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FEDERAL COMMUNICATIONS COMMISSION

47 CFR Parts 27 and 73

[GN Docket No. 12-268; ET Docket Nos. 13-26 and 14-14; FCC 15-141]

**Expanding the Economic and Innovation Opportunities of Spectrum Through
Incentive Auctions**

AGENCY: Federal Communications Commission.

ACTION: Final rule.

SUMMARY: This document resolves the remaining technical issues affecting the operation of new 600 MHz wireless licensees and broadcast television stations in areas where they operate on the same or adjacent channels in geographic proximity. Specifically, the Commission adopted the methodology and the regulatory framework for the protection of both wireless services and broadcasting in the post-auction environment that it proposed in October 2014. The Commission affirms its decision regarding the methodology to be used during the incentive auction to predict inter-service interference between broadcasting and wireless services. The Commission also affirmed its decision declining to adopt a cap on the aggregate amount of new interference a broadcast television station may receive from other television stations in the repacking process.

DATES: Effective **[INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]**, except for the amendments to §§ 27.1310 and 73.3700(b)(1)(iv)(B), which contain new or modified information collection requirements subject to the Paperwork Reduction Act of 1995, Public Law 104-13, that are not effective until approved by the Office of Management and Budget (OMB). The Commission will publish a document in the Federal Register announcing the effective date once OMB approves.

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SUPPLEMENTARY INFORMATION: This is a summary of the Commission's Third Report and Order and First Reconsideration Order, GN Docket No. 12-268; ET Docket Nos. 13-26 and No. 14-14, FCC 15-141, adopted October 21, 2015 and released October 26, 2015. The full text of this document is available for inspection and copying during normal business hours in the FCC Reference Center (Room CY-A257), 445 12th Street, SW., Washington, DC 20554. The full text may also be downloaded at: www.fcc.gov.

People with Disabilities: To request materials in accessible formats for people with disabilities (braille, large print, electronic files, audio format), send an e-mail to fcc504@fcc.gov or call the Consumer & Governmental Affairs Bureau at 202-418-0530 (voice), 202-418-0432 (tty).

Synopsis

1. In the Third Report and Order the Commission adopts a framework to govern the interference environment in the 600 MHz Band where wireless operations and television stations may operate on the same or adjacent channels in nearby areas following the incentive auction. The Commission establishes a zero percent threshold for allowable harmful interference from 600 MHz wireless services to television stations assigned to channels in the 600 MHz Band. In addition, the Commission requires 600 MHz wireless licensees to use the methodology in Bulletin OET-74 to predict potential interference to nearby co-channel or adjacent-channel television operations before deploying base stations, prohibits operation of wireless user equipment operating in the 600 MHz Band near these television stations' contours, and prohibits the expansion of television stations' contours that would result in additional impairments to wireless operations. The Commission also addresses the applicability of the ISIX Methodology previously adopted in other interference contexts, including between LPTV and TV translators and wireless operations, between television and wireless operations during the post-transition

period, and in identifying impairments to wireless licenses along the borders with Canada and Mexico.

2. In the First Order on Reconsideration, the Commission rejects a number of petitions for reconsideration of the ISIX Methodology that the Commission previously adopted for use during the incentive auction to predict the extent that 600 MHz Band wireless licenses may be impaired due to interference to, and from, television stations in the 600 MHz Band. The Commission also made a number of adjustments to the ISIX Methodology to be consistent with the decisions made in the Third Report and Order regarding OET-74, to reflect recent Commission decisions, and to reflect updates and revisions of input values and settings of the ISIX software. The Commission also affirmed its previous decision to not adopt a cap on new-station-to-station interference in the television station repacking process during the incentive auction and declined to establish a cap on population loss resulting from a new channel assignment in the repacking process.

3. In the Incentive Auction R&O, 79 FR 48442, August 15, 2014, the Commission adopted a flexible band plan framework that accommodates market variation, that is, areas where broadcast stations are assigned to channels in the 600 MHz Band. Because the amount of spectrum repurposed through the incentive auction and the repacking process depends on broadcaster participation and other factors, market variation will allow the Commission to avoid limiting the amount of spectrum repurposed across the nation to what is available in the most constrained market. However, market variation creates the potential for inter-service interference (“ISIX”) because in markets where broadcast television stations are assigned to channels within the 600 MHz Band, television and wireless services will be operating in close geographic proximity on the same and/or adjacent frequencies. There are four scenarios of potential interference when broadcast television and wireless operations are co-channel or on adjacent channels in nearby areas: (1) a digital television (“DTV”) transmitter causing interference to a wireless base station (Case 1); (2) a DTV transmitter causing interference to wireless user

equipment (Case 2); (3) a wireless base station causing interference to a DTV receiver (Case 3); and (4) wireless user equipment causing interference to a DTV receiver (Case 4).

4. In the ISIX R&O, 79 FR 76903, December 23, 2014, the Commission addressed potential interference between DTV stations and wireless service in areas with market variation. The ISIX R&O adopted a methodology for predicting inter-service interference during the incentive auction (“ISIX Methodology”), a methodology which necessarily is based on hypothetical 600 MHz Band network deployments, as the actual networks will not be deployed until after the auction. The companion ISIX Further Notice, 79 FR 76282, December 22, 2014, proposed a post-auction inter-service interference methodology for evaluating interference from wireless base stations to television reception, set forth in the Office of Engineering and Technology Bulletin No. 74 (“OET-74”). The ISIX Further Notice also proposed rules for preventing interference from wireless to broadcasting services on the same or adjacent channels in nearby markets in the Cases 3 and 4.

A. Protecting Broadcast Television Receivers from Inter-Service Interference

1. Threshold for Interference from Wireless Operations to Television Receivers in the 600 MHz Band.

5. The Commission adopts a zero percent threshold for harmful interference from wireless operations to the reception of television station’s signals in the 600 MHz Band. Under this standard, 600 MHz wireless licensees will not be permitted to cause harmful interference at any level within the noise-limited contour of a full power television station or the protected contour of a Class A television station to the degree it affects populated areas within those contours. The Commission finds that a zero percent threshold, with no rounding tolerance, is warranted in the post-auction environment. For the reasons discussed below, any interference standard other than zero presents practical difficulties given the multiple sources of potential interference to the reception of signals from television stations assigned to the 600 MHz Band and the continuing evolution of wireless networks. Furthermore, the Commission delegates

authority to the Media Bureau to issue a Public Notice following completion of the incentive auction with the final contours of all television stations assigned to channels in the 600 MHz Band. The Public Notice will include the technical parameters by which the television station contours can be generated regardless of whether the station will remain on its pre-auction channel or has been reassigned to new a channel.

6. There will be numerous sources of potential interference to the reception of signals from television stations assigned to the 600 MHz Band because the five-megahertz wireless spectrum blocks will overlap in varying degrees with the six-megahertz television channels, creating the potential for multiple co- and adjacent-channel relationships between television stations and wireless operations in the same or nearby geographic areas. Moreover, wireless networks evolve over time with the deployment of additional base stations and the adjustment of base stations' technical parameters. Addressing the possibility of a television receiver receiving interference from multiple wireless networks that are continuously evolving presents significant practical difficulties, such as how to apportion the permitted interference among the multiple sources of interference and how to monitor compliance as wireless networks evolve. Given the different interference environment that television stations will face in the 600 MHz Band, the Commission finds that it would be impractical, if not infeasible, to manage any interference percentage other than zero percent.

7. The Commission clarifies that the zero-percent interference threshold will prohibit 600 MHz wireless licensees from causing any interference to television receivers in any populated area of the noise-limited contour of a full power television station or the protected contour of a Class A television station. The Commission also adopts the proposal from the ISIX Further Notice to treat interference between television stations assigned in the 600 MHz Band as “masking interference” in evaluating wireless interference to a television station. Therefore, in a grid cell where masking interference to one television station from another television station is predicted, inter-service interference from wireless operations can be ignored.

2. Determining Potential Interference from Wireless Operations to DTV Receivers

a. Case 3: Interference to Television Receivers from Wireless Base Stations

8. Adoption of OET-74. The Commission adopts OET-74, as proposed in the ISIX Further Notice, with several modifications as described in more detail below. OET-74 is to be used following the incentive auction to predict interference to television receivers operating in the 600 MHz Band from co-channel and adjacent channel wireless base stations in nearby markets. The adopted OET-74 Bulletin is included below. The Commission rejects the National Association of Broadcaster's (NAB's) claim that the Spectrum Act limits our authority to require the use of OET-74 to address inter-service interference following the auction

9. D/U Ratio Adjustment. The Commission adopts slightly revised desired/undesired (D/U) ratio thresholds from those proposed in the ISIX Further Notice. Under the methodology of OET-74, the D/U ratio is calculated at the population centroid in each two kilometer square cell in the television station's contour. This D/U ratio is compared to a threshold to determine if harmful interference is predicted to occur to DTV service in that cell. The D/U threshold is defined in OET-74 to include an adjustment factor " α ," which is dependent on the signal-to-noise ratio (S/N ratio) of the received television signal. The " α " factor in the D/U threshold is necessary to account for the effect of the television signal strength on the amount of interference that the television receiver can tolerate when the desired DTV signal is weak. When the television signal strength is weak (i.e., closer to the noise floor), a lower amount of interference from the wireless base stations will impede television reception than if the television signal is stronger. CEA points out that for faint television signals, " α " increases exponentially under the proposed OET-74, which can result in a high D/U threshold that will require a large separation distance between wireless base stations and the television station's contour. To avoid such results and to conform OET-74 with the approach used in OET-69 and the Commission's rules, OET-74 as adopted will limit the use of the D/U adjustment factor " α " to situations where the signal-to-

noise ratio of the desired DTV signal is greater than 16 dB and less than 28 dB. Specifically, the “ α ” factor will be limited to a maximum value of 8.

10. In addition, the Commission removes the “ α ” factor in the D/U threshold in OET-74 as adopted when there is no overlap between the DTV signal and LTE signal (adjacent channel) in order to be consistent with the approach followed in the Commission’s rules for DTV-to-DTV interference. The Commission’s rules specify a constant D/U threshold for DTV-to-DTV adjacent channel interference. Consequently, OET-74 will not use a D/U threshold that varies with “ α ” for adjacent channel LTE-to-DTV interference. Also, OET-74 will set the required D/U threshold for LTE-to-DTV interference to -33 dB because the ATSC receiver guidelines specify that DTV receivers should have this level of tolerance of adjacent channel DTV interference, and measurements have shown that actual DTV receivers do in fact meet or exceed this level of performance in the presence of adjacent channel LTE interference.

11. Aggregate Interference. OET-74 will incorporate the root sum square (RSS) method to predict the potential for aggregate interference to television receivers from multiple base stations for each co-channel or adjacent channel 600 MHz licensee. The methodology of OET-74, which is based on real-world network deployments, will allow for the aggregation of the field strength of interfering signals at the DTV receiver from the wireless base stations of a co-channel or adjacent channel 600 MHz wireless licensee. The Commission will not, however, require a 600 MHz wireless licensee to account for the aggregate interference generated by the wireless operations of other 600 MHz wireless licensees because it would require wireless licensees to incorporate each other’s site-specific information into their OET-74 analysis.

12. Intermodulation Interference. The Commission rejects arguments that it should study further the impact of third order intermodulation interference (IM3) from wireless services and television signals to television receivers. CEA claims that tests it conducted indicate that IM3 interference from LTE and DTV operations into DTV receivers poses a substantial risk to DTV reception, not only for legacy receivers currently in the market but also for future receivers

that may need to continue receiving frequencies also used for LTE operations due to market variation. CEA further argues that IM3 from two LTE signals is a distinct potential problem in the 600 MHz Band that has not been adequately analyzed. Based on the present record, further analysis of intermodulation effects, either from DTV and LTE signals or two LTE signals, is not warranted. The Commission is not aware of any intermodulation interference concerns between DTV stations, which currently do not have to protect for intermodulation interference. Indeed, as CEA acknowledges, providing larger exclusions for interference protection reduces the efficiency of spectrum use. Protection of DTV receivers from the combinations of signals that can produce IM3 interference would impose additional constraints on the repacking process that would impact the Commission's ability to clear spectrum for new uses in the incentive auction and limit use of the recovered spectrum.

13. The Commission does not expect that the potential for interference from intermodulation products from a DTV signal and an LTE signal or from two LTE signals will be significantly higher than that expected from two DTV signals. In addition, potential intermodulation interference can be mitigated through DTV receiver design, antenna reorientation, and other factors. In order to meet consumers' expectations, receiver manufacturers should design their products to operate without experiencing interference from signals permitted by the Commission's rules. To the extent that CEA and manufacturers believe that current models of DTV receivers are susceptible to IM3, the appropriate solution is for them to design their new products to be immune to such interference.

14. "Error Code 3" Messages. When "error code 3" messages are returned by the software used to implement the Longley-Rice propagation model, OET-74 will use the desired and undesired signal strengths determined by the Longley-Rice propagation model in evaluating the subject cell for potential interference. The Commission declines to adopt NAB's suggestion that when an "error code 3" warning is returned and the desired signal strength calculated by OET-74 is below 41 dB μ V/m, the threshold of service, the calculated desired signal strength be

replaced with a signal strength equal to the threshold of service or threshold of service plus 3 dB. NAB's approach would be contrary to the goal of OET-74 which is to provide a methodology for predicting interference to television receivers based on the actual technical parameters of the television stations and wireless networks.

15. Other OET-74 Technical Issues. The Commission rejects NAB's contention that it should evaluate interference to the reception of Class A station's signals using a one-kilometer grid instead of the two-kilometer grid proposed in OET-74 so as to be "consistent with current practice." Using a different grid size for Class A stations than for full power stations would be inconsistent with the Commission's repacking methodology and would create a layer of unnecessary complexity for the ISIX and OET-74 calculations. Accordingly, the Commission will use a two-kilometer grid for the ISIX and OET-74 calculations for both full power and Class A stations.

16. The Commission also rejects NAB's suggestion that OET-74 consider interference in all cells, and not only the populated cells. OET-74 will consider interference harmful only if the D/U ratio is below the threshold in a cell containing population.

17. In addition, the Commission rejects NAB's argument that OET-74 should not rely on manufacturers' published antenna patterns for wireless base stations. According to NAB, the manufacturers' published patterns may suggest unrealistically superior performance, while the wireless licensee may adjust the antenna after installation to manage coverage or interference conditions, or the antenna alignment during installation may be imprecise. While the Commission is cognizant that wireless base station antenna installations may vary from the antenna manufacturer's specified patterns or may be misaligned, it sees no reason to modify the manufacturer's specified wireless base station antenna patterns based on NAB's assumptions, which may or may not be more accurate for any given base station installation.

18. The Commission disagrees with Cohen, Dippell, and Everist, P.C.'s ("CDE") claim that the FCC has not forecasted the potential interference to television receivers in cases where

five megahertz 600 MHz licenses are aggregated. Given the DTV receiver performance measurements in the record and the fact that OET-74 is applicable to aggregated channels, CDE fails to articulate the need for additional testing of the effects of inter-service interference where five megahertz wireless licenses are aggregated. Nevertheless, based on examination of the record, the Commission concludes that the proposal for a separate analysis for each frequency overlap when two five-megahertz blocks are aggregated into a ten megahertz block would require additional effort by the wireless licensee without providing increased protection for DTV signal reception compared with a combined analysis of aggregated five megahertz blocks. For this reason, OET-74 will require that only a single interference analysis be performed when five megahertz blocks are aggregated. Therefore, in cases of aggregated wireless blocks the OET-74 analysis will be adjusted to reflect the amount of spectral overlap between the aggregated wireless signal and the DTV channel and the effective radiated power (“ERP”) as described. When the aggregated wireless signal completely overlaps the DTV channel, the analysis will use the values in the OET-74 tables associated with a spectral overlap of five megahertz and the ERP that is the portion of the power in the aggregated wireless signal that overlaps the six megahertz television channel. When the aggregated wireless signal overlaps the DTV channel by five megahertz or less, the analysis will use the values in the OET-74 tables associated with the amount of spectral overlap and the ERP of the overlapping wireless five megahertz block (i.e. the analysis will ignore the other five megahertz blocks of the aggregated signal). When the aggregate wireless signal is adjacent to the DTV channel (i.e. no overlap), the interference analysis will use the values in the OET-74 tables associated with the five megahertz block that is closest to the adjacent DTV channel and the ERP of that block. A wireless licensee with non-contiguous spectrum blocks will be required to conduct a separate OET-74 interference analysis for each spectrum block. In addition, a wireless licensee that is adjacent or co-channel to multiple DTV stations, will have to perform separate OET-74 interference analysis for each of the DTV stations.

b. Case 4: Interference to Television Receivers from Wireless User Equipment

19. The Commission adopts fixed geographic separation distances for Case 4. Specifically, 600 MHz wireless licensees will be required to limit the service area of their wireless networks so that wireless user equipment (i.e., mobile and portable devices) will not operate within the contour or within a set distance from the contour of a co-channel or adjacent channel television station. As proposed in the ISIX Further Notice, the Commission adopts a separation distance of five kilometers for co-channel operations, and one-half kilometer for adjacent channel operations. Therefore, wireless licenses that will be co-channel or adjacent channel to a television station in the 600 MHz Band uplink spectrum will have impairments that cover the area of the station's contour and an additional five kilometers if the television station is co-channel or one-half kilometer if the television station is adjacent channel to the wireless operations. The separation distance for adjacent channel operation will only apply to the first adjacent channel. Consequently, wireless user equipment may be operated within the contour of a television station if there is a frequency separation of at least six megahertz or more between the wireless spectrum block edge and a television channel edge.

3. Obligations of 600 MHz Licensees in Markets with Variation

a. Requirements on Wireless Base Station Deployment

20. As proposed in the ISIX Further Notice, the Commission will (1) prohibit a 600 MHz wireless licensee from operating base stations within the contour of a co-channel or adjacent-channel full power and Class A television station, (2) require the 600 MHz wireless licensee to use OET-74 to predict interference to television receivers within such a station's contour prior to deploying base stations within a specified culling distance of the station's contour, and (3) prohibit operating base stations within that distance if harmful interference is predicted. The culling distances are specified in OET-74 and are based on the spectral overlap between wireless operations and television operations, and the power and antenna height of wireless base stations.

21. The Commission finds that prohibiting wireless base stations from operating within the contours of co-channel and adjacent channel DTV stations is an appropriate safeguard for preventing interference to television receivers. The Commission also finds that requiring the use of OET-74 to identify potential interference from base stations located within the culling distance, and prohibiting operation of base stations within that distance if harmful interference is predicted, will ensure that television stations assigned to channels in the 600 MHz Band are not subject to harmful interference from 600 MHz Band wireless operations following the auction.

22. The Commission declines CTIA's request that the required use of OET-74 apply only to 600 MHz wireless licenses that have been formally designated as impaired during the incentive auction. Rather, as proposed, the OET-74 analysis must be performed for any base station located within the culling distance, even if the license was not identified as impaired during the auction. Qualified forward auction bidders will be provided information about the degree of impairment to the license, but such impairments will be estimated using the ISIX Methodology based on assumptions of a hypothetical wireless network deployment. Post-auction, the Commission's inter-service interference methodology will be based on the actual interference environment to protect DTV receivers. The Commission notes that qualified forward auction bidders will be able to determine prior to bidding whether they will be subject to regulatory requirements for a particular license because it will provide them with specific information about the television stations that will potentially cause impairments to wireless licenses (including the facility ID) prior to each stage of the auction.

23. The Commission rejects CTIA's claims that the OET-74 methodology is burdensome and impractical. A new OET-74 analysis will be required only if a base station modification could result in an increase in energy in the direction of a full power or Class A television station's contour. CTIA's concerns over the number of base stations subject to the OET-74 analysis, especially with the deployment of small cell architectures, are exaggerated. Antennas at lower power and lower height as found in small cell architectures result in shorter

culling distances, as small as three kilometers in some cases, thereby reducing the likelihood that an OET-74 analysis will have to be performed for small cell antennas.

24. The Commission will require a 600 MHz wireless licensee to retain the latest copy of its OET-74 interference analysis for each co-channel or adjacent channel partial economic area (“PEA”) license area where any of its base stations fall within the specified OET-74 culling distances. The wireless licensee will be required to make this analysis available for inspection by the Commission at any time and to make this analysis available to a television station upon request when there are complaints of interference either from the subject television station or a station viewer. The Commission rejects NAB’s request that wireless licensees be required to send all of their OET-74 analyses to all potentially affected broadcasters. The Commission finds that requiring wireless licensees to retain their most recent OET-74 analyses, which they may store electronically, and make them available in cases of interference complaints will more efficiently assist in the investigation and resolution of any complaints.

b. Elimination of Actual Interference to Broadcast Television Stations in the

600 MHz Band

25. The Commission adopts the proposal to require wireless licensees to eliminate any actual harmful interference to television reception within the contours of a full power or Class A television station in the 600 MHz Band, even if OET-74 did not predict such interference. The Commission also adopts the proposal for handling such interference incidents. As proposed in the ISIX Further Notice, a television station operating in the 600 MHz Band that experiences harmful interference from co-channel or adjacent channel wireless operations must first contact the wireless licensee to resolve the issue. The wireless licensee must provide to the television station the latest OET-74 analysis showing that no harmful interference was predicted to occur in the specific geographic area at issue. Wireless licensees and television stations are required to cooperate in good faith to resolve any disputes, so as not to unreasonably disrupt wireless and

broadcast operations. In the event the parties do not reach resolution, the broadcaster can submit a claim of harmful interference to the Commission.

26. The Commission declines CDE's requests that it create a toll-free number and a website for consumers to report potential inter-service interference problems or that it create an interference handbook that demonstrates how a television viewer may face interference. Instead, the Commission will rely on the framework described above, which requires television stations experiencing interference problems to contact wireless licensees to resolve the potential interference issues.

c. Effect of Interference-Related Restrictions on Wireless Licenses

27. A 600 MHz wireless licensee will hold a license for its entire PEA service area, but its operations will be limited only to those portions of the PEA where the licensee will not cause harmful interference to the reception of signals from television stations assigned to the 600 MHz Band consistent with the standards set forth above.

28. As discussed in the Incentive Auction R&O, 600 MHz licensees will be required to meet the 600 MHz Band interim and final build-out requirements, except that they may show they are unable to operate in areas where they may cause harmful interference to the reception of the signals of television stations that remain in the 600 MHz Band due to market variation. The same exception to interim and final build-out requirements will apply to cases where 600 MHz licensees receive harmful interference from television stations assigned to channels in the 600 MHz Band. The Commission adopts its proposal to require wireless licensees to use the ISIX Methodology it adopted for use during the auction for prediction of interference in the Case 1, 2 and 4 scenarios and the methodology in OET-74 for the Case 3 interference scenario to demonstrate that they cannot serve the entire PEA service area for purposes of fulfilling the build-out requirements of their license. If a licensee is not able to serve its entire license area, it must demonstrate why certain areas are excluded from its service area due to impairments when it files its construction notification. If the impairing television station ceases to operate before the

construction benchmarks, the wireless licensee will be permitted to use the entire license area, and will be obligated to serve the area that was previously restricted in demonstrating that it has met its build-out requirements.

B. Protecting Wireless Licensees in the 600 MHz Band from Inter-Service Interference

29. In this section, the Commission adopts rules to ensure that 600 MHz wireless licenses obtained in the forward auction do not experience additional impairments following the incentive auction.

1. Limitation on Expanding 600 MHz Broadcast Television Stations' Contour

30. The Commission limits full-power and Class A television stations assigned to channels in the 600 MHz Band from expanding their noise-limited and protected contours, respectively, if doing so would increase the impairments to co-channel or adjacent channel 600 MHz wireless licenses, unless an agreement is reached with the co-channel or adjacent channel wireless licensee allowing for such expansion. For purposes of this limitation, impairments refer to both additional interference from a television station anywhere in the 600 MHz Band in a PEA (Cases 1 and 2), and to any increased restriction on wireless operations within a PEA in order to avoid causing harmful interference to television receivers within a television station's expanded contour (Cases 3 and 4). For purposes of this limitation, a television station's baseline contours are those set forth in its initial post-auction construction permit application. As the Commission stated in the Incentive Auction R&O, it will carefully consider requests for waiver of the limitation in extraordinary circumstances.

31. CEA argues for a set distance between the edge of a wireless license area and the contours of a co-channel or adjacent channel television station beyond which the television station would be allowed to expand. The Commission rejects this proposal because the appropriate distance would depend largely on factors like transmitted power, antenna height, and antenna pattern, as well as terrain and frequency overlap, that vary by station. However, if the distance between the proposed expanded contour and a co-channel or adjacent channel wireless

licensee's service area is greater than 500 kilometers, the television station will not be required to make a showing that its expanded contour does not cause additional impairments to the wireless operations.

2. Predicting Potential Interference from LPTV or TV Translator into Wireless Service

32. As set forth in the Incentive Auction R&O, LPTV and TV translator stations in the 600 MHz Band may continue operating indefinitely unless a 600 MHz wireless licensee provides advance notice that it intends to commence operations and that the LPTV or TV translator station is likely to cause harmful interference to the wireless operations, based on the methodology the Commission adopts to prevent inter-service interference. As proposed in the ISIX Further Notice, 600 MHz wireless licensees will use the ISIX Methodology, as modified in the First Order on Reconsideration, for predicting interference to their operations from LPTV and TV translator stations for purposes of providing these stations with advance displacement notice.

33. For this analysis, 600 MHz licensees will use the threshold values for the prediction of interference from full power television to wireless operations from the ISIX Methodology. With regard to adjacent channel interference, LPTV and TV translator stations are allowed to operate using either the same emission mask as a full power station or one of the other two alternative emission masks specified in the Commission's rules. The Commission analyzed the frequency dependent rejection ("FDR") performance of wireless receivers in the presence of DTV signals using the three different emission masks and found that there is only a 1 dB difference in the threshold values for adjacent channel interference to the wireless service across the three masks, for both wireless base stations and user equipment. The Commission does not find this 1 dB difference to be significant enough to warrant using separate thresholds for each emission mask option. Therefore, the Commission adopts the same field strengths for co-channel and adjacent channel emissions from LPTV and TV translator stations to wireless service as the ISIX Methodology provides for full power television stations. The Commission will also use the

antenna elevation patterns for LPTV and TV translator stations in the Consolidated Database System (CDBS) or LMS (Licensing and Management System), the successor system to CDBS. If CDBS/LMS does not include elevation pattern values for a given LPTV or TV translator station, the elevation pattern of these stations as they are defined in section 74.793(d) of the Commission's rules will apply. The Commission finds that the more conservative F(50,10) measure is appropriate when 600 MHz wireless licensees use the ISIX Methodology to predict if they will experience interference from LPTV or translator stations.

34. The Commission will require that interference from analog LPTV and TV translator stations be analyzed using TVStudy's capability to replicate an analog signal as an equivalent digital signal and analyze the station as though it were operating in digital. The interfering field strength of the "replicated" analog television signal should be treated the same as an interfering digital television signal when conducting the interference analysis.

C. Inter-Service Interference During the Post-Auction Transition Period

35. The Commission adopts its proposal in the ISIX Further Notice to protect full power and Class A television stations that have not yet relocated from the 600 MHz Band during the Post-Auction Transition Period in the same manner that it will protect stations that remain in or relocate to the 600 MHz Band. A wireless operator commencing operations before the end of the Post-Auction Transition Period must perform an OET-74 analysis when it intends to deploy base stations within the culling distance of a co-channel or adjacent channel full power or Class A television station that is operating in the 600 MHz Band to predict whether its wireless operations in all or part of its license area would cause harmful interference to the reception of signals from nearby television stations, regardless of whether these television stations will be relocated by the end of the Post-Auction Transition Period. Consistent with the requirements adopted, the wireless licensee must retain the latest copy of its OET-74 interference analysis, make this analysis available for inspection by the Commission at any time, and make this analysis available to a television station upon request when there are complaints of interference either from the

subject television station or a station viewer. In addition, if there are co-channel or adjacent channel television stations in the wireless licensee's uplink spectrum, the wireless provider must limit its service area to ensure that user equipment does not operate within five kilometers of the contour when co-channel or within a half kilometer when adjacent channel. Consistent with the rules set forth, once a nearby full power or Class A station has transitioned from its pre-auction channel, the 600 MHz Band licensee need no longer limit its operations in order to protect the station from inter-service interference.

36. Television stations assigned to the 600 MHz Band in the repacking process may not actually relocate to their assigned channel until late in the Post-Auction Transition Period. However, the Commission will not permit wireless licensees to deploy networks in the period before the station relocates in areas that will potentially interfere with these television stations once they commence broadcasting. Consequently, television stations that have not yet constructed their new facilities will be protected from inter-service interference during the Post-Auction Transition Period based on the contours specified in their initial post-auction construction permits. Therefore, a 600 MHz wireless licensee that wants to commence operations prior to the end of the Post-Auction Transition Period will have to protect television stations that are operating co-channel or adjacent channel at that time and television stations that will be operating co-channel or adjacent channel by the end of the Post-Auction Transition Period.

D. Assessing Interference from and to International Broadcast Television Stations During the Auction

37. The Commission adopts its proposal to use the ISIX Methodology to identify impairments to repurposed 600 MHz spectrum along the international borders during the auction. During the incentive auction, the ISIX Methodology will be used to predict interference from U.S. television stations to Canadian wireless operators (Cases 1 and 2). In accordance with the U.S.-Canada Statement of Intent, the ISIX Methodology will use F(50,10) signal strength predictions for the signals from U.S. television stations and will assume the Canadian wireless

base stations are 50 meters above ground level. Even though the U.S. and Mexico have not reached an agreement on inter-service interference between television and wireless operations across the U.S.-Mexico border, coordination letters have been exchanged which provide a channel plan for the reassignment of broadcast television stations in the border region. Because the ISIX methodology is not designed for analog signals, and Canada and Mexico have not completed their digital transitions, the Commission will use TVStudy's capability to "replicate" a Canadian or Mexican analog signal as an equivalent digital signal and analyze the station as though it is transmitting a digital signal.

Summary of the First Order on Reconsideration

A. ISIX Methodology

38. In the ISIX R&O, the Commission adopted the ISIX Methodology for use during the incentive auction to predict the extent to which 600 MHz Band wireless licenses may be impaired due to potential interference to, and from, broadcast television stations assigned to the 600 MHz Band as a result of market variation. The Commission received several petitions for reconsideration regarding the ISIX Methodology.

39. In its Petition for Reconsideration, NAB claims that the ISIX Methodology will fail to predict wireless impairments "with any useful degree of accuracy" because wireless carriers will have to use a "different methodology" following the auction based on real-world deployments. NAB repeats its recommendation made in several of its filings in this proceeding that, instead of the ISIX Methodology, the Commission should use a fixed distance-based approach, because doing so would be "far easier to implement and will not sacrifice meaningful spectral efficiency." The Commission denies NAB'S petition for reconsideration because NAB offers no basis to revisit its conclusion that the ISIX Methodology accommodates market variation in a more spectrally efficient manner than a fixed distance-based approach and disagree with NAB's claim that the decision to use a different methodology to predict inter-service interference after the auction calls into question the accuracy of the ISIX Methodology for

predicting impairments during the auction. NAB also claims that the base station antenna heights and powers assumed in the ISIX Methodology are less than what is permitted by the Commission's rules and therefore understates the potential for interference. The Commission rejects this claim because it was fully considered and rejected when the ISIX R&O was adopted.

40. Sprint and NAB, sought reconsideration of the decision to use the F(50,50) statistical measure instead of the F(50,10) measure in the ISIX Methodology when estimating interference from television stations to wireless operations. The Commission denies Sprint's and NAB's Petitions for Reconsideration and affirms its conclusion that F(50,50) is an appropriate statistical measure for this purpose, whereas the F(50,10) measure is unnecessarily conservative. In any event, bidders in the forward auction will have the necessary information to make their own calculations of impairments based on any number of factors they wish to consider, including their choice of statistical parameter.

41. The Commission will revise the ISIX Methodology to reflect the adjustments to the D/U thresholds for the Case 3 interference scenario it adopted in the companion Third Report and Order. These values are not assumptions that will change once the wireless networks are deployed. Accordingly, there is no basis to have interference threshold values applied during the auction to determine impairments that differ from the interference threshold values applied after the auction to determine interference. Therefore, the Commission will update the interference threshold values in the ISIX Methodology to be consistent with the values adopted above.

42. The Commission also makes a number of miscellaneous changes to the ISIX Methodology. These changes were made to reflect updates and revisions of input values and software settings to improve functionality and to reflect the U.S.-Canada Statement of Intent and decisions the Commission made in the Bidding Procedures PN, 80 FR 61918, October 14, 2015. These changes are reflected in the Appendix D of the Third Report and Order and First Order on Reconsideration describing the ISIX Methodology:

- Updated references to the LPTV digital transition.

- Updated references to license categories which were adopted in the Bidding Procedures PN.
- Revised references to emission limits and receiver standards in paragraph 13 to reflect the use of the FCC’s emission limits for DTV and wireless receiver performance standards published by 3GPP.
- Provided threshold values for inter-service interference calculations in the repacking process along the border regions. These values do not relate to the computation of impairments on 600 MHz licenses.
- Added an explanation in paragraph 31 that for Case 3, the base station transmitter azimuth pattern is assumed to be non-directional and is based on UHF DTV vertical pattern described in OET Bulletin No. 69, Table 8. However, the elevation pattern is assumed to be symmetrical above and below the maximum.
- Table 14 lists the TVStudy settings unique to the ISIX Methodology.
- In Table 15, the entry HAS_EPAT was changed from “False” to “True” because TVStudy will import the pattern in the XML scenario.
- Paragraph 38 updated to indicate that the elevation pattern for each base station must be imported in the XML file and lists the values for the symmetrical generic pattern.

B. Request for Additional Protection in the Repacking Process

43. In the ISIX R&O, the Commission declined to adopt a cap on the amount of total or aggregate new station-to-station interference that a broadcast station will be allowed to receive as a result of the repacking process. The Commission denies the petitions for reconsideration of CDE and NAB requesting reconsideration of this decision. Neither CDE nor NAB challenge the

staff study that concluded that approximately 99 percent of stations will not experience new interference above one percent or otherwise dispute the study's conclusion that stations are unlikely to be experience significant new interference as a result of the repacking process. The Commission explained in the ISIX R&O how an aggregate interference cap would deprive the repacking feasibility checker of its speed. CDE and NAB do not offer any reason to dispute this conclusion, nor do they propose a means of implementing an aggregate interference cap without compromising the speed of the bidding process.

44. Because radio signals propagate differently on different frequencies, the signal of a station reassigned to a different channel will generally not be receivable in precisely the same locations within a station's contour as it was in its original channel. In its ex parte filings prior to adoption of the ISIX R&O, NAB asked the Commission to address both station-to-station interference and population loss resulting from new channel assignments by adopting a cap on "aggregate population loss," which the Commission refused to do on procedural grounds. NAB ask for reconsideration of the Commission's decision declining to adopt a cap on population loss resulting from new channel assignments in the repacking process. The Commission grants in part and denies in part NAB's petition for reconsideration. The Commission expects most stations will not lose viewers as a result of terrain loss resulting from new channel assignments. Even if some stations are predicted to lose viewers as a result of terrain loss resulting from new channel assignments, the Commission's final television channel assignment plan selection procedure includes optimization techniques to address this concern.

45. In the event some stations are predicted to lose viewers as a result of new channel assignments even after optimization techniques are applied, there will be post-auction solutions to address this situation. First, as adopted in the Incentive Auction R&O, a television station may request up to a one percent coverage contour increase as part of its initial post-auction construction permit application, subject to certain conditions. Second, the Commission amends its rules to provide that stations predicted to experience a loss in population served in excess of

one percent as a result of the repacking process - either because of new station-to-station interference or terrain loss resulting from a new channel assignment (or a combination of both) - may file an application proposing an alternate channel or expanded facilities in a priority filing window, along with a limited number of other stations that have been assigned the same priority. Third, the Commission proposed in the LPTV Third FNPRM to allow a full power station that is predicted to experience a loss in its pre-auction digital service area as a result of its new channel assignment to seek authority to deploy a digital-to-digital replacement translator (“DTDRT”) to serve the loss area.

46. A cap on population loss resulting from new channel assignments as proposed by NAB would compromise the central objective of a successful auction to allow market forces to repurpose spectrum. NAB’s proposed approach for incorporating its cap on population loss into the repacking process involves certain elements that are either infeasible or meaningless and, on the whole, would impede the Commission’s ability to conduct a successful auction and thereby sacrifice the goal of repurposing spectrum.

C. Use of TVStudy to Determine Coverage Area and Population Served by Television Stations

47. The Commission denies Petitions for Reconsideration of the Incentive Auction R&O filed by the Affiliates Associations and CDE challenging the Commission’s decision to use the TVStudy software and certain inputs in applying the methodology described in OET-69 to determine the coverage area and population served by television stations. The Commission explained in the Incentive Auction R&O why the TVStudy software and inputs are distinct from the OET-69 methodology and Affiliates Associations offer no basis to revisit this conclusion. Affiliates Associations and CDE take issue with the fact that, using identical inputs, TVStudy produces different results than previous versions of the software used to implement OET-69. The Spectrum Act mandates that the Commission use the “methodology described in OET Bulletin 69,” not particular software to implement that methodology or arrive at a pre-determined result.

The Commission’s decision to use software that is “user-friendly and better adapted to handle the kinds of computations the Commission will need to conduct in the reverse auction and repacking process called for by the Spectrum Act” is fully consistent with Congressional intent

48. Affiliates Associations also claims that the Incentive Auction R&O “fail[ed] to address” losses in “coverage area.” The Commission’s decision pertaining to preservation of “coverage area” was affirmed by the D.C. Circuit. Affiliates Associations offers no basis to revisit the Commission’s approach to preserving “coverage area.”

PROCEDURAL MATTERS

Final Regulatory Flexibility Analysis

49. As required by the Regulatory Flexibility Act of 1980, as amended (RFA),¹ an Initial Regulatory Flexibility Analysis (IRFA) was incorporated in the Notice of Proposed Rule Making (NPRM).² The Commission sought written public comment on the proposals in the *NPRM*, including comment on the IRFA. This present Final Regulatory Flexibility Analysis (FRFA) conforms to the RFA.³

A. Need for, and Objectives of, the Rules

50. In the Incentive Auction R&O, the Commission adopted a flexible band plan framework that accommodates market variation. Market variation occurs where broadcast stations remain on spectrum that is repurposed for wireless broadband under the 600 MHz Band Plan. In this Third Report and Order and First Order on Reconsideration, it adopted the framework proposed in the inter-service interference, Further Notice (ISIX Further Notice) to govern the interference environment in the new 600 MHz Band due to market variation.

51.

¹ See 5 U.S.C. 603. The RFA, see 5 U.S.C. 601 through 612, has been amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA), Public Law 104-121, Title II, 110 Stat. 857 (1996).

² See Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions, GN Docket No. 12-268, ET Docket No. 13-26, ET Docket No. 14-14, Second Report and Order and Further Notice of Proposed Rulemaking, 29 FCC Rcd 13071 (2014) (ISIX R&O/FNPRM or ISIX R&O or ISIX Further Notice).

³ See 5 U.S.C. 604.

The Commission adopted a number of measures to protect television reception for those television stations that will remain in the 600 MHz Band after the incentive auction. It adopted a zero percent threshold for interference from wireless operations to the reception of signals from television broadcast stations in the 600 MHz Band, which will prohibit 600 MHz wireless licensees from causing harmful interference at any level within the contour of a broadcast station. The Commission also adopted OET-74, a methodology for predicting interference to television receivers from wireless base stations. However, the Commission modified the D/U threshold used to determine if interference to television reception is occurring in OET-74 from what was proposed in the ISIX Further Notice so that the threshold does not become unrealistically large when the television signal is weak. Wireless licensees will be allowed to deploy base stations within a specified culling distance of co-channel or adjacent channel television stations only where they can demonstrate using OET-74 that they will not cause harmful interference to television reception within the stations' contours. In addition, the Commission prohibits the operation of wireless user equipment within five kilometers of the contours of co-channel television stations and one-half kilometer of adjacent channel television stations. It will require wireless licensees to eliminate any actual harmful interference to the reception of signals from television station in the 600 MHz Band, even if such interference was not predicted using OET-74.

52. The Commission also adopted measures to protect the future operations of 600 MHz Band wireless licensees from television stations that remain in the 600 MHz band. It will prohibit broadcast television licensees who operate in the 600 MHz Band from expanding their noise-limited or protected contours if doing so would increase the potential for interference to a wireless licensee's service area or would result in additional impairments to the wireless licenses because of the obligations of the wireless licensee to protect television reception. The Commission also adopted the use of the ISIX Methodology specified in the ISIX R&O, as modified in the First Order on Reconsideration, for predicting when an LPTV or TV translator

station will cause harmful interference to wireless operations. For this purpose, the ISIX Methodology will use the same threshold values for the prediction of interference from full power television to wireless operations as specified in the ISIX R&O and will use the F(50,10) statistical measure to predict the strength of the LPTV or TV translator signal.

53. Under the rules adopted in the Incentive Auction R&O, 600 MHz Band wireless licensees are required to meet interim and final build-out requirements, but the build-out requirements only apply to areas they are permitted to serve. The Commission will require 600 MHz wireless licensees to use the ISIX Methodology and/or OET-74 to demonstrate that they cannot meet build-out requirements for portions of the geographic area covered by their license.

54. U.S. television stations may cause interference to Canadian wireless operations after the incentive auction. For purposes of predicting these impairments during the incentive auction, the Commission adopts the use of the ISIX Methodology with adjustments to reflect an agreement reached with Canada.

55. In the First Order on Reconsideration the Commission considered a number of petitions for reconsideration filed in response to the ISIX R&O. It affirmed our decision to use the ISIX Methodology to predict inter-service interference between television and wireless services during the incentive auction. The Commission modified the ISIX Methodology adopted in the ISIX R&O by making the same adjustment to the D/U threshold used to determine if interference will occur to television reception as we did for OET-74. The Commission also affirmed its decisions declining to adopt a cap on the aggregate amount of new interference a broadcast television station may receive from other television stations in the repacking process and declining to adopt a cap on population loss that a television station may experience because of a new channel assignment in the repacking process. The Commission amended its rules to provide that a television station that will experience a loss in population served in excess of one percent as a result of the repacking process -- either because of new station-to-station interference or terrain loss resulting from a new channel assignment (or a combination of both) -- may file an

application proposing an alternate channel or expanded facilities in a priority filing window. In response to a petition for reconsideration of the Incentive Auction R&O, the Commission affirmed its decision to use the TVStudy software and certain inputs in applying the methodology described in OET-69 to determine the coverage area and population served by television stations when making new channel assignments during the incentive auction.

B. Summary of Significant Issues Raised by Public Comments in Response to the IRFA

56. There were no comments filed that specifically addressed the rules and policies proposed in the IRFA.

C. Response to Comments by the Chief Counsel for Advocacy of the Small Business Administration

57. Pursuant to the Small Business Jobs Act of 2010, the Commission is required to respond to any comments filed by the Chief Counsel for Advocacy of the Small Business Administration (SBA), and to provide a detailed statement of any change made to the proposed rules as a result of those comments. The Chief Counsel did not file any comments in response to the proposed rules in this proceeding.

D. Description and Estimate of the Number of Small Entities To Which the Rules Will Apply

58. The RFA directs agencies to provide a description of and, where feasible, an estimate of the number of small entities that may be affected by the proposed rules, if adopted.⁴ The RFA generally defines the term "small entity" as having the same meaning as the terms "small business," "small organization," and "small governmental jurisdiction."⁵ In addition, the term "small business" has the same meaning as the term "small business concern" under the Small

⁴ 5 U.S.C. 603(b)(3).

⁵ 5 U.S.C. 601(6).

Business Act.⁶ A small business concern is one which: (1) is independently owned and operated; (2) is not dominant in its field of operation; and (3) satisfies any additional criteria established by the SBA.⁷

59. Television Broadcasting. This economic census category “comprises establishments primarily engaged in broadcasting images together with sound. These establishments operate television broadcasting studios and facilities for the programming and transmission of programs to the public.”⁸ The SBA has created the following small business size standard for Television Broadcasting firms: those having \$38.5 million or less in annual receipts.⁹ The Commission has estimated the number of licensed commercial television stations to be 1,388.¹⁰ In addition, according to Commission staff review of the BIA Advisory Services, LLC’s Media Access Pro Television Database on March 28, 2012, about 950 of an estimated 1,300 commercial television stations (or approximately 73 percent) had revenues of \$38.5 million or less.¹¹ The Commission therefore estimate that the majority of commercial television broadcasters are small entities.

60. The Commission notes, however, that in assessing whether a business concern qualifies as small under the above definition, business (control) affiliations must be included.¹² Our estimate, therefore, likely overstates the number of small entities that might be affected by our action because the revenue figure on which it is based does not include or aggregate revenues

⁶ 5 U.S.C. 601(3) (incorporating by reference the definition of “small business concern” in 15 U.S.C. 632). Pursuant to the RFA, the statutory definition of a small business applies “unless an agency, after consultation with the Office of Advocacy of the Small Business Administration and after opportunity for public comment, establishes one or more definitions of such term which are appropriate to the activities of the agency and publishes such definition(s) in the Federal Register.” 5 U.S.C. 601(3).

⁷ Small Business Act, 15 U.S.C. 632 (1996).

⁸ U.S. Census Bureau, 2012 NAICS Definitions: 515120 Television Broadcasting, <http://www.census.gov/cgi-bin/sssd/naics/naicsrch?code=515120&search=2012> (last visited Mar. 6, 2014).

⁹ 13 CFR 121.201 (NAICS code 515120) (updated for inflation in 2010).

¹⁰ See FCC News Release, Broadcast Station Totals as of December 31, 2013 (rel. Jan. 8, 2014), http://transition.fcc.gov/Daily_Releases/Daily_Business/2014/db0108/DOC-325039A1.pdf.

¹¹ We recognize that BIA’s estimate differs slightly from the FCC total given the information provided above.

¹² “[Business concerns] are affiliates of each other when one concern controls or has the power to control the other, or a third party or parties controls or has the power to control both.” 13 CFR 121.103(a)(1).

from affiliated companies. In addition, an element of the definition of “small business” is that the entity not be dominant in its field of operation. The Commission is unable at this time to define or quantify the criteria that would establish whether a specific television station is dominant in its field of operation. Accordingly, the estimate of small businesses to which rules may apply does not exclude any television station from the definition of a small business on this basis and is therefore possibly over-inclusive to that extent.

61. In addition, the Commission has estimated the number of licensed noncommercial educational (“NCE”) television stations to be 395.¹³ These stations are non-profit, and therefore considered to be small entities.¹⁴

62. There are also 2,414 LPTV stations, including Class A stations, and 4,046 TV translator stations.¹⁵ Given the nature of these services, we will presume that all of these entities qualify as small entities under the above SBA small business size standard.

63. Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing. The Census Bureau defines this category as follows: “This industry comprises establishments primarily engaged in manufacturing radio and television broadcast and wireless communications equipment. Examples of products made by these establishments are: transmitting and receiving antennas, cable television equipment, GPS equipment, pagers, cellular phones, mobile communications equipment, and radio and television studio and broadcasting equipment.” The SBA has developed a small business size standard for Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing, which is: all such firms having 750 or fewer employees. According to Census Bureau data for 2007, there were a total of 939 establishments in this category that operated for part or all of the entire year. Of this total, 912

¹³ See FCC News Release, Broadcast Station Totals as of December 31, 2013 (rel. Jan. 8, 2014), http://transition.fcc.gov/Daily_Releases/Daily_Business/2014/db0108/DOC-325039A1.pdf.

¹⁴ See generally 5 U.S.C. 601(4), (6).

¹⁵ See FCC News Release, Broadcast Station Totals as of December 31, 2013 (rel. January 8, 2014), http://transition.fcc.gov/Daily_Releases/Daily_Business/2014/db0108/DOC-325039A1.pdf.

had less than 500 employees and 17 had more than 1000 employees. Thus, under that size standard, the majority of firms can be considered small.

64. Audio and Video Equipment Manufacturing. The SBA has classified the manufacturing of audio and video equipment under in NAICS Codes classification scheme as an industry in which a manufacturer is small if it has less than 750 employees. Data contained in the 2007 U.S. Census indicate that 492 establishments operated in that industry for all or part of that year. In that year, 488 establishments had fewer than 500 employees; and only 1 had more than 1000 employees. Thus, under the applicable size standard, a majority of manufacturers of audio and video equipment may be considered small.

65. Wireless Telecommunications Carriers (except satellite). The Census Bureau defines this category as follows: “This industry comprises establishments engaged in operating and maintaining switching and transmission facilities to provide communications via the airwaves. Establishments in this industry have spectrum licenses and provide services using that spectrum, such as cellular phone services, paging services, wireless Internet access, and wireless video services.”¹⁶ The appropriate size standard under SBA rules is for the category Wireless Telecommunications Carriers (except Satellite). The size standard for that category is that a business is small if it has 1,500 or fewer employees.¹⁷ For this category, census data for 2007 show that there were 1,383 firms that operated for the entire year.¹⁸ Of this total, 1,368 firms had employment of 999 or fewer employees and 15 had employment of 1000 employees or more.¹⁹ Similarly, according to Commission data, 413 carriers reported that they were engaged in the

¹⁶ U.S. Census Bureau, 2012 NAICS Definitions: 517210 Wireless Telecommunications Carriers (except Satellite), <http://www.census.gov/cgi-bin/sssd/naics/naicsrch?code=517210&search=2012> (last visited Mar. 6, 2014).

¹⁷ 13 CFR 121.201 (NAICS code 517210).

¹⁸ U.S. Census Bureau, Table No. EC0751SSSZ5, Information: Subject Series - Establishment and Firm Size: Employment Size of Firms for the United States: 2007 (NAICS code 517210), http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ECN_2007_US_51SSSZ5.

¹⁹ Id. Available census data do not provide a more precise estimate of the number of firms that have employment of 1,500 or fewer employees; the largest category provided is for firms with 1000 employees or more.

provision of wireless telephony, including cellular service, PCS, and Specialized Mobile Radio (“SMR”) Telephony services.²⁰ Of these, an estimated 261 have 1,500 or fewer employees and 152 have more than 1,500 employees.²¹ Consequently, the Commission estimates that approximately half or more of these firms can be considered small. Thus, using available data, we estimate that the majority of wireless firms can be considered small.

E. Description of Projected Reporting, Recordkeeping, and Other Compliance Requirements for Small Entities

66. Wireless licensees in the 600 MHz Band will be required to conduct an interference analysis using OET-74 before operating a base station within the culling distance of the contour of a co-channel or adjacent channel broadcast television station. They will also be required to conduct an OET-74 interference analysis when making a modification to such a base station that could result in an increase in energy in the direction of broadcast station’s contour. The wireless licensee will be required to retain the latest copy of their OET-74 analysis for each base station that is within the culling distance of a co-channel or adjacent channel broadcast station. The wireless licensee will be required to make this analysis available for inspection by the Commission at any time and to make this analysis available to a television station upon request when there are complaints of interference either from the subject television station or a station viewer. Wireless licensees and television stations will cooperate in good faith to resolve any disputes, as not to unreasonably frustrate wireless and broadcast operations. In the event the parties do not reach resolution, a broadcaster can submit a claim of harmful interference to the Commission.

67.

²⁰ See Trends in Telephone Service at Table 5.3.

²¹ See id.

Wireless licensees in the 600 MHz Band will be prohibited from operating a base station within the contour of a co-channel or adjacent channel broadcast station. Wireless licensees will also be required to limit their coverage areas so that mobile and portable devices maintain a minimum distance of five kilometers from a co-channel broadcast station's contour and 500 meters from an adjacent channel broadcast station's contour.

68. Wireless licensees will be required to eliminate any harmful interference that occurs to television reception within the contours of a co-channel or adjacent channel broadcast television station. This requirement to eliminate harmful interference applies even if the OET-74 analysis indicates that no harmful interference will occur.

69. A broadcast television station in the 600 MHz Band will not be allowed to expand its contour such that it would increase impairments to a wireless licensee either by causing additional interference to the wireless licensee's service area or because of the obligations of the wireless licensee to protect television reception, unless an agreement is reached with the wireless licensee allowing the expansion.

70. A wireless licensee that intends to commence operations will be required to use the ISIX Methodology adopted in the ISIX R&O, as modified in the First Order on Reconsideration, to determine if a LPTV or translator station will cause it harmful interference. The wireless licensee will then be able to send the required notification to the LPTV or translator station that will cause it harmful interference.²²

71. Wireless licensees will use the ISIX Methodology or OET-74 to show that they are unable to operate in portions of their license area for purposes of satisfying their build-out requirements. They will use the ISIX Methodology for demonstrating harmful interference from co-channel and adjacent channel broadcast television stations to their base stations and user

²² The requirement that the LPTV or translator station that will cause a wireless licensee harmful interference cease operation within 120 days after receiving notification from a wireless licensee that is going to commence operations was adopted in the Incentive Auction R&O. Incentive Auction R&O, 29 FCC Rcd at 6834-6835, 6839-6841, paras. 657, 668-671.

equipment as well as demonstrating harmful interference from wireless user equipment to television receivers. They will use OET-74 for demonstrating harmful interference from wireless base stations to television receivers.²³ If the impairing television station ceases to operate before the construction benchmarks, the wireless licensee will be permitted to use the entire license area, and will be obligated to serve the area that was previously restricted in demonstrating that it has met its build-out requirements.²⁴

72. A television station that will experience a loss in population served in excess of one percent as a result of the repacking process -- either because of new station-to-station interference or terrain loss resulting from a new channel assignment (or a combination of both) -- may file an application proposing an alternate channel or expanded facilities in a priority filing window. Previously, our rules permitted a station to file an application in the priority filing window only when the greater than one percent loss in population served was from station-to-station interference.

F. Steps Taken to Minimize Significant Economic Impact on Small Entities, and Significant Alternatives Considered

73. The RFA requires an agency to describe any significant alternatives that it has considered in reaching its proposed approach, which may include the following four alternatives (among others): (1) the establishment of differing compliance or reporting requirements or timetables that take into account the resources available to small entities; (2) the clarification, consolidation, or simplification of compliance or reporting requirements under the rule for small entities; (3) the use of performance, rather than design, standards; and (4) an exemption from coverage of the rule, or any part thereof, for small entities.²⁵

²³ Incentive Auction R&O, 29 FCC Rcd at 6883, 684, paras. 778, 781; 47 CFR 1.946(d). The construction notification will have to be filed within 15 days of the relevant milestone certifying that it has met the applicable performance benchmark within its permitted boundaries.

²⁴ Incentive Auction R&O, 29 FCC Rcd at 6606, para. 86 n. 277.

²⁵ See 5 U.S.C. 603(c).

74. Many of the reporting, recordkeeping, and compliance requirements we adopt here are designed to protect television broadcast stations and 600 MHz Band wireless licensees from harmful interference. Because many of these television broadcast stations and wireless licensees are small entities, the rules will protect the economic interest of small entities. Consequently, the effect of these rules on small entities can be viewed as a tradeoff between the compliance burdens of the rules on some small entities balanced against the interference protections supplied by the rules to other small entities. We conclude that the benefits of these rules in protecting small entities from interference is stronger than the compliance burdens that the rules place on small entities.

75. For example, the adopted rules require wireless licensees to conduct an OET-74 interference analysis before locating a base station within the culling distance of a co-channel or adjacent channel television broadcast station. This rule will impact those wireless licensees that are small entities by requiring them to perform the OET-74 analysis and potentially preventing them from constructing base stations in portions of their licensed service areas. However, this requirement will help prevent harmful interference to the reception of signals from co-channel and adjacent channel television broadcast stations, many of whom are small entities. As an alternative to requiring an OET-74 analysis, we could have specified an exclusion zone around a broadcast television station's contour that wireless base stations could not be located within to prevent interference to television reception. However, this would have excluded the base stations from a much larger area than the adopted rules because it would not have taken into account the effects that terrain has on signal propagation and the characteristics of the base stations such as transmitted power and antenna height. Requiring an OET-74 analysis instead of relying on an exclusion zone thereby enables the wireless licensee to use a greater portion of its licensed service area, which is of significant economic benefit to the wireless licensee.

76. As another example, the adopted rules prohibit television broadcast stations in the 600 MHz Band from expanding their contours in a way that will impair a wireless license by

causing interference to a wireless licensee or because of a wireless licensee's obligation to protect television reception. This rule will impact television broadcast stations in the 600 MHz Band by preventing them from expanding their contours in the future, but the rule will protect the interests of wireless licensees by preventing impairments of their licenses.

77. Some of the rules adopted here provide a means to implement rules we have previously adopted. For example, in the Incentive Auction R&O, the Commission adopted rules requiring 600 MHz Band wireless licensees to meet build-out requirements.²⁶ While the previously adopted rules do not require wireless licensees to build-out their networks in areas that are impaired by either receiving interference from television broadcasters remaining in the band or because they will cause interference to television reception, the rules do not specify how the wireless licensee will show what areas are impaired. For purposes of demonstrating impairments for the build-out requirements, the Third Report and Order will require 600 MHz wireless licensees to use the ISIX Methodology for showing interference from television broadcasters to wireless operations and for interference from wireless user equipment to television receivers and will require wireless licenses to use OET-74 to demonstrate interference to television receivers. This requirement will benefit 600 MHz Band wireless licensees by enabling them to exclude impaired locations of their licensed areas from the build-out requirements.

78. In the Incentive Auction R&O, we specified that LPTV and TV translator station in the 600 MHz band could continue to operate until a wireless licensee provided advance notice that it intends to commence operations and the LPTV or TV translator is likely to cause harmful interference. For purposes of providing this displacement notice, in the Third Report and Order the Commission specify that wireless licensees will use the ISIX Methodology to determine if the LPTV or TV translator stations will cause them interference for purposes of notifying the LPTV or TV translator stations. While this requirement will burden 600 MHz Band wireless licensees by requiring them to perform an ISIX Methodology interference study, it will benefit LPTV and

²⁶ Incentive Auction R&O, 29 FCC Rcd at 6877-78, para 764.

TV translator licensees by allowing them to continue operating until their spectrum is actually needed by the wireless licensees. Consequently, this requirement represents a reasonable balancing between the interest of LPTV and translators, many of whom are small businesses, and 600 MHz Band wireless licensees, many of whom are also small licensees.

79. To minimize the burdens on small businesses that are required by the rules we are adopting that require OET-74 and ISIX Methodology interference analyses, we intend to make a version of our TVStudy software available that can perform these analyses. The software can be used on a computer that costs less than \$2000 and is available free online at <http://data.fcc.gov/download/incentive-auctions/OET-69/>. Because we are making this software available, licensees will not need to develop their own software or contract with an engineering consultant to perform these interference analyses. To further reduce the compliance burden on 600 MHz Band wireless licensees, we will not require them to share their OET-74 interference analysis with television broadcasters unless there is an actual interference complaint. The wireless licensee will be able to store the OET-74 analysis electronically, which will reduce the record keeping and compliance cost to the wireless licensee.

80. Television stations that are relocated during the incentive auction may experience a change in coverage area due to terrain loss because of the different propagation characteristics at their new frequency. Television stations that experience a loss in population served in excess of one percent as a result of the repacking process -- either because of new station-to-station interference or terrain loss resulting from a new channel assignment (or a combination of both) -- will now be permitted to file an application proposing an alternate channel or expanded facilities in a priority filing window. This will benefit television stations that experience such a loss of population serviced.

81. **Report to Congress:** The Commission will send a copy of the Third Report and Order and First Order on Reconsideration, including this FRFA, in a report to Congress pursuant to the Congressional Review Act.²⁷ In addition, the Commission will send a copy of the Third Report and Order and First Order on Reconsideration, including this FRFA, to the Chief Counsel for Advocacy of the SBA. A copy of the Third Report and Order and First Order on Reconsideration, including this FRFA, to the Chief Counsel for Advocacy of the SBA.

Ordering Clauses

82. Pursuant to the authority found in sections 1, 4, 301, 303, 307, 308, 309, 316, 319, 332, and 403 of the Communications Act of 1934, as amended, and sections 6402 and 6403 of Middle Class Tax Relief and Job Creation Act of 2012, Public Law 112-96, 126 Stat. 156, 47 U.S.C. 151, 154, 301, 303, 307, 308, 309, 316, 319, 332, 403, 1452, and 1454, the Third Report and Order and First Order on Reconsideration **IS ADOPTED**. The Commission's rules **ARE HEREBY AMENDED** as set forth in Appendix B.

83. The rules adopted herein **WILL BECOME EFFECTIVE [30 DAYS AFTER THE DATE OF FEDERAL REGISTER PUBLICATION]**, except for Sections 27.1310 and 73.3700(b)(1)(iv)(B) of the rules which contain new or modified information collection requirements subject to the Paperwork Reduction Act of 1995, Public Law 104-13, that are not effective until approved by the Office of Management and Budget (OMB). The Federal Communications Commission will publish a document in the Federal Register announcing OMB approval and the effective date of this rule.

84. Pursuant to Section 405 of the Communications Act of 1934, as amended, 47 U.S.C. 405, and 1.429 of the Commission's rules, 47 CFR 1.429, the Petitions for Reconsideration of the Second Report and Order in GN Docket No. 12-268, ET Docket No. 13-

²⁷ See 5 U.S.C. 801(a)(1)(A).

26, and ET Docket No. 14-14 filed by Cohen, Dippell, and Everist, P.C. and by Sprint Corporation **ARE DENIED** to the extent described herein.

85. Pursuant to Section 405 of the Communications Act of 1934, as amended, 47 U.S.C. 405, and section 1.429 of the Commission's rules, 47 CFR 1.429, the Petition for Reconsideration of the Second Report and Order in GN Docket No. 12-268, ET Docket No. 13-26, and ET Docket No. 14-14 filed by the National Association of Broadcasters **IS GRANTED IN PART AND DENIED IN PART** to the extent described herein.

86. Pursuant to Section 405 of the Communications Act of 1934, as amended, 47 U.S.C. 405, and 1.429 of the Commission's rules, 47 CFR 1.429, the Petitions for Reconsideration of the Report and Order in GN Docket No. 12-268 filed by ABC Television Affiliates Association, CBS Television Network Affiliates Association, FBC Television Affiliates Association, and NBC Television Affiliates and by Cohen, Dippell, and Everist, P.C. **ARE DENIED** to the extent described herein.

87. The Commission's Consumer and Governmental Affairs Bureau, Reference Information Center, **SHALL SEND** a copy of this Third Report and Order and First Order on Reconsideration in GN Docket No. 12-268, ET Docket No. 13-26, and ET Docket No. 14-14, including the Final Regulatory Flexibility Analysis, to the Chief Counsel for Advocacy of the Small Business Administration.

88.

The Commission **SHALL SEND** a copy of this Third Report and Order and First Order on Reconsideration in GN Docket No. 12-268, ET Docket No. 13-26, and ET Docket No. 14-14 in a report to be sent to Congress and the Government Accountability Office pursuant to the Congressional Review Act, see 5 U.S.C. 801(a)(1)(A).

List of Subjects in 47 CFR Parts 27 and 73

Communications equipment, Radio, Television, Reporting and recordkeeping requirements.

FEDERAL COMMUNICATIONS COMMISSION

Gloria J. Miles,
Federal Register Liaison Officer.
Office of the Secretary

Final Rules

For the reasons discussed in the preamble, the Federal Communications Commission amends 47 CFR parts 27 and 73 as follows:

PART 27 – MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES

1. The authority citation for part 27 continues to read as follows:

Authority: 47 U.S.C. 154, 301, 302(a), 303, 307, 309, 332, 336, 337, 1403, 1404, 1451, and 1452, unless otherwise noted.

2. Add an undesignated center heading and § 27.1310.to read as follows:

Protection of Other Services

§ 27.1310 Protection of Broadcast Television Service in the 600 MHz Band from Wireless Operations.

(a) Licensees authorized to operate wireless services in the 600 MHz band must cause no

harmful interference to public reception of the signals of broadcast television stations transmitting co-channel or on an adjacent channel.

(1) Such wireless operations must comply with the D/U ratios in Table 5 in OET Bulletin No. 74, Methodology for Predicting Inter-Service Interference to Broadcast Television from Mobile Wireless Broadband Services in the UHF Band ([DATE]) ("OET Bulletin No. 74"). Copies of OET Bulletin No. 74 may be inspected during normal business hours at the Federal Communications Commission, 445 12th St., SW, Dockets Branch (Room CY A09257), Washington, DC 20554. This document is also available through the Internet on the FCC Home Page at <http://www.fcc.gov>.

(2) If a 600 MHz band licensee causes harmful interference within the noise-limited contour or protected contour of a broadcast television station that is operating co-channel or on an adjacent channel, the 600 MHz band licensee must eliminate the harmful interference.

(b) A licensee authorized to operate wireless services in the 600 MHz downlink band:

(1) Is not permitted to deploy wireless base stations within the noise-limited contour or protected contour of a broadcast television station licensed on a co-channel or adjacent channel in the 600 MHz downlink band;

(2) Is required to perform an interference study using the methodology in OET Bulletin No. 74 before deploying or operating wireless base stations within the culling distances specified in Tables 7-12 of OET Bulletin No. 74 from the noise-limited contour or protected contour of such a broadcast television station;

(3) Is required to perform an interference study using the methodology in OET Bulletin No. 74 when modifying a base station within the culling distances in Tables 7-12 of OET Bulletin 74 that results in an increase in energy in the direction of co-channel or adjacent channel broadcast television station's contours;

(4) Is required to maintain records of the latest OET Bulletin No. 74 study for each base station and make them available for inspection to the Commission and, upon a claim of harmful

interference, to the requesting broadcasting television station.

(c) A licensee authorized to operate wireless services in the 600 MHz uplink band must limit its service area so that mobile and portable devices do not transmit:

(1) Co-channel or adjacent channel to a broadcast television station within that station's noise-limited contour or protected contour;

(2) Co-channel to a broadcast television station within five kilometers of that station's noise-limited contour or protected contour; and

(3) Adjacent channel to a broadcast television station within 500 meters of that station's noise-limited contour or protected contour.

(d) For purposes of this section, the following definitions apply:

(1) Broadcast television station is defined pursuant to §73.3700(a)(1) of this chapter;

(2) Noise-limited contour is defined to be the full power station's noise-limited contour pursuant to § 73.622(e);

(3) Protected contour is defined to be a Class A television station's protected contour as specified in section 73.6010;

(4) Co-channel operations in the 600 MHz band are defined as operations of broadcast television stations and wireless services where their assigned channels or frequencies spectrally overlap;

(5) Adjacent channel operations are defined as operations of broadcast television stations and wireless services where their assigned channels or frequencies spectrally abut each other or are separated by up to 5 MHz.

PART 73 – RADIO BROADCAST SERVICES

3. The authority citation for part 73 continues to read as follows:

Authority: 47 U.S.C. 154, 303, 334, 336, and 339.

4. Section 73.3700 is amended by revising paragraph (b)(1)(iv)(B) and adding paragraph (i) to read as follows:

§ 73.3700 Post-Incentive Auction Licensing and Operation.

* * * * *

(b) ***

(1) ***

(iv) ***

(B) The licensee of any broadcast television station that the Commission makes all reasonable efforts to preserve pursuant to section 6403(b)(2) of the Spectrum Act that is predicted to experience a loss in population served in excess of one percent as a result of the repacking process, either because of new station-to-station interference or terrain loss resulting from a new channel assignment (or a combination of both), will be afforded an opportunity to submit an application for a construction permit pursuant to paragraph (b)(2)(i) or (ii) of this section in the priority filing window required by paragraph (b)(1)(iv)(A) of this section.

* * * * *

(i) A broadcast television station licensed in the 600 MHz band, as that band is defined in section 27.5(1)—

(1) Shall not be permitted to modify its facilities, except as provided in paragraph (b)(1)(ii) of this section, if such modification will expand its noise limited service contour (in the case of a full power station) or protected contour (in the case of a Class A station) in such a way as to:

(i) Increase the potential of harmful interference to a wireless licensee which is co-channel or adjacent channel to the broadcast television station; or

(ii) Require such a wireless licensee to restrict its operations in order to avoid causing harmful interference to the broadcast television station's expanded noise limited service or protected contour;

(2) Shall be permitted to modify its facilities, even when prohibited by paragraph (i)(1) of this section, if all the wireless licensees in paragraph (i)(1) who either will experience an increase in the potential for harmful interference or must restrict their operations in order to avoid causing interference agree to permit the modification and the modification otherwise meets all the

requirements in this part;

(3) For purposes of this section, the following definitions apply:

(i) Co-channel operations in the 600 MHz band are defined as operations of broadcast television stations and wireless services where their assigned channels or frequencies spectrally overlap.

(ii) Adjacent channel operations are defined as operations of broadcast television stations and wireless services where their assigned channels or frequencies spectrally abut each other or are separated by up to 5 MHz.

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