



**Issue 1**

BT's response to the Ofcom consultation document:

**TV White Spaces: Approach to coexistence**

*(Issued by Ofcom on 4 September 2013)*

## INTRODUCTION

BT is pleased to have the opportunity to comment on these proposals from Ofcom for the coexistence of TVWS devices. We have been supportive of this work being done by Ofcom and we believe that this consultation lays down a set of proposals which can be used to advance the work through and beyond the pilot trial stage, ultimately to successful licence exempt deployment, co-existing with the incumbent users.

The consultation is extensive and contains many different proposals. We are generally supportive of the approach presented, although there are a few aspects where we hold a different viewpoint. These are detailed in our answers to the individual questions.

## BT'S RESPONSES TO THE QUESTIONS PRESENTED IN THE CONSULTATION DOCUMENT

*Question 1: 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.*

We believe that the general approach proposed by Ofcom is reasonable and appropriate for ensuring a low probability of harmful interference to DTT services. We do have a comment regarding the defined coverage areas for DTT (elaborated below in response to Question T2) but we support the general approach proposed by Ofcom.

*Question 2: 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 are happy with the approach proposed by Ofcom to provide protection to PMSE services.

*Question 3: 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 believe that the approach proposed by Ofcom aligns with the conclusions from CEPT SE 43 (as reported in ECC Report 185) on ensuring compatibility with 4G services.

*Question 4: 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.*

We are surprised to see that Ofcom are proposing to impose additional measures to protect a service which is proposed to be moved to a band below the UHF TV band. To be clear, we fully understand the need to protect the operation of breathing apparatus (BA). However we note that

the default European wide unwanted emission limit applies to other radio systems operating close by in the VHF and UHF bands, including PMR radios and we question whether similar protection will be provided to the BA from the out of band emissions from these existing systems. We also question the practicality of imposing a different set of unwanted emissions limit specifically for the UK TVWS devices, recognising both the ability for devices to roam, and the need for a European wide market. In the circumstances, if the European harmonised unwanted emission limits do not provide sufficient protection to the BA equipment, then we question whether consideration should be given to moving them to a more appropriate frequency band.

## **BT'S RESPONSES TO THE QUESTIONS PRESENTED IN THE TECHNICAL REPORT**

In the absence of any Questions on Section 3 of the Technical Report, we would like to comment on the validity of Equation 3.2 (in §3.34). It has been well understood that the limit  $P_1$  applies in an 8 MHz bandwidth with the intention of providing protection to DTT, while the limit  $P_0$  applies in a 100 kHz bandwidth with the intention of providing protection to PMSE. The Ofcom TWG has previously acknowledged that these two limits serve different purposes, and it should not be assumed that they will be linked by the bandwidth factor of 80.

We are therefore surprised to see that the Equation 3.2 in the Technical Report identifies the minimum of either  $P_{WSD-PMSE}$  or  $P_1 - 10 \log(80)$ . We believe that the consideration of  $P_1 - 10 \log(80)$  is not appropriate in this equation, and is excessively stringent.

To elaborate further, this would penalise TVWS devices with bandwidths of significantly less than 8 MHz. In such cases it should be sufficient to ensure that they have a total transmit power which is less than  $P_1$  (in 8 MHz), and a value of  $P_0$  (in 100 kHz) which is sufficiently low to protect the PMSE. Constraining the value  $P_0$  even further (i.e. to meet  $P_1 - 10 \log(80)$ ) does not seem to be appropriate or necessary.

Furthermore Equation 3.2 would also penalise devices for which the power spectral density is non-linear across the band. Typically transmitted signals are filtered such that the power spectral density is lower at the channel edge, and furthermore different modulation techniques can give rise to different distributions of power spectral density across the channel. Consequently the power in some/many of the 100 kHz channels will be more than 1/80 of the total power. To include  $P_1 - 10 \log(80)$  in the Equation 3.2 will effectively ensure that a TVWS device has to reduce its total power in 8 MHz to *less* than  $P_1$ . This could prove to be a considerable constraint, for no apparent reason.

Consequently we propose that " $P_1 - 10 \log(80)$ " (and the associated "min" function) should be removed from Equation 3.2.

*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)?*

The question of an overall maximum in-block EIRP figure has been discussed for a while. On the one hand it was recognised that an arbitrary constraint on maximum power would not be appropriate,

however some indication on the upper power limit for the operation of devices could be helpful. Recognising that there is currently a widespread view that there is unlikely to be a requirement for EIRP figures greater than 36 dBm/(8 MHz), we are happy for this to be adopted as a provisional cap. However, we note that any such cap will be imposed within the database, and hence it could be easily adjusted retrospectively. Therefore it would be appropriate to review it in the light of experience once TVWS operation has become established, given that it should not be difficult to change it in the future.

*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?*

We are generally happy with the approach proposed by Ofcom for calculating WSD emission limits.

However we would like to raise a concern with regard to the issue of identifying which DTT receivers should be taken into consideration in the calculation of the WSD emission limits. In general it is appropriate to consider protection only to DTT receivers within a pixel for which the location probability exceeds 70% (as per Clause 4.16 of the technical report). Although not stated we assume that this criterion is intended to apply to pixels for which that location probability applies for 99% of time, corresponding to “Primary Layer coverage”. This would seem to be reasonable given that most occupied pixels will have Primary Layer coverage from at least one DTT transmitter.

However, there are a considerable number of households who do not receive Primary Layer coverage from any DTT transmitter. But recognising that the “UK Planning Model” (UKPM) takes a conservative approach, many of these households are still receiving a perfectly acceptable signal, possibly through the use of higher gain antenna and/or an aerial amplifier, even though the UKPM has identified them to be in a pixel which is not served. Unfortunately, as the UKPM considers those pixels to be unserved by DTT, the approach presented by Ofcom would not offer them any protection against interference from TVWS, even though they are receiving an acceptable DTT signal.

Consequently we propose that (occupied) pixels which are identified as not being served (i.e. not within Primary Layer coverage) by any DTT transmitter, but which are still receiving an adequate DTT signal, should still be considered for protection. In such cases, it could be assumed that additional engineering has been used to boost a low signal, and therefore DTT reception should be protected to a lower level.

Therefore we agree with Ofcom’s proposal that “Primary Layer Coverage” is protected, where it exists. However in locations where there is no Primary Layer Coverage, then we propose that “Fringe coverage” (70% location probability for 50% of time) should be protected instead.

*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?*

Clearly it is impossible to be specific about the precise coupling between TVWS devices and DTT receivers, and therefore an approximation has to be made. The approach that Ofcom is proposing has been discussed for more than a year, and we believe that the general approach strikes a good balance between precision, complexity and practicality.

*(Revised) Question T4: 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?*

Whilst we acknowledge the importance of providing good DTT coverage to as much of the population as possible, we believe that Ofcom's proposal for the permitted level of interference into DTT is reasonable. A 1dB rise in noise plus interference floor is a commonly used metric for sharing, and given that the edge of coverage is determined on a conservative basis, we believe that this is a good basis for moving forwards.

*(Revised) 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?*

The approach taken appears to be reasonable.

*(Revised) 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?*

The approach taken appears to be reasonable.

*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?*

The approach taken appears to be reasonable.

*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?*

The approach taken appears to be reasonable.

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

The approach taken appears to be reasonable.

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

The approach taken appears to be reasonable.

*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?*

The approach taken appears to be reasonable.

*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?*

The approach taken appears to be reasonable.

*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?*

The approach taken appears to be reasonable.

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

The approach taken appears to be reasonable.

*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?*

The approach taken appears to be reasonable.

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

The approach taken appears to be reasonable.

*Question T17: Do you have any comments on our proposal not to permit WSDs to operate in channel 60?*

This decision would seem to be reasonable, in the circumstances, particularly since the CEPT SE43 studies (albeit based on some conservative assumptions) drew a similar conclusion.

*Question T18: Do you have any comments on our proposal that, if the unwanted emissions limit (over 230-470 MHz) in the draft ETSI standard (EN 301 598) is tightened by 8 dB, there should be no further restrictions on the operation of WSDs in relation to services below the UHF TV band?*

We would certainly agree that no further restrictions should be placed on the operation of WSDs in relation to services below the UHF TV band.

*Question T19: Do you have any comments on our proposal that, if unwanted emissions limit (over 230-470 MHz) in the draft ETSI standard (EN 301 598) is not changed, there should be restrictions on the in-block powers of WSDs in channels 21 to 23?*

As noted above in our response to Question 4 (of the main consultation), we question the practicality of applying an unwanted emission limit for TVWS devices, that is tighter than the default harmonised European limit. This is for the following reasons:

- There will be other radio systems (not necessarily in neighbouring bands) which have been designed to meet the default harmonised European limit, rather than the tighter limit proposed here by Ofcom.
- Given that TVWS equipment may be carried between European countries, it may be difficult to prevent equipment which does not meet this tighter limit from being operated in the UK
- Equipment is normally designed for a European market, and any deviation in terms of unwanted emission limits would fragment the market
- If the breathing apparatus (BA) is unable to be operated in the lower UHF band in proximity to equipment which conforms to the European harmonised unwanted emission limits, then we would question whether it is really appropriate to consider moving the BA to operate in this part of the lower UHF band.

Finally, if additional in-block emission limits are to be applied for channels 21 to 24, then they should only apply if and when the operation of such breathing apparatus is moved to the lower UHF band.