BEIRG
BRITISH ENTERTAINMENT INDUSTRY RADIO GROUP

Digital Dividend: Geolocation for Cognitive Access

British Entertainment Industry Radio Group (BEIRG)

Response to discussion document on using geolocation to enable licence exempt access to the interleaved spectrum

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Contact Details:

Alun Rees
Ranelagh International Ltd on behalf of the BEIRG Steering Committee
One Ranelagh Road
Westminster
London SW1V 3EX

Tel: 020 7828 1603

Response

1. Any interference with PMSE applications will disrupt content production at its live source. As a consequence of interference, the value and benefits this content would normally generate through its consumption via a variety of media and exposure to a much wider audience will be significantly reduced or lost at the beginning of the value chain. Based on current evidence, permitting cognitive access to the interleaved spectrum will risk devastating live and recorded content production without guaranteeing any discernible benefits to citizens and consumers of the UK. Indeed, interference to PMSE devices will result in a negative impact on UK citizens and consumers who enjoy the benefits that these services bring. Further risks are that (1) devices that do not meet the requisite technical specifications may be used in the UK nonetheless or (2) the devices could be adjusted to remove the interference-protection functions.

2. In light of these risks, we believe that Ofcom must consider restricting cognitive devices to bands where there are no incumbent PMSE applications; whilst we do not believe (and indeed current evidence suggests) that they can coexist with existing radio-microphones and other short-range licensed wireless devices, deployment in alternative available bands will not preclude future coexistence with new technologies or applications.

3. We note that William Webb has been quoted as saying that 'feedback from the PMSE side is that it too favours geolocation because Ofcom will have hour-by-hour control over the system'[1]. BEIRG would like to make it absolutely clear that if cognitive devices are to be permitted to operate in the interleaved spectrum then, as a PMSE stakeholder, BEIRG favours a geolocation approach combined with sensing rather than one or the other. For reasons explained in our response to Ofcom's original consultation on cognitive access[2], we believe that both approaches will be necessary in combination to maximize the avoidance of harmful interference to PMSE devices. It is regrettable that having once been an option, local device sensing would not now appear to be 'practical'. It would appear that this critical additional level of protection for PMSE has been removed from the table on the basis that device manufacturers would find it extremely difficult to make devices that could sense to the requisite level to avoid harmful interference to PMSE. So sensing has been dropped on the basis that manufacturers of as yet undeveloped kit believe that they cannot meet these criteria. This decision will negatively impact on PMSE users.

4. The discussion document states that '*(cognitive devices) are prohibited from transmitting until they have successfully determined from the database which frequencies, if any, they are able to transmit on in their location'*[3]. Ofcom should not underestimate how important it is that they ' adhere to' this statement and ensure that this guarantee is upheld in practice. If cognitive devices do not accurately determine where they are and which frequencies are unused for PMSE and DTT in any given location and then only use those frequencies, they will cause interference to these licensed services.

5. Ofcom state that they '*believe that markets generally deliver the best solutions and that intervention is only required where there are clear indications that the market will not do so'*[4] and that their preference '*is for the market (including entities such as standards bodies) to deliver as much as possible of the specification for cognitive devices'*[5]. BEIRG believes that it would be wholly irresponsible and naïve for Ofcom to trust that cognitive device manufacturers will voluntarily produce equipment that avoids interfering with PMSE services, since they would have no incentive to do so. Ofcom must take an extremely cautious approach in considering whether cognitive devices should be permitted to operate in the interleaved spectrum and under what parameters.

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[1] Policytracker – Dec '09 Edition
[2] http://www.ofcom.org.uk/consult/condocs/cognitive/responses/BEIRG.pdf
[3] http://www.ofcom.org.uk/consult/condocs/cogaccess/cogaccess.pdf s. 1.5
[4] http://www.ofcom.org.uk/consult/condocs/cogaccess/cogaccess.pdf s. 2.4
[5] http://www.ofcom.org.uk/consult/condocs/cogaccess/cogaccess.pdf s. 2.5

6. Ofcom have said and reaffirmed on a number of occasions that '*we should allow cognitive access as long as we were satisfied that it would not cause harmful interference to licensed uses, including DTT and programme-making and special events (PMSE)*'[6][7]. Whilst we welcome this statement, we are extremely concerned that Ofcom is becoming less cautious in its approach and risks reneging on this commitment. For example, the discussion document states that intervention '*may*' be necessary and '*might include ensuring the protection of existing licence holders by specifying the maximum probability they can expect to receive harmful interference*'[8]. It seems from this statement that Ofcom have now accepted that there will be harmful interference inflicted on incumbent licensed services such as PMSE and that it is the degree of harmful interference permitted that will be the matter for debate. In addition, it is extremely concerning that Ofcom are not convinced that intervention will be necessary to ensure protection for PMSE. We strongly urge Ofcom to revert to their previously more robust positions of not permitting cognitive access to interleaved spectrum unless they are satisfied that they will not cause interference to PMSE. In this regard, it is also worth reminding Ofcom that any interference, however short in duration and irrespective of whether it is transient, to PMSE applications is harmful, particularly for live professional performances. No audio distortions or disruptions are acceptable to contemporary audiences.

7. ***Question 1: Should we suggest only high level parameters, leaving further work to industry, or should we seek to set out full details of parameters to be exchanged?***

    a. Ofcom should set out the full details of parameters to be exchanged. As explained above, BEIRG believes that it would be extremely naïve to effectively 'trust' cognitive device manufacturers to deliver standards that would protect PMSE services that they have no incentive to protect. Ofcom must set out full details of parameters to be exchanged. It is also imperative that cognitive devices are covered by harmonised standards as part of the CE marking procedure (via CENELEC or ETSI). Once this is in place, manufacturers would need to submit products to a notified body for third party testing before being able to place them on the market. Once on the market, trading standards must ensure that consumer devices work to the same specifications.

8. ***Question 2: Should both closed and open approaches be allowed? Should there be any additional requirements on the providers of closed databases?***

    a. Only the open approach should be allowed. The closed approach leaves open the possibility that different data on licensed incumbent services is provided by each. Multiple databases would make addressing interference issues after the initial occurrence much more difficult to resolve. Combined with the vast amount of resources that would be required to properly police each individual database that would probably not be delivered, we conclude that the closed approach poses unacceptable risks to the PMSE community in terms of harmful interference. In addition, multiple databases would place huge burdens on PMSE users if they had to register with each. Of course, a solution to this would be a single 'master' database held by an independent third party. However, there would need to be some way to ensure that each individual database supplied the same information as on the master database and that no time-delay issues existed. More generally, BEIRG's firm position that the database must be held and administrated by a third party rather than those who have no interest in protecting PMSE.

9. The discussion document states that '*the device could provide some information on the accuracy of its location determination or a default level could be assumed*'[9]. BEIRG does not see how Ofcom would be in the position to 'assume' any default level with confidence that it would be realised in practice without being responsible for testing of consumer devices and standardsation of specifications.

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[6] http://www.ofcom.org.uk/consult/condocs/cognitive/statement/statement.pdf s. 1.2
[7] http://www.ofcom.org.uk/consult/condocs/cogaccess/cogaccess.pdf s. 1.2
[8] http://www.ofcom.org.uk/consult/condocs/cogaccess/cogaccess.pdf s. 2.6
[9] http://www.ofcom.org.uk/consult/condocs/cogaccess/cogaccess.pdf 3.10

10. The discussion document states that '*providing information about the type of device, such as the make and model number, might allow information to be returned according to device capabilities. For example, devices which are known to have superior out-of-band emission characteristics might be able to transmit with higher power levels at certain frequencies and/or locations.*'[10] This option assumes that all devices are made according to the specifications laid out and that the database is sufficiently 'intelligent' to deal with them. BEIRG is concerned that there must be some action taken by Ofcom to ensure that cognitive devices sold to the consumer are built to the correct specifications. This would need to involve notified body 3rd party testing.

11. Ofcom have suggested that '*if (a cognitive device) is able to determine this to an accuracy of better than 100m then no additional information is needed*'[11]. As previously stated, wireless microphones typically have a working range of 100 metres. Thus, a positional accuracy of 100 metres would make it likely that a cognitive device could interfere with a wireless microphone due to positional uncertainty alone. As 3-10 metres should be practical, given current commercial technology, the specified positional accuracy should be at a comparable level. If this is not practical (which we do not believe is the case), a larger separation distance would be required between the cognitive device and the PMSE system. A PMSE system has a working range of ca. 100m which is of the order of the accuracy of the geolocation system. This needs to be taken into account in determining the required separation distance.

12. We are aware that GPS technology does not work indoors. We would presume that, since Ofcom have stated that cognitive devices that use geolocation are prohibited from transmitting until they have successfully determined which frequencies they are permitted to use in that location, which in turn depends on them providing accurate information on that location, that they would not work indoors if they used GPS technology. We would like Ofcom to confirm this.

13. Ofcom have suggested that '*if the device was aware of its speed of movement it might opt for a small radius in the case it was moving slowly or a larger radius when moving quickly*[12]'. Even if the device was aware of its speed of movement, we would like Ofcom to make it clear that it must not be assumed that this speed of movement remains constant. Therefore, the size of the radius would need to be updated in real-time, as would information on the availability of relevant frequencies in a (potentially new) given location.

14. Ofcom have stated that '*if (cognitive devices) move outside of the geographical area for which they have frequency information they must re-interrogate the database before transmitting*'[13]. This, of course, is absolutely critical for PMSE users. The cognitive devices must know in real time when they move outside the geographical area and automatically cease transmitting immediately. Transmission must not be permitted again until the database has been re-interrogated. In practice, this may mean that a fast-moving cognitive device either cannot transmit because of technical limitations or there has to be an extremely large radius for protection (i.e. increased 'locational' protection).

15. ***Q4: Should the translation from transmitter location to frequency availability be performed in the database or in the device?***

    a. In addition to the reasons that Ofcom describe in point 4.4, BEIRG believes that the translation from transmitter location to frequency availability should be performed in the database because it will be easier to control (and make changes if necessary). This more cautious approach is consistent with the need to protect PMSE from harmful interference. If problems occur and the protection parameters need to be changed, the database must be in control or there will be effectively no way to carry this out.

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[10] http://www.ofcom.org.uk/consult/condocs/cogaccess/cogaccess.pdf 3.10
[11] http://www.ofcom.org.uk/consult/condocs/cogaccess/cogaccess.pdf 3.11
[12] http://www.ofcom.org.uk/consult/condocs/cogaccess/cogaccess.pdf 3.11
[13] http://www.ofcom.org.uk/consult/condocs/cogaccess/cogaccess.pdf 4.2

16. Ofcom has suggested that 100m x 100m pixel-size would be an appropriate compromise between ‘sterilisation’ and ‘information transfer’. Whatever the pixel size chosen, it is critical that the geolocation function on the cognitive device ascertains 100% accurately in which pixel it (the device) is located.

17. In terms of bandwidth being fixed or adopting a ‘start-to-end frequency’, we would need to look at this in more detail. What we can say at this stage is that use of a narrowband high powered emission could cause IMD problems for PMSE. The option chosen must be that which provides most protection to PMSE.

18. ***Question 5: Have we outlined an appropriate information set for the database to provide to the device? Can industry be expected to develop the detailed protocols?***

    a. We believe that Ofcom and the PMSE sector should be involved in the development of detailed protocols in conjunction with those intending to manufacture cognitive devices. Having said this, the devices should still be subject to the official CE marking procedure as explained above. This will help ensure that PMSE interests, in terms of avoiding interference, are properly heeded. In addition, mechanisms must be put in place to ensure that the detailed protocols agreed are implemented in practice. Again, BEIRG is concerned about the possibility of consumer devices and cheap imitations not being built or performing to the requisite specifications

19. ***Question 6: Is a two-hourly update frequency an appropriate balance between the needs of licence holders and of cognitive device users?***

    a. Many PMSE end-users, especially on the professional side, need to use different or additional frequencies at short notice. This notice is often less than two hours and sometimes moments before they are needed. Examples of this type of use are
        i. Production requires ‘extra’ frequencies because those already secured are not sufficient to ‘do the job’
        ii. Interference problems experienced in already licensed frequencies so ad hoc migration is required
        iii. The production itself is not planned

    b. In light of this requirement for additional frequencies being foreseen and in the knowledge that only those registered on the database will receive protection from interference from cognitive devices, we anticipate that end-users may feel it necessary to block-book a number if additional channels for such ad hoc use if and when required. It has been suggested that a few channels in each location could be designated as a safe-harbour from cognitive use in order to accommodate this need. Whilst this might work in theory, in practice the ‘safe-harbour’ channels may well be used relatively heavily by unlicensed users (i.e. not registered in the database) and so will not offer a viable alternative for professional use.

20. ***Question 8: What role could push technology play?***

    a. As a database that proactively sends a message to the device if the licensed use in its area changed would provide an additional layer of protection to PMSE users, we believe that it should be part of the obligatory product specifications in combination with automatic periodic re-checking (in case the internet connection was lost at any point). We understand that potential database-providers have moved towards the concept of near-real time updates using push technology in the US; we do not understand why this approach could not be adopted in the UK.

21. ***Question 10: Do you have any comments on the suggested approach to implementing the database for PMSE?***

a. Ofcom have suggested that free-space propagation modeling should be used to predict the received signal level, as it '*will generally reflect the real-world case where PMSE transmitter and receiver have a line-of-sight between each other*'[14]. PMSE transmitters and receivers do not always have a line-of-sight between each other; this needs to be taken into account.

b. Ofcom have said that '*where the PMSE use is indoors but the cognitive devices are outside of the building we recommend assuming a 20dB building penetration loss*'[15]. Assuming a building attenuation value of 20 dB is certainly not 'conservative' from the viewpoint of PMSE. Ofcom are assuming that if a cognitive device is operating outside its signal would be attenuated by 20 dB inside the building. In some cases this is true, but in others it is not (e.g. if the building has glass windows that are fairly RF transparent). The best that can be said about building attenuation is that it is highly variable. In the case of the UHF band 20 dB can be taken as somewhat of an "average" value based on a number of studies. It is BEIRG's view that Ofcom should not assume an 'average' value because it would not do enough to protect PMSE under all circumstances. We therefore ask Ofcom to look at this again with a view to protecting PMSE in all situations, not some.

c. Ofcom are suggesting that *'-77dBm be used to determine the limit of PMSE coverage for the purposes of the geolocation database'*[16]. This is too high. Wireless systems typically have a squelch threshold of around -95dBm. Ofcom's objective is to '*ensure that cognitive devices will not cause harmful interference to licensed uses of the same spectrum, particularly DTT and PMSE*'. The parameters for licence-exempt cognitive devices using interleaved spectrum must protect all licensed users and hence all existing PMSE applications and technologies. If Ofcom are to ensure protection to all existing wireless microphones then the reference receive level should be the greatest sensitivity at the input of any wireless microphone receiver. As far as we are aware, this is -95 dBm (i.e. interference to the receiver is possible anywhere up to this sensitivity). As Ofcom have accepted[17] that there were some cases where signal levels were lower than -77dBm; it would not therefore be acceptable for -77dBm to determine the limit of PMSE coverage. Rather, the figure should take into account all possible sensitivities (-95dBm).

d. At -95dBm, there would (as Ofcom have accepted) still need to be a C/I ratio of 25dB in place. This means that the interference level should be -120dBm.

e. -70 dB C/I figure for channels 4 MHz away seems high. A typical **high quality** wireless system will tolerate about -20 dBm at antenna input on adjacent TV channels and this is independent of the C/I ratio. Thus you cannot have a wireless microphone signal at -60 dBm and believe that it is acceptable to have an interfering signal 4 MHz away coming in at +10 dBm

22. The discussion document states that Ofcom concluded in the previous consultation that '*harmful interference probabilities should be no more than 0.6% in order that the benefits of cognitive access were greater than the potential loss of value to users of licensed systems (and we proposed levels that would result in a harmful interference probability in the region of 0.05%)*'[18]. Firstly, we do not recall any assessment that weighed up the potential damage that would be caused to PMSE end-users with 'benefits' of cognitive devices. Secondly, as we are not aware of <u>any</u> research undertaken by Ofcom that has put a value on the benefits that PMSE brings to society, we would be very surprised if it was possible for them to undertake such a comparison. Thirdly, we would like to see how Ofcom managed to place a value on the potential loss that would be generated by interference to a PMSE performance and the

[14] http://www.ofcom.org.uk/consult/condocs/cogaccess/cogaccess.pdf 6.14
[15] http://www.ofcom.org.uk/consult/condocs/cogaccess/cogaccess.pdf 6.14
[16] http://www.ofcom.org.uk/consult/condocs/cogaccess/cogaccess.pdf 6.15
[17] http://www.ofcom.org.uk/consult/condocs/cogaccess/cogaccess.pdf 6.15
[18] http://www.ofcom.org.uk/consult/condocs/cogaccess/cogaccess.pdf 6.21

assumptions that they used to reach this figure of 0.6% (which presumably combines DTT with PMSE). To illustrate the extent of the damage that interference from cognitive devices would cause to PMSE, a good example might be a live music performance/concert being watched by 100,000 people in a stadium, being broadcast live and also being recorded for DVD sales. The loss in value to the band, the audience and the downstream value chain of interference from cognitive devices would be huge in this instance.

23. The discussion document states that Ofcom '*can be somewhat less conservative with geolocation as long as the mechanisms exist for rapidly changing the level should evidence emerge that this is appropriate*'[19]. BEIRG is extremely disappointed with Ofcom's position in this regard, which favours addressing interference issues after the event rather than preventing them in the first place. We believe that such lack of caution is not in keeping with Ofcom's previously more robust position. Secondly, we believe that assuming that mechanisms will exist for rapidly changing the level is naïve. Thirdly, having an ability to change the levels rapidly is different to such a mechanism being actually used rapidly if the corresponding evidence 'emerges'. More specifically, we believe that once the original levels are implemented, it will be very difficult to get them changed to something more conservative even if persuasive evidence for such a change emerges. Possible reasons for this include (a) lobbying power and resources of those with an interest in maintaining the status quo and (b) the considerable time it generally takes for Ofcom to make decisions.

24. It is extremely disappointing that Ofcom have suggested using a 0.1% level for probability of harmful interference. This is predicated on the assumption that any level of harmful interference is acceptable. It is not. If guarantees cannot be provided that cognitive devices will not interfere with PMSE applications, then they should not be permitted to use the interleaved spectrum.

25. Ofcom have said that they 'do not see the need to make any allowance for multiple devices' at this stage but that they would 'take appropriate action' should there be evidence that multiple devices might be problematic[20]. Again, it is disappointing that Ofcom are seeking to address interference issues after the event as cure rather than prevention. Quite simply, we are not convinced that Ofcom know enough about cognitive devices to simply assume that multiple devices will not be problematic. Firstly, there is not an adequate explanation as to why modeling for 'ultra-wideband' should automatically apply to cognitive devices. Secondly, Ofcom have admitted that '*there is not a good understanding of the likely density of cognitive devices*[21]'; therefore, to simply assume that multiple devices will not be a problem seems lackadaisical. The percentage of (i.e. improbability of all) devices transmitting simultaneously is not a persuasive argument for or against the requirement to take multiple devices into account when there are large numbers of devices in a small location. Whether 2000 or 9000 of 10,000 devices are transmitting, this is still a very high number. Again, we believe that Ofcom should determine what the interference-effect of multiple devices will be on PMSE services using assumptions that will favour protecting PMSE (e.g. assume high number of devices in use, regularly in small geographic areas) before they are brought onto the market and not after. Otherwise, Ofcom will not legitimately be able to say that they are satisfied that they will not cause harmful interference; they simply will not know.

26. ***Question 13: How can any costs best be met?***

    a. BEIRG believes that those who benefit from cognitive devices, with particular emphasis on manufacturers, should meet any and all costs. No burden should fall on the PMSE sector or DTT providers or the PMSE band manager. In addition, we believe that it would be inappropriate for the Government to 'foot the bill', particularly when these devices will benefit private sector companies and have the potential to interfere with important services that generate much for the UK economy, as well as bring significant cultural and social benefits.

[19] http://www.ofcom.org.uk/consult/condocs/cogaccess/cogaccess.pdf 6.21
[20] http://www.ofcom.org.uk/consult/condocs/cogaccess/cogaccess.pdf 6.28
[21] http://www.ofcom.org.uk/consult/condocs/cogaccess/cogaccess.pdf 6.26

27. ***Q14: What are the difficulties and expected costs to licence holders in providing the necessary information to the database? Could this information be provided in any other way?***

    a. The most sensible way of PMSE licensees providing information to the database is through the PMSE band manager (i.e. when they buy licence), which could either input to the database held by an independent third party or could hold the database itself. Neither the band manager nor PMSE users should incur any costs for any related administrative burden. PMSE users would provide their information to the band manager online or by telephone.

28. BEIRG is interested to learn that one of Ofcom's 'key points of interaction' is with the White Spaces Coalition in the US yet this is not balanced with having PMSE and DTT interest-groups as key points of interaction also. We urge Ofcom to address this and ensure that they take views from a variety of interested parties from all sides of the debate on any and all relevant issues.

29. With respect to the issue of allowing white space devices to use higher power under certain conditions, it would still be useful to set an absolute limit on the maximum power of these devices. There can be unforeseen interactions between these devices and many other kinds of equipment that might be operating in close proximity if the power level allowed is not appropriately capped.