

is also concerned about delays in developing a standard and requests that manufacturers be permitted to specify their own transmitter identification signal.<sup>307</sup> It believes that the current rule creates an incentive for delaying the market adoption of TV bands devices through the standardization process and violates the Administrative Procedure Act by delegating the Commission's powers to a non-government group.<sup>308</sup> NCTA objects to removing the requirement that fixed devices emit standardized identifying information, stating that the absence of that identifier this would make it even more difficult to diagnose white space interference problems.<sup>309</sup> MSTV/NAB believes that adding a requirement that devices operating in Mode I transmit a unique identifier could reduce the risk of interference by creating a mechanism to assist in locating devices that are not operating properly.<sup>310</sup>

144. *Decision.* We affirm our decision to require fixed TV bands devices to transmit an identification signal to identify the specific device and its location. We concluded previously that an identification signal will provide a useful means to help locate a specific device in the event that it causes interference. Although we have not specified the type of information that should be transmitted, we anticipate that, because fixed devices also have to register in the TV bands database, the transmitted identification information will be correlated, perhaps identical, with the database information to facilitate the location of a specific device.

145. We recognize the concerns of Motorola and Adaptrum about possible delays in development of a standard for the identification signal. Although our rules require that the signal conform to a standard established by a "recognized industry standards setting organization,"<sup>311</sup> we do not specify beyond this general criterion the type of organization that could develop such a standard, nor limit the number of organizations that might participate in the development of the standard. If necessary, we will work with industry groups to ensure development of a standard in a timely fashion. Accordingly, we anticipate that the development of a standard, at worst, will result in relatively little delay in the entry into the market of new TV bands devices. This slight potential downside is more than outweighed by the benefits of standardizing the delivery of the identification information.

146. Adaptrum is mistaken in asserting that the Commission's reliance on a non-governmental group for developing a standard for the identification signal constitutes an improper delegation of authority. The Commission established minimum requirements for the identification information in the *Second Report and Order*, and it retained authority to determine whether fixed TV bands device operators comply with this requirement. The referral to an industry standards-setting organization in the *Second Report and Order* of the task to develop a standard for the identification signal only involves issues related to the details of the identifying information to be transmitted, such as format. To the extent the standard fails to facilitate the intended use of the identification information that the device operators are required to provide, the Commission can easily address this failing by revisiting the sufficiency of the device operators' compliance with the underlying identification requirements and the framework for ensuring such compliance. Under these circumstances, the Commission's instruction that the device operators conform their identification signals to an industry standard established by a non-governmental standards-setting group does not come close to crossing the line drawn by the courts against improper delegations of agency authority.<sup>312</sup>

<sup>307</sup> See Adaptrum petition at 8.

<sup>308</sup> *Id.* at 7.

<sup>309</sup> See NCTA opposition at 12.

<sup>310</sup> See NAB/MSTV opposition at 16. We note that NAB/MSTV did not file a petition for reconsideration; nonetheless, we address this issue to provide a complete record.

<sup>311</sup> 47 C.F.R. § 15.711(e).

<sup>312</sup> See *Fund for Animals v. Kempthorne*, 538 F.3d 124, 133 (D.C. Cir., 2008), quoting *U.S. Telecommunications Ass'n v. FCC*, 359 F.3d 554, 567 (D.C. Cir., 2004), cert. denied, 543 U.S. 925 (2004); *Nat'l Park & Conservation*

147. We decline to require that personal/portable devices operating in Mode I transmit an identification signal. Personal/portable devices operate at lower power than fixed devices and have a lower interference potential so there is less need for them to transmit identification information. Also, a personal/portable device operating in Mode I will not “know,” and therefore cannot transmit, its geographic coordinates, making an identification signal from such a device significantly less useful.

### 3. Professional Installation

148. The geographic coordinates of a fixed TV bands device are to be determined by either an incorporated geo-location capability or a professional installer.<sup>313</sup> In the case of professional installation, the party who registers the device in the database will be responsible for assuring the accuracy of the entered coordinates.

149. *Petitions and Replies.* PISC argues that the Commission should not create a category of professional installer for equipment.<sup>314</sup> Rudman/Ericksen claim that because the Commission did not define professionally installed, it now needs to issue a Further Notice of Proposed Rule Making to define it.<sup>315</sup>

150. *Decision.* We see no need to modify the rules concerning the requirements for professional installation. The rules provide professional installation as an alternative to including a geo-location capability in the devices, and the intended purpose is to ensure that the geographic coordinates are correctly ascertained. We generally intend that a “professional installer” mean an entity consisting of an individual or team of individuals with experience in installing radio communications equipment and that provides service on a fee basis – such an individual or team can generally be expected to be capable of ascertaining the geographic coordinates of a site and entering them into the device for communication to a database. The task of ascertaining geographic coordinates and entering them into a device is not particularly difficult or complex and we therefore do not believe it is necessary to define the qualifications of a professional installer in the rules. In this context, we find it adequate to simply provide that a professional installer may be responsible for assuring the accuracy of the entered coordinates. Further, the rules already recognize professional installation for certain categories of Part 15 transmitters,<sup>316</sup> and if professional installation is deemed appropriate for a device, the grant of certification is conditioned accordingly.

### 4. Section 301 Licensing

151. *Petitions and Replies.* SBE argues that Section 301 of the Communications Act requires licensing for any apparatus that transmits enough energy to have a significant potential for causing interference.<sup>317</sup> It claims that the rules do not protect Part 74 licensed facilities against interference from Part 15 device and that this is arbitrary, capricious and beyond the Commission's authority under Section 301.<sup>318</sup> Rudman/Ericksen argue that Section 15.5(c) of the rules should be amended to allow private legal

(...continued from previous page)

*Ass'n. v. Stanton*, 54 F.Supp. 7, 19 (D.D.C. 1999) (An agency delegates its authority when it shifts to another party almost the entire determination of whether a statutory requirement has been satisfied, or where it abdicates its final reviewing authority.)

<sup>313</sup> 47 C.F.R. § 15.711(b)(1).

<sup>314</sup> See PISC petition at 27.

<sup>315</sup> See Rudman/Ericksen petition at 10.

<sup>316</sup> 47 C.F.R. §§ 15.203 and 15.212.

<sup>317</sup> See SBE opposition at 9.

<sup>318</sup> *Id.* at 11.

action against TV bands device users that cause interference.<sup>319</sup>

152. *Decision.* In this Order above, we considered and rejected SBE's contention that the rules that the Commission adopted in the *Second Report and Order* do not provide adequate protection against interference.<sup>320</sup> Accordingly, we need not address SBE's assertion that Section 301 of the Act requires licensing in this case.<sup>321</sup> In addition, we decline to modify our rules to provide a private right of action if interference occurs. The Commission's statutory authority and its rules provide for a range of enforcement actions that could be relied upon to eliminate and prevent interference.

### 5. Radio Astronomy

153. In the *Second Report and Order*, the Commission prohibited both fixed and personal/portable TV bands devices from operating on any channel within 2.4 kilometers (1.5 miles) of certain radio astronomy receive sites, including the Very Large Array (VLA) observatory located approximately 50 miles west of Socorro, New Mexico.<sup>322</sup> This observatory consists of 27 moveable antennas laid out in a Y-shaped configuration. The Commission's rules list the coordinates of the center of the array, but each segment of the array is 13 miles long, so the protection zone of 2.4 kilometers around the center point does not encompass large portions of the array.<sup>323</sup> The National Telecommunications and Information Administration (NTIA) requests that we change the protected coordinates from a single point to a rectangular area that encompasses the entire VLA.<sup>324</sup> To ensure that this facility is protected from interference from TV bands devices, we are adopting the change requested by NTIA. The rectangular area recommended by NTIA is approximately 19 miles by 22.5 miles, but because the observatory is in a generally unpopulated area, this change will affect few potential users of TV bands devices.

### 6. Other Rule Clarifications

154. Upon review of the rules adopted in the *Second Report and Order*, we discovered a number of minor inconsistencies between the text of the *Second Report and Order* and the rules. In addition, we noted a number of cases where we believe it is appropriate to clarify the rules, consistent with the *Second Report and Order*. Because these changes are not substantive, we may make them on our own motion without prior notice and comment.<sup>325</sup> A summary of the changes is provided below.

- Changes to definitions:

<sup>319</sup> See Rudman/Ericksen petition at 14.

<sup>320</sup> See paras. 19-22, *supra*.

<sup>321</sup> See also Amendment of Part 15 of the Commission's Rules to Allow Certification of Equipment in the 24.05-24.25 GHz Band at Field Strengths Up to 2500 mV/m, *Memorandum Opinion and Order*, 18 FCC Rcd 15944, 15948 ¶ 11 (2003). In that Order, the Commission adopted rules allowing unlicensed operation of certain transmitters under certain conditions. A party filing a petition for reconsideration claimed that the Commission's rules failed to provide adequate protection against interference to other licensed operations, and therefore the transmitters at issues were required to be licensed under Section 301. The Commission found that the petitioner failed to demonstrate that the rules might permit harmful interference, and concluded therefore that it need not reach the petitioner's Section 301 argument.

<sup>322</sup> See *Second Report and Order* 23 FCC Rcd 16861 (2008) at ¶156.

<sup>323</sup> See 47 C.F.R. § 15.712(h)(3).

<sup>324</sup> See NTIA letter dated August 4, 2009.

<sup>325</sup> See 5 U.S.C. § 553(b)(3)(B).

- We are correcting an erroneous cross-reference in the definition of available channel and removing text that is not necessary as part of this definition; we are also clarifying the definition of a television channel.
  - We are removing the specific definitions of client mode, client device, master mode and master device and revising the text of other portions of the TV white space rules to reflect these changes.
  - We are incorporating the concepts of master and client in the definitions of fixed, Mode I and Mode II personal/portable devices.
  - We are indicating that a TV receive site may be used to provide signals to a Multiple Video Program Distributor (MVPD) and making minor wording edits to the definition of receive site.
  - We are indicating in the definition of TV bands devices that they operate on an unlicensed basis.
  - We are indicating that TV bands device databases used by TV bands devices to obtain lists of available channels must be authorized by the Commission.
- Clarifications of the requirements for Mode I TV bands devices.
    - We are specifying that the list of channels provided to a Mode I device must be the same as the list of channels that are available to the fixed or Mode II device that provides the list.
    - We are clarifying that a Mode I device may operate only on channels that are permissible for its use, even if there are available channels outside the permitted range for Mode I devices, *e.g.*, channels below 21, where only fixed devices may operate.
    - We are clarifying that a fixed device or a Mode II device has the option to provide a supplemental list of available channels to Mode I devices (*i.e.*, a list of available channels in addition to the list of channels available to the fixed or Mode II device) that includes channels that are adjacent occupied TV channels and therefore not available to the fixed or Mode II device.

#### IV. PROCEDURAL MATTERS

##### A. Final Regulatory Flexibility Analysis

155. The Final Regulatory Flexibility Analysis, required by the Regulatory Flexibility Act, *see* 5 U.S.C. § 604, is contained in Appendix C.

##### B. Final Paperwork Reduction Act of 1995 Analysis

156. This Second Memorandum Opinion and Order contains new or modified information collections subject to the Paperwork Reduction Act of 1995 (PRA) and will be submitted to the Office of Management and Budget (OMB) for review under Section 3507(d) of the PRA, Public Law 104-13. A modification is required to the Form 731 (OMB 3060-0057). OMB, the general public, and other Federal agencies are invited to comment on the new or modified information collection requirements contained in this proceeding. In addition, we note that pursuant to the Small Business Paperwork Relief Act of 2002, Public Law 107-198, *see* 44 U.S.C. 3506(c)(4), we previously sought specific comment on how the Commission might further reduce the information collection burden for small business concerns with fewer than 25 employees.

##### C. Contact Persons

157. For additional information concerning this Second Memorandum Opinion and Order, please contact Mr. Hugh L. Van Tnyl at (202) 418-7506 or Mr. Alan Stillwell at (202) 418-2925, or via the Internet at [Hugh.VanTnyl@fcc.gov](mailto:Hugh.VanTnyl@fcc.gov) or [Alan.Stillwell@fcc.gov](mailto:Alan.Stillwell@fcc.gov).

#### V. ORDERING CLAUSES

158. Accordingly, **IT IS ORDERED** that, 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 USC Sections 154(i), 302, 303(e), 303(f), and 307 this Second Memorandum Opinion and Order **IS HEREBY ADOPTED**.

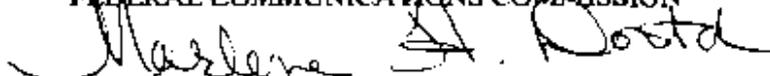
159. **IT IS FURTHER ORDERED** that, pursuant to Sections 4(i), 302, 303(e) 303(f), 303(g), 303(r) and 405 of the Communications Act of 1934, as amended, 47 U.S.C. §§ 154(i), 302, 303(e), 303(f), 303(g), 303(r) and 405, the petitions for reconsideration addressed herein **ARE GRANTED** to the extent discussed above and the remainder of requests in the petitions for reconsideration **ARE DENIED** as discussed above.

160. **IT IS FURTHER ORDERED** that Part 15 of the Commission's rules **IS AMENDED** as specified in Appendix B, and such rule amendments shall be **EFFECTIVE** 30 days after the date of publication in the Federal Register, except for Sections 15.713, 15.714, 15.715 and 15.717, which contain new information collection requirements that require approval by the Office of Management and Budget (OMB) under the PRA. The Federal Communications Commission will publish a document in the Federal Register announcing such approval and the relevant effective date.

161. **IT IS FURTHER ORDERED** that, 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 remainder of requests in the petitions for reconsideration addressed herein **ARE DENIED**.

162. **IT IS FURTHER ORDERED** that the Commission's Consumer and Governmental Affairs Bureau, Reference Information Center, **SHALL SEND** a copy of the Second Memorandum Opinion and Order, including the Final Regulatory Flexibility Analysis, to the Chief Counsel for Advocacy of the U.S. Small Business Administration.

FEDERAL COMMUNICATIONS COMMISSION

  
Marlene H. Dortch  
Secretary

## APPENDIX A

## Parties Filing Petitions

**Petitions for Reconsideration**

1. Adaptrum, Inc.
2. Cohen, Dippell and Everist, P.C.
3. Community Broadcasters Association
4. Dell, Inc. and Microsoft Corp.
5. DIRECTV and DISH Network
6. FiberTower, Sprint Nextel, COMPTTEL, and RTG
7. IEEE 802 Local and Metropolitan Area Networks Standards Committee
8. Key Bridge Global, LLC
9. Motorola, Inc.
10. National Cable and Telecommunications Association
11. Public Interest Spectrum Coalition
12. Richard A. Rudman
13. Shure Incorporated
14. Society of Broadcast Engineers, Inc.
15. Tribal Digital Village
16. Wi-Fi Alliance
17. Wireless Internet Service Providers Association

**Oppositions to Petitions for Reconsideration**

1. APCO
2. Carlson Wireless Technologies, Inc.
3. Coalition of Wireless Microphone Users
4. Community Broadcasters Association
5. County of Los Angeles
6. Dell, Inc. and Microsoft Corp.
7. DIRECTV, Inc.
8. Federation of Internet Solution Providers of the Americas
9. Google, Inc.
10. Key Bridge Global, LLC
11. Land Mobile Communications Council
12. Motorola, Inc.
13. The Association for Maximum Service Television and the National Association of Broadcasters (MSTV/NAB)
14. National Cable and Telecommunications Association
15. Public Interest Spectrum Coalition
16. Sennheiser Electronic Corporation
17. Shure Incorporated
18. Society of Broadcast Engineers, Inc.
19. Wi-Fi Alliance
20. Wireless Internet Service Providers Association

**Replies to Oppositions to Petitions for Reconsideration**

1. Coalition of Wireless Microphone Users
2. Cohen, Dippell and Everist, P.C.
3. Dell, Inc. and Microsoft Corp.
4. FiberTower Corp., the Rural Telecommunications Group, Inc., COMPTTEL and Sprint Nextel Corp.

5. Google, Inc.
6. Key Bridge Global, LLC
7. MSTV/NAB
8. National Cable and Telecommunications Association
9. Shure Incorporated
10. Society of Broadcast Engineers, Inc.
11. Wireless Internet Service Providers Association

## APPENDIX B

## Final Rules

Parts 0 and 15 of Title 47 of the Code of Federal Regulations is amended as follows:

## PART 0 COMMISSION ORGANIZATION

1. The authority citation for Part 0 continues to read as follows:

AUTHORITY: Secs. 5, 48 Stat. 1068, as amended; 47 U.S.C. 155

2. Section 0.241 is amended by re-designating the existing paragraph (h) as paragraph (i) and adding new paragraph (h) to read as follows:

**§ 0.241 Authority delegated.**

\*\*\*\*\*

(h) The Chief of the Office of Engineering and Technology is delegated authority to administer the database functions for unlicensed devices operating in the television broadcast bands (TV bands) as set forth in Subpart H of Part 15 of this chapter. The Chief is delegated authority to develop specific methods that will be used to designate TV bands database managers, to designate these database managers; to develop procedures that these database managers will use to ensure compliance with the requirements for database operations; to make determinations regarding the continued acceptability of individual database managers; and to perform other functions as needed for the administration of the TV bands databases. The Chief is also delegated authority jointly with the Chief of the Wireless Telecommunications Bureau to administer provisions of § 15.713(h)(8) of this chapter pertaining to the registration of event sites where large numbers of wireless microphones that operate on frequencies specified in § 74.802 of this chapter are used.

3. Section 0.331 is amended by revising the introductory paragraph and adding new paragraph (e) to read as follows:

**§ 0.241 Authority delegated.**

The Chief, Wireless Telecommunications Bureau, is hereby delegated authority to perform all functions of the Bureau, described in § 0.131, subject to the exceptions and limitations in paragraphs (a) through (d), and also the functions described in paragraph (e).

\*\*\*\*\*

(e) The Chief of the Wireless Telecommunications Bureau is delegated authority jointly with the Chief of the Office of Engineering and Technology to administer provisions of § 15.713(h)(8) of this chapter pertaining to the registration of event sites where large numbers of wireless microphones that operate on frequencies specified in Section 74.802 of this chapter are used.

## PART 15 RADIO FREQUENCY DEVICES

4. The authority citation for Part 15 continues to read as follows:

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

5. Section 15.701 is revised to read as follows:

**§ 15.701 Scope.**

This subpart sets forth the regulations for unlicensed Television Band Devices (TVBDs). These devices are unlicensed intentional radiators that operate on available TV channels in the broadcast television frequency bands at 54-60 MHz (TV channel 2), 76-88 MHz (TV channels 5 and 6), 174-216 MHz (TV channels 7-13), 470-608 MHz (TV channels 14-36) and 614-698 MHz (TV channels 38-51).

6. Section 15.703 is revised to read as follows:

**§ 15.703 Definitions.**

(a) *Available channel.* A six-megahertz television channel, as specified in § 73.603 of this chapter, which is not being used by an authorized service at or near the same geographic location as the TVBD and is acceptable for use by an unlicensed device under the provisions of this subpart.

(b) *Contact verification signal.* An encoded signal broadcast by a fixed or Mode II device for reception by Mode I devices to which the fixed or Mode II device has provided a list of available channels for operation. Such signal is for the purpose of establishing that the Mode I device is still within the reception range of the fixed or Mode II device for purposes of validating the list of available channels used by the Mode I device and shall be encoded to ensure that the signal originates from the device that provided the list of available channels. A Mode I device may respond only to a contact verification signal from the fixed or Mode II device that provided the list of available channels on which it operates. A fixed or Mode II device shall provide the information needed by a Mode I device to decode the contact verification signal at the same time it provides the list of available channels.

(c) *Fixed device.* A TVBD that transmits and/or receives radiocommunication signals at a specified fixed location. A fixed TVBD may select channels for operation itself from a list of available channels provided by a TV bands database, initiate and operate a network by sending enabling signals to one or more fixed TVBDs and/or personal/portable TVBDs. Fixed devices may provide to a Mode I personal/portable device a list of available channels on which the Mode I device may operate under the rules, including available channels above 512 MHz (above TV channel 20) on which the fixed TVBD also may operate and a supplemental list of available channels above 512 MHz (above TV channel 20) that are adjacent to occupied TV channels on which the Mode I device, but not the fixed device, may operate.

(d) *Geo-location capability.* The capability of a TVBD to determine its geographic coordinates within the level of accuracy specified in section 15.711(b)(1), i.e. 50 meters. This capability is used with a TV bands database approved by the FCC to determine the availability of TV channels at a TVBD's location.

(e) *Mode I personal/portable device.* A personal/portable TVBD that does not use an internal geo-location capability and access to a TV bands database to obtain a list of available channels. A Mode I device must obtain a list of available channels on which it may operate from either a fixed TVBD or Mode II personal/portable TVBD. A Mode I device may not initiate a network of fixed and/or personal/portable TVBDs nor may it provide a list of available channels to another Mode I device for operation by such device.

(f) *Mode II personal/portable device.* A personal/portable TVBD that uses an internal geo-location capability and access to a TV bands database, either through a direct connection to the Internet or through an indirect connection to the Internet by way of fixed TVBD or another Mode II TVBD, to obtain a list of available channels. A Mode II device may select a channel itself and initiate and operate as part of a network of TVBDs, transmitting to and receiving from one or more fixed TVBDs or personal/portable TVBDs. A Mode II personal/portable device may provide its list of available channels to a Mode I personal/portable device for operation on by the Mode I device.

- (g) *Network initiation*. The process by which a fixed or Mode II TVBD sends control signals to one or more fixed TVBDs or personal/portable TVBDs and allows them to begin communications.
- (h) *Operating channel*. An available channel used by a TVBD for transmission and/or reception.
- (i) *Personal/portable device*. A TVBD that transmits and/or receives radiocommunication signals at unspecified locations that may change. Personal/portable devices may only transmit on available channels in the frequency bands 512-608 MHz (TV channels 21-36) and 614-698 MHz (TV channels 38-51).
- (j) *Receive site*. The location where the signal of a full service television station is received for rebroadcast by a television translator or low power TV station, including a Class A TV station, or for distribution by a Multiple Video Program Distributor (MVPD) as defined in 47 U.S.C. 602(13).
- (k) *Sensing only device*. A personal/portable TVBD that uses spectrum sensing to determine a list of available channels. Sensing only devices may transmit on any available channels in the frequency bands 512-608 MHz (TV channels 21-36) and 614-698 MHz (TV channels 38-51).
- (l) *Spectrum sensing*. A process whereby a TVBD monitors a television channel to detect whether the channel is occupied by a radio signal or signals from authorized services.
- (m) *Television band device (TVBD)*. Intentional radiators that operate on an unlicensed basis on available channels in the broadcast television frequency bands at 54-60 MHz (TV channel 2), 76-88 MHz (TV channels 5 and 6), 174-216 MHz (TV channels 7-13), 470-608 MHz (TV channels 14-36) and 614-698 MHz (TV channels 38-51).
- (n) *TV bands database*. A database system that maintains records of all authorized services in the TV frequency bands, is capable of determining the available channels as a specific geographic location and provides lists of available channels to TVBDs that have been certified under the Commission's equipment authorization procedures. TV bands databases that provide lists of available channels to TVBDs must receive approval by the Commission.

7. Section 15.706 is amended by revising paragraphs (a), (b), (c), (c)(1), (c)(2), and (c)(3) to read as follows:

**15.706 Information to the user.**

- (a) In addition to the labeling requirements contained in § 15.19, the instructions furnished to the user of a TVBD shall include the following statement, placed in a prominent location in the text of the manual:

This equipment has been tested and found to comply with the rules for TV band devices, pursuant to Part 15 of the FCC Rules. These rules are designed to provide reasonable protection against harmful interference. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

1. Reorient or relocate the receiving antenna.
2. Increase the separation between the equipment and receiver.

3. Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
4. Consult the manufacturer, dealer or an experienced radio/ TV technician for help.

\* \* \* \* \*

5. Section 15.707 is amended by revising paragraphs (a), (b), (c) and (d) to read as follows:

**§ 15.707 Permissible channels of operation.**

(a) All TVBDs are permitted to operate available channels in the frequency bands 512-608 MHz (TV channels 21-36) and 614-698 MHz (TV channels 38-51), subject to the interference protection requirements in §§ 15.711 and 15.712, except that operation of TVBDs is prohibited on the first channel above and the first channel below TV channel 37 (608-614 MHz) that are available, *i.e.*, not occupied by an authorized service. If a channel is not available both above and below channel 37, operation is prohibited on the first two channels nearest to channel 37. These channels will be identified and protected in the TV bands database(s).

(b) Operation on available channels in the bands 54-60 MHz (TV channel 2), 76-88 MHz (TV channels 5 and 6), 174-216 MHz (TV channels 7-13) and 470-512 MHz (TV channels 14-20), subject to the interference protection requirements in §§ 15.711 and 15.712, is permitted only for fixed TVBDs that communicate only with other fixed TVBDs.

(c) Fixed and Mode II TVBDs shall operate only on available channels as identified in paragraphs (a) and (b) of this section and as determined by a TV bands database in accordance with the interference avoidance mechanisms of §§ 15.711 and 15.712.

(d) Mode I TVBDs shall operate only on available channels as identified in paragraphs (a) and (b) of this section and provided from a fixed or Mode II TVBD in accordance with § 15.711(b)(3)(iv).

6. Section 15.709 is amended by adding new paragraphs (a)(5) and (a)(6) and modifying paragraphs (a)(1), (a)(2), (a)(3), (b), and (c) to read as follows:

**§ 15.709 General technical requirements.**

*(a) Power limits for TVBDs.*

(1) For fixed TVBDs, the maximum power delivered to the transmitting antenna shall not exceed one watt; this maximum applies regardless of the number of TV channels on which the device operates. The power delivered to the transmitting antenna is the maximum conducted output power reduced by the signal loss experienced in the cable used to connect the transmitter to the transmit antenna. If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(2) For personal/portable TVBDs, the maximum EIRP shall not exceed 100 milliwatts (20 dBm) with the following exceptions; Mode II personal/portable TVBDs that do not meet the adjacent channel separation requirements in § 15.712(a) and Mode I personal/portable TVBDs that operate on available channels (provided by a Mode II TVBD) that do not meet the adjacent channel separation requirements of § 15.712(a) are limited to a maximum EIRP of 40 milliwatts (16 dBm). These maximum power levels apply regardless of the number of TV channels on which the device operates.

(3) TVBDs shall incorporate transmit power control to limit their operating power to the minimum necessary for successful communication. Applicants for equipment certification shall include a description of a device's transmit power control feature mechanism.

(4) Maximum conducted output power is the total transmit power over the occupied bandwidth delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the

transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

(5) The power spectral density conducted from the TVBD to the antenna 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: 12.2 dBm

(ii) Personal/portable devices operating adjacent to occupied TV channels: -1.8 dBm

(iii) Sensing-only devices: -0.8 dBm

(iii) All other personal/portable devices: 2.2 dBm

(6) TVBDs shall incorporate adequate security measures to prevent the TVBD from accessing databases not approved by the FCC and to ensure that unauthorized parties can not modify the TVBD or configure its control features to operate inconsistent with the rules and protection criteria set forth in this subpart.

*(b) Antenna requirements.*

(1) All transmit and receive antenna(s) of personal/portable devices shall be permanently attached.

(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 height above average terrain (HAAT) at ground level is more than 76 meters. The ground level HAAT is to be calculated by the TV bands database that the device contacts for available channels using computational software employing the methodology in section 73.684(d) of this chapter. (3) For personal/portable TVBDs operating under § 15.717, the provisions of § 15.204(c)(4) do not apply to an antenna used for transmission and reception/spectrum sensing.

(4) For personal/portable TVBDs operating under § 15.717 that incorporate a separate sensing antenna, compliance testing shall be performed using the lowest gain antenna for each type of antenna to be certified.

*(c) Emission limits for TVBDs.*

(1) In the television channels immediately adjacent to the channel in which a TVBD is operating, emissions from the TVBD shall be at least 72.8 dB below the highest average power in the TV channel in which the device is operating.

(2) Emission measurements in the channel of operation shall be performed using a resolution bandwidth of 6 megahertz with an average detector. 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) At frequencies beyond the television channels immediately adjacent to the channel in which the TVBD is operating, the radiated emissions from TVBDs shall meet the requirements of § 15.209.

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7. Section 15.711 is amended by revising the section heading and introductory text and by revising paragraphs (a) through (f) to read as follows:

**§ 15.711 Interference avoidance methods.**

Except as provided in § 15.717, television channel availability for a TVBD is determined based on the geo-location and database access method described in paragraphs (a) and (b) of this section.

*(a) Geo-location and database access.* A TVBD shall rely on the geo-location and database access mechanism to identify available television channels consistent with the interference protection

requirements of § 15.712. Such protection will be provided for the following authorized and unlicensed services: digital television stations, digital and analog Class A, low power, translator and booster stations; translator receive operations; fixed broadcast auxiliary service links; private land mobile service/commercial radio service (PLMRS/CMRS) operations; offshore radiotelephone service; low power auxiliary services authorized pursuant to §§ 74.801-74.882 of this chapter, including wireless microphones and MVPD receive sites; and unlicensed wireless microphones used by venues of large events and productions/shows as provided under section 15.713(h)(8). In addition, protection shall be provided in border areas near Canada and Mexico in accordance with § 15.712(g).

(b) *Geo-location and database access requirements.*

(1) The geographic coordinates of a fixed TVBD shall be determined to an accuracy of +/- 50 meters by either an incorporated geo-location capability or a professional installer. In the case of professional installation, the party who registers the fixed TVBD in the database will be responsible for assuring the accuracy of the entered coordinates. The geographic coordinates of a fixed TVBD shall be determined at the time of installation and first activation from a power-off condition, and this information may be stored internally in the TVBD. If the fixed TVBD is moved to another location or if its stored coordinates become altered, the operator shall re-establish the device's:

(i) Geographic location and store this information in the TVBD either by means of the device's incorporated geo-location capability or through the services of a professional installer; and

(ii) Registration with the database based on the device's new coordinates.

(2) A Mode II personal/portable device shall incorporate a geo-location capability to determine its geographic coordinates to an accuracy of +/- 50 meters. A Mode II device must also re-establish its position each time it is activated from a power-off condition and use its geo-location capability to check its location at least once every 60 seconds while in operation, except while in sleep mode, i.e., in a mode in which the device is inactive but is not powered-down.

(3)(i) Fixed devices must access a TV bands database over the Internet to determine the TV channels that are available at their geographic coordinates, taking into consideration the fixed device's antenna height, prior to their initial service transmission at a given location. Operation is permitted only on channels that are indicated in the database as being available for such TVBDs. Fixed TVBDs shall access the database at least once a day to verify that the operating channels continue to remain available. Operation on a channel must cease immediately if the database indicates that the channel is no longer available. Fixed TVBD must adjust their use of channels in accordance with channel availability schedule information provided by their database for the 48 hour period beginning at the time of the device last accessed the database for a list of available channels.

(ii) Mode II personal/portable devices must access a TV bands database over the Internet to determine the TV channels that are available at their geographic coordinates prior to their initial service transmission at a given location. Operation is permitted only on channels that are indicated in the database as being available for personal/portable TVBDs. A Mode II personal/portable device must access the database for a list of available channels each time it is activated from a power-off condition and re-check its location and the database for available channels if it changes location during operation by more than 100 meters from the location at which it last accessed the database. A Mode II personal/portable device that has been in a powered state shall re-check its location and access the database daily to verify that the operating channel(s) continue to be available. Mode II personal/portable devices must adjust their use of channels in accordance with channel availability schedule information provided by their database for the 48 hour period beginning at the time of the device last accessed the database for a list of available channels. A Mode II personal/portable device may load channel availability information for multiple locations around, i.e., in the vicinity of, its current location and use that information in its operation. A Mode II TVBD may use such available channel information to define a geographic area within which it can operate on the same available channels at all locations, for example a Mode II TVBD could calculate a bounded area in which a channel or channels are available at all locations within the area and operate on a mobile basis within that area. A Mode II TVBD using such channel availability information for multiple locations must contact the database again if/when it moves beyond the boundary of the area where the channel

availability data is valid, and must access the database daily even if it has not moved beyond that range to verify that the operating channel(s) continue to be available. Operation must cease immediately if the database indicates that the channel is no longer available.

(iii) If a fixed or Mode II personal/portable TVBD fails to successfully contact the TV bands database during any given day, it may continue to operate until 11:59 PM of the following day at which time it must cease operations until it re-establishes contact with the TV bands database and re-verifies its list of available channels.

(iv) A Mode I personal/portable TVBD may only transmit upon receiving a list of available channels from a fixed or Mode II TVBD that has contacted a database and verified that the FCC identifier (FCC ID) of the Mode I device is valid. The list of channels provided to the Mode I device must be the same as the list of channels that are available to the fixed or Mode II device, except that a Mode I device may operate only on 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. 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 verification that the FCC ID is valid for operation. 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/reestablish contact with a fixed or Mode II device to obtain a list of available channels if they lose 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 new channel list.

(v) Device manufacturers and database administrators may implement a system that pushes updated channel availability information from the database to TVBDs. However, the use of such systems is not mandatory, and the requirements for TVBDs to validate the operating channel at least daily and to cease operation in accordance with paragraph (b)(3)(iii) of this section continue to apply if such a system is used.

(vi) TV band devices shall incorporate adequate security measures to ensure that they are capable of communicating for purposes of obtaining lists of available channels only with databases operated by administrators authorized by the Commission, and to ensure that communications between TV band devices and databases between TV band devices are secure to prevent corruption or unauthorized interception of data. This requirement includes implementing security for communications between Mode I personal portable devices and fixed or Mode II devices for purposes of providing lists of available channels.

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(c) *Display of available channels.* A TVBD must incorporate the capability to display a list of identified available channels and its operating channels.

(d) *Identifying information.* Fixed TVBDs shall transmit identifying information. The identification signal must conform to a standard established by a recognized industry standards setting organization. The identification signal shall carry sufficient information to identify the device and its geographic coordinates.

(e) *Fixed devices without a direct connection to the internet.* If a fixed TVBD does not have a direct connection to the Internet and has not yet been initialized and registered with the TV bands database consistent with § 15.713, but can receive the transmissions of another fixed TVBD, the fixed TVBD needing initialization may transmit to that other fixed TVBD on either a channel that the other TVBD has transmitted on or on a channel which the other TVBD indicates is available for use to access the database to register its location and receive a list of channels that are available for it to use. Subsequently, the newly registered TVBD must only use the television channels that the database indicates are available for it to use. A fixed device may not obtain lists of available channels from another fixed device as provided by a TV bands database for such other device, *i.e.*, a fixed device may not simply operate on the list of available channels provided by a TV bands database for another fixed device with which it communicates but must contact a database to obtain a list of available channels on which it may operate.

(f) *Security.*

(i) For purposes of obtaining a list of available channels and related matters, fixed and Mode II TVBDs shall only be capable of contacting databases operated by FCC designated administrators.

(ii) Communications between TV bands devices and TV bands databases are to be transmitted using secure methods that ensure against corruption or unauthorized modification of the data; this requirement applies to communications of channel availability and other spectrum access information between fixed and Mode II devices (it is not necessary for TVBDs to apply security coding to channel availability and channel access information where they are not the originating or terminating device and that they simply pass through).

(iii) Communications between a Mode I device and a fixed or Mode II device for purposes of obtaining a list of available channels shall employ secure methods that ensure against corruption or unauthorized modification of the data. When a Mode I device makes a request to a fixed or Mode II device for a list of available channels the receiving device shall check with TV bands database that the Mode I device has a valid FCC Identified before providing a list of available channels. Contact verification signals transmitted for Mode I devices are to be encoded with encryption to secure the identity of the transmitting device. Mode I devices using contact verification signals shall accept as valid for authorization only the signals of the device from which they obtained their list of available channels.

(iv) A TV bands database shall be protected from unauthorized data input or alteration of stored data. To provide this protection, the administrator of the TV bands database administrator shall establish communications authentication procedures that allow the fixed or Mode II devices to be assured that the data they receive is from an authorized source.

(v) Applications for certification of TV bands devices are to include a high level operational description of the technologies and measures that are incorporated in the device to comply with the security requirements of this section. In addition, applications for certification of fixed and Mode II devices are to identify at least one of the TV bands databases operated by a designated TV bands database administrator that the device will access for channel availability and affirm that the device will conform to the communications security methods used by that database.

\* \* \* \* \*

8. Section 15.712 is amended by revising paragraphs a(1), a(2), (b), (d), (f), (g) and (h)(3) to read as follows:

**§ 15.712 Interference protection requirements.**

(a) \* \* \*

(1) *Protected contour.* TVBDs must protect digital and analog TV services within the contours shown in the following table. These contours are calculated using the methodology in § 73.684 of this chapter and the R-6602 curves contained in § 73.699 of this chapter.

Type of station	Protected contour		
	Channel	Contour (dBu)	Propagation curve
Analog: Class A TV, LPTV, translator and booster	Low VHF (2-6)	47	F(50,50)
	High VHF (7-13)	56	F(50,50)
	UHF (14-69)	64	F(50,50)
Digital: Full service TV, Class A TV, LPTV, translator and booster	Low VHF (2-6)	28	F(50,90)
	High VHF (7-13)	36	F(50,90)
	UHF (14-51)	41	F(50,90)

(2) Required separation distance. TVBDs must be located outside the contours indicated in paragraph (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, 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 of Unlicensed Device	Required Separation (km) From Digital or Analog TV (Full Service or Low Power) Protected Contour	
	Co-channel	Adjacent Channel
Less than 3 meters	6.0 km	0.1 km
3 - Less than 10 meters	8.0 km	0.1 km
10 - 30 meters	14.4 km	0.74 km

(b) *TV translator and Multi-channel Video Programming Distributor (MVPD) receive sites.* MVPD and TV translator receive sites located outside the protected contour of the TV station(s) being received may be registered in the TV bands database if they are no farther than 80 km outside the nearest edge of the relevant contour(s). Only channels received over the air and used by the MVPD or TV translator may be registered. TVBDs may not operate within an arc of +/-30 degrees from a line between the registered receive site and the contour of the TV station being received in the direction of the station's transmitter at a distance of up to 80 km from the edge of the protected contour of the received TV station for co-channel operation and up to 20 km from the edge of the protected contour of the received TV station for adjacent channel operation, except that the protection distance shall not exceed the distance from the receive site to the protected contour. Outside of this +/-30 degree arc, TVBDs may not operate within 8 km from the receive site for co-channel operation and 2 km from the receive site for adjacent channel operation.

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(d) *PLMRS/CMRS operations:* TVBDs may not operate at distances less than 134 km for co-channel operations and 131 km for adjacent channel operations from the coordinates of the metropolitan areas and on the channels listed in § 90.303(a) of this chapter. For PLMRS/CMRS operations authorized by waiver outside of the metropolitan areas listed in § 90.303(a) of this chapter, co-channel and adjacent channel TVBDs may not operate closer than 54 km and 51 km, respectively from a base station.

(f) *Low power auxiliary services, including wireless microphones:*

(1) Fixed TVBDs are not permitted to operate within 1 km, and personal/portable TVBDs will not be permitted to operate within 400 meters, of the coordinates of registered low power auxiliary station sites on the registered channels during the designated times they are used by low power auxiliary stations.

(2) TVBDs are not permitted to operate on the first channel on each side of TV channel 37 (608-614 MHz) that is not occupied by a licensed service.

(g) *Border areas near Canada and Mexico:* Fixed and personal/portable TVBDs shall comply with the required separation distances in §15.712(a)(2) from the protected contours of TV stations in Canada and Mexico. TVBDs are not required to comply with these separation distances from portions of the protected contours of Canadian or Mexican TV stations that fall within the United States.

(h) *Radio astronomy services:* Operation of fixed and personal/portable TVBDs is prohibited on all channels within 2.4 kilometers at the following locations.

(1) \* \* \*

(2) \* \* \*

(3) The following facilities.

Observatory	Longitude (Deg/Min/Sec)	Latitude (Deg/Min/Sec)
Allen Telescope Array	121 28 24 W	40 49 04 N
Arecibo Observatory	066 45 11 W	18 20 46 N
Green Bank Telescope (GBT)	079 50 24 W	38 25 59 N
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		
Pir Town, AZ	108 07 07 W	34 18 04 N
Kiti Peak, AZ	111 36 42 W	31 57 22 N
Los Alamos, NM	106 14 42 W	35 46 30 N
Ft. Davis, TX	103 56 39 W	30 38 06 N
N. Liberty, IA	091 34 26 W	41 46 17 N
Brewster, WA	119 40 55 W	48 07 53 N
Owens Valley, CA	118 16 34 W	37 13 54 N
St. Croix, VI	064 35 03 W	17 45 31 N
Hancock, NH	071 59 12 W	42 56 01 N
Mauna Kea, HI	155 27 29 W	19 48 16 N

9. Section 15.713 is amended by revising paragraphs (a)(1), (c)(2), (d), (e), (f)(3), (h)(1), (h)(6), (h)(7) and (h)(8) and adding new paragraph (j) to read as follows:

§ 15.713 TV bands database.

(a) \* \* \*

(1) To determine and provide to a TVBD, upon request, the available TV channels at the TVBD's location. Available channels are determined based on the interference protection requirements in § 15.712. A database must provide fixed and Mode II personal portable TVBDs with channel availability information that includes scheduled changes in channel availability over the course of the 48 hour period beginning at the time the TVBDs make a re-check contact. In making lists of available channels available to a TVBD, the TV bands database shall ensure that all communications and interactions between the TV bands database and the TVBD include adequate security measures such that unauthorized parties cannot access or alter the TV bands database or the list of available channels sent to TVBDs or otherwise affect the database system or TVBDs in performing their intended functions or in providing adequate interference protections to authorized services operating in the TV bands. In addition, a TV bands

database must also verify that the FCC identifier (FCC ID) of a device seeking access to its services is valid; under this requirement the TV bands database must also verify that the FCC ID of a Mode I device provided by a fixed or Mode II device is valid. A list of devices with valid FCC IDs and the FCC IDs of those devices is to be obtained from the Commission's Equipment Authorization System.

\* \* \* \* \*

(c) \* \* \*

(1) \* \* \*

(2) MVPD receive sites within the protected contour of a television station are not eligible to register that station's channel in the database.

(d) *Determination of available channels.* The TV bands database will determine the available channels at a location using the interference protection requirements of § 15.712, the location information supplied by a TVBD, and the data for protected stations/locations in the database.

(e) *TVBD initialization.*

(1) Fixed and Mode II TVBDs must provide their location and required identifying information to the TV bands database in accordance with the provisions of this subpart.

(2) Fixed and Mode II TVBDs shall not transmit unless they receive, from the TV bands database, a list of available channels and may only transmit on the available channels on the list provided by the database.

(3) Fixed TVBDs register and receive a list of available channels from the database by connecting to the internet, either directly or through another fixed TVBD that has a direct connection to the Internet.

(4) Mode II TVBDs receive a list of available channels from the database by connecting to the internet, either directly or through a fixed or Mode II TVBD that has a direct connection to the Internet.

(5) A fixed or Mode II TVBD that provides a list of available channels to a Mode I device shall notify the database of the FCC identifier of such Mode I device and receive verification that that FCC identifier is valid before providing the list of available channels to the Mode I device.

(6) A fixed device located at a site where the ground level height above average terrain (HAAT) is greater than 76 meters shall not be provided a list of available channels. The ground level HAAT of sites occupied by fixed TVBDs is to be calculated using computational software employing the methodology in section 73.684(d) of this chapter.

(f) \* \* \*

(1) \* \* \*

(2) \* \* \*

(3) The TVBD registration database shall contain the following information for fixed TVBDs:

(i) FCC identifier (FCC ID) of the device

(ii) manufacturer's serial number of the device

(iii) device's geographic coordinates (latitude and longitude (NAD 83) accurate to +/- 50 m)

(iv) device's antenna height above ground level

(v) name of the individual or business that owns the device

(vi) name of a contact person responsible for the device's operation

(vii) address for the contact person

(viii) e-mail address for the contact person

(ix) phone number for the contact person.

\* \* \* \* \*

(h) *TV bands database information.* The TV bands database shall contain the listed information for each of the following:

(1) Digital television stations, digital and analog Class A, low power, translator and booster stations, including stations in Canada and Mexico that are within the border coordination areas as specified in § 73.1630 of this chapter (a TV bands database is to include only TV station information from station license or license application records. In cases where a station has records for both a license application and a license, a TV bands database should include the information from the license application rather than the license. In cases where there are multiple license application records or license records for the same station, the database is to include the most recent records, and again with license applications taking precedence over licenses.):

- (i) transmitter coordinates (latitude and longitude in NAD 83)
- (ii) effective radiated power (ERP)
- (iii) height above average terrain of the transmitting antenna (HAAT)
- (iv) horizontal transmit antenna pattern (if the antenna is directional)
- (v) amount of electrical and mechanical beam tilt (degrees depression below horizontal) and orientation of mechanical beam tilt (degrees azimuth clockwise from true north)
- (vi) channel number
- (vii) station call sign

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(6) MVPD receive sites. Registration for receive sites is limited to channels that are received over-the-air and are used as part of the MVPD service.

- (i) name and address of MVPD company
- (ii) location of the MVPD receive site (latitude and longitude in NAD 83, accurate to +/- 50 m)
- (iii) channel number of each television channel received, subject to the following condition: channels for which the MVPD receive site is located within the protected contour of that channel's transmitting station are not eligible for registration in the database
- (iv) call sign of each television channel received and eligible for registration
- (v) location (latitude and longitude) of the transmitter of each television channel received

(7) Television translator, low power TV and Class A TV station receive sites. Registration for television translator, low power TV and Class A receive sites is limited to channels that are received over-the-air and are used as part of the station's service.

- (i) call sign of the TV translator station
- (ii) location of the TV translator receive site (latitude and longitude in NAD 83, accurate to +/- 50 m)
- (iii) channel number of the re-transmitted television station, subject to the following condition: a channel for which the television translator receive site is located within the protected contour of that channel's transmitting station is not eligible for registration in the database
- (iv) call sign of the retransmitted television station
- (v) location (latitude and longitude) of the transmitter of the retransmitted television station

(8) Licensed low power auxiliary stations, including wireless microphones and wireless assist video devices, and venues of events and productions/shows that use large numbers of wireless microphones on either a licensed or unlicensed basis that cannot be accommodated in the two reserved channels and other channels that are not available for use by TVBDs at that location. Sites of licensed stations and eligible venues of large events with significant wireless microphone use at well defined times and locations may be registered in the database. Entities responsible for eligible event venues registering their site with a TV bands data base are required to first make use of the two reserved channels and other channels that are not available for use by TVBDs at that location. As a benchmark, at least 6 - 8 wireless microphones should be operating in each channel used at such venues. Multiple registrations that specify more than one point in the facility may be entered for very large sites. Registrations will be valid for no more than one year, after which they may be renewed. Sites of licensed low power auxiliary stations may be registered with a designated TV bands device database administrator. Sites of eligible event venues using unlicensed wireless microphones must be registered with the Commission at least 30 days in advance and the Commission will provide this information to the data base managers. Parties responsible for eligible

event venues filing registration requests must certify that they are making use of all TV channels not available to TV bands devices and on which wireless microphones can practically be used, including channels 7-51 (except channel 37). The Commission will make requests for registration of sites that use unlicensed wireless microphones public and will provide an opportunity for public comment or objections. The Commission will take actions against parties that file inaccurate or incomplete information, such as denial of registration in the database, removal of information from the database pursuant to Section 15.713(i), or other sanctions as appropriate to ensure compliance with the rules. Registrations must include the following information.

- (i) name of the individual or business that owns the low power auxiliary device(s)
- (ii) an address for the contact person
- (iii) an email address for the contact person (optional)
- (iv) a phone number for the contact person
- (v) coordinates where the device(s) are used (latitude and longitude in NAD 83, accurate to +/- 50 m)
- (vi) channels used by the low power auxiliary devices operated at the site and the number of wireless microphones used in each channel. As a benchmark, least 6 – 8 wireless microphones must be used in each channel. Registration requests that do not meet this criteria will not be registered in the TV bands date bases.
- (vii) specific months, weeks, days of the week and times when the device(s) are used (on dates when microphones are not used the site will not be protected)
- (viii) for licensed devices, the stations call sign; for eligible venues using unlicensed devices, the name of the venue

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(j) *Security.* The TV bands database shall employ protocols and procedures to ensure that all communications and interactions between the TV band database and TVBDs are accurate and secure and that unauthorized parties cannot access or alter the database or the list of available channels sent to a TVBD.

(i) Communications between TV band devices and TV bands databases, and between different TV bands databases, shall be secure to prevent corruption or unauthorized interception of data. A TV bands database shall be protected from unauthorized data input or alteration of stored data.

(ii) A TV bands database shall verify that the FCC identification number supplied by a fixed or personal/portable TV band device is for a certified device and may not provide service to an uncertified device.

(iii) A TV bands database must not provide lists of available channels to uncertified TV bands devices for purposes of operation (it is acceptable for a TV bands database to distribute lists of available channels by means other than contact with TVBDs to provide list of channels for operation). To implement this provision, a TV bands database administrator shall obtain a list of certified TVBDs from the FCC Equipment Authorization System.

10. Section 15.714 is amended by revising paragraph (n) to read as follows:

**§ 15.714 TV bands database administration fees.**

(a) A TV bands database administrator may charge a fee for provision of lists of available channels to fixed and personal/portable TVBDs and for registering fixed TVBDs.

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11. Section 15.715 is amended by revising the introductory text, revising paragraphs (c), (d), (e) and (g) and by adding new paragraph (f) and re-designating the existing paragraphs (f) through and (k) as paragraphs (g) through (l) to read as follows:

**§ 15.715 TV bands database administrator.**

The Commission will designate one or more entities to administer the TV bands database(s). The Commission may, at its discretion, permit the functions of a TV bands database, such as a data repository, registration, and query services, to be divided among multiple entities; however, it will designate specific entities to be a database administrator responsible for coordination of the overall functioning of a database and providing services to TVBDs. Each database administrator designated by the Commission shall:

\* \* \* \* \*

(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 and TV translator receive sites.

(d) Establish a process for registering facilities where Part 74 low power auxiliary stations are used on a regular basis.

(e) Provide accurate lists of available channels to fixed and personal/portable TVBDs that submit to it the information required under §§ 15.713(e), (f), and (g) based on their geographic location and provide accurate lists of available channels to fixed and Mode II devices requesting lists of available channels for Mode I devices. Database administrators may allow prospective operators of TV bands devices to query the database and determine whether there are vacant channels at a particular location.

(f) Establish protocols and procedures to ensure that all communications and interactions between the TV band database and TVBDs are accurate and secure and that unauthorized parties cannot access or alter the database or the list of available channels sent to a TVBD consistent with the provisions of Section 15.713(i).

(g) Make its services available to all unlicensed TV band device users on a non-discriminatory basis.

(h) Provide service for a five-year term. This term can be renewed at the Commission's discretion.

(i) Respond in a timely manner to verify, correct and/or remove, as appropriate, data in the event that the Commission or a party brings claim of inaccuracies in the database to its attention. This requirement applies only to information that the Commission requires to be stored in the database.

(j) Transfer its database along with the IP addresses and URLs used to access the database and list of registered Fixed TVBDs, to another designated entity in the event it does not continue as the database administrator at the end of its term. It may charge a reasonable price for such conveyance.

(k) The database must have functionality such that upon request from the Commission it can indicate that no channels are available when queried by a specific TVBD or model of TVBDs.

(l) If more than one database is developed, the database administrators shall cooperate to develop a standardized process for providing on a daily basis or more often, as appropriate, the data collected for the facilities listed in § 15.713(h)(2) to all other TV bands databases to ensure consistency in the records of protected facilities.

12. Section 15.717 is amended by revising paragraphs (a) and (b) and adding a new paragraph (c) to read as follows:

**§ 15.717 TVBDs that rely on spectrum sensing.**

(a) *Applications for Certification.* Parties may submit applications for certification of TVBDs that rely solely on spectrum sensing to identify available channels. Devices authorized under this section must

demonstrate with an extremely high degree of confidence that they will not cause harmful interference to incumbent radio services.

(1) In addition to the procedures in Subpart J of Part 2 of this chapter, applicants shall comply with the following.

(i) The application must include a full explanation of how the device will protect incumbent authorized services against interference.

(ii) Applicants must submit a pre-production device, identical to the device expected to be marketed.

(2) The Commission will follow the procedures below for processing applications pursuant to this section.

(i) Applications will be placed on Public Notice for a minimum of 30 days for comments and 15 days for reply comments. Applicants may request that portions of their application remain confidential in accordance with § 0.459 of this chapter. This Public Notice will include proposed test procedures and methodologies.

(ii) The Commission will conduct laboratory and field tests of the pre-production device. This testing will be conducted to evaluate proof of performance of the device, including characterization of its sensing capability and its interference potential. The testing will be open to the public.

(iii) Subsequent to the completion of testing, the Commission will issue by Public Notice, a test report including recommendations. The Public Notice will specify a minimum of 30 days for comments and, if any objections are received, an additional 15 days for reply comments.

(b) *Power limit for devices that rely on sensing.* The TVBD shall meet the requirements for personal/portable devices in this subpart except that it will be limited to a maximum EIRP of 50 mW and it does not have to comply with the requirements for geo-location and database access in § 15.711(b). Compliance with the detection threshold for spectrum sensing in § 15.717(c), although required, is not necessarily sufficient for demonstrating reliable interference avoidance. Once a device is certified, additional devices that are identical in electrical characteristics and antenna systems may be certified under the procedures of Part 2, Subpart J of this chapter.

(c) *Sensing requirements.*

(1) *Detection threshold.*

(i) The required detection thresholds are:

(A) ATSC digital TV signals: -114 dBm, averaged over a 6 MHz bandwidth;

(B) NTSC analog TV signals: -114 dBm, averaged over a 100 kHz bandwidth;

(C) Low power auxiliary, including wireless microphone, signals: -107 dBm, averaged over a 200 kHz bandwidth.

(ii) The detection thresholds are referenced to an omnidirectional receive antenna with a gain of 0 dBi. If a receive antenna with a minimum directional gain of less than 0 dBi is used, the detection threshold shall be reduced by the amount in dB that the minimum directional gain of the antenna is less than 0 dBi. Minimum directional gain shall be defined as the antenna gain in the direction and at the frequency that exhibits the least gain. Alternative approaches for the sensing antenna are permitted, e.g., electronically rotatable antennas, provided the applicant for equipment authorization can demonstrate that its sensing antenna provides at least the same performance as an omnidirectional antenna with 0 dBi gain.

(2) *Channel availability check time.* A TVBD may start operating on a TV channel if no TV, wireless microphone or other low power auxiliary device signals above the detection threshold are detected within a minimum time interval of 30 seconds.

(3) *In-service monitoring.* A TVBD must perform in-service monitoring of an operating channel at least once every 60 seconds. There is no minimum channel availability check time for in-service monitoring.

(4) *Channel move time.* After a TV, wireless microphone or other low power auxiliary device signal is detected on a TVBD operating channel, all transmissions by the TVBD must cease within two seconds.

## APPENDIX C

## Final Regulatory Flexibility Analysis

1. As required by the Regulatory Flexibility Act (RFA),<sup>1</sup> an Initial Regulatory Flexibility Analysis (IRFA) was incorporated in the *Notice of Proposed Rule Making (NPRM)* in ET Docket No. 04-186<sup>2</sup> and an additional IRFA was incorporated in the *First Report and Order and Further Notice of Proposed Rule Making (Further Notice)* in ET Docket No. 04-186.<sup>3</sup> The Commission sought written public comment on the proposals in the *NPRM* and in the *Further Notice*, including comment on the IRFAs. No comments were received in response to either IRFA. This Final Regulatory Flexibility Analysis (FRFA) conforms to the RFA.<sup>4</sup>

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

2. This Second Memorandum Opinion and Order responds to seventeen petitions for reconsideration that were filed in response to the *Second Report and Order and Memorandum Opinion and Order* ("*Second Report and Order*") in this proceeding.<sup>5</sup> It upholds the majority of the Commission's prior decisions permitting unlicensed broadband operations in the TV bands and also makes 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.

3. In the Second Memorandum Opinion and Order, the Commission is taking steps to provide access to unused TV spectrum that will fuel innovation and investment in new unlicensed wireless technologies, much as Wi-Fi and Bluetooth have changed the landscape of communications in recent years. It is resolving on reconsideration certain legal and technical issues in order to provide certainty concerning the rules for operation of unlicensed transmitting devices in the television broadcast frequency bands (unlicensed TV bands devices, or "TVBDs"). The steps being taken will make a significant amount of currently unused spectrum with very desirable propagation characteristics available for new and innovative products and services, particularly broadband data and other services for businesses and consumers. Resolution of these issues will allow manufacturers to begin marketing unlicensed communications devices and systems that operate on frequencies in the TV bands in areas where they are not used by licensed services ("TV white spaces"). The opening of these bands for unlicensed use, which represents the first significant increase in unlicensed spectrum below 5 GHz in over 20 years, will spur manufacturers to develop new radio technologies that will have wide ranging applicability for spectrum sharing in many frequency bands, will have significant benefits for both businesses and consumers and will promote more efficient spectrum use. The technology that enables access to TV white spaces will also serve as a foundation for a model that can be extended to provide opportunistic access to other spectrum bands.

<sup>1</sup> 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), Pub. L. No. 104-121, Title II, 110 Stat. 857 (1996).

<sup>2</sup> *NPRM*, 19 FCC Red at 10018.

<sup>3</sup> *Further Notice*, 21 FCC Red at 12299.

<sup>4</sup> See 5 U.S.C. 604.

<sup>5</sup> We are addressing seventeen petitions for reconsideration that were filed in response to the *Second Report and Order and Memorandum Opinion and Order* ("*Second Report and Order*") in this proceeding. See *Second Report and Order and Memorandum Opinion and Order* in ET Docket Nos. 02-380 and 04-186, 23 FCC Red 16807 (2008).

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

4. Richard A. Rudman and Dane E. Ericksen ("Rudman/Ericksen") argue that the Final Regulatory Flexibility Analysis (FRFA) in the *Second Report and Order* is deficient because it did not address certain burdens on industry.<sup>6</sup> Specifically, they argue that the FRFA failed to consider the burden of every one of the 6,635 cable television systems in the United States having to register with the TV bands device database to protect the multiple TV receivers typically installed at a cable headend. Rudman/Ericksen state that because the rules permit the registration of receive sites only if they are outside the protected contour of the station being received, and only at distances up to 80 km from the protected contour, a cable system operator will have to calculate the contour for each station being received to determine if the receive site is eligible for registration. They state that there are 8,126 cable headends in the United States, and that if each headend receives ten stations, then over 80,000 contour calculations must be performed. Similarly, Rudman/Ericksen argue that thousands of TV translator licensees will have to perform contour calculations to determine whether their receive sites are at locations that are eligible for registration in the TV bands device database.

5. We disagree with Rudman/Ericksen that voluntary registration of receive sites for cable headends and TV translators poses a significant burden. As the Commission noted in the *Second Report and Order*, the receive sites that may be registered in the TV bands device database are located in areas where TV services are normally not protected, but the Commission decided to provide parties the option of registering sites if they choose to minimize the potential for interference from TV band devices. However, there is no requirement to register a site. Further, operators of cable systems or other multi-channel video programming distributors (MVPDs) typically already have information on the location of the protected contours of TV stations in their service areas, so they can quickly determine whether a particular receive site is eligible for registration. Even if the operator of a receive site does not know its location with respect to the protected contour of the station being received, such information can be readily obtained. We note that we received petitions for reconsideration from the cable and TV translator industries and two MVPDs, and none of these parties claimed that registration of receive sites is unduly burdensome as Rudman/Ericksen allege.<sup>7</sup>

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

6. 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.<sup>8</sup> The RFA generally defines the term "small entity" as having the same meaning as the terms "small business," "small organization," and "small governmental jurisdiction."<sup>9</sup> In addition, the term "small business" has the same meaning as the term "small business concern" under the Small Business Act.<sup>10</sup> 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

<sup>6</sup> See Rudman/Ericksen petition at 7.

<sup>7</sup> See petitions of the National Cable and Telecommunications Association (March 19, 2009), Community Broadcasters Association (March 19, 2009) and DirecTV and Dish Network (March 19, 2009).

<sup>8</sup> 5 U.S.C. § 604(a)(3).

<sup>9</sup> 5 U.S.C. § 601(6).

<sup>10</sup> 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."

(SBA).<sup>11</sup>

7. *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."<sup>12</sup> 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.<sup>13</sup> According to Census Bureau data for 2002, there were a total of 1,041 establishments in this category that operated for the entire year.<sup>14</sup> Of this total, 1,010 had employment of under 500, and an additional 13 had employment of 500 to 999.<sup>15</sup> Thus, under this size standard, the majority of firms can be considered small.

8. *Wireless Telecommunications Carriers (except Satellite).* Since 2007, the Census Bureau has placed wireless firms within this new, broad, economic census category.<sup>16</sup> Prior to that time, such firms were within the now-superseded categories of "Paging" and "Cellular and Other Wireless Telecommunications."<sup>17</sup> Under the present and prior categories, the SBA has deemed a wireless business to be small if it has 1,500 or fewer employees.<sup>18</sup> Because Census Bureau data are not yet available for the new category, we will estimate small business prevalence using the prior categories and associated data. For the category of Paging, data for 2002 show that there were 807 firms that operated for the entire year.<sup>19</sup> Of this total, 804 firms had employment of 999 or fewer employees, and three firms had

<sup>11</sup> 15 U.S.C. § 632.

<sup>12</sup> 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>.

<sup>13</sup> 13 C.F.R. § 121.201, NAICS code 334220.

<sup>14</sup> U.S. Census Bureau, American FactFinder, 2002 Economic Census, Industry Series, Industry Statistics by Employment Size, NAICS code 334220 (released May 26, 2005); <http://factfinder.census.gov>. The number of "establishments" is a less helpful indicator of small business prevalence in this context than would be the number of "firms" or "companies," because the latter take into account the concept of common ownership or control. Any single physical location for an entity is an establishment, even though that location may be owned by a different establishment. Thus, the numbers given may reflect inflated numbers of businesses in this category, including the numbers of small businesses. In this category, the Census breaks-out data for firms or companies only to give the total number of such entities for 2002, which was 929.

<sup>15</sup> *Id.* An additional 18 establishments had employment of 1,000 or more.

<sup>16</sup> U.S. Census Bureau, 2007 NAICS Definitions, "517210 Wireless Telecommunications Categories (Except Satellite)"; <http://www.census.gov/naics/2007/def/ND517210.HTM#N517210>.

<sup>17</sup> U.S. Census Bureau, 2002 NAICS Definitions, "517211 Paging"; <http://www.census.gov/epcd/naics02/def/NDEF517.HTM>; U.S. Census Bureau, 2002 NAICS Definitions, "517212 Cellular and Other Wireless Telecommunications"; <http://www.census.gov/epcd/naics02/def/NDEF517.HTM>.

<sup>18</sup> 13 C.F.R. § 121.201, NAICS code 517210 (2007 NAICS). The now-superseded, pre-2007 C.F.R. citations were 13 C.F.R. § 121.201, NAICS codes 517211 and 517212 (referring to the 2002 NAICS).

<sup>19</sup> U.S. Census Bureau, 2002 Economic Census, Subject Series: Information, "Establishment and Firm Size (including Legal Form of Organization)," Table 5, NAICS code 517211 (issued Nov. 2005).

employment of 1,000 employees or more.<sup>20</sup> For the category of Cellular and Other Wireless Telecommunications, data for 2002 show that there were 1,397 firms that operated for the entire year.<sup>21</sup> Of this total, 1,378 firms had employment of 999 or fewer employees, and 19 firms had employment of 1,000 employees or more.<sup>22</sup> Thus, we estimate that the majority of wireless firms are small.

#### D. Description of Projected Reporting, Record Keeping, and Other Compliance Requirements

9. TV bands devices are required to be authorized under the Commission's certification procedure as a prerequisite to marketing and importation, and the Second 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 below. In addition, the Second Memorandum Opinion and Order makes certain changes to the requirements for TV bands device databases, which are also discussed below.

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

10. 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."<sup>23</sup>

11. The Second Memorandum Opinion and Order generally upholds the rules adopted in the *Second Report and Order*, the Commission made certain changes. However, the Commission agreed with petitioners with regard to a number of the requested changes to the rules and modified and clarified the rules as appropriate in granting those requests. It believed those changes and clarifications will 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.

12. The Commission eliminated the requirement for TV bands devices that rely on geo-location and database access to sense analog and digital TV signals and also wireless microphones and other low power auxiliary stations. In reaching this decision, it considered the competing views from various parties on whether spectrum sensing is a viable tool for providing access to spectrum. The Commission believes that spectrum sensing will continue to develop and improve and anticipates that some form of spectrum sensing may very well be included in TVBDs on a voluntary basis for purposes such as determining the quality of each channel and enhancing spectrum sharing among TVBDs. However, the Commission did not believe that a mandatory spectrum sensing requirement best serves the public interest. It found that the geo-location and database access method and other provisions of the rules will provide adequate and reliable protection for television and low power broadcast auxiliary services, so that

<sup>20</sup> *Id.* The 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."

<sup>21</sup> U.S. Census Bureau, 2002 Economic Census, Subject Series: Information, "Establishment and Firm Size (Including Legal Form of Organization)," Table 5, NAICS code 517212 (issued Nov. 2005).

<sup>22</sup> *Id.* The 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."

<sup>23</sup> 5 U.S.C. § 603(c)(1) – (c)(4).

spectrum sensing is not necessary. These other rule provisions include: 1) reserving two vacant UHF channels for wireless microphones and other low power auxiliary service devices in all areas of the country, and 2) allowing operators of the venues of large events and productions/shows that use large numbers of wireless microphones on an unlicensed basis to register the sites of those venues with the Commission to receive the same geographic spacing protections afforded licensed wireless microphones.

13. The Commission also adopted changes to the requirements for the databases that TV band devices must contact to contain lists of available channels. Specifically, it required that communications between TV bands devices and TV bands databases, and between multiple databases, are secure. The Commission found that it is important and necessary for TV bands devices and TV bands databases to incorporate reasonable and reliable security measures to minimize the possibility that TV bands devices will operate on occupied channels and cause interference to licensed services and to protect the operation of the databases and the devices they serve from outside manipulation. The Commission noted that virtually all online transactions involving financial or other confidential information currently use security measures to protect against unauthorized viewing and/or alteration of information being sent and to ensure that only authorized users have access to information. It therefore expects that device manufacturers and database administrators will have access to and be able to incorporate the reliability and security measures needed to protect the contents of databases and communications between databases and TV bands devices or other databases. In addition, the Commission required that all information that required by the Commission's rules to be in a TV bands device database be publicly available, including fixed TV bands device registration and voluntarily submitted protected entity (e.g., cable head ends) information. Although 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 found it is appropriate to permit public examination of protected entity registration information to allow the detection and correction of errors.

14. The Commission made certain changes to the technical requirements for TV band devices. It adopted a power spectral density (PSD) limit, which is a measure of transmitter power per unit of bandwidth. In the absence of a PSD limit, multiple devices with transmit bandwidths of significantly less than the width of a TV channel (6 megahertz) could share a single channel, resulting in a total transmitted power within a channel significantly greater than the power limits for fixed or personal/portable devices. A PSD limit will prohibit high power concentrations in a single channel, which will reduce the interference potential to TV stations and other services in the TV bands. The Commission also adopted changes to the measurement procedure for TV bands device emissions that fall into a TV channel adjacent to the operating channel to ensure that consistent measurement results are obtained regardless of the bandwidth of the transmitted signal.

15. The Commission also removed the prohibition on TV bands devices operating within the border areas near Canada and Mexico. It found that TV stations in Canada and Mexico could be protected by including them in the TV bands device database rather than by a blanket exclusion on TV bands device operation within the border areas.

#### **F. Report to Congress**

16. The Commission will send a copy of the Second Memorandum Opinion and Order, including this FRFA, in a report to be sent to Congress and the Government Accountability Office pursuant to the Congressional Review Act.<sup>24</sup> A copy of the Second Memorandum Opinion and Order and FRFA (or summaries thereof) will also be published in the Federal Register.<sup>25</sup>

<sup>24</sup> See 5 U.S.C. § 801(a)(1)(A).

<sup>25</sup> See 5 U.S.C. § 604(b).

**STATEMENT OF  
CHAIRMAN JULIUS GENACHOWSKI**

*Re: Unlicensed Operation in the TV Broadcast Bands, ET Docket No. 04-186; Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz Band, Second Memorandum Opinion and Order, ET Docket No. 02-380*

As President Obama recently said, “our nation’s success depends on strengthening America’s role as the world’s engine of discovery and innovation.” Today, the Commission takes a big step to open a new platform for American innovation. This is important. It will enhance our economy and strengthen our global competitiveness, lead to billions of dollars in private investment and to valuable new products and services – some we can imagine, and many we can’t.

It is another implementation of an important recommendation of the National Broadband Plan, which emphasized the vital role of spectrum to our economic future and the need for spectrum efficiency, spectrum recovery, and smart spectrum policy. As the National Broadband Plan explained, both licensed and unlicensed spectrum are important for a vibrant mobile ecosystem.

Today’s focus is on unlicensed spectrum, which offers unique opportunities to innovators and entrepreneurs. Today’s Order marks the Commission’s first significant release of unlicensed spectrum in 25 years.

This new unlicensed spectrum will be a powerful platform for innovation. And as we’ve seen time and again, when we unleash American ingenuity, great things happen.

We know from experience that unlicensed spectrum can trigger unexpected but hugely beneficial innovation. For example, years ago, there was a band of low-quality spectrum that was lying fallow. Nobody could figure out what to do with this so-called “junk band,” so the FCC decided to free it up as unlicensed spectrum.

The result was a wave of new technologies – baby monitors, cordless phones, and eventually a real game changer: Wi-Fi. Today, Wi-Fi is a multi-billion industry and an essential part of the mobile ecosystem.

As compared to the airwaves we released for unlicensed use in 1985, this “white spaces” spectrum is far more robust – traveling longer distances and through walls, making the potential for this unlicensed spectrum much greater.

One analyst estimates white spaces applications could generate more than \$7 billion in economic value annually.

We know what the first major application will be: super Wi-Fi. Super Wi-Fi is what it sounds like: Wi-Fi, but with longer range, faster speeds, and more reliable connections.

We can also expect, as we’ve seen now with Wi-Fi, enhanced performance from the mobile devices using licensed spectrum that we’ve come to rely on so heavily.

The FCC has already granted experimental licenses to a handful of cities, giving us an idea of the myriad ways super Wi-Fi will be put to use.

In Claudeville, Virginia, they are providing broadband access to a remotely located elementary school. In

Wilmington, North Carolina, they are trialing "smart city" applications to manage traffic and monitor water quality at nearby wetlands. In Logan, Ohio they are using the white space to deliver Telemedicine to health care providers. Plumas County, California is utilizing "Smart Grid" technologies for its electricity network.

We're seeing "machine-to-machine" Internet uses of this spectrum that could be its own harbinger of benefits to come.

These are just some of the applications we know about. But again what may be even more exciting are the applications that American innovators and entrepreneurs will invent.

One last point. Today's Order is important not only for the innovation, investment and economic benefit it will unleash, but because of the competitive edge it will offer.

U.S. companies have already invested in research and development of super Wi-Fi technologies. Now they can take this technology out of the labs and onto the market.

Other countries have been looking at Super Wi-Fi. By giving the green light now, the United States will be the first nation to deploy this technology. We can have the investment here, the intellectual property developed and the products launched here, and then export our products globally - all contributing to U.S. job creation and economic growth.

**STATEMENT OF  
COMMISSIONER MICHAEL J. COPPS**

*Re: Unlicensed Operation in the TV Broadcast Bands, ET Docket No. 04-186.; Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz Band, Second Memorandum Opinion and Order, ET Docket No. 03-380*

It's been a long time coming, but it looks like white spaces' time has indeed come. This is a truly major step to make more spectrum available for wireless broadband. I have long advocated the full-scale development of white spaces technology to maximize the spectrum resource. In the absence of innovative technological solutions, too much spectrum—and prime spectrum below 1 GHz, at that—will lie fallow. When we last addressed white spaces on November 4, 2008, a momentous day in many ways, we left too many questions unresolved about the use of white spaces within the broadcasting spectrum. A lot has changed since then, including a focused commitment to ensuring that every American has access to affordable, value-laden, opportunity-creating broadband. Now we finally resolve the difficult questions and set ourselves on a course to unleash the tremendous potential of the white spaces.

Throughout the implementation of the National Broadband Plan, I have emphasized the countless ways that transformative broadband technology intersects with nearly all aspects of our everyday lives. The opportunities created by white space technologies are endless: whether it's increasing the reach of broadband to unserved and underserved populations, including Tribal Lands; whether it's giving local governments tools for implementing smart city, eco-friendly wireless applications; whether it's providing robust wireless coverage for school children, inside and outside the classroom. The possibilities are just about limitless.

We began our work on white spaces mindful of these opportunities, but with a focus on how to address the needling challenges of avoiding potential interference with other occupants of the TV spectrum—including broadcasters, cable headends and wireless microphone users, licensed and unlicensed. I am proud of our Office of Engineering and Technology staff for confronting the hard questions head on, and bringing us an item that provides a technologically-sound way forward. Here again, hero status goes to Julie Knapp and his team for persevering, asking all the right questions, doing the rigorous testing and analysis, and bringing us an item that is both visionary and balanced. Unlicensed spectrum is no longer just about garage door openers, and it is the type of clever, outside-the-box thinking demonstrated here that is exactly the kind of thinking that the United States needs to encourage if it is to continue to lead in technology innovation.

Recognizing the importance of licensed wireless microphones to electronic news gathering and the reality that many venues—Broadway theaters, sports arena, churches and schools—have come to rely on unlicensed wireless microphones, we have gone to great lengths to accommodate their needs. In fact, we take the bold step of setting aside two reserve channels nationwide, where wireless microphones can operate without the potential of interference from white spaces devices. In addition to the reserve channels, wireless microphones have other channels available in the TV bands that are not available for white spaces devices. For large events that need more than the channels available in a given area for wireless microphones, we will allow users to register the time, place and duration in the TV Bands Database. The Commission will ensure transparency in this process, and—in order to register—will require large users to demonstrate that all other spectrum above Channel 7 is unavailable for wireless microphone use. I believe that this approach will not only ensure adequate spectrum for both wireless microphones and white spaces devices, but also encourage wireless microphone manufacturers to make much-needed improvements to equipment efficiency and interference resistance.

One of the great lessons that I quickly learned here at the FCC is the power of technology to turn

scarcity into abundance. Now is the time for us to implement a framework that allows innovators and entrepreneurs to use technology to bring the promise of under-used white spaces spectrum from the test mode to widespread use. We are providing that golden opportunity today, and I look forward to seeing new devices widely-available in consumer markets next year.

A great example of white spaces potential was demonstrated last week when the Hocking Valley Community Hospital in Ohio—working with Google and Spectrum Bridge—became the first hospital to utilize white spaces for the purposes of telemedicine. Down in Wilmington, North Carolina, using an 18-month experimental license from the FCC, Mayor Bill Saffo has unveiled a municipal wireless white spaces network that transmits video of traffic along highways, monitors water level and quality, saves energy by remotely turning off lights at ball parks and provides public Wi-Fi in some areas. I hope and expect to see examples like these popping up all over the country.

Again, thanks to Julie Knapp and his team for their tireless work in bringing us today's Order. They have given us a workable balance that promotes wireless broadband use of the white spaces, allows venues to continue to use wireless microphones and protects the operations of broadcasters. The American people will reap real benefits from your work here. Of course, your work is not yet done. We have wisely delegated the technical issues surrounding the creation of the TV Bands Database administrators to OET. I hope this will move expeditiously and that we can get that Database management up-and-running within the next two months. Thanks to the Chairman for his leadership here and to all my colleagues who have supported this step, asked great questions and made good suggestions to improve the item. Finally, let's recognize the vast stakeholder input we have enjoyed here—although to say we always "enjoyed it" might be just a tad of a stretch. Absent the robust dialogue and input we have had from so many stakeholders, this would be a lesser item.

STATEMENT OF  
COMMISSIONER ROBERT M. McDOWELL

*Re: Unlicensed Operation in the TV Broadcast Bands, ET Docket No. 04-186; Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz Band, Second Memorandum Opinion and Order, ET Docket No. 02-380*

I am pleased to support today's order resolving the petitions for reconsideration of our historic – and unanimous – November 2008 vote to make a portion of the unused spectrum in the TV bands available for unlicensed wireless devices. This proceeding started under the leadership of Chairman Michael Powell in 2002. Foreseeing the wonderful consumer benefits and the huge opportunity for job growth associated with this spectrum, many of us, including me, for years have been strong advocates for unlicensed use of the TV “white spaces.” And, it's no secret that, for some time now, I have emphasized the importance of concluding this proceeding as soon as possible. Although our work is not entirely complete, we have taken another important step.

The potential uses for this spectrum are limitless. Moreover, the protocol developed in this proceeding for “smart use” of this spectrum has great potential for enabling access to and improving efficiency in other frequency bands. The white spaces formula – unlicensed spectrum distribution, limitless potential applications and a path for continued development of advanced smart technologies – illustrates another reason why neither open access nor net neutrality rules need be mandated. The ubiquitous availability of white spaces provides consumers a competitive alternative to existing broadband providers, an additional check against potential anti-competitive mischief, and a means to relieve spectrum congestion in licensed bands. Furthermore, as with Wi-Fi, the *unlicensed* nature of white spaces use will accelerate its deployment and adoption much faster than if this spectrum was auctioned (if that were even practical to begin with). Our action thus helps to bring more broadband to consumers as quickly as innovation, rather than the government, will allow.

Although we have eliminated the *requirement* that TV band devices that incorporate geo-location and database access must listen and adjust for other signals, I am pleased that we emphasize the importance of the continued development of this sensing capability. Because sensing holds great promise to improve spectral efficiency and provide “smart” access to other bands, I thank the entrepreneurs that are investing in the costly research and development to continue to improve this technology.

In addition, I look forward to coordinating closely with our talented colleagues in the Office of Engineering and Technology on completing our next task: getting the TV bands geo-location databases up and running. Certainly it is important that we proceed to this next step as quickly as possible, which will bring greater certainty to the entities that tell us they are standing ready to build the technologies for this spectrum band. Given that we have eliminated the sensing requirement, however, it will be just as important to proceed with great care. We all agree that we have a duty to create an effective tool, as well as to ensure that we “do no harm” to incumbent users or, ultimately, consumers.

Finally, as the use of mobile data increases, providers will need to increase their backhaul capacity, including microwave backhaul, to accommodate the expected exponential increase in traffic. Increasing the availability of microwave will serve as an additional choice for backhaul services. This, too, is an issue that I've been speaking about for some time now, most recently at last month's open meeting. Therefore, I appreciate today's express commitment to pursue the question of whether we can accommodate licensed rural backhaul in the white spaces. Specifically, Commission staff will evaluate this possibility and will formulate and submit a recommendation to the Commissioners by the end of the year. I will continue to stay engaged on this issue, and look forward to learning more.

First, I thank the commissioners and chairmen who worked on these ideas years ago. I also applaud Chairman Genachowski's leadership and the contributions of my fellow commissioners here

today. These issues are complicated, yet they were easier to grasp and resolve because the process was collegial and consensus-based. Thank you also to Julie Knapp, Alan Stillwell, and all of our colleagues in the Office of Engineering and Technology and Ruth Milkman and her team in the Wireless Telecommunications Bureau. We are grateful for your guidance, insights and creativity.

STATEMENT OF  
COMMISSIONER MIGNON L. CLYBURN

*Re: Unlicensed Operation in the TV Broadcast Bands, ET Docket No. 04-186; Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz Band, Second Memorandum Opinion and Order, ET Docket No. 02-380*

Today, I join the chorus of support that every Commissioner, who has voted during the history of this proceeding, has expressed for permitting the development of unlicensed services in the TV White Spaces. The National Broadband Plan, and the 14<sup>th</sup> Mobile Services Report, made it clear that licensed communications companies, find it difficult to develop a profitable business plan, to serve the communications needs of many sparsely populated rural areas. As pilot programs in Claudville, Virginia and Wilmington, North Carolina demonstrate, when unlicensed services are allowed to take advantage of the enhanced propagation characteristics of the TV spectrum, these services can successfully bring affordable wireless broadband services, to both sparsely populated rural areas and low-income communities in urban areas. I am excited to see that companies such as Dell, Google, Microsoft, Motorola, and Nokia, have expressed such optimism about developing products and services for the TV White Spaces.

I was pleased to see that we revisited the Commission's decision, from 2008, to prohibit the operation of TV White Space devices in geographic areas near the borders of Canada and Mexico. Many tribal communities are located near these borders, in rural areas, that are the most difficult for commercial wireless firms to serve. Consequently, these tribal communities are among those that stand to benefit the most from the wireless broadband services that the TV White Space device manufacturers plan to deliver. As the 2008 Order pointed out, we should be concerned about Canadian and Mexican licensed operations. But, as the Tribal Digital Village persuasively demonstrated, the straightforward solution, which is consistent with the rules we adopt today, is to include information on the Canadian and Mexican stations in the TV White Space database as protected services.

As you know, there were a number of contentious issues in this proceeding. Julie Knapp, and the talented staff in the Office of Engineering and Technology, took a thoughtful and measured approach to strike the proper balance, between the interests of the TV White Space advocates, public safety agencies, and wireless microphone users. I am confident that this agency will continue to take approaches that promote the development of TV White Space devices and services.

**STATEMENT OF  
COMMISSIONER MEREDITH A. BAKER**

*Re: Unlicensed Operation in the TV Broadcast Bands, ET Docket No. 04-186; Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz Band, Second Memorandum Opinion and Order, ET Docket No. 02-380*

I am excited about today's TV White Spaces item. I believe it represents real progress in enabling and empowering innovation and entrepreneurship in cutting edge technologies. Today's item is a solid building block for spectrum policy. It is a win for American leadership in the wireless space that has the potential to transform the way we use congested spectrum, to take the "mobile revolution" to new levels. I hope that the pioneering work that has been done to engineer TV Band devices will lead to similar approaches for other spectrum bands. There are "white spaces" in all parts of the spectrum and we need to use them more effectively.

Today, we clarify the conditions under which unlicensed devices can use TV white spaces. It is a defining step in a process that began many years ago. The ample record reflects the wide range of views in this complicated area. I take them all very seriously. The item before us reflects the staff's hard and careful analysis and strikes an appropriate balance.

There is still work ahead of us. I hope other users of the TV Bands, like wireless mics, will make every effort to ensure that the technology solutions they develop and deploy use the spectrum, which is necessarily constrained in certain parts of the country, as efficiently as possible. In this regard, in particular, I believe there is much that can and should be done.

There are three areas in this item where I hope we will take additional action in the near future to advance our spectrum policy and ensure its alignment with the needs and requirements of the millions of people across the country that use wireless technologies every day.

First, I support the approach we are taking today with respect to the development of a TV Band geolocation database. A robust, reliable and secure database is critical to the successful deployment of TV Band devices. We are giving appropriate latitude to the Office of Engineering and Technology to develop the regulations and requirements that will govern the TV Band Database. I hope Julie and his team can complete their work on a timely basis. I look forward to working on the details with them. It is important to define an approach that includes adequate safeguards to ensure that the database is as accurate, user-friendly and accessible as possible. Setting appropriate standards for database maintenance while leaving the database architecture open for customization and advanced services fosters the twin goals of empowering innovation and ensuring that novel uses of white spaces don't harmfully interfere with incumbent users.

In this regard I reiterate my view that for this and any form of dynamic spectrum access to work, our guiding principle must always be that we do not harm legitimate incumbent operations. Broadcasters' rights, in particular, must be respected and protected. We must ensure oversight and enforcement of our rules applicable to the band, including the rules governing the operation of the database.

Second, I hope that equipment developers and device manufacturers will continue their work on sensing technologies and take advantage of the flexible approach outlined in the item. I appreciate the well-articulated concern that requiring *both* sensing and database consultation could have a chilling effect on the initial deployment of white space devices. However, I am hopeful that the widespread commercial deployment of sensing technologies will play a critical role in increasing access to spectrum not only in the TV white spaces but in other spectrum that from time-to-time or in certain locations lies fallow.

Sensing technologies have shown great promise in other contexts, including Department of Defense research, and I look forward to finding ways to encourage and advance their deployment for commercial purposes.

Finally, it is important that we address additional proposals to set aside TV channels in rural areas for fixed licensed backhaul in the very near future. The ability of both new and incumbent wireless providers to provide 4G wireless services ubiquitously is dependent upon a robust wireless infrastructure that is too often lacking in rural areas. The prospect of fixed licensed backhaul in the TV bands holds great merit and I would hope that we could move forward along the lines that have been proposed as soon as we have completed our official analysis of TV spectrum availability.

I would like to add my thanks to Julie and Ruth and their teams who have been working on this item for so many years. Today we have taken a real step forward.