§ 14.60 Applicability.

(a) This subpart E shall apply to a manufacturer of a telephone used with public mobile services (as such term is defined in 47 U.S.C. 710(b)(4)(B)) that includes an Internet browser in such telephone that is offered for sale or otherwise distributed in interstate commerce, or a provider of mobile services that arranges for the inclusion of a browser in telephones to sell or otherwise distribute to customers in interstate commerce.

(b) Only the following enumerated provisions contained in this part 14 shall apply to this subpart E.

(1) The limitations contained in §14.2 shall apply to this subpart E.

(2) The definitions contained in §14.10 shall apply to this subpart E.

(3) The product design, development and evaluation provisions contained in §14.20(b) shall apply to this subpart E.

(4) The information, documentation, and training provisions contained in §14.20(d) shall apply to this subpart E.

(5) The performance objectives provisions contained in §14.21(a), (b)(1)(i), (b)(1)(ii), (b)(1)(iii), (b)(2)(i), (b)(2)(ii), (b)(2)(iii), (b)(2)(vii), and (c) shall apply to this subpart E.

(6) All of subpart D shall apply to this subpart E.

§ 14.61 Obligations with respect to internet browsers built into mobile phones.

(a) *Accessibility*. If on or after October 8, 2013 a manufacturer of a telephone used with public mobile services includes an Internet browser in such telephone, or if a provider of mobile service arranges for the inclusion of a browser in telephones to sell to customers, the manufacturer or provider shall ensure that the functions of the included browser (including the ability to launch the browser) are accessible to and usable by individuals who are blind or have a visual impairment, unless doing so is not achievable, except that this subpart shall not impose any requirement on such manufacturer or provider—

(1) To make accessible or usable any Internet browser other than a browser that such manufacturer or provider includes or arranges to include in the telephone; or

(2) To make Internet content, applications, or services accessible or usable (other than enabling individuals with disabilities to use an included browser to access such content, applications, or services).

(b) *Industry flexibility*. A manufacturer or provider may satisfy the requirements of this subpart with respect to such telephone or services by—

(1) Ensuring that the telephone or services that such manufacturer or provider offers is accessible to and usable by individuals with disabilities without the use of third-party applications, peripheral devices, software, hardware, or customer premises equipment; or

(2) Using third-party applications, peripheral devices, software, hardware, or customer premises equipment that is available to the consumer at nominal cost and that individuals with disabilities can access.

PART 15—RADIO FREQUENCY DEVICES

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AUTHORITY: 47 U.S.C. 154, 302a, 303, 304, 307, 336, 544a, and 549.

SOURCE: 54 FR 17714, Apr. 25, 1989, unless otherwise noted.

Subpart A—General

§ 15.1 Scope of this part.

(a) This part sets out the regulations under which an intentional, unintentional, or incidental radiator may be operated without an individual license. It also contains the technical specifications, administrative requirements and other conditions relating to the marketing of part 15 devices.

(b) The operation of an intentional or unintentional radiator that is not in accordance with the regulations in this part must be licensed pursuant to the provisions of section 301 of the Communications Act of 1934, as amended, unless otherwise exempted from the licensing requirements elsewhere in this chapter.

(c) Unless specifically exempted, the operation or marketing of an intentional or unintentional radiator that is not in compliance with the administrative and technical provisions in this part, including prior equipment authorization, as appropriate, is prohibited under section 302 of the Communications Act of 1934, as amended, and subpart I of part 2 of this chapter. The equipment authorization procedures are detailed in subpart J of part 2 of this chapter.

[54 FR 17714, Apr. 25, 1989, as amended at 82 FR 50830, Nov. 2, 2017]

§ 15.3 Definitions.

(a) *Auditory assistance device.* An intentional radiator used to provide auditory assistance communications (including but not limited to applications such as assistive listening, auricular training, audio description for the blind, and simultaneous language translation) for:

(1) Persons with disabilities: In the context of part 15 rules (47 CFR part 15), the term ''disability,'' with respect to the individual, has the meaning given to it by section 3(2)(A) of the Americans with Disabilities Act of 1990 (42 U.S.C. 12102(2)(A)), *i.e.*, a physical or mental impairment that substantially limits one or more of the major life activities of such individuals;

(2) Persons who require language translation; or

(3) Persons who may otherwise benefit from auditory assistance communications in places of public gatherings, such as a church, theater, auditorium, or educational institution.

(b) *Biomedical telemetry device.* An intentional radiator used to transmit measurements of either human or animal biomedical phenomena to a receiver.

(c) *Cable input selector switch.* A transfer switch that is intended as a means to alternate between the reception of broadcast signals via connection to an antenna and the reception of cable television service.

(d) *Cable locating equipment.* An intentional radiator used intermittently by

trained operators to locate buried cables, lines, pipes, and similar structures or elements. Operation entails coupling a radio frequency signal onto the cable, pipes, etc. and using a receiver to detect the location of that structure or element.

(e) *Cable system terminal device (CSTD).* A TV interface device that serves, as its primary function, to connect a cable system operated under part 76 of this chapter to a TV broadcast receiver or other subscriber premise equipment. Any device which functions as a CSTD in one of its operating modes must comply with the technical requirements for such devices when operating in that mode.

(f) *Carrier current system.* A system, or part of a system, that transmits radio frequency energy by conduction over the electric power lines. A carrier current system can be designed such that the signals are received by conduction directly from connection to the electric power lines (unintentional radiator) or the signals are received over-the-air due to radiation of the radio frequency signals from the electric power lines (intentional radiator).

(g) *CB receiver.* Any receiver that operates in the Personal Radio Services on frequencies designated for CB Radio Service stations, as well as any receiver provided with a separate band specifically designed to receive the transmissions of CB stations in the Personal Radio Services. This includes the following:

(1) A CB receiver sold as a separate unit of equipment;

(2) The receiver section of a CB transceiver;

(3) A converter to be used with any receiver for the purpose of receiving CB transmissions; and

(4) A multiband receiver that includes a band labelled ''CB'' or ''11-meter'' in which such band can be separately selected, except that an Amateur Radio Service receiver that was manufactured prior to January 1, 1960, and which includes an 11-meter band shall not be considered to be a CB receiver.

(h) *Class A digital device.* A digital device that is marketed for use in a commercial, industrial or business environment, exclusive of a device which is marketed for use by the general public or is intended to be used in the home.

(i) *Class B digital device.* A digital device that is marketed for use in a residential environment notwithstanding use in commercial, business and industrial environments. Examples of such devices include, but are not limited to, personal computers, calculators, and similar electronic devices that are marketed for use by the general public.

NOTE: The responsible party may also qualify a device intended to be marketed in a commercial, business or industrial environment as a Class B device, and in fact is encouraged to do so, provided the device complies with the technical specifications for a Class B digital device. In the event that a particular type of device has been found to repeatedly cause harmful interference to radio communications, the Commission may classify such a digital device as a Class B digital device, regardless of its intended use.

(j) *Cordless telephone system.* A system consisting of two transceivers, one a base station that connects to the public switched telephone network and the other a mobile handset unit that communicates directly with the base station. Transmissions from the mobile unit are received by the base station and then placed on the public switched telephone network. Information received from the switched telephone network is transmitted by the base station to the mobile unit.

NOTE: The Domestic Public Cellular Radio Telecommunications Service is considered to be part of the switched telephone network. In addition, intercom and paging operations are permitted provided these are not intended to be the primary modes of operation.

(k) *Digital device.* (Previously defined as a computing device). An unintentional radiator (device or system) that generates and uses timing signals or pulses at a rate in excess of 9,000 pulses (cycles) per second and uses digital techniques; inclusive of telephone equipment that uses digital techniques or any device or system that generates and uses radio frequency energy for the purpose of performing data processing functions, such as electronic computations, operations, transformations, recording, filing, sorting, storage, retrieval, or transfer. A radio frequency device that is specifically subject to an emanation requirement in any other

FCC Rule part or an intentional radiator subject to subpart C of this part that contains a digital device is not subject to the standards for digital devices, provided the digital device is used only to enable operation of the radio frequency device and the digital device does not control additional functions or capabilities.

NOTE: Computer terminals and peripherals that are intended to be connected to a computer are digital devices.

(l) *Field disturbance sensor.* A device that establishes a radio frequency field in its vicinity and detects changes in that field resulting from the movement of persons or objects within its range.

(m) *Harmful interference.* Any emission, radiation or induction that endangers the functioning of a radio navigation service or of other safety services or seriously degrades, obstructs or repeatedly interrupts a radiocommunications service operating in accordance with this chapter.

(n) *Incidental radiator.* A device that generates radio frequency energy during the course of its operation although the device is not intentionally designed to generate or emit radio frequency energy. Examples of incidental radiators are dc motors, mechanical light switches, etc.

(o) *Intentional radiator.* A device that intentionally generates and emits radio frequency energy by radiation or induction.

(p) *Kit.* Any number of electronic parts, usually provided with a schematic diagram or printed circuit board, which, when assembled in accordance with instructions, results in a device subject to the regulations in this part, even if additional parts of any type are required to complete assembly.

(q) *Perimeter protection system.* A field disturbance sensor that employs RF transmission lines as the radiating source. These RF transmission lines are installed in such a manner that allows the system to detect movement within the protected area.

(r) *Peripheral device.* An input/output unit of a system that feeds data into and/or receives data from the central processing unit of a digital device. Peripherals to a digital device include any device that is connected external to the digital device, any device internal to the digital device that connects the digital device to an external device by wire or cable, and any circuit board designed for interchangeable mounting, internally or externally, that increases the operating or processing speed of a digital device, e.g., ''turbo'' cards and ''enhancement'' boards. Examples of peripheral devices include terminals, printers, external floppy disk drives and other data storage devices, video monitors, keyboards, interface boards, external memory expansion cards, and other input/output devices that may or may not contain digital circuitry. This definition does not include CPU boards, as defined in paragraph (bb) of this section, even though a CPU board may connect to an external keyboard or other components.

(s) *Personal computer.* An electronic computer that is marketed for use in the home, notwithstanding business applications. Such computers are considered Class B digital devices. Computers which use a standard TV receiver as a display device or meet all of the following conditions are considered examples of personal computers:

(1) Marketed through a retail outlet or direct mail order catalog.

(2) Notices of sale or advertisements are distributed or directed to the general public or hobbyist users rather than restricted to commercial users.

(3) Operates on a battery or 120 volt electrical supply.

If the responsible party can demonstrate that because of price or performance the computer is not suitable for residential or hobbyist use, it may request that the computer be considered to fall outside of the scope of this definition for personal computers.

(t) *Power line carrier systems.* An unintentional radiator employed as a carrier current system used by an electric power utility entity on transmission lines for protective relaying, telemetry, etc. for general supervision of the power system. The system operates by the transmission of radio frequency energy by conduction over the electric power transmission lines of the system. The system does not include those electric lines which connect the distribution substation to the customer or house wiring.

(u) *Radio frequency (RF) energy.* Electromagnetic energy at any frequency in the radio spectrum between 9 kHz and 3,000,000 MHz.

(v) *Scanning receiver.* For the purpose of this part, this is a receiver that automatically switches among two or more frequencies in the range of 30 to 960 MHz and that is capable of stopping at and receiving a radio signal detected on a frequency. Receivers designed solely for the reception of the broadcast signals under part 73 of this chapter, for the reception of NOAA broadcast weather band signals, or for operation as part of a licensed service are not included in this definition.

(w) *Television (TV) broadcast receiver.* A device designed to receive television pictures that are broadcast simultaneously with sound on the television channels authorized under part 73 of this chapter.

(x) *Transfer switch.* A device used to alternate between the reception of over-the-air radio frequency signals via connection to an antenna and the reception of radio frequency signals received by any other method, such as from a TV interface device.

(y) *TV interface device.* An unintentional radiator that produces or translates in frequency a radio frequency carrier modulated by a video signal derived from an external or internal signal source, and which feeds the modulated radio frequency energy by conduction to the antenna terminals or other non-baseband input connections of a television broadcast receiver. A TV interface device may include a standalone RF modulator, or a composite device consisting of an RF modulator, video source and other components devices. Examples of TV interface devices are video cassette recorders and terminal devices attached to a cable system or used with a Master Antenna (including those used for central distribution video devices in apartment or office buildings).

(z) *Unintentional radiator.* A device that intentionally generates radio frequency energy for use within the device, or that sends radio frequency signals by conduction to associated equipment via connecting wiring, but which is not intended to emit RF energy by radiation or induction.

(aa) *Cable ready consumer electronics equipment.* Consumer electronics TV receiving devices, including TV receivers, videocassette recorders and similar devices, that incorporate a tuner capable of receiving television signals and an input terminal intended for receiving cable television service, and are marketed as ''cable ready'' or ''cable compatible.'' Such equipment shall comply with the technical standards specified in §15.118 and the provisions of §15.19(d).

(bb) *CPU board.* A circuit board that contains a microprocessor, or frequency determining circuitry for the microprocessor, the primary function of which is to execute user-provided programming, but not including:

(1) A circuit board that contains only a microprocessor intended to operate under the primary control or instruction of a microprocessor external to such a circuit board; or

(2) A circuit board that is a dedicated controller for a storage or input/output device.

(cc) *External radio frequency power amplifier.* A device which is not an integral part of an intentional radiator as manufactured and which, when used in conjunction with an intentional radiator as a signal source, is capable of amplifying that signal.

(dd) *Test equipment* is defined as equipment that is intended primarily for purposes of performing measurements or scientific investigations. Such equipment includes, but is not limited to, field strength meters, spectrum analyzers, and modulation monitors.

(ee) *Radar detector.* A receiver designed to signal the presence of radio signals used for determining the speed of motor vehicles. This definition does not encompass the receiver incorporated within a radar transceiver certified under the Commission's rules.

(ff) *Access Broadband over Power Line (Access BPL).* A carrier current system installed and operated on an electric utility service as an unintentional radiator that sends radio frequency energy on frequencies between 1.705 MHz and 80 MHz over medium voltage lines or over low voltage lines to provide broadband communications and is located on the supply side of the utility

service's points of interconnection with customer premises. Access BPL does not include power line carrier systems as defined in §15.3(t) or In-House BPL as defined in §15.3(gg).

(gg) *In-House Broadband over Power Line (In-House BPL).* A carrier current system, operating as an unintentional radiator, that sends radio frequency energy by conduction over electric power lines that are not owned, operated or controlled by an electric service provider. The electric power lines may be aerial (overhead), underground, or inside the walls, floors or ceilings of user premises. In-House BPL devices may establish closed networks within a user's premises or provide connections to Access BPL networks, or both.

(hh) *Slant-Range distance.* Diagonal distance measured from the center of the measurement antenna to the nearest point of the overhead power line carrying the Access BPL signal being measured. This distance is equal to the hypotenuse of the right triangle as calculated in the formula below. The slant-range distance shall be calculated as follows:

$$d_{slant} = \sqrt{\left(h_{pwr\_line} - h_{ant}\right)^2 + \left(d_h\right)^2}$$

Where:

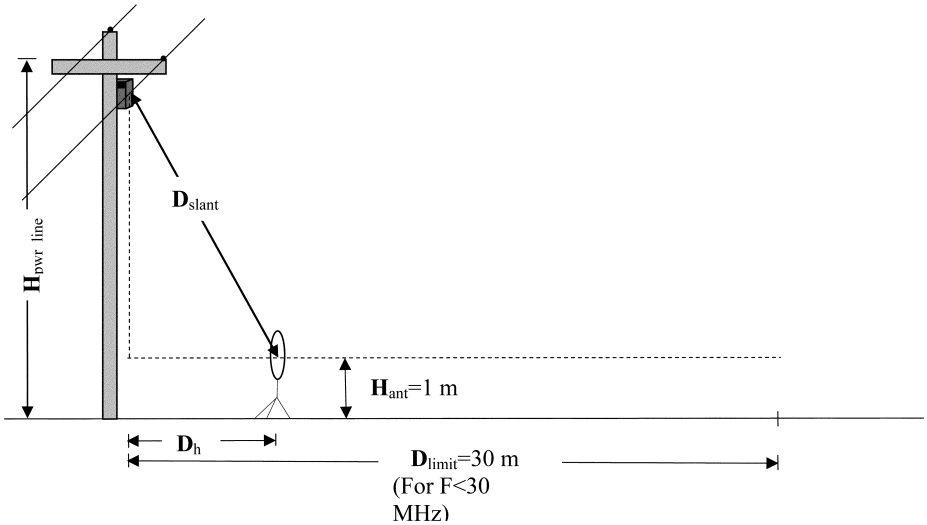
d_{slant} is the slant-range distance, in meters (see Figure 1, below);

d_h is the horizontal (lateral) distance between the center of the measurement antenna and the vertical projection of the overhead power line carrying the BPL signals down to the height of the measurement antenna, in meters;

$h_{pwr—line}$ is the height of the power line, in meters; and

h_{ant} is the measurement antenna height, in meters.

Figure 1 – Illustration of Slant-Range Distance



D_{slant} is the slant-range distance, in meters;
D_h is the horizontal (lateral) distance between the center of the measurement antenna and the vertical projection of the overhead power line carrying the BPL signals down to the height of the measurement antenna, in meters;
D_{limit} is the distance at which the emission limit is specified in Part 15 (e.g., 30 meters for frequencies below 30 MHz);
$H_{pwr—line}$ is the height of the power line, in meters; and
H_{ant} is the measurement antenna height, in meters.

(ii) *Level Probing Radar (LPR):* A short-range radar transmitter used in a wide range of applications to measure the amount of various substances, mostly liquids or granulates. LPR equipment may operate in open-air environments or inside an enclosure containing the substance being measured.

[54 FR 17714, Apr. 25, 1989, as amended at 55 FR 18340, May 2, 1990; 57 FR 33448, July 29, 1992; 59 FR 25340, May 16, 1994; 61 FR 31048, June 19, 1996; 62 FR 26242, May 13, 1997; 64 FR 22561, Apr. 27, 1999; 65 FR 64391, Oct. 27, 2000; 66 FR 32582, June 15, 2001; 67 FR 48993, July 29, 2002; 70 FR 1373, Jan. 7, 2005; 76 FR 71907, Nov. 21, 2011; 78 FR 34927, June 11, 2013; 79 FR 12677, Mar. 6, 2014; 82 FR 41103, Aug. 29, 2017]

§ 15.5 General conditions of operation.

(a) Persons operating intentional or unintentional radiators shall not be deemed to have any vested or recognizable right to continued use of any given frequency by virtue of prior registration or certification of equipment, or, for power line carrier systems, on the basis of prior notification of use pursuant to §90.35(g) of this chapter.

(b) Operation of an intentional, unintentional, or incidental radiator is subject to the conditions that no harmful interference is caused and that interference must be accepted that may be caused by the operation of an authorized radio station, by another intentional or unintentional radiator, by industrial, scientific and medical (ISM) equipment, or by an incidental radiator.

(c) The operator of a radio frequency device shall be required to cease operating the device upon notification by a Commission representative that the device is causing harmful interference. Operation shall not resume until the condition causing the harmful interference has been corrected.

(d) Intentional radiators that produce Class B emissions (damped wave) are prohibited.

[54 FR 17714, Apr. 25, 1989, as amended at 75 FR 63031, Oct. 13, 2010]

§ 15.7 [Reserved]

§ 15.9 Prohibition against eavesdropping.

Except for the operations of law enforcement officers conducted under lawful authority, no person shall use, either directly or indirectly, a device operated pursuant to the provisions of this part for the purpose of overhearing or recording the private conversations of others unless such use is authorized by all of the parties engaging in the conversation.

§ 15.11 Cross reference.

The provisions of subparts A, H, I, J and K of part 2 apply to intentional and unintentional radiators, in addition to the provisions of this part. Also, a cable system terminal device and a cable input selector switch shall be subject to the relevant provisions of part 76 of this chapter.

§ 15.13 Incidental radiators.

Manufacturers of these devices shall employ good engineering practices to minimize the risk of harmful interference.

§ 15.15 General technical requirements.

(a) An intentional or unintentional radiator shall be constructed in accordance with good engineering design and manufacturing practice. Emanations from the device shall be suppressed as much as practicable, but in no case shall the emanations exceed the levels specified in these rules.

(b) Except as follows, an intentional or unintentional radiator must be constructed such that the adjustments of any control that is readily accessible by or intended to be accessible to the user will not cause operation of the device in violation of the regulations. Access BPL equipment shall comply with the applicable standards at the control adjustment that is employed. The measurement report used in support of an application for Certification and the

user instructions for Access BPL equipment shall clearly specify the user-or installer-control settings that are required for conformance with these regulations.

(c) Parties responsible for equipment compliance should note that the limits specified in this part will not prevent harmful interference under all circumstances. Since the operators of part 15 devices are required to cease operation should harmful interference occur to authorized users of the radio frequency spectrum, the parties responsible for equipment compliance are encouraged to employ the minimum field strength necessary for communications, to provide greater attenuation of unwanted emissions than required by these regulations, and to advise the user as to how to resolve harmful interference problems (for example, see §15.105(b)).

[54 FR 17714, Apr. 25, 1989, as amended at 70 FR 1373, Jan. 7, 2005]

§15.17 Susceptibility to interference.

(a) Parties responsible for equipment compliance are advised to consider the proximity and the high power of non-Government licensed radio stations, such as broadcast, amateur, land mobile, and non-geostationary mobile satellite feeder link earth stations, and of U.S. Government radio stations, which could include high-powered radar systems, when choosing operating frequencies during the design of their equipment so as to reduce the susceptibility for receiving harmful interference. Information on non-Government use of the spectrum can be obtained by consulting the Table of Frequency Allocations in §2.106 of this chapter.

(b) Information on U.S. Government operations can be obtained by contacting: Director, Spectrum Plans and Policy, National Telecommunications and Information Administration, Department of Commerce, Room 4096, Washington, DC 20230.

[54 FR 17714, Apr. 25, 1989, as amended at 62 FR 4655, Jan. 31, 1997; 63 FR 40835, July 31, 1998]

§15.19 Labeling requirements.

(a) In addition to the requirements in part 2 of this chapter, a device subject to certification, or Supplier's Declaration of Conformity shall be labeled as follows:

(1) Receivers associated with the operation of a licensed radio service, *e.g.*, FM broadcast under part 73 of this chapter, land mobile operation under part 90 of this chapter, etc., shall bear the following statement in a conspicuous location on the device:

This device complies with part 15 of the FCC Rules. Operation is subject to the condition that this device does not cause harmful interference.

(2) A stand-alone cable input selector switch, shall bear the following statement in a conspicuous location on the device:

This device complies with part 15 of the FCC Rules for use with cable television service.

(3) All other devices shall bear the following statement in a conspicuous location on the device:

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

(4) Where a device is constructed in two or more sections connected by wires and marketed together, the statement specified under paragraph (a) of this section is required to be affixed only to the main control unit.

(5) When the device is so small or for such use that it is impracticable to label it with the statement specified under paragraph (a) of this section in a font that is four-point or larger, and the device does not have a display that can show electronic labeling, then the information required by this paragraph shall be placed in the user manual and must also either be placed on the device packaging or on a removable label attached to the device.

(b)–(c) [Reserved]

(d) Consumer electronics TV receiving devices, including TV receivers,

videocassette recorders, and similar devices, that incorporate features intended to be used with cable television service, but do not fully comply with the technical standards for cable ready equipment set forth in §15.118, shall not be marketed with terminology that describes the device as ''cable ready'' or ''cable compatible,'' or that otherwise conveys the impression that the device is fully compatible with cable service. Factual statements about the various features of a device that are intended for use with cable service or the quality of such features are acceptable so long as such statements do not imply that the device is fully compatible with cable service. Statements relating to product features are generally acceptable where they are limited to one or more specific features of a device, rather than the device as a whole. This requirement applies to consumer TV receivers, videocassette recorders and similar devices manufactured or imported for sale in this country on or after October 31, 1994.

[54 FR 17714, Apr. 25, 1989, as amended at 59 FR 25341, May 16, 1994; 61 FR 18509, Apr. 26, 1996; 61 FR 31048, June 19, 1996; 62 FR 41881, Aug. 4, 1997; 63 FR 36602, July 7, 1998; 65 FR 64391, Oct. 27, 2000; 68 FR 66733, Nov. 28, 2003; 68 FR 68545, Dec. 9, 2003; 82 FR 50830, Nov. 2, 2017]

§15.21 Information to user.

The users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. In cases where the manual is provided only in a form other than paper, such as on a computer disk or over the Internet, the information required by this section may be included in the manual in that alternative form, provided the user can reasonably be expected to have the capability to access information in that form.

[54 FR 17714, Apr. 25, 1989, as amended at 68 FR 68545, Dec. 9, 2003]

§15.23 Home-built devices.

(a) Equipment authorization is not required for devices that are not marketed, are not constructed from a kit, and are built in quantities of five or less for personal use.

(b) It is recognized that the individual builder of home-built equipment may not possess the means to perform the measurements for determining compliance with the regulations. In this case, the builder is expected to employ good engineering practices to meet the specified technical standards to the greatest extent practicable. The provisions of §15.5 apply to this equipment.

§15.25 Kits.

A TV interface device, including a cable system terminal device, which is marketed as a kit shall comply with the following requirements:

(a) All parts necessary for the assembled device to comply with the technical requirements of this part must be supplied with the kit. No mechanism for adjustment that can cause operation in violation of the requirements of this part shall be made accessible to the builder.

(b) At least two units of the kit shall be assembled in exact accordance with the instructions supplied with the product to be marketed. If all components required to fully complete the kit (other than those specified in paragraph (a) of this section that are needed for compliance with the technical provisions and must be included with the kit) are not normally furnished with the kit, assembly shall be made using the recommended components. The assembled units shall be certified or authorized under Supplier's Declaration of Conformity, as appropriate, pursuant to the requirements of this part.

(1) The measurement data required for a TV interface device subject to certification shall be obtained for each of the two units and submitted with an application for certification pursuant to subpart J of part 2 of this chapter.

(2) The measurement data required for a TV interface device subject to Supplier's Declaration of Conformity shall be obtained for the units tested and retained on file pursuant to the provisions of subpart J of part 2 of this chapter.

(c) A copy of the exact instructions that will be provided for assembly of

the device shall be submitted with an application for certification. Those parts that are not normally furnished shall be detailed in the application for certification.

(d) In lieu of the label required by §15.19, the following label, along with the label bearing the FCC identifier and other information specified in §§2.925 and 2.926, shall be included in the kit with instructions to the builder that it shall be attached to the completed kit:

(Name of Grantee)

(FCC Identifier)

This device can be expected to comply with part 15 of the FCC Rules provided it is assembled in exact accordance with the instructions provided with this kit. Operation is subject to the following conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received including interference that may cause undesired operation.

(e) For the purpose of this section, circuit boards used as repair parts for the replacement of electrically identical defective circuit boards are not considered to be kits.

[54 FR 17714, Apr. 25, 1989,as amended at 63 FR 36602, July 7, 1998; 82 FR 50830, Nov. 2, 2017]

§15.27 Special accessories.

(a) Equipment marketed to a consumer must be capable of complying with the necessary regulations in the configuration in which the equipment is marketed. Where special accessories, such as shielded cables and/or special connectors, are required to enable an unintentional or intentional radiator to comply with the emission limits in this part, the equipment must be marketed with, *i.e.*, shipped and sold with, those special accessories. However, in lieu of shipping or packaging the special accessories with the unintentional or intentional radiator, the responsible party may employ other methods of ensuring that the special accessories are provided to the consumer, without additional charge, at the time of purchase. Information detailing any alternative method used to supply the special accessories shall be included in the application for a grant of equipment authorization or retained in the Supplier's Declaration of Conformity records, as appropriate. The party responsible for the equipment, as detailed in §2.909 of this chapter, shall ensure that these special accessories are provided with the equipment. The instruction manual for such devices shall include appropriate instructions on the first page of the text concerned with the installation of the device that these special accessories must be used with the device. It is the responsibility of the user to use the needed special accessories supplied with the equipment. In cases where the manual is provided only in a form other than paper, such as on a computer disk or over the Internet, the information required by this section may be included in the manual in that alternative form, provided the user can reasonably be expected to have the capability to access information in that form.

(b) If a device requiring special accessories is installed by or under the supervision of the party marketing the device, it is the responsibility of that party to install the equipment using the special accessories. For equipment requiring professional installation, it is not necessary for the responsible party to market the special accessories with the equipment. However, the need to use the special accessories must be detailed in the instruction manual, and it is the responsibility of the installer to provide and to install the required accessories.

(c) Accessory items that can be readily obtained from multiple retail outlets are not considered to be special accessories and are not required to be marketed with the equipment. The manual included with the equipment must specify what additional components or accessories are required to be used in order to ensure compliance with this part, and it is the responsibility of the user to provide and use those components and accessories.

(d) The resulting system, including any accessories or components marketed with the equipment, must comply with the regulations.

[54 FR 17714, Apr. 25, 1989, as amended at 68 FR 68545, Dec. 9, 2003; 82 FR 50831, Nov. 2, 2017]

§ 15.29 Inspection by the Commission.

(a) Any equipment or device subject to the provisions of this part, together with any certificate, notice of registration or any technical data required to be kept on file by the operator, supplier or party responsible for compliance of the device shall be made available for inspection by a Commission representative upon reasonable request.

(b) The owner or operator of a radio frequency device subject to this part shall promptly furnish to the Commission or its representative such information as may be requested concerning the operation of the radio frequency device.

(c) The party responsible for the compliance of any device subject to this part shall promptly furnish to the Commission or its representatives such information as may be requested concerning the operation of the device, including a copy of any measurements made for obtaining an equipment authorization or demonstrating compliance with the regulations.

(d) The Commission, from time to time, may request the party responsible for compliance, including an importer, to submit to the FCC Laboratory in Columbia, Maryland, various equipment to determine that the equipment continues to comply with the applicable standards. Shipping costs to the Commission's Laboratory and return shall be borne by the responsible party. Testing by the Commission will be performed using the measurement procedure(s) that was in effect at the time the equipment was authorized.

[54 FR 17714, Apr. 25, 1989, as amended at 82 FR 50831, Nov. 2, 2017]

§ 15.31 Measurement standards.

(a) The following measurement procedures are used by the Commission to determine compliance with the technical requirements in this part. Except where noted, copies of these procedures are available from the Commission's current duplicating contractor whose name and address are available from the Commission's Consumer and Governmental Affairs Bureau at 1–888–CALL-FCC (1–888–225–5322).

(1) FCC/OET MP–2: Measurement of UHF Noise Figures of TV Receivers.

(2) Unlicensed Personal Communications Service (UPCS) devices are to be measured for compliance using ANSI C63.17–2013: ''American National Standard Methods of Measurement of the Electromagnetic and Operational Compatibility of Unlicensed Personal Communications Services (UPCS) Devices'' (incorporated by reference, see §15.38).

(3) Other intentional radiators are to be measured for compliance using the following procedure: ANSI C63.10–2013 (incorporated by reference, see §15.38).

(4) Unintentional radiators are to be measured for compliance using the following procedure excluding clauses 4.5.3, 4.6, 6.2.13, 8.2.2, 9, and 13: ANSI C63.4–2014 (incorporated by reference, see §15.38).

NOTE 1 TO PARAGRAPH (a)(4): Digital devices tested to show compliance with the provisions of §15.109(g)(2) must be tested following the ANSI C63.4–2014 procedure described in paragraph (a)(4) of this section.

(b) All parties making compliance measurements on equipment subject to the requirements of this part are urged to use these measurement procedures. Any party using other procedures should ensure that such other procedures can be relied on to produce measurement results compatible with the FCC measurement procedures. The description of the measurement procedure used in testing the equipment for compliance and a list of the test equipment actually employed shall be made part of an application for certification or included with the data required to be retained by the party responsible for devices authorized pursuant to Supplier's Declaration of Conformity.

(c) Except as otherwise indicated in §15.256, for swept frequency equipment, measurements shall be made with the frequency sweep stopped at those frequencies chosen for the measurements to be reported.

(d) Field strength measurements shall be made, to the extent possible, on an open area test site. Test sites other than open area test sites may be employed if they are properly calibrated so that the measurement results correspond to what would be obtained from an open area test site. In the case of equipment for which measurements

can be performed only at the installation site, such as perimeter protection systems, carrier current systems, and systems employing a ''leaky'' coaxial cable as an antenna, measurements for Supplier's Declaration of Conformity or for obtaining a grant of equipment authorization shall be performed at a minimum of three installations that can be demonstrated to be representative of typical installation sites.

(e) For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery.

(f) To the extent practicable, the device under test shall be measured at the distance specified in the appropriate rule section. The distance specified corresponds to the horizontal distance between the measurement antenna and the closest point of the equipment under test, support equipment or interconnecting cables as determined by the boundary defined by an imaginary straight line periphery describing a simple geometric configuration enclosing the system containing the equipment under test. The equipment under test, support equipment and any interconnecting cables shall be included within this boundary.

(1) At frequencies at or above 30 MHz, measurements may be performed at a distance other than what is specified provided: measurements are not made in the near field except where it can be shown that near field measurements are appropriate due to the characteristics of the device; and it can be demonstrated that the signal levels needed to be measured at the distance employed can be detected by the measurement equipment. Measurements shall not be performed at a distance greater than 30 meters unless it can be further demonstrated that measurements at a distance of 30 meters or less are impractical. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements; inverse-linear-distance-squared for power density measurements).

(2) At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field. Pending the development of an appropriate measurement procedure for measurements performed below 30 MHz, when performing measurements at a closer distance than specified, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade). This paragraph (f) shall not apply to Access BPL devices operating below 30 MHz.

(3) For Access BPL devices operating below 30 MHz, measurements shall be performed at the 30-meter reference distance specified in the regulations whenever possible. Measurements may be performed at a distance closer than that specified in the regulations if circumstances such as high ambient noise levels or geographic limitations are present. When performing measurements at a distance which is closer than specified, the field strength results shall be extrapolated to the specified distance by using the square of an inverse linear distance extrapolation factor (*i.e.*, 40 dB/decade) in conjunction with the slant-range distance defined in §15.3(hh) of this part. As an alternative, a site-specific extrapolation factor derived from a straight line best fit of measurements of field strength in dBμV/m vs. logarithmic distance in meters for each carrier frequency, as determined by a linear least squares regression calculation from measurements for at least four distances from the power line, may be used. Compliance measurements for Access BPL and the use of site-specific extrapolation factors shall be made in accordance with the Measurement Guidelines for Access BPL systems specified by the

Commission. Site-specific determination of the distance extrapolation factor shall not be used at locations where a ground conductor is present within 30 meters if the Access BPL signals are on the neutral/grounded line of a power system.

(4) The applicant for a grant of certification shall specify the extrapolation method used in the application filed with the Commission. For equipment subject to Supplier's Declaration of Conformity, this information shall be retained with the measurement data.

(5) When measurement distances of 30 meters or less are specified in the regulations, the Commission will test the equipment at the distance specified unless measurement at that distance results in measurements being performed in the near field. When measurement distances of greater than 30 meters are specified in the regulations, the Commission will test the equipment at a closer distance, usually 30 meters, extrapolating the measured field strength to the specified distance using the methods shown in this section.

(6) Measurements shall be performed at a sufficient number of radials around the equipment under test to determine the radial at which the field strength values of the radiated emissions are maximized. The maximum field strength at the frequency being measured shall be reported in the equipment authorization report. This paragraph shall not apply to Access BPL equipment on overhead medium voltage lines. In lieu thereof, the measurement guidelines established by the Commission for Access BPL shall be followed.

(g) Equipment under test shall be positioned and adjusted, using those controls that are readily accessible to or are intended to be accessible to the consumer, in such a manner as to maximize the level of the emissions. For those devices to which wire leads may be attached by the operator, tests shall be performed with wire leads attached. The wire leads shall be of the length to be used with the equipment if that length is known. Otherwise, wire leads one meter in length shall be attached to the equipment. Longer wire leads may be employed if necessary to interconnect to associated peripherals.

(h) A composite system, as defined in §2.947(f) of this chapter, that incorporates a carrier current system shall be tested as if the carrier current system were incorporated in a separate device; that is, the device shall be tested for compliance with whatever rules would apply to the device were the carrier current system not incorporated, and the carrier current system shall be tested for compliance with the rules applicable to carrier current systems.

(i) If the device under test provides for the connection of external accessories, including external electrical input signals, the device shall be tested with the accessories attached. The device under test shall be fully exercised with these external accessories. The emission tests shall be performed with the device and accessories configured in a manner that tends to produce maximized emissions within the range of variations that can be expected under normal operating conditions. In the case of multiple accessory external ports, an external accessory shall be connected to one of each type of port. Only one test using peripherals or external accessories that are representative of the devices that will be employed with the equipment under test is required. All possible equipment combinations do not need to be tested. The accessories or peripherals connected to the device being tested shall be unmodified, commercially available equipment.

(j) If the equipment under test consists of a central control unit and an external or internal accessory(ies) (peripheral) and the party declaring compliance of the equipment or applying for a grant of equipment authorization manufactures or assembles the central control unit and at least one of the accessory devices that can be used with that control unit, testing of the control unit and/or the accessory(ies) must be performed using the devices manufactured or assembled by that party, in addition to any other needed devices which the party does not manufacture or assemble. If the party declaring compliance of the equipment or applying for a grant of equipment authorization does not manufacture or assemble

the central control unit and at least one of the accessory devices that can be used with that control unit or the party can demonstrate that the central control unit or accessory(ies) normally would be marketed or used with equipment from a different entity, testing of the central control unit and/or the accessory(ies) must be performed using the specific combination of equipment which is intended to be marketed or used together. Only one test using peripherals or accessories that are representative of the devices that will be employed with the equipment under test is required. All possible equipment combinations are not required to be tested. The accessories or peripherals connected to the device being tested shall be unmodified, commercially available equipment.

(k) Composite systems (*i.e.*, systems that incorporate different devices contained in a single enclosure or in separate enclosures connected by wire or cable) shall be measured for compliance with the technical standards of this part in accordance with the procedures in §2.947(f) of this chapter. For digital devices that consist of a combination of Class A and Class B devices, the total combination of which results in a Class A digital device, it is only necessary to demonstrate that the equipment combination complies with the limits for a Class A device. This equipment combination may not be employed for obtaining a grant of equipment authorization or declaring compliance of a Class B digital device. However, if the digital device combination consists of a Class B central control unit, *e.g.*, a personal computer, and a Class A internal peripheral(s), it must be demonstrated that the Class B central control unit continues to comply with the limits for a Class B digital device with the Class A internal peripheral(s) installed but not active.

(l) Measurements of radio frequency emissions conducted to the public utility power lines shall be performed using a 50 ohm/50 uH line-impedance stabilization network (LISN).

(m) Measurements on intentional radiators or receivers, other than TV broadcast receivers, shall be performed and, if required, reported for each band in which the device can be operated with the device operating at the number of frequencies in each band specified in the following table:

Frequency range over which device operates	Number of frequencies	Location in the range of operation
1 MHz or less	1	Middle.
1 to 10 MHz	2	1 near top and 1 near bottom.
More than 10 MHz	3	1 near top, 1 near middle and 1 near bottom.

(n) Measurements on TV broadcast receivers shall be performed with the receiver tuned to each VHF frequency and also shall include the following oscillator frequencies: 520, 550, 600, 650, 700, 750, 800, 850, 900 and 931 MHz. If measurements cannot be made on one or more of the latter UHF frequencies because of the presence of signals from licensed radio stations or for other reasons to be detailed in the measurement report, measurements shall be made with the receiver oscillator at a nearby frequency. If the receiver is not capable of receiving channels above 806 MHz, the measurements employing the oscillator frequencies 900 and 931 MHz may be omitted.

(o) The amplitude of spurious emissions from intentional radiators and emissions from unintentional radiators which are attenuated more than 20 dB below the permissible value need not be reported unless specifically required elsewhere in this part.

(p) In those cases where the provisions in this section conflict with the measurement procedures in paragraph (a) of this section and the procedures were implemented after June 23, 1989, the provisions contained in the measurement procedures shall take precedence.

(q) As an alternative to §15.256, a level probing radar (LPR) may be certified as an intentional radiator by showing compliance with the general provisions for operation under part 15 subpart C of this chapter, provided that the device is tested in accordance with the provisions in either paragraphs (q)(1) or (2) of this section. Compliance with the general provisions for an intentional radiator may require compliance with other rules in this part, e.g.,

§§15.5, 15.31, and 15.35, etc., when referenced.

(1) An LPR device intended for installation inside metal and concrete enclosures may show compliance for radiated emissions when measured outside a representative enclosure with the LPR installed inside, in accordance with the measurement guidelines established by the Commission for these devices. LPR devices operating inside these types of enclosures shall ensure that the enclosure is closed when the radar device is operating. Care shall be taken to ensure that gaskets, flanges, and other openings are sealed to eliminate signal leakage outside of the structure. The responsible party shall take reasonable steps to ensure that LPR devices intended for use in these types of enclosures shall not be installed in open-air environments or inside enclosures with lower radio-frequency attenuating characteristics (e.g., fiberglass, plastic, etc.). An LPR device approved under this subsection may only be operated in the type of enclosure for which it was approved.

(2) Except as provided in paragraph (q)(1) of this section, an LPR device shall be placed in testing positions that ensure the field strength values of the radiated emissions are maximized, including in the main beam of the LPR antenna.

[54 FR 17714, Apr. 25, 1989, as amended at 56 FR 13083, Mar. 29, 1991; 57 FR 24990, June 12, 1992; 57 FR 33448, July 29, 1992; 58 FR 37430, July 12, 1993; 58 FR 51249, Oct. 1, 1993; 61 FR 14502, Apr. 2, 1996; 62 FR 41881, Aug. 4, 1997; 62 FR 45333, Aug. 27, 1997; 63 FR 36602, July 7, 1998; 63 FR 42278, Aug. 7, 1998; 65 FR 58466, Sept. 29, 2000; 68 FR 68545, Dec. 9, 2003; 69 FR 54034, Sept. 7, 2004; 70 FR 1373, Jan. 7, 2005; 76 FR 71908, Nov. 21, 2011; 77 FR 4913, Feb. 1, 2012; 77 FR 43013, July 23, 2012; 79 FR 12677, Mar. 6, 2014; 80 FR 2838, Jan. 21, 2015; 80 FR 33447, June 12, 2015; 82 FR 50831, Nov. 2, 2017]

§ 15.32 Test procedures for CPU boards and computer power supplies.

Power supplies and CPU boards used with personal computers and for which separate authorizations are required to be obtained shall be tested in accordance with the specific procedures published or otherwise authorized by the Commission.

[82 FR 50832, Nov. 2, 2017]

§ 15.33 Frequency range of radiated measurements.

(a) For an intentional radiator, the spectrum shall be investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to at least the frequency shown in this paragraph:

(1) If the intentional radiator operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

(2) If the intentional radiator operates at or above 10 GHz and below 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 100 GHz, whichever is lower.

(3) If the intentional radiator operates at or above 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 200 GHz, whichever is lower, unless specified otherwise elsewhere in the rules.

(4) If the intentional radiator operates at or above 95 GHz: To the third harmonic of the highest fundamental frequency or to 750 GHz, whichever is lower, unless specified otherwise elsewhere in the rules.

(5) If the intentional radiator contains a digital device, regardless of whether this digital device controls the functions of the intentional radiator or the digital device is used for additional control or function purposes other than to enable the operation of the intentional radiator, the frequency range shall be investigated up to the range specified in paragraphs (a)(1) through (4) of this section or the range applicable to the digital device, as shown in paragraph (b)(1) of this section, whichever is the higher frequency range of investigation.

(b) For unintentional radiators:

(1) Except as otherwise indicated in paragraphs (b)(2) or (b)(3) of this section, for an unintentional radiator, including a digital device, the spectrum shall be investigated from the lowest radio frequency signal generated or used in the device, without going below the lowest frequency for which a radiated emission limit is specified, up to the frequency shown in the following table:

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30.
1.705–108	1000.
108–500	2000.
500–1000	5000.
Above 1000	5th harmonic of the highest frequency or 40 GHz, whichever is lower.

(2) A unintentional radiator, excluding a digital device, in which the highest frequency generated in the device, the highest frequency used in the device and the highest frequency on which the device operates or tunes are less than 30 MHz and which, in accordance with §15.109, is required to comply with standards on the level of radiated emissions within the frequency range 9 kHz to 30 MHz, such as a CB receiver or a device designed to conduct its radio frequency emissions via connecting wires or cables, e.g., a carrier current system not intended to radiate, shall be investigated from the lowest radio frequency generated or used in the device, without going below 9 kHz (25 MHz for CB receivers), up to the frequency shown in the following table. If the unintentional radiator contains a digital device, the upper frequency to be investigated shall be that shown in the table below or in the table in paragraph (b)(1) of this section, as based on both the highest frequency generated and the highest frequency used in the digital device, whichever range is higher.

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30
1.705–10	400
10–30	500

(3) Except for a CB receiver, a receiver employing superheterodyne techniques shall be investigated from 30 MHz up to at least the second harmonic of the highest local oscillator frequency generated in the device. If such receiver is controlled by a digital device, the frequency range shall be investigated up to the higher of the second harmonic of the highest local oscillator frequency generated in the device or the upper frequency of the measurement range specified for the digital device in paragraph (b)(1) of this section.

(c) The above specified frequency ranges of measurements apply to the measurement of radiated emissions and, in the case of receivers, the measurement to demonstrate compliance with the antenna conduction limits specified in §15.111. The frequency range of measurements for AC power line conducted limits is specified in §§15.107 and 15.207 and applies to all equipment subject to those regulations. In some cases, depending on the frequency(ies) generated and used by the equipment, only signals conducted onto the AC power lines are required to be measured.

(d) Particular attention should be paid to harmonics and subharmonics of the fundamental frequency as well as to those frequencies removed from the fundamental by multiples of the oscillator frequency. Radiation at the frequencies of multiplier states should also be checked.

[54 FR 17714, Apr. 25, 1989, as amended at 61 FR 14502, Apr. 2, 1996; 63 FR 42278, Aug. 7, 1998; 84 FR 25691, June 4, 2019]

§15.35 Measurement detector functions and bandwidths.

The conducted and radiated emission limits shown in this part are based on the following, unless otherwise specified in this part:

(a) On any frequency or frequencies below or equal to 1000 MHz, the limits shown are based on measuring equipment employing a CISPR quasi-peak detector function and related measurement bandwidths, unless otherwise specified. The specifications for the measuring instrumentation using the CISPR quasi-peak detector can be found in ANSI C63.4–2014, clause 4 (incorporated by reference, see §15.38). As an alternative to CISPR quasi-peak measurements, the responsible party, at its option, may demonstrate compliance with the emission limits using measuring equipment employing a peak detector function as long at the same bandwidth as indicated for CISPR quasi-peak measurements are employed.

(b) Unless otherwise specified, on any frequency or frequencies above 1000

MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1 MHz. When average radiated emission measurements are specified in this part, including average emission measurements below 1000 MHz, there also is a limit on the peak level of the radio frequency emissions. Unless otherwise specified, *e.g.*, see §§ 15.250, 15.252, 15.253(d), 15.255, 15.256, and 15.509 through 15.519, the limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device, *e.g.*, the total peak power level. Note that the use of a pulse desensitization correction factor may be needed to determine the total peak emission level. The instruction manual or application note for the measurement instrument should be consulted for determining pulse desensitization factors, as necessary.

(c) Unless otherwise specified, *e.g.*, §§ 15.255(b), and 15.256(l)(5), when the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value. The exact method of calculating the average field strength shall be submitted with any application for certification or shall be retained in the measurement data file for equipment subject to Supplier's Declaration of Conformity.

[82 FR 50832, Nov. 2, 2017]

§ 15.37 Transition provisions for compliance with this part.

(a) The manufacture or importation of scanning receivers, and frequency converters designed or marketed for use with scanning receivers, that do not comply with the provisions of § 15.121 shall cease on or before October 25, 1999. Effective July 26, 1999, the Commission will not grant equipment authorization for receivers that do not comply with the provisions of § 15.121. This paragraph does not prohibit the sale or use of authorized receivers manufactured in the United States, or imported into the United States, prior to October 25, 1999.

(b) Effective October 16, 2002, an equipment approval may no longer be obtained for medical telemetry equipment operating under the provisions of § 15.241 or § 15.242. The requirements for obtaining an approval for medical telemetry equipment after this date are found in subpart H of part 95 of this chapter.

(c) All radio frequency devices that are authorized on or after July 12, 2004 under the certification, or Supplier's Declaration of Conformity procedures (or the prior verification or declaration of conformity procedures, as applicable) shall comply with the conducted limits specified in § 15.107 or § 15.207 as appropriate. All radio frequency devices that are manufactured or imported on or after July 11, 2005 shall comply with the conducted limits specified in § 15.107 or § 15.207, as appropriate. Equipment authorized, imported or manufactured prior to these dates shall comply with the conducted limits specified in § 15.107 or § 15.207, as appropriate, or with the conducted limits that were in effect immediately prior to September 9, 2002.

(d) Radar detectors manufactured or imported after August 28, 2002 and marketed after September 27, 2002 shall comply with the regulations specified in this part. Radar detectors manufactured or imported prior to January 27, 2003 may be labeled with the information required by § 2.925 of this chapter and § 15.19(a) on the individual equipment carton rather than on the device, and are exempt from complying with the requirements of § 15.21.

(e) U–NII equipment operating in the 5.25–5.35 GHz band for which applications for certification are filed on or after July 20, 2006 shall comply with the DFS and TPC requirements specified in §15.407. U–NII equipment operating in the 5.25–5.35 GHz band that are imported or marketed on or after July 20, 2007 shall comply with the DFS and TPC requirements in §15.407.

(f) All Access BPL devices that are manufactured, imported, marketed or installed on or after July 7, 2006, shall comply with the requirements specified in subpart G of this part, including certification of the equipment.

(g) The manufacture or importation of auditory assistance devices that operate in the 72.0–73.0 MHz, 74.6–74.8 MHz, and 75.2–76.0 MHz bands that do not comply with the requirements of §15.237(c) shall cease on or before July 11, 2016. Effective January 12, 2015, equipment approval will not be granted for auditory assistance devices that operate in the 72.0–73.0 MHz, 74.6–74.8 MHz, and 75.2–76.0 MHz bands that do not comply with the requirements of §15.237(c). These rules do not prohibit the sale or use of authorized auditory assistance devices that operate in the 72.0–73.0 MHz, 74.6–74.8 MHz, and 75.2–76.0 MHz bands manufactured in the United States, or imported into the United States, prior to July 11, 2016.

(h) Effective June 2, 2015 devices using digital modulation techniques in the 5725–5850 MHz bands will no longer be certified under the provisions of §15.247. The technical requirements for obtaining certification after this date for digitally modulated devices and the digitally modulated portion of hybrid devices are found in subpart E of this part. The provisions for the frequency hopping spread spectrum portion of hybrid devices will remain in §15.247. Effective June 2, 2016 systems using digital modulation techniques in the 5725–5850 MHz band certified under the provisions of §15.247 may no longer be imported or marketed within the United States.

(i) As of December 26, 2017, wireless microphones for which an application for certification is filed must comply with the requirements of §15.236. Manufacturing and marketing of wireless microphones that would not comply with the rules for operation in §15.236 must cease no later than September 24, 2018. Only wireless microphones certified for operation under this part may be operated under this part as of July 13, 2020.

(j) White space devices for which a certification application is filed beginning June 23, 2016, must comply with the channel push requirements in §15.711(i) of this part. White space devices that are imported or marketed beginning September 23, 2016, must comply with this requirement. White space devices that do not comply with this requirement must cease operation no later than December 23, 2016.

(k) *Disclosure requirements for unlicensed wireless microphones capable of operating in the 600 MHz service band.* Any person who manufactures, sells, leases, or offers for sale or lease, unlicensed wireless microphones that are capable of operating in the 600 MHz service band, as defined in this part, on or after July 13, 2017, is subject to the following disclosure requirements:

(1) Such persons must display the consumer disclosure text, as specified by the Consumer and Governmental Affairs Bureau, at the point of sale or lease of each such unlicensed wireless microphone. The text must be displayed in a clear, conspicuous, and readily legible manner. One way to fulfill the requirement in this section is to display the consumer disclosure text in a prominent manner on the product box by using a label (either printed onto the box or otherwise affixed to the box), a sticker, or other means. Another way to fulfill this requirement is to display the text immediately adjacent to each unlicensed wireless microphone offered for sale or lease and clearly associated with the model to which it pertains.

(2) If such persons offer such unlicensed wireless microphones via direct mail, catalog, or electronic means, they shall prominently display the consumer disclosure text in close proximity to the images and descriptions of each such unlicensed wireless microphone. The text should be in a size large enough to be clear, conspicuous, and readily legible, consistent with the dimensions of the advertisement or description.

(3) If such persons have Web sites pertaining to these unlicensed wireless microphones, the consumer disclosure text must be displayed there in a clear, conspicuous, and readily legible manner (even in the event such persons do not sell unlicensed wireless microphones directly to the public).

(4) The consumer disclosure text described in paragraph (k)(1) of this section is set forth in Figure 1 to this paragraph.

Figure 1 to § 15.37(k) – Consumer Disclosure Text

CONSUMER ALERT
This particular wireless microphone device operates in portions of the 617-652 MHz or 663-698 MHz frequencies. Beginning in 2017, these frequencies are being transitioned by the Federal Communications Commission (FCC) to the 600 MHz service to meet increasing demand for wireless broadband services. Users of this device must cease operating on these frequencies no later than July 13, 2020. In addition, users of this device may be required to cease operations earlier than that date if their operations could cause harmful interference to a 600 MHz service licensee's wireless operations on these frequencies. For more information, visit the FCC's wireless microphone website at www.fcc.gov/wireless-microphones-guide or call the FCC at 1-888-CALL-FCC (TTY: 1-888-TELL-FCC).

(l) The certification of wideband vehicular radars designed to operate in the 23.12–29 GHz band under §15.252 and ultra-wideband vehicular radars designed to operate in the 22–29 GHz band under §15.515 shall not be permitted on or after September 20, 2018.

(m) The manufacture, importation, marketing, sale, and installation of wideband or ultra-wideband vehicular radars that are designed to operate in the 23.12–29 GHz band under §15.252 and/or in the 22–29 GHz band under §15.515 shall not be permitted after January 1, 2022. Notwithstanding the foregoing, sale and installation of such radars is permitted, for the life of the vehicle, when the following conditions have been met:

(1) The sale and installation is for the exclusive purpose of repairing or replacing defective, damaged, or potentially malfunctioning radars that are designed to operate in the 23.12–29 GHz band under §15.252 and/or in the 22–29 GHz band under §15.515;

(2) The equipment being repaired or replaced has been installed in the vehicle on or before January 1, 2022; and

(3) It is not possible to replace the vehicular radar equipment designed to operate in the 23.12–29 GHz and/or 22–29 GHz bands with vehicular radar equipment designed to operate in the 76–81 GHz band.

(n) Wideband or ultra-wideband vehicular radars operating in the 23.12–29 GHz band under §15.252 and/or in the 22–29 GHz band under §15.515 that are already installed or in use may continue to operate in accordance with their previously obtained certification. Class II permissive changes for such equipment shall not be permitted after January 1, 2022.

(o) Applicable July 13, 2017, the certification, manufacture, importation, marketing, sale, and installation of field disturbance sensors that are designed to operate in the 16.2–17.7 GHz and 46.7–46.9 GHz bands shall not be permitted. Field disturbance sensors already installed or in use in the 16.2–17.7 GHz band may continue to operate in accordance with their previously obtained certification. Class II permissive changes shall not be permitted for such equipment.

(p) Effective October 20, 2017, the certification under this part of vehicular radars and fixed radar systems used in airport air operations areas that are designed to operate in the 76–77 GHz band shall not be permitted. Vehicular radars and fixed radar systems used in airport air operations areas operating in the 76–77 GHz band that are already installed or in use may continue to operate in accordance with their previously obtained certification. Any future certification, or any change of already issued certification and operations of such equipment, shall be under part 95, subpart M, of this chapter.

(q) All fixed white space devices which are approved by Telecommunication Certification Bodies on or after February 19, 2020 or that are marketed on or after February 19, 2021 shall comply with the requirements of §15.711(c). Fixed white space devices which are approved or marketed before the dates in the preceding sentence shall comply with either the requirements of §15.711(c) or the requirements of §15.711(c) as in effect prior to August 19, 2019 (see 47 CFR part 15 as revised October 1, 2018).

[77 FR 4913, Feb. 1, 2012, as amended at 78 FR 34927, June 11, 2013; 79 FR 24578, May 1, 2014; 80 FR 71728, Nov. 17, 2015; 80 FR 73068, Nov. 23, 2015; 82 FR 41559, Sept. 1, 2017; 82 FR 43870, Sept. 20, 2017; 82 FR 50832, Nov. 2, 2017; 83 FR 10640, 10642, Mar. 12, 2018; 84 FR 34796, July 19, 2019]

§ 15.38 Incorporation by reference.

(a) The materials listed in this section are incorporated by reference in this part. These incorporations by reference were approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. These materials are incorporated as they exist on the date of the approval, and notice of any change in these materials will be published in the FEDERAL REGISTER. The materials are available for purchase at the corresponding addresses as noted, and all are available for inspection at the Federal Communications Commission, located at the address indicated in 47 CFR 0.401(a), Tel: (202) 418–0270, and at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call (202) 741–6030, or go to: *http://www.archives.gov/federal__register/code__of__federal__regulations/ibr__locations.html.*

(b) The following documents are available from the following address: American National Standards Institute (ANSI), 25 West 43rd Street, 4th Floor, New York, NY 10036, (212) 642–4900, or at *http://webstore.ansi.org/ansidocstore/default.asp;*

(1) ANSI C63.17–2013: ''American National Standard for Methods of Measurement of the Electromagnetic and Operational Compatibility of Unlicensed Personal Communications Services (UPCS) Devices,'' approved August 12, 2013, IBR approved for §15.31.

(2) Third Edition of the International Special Committee on Radio Interference (CISPR), Pub. 22, Information Technology Equipment-Radio Disturbance Characteristics-Limits and Methods of Measurement,'' 1997, IBR approved for §15.09.

(c) The following documents are available from the following address: Cable Television Laboratories, Inc., 858 Coal Creek Circle, Louisville, Colorado, 80027, *http://www.cablelabs.com/opencable/udcp,* (303) 661–9100;

(1) M–UDCP–PICS–I04–080225, ''Uni-Directional Cable Product Supporting M–Card: Multiple Profiles; Conformance Checklist: PICS,'' February 25, 2008, IBR approved for §15.123(c).

(2) TP–ATP–M–UDCP–I05–20080304, ''Uni-Directional Digital Cable Products Supporting M–Card; M–UDCP Device Acceptance Test Plan,'' March 4, 2008, IBR approved for §15.123(c).

(d) The following documents are available from the following address: Consumer Electronics Association, 1919 S. Eads St., Arlington; VA 22202, *http://www.ce.org/Standards/Standard-Listings.aspx,* (703) 907–7634.

(1) CEA–542–B: ''CEA Standard: Cable Television Channel Identification Plan,'' July 2003, IBR approved for §15.118.

(2) CEA–766–A: ''U.S. and Canadian Region Rating Tables (RRT) and Content Advisory Descriptors for Transport of Content Advisory Information using ATSC A/65–A Program and System Information Protocol (PSIP),'' April 2001, IBR approved for §15.120.

(3) Uni-Dir-PICS–I01–030903: ''Uni-Directional Receiving Device: Conformance Checklist: PICS Proforma,'' September 3, 2003, IBR approved for §15.123(c).

(4) Uni-Dir-ATP–I02–040225: ''Uni-Directional Receiving Device, Acceptance Test Plan,'' February 25, 2004, IBR approved for §15.123(c).

(e) The following document is available from the European Telecommunications Standards Institute, 650 Route des Lucioles, F–06921 Sophia Antipolis Cedex, France, or at *http://www.etsi.org/deliver/etsi__en/300400__300499/30042201/01.04.02__60/en__30042201v010402p.pdf*.

(1) ETSI EN 300 422–1 V1.4.2 (2011–08): ''*Electromagnetic compatibility and Radio spectrum Matters (ERM); Wireless microphones in the 25 MHz to 3 GHz frequency range; Part 1: Technical characteristics and methods of measurement,*'' Copyright 2011, IBR approved for §15.236(g).

(2) [Reserved]

(f) The following documents are available from the following address: Global Engineering Documents, 15 Inverness Way East, Englewood, CO 80112, (800) 854–7179, or at *http://global.ihs.com;*

(1) EIA–608: ''Recommended Practice for Line 21 Data Service,'' 1994, IBR approved for §15.120.

(2) EIA–744: ''Transport of Content Advisory Information Using Extended Data Service (XDS),'' 1997, IBR approved for §15.120.

(g) Institute of Electrical and Electronic Engineers (IEEE), 3916 Ranchero Drive, Ann Arbor, MI 48108, 1–800–699–9277, *http://www.techstreet.com/ieee*.

(1) ANSI C63.4–2014: ''American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz,'' ANSI approved June 13, 2014, IBR approved for §15.35(a).

(2) ANSI C63.4–2014: ''American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz,'' ANSI approved June 13, 2014, IBR approved for §15.31(a)(4), except clauses 4.5.3, 4.6, 6.2.13, 8.2.2, 9, and 13.

(3) ANSI C63.10–2013, ''American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices,''ANSI approved June 27, 2013, IBR approved for §15.31(a)(3).

(h) The following documents are available from the following addresses: Society of Cable Telecommunications Engineers (SCTE) c/o Global Engineering Documents, 15 Inverness Way East, Englewood, Colorado 80112 or the American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036 or at *http://www.scte.org/standards/index.cfm;*

(1) SCTE 28 2003 (formerly DVS 295): ''Host-POD Interface Standard,'' 2003, IBR approved for §15.123.

(2) SCTE 40 2003 (formerly DVS 313): ''Digital Cable Network Interface Standard,'' 2003, IBR approved for §15.123.

(3) SCTE 41 2003 (formerly DVS 301): ''POD Copy Protection System,'' 2003, IBR approved for §15.123.

(4) ANSI/SCTE 54 2003 (formerly DVS 241): ''Digital Video Service Multiplex and Transport System Standard for Cable Television,'' 2003, IBR approved for §15.123.

(5) ANSI/SCTE 65 2002 (formerly DVS 234): ''Service Information Delivered Out-of-Band for Digital Cable Television,'' 2002, IBR approved for §15.123.

[77 FR 43013, July 23, 2012, as amended at 80 FR 2838, Jan. 21, 2015; 80 FR 33447, June 12, 2015; 80 FR 73068, Nov. 23, 2015; 82 FR 50832, Nov. 2, 2017; 85 FR 64406, Oct. 13, 2020]

Subpart B—Unintentional Radiators

§15.101 Equipment authorization of unintentional radiators.

(a) Except as otherwise exempted in §§15.23, 15.103, and 15.113, unintentional radiators shall be authorized prior to the initiation of marketing, pursuant to the procedures for certification or Supplier's Declaration of Conformity (SDoC) given in subpart J of part 2 of this chapter, as follows:

TABLE 1 TO PARAGRAPH (a)

Type of device	Equipment authorization required
TV Broadcast Receiver	SDoC or Certification.

TABLE 1 TO PARAGRAPH (a)—Continued

Type of device	Equipment authorization required
FM Broadcast Receiver	SDoC or Certification.
CB Receiver	SDoC or Certification.
Superregenerative Receiver	SDoC or Certification.
Scanning Receiver	Certification.
Radar Detector	Certification.
All other receivers subject to Part 15	SDoC or Certification.
TV Interface Device	SDoC or Certification.
Cable System Terminal Device	SDoC or Certification.
Stand-alone Cable input selector switch	SDoC or Certification.
Class B personal computers and peripherals	SDoC or Certification.
CPU boards and internal power supplies used with Class B personal computers	SDoC or Certification.
Class B personal computers assembled using authorized CPU boards or power supplies	SDoC or Certification.
Class B external switching power supplies	SDoC or Certification.
Other Class B digital devices & peripherals	SDoC or Certification.
Class A digital devices, peripherals & external switching power supplies	SDoC or Certification.
Access Broadband over Power Line (Access BPL)	Certification.
All other devices	SDoC or Certification.

(b) Only those receivers that operate (tune) within the frequency range of 30–960 MHz, CB receivers and radar detectors are subject to the authorizations shown in paragraph (a) of this section. Receivers operating above 960 MHz or below 30 MHz, except for radar detectors and CB receivers, are exempt from complying with the technical provisions of this part but are subject to §15.5.

(c) Personal computers shall be authorized in accordance with one of the following methods:

(1) The specific combination of CPU board, power supply and enclosure is tested together and authorized under Supplier's Declaration of Conformity or a grant of certification;

(2) The personal computer is authorized under Supplier's Declaration of Conformity or a grant of certification, and the CPU board or power supply in that computer is replaced with a CPU board or power supply that has been separately authorized under Supplier's Declaration of Conformity or a grant of certification; or

(3) The CPU board and power supply used in the assembly of a personal computer have been separately authorized under Supplier's Declaration of Conformity or a grant of certification; and

(4) Personal computers assembled using either of the methods specified in paragraphs (c)(2) or (c)(3) of this section must, by themselves, also be authorized under Supplier's Declaration of Conformity if they are marketed. However, additional testing is not required for this Supplier's Declaration of Conformity, provided the procedures in §15.102(b) are followed.

(d) Peripheral devices, as defined in §15.3(r), shall be authorized under Supplier's Declaration of Conformity, or a grant of certification, as appropriate, prior to marketing. Regardless of the provisions of paragraphs (a) or (c) of this section, if a CPU board, power supply, or peripheral device will always be marketed with a specific personal computer, it is not necessary to obtain a separate authorization for that product provided the specific combination of personal computer, peripheral device, CPU board and power supply has been authorized under Supplier's Declaration of Conformity or a grant of certification as a personal computer.

(1) No authorization is required for a peripheral device or a subassembly that is sold to an equipment manufacturer for further fabrication; that manufacturer is responsible for obtaining the necessary authorization prior to further marketing to a vendor or to a user.

(2) Power supplies and CPU boards that have not been separately authorized and are designed for use with personal computers may be imported and marketed only to a personal computer equipment manufacturer that has indicated, in writing, to the seller or importer that they will obtain Supplier's Declaration of Conformity or a grant of

certification for the personal computer employing these components.

(e) Subassemblies to digital devices are not subject to the technical standards in this part unless they are marketed as part of a system in which case the resulting system must comply with the applicable regulations. Subassemblies include:

(1) Devices that are enclosed solely within the enclosure housing the digital device, except for: Power supplies used in personal computers; devices included under the definition of a peripheral device in §15.3(r); and personal computer CPU boards, as defined in §15.3(bb);

(2) CPU boards, as defined in §15.3(bb), other than those used in personal computers, that are marketed without an enclosure or power supply; and

(3) Switching power supplies that are separately marketed and are solely for use internal to a device other than a personal computer.

[82 FR 50832, Nov. 2, 2017]

§15.102 CPU boards and power supplies used in personal computers.

(a) Authorized CPU boards and power supplies that are sold as separate components shall be supplied with complete installation instructions. These instructions shall specify all of the installation procedures that must be followed to ensure compliance with the standards, including, if necessary, the type of enclosure, e.g., a metal enclosure, proper grounding techniques, the use of shielded cables, the addition of any needed components, and any necessary modifications to additional components.

(1) Any additional parts needed to ensure compliance with the standards, except for the enclosure, are considered to be special accessories and, in accordance with §15.27, must be marketed with the CPU board or power supply.

(2) Any modifications that must be made to a personal computer, peripheral device, CPU board or power supply during installation of a CPU board or power supply must be simple enough that they can be performed by the average consumer. Parts requiring soldering, disassembly of circuitry or other similar modifications are not permitted.

(b) Assemblers of personal computer systems employing modular CPU boards and/or power supplies are not required to test the resulting system provided the following conditions are met:

(1) Each device used in the system has been authorized as required under this part (according to §15.101(e), some subassemblies used in a personal computer system may not require an authorization);

(2) The original label and identification on each piece of equipment remain unchanged;

(3) Each responsible party's instructions to ensure compliance (including, if necessary, the use of shielded cables or other accessories or modifications) are followed when the system is assembled;

(4) If the system is marketed, the resulting equipment combination is authorized under Supplier's Declaration of Conformity pursuant to §15.101(c)(4) and a compliance information statement, as described in §2.1077(b) of this chapter, is supplied with the system. Marketed systems shall also comply with the labeling requirements in §15.19 and must be supplied with the information required under §§15.21, 15.27 and 15.105; and

(5) The assembler of a personal computer system may be required to test the system and/or make necessary modifications if a system is found to cause harmful interference or to be noncompliant with the appropriate standards in the configuration in which it is marketed (see §§2.909, 15.1, 15.27(d) and 15.101(e)).

[61 FR 31050, June 19, 1996, as amended at 82 FR 50833, Nov. 2, 2017]

§15.103 Exempted devices.

The following devices are subject only to the general conditions of operation in §§15.5 and 15.29 and are exempt from the specific technical standards and other requirements contained in this part. The operator of the exempted device shall be required to stop operating the device upon a finding by the Commission or its representative that the device is causing harmful interference. Operation shall not resume

until the condition causing the harmful interference has been corrected. Although not mandatory, it is strongly recommended that the manufacturer of an exempted device endeavor to have the device meet the specific technical standards in this part.

(a) A digital device utilized exclusively in any transportation vehicle including motor vehicles and aircraft.

(b) A digital device used exclusively as an electronic control or power system utilized by a public utility or in an industrial plant. The term *public utility* includes equipment only to the extent that it is in a dedicated building or large room owned or leased by the utility and does not extend to equipment installed in a subscriber's facility.

(c) A digital device used exclusively as industrial, commercial, or medical test equipment.

(d) A digital device utilized exclusively in an appliance, e.g., microwave oven, dishwasher, clothes dryer, air conditioner (central or window), etc.

(e) Specialized medical digital devices (generally used at the direction of or under the supervision of a licensed health care practitioner) whether used in a patient's home or a health care facility. Non-specialized medical devices, *i.e.*, devices marketed through retail channels for use by the general public, are not exempted. This exemption also does not apply to digital devices used for record keeping or any purpose not directly connected with medical treatment.

(f) Digital devices that have a power consumption not exceeding 6 nW.

(g) Joystick controllers or similar devices, such as a mouse, used with digital devices but which contain only non-digital circuitry or a simple circuit to convert the signal to the format required (e.g., an integrated circuit for analog to digital conversion) are viewed as passive add-on devices, not themselves directly subject to the technical standards or the equipment authorization requirements.

(h) Digital devices in which both the highest frequency generated and the highest frequency used are less than 1.705 MHz and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines. Digital devices that include, or make provision for the use of, battery eliminators, AC adaptors or battery chargers which permit operation while charging or that connect to the AC power lines indirectly, obtaining their power through another device which is connected to the AC power lines, do not fall under this exemption.

(i) Responsible parties should note that equipment containing more than one device is not exempt from the technical standards in this part unless all of the devices in the equipment meet the criteria for exemption. If only one of the included devices qualifies for exemption, the remainder of the equipment must comply with any applicable regulations. If a device performs more than one function and all of those functions do not meet the criteria for exemption, the device does not qualify for inclusion under the exemptions.

§ 15.105 Information to the user.

(a) For a Class A digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

(b) For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

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. However, there is no guarantee that interference will not occur in a particular installation. 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:

—Reorient or relocate the receiving antenna.

—Increase the separation between the equipment and receiver.

—Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

—Consult the dealer or an experienced radio/TV technician for help.

(c) The provisions of paragraphs (a) and (b) of this section do not apply to digital devices exempted from the technical standards under the provisions of §15.103.

(d) For systems incorporating several digital devices, the statement shown in paragraph (a) or (b) of this section needs to be contained only in the instruction manual for the main control unit.

(e) In cases where the manual is provided only in a form other than paper, such as on a computer disk or over the Internet, the information required by this section may be included in the manual in that alternative form, provided the user can reasonably be expected to have the capability to access information in that form.

[54 FR 17714, Apr. 25, 1989, as amended at 68 FR 68546, Dec. 9, 2003]

§15.107 Conducted limits.

(a) Except for Class A digital devices, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges.

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50

*Decreases with the logarithm of the frequency.

(b) For a Class A digital device that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms LISN. Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15–0.5	79	66
0.5–30	73	60

(c) The limits shown in paragraphs (a) and (b) of this section shall not apply to carrier current systems operating as unintentional radiators on frequencies below 30 MHz. In lieu thereof, these carrier current systems shall be subject to the following standards:

(1) For carrier current systems containing their fundamental emission within the frequency band 535–1705 kHz and intended to be received using a standard AM broadcast receiver: no limit on conducted emissions.

(2) For all other carrier current systems: 1000 μV within the frequency band 535–1705 kHz, as measured using a 50 μH/50 ohms LISN.

(3) Carrier current systems operating below 30 MHz are also subject to the radiated emission limits in §15.109(e).

(d) Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC

power lines. Devices that include, or make provision for, the use of battery chargers which permit operating while charging, AC adaptors or battery eliminators or that connect to the AC power lines indirectly, obtaining their power through another device which is connected to the AC power lines, shall be tested to demonstrate compliance with the conducted limits.

[54 FR 17714, Apr. 25, 1989, as amended at 57 FR 33448, July 29, 1992; 58 FR 51249, Oct. 1, 1993; 66 FR 19098, Apr. 13, 2001; 67 FR 45670, July 10, 2002]

§ 15.109 Radiated emission limits.

(a) Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency of emission (MHz)	Field strength (microvolts/meter)
30–88	100
88–216	150
216–960	200
Above 960	500

(b) The field strength of radiated emissions from a Class A digital device, as determined at a distance of 10 meters, shall not exceed the following:

Frequency of emission (MHz)	Field strength (microvolts/meter)
30–88	90
88–216	150
216–960	210
Above 960	300

(c) In the emission tables above, the tighter limit applies at the band edges. Sections 15.33 and 15.35 which specify the frequency range over which radiated emissions are to be measured and the detector functions and other measurement standards apply.

(d) For CB receivers, the field strength of radiated emissions within the frequency range of 25–30 MHz shall not exceed 40 microvolts/meter at a distance of 3 meters. The field strength of radiated emissions above 30 MHz from such devices shall comply with the limits in paragraph (a) of this section.

(e) Carrier current systems used as unintentional radiators or other unintentional radiators that are designed to conduct their radio frequency emissions via connecting wires or cables and that operate in the frequency range of 9 kHz to 30 MHz, including devices that deliver the radio frequency energy to transducers, such as ultrasonic devices not covered under part 18 of this chapter, shall comply with the radiated emission limits for intentional radiators provided in §15.209 for the frequency range of 9 kHz to 30 MHz. As an alternative, carrier current systems used as unintentional radiators and operating in the frequency range of 525 kHz to 1705 kHz may comply with the radiated emission limits provided in §15.221(a). At frequencies above 30 MHz, the limits in paragraph (a), (b), or (g) of this section, as appropriate, apply.

(f) For a receiver which employs terminals for the connection of an external receiving antenna, the receiver shall be tested to demonstrate compliance with the provisions of this section with an antenna connected to the antenna terminals unless the antenna conducted power is measured as specified in §15.111(a). If a permanently attached receiving antenna is used, the receiver shall be tested to demonstrate compliance with the provisions of this section.

(g) As an alternative to the radiated emission limits shown in paragraphs (a) and (b) of this section, digital devices may be shown to comply with the standards contained in Third Edition of the International Special Committee on Radio Interference (CISPR), Pub. 22, ''Information Technology Equipment—Radio Disturbance Characteristics—Limits and Methods of Measurement'' (incorporated by reference, *see* §15.38). In addition:

(1) The test procedure and other requirements specified in this part shall continue to apply to digital devices.

(2) If, in accordance with §15.33 of this part, measurements must be performed above 1000 MHz, compliance above 1000 MHz shall be demonstrated with the emission limit in paragraph (a) or (b) of this section, as appropriate. Measurements above 1000 MHz may be performed at the distance specified in the CISPR 22 publications for measurements below 1000 MHz provided

the limits in paragraphs (a) and (b) of this section are extrapolated to the new measurement distance using an inverse linear distance extrapolation factor (20 dB/decade), e.g., the radiated limit above 1000 MHz for a Class B digital device is 150 uV/m, as measured at a distance of 10 meters.

(3) The measurement distances shown in CISPR Pub. 22, including measurements made in accordance with this paragraph above 1000 MHz, are considered, for the purpose of §15.31(f)(4) of this part, to be the measurement distances specified in this part.

(h) Radar detectors shall comply with the emission limits in paragraph (a) of this section over the frequency range of 11.7–12.2 GHz.

[54 FR 17714, Apr. 25, 1989, as amended at 56 FR 373, Jan. 4, 1991; 58 FR 51249, Oct. 1, 1993; 66 FR 19098, Apr. 13, 2001; 67 FR 48993, July 29, 2002; 69 FR 2849, Jan. 21, 2004; 80 FR 33447, June 12, 2015]

§15.111 Antenna power conduction limits for receivers.

(a) In addition to the radiated emission limits, receivers that operate (tune) in the frequency range 30 to 960 MHz and CB receivers that provide terminals for the connection of an external receiving antenna may be tested to demonstrate compliance with the provisions of §15.109 with the antenna terminals shielded and terminated with a resistive termination equal to the impedance specified for the antenna, provided these receivers also comply with the following: With the receiver antenna terminal connected to a resistive termination equal to the impedance specified or employed for the antenna, the power at the antenna terminal at any frequency within the range of measurements specified in §15.33 shall not exceed 2.0 nanowatts.

(b) CB receivers and receivers that operate (tune) in the frequency range 30 to 960 MHz that are provided only with a permanently attached antenna shall comply with the radiated emission limitations in this part, as measured with the antenna attached.

§15.113 Power line carrier systems.

Power line carrier systems, as defined in §15.3(t), are subject only to the following requirements:

(a) A power utility operating a power line carrier system shall submit the details of all existing systems plus any proposed new systems or changes to existing systems to an industry-operated entity as set forth in §90.35(g) of this chapter. No notification to the FCC is required.

(b) The operating parameters of a power line carrier system (particularly the frequency) shall be selected to achieve the highest practical degree of compatibility with authorized or licensed users of the radio spectrum. The signals from this operation shall be contained within the frequency band 9 kHz to 490 kHz. A power line carrier system shall operate on an unprotected, non-interference basis in accordance with §15.5 of this part. If harmful interference occurs, the electric power utility shall discontinue use or adjust its power line carrier operation, as required, to remedy the interference. Particular attention should be paid to the possibility of interference to Loran C operations at 100 kHz.

(c) Power line carrier system apparatus shall be operated with the minimum power possible to accomplish the desired purpose. No equipment authorization is required.

(d) The best engineering principles shall be used in the generation of radio frequency currents by power line carrier systems to guard against harmful interference to authorized radio users, particularly on the fundamental and harmonic frequencies.

(e) Power line carrier system apparatus shall conform to such engineering standards as may be promulgated by the Commission. In addition, such systems should adhere to industry approved standards designed to enhance the use of power line carrier systems.

(f) The provisions of this section apply only to systems operated by a power utility for general supervision of the power system and do not permit operation on electric lines which connect the distribution substation to the customer or house wiring. Such operation can be conducted under the other provisions of this part.

(g) *Special provisions.* An electric power utility entity shall not operate a new or modified power line carrier (PLC) system in the 135.7–137.8 kHz and/

or 472–479 kHz bands if a previously coordinated amateur station pursuant to §97.301(g)(2) of this chapter is located within one kilometer of the transmission lines conducting the PLC signal.

[54 FR 17714, Apr. 25, 1989; 54 FR 32339, Aug. 7, 1989; 75 FR 63031, Oct. 13, 2010; 82 FR 27213, June 14, 2017]

§15.115 TV interface devices, including cable system terminal devices.

(a) Measurements of the radiated emissions of a TV interface device shall be conducted with the output terminal(s) of the device terminated by a resistance equal to the rated output impedance. The emanations of a TV interface device incorporating an intentional radiator shall not exceed the limits in §15.109 or subpart C of this part, whichever is higher for each frequency. Where it is possible to determine which portion of the device is contributing a particular radio frequency emission, the emissions from the TV interface device portion shall comply with the emission limits in §15.109, and the emissions from the intentional radiator shall comply with subpart C of this part.

(b) Output signal limits:

(1) At any RF output terminal, the maximum measured RMS voltage, in microvolts, corresponding to the peak envelope power of the modulated signal during maximum amplitude peaks across a resistance (R in ohms) matching the rated output impedance of the TV interface device, shall not exceed the following:

(i) For a cable system terminal device or a TV interface device used with a master antenna, 692.8 times the square root of (R) for the video signal and 155 times the square root of (R) for the audio signal.

(ii) For all other TV interface devices, 346.4 times the square root of (R) for the video signal and 77.5 times the square root of (R) for the audio signal.

(2) At any RF output terminal, the maximum measured RMS voltage, in microvolts, corresponding to the peak envelope power of the modulated signal during maximum amplitude peaks across a resistance (R in ohms) matching the rated output impedance of the TV interface device, of any emission appearing on frequencies removed by more than 4.6 MHz below or 7.4 MHz above the video carrier frequency on which the TV interface device is operated shall not exceed the following:

(i) For a cable system terminal device or a TV interface device used with a master antenna, 692.8 times the square root of (R).

(ii) For all other TV interface devices, 10.95 times the square root of (R).

(3) The term *master antenna* used in this section refers to TV interface devices employed for central distribution of television or other video signals within a building. Such TV interface devices must be designed to:

(i) Distribute multiple television signals at the same time;

(ii) Distribute such signals by cable to outlets or TV receivers in multiple rooms in the building in which the TV interface devices are installed; and,

(iii) Distribute all over-the-air or cable signals.

NOTE: Cable-ready video cassette recorders continue to be subject to the provisions for general TV interface devices.

(c) A TV interface device shall be equipped with a transfer switch for connecting the antenna terminals of a receiver selectively either to the receiving antenna or to the radio frequency output of the TV interface device, subject to the following:

(1) When measured in any of its set positions, transfer switches shall comply with the following requirements:

(i) For a cable system terminal device or a TV interface device equipped for use with a cable system or a master antenna, as defined in paragraph (b)(3) of this section, the isolation between the antenna and cable input terminals shall be at least 80 dB from 54 MHz to 216 MHz, at least 60 dB from 216 MHz to 550 MHz and at least 55 dB from 550 MHz to 806 MHz. The 80 dB standard applies at 216 MHz and the 60 dB standard applies at 550 MHz. In the case of a transfer switch requiring a power source, the required isolation shall be maintained in the event the device is not connected to a power source or power is interrupted.

(ii) For all other TV interface devices, the maximum voltage, corresponding to the peak envelope power of the modulated video signal during

maximum amplitude peaks, in microvolts, appearing at the receiving antenna input terminals when terminated with a resistance (R in ohms) matching the rated impedance of the antenna input of the switch, shall not exceed 0.346 times the square root of (R).

(iii) Measurement to determine compliance with the transfer switch limits shall be made using a connecting cable, where required, between the TV interface device and the transfer switch of the type and length:

(A) Provided with the TV interface device,

(B) Recommended in the instruction manual, or

(C) Normally employed by the consumer.

(2) A TV interface device shall be designed and constructed, to the extent practicable, so as to preclude the possibility that the consumer may inadvertently attach the output of the device to the receiving antenna, if any, without first going through the transfer switch.

(3) A transfer switch is not required for a TV interface device that, when connected, results in the user no longer having any need to receive standard over-the-air broadcast signals via a separate antenna. A transfer switch is not required to be marketed with a cable system terminal device unless that device provides for the connection of an external antenna. A transfer switch is not required for a device that is intended to be used as an accessory to an authorized TV interface device.

(4) An actual transfer switch is not required for a TV interface device, including a cable system terminal device, that has an antenna input terminal(s); provided, the circuitry following the antenna input terminal(s) has sufficient bandwidth to allow the reception of all TV broadcast channels authorized under part 73 of this chapter and: For a cable system terminal device that can alternate between the reception of cable television service and an antenna, compliance with the isolation requirement specified in paragraph (c)(1)(i) of this section can be demonstrated; and, for all other TV interface devices, the maximum voltage appearing at the antenna terminal(s) does not exceed the limit in paragraph (c)(1)(ii) of this section.

(5) If a transfer switch is not required, the following label shall be used in addition to the label shown in §15.19(a):

> This device is intended to be attached to a receiver that is not used to receive over-the-air broadcast signals. Connection of this device in any other fashion may cause harmful interference to radio communications and is in violation of the FCC Rules, part 15.

(d) A TV interface device, including a cable system terminal device, shall incorporate circuitry to automatically prevent emanations from the device from exceeding the technical specifications in this part. These circuits shall be adequate to accomplish their functions when the TV interface device is presented, if applicable, with video input signal levels in the range of one to five volts; this requirement is not applicable to a TV interface device that uses a built-in signal source and has no provisions for the connection of an external signal source. For devices that contain provisions for an external signal source but do not contain provisions for the input of an external baseband signal, e.g., some cable system terminal devices, compliance with the provisions of this paragraph shall be demonstrated with a radio frequency input signal of 0 to 25 dBmV.

(e) For cable system terminal devices and TV interface devices used with a master antenna, as defined in paragraph (b)(3) of this section, the holder of the grant of authorization shall specify in the instruction manual or pamphlet, if a manual is not provided, the types of wires or coaxial cables necessary to ensure that the unit complies with the requirements of this part. The holder of the grant of authorization must comply with the provisions of §15.27. For all other TV interface devices, the wires or coaxial cables used to couple the output signals to the TV receiver shall be provided by the responsible party.

(f) A TV interface device which is submitted to the Commission as a composite device in a single enclosure containing a RF modulator, video source and other component devices shall be submitted on a single application (FCC

Form 731) and shall be authorized as a single device.

(g) An external device or accessory that is intended to be attached to a TV interface device shall comply with the technical and administrative requirements set out in the rules under which it operates. For example, a personal computer must be certificated to show compliance with the regulations for digital devices.

(h) Stand-alone switches used to alternate between cable service and an antenna shall provide isolation between the antenna and cable input terminals that is at least 80 dB from 54 MHz to 216 MHz, at least 60 dB from 216 MHz to 550 MHz and at least 55 dB from 550 MHz to 806 MHz. The 80 dB standard applies at 216 MHz and the 60 dB standard applies at 550 MHz. In the case of stand-alone switches requiring a power source, the required isolation shall be maintained in the event the device is not connected to a power source or power is interrupted.

(i) Switches and other devices intended to be used to by-pass the processing circuitry of a cable system terminal device, whether internal to such a terminal device or a stand-alone unit, shall not attenuate the input signal more than 6 dB from 54 MHz to 550 MHz, or more than 8 dB from 550 MHz to 804 MHz. The 6 dB standard applies at 550 MHz.

[54 FR 17714, Apr. 25, 1989, as amended at 57 FR 33448, July 29, 1992; 59 FR 25341, May 16, 1994; 61 FR 18509, Apr. 26, 1996; 77 FR 4913, Feb. 1, 2012]

§ 15.117 TV broadcast receivers.

(a) All TV broadcast receivers shipped in interstate commerce or imported into the United States, for sale or resale to the public, shall comply with the provisions of this section, except that paragraphs (f) and (g) of this section shall not apply to the features of such sets that provide for reception of digital television signals. The reference in this section to TV broadcast receivers also includes devices, such as TV interface devices and set-top devices that are intended to provide audio-video signals to a video monitor, that incorporate the tuner portion of a TV broadcast receiver and that are equipped with an antenna or antenna terminals that can be used for off-the-air reception of TV broadcast signals, as authorized under part 73 of this chapter.

(b) TV broadcast receivers shall be capable of adequately receiving all channels allocated by the Commission to the television broadcast service that broadcast digital signals using the DTV transmission standard in §73.682(d) of this chapter, but need not be capable of receiving analog signals or signals using the Next Gen TV transmission standard in §73.682(f) of this chapter.

(c) On a given receiver, use of the UHF and VHF tuning systems shall provide approximately the same degree of tuning accuracy with approximately the same expenditure of time and effort: *Provided, however,* That this requirement will be considered to be met if the need for routine fine tuning is eliminated on UHF channels.

(1) *Basic tuning mechanism.* If a TV broadcast receiver is equipped to provide for repeated access to VHF television channels at discrete tuning positions, that receiver shall be equipped to provide for repeated access to a minimum of six UHF television channels at discrete tuning positions. Unless a discrete tuning position is provided for each channel allocated to UHF television, each position shall be readily adjustable to a particular UHF channel by the user without the use of tools. If 12 or fewer discrete tuning positions are provided, each position shall be adjustable to receive any channel allocated to UHF television.

NOTE: The combination of detented rotary switch and pushbutton controls is acceptable, provided UHF channels, after their initial selection, can be accurately tuned with an expenditure of time and effort approximately the same as that used in accurately tuning VHF channels. A UHF tuning system comprising five pushbuttons and a separate manual tuning knob is considered to provide repeated access to six channels at discrete tuning positions. A one-knob (VHF/UHF) tuning system providing repeated access to 11 or more discrete tuning positions is also acceptable, provided each of the tuning positions is readily adjustable, without the use of tools, to receive any UHF channel.

(2) *Tuning controls and channel readout.* UHF tuning controls and channel readout on a given receiver shall be

comparable in size, location, accessibility and legibility to VHF controls and readout on that receiver.

NOTE: Differences between UHF and VHF channel readout that follow directly from the larger number of UHF television channels available are acceptable if it is clear that a good faith effort to comply with the provisions of this section has been made.

(d) If equipment and controls that tend to simplify, expedite or perfect the reception of television signals (e.g., AFC, visual aids, remote control, or signal seeking capability referred to generally as tuning aids) are incorporated into the VHF portion of a TV broadcast receiver, tuning aids of the same type and comparable capability and quality shall be provided for the UHF portion of that receiver.

(e) If a television receiver has an antenna affixed to the VHF antenna terminals, it must have an antenna designed for and capable of receiving all UHF television channels affixed to the UHF antenna terminals. If a VHF antenna is provided with but not affixed to a receiver, a UHF antenna shall be provided with the receiver.

(f) The picture sensitivity of a TV broadcast receiver averaged for all channels between 14 and 69 inclusive shall not be more than 8dB larger than the peak picture sensitivity of that receiver averaged for all channels between 2 and 13 inclusive.

(g) The noise figure for any television channel 14 to 69 inclusive shall not exceed 14 dB. A TV receiver model is considered to comply with this noise figure if the maximum noise figure for channels 14–69 inclusive of 97.5% of all receivers within that model does not exceed 14 dB.

(1) The responsible party shall measure the noise figure of a number of UHF channels of the test sample to give reasonable assurance that the UHF noise figure for each channel complies with the above limit.

(2) The responsible party shall insert in his files a statement explaining the basis on which it will rely to ensure that at least 97.5% of all production units of the test sample that are manufactured have a noise figure of no greater than 14 dB.

(3) [Reserved]

(4) In the case of a TV tuner built-in as part of a video tape recorder that uses a power splitter between the antenna terminals of the video tape recorder and the input terminals of the TV tuner or a TV broadcast receiver that uses a power splitter between the antenna terminals of two or more UHF tuners contained within that receiver, 4 dB may be subtracted from the noise figure measured at the antenna terminals of the video tape recorder or TV broadcast receiver for determining compliance of the UHF tuner(s) with the 14 dB noise figure limit.

(h) *Digital television reception capability.* TV broadcast receivers are required only to provide useable picture and sound commensurate with their video and audio capabilities when receiving digital television signals.

(i) *Digital television reception requirement.* (1) Responsible parties, as defined in §2.909 of this chapter, are required to equip with DTV tuners new TV broadcast receivers that are shipped in interstate commerce or imported from any foreign country into the United States and for which they are responsible to comply with the provisions of this section. For purposes of this section, the term ''TV broadcast receivers'' includes other video devices (videocassette recorders (VCRs), digital video recorders such as hard drive and DVD recorders, etc.) that receive television signals.

(2) The requirement to include digital television reception capability in new TV broadcast receivers does not apply to devices such as mobile telephones and personal digital assistants where such devices do not include the capability to receive TV service on the frequencies allocated for broadcast television service.

(j) For a TV broadcast receiver equipped with a cable input selector switch, the selector switch shall provide, in any of its set positions, isolation between the antenna and cable input terminals of at least 80 dB from 54 MHz to 216 MHz, at least 60 dB from 216 MHz to 550 MHz and at least 55 dB from 550 MHz to 806 MHz. The 80 dB standard applies at 216 MHz and the 60 dB standard applies at 550 MHz. In the case of a selector switch requiring a power source, the required isolation

shall be maintained in the event the device is not connected to a power source or power is interrupted. An actual switch that can alternate between reception of cable television service and an antenna is not required for a TV broadcast receiver, provided compliance with the isolation requirement specified in this paragraph can be demonstrated and the circuitry following the antenna input terminal(s) has sufficient band-width to allow the reception of all TV broadcast channels authorized under this chapter.

(k) The following requirements apply to all responsible parties, as defined in §2.909 of this chapter, and any person that displays or offers for sale or rent television receiving equipment that is not capable of receiving, decoding and tuning digital signals.

(1) Such parties and persons shall place conspicuously and in close proximity to such television broadcast receivers a sign containing, in clear and conspicuous print, the Consumer Alert disclosure text required by paragraph (k)(3) of this section. The text should be in a size of type large enough to be clear, conspicuous and readily legible, consistent with the dimensions of the equipment and the label. The information may be printed on a transparent material and affixed to the screen, if the receiver includes a display, in a manner that is removable by the consumer and does not obscure the picture, or, if the receiver does not include a display, in a prominent location on the device, such as on the top or front of the device, when displayed for sale, or the information in this format may be displayed separately immediately adjacent to each television broadcast receiver offered for sale and clearly associated with the analog-only model to which it pertains.

(2) If such parties and persons display or offer for sale or rent such television broadcast receivers via direct mail, catalog, or electronic means, they shall prominently display in close proximity to the images or descriptions of such television broadcast receivers, in clear and conspicuous print, the Consumer Alert disclosure text required by paragraph (k)(3) of this section. The text should be in a size large enough to be clear, conspicuous, and readily legible, consistent with the dimensions of the advertisement or description.

(3) *Consumer alert.* This television receiver has only an analog broadcast tuner and will require a converter box after February 17, 2009, to receive over-the-air broadcasts with an antenna because of the Nation's transition to digital broadcasting. Analog-only TVs should continue to work as before with cable and satellite TV services, gaming consoles, VCRs, DVD players, and similar products. For more information, call the Federal Communications Commission at 1–888–225–5322 (TTY: 1–888–835–5322) or visit the Commission's digital television Web site at: *http://www.dtv.gov*.

[54 FR 17714, Apr. 25, 1993, as amended at 59 FR 25341, May 16, 1994; 61 FR 30532, June 17, 1996; 67 FR 63294, Oct. 11, 2002; 70 FR 38804, July 6, 2005; 70 FR 75743, Dec. 21, 2005; 72 FR 26560, May 10, 2007; 73 FR 5681, Jan. 30, 2008; 77 FR 4913, Feb. 1, 2012; 81 FR 5052, Feb. 1, 2016; 83 FR 5021, Feb. 2, 2018]

§15.118 Cable ready consumer electronics equipment.

(a) All consumer electronics TV receiving equipment marketed in the United States as cable ready or cable compatible shall comply with the provisions of this section. Consumer electronics TV receiving equipment that includes features intended for use with cable service but does not fully comply with the provisions of this section are subject to the labelling requirements of §15.19(d). Until such time as generally accepted testing standards are developed, paragraphs (c) and (d) of this section will apply only to the analog portion of covered consumer electronics TV receiving equipment

(b) Cable ready consumer electronics equipment shall be capable of receiving all NTSC or similar video channels on channels 1 through 125 of the channel allocation plan set forth in CEA–542–B: ''CEA Standard: Cable Television Channel Identification Plan,'' (incorporated by reference, *see* §15.38).

(c) Cable ready consumer electronics equipment must meet the following technical performance requirements. Compliance with these requirements shall be determined by performing

measurements at the unfiltered IF output port. Where appropriate, the Commission will consider allowing alternative measurement methods.

(1) *Adjacent channel interference.* In the presence of a lower adjacent channel CW signal that is 1.5 MHz below the desired visual carrier in frequency and 10 dB below the desired visual carrier in amplitude, spurious signals within the IF passband shall be attenuated at least 55 dB below the visual carrier of the desired signal. The desired input signal shall be an NTSC visual carrier modulated with a 10 IRE flat field with color burst and the aural carrier which is 10 dB below the visual carrier should be unmodulated. Measurements are to be performed for input signal levels of 0 dBmV and + 15 dBmV, with the receiver tuned to ten evenly spaced EIA IS–132 channels covering the band 54 MHz to 804 MHz.

(2) *Image channel interference.* Image channel interference within the IF passband shall be attenuated below the visual carrier of the desired channel by at least 60 dB from 54 MHz to 714 MHz and 50 dB from 714 MHz to 804 MHz. The 60 dB standard applies at 714 MHz. In testing for compliance with this standard, the desired input signal is to be an NTSC signal on which the visual carrier is modulated with a 10 IRE flat field with color burst and the aural carrier is unmodulated and 10 dB below the visual carrier. The undesired test signal shall be a CW signal equal in amplitude to the desired visual carrier and located 90 MHz above the visual carrier frequency of the desired channel. Measurements shall be performed for input signals of 0 dBmV and + 15 dBmV, with the receiver tuned to at least ten evenly spaced EIA IS–132 channels covering the band 54 MHz to 804 MHz.

(3) *Direct pickup interference.* The direct pickup (DPU) of a co-channel interfering ambient field by a cable ready device shall not exceed the following criteria. The ratio of the desired to undesired signal levels at the IF passband on each channel shall be at least 45 dB. The average ratio over the six channels shall be at least 50 dB. The desired input signal shall be an NTSC signal having a visual carrier level of 0 dBmV. The visual carrier is modulated with a 10 IRE flat field with color burst, visual to aural carrier ratio of 10 dB, aural carrier unmodulated. The equipment under test (EUT) shall be placed on a rotatable table that is one meter in height. Any excess length of the power cord and other connecting leads shall be coiled on the floor under the table. The EUT shall be immersed in a horizontally polarized uniform CW field of 100 mV/m at a frequency 2.55 MHz above the visual carrier of the EUT tuned channel. Measurements shall be made with the EUT tuned to six EIA IS–132 channels, two each in the low VHF, high VHF and UHF broadcast bands. On each channel, the levels at the IF passband due to the desired and interfering signals are to be measured.

(4) *Tuner overload.* Spurious signals within the IF passband shall be attenuated at least 55 dB below the visual carrier of the desired channel using a comb-like spectrum input with each visual carrier signal individually set at + 15 dBmV from 54 to 550 MHz. The desired input signal is to be an NTSC signal on which the visual carrier is modulated with a 10 IRE flat field with color burst and the aural carrier is unmodulated and 10 dB below the visual carrier. Measurements shall be made with the receiver tuned to at least seven evenly spaced EIA IS–132 channels covering the band 54 MHz to 550 MHz. In addition, spurious signals within the IF passband shall be attenuated at least 51 dB below the visual carrier of the desired channel using a comb spectrum input with each signal individually set at + 15 dBmV from 550 to 804 MHz. Measurements shall be made with the receiver tuned to at least three evenly spaced EIA IS–132 channels covering the band 550 MHz to 804 MHz.

(5) *Cable input conducted emissions.* (i) Conducted spurious emissions that appear at the cable input to the device must meet the following criteria. The input shall be an NTSC video carrier modulated with a 10 IRE flat field with color burst at a level of 0 dBmV and with a visual to aural ratio of 10 dB. The aural carrier shall be unmodulated. The peak level of the spurious signals will be measured using

a spectrum analyzer connected by a directional coupler to the cable input of the equipment under test. Spurious signal levels must not exceed the limits in the following table:

From 54 MHz up to and including 300 MHz–26 dBmV
From 300 MHz up to and including 450 MHz–20 dBmV
From 450 MHz up to and including 804 MHz-15 dBmV

(ii) The average of the measurements on multiple channels from 450 MHz up to and including 804 MHz shall be no greater than −20 dBmV. Measurements shall be made with the receiver tuned to at least four EIA IS–132 channels in each of the above bands. The test channels are to be evenly distributed across each of the bands. Measurements for conducted emissions caused by sources internal to the device are to be made in a shielded room. Measurements for conducted emissions caused by external signal sources shall be made in an ambient RF field whose field strength is 100 mV/m, following the same test conditions as described in paragraph (c)(3) of this section.

(d) The field strength of radiated emissions from cable ready consumer electronics equipment shall not exceed the limits in §15.109(a) when measured in accordance with the applicable procedures specified in §§15.31 and 15.35 for unintentional radiators, with the following modifications. During testing the NTSC input signal level is to be + 15 dBmV, with a visual to aural ratio of 10 dB. The visual carrier is to be modulated by a 10 IRE flat field with color burst; the aural carrier is to be unmodulated. Measurements are to be taken on six EIA IS–132 channels evenly spaced across the required RF input range of the equipment under test.

[59 FR 25341, May 16, 1994, as amended at 61 FR 18509, Apr. 26, 1996; 65 FR 64391, Oct. 27, 2000; 68 FR 68546, Dec. 9, 2003; 69 FR 2849, Jan. 21, 2004; 69 FR 57861, Sept. 28, 2004; 77 FR 4913, Feb. 1, 2012]

§15.119 [Reserved]

§15.120 Program blocking technology requirements for television receivers.

(a) Effective July 1, 1999, manufacturers of television broadcast receivers as defined in section 15.3(w) of this chapter, including personal computer systems meeting that definition, must ensure that one-half of their product models with picture screens 33 cm (13 in) or larger in diameter shipped in interstate commerce or manufactured in the United States comply with the provisions of paragraphs (c), (d), and (e) of this section.

NOTE: This paragraph places no restrictions on the shipping or sale of television receivers that were manufactured before July 1999.

(b) All TV broadcast receivers as defined in §15.3(w), including personal computer systems meeting that definition, with picture screens 33 cm (13 in) or larger, measured diagonally, or with displays in the 16:9 aspect ratio that are 19.8 cm (7.8 in) or greater in height and digital television receivers without an associated display device shipped in interstate commerce or manufactured in the United States shall comply with the provisions of paragraphs (c), (d), and (e) of this section.

(c) *Transmission format.* (1) Analog television program rating information shall be transmitted on line 21 of field 2 of the vertical blanking interval of television signals, in accordance with §73.682(a)(22) of this chapter.

(2) Digital television program rating information shall be transmitted in digital television signals in accordance with §73.682(d) of this chapter.

(d) *Operation.* (1) Analog television receivers will receive program ratings transmitted pursuant to EIA–744: ''Transport of Content Advisory Information Using Extended Data Service (XDS)'' (incorporated by reference, *see* §15.38) and EIA–608: ''Recommended Practice for Line 21 Data Service'' (incorporated by reference, *see* §15.38). Blocking of programs shall occur when a program rating is received that meets the pre-determined user requirements.

(2) Digital television receivers shall react in a similar manner as analog televisions when programmed to block specific rating categories. Digital television receivers will receive program rating descriptors transmitted pursuant to industry standard EIA/CEA–766–A ''U.S. and Canadian Region Rating Tables (RRT) and Content Advisory

Descriptors for Transport of Content Advisory Information using ATSC A/65–A Program and System Information Protocol (PSIP),'' 2001 (incorporated by reference, *see* §15.38). Blocking of programs shall occur when a program rating is received that meets the pre-determined user requirements. Digital television receivers shall be able to respond to changes in the content advisory rating system.

(e) All television receivers as described in paragraph (a) of this section shall block programming as follows:

(1) *Channel Blocking.* Channel Blocking should occur as soon as a program rating packet with the appropriate Content Advisory or MPAA rating level is received. Program blocking is described as a receiver performing all of the following:

- Muting the program audio.
- Rendering the video black or otherwise indecipherable.
- Eliminating program-related captions.

(2) *Default State.* The default state of a receiver (*i.e.*, as provided to the consumer) should not block unrated programs. However, it is permissible to include features that allow the user to reprogram the receiver to block programs that are not rated.

(3) *Picture-In-Picture (PIP).* If a receiver has the ability to decode program-related rating information for the Picture-In-Picture (PIP) video signal, then it should block the PIP channel in the same manner as the main channel. If the receiver does not have the ability to decode PIP program-related rating information, then it should block or otherwise disable the PIP if the viewer has enabled program blocking.

(4) *Selection of Ratings.* Each television receiver, in accordance with user input, shall block programming based on the age based ratings, the content based ratings, or a combination of the two.

(i) If the user chooses to block programming according to its age based rating level, the receiver must have the ability to automatically block programs with a more restrictive age based rating. For example, if all shows with an age-based rating of TV-PG have been selected for blocking, the user should be able to automatically block programs with the more restrictive ratings of TV–14 and TV-MA.

(ii) If the user chooses to block programming according to a combination of age based and content based ratings the receiver must have the ability to automatically block programming with a more restrictive age rating but a similar content rating. For example, if all shows rated TV-PG-V have been selected for blocking, the user should be able to block automatically shows with the more restrictive ratings of TV–14–V and TV-MA-V.

(iii) The user should have the capability of overriding the automatic blocking described in paragraphs (e)(4)(i) and (4)(ii) of this section.

[63 FR 20133, Apr. 23, 1998, as amended at 68 FR 68546, Dec. 9, 2003; 69 FR 2849, Jan. 21, 2004; 69 FR 59534, Oct. 4, 2004; 73 FR 5682, Jan. 30, 2008; 74 FR 63079, Dec. 2, 2009; 77 FR 4913, Feb. 1, 2012]

§15.121 Scanning receivers and frequency converters used with scanning receivers.

(a) Except as provided in paragraph (c) of this section, scanning receivers and frequency converters designed or marketed for use with scanning receivers, shall:

(1) Be incapable of operating (tuning), or readily being altered by the user to operate, within the frequency bands allocated to the Cellular Radiotelephone Service in part 22 of this chapter (cellular telephone bands). Scanning receivers capable of ''readily being altered by the user'' include, but are not limited to, those for which the ability to receive transmissions in the cellular telephone bands can be added by clipping the leads of, or installing, a simple component such as a diode, resistor or jumper wire; replacing a plug-in semiconductor chip; or programming a semiconductor chip using special access codes or an external device, such as a personal computer. Scanning receivers, and frequency converters designed for use with scanning receivers, also shall be incapable of converting digital cellular communication transmissions to analog voice audio.

(2) Be designed so that the tuning, control and filtering circuitry is inaccessible. The design must be such that any attempts to modify the equipment

to receive transmissions from the Cellular Radiotelephone Service likely will render the receiver inoperable.

(b) Except as provided in paragraph (c) of this section, scanning receivers shall reject any signals from the Cellular Radiotelephone Service frequency bands that are 38 dB or lower based upon a 12 dB SINAD measurement, which is considered the threshold where a signal can be clearly discerned from any interference that may be present.

(c) Scanning receivers and frequency converters designed or marketed for use with scanning receivers, are not subject to the requirements of paragraphs (a) and (b) of this section provided that they are manufactured exclusively for, and marketed exclusively to, entities described in 18 U.S.C. 2512(2), or are marketed exclusively as test equipment pursuant to §15.3(dd).

(d) Modification of a scanning receiver to receive transmissions from Cellular Radiotelephone Service frequency bands will be considered to constitute manufacture of such equipment. This includes any individual, individuals, entity or organization that modifies one or more scanners. Any modification to a scanning receiver to receive transmissions from the Cellular Radiotelephone Service frequency bands voids the certification of the scanning receiver, regardless of the date of manufacture of the original unit. In addition, the provisions of §15.23 shall not be interpreted as permitting modification of a scanning receiver to receiver Cellular Radiotelephone Service transmissions.

(e) Scanning receivers and frequency converters designed for use with scanning receivers shall not be assembled from kits or marketed in kit form unless they comply with the requirements in paragraph (a) through (c) of this section.

(f) Scanning receivers shall have a label permanently affixed to the product, and this label shall be readily visible to the purchaser at the time of purchase. The label shall read as follows: WARNING: MODIFICATION OF THIS DEVICE TO RECEIVE CELLULAR RADIOTELEPHONE SERVICE SIGNALS IS PROHIBITED UNDER FCC RULES AND FEDERAL LAW.

(1) ''Permanently affixed'' means that the label is etched, engraved, stamped, silkscreened, indelible printed or otherwise permanently marked on a permanently attached part of the equipment or on a nameplate of metal, plastic or other material fastened to the equipment by welding, riveting, or permanent adhesive. The label shall be designed to last the expected lifetime of the equipment in the environment in which the equipment may be operated and must not be readily detachable. The label shall not be a stick-on, paper label.

(2) When the device is so small that it is not practicable to place the warning label on it, the information required by this paragraph shall be placed in a prominent location in the instruction manual or pamphlet supplied to the user and shall also be placed on the container in which the device is marketed. However, the FCC identifier must be displayed on the device.

[64 FR 22561, Apr. 27, 1999, as amended at 66 FR 32582, June 15, 2001]

§15.122 [Reserved]

§15.123 Labeling of digital cable ready products.

(a) The requirements of this section shall apply to unidirectional digital cable products. Unidirectional digital cable products are one-way devices that accept a Point of Deployment module (POD) and which include, but are not limited to televisions, set-top-boxes and recording devices connected to digital cable systems. Unidirectional digital cable products do not include interactive two-way digital television products.

(b) A unidirectional digital cable product may not be labeled with or marketed using the term ''digital cable ready,'' or other terminology that describes the device as ''cable ready'' or ''cable compatible,'' or otherwise indicates that the device accepts a POD or conveys the impression that the device is compatible with digital cable service unless it implements at a minimum the following features:

(1) Tunes NTSC analog channels transmitted in-the-clear.

(2) Tunes digital channels that are transmitted in compliance with SCTE

40 2003 (formerly DVS 313): ''Digital Cable Network Interface Standard'' (incorporated by reference, *see* §15.38), provided, however, that with respect to Table B.11 of that standard, the phase noise requirement shall be −86 dB/Hz including both in-the-clear channels and channels that are subject to conditional access.

(3) Allows navigation of channels based on channel information (virtual channel map and source names) provided through the cable system in compliance with ANSI/SCTE 65 2002 (formerly DVS 234): ''Service Information Delivered Out-of-Band for Digital Cable Television'' (incorporated by reference, *see* §15.38), and/or PSIP-enabled navigation (ANSI/SCTE 54 2003 (formerly DVS 241): ''Digital Video Service Multiplex and Transport System Standard for Cable Television'' (incorporated by reference, *see* §15.38)).

(4) Includes the POD-Host Interface specified in SCTE 28 2003 (formerly DVS 295): ''Host-POD Interface Standard'' (incorporated by reference, *see* §15.38), and SCTE 41 2003 (formerly DVS 301): ''POD Copy Protection System'' (incorporated by reference, *see* §15.38), or implementation of a more advanced POD-Host Interface based on successor standards. Support for Internet protocol flows is not required.

(5) Responds to emergency alerts that are transmitted in compliance with ANSI/SCTE 54 2003 (formerly DVS 241): ''Digital Video Service Multiplex and Transport System Standard for Cable Television'' (incorporated by reference, *see* §15.38).

(6) In addition to the requirements of paragraphs (b)(1) through (5) of this section, a unidirectional digital cable television may not be labeled or marketed as digital cable ready or with other terminology as described in paragraph (b) of this section, unless it includes a DTV broadcast tuner as set forth in §15.117(i) and employs at least one interface specified in paragraphs (b)(6)(i) and (ii) of this section:

(i) For 480p grade unidirectional digital cable televisions, either a DVI/HDCP, HDMI/HDCP, or 480p Y,Pb,Pr interface.

(ii) For 720p/1080i grade unidirectional digital cable televisions, either a DVI/HDCP or HDMI/HDCP interface.

(c) Before a manufacturer's or importer's first unidirectional digital cable product may be labeled or marketed as digital cable ready or with other terminology as described in paragraph (b) of this section, the manufacturer or importer shall verify the device as follows:

(1) The manufacturer or importer shall have a sample of its first model of a unidirectional digital cable product tested to show compliance with the procedures set forth in Uni-Dir-PICS–I01–030903: Uni-Directional Receiving Device: Conformance Checklist: PICS Proforma (incorporated by reference, see §15.38) at a qualified test facility. If the model fails to comply, the manufacturer or importer shall have any modifications to the product to correct failures of the procedures in Uni–Dir–PICS–I01–030903: ''Uni-Directional Receiving Device: Conformance Checklist: PICS Proforma,'' September 3, 2003 (incorporated by reference, see §15.38) retested at a qualified test facility and the product must comply with Uni-Dir-PICS–I01–030903: ''Uni-Directional Receiving Device: Conformance Checklist: PICS Proforma,'' September 3, 2003 (incorporated by reference, see §15.38) in accordance with the test procedures set forth in Uni–Dir–ATP–I02–040225: ''Uni-Directional Receiving Device, Acceptance Test Plan,'' February 25, 2004 (incorporated by reference, see §15.38) or with M–UDCP–PICS–I04–080225, ''Uni-Directional Cable Product Supporting M–Card: Multiple Profiles; Conformance Checklist: PICS,'' February 25, 2008 (incorporated by reference, see §15.38) in accordance with the test procedures set forth in TP–ATP–M–UDCP–I05–20080304, ''Uni-Directional Digital Cable Products Supporting M–Card; M–UDCP Device Acceptance Test Plan,'' March 4, 2008 (incorporated by reference, see §15.38) before the product or any related model may be labeled or marketed. If the manufacturer or importer's first unidirectional digital cable product is not a television, then that manufacturer or importer's first model of a unidirectional digital cable product which is a television shall be tested pursuant to this subsection as though it were the first unidirectional

digital cable product. A qualified test facility may only require compliance with the procedures set forth in Uni-Dir-PICS–I01–030903: Uni-Directional Receiving Device: Conformance Checklist: PICS Proforma, September 3, 2003 (incorporated by reference, see §15.38). Compliance testing beyond those procedures shall be at the discretion of the manufacturer or importer.

(2) A qualified test facility is a testing laboratory representing cable television system operators serving a majority of the cable television subscribers in the United States or an appropriately qualified independent laboratory with adequate equipment and competent personnel knowledgeable with respect to Uni-Dir-PICS–I01–030903: ''Uni-Directional Receiving Device: Conformance Checklist: PICS Proforma,'' September 03, 2003 (incorporated by reference, see §15.38); Uni–Dir–ATP–I02–040225: ''Uni-Directional Receiving Device, Acceptance Test Plan,'' February 25, 2004 (incorporated by reference, see §15.38); M–UDCP–PICS–I04–080225, ''Uni-Directional Cable Product Supporting M–Card: Multiple Profiles; Conformance Checklist: PICS,'' February 25, 2008 (incorporated by reference, see §15.38); and TP–ATP–M–UDCP–I05–20080304, ''Uni-Directional Digital Cable Products Supporting M–Card; M–UDCP Device Acceptance Test Plan,'' March 4, 2008 (incorporated by reference, see §15.38). For any independent testing laboratory to be qualified hereunder such laboratory must ensure that all its decisions are impartial and have a documented structure which safeguards impartiality of the operations of the testing laboratory. In addition, any independent testing laboratory qualified hereunder must not supply or design products of the type it tests, nor provide any other products or services that could compromise confidentiality, objectivity or impartiality of the testing laboratory's testing process and decisions.

(3) Subsequent to the testing of its initial unidirectional digital cable product model, a manufacturer or importer is not required to have other models of unidirectional digital cable products tested at a qualified test facility for compliance with the procedures of Uni–Dir–PICS–I01–030903: ''Uni-Directional Receiving Device: Conformance Checklist: PICS Proforma,'' September 03, 2003 (incorporated by reference, see §15.38) unless the first model tested was not a television, in which event the first television shall be tested as provided in paragraph (c)(1) of this section. The manufacturer or importer shall ensure that all subsequent models of unidirectional digital cable products comply with the procedures in the Uni–Dir–PICS–I01–030903: ''Uni-Directional Receiving Device: Conformance Checklist: PICS Proforma,'' September 03, 2003 (incorporated by reference, see §15.38) and all other applicable rules and standards. The manufacturer or importer shall maintain records indicating such compliance in accordance with Supplier's Declaration of Conformity requirements in part 2, subpart J of this chapter. The manufacturer or importer shall further submit documentation demonstrating compliance with the procedures in the Uni–Dir–PICS–I01–030903: ''Uni-Directional Receiving Device: Conformance Checklist: PICS Proforma,'' September 03, 2003 (incorporated by reference, see §15.38) to the qualified test facility.

(4) Unidirectional digital cable product models must be tested for compliance with Uni-Dir-PICS–I01–030903: ''Uni-Directional Receiving Device: Conformance Checklist: PICS Proforma,'' September 3, 2003 (incorporated by reference, see §15.38) in accordance with Uni–Dir–ATP–I02–040225: ''Uni-Directional Receiving Device Acceptance Test Plan,'' February 25, 2004, (incorporated by reference, see §15.38) or an equivalent test procedure that produces identical pass/fail test results. In the event of any dispute over the applicable results under an equivalent test procedure, the results under Uni–Dir–ATP–I02–040225: ''Uni-Directional Receiving Device Acceptance Test Plan,'' February 25, 2004 (incorporated by reference, see §15.38) shall govern.

(5) This paragraph applies to unidirectional digital cable product models which utilize Point-of-Deployment modules (PODs) in multi-stream mode (M–UDCPs).

(i) The manufacturer or importer shall have a sample of its first model of

a M–UDCP tested at a qualified test facility to show compliance with M–UDCP–PICS–I04–080225, ''Uni-Directional Cable Product Supporting M–Card: Multiple Profiles; Conformance Checklist: PICS,'' February 25, 2008 (incorporated by reference, see §15.38) as specified in the procedures set forth in TP–ATP–M–UDCP–I05–20080304, ''Uni-Directional Digital Cable Products Supporting M–Card; M–UDCP Device Acceptance Test Plan,'' March 4, 2008 (both references incorporated by reference, see §15.38). If the model fails to comply, the manufacturer or importer shall have retested, at a qualified test facility, a product that complies with Uni-Dir-PICS–I01–030903: ''Uni-Directional Receiving Device: Conformance Checklist: PICS Proforma,'' September 03, 2003 (incorporated by reference, see §15.38) in accordance with Uni–Dir–ATP–I02–040225: ''Uni-Directional Receiving Device Acceptance Test Plan,'' February 25, 2004, (incorporated by reference, see §15.38) or an equivalent test procedure that produces identical pass/fail test results before any product or related model may be labeled or marketed. If the manufacturer or importer's first M–UDCP is not a television, then that manufacturer or importer's first model of a M–UDCP which is a television shall be tested pursuant to this subsection as though it were the first M–UDCP.

(ii) A qualified test facility is a testing laboratory representing cable television system operators serving a majority of the cable television subscribers in the United States or an appropriately qualified independent laboratory with adequate equipment and competent personnel knowledgeable with Uni-Dir-PICS–I01–030903: ''Uni-Directional Receiving Device: Conformance Checklist: PICS Proforma,'' September 03, 2003 (incorporated by reference, see §15.38); Uni–Dir–ATP–I02–040225: ''Uni-Directional Receiving Device, Acceptance Test Plan,'' February 25, 2004 (incorporated by reference, see §15.38); M–UDCP–PICS–I04–080225, ''Uni-Directional Cable Product Supporting M–Card: Multiple Profiles; Conformance Checklist: PICS,'' February 25, 2008 (incorporated by reference, see §15.38); and TP–ATP–M–UDCP–I05–20080304, ''Uni-Directional Digital Cable Products Supporting M–Card; M–UDCP Device Acceptance Test Plan,'' March 4, 2008 (incorporated by reference, see §15.38). For any independent testing laboratory to be qualified hereunder such laboratory must ensure that all its decisions are impartial and have a documented structure which safeguards impartiality of the operations of the testing laboratory. In addition, any independent testing laboratory qualified hereunder must not supply or design products of the type it tests, nor provide any other products or services that could compromise confidentiality, objectivity or impartiality of the testing laboratory's testing process and decisions.

(iii) Subsequent to the successful testing of its initial M–UDCP, a manufacturer or importer is not required to have other M–UDCP models tested at a qualified test facility for compliance with M–UDCP–PICS–I04–080225, ''Uni-Directional Cable Product Supporting M-Card: Multiple Profiles; Conformance Checklist: PICS,'' February 25, 2008 (incorporated by reference, see §15.38) unless the first model tested was not a television, in which event the first television shall be tested as provided in paragraph (c)(5)(i) of this section. The manufacturer or importer shall ensure that all subsequent models of M–UDCPs comply with M–UDCP–PICS–I04–080225, ''Uni-Directional Cable Product Supporting M-Card: Multiple Profiles; Conformance Checklist: PICS,'' February 25, 2008 (incorporated by reference, see §15.38) and all other applicable rules and standards. The manufacturer or importer shall maintain records indicating such compliance in accordance with Supplier's Declaration of Conformity requirements in part 2, subpart J of this chapter. For each M–UDCP model, the manufacturer or importer shall further submit documentation demonstrating compliance with M–UDCP–PICS–I04–080225, ''Uni-Directional Cable Product Supporting M-Card: Multiple Profiles; Conformance Checklist: PICS,'' February 25, 2008 (incorporated by reference, see §15.38) to the qualified test facility.

(iv) M–UDCPs must be in compliance with M–UDCP–PICS–I04–080225, ''Uni-Directional Cable Product Supporting

M–Card: Multiple Profiles; Conformance Checklist: PICS,'' February 25, 2008 (incorporated by reference, see §15.38) in accordance with the procedures set forth in TP–ATP–M–UDCP–I05–20080304, ''Uni-Directional Digital Cable Products Supporting M–Card; M–UDCP Device Acceptance Test Plan,'' March 4, 2008 (incorporated by reference, see §15.38) or an equivalent test procedure that produces identical pass/fail test results. In the event of any dispute over the applicable results under an equivalent test procedure, the results under TP–ATP–M–UDCP–I05–20080304, ''Uni-Directional Digital Cable Products Supporting M–Card; M–UDCP Device Acceptance Test Plan,'' March 4, 2008 (incorporated by reference, see §15.38) shall govern.

(d) Manufacturers and importers shall provide in appropriate post-sale material that describes the features and functionality of the product, such as the owner's guide, the following language: ''This digital television is capable of receiving analog basic, digital basic and digital premium cable television programming by direct connection to a cable system providing such programming. A security card provided by your cable operator is required to view encrypted digital programming. Certain advanced and interactive digital cable services such as video-on-demand, a cable operator's enhanced program guide and data-enhanced television services may require the use of a set-top box. For more information call your local cable operator.''

[68 FR 66733, Nov. 28, 2003, as amended at 76 FR 40277, July 8, 2011; 77 FR 4914, Feb. 1, 2012; 82 FR 50833, Nov. 2, 2017]

Subpart C—Intentional Radiators

§15.201 Equipment authorization requirement.

(a) Intentional radiators operated as carrier current systems, devices operated under the provisions of §§15.211, 15.213, and 15.221, and devices operating below 490 kHz in which all emissions are at least 40 dB below the limits in §15.209 are subject to Suppliers Declaration of Conformity pursuant to the procedures in subpart J of part 2 of this chapter prior to marketing.

(b) Except as otherwise exempted in paragraph (c) of this section and in §15.23, all intentional radiators operating under the provisions of this part shall be certified by the Telecommunication Certification Bodies pursuant to the procedures in subpart J of part 2 of this chapter prior to marketing.

(c) For devices such as perimeter protection systems which, in accordance with §15.31(d), are required to be measured at the installation site, each application for certification must be accompanied by a statement indicating that the system has been tested at three installations and found to comply at each installation. Until such time as certification is granted, a given installation of a system that was measured for the submission for certification will be considered to be in compliance with the provisions of this chapter, including the marketing regulations in subpart I of part 2 of this chapter, if tests at that installation show the system to be in compliance with the relevant technical requirements. Similarly, where measurements must be performed on site for equipment subject to Supplier's Declaration of Conformity, a given installation that has been found compliant with the applicable standards will be considered to be in compliance with the provisions of this chapter, including the marketing regulations in subpart I of part 2 of this chapter.

(d) For perimeter protection systems operating in the frequency bands allocated to television broadcast stations operating under part 73 of this chapter, the holder of the grant of certification must test each installation prior to initiation of normal operation to verify compliance with the technical standards and must maintain a list of all installations and records of measurements. For perimeter protection systems operating outside of the frequency bands allocated to television broadcast stations, upon receipt of a grant of certification, further testing of the same or similar type of system or installation is not required.

[54 FR 17714, Apr. 25, 1989, as amended at 68 FR 68546, Dec. 9, 2003; 82 FR 50834, Nov. 2, 2017]

§ 15.202 Certified operating frequency range.

Client devices that operate in a master/client network may be certified if they have the capability of operating outside permissible part 15 frequency bands, provided they operate on only permissible part 15 frequencies under the control of the master device with which they communicate. Master devices marketed within the United States must be limited to operation on permissible part 15 frequencies. Client devices that can also act as master devices must meet the requirements of a master device. For the purposes of this section, a master device is defined as a device operating in a mode in which it has the capability to transmit without receiving an enabling signal. In this mode it is able to select a channel and initiate a network by sending enabling signals to other devices. A network always has at least one device operating in master mode. A client device is defined as a device operating in a mode in which the transmissions of the device are under control of the master. A device in client mode is not able to initiate a network.

[70 FR 23040, May 4, 2005]

§ 15.203 Antenna requirement.

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §§ 15.211, 15.213, 15.217, 15.219, 15.221, or § 15.236. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with § 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

[82 FR 41559, Sept. 1, 2017]

§ 15.204 External radio frequency power amplifiers and antenna modifications.

(a) Except as otherwise described in paragraphs (b) and (d) of this section, no person shall use, manufacture, sell or lease, offer for sale or lease (including advertising for sale or lease), or import, ship, or distribute for the purpose of selling or leasing, any external radio frequency power amplifier or amplifier kit intended for use with a part 15 intentional radiator.

(b) A transmission system consisting of an intentional radiator, an external radio frequency power amplifier, and an antenna, may be authorized, marketed and used under this part. Except as described otherwise in this section, when a transmission system is authorized as a system, it must always be marketed as a complete system and must always be used in the configuration in which it was authorized.

(c) An intentional radiator may be operated only with the antenna with which it is authorized. If an antenna is marketed with the intentional radiator, it shall be of a type which is authorized with the intentional radiator. An intentional radiator may be authorized with multiple antenna types. Exceptions to the following provisions, if any, are noted in the rule section under which the transmitter operates, e.g., § 15.255(b)(1)(ii) of this part.

(1) The antenna type, as used in this paragraph, refers to antennas that have similar in-band and out-of-band radiation patterns.

(2) Compliance testing shall be performed using the highest gain antenna for each type of antenna to be certified with the intentional radiator. During this testing, the intentional radiator shall be operated at its maximum available output power level.

(3) Manufacturers shall supply a list of acceptable antenna types with the application for equipment authorization of the intentional radiator.

(4) Any antenna that is of the same type and of equal or less directional gain as an antenna that is authorized with the intentional radiator may be marketed with, and used with, that intentional radiator. No retesting of this system configuration is required. The marketing or use of a system configuration that employs an antenna of a different type, or that operates at a higher gain, than the antenna authorized with the intentional radiator is not permitted unless the procedures specified in §2.1043 of this chapter are followed.

(d) Except as described in this paragraph, an external radio frequency power amplifier or amplifier kit shall be marketed only with the system configuration with which it was approved and not as a separate product.

(1) An external radio frequency power amplifier may be marketed for individual sale provided it is intended for use in conjunction with a transmitter that operates in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands pursuant to §15.247 of this part or a transmitter that operates in the 5.725–5.825 GHz band pursuant to §15.407 of this part. The amplifier must be of a design such that it can only be connected as part of a system in which it has been previously authorized. (The use of a non-standard connector or a form of electronic system identification is acceptable.) The output power of such an amplifier must not exceed the maximum permitted output power of its associated transmitter.

(2) The outside packaging and user manual for external radio frequency power amplifiers sold in accordance with paragraph (d)(1) of this section must include notification that the amplifier can be used only in a system which it has obtained authorization. Such a notice must identify the authorized system by FCC Identifier.

[69 FR 54034, Sept. 7, 2004, as amended at 78 FR 59850, Sept. 30, 2013]

§15.205 Restricted bands of operation.

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090–0.110	16.42–16.423	399.9–410	4.5–5.15
[1] 0.495–0.505	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225	123–138	2200–2300	14.47–14.5
8.291–8.294	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675	156.7–156.9	2690–2900	22.01–23.12
8.41425–8.41475	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025	240–285	3345.8–3358	36.43–36.5
12.57675–12.57725	322–335.4	3600–4400	[2]
13.36–13.41.			

[1] Until February 1, 1999, this restricted band shall be 0.490–0.510 MHz.
[2] Above 38.6

(b) Except as provided in paragraphs (d) and (e) of this section, the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in §15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in §15.35 apply to these measurements.

(c) Except as provided in paragraphs (d) and (e) of this section, regardless of the field strength limits specified elsewhere in this subpart, the provisions of this section apply to emissions from any intentional radiator.

(d) The following devices are exempt from the requirements of this section:

(1) Swept frequency field disturbance sensors operating between 1.705 and 37 MHz provided their emissions only sweep through the bands listed in paragraph (a) of this section, the sweep is never stopped with the fundamental emission within the bands listed in paragraph (a) of this section, and the fundamental emission is outside of the bands listed in paragraph (a) of this section more than 99% of the time the device is actively transmitting, without compensation for duty cycle.

(2) Transmitters used to detect buried electronic markers at 101.4 kHz which are employed by telephone companies.

(3) Cable locating equipment operated pursuant to §15.213.

(4) Any equipment operated under the provisions of §§15.255 and 15.256 in the frequency band 75–85 GHz, §15.257 in the 92–95 GHz band or §15.258.

(5) Biomedical telemetry devices operating under the provisions of §15.242 of this part are not subject to the restricted band 608–614 MHz but are subject to compliance within the other restricted bands.

(6) Transmitters operating under the provisions of subparts D or F of this part.

(7) Devices operated pursuant to §15.225 are exempt from complying with this section for the 13.36–13.41 MHz band only.

(8) Devices operated in the 24.075–24.175 GHz band under §15.245 are exempt from complying with the requirements of this section for the 48.15–48.35 GHz and 72.225–72.525 GHz bands only, and shall not exceed the limits specified in §15.245(b).

(9) Devices operated in the 24.0–24.25 GHz band under §15.249 are exempt from complying with the requirements of this section for the 48.0–48.5 GHz and 72.0–72.75 GHz bands only, and shall not exceed the limits specified in §15.249(a).

(10) White space devices operating under subpart H of this part are exempt from complying with the requirements of this section for the 608–614 MHz band.

(e) Harmonic emissions appearing in the restricted bands above 17.7 GHz from field disturbance sensors operating under the provisions of §15.245 shall not exceed the limits specified in §15.245(b).

[54 FR 17714, Apr. 25, 1989, as amended at 55 FR 46791, Nov. 7, 1990; 56 FR 6288, Feb. 15, 1991; 57 FR 13048, Apr. 15, 1992; 58 FR 33774, June 21, 1993; 60 FR 28068, May 30, 1995; 61 FR 14503, Apr. 2, 1996; 62 FR 4655, Jan. 31, 1997; 62 FR 58658, Oct. 30, 1997; 67 FR 34855, May 16, 2002; 68 FR 68546, Dec. 9, 2003; 69 FR 3265, Jan. 23, 2004; 69 FR 72031, Dec. 10, 2004; 79 FR 12678, Mar. 6, 2014; 80 FR 73069, Nov. 23, 2015; 84 FR 25691, June 4, 2019]

§15.207 Conducted limits.

(a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50

*Decreases with the logarithm of the frequency.

(b) The limit shown in paragraph (a) of this section shall not apply to carrier current systems operating as intentional radiators on frequencies below 30 MHz. In lieu thereof, these carrier current systems shall be subject to the following standards:

(1) For carrier current system containing their fundamental emission within the frequency band 535–1705 kHz and intended to be received using a standard AM broadcast receiver: no limit on conducted emissions.

(2) For all other carrier current systems: 1000 μV within the frequency band 535–1705 kHz, as measured using a 50 μH/50 ohms LISN.

(3) Carrier current systems operating below 30 MHz are also subject to the radiated emission limits in §15.205, §15.209, §15.221, §15.223, or §15.227, as appropriate.

(c) Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines. Devices that include, or make provisions for, the use of battery chargers which permit operating while charging, AC adapters or battery eliminators or that connect to the AC power lines indirectly, obtainig their power through another device which is connected to the AC power lines, shall be tested to demonstrate compliance with the conducted limits.

[54 FR 17714, Apr. 25, 1989, as amended at 56 FR 373, Jan. 4, 1991; 57 FR 33448, July 29, 1992; 58 FR 51249, Oct. 1, 1993; 67 FR 45671, July 10, 2002]

§15.209 Radiated emission limits; general requirements.

(a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009–0.490	2400/F(kHz)	300
0.490–1.705	24000/F(kHz)	30
1.705–30.0	30	30
30–88	100**	3
88–216	150**	3
216–960	200**	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54–72 MHz, 76–88 MHz, 174–216 MHz or 470–806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§15.231 and 15.241.

(b) In the emission table above, the tighter limit applies at the band edges.

(c) The level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission. For intentional radiators which operate under the provisions of other sections within this part and which are required to reduce their unwanted emissions to the limits specified in this table, the limits in this table are based on the frequency of the unwanted emission and not the fundamental frequency. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.

(d) The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

(e) The provisions in §§15.31, 15.33, and 15.35 for measuring emissions at distances other than the distances specified in the above table, determining the frequency range over which radiated emissions are to be measured, and limiting peak emissions apply to all devices operated under this part.

(f) In accordance with §15.33(a), in some cases the emissions from an intentional radiator must be measured to beyond the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator because of the incorporation of a digital device. If measurements above the tenth harmonic are so required, the radiated emissions above the tenth harmonic shall comply with the general radiated emission limits applicable to the incorporated digital device, as shown in §15.109 and as based on the frequency of the emission being measured, or, except for emissions contained in the restricted frequency bands shown in §15.205, the limit on spurious emissions specified for the intentional radiator, whichever is the higher limit. Emissions which must be measured above the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator and which fall within the restricted bands shall comply with the general radiated emission limits in §15.109 that are applicable to the incorporated digital device.

(g) Perimeter protection systems may operate in the 54–72 MHz and 76–88 MHz bands under the provisions of this

section. The use of such perimeter protection systems is limited to industrial, business and commercial applications.

[54 FR 17714, Apr. 25, 1989; 54 FR 32339, Aug. 7, 1989; 55 FR 18340, May 2, 1990; 62 FR 58658, Oct. 30, 1997]

§ 15.211 Tunnel radio systems.

An intentional radiator utilized as part of a tunnel radio system may operate on any frequency provided it meets all of the following conditions:

(a) Operation of a tunnel radio system (intentional radiator and all connecting wires) shall be contained solely within a tunnel, mine or other structure that provides attenuation to the radiated signal due to the presence of naturally surrounding earth and/or water.

(b) Any intentional or unintentional radiator external to the tunnel, mine or other structure, as described in paragraph (a) of this section, shall be subject to the other applicable regulations contained within this part.

(c) The total electromagnetic field from a tunnel radio system on any frequency or frequencies appearing outside of the tunnel, mine or other structure described in paragraph (a) of this section, shall not exceed the limits shown in §15.209 when measured at the specified distance from the surrounding structure, including openings. Particular attention shall be paid to the emissions from any opening in the structure to the outside environment. When measurements are made from the openings, the distances shown in §15.209 refer to the distance from the plane of reference which fits the entire perimeter of each above ground opening.

(d) The conducted limits in §15.207 apply to the radiofrequency voltage on the public utility power lines outside of the tunnel.

§ 15.212 Modular transmitters.

(a) Single modular transmitters consist of a completely self-contained radiofrequency transmitter device that is typically incorporated into another product, host or device. Split modular transmitters consist of two components: a radio front end with antenna (or radio devices) and a transmitter control element (or specific hardware on which the software that controls the radio operation resides). All single or split modular transmitters are approved with an antenna. All of the following requirements apply, except as provided in paragraph (b) of this section.

(1) Single modular transmitters must meet the following requirements to obtain a modular transmitter approval.

(i) The radio elements of the modular transmitter must have their own shielding. The physical crystal and tuning capacitors may be located external to the shielded radio elements.

(ii) The modular transmitter must have buffered modulation/data inputs (if such inputs are provided) to ensure that the module will comply with part 15 requirements under conditions of excessive data rates or over-modulation.

(iii) The modular transmitter must have its own power supply regulation.

(iv) The modular transmitter must comply with the antenna and transmission system requirements of §§15.203, 15.204(b) and 15.204(c). The antenna must either be permanently attached or employ a ''unique'' antenna coupler (at all connections between the module and the antenna, including the cable). The ''professional installation'' provision of §15.203 is not applicable to modules but can apply to limited modular approvals under paragraph (b) of this section.

(v) The modular transmitter must be tested in a stand-alone configuration, *i.e.*, the module must not be inside another device during testing for compliance with part 15 requirements. Unless the transmitter module will be battery powered, it must comply with the AC line conducted requirements found in §15.207. AC or DC power lines and data input/output lines connected to the module must not contain ferrites, unless they will be marketed with the module (see §15.27(a)). The length of these lines shall be the length typical of actual use or, if that length is unknown, at least 10 centimeters to insure that there is no coupling between the case of the module and supporting equipment. Any accessories, peripherals, or support equipment connected to the module during testing shall be

unmodified and commercially available (see §15.31(i)).

(vi) The modular transmitter must be equipped with either a permanently affixed label or must be capable of electronically displaying its FCC identification number.

(A) If using a permanently affixed label, the modular transmitter must be labeled with its own FCC identification number, and, if the FCC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: ''Contains Transmitter Module FCC ID: XYZMODEL1'' or ''Contains FCC ID: XYZMODEL1.'' Any similar wording that expresses the same meaning may be used. The Grantee may either provide such a label, an example of which must be included in the application for equipment authorization, or, must provide adequate instructions along with the module which explain this requirement. In the latter case, a copy of these instructions must be included in the application for equipment authorization.

(B) If the modular transmitter uses an electronic display of the FCC identification number, the information must be readily accessible and visible on the modular transmitter or on the device in which it is installed. If the module is installed inside another device, then the outside of the device into which the module is installed must display a label referring to the enclosed module. This exterior label can use wording such as the following: ''Contains FCC certified transmitter module(s).'' Any similar wording that expresses the same meaning may be used. The user manual must include instructions on how to access the electronic display. A copy of these instructions must be included in the application for equipment authorization.

(vii) The modular transmitter must comply with any specific rules or operating requirements that ordinarily apply to a complete transmitter and the manufacturer must provide adequate instructions along with the module to explain any such requirements. A copy of these instructions must be included in the application for equipment authorization.

(viii) Radio frequency devices operating under the provisions of this part are subject to the radio frequency radiation exposure requirements specified in §§1.1307(b), 1.1310, 2.1091, and 2.1093 of this chapter, as appropriate. Applications for equipment authorization of modular transmitters under this section must contain a statement confirming compliance with these requirements. The modular transmitter must comply with any applicable RF exposure requirements in its final configuration. Technical information showing the basis for this statement must be submitted to the Commission upon request.

(2) Split modular transmitters must meet the requirements in paragraph (a)(1) of this section, excluding paragraphs (a)(1)(i) and (a)(1)(v), and the following additional requirements to obtain a modular transmitter approval.

(i) Only the radio front end must be shielded. The physical crystal and tuning capacitors may be located external to the shielded radio elements. The interface between the split sections of the modular system must be digital with a minimum signaling amplitude of 150 mV peak-to-peak.

(ii) Control information and other data may be exchanged between the transmitter control elements and radio front end.

(iii) The sections of a split modular transmitter must be tested installed in a host device(s) similar to that which is representative of the platform(s) intended for use.

(iv) Manufacturers must ensure that only transmitter control elements and radio front end components that have been approved together are capable of operating together. The transmitter module must not operate unless it has verified that the installed transmitter control elements and radio front end have been authorized together. Manufacturers may use means including, but not limited to, coding in hardware and electronic signatures in software to meet these requirements, and must describe the methods in their application for equipment authorization.

(b) A limited modular approval may be granted for single or split modular

transmitters that do not comply with all of the above requirements, e.g., shielding, minimum signaling amplitude, buffered modulation/data inputs, or power supply regulation, if the manufacturer can demonstrate by alternative means in the application for equipment authorization that the modular transmitter meets all the applicable part 15 requirements under the operating conditions in which the transmitter will be used. Limited modular approval also may be granted in those instances where compliance with RF exposure rules is demonstrated only for particular product configurations. The applicant for certification must state how control of the end product into which the module will be installed will be maintained such that full compliance of the end product is always ensured.

[72 FR 28893, May 23, 2007, as amended at 85 FR 18149, Apr. 1, 2020]

§ 15.213 Cable locating equipment.

An intentional radiator used as cable locating equipment, as defined in §15.3(d), may be operated on any frequency within the band 9–490 kHz, subject to the following limits: Within the frequency band 9 kHz, up to, but not including, 45 kHz, the peak output power from the cable locating equipment shall not exceed 10 watts; and, within the frequency band 45 kHz to 490 kHz, the peak output power from the cable locating equipment shall not exceed one watt. If provisions are made for connection of the cable locating equipment to the AC power lines, the conducted limits in §15.207 also apply to this equipment.

§ 15.214 Cordless telephones.

(a) For equipment authorization, a single application form, FCC Form 731, may be filed for a cordless telephone system, provided the application clearly identifies and provides data for all parts of the system to show compliance with the applicable technical requirements. When a single application form is submitted, both the base station and the portable handset must carry the same FCC identifier. The application shall include a fee for certification of each type of transmitter and for certification, if appropriate, for each type of receiver included in the system.

(b) A cordless telephone that is intended to be connected to the public switched telephone network shall also comply with the applicable regulations in part 68 of this chapter. A separate procedure for approval under part 68 is required for such terminal equipment.

(c) The label required under subpart A of this part shall also contain the following statement: ''Privacy of communications may not be ensured when using this phone.''

(d) Cordless telephones shall incorporate circuitry which makes use of a digital security code to provide protection against unintentional access to the public switched telephone network by the base unit and unintentional ringing by the handset. These functions shall operate such that each access of the telephone network or ringing of the handset is preceded by the transmission of a code word. Access to the telephone network shall occur only if the code transmitted by the handset matches code set in the base unit. Similarly, ringing of the handset shall occur only if the code transmitted by the base unit matches the code set in the handset. The security code required by this section may also be employed to perform other communications functions, such as providing telephone billing information. This security code system is to operate in accordance with the following provisions.

(1) There must be provision for at least 256 possible discrete digital codes. Factory-set codes must be continuously varied over at least 256 possible codes as each telephone is manufactured. The codes may be varied either randomly, sequentially, or using another systematic procedure.

(2) Manufacturers must use one of the following approaches for facilitating variation in the geographic distribution of individual security codes:

(i) Provide a means for the user to readily select from among at least 256 possible discrete digital codes. The cordless telephone shall be either in a non-operable mode after manufacture until the user selects a security code or the manufacturer must continuously vary the initial security code as each telephone is produced.

(ii) Provide a fixed code that is continuously varied among at least 256 discrete digital codes as each telephone is manufactured.

(iii) Provide a means for the cordless telephone to automatically select a different code from among at least 256 possible discrete digital codes each time it is activated.

(iv) It is permissible to provide combinations of fixed, automatic, and user-selectable coding provided the above criteria are met.

(3) A statement of the means and procedures used to achieve the required protection shall be provided in any application for equipment authorization of a cordless telephone.

[56 FR 3785, Jan. 31, 1991, as amended at 63 FR 36603, July 7, 1998; 66 FR 7580, Jan. 24, 2001]

RADIATED EMISSION LIMITS, ADDITIONAL PROVISIONS

§ 15.215 Additional provisions to the general radiated emission limitations.

(a) The regulations in §§15.217 through 15.257 provide alternatives to the general radiated emission limits for intentional radiators operating in specified frequency bands. Unless otherwise stated, there are no restrictions as to the types of operation permitted under these sections.

(b) In most cases, unwanted emissions outside of the frequency bands shown in these alternative provisions must be attenuated to the emission limits shown in §15.209. In no case shall the level of the unwanted emissions from an intentional radiator operating under these additional provisions exceed the field strength of the fundamental emission.

(c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. In the case of intentional radiators operating under the provisions of subpart E, the emission bandwidth may span across multiple contiguous frequency bands identified in that subpart. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

[54 FR 17714, Apr. 25, 1989, as amended at 62 FR 45333, Aug. 27, 1997; 67 FR 34855, May 16, 2002; 69 FR 3265, Jan. 23, 2004; 70 FR 6774, Feb. 9, 2005; 79 FR 24578, May 1, 2014]

§ 15.216 [Reserved]

§ 15.217 Operation in the band 160–190 kHz.

(a) The total input power to the final radio frequency stage (exclusive of filament or heater power) shall not exceed one watt.

(b) The total length of the transmission line, antenna, and ground lead (if used) shall not exceed 15 meters.

(c) All emissions below 160 kHz or above 190 kHz shall be attenuated at least 20 dB below the level of the unmodulated carrier. Determination of compliance with the 20 dB attenuation specification may be based on measurements at the intentional radiator's antenna output terminal unless the intentional radiator uses a permanently attached antenna, in which case compliance shall be demonstrated by measuring the radiated emissions.

§ 15.219 Operation in the band 510–1705 kHz.

(a) The total input power to the final radio frequency stage (exclusive of filament or heater power) shall not exceed 100 milliwatts.

(b) The total length of the transmission line, antenna and ground lead (if used) shall not exceed 3 meters.

(c) All emissions below 510 kHz or above 1705 kHz shall be attenuated at least 20 dB below the level of the unmodulated carrier. Determination of compliance with the 20 dB attenuation specification may be based on measurements at the intentional radiator's antenna output terminal unless the intentional radiator uses a permanently attached antenna, in which case compliance shall be deomonstrated by measuring the radiated emissions.

§ 15.221 Operation in the band 525–1705 kHz.

(a) Carrier current systems and transmitters employing a leaky coaxial cable as the radiating antenna may operate in the band 525–1705 kHz provided the field strength levels of the radiated emissions do not exceed 15 uV/m, as measured at a distance of 47,715/(frequency in kHz) meters (equivalent to Lambda/2Pi) from the electric power line or the coaxial cable, respectively. The field strength levels of emissions outside this band shall not exceed the general radiated emission limits in §15.209.

(b) As an alternative to the provisions in paragraph (a) of this section, intentional radiators used for the operation of an AM broadcast station on a college or university campus or on the campus of any other education institution may comply with the following:

(1) On the campus, the field strength of emissions appearing outside of this frequency band shall not exceed the general radiated emission limits shown in §15.209 as measured from the radiating source. There is no limit on the field strength of emissions appearing within this frequency band, except that the provisions of §15.5 continue to comply.

(2) At the perimeter of the campus, the field strength of any emissions, including those within the frequency band 525–1705 kHz, shall not exceed the general radiated emission in §15.209.

(3) The conducted limits specified in §15.207 apply to the radio frequency voltage on the public utility power lines outside of the campus. Due to the large number of radio frequency devices which may be used on the campus, contributing to the conducted emissions, as an alternative to measuring conducted emissions outside of the campus, it is acceptable to demonstrate compliance with this provision by measuring each individual intentional radiator employed in the system at the point where it connects to the AC power lines.

(c) A grant of equipment authorization is not required for intentional radiators operated under the provisions of this section. In lieu thereof, the intentional radiator shall be verified for compliance with the regulations in accordance with subpart J of part 2 of this chapter. This data shall be kept on file at the location of the studio, office or control room associated with the transmitting equipment. In some cases, this may correspond to the location of the transmitting equipment.

(d) For the band 535–1705 kHz, the frequency of operation shall be chosen such that operation is not within the protected field strength contours of licensed AM stations.

[56 FR 373, Jan. 4, 1991]

§ 15.223 Operation in the band 1.705–10 MHz.

(a) The field strength of any emission within the band 1.705–10.0 MHz shall not exceed 100 microvolts/meter at a distance of 30 meters. However, if the bandwidth of the emission is less than 10% of the center frequency, the field strength shall not exceed 15 microvolts/meter or (the bandwidth of the device in kHz) divided by (the center frequency of the device in MHz) microvolts/meter at a distance of 30 meters, whichever is the higher level. For the purposes of this section, bandwidth is determined at the points 6 dB down from the modulated carrier. The emission limits in this paragraph are based on measurement instrumentation employing an average detector. The provisions in §15.35(b) for limiting peak emissions apply.

(b) The field strength of emissions outside of the band 1.705–10.0 MHz shall not exceed the general radiated emission limits in §15.209.

§ 15.225 Operation within the band 13.110–14.010 MHz.

(a) The field strength of any emissions within the band 13.553–13.567 MHz

shall not exceed 15,848 microvolts/meter at 30 meters.

(b) Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

(c) Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

(d) The field strength of any emissions appearing outside of the 13.110–14.010 MHz band shall not exceed the general radiated emission limits in §15.209.

(e) The frequency tolerance of the carrier signal shall be maintained within ±0.01% of the operating frequency over a temperature variation of −20 degrees to + 50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

(f) In the case of radio frequency powered tags designed to operate with a device authorized under this section, the tag may be approved with the device or be considered as a separate device subject to its own authorization. Powered tags approved with a single application shall be labeled with the same identification number as the device.

[68 FR 68546, Dec. 9, 2003]

§15.227 Operation within the band 26.96–27.28 MHz.

(a) The field strength of any emission within this band shall not exceed 10,000 microvolts/meter at 3 meters. The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply.

(b) The field strength of any emissions which appear outside of this band shall not exceed the general radiated emission limits in §15.209.

§15.229 Operation within the band 40.66–40.70 MHz.

(a) Unless operating pursuant to the provisions in §15.231, the field strength of any emissions within this band shall not exceed 1,000 microvolts/meter at 3 meters.

(b) As an alternative to the limit in paragraph (a) of this section, perimeter protection systems may demonstrate compliance with the following: the field strength of any emissions within this band shall not exceed 500 microvolts/meter at 3 meters, as determined using measurement instrumentations employing an average detector. The provisions in §15.35 for limiting peak emissions apply where compliance of these devices is demonstrated under this alternative emission limit.

(c) The field strength of any emissions appearing outside of this band shall not exceed the general radiated emission limits in §15.209.

(d) The frequency tolerance of the carrier signal shall be maintained within ±0.01% of the operating frequency over a temperature variation of −20 degrees to + 50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

[54 FR 17714, Apr. 25, 1989, as amended at 55 FR 33910, Aug. 20, 1990]

§15.231 Periodic operation in the band 40.66–40.70 MHz and above 70 MHz.

(a) The provisions of this section are restricted to periodic operation within the band 40.66–40.70 MHz and above 70 MHz. Except as shown in paragraph (e) of this section, the intentional radiator is restricted to the transmission of a control signal such as those used with alarm systems, door openers, remote switches, etc. Continuous transmissions, voice, video and the radio control of toys are not permitted. Data is permitted to be sent with a control signal. The following conditions shall be met to comply with the provisions for this periodic operation:

(1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

(2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.

(3) Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions, including data, to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than two seconds per hour for each transmitter. There is no limit on the number of individual transmissions, provided the total transmission time does not exceed two seconds per hour.

(4) Intentional radiators which are employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition

(5) Transmission of set-up information for security systems may exceed the transmission duration limits in paragraphs (a)(1) and (a)(2) of this section, provided such transmissions are under the control of a professional installer and do not exceed ten seconds after a manually operated switch is released or a transmitter is activated automatically. Such set-up information may include data.

(b) In addition to the provisions of §15.205, the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emissions (microvolts/meter)
40.66–40.70.	2,250	225
70–130	1,250	125
130–174	[1] 1,250 to 3,750	[1] 125 to 375
174–260	3,750	375
260–470	[1] 3,750 to 12,500	[1] 375 to 1,250
Above 470	12,500	1,250

[1] Linear interpolations.

(1) The above field strength limits are specified at a distance of 3 meters. The tighter limits apply at the band edges.

(2) Intentional radiators operating under the provisions of this section shall demonstrate compliance with the limits on the field strength of emissions, as shown in the above table, based on the average value of the measured emissions. As an alternative, compliance with the limits in the above table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector. The specific method of measurement employed shall be specified in the application for equipment authorization. If average emission measurements are employed, the provisions in §15.35 for averaging pulsed emissions and for limiting peak emissions apply. Further, compliance with the provisions of §15.205 shall be demonstrated using the measurement instrumentation specified in that section.

(3) The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in §15.209, whichever limit permits a higher field strength.

(c) The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

(d) For devices operating within the frequency band 40.66–40.70 MHz, the bandwidth of the emission shall be confined within the band edges and the frequency tolerance of the carrier shall be ±0.01%. This frequency tolerance shall be maintained for a temperature variation of −20 degrees to + 50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

(e) Intentional radiators may operate at a periodic rate exceeding that specified in paragraph (a) of this section and may be employed for any type of operation, including operation prohibited in paragraph (a) of this section, provided the intentional radiator complies with the provisions of paragraphs (b) through (d) of this section, except the field strength table in paragraph (b) of

this section is replaced by the following:

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emission (microvolts/meter)
40.66–40.70.	1,000	100
70–130	500	50
130–174	500 to 1,500 [1]	50 to 150 [1]
174–260	1,500	150
260–470	1,500 to 5,000 [1]	150 to 500 [1]
Above 470	5,000	500

[1] Linear interpolations.

In addition, devices operated under the provisions of this paragraph shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.

[54 FR 17714, Apr. 25, 1989; 54 FR 32340, Aug. 7, 1989, as amended at 68 FR 68546, Dec. 9, 2003; 69 FR 71383, Dec. 9, 2004]

§ 15.233 Operation within the bands 43.71–44.49 MHz, 46.60–46.98 MHz, 48.75–49.51 MHz and 49.66–50.0 MHz.

(a) The provisions shown in this section are restricted to cordless telephones.

(b) An intentional radiator used as part of a cordless telephone system shall operate centered on one or more of the following frequency pairs, subject to the following conditions:

(1) Frequencies shall be paired as shown below, except that channel pairing for channels one through fifteen may be accomplished by pairing any of the fifteen base transmitter frequencies with any of the fifteen handset transmitter frequencies.

(2) Cordless telephones operating on channels one through fifteen must:

(i) Incorporate an automatic channel selection mechanism that will prevent establishment of a link on any occupied frequency; and

(ii) The box or an instruction manual which is included within the box which the individual cordless telephone is to be marketed shall contain information indicating that some cordless telephones operate at frequencies that may cause interference to nearby TVs and VCRs; to minimize or prevent such interference, the base of the cordless telephone should not be placed near or on top of a TV or VCR; and, if interference is experienced, moving the cordless telephone farther away from the TV or VCR will often reduce or eliminate the interference. A statement describing the means and procedures used to achieve automatic channel selection shall be provided in any application for equipment authorization of a cordless telephone operating on channels one through fifteen.

Channel	Base transmitter (MHz)	Handset transmitter (MHz)
1	43.720	48.760
2	43.740	48.840
3	43.820	48.860
4	43.840	48.920
5	43.920	49.020
6	43.960	49.080
7	44.120	49.100
8	44.160	49.160
9	44.180	49.200
10	44.200	49.240
11	44.320	49.280
12	44.360	49.360
13	44.400	49.400
14	44.460	49.460
15	44.480	49.500
16	46.610	49.670
17	46.630	49.845
18	46.670	49.860
19	46.710	49.770
20	46.730	49.875
21	46.770	49.830
22	46.830	49.890
23	46.870	49.930
24	46.930	49.990
25	46.970	49.970

(c) The field strength of the fundamental emission shall not exceed 10,000 microvolts/meter at 3 meters. The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply.

(d) The fundamental emission shall be confined within a 20 kHz band and shall be centered on a carrier frequency shown above, as adjusted by the frequency tolerance of the transmitter at the time testing is performed. Modulation products outside of this 20 kHz band shall be attenuated at least 26 dB below the level of the unmodulated carrier or to the general limits in §15.209, whichever permits the higher emission levels. Emissions on any frequency more than 20 kHz removed from

the center frequency shall consist solely of unwanted emissions and shall not exceed the general radiated emission limits in §15.209. Tests to determine compliance with these requirements shall be performed using an appropriate input signal as prescribed in §2.989 of this chapter.

(e) All emissions exceeding 20 microvolts/meter at 3 meters are to be reported in the application for certification.

(f) If the device provides for the connection of external accessories, including external electrical input signals, the device must be tested with the accessories attached. The emission tests shall be performed with the device and accessories configured in a manner which tends to produce the maximum level of emissions within the range of variations that can be expected under normal operating conditions.

(g) The frequency tolerance of the carrier signal shall be maintained within ±0.01% of the operating frequency. The tolerance shall be maintained for a temperature variation of −20 degrees C to + 50 degrees C at normal supply voltage, and for variation in the primary voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

(h) For cordless telephones that do not comply with §15.214(d) of this part, the box or other package in which the individual cordless telephone is to be marketed shall carry a statement in a prominent location, visible to the buyer before purchase, which reads as follows:

NOTICE: The base units of some cordless telephones may respond to other nearby units or to radio noise resulting in telephone calls being dialed through this unit without your knowledge and possibly calls being misbilled. In order to protect against such occurrences, this cordless telephone is provided with the following features: (to be completed by the responsible party).

An application for certification of a cordless telephone shall specify the complete text of the statement that will be carried on the package and indicate where, specifically, it will be located on the carton.

[54 FR 17714, Apr. 25, 1989; 54 FR 32340, Aug. 7, 1989, as amended at 56 FR 3785, Jan. 31, 1991; 56 FR 5659, Feb. 12, 1991; 60 FR 21985, May 4, 1995]

§15.235 Operation within the band 49.82–49.90 MHz.

(a) The field strength of any emission within this band shall not exceed 10,000 microvolts/meter at 3 meters. The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply.

(b) The field strength of any emissions appearing between the band edges and up to 10 kHz above and below the band edges shall be attenuated at least 26 dB below the level of the unmodulated carrier or to the general limits in §15.209, whichever permits the higher emission levels. The field strength of any emissions removed by more than 10 kHz from the band edges shall not exceed the general radiated emission limits in §15.209. All signals exceeding 20 microvolts/meter at 3 meters shall be reported in the application for certification.

(c) For a home-built intentional radiator, as defined in §15.23(a), operating within the band 49.82–49.90 MHz, the following standards may be employed:

(1) The RF carrier and modulation products shall be maintained within the band 49.82–49.90 MHz.

(2) The total input power to the device measured at the battery or the power line terminals shall not exceed 100 milliwatts under any condition of modulation.

(3) The antenna shall be a single element, one meter or less in length, permanently mounted on the enclosure containing the device.

(4) Emissions outside of this band shall be attenuated at least 20 dB below the level of the unmodulated carrier.

(5) The regulations contained in §15.23 of this part apply to intentional radiators constructed under the provisions of this paragraph.

(d) Cordless telephones are not permitted to operate under the provisions of this section.

§ 15.236 Operation of wireless microphones in the bands 54–72 MHz, 76–88 MHz, 174–216 MHz, 470–608 MHz and 614–698 MHz.

(a) *Definitions.* The following definitions apply in this section.

(1) *Wireless Microphone.* An intentional radiator that converts sound into electrical audio signals that are transmitted using radio signals to a receiver which converts the radio signals back into audio signals that are sent through a sound recording or amplifying system. Wireless microphones may be used for cue and control communications and synchronization of TV camera signals as defined in §74.801 of this chapter. Wireless microphones do not include auditory assistance devices as defined in §15.3(a) of this part.

(2) *600 MHz duplex gap.* An 11 megahertz guard band at 652–663 MHz that separates part 27 600 MHz service uplink and downlink frequencies.

(3) *600 MHz guard band.* Designated frequency band at 614–617 MHz that prevents interference between licensed services in the 600 MHz service band and channel 37.

(4) *600 MHz service band.* Frequencies in the 617–652 MHz and 663–698 MHz bands that are reallocated and reassigned for 600 MHz band services under part 27.

NOTE TO PARAGRAPHS (a)(2), (3) AND (4): The specific frequencies will be determined in light of further proceedings pursuant to GN Docket No. 12–268 and the rules will be updated accordingly pursuant to a future public notice.

(5) *Spectrum Act.* Title VI of the Middle Class Tax Relief and Job Creation Act of 2012 (Pub. L. 112–96).

(b) Operation under this section is limited to wireless microphones as defined in this section.

(c) Operation is permitted in the following frequency bands.

(1) Channels allocated and assigned for the broadcast television service.

(2) Frequencies in the 600 MHz service band on which a 600 MHz service licensee has not commenced operations, as defined in §27.4 of this chapter. Operation on these frequencies must cease no later than the end of the post-auction transition period, as defined in §27.4 of this chapter. Operation must cease immediately if harmful interference occurs to a 600 MHz service licensee.

(3) The 657–663 MHz segment of the 600 MHz duplex gap.

(4) [Reserved]

(5) The 614–616 MHz segment of the 600 MHz guard band.

(6) Prior to operation in the frequencies identified in paragraphs (c)(2) through (5) of this section, wireless microphone users shall rely on the white space databases in part 15, Subpart H to determine that their intended operating frequencies are available for unlicensed wireless microphone operation at the location where they will be used. Wireless microphone users must register with and check a white space database to determine available channels prior to beginning operation at a given location. A user must re-check the database for available channels if it moves to another location.

(d) The maximum radiated power shall not exceed the following values:

(1) In the bands allocated and assigned for broadcast television and in the 600 MHz service band: 50 mW EIRP

(2) In the 600 MHz guard band and the 600 MHz duplex gap: 20 mW EIRP.

(e) Operation is limited to locations separated from licensed services by the following distances.

(1) Four kilometers outside the following protected service contours of co-channel TV stations.

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 (14–51)	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) The following distances outside of the area where a 600 MHz service licensee has commenced operations, as defined in §27.4 of this chapter.

Type of station	Separation distance in kilometers	
	Co-channel	Adjacent channel
Base	7	0.2
Mobile	35	31

(f) The operating frequency within a permissible band of operation as defined in paragraph (c) must comply with the following requirements.

(1) The frequency selection shall be offset from the upper or lower band limits by 25 kHz or an integral multiple thereof.

(2) One or more adjacent 25 kHz segments within the assignable frequencies may be combined to form a channel whose maximum bandwidth shall not exceed 200 kHz. The operating bandwidth shall not exceed 200 kHz.

(3) The frequency tolerance of the carrier signal shall be maintained within ±0.005% of the operating frequency over a temperature variation of −20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. Battery operated equipment shall be tested using a new battery.

(g) Emissions within the band from one megahertz below to one megahertz above the carrier frequency shall comply with the emission mask in §8.3 of ETSI EN 300 422–1 V1.4.2 (2011–08), *Electromagnetic compatibility and Radio spectrum Matters (ERM); Wireless microphones in the 25 MHz to 3 GHz frequency range; Part 1: Technical characteristics and methods of measurement*. Emissions outside of this band shall comply with the limits specified in section 8.4 of ETSI EN 300 422–1 V1.4.2 (2011–08).

[80 FR 73069, Nov. 23, 2015, as amended at 81 FR 4974, Jan. 29, 2016; 82 FR 41559, Sept. 1, 2017]

§15.237 Operation in the bands 72.0–73.0 MHz, 74.6–74.8 MHz and 75.2–76.0 MHz.

(a) The intentional radiator shall be restricted to use as an auditory assistance device.

(b) Emissions from the intentional radiator shall be confined within a band 200 kHz wide centered on the operating frequency. The 200 kHz band shall lie wholly within the above specified frequency ranges.

(c) The field strength within the permitted 200 kHz band shall not exceed 80 millivolts/meter at 3 meters. The field strength of any emissions radiated on any frequency outside of the specified 200 kHz band shall not exceed the general radiated emissions limits specified in §15.209. The emission limits in this paragraph are based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply.

[54 FR 17714, Apr. 25, 1989, as amended at 57 FR 13048, Apr. 15, 1992; 78 FR 34927, June 11, 2013]

§15.239 Operation in the band 88–108 MHz.

(a) Emissions from the intentional radiator shall be confined within a band 200 kHz wide centered on the operating frequency. The 200 kHz band shall lie wholly within the frequency range of 88–108 MHz.

(b) The field strength of any emissions within the permitted 200 kHz band shall not exceed 250 microvolts/meter at 3 meters. The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply.

(c) The field strength of any emissions radiated on any frequency outside of the specified 200 kHz band shall not exceed the general radiated emission limits in §15.209.

(d) A custom built telemetry intentional radiator operating in the frequency band 88–108 MHz and used for experimentation by an educational institute need not be certified provided the device complies with the standards in this part and the educational institution notifies the Office of Engineering and Technology, in writing, in advance of operation, providing the following information:

(1) The dates and places where the device will be operated;

(2) The purpose for which the device will be used;

(3) A description of the device, including the operating frequency, RF power output, and antenna; and,

(4) A statement that the device complies with the technical provisions of this part.

[54 FR 17714, Apr. 25, 1989; 54 FR 32340, Aug. 7, 1989; 80 FR 53750, Sept. 8, 2015]

§ 15.240 Operation in the band 433.5–434.5 MHz.

(a) Operation under the provisions of this section is restricted to devices that use radio frequency energy to identify the contents of commercial shipping containers. Operations must be limited to commercial and industrial areas such as ports, rail terminals and warehouses. Two-way operation is permitted to interrogate and to load data into devices. Devices operated pursuant to the provisions of this section shall not be used for voice communications.

(b) The field strength of any emissions radiated within the specified frequency band shall not exceed 11,000 microvolts per meter measured at a distance of 3 meters. The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The peak level of any emissions within the specified frequency band shall not exceed 55,000 microvolts per meter measured at a distance of 3 meters. Additionally, devices authorized under these provisions shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than 60 seconds and be only permitted to reinitiate an interrogation in the case of a transmission error. Absent such a transmission error, the silent period between transmissions shall not be less than 10 seconds.

(c) The field strength of emissions radiated on any frequency outside of the specified band shall not exceed the general radiated emission limits in § 15.209.

(d) In the case of radio frequency powered tags designed to operate with a device authorized under this section, the tag may be approved with the device or be considered as a separate device subject to its own authorization. Powered tags approved with a device under a single application shall be labeled with the same identification number as the device.

(e) To prevent interference to Federal Government radar systems, operation under the provisions of this section is not permitted within 40 kilometers of the following locations:

DoD Radar Site	Latitude	Longitude
Beale Air Force Base	39°08′10″ N	121°21′04″ W
Cape Cod Air Force Station	41°45′07″ N	070°32′17″ W
Clear Air Force Station	64°55′16″ N	143°05′02″ W
Cavalier Air Force Station ..	48°43′12″ N	097°54′00″ W
Eglin Air Force Base	30°43′12″ N	086°12′36″ W

(f) As a condition of the grant, the grantee of an equipment authorization for a device operating under the provisions of this section shall provide information to the user concerning compliance with the operational restrictions in paragraphs (a) and (e) of this section. As a further condition, the grantee shall provide information on the locations where the devices are installed to the FCC Office of Engineering and Technology, which shall provide this information to the Federal Government through the National Telecommunications and Information Administration. The user of the device shall be responsible for submitting updated information in the event the operating location or other information changes after the initial registration. The grantee shall notify the user of this requirement. The information provided by the grantee or user to the Commission shall include the name, address, telephone number and e-mail address of the user, the address and geographic coordinates of the operating location, and the FCC identification number of the device. The material shall be submitted to the following address: Experimental Licensing Branch, OET, Federal Communications Commission, at the address of the FCC's main office indicated in 47 CFR 0.401(a), ATTN: RFID Registration.

[69 FR 29464, May 24, 2004, as amended at 85 FR 64406, Oct. 13, 2020]

§ 15.241 Operation in the band 174–216 MHz.

(a) Operation under the provisions of this section is restricted to biomedical telemetry devices.

(b) Emissions from the device shall be confined within a 200 kHz band

which shall lie wholly within the frequency range of 174–216 MHz.

(c) The field strength of any emissions radiated within the specified 200 kHz band shall not exceed 1500 microvolts/meter at 3 meters. The field strength of emissions radiated on any frequency outside of the specified 200 kHz band shall not exceed 150 microvolts/meter at 3 meters. The emission limits in this paragraph are based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply.

§ 15.242 Operation in the bands 174–216 MHz and 470–668 MHz.

(a) The marketing and operation of intentional radiators under the provisions of this section is restricted to biomedical telemetry devices employed solely on the premises of health care facilities.

(1) A health care facility includes hospitals and other establishments that offer services, facilities, and beds for use beyond 24 hours in rendering medical treatment and institutions and organizations regularly engaged in providing medical services through clinics, public health facilities, and similar establishments, including governmental entities and agencies for their own medical activities.

(2) This authority to operate does not extend to mobile vehicles, such as ambulances, even if those vehicles are associated with a health care facility.

(b) The fundamental emissions from a biomedical telemetry device operating under the provisions of this section shall be contained within a single television broadcast channel, as defined in part 73 of this chapter, under all conditions of operation and shall lie wholly within the frequency ranges of 174–216 MHz and 470–668 MHz.

(c) The field strength of the fundamental emissions shall not exceed 200 mV/m, as measured at a distance of 3 meters using a quasi-peak detector. Manufacturers should note that a quasi-peak detector function indicates field strength per 120 kHz of bandwidth ±20 kHz. Accordingly, the total signal level over the band of operation may be higher than 200 mV/m. The field strength of emissions radiated on any frequency outside of the television broadcast channel within which the fundamental is contained shall not exceed the general limits in §15.209.

(d) The user and the installer of a biomedical telemetry device operating within the frequency range 174–216 MHz, 470–608 MHz or 614–668 MHz shall ensure that the following minimum separation distances are maintained between the biomedical telemetry device and the authorized radio services operating on the same frequencies:

(1) At least 10.3 km outside of the Grade B field strength contour (56 dBuV/m) of a TV broadcast station or an associated TV booster station operating within the band 174–216 MHz.

(2) At least 5.5 km outside of the Grade B field strength contour (64 dBuV/m) of a TV broadcast station or an associated TV booster station operating within the bands 470–608 MHz or 614–668 MHz.

(3) At least 5.1 km outside of the 68 dBuV/m field strength contour of a low power TV or a TV translator station operating within the band 174–216 MHz.

(4) At least 3.1 km outside of the 74 dBuV/m field strength contour of a low power TV or a TV translator station operating within the bands 470–608 MHz or 614–668 MHz.

(5) Whatever distance is necessary to protect other authorized users within these bands.

(e) The user and the installer of a biomedical telemetry device operating within the frequency range 608–614 MHz and that will be located within 32 km of the very long baseline array (VLBA) stations or within 80 km of any of the other radio astronomy observatories noted in footnote US385 of Section 2.106 of this chapter must coordinate with, and obtain the written concurrence of, the director of the affected radio astronomy observatory before the equipment can be installed or operated. The National Science Foundation point of contact for coordination is: Spectrum Manager, Division of Astronomical Sciences, NSF Room 1045, 4201 Wilson Blvd., Arlington, VA 22230; tel: (703) 306–1823.

(f) Biomedical telemetry devices must not cause harmful interference to licensed TV broadcast stations or to other authorized radio services, such as

operations on the broadcast frequencies under subparts G and H of part 74 of this chapter, land mobile stations operating under part 90 of this chapter in the 470–512 MHz band, and radio astronomy operation in the 608–614 MHz band. (See §15.5.) If harmful interference occurs, the interference must either be corrected or the device must immediately cease operation on the occupied frequency. Further, the operator of the biomedical telemetry device must accept whatever level of interference is received from other radio operations. The operator, *i.e.,* the health care facility, is responsible for resolving any interference that occurs subsequent to the installation of these devices.

(g) The manufacturers, installers, and users of biomedical telemetry devices are reminded that they must ensure that biomedical telemetry transmitters operating under the provisions of this section avoid operating in close proximity to authorized services using this spectrum. Sufficient separation distance, necessary to avoid causing or receiving harmful interference, must be maintained from co-channel operations. These parties are reminded that the frequencies of the authorized services are subject to change, especially during the implementation of the digital television services. The operating frequencies of the part 15 devices may need to be changed, as necessary and in accordance with the permissive change requirements of this chapter, to accommodate changes in the operating frequencies of the authorized services.

(h) The manufacturers, installers and users of biomedical telemetry devices are cautioned that the operation of this equipment could result in harmful interference to other nearby medical devices.

[62 FR 58658, Oct. 30, 1997, as amended at 77 FR 76248, Dec. 27, 2012]

§15.243 Operation in the band 890–940 MHz.

(a) Operation under the provisions of this section is restricted to devices that use radio frequency energy to measure the characteristics of a material. Devices operated pursuant to the provisions of this section shall not be used for voice communications or the transmission of any other type of message.

(b) The field strength of any emissions radiated within the specified frequency band shall not exceed 500 microvolts/meter at 30 meters. The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply.

(c) The field strength of emissions radiated on any frequency outside of the specified band shall not exceed the general radiated emission limits in §15.209.

(d) The device shall be self-contained with no external or readily accessible controls which may be adjusted to permit operation in a manner inconsistent with the provisions in this section. Any antenna that may be used with the device shall be permanently attached thereto and shall not be readily modifiable by the user.

§15.245 Operation within the bands 902–928 MHz, 2435–2465 MHz, 5785–5815 MHz, 10500–10550 MHz, and 24075–24175 MHz.

(a) Operation under the provisions of this section is limited to intentional radiators used as field disturbance sensors, excluding perimeter protection systems.

(b) The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency (MHz)	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (millivolts/meter)
902–928	500	1.6
2435–2465	500	1.6
5785–5815	500	1.6
10500–10550	2500	25.0
24075–24175	2500	25.0

(1) Regardless of the limits shown in the above table, harmonic emissions in the restricted bands below 17.7 GHz, as specified in §15.205, shall not exceed the field strength limits shown in §15.209. Harmonic emissions in the restricted bands at and above 17.7 GHz shall not exceed the following field strength limits:

(i) For the second and third harmonics of field disturbance sensors operating in the 24075–24175 MHz band

and for other field disturbance sensors designed for use only within a building or to open building doors, 25.0 mV/m.

(ii) For all other field disturbance sensors, 7.5 mV/m.

(iii) Field disturbance sensors designed to be used in motor vehicles or aircraft must include features to prevent continuous operation unless their emissions in the restricted bands, other than the second and third harmonics from devices operating in the 24075–24175 MHz band, fully comply with the limits given in §15.209. Continuous operation of field disturbance sensors designed to be used in farm equipment, vehicles such as fork lifts that are intended primarily for use indoors or for very specialized operations, or railroad locomotives, railroad cars and other equipment which travels on fixed tracks is permitted. A field disturbance sensor will be considered not to be operating in a continuous mode if its operation is limited to specific activities of limited duration (e.g., putting a vehicle into reverse gear, activating a turn signal, etc.).

(2) Field strength limits are specified at a distance of 3 meters.

(3) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

(4) The emission limits shown above are based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply.

[54 FR 17714, Apr. 25, 1989, as amended at 55 FR 46792, Nov. 7, 1990; 61 FR 42558, Aug. 16, 1996; 68 FR 68547, Dec. 9, 2003]

§15.247 Operation within the bands 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz.

(a) Operation under the provisions of this Section is limited to frequency hopping and digitally modulated intentional radiators that comply with the following provisions:

(1) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

(i) For frequency hopping systems operating in the 902–928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

(ii) Frequency hopping systems operating in the 5725–5850 MHz band shall use at least 75 hopping frequencies. The maximum 20 dB bandwidth of the hopping channel is 1 MHz. The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 30 second period.

(iii) Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

(2) Systems using digital modulation techniques may operate in the 902–928

MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

(b) The maximum peak conducted output power of the intentional radiator shall not exceed the following:

(1) For frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725–5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts.

(2) For frequency hopping systems operating in the 902–928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.

(3) For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power 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.

(4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(c) Operation with directional antenna gains greater than 6 dBi.

(1) Fixed point-to-point operation:

(i) Systems operating in the 2400–2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

(ii) Systems operating in the 5725–5850 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted output power.

(iii) Fixed, point-to-point operation, as used in paragraphs (c)(1)(i) and (c)(1)(ii) of this section, excludes the use of point-to-multipoint systems, omnidirectional applications, and multiple co-located intentional radiators transmitting the same information. The operator of the spread spectrum or digitally modulated intentional radiator or, if the equipment is professionally installed, the installer is responsible for ensuring that the system is used exclusively for fixed, point-to-point operations. The instruction manual furnished with the intentional radiator shall contain language in the installation instructions informing the operator and the installer of this responsibility.

(2) In addition to the provisions in paragraphs (b)(1), (b)(3), (b)(4) and (c)(1)(i) of this section, transmitters operating in the 2400–2483.5 MHz band that emit multiple directional beams, simultaneously or sequentially, for the purpose of directing signals to individual receivers or to groups of receivers provided the emissions comply with the following:

(i) Different information must be transmitted to each receiver.

(ii) If the transmitter employs an antenna system that emits multiple directional beams but does not do emit

multiple directional beams simultaneously, the total output power conducted to the array or arrays that comprise the device, *i.e.*, the sum of the power supplied to all antennas, antenna elements, staves, etc. and summed across all carriers or frequency channels, shall not exceed the limit specified in paragraph (b)(1) or (b)(3) of this section, as applicable. However, the total conducted output power shall be reduced by 1 dB below the specified limits for each 3 dB that the directional gain of the antenna/antenna array exceeds 6 dBi. The directional antenna gain shall be computed as follows:

(A) The directional gain shall be calculated as the sum of 10 log (number of array elements or staves) plus the directional gain of the element or stave having the highest gain.

(B) A lower value for the directional gain than that calculated in paragraph (c)(2)(ii)(A) of this section will be accepted if sufficient evidence is presented, e.g., due to shading of the array or coherence loss in the beamforming.

(iii) If a transmitter employs an antenna that operates simultaneously on multiple directional beams using the same or different frequency channels, the power supplied to each emission beam is subject to the power limit specified in paragraph (c)(2)(ii) of this section. If transmitted beams overlap, the power shall be reduced to ensure that their aggregate power does not exceed the limit specified in paragraph (c)(2)(ii) of this section. In addition, the aggregate power transmitted simultaneously on all beams shall not exceed the limit specified in paragraph (c)(2)(ii) of this section by more than 8 dB.

(iv) Transmitters that emit a single directional beam shall operate under the provisions of paragraph (c)(1) of this section.

(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

(e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

(f) For the purposes of this section, hybrid systems are those that employ a combination of both frequency hopping and digital modulation techniques. The frequency hopping operation of the hybrid system, with the direct sequence or digital modulation operation turned-off, shall have an average time of occupancy on any frequency not to exceed 0.4 seconds within a time period in seconds equal to the number of hopping frequencies employed multiplied by 0.4. The power spectral density conducted from the intentional radiator to the antenna due to the digital modulation operation of the hybrid system, with the frequency hopping operation turned off, shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

NOTE TO PARAGRAPH (f): The transition provisions found in §15.37(h) will apply to hybrid devices beginning June 2, 2015.

(g) Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the

system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be presented with a continuous data (or information) stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its transmissions over the minimum number of hopping channels specified in this section.

(h) The incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hopsets to avoid hopping on occupied channels is permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

NOTE TO PARAGRAPH (h): Spread spectrum systems are sharing these bands on a non-interference basis with systems supporting critical Government requirements that have been allocated the usage of these bands, secondary only to ISM equipment operated under the provisions of part 18 of this chapter. Many of these Government systems are airborne radiolocation systems that emit a high EIRP which can cause interference to other users. Also, investigations of the effect of spread spectrum interference to U. S. Government operations in the 902–928 MHz band may require a future decrease in the power limits allowed for spread spectrum operation.

(i) Radio frequency devices operating under the provisions of this part are subject to the radio frequency radiation exposure requirements specified in §§1.1307(b), 1.1310, 2.1091, and 2.1093 of this chapter, as appropriate. Applications for equipment authorization of mobile or portable devices operating under this section must contain a statement confirming compliance with these requirements. Technical information showing the basis for this statement must be submitted to the Commission upon request.

[54 FR 17714, Apr. 25, 1989, as amended at 55 FR 28762, July 13, 1990; 62 FR 26242, May 13, 1997; 65 FR 57561, Sept. 25, 2000; 67 FR 42734, June 25, 2002; 69 FR 54035, Sept. 7, 2004; 72 FR 5632, Feb. 7, 2007; 79 FR 24578, May 1, 2014; 85 FR 18149, Apr. 1, 2020]

§15.249 Operation within the bands 902–928 MHz, 2400–2483.5 MHz, 5725–5875 MHZ, and 24.0–24.25 GHz.

(a) Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

(b) Fixed, point-to-point operation as referred to in this paragraph shall be limited to systems employing a fixed transmitter transmitting to a fixed remote location. Point-to-multipoint systems, omnidirectional applications, and multiple co-located intentional radiators transmitting the same information are not allowed. Fixed, point-to-point operation is permitted in the 24.05–24.25 GHz band subject to the following conditions:

(1) The field strength of emissions in this band shall not exceed 2500 millivolts/meter.

(2) The frequency tolerance of the carrier signal shall be maintained within ±0.001% of the operating frequency over a temperature variation of −20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

(3) Antenna gain must be at least 33 dBi. Alternatively, the main lobe beamwidth must not exceed 3.5 degrees. The beamwidth limit shall apply to both the azimuth and elevation planes. At antenna gains over 33 dBi or

beamwidths narrower than 3.5 degrees, power must be reduced to ensure that the field strength does not exceed 2500 millivolts/meter.

(c) Field strength limits are specified at a distance of 3 meters.

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

(e) As shown in §15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For point-to-point operation under paragraph (b) of this section, the peak field strength shall not exceed 2500 millivolts/meter at 3 meters along the antenna azimuth.

[54 FR 17714, Apr. 25, 1989, as amended at 55 FR 25095, June 20, 1990; 67 FR 1625, Jan. 14, 2002; 77 FR 4914, Feb. 1, 2012]

§ 15.250 Operation of wideband systems within the band 5925–7250 MHz.

(a) The −10 dB bandwidth of a device operating under the provisions of this section must be contained within the 5925–7250 MHz band under all conditions of operation including the effects from stepped frequency, frequency hopping or other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage.

(b) The −10 dB bandwidth of the fundamental emission shall be at least 50 MHz. For transmitters that employ frequency hopping, stepped frequency or similar modulation types, measurement of the −10 dB minimum bandwidth specified in this paragraph shall be made with the frequency hop or step function disabled and with the transmitter operating continuously at a fundamental frequency following the provisions of §15.31(m).

(c) Operation on board an aircraft or a satellite is prohibited. Devices operating under this section may not be employed for the operation of toys. Except for operation onboard a ship or a terrestrial transportation vehicle, the use of a fixed outdoor infrastructure is prohibited. A fixed infrastructure includes antennas mounted on outdoor structures, e.g., antennas mounted on the outside of a building or on a telephone pole.

(d) Emissions from a transmitter operating under this section shall not exceed the following equivalent isotropically radiated power (EIRP) density levels:

(1) The radiated emissions above 960 MHz from a device operating under the provisions of this section shall not exceed the following RMS average limits based on measurements using a 1 MHz resolution bandwidth:

Frequency in MHz	EIRP in dBm
960–1610	−75.3
1610–1990	−63.3
1990–3100	−61.3
3100–5925	−51.3
5925–7250	−41.3
7250–10600	−51.3
Above 10600	−61.3

(2) In addition to the radiated emission limits specified in the table in paragraph (d)(1) of this section, transmitters operating under the provisions of this section shall not exceed the following RMS average limits when measured using a resolution bandwidth of no less than 1 kHz:

Frequency in MHz	EIRP in dBm
1164–1240	−85.3
1559–1610	−85.3

(3) There is a limit on the peak level of the emissions contained within a 50 MHz bandwidth centered on the frequency at which the highest radiated emission occurs and this 50 MHz bandwidth must be contained within the 5925–7250 MHz band. The peak EIRP limit is 20 log (RBW/50) dBm where RBW is the resolution bandwidth in megahertz that is employed by the measurement instrument. RBW shall not be lower than 1 MHz or greater than 50 MHz. The video bandwidth of the measurement instrument shall not be less than RBW. If RBW is greater

than 3 MHz, the application for certification filed with the Commission shall contain a detailed description of the test procedure, calibration of the test setup, and the instrumentation employed in the testing.

(4) Radiated emissions at or below 960 MHz shall not exceed the emission levels in §15.209.

(5) Emissions from digital circuitry used to enable the operation of the transmitter may comply with the limits in §15.209 provided it can be clearly demonstrated that those emissions are due solely to emissions from digital circuitry contained within the transmitter and the emissions are not intended to be radiated from the transmitter's antenna. Emissions from associated digital devices, as defined in §15.3(k), e.g., emissions from digital circuitry used to control additional functions or capabilities other than the operation of the transmitter, are subject to the limits contained in subpart B of this part. Emissisons from these digital circuits shall not be employed in determining the −10 dB bandwidth of the fundamental emission or the frequency at which the highest emission level occurs.

(e) Measurement procedures:

(1) All emissions at and below 960 MHz are based on measurements employing a CISPR quasi-peak detector. Unless otherwise specified, all RMS average emission levels specified in this section are to be measured utilizing a 1 MHz resolution bandwidth with a one millisecond dwell over each 1 MHz segment. The frequency span of the analyzer should equal the number of sampling bins times 1 MHz and the sweep rate of the analyzer should equal the number of sampling bins times one millisecond. The provision in §15.35(c) that allows emissions to be averaged over a 100 millisecond period does not apply to devices operating under this section. The video bandwidth of the measurement instrument shall not be less than the resolution bandwidth and trace averaging shall not be employed. The RMS average emission measurement is to be repeated over multiple sweeps with the analyzer set for maximum hold until the amplitude stabilizes.

(2) The peak emission measurement is to be repeated over multiple sweeps with the analyzer set for maximum hold until the amplitude stabilizes.

(3) For transmitters that employ frequency hopping, stepped frequency or similar modulation types, the peak emission level measurement, the measurement of the RMS average emission levels, and the measurement to determine the frequency at which the highest level emission occurs shall be made with the frequency hop or step function active. Gated signals may be measured with the gating active. The provisions of §15.31(c) continue to apply to transmitters that employ swept frequency modulation.

(4) The −10 dB bandwidth is based on measurement using a peak detector, a 1 MHz resolution bandwidth, and a video bandwidth greater than or equal to the resolution bandwidth.

(5) Alternative measurement procedures may be considered by the Commission.

[70 FR 6774, Feb. 9, 2005]

§15.251 Operation within the bands 2.9–3.26 GHz, 3.267–3.332 GHz, 3.339–3.3458 GHz, and 3.358–3.6 GHz.

(a) Operation under the provisions of this section is limited to automatic vehicle identification systems (AVIS) which use swept frequency techniques for the purpose of automatically identifying transportation vehicles.

(b) The field strength anywhere within the frequency range swept by the signal shall not exceed 3000 microvolts/meter/MHz at 3 meters in any direction. Further, an AVIS, when in its operating position, shall not produce a field strength greater than 400 microvolts/meter/MHz at 3 meters in any direction within ±10 degrees of the horizontal plane. In addition to the provisions of §15.205, the field strength of radiated emissions outside the frequency range swept by the signal shall be limited to a maximum of 100 microvolts/meter/MHz at 3 meters, measured from 30 MHz to 20 GHz for the complete system. The emission limits in this paragraph are based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply.

(c) The minimum sweep repetition rate of the signal shall not be lower than 4000 sweeps per second, and the maximum sweep repetition rate of the signal shall not exceed 50,000 sweeps per second.

(d) An AVIS shall employ a horn antenna or other comparable directional antenna for signal emission.

(e) Provision shall be made so that signal emission from the AVIS shall occur only when the vehicle to be identified is within the radiated field of the system.

(f) In addition to the labelling requirements in §15.19(a), the label attached to the AVIS transmitter shall contain a third statement regarding operational conditions, as follows:

* * * and, (3) during use this device (the antenna) may not be pointed within ±** degrees of the horizontal plane.

The double asterisks in condition three (**) shall be replaced by the responsible party with the angular pointing restriction necessary to meet the horizontal emission limit specified in paragraph (b).

(g) In addition to the information required in subpart J of part 2, the application for certification shall contain:

(1) Measurements of field strength per MHz along with the intermediate frequency of the spectrum analyzer or equivalent measuring receiver;

(2) The angular separation between the direction at which maximum field strength occurs and the direction at which the field strength is reduced to 400 microvolts/meter/MHz at 3 meters;

(3) A photograph of the spectrum analyzer display showing the entire swept frequency signal and a calibrated scale for the vertical and horizontal axes; the spectrum analyzer settings that were used shall be labelled on the photograph; and,

(4) The results of the frequency search for spurious and sideband emissions from 30 MHz to 20 GHz, exclusive of the swept frequency band, with the measuring instrument as close as possible to the unit under test.

[54 FR 17714, Apr. 25, 1989; 54 FR 32340, Aug. 7, 1989]

§15.252 Operation of wideband vehicular radar systems within the band 23.12–29.0 GHz.

(a) Operation under this section is limited to field disturbance sensors that are mounted in terrestrial transportation vehicles. Terrestrial use is limited to earth surface-based, non-aviation applications.

(1) The −10 dB bandwidth of the fundamental emissions shall be located within the 23.12–29.0 GHz band, exclusive of the 23.6–24.0 GHz restricted band, as appropriate, under all conditions of operation including the effects from stepped frequency, frequency hopping or other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage.

(2) The −10 dB bandwidth of the fundamental emission shall be 10 MHz or greater. For transmitters that employ frequency hopping, stepped frequency or similar modulation types, measurement of the −10 dB minimum bandwidth specified in this paragraph shall be made with the frequency hop or step function disabled and with the transmitter operating continuously at a fundamental frequency following the provisions of §15.31(m).

(3) For systems operating in the 23.12–29.0 GHz band, the frequencies at which the highest average emission level and at which the highest peak level emission appear shall be greater than 24.075 GHz.

(4) These devices shall operate only when the vehicle is operating, e.g., the engine is running. Operation shall occur only upon specific activation, such as upon starting the vehicle, changing gears, or engaging a turn signal. The operation of these devices shall be related to the proper functioning of the transportation vehicle, e.g., collision avoidance.

(b) Emissions from a transmitter operating under this section shall not exceed the following equivalent isotropically radiated power (EIRP) density levels:

(1) For transmitters operating in the 23.12–29.0 GHz band, the RMS average radiated emissions above 960 MHz from a device operating under the provisions

of this section shall not exceed the following EIRP limits based on measurements using a 1 MHz resolution bandwidth:

Frequency in MHz	EIRP in dBm
960–1610	−75.3
1610–23,120	−61.3
23,120–23,600	−41.3
23,600–24,000	−61.3
24,000–29,000	−41.3
Above 29,000	—61.3

(2) In addition to the radiated emissions limits specified in the table in paragraph (b)(1) of this section, transmitters operating under the provisions of this section shall not exceed the following RMS average EIRP limits when measured using a resolution bandwidth of no less than 1 kHz:

Frequency in MHz	EIRP in dBm
1164–1240	−85.3
1559–1610	−85.3

(3) There is a limit on the peak level of the emissions contained within a 50 MHz bandwidth centered on the frequency at which the highest radiated emission occurs and this 50 MHz bandwidth must be contained within the 24.05–29.0 GHz band. The peak EIRP limit is 20 log (RBW/50) dBm where RBW is the resolution bandwidth in MHz employed by the measurement instrument. RBW shall not be lower than 1 MHz or greater than 50 MHz. Further, RBW shall not be greater than the −10 dB bandwidth of the device under test. For transmitters that employ frequency hopping, stepped frequency or similar modulation types, measurement of the −10 dB minimum bandwidth specified in this paragraph shall be made with the frequency hop or step function disabled and with the transmitter operating continuously at a fundamental frequency. The video bandwidth of the measurement instrument shall not be less than RBW. The limit on peak emissions applies to the 50 MHz bandwidth centered on the frequency at which the highest level radiated emission occurs. If RBW is greater than 3 MHz, the application for certification shall contain a detailed description of the test procedure, the instrumentation employed in the testing, and the calibration of the test setup.

(4) Radiated emissions at or below 960 MHz shall not exceed the emission levels in §15.209.

(5) Emissions from digital circuitry used to enable the operation of the transmitter may comply with the limits in §15.209 provided it can be clearly demonstrated that those emissions are due solely to emissions from digital circuitry contained within the transmitter and the emissions are not intended to be radiated from the transmitter's antenna. Emissions from associated digital devices, as defined in §15.3(k) , e.g., emissions from digital circuitry used to control additional functions or capabilities other than the operation of the transmitter, are subject to the limits contained in subpart B of this part. Emissions from these digital circuits shall not be employed in determining the −10 dB bandwidth of the fundamental emission or the frequency at which the highest emission level occurs.

(c) Measurement procedures:

(1) All emissions at and below 960 MHz are based on measurements employing a CISPR quasi-peak detector. Unless otherwise specified, all RMS average emission levels specified in this section are to be measured utilizing a 1 MHz resolution bandwidth with a one millisecond dwell over each 1 MHz segment. The frequency span of the analyzer should equal the number of sampling bins times 1 MHz and the sweep rate of the analyzer should equal the number of sampling bins times one millisecond. The provision in §15.35(c) that allows emissions to be averaged over a 100 millisecond period does not apply to devices operating under this section. The video bandwidth of the measurement instrument shall not be less than the resolution bandwidth and trace averaging shall not be employed. The RMS average emission measurement is to be repeated over multiple sweeps with the analyzer set for maximum hold until the amplitude stabilizes.

(2) The peak emission measurement is to be repeated over multiple sweeps with the analyzer set for maximum hold until the amplitude stabilizes.

(3) For transmitters that employ frequency hopping, stepped frequency or similar modulation types, the peak

emission level measurement, the measurement of the RMS average emission levels, the measurement to determine the center frequency, and the measurement to determine the frequency at which the highest level emission occurs shall be made with the frequency hop or step function active. Gated signals may be measured with the gating active. The provisions of §15.31(c) continue to apply to transmitters that employ swept frequency modulation.

(4) The −10 dB bandwidth is based on measurement using a peak detector, a 1 MHz resolution bandwidth, and a video bandwidth greater than or equal to the resolution bandwidth.

(5) Alternative measurement procedures may be considered by the Commission.

(d) Wideband vehicular radar systems operating in the 23.12–29.0 GHz band are subject to the transition provisions of §15.37(l) through (n).

[70 FR 6775, Feb. 9, 2005, as amended at 82 FR 43870, Sept. 20, 2017]

§15.253 [Reserved]

§15.255 Operation within the band 57–71 GHz.

(a) Operation under the provisions of this section is not permitted for the following products:

(1) Equipment used on satellites.

(2) Field disturbance sensors, including vehicle radar systems, unless the field disturbance sensors are employed for fixed operation, or used as short-range devices for interactive motion sensing. For the purposes of this section, the reference to fixed operation includes field disturbance sensors installed in fixed equipment, even if the sensor itself moves within the equipment.

(b) Operation on aircraft is permitted under the following conditions:

(1) When the aircraft is on the ground.

(2) While airborne, only in closed exclusive on-board communication networks within the aircraft, with the following exceptions:

(i) Equipment shall not be used in wireless avionics intra-communication (WAIC) applications where external structural sensors or external cameras are mounted on the outside of the aircraft structure.

(ii) Equipment shall not be used on aircraft where there is little attenuation of RF signals by the body/fuselage of the aircraft. These aircraft include, but are not limited to, toy/model aircraft, unmanned aircraft, crop-spraying aircraft, aerostats, etc.

(c) Within the 57–71 GHz band, emission levels shall not exceed the following equivalent isotropically radiated power (EIRP):

(1) Products other than fixed field disturbance sensors and short-range devices for interactive motion sensing shall comply with one of the following emission limits, as measured during the transmit interval:

(i) The average power of any emission shall not exceed 40 dBm and the peak power of any emission shall not exceed 43 dBm; or

(ii) For fixed point-to-point transmitters located outdoors, the average power of any emission shall not exceed 82 dBm, and shall be reduced by 2 dB for every dB that the antenna gain is less than 51 dBi. The peak power of any emission shall not exceed 85 dBm, and shall be reduced by 2 dB for every dB that the antenna gain is less than 51 dBi.

(A) The provisions in this paragraph (c) for reducing transmit power based on antenna gain shall not require that the power levels be reduced below the limits specified in paragraph (c)(1)(i) of this section.

(B) The provisions of §15.204(c)(2) and (4) that permit the use of different antennas of the same type and of equal or less directional gain do not apply to intentional radiator systems operating under this provision. In lieu thereof, intentional radiator systems shall be certified using the specific antenna(s) with which the system will be marketed and operated. Compliance testing shall be performed using the highest gain and the lowest gain antennas for which certification is sought and with the intentional radiator operated at its maximum available output power level. The responsible party, as defined in §2.909 of this chapter, shall supply a list of acceptable antennas with the application for certification.

(2) For fixed field disturbance sensors that occupy 500 MHz or less of bandwidth and that are contained wholly within the frequency band 61.0–61.5 GHz, the average power of any emission, measured during the transmit interval, shall not exceed 40 dBm, and the peak power of any emission shall not exceed 43 dBm. In addition, the average power of any emission outside of the 61.0–61.5 GHz band, measured during the transmit interval, but still within the 57–71 GHz band, shall not exceed 10 dBm, and the peak power of any emission shall not exceed 13 dBm.

(3) For fixed field disturbance sensors other than those operating under the provisions of paragraph (c)(2) of this section, and short-range devices for interactive motion sensing, the peak transmitter conducted output power shall not exceed −10 dBm and the peak EIRP level shall not exceed 10 dBm.

(4) The peak power shall be measured with an RF detector that has a detection bandwidth that encompasses the 57–71 GHz band and has a video bandwidth of at least 10 MHz. The average emission levels shall be measured over the actual time period during which transmission occurs.

(d) Limits on spurious emissions:

(1) The power density of any emissions outside the 57–71 GHz band shall consist solely of spurious emissions.

(2) Radiated emissions below 40 GHz shall not exceed the general limits in §15.209.

(3) Between 40 GHz and 200 GHz, the level of these emissions shall not exceed 90 pW/cm^2 at a distance of 3 meters.

(4) The levels of the spurious emissions shall not exceed the level of the fundamental emission.

(e) Except as specified paragraph (e)(1) of this section, the peak transmitter conducted output power shall not exceed 500 mW. Depending on the gain of the antenna, it may be necessary to operate the intentional radiator using a lower peak transmitter output power in order to comply with the EIRP limits specified in paragraph (b) of this section.

(1) Transmitters with an emission bandwidth of less than 100 MHz must limit their peak transmitter conducted output power to the product of 500 mW times their emission bandwidth divided by 100 MHz. For the purposes of this paragraph, emission bandwidth is defined as the instantaneous frequency range occupied by a steady state radiated signal with modulation, outside which the radiated power spectral density never exceeds 6 dB below the maximum radiated power spectral density in the band, as measured with a 100 kHz resolution bandwidth spectrum analyzer. The center frequency must be stationary during the measurement interval, even if not stationary during normal operation (e.g., for frequency hopping devices).

(2) Peak transmitter conducted output power shall be measured with an RF detector that has a detection bandwidth that encompasses the 57–71 GHz band and that has a video bandwidth of at least 10 MHz.

(3) For purposes of demonstrating compliance with this paragraph, corrections to the transmitter conducted output power may be made due to the antenna and circuit loss.

(f) *Frequency stability.* Fundamental emissions must be contained within the frequency bands specified in this section during all conditions of operation. Equipment is presumed to operate over the temperature range −20 to + 50 degrees Celsius with an input voltage variation of 85% to 115% of rated input voltage, unless justification is presented to demonstrate otherwise.

(g) Radio frequency devices operating under the provisions of this part are subject to the radio frequency radiation exposure requirements specified in §§1.1307(b), 1.1310, 2.1091, and 2.1093 of this chapter, as appropriate. Applications for equipment authorization of mobile or portable devices operating under this section must contain a statement confirming compliance with these requirements. Technical information showing the basis for this statement must be submitted to the Commission upon request.

(h) Any transmitter that has received the necessary FCC equipment authorization under the rules of this chapter may be mounted in a group installation for simultaneous operation with one or more other transmitter(s) that

have received the necessary FCC equipment authorization, without any additional equipment authorization. However, no transmitter operating under the provisions of this section may be equipped with external phase-locking inputs that permit beam-forming arrays to be realized.

(i) Measurement procedures that have been found to be acceptable to the Commission in accordance with §2.947 of this chapter may be used to demonstrate compliance.

[63 FR 42279, Aug. 7, 1998, as amended at 66 FR 7409, Jan. 23, 2001; 68 FR 68547, Dec. 9, 2003; 78 FR 59850, Sept. 30, 2013; 81 FR 79936, Nov. 14, 2016; 83 FR 63, Jan. 2, 2018; 85 FR 18149, Apr. 1, 2020]

§15.256 Operation of level probing radars within the bands 5.925–7.250 GHz, 24.05–29.00 GHz, and 75–85 GHz.

(a) Operation under this section is limited to level probing radar (LPR) devices.

(b) LPR devices operating under the provisions of this section shall utilize a dedicated or integrated transmit antenna, and the system shall be installed and maintained to ensure a vertically downward orientation of the transmit antenna's main beam.

(c) LPR devices operating under the provisions of this section shall be installed only at fixed locations. The LPR device shall not operate while being moved, or while inside a moving container.

(d) Hand-held applications are prohibited.

(e) Marketing to residential consumers is prohibited.

(f) The fundamental bandwidth of an LPR emission is defined as the width of the signal between two points, one below and one above the center frequency, outside of which all emissions are attenuated by at least 10 dB relative to the maximum transmitter output power when measured in an equivalent resolution bandwidth.

(1) The minimum fundamental emission bandwidth shall be 50 MHz for LPR operation under the provisions of this section.

(2) LPR devices operating under this section must confine their fundamental emission bandwidth within the 5.925–7.250 GHz, 24.05–29.00 GHz, and 75–85 GHz bands under all conditions of operation.

(g) *Fundamental emissions limits.* (1) All emission limits provided in this section are expressed in terms of Equivalent Isotropic Radiated Power (EIRP).

(2) The EIRP level is to be determined from the maximum measured power within a specified bandwidth.

(i) The EIRP in 1 MHz is computed from the maximum power level measured within any 1-MHz bandwidth using a power averaging detector;

(ii) The EIRP in 50 MHz is computed from the maximum power level measured with a peak detector in a 50-MHz bandwidth centered on the frequency at which the maximum average power level is realized and this 50 MHz bandwidth must be contained within the authorized operating bandwidth. For a RBW less than 50 MHz, the peak EIRP limit (in dBm) is reduced by 20 log(RBW/50) dB where RBW is the resolution bandwidth in megahertz. The RBW shall not be lower than 1 MHz or greater than 50 MHz. The video bandwidth of the measurement instrument shall not be less than the RBW. If the RBW is greater than 3 MHz, the application for certification filed shall contain a detailed description of the test procedure, calibration of the test setup, and the instrumentation employed in the testing.

(3) The EIRP limits for LPR operations in the bands authorized by this rule section are provided in Table 1. The emission limits in Table 1 are based on boresight measurements (*i.e.*, measurements performed within the main beam of an LPR antenna).

TABLE 1—LPR EIRP EMISSION LIMITS

Frequency band of operation (GHz)	Average emission limit (EIRP in dBm measured in 1 MHz)	Peak emission limit (EIRP in dBm measured in 50 MHz)
5.925–7.250	−33	7
24.05–29.00	−14	26
75–85	−3	34

(h) *Unwanted emissions limits.* Unwanted emissions from LPR devices shall not exceed the general emission limit in §15.209 of this chapter.

(i) *Antenna beamwidth.* (A) LPR devices operating under the provisions of this section within the 5.925–7.250 GHz and 24.05–29.00 GHz bands must use an antenna with a −3 dB beamwidth no greater than 12 degrees.

(B) LPR devices operating under the provisions of this section within the 75–85 GHz band must use an antenna with a −3 dB beamwidth no greater than 8 degrees.

(j) *Antenna side lobe gain.* LPR devices operating under the provisions of this section must limit the side lobe antenna gain relative to the main beam gain for off-axis angles from the main beam of greater than 60 degrees to the levels provided in Table 2.

TABLE 2—ANTENNA SIDE LOBE GAIN LIMITS

Frequency range (GHz)	Antenna side lobe gain limit relative to main beam gain (dB)
5.925–7.250	−22
24.05–29.00	−27
75–85	−38

(k) Emissions from digital circuitry used to enable the operation of the transmitter may comply with the limits in §15.209 of this chapter provided it can be clearly demonstrated that those emissions are due solely to emissions from digital circuitry contained within the transmitter and the emissions are not intended to be radiated from the transmitter's antenna. Emissions from associated digital devices, as defined in §15.3(k) of this part, e.g., emissions from digital circuitry used to control additional functions or capabilities other than the operation of the transmitter, are subject to the limits contained in subpart B, part 15 of this chapter. Emissions from these digital circuits shall not be employed in determining the −10 dB bandwidth of the fundamental emission or the frequency at which the highest emission level occurs.

(l) *Measurement procedures.* (1) Radiated measurements of the fundamental emission bandwidth and power shall be made with maximum main-beam coupling between the LPR and test antennas (boresight).

(2) Measurements of the unwanted emissions radiating from an LPR shall be made utilizing elevation and azimuth scans to determine the location at which the emissions are maximized.

(3) All emissions at and below 1,000 MHz except 9–90 kHz and 110–490 kHz bands are based on measurements employing a CISPR quasi-peak detector.

(4) The fundamental emission bandwidth measurement shall be made using a peak detector with a resolution bandwidth of 1 MHz and a video bandwidth of at least 3 MHz.

(5) The provisions in §15.35(b) and (c) of this part that require emissions to be averaged over a 100 millisecond period and that limits the peak power to 20 dB above the average limit do not apply to devices operating under paragraphs (a) through (l) of this section.

(6) Compliance measurements for minimum emission bandwidth of frequency-agile LPR devices shall be performed with any related frequency sweep, step, or hop function activated.

(7) Compliance measurements shall be made in accordance with the specific procedures published or otherwise authorized by the Commission.

[79 FR 12678, Mar. 6, 2014]

§15.257 Operation within the band 92–95 GHz.

(a) Operation of devices under the provisions of this section is limited to indoor use;

(1) Devices operating under the provisions of this section, by the nature of their design, must be capable of operation only indoors. The necessity to operate with a fixed indoor infrastructure, e.g., a transmitter that must be connected to the AC power lines, may be considered sufficient to demonstrate this.

(2) The use of outdoor mounted antennas, e.g., antennas mounted on the outside of a building or on a telephone pole, or any other outdoors infrastructure is prohibited.

(3) The emissions from equipment operated under this section shall not be intentionally directed outside of the building in which the equipment is located, such as through a window or a doorway.

(4) Devices operating under the provisions of this section shall bear the following or similar statement in a conspicuous location on the device or in

the instruction manual supplied with the device: ''This equipment may only be operated indoors. Operation outdoors is in violation of 47 U.S.C. 301 and could subject the operator to serious legal penalties.''

(b) Operation under the provisions of this section is not permitted on aircraft or satellites.

(c) Within the 92–95 GHz bands, the emission levels shall not exceed the following:

(1) The average power density of any emission, measured during the transmit interval, shall not exceed 9 uW/sq. cm, as measured at 3 meters from the radiating structure, and the peak power density of any emission shall not exceed 18 uW/sq. cm, as measured 3 meters from the radiating structure.

(2) Peak power density shall be measured with an RF detector that has a detection bandwidth that encompasses the band being used and has a video bandwidth of at least 10 MHz, or uses an equivalent measurement method.

(3) The average emission limits shall be calculated based on the measured peak levels, over the actual time period during which transmission occurs.

(d) Limits on spurious emissions:

(1) The power density of any emissions outside the band being used shall consist solely of spurious emissions.

(2) Radiated emissions below 40 GHz shall not exceed the general limits in §15.209.

(3) Between 40 GHz and 200 GHz, the level of these emissions shall not exceed 90 pW/cm^2 at a distance of 3 meters.

(4) The levels of the spurious emissions shall not exceed the level of the fundamental emission.

(e) The total peak transmitter output power shall not exceed 500 mW.

(f) Fundamental emissions must be contained within the frequency bands specified in this section during all conditions of operation. Equipment is presumed to operate over the temperature range −20 to + 50 degrees Celsius with an input voltage variation of 85% to 115% of rated input voltage, unless justification is presented to demonstrate otherwise.

(g) Radio frequency devices operating under the provisions of this part are subject to the radio frequency radiation exposure requirements specified in §§1.1307(b), 1.1310, 2.1091, and 2.1093 of this chapter, as appropriate. Applications for equipment authorization of mobile or portable devices operating under this section must contain a statement confirming compliance with these requirements. Technical information showing the basis for this statement must be submitted to the Commission upon request.

(h) Any transmitter that has received the necessary FCC equipment authorization under the rules of this chapter may be mounted in a group installation for simultaneous operation with one or more other transmitter(s) that have received the necessary FCC equipment authorization, without any additional equipment authorization. However, no transmitter operating under the provisions of this section may be equipped with external phase-locking inputs that permit beam-forming arrays to be realized.

[69 FR 3265, Jan. 23, 2004, as amended at 85 FR 18149, Apr. 1, 2020]

§15.258 Operation in the bands 116–123 GHz, 174.8–182 GHz, 185–190 GHz and 244–246 GHz.

(a) Operation on board an aircraft or a satellite is prohibited.

(b) Emission levels within the 116–123 GHz, 174.8–182 GHz, 185–190 GHz and 244–246 GHz bands shall not exceed the following equivalent isotropically radiated power (EIRP) limits as measured during the transmit interval:

(1) The average power of any emission shall not exceed 40 dBm and the peak power of any emission shall not exceed 43 dBm; or

(2) For fixed point-to-point transmitters located outdoors, the average power of any emission shall not exceed 82 dBm and shall be reduced by 2 dB for every dB that the antenna gain is less than 51 dBi. The peak power of any emission shall not exceed 85 dBm and shall be reduced by 2 dB for every dB that the antenna gain is less than 51 dBi. The provisions in this paragraph (b)(2) for reducing transmit power based on antenna gain shall not require that the power levels be reduced below the limits specified in paragraph (b)(1) of this section.

(3) The peak power shall be measured with a detection bandwidth that encompasses the entire occupied bandwidth within the intended band of operation, *e.g.*, 116–123 GHz, 174.8–182 GHz, 185–190 GHz or 244–246 GHz. The average emission levels shall be measured over the actual time period during which transmission occurs.

(4) Transmitters with an emission bandwidth of less than 100 MHz must limit their peak radiated power to the product of the maximum permissible radiated power (in milliwatts) times their emission bandwidth divided by 100 MHz. For the purposes of this paragraph (b)(4), emission bandwidth is defined as the instantaneous frequency range occupied by a steady state radiated signal with modulation, outside which the radiated power spectral density never exceeds 6 dB below the maximum radiated power spectral density in the band, as measured with a 100 kHz resolution bandwidth spectrum analyzer. The center frequency must be stationary during the measurement interval, even if not stationary during normal operation (*e.g.*, for frequency hopping devices).

(c) Spurious emissions shall be limited as follows:

(1) The power density of any emissions outside the band of operation, *e.g.*, 116–123 GHz, 174.8–182 GHz, 185–190 GHz or 244–246 GHz, shall consist solely of spurious emissions.

(2) Radiated emissions below 40 GHz shall not exceed the general limits in §15.209.

(3) Between 40 GHz and the highest frequency specified in §15.33, the level of these emissions shall not exceed 90 pW/cm^2 at a distance of 3 meters.

(4) The levels of the spurious emissions shall not exceed the level of the fundamental emission.

(d) Fundamental emissions must be contained within the frequency bands specified in this section during all conditions of operation. Equipment is presumed to operate over the temperature range −20 to + 50 degrees Celsius with an input voltage variation of 85% to 115% of rated input voltage, unless justification is presented to demonstrate otherwise.

(e) Regardless of the power density levels permitted under this section, devices operating under the provisions of this section are subject to the radiofrequency radiation exposure requirements specified in §§1.1307(b), 2.1091, and 2.1093 of this chapter, as appropriate. Applications for equipment authorization of devices operating under this section must contain a statement confirming compliance with these requirements for both fundamental emissions and unwanted emissions. Technical information showing the basis for this statement must be submitted to the Commission upon request.

(f) Any transmitter that has received the necessary FCC equipment authorization under the rules of this chapter may be mounted in a group installation for simultaneous operation with one or more other transmitter(s) that have received the necessary FCC equipment authorization, without any additional equipment authorization. However, no transmitter operating under the provisions of this section may be equipped with external phase-locking inputs that permit beam-forming arrays to be realized.

(g) Measurement procedures that have been found to be acceptable to the Commission in accordance with §2.947 of this chapter may be used to demonstrate compliance.

[84 FR 25691, June 4, 2019]

Subpart D—Unlicensed Personal Communications Service Devices

SOURCE: 58 FR 59180, Nov. 8, 1993, unless otherwise noted.

§15.301 Scope.

This subpart sets out the regulations for unlicensed personal communications services (PCS) devices operating in the 1920–1930 MHz band.

[69 FR 77949, Dec. 29, 2004]

§15.303 Definitions.

Asynchronous devices. Devices that transmit RF energy at irregular time intervals, as typified by local area network data systems.

Emission bandwidth. For purposes of this subpart the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency

and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier. Compliance with the emissions limits is based on the use of measurement instrumentation employing a peak detector function with an instrument resolutions bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.

Isochronous devices. Devices that transmit at a regular interval, typified by time-division voice systems.

Peak transmit power. The peak power output as measured over an interval of time equal to the frame rate or transmission burst of the device under all conditions of modulation. Usually this parameter is measured as a conducted emission by direct connection of a calibrated test instrument to the equipment under test. If the device cannot be connected directly, alternative techniques acceptable to the Commission may be used.

Personal Communications Services (PCS) Devices [Unlicensed]. Intentional radiators operating in the frequency band 1920–1930 MHz that provide a wide array of mobile and ancillary fixed communication services to individuals and businesses.

Spectrum window. An amount of spectrum equal to the intended emission bandwidth in which operation is desired.

Thermal noise power. The noise power in watts defined by the formula N = kTB where N is the noise power in watts, K is Boltzmann's constant, T is the absolute temperature in degrees Kelvin (e.g., 295 °K) and B is the emission bandwidth of the device in hertz.

Time window. An interval of time in which transmission is desired.

[58 FR 59180, Nov. 8, 1993, as amended at 59 FR 32852, June 24, 1994; 60 FR 13073, Mar. 10, 1995; 69 FR 62620, Oct. 27, 2004; 69 FR 77949, Dec. 29, 2004; 77 FR 43013, July 23, 2012]

§ 15.305 Equipment authorization requirement.

PCS devices operating under this subpart shall be certified by the Commission under the procedures in subpart J of part 2 of this chapter before marketing. The application for certification must contain sufficient information to demonstrate compliance with the requirements of this subpart.

§ 15.307 [Reserved]

§ 15.309 Cross reference.

(a) The provisions of subpart A of this part apply to unlicensed PCS devices, except where specific provisions are contained in subpart D.

(b) The requirements of subpart D apply only to the radio transmitter contained in the PCS device. Other aspects of the operation of a PCS device may be subject to requirements contained elsewhere in this chapter. In particular, a PCS device that includes digital circuitry not directly associated with the radio transmitter also is subject to the requirements for unintentional radiators in subpart B.

§ 15.313 Measurement procedures.

Measurements must be made in accordance with subpart A, except where specific procedures are specified in subpart D. If no guidance is provided, the measurement procedure must be in accordance with good engineering practice.

§ 15.315 Conducted limits.

An unlicensed PCS device that is designed to be connected to the public utility (AC) power line must meet the limits specified in § 15.207.

§ 15.317 Antenna requirement.

An unlicensed PCS device must meet the antenna requirement of § 15.203.

§ 15.319 General technical requirements.

(a) [Reserved]

(b) All transmissions must use only digital modulation techniques. Both asynchronous and isochronous operations are permitted within the 1920–1930 MHz band.

(c) Peak transmit power shall not exceed 100 microwatts multiplied by the square root of the emission bandwidth in hertz. Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage. The measurement results shall be properly adjusted for

any instrument limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, sensitivity, etc., so as to obtain a true peak measurement for the emission in question over the full bandwidth of the channel.

(d) Power spectral density shall not exceed 3 milliwatts in any 3 kHz bandwidth as measured with a spectrum analyzer having a resolution bandwidth of 3 kHz.

(e) The peak transmit power shall be reduced by the amount in decibels that the maximum directional gain of the antenna exceeds 3 dBi.

(f) The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. The provisions in this section are not intended to preclude transmission of control and signaling information or use of repetitive codes used by certain digital technologies to complete frame or burst intervals.

(g) Notwithstanding other technical requirements specified in this subpart, attenuation of emissions below the general emission limits in §15.209 is not required.

(h) Where there is a transition between limits, the tighter limit shall apply at the transition point.

(i) Radio frequency devices operating under the provisions of this part are subject to the radio frequency radiation exposure requirements specified in §§1.1307(b), 1.1310, 2.1091, and 2.1093 of this chapter, as appropriate. All equipment shall be considered to operate in a ''general population/uncontrolled'' environment. Applications for equipment authorization of mobile or portable devices operating under this section must contain a statement confirming compliance with these requirements. Technical information showing the basis for this statement must be submitted to the Commission upon request.

[58 FR 59180, Nov. 8, 1993, as amended at 59 FR 32852, June 24, 1994; 59 FR 40835, Aug. 10, 1994; 60 FR 13073, Mar. 10, 1995; 61 FR 41018, Aug. 7, 1996; 69 FR 62621, Oct. 27, 2004; 69 FR 77949, Dec. 29, 2004; 77 FR 43013, July 23, 2012; 85 FR 18149, Apr. 1, 2020]

§15.321 [Reserved]

§15.323 Specific requirements for devices operating in the 1920–1930 MHz band.

(a) Operation shall be contained within the 1920–1930 MHz band. The emission bandwidth shall be less than 2.5 MHz. The power level shall be as specified in §15.319(c), but in no event shall the emission bandwidth be less than 50 kHz.

(b) [Reserved]

(c) Devices must incorporate a mechanism for monitoring the time and spectrum windows that its transmission is intended to occupy. The following criteria must be met:

(1) Immediately prior to initiating transmission, devices must monitor the combined time and spectrum windows in which they intend to transmit for a period of at least 10 milliseconds for systems designed to use a 10 milliseconds or shorter frame period or at least 20 milliseconds for systems designed to use a 20 milliseconds frame period.

(2) The monitoring threshold must not be more than 30 dB above the thermal noise power for a bandwidth equivalent to the emission bandwidth used by the device.

(3) If no signal above the threshold level is detected, transmission may commence and continue with the same emission bandwidth in the monitored time and spectrum windows without further monitoring. However, occupation of the same combined time and spectrum windows by a device or group of cooperating devices continuously over a period of time longer than 8 hours is not permitted without repeating the access criteria.

(4) Once access to specific combined time and spectrum windows is obtained an acknowledgment from a system participant must be received by the initiating transmitter within one second or transmission must cease. Periodic acknowledgments must be received at least every 30 seconds or transmission must cease. Channels used exclusively for control and signaling information may transmit continuously for 30 seconds without receiving an acknowledgment, at which time the access criteria must be repeated.

(5) If access to spectrum is not available as determined by the above, and a minimum of 20 duplex system access channels are defined for the system, the time and spectrum windows with the lowest power level may be accessed. A device utilizing the provisions of this paragraph must have monitored all access channels defined for its system within the last 10 seconds and must verify, within the 20 milliseconds (40 milliseconds for devices designed to use a 20 milliseconds frame period) immediately preceding actual channel access that the detected power of the selected time and spectrum windows is no higher than the previously detected value. The power measurement resolution for this comparison must be accurate to within 6 dB. No device or group of co-operating devices located within 1 meter of each other shall during any frame period occupy more than 6 MHz of aggregate bandwidth, or alternatively, more than one third of the time and spectrum windows defined by the system.

(6) If the selected combined time and spectrum windows are unavailable, the device may either monitor and select different windows or seek to use the same windows after waiting an amount of time, randomly chosen from a uniform random distribution between 10 and 150 milliseconds, commencing when the channel becomes available.

(7) The monitoring system bandwidth must be equal to or greater than the emission bandwidth of the intended transmission and have a maximum reaction time less than 50xSQRT (1.25/emission bandwidth in MHz) microseconds for signals at the applicable threshold level but shall not be required to be less than 50 microseconds. If a signal is detected that is 6 dB or more above the applicable threshold level, the maximum reaction time shall be 35xSQRT (1.25/emission bandwidth in MHz) microseconds but shall not be required to be less than 35 microseconds.

(8) The monitoring system shall use the same antenna used for transmission, or an antenna that yields equivalent reception at that location.

(9) Devices that have a power output lower than the maximum permitted under this subpart may increase their monitoring detection threshold by one decibel for each one decibel that the transmitter power is below the maximum permitted.

(10) An initiating device may attempt to establish a duplex connection by monitoring both its intended transmit and receive time and spectrum windows. If both the intended transmit and receive time and spectrum windows meet the access criteria, then the initiating device can initiate a transmission in the intended transmit time and spectrum window. If the power detected by the responding device can be decoded as a duplex connection signal from the initiating device, then the responding device may immediately begin transmitting on the receive time and spectrum window monitored by the initiating device.

(11) An initiating device that is prevented from monitoring during its intended transmit window due to monitoring system blocking from the transmissions of a co-located (within one meter) transmitter of the same system, may monitor the portions of the time and spectrum windows in which they intend to receive over a period of at least 10 milliseconds. The monitored time and spectrum window must total at least 50 percent of the 10 millisecond frame interval and the monitored spectrum must be within 1.25 MHz of the center frequency of channel(s) already occupied by that device or co-located co-operating devices. If the access criteria is met for the intended receive time and spectrum window under the above conditions, then transmission in the intended transmit window by the initiating device may commence.

(12) The provisions of (c)(10) or (c)(11) of this section shall not be used to extend the range of spectrum occupied over space or time for the purpose of denying fair access to spectrum to other devices.

(d) Emissions outside the band shall be attenuated below a reference power of 112 milliwatts as follows: 30 dB between the band and 1.25 MHz above or below the band; 50 dB between 1.25 and 2.5 MHz above or below the band; and 60 dB at 2.5 MHz or greater above or below the band. Emissions inside the band must comply with the following emission mask: In the bands between 1B

and 2B measured from the center of the emission bandwidth the total power emitted by the device shall be at least 30 dB below the transmit power permitted for that device; in the bands between 2B and 3B measured from the center of the emission bandwidth the total power emitted by an intentional radiator shall be at least 50 dB below the transmit power permitted for that radiator; in the bands between 3B and the band edge the total power emitted by an intentional radiator in the measurement bandwidth shall be at least 60 dB below the transmit power permitted for that radiator. B'' is defined as the emission bandwidth of the device in hertz. Compliance with the emission limits is based on the use of measurement instrumentation employing peak detector function with an instrument resolution bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.

(e) The frame period (a set of consecutive time slots in which the position of each time slot can be identified by reference to a synchronizing source) of an intentional radiator operating in this band shall be 20 milliseconds or 10 milliseconds/X where X is a positive whole number. Each device that implements time division for the purposes of maintaining a duplex connection on a given frequency carrier shall maintain a frame repetition rate with a frequency stability of at least 50 parts per million (ppm). Each device which further divides access in time in order to support multiple communication links on a given frequency carrier shall maintain a frame repetition rate with a frequency stability of at least 10 ppm. The jitter (time-related, abrupt, spurious variations in the duration of the frame interval) introduced at the two ends of such a communication link shall not exceed 25 microseconds for any two consecutive transmissions. Transmissions shall be continuous in every time and spectrum window during the frame period defined for the device.

(f) The frequency stability of the carrier frequency of the intentional radiator shall be maintained within ±10 ppm over 1 hour or the interval between channel access monitoring, whichever is shorter. The frequency stability shall be maintained over a temperature variation of −20° to + 50 °C at normal supply voltage, and over a variation in the primary supply voltage of 85 percent to 115 percent of the rated supply voltage at a temperature of 20 °C. For equipment that is capable only of operating from a battery, the frequency stability tests shall be performed using a new battery without any further requirement to vary supply voltage.

[58 FR 59180, Nov. 8, 1993; 59 FR 15269, Mar. 31, 1994. Redesignated at 59 FR 32852, June 24, 1994, as amended at 59 FR 32853, June 24, 1994; 59 FR 40835, Aug. 10, 1994; 59 FR 55373, Nov. 7, 1994; 60 FR 3303, Jan. 13, 1995; 69 FR 62621, Oct. 27, 2004; 77 FR 43013, July 23, 2012]

Subpart E—Unlicensed National Information Infrastructure Devices

§ 15.401 Scope.

This subpart sets out the regulations for Unlicensed National Information Infrastructure (U–NII) devices operating in the 5.15–5.35 GHz, 5.47–5.895 GHz bands, and 5.925–7.125 GHz bands.

[86 FR 23295, May 3, 2021]

§ 15.403 Definitions.

Access Point (AP). A U–NII transceiver that operates either as a bridge in a peer-to-peer connection or as a connector between the wired and wireless segments of the network or as a relay between wireless network segments.

Automated Frequency Coordination (AFC) System. A system that automatically determines and provides lists of which frequencies are available for use by standard power access points operating in the 5.925–6.425 GHz and 6.525–6.875 GHz bands.

Available Channel. A radio channel on which a *Channel Availability Check* has not identified the presence of a radar.

Average Symbol Envelope Power. The average symbol envelope power is the average, taken over all symbols in the signaling alphabet, of the envelope power for each symbol.

Channel Availability Check. A check during which the U–NII device listens

on a particular radio channel to identify whether there is a radar operating on that radio channel.

Channel Move Time. The time needed by a U–NII device to cease all transmissions on the current channel upon detection of a radar signal above the DFS detection threshold.

Client Device. A U–NII device whose transmissions are generally under the control of an access point and is not capable of initiating a network

Contention-based protocol. A protocol that allows multiple users to share the same spectrum by defining the events that must occur when two or more transmitters attempt to simultaneously access the same channel and establishing rules by which a transmitter provides reasonable opportunities for other transmitters to operate. Such a protocol may consist of procedures for initiating new transmissions, procedures for determining the state of the channel (available or unavailable), and procedures for managing retransmissions in the event of a busy channel.

Digital modulation. The process by which the characteristics of a carrier wave are varied among a set of predetermined discrete values in accordance with a digital modulating function as specified in document ANSI C63.17–1998.

Dynamic Frequency Selection (DFS) is a mechanism that dynamically detects signals from other systems and avoids co-channel operation with these systems, notably radar systems.

DFS Detection Threshold. The required detection level defined by detecting a received signal strength (RSS) that is greater than a threshold specified, within the U–NII device channel bandwidth.

Emission bandwidth. For purposes of this subpart the emission bandwidth is determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier.

Fixed client device. For the purpose of this subpart, a client device intended as customer premise equipment that is permanently attached to a structure, operates only on channels provided by an AFC, has a geolocation capability, and complies with antenna pointing angle requirements.

Indoor Access Point. For the purpose of this subpart, an access point that operates in the 5.850–5.895 GHz or the 5.925–7.125 GHz band, is supplied power from a wired connection, has an integrated antenna, is not battery powered, and does not have a weatherized enclosure. Indoor access point devices must bear the following statement in a conspicuous location on the device and in the user's manual: FCC regulations restrict operation of this device to indoor use only.

In-Service Monitoring. A mechanism to check a channel in use by the U–NII device for the presence of a radar.

Non-Occupancy Period. The required period in which, once a channel has been recognized as containing a radar signal by a U–NII device, the channel will not be selected as an available channel.

Operating Channel. Once a U–NII device starts to operate on an Available Channel then that channel becomes the Operating Channel.

Maximum Power Spectral Density. The maximum power spectral density is the maximum power spectral density, within the specified measurement bandwidth, within the U–NII device operating band.

Maximum Conducted Output Power. The total transmit power 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.

Power Spectral Density. The power spectral density is the total energy output per unit bandwidth from a pulse or sequence of pulses for which the transmit power is at its maximum level, divided by the total duration of

the pulses. This total time does not include the time between pulses during which the transmit power is off or below its maximum level.

Pulse. A pulse is a continuous transmission of a sequence of modulation symbols, during which the average symbol envelope power is constant.

RLAN. Radio Local Area Network.

Standard Power Access Point. An access point that operates in the 5.925–6.425 GHz and 6.525–6.875 GHz bands pursuant to direction from an Automated Frequency Coordination System.

Subordinate Device. For the purpose of this subpart, a device that operates in the 5.850–5.895 GHz band or in the 5.925–7.125 GHz band under the control of an Indoor Access Point, is supplied power from a wired connection, has an integrated antenna, is not battery powered, does not have a weatherized enclosure, and does not have a direct connection to the internet. Subordinate devices must not be used to connect devices between separate buildings or structures. Subordinate devices must be authorized under certification procedures in part 2 of this chapter. Modules may not be certified as subordinate devices.

Transmit Power Control (TPC). A feature that enables a U–NII device to dynamically switch between several transmission power levels in the data transmission process.

U–NII devices. Intentional radiators operating in the frequency bands 5.15–5.35 GHz, 5.47–5.895 GHz, and 5.925–7.125 GHz that use wideband digital modulation techniques and provide a wide array of high data rate mobile and fixed communications for individuals, businesses, and institutions.

[85 FR 31410, May 26, 2020, as amended at 86 FR 23295, May 3, 2021]

§ 15.405 Cross reference.

(a) The provisions of subparts A, B, and C of this part apply to unlicensed U-NII devices, except where specific provisions are contained in subpart E. Manufacturers should note that this includes the provisions of §§ 15.203 and 15.205.

(b) The requirements of subpart E apply only to the radio transmitter contained in the U-NII device. Other aspects of the operation of a U-NII device may be subject to requirements contained elsewhere in this chapter. In particular, a U-NII device that includes digital circuitry not directly associated with the radio transmitter also is subject to the requirements for unintentional radiators in subpart B.

[63 FR 40835, July 31, 1998]

§ 15.407 General technical requirements.

(a) *Power limits:*

(1) For the band 5.15–5.25 GHz.

(i) For an outdoor access point operating in the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(ii) For an indoor access point operating in the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(iii) For fixed point-to-point access points operating in the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. Fixed point-to-point U–NII devices may employ antennas with directional gain up to 23 dBi without any

corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U–NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(iv) For client devices in the 5.15–5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(2) For the 5.25–5.35 GHz and 5.47–5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(3) *For the band 5.725–5.895 GHz:* (i) For the band 5.725–5.850 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500–kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U–NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U–NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(ii) For an indoor access point operating in the 5.850–5.895 GHz band, the maximum power spectral density must not exceed 20 dBm e.i.r.p. in any 1–megahertz band. In addition, the maximum e.i.r.p. over the frequency band of operation must not exceed 36 dBm. Indoor access points operating on a channel that spans the 5.725–5.850 GHz and 5.850–5.895 GHz bands must not exceed an e.i.r.p. of 36 dBm.

(iii) For client devices operating under the control of an indoor access point in the 5.850–5.895 GHz band, the maximum power spectral density must not exceed 14 dBm e.i.r.p. in any 1-megahertz band, and the maximum e.i.r.p. over the frequency band of operation must not exceed 30 dBm. Client devices operating on a channel that spans the 5.725–5.850 GHz and 5.850–5.895 GHz bands must not exceed an e.i.r.p. of 30 dBm.

(iv) For a subordinate device operating under the control of an indoor access point in the 5.850–5.895 GHz band, the maximum power spectral density must not exceed 20 dBm e.i.r.p in any 1–megahertz band, and the maximum e.i.r.p. over the frequency band of operation must not exceed 36 dBm.

(v) In the 5.850–5.895 GHz band, client devices must operate under the control of an indoor access point. In all cases, an exception exists for transmitting

brief messages to an access point when attempting to join its network after detecting a signal that confirms that an access point is operating on a particular channel. Access points may connect to other access points. Client devices are prohibited from connecting directly to another client device.

NOTE TO PARAGRAPH (a)(3): The Commission strongly recommends that parties employing U–NII devices to provide critical communications services should determine if there are any nearby Government radar systems that could affect their operation.

(4) For a standard power access point and fixed client device operating in the 5.925–6.425 GHz and 6.525–6.875 GHz bands, the maximum power spectral density must not exceed 23 dBm e.i.r.p in any 1-megahertz band. In addition, the maximum e.i.r.p. over the frequency band of operation must not exceed 36 dBm. For outdoor devices, the maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(5) For an indoor access point operating in the 5.925–7.125 GHz band, the maximum power spectral density must not exceed 5 dBm e.i.r.p. in any 1-megahertz band. In addition, the maximum e.i.r.p. over the frequency band of operation must not exceed 30 dBm.

(6) For a subordinate device operating under the control of an indoor access point in the 5.925–7.125 GHz band, the maximum power spectral density must not exceed 5 dBm e.i.r.p in any 1-megahertz band, and the maximum e.i.r.p. over the frequency band of operation must not exceed 30 dBm.

(7) For client devices, except for fixed client devices as defined in this subpart, operating under the control of a standard power access point in 5.925–6.425 GHz and 6.525–6.875 GHz bands, the maximum power spectral density must not exceed 17 dBm e.i.r.p. in any 1-megahertz band, and the maximum e.i.r.p. over the frequency band of operation must not exceed 30 dBm and the device must limit its power to no more than 6 dB below its associated standard power access point's authorized transmit power.

(8) For client devices operating under the control of an indoor access point in the 5.925–7.125 GHz bands, the maximum power spectral density must not exceed −1 dBm e.i.r.p. in any 1-megahertz band, and the maximum e.i.r.p. over the frequency band of operation must not exceed 24 dBm.

(9) Access points operating under the provisions of paragraphs (a)(5) and (a)(6) of this section must employ a permanently attached integrated antenna.

(10) The maximum transmitter channel bandwidth for U–NII devices in the 5.925–7.125 GHz band is 320 megahertz.

(11) The maximum conducted output power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage.

(12) Power spectral density measurement: The maximum power spectral density is measured as a conducted emission by direct connection of a calibrated test instrument to the equipment under test. If the device cannot be connected directly, alternative techniques acceptable to the Commission may be used. Measurements in the 5.725–5.895 GHz band are made over a reference bandwidth of 500 kHz or the 26 dB emission bandwidth of the device, whichever is less. Measurements in all other bands are made over a bandwidth of 1 MHz or the 26 dB emission bandwidth of the device, whichever is less. A narrower resolution bandwidth can be used, provided that the measured power is integrated over the full reference bandwidth.

(b) *Undesirable emission limits.* Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

(1) For transmitters operating in the 5.15–5.25 GHz band: All emissions outside of the 5.15–5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

(2) For transmitters operating in the 5.25–5.35 GHz band: All emissions outside of the 5.15–5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

(3) For transmitters operating in the 5.47–5.725 GHz band: All emissions outside of the 5.47–5.725 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

(4) For transmitters operating solely in the 5.725–5.850 GHz band:

(i) All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

(ii) Devices certified before March 2, 2017 with antenna gain greater than 10 dBi may demonstrate compliance with the emission limits in §15.247(d), but manufacturing, marketing and importing of devices certified under this alternative must cease by March 2, 2018. Devices certified before March 2, 2018 with antenna gain of 10 dBi or less may demonstrate compliance with the emission limits in §15.247(d), but manufacturing, marketing and importing of devices certified under this alternative must cease before March 2, 2020.

(5) For transmitters operating solely in the 5.850–5.895 GHz band or operating on a channel that spans across 5.725–5.895 GHz:

(i) For an indoor access point or subordinate device, all emissions at or above 5.895 GHz shall not exceed an e.i.r.p. of 15 dBm/MHz and shall decrease linearly to an e.i.r.p. of −7 dBm/MHz at or above 5.925 GHz.

(ii) For a client device, all emissions at or above 5.895 GHz shall not exceed an e.i.r.p. of −5 dBm/MHz and shall decrease linearly to an e.i.r.p. of −27 dBm/MHz at or above 5.925 GHz.

(iii) For a client device or indoor access point or subordinate device, all emissions below 5.725 GHz shall not exceed an e.i.r.p. of −27 dBm/MHz at 5.65 GHz increasing linearly to 10 dBm/MHz at 5.7 GHz, and from 5.7 GHz increasing linearly to a level of 15.6 dBm/MHz at 5.72 GHz, and from 5.72 GHz increasing linearly to a level of 27 dBm/MHz at 5.725 GHz.

(6) For transmitters operating within the 5.925–7.125 GHz band: Any emissions outside of the 5.925–7.125 GHz band must not exceed an e.i.r.p. of −27 dBm/MHz.

(7) For transmitters operating within the 5.925–7.125 GHz bands: Power spectral density must be suppressed by 20 dB at 1 MHz outside of channel edge, by 28 dB at one channel bandwidth from the channel center, and by 40 dB at one- and one-half times the channel bandwidth away from channel center. At frequencies between one megahertz outside an unlicensed device's channel edge and one channel bandwidth from the center of the channel, the limits must be linearly interpolated between 20 dB and 28 dB suppression, and at frequencies between one and one- and one-half times an unlicensed device's channel bandwidth, the limits must be linearly interpolated between 28 dB and 40 dB suppression. Emissions removed from the channel center by more than one- and one-half times the channel bandwidth must be suppressed by at least 40 dB.

(8) The emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.

(9) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in §15.207.

(10) The provisions of §15.205 apply to intentional radiators operating under this section.

(11) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the upper and lower frequency band edges as the design of the equipment permits.

(c) The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude the transmission of control or signalling information or the use of repetitive codes used by certain digital technologies to complete frame or burst intervals. Applicants shall include in their application for equipment authorization a description of how this requirement is met.

(d) *Operational restrictions for 6 GHz U–NII devices.* (1) Operation of standard access points, fixed client devices and

indoor access points in the 5.925–7.125 GHz band is prohibited on oil platforms, cars, trains, boats, and aircraft, except that indoor access points are permitted to operate in the 5.925–6.425 GHz bands in large aircraft while flying above 10,000 feet.

(2) Operation of transmitters in the 5.925–7.125 GHz band is prohibited for control of or communications with unmanned aircraft systems.

(3) Transmitters operating under the provisions of paragraphs (a)(5), (a)(6), and (a)(8) of this section are limited to indoor locations.

(4) In the 5.925–7.125 GHz band, indoor access points and subordinate devices must bear the following statement in a conspicuous location on the device and in the user's manual: FCC regulations restrict operation of this device to indoor use only. The operation of this device is prohibited on oil platforms, cars, trains, boats, and aircraft, except that operation of this device is permitted in large aircraft while flying above 10,000 feet.

(5) In the 5.925–7.125 GHz band, client devices, except fixed client devices, must operate under the control of a standard power access point, indoor access point or subordinate devices; Subordinate devices must operate under the control of an indoor access point. In all cases, an exception exists for transmitting brief messages to an access point when attempting to join its network after detecting a signal that confirms that an access point is operating on a particular channel. Access points and subordinate devices may connect to other access points or subordinate devices. Client devices are prohibited from connecting directly to another client device.

(6) Indoor access points, subordinate devices and client devices operating in the 5.925–7.125 GHz band must employ a contention-based protocol.

(7) Fixed client devices may only connect to a standard power access point.

(e) Within the 5.725–5.850 GHz and 5.850–5.895 GHz bands, the minimum 6 dB bandwidth of U–NII devices shall be at least 500 kHz.

(f) Radio frequency devices operating under the provisions of this part are subject to the radio frequency radiation exposure requirements specified in §§1.1307(b), 1.1310, 2.1091, and 2.1093 of this chapter, as appropriate. All equipment shall be considered to operate in a ''general population/uncontrolled'' environment. Applications for equipment authorization of mobile or portable devices operating under this section must contain a statement confirming compliance with these requirements. Technical information showing the basis for this statement must be submitted to the Commission upon request.

(g) Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the users manual.

(h) Transmit Power Control (TPC) and Dynamic Frequency Selection (DFS).

(1) Transmit power control (TPC). U-NII devices operating in the 5.25–5.35 GHz band and the 5.47–5.725 GHz band shall employ a TPC mechanism. The U-NII device is required to have the capability to operate at least 6 dB below the mean EIRP value of 30 dBm. A TPC mechanism is not required for systems with an e.i.r.p. of less than 500 mW.

(2) Radar Detection Function of Dynamic Frequency Selection (DFS). U–NII devices operating with any part of its 26 dB emission bandwidth in the 5.25–5.35 GHz and 5.47–5.725 GHz bands shall employ a DFS radar detection mechanism to detect the presence of radar systems and to avoid co-channel operation with radar systems. Operators shall only use equipment with a DFS mechanism that is turned on when operating in these bands. The device must sense for radar signals at 100 percent of its emission bandwidth. The minimum DFS detection threshold for devices with a maximum e.i.r.p. of 200 mW to 1 W is −64 dBm. For devices that operate with less than 200 mW e.i.r.p. and a power spectral density of less than 10 dBm in a 1 MHz band, the minimum detection threshold is −62 dBm. The detection threshold is the received power averaged over 1 microsecond referenced to a 0 dBi antenna. For the initial channel setting, the manufacturers shall be permitted to

provide for either random channel selection or manual channel selection.

(i) Operational Modes. The DFS requirement applies to the following operational modes:

(A) The requirement for channel availability check time applies in the master operational mode.

(B) The requirement for channel move time applies in both the master and slave operational modes.

(ii) Channel Availability Check Time. A U–NII device shall check if there is a radar system already operating on the channel before it can initiate a transmission on a channel and when it has to move to a new channel. The U–NII device may start using the channel if no radar signal with a power level greater than the interference threshold values listed in paragraph (h)(2) of this section, is detected within 60 seconds.

(iii) Channel Move Time. After a radar's presence is detected, all transmissions shall cease on the operating channel within 10 seconds. Transmissions during this period shall consist of normal traffic for a maximum of 200 ms after detection of the radar signal. In addition, intermittent management and control signals can be sent during the remaining time to facilitate vacating the operating channel.

(iv) Non-occupancy Period. A channel that has been flagged as containing a radar system, either by a channel availability check or in-service monitoring, is subject to a non-occupancy period of at least 30 minutes. The non-occupancy period starts at the time when the radar system is detected.

(i) *Device Security*. All U–NII devices must contain security features to protect against modification of software by unauthorized parties.

(1) Manufacturers must implement security features in any digitally modulated devices capable of operating in any of the U–NII bands, so that third parties are not able to reprogram the device to operate outside the parameters for which the device was certified. The software must prevent the user from operating the transmitter with operating frequencies, output power, modulation types or other radio frequency parameters outside those that were approved for the device. Manufacturers may use means including, but not limited to the use of a private network that allows only authenticated users to download software, electronic signatures in software or coding in hardware that is decoded by software to verify that new software can be legally loaded into a device to meet these requirements and must describe the methods in their application for equipment authorization.

(2) Manufacturers must take steps to ensure that DFS functionality cannot be disabled by the operator of the U–NII device.

(j) *Operator Filing Requirement:* Before deploying an aggregate total of more than one thousand outdoor access points within the 5.15–5.25 GHz band, parties must submit a letter to the Commission acknowledging that, should harmful interference to licensed services in this band occur, they will be required to take corrective action. Corrective actions may include reducing power, turning off devices, changing frequency bands, and/or further reducing power radiated in the vertical direction. This material shall be submitted to Laboratory Division, Office of Engineering and Technology, Federal Communications Commission, 7435 Oakland Mills Road, Columbia, MD 21046. Attn: U–NII Coordination, or via Web site at *https://www.fcc.gov/labhelp* with the SUBJECT LINE: ''U–NII–1 Filing''.

(k) *Automated frequency coordination (AFC) system.* (1) Standard power access points and fixed client devices operating under paragraph (a)(4) of this section must access an AFC system to determine the available frequencies and the maximum permissible power in each frequency range at their geographic coordinates prior to transmitting. Standard power access points and fixed client devices may transmit only on frequencies and at power levels that an AFC system indicates as available.

(2) An AFC system must be capable of determining the available frequencies in steps of no greater than 3 dB below the maximum permissible e.i.r.p of 36 dBm, and down to at least a minimum level of 21 dBm.

(3) An AFC system must obtain information on protected services within the 5.925–6.425 GHz and 6.525–6.875 GHz bands from Commission databases and

use that information to determine frequency availability for standard power access points and fixed client devices based on protection criteria specified in paragraph (l)(2) of this section.

(4) An AFC system must use the information supplied by standard power access points and fixed client devices during registration, as set forth in this section, to determine available frequencies and the maximum permissible power in each frequency range for a standard power access point at any given location. All such determinations and assignments must be made in a non-discriminatory manner, consistent with this part.

(5) An AFC system must store registered information in a secure database until a standard power access point or fixed client device ceases operation at a location. For the purpose of this paragraph, a standard power access point or fixed client device is considered to have ceased operation when that device has not contacted the AFC system for more than three months to verify frequency availability information.

(6) An AFC system must verify the validity of the FCC identifier (FCC ID) of any standard power access point and fixed client device seeking access to its services prior to authorizing the access point to begin operation. A list of standard power access points with valid FCC IDs and the FCC IDs of those devices must be obtained from the Commission's Equipment Authorization System.

(7) The general purposes of AFC system include:

(i) Enacting all policies and procedures developed by the AFC system operators pursuant to this section.

(ii) Registering, authenticating, and authorizing standard power access point and fixed client device operations, individually or through a network element device representing multiple standard power access points from the same operating network.

(iii) Providing standard power access points and fixed client devices with the permissible frequencies and the maximum permissible power in each frequency range at their locations using propagation models and interference protection criteria defined in paragraph (l) of this section.

(iv) Obtaining updated protected sites information from Commission databases.

(8) Standard power access points and fixed client devices:

(i) Must register with and be authorized by an AFC system prior to the standard power access point and fixed client device's initial service transmission, or after a standard power access point or fixed client device changes location, and must obtain a list of available frequencies and the maximum permissible power in each frequency range at the standard power access point and fixed client device's location.

(ii) Must register with the AFC system by providing the following parameters: Geographic coordinates (latitude and longitude referenced to North American Datum 1983 (NAD 83)), antenna height above ground level, FCC identification number, and unique manufacturer's serial number. If any of these parameters change, the standard power access point or fixed client device must provide updated parameters to the AFC system. All information provided by the standard power access point and the fixed client device to the AFC system must be true, complete, correct, and made in good faith.

(iii) Must provide the registration information to the AFC system either directly and individually or by a network element representing multiple standard power access points or fixed client devices from the same operating network. The standard power access point, fixed client device or its network element must register with the AFC system via any communication link, wired or wireless, outside 5.925–6.425 GHz and 6.525–6.875 GHz bands.

(iv) Must contact an AFC system at least once per day to obtain the latest list of available frequencies and the maximum permissible power the standard power access point or fixed client device may operate with on each frequency at the standard power access point and fixed client device's location. If the standard power access point or fixed client device fails to successfully contact the AFC system during any given day, the standard power access

point or fixed client device may continue to operate until 11:59 p.m. of the following day at which time it must cease operations until it re-establishes contact with the AFC system and re-verifies its list of available frequencies and associated power levels.

(v) Must incorporate adequate security measures to prevent it from accessing AFC systems not approved by the FCC and to ensure that unauthorized parties cannot modify the device to operate in a manner inconsistent with the rules and protection criteria set forth in this section and to ensure that communications between standard power access points, fixed client devices and AFC systems are secure to prevent corruption or unauthorized interception of data. Additionally, the AFC system must incorporate security measures to protect against unauthorized data input or alteration of stored data, including establishing communications authentication procedures between client devices and standard power access points.

(9) Standard power access point and fixed client device geo-location capability:

(i) A standard power access point and a fixed client device must include either an internal geo-location capability or an integrated capability to securely connect to an external geolocation devices or service, to automatically determine the standard power access point's geographic coordinates and location uncertainty (in meters), with a confidence level of 95%. The standard power access point and fixed client device must report such coordinates and location uncertainty to an AFC system at the time of activation from a power-off condition.

(ii) An external geo-location source may be connected to a standard power access point or fixed client device through either a wired or a wireless connection. A single geo-location source may provide location information to multiple standard power access points or fixed client devices.

(iii) An external geo-location source must be connected to a standard power access point or fixed client device using a secure connection that ensures that only an external geo-location source approved for use with a standard power access point or fixed client device provides geographic coordinates to that standard power access point or fixed client device. Alternatively, an extender cable may be used to connect a remote receive antenna to a geo-location receiver within a standard power access point or fixed client device.

(iv) The applicant for certification of a standard power access point or fixed client device must demonstrate the accuracy of the geo-location method used and the location uncertainty. For standard power access points and fixed client devices that may not use an internal geo-location capability, this uncertainty must account for the accuracy of the geo-location source and the separation distance between such source and the standard power access point or fixed client device.

(10) An AFC system operator will be designated for a five-year term which can be renewed by the Commission based on the operator's performance during the term. If an AFC system ceases operation, it must provide at least 30-days' notice to the Commission and transfer any registration data to another AFC system operator.

(11) The Commission will designate one or more AFC system operators to provide service in the 5.925–6.425 GHz and 6.525–6.875 GHz bands.

(12) The Commission may permit the functions of an AFC system, such as a data repository, registration, and query services, to be divided among multiple entities; however, entities designated as AFC system operators will be held accountable for the overall functioning and system administration of the AFC system.

(13) The AFC system must ensure that all communications and interactions between the AFC system and standard power access points and fixed client devices are accurate and secure and that unauthorized parties cannot access or alter the database, or the list of available frequencies and associated powers sent to a standard power access point.

(14) An AFC system must implement the terms of international agreements with Mexico and Canada.

(15) Each AFC system operator designated by the Commission must:

(i) Maintain a regularly updated AFC system database that contains the information described in this section, including incumbent's information and standard power access points and fixed client devices registration parameters.

(ii) Establish and follow protocols and procedures to ensure compliance with the rules set forth in this part.

(iii) Establish and follow protocols and procedures sufficient to ensure that all communications and interactions between the AFC system and standard power access points and fixed client devices are accurate and secure and that unauthorized parties cannot access or alter the AFC system, or the information transmitted from the AFC system to standard power access points or fixed client devices.

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

(v) Respond in a timely manner to verify, correct, or remove, as appropriate, data in the event that the Commission or a party presents to the AFC system Operator a claim of inaccuracies in the AFC system. This requirement applies only to information that the Commission requires to be stored in the AFC system.

(vi) Establish and follow protocols to comply with enforcement instructions from the Commission, including discontinuance of standard power access point operations in designated geographic areas.

(16) An AFC system operator may charge fees for providing service in registration and channel availability functions. The Commission may, upon request, review the fees and can require changes to those fees if the Commission finds them unreasonable.

(l) *Incumbent Protection by AFC system: Fixed Microwave Services.* A standard power access point or fixed client device must not cause harmful interference to fixed microwave services authorized to operate in the 5.925–6.425 GHz and 6.525–6.875 GHz bands. Based on the criteria set forth below, an AFC system must establish location and frequency-based exclusion zones (both co-channel and adjacent channel) around fixed microwave receivers operating in the 5.925–6.425 GHz and 6.525–6.875 GHz bands. Individual standard power access points and fixed client devices must not operate co-channel to fixed microwave system frequencies within co-channel exclusion zones, or on adjacent channel frequencies within adjacent channel exclusion zones.

(1) Propagation Models: Propagation models to determine the appropriate separation distance between a standard power access point or a fixed client device and an incumbent fixed microwave service receiver. For a separation distance:

(i) Up to 30 meters, the AFC system must use the free space path-loss model.

(ii) More than 30 meters and up to and including one kilometer, the AFC system must use the Wireless World Initiative New Radio phase II (WINNER II) model. The AFC system must use site-specific information, including buildings and terrain data, for determining the line-of-sight/non-line-of-sight path component in the WINNER II model, where such data is available. For evaluating paths where such data is not available, the AFC system must use a probabilistic model combining the line-of-sight path and non-line-of-sight path into a single path-loss as follows:

$$\text{Path-loss (L)} = \Sigma_i\, P(i) * L_i = P_{LOS} * L_{LOS} + P_{NLOS} * L_{NLOS},$$

where P_{LOS} is the probability of line-of-sight, L_{LOS} is the line-of-sight path loss, P_{NLOS} is the probability of non-line-of sight, L_{NLOS} is the non-line-of-sight path loss, and L is the combined path loss. The WINNER II path loss models include a formula to determine P_{LOS} as a function of antenna heights and distance. P_{NLOS} is equal to $(1-P_{LOS})$. In all cases, the AFC system will use the correct WINNER II parameters to match the morphology of the path between a standard power access point and a fixed microwave receiver (*i.e.*, Urban, Suburban, or Rural).

(iii) More than one kilometer, the AFC system must use Irregular Terrain Model (ITM) combined with the appropriate clutter model. To account for the effects of clutter, such as buildings and foliage, that the AFC system must combine the ITM with the ITU–R P.2108–0 (06/2017) clutter model for urban and suburban environments and

the ITU–R P.452–16 (07/2015) clutter model for rural environments. The AFC system should use the most appropriate clutter category for the local morphology when using ITU–R P.452–16. However, if detailed local information is not available, the ''Village Centre'' clutter category should be used. The AFC system must use 1 arc-second digital elevation terrain data and, for locations where such data is not available, the most granular available digital elevation terrain data.

(2) Interference Protection Criteria:

(i) The AFC system must use −6 dB I/N as the interference protection criteria in determining the size of the co-channel exclusion zone where I (interference) is the co-channel signal from the standard power access point or fixed client device at the fixed microwave service receiver, and N (noise) is background noise level at the fixed microwave service receiver.

(ii) The AFC system must use −6 dB I/N as the interference protection criteria in determining the size of the adjacent channel exclusion zone, where I (interference) is the signal from the standard power access point or fixed client device's out of channel emissions at the fixed microwave service receiver and N (noise) is background noise level at the fixed microwave service receiver. The adjacent channel exclusion zone must be calculated based on the emissions requirements of paragraph (b)(6) of this section.

(m) *Incumbent Protection by AFC system: Radio Astronomy Services.* The AFC system must enforce an exclusion zones to the following radio observatories that observe between 6650–6675.2 MHz: Arecibo Observatory, the Green Bank Observatory, the Very Large Array (VLA), the 10 Stations of the Very Long Baseline Array (VLBA), the Owens Valley Radio Observatory, and the Allen Telescope Array. The exclusion zone sizes are based on the radio line-of-sight and determined using ⅓ earth curvature and the following formula:

dkm_los = 4.12 * (sqrt(Htx) + sqrt(Hrx)),

where Htx is the height of the unlicensed standard power access point or fixed client device and Hrx is the height of the radio astronomy antenna in meters above ground level. Coordinate locations of the radio observatories are listed in section 2.106, notes US 131 and US 385 of this part.

(n) *Incumbent Protection by AFC system: Fixed-Satellite Services.* Standard power access points and fixed client devices located outdoors must limit their maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon to 21 dBm (125 mW) to protect fixed satellite services.

[63 FR 40836, July 31, 1998, as amended at 69 FR 2687, Jan. 20, 2004; 69 FR 54036, Sept. 7, 2004; 79 FR 24579, May 1, 2014; 79 FR 56988, Sept. 24, 2014; 79 FR 76903, Dec. 23, 2014; 81 FR 19901, Apr. 6, 2016; 85 FR 18149, Apr. 1, 2020; 85 FR 31411, May 26, 2020; 86 FR 23295, May 3, 2021]

Subpart F—Ultra-Wideband Operation

SOURCE: 67 FR 34856, May 16, 2002, unless otherwise noted.

§ 15.501 Scope.

This subpart sets out the regulations for unlicensed ultra-wideband transmission systems.

§ 15.503 Definitions.

(a) *UWB bandwidth.* For the purpose of this subpart, the UWB bandwidth is the frequency band bounded by the points that are 10 dB below the highest radiated emission, as based on the complete transmission system including the antenna. The upper boundary is designated f_H and the lower boundary is designated f_L. The frequency at which the highest radiated emission occurs is designated f_M.

(b) *Center frequency.* The center frequency, f_C, equals $(f_H + f_L)/2$.

(c) *Fractional bandwidth.* The fractional bandwidth equals $2(f_H - f_L)/(f_H + f_L)$.

(d) *Ultra-wideband (UWB) transmitter.* An intentional radiator that, at any point in time, has a fractional bandwidth equal to or greater than 0.20 or has a UWB bandwidth equal to or greater than 500 MHz, regardless of the fractional bandwidth.

(e) *Imaging system.* A general category consisting of ground penetrating radar systems, medical imaging systems,

wall imaging systems through-wall imaging systems and surveillance systems. As used in this subpart, imaging systems do not include systems designed to detect the location of tags or systems used to transfer voice or data information.

(f) *Ground penetrating radar (GPR) system.* A field disturbance sensor that is designed to operate only when in contact with, or within one meter of, the ground for the purpose of detecting or obtaining the images of buried objects or determining the physical properties within the ground. The energy from the GPR is intentionally directed down into the ground for this purpose.

(g) *Medical imaging system.* A field disturbance sensor that is designed to detect the location or movement of objects within the body of a person or animal.

(h) *Wall imaging system.* A field disturbance sensor that is designed to detect the location of objects contained within a ''wall'' or to determine the physical properties within the ''wall.'' The ''wall'' is a concrete structure, the side of a bridge, the wall of a mine or another physical structure that is dense enough and thick enough to absorb the majority of the signal transmitted by the imaging system. This category of equipment does not include products such as ''stud locators'' that are designed to locate objects behind gypsum, plaster or similar walls that are not capable of absorbing the transmitted signal.

(i) *Through-wall imaging system.* A field disturbance sensor that is designed to detect the location or movement of persons or objects that are located on the other side of an opaque structure such as a wall or a ceiling. This category of equipment may include products such as ''stud locators'' that are designed to locate objects behind gypsum, plaster or similar walls that are not thick enough or dense enough to absorb the transmitted signal.

(j) *Surveillance system.* A field disturbance sensor used to establish a stationary RF perimeter field that is used for security purposes to detect the intrusion of persons or objects.

(k) *EIRP.* Equivalent isotropically radiated power, *i.e.*, the product of the power supplied to the antenna and the antenna gain in a given direction relative to an isotropic antenna. The EIRP, in terms of dBm, can be converted to a field strength, in dBuV/m at 3 meters, by adding 95.2. As used in this subpart, EIRP refers to the highest signal strength measured in any direction and at any frequency from the UWB device, as tested in accordance with the procedures specified in §15.31(a) and 15.523 of this chapter.

(l) *Law enforcement, fire and emergency rescue organizations.* As used in this subpart, this refers to those parties eligible to obtain a license from the FCC under the eligibility requirements specified in §90.20(a)(1) of this chapter.

(m) *Hand held.* As used in this subpart, a hand held device is a portable device, such as a lap top computer or a PDA, that is primarily hand held while being operated and that does not employ a fixed infrastructure.

§15.505 Cross reference.

(a) Except where specifically stated otherwise within this subpart, the provisions of subparts A and B and of §§15.201 through 15.204 and 15.207 of subpart C of this part apply to unlicensed UWB intentional radiators. The provisions of §15.35(c) and 15.205 do not apply to devices operated under this subpart. The provisions of Footnote US 246 to the Table of Frequency Allocations contained in §2.106 of this chapter does not apply to devices operated under this subpart.

(b) The requirements of this subpart apply only to the radio transmitter, *i.e.*, the intentional radiator, contained in the UWB device. Other aspects of the operation of a UWB device may be subject to requirements contained elsewhere in this chapter. In particular, a UWB device that contains digital circuitry not directly associated with the operation of the transmitter also is subject to the requirements for unintentional radiators in subpart B of this part. Similarly, an associated receiver that operates (tunes) within the frequency range 30 MHz to 960 MHz is subject to the requirements in subpart B of this part.

§ 15.507 Marketing of UWB equipment.

In some cases, the operation of UWB devices is limited to specific parties, e.g., law enforcement, fire and rescue organizations operating under the auspices of a state or local government. The marketing of UWB devices must be directed solely to parties eligible to operate the equipment. The responsible party, as defined in §2.909 of this chapter, is responsible for ensuring that the equipment is marketed only to eligible parties. Marketing of the equipment in any other manner may be considered grounds for revocation of the grant of certification issued for the equipment.

§ 15.509 Technical requirements for ground penetrating radars and wall imaging systems.

(a) The UWB bandwidth of an imaging system operating under the provisions of this section must be below 10.6 GHz.

(b) Operation under the provisions of this section is limited to GPRs and wall imaging systems operated for purposes associated with law enforcement, fire fighting, emergency rescue, scientific research, commercial mining, or construction.

(1) Parties operating this equipment must be eligible for licensing under the provisions of part 90 of this chapter.

(2) The operation of imaging systems under this section requires coordination, as detailed in §15.525.

(c) A GPR that is designed to be operated while being hand held and a wall imaging system shall contain a manually operated switch that causes the transmitter to cease operation within 10 seconds of being released by the operator. In lieu of a switch located on the imaging system, it is permissible to operate an imaging system by remote control provided the imaging system ceases transmission within 10 seconds of the remote switch being released by the operator.

(d) The radiated emissions at or below 960 MHz from a device operating under the provisions of this section shall not exceed the emission levels in §15.209. The radiated emissions above 960 MHz from a device operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz:

Frequency in MHz	EIRP in dBm
960–1610	–65.3
1610–1990	–53.3
1990–3100	–51.3
3100–10600	–41.3
Above 10600	–51.3

(e) In addition to the radiated emission limits specified in the table in paragraph (d) of this section, UWB transmitters operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of no less than 1 kHz:

Frequency in MHz	EIRP in dBm
1164–1240	–75.3
1559–1610	–75.3

(f) For UWB devices where the frequency at which the highest radiated emission occurs, f_M, is above 960 MHz, there is a limit on the peak level of the emissions contained within a 50 MHz bandwidth centered on f_M. That limit is 0 dBm EIRP. It is acceptable to employ a different resolution bandwidth, and a correspondingly different peak emission limit, following the procedures described in §15.521.

[68 FR 19749, Apr. 22, 2003]

§ 15.510 Technical requirements for through-wall imaging systems.

(a) The UWB bandwidth of an imaging system operating under the provisions of this section must be below 960 MHz or the center frequency, f_C, and the frequency at which the highest radiated emission occurs, f_M, must be contained between 1990 MHz and 10600 MHz.

(b) Operation under the provisions of this section is limited to through-wall imaging systems operated by law enforcement, emergency rescue or firefighting organizations that are under the authority of a local or state government.

(c) For through-wall imaging systems operating with the UWB bandwidth below 960 MHz:

(1) Parties operating this equipment must be eligible for licensing under the provisions of part 90 of this chapter.

(2) The operation of these imaging systems requires coordination, as detailed in §15.525.

(3) The imaging system shall contain a manually operated switch that causes the transmitter to cease operation within 10 seconds of being released by the operator. In lieu of a switch located on the imaging system, it is permissible to operate an imaging system by remote control provided the imaging system ceases transmission within 10 seconds of the remote switch being released by the operator.

(4) The radiated emissions at or below 960 MHz shall not exceed the emission levels in §15.209. The radiated emissions above 960 MHz shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz:

Frequency in MHz	EIRP in dBm
960–1610	−65.3
1610–1990	−53.3
Above 1990	−51.3

(5) In addition to the radiated emission limits specified in the table in paragraph (c)(4) of this section, emissions from these imaging systems shall not exceed the following average limits when measured using a resolution bandwidth of no less than 1 kHz:

Frequency in MHz	EIRP in dBm
1164–1240	−75.3
1559–1610	−75.3

(d) For equipment operating with f_C and f_M between 1990 MHz and 10600 MHz:

(1) Parties operating this equipment must hold a license issued by the Federal Communications Commission to operate a transmitter in the Public Safety Radio Pool under part 90 of this chapter. The license may be held by the organization for which the UWB operator works on a paid or volunteer basis.

(2) This equipment may be operated only for law enforcement applications, the providing of emergency services, and necessary training operations.

(3) The radiated emissions at or below 960 MHz shall not exceed the emission levels in §15.209 of this chapter. The radiated emissions above 960 MHz shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz:

Frequency in MHz	EIRP in dBm
960–1610	−46.3
1610–10600	−41.3
Above 10600	−51.3

(4) In addition to the radiated emission limits specified in the paragraph (d)(3) of this section, emissions from these imaging systems shall not exceed the following average limits when measured using a resolution bandwidth of no less than 1 kHz:

Frequency in MHz	EIRP in dBm
1164–1240	−56.3
1559–1610	−56.3

(5) There is a limit on the peak level of the emissions contained within a 50 MHz bandwidth centered on the frequency at which the highest radiated emission occurs, f_M. That limit is 0 dBm EIRP. It is acceptable to employ a different resolution bandwidth, and a correspondingly different peak emission limit, following the procedures described in §15.521.

(e) Through-wall imaging systems operating under the provisions of this section shall bear the following or similar statement in a conspicuous location on the device: ''Operation of this device is restricted to law enforcement, emergency rescue and firefighter personnel. Operation by any other party is a violation of 47 U.S.C. 301 and could subject the operator to serious legal penalties.''

[68 FR 19750, Apr. 22, 2003, as amended at 85 FR 38740, June 26, 2020]

§15.511 Technical requirements for surveillance systems.

(a) The UWB bandwidth of an imaging system operating under the provisions of this section must be contained between 1990 MHz and 10,600 MHz.

(b) Operation under the provisions of this section is limited to fixed surveillance systems operated by law enforcement, fire or emergency rescue organizations or by manufacturers licensees, petroleum licensees or power licensees as defined in §90.7 of this chapter.

(1) Parties operating under the provisions of this section must be eligible

for licensing under the provisions of part 90 of this chapter.

(2) The operation of imaging systems under this section requires coordination, as detailed in §15.525.

(c) The radiated emissions at or below 960 MHz from a device operating under the provisions of this section shall not exceed the emission levels in §15.209. The radiated emissions above 960 MHz from a device operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz:

Frequency in MHz	EIRP in dBm
960–1610	−53.3
1610–1990	−51.3
1990–10600	−41.3
Above 10600	−51.3

(d) In addition to the radiated emission limits specified in the table in paragraph (c) of this section, UWB transmitters operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of no less than 1 kHz:

Frequency in MHz	EIRP in dBm
1164–1240	−63.3
1559–1610	−63.3

(e) There is a limit on the peak level of the emissions contained within a 50 MHz bandwidth centered on the frequency at which the highest radiated emission occurs, f_M. That limit is 0 dBm EIRP. It is acceptable to employ a different resolution bandwidth, and a correspondingly different peak emission limit, following the procedures described in §15.521.

(f) Imaging systems operating under the provisions of this section shall bear the following or similar statement in a conspicuous location on the device: ''Operation of this device is restricted to law enforcement, fire and rescue officials, public utilities, and industrial entities. Operation by any other party is a violation of 47 U.S.C. 301 and could subject the operator to serious legal penalties.''

[68 FR 19750, Apr. 22, 2003]

§15.513 Technical requirements for medical imaging systems.

(a) The UWB bandwidth of an imaging system operating under the provisions of this section must be contained between 3100 MHz and 10,600 MHz.

(b) Operation under the provisions of this section is limited to medical imaging systems used at the direction of, or under the supervision of, a licensed health care practitioner. The operation of imaging systems under this section requires coordination, as detailed in §15.525.

(c) A medical imaging system shall contain a manually operated switch that causes the transmitter to cease operation within 10 seconds of being released by the operator. In lieu of a switch located on the imaging system, it is permissible to operate an imaging system by remote control provided the imaging system ceases transmission within 10 seconds of the remote switch being released by the operator.

(d) The radiated emissions at or below 960 MHz from a device operating under the provisions of this section shall not exceed the emission levels in §15.209. The radiated emissions above 960 MHz from a device operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz:

Frequency in MHz	EIRP in dBm
960–1610	−65.3
1610–1990	−53.3
011990–3100	−51.3
3100–10600	−41.3
Above 10600	−51.3

(e) In addition to the radiated emission limits specified in the table in paragraph (d) of this section, UWB transmitters operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of no less than 1 kHz:

Frequency in MHz	EIRP in dBm
1164–1240	−75.3
1559–1610	−75.3

(f) There is a limit on the peak level of the emissions contained within a 50 MHz bandwidth centered on the frequency at which the highest radiated

emission occurs, f_M. That limit is 0 dBm EIRP. It is acceptable to employ a different resolution bandwidth, and a correspondingly different peak emission limit, following the procedures described in §15.521.

[68 FR 19751, Apr. 22, 2003, as amended at 72 FR 63823, Nov. 13, 2007]

§15.515 Technical requirements for vehicular radar systems.

(a) Operation under the provisions of this section is limited to UWB field disturbance sensors mounted in terrestrial transportation vehicles. These devices shall operate only when the vehicle is operating, e.g., the engine is running. Operation shall occur only upon specific activation, such as upon starting the vehicle, changing gears, or engaging a turn signal.

(b) The UWB bandwidth of a vehicular radar system operating under the provisions of this section shall be contained between 22 GHz and 29 GHz. In addition, the center frequency, f_C, and the frequency at which the highest level emission occurs, f_M, must be greater than 24.075 GHz.

(c) Following proper installation, vehicular radar systems shall attenuate any emissions within the 23.6–24.0 GHz band that appear 38 degrees or greater above the horizontal plane by 25 dB below the limit specified in paragraph (d) of this section. For equipment authorized, manufactured or imported on or after January 1, 2005, this level of attenuation shall be 25 dB for any emissions within the 23.6–24.0 GHz band that appear 30 degrees or greater above the horizontal plane. For equipment authorized, manufactured or imported on or after January 1, 2010, this level of attenuation shall be 30 dB for any emissions within the 23.6–24.0 GHz band that appear 30 degrees or greater above the horizontal plane. For equipment authorized, manufactured or imported on or after January 1, 2014, this level of attenuation shall be 35 dB for any emissions within the 23.6–24.0 GHz band that appear 30 degrees or greater above the horizontal plane. This level of attenuation can be achieved through the antenna directivity, through a reduction in output power or any other means.

(d) The radiated emissions at or below 960 MHz from a device operating under the provisions of this section shall not exceed the emission levels in §15.209. The radiated emissions above 960 MHz from a device operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz:

Frequency in MHz	EIRP in dBm
960–1610	−75.3
1610–22,000	−61.3
22,000–29,000	−41.3
29,000–31,000	−51.3
Above 31,000	−61.3

(e) In addition to the radiated emission limits specified in the table in paragraph (d) of this section, UWB transmitters operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of no less than 1 kHz:

Frequency in MHz	EIRP in dBm
1164–1240	−85.3
1559–1610	−85.3

(f) There is a limit on the peak level of the emissions contained within a 50 MHz bandwidth centered on the frequency at which the highest radiated emission occurs, f_M. That limit is 0 dBm EIRP. It is acceptable to employ a different resolution bandwidth, and a correspondingly different peak emission limit, following the procedures described in §15.521.

(g) The emission levels from devices operating under the provisions of this section that employ gated transmissions may be measured with the gating active. Measurements made in this manner shall be repeated over multiple sweeps with the analyzer set for maximum hold until the amplitude stabilizes.

(h) UWB vehicular systems operating in the 22–29 GHz band are subject to the transition provisions of §15.37(l) through (n).

[67 FR 34856, May 16, 2002, as amended at 70 FR 6776, Feb. 9, 2005; 82 FR 43871, Sept. 20, 2017]

§ 15.517 Technical requirements for indoor UWB systems.

(a) Operation under the provisions of this section is limited to UWB transmitters employed solely for indoor operation.

(1) Indoor UWB devices, by the nature of their design, must be capable of operation only indoors. The necessity to operate with a fixed indoor infrastructure, e.g., a transmitter that must be connected to the AC power lines, may be considered sufficient to demonstrate this.

(2) The emissions from equipment operated under this section shall not be intentionally directed outside of the building in which the equipment is located, such as through a window or a doorway, to perform an outside function, such as the detection of persons about to enter a building.

(3) The use of outdoor mounted antennas, e.g., antennas mounted on the outside of a building or on a telephone pole, or any other outdoors infrastructure is prohibited.

(4) Field disturbance sensors installed inside of metal or underground storage tanks are considered to operate indoors provided the emissions are directed towards the ground.

(5) A communications system shall transmit only when the intentional radiator is sending information to an associated receiver.

(b) The UWB bandwidth of a UWB system operating under the provisions of this section must be contained between 3100 MHz and 10,600 MHz.

(c) The radiated emissions at or below 960 MHz from a device operating under the provisions of this section shall not exceed the emission levels in § 15.209. The radiated emissions above 960 MHz from a device operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz:

Frequency in MHz	EIRP in dBm
960–1610	−75.3
1610–1990	−53.3
1990–3100	−51.3
3100–10600	−41.3
Above 10600	−51.3

(d) In addition to the radiated emission limits specified in the table in paragraph (c) of this section, UWB transmitters operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of no less than 1 kHz:

Frequency in MHz	EIRP in dBm
1164–1240	−85.3
1559–1610	−85.3

(e) There is a limit on the peak level of the emissions contained within a 50 MHz bandwidth centered on the frequency at which the highest radiated emission occurs, f_M. That limit is 0 dBm EIRP. It is acceptable to employ a different resolution bandwidth, and a correspondingly different peak emission limit, following the procedures described in § 15.521.

(f) UWB systems operating under the provisions of this section shall bear the following or similar statement in a conspicuous location on the device or in the instruction manual supplied with the device:

''This equipment may only be operated indoors. Operation outdoors is in violation of 47 U.S.C. 301 and could subject the operator to serious legal penalties.''

[67 FR 34856, May 16, 2002; 67 FR 39632, June 10, 2002]

§ 15.519 Technical requirements for hand held UWB systems.

(a) UWB devices operating under the provisions of this section must be hand held, *i.e.*, they are relatively small devices that are primarily hand held while being operated and do not employ a fixed infrastructure.

(1) A UWB device operating under the provisions of this section shall transmit only when it is sending information to an associated receiver. The UWB intentional radiator shall cease transmission within 10 seconds unless it receives an acknowledgement from the associated receiver that its transmission is being received. An acknowledgment of reception must continue to be received by the UWB intentional radiator at least every 10 seconds or the UWB device must cease transmitting.

(2) The use of antennas mounted on outdoor structures, e.g., antennas mounted on the outside of a building or

on a telephone pole, or any fixed outdoors infrastructure is prohibited. Antennas may be mounted only on the hand held UWB device.

(3) UWB devices operating under the provisions of this section may operate indoors or outdoors.

(b) The UWB bandwidth of a device operating under the provisions of this section must be contained between 3100 MHz and 10,600 MHz.

(c) The radiated emissions at or below 960 MHz from a device operating under the provisions of this section shall not exceed the emission levels in §15.209. The radiated emissions above 960 MHz from a device operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz:

Frequency in MHz	EIRP in dBm
960–1610	−75.3
1610–1990	−63.3
1990–3100	−61.3
3100–10600	−41.3
Above 10600	−61.3

(d) In addition to the radiated emission limits specified in the table in paragraph (c) of this section, UWB transmitters operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of no less than 1 kHz:

Frequency in MHz	EIRP in dBm
1164–1240	−85.3
1559–1610	−85.3

(e) There is a limit on the peak level of the emissions contained within a 50 MHz bandwidth centered on the frequency at which the highest radiated emission occurs, f_M. That limit is 0 dBm EIRP. It is acceptable to employ a different resolution bandwidth, and a correspondingly different peak emission limit, following the procedures described in §15.521.

[67 FR 34856, May 16, 2002; 67 FR 39632, June 10, 2002]

§15.521 Technical requirements applicable to all UWB devices.

(a) UWB devices may not be employed for the operation of toys. Operation onboard an aircraft, a ship or a satellite is prohibited.

(b) Manufacturers and users are reminded of the provisions of §§15.203 and 15.204.

(c) Emissions from digital circuitry used to enable the operation of the UWB transmitter shall comply with the limits in §15.209, rather than the limits specified in this subpart, provided it can be clearly demonstrated that those emissions from the UWB device are due solely to emissions from digital circuitry contained within the transmitter and that the emissions are not intended to be radiated from the transmitter's antenna. Emissions from associated digital devices, as defined in §15.3(k), e.g., emissions from digital circuitry used to control additional functions or capabilities other than the UWB transmission, are subject to the limits contained in Subpart B of this part.

(d) Within the tables in §§15.509, 15.511, 15.513, 15.515, 15.517, and 15.519, the tighter emission limit applies at the band edges. Radiated emission levels at and below 960 MHz are based on measurements employing a CISPR quasi-peak detector. Radiated emission levels above 960 MHz are based on RMS average measurements over a 1 MHz resolution bandwidth. The RMS average measurement is based on the use of a spectrum analyzer with a resolution bandwidth of 1 MHz, an RMS detector, and a 1 millisecond or less averaging time. Unless otherwise stated, if pulse gating is employed where the transmitter is quiescent for intervals that are long compared to the nominal pulse repetition interval, measurements shall be made with the pulse train gated on. Alternative measurement procedures may be considered by the Commission.

(e) The frequency at which the highest radiated emission occurs, f_M, must be contained within the UWB bandwidth.

(f) Imaging systems may be employed only for the type of information exchange described in their specific definitions contained in §15.503. The detection of tags or the transfer or data or voice information is not permitted under the standards for imaging systems.

(g) When a peak measurement is required, it is acceptable to use a resolution bandwidth other than the 50 MHz specified in this subpart. This resolution bandwidth shall not be lower than 1 MHz or greater than 50 MHz, and the measurement shall be centered on the frequency at which the highest radiated emission occurs, f_M. If a resolution bandwidth other than 50 MHz is employed, the peak EIRP limit shall be 20 log (RBW/50) dBm where RBW is the resolution bandwidth in megahertz that is employed. This may be converted to a peak field strength level at 3 meters using E(dBuV/m) = P(dBm EIRP) + 95.2. If RBW is greater than 3 MHz, the application for certification filed with the Commission must contain a detailed description of the test procedure, calibration of the test setup, and the instrumentation employed in the testing.

(h) The highest frequency employed in §15.33 to determine the frequency range over which radiated measurements are made shall be based on the center frequency, f_C, unless a higher frequency is generated within the UWB device. For measuring emission levels, the spectrum shall be investigated from the lowest frequency generated in the UWB transmitter, without going below 9 kHz, up to the frequency range shown in §15.33(a) or up to f_C + 3/(pulse width in seconds), whichever is higher. There is no requirement to measure emissions beyond 40 GHz provided f_C is less than 10 GHz; beyond 100 GHz if f_C is at or above 10 GHz and below 30 GHz; or beyond 200 GHz if f_C is at or above 30 GHz.

(i) The prohibition in §2.201(f) and 15.5(d) of this chapter against Class B (damped wave) emissions does not apply to UWB devices operating under this subpart.

(j) Responsible parties are reminded of the other standards and requirements cross referenced in §15.505, such as a limit on emissions conducted onto the AC power lines.

[67 FR 34856, May 16, 2002, as amended at 68 FR 19751, Apr. 22, 2003; 70 FR 6776, Feb. 9, 2005]

§15.523 Measurement procedures.

Measurements shall be made in accordance with the procedures specified by the Commission.

§15.525 Coordination requirements.

(a) UWB imaging systems require coordination through the FCC before the equipment may be used. The operator shall comply with any constraints on equipment usage resulting from this coordination.

(b) The users of UWB imaging devices shall supply operational areas to the FCC Office of Engineering and Technology, which shall coordinate this information with the Federal Government through the National Telecommunications and Information Administration. The information provided by the UWB operator shall include the name, address and other pertinent contact information of the user, the desired geographical area(s) of operation, and the FCC ID number and other nomenclature of the UWB device. If the imaging device is intended to be used for mobile applications, the geographical area(s) of operation may be the state(s) or county(ies) in which the equipment will be operated. The operator of an imaging system used for fixed operation shall supply a specific geographical location or the address at which the equipment will be operated. This material shall be submitted to Frequency Coordination Branch, OET, Federal Communications Commission, at the address of the FCC's main office indicated in 47 CFR 0.401(a), ATTN: UWB Coordination.

(c) The manufacturers, or their authorized sales agents, must inform purchasers and users of their systems of the requirement to undertake detailed coordination of operational areas with the FCC prior to the equipment being operated.

(d) Users of authorized, coordinated UWB systems may transfer them to other qualified users and to different locations upon coordination of change of ownership or location to the FCC and coordination with existing authorized operations.

(e) The FCC/NTIA coordination report shall identify those geographical areas within which the operation of an

imaging system requires additional coordination or within which the operation of an imaging system is prohibited. If additional coordination is required for operation within specific geographical areas, a local coordination contact will be provided. Except for operation within these designated areas, once the information requested on the UWB imaging system is submitted to the FCC no additional coordination with the FCC is required provided the reported areas of operation do not change. If the area of operation changes, updated information shall be submitted to the FCC following the procedure in paragraph (b) of this section.

(f) The coordination of routine UWB operations shall not take longer than 15 business days from the receipt of the coordination request by NTIA. Special temporary operations may be handled with an expedited turn-around time when circumstances warrant. The operation of UWB systems in emergency situations involving the safety of life or property may occur without coordination provided a notification procedure, similar to that contained in §2.405(a) through (e) of this chapter, is followed by the UWB equipment user.

[67 FR 34856, May 16, 2002, as amended at 68 FR 19751, Apr. 22, 2003; 85 FR 64406, Oct. 13, 2020]

Subpart G—Access Broadband Over Power Line (Access BPL)

SOURCE: 70 FR 1374, Jan. 7, 2005, unless otherwise noted.

§15.601 Scope.

This subpart sets out the regulations for Access Broadband over Power Line (Access BPL) devices operating in the 1.705–80 MHz band over medium or low voltage lines.

§15.603 Definitions.

(a) *Excluded Band:* A band of frequencies within which Access BPL operations are not permitted.

(b) *Exclusion Zone:* A geographical area within which Access BPL operations are not permitted in certain frequency bands.

(c) *Consultation.* The process of communication between an entity operating Access BPL and a licensed public safety or other designated point of contact for the purpose of avoiding potential harmful interference.

(d) *Consultation area:* A designated geographical area within which consultation with public safety users or other designated point of contact is required before an Access BPL may be operated at designated frequencies.

(e) *Low Voltage power line.* A power line carrying low voltage, e.g., 240/120 volts from a distribution transformer to a customer's premises.

(f) *Medium Voltage power line.* A power line carrying between 1,000 to 40,000 volts from a power substation to neighborhoods. Medium voltage lines may be overhead or underground, depending on the power grid network topology.

(g) *Access BPL Database.* A database operated by an industry-sponsored entity, recognized by the Federal Communications Commission and the National Telecommunications and Information Administration (NTIA), containing information regarding existing and planned Access BPL systems, as required in §15.615(a) of this chapter.

§15.605 Cross reference.

(a) The provisions of subparts A and B of this part apply to Access BPL devices, except where specifically noted. The provisions of subparts C through F of this part do not apply to Access BPL devices except where specifically noted.

(b) The requirements of this subpart apply only to the radio circuitry that is used to provide carrier current operation for the Access BPL device. Other aspects of the operation of an Access BPL device may be subject to requirements contained elsewhere in this chapter. In particular, an Access BPL device that includes digital circuitry that is not used solely to enable the operation of the radio frequency circuitry used to provide carrier current operation also is subject to the requirements for unintentional radiators in subpart B of this part.

§ 15.607 Equipment authorization of Access BPL equipment.

Access BPL equipment shall be subject to Certification as specified in § 15.101.

§ 15.609 Marketing of Access BPL equipment.

The marketing of Access BPL equipment must be directed solely to parties eligible to operate the equipment. Eligible parties consist of AC power line public utilities, Access BPL service providers and associates of Access BPL service providers. The responsible party, as defined in § 2.909 of this chapter, is responsible for ensuring that the equipment is marketed only to eligible parties. Marketing of the equipment in any other manner may be considered grounds for revocation of the grant of certification issued for the equipment.

§ 15.611 General technical requirements.

(a) *Conducted emission limits.* Access BPL is not subject to the conducted emission limits of § 15.107.

(b) *Radiated emission limits*—(1) *Medium voltage power lines.* (i) Access BPL systems that operate in the frequency range of 1.705 kHz to 30 MHz over medium voltage power lines shall comply with the radiated emission limits for intentional radiators provided in § 15.209.

(ii) Access BPL systems that operate in the frequency range above 30 MHz over medium voltage power lines shall comply with the radiated emission limits provided in § 15.109(b).

(2) *Low voltage power lines.* Access BPL systems that operate over low-voltage power lines, including those that operate over low-voltage lines that are connected to the in-building wiring, shall comply with the radiated emission limits provided in § 15.109(a) and (e).

(c) *Interference Mitigation and Avoidance.* (1) Access BPL systems shall incorporate adaptive interference mitigation techniques to remotely reduce power and adjust operating frequencies, in order to avoid site-specific, local use of the same spectrum by licensed services. These techniques may include adaptive or ''notch'' filtering, or complete avoidance of frequencies, or bands of frequencies, locally used by licensed radio operations.

(i) For frequencies below 30 MHz, when a notch filter is used to avoid interference to a specific frequency band, the Access BPL system shall be capable of attenuating emissions within that band to a level at least 25 dB below the applicable Part 15 limits.

(ii) For frequencies above 30 MHz, when a notch filter is used to avoid interference to a specific frequency band, the Access BPL system shall be capable of attenuating emissions within that band to a level at least 10 dB below the applicable part 15 limits.

(iii) At locations where an Access BPL operator attenuates radiated emissions from its operations in accordance with the above required capabilities, we will not require that operator to take further actions to resolve complaints of harmful interference to mobile operations.

(2) Access BPL systems shall comply with applicable radiated emission limits upon power-up following a fault condition, or during a start-up operation after a shut-off procedure, by the use of a non-volatile memory, or some other method, to immediately restore previous settings with programmed notches and excluded bands, to avoid time delay caused by the need for manual re-programming during which protected services may be vulnerable.

(3) Access BPL systems shall incorporate a remote-controllable shutdown feature to deactivate, from a central location, any unit found to cause harmful interference, if other interference mitigation techniques do not resolve the interference problem.

[70 FR 1374, Jan. 7, 2005, as amended at 71 FR 49379, Aug. 23, 2006; 76 FR 71908, Nov. 21, 2011]

§ 15.613 Measurement procedures.

Compliance measurements for Access BPL shall be made in accordance with the Guidelines for Access BPL systems specified by the Commission.

§ 15.615 General administrative requirements.

(a) *Access BPL Database.* Entities operating Access BPL systems shall supply to an industry-recognized entity, information on all existing Access BPL systems and all proposed Access BPL

systems for inclusion into a publicly available data base, within 30 days prior to initiation of service. Such information shall include the following:

(1) The name of the Access BPL provider.

(2) The frequencies of the Access BPL operation.

(3) The postal zip codes served by the specific Access BPL operation.

(4) The manufacturer and type of Access BPL equipment and its associated FCC ID number, or, in the case of Access BPL equipment that has not been subject to certification in the past, the Trade Name and Model Number, as specified on the equipment label.

(5) The contact information, including both phone number and e-mail address of a person at, or associated with, the BPL operator's company, to facilitate the resolution of any interference complaint.

(6) The proposed/or actual date of Access BPL operation.

(b) The Access BPL database manager shall enter this information into the publicly accessible database within three (3) business days of receipt.

(c) No notification to the Commission is required.

(d) A licensed spectrum user experiencing harmful interference that is suspected to be caused by an Access BPL system shall inform the local BPL operator's contact person designated in the Access BPL database. The investigation of the reported interference and the resolution of confirmed harmful interference from the Access BPL system shall be successfully completed by the BPL operator within a reasonable time period according to a mutually acceptable schedule, after the receipt of an interference complaint, in order to avoid protracted disruptions to licensed services. The Access BPL operator shall respond to complaints of harmful interference from public safety users within 24 hours. With regard to public safety complaints, the BPL provider shall be required to immediately cease the operations causing such complaint if it fails to respond within 24 hours.

(e) *Consultation with public safety users.* An entity operating an Access BPL system shall notify and consult with the public safety users in the area where it plans to deploy Access BPL, at least 30 days prior to initiation of any operation or service. This entity shall design or implement the Access BPL system such that it does not cause harmful interference in those frequencies or bands used by the public safety agencies in the area served by the Access BPL system. The notification shall include, at a minimum, the information in paragraph (a) of this section.

(f) *Federal government spectrum users and other radio service users.* An entity operating an Access BPL system shall ensure that, within its Access BPL deployment area, its system does not operate on any frequencies designated as excluded bands or on identified frequencies within any designated exclusion zones.

(1) *Excluded Bands.* To protect Aeronautical (land) stations and aircraft receivers, Access BPL operations using overhead medium voltage power lines are prohibited in the frequency bands listed in Table 1. Specifically, such BPL systems shall not place carrier frequencies in these bands.

TABLE 1—EXCLUDED FREQUENCY BANDS

Frequency band
2,850–3,025 kHz
3,400–3,500 kHz
4,650–4,700 kHz
5,450–5,680 kHz
6,525–6,685 kHz
8,815–8,965 kHz
10,005–10,100 kHz
11,275–11,400 kHz
13,260–13,360 kHz
17,900–17,970 kHz
21,924–22,000 kHz
74.8–75.2 MHz

(2) *Exclusion zones.* Exclusion zones encompass the operation of any Access BPL system within 1km of the boundary of coast station facilities at the coordinates listed in Tables 2 and 2.1. Exclusion zones also encompass the operation of Access BPL systems using overhead medium voltage power lines within 65 km of the Very Large Array observatory located at the coordinate 34°04′43.50″; N, 107°37′03.82″ W. Exclusion zones further encompass the operation of Access BPL systems using overhead low voltage power lines or underground power lines within 47 km of the Very Large Array observatory located at the

coordinate 34°04′43.50″; N, 107°37′03.82″ W. Within the exclusion zones for coast stations, Access BPL systems shall not use carrier frequencies within the band of 2173.5–2190.5 kHz. Within the exclusion zone for the Very Large Array radio astronomy observatory, Access BPL systems shall not use carrier frequencies within the 73.0–74.6 MHz band.

(i) *Existing coast station facilities.* Access BPL systems shall not operate in the frequency band 2,173.5–2,190.5 kHz, within 1 kilometer (km) of the boundary of coast station facilities at the coordinates listed in Tables 2 and 2.1. BPL operators planning to deploy Access BPL devices at these frequencies in areas within these exclusion zones as defined above shall consult with the appropriate point of contact for these coast stations to ensure harmful interference is prevented at these facilities.

Point of contact: Commandant (CG 622), U.S. Coast Guard, 2100 2nd Street, SW., Washington, DC 20593–0001, Telephone: (202) 267–2860, e-mail: *cgcomms@comdt.uscg.mil*.

TABLE 2—EXCLUSION ZONES FOR U.S. COAST GUARD COAST STATIONS

Locale	Latitude	Longitude
Group Guam	13°35′23″ N	144°50′24″ E
GANTSEC	18°18′00″ N	65°46′59″ W
Puerto Rico	18°28′11″ N	66°07′47″ W
Honolulu	21°18′21″ N	157°53′23″ W
Group Key West	24°33′35″ N	81°47′59″ W
Trumbo Point CG Base	24°33′58″ N	81°47′57″ W
Miami	25°37′28″ N	80°23′07″ W
Everglades Park	25°50′10″ N	81°23′13″ W
Group Saint Petersburg (Everglades).	25°51′00″ N	81°23′24″ W
Station Ft. Lauderdale	26°05′21″ N	80°06′40″ W
Station Ft. Myers Beach	26°27′34″ N	81°57′15″ W
Group Miami (Ft. Pierce)	27°27′36″ N	80°18′36″ W
Station Ft. Pierce	27°27′50″ N	80°18′27″ W
Group Corpus Christi	27°42′01″ N	97°16′11″ W
Group Corpus Christi	27°42′06″ N	97°16′45″ W
ESD Saint Petersburg	27°45′21″ N	82°37′32″ W
Group Saint Petersburg	27°46′11″ N	82°37′47″ W
Station Port O'Connor	28°26′03″ N	96°25′39″ W
S. Padre Island	28°26′22″ N	97°09′56″ W
Freeport	28°55′59″ N	95°16′59″ W
Group Galveston (Freeport).	28°56′24″ N	95°17′59″ W
Station YANKEETOWN	29°01′51″ N	82°43′39″ W
Station Ponce De Leon Inlet.	29°03′50″ N	81°55′01″ W
Group New Orleans (Grand Isle).	29°15′53″ N	89°57′26″ W
Galveston	29°19′59″ N	94°46′18″ W
Kapalan	29°20′04″ N	94°47′17″ W
Sabine	29°43′42″ N	93°52′14″ W
New Orleans	30°01′17″ N	90°07′24″ W
Panama City	30°10′01″ N	85°45′04″ W
Group Mobile (Panama City).	30°10′12″ N	85°45′36″ W
ANT Jacksonville Beach	30°17′16″ N	81°24′10″ W
Pensacola	30°20′24″ N	87°18′17″ W
Group Mayport	30°23′10″ N	81°26′01″ W
Group Mayport	30°23′24″ N	81°25′48″ W
Ft. Morgan	30°39′07″ N	88°03′12″ W
Tybee Lighthouse	32°01′15″ N	80°50′39″ W
Point Loma Lighthouse	32°39′56″ N	117°14′34″ W
Point Loma	32°40′07″ N	117°14′14″ W
Activities San Diego	32°43′59″ N	117°11′13″ W
Group Charleston (Sullivan's Island).	32°45′00″ N	79°49′47″ W
Sullivan's Island Lights	32°45′02″ N	79°50′03″ W
Group Charleston	32°46′25″ N	79°56′37″ W
Group San Diego	32°52′48″ N	118°26′23″ W
San Pedro	33°45′00″ N	118°15′58″ W
Group Fort Macon	33°53′24″ N	78°01′48″ W
Point Mugu	33°59′32″ N	119°07′18″ W
Group LA/Long Beach	34°07′11″ N	119°06′35″ W
Channel Island	34°09′17″ N	119°13′11″ W
Station Oxnard Channel Island.	34°09′43″ N	119°13′19″ W
Group Ft. Macon	34°41′48″ N	76°40′59″ W
Group Cape Hatteras	35°13′59″ N	75°31′59″ W
Group Cape Hatteras	35°15′35″ N	75°31′48″ W
Morro Bay (Cambria)	35°31′21″ N	121°03′31″ W
San Clemente Island	32°50′24″ N	118°23′15″ W
Point Pinos	36°38′12″ N	121°56′06″ W
CAMSLANT	36°43′47″ N	76°01′11″ W
Group Hampton Roads	36°53′01″ N	76°21′10″ W
Point Montara	37°31′23″ N	122°30′47″ W
Point Montara Lighthouse	37°32′09″ N	122°31′08″ W
Group San Francisco	37°32′23″ N	122°31′11″ W
Group San Francisco	37°48′34″ N	122°21′55″ W
Point Bonita	37°49′00″ N	122°31′41″ W
Group Eastern Shores	37°55′47″ N	75°22′47″ W
Group Eastern Shore	37°55′50″ N	75°22′58″ W
CAMSPAC	38°06′00″ N	122°55′48″ W
Point Arena Lighthouse	38°57′18″ N	124°44′28″ W
Point Arena	38°57′36″ N	123°44′23″ W
Group Atlantic City	39°20′59″ N	74°27′42″ W
Activities New York	40°36′06″ N	74°03′36″ W
Activities New York	40°37′11″ N	74°04′11″ W
ESD Moriches Hut	40°47′19″ N	72°44′53″ W
Group Moriches	40°47′23″ N	72°45′00″ W
Group Humboldt Bay	40°58′41″ N	124°06′31″ W
Group Humboldt Bay	40°58′47″ N	124°06′35″ W
Trinidad Head	41°03′15″ N	124°09′02″ W
Group Long Island Sound	41°16′12″ N	72°54′00″ W
Station New Haven	41°16′12″ N	72°54′06″ W
Station Brant Point	41°17′21″ N	70°05′31″ W
Group Woods Hole	41°17′23″ N	70°04′47″ W
Station Castle Hill	41°27′46″ N	71°21′42″ W
Group Woods Hole	41°17′29″ N	70°401′07″ W
Boston Area	41°40′12″ N	70°31′48″ W
Station Provincetown	42°01′48″ N	70°12′42″ W
Eastern Point	42°36′24″ N	70°39′26″ W
Cape Blanco	42°50′16″ N	124°33′52″ W
Group North Bend	43°24′16″ N	124°13′22″ W
Group North Bend	43°24′35″ N	124°14′23″ W
Cape Elizabeth	43°33′28″ N	70°12′00″ W
Group South Portland	43°38′24″ N	70°15′00″ W
Group South Portland	43°38′45″ N	70°14′51″ W
Group SW Harbor	44°16′19″ N	68°18′27″ W
Group Southwest Harbor	44°16′48″ N	68°18′36″ W
Fort Stevens, Oregon	46°09′14″ N	123°53′07″ W
Group Astoria	46°09′29″ N	123°31′48″ W
Group Astoria	46°09′35″ N	123°53′24″ W
La Push	47°49′00″ N	124°37′59″ W
Station Quillayute River	47°54′49″ N	124°38′01″ W
Port Angeles	48°07′59″ N	123°25′59″ W
Group Port Angeles	48°08′24″ N	123°24′35″ W

TABLE 2—EXCLUSION ZONES FOR U.S. COAST GUARD COAST STATIONS—Continued

Locale	Latitude	Longitude
Juneau (Sitka)	57°05′24″ N	135°15′35″ W
Kodiak	57°40′47″ N	152°28′47″ W

TABLE 2—EXCLUSION ZONES FOR U.S. COAST GUARD COAST STATIONS—Continued

Locale	Latitude	Longitude
Valdez (Cape Hinchinbrook).	60°26′23″ N	146°25′48″ W

Note: Systems of coordinates comply with NAD 83.

TABLE 2.1—EXCLUSION ZONES FOR MARITIME PUBLIC COAST STATIONS

[Points of Contact Are Identified in the Commission's License Database]

Licensee name	Location	Latitude	Longitude
Shipcom LLC	Marina Del Ray, CA	33°56′21″ N	118°27′14″ W
Globe Wireless	Rio Vista, CA	38°11′55″ N	121°48′34″ W
Avalon Communications Corp	St. Thomas, VI	18°21′19″ N	64°56′48″ W
Globe Wireless	Bishopville, MD	38°24′10″ N	75°12′59″ W
Shipcom LLC	Mobile, AL	30°40′07″ N	88°10′23″ W
Shipcom LLC	Coden, AL	30°22′35″ N	88°12′20″ W
Globe Wireless	Pearl River, LA	30°22′13″ N	89°47′26″ W
Globe Wireless	Kahalelani, HI	21°10′33″ N	157°10′39″ W
Globe Wireless	Palo Alto, CA	37°26′44″ N	122°06′48″ W
Globe Wireless	Agana, GU	13°29′22″ N	144°49′39″ E

NOTE: Systems of coordinates comply with NAD 83.

(ii) *New or relocated Coast stations.* In the unlikely event that a new or relocated coast station is established for the 2.173.5–2.190.5 kHz band at a coordinate not specified in Table 2 or 2.1, Access BPL operations in that frequency band shall also be excluded within 1 km of the new coast station facility;

(3) *Consultation areas.* Access BPL operators shall provide notification to the appropriate point of contact specified regarding Access BPL operations at any frequencies of potential concern in the following consultation areas, at least 30 days prior to initiation of any operation or service. The notification shall include, at a minimum, the information in paragraph (a) of this section. We expect parties to consult in good faith to ensure that no harmful interference is caused to licensed operations and that any constraints on BPL deployments are minimized to those necessary to avoid harmful interference. In the unlikely event that a new or relocated aeronautical receive station is established for the 1.7–30 MHz band at a coordinate not specified in Table 3b, Access BPL operators are also required to coordinate with the appropriate point of contact regarding Access BPL operations at any frequencies of potential concern in the new or relocated consultation areas, and to adjust their system operating parameters to protect the new or relocated aeronautical receive station.

(i) For frequencies in the 1.7–30 MHz frequency range, the areas within 4 km of facilities located at the following coordinates:

(A) The Commission's protected field offices listed in 47 CFR 0.121, the point-of-contact for which is specified in that section;

(B) The aeronautical stations listed in Tables 3a and 3b;

(C) The land stations listed in Tables 4 and 5;

(ii) For frequencies in the 1.7–80.0 MHz frequency range, the areas within 4 km of facilities located at the coordinates specified for radio astronomy facilities in 47 CFR 2.106, Note U.S. 311.

Point of contact: Electromagnetic Spectrum Manager, National Science Foundation, Division of Astronomical Sciences, 4201 Wilson Blvd., Suite 1045, Arlington, VA 22230, (703) 292–4896, *esm@nsf.gov*.

(iii) For frequencies in the 1.7–80 MHz frequency range, the area within 1 km of the Table Mountain Radio Receiving Zone, the coordinates and point of contact for which are specified in 47 CFR 21.113(b).

(iv) For frequencies in the 1.7–30 MHz frequency range, the areas within 37 km of radar receiver facilities located at the coordinates specified in Table 6.

Point of contact: U.S. Coast Guard HQ, Division of Spectrum Management CG–622, 2100 Second St., SW., Rm. 6611, Washington, DC 20593, Tel: (202) 267–6036, Fax: (202) 267–4106, e-mail: *jtaboada@comdt.uscg.mil*.

TABLE 3a—CONSULTATION AREA COORDINATES FOR AERONAUTICAL (OR) STATIONS (1.7–30 MHz)

Command name	Location	Latitude	Longitude
Washington	Arlington, VA	38°51′07″ N	77°02′15″ W
Cape Cod	Cape Cod, MA	41°42′00″ N	70°30′00″ W
Atlantic City	Atlantic City, NJ	39°20′59″ N	74°27′42″ W
Elizabeth City	Elizabeth City, NC	36°15′53″ N	76°10′32″ W
Savannah	Savannah, GA	32°01′30″ N	81°08′30″ W
Miami	Opa Locka, FL	25°54′22″ N	80°16′01″ W
Clearwater	Clearwater, FL	27°54′27″ N	82°41′29″ W
Borinquen	Aguadilla, PR	18°18′36″ N	67°04′48″ W
New Orleans	New Orleans, LA	29°49′31″ N	90°02′06″ W
Traverse City	Traverse City, MI	44°44′24″ N	85°34′54″ W
San Diego	San Diego, CA	32°43′33″ N	117°10′15″ W
Sacramento	McCllelan AFB, CA	38°40′06″ N	121°24′04″ W
Astoria	Warrenton, OR	46°25′18″ N	123°47′46″ W
North Bend	North Bend, OR	43°24′39″ N	124°14′35″ W
Barbers Point	Kapolei, HI	21°18′01″ N	158°04′15″ W
Kodiak	Kodiak, AK	57°44′19″ N	152°30′18″ W
Houston	Houston, TX	29°45′00″ N	95°22′00″ W
Detroit	Mt. Clemens, MI	42°36′05″ N	82°50′12″ W
San Francisco	San Francisco, CA	37°37′58″ N	122°23′20″ W
Los Angeles	Los Angeles, CA	33°56′36″ N	118°23′48″ W
Humboldt Bay	McKinleyville, CA	40°58′39″ N	124°06′45″ W
Port Angeles	Port Angeles, WA	48°08′25″ N	123°24′48″ W
Sitka	Sitka, AK	57°05′50″ N	135°21′58″ W

NOTE: Systems of coordinates conform to NAD 83.

Point of contact: ARINC, 2551 Riva Road, Annapolis, MD 21401, Tel: 1–800–633–6882, Fax: (410) 266–2329, e-mail: *arincmkt@arinc.com*, *http://www.arinc.com*.

Point of contact: ARINC, 2551 Riva Road, Annapolis, MD 21401, Tel: 1–800–633–6882, Fax: 410–266–2329, e-mail: *bplnotifications@arinc.com*, *http://www.arinc.com*.

TABLE 3B—CONSULTATION AREA COORDINATES FOR AERONAUTICAL RECEIVE STATIONS (1.7–30 MHz)

Locale	Latitude	Longitude
Southampton, NY	40°55′15″ N	72°23′41″ W
Molokai, HI	21°12′23″ N	157°12′30″ W
Oahu, HI	21°22′27″ N	158°05′56″ W
Half Moon Bay, CA	37°39′64″ N	122°24′44″ W
Pt. Reyes, CA	38°06′00″ N	122°56′00″ W
Barrow, AK	71°17′24″ N	156°40′12″; W
Guam	13°28′12″ N	144°48′0.0″ E (note: Eastern Hemisphere)
NY Comm Center, NY	40°46′48″ N	73°05′46″ W
Cedar Rapids, IA	42°02′05.0″ N	91°38′37.6″ W
Beaumont, CA	33°54′27.1″ N	116°59′49.1″ W
Fairfield, TX	31°47′02.6″ N	96°47′03.0″ W
Houston, TX	29°36′35.8″ N	95°16′54.8″ W
Miami, FL	25°49′05″ N	80°18′28″ W

Note: Systems of coordinates conform to NAD 83.

Point of contact: U.S. Coast Guard HQ, Division of Spectrum Management CG–622, 2100 Second St., SW., Rm. 6611, Washington, DC 20593, Tel: (202) 267–6036, Fax: (202) 267–4106, e-mail: *jtaboada@comdt.uscg.mil*.

TABLE 4—CONSULTATION AREA COORDINATES FOR LAND STATIONS, SET 1 (1.7–30 MHz)

Command name	Location	Latitude	Longitude
COMMSTA Boston	Maspee, MA	41°24′00″ N	70°18′57″ W
Camslant	Chesapeake, VA	36°33′59″ N	76°15′23″ W
COMMSTA Miami	Miami, FL	25°36′58″ N	80°23′04″ W
COMMSTA New Orleans	Belle Chasse, IA	29°52′40″ N	89°54′46″ W
Camspac	Pt. Reyes Sta, CA	38°06′00″ N	122°55′48″ W
COMMSTA Honolulu	Wahiawa, HI	21°31′08″ N	157°59′28″ W
COMMSTA Kodiak	Kodiak, AK	57°04′26′ N	152°28′20″ W
Guam	Finegayan, GU	13°53′08″ N	144°50′20″ E

NOTE: Systems of coordinates conform to NAD 83.

Point of contact: COTHEN Technical Support Center, COTHEN Program Manager, Tel: (800) 829–6336.

TABLE 5—CONSULTATION AREA COORDINATES FOR LAND STATIONS, SET 2 (1.7–30 MHz)

Site name	Latitude	Longitude
Albuquerque, NM	35°05′02″ N	105°34′23″ W
Arecibo, PR	18°17′26″ N	66°22′33″ W
Atlanta, GA	32°33″06 N	84°23′35″ W
Beaufort, SC	34°34′22″ N	76°09′48″ W
Cape Charles, VA	37°05′37″ N	75°58′06″ W
Cedar Rapids, IA	42°00′09″ N	91°17′39″ W
Denver, CO	39°15′45″ N	103°34′23″ W
Fort Myers, FL	81°31′20″ N	26°20′01″ W
Kansas City, MO	38°22′10″ N	93°21′48″ W
Las Vegas, NV	36°21′15″ N	114°17′33″ W
Lovelock, NV	40°03′07″ N	118°18′56″ W
Memphis, TN	34°21′57″ N	90°02′43″ W
Miami, FL	25°46′20″ N	80°28′48″ W
Morehead City, NC	34°34′50″ N	78°13′59″ W
Oklahoma City, OK	34°30′52″ N	97°30′52″ W
Orlando, FL	28°31′30″ N	80°48′58″ W
Reno, NV	38°31′12″ N	119°14′37″ W
Sarasota, FL	27°12′41″ N	81°31′20″ W
Wilmington, NC	34°29′24″ N	78°04′31″ W

NOTE: Systems of coordinates conform to NAD 83.

Point Of Contact: ROTHR Deputy Program Manager, (540) 653–3624.

TABLE 6—CONSULTATION AREA COORDINATES FOR RADAR RECEIVER STATIONS (1.7–30 MHz)

Latitude/Longitude
18°01′ N/66°30′ W
28°05′ N/98°43′ W
36°34′ N/76°18′ W

NOTE: Systems of coordinates conform to NAD 83.

[70 FR 1374, Jan. 7, 2005, as amended at 71 FR 49379, Aug. 23, 2006; 82 FR 50834, Nov. 2, 2017]

Subpart H—White Space Devices

SOURCE: 80 FR 73070, Nov. 23, 2015, unless otherwise noted.

§ 15.701 Scope.

This subpart sets forth the regulations for unlicensed white space devices. These devices are unlicensed intentional radiators that operate on available TV channels in the broadcast television frequency bands, the 600 MHz band (including the guard bands and duplex gap), and in 608–614 MHz (channel 37).

§ 15.703 Definitions.

600 MHz duplex gap. An 11 megahertz guard band at 652–663 MHz that separates part 27 600 MHz service uplink and downlink frequencies.

600 MHz guard band. Designated frequency band at 614–617 MHz that prevents interference between licensed services in the 600 MHz service band and channel 37.

600 MHz service band. Frequencies in the 617–652 MHz and 663–698 MHz bands that are reallocated and reassigned for 600 MHz band services under part 27 of this chapter.

Available channel. A channel which is not being used by an authorized service and is acceptable for use by the device at its geographic location under the provisions of this subpart.

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.

Fixed device. A white space device that transmits and/or receives radiocommunication signals at a specified fixed location. A fixed device may select channels for operation from a list of available channels provided by a white space database, and initiate and operate a network by sending enabling signals to one or more fixed devices and/or personal/portable devices. Fixed devices may provide to a Mode I personal/portable device a list of available channels on which the Mode I device may operate, including channels on which the Mode I device but not the fixed device may operate.

Geo-fenced area. A defined geographic area over which the white space database has determined the set of available channels.

Geo-location capability. The capability of a white space device to determine its geographic coordinates and geo-location uncertainty. This capability is used with a white space database approved by the FCC to determine the availability of spectrum at a white space device's location.

Less congested area. Geographic areas where at least half of the TV channels within a specific TV band are unused for broadcast and other protected services and available for white space device use. Less congested areas are determined separately for each TV band—the low VHF band (channels 2–6), the high VHF band (channels 7–13) and the UHF band (channels 14–36); *i.e.*, one, two or all three bands or any combination could qualify as less congested. White space devices may only operate at the levels permitted for less congested areas within the area and the specific TV band(s) that qualify as a less congested area. For the purpose of this definition, a channel is considered available for white space device use if it is available for fixed devices operating with 40 milliwatts EIRP at 3 meters HAAT. Less congested areas in the UHF TV band are also considered to be less congested areas in the 600 MHz service band.

Mobile white space device. A white space device that transmits and/or receives radiocommunication signals on available channels within a defined geo-fenced area. A mobile white space device uses an incorporated geo-location capability to determine its location with respect to the boundaries of the defined area. A mobile white space device may operate only in less congested areas.

Mode I personal/portable device. A personal/portable white space device that does not use an internal geo-location capability and access to a white space 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 white space device or Mode II personal/portable white space device. A Mode I device may not initiate a network of fixed and/or personal/portable white space devices nor may it provide a list of available channels to another Mode I device for operation by such device.

Mode II personal/portable device. A personal/portable device that uses an internal geo-location capability and access to a white space database, either through a direct connection to the Internet or through an indirect connection to the Internet by way of fixed device or another Mode II device, 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 white space devices, transmitting to and receiving from one or more fixed devices or personal/portable devices. 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.

Narrowband white space device. A fixed or personal/portable white space device operating in a bandwidth of no greater than 100 kilohertz.

Network initiation. The process by which a fixed or Mode II white space device sends control signals to one or more fixed white space devices or personal/portable white space devices and allows them to begin communications.

Operating channel. An available channel used by a white space device for transmission and/or reception.

Personal/portable device. A white space device that transmits and/or receives radiocommunication signals on available channels at unspecified locations that may change.

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).

Sensing only device. A personal/portable white space device 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).

Spectrum Act. Title VI of the Middle Class Tax Relief and Job Creation Act of 2012 (Pub. L. 112–96).

Spectrum sensing. A process whereby a white space device monitors a television channel to detect whether the channel is occupied by a radio signal or signals from authorized services.

Television bands. The broadcast television frequency bands at 54–72 MHz (TV channels 2–4), 76–88 MHz (TV channels 5–6), 174–216 MHz (TV channels 7–13) and 470–608 MHz (channels 14–36).

White space database. A database system approved by the Commission that maintains records on authorized services and provides lists of available channels to white space devices and unlicensed wireless microphone users.

[80 FR 73070, Nov. 23, 2015, as amended at 84 FR 34796, July 19, 2019; 86 FR 2290, Jan. 12, 2021]

§ 15.705 Cross reference.

(a) The provisions of subparts A, B, and C of this part apply to white space devices, except where specific provisions are contained in this subpart.

(b) The requirements of this subpart apply only to the radio transmitter contained in the white space device. Other aspects of the operation of a white space device may be subject to requirements contained elsewhere in this chapter. In particular, a white space device that includes a receiver that tunes within the frequency range specified in §15.101(b) and contains digital circuitry not directly associated with the radio transmitter is also subject to the requirements for unintentional radiators in subpart B.

§ 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 white space device 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 white space 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.

(b) In cases where the manual is provided only in a form other than paper, such as on a computer disk or over the Internet, the information required by this section may be included in the manual in that alternative form, provided the user can reasonably be expected to have the capability to access information in that form.

§ 15.707 Permissible channels of operation.

(a)(1) *470–614 MHz band.* Fixed and personal/portable white space devices are permitted to operate on available channels in the frequency bands 470–614 MHz (TV channels 14–37), subject to the interference protection requirements in §§15.711 and 15.712.

(2) *600 MHz duplex gap.* Fixed and personal/portable white space devices may

operate in the 657–663 MHz segment of the 600 MHz duplex gap.

(3) *600 MHz service band.* Fixed and personal/portable white space devices may operate on frequencies in the bands 617–652 MHz and 663–698 MHz in areas where 600 MHz band licensees have not commenced operations, as defined in §27.4 of this chapter.

(4) *Channel 37 guard band.* White space devices are not permitted to operate in the band 614–617 MHz.

(b) Only mobile white space devices and fixed white space devices that communicate only with other fixed or mobile white space devices may operate on available channels in the bands 54–72 MHz (TV channels 2–4), 76–88 MHz (TV channels 5 and 6), and 174–216 MHz (TV channels 7–13), subject to the interference protection requirements in §§15.711 and 15.712.

(c) Narrowband and mobile white space devices may only operate on frequencies below 602 MHz.

[86 FR 2291, Jan. 12, 2021]

§15.709 General technical requirements.

(a) *Radiated power limits.* The maximum white space device EIRP per 6 MHz shall not exceed the limits of paragraphs (a)(2) through (4) of this section.

(1) *General requirements.* (i) White space devices may be required to operate with less power than the maximum permitted to meet the co-channel and adjacent channel separation requirements of §15.712 of this part.

(ii) Mode I personal/portable devices are limited to 40 mW, if the white space device that controls it is limited to 40 mW.

(2) *TV bands and 600 MHz service band.* (i)(A) Fixed devices in the TV bands below 602 MHz: Up to 4 W (36 dBm) EIRP, and up to 16 W (42 dBm) EIRP in less congested areas. Fixed devices in the 602–608 MHz band may operate with up to 4 W (36 dBm) EIRP.

(B) Fixed devices in the 600 MHz service bands above 620 MHz: Up to 4 W (36 dBm) EIRP, and up to 10 W (40 dBm) EIRP in less congested areas. Fixed devices that operate in any portion of the 614–620 MHz band may operate with up to 4 W (36 dBm) EIRP.

(ii) Personal/Portable devices: Up to 100 mW (20 dBm) EIRP.

(3) *608–614 MHz band (channel 37).* Up to 40 mW (16 dBm) EIRP.

(ii) Personal/Portable devices: Up to 100 mW (20 dBm) EIRP.

(4) *600 MHz duplex gap and guard bands.* Up to 40 mW (16 dBm) EIRP.

(5) *Mobile devices in the TV bands below 602 MHz.* Up to 16 W (42 dBm) EIRP in less congested areas. Mobile device operation is not permitted above 602 MHz. Mobile devices may operate only in less congested areas.

(b) *Technical limits*—(1) *Fixed and mobile white space devices.* (i) Technical limits for fixed and mobile white space devices are shown in the table in paragraph (b)(1)(iii) of this section and subject to the requirements of this section.

(ii) For operation at EIRP levels of 36 dBm (4,000 mW) or less, fixed and mobile white space devices may operate at EIRP levels between the values shown in the table in paragraph (b)(1)(iii) of this section provided that the conducted power and the conducted power spectral density (PSD) limits are linearly interpolated between the values shown and the adjacent channel emission limit of the higher value shown in the table is met. Operation at EIRP levels above 36 dBm (4,000 mW) but not greater than 40 dBm (10,000 mW) shall follow the requirements for 40 dBm (10,000 mW). Operation at EIRP levels above 40 dBm (10,000 mW) shall follow the requirements for 42 dBm (16,000 mW).

(iii) The conducted power spectral density from a fixed or mobile white space device shall not be greater than the values shown in the table in this paragraph (b)(1)(iii) when measured in any 100 kilohertz band during any time interval of continuous transmission.

TABLE 1 TO PARAGRAPH (b)(1)(iii)

EIRP (6 MHz)	Conducted power limit (6 MHz)	Conducted PSD limit [1] (100 kHz) (dBm)	Conducted adjacent channel emission limit (100 kHz) (dBm)
16 dBm (40 mW)	10 dBm (10 mW)	−7.4	−62.8
20 dBm (100 mW)	14 dBm (25 mW)	−3.4	−58.8
24 dBm (250 mW)	18 dBm (63 mW)	0.6	−54.8
28 dBm (625 mW)	22 dBm (158 mW)	4.6	−50.8
32 dBm (1,600 mW)	26 dBm (400 mW)	8.6	−46.8
36 dBm (4,000 mW)	30 dBm (1,000 mW)	12.6	−42.8
40 dBm (1,0000 mW)	30 dBm (1,000 mW)	12.6	−42.8
42 dBm (16,000 mW)	30 dBm (1,000 mW)	12.6	−42.8

(2) *Personal/portable white space devices.* (i) Technical limits for personal/portable white space devices are shown in the table in paragraph (b)(2)(ii) of this section and subject to the requirements of this section.

(ii) The radiated power spectral density from a personal/portable white space device shall not be greater than the values shown in the table in this paragraph (b)(2)(ii) when measured in any 100 kHz band during any time interval of continuous transmission.

TABLE 2 TO PARAGRAPH (b)(2)(ii)

EIRP (6 MHz)	Radiated PSD limit EIRP (100 kHz) (dBm)	Radiated adjacent channel emission limit EIRP (100 kHz) (dBm)
16 dBm (40 mW)	−1.4	−56.8
20 dBm (100 mW)	2.6	−52.8

(3) *Sensing-only devices.* Sensing-only white space devices are limited to 17 dBm (50 mW) EIRP and are subject to the requirements of this paragraph and of § 15.717 of this part.

(i) Radiated PSD limit: −0.4 dBm EIRP.

(ii) Adjacent channel emission limit: −55.8 dBm EIRP.

(4) *Narrowband white space devices.* (i) A narrowband white space device that operates as a client must communicate with a master device (fixed, Mode II, mobile or narrowband) that contacts the white space database to obtain a list of available channels and operating powers at its location. A narrowband white space device that acts as a master must incorporate a geo-location mechanism and be capable of obtaining lists of available channels and operating powers from the white space database.

(ii) Narrowband white space devices shall operate on channel sizes that are no more than 100 kilohertz. The edge of a narrowband channel shall be offset from the upper and lower edge of the 6 megahertz channel in which it operates by at least 250 kilohertz, except in the case where bonded 6 megahertz channels share a common band edge. Narrowband operating channels shall be at integral multiples of 100 kilohertz beginning at a 250 kilohertz offset from a 6 megahertz channel's edge, or with no offset at the common band edge of two bonded 6 megahertz channels.

(iii) The conducted power limit is 12.6 dBm in a 100 kilohertz segment. The EIRP limit is 18.6 dBm in a 100 kilohertz segment. The conducted power spectral density limit is 12.6 dBm in any 100 kilohertz band during any time interval of continuous transmission.

(iv) Conducted adjacent channel emissions shall be limited to −42.8 dBm in 100 kilohertz in a first adjacent 6 megahertz channel, starting at the edge of the 6 megahertz channel within which the narrowband device is operating. This limit shall not apply between the edge of the narrowband channel and the edge of the 6 megahertz channel that contains it.

(v) If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted power output shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(vi) Total occupancy for each narrowband channel shall be limited to 36 seconds per hour.

(c) *Conducted power limits.* (1) The conducted power, PSD and adjacent channel limits for fixed white space devices operating at up to 36 dBm (4000 milliwatts) EIRP shown in the table in paragraph (b)(1) of this section are based on a maximum transmitting antenna gain of 6 dBi. 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) The conducted power, PSD, and adjacent channel limits for fixed and mobile white space devices operating at greater than 36 dBm (4,000 milliwatts) EIRP shown in the table in paragraph (b)(1)(iii) of this section are based on a maximum transmitting antenna gain of 12 dBi. If transmitting antennas of directional gain greater than 12 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 12 dBi.

(3) 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 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.

(4) White space devices connected to the AC power line are required to comply with the conducted limits set forth in §15.207.

(d) *Emission limits.* (1) The adjacent channel emission limits shown in the tables in paragraphs (b)(1) and (2) of this section apply in the six megahertz channel immediately adjacent to each white space channel or group of contiguous white space channels in which the white space device is operating.

(2) At frequencies beyond the six megahertz channel immediately adjacent to each white space channel or group of contiguous white space channels in which the white space device is operating the white space device shall meet the requirements of §15.209.

(3) Emission measurements in the adjacent bands 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.

(e) *Transmit power control.* White space devices 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 the device's transmit power control feature mechanism.

(f) *Security.* White space devices shall incorporate adequate security measures to prevent the devices from accessing databases not approved by the FCC and to ensure that unauthorized parties cannot modify the device or configure its control features to operate in a manner inconsistent with the rules and protection criteria set forth in this subpart.

(g) *Antenna requirements*—(1) *Fixed white space devices*— (i) *Above ground level.* The transmit antenna height shall not exceed 10 meters above ground level in any area for fixed white space devices operating in the TV bands at 40 mW EIRP or less or operating across multiple contiguous TV channels at 100 mW EIRP or less.

(ii) *Height above average terrain (HAAT).* The transmit antenna shall not be located where the height above average terrain is more than 250 meters. The HAAT is to be calculated by the white space database using the

methodology in §73.684(d) of this chapter.

(2) *Personal/portable white space devices.* Personal/portable devices shall have permanently attached transmit and receive antenna(s).

(3) *Sensing-only white space devices operating under the provisions of §15.717 of this subpart.* (i) The provisions of §15.204(c)(4) do not apply to an antenna used for transmission and reception/spectrum sensing.

(ii) Compliance testing for white space devices that incorporate a separate sensing antenna shall be performed using the lowest gain antenna for each type of antenna to be certified.

(h) *Compliance with radio frequency exposure requirements.* White space devices shall ensure compliance with the Commission's radio frequency exposure requirements in §§1.1307(b), 2.1091 and 2.1093 of this chapter, as appropriate. Applications for equipment authorization of RF sources under this section must contain a statement confirming compliance with these requirements. Technical information showing the basis for this statement must be submitted to the Commission upon request.

[80 FR 73070, Nov. 23, 2015, as amended at 84 FR 34797, July 19, 2019; 85 FR 18149, Apr. 1, 2020; 86 FR 2291, Jan. 12, 2021]

EFFECTIVE DATE NOTE: At 86 FR 2291, Jan. 12, 2021, §15.709(g)(1)(ii) was revised. At 86 FR 2278, this revision was delayed indefinitely. For the convenience of the user, the revised text is set forth as follows:

§15.709 General technical requirements.

* * * * *

(g) * * *

(1) * * *

(ii) *Height above average terrain (HAAT).* For devices operating in the TV bands below 602 MHz, the transmit antenna shall not be located where its height above average terrain exceeds 250 meters generally, or 500 meters in less congested areas. For devices operating in all other bands the transmit antenna shall not be located where its height above average terrain exceeds 250 meters. The HAAT is to be calculated by the white space database using the methodology in §73.684(d) of this chapter. For HAAT greater than 250 meters the following procedures are required:

(A) The installing party must contact a white space database and identify all TV broadcast station contours that would be potentially affected by operation at the planned HAAT and EIRP. A potentially affected TV station is one where the protected service contour is within the applicable separation distance for the white space device operating at an assumed HAAT of 50 meters above the planned height at the proposed power level.

(B) The installing party must notify each of these licensees and provide the geographic coordinates of the white space device, relevant technical parameters of the proposed deployment, and contact information.

(C) No earlier than four calendar days after the notification in paragraph (g)(1)(ii)(B) of this section, the installing party may commence operations.

(D) Upon request, the installing party must provide each potentially affected licensee with information on the time periods of operations.

(E) If the installing party seeks to modify its operations by increasing its power level, by moving more than 100 meters horizontally from its location, or by making an increase in the HAAT or EIRP of the white space device that results in an increase in the minimum required separation distances from co-channel or adjacent channel TV station contours, it must conduct a new notification.

(F) All notifications required by this section must be in written form (including email). In all cases, the names of persons contacted, and dates of contact should be kept by the white space device operator for its records and supplied to the Commission upon request.

* * * * *

§15.711 Interference avoidance methods.

Except as provided in §15.717 of this part, channel availability for a white space device is determined based on the geo-location and database access method described in paragraphs (a) through (e) of this section.

(a) *Geolocation required.* White space devices shall rely on a geolocation capability and database access mechanism to protect the following authorized service in accordance with the interference protection requirements of §15.712: 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 through 74.882 of this chapter, including licensed wireless microphones; MVPD receive sites; wireless medical telemetry service (WMTS); radio astronomy service (RAS); and 600 MHz service band licensees where they have commenced operations, as defined in §27.4 of this chapter. In addition, protection shall be provided in border areas near Canada and Mexico in accordance with §15.712(g).

(b) *Geo-location requirement*—(1) *Accuracy*. Fixed white space devices that incorporate a geo-location capability and Mode II devices shall determine their location and their geo-location uncertainty (in meters), with a confidence level of 95%.

(2) *Reference datum.* All geographic coordinates shall be referenced to the North American Datum of 1983 (NAD 83).

(c) *Requirements for fixed white space devices.* (1) The geographic coordinates of a fixed white space device shall be determined at the time of installation and first activation from a power off condition by an incorporated geo-location capability. The antenna height above ground shall be determined by the installer or operator of the device, or by an automatic means. This information shall be stored internally in the white space device and transmitted automatically by the device to the white space database. The operator of a fixed white space device shall be responsible for assuring the accuracy of the information registered in the white space database. If a fixed white space device is moved to another location or if its stored coordinates become altered, the operator shall reestablish the device's:

(i) Geographic location through the incorporated geo-location capability and the antenna height above ground level and store this information in the white space device; and

(ii) Registration with the database based on the device's new coordinates and antenna height above ground level.

(iii) A fixed white space device may obtain its geographic coordinates through an external geo-location source when it is used at a location where its internal geo-location capability does not function. An external geo-location source may be connected to a fixed device through either a wired or a wireless connection, and a single geo-location source may provide location information to multiple fixed devices. An external geo-location source must be connected to a fixed device using a secure connection that ensures that only an external geo-location source that has been approved with a particular fixed device can provide geographic coordinates to that device. The geographic coordinates must be provided automatically by the external geo-location source to the fixed device; users may not manually enter them. Alternatively, an extender cable may be used to connect a remote receive antenna to a geo-location receiver within a fixed device.

(iv) The applicant for certification of a fixed device must demonstrate the accuracy of the geo-location method used and the location uncertainty as defined in paragraph (b) of this section. For fixed devices that are not using an internal geo-location capability, this uncertainty must account for the accuracy of the geo-location source and the separation distance between such source and the white space device.

(2)(i) Each fixed white space device must access a white space database over the Internet to determine the available channels and the corresponding maximum permitted power for each available channel that is available at its geographic coordinates, taking into consideration the fixed device's antenna height above ground level and geo-location uncertainty, prior to its initial service transmission at a given location.

(ii) Operation is permitted only on channels and at power levels that are indicated in the database as being available for each white space device. Operation on a channel must cease immediately or power must be reduced to a permissible level if the database indicates that the channel is no longer available at the current operating level.

(iii) Each fixed white space device shall access the database at least once a day to verify that the operating channels continue to remain available.

Each fixed white space device must adjust its use of channels in accordance with channel availability schedule information provided by its database for the 48-hour period beginning at the time the device last accessed the database for a list of available channels. The fixed device's registration information shall be updated if the geographic coordinates reported to the database differ by more than ±50 meters from the previously registered coordinates.

(iv) Fixed devices without a direct connection to the Internet: A fixed white space device may not operate on channels provided by a white space database for another fixed device. A fixed white space device that has not yet been initialized and registered with a white space database consistent with §15.713 of this part, but can receive the transmissions of another fixed white space device, may transmit to that other fixed white space device on either a channel that the other white space device has transmitted on or on a channel which the other white space device 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 fixed white space device must only use the channels that the database indicates are available for it to use.

(d) *Requirements for Mode II personal/portable white space devices.* (1) The geographic coordinates of a Mode II personal/portable white space device shall be determined by an incorporated geolocation capability prior to its initial service transmission at a given location and each time the device is activated from a power-off condition to determine the available channels and the corresponding maximum permitted power for each available channel at its geographic coordinates, taking into consideration the device's geo-location uncertainty. The location must be checked 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.

(2) Each Mode II personal/portable white space device must access a white space database over the Internet to obtain a list of available channels for its location. The device must access the database for an updated available channel list if its location changes by more than 100 meters from the location at which it last established its available channel list.

(3) Operation is permitted only on channels and at power levels that are indicated in the database as being available for the Mode II personal/portable white space device. Operation on a channel must cease immediately or power must be reduced to a permissible level if the database indicates that the channel is no longer available at the current operating level.

(4) A Mode II personal/portable white space 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) and corresponding power levels continue to be available. Mode II personal/portable devices must adjust their use of channels and power levels 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.

(5) A Mode II personal/portable device may load channel availability information for multiple locations, (*i.e.*, in the vicinity of its current location) and use that information to define a geographic area within which it can operate on the same available channels at all locations. For example a Mode II personal/portable white space device 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 white space device 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.

(e) *Requirements for Mode I personal/portable white space devices.* (1) A Mode I personal/portable white space device may only transmit upon receiving a list of available channels from a fixed or Mode II white space device. A fixed or Mode II white space 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.

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

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

(4) 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 white space device or on a channel the fixed or Mode II white space device indicates is available for use by a Mode I device. 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 white space device that provided its current list of available channels or contact a Mode II or fixed white space 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. If a fixed or Mode II white space device loses power and obtains a new channel list, it must signal all Mode I devices it is serving to acquire and use a new channel list.

(f) *Display of available channels.* A white space device must incorporate the capability to display a list of identified available channels and its operating channels.

(g) *Identifying information.* Fixed white space devices 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.

(h) *Continuing operation.* If a fixed or Mode II personal/portable white space device fails to successfully contact the white space database during any given day, it may continue to operate until 11:59 p.m. of the following day at which time it must cease operations until it re-establishes contact with the white space database and re-verifies its list of available channels.

(i) *Push notifications.* White space device manufacturers and database administrators must implement the push notification requirements of paragraphs (i)(1) and (2) of this section, and may also implement a system that pushes additional updated channel availability information from the database to white space devices.

(1) In response to a request for immediate access to a channel by a licensed wireless microphone user, white space database administrators are required to share the licensed microphone channel registration information to all other white space database administrators within 10 minutes of receiving each wireless microphone registration.

(2) White space database administrators shall push updated available channel lists to fixed and Mode II personal/portable white space devices within 20 minutes of receiving the notification required by paragraph (i)(1) of this section. The information need only be pushed to white space devices that are located within the separation distances, specified in §15.712(f) of this part, for each licensed wireless microphone registration received.

(3) White space database administrators must update their systems to comply with these requirements no later than December 23, 2016.

(j) *Security*. (1) White space 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 white space devices and databases 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. This requirement applies to communications of channel availability and other spectrum access information between the databases and fixed and Mode II devices (it is not necessary for white space devices 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).

(2) 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 the white space database that the Mode I device has a valid FCC Identifier 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.

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

(4) Applications for certification of white space devices shall 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, mobile, and Mode II white space devices shall identify at least one of the white space databases operated by a designated white space 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.

(k) *Requirements for mobile white space devices*. (1) Mobile white space devices shall operate within geo-fenced areas over which the white space database has determined channel availability. A mobile white space device shall have the capability to internally store the boundaries of a geo-fenced area and determine its location with respect to those boundaries. The area boundaries stored within a mobile white space device must be the same as those used by the white space database to determine channel availability.

(2) A mobile white space device shall incorporate a geo-location capability to determine its geographic coordinates. A mobile white space device may obtain its geographic coordinates through an external geo-location source, provided that source is on the same vehicle or other mobile platform as the mobile device. An external geo-location source may be connected to a mobile device through either a wired or a wireless connection, and a single geo-location source may provide location information to multiple mobile devices on the same mobile platform. An external geo-location source must be connected to a mobile device using a secure connection that ensures that only an external geo-location source that has been approved with a particular mobile device can provide geographic coordinates to that device. The geographic coordinates must be provided automatically by the external geo-location source to the mobile device; users may not manually enter them. Alternatively, an extender cable may

be used to connect a remote receive antenna to a geo-location receiver within a mobile device.

(3) The applicant for certification of a mobile device must demonstrate the accuracy of the geo-location method used and the location uncertainty as defined in paragraph (b) of this section. For mobile devices that are not using an internal geo-location capability, this uncertainty must account for the accuracy of the geo-location source and the separation distance between such source and the white space device.

(4) The antenna height above ground shall be determined by the operator of the device, or by an automatic means. The mobile device shall provide this information to the white space database when it requests a list of available channels for the geo-fenced area in which it will operate.

(5) Each mobile device must access a white space database over the internet to determine the available channels and the maximum permitted power for each available channel within the geo-fenced area in which it will operate. The white space database must take into consideration the mobile device's antenna height above ground level and geo-location uncertainty in determining the list of available channels. It must also take into consideration any variation in mobile device HAAT throughout the geo-fenced area and must use the highest HAAT within the geo-fenced area in determining channel availability. Operation is permitted only on channels that are indicated by the database as being available at the same power level throughout the entire geo-fenced area in which the mobile device will operate.

(6) Mobile devices must comply with the same separation distances from protected services in §15.712 as fixed devices.

(7) Mobile devices may use electrically steerable directional antennas, but a device's maximum EIRP in any direction must be used by the white space database in determining channel availability.

(8) A mobile device must re-check its coordinates 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. It must cease operation if its location is within 1.9 kilometers of the boundary, or outside the boundary, of the geo-fenced area over which the white space database has determined the available channels.

(9) Each mobile white space device shall access the white space database at least once a day to verify that the operating channels within the geo-fenced area continue to remain available. Each mobile white space device must adjust its use of channels in accordance with channel availability schedule information provided by its database for the 48-hour period beginning at the time the device last accessed the database for a list of available channels.

(10) Operation of mobile white space devices on satellites and aircraft, including unmanned aerial vehicles, is prohibited.

[80 FR 73070, Nov. 23, 2015, as amended at 81 FR 4974, Jan. 29, 2016; 82 FR 41559, Sept. 1, 2017; 84 FR 34797, July 19, 2019; 86 FR 2292, Jan. 12, 2021]

§15.712 Interference protection requirements.

The separation distances in this section apply to fixed, mobile, and personal/portable white space devices with a location accuracy of ±50 meters. These distances must be increased by the amount that the location uncertainty of a white space device exceeds ±50 meters. Narrowband white space devices shall comply with the separation distances applicable to a fixed white space device operating with 30 dBm conducted power and 36 dBm EIRP across a 6 megahertz channel.

(a) *Digital television stations, and digital and analog Class A TV, low power TV, TV translator and TV booster stations*—(1) *Protected contour*. White space devices 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.* White space devices must be located outside the contours indicated in paragraph (a)(1) of this section of co-channel and adjacent channel stations by at least the minimum distances specified in the tables in paragraph (a)(2)(v) of this section.

(i) If a device operates between two defined power levels, it must comply with the separation distances for the higher power level.

(ii) White space devices operating at 40 mW EIRP or less are not required to meet the adjacent channel separation distances.

(iii) Fixed white space devices operating at 100 mW EIRP or less per 6 megahertz across multiple contiguous TV channels with at least 3-megahertz separation between the frequency band occupied by the white space device and adjacent TV channels are not required to meet the adjacent channel separation distances.

(iv) Fixed white space devices may only operate above 4 W EIRP in less congested areas as defined in § 15.703.

(v) The following are the tables of minimum required separation distances outside the contours of co-channel and adjacent channel stations that white space devices must meet.

TABLE 2 TO PARAGRAPH (a)(2)(v)

Mode II personal/portable white space devices		
	Required separation in kilometers from co-channel digital or analog TV (full service or low power) protected contour	
	16 dBm (40 mW)	20 dBm (100 mW)
Communicating with Mode II or Fixed device.	1.3	1.7
Communicating with Mode I device	2.6	3.4

TABLE 3 TO PARAGRAPH (a)(2)(v)

Fixed white space devices								
Antenna height above average terrain of unlicensed devices (meters)	Required separation in kilometers from co-channel digital or analog TV (full service or low power) protected contour [1]							
	16 dBm (40 mW)	20 dBm (100 mW)	24 dBm (250 mW)	28 dBm (625 mW)	32 dBm (1,600 mW)	36 dBm (4 W)	40 dBm (10 W)	42 dBm (16 W)
Less than 3	1.3	1.7	2.1	2.7	3.3	4.0	4.5	5.0
3–10	2.4	3.1	3.8	4.8	6.1	7.3	8.5	9.4
10–30	4.2	5.1	6.0	7.1	8.9	11.1	13.9	15.3
30–50	5.4	6.5	7.7	9.2	11.5	14.3	19.1	20.9
50–75	6.6	7.9	9.4	11.1	13.9	18.0	23.8	26.2
75–100	7.7	9.2	10.9	12.8	17.2	21.1	27.2	30.1
100–150	9.4	11.1	13.2	16.5	21.4	25.3	32.3	35.5
150–200	10.9	12.7	15.8	19.5	24.7	28.5	36.4	39.5
200–250	12.1	14.3	18.2	22.0	27.3	31.2	39.5	42.5
250–300	13.9	16.4	20.0	23.9	29.4	35.4	42.1	45.9
300–350	15.3	17.9	21.7	25.7	31.4	37.6	44.5	48.4
350–400	16.6	19.3	23.2	27.3	33.3	39.7	46.9	51.0
400–450	17.6	20.4	24.4	28.7	35.1	41.9	49.4	53.8
450–500	18.3	21.4	25.5	30.1	36.7	43.7	51.4	55.9

TABLE 3 TO PARAGRAPH (a)(2)(v)—Continued

Fixed white space devices								
Antenna height above average terrain of unlicensed devices (meters)	Required separation in kilometers from co-channel digital or analog TV (full service or low power) protected contour [1]							
	16 dBm (40 mW)	20 dBm (100 mW)	24 dBm (250 mW)	28 dBm (625 mW)	32 dBm (1,600 mW)	36 dBm (4 W)	40 dBm (10 W)	42 dBm (16 W)
500–550	18.9	21.8	26.3	31.0	37.9	45.3	53.3	57.5

[1] When communicating with Mode I personal/portable white space devices, the required separation distances must be increased beyond the specified distances by 1.3 kilometers if the Mode I device operates at power levels no more than 40 mW EIRP or 1.7 kilometers if the Mode I device operates at power levels above 40 mW EIRP.

TABLE 4 TO PARAGRAPH (a)(2)(v)

Personal/portable white space devices	
	Required separation in kilometers from adjacent channel digital or analog TV (full service or low power) protected contour
	20 dBm (100 mW)
Communicating with Mode II or Fixed device	0.1
Communicating with Mode I device	0.2

TABLE 5 TO PARAGRAPH (a)(2)(v)

Fixed white space devices							
Antenna height above average terrain of unlicensed devices (meters)	Required separation in kilometers from adjacent channel digital or analog TV (full service or low power) protected contour [1]						
	20 dBm (100 mW)	24 dBm (250 mW)	28 dBm (625 mW)	32 dBm (1,600 mW)	36 dBm (4 W)	40 dBm (10 W)	42 dBm (16 W)
Less than 3	0.1	0.1	0.1	0.1	0.2	0.2	0.3
3–10	0.1	0.2	0.2	0.2	0.3	0.4	0.5
10–30	0.2	0.3	0.3	0.4	0.5	0.6	0.7
30–50	0.3	0.3	0.4	0.5	0.7	0.8	1.0
50–75	0.3	0.4	0.5	0.7	0.8	0.9	1.0
75–100	0.4	0.5	0.6	0.8	1.0	1.1	1.3
100–150	0.5	0.6	0.8	0.9	1.2	1.3	1.5
150–200	0.5	0.7	0.9	1.1	1.4	1.5	1.7
200–250	0.6	0.8	1.0	1.2	1.5	1.7	1.9
250–300	0.7	0.8	1.0	1.3	1.6	2.1	2.3
300–350	0.7	0.9	1.1	1.4	1.8	2.2	2.4
350–400	0.8	1.0	1.2	1.5	1.9	2.4	2.7
400–450	0.8	1.0	1.3	1.6	2.1	2.6	2.9
450–500	0.8	1.1	1.4	1.7	2.1	2.7	2.9
500–550	0.9	1.2	1.5	1.8	2.2	2.8	3.0

[1] When communicating with a Mode I personal/portable white space device that operates at power levels above 40 mW EIRP, the required separation distances must be increased beyond the specified distances by 0.1 kilometers.

(3) *Fixed white space device antenna height.* Fixed white space devices must comply with the requirements of §15.709(g).

(b) *TV translator, Low Power TV (including Class A) and Multi-channel Video Programming Distributor (MVPD) receive sites.* (1) MVPD, TV translator station and low power TV (including Class A) station receive sites located outside the protected contour of the TV station(s) being received may be registered in the white space 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, TV translator station or low power/Class A TV station may be registered.

(2) White space devices may not operate within an arc of ±30 degrees from a line between a 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 registered receive site for adjacent channel operation, except that the protection distance shall not exceed the distance from the receive site to the protected contour.

(3) Outside of the ±30 degree arc defined in paragraph (b)(2) of this section:

(i) White space devices operating at 4 watts EIRP or less 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.

(ii) White space devices operating with more than 4 watts EIRP and up to 10 watts EIRP may not operate within 10.2 kilometers from the receive site for co-channel operation and 2.5 kilometers from the receive site for adjacent channel operation.

(iii) White space devices operating with more than 10 watts EIRP may not operate within 16.6 kilometers from the receive site for co-channel operation and 3.5 kilometers from the receive site for adjacent channel operation.

(iv) For purposes of this section, a TV station being received may include a full power TV station, TV translator station or low power TV/Class A TV station.

(c) *Fixed Broadcast Auxiliary Service (BAS) links.* (1) For permanent BAS receive sites appearing in the Commission's Universal Licensing System or temporary BAS receive sites registered in the white space database, white space devices 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.

(2) Outside of the ±30 degree arc defined in paragraph (c)(1) of this section:

(i) White space devices operating at 4 watts EIRP or less 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.

(ii) White space devices operating with more than 4 watts EIRP and up to 10 watts EIRP may not operate within 10.2 km from the receive site for co-channel operation and 2.5 km from the receive site for adjacent channel operation.

(iii) White space devices operating with more than 10 watts EIRP may not operate within 16.6 kilometers from the receive site for co-channel operation and 3.5 kilometers from the receive site for adjacent channel operation.

(d) *PLMRS/CMRS operations.* (1) White space devices may not operate at distances less than those specified in the table in this paragraph (d)(1) from the coordinates of the metropolitan areas and on the channels listed in §90.303(a) of this chapter.

TABLE 6 TO PARAGRAPH (d)(1)

White space device transmitter power	Required separation in kilometers from the areas specified in §90.303(a) of this chapter			
	Co-channel operation		Adjacent channel operation	
	Up to 250 meters HAAT	Greater than 250 meters HAAT	Up to 250 meters HAAT	Greater than 250 meters HAAT
Up to 4 watts EIRP	134.0	158.0	131.0	155.4
Greater than 4 watts and up to 10 watts EIRP	136.0	169.8	131.5	166.0
Greater than 10 watts and up to 16 watts EIRP	139.2	171.1	132.2	166.2

(2) White space devices may not operate at distances less than those specified in the table in this paragraph (d)(2) from PLMRS/CMRS operations authorized by waiver outside of the metropolitan areas listed in §90.303(a) of this chapter.

TABLE 7 TO PARAGRAPH (d)(2)

White space device transmitter power	Required separation in kilometers from operations authorized by waiver outside of the areas specified in § 90.303(a) of this chapter			
	Co-channel operation		Adjacent channel operation	
	Up to 250 meters HAAT	Greater than 250 meters HAAT	Up to 250 meters HAAT	Greater than 250 meters HAAT
Up to 4 watts EIRP	54.0	78.0	51.0	75.4
Greater than 4 watts and up to 10 watts EIRP	56.0	89.8	51.5	86.0
Greater than 10 watts and up to 16 watts EIRP	59.2	91.1	52.2	86.2

(e) *Offshore Radiotelephone Service.* White space devices may not operate on channels used by the Offshore Radio Service within the geographic areas specified in § 74.709(e) of this chapter.

(f) *Low power auxiliary services, including wireless microphones.* White space devices are not permitted to operate within the following distances 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.

(1) Fixed white space devices with 10 watts EIRP or less: 1 kilometer.

(2) Fixed white space devices with greater than 10 watts EIRP: 1.3 kilometers.

(3) Personal/portable white space devices: 400 meters.

(g) *Border areas near Canada and Mexico.* Fixed, mobile, and personal/portable white space devices shall comply with the required separation distances in paragraph (a)(2) of this section from the protected contours of TV stations in Canada and Mexico. White space devices are not required to comply with the separation distances in paragraph (a)(2) from portions of the protected contours of Canadian or Mexican TV stations that fall within the United States.

(h) *Radio astronomy services.* (1) Operation of fixed, mobile, and personal/portable white space devices is prohibited on all channels within 2.4 kilometers at the following locations.

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

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

(iii) The following facilities:

Observatory	Latitude (deg/min/sec)	Longitude (deg/min/sec)
Arecibo Observatory	18 20 37 N	066 45 11 W
Green Bank Telescope (GBT)	38 25 59 N	079 50 23 W
Very Long Baseline Array (VLBA) Stations:		
Pie Town, NM	34 18 04 N	108 07 09 W
Kitt Peak, AZ	31 57 23 N	111 36 45 W
Los Alamos, NM	35 46 30 N	106 14 44 W
Ft. Davis, TX	30 38 06 N	103 56 41 W
N. Liberty, IA	41 46 17 N	091 34 27 W
Brewster, WA	48 07 52 N	119 41 00 W
Owens Valley, CA	37 13 54 N	118 16 37 W
St. Croix, VI	17 45 24 N	064 35 01 W
Hancock, NH	42 56 01 N	071 59 12 W
Mauna Kea, HI	19 48 05 N	155 27 20 W

(2) Operation within the band 608–614 MHz is prohibited within the areas defined by the following coordinates (all coordinates are NAD 83):

(i) Pie Town, NM

North latitude (deg/min/sec)	West longitude (deg/min/sec)
35 25 56.28	107 44 56.40
35 15 57.24	107 41 27.60
33 52 14.16	107 30 25.20
33 22 39.36	107 49 26.40
33 57 38.52	109 36 10.80
34 04 46.20	109 34 12.00

North latitude (deg/min/sec)	West longitude (deg/min/sec)
34 27 20.88	109 12 43.20
35 15 30.24	108 25 55.20

(ii) Kitt Peak, AZ

North latitude (deg/min/sec)	West longitude (deg/min/sec)
34 08 18.24	111 36 46.80
33 54 10.08	109 38 20.40
32 09 25.56	113 42 03.60
31 29 15.72	111 33 43.20
33 20 36.60	113 36 14.40
34 09 20.52	112 34 37.20

(iii) Los Alamos, NM

North latitude (deg/min/sec)	West longitude (deg/min/sec)
36 25 54.12	106 06 07.20
36 32 26.88	105 59 27.60
36 45 23.40	105 48 03.60
36 48 10.44	105 30 21.60
36 13 37.92	105 26 38.40
35 38 40.92	105 48 36.00
35 36 51.48	105 49 30.00
34 06 17.28	107 10 48.00
34 16 18.12	107 17 16.80
35 21 22.68	106 51 07.20

(iv) Ft. Davis, TX

North latitude (deg/min/sec)	West longitude (deg/min/sec)
30 42 16.92	103 55 22.80
30 35 49.92	103 41 52.80
30 32 35.88	103 43 04.80
30 25 20.64	103 49 48.00
30 24 30.24	103 52 30.00
30 26 14.28	103 57 54.00
30 33 03.60	104 09 10.80
30 40 03.36	104 05 9.60
30 43 11.28	103 58 48.00

(v) N. Liberty, IA

North latitude (deg/min/sec)	West longitude (deg/min/sec)
42 03 27.00	90 54 16.56
41 59 03.12	90 46 49.44
41 34 19.20	90 51 11.16
41 19 27.12	90 58 58.80
41 02 09.96	91 07 18.84
41 07 51.24	92 03 44.64
41 50 03.12	92 36 20.16
42 28 50.16	91 44 35.16

(vi) Brewster, WA

North latitude (deg/min/sec)	West longitude (deg/min/sec)
48 18 00.36	119 35 27.60
48 16 40.08	119 34 51.60
48 15 20.52	119 34 33.60
48 12 26.64	119 34 08.40
48 07 51.96	119 34 33.60
48 06 44.64	119 34 48.00
47 58 44.40	119 36 03.60
47 55 06.60	119 37 40.80
47 52 48.72	119 39 03.60
48 00 49.68	119 59 06.00
48 26 59.64	119 46 04.80
48 26 08.52	119 43 22.80

(vii) Owens Valley, CA

North latitude (deg/min/sec)	West longitude (deg/min/sec)
37 05 49.56	118 02 13.20
37 03 27.36	118 01 08.40
36 29 09.96	118 06 50.40
36 30 48.60	118 11 56.40
36 37 08.04	118 16 37.20
37 25 12.72	118 41 16.80
37 27 30.24	118 41 02.40
37 44 45.96	118 39 03.60
37 59 49.92	118 32 09.60
37 46 12.72	118 20 09.60

(viii) St. Croix, VI

North latitude (deg/min/sec)	West longitude (deg/min/sec)
18 29 15.36	64 22 38.28
18 06 51.12	64 08 03.84
18 04 31.44	64 06 12.24
18 02 02.76	64 04 33.96
17 59 26.52	64 03 09.36
17 56 43.80	64 01 59.52
17 53 56.04	64 01 04.80
17 51 03.96	64 00 25.56
17 48 09.72	64 00 02.16
17 42 19.08	63 58 57.36
17 39 07.92	63 58 15.96
17 42 10.44	64 39 37.44
17 43 57.00	64 50 46.32
18 07 24.24	66 02 36.96
18 16 13.80	65 44 56.04

(ix) Hancock, NH

North latitude (deg/min/sec)	West longitude (deg/min/sec)
44 08 59.64	71 32 01.68
43 46 24.60	71 18 57.60
42 58 41.88	71 15 14.04
42 29 25.08	71 52 51.96
42 34 05.88	72 07 08.76
42 34 41.52	72 09 41.76
42 55 47.28	72 55 03.72

(x) Mauna Kea, HI

North latitude (deg/min/sec)	West longitude (deg/min/sec)
20 11 01.32	153 03 43.20
20 00 52.92	152 35 56.40
19 46 42.60	152 35 34.80
19 32 33.36	152 36 28.80
19 18 31.68	152 38 38.40
19 04 44.04	152 42 07.20
18 51 16.56	152 46 51.60
18 38 15.72	152 52 44.40
18 25 46.56	152 59 49.20
18 13 55.20	153 07 55.20
18 02 46.68	153 17 06.00

North latitude (deg/min/sec)	West longitude (deg/min/sec)
17 52 26.40	153 27 14.40
17 42 57.96	153 38 16.80
17 35 20.04	153 50 45.60
17 27 52.20	154 03 10.80
17 21 27.00	154 16 15.60
17 16 08.40	154 29 49.20
17 11 57.84	154 43 51.60
17 08 57.48	154 58 08.40
17 07 09.12	155 12 43.20
17 23 53.52	155 27 21.60
19 29 13.92	155 36 21.60
19 47 53.88	155 29 27.60
19 48 52.92	155 27 39.60
19 48 58.68	155 27 14.40

(3) Operation within the band 608–614 MHz is prohibited within the following areas:

(i) The National Radio Quiet Zone as defined in §1.924(a)(1) of this chapter.

(ii) The islands of Puerto Rico, Desecheo, Mona, Vieques or Culebra

(i) *600 MHz service band:* Fixed and personal/portable devices operating in the 600 MHz Service Band must comply with the following co-channel and adjacent channel separation distances outside the defined polygonal area encompassing the base stations or other radio facilities deployed by a part 27 600 MHz Service Band licensee that has commenced operations, as defined in §27.4 of this chapter.

(1) Fixed white space devices may only operate above 4 W EIRP in less congested areas as defined in §15.703.

(2) If a device operates between two defined power levels, it must comply with the separation distances for the higher power level.

(3) For the purpose of this rule, co-channel means any frequency overlap between a channel used by a white space device and a five megahertz spectrum block used by a part 27 600 MHz band licensee, and adjacent channel means a frequency separation of zero to four megahertz between the edge of a channel used by a white space device and the edge of a five megahertz spectrum block used by a part 27 600 MHz band licensee.

(4) On frequencies used by wireless uplink services:

MODE II PERSONAL/PORTABLE WHITE SPACE DEVICES

	600 MHz band wireless uplink spectrum Minimum co-channel separation distances in kilometers between white space devices and any point along the edge of a polygon representing the outer edge of base station or other radio facility deployment	
	16 dBm (40 mW)	20 dBm (100 mW)
Communicating with Mode II or Fixed device	5	6
Communicating with Mode I device	10	12

FIXED WHITE SPACE DEVICES

Antenna height above average terrain of unlicensed devices (meters)	600 MHz band wireless uplink spectrum Minimum co-channel separation distances in kilometers between white space devices and any point along the edge of a polygon representing the outer edge of base station or other radio facility deployment*						
	16 dBm (40mW)	20 dBm (100 mW)	24 dBm (250mW)	28 dBm (625 mW)	32 dBm (1600 mW)	36 dBm (4 W)	40 dBm (10 W)
Less than 3	5	6	7	9	12	15	19
3—10	9	11	14	17	22	27	34
10—30	15	19	24	30	38	47	60
30—50	20	24	31	38	49	60	60
50—75	24	30	37	47	60	60	60
75—100	27	34	43	54	60	60	60
100—150	33	42	53	60	60	60	60
150—200	39	49	60	60	60	60	60
200–250	43	54	60	60	60	60	60

*When communicating with Mode I personal/portable white space devices, the required separation distances must be increased beyond the specified distances by 5 kilometers if the Mode I device operates at power levels no more than 40 mW EIRP or 6 kilometers if the Mode I device operates at power levels above 40 mW EIRP.

PERSONAL/PORTABLE WHITE SPACE DEVICES

	600 MHz band wireless uplink spectrum Minimum adjacent channel separation distances in kilometers between white space devices and any point along the edge of a polygon representing the outer edge of base station or other radio facility deployment
	20 dBm (100 mW)
Communicating with Mode II or Fixed device	0.1
Communicating with Mode I device	0.3

FIXED WHITE SPACE DEVICES

Antenna height above average terrain of unlicensed devices (meters)	600 MHz band wireless uplink spectrum Minimum adjacent channel separation distances in kilometers between white space devices and any point along the edge of a polygon representing the outer edge of base station or other radio facility deployment*					
	20 dBm (100 mW)	24 dBm (250mW)	28 dBm (625 mW)	32 dBm (1600 mW)	36 dBm (4 W)	40 dBm (10 W)
Less than 3	0.1	0.2	0.2	0.3	0.4	0.4
3–10	0.3	0.3	0.4	0.5	0.6	0.8
10–30	0.4	0.6	0.7	0.9	1.1	1.4
30–50	0.6	0.7	0.9	1.2	1.4	1.8
50–75	0.7	0.9	1.1	1.4	1.8	2.2
75–100	0.8	1.0	1.3	1.6	2.0	2.6
100–150	1.0	1.3	1.6	2.0	2.5	3.1
150–200	1.2	1.4	1.8	2.3	2.9	3.6
200–250	1.3	1.6	2.0	2.6	3.2	4.1

*When communicating with Mode I personal/portable white space devices, the required separation distances must be increased beyond the specified distances by 0.1 kilometers.

(5) On frequencies used by wireless downlink services: 35 kilometers for co-channel operation, and 31 kilometers for adjacent channel operation.

(j) *Wireless Medical Telemetry Service.* (1) White space devices operating in the 608–614 MHz band (channel 37) are not permitted to operate within an area defined by the polygon described in §15.713(j)(11) plus the distances specified in the tables in this paragraph (j)(1):

(i) Mode II personal/portable white space devices.

TABLE 23 TO PARAGRAPH (j)(1)(i)

	Required co-channel separation distances in kilometers from edge of polygon
	16 dBm (40 mW)
Communicating with Mode II or Fixed device	0.38
Communicating with Mode I device	0.76

(ii) Fixed white space devices, except that when communicating with Mode I personal/portable white space devices, the required separation distances must be increased beyond the specified distances by 0.38 kilometers.

TABLE 24 TO PARAGRAPH (j)(1)(ii)

Antenna height above average terrain of unlicensed devices (meters)	Required co-channel separation distances in kilometers from edge of polygon
	16 dBm (40 mW)
Less than 3	0.38
3–10	0.70
10–30	1.20
30–50	1.55
50–75	1.90
75–100	2.20
100–150	2.70
150–200	3.15
200–250	3.50

(2) White space devices operating in the 602–608 MHz band (channel 36) and 614–620 MHz band (channel 38) are not permitted to operate within an area defined by the polygon described in §15.713(j)(11) plus the distances specified in the tables in this paragraph (j)(2):

(i) Mode II personal/portable white space devices.

TABLE 25 TO PARAGRAPH (j)(2)(i)

	Required adjacent channel separation distances in meters from edge of polygon	
	16 dBm (40 mW)	20 dBm (100 mW)
Communicating with Mode II or Fixed device	8	13
Communicating with Mode I device	16	26

(ii) Fixed white space devices, except that when communicating with Mode I personal/portable white space devices, the required separation distances must be increased beyond the specified distances by 8 meters if the Mode I device operates at power levels no more than 40 mW EIRP, or 13 meters if the Mode I device operates at power levels above 40 mW EIRP.

TABLE 26 TO PARAGRAPH (j)(2)(ii)

Required adjacent channel separation distances in meters from edge of polygon					
16 dBm (40 mW)	20 dBm (100 mW)	24 dBm (250 mW)	28 dBm (625 mW)	32 dBm (1600 mW)	36 dBm (4 watts)
8	13	20	32	50	71

(k) *488–494 MHz band in Hawaii*. White space devices are not permitted to operate in the 488–494 MHz band in Hawaii.

[80 FR 73070, Nov. 23, 2015, as amended at 81 FR 4974, Jan. 29, 2016; 84 FR 34798, July 19, 2019; 86 FR 2293, Jan. 12, 2021; 86 FR 8558, Feb. 8, 2021]

§ 15.713 White space database.

(a) *Purpose*. The white space database serves the following functions:

(1) To determine and provide to a white space device, upon request, the available channels at the white space device's location in the TV bands, the 600 MHz duplex gap, the 600 MHz service band, and 608–614 MHz (channel 37). Available channels are determined based on the interference protection requirements in §15.712. A database must provide fixed, mobile, and Mode II personal portable white space devices with channel availability information that

includes scheduled changes in channel availability over the course of the 48-hour period beginning at the time the white space devices make a recheck contact. In making lists of available channels available to a white space device, the white space database shall ensure that all communications and interactions between the white space database and the white space device include adequate security measures such that unauthorized parties cannot access or alter the white space database or the list of available channels sent to white space devices or otherwise affect the database system or white space devices in performing their intended functions or in providing adequate interference protections to authorized services operating in the TV bands, the 600 MHz duplex gap, the 600 MHz service band, and 608–614 MHz (channel 37). In addition, a white space database must also verify that the FCC identifier (FCC ID) of a device seeking access to its services is valid; under the requirement in this paragraph (a)(1) the white space 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.

(2) To determine and provide to an unlicensed wireless microphone user, upon request, the available channels at the microphone user's location in the 600 MHz guard bands, the 600 MHz duplex gap, and the 600 MHz service band. Available channels are determined based on the interference protection requirements in §15.236.

(3) To register the identification information and location of fixed white space devices and unlicensed wireless microphone users.

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

(i) Digital television stations.

(ii) Class A television stations.

(iii) Low power television stations.

(iv) Television translator and booster stations.

(v) Broadcast Auxiliary Service stations (including receive only sites), except low power auxiliary stations.

(vi) Private land mobile radio service stations.

(vii) Commercial mobile radio service stations.

(viii) Offshore radiotelephone service stations.

(ix) Class A television station receive sites.

(x) Low power television station receive sites.

(xi) Television translator station receive sites.

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

(i) MVPD receive sites.

(ii) Sites where low power auxiliary stations, including wireless microphones and wireless assist video devices, are used and their schedule for operation.

(iii) Fixed white space device registrations.

(iv) 600 MHz service band operations in areas where the part 27 600 MHz service licensee has commenced operations, as defined in §27.4 of this chapter.

(v) Locations of health care facilities that use WMTS equipment operating on channel 37 (608–614 MHz).

(c) *Restrictions on registration.* (1) Television translator, low power TV and Class A station receive sites within the protected contour of the station being received are not eligible for registration in the database.

(2) MVPD receive sites within the protected contour or more than 80 kilometers from the nearest edge of the protected contour of a television station being received are not eligible to register that station's channel in the database.

(d) *Determination of available channels.* The white space database will determine the available channels at a location using the interference protection requirements of §15.712, the location

information supplied by a white space device, and the data for protected stations/locations in the database.

(e) *White space device initialization.* (1) Fixed, mobile, and Mode II white space devices must provide their location and required identifying information to the white space database in accordance with the provisions of this subpart.

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

(3) Fixed and mobile white space devices register and receive a list of available channels from the database by connecting to the internet, either directly or through another fixed white space device that has a direct connection to the internet. Fixed devices must also register with the database in accordance with paragraph (g) of this section.

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

(5) A fixed or Mode II white space device 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 with an antenna height above ground that exceeds 30 meters or an antenna height above average terrain (HAAT) that exceeds 250 meters generally, or 500 meters in less congested areas shall not be provided a list of available channels. The HAAT is to be calculated using computational software employing the methodology in §73.684(d) of this chapter.

(f) *Unlicensed wireless microphone database access.* Unlicensed wireless microphone users in the 600 MHz band may register with and access the database manually via a separate Internet connection. Wireless microphone users must register with and check a white space database to determine available channels prior to beginning operation at a given location. A user must recheck the database for available channels if it moves to another location.

(g) *Fixed white space device registration.* (1) Prior to operating for the first time or after changing location, a fixed white space device must register with the white space database by providing the information listed in paragraph (g)(3) of this section.

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

(3) The white space device registration database shall contain the following information for fixed white space devices:

(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));

(iv) Device's antenna height above ground level (meters);

(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) Email address for the contact person;

(ix) Phone number for the contact person.

(h) *Mode II personal/portable and mobile device information to database.* (1) A mobile device and a personal/portable device operating in Mode II shall provide the database its FCC Identifier (as required by §2.926 of this chapter) and serial number as assigned by the manufacturer.

(2) A personal/portable device operating in Mode II shall provide the database the device's geographic coordinates (latitude and longitude (NAD 83)).

(3) A mobile device shall provide the database with the boundaries of the geo-fenced area in which it will operate. Alternatively, the boundaries of the geo-fenced area may be loaded from the database into the mobile device.

(i) *Unlicensed wireless microphone registration.* Unlicensed wireless microphone users in the 600 MHz band shall

register with the database prior to operation and include the following information:

(1) Name of the individual or business that owns the unlicensed wireless microphone

(2) Address for the contact person

(3) Email address for the contact person

(4) Phone number for the contact person; and

(5) Coordinates where the device will be used (latitude and longitude in NAD 83).

(j) *White space database information.* The white space 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 §73.1650 of this chapter (a white space 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 white space 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) 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; and

(vii) Station call sign.

(2) Broadcast Auxiliary Service.

(i) Transmitter coordinates (latitude and longitude in NAD 83).

(ii) Receiver coordinates (latitude and longitude in NAD 83).

(iii) Channel number.

(iv) Call sign.

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

(i) Region name.

(ii) Channel(s) reserved for use in the region.

(iii) Geographic center of the region (latitude and longitude in NAD 83).

(iv) Call sign.

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

(i) Transmitter location (latitude and longitude in NAD 83) or geographic area of operations.

(ii) TV channel of operation.

(iii) Call sign.

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

(i) Geographic boundaries of the region (latitude and longitude in NAD 83 for each point defining the boundary of the region.

(ii) Channel(s) used by the service in that region.

(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; and

(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: Use of licensed low power auxiliary stations 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. Registrations must include the following information:

(i) Name of the individual or business responsible for 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;

(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); and

(viii) The stations call sign.

(9) [Reserved]

(10) 600 MHz service in areas where the part 27 600 MHz band licensee has commenced operations, as defined in §27.4 of this chapter:

(i) Name of 600 MHz band licensee;

(ii) Name and address of the contact person;

(iii) An email address for the contact person (optional);

(iv) A phone number for the contact person;

(v) Area within a part 27 600 MHz band licensee's Partial Economic Areas (PEA), as defined in §27.6 of this chapter, where it has commenced operation. This area must be delineated by at minimum of eight and a maximum of 120 geographic coordinates (latitude and longitude in NAD 83, accurate to ±50 m);

(vi) Date of commencement of operations;

(vii) Identification of the frequencies on which the part 27 600 MHz band licensee has commenced operations;

(viii) Call sign.

(11) Location of health care facilities operating WMTS networks on channel 37 (608–614 MHz):

(i) Name and address of the health care facility;

(ii) Name and address of a contact person;

(iii) Phone number of a contact person;

(iv) Email address of a contact person;

(v) Latitude and longitude coordinates referenced to North American Datum 1983 (NAD 83) that define the perimeter of each facility. If several health care facilities using 608–614 MHz wireless medical telemetry equipment are located in close proximity, it is permissible to register a perimeter to protect all facilities in that cluster.

(k) *Commission requests for data.* (1) A white space database administrator must provide to the Commission, upon request, any information contained in the database.

(2) A white space database administrator must remove information from the database, upon direction, in writing, by the Commission.

(l) *Security.* The white space database shall employ protocols and procedures to ensure that all communications and interactions between the white space database and white space devices are accurate and secure and that unauthorized parties cannot access or alter the database or the list of available channels sent to a white space device.

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

(2) A white space database shall verify that the FCC identification number supplied by a fixed, mobile, or personal/portable white space device is for a certified device and may not provide service to an uncertified device.

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

[80 FR 73070, Nov. 23, 2015, as amended at 81 FR 4974, Jan. 29, 2016; 82 FR 41559, Sept. 1, 2017; 84 FR 34799, July 19, 2019; 86 FR 2295, Jan. 12, 2021]

§ 15.714 White space database administration fees.

(a) A white space database administrator may charge a fee for provision of lists of available channels to fixed, mobile, and personal/portable devices and for registering fixed devices. This paragraph (a) applies to devices that operate in the TV bands, the 600 MHz service band, the 600 MHz duplex gap, and 608–614 MHz (channel 37).

(b) A white space database administrator may charge a fee for provision of lists of available channels to wireless microphone users.

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

[80 FR 73070, Nov. 23, 2015, as amended at 84 FR 34799, July 19, 2019; 86 FR 2296, Jan. 12, 2021]

§ 15.715 White space database administrator.

The Commission will designate one or more entities to administer the white space database(s). The Commission may, at its discretion, permit the functions of a white space 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 white space devices. Each database administrator designated by the Commission shall:

(a) Maintain a database that contains the information described in § 15.713.

(b) Establish a process for acquiring and storing in the database necessary and appropriate information from the Commission's databases and synchronizing the 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 white space devices and registering and including in the database facilities entitled to protection but not contained in a Commission database, including MVPD 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 and the corresponding maximum permitted power for each available channel to fixed, mobile, and personal/portable white space devices that submit to it the information required under § 15.713(e), (g), and (h) based on their geographic location and provide accurate lists of available channels and the corresponding maximum permitted power for each available channel to fixed, mobile, and Mode II devices requesting lists of available channels for Mode I devices. Database administrators may allow prospective operators of white space 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 white space database and white space devices are accurate and secure and that unauthorized parties cannot access or alter the

database or the list of available channels sent to a white space device consistent with the provisions of §15.713(l).

(g) Make its services available to all unlicensed white space 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 white space devices, 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 white space device or model of white space devices.

(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(b)(2) to all other white space databases to ensure consistency in the records of protected facilities.

(m) Provide a means to make publicly available all information the rules require the database to contain, including fixed white space device registrations and voluntarily submitted protected entity information, except the information provided by 600 MHz band licensees pursuant to §15.713(j)(10)(v) and (vi) of this part shall not be made publicly available.

(n) Establish procedures to allow part 27 600 MHz service licensees to upload the registration information listed in §15.713(j)(10) for areas where they have commenced operations, as defined in §27.4 of this chapter, and to allow the removal and replacement of registration information in the database when corrections or updates are necessary.

(o) Remove from the database the registrations of fixed white space devices that have not checked the database for at least three months to update their channel lists. A database administrator may charge a new registration fee for a fixed white space device that is removed from the database under this provision but is later re-registered.

(p) Establish procedures to allow health care facilities to register the locations of facilities where they operate WMTS networks on channel 37.

(q) Establish procedures to allow unlicensed wireless microphone users in the 600 MHz band to register with the database and to provide lists of channels available for wireless microphones at a given location.

[80 FR 73070, Nov. 23, 2015, as amended at 81 FR 4975, Jan. 29, 2016; 86 FR 2296, Jan. 12, 2021]

§15.717 White space devices that rely on spectrum sensing.

(a) *Applications for certification.* Parties may submit applications for certification of white space devices 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 preproduction 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 white space 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 per 6 megahertz of bandwidth on which the device operates and it does not have to comply with the requirements for geo-location and database access in §15.711(b), (d), and (e). 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 white space device 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 white space device 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 white space device operating channel, all transmissions by the white space device must cease within two seconds.

PART 17—CONSTRUCTION, MARKING, AND LIGHTING OF ANTENNA STRUCTURES

Subpart A—General Information

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