Allocations as revised by the World Radiocommunication Conference (Istanbul, 2000);

c) that there is still limited knowledge of characteristics of active services that may be developed to operate in bands above 71 GHz;

d) that sharing criteria for sharing between active services in bands above 71 GHz have not yet been fully developed within ITU-R;

e) that sharing between multiple co-primary active services may hinder the development of each active service in bands above 71 GHz;

f) that the technology for some active services may be commercially available earlier than for some other active services;

g) that adequate spectrum should be available for the active services for which the technology is available at a later time,

noting

that sharing criteria need to be developed and included in ITU-R Recommendations, which may be used by a future competent conference, for determining to what extent sharing between multiple co-primary active services is possible in each of the bands,

resolves

1 that appropriate measures should be taken to meet the spectrum requirements for active services for which the technology will be commercially available at a later time;

2 that sharing criteria be developed for co-primary active services in bands above 71 GHz;

3 that the sharing criteria developed should form the basis for a review of active service allocations above 71 GHz at a future competent conference, if necessary,

urges administrations

to note the possibility of changes to Article **5** to accommodate emerging requirements for active services, as indicated in this Resolution, and to take this into account in the development of national policies and regulations,

invites ITU-R

to complete the necessary studies and develop ITU-R Recommendation(s) with a view to presenting, at the appropriate time, the technical information likely to be required as a basis for the work of a future competent conference,

instructs the Secretary-General

to bring this Resolution to the attention of the international and regional organizations concerned.

RESOLUTION 739 (REV.WRC-15)

Compatibility between the radio astronomy service and the active space services in certain adjacent and nearby frequency bands

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that adjacent or nearby primary service allocations have been made to the radio astronomy service, and to various space services, such as the fixed-satellite service (FSS), radionavigation-satellite service (RNSS), mobile-satellite service (MSS) and broadcasting-satellite service (BSS), hereafter referred to as "active space services";

b) that, in many cases, the frequencies used by the radio astronomy service (RAS) are chosen to study natural phenomena producing radio emissions at frequencies fixed by the laws of nature, so shifting frequency to avoid or mitigate interference problems may not be possible;

c) that Report ITU-R SM.2091 provides a methodology for conducting, and a framework for documenting the results of, compatibility studies between active space service and the radio astronomy service band-pairs;

d) that Report ITU-R SM.2091 also provides the results of compatibility studies between the radio astronomy service and an active space service in certain adjacent and nearby frequency bands;

e) that appropriate consultation between administrations has the potential to lead to the development of innovative solutions and to the rapid deployment of systems;

f) that, for technical or operational reasons, more stringent spurious emission limits than the general limits in Appendix **3** may be required to protect the RAS from active services in specific frequency bands,

noting

a) that the additional burden of undertaking any technical examination should not be placed on the Radiocommunication Bureau;

b) that a consultation procedure, as contained in this Resolution, would not place an additional burden on the Bureau;

c) that Recommendation ITU-R M.1583 provides a methodology based on the equivalent power flux-density (epfd) concept for calculation of interference resulting from unwanted emissions from non-geostationary (non-GSO) satellite systems of the MSS or RNSS into radio astronomy stations;

d) that Recommendation ITU-R S.1586 provides a methodology based on the epfd concept for calculation of interference resulting from unwanted emissions from non-GSO systems of the FSS into radio astronomy stations;

e) that the methodology described in these Recommendations may also be used to study the case of non-GSO systems in the BSS;

f) that Recommendation ITU-R RA.1631 provides antenna patterns to be used for compatibility analyses between non-GSO systems and RAS stations, based on the epfd concept;

g) that Recommendation ITU-R RA.1513 provides acceptable levels of data loss to radio astronomy observations, stating in particular that the percentage of data loss caused by any system should be lower than 2%;

h) that some of the results documented in Report ITU-R SM.2091 may be used as threshold levels to initiate the consultation procedure;

i) that the results of successful consultation between concerned administrations would ensure that the interests of both the active and radio astronomy services are considered;

j) that measures taken by active space services to protect radio astronomy stations from interference may result in increased costs and/or reduced capabilities for those services;

k) that conversely, not taking such measures may result in additional operating costs and reduced operational effectiveness for the radio astronomy stations concerned;

l) that the implementation of additional interference mitigation measures at the radio astronomy station may increase operating costs and reduce observational effectiveness;

m) that conversely, not implementing such measures may impose upon the active space services an additional cost burden and reduction in service capability,

recognizing

a) that unwanted emissions produced by stations of the active space services may cause unacceptable interference to stations of the RAS;

b) that, although some unwanted emissions from transmitters on space stations can be controlled through careful design methods and appropriate testing procedures, other unwanted emissions, such as narrow-band spurious emissions, generated by uncontrollable and/or unpredictable physical mechanisms, may only be detected after the spacecraft is launched;

c) that there is an uncertainty in the pre-launch assessment of the levels of unwanted emissions;

d) that it is necessary to ensure an equitable sharing of burden for achieving compatibility between the active space services and the RAS;

e) that for those cases where difficulties are encountered in meeting the values in Annex 1, a consultation procedure could be used to resolve the difficulties,

resolves

1 that an administration takes all reasonable steps to ensure that any space station or satellite system being designed and constructed to operate in the frequency bands in Annex 1 meets the values given therein at any radio astronomy station operating in the corresponding frequency bands identified in this Annex;

2 that in the event that during construction and prior to launch it is determined that, after having considered all reasonable means, the unwanted emissions from the space station or satellite system cannot meet the values given in Annex 1, the administration that notified the space station or satellite system contacts, as soon as possible, the administration operating the radio astronomy station to confirm that *resolves* 1 has been fulfilled, and the concerned administrations enter into a consultation process in order to achieve a mutually acceptable solution;

3 that in the event, following the space station launch, an administration operating a radio astronomy station determines that, due to unexpected circumstances, a space station or satellite system does not meet the values for unwanted emissions given in Annex 1 at that radio astronomy station, it contacts the administration that notified the space station or satellite system so that the administration that notified the space station or satellite system confirms that *resolves* 1 has been fulfilled, and the concerned administrations enter into a consultation process in order to identify further steps with a view to achieving a mutually acceptable solution;

4 that the radio astronomy stations to be taken into account in applying *resolves* 1, 2 and 3 are those which are operating in the frequency band(s) identified in Annex 1 and which are notified before the date of reception of the advance publication information of the space station or satellite system to which this Resolution applies;

5 that the space stations or satellite systems to be considered in the application of *resolves* 1 to 4 above are those designed to operate in the space service frequency bands listed in the tables of Annex 1 for which advance publication information (API) is received by the Bureau following the entry into force of the Final Acts of the appropriate conference, as specified in these tables;

6 that the objective of the consultation process in *resolves* 1, 2 and 3 is to achieve a mutually acceptable solution, using as guidance Report ITU-R SM.2091 and any other ITU-R Recommendations deemed relevant by the concerned administrations;

7 that the Bureau shall make no examination or finding with respect to this Resolution under either Article **9** or **11**,

invites administrations

1 to take all appropriate and practicable steps, from the design phase onward, to ensure that unwanted emissions are minimized from space stations that are planned to operate in one or more space service allocations, in order to avoid exceeding the threshold levels of unwanted emissions identified in Annex 1 at any radio astronomy station;

2 to take all practicable steps, from the design phase onward, to minimize the sensitivity of radio astronomy stations to interference and to take into account the need to implement interference mitigation measures.

ANNEX 1 TO RESOLUTION 739 (REV.WRC-15)

Unwanted emission threshold levels

The unwanted emission threshold levels applicable to geostationary space stations are given in Table 1-1 in terms of power flux-density (pfd) in a reference bandwidth produced at a radio astronomy station.

In Table 1-1 the unwanted emission threshold levels given in the fourth, sixth and eighth columns (associated with the reference bandwidth contained in the adjacent columns) should be met by any geostationary space station operating in the frequency bands indicated in the second column at the radio astronomy station operating in the frequency band mentioned in the third column.

The unwanted emission threshold levels applicable to space stations of a non-geostationary system are given in Table 1-2 in terms of the equivalent power flux-density (epfd), produced at a radio astronomy station in a reference bandwidth by all the space stations in a non-geostationary satellite system that are visible to the radio astronomy station considered, not to be exceeded during a given percentage of time, over the whole sky.

In Table 1-2 the epfd value given in the fourth, sixth and eighth columns (associated with the reference bandwidths contained in the adjacent column) should be met by all the space stations of a non-geostationary satellite system operating in the frequency bands indicated in the second column at the radio astronomy station operating in the frequency band mentioned in the third column. The epfd value at a given radio astronomy station shall be evaluated by using the antenna pattern and the RAS maximum antenna gain given in Recommendation ITU-R RA.1631-0. Guidance on the calculation of epfd can be found in Recommendations ITU-R S.1586 and ITU-R M.1583. The elevation angles of the radio astronomy stations to be taken into account in the epfd calculation are those higher than the minimum elevation angle θ_{min} of the radio telescope. In the absence of such information a value of 5° shall be taken. The percentage of time during which the epfd level shall not be exceeded is mentioned in Note (1) of Table 1-2.

Some sections of Report ITU-R SM.2091 indicate levels of unwanted emissions in radio astronomy bands that certain satellite systems, by design, do not exceed.

TABLE 1-1

pfd thresholds for unwanted emissions from any geostationary space station at a radio astronomy station

Space service	Space service frequency band	Radio astronomy frequency band	Single dish, continuum observations		Single dish, spectral line observations		VLBI		Condition of application: the API is received by the Bureau following the entry into force of the Final Acts of:
			pfd(1)	Reference bandwidth	pfd(1)	Reference bandwidth	pfd(1)	Reference bandwidth	
	(MHz)	(MHz)	(dB(W/m^2))	(MHz)	(dB(W/m^2))	(kHz)	(dB(W/m^2))	(kHz)	
MSS (space-to-Earth)	387-390	322-328.6	−189	6.6	−204	10	−177	10	WRC-07
BSS MSS (space-to-Earth)	1 452-1 492 1 525-1 559	1 400-1 427	−180	27	−196	20	−166	20	WRC-03
MSS (space-to-Earth) MSS (space-to-Earth)	1 525-1 559 1 613.8-1 626.5	1 610.6-1 613.8	NA	NA	−194	20	−166	20	WRC-03
RNSS (space-to-Earth)	1 559-1 610	1 610.6-1 613.8	NA	NA	−194	20	−166	20	WRC-07
BSS FSS (space-to-Earth)	2 655-2 670	2 690-2 700	−177	10	NA	NA	−161	20	WRC-03
FSS (space-to-Earth)	2 670-2 690	2 690-2 700 (in Regions 1 and 3)	−177	10	NA	NA	−161	20	WRC-03
	(GHz)	(GHz)	–	–	–	–	–	–	
BSS	21.4-22.0	22.21-22.5	−146	290	−162	250	−128	250	WRC-03 for VLBI, and WRC-07 for other types of observation

NA: Not applicable, measurements of this type are not made in this frequency band.

(1) Integrated over the reference bandwidth with an integration time of 2 000 s.

TABLE 1-2

epfd thresholds[1] for unwanted emissions from all space stations of a non-GSO satellite system at a radio astronomy station

Space service	Space service frequency band	Radio astronomy frequency band	Single dish, continuum observations		Single dish, spectral line observations		VLBI		Condition of application: the API is received by the Bureau following the entry into force of the Final Acts of:
			epfd[2]	Reference bandwidth	epfd[2]	Reference bandwidth	epfd[2]	Reference bandwidth	
	(MHz)	(MHz)	(dB(W/m^2))	(MHz)	(dB(W/m^2))	(kHz)	(dB(W/m^2))	(kHz)	
MSS (space-to-Earth)	137-138	150.05-153	−238	2.95	NA	NA	NA	NA	WRC-07
MSS (space-to-Earth)	387-390	322-328.6	−240	6.6	−255	10	−228	10	WRC-07
MSS (space-to-Earth)	400.15-401	406.1-410	−242	3.9	NA	NA	NA	NA	WRC-07
MSS (space-to-Earth)	1 525-1 559	1 400-1 427	−243	27	−259	20	−229	20	WRC-07
RNSS (space-to-Earth)[3]	1 559-1 610	1 610.6-1 613.8	NA	NA	−258	20	−230	20	WRC-07
MSS (space-to-Earth)	1 525-1 559	1 610.6-1 613.8	NA	NA	−258	20	−230	20	WRC-07
MSS (space-to-Earth)	1 613.8-1 626.5	1 610.6-1 613.8	NA	NA	−258	20	−230	20	WRC-03

NA: Not applicable, measurements of this type are not made in this frequency band.

(1) These epfd thresholds should not be exceeded for more than 2% of time.

(2) Integrated over the reference bandwidth with an integration time of 2 000 s.

(3) This Resolution does not apply to current and future assignments of the radionavigation-satellite system GLONASS/GLONASS-M in the frequency band 1 559-1 610 MHz, irrespective of the date of reception of the related coordination or notification information, as appropriate. The protection of the radio astronomy service in the frequency band 1 610.6-1 613.8 MHz is ensured and will continue to be in accordance with the bilateral agreement between the Russian Federation, the notifying administration of the GLONASS/GLONASS-M system, and IUCAF, and subsequent bilateral agreements with other administrations.

RESOLUTION 741 (REV.WRC-15)

Protection of the radio astronomy service in the frequency band 4 990-5 000 MHz from unwanted emissions of the radionavigation-satellite service (space-to-Earth) operating in the frequency band 5 010-5 030 MHz

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that unwanted emissions from space stations of the radionavigation-satellite service (RNSS) operating in the frequency band 5 010-5 030 MHz may cause interference to the radio astronomy service (RAS) in the frequency band 4 990-5 000 MHz;

b) that WRC-2000 decided to introduce a provisional power flux-density (pfd) limit in the frequency band 4 990-5 000 MHz to protect the RAS, and invited ITU-R to conduct studies to review this limit;

c) that protection requirements for the RAS are given in Recommendations ITU-R RA.769 and ITU-R RA.1513, and are different for geostationary (GSO) and non-GSO satellite systems,

noting

a) that Recommendation ITU-R M.1583 provides a methodology based on the equivalent pfd (epfd) concept for calculation of interference resulting from unwanted emissions from non-GSO systems of the mobile-satellite service or RNSS into radio astronomy stations;

b) that Recommendation ITU-R RA.1631 provides antenna patterns and maximum antenna gain to be used for compatibility analyses between non-GSO systems and RAS stations based on the epfd concept;

c) that Recommendation ITU-R RA.1513 recommends acceptable levels of data loss to radio astronomy observations, stating in particular that the percentage of data loss caused by any system should be lower than 2%;

d) that as from the end of WRC-03, the Radiocommunication Bureau reviewed all RNSS systems for which complete coordination or notification information, as appropriate, had been received for the frequency band 5 010-5 030 MHz, and revised its findings regarding compliance with No. **5.443B**, taking into account additional information received under *resolves* 4,

resolves

1 that in order not to cause harmful interference to the RAS in the frequency band 4 990-5 000 MHz, the pfd produced in this frequency band by any GSO RNSS network operating in the 5 010-5 030 MHz frequency band shall not exceed −171 dB(W/m^2) in a 10 MHz frequency band at any radio astronomy station;

2 that in order not to cause harmful interference to the RAS in the frequency band 4 990-5 000 MHz, over the whole sky, for elevations higher than the minimum operating elevation angle θ_{min}[1] specified for the radio telescope, the epfd produced in this frequency band by all space stations within any non-GSO RNSS system operating in the 5 010-5 030 MHz frequency band shall not exceed −245 dB(W/m^2) in a 10 MHz frequency band at any radio astronomy station for more than 2% of the time, using the methodology in Recommendation ITU-R M.1583-1 and a reference antenna with a radiation pattern and maximum antenna gain given in Recommendation ITU-R RA.1631-0;

3 that the limits referred to in *resolves* 1 and 2 shall apply to RNSS systems as from 3 June 2000;

4 that administrations planning to operate a GSO or a non-GSO RNSS system in the frequency band 5 010-5 030 MHz, for which complete coordination or notification information, as appropriate, has been received by the Bureau after 2 June 2000, shall send to the Bureau the value of the maximum level of pfd as referred to in *resolves* 1 or the value of the maximum level of epfd as referred to in *resolves* 2, as appropriate.

[1] Until adoption of a definition of θ_{min} by ITU-R, and publication of notified radio astronomy observatory data, a value of 5° should be assumed in appropriate calculations.

RESOLUTION 743 (WRC-03)

Protection of single-dish radio astronomy stations in Region 2 in the 42.5-43.5 GHz band

The World Radiocommunication Conference (Geneva, 2003),

considering

a) that the band 42.5-43.5 GHz is allocated to the radio astronomy service (RAS) on a primary basis, and that both continuum and spectral line observations are conducted in this band;

b) that there are primary allocations to the fixed-satellite service (FSS) (space-to-Earth) and to the broadcasting-satellite service (BSS) in the 42-42.5 GHz band;

c) that a geostationary (GSO) FSS or BSS satellite operating in the 42-42.5 GHz band could encounter great difficulty in meeting the values given in No. **5.551I** for single-dish radio telescope observations in the 42.5-43.5 GHz band for 100% of the time;

d) that an FSS or BSS satellite or system operating in the 42-42.5 GHz band would encounter great difficulty in meeting the power flux-density (pfd) level of −153 dB(W/m^2) in any 500 kHz for GSO satellites or the equivalent pfd (epfd) level of −246 dB(W/m^2) in any 500 kHz for any non-GSO system for single-dish radio telescope spectral-line observations near the 42.5 GHz band edge of the 42.5-43.5 GHz band, even when all practicable technical or operational measures to reduce the potential for interference detrimental to the RAS stations are employed;

e) that because there are relatively few RAS stations operating single-dish telescopes in the band 42.5-43.5 GHz, and because there are expected to be relatively few FSS or BSS earth stations operating in the 42-42.5 GHz band, it may be feasible for both services to employ technical or operational measures, including but not limited to such interference mitigation techniques as geographical isolation, time sharing, etc., in order to reduce the potential for interference detrimental to the RAS stations operating in this band;

f) that, taking into account the above *considerings*, it should be feasible to rely on arrangements between concerned RAS and FSS/BSS administrations to ensure that the unwanted emissions from FSS or BSS satellites and systems in the 42-42.5 GHz band do not cause interference detrimental to RAS stations in Region 2 conducting spectral-line observations in the 42.5-42.77 GHz band,

resolves

1 that a GSO FSS or BSS satellite in the band 42-42.5 GHz shall not exceed the values given in No. **5.551I** for more than 2% of the time at any radio astronomy station in Region 2 registered as a single-dish radio telescope in the 42.5-43.5 GHz band;

2 that an administration that plans to operate a GSO FSS or BSS satellite or a non-GSO FSS or BSS system in the 42-42.5 GHz band shall take all practicable steps to avoid exceeding the pfd value of −153 dB(W/m^2) in any 500 kHz for a GSO satellite, and the epfd value of −246 dB(W/m^2) in any 500 kHz for any non-GSO system in the 42.5-42.77 GHz band, for more than 2% of the time, at the site of a radio astronomy station registered as a single-dish radio telescope in Region 2;

3 that in the event that an administration planning to operate a GSO FSS or BSS satellite or a non-GSO FSS or BSS system in the band 42-42.5 GHz has taken all practicable steps to avoid exceeding the values and percentage of time criterion in *resolves* 2 in the 42.5-42.77 GHz band, but that nevertheless would not meet them, the administration planning to operate such a satellite or systems shall enter into discussions with the administration operating the affected radio astronomy station in Region 2 to arrive at a mutually satisfactory arrangement with respect to the unwanted emissions produced into the band 42.5-42.77 GHz;

4 that *resolves* 1, 2 and 3 shall apply with respect to any radio astronomy station in Region 2 registered as a single-dish radio telescope in the band 42.5-43.5 GHz that was in operation prior to 5 July 2003 and that has been notified to the Radiocommunication Bureau before 4 January 2004, or that was notified before the date of receipt of the complete Appendix **4** information for coordination or notification, as appropriate, for an FSS or BSS satellite or system to which this Resolution applies (see Note 1);

5 that an administration notifying a radio astronomy station in Region 2 as a single-dish radio telescope after the dates provided in *resolves* 4 may seek an agreement with administrations that have authorized FSS or BSS satellites or systems to which this Resolution applies,

invites ITU-R

to conduct studies and develop Recommendations to establish the appropriate balance between the percentage of time that GSO satellites operating in the 42-42.5 GHz band exceed the single-dish values in No. **5.551I** at the site of a radio astronomy station and the associated impact on radio astronomy observations.

NOTE 1 − For purposes of No. **5.551H**, No. **5.551I** and *resolves* 4 of this Resolution, the radio astronomy stations currently under construction in Sierra Negra, Mexico, 18° 59′ N/97° 18′ W (station Volcan Sierra Negra) and San Pedro de Atacama, Chile, 23° 20′ S/67° 44′ W (station Atacama Large Millimeter Array) to conduct observations in the 42.5-43.5 GHz band, shall be considered to have been in operation prior to 5 July 2003 if they are notified to the Radiocommunication Bureau before 1 January 2005.

RESOLUTION 744 (REV.WRC-07)

Sharing between the mobile-satellite service (Earth-to-space) and the fixed and mobile services in the band 1 668.4-1 675 MHz

The World Radiocommunication Conference (Geneva, 2007),

considering

a) that WRC-03 made a global allocation to the mobile-satellite service (MSS) (Earth-to-space) in the band 1 668-1 675 MHz and a global allocation to the MSS (space-to-Earth) in the band 1 518-1 525 MHz;

b) that the band 1 668.4-1 675 MHz is also allocated to the fixed and mobile services;

c) that due to sharing conditions between MSS (space-to-Earth) and the aeronautical mobile service for telemetry in the band 1 518-1 525 MHz (see No. **5.348B**), MSS operation in the United States of America is unlikely to be feasible;

d) that the above constraints on the MSS in the band 1 518-1 525 MHz therefore limit the possible use of the band 1 668-1 675 MHz by the MSS in the United States of America;

e) that the band 1 670-1 675 MHz is used in Canada and the United States of America for the fixed and mobile services;

f) that some administrations operate transportable radio-relay systems in the band 1 668.4-1 675 MHz which could operate as part of the fixed or mobile service allocations;

g) that sharing between the mobile service and the mobile-satellite service (Earth-to-space) in the band 1 668.4-1 675 MHz has been studied in Recommendation ITU-R M.1799,

resolves

1 that the use of the band 1 668.4-1 675 MHz by systems in the mobile service is limited to transportable radio-relay systems;

2 that administrations operating transportable radio-relay systems should take into account Recommendation ITU-R M.1799, which states that, to adequately protect MSS networks, the e.i.r.p. of transportable radio-relay stations should not exceed −27 dB(W/4 kHz) in the band 1 668.4-1 675 MHz in the direction of the geostationary orbit;

3 that from 1 January 2015 administrations operating such systems in the mobile service shall limit the e.i.r.p. spectral density radiated in the direction of the geostationary orbit by these systems to −27 dB(W/4 kHz) in the band 1 668.4-1 675 MHz;

4 that, in the band 1 670-1 675 MHz, stations in the MSS shall not claim protection from stations in the fixed and mobile services operating in Canada and the United States of America;

5 that *resolves* 1, 2 and 3 do not apply to stations in the fixed and mobile services operating in Canada and the United States of America.

RESOLUTION 748 (REV.WRC-15)

Compatibility between the aeronautical mobile (R) service and the fixed-satellite service (Earth-to-space) in the frequency band 5 091-5 150 MHz

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that the allocation of the frequency band 5 091-5 150 MHz to the fixed-satellite service (FSS) (Earth-to-space) is limited to feeder links of non-geostationary-satellite (non-GSO) systems in the mobile-satellite service (MSS);

b) that the frequency band 5 000-5 150 MHz is currently allocated to the aeronautical mobile-satellite (R) service (AMS(R)S), subject to agreement obtained under No. **9.21**, and to the aeronautical radionavigation service (ARNS);

c) that WRC-07 allocated the frequency band 5 091-5 150 MHz to the aeronautical mobile service (AMS) on a primary basis subject to No. **5.444B**;

d) that the International Civil Aviation Organization (ICAO) is in the process of identifying the technical and operating characteristics of new systems operating in the AM(R)S in the frequency band 5 091-5 150 MHz;

e) that the compatibility of one AM(R)S system, to be used by aircraft operating on the airport surface, and the FSS has been demonstrated in the frequency band 5 091-5 150 MHz;

f) that ITU-R studies have examined potential sharing among the separate AMS applications and the FSS in the frequency band 5 091-5 150 MHz;

g) that the frequency band 117.975-137 MHz currently allocated to the AM(R)S is reaching saturation in certain areas of the world, and therefore that frequency band would not be available to support additional surface applications at airports;

h) that this new allocation is intended to support the introduction of applications and concepts in air traffic management which are data intensive, and which will support data links that carry safety-critical aeronautical data,

recognizing

a) that in the frequency band 5 030-5 091 MHz priority is to be given to the microwave landing system (MLS) in accordance with No. **5.444**;

b) that ICAO publishes recognized international aeronautical standards for AM(R)S systems;

c) that Resolution **114 (Rev.WRC-15)** applies to the sharing conditions between the FSS and ARNS in the frequency band 5 091-5 150 MHz,

noting

a) that the number of FSS transmitting earth stations required may be limited;

b) that the use of the frequency band 5 091-5 150 MHz by the AM(R)S needs to ensure protection of the current or planned use of this frequency band by the FSS (Earth-to-space);

c) that ITU-R studies describe methods for ensuring compatibility between the AM(R)S and FSS operating in the frequency band 5 091-5 150 MHz, and compatibility has been demonstrated for the AM(R)S system referred to in *considering e)*,

resolves

1 that any AM(R)S systems operating in the frequency band 5 091-5 150 MHz shall not cause harmful interference to, nor claim protection from, systems operating in the ARNS;

2 that any AM(R)S systems operating in the frequency band 5 091-5 150 MHz shall meet the SARPs requirements published in Annex 10 of the ICAO Convention on International Civil Aviation and the requirements of Recommendation ITU-R M.1827-1, to ensure compatibility with FSS systems operating in that frequency band;

3 that, in part to meet the provisions of No. **4.10**, the coordination distance with respect to stations in the FSS operating in the frequency band 5 091-5 150 MHz shall be based on ensuring that the signal received at the AM(R)S station from the FSS transmitter does not exceed −143 dB(W/MHz), where the required basic transmission loss shall be determined using the methods described in Recommendations ITU-R P.525-2 and ITU-R P.526-13,

invites

1 administrations to supply technical and operational criteria necessary for sharing studies for the AM(R)S, and to participate actively in such studies;

2 ICAO and other organizations to actively participate in such studies,

instructs the Secretary-General

to bring this Resolution to the attention of ICAO.

RESOLUTION 749 (REV.WRC-15)

Use of the frequency band 790-862 MHz in countries of Region 1 and the Islamic Republic of Iran by mobile applications and by other services

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that the favourable propagation characteristics of the frequency band 470-862 MHz are beneficial to provide cost-effective solutions for coverage, including large areas of low population density;

b) that the operation of broadcasting stations and base stations of the mobile service in the same geographical area may create incompatibility issues;

c) that many communities are particularly underserved compared to urban centres;

d) that applications ancillary to broadcasting are sharing the frequency band 470-862 MHz with the broadcasting service in all three Regions, and are expected to continue their operations in this frequency band;

e) that it is necessary to adequately protect, *inter alia*, terrestrial television broadcasting and other systems in this frequency band,

recognizing

a) that, in Article **5** of the Radio Regulations, the frequency band 790-862 MHz, or parts of that frequency band, is allocated, and is used on a primary basis, for various services including broadcasting;

b) that the GE06 Agreement applies in all Region 1 countries except Mongolia and in Iran (Islamic Republic of) in the frequency bands 174-230/470-862 MHz;

c) that the transition from analogue to digital television is expected to result in situations where the frequency band 790-862 MHz will be used for both analogue and digital terrestrial transmission; and the demand for spectrum during the transition period may be even greater than the stand-alone usage of analogue broadcasting systems;

d) that the switch-over to digital may result in spectrum opportunities for new applications;

e) that the timing of the switch-over to digital is likely to vary from country to country;

f) that the use of spectrum for different services should take into account the need for sharing studies;

g) that the Radio Regulations provide that the identification of a given frequency band for IMT does not preclude the use of that frequency band by any application of the services to which it is allocated and does not establish priority in the Radio Regulations;

h) that the GE06 Agreement contains provisions for the terrestrial broadcasting service and other terrestrial services, a Plan for digital TV, and the List of other primary terrestrial services;

i) that the GE06 Agreement established, for the frequency band 470-862 MHz, 16 June 2015 as the date when the transition period ended, meaning that the assignments that were in the analogue Plan are no longer protected and shall not cause unacceptable interference in countries which are Contracting Members to the Agreement;

j) that the studies carried out by ITU-R pursuant to Resolution **749 (WRC-07)**[*] showed that the potential impact of the cumulative effect of interference from base stations, which individually did not trigger the need for coordination with broadcasting, could be significant; on the other hand, the potential impact of cumulative interference might be less significant in practice;

k) that ITU-R initiated studies, with a view to developing and completing comprehensive Recommendations and Reports, in accordance with Resolution **224 (Rev.WRC-07)**, which need to take into account the cumulative effect of interference,

further recognizing

a) that the frequency band 790-862 MHz, as part of a wider frequency band, has been allocated to the mobile service in Region 3 (including Iran (Islamic Republic of)) since 1971 (prior to WRC-07);

b) that the GE06 Agreement, in its relevant Annexes, establishes the relation between digital terrestrial broadcasting, on the one hand, and other primary terrestrial services, including the aeronautical radionavigation service in the countries mentioned in No. **5.312**, on the other hand;

c) that WRC-07, under No. **5.316B**, allocated the frequency band 790-862 MHz in Region 1 to the mobile, except aeronautical mobile, service on a primary basis, and that this allocation shall come into effect as of 17 June 2015 and shall be subject to agreement obtained under No. **9.21** with respect to the aeronautical radionavigation service in countries mentioned in No. **5.312**;

d) that the frequency band 790-862 MHz in Region 1 and the frequency band 790-806 MHz in Region 3 were identified by WRC-07 for use by administrations wishing to implement International Mobile Telecommunications (IMT), whereas the frequency band 806-960 MHz in Region 3 was identified for IMT in WRC-2000;

e) that for Contracting Members to the GE06 Agreement, the use of stations of the mobile service in relation to the broadcasting service is also subject to the successful application of the procedures of the GE06 Agreement;

f) that the coordination between terrestrial services (fixed, mobile and broadcasting) in the frequency band 790-862 MHz between Iran (Islamic Republic of), on the one hand, and the other countries of Region 3, on the other hand, is a matter to be left to the administrations concerned, based on bilateral or multilateral negotiations, if it is mutually agreed by those administrations,

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[*] *Note by the Secretariat:* This Resolution was revised by WRC-15.

noting

a) that Resolution ITU-R 57 provides principles for the process of development of IMT-Advanced and that this process had already started after WRC-07;

b) that in the frequency band 790-862 MHz, Resolution **224 (Rev.WRC-15)** applies,

emphasizing

a) that the use of the frequency band 470-862 MHz by broadcasting and other primary services is also covered by the GE06 Agreement;

b) that the requirements of the different services to which the frequency band is allocated, including the mobile, aeronautical radionavigation (in accordance with No. **5.312**), fixed and broadcasting services, shall be taken into account,

taking into account

that the results of the studies carried out by ITU-R pursuant to Resolution **749 (WRC-07)*** indicate that there is a need to protect other primary terrestrial services from the mobile service in Region 1,

resolves

1 that in Region 1:

in accordance with No. **5.316B**, and based on the criteria contained in Annex 1 to this Resolution, administrations implementing the mobile service in Region 1 shall seek agreement under No. **9.21** with respect to the aeronautical radionavigation service in the countries mentioned in No. **5.312** of the Radio Regulations;

2 that for Region 1 and Iran (Islamic Republic of):

2.1 when coordination between administrations is being effected, the protection ratios applicable to the generic case NB contained in the GE06 Agreement for the protection of the broadcasting service shall be used only for mobile systems with a bandwidth of 25 kHz. If another bandwidth is used, the relevant protection ratios are to be found in Recommendations ITU-R BT.1368 and ITU-R BT.2033;

2.2 to invite administrations to take into account, *inter alia*, the results of the sharing studies conducted by ITU-R in response to Resolution **749** (**WRC-07**)*;

3 that with respect to adjacent channel interference within the frequency band 790-862 MHz:

3.1 adjacent channel interference within a given country is a national matter and needs to be dealt with by each administration as a national matter;

3.2 adjacent channel interference should be treated among administrations concerned, using mutually agreed criteria or those contained in relevant ITU-R Recommendations (see also the most recent versions of Recommendations ITU-R BT.1368, ITU-R BT.1895 and ITU-R BT.2033 when sharing with the broadcasting service is concerned), as appropriate,

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* *Note by the Secretariat:* This Resolution was revised by WRC-15.

invites administrations

to contribute further to the studies conducted by ITU-R in accordance with *recognizing k)* above,

instructs the Director of the Radiocommunication Bureau

to implement this Resolution and to take appropriate actions.

ANNEX 1 TO RESOLUTION 749 (REV.WRC-15)

The criteria for identifying potentially affected administrations with respect to the aeronautical radionavigation service in countries listed in No. 5.312

To identify potentially affected administrations when applying the procedure for seeking agreement under No. **9.21** by the mobile service with respect to the aeronautical radionavigation service (ARNS) operating in countries mentioned in No. **5.312**, as stipulated in No. **5.316B**, the coordination distances (between a base station in the mobile service and a potentially affected ARNS station) indicated below should be used.

When applying No. **5.316B**, notifying administrations may indicate in the notice sent to BR the list of administrations with which bilateral agreement has already been reached. BR shall take this into account in determining the administrations with which coordination under No. **9.21** is required.

1 Case where the mobile service is operated according to the frequency arrangement where the base stations transmit only in the frequency band 791-821 MHz and receive only in the frequency band 832-862 MHz

ARNS station	System type code	Coordination distances for receiving base stations of MS (km)	Coordination distances for transmitting base stations of MS (km)
RSBN (ground receiver)	AA8	–	70/125/175**
RLS 2 (Type 2) (aircraft receiver)	BC	70/150*	–
RLS 1 (Types 1 and 2) (ground receiver)	AB	70/125/175**	–

* The first value should be used when the notifying administration indicates in the notice form that aggregate e.i.r.p. value of all user equipment operating simultaneously with the notified base station is assumed not to exceed 21 dBm in 1 MHz. The second value should be used in other cases.

** 90% ≤ land path ≤ 100% / 50% ≤ land path < 90% / 0% ≤ land path < 50%.

2 Other cases

ARNS station	System type code	Coordination distances for MS receiving base stations (km)	Coordination distances for MS transmitting base stations (km)
RSBN	AA8	50	125/175*
RLS 2 (Type 1) (aircraft receiver)	BD	410	432
RLS 2 (Type 1) (ground receiver)	BA	50	250/275*
RLS 2 (Type 2) (aircraft receiver)	BC	150	432
RLS 2 (Type 2) (ground receiver)	AA2	50/75*	300/325*
RLS 1 (Types 1 and 2) (ground receiver)	AB	125/175*	400/450*
Other types of ARNS terrestrial station	Not applicable	125/175*	400/450*
Other types of ARNS airborne station	Not applicable	410	432

* 50% ≤ land path ≤ 100% / 0% ≤ land path < 50%.

RESOLUTION 750 (REV.WRC-15)

Compatibility between the Earth exploration-satellite service (passive) and relevant active services

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that primary allocations have been made to various space services such as the fixed-satellite service (Earth-to-space), the space operation service (Earth-to-space) and the inter-satellite service and/or to terrestrial services such as the fixed service, the mobile service and the radiolocation service, hereinafter referred to as "active services", in frequency bands adjacent or nearby to frequency bands allocated to the Earth exploration-satellite service (EESS) (passive) subject to No. **5.340**;

b) that unwanted emissions from active services have the potential to cause unacceptable interference to EESS (passive) sensors;

c) that, for technical or operational reasons, the general limits in Appendix **3** may be insufficient in protecting the EESS (passive) in specific frequency bands;

d) that, in many cases, the frequencies used by EESS (passive) sensors are chosen to study natural phenomena producing radio emissions at frequencies fixed by the laws of nature, and therefore shifting frequency to avoid or mitigate interference problems is not possible;

e) that the frequency band 1 400-1 427 MHz is used for measuring soil moisture, and also for measuring sea-surface salinity and vegetation biomass;

f) that long-term protection of the EESS in the frequency bands 23.6-24 GHz, 31.3-31.5 GHz, 50.2-50.4 GHz, 52.6-54.25 GHz and 86-92 GHz is vital to weather prediction and disaster management, and measurements at several frequencies must be made simultaneously in order to isolate and retrieve each individual contribution;

g) that, in many cases, the frequency bands adjacent or nearby to passive service frequency bands are used and will continue to be used for various active service applications;

h) that it is necessary to ensure equitable burden sharing for achieving compatibility between active and passive services operating in adjacent or nearby frequency bands,

noting

a) that the compatibility studies between relevant active and passive services operating in adjacent and nearby frequency bands are documented in Report ITU-R SM.2092;

b) that the compatibility studies between IMT systems in the frequency bands 1 375-1 400 MHz and 1 427-1 452 MHz and EESS (passive) systems in the frequency band 1 400-1 427 MHz are documented in Report ITU-R RS.2336;

c) that Report ITU-R F.2239 provides the results of studies covering various scenarios between the fixed service, operating in the frequency band 81-86 GHz and/or 92-94 GHz, and the Earth exploration-satellite service (passive), operating in the frequency band 86-92 GHz;

d) that Recommendation ITU-R RS.1029 provides the interference criteria for satellite passive remote sensing,

noting further

that, for the purpose of this Resolution:

– point-to-point communication is defined as radiocommunication provided by a link, for example a radio-relay link, between two stations located at specified fixed points;

– point-to-multipoint communication is defined as radiocommunication provided by links between a single station located at a specified fixed point (also called “hub station”) and a number of stations located at specified fixed points (also called “customer stations”),

recognizing

a) that studies documented in Report ITU-R SM.2092 do not consider point-to-multipoint communication links in the fixed service in the frequency bands 1 350-1 400 MHz and 1 427-1 452 MHz;

b) that, in the frequency band 1 427-1 452 MHz, mitigation measures, such as channel arrangements, improved filters and/or guardbands, may be necessary in order to meet the limits of unwanted emission for IMT stations in the mobile service specified in Table 1-1 of this Resolution;

c) that, in the frequency band 1 427-1 452 MHz, IMT mobile stations typically perform better than the equipment specifications as stated by relevant standards organizations, which may be taken into account in meeting the limits specified in Table 1-1 (see also sections 4 and 5 of Report ITU-R RS.2336),

resolves

1 that unwanted emissions of stations brought into use in the frequency bands and services listed in Table 1-1 below shall not exceed the corresponding limits in that table, subject to the specified conditions;

2 to urge administrations to take all reasonable steps to ensure that unwanted emissions of active service stations in the frequency bands and services listed in Table 1-2 below do not exceed the recommended maximum levels contained in that table, noting that EESS (passive) sensors provide worldwide measurements that benefit all countries, even if these sensors are not operated by their country;

3 that the Radiocommunication Bureau shall not make any examination or finding with respect to compliance with this Resolution under either Article **9** or **11**.

TABLE 1-1

EESS (passive) band	Active service band	Active service	Limits of unwanted emission power from active service stations in a specified bandwidth within the EESS (passive) band[1]
1 400-1 427 MHz	1 427-1 452 MHz	Mobile	−72 dBW in the 27 MHz of the EESS (passive) band for IMT base stations −62 dBW in the 27 MHz of the EESS (passive) band for IMT mobile stations[2, 3]
23.6-24.0 GHz	22.55-23.55 GHz	Inter-satellite	−36 dBW in any 200 MHz of the EESS (passive) band for non-geostationary (non-GSO) inter-satellite service (ISS) systems for which complete advance publication information is received by the Bureau before 1 January 2020, and −46 dBW in any 200 MHz of the EESS (passive) band for non-GSO ISS systems for which complete advance publication information is received by the Bureau on or after 1 January 2020
31.3-31.5 GHz	31-31.3 GHz	Fixed (excluding HAPS)	For stations brought into use after 1 January 2012: −38 dBW in any 100 MHz of the EESS (passive) band. This limit does not apply to stations that have been authorized prior to 1 January 2012
50.2-50.4 GHz	49.7-50.2 GHz	Fixed-satellite (E-to-s)[4]	For stations brought into use after the date of entry into force of the Final Acts of WRC-07: −10 dBW into the 200 MHz of the EESS (passive) band for earth stations having an antenna gain greater than or equal to 57 dBi −20 dBW into the 200 MHz of the EESS (passive) band for earth stations having an antenna gain less than 57 dBi
50.2-50.4 GHz	50.4-50.9 GHz	Fixed-satellite (E-to-s)[4]	For stations brought into use after the date of entry into force of the Final Acts of WRC-07: −10 dBW into the 200 MHz of the EESS (passive) band for earth stations having an antenna gain greater than or equal to 57 dBi −20 dBW into the 200 MHz of the EESS (passive) band for earth stations having an antenna gain less than 57 dBi
52.6-54.25 GHz	51.4-52.6 GHz	Fixed	For stations brought into use after the date of entry into force of the Final Acts of WRC-07: −33 dBW in any 100 MHz of the EESS (passive) band

[1] The unwanted emission power level is to be understood here as the level measured at the antenna port.

[2] This limit does not apply to mobile stations in the IMT systems for which the notification information has been received by the Radiocommunication Bureau by 28 November 2015. For those systems, −60 dBW/27 MHz applies as the recommended value.

[3] The unwanted emission power level is to be understood here as the level measured with the mobile station transmitting at an average output power of 15 dBm.

[4] The limits apply under clear-sky conditions. During fading conditions, the limits may be exceeded by earth stations when using uplink power control.

TABLE 1-2

EESS (passive) band	**Active service band**	**Active service**	**Recommended maximum level of unwanted emission power from active service stations in a specified bandwidth within the EESS (passive) band[1]**
1 400-1 427 MHz	1 350-1 400 MHz	Radiolocation[2]	−29 dBW in the 27 MHz of the EESS (passive) band
		Fixed	−45 dBW in the 27 MHz of the EESS (passive) band for point-to-point
		Mobile	−60 dBW in the 27 MHz of the EESS (passive) band for mobile service stations except transportable radio-relay stations −45 dBW in the 27 MHz of the EESS (passive) band for transportable radio-relay stations
	1 427-1 429 MHz	Space operation (E-to-s)	−36 dBW in the 27 MHz of the EESS (passive) band
	1 427-1 429 MHz	Mobile except aeronautical mobile	−60 dBW in the 27 MHz of the EESS (passive) band for mobile service stations except IMT stations and transportable radio-relay stations[3] −45 dBW in the 27 MHz of the EESS (passive) band for transportable radio-relay stations
		Fixed	−45 dBW in the 27 MHz of the EESS (passive) band for point-to-point
	1 429-1 452 MHz	Mobile	−60 dBW in the 27 MHz of the EESS (passive) band for mobile service stations except IMT stations, transportable radio-relay stations and aeronautical telemetry stations −45 dBW in the 27 MHz of the EESS (passive) band for transportable radio-relay stations −28 dBW in the 27 MHz of the EESS (passive) band for aeronautical telemetry stations[3]
		Fixed	−45 dBW in the 27 MHz of the EESS (passive) band for point-to-point
31.3-31.5 GHz	30.0-31.0 GHz	Fixed-satellite (E-to-s)[4]	−9 dBW into the 200 MHz of the EESS (passive) band for earth stations having an antenna gain greater than or equal to 56 dBi −20 dBW into the 200 MHz of the EESS (passive) band for earth stations having an antenna gain less than 56 dBi
86-92 GHz[5]	81-86 GHz	Fixed	$-41 - 14(f - 86)$ dBW/100 MHz for $86.05 \le f \le 87$ GHz −55 dBW/100 MHz for $87 \le f \le 91.95$ GHz where f is the centre frequency of the 100 MHz reference bandwidth expressed in GHz
	92-94 GHz	Fixed	$-41 - 14(92 - f)$ dBW/100 MHz for $91 \le f \le 91.95$ GHz −55 dBW/100 MHz for $86.05 \le f \le 91$ GHz where f is the centre frequency of the 100 MHz reference bandwidth expressed in GHz

Notes to Table 1-2:

[1] The unwanted emission power level is to be understood here as the level measured at the antenna port.

[2] The mean power is to be understood here as the total power measured at the antenna port (or an equivalent thereof) in the frequency band 1 400-1 427 MHz, averaged over a period of the order of 5 s.

[3] The frequency band 1 429-1 435 MHz is also allocated to the aeronautical mobile service in eight Region 1 administrations on a primary basis exclusively for the purposes of aeronautical telemetry within their national territory (No. **5.342**).

[4] The recommended maximum levels apply under clear-sky conditions. During fading conditions, these levels may be exceeded by earth stations when using uplink power control.

[5] Other maximum unwanted emission levels may be developed based on different scenarios provided in Report ITU-R F.2239 for the frequency band 86-92 GHz.

RESOLUTION 751 (WRC-07)

Use of the frequency band 10.6-10.68 GHz

The World Radiocommunication Conference (Geneva, 2007),

considering

a) that the frequency band 10.6-10.7 GHz is allocated to the Earth exploration-satellite service (EESS) (passive) and to the space research service (passive) on a primary basis;

b) that the band 10.6-10.7 GHz is of primary interest for the measurement of rain, snow, sea state, ocean wind and soil moisture;

c) that this frequency band is used by passive sensors to study natural phenomena producing radio emissions at frequencies fixed by the laws of nature, and therefore shifting frequency to avoid or mitigate interference problems may not be possible;

d) that any limitation of the operation of passive sensors in the band 10.68-10.7 GHz covered by No. **5.340** would degrade the sensitivity of those sensors;

e) that the frequency band 10.6-10.68 GHz is also allocated to the mobile, except aeronautical mobile, and the fixed services on a primary basis;

f) that experience has shown that EESS (passive) sensors currently operating in the band 10.6-10.68 GHz are facing high interference levels from the emissions of systems of active services in some parts of the world;

g) that studies have concluded that appropriate sharing criteria applicable to both passive and active services would reduce this interference to a level that would permit passive sensors to operate successfully, while allowing continuing operation of active services in the same band,

noting

that, for the purpose of this Resolution:

– point-to-point communication is defined as radiocommunication provided by a link, for example a radio-relay link, between two stations located at specified fixed points;

– point-to-multipoint communication is defined as radiocommunication provided by links between a single station located at a specified fixed point (also called “hub station”) and a number of stations located at specified fixed points (also called “customer stations”);

– automatic transmit-power control (ATPC) is a technique in which the output power of a microwave transmitter is automatically varied to compensate for path propagation conditions; in normal propagation conditions, ATPC maintains the transmitter output power at a reduced level; ATPC is characterized by its range, which is defined as the difference between the maximum and minimum values of transmitted power, and has no impact on the design of the related link,

resolves

1 to urge administrations to take all reasonable steps to comply with the sharing criteria in Tables 1 to 4 contained in Annex 1 to this Resolution when bringing into use stations in the Earth exploration-satellite service (passive), the fixed service and the mobile, except aeronautical mobile, service, noting that EESS (passive) sensors provide worldwide measurements that benefit all countries, even if these sensors are not operated by their country;

2 that the Radiocommunication Bureau shall not make any examination or finding with respect to compliance with this Resolution under either Article **9** or **11**.

ANNEX 1 TO RESOLUTION 751 (WRC-07)

Sharing criteria in the band 10.6-10.68 GHz

TABLE 1

Earth exploration-satellite service (passive)

Parameter	Value
Incidence angle (defined as the angle at the Earth's surface between the local vertical and the direction of the passive sensor)	≤ 60°
Spatial resolution (defined as the maximum cross-section of the passive sensor −3 dB contour on the Earth's surface)	≤ 50 km (See Note 1)
Main-beam efficiency (defined as the energy of main and cross-polarization components within 2.5 times the −3 dB beamwidth region, relative to the total energy within all angles)	≥ 85% (See Note 1)

NOTE 1 − These parameters only apply to real-aperture EESS (passive) systems.

TABLE 2

Stations of point-to-point systems in the fixed service

Parameter	Value
Maximum elevation angle	20°
Maximum transmitter power at the antenna port	−15 dBW (See Notes 2 and 3)

NOTE 2 − In the case of point-to-point systems using ATPC, the maximum transmitter power at the antenna port may be increased by a value corresponding to the ATPC range, up to a maximum of −3 dBW.

NOTE 3 − In the case of point-to-point fixed service used for unidirectional transmissions for broadcasting applications, the maximum transmitter power at the antenna port may be increased up to −3 dBW. For such applications, administrations are urged to limit the off-axis e.i.r.p. above 20° elevation to a level of −10 dBW.

TABLE 3

Stations of point-to-multipoint systems in the fixed service

Parameter	Value
Hub stations (See Note 4)	
Maximum transmitter power at the antenna port	−7 dBW
Maximum off-axis e.i.r.p. above 20° from the horizontal plane	−6 dBW
Maximum off-axis e.i.r.p. above 45° from the horizontal plane	−11 dBW
Maximum off-axis e.i.r.p. at 90° from the horizontal plane	−13 dBW
Customer stations (See Note 4)	
Maximum elevation angle	20°
Maximum transmitter power at the antenna port	−8 dBW
Maximum off-axis e.i.r.p. above 45° from the horizontal plane	−18 dBW (See Note 5)

NOTE 4 − Administrations planning point-to-multipoint deployment in the band 10.6-10.68 GHz, paired with another frequency band, are encouraged to only deploy return links (i.e. emissions from customer stations) in the 10.6-10.68 GHz band.

NOTE 5 − In the case of point-to-multipoint systems using ATPC, the maximum transmitter power at the antenna port may be increased by a value corresponding to the ATPC range, up to a maximum of −3 dBW.

TABLE 4

Stations in the mobile service

Parameter	Value
Maximum transmitter power at the antenna port	−17 dBW (See Note 6)

NOTE 6 − In the case of mobile service systems used for broadcasting applications, the maximum transmitter power at the antenna port may be increased up to −3 dBW. For such applications, administrations are urged to limit the off-axis e.i.r.p. above 20° elevation to a level of −10 dBW.

RESOLUTION 752 (WRC-07)

Use of the frequency band 36-37 GHz

The World Radiocommunication Conference (Geneva, 2007),

considering

a) that the frequency band 36-37 GHz is allocated to the Earth exploration-satellite service (EESS) (passive) and to the space research service (passive) on a primary basis;

b) that the band 36-37 GHz is of primary interest for the measurement of rain, snow, ocean ice and water vapour;

c) that this frequency band is used by passive sensors to study natural phenomena producing radio emissions at frequencies fixed by the laws of nature, and therefore shifting frequency to avoid or mitigate interference problems may not be possible;

d) that the frequency band 36-37 GHz is also allocated to the fixed service and to the mobile service on a primary basis;

e) that the EESS (passive) operating in the band 36-37 GHz may suffer from interference from the emissions of systems of active services;

f) that studies have concluded that appropriate sharing criteria applicable to both passive and active services would reduce this interference to a level that would permit passive sensors to operate successfully in this band, while allowing continuing operation of active services in the same band,

noting

that, for the purpose of this Resolution:

– point-to-point communication is defined as radiocommunication provided by a link, for example a radio-relay link, between two stations located at specified fixed points;

– point-to-multipoint communication is defined as radiocommunication provided by links between a single station located at a specified fixed point (also called “hub station”) and a number of stations located at specified fixed points (also called “customer stations”);

– automatic transmit-power control (ATPC) is a technique in which the output power of a microwave transmitter is automatically varied to compensate for path propagation conditions; in normal propagation conditions, ATPC maintains the transmitter output power at a reduced level; ATPC is characterized by its range, which is defined as the difference between the maximum and minimum values of transmitted power,

resolves

1 that, in order to facilitate sharing between active and passive services in the band 36-37 GHz, EESS (passive) stations brought into use after the date of entry into force of the Final Acts of WRC-07 shall comply with the sharing criteria contained in Table 1 of Annex 1 to this Resolution;

2 that, in order to facilitate sharing between active and passive services in the band 36-37 GHz, stations of point-to-point systems in the fixed service brought into use after 1 January 2012 shall comply with the sharing criteria contained in Table 2 of Annex 1 to this Resolution;

3 that, in order to facilitate sharing between active and passive services in the band 36-37 GHz, stations of point-to-multipoint systems in the fixed service brought into use after the date of entry into force of Final Acts of WRC-07 shall comply with the sharing criteria contained in Table 2 of Annex 1 to this Resolution;

4 that, in order to facilitate sharing between active and passive services in the band 36-37 GHz, stations in the mobile service brought into use after the date of entry into force of the Final Acts of WRC-07 shall comply with the sharing criteria contained in Table 3 of Annex 1 to this Resolution;

5 that the Radiocommunication Bureau shall not make any examination or finding with respect to compliance with this Resolution under either Article **9** or **11**.

ANNEX 1 TO RESOLUTION 752 (WRC-07)

Sharing criteria in the band 36-37 GHz

TABLE 1

Earth exploration-satellite service (passive)

Parameter	Value
Incidence angle (defined as the angle at the Earth's surface between the local vertical and the direction of the passive sensor)	≤ 60°
Spatial resolution (defined as the maximum cross-section of the passive sensor −3 dB contour on the Earth's surface)	≤ 50 km (See Note 1)
Main-beam efficiency (defined as the energy of main and cross-polarization components within 2.5 times the −3 dB beamwidth region, relative to the total energy within all angles)	≥ 92% (See Note 1)

NOTE 1 − These parameters only apply to real-aperture EESS (passive) systems.

TABLE 2

Fixed service

Parameter	Value
Maximum elevation angle	20°
Point-to-point systems Maximum transmitter power at the antenna port	 −10 dBW (See Note 2)
Point-to-multipoint systems Maximum transmitter power at the antenna port of hub stations Maximum transmitter power at the antenna port of customer stations	 −5 dBW −10 dBW (See Note 2)

NOTE 2 − In the case of fixed service systems using ATPC, the maximum transmitter power at the antenna port may be increased by a value corresponding to the ATPC range, up to a maximum of −7 dBW.

TABLE 3

Mobile service

Parameter	Value
Maximum transmitter power at the antenna port	−10 dBW (See Note 3)

NOTE 3 − The maximum transmitter power at the antenna port may be increased up to −3 dBW for stations used for public safety and disaster management.

RESOLUTION 759 (WRC-15)

Technical studies on the coexistence of the radiolocation service and the amateur, amateur-satellite and radio astronomy services in the frequency band 76-81 GHz

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that the frequency band 77.5-78 GHz is allocated to the amateur and amateur-satellite services on a primary basis;

b) that the frequency band 77.5-78 GHz is allocated to the radio astronomy service (RAS) on a secondary basis;

c) that this conference has allocated the frequency band 77.5-78 GHz to the radiolocation service on a primary basis;

d) that under No. **5.149**, administrations, in making assignments to stations of services other than radio astronomy to which the frequency band 76-86 GHz is allocated, are urged to take all practicable steps to protect the RAS from harmful interference,

noting

a) that the allocation of the frequency band 76-81 GHz to the radiolocation service is used by radar applications and that a radar station may use the entire frequency band 76-81 GHz;

b) that technical parameters of radars for automotive applications are contained in Recommendation ITU-R M.2057;

c) that sharing studies between the amateur, amateur-satellite and radio astronomy services and the radiolocation service are limited to automotive radars as described in Report ITU-R M.2322,

recognizing

a) that administrations may benefit from the availability of studies and guidelines about the protection of the RAS in the frequency band 76-81 GHz;

b) that the protection of the RAS, in accordance with *considering d)*, may require additional measures in some countries, such as the definition of specific exclusion zones around RAS sites,

resolves to invite the ITU Radiocommunication Sector

to perform studies to assist administrations in ensuring compatibility between applications of the amateur, amateur-satellite and radio astronomy services and radiolocation service applications in the frequency band 76-81 GHz, taking into account those already completed in Report ITU-R M.2322, and develop ITU-R Recommendations and Reports, as appropriate.

RESOLUTION 760 (WRC-15)

Provisions relating to the use of the frequency band 694-790 MHz in Region 1 by the mobile, except aeronautical mobile, service and by other services

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that the favourable propagation characteristics of the frequency band 694-790 MHz are beneficial in providing cost-effective solutions for coverage;

b) that the ITU Radiocommunication Sector (ITU-R) carried out studies, in accordance with Resolution **232 (WRC-12)**[*], on the compatibility between the mobile service and other services currently allocated in the frequency band 694-790 MHz;

c) that it is necessary to adequately protect all primary services in the frequency band 694-790 MHz and in adjacent frequency bands;

d) that Report ITU-R BT.2339 provides elements on co-channel sharing and compatibility between digital terrestrial television broadcasting and International Mobile Telecommunications (IMT) in the frequency band 694-790 MHz in the GE06 planning area which administrations can use in the development of their bilateral agreements;

e) that the frequency band 645-862 MHz is allocated on a primary basis to the aeronautical radionavigation service (ARNS) in the countries listed in No. **5.312**;

f) that, in some countries, applications ancillary to broadcasting and programme-making are operating in the frequency band 470-862 MHz or in parts of that band and are expected to continue such operations;

g) that, in some countries, the implementation of IMT in the frequency band 694-790 MHz may affect the availability of frequencies for applications ancillary to broadcasting and programme-making,

recognizing

a) that, in Article **5** of the Radio Regulations, the frequency band 694-790 MHz, or parts of that band, is allocated, and is used on a primary basis, for various services;

b) that the GE06 Agreement applies in all Region 1 countries except Mongolia and in Iran (Islamic Republic of) in the frequency bands 174-230/470-862 MHz;

c) that, in the frequency band 694-790 MHz, Resolution **224 (Rev.WRC-15)** applies;

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[*] *Note by the Secretariat:* This Resolution was abrogated by WRC-15.

d) that WRC-12, through Resolution **232 (WRC-12)***, allocated the frequency band 694-790 MHz in Region 1 to the mobile, except aeronautical mobile, service on a primary basis, subject to agreement obtained under No. **9.21** with respect to the ARNS in countries listed in No. **5.312**, and requested this conference to specify technical and regulatory conditions applicable to the mobile service allocation, as appropriate, taking into account the ITU-R studies;

e) that the identification of a given frequency band for IMT in the Radio Regulations does not preclude the use of that band by any application of the services to which it is allocated and does not establish priority in the Radio Regulations;

f) that interference generated and received within a given country is a national matter and needs to be dealt with by each administration as a national matter;

g) that adjacent channel interference generated in one country and affecting a neighbouring country needs to be mutually considered;

h) that Recommendation ITU-R M.2090 provides specific unwanted emission limits of IMT mobile stations operating in the frequency band 694-790 MHz in order to facilitate protection of existing services in the frequency band 470-694 MHz in Region 1;

i) that Recommendation ITU-R M.1036 provides frequency arrangements for implementation of the terrestrial component of IMT in the frequency bands identified for IMT in the Radio Regulations, and provides frequency arrangements in the frequency band 694-960 MHz;

j) that the studies carried out by ITU-R pursuant to Resolution **232 (WRC-12)*** showed that the potential impact of the cumulative effect of interference from base stations, which individually did not trigger the need for coordination with broadcasting, could be significant; on the other hand, the potential impact of cumulative interference might be less significant in practice;

k) that bilateral coordination agreements have already been reached and will be used by administrations as an agreement obtained under No. **9.21** with respect to ARNS in countries listed in No. **5.312**;

l) that in Region 1, a number of countries have deployments of applications ancillary to broadcasting and programme-making which provide tools for daily content production for the broadcasting service,

noting

a) that while some administrations may decide to use all or part of the frequency band 694-790 MHz for IMT, other countries may continue to operate other services to which the band is also allocated;

b) that the timing of the deployment of IMT in the frequency band 694-790 MHz is likely to vary from country to country;

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* *Note by the Secretariat:* This Resolution was abrogated by WRC-15.

c) that parts of Region 1 have successfully completed or committed to completing modification of the GE06 Digital Plan in the frequency band 470-790 MHz in order to harmonize the use of the frequency band 694-790 MHz for IMT, while other parts of Region 1 have not started;

d) that a digital entry in the GE06 Plan may also be used for transmissions in the mobile service under the conditions set out in § 5.1.3 of the GE06 Agreement;

e) that, in some countries, applications ancillary to broadcasting and programme-making may be operated in parts of the frequency band 694-790 MHz;

f) that ITU-R studies regarding possible solutions for global/regional harmonization of frequency bands and tuning ranges for electronic news gathering (ENG)[1] are needed and Resolution ITU-R 59 provides the framework for such studies,

resolves

1 that use of the frequency band 694-790 MHz in Region 1 by the mobile, except aeronautical mobile, service is subject to agreement obtained under No. **9.21** with respect to ARNS in countries listed in No. **5.312**, in which regard the criteria for identifying affected administrations under No. **9.21** for the mobile service with respect to the ARNS in the frequency band 694-790 MHz are set out in the Annex to this Resolution;

2 that, for Region 1 and Iran (Islamic Republic of):

2.1 when coordination between administrations is being effected, the protection ratios applicable to the generic case NB contained in the GE06 Regional Agreement for the protection of the broadcasting service shall be used only for mobile systems with a bandwidth of 25 kHz; if another bandwidth is used, the relevant protection ratios are to be found in Recommendations ITU-R BT.1368 and ITU R BT.2033;

2.2 to invite administrations to take into account, *inter alia*, the results of the sharing studies conducted by ITU-R in response to Resolution **232 (WRC-12)**[*];

3 that, with respect to adjacent channel interference between the mobile service in the frequency band 694-790 MHz and the broadcasting service in the frequency band 470-694 MHz:

3.1 adjacent channel interference within a given country is a national matter and needs to be dealt with by each administration as a national matter;

3.2 adjacent channel interference should be treated among administrations concerned, using mutually agreed criteria or those contained in relevant ITU-R Recommendations (see also the most recent versions of Recommendations ITU-R BT.1368, ITU-R BT.1895 and ITU-R BT.2033, as well as ITU-R M.2090 when sharing with the broadcasting service is concerned), as appropriate,

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[1] ENG within Resolution ITU-R 59 represents all applications ancillary to broadcasting, such as terrestrial electronic news gathering, electronic field production, TV outside broadcast, wireless radio microphones and radio outside production and broadcast.

[*] *Note by the Secretariat:* This Resolution was abrogated by WRC-15.

invites the ITU Radiocommunication Sector

1 to consider the information received about the implementation of IMT in the frequency band 694-790 MHz and develop ITU-R Reports, as appropriate;

2 to pursue studies on the implementation of applications ancillary to broadcasting and programme-making on the basis of Resolution ITU-R 59,

invites the Director of the Radiocommunication Bureau

to work, in cooperation with the Director of the Telecommunication Development Bureau, to bring assistance to developing countries wishing to implement the new mobile allocation in order to help these administrations to determine the modifications of the GE06 entries according to their needs,

invites administrations

1 to provide information to ITU-R about the implementation of IMT in the frequency band 694-790 MHz, including, for example, implementation of measures for interference mitigation;

2 to communicate on a bilateral basis in order to eliminate possible cumulative interference, as appropriate;

3 to consider the use of applications ancillary to broadcasting and programme-making in those parts of the frequency band 694-790 MHz that are not used for other applications in the mobile service or other primary services,

instructs the Director of the Radiocommunication Bureau

to implement this Resolution and to take appropriate actions.

ANNEX TO RESOLUTION 760 (WRC-15)

Criteria for identifying potentially affected administrations in the frequency band 694-790 MHz with respect to the aeronautical radionavigation service for countries listed in No. 5.312

To identify affected administrations when applying the procedure for seeking agreement under No. **9.21** by the mobile service (MS) with respect to the aeronautical radionavigation service (ARNS) operating in countries mentioned in No. **5.312**, the coordination distances (between a base station in the MS and a potentially affected ARNS station) indicated below should be used.

Notifying administrations may indicate in the notice sent to the Radiocommunication Bureau (BR) the list of administrations with which bilateral agreement has already been reached. BR shall take this into account in determining the administrations with which coordination under No. **9.21** is required.

1 Case of mobile service usage under the frequency allocation plans when base stations transmit only in the frequency band 758-788 MHz and receive signals only in the frequency band 703-733 MHz

TABLE 1

ARNS station	System type code	Coordination distances for the receiving MS base stations (km)	Coordination distances for the transmitting MS base stations (km)
RSBN (ground receiver)	AA8	-	70/125/175*

* 90% ≤ land path ≤ 100% / 50% ≤ land path < 90% / 0% ≤ land path < 50%.

2 Other cases

TABLE 2

ARNS station	System type code	Coordination distances for the receiving MS base stations (km)**	Coordination distances for the transmitting MS base stations (km)
RSBN	AA8	50	125/175*
RLS 2 (type 1) (airborne receiver)	BD	410	432
RLS 2 (type 1) (ground receiver)	BA	50	250/275*
RLS 2 (type 2) (airborne receiver)	BC	150	432
RLS 2 (type 2) (ground receiver)	AA2	50/75*	300/325*
RLS 1 (types 1 and 2) (ground receiver)	AB	125/175*	400/450*
Other ARNS ground stations	Not applied	125/175*	400/450*
Other ARNS airborne stations	Not applied	410	432

* 50% ≤ land path ≤ 100% / 0% ≤ land path < 50%.

** Coordination distances for the receiving MS base stations are based on protection of ARNS stations from the stations in the mobile service and do not ensure protection for receiving base stations of MS from ARNS stations.

RESOLUTION 761 (WRC-15)

Compatibility of International Mobile Telecommunications and broadcasting-satellite service (sound) in the frequency band 1 452-1 492 MHz in Regions 1 and 3

The World Radiocommunication Conference (Geneva, 2015),

noting

a) Recommendation ITU-R M.1459, "Protection criteria for telemetry systems in the aeronautical mobile service and mitigation techniques to facilitate sharing with geostationary broadcasting-satellite and mobile-satellite services in the frequency bands 1 452-1 525 MHz and 2 310-2 360 MHz";

b) that ITU Radiocommunication Bureau (ITU-R) studies provide useful information on the power flux-density (pfd) level to protect broadcasting-satellite service (BSS) earth stations that could be used for coordination purposes,

recognizing

a) that the frequency band 1 452-1 492 MHz is allocated to BSS (sound) and the mobile service (MS) on a primary basis;

b) that the sharing conditions between BSS (sound) and MS are currently governed by No. **9.11**;

c) that the application of No. **9.11** does not provide long-term stability for the operation of International Mobile Telecommunications (IMT) due to the fact that only the IMT systems that would come into operation within the next three years would be protected if their coordination is agreed, and only for those three years;

d) that coordination requests for BSS (sound) in the frequency band 1 467-1 492 MHz have been submitted to the ITU Radiocommunication Bureau, moreover some BSS (sound) satellite systems are planned to be launched before WRC-19,

taking into account

a) that currently there is no power flux-density (pfd) limit for the frequency band 1 452-1 492 MHz in Article **21** to protect MS (service area protection);

b) that agreement was not reached at this conference on the results of technical and regulatory studies so far carried out on sharing of the frequency band 1 452-1 492 MHz by IMT and BSS;

c) that there is no pfd limit at the border for IMT systems, and IMT systems which will be deployed in this frequency band will have to apply the coordination procedure under No. **9.19** in order to protect BSS (sound) systems deployed in neighbouring countries,

further recognizing

a) that this conference has identified the frequency band 1 452-1 492 MHz for IMT on a worldwide basis;

b) that compatibility studies need to be completed in order to establish appropriate sharing criteria between BSS (sound) and MS in the frequency band 1 452-1 492 MHz,

resolves to invite ITU-R

1 to conduct, in time for WRC-19, the appropriate regulatory and technical studies, with a view to ensuring the compatibility of IMT and BSS (sound) in the frequency band 1 452-1 492 MHz in Regions 1 and 3, taking into account IMT and BSS (sound) operational requirements;

2 to prepare, *inter alia*, the regulatory action that could be taken, based on the studies carried out under *resolves to invite ITU-R* 1 above, in order to facilitate the long-term stability of IMT and BSS (sound) in the frequency band 1 452-1 492 MHz,

invites the 2019 World Radiocommunication Conference

to consider the above-mentioned results and to take necessary actions, as appropriate,

invites Member States

1 to actively participate in the ITU-R activities with regard to the studies referred to above;

2 in Region 1, to use guidance from the ITU-R studies to determine the need for bilateral coordination between IMT systems and BSS earth stations, taking into account *noting b)*, until WRC-19 defines regulatory and technical conditions for this bilateral coordination;

3 in Region 3, to use guidance from ITU-R studies to determine the need for bilateral coordination to protect BSS earth stations, taking into account *noting b)*, until WRC-19 defines regulatory and technical conditions for this bilateral coordination,

instructs the Director of the Radiocommunication Bureau

to report to WRC-19, under agenda item 9.1, the results of the studies referred to in *resolves to invite ITU-R* 1.

RESOLUTION 762 (WRC-15)

Application of power flux-density criteria to assess the potential for harmful interference under No. 11.32A for fixed-satellite and broadcasting-satellite service networks in the 6 GHz and 10/11/12/14 GHz frequency bands not subject to a Plan

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that the 6 GHz and 10/11/12/14 GHz frequency bands, not subject to a Plan, are extensively used with operational satellites about every 2-3° around the geostationary-satellite orbit;

b) that there are currently a very large number of satellite networks submitted to the ITU Radiocommunication Sector for these frequency bands;

c) that the above factors have led to significant difficulties for administrations to introduce new satellite networks;

d) that more precise criteria to assess the probability of harmful interference under No. **11.32A** have the potential to reduce undue protection requirements for assignments in respect of incoming assignments;

e) that due to the congestion in these frequency bands as well as advances in technology and applications in these frequency bands, practical satellite implementations are seen in practice to use relatively homogeneous technical parameters;

f) that use of more homogeneous technical parameters will facilitate efficient spectrum usage and support the introduction of new networks;

g) that the use of power flux-density (pfd) thresholds will encourage use of more homogeneous technical parameters and support efficient spectrum usage,

resolves

1 that, for satellite networks operating in the frequency bands 5 725-5 850 MHz (Region 1), 5 850-6 725 MHz and 7 025-7 075 MHz (Earth-to-space) having a nominal orbital separation in the geostationary-satellite orbit of more than 7°, assignments for a fixed-satellite service (FSS) satellite network with respect to other FSS networks do not have the potential to cause harmful interference if the pfd produced at the location in the geostationary-satellite orbit of the other FSS network under assumed free-space propagation conditions does not exceed −204.0 dB(W/(m^2 · Hz))*;

2 that, in the frequency bands 10.95-11.2 GHz, 11.45-11.7 GHz, 11.7-12.2 GHz (Region 2), 12.2-12.5 GHz (Region 3), 12.5-12.7 GHz (Regions 1 and 3) and 12.7-12.75 GHz (space-to-Earth), assignments for an FSS or broadcasting-satellite service (BSS) satellite network not subject to a Plan with respect to other FSS or BSS networks not subject to a Plan having a nominal orbital separation in the geostationary-satellite orbit of more than 6° do not have the potential to cause harmful interference if the pfd produced under assumed free-space propagation conditions does not exceed the threshold values shown below*, anywhere within the service area of the potentially affected assignment:

5.8°	< θ ≤	20.9°	−187.2 + 25log(θ/5)	dB(W/(m^2 · Hz))
20.9°	< θ		−171.67	dB(W/(m^2 · Hz))

where θ is the minimum orbital separation in the geostationary-satellite orbit, in degrees, between the wanted and interfering space stations, taking into account the longitudinal station-keeping tolerance;

* NOTE – The pfd thresholds were derived from the parameters shown below.

Downlink		**10/11/12 GHz**
Earth station antenna diameter	N/A	0.45-11 m
Earth station antenna diagram	N/A	Main lobe: According to Appendix **8**, Section III Sidelobes: 29−25logθ dBi (Recommendation ITU-R BO.1213, which implements these main and sidelobe characteristics, was used in deriving the pfd threshold)
Earth station noise temperature	N/A	125 K
Earth station antenna efficiency	N/A	70%
Equivalent Δ*T*/*T*	N/A	6%
Uplink	**6 GHz**	**14 GHz**
Maximum satellite G/T	0 dB/K	11 dB/K
Equivalent Δ*T*/*T*	6%	6%

3 that, for satellite networks operating in the frequency band 13.75-14.5 GHz (Earth-to-space) having a nominal orbital separation in the geostationary-satellite orbit of more than 6°, assignments for an FSS satellite network with respect to other FSS satellite networks do not have the potential to cause harmful interference if the pfd produced at the location in the geostationary-satellite orbit of the other FSS satellite network under assumed free-space propagation conditions does not exceed −208 dB(W/(m^2 · Hz))*,

4 that as of 1 January 2017 the Bureau and administrations shall apply this Resolution,

instructs the Director of the Radiocommunication Bureau

to include in his report, for consideration by WRC-19, the results and any potential difficulties relating to the implementation of this Resolution.

RESOLUTION 763 (WRC-15)

Stations on board sub-orbital vehicles

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that the radio spectrum is a limited resource;

b) that the boundary between the Earth's atmosphere and space is usually assumed to be 100 kilometres above the Earth's surface;

c) that some vehicles, including aircraft, are being developed which can fly at altitudes of over 100 km into sub-orbital trajectories;

d) that other vehicles may also operate at altitudes over 100 km and use non-orbital trajectories;

e) that some of these vehicles reach space and after releasing the spacecraft, accelerate away and land on Earth as a sub-orbital space flight;

f) that stations onboard sub-orbital vehicles may be using frequencies allocated to space and terrestrial services for the purpose of telemetry, tracking and command (TT&C) and voice communications,

recognizing

that the current regulatory provisions and procedures for terrestrial and space services may not be adequate for international recognition of the use of relevant frequency assignments by stations on board sub-orbital vehicles,

recognizing further

that the spectrum requirements for TT&C and voice communications on stations on board sub-orbital vehicles have not been studied,

noting

a) Question ITU-R 259/5, on Operational and radio regulatory aspects for planes operating in the upper level of the atmosphere;

b) that provisions of No. **4.10** may apply for certain aspects of these operations,

resolves to invite the ITU Radiocommunication Sector

1 to conduct studies to identify any required technical and operational measures, in relation to stations on board sub-orbital vehicles, that could assist in avoiding harmful interference between radiocommunication services;

2 to conduct studies to determine spectrum requirements and, based on the outcome of those studies, to consider a possible future agenda item for WRC-23;

3 to complete the studies within the next ITU Radiocommunication Sector (ITU-R) study cycle,

instructs the Director of the Radiocommunication Bureau

1 to bring this Resolution to the attention of the ITU-R study groups;

2 to include in his report, for consideration by WRC-19, the results of the ITU-R studies referred to in *resolves to invite the ITU Radiocommunication Sector* above,

invites administrations

to participate actively in the studies by submitting contributions to ITU-R,

instructs the Secretary-General

to bring this Resolution to the attention of the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS) and International Civil Aviation Organization (ICAO) and other international and regional organizations concerned.

RESOLUTION 764 (WRC-15)

Consideration of the technical and regulatory impacts of referencing Recommendations ITU-R M.1638-1 and ITU-R M.1849-1 in Nos. 5.447F and 5.450A of the Radio Regulations

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that the frequency bands 5 250-5 350 MHz and 5 470-5 725 MHz are allocated worldwide on a primary basis to the radiolocation service;

b) that WRC-03 allocated the frequency bands 5 150-5 350 MHz and 5 470-5 725 MHz on a primary basis to the mobile service for the implementation of wireless access systems (WAS) including radio local area networks (RLANs);

c) that Resolution **229 (Rev.WRC-12)** defines the conditions for the use of the frequency bands 5 150-5 250 MHz, 5 250-5 350 MHz and 5 470-5 725 MHz by the mobile service for the implementation of WAS including RLANs while protecting existing primary services;

d) that No **5.447F** states that in the frequency band 5 250-5 350 MHz, stations in the mobile service shall not claim protection from the radiolocation service, the Earth exploration-satellite service (active) and the space research service (active) and that these services shall not impose on the mobile service more stringent protection criteria, based on system characteristics and interference criteria, than those stated in Recommendations ITU-R M.1638-0 and ITU-R RS.1632-0;

e) that No **5.450A** states that in the frequency band 5 470-5 725 MHz, stations in the mobile service shall not claim protection from radiodetermination services and that radiodetermination services shall not impose on the mobile service more stringent protection criteria, based on system characteristics and interference criteria, than those stated in Recommendation ITU-R M.1638-0,

noting

a) that Recommendation ITU-R M.1638-0 identifies the characteristics of, and protection criteria for sharing studies for, radiolocation, aeronautical radionavigation and meteorological radars operating in the frequency range 5 250-5 850 MHz;

b) that Recommendation ITU-R M.1638-1 identifies the characteristics of, and protection criteria for sharing studies for, radiolocation (except ground-based meteorological radars) and aeronautical radionavigation radars operating in the frequency bands between 5 250 and 5 850 MHz and that Recommendation ITU-R M.1849-1 identifies the technical and operational aspects of ground-based meteorological radars;

c) that Recommendation ITU-R M.1638-1 includes additional new radar characteristics not included in Recommendation ITU-R M.1638-0,

further noting

that, according to Annex 1 to Resolution **27 (Rev.WRC-12)**, the reference of material which is incorporated by reference on a mandatory basis must be explicit, specifying the specific part of the text, if appropriate,

resolves to invite the ITU Radiocommunication Sector

1 to investigate the technical and regulatory impacts on the services referred to in Nos. **5.447F** and **5.450A** that would result from referencing Recommendation ITU-R M.1638-1 in place of Recommendation ITU-R M.1638-0 in those footnotes, while ensuring that no undue constraints are imposed on the services referenced in these footnotes;

2 to investigate the technical and regulatory impacts on the services referred to in Nos **5.447F** and **5.450A** that would result from adding a new reference to Recommendation ITU-R M.1849-1 to these footnotes**,** while ensuring that no undue constraints are imposed on the services referenced in these footnotes,

instructs the Director of the Radiocommunication Bureau

to include the results of these studies in the Director's Report to WRC-19 for consideration of any regulatory action in response to *resolves to invite the ITU Radiocommunication Sector* above.

RESOLUTION 765 (WRC-15)

Establishment of in-band power limits for earth stations operating in mobile-satellite service, the meteorological-satellite service and the Earth exploration-satellite service in the frequency bands 401-403 MHz and 399.9-400.05 MHz

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that the Earth exploration-satellite service (EESS) (Earth-to-space) and meteorological-satellite service (MetSat) (Earth-to-space) systems deployed in the frequency band 401-403 MHz and mobile-satellite service (MSS) (Earth-to-space) systems in the frequency band 399.9-400.05 MHz are currently used for data collection;

b) that these systems usually operate using moderate/low power levels;

c) that Recommendation ITU-R SA.2045 provides information on the performance and interference criteria for relevant geostationary-satellite orbit (GSO) and non-geostationary satellite (non-GSO) data collection systems (DCS) in the frequency band 401-403 MHz;

d) that Recommendation ITU-R SA.2044 provides information on the current and future usage of non-GSO DCS in the frequency band 401-403 MHz, and the portioning of the frequency band to allow all DCS equal access to the spectrum;

e) that Recommendation ITU-R M.2046 provides a description, and the corresponding protection criteria for broadband noise and narrowband interference, of one MSS system that uses the frequency band 399.9-400.05 MHz (Earth-to-space);

f) that these EESS, MetSat and MSS systems are essential for monitoring and predicting climate change, monitoring oceans, weather and water resources, weather forecasting and assisting in protecting biodiversity, improving maritime security;

g) that a growing number of satellites are planned to use these frequency bands mainly for telecommand (see No. **1.135**) (Earth-to-space) purposes under the EESS, MetSat or MSS allocations,

considering further

a) that the output power levels of the earth stations referred to in *considering g)*, at the antenna port of these telecommand links (Earth-to-space), can be much higher than the moderate/low power levels traditionally used for the operation of EESS, MetSat or MSS system, service links in the frequency bands 401-403 MHz and 399.9-400.05 MHz referred to in *considering a)*;

b) that, according to the ITU Radiocommunication Sector (ITU-R) Recommendations referred to in *considering c)*, *d)*, and *e)*, the frequency bands 401-403 MHz and 399.9-400.05 MHz are mainly currently dedicated to data collection platforms;

c) that the operation of the telecommand links referred to in *considering g)* would cause harmful interference to the satellite receivers on board the satellites referred to in *considering a)*,

recognizing

a) that it is necessary to have stable regulatory certainty in order to be able to provide long-term continuity for the operation of DCS;

b) that these DCS represent a long-term effort and investment;

c) that it is necessary to ensure the operations of existing and future systems that usually implement low or moderate output power levels for EESS, MetSat and MSS systems referred to in *considering a)*;

d) that the establishment of in-band power limits for earth stations within the Radio Regulations applicable to the EESS, MetSat and MSS will bring confidence for DCS using these frequency bands,

resolves to invite the 2019 World Radiocommunication Conference

to take into account the results of ITU-R studies, and consider the possibility of establishing in-band power limits for earth stations in the EESS and MetSat in the frequency bands 401-403 MHz and in the MSS frequency band 399.9-400.05 MHz,

invites ITU-R

to conduct and complete, in time for WRC-19, the necessary technical, operational and regulatory studies on the possibility of establishing in-band power limits for earth stations in the EESS and MetSat in the frequency band 401-403 MHz and the MSS in the frequency band 399.9-400.05 MHz,

invites administrations

to participate actively in the studies and provide the technical and operational characteristics of the systems involved by submitting contributions to ITU-R,

instructs the Secretary-General

to bring this Resolution to the attention of the World Meteorological Organization (WMO) and other international and regional organizations concerned.

RESOLUTION 766 (WRC-15)

Consideration of possible upgrading of the secondary allocation to the meteorological-satellite service (space-to-Earth) to primary status and a primary allocation to the Earth exploration-satellite service (space-to-Earth) in the frequency band 460-470 MHz

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that data collection systems (DCS) operate on geostationary and non-geostationary orbits in the meteorological-satellite (MetSat) service and the Earth exploration-satellite service (EESS) (Earth-to-space) systems in the frequency band 401-403 MHz;

b) that DCS are essential for monitoring and predicting climate change, monitoring oceans, and water resources, weather forecasting and assisting in protecting biodiversity, improving maritime security;

c) that most of these DCS have implemented satellite downlinks (space-to-Earth) in the frequency band 460-470 MHz which bring significant improvements to the operation of satellite DCS, such as the transmission of information to optimize the usage of the terrestrial data collection platforms;

d) that the frequency band 460-470 MHz is currently allocated to MetSat (space-to-Earth) on a secondary basis;

e) that No. **5.290** identifies some administrations that already have a primary MetSat allocation, subject to agreement obtained under No. **9.21**;

f) that the frequency band 460-470 MHz is currently allocated to the fixed and mobile services on a primary basis and is widely used by these services;

g) that there is a need to protect the fixed and mobile services in the frequency band 460-470 MHz and not to constrain their future development;

h) that, according to No. **5.289**, EESS applications, other than MetSat, may also be used in the frequency bands 460-470 MHz and 1 690-1 710 MHz for space-to-Earth transmissions, subject to not causing harmful interference to stations operating in accordance with the Table of Frequency Allocations;

i) that No. **5.286AA** identifies the frequency band 450-470 MHz for use by administrations wishing to implement International Mobile Telecommunications (IMT),

considering further

a) that at least one administration has adopted national regulatory provisions providing a power flux-density (pfd) limit of −152 dBW/m^2/4 kHz for protecting systems of the terrestrial services;

b) that, in order to meet this limit, space agencies have designed and are implementing a spread spectrum solution, making the operation of at least one satellite DCS downlink operating in the frequency band 460-470 MHz compliant with the pfd limit mentioned in *considering further a)*,

recognizing

a) that it is necessary for MetSat and EESS operators to have stable regulatory certainty in order to be able to provide long-term continuity for this service of public interest, and that operating under a secondary allocation status is conflicting with this objective;

b) that these space programmes represent long-term effort and investment that span across decades from the time when the programme is officially decided, through the development period and the launch phase to the time when the corresponding satellites are in operation;

c) that space and meteorological agencies are investing in the continuity of these programmes providing subsequent satellites and payloads;

d) that an upgrade to a primary status of the allocation of the frequency band 460-470 MHz to MetSat and EEES (space-to-Earth), alongside appropriate measures to ensure adequate protection of existing primary allocated services in that frequency band, will bring confidence for administrations and space agencies involved in satellite data collection programmes and for the public sectors funding the development and operation of such systems;

e) that it is necessary to keep the priority of MetSat over EESS in the frequency band 460-470 MHz;

f) that MetSat and EESS earth stations will not claim protection from stations in the fixed and mobile services;

g) that the agreements obtained under No. **5.290** remain in force,

resolves to invite the 2019 World Radiocommunication Conference

to consider, based on the results of ITU Radiocommunication Sector (ITU-R) studies, the possibility of upgrading the secondary MetSat (space-to-Earth) allocation to primary status and adding a primary EESS (space-to-Earth) allocation in the frequency band 460-470 MHz, while providing protection and not imposing any additional constraints on existing primary services to which the frequency band is already allocated and in the adjacent frequency bands,

invites ITU-R

1 to conduct and complete, in time for WRC-19, sharing and compatibility studies to determine the feasibility of upgrading the MetSat (space-to-Earth) allocation to primary status, and the addition of a primary EESS (space-to-Earth) allocation in the frequency band 460-470 MHz, while protecting the primary fixed and mobile services to which the frequency band is already allocated and maintaining the conditions contained in No. **5.289**;

2 to complete the studies, taking into account the present usage of the frequency band 460-470 MHz by incumbent services, to determine the appropriate pfd limit to be placed on MetSat (space-to-Earth) and EESS (space-to-Earth) to protect the existing primary services to which this frequency band is already allocated, provided that, if the studies conclude that a less restrictive pfd limit than that contained in *considering further a)* can protect incumbent services, then the pfd limit contained in *considering further a)* shall apply,

invites administrations

to participate actively in the studies and provide the technical and operational characteristics of the systems involved by submitting contributions to ITU-R,

instructs the Secretary-General

to bring this Resolution to the attention of the World Meteorological Organization (WMO) and other international and regional organizations concerned.

RESOLUTION 767 (WRC-15)

Studies towards an identification for use by administrations for land-mobile and fixed services applications operating in the frequency range 275-450 GHz

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that a number of bands in the frequency range 275-1 000 GHz are identified for use by administrations for passive services, such as the radio astronomy service, the Earth exploration-satellite service (passive) and the space research service (passive);

b) that No. **5.565** states that the use of the range above 275 GHz by the passive services does not preclude use of this range by active services;

c) that administrations wishing to make available frequencies in the 275-1 000 GHz range for active service applications are urged to take all practicable steps to protect these passive services from harmful interference until the date when the Table of Frequency Allocations is established for the relevant frequencies;

d) that active devices which can operate at frequencies above 275 GHz are available due to technology developments;

e) that studies on technical and operational characteristics of some active services operating in the range 275-1 000 GHz have been carried out by the ITU Radiocommunication Sector (ITU-R);

f) that the technical and operational characteristics of land-mobile and fixed services operating in the bands above 275 GHz have not been specified, and further studies are required;

g) that propagation characteristics of the frequencies above 275 GHz are being studied by ITU-R Study Group 3;

h) that propagation models for the land-mobile and fixed services operating in the band above 275 GHz are required;

i) that sharing and compatibility studies between land-mobile, fixed and passive services identified by No. **5.565** operating in the band above 275 GHz are required,

noting

a) that Question ITU-R 228-1/3 addresses the study of which propagation models best describe the relationship between atmospheric parameters and electromagnetic wave characteristics on terrestrial links operating at frequencies above 275 GHz;

b) that Question ITU-R 235-1/7 addresses the study of the technical and operational characteristics of systems operating at frequencies above 275 GHz within the science services;

c) that Question ITU-R 237/1 addresses the study of the technical and operational characteristics of active services in the frequency range 275-1 000 GHz;

d) that Question ITU-R 256-0/5 addresses studies on the technical and operational characteristics of the land-mobile service in the frequency range 275-1 000 GHz;

e) that Question ITU-R 257-0/5 addresses studies on the technical and operational characteristics of the fixed service in the frequency range 275-1 000 GHz;

f) that other international organizations are developing standards for the suitable frequency ranges for ultra-high-speed (100 Gbit/s) data communication systems for Wireless Personal Area Network (WPAN);

g) that several ultra-high-speed data communication systems are identified by other international standards bodies,

recognizing

that other active services, including the radiolocation service and the amateur service, are also developing and demonstrating applications above 275 GHz,

resolves to invite the 2019 World Radiocommunication Conference

taking into account the results of ITU-R studies on sharing and compatibility between passive and active services as well as spectrum needs for those services, to consider identification for use by administrations for the land-mobile and fixed service applications operating in the frequency range 275-450 GHz, while maintaining protection of the passive services identified in No. **5.565**, and take appropriate action,

invites ITU-R

1 to identify technical and operational characteristics of systems in the land-mobile and fixed services operating at frequencies above 275 GHz;

2 to study spectrum needs of systems in the land-mobile and fixed services, taking into account the results of the above studies;

3 to develop propagation models within the frequency range 275-450 GHz so as to enable sharing and compatibility studies between the land-mobile, fixed and passive services in this frequency range;

4 to conduct sharing and compatibility studies between the land-mobile, fixed and passive services operating in the frequency range 275-450 GHz, while maintaining protection of the passive services identified in No. **5.565**;

5 to identify candidate frequency bands for use by systems in the land-mobile and fixed services, taking into account the results of the studies under *invites ITU-R* 1, 2 and 4, and the protection of passive services identified in No. **5.565**,

encourages Member States, Sector Members, Associates and Academia

to submit contributions during the study period on their assessment of the impact on the identified services, based on the studies carried out under this Resolution.

RESOLUTION 804 (REV.WRC-12)

Principles for establishing agendas for world radiocommunication conferences

The World Radiocommunication Conference (Geneva, 2012),

considering

a) that, in accordance with No. 118 of the ITU Convention, the general scope of the agendas for world radiocommunication conferences (WRCs) should be established four to six years in advance;

b) Article 13 of the ITU Constitution relating to the competence and scheduling of WRCs and Article 7 of the Convention relating to their agendas;

c) that No. 92 of the Constitution and Nos. 488 and 489 of the Convention require conferences to be fiscally responsible;

d) that in Resolution 71 (Rev. Marrakesh, 2002), concerning the strategic plan of the Union, the Plenipotentiary Conference noted the increasingly complex and lengthy agendas for world radiocommunication conferences;

e) that Resolution 80 (Rev. Marrakesh, 2002) of the Plenipotentiary Conference and Resolution **72 (Rev.WRC-07)** recognize the positive contribution of regional and informal groups and the need for improved efficiency and fiscal prudence;

f) the relevant Resolutions of previous WRCs,

noting

a) that the number of issues addressed in agendas for WRCs has been growing, and that some issues could not be resolved adequately in the time allotted to the Conference, including conference preparations;

b) that some agenda items may have a greater impact on the future of radiocommunications than others;

c) that the human and financial resources of ITU are limited;

d) that there is a need to limit the agenda of conferences, taking account of the needs of developing countries, in a manner that allows the major issues to be dealt with equitably and efficiently;

e) that, in accordance with No. 90 of the Constitution, the interval between WRCs should normally be three to four years, to ensure that changes in technology and requirements of Member States are adequately reflected in conference agendas,

resolves

that the principles in Annex 1 should be used when developing future WRC agendas,

resolves to invite administrations

1 to use the template in Annex 2 in proposing agenda items for WRCs;

2 to participate in regional activities for the preparation of future WRC agendas.

ANNEX 1 TO RESOLUTION 804 (REV.WRC-12)

Principles for establishing agendas for WRCs

A conference agenda shall include:

1) items assigned to it by the ITU Plenipotentiary Conference;

2) items on which the Director of the Radiocommunication Bureau has been requested to report;

3) items concerning instructions to the Radio Regulations Board and the Radiocommunication Bureau regarding their activities, and concerning the review of those activities.

In general, a conference may include on a future conference agenda an item proposed by a group of administrations or an administration, if all the following conditions are met:

1) it addresses issues of a worldwide or regional character;

2) it is expected that changes in the Radio Regulations, including WRC Resolutions and Recommendations, may be necessary;

3) it is expected that required studies can be completed (e.g. that appropriate ITU-R Recommendations will be approved) prior to that conference;

4) resources associated with the subject are kept within a range which is manageable for Member States and Sector Members, the Radiocommunication Bureau and ITU-R Study Groups, Conference Preparatory Meeting (CPM) and the Special Committee.

To the extent possible, agenda items arising from previous conferences, normally reflected in Resolutions, and which have been considered by two successive conferences, should not be considered, unless justified.

In addition, there may be issues that could be addressed through actions undertaken by a Radiocommunication Assembly, particularly those not involving amendments to the Radio Regulations.

In developing the conference agenda, efforts should be made to:

a) encourage regional and interregional coordination on the subjects to be considered in the preparatory process for the WRC, in accordance with Resolution **72 (Rev.WRC-07)** and Resolution 80 (Rev. Marrakesh, 2002) of the Plenipotentiary Conference, with a view to addressing potentially difficult issues well before a WRC;

b) include, to the extent possible, agenda items that are prepared within regional groups, taking into account the equal right of individual administrations to submit proposals for agenda items;

c) ensure that proposals are submitted with an indication of priority;

d) include in proposals an assessment of their financial and other resource implications (with the assistance of the Radiocommunication Bureau) to ensure that they are within the agreed budgetary limits for ITU-R;

e) ensure that the objectives and scope of proposed agenda items are complete and unambiguous;

f) take into account the status of the ITU-R studies related to the potential agenda items before considering them as possible candidates for future agendas;

g) distinguish between items intended to result in changes to the Radio Regulations and those dealing solely with the progress of studies;

h) arrange items on the agenda by subject to the extent possible.

ANNEX 2 TO RESOLUTION 804 (REV.WRC-12)

Template for the submission of proposals for agenda items

Subject:

Origin:

***Proposal*:**

***Background/reason*:**

***Radiocommunication services concerned*:**

***Indication of possible difficulties*:**

***Previous/ongoing studies on the issue*:**

***Studies to be carried out by*:**	***with the participation of*:**

***ITU-R Study Groups concerned*:**

***ITU resource implications, including financial implications (refer to CV126)*:**

***Common regional proposal*:** Yes/No	***Multicountry proposal*:** Yes/No ***Number of countries*:**

Remarks

RESOLUTION 809 (WRC-15)

Agenda for the 2019 World Radiocommunication Conference

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that, in accordance with No. 118 of the ITU Convention, the general scope of the agenda for a world radiocommunication conference should be established four to six years in advance and that a final agenda shall be established by the ITU Council two years before the conference;

b) Article 13 of the ITU Constitution relating to the competence and scheduling of world radiocommunication conferences and Article 7 of the Convention relating to their agendas;

c) the relevant resolutions and recommendations of previous world administrative radio conferences (WARCs) and world radiocommunication conferences (WRCs),

recognizing

a) that this conference has identified a number of urgent issues requiring further examination by WRC-19;

b) that, in preparing this agenda, some items proposed by administrations could not be included and have had to be deferred to future conference agendas,

resolves

to recommend to the Council that a world radiocommunication conference be held in 2019 for a maximum period of four weeks, with the following agenda:

1 on the basis of proposals from administrations, taking account of the results of WRC-15 and the Report of the Conference Preparatory Meeting, and with due regard to the requirements of existing and future services in the frequency bands under consideration, to consider and take appropriate action in respect of the following items:

1.1 to consider an allocation of the frequency band 50-54 MHz to the amateur service in Region 1, in accordance with Resolution **658 (WRC-15)**;

1.2 to consider in-band power limits for earth stations operating in the mobile-satellite service, meteorological-satellite service and Earth exploration-satellite service in the frequency bands 401-403 MHz and 399.9-400.05 MHz, in accordance with Resolution **765 (WRC-15)**;

1.3 to consider possible upgrading of the secondary allocation to the meteorological-satellite service (space-to-Earth) to primary status and a possible primary allocation to the Earth exploration-satellite service (space-to-Earth) in the frequency band 460-470 MHz, in accordance with Resolution **766 (WRC-15)**;

1.4 to consider the results of studies in accordance with Resolution **557 (WRC-15)**, and review, and revise if necessary, the limitations mentioned in Annex 7 to Appendix **30 (Rev.WRC-15)**, while ensuring the protection of, and without imposing additional constraints on, assignments in the Plan and the List and the future development of the broadcasting-satellite service within the Plan, and existing and planned fixed-satellite service networks;

1.5 to consider the use of the frequency bands 17.7-19.7 GHz (space-to-Earth) and 27.5-29.5 GHz (Earth-to-space) by earth stations in motion communicating with geostationary space stations in the fixed-satellite service and take appropriate action, in accordance with Resolution **158 (WRC-15)**;

1.6 to consider the development of a regulatory framework for non-GSO FSS satellite systems that may operate in the frequency bands 37.5-39.5 GHz (space-to-Earth), 39.5-42.5 GHz (space-to-Earth), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space), in accordance with Resolution **159 (WRC-15)**;

1.7 to study the spectrum needs for telemetry, tracking and command in the space operation service for non-GSO satellites with short duration missions, to assess the suitability of existing allocations to the space operation service and, if necessary, to consider new allocations, in accordance with Resolution **659 (WRC-15)**;

1.8 to consider possible regulatory actions to support Global Maritime Distress Safety Systems (GMDSS) modernization and to support the introduction of additional satellite systems into the GMDSS, in accordance with Resolution **359** (**Rev.WRC-15**);

1.9 to consider, based on the results of ITU-R studies:

1.9.1 regulatory actions within the frequency band 156-162.05 MHz for autonomous maritime radio devices to protect the GMDSS and automatic identifications system (AIS), in accordance with Resolution **362 (WRC-15)**;

1.9.2 modifications of the Radio Regulations, including new spectrum allocations to the maritime mobile-satellite service (Earth-to-space and space-to-Earth), preferably within the frequency bands 156.0125-157.4375 MHz and 160.6125-162.0375 MHz of Appendix **18**, to enable a new VHF data exchange system (VDES) satellite component, while ensuring that this component will not degrade the current terrestrial VDES components, applications specific messages (ASM) and AIS operations and not impose any additional constraints on existing services in these and adjacent frequency bands as stated in *recognizing d)* and *e)* of Resolution **360** (**Rev.WRC-15**);

1.10 to consider spectrum needs and regulatory provisions for the introduction and use of the Global Aeronautical Distress and Safety System (GADSS), in accordance with Resolution **426 (WRC-15)**;

1.11 to take necessary actions, as appropriate, to facilitate global or regional harmonized frequency bands to support railway radiocommunication systems between train and trackside within existing mobile service allocations, in accordance with Resolution **236 (WRC-15)**;

1.12 to consider possible global or regional harmonized frequency bands, to the maximum extent possible, for the implementation of evolving Intelligent Transport Systems (ITS) under existing mobile-service allocations, in accordance with Resolution **237 (WRC-15)**;

1.13 to consider identification of frequency bands for the future development of International Mobile Telecommunications (IMT), including possible additional allocations to the mobile service on a primary basis, in accordance with Resolution **238 (WRC-15)**;

1.14 to consider, on the basis of ITU-R studies in accordance with Resolution **160 (WRC-15)**, appropriate regulatory actions for high-altitude platform stations (HAPS), within existing fixed-service allocations;

1.15 to consider identification of frequency bands for use by administrations for the land-mobile and fixed services applications operating in the frequency range 275-450 GHz, in accordance with Resolution **767 (WRC-15)**;

1.16 to consider issues related to wireless access systems, including radio local area networks (WAS/RLAN), in the frequency bands between 5 150 MHz and 5 925 MHz, and take the appropriate regulatory actions, including additional spectrum allocations to the mobile service, in accordance with Resolution **239 (WRC-15)**;

2 to examine the revised ITU-R Recommendations incorporated by reference in the Radio Regulations communicated by the Radiocommunication Assembly, in accordance with Resolution **28 (Rev.WRC-15)**, and to decide whether or not to update the corresponding references in the Radio Regulations, in accordance with the principles contained in Annex 1 to Resolution **27 (Rev.WRC-12)**;

3 to consider such consequential changes and amendments to the Radio Regulations as may be necessitated by the decisions of the conference;

4 in accordance with Resolution **95 (Rev.WRC-07)**, to review the Resolutions and Recommendations of previous conferences with a view to their possible revision, replacement or abrogation;

5 to review, and take appropriate action on, the Report from the Radiocommunication Assembly submitted in accordance with Nos. 135 and 136 of the Convention;

6 to identify those items requiring urgent action by the radiocommunication study groups in preparation for the next world radiocommunication conference;

7 to consider possible changes, and other options, in response to Resolution 86 (Rev. Marrakesh, 2002) of the Plenipotentiary Conference, an advance publication, coordination, notification and recording procedures for frequency assignments pertaining to satellite networks, in accordance with Resolution **86 (Rev.WRC-07)**, in order to facilitate rational, efficient and economical use of radio frequencies and any associated orbits, including the geostationary-satellite orbit;

8 to consider and take appropriate action on requests from administrations to delete their country footnotes or to have their country name deleted from footnotes, if no longer required, taking into account Resolution **26 (Rev.WRC-07)**;

9 to consider and approve the Report of the Director of the Radiocommunication Bureau, in accordance with Article 7 of the Convention:

9.1 on the activities of the Radiocommunication Sector since WRC-15;

9.2 on any difficulties or inconsistencies encountered in the application of the Radio Regulations*; and

9.3 on action in response to Resolution **80 (Rev.WRC-07)**;

10 to recommend to the Council items for inclusion in the agenda for the next WRC, and to give its views on the preliminary agenda for the subsequent conference and on possible agenda items for future conferences, in accordance with Article 7 of the Convention,

resolves further

to activate the Conference Preparatory Meeting,

invites the Council

to finalize the agenda and arrange for the convening of WRC-19, and to initiate as soon as possible the necessary consultations with Member States,

instructs the Director of the Radiocommunication Bureau

to make the necessary arrangements to convene meetings of the Conference Preparatory Meeting and to prepare a report to WRC-19,

instructs the Secretary-General

to communicate this Resolution to international and regional organizations concerned.

* This agenda item is strictly limited to the Report of the Director on any difficulties or inconsistencies encountered in the application of the Radio Regulations and the comments from administrations.

RESOLUTION 810 (WRC-15)

Preliminary agenda for the 2023 World Radiocommunication Conference

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that, in accordance with No. 118 of the ITU Convention, the general scope of the agenda for WRC-23 should be established four to six years in advance;

b) Article 13 of the ITU Constitution relating to the competence and scheduling of world radiocommunication conferences and Article 7 of the Convention relating to their agendas;

c) the relevant resolutions and recommendations of previous world administrative radio conferences (WARCs) and world radiocommunication conferences (WRCs),

resolves to give the view

that the following items should be included in the preliminary agenda for WRC-23:

1 to take appropriate action in respect of those urgent issues that were specifically requested by WRC-19;

2 on the basis of proposals from administrations and the Report of the Conference Preparatory Meeting, and taking account of the results of WRC-19, to consider and take appropriate action in respect of the following items:

2.1 to consider possible spectrum needs and regulatory actions to support Global Maritime Distress and Safety System (GMDSS) modernization and the implementation of e-navigation, in accordance with Resolution **361 (WRC-15)**;

2.2 to conduct, and complete in time for WRC-23, studies for a possible new allocation to the Earth exploration-satellite (active) service for spaceborne radar sounders within the range of frequencies around 45 MHz, taking into account the protection of incumbent services, in accordance with Resolution **656 (WRC-15)**;

2.3 in accordance with Resolution **657 (WRC-15)**, to review the results of studies relating to the technical and operational characteristics, spectrum requirements and appropriate radio service designations for space weather sensors, with a view to providing appropriate recognition and protection in the Radio Regulations without placing additional constraints on incumbent services;

2.4 study of spectrum needs and possible new allocations to the fixed-satellite service in the frequency band 37.5-39.5 GHz (Earth-to-space), in accordance with Resolution **161 (WRC-15)**;

2.5 to review the spectrum use and spectrum needs of existing services in the frequency band 470-960 MHz in Region 1 and consider possible regulatory actions in the frequency band 470-694 MHz in Region 1 on the basis of the review in accordance with Resolution **235 (WRC-15)**;

3 to examine the revised ITU Radiocommunication Sector (ITU-R) Recommendations incorporated by reference in the Radio Regulations communicated by the Radiocommunication Assembly, in accordance with Resolution **28 (Rev.WRC-15)**, and to decide whether or not to update the corresponding references in the Radio Regulations, in accordance with the principles contained in Annex 1 to Resolution **27 (Rev.WRC-12)**;

4 to consider such consequential changes and amendments to the Radio Regulations as may be necessitated by the decisions of the conference;

5 in accordance with Resolution **95 (Rev.WRC-07)**, to review the Resolutions and Recommendations of previous conferences with a view to their possible revision, replacement or abrogation;

6 to review, and take appropriate action on, the Report from the Radiocommunication Assembly submitted in accordance with Nos. 135 and 136 of the Convention;

7 to identify those items requiring urgent action by the radiocommunication study groups;

8 to consider possible changes, and other options, in response to Resolution 86 (Rev. Marrakesh, 2002) of the Plenipotentiary Conference, on advance publication, coordination, notification and recording procedures for frequency assignments pertaining to satellite networks, in accordance with Resolution **86 (Rev.WRC-07)**, in order to facilitate the rational, efficient and economical use of radio frequencies and any associated orbits, including the geostationary-satellite orbit;

9 to consider and take appropriate action on requests from administrations to delete their country footnotes or to have their country name deleted from footnotes, if no longer required, taking into account Resolution **26 (Rev.WRC-07)**;

10 to consider and approve the Report of the Director of the Radiocommunication Bureau, in accordance with Article 7 of the Convention:

10.1 on the activities of ITU-R since WRC-19;

10.2 on any difficulties or inconsistencies encountered in the application of the Radio Regulations; and

10.3 on action in response to Resolution **80 (Rev.WRC-07)**;

11 to recommend to the ITU Council items for inclusion in the agenda for the following WRC, in accordance with Article 7 of the Convention,

invites the Council

to consider the views given in this Resolution,

instructs the Director of the Radiocommunication Bureau

to make the necessary arrangements to convene meetings of the Conference Preparatory Meeting and to prepare a report to WRC-23,

instructs the Secretary-General

to communicate this Resolution to international and regional organizations concerned.

RESOLUTION 901 (REV.WRC-15)

Determination of the orbital arc separation for which coordination would be required between two satellite networks operating in a space service not subject to a Plan

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that WRC-2000 adopted a coordination arc concept in Appendix **5** to simplify the coordination between fixed-satellite service (FSS) networks in certain frequency bands between 3.4 GHz and 30 GHz;

b) that in frequency bands below 3.4 GHz, mobile-satellite service (MSS) satellite networks normally have to coordinate with other networks with overlapping service areas operating anywhere in the visible arc;

c) that the application of such a concept was limited to the frequency ranges where very large numbers of FSS satellite filings had been received by ITU-R;

d) that many satellite networks and systems are now proposing to use higher frequency bands for which the coordination arc does not yet apply;

e) that the Radio Regulations Board (RRB) adopted a Rule of Procedure on No. **9.36** that extended the coordination arc concept to the FSS and broadcasting-satellite service (BSS), not subject to a Plan, and in all frequency bands above 3.4 GHz until a review by WRC-03;

f) that the use of the coordination arc considerably reduces the volume of data that needs to be supplied to the Radiocommunication Bureau under Section D of Annex 2 to Appendix **4**;

g) that application of the coordination arc concept has the potential to reduce the workload of the Bureau in identifying affected administrations;

h) that the coordination arc concept may be valid for all geostationary space stations operating in any space radiocommunication service above 3.4 GHz that is not subject to a Plan, but may require different values for different services and frequency bands;

i) that the ITU-R studies for other services and for frequency bands above 17.3 GHz, except for the 17.7-20.2 GHz and 29.5-30 GHz ranges for the FSS, have not been completed;

j) that application of the coordination arc concept could facilitate the introduction of satellite services above 17.3 GHz after the studies conclude on the appropriate value(s) of the coordination arc,

recognizing

that there have been no difficulties resulting from the application of the coordination arc concept in the frequency bands where it applies,

noting

Recommendation ITU-R S.1780 "Coordination between geostationary-satellite orbit fixed-satellite service networks and broadcasting-satellite service networks in the frequency band 17.3-17.8 GHz",

further noting

that WRC-07 incorporated part of the Rule of Procedure referred to in *considering e)* and extended the coordination arc of ±8° for the FSS in frequency bands above 17.3 GHz on a provisional basis, and has adopted an alternative value of ±16° on a provisional basis for the coordination arc applicable for the BSS in these frequency bands in Table 5-1 of Appendix **5**,

resolves

to recommend that a future competent conference review the results of ITU-R studies on the application of the coordination arc value(s) to other frequency bands and other services, as applicable, and consider their inclusion in Appendix **5**,

invites ITU-R

1 to conduct studies on the applicability of the coordination arc concept for space radiocommunication services not yet covered by these Regulations;

2 to recommend, as appropriate, the orbital separation required for triggering inter-service and intra-service coordination concerning the satellite services in frequency bands above 3.4 GHz for geostationary-satellite (GSO) networks not subject to a Plan and not already covered by the coordination arc concept specified in No. **9.7** (GSO/GSO) of Table 5-1 (Appendix **5**), under items 1) to 8) of the frequency band column, and subject to Section II of Article **9**,

instructs the Director of the Radiocommunication Bureau

to report the results of these studies to the RRB once Recommendations are approved, and to the next competent conference.

RESOLUTION 902 (WRC-03)

Provisions relating to earth stations located on board vessels which operate in fixed-satellite service networks in the uplink bands 5 925-6 425 MHz and 14-14.5 GHz

The World Radiocommunication Conference (Geneva, 2003),

considering

a) that there is a demand for global wideband satellite communication services on vessels;

b) that the technology exists that enables earth stations on board vessels (ESVs) to use fixed-satellite service (FSS) networks operating in the uplink bands 5 925-6 425 MHz and 14-14.5 GHz;

c) that ESVs are currently operating through FSS networks in the bands 3 700-4 200 MHz, 5 925-6 425 MHz, 10.7-12.75 GHz and 14-14.5 GHz under No. **4.4**;

d) that ESVs have the potential to cause unacceptable interference to other services in the bands 5 925-6 425 MHz and 14-14.5 GHz;

e) that, with respect to the bands considered in this Resolution, global coverage is only available in the band 5 925-6 425 MHz and that only a limited number of geostationary FSS systems can provide such global coverage;

f) that, without special regulatory provisions, ESVs could place a heavy coordination burden on some administrations, especially those in developing countries;

g) that, in order to ensure the protection and future growth of other services, ESVs need to operate under certain technical and operational limitations;

h) that, within ITU-R studies, based on agreed technical assumptions, minimum distances from the low-water mark as officially recognized by the coastal State have been calculated, beyond which an ESV will not have the potential to cause unacceptable interference to other services in the bands 5 925-6 425 MHz and 14-14.5 GHz;

i) that, in order to limit the interference into other networks in the FSS, it is necessary to establish maximum off-axis e.i.r.p. density limits on ESV emissions;

j) that establishing a minimum antenna diameter for ESVs has an impact on the number of ESVs that will ultimately be deployed, hence it will reduce interference into the fixed service,

noting

a) that ESVs may be assigned frequencies to operate in FSS networks in the bands 3 700-4 200 MHz, 5 925-6 425 MHz, 10.7-12.75 GHz and 14-14.5 GHz pursuant to No. **4.4** and shall not claim protection from, nor cause interference to, other services having allocations in these bands;

b) that the regulatory procedures of Article **9** apply for ESVs operating at specified fixed points,

resolves

that ESVs transmitting in the 5 925-6 425 MHz and 14-14.5 GHz bands shall operate under the regulatory and operational provisions contained in Annex 1 and the technical limitations in Annex 2 of this Resolution,

encourages concerned administrations

to cooperate with administrations which license ESVs while seeking agreement under the above-mentioned provisions, taking into consideration the provisions of Recommendation **37 (WRC-03)**,

instructs the Secretary-General

to bring this Resolution to the attention of the Secretary-General of the International Maritime Organization (IMO).

ANNEX 1 TO RESOLUTION 902 (WRC-03)

Regulatory and operational provisions for ESVs transmitting in the 5 925-6 425 MHz and 14-14.5 GHz bands

1 The administration that issues the licence for the use of ESVs in these bands (licensing administration) shall ensure that such stations follow the provisions of this Annex and thus do not present any potential to cause unacceptable interference to the services of other concerned administrations.

2 ESV service providers shall comply with the technical limitations listed in Annex 2 and, when operating within the minimum distances as identified in item 4 below, with the additional limitations agreed by the licensing and other concerned administrations.

3 In the 3 700-4 200 MHz band and 10.7-12.75 GHz range, ESVs in motion shall not claim protection from transmissions of terrestrial services operating in accordance with the Radio Regulations.

4 The minimum distances from the low-water mark as officially recognized by the coastal State beyond which ESVs can operate without the prior agreement of any administration are 300 km in the 5 925-6 425 MHz band and 125 km in the 14-14.5 GHz band, taking into account the technical limitations in Annex 2. Any transmissions from ESVs within the minimum distances shall be subject to the prior agreement of the concerned administration(s).

5 The potentially concerned administrations referred to in the previous item 4 are those where fixed or mobile services are allocated on a primary basis in the Table of Frequency Allocations of the Radio Regulations:

Frequency bands	Potentially concerned administrations
5 925-6 425 MHz	All three Regions
14-14.25 GHz	Countries listed in No. **5.505**, except those listed in No. **5.506B**
14.25-14.3 GHz	Countries listed in Nos. **5.505**, **5.508** and **5.509**, except those listed in No. **5.506B**
14.3-14.4 GHz	Regions 1 and 3, except countries listed in No. **5.506B**
14.4-14.5 GHz	All three Regions, except countries listed in No. **5.506B**

6 The ESV system shall include means of identification and mechanisms to immediately cease emissions, whenever the station does not operate in compliance with the provisions of items 2 and 4 above.

7 Cessation of emissions as referred to in item 6 above shall be implemented in such a way that the corresponding mechanisms cannot be bypassed on board the vessel, except under the provisions of No. **4.9**.

8 ESVs shall be equipped so as to:

– enable the licensing administration under the provisions of Article **18** to verify earth station performance; and

– enable the cessation of ESV emissions immediately upon request by an administration whose services may be affected.

9 Each licence-holder shall provide a point of contact to the administration with which agreements have been reached for the purpose of reporting unacceptable interference caused by the ESV.

10 When ESVs operating beyond the territorial sea but within the minimum distance (as referred to in item 4 above) fail to comply with the terms required by the concerned administration pursuant to items 2 and 4, then that administration may:

– request the ESV to comply with such terms or cease operation immediately; or

– request the licensing administration to require such compliance or immediate cessation of the operation.

ANNEX 2 TO RESOLUTION 902 (WRC-03)

Technical limitations applicable to ESVs transmitting in the bands 5 925-6 425 MHz and 14-14.5 GHz

	5 925-6 425 MHz	14-14.5 GHz
Minimum diameter of ESV antenna	2.4 m	1.2 m[1]
Tracking accuracy of ESV antenna	±0.2° (peak)	±0.2° (peak)
Maximum ESV e.i.r.p. spectral density toward the horizon	17 dB(W/MHz)	12.5 dB(W/MHz)
Maximum ESV e.i.r.p. towards the horizon	20.8 dBW	16.3 dBW
Maximum off-axis e.i.r.p. density[2]	See below	See below

[1] While operations within the minimum distances are subject to specific agreement with concerned administrations, licensing administrations may authorize the deployment of smaller antenna sizes down to 0.6 m at 14 GHz provided that the interference to the terrestrial services is no greater than that which would be caused with an antenna size of 1.2 m, taking into account Recommendation ITU-R SF.1650. In any case, the use of smaller antenna size shall be in compliance with the tracking accuracy of ESV antenna, maximum ESV e.i.r.p. spectral density toward the horizon, maximum ESV e.i.r.p. towards the horizon and maximum off-axis e.i.r.p. density limits in the Table above and the protection requirements of the FSS intersystem coordination agreements.

[2] In any case, the e.i.r.p. off-axis limits shall be compliant with the FSS intersystem coordination agreements that may agree to more stringent off-axis e.i.r.p. levels.

Off-axis limits

For earth stations on board vessels operating in the 5 925-6 425 MHz band, at any angle φ specified below, off the main-lobe axis of an earth-station antenna, the maximum e.i.r.p. in any direction within 3° of the GSO shall not exceed the following values:

5 925-6 425 MHz

Angle off-axis	*Maximum e.i.r.p. per 4 kHz band*
$2.5° \leq \varphi \leq 7°$	$(32 - 25 \log \varphi)$ dB(W/4 kHz)
$7° < \varphi \leq 9.2°$	11 dB(W/4 kHz)
$9.2° < \varphi \leq 48°$	$(35 - 25 \log \varphi)$ dB(W/4 kHz)
$48° < \varphi \leq 180°$	−7 dB(W/4 kHz)

For ESV operating in the 14-14.5 GHz band, at any angle φ specified below, off the main-lobe axis of an earth station antenna, the maximum e.i.r.p. in any direction within 3° of the GSO shall not exceed the following values:

14.0-14.5 GHz

Angle off-axis	*Maximum e.i.r.p. per 40 kHz band*
$2° \leq \varphi \leq 7°$	$(33 - 25 \log \varphi)$ dB(W/40 kHz)
$7° < \varphi \leq 9.2°$	12 dB(W/40 kHz)
$9.2° < \varphi \leq 48°$	$(36 - 25 \log \varphi)$ dB(W/40 kHz)
$48° < \varphi \leq 180°$	−6 dB(W/40 kHz)

RESOLUTION 903 (REV.WRC-15)

Transitional measures for certain broadcasting-satellite/fixed-satellite service systems in the frequency band 2 500-2 690 MHz

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that WRC-07 revised the limits of power flux-density from space stations in Article **21**, Table **21-4** for the frequency band 2 500-2 690 MHz;

b) that use of the frequency bands 2 500-2 690 MHz in Region 2 and 2 500-2 535 MHz and 2 655-2 690 MHz in Region 3 by the fixed-satellite service (FSS) is limited to national and regional systems, subject to agreement obtained under No. **9.21** (see No. **5.415** and No. **5.2.1**);

c) that in the frequency band 2 520-2 670 MHz, the broadcasting-satellite service (BSS) is limited to national and regional systems, subject to agreement obtained under No. **9.21** (see No. **5.416** and No. **5.2.1**);

d) that, in No. **5.384A**, the frequency band 2 500-2 690 MHz is identified as one of the frequency bands for use by administrations wishing to implement International Mobile Telecommunications (IMT) in accordance with Resolution **223 (Rev.WRC-15)**;

e) that, due to the specific national and regional allocation status applied to the space services mentioned above, and the identification for use by administrations wishing to implement IMT, it is advantageous to apply the revised Article **21**, Table **21-4** limits in the frequency band 2 500-2 690 MHz at an early date;

f) that agenda item 1.9 of WRC-07 mentioned a requirement to not place undue constraints on the services to which the frequency band is allocated,

resolves

1 that in the frequency band 2 500-2 690 MHz space stations of satellite networks listed in the Annex to this Resolution shall not exceed the following pfd values:

-152 dB(W/m^2) for $\delta < 5°$

$-152 + 0.75\ (\delta - 5)$ dB(W/m^2) for $5° \leq \delta \leq 25°$

-137 dB(W/m^2) for $\delta > 25°$

in any 4 kHz band, where δ is the angle of arrival above the horizontal plane. The limits in Table **21-4** do not apply;

2 that, for systems other than those addressed in *resolves* 1, No. **5.418** and Resolution **539 (Rev.WRC-15)**, the Bureau shall examine any coordination and notification information with respect to the provisions Nos. **9.35** and **11.31** (respectively) for frequency assignments in the FSS or BSS received by the Bureau after 14 November 2007 using the pfd limits for the frequency band 2 500-2 690 MHz in Table **21-4** of Article **21**,

instructs the Bureau

to implement *resolves* 1 and *resolves* 2.

ANNEX TO RESOLUTION 903 (REV.WRC-15)

Notifying administration	Name of space station	Orbital position	Coordination request Special Section	Date of receipt of Advance Publication Information
IND	INSAT-2(74)	74.00 E	CR/C/1311 and CR/C/1311 M1	07.08.85
IND	INSAT-2(83)	83.00 E	CR/C/1312 and CR/C/1312 M1	07.08.85
IND	INSAT-2(93.5)	93.50 E	CR/C/1313 and CR/C/1313 M1	07.08.85

RESOLUTION 904 (WRC-07)

Transitional measures for coordination between the mobile-satellite service (Earth-to-space) and the space research (passive) service in the band 1 668-1 668.4 MHz for a specific case

The World Radiocommunication Conference (Geneva, 2007),

considering

a) that WRC-03 made a global allocation to the mobile-satellite service (MSS) (Earth-to-space) in the band 1 668-1 675 MHz and a global allocation to the MSS (space-to-Earth) in the band 1 518-1 525 MHz;

b) that the band 1 660.5-1 668.4 MHz is allocated to the space research (passive) service;

c) that in the band 1 668-1 668.4 MHz, mobile earth stations and space research (passive) stations are subject to coordination under No. **9.11A**;

d) that the relevant coordination threshold condition is given in Appendix **5**;

e) that before WRC-07, Appendix **4** did not contain the relevant information for the request for coordination for passive services;

f) that before WRC-07, Appendix **4** contained all necessary data for request for coordination for MSS systems, and coordination information was submitted after WRC-03 for some MSS systems;

g) that there is one satellite system (SPECTR-R) in the space research (passive) service in the band 1 668-1 668.4 MHz for which relevant advance publication information has been communicated to the Bureau prior to WRC-07, and that it is necessary to provide some transitional measures for the treatment of this information by the Bureau,

noting

a) that Report ITU-R M.2124 contains an assessment of sharing between the mobile-satellite service and space research (passive) service in the band 1 668-1 668.4 MHz;

b) that the satellite system SPECTR-R is associated with the RADIOASTRON project, which is an international project for a space very long baseline interferometry system,

resolves

that, in the band 1 668-1 668.4 MHz, mobile-satellite service systems that exceed the relevant coordination threshold condition shall be coordinated with the SPECTR-R system operating in the space research service (passive), for which advance publication information was received by the Bureau on 7 December 2005[1], provided that the complete coordination information is received by the Bureau within the time-limit mentioned in No. **9.5D**.

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[1] API/A/3957 dated 24 January 2006.

RESOLUTION 906 (REV.WRC-15)

Electronic submission of notices for terrestrial services to the Radiocommunication Bureau and exchange of data between administrations

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that the electronic format for submission of notifications concerning terrestrial services under Article **11** and Plans annexed to Regional Agreements has been used by the Radiocommunication Bureau since September 1994;

b) that, since 8 December 1998, submission of high-frequency broadcasting schedule requirements under Article **12** has been in electronic format only;

c) that, since 3 June 2001 for space services, all notices and related information submitted to the Radiocommunication Bureau pursuant to Articles **9** and **11** have been submitted in electronic format only;

d) that, since January 2009, the submission of notices for terrestrial services is done in electronic format only, using the secured ITU web interface WISFAT (Web Interface for the Submission of Frequency Assignments/Allotments to Terrestrial Services) in accordance with Circular Letter CR/297;

e) that RRC-06 decided that all submissions in the application of Articles 4 and 5 of the GE06 Regional Agreement shall be in electronic format only;

f) that preparation of notices for terrestrial services in electronic format allows administrations to validate the data prior to submission using Radiocommunication Bureau software tools;

g) that submission of notices for terrestrial services in electronic format removes the need for the Radiocommunication Bureau to transcribe the data, avoids the potential for the introduction of errors and reduces the data processing effort required by the Radiocommunication Bureau;

h) that the submission of notices for terrestrial services in electronic format only may require appropriate training on the Radiocommunication Bureau's software tools, especially in developing and least-developed countries;

i) that, for some administrations, the submission of notices for terrestrial services in electronic format only may require the adaptation of their national procedures and the development of appropriate electronic facilities;

j) that information in electronic format could be used to fulfil administrations' database requirements and facilitate the exchange of information between administrations and with the Radiocommunication Bureau;

k) that administrations have the sovereign right to establish bilateral agreements pertaining to cross-border coordination issues, including the definition of the format for the mutual exchange of information;

l) that administrations recognize the importance and requirement of electronic submission of notices for terrestrial services to the Radiocommunication Bureau,

further considering

a) that the use of an electronic format for the submission of notices for terrestrial services to the Radiocommunication Bureau tends to reduce its costs and allows a better publication of data;

b) that the Radiocommunication Bureau makes available free of charge to administrations terrestrial notification software (TerRaNotices) through the distribution of its BR International Frequency Information Circular (BR IFIC) for terrestrial services;

c) that in its Resolution 9 (Rev. Dubai, 2014), on the participation of countries, particularly developing countries, in spectrum management, the World Telecommunication Development Conference 2014 (WTDC-14) recognizes the importance of facilitating access to radiocommunication-related documentation in order to facilitate the task of radio-frequency spectrum managers;

d) that in its Decision 12 (Rev. Busan, 2014), on free online access to ITU publications, the Plenipotentiary Conference instructed the Secretary-General of ITU to prepare a report on an ongoing basis on sales of ITU software and databases, and to present this report to the Council, which will decide on further policies for improving access to ITU publications, software and databases;

e) that an automated spectrum management system would, among other things, facilitate national spectrum management and monitoring, coordination among administrations and notification to the Radiocommunication Bureau;

f) that Recommendation ITU-R SM.1370 provides design guidelines for developing automated spectrum management systems at the national level;

g) that data elements used in national spectrum management for international coordination and notification have been reflected in Appendix **4** of the Radio Regulations and in Recommendation ITU-R SM.1413;

h) that the Radiocommunication Advisory Group has established a task group to review the Radiocommunication Bureau's information systems used for the submission and treatment of notices for terrestrial and space services;

i) the difficulty faced by many countries, particularly developing and least-developed countries, in participating in the activities of ITU-R world radiocommunication seminars and study group meetings dealing with terrestrial services,

resolves

1 that administrations are encouraged to accelerate migration to the use of an electronic format and electronic facilities for the submission of notices to the Bureau and for the exchange of coordination data between administrations;

2 that the format established by ITU-R for electronic notices be considered by administrations for the exchange of information,

instructs the Director of the Radiocommunication Bureau

1 to refine, as required, the specification of the electronic format and related software to be used for the submission of notices for terrestrial services;

2 to provide assistance, as required, to any administration in the use of the electronic format for the submission of notices for terrestrial services;

3 to support developing and least-developed countries while deploying electronic facilities for the submission of electronic notices to the Bureau and for the exchange of coordination data between administrations;

4 to include in radiocommunication seminars and regional workshops appropriate training in the use of the electronic format and related software for the submission of notices for terrestrial services.

RESOLUTION 907 (REV.WRC-15)

Use of modern electronic means of communication for administrative correspondence related to advance publication, coordination and notification of satellite networks including that related to Appendices 30, 30A and 30B, earth stations and radio astronomy stations

The World Radiocommunication Conference (Geneva, 2015),

considering

that the use of electronic means of communication for administrative correspondence related to advance publication, coordination and notification of satellite networks, earth stations and radio astronomy stations would facilitate the tasks of the Radiocommunication Bureau and of administrations and has the potential to improve the coordination and notification process by reducing the amount of duplicated correspondence,

noting

that Decision 5 (Rev. Busan, 2014) of the Plenipotentiary Conference includes, in its Annex 2, paragraph 28, which proposes to "*discontinue to the greatest extent possible communications by fax and traditional postal mail between the Union and Member States and replace it with modern electronic communication methods*",

recognizing

that administrations could use the time freed by a reduction of administrative correspondence to effect coordination,

resolves

1 that modern electronic means of communication shall be used whenever possible in the administrative correspondence between administrations and the Radiocommunication Bureau related to the advance publication, coordination, notification and recording processes, including correspondence related to Appendices **30**, **30A** and **30B**, for satellite networks, earth stations and radio astronomy stations;

2 that, wherever the words "telegram", "telex" or "fax" are inserted in provisions related to the advance publication, coordination, notification and recording processes of satellite networks, earth stations and radio astronomy stations, including the provisions contained in Appendices **30**, **30A** and **30B**, modern electronic means shall be used, to the greatest extent possible;

3 that other traditional means of communication shall continue to be used unless the administration informs the Bureau of its willingness to discontinue such use,

instructs the Radiocommunication Bureau

1 to provide administrations with the necessary technical means to ensure that the modern electronic correspondence between administrations and the Radiocommunication Bureau is secure;

2 to inform administrations of the availability of such means and of the associated schedule of implementation;

3 to automatically acknowledge receipt of all electronic correspondence;

4 to report to the next world radiocommunication conference on the experience gained in the application of this Resolution, with a view to making any necessary consequential amendments to the Radio Regulations,

urges administrations

to use, to the extent possible, modern electronic means of communication in the administrative correspondence between themselves related to advance publication, coordination and notification of satellite networks, including that related to Appendices **30**, **30A** and **30B**, and to earth stations and radio astronomy stations, recognizing that other means of communication may still be used if necessary (see also *resolves* 3).

RESOLUTION 908 (REV.WRC-15)

Electronic submission and publication of satellite network filings

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that the volume of advance publication information (API), coordination requests (CR/C), notifications and filings under Appendices **30**, **30A** and **30B** for satellite networks or systems has been steadily increasing in recent years;

b) that a significant amount of effort is required to maintain the relevant databases;

c) that a paperless electronic approach for the submission of satellite network filings and comments, if required, would make this information readily accessible to all, and would limit the workload for administrations and the Bureau in the processing of these filings,

noting

a) that, through Circular Letters CR/363 and CR/376, the Bureau informed administrations that a web-based application (SpaceWISC) is available as of 1 March 2015 for the submission and publication of API notices for satellite networks or systems subject to coordination and of administrations' associated comments;

b) that, through Circular Letter CR/360, the Bureau informed administrations that web-based online distribution of the International Frequency Information Circular BR IFIC (Space services) on DVD-ROM in ISO format has been developed, allowing the data to be available without delay on the BR IFIC publication date and enabling administrations to obtain a secure local reproduction of the BR IFIC (Space services) DVD-ROM,

resolves

that administrations shall submit all satellite network filings and comments, if required, using a secure paperless electronic approach upon being advised that the means for such electronic submission of a satellite network filing for satellite networks or systems has been implemented and upon receiving assurances that such means are indeed secure,

instructs the Director of the Radiocommunication Bureau

1 to implement a secure paperless electronic approach for the electronic submission and publication of satellite network filings and comments, if required, for satellite networks or systems, taking into account the conditions mentioned in the *resolves* of this Resolution;

2 to study and implement, as appropriate, a consolidated approach for the electronic submission of both satellite network filings and their related correspondence.

RESOLUTION 958 (WRC-15)

Urgent studies required in preparation for the 2019 World Radiocommunication Conference

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that the agenda of this conference included consideration of items for the agenda for the 2019 World Radiocommunication Conference (WRC-19);

b) that the agenda of this conference included consideration of items for the preliminary agenda for the 2023 World Radiocommunication Conference (WRC-23);

c) that items for the agenda for WRC-19 have been identified in Resolution **809 (WRC-15)**;

d) that items for the preliminary agenda for WRC-23 have been identified in Resolution **810 (WRC-15)**,

resolves

to complete studies on the topics identified in this Resolution and its annex,

invites ITU-R

as a matter of urgency, to complete the studies called for in this Resolution,

instructs the Director of the Radiocommunication Bureau

to report on these studies under agenda item 9.1 of WRC-19, as appropriate, based on the results of studies.

ANNEX TO RESOLUTION 958 (WRC-15)

Urgent studies required in preparation for the 2019 World Radiocommunication Conference

1) Studies concerning Wireless Power Transmission (WPT) for electric vehicles:

a) to assess the impact of WPT for electric vehicles on radiocommunication services;

b) to study suitable harmonized frequency ranges which would minimize the impact on radiocommunication services from WPT for electrical vehicles.

These studies should take into account that the International Electrotechnical Commission (IEC), the International Organization for Standardization (ISO) and the Society of Automotive Engineers (SAE) are in the process of approving standards intended for global and regional harmonization of WPT technologies for electric vehicles.

2) Studies to examine:

a) whether there is a need for possible additional measures in order to limit uplink transmissions of terminals to those authorized terminals in accordance with No. **18.1**;

b) the possible methods that will assist administrations in managing the unauthorized operation of earth station terminals deployed within its territory, as a tool to guide their national spectrum management programme, in accordance with Resolution ITU-R 64 (RA-15).

3) Studies on the technical and operational aspects of radio networks and systems, as well as spectrum needed, including possible harmonized use of spectrum to support the implementation of narrowband and broadband machine-type communication infrastructures, in order to develop Recommendations, Reports and/or Handbooks, as appropriate, and to take appropriate actions within the ITU Radiocommunication Sector (ITU-R) scope of work.

RECOMMENDATIONS

RECOMMENDATION 7 (REV.WRC-97)

Adoption of standard forms for ship station and ship earth station licences and aircraft station and aircraft earth station licences[1]

The World Radiocommunication Conference (Geneva, 1997),

considering

a) that the standardization of the licence forms issued to stations installed on board ships and aircraft making international voyages and flights would greatly facilitate the task of inspection of such stations;

b) that standard licence forms for ship stations and for aircraft stations would serve as a useful guide to those administrations desiring to improve their existing national licences;

c) that standard licence forms could be advantageously used by these administrations as the form of certification specified in No. **18.8**,

considering further

that the Administrative Radio Conference (Geneva, 1959), formulated:

a) a set of principles for the draft of a standard licence form (see Annex 1);

b) specimens of a ship station licence and of an aircraft station licence (see Annexes 2 and 3),

considering also

changes in radio systems and shipborne radiocommunication equipment introduced in connection with the implementation of the Global Maritime Distress and Safety System (GMDSS),

recommends

1 that administrations which find these forms practicable and acceptable should adopt them for international use;

2 that administrations should, as far as possible, endeavour to bring their national licence forms into line with these standard forms.

---

[1] Throughout this Recommendation, references to ship stations may include references to ship earth stations and references to aircraft stations may include references to aircraft earth stations.

ANNEX 1 TO RECOMMENDATION 7 (REV.WRC-97)

Principles for the formulation of standard ship and aircraft station licences

The Administrative Radio Conference (Geneva, 1959), considered that, in formulating standard ship and aircraft station licences, the following set of principles should be applied:

1 The licence should, as far as possible, be prepared in tabular form, and each line and column of the table clearly numbered or lettered.

2 The licence for ship stations and the licences for aircraft stations should be as similar as possible.

3 The size of the licence should be international standard A4.

4 The licence should be designed in a form which facilitates its display on board a ship or an aircraft.

5 The licence should be printed in Latin characters in the national language of the country which issues it. Those countries whose national language cannot be written in Latin characters should use their national language and, in addition, English, Spanish or French.

6 The title “Ship Station Licence” or “Aircraft Station Licence” should appear at the top of the licence in the national language as well as in English, Spanish and French.

These principles were used in formulating the two standard forms which are given in Annexes 2 and 3.

ANNEX 2 TO RECOMMENDATION 7 (REV.WRC-97)

(Full name of the authority issuing the licence, in the national language)

.....*

SHIP STATION LICENCE
LICENCE DE STATION DE NAVIRE
LICENCIA DE ESTACIÓN DE BARCO

No. .....
Period of validity .....

In accordance with (*Title of the National Regulation*) and with the Radio Regulations which complement the Constitution and the Convention of the International Telecommunication Union now in force, this authorization is herewith issued for the installation and for the use of the radio equipment described below:

1	2			3	4
	Identification of the ship station				
Name of ship	Call sign	MMSI	Other identification *(optional)*	Holder of licence	Accounting authority identification code, or additional information including accounting information if required

	Equipment	**Type or description of equipment**	**Frequencies**
5	Transmitters		**
6	Other equipment *(optional)*		

For the Issuing Authority:

.....

Place Date Authentication

---

* The words “Ship Station Licence” written in the national language, if this is not English, Spanish or French.

** Specifically or by reference to List V, columns 8 and 9.

ANNEX 3 TO RECOMMENDATION 7 (REV.WRC-97)

(Full name of the authority issuing the licence, in the national language)

.....*

AIRCRAFT STATION LICENCE
LICENCE DE STATION D'AÉRONEF
LICENCIA DE ESTACIÓN DE AERONAVE

No. .....
Period of validity .....

In accordance with *(Title of the National Regulation)* and with the Radio Regulations which complement the Constitution and the Convention of the International Telecommunication Union now in force, this authorization is herewith issued for the installation and for the use of the radio equipment described below:

1	2	3	4
Nationality and registration mark of the aircraft	Call sign or other identification	Type of aircraft	Owner of aircraft

		a	b	c	d
	Equipment	**Type**	**Power (W)**	**Class of emission**	**Frequency bands or assigned frequencies**
5	Transmitters				**
6	Survival craft transmitters *(when applicable)*				**
7	Other equipment	*(Optional)*			

For the Issuing Authority:

.....

Place Date Authentication

---

* The words "Aircraft Station Licence" written in the national language, if this is not English, Spanish or French.

** Specifically or by reference.

RECOMMENDATION 8

Relating to automatic identification of stations

The World Administrative Radio Conference (Geneva, 1979),

considering

a) Article **19** which allows, where practicable, automatic identification of stations in appropriate services, and under certain circumstances;

b) that it is not always feasible or convenient to give manual identification;

c) that sources of harmful interference often remain unidentified for long periods, with consequential delay in measures that might be taken to minimize the interference;

d) that automatic identification procedures, where appropriate, may help overcome some of the disadvantages of manual identification;

e) that automatic transmission of a call sign or other signals may provide a means of identifying some stations for which identification is not always possible, e.g. radio relay and space systems;

f) the desirability of fostering a common automatic identification method to facilitate effective implementation of the provisions of Article **19**, as an alternative to the proliferation of many different systems and modulation techniques that might be used for this purpose,

recommends

that the ITU-R study the matter of automatic identification of stations with a view to recommending technical characteristics and methods of implementing a common universal system, including standard modulation techniques, for application in accordance with Article **19**, with due consideration to the needs of the different services and types of stations.

RECOMMENDATION 9

Relating to the measures to be taken to prevent the operation of broadcasting stations on board ships or aircraft outside national territories[1]

The World Administrative Radio Conference (Geneva, 1979),

considering

a) that the operation of broadcasting stations on board ships or aircraft outside national territories is in conflict with the provisions of Nos. **23.2** and **42.4**;

b) that such operation is contrary to the orderly use of the radio-frequency spectrum and may result in chaotic conditions;

c) that the operation of such broadcasting stations may take place outside the jurisdiction of Member States, thereby making the direct application of national laws difficult;

d) that a particularly difficult legal situation arises when such broadcasting stations are operated on board ships or aircraft not duly registered in any country,

recommends

1 that administrations ask their governments to study possible means, direct or indirect, to prevent or suspend such operations and, where appropriate, take the necessary action;

2 that administrations inform the Secretary-General of the results of these studies and submit any other information which may be of general interest, so that the Secretary-General can inform Member States accordingly.

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1 WRC-97 made editorial amendments to this Recommendation.

RECOMMENDATION 16 (WRC-12)

Interference management for stations that may operate under more than one terrestrial radiocommunication service

The World Radiocommunication Conference (Geneva, 2012),

considering

a) that radiocommunication services and spectrum allocation aim at achieving international uniformity in spectrum usage in order to simplify interference management rules and promote equitable spectrum access;

b) that the principles behind radiocommunication services and spectrum allocation have been adopted since the first Radio Telegraph Conference of Berlin in 1906, where frequency bands were allocated to the maritime service;

c) that technological, market and regulatory developments are resulting in significant changes to the radiocommunication environment, especially in bands below 6 GHz;

d) that these changes to the radiocommunication environment, and in particular the convergence of services, will make the classification of certain radio stations under existing radiocommunication services increasingly difficult;

e) that the issues raised by the convergence of services may not always be addressed through the redefinition of radiocommunication services;

f) that previous world radiocommunication conferences (WRCs) have considered the possibility of enhancing the international spectrum regulatory framework in the light of the changing radiocommunication environment;

g) that ITU-R studies to enhance the international spectrum management framework have so far been carried out under the traditional framework of radiocommunication services and spectrum allocation only;

h) that administrations have adopted, or are in the process of adopting, approaches to spectrum management on a national basis that are not based on the above traditional framework, with a view to improving flexibility and to catering for the changing radiocommunication environment;

i) that in order to obtain the required degree of flexibility at national level while not causing harmful interference at international level, these administrations may use No. **4.4** of the Radio Regulations;

j) that through the application of No. **4.4**, administrations having adopted national spectrum management that is not based on the above traditional framework and that is in derogation of the Table of Frequency Allocations and of the provisions of the Radio Regulations cannot claim protection for their radio stations from cross-border harmful interference, or cause harmful interference to stations operated in conformance with the Radio Regulations by other administrations,

recognizing

a) that improvement of the international spectrum management framework is a continuous process;

b) that Question ITU-R 224/1 calls for studies on the impact of technical convergence on the national and international radio regulatory environment;

c) that Article 42 of the Constitution provides that administrations reserve for themselves the right to make special arrangements on telecommunications matters which do not concern Member States in general, so far as this is not in conflict with the provisions of the Constitution, the Convention or the Administrative Regulations, so far as concerns harmful interference which their operation might cause to the radio operations of other Member States,

recommends

that ITU-R study all aspects of interference management resulting from the impact of technical convergence on the radio regulatory environment, involving stations that may operate under more than one terrestrial radiocommunication service, particularly cross-border interference cases (see also *recognizing b)* above), to ensure harmful interference is not caused to stations of other Member States,

invites administrations

to participate actively in the studies by submitting contributions to ITU-R under Question ITU-R 224/1.

RECOMMENDATION 34 (REV.WRC-12)

Principles for the allocation of frequency bands

The World Radiocommunication Conference (Geneva, 2012),

considering

a) that the Radio Regulations contain an international Table of Frequency Allocations covering the radio-frequency spectrum;

b) that it may be desirable, in certain cases, to allocate frequency bands to the most broadly defined services of Article **1** in order to improve flexibility of use but without detriment to other services;

c) that the development of common worldwide allocations is desirable in order to improve and harmonize utilization of the radio-frequency spectrum;

d) that adherence to these principles for the allocation of spectrum will allow the Table of Frequency Allocations to focus on matters of regulatory significance while enabling greater flexibility in national spectrum use;

e) that technological developments occur at a rapid pace and administrations desire to take advantage of such developments to increase spectrum efficiency and facilitate spectrum access;

f) that the needs of developing countries need to be taken into account;

g) that Recommendation ITU-R SM.1133 provides a guide to the use of broadly-defined services;

h) that radiocommunications play a significant role in achieving national, as well as regional and global priorities, including those found in relevant ITU Plenipotentiary Conference and WRC Resolutions,

recognizing

that Resolution **26 (Rev.WRC-07)** provides guidelines for the use of footnotes, including additions, modifications or deletions,

recommends that future world radiocommunication conferences

1 should, wherever possible, allocate frequency bands to the most broadly defined services with a view to providing the maximum flexibility to administrations in spectrum use, taking into account safety, technical, operational, economic and other relevant factors;

2 should, wherever possible, allocate frequency bands on a worldwide basis (aligned services, categories of service and frequency band limits) taking into account safety, technical, operational, economic and other relevant factors;

3 should, wherever possible, keep the number of footnotes in Article **5** to a minimum when allocating frequency bands through footnotes, in line with Resolution **26 (Rev.WRC-07)**;

4 should take into account relevant studies by the Radiocommunication Sector and report(s) of the relevant Conference Preparatory Meeting(s) (CPM), as appropriate, considering also contributions by members, including technical and operational developments, forecasts and usages as per the agenda of the WRC,

recommends administrations

in making proposals to world radiocommunication conferences, to take account of *recommends* 1 to 4 and *considering a)* to *g),*

invites administrations

to actively participate in ITU-R studies, providing their technical and operational developments, forecasts and usages,

instructs the Director of the Radiocommunication Bureau and requests the ITU-R study groups

1 when carrying out technical studies relating to a frequency band, to examine the compatibility of broadly defined services with the existing utilizations and the possibility of aligning allocations on a worldwide basis, having regard to *considerings a)* to *g)* and *recommends* 1 to 4 above;

2 to conduct these studies, with the participation of the International Civil Aviation Organization (ICAO), the International Maritime Organization (IMO), the World Meteorological Organization (WMO) and other international organizations concerned, where appropriate;

3 to submit a report to future world radiocommunication conferences containing the results of these studies,

invites ITU-R

to identify areas for study and to undertake the studies necessary to determine the impact on existing services of those agenda items of future world radiocommunication conferences which involve broadening the scope of existing service allocations,

instructs the Secretary-General

to communicate this Recommendation to ICAO, IMO, WMO and other international organizations concerned, where appropriate,

invites the Director of the Radiocommunication Bureau

to bring this Recommendation to the attention of ITU-T and ITU-D.

RECOMMENDATION 36 (WRC-97)

Role of international monitoring in reducing apparent congestion in the use of orbit and spectrum resources

The World Radiocommunication Conference (Geneva, 1997),

considering

a) that the geostationary-satellite orbit and the radio-frequency spectrum are limited natural resources and are being increasingly utilized by space services;

b) the desirability of achieving a more effective use of the geostationary-satellite orbit and radio-frequency spectrum in order to assist administrations in satisfying their requirements and, to that end, the desirability of taking steps to make the International Frequency List reflect more accurately the actual use being made of these resources;

c) that monitoring information should assist ITU-R in discharging this function;

d) that facilities for monitoring of emissions originating from space stations are expensive,

recognizing

that an international monitoring system cannot be fully effective unless it covers all areas of the world,

invites ITU-R

to study and make recommendations concerning the facilities required to provide adequate coverage of the world with a view to ensuring efficient use of resources,

invites administrations

1 to make every effort to provide monitoring facilities as envisaged in Article **16**;

2 to inform ITU-R of the extent to which they are prepared to cooperate in such monitoring programmes as may be requested by ITU-R;

3 to consider the various aspects of monitoring emissions originating from space stations to enable the provisions of Articles **21** and **22** to be applied.

RECOMMENDATION 37 (WRC-03)

Operational procedures for earth stations on board vessels (ESVs) use

The World Radiocommunication Conference (Geneva, 2003),

considering

a) that under the provisions of Resolution **902 (WRC-03)** transmissions from ESVs within the distances defined in item 4 of Annex 1 of Resolution **902 (WRC-03)** should be based upon prior agreement of concerned administrations;

b) that it is desirable to provide guidance on activities to achieve such prior agreement with concerned administrations;

c) that such guidance should include the operational procedures for ESV use,

recommends

that operation of ESVs follow the procedures set forth in the Annex.

ANNEX 1 TO RECOMMENDATION 37 (WRC-03)

Operational procedures for ESV use

A Initiation of contact

The ESV licensing administration or the licence-holder should contact, in advance of ESV operations within the minimum distances, the concerned administration(s) to obtain agreements that will establish the technical bases for avoiding unacceptable interference to the terrestrial facilities of the concerned administration or administrations.

The minimum distances and concerned administrations are defined in items 4 and 5 of Annex 1 of Resolution **902 (WRC-03)**, respectively.

B Recommended actions of licensing administrations, licence-holders and concerned administrations

– The licensing administration or the licence-holder should provide the technical and operational parameters required by the concerned administration, among them, if required, information on the movement of the ship(s) equipped with ESVs within the minimum distances.

– Concerned administrations that wish to permit the operation of ESVs should determine if they have terrestrial stations that could be affected by ESV operations with a view to identifying possible frequencies for ESV use that would avoid potential interference.

C Frequency use arrangements

National practices, as well as applicable Recommendations of ITU-R (such as ITU-R S.1587, ITU-R SF.1585, ITU-R SF.1648, ITU-R SF.1649, ITU-R SF.1650), may be used in reaching frequency usage arrangements.

D Avoidance of unacceptable interference

According to Annex 1 of Resolution **902 (WRC-03)** the ESV licensing administration shall ensure that such stations do not cause unacceptable interference to the services of other concerned administrations. In the event that unacceptable interference occurs, the licence-holder must eliminate the source of any interference from its station immediately upon being advised of such interference. Additionally, the licence-holder shall immediately terminate transmissions at the request of either the concerned administration or the ESV licensing administration if either administration determines that the ESV is causing unacceptable interference or is otherwise not being operated in compliance with the operating agreement.

RECOMMENDATION 63

Relating to the provision of formulae and examples for the calculation of necessary bandwidths[1]

The World Administrative Radio Conference (Geneva, 1979),

considering

a) that Appendix **1**, Section I requires that the necessary bandwidth be part of the full designation of emissions;

b) that Recommendation ITU-R SM.1138, gives a partial list of examples and formulae for the calculation of the necessary bandwidth of some typical emissions;

c) that sufficient information is not available for the determination of the *K*-factors used throughout the table of examples of the necessary bandwidth in Recommendation ITU-R SM.1138;

d) that, especially with regard to the efficient utilization of the radio-frequency spectrum, monitoring and the notification of emissions, it is required that necessary bandwidths for the individual classes of emission be known;

e) that for reasons of simplification and international uniformity it is desirable that measurements for determining the necessary bandwidth be made as seldom as possible,

recommends that ITU-R

1 provide, from time to time, additional formulae for the determination of necessary bandwidth for common classes of emission, as well as examples to supplement those given in Recommendation ITU-R SM.1138;

2 study and provide values of supplementary *K*-factors required for the calculation of the necessary bandwidth for common classes of emission,

invites the Radiocommunication Bureau

to publish examples of such calculations in the Preface to the International Frequency List.

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1 WRC-97 made editorial amendments to this Recommendation.

RECOMMENDATION 71

Relating to the standardization of the technical and operational characteristics of radio equipment[1]

The World Administrative Radio Conference (Geneva, 1979),

considering

a) that administrations are confronted with the necessity of allocating increasing resources to the regulation of radio equipment performance;

b) that administrations, and in particular those in developing countries, often have difficulty in providing such resources;

c) that it would be of advantage to apply, as far as practicable, any mutually agreed standards and associated type approvals;

d) that a number of international bodies including the ITU-R, International Civil Aviation Organization (ICAO), International Maritime Organization (IMO), International Special Committee on Radio Interference (CISPR) and the International Electrotechnical Commission (IEC) already provide recommendations and standards for technical and operating characteristics applicable to equipment performance and its measurement;

e) that in this context the specific requirements of developing countries have not always been taken fully into account,

recommends

1 that administrations endeavour to cooperate with a view to establishing international performance specifications and associated measuring methods that could be used as models for domestic standards for radio equipment;

2 that such international performance specifications and associated measuring methods respond to widely representative conditions including specific requirements of developing countries;

3 that, when such international performance specifications for radio equipment exist, administrations, as far as practicable, adopt these specifications as a basis for their national standards;

4 that administrations consider as far as practicable mutual acceptance for the type approval of equipment which conforms to such performance specifications.

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1 WRC-97 made editorial amendments to this Recommendation.

RECOMMENDATION 75 (REV.WRC-15)

Study of the boundary between the out-of-band and spurious domains of primary radars using magnetrons

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that the principal objective of Appendix **3** is to specify the maximum permitted level of unwanted emissions in the spurious domain;

b) that the out-of-band and spurious domains of an emission are defined in Article **1**;

c) that Recommendation ITU-R SM.1541 specifies the boundary between the out-of-band and spurious domains for primary radars, and that the boundary is related to the emission mask based on the −40 dB bandwidth;

d) that Appendix **3** refers to Recommendation ITU-R SM.1541;

e) that Recommendation ITU-R M.1177 describes the techniques for measurement of unwanted emissions of radars,

recognizing

that there is a possibility that calculated values for the −40 dB bandwidth related to unwanted emissions of primary radars using magnetrons underestimate the actual bandwidth,

recommends

that ITU-R study calculation methods for the −40 dB bandwidth necessary for the determination of the boundary between the spurious and out-of-band domains of primary radars using magnetrons,

invites administrations

to participate actively in the above studies by submitting contributions to ITU-R.

RECOMMENDATION 76 (WRC-12)

Deployment and use of cognitive radio systems

The World Radiocommunication Conference (Geneva, 2012),

considering

a) that a cognitive radio system (CRS) is defined as *a radio system employing technology that allows the system to obtain knowledge of its operational and geographical environment, established policies and its internal state; to dynamically and autonomously adjust its operational parameters and protocols according to its obtained knowledge in order to achieve predefined objectives; and to learn from the results obtained* (Report ITU-R SM.2152);

b) that a method of spectrum management to be used for aiding frequency assignment for terrestrial services in border areas can be found in Recommendation ITU-R SM.1049;

c) that ITU-R is studying the implementation and use of CRS in accordance with Resolution ITU-R 58;

d) that studies on regulatory measures related to the implementation of CRS are outside the scope of Resolution ITU-R 58;

e) that there are plans to deploy CRS in some radiocommunication services,

recognizing

a) that any radio system implementing CRS technology needs to operate in accordance with the provisions of the Radio Regulations;

b) that the use of CRS does not exempt administrations from their obligations with regard to the protection of stations of other administrations operating in accordance with the Radio Regulations;

c) that CRSs are expected to provide flexibility and improved efficiency to overall spectrum use,

recommends

that administrations participate actively in the ITU-R studies conducted under Resolution ITU-R 58, taking into account *recognizing a)* and *b)*.

RECOMMENDATION 100 (REV.WRC-03)

Preferred frequency bands for systems using tropospheric scatter

The World Radiocommunication Conference (Geneva, 2003),

considering

a) the technical and operational difficulties pointed out by Recommendation ITU-R F.698 in the frequency bands shared by tropospheric scatter systems, space systems and other terrestrial systems;

b) the additional allocation of frequency bands made by WARC-79 and WARC-92 for the space services in view of their increasing development;

c) that the Radiocommunication Bureau requires administrations to supply specific information on systems using tropospheric scatter in order to verify compliance with certain provisions of the Radio Regulations (such as Nos. **5.410** and **21.16.3**),

recognizing nevertheless

that, to meet certain telecommunication requirements, administrations will wish to continue using tropospheric scatter systems,

noting

that the proliferation of such systems in all frequency bands and particularly in those shared with space systems is bound to aggravate an already difficult situation,

recommends that administrations

1 for the assignment of frequencies to new stations in systems using tropospheric scatter, take into account the latest information prepared by ITU-R to ensure that systems established in the future use a limited number of certain frequency bands;

2 in frequency assignment notifications to the Bureau, indicate expressly whether they relate to stations of tropospheric scatter systems.

RECOMMENDATION 206 (REV.WRC-12)

Studies on the possible use of integrated mobile-satellite service and ground component systems in the bands 1 525-1 544 MHz, 1 545-1 559 MHz, 1 626.5-1 645.5 MHz and 1 646.5-1 660.5 MHz

The World Radiocommunication Conference (Geneva, 2012),

considering

a) that mobile-satellite service (MSS) systems may provide service to a wide area;

b) that integrated MSS systems employ a satellite component and a ground component where the ground component is complementary to the satellite component and operates as, and is, an integral part of the MSS system. In such systems, the ground component is controlled by the satellite resource and network management system. Further, the ground component uses the same portions of MSS frequency bands as the associated operational mobile-satellite system;

c) that MSS systems have a limited capacity for providing reliable radiocommunication services in urban areas on account of natural or man-made obstacles and that the ground component of an integrated MSS system can mitigate blockage areas, as well as allow for indoor service coverage;

d) that MSS systems can improve coverage of rural areas, thus being one element that can bridge the digital divide in terms of geography;

e) that MSS systems are suitable for public protection and disaster relief communications, as stated in Resolution **646 (Rev.WRC-12)**[*];

f) that the bands 1 525-1 544 MHz, 1 545-1 559 MHz, 1 626.5-1 645.5 MHz and 1 646.5-1 660.5 MHz are allocated on a primary basis to the mobile-satellite service and to other services but that none of these bands are allocated to the mobile service on a primary basis except by country footnote;

g) that within their territories in some of the bands identified in *considering f)*, some administrations have authorized or plan to authorize integrated MSS systems;

h) that ITU-R has performed frequency sharing studies and has determined that the coexistence between independent systems in the MSS and systems in the mobile services in the same spectrum without harmful interference is not feasible in the same or adjacent geographical area,

recognizing

a) that ITU-R has not performed studies on sharing, technical or regulatory issues with regard to integrated MSS systems, but that some administrations have performed such studies;

b) that the radionavigation-satellite service in the 1 559-1 610 MHz band and the radio astronomy service in the bands 1 610.6-1 613.8 MHz and 1 660-1 670 MHz need to be protected from harmful interference;

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[*] *Note by the Secretariat:* This Resolution was revised by WRC-15.

c) that the MSS in the 1 525-1 559 MHz and 1 626.5-1 660.5 MHz bands needs to be protected from harmful interference that may be caused due to co-channel and/or adjacent channel operation of the ground component of integrated MSS systems;

d) that Nos. **5.353A** and **5.357A** are applicable to MSS systems in different portions of the bands 1 525-1 559 MHz and 1 626.5-1 660.5 MHz with respect to the spectrum requirements and prioritization of communications for the Global Maritime Distress and Safety System and the aeronautical mobile-satellite (R) service;

e) that, subject to satisfactory measures being taken to protect RNSS systems, integrated MSS systems may be deployed in the 1 980-2 010 MHz, 2 170-2 200 MHz, 2 483.5-2 500 MHz bands in all three Regions and also in the 2 010-2 025 MHz band in Region 2, all of which bands are allocated both to the MSS and MS services, without the need for ITU-R studies,

noting

a) that the combined wide-area and urban coverage capabilities of integrated MSS systems may contribute to meeting the particular needs of developing countries such as is noted in Resolution **212 (Rev.WRC-07)**[*];

b) that some administrations that are planning to implement or are implementing integrated systems within their national territories have imposed limitations, in rules and authorization actions, on the e.i.r.p. density that the ground component of such systems may produce into bands allocated to the radionavigation-satellite service;

c) that there are a limited number of frequency bands allocated to the MSS, that these bands are already congested, and that the introduction of integrated ground components may in some instances make spectrum access for other MSS systems more difficult;

d) that administrations implementing integrated MSS systems may provide, in bilateral consultations of administrations, information on system characteristics of the ground component,

recommends

to invite ITU-R to conduct studies on the possible use of integrated MSS systems in the bands 1 525-1 544 MHz, 1 545-1 559 MHz, 1 626.5-1 645.5 MHz and 1 646.5-1 660.5 MHz, as appropriate, taking into account the need to protect existing and planned systems, as well as the above *considering*, *recognizing* and *noting*, and in particular *recognizing a), b)* and *c)*,

invites administrations

to participate as necessary in the ITU-R studies taking into account *recognizing a).*

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[*] *Note by the Secretariat:* This Resolution was revised by WRC-15.

RECOMMENDATION 207 (REV.WRC-15)

Future IMT systems

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that the future development of IMT is being studied by ITU-R in accordance with Recommendations ITU-R M.1645 and ITU-R M.2083, and further Recommendations are to be developed for IMT;

b) that the future development of IMT for 2020 and beyond is foreseen to address the need for higher data rates, corresponding to user needs, as appropriate, than those of currently deployed IMT systems;

c) the need to define the requirements associated with ongoing enhancement of future IMT systems,

noting

a) the ongoing relevant studies by ITU-R on IMT-Advanced, in particular the outputs from Question ITU-R 229/5;

b) the need to take into consideration requirements of applications of other services,

recommends

to invite ITU-R to study as necessary technical, operational and spectrum related issues to meet the objectives of future development of IMT systems.

RECOMMENDATION 316 (REV.MOB-87)

Use of ship earth stations within harbours and other waters under national jurisdiction[1]

The World Administrative Radio Conference for the Mobile Services (Geneva, 1987),

recognizing

that permitting the use of ship earth stations within harbours and other waters under national jurisdiction belongs to the sovereign right of countries concerned,

recalling

that WARC-79, allocated the bands 1 530-1 535 MHz (with effect from 1 January 1990), 1 535-1 544 MHz and 1 626.5-1 645.5 MHz to the maritime mobile-satellite service and the bands 1 544-1 545 MHz and 1 645.5-1 646.5 MHz to the mobile-satellite service,

noting

that the international agreement on the use of INMARSAT ship earth stations within the territorial sea and ports has been adopted and this Agreement is open to accession, ratification, approval or acceptance, as appropriate,

considering

a) that the maritime mobile-satellite service, which is at present in operation worldwide, has improved maritime communications greatly and has contributed much to the safety and efficiency of ship navigation, and that fostering and developing the use of that service in future will contribute further to their improvement;

b) that the maritime mobile-satellite service will play an important role in the Global Maritime Distress and Safety System (GMDSS);

c) that the use of the maritime mobile-satellite service will be beneficial not only to the countries having ship earth stations at present but also to those considering the introduction of that service,

is of the opinion

that all administrations should be invited to consider permitting, to the extent possible, ship earth stations to operate within harbours and other waters under national jurisdiction in the bands 1 530-1 535 MHz (with effect from 1 January 1990), 1 535-1 545 MHz and 1 626.5-1 646.5 MHz,

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1 WRC-97 made editorial amendments to this Recommendation.

recommends

1 that all administrations should consider permitting, to the extent possible, ship earth stations to operate within harbours and other waters under national jurisdiction, in the above-mentioned frequency bands;

2 that administrations should consider the adoption, where required, of international agreements on this matter.

RECOMMENDATION 401

Relating to the efficient use of aeronautical mobile (R) worldwide frequencies

The World Administrative Radio Conference (Geneva, 1979),

considering

that WARC-Aer2 allotted a limited number of worldwide frequencies for exercising control over regularity of flight and for safety of aircraft,

recommends to administrations

1 that the number of HF aeronautical stations on the worldwide channels should be kept to a minimum consistent with the economic and efficient use of frequencies;

2 that, if possible and practicable, one such station should serve aircraft operating agencies in adjacent countries and there should not normally be more than one station per country.

RECOMMENDATION 503 (REV.WRC-2000)

High-frequency broadcasting

The World Radiocommunication Conference (Istanbul, 2000),

considering

a) the congestion in the HF broadcasting bands;

b) the extent of co-channel and adjacent-channel interference;

c) that AM reception quality is relatively poor compared with FM broadcast or CD quality;

d) that new digital techniques have enabled significant improvements in reception quality to be obtained in other broadcasting bands;

e) that the introduction of digital modulation systems in the broadcasting bands below 30 MHz has been shown to be feasible using low bit-rate coding;

f) that Resolution **517 (Rev.WRC-97)*** invites ITU-R to continue its studies on digital techniques in HF broadcasting, as a matter of urgency;

g) that urgent studies on this subject are currently being carried out by ITU-R under former Question ITU-R 217/10, with a view to issuing a relevant Recommendation in a very short time period,

recognizing

a) that the implementation of an ITU-recommended worldwide system for digital sound in the HF bands would be extremely beneficial, particularly for developing countries, since it allows for:

– mass-scale production resulting in receivers as economical as possible;

– more economical analogue-to-digital conversion of existing transmitting infrastructures;

b) that the above system would result in digital receivers having a number of advanced features such as assisted tuning, improved audio quality and robustness to co-channel and adjacent-channel interference, which would greatly contribute to a better spectrum utilization,

recommends administrations

1 to draw the attention of manufacturers to this matter, in order to ensure that future digital receivers take full advantage of the advanced technology while maintaining low cost;

2 to encourage manufacturers to monitor closely the development of the studies carried out by ITU-R, with a view to starting mass production of new low-cost digital receivers as soon as possible after the approval of relevant ITU-R Recommendation(s).

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* *Note by the Secretariat:* This Resolution was revised by WRC-03, WRC-07 and WRC-15.

RECOMMENDATION 506

Relating to the harmonics of the fundamental frequency of broadcasting-satellite stations[1]

The World Administrative Radio Conference (Geneva, 1979),

considering

a) that the frequency band 23.6-24 GHz is allocated to the radio astronomy service on a primary basis;

b) that the second harmonic of the fundamental frequency of broadcasting-satellite stations operating within the band 11.8-12 GHz may seriously disturb radio astronomy observations in the band 23.6-24 GHz if effective steps are not taken to reduce the level of this harmonic,

in view of

the provisions of No. **3.8**,

recommends

that, when defining the characteristics of their space stations operating in the broadcasting-satellite service, particularly within the band 11.8-12 GHz, administrations take all necessary steps to reduce the level of the second harmonic below the values indicated in the relevant ITU-R Recommendations.

[1] WRC-97 made editorial amendments to this Recommendation.

RECOMMENDATION 520 (WARC-92)

Elimination of HF broadcasting on frequencies outside the HF bands allocated to the broadcasting service

The World Administrative Radio Conference for Dealing with Frequency Allocations in Certain Parts of the Spectrum (Malaga-Torremolinos, 1992),

considering

a) that there is an increasing number of HF broadcasting stations operating on frequencies outside the bands allocated to the broadcasting service;

b) that the common use of the HF bands by the broadcasting and other services, without the relevant allocations or detailed regulations, results in inefficient use of the frequency spectrum;

c) that such use has led to harmful interference;

d) that this Conference has allocated additional spectrum to the broadcasting service in the HF bands,

recommends

that administrations shall take practicable steps to eliminate HF broadcasting outside the HF bands allocated to the broadcasting service.

RECOMMENDATION 522 (WRC-97)

Coordination of high-frequency broadcasting schedules in the bands allocated to the broadcasting service between 5 900 kHz and 26 100 kHz

The World Radiocommunication Conference (Geneva, 1997),

considering

a) that Article **12** establishes the principles and the procedure for use of the frequency bands allocated to the HF broadcasting service between 5 900 kHz and 26 100 kHz;

b) that the aforementioned principles stipulate, *inter alia*, that the procedure should promote the development of a voluntary coordination process among administrations to resolve incompatibilities;

c) that the procedure itself encourages administrations to coordinate their schedules with other administrations as far as possible prior to submission;

d) that the development of coordination among administrations with the assistance of the Radiocommunication Bureau, when requested, would result in better use of the spectrum allocated to the HF broadcasting service between 5 900 kHz and 26 100 kHz,

recognizing

a) that the participation of broadcasting organizations in this coordination process would make the task of resolving incompatibilities easier;

b) that multilateral coordination of the use of the HF broadcasting bands is already practised on an informal basis in various regional coordination groups[1],

recommends administrations

to promote, as far as possible, regular coordination of their broadcasting schedules within appropriate regional coordination groups of administrations or broadcasting organizations in order to resolve or reduce incompatibilities, through bilateral or multilateral meetings or by correspondence (telephone, facsimile, e-mail, etc.).

[1] Not related to the ITU Regions.

RECOMMENDATION 608 (REV.WRC-07)

Guidelines for consultation meetings established in Resolution 609 (Rev.WRC-07)

The World Radiocommunication Conference (Geneva, 2007),

considering

a) that in accordance with the Radio Regulations (RR), the band 960-1 215 MHz is allocated on a primary basis to the aeronautical radionavigation service (ARNS) in all the ITU Regions;

b) that WRC-2000 introduced a co-primary allocation for the radionavigation-satellite service (RNSS) in the frequency band 1 164-1 215 MHz (subject to the conditions specified under No. **5.328A**), with a provisional limit on the aggregate power flux-density (pfd) produced by all the space stations within all radionavigation-satellite systems at the Earth's surface of −115 dB(W/m^2) in any 1 MHz band for all angles of arrival;

c) that WRC-03 revised this provisional limit and decided that the level of −121.5 dB(W/m^2) in any 1 MHz for the aggregate equivalent pfd (epfd) applying for all the space stations within all RNSS systems, taking into account the reference worst-case ARNS system antenna characteristics described in Annex 2 of Recommendation ITU-R M.1642-2, is adequate to ensure the protection of the ARNS in the band 1 164-1 215 MHz;

d) that WRC-03 decided that to achieve the objectives in *resolves* 1 and 2 of Resolution **609 (Rev.WRC-07)**, administrations operating or planning to operate RNSS systems will need to agree cooperatively through consultation meetings to achieve the level of protection for ARNS systems, and shall establish mechanisms to ensure that all potential RNSS system operators are given full visibility of the process but that only real systems are taken into account in the calculation of the aggregate epfd,

recommends

1 that in the implementation of *resolves* 5 of Resolution **609 (Rev.WRC-07)**, in the frequency band 1 164-1 215 MHz, the maximum pfd produced at the surface of the Earth by emissions from a space station in the RNSS, for all angles of arrival, should not exceed −129 dB(W/m^2) in any 1 MHz band under free space propagation conditions;

2 that the RNSS characteristics listed in the Annex 1, used when applying the methodology contained in Recommendation ITU-R M.1642-2, as well as the calculated aggregate epfd in dB(W/m^2) in each 1 MHz in the range 1 164-1 215 MHz, should be made available in electronic format by the consultation meetings.

ANNEX 1 TO RECOMMENDATION 608 (REV.WRC-07)

List of RNSS system characteristics and format of the result of the aggregate epfd calculation to be provided to the Radiocommunication Bureau for publication for information

I RNSS systems characteristics

I-1 RNSS ITU publication reference

RNSS network name	Network ID	ITU Publication reference	IFIC
		AR11/A/....	
		API/A/....	
		AR11/C/....	
		CR/C/....	

I-2 Non-GSO satellite system constellation parameters

For each non-GSO satellite system, the following constellation parameters should be provided to the Bureau for publication for information:

N: number of space stations of the non-GSO system

K: number of orbital planes

h: satellite altitude above the Earth (km)

I: inclination angle of the orbital plane above the Equator (degrees).

Satellite index *I*	RAAN $\Omega_{i,0}$ (degrees)	Argument of latitude $E_{i,0}$ (degrees)
1	...	...
2	...	...
...	...	...
N	...	...

I-3 GSO satellite system longitude

For each GSO satellite network, the satellite longitude should be provided to the Bureau for publication for information, as follows:

$LonGSO_i$: longitude of each of the GSO satellites (degrees).

I-4 Maximum non-GSO space station pfd versus the elevation angle at the Earth's surface (worst 1 MHz)

For the non-GSO satellite system space stations, the maximum pfd in the worst 1 MHz versus elevation angle should be provided to the Bureau for publication for information in a table format as follows:

Elevation angle (each 1°)	pfd (dB(W/(m^2 · MHz)))
−4	pfd (−4°)
−3	pfd (−3°)
…	…
…	…
90	pfd (−90°)

I-5 Maximum GSO space station pfd versus latitude and longitude at the Earth's surface (worst 1 MHz)

For each GSO satellite network space station, the maximum pfd in the worst 1 MHz, defined as the 1 MHz in which the pfd of the signal is maximum versus latitude and longitude should be provided to the Bureau for publication for information in a table format as follows:

Longitude (each 1°)	0	1	…	360
Latitude (each 1°)	Maximum pfd dB(W/m^2) in worst 1 MHz			
−90	pfd (0, −90)	…	…	…
−89	…	…	…	…
…	…	…	…	…
…	…	…	…	…
90	…	…	…	pfd (360, 90)

I-6 Spectrum for GSO satellite networks or non-GSO satellite systems

For each GSO satellite network or non-GSO satellite system, the level of spectrum emission in each 1 MHz relative to the spectrum value at the worst 1 MHz of the whole band (1 164-1 215 MHz) should also be provided to the Bureau for publication for information.

II Results of the aggregate epfd calculation in the worst 1 MHz of the 1 164-1 215 MHz band

Maximum aggregate epfd in dB(W/m^2) in the worst-case megahertz in the range 1 164-1 215 MHz.

RECOMMENDATION 622 (WRC-97)

Use of the frequency bands 2 025-2 110 MHz and 2 200-2 290 MHz by the space research, space operation, Earth exploration-satellite, fixed and mobile services

The World Radiocommunication Conference (Geneva, 1997),

considering

a) that the bands 2 025-2 110 MHz and 2 200-2 290 MHz are allocated on a primary basis to the space research, space operation, Earth exploration-satellite, fixed and mobile services;

b) that, in response to Resolutions from the 1992 Conference (WARC-92), studies have resulted in a number of ITU-R Recommendations, which, when adhered to by the services, will result in a stable, long-term sharing environment (Recommendations ITU-R SA.364, ITU-R SA.1019, ITU-R F.1098, ITU-R SA.1154, ITU-R F.1247, ITU-R F.1248, ITU-R SA.1273, ITU-R SA.1274 and ITU-R SA.1275);

c) that this Conference adopted No. **5.391** which states that high-density mobile systems shall not be introduced in these frequency bands,

considering further

that enhancements in technology may enable the services mentioned in *considering a)* to minimize the total bandwidth requirement in these frequency bands,

noting

that WARC-92 considered that it is desirable to review the present and planned use of the frequency bands 2 025-2 110 MHz and 2 200-2 290 MHz, with the intent, where practicable, of satisfying some space mission requirements in bands above 20 GHz,

recognizing

that there are increasing requirements for emerging communication systems which need to be satisfied in the frequency range below 3 GHz,

recommends

that administrations planning to introduce new systems in the space research, space operation, earth exploration-satellite, fixed or mobile services in the bands 2 025-2 110 MHz and 2 200-2 290 MHz take into account the ITU-R Recommendations referred to in *considering b)* above when making assignments to these services, and implement enhancements in technology as early as practicable with a view to minimizing the total bandwidth required by systems of each service.

RECOMMENDATION 707

Relating to the use of the frequency band 32-33 GHz shared between the inter-satellite service and the radionavigation service[1]

The World Administrative Radio Conference (Geneva, 1979),

considering

a) that the band 32-33 GHz is allocated to the inter-satellite service and the radionavigation service;

b) that there are safety aspects associated with the radionavigation service;

c) that No. **5.548** has been incorporated into Article **5**,

recommends

that, as a matter of urgency, studies should be made of the sharing criteria for these two services in the frequency band listed above,

requests the ITU-R

to carry out these studies,

recommends further

that a future competent world radiocommunication conference review the ITU-R Recommendations with a view to the inclusion of such sharing criteria in Article **21**.

1 WRC-97 made editorial amendments to this Recommendation.

RECOMMENDATION 724 (WRC-07)

Use by civil aviation of frequency allocations on a primary basis to the fixed-satellite service

The World Radiocommunication Conference (Geneva, 2007),

considering

a) that remote and rural areas often still lack a terrestrial communication infrastructure that meets the evolving requirements of modern civil aviation;

b) that the cost of providing and maintaining such an infrastructure could be expensive, particularly in remote regions;

c) that satellite communication systems operating in the fixed-satellite service (FSS) may be the only medium to satisfy the requirements of the International Civil Aviation Organization's (ICAO) communication, navigation, surveillance and air traffic management (CNS/ATM) systems, where an adequate terrestrial communication infrastructure is not available;

d) that the use of VSAT systems, operating in the FSS and being deployed on a large scale in aeronautical communications, has the potential to significantly enhance communications between air traffic control centres as well as with remote aeronautical stations;

e) that establishing and utilizing satellite communication systems for civil aviation would also bring benefits for developing countries and countries with remote and rural areas by enabling the use of VSAT systems for non-aeronautical communications;

f) that in the cases identified in *considering e)* it is necessary to draw attention to the importance of aeronautical communications as opposed to non-aeronautical communications,

noting

a) that the FSS is not a safety service;

b) that Resolution **20 (Rev.WRC-03)** *resolves to instruct the Secretary-General* "to encourage ICAO to continue its assistance to developing countries which are endeavouring to improve their aeronautical telecommunications ...",

recommends

1 that administrations, in particular in developing countries and in countries with remote and rural areas, recognize the importance of VSAT operations to the modernization of civil aviation telecommunications systems and encourage the implementation of VSAT systems that could support both aeronautical and other communication requirements;

2 that administrations in developing countries be encouraged, to the maximum extent possible and as necessary, to expedite the authorization process to enable aeronautical communications using VSAT technology;

3 that arrangements should be made to provide for urgent service restoration or alternative routing in case of a disruption of a VSAT link associated with the aeronautical communications;

4 that administrations implementing VSAT systems in accordance with *recommends* 1 to 3 should do so in satellite networks operating in frequency bands with a primary allocation to the satellite services;

5 to invite ICAO, noting Resolution **20 (Rev.WRC-03)**, to continue its assistance to developing countries to improve their aeronautical telecommunications, including interoperability of VSAT networks, and provide guidance to developing countries on how they could best use VSAT technology for this purpose,

requests the Secretary-General

to bring this Recommendation to the attention of ICAO.

ISBN 978-92-61-19121-4

Printed in Switzerland
Geneva, 2016