SONY

Sony Europe Limited
The Heights, Brooklands, Weybridge, SurreyKT13 0XW, United Kingdom
Telephone: +44 (0) 1932 816000 Fax: +44 (0) 1932 817000

Sony Europe's response to Ofcom's Consultation on "TV white spaces: approach to coexistence"

Q1: Do you have any comments on our proposed approach to ensuring a low probability of harmful interference to DTT services? Please state your reasons for your comments.

There are many unknowns in the deployment of WS devices that need to be tested – such as the extent of domestic booster and communal antenna amplifier overloading which (according to DMSL) has been the cause of 95% of the interference cases during the UK 4G rollout so far. The quality of these amplifiers is not regulated by any specification and the quality of cabling in the consumer installations are not well documented. Recent improvements in the design of these amplifiers by the inclusion of 4G (790MHz) filters is unlikely to help with WS interference. In addition the rollout of 4G makes identifying the cause of interference as WS or 4G difficult for the consumer. We are concerned that the approach of allowing an increased level of interference in stronger DTT signal areas may cause interference to consumers with less than ideal amplifier/cable screening setups which are currently working perfectly well due to the strong DTT signal and low interference levels, but may be problematic in the presence of strong WS interference eroding the large C/(I+N) margin they currently enjoy. Targeted trials are necessary to verify the extent of this problem. Typically DTT consumers at the edge of coverage may have been forced to invest in better quality antennas and cabling/amplifier setups in order to receive a reliable signal, but this might not be true in areas closer to the DTT transmitter.

We also wish to make the following comments about the Ofcom approach;

5.20 – We do not know the proportion of antennas that are not pointing to the preferred transmitter, therefore it is difficult to assess the number of homes that don't comply with the planning assumptions in the consultation. We suggest Ofcom make a study of the number of antennas that are not pointing to the preferred transmitter to estimate the impact of this issue rather than let users complain about interference before adjusting the database. We believe a substantial number of DTT users are not pointing to the preferred antenna for a variety of reasons such as local terrain obstructions, preference for services from a different region, or a better set of programs from the alternative DTT transmitter.

5.34 – Targeted trials with real DTT installations including substandard cabling and booster amplifiers are needed to prove the validity of reducing the C/(N+I) margin currently enjoyed by DTT consumers in stronger DTT signal areas closer to the DTT transmitter in order to get better WSD coverage.

5.47 What is the accuracy of height measurement on a type B device that is not fixed, particularly in an indoor situation where it is not possible for it to be specified by the installer? GPS doesn't work well in such circumstances.

Q2: Do you have any comments on our proposed approach to ensuring a low probability of harmful interference to PMSE services? Please state your reasons for your comments.

We support Ofcom's proposed overall framework to ensure a low probability of harmful interference to PMSE services, however the received wanted signal power, PS,0, for wireless microphones should be -95dBm/(200 kHz) and not -65dBm/(200 kHz). Please refer to ECC report 186 section 5.3 which specifies -114dBm (worst case PMSE receiving level).

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Q3: Do you have any comments on our proposed approach to ensuring a low probability of harmful interference to 4G services above the UHF TV band? Please state your reasons for your comments.

We support Ofcom's proposed approach to reserve channel 60 as a guard band.

Q4: Do you have any comments on our proposed approach to ensuring a low probability of harmful interference to services below the UHF TV band? Please state your reasons for your comments.

Reference 7.23 Interference to cable services: Given proximity of WSD to cable Rx, has Ofcom conducted interference tests on cable receivers using white space signals?

Question T1: Do you have any comments on our proposal to cap the maximum in-block EIRP of all WSDs at 36 dBm/(8 MHz)?

Higher power might be reasonable provided it can be guaranteed that no DTT homes are nearby that could be overloaded by such high powers – this ought to be ensured by the database. It would be useful to see what the improvement in coverage would be if there was no cap on power.

However, it is not clear what happens if someone moves into a house that was previously using satellite TV, but wishes to watch DTT and having erected a DTT antenna finds that the DTT receiver is overloaded by a high power WSD nearby? How does that user regain use of DTT in that area and what happens to the WS service if this happens? Presumably he needs to register his location in the database, assuming that it was not counted as a DTT home previously. We are not sure how the mechanism to do this will be set up, but this is primarily a policy issue rather than technical. The same situation would apply to new builds using DTT, which would need to be added to the database and the WS coverage might be affected.

The current Ofcom protection ratio proposals set a TV overload limit of 0dBm, but many TV sets can overload well below this level as shown by Fig. A4.12 in the report. How will these TVs be protected which are working perfectly well at the moment?

The FCC operates a system of exclusion zones where WSD cannot transmit, otherwise they can transmit up to 36dBm. Why are Ofcom not proposing the same approach with exclusion zones?

Question T2: Do you have any comments on our proposed approach for calculating WSD emission limits, as expressed in Equation (4.3), in relation to DTT coexistence calculations?

Everything proposed in the consultation has been calculated on the basis of the DVB-T mode being DTG option 3 = 64QAM 2/3 used by PSB Muxes. How are proposals for AFLR and protection ratios affected by the use of other DTT modes, such as DTG option 8=64QAM ¾ used by the commercial Muxes, or DTG option 7= QPSK used for local TV, or the DTG DVB-T2 option 6= 256QAM 2/3 – all of which have different protection ratios and C/N requirements? Is the database going to check all the applicable DTT modes in the receive area, and base the allowed power of the WSD on the least robust of these modes? Have any tests been made of DTT receiver protection ratios for option 7 – the operating point of this mode is so different to the current option 3 that linear interpolation of 64QAM 2/3 protection ratios may not be sufficiently accurate due to other nonlinear effects in the receiver?

We do not support Ofcom's conclusion that aggregated interference is not an issue. The following pages demonstrate that if multiple master WSDs transmit with IM=0, then unacceptable interference to DTV receivers may occur even during the introductory phase.

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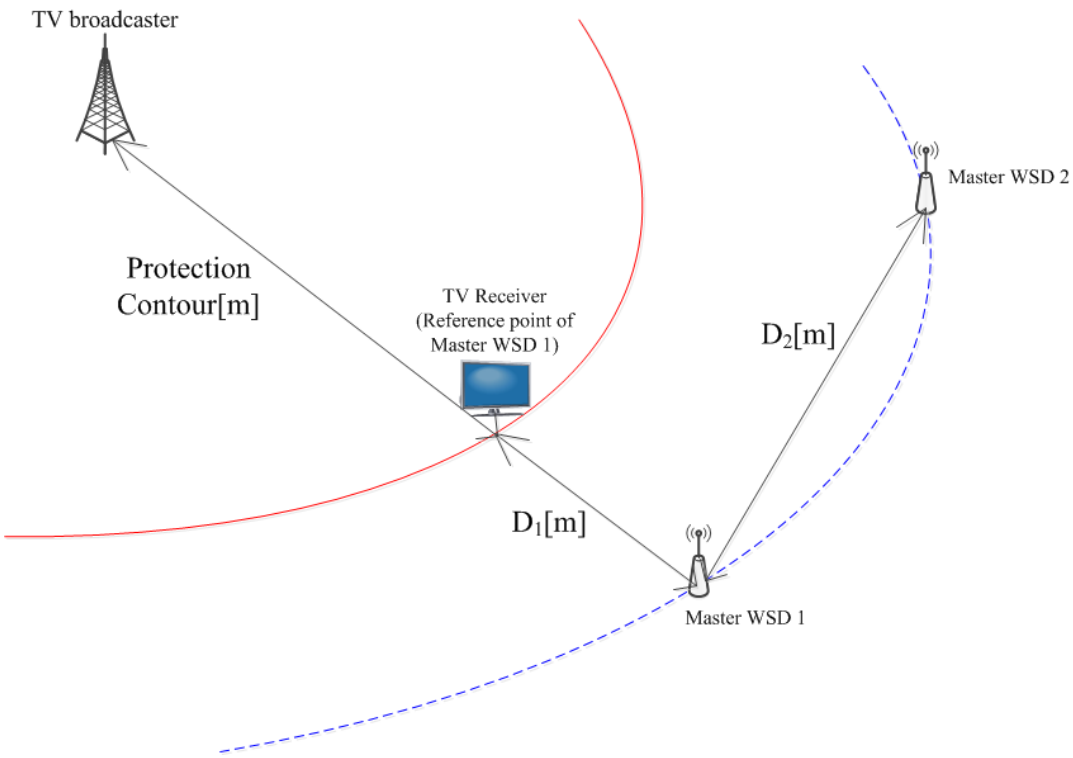
Simulation Assumption

- TV (Incumbent)
  - According to ECC report 186.
  - Incumbent protection achievement threshold : 5.1%

- Master WSD
  - According to ECC report 186 except below:
  - The number of master WSD : 2, 3, 4
  - Maximum allowable output power calculation : Ofcom original (i.e. No IM)
  - D1(protection distance): 5,000[m]

Deployment



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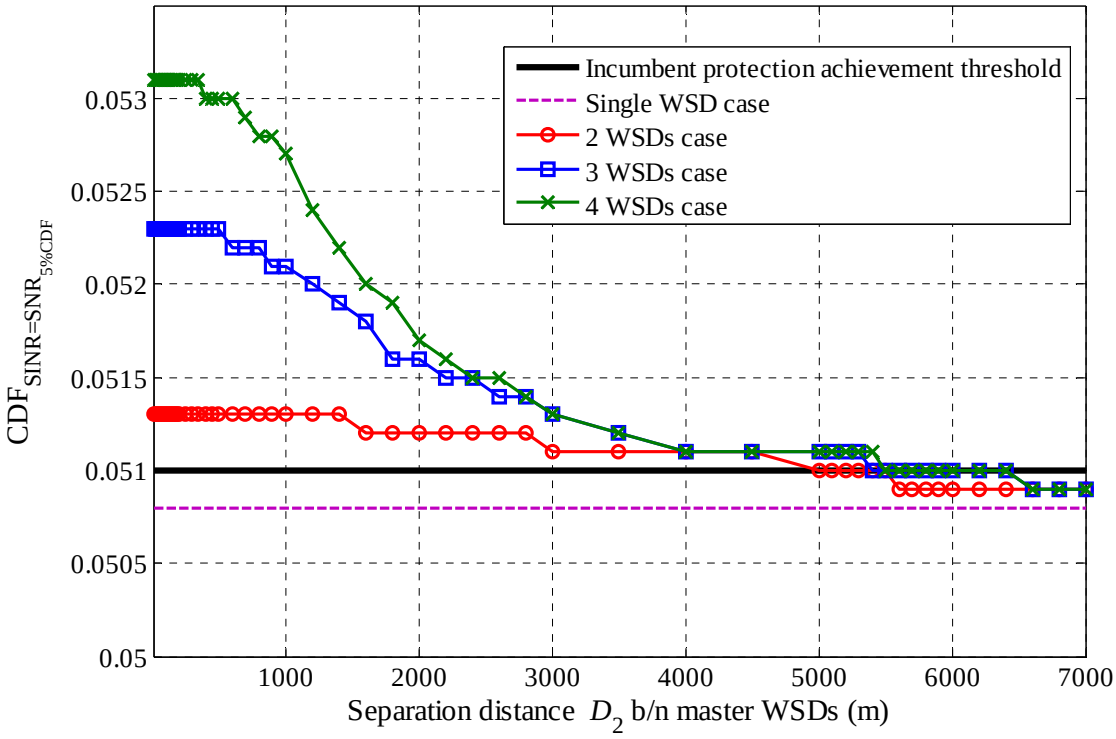
Simulation Results



Result

- When about D2<5,600m, then the acceptable degradation threshold of 0.1% is exceeded.
- 2WSDs : 5,600m, 3WSDs : 6,600m
- Interference power at victim DTV receiver increases and the LP (location probability) becomes below 94.9%.
- This may happen even when at introductory phase of TVWS..

For example

- Number of households in London
  - Population density :
    - Inner London : 9,300 people/km^2
    - Outer London : 3,800 people/km^2
  - Average people in a household : 2.5people.(*)
  - Number of households :

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- Inner London : 3,720 / km^2
- Outer London : 1,520 /km^2

– Average area of a household :

- Inner London : 269 m^2
- Outer London : 658m^2
- Average area of a master WSD

– Assumption : master WSDs are set in (a)0.1%, (b)0.01% of deploy rate of all the households in London.

- Inner London : (a)269,000 m^2, (b) 2,690,000 m^2
- Outer London : (b) 658,000 m^2, (b) 6,580,000 m^2

- Average distance between master WSDs (honeycomb deployment of WSDs)
  - Inner London : (a) 320m, (b)1,000m
  - Outer London : (a) 660m, (b)1,600m

(*) 2.7 people in 1981 decreasing a little recently.

Average distance between master WSDs at 0.1% deploy rate will be about 320m and 660m in the inner London and outer London, respectively.

- Average distance between master WSDs at 0.01% deploy rate will be about 1,000m and 1,600m in the inner London and outer London, respectively.
- Those distances are less than the simulation result of 5.6km which exceeds the acceptable interference to DTV receivers.
- 0.1%~0.01% of the deploy rate could occur during the start phase of the TVWS.
- So “IM=0” may not be acceptable

Conclusion

Multiple (2-4) master WSDs are set with IM=0 scenario

When the distances between WSDs become less than 5.6km, then acceptable degradation rate of 0.1% is exceeded.

In case of the deploy rate of 0.1, 0.01% of the households in London area, the estimated average distances between WSDs are 320m to 1.6km.

In all cases, the unacceptable degradation rate will occur.

Thus, Ofcom’s “IM=0” may not be acceptable and the evaluation of IM should begin now.

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Question T3: Do you have any comments on our proposed approach for dealing with the uncertainty in the locations of DTT receivers in relation to DTT calculations?

5.20 – Ofcom's approach assumes all DTT antennas point towards the preferred transmitter, however there are many reasons why this is not always the case such as local terrain obstructions, preference for services from a different region, or a better set of programs from the alternative DTT transmitter. We suggest Ofcom make a study of the number of antennas that are not pointing to the preferred transmitter (assumed in the Ofcom studies) to understand the extent of the issue rather than let users complain about interference before adjusting the database.

4.7.4 – It would be useful for Ofcom to define urban/suburban and rural situations. For example would a small group of modern houses in the countryside separated by 5m count as urban?

Q4: Do you have any comments on our proposed target 1 dB rise in the noise-plus- interference floor at the edge of DTT coverage, and our approach for allowing greater rise in the noise plus interference floor in areas inside DTT coverage?

3.3/4.62 – We are concerned that the approach of allowing an increased level of interference in stronger DTT signal areas may cause interference to consumers with less than ideal amplifier/cable screening setups which are currently working perfectly well due to the strong DTT signal and low interference levels, but may be problematic in the presence of strong WS interference eroding the large C/(I+N) margin they currently enjoy. Targeted trials are necessary to verify the extent of this problem. Typically DTT consumers at the edge of coverage may have been forced to invest in better quality antennas and cabling/amplifier setups in order to receive a reliable signal, but this might not be true in areas closer to the DTT transmitter.

Question T5: Do you have any comments on our proposed approach for calculating coupling gains in relation to DTT calculations, including the use of 70th percentile coupling gain values for same pixel, tier 1 pixel and tier 2 pixel scenarios, and the use of median coupling gains for tier 3 pixel (and beyond) scenarios?

We suggest Ofcom make a survey of building penetration losses on a representative selection of UK building types as part of its pilot trial, as there is a very large range of values in literature studies but some of these may refer to non UK buildings which can use different materials. The UK Building Research Establishment has a broad selection of suitable houses and would be ideal for such a survey.

Question T6: Do you have any comments on our proposed protection ratios in relation to DTT calculations, including the use of 17 dB for co-channel protection ratio, and 70th percentile values for adjacent channel protection ratios?

Have Ofcom given consideration to the other DVB-T and DVB-T2 modes that are deployed in the UK? For the 8k 64QAM 2/3 DVB-T mode considered in the consultation, most of the receivers measured around 17dB co-channel C/I which seems reasonable, however this figure will change according to the characteristics and bandwidth of other WSD modulation technologies.

More WSD interferer types should be measured and the effects of bandwidth, crest factor and the traffic load dependent time variation of the WSD signal power should be measured and accounted for in any data base entries for other WS technologies.

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There are differences in the Ofcom measured protection ratios between the older can tuners and the newer silicon tuners. Comparisons show both types have strong and weak points at different frequency offsets and wanted signal levels – see example plots below. There is a substantial legacy DTT receiver population of both types. Given these differences, we propose the WSD protection ratios used to protect the legacy population should not be based on the performance of all the tuner types collected together, but should consider the lower performing tuner type (can or silicon) in each case of wanted signal level, WSD class and frequency offset. An example using Class 1 ACLRs for 70 percentile protection ratios is shown in Table 1 below. The differences in PR relative to the proposed consultation PR in Table A4.16 are shown in Table 2. Going forward, there will be an increasing proportion of silicon tuners used compared with the current top 50 survey (17 silicon/33 can).

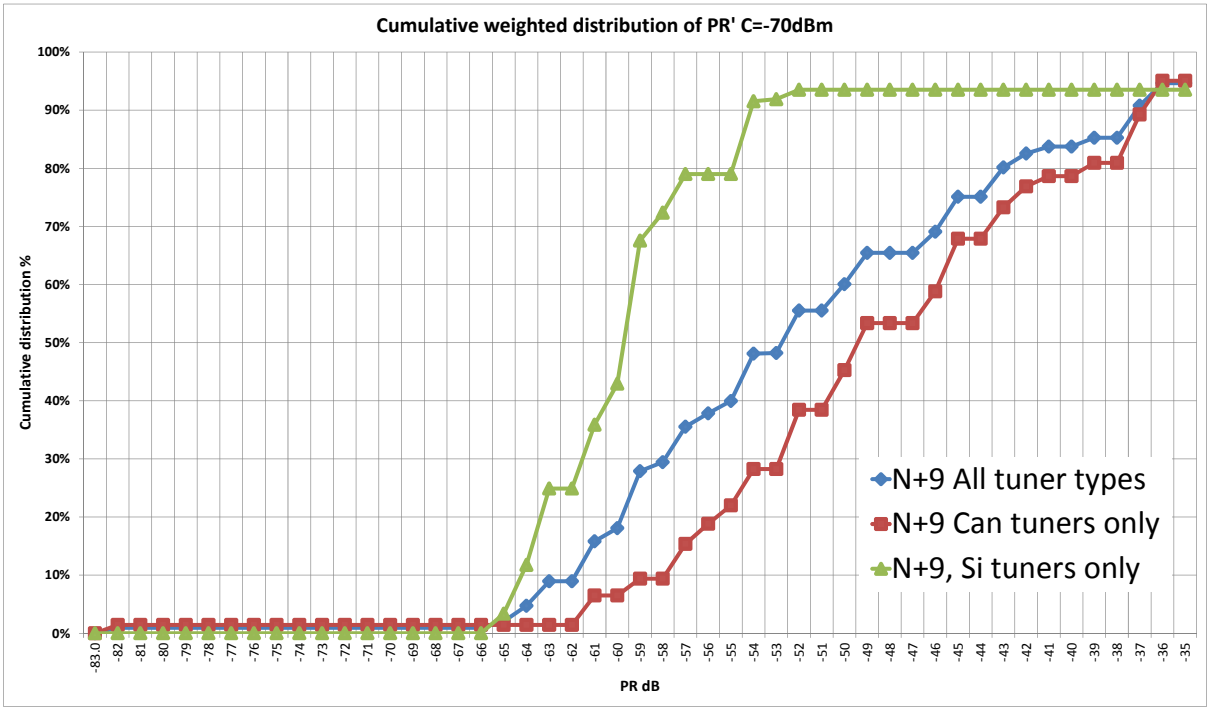

Figure 1 - Example where silicon tuner category is 15dB better than can tuner category, but combined result (blue line) is >2dB lower PR than the 70Percentile of can tuners only due to the contribution of the better silicon tuner performance

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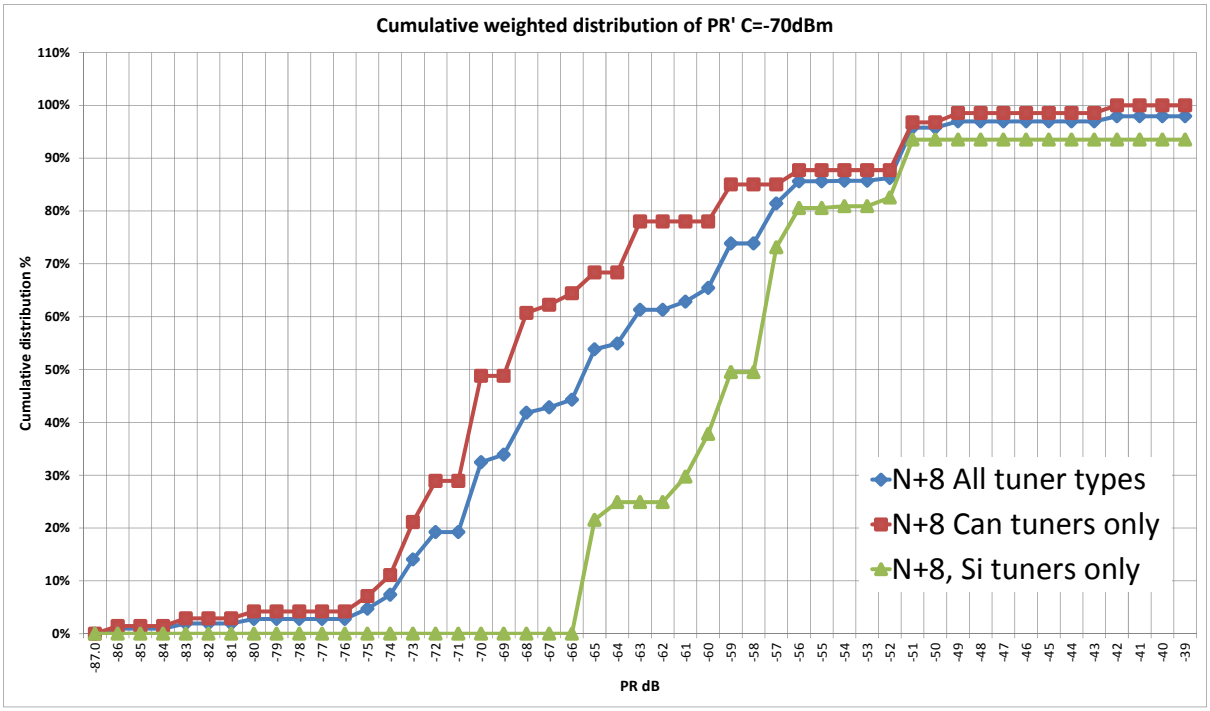

Figure 2 - Example where silicon tuner category is 7dB worse than can tuner category, but combined result (blue line) is >2dB lower PR than the 70Percentile of silicon tuners only due to the contribution of the better can tuner performance

	C (dBm/8MHz)				
	-70	**-60**	**-50**	**-40**	**-30**
N+/-1	-35	-34	-34	-30	-24
N+/-2	-41	-40	-39	-33	-25
N+/-3	-42	-40	-36	-33	-27
N+/-4	-54	-46	-39	-34	-28
N+/-8	-56	-54	-44	-36	-27
N+9	-43	-36	-36	-34	-27
N-9					
N+/-10	-57	-56	-48	-38	-28

Table 1 - Class 1 70 Percentile based on highest PR of either Si or Can tuner cumulative PR distribution at each wanted signal level and frequency offset

	C (dBm/8MHz)				
	-70	**-60**	**-50**	**-40**	**-30**
N+/-1	1	2	1	0	0
N+/-2	1	1	0	0	1
N+/-3	3	0	4	1	1
N+/-4	1	3	5	3	1
N+/-8	2	3	3	3	3
N+9	4	7	3	1	1
N-9					
N+/-10	5	2	0	1	1

Table 2 - Differences dB between Table 1 and Consultation table A4.16

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We would like to see the effects on WS coverage for the 80 percentile and 90 percentile cases as well as the 70 percentile case shown in order to understand the balance between good WS coverage and number of DTT receivers at risk of interference.

It seems table A4.5 is incorrect because it refers to ACLRs for PMSE (ETSI AFLR -3dB) rather than ACLRs for DTT (ETSI AFLR – 19dB as given by eqn A4.11). However, the correct ACLR has been used in proposed protection ratio calculation in tables A4.15 to A4.18.

A4.33 – assumption of ACLR improvement vs frequency:
A4.33 and table A4.5 assume that the WSD ACLR improves by 10dB/8MHz which may or may not be true on some WSDs, however this behaviour is not reflected in the ETSI EN 301 598 standard to which WSD will be designed and tested. There is nothing to prevent a WSD manufacturer from using different design technique (such as envelope tracking) that might not conform to Ofcom's assumption of 10dB/8MHz roll-off, whilst still conforming to the less demanding ETSI specification mask. We think Ofcom's planning assumptions should only follow what is legally binding on the manufacturer.

The method (based on measurements at DTG) seems reasonable, but we would like to understand what is meant by a "pre-specified group of DTT receivers" as mentioned in 4.106. We recognise the trade-offs between keeping test costs down (small # DTT Rx) and ensuring a representative result (high # DTT Rx).

What happens to "pre-specified group of DTT receivers" when new DTT Rx are introduced?

Question T7: Do you have any comments on our proposed approach for dealing with the uncertainty in the locations of WSDs in relation to DTT calculations?

4.134 What is the accuracy of height measurement on a type B device that is not fixed, particularly in an indoor situation and it is not possible for it to be specified by the installer? GPS doesn't work well such circumstances.

Question T8: Do you have any comments on our proposed approach for calculating WSD emission limits, as expressed in Equation (5.2), in relation to PMSE coexistence calculations?

Currently wireless microphones are expected to work at -95dBm/200kHz,. Please refer to ECC report 186 section 5.3 which specifies -114dBm (worst case PMSE receiving level).

Question T9: Do you have any comments on the PMSE wanted signal power levels that we propose in relation to coexistence calculations?

For coexistence calculations the PMSE wanted signal power level should be -95dBm/(200kHz).

Question T10: Do you have any comments on our proposed approach for calculating coupling gains in relation to PMSE calculations

The report assumes a PMSE antenna height of 5m which is reasonable for BC studio and theatre use. However, it should be taken into account that for ENG use, the PMSE receiver's antenna height is 1m - 1.5m.

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Question T11: Do you have any comments on our proposed approach for dealing with the uncertainty in the locations of WSDs in relation to PMSE calculations?

No comment.

Question T12: Do you have any comments on our proposed approach for dealing with the uncertainty in the locations of PMSE receivers in relation to PMSE calculations?

No comment.

Question T13: Do you have any comments on our proposed approach for the derivation of WSD-PMSE coupling gains for non-geolocated slaves in relation to PMSE calculations?

No comment.

Question T14: Do you have any comments on our proposed protection ratios in relation to PMSE calculations?

The proposed protection ratio is based on the PMSE wanted signal power levels -65dBm/200kHz and this should be changed to -95dBm/(200kHz).

Question T15: Do you have any comments on our assessment that a margin for uncertainties in radio propagation is not necessary given the proposed parameters for derivation of coupling gains in relation to PMSE coexistence calculations?

No comment.

Question T16: Do you have any comments on our proposed WSD emission limits in relation to PMSE use in channel 38?

Allow for ENG/mobile PMSE use with a receiving RF level of under -95dBm/(200kHz)