Cover sheet for response to an Ofcom consultation

BASIC DETAILS

Consultation title: Digital dividend: cognitive access

To (Ofcom contact): Mr. William Webb

Name of respondent: European Manufacturer Group

Representing (self or organisation/s): AKG, Audio Technica, Beyerdynamic, Sennheiser, Shure

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Part of the response	☐	If there is no separate annex, which parts?	

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Name: Wolfgang Bilz (Shure Europe GmbH) Signed (if hard copy)

Digital Dividend: Cognitive Access

European Manufacturer Group

AKG Acoustics GmbH
Audio-Technica Ltd.
Beyerdynamic GmbH & Co. KG
Sennheiser electronic GmbH & Co. KG
Shure Europe GmbH

Response to consultation on licence-exempting cognitive devices using interleaved spectrum

Date: Friday 1st May 2009

Question 1. The executive summary sets out our proposals for licence-exempting cognitive devices using interleaved spectrum. Do you agree with these proposals?

Ofcom should be mindful of the recent compromise on the EU Review that also has an impact on frequency allocations:

Recital 21 of the Amendments mandates the national regulators to increase their spectrum coordination efforts, in particular through the EU Radio Spectrum Policy Group ("RSPG"):

" (21) Although spectrum management remains within the competence of the Member States, strategic planning, coordination and, where appropriate, harmonization at Community level can help ensure that spectrum users derive the full benefits of the internal market and that EU interests can be effectively defended globally."

Moreover, Recital 23 of the Amendments obliges the national regulators to avoid **harmful interference:**

"(23) Radio frequencies should be managed so as to ensure that harmful interference is avoided. This basic concept of harmful interference should therefore be properly defined to ensure that regulatory intervention is limited to the extent necessary to prevent such interference."

PWMS, Professional Wireless Microphone Systems, are the first part of the production chain and therefore cannot accept any distortion or interference. The intended use of cognitive devices in the interleaved spectrum is unlicensed and mobile. Every step of defining spectrum access specifications need to be accomplished by detailed lab and real life outdoor testing with involvement of the PMSE industry.
Spectrum access given to different cognitive devices might include different protocols, however should always include sensing and connecting a database.

Please find attached a testing procedure proposal. (Annex 1)

Detection

Question 4. Do you agree with a maximum transmit power level of 13 dBm EIRP on adjacent channels and 20 dBm on non-adjacent channels?

The CD RF output power is related to the possible sensing level, which need to be confirmed by real life testing.

Question 6. Do you agree that the reference receive level for wireless microphones should be -67 dBm?

Please note: Minimum sensitivity level of a standard analogue system is - 95 dBm.

Current and future digital modulated wireless microphone systems minimum sensitivity levels vary depending on grade of modulation; this need to be investigated further to be future proof.
Moreover the minimum sensitivity value need to be completed with the C/I value, which varies with different modulation techniques.

Question 7. Do you agree with an additional margin of 59 dB for wireless microphones?

This is a critical value as it includes:

- the distance between the detected wireless microphone and the actual victim, the wireless receiver
- body absorption
- antenna specifications
- RF output power of the wireless transmitter signal
- fading notches
- multipath signals …

As these values can vary significantly in value we urge Ofcom to mandate network sensing for all CDs.

Question 8. Do you agree with a sensitivity requirement for -126 dB (in a 200 kHz channel) for wireless microphones?

We agree with this value; however ask OFCOM to be in close contact with the PMSE industry to ensure that the -126 dBm sensitivity threshold is clearly defined and provides meaningful protection, and also to assist in the development of laboratory and field tests that replicate real-world environments and thoroughly vet the -126 dBm threshold and certification procedures for devices equipped with sensors designed to satisfy this threshold.

Question 9. Do you agree with a maximum transmit power level in line with that for DTT? Are there likely to be any issues associated with front end overload?

If cooperating cognitive devices fail to establish a satisfactory connection, they will always default to the highest available RF output power. Therefore, the highest possible RF output power should be the value for calculation and testing.

Question 13. Should we take cooperative detection into account now, or await further developments and consult further as the means for its deployment become clearer?

Please see questions 7

Geolocation databases

Question 14. How could the database approach accommodate ENG and other similar applications?

The database approach will be able to protect PMSE equipment while increasing the number of possible CDs in the interleaved spectrum, if the database accurately identifies the location and spectrum use of incumbent PMSE users in real time or near-real time. PMSE equipment can change in number and location within minutes. Therefore, a database has to be updated within minutes. Moreover, to ensure that the database accurately authorizes license exempt use of spectrum, CDs must provide their location +/- 3 meters, which current technology (GPS data logger) already accommodates.

Question 19. Should any special measures be taken to facilitate the deployment of cognitive base stations?

The idea is to grant easy access unlicensed access to cognitive devices in the interleaved access. If testing in lab and real life showed compatibility with existing and future PMSE equipment and demonstrated interference free operation – free access can be given.

However, there must always be a balance between the protective zone around PMSE equipment and the interference range of a CD. The emissions from a CD outside the protective zone should not interfere with PMSE operations inside the zone. Any increase in the available output power of a cognitive base station must be offset by an increase in the protective zone entitled to registered PMSE equipment and an increase in the sensing threshold of the base station. For example, it may be necessary to expand the protective zone around a registered PMSE site to 3-4 kilometers if a base station in close proximity is permitted to operate with more output power.

Beacon reception

Question 20. Where might the funding come from to cover the cost of provision of a beacon frequency?

The beacon concept was raised early in the FCC "white spaces" proceeding as one protection for PMSE in a larger suite of interference protection measures. It is susceptible to being shielded or hidden from a scanning CD, and is not considered a viable interference protection mechanism. Requiring CDs to have a network sensing function (sensitive to -126 dBm) coupled with database access offers PMSE users significantly more protection than a disabling beacon.

To the extent Ofcom pursues the beacon concept further, funding should not come from the PMSE industry.

Question 21. Is a reliability of 99.99% in any one location appropriate? Does reliability need to be specified in any further detail?

PMSE equipment cannot accept any level of interference, i.e. 100 % protection is required.

Comparing the different options

Question 22. Do you agree with our proposal to enable both detection and geolocation as alternative approaches to cognitive access?

No. Interference free operation of PMSE equipment can only be achieved with both technologies, i.e. detection / sensing and geolocation are access technologies which complement each other and must be integrated in every cognitive device approved to operate in the interleaved spectrum.

Other important parameters

Question 23. Should we restrict cognitive use of the interleaved spectrum at the edge of these bands? If so, what form should these restrictions take?

Ofcom is consulting on channel 38 as alternative to channel 69. Cognitive devices should get no access to a nationwide 'PMSE band'.

Question 24. Do you agree that there should be no limits on bandwidth?

The maximum allowed bandwidth must be defined by the adjacent / out of band emissions of the cognitive device and the IMD products created (depends on used modulation techniques). This need to be further investigated accompanied by real life testing.

Question 25. Do you agree that a maximum time between checks for channel availability should be 1s?

Yes, we agree. 1s check time is critical to prevent a CD from inadvertently creating prolonged co-channel intereference for an itinerant PMSE user that is temporarily shielded or powered down. For example, at a major sporting event a PMSE microphone may be heavily shielded while a reporter conducts an interview within the bowels of a stadium. Once back on the field that reporter needs instant access to clean spectrum. Any delay in check time beyond 1s may create a significant degradation or disruption in the broadcast audio. Actually, even a 1s check time may result in some degradation in the above scenario; however, we recognize that making the check time more rapid than 1s may be impractical.

Question 26. Do you agree that the out-of-band performance should be -44 dBm?

No. Out-of-band emissions should be -57 dBm below peak values.

Question 27. Is a maximum transmission time of 400ms and a minimum silence time of 100ms appropriate?

Yes, we agree. A reasonable spectrum etiquette will prevent CDs from "permanently" occupying spectrum and ensure access to other interested users. Silent periods also offer CDs a better opportunity to scan for higher priority incumbent devices without their own transmissions interfering with the scan.

Question 28. Is it appropriate to allow "slave" operation where a "master" device has used a geolocation database to verify spectrum availability?

Yes, however spectrum access need to be asked for the complete cognitive system, i.e. if the two devices a have distance of 100 m, the geolocation database need to show free spectrum for 100 m (including hidden node margin, CD RF output power…)

Annex 1

Test procedure proposal by European PMSE industry

MINIMUM CERTIFICATION TEST PARAMETERS TO CONFIRM DETECTING AND AVOIDING PROFESSIONAL WIRELESS MICROPHONES

Test Series 1 - Evaluation Sensitivity / Detection to PMSE Signals

Overview:

Confirm that the DUT (Device Under Test) successfully detects professional wireless microphones to a defined level of accuracy in real-world conditions. A successful test requires the sensing logic in the DUT to correctly identify the channel under test as occupied when wireless microphone signals are present at or above –126 dBm, and vacant when the channel is not in use by a professional wireless microphone.

Test Configuration:

• Sensitivity measurements should be carried out on at least two TV channels within the tuning range of the DUT; preferably near the lower and upper ends of the tuning range.
• Within each TV channel above, tests must be conducted with a single wireless microphone with its center frequency tuned at low channel (+0.2 MHz from bottom edge), mid channel (+4.0 MHz from bottom edge), and high channel (+7.8 MHz from top edge) frequencies

At a minimum, sensitivity tests must be performed in each of the following configurations:

1. Only wireless microphone signals present
2. Wireless microphones, plus one DVB signal at N+1
3. Wireless microphones, plus one DVB signal at N–1
4. Wireless microphones, plus two DVB signals at N+1 and N–1
5. Wireless microphones, plus two DVB signals at N+1 and N+2
6. Wireless microphones, plus two DVB signals at N–1 and N–2

• For each of the configurations involving DVB signals in combination with wireless microphones, the level of the DVB signals must be varied from –75 dBm (simulating a weak but usable DVB signal) up to –20 dBm (simulating a very strong DVB signal, such as would be present at an outdoor venue near a TV transmitter).

Test Series 2 - Evaluation of Hybrid TVBD Behavior When PMSE Signals Are Detected

Overview:

Confirm that the DUT takes corrective action within an appropriate time limit when PMSE signals are detected.

Test Configuration:

1. Configure a pair of DUTs to operate normally (e.g., exchanging data) in the desired test TV channel; e.g., channel N.
2. Turn on a wireless microphone transmitter and receiver system in the same TV channel N.
3. Confirm that each DUT is able to sense the presence of the wireless microphone transmitter (i.e., the system employs network sensing)
4. Observe the DUT system behavior. Within the "Channel Move Time" (2 sec) after the PMSE system is turned on, the Cognitive Devices should cease transmission completely.
5. Repeat the test for each of the configurations described above with DVB signals present

Paramter for Detecion and Interference Avidance	Value
Channel Recheck time	Less than 1 second
Channel Move Time	Less than 2 second
Network sensing*	Less than 2 second
No-Occupancy Period	60 minutes

*Network Sensing Test Configuration:
Configure a pair of Cognitive Devices for normal operation (e.g., exchanging data). Verify that whenever an on-channel wireless microphone signal is present at or above -126 dBm at the input of either DUT, both devices vacate the channel within the channel move time period. This may be accomplished, for example, by conducting the attenuated wireless microphone signal into the input of the DUT through a passive combiner, along with the received signal from the other DUT. The DUT link may be radiated or conducted, so long as there is enough isolation to ensure that the wireless microphone signal is above the -126 dBm detection threshold of only one DUT at a time in order to confirm that the devices will vacate the channel if either one detects the microphone.