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1. ARISS

ARISS contacts are continuing to drain the interest of schools and the press. Due to the popularity and the high demand for ARISS contacts the selection procedure has changed:

- Twice a year a 3-month window is opened where schools can apply for a contact.
- At the end of this period the selection committee will chose only the amount of contacts that can be handled by the ISS crew (depending on availability of licensed astronauts)
- The school will be informed of the approval or the denial of the application
- The actual contact will be scheduled about one year later.
- This system will insure that schools will not wait in excess of one year.

This procedure has been communicated for the first time in fall 2015 for the application window February-April 2016, the selection occurs in May 2016 and the contacts will be made during Q1-2017.

The next application window will be September-November 2016, the selection will take place in December 2016 and the contacts during Q2 2017. This schema will continue twice a year.

In the meantime, the ARISS team performed its 1 000th school contact.

The RSGB has set up an extensive programme for the Tim Peake mission in Q1-2016. Many school contacts have been planned and are also enhanced with "HAM TV". Tim Peake also brought with him a pair of Raspberry Pi's, for which students can write software that will be tried out in space.

There is currently one European ground station used for "telebridge" contacts: IK1SLD located at Casale Monferrato Airport in northern Italy. A second ground station, ON4ISS, has been rebuild at ON7UX's location and will soon be commissioned. All other ground stations are located in Regions 2 and 3.

2. HAM TV

Over one year ago the "HAM TV" transmitter on board of the ISS has periodically been turned on with "blind transmissions" (i.e. the RF signal is modulated by a MPEG signal, but the image content is just black). After discovering that the data stream was not DVB-S compliant so that ordinary set-top boxes could not decode the signal, Jean Pierre, F6DZP, wrote the software "titioune" to decode the data stream. He is currently working on such software for a Raspberry Pi.

In the meantime, several ground stations have been set up (or are in progress of being completed) and are streaming the received images from ISS via Internet.

The configuration of the ground stations will allow typical NW->SE or SW->NE passes over Europe, "handing over the image" to the next ground station to extend the typical 5-minute visibility to a total of 15 - 20-minute video stream.

The current ground stations are EI9FHB in Cork/Ireland, F6DZP in Poitiers/France, IK1SLD in Casale Monferrato/Italy, CS5SS near Lisbon/Portugal and SP3QFE in Kolo/Poland. There is also a planned station in Sicily. Kaiser Italy, the manufacturer of the HAM TV transmitter, has also a ground station, but is not networked.

All video streams can be watched on the BATC streaming server. This server cannot insure trouble-free operations (overload) during school contacts, so a distinct server has been set up in between that will relay the video stream between the ground stations and the BATC streaming server. This server can directly be accessed by the school (only during its own planned contact) insuring overload-free access to the video stream. On top of that this server will unify the streams from all networked ground stations and generate one single continuous video stream (so handover will be transparent). This server is currently hosted by AMSAT-ON.

HAM TV is now used during ARISS school contacts to provide a live image of the astronaut during contacts. This allows him also to explain visually some questions.

During the Principia mission of Tim Peake, many HAM TV contacts also use streaming coming from Goonhilly ground station in the UK. RSGB has been allowed to use one of the antennas for HAM TV.

The ARISS team is now working on a "slide-show": A Raspberry Pi would generate some fixed slide show that can be transmitted all the time except when an ARISS school contact takes place (or when ISS operations requests HAM TV to be shut off). This would stimulate more hams to set up ground stations and ground station networks. Already there are networks building up in Australia and the United States of America.

3. CubeSat projects

The number of universities and science institutes interested in CubeSats is growing tremendously. QB-50 is a good example for this:

- The QB-50 project consists of 50 satellites in LEO (<350 km, expected lifetime = 3 month)
- Most will use 70 cm downlink and 2 m uplink.

The "deal" for using amateur satellite frequencies is to implement a "return value" for the amateur community:

- 2 precursor satellites (EO-79 and EO-80) have been launched and have amateur payloads
- Some of the 50 CubeSats will also have specific amateur payloads

- It will give us the opportunity to experiment "early object discrimination" (determining which satellite is which NORAD object just after launch)
- It will also allow us to experiment "simultaneous satellite reception" (one ground station receiving multiple satellites at the same time)

Another good example is OUFTI-1. This is a CubeSat of the University of Liège/Belgium which implements a D-STAR repeater on board. A very good working relationship between the academic world and the amateur community has been set up (collaboration on RF electronics, tutoring of PhD students by amateurs ...). Launch is scheduled April 22nd 2016 from Kourou. Quite a few students passed their radio-amateur license.

SIMBA and PICASSO, two Belgian research CubeSats, are currently in design. Amateur payload (FM transponders) will be integrated for free.

Last, but not least: ESA has published a tender for a W-Band propagation study (Artes project).

A consortium around the Von Karman Institute is responding, but is encouraging the amateur community to participate. The project consists of a satellite with a 47 and 76 GHz beacon on board and a set of ground stations measuring the signal strength and correlating this with local weather (fog, rain, snow, etc.)

Currently there are not many amateurs active in those bands and satellite activity is zero. The primary return of this is of course precise propagation model in 47 and 76 GHz bands, especially taking into account the upper atmosphere. Direct access to on-board GPS data will also incite us to experiment with HPOP propagators in place of the less accurate SGP-4/8. Finally, VKI committed to embark a full FunCube TRX available to the amateur community and work on possible amateur payloads/experiments.

4. Education

Currently "space" is a very good driver for science and technology in schools. The popularity of ARISS is one proof of this.

The CanSat competition is another example: schools build a "satellite" in form of a can, which is launched at +/- 1,5 km height. I had the opportunity to help one team (that won).

Schools are starting to use satellites such as Funcube in their classes. With all the sensors of Funcube it is possible to do quite a lot: the Leslie experiment (radiation of white/black surface) has been built in, but this can also be used to show the earth's own thermal radiation, to measure the albedo, the spin cycle of the satellite.

A first summer camp will be organised in 2016 at the Eurospace centre for building "satellites". The first module will build a simple Arduino-based weather station that will be lifted to +/- 300 m using a captive balloon. Telemetry will be done on the 2,4 GHz ISM bands. The project is nick-named "MySat" as students will go home with "my satellite!" This kit can be made available to other associations.

The second module will reuse this platform and add 3-axis sensors and a GPS receiver. A third module is planned around EYASSAT.

5. ARSPEX pages on IARU website

I must admit that I did not publish many information on the IARU-R1 website. The major reason for this is that everything I publish gets completely messed up (formatting and layout). So far, I could not find any help to address this, nor do I have the possibility to correct (edit) the information or the presentation.

6. Plans for 2016 and beyond:

HAM TV project will focus on finishing the central server and the stream reunification.

On the CubeSat front we will continue working on current projects (QB-50, OUFTI-1 ...) and hope that the W-Band propagation project is initiated. This will give us 2 years to set up a few 76 GHz ground stations around Europe.

The "MySat" project will be published in Q2-2016 with the first hands-on results of the summer camp 2016. I will make this available together with the PCB layout, 3D-models of the case, software... so that all countries can reuse this.

73's Stefan ON6TI – chairman of ARSPEX WG