



International Amateur Radio Union Region 1 2017 General Conference – Landshut, Germany



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Author:	Graham Shirville, G3VZV		

1. Current satellites

There are currently fourteen OSCAR satellites, in low earth orbit, carrying amateur radio voice transponders:

A07	– Linear transponders – launched in 1974
FO29	- Linear transponder
SO50	– FM transponder
A073/FUNcube-1	- Linear transponder and educational telemetry
FUNcube-2 on UKube-1	- Linear transponder and educational telemetry
EO79/FUNcube-3 on QB50p1	- Linear transponder (only)
AO85/Fox-1A	- FM transponder with telemetry for educational out-reach
IO86 /LapanA2	- FM transponder
EO88/FUNcube-5 on Nayif-1 (UAE)	- Linear transponder and educational telemetry
XW2A	- Linear transponder
XW2B	- Linear transponder
XW2C	- Linear transponder
XW-2D	- Linear transponder
XW-2F	- Linear transponder

This represents a doubling of availability since my previous report prepared for our 2014 Conference. There are, additionally, a number of satellites with APRS capability including the ARISS payload on the ISS.

2. Other active satellites

In addition to the above spacecraft, there are more than sixty, currently active, other satellites which use downlink frequencies within the amateur satellite service allocations. These are generally using the 145 and/or 435 MHz bands. These have a variety of functions and their current status can be checked at http://www.dk3wn.info/p/?page_id=29535

3. AMSAT transponder satellite projects (under construction or at proposal stage)

This list shows a few of the projects believed to be underway at this time:

Phase 3E	AMSAT-DL/US – a HEO (High Earth Orbit) project (5,6 GHz up 10,4 GHz down) - launch date unknown
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Es'HailSat-2	AMSAT-DL – a ride share to GEO (Geostationary Earth orbit) see details below
Phase 4E	AMSAT-US – another ride share GEO (5,6 GHz up 10,4 GHz down) – launch date NET 2018
ESEO	AMSAT-UK – L/V transponder and educational telemetry sub system - now has an expected launch 2017/18 into LEO.
Fox 1B, 1C & ID	AMSAT-NA – Three more CubeSats with FM U/V transponders and educational telemetry. Expected launch 2017/18 into LEO
Fox1E	AMSAT-NA – A linear V/U transponder and telemetry is planned
JY1Sat	Jordan A FUNcube follow on mission. Will have enhanced performance and image download capability. Expected launch into LEO late 2017 or early 2018

4. EsHailSat-2

This will be a Geostationary Spacecraft at 25,5 degrees east and will carry two “Phase 4” amateur transponders. They will both use 2,4 GHz for uplink and 10 GHz for downlinks.

The launch of this spacecraft has been delayed and is now expected to take place in 2018. Es'HailSat-2 will provide a 250kHz linear transponder intended for conventional analogue operations in addition to another transponder which will have an 8 MHz bandwidth. The latter transponder is intended for experimental digital modulation schemes and DVB-S amateur television.

Both transponders will have broad beam antennas to provide full coverage over more than one third of the earth's surface centered over Africa.

Precise operational plans remain to be finalized but it is anticipated that only quite simple ground equipment will be required to use this satellite. Considerable work is being undertaken by AMSAT-DL, BATC and other interested groups to develop a suitable CONOPS for this spacecraft

5. CubeSats

There continues to be a large number of CubeSats under construction and many continue to be launched.

The WRC-15 Conference agreed an agenda item for its 2019 meeting. Agenda item 1.7 for WRC-19 reads: “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 COM6/19 (WRC-15).” It now looks possible that additional VHF and/or UHF spectrum may be found for these missions

If additional spectrum is made available for these spacecraft this will relieve the pressure on “our” bands, but it will also reduce the chances of our obtaining ride shares for transponders.

In addition, it will also be likely to reduce the number of students and young professional engineers obtaining their amateur licences.

6. The QB50 Project

This is a CubeSat project which is intended to fly approximately fifty CubeSats into a very low earth orbit. Most are now expected to be deployed from the ISS into a sub 400 km orbit. This orbit will enable the spacecraft to do some fundamental research at the upper edge of the atmosphere and they will de-orbit within a year. Additionally, some of these spacecraft are also undertaking tests of, space to space, mesh communications and others carry transmitters operating at microwave frequencies. A small number of QB50 spacecraft will be launched to a higher, approximately 600 km, orbit from India. Generally, these spacecraft have downlinks around 436 - 437MHz and frequency coordination has been completed.

Two double CubeSats, QB50p1 and QB50p2, were launched to a 600 km orbit in 2014 to test the science payloads for this project. The QB50 consortium has enabled both “Precursor” spacecraft to carry Amateur radio payloads (mentioned above) for use after the results of the science mission have been obtained.

7. Frequency Coordination

The IARU Frequency Coordination Panel has continued to be very active and is working to ensure that any satellite project which is intending to use frequencies in the amateur satellite service is actually compliant with the requirements for such use.

Full details of all satellite projects about which the Coordination Panel is aware can be found at <http://www.amsat.org.uk/iaru/> and information about the Coordination process itself is available at www.iaru.org/satellite.html

8. Education Outreach

Both FUNcube-1 and Nayif-1 now provide telemetry for educational outreach for schools and colleges and a simple omni-directional 145MHz antenna and SDR dongle are all that is required for satisfactory reception. Simple, windows based, decoders and user interfaces have also been developed and are available for free download.

More than 1 100 stations around the world have been submitting the telemetry data that they have received to the central Data Warehouses.

The FOX CubeSat programme from AMSAT-NA is also intended to provide educational outreach opportunities and is compatible with the FUNcube type receiver systems.

9. The International Space Station

The ARISS team have recently had to contend with equipment failure in the Columbus Module but have continued to organise a large number of contacts between the astronauts and schools using both 145 MHz and 435 MHz bands

The equipment for the HAMtv project was finally put into service during the Tim Peake “Principia” mission during the first half of 2016. This provided live and direct video downlinks to schools using Reduced Bandwidth digital ATV (RB-TV) and proved to greatly enhance the experience of a “schools contact.” Thomas Pesquet has continued to use the equipment during his current mission in 2017 and a full network of ground stations and a seamless streaming server network has been developed to further facilitate its use.

Development work for additional and improved flight hardware for the ISS amateur radio payloads is continuing.

Graham Shirville, G3VZV

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