Before The
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matters of	)	
	)	
Expanding the Economic and Innovation	)	
Opportunities of Spectrum Through	)	GN Docket No. 12-268
Incentive Auctions	)	
	)	
Office of Engineering and Technology	)	
Releases and Seeks Comment on	)	ET Docket No. 13-26
Updated OET-69 Software	)	
	)	

To: The Commission

Comments of the Merrill Weiss Group, LLC

Summary

By Public Notice DA 13-138, released February 4, 2013, the FCC's Office of Engineering and Technology (OET) has announced the release of new software to perform interference analyses using the methodology described in OET Bulletin No. 69 ("OET-69"). In the Public Notice, the Commission invites the public to install and test new software, in a program named *TVStudy*, and to provide comments to the FCC on various aspects of the changes incorporated into the software relative to the software used previously for the purpose of implementing the provisions of OET-69.

The comments provided herein address specific areas of concern with respect to evaluation of the coverage, service, interference from, and interference to stations operating using Distributed Transmission System (DTS) technologies, as provided in Section 73.626 of the Commission's rules and in the Report and Order in MB Docket No. 05-312 promulgating the DTS rules.[1] In particular, they address certain aspects of the DTS Order that enable enhanced service by stations using DTS methods but that were not were not explicitly incorporated into §73.626. These aspects are pointed out for the

[1] *In the Matter of Digital Television Distributed Transmission System Technologies*, Report and Order, FCC 08-256 (rel. Nov 7, 2008), hereinafter the "DTS Order."

purpose of calling attention to the existence of the provisions of the DTS Order that have been applied by stations currently authorized, which provisions, if not taken into account by the TVStudy software, will lead to incorrect analysis of the service of stations using DTS technology and of the interference between stations using DTS methods and those not using such methods and between multiple DTS stations.

Introduction

The Merrill Weiss Group LLC (MWG) offers these comments to provide information with respect to the use of Distributed Transmission System (DTS) technologies, under the FCC rules applicable to facilities making use of such technologies, in the context of the technical analyses expected to be conducted in conjunction with the spectrum repacking anticipated as part of the Incentive Auction process.[2] This information is provided in recognition of the fact that there are a number of DTV stations for which MWG designed and prepared the FCC applications for DTS networks now authorized by construction permit, which designs and applications depended upon certain provisions in the DTS Order that were not explicitly incorporated into Section 73.626 of the FCC Rules. MWG has designed DTS networks and prepared FCC applications for DTV stations in the United States over the period since the FCC adopted DTS rules in late 2008. MWG also designed the first DTS station built in the United States, prior to adoption of the DTS rules, under an experimental authorization to prove the benefits and viability of DTS operations, and MWG was a major contributor to the development of DTS rules by the Commission.[3]

There are two principal categories of issues regarding the design of DTS networks that must be recognized to properly analyze the service areas and populations of stations using DTS technologies, as will be necessary during any repacking process. One is the set of provisions made in the DTS Order. The other is the methods that are necessary to

[2] *In the Matter of Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions*, Notice of Proposed Rulemaking, FCC 12-118 (rel. Oct. 2, 2012).
[3] *In the Matter of Digital Television Distributed Transmission System Technologies*, Report and Order, FCC 08-256 (rel. Nov 7, 2008).

correctly represent the types of directional antennas frequently used for DTS transmitters when filing data on the patterns of such antennas in the FCC Electronic Filing System.

Upon releasing the Public Notice and the *TVStudy* software, the Commission provided just over six weeks for evaluation of the software prior to the due date for these comments. Setting up a software system as complex as the TVStudy environment is a time-consuming exercise. Then evaluating such software in detail takes even more time. For a small organization such as MWG, six weeks has not been sufficient to get the software environment installed, operating, and tested, given the necessity to continue providing services to clients who depend upon us. Consequently, there has not been the time to determine whether or not the matters addressed in these comments have been adequately treated in the *TVStudy* software. Because of the lack of adequate time for such an evaluation, it was determined to be better to call attention to the issues, without benefit of determining how they are handled in the software, than to be silent on these matters in the hope that they are correctly analyzed by the *TVStudy* software.

DTS Report and Order Provisions

There are three primary provisions included in the DTS Order that are substantially different from those applied to single-transmitter operations and upon which stations have depended in their DTS applications. To correctly analyze the service areas of, and populations served by, those stations, the DTS Order provisions must be included in any analytical process ultimately adopted with regard to repacking DTS facilities in accordance with the requirements under Section 6403(b)(2) of the Spectrum Act that the FCC employ "all reasonable efforts" to preserve the coverage areas and populations served by television stations. These provisions are the "'Largest Station' Alternative," the corresponding service area maximization, and Reference Point relocation. These provisions are not reflected in the DTS rules in §73.626 despite having been established by the DTS Order.

The DTS Order provides that stations using DTS are permitted to make use of the provisions of §73.622(f)(5), which allows single-transmitter stations to exceed the height and power limits normally applied to stations in their zones and bands of operation, up to

the sizes of service areas contained within the predicted noise-limited contours (PNLCs) of the largest stations within their markets. Markets are defined to be the DMAs in which the stations are located. In the cases of DTS operations, the sizes of the circles used to constrain the PNLCs of the transmitters in DTS networks could be up to those of the largest stations in their markets, in lieu of the limitations imposed by the Table of Distances included in §73.626(c). This was described as the "'Largest Station' Alternative" in ¶35 of the DTS Order.

The DTS Order also provides that "DTS stations seeking to maximize under this rule to cover an area greater than can be covered using the values in the Table of Distances may request an increase in ERP and antenna HAAT values to determine the circle within which all DTS station coverage contours must be contained. In other words, DTS stations may obtain the same coverage under the rule as would a single-transmitter station, provided the DTS service would not result in new interference."[4] In other words, DTS stations may expand their service areas beyond the limitations of the Table of Distances circle if the ERP and HAAT values for which they could have applied in a single transmitter application would result in a larger circle than that provided by the Table of Distances.

Finally, the DTS Order provides that DTS stations may change the reference points on which are centered the limiting circles based on the Table of Distances, the "'Largest Station' Alternative," or service area maximization. As described in the DTS Order, "Generally, a station would use its current reference point based on its Appendix B facility or the Order granting it a new channel, as appropriate. Upon the appropriate public interest showing, a station may request a change to its reference point, just as stations have done historically, provided certain criteria are met. Such changes in reference points are subject to a station showing that the resulting service area circle fully encompasses the station's authorized service area."[5] (Footnotes omitted.)

[4] DTS Order ¶35.
[5] DTS Order ¶29.

Multiple DTS stations have applied one or more of these provisions in their DTS applications. For example, KILM in Barstow, CA, utilized the "'Largest Station' Alternative" and the reference point relocation provisions of the DTS Order in developing the facilities that were authorized by the grant on November 4, 2011 of the station's construction permit (File No. BMPCDT-20090601AAG). Station KVMD in Twentynine Palms, CA, made use of the same combination of provisions in its DTS application (File No. BPCDT-20100325ACD). Two other DTS stations of which we are aware, Station KRBK in Osage Beach, MO, (File No. BLCDT-20120412ACM) and Station KEMO in Santa Rosa, CA, (File No. BMPCDT-20120504ADE) made use of the service area maximization provision by itself. Correctly analyzing these stations with respect to their protected service areas, populations served, and populations receiving interference will require recognition of these facts and the specifics of the authorizations, even though the provisions described were not separately written into Section 73.626 of the FCC Rules when the DTS Order was adopted.

Antenna Pattern Filing Considerations

The DTS Order recognizes that one of the beneficial applications of DTS technology is to increase signal levels delivered to viewers near the edges of the service areas circumscribed by the Table of Distances circle or its alternatives. It noted that "DTS techniques will distribute more uniform and higher-level signals throughout a DTV station's service area. This will offer improved service within stations' coverage areas, including near the edges where signals can be low using traditional means."[6] Increasing signal levels in such areas while respecting the limits inherent in the Table of Distances and its alternatives frequently involves the use of complex antenna patterns, often having different elevation patterns in different azimuthal directions. In some designs, such patterns are obtained from the electrical properties of the antenna alone; in some cases, mechanical beam tilt may be used in conjunction with carefully designed elevation patterns. In all such cases, detailed data on the resulting patterns must be filed to obtain the correct results in the Commission's application processing software.

[6] DTS Order, ¶14, Bullet 2.

To describe the complex patterns sometimes inherent in particular antenna designs or that result from the use of mechanical beam tilt, pattern data with up to 72 slices of elevation information typically are filed in the Electronic Filing System. No limit on the number of such slices is specified.[7] The Commission's application processing software multiplies the elevation slice data by the corresponding azimuth pattern value for each slice to obtain the resulting relative field value at each combination of azimuth and elevation direction to be evaluated. Not specified in the DTS Order or anywhere else is the relationship required between the azimuth data and the elevation slice data, which could be computed in a large number of ways. After consultation with Commission staff and the author of the Commission's current processing software to explore the alternative data expression possibilities, instructions were given to put all of the antenna pattern data into the elevation data files and to set the azimuth values uniformly to unity (1.000). This is the procedure that has been followed in all of the situations of DTS transmitters utilizing complex antenna patterns of which we are aware.

Notwithstanding the instructions included in the DTS Order and in Form 301-DTS in the Electronic Filing System, if only the azimuth pattern data is considered for DTS transmitters having complex antenna patterns, for which all of the meaningful information is contained in the elevation patterns, the transmitters will appear to have omnidirectional antennas, even when the boxes provided to indicate use of a directional pattern have been checked affirmatively. Analysis of these transmitters based on the data in their azimuth patterns alone (normally set to unity) would result in the prediction of too much coverage for such stations. Furthermore, since there frequently is considerably higher power radiated at significant depression angles below the horizontal in these cases, consideration of radiation only in the horizontal planes of the real patterns would result in the prediction of too little coverage. Failure to correctly analyze complex antenna patterns of such stations also would result in calculations of considerably higher baseline interference to neighboring stations, thereby providing them with less interference protection in the repacking process than that to which they are entitled. Indeed, the complex patterns often are implemented exactly to provide such protection. Thus, correct

[7] DTS Order Appendix C, instructions following Tech Box Item 9.g.

analysis of the coverage of DTS stations must include full use of all the data provided in both the azimuth and elevation patterns that have been filed with applications to authorize DTS operations.

Analysis Methodology

To obtain correct analyses of the service areas and populations served of stations applying DTS technology, the appropriate parameters must be applied in each case. First, the reference point for the limiting circle must be located correctly; it may be at the Appendix B coordinates, or it may be at a different location that was specified in the DTS application for the station. When a modified reference point has been used, it is included in one of the records in the CDBS database associated with the DTS network.

Once the correct reference point is established, the correct limiting circle radius must be determined. The radius could be based on the Table of Distances, on the ERP and HAAT for a maximized facility, or on the area within the PNLC of a "Largest Station" in the same market as the DTS station. The value used will be found in the narrative filed in one of the exhibits to the application, but there is no place in the application itself for such data to be entered. Of course, the limiting circle may not be the determinant of the actual limit in any particular direction, as a contour from an authorized facility or a hypothetical maximization that extends farther in any direction takes precedence over the limiting circle.

Finally, when complex antenna patterns have been filed, the actual patterns for the DTS transmitters must be applied. Failing to do so could result in substantial over-reporting or under-reporting of the service areas and populations for such stations. Use of a standardized elevation pattern is likely to lead to incorrect results. To obtain the relative field value at any combination of azimuth and depression angle, the correct method is to multiply the relative field value in the azimuth pattern data supplied in the application by the relative field value of the elevation pattern data supplied. Of course, linear interpolation between supplied values may be necessary to obtain results located at positions between the positions for which values explicitly were supplied.

Conclusion

In these comments, we have endeavored to information that will be helpful in use of the *TVStudy* software to model stations operating with Distributed Transmission Systems. We have pointed out where it is possible that the software might not have taken into account all of the factors that predict the coverage, service, and interference from and the interference to stations utilizing DTS technology. Unfortunately, due to the exigencies of meeting client needs and the relatively short time provided for first installing and then analyzing the very complex new software, we have not been able to confirm by ourselves the manner in which the *TVStudy* software treats these issues. It is our hope that, by calling these matters to the attention of the Commission, its contractors, and others, that the tests necessary to determine correct analysis of DTS facilities can be made. We hereby offer to assist, in any way we can, those seeking to confirm correct analysis of DTS networks by the new software.

Respectfully submitted,

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