Response to Ofcom Consultation:
Digital Dividend Review: Geolocation for cognitive access

A discussion on using geolocation to enable licence-exempt access to the interleaved spectrum

We would like to thank Ofcom for the opportunity to offer our views on using geolocation to enable licence exempt access to the interleaved spectrum.

As detailed in our response to Ofcom's first consultation on this subject there is considerable concern throughout the PMSE industry regarding the inclusion of cognitive devices within interleaved spectrum. We recognise that Ofcom are keen to press on with work to enable the manufacture and release of these devices into the market and so believe that the only way to allay PMSE users' concerns is to work with the relevant organisations (i.e. the regulator and cognitive device manufacturers) to ensure that the process implemented protects PMSE users to the utmost degree. We strongly believe that the use of reliable geolocation technology is pivotal in achieving this goal.

In this response we focus on the need to ensure consistent interleaved usage information is used regardless of whether there exists one or many geolocation databases. We therefore believe that there should be one source of PMSE information (i.e. the band manager with PMSE obligations); this would remove any administrative burden for PMSE users who wish to protect their use from cognitive devices. We believe when a PMSE user licenses their equipment in the future they will be securing and paying for interference free access to spectrum whether it be from other PMSE users or cognitive devices.

We also provide some minor comments on the technical aspects of calculating protection for PMSE use and highlight again the need to bear in mind that PMSE use can be varied in its characteristics. Therefore indoor and outdoor use should be looked at in equal measure to ensure all uses and users are protected from cognitive devices in any location.

1. Consultation Questions

***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?*

We support Ofcom suggesting only high level parameters so that harmonised standards can be developed by standards bodies and utilised throughout the marketplace. Setting full parameters for the UK could limit the mobility of devices if other countries do not follow suit.

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

We recognise that the closed database approach will be attractive to device manufacturers as it would remove the need to agree harmonised standards for message formatting and potentially accelerate implementation.

However, we believe multiple databases whether 'closed' or 'open' could increase the potential for inaccuracy and inconsistency of data as well as duplicate work and increase costs unnecessarily. Different upload times and licence information gathering processes could lead to different devices at the same location receiving different results. Whilst we accept multiple identical 'open' databases are likely to be preferable from a resilience perspective we feel that 'closed' databases should be discouraged for a number of reasons.

Firstly we believe that all databases should be updated with the latest data at the same time and in the same format. If harmonised standards were not agreed it may be that the data manufacturers receive from their information source requires manipulation before uploading onto their systems

causing a delay. In addition 'closed' databases may source their information in different ways resulting in the information they hold differing from one database to another.

It would therefore appear to make sense to require all manufacturers to obtain their data from the same source resulting in consistency of results regardless of the database used.

We also believe that a 'closed' database may not be preferable for citizens and consumers. If a device can only access a particular database it could cause usage problems when travelling abroad, especially if that manufacturer does not host a database in that area or they have decided to withdraw it for some reason or other.

All of these factors will increase the anxiety of PMSE users surrounding whether these devices can share the interleaved spectrum without impacting on licensed users.

***Question 3)**: What information should be provided to the database? Are our assumptions about fields and default values appropriate?*

We believe that Ofcom have identified the information that should be provided to the database.

It would appear vital for devices to provide the database with details of their location and estimated determination accuracy, especially if this were to differ greatly between devices. This would ensure that for those less sophisticated devices a conservative estimate of safe operating distances could be returned, whilst for those with greater accuracy a more bespoke calculation could be made.

At this stage it isn't clear how devices will determine their position but it is important that location accuracy to 100m is achieved. It is feasible for whitespace availability information to be available to 100m resolution, based on UK TV coverage planning. This is consistent with the typical resolution of location-of-use data currently supplied by PMSE users. This would ensure certainty of the specific 100m square in which the device is to operate and maximise whitespace availability for cognitive devices.

Whilst we would support location accuracy being included in the data to be provided it should be noted that the way devices determine their location will differ depending on whether they use GPS or another technology. Whilst GPS would appear to be accurate where it is available (outdoors), there is a concern that even then there are instances where the device states a location with certainty but in fact is not certain because of a loss of signal etc. These factors therefore need to be carefully considered before geolocation can be seen universally as a reliable way of protecting existing users of interleaved spectrum.

Whitespace usability would also be further enhanced by knowing the device type and whether it was a model that had the ability to adjust its power levels; allowing the possibility of returning higher values in rural areas, or lower ERPs in spectrally congested locations. All of this could be achieved without compromising the protection of other spectrum users.

In addition, for devices to be used 'on the move' it will be vital to develop a way of sending information to the database so it can deliver reliable availability data over the exact distance covered. The distance travelled and the speed of travel would also have an impact on the frequency of device enquiries.

All of these fields suggest that harmonisation of data fields and formats will be vital to ensure the successful and reliable implementation of cognitive devices.

***Question 4)**: Should the translation from transmitter location to frequency availability be performed in the database or in the device?*

We believe the translation from transmitter location to frequency availability should be performed in the database. This will ensure accuracy and provide the facility to change the way availability is calculated as technology develops.

***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?*

We agree that Ofcom have outlined an appropriate information set for the database to provide to cognitive devices.

The delivery of a useable frequency range within a location pixel of 100m x 100m as well as the maximum transmit power would ensure sufficient protection for existing users whilst providing maximum usability and future proofing for the device. For devices that are moving the requirement to re-interrogate the database once outside the initial geographic area would be sufficient to prevent inappropriate transmission.

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

We believe that a minimum two-hourly update represents a reasonable balance between the needs of licence holders and of cognitive device users. However it should be noted that there will still be a risk that a PMSE user licences and uses their equipment with immediate effect, especially in built-up areas. Therefore some further work may be required to verify the extent of this risk, including some additional consultation with PMSE users to check whether there is a common operational requirement for immediate access or whether it is an exceptional requirement that could be accommodated through revised planning and procedures. We would certainly be able to investigate this issue further if necessary.

We support the view that adopting a 'safe harbour' approach to PMSE use is on the whole impractical and spectrally inefficient so should not be adopted throughout the interleaved spectrum.

***Question 7)**: Is there benefit to devices receiving a time validity along with any database request and to act accordingly?*

We can see that there may be a benefit for the database to return time validity information to the device in order to minimise the number of database checks in the future, but we doubt that the information will be useable in the near/mid-term because PMSE users will continue to licence their equipment at the last minute and this can happen regardless of where they may be located. The time validity information could in the long run be used to reduce the two hourly update time suggested here rather than increase it.

In addition, as stated above we do not think that this would aid the safe harbour approach as it will not work unless all PMSE wireless equipment in circulation tunes to the entire available interleaved spectrum. PMSE equipment lasts for many years so it is unlikely that this will ever be the case even if manufacturers were to routinely produce only this kind of equipment in the future.

In addition, it is not clear how time validity for a particular frequency/location would be determined, and who would be responsible for setting it.

Question 8): *What role could push technology play?*

We believe there could be benefits from a PMSE user's perspective as push technology would ensure that the database informed all devices as soon as a new PMSE user had become licensed in that area. However it is likely to be unattractive to manufacturers of devices as this would no doubt add extra complexity to both the design and cost of the database and devices.

In addition this would be particularly difficult if the database supplying the information was not directly connected to the issuing of the licences as there would no doubt still be a delay between information updates, although still quicker than the two hourly update approach.

Question 9): *Do you have any comments on the suggested approach to implementing the database for DTT?*

No comment

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

In the first instance JFMG would like to highlight that there is a single source of information which could provide the database/s with the appropriate information regarding the frequencies used by PMSE users and their transmitter locations.

JFMG and in the future, the Band Manager with PMSE obligations will hold all records of authorised PMSE use. It will not include users who are operating illegally but it should be argued that those who are not authorised should not be protected from cognitive devices in the same way that they are not currently protected from other licensed spectrum users.

With regards to Ofcom's approach to implementing the database for PMSE we agree that free-space propagation modelling is the most appropriate method for calculating the PMSE wanted signal and believe a minimum signal level of -77dBm is reasonable. Whilst actual receive levels will vary and drop significantly below -77dBm, as noted, PMSE users will generally rig for receive levels above -67dBm. However we believe the recommended figure of 20dB for building penetration loss is too high. Whilst there is the opportunity to revise it with experience, based on measurements carried out for the Chester 1997 Agreement, 7dB would be a more appropriate starting figure.

The consultation document acknowledges the range of PMSE applications, both indoor and outdoor, with varying antenna heights and signal paths. In determining the limit of coverage and likely locations of PMSE receivers it is important to continue to consider these differences, from conventional indoor studio use to outdoor use on a golf course where receive antennas may be mounted on a hoist at some 30m.

Question 11): *Do you believe it is practical to implement such a database?*

The proposed propagation model appears better able to characterise paths between 'terminals of low height' so may be suitable when both cognitive devices and PMSE receivers are near street level and well below rooftop height. It is however a new approach which may need further validation. Propagation from cognitive devices to PMSE receivers also needs to be considered when the PMSE terminal is located above roof height. Alternative propagation models should be chosen in this instance and conventional propagation models for high and low level terminals will be suitable.

We agree that no additional allowance should be incorporated for multiple devices at this time, given that it is unlikely that they would be transmitting simultaneously. The capability should however be retained for the future if there is evidence of a need.

Maintaining a database which models the UK to a resolution of 100m is clearly a significant task and it will be particularly challenging to update it in a timely manner, but it would appear to be an achievable task.

***Question 12)**: Is it appropriate for third parties to host the database? If so should there be any constraints? If not, who should host the database instead?*

We can see no reason why a third party could not host the database. Although we can see why there may be some objection to organisations involved in manufacturing devices hosting an open database. We believe that this could be overcome by ensuring that no advantage would be taken as a result of their unique position above other device manufacturers.

The database would also need to undergo checks to ensure that the results it was returning were correct. This could be done by asking an independent body to test the results on an annual basis.

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

We support the use of cost causation principles to decide who should meet the costs of the database. We strongly believe that those benefiting from cognitive device implementation should bear the cost of the database and that licensees who require protection should not have to shoulder any additional costs or administrative burdens.

Therefore whoever owns the database should gain agreement with the band manager with PMSE obligations to supply the necessary licensing information. This information is also likely to include all of the necessary DTT data.

We believe royalties on the sale of each device could be a workable business model. Alternatively a fixed fee could be agreed between the manufacturers and the database owner (a cut of which passed to party providing original data) and the manufacturer could then work out where to recover these costs themselves.

***Question 14)**: 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?*

As previously mentioned we do not believe that there need be any difficulties and costs for licence holders involved in providing information to the database. We believe that the information they provide the band manager with PMSE obligations would be enough. The database owner need only create an arrangement with the band manager to access the data without PMSE licensees being inconvenienced in any way.

The costs of accessing the data would then be fully met by the database owner/manufacturers and not the licensees.