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Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Unlicensed White Space Device Operations in the Television Bands	)	ET Docket No. 20-36
	)	

REPLY COMMENTS OF THE DYNAMIC SPECTRUM ALLIANCE

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President
Dynamic Spectrum Alliance

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DSA
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I. INTRODUCTION AND SUMMARY

The Dynamic Spectrum Alliance ("DSA") [1] is pleased to submit these Reply Comments *In the Matter of Unlicensed White Space Device Operations in the Television Bands*. [2] Amongst commenters there was general support for (1) increasing the EIRP limit for fixed White Space Devices ("WSDs") operating in less congested areas from 40 dBm to 42 dBm, (2) increasing the Height Above Average Terrain (HAAT) limit from 250 meter to 500 meters, although there was a difference of views on some implementation details such as whether the FCC's coordination proposal was preferable or not need at all, (3) allowing higher power WSDs to operate on mobile platforms within geofenced areas and (4) authorizing a new category of narrowband WSDs intended for IoT applications. The DSA believes that the Commission should authorize a second new category for WSDs operating on mobile platforms within a geofence. The technical rules for the new category would borrow many of its rules for fixed WSDs.

The DSA believes the Commission should permit White Space Database (WSDB) Administrators the option to use a terrain-based model to determine the desired DTV signal and the undesired WSD signal strengths in the proposed WSD coverage area as a means to establish the list of available channels for WSD operations and the EIRP limit for each. The Commission's

[1] The Dynamic Spectrum Alliance is a global, cross-industry alliance focused on increasing dynamic access to unused radio frequencies. The membership spans multinational companies, small- and medium-sized enterprises, academic, research, and other organizations from around the world, all working to create innovative solutions that will increase the utilization of available spectrum to the benefit of consumers and businesses alike. A full list of DSA members is available on the DSA's website at www.dynamicspectrumalliance.org/members.

[2] *See* Notice of Proposed Rulemaking, Unlicensed White Space Operations in the Television Bands, ET Docket No. 20-36 (Released March 2, 2020). ("NPRM").

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recent decision to approve the use of a hybrid terrain-based model in its 6 GHz Report and Order[3] indicates that it may be open to consider more sophisticated models that can be calculated in the cloud before a WSD is powered up. The hybrid terrain-based model should only rely on HAAT, so that the Commission can eliminate its height above ground level limit for WSDs.

Finally, the Commission should consider permitting higher power fixed WSDs to operate closer in frequency to the nearest broadcast TV station than under its current rules. The results of Microsoft's laboratory and field test results, when combined with RED Technologies / Nominet's framework and the use of a terrain-based model, taking into account real-world loss mechanisms, creates a possible pathway for such WSD operations. But additional work is necessary.

II. THE COMMISSION SHOULD ALLOW WHITESPACE DATABASE PROVIDERS TO INCORPORATE A TERRAIN-BASED MODEL

The time is right for the Commission to allow white spaces database ("WSDB") providers to incorporate a terrain-based model into their calculation engines. A terrain-based model can determine the separation distance beyond the protected contour on the co- and first-adjacent channels required to provide the requisite level of protection for incumbent broadcasters with greater accuracy than the current methodology based on the F-curves and HAAT. A terrain-

[3] *See* Unlicensed Use of the 6 GHz Band, Report and Order and Further Notice of Proposed Rulemaking, (released April 23, 2020). ("6 GHz Report and Order").

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based model can also be used to enable higher power WSD operations on the first adjacent channel and on a channel whose edge is located 3 MHz for the edge of the broadcast channel.

Based on the minimum separation distances, the WSDB can determine the list of available channels and the maximum EIRP level for each available channel. The DSA model rules for WSDs include the use of terrain-based models such as Longley-Rice and those developed by the International Telecommunication Union.[4] The DSA believes the use of the ITU-R P.452-16 clutter model[5] for rural environments is applicable to less congested areas.

As WISPA states, "now widely accepted, this [Longely-Rice] model is a far more accurate model of interference potential that the Commission has adopted for the Citizens Broadband Radio Service and standard power in the 6 GHz band in the five years since the Commission adopted its distance separation tables".[6]

More recently, hybrid propagation models were adopted by the Wireless Innovation Forum for CBRS[7] and the Commission for the 6 GHz[8] band. The use of a hybrid model ensures

[4] *See* Model Rules and Regulations for the Use of Television White Spaces v2.0, Dynamic Spectrum Alliance, December 2017. http://dynamicspectrumalliance.org/wp-content/uploads/2018/01/Model-Rules-and-Regulations-for-the-use-of-TVWS.pdf

[5] ITU-R P.452-16, Prediction procedure for the evaluation of interference between stations on the surface of the Earth at frequencies above about 0.1 GHz. https://www.itu.int/dms_pubrec/itu-r/rec/p/R-REC-P.452-16-201507-I!!PDF-E.pdf.

[6] See Comment of WISPA at 4-6.

[7] See "Requirements for commercial operation in the U.S. 3550–3700 MHz citizens broadband radio service band," Wireless Innovation Forum Document WINNF-TS-0112, Version V1.9.1, 11 March 2020. [Online]. Available: https://cbrs.wirelessinnovation.org/release-1-standards-specifications.

[8] *See* new 47 CFR § 15.407(l)(1).

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that the combined model operates over a valid frequency range, distance, and elevation. In its 6 GHz Report and Order, the Commission uses the Free Space Path Loss model from 0-30 meters from the transmitter, the WINNER II model from 30 meters to 1 km, and the Longley-Rice model beyond 1 km.

The Commission will have to use a different hybrid model for WSDs as WINNER II is valid above 2 GHz in frequency and the Longley-Rice model is valid at distances beyond 1 km. The Commission would no longer be breaking new ground if it allows WSDB administrators to incorporate a hybrid terrain-based model.

The NAB raises a number of implementation issues about the use of the Longley-Rice model (how to handle error codes, and what terrain data, sampling strategy, and other parameters are appropriate) without providing any level of detail.[9] Some of these issues harken back two decades to the Commission's implementation of laws authorizing home viewing of programming over satellite service. The DSA does not want to downplay the importance of getting the details right, but these are second order matters to work through once the Commission decides to move forward with a hybrid terrain-based model. Our expectation is that there will be time for discussion as Commission will not allow a flash cut over from HAAT and the F-curves to a hybrid Longley-Rice model overnight.

[9] See Comments of NAB at 7.

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III. THERE IS OVERWHELMING SUPPORT FOR INCREASING THE EIRP LIMIT FOR FIXED WHITE SPACES DEVICES OPERATING IN LESS CONGESTED AREAS

There is overwhelming support for increasing the EIRP limit for fixed WSDs operating in less congested areas from 40 dBm to 42 dBm.[10] While the DSA recommends the Commission allow for a terrain-based model to determine the appropriate increase in the separation distance beyond the protected contour, if this is not politically possible, the extension of the Commission's current framework represents a second-best solution.

The Commission should also give serious consideration to Adaptrum's proposal to increase the conducted power limit through the use of multiple-input-multiple output ("MIMO") technologies, while maintaining the Commission's proposed 42 dBm EIRP limit for fixed WSD.[11] Such an increase would provide WISPs with greater flexibility in delivering broadband capacity to its customers over the coverage area. Microsoft also cites the importance of how the Commission considers (and certifies) MIMO WSDs as opposed to single-input-single-output ("SISO") WSDs.[12] While DSA is not in a position to discuss the technical nuances of the device certification process between SISO and MIMO devices, from a policy standpoint, we have

[10] See Comments of App Association at 8; Adaptrum at 2; American Farm Bureau at 1; ARK at 5; BCA Coalition at 3, 11-12; Cal.net at 1; Taxpayers Coalition at 1; CAN at 1; DNG Comments at 1; MFPA at 1; Microsoft at 13-15; NREA at 1; PISC at 13; RED Technologies at 2; RTO Comments at 1.

[11] See Comments of Adaptrum at 2.

[12] See Comments of Microsoft at 12-13.

observed an increased number of MIMO devices operating in unlicensed bands, and this proceeding may be a good opportunity for the Commission to clarify its policies.

IV. THE COMMISSION SHOULD INCREASE THE HIGHT ABOVE AVERAGE TERRAIN LIMIT TO 500 METERS

There is broad support for increasing the Height Above Average Terrain ("HAAT") limit for fixed WSDs from 250 meters to 500 meters.[13] The DSA recommends the increase in separation distance beyond the protected contour is determined through use of a terrain-based model for the reasons stated above, but we recognize the best that can be done at this time may only be to increase WSD HAAT based on extending the Commission's existing framework.

Several commenters agreed with DSA that there was no need to limit the HAAT increase to less congested areas.[14] WSD operating parameters and separation distances can be adjusted accordingly to ensure that incumbents are protected from receiving harmful interference. Some commenters also preferred the Commission's coordination proposal to that proposed by Microsoft in its Petition.[15]

[13] See Comments of App Association at 9; Adaptrum at 3; ARK at 5; BCA Coalition at 12; Cal.net at 1; CAN at 1; DNG at 1; MFPA at 1; Microsoft at 15-18; PISC at 13; RADWIN at 3; RED Technologies at 2; RTO at 1; WISPA Comments at 7.

[14] See Comments of BCA at 12-13; Microsoft at 19; PISC at 15; Radwin at 3; RED Technologies at 2; WISPA at 8.

[15] See Comments of App Association at 9; Adaptrum at 3; BCA Coalition at 12; WISPA at 7.

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A handful of commenters, such as RED Technologies, agreed with the DSA that there is no need for a coordination procedure between WSDs operating with a HAAT above 250 meters and broadcast licensees. [16] RED Technologies believe the Commission has in place other measures for diagnosing most interference events. The DSA believes that no coordination is required because, WSD operators must protect incumbents from receiving harmful interference – end of story.

V. THE COMMISSION SHOULD ELIMINATE THE HEIGHT ABOVE GROUND LEVEL LIMIT

Several Commenters support the idea of eliminating the height above ground limit because as the Commission stated in the NPRM, it uses HAAT for protecting incumbents.[17] RED Technologies believes that the height AGL limit has negligible impact on the potential for WSDs causing harmful interference to broadcasters and can safely be removed.[18]

As the Commission explained, the difference between the HAAT limit and the Height AGL limit unnecessarily penalizes WISPs seeking to provide broadband in parts of rural America where the terrain is flat by dramatically reducing the coverage area.[19]

[16] See Comments of Red Technologies at 2; Radwin at 3.

[17] See NPRM at ¶25; See Comments of BCA Coalition at 12; Microsoft at 17-18; WISPA at 8.

[18] See Comments of Red Technologies at 4.

[19] See NPRM at ¶25.

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The DSA recognizes that the Commission relies on the FCC/OET TM-91-1 model[20] for determining separation distances for WSD with heights above ground level below 30 meters, where the F-curves are not valid, and at distances where HAAT is not valid. The Commission also uses the TM-91-1 model to determine the exclusion zones around Wireless Medical Telemetry Service systems. The TM-91-1 model does not use HAAT, only the heights of the transmit and receive antennas. It means, the Commission should consider using a terrain-based propagation model between 0 and 1 km from the WSD transmitter as part of a hybrid propagation model, that would allow it to eliminate its height AGL limit for WSDs.

VI. THE COMMISSION SHOULD MODIFY ITS DEFINITION OF LESS CONGESTED AREAS

Most commenters support maintaining the definition of less congested area. As a less congested designation is a proxy for rural areas, rather than a technical measure, the DSA continues to believe the Commission should look at it across the entire 2-36 channel span rather than within each tier of channels.[21]

[20] See William Daniel and Harry Wong, "Propagation in Suburban Areas at Distances less than Ten Miles", FCC/OET TM-91-1, Federal Communications Commission, January 25, 1991, https://transition.fcc.gov/oet/info/documents/technical/tm91-1.pdf.

[21] See DSA Comments at 13-15.

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VII. HIGHER POWER MOBILE OPERATIONS WITHIN A GEOFENCE SHOULD BE A NEW CATEGORY OF WHITE SPACE DEVICE

The Commission should create a new category for higher power mobile devices operating within a geofenced area. Several commenters identified the magnitude of the work and regulatory gyrations that would be required by the Commission if it wants to fit this type of operation into its existing WSD categories.[22] Creating a new category of WSD is cleaner. The Commission can repurpose the sections of its applicable fixed and personal / portable rules and craft new language where required.

There was considerable agreement that the WSD operating within the geofence should be treated as a fixed device.[23] This includes no objection to the WSD having a detachable antenna.[24] As a practical matter, many of vehicles envisioned for such applications are typically driven daily through an automated wash. Having a non-detachable antenna could present a significant barrier to adoption.

Overall, treating the WSD within the geofence as a fixed WSD will make the hardware portion of equipment certification process very straightforward. The certification procedures for the operation of the WSD in conjunction with the WSDB created geofence will have to be established.

[22] See Comments of RED Technologies at 5; Shure at 7-8.

[23] See Comments of App Association at 9; BCA Coalition at 14; CAN at 1; CTA Comments at 2; DNG at 1; MFPA at 1; Microsoft at ;PISC at 15; RADWIN at 4; RED Technologies at 4-5; RTO at 1; Sennheiser at 8; NPSTC at 8.

[24] See Comments of Sennheiser at 9.

As a start, the DSA supports the Commission permitting this new class of WSDs to operate only in less congested areas. While the DSA believes that in the longer term the WSDB can provide these WSDs the flexibility to operate within any geofenced area or in fact, a 3-D volume, and at power levels and heights that vary across the inscribed area, the initial focus should be to get this type of service up and running as soon as possible. Initially, the DSA suggests the EIRP limit for each available channel within the geofenced area should be the lowest EIRP limit for that channel across the entire geofenced area. Similarly, the WSDB should calculate channel availability and the EIRP limit of each available channel for the geofenced area based on the highest HAAT value within the geofence.

If this category of WSD is limited to less congested areas, the Commission should allow the devices to operate at up the corresponding fixed EIRP limit for less congested areas. Whether the mobile WSDs operating within the geofence can operate at the theoretical EIRP limit for less congested areas depends on the specifics of the incumbent protections required within the proposed inscribed area. Within the geofenced area, available WSD channels should be allowed to be bonded and aggregated.

Finally, if the Commission decides to treat the WSD within the geofence as a fixed WSD, it can also accommodate narrowband WSDs as the regulatory construction for a narrowband WSD base station is that of a fixed WSD. An application would be a tractor operating on a farm enclosed by a geofence, where the fixed WSD (narrow band) base station on the tractor communicates to narrowband WSD sensors in the ground (and on livestock) and backhaul to the Internet is provided through a satellite link.

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VIII. THE COMMISSION SHOULD AUTHORIZE NARROWBAND WHITE SPACE DEVICES AS A NEW CATEGORY OF WHITE SPACE DEVICE

Most commenters supported the Commission's proposal to create a new category of narrowband WSD that can be used for IoT and no commenter opposed the idea.[25] The rationale for the new WSD category is to address regulatory barriers to adoption of narrow band IoT devices operating in the TV white spaces. Specifically, the Commission's rules for power spectral density limits and conducted adjacent channel limits intended for WSDs operating in 6 MHz channels, lead to EIRP levels that have very limited commercial utility.

The Commission's proposed framework treats the narrowband WSD base station as a fixed WSD. The narrowband WSD base station / IoT gateway may be connected to the Internet directly or through another fixed WSD. Under the Commission's rules, three contiguous vacant channels are required to have a fixed WSD device operate on the center 6 MHz channel. Regardless of how many narrowband channels are in use at any one time, the proposed rules assume that narrowband WSDs are operating on all 55, 100 kHz-wide channels. This is a very conservative approach that overprotects incumbents. For this reason, the DSA believes that the Commission should not limit this category of WSDs to less congested areas. In fact, the Commission should allow higher power operation of the narrowband WSDs in less congested areas scaled up from the EIRP limit in other areas.[26] Here too, there would need to be three

[25] See Comments of the App Association at 11; BCA Coalition at 16; Taxpayers Coalition at 1; CAN at 1; CTA at 4; DNG at 1; MFPA at 1; NPSTC at 10-11; PISC at 20; RED Technologies at 8; RTO at 1.

[26] The narrowband WSD conducted power limit equals 12.6 dBm in a 100 kHz channel, the same as the power spectral density limit of a fixed WSD operating at its conducted power limit of 1 W (30 dBm). In less congested

contiguous vacant 6 MHz channels for the WSD base station / gateway and narrowband WSD to operate within the center 6 MHz. Additionally, if the narrowband WSD is operating within a geofence as described in the section above, its maximum duty cycle can be increased safely to one percent or 36 seconds per hour.

Some commenters raise concerns about narrow channel WSD operations in urban areas.[27] Neither specified whether its concerns apply to narrowband WSD operations in the high-VHF band, the UHF band, or both bands. It is important for the Commission to tease out whether their concerns are about licensed wireless microphones that are protected under the Commission's rules or unlicensed wireless microphones that must share channels with WSDs under the Commission's rules. If it is the former, presumably the Commission will establish a separation distance from the WSD base station / gateway. If it is the latter, under Part 15 of the Commission's rules, unlicensed devices, including less than 50 unlicensed wireless microphones operating at a location, cannot cause harmful interference to other devices and cannot seek protection from interference.

Shure's proposal to have the Commission require narrow band WSDs meet its ETSI emissions mask and spurious emission limits for microphones incorporated by reference into the Commission's rules is burdensome given the variability of the narrowband WSD's operating

areas, an antenna with a gain of up to 10 dBi is currently allowed, with an antenna of up to 12 dBi proposed in the NPRM. If EIRP limit for narrowband WSDs is scaled up in less congested areas under the current limit for fixed WSDs, it maximum radiated power would be 22.6 dBm in 100 kHz, the same as the radiated power spectral density in 100 kHz for a 10 W EIRP WSD.

[27] See Comments of CP Communications at 6-7; Sennheiser at 9-10; Shure at 9.

bandwidth in the 100 kHz channel, unnecessary to protect licensed wireless microphones, and would establish a bad precedent. It is similar in concept to what the unlicensed ultrawide band interests asked the Commission to impose its technical limits on unlicensed RLANs seeking to operate in the 6 GHz band.[28] The Commission should reject Shure's proposal.

IX. THE COMMISSION SHOULD AUTHORIZE A CLASS OF FIXED WHITE SPACE DEVICES WITH A MORE RELAXED EMISSIONS MASK

The Commission asked whether a further tightening of the emission mask could enable WSD to operate on the first adjacent channel to broadcaster at higher power. In theory yes, but it is not practical. Many in the white spaces ecosystem view the overly conservative emission mask is the primary reason why WSD technology providers have been so challenged to produce an affordable fixed WSD at the 30 dBm conducted power limit in a SISO configuration.

WISPA raises the same point in its Comments to the NPRM that DSA has made previously, that the Commission should authorize a fixed WSD with a more relaxed emissions mask.[29] In the UK, Ofcom's WSD rules, based on the ETSI standard EN 301 598 allow for five device emission classes, with device emission class 1 being the most stringent (comparable to the FCC's emission mask requirements) and device emission class 5 being the least stringent.[30]

[28] See 6 GHz Report and Order at ¶¶220-221.

[29] See Comments of WISPA at 11.

[30] See Harmonized European Standard "White Space Devices (WSD);Wireless Access Systems operating in the 470 MHz to 790 MHz TV broadcast band; Harmonized EN covering the essential requirements of article 3.2 of the

For a fixed WSD at a given location, the database uses a larger separation distance for a Device Emission Class 5 WSD than for a Device Emission Class 1 WSD. The result being that for Device Emission Class 5 WSDs, there may be fewer channels available at that location and/or at lower power operations, but it is a more affordable device. Such a framework gives the WSD technology providers incentives to develop fixed WSDs at different prices points. The WISPA and previous DSA comments did not request the Commission authorize 5 device emission classes, but only that it authorizes a second Device Emission Class that has an emissions mask that is less stringent than the current FCC mask.

X. THE COMMISSION SHOULD ALLOW FIXED WHITE SPACES DEVICES TO OPERATE ON THE FIRST ADJACENT CHANNEL AND ON A CHANNEL OFFSET BY 3 MHz

Several commenters believe the Commission should consider higher power WSD operations closer to the broadcast station than currently allowed.[31] Microsoft demonstrated in its field testing that a 34 dB EIRP fixed WSD downlink and a 33 dB EIRP fixed WSD uplink can operate without causing harmful interference to ATSC 1.0 (DTV) receivers.[32] Based on the F-

R&TTE Directive", European Telecommunications Standards Institute, ETSI EN 301 598, 2014 V1.1.1 (2014-04) at 15.

[31] See Comments of App Association at 11; Adaptrum at 2-3; ARK 4-5; Cal.net at 1; DNG at 1; Microsoft at 28; PISC 18-19; RTO at 1.

[32] See Comments of Microsoft at Appendix B.

curves, the field strength of the DTV signal at the 24 test points, which were roughly 20 km from the broadcast tower, were all considered in the 'moderate' desired signal range. The distance between the WSD tower and the test points ranged between 0.5 to 3.7 km. The test area was hilly and looking on Google maps, there appears to be a great deal of tree cover in much of Grapeland. Thus, it is not surprising that measured DTV and WSD signals were significantly less than what was predicted. It is evident that in this environment, use of a terrain-based model to make better prediction of the strength of DTV and WSD signals at the DTV antenna would have been very useful in predicting where fixed WSD operations on the first adjacent channel are possible and where they are not.

Microsoft's results in Grapeland are consistent with the observations made regarding higher power WSD operations on the first adjacent channel observed previously in separate field trials in Ghana and South Africa. The DSA continues to believe there are areas within the protected contour where a WSD device can safely operate above 40 mW on the first adjacent channel at up to 10 meters above ground level and above 100 mW on the center 6 MHz of the first two adjacent channels at up to 10 meters above ground level. The DSA sees the challenge as developing a predictive model to determine the list of available channels and the maximum EIRP level for each channel within the protected contour for first adjacent channel operations and operations on a channel offset by 3 MHz.

Subtracting the D/U ratio on the first adjacent channel from the sensitivity threshold of the DTV tuner determines the maximum undesired signal in the first adjacent channel that can be received by the DTV tuner and not be detected. For WSDs, the FCC uses a D/U ratio of -33 dB,

which is the same value as the ATSC A/74 recommended practice for laboratory D/U ratio measurements. [33] Microsoft's lab testing showed that overall, on average, the threshold sensitivity of ATSC 1.0 receivers test is about the same as the FCC's number. Consistent with the results of studies over the past decade, it found that the overall D/U ratio on the first adjacent channel over the ATSC 1.0 has improved significantly. Further, it found that the D/U ratio on a channel separated by 3 MHz from the edge of a broadcast channel has even greater adjacent channel selectivity, on average.[34] The D/U ratio was even better with the two ATSC 3.0 receivers tested, but with less adjacent channel selectivity shown at higher modulation levels. For the first adjacent channel (or 3 MHz offset) model to have predictive power, it needs to be based on a D/U ratio that reflects the current crop of ATSC 1.0 receivers.

Once the maximum WSD power limit on the first adjacent channel is established, a link budget can be created and reverse engineered to figure out maximum fixed WSD EIRP level based on the locations of the WSD base station and customer premise equipment, frequency, antenna gains of the WSD and DTV antenna, miscellaneous losses, etc. The more information that goes into the model – a terrain-based model - the better the prediction. Antenna mismatch between the WSD antenna pattern and that of the DTV antenna should be accounted for. So should clutter. The composition and magnitude of the various loss mechanisms are likely to be different for the WSD downlink and the WSD uplink. For example, the DSA located an ITU-R

[33] See ATSC Recommended Practice: Receiver Performance Guidelines, Document A/74:2010 at 15, Tbl. 5.2 (Apr. 7, 2010), https://www.atsc.org/wp-content/uploads/2015/03/Receiver-Performance-Guidelines-1.pdf.

[34] See Comments of Microsoft at Appendix A.

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recommendation describing how cross-polarization loss was used as a means for discrimination between over-the-air broadcasts operating on adjacent channels.[35] Given that the majority of DTV broadcasts are polarized horizontally and fixed WSD are polarized vertically, there can be significant loss in the WSD uplink where the two antenna are relatively close together and there is only free space between the two and very little depolarization.

Finally, the DSA thinks the donut proposal merits consideration.[36] It can be used to account for the fact that the D/U ratio varies across the DTV coverage area. If the desired signal is 'strong', the D/U ratio on the first adjacent channel is 13 dB greater (less selective) than for moderate and weak desired signals. Similarly, if the desired signal is very weak, there is a good chance that the undesired signal will overwhelm it. The inner diameter of the donut is defined by a contour where the desired signal is in the moderate to strong range. The outer diameter of the annuls is defined by a contour where the desired signal is the weak to very weak range. Within these coarse boundaries, at a given location, the D/U ratio on the first adjacent channel and on a channel with a 3 MHz offset from the edge of the broadcast channel within the annulus can then be determined through the use of a terrain-based model. The FCC OET-69 model typically uses a 2 km by 2 km cell size. More recently it used 500-meter square cells and 1 km square cells.[37]

[35] See Comments of DSA at 26-27.

[36] See Comments of RED Technologies at 8.

[37] See 47 C.F.R. § 73.616(d)(1).

The DSA believes it is possible to develop a predictive model to allow fixed WSD to operate at higher powers closer to a broadcast station within the protected contour than the Commission's rules currently allow.

XI. CONCLUSIONS

There was overall support for the Commission's proposals to increase the WSD EIRP level in less congested areas from 40 dBm to 42 dBm, increase the HAAT level from 250 to 500 meters, allow mobile WSD operations within a geofence in less congested areas, and authorize a new category of narrowband WSDs intended for IoT use and allow it to operate where the WSDB determines it can. DSA believes it makes most sense for the Commission to create a new category for mobile WSDs operating within a geofence, with technical rules for the devices being those for fixed WSDs.

The DSA recommends the Commission authorize use of a terrain-based model to determine separation distances. Use of a terrain-based model will make available for broadband access over WSDs sizeable areas of land that are currently off-limits due to the artificially large separation distance on the co-channel beyond the protected contour. The actual terrain-based model will likely be a hybrid model to ensure the model is valid over all the heights, distances, and frequencies of interest. This model should only rely on HAAT so that the height above ground level limit can be eliminated.

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Finally, based on Microsoft's laboratory and field test results, it seems possible to develop a model that will allow higher power fixed WSD operations on a first adjacent channel or on a channel with a 3 MHz offset to the edge of the broadcast channel.

The Commission's proposal combined with our proposed improvements will increase access to broadband over fixed WSD in rural areas, support rural industries, and create a new category of WSDs that will support IoT. The record is clear. The Commission should act as soon as possible.

Respectfully submitted,

Martha SUAREZ
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