



**AMSAT-UK**

## Introduction

AMSAT-UK is the only organisation which represents users of the Amateur Satellite Service in the UK. It is run by volunteers and receives no external funding. It liaises closely with similar groups in Europe and the rest of the World.

Our members carry out innovative experimental work with satellite communications and design and build the hardware and software required. The signals from these satellites are very weak and Radio Amateurs have developed highly sensitive state-of-the-art receiving equipment in order to receive these signals.

*We wish to comment on these questions:*

*Q10: Do you agree that the 5350 – 5470 MHz and 5725 – 5925 MHz bands could provide important additional capacity for Wi-Fi and similar systems? If so, and noting the need to protect both earth observation satellites and radar systems, do you agree that sharing solutions should be considered at WRC-15?*

5830-5850 MHz is a key Amateur Satellite Service downlink allocation available and used for both Low Earth Orbit and Deep Space amateur spacecraft. The unconstrained use of 5725–5925 MHz for Wi-Fi would significantly raise the noise floor making it impossible for radio amateurs in urban areas to receive the weak satellite signals. Mitigation measures including DFS, TPC etc must be considered to minimise the level of outdoor interference

*Q15: Do you agree that if any allocations to the fixed satellite service in the 10-17 GHz range impose undue constraints on existing services then further studies on the demand and justification for use of the spectrum would need to be carried out?*

10 450 - 10 500 MHz is a key amateur-satellite allocation. Satellites using this allocation are currently under construction and will be deployed in Low-Earth, High-Earth and Geostationary orbits. Whilst accepting that the amateur satellite allocation is a secondary one, it is deeply disappointing the studies for this item appear to have entirely overlooked our activity despite CEPT EU allocation footnote EU23 requesting administration to carefully consider our activity. The use of this band by the fixed satellite service would cause unacceptable levels of interference to the amateur-satellite service and thus strongly support alternative options to resolve the FSS request further up the 10-17GHz range outside of our own allocation.

*Q25: Do you agree that the UK should support a generic radiolocation allocation in the 77.5-78 GHz band, where appropriate technical conditions are established?*

77.5 - 78.0 GHz is a Primary amateur satellite service allocation. A primary allocation is not necessary for existing automotive radars (or similar) which are license exempt short range devices. The use of this band for generic unconstrained radiolocation (which would be totally out of scope of the Agenda Item) could adversely impact both ground and satellite receivers so agreed technical conditions do need to be established.

*Q27: Do you agree that it is right to wait for the relevant sharing studies to mature before coming to a final position on the potential for additional allocations to the earth exploration-satellite (active) service in the 8/9/10GHz band?*

As mentioned in our answer to Q15 the amateur satellite service has an allocation at 10 450 - 10 500 MHz with plans for new satellites. We are pleased in this case that the relevant studies have included the amateur services. It is right to wait for sharing studies which take into account the impact on the Amateur Satellite Service. Should EEES deployments be denser than originally indicated then we would have particular concern regarding compatibility with our own plans

*Q38: Do you agree that no specific measures need to be introduced for nano and pico-satellites and that the current approach to their regulation is sufficient?*

We agree that no major change of the radio regulations is required to specifically accommodate nano and picosatellites. However we might support specific proposals that facilitate some flexibility given the constraints/uncertainties on developers and launches.

It is also correct that an increase of awareness of the ITU filing process is required among the developers, in order to make sure that these satellites operate in conformance with the Radio Regulations. This would also ensure that any nano/picosatellite operating in the amateur satellite service conforms to the definition of an amateur satellite.

However, given the rapidly growing number of nano and picosatellites already launched and under development and, noting the number of these satellites which are operating or planned to operate in the amateur satellite service, additional studies to see how this growing number of satellites can be accommodated are now required.

Our views are based on the experience that we have gained in our direct involvement with the development of two CubeSats over the past four years-

**FUNcube-1** is a complete educational single CubeSat project with the goal of enthusing and educating young people about radio, space, physics and electronics. FUNcube-1 was successfully launched from Russia on a DNEPR rocket on Nov 21st 2013 and is performing well. More than 750 stations around the world are already receiving and decoding the telemetry and many schools are already involved. Details of current operations and the telemetry available from FUNcube-1 can be seen at [www.warehouse.funcube.org.uk](http://www.warehouse.funcube.org.uk) We also have a dedicated educational outreach page here <http://funcube.org.uk/education-outreach/>



**FUNcube-2 on UKube-1** (a mission of the UK Space Agency) is a follow-on project and comprises of a set of FUNcube boards that is flying as a subsystem on UKube-1 and it has identical goals. This spacecraft was successfully launched on a Soyuz rocket from Baikonur on July 8th 2014. See this page for the latest UKube-1 information <http://funcube.org.uk/news>

They are both intended to support the educational Science, Technology, Engineering and Maths (STEM) initiatives presently underway in the UK and around the world.

The target audience for these spacecraft consists of primary and secondary school pupils and the FUNcubes feature a 145 MHz telemetry beacon provides a strong signal for the pupils to receive.

*Q42: Do you have any comments regarding UK positions for future WRC agenda items?*

Amsat-UK strongly supports the IARU Region-1 proposals in 1.8, 50 and 3400MHz, and request that Ofcom support and help develop these.

We are however strongly opposed to the Swedish proposals requesting additional Mobile allocations that overlap these established amateur frequencies

*Q43: Are there any other possible agenda items you wish to see addressed by future WRCs?*

The Amateur Satellite Service has seen rising interference levels in the allocations at 1260-1270 MHz, 2400-2450 MHz, 5650-5670 MHz, 5830-5850 MHz and 10 450-10 500 MHz, potentially rendering these allocations useless in urban areas. Whilst we have only secondary status, we have a deep concern that not just one, but all our options, are being impacted and therefore we support the current IARU Region-1 input to CEPT that includes 50 MHz and 3.4GHz as new globally harmonised options for the amateur satellite service

More broadly, replacement spectrum is sought for both Earth-to-Space and Space-to-Earth communications in the following bands:

- 50.0-51.0 MHz – As this spectrum is now becoming available to radio amateurs terrestrially around the world and would have unique low Doppler and propagation benefits.
- 1300.0-1310.0 MHz – Due to increased usage by primary users of the existing 1.2GHz allocation
- 2300.0-2310.0 MHz or equivalent – Due to the massive increased use by Wi-Fi and other activities in our existing 2.40-2.45GHz allocation
- 3400.0-3410.0 MHz - As this is already allocated to the Amateur Satellite Service in ITU Regions 2 and 3 (and thus in the IARU proposal

Finally we would highlight that if demand continues to rise from nano and pico satellites in our 435-438 allocation, an expansion of that band would also be required in future.