Statement of interests and background.

I have worked as a professional engineer, largely in private practice, within the RF and microwave industries for in excess of 35 years. My particular areas of expertise are RF and microwave circuit design. I am a Member of the Institution of Engineering and Technology, and of The Institute Of Electrical and Electronic Engineers, where I also am a member of its Microwave Theory and Techniques Society.

I am also a radio amateur. I have held the 'Advanced' Amateur Radio Licence (or it's predecessors) since 1972 and have a particular interest in exploring some of the more esoteric aspects of microwave propagation. I am a member of the Radio Society of Great Britain, and currently Chairman of the UK Microwave Group, the organisation which promotes activity in those parts of the UHF/microwave spectrum available to radio amateurs.

My amateur radio interest also includes the design and manufacture of small quantities of system components suitable for incorporation into amateur microwave equipment.

This reply represents my personal view, and does not necessarily represent that of the RSGB or UK Microwave Group.

Replies to Consultation Questions

Q1. I am fully in favour of the principles of good spectrum management. However, I question whether Ofcom's proposals within the Consultation document fall into that category. The 'mobile industry' seems to have large parts of its expensively purchased spectrum lying fallow; presumably this national resource is seen as an investment vehicle, which itself seriously distorts any attempt to manage the spectrum. The frequency ranges

proposed for release do not seem particularly suitable for providing access to those parts of the UK which currently have no 'mobile' coverage. That must surely be a first priority to Government. As a resident of a village in rural Wales which effectively is not served by any mobile operator, it seems that refarming of the 700 – 1000MHz region effectively would do more for the extension of mobile coverage than attempting to use 2.3 – 3.6GHz, a part of the spectrum which, when using typical 'mobile' equipment is less than ideal for all but very short range and line-of-sight links. The choice of the release bands also seems at variance with frequency planning across Europe, and may well lead to equipment compatibility issues.

I thus find it difficult to agree with the question posed.

Q2. None that I am aware of.

Q3. No.

Q4. The most significant consequence of the proposed changes to these allocations would be the partial loss of frequencies which provide relatively straightforward access to radio amateurs who wish, for interest, or self-education, to explore the characteristics of the area of the spectrum where the definition changes from UHF to microwave. Many highly reputable professional engineers have used and continue to use amateur radio as a vehicle for continuing self-education.

Complete removal of access to the 2.3 and 3.4GHz bands would also lead to significant personal financial loss, possibly individually in the region of £2k/band, to the several hundred individuals who have invested in equipment for these allocations. It is very probable that much of the equipment used could not be readily adapted for use at other than very similar frequencies.

By nature of a happy confluence of equipment performance and background noise temperature, the 2.3GHz segment also provides a highly accessible introduction to the techniques and technology involved in microwave EME (moonbounce) communication.

At 3.4GHz, it is unlikely that inband television repeaters will be practicable in the proposed

10MHz allocation, except perhaps by some form of time domain division (TDD) technique. This would be in advance of any functioning commercially available system, apparently including real-world 4G mobile systems. 3.4GHz outputs from television repeaters with an input at another frequency such as 2.3GHz also have technical attractions.

Q5. 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 surely desirable from a UK viewpoint to have a body of informed individuals with practical experience of these phenomena.

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 bandplans. Within Europe, all 2.3GHz narrowband work is contained within the segment 2319 – 2322MHz, and it is highly desirable that these frequencies are retained.

Under conditions of anomalous propagation, signals in the 2.4 and 3.4GHz region can be received at levels greater than the free-space path loss over hundreds of km particularly over predominantly sea paths. I note no consideration of these effects within the Consultation document: indeed it treats the frequency spectrum as a closed, UK only, domain. That is simply not the case. The practical effect of removing UK amateur radio activity, particularly narrowband activity, from the existing frequencies would not be to remove amateur activity. Legitimate amateur activity from neighbouring countries could still lead to interference events, over which Ofcom or other UK users would have no direct control.

The amateur 3.4GHz band is located in a part of the spectrum where a number of marginal propagation mechanisms 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.

Q6. Proper bandplanning by the RSGB and special interest groups, such as UKuG and BATC, in conjunction with the Primary User and other interested parties has to be at the heart of mitigation.

There are unlikely to be insuperable technical problems. Some further development may be possible, particularly with respect to the linearity of amateur television repeater transmitters, but solutions can be found. This is clearly within the 'self-training' spirit of the amateur radio hobby.

With regard to the performance of potential base station receivers in adjacent bands. Providing extra low-loss bandstop filtering to reject large signals in specific areas of the adjacent band is not particularly difficult. The cost to the system operator would be marginal, particularly if the protection measures were included at an early point in the system planning. It would also not be particularly difficult to add frequency domain filtering to the output circuitry of an amateur transmitter to reduce energy radiated a few MHz away from the centre frequency to levels below any current professional specification.

Amateurs have the equipment and expertise to design, make and test suitable filters.

The use of appropriate transmitter linearisation schemes is already under consideration and development by the amateur television community. These could make considerable improvement to the output spectrum of current digital amateur television transmitters.

Q7. 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. Given that, it would be difficult to justify a global modification to licences as necessary to solve specific interference problems.

I have some concern that the mechanism proposed by Ofcom could set a dangerous

precedent: an organisation wishing to clear amateurs from these allocations could very simply set-up a series of malicious interference allegations.

It is very likely that amateur radio organisations, such as the UK Microwave Group (UKuG) and the British Amateur Television Club (BATC) under the auspicies of the Radio Society of Great Britain (RSGB) could provide first-line investigation of reported interference to other users. This has informally received wide support from the amateur microwave community. As noted in a reply to previous question, many amateurs operating at these frequencies are, in reality, very experienced professionals. This is surely an example of self-help which the current government would welcome.

UkuG has for several decades made professional test equipment available at its meetings in order to assess the performance of both commercially available and homebuilt equipment. Members with particular expertise and equipment also provide technical assistance to others by way of a network of volunteers. These are located throughout the UK. A list of equipment, locations and capabilities is available at the group's website: <http://www.microwavers.org/tech-support.htm>

Q8. Ofcom's preferred option is, if not entirely desirable from the amateur point of view, acceptable. Continued amateur access to this frequency range is highly desirable from considerations of self-education and experimentation.

Q9. The Amateur Radio Licence already contains clauses requiring amateurs not to cause undue interference to other services. It is difficult to see any variation to the current Licence which would reduce the risk of causing harmful interference.'

Christopher Bartram
21 July 2013