

AMSAT-UK Response to Ofcom Consultation: Improving spectrum access for consumers in the 5 GHz band



Introduction.

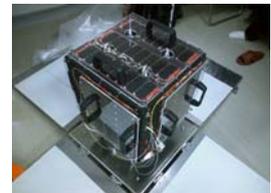
AMSAT-UK represents the interests of Radio Amateurs who design, build and operate satellites under the regulations of the Amateur Satellite Service.

Our members carry out innovative experimental work with satellite communications using frequencies allocated to the Amateur Satellite Service between 7 MHz and 78 GHz.

Since the launch of the first Amateur Radio Satellite in 1961, over 200 satellite payloads have been built by Radio Amateurs from various countries. Currently there are over 40 operational satellites in orbit operating in the Amateur Satellite Service, including the International Space Station, a facility supported by AMSAT-UK members.

Further information on AMSAT UK is available at <http://www.amsat-uk.org/>

The Amateur Satellite Service has a Space to Earth allocation from 5830-5850 MHz. This allocation is used for downlinks from spacecraft, which may be in orbit up to 60,000 kilometres from Earth or in transit to other planets such as the Venus orbiter spacecraft UNITEC-1 (right) which operated on 5840 MHz.



A detailed description of the UNITEC-1 satellite, its capabilities and data structure appeared in the AMSAT-UK publication Oscar News edition 188.

The signals from these satellites are very weak and Radio Amateurs have developed highly sensitive state-of-the-art receiving equipment for this band in order to receive these signals.

The deployment of Wi-Fi using these frequencies would raise the noise floor to such an extent as to make the reception of Amateur Satellites unfeasible.

Satellites which have or will utilise 5 GHz include

- AO-40 a 646 kg amateur satellite in a 60,000 km elliptical High Earth Orbit
- UNITEC-1 a 16 kg Venus orbiter spacecraft
- FitSat-1 a 1kg Low Earth Orbit CubeSat
- P4B Geosynchronous satellite amateur radio payload
- P3E High Earth Orbit amateur satellite

Analysis and Comments

A5.28: This misleading states that amateur satellites operate at 60-800 km altitude. The minimum altitude required for a satellite to make an orbit of the Earth would be about 160 km rather than 60 km. In practice the Low Earth Orbits used by most Amateur Satellites are 300-1500 km. Amateurs also use High Earth Orbit satellites with an apogee of up to 60,000 km. A satellite with an amateur radio transponder payload is planned to be deployed into a Geostationary orbit (35,786 km) in early 2017.

Amateur spacecraft such as DESPATCH have left Earth orbit, radio amateurs successfully received the signal from DESPATCH out to a distance of over 4.7 million km from Earth.

A5.28 notes: *These smaller satellites have relatively low power and antenna gain. This is why the signals are extremely weak and amateurs are dependent on a **low noise floor** for reception.*

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Questions & Answers

Question 1: *Do you agree with our proposal to prioritise consideration of the 5725-5850 MHz frequencies for Wi-Fi, subject to appropriate protections to other users, in particular satellite services?*

No, the experience with 2400-2450 MHz has already shown what happens when consumer Wi-Fi devices are allowed to operate in an Amateur Satellite Service allocation. The dramatic increase in the Noise Floor renders reception of weak amateur satellite signals impossible. Alternatives to 5725-5850 MHz Wi-Fi should be used.

In A5.29 you acknowledge no study has been made on the impact of Wi-Fi on weak-signal satellite reception. The experience with 2400-2450 MHz shows what the likely outcome will be. A full study needs to be made into the impact on the ITU Amateur Satellite Service before progressing further.

The terrestrial amateur radio beacon network at 5.7 GHz is used by radio amateurs when developing their sophisticated receiving stations for satellites operating in 5830-5850 MHz. For example Alexandru Csete OZ9AEC used the OZ7IGY beacon on 5760.929 MHz while developing his ground station for the UNITEC-1 Venus orbiter spacecraft which was built by University students. See his YouTube video <https://www.youtube.com/watch?v=6UToyq7yptg>

Wi-Fi in 5725-5850 MHz would make reception of the terrestrial beacons impossible.

Amateur satellite projects are long-term ventures which may take 3-8 years to develop. It is not possible to change the frequencies used once the satellites are in orbit. The oldest operational amateur satellite, OSCAR-7, was launched in 1974 and is still going strong after 42 years in orbit. The Amateur Satellite Service needs long-term access to low noise floor spectrum at UHF and Microwaves.

Question 2: *Do you agree with our proposal to re-examine the requirement for DFS across the 5 GHz band, subject to appropriate protections to other users?*

Question 3: *Do you think we should pursue the other options we have identified: opening up 5850-5925 MHz; outdoor Wi-Fi use at 5150-5350 MHz; and opening up the 'centre gap' at 5350-5470?*

All three options have merit.

Question 4: *What are your views on the future growth in demand for Wi-Fi? In which use scenarios do you expect to see the greatest pressure for delivery of high quality Wi-Fi access? What evidence do you have to support your views?*

Question 5: *Do you think technology improvements and densification of access points will be sufficient to meet demand or will there also be a need for more spectrum beyond that which we propose to make available? What evidence do you have to link between demand for data and demand for additional spectrum?*

Question 6: *What real life speed and quality of experience can consumers expect in practice from devices using the 5GHz spectrum as authorised in the UK now?*

*What changes can we expect as the number of devices increases and technology improves?
What difference in speeds and quality of experience would additional spectrum make?*

Question 7: *How important is contiguous spectrum?
How wide should channels be to support future demand?*

Question 8: *Do you believe we have correctly identified the incumbent services in 5150-5925 MHz which need to be taken into account in considering opening up more 5 GHz spectrum for Wi-Fi?
Are there any other services which will need to be taken into account in future studies?*

You have failed to fully take into account the devastating impact of 5725-585 MHz Wi-Fi on both the ITU Amateur and Amateur Satellite Services which dependent on weak-signal reception.

Question 9: *What coexistence studies, measurement campaigns and mitigation techniques do you believe would be most effective for demonstrating coexistence between Wi-Fi and incumbent users?*

Question 10: *Do you intend to participate and provide technical material into the ITU and CEPT work?
In what way?*