(d) Compliance with radio frequency exposure requirements. To ensure compliance with the Commission's radio frequency exposure requirements in §§ 1.1307(b), 2.1091 and 2.1093 of this chapter, fixed TVBDs shall be accompanied by instructions on measures to take to ensure that persons maintain a distance of at least 40 cm from the device, as well as any necessary hardware that may be needed to implement that protection. These instructions shall be submitted with the application for certification. Personal/portable TVBDs that meet the definition of portable devices under Section 2.1093 of this chapter and that operate with a source-based time-averaged output of less than 20 mW will not be subject to routine evaluation for compliance with the radio frequency exposure guidelines, while devices that operate with a source-based time-average output power greater than 20 mW will be subject to the routine evaluation requirements.

Section 15.711 Interference avoidance mechanisms.

(a) Except as provided in Section 15.717, television channel availability for a TVBD is determined based on either the geo-location and database access mechanism described in paragraph (b) of this section or spectrum sensing described in paragraph (c) of this section.

(1) A TVBD shall rely on the geo-location and database access mechanism to identify available television channels consistent with the interference protection requirements of Section 15.712. Such protection will be provided for the following authorized services: digital television stations, and digital and analog Class A, low power, translator and booster stations; translator receive; fixed broadcast auxiliary service links; private land mobile service/ commercial radio service (PLMRS/CMRS) operations; offshore radiotelephone service; and cable system head-ends. In addition, protection shall be provided in border areas near Canada and Mexico in accordance with Section 15.712(g) of this part.

(2) For low power auxiliary services authorized pursuant to Section 74.801-74.882 of this chapter, including wireless microphones, a TVBD shall rely on the geo-location and database access mechanism to identify available television channels to provide interference protection to registered locations of such operations, consistent with the requirements of Section 15.722, and shall rely on spectrum sensing to identify available television channels to provide interference protection to all other operations.

(b) Geo-location and database access.

(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 the stored coordinates become altered, the operator shall re-establish its 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.

(2) A Mode II personal/portable device shall incorporate a geo-location capability to determine its geographic coordinates to an accuracy of +/- 50 meters. The device must re-establish its position each time it is activated from a power-off condition.

(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 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 TVBDs. Fixed TVBDS shall access the database at least once a day to verify that the operating channels continue to remain available. Operation must cease immediately if the channel is no longer available.

(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 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. 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.

(iii) If a fixed or mode II TVBD fails to 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 unless it has contacted the TV bands database during the intervening period.

(iv) Personal/portable devices operating in Mode I shall obtain a list of channels on which they may operate from a master device.

(4) All geographic coordinates shall be referenced to the North American Datum of 1983 (NAD 83).

(c) Spectrum sensing.

(1) Detection threshold.

(i) All fixed and personal/portable TVBDs must be capable of detecting ATSC digital TV, NTSC analog TV and wireless microphone signals using analog or digital modulation methods. The required detection thresholds are.

(A) ATSC signals: -114 dBm, averaged over a 6 MHz bandwidth;
(B) NTSC signals: -114 dBm, averaged over a 100 kHz bandwidth;
(C) Wireless microphone signals: -114 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 rotateable 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) Low power auxiliary device channel availability check time. A TVBD may start operating on a TV channel if no wireless microphone or other low power auxiliary device signals above the detection threshold are detected within a minimum time interval of 30 seconds.

(3) TV channel availability check time. A TVBD is required to check for TV signals for a minimum time interval of 30 seconds. If a TV signal is detected on a channel indicated as

available for use by the database system, the device will provide a notice of that detection to the operator of the device and a means for the operator to optionally remove the channel from the device's list of available channels.

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

(5) Channel move time. After a 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.

(6) Personal/portable devices operating in the client mode shall identify to the fixed or Mode II personal/portable device those television channels on which it senses any signals above the detection threshold. The fixed or Mode II device shall respond in accordance with the provisions of this paragraph as if it had detected the signal itself.

(7) TVBDs communicating either directly with one another or linked through a base station must share information on channel occupancy determined by sensing. If any device in a local area group or network determines that a channel is occupied, all other linked devices will also be required to respond in accordance with the provisions of this paragraph as if it had detected the signal itself.

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

(e) 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.

(f) If a fixed TVBD device does not have a direct connection to the Internet and has not yet been initialized and registered with the TV bands database, consistent with Section 15.713, but can receive the transmissions of another fixed TVBD, the device needing initialization may transmit 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. Such client fixed devices must re-contact their master device to review their list of available channels at least once every 60 seconds. A fixed device may not operate as a client to another fixed device.

(g) A personal/portable TVBD operating in Mode I may only transmit upon receiving the transmissions of fixed or Mode II TVBD. A personal/portable device operating in Mode I may transmit on either an operating channel of the fixed or Mode II TVBD or on a channel the fixed or Mode II TVBD indicates is available for use.

Section 15.712 Interference protection requirements.

(a) *Digital television stations, and digital and analog Class A TV, low power TV, TV translator and TV booster stations*:

(1) Protected contour. TVBDs must protect digital and analog TV services within the contours shown in the following table. These contours are based on the R-6602 curves contained in Section 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. Fixed TVBDs and personal/portable TVBDs operating in Mode II 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. 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 as specified in Section 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) *Translator receive sites and cable headends*: For translator receive sites and cable headends registered in the TV bands database, TVBDs may not operate within an arc of +/-30 degrees from a line between the registered translator or cable headend receive site and the TV station being received within a distance of 80 km from the receive site for co-channel operation and 20 km for adjacent channel operation. 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.

(c) *Fixed Broadcast Auxiliary Service (BAS) Links*: For permanent BAS receive sites appearing in the Commission's Universal Licensing System or temporary BAS receive sites registered in the TV bands database, TVBDs may not operate within an arc of +/-30 degrees from a line between the BAS receive site and its associated permanent transmitter within a distance of 80 km from the receive site for co-channel operation and 20 km for adjacent channel operation. Outside 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.

(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 Section 90.303(a) of this chapter. For PLMRS/CMRS operations outside of the metropolitan areas listed in Section 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.

(e) *Offshore Radiotelephone Service*: TVBDs may not operate on channels used by the Offshore Radio Service within the geographic areas specified in Section 74.709(e) of this chapter.

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

(1) TVBDs will not be permitted to operate within 1 km of the coordinates of registered wireless microphone sites during designated times when wireless microphones are used.

(2) (A) TVBDs will not be permitted to operate within 134 km of the 13 metropolitan areas listed in Section 90.303(a) of this chapter. ,

(B) TVBDs will not be permitted to operate on the first available channel on each side of TV channel 37 (608-614 MHz) within 134 km of the 13 metropolitan areas listed in Section 90.303(a) of this chapter. If one or both of those channels are occupied by a licensed service in one or more of these metropolitan areas, operation of TVBDs is prohibited on the first channel adjacent to the occupied channel(s).

(g) *Border areas near Canada and Mexico*:

(1) Fixed and personal/portable TVBDs shall not operate within 32 kilometers of the Canadian Border.

(2) Fixed and personal/portable TVBDs shall not operate within 40 kilometers of the Mexican border on UHF channels, or within 60 kilometers on VHF channels.

(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) The Naval Radio Research Observatory in Sugar Grove, West Virginia.

(2) The Table Mountain Radio Receiving Zone (TMRZ) at 40°07'50" N and 105°15'40" W.

(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)	107 37 04 W	34 04 44 N
Very Long Baseline Array (VLBA) Stations		
Pie Town, AZ	108 07 07 W	34 18 04 N
Kitt 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

Section 15.713 TV bands database.

One or more entities will be designated to serve as database administrator.

(a) Purpose. The TV bands database serves the following functions:

(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 Section 15.712 of this part.

(2) To register the identification information and location of fixed TVBDs.

(3) To register protected locations and channels as specified in paragraph (b)(2) of this section, that are not otherwise recorded in Commission licensing databases.

(b) Information in the TV bands database.

(1) Facilities already recorded in Commission databases. Identifying and location information will come from the official Commission database. These services include:

(A) Digital television stations
(B) Digital and analog Class A television stations
(C) Low power television stations
(D) Television translator and booster stations
(E) Broadcast Auxiliary Service stations (including receive only sites), except low power auxiliary stations
(F) Private land mobile radio service stations
(G) Commercial mobile radio service stations
(H) Offshore radiotelephone service stations

(2) Facilities that are not recorded in Commission databases. Identifying and location information will be entered into the TV bands database in accordance with the procedures established by the TV bands database administrator(s). These include:

(A) Cable television headends
(B) Television translator station receive sites
(C) Sites where low power auxiliary stations, including wireless microphones and wireless assist video devices, are used and their schedule for operation
(D) Fixed TVBDs

(c) Restrictions on registration.

(1) Television translator station receive sites within the protected contour of the station being received are not eligible for registration in the database.

(2) Cable television headends within the protected contour of a television channel are not eligible to register that channel in the database.

(d) Determination of available channels.

(1) The TV bands database will determine the available channels at a location using the interference protection requirements of section 15.712 of this part, the location information supplied by a TVBD, and the data for protected stations/locations in the database. The TV bands database will also check for proximity of a TVBD to the Canadian and Mexican borders where operation may be prohibited pursuant to Section 15.712(g) of this chapter.

(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 paragraph (b) of this section.

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

(3) Fixed TVBDs register and receive a list of available channels by either connecting directly to the internet or by receiving information from another fixed TVBD.

(4) Mode II TVBDs register and receive a list of available channels by connecting directly to the internet.

(f) Fixed TVBD registration.

(1) Prior to operating for the first time or after changing location, a fixed TVBD must register with the TV bands database by providing the information listed in (c)(3) of this paragraph.

(2) The party responsible for a Fixed TVBD must ensure that the TVBD registration database has the most current, up-to-date information for that device.

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

(A) FCC identifier (FCC ID) of the device
(B) manufacturer's serial number of the device
(C) device's geographic coordinates (latitude and longitude (NAD 83) accurate to +/- 50 m)
(D) name of the individual or business that owns for the device
(E) name of a contact person responsible for the device's operation
(F) address for the contact person
(G) email address for the contact person
(H) phone number for the contact person.

(g) A personal/portable device operating in Mode II shall provide the database its FCC Identifier (as required by Section 2.926 of this chapter), serial number as assigned by the manufacturer, and the device's geographic coordinates (latitude and longitude (NAD 83) accurate to +/- 50 m)

(h) 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:

(A) transmitter coordinates (latitude and longitude in NAD 83)
(B) Effective radiated power (ERP)
(C) height above average terrain of the transmitter (HAAT)

(D) horizontal transmit antenna pattern (if the antenna is directional)
(E) channel number
(F) station call sign

(2) Broadcast Auxiliary Service.

(A) transmitter coordinates (latitude and longitude in NAD 83)
(B) receiver coordinates (latitude and longitude in NAD 83)
(C) channel number
(D) call sign

(3) Metropolitan areas listed in section 90.303(a) of this chapter.

(A) region name
(B) channel(s) reserved for use in the region
(C) geographic center of the region (latitude and longitude in NAD 83)
(D) call sign

(4) PLMRS/CMRS base station operations located more than 80 km from the geographic centers of the 13 metropolitan areas defined in section 90.303(a) of this chapter (*e.g.*, in accordance with a waiver).

(A) transmitter location (latitude and longitude in NAD 83) or geographic area of operations
(B) Effective radiated power
(C) transmitter height above average terrain (if specified)
(D) antenna height above ground level (if specified)
(E) call sign

(5) Offshore Radiotelephone Service. For each of the four regions where the Offshore Radiotelephone Service operates.

(A) geographic boundaries of the region (latitude and longitude in NAD 83 for each point defining the boundary of the region
(B) channel(s) used by the service in that region

(6) Cable Television headends.

(A) name and address of cable company
(B) location of the headend receiver (latitude and longitude in NAD 83, accurate to +/- 50 m)
(C) channel number of each television channel received, subject to the following condition: channels for which the cable headend is located within the protected contour of that channel's transmitting station are not eligible for registration in the database
(D) call sign of each television channel received and eligible for registration
(E) location (latitude and longitude) of the transmitter of each television channel received

(7) Television translator and low power TV, including Class A TV stations, receive sites.

(A) call sign of the TV translator station
(B) location of the TV translator receive site (latitude and longitude in NAD 83, accurate to +/- 50 m)

(C) channel number of the retransmitted 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
(D) call sign of the retransmitted television station
(E) location (latitude and longitude) of the transmitter of the retransmitted television station

(8) Low power auxiliary stations, including wireless microphones and wireless assist video devices. Sites with significant wireless microphone use at well defined times and locations may be registered in the database. 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.

(A) name of the individual or business that owns the low power auxiliary device(s)
(B) an address for the contact person
(C) an email address for the contact person (optional)
(D) a phone number for the contact person
(E) coordinates where the device(s) are used (latitude and longitude in NAD 83, accurate to +/- 50 m)
(F) channels used by the low power auxiliary devices operated at the site
(G) specific months, days and times when the device(s) are used.

(h) Commission requests for data.

(1) A TV bands database administrator must supply upon request by the Commission, any information contained in the database.

(2) A TV bands database administrator must remove information from the database, upon direction, in writing, by the Commission

Section 15.714 TV bands database administration fees.

(a) A TV bands database administrator may charge a fee for provision of lists of available channels and for registering Fixed TVBDs and temporary BAS links.

(b) The Commission, upon request, will review the fees and can require changes in those fees if they are found to be excessive.

Section 15.715 TV bands database administrator.

The Commission will designate one or more entities to administer a TV bands database. Each database administrator shall:

(a) Maintain a database that contains the information described in Section 15.713 of this part.

(b) Establish a process for downloading and storing in the database necessary and appropriate information from the Commission's databases and synchronizing the TV bands database with the current Commission databases at least once a week to include newly licensed facilities or any changes to licensed facilities.

(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 cable headends and TV translator receiver sites.

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

(e) Provide lists of available channels to Fixed and personal/portable TVBDs that submit to it the information required under Section 15.713(f) based on their geographic location.

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

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

(h) 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.

(i) 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.

(j) 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.

(k) If more than one database is developed, the database administrators must cooperate to develop a standardized process for providing on a daily basis or more often, the data collected for the facilities listed in section 15.713(b)(2) of this part to all other TV bands databases.

Section 15.717 TVBDs that rely on spectrum sensing.

(a) 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 section 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) The device 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 Section 15.711(b). Compliance with the detection threshold for spectrum sensing in Section 15.711(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.

APPENDIX C

Final Regulatory Flexibility Analysis

As required by the Regulatory Flexibility Act (RFA),[343] an Initial Regulatory Flexibility Analysis (IRFA) was incorporated in the *Notice of Propose Rule Making* (*NPRM*) in ET Docket No. 04-186[344] 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.[345] 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.[346]

A. Need for, and Objectives of, the Second Report and Order

This Second Report and Order allows low power unlicensed transmitters to operate in the TV broadcast bands at locations where spectrum is not being used by authorized services. The new rules provide for operation of two types of unlicensed devices that may provide broadband data and other types of communications services: 1) fixed devices, which will operate from a fixed location with relatively higher power and could be used to provide a variety of services including wireless broadband access in urban and rural areas, and 2) personal/portable devices, which will use lower power and could, for example, take the form of devices such as Wi-Fi-like cards in laptop computers or wireless in-home local area networks (LANs). In order to operate without causing interference to licensed services, both types of devices will be required to be able to reliably determine which channels are occupied by licensed operations at their location at any given time and to avoid interfering with services on those channels. The specific compliance requirements are described in Section D below.

The actions in this Second Report and Order will open for use a significant amount of spectrum with very desirable propagation characteristics that has heretofore lain fallow. These new rules will allow the development of new and innovative types of unlicensed devices that provide broadband data and other services for businesses and consumers without disrupting the incumbent television and other authorized services that operate in the TV bands. In addition, because transmissions on frequencies in the TV bands are less subject to propagation losses than transmissions in the spectrum bands where existing low power broadband unlicensed operations are permitted, *i.e.*, the 2.4 GHz and 5 GHz bands, the Commission anticipates that allowing unlicensed operation in the TV bands will benefit wireless internet service providers (WISPs) by extending the service range of their operations. This will allow wireless broadband providers that use unlicensed devices to reach new customers and to extend and improve their services in rural areas. The Commission anticipates that allowing use of the TV white spaces by unlicensed devices will have significant benefits for both businesses and consumers and thereby promote more efficient and effective use of the TV spectrum.

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

No comments were received in response to either the IRFA in the *NPRM* or the IRFA in the *Further Notice.*

---

[343] *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).

[344] *NPRM*, 19 FCC Rcd at 10018.

[345] *Further Notice*, 21 FCC Rcd at 12299.

[346] *See* 5 U.S.C. 603, Title II, 110 Stat 857 (1996).

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

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.[347] The RFA generally defines the term "small entity" as having the same meaning as the terms "small business," "small organization," and "small governmental jurisdiction."[348] In addition, the term "small business" has the same meaning as the term "small business concern" under the Small Business Act.[349] A "small business concern" is one which: (1) is independently owned and operated; (2) is not dominant in its field of operation; and (3) satisfies any additional criteria established by the Small Business Administration (SBA).[350]

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."351 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.352 According to Census Bureau data for 2002, there were a total of 1,041 establishments in this category that operated for the entire year.353 Of this total, 1,010 had employment of under 500, and an additional 13 had employment of 500 to 999.354 Thus, under this size standard, the majority of firms can be considered small.

Wireless Service Providers. The SBA has developed a small business size standard for wireless firms within the two broad economic census categories of "Paging"[355] and "Cellular and Other Wireless Telecommunications."[356] Under both categories, the SBA deems a wireless business to be small if it has

[347] 5 U.S.C. § 604(a)(3).

[348] 5 U.S.C. § 601(6).

[349] 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."

[350] 15 U.S.C. § 632.

[351] 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.

[352] 13 C.F.R. § 121.201, NAICS code 334220.

[353] 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.

[354] *Id.* An additional 18 establishments had employment of 1,000 or more.

[355] 13 C.F.R. § 121.201, NAICS code 517211.

[356] 13 C.F.R. § 121.201, NAICS code 517212.

1,500 or fewer employees. For the census category of Paging, Census Bureau data for 2002 show that there were 807 firms in this category that operated for the entire year.[357] Of this total, 804 firms had employment of 999 or fewer employees, and three firms had employment of 1,000 employees or more.[358] Thus, under this category and associated small business size standard, the majority of firms can be considered small. For the census category of Cellular and Other Wireless Telecommunications, Census Bureau data for 2002 show that there were 1,397 firms in this category that operated for the entire year.[359] Of this total, 1,378 firms had employment of 999 or fewer employees, and 19 firms had employment of 1,000 employees or more.[360] Thus, under this second category and size standard, the majority of firms can, again, be considered small.

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

Unlicensed transmitters are currently required to be authorized under the Commission's certification procedure as a prerequisite to marketing and importation, and TV band devices would be subject to a certification requirement. The existing certification procedure in the Commission's rules will be used for TV band devices, except that TV band devices that rely on spectrum sensing as the sole method of determining whether a channel is available will have additional certification requirements which are described below. The compliance requirements for TV band devices are as follows.

Fixed devices

- may communicate with other fixed devices and with personal/portable devices
- are permitted to operate on TV channels 2-51, excluding channels 3,4 and 37; may not operate on adjacent TV channels; and, must not use any channels used locally by the private land mobile radio service (PLMRS)
- determine their geographic location by means of an incorporated geo-location capability or a professional installer
- access a database system to determine the available channels at a location
- use outdoor antennas
- are allowed up to 1 watt (W) transmitter output power with a gain antenna to achieve up to 4 W effective isotropic radiated power (EIRP)
- Must register identifying information in a database to help investigate any potential interference due to higher powered operations.

Personal/portable devices

- may communicate with fixed devices and with other personal/portable devices

[357] 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).

[358] *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."

[359] 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).

[360] *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."

- are permitted to operate on TV channels 21-51, excluding channel 37
- can operate in two different modes:
  - Mode I - client, controlled by a fixed device that has determined the available channels in the area
  - Mode II - independent, in which the device determines the available channels using its own internal geo-location/database access capabilities
- 100 milliwatts (mW) EIRP, but limited to 40 mW EIRP when operating adjacent to occupied channels.

All TV band devices

- must be capable of sensing TV and wireless microphone signals at levels as low as -114 dBm
  - Operation prohibited on channels where wireless microphones are detected
  - Will provide an additional indication as to whether a TV channel is occupied
  - Will encourage the further development of sensing technology

The purpose of the TV bands database system for fixed and Mode II personal/portable devices is to identify all services in the TV bands that are eligible for protection. A TV band device will send its geographic coordinates to the database, which will return a list of channels available at that location. The Commission will issue a Public Notice to solicit interested parties in administering the database. The database will contain information about licensed services operating in the TV bands obtained from the Commission's databases, including full service and low power TV stations, Broadcast Auxiliary Service (BAS) links, and PLMRS operations under waivers. In addition, the database will contain voluntarily submitted information on services in the TV bands that are either not in the Commission's databases or are not licensed by specific coordinates, such as wireless microphones.

The Second Report and Order provides for certification of devices that rely on sensing alone based on a proof of performance standard. The manufacturer may submit an application for certification of a device that meets all of the requirements for a TV band device except for geo-location and database access. The application would be available to the public, except for information that may qualify as a trade secret under our rules. A fully functioning pre-production prototype would need to be submitted to the Commission for laboratory and field testing. The testing will be open to the public. The determination of whether to certify the equipment will depend on whether the device is shown to provide a high level of confidence that it will not interfere with incumbent radio services. It must perform at least as well as a device that uses geo-location and database access for interference avoidance. Once a device is certified under these provisions, the Commission would certify other devices that are electrically identical under the usual certification process.

The Second Report and Order imposes new reporting requirements on parties operating fixed TV band devices. Operators of fixed TV band devices will be required to register their location and information about the operator with a TV bands database. When a fixed TV band device queries the database the first time, the device will be registered in the database system. Operators of fixed TV band devices must supply the following registration information and update this information, as necessary, when performing the daily database queries to verify continued channel availability. The Commission may ask a database administrator for this information in the event that a device is found to be causing interference.

(1) FCC identifier (FCC ID) of the device
(2) manufacturer's serial number of the device

(3) device's coordinates (latitude and longitude accurate to within 50 m)
(4) name of the entity, whether an individual or business, responsible for the device
(5) name of a contact person responsible for the device's operation
(6) address for the contact person
(7) email address for the contact person
(8) phone number for the contact person.

As noted above, the Commission's Office of Engineering and Technology will designate a party or parties to administer the database of authorized services in the TV bands. Much of this information will be obtained from the Commission's databases, including information on full service and low power TV stations, Broadcast Auxiliary Service (BAS) links, and PLMRS operations under waivers. However, the database will also contain information submitted voluntarily by parties operating services in the TV bands that are either not listed in the Commission's databases or are not licensed by specific coordinates. These services include BAS links authorized on a temporary basis, receive sites for TV translators and cable TV systems, and sites where wireless microphones are used regularly and predictably, such as major sporting events. The purpose of this voluntarily submitted information is to prevent TV band devices from causing interference to services that do not appear in the Commission's database. The submission of such information is strictly voluntary, but services operated by parties that do not submit this information may not be protected against interference from TV band devices.

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

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."[361]

The rules adopted in the Second Report and Order may have a significant economic impact on a substantial number of small entities. For an entity that chooses to manufacture or import equipment for the subject bands, the rules would impose costs for compliance with equipment technical requirements. The costs for fixed and Mode II personal/portable devices include incorporating a geo-location method to determine the geographic coordinates and the ability to access a database of authorized services in the TV bands, for which a fee may be charged by the database administrator. The costs for all TV band devices include incorporating the ability to detect TV and wireless microphone signals. However, the burdens for complying with these rules would be the same for both large and small entities. Therefore, no disproportionate burden of compliance would be sustained by small entities. Further, the rules adopted in the Second Report and Order are ultimately beneficial for both large and small entities because they will provide for more efficient and effective use of the TV spectrum and allow the development of new and innovative types of wireless devices and communication services for businesses and consumers. Also, because transmissions in the TV band are subject to less propagation attenuation than transmissions in other bands where lower power operations are permitted (such as unlicensed operations in the 2.4 GHz band), operations in the TV bands can improve the service range of wireless operations, thereby allowing operators to reach new customers.

[361] 5 U.S.C. § 603(c)(1) – (c)(4).

F. Report to Congress

The Commission will send a copy of the Second Report and Order, including this FRFA, in a report to be sent to Congress pursuant to the Congressional Review Act.[362] In addition, the Commission will send a copy of the second Report and Order, including the FRFA, to Congress and the Government Accountability Office. A copy of the Second Report and Order and FRFA (or summaries thereof) will also be published in the Federal Register.[363]

[362] *See* 5 U.S.C. § 801(a)(1)(A).

[363] *See* 5 U.S.C. § 604(b).

STATEMENT OF
CHAIRMAN KEVIN J. MARTIN

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, ET Docket No. 02-380***

Today's approval of rules authorizing the use of television (TV) "white spaces" spectrum is a significant victory for consumers.

Today's action was advocated by a diverse coalition of consumer groups, technology leaders and Internet pioneers. Opening the white spaces will allow for the creation of a WiFi on steroids. It has the potential to improve wireless broadband connectivity and inspire an ever-widening array of new Internet based products and services for consumers. Consumers across the country will have access to devices and services that they may have only dreamed about before. I fully expect that everything from enhanced home broadband networks, to intelligent peer-to-peer devices, and even small communications networks will come into being in TV "white spaces."

More specifically, the rules adopted by the Commission establish a framework for enhanced wireless communications by building on a proven concept: the safe deployment of new, intelligent devices in the unused spectrum that exists between television channels.

We do so without disrupting TV services, wireless microphones, or other permitted uses of this spectrum. I have always said that opening the white spaces must be conditioned on protecting primary spectrum users from interference.

We have been cautious in our approach. Significantly, the Commission embarked on extraordinary testing. Not only did the Commission consider thousands of comments, ideas and recommendations submitted by the public, we opened up the testing of the prototype white spaces devices that had been submitted to the FCC. For months, both proponents and opponents of opening the white spaces participated in laboratory and field testing conducted by our engineers. OET also released a lengthy and detailed report of its findings to the public.

Normally, the Commission adopts prospective rules about interference and then certifies devices to ensure they are in compliance. Here, we took the extraordinary step of first conducting this extensive interference testing in order to prove the concept that white space devices could be safely deployed. Prior to going to market any white space device will undergo a rigorous certification process. Today's item protects broadcasters' operations. It also protects entertainment, sports and other significant venues, including the unlicensed operation of many wireless microphones and other wireless devices in those areas. Additionally, channels have even been set aside to protect wireless microphones in major markets.

In order to protect broadcasters, all white space devices must initially use geo-location in conjunction with database consultation to ensure they can operate in a particular location without interference. Manufacturers remain free to demonstrate that sensing-only devices can operate safely and efficiently, without causing interference to television viewers. Such devices will only be deployed after they have demonstrated their effectiveness through a vigorous, public, proof of performance process.

Similarly, manufacturers are challenged to show ways that devices using higher power levels that authorized today can be deployed on adjacent channels.

In conjunction with our other actions today regarding Verizon-Alltel and Sprint-Clearwire, opening up the TV white spaces furthers the goal of making wireless a powerful, competitive broadband platform and offers significant benefits to consumers across the country.

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, ET Docket No. 02-380***

One of the great lessons of history I quickly learned here at the FCC is the power of technology to turn scarcity into abundance. Once upon a time, it seemed that certain swaths of the public airwaves could support only a few expensive, bulky "brick" telephones (so named because of their forbidding size and weight). These early phones permitted just 30 minutes of scratchy voice communications on a single battery charge. Today, thanks to the extraordinary work of America's great engineers and inventors, the same amount of spectrum can support millions of full-featured, relatively inexpensive, multimedia handsets—like the popular iPhone—that perform many of the functions of a desktop computer for days between charges.

Or, to take an example even closer to today's item, we have learned in the past decade that unlicensed bands—once derided as "junk spectrum" suitable only for garage door openers—can actually support Wi-Fi connectivity for tens and even hundreds of millions of users every day. Something that seemed of marginal value has given us broadband in homes, airports, hotels, coffee shops, and downtown areas—developments that are changing the ways in which we live. Just stop by a Starbucks and look at how many people are typing away on laptops. That, to me, is the most important lesson of the wireless revolution: as technology marches on, the real winners are American consumers. This process is as it should be—the airwaves, after all, are the ***people's*** airwaves. And it is the FCC's job to make sure that the American people continue to extract full value from their property.

So in setting responsible spectrum policy, the FCC must always recognize that technology cannot stand still, and that even as we protect existing users from harmful interference, we also have to promote innovation—because until someone finds a way to make more electromagnetic spectrum, it is only ***innovation*** that can improve the wireless choices available to consumers.

For four years, the FCC has been considering proposals to authorize unlicensed devices in the TV white spaces. The proponents have argued that we can enable a whole new generation of wireless devices—bringing new broadband connectivity to our rural and urban communities—without harming free, over-the-air TV. Does this seem almost too good to be true? Of course. But so did the modern cellular industry, the explosion of Wi-Fi devices, and so many other innovations at comparable stages in their development. Even the notion of transmitting high quality video through the air to millions of TV sets must have seemed pretty fantastical when it was first demonstrated decades ago. This is the history of wireless innovation in a nutshell—the nearly miraculous becomes commonplace.

My approach throughout this process has been to let the engineering analysis drive our decision-making. The good news is that the process—while far from perfect—has involved a great deal of serious study and public openness. In fact, the last round of testing was conducted with engineers and lawyers from all sides looking over the shoulders of the FCC's engineers as they performed their bench and field testing. While I do not envy the Commission's engineers for undergoing this level of scrutiny as they go about their daily tasks, I think it's fair to say that few other engineering analyses at the FCC have been as lengthy or open as this one.

The results of our testing have shown that there is merit in the initial positions of ***both*** sides in this debate—and I believe our conclusion today reflects this point. For example, the white spaces proponents initially argued that spectrum-sensing alone would be adequate. Our testing has shown that this approach, right now, is not ready for prime time. That is why our decision does not authorize devices today that rely

exclusively on sensing—though we do create a process for evaluating the next generation of such devices.

Instead, today, we move towards a compromise technology—geo-location—that represents a simpler and more conservative approach to protecting existing licensed users of the television band. We also have built in several forms of belt-and-suspender protections. First, we still will have a chance to "kick the tires" of these devices at the certification stage—to make sure they operate as designed. Second, because we permit these devices to operate under our Part 15 unlicensed rules, they must protect broadcast licensees and shut off if they create harmful interference. Third, because we use geo-location technology, we retain the ability to require particular makes and models of white space devices to turn off if they have a manufacturing flaw. Fourth, to the extent that we consider certifying a next-generation sensing-only device, we have established a process to make sure that all parties have an opportunity to be present during the testing process. So, though there will never be metaphysical certainty when it comes to interference issues, I am comfortable that the FCC and its dedicated engineers have approached this issue with the necessary seriousness and developed an approach that will adequately protect over-the-air viewers.

In this lengthy process, some parties have come forward with arguments for licensed use of the TV white spaces, either in whole or in part. As I have stated before, I think that both licensed and unlicensed regimes benefit consumers. The key is to get the right mix. In the past few years, we have auctioned off almost 150 MHz of new ***licensed*** spectrum. The time has now come, I believe, to increase the amount of ***unlicensed*** spectrum—especially the amount of spectrum below 1 GHz. The order we vote on today will do exactly that.

Some have called this new technology "Wi-Fi on steroids"—and I hope they are right. Certainly, this new technology, taking advantage of the enhanced propagation characteristics of TV spectrum, should be of enormous benefit in solving the broadband deficit in many rural areas. Indeed, I agree with the view of several of my colleagues that it should be quite possible, at some point, to authorize higher-power devices in rural areas that will support backhaul and broadband infrastructure. That is why I support our commitment to issue a Notice of Inquiry on this topic—which should give the Commission more than enough time to build a record and act before the first commercially-ready devices enter the market.

Today's item represents the culmination of a lot of hard work by the Commission's skilled engineers and staff in our Office of Engineering and Technology and elsewhere. I want to thank them for their dedication to this task and their accomplishment in charting a course that accommodates both existing users and innovators in this spectrum. Ultimately, this careful threading of the needle between the path-breaking and the tried-and-true will reap huge benefits for the American people.

STATEMENT OF COMMISSIONER JONATHAN S. ADELSTEIN

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, ET Docket No. 02-380***

Today the Commission takes a critically important step towards managing the public's spectrum to promote efficiency, and to encourage the development and availability of innovative devices and services.

White spaces are the blank pages on which we will write our broadband future. I have long called for not only a "third pipe" into the home but a "third channel" directly to consumers, wherever they may roam. Today, we make a key advance toward a third channel for broadband competition and deployment. This Order is a central element of the national broadband strategy that I have advocated for quite some time.

Today's decision is consequential to our nation's future because wireless broadband has the potential to improve our economy and quality of life in even the remotest areas. One of the best options for promoting broadband and competition across the country, particularly in rural areas, is maximizing the potential of spectrum-based services. Because we are a nation of innovators and entrepreneurs, the Commission's decision to open fallow spectrum to new uses will give our country an opportunity to reclaim its place as a world leader in broadband deployment.

Wireless devices have become a central part of many of our lives. As the market continues to expand, so too does our need for spectrum and infrastructure that can meet the rising demands. Our job as a Commission is to pack as much data as possible over the public spectrum without causing harmful interference. Unlicensed spectrum holds by far the most promise for maximizing the use of white spaces. Our balanced approach in this order provides the flexibility and low barriers to entry needed to provide an opportunity for everyone to make the best use of this under-used spectrum. It also implements safeguards to protect those that already make valuable use of the spectrum.

The results of the Office of Engineering and Technology's study show that geo-location technology offers an accurate and dependable means of protecting spectrum incumbents from interference. I am pleased with our decision to require both master-client based and independent based devices to utilize geo-location technology and database access for identifying vacant channels. Because broadcasters have such a vital role in local communities, preservation of consumers' television reception and other services is critical to acceptance of new white spaces devices. Although spectrum-sensing technology has not yet been proven to offer the same level of protection, I applaud our support for its continuing development and look forward to the innovation it may bring.

I am pleased that my colleagues have agreed to provide details regarding the certification process for white space devices. These additional details will provide an avenue for public comment on this process and ensure that the resulting process is fully vetted by interested parties.

Many have raised the concern that broadcasters and users of wireless microphones will suffer harmful interference as a result of this Order. The Office of Engineering and Technology assures us that there are adequate protections here to prevent harmful interference to licensed users, and I accept their assurances.

It is small consolation to those that feel justifiably aggrieved by the process that there was overwhelming support for acting now, and that more time was unlikely to change the outcome. This process is not a model of transparency. When the Commission puts expediency ahead of an open process, it creates unnecessary resentment from parties that believe they were not given a fair hearing. This is not

the process I would have undertaken, but since our independent engineering staff justifies the decision on the basis of their best expert analysis, I approve this item.

An issue of great concern remains, though, that many unwary consumers purchased wireless microphones that may not comport with Commission rules. An investigation is underway, and if we find that Commission rules were violated, we must act to protect the many musicians, performers and others who will need to ensure their equipment continues to work. While I am hopeful the protections we adopt today are sufficient, we will need to closely follow the impact on users of wireless microphones, and devise solutions, considering all spectrum at our disposal, so they can continue to use them with confidence they will function as they have come to expect.

I am pleased that the Chairman and my colleagues have agreed to launch a separate Notice of Inquiry (NOI) into the best use of the white space spectrum for higher powered unlicensed operations in rural areas. In order for the white spaces to achieve maximum utilization in rural areas, rural wireless Internet service providers will need cheap, available and reliable backhaul. We need to explore all ways of achieving this. Variable power limits deserve our consideration as one possible means. I would have preferred that these questions were raised in a Notice of Proposed Rulemaking rather than an NOI, and that they covered all spectrum, but getting this discussion underway is a positive development.

Historians looking at American telecommunications policy may well view today as a day that heralded change not only with the nationwide vote that is taking place at the polls, but also the vote that takes place here to open the white spaces for broadband deployment. Both portend great progress for our future technological development. Just as I enthusiastically voted at the polls earlier this morning, I vote again enthusiastically for this item here today.

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, ET Docket No. 02-380***

To paraphrase astronaut Neil Armstrong as he became the first person to step on the moon, today the FCC is making both a small step and a giant leap. It will be a giant leap for American consumers to be able to use the untapped television "white spaces." At the same time, we enter this new frontier with a small step in the form of a prudent and cautious order that sets up safeguards to ensure that new unlicensed devices do not cause harmful interference with licensees and other users of these frequencies.

While new broadband technologies are the most likely uses of these channels, the most exciting part about our action today is that we are creating the opportunity for an explosion of entrepreneurial brilliance. Our de-regulatory order will allow the market place to produce new devices and new applications that we can't even imagine today. Not only will the lives of millions of Americans be enriched by these new technologies, but I am confident that imaginative use of the TV white spaces could actually improve our safety as well.

We owe this historic moment to several white spaces pioneers including former FCC Chairman Michael Powell who initiated this proceeding four years ago, many Members of Congress, countless entrepreneurs and, of course, my Commission colleagues. I also acknowledge our chief engineer and technologist, Julie Knapp, and his entire OET team. Thank you for your patience, openness, fortitude and counsel.

To those who have expressed concern regarding the results of this proceeding, I would like to offer them comfort in the form of the text of today's order. As a preliminary matter, I note that the empirical data we have studied suggests a very real potential for deployment of new personal/portable devices, and it would be premature to either wholly endorse or close the door entirely on future developments. Accordingly, it is appropriate that the steps today are limited in scope, define an outline for our future approach toward device certification and allow for any and all changes that may be required by future circumstances.

We have listened carefully to the arguments of broadcasters, cable TV operators, wireless microphone companies and entertainers, and today's order addresses their concerns. In short, all avenues of modification and improvement remain open. And I thank my colleagues for working collectively to strengthen and clarify these protections. In fact, as technology improves, I expect that one day we will likely look back on this order and think of it as quaint; but today it is state-of-the-art.

Our decision today also obviates the need for artificial government mandates, such as those imposed on the C Block of our 700 MHz auction. Make no mistake, I have long advocated application and device portability as well as free and open networks. Consumers want these features, and the market started working on delivering them years before unnecessary, counterproductive and after-the-fact Commission mandates. Therefore, if such mandates were not necessary then, they are even more unnecessary after our action today. Robust unlicensed use of white spaces will give nimble entrepreneurs the freedom to disrupt the market in positive and constructive ways that will force incumbents to keep pace with this new revolution. As a result, the pressure created by dynamic competition will knock down barriers created by walled gardens and pry open closed networks. This liberation will come about not

through increased regulation, but through increased competition. Our ultimate shareholders, American consumers, will reap the dividends.

I also appreciate my colleagues' support for a notice of inquiry to commence an examination of possible other limited uses of white spaces, such as point-to-point backhaul in rural areas as a substitute for special access. This is an idea that was raised in our original notice, is thoroughly discussed on the record, and is already ripe for decision. I still believe that a further notice of proposed rulemaking would have presented us with a clearer path toward a closer examination. Nonetheless, I hope my colleagues in the next Commission will move forward expeditiously on what I believe to be a win-win solution.

Here is the challenge: all wireless services have to be backhauled to the PSTN and the Internet via a network of some kind. Over the years, some people in the tech industry, as well as some of my colleagues, have complained about a lack of competition in the special access market which, they allege, artificially drives up backhaul costs. Competitive local exchange carriers (CLECs) and competitive wireless carriers presented us with a possible solution to this challenge for rural areas which enjoy more unused spectrum than urban areas and suffer from the least amount of special access competition. Some form of limited white spaces point-to-point licensing may allow entrepreneurs to find more efficient paths for their backhaul needs while leaving the lion's share of white spaces spectrum on the table for unlicensed users.

I am disappointed by some in the tech industry and public interest community who seem to oppose the Commission even discussing this issue while also complaining about the condition of the special access market. All of us should remember that CLECs, wireless companies and their supplier partners are also part of the tech industry and their voices should be heard as well. Hopefully, this notice of inquiry can plant the seeds of progress to find a workable solution that inures to the benefit of all parties, but mainly, American consumers.

Our decision today is revolutionary. It does more than simply foster the development of exciting new wireless services. It also has the potential to sustain the continuing good health of an "old" technology: television broadcasting, by protecting the interests of the millions of consumers who continue to rely on broadcasting for their news, entertainment and public safety information.

Accordingly, I strongly support today's order.

STATEMENT OF
COMMISSIONER DEBORAH TAYLOR TATE
APPROVING IN PART AND DISSENTING IN PART

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, ET Docket No. 02-380***

In the midst of the present economic downturn gripping our nation and the world, there is one bright spot on the horizon – American technology and the American entrepreneurial spirit, especially in the communications and technology sector, which hold the promise of future innovation, investment, jobs and economic growth. One of the more promising areas of innovation cannot even be seen – the "white spaces" that represent the unused portions of spectrum in the bands presently allocated to TV broadcast operations. Today's item advances us on a path to facilitate use of the white spaces for new wireless services, including broadband services, for all Americans.

These are first steps only, ones that hopefully will move us towards modernization and more effective use of the unused portions of this spectrum. Indeed, these are revolutionary times in an evolutionary industry, with the promise of even yet unseen innovative devices on the horizon. Many visions exist for how unlicensed use of the white spaces will evolve, but evolve they certainly will. Hopefully, this item will help facilitate the deployment of unlicensed devices and services that enable consumers to enjoy more television programming and video than ever before, and that will allow families to transfer and network information, photos, and much more across multiple devices, technologies and platforms in their homes. Similarly, communities of users may find they are able to communicate seamlessly through mesh networks rather than traditional phone lines. Finally, as someone who has championed rural America, I hope that this item will facilitate services, including broadband, to rural areas and thus help reduce the digital divide that is far too prevalent in rural communities across our nation.

In considering this order, I have listened to and weighed seriously the concerns of an amazingly broad array of interests. In the end, I have tried to reach a reasonable position that takes into account all interests, including, most especially, the interests of the American consumer. The order is not perfect – it precludes licensed services and lacks needed language regarding a specific and expedited complaint process for broadcasters, cable providers, wireless microphones and individual users in the case of interference. Nonetheless, the order ultimately may help promote the innovation and investment in advanced services that consumers have come to expect from the communications and technology sector. Accordingly, I would like to address several important public policy goals, as well as some of my concerns regarding how this item falls short of our mandate to advance the interests of the American public.

Measures to Address Interference

In crafting public policy, one must weigh the benefits and costs of various options. In this case, the potential costs of enabling unlicensed use of the white spaces are substantial. Specifically, this order enables a vision for entirely new services and devices but ones that also hold a real risk of causing interference with existing services, including broadcasting, cable television, and wireless microphones, among others.

Addressing interference in the use of the spectrum has always been one of the primary roles of the Federal Communications Commission since its creation by Congress in 1934. Our predecessor agency, the Federal Radio Commission, also assumed this important responsibility starting as early as 1927. Clearly, addressing interference is one of the crucial tasks this agency takes most seriously and performs most effectively.

Within the Commission, the Office of Engineering and Technology (OET) is the team responsible for conducting the research, analysis, and evaluation of devices that use the airwaves in this country. This group of talented staff has spent the past four years carefully considering whether and to what extent unlicensed devices may utilize the white spaces in the broadcast spectrum without causing undue harm to incumbent users. I have placed much faith in the Chief of OET, Julie Knapp, and his entire staff of engineers. Their recommendations, while always useful in any rulemaking, played an especially persuasive role in my final decision to support this item.

I have been assured by Chief Knapp and our top engineers that the risks of interference have been appropriately considered. Ultimately, as the Commission's most recent report states, the extensive testing by OET has provided "proof of concept" for some types of unlicensed devices to use the white spaces. Further, as this order makes very clear, all devices that in the future will be used in the U.S. market must first be tested and approved by the Commission, in effect demonstrating not only that there is "proof of concept" but also "proof in practice." While some commenters have criticized our testing process, both our 2007 and 2008 reports on the test results were peer reviewed by other expert staff within the Commission. In addition, these tests were open to the public, and at various points during this long process the work of our OET engineers was observed by members of the press, Congressional staff, broadcasters and other industry representatives, as well as other interested parties. I am proud of this transparent and open process and encourage OET to continue this commitment going forward.

Based on the results of these tests, this order establishes a number of significant technical rules related to unlicensed use of the white spaces in the broadcast bands. Power limits are more restricted – to 40 milliwatts, or a fraction of what wireless microphones are authorized to employ in these frequencies – when operated in a channel immediately adjacent to a broadcast service, while a higher power limit applies in non-adjacent channels.

In addition, and of critical importance to incumbent providers, the item will create a database of existing operations in specific channels and entire geographic areas that will remain unavailable to all unlicensed operations. Incumbent providers may register their locations and unlicensed devices will be required to first verify that channels are available prior to accessing them. This requirement to use this database will ensure that broadcast operations, broadcast auxiliary services (BAS), cable head-ins, public safety operations, and venues such as sports stadiums and theatres may register their locations and receive complete protection.

The Commission, through our Enforcement Bureau and in consultation with the Office of Engineering and Technology, will investigate complaints of interference and take appropriate action, as we do with all cases of interference. I regret that my colleagues were unwilling to set forth in this item a more specific and swift process to deal with complaints of interference. I remain concerned that the item is too vague and does not provide necessary protections after the interference has occurred.

I also would like to acknowledge the legitimate concerns of the many industries that already provide valuable services using the core TV bands. Regarding the concerns of my friends in the broadcasting industry, I want to recognize the important service they provide, especially all they currently are doing to make the DTV transition as smooth as possible. Over 90 percent of Americans are now aware of the DTV transition, thanks in large part to the more than $1 billion invested by the broadcasters and the cable industry in PSAs and other public education efforts. The DTV transition is an extraordinary opportunity for consumers to receive revolutionary TV picture quality and additional programming, as well as new wireless services that will be available in the 700 MHz band when those channels are vacated. In addition, broadcasters play a key role in providing emergency alerts to the public. It is, therefore, imperative that TV broadcasting continue to be protected from interference. The power limits and other technical rules, proposed by OET and adopted herein, are designed to do just that.

Regarding similar concerns by cable operators, I also recognize the potential for interference, both to cable head ends as well as to cable connections inside the home. The item takes steps to protect cable head ends by restricting use of white spaces devices in the geographic areas in which head ends are located. With regard to cable systems in the home, OET has attempted to establish power limits that will lower the risk of interference between devices in the home, though this risk is not, in my mind, fully mitigated. However, the Commission does not generally focus on interference that users cause to themselves. Just as we have all learned to move devices away from each other in the office and we no longer place our cell phones next to the computer, so might consumers need to reduce interference inside their home by moving devices, at least until the next generation of cable equipment becomes more widely disseminated. I encourage device manufacturers and indeed the Commission to provide information to consumers regarding these devices as they come online, as well as establishing 800 numbers, arming call centers with tech-specific solutions, email alerts, software "fixes" that lower power and other forms of outreach to consumers.

Regarding the concerns of facilities and events managers – including Broadway, sports stadiums, churches, my friends at the Grand Ole Opry, and many others – the geographic database provides a critical line of defense. In addition, the item will make spectrum available in two channels above Channel 20 in those markets that are particularly congested due to public safety operations in Channels 14 – 20. Taken together, these measures should protect the vast majority of wireless microphones.

Remaining Concerns

While the use of white spaces by unlicensed devices holds great promise and I am excited about their potential, I also have several significant concerns that I believe we should have addressed and encourage a future Commission to re-address.

With regard to the possibility of interference, I regret that the Order does not include language that would specifically state the legal responsibilities of those who provide these new unlicensed devices. In particular, I would like providers of these devices to have clear notice of what they must and must not do under the Commission's rules. Perhaps more important still, I wanted to ensure that our rules specify that, in the event of significant interference caused by an unlicensed device, the party responsible for this device will also be responsible for rectifying the problem and assume the cost. Some companies have assured us that this will be the case; that their business reputation requires it and it is indeed "good business" for them to correct the situation. However, the potential impact of millions of devices in the marketplace calls for a prudent process for recall, provisions for mitigating interference caused by faulty equipment, and a clear exposition of fines and penalties for violations. I felt it was imperative to deal with this on the front end, but today's item is not sufficiently clear on these matters. I hope the next Commission will address this before, rather than after, any harm occurs.

In addition, I am disappointed that this item does not take more specific steps to address higher-power fixed operations in rural areas, which could have been used to provide much needed backhaul, a key component of broadband service in rural communities. While I understand that the Commission will issue a Notice of Inquiry on this issue, this is too little and too late. Rural consumers need help now, and the record on the various options – including licensed approaches – is sufficiently developed for the Commission to take action today.

More fundamentally, and most troubling about today's order, the Commission's decision makes it difficult if not impossible to allow anything other than unlicensed use in the white spaces of the roughly 300 megahertz that comprise the TV broadcast spectrum. Other valuable uses, such as licensed operations, are precluded. I am not convinced that all of the white spaces in Channels 2 – 51 needed to be

made available for unlicensed use. Indeed, many of the companies that have discussed with me their exciting new business models have focused only on the use of Channels 21 – 51.

As with any policy decision, we must be cognizant of the opportunity cost – that is, we must look with a clear head at that which we are giving up. This is extremely valuable spectrum – beachfront property spectrum – with estimates of the value of white spaces under a licensed approach ranging from $8 billion to over $24 billion. Even if the low estimates in this range are the most accurate, we must consider this lost value to the U.S. Treasury and, ultimately, to taxpayers. Even more important than the lost auction revenues, the consumer benefits of spectrum use in a licensed regime are many times greater than what service providers pay to the U.S. Treasury. Of course, the benefits to consumers of services in unlicensed bands also may be significant. But if all white spaces spectrum in this band is set aside for unlicensed use – rather than appropriately balancing licensed and unlicensed approaches – we are likely to ignore the huge value of alternative uses. In short, we need to consider the tradeoffs, and the American consumer – in urban as well as rural areas – will suffer if we do not.

Based on my conversations with OET, independent engineers and various members of the White Spaces Coalition, it would appear that allowing unlicensed use of the white spaces only in Channels 31-51 would be sufficient to provide four channels – that is, 24 megahertz – in even the most congested markets and many, many more channels in suburban and rural markets. As an example, 24 megahertz is greater than the amount of spectrum made available in the largest block in the 700 MHz auction held this spring. In that auction, the C block sold for $3.7 billion, despite significant use restrictions that arguably lowered the final bid. While four channels of white spaces creating 24 megahertz would not represent contiguous spectrum, this nonetheless would be sufficient for broadband services in these highly congested markets. Other urban markets would have somewhat more spectrum available, while rural markets might have as much as 100 megahertz more spectrum available.

Accordingly, I am not convinced that making Channels 21 – 51 available only for unlicensed use is necessary to create the types of exciting new services that have been predicted. I am even less convinced – and the record does not support – that we must make the entire core TV band, Channels 2 – 51, available for such use. This is more spectrum than was requested by most of the parties who argued that they could provide new and innovative services using Channels 21 – 51. Therefore, while I supported moving forward to allow a portion of the white spaces be made available for unlicensed use, I respectfully dissent from including all channels in the band plan in this order.

I thank Chief Julie Knapp, the fine staff at OET, and all those who have worked so hard on this item, including the many hours spent testing and analyzing devices. However, this was only a step on this incredible technology journey. Testing on individual devices will now commence and must be subject to the same stringent, thorough, and transparent procedures and reporting we have seen thus far in this process, consistent with the Commission's procedures for all device certifications. In addition, it is of critical importance that the Commission establishes and ensures a process that will immediately respond to and mitigate any interference experienced by incumbent users and individual consumers alike.