

**Title:**

Dr

**Forename:**

John

**Surname:**

Worsnop

**Representing:**

Self

**Organisation (if applicable):**

**What additional details do you want to keep confidential?:**

No

**If you want part of your response kept confidential, which parts?:**

**Ofcom may publish a response summary:**

Yes

**I confirm that I have read the declaration:**

Yes

**Additional comments:**

I have held the 'Advanced' Amateur Radio Licence (or it's predecessors) since 1972. Professionally, I have worked as a systems and development engineer in the Wireless Industry for over 35 years. I am a Corporate Member of the Institution of Engineering and Technology, and my PhD thesis studied antennas and path geometries for Meteor Burst propagation.

I am also a radio amateur with a particular interest in VHF and microwave propagation, a member of the Radio Society of Great Britain, former Chairman and currently Treasurer of the UK Microwave Group, the organisation which promotes activity in those parts of the UHF/microwave spectrum available to radio amateurs.

**Question 1: Do you agree that it is likely that the benefits to UK consumers and citizens will be greater from the MoD's release of spectrum in the 2.3 GHz and 3.4 GHz release bands than from retaining the current amateur use?:**

From the perspective of good spectrum management and Commercial spectrum usage, it is difficult to argue for the retention of the release bands as secondary amateur allocations.

**Question 2: Are there current uses in the release bands other than those detailed in RSGB's band plan and discussed in Section 3 of this consultation?:**

None that I am aware of

**Question 3: Are there further consequences of removing the release bands from amateur licences that have not been considered in our analysis?:**

No

**Question 4: There is an option (although not preferred) to remove access to the adjacent bands, as well as to the release bands. What are the consequences of removing access to the adjacent bands from amateur licences?:**

The consequence of the proposed changes to these allocations would be the loss of a part of the UHF/microwave spectrum which provides relatively straightforward access to radio amateurs who wish, for interest, or self-education, to explore the characteristics of this area of the spectrum. Complete removal of access to the 2.3 - 3.4GHz spectrum would, notwithstanding the significant amount of time and effort wasted, also lead to significant personal financial loss, possibly individually in the region of £2k, to the several hundred individuals who have invested in equipment for these allocations. It is unlikely that any of the equipment used could be readily adapted for use at other than very similar frequencies. The 2.3GHz segment also provides a highly accessible introduction to the techniques and technology involved in microwave EME (moonbounce) communication.

**Question 5: Are there current uses in the adjacent bands other than those detailed in the RSGB's band plan and discussed in Section 3?:**

Many of those 'amateurs' active using narrowband techniques at 2.3 and 3.4GHz are actually professional engineers involved in non-profit, self-directed research and continuing education via amateur radio. Often these projects explore marginal propagation mechanisms, which are not seen as immediately useful commercially. It is desirable from a National viewpoint to have a body of informed individuals with practical experience of these phenomena.

Typical of the current areas of interest is international communication via reflection from aircraft, a form of bistatic radar. This propagation mechanism is currently being extended to the use of orbital objects, particularly the International Space Station, (<http://www.dj5ar.de/?p=878>) and large Clarke Belt objects also appear to be suitable targets. Advanced projects require international cooperation, and it would be a very severe constraint on this work if it proved impossible to use frequencies designated by International Amateur Radio Union band plans. Within Europe, all 2.3GHz narrowband work is contained within the segment 2319 - 2322MHz, and it is highly desirable that these frequencies are retained. The amateur 3.4GHz band is located in a part of the spectrum where a number of marginal propagation mechanisms such as rainscatter (<http://bit.ly/1bIrekp>) prevalent at lower frequencies exist alongside others more commonly found in the upper part

of the microwave spectrum. This makes the band of considerable interest for experimental activities

**Question 6: Are there additional mitigation measures which would provide demonstrable proof that amateurs would not cause interference into LTE in the release bands following the release?:**

At the heart of any mitigation has to be proper band planning by the RSGB and special interest groups, such as UKuG and BATC, in conjunction with the Primary User and other interested parties. There are unlikely to be insuperable technical problems: it may require some further development, particularly with respect to the linearity of amateur television repeater transmitters, but solutions can be found. With regard to the receiver performance of LTE base stations, providing extra low-loss bandstop filtering to reject large signals in specific areas of the adjacent band is advised, and the cost to the system operator would be marginal, particularly if the protection measures were included at an early point in the system planning. I believe that it could be acceptable, in this case, to specify the maximum adjacent channel power performance of amateur transmitters to assist with the mobile operator's system implementation. This would also be significant to the Primary User and to other services sharing the allocations. It would not be particularly onerous to add frequency domain filtering to the output circuitry of an amateur transmitter to minimise energy radiated a few MHz away from the centre frequency. Amateurs have the equipment and expertise to design, make and test suitable filters.

**Question 7: Do you agree with the proposed process for varying licences following cases of reported interference and our proposal to vary licences should dealing with the number of reported cases become too onerous?:**

It would be difficult to justify a global modification to licences as necessary to solve specific interference problems. There has long been a mechanism within amateur radio licensing by which the licence schedule has been individually modified in order to solve specific interference problems. It is likely that amateur radio organisations, such as the UK Microwave Group (UKuG) and the British Amateur Television Club (BATC) under the auspices of the Radio Society of Great Britain (RSGB) could provide first-line investigation of reported interference to Primary Users. As noted in a reply to previous question, many amateurs operating at these frequencies are, in reality, very experienced professionals. The UkuG has a long track record in making professional test equipment available at its meetings in order to assess the performance of commercially available and homebuilt equipment. There is a network of members with particular expertise and equipment who provide assistance to others. These are located throughout the UK. A list of equipment, locations and capabilities is available at the group's website: [www.microwavers.org/tech-support.htm](http://www.microwavers.org/tech-support.htm)

**Question 8: Do you agree with our preferred option?:**

Ofcom's preferred option is acceptable under the circumstances. Continued amateur access to this frequency range is highly desirable from considerations of self-education and experimentation

**Question 9: Are there additional changes to the Amateur Radio Licence which would assist amateur in lowering the risk of causing harmful interference to new uses?:**

I cannot envisage any variation to the current Licence which would reduce the risk of causing harmful interference. The Amateur Radio Licence already contains clauses requiring amateurs not to cause undue interference to other services, and I see this as more than adequate.