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

In the Matter of	)	
	)	
Office of Engineering and Technology Seeks to Supplement the Incentive Auction Proceeding Record Regarding Potential Interference Between Broadcast Television and Wireless Services	)	ET Docket No. 14-14
	)	
Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions	)	GN Docket No. 12-268

COMMENTS OF CTIA – THE WIRELESS ASSOCIATION®

I. INTRODUCTION AND SUMMARY

CTIA – The Wireless Association® ("CTIA") hereby offers its comments in response to the Office of Engineering and Technology's ("OET") Public Notice seeking to supplement the record in the incentive auction proceeding by inviting feedback on a methodology for predicting potential interference between broadcast television and licensed wireless services.[1] As OET recognized in the Public Notice, several commenters in this proceeding have raised concerns about co-channel and adjacent-channel interference between television and wireless services in nearby markets as a result of accommodating market variations.[2] CTIA therefore supports the Commission's efforts to investigate this matter further. As indicated previously, CTIA

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1 *Office of Engineering and Technology Seeks to Supplement the Incentive Auction Proceeding Record Regarding Potential Interference Between Broadcast Television and Wireless Services*, Public Notice, DA 14-98 (Jan. 29, 2014) ("Public Notice").

2 *Id.* at 1.

encourages the Commission to make every effort to mitigate the amount of market-by-market variance in the 600 MHz band plan, but recognizes that it may occur.[3]

CTIA has reviewed the Public Notice and accompanying Appendix and believes that the Commission's suggested approach is fundamentally sound, though it requires some modifications and additions. In particular, CTIA supports the use of the Longley-Rice propagation model for analysis of the broadcast television stations, and agrees that the Commission should use 3GPP standards for modeling of LTE systems. The Commission should also investigate appropriate propagation models for analyzing the path loss from wireless LTE systems to broadcast receivers. Perhaps most importantly, regardless of the approach the Commission uses to model and define the interference environment in this band, it is vitally important that all data be shared and clarified with interested parties prior to the auction. This will enable affected parties to accurately quantify the effect of market variability on particular licenses within the forward auction portion of the incentive auction.

II. CTIA SUPPORTS THE COMMISSION'S EFFORTS TO INVESTIGATE INTERFERENCE PROTECTIONS BETWEEN BROADCAST AND WIRELESS LICENSEES.

Numerous commenters in this proceeding have expressed concerns about co-channel and adjacent-channel interference between television and wireless services in nearby markets as a result of market variability.[4] CTIA understands that market variability will be a factor in

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[3] Reply Comments of CTIA – The Wireless Association®, GN Docket No. 12-268, at 14 (June 28, 2013) ("CTIA Band Plan Reply Comments").

[4] *See, e.g.*, Comments of AT&T Inc., GN Docket No. 12-268, at 4 (Jan. 25, 2013) ("*Third,* because the NPRM's proposal relies so heavily on varying the number of cleared uplink blocks from market to market, depending on how much spectrum is cleared in each market, it would exacerbate the risk of co-channel interference."): Comments of Qualcomm Incorporated, GN Docket No. 12-268, at 2 (June 14, 2013) ("Moreover, neither plan allows for very much market variation because both plans would allow TV broadcast operations to occupy the same channel as mobile uplink operations in adjacent markets, which according to Qualcomm's calculations,

developing a 600 MHz band plan, and it is committed to working with the Commission to minimize market-by-market variances and maximize the amount of spectrum made available for wireless service. CTIA agrees with the Commission that a certain degree of market variability is preferable to a "least common denominator" band plan that clears a uniform – but far lower – amount of spectrum nationwide.

CTIA strongly encourages the Commission to make every effort to create a consistent amount of spectrum to be made available for forward auction participants. Such action is especially important in the largest markets, where the need for mobile broadband spectrum is most acute and the number of broadcasters greatest. That said, a review of the Commission's interference and domain file data makes clear that there will likely be some market variability due to factors such as international borders, T-Band incumbents, and limited broadcaster participation in certain markets.[5] CTIA supports the Commission's efforts through the February 21, 2014 LEARN Workshop and this Public Notice to seek an approach that will best model the interference environment between broadcast and wireless licensees.

As has been outlined by commenters in this proceeding and by OET in the Public Notice, the interference environment between broadcast and wireless licensees created by market variability is a highly complex one. Close examination will be required to determine the impact of what will be an unprecedented feat of spectrum planning. CTIA and its members believe that the overall framework presented in the Public Notice is fundamentally correct and appears to have the building blocks needed to model this intricate interference environment.

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would require a separation distances of more than 300 miles in order to avoid TV co-channel interference to mobile base station receivers.").

[5] *Incentive Auction Task Force Releases Information Related to Incentive Auction Repacking*, Public Notice, 28 FCC Rcd 10370 (WTB 2013).

III. THE COMMISSION'S SUGGESTED APPROACH IS FUNDAMENTALLY SOUND, BUT REQUIRES SOME MODIFICATIONS AND ADDITIONS.

A. The Commission Has Accurately Outlined the Four Wireless/Broadcaster Interference Scenarios Likely in the 600 MHz Band.

In the Public Notice, OET has outlined four potential interference scenarios that could result from the proximity of wireless and broadcast operations in the same or adjacent spectrum. The severity of interference under each scenario depends on the geographic locations and spectrum where DTV operation would be permitted relative to wireless operation under the Commission's chosen 600 MHz band plan. CTIA and its members have reviewed the four scenarios and agree that the Commission has correctly directed its focus.

Under the first interference scenario, a DTV transmitter may cause interference to a wireless base station operating in the same or adjacent spectrum in a nearby market. The Commission noted that this case "tends to lead to the largest required separation distances because both the base station receive antenna and the DTV transmitting antenna are often located well above the surrounding terrain."[6] CTIA agrees that this interference case constitutes the "worst case" interference scenario and will dictate the extent of any exclusion zones deemed necessary based on the Commission's interference-determining methodology.

Under the second interference scenario, a DTV transmitter may cause interference to wireless user equipment ("UE") (*e.g.*, phones and tablets) operating in the same or adjacent spectrum in a nearby market. While similar to the first interference scenario, this case is less likely to require large separation distances. This is because unlike wireless base stations, wireless user equipment generally operates closer to the ground and/or inside buildings and at much reduced power levels. As a result, propagation conditions are likely to reduce the strength

[6] Public Notice at 3.

of distant co-channel DTV stations. As the Commission noted, there is also a potential for interference to UE receivers from nearby adjacent-channel DTV transmissions because the off-channel rejection of UE receivers is often limited compared to base station receivers.[7]

Under the third interference scenario, a wireless base station's downlink transmissions may interfere with DTV receivers. Even if there is a large separation distance between a wireless base station and a co-channel DTV transmitter, DTV receivers at the edge of that station's service contour would likely be much closer to the wireless base station. And, as the Commission noted, an outdoor DTV receive antenna mounted on a roof would be more susceptible to this form of interference.[8] The Commission found that "[a] separate analysis that factors in these conditions needs to be performed relative to the potential for co-channel and adjacent-channel harmful interference that could be caused to DTV reception by the base station downlink transmitter."[9]

Finally, under the fourth interference scenario, wireless user equipment's uplink transmissions could interfere with DTV receivers. This is more likely to be an adjacent-channel interference problem than a co-channel interference problem. As the Commission noted, the large separation distances required between DTV transmitters and wireless base stations should largely preclude the possibility of co-channel interference from wireless UE to DTV receivers. However, adjacent-channel interference remains a possibility.

CTIA agrees that the four interference scenarios presented by the Commission accurately outline the potential interference environment between broadcast and wireless services in the 600

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7 *Id.*

8 *Id.*

9 *Id.*

MHz band. CTIA understands that market variability will be a factor in developing a band plan, and CTIA is committed to working with the Commission to minimize these variances while maximizing the amount of spectrum made available for new wireless services. CTIA also believes that a productive forward auction will be facilitated by a fulsome analysis of these interference scenarios and their potential impact on wireless broadband deployment.

B. CTIA Supports the Commission's Proposed Approach, With Some Modifications

In the Public Notice, OET has sought comment on the methodology for predicting potential interference between television and wireless services under the four scenarios outlined above.[10] Specifically, OET has asked whether its proposed methodology "can provide greater accuracy than a generic separation distance . . . in predicting potential harmful interference between services, thereby enabling the Commission to repurpose more spectrum by accommodating market variation."[11] Overall, CTIA supports the Commission's proposed approach, though it suggests some modifications and additions as discussed further below.

General Methodology. The Public Notice states that "[w]hile the OET Methodology may potentially improve the efficiency of spectrum use compared to the use of fixed separation distances, OET recognizes that it also increases the complexity of the analysis required."[12] Nonetheless, CTIA supports the approach presented by the Commission and believes that it will allow much more flexibility for licensees to determine the actual interference effects between affected parties. Conversely, using a rigid approach such as that previously utilized by the Commission under Section 27.60 of the rules, or any other pre-defined radius for exclusion

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10 *Id.* at 4.

11 Public Notice at 4.

12 *Id.*

zones, would result in spectral inefficiency, something that simply cannot be afforded given the current spectrum shortage.

Methodology to Determine Wireless Interference to DTV. The Commission has sought comment on its proposed approach to determine interference to DTV stations.[13] CTIA supports the Commission's proposed calculation of desired to undesired ("D/U") ratio values on a 2-kilometer grid with base stations spaced uniformly at 10-kilometer intervals as an acceptable method for determining the interference from wireless operations to TV stations. However, CTIA does not believe that all wireless operations in a particular market should be inferred as causing interference, but instead the Commission should look for a more representative methodology (such as a radius around an interfering base station) as the more appropriate metric.

Technical Assumptions. CTIA concurs with the Commission's choices of 3GPP-established planning factors, industry standards, typical engineering specifications, and commonly used protocols, databases, and terrain and clutter models to model LTE characteristics. CTIA also believes that use of the Longley-Rice radio propagation model is appropriate for modeling the effects from DTV transmissions. However, CTIA believes that other propagation models may be better suited for modeling the propagation losses from wireless LTE systems given the inherent operational differences between LTE and high powered broadcast television transmissions. CTIA encourages the Commission to continue exploring which technical assumptions will best and most accurately model the potential interference environment in the 600 MHz band. To that end, the Commission should also consider clutter effects for the second, third, and fourth interference scenarios.

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13 *Id.* at 5.

The Commission also correctly notes that there may be a varying degree of spectral overlap that exists between broadcast television and wireless services.[14] As the Commission observes, a television channel may overlap two wireless channels in a nearby wireless license area, and the degree of this overlap may vary from market to market and channel to channel.[15] CTIA believes that the approach suggested in the Public Notice to account for co-channel and adjacent-channel interference, especially in light of this potential variable overlap, is appropriate.

IV. THE COMMISSION MUST ENSURE THAT ALL DATA CONCERNING INTERFERENCE EFFECTS IS PROVIDED TO POTENTIAL BIDDERS IN A TRANSPARENT AND READILY UNDERSTANDABLE MANNER.

CTIA has stressed that "to achieve maximum participation in the forward auction, the Commission must design its forward auction to be as transparent as possible."[16] CTIA continues to believe that it is absolutely crucial that forward auction bidders be able to clearly understand the encumbrances on spectrum licenses that they may attempt to obtain during the auction process. CTIA believes that the process proposed by OET is an important and valuable one, but its utility can only be maximized through the open sharing of information with potential bidders.

The approach presented by OET in the Public Notice will generate a great deal of useful information, information that must be publicly disclosed. This information must be released with sufficient granularity to permit a thorough assessment of every grid point. Such data will be necessary for wireless bidders to be able to assess whether, how, and to what extent it may be

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14 *Id.*

15 *Id.* at 6 ("Figure 2 provides an example where the spectral overlap between potential wireless Block E and TV Channel 47 is one megahertz, meaning that one megahertz of TV Channel 47 is co-channel with Block E. On the other hand, the spectral overlap between potential wireless Block D and TV Channel 47is -4 megahertz, because there are four megahertz of frequency separation between the respective channel edges.").

16 Comments of CTIA – The Wireless Association®, GN Docket No. 12-268, at 15 (Jan. 25, 2013).

possible to mitigate the interference and degree of impairment to the license. Only then can a bidder assign a value to a license area containing the grid points at issue. With respect to TV interference to wireless use, the Commission should disclose, at a minimum and at all relevant times during the forward auction process, the following information about each license area, grid point-by-grid point and block-by-block:

- The number and identity (by channel number and station identification) of any interferers;
- Whether the interference is to uplink or downlink LTE blocks;
- Whether the interference is co-channel or adjacent channel to LTE blocks;
- The interference field strength limits for DTV into wireless, as defined in Table 4 of the Technical Appendix to the Public Notice;
- To what extent a DTV contour (including any additional 5 km radius needed to protect the TV station from wireless UE transmissions) overlaps the license area; and
- To what extent restricted areas within the license area would be subject to exclusion zones due to the presumed presence of one or more base stations that would cause harmful interference to a TV station.

As CTIA previously noted, the Commission can maximize auction participation – and help ensure auction success – "through the adoption of transparent processes in both the reverse and forward auction, sufficient information for bidders, and policies that enable participation by as many participants as possible."[17] A key component of meeting this policy goal will be arming potential forward auction bidders with the maximum amount of information regarding potential encumbrances to the auctioned spectrum. CTIA is optimistic that by ensuring transparency for interested parties and by carefully modeling the potential interference environment, the

[17] *Id.* at 12.

Commission can accommodate market variations and maximize the amount of spectrum made available for new mobile broadband services.

V. CONCLUSION

CTIA supports the development of a 600 MHz band plan that frees up as much spectrum as possible for mobile broadband services. CTIA recognizes, however, that potential interference between wireless and broadcast operations is a key challenge, and CTIA commends the Commission for its efforts to investigate this matter further. CTIA stresses that regardless of the methodology and process used by the Commission, it must provide relevant, granular data to interested parties so that they can make informed bidding decisions in the forward auction.

Respectfully submitted,

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