

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554**

In the Matter of)	
)	
BROADCAST TELEVISION INCENTIVE)	ET Docket No. 14-14
AUCTION)	GN Docket No. 12-268

To: The Office of Engineering and Technology

**COMMENTS OF THE
SOCIETY OF BROADCAST ENGINEERS, INCORPORATED**

The Society of Broadcast Engineers, Incorporated (“SBE”)¹ respectfully submits its Comments in response to the Commission’s *Public Notice*, DA 14-98, released January 29, 2014 in the above-captioned proceeding (the “*Notice*”).² The Notice seeks “to supplement the record in the incentive auction proceeding by inviting comment on a methodology for predicting potential interference between broadcast television and licensed wireless services.” In the interests of its members in avoiding interaction between broadcast television and wireless services in the UHF television broadcast band, SBE states as follows.

1. The premise of the *Incentive Auction NPRM* is to create a 600 MHz “wireless band plan” from the spectrum made available for “flexible use” through the broadcast television incentive auction. The Commission intends to create a band plan that will differ relative to

¹ SBE is the national association of broadcast engineers and technical communications professionals, with more than 5,000 members worldwide.

² The *Notice* called for comments to be filed by February 28, 2014, but the Commission subsequently, by a second Public Notice, DA 14-254, released February 26, 2014 extended the date for comments in response to the *Notice* until March 17, 2014. Accordingly, these comments are timely filed.

television broadcast and wireless use in different markets, depending on the success of the incentive auction process in each one. Obviously, given this market variation, it wishes to maximize the amount of spectrum recovered for wireless use. Because of this market variation, there are concerns with respect to co-channel and adjacent-channel interference between television and wireless services in abutting or geographically proximate markets. There are four manifestations of this interference: (1) DTV transmitter to wireless base station uplinks; (2) DTV transmitter to wireless user equipment downlinks; (3) Wireless base station downlinks to DTV receivers; and (4) Wireless user equipment uplinks to DTV receivers. The Commission is dissatisfied with the method of precluding these types of interference proposed by most commenters, which is to adopt a pre-defined separation distance between TV and mobile service areas, believing it to be inefficient in terms of spectrum deployment. The necessary distance separations are substantial under any circumstances, varying from the 200 kilometers calculated by the wireless companies to 500 kilometers calculated by NAB. The Commission suggests another methodology (the “OET Methodology”), thus to avoid the distance separation method, which it fears is overly conservative and does not maximize efficiency of use of redeployed spectrum by wireless companies.

2. While the Commission desires to avoid using separation distances, SBE urges that appropriate separation distances be retained as the interference avoidance mechanism for all four interference scenarios, precisely *because* they are conservative, and create the best opportunity to avoid interference *ex ante*. Interference in any of the four scenarios cannot be remedied *post hoc*, and the Commission hasn’t the enforcement resources to address such interference on a case-by case basis. The fact is that distance separations are easily implemented, and interference avoidance is predictable. The proper calculation of distance separation to avoid the worst-case

interference potential³ is the key to maximizing spectrum efficiency and reuse in this process. The Commission's OET Methodology would, by contrast, over-complicate what otherwise is, has been and should remain a simple and effective process. Furthermore, the separation distance method would allow for future changes in DTV and Wireless modulation systems and techniques, without changing the evaluation of desired-to-undesired (D/U) signal ratios that would be necessitated by the OET Methodology.

3. If, notwithstanding the clear benefits of utilizing the objective and predictable distance separation method, the Commission does nevertheless proceed with the OET Methodology, there are many factors and considerations which must be thoroughly explored and evaluated in this proceeding prior to implementing the proposed methodology. First of all, a prerequisite to the use of D/U ratios for interference avoidance in the four cases described in the *Notice* is the conducting of extensive laboratory testing on DTV receivers using LTE signals, as well as testing LTE interference to DTV Receivers. Furthermore, this is not a once-and-done process. As broadcasters move toward implementation of ATSC 3.0, the actual interference D/U ratios will likely change, as new modulation methods are likely to be utilized for ATSC 3.0 transmission, such as DVB-T2 or some other system. Therefore, existing ATSC ratios will not provide appropriate protections in the future as ATSC 3.0 is implemented.

4. SBE questions the D/U ratio assumptions outlined in the *Notice*. Interference ratios may be variable depending upon the levels of "channel loading". It may be appropriate to utilize the "worst case" D/U ratios. However, laboratory testing should be conducted by OET to verify this before proceeding to adopt any specific D/U ratios. In addition, the Commission should

³ The Commission claims that DTV transmitter-into-wireless base station (uplink) interference is the worst-case consideration, because the base station receive antenna and the DTV transmitting antenna are typically located well above the surrounding terrain, creating line-of-sight paths between them.

consider expanding its methodology to include evaluation and consideration of “taboo” channel interference. As shown by the Commission’s own tests,⁴ taboo channel interference is likely to be an issue with any repacking of the DTV spectrum. Appropriate measures should be taken to ensure that LTE and DTV interaction on Taboo channels is also considered. This is particularly important in the evaluation and analysis of multiple DTV interferers. Significant impairment to both DTV and Wireless services should be evaluated.

5. Another assumption that is subject to question is LTE base station locations and distribution. The assumption of uniformity is not representative of carriers’ system implementation. The Commission’s methodology should take into account the increase in use of microcells and the distribution of transmitters in urbanized areas where base stations are more densely packed.

6. The Commission should avoid the use of clutter losses in calculation of interference. That factor is not used currently in OET-69 for DTV and its use in this context would substantially change the way the evaluations are conducted. The only context in which clutter losses are used in connection with DTV is in (wholly-inappropriate) Satellite Home-Viewer Extension and Reauthorization Act (SHVERA) evaluations. Inclusion of clutter losses in the analysis does not provide a sufficiently conservative and safe result and may well under-predict interference.

7. The *Notice* proposes the use of a new “*de minimus*” interference threshold of 5 percent for interference from DTV to wireless services, thus to define “Wireless Market Area

⁴ See Stephen R. Martin, “Interference Rejection Thresholds of Consumer Digital Television Receivers Available in 2005 and 2006,” FCC/OET Report TR-07-1003, March 30, 2007. See also “Tests of ATSC 8-VSB Reception Performance of Consumer Digital Television Receivers Available in 2005,” FCC/OET Report TR-05-1017, November 2, 2005.

Impairment.” The proposed 5% threshold is excessive. It would include very significant number of people in large urban environments. A one or two percent threshold is more appropriate. The 2% threshold is proposed in the modified version of OET 69. By creating an overly lax interference threshold, the Commission risks selling potentially unusable spectrum, which is in no one’s interest. Perhaps a more flexible option that deals with future population changes would be to base the evaluation on geographic area impairment, or a combination of areas and populations impacted, rather than on population alone.

8. The OET Methodology uses a version of the Longley-Rice propagation model to predict desired field strength at receive points. Interference in each grid cell of the area under study is determined by further application of Longley-Rice methodology, taking into account clutter losses. Paths between undesired transmitters and each 2-kilometer⁵ grid point inside the service area are examined using the Longley-Rice model. At each point, F(50, 10) is used for the prediction of potential interference to TV receivers from wireless base stations. For prediction of potential interference from DTV to wireless receivers, the methodology uses F(50, 50). SBE suggests that Longley-Rice modeling for DTV and Wireless interference calculations in “long paths” is appropriate. However, in short paths (perhaps less than 5KM) the free space model should be used. As to the use of F(50,10) for wireless interference to DTV but F(50,50) for interference to wireless service areas, the justification for the distinction is not readily apparent. F(50,10) would be more appropriate for the latter, just as it is in the DTV scenario. Otherwise, the reliability of the wireless services would be problematic. An illustration of the problem occurred during the DTV transition, where tropospheric propagation created co-channel interference between WBOC and WHRO along the Chesapeake Bay. The potential for

⁵ See Paragraph 13, *infra*. OET-69 uses a 1 kilometer grid, which is more appropriate for this application.

tropospheric ducting is very high in this frequency range, especially in many areas of the East and West coasts. It must be kept in mind that propagation prediction is statistical. There will be a time (which may not be entirely predictable) when DTV interferes with wireless services and when wireless services interfere with DTV reception. The point is that statistics that are conservative must be used, which minimize these occurrences and ensure their infrequency

9. The OET methodology proposes to conduct the evaluation of DTV interference scenarios without reference to final [“post-repack”] DTV transmitter facility parameters. It is assumed that existing station location and antenna heights will be utilized. If that is correct, it is unclear how the Commission will account for possible changes in the facility parameters once the “new DTV” facilities are constructed. Some allowance for changes in antenna height and location should be allowed in the initial “New Table of Allotments” without protection to the new wireless services.

10. The Commission uses, in its methodology for calculating field strength limits for interference from DTV to wireless receivers, receiver on-tune rejection (“OTR”) values from 3G receivers. It is not clear from where those values were derived. If they were not from laboratory testing, actual receiver performance could be much worse. SBE questions the assumptions in choosing these OTR values.

11. Nor is it apparent that the Commission has taken into account the aggregate interference effect of multiple interference sources, especially with respect to the taboo channels in the wireless to DTV interference context. It is urgent, as noted in the Stephen R. Martin studies, that appropriate D/U Ratios be used.

12. At footnote 21 of the *Notice*, the Commission states that it assumes -33 dB of adjacent channel rejection for the DTV receiver and $43 + 10 \log(P)$ in a 100 kHz bandwidth attenuation for the wireless emission mask. The Commission states that these flat response curves lead to a constant OTR rejection at spectral overlaps less than 0 MHz. This assumption may not be appropriate for a re-packed DTV spectrum landscape where a DTV station is on the lower adjacent and wireless on the upper adjacent channel). SBE suggests using a multiple impairments regime.

13. Certain other assumptions are subject to question. For example, the OET Methodology proposes to evaluate a wireless system assuming a maximum Effective Radiated Power of 720 Watts. This may not be an appropriate power level to use for analysis. The figure should correspond to the maximum ERP allowed for the service, which in this case is 1 kilowatt. Nor is it clear from the *Notice* whether the Commission will utilize a specific terrain database increment (cell size) or whether that will be a variable, as is the case with the current Media Bureau policy. The OET methodology proposes to use 2K cell size. 1K is generally used for OET 69 calculations. It would seem that the current OET 69 practice should carry forward for these calculations.

14. The Commission fails to consider in its proposal the possible effects on multichannel video providers that utilize off-air receive antenna systems. These systems are generally installed at receive heights of up to 100 meters. The interference potential from wireless operations in geographic proximity to multichannel video provider receive locations could become problematic for off-air pickups used for Cable TV system and Satellite MVPD providers. It is unclear how these interference occurrences will be resolved.

15. Similarly, the Commission has apparently not addressed the potential interference to the off-air pickups of TV translators, boosters, and other supplemental services. These receivers are generally located outside a television station's Protected Grade B contour. Thus, interference from wireless operations in adjacent cities will be problematic and are not accounted for under the proposed OET Methodology.

16. Finally, the Commission should maintain a public database similar to CDBS for all wireless base stations, so that technical information concerning transmission and reception from those sites are readily available to the public for analysis. As mentioned above, it is unlikely that there will be sufficient resources to deal with case-by-case interference problems. SBE suggests that this *Notice* is problematic for the reasons noted herein. It is clear that the most objective, predictable and reliable method of avoiding interaction between and among DTV and wireless facilities, either co-channel or adjacent channel, should be based on geographic distance separation. The dialog should be about the proper distance to address each of the four interaction scenarios, and use the worst-case to determine the proper separation. However, should the Commission nevertheless proceed to adopt the OET Methodology, the foregoing issues should be addressed and the final parameters should be based on actual laboratory testing.

Therefore, for the reasons discussed herein, SBE respectfully requests that the Commission continue to utilize the distance separation method of avoiding DTV and wireless interaction in the UHF television bands, post-auction. Alternatively, the OET Methodology

should not be adopted unless and until each and all of the serious issues raised herein are addressed after appropriate real-world testing.

Respectfully submitted,

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March 17, 2014