

**Before the  
Federal Communications Commission  
Washington, D.C. 20554**

In the Matter of	)	
	)	
Unlicensed Operation in the TV Broadcast Bands	)	ET Docket No. 04-186
	)	
Additional Spectrum for Unlicensed Devices	)	ET Docket No. 02-380
Below 900 MHz and in the 3 GHz Band	)	

To: The Commission

**JOINT PETITION FOR PARTIAL RECONSIDERATION**

The Wireless Internet Service Providers Association, the Federation of Internet Solution Providers of the Americas, the Native American Broadband Association, Spectrum Bridge, Inc., Comsearch, Carlson Wireless Technologies Inc. and Wireless Strategies, Inc. (collectively, “Joint Petitioners”), by counsel and pursuant to Section 1.429 of the Commission’s Rules, hereby seek reconsideration of two aspects of the *Second Memorandum Opinion and Order* (“*Order*”)<sup>1</sup> adopted September 23, 2010 in the above-captioned proceedings.<sup>2</sup> First, the Commission should amend Sections 15.709(b)(2), 15.713(e)(6) and 15.712(a)(2) to eliminate the preclusive 76-meter limitation on the height above average terrain (“HAAT”) of fixed station locations, and instead should allow antenna heights up to 250 meters HAAT. By permitting fixed antenna heights at higher elevations with corresponding increases in the distance separation criteria, many large hilly and rural areas of the country precluded from white

---

<sup>1</sup> *Second Memorandum Opinion and Order*, ET Docket Nos. 04-186 and 02-380, FCC 10-174 (rel. Sept. 23, 2010) (“*Order*”).

<sup>2</sup> The rules adopted in the *Second Memorandum Opinion and Order* were published in the Federal Register on December 6, 2010. See 75 Fed.Reg. 75814 (Dec. 6, 2010).

space service under the existing rules will be available for white space deployment.<sup>3</sup>

Second, the Joint Petitioners support the changes to Sections 15.709(c)(2) proposed by Motorola, Inc. (“Motorola”) that would relax the spectral mask for fixed TV band devices (“TVBDs”) and thereby lower network and customer premise equipment costs and make broadband service more affordable.<sup>4</sup> In each case, the Commission can adopt these proposed rule changes without increasing the potential for harmful interference to incumbent TV stations entitled to protection.<sup>5</sup>

### **Introduction**

The Joint Petitioners commend the Commission for making unused TV spectrum available for fixed wireless broadband services. In areas where propagation constraints inherent in higher-frequency operations present obstacles to the provision of fixed broadband service, the availability of white space spectrum will enable more consumers to receive broadband service. In two respects, however, unintended consequences of the rules stand in the way of affordable, wide-area broadband deployment. The Joint Petitioners herein discuss and propose specific rule changes that address these concerns without increasing the potential for interference to TV stations.

---

<sup>3</sup> By letter dated December 14, 2010, certain of the Joint Petitioners asked the Commission to *sua sponte* amend its fixed station height rules pursuant to Section 1.108. *See* letter from the Wireless Internet Service Providers Association, Motorola, Inc., Spectrum Bridge, Inc., Comsearch, Carlson Wireless Technologies, Inc. and the Federation of Internet Solution Providers of the Americas dated December 14, 2010, ET Docket Nos. 04-186 and 02-380. The Commission did not act on the request in advance of the petition for reconsideration deadline.

<sup>4</sup> *See* letter from Barry Lambergman of Motorola to Marlene H. Dortch, FCC Secretary, dated December 7, 2010, ET Docket No. 04-186 (“Motorola Letter”).

<sup>5</sup> The text of the proposed changes to Sections 15.709(b)(2), 15.709(c)(1), 15.712(a)(2) and 15.713(e)(6) are set out in Appendix A hereto. In addition, the current rules appear to limit the heights of receive-only TVBDs in the same manner that transmit devices are restricted. The Joint Petitioners believe that the Commission did not intend to apply height requirements on devices used solely for reception of signals. The rule changes proposed in Appendix A would eliminate the height restrictions for receive-only devices.

## Discussion

### I. THE COMMISSION SHOULD AMEND ITS ANTENNA HEIGHT RULES TO PERMIT FIXED OPERATIONS FROM HIGHER ELEVATIONS TO SERVE MOUNTAINOUS AND HILLY AREAS OF THE COUNTRY.

In the *Order*, the Commission imposed a new requirement – without any support in the record – that arbitrarily forbids tower sites with ground level elevations 76 meters or higher HAAT. While the Commission recognized “the increased potential for interference in instances where a fixed TV bands device is located on a local geographic high point such as a hill or mountain,” it also stated that “we do not want to preclude fixed white space devices from a large number of sites in areas where there are rolling hills or a large number of relatively high points that do not generally provide open, line-of-sight paths for propagation over long distances.”<sup>6</sup>

Unfortunately, the unsupported imposition of the 76-meter HAAT restriction does not strike the balance the Commission intended to create. Instead, as the map attached at [Appendix B](#) demonstrates, there are significant areas of the country where fixed devices cannot be deployed solely because the 76-meter HAAT limit is too low to allow fixed stations to be installed. Not surprisingly, these areas are in rural, mountainous and hilly areas where broadband service to the public is already lacking and where white space spectrum would provide an affordable and viable broadband access solution. The table included in [Appendix B](#) shows existing sites used by fixed wireless Internet service providers (“WISPs”) to provide broadband service, towers where white space devices

---

<sup>6</sup> *Order* at ¶ 66. Following release of the *Second Memorandum Opinion and Order*, certain signatories prepared information illustrating the preclusive effect of the 76-meter HAAT restriction. On October 13, 2010, representatives from the WISPA, Motorola, Spectrum Bridge and Comsearch met with OET staff to discuss the adverse consequences that the HAAT restriction created. See Notice of Ex Parte Presentation to Marlene H. Dortch, FCC Secretary, from Stephen E. Coran, ET Docket Nos. 04-186 and 02-380, filed Oct. 14, 2010.

could be economically and efficiently co-located. Of the 50 tower sites the Joint Petitioners sampled – all located where white space spectrum is available – more than half cannot be used because of the unduly restrictive 76-meter HAAT restriction. This unnecessarily forces WISPs to locate and engineer new tower sites (if possible); obtain zoning/FAA approvals; research, design and develop new backhaul networks; and construct the new towers – all of which combine to delay service in areas where suitable tower sites are already available. In addition to the significant increases in infrastructure costs, service areas would be reduced in size because of the lower elevations where transmit facilities can be located.

To address these significant problems, the Joint Petitioners ask the Commission to amend Sections 15.709(b)(2) and 15.713(e)(6) to eliminate interference protection based on both TVBD antenna height above ground level (“AGL”) and the 76-meter antenna ground level HAAT restriction. Instead, the Commission should make TVBD antenna HAAT the sole metric for determining the allowable height of fixed device antennas and should allow operation of fixed device antennas up to 250 meters HAAT. In connection with these changes, the Commission also should amend Section 15.712(a)(2) to adjust the required co-channel and adjacent-channel distance separation values to ensure and improve the protection of TV stations.<sup>7</sup>

There are several benefits that would result from amending these rules. First, increasing the permissible transmit antenna height to 250 meters HAAT will dramatically reduce those geographic areas where white space broadband services would otherwise be precluded. The map at [Appendix D](#) shows the large increase in the areas where white

---

<sup>7</sup> [Appendix C](#) contains an Engineering Statement describing technical aspects of the proposed rule amendments.

space devices could provide broadband services under the Joint Petitioners' proposal. By comparing this map to the map at Appendix B, one can readily see the tremendous, positive difference this rule change will have on the ability of consumers throughout the country to receive broadband service using white space spectrum.

Second, the areas that exceed the current 76-meter HAAT limit are mostly rural areas located in hilly and mountainous regions where population density is low and broadband service availability is lacking. These are precisely the areas of the country where TV white space spectrum can do the most good because of the superior propagation characteristics of UHF and VHF spectrum. As Appendix D depicts, adopting the Joint Petitioners' proposal will enable these areas to be served, consistent with the Commission's broadband objectives.

Third, HAAT is a more accurate predictor of harmful interference than AGL and, significantly, has been endorsed by both the IEEE and the Society of Broadcast Engineers, Inc. ("SBE"), an organization of engineers advocating on behalf of the broadcast industry. In its petition for reconsideration of the white space rules adopted in November 2008,<sup>8</sup> the IEEE 802 Committee "recommend[ed] that the antenna height for such fixed stations should be expressed in terms of HAAT . . . rather than height above ground level (AGL) to allow the determination of the appropriate separation distances necessary to protect the incumbents while allowing to achieve extended coverage."<sup>9</sup> Notably, IEEE 802 recommended supporting antenna heights (HAAT) beyond 600 meters, observing that "[a] maximum that turns on height above ground level would permit fixed antennas to be placed on mountains and other high-elevation sites,

---

<sup>8</sup> *Second Report and Order and Memorandum Opinion and Order*, 23 FCC Rcd 16807 (2008).

<sup>9</sup> IEEE 802 Petition for Reconsideration, ET Docket Nos. 04-186 and 02-380, filed March 19, 2009, at 4.

undermining the effectiveness of the maximum antenna height requirements. . . . HAAT requirements can be easily implemented as part of the computations performed by the database manager from the existing geo-location information required to be submitted by the registrant.”<sup>10</sup> In each case, IEEE and SBE advocated use of HAAT as an alternative – *not as an addition* – to AGL. As noted above and in Appendix C, the Joint Petitioners propose distance separations that are larger than those in the current rules, as well as those recommended by the IEEE 802 Committee, and the proposal therefore offers greater protection to TV broadcast stations. In addition, the geo-location database would now require only one metric – TVBD antenna height AGL – to be sent to the database in order to compute the antenna’s effective HAAT for incumbent protection calculation. Because the database will consistently perform HAAT computations, it will more reliably protect incumbent TV stations.

Fourth, this proposal increases the size of the protection zones afforded to TV stations under Section 15.712(a)(2) and thus provides greater interference protection for incumbent TV stations. The proposed co-channel and adjacent-channel separation distances exceed the current AGL-only distances in current Section 15.712(a)(2), meaning that at comparable antenna heights, there will be greater separation distances between TV contours and fixed white space stations. Further, this approach also beneficially results in increased separation distances for devices that might use relaxed transmit spectral masks.<sup>11</sup>

Fifth, in areas where the distance separation requirements reduce or eliminate the number of available white space channels at higher antenna elevations, fixed white space

---

<sup>10</sup> SBE Petition for Reconsideration, ET Docket Nos. 04-186 and 02-380, filed March 19, 2009, at 13-14.

<sup>11</sup> See Part II, *infra*. See also Motorola Letter, Attachment at 6-8.

operators will still have the flexibility to operate using lower antennas to provide needed broadband services.

The balance the Commission intended in the *Order* will be realized if the Commission amends the fixed station height rules as proposed herein. A larger number of consumers will be able to enjoy the benefits of broadband services offered over white space spectrum, and TV stations will be able to operate with a reduced level of potential interference. The Commission should adopt the rules proposed in Appendix A.

## **II. THE COMMISSION SHOULD RELAX THE EMISSION MASK TO ENABLE DEPLOYMENT OF MORE AFFORDABLE FIXED TVBDs.**

In the *Order*, the Commission tightened the adjacent-channel emission limits in Section 15.709(c)(1), ignoring the recommendations of Motorola and the Wi-Fi Alliance to relax the limits for all TVBDs.<sup>12</sup> The Commission indicated that the spectral mask “should be increased to reflect the in-band measuring bandwidth while providing the same level of adjacent channel protection.”<sup>13</sup>

Fixed devices are already prohibited from operating on the adjacent channels of many incumbent services (*e.g.*, TV, PLMRS/CMRS, receive sites, etc.). The Joint Petitioners agree with the Commission’s desire to correctly measure in-band power across the entire 6-megahertz bandwidth of a white space channel and to adjust the resulting adjacent channel attenuation accordingly to maintain the same level of protection for incumbent broadcasters. However, rather than burden the entire *fixed* wireless industry with higher equipment costs, lower bandwidth-delivery capabilities and higher network deployment costs, a far simpler solution would be to increase the required

---

<sup>12</sup> See *Order* at ¶¶ 87-88.

<sup>13</sup> *Id.* at ¶ 87.

separation distance from the TV station protected contour. The Commission apparently did not consider this separation-distance alternative which can accomplish the same level of incumbent protection.

As explained in the Motorola Letter, the stricter mask would reduce by 25 percent the amount of usable bandwidth in a 6-megahertz channel, thereby increasing the number of access points a WISP needs to establish.<sup>14</sup> According to Motorola, this would result in a 33 percent increase in network deployment costs. In addition, CPE costs would increase by 65 percent in light of the need for custom transmit circuitry, higher-power PA requirements, and additional thermal heat sinks.<sup>15</sup> Taken together, the existing OOB mask would force WISPs to charge their customers roughly 50 percent more in monthly subscription fees simply to meet this overly strict and unnecessary spectral mask requirement. Moreover, the increased costs that would result from tightening the OOB mask would have a chilling effect on fixed white space broadband deployment, contrary to the Commission's objectives.

To address this problem, the Joint Petitioners propose to amend Section 15.709(c)(1) to relax the current -72.8 dBr spectral mask to -47.8 dBr<sup>16</sup> in the adjacent channel and require a corresponding increase in the adjacent-channel distance separation criteria in Section 15.712(a)(2). The transmit spectral mask could be relaxed for *all* fixed TVBDs, resulting in increased adjacent channel separation distances for all fixed TVBDs. The impact of these changes on database administrators would be minimal.<sup>17</sup>

---

<sup>14</sup> See Motorola Letter at 4.

<sup>15</sup> See *id.*

<sup>16</sup> OOB in the adjacent channel would be measured in the same manner as in the current rules (*i.e.*, average power measured in 6 MHz resolution bandwidth on-channel, and a 100 kHz resolution bandwidth in the adjacent channel). See Section 15.709(c)(2).

<sup>17</sup> The rules proposed in [Appendix A](#) reflect this alternative and not the alternative discussed in the next paragraph.

As an alternative to this option, the spectral mask could be relaxed to -47.8 dBm in the adjacent channel for a second class of fixed TVBDs, and the original -72.8 dBm adjacent channel mask could be retained for the first class of fixed TVBDs. This solution would afford white space device manufacturers a choice between building one class of equipment that delivers less bandwidth by using a tight mask and less separation distance and/or a second class of equipment that delivers greater bandwidth by using a relaxed mask and greater separation distance.<sup>18</sup> Similarly, WISPs could choose to deploy equipment that best meets their cost model, service objectives and consumer demand. The class of fixed TVBDs could be linked in the database to the device's FCC ID, thus allowing the database to return an appropriate list of allowable channels for the particular class of device.

In addition to the potential cost savings from reducing the number of access points needed, allowing a relaxed mask will enable existing wireless broadband equipment components to be used in new white space equipment, thereby lowering white space deployment costs. Moreover, the increased distance separation for fixed devices employing the relaxed mask will ensure that incumbent TV stations will enjoy the same level of interference protection.

As with the height restrictions imposed in the *Order*, the restrictive out-of-band emission requirements create unintended consequences that will have adverse impacts on spectral efficiency, network and equipment costs, and consumer access to broadband delivered via white space spectrum. The proposed changes to Sections 15.709(c)(1) and 15.712(a)(2) set out in Appendix A address these issues while maintaining or increasing the level of protection for incumbent TV stations and should be adopted.

---

<sup>18</sup> See *id.* at 6-7.

**Conclusion**

By adopting the rule changes described herein and provided at Appendix A, the Commission can eliminate the unintended consequences of its fixed station height and out-of-band emission rules and accelerate the deployment of affordable fixed white space broadband services throughout the country.

Respectfully submitted,

January 5, 2011

**WIRELESS INTERNET SERVICE  
PROVIDERS ASSOCIATION**

**FEDERATION OF INTERNET SOLUTION  
PROVIDERS OF THE AMERICAS**

**NATIVE AMERICAN BROADBAND  
ASSOCIATION**

**SPECTRUM BRIDGE, INC.**

**COMSEARCH, A COMMSCOPE COMPANY**

**CARLSON WIRELESS TECHNOLOGIES INC.**

**WIRELESS STRATEGIES, INC.**

By: /s/ Stephen E. Coran  
Stephen E. Coran  
Rini Coran, PC  
1140 19<sup>th</sup> Street, NW, Suite 600  
Washington, DC 20036  
(202) 463-4310  
*Counsel to the Wireless Internet Service Providers  
Association and Special Counsel to other  
Joint Petitioners*

## Appendix A

### Proposed Rule Changes

Part 15 of the Code of Federal Regulations is amended as follows:

#### PART 15 RADIO FREQUENCY DEVICES

1. Section 15.709 is amended by revising paragraphs (b)(2) and (c)(1) to read as follows:

##### **§ 15.709 General Technical Requirements.**

(b) \* \* \*

(2) The transmit antenna used with fixed devices may not be more than 250 meters height above average terrain (HAAT). The HAAT is to be calculated by the TV bands database that the device contacts for available channels using computational software employing the methodology in section 73.684(d) of this chapter.

(c) \* \* \*

(1) In the television channels immediately adjacent to the channel in which a fixed TVBD is operating, emissions from the TVBD shall be at least 47.8 dB below the highest average power in the TV channel in which the device is operating. Fixed devices shall comply with the required adjacent channel separation distances in § 15.712(a)(2).

2. Section 15.712 is amended by revising paragraph (a)(2) to read as follows:

##### **§ 15.712 Interference protection requirements.**

(a) \* \* \*

(2) Required separation distance. TVBDs must be located outside the contours indicated in paragraph (a)(1) of this section of co-channel and adjacent channel stations by at least the minimum distances specified in the following table. Personal/portable TVBDs operating in Mode II must comply with the distance separation distances specified for an unlicensed device with an antenna height of less than 3 meters. Alternatively, Mode II personal/portable TVBDs may operate at closer separation distances, including inside the contour of adjacent channel stations, provided the power level is reduced to 40 mW or less as specified in § 15.709(a)(2).

Antenna Height Above Average Terrain for Unlicensed Device	Required Separation (km) From Digital or Analog TV (Full Service or Low Power) Protected Contour	
	Co-channel	Adjacent Channel
Less than 3 meters	6.0 km	0.8 km
3 – Less than 10 meters	8.0 km	1.4 km
10 – Less than 30 meters	14.4 km	2.5 km
30 – Less than 50 meters	20.0 km	3.3 km
50 – Less than 75 meters	24.7 km	3.9 km
75 – Less than 100 meters	28.2 km	4.5 km
100 – Less than 150 meters	33.4 km	5.5 km
150 – Less than 200 meters	37.5 km	6.3 km
200 – Less than 250 meters	40.7 km	6.9 km

3. Section 15.713 is amended by revising paragraph (e)(6) to read as follows:

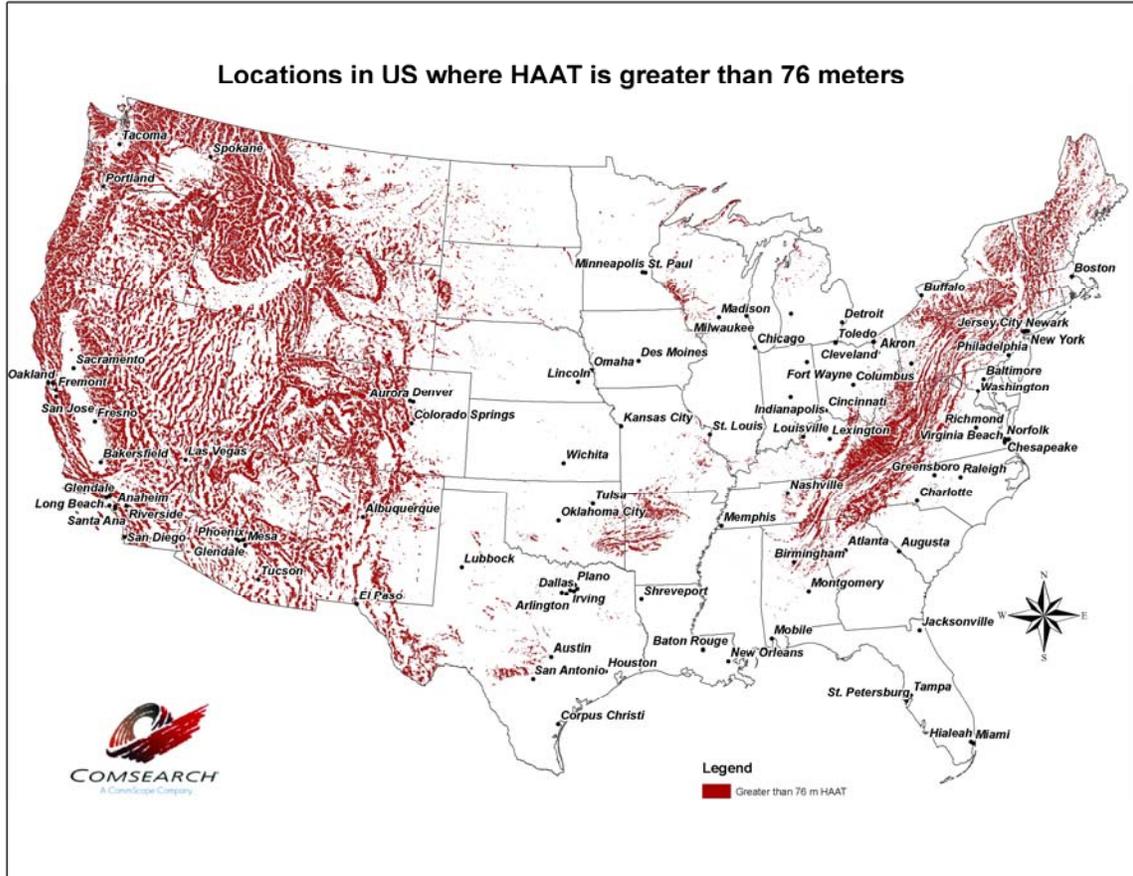
**§ 15.713 TV bands database.**

(e) \* \* \*

(6) A fixed device that attempts to utilize an antenna height above average terrain (HAAT) greater than 250 meters shall not be provided a list of available channels. The HAAT is to be calculated using computational software employing the methodology in section 73.684(d) of this chapter.

## Appendix B

### Map of Locations Where HAAT Exceeds 76 Meters



**Table of Selected WISP Tower Locations  
(Yellow = HAAT > 76 Meters)**

<u>Site State</u>	<u>Site Designation</u>	<u>Latitude</u>	<u>Longitude</u>	<u>White Space Channels Available?</u>	<u>Site Elevation (M)</u>	<u>Site HAAT (M)</u>	<u>PASS</u>
Vermont	BM-1	44.24124	-72.42659	15	485.4	84	NO
Vermont	BM-2	44.30029	-72.41573	15	346.8	46	YES
Vermont	BM-3	44.31866	-72.5085	13	357.0	2	YES
Vermont	BM-4	44.37299	-72.50707	13	438.7	57	YES
Vermont	BM-5	44.34086	-72.42399	15	376.2	-8	YES
Vermont	BM-6	44.44096	-72.39307	18	576.0	166	NO
Vermont	BM-7	44.48362	-72.33789	18	461.8	24	YES
Vermont	BM-8	44.5205	-72.35456	18	404.9	-22	YES
Vermont	BM-9	44.58051	-72.39427	16	575.6	180	NO
West Virginia	IR-1	40.09108	-80.71114	4	372.4	53	YES
West Virginia	IR-2	40.36658	-80.59024	2	386.8	71	YES
West Virginia	IR-3	40.17706	-80.59553	2	398.5	73	YES
West Virginia	IR-4	40.0605	-80.59064	4	400.7	59	YES
West Virginia	IR-5	40.05472	-80.76004	5	374.5	60	YES
West Virginia	IR-6	39.66015	-80.81557	18	435.5	125	NO
West Virginia	IR-7	39.54241	-80.63222	16	377.4	38	YES
West Virginia	IR-8	39.81294	-80.59781	7	447.1	87	NO
West Virginia	IR-9	40.0605	-80.59064	4	400.7	59	YES
West Virginia	IR-10	39.41864	-78.95389	8	596.6	209	NO
West Virginia	IR-11	39.51931	-78.79475	7	294.0	-13	YES
Virginia	PA-1	38.59997	-78.63314	10	894.7	515	NO
Virginia	PA-2	38.44814	-78.73267	5	959.0	543	NO
Virginia	PA-3	38.39547	-78.76868	5	817.9	398	NO
Virginia	PA-4	38.56398	-78.9499	10	813.5	281	NO
Virginia	PA-5	38.69218	-79.09074	16	1226.9	534	NO
Virginia	PA-6	38.16773	-79.31398	19	1343.4	698	NO
Virginia	PA-7	38.74461	-78.35692	11	523.4	109	NO
Utah	CD-1	41.34084	-112.0191	1	1467.1	-94	YES
Utah	CD-2	41.33881	-111.8163	1	1847.6	-107	YES
Utah	CD-3	41.41777	-112.0208	2	1595.6	-13	YES
Utah	CD-4	41.50148	-112.0044	2	1397.0	-226	YES
Utah	CD-5	41.77923	-112.1775	1	1474.8	-8	YES
Washington	SM-1	47.32041	-119.5734	16	600.4	96	NO
Washington	SM-2	47.45137	-119.5543	18	801.0	244	NO

Wyoming	MS-1	43.0434	-108.4386	13	1634.7	66	YES
Wyoming	MS-2	43.07164	-108.4958	13	1706.9	119	NO
Wyoming	MS-3	43.17046	-108.4456	16	1733.6	151	NO
Wyoming	MS-4	43.19514	-108.2159	12	1559.9	58	YES
Wyoming	MS-5	42.90506	-108.7057	22	1761.0	96	NO
California	SB-1	39.24612	-120.9665	22	1162.8	301	NO
California	SB-2	39.26314	-121.0863	8	769.0	99	NO
California	SB-3	39.0461	-121.0301	8	627.7	87	NO
California	SB-4	39.17227	-120.8323	10	1156.9	167	NO
California	SB-5	39.25205	-121.1506	8	665.7	114	NO
California	SB-6	39.18429	-121.0359	8	916.9	222	NO
California	SB-7	39.16951	-121.1824	8	674.1	237	NO
California	SB-8	39.1849	-120.9635	10	927.7	126	NO
California	SB-9	39.16368	-121.0574	8	681.7	36	YES
California	SB-10	39.13388	-121.0994	8	793.4	241	NO
California	SB-11	39.13564	-120.9252	10	914.6	132	NO

Number of Sites: 50

Number of Sites to Fail: 28

Hardin & Associates, Inc.  
11-Oct-10

Percentage Failure: 56.0%

## Appendix C

### Engineering Statement

The current FCC TVWS rules (FCC 10-174) utilize only TVBD antenna height above ground level (AGL) to compute incumbent protection requirements (i.e., antenna height above average terrain (HAAT) is not considered in the analysis). While this simplifies the incumbent protection calculations, it is significantly different from well-accepted FCC practices for computing protected service areas<sup>19</sup>, and may significantly under-estimate incumbent protection levels in cases where the TVBD transmitter site elevation is at a high level. For example, if a TVBD transmitter site is located at 75 m HAAT, and a 30 m TVBD antenna height (AGL) is deployed, the antenna is effectively at 105 m HAAT, which would normally result in a larger required separation distance than the 30 m AGL separation distance computation specified under the current rules. This oversight can be best addressed by considering the composite TVBD antenna height above average terrain in the protection computations (i.e., TVBD antenna height AGL + transmitter site HAAT, in a combined value). This approach provides significantly better overall protection to TV broadcast operations than under the current rules.

The fixed TVBD would still report its antenna height AGL to the database, and the database would add that value to the computed site HAAT for the specified location, resulting in a single accurate antenna height relative to local terrain features. The combined antenna height above average terrain value would be utilized to determine the required separation distance, as shown in the table above. The HAAT computations for the transmitter site would be specified as in Section 73.684(d), as is utilized under the current rules.

The required separation distances for TVBD co-channel operation are based again on the minimum 41 dB $\mu$  contour level, and a 16 dB DTV receiver required co-channel D/U ratio, with approximately 3 dB of polarization mismatch, as was utilized in the current rules.<sup>20</sup> Note that these values are also very conservative, since they do not account at all for the roughly 14 dB of TV receiver antenna pattern discrimination (front-to-back ratio, as specified in OET Bulletin 69) that would significantly improve the DTV receiver D/U ratio. Nevertheless, a consistent methodology was retained in the values shown in the table. The values shown utilize the FCC's R-6602 F(50,10) curves to compute the TVBD induced interference level at the edge of the TV station's protected service contour, and ensure that the interference level does not exceed 27.5 dB $\mu$ . (accounting for the required 16 dB required D/U ratio and approximately 3 dB of polarization mismatch).

Note that the required separation distances for TVBD adjacent channel operation are based on the minimum 41 dB $\mu$  contour level, a highly conservative -26 dB DTV receiver required adjacent channel D/U ratio, and a 16 dB D/U co-channel D/U ratio with

---

<sup>19</sup> See FCC Section 73.684 and Section 73.699.

<sup>20</sup> See "Second Report and Order and Memorandum Opinion and Order," FCC 08-260, released Nov. 14, 2008.

3 dB of polarization mismatch. Note that these values are additionally conservative, since they do not account for the roughly 14 dB of TV receiver antenna pattern discrimination that would significantly improve the DTV receiver D/U ratio. In the case of the relaxed transmit spectral mask, fixed TVBD adjacent channel emissions (falling co-channel into the DTV receiver, when operating outside of an adjacent channel contour) dominate the interference protection computations, and determine the required adjacent channel separation distances. The calculations utilize the FCC's TM-91 propagation model<sup>21</sup> for TVBD antenna heights below 30 m, and the FCC's R-6602 F(50,10) curves for TVBD antenna heights of 30 m and above, to compute the TVBD induced interference level at the edge of the TV station's protected service contour, to ensure that it meets the required -26 dB adjacent channel and 16 dB co-channel D/U ratios. This overall approach is more conservative than the current TVWS rules, and should provide equivalent or better interference protection to TV broadcasters.

---

<sup>21</sup> See "*Propagation in Suburban Areas at Distances less than Ten Miles*", FCC/OET TM 91-1, January 25, 1991. Note that this model is functionally equivalent to the Egli propagation model.

# Appendix D

## Map of Locations Where HAAT Exceeds 250 Meters

