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Subject	Report Satellite Coordinator IARU-R1		
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Current satellites

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

AO7	– linear transponders – launched in 1974
FO29	- linear transponder
SO50	– FM transponder
AO73/FUNcube-1	- linear transponder and educational telemetry
FUNcube-2 on UKube-1	- linear transponder and educational telemetry- transponder not yet activated
EO79 by AMSAT-UK/NL on QB50p1	- linear transponder only- transponder currently under test
EO80 by AMSAT-F on QB50p2	- FM transponder –transponder not yet activated
AO85/Fox-1A by AMSAT-US	- FM transponder with telemetry for educational outreach
IO86 /LapanA2	- FM transponder
XW2A by CAMSAT	- Linear transponder
XW2B by CAMSAT	- Linear transponder
XW2C by CAMSAT	- Linear transponder
XW-2D by CAMSAT	- Linear transponder
XW-2F by CAMSAT	- Linear transponder

This represents a doubling of availability since my previous report prepared for our 2014 Conference.

Other active satellites

There are approximately another 66, other, currently active, satellites which use downlink frequencies within the amateur satellite service allocations. These have a variety of functions and their current status can be checked at http://www.dk3wn.info/p/?page_id=29535

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

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

Phase 3E	- AMSAT-DL/US – a HEO (High Earth Orbit) project (5.6GHz up 10.4GHz down) - launch date unknown
Es'HailSat-2	- AMSAT-DL – a ride share to GEO (Geostationary Earth orbit) see details below
Phase 4E	-AMSAT-US – another ride share GEO (5.6GHz up 10.4GHz down) – launch date

	NET 2018
Kiwisat	- AMSAT-ZL – a LEO (Low Earth Orbit) project - launch date unknown
ESEO	- AMSAT-UK - LV transponder and educational telemetry sub system anticipated launch 2016/7 into LEO.
Fox 1B, 1C & ID	- AMSAT-NA – Three more CubeSats with FM transponders and educational telemetry. Expected launch 2016/7 into LEO
Nayif-1	AMSAT UK/NL – A FUNcube-1 follow on mission with enhanced performance. Expected launch into LEO during H1 2016

EsHailSat-2

This is a planned Geostationary Spacecraft and will carry two geostationary “Phase 4” amateur transponders. They will both use 2.4Ghz for uplink and 10GHz for downlinks.

The spacecraft is expected to be ready for launch by the end of 2016.

Es'HailSat-2 will provide a 250kHz linear transponder intended for conventional analogue operations in addition to another transponder which will have an 8MHz bandwidth. The latter transponder is intended for experimental digital modulation schemes and DVB amateur television.

Both transponders will have broad beam antennas to provide full coverage over about 1/3rd 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.

CubeSats

There continues to be a large number of CubeSats under construction and many are now being launched.

The recent WRC-15 Conference has 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).”

If additional spectrum was made available for these spacecraft this would relieve the pressure on “our” bands, but it would also reduce the chances of our obtaining ride shares for transponders. In addition, it would also be likely to reduce the number of students and young professional engineers obtaining their amateur licences.

The QB50 Project

This is a CubeSat project which is intended to fly approximately fifty CubeSats into a very low earth orbit. They are now expected to be deployed from the ISS into a sub 400km 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. Generally these spacecraft will have downlinks around 436-437MHz and frequency coordination is presently underway.

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

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

Two coordination problems have occurred in recent months. One where an old APRS spacecraft has occasionally been activated over Europe with intermittent bursts on a downlink on 144.390 MHz and also where some of the XW-2 spacecraft, mentioned above, have been built with outputs outside the R1 2 metre Bandplan arrangements. The latter spacecraft were not coordinated by the IARU as a result.

The IARU have recently decided not to provide frequency coordination for spacecraft requesting downlink frequencies in our 2 metre band except those carrying transponders and those coming from universities and similar non commercial organisations.

The Administrative Council are presently working with the Frequency Coordination Panel to develop new systems to enable the process to be undertaken more efficiently.

All three IARU regions have now included satellite operation the bottom section of their 2 metre bandplans and these are now therefore available on a worldwide basis.

Education Outreach

FUNcube-1 continues to 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. A simple, windows based decoder and user interface has also been developed and is available for free download.

More than 950 stations around the world have been submitting the telemetry data that they have received to the central Data Warehouse.

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

The International Space Station

The ARISS team have recently celebrated 15 years of amateur radio activity on the Space Station. There continue to be a large number of contacts between the astronauts and schools using the 145MHz band organised by ARISS.

The equipment for the HAMtv project has been tested and it is hoped that it will be put into use for an actual school contact early this year. This will provide live and direct video downlinks to schools using Reduced Bandwidth digital ATV (RB-TV).

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