
**FEDERAL COMMUNICATIONS
COMMISSION**

47 CFR Part 15

**[ET Docket No. 04–186 and 02–380; FCC
12–36]**

**Unlicensed Operation in the TV
Broadcast Band**

AGENCY: Federal Communications
Commission.

ACTION: Final rule.

SUMMARY: This document addresses five petitions for reconsideration of the Commission's decisions in the *Second Memorandum Opinion and Order* ("Second MO&O") in this proceeding and modifies the Commission's rules in certain respects. In particular, the Commission is increasing the maximum height above average terrain (HAAT) for sites where fixed devices may operate; modifying the adjacent channel emission limits to specify fixed rather than relative levels; and slightly increasing the maximum permissible power spectral density (PSD) for each category of TV bands device. These changes will result in decreased

operating costs for fixed TVBDs and allow them to provide greater coverage, thus increasing the availability of wireless broadband services in rural and underserved areas without increasing the risk of interference to incumbent services. The Commission is also revising and amending several of its rules to better effectuate the Commission's earlier decisions in this docket and to remove ambiguities.

DATES: Effective June 18, 2012.

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SUPPLEMENTARY INFORMATION: This is a summary of the Commission's Third Memorandum Opinion and Order, ET Docket No. 04–186 and 02–380, FCC 12–36, adopted April 4, 2012 and released April 5, 2012. 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 complete text of this document also may be purchased from the Commission's copy contractor, Best Copy and Printing, Inc., 445 12th Street SW., Room CY–B402, 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 email to fcc504@fcc.gov or call the Consumer & Governmental Affairs Bureau at 202–418–0530 (voice), 202–418–0432 (tty).

**Summary of the Third Memorandum
Opinion and Order**

1. In this Order, the Commission addressed five petitions for reconsideration of its decisions in the *Second Memorandum Opinion and Order* ("Second MO&O"), 75 FR 75814, December 6, 2010, in this proceeding and modified its rules in certain respects. In particular, the Commission increased the maximum height above average terrain (HAAT) for sites where fixed devices may operate; modified the adjacent channel emission limits to specify fixed rather than relative levels; and slightly increased the maximum permissible power spectral density (PSD) for each category of TV bands device. These changes will result in decreased operating costs for fixed TVBDs and allow them to provide greater coverage, thus increasing the availability of wireless broadband services in rural and underserved areas without increasing the risk of interference to incumbent services. The

Commission also revised and amended several of its rules to better effectuate the Commission's earlier decisions in this docket and to remove ambiguities.

Background

2. In the *First Report and Order and Further Notice of Proposed Rule Making* in this proceeding, 71 FR 66876, and 71 FR 66897, November 17, 2006, respectively, the Commission allowed fixed unlicensed devices to operate on vacant TV channels, excluding channel 37, and prohibited personal/portable devices from operating on channels 14–20 that are used by public safety operations in some cities. However, it did not adopt final technical rules at that time. In the *Second Report and Order* in this proceeding, the Commission adopted rules that allow unlicensed devices to operate in the TV bands at locations where frequencies are not in use by licensed services. The TV bands consist of six-megahertz channels designated 2 to 51 in four bands of frequencies in the VHF and UHF regions of the radio spectrum (54–72 MHz, 76–88 MHz, 174–216 MHz, and 470–698 MHz).

3. The Commission permitted two categories of unlicensed devices, fixed and personal/portable unlicensed, to operate in the TV bands. Fixed devices must incorporate a geo-location capability and a means to access a database that provides a list of available TV channels that may be used at their location. Such devices must contact a database to obtain a channel list before operating and re-check the database at least once daily. Fixed devices are permitted to operate with up to one watt transmitter power output and may use an antenna that provides up to 6 dBi of gain. Portable devices can operate either as "Mode I" or "Mode II". A Mode II device must incorporate similar geo-location and database access capabilities to fixed devices. A Mode I device is not required to incorporate geo-location or database access capabilities but instead obtains the list of available channels on which it can operate from either a fixed or Mode II device that has database access. Personal/portable devices are permitted to operate with up to 100 mW EIRP except when operating on channels adjacent to a TV service, in which case they may operate with up to 40 mW EIRP. The databases used by TV bands devices are established and administered by parties selected by the Commission.

4. In the *Second MO&O* in this proceeding, the Commission upheld the majority of its prior decisions but made the following changes to the rules that are at issue in one or more of the five

petitions for reconsideration that it addressed in this order:

- Restricted fixed TV bands devices from operating at locations where the ground level is more than 76 meters above the average terrain level in the area.
- Eliminated the requirement that TV bands devices that incorporate geo-location and database access must also listen (sense) to detect the signals of TV stations and low power auxiliary service stations (wireless microphones). As part of that change, the Commission also revised the rules in several respects to reflect use of that method as the only means for determining channel availability. These changes include requiring Mode I devices to verify channel availability and Mode II devices to verify their operating location at regular time intervals.
- Modified the rules governing the measurement of adjacent channel emissions.
- Required that information in the TV bands databases be publicly available.

5. The petitions for reconsideration raise the following issues: (1) The height above average terrain (HAAT) limit for TV bands devices; (2) out-of-band emission limits; (3) protection of wireless services on TV channel 52; (4) establishment of a new category of fixed indoor TV bands devices; and (5) the confidentiality of certain information in the TV bands database.

Discussion

6. The Commission found that in the *Second MO&O*, it generally established the appropriate balance between providing for operation of TV bands devices that will make new broadband services available to the public while protecting incumbent services in the TV bands from interference. Thus, it upheld the majority of its decisions in the *Second MO&O* that are addressed in the petitions for reconsideration. The Commission found merit in some of those requests and therefore modified certain rules to enhance TVBD operations, particularly in rural and underserved areas. In particular, it increased the maximum height above average terrain (HAAT) of sites where fixed devices may operate, modified the adjacent channel (out-of-band) emission limits to specify fixed levels, and slightly increased the maximum permissible power spectral density (PSD) for each category of TV bands device. These changes will result in decreased operating costs and greater coverage from fixed TV bands devices that the Commission expects will increase the availability of wireless broadband services in rural and

underserved areas. It found that these changes will not increase the risk of interference to incumbent services. The Commission corrected several of its rules to better effectuate the Commission's earlier decisions in this docket and to remove ambiguities.

7. *Decision.* The Commission modified its rules to establish a maximum HAAT for a fixed device antenna of 250 meters and maintained the limit for fixed device antenna height AGL at 30 meters. The Commission took this action because it found that the current rule, which limits fixed TV bands devices to sites where the ground HAAT is no greater than 76 meters, unnecessarily precludes the operation of fixed TV bands devices at many locations in the country, particularly in rural and other areas that are currently underserved by broadband services. Under the modifications that the Commission adopted, a site with an elevation of up to 220 meters above average terrain could be used with a 30-meter antenna, or a site with a higher elevation above average terrain could be used with a shorter antenna, provided the sum of the site elevation above average terrain and antenna height above ground does not exceed 250 meters. These changes will result in lower costs and greater flexibility for fixed device operators by allowing the use of sites that were previously precluded by the rules and permitting greater coverage from each site. This will increase the availability of wireless broadband services, particularly in rural and underserved areas.

8. The Commission declined to raise the limit for fixed device antenna height AGL to 75 meters. It previously considered and rejected requests to raise this limit in the *Second MO&O*, noting that the 30-meter height above ground limit was established as a balance between increasing the TV bands device transmission range and the need to minimize the impact on licensed services. While the Commission recognized the argument that an increased antenna height above ground limit could improve TV bands device range in certain circumstances, it found that the Commission appropriately took a conservative approach to minimize the potential for interference to authorized services by limiting the antenna height AGL to 30 meters. It therefore declined to increase this limit at this time. As the Commission previously stated, it could revisit this height limit in the future if experience with TV bands devices indicates they could operate at higher antenna heights without causing interference. Also, the changes the Commission made by removing the 76-

meter site HAAT limit and permitting an antenna HAAT of up to 250 meters will serve to increase the coverage of TV bands devices in many instances.

Height Above Average Terrain (HAAT) Limit

9. Because the range at which interference occurs increases as the antenna height is raised, the

Commission made additional changes to offset the increased potential for harmful interference at the higher antenna heights it is permitting. As recommended by the Joint Petitioners, the Commission revised the table of minimum required separation distances between fixed devices and the contours of co-channel and adjacent channel TV stations to specify separation distances

for HAAT ranging from less than three meters to a maximum of 250 meters. The Commission found that the Joint Petitioners' recommended separation distances are greater than necessary to provide the level of protection to TV services that the Commission decided to provide. It therefore modified the table as shown.

Antenna height above average terrain of unlicensed device	Required separation (km) from digital or analog TV (full service or low power) protected contour	
	Co-channel (km)	Adjacent channel (km)
Less than 3 meters	4.0	0.4
3–Less than 10 meters	7.3	0.7
10–Less than 30 meters	11.1	1.2
30–Less than 50 meters	14.3	1.8
50–Less than 75 meters	18.0	2.0
75–Less than 100 meters	21.1	2.1
100–Less than 150 meters	25.3	2.2
150–Less than 200 meters	28.5	2.3
200–250 meters	31.2	2.4

10. The methodology used by the Joint Petitioners to calculate the required separation distances between TV bands devices and co-channel and adjacent channel TV contours is generally consistent with the methodology described in the *Second Report and Order*. The Joint Petitioners calculated separation distances from fixed devices with an antenna HAAT of 30 meters and greater in the same manner as the Commission by using the F(50,10) propagation curves in the rules. The Joint Petitioners used the OET TM–91–1 method to calculate separation distances for fixed device antenna heights below 30 meters HAAT because the Commission's propagation curves are undefined for HAAT values below 30 meters. OET TM–91–1 is a model that the Commission uses for calculating signal levels at short distances and low antenna heights above ground. While the Commission used a different propagation model to calculate the separation distances at low antenna heights in the *Second Report and Order* (the Okumara model), it used the TM–91–1 model in the *Second Report and Order* to calculate the impact of personal/portable TV bands devices on TV reception at short distances, e.g., up to approximately 1.5 km. Based on its comparison of these models, the Commission found that TM–91–1 is appropriate for calculating signal levels at distances less than 1 km (as well as longer distances), whereas the Okumura model was not designed for use at

distances less than 1 km. Thus, the Commission agreed with the Joint Petitioners' suggestion to use the TM–91–1 model to calculate the required separation distances from TV bands devices at antenna heights below 30 meters HAAT where the Commission's propagation curves are undefined.

11. The Commission prohibited fixed devices with an HAAT greater than the current maximum of 106 meters from providing channel lists to Mode I personal/portable devices. This action was necessary because a Mode I device, which does not incorporate a geo-location capability, obtains a list of available channels from a fixed or Mode II device that is determined by the geographic coordinates of those devices. Under the 106 meter limitation, the communication distance between a Mode I device and the fixed or Mode II device that provides a channel list is relatively short, and thus there is a low probability that a Mode I device would operate at a location where its channel list is not valid, i.e., does not meet the minimum separation distances from co-channel and adjacent channels TV stations or other protected services. However, if the fixed device that obtains the channel list for a Mode I device operates with greater HAAT than the current rules permit, the Mode I device could operate at a greater distance from the coordinates of the fixed device where the available channel list was calculated. This will increase the chance that the Mode I device could

operate at a location where the channel list is not valid. The Commission therefore required that the TV bands database not provide channel lists for Mode I devices through fixed devices with an antenna HAAT of greater than 106 meters.

12. The Commission did not increase the minimum required separation of one kilometer between wireless microphones and fixed devices operating at a higher HAAT than the current rules allow, because the higher HAAT will not increase fixed device signal strength at a one kilometer distance. The OET TM–91–1 model that is used to calculate signal strength at the distance takes into account radiated power, separation distance, and the antenna height AGL, but is independent of the HAAT. Because the Commission did not increase the maximum fixed device antenna height AGL or radiated power, there will be no increase in signal level at one kilometer. The Commission also did not increase the size of the exclusion zones around receive sites for MVPDs, low power TV or BAS links, because it has no information demonstrating that the existing requirements are insufficient to provide adequate protection at the higher antenna HAAT that it is permitting for fixed devices.

Out-of-Band Emissions

13. In the *Second Report and Order*, the Commission adopted out-of-band emission limits for TV bands devices to protect other authorized services both

inside and outside the TV bands. For emissions that fall in a TV channel adjacent to the operating channel of a TV bands device, the Commission required that these emissions be at least 55 dB below the highest emission in the operating channel, with both the in-band and out-of-band emissions measured with a 100 kHz bandwidth. Emissions that are more than one channel removed from the operating channel must comply with the limits specified in § 15.209 of the rules. These field strength limits, measured at a distance of 3 meters, are 100 microvolts per meter (30–88 MHz), 150 microvolts per meter (88–216 MHz), 200 microvolts per meter (216–960 MHz), and 500 microvolts per meter (above 960 MHz).

14. In the *Second MO&O*, the Commission modified the limits for emissions that fall in TV channels adjacent to the operating channel. Specifically, it required that in-band emissions be measured within a 6 MHz bandwidth instead of within a 100 kHz bandwidth, and it revised the required level of attenuation from 55 dB to 72.8 dB to compensate for the difference in measurement bandwidths while providing the same level of interference protection. The Commission made these changes to ensure consistency in emission measurements, because the in-band power measured within a 100 kHz bandwidth could vary depending on the bandwidth of the transmitted signal, whereas the total power measured within a 6 MHz bandwidth will be the same regardless of whether the signal fills the entire channel or just part.

15. *Decision.* The Commission modified the rules for adjacent channel emission limits to specify fixed values, rather than vary the limit relative to the in-band power. Specifically, it adopted

a fixed adjacent channel emission limit for each category of TV bands device that is equivalent to the current emission limit for devices operating at maximum power. Devices operating at less than the maximum permitted power will not be required to suppress emissions below the fixed limits. This eliminates the need for a device operating at less than the maximum permitted power to unnecessarily suppress adjacent channel emissions below the levels needed to prevent interference to other services in the TV bands, thus simplifying equipment design and reducing its cost. A fixed emission limit also simplifies compliance measurements, because the emission level can be measured directly rather than by comparing the in-band and adjacent channel power measured in two different bandwidths.

16. The Commission calculated the appropriate fixed adjacent channel emission limits as follows. The current adjacent channel emission limit is – 72.8 dB in a 100 kHz bandwidth, measured relative to the total in-band power in a 6 MHz bandwidth. It defined a fixed adjacent channel emission limit for each of the four maximum power levels at which TV bands devices can operate (fixed: 1 Watt; personal/portable: 100 mW; personal/portable operating adjacent to occupied channels: 40 mW; and sensing-only devices: 50 mW). The adjacent channel emission limit for each category of device is simply the maximum power permitted in a 6 MHz bandwidth minus 72.8 dB. A table showing these limits is provided.

17. The Commission also slightly increased the maximum permissible PSD for each category of TV bands device to address the roll-off concern

raised by Spectrum Bridge. It established the PSD limits to prevent multiple TV bands devices with transmit bandwidths of much less than 6 MHz from sharing a channel, which could result in a total transmitted power within a channel significantly greater than the limits for individual fixed or personal/portable devices. These limits were derived using the assumption that the maximum permitted power of a TV bands device is spread uniformly across a 6 MHz channel. However, the Commission recognized that this assumption makes compliance with either the current or the modified adjacent channel emission limits it adopted impractical if a device operates at the maximum permissible power level. For a TV bands device to operate at the maximum permissible power, it must fill the entire 6 MHz channel, leaving no margin for a roll-off from the in-band signal to the much lower level it must meet in the adjacent channel. The Commission therefore increased the PSD limit for each category of TV bands device by 0.4 dB, which will allow a TV bands device to operate at the maximum permissible power in a bandwidth of 5.5 MHz instead of 6 MHz. This will allow 250 kHz for a roll-off from the in-band signal to each adjacent channel. The Commission did not adopt a 6 dB (4 times) increase in the PSD limit as Spectrum Bridge suggests, because that change would allow devices to operate at maximum power in a bandwidth of much less than 6 MHz, thus making it possible for multiple devices to share a channel with a total power greater than the limits currently allowed for an individual device.

18. The revised PSD and adjacent channel emission limits that the Commission adopted are as follows.

Type of TV bands device	Power limit (6 MHz)	PSD limit (100 kHz)	Adjacent channel limit (100 kHz)
Fixed	30 dBm (1 Watt)	12.6 dBm	– 42.8 dBm.
Personal/portable (adj. channel) ...	16 dBm (40 mW)	– 1.4 dBm	– 56.8 dBm.
Sensing only	17 dBm (50 mW)	– 0.4 dBm	– 55.8 dBm.
All other personal/portable	20 dBm (100 mW)	2.6 dBm	– 52.8 dBm.

19. In the Commission’s review of the PSD and adjacent channel emission issues, it discovered some minor inconsistencies and omissions in the rules concerning the measurement of emissions and corrected them herein. Specifically, § 15.709(c) does not specify whether compliance with the adjacent channel emission limits is determined through radiated or conducted measurements. In addition, § 15.709(a)(5) requires measurement of the power conducted from the TV bands

device into the antenna to determine compliance with the PSD limits. However, this is not possible for personal/portable devices which are required to have a permanently attached antenna. This section also does not include a requirement that fixed device PSD must be reduced in the same manner as the maximum conducted output power when the transmit antenna gain exceeds 6 dBi. Such a requirement is necessary to ensure that the PSD is proportionally reduced when

the maximum output power is reduced to prevent a device from transmitting in a bandwidth of much less than 5.5 MHz at the maximum permissible power level. To correct these omissions and inconsistencies, the Commission revised § 15.709(a) and (c) to specify that the PSD and adjacent channel emission limits are conducted power limits for fixed devices and EIRP (radiated) limits for personal/portable devices. It also required that the conducted PSD limit for fixed devices be reduced by one dB

for each dB that the maximum directional gain of the transmit antenna exceeds 6 dBi. These rule clarifications will not result in any increased compliance costs for equipment manufacturers.

20. The Commission declined to relax the out-of-band emission limit to the specific values requested by Motorola, the Joint Petitioners, and the Wi-Fi Alliance. As the Commission previously noted in the *Second MO&O*, adjacent channel emissions from a TV bands device appear as co-channel emissions in an adjacent channel used by a TV station or other authorized service, and interference can occur to TV reception at very low undesired co-channel signal levels. The Commission also noted that personal/portable TV bands devices are permitted to operate within the protected contours of adjacent channel TV stations, and fixed TV bands devices can operate as close as 0.1 kilometers outside the contours of adjacent channel stations and at significantly higher power than personal/portable TV bands devices. Thus, the Commission found it appropriate to require TV bands devices to meet tighter adjacent channel emission limits than other equipment such as Wi-Fi devices that do not typically operate adjacent to services that receive interference at the same low level as the broadcast TV service. The Commission noted that the relaxation of the limit requested by the petitioners is approximately 25 dB (316 times the power), which would be a very significant increase in adjacent channel power over the maximum the rules currently permit and would have the potential to cause interference to adjacent channel users in the TV bands.

21. The Commission found that increasing the minimum separation distances between TV bands devices and adjacent channel TV stations as a way to offset the increased interference potential would be effective only in protecting TV reception but not other services that operate in or adjacent to the TV bands. For example, registered wireless microphones and other low power auxiliary services authorized under part 74 would be impacted by the increased noise that TV bands devices would place in adjacent channels. This increased noise also could limit the use of personal/portable TV bands devices operating adjacent to fixed TV bands devices, thereby impairing efficient use of spectrum. Increasing the 1 kilometer protection distance around registered wireless microphones would be ineffective because registration provides only co-channel and not adjacent channel protection from TV bands devices. Further, the increased adjacent

channel emission levels could impact wireless services adjacent to the TV bands, such as those above channel 51 (the subject of another petition discussed in detail below), land mobile radio services on frequencies below channels 7 and 14, and the Low Power Radio Service above channel 13.

22. For the reasons stated, the Commission declined to relax the adjacent channel emission limits to prevent interference to authorized services in and adjacent to the TV bands. It concluded that its decision on this issue promotes more efficient use of the TV spectrum by both licensed and unlicensed devices. The Commission recognized the petitioners' argument that tighter emission limits could result in higher equipment costs. It found, however, that the record in this proceeding indicates that at least one equipment manufacturer, Adaptrum, is capable of building a prototype device that complies with the limits adopted in the *Second MO&O*. In addition, another manufacturer, Koos Technical Services, Inc., developed a device that complies with all the requirements for fixed TV bands, devices, including the adjacent channel emission limits, and became the first party to obtain certification for a TV bands device. Further, tighter out-of-band emission limits can allow users to operate in adjacent frequency bands with less geographic separation between them, thus enabling more efficient and intensive use of spectrum. Thus, the Commission concluded that the benefits of tighter out-of-band emission limits outweigh any increase in equipment cost that may be necessary to comply with these rules.

Protection of Wireless Services on Channel 52

23. Prior to the June 12, 2009 digital television transition, full-service TV stations were permitted to operate on channels 52–69 (698 MHz to 806 MHz, also referred to as the 700 MHz band). The Commission reallocated these channels for services other than broadcast television. Under the band plan that the Commission adopted, there are two channel groupings: (1) The lower 700 MHz band, consisting of channels 52–59, and (2) the upper 700 MHz band, consisting of channels 60–69. The lower 700 MHz band is divided into five blocks designated A through E, and the upper 700 MHz band is divided into four blocks designated A through D, with two additional bands allocated for public safety use. Block A in the lower 700 MHz band, which is the subject of Cellular South's petition for reconsideration in this proceeding, consists of TV channel 52 paired with

TV channel 57. This pairing of channels with a 30 MHz frequency separation between them is designed to allow the use of these channels for two-way wireless operations. Fixed base stations will transmit to mobile devices using channel 57, while mobile devices will transmit to base stations using channel 52. Therefore, base stations will incorporate receivers that receive signals from mobile devices on channel 52. The lower 700 MHz Block A was licensed through Commission Auction 73 in 2008. Cellular South is one of the entities that obtained licenses for Block A through this auction. It did not previously participate in this proceeding.

24. Prospective bidders were made aware prior to Auction 73 that there would continue to be full-service and low power television stations on channel 51 after the auction. The Public Notice describing this auction's procedures cautioned potential bidders about Commission rules and requirements that place limits on the ability of 700 MHz band licensees to use this spectrum. The Public Notice specifically pointed to § 27.60 of the rules that requires wireless licensees to protect co-channel and adjacent channel TV stations, including stations on channel 51. Thus, prospective bidders for Block A were given notice that there would be TV stations on adjacent channel 51, and the emission levels that a TV station may place in an adjacent channel are clearly specified in the Commission's rules. These limits permit TV stations to place significantly higher power in an adjacent channel than part 15 TV bands devices.

25. CTIA—the Wireless Association and the Rural Cellular Association filed a petition for rulemaking and a licensing freeze on March 15, 2011, requesting that the Commission take action to prevent further interference to Block A licensees. To permit the Commission to evaluate the matters raised in the petition, the Media Bureau placed a freeze on the filing of new applications and most applications for minor changes to low power and full power television stations on channel 51. The Commission took that action to preserve the status quo and to ensure that new applications are not filed in anticipation of the future limitations proposed in the petition. It has not yet taken any other action with respect to this petition.

26. *Decision.* The Commission declined to establish in this docket new requirements to protect wireless operations on channel 52. As an initial matter, it noted that Cellular South's petition on this issue was not timely filed. The Commission adopted rules

permitting TV band devices to operate on Channel 51 in its 2008 *Second Report and Order*. Pursuant to § 1.429(d) of the Commission's rules, the deadline for seeking reconsideration of that decision was 30 days after the summary of the *Second Report and Order* was published in the **Federal Register**. Cellular South filed its petition in January 2011, more than two years after the applicable due date.

27. As an independent and alternative basis, the Commission dismissed Cellular South's petition on this issue pursuant to § 1.429(b) of the Commission's rules, which precludes parties from relying on facts in petitions for reconsideration that were not presented to the Commission previously, unless those facts have changed or the party could not have known about those facts when it had an opportunity to comment. No party raised the issue of protection criteria for services on channel 52 in response to the *NPRM* or *FNPRM* in this proceeding or at any time prior to Cellular South's petition for reconsideration. The Commission was not persuaded that Cellular South could not previously participate in this proceeding. Cellular South purchased its licenses at auction in 2008, several months before the adoption of the *Second Report and Order*, and over two years before the adoption of the *Second MO&O*. Cellular South therefore had ample opportunity to make any concerns about potential interference from TV bands devices to wireless services in the lower 700 MHz Block A known to the Commission but failed to do so. While the Commission recognized Cellular South's argument that the final technical specifications for 700 MHz band equipment were not available until more recently, it did not find that a convincing explanation for not participating in the proceeding. If the precise technical parameters needed to perform an interference analysis are not known (*e.g.*, receiver bandwidth, noise floor, noise figure, antenna gain, and desired-to-undesired signal ratio), parties could make reasonable estimates of these parameters. Cellular South, however, did not provide any analysis or even express to the Commission any general concerns about possible interference prior to filing its petition for reconsideration.

28. As another independent and alternative basis for dismissing the petition on this issue, the Commission reached the merits and rule against Cellular South. The Commission found that there is no need to adopt new requirements as Cellular South requests because the current rules appropriately protect wireless operations on channel

52. The emission levels that a TV bands device may place in an adjacent channel are far below the levels that a full-service TV station on channel 51 may place in adjacent channel 52. Specifically, emissions from TV bands devices in the adjacent channel must be at least 72.8 dB below the level in the 6 MHz channel where the TV bands device operates. As discussed, the Commission modified the rules to specify maximum adjacent channel emission levels that provide this level of adjacent channel protection. For a personal/portable TV bands device operating on channel 51 at the maximum allowable power of 100 milliwatts EIRP, the maximum radiated emission in the adjacent channel would be -52.8 dBm EIRP or 132 microvolts per meter at a distance of three meters. This is below the § 15.209 out-of-band emission limit of 200 microvolts per meter at three meters that applies to most part 15 transmitters in this frequency band. In the case of fixed TV bands devices operating on channel 51 at the maximum EIRP of 4 watts, the maximum permitted emission in the adjacent channel is -36.8 dBm EIRP or 835 microvolts per meter at three meters. While this is greater than the § 15.209 limit, the Commission noted that this limit was developed with the assumption that there would be a 10 meter separation between a potentially interfering device and the device being protected. The Commission expects that there would typically be a much greater separation distance between a TV bands device and a wireless base station receiving channel 52, thus significantly reducing the signal level at the receiver and the likelihood of interference. Thus, the Commission found that there is a very low probability that TV bands devices on channel 51 will cause harmful interference to wireless services in the adjacent band. Because the Commission did not adopt here protection criteria between TV bands devices and Block A stations, it saw no reason to include 700 MHz Block A base stations in the TV bands databases.

29. While the part 15 rules are designed to minimize the likelihood of interference to authorized services, there is always the possibility that interference may occur in certain situations. Therefore TV bands devices, like all other part 15 devices, operate on a non-interference basis, meaning that in the event a device causes interference to an authorized service, the device must cease operation. Because fixed TV bands devices must be registered in the TV bands database, if a licensee of a wireless system were to receive

interference, it could check the database to find information on the interfering device. Also, as the Commission stated in the *Second Report and Order*, it intends to closely oversee the development and introduction of TV bands devices and take whatever actions may be necessary to correct any interference that may occur and will consider any rule changes that might be needed to better protect against harmful interference to incumbent services. Because TV bands devices operate under the control of a database that provides a list of available channels to the TV bands devices, in the event of harmful interference the Commission could take steps such as requesting the database operators to limit the use of certain TV channels in an area. Thus, the Commission found no need to adopt new protection requirements for wireless services on channel 52 at this time.

New Class of TV Bands Devices

30. As discussed, the rules that the Commission adopted in the *Second Report and Order* allow for two classes of TV bands devices—fixed and personal/portable. Fixed devices may operate at power levels up to 4 watts EIRP and must either incorporate a geo-location capability such as GPS or be professionally installed and have the devices' geographic coordinates manually entered by the installer. Personal/portable devices may operate with a power level up to 100 mW EIRP. Mode II personal/portable devices must incorporate a geo-location capability such as GPS to determine the geographic coordinates to within ± 50 meters. Both fixed and Mode II portable devices must access a database that provides a list of available channels at the devices' location. A Mode II portable device must re-check its location and the database for available channels if it changes location during operation. Mode I devices are not required to incorporate geo-location or database access capabilities, and they obtain a list of available channels on which they can operate from either a fixed or Mode II device that accesses a database. A portable device can operate in Mode II at locations where it can receive a geo-location signal, and in Mode I at locations where it cannot. Fixed devices may operate only on vacant TV channels that are not adjacent to occupied TV channels, while personal/portable devices may operate adjacent to occupied TV channels if their maximum EIRP is reduced to no more than 40 milliwatts.

31. In the *Second MO&O*, the Commission decided that a Mode II

device must use its geo-location capability to check its location at least once every 60 seconds while in operation to determine whether it has moved. In addition, the Commission required that a Mode II device check the database when it moves more than 100 meters from the location where it performed its last database check.

32. *Decision.* The Commission declined to establish a new class of fixed indoor devices as requested by the Wi-Fi Alliance. The Wi-Fi Alliance states that the devices of interest would be mass market Mode II personal/portable devices, thus indicating to us that they would be small and easily transportable. The Commission found that such devices would have a high potential for causing interference to authorized services in the TV bands if they did not incorporate a geo-location capability to accurately determine their location. The devices could easily be moved to a different location without updating the coordinates, where they would then receive an inaccurate list of available channels. In the absence of a geo-location capability, the coordinates would have to be manually entered into a device. In the case of mass market consumer devices, the Commission would not consider the consumer to be a professional installer. It expected that many consumers would lack knowledge or experience in determining and entering a device's coordinates and therefore would be likely to make more errors than a professional installer or, alternately, would be more likely to enter an improper set of coordinates. While the Commission denied the Wi-Fi Alliance's request to create a new category of TV bands device, it noted the current rules do in fact contain provisions that allow TV bands devices to operate without GPS under certain circumstances. Specifically, a personal/portable device can operate without GPS in Mode I if it communicates with either a fixed device or a Mode II personal/portable device that provides it with a list of available channels on which it can operate.

Confidentiality of Database Information

33. In the *Second MO&O*, the Commission decided that all information that is required by the Commission's rules to be in a TV bands database is to be publicly available, including fixed TV bands device registration and voluntarily submitted protected entity information, such as cable headends. The Commission noted that the registration of a protected entity in the database will preclude operation of TV bands devices on one or more channels over specific areas and that

there is the possibility of errors in the registration information. It further noted that while much of the data will come from Commission databases that already are public sources, errors could result from the inadvertent entry of incorrect data or as a result of a party deliberately entering false data. The Commission therefore found that it is appropriate to permit public examination of protected entity registration information to allow the detection and correction of errors.

34. *Decision.* The Commission declined to require that the geographic coordinates or other information concerning cable headends in the TV bands database be kept confidential. First, it noted that NCTA previously participated in this proceeding but never alleged prior to filing its petition that there is any need to keep information on cable headends confidential. The issue of public availability of database information was raised in the petitions for reconsideration of the *Second Report and Order* in this proceeding, and NCTA raised no concerns about the confidentiality of headend registrations in its response to these petitions. In any case, the Commission was not persuaded that making information about cable headends publicly available poses a security threat to communications infrastructure. Based on the documents referenced in NCTA's petition, virtually all communications facilities, including wireline, wireless, satellite, cable, and broadcasting facilities, could be classified as critical infrastructure. Information on a large number of these communications facilities is already publicly available through the Commission's databases, and there is no evidence that the public availability of this information has ever posed a threat to the security of communications infrastructure. Also, as NCTA and PISC note, information on the locations of cable headends is already publicly available from other sources, and the TV bands databases will only list those facilities that are outside the protected contours of the over-the-air TV stations being received and that the headend operator chooses to register.

35. While the Commission upheld its previous decision to make all information in the TV bands database publicly available, it noted that the *Second MO&O* did not include specific text to codify this decision. The Commission therefore added a new paragraph to § 15.715 of the rules to specify that database administrators must provide a means to allow public access to the information in the database. Such access will be limited to

the information that is required by the rules to be included in the databases and will not include any additional information that the database administrators may choose to collect. OET will advise the database administrators as necessary to implement this requirement. Codifying this rule does not impose any new costs or other burdens on database administrators because they were already required to provide the capability described.

Other Matters

36. OET designated ten parties as TV bands database administrators and requires them to attend workshops conducted by Commission staff. During the course of these workshops, the database administrators have noted that some rules require Commission interpretation and guidance to ensure that they are implemented consistently across all TV White Space databases. OET staff has provided guidance on how certain rules as written should be implemented by the database administrators. Information regarding these discussions, including any rule interpretations provided to the database administrators at these workshops, is posted on the Commission's Web site at <http://www.fcc.gov/encyclopedia/white-space-database-administration>. The Commission concluded that the rules should be modified to clearly state the requirements for protecting these services.

TV Translator, Low Power TV and Class A TV Station Receive Sites

37. The rules require that TV bands databases contain information on the location of receive sites for TV translator, low power TV, and Class A TV stations (collectively low power stations) and the channels of TV signals received for retransmission at such sites. The Commission's Consolidated Data Base System (CDBS) has the ability to store receive site information for low power stations, but the receive site information currently contained in the CDBS is incomplete or inaccurate and therefore not always reliable. For this reason, the Commission adopted rules that require low power stations to register their receive sites with the TV bands database administrators to obtain protection. Subsequent to the adoption of these rules, the Commission has become concerned that if it were to allow parties to register receive site information both in the TV bands database and the CDBS, there could be conflicts in the data between the CDBS and the database registrations due to data entry errors or updates to the

information in one database but not the other. The Commission therefore found it is necessary to provide for a single registry for low power station receive site information, and that registry is to be the CDBS. The Commission's staff has constructed a Web page interface that will allow licensees of low power stations to easily provide us with their correct receive channel information. The information collected through this Web page interface will be used to update the CDBS. The Commission will issue a public notice when the interface is available to the public and will provide instructions on how to access it.

38. In view of the Commission's decision to acquire and maintain all low power station receive site data by means of the new receive site update facility and the CDBS system, it no longer finds it necessary to require database administrators to provide a separate registration process for this information. In addition to relieving the database operators of a significant burden, this change will make the low power station receive site data in the CDBS more reliable and also avoid data conflicts between the CDBS and the database registration records. Accordingly, the Commission modified § 15.713(b)(2) of the rules to remove receive sites of TV translator, low power TV, and Class A TV stations from the list of facilities that are not contained in Commission databases and placing them in § 15.713(b)(1) in the list of facilities that are contained in Commission databases. The Commission also modified § 15.715(c) to remove TV translator receive sites as an example of facilities not contained in Commission databases. These rule changes are procedural in nature in that the Commission changed the manner in which low power TV receive site information is collected and placed in the TV bands databases, but not the protection afforded to receive sites. Thus, these changes do not require prior notice under the Administrative Procedure Act (APA).

Protection of Radio Astronomy

39. Section 15.712(h) of the rules prohibits the operation of TV bands devices within 2.4 kilometers of certain radio astronomy and other receive sites to prevent interference to operations at those locations. This rule section specifies the geographic coordinates of receive sites that were provided to the Commission by the National Telecommunications and Information Administration (NTIA) in 2005. NTIA recently discovered inaccuracies in the coordinates for several radio astronomy receive sites and filed a request with the Commission to correct these

inaccuracies. In particular, it provided corrected coordinates for the Arecibo Observatory in Puerto Rico and the Table Mountain receive site in Colorado. NTIA also requested that the Commission modify the receive site coordinates listed in § 15.712(h) to match those in footnote US388 to the Table of Frequency Allocations in § 2.106 of the rules because it determined that the coordinates in that footnote are correct. The Commission found that NTIA's requested changes to this section will ensure that radio astronomy and other receive sites are protected against interference from TV bands devices and therefore updated the rules to reflect the correct coordinates. In addition, the Commission noted that § 15.712(h)(1) lists the Naval Radio Research Observatory in Sugar Grove, West Virginia as a protected site but does not specify its geographic coordinates. The Commission therefore revised this section to add the coordinates of that observatory. These rule revisions do not require TV bands devices to protect any additional radio astronomy sites or increase the size of the protected zones around them; they merely provide more precise geographic coordinates for the sites that TV bands devices were already required to protect. The Commission found that these changes are insignificant in nature and impact, and inconsequential to the industry and the public. Thus, these rule changes do not require prior notice under the APA.

Final Regulatory Flexibility Analysis

40. As required by the Regulatory Flexibility Act (RFA),¹ an Initial Regulatory Flexibility Analysis (IRFA) was incorporated in the *Notice of Proposed Rule Making (NPRM)* in ET Docket No. 04–186,² and an additional IRFA was incorporated in the *First Report and Order and Further Notice of Proposed Rule Making (FNPRM)* in ET Docket No. 04–186.³ The Commission sought written public comment on the proposals in the *NPRM* and in the *FNPRM*, including comment on the IRFAs. No comments were received in response to either IRFA. This present Final Regulatory Flexibility Analysis (FRFA) conforms to the RFA.⁴

¹ See 5 U.S.C. 603. The RFA, see 5 U.S.C. 601–612, has been amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA), Public Law 104–121, Title II, 110 Stat. 857 (1996), and the Small Business Jobs Act of 2010, Public Law 111–240, 124 Stat. 2504 (2010).

² *NPRM*, 19 FCC Rcd at 10018, 10048 (2004).

³ *FNPRM*, 21 FCC Rcd 12266, 12299 (2006).

⁴ See 5 U.S.C. 604.

A. Need for, and Objectives of, the Third Memorandum Opinion and Order

41. This Third Memorandum Opinion and Order responds to five petitions for reconsideration that were filed in response to the *Second Memorandum Opinion and Order* (“*Second MO&O*”) in this proceeding.⁵ It eliminates the 76 meter limitation on the height above average terrain of the sites where fixed TV bands devices may operate and increases the maximum permitted antenna height above average terrain from 106 meters to 250 meters. The Third Memorandum Opinion and Order also replaces the current relative limit with a fixed limit for TV bands device emissions that fall in the 6 MHz channels adjacent to the operating channel. Devices operating at the maximum permitted power must suppress adjacent channel emissions to the same level that the current rules require, but devices operating at less than the maximum power do not have to suppress emissions below this level. However, the Third Memorandum Opinion and Order upholds the majority of the Commission's prior decisions permitting unlicensed broadband operations in the TV bands while making certain other minor changes and refinements to the rules for TV band devices. The Commission believes that these changes and clarifications to the rules will better ensure that licensed services are protected from interference while retaining flexibility for unlicensed devices to share spectrum with new services or to change frequencies if TV spectrum is reallocated for other purposes.

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

42. There were no public 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

43. 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 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.

⁵ See *Second Memorandum Opinion and Order* in ET Docket No. 04–186, 25 FCC Rcd 18661 (2010).

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

44. 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 rules adopted herein.⁶ The RFA generally defines the term "small entity" as having the same meaning as the terms "small business," "small organization," and "small governmental jurisdiction."⁷ In addition, the term "small business" has the same meaning as the term "small business concern" under the Small Business Act.⁸ 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 Small Business Administration (SBA).⁹

45. *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.^{FN1} 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."¹⁰ In this category, the SBA has deemed a business manufacturing radio and television broadcasting equipment, wireless telecommunications equipment, or both, to be small if it has fewer than 750 employees.¹¹ For this category of manufacturing, Census data for 2007 show that there were 919 firms that operated that year. Of those establishments, 531 had between 1 and 19 employees; 240 had between 20 and 99 employees; and 148 had more than

100 employees.¹² Since 771 establishments had fewer than 100 employees, and since only 148 had more than 100 employees, the vast majority of manufacturers in this category would be considered small under applicable standards.

46. *Wireless Telecommunications Carriers (except satellite).* Since 2007, the Census Bureau has placed wireless firms within this new, broad, economic census category.¹³ Under the present and prior categories, the SBA has deemed a wireless business to be small if it has 1,500 or fewer employees.¹⁴ For this category, census data for 2007 show that there were 1,383 firms that operated for the entire year.¹⁵ Of this total, 1,368 firms had employment of 999 or fewer employees and 15 had employment of 1000 employees or more.¹⁶ Similarly, according to Commission data, 413 carriers reported that they were engaged in the provision of wireless telephony, including cellular service, Personal Communications Service (PCS), and Specialized Mobile Radio (SMR) Telephony services.¹⁷ Of these, an estimated 261 have 1,500 or fewer employees and 152 have more than 1,500 employees.¹⁸ 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

47. TV bands devices are required to be authorized under the Commission's certification procedure as a prerequisite to marketing and importation, and the Third Memorandum Opinion and Order makes no change to that requirement. However, it makes certain changes to the technical requirements for TV bands devices, which are discussed.

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

48. The RFA requires an agency to describe any significant alternatives that it has considered in developing its 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 and reporting requirements under the rule for such 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 such small entities."¹⁹

49. While the Third Memorandum Opinion and Order generally upholds the rules adopted in the *Second Memorandum Opinion and Order*, the Commission made certain changes to those rules. It believed those changes and clarifications would provide for improved protection of licensed services in the TV bands, resolve certain uncertainties in the rules, and provide manufacturers with greater flexibility in designing products to meet market demands.

50. The Commission eliminated the prohibition on fixed TV bands device operation at sites where the ground elevation is more than 76 meters above the average elevation of the surrounding terrain, while maintaining the current antenna height above ground limit of 30 meters. In place of the site elevation limit, the Commission adopted a requirement that a fixed device may operate with an antenna height above average terrain of up to 250 meters, which is an increase from the current antenna height above average terrain limit of 106 meters (30 meters antenna height above ground plus 76 meters site above average terrain). Under the new rule, a fixed TV bands device could operate from a site with an elevation of up to 220 meters above average terrain using an antenna height above ground of 30 meters, resulting in an antenna height above average terrain of 250 meters. In reaching this decision, the Commission considered the competing views from various parties on whether the ground elevation limit unnecessarily restricts the locations where fixed TV bands devices can operate and whether an increase in the maximum antenna height above ground and average terrain can allow greater coverage by fixed TV bands devices without causing

⁶ 5 U.S.C. 604(a)(3).

⁷ 5 U.S.C. 601(6).

⁸ 5 U.S.C. 601(3) (incorporating by reference the definition of "small-business concern" in the Small Business Act, 15 U.S.C. 632). Pursuant to 5 U.S.C. 601(3), 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*."

⁹ 15 U.S.C. 632.

¹⁰ U.S. Census Bureau, 2002 NAICS Definitions, "334220 Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing"; <http://www.census.gov/epcd/naics02/def/NDEF334.HTM#N3342>.

¹¹ See 13 CFR 121.201, NAICS code 334220.

¹² http://factfinder.census.gov/servlet/IBQTable?_bm=y&-geo_id=&-skip=300&-ds_name=EC073111&-lang=en.

¹³ U.S. Census Bureau, 2007 NAICS Definitions, "517210 Wireless Telecommunications Categories (Except Satellite)"; <http://www.census.gov/naics/2007/def/ND517210.HTM#N517210>.

¹⁴ 13 CFR 121.201, NAICS code 517210.

¹⁵ U.S. Census Bureau, Subject Series: Information, Table 5, "Establishment and Firm Size: Employment Size of Firms for the United States: 2007 NAICS Code 517210" (issued Nov. 2010).

¹⁶ *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 "100 employees or more."

¹⁷ See *Trends in Telephone Service* at Table 5.3.

¹⁸ See *id.*

¹⁹ 5 U.S.C. 603(c)(1) through (4).

interference to authorized users of the TV bands. The Commission believes that the changes it adopted will allow for increased availability of wireless broadband services in rural and underserved areas while protecting television and other services that operate in the TV bands.

51. The Commission made certain changes to the technical requirements for TV bands devices. Specifically, it modified the limits for emissions that fall in TV channels adjacent to those where a TV bands device operates by specifying limits that are at fixed levels, rather than relative to the in-band power. This change simplifies compliance measurements, because it will no longer be necessary to compare the in-band and adjacent channel power, which had to be measured with two different bandwidths under the previous rules. Instead, compliance can be determined by directly measuring the adjacent channel power in a specified bandwidth for comparison to the limit. The rule changes that the Commission adopted also eliminate the need for devices operating at less than the maximum permitted power to suppress adjacent channel emissions to levels below those needed to prevent interference to other services in the TV bands. In reaching its decision to modify the adjacent channel emission limits, the Commission considered and rejected requests for a greater relaxation of the limit. The Commission found that the adopted limits are necessary to prevent interference to authorized services in and adjacent to the TV bands and to allow more efficient use of the TV spectrum by both licensed and unlicensed devices. The Commission recognized petitioners' arguments that tighter emission limits can result in higher equipment costs. However, the record indicated that at least one equipment manufacturer is capable of complying with the limits adopted in the *Second Memorandum Opinion and Order*.²⁰ The Commission noted that tighter out-of-band emission limits can allow users to operate in adjacent frequency bands with less geographic separation between them, thus enabling more efficient and intensive use of spectrum. Thus, it found that the benefits of tighter out-of-band emission limits outweigh the increase in equipment cost necessary to comply with the limits.

G. Report to Congress

52. The Commission will send a copy of the Third Memorandum Opinion and Order, including this FRFA, in a report

to Congress and the Government Accountability Office pursuant to the Congressional Review Act.²¹

Ordering Clauses

53. Pursuant to the authority contained in sections 4(i), 302, 303(e), 303(f), and 307 of the Communications Act of 1934, as amended, 47 U.S.C. 154(i), 302, 303(c), 303(f), and 307 this Third Memorandum Opinion and Order is hereby adopted.

54. Pursuant to sections 4(i), 302, 303(e) 303(f), 303(g), 303(r), and 405 of the Communications Act of 1934, as amended, 47 U.S.C. 154(i), 302, 303(e), 303(f), 303(g), 303(r), and 405, the petitions for reconsideration addressed herein are granted to the extent discussed and the remainder of requests in the petitions for reconsideration are denied.

55. Part 15 of the Commission's rules is amended, and such rule amendments shall be effective June 18, 2012.

56. The Commission's Consumer and Governmental Affairs Bureau, Reference Information Center, shall send a copy of the Third Memorandum Opinion and Order, including the Final Regulatory Flexibility Analysis, to the Chief Counsel for Advocacy of the U.S. Small Business Administration.

List of Subjects in 47 CFR Part 15

Communications equipment, Radio.

Federal Communications Commission.

Marlene H. Dortch,
Secretary.

For the reasons discussed in the preamble, the Federal Communications Commission amends 47 CFR part 15 as follows:

PART 15—RADIO FREQUENCY DEVICES

- 1. The authority citation for part 15 continues to read as follows:

Authority: 47 U.S.C. 154, 302a, 303, 304, 307, 336, and 544a.

- 2. Section 15.709 is amended by revising paragraphs (a)(5), (b)(2), (c)(1) and (c)(2) to read as follows:

§ 15.709 General technical requirements.

(a) * * *
(5) The power spectral density from the TVBD shall not be greater than the following values when measured in any 100 kHz band during any time interval of continuous transmission.

(i) Fixed devices: 12.6 dBm conducted power. If transmitting antennas of directional gain greater than 6 dBi are used, this conducted power level shall

be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(ii) Personal/portable device operating adjacent to occupied TV channels: -1.4 dBm EIRP.

(iii) Sensing-only devices: -0.4 dBm EIRP.

(iv) All other personal/portable devices: 2.6 dBm EIRP.

* * * * *

(b) * * *

(2) The transmit antenna used with fixed devices may not be more than 30 meters above the ground. In addition, fixed devices may not be located at sites where the antenna height above average terrain is more than 250 meters. The HAAT is to be calculated by the TV bands database that the device contacts for available channels using computational software employing the methodology in § 73.684(d) of this chapter.

* * * * *

(c) * * *

(1) In the television channels immediately adjacent to the channel in which the TVBD is operating, emissions from the TVBD shall not exceed the following levels.

(i) Fixed devices: -42.8 dBm conducted power.

(ii) Personal/portable device operating adjacent to occupied TV channels: -56.8 dBm EIRP.

(iii) Sensing-only devices: -55.8 dBm EIRP.

(iv) All other personal/portable devices: -52.8 dBm EIRP.

(2) Emission measurements in the adjacent channels shall be performed using a minimum resolution bandwidth of 100 kHz with an average detector. A narrower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 100 kHz.

* * * * *

- 3. Section 15.711 is amended by revising paragraph (b)(3)(iv) to read as follows:

§ 15.711 Interference avoidance methods.

* * * * *

(b) * * *

(3) * * *

(iv)(A) A Mode I personal/portable TVBD may only transmit upon receiving a list of available channels from a fixed or Mode II TVBD. A fixed or Mode II device may provide a Mode I device with a list of available channels only after it contacts its database, provides the database the FCC Identifier (FCC ID) of the Mode I device requesting available channels, and receives

²⁰ See *Adaptum ex parte* dated March 8, 2011.

²¹ See 5 U.S.C. 801(a)(1)(A).

verification that the FCC ID is valid for operation.

(B) A Mode II device must provide a list of channels to the Mode I device that is the same as the list of channels available to the Mode II device.

(C) A fixed device may provide a list of available channels to a Mode I device only if the fixed device HAAT as verified by the TV bands database does not exceed 106 meters. The fixed device must provide a list of available channels to the Mode I device that is the same as the list of channels available to the fixed device, except that a Mode I device may operate only on those channels that are permissible for its use under § 15.707. A fixed device may also obtain from a database a separate list of available channels that includes adjacent channels that would be available to a Mode I personal/portable device and provide that list to the Mode I device.

(D) To initiate contact with a fixed or Mode II device, a Mode I device may transmit on an available channel used by the fixed or Mode II TVBD or on a channel the fixed or Mode II TVBD

indicates is available for use by a Mode I device on a signal seeking such contacts. At least once every 60 seconds, except when in sleep mode, *i.e.*, a mode in which the device is inactive but is not powered-down, a Mode I device must either receive a contact verification signal from the Mode II or fixed device that provided its current list of available channels or contact a Mode II or fixed device to re-verify/re-establish channel availability. A Mode I device must cease operation immediately if it does not receive a contact verification signal or is not able to re-establish a list of available channels through contact with a fixed or Mode II device on this schedule. In addition, a Mode II device must re-check/re-establish contact with a fixed or Mode II device to obtain a list of available channels if it loses power. Collaterally, if a Mode II device loses power and obtains a new channel list, it must signal all Mode I devices it is serving to acquire and use a new channel list.

* * * * *

■ 4. Section 15.712 is amended by revising paragraph (a)(2), adding paragraph (a)(3) and revising paragraph (h) to read as follows:

§ 15.712 Interference protection requirements.

* * * * *

(a) * * *

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

Antenna height above average terrain of unlicensed device	Required separation (km) from digital or analog TV (full service or low power) protected contour	
	Co-channel (km)	Adjacent channel (km)
Less than 3 meters	4.0	0.4
3–Less than 10 meters	7.3	0.7
10–Less than 30 meters	11.1	1.2
30–Less than 50 meters	14.3	1.8
50–Less than 75 meters	18.0	2.0
75–Less than 100 meters	21.1	2.1
100–Less than 150 meters	25.3	2.2
150–Less than 200 meters	28.5	2.3
200–250 meters	31.2	2.4

(3) The antenna height above ground for a fixed TVBD may not exceed 30 meters.

* * * * *

(h) * * *

(1) The Naval Radio Research Observatory in Sugar Grove, West Virginia at 38 30 58 N and 79 16 48 W.

(2) The Table Mountain Radio Receiving Zone (TMRZ) at 40 08 02 N and 105 14 40 W.

(3) The following facilities:

Observatory	Latitude (deg/min/sec)	Longitude (deg/min/sec)
Allen Telescope Array	40 49 04 N	121 28 24 W
Arecibo Observatory	18 20 37 N	066 45 11 W
Green Bank Telescope (GBT)	38 25 59 N	079 50 23 W
Very Large Array (VLA)	Rectangle between latitudes 33 58 22 N and 34 14 56 N, and longitudes 107 24 40 W and 107 48 22 W	
Very Long Baseline Array (VLBA) Stations:		
Pie Town, NM	34 18 04 N	108 07 09 W
Kitt Peak, AZ	31 57 23 N	111 36 45 W
Los Alamos, NM	35 46 30 N	106 14 44 W

Observatory	Latitude (deg/min/sec)	Longitude (deg/min/sec)
Ft. Davis, TX	30 38 06 N	103 56 41 W
N. Liberty, IA	41 46 17 N	091 34 27 W
Brewster, WA	48 07 52 N	119 41 00 W
Owens Valley, CA	37 13 54 N	118 16 37 W
St. Croix, VI	17 45 24 N	064 35 01 W
Hancock, NH	42 56 01 N	071 59 12 W
Mauna Kea, HI	19 48 05 N	155 27 20 W

■ 5. Section 15.713 is amended by adding paragraphs (b)(1)(ix) through (xi), removing paragraphs (b)(2)(ii) through (iv), redesignating paragraphs (b)(2)(v) through (vi) as paragraphs (b)(2)(ii) and (iii), and revising paragraph (e)(6) to read as follows:

§ 15.713 TV bands database.

* * * * *

(b) * * *

(1) * * *

(ix) Class A television station receive sites.

(x) Low power television station receive sites.

(xi) Television translator station receive sites.

* * * * *

(e) * * *

(6) A fixed device with an antenna height above ground that exceeds 30 meters or an antenna height above average terrain (HAAT) that exceeds 250 meters shall not be provided a list of available channels. The HAAT is to be calculated using computational software employing the methodology in § 73.684(d) of this chapter.

* * * * *

■ 6. Section 15.715 is amended by revising paragraph (c) and adding paragraph (m) to read as follows:

§ 15.715 TV bands database administrator.

* * * * *

(c) Establish a process for registering fixed TVBDs and registering and including in the database facilities entitled to protection but not contained in a Commission database, including MVPD receive sites.

* * * * *

(m) Provide a means to make all information the rules require the database to contain publicly available, including fixed TVBD registrations and voluntarily submitted protected entity information.