



10900-B Stonelake Boulevard, Suite 126 • Austin, TX 78759 USA
Phone: +1-512-498-WIFI (+1-512-498-9434) | Fax: +1-512-498-9435
www.wi-fi.org

Wi-Fi Alliance Response to Ofcom Consultation: TV white spaces: approach to coexistence

Wi-Fi Alliance is pleased to provide here our responses to the questions contained in the Ofcom Consultation entitled “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.

Wi-Fi Alliance supports using databases to manage coexistence between digital television and white spaces devices. In addition, Ofcom should consider a coexistence framework that allows database developers to innovate: it should set interference protection thresholds and recommend propagation models, but it should not lay out detailed or prescriptive algorithms.

Wi-Fi Alliance also strongly suggests moving away from a protection model that requires knowing the locations of television receivers. Currently, Ofcom’s protection model depends on data regarding receivers, rather than the overall characteristics of the transmitter. This method relies on a proprietary dataset, will require much more frequent updating, and is likely not scalable to the rest of Europe. Moreover, reliance on a non-transparent, proprietary dataset limits innovation on the part of database developers -- if they lack access to the raw data, they can’t effectively suggest improvements to the current model. In addition, as technology develops, Ofcom should consider allowing spectrum sensing for channel access that could possibly provide for more TVWS channels available to WSDs.

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.

Ofcom proposes that WSDs query the database every fifteen minutes to receive up-to-date channel availability information. This requirement is driven primarily by a need to protect PMSE use that may be introduced on relatively short notice. However, the need to query the database so frequently increases the cost of service. Wi-Fi Alliance suggests a compromise approach: Confine PMSE to one [or two]

channels. If a device seeks to use those channels, it should be required to check in every 30 minutes. If a device refrains from using those channels, it need not check as frequently.

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.

Wi-Fi Alliance offers some comments on this matter relating to CH60 in our response to Question T17, below.

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.

Wi-Fi Alliance agrees with Ofcom's proposed approach for protecting services below the UHF television band.

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)?

Ofcom should reconsider the hard power cap of 36 dBm/8 MHz. In rural areas where there are fewer broadcasters, broadband providers may be able to reach more end users if they are able to increase the power of their operations.

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?

Wi-Fi Alliance has no comment at this time and needs further time to study the matter. Further, Wi-Fi Alliance believes that location probability as a measure of degradation may not be feasible in other regulatory domains.

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?

The uncertainty regarding locations and characteristics of DTT receivers would create few challenges, if any, if Ofcom moved away from a receiver-centric framework. In particular, relying on a receiver-focused approach often results in over-protection. For example, in a given 300 m x 300 m, the calculations assume that the WSD and the receiver are within 5, 10, or 20 meters of each other. However, in such a scenario, the device and the receiver could be *significantly* farther apart. Relying on conservative hypotheticals such as these artificially decreases available white space. The building penetration loss of 7dB seems to be overly conservative; building penetration loss has been found to be in the range from 6dB to 27dB for frequencies below 1GHz (see References [1] – [8]).

Question T4: Do you have any comments on our proposed target of a 10% likelihood of a 1 dB rise in the noise-plus-interference floor at the edge of DTT coverage?

Wi-Fi Alliance supports this approach. However, we remain optimistic that the pilots will demonstrate that it is feasible to tune the resulting parameters to allow for more white space usage, thereby allowing Ofcom to reconsider the target. Wi-Fi Alliance would like to point out that the Ofcom analysis ignored WSD angular discrimination, which may severely underestimate the coupling loss for all applications.

Question T5: Do you have any comments on our proposed approach for calculating coupling gains in relation to DTT calculations?

Wi-Fi Alliance believes that Ofcom's approach to coupling gains for portable devices should be reconsidered. Ofcom proposes that if a Type A portable device does not report its height, then Ofcom will consider the default height to be 10 meters. It is fairly unlikely that portable devices will be operating outdoors, rather than indoors, at a height of 10 meters. Therefore, we suggest that Ofcom consider using a height of 1.5m to represent the height of a mobile user. In addition, the building penetration loss should be changed from 7dB to 10dB, based on the measurement results reported in the open literature. Losing the building penetration loss when antenna height is not reported seems too pessimistic (outdoor classification). The indoor coupling loss for the portable/indoor devices also seems too pessimistic because the DTT receiver antennas are usually pointing towards the TV transmitters and are also at a higher height, resulting in a reduced antenna gain.

Question T6: Do you have any comments on our proposed protection ratios in relation to DTT calculations?

Wi-Fi Alliance suggests that Ofcom perform additional measurements using 802.11af technology.

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?

Wi-Fi Alliance is concerned that Ofcom's proposed approach does not maximize spectrum utilization. In particular, the absolute nature of the power levels for non-geolocated slave devices could result in significant overprotection and diminished use of available spectrum. In all of the other interference calculations, Ofcom has suggested a probabilistic approach, but this computation uses a worst case scenario. As a result, it severely limits the use of non-geolocated slave devices.

For example, if there is a master transmitting at 36 dBm with an antenna height of 30 meters in a pixel classified as open, the resulting radius will be over 20 kilometers. This implies that over 125,000 pixels will need to be examined. With such a large area covered, the odds of one pixel completely blocking the channel increases while the odds of the slave residing in that pixel decreases dramatically.

To improve spectrum utilization, we suggest computing the maximum allowable power level for the slave device in a probabilistic way. The radius should be computed and every pixel should be examined using a 95% value. This assessment will better capture the random placement of the slaves in the master's service area. With this small change of the interference criteria, the resulting impact on DTT will be negligible and the usability of non-geolocated slaves will greatly increase.

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?

Ofcom should consider introducing a 1 MHz guard band at the beginning and end of each TV channel where PMSE devices are prohibited from transmitting. Wi-Fi Alliance agrees with a value of -65 dBm rather than using sensitivity.

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

Wi-Fi Alliance has no comment at this time and needs further time to study the matter.

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

Wi-Fi Alliance believes the default height of 30 meters is too high and suggests Ofcom use an average value instead of the worst case. Wi-Fi Alliance suggests adding a parameter for the WSD to the WSDb to indicate whether it is indoor or outdoor instead of making assumptions. It is not clear whether Ofcom is assuming Type B devices are all outdoors if less than 2 meters high. Type B device should be able to report being indoors even if height is not reported and thus benefit from the additional 7 dB or 14dB indoor to outdoor and indoor to indoor isolation, respectively. Wi-Fi Alliance suggests that Ofcom request PMSE to report height also. Once PMSE antenna height is known, coupling will be calculated much more accurately thereby increasing spectrum efficiency. For example, the coupling between a 1.5m PMSE and a 1.5 WSD can increase significantly over the distance, often following a path loss exponent of 3.5 or 4.

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?

Wi-Fi Alliance has no comment on this question.

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?

Wi-Fi Alliance has no comment on this question.

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?

Wi-Fi Alliance has concerns regarding the treatment of non-geolocated slaves as set forth in the response to Question T7, and as also applied to the derivation of WSD-PMSE coupling gains. Therefore, Wi-Fi Alliance proposes that the same type of calculation be used in this context as well.

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

Wi-Fi Alliance agrees that the current protection ratios are adequate based on the assumptions used. However, Ofcom's analysis to date has assumed that all white space signals look similar to those emitted by Weightless devices. It is unlikely that Wi-Fi technology characteristics should be considered the same as narrow band technologies. Ofcom may need to adjust protection ratios in the future as it collects more information regarding the characteristics of other white spaces devices.

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?

Wi-Fi Alliance agrees that an additional margin is not necessary.

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

Wi-Fi Alliance has no comment on this question.

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

Wi-Fi Alliance questions the need to reserve channel 60 as a guard band and believes that: 1) valuable spectrum capacity could be gained, and 2) the intended objective achieved by restricting WSD emission power, proposed as is in channels adjacent to DTT channels. Wi-Fi Alliance suggests a compromise be reached to restrict operation of only portable WSDs in channel 60, or tighter spectrum leakage masks which seems like an unnecessary waste of spectrum (8 MHz). Instead, Ofcom should just state the out-of-band emission limit that a WSD shall comply with, but not restrain the use of channel 60.

Alternatively, Ofcom could limit the emission power of the WSD device when using channel 60. With the proliferation of small cells in 3GPP (i.e. femto-cells, pico-cells, ..), UMTS will cause the same issues. It will be just as difficult for UMTS to make sure that there is no adjacent channel femto-cell transmitting in the vicinity of an adjacent channel UE. In addition, the WSD power levels are significantly lower than the levels of an adjacent base station in the reference scenario.

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?

Ofcom and ETSI are undertaking independent processes, and Wi-Fi Alliance believes Ofcom should maintain flexibility. We believe it is reasonable for Ofcom to take the baseline ETSI standard and locally tighten the constraints as needed. However, we don't believe it is constructive for Ofcom's specific requirements to create tighter restrictions for everyone across Europe. Databases can be provided that are both ETSI-compliant and Ofcom-compliant even if Ofcom sets its own rules for channel 21-23.

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?

Wi-Fi Alliance has no comment on this question.

REFERENCES

- [1] S. Aguirre, L.H. Loew, and L. Yeh, "Radio Propagation into Buildings at 912, 1920, and 5990 MHz Using Microcells", in *Proc. 3rd IEEE ICUPC*, pp. 129–134, October 1994.
- [2] P.I. Wells, "The attenuation of UHF radio signals by houses", in *IEEE Transactions on Vehicular Technology*, Vol. 26, Issue 4, Nov 1977. pp. 358–362.
- [3] L.H. Loew, Y. Lo, M.G. Laflin, E.E. Pol, "Building Penetration Measurements From Low-height Base Stations At 912, 1920, and 5990 MHz", NTIA Report 95-325, September 1995.
- [4] H. Okamoto, K. Kitao, S. Ichitsubo, "Outdoor-to-indoor propagation loss prediction in 800-MHz to 8-GHz band for an urban area", In *IEEE Transactions on Vehicular Technology*, v 58, n 3, pp. 1059–1067, 2009.
- [5] A. Davidson, C. Hill, "Measurement of building penetration into medium buildings at 900 and 1500 MHz", *IEEE Transactions on Vehicular Technology*, Volume 46, Issue 1, Feb. 1997 pp. 161–168 .
- [6] A.F. de Toledo, A.M.D. Turkmani, J.D. Parsons, "Estimating coverage of radio transmission into and within buildings at 900, 1800, and 2300 MHz", in *IEEE Personal Communications*, vol. 5, no. 2, April 1998 pp. 40–47 .
- [7] W. J. Tanis and G. J. Pilato, "Building penetration characteristics of 880 MHz and 1922 MHz radio waves", in *IEEE Veh. Technol. Conf. Proc.*, 1993, pp. 206–209.
- [8] J.-E. Berg, "Building penetration loss along urban street microcells", in *Seventh IEEE International Symposium on Personal, Indoor and Mobile Radio Communications, 1996, PIMRC'96.*, Volume 3, 15-18 Oct. 1996 pp. 795–797 vol.3.

Respectfully submitted

WI-FI ALLIANCE

A handwritten signature in black ink, appearing to read 'Edgar Figueroa', with a long horizontal flourish extending to the right.

Edgar Figueroa

President and CEO

10900-B Stonelake Blvd., Suite 126

Austin, Texas 78759

+1-512-498-9434

efigueroa@wi-fi.org

13 December 2013