

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 inter-

ference 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]

§ 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.

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(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

Frequency range	In authorized bandwidth of service	
	Field strength (mV/m)	Power flux density ¹ (dBW/m 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/m² 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/m²) 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 co-primary 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

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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.

(1) 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/m² 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/m²/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 $\theta \leq 0^\circ$
- +40 + 3 θ dBW in any 4 kHz band for $0^\circ < \theta \leq 5^\circ$

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 $\theta \leq 0^\circ$
- +64 + 3 θ dBW in any 1 MHz band for $0^\circ < \theta \leq 5^\circ$

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