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(2) Scheduled to be launched so that it will be brought into use at approximately the same time as, but no later than, the existing satellite is retired.

[68 FR 51507, Aug. 27, 2003, as amended at 69 FR 51587, Aug. 20, 2004]

Subpart C—Technical Standards

SOURCE: 30 FR 7176, May 28, 1965; 36 FR 2562, Feb. 6, 1971, unless otherwise noted.

§ 25.201 Definitions.

Definitions for terms in subpart C of this part appear in this section, and in § 2.1 of this chapter.

1.6/2.4 GHz Mobile-Satellite Service. A mobile-satellite service that operates in the 1610–1626.5 MHz and 2483.5–2500 MHz frequency bands, or in any portion thereof.

2 GHz Mobile Satellite Service. A mobile-satellite service that operated in the 2000–2020 MHz and 2180–2200 MHz frequency bands, or in any portion thereof.

17/24 GHz Broadcasting-Satellite Service. A radiocommunications service using geostationary satellites between one or more feeder link earth stations and other earth stations, in the 17.3—17.7 GHz (space-to-Earth) (domestic allocation), 17.3—17.8 GHz (international allocation) and 24.75—25.25 GHz frequency bands. This service is also known as ''17/24 GHz BSS.'' For purposes of the application processing provisions of this part, 17/24 GHz BSS is a GSO-like service. For purposes of the technical requirements of this part, we will treat 17/24 GHz BSS as if it were FSS. Unless specifically stated otherwise, the 17/24 GHz BSS systems are subject to the rules in this part applicable to FSS.

Active satellite. An earth satellite carrying a station intended to transmit or re-transmit radiocommunication signals.

Ambulatory. Not stationary. Baselines from which maritime boundaries are measured change with accretion- and erosion-caused ambulation of the boundaries themselves.

Ancillary terrestrial component. The term ''ancillary terrestrial component'' means a terrestrial communications network used in conjunction with a qualifying satellite network system authorized pursuant to these rules and the conditions established in the Orders issued in IB Docket No. 01–185, *Flexibility for Delivery of Communications by Mobile Satellite Service Providers in the 2 GHz Band, the L-Band, and the 1.6/2.4 GHz Band.*

Ancillary terrestrial component base station. The term ''ancillary terrestrial component base station'' means a terrestrial fixed facility used to transmit communications to or receive communications from one or more ancillary terrestrial component mobile terminals.

Ancillary terrestrial component mobile terminal. The term ''ancillary terrestrial component mobile terminal'' means a terrestrial mobile facility used to transmit communications to or receive communications from an ancillary terrestrial component base station or a space station.

Base Earth Station. An earth station in the fixed-satellite service or, in some cases, in the land mobile-satellite service, located at a specified fixed point or within a specified area on land to provide a feeder link for the land mobile-satellite service. (RR)

Baseline. The line from which maritime zones are measured, also known as the coast line. The baseline is a combination of the low-water line (''low-tide elevation'') and closing lines across the mouths of inland water bodies. The baseline is defined by a series of baseline points. The baseline points are not just the low-water marks of the shore of mainland but also includes islands and ''low-water elevations'' (*i.e.*, natural rocks). Baseline points are ambulatory, and thus, require adjustment from time-to-time by the U.S. Department of State's Baseline Committee.

C-band. For purposes of this part, the terms ''C-band'' and ''conventional C-band'' refer specifically to the 3700–4200 MHz downlink and 5925–6425 MHz uplink frequency bands. These paired bands are allocated to the Fixed-Satellite Service and are also referred to as the 4/6 GHz band(s).

Coordination distance. For the purposes of this part, the expression ''coordination distance'' means the distance from an earth station, within which there is a possibility of the use

of a given transmitting frequency at this earth station causing harmful interference to stations in the fixed or mobile service, sharing the same band, or of the use of a given frequency for reception at this earth station receiving harmful interference from such stations in the fixed or mobile service.

Direct Broadcast Satellite Service. A radiocommunication service in which signals transmitted or retransmitted by space stations, using frequencies specified in §25.202(a)(7), are intended for direct reception by the general public. For the purposes of this definition, the term direct reception shall encompass both individual reception and community reception.

Earth station. A station located either on the Earth's surface or within the major portion of the Earth's atmosphere intended for communication:

(a) With one or more space stations; or

(b) With one or more stations of the same kind by means of one or more reflecting satellites or other objects in space.

Earth Station on Vessel (''ESV''). An ESV is an earth station onboard a craft designed for traveling on water receiving from and transmitting to fixed-satellite space stations.

Electronic filing. The submission of applications, exhibits, pleadings, or other filings to the Commission in an electronic form using *Internet* or *World Wide Web* on-line filing forms.

Equivalent diameter. When circular aperture reflector antennas are employed, the size of the antenna is generally expressed as the diameter of the antenna's main reflector. When non-reflector or non-circular aperture antennas are employed, an equivalent diameter can be computed for the antenna. The equivalent diameter is the diameter of a hypothetical circular aperture antenna with the same aperture area as the actual antenna. For example, an elliptical aperture antenna with major axis, a, and minor axis, b, will have an equivalent diameter of $[a \times b]^{1/2}$. A rectangular aperture antenna with length, l, and width, w, will have an equivalent diameter of $[4(l \times w)/\pi]^{1/2}$.

Equivalent power flux-density. The equivalent power flux-density (EPFD) is the sum of the power flux-densities produced at a geostationary satellite orbit (GSO) receive earth or space station on the Earth's surface or in the geostationary satellite orbit, as appropriate, by all the transmit stations within a non-geostationary satellite orbit fixed-satellite service (NGSO FSS) system, taking into account the off-axis discrimination of a reference receiving antenna assumed to be pointing in its nominal direction. The equivalent power flux-density, in dB(W/m^2) in the reference bandwidth, is calculated using the following formula:

$$\mathrm{EPFD} = 10 \cdot \log_{10}\left[\sum_{i=1}^{N_a} 10^{\frac{P_i}{10}} \cdot \frac{G_t(\theta_i)}{4.\pi d_i^2} \cdot \frac{G_r(\phi_i)}{G_{r,\max}}\right]$$

Where:

N_a is the number of transmit stations in the non-geostationary satellite orbit system that are visible from the GSO receive station considered on the Earth's surface or in the geostationary satellite orbit, as appropriate;

i is the index of the transmit station considered in the non-geostationary satellite orbit system;

P_i is the RF power at the input of the antenna of the transmit station, considered in the non-geostationary satellite orbit system in dBW in the reference bandwidth;

2_i is the off-axis angle between the boresight of the transmit station considered in the non-geostationary satellite orbit system and the direction of the GSO receive station;

$G_r(2_i)$ is the transmit antenna gain (as a ratio) of the station considered in the non-geostationary satellite orbit system in the direction of the GSO receive station;

d_i is the distance in meters between the transmit station considered in the non-

geostationary satellite orbit system and the GSO receive station;

N_i is the off-axis angle between the boresight of the antenna of the GSO receive station and the direction of the ith transmit station considered in the non-geostationary satellite orbit system;

$G_r(N_i)$ is the receive antenna gain (as a ratio) of the GSO receive station in the direction of the ith transmit station considered in the non-geostationary satellite orbit system;

$G_{r,max}$ is the maximum gain (as a ratio) of the antenna of the GSO receive station;

Fixed earth station. An earth station intended to be used at a specified fixed point.

Fixed-Satellite Service. A radiocommunication service between earth stations at given positions, when one or more satellites are used; the given position may be a specified fixed point or any fixed point within specified areas; in some cases this service includes satellite-to-satellite links, which may also be operated in the inter-satellite service; the fixed-satellite service may also include feeder links of other space radiocommunication services. (RR)

Geostationary satellite. A geosynchronous satellite whose circular and direct orbit lies in the plane of the Earth's equator and which thus remains fixed relative to the Earth; by extension, a satellite which remains approximately fixed relative to the Earth.

Inter-Satellite Service. A radiocommunication service providing links between artificial earth satellites.

Land Earth Station. An earth station in the fixed-satellite service or, in some cases, in the mobile-satellite service, located at a specified fixed point or within a specified area on land to provide a feeder link for the mobile-satellite service. (RR)

Land Mobile Earth Station. A mobile earth station in the land mobile-satellite service capable of surface movement within the geographical limits of a country or continent. (RR)

Ku-band. In this rule part, the terms ''Ku-band'' and ''conventional Ku-band'' refer specifically to the 11700–12200 MHz downlink and 14000–14500 MHz uplink frequency bands. These paired bands are allocated to the Fixed-Satellite Service and are also referred to as the 12/14 GHz band(s).

Low-Tide Elevation. A naturally formed area of land that is surrounded by and above water at low tide but below water at high tide. Low-tide elevations serve as part of the coast line when they are within the breath of the territorial sea of the mainland (either uplands or inland waters) or an island. 1958 Convention on the Territorial Sea, Article 11.

Mobile earth station. An earth station intended to be used while in motion or during halts at unspecified points.

Mobile-Satellite Service. A radiocommunication service:

(1) Between mobile earth stations and one or more space stations, or between space stations used by this service; or

(2) Between mobile earth stations, by means of one or more space stations.

This service may also include feeder links necessary for its operation. (RR)

NGSO FSS gateway earth station. A gateway earth station is an earth station complex consisting of multiple interconnecting earth station antennas supporting the communication routing and switching functions of a non-geostationary satellite orbit fixed-satellite service (NGSO FSS) system as a whole. A gateway earth station in the NGSO FSS:

(1) Does not originate or terminate radiocommunication traffic, but interconnects multiple non-collocated user earth stations operating in frequency bands other than designated gateway bands, through a satellite with other primary terrestrial networks, such as the public switched telephone network (PSTN) and/or Internet networks.

(2) Shall not be for the exclusive use of any customer.

(3) May also be used for telemetry, tracking, and command transmissions for the same NGSO FSS system.

(4) May include multiple antennas, each required to meet the antenna performance standard in §25.209(h), located within an area of one second latitude by one second longitude.

(5) Is considered as a separate gateway earth station complex if it is out side of the area of one second latitude by one second longitude of paragraph (4) of this definition, for the purposes of coordination with terrestrial services.

Non-Voice, Non-Geostationary Mobile-Satellite Service. A mobile-satellite service reserved for use by non-geostationary satellites in the provision of non-voice communications which may include satellite links between land earth stations at fixed locations.

Passive satellite. An earth satellite intended to transmit radio communication signals by reflection.

Permitted Space Station List. A list of satellites operating in the C-band and/or Ku-band including all U.S.-licensed satellites and those non-U.S.-licensed satellites for which the Commission has authorized routine U.S.-licensed earth stations to communicate with that satellite, and the satellite operator has requested the Commission to place its satellite on the Permitted Space Station List.

Power flux density. The amount of power flow through a unit area within a unit bandwidth. The units of power flux density are those of power spectral density per unit area, namely watts per hertz per square meter. These units are generally expressed in decibel form as $dB(W/Hz/m^2)$, $dB(W/m^2)$ in a 4 kHz band, or $dB(W/m^2)$ in a 1 MHz band.

Power spectral density. The amount of an emission's transmitted carrier power falling within the stated reference bandwidth. The units of power spectral density are watts per hertz and are generally expressed in decibel form as dB(W/Hz), dB(W/4kHz), or dB(W/1MHz).

Protection areas. The geographic regions on the surface of the Earth where United States Department of Defense (''DoD'') meteorological satellite systems or National Oceanic and Atmospheric Administration (''NOAA'') meteorological satellite systems, or both such systems, are receiving signals from low earth orbiting satellites.

Radiodetermination-Satellite Service. A radiocommunication service for the purpose of radiodetermination involving the use of one of more space stations. This service may also include feeder links necessary for its own operation. (RR)

Routine processing or licensing. A licensing process whereby applications are processed in an expedited fashion. Such applications must be complete in all regards and consistent with all Commission Rules and must not raise any policy issues. With respect to earth station licensing, an application is ''routine'' only if it conforms to all antenna, power, coordination, radiation hazard, and FAA notification rules, and accesses only ''Permitted Space Station List'' satellites in the conventional C-band or Ku-band frequency bands.

Satellite Digital Audio Radio Service (''DARS''). A radiocommunication service in which audio programming is digitally transmitted by one or more space stations directly to fixed, mobile, and/or portable stations, and which may involve complementary repeating terrestrial transmitters, telemetry, tracking and control facilities.

Satellite system. A space system using one or more artificial earth satellites.

Selected assignment. The term ''selected assignment'' means a spectrum assignment voluntarily identified by a 2 GHz MSS licensee at the time that the licensee's first 2 GHz mobile-satellite service satellite reaches its intended orbit, or other mobile-satellite service spectrum in which the Commission permits a 2 GHz mobile-satellite service licensee to conduct mobile-satellite service operations with authority superior to that of other in-band, mobile-satellite service licensees.

Spacecraft. A man-made vehicle which is intended to go beyond the major portion of the Earth's atmosphere.

Space operation service. A radiocommunication service concerned exclusively with the operation of spacecraft, in particular space tracking, space telemetry and space telecommand. These functions will normally be provided within the service in which the space station is operating.

Space radiocommunication. Any radiocommunication involving the use of one or more space stations or the use of one or more reflecting satellites or other objects in space.

Space station. A station located on an object which is beyond, is intended to go beyond, or has been beyond, the major portion of the Earth's atmosphere.

Space system. Any group of cooperating earth stations and/or space stations employing space

radiocommunication for specific purposes.

Space telecommand. The use of radiocommunication for the transmission of signals to a space station to initiate, modify or terminate function of the equipment on a space object, including the space station.

Space telemetering. The use of telemetering for the transmission from a space station of results of measurements made in a spacecraft, including those relating to the functioning of the spacecraft.

Space tracking. Determination of the orbit, velocity or instantaneous position of an object in space by means of radiodetermination, excluding primary radar, for the purpose of following the movement of the object.

Structural attenuation. The term ''structural attenuation'' means the signal attenuation caused by transmitting to and from mobile terminals which are located in buildings or other man-made structures that attenuate the transmission of radiofrequency radiation.

Terrestrial radiocommunication. Any radiocommunication other than space radiocommunication or radio astronomy.

Terrestrial station. A station effecting terrestrial radiocommunication.

[30 FR 7176, May 28, 1965, as amended at 36 FR 2562, Feb. 6, 1971; 48 FR 40254, Sept. 6, 1983; 51 FR 18445, May 20, 1986; 54 FR 49993, Dec. 4, 1989; 56 FR 42706, Aug. 29, 1991; 58 FR 68059, Dec. 23, 1993; 59 FR 53329, Oct. 21, 1994; 62 FR 11105, Mar. 11, 1997; 62 FR 59296, Nov. 3, 1997; 65 FR 59143, Oct. 4, 2000; 66 FR 10621, Feb. 16, 2001; 67 FR 51114, Aug. 7, 2002; 68 FR 11993, Mar. 13, 2003; 68 FR 33650, June 5, 2003; 68 FR 34338, June 9, 2003; 70 FR 4783, Jan. 31, 2005; 70 FR 19318, Apr. 13, 2005; 70 FR 32255, June 2, 2005; 72 FR 50028, Aug. 29, 2007]

§ 25.202 Frequencies, frequency tolerance and emission limitations.

(a)(1) *Frequency band*. The following frequencies are available for use by the fixed-satellite service. Precise frequencies and bandwidths of emission shall be assigned on a case-by-case basis. The Table follows:

Space-to-earth (GHz)	Earth-to-space (GHz)
3.65–3.7 [17]	[12] [19] 5.091–5.25
3.7–4.2 [1]	[1] 5.925–6.425
6.7–7.025 [12]	[1] [12] [14] 12.75–13.25
10.7–10.95 [1] [12]	[4] [12] 13.75–14
10.95–11.2 [1] [2] [12]	[5] 14–14.2
11.2–11.45 [1] [12]	14.2–14.5
11.45–11.7 [1] [2] [12]	[12] [20] 15.43–15.63
11.7–12.2 [3]	[9] 17.3–17.8
12.2–12.7 [13]	[18] 24.75–25.05
18.3–18.58 [1] [10]	[1] [18] 25.05–25.25
18.58–18.8 [6] [10] [11]	[1] 27.5–29.5
18.8–19.3 [7] [10]	29.5–30
19.3–19.7 [8] [10]	[1] 47.2–50.2
19.7–20.2 [10]	
37.5–40 [15] [16]	
40–42 [16]	

[1] This band is shared coequally with terrestrial radiocommunication services.

[2] Use of this band by geostationary satellite orbit satellite systems in the fixed-satellite service is limited to international systems; *i.e.*, other than domestic systems.

[3] Fixed-satellite transponders may be used additionally for transmissions in the broadcasting-satellite service.

[4] This band is shared on an equal basis with the Government radiolocation service and grandfathered space stations in the Tracking and Data Relay Satellite System.

[5] In this band, stations in the radionavigation service shall operate on a secondary basis to the fixed-satellite service.

[6] The band 18.58–18.8 GHz is shared coequally with existing terrestrial radiocommunication systems until June 8, 2010.

[7] The band 18.8–19.3 GHz is shared coequally with terrestrial radiocommunication services, until June 8, 2010. After this date, the sub-band 19.26–19.3 GHz is shared coequally with existing terrestrial radiocommunication systems.

[8] The use of the band 19.3–19.7 GHz by the fixed-satellite service (space-to-Earth) is limited to feeder links for the mobile-satellite service.

[9] The use of the band 17.3–17.8 GHz by the fixed-satellite service (Earth-to-space) is limited to feeder links for broadcasting-satellite service, and the sub-band 17.7–17.8 GHz is shared coequally with terrestrial fixed services.

[10] This band is shared coequally with the Federal Government fixed-satellite service.

[11] The band 18.6–18.8 GHz is shared coequally with the non-Federal Government and Federal Government Earth exploration-satellite (passive) and space research (passive) services.

[12] Use of this band by nongeostationary satellite orbit systems in the fixed-satellite service is limited to gateway earth station operations.

[13] Use of this band by the fixed-satellite service is limited to nongeostationary satellite orbit systems.

[14] Use of this band by NGSO FSS gateway earth station uplink operations is subject to the provisions of § 2.106 NG53.

[15] Use of this band by the fixed-satellite service is limited to ''gateway'' earth station operations, provided the licensee under this Part obtains a license under Part 101 of this Chapter or an agreement from a Part 101 licensee for the area in which an earth station is to be located. Satellite earth station facilities in this band may not be ubiquitously deployed and may not be used to serve individual consumers.

[16] The band 37.5–40.0 GHz is designated as being available for use by the fixed and mobile services and the band 40.0–42.0 GHz is designated as being available for use by the fixed-satellite service.

[17] FSS earth stations in this band must operate on a secondary basis to terrestrial radiocommunication services, except that the band is shared coequally between certain grandfathered earth stations and the terrestrial radiocommunication services.

[18] Use of the band 24.75–25.25 GHz by the fixed-satellite service (Earth-to-space) is limited to feeder links for space stations in the broadcasting-satellite service, and the sub-band 25.05–25.25 GHz is shared coequally with terrestrial fixed services.

[19] See 47 CFR 2.106, footnotes 5.444A and US344, for conditions that apply to this band.

[20] See 47 CFR 2.106, footnotes 5.511C and US359, for conditions that apply to this band.

(2) [Reserved]

(3) The following frequencies are available for use by the non-voice, non-geostationary mobile-satellite service:

137–138 MHz: Space-to-Earth
148–150.05 MHz: Earth-to-space
399.9–400.05 MHz: Earth-to-space
400.15–401 MHz: Space-to-Earth

(4)(i) The following frequencies are available for use by the 1.6/2.4 GHz Mobile-Satellite Service:

1610–1626.5 MHz: User-to-Satellite Link
1613.8–1626.5 MHz: Satellite-to-User Link (secondary)
2483.5–2500 MHz: Satellite-to-User Link

(ii) The following frequencies are available for use by the 2 GHz Mobile-Satellite Service: 2000–2020 MHz: User-to-Satellite Link; 2180–2200 MHz: Satellite-to-User Link.

(iii)(A) The following frequencies are available for use by the L-band Mobile-Satellite Service:

1525–1559 MHz: Space-to-Earth
1626.5–1660.5 MHz: Earth-to-space

(B) The use of the frequencies 1544–1545 MHz and 1645.5–1646.5 MHz is limited to distress and safety communications.

(5) The following frequencies are available for use by the inter-satellite service:

22.55–23.00 GHz
23.00–23.55 GHz
24.45–24.65 GHz
24.65–24.75 GHz

(6) The following spectrum is available for exclusive use by the satellite digital audio radio service:

2320–2345 MHz: space-to-Earth (primary).

(7) The following frequencies are available for use by the Direct Broadcast Satellite service:

12.2–12.7 GHz: Space-to-Earth.

(8) The following frequencies are available for use by ESVs:

3700–4200 MHz (space-to-Earth)
5925–6425 MHz (Earth-to-space)
10.95–11.2 GHz (space-to-Earth)
11.45–11.7 GHz (space-to-Earth)
11.7–12.2 GHz (space-to-Earth)
14.0–14.5 GHz (Earth-to-space)

ESVs shall be authorized and coordinated as set forth in §§ 25.221 and 25.222. ESV operators, collectively, may coordinate up to 180 megahertz of spectrum in the 5925–6425 MHz (Earth-to-space) band for all ESV operations at any given location subject to coordination.

(9) The following frequencies are available for use by the Broadcasting-Satellite Service after 1 April 2007:

17.3–17.7 GHz (space-to-Earth)
17.7–17.8 GHz (space-to-Earth)

NOTE 1 TO PARAGRAPH (a)(9): Use of the 17.3–17.7 GHz band by the broadcasting-satellite service is limited to geostationary satellite orbit systems.

NOTE 2 TO PARAGRAPH (a)(9): Use of the 17.7–17.8 GHz band (space-to-Earth) by the broadcasting-satellite service is limited to transmissions from geostationary satellite orbit systems to receiving earth stations located outside of the United States and its Possessions. In the United States and its Possessions, the 17.7–17.8 GHz band is allocated on a primary basis to the Fixed Service.

(b) Other frequencies and associated bandwidths of emission may be assigned on a case-by-case basis to space systems under this part in conformance with § 2.106 of this chapter and the Commission's rules and policies.

(c) Orbital locations assigned to space stations licensed under this part by the commission are subject to change by summary order of the Commission on 30 days notice. An authorization to construct and/or to launch a space station becomes null and void if the construction is not begun or is not completed, or if the space station is not launched and positioned at its assigned orbital location and operations commenced in accordance with the station authorization, by the respective date(s) specified in the authorization. Frequencies and orbital location assignments are subject to the policies set forth in the Report and Order, FCC 83–184, adopted April 27, 1983 in CC

Docket No. 81–704 and the Report and Order, adopted July 25, 1985 in CC Docket No. 84–1299 as modified by the Report and Order, adopted January 19, 1996 in IB Docket No. 95–41.

(d) *Frequency tolerance, Earth stations.* The carrier frequency of each earth station transmitter authorized in these services shall be maintained within 0.001 percent of the reference frequency.

(e) *Frequency tolerance, space stations.* The carrier frequency of each space station transmitter authorized in these services shall be maintained within 0.002 percent of the reference frequency.

(f) *Emission limitations.* The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule:

(1) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: 25 dB;

(2) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: 35 dB;

(3) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 250 percent of the authorized bandwidth: An amount equal to 43 dB plus 10 times the logarithm (to the base 10) of the transmitter power in watts;

(4) In any event, when an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in paragraphs (f) (1), (2) and (3) of this section.

(g) Telemetry, tracking and telecommand functions for U.S. domestic satellites shall be conducted at either or both edges of the allocated band(s). Frequencies, polarization and coding shall be selected to minimize interference into other satellite networks and within their own satellite system.

[30 FR 7176, May 28, 1965, as amended at 36 FR 2562, Feb. 6, 1971; 38 FR 8573, Apr. 4, 1973; 39 FR 33527, Sept. 18, 1974; 48 FR 40254, Sept. 6, 1983; 50 FR 36079, Sept. 5, 1985; 51 FR 18445, May 20, 1986; 51 FR 20975, June 10, 1986; 54 FR 49993, Dec. 4, 1989; 56 FR 24024, May 28, 1991; 58 FR 13419, Mar. 11, 1993; 58 FR 68061, Dec. 23, 1993; 59 FR 53329, Oct. 21, 1994; 61 FR 9952, Mar. 12, 1996; 61 FR 52307, Oct. 7, 1996; 62 FR 11105, Mar. 11, 1997; 64 FR 2591, Jan. 15, 1999; 64 FR 6565, Feb. 10. 1999; 65 FR 54171, Sept. 7, 2000; 65 FR 59144, Oct. 4, 2000; 66 FR 10622, Feb. 16, 2001; 66 FR 63515, Dec. 7, 2001; 67 FR 17299, Apr. 10, 2002; 67 FR 39862, June 11, 2002; 67 FR 51114, Aug. 7, 2002; 68 FR 11993, Mar. 13, 2003; 68 FR 16966, Apr. 8, 2003; 68 FR 34338, June 9, 2003; 68 FR 74387, Dec. 23, 2003; 69 FR 52206, Aug. 25, 2004; 70 FR 4783, Jan. 31, 2005; 70 FR 24725, May 11, 2005; 70 FR 32255, June 2, 2005; 72 FR 50028, Aug. 29, 2007; 73 FR 25495, May 6, 2008]

§ 25.203 Choice of sites and frequencies.

(a) Sites and frequencies for earth stations, other than ESVs, operating in frequency bands shared with equal rights between terrestrial and space services, shall be selected, to the extent practicable, in areas where the surrounding terrain and existing frequency usage are such as to minimize the possibility of harmful interference between the sharing services.

(b) An applicant for an earth station authorization, other than an ESV, in a frequency band shared with equal rights with terrestrial microwave services shall compute the great circle coordination distance contour(s) for the proposed station in accordance with the procedures set forth in § 25.251. The applicant shall submit with the application a map or maps drawn to appropriate scale and in a form suitable for reproduction indicating the location of the proposed station and these contours. These maps, together with the pertinent data on which the computation of these contours is based, including all relevant transmitting and/or receiving parameters of the proposed station that is necessary in assessing the likelihood of interference, an appropriately scaled plot of the elevation of the local horizon as a function of azimuth, and the electrical characteristics of the earth station antenna(s), shall be submitted by the applicant in

a single exhibit to the application. The coordination distance contour plot(s), horizon elevation plot, and antenna horizon gain plot(s) required by this section may also be submitted in tabular numerical format at 5° azimuthal increments instead of graphical format. At a minimum, this exhibit shall include the information listed in paragraph (c)(2) of this section. An earth station applicant shall also include in the application relevant technical details (both theoretical calculations and/or actual measurements) of any special techniques, such as the use of artificial site shielding, or operating procedures or restrictions at the proposed earth station which are to be employed to reduce the likelihood of interference, or of any particular characteristics of the earth station site which could have an effect on the calculation of the coordination distance.

(c) Prior to the filing of its application, an applicant for operation of an earth station, other than an ESV, shall coordinate the proposed frequency usage with existing terrestrial users and with applicants for terrestrial station authorizations with previously filed applications in accordance with the following procedure:

(1) An applicant for an earth station authorization shall perform an interference analysis in accordance with the procedures set forth in §25.251 for each terrestrial station, for which a license or construction permit has been granted or for which an application has been accepted for filing, which is or is to be operated in a shared frequency band to be used by the proposed earth station and which is located within the great circle coordination distance contour(s) of the proposed earth station.

(2) The earth station applicant shall provide each such terrestrial station licensee, permittee, and prior filed applicant with the technical details of the proposed earth station and the relevant interference analyses that were made. At a minimum, the earth station applicant shall provide the terrestrial user with the following technical information:

(i) The geographical coordinates of the proposed earth station antenna(s),

(ii) Proposed operating frequency band(s) and emission(s),

(iii) Antenna center height above ground and ground elevation above mean sea level,

(iv) Antenna gain pattern(s) in the plane of the main beam,

(v) Longitude range of geostationary satellite orbit (GSO) satellites at which antenna may be pointed, for proposed earth station antenna(s) accessing GSO satellites,

(vi) Horizon elevation plot,

(vii) Antenna horizon gain plot(s) determined in accordance with §25.251 for satellite longitude range specified in paragraph (c)(2)(v) of this section, taking into account the provisions of §25.251 for earth stations operating with non-geostationary satellites,

(viii) Minimum elevation angle,

(ix) Maximum equivalent isotropically radiated power (e.i.r.p.) density in the main beam in any 4 kHz band, (dBW/4 kHz) for frequency bands below 15 GHz or in any 1 MHz band (dBW/MHz) for frequency band above 15 GHz,

(x) Maximum available RF transmit power density in any 1 MHz band and in any 4 kHz band at the input terminals of the antenna(s),

(xi) Maximum permissible RF interference power level as determined in accordance with §25.251 for all applicable percentages of time, and

(xii) A plot of great circle coordination distance contour(s) and rain scatter coordination distance contour(s) as determined by §25.251.

(3) The coordination procedures specified in §101.103 of this chapter and §25.251 shall be applicable except that the information to be provided shall be that set forth in paragraph (c)(2) of this section, and that the 30-day period allowed for response to a request for coordination may be increased to a maximum of 45 days by mutual consent of the parties.

(4) Where technical problems are resolved by an agreement or operating arrangement between the parties that would require special procedures be taken to reduce the likelihood of harmful interference (such as the use of artificial site shielding) or would result in lessened quality or capacity of either system, the details thereof shall be contained in the application.

(5) The Commission may, in the course of examining any application, require the submission of additional showings, complete with pertinent data and calculations in accordance with §25.251, showing that harmful interference is not likely to result from the proposed operation.

(d) An applicant for operation of an earth station, other than an ESV, shall also ascertain whether the great circle coordination distance contours and rain scatter coordination distance contours, computed for those values of parameters indicated in §25.251 (Appendix 7 of the ITU RR) for international coordination, cross the boundaries of another Administration. In this case, the applicant shall furnish to the Commission copies of these contours on maps drawn to appropriate scale for use by the Commission in effecting coordination of the proposed earth station with the Administration(s) affected.

(e) Protection for Table Mountain Radio Receiving Zone, Boulder County, Colorado.

(1) Applicants for a station authorization to operate in the vicinity of Boulder County, Colorado under this part are advised to give due consideration, prior to filing applications, to the need to protect the Table Mountain Radio Receiving Zone from harmful interference. These are the research laboratories of the Department of Commerce, Boulder County, Colorado. To prevent degradation of the present ambient radio signal level at the site, the Department of Commerce seeks to ensure that the field strengths of any radiated signals (excluding reflected signals) received on this 1800 acre site (in the vicinity of coordinates 40°07′50″ N Latitude, 105°14′40″ W Longitude) resulting from new assignments (other than mobile stations) or from the modification or relocation of existing facilities do not exceed the following values:

Frequency range	In authorized bandwidth of service	
	Field strength (mV/m)	Power flux density [1] (dBW/m^2)
Below 540 kHz	10	−65.8
540 to 1600 kHz	20	−59.8
1.6 to 470 MHz	10	[2] −65.8
470 to 890 MHz	30	[2] −56.2
Above 890 MHz	1	[2] −85.8

[1] Equivalent values of power flux density are calculated assuming free space characteristic impedance of 376.7=120π ohms.

[2] Space stations shall conform to the power flux density limits at the earth's surface specified in appropriate parts of the FCC rules, but in no case should exceed the above levels in any 4 kHz band for all angles of arrival.

(2) Advance consultation is recommended particularly for those applicants who have no reliable data which indicates whether the field strength or power flux density figures in the above table would be exceeded by their proposed radio facilities (except mobile stations). In such instances, the following is a suggested guide for determining whether coordination is recommended:

(i) All stations within 2.5 kilometers;

(ii) Stations within 5 kilometers with 50 watts or more average effective radiated power (ERP) in the primary plane of polarization in the azimuthal direction of the Table Mountain Radio Receiving Zone;

(iii) Stations within 15 kilometers with 1 kW or more average ERP in the primary plane of polarization in the azimuthal direction of Table Mountain Receiving Zone;

(iv) Stations within 80 kilometers with 25 kW or more average ERP in the primary plane of polarization in the azimuthal direction of Table Mountain Receiving Zone.

(3) Applicants concerned are urged to communicate with the Radio Frequency Management Coordinator, Department of Commerce, Research Support Services, NOAA R/E5X2, Boulder Laboratories, Boulder, CO 80303; telephone (303) 497–6548, in advance of filing their applications with the Commission.

(4) The Commission will not screen applications to determine whether advance consultation has taken place. However, applicants are advised that such consultation can avoid objections from the Department of Commerce or proceedings to modify any authorization which may be granted which, in fact, delivers a signal at the site in excess of the field strength specified herein.

(f) Notification to the National Radio Astronomy Observatory: In order to minimize possible harmful interference at the National Radio Astronomy Observatory site located at Green Bank, Pocahontas County, W. Va., and at the Naval Radio Research Observatory site at Sugar Grove, Pendleton County, W. Va. any applicant for a station authorization other than mobile, temporary base, temporary fixed, Personal Radio, Civil Air Patrol, or amateur seeking a station license for a new station, a construction permit to construct a new station or to modify an existing station license in a manner which would change either the frequency, power, antenna height or directivity, or location of such a station within the area bounded by 39°15′ N. on the north, 78°30′ W. on the east, 37°30′ N. on the south and 80°30′ W. on the west shall, at the time of filing such application with the Commission, simultaneously notify the Director, National Radio Astronomy Observatory, P.O. Box No. 2, Green Bank, W. Va. 24944, in writing, of the technical particulars of the proposed station. Such notification shall include the geographical coordinates of the antenna, antenna height, antenna directivity if any, proposed frequency, type of emission, and power. In addition, the applicant shall indicate in his application to the Commission the date notification was made to the observatory. After receipt of such applications, the Commission will allow a period of 20 days for comments or objections in response to the notifications indicated. If an objection to the proposed operation is received during the 20-day period from the National Radio Astronomy Observatory for itself or on behalf of the Naval Radio Research Observatory, the Commission will consider all aspects of the problem and take whatever action is deemed appropriate.

(g) Protection for Federal Communications Commission monitoring stations:

(1) Applicants in the vicinity of an FCC monitoring station for a radio station authorization to operate new transmitting facilities or changed transmitting facilities which would increase the field strength produced over the monitoring station over that previously authorized are advised to give consideration, prior to filing applications, to the possible need to protect the FCC stations from harmful interference. Geographical coordinates of the facilities which require protection are listed in §0.121(c) of the Commission's Rules. Applications for stations (except mobile stations) which will produce on any frequency a direct wave fundamental field strength of *greater than 10 mV/m* in the authorized bandwidth of service (-65.8 dBW/m^2 power flux density assuming a free space characteristic impedance of 120 ohms) at the referenced coordinates, may be examined to determine extent of possible interference. Depending on the theoretical field strength value and existing root-sum-square or other ambient radio field signal levels at the indicated coordinates, a clause protecting the monitoring station may be added to the station authorization.

(2) In the event that calculated value of expected field exceeds 10 mV/m (-65.8 dBW/m^2) at the reference coordinates, or if there is any question whether field strength levels might exceed the threshold value, advance consultation with the FCC to discuss any protection necessary should be considered. Prospective applicants may communicate with: Chief, Compliance and Information Bureau, Federal Communications Commission, Washington, DC 20554, Telephone (202) 632–6980.

(3) Advance consultation is suggested particularly for those applicants who have no reliable data which indicates whether the field strength or power flux density figure indicated would be exceeded by their proposed radio facilities (except mobile stations). In such instances, the following is a suggested guide for determining whether an applicant should coordinate:

(i) All stations within 2.5 kilometers;

(ii) Stations within 5 kilometers with 50 watts or more average effective radiated power (ERP) in the primary plane of polarization in the azimuthal direction of the Monitoring Station;

(iii) Stations within 15 kilometers with 1 kW or more average ERP in the primary plane of polarization in the azimuthal direction of the Monitoring Station;

(iv) Stations within 80 kilometers with 25 kW or more average ERP in the

primary plane of polarization in the azimuthal direction of the Monitoring Station.

(4) Advance coordination for stations operating above 1000 MHz is recommended only where the proposed station is in the vicinity of a monitoring station designated as a satellite monitoring facility in §0.121(c) of the Commission's Rules and also meets the criteria outlined in paragraphs (h)(2) and (3) of this section.

(5) The Commission will not screen applications to determine whether advance consultation has taken place. However, applicants are advised that such consultation can avoid objections from the Federal Communications Commission or modification of any authorization which will cause harmful interference.

(h) Sites and frequencies for GSO and NGSO earth stations, operating in a frequency band where both have a coprimary allocation, shall be selected to avoid earth station antenna mainlobe-to-satellite antenna mainlobe coupling, between NGSO systems and between NGSO and GSO systems, in order to minimize the possibility of harmful interference between these services. Prior to filing an earth station application, in bands with co-primary allocations to NGSO and GSO earth stations, the applicant shall coordinate the proposed site and frequency usage with existing earth station licensees and with current earth station authorization applicants.

(i) Any applicant for a new permanent transmitting fixed earth station authorization to be located on the islands of Puerto Rico, Desecheo, Mona, Vieques, and Culebra, or for a modification of an existing authorization which would change the frequency, power, antenna height, directivity, or location of such station on these islands and would increase the likelihood of the authorized facility causing interference, shall notify the Interference Office, Arecibo Observatory, HC3 Box 53995, Arecibo, Puerto Rico 00612, in writing or electronically, of the technical parameters of the proposal. Applicants may wish to consult interference guidelines, which will be provided by Cornell University. Applicants who choose to transmit information electronically should e-mail to: *prcz@naic.edu*.

(1) The notification to the Interference Office, Arecibo Observatory shall be made prior to, or simultaneously with, the filing of the application with the Commission. The notification shall state the geographical coordinates of the antenna (NAD–83 datum), antenna height above ground, ground elevation at the antenna, antenna directivity and gain, proposed frequency and FCC Rule Part, type of emission, effective radiated power, and whether the proposed use is itinerant. Generally, submission of the information in the technical portion of the FCC license application is adequate notification. In addition, the applicant shall indicate in its application to the Commission the date notification was made to the Arecibo Observatory.

(2) After receipt of such applications, the Commission will allow the Arecibo Observatory a period of 20 days for comments or objections in response to the notification indicated. The applicant will be required to make reasonable efforts in order to resolve or mitigate any potential interference problem with the Arecibo Observatory and to file either an amendment to the application or a modification application, as appropriate. If the Commission determines that an applicant has satisfied its responsibility to make reasonable efforts to protect the Observatory from interference, its application may be granted.

(3) The provisions of this paragraph do not apply to operations that transmit on frequencies above 15 GHz.

(j) Applicants for non-geostationary 1.6/2.4 GHz Mobile-Satellite Service/Radiodetermination satellite service feeder links in the bands 17.7–20.2 GHz and 27.5–30.0 GHz shall indicate the frequencies and spacecraft antenna gain contours towards each feeder-link earth station location and will coordinate with licensees of other fixed-satellite service and terrestrial-service systems sharing the band to determine geographic protection areas around each non-geostationary mobile-satellite service/radiodetermination satellite service feeder-link earth station.

(k) An applicant for operation of an earth station, other than an ESV, that

will operate with a geostationary satellite or non-geostationary satellite in a shared frequency band in which the non-geostationary system is (or is proposed to be) licensed for feeder links, shall demonstrate in its applications that its proposed earth station will not cause unacceptable interference to any other satellite network that is authorized to operate in the same frequency band, or certify that the operations of its earth station shall conform to established coordination agreements between the operator(s) of the space station(s) with which the earth station is to communicate and the operator(s) of any other space station licensed to use the band.

(l) Applicants for feeder link earth station facilities operating in the 25.05–25.25 GHz band may be licensed only in Economic Areas where no existing FS licensee has been authorized, and shall coordinate their operations with 24 GHz fixed service operations if the power flux density of their transmitted signal at the boundary of the fixed service license area is equal to or greater than -114 dBW/m^2 in any 1 MHz.

(1) When uplink adaptive power control is used, the EIRP used for calculation of the power flux density level should be the maximum possible, taking into account the adaptive power increase.

(2) The power flux density levels should be calculated based on the actual off-axis gain characteristics of the earth station antenna, and should assume free space propagation conditions.

(3) When determining whether the power flux density threshold limit is exceeded at the 24 GHz FS licensing boundary, a feeder link earth station applicant must take into account not only the transmissions from its own antenna(s), but also those from any previously authorized feeder link earth stations. Thus, if the cumulative power flux density level at the FS license boundary is in excess of -114 dBW/m^2/MHz, the earth station applicant must either modify its proposed operations such that this value is not exceeded, or enter into coordination with the affected FS licensee.

[30 FR 7176, May 28, 1965, as amended at 36 FR 2562, Feb. 6, 1971; 38 FR 8573, Apr. 4, 1973; 42 FR 8329, Feb. 9, 1977; 44 FR 77167, Dec. 31, 1979; 50 FR 40862, Oct. 7, 1985; 58 FR 13419, Mar. 11, 1993; 58 FR 44904, Aug. 25, 1993; 59 FR 53329, Oct. 21, 1994; 61 FR 8477, Mar. 5, 1996; 61 FR 9945, Mar. 12, 1996; 61 FR 44181, Aug. 28, 1996; 62 FR 55531, Oct. 27, 1997; 65 FR 38325, June 20, 2000; 65 FR 59144, Oct. 4, 2000; 66 FR 10622, Feb. 16, 2001; 70 FR 4784, Jan. 31, 2005; 70 FR 31373, June 1, 2005; 72 FR 50029, Aug. 29, 2007]

§ 25.204 Power limits.

(a) In bands shared coequally with terrestrial radio communication services, the equivalent isotropically radiated power transmitted in any direction towards the horizon by an earth station, other than an ESV, operating in frequency bands between 1 and 15 GHz, shall not exceed the following limits except as provided for in paragraph (c) of this section:

$+40$ dBW in any 4 kHz band for $\theta \leq 0°$
$+40 + 3\theta$ dBW in any 4 kHz band for $0° < \theta \leq 5°$

where θ is the angle of elevation of the horizon viewed from the center of radiation of the antenna of the earth station and measured in degrees as positive above the horizontal plane and negative below it.

(b) In bands shared coequally with terrestrial radiocommunication services, the equivalent isotropically radiated power transmitted in any direction towards the horizon by an earth station operating in frequency bands above 15 GHz shall not exceed the following limits except as provided for in paragraph (c) of this section:

$+64$ dBW in any 1 MHz band for $\theta \leq 0°$
$+64 + 3\theta$ dBW in any 1 MHz band for $0° < \theta \leq 5°$

where θ is as defined in paragraph (a) of this section.

(c) For angles of elevation of the horizon greater than 5° there shall be no restriction as to the equivalent isotropically radiated power transmitted by an earth station towards the horizon.

(d) Notwithstanding the e.i.r.p. and e.i.r.p. density limits specified in the station authorization, each earth station transmission shall be conducted at

the lowest power level that will provide the required signal quality as indicated in the application and further amended by coordination agreements.

(e) For operations at frequencies above 10 GHz, earth station operators may exceed the uplink e.i.r.p. and e.i.r.p. density limits specified in the station authorization under the conditions of uplink fading due to precipitation by an amount not to exceed 1 dB above the actual amount of monitored excess attenuation over clear sky propagation conditions. The e.i.r.p. levels shall be returned to normal as soon as the attenuating weather pattern subsides. The maximum power level for power control purposes shall be coordinated between and among adjacent satellite operators.

(f) In the band 13.75–14 GHz, an earth station in the fixed-satellite service shall have a minimum antenna diameter of 4.5 m and the e.i.r.p. of any emission should be at least 68 dBW and should not exceed 85 dBW. The e.i.r.p. density of emissions from any earth station in the FSS operating with a space station in geostationary-satellite orbit shall not exceed 71 dBW in any 6 MHz band from 13.77 to 13.78 GHz. The e.i.r.p. density of emissions from any earth station in the FSS operating with a space station in non-geostationary-satellite orbit shall not exceed 51 dBW in any 6 MHz band from 13.77 to 13.78 GHz. Automatic power control may be used to increase the e.i.r.p. density in the 6 MHz band in this frequency range to compensate for rain attenuation, to the extent that the power flux-density at the FSS space station does not exceed the value resulting from use by an earth station of an e.i.r.p. of 71 dBW or 51 dBW, as appropriate, in the 6 MHz band in clear-sky conditions.

(g) All earth stations in the Fixed Satellite Service in the 20/30 GHz band, and feeder link earth stations operating in the 24.75–25.25 GHz band (Earth-to-space) and providing service to geostationary satellites in the 17/24 GHz BSS, shall employ uplink adaptive power control or other methods of fade compensation such that the earth station transmissions shall be conducted at the power level required to meet the desired link performance while reducing the level of mutual interference between networks.

(h) ESV transmissions in the 5925–6425 MHz (Earth-to-space) band shall not exceed an e.i.r.p. spectral density towards the radio-horizon of 17 dBW/MHz, and shall not exceed an e.i.r.p. towards the radio-horizon of 20.8 dBW. The ESV network shall shut-off the ESV transmitter if the e.i.r.p. spectral density towards the radio-horizon or e.i.r.p. towards the radio-horizon are exceeded.

(i) Within 125 km of the TDRSS sites identified in § 25.222(d), ESV transmissions in the 14.0–14.2 GHz (Earth-to-space) band shall not exceed an e.i.r.p. spectral density towards the horizon of 12.5 dBW/MHz, and shall not exceed an e.i.r.p. towards the horizon of 16.3 dBW.

[48 FR 40255, Sept. 6, 1983, as amended at 58 FR 13420, Mar. 11, 1993; 61 FR 52307, Oct. 7, 1996; 62 FR 61457, Nov. 18, 1997; 66 FR 10623, Feb. 16, 2001; 70 FR 4784, Jan. 31, 2005; 70 FR 32255, June 2, 2005; 72 FR 50029, Aug. 29, 2007]

§ 25.205 Minimum angle of antenna elevation.

(a) Earth station antennas shall not normally be authorized for transmission at angles less than 5° measured from the horizontal plane to the direction of maximum radiation. However, upon a showing that the transmission path will be seaward and away from land masses or upon special showing of need for lower angles by the applicant, the Commission will consider authorizing transmissions at angles between 3° and 5° in the pertinent directions. In certain instances, it may be necessary to specify minimum angles greater than 5° because of interference considerations.

(b) ESVs making a special showing requesting angles of elevation less than 5° measured from the horizontal plane to the direction of maximum radiation pursuant to (a) of this Section must still meet the effective isotropically radiated power (e.i.r.p.) and e.i.r.p. density towards the horizon limits contained in § 25.204(h) and (i).

[70 FR 4784, Jan. 31, 2005]

§ 25.206 Station identification.

The requirement for transmission of station identification is waived for all radio stations licensed under this part

with the exception of satellite uplinks carrying broadband video information which are required to incorporate ATIS in accordance with the provisions set forth under § 25.308 of these rules.

[55 FR 21551, May 25, 1990]

§ 25.207 Cessation of emissions.

Space stations shall be made capable of ceasing radio emissions by the use of appropriate devices (battery life, timing devices, ground command, etc.) that will ensure definite cessation of emissions.

§ 25.208 Power flux density limits.

(a) In the band 3650–4200 MHz, the power flux density at the Earth's surface produced by emissions from a space station for all conditions and for all methods of modulation shall not exceed the following values:

-152 dB(W/m^2) in any 4 kHz band for angles of arrival between 0 and 5 degrees above the horizontal plane;
$-152+(\delta-5)/2$ dB(W/m^2) in any 4 kHz band for angles of arrival δ (in degrees) between 5 and 25 degrees above the horizontal plane; and
-142 dB(W/m^2) in any 4 kHz band for angles of arrival between 25 and 90 degrees above the horizontal plane

These limits relate to the power flux density which would be obtained under assumed free-space propagation conditions.

(b) In the bands 10.95–11.2 and 11.45–11.7 GHz for GSO FSS space stations and 10.7–11.7 GHz for NGSO FSS space stations, the power flux-density at the Earth's surface produced by emissions from a space station for all conditions and for all methods of modulation shall not exceed the lower of the following values:

(1) -150 dB(W/m^2) in any 4 kHz band for angles of arrival between 0 and 5 degrees above the horizontal plane; $-150 + (\delta-5)/2$ dB(W/m^2) in any 4 kHz band for angles of arrival (δ) (in degrees) between 5 and 25 degrees above the horizontal plane; and -140 dB(W/m^2) in any 4 kHz band for angles of arrival between 25 and 90 degrees above the horizontal plane; or

(2) -126 dB(W/m^2) in any 1 MHz band for angles of arrival between 0 and 5 degrees above the horizontal plane; $-126 + (\delta-5)/2$ dB(W/m^2) in any 1 MHz band for angles of arrival (δ) (in degrees) between 5 and 25 degrees above the horizontal plane; and -116 dB(W/m^2) in any 1 MHz band for angles of arrival between 25 and 90 degrees above the horizontal plane.

NOTE TO PARAGRAPH (b): These limits relate to the power flux density, which would be obtained under assumed free-space propagation conditions.

(c) In the 17.7–17.8 GHz, 18.3–18.8 GHz, 19.3–19.7 GHz, 22.55–23.00 GHz, 23.00–23.55 GHz, and 24.45–24.75 GHz frequency bands, the power flux density at the Earth's surface produced by emissions from a space station for all conditions for all methods of modulation shall not exceed the following values:

(1) -115 dB (W/m^2) in any 1 MHz band for angles of arrival between 0 and 5 degrees above the horizontal plane.

(2) $-115 + 0.5\ (\delta-5)$ dB (W/m^2) in any 1 MHz band for angles of arrival d (in degrees) between 5 and 25 degrees above the horizontal plane.

(3) -105 dB (W/m^2) in any 1 MHz band for angles of arrival between 25 and 90 degrees above the horizontal plane.

(d) In addition to the limits specified in paragraph (c) of this section, the power flux-density across the 200 MHz band 18.6–18.8 GHz produced at the Earth's surface by emissions from a space station under assumed free-space propagation conditions shall not exceed -95 dB (W/m^2) for all angles of arrival. This limit may be exceeded by up to 3 dB for no more than 5% of the time.

(e) In the 18.8–19.3 GHz frequency band, the power flux-density at the Earth's surface produced by emissions from a space station for all conditions and for all methods of modulation shall not exceed the following values:

$-115-X$ dB(W/m$^2\div$MHz)	for $0° \le \delta < 5°$
$-115-X+((10+X)/20)(\delta-5)$dB(W/m$^2\div$MHz)	for $5° \le \delta < 25°$
-105 dB(W/m$^2\div$MHz)	for $25° \le \delta < 90°$

Where:

δ: is the angle of arrival above the horizontal plane; and

X is defined as a function of the number of satellites in the non-GSO FSS constellation, n, as follows:

for $n \leq 50$ ..... X = 0 (dB)
for $50 < n \leq 288$ X = (5/119) (n − 50) (dB)
for $n > 288$ ..... X = (1/69) (n + 402) (dB)

(f) [Reserved]

(g) In the frequency bands 10.7–11.7 GHz and 11.7–12.2 GHz, the single-entry equivalent power-flux density in the space-to-Earth direction ($EPFD_{down}$), at any point on the Earth's surface, produced by emissions from all co-frequency space stations of a single non-geostationary-satellite orbit (NGSO) system operating in the fixed-satellite service (FSS) shall not exceed the following limits for the given percentages of time. Tables 1G and 2G follow:

TABLE 1G—SINGLE-ENTRY $EPFD_{down}$ LIMITS FOR PROTECTION OF 0.6, 1.2, 3 AND 10 METER GSO FSS EARTH STATION ANTENNAS [1,2]

Frequency band (GHz) for International Allocations	Single-entry $EPFD_{down}$ dB(W/m²)	Percentage of time during which $EPFD_{down}$ level may not be exceeded	Reference bandwidth (kHz)	Reference antenna diameter and reference radiation pattern [3]
10.7–11.7 in all Regions; 11.7–12.2 in Region 2; 12.2–12.5 in Region 3; and 12.5–12.75 in Regions 1 and 3.	−175.4	0	40	60 cm, Recommendation ITU-R S.1428.
	−174	90		
	−170.8	99		
	−165.3	99.73		
	−160.4	99.991		
	−160	99.997		
	−160	100		
10.7–11.7 in all Regions; 11.7–12.2 in Region 2; 12.2–12.5 in Region 3; and 12.5–12.75 in Regions 1 and 3.	−181.9	0	40	1.2 m, Recommendation ITU-R S.1428.
	−178.4	99.5		
	−173.4	99.74		
	−173	99.857		
	−164	99.954		
	−161.6	99.984		
	−161.4	99.991		
	−160.8	99.997		
	−160.5	99.997		
	−160	99.9993		
	−160	100		
10.7–11.7 in all Regions; 11.7–12.2 in Region 2; 12.2–12.5 in Region 3; and 12.5–12.75 in Regions 1 and 3.	−190.45	0	40	3 m, Recommendation ITU-R S.1428.
	−189.45	90		
	−187.45	99.5		
	−182.4	99.7		
	−182	99.855		
	−168	99.971		
	−164	99.988		
	−162	99.995		
	−160	99.999		
	−160	100		
10.7–11.7 in all Regions; 11.7–12.2 in Region 2; 12.2–12.5 in Region 3; and 12.5–12.75 in Regions 1 and 3.	−195.45	0	40	10 m, Recommendation ITU-R S.1428.
	−195.45	99		
	−190	99.65		
	−190	99.71		
	−172.5	99.99		
	−160	99.998		
	−160	100		

[1] In addition to the limits shown in Table 1G, the limits shown in Table 2G shall apply to all antenna sizes greater than 60 cm in the frequency bands listed in Table 1G.

[2] For each reference antenna diameter, the limit consists of the complete curve on a plot which is linear in decibels for the EPFD levels and logarithmic for the time percentages, with straight lines joining the data points.

[3] The earth station antenna reference radiation patterns are to be used only for the calculation of interference from NGSO FSS systems into GSO FSS systems.

TABLE 2G—SINGLE-ENTRY $EPFD_{down}$ LIMITS RADIATED BY NON-GSO FSS SYSTEMS AT CERTAIN LATITUDES

100% of the time $EPFD_{down}$ dB(W/(m²/40 kHz))	Latitude (North or South in degrees)
–160	0 < | Latitude | ≤ 57.5.
–160 + 3.4 (57.5 − | Latitude |)/4	57.5 < | Latitude | ≤ 63.75
–165.3	63.75 ≤ | Latitude |

NOTE TO PARAGRAPH (g): These limits relate to the equivalent power flux density, which would be obtained under free-space propagation conditions, for all conditions and for all methods of modulation.

(h) In the frequency bands 10.7–11.7 GHz and 11.7–12.2 GHz, the aggregate equivalent power-flux density in the space-to-Earth direction ($EPFD_{down}$), at any point on the Earth's surface, produced by emissions from all co-frequency space stations of all non-geostationary-satellite orbit systems operating in the fixed-satellite service (FSS) shall not exceed the following limits for the given percentages of time. Tables 1H and 2H follow:

TABLE 1H—AGGREGATE $EPFD_{down}$ LIMITS FOR PROTECTION OF 0.6, 1.2, 3 AND 10 METER GSO FSS EARTH STATION ANTENNAS [1]

Frequency band (GHz) for International Allocations	Aggregate $EPFD_{down}$ dB(W/m²)	Percentage of time during which $EPFD_{down}$ may not be exceeded	Reference bandwidth (kHz)	Reference antenna diameter and reference radiation pattern [2]
10.7–11.7 in all Regions; 11.7–12.2 in Region 2; 12.2–12.5 in Region 3; and 12.5–12.75 in Regions 1 and 3.	−170 −168.6 −165.3 −160.4 −160 −160	0 90 99 99.97 99.99 100	40	60 cm, Recommendation ITU-R S.1428.
10.7–11.7 in all Regions; 11.7–12.2 in Region 2; 12.2–12.5 in Region 3; and 12.5–12.75 in Regions 1 and 3.	−176.5 −173 −164 −161.6 −164.4 −160.8 −160.5 −160 −160	0 99.5 99.84 99.945 99.97 99.99 99.99 99.9975 100	40	1.2 m, Recommendation ITU-R S.1428.
10.7–11.7 in all Regions; 11.7–12.2 in Region 2; 12.2–12.5 in Region 3; and 12.5–12.75 in Regions 1 and 3.	−185 −184 −182 −168 −164 −162 −160 −160	0 90 99.5 99.9 99.96 99.982 99.997 100	40	3 m, Recommendation ITU-R S.1428.
10.7–11.7 in all Regions; 11.7–12.2 in Region 2; 12.2–12.5 in Region 3; and 12.5–12.75 in Regions 1 and 3.	−190 −190 −166 −160 −160	0 99 99.99 99.998 100	40	10 m, Recommendation ITU-R S.1428.

[1] In addition to the limits shown in Table 1H, the aggregate $EPFD_{down}$ limits shown in Table 2H shall apply to all antenna sizes greater than 60 cm in the frequency bands listed in Table 1H.

[2] The earth station antenna reference patterns are to be used only for the calculation of interference from NGSO FSS systems into GSO FSS systems.

TABLE 2H—SINGLE-ENTRY $EPFD_{down}$ LIMITS RADIATED BY NON-GSO FSS SYSTEMS AT CERTAIN LATITUDES

100% of the time $EPFD_{down}$ dB(W/(m²/40 kHz))	Latitude (North or South in degrees)
–160	0 < | Latitude | ≤ 57.5

TABLE 2H—SINGLE-ENTRY $EPFD_{down}$ LIMITS RADIATED BY NON-GSO FSS SYSTEMS AT CERTAIN LATITUDES—Continued

100% of the time $EPFD_{down}$ dB(W/(m²/40 kHz))	Latitude (North or South in degrees)
–160 + 3.4 (57.5 − | Latitude |)/4	57.5 < | Latitude | ≤ 63.75
–165.3	63.75 ≤ | Latitude |

NOTE TO PARAGRAPH (h): These limits relate to the equivalent power flux density, which would be obtained under free-space propagation conditions, for all conditions and for all methods of modulation.

(i) In the frequency bands 10.7–11.7 GHz and 11.7–12.2 GHz, the additional operational equivalent power-flux density, in the space-to-Earth direction, (additional operational $EPFD_{down}$) at any point on the Earth's surface, produced by actual operational emissions from all co-frequency space stations of a non-geostationary-satellite orbit (NGSO) system operating in the fixed-satellite service (FSS) shall not exceed the following operational limits for the given percentages of time:

ADDITIONAL OPERATIONAL LIMITS ON THE $EPFD_{down}$ RADIATED BY NON-GSO FSS SYSTEMS INTO 3 M AND 10 M GSO FSS EARTH STATION ANTENNAS

$EPFD_{down}$ dB(W/(m²/40 kHz))	Percentage of time during which $EPFD_{down}$ may not be exceeded	Receive GSO earth station antenna diameter (m)
−182	99.9.	
−179	99.94.	
−176	99.97.	
−171	99.98.	
−168	99.984	3.
−165	99.993.	
−163	99.999.	
−161.25	99.99975.	
−161.25	100.	
−185	99.97.	
−183	99.98.	
−179	99.99.	
−175	99.996.	
−171	99.998	10.
−168	99.999.	
−166	99.9998.	
−166	100.	

NOTE TO PARAGRAPH (i): These limits relate to the equivalent power flux density, which is obtained under free-space propagation conditions, for all conditions and for all methods of modulation.

(j) In the frequency bands 10.7–11.7 GHz and 11.7–12.2 GHz, the operational equivalent power-flux density, in the space-to-Earth direction, (operational $EPFD_{down}$) at any point on the Earth's surface, produced by actual operational emissions from the in-line co-frequency space station of a non-geostationary-satellite orbit (NGSO) system operating in the fixed-satellite service (FSS) shall not exceed the following operational limits for 100% of the time:

OPERATIONAL LIMITS TO THE $EPFD_{down}$ RADIATED BY NON-GSO FSS SYSTEMS IN CERTAIN FREQUENCY BANDS[1]

Frequency band (GHz) for International allocations	$EPFD_{down}$ dB(W/m^2)	Percentage of time during which $EPFD_{down}$ may not be exceeded	Reference bandwidth (kHz)	Receive GSO earth station antenna diameter[2] (m)	Orbital inclination of GSO satelite (degrees)
Prior to 31 December 2005: 10.7–11.7 in all Regions; 11.7–12.2 in Regions 2; 12.2–12.5 in Region 3; and 12.5;–12.75 in Regions 1 and 3	−163	3			
	−166	6			
	−167.5	9			
	−169.5	≥18			
	100	≤2.5			
	40				
Prior to 31 December 2005: 10.7–11.7 in all Regions; 11.7–12.2 in Region 2; 12.2–12.5 in Region 3; and 12.5–12.75 in Regions 1 and 3	−160	3			
	−163	6			
	−164.5	9			
	−166.5	≥18			
	100	>2.5 and			
	40	≤4.5			
From 31 December 2005: 10.7–11.7 in all Regions; 11.7–12.2 in Region 2; 12.2–12.5 in Region 3; and 12.5–12.75 in Regions 1 and 3	−161.25	3			
	−164	6			
	−165.5	9			
	−167.5	≥18			
	100	≤2.5			
	40				
From 31 December 2005: 10.7–11.7 in all Regions; 11.7–12.2 in Region 2; 12.2–12.5 in Region 3; and 12.5–12.75 in Regions 1 and 3	−158.25	3			
	−161	6			
	−162.5	9			
	−164.5	≥18			
	100	>2.5 and			
	40	≤4.5			

[1] The operational limits on the $EPFD_{down}$ radiated by non-GSO FSS systems shall be the values given in Table 2G or this table, whichever are the more stringent.

[2] For antenna diameters between the values given in this table, the limits are given by linear interpolation using a linear scale for $EPFD_{down}$ in decibels and a logarithmic scale for antenna diameter in meters.

NOTE TO PARAGRAPH (j): These limits relate to the operational equivalent power flux-density which would be obtained under free-space propagation conditions, for all conditions, for all methods of modulation and for the specified inclined GSO FSS operations.

(k) In the frequency bands 12.75–13.15 GHz, 13.2125–13.25 GHz and 13.75–14.5 GHz, the equivalent power flux-density, in the Earth-to-space direction, ($EPFD_{up}$) produced at any point on the geostationary satellite orbit (GSO) by the emissions from all co-frequency earth stations in a non-geostationary satellite orbit fixed-satellite service (NGSO FSS) system, for all conditions and for all methods of modulation, shall not exceed the following limits for the specified percentages of time limits:

LIMITS TO THE $EPFD_{up}$ RADIATED BY NGSO FSS SYSTEMS IN CERTAIN FREQUENCY BANDS

Frequency band (GHz) for International Allocations	$EPFD_{up}$ dB(W/m²)	Percentage of time during which $EPFD_{up}$ may not be exceeded	Reference bandwidth (kHz)	Reference antenna beamwidth and reference radiation pattern [1]
12.5–12.75; 12.75–13.25; 13.75–14.5	−160	100	40	4° ITU-R S.672–4, Ls=−20

[1] For the case of $L_s = -10$, the values a = 1.83 and b = 6.32 should be used in the equations in the Annex of Recommendation ITU-R S.672–4 for single-feed circular beams. In all cases of L_s, the parabolic main beam equation should start at zero.

NOTE TO PARAGRAPH (k): These limits relate to the uplink equivalent power flux density, which would be obtained under free-space propagation conditions, for all conditions and for all methods of modulation.

(l) In the frequency bands 11.7–12.2 GHz and 12.5–12.75 GHz in Region 3, 11.7–12.5 GHz in Region 1 and 12.2–12.7 GHz in Region 2, the single-entry equivalent power-flux density, in the space-to-Earth direction, ($EPFD_{down}$), at any point on the Earth's surface, produced by emissions from all co-frequency space stations of a single non-geostationary-satellite orbit (NGSO) system operating in the fixed-satellite service (FSS) shall not exceed the following limits in Tables 1L and 2L for the given percentages of time:

TABLE 1L—SINGLE-ENTRY EPFD DOWN LIMITS FOR PROTECTION OF 30, 45, 60, 90, 120, 180, 240 AND 300 CM GSO BSS EARTH STATION ANTENNAS [1,2,3,5]

Frequency band (GHz) for international allocations	$EPDF_{down}$ dB(W/m²)	Percentage of time during which $EPFD_{down}$ level may not be exceeded	Reference bandwidth (kHz)	Reference antenna diameter and reference radiation pattern [4]
11.7–12.5 in Region 1; 1.7–12.2 and 12.5–12.75 in Region 3; 12.2–12.7 in Region 2.	−165.841	0	40	30 cm Recommendation ITU-R BO.1443 Annex 1
	−165.541	25		
	−164.041	96		
	−158.6	98.857		
	−158.6	99.429		
	−158.33	99.429		
	−158.33	99.429		
		100		
11.7–12.5 in Region 1; 1.7–12.2 and 12.5–12.75 in Region 3; 12.2–12.7 in Region 2.	−175.441	0	40	45 cm Recommendation ITU-R BO.1443 Annex 1
	−172.441	66		
	−169.441	97.75		
	−164	99.357		
	−160.75	99.809		
	−160	99.986		
	−160	100		
11.7–12.5 in Region 1; 1.7–12.2 and 12.5–12.75 in Region 3; 12.2–12.7 in Region 2.	−176.441	0	40	60 cm Recommendation ITU-R BO. 1443 Annex 1
	−173.191	97.8		
	−167.75	99.371		
	−162	99.886		
	−161	99.943		
	−160.2	99.971		
	−160	99.997		
	−160	100		
11.7–12.5 in Region 1; 1.7–12.2 and 12.5–12.75 in Region 3; 12.2–12.7 in Region 2.	−178.94	0	40	90 cm Recommendation ITU-R BO.1443 Annex 1
	−178.44	33		
	−176.44	98		
	−171	99.429		
	−165.5	99.714		
	−163	99.857		
	−161	99.943		
	−160	99.991		
	−160	100		

TABLE 1L—SINGLE-ENTRY EPFD DOWN LIMITS FOR PROTECTION OF 30, 45, 60, 90, 120, 180, 240 AND 300 CM GSO BSS EARTH STATION ANTENNAS [1,2,3,5]—Continued

Frequency band (GHz) for international allocations	EPDF $_{down}$ dB(W/m^2)	Percentage of time during which EPFD$_{down}$ level may not be exceeded	Reference bandwidth (kHz)	Reference antenna diameter and reference radiation pattern [4]
11.7–12.5 in Region 1; 1.7–12.2 and 12.5–12.75 in Region 3; 12.2–12.7 in Region 2.	−182.44	0	40	120 cm Recommendation ITU-R BO.1443 Annex 1
	−180.69	90		
	−179.19	98.9		
	−178.44	98.9		
	−174.94	99.5		
	−173.75	99.68		
	−173	99.68		
	−169.5	99.85		
	−167.8	99.915		
	−164	99.94		
	−161.9	99.97		
	−161	99.99		
	−160.4	99.998		
	−160	100		
11.7–12.5 in Region 1; 1.7–12.2 and 12.5–12.75 in Region 3; 12.2–12.7 in Region 2.	−184.941	0	40	180 cm [3] Recommendation ITU-R BO.1443 Annex 1
	−184.101	33		
	−181.691	98.5		
	−176.25	99.571		
	−163.25	99.946		
	−161.5	99.974		
	−160.35	99.993		
	−160	99.999		
	−160	100		
11.7–12.5 in Region 1; 1.7–12.2 and 12.5–12.75 in Region 3; 12.2–12.7 in Region 2.	−187.441	0	40	240 cm [2] Recommendation ITU-R BO.1443 Annex 1
	−186.341	33		
	−183.441	99.25		
	−178	99.786		
	−161.4	99.957		
	−161.9	99.983		
	−160.5	99.994		
	−160	99.999		
	−160	100		
11.7–12.5 in Region 1; 1.7–12.2 and 12.5–12.75 in Region 3; 12.2–12.7 in Region 2.	−191.941	0	40	300 cm Recommendation ITU-R BO.1443 Annex 1
	−189.441	33		
	−185.941	99.5		
	−180.5	99.857		
	−173	99.914		
	−167	99.951		
	−162	99.983		
	−160	99.991		
	−160	100		

[1] For BSS antenna diameters 180 cm, 240 cm and 300 cm, in addition to the single-entry limits shown in Table 1L, the limits in Table 2L shall also apply in the frequency band listed in Table 1L.

[2] For 240 cm GSO BSS earth station antennas located in Alaska, communicating with GSO BSS satellites at the 91° W.L., 101° W.L., 110° W.L., 119° W.L. and 148° W.L. nominal orbital locations with elevation angles greater than 5°, −167 dB(W/(m^2/40 kHz)) single-entry 100% of the time operational EPFD$_{down}$ limit also applies to receive antennas.

[3] For 180 cm GSO BSS earth station antennas located in Hawaii communicating with GSO BSS satellites that are operational as of December 30, 1999 at the 110° W.L., 119° W.L. and 148° W.L. nominal orbital positions, −162.5 dB(W/(m^2/40 kHz)) single-entry 100% of the time operational EPFD$_{down}$ limit also applies.

[4] Under the section reference pattern of Annex 1 to Recommendation ITU-R BO.1443 shall be used only for the calculation of interference from non-GSO FSS systems into BSS systems.

[5] For each reference antenna diameter, the limit consists of the complete curve on a plot which is linear in decibels for the EPFD levels and logarithmic for the time percentages, with straight line joining the data points.

TABLE 2L—SINGLE-ENTRY EPFD$_{down}$ LIMITS RADIATED BY NON-GSO FSS SYSTEMS AT CERTAIN LATITUDES

100% of the time EPFD$_{down}$ dB(W/(m^2/40 kHz))	Latitude (North or South in degrees)
−160.0	0 ≤ | Latitude | ≤ 57.5
−160.0 + 3.4 (57.5 − | Latitude |)/4	57.5 ≤ | Latitude | ≤ 63.75
−165.3	63.75 ≤ | Latitude |

NOTE TO PARAGRAPH (l): These limits relate to the equivalent power flux density, which would be obtained under free-space propagation conditions, for all conditions and for all methods of modulation.

(m) In the frequency bands 11.7–12.2 GHz and 12.5–12.75 GHz in Region 3, 11.7–12.5 GHz in Region 1 and 12.2–12.7 GHz in Region 2, the aggregate equivalent power-flux density, in the space-to-Earth direction, ($EPFD_{down}$) at any point on the Earth's surface, produced by emissions from all co-frequency space stations of all non-geostationary-satellite orbit systems operating in the fixed-satellite service (FSS) shall not exceed the following limits in Tables 1M and 2M for the given percentages of time:

TABLE 1M—AGGREGATE $EPFD_{down}$ LIMITS FOR PROTECTION OF 30, 45, 60, 90, 120, 180, 240 AND 300 CM GSO BSS EARTH STATION ANTENNAS [1,2,3,5]

Frequency band (GHz) for international allocations	$EPFD_{down}$ dB (W/m^2)	Percentage of time during which $EPFD_{down}$ level may not be exceeded	Reference bandwidth (kHz)	Reference antenna diameter, and reference radiation pattern [4]
11.7–12.5 in Region 1; 11.7–12.2 and 12.5–12.75 in Region 3; 12.2–12.7 in Region 2.	−160.4 −160.1 −158.6 −158.6 −158.33 −158.33	0 25 96 98 98 100	40	30 cm Recommendation ITU-R BO.1443 Annex 1.
11.7–12.5 in Region 1; 11.7–12.2 and 12.5–12.75 in Region 3; 12.2–12.7 in Region 2.	−170 −167 −164 −160.75 −160 −160	0 66 97.75 99.33 99.95 100	40	45 cm Recommendation ITU-R BO.1443 Annex 1.
11.7–12.5 in Region 1; 11.7–12.2 and 12.5–12.75 in Region 3; 12.2–12.7 in Region 2.	−171 −168.75 −167.75 −162 −161 −160.2 −160 −160	0 90 97.8 99.6 99.8 99.9 99.99 100	40	60 cm Recommendation ITU-R BO.1443 Annex 1.
11.7–12.5 in Region 1; 11.7–12.2 and 12.5–12.75 in Region 3; 12.2–12.7 in Region 2.	−173.75 −173 −171 −165.5 −163 −161 −160 −160	0 33 98 99.1 99.5 99.8 99.97 100	40	90 cm Recommendation ITU-R BO.1443 Annex 1.
11.7–12.5 in Region 1; 11.7–12.2 and 12.5–12.75 in Region 3; 12.2–12.7 in Region 2.	−177 −175.25 −173.75 −173 −169.5 −167.8 −164 −161.9 −161 −160.4 −160	0 90 98.9 98.9 99.5 99.7 99.82 99.9 99.965 99.993 100	40	120 cm Recommendation ITU-R BO.1443 Annex 1.

TABLE 1M—AGGREGATE $EPFD_{down}$ LIMITS FOR PROTECTION OF 30, 45, 60, 90, 120, 180, 240 AND 300 CM GSO BSS EARTH STATION ANTENNAS [1,2,3,5]—Continued

Frequency band (GHz) for international allocations	$EPFD_{down}$ dB (W/m^2)	Percentage of time during which $EPFD_{down}$ level may not be exceeded	Reference bandwidth (kHz)	Reference antenna diameter, and reference radiation pattern [4]
11.7–12.5 in Region 1; 11.7–12.2 and 12.5–12.75 in Region 3; 12.2–12.7 in Region 2.	−179.5 −178.66 −176.25 −163.25 −161.5 −160.35 −160 −160	0 33 98.5 99.81 99.91 99.975 99.995 100	40	180 cm Recommendation ITU-R BO.1443 Annex 1.
11.7–12.5 in Region 1; 11.7–12.2 and 12.5–12.75 in Region 3; 12.2–12.7 in Region 2.	−182 −180.9 −178 −164.4 −161.9 −160.5 −160 −160	0 33 99.25 99.85 99.94 99.98 99.995 100	40	240 cm Recommendation ITU-R BO.1443 Annex 1.
11.7–12.5 in Region 1; 11.7–12.2 and 12.5–12.75 in Region 3; 12.2–12.7 in Region 2.	−186.5 −184 −180.5 −173 −167 −162 −160 −160	0 33 99.5 99.7 99.83 99.94 99.97 100	40	300 cm Recommendation ITU-R BO.1443 Annex 1.

[1] For BSS antenna diameters 180 cm, 240 cm and 300 cm, in addition to the aggregate limit shown in Table 1M, the limits in Table 2M shall also apply.

[2] For 240 cm GSO BSS earth station antennas located in Alaska, communicating with GSO BSS satellites at the 91° W.L., 101° W.L., 110° W.L., 119° W.L. and 148° W.L. nominal orbital locations with elevation angles greater than 5°, −167 dB($W/(m^2$/40 kHz)) aggregate 100% of the time operational $EPFD_{down}$ limit also applies to receive antennas.

[3] For 180 cm GSO BSS earth station antennas located in Hawaii communicating with GSO BSS satellites that are operational as of December 30, 1999 at the 110° W.L., 119° W.L. and 148° W.L. nominal orbital positions, −162.5 dB($W/(m^2$/40 kHz)) aggregate 100% of the time operational $EPFD_{down}$ limit also applies.

[4] Under the section reference pattern of Annex 1 to Recommendation ITU-R BO.1443 shall be used only for the calculation of interference from non-GSO FSS systems into GSO BSS systems.

[5] For each reference antenna diameter, the limit consists of the complete curve on a plot which is linear in decibels for the EPFD levels and logarithmic for the time percentages, with straight line joining the data points.

TABLE 2M—AGGREGATE $EPFD_{down}$ LIMITS RADIATED BY NON-GSO FSS SYSTEMS AT CERTAIN LATITUDES

00% of the time $EPFD_{down}$ dB($W/(m^2$/40 kHz))	Latitude (North or South in degrees)
160.0	0 ≤ | Latitude | ≤ 57.5.
160.0 + 3.4 (57.5 − | Latitude |)/4	57.5 ≤ | Latitude | ≤ 63.75.
165.3	63.75 ≤ | Latitude |.

NOTE TO PARAGRAPH (m): These limits relate to the equivalent power flux density, which would be obtained under free-space propagation conditions, for all conditions and for all methods of modulation.

(n) The power-flux density at the Earth's surface produced by emissions from a space station in the fixed-satellite service (space-to-Earth), for all conditions and for all methods of modulation, shall not exceed the limits given in Table N. These limits relate to the power flux-density which would be obtained under assumed free-space conditions.

TABLE N—LIMITS OF POWER-FLUX DENSITY FROM SPACE STATIONS IN THE BAND 6700–7075 MHZ

Frequency band	Limit in dB (W/m²) for angle of arrival (δ) above the horizontal plane			Reference bandwidth
	0°–5°	5°–25°	25°–90°	
6700–6825 MHz	−137	−137 + 0.5(δ−5)	−127	1 MHz.
6825–7075 MHz	−154	−154 + 0.5(δ−5)	−144	4 kHz.
	and	and	and	
	−134	−134 + 0.5(δ−5)	−124	1 MHz.

(o) In the band 12.2–12.7 GHz, for NGSO FSS space stations, the specified low-angle power flux-density at the Earth's surface produced by emissions from a space station shall not be exceeded into an operational MVDDS receiver:

(1) −158 dB(W/m²) in any 4 kHz band for angles of arrival between 0 and 2 degrees above the horizontal plane; and

(2) −158 + 3.33(δ−2) dB(W/m²) in any 4 kHz band for angles of arrival (δ) (in degrees) between 2 and 5 degrees above the horizontal plane.

NOTE TO PARAGRAPH (o): These limits relate to the power flux density, which would be obtained under assumed free-space propagation conditions.

(p) The power flux-density at the Earth's surface produced by emissions from a space station in either the Earth exploration-satellite service in the band 25.5–27 GHz or the inter-satellite service in the band 25.25–27.5 GHz for all conditions and for all methods of modulation shall not exceed the following values:

−115 dB(W/m²) in any 1 MHz band for angles of arrival between 0 and 5 degrees above the horizontal plane;

−115 + 0.5(−5) dB(W/m²) in any 1 MHz band for angles of arrival between 5 and 25 degrees above the horizontal plane;

−105 dB(W/m²) in any 1 MHz band for angles of arrival between 25 and 90 degrees above the horizontal plane.

These limits relate to the power flux-density which would be obtained under assumed free-space propagation conditions.

(q) In the band 37.5–40.0 GHz, the power flux-density at the Earth's surface produced by emissions from a geostationary space station for all methods of modulation shall not exceed the following values.

(1) This limit relates to the power flux-density which would be obtained under assumed free space conditions (that is, when no allowance is made for propogation impairments such as rain-fade):

−139 dB(W/m²) in any 1 MHz band for angles of arrival between 0 and 5 degrees above the horizontal plane;

−139 + 4/3 (δ−5) dB(W/m²) in any 1 MHz band for angles of arrival δ (in degrees) between 5 and 20 degrees above the horizontal plane; and

−119 + 0.4 (δ−20) dB(W/m²) in any 1 MHz band for angles of arrival δ (in degrees) between 20 and 25 degrees above the horizontal plane;

−117 dB(W/m²) in any 1 MHz band for angles of arrival between 25 and 90 degrees above the horizontal plane;

(2) This limit relates to the maximum power flux-density which would be obtained anywhere on the surface of the Earth during periods when FSS system raises power to compensate for rain-fade conditions at the FSS Earth station:

−127 dB(W/m²) in any 1 MHz band for angles of arrival between 0 and 5 degrees above the horizontal plane;

−127 + 4/3 (δ−5) dB(W/m²) in any 1 MHz band for angles of arrival δ (in degrees) between 5 and 20 degrees above the horizontal plane; and

−107 + 0.4 (δ−20) dB(W/m²) in any 1 MHz band for angles of arrival δ (in degrees) between 20 and 25 degrees above the horizontal plane;

−105 dB(W/m²) in any 1 MHz band for angles of arrival between 25 and 90 degrees above the horizontal plane.

NOTE TO PARAGRAPH (q): The conditions under which satellites may exceed the power flux-density limits for normal free space propagation described in paragraph (p)(1) to compensate for the effects of rain fading are under study and have therefore not yet been defined. Such conditions and the extent to which these limits can be exceeded will be

the subject of a further rulemaking by the Commission on the satellite service rules.

(r) In the band 37.5–40.0 GHz, the power flux-density at the Earth's surface produced by emissions from a non-geostationary space station for all methods of modulation shall not exceed the following values:

(1) This limit relates to the power flux-density which would be obtained under assumed free space conditions (that is, when no allowance is made for propogation impairments such as rain-fade):

-132 dB(W/m^2) in any 1 MHz band for angles of arrival between 0 and 5 degrees above the horizontal plane;

$-132 + 0.75\ (\delta - 5)$ dB(W/m^2) in any 1 MHz band for angles of arrival δ (in degrees) between 5 and 25 degrees above the horizontal plane; and

-117 dB(W/m^2) in any 1 MHz band for angles of arrival between 25 and 90 degrees above the horizontal plane;

(2) This limit relates to the maximum power flux-density which would be obtained anywhere on the surface of the Earth during periods when FSS system raises power to compensate for rain-fade conditions at the FSS Earth station:

-120 dB(W/m^2) in any 1 MHz band for angles of arrival between 0 and 5 degrees above the horizontal plane;

$-120 + 0.75\ (\delta - 5)$ dB(W/m^2) in any 1 MHz band for angles of arrival δ (in degrees) between 5 and 25 degrees above the horizontal plane; and

-105 dB(W/m^2) in any 1 MHz band for angles of arrival between 25 and 90 degrees above the horizontal plane.

NOTE TO PARAGRAPH (r): The conditions under which satellites may exceed these power flux-density limits for normal free space propagation described in paragraph (q)(1) to compensate for the effects of rain fading are under study and have therefore not yet been defined. Such conditions and the extent to which these limits can be exceeded will be the subject of a further rulemaking by the Commission on the satellite service rules.

(s) In the band 40.04 0.5 GHz, the power flux-density at the Earth's surface produced by emissions from a space station for all conditions and for all methods of modulation shall not exceed the following values:

-115 dB(W/m^2) in any 1 MHz band for angles of arrival between 0 and 5 degrees above the horizontal plane;

$-115 + 0.5\ (\delta - 5)$ dB(W/m^2) in any 1 MHz band for angles of arrival δ (in degrees) between 5 and 25 degrees above the horizontal plane; and

-105 dB(W/m^2) in any 1 MHz band for angles of arrival between 25 and 90 degrees above the horizontal plane;

NOTE TO PARAGRAPH (s): These limits relate to the power flux-density that would be obtained under assumed free-space propagation conditions.

(t) In the band 40.5–42.0 GHz, the power flux density at the Earth's surface produced by emissions from a non-geostationary space station for all conditions and for all methods of modulation shall not exceed the following values:

-115 dB(W/m^2) in any 1 MHz band for angles of arrival between 0 and 5 degrees above the horizontal plane;

$-115 + 0.5\ (\delta - 5)$ dB(W/m^2) in any 1 MHz band for angles of arrival δ (in degrees) between 5 and 25 degrees above the horizontal plane; and

-105 dB(W/m^2) in any 1 MHz band for angles of arrival between 25 and 90 degrees above the horizontal plane;

NOTE TO PARAGRAPH (t): These limits relate to the power flux density that would be obtained under assumed free-space propagation conditions.

(u) In the band 40.5–42.0 GHz, the power flux-density at the Earth's surface produced by emissions from a geostationary space station for all conditions and for all methods of modulation shall not exceed the following values:

-120 dB(W/m^2) in any 1 MHz band for angles of arrival between 0 and 5 degrees above the horizontal plane;

$-120 + (\delta - 5)$ dB(W/m^2) in any 1 MHz band for angles of arrival δ (in degrees) between 5 and 15 degrees above the horizontal plane;

$-110 + 0.5\ (\delta - 15)$ dB(W/m^2) in any 1 MHz band for angles of arrival δ (in degrees) between 15 and 25 degrees above the horizontal plane; and

-105 dB(W/m^2) in any 1 MHz band for angles of arrival between 25 and 90 degrees above the horizontal plane;

NOTE TO PARAGRAPH (u): These limits relate to the power flux-density that would be

obtained under assumed free-space propagation conditions.

(v) In the band 2496–2500 MHz, the power flux-density at the Earth's surface produced by emissions from non-geostationary space stations for all conditions and all methods of modulation shall not exceed the following values (these values are obtained under assumed free-space propagation conditions):

(1) −144 dB (W/m^2) in 4 kHz for all angles of arrival between 0 and 5 degrees above the horizontal plane; −144 dB (W/m^2) + 0.65(δ −5) in 4 kHz for all angles of arrival between 5 and 25 degrees above the horizontal plane; and

−131 dB (W/m^2) in 4 kHz and for all angles of arrival between 25 and 90 degrees above the horizontal plane.

(2) −126 dB (W/m^2) in 1 MHz for all angles of arrival between 0 and 5 degrees above the horizontal plane; −126 dB (W/m^2) + 0.65(δ −5) in 1 MHz for all angles of arrival between 5 and 25 degrees above the horizontal plane; and

−113 dB (W/m^2) in 1 MHz and for all angles of arrival between 25 and 90 degrees above the horizontal plane.

(w) The power flux density at the Earth's surface produced by emissions from a 17/24 GHz BSS space station operating in the 17.3–17.7 GHz band for all conditions, including clear sky, and for all methods of modulation shall not exceed the regional power flux density levels defined below.

(1) In the region of the contiguous United States, located south of 38° North Latitude and east of 100 West Longitude: −115 dBW/m^2/MHz.

(2) In the region of the contiguous United States, located north of 38° North Latitude and east of 100° West Longitude: −118 dBW/m^2/MHz.

(3) In the region of the contiguous United States, located west of 100 West Longitude: −121 dBW/m^2/MHz.

(4) For all regions outside of the contiguous United States including Alaska and Hawaii: −115 dBW/m^2/MHz.

[48 FR 40255, Sept. 6, 1983, as amended at 52 FR 45636, Dec. 1, 1987; 59 FR 53329, Oct. 21, 1994; 65 FR 54171, Sept. 7, 2000; 66 FR 10623, Feb. 16, 2001; 66 FR 63515, Dec. 7, 2001; 67 FR 17299, Apr. 10, 2002; 67 FR 46911, July 17, 2002; 68 FR 16448, Apr. 4, 2003; 68 FR 43946, July 25, 2003; 69 FR 31745, June 7, 2004; 69 FR 52207, Aug. 25, 2004; 70 FR 24725, May 11, 2005; 70 FR 46675, Aug. 10, 2005; 71 FR 35188, June 19, 2006; 72 FR 50029, Aug. 29, 2007; 73 FR 25496, May 6, 2008]

§ 25.209 Antenna performance standards.

(a) The gain of any antenna to be employed in transmission from an earth station in the geostationary satellite orbit fixed-satellite service (GSO FSS) shall lie below the envelope defined as follows:

(1) In the plane of the geostationary satellite orbit as it appears at the particular earth station location:

$$29\text{-}25 \log_{10} (\text{Theta}) \text{ dBi } 1° \text{ </= Theta </= } 7°$$

$$+8 \text{ dBi } 7° \text{ < Theta </= } 9.2°$$

$$32\text{-}25 \log_{10} (\text{Theta}) \text{ dBi } 9.2° \text{ < Theta </= } 48°$$

$$-10 \text{ dBi } 48° \text{ < Theta </= } 180°$$

where Theta is the angle in degrees from the axis of the main lobe, and dBi refers to dB relative to an isotropic radiator. For the purposes of this section, the peak gain of an individual sidelobe may not exceed the envelope defined above for Theta between 1.0 and 7.0 degrees. For Theta greater than 7.0 degrees, the envelope may be exceeded by no more than 10% of the sidelobes, provided no individual sidelobe exceeds the gain envelope given above by more than 3 dB.

(2) In all other directions, or in the plane of the horizon including any out-of-plane potential terrestrial interference paths:

Outside the main beam, the gain of the antenna shall lie below the envelope defined by:

$$32\text{-}25 \log_{10} (\text{Theta}) \text{ dBi } 1° \text{ </= Theta </= } 48°$$

$$-10 \text{ dBi } 48° \text{ < Theta </= } 180°$$

where Theta and dBi are defined above. For the purposes of this section, the envelope may be exceeded by no more than 10% of the sidelobes provided no individual sidelobe exceeds the gain envelope given

above by more than 6 dB. The region of the main reflector spillover energy is to be interpreted as a single lobe and shall not exceed the envelope by more than 6 dB.

(b) The off-axis cross-polarization gain of any antenna to be employed in transmission from an earth station to a space station in the domestic fixed-satellite service shall be defined by:

$$19\text{-}25 \log_{10} (\text{Theta}) \text{ dBi } 1.8° < \text{Theta} <= 7°$$

$$-2 \text{ dBi } 7° < \text{Theta} <= 9.2°$$

(c)(1) Earth station antennas licensed for reception of radio transmissions from a space station in the fixed-satellite service are protected from radio interference caused by other space stations only to the degree to which harmful interference would not be expected to be caused to an earth station employing an antenna conforming to the referenced patterns defined in paragraphs (a) and (b) of this section, and protected from radio interference caused by terrestrial radio transmitters identified by the frequency coordination process only to the degree to which harmful interference would not be expected to be caused to an earth station conforming to the reference pattern defined in paragraph (a)(2) of this section.

(2) 17/24 GHz BSS telemetry earth stations are protected from harmful interference caused by other space stations to the extent set forth in paragraph (c)(1) of this section. Receive-only earth stations in the 17/24 GHz BSS are protected from harmful interference caused by other space stations to the extent set forth in § 25.224 of this part.

(d) The patterns specified in paragraphs (a) and (b) of this section shall apply to all new earth station antennas initially authorized after February 15, 1985 and shall apply to all earth station antennas after March 11, 1994.

(e) The operations of any earth station with an antenna not conforming to the standards of paragraphs (a) and (b) of this section shall impose no limitations upon the operation, location or design of any terrestrial station, any other earth station, or any space station beyond those limitations that would be expected to be imposed by an earth station employing an antenna conforming to the reference patterns defined in paragraphs (a) and (b) of this section.

(f) An earth station with an antenna not conforming to the standards of paragraphs (a) and (b) of this section will be authorized after February 15, 1985 upon a finding by the Commission that unacceptable levels of interference will not be caused under conditions of uniform 2° orbital spacing. An earth station antenna initially authorized on or before February 15, 1985 will be authorized by the Commission to continue to operate as long as such operations are found not to cause unacceptable levels of adjacent satellite interference. In either case, the Commission will impose appropriate terms and conditions in its authorization of such facilities and operations. The applicant has the burden of demonstrating that its antenna not conforming to the standards of paragraphs (a) and (b) of this section will not cause unacceptable interference. This demonstration must comply with the procedures set forth in § 25.220.

(g) The antenna performance standards of small antennas operating in the 12/14 GHz band with diameters as small as 1.2 meters starts at 1.25° instead of 1° as stipulated in paragraph (a) of this section.

(h)(1) The gain of any antennas to be employed in transmission from a gateway earth station antenna operating in the frequency bands 10.7–11.7 GHz, 12.75–13.15 GHz, 13.2125–13.25 GHz, 13.8–14.0 GHz, and 14.4–14.5 GHz and communicating with NGSO FSS satellites shall lie below the envelope defined as follows:

$29 - 25\log_{10} (\theta)$ dBi $- 10$ dBi
$1^B \leq \theta \leq 36^B$
$36^B \leq \theta \leq 180^B$

Where: θ is the angle in degrees from the axis of the main lobe, and dBi refers to dB relative to an isotropic radiator.

(2) For the purposes of this section, the peak gain of an individual sidelobe may not exceed the envelope defined in paragraph (h)(1) of this section.

[48 FR 40255, Sept. 6, 1983, as amended at 50 FR 2675, Jan. 18, 1985; 50 FR 39004, Sept. 26, 1985; 58 FR 13420, Mar. 11, 1993; 66 FR 10630, Feb. 16, 2001; 70 FR 32255, June 2, 2005; 72 FR 50029, Aug. 29, 2007]

§ 25.210 Technical requirements for space stations in the Fixed-Satellite Service.

(a) All space stations in the Fixed-Satellite Service used for domestic service in the 3700–4200 MHz and 5925–6425 MHz frequency bands shall:

(1) Use orthogonal linear polarization with one of the planes defined by the equatorial plane;

(2) Be designed so that the polarization sense of uplink transmissions is opposite to that of downlink transmissions on the same transponder; and

(3) Shall be capable of switching polarization sense upon ground command.

(b) All space stations in the Fixed-Satellite Service in the 20/30 GHz band shall use either orthogonal linear or orthogonal circular polarization. Those space stations utilizing orthogonal linear polarization shall also comply with paragraph (a) of this section.

(c) All space stations in the Fixed-Satellite Service shall have a minimum capability to change transponder saturation flux densities by ground command in 4 dB steps over a range of 12 dB.

(d) All space stations in the Fixed Satellite Service in the 20/30 GHz band shall employ state-of-the-art full frequency reuse either through the use of orthogonal polarizations within the same beam and/or through the use of spatially independent beams.

(e) [Reserved]

(f) All space stations in the Fixed Satellite Service in the 3600–3700 MHz, 3700–4200 MHz, 5091–5250 MHz, 5825–5925 MHz, 5925–6425 MHz, 6425–6525 MHz, 6525–6700 MHz, 6700–7025 MHz, 10.7–10.95 GHz, 10.95–11.2 GHz, 11.2–11.45 GHz, 11.45–11.7 GHz, 11.7–12.2 GHz, 12.2–12.7 GHz, 12.75–13.15 GHz, 13.15–13.2125 GHz, 13.2125–13.25 GHz, 13.75–14.0 GHz, 14.0–14.5 GHz, 15.43–15.63 GHz, and 24.75–25.25 GHz bands, or in the Broadcasting-Satellite Service in the 17.3–17.8 GHz band (space-to-Earth), shall employ state-of-the-art full frequency reuse either through the use of orthogonal polarizations within the same beam and/or the use of spatially independent beams.

(g)–(h) [Reserved]

(i)(1) Space station antennas in the Fixed-Satellite Service, other than antennas in the 17/24 GHz BSS, must be designed to provide a cross-polarization isolation such that the ratio of the on axis co-polar gain to the cross-polar gain of the antenna in the assigned frequency band shall be at least 30 dB within its primary coverage area.

(2) Space station antennas in the 17/24 GHz Broadcasting Satellite Service must be designed to provide a cross-polarization isolation such that the ratio of the on axis co-polar gain to the cross-polar gain of the antenna in the assigned frequency band shall be at least 25 dB within its primary coverage area.

(j) Space stations operated in the geostationary satellite orbit must be maintained within 0.05° of their assigned orbital longitude in the east/west direction, unless specifically authorized by the Commission to operate with a different longitudinal tolerance, and except as provided in Section 25.283(b) (End-of-life Disposal).

(k) Antenna measurements of both co-polarized and cross-polarized performance must be made on all antennas employed by space stations both within the primary coverage area to facilitate coordination with other Commission space station licensees and outside the primary coverage area to facilitate international frequency coordination with other Administrations. The results of such measurements shall be submitted to the Commission within thirty days after preliminary in-orbit testing is completed.

(l) All operators of space stations shall, on June 30 of each year, file a report with the International Bureau and the Commission's Columbia Operations Center in Columbia, Maryland, containing the following information current as of May 31 of that year:

(1) Status of satellite construction and anticipated launch dates, including any major problems or delays encountered;

(2) A listing of any non-scheduled transponder outages for more than thirty minutes and the cause(s) of such outages;

(3) A detailed description of the utilization made of each transponder on each of the in-orbit satellites. This description should identify the total capacity or the percentage of time each

transponder is actually used for transmission, and the amount of unused system capacity in the transponder. This information is not required for those transponders that are sold on a non-common carrier basis. In that case, operators should indicate the number of transponders sold on each in-satellite orbit.

(4) Identification of any transponders not available for service or otherwise not performing to specifications, the cause of these difficulties, and the date any transponder was taken out of service or the malfunction identified.

[58 FR 13420, Mar. 11, 1993, as amended at 61 FR 9952, Mar. 12, 1996; 62 FR 5931, Feb. 10, 1997; 62 FR 61457, Nov. 18, 1997; 68 FR 51508, Aug. 27, 2003; 69 FR 54587, Sept. 9, 2004; 70 FR 32256, June 2, 2005; 72 FR 50029, Aug. 29, 2007]

§ 25.211 Analog video transmissions in the Fixed-Satellite Services.

(a) Downlink analog video transmissions in the band 3700–4200 MHz shall be transmitted only on a center frequency of 3700+20N MHz, where N=1 to 24. The corresponding uplink frequency shall be 2225 MHz higher.

(b) All 4/6 GHz analog video transmissions shall contain an energy dispersal signal at all times with a minimum peak-to-peak bandwidth set at whatever value is necessary to meet the power flux density limits specified in § 25.208(a) and successfully coordinated internationally and accepted by adjacent U.S. satellite operators based on the use of state of the art space and earth station facilities. Further, all transmissions operating in frequency bands described in § 25.208 (b) and (c) shall also contain an energy dispersal signal at all times with a minimum peak-to-peak bandwidth set at whatever value is necessary to meet the power flux density limits specified in § 25.208(b) and (c) and successfully coordinated internationally and accepted by adjacent U.S. satellite operators based on the use of state of the art space and earth station facilities. The transmission of an unmodulated carrier at a power level sufficient to saturate a transponder is prohibited, except by the space station licensee to determine transponder performance characteristics. All 12/14 GHz video transmissions for TV/FM shall identify the particular carrier frequencies for necessary coordination with adjacent U.S. satellite systems and affected satellite systems of other administrations.

(c) All initial analog video transmissions shall be preceded by a video test transmission at an uplink e.i.r.p. at least 10 dB below the normal operating level. The earth station operator shall not increase power until receiving notification from the satellite network control center that the frequency and polarization alignment are satisfactory pursuant to the procedures specified in § 25.272. The stationary earth station operator that has successfully transmitted an initial video test signal to a satellite pursuant to this paragraph is not required to make subsequent video test transmissions if subsequent transmissions are conducted using exactly the same parameters as the initial transmission.

(d) An earth station may be routinely licensed for transmission of full transponder video analog services provided:

(1) In the 5925–6425 MHz band, with an antenna equivalent diameter 4.5 meters or greater, the maximum input power into the antenna does not exceed 26.5 dBW; or

(2) In the 14.0–14.5 GHz band, with an antenna equivalent diameter of 1.2 meters or greater, the maximum input power into the antenna does not exceed 27 dBW.

(e) Antennas smaller than those specified in paragraph (d) of this section are subject to the provisions of § 25.220, which may include power reduction requirements. These antennas will not be routinely licensed for transmission of full transponder services.

(f) Each applicant for authorization for analog transmissions in the fixed-satellite service proposing to use maximum power into the antenna in excess of those specified in § 25.211(d), must comply with the procedures set forth in § 25.220.

[58 FR 13421, Mar. 11, 1993, as amended at 61 FR 9952, Mar. 12, 1996; 62 FR 5931, Feb. 10, 1997; 70 FR 32256, June 2, 2005]

§ 25.212 Narrowband analog transmissions, digital transmissions, and video transmissions in the GSO Fixed-Satellite Service.

(a) Except as otherwise provided by this part, criteria for unacceptable levels of interference caused by other satellite networks shall be established on the basis of nominal operating conditions and with the objective of minimizing orbital separations between satellites.

(b) Emissions with an occupied bandwidth of less than 2 MHz are not protected from interference from wider bandwidth transmissions if the r.f. carrier frequency of the narrowband signal is within ±1 MHz of one of the frequencies specified in § 25.211(a).

(c) In the 14.0–14.5 GHz band, an earth station with an antenna equivalent diameter of 1.2 meters or greater may be routinely licensed for transmission of narrowband analog services with bandwidths up to 200 kHz if the maximum input power spectral density into the antenna does not exceed −8 dBW/4 kHz and the maximum transmitted satellite carrier EIRP density does not exceed 13 dBW/4 kHz. Such earth stations may be routinely licensed for transmission of narrowband and/or wideband digital services, including digital video services, if the maximum input spectral power density into the antenna does not exceed −14 dBW/4 kHz and the maximum transmitted satellite carrier EIRP density does not exceed +6.0 dBW/4 kHz. Antennas with a smaller major or minor axis in the 14 GHz band are subject to the provisions of § 25.220, which may include power reduction requirements.

(d)(1) For earth stations licensed before March 10, 2005 in the 5925–6425 MHz band, an earth station with an equivalent diameter of 4.5 meters or greater may be routinely licensed for transmission of SCPC services if the maximum power densities into the antenna do not exceed +0.5 dBW/4 kHz for analog SCPC carriers with bandwidths up to 200 kHz, and do not exceed −2.7 dBW/4 kHz for narrow and/or wideband digital SCPC carriers.

(2) For earth stations licensed after March 10, 2005 in the 5925–6425 MHz band, an earth station with an equivalent diameter of 4.5 meters or greater may be routinely licensed for transmission of SCPC services if the maximum power densities into the antenna do not exceed +0.5 dBW/4 kHz for analog SCPC carriers with bandwidths up to 200 kHz, and do not exceed $-2.7 - 10\log(N)$ dBW/4 kHz for narrow and/or wideband digital SCPC carriers. For digital SCPC using frequency division multiple access (FDMA) or time division multiple access (TDMA) technique, N is equal to one. For digital SCPC using code division multiple access (CDMA) technique, N is the maximum number of co-frequency simultaneously transmitting earth stations in the same satellite receiving beam.

(3) Antennas with an equivalent diameter smaller than 4.5 meters in the 5925–6425 MHz band are subject to the provisions of § 25.220 of this chapter, which may include power reduction requirements.

(e) Each applicant for authorization for transmissions in the fixed-satellite service proposing to use transmitted satellite carrier EIRP densities, and/or maximum antenna input power densities in excess of those specified in paragraph (c) of this section in the 14.0–14.5 GHz band, or in paragraph (d) of this section in the 5925–6425 MHz band, respectively, must comply with the procedures set forth in § 25.220.

(f) In the 24.75–25.25 GHz band, an earth station that meets the antenna gain pattern requirements set forth in §§ 25.209(a) and (b) of this part may be routinely licensed if the maximum power density into the antenna does not exceed 3.5 dBW/MHz.

[58 FR 13421, Mar. 11, 1993, as amended at 62 FR 5931, Feb. 10, 1997; 62 FR 51378, Oct. 1, 1997; 70 FR 32256, June 2, 2005; 70 FR 33376, June 8, 2005; 72 FR 50030, Aug. 29, 2007]

§ 25.213 Inter-Service coordination requirements for the 1.6/2.4 GHz mobile-satellite service.

(a) Protection of the radio astronomy service in the 1610.6–1613.8 MHz band against interference from 1.6/2.4 GHz Mobile-Satellite Service systems.

(1) *Protection zones.* All 1.6/2.4 GHz Mobile Satellite Service systems shall be capable of determining the position of the user transceivers accessing the space segment through either internal

radiodetermination calculations or external sources such as LORAN-C or the Global Positioning System. During periods of radio astronomy observations, land mobile earth stations shall not operate when located within geographic protection zones defined by the radio observatory coordinates and separation distances as follows:

(i) In the band 1610.6–1613.8 MHz, within a 160 km radius of the following radio astronomy sites:

Observatory	Latitude (DMS)	Longitude (DMS)
Arecibo, PR	18 20 46	66 45 11
Green Bank Telescope, WV	38 25 59	79 50 24
	38 26 09	79 49 42
Very Large Array, NM	34 04 43	107 37 04
Owens Valley, CA	37 13 54	118 17 36
Ohio State, OH	40 15 06	83 02 54

(ii) In the band 1610.6–1613.8 MHz, within a 50 km radius of the following sites:

Observatory	Latitude (DMS)	Longitude (DMS)
Pile Town, NM	34 18 04	108 07 07
Los Alamos, NM	35 46 30	106 14 42
Kitt Peak, AZ	31 57 22	111 36 42
Ft. Davis, TX	30 38 06	103 56 39
N. Liberty, IA	41 46 17	91 34 26
Brewster, WA	48 07 53	119 40 55
Owens Valley, CA	37 13 54	118 16 34
St. Croix, VI	17 45 31	64 35 03
Mauna Kea, HI	19 48 16	155 27 29
Hancock, NH	42 56 01	71 59 12

(iii) Out-of-band emissions of a mobile earth station licensed to operate within the 1610.0–1626.5 MHz band shall be attenuated so that the power flux density it produces in the 1610.6–1613.8 MHz band at any radio astronomy site listed in paragraph (a)(1) (i) or (ii) of this section shall not exceed the emissions of a mobile earth station operating within the 1610.6–1613.8 MHz band at the edge of the protection zone applicable for that site. As an alternative, a mobile earth station shall not operate during radio astronomy observations within the 1613.8–1615.8 MHz band within 100 km of the radio astronomy sites listed in paragraph (a)(1)(i) of this section, and within 30 km of the sites listed in paragraph (a)(1)(ii) of this section, there being no restriction on a mobile earth station operating within the 1615.8–1626.5 MHz band.

(iv) For airborne mobile earth stations operating in the 1610.0–1626.5 MHz band, the separation distance shall be the larger of the distances specified in paragraph (a)(1) (i), (ii) or (iii) of this section, as applicable, or the distance, d, as given by the formula:

d (km) = 4.1 square root of (h)

where h is the altitude of the aircraft in meters above ground level.

(v) Smaller geographic protection zones may be used in lieu of the areas specified in paragraphs (a)(1) (i), (ii), (iii), and (iv) of this section if agreed to by the Mobile-Satellite Service licensee and the Electromagnetic Spectrum Management Unit (ESMU), National Science Foundation, Washington, D.C. upon a showing by the Mobile-Satellite Service licensee that the operation of a mobile earth station will not cause harmful interference to a radio astronomy observatory during periods of observation.

(vi) The ESMU shall notify Mobile-Satellite Service space station licensees authorized to operate mobile earth terminals in the 1610.0–1626.5 MHz band of periods of radio astronomy observations. The mobile-satellite systems shall be capable of terminating operations within the frequency bands and protection zones specified in paragraphs (a)(1) (i) through (iv) of this section, as applicable, after the first position fix of the mobile earth terminal either prior to transmission or, based upon its location within the protection zone at the time of initial transmission of the mobile earth terminal. Once the mobile-satellite system determines that a mobile earth terminal is located within an RAS protection zone, the mobile-satellite system shall immediately initiate procedures to relocate the mobile earth terminal operations to a non-RAS frequency.

(vii) A beacon-actuated protection zone may be used in lieu of fixed protection zones in the 1610.6–1613.8 MHz band if a coordination agreement is reached between a mobile-satellite system licensee and the ESMU on the specifics of beacon operations.

(viii) Additional radio astronomy sites, not located within 100 miles of the 100 most populous urbanized areas as defined by the United States Census Bureau at the time, may be afforded

similar protection one year after notice to the mobile-satellite system licensees by issuance of a public notice by the Commission.

(2) Mobile-Satellite Service space stations transmitting in the 1613.8–1626.5 MHz band shall take whatever steps necessary to avoid causing harmful interference to the radio astronomy facilities listed in paragraphs (a)(1)(i) and (ii) of this section during periods of observation.

(3) Mobile-Satellite Service space stations operating in the 2483.5–2500 MHz frequency band shall limit spurious emission levels in the 4990–5000 MHz band so as not to exceed −241 dB ($W/m^2/Hz$) at the surface of the Earth.

(4) The Radioastronomy Service shall avoid scheduling radio astronomy observations during peak MSS/RDSS traffic periods to the greatest extent practicable.

(b) If a Mobile-Satellite Service space station operator in the 2496–2500 MHz band intends to operate at powers levels that exceed the PFD limits in §25.208(v), or if actual operations routinely exceed these PFD limits, we require the Mobile-Satellite Service operator to receive approval from each operational BRS system in the affected geographical region.

[59 FR 53329, Oct. 21, 1994, as amended at 61 FR 9945, Mar. 12, 1996; 67 FR 61816, Oct. 2, 2002; 71 FR 35188, June 19, 2006]

§25.214 Technical requirements for space stations in the satellite digital audio radio service.

(a) Definitions.

(1) *Allocated bandwidth.* The term ''allocated bandwidth'' refers to the entry in the Table of Frequency Allocations of a given frequency band for the purpose of its use by one or more terrestrial or space radiocommunication services under specified conditions. This term shall be applied to the 2310–2360 MHz band for satellite DARS.

(2) *Frequency Assignment.* The term ''frequency assignment'' refers to the authorization given by the Commission for a radio station to use a radio frequency or radio frequency channel under specified conditions. This term shall be applied to the two frequency bands (A) 2320.0–2332.5 MHz and (B) 2332.5–2340.0 MHz for satellite DARS.

(b) Each system authorized under this section will be conditioned upon construction, launch and operation milestones as outlined in §25.144(b). The failure to meet any of the milestones contained in an authorization will result in its cancellation, unless such failure is due to circumstances beyond the licensee's control or unless otherwise determined by the Commission upon proper showing by the licensee in any particular case.

(c) Frequency assignments will be made for each satellite DARS system as follows:

(1) Exclusive satellite DARS licenses are limited to the 2320–2345 MHz band segment of the allocated bandwidth for satellite DARS;

(2) Two, 12.5 MHz frequency assignments are available for satellite DARS: 2320.0–2332.5 MHz and 2332.5–2345.0 MHz;

(3) Satellite DARS licensees may reduce their assigned bandwidth occupancy to provide telemetry beacons in their exclusive frequency assignments;

(4) Each licensee may employ cross polarization within its exclusive frequency assignment and/or may employ cross polarized transmissions in frequency assignments of other satellite DARS licensees under mutual agreement with those licensees. Licensees who come to mutual agreement to use cross-polarized transmissions shall apply to the Commission for approval of the agreement before coordination is initiated with other administrations by the licensee of the exclusive frequency assignment; and

(5) Feeder uplink networks are permitted in the following Fixed-Satellite Service frequency bands: 7025–7075 MHz and 6725–7025 MHz (101° W.L. orbital location only).

[62 FR 11106, Mar. 11, 1997]

§25.215 Technical requirements for space stations in the Direct Broadcast Satellite Service.

In addition to §25.148(f), space station antennas operating in the Direct Broadcast Satellite Service must be designed to provide a cross-polarization isolation such that the ratio of the on-axis co-polar gain to the cross-polar

gain of the antenna in the assigned frequency band shall be at least 30 dB within its primary coverage area.

[67 FR 51114, Aug. 7, 2002]

§ 25.216 Limits on emissions from mobile earth stations for protection of aeronautical radionavigation-satellite service.

(a) The e.i.r.p. density of emissions from mobile earth stations placed in service on or before July 21, 2002 with assigned uplink frequencies between 1610 MHz and 1660.5 MHz shall not exceed −70 dBW/MHz, averaged over any 2 millisecond active transmission interval, in the band 1559–1587.42 MHz. The e.i.r.p. of discrete emissions of less than 700 Hz bandwidth generated by such stations shall not exceed −80 dBW, averaged over any 2 millisecond active transmission interval, in that band.

(b) The e.i.r.p. density of emissions from mobile earth stations placed in service on or before July 21, 2002 with assigned uplink frequencies between 1610 MHz and 1626.5 MHz shall not exceed −64 dBW/MHz, averaged over any 2 millisecond active transmission interval, in the band 1587.42–1605 MHz. The e.i.r.p. of discrete emissions of less than 700 Hz bandwidth generated by such stations shall not exceed −74 dBW, averaged over any 2 millisecond active transmission interval, in the 1587.42–1605 MHz band.

(c) The e.i.r.p. density of emissions from mobile earth stations placed in service after July 21, 2002 with assigned uplink frequencies between 1610 MHz and 1660.5 MHz shall not exceed −70 dBW/MHz, averaged over any 2 millisecond active transmission interval, in the band 1559–1605 MHz. The e.i.r.p. of discrete emissions of less than 700 Hz bandwidth from such stations shall not exceed −80 dBW, averaged over any 2 millisecond active transmission interval, in the 1559–1605 MHz band.

(d) As of January 1, 2005, the e.i.r.p. density of emissions from mobile earth stations placed in service on or before July 21, 2002 with assigned uplink frequencies between 1610 MHz and 1660.5 MHz (except Standard A and B Inmarsat terminals used as Global Maritime Distress and Safety System ship earth stations) shall not exceed −70dBW/MHz, averaged over any 2 millisecond active transmission interval, in the 1559–1605 MHz band. The e.i.r.p. of discrete emissions of less than 700 Hz bandwidth from such stations shall not exceed −80 dBW, averaged over any 2 millisecond active transmission interval, in the 1559–1605 MHz band. Standard A Inmarsat terminals used as Global Maritime Distress and Safety System ship earth stations that do not meet the e.i.r.p. density limits specified in this paragraph may continue operation until December 31, 2007. Inmarsat-B terminals manufactured more than six months after FEDERAL REGISTER publication of the rule changes adopted in FCC 03–283 must meet these limits. Inmarsat B terminals manufactured before then are temporarily grandfathered under the condition that no interference is caused by these terminals to aeronautical satellite radio-navigation systems. The full-compliance deadline for grandfathered Inmarsat-B terminals is December 31, 2012.

(e) The e.i.r.p density of emissions from mobile earth stations with assigned uplink frequencies between 1990 MHz and 2025 MHz shall not exceed −70 dBW/MHz, averaged over any 2 millisecond active transmission interval, in frequencies between 1559 MHz and 1610 MHz. The e.i.r.p. of discrete emissions of less than 700 Hz bandwidth from such stations between 1559 MHz and 1605 MHz shall not exceed −80 dBW, averaged over any 2 millisecond active transmission interval. The e.i.r.p. of discrete emissions of less than 700 Hz bandwidth from such stations between 1605 MHz and 1610 MHz manufactured more than six months after FEDERAL REGISTER publication of the rule changes adopted in FCC 03–283 shall not exceed −80 dBW, averaged over any 2 millisecond active transmission interval.

(f) Mobile earth stations placed in service after July 21, 2002 with assigned uplink frequencies in the 1610–1660.5 MHz band shall suppress the power density of emissions in the 1605–1610 MHz band to an extent determined by linear interpolation from −70 dBW/MHz at 1605 MHz to −10 dBW/MHz at 1610 MHz.

(g) Mobile earth stations manufactured more than six months after FEDERAL REGISTER publication of the rule changes adopted in FCC 03–283 with assigned uplink frequencies in the 1610–1626.5 MHz band shall suppress the power density of emissions in the 1605–1610 MHz band-segment to an extent determined by linear interpolation from −70 dBW/MHz at 1605 MHz to −10 dBW/MHz at 1610 MHz averaged over any 2 millisecond active transmission interval. The e.i.r.p of discrete emissions of less than 700 Hz bandwidth from such stations shall not exceed a level determined by linear interpolation from −80 dBW at 1605 MHz to −20 dBW at 1610 MHz, averaged over any 2 millisecond active transmission interval.

(h) Mobile earth stations manufactured more than six months after FEDERAL REGISTER publication of the rule changes adopted in FCC 03–283 with assigned uplink frequencies in the 1626.5–1660.5 MHz band shall suppress the power density of emissions in the 1605–1610 MHz band-segment to an extent determined by linear interpolation from −70 dBW/MHz at 1605 MHz to −46 dBW/MHz at 1610 MHz, averaged over any 2 millisecond active transmission interval. The e.i.r.p of discrete emissions of less than 700 Hz bandwidth from such stations shall not exceed a level determined by linear interpolation from −80 dBW at 1605 MHz to −56 dBW at 1610 MHz, averaged over any 2 millisecond active transmission interval.

(i) The e.i.r.p density of carrier-off state emissions from mobile earth stations manufactured more than six months after FEDERAL REGISTER publication of the rule changes adopted in FCC 03–283 with assigned uplink frequencies between 1 and 3 GHz shall not exceed -80 dBW/MHz in the 1559–1610 MHz band averaged over any two millisecond interval.

(j) A Root-Mean-Square detector shall be used for all power density measurements.

[69 FR 5710, Feb. 6, 2004, as amended at 70 FR 19318, Apr. 13, 2005]

§ 25.217 Default service rules.

(a) The technical rules in this section apply only to licenses to operate a satellite system in a frequency band granted after a domestic frequency allocation has been adopted for that frequency band, but before any frequency-band-specific service rules have been adopted for that frequency band.

(b)(1) For all NGSO-like satellite licenses for which the application was filed pursuant to the procedures set forth in § 25.157 after August 27, 2003, authorizing operations in a frequency band for which the Commission has not adopted frequency band-specific service rules at the time the license is granted, the licensee will be required to comply with the following technical requirements, notwithstanding the frequency bands specified in these rule provisions: §§ 25.142(d), 25.143(b)(2)(ii), 25.143(b)(2)(iii), 25.204(g), 25.210(c), 25.210(d), 25.210(f), 25.210(i), 25.210(k), and 25.210(l).

(2) In addition to the requirements set forth in paragraph (b)(1) of this section, the Commission will coordinate with the National Telecommunications and Information Administration (NTIA) regarding the operations of any licensees authorized to operate in a shared government/non-government frequency band, pursuant to the procedure set forth in § 25.142(b)(2)(ii).

(3) Earth station licensees authorized to operate with one or more space stations described in paragraph (b)(1) of this section shall comply with the requirements in § 25.136. In addition, earth station licensees authorized to operate with one or more space stations described in paragraph (b)(1) of this section in frequency bands shared with terrestrial wireless services shall comply with the requirements in § 25.203(c).

(c)(1) For all GSO-like satellite licenses for which the application was filed pursuant to the procedures set forth in § 25.158 after August 27, 2003, authorizing operations in a frequency band for which the Commission has not adopted frequency band-specific service rules at the time the license is granted, the licensee will be required to comply with the following technical requirements, notwithstanding the frequency bands specified in these rule provisions: §§ 25.142(d), 25.143(b)(2)(iv), 25.204(g), 25.210(c), 25.210(d), 25.210(f), 25.210(i), 25.210(j), 25.210(k), and 25.210(l).

(2) In addition to the requirements set forth in paragraph (c)(1) of this section, the Commission will coordinate with the National Telecommunications and Information Administration (NTIA) regarding the operations of any licensees authorized to operate in a shared government/non-government frequency band, pursuant to the procedure set forth in §25.142(b)(2)(ii).

(3) Earth station licensees authorized to operate with one or more space stations described in paragraph (c)(1) of this section shall comply with the earth station antenna performance verification requirements in §25.132, and the antenna gain pattern requirements in §§25.209(a) and (b). In addition, earth station licensees authorized to operate with one or more space stations described in paragraph (c)(1) of this paragraph in frequency bands shared with terrestrial wireless services shall comply with the requirements in §25.203(c).

(4) In addition to the requirements set forth in paragraph (c)(3) of this section, earth station licensees with a gain equivalent or higher than the gain of a 1.2 meter antenna operating in the 14.0–14.5 GHz band, authorized to operate with one or more space stations described in paragraph (c)(1) of this paragraph in frequency bands greater than 14.5 GHz shall be required to comply with the antenna input power density requirements set forth in §25.212(c).

(d) [Reserved]

(e) In the event that the Commission adopts frequency band-specific service rules for a particular frequency band after it has granted one or more space station or earth station licenses for operations in that frequency band, those licensees will be required to come into compliance with the frequency band-specific service rules within 30 days of the effective date of those rules, unless otherwise specified by either Commission or Bureau Order.

[68 FR 51508, Aug. 27, 2003, as amended at 70 FR 59277, Oct. 12, 2005]

§§25.218–25.219 [Reserved]

§25.220 Non-conforming transmit/receive earth station operations.

(a)(1) This section applies to earth station applications other than ESV and 17/24 GHz BSS feeder link applications in which:

(i) The proposed antenna does not conform to the standards of §§25.209(a) and

(b), and/or

(ii) The proposed power density levels are in excess of those specified in §25.134, §25.211, or §25.212, or those derived by the procedure set forth in paragraph (c)(1) of this section, whichever is applicable.

(2) Paragraphs (b) through (e) and (g) of this section apply to the earth station applications described in paragraph (a)(1) of this section, in which the applicant seeks transmit/receive authority.

(3) Paragraphs (f) and (g) of this section applies to the earth station applications described in paragraph (a)(1) of this section in which the applicant seeks transmit-only or receive-only authority.

(4) The requirements for petitions to deny applications filed pursuant to this section are set forth in §25.154.

(b) If an antenna proposed for use by the applicant does not comply with the antenna performance standards contained in §25.209(a) and (b), the applicant must provide, as an exhibit to its FCC Form 312 application, the antenna gain patterns specified in §25.132(b).

(c) If an antenna proposed for use by the applicant does not comply with the performance standards contained in §25.209(a) and (b), the applicant must meet the requirements of either paragraph (c)(1) or (c)(2) of this section to obtain authority to transmit. The applicant must meet the requirements of paragraph (c)(3) of this section to obtain protection from receiving interference from adjacent satellite operators.

(1) The applicant must provide in its Form 312, Schedule B, the power and power density levels that result by reducing the values stated in §§25.134, 25.211, or 25.212, whichever is applicable, by the number of decibels that the non-compliant antenna fails to meet the antenna performance standard of §25.209(a) and (b), or

(2) The applicant will not be permitted to transmit to any satellite unless the applicant has provided the certifications listed in paragraph (e)(1) of

this section from the operator of that satellite(s).

(3) The applicant will not receive protection from adjacent satellite interference from any satellite unless the applicant has provided the certifications listed in paragraph (d)(1) of this section from the operator of that satellite(s) from which it plans to receive.

(d)(1) If an antenna proposed for use by the applicant does not comply with the performance standards contained in § 25.209(a) and (b), the applicant must submit the certifications listed in paragraphs (d)(1)(i) through (d)(1)(iv) of this section to qualify for protection from receiving interference from other satellite systems. The applicant will be granted protection from receiving interference only with respect to the satellite systems included in the coordination agreements referred to in the certification required by paragraph (d)(1)(ii) of this section, and only to the extent that protection from receiving interference is afforded by those coordination agreements.

(i) A statement from the satellite operator acknowledging that the proposed operation of the subject non-conforming earth station with its satellite(s) has the potential to receive interference from adjacent satellite networks that may be unacceptable.

(ii) A statement from the satellite operator that it has coordinated the operation of the subject non-conforming earth station accessing its satellite(s), including its required downlink power density based on the information contained in the application, with all adjacent satellite networks within 6° of orbital separation from its satellite(s), and the operations will operate in conformance with existing coordination agreement for its satellite(s) with other satellite systems.

(iii) A statement from the satellite operator that it will include the subject non-conforming earth station operations in all future satellite network coordinations, and

(iv) A statement from the earth station applicant certifying that it will comply with all coordination agreements reached by the satellite operator(s).

(2) A license granted pursuant to paragraph (d)(1) of this section will include, as a condition on that license, that if a good faith agreement cannot be reached between the satellite operator and the operator of a future 2° compliant satellite, the earth station operator shall accept the power density levels that would accommodate the 2° compliant satellite.

(e)(1) An earth station applicant proposing to use transmitted satellite carrier EIRP densities, and/or maximum power into the antenna in excess of the levels in §§ 25.134, 25.211, 25.212, or the power density levels derived through the procedure set forth in paragraph (c)(1) of this section, whichever is applicable, shall provide the following certifications as an exhibit to its earth station application:

(i) A statement from the specified satellite operator acknowledging that the proposed operation of the subject non-conforming earth station with its satellite(s) has the potential to create interference to adjacent satellite networks that may be unacceptable.

(ii) A statement from the specified satellite operator that it has coordinated the operation of the subject non-conforming Earth Station accessing its satellite(s), and its corresponding downlink power density requirements (based on the information contained in the application) with all adjacent satellite networks within 6° of orbital separation from its satellite(s), and the operations will not violate any existing coordination agreement for its satellite(s) with other satellite systems.

(iii) A statement from the specified satellite operator that it will include the subject non-conforming Earth Station power and power densities in all future satellite network coordinations, and

(iv) A statement from the earth station applicant certifying that it will comply with all coordination agreements reached by the satellite operator(s).

(2) A license granted pursuant to paragraph (e)(1) of this section will include, as a condition on that license, that if a good faith agreement cannot be reached between the satellite operator and the operator of a future 2° compliant satellite, the earth station operator shall reduce its power to

those levels that would accommodate the 2° compliant satellite.

(f)(1) If an earth station applicant requests transmit-only authority, and its proposed antenna does not conform to the standards of §25.209(a) and (b), it must meet the requirements of paragraphs (b) and (c) of this section.

(2) If an earth station applicant requests transmit-only authority, and its proposed power density levels are in excess of those specified in §§25.134, 25.211, or 25.212, or those derived by the procedure set forth in paragraph (c)(1) of this section, it must meet the requirements of paragraph (e) of this section.

(3) If an earth station applicant requests receive-only authority, and its proposed antenna does not conform to the standards of §25.209(a) and (b), it must meet the requirements of paragraphs (b) and (d) of this section.

(g) Applicants filing applications for earth stations pursuant to this section must provide the following information for the Commission's public notice:

(1) Detailed description of the service to be provided, including frequency bands and satellites to be used. The applicant must identify either the specific satellites with which it plans to operate, or the eastern and western boundaries of the geostationary satellite orbit arc it plans to coordinate.

(2) The diameter or equivalent diameter of the antenna.

(3) Proposed power and power density levels.

(4) Identification of any rule or rules for which a waiver is requested.

[70 FR 32256, June 2, 2005, as amended at 72 FR 50030, Aug. 29, 2007]

§25.221 Blanket Licensing provisions for Earth Stations on Vessels (ESVs) receiving in the 3700–4200 MHz (space-to-Earth) frequency band and transmitting in the 5925–6425 MHz (Earth-to-space) frequency band, operating with Geostationary Satellites in the Fixed-Satellite Service.

(a) All applications for licenses for ESVs transmitting in the 5925–6425 MHz (Earth-to-space) bands to geostationary-orbit satellites in the fixed-satellite service shall provide sufficient data to demonstrate that the ESV operations meet the following criteria, which are ongoing requirements that govern all ESV licensees and operations in these bands:

(1) The off-axis EIRP spectral density for co-polarized signals, emitted from the ESV, in the plane of the geostationary satellite orbit as it appears at the particular earth station location (*i.e.*, the plane determined by the focal point of the antenna and the line tangent to the arc of the geostationary satellite orbit at the position of the target satellite), shall not exceed the following values:

$26.3 - 25\log(\theta) - 10\log(N)$ dBW/4kHz for $1.0° \le \theta \le 7.0°$

$5.3 - 10\log(N)$dBW/4kHz for $7.0° < \theta \le 9.2°$

$29.3 - 25\log(\theta) - 10\log(N)$ dBW/4kHz for $9.2° < \theta \le 48°$

$-12.7 - 10\log(N)$ dBW/4kHz for $48° < \theta \le 180°$

where θ is the angle in degrees from the axis of the main lobe. For an ESV network using frequency division multiple access (FDMA) or time division multiple access (TDMA) technique, N is equal to one. For an ESV network using code division multiple access (CDMA) technique, N is the maximum number of co-frequency simultaneously transmitting earth stations in the same satellite receiving beam.

(2) In all other directions, the off-axis EIRP spectral density for co-polarized signals emitted from the ESV shall not exceed the following values:

$29.3 - 25\log(\theta) - 10\log(N)$ dBW/4kHz for $1.0° \le \theta \le 48°$

$-12.7 - 10\log(N)$ dBW/4kHz for $48° < \theta \le 180°$

where θ and N are defined as set forth in paragraph (a)(1) of this section.

(3) For $\theta > 7°$, the values given in paragraphs (a)(1) of this Section may be exceeded by no more than 10% of the earth station antenna sidelobes, provided no individual sidelobe exceeds the criteria given by more than 3 dB.

(4) In all directions, the off-axis EIRP spectral density for cross-polarized signals emitted from the ESV shall not exceed the following values:

$16.3 - 25\log(\theta) - 10\log(N)$ dBW/4kHz for $1.8° \le \theta \le 7.0°$

$-4.7 - 10\log(N)$ dBW/4kHz for $7.0° < \theta \le 9.2°$

where θ and N are defined as set forth in paragraph (a)(1) of this section.

(5) For non-circular ESV antennas, the major axis of the antenna will be aligned with the tangent to the geostationary satellite orbital arc at the target satellite point, to the extent required to meet specified off-axis e.i.r.p. criteria.

(6) A pointing error of less than 0.2°, between the orbital location of the target satellite and the axis of the main lobe of the ESV antenna.

(7) All emissions from the ESV shall automatically cease within 100 milliseconds if the angle between the orbital location of the target satellite and the axis of the main lobe of the ESV antenna exceeds 0.5°, and transmission will not resume until such angle is less than 0.2°.

(8) There shall be a point of contact in the United States, with phone number and address included with the application, available 24 hours a day, seven days a week, with authority and ability to cease all emissions from the ESVs, either directly or through the facilities of a U.S. Hub or a Hub located in another country with which the U.S. has a bilateral agreement that enables such cessation of emissions.

(9) ESVs that exceed the radiation guidelines of Section 1.1310 Radiofrequency radiation exposure limits must provide, with their environmental assessment, a plan for mitigation of radiation exposure to the extent required to meet those guidelines.

(10) ESV operators transmitting in the 5925–6425 MHz (Earth-to-space) frequency bands to geostationary satellites in the fixed-satellite service (FSS) shall not seek to coordinate, in any geographic location, more than 36 MHz of uplink bandwidth on each of no more than two GSO FSS satellites.

(11) There shall be an exhibit included with the application describing the geographic area(s) in which the ESVs will operate.

(12) ESVs shall not operate in the 5925–6425 MHz (Earth-to-space) and 3700–4200 MHz (space-to-Earth) frequency bands on vessels smaller than 300 gross tons.

(b) Applications for ESV operation in the 5925–6425 MHz band to geostationary satellites in the fixed-satellite service must include, in addition to the particulars of operation identified on Form 312, and associated Schedule B, the following data, for each earth station antenna type:

(1) A series of e.i.r.p. density charts or tables, calculated for a production earth station antenna, based on measurements taken on a calibrated antenna range at 6.0 GHz, with the off-axis e.i.r.p. envelope set forth in paragraphs (a)(1) through (a)(4) of this section superimposed, as follows:

(i) Showing off-axis co-polarized e.i.r.p. spectral density in the azimuth plane, for off-axis angles from minus 10° to plus 10° and from minus 180° to plus 180°.

(ii) Showing off-axis co-polarized e.i.r.p. spectral density in the elevation plane, at off-axis angles from 0° to plus 30°.

(iii) Showing off-axis cross-polarized e.i.r.p. spectral density in the azimuth plane, at off-axis angles from minus 10° to plus 10°.

(iv) Showing off-axis cross-polarized e.i.r.p. spectral density in the elevation plane, at off-axis angles from minus 10° to plus 10°; or

(2) A series of gain charts or tables, for a production earth station antenna, measured on a calibrated antenna range at 6.0 GHz, with the Earth station antenna gain envelope set forth in § 25.209(a) and (b) superimposed, for the same planes and ranges enumerated in paragraphs (b)(1)(i) through (b)(1)(iv) of this section, that, combined with input power density entered in Schedule B, demonstrates that the off-axis e.i.r.p. spectral density envelope set forth in paragraphs (a)(1) through (a)(4) of this section will be met; or

(3) A certification that the antenna conforms to the gain pattern criteria of § 25.209(a) and (b), that, combined with input power density entered in Schedule B, demonstrates that the off-axis e.i.r.p. spectral density envelope set forth in paragraphs (a)(1) through (a)(4) of this section will be met.

(c) ESVs receiving and transmitting in the 3700–4200 MHz (space-to-Earth) and 5925–6425 MHz (Earth-to-space) frequency bands shall operate with the following provisions:

(1) For each ESV transmitter, a record of the ship location (*i.e.*, latitude/longitude), transmit frequency, channel bandwidth and satellite used shall be time annotated and maintained for a period of not less than 1 year. Records will be recorded at time intervals no greater than every 20 minutes while the ESV is transmitting. The ESV operator will make this data available upon request to a coordinator, fixed system operator, fixed-satellite system operator, or the Commission within 24 hours of the request.

(2) ESV operators communicating with vessels of foreign registry must maintain detailed information on each vessel's country of registry and a point of contact for the relevant administration responsible for licensing ESVs.

(3) ESV operators shall control all ESVs by a Hub earth station located in the United States, except that an ESV on U.S.-registered vessels may operate under control of a Hub earth station location outside the United States provided the ESV operator maintains a point of contact within the United States that will have the capability and authority to cause an ESV on a U.S.-registered vessel to cease transmitting if necessary.

(4) ESVs, operating while docked, that complete coordination with terrestrial stations in the 3700–4200 MHz band in accordance with §25.251, shall receive protection from such terrestrial stations in accordance with the coordination agreements, for 180 days, renewable for 180 days.

(d) ESVs in motion shall not claim protection from harmful interference from any authorized terrestrial stations or lawfully operating satellites to which frequencies are either already assigned, or may be assigned in the future in the 3700–4200 MHz (space-to-Earth) frequency band.

(e) ESVs operating in the 5925–6425 MHz (Earth-to-space) band, within 200 km from the baseline of the United States, or within 200 km from a fixed service offshore installation, shall complete coordination prior to operation. The coordination method and the interference criteria objective shall be determined by the frequency coordinator. The details of the coordination shall be maintained and available at the frequency coordinator, and shall be filed with the Commission to be placed on Public Notice. Operation of each individual ESV may commence immediately after the Public Notice is released that identifies the notification sent to the Commission. Continuance of operation of that ESV for the duration of the coordination term shall be dependent upon successful completion of the normal public notice process. If any objections are received to the coordination prior to the end of the 30-day comment period of the Public Notice, the licensee shall immediately cease operation of that particular station until the coordination dispute is resolved and the ESV licensee informs the Commission of the resolution.

(f) ESV operators must automatically cease transmission if the ESV operates in violation of the terms of its coordination, including, but not limited to, conditions related to speed of the vessel or if the ESV travels outside the coordinated area, if within 200 km from the baseline of the United States, or within 200 km from a fixed service offshore installation. Transmissions may be controlled by the ESV network. The frequency coordinator may decide whether ESV operators should automatically cease transmissions if the vessel falls below a prescribed speed within a prescribed geographic area.

[70 FR 4784, Jan. 31, 2005, as amended at 70 FR 33377, June 8, 2005]

§ 25.222 Blanket Licensing provisions for Earth Stations on Vessels (ESVs) receiving in the 10.95–11.2 GHz (space-to-Earth), 11.45–11.7 GHz (space-to-Earth), 11.7–12.2 GHz (space-to-Earth) frequency bands and transmitting in the 14.0–14.5 GHz (Earth-to-space) frequency band, operating with Geostationary Satellites in the Fixed-Satellite Service.

(a) All applications for licenses for ESVs receiving in the 10.95–11.2 GHz (space-to-Earth), 11.45–11.7 GHz (space-to-Earth), 11.7–12.2 GHz (space-to-Earth) frequency bands, and transmitting in the 14.0–14.5 GHz (Earth-to-space) frequency band, to Geostationary Satellites in the fixed-satellite service shall provide sufficient data to demonstrate that the ESV operations meet the following criteria,

which are ongoing requirements that govern all ESV licensees and operations in these bands:

(1) The off-axis EIRP spectral density for co-polarized signals, emitted from the ESV in the plane of the geostationary satellite orbit as it appears at the particular earth station location (*i.e.*, the plane determined by the focal point of the antenna and the line tangent to the arc of the geostationary satellite orbit at the position of the target satellite), shall not exceed the following values:

$15 - 25\log(\theta) - 10\log(N)$ dBW/4kHz for $1.25° \le \theta \le 7.0°$

$-6 - 10\log(N)$ dBW/4kHz for $7.0° < \theta \le 9.2°$

$18 - 25\log(\theta) - 10\log(N)$ dBW/4kHz for $9.2° < \theta \le 48°$

$-24 - 10\log(N)$ dBW/4kHz for $48° < \theta \le 180°$

where θ is the angle in degrees from the axis of the main lobe. For an ESV network using frequency division multiple access (FDMA) or time division multiple access (TDMA) technique, N is equal to one. For an ESV network using code division multiple access (CDMA) technique, N is the maximum number of co-frequency simultaneously transmitting earth stations in the same satellite receiving beam.

(2) In all other directions, the off-axis EIRP spectral density for co-polarized signals emitted from the ESV shall not exceed the following values:

$18 - 25\log(\theta) - 10\log(N)$ dBW/4kHz for $1.25° \le \theta \le 48°$

$-24 - 10\log(N)$ dBW/4kHz for $48° < \theta \le 180°$

where θ and N are defined as set forth in paragraph (a)(1) of this section.

(3) For $\theta > 7°$, the values given in paragraphs (a)(1) of this section may be exceeded by no more than 10% of the sidelobes, provided no individual sidelobe exceeds the criteria given by more than 3 dB.

(4) In all directions, the off-axis EIRP spectral density for cross-polarized signals emitted from the ESV shall not exceed the following values:

$5 - 25\log(\theta) - 10\log(N)$ dBW/4kHz for $1.8° \le \theta \le 7°$

$-16 - 10\log(N)$ dBW/4kHz for $7° \le \theta \le 9.2°$

where θ and N are defined as set forth in paragraph (a)(1) of this section.

(5) For non-circular ESV antennas, the major axis of the antenna will be aligned with the tangent to the geostationary satellite orbital arc at the target satellite point, to the extent required to meet specified off-axis e.i.r.p. criteria.

(6) A pointing error of less than 0.2°, between the orbital location of the target satellite and the axis of the main lobe of the ESV antenna.

(7) All emissions from the ESV shall automatically cease within 100 milliseconds if the angle between the orbital location of the target satellite and the axis of the main lobe of the ESV antenna exceeds 0.5°, and transmission will not resume until such angle is less than 0.2°.

(8) There shall be a point of contact in the United States, with phone number and address included with the application, available 24 hours a day, seven days a week, with authority and ability to cease all emissions from the ESVs, either directly or through the facilities of a U.S. Hub or a Hub located in another country with which the U.S. has a bilateral agreement that enables such cessation of emissions.

(9) ESVs that exceed the radiation guidelines of §1.1310 of this chapter, Radiofrequency radiation exposure limits, must provide, with their environmental assessment, a plan for mitigation of radiation exposure to the extent required to meet those guidelines.

(10) There shall be an exhibit included with the application describing the geographic area(s) in which the ESVs will operate.

(b) Applications for ESV operation in the 14.0–14.5 GHz (Earth-to-space) to geostationary satellites in the fixed-satellite service must include, in addition to the particulars of operation identified on Form 312 and associated Schedule B, the following data for each earth station antenna type:

(1) A series of e.i.r.p. density charts or tables, calculated for a production earth station antenna, based on measurements taken on a calibrated antenna range at 14.25 GHz, with the off-axis e.i.r.p. envelope set forth in paragraphs (a)(1) through (a)(4) of this section superimposed, as follows:

(i) Showing off-axis co-polarized e.i.r.p. spectral density in the azimuth plane, for off-axis angles from minus 10° to plus 10° and from minus 180° to plus 180°.

(ii) Showing off-axis co-polarized e.i.r.p. spectral density in the elevation plane, at off-axis angles from 0° to plus 30°.

(iii) Showing off-axis cross-polarized e.i.r.p. spectral density in the azimuth plane, at off-axis angles from minus 10° to plus 10°.

(iv) Showing off-axis cross-polarized e.i.r.p. spectral density in the elevation plane, at off-axis angles from minus 10° to plus 10°; or

(2) A series of gain charts or tables, for a production earth station antenna, measured on a calibrated antenna range at 14.25 GHz, with the Earth station antenna gain envelope set forth in §25.209(a) and (b) superimposed, for the same planes and ranges enumerated in paragraphs (b)(1)(i) through (b)(1)(iv) of this section, that, combined with input power density entered in Schedule B, demonstrates that off-axis e.i.r.p. spectral density envelope set forth in paragraphs (a)(1) through (a)(4) of this section will be met; or

(3) A certification that the ESV antenna conforms to the gain pattern criteria of §25.209(a) and (b), that, combined with input power density entered in Schedule B, demonstrates that the off-axis e.i.r.p. spectral density envelope set forth in paragraphs (a)(1) through (a)(4) of this section will be met.

(c) ESVs receiving in the 10.95–11.2 GHz (space-to-Earth), 11.45–11.7 GHz (space-to-Earth), 11.7–12.2 GHz (space-to-Earth) frequency bands, and transmitting in the 14.0–14.5 GHz (Earth-to-space) frequency band shall operate with the following provisions:

(1) For each ESV transmitter a record of the ship location (*i.e.*, latitude/longitude), transmit frequency, channel bandwidth and satellite used shall be time annotated and maintained for a period of not less than 1 year. Records will be recorded at time intervals no greater than every 20 minutes while the ESV is transmitting. The ESV operator will make this data available upon request to a coordinator, fixed system operator, fixed-satellite system operator, NTIA, or the Commission within 24 hours of the request.

(2) ESV operators communicating with vessels of foreign registry must maintain detailed information on each vessel's country of registry and a point of contact for the relevant administration responsible for licensing ESVs.

(3) ESV operators shall control all ESVs by a Hub earth station located in the United States, except that an ESV on U.S.-registered vessels may operate under control of a Hub earth station location outside the United States provided the ESV operator maintains a point of contact within the United States that will have the capability and authority to cause an ESV on a U.S.-registered vessel to cease transmitting if necessary.

(d) Operations of ESVs in the 14.0–14.2 GHz (Earth-to-space) frequency band within 125 km of the NASA TDRSS facilities on Guam (located at latitude: 13° 36′ 55″ N, longitude 144° 51′ 22″ E) or White Sands, New Mexico (latitude: 32° 20′ 59″ N, longitude 106° 36′ 31″ W and latitude: 32° 32′ 40″ N, longitude 106° 36′ 48″ W) are subject to coordination through the National Telecommunications and Information Administration (NTIA) Interdepartment Radio Advisory Committee (IRAC). When NTIA seeks to provide similar protection to future TDRSS sites that have been coordinated through the IRAC Frequency Assignment Subcommittee process, NTIA will notify the Commission that the site is nearing operational status. Upon public notice from the Commission, all Ku-band ESV operators must cease operations in the 14.0–14.2 GHz band within 125 km of the new TDRSS site until after NTIA/IRAC coordination for the new TDRSS facility is complete. ESV operations will then again be permitted to operate in the 14.0–14.2 GHz band within 125 km of the new TDRSS site, subject to any operational constraints developed in the coordination process.

(e) Operations of ESVs in the 14.47–14.5 GHz (Earth-to-space) frequency band within a) 45 km of the radio observatory on St. Croix, Virgin Islands (latitude 17° 46′ N, longitude 64° 35′ W); b) 125 km of the radio observatory on Mauna Kea, Hawaii (at latitude 19° 48′

N, longitude 155° 28′ W); and c) 90 km of the Arecibo Observatory on Puerto Rico (latitude 18° 20′ 46″ W, longitude 66° 45′ 11″ N) are subject to coordination through the National Telecommunications and Information Administration (NTIA) Interdepartment Radio Advisory Committee (IRAC).

(f) In the 10.95–11.2 GHz (space-to-Earth) and 11.45–11.7 GHz (space-to-Earth) frequency bands ESVs shall not claim protection from interference from any authorized terrestrial stations to which frequencies are either already assigned, or may be assigned in the future.

[70 FR 4786, Jan. 31, 2005, as amended at 70 FR 33377, June 8, 2005]

§ 25.223 Off-axis EIRP spectral density limits for feeder link earth stations in the 17/24 GHz BSS.

(a) This section applies to all applications for earth station licenses in the 17/24 GHz BSS frequency bands, except for applications in which the proposed antenna does not conform to the standards of §§ 25.209(a) and (b), and/or the proposed power density levels are in excess of those specified in § 25.212(f) of this part.

(b) All applications for earth station licenses in the 24.75–25.25 GHz portion of 17/24 GHz BSS shall be routinely processed if they meet the following requirements:

(1) 17/24 GHz BSS earth station antenna off-axis EIRP spectral density for co-polarized signals shall not exceed the following values, within ±3° of the GSO arc, under clear sky conditions:

$32.5–25\log(\theta)$	dBW/MHz	for $2° \le \theta \le 7°$
11.4	dBW/MHz	for $7° \le \theta \le 9.2°$
$35.5–25\log(\theta)$	dBW/MHz	for $9.2° \le \theta \le 48°$
3.5	dBW/MHz	for $48° \le \theta \le 180°$

Where θ is the angle in degrees from the axis of the main lobe.

(2) 17/24 GHz BSS earth station antenna off-axis EIRP spectral density for co-polarized signals shall not exceed the following values, for all directions other than within ±3° of the GSO arc, under clear sky conditions:

$35.5–25\log(\theta)$	dBW/MHz	for $2° \le \theta \le 7°$
14.4	dBW/MHz	for $7° \le \theta \le 9.2°$
$38.5–25\log(\theta)$	dBW/MHz	for $9.2° \le \theta \le 48°$
6.5	dBW/MHz	for $48° \le \theta \le 180°$

Where θ is the angle in degrees from the axis of the main lobe.

(3) The values given in paragraphs (b)(1) and (2) of this section may be exceeded by 3 dB, for values of $\theta > 10°$, provided that the total angular range over which this occurs does not exceed 20° when measured along both sides of the GSO arc.

(4) 17/24 GHz BSS earth station antenna off-axis EIRP spectral density for cross-polarized signals shall not exceed the following values, in all directions greater than +3 relative to the GSO arc, under clear sky conditions:

$22.5–25\log(\theta)$	dBW/MHz	for $2° \le \theta \le 7°$
1.4	dBW/MHz	for $7° \le \theta \le 9.2°$

Where is the angle in degrees from the axis of the main lobe.

(c) Notwithstanding § 25.220 of this part, each applicant for earth station license(s) that proposes levels in excess of those defined in paragraph (b) of this section shall:

(1) Submit link budget analyses of the operations proposed along with a detailed written explanation of how each uplink and each transmitted satellite carrier density figure is derived;

(2) Submit a narrative summary which must indicate whether there are margin shortfalls in any of the current baseline services as a result of the addition of the applicant's higher power service, and if so, how the applicant intends to resolve those margin short falls;

(3) Certify that all potentially affected parties acknowledge and do not object to the use of the applicant's higher power densities. For proposed power levels less than or equal to 3 dB in excess of the limits defined above, the affected parties shall be those co-frequency U.S. licensed 17/24 GHz BSS satellite networks that are located at angular separations of up to ±6° away; for power levels greater than 3 dB and less than or equal to 6 dB in excess of the limits defined above, affected parties shall be all those co-frequency U.S. licensed operators at up to ±10° away. No power levels greater than 6 dB in excess of the limits defined above shall be permitted.

(d) Licensees authorized pursuant to paragraph (c) of this section shall bear the burden of coordinating with any future applicants or licensees whose proposed compliant operations at 10 degrees or smaller orbital spacing, as defined by paragraph (b) of this section, is potentially or actually adversely affected by the operation of the non-compliant licensee. If no good faith agreement can be reached, however, the non-compliant licensee shall reduce its earth station EIRP spectral density levels to be compliant with those specified in paragraph (b) of this section.

(e) For earth stations employing uplink power control, the values in paragraphs (b) (1), (2), and (4) of this section may be exceeded by up to 20 dB under conditions of uplink fading due to precipitation. The amount of such increase in excess of the actual amount of monitored excess attenuation over clear sky propagation conditions shall not exceed 1.5 dB or 15% of the actual amount of monitored excess attenuation in dB, whichever is larger, with a confidence level of 90 percent except over transient periods accounting for no more than 0.5% of the time during which the excess is no more than 4.0 dB.

[72 FR 50030, Aug. 29, 2007]

§ 25.224 Protection of receive-only earth stations in the 17/24 GHz BSS.

(a) Notwithstanding § 25.209(c) of this part, receive-only earth stations operating in the 17/24 GHz broadcasting-satellite service can claim no greater protection from interference than they would receive if the equivalent antenna diameter were equal to or greater than 45 cm and the antenna meets the co-polar and cross-polar performance patterns represented by the following set of formulas (adopted in Recommendation ITU–R BO.1213–1, dated November 2005) that are valid for $D/\lambda \geq 11$:

(1) Co-polar pattern:

$$G_{co}(\varphi) = G_{max} - 2.5 \times 10^{-3}\left(\frac{D}{\lambda}\varphi\right)^2 \text{ for } \quad 0 \le \varphi < \varphi_m$$

where:

$$\varphi_m = \frac{\lambda}{D}\sqrt{\frac{G_{max} - G_1}{0.0025}}$$

$$G_{max} = 10\log\left(\eta\left(\frac{\pi D}{\lambda}\right)^2\right)$$

$G_1 = 29 - 25 \log \varphi_r$, and $\varphi_r = 95\frac{\lambda}{D}$

$G_{CO}(\varphi) = G_1$ for $\varphi_m \le \varphi < \varphi_r$

$G_{CO}(\varphi) = 29 - 25 \log \varphi$ for $\varphi_r \le \varphi < \varphi_b$ where $\varphi_b = 10^{(34/25)}$

$G_{CO}(\varphi) = -5$ dBi for $\varphi_b \le \varphi < 70°$

$G_{CO}(\varphi) = 0$ dBi for $70° \le \varphi < 180°$

(2) Cross-polar pattern:

$G_{cross}(\varphi) = G_{max} - 25$ for $0 \le \varphi < 0.25\ \varphi_0$

where:

$$\varphi_0 = 2\frac{\lambda}{D}\sqrt{\frac{3}{0.0025}} = 3 \text{ dB beamwidth}$$

$$G_{cross}(\varphi) = G_{max} - 25 + 8\left(\frac{\varphi - 0.25\ \varphi_0}{0.19\ \varphi_0}\right) \text{ for } 0.25\ \varphi_0 \le \varphi < 0.44\ \varphi_0$$

$G_{cross}(\varphi) = G_{max} - 17$ for $0.44\ \varphi_0 \le \varphi < \varphi_0$

$$G_{cross}(\varphi) = G_{max} - 17 + C\left|\frac{\varphi - \varphi_0}{\varphi_1 - \varphi_0}\right| \text{ for } \varphi_0 \le \varphi < \varphi_1 \text{ where } \varphi_1 = \frac{\varphi_0}{2}\sqrt{10.1875}$$

and $C = 21 - 25 \log(\varphi_1) - (G_{max} - 17)$

$G_{cross}(\varphi) = 21 - 25 \log \varphi$ for $\varphi_1 \le \varphi < \varphi_2$ where $\varphi_2 = 10^{(26/25)}$

$G_{cross}(\varphi) = -5$ dBi for $\varphi_2 \le \varphi < 70°$

$G_{cross}(\varphi) = 0$ dBi for $70° \le \varphi < 180°$

where:

D: equivalent antenna diameter

λ: wavelength expressed in the same unit as the diameter

φ: off-axis angle of the antenna relative to boresight (degrees)

η: antenna efficiency = 0.65

(b) Paragraph (a) of this section does not apply to 17/24 GHz BSS telemetry earth stations. Those earth stations are subject to the antenna performance standards of §25.209(a) and (b) of this part.

[72 FR 50031, Aug. 29, 2007]

§ 25.225 Geographic Service Requirements for 17/24 GHz Broadcasting Satellite Service.

(a) Each operator of a 17/24 GHz BSS space station that is used to provide video programming directly to consumers in the 48 contiguous United States (CONUS) must provide comparable service to Alaska and Hawaii, unless such service is not technically feasible or not economically reasonable from the authorized orbital location.

(b) Each operator of a 17/24 GHz BSS space station subject to paragraph (a) of this section must design and configure its space station to be capable of providing service to Alaska and Hawaii, that is comparable to the service that such satellites will provide to CONUS subscribers, from any orbital location capable of providing service to either Alaska or Hawaii to which it may be located or relocated in the future.

(c) If an operator of a 17/24 GHz BSS space station that is used to provide video programming directly to consumers in the United States relocates or replaces a 17/24 GHz BSS space station at a location from which service to Alaska and Hawaii had been provided by another 17/24 GHz BSS space station, the operator must use a space station capable of providing at least the same level of service to Alaska and Hawaii as previously provided from that location.

[72 FR 50033, Aug. 29, 2007]

§§ 25.226–25.249 [Reserved]

§ 25.250 Sharing between NGSO MSS Feeder links Earth Stations in the 19.3–19.7 GHz and 29.1–29.5 GHz Bands.

(a) NGSO MSS applicants shall be licensed to operate in the 29.1–29.5 GHz band for Earth-to-space transmissions and 19.3–19.7 GHz for space-to-Earth transmissions from feeder link earth station complexes. A ''feeder link earth station complex'' may include up to three (3) earth station groups, with each earth station group having up to four (4) antennas, located within a radius of 75 km of a given set of geographic coordinates provided by NGSO-MSS licensees or applicants.

(b) Licensees of NGSO MSS feeder link earth stations separated by 800 km or less are required to coordinate their operations, see § 25.203. The results of the coordination shall be reported to the Commission.

[61 FR 44181, Aug. 28, 1996]

§ 25.251 Special requirements for coordination.

(a) The administrative aspects of the coordination process are set forth in § 101.103 of this chapter in the case of coordination of terrestrial stations with earth stations, and in § 25.203 in the case of coordination of earth stations with terrestrial stations.

(b) The technical aspects of coordination are based on Appendix S7 of the International Telecommunication Union Radio Regulations and certain recommendations of the ITU Radiocommunication Sector (available at the FCC's Reference Information Center, Room CY-A257, 445 12th Street, SW., Washington, DC 20554).

[66 FR 10630, Feb. 16, 2001]

§ 25.252 Special requirements for ancillary terrestrial components operating in the 2000–2020 MHz/2180–2200 MHz bands.

(a) Applicants for an ancillary terrestrial component in these bands must demonstrate that ATC base stations shall not:

(1) Exceed an EIRP of −100.6 dBW/4 kHz for out-of-channel emissions at the edge of the MSS licensee's selected assignment.

(2) Exceed a peak EIRP of 27 dBW in 1.23 MHz.

(3) Exceed an EIRP toward the physical horizon (not to include man-made structures) of 25.5 dBW in 1.23 MHz.

(4) Be located less than 190 meters from all airport runways and aircraft stand areas, including takeoff and landing paths.

(5) Exceed an aggregate power flux density of −51.8 dBW/m^2 in a 1.23 MHz bandwidth at all airport runways and aircraft stand areas, including takeoff and landing paths and all ATC base station antennas shall have an overhead gain suppression according to the following.

(6) Be located less than 820 meters from a U.S. Earth Station facility operating in the 2200–2290 MHz band. In its MSS ATC application, the MSS licensee should request a list of operational stations in the 2200–2290 MHz band.

(7) Generate EIRP density, averaged over any two millisecond active transmission interval, greater than -70 dBW/MHz in the 1559–1610 MHz band. The EIRP, measured over any two millisecond active transmission interval, of discrete out-of-band emissions of less than 700 Hz bandwidth from such base stations, shall not exceed -80 dBW in the 1559–1610 MHz band. A root-mean-square detector function with a resolution bandwidth of one megahertz or equivalent and no less video bandwidth shall be used to measure wideband EIRP density for purposes of this rule, and narrowband EIRP shall be measured with a root-mean-square detector function with a resolution bandwidth of one kilohertz or equivalent.

(8) Use ATC base station antennas that have a gain greater than 17 dBi and must have an overhead gain suppression according to the following:

Angle from direction of maximum gain, in vertical plane, above antenna (degrees)	Antenna discrimination pattern (dB)
0	Gmax
2	Not to Exceed Gmax − 14
8 to 180	Not to Exceed Gmax − 25

Where: Gmax is the maximum gain of the base station antenna in dBi.

(b) Applicants for an ancillary terrestrial component in these bands must demonstrate that ATC mobile terminals shall:

(1) Observe a peak EIRP limit of 1.0 dBW in 1.23 MHz.

(2) Limit out-of-channel emissions at the edge of a MSS licensee's selected assignment to an EIRP density of − 67 dBW/4 kHz.

(3) Not generate EIRP density, averaged over any two-millisecond active transmission interval, greater than -70 dBW/MHz in the 1559–1610 MHz band. The EIRP, measured over any two-millisecond active transmission interval, of discrete out-of-band emissions of less than 700 Hz bandwidth from such mobile terminals shall not exceed -80 dBW in the 1559–1610 MHz band. The EIRP density of carrier-off-state emissions from such mobile terminals shall not exceed -80 dBW/MHz in the 1559–1610 MHz band, averaged over a two-millisecond interval. A root-mean-square detector function with a resolution bandwidth of one megahertz or equivalent and no less video bandwidth shall be used to measure wideband EIRP density for purposes of this rule, and narrowband EIRP shall be measured with a root-mean-square detector function with a resolution bandwidth of one kilohertz or equivalent.

(c) For ATC operations in the 2000–2020 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(1) On any frequency within the 2000 to 2020 MHz band outside the licensee's frequency band(s) of operations, emissions shall be attenuated by at least 43 + 10 log (P) dB.

(2) Emissions on frequencies lower than 1995 MHz and higher than 2025 MHz shall be attenuated by at least 70 + 10 log P. Emissions in the bands 1995–2000 MHz and 2020–2025 MHz shall be attenuated by at least a value as determined by linear interpolation from 70 + 10 log P at 1995 MHz or 2025 MHz, to 43 + 10 log P dB at the nearest MSS band edge at 2000 MHz or 2020 MHz respectively.

(3) When an emission outside of the authorized bandwidth causes harmful interference, the Commission may, in its discretion, require greater attenuation than specified in paragraphs (c)(1) and (2) of this section.

(4) Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater.

NOTE TO §25.252: The preceding rules of §25.252 are based on cdma2000 system architecture. To the extent that a 2 GHz MSS licensee is able to demonstrate that the use of a different system architecture would produce no greater potential interference than that produced as a result of implementing the rules of this section, an MSS licensee is permitted to apply for ATC authorization based on another system architecture.

[68 FR 33651, June 5, 2003, as amended at 70 FR 19318, Apr. 13, 2005]

§ 25.253 Special requirements for ancillary terrestrial components operating in the 1626.5–1660.5 MHz/1525–1559 MHz bands.

(a) An ancillary terrestrial component in these bands shall:

(1) In any band segment coordinated for the exclusive use of an MSS applicant within the land area of the U.S., where there is no other L-Band MSS satellite making use of that band segment within the visible portion of the geostationary arc as seen from the ATC coverage area, the ATC system will be limited by the in-band and out-of-band emission limitations contained in this section and the requirement to maintain a substantial MSS service.

(2) In any band segment that is coordinated for the shared use of the applicant's MSS system and another MSS operator, where the coordination agreement existed prior to February 10, 2005 and permits a level of interference to the other MSS system of less than 6% ΔT/T, the applicant's combined ATC and MSS operations shall increase the system noise level of the other MSS to no more then 6% ΔT/T. Any future coordination agreement between the parties governing ATC operation will supersede this paragraph.

(3) In any band segment that is coordinated for the shared use of the applicant's MSS system and another MSS operator, where a coordination agreement existed prior to February 10, 2005 and permits a level of interference to the other MSS system of 6% ΔT/T or greater, the applicant's ATC operations may increase the system noise level of the other MSS system by no more than an additional 1% ΔT/T. Any future coordination agreement between the parties governing ATC operations will supersede this paragraph.

(4) In a band segment in which the applicant has no rights under a coordination agreement, the applicant may not implement ATC in that band.

(b) ATC base stations shall not exceed an out-of-channel emissions measurement of -57.9 dBW/MHz at the edge of a MSS licensee's authorized and internationally coordinated MSS frequency assignment.

(c) An applicant for an ancillary terrestrial component in these bands shall:

(1) Demonstrate, at the time of application, how its ATC network will comply with the requirements of footnotes US308 and US315 to the table of frequency allocations contained in §2.106 of this chapter regarding priority and preemptive access to the L-band MSS spectrum by the aeronautical mobile-satellite en-route service (AMS(R)S) and the global maritime distress and safety system (GMDSS).

(2) Coordinate with the terrestrial CMRS operators prior to initiating ATC transmissions when co-locating ATC base stations with terrestrial commercial mobile radio service (CMRS) base stations that make use of Global Positioning System (GPS) time-based receivers.

(3) Provide, at the time of application, calculations that demonstrate the ATC system conforms to the ΔT/T requirements in paragraphs (a)(2) and (a)(3) of this section, if a coordination agreement that incorporates the ATC operations does not exist with other MSS operators.

(d) Applicants for an ancillary terrestrial component in these bands must demonstrate that ATC base stations shall not:

(1) Exceed a peak EIRP of 31.9–10*log (number of carriers) dBW/200kHz, per sector, for each carrier in the 1525–1541.5 MHz and 1547.5–1559 MHz frequency bands;

(2) Exceed an EIRP in any direction toward the physical horizon (not to include man-made structures) of 26.9–10*log (number of carriers) dBW/200 kHz, per sector, for each carrier in the 1525–1541.5 MHz and 1547.5–1559 MHz frequency bands;

(3) Exceed a peak EIRP of 23.9 −10*log(number of carriers) dBW/200

kHz, per sector, for each carrier in the 1541.5–1547.5 MHz frequency band;

(4) Exceed an EIRP toward the physical horizon (not to include man-made structures) of 18.9–10*log(number of carriers) dBW/200 kHz, per sector, for each carrier in the 1541.5–1547.5 MHz frequency band;

(5) Exceed a total power flux density level of −56.8 dBW/m^2/200 kHz at the edge of all airport runways and aircraft stand areas, including takeoff and landing paths from all carriers operating in the 1525–1559 MHz frequency bands. The total power flux density here is the sum of all power flux density values associated with all carriers in a sector in the 1525–1559 MHz frequency band, expressed in dB(Watts/m^2/200 kHz). Free-space loss must be assumed if this requirement is demonstrated via calculation;

(6) Exceed a total power flux density level of −56.6 dBW/ m^2/200 kHz at the water's edge of any navigable waterway from all carriers operating in the 1525–1541.5 MHz and 1547.5–1559 MHz frequency bands. The total power flux density here is the sum of all power flux density values associated with all carriers in a sector in the 1525–1541.5 MHz and 1547.5–1559 MHz frequency bands, expressed in dB(Watts/m^2/200 kHz). Free-space loss must be assumed if this requirement is demonstrated via calculation;

(7) Exceed a total power flux density level of −64.6 dBW/ m^2/200 kHz at the water's edge of any navigable waterway from all carriers operating in the 1541.5–1547.5 MHz frequency band. The total power flux density here is the sum of all power flux density values associated with all carriers in a sector in the 1541.5–1547.5 MHz frequency band, expressed in dB(Watts/m^2/200 kHz). Free-space loss must be assumed if this requirement is demonstrated via calculation;

(8) Exceed a peak antenna gain of 16 dBi;

(9) Generate EIRP density, averaged over any two-millisecond active transmission interval, greater than −70 dBW/MHz in the 1559–1605 MHz band or greater than a level determined by linear interpolation in the 1605–1610 MHz band, from −70 dBW/MHz at 1605 MHz to −46 dBW/MHz at 1610 MHz. The EIRP, averaged over any two-millisecond active transmission interval, of discrete out-of-band emissions of less than 700 Hz bandwidth from such base stations shall not exceed −80 dBW in the 1559–1605 MHz band or exceed a level determined by linear interpolation in the 1605–1610 MHz band, from −80 dBW at 1605 MHz to −56 dBW at 1610 MHz. A root-mean-square detector function with a resolution bandwidth of one megahertz or equivalent and no less video bandwidth shall be used to measure wideband EIRP density for purposes of this rule, and narrowband EIRP shall be measured with a root-mean-square detector function with a resolution bandwidth of one kilohertz or equivalent.

(e) Applicants for an ancillary terrestrial component in these bands must demonstrate, at the time of the application, that ATC base stations shall use left-hand-circular polarization antennas with a maximum gain of 16 dBi and overhead gain suppression according to the following:

Angle from direction of maximum gain, in vertical plane, above antenna (degrees)	Antenna discrimination pattern (dB)
0	Gmax
5	Not to Exceed Gmax −5
10	Not to Exceed Gmax −19
15 to 55	Not to Exceed Gmax −27
55 to 145	Not to Exceed Gmax −30
145 to 180	Not to Exceed Gmax −26

Where: Gmax is the maximum gain of the base station antenna in dBi.

(f) Prior to operation, ancillary terrestrial component licensees shall:

(1) Provide the Commission with sufficient information to complete coordination of ATC base stations with Search-and-Rescue Satellite-Aided Tracking (SARSAT) earth stations operating in the 1544–1545 MHz band for any ATC base station located either within 27 km of a SARSAT station, or

within radio horizon of the SARSAT station, whichever is less.

(2) Take all practicable steps to avoid locating ATC base stations within radio line of sight of Mobile Aeronautical Telemetry (MAT) receive sites in order to protect U.S. MAT systems consistent with ITU–R Recommendation ITU–R M.1459. MSS ATC base stations located within radio line of sight of a MAT receiver must be coordinated with the Aerospace and Flight Test Radio Coordinating Council (AFTRCC) for non-Government MAT receivers on a case-by-case basis prior to operation. For government MAT receivers, the MSS licensee shall supply sufficient information to the Commission to allow coordination to take place. A listing of current and planned MAT receiver sites can be obtained from AFTRCC for non-Government sites and through the FCC's IRAC Liaison for Government MAT receiver sites.

(g) ATC mobile terminals shall:

(1) Be limited to a peak EIRP level of 0 dBW and an out-of-channel emissions of −67 dBW/4 kHz at the edge of an MSS licensee's authorized and internationally coordinated MSS frequency assignment.

(2) Be operated in a fashion that takes all practicable steps to avoid causing interference to U.S. radio astronomy service (RAS) observations in the 1660–1660.5 MHz band.

(3) Not generate EIRP density, averaged over any two-millisecond active transmission interval, greater than −70 dBW/MHz in the 1559–1605 MHz band or greater than a level determined by linear interpolation in the 1605–1610 MHz band, from −70 dBW/MHz at 1605 MHz to −46 dBW/MHz at 1610 MHz. The EIRP, averaged over any two-millisecond active transmission interval, of discrete out-of-band emissions of less than 700 Hz bandwidth from such mobile terminals shall not exceed −80 dBW in the 1559–1605 MHz band or exceed a level determined by linear interpolation in the 1605–1610 MHz band, from −80 dBW at 1605 MHz to −56 dBW at 1610 MHz. The EIRP density of carrier-off-state emissions from such mobile terminals shall not exceed −80 dBW/MHz in the 1559–1610 MHz band, averaged over a two-millisecond interval. A root-mean-square detector function with a resolution bandwidth of one megahertz or equivalent and no less video bandwidth shall be used to measure wideband EIRP density for purposes of this rule, and narrowband EIRP shall be measured with a root-mean-square detector function with a resolution bandwidth of one kilohertz or equivalent.

(h) When implementing multiple base stations and/or base stations using multiple carriers, where any third-order intermodulation product of these base stations falls on an L-band MSS band coordinated for use by another MSS operator with rights to the coordinated band, the MSS ATC licensee must notify the MSS operator. The MSS operator may request coordination to modify the base station carrier frequencies, or to reduce the maximum base station EIRP on the frequencies contributing to the third-order intermodulation products. The threshold for this notification and coordination is when the sum of the calculated signal levels received by an MSS receiver exceeds −70 dBm. The MSS receiver used in these calculations can be assumed to have an antenna with 0 dBi gain. Free-space propagation between the base station antennas and the MSS terminals can be assumed and actual signal polarizations for the ATC signals and the MSS system may be used.

[70 FR 19319, Apr. 13, 2005]

§ 25.254 Special requirements for ancillary terrestrial components operating in the 1610–1626.5 MHz/2483.5–2500 MHz bands.

(a) An applicant for an ancillary terrestrial component in these bands must demonstrate that ATC base stations shall:

(1) Not exceed a peak EIRP of 32 dBW in 1.25 MHz;

(2) Not cause unacceptable interference to systems identified in paragraph (c) of this section and, in any case, shall not exceed out-of-channel emissions of −44.1 dBW/30 kHz at the edge of the MSS licensee's authorized frequency assignment;

(3) At the time of application, that it has taken, or will take steps necessary to avoid causing interference to other services sharing the use of the 2450–2500

MHz band through frequency coordination; and

(4) Base stations operating in frequencies above 2483.5 MHz shall not generate EIRP density, averaged over any two-millisecond active transmission interval, greater than −70 dBW/MHz in the 1559–1610 MHz band. The EIRP, averaged over any two-millisecond active transmission interval, of discrete out-of-band emissions of less than 700 Hz bandwidth from such base stations shall not exceed −80 dBW in the 1559–1610 MHz band. A root-mean-square detector function with a resolution bandwidth of one megahertz or equivalent and no less video bandwidth shall be used to measure wideband EIRP density for purposes of this rule, and narrowband EIRP shall be measured with a root-mean-square detector function with a resolution bandwidth of one kilohertz or equivalent.

(b) An applicant for an ancillary terrestrial component in these bands must demonstrate that mobile terminals shall:

(1) Meet the requirements contained in §25.213 to protect radio astronomy service (RAS) observations in the 1610.6–1613.8 MHz band from unacceptable interference;

(2) Observe a peak EIRP limit of 1.0 dBW in 1.25 MHz;

(3) Observe an out-of-channel EIRP limit of −57.1 dBW/30 kHz at the edge of the licensed MSS frequency assignment.

(4) ATC mobile terminals operating in assigned frequencies in the 1610–1626.5 MHz band shall not generate EIRP density, averaged over any two-millisecond active transmission interval, greater than -70 dBW/MHz in the 1559–1605 MHz band or greater than a level determined by linear interpolation in the 1605–1610 MHz band, from −70 dBW/MHz at 1605 MHz to −10 dBW/MHz at 1610 MHz. The EIRP, averaged over any two-millisecond active transmission interval, of discrete out-of-band emissions of less than 700 Hz bandwidth from such mobile terminals shall not exceed −80 dBW in the 1559–1605 MHz band or exceed a level determined by linear interpolation in the 1605–1610 MHz band, from −80 dBW at 1605 MHz to −20 dBW at 1610 MHz. The EIRP density of carrier-off-state emissions from such mobile terminals shall not exceed −80 dBW/MHz in the 1559–1610 MHz band, averaged over a two-millisecond interval. A root-mean-square detector function with a resolution bandwidth of one megahertz or equivalent and no less video bandwidth shall be used to measure wideband EIRP density for purposes of this rule, and narrowband EIRP shall be measured with a root-mean-square detector function with a resolution bandwidth of one kilohertz or equivalent.

(c) Applicants for an ancillary terrestrial component to be used in conjunction with a mobile-satellite service system using CDMA technology shall coordinate the use of the Big LEO MSS spectrum designated for CDMA systems using the framework established by the ITU in Recommendation ITU-R M.1186 ''Technical Considerations for the Coordination Between Mobile Satellite Service (MSS) Networks Utilizing Code Division Multiple Access (CDMA) and Other Spread Spectrum Techniques in the 1–3 GHz Band'' (1995). Recommendation ITU-R M.1186 is incorporated by reference. The Director of the Federal Register approves this incorporation by reference in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies of this standard can be inspected at the Federal Communications Commission, 445 12th Street, SW., Washington, DC (Reference Information Center) or 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.* The ITU-R Recommendations can also be purchased from the International Telecommunication Union (ITU), Place des Nations, CH–1211 Geneva 20, Switzerland.

(d) To avoid interference to an adjacent channel licensee in the Broadband Radio Service (BRS), the power of any ATC base station emission above 2495 MHz shall be attenuated below the transmitter power (P) measured in watts in accordance with the standards below. If these measures do not resolve a documented interference complaint received from the adjacent channel

BRS licensee, the provisions of § 25.255 shall apply.

(1) For base stations, the attenuation shall be not less than 43 + 10 log (P) dB at the upper edge of the authorized ATC band, unless a documented interference complaint is received from an adjacent channel licensee in the BRS. Provided that a documented interference complaint cannot be mutually resolved between the parties, the following additional attenuation requirements set forth in subsections (2)–(5) shall apply:

(2) If a pre-existing BRS base station suffers harmful interference from emissions caused by a new or modified ATC base station located 1.5 km or more away, within 24 hours of the receipt of a documented interference complaint the ATC licensee must attenuate its emissions by at least 67 + 10 log (P) dB measured at 3 megahertz above the edge of the authorized ATC band, and shall immediately notify the complaining licensee upon implementation of the additional attenuation.

(3) If a pre-existing BRS base station suffers harmful interference from emissions caused by a new or modified ATC base station located less than 1.5 km away, within 24 hours of the receipt of a documented interference complaint the ATC licensee must attenuate its emissions by at least 67 + 10 log (P) -20 log(D_{km}/1.5) dB measured at 3 megahertz above the edge of the authorized ATC band, or if both base stations are co-located, limit its undesired signal level at the pre-existing BRS base station receiver(s) to no more than -107 dBm measured in a 5.5 megahertz bandwidth and shall immediately notify the complaining licensee upon such reduction in the undesired signal level.

(4) If a new or modified BRS base station suffers harmful interference from emissions caused by a pre-existing ATC base station located 1.5 km or more away, within 60 days of receipt of a documented interference complaint the licensee of the ATC base station must attenuate its base station emissions by at least 67 + 10 log (P) dB measured at 3 megahertz above the edge of the authorized ATC band.

(5) If a new or modified BRS base station suffers harmful interference from emissions caused by a pre-existing ATC base station located less than 1.5 km away, within 60 days of receipt of a documented interference complaint:

(i) the ATC licensee must attenuate its base station emissions by at least 67 + 10 log (P) -20 log(D_{km}/1.5) dB measured 3 megahertz above the edge of the authorized ATC band, or

(ii) if both base stations are co-located, the ATC licensee must limit its undesired signal level at the new or modified BRS base station receiver(s) to no more than -107 dBm measured in a 5.5 megahertz bandwidth.

(6) Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately above and adjacent to the 2495 MHz a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy, provided the measured power is integrated over the full required measurement bandwidth (i.e., 1 MHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power. When an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in this section.

NOTE TO § 25.254: The preceding rules of § 25.254 are based on cdma2000 and IS–95 system architecture. To the extent that a Big LEO MSS licensee is able to demonstrate that the use of different system architectures would produce no greater potential interference than that produced as a result of implementing the rules of this section, an MSS licensee is permitted to apply for ATC authorization based on another system architecture.

[68 FR 33653, June 5, 2003, as amended at 69 FR 18803, Apr. 9, 2004; 70 FR 19320, Apr. 13, 2005; 73 FR 25592, May 5, 2008]

§ 25.255 Procedures for resolving harmful interference related to operation of ancillary terrestrial components operating in the 1.5./1.6 GHz, 1.6/2.4 GHz and 2 GHz bands.

If harmful interference is caused to other services by ancillary MSS ATC operations, either from ATC base stations or mobile terminals, the MSS ATC operator must resolve any such interference. If the MSS ATC operator claims to have resolved the interference and other operators claim that interference has not been resolved, then the parties to the dispute may petition the Commission for a resolution of their claims.

[68 FR 33653, June 5, 2003]

§ 25.256 Special Requirements for operations in the 3.65–3.7 GHz band.

Upon request from a terrestrial licensee authorized under Subpart Z, Part 90 that seeks to place base and fixed stations in operation within 150 km of a primary earth station, licensees of earth stations operating on a primary basis in the fixed satellite service in the 3.65–3.7 GHz band must negotiate in good faith with that terrestrial licensee to arrive at mutually agreeable operating parameters to prevent unacceptable interference.

[70 FR 24725, May 11, 2005]

§ 25.257 Special requirements for operations in the band 29.1–29.25 GHz between NGSO MSS and LMDS.

(a) Non-geostationary mobile satellite service (NGSO MSS) operators shall be licensed to use the 29.1–29.25 GHz band for Earth-to-space transmissions from feeder link earth station complexes. A ''feeder link earth station complex'' may include up to three (3) earth station groups, with each earth station group having up to four (4) antennas, located within a radius of 75 km of a given set of geographic coordinates provided by a NGSO MSS licensees or applicants pursuant to § 101.147.

(b) A maximum of seven (7) feeder link earth station complexes in the contiguous United States, Alaska and Hawaii may be placed into operation, in the largest 100 MSAs, in the band 29.1–29.25 GHz in accordance with § 25.203 and § 101.147 of this chapter.

(c) One of the NGSO MSS operators licensed to use the 29.1–29.25 GHz band may specify geographic coordinates for a maximum of eight feeder link earth station complexes that transmit in the 29.1–29.25 GHz band. The other NGSO MSS operator licensed to use the 29.1–29.25 GHz band may specify geographic coordinates for a maximum of two feeder link earth station complexes that transmit in the 29.1–29.25 GHz band.

(d) Additional NGSO MSS operators may be licensed in this band if the additional NGSO MSS operator shows that its system can share with the existing NGSO MSS systems.

(e) All NGSO MSS operators shall cooperate fully and make reasonable efforts to identify mutually acceptable locations for feeder link earth station complexes. In this connection, any single NGSO MSS operator shall only identify one feeder link earth station complex protection zone in each category identified in § 101.147(c)(2) of this chapter until the other NGSO MSS operator has been given an opportunity to select a location from the same category.

[61 FR 44181, Aug. 28, 1996]

§ 25.258 Sharing between NGSO MSS Feeder links Stations and GSO FSS services in the 29.25–29.5 GHz Bands.

(a) Operators of NGSO MSS feeder link earth stations and GSO FSS earth stations in the band 29.25 to 29.5 GHz where both services have a co-primary allocation shall cooperate fully in order to coordinate their systems. During the coordination process both service operators shall exchange the necessary technical parameters required for coordination.

(b) Licensed GSO FSS systems shall, to the maximum extent possible, operate with frequency/polarization selections, in the vicinity of operational or planned NGSO MSS feeder link earth station complexes, that will minimize instances of unacceptable interference to the GSO FSS space stations. Earth station licensees operating with GSO FSS systems shall be capable of providing earth station locations to support coordination of NGSO MSS feeder link stations under paragraphs (a) and

(c) of this section. Operation of ubiquitously deployed GSO FSS earth stations in the 29.25–29.5 GHz frequency band shall conform to the rules contained in § 25.138.

(c) Applicants for authority to use the 29.25–29.5 GHz band for NGSO MSS feeder uplinks will have to demonstrate that their systems can share with GSO FSS and NGSO MSS systems that have been authorized for operation in that band.

[67 FR 37336, May 29, 2002, as amended at 68 FR 16967, Apr. 8, 2003]

§ 25.259 Time sharing between NOAA meteorological satellite systems and non-voice, non-geostationary satellite systems in the 137–138 MHz band.

(a) A non-voice, non-geostationary mobile-satellite service system licensee (''NVNG licensee'') time-sharing spectrum in the 137–138 MHz frequency band shall not transmit signals into the ''protection areas'' of National Oceanic and Atmospheric Administration (''NOAA'') satellite systems. When calculating the protection areas for a NOAA satellite in the 137.333–137.367 MHz, 137.485–137.515 MHz, 137.605–137.635 MHz and 137.753–137.787 MHz bands, a NVNG licensee shall use an earth station elevation angle of five degrees towards the NOAA satellite and will cease its transmissions prior to the NVNG licensee's service area, based on an elevation angle of zero degrees towards the NVNG licensee's satellite, overlapping the NOAA protection area. When calculating the protection areas for a NOAA satellite in the 137.025–137.175 MHz and 137.825–138 MHz bands, a NVNG licensee shall use an earth station elevation angle of zero degrees, or less if reasonably necessary, towards the NOAA satellite and will cease its transmissions prior to the NVNG licensee's service area, based on an elevation angle of zero degrees towards the NVNG licensee's satellite, overlapping the NOAA protection area. A NVNG licensee is responsible for obtaining the necessary ephemeris data. This information shall be updated system-wide on at least a weekly basis. A NVNG licensee shall use an orbital propagator algorithm with an accuracy equal to or greater than the NORAD propagator used by NOAA.

(b) A NVNG licensee time sharing spectrum in the 137–138 MHz band shall establish a 24-hour per day contact person and telephone number so that claims of harmful interference into NOAA earth station users and other operational issues can be reported and resolved expeditiously. This contact information shall be made available to NOAA or its designee. If the National Telecommunications and Information Administration (''NTIA'') notifies the Commission that NOAA is receiving unacceptable interference from a NVNG licensee, the Commission will require such NVNG licensee to terminate its interfering operations immediately unless it demonstrates to the Commission's reasonable satisfaction, and that of NTIA, that it is not responsible for causing harmful interference into the worldwide NOAA system. A NVNG licensee assumes the risk of any liability or damage that it and its directors, officers, employees, affiliates, agents and subcontractors may incur or suffer in connection with an interruption of its non-voice, non-geostationary mobile-satellite service, in whole or in part, arising from or relating to its compliance or noncompliance with the requirements of this paragraph (b). The Commission will not hesitate to impose sanctions on a NVNG licensee time-sharing spectrum in the 137–138 MHz band with NOAA, including monetary forfeitures and license revocations, when appropriate.

(c) Each satellite in a NVNG licensee's system time-sharing spectrum with NOAA in the 137–138 MHz band shall automatically turn off and cease satellite transmissions if, after 72 consecutive hours, no reset signal is received from the NVNG licensee's gateway earth station and verified by the satellite. All satellites in such NVNG licensee's system shall be capable of instantaneous shutdown on any sub-band upon command from such NVNG licensee's gateway earth station.

[62 FR 59296, Nov. 3, 1997]

§ 25.260 Time sharing between DoD meteorological satellite systems and non-voice, non-geostationary satellite systems in the 400.15–401 MHz band.

(a) A non-voice, non-geostationary mobile-satellite service system licensee (''NVNG licensee'') time-sharing spectrum in the 400.15–401.0 MHz band shall not transmit signals into the ''protection areas'' of Department of Defense (''DoD''). When calculating the protection areas for a DoD satellite in the 400.15–401 MHz band, a NVNG licensee shall use an earth station elevation angle of five degrees towards the DoD satellite and will shut off its transmissions prior to the NVNG licensee's service area, based on an elevation angle of zero degrees towards the NVNG licensee's satellite, overlapping the DoD protection area. A NVNG licensee is responsible for obtaining the necessary ephemeris data. This information shall be updated systemwide at least once per week. A NVNG licensee shall use an orbital propagator algorithm with an accuracy equal to or greater than the NORAD propagator used by DoD.

(b) A NVNG licensee time sharing spectrum in the 400.15–401 MHz band shall establish a 24-hour per day contact person and telephone number so that claims of harmful interference into DoD earth station users and other operational issues can be reported and resolved expeditiously. This contact information shall be made available to DoD or its designee. If the National Telecommunications and Information Administration (''NTIA'') notifies the Commission that DoD is receiving unacceptable interference from a NVNG licensee, the Commission will require such NVNG licensee to terminate its interfering operations immediately unless it demonstrates to the Commission's reasonable satisfaction, and that of NTIA, that it is not responsible for causing harmful interference into the worldwide DoD system. A NVNG licensee assumes the risk of any liability or damage that it and its directors, officers, employees, affiliates, agents and subcontractors may incur or suffer in connection with an interruption of its non-voice, non-geostationary mobile-satellite service, in whole or in part, arising from or relating to its compliance or noncompliance with the requirements of this paragraph (b). The Commission will not hesitate to impose sanctions on a NVNG licensee time-sharing spectrum in the 400.15–401 MHz band with DoD, including monetary forfeitures and license revocations, when appropriate.

(c) Each satellite in a NVNG licensee's system time-sharing spectrum with DoD in the 400.15–401 MHz band shall automatically turn off and cease satellite transmissions if, after 72 consecutive hours, no reset signal is received from the NVNG licensee's gateway earth station and verified by the satellite. All satellites in such NVNG licensee's system shall be capable of instantaneous shutdown on any sub-band upon command from such NVNG licensee's gateway earth station.

(d) Initially, a NVNG licensee time-sharing spectrum with DoD in the 400.15–401 MHz band shall be able to change the frequency on which its system satellites are operating within 125 minutes of receiving notification from a DoD required frequency change in the 400.15–401 MHz band. Thereafter, when a NVNG licensee constructs additional gateway earth stations located outside of North and South America, it shall use its best efforts to decrease to 90 minutes the time required to implement a DoD required frequency change. A NVNG licensee promptly shall notify the Commission and NTIA of any decrease in the time it requires to implement a DoD required frequency change.

(e) Once a NVNG licensee time-sharing spectrum with DoD in the 400.15–401 MHz band demonstrates to DoD that it is capable of implementing a DoD required frequency change within the time required under paragraph (d) of this section, thereafter, such NVNG licensee shall demonstrate its capability to implement a DoD required frequency change only once per year at the instruction of DoD. Such demonstrations shall occur during off-peak hours, as determined by the NVNG licensee, unless otherwise agreed by the NVNG licensee and DoD. Such NVNG licensee will coordinate with DoD in establishing a plan for such a demonstration. In the event that a NVNG licensee fails to demonstrate to DoD

that it is capable of implementing a DoD required frequency change in accordance with a demonstration plan established by DoD and the NVNG licensee, upon the Commission's receipt of a written notification from NTIA describing such failure, the Commission shall impose additional conditions or requirements on the NVNG licensee's authorization as may be necessary to protect DoD operations in the 400.15–401 MHz downlink band until the Commission is notified by NTIA that the NVNG licensee has successfully demonstrated its ability to implement a DoD required frequency change. Such additional conditions or requirements may include, but are not limited to, requiring such NVNG licensee immediately to terminate its operations interfering with the DoD system.

[62 FR 59296, Nov. 3, 1997]

§ 25.261 Procedures for avoidance of in-line interference events for Non Geostationary Satellite Orbit (NGSO) Satellite Network Operations in the Fixed Satellite Service (FSS) Bands.

(a) *Applicable NGSO FSS Bands.* The coordination procedures in this section apply to non-Federal-Government NGSO FSS satellite networks operating in the following assigned frequency bands: The 28.6–29.1 GHz or 18.8–19.3 GHz frequency bands.

(b) *Definition of ''In-line interference events.''* For purposes of this section, an ''in-line interference event'' is defined as the interference associated with an occurrence of any physical alignment of space stations of two or more satellite networks with an operating Earth station of one of these networks in such a way that the angular separation between operational links of the two networks is less than 10° as measured at the Earth station.

(c) *Default procedure.* If no agreed coordination exists between two or more satellite networks, then the bands will be divided among the affected satellite networks involved in an in-line interference event in accordance with the following procedure:

(1) Each of n (number of) satellite networks involved in a particular in-line interference event shall select 1/n of the assigned spectrum available in each frequency band for its home base spectrum. The selection order for each satellite network shall be determined by and be in accordance with the date that the first space station in each satellite network is launched and operating;

(2) The affected space station(s) of the respective satellite networks shall only operate in the selected (1/n) spectrum associated with its satellite network, its home base spectrum, for the duration of the in-line interference event;

(3) All affected space station(s) may resume operations throughout the assigned frequency bands once the angular separation between the affected space stations in the in-line interference event is again greater than 10°.

(d) *Coordination procedure.* Any coordination procedure agreed among the affected operating satellite networks, which allows operations of the satellite networks when each network's respective space stations are within the 10 degree avoidance angle associated with an in-line interference event, shall supersede the default procedure of paragraph (c) of this section. Coordination may be effected using information relating to the space stations and the parameters of one or more typical earth stations. All parties are required to coordinate in good faith.

[68 FR 59129, Oct. 14, 2003]

§ 25.262 Licensing and domestic coordination requirements for 17/24 GHz BSS space stations.

(a) Except as described in paragraphs (b), (c) or (e) of this section, applicants seeking to operate a space station in the 17/24 GHz BSS must locate that space station at one of the orbital positions described in Appendix F of the Report and Order adopted May 2, 2007, IB Docket No. 06–123, FCC 07–76.

(b) An applicant may be authorized to operate a 17/24 GHz BSS space station at an orbital location described in Appendix F as set forth in paragraph (a) of this section, or at a location with a geocentric angular separation of one degree or less from an Appendix F location, and may operate at the maximum power flux density limits defined in §§ 25.208(c) and (w) of this part, without

coordinating its power flux density levels with adjacent licensed or permitted operators, only if there is no licensed 17/24 GHz BSS space station or prior-filed application at a location less than four degrees from the offset orbital location at which the applicant proposes to operate.

(c)(1) Notwithstanding the provisions of this section, licensees and permittees will be allowed to apply for a license or authorization for a replacement satellite that will be operated at the same power level and interference protection as the satellite to be replaced.

(2) In addition, applicants for licenses or authority for a satellite to be operated at an orbit location that was made available after a previous 17/24 GHz BSS license was cancelled or surrendered will be permitted to apply for authority to operate a satellite at the same power level and interference protection as the previous licensee at that orbit location, to the extent that their proposed operations are consistent with the provisions of this part. Such applications will be considered pursuant to the first-come, first-served procedures set forth in §25.158 of this part.

(d) Any U.S. licensee or permittee using a 17/24 GHz BSS space station that is located less than four degrees away from a prior-authorized 17/24 GHz BSS space station that is authorized to operate in accordance with paragraph (b) of this section:

(1) may not cause any more interference to the adjacent satellite network than would be caused if the adjacent 17/24 GHz BSS space station were located four degrees away from the proposed space station; and

(2) must accept any increased interference that results from the adjacent space station network operating at the offset orbital location less than four degrees away.

(e) Any 17/24 GHz BSS U.S. licensee or permittee that is required to provide information in its application pursuant to §§25.140(b)(4)(ii) or (b)(4)(iii) of this part must accept any increased interference that may result from adjacent 17/24 GHz BSS space stations that are operating in compliance with the rules for this service.

(f) Any 17/24 GHz BSS U.S. licensee or permittee that does not comply with the power flux-density limits set forth in §25.208(w) of this part shall bear the burden of coordinating with any future co-frequency licensees and permittees of a 17/24 GHz BSS network under the following circumstances:

(1) If the operator's space-to-Earth power flux-density levels exceed the power flux-density limits set forth in §25.208(w) of this part by 3 dB or less, the operator shall bear the burden of coordinating with any future operators proposing a 17/24 GHz BSS space station in compliance with power flux-density limits set forth in §25.208(w) of this part and located within ±6 degrees of the operator's 17/24 GHz BSS space station.

(2) If the operator's space-to-Earth power flux-density levels exceed the power flux-density limits set forth in §25.208(w) of this part by more than 3 dB, the operator shall bear the burden of coordinating with any future operators proposing a 17/24 GHz BSS space station in compliance with power flux-density limits set forth in §25.208(w) of this part and located within ±10 degrees of the operator's 17/24 GHz BSS space station.

(3) If no good faith agreement can be reached, the operator of the 17/24 GHz BSS satellite network that does not comply with §25.208(w) of this part shall reduce its space-to-Earth power flux-density levels to be compliant with those specified in §25.208(w) of this part.

[72 FR 60280, Oct. 24, 2007]

Subpart D—Technical Operations

SOURCE: 58 FR 13421, Mar. 11, 1993, unless otherwise noted.

§25.271 Control of transmitting stations.

(a) The licensee of a facility licensed under this part is responsible for the proper operation and maintenance of the station.

(b) The licensee of a transmitting earth station, other than an ESV, licensed under this part shall ensure that a trained operator is present on