

representing the class of emission which must be prefixed by a number specifying the necessary bandwidth. This figure does not necessarily indicate the bandwidth actually occupied by the emission at any instant. In those cases where Part 2 of this chapter does not provide a formula for the computation of the necessary bandwidth, the occupied bandwidth may be used in the emission designator.

(b) Stations in this service will be authorized any type of emission, method of modulation, and transmission characteristic, consistent with efficient use of the spectrum and good engineering practice, except that Type B, damped-wave emission will not be authorized.

§ 101.111 Emission limitations.

(a) The mean power of emissions must be attenuated below the mean output power of the transmitter in accordance with the following schedule:

(1) When using transmissions other than those employing digital modulation techniques:

(i) On any frequency removed from the assigned frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: At least 25 decibels;

(ii) On any frequency removed from the assigned frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: At least 35 decibels;

(iii) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least $43+10 \text{ Log}_{10}$ (mean output power in watts) decibels, or 80 decibels, whichever is the lesser attenuation.

(2) When using transmissions employing digital modulation techniques (see § 101.141(b)) in situations not covered in this section:

(i) For operating frequencies below 15 GHz, 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 250 percent of the authorized bandwidth: As specified by the following equation but in no event less than 50 decibels.

$$A=35+0.8(P-50)+10 \text{ Log}_{10}B. \text{ (Attenuation greater than 80 decibels is not required.)}$$

where:

A=Attenuation (in decibels) below the mean output power level.

P=Percent removed from the carrier frequency.

B=Authorized bandwidth in MHz.

(ii) For operating frequencies above 15 GHz, in any 1 MHz band, the center frequency of which is removed from the assigned frequency by more than 50 percent up to and including 250 percent of the authorized bandwidth: As specified by the following equation but in no event less than 11 decibels.

$$A=11+0.4(P-50)+10 \text{ Log}_{10}B. \text{ (Attenuation greater than 56 decibels is not required.)}$$

(iii) 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: At least $43+10 \text{ Log}_{10}$ (mean output power in watts) decibels, or 80 decibels, whichever is the lesser attenuation.

(3) For Digital Termination System channels used in the Digital Electronic Message Service (DEMS) operating in the 10,550-10,680 MHz band:

(i) In any 4 kHz band, the center frequency of which is removed from the edge of the DEMS channel by up to and including 1.125 times the DEMS subchannel bandwidth: As specified by the following equation may in no event be less than $50+10 \log_{10} N$ decibels.

$$A=50+0.0333 (F-0.5B)+10 \log_{10} N \text{ decibels}$$

Where:

A=Attenuation (in decibels) below means output power level contained within the DEMS channel for a given polarization.

B=Bandwidth of DEMS channel (in kHz).

F=Absolute value of the difference between the center frequency of the 4 kHz band measured and the center frequency of the DEMS channel (in kHz).

N=Number of active subchannels of the given polarization within the DEMS channel.

(ii) In any 4 kHz band within the authorized DEMS band the center frequency of which is removed from the center frequency of the DEMS channel by more than the sum of 50% of the DEMS channel bandwidth plus 1.125 times the subchannel bandwidth: As specified by the following equation but in no event less than 80 decibels.

$$A=80+10 \log_{10} N \text{ decibels}$$

(iii) In any 4 kHz band the center frequency of which is outside the authorized DEMS band: At least $43+10 \log_{10}$ (mean output power in Watts) decibels.

(4) For Digital Termination System channels used in the Digital Electronic Message Service (DEMS) operating in the 17,700-19,700 MHz band:

(i) In any 4 kHz band, the center frequency of which is removed from the frequency of the center of the DEMS channel by more than 50 percent of the DEMS channel bandwidth up to and including 50 percent plus 500 kHz: As specified by the following equation but in no event be less than $50+10 \log_{10} N$ decibels.

$$A=50+0.06 (F-0.5B)+10 \log_{10} N \text{ decibels}$$

Where:

A=Attenuation (in decibels) below mean output power level contained within the DEMS channel for a given polarization.

B=Bandwidth of DEMS channel (in kHz).

F=Absolute value of the difference between the center frequency of the 4 kHz band measured and the center frequency of the DEMS channel (in kHz).

N=Number of active subchannels of the given polarization within the DEMS channel.

(ii) In any 4 kHz band within the authorized DEMS band, the center frequency of which is removed from the center frequency of the DEMS channel by more than the sum of 50 percent of the channel bandwidth plus 500 kHz: as specified by the following equation but in no event less than 80 decibels.

$$A=80+10 \log_{10} N \text{ decibels}$$

(iii) In any 4 kHz band the center frequency of which is outside the authorized Digital Message Service band:

At least $43 + 10 \log_{10}$ (mean output power in Watts) decibels.

(5) When using transmissions employing digital modulation techniques on the 900 MHz multiple address frequencies with a 12.5 kHz bandwidth, the power of any emission must be attenuated below the unmodulated carrier power of the transmitter (P) in accordance with the following schedule:

(i) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 2.5 kHz up to and including 6.25 kHz: At least $53 \log_{10} (f_d/2.5)$ decibels;

(ii) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 6.25 kHz up to and including 9.5 kHz: At least $103 \log_{10} (f_d/3.9)$ decibels;

(iii) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 9.5 kHz up to and including 15 kHz: At least $157 \log_{10} (f_d/5.3)$ decibels;

(iv) On any frequency removed from the center of the authorized bandwidth by a displacement frequency greater than 15 kHz: At least 50 plus $10 \log_{10}(P)$ or 70 decibels, whichever is the lesser attenuation.

(4) When using transmissions employing digital modulation techniques on the 900 MHz multiple address frequencies with a bandwidth greater than 12.5 kHz, the power of any emission must be attenuated below the unmodulated carrier power of the transmitter (P) in accordance with the following schedule;

(i) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5 kHz up to and including 10 kHz: At least $83 \log_{10} (f_d/5)$ decibels;

(ii) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 10 kHz up to and including 250 percent of the authorized bandwidth: At least $116 \log_{10} (f_d/6.1)$ decibels or 50 plus $10 \log_{10}(P)$ or 70 decibels, whichever is the lesser attenuation;

(iii) On any frequency removed from the center of the authorized bandwidth by more than 250 percent of the authorized bandwidth: At least 43 plus $10 \log_{10}(\text{output power in watts})$ decibels or 80 decibels, whichever is the lesser attenuation.

(b) When an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in paragraph (a) of this section.

(c) The emission of an unmodulated carrier is prohibited except for test purposes as required for proper station and system maintenance.

§ 101.113 Transmitter power limitations.

(a) On any authorized frequency, the average power delivered to an antenna in this service must be the minimum amount of power necessary to carry out the communications desired. Application of this principle includes, but is not limited to, requiring a licensee who replaces one or more of its antennas with larger antennas to reduce its antenna input power by an amount appropriate to compensate for the increased primary lobe gain of the replacement antenna(s). In no event shall the average equivalent isotropically radiated power (EIRP), as referenced to an isotropic radiator, exceed the values specified below. In cases of harmful interference, the Commission may, after notice and opportunity for hearing, order a change in the effective radiated power of this station. Further, the output power of a transmitter on any authorized frequency in this service may not exceed the following:

Frequency band (MHz)	Maximum allowable EIRP	
	Fixed (dBW)	Mobile (dBW)
928.0 to 929.0	+17	.....
932.0 to 932.5	+17	.....
932.5 to 935.0	+40	.....
941.0 to 941.5	+30	.....
941.5 to 944.0	+40	.....
952.0 to 960.0	(1)+40	.....
1,850 to 1,990	+45	.....
2,110 to 2,160	(4)+45	.....
2,160 to 2,180	(1)+45	.....
2,180 to 2,200	+45	.....
2,450 to 2,500	+45	.....
2,686 to 2,690	+45	.....
3,700 to 4,200	+55	.....
5,925 to 6,425	+55	.....
6,425 to 6,525	.....	+35
6,525 to 6,875	+55	.....
10,550 to 10,680	(3)+55	.....
10,700 to 11,700	+55	.....
12,200 to 13,250	(4)+50	.....
17,700 to 18,600	+55	.....
18,600 to 18,800	(2)+35	.....
18,800 to 19,700	+55	.....
21,200 to 23,600	(4)+55	.....
27,500 to 29,500	+55	.....
31,000 to 31,300		
38,600 to 40,000	+55	.....

(1) For multiple address operations, see § 101.605(a)(1)(v). When an omnidirectional antenna is authorized in the 2150-2160 MHz band, the maximum power is 60 dBm. Remote alarm units that are part of a multiple address central station protection system are authorized a maximum of 2 watts.

(2) The power delivered to the antenna is limited to -3 dBW.

(3) Output power of a DEMS System nodal transmitter may not exceed 0.5 watts per 250 KHz. The output power of a DEMS System user transmitter may not exceed 0.04 watts per 250 KHz. The transmitter power in terms of the watts specified is the peak envelope power of the emission measured at the associated antenna input power. The operating power may not exceed the authorized power by more

than 10 percent of the authorized power in watts at any time.

(4) Also, see §§ 101.145 and 101.605.

§ 101.115 Directional antennas.

(a) Unless otherwise authorized upon specific request by the applicant, each station authorized under the rules of this part must employ a directional antenna adjusted with the center of the major lobe of radiation in the horizontal plane directed toward the receiving station with which it communicates: *provided, however,* where a station communicates with more than one point, a multi- or omni-directional antenna may be authorized if necessary. New Periscope antenna systems will not, under ordinary circumstances, be authorized.

(b) Stations operating below 2500 MHz that are required to use directional antennas must employ antennas meeting the standards indicated below.

(Maximum beamwidth is for the major lobe of radiation at the half power points. Suppression is the minimum attenuation required for any secondary lobe signal and is referenced to the maximum signal in the main lobe.)

Frequency range	Maximum beamwidth (degrees)	Suppression (dB)
Below 512 MHz	80	10
512 to 1000 MHz	20	13
1500 to 2500 MHz	12	13

(c) Fixed stations (other than temporary fixed stations and DEMS nodal stations) operating at 2,500 MHz or higher must employ transmitting and receiving antennas (excluding second receiving antennas for operations such as space diversity) meeting the appropriate performance Standard A indicated below, except that in areas not subjected to frequency congestion antennas meeting performance Standard B may be used subject to the requirements set forth in paragraph (d) of this Section.

Antenna Standards

Minimum radiation suppression to angle in degrees from centerline of main beam in decibels

Frequency (MHz)	Category		Minimum antenna gain (dbi)	Minimum radiation suppression to angle in degrees from centerline of main beam in decibels						
				5° to 10°	10° to 15°	15° to 20°	20° to 30°	30° to 100°	100° to 140°	140° to 180°
932.5 to 935	A	14.0	n/a		6	11	14	17	20	24
941.5 to 944	B	20.0	n/a			6	10	13	15	20

952 to 960 (8) (9)	A	14.0	n/a		6	11	14	17	20	24
	B	20.0	n/a			6	10	13	15	20
1,850 to 1,990	A	5.0	n/a	12	18	22	25	29	33	39
	B	8.0	n/a	5	18	20	20	25	28	36
3,700 to 4,200	A	n/a	36	23	29	33	36	42	55	55
	B	n/a	36	20	24	28	32	32	32	32
5,925 to 6,425 (5)	A	n/a	38	25	29	33	36	42	55	55
	B	n/a	38	21	25	29	32	35	39	45
5,925 to 6,425 (6)	A	n/a	38	25	29	33	36	42	55	55
	B	n/a	38	20	24	28	32	35	36	36
6,525 to 6,875 (5)	A	n/a	38	25	29	33	36	42	55	55
	B	n/a	38	21	25	29	32	35	39	45
6,525 to 6,875 (6)	A	1.5	n/a	26	29	32	34	38	41	49
	B	2.0	n/a	21	25	29	32	35	39	45
10,550 to 10,680 (4) (5)	A	n/a	38	25	29	33	36	42	55	55
	B	n/a	38	20	24	28	32	35	35	39
10,550 to 10,680 (6)	A	3.4	34	20	24	28	32	35	55	55
	B	3.4	34	20	24	28	32	35	35	39
10,565 to 10,615 (7)	n/a	360	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
10,630 to 10,680 (7)	n/a	n/a	34	20	24	28	32	35	36	36
10,700 to 11,700 (5)	A	n/a	38	25	29	33	36	42	55	55
	B	n/a	38	20	24	28	32	35	36	36
17,700 to 18,820	A	n/a	38	25	29	33	36	42	55	55
	B	n/a	38	20	24	28	32	35	36	36
18,920 to 19,700 (1)	A	n/a	38	25	29	33	36	42	55	55
	B	n/a	38	20	24	28	32	35	36	36
21,200 to 23,600 (10)	A	n/a	38	25	29	33	36	42	55	55

Stations. DEMS Nodal Stations need not comply with these standards.

(2) The minimum front-to-back ratio must be 38 dBi.

(3) Mobile, except aeronautical mobile, stations need not comply with these standards.

(4) Except for antennas between 140° and 180° authorized or pending on January 1, 1989, in the band 10,550 to 10,565 MHz for which minimum radiation to suppression to angle (in degrees) from centerline of main beam is 36 decibels.

(5) These antenna standards apply to all point-to-point stations authorized after June 1, 1997. Existing licensees and pending applicants on that date are grandfathered and need not comply with these standards.

(6) These antenna standards apply to all point-to-point stations authorized on or before June 1, 1997.

(7) These antenna standards apply only to DEMS User Stations licensed, in operation, or applied for prior to July 15, 1993.

(8) Except for Multiple Address System frequencies listed in where omnidirectional antennas may be used.

(9) Antennas used at outlying stations as part of a central protection alarm system need conform to only the following 2 standards: (1) The minimum on-beam forward gain must be at least 10 dBi, and (2) the minimum front-to-back ratio must be at least 20 dB.

(10) Except as provided in Section 101.605.

NOTE: Stations must employ an antenna that meets the performance standards for Category A, except that in areas not subject to frequency congestion, antennas meeting standards for Category B may be employed. Note, however, that the Commission may require the use of high performance antennas where interference problems can be resolved by the use of such antennas.

(d) The Commission may require the replacement, prior to activation of the new facilities, at the licensee's expense, of any antenna or periscope antenna system of a permanent fixed station operating at 2500 MHz or higher that does not meet performance Standard A specified in paragraph (c) of this Section, upon a showing that said antenna causes or is likely to cause interference to (or receive interference from) any other authorized or applied for station whereas a higher performance antenna is not likely to involve such interference. Antenna performance is expected to meet the standards of paragraph (c) of this Section for parallel polarization. For cases of potential interference, an antenna will not be considered to meet Standard A unless the parallel polarization performance for the discrimination angle involved meets the requirements, even if the cross-polarization performance controls the interference.

(e) In cases where passive reflectors are employed in conjunction with transmitting antenna systems, the foregoing paragraphs of this section also will be applicable. However, in such instances, the center of the major lobe of radiation from the antenna normally must be directed at the passive reflector, and the center of the major lobe of radiation from the passive reflector directed toward the receiving station with which it communicates.

(f) New periscope antenna systems will be authorized for operation in private operational fixed stations upon a certification that the radiation, in a horizontal plane, from an illuminating antenna and reflector

combination meets or exceeds the antenna standards of this section and, at locations where multiple periscope antennas are employed, that the cross-coupling between periscope antennas is suppressed by an amount equal to or greater than the radiation suppression specified in the standards for angles from the main beam of 140-180° for the particular band and antenna category selected. In no event will periscope antennas be authorized in frequency bands shared with common carriers.

(g) Periscope antennas used at an electric power facility plant area will be excluded from the requirements of paragraphs (c) and (e) of this section on a case-by-case basis where technical considerations preclude the use of other types of antenna systems.

(h) In the event harmful interference is caused to the operation of other stations, the Commission may, after notice and opportunity for hearing, order changes to be made in the height, orientation, gain and radiation pattern of the antenna system.

§ 101.117 Antenna polarization.

Stations operating in the radio services included in this part are not limited as to the type of polarization of the radiated signal, provided, however, that in the event interference in excess of permissible levels is caused to the operation of other stations the Commission may, after notice and opportunity for hearing, order the licensee to change the polarization of the radiated signal. No change in polarization may be made without prior authorization from the Commission.

§ 101.119 Simultaneous use of common antenna structures.

The simultaneous use of common antenna structures by more than one radio station, or by one or more domestic public radio stations and one or more stations of any other class or service, may be authorized: Provided, however, That each licensee or user of any such structure is responsible for maintaining the structure, and for painting and illuminating the structure when obstruction marking is required by the Commission. (See § 101.21(d).)

§ 101.121 Marking of antenna structures.

No permittee or licensee who has been required to paint or light an antenna structure may discontinue the required painting or lighting without having obtained prior written authorization therefor from the Commission. (For complete regulations relative to antenna marking requirements, see Part 17 of this chapter.)

§ 101.123 Quiet zones.

Quiet zones are those areas where it is necessary to restrict radiation so as to minimize possible impact on the operations of radio astronomy or other facilities that are highly sensitive to radio frequency interference.

(a) In order to minimize possible harmful interference at the National Radio Astronomy Observatory site located at Green Bank, Pocohontas 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 temporary-fixed seeking a station license for a new station or to modify an existing station 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 must at the time of filing such application with the Commission, simultaneously notify the Director, National Radio Astronomy Observatory, Post Office Box No. 2, Green Bank, W. Va. 24944, in writing, of the technical particulars of the proposed station. Such notification must include the

geographical coordinates of the antenna, antenna height, antenna directivity if any, proposed frequency, type of emission and power. In addition, the applicant must 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 twenty (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.

(b) Protection for Table Mountain Radio Receiving Zone, Boulder County, Colorado. 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 or from the modification or relocation of existing facilities do not exceed 1 mV/m in the authorized bandwidth of service. (A field strength of 1 mV/m is equivalent to a power flux density of 85.8 dBW/M² assuming a free-space characteristic impedance of 376.7 ohms.)

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

(i) All stations within 2.4 km (1.5 statute miles);

(ii) Stations within 4.8 km (3 statute miles) with 50 watts or more effective radiated power (ERP) in the primary plane of polarization in the azimuthal direction of the Table Mountain Receiving Zone;

(iii) Stations within 16 km (10 statute miles) with 1 kW or more ERP in the primary plane of polarization in the azimuthal direction of the Table Mountain Receiving Zone;

(iv) Stations within 80 km (50 statute miles) with 25 kW or more ERP in the primary plane of polarization in the azimuthal direction of the Table Mountain Receiving Zone.

(2) 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.

(3) 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.

(c) Applications for authorizations to construct microwave operational-fixed radio stations for transmission of program material to cable television systems will not be accepted, except in the frequency bands above 21,200 MHz.

(d) 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, Field Operations Bureau, Federal Communications Commission, Washington, D.C. 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 2.4 kilometers (1.5 statute miles);

(ii) Stations within 4.8 kilometers (3 statute miles) with 50 watts or more average effective radiated power (ERP) in the primary plane of polarization in the azimuthal direction of the Monitoring Stations.

(iii) Stations within 16 kilometers (10 statute miles) 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 (50 statute miles) 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 (i) (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.

§ 101.125 Temporary fixed antenna height restrictions.

The overall antenna structure heights employed by mobile stations in the Local Television Transmission Service and by stations authorized to operate at temporary fixed locations may not exceed the height criteria set forth in Sec. 17.7 of this chapter, unless in each instance, authorization for use of a specific maximum antenna height (above ground and above mean sea level) for each location has been obtained from the Commission prior to erection of the antenna. Requests for such authorization must show the inclusive dates of the proposed operation. (Complete information as to rules concerning the construction, marking and lighting of antenna structures is contained in Part 17 of this chapter.)

§ 101.127 Topographical data.

Determining the location and height above sea level of the antenna site, the elevation or contour intervals must be taken from United States Geological Survey Topographic Quadrangle Maps, United States Army Corps of Engineers maps or Tennessee Valley Authority maps, whichever is the latest, for all areas for which such maps are available. If such maps are not published for the area in question, the next best topographic information should be used. Topographic data may sometimes be obtained from State and municipal agencies. Data from Sectional Aeronautical Charts (including bench marks) or railroad depot elevations and highway elevations from road maps may be used where no better information is available. In cases where limited topographic data is available, use may be made of an altimeter in a car driven along roads extending generally radially from the transmitter site. If it appears necessary, additional data may be requested. United States Geological Survey Topographic Quadrangle Maps may be obtained from the Department of the Interior, Geological Survey, Washington, DC 20242. Sectional Aeronautical Charts are available from the Department of Commerce, Coast and Geodetic Survey, Washington, DC 20230.

§ 101.129 Transmitter location.

(a) The applicant must determine, prior to filing an application for a radio station authorization, that the antenna site specified therein is adequate to render the service proposed. In cases of questionable antenna locations, it is desirable to conduct propagation tests to indicate the field intensity which may be expected in the principal areas or at the fixed points of communication to be served, particularly where severe shadow problems may be expected. In considering applications proposing the use of such locations, the Commission may require site survey tests to be made pursuant to a developmental authorization in the particular service concerned. In such cases, propagation tests should be conducted in accordance with recognized engineering methods and should be made with a transmitting antenna simulating, as near as possible, the proposed antenna installation. Full data obtained from such surveys and its analysis, including a description of the methods used and the name, address and qualifications of the engineer making the survey, must be supplied to the Commission.

(b) Antenna structures should be so located and constructed as to avoid making them hazardous to air navigation. (See Part 17 of this chapter for provisions relating to antenna structures.) Such installation must be maintained in good structural condition together with any required painting or lighting.

§ 101.131 Transmitter construction and installation.

(a) The equipment at the operating and transmitting positions must be so installed and protected that it is not accessible to, or capable of being operated by, persons other than those duly authorized by the licensee.

(b) In any case where the maximum modulating frequency of a transmitter is prescribed by the Commission, the transmitter must be equipped with a low-pass or band-pass modulation filter of suitable performance characteristics. In those cases where a modulation limiter is employed, the modulation filter must be installed between the transmitter stage in which limiting is effected and the modulated stage of the transmitter.

(c) Each transmitter employed in these services must be equipped with an appropriately labeled pilot lamp or meter which will provide continuous visual indication at the transmitter when its control circuits have been placed in a condition to activate the transmitter. In addition, facilities must be provided at each transmitter to permit the transmitter to be turned on and off independently of any remote control circuits associated therewith.

(d) At each transmitter control point the following facilities must be installed:

(1) A carrier operated device which will provide continuous visual indication when the transmitter is radiating, or, in lieu thereof, a pilot lamp or meter which will provide continuous visual indication when the transmitter control circuits have been placed in a condition to activate the transmitter.

(2) Facilities which will permit the operator to turn transmitter carrier on and off at will.

(e) Transmitter control circuits from any control point must be so installed that grounding or shorting any line in the control circuit will not cause the transmitter to radiate: Provided, however, That this provision will not be applicable to control circuits of stations which normally operate with continuous radiation or to control circuits which are under the effective operational control of responsible operating personnel 24 hours per day.

§ 101.133 Limitations on use of transmitters.

(a) Transmitters licensed for operation in Common Carrier services may not be concurrently licensed or used for non-common carrier communication purposes except in the Multipoint Distribution Service (See Part 21 of this Chapter). However, mobile units may be concurrently licensed or used for non-common carrier communication purposes provided that the transmitter is type-accepted for use in each service.

(b) Private operational fixed stations authorized in this service may communicate with associated operational-fixed stations and fixed receivers and with units of associated stations in the mobile service licensed under Private Radio Service rule parts. In addition, intercommunication is permitted with other licensed stations and with U.S. Government stations in those cases which require cooperation or coordination of activities or when cooperative use arrangements in accordance with § 101.135 are contemplated; provided, however, that where communication is desired with stations authorized to operate under the authority of a foreign jurisdiction, prior approval of this Commission must be obtained; And provided further, That the authority under which such other stations operate does not prohibit the intercommunication.

(c) Two or more persons or governmental entities eligible for private operational fixed licenses may use the same transmitting equipment under the following terms and conditions:

(1) Each licensee complies with the general operating requirements set out in this Part.

(2) Each licensee is eligible for the frequency(ies) on which the facility operates.

(3) Each licensee must have the ability to access the transmitter(s) that it is authorized to operate under the multiple licensing arrangement.

§ 101.135 Shared use of radio stations and the offering of private carrier service.

(a) Licensees of Private Operational Fixed radio stations may share the use of their facilities on a non-profit basis or may offer service on a for-profit private carrier basis, subject to the following conditions and limitations:

(1) Persons or governmental entities licensed to operate radio systems on any of the private radio frequencies set out in § 101.101 may share such systems with, or provide private carrier service to, any eligible for licensing under this part, regardless of individual eligibility restrictions, provided that the communications being carried are permissible under § 101.603.

(2) The licensee must maintain access to and control over all facilities authorized under its license.

(3) All sharing and private carrier arrangements must be conducted pursuant to a written agreement to be kept as part of the station records.

(4) The licensee must keep an up-to-date list of system sharers and private carrier subscribers and the basis of their eligibility under this part. Such records must be kept current and must be made available upon request for inspection by the Commission.

§ 101.137 Interconnection of private operational fixed microwave stations.

Private operational fixed stations may be interconnected with facilities of common carriers subject to applicable tariffs.

§ 101.139 Authorization of transmitters.

(a) Except for transmitters used at developmental stations or for fixed point-to-point operation pursuant to Subparts H and I, each transmitter must be a type which has been type accepted by the Commission for use under the applicable rules of this part. Transmitters used in the point-to-point microwave service under Subparts H and I for fixed operation must be of a type that has been either notified or type accepted by the Commission (see Sec. 2.904(d) of this chapter). Effective March 5, 1984, only grants of notification will be issued for transmitters used exclusively for fixed point-to-point operation. Transmitters designed for use in the 31.0 to 31.3 GHz band will be authorized under the notification procedure.

(b) Any manufacturer of a transmitter to be produced for use under the rules of this part may request type acceptance or notification by following the applicable procedures set forth in Part 2 of this chapter. Type accepted and notified transmitters are included in the Commission's Radio Equipment List. Copies of this list are available for inspection at the Commission's office in Washington, D.C. and at each of its field offices.

(c) Type acceptance or notification for an individual transmitter may also be requested by an applicant for a station authorization, pursuant to the procedures set forth in Part 2 of this chapter. An individual transmitter will not normally be included in the Radio Equipment List but will be enumerated on the station authorization.

(d) A transmitter presently shown on an instrument of authorization, which operates on an assigned frequency in the 890-940 MHz band and has not been type accepted, may continue to be used by the licensee without type acceptance provided such transmitter continues otherwise to comply with the applicable rules and regulations of the Commission.

(e) Type acceptance or notification is not required for portable transmitters operating with peak output power not greater than 250 mW. If operation of such equipment causes harmful interference the FCC may, at its discretion, require the licensee to take such corrective action as is necessary to eliminate the interference.

(f) After July 15, 1996, the manufacture (except for export) or importation of equipment employing digital modulation techniques in the 3700-4200, 5925-6425, 6525-6875, 10,550-10,680 and 10,700-11,700 MHz bands must meet the minimum payload capacity requirements of § 101.139.

§ 101.141 Microwave digital modulation.

(a) Microwave transmitters employing digital modulation techniques and operating below 15 GHz must, with appropriate multiplex equipment, comply with the following additional requirements:

(1) The bit rate, in bits per second, must be equal to or greater than the bandwidth specified by the emission designator in Hertz (e.g., to be acceptable, equipment transmitting at a 20 Mb/s rate must not require a bandwidth of greater than 20 MHz), except the bandwidth used to calculate the minimum rate may not include any authorized guard band.

(2) Equipment to be used for voice transmission placed in service, authorized, or applied for on or before June 1, 1997 in the 2110 to 2130 and 2160 to 2180 MHz bands must be capable of satisfactory operation within the authorized bandwidth to encode at least 96 voice channels. Equipment placed in service, authorized, or applied for on or before June 1, 1997 in the 3700-4200, 5925-6425 (30 MHz bandwidth), and 10,700-11,700 MHz (30 and 40 MHz bandwidths) bands must be capable of satisfactory operation within the authorized bandwidth to encode at least 1152 voice channels. These required loading levels may be reduced by a factor of 1/N provided that N transmitters may be operated satisfactorily, over the same radio path, within an authorized bandwidth less than, or equal to, the maximum authorizable bandwidth (e.g., the 1152 channel requirement may be reduced to 576 if two transmitters can be satisfactorily operated over the same path within the maximum bandwidth). Where type accepted equipment is designed to operate on the same frequency in a cross polarized configuration to meet the above capacity requirements, the Commission will require, at the time additional transmitters are authorized, that both polarizations of a frequency be used before a new frequency assignment is made, unless a single transmitter installation was found to be justified by the Commission at the time it authorized the first transmitter.

(3) The following capacity and loading requirements must be met for equipment applied for, authorized, and placed in service after June 1, 1997 in the 3700-4200 MHz (4 GHz), 5925-6425 and 6525-6875 MHz (6 GHz), 10,550-10,680 MHz (10 GHz), and 10,700-11,700 MHz (11 GHz) bands:

Nominal Channel Bandwidth (MHz)	Minimum Payload Capacity (Mbits/s)	Minimum Traffic Loading Payload (as percent of payload capacity)	Typical Utilization*
0.400	1.54	n/a	1 DS-1
0.800	3.08	n/a	2 DS-1
1.25	3.08	n/a	2 DS-1
1.60	6.17	n/a	4 DS-1
2.50	6.17	n/a	4 DS-1
3.75	12.3	n/a	8 DS-1
5.0	18.5	n/a	12 DS-1
10.0	44.7	50**	1 DS-3/STS-1
20.0	89.4	50**	2 DS-3/STS-1
30.0 (11 GHz)	89.4	50**	2 DS-3/STS-1
30.0 (6 GHz)	134.1	50**	3 DS-3/STS-1
40.0	134.1	50**	3 DS-3/STS-1

* DS and STS refer to the number of voice circuits a channel can accommodate. 1 DS-1 = 24 voice circuits; 2 DS-1 = 48; 4 DS-1 = 96; 8 DS-1 = 192; 12 DS-1 = 288; 1 DS-3/STS-1 = 672; 2 DS-3/STS-1 = 1344; 3 DS-3/STS-1 = 2016.

** This loading requirement must be met within 30 months of licensing. If two transmitters simultaneously operate on the same frequency over the same path, the requirement is reduced to 25 percent.

(4) If a transmitter is authorized to operate in a bandwidth that is not listed in paragraph (a)(3) of this section, it must meet the minimum payload capacity and traffic loading requirements of the next largest channel bandwidth listed in the table; e.g., if the authorized bandwidth is 3.5 MHz, the minimum payload capacity must be 12.3 Mbits/s.

(5) Transmitters carrying digital motion video motion material are exempt from the requirements

specified in paragraphs (a)(2) and (a)(3) of this section, provided that at least 50 percent of the payload is digital video motion material and the minimum bit rate specified in paragraph (a)(1) is met. In the 6, 10, and 11 GHz bands, concatenation of multiple contiguous channels is permitted for channels of equal bandwidth on center frequencies, provided no other channels are available and the minimum payload capacity requirements are met.

(b) For purposes of compliance with the emission limitation requirements of § 101.111(a)(2) of this part and the requirements of paragraph (a) of this section, digital modulation techniques are considered as being employed when digital modulation occupies 50 percent or more to the total peak frequency deviation of a transmitted radio frequency carrier. The total peak frequency deviation will be determined by adding the deviation produced by the digital modulation signal and the deviation produced by any frequency division multiplex (FDM) modulation used. The deviation (D) produced by the FDM signal must be determined in accordance with § 2.202(f) of Part 2 of this chapter.

(c) Transmitters employing digital modulation techniques must effectively eliminate carrier spikes or single frequency tones in the output signal to the degree which would be obtained without repetitive patterns occurring in the signal.

(d) Transmitters type accepted for use with digital modulation prior to November 1, 1974 may continue to be used where authorized until December 31, 1976. After the latter date, such equipment will no longer be type accepted for digital modulation unless it is type accepted for such use after November 1, 1974.

(e) Microwave transmitters employing digital modulation techniques in the bands 17,700-19,700 MHz must transmit at bit rate, in bits per second (bps), equal to or greater than the authorized bandwidth in Hertz (e.g., to be acceptable, equipment transmitting at a 20 Mbps rate must not require an authorized bandwidth greater than 20 MHz). This bps/Hz standard is independent of the antenna (polarization) used, frequency reuse, or how the system is configured.

NOTE: Until December 1, 1988, no minimum bit rate will apply to the 17,700-19,700 MHz band. Systems authorized prior to that date may install equipment after that date with no minimum bit rate.

§ 101.143 Minimum path lengths for fixed lengths.

(a) The distance between end points of a fixed link in the private operational fixed service and the point-to-point service must equal or exceed the value set forth in the table below or the EIRP must be reduced in accordance with the equation set forth below.

Frequency Band (MHz)	Minimum path length (km)
Below 1,850.....	n/a
1,850 to 7,125.....	17
10,550 to 13,250.....	5
Above 17,700.....	n/a

(b) For paths shorter than those specified in the Table, the EIRP may not exceed the value derived from the following equation.

$$\text{EIRP} = 30 - 20 \log[A/B], \text{ dBW}$$

Where:

EIRP = Equivalent isotropic radiated power in dBW.

A = Minimum path length from the Table for the frequency band in kilometers.

B = The actual path length in kilometers.

NOTE: Automatic transmit power control may be used to meet this requirement up to a 3 dB increase in EIRP.

(c) Upon an appropriate technical showing, applicants and licensees unable to meet the minimum path length requirement may be granted an exception to these requirements.

§ 101.145 Interference to geostationary-satellites.

These limitations are necessary to minimize the probability of harmful interference to reception in the bands 2655-2690 MHz, 5925-6875 MHz, and 12.7-12.75 GHz on board geostationary-space stations in the fixed-satellite service (Part 25).

(a) Stations authorized prior to July 1, 1976 in the band 2655-2690 MHz, which exceed the power levels in paragraphs (a) and (b) of this section are permitted to operate indefinitely, provided that the operations of such stations does not result in harmful interference to reception in these band on board geostationary space stations.

(b) 2655 to 2690 MHz and 5925 to 6875 MHz. No directional transmitting antenna utilized by a fixed station operating in these bands may be aimed within 2 degrees of the geostationary-satellite orbit, taking into account atmospheric refraction. However, exception may be made in unusual circumstances upon a showing that there is no reasonable alternative to the transmission path proposed. If there is no evidence that such exception would cause possible harmful interference to an authorized satellite system, said transmission path may be authorized on waiver basis where the maximum value of the equivalent isotropically radiated power (EIRP) does not exceed:

(1) +47 dBW for any antenna beam directed within 0.5 degrees of the stationary satellite orbit or

(2) +47 to +55 dBW, on a linear decibel scale (8 dB per degree) for any antenna beam directed between 0.5 degrees and 1.5 degrees of the stationary orbit.

(c) 12.7 to 12.75 GHz. No directional transmitting antenna utilized by a fixed station operating in this band may be aimed within 1.5 degrees of the geostationary-satellite orbit, taking into account atmospheric refraction. However, exception may be made in unusual circumstances upon a showing that there is no reasonable alternative to the transmission path proposed. If there is no evidence that such exception would cause possible harmful interference to an authorized satellite system, said transmission path may be authorized on waiver basis where the maximum value of the equivalent isotropically radiated power (EIRP) does not exceed +45 dBW for any antenna beam directed within 1.5 degrees of the stationary satellite orbit.

(d) Methods for calculating the azimuths to be avoided may be found in: CCIR Report No. 393 (Green Books), New Delhi, 1970; in "Radio-Relay Antenna Pointing for controlled Interference With Geostationary-Satellites" by C. W. Lundgren and A. S. May, Bell System Technical Journal, Vol. 48, No. 10, pp. 3387-3422, December 1969; and in "Geostationary Orbit Avoidance Computer Program" by Richard G. Gould, Common Carrier Bureau Report CC-7201, FCC, Washington, DC, 1972. This latter report is available through the National Technical Information Service, U.S. Department of Commerce, Springfield, VA 22151, in printed form (PB-211 500) or source card deck (PB-211 501).

Subpart D - Operational Requirements

§ 101.201 Station inspection.

The licensee of each station authorized in the radio services included in this part must make the station available for inspection by representatives of the Commission at any reasonable hour.

§ 101.203 Communications concerning safety of life and property.

(a) Handling and transmission of messages concerning the safety of life or property which is in imminent danger must be afforded priority over other messages.

(b) No person may knowingly cause to be transmitted any false or fraudulent message concerning the safety of life or property, or refuse upon demand immediately to relinquish the use of a radio circuit to enable the transmission of messages concerning the safety of life or property which is in imminent danger, or knowingly interfere or otherwise obstruct the transmission of such messages.

§ 101.205 Operation during emergency.

The licensee of any station in these services may, during a period of emergency in which normal communication facilities are disrupted as a result of hurricane, flood, earthquake, or similar disaster, utilize such station for emergency communication service in a manner other than that specified in the instrument of authorization: Provided, (a) That as soon as possible after the beginning of such emergency use, notice be sent to the Commission at Washington, D.C. stating the nature of the emergency and the use to which the station is being put, and (b) that the emergency use of the station must be discontinued as soon as substantially normal communication facilities are again available, and (c) that the Commission at Washington, D.C. must be notified immediately when such special use of the station is terminated, and (d) that, in no event, will any station engage in emergency transmission on frequencies other than, or with power in excess of, that specified in the instrument of authorization or as otherwise expressly provided by the Commission, or by law, and (e) that the Commission may, at any time, order the discontinuance of any such emergency communication.

§ 101.207 Suspension of transmission.

Transmission must be suspended immediately upon detection by the station or operator licensee or upon notification by the Commission of a deviation from the technical requirements of the station authorization and must remain suspended until such deviation is corrected, except for transmission concerning the immediate safety of life or property, in which case transmission must be suspended immediately after the emergency is terminated.

§ 101.209 Operation of stations at temporary fixed locations for communication between the United States and Canada or Mexico.

Stations authorized to operate at temporary fixed locations may not be used for transmissions between the United States and Canada, or the United States and Mexico, without prior specific notification to, and authorization from, the Commission. Notification of such intended usage of the facilities should include a detailed showing of the operation proposed, including the parties involved, the nature of the communications to be handled, the terms and conditions of such operations, the time and place of operation, such other matters as the applicant deems relevant, and a showing as to how the public interest, convenience and necessity would be served by the proposed operation. Such notification should

be given sufficiently in advance of the proposed date of operation to permit any appropriate correlation with the respective foreign government involved (see §§ 101.717, 101.811, 101.813, and 101.815).

§ 101.211 Operator requirements for Private Operational Fixed Stations.

(a) No operator license is required for the operation, maintenance, or repair of stations licensed under this part.

(b) An unlicensed person, with the consent or authorization of the licensee, may employ stations in this service for the purpose of telecommunications in accordance with the conditions and limitations set forth in § 101.135 of this part.

(c) The station licensee is responsible for the proper operation of the station at all times and is expected to provide for observations, servicing and maintenance as often as may be necessary to ensure proper operation. All adjustments or tests during or coincident with the installation, servicing, or maintenance of the station should be performed by or under the immediate supervision and responsibility of a person technically qualified to perform transmitter installation, operation, maintenance, and repair duties in the private land mobile services and fixed services by an organization or committee representative of users in those services.

(d) The provisions of paragraph (b) of this section authorizing unlicensed persons to operate stations may not be construed to change or diminish in any respect the responsibility of station licensees to have and to maintain control over the stations licensed to them (including all transmitter units thereof), or for the proper functioning and operation of those stations (including all transmitter units thereof) in accordance with the terms of the licenses of those stations.

§ 101.213 Station identification.

Stations in the private service are exempt from the requirement to identify transmissions by call sign or any other station identifier.

Subpart E - Miscellaneous Common Carrier Provisions

§ 101.301 National defense; free service.

Any common carrier authorized under the rules of this part may render to any agency of the United States Government free service in connection with the preparation for the national defense. Every such carrier rendering any such free service must make and file, in duplicate, with the Commission, on or before the 31st of July and on or before the 31st day of January in each year, reports covering the periods of 6 months ending on the 30th of June and the 31st of December, respectively, next prior to said dates. These reports must show the names of the agencies to which free service was rendered pursuant to this rule, the general character of the communications handled for each agency, and the charges in dollars which would have accrued to the carrier for such service rendered to each agency if charges for such communications had been collected at the published tariff rates.

§ 101.303 Answers to notices of violation.

Any person receiving official notice of a violation of the terms of the Communications Act of 1934, as amended, any other Federal statute or Executive Order pertaining to radio or wire communications or any international radio or wire communications treaty or convention, or regulations annexed thereto to which the United States is a party, or the rules and regulations of the Federal Communications Commission, must, within 10 days from such receipt, send a written answer to the office of the Commission originating the official notice. If an answer cannot be sent or an acknowledgment made within such 10-day period by reason of illness or other unavoidable circumstances, acknowledgment and answer must be made at the earliest practicable date with a satisfactory explanation of the delay. The answer to each notice must be complete in itself and may not be abbreviated by reference to other communications or answers to other notices. If the notice relates to some violation that may be due to the physical or electrical characteristics of transmitting apparatus, the answer must state fully what steps have been taken to prevent future violations, and, if any new apparatus is to be installed, the date such apparatus was ordered, the name of the manufacturer, and promised date of delivery. If the installation of such apparatus requires a construction permit, the file number of the application must be given or, if a file number has not been assigned by the Commission, such identification as will permit ready reference thereto. If the notice of violation relates to inadequate maintenance resulting in improper operation of the transmitter, the name and license number of the operator performing the maintenance must be given. If the notice of violation relates to some lack of attention to, or improper operation of, the transmitter by other employees, the reply must enumerate the steps taken to prevent a recurrence of such lack of attention or improper operation.

§ 101.305 Discontinuance, reduction or impairment of service.

(a) If the public communication service provided by a station in the Common Carrier Radio Services is involuntarily discontinued, reduced or impaired for a period exceeding 48 hours, the station licensee must promptly notify the Commission, in writing, at Federal Communications Commission, Common Carrier Radio Services, 1270 Fairfield Road, Gettysburg, Pennsylvania 17325. In every such case, the licensee must furnish full particulars as to the reasons for such discontinuance, reduction or impairment of service, including a statement as to when normal service is expected to be resumed. When normal service is resumed, prompt notification thereof must be given in writing to the Federal Communications Commission, Common Carrier Radio Services, 1270 Fairfield Road, Gettysburg, Pennsylvania 17325.

(b) No station licensee subject to title II of the Communications Act of 1934, as amended, may voluntarily discontinue, reduce or impair public communication service to a community or part of a community without obtaining prior authorization from the Commission pursuant to the procedures set forth in part 63 of this chapter. In the event that permanent discontinuance of service is authorized by the Commission, the station licensee must promptly send the station license to the Federal Communications Commission,

Common Carrier Radio Services, 1270 Fairfield Road, Gettysburg, Pennsylvania 17325 for cancellation.

(c) Any common carrier station licensee, not subject to title II of the Communications Act of 1934, as amended, who voluntarily discontinues, reduces or impairs public communication service to a community or a part of a community must give written notification to the Commission within 7 days thereof. In the event of permanent discontinuance of service, the station licensee must promptly send the station license to the Federal Communications Commission, Common Carrier Radio Services, 1270 Fairfield Road, Gettysburg, Pennsylvania 17325 for cancellation.

(d) If any common carrier radio frequency should not be used to render any service as authorized during a consecutive period of twelve months at any time after construction is completed and a certification of completion of construction has been filed, under circumstances that do not fall within the provisions of paragraph (a), (b) or (c) of this section, or, if removal of equipment or facilities has rendered the station not operational, the licensee must, within thirty days of the end of such period of nonuse:

(1) Submit for cancellation the station license (or licenses) to the Federal Communications Commission, Common Carrier Radio Services, 1270 Fairfield Road, Gettysburg, Pennsylvania 17325 for cancellation.

(2) File an application for modification of the license (or licenses) to delete the unused frequency (or frequencies); or

(3) Request waiver of this rule and demonstrate either that the frequency will be used (as evidenced by appropriate requests for service, etc.) within six months of the end of the initial period of nonuse, or that the frequency will be converted to allow rendition of other authorized public services within one year of the end of the initial period of nonuse by the filing of appropriate applications within six months of the end of the period of nonuse.

§ 101.307 Tariffs, reports, and other material required to be submitted to the Commission.

Sections 1.771 through 1.815 of this chapter contain summaries of certain materials and reports, including schedule of charges and accounting and financial reports, which, when applicable, must be filed with the Commission.

§ 101.309 Requirement that licensees respond to official communications.

All licensees in these services are required to respond to official communications from the Commission with reasonable dispatch and according to the tenor of such communications. Failure to do so will be given appropriate consideration in connection with any subsequent applications which the offending party may file and may result in the designation of such applications for hearing, or in appropriate cases, the institution of proceedings looking to the modification or revocation of the pertinent authorizations.

§ 101.311 Equal employment opportunities.

Equal opportunities in employment must be afforded by all common carrier licensees in accordance with the provisions of § 21.307 of this Chapter.

Subpart F—Developmental Authorizations

§ 101.401 Eligibility.

Developmental authorizations for stations in the radio services included in this part will be issued only to existing and proposed licensees who are legally, financially and otherwise qualified to conduct experimentation for the development of engineering or operational data, or techniques, directly related to a proposed radio service or to a regularly established radio service regulated by the rules of this part.

§ 101.403 Scope of service.

Developmental authorizations may be issued for:

- (a) Field strength surveys relative to or precedent to the filing of applications for licenses, in connection with the selection of suitable locations for stations proposed to be established in any of the regularly established radio services regulated by the rules of this part; or
- (b) The testing of existing or authorized antennas, wave guides, or transmission paths.

§ 101.405 Adherence to program of research and development.

The program of research and development, as stated by an applicant in the application for license or stated in the instrument of station authorization, must be substantially adhered to unless the licensee is otherwise authorized by the Commission.

§ 101.407 Special procedure for the development of a new service or for the use of frequencies not in accordance with the provisions of the rules in this part.

(a) An authorization for the development of a new service not in accordance with the provisions of the rules in this part may be granted for a limited time, but only after the Commission has made a preliminary determination with respect to the factors set forth in this paragraph, as each case may require. This procedure also applies to any application that involves use of a frequency which is not in accordance with the provisions of the rules in this part, although in accordance with the Table of Frequency Allocations contained in Part 2 of this chapter. (An application which involves use of a frequency which is not in accordance with the Table of Frequency Allocations in Part 2 of this chapter should be filed in accordance with the provisions of Part 5 of this chapter, Experimental Radio Services.) The factors with respect to which the Commission will make a preliminary determination before acting on an application filed under this paragraph are as follows:

(1) That the public interest, convenience or necessity warrants consideration of the establishment of the proposed service or the use of the proposed frequency;

(2) That the proposed operation appears to warrant consideration to effect a change in the provisions of the rules in this part; and/or

(3) That some operational data should be developed for consideration in any rule making proceeding which may be initiated.

(b) Applications for stations that are intended to be used in the development of a proposed service must be accompanied by a petition to amend the Commission's rules with respect to frequencies and such other items as may be necessary to provide for the regular establishment of the proposed service.

§ 101.409 Terms of grant; general limitations.

(a) Developmental authorizations normally will be issued for one year, or such shorter term as the Commission may deem appropriate in any particular case, and will be subject to cancellation without hearing by the Commission at any time upon notice to the licensee.

(b) Where some phases of the developmental program are not covered by the general rules of the Commission or by the rules of this part, the Commission may specify supplemental or additional requirements or conditions in each case as it may deem necessary in the public interest, convenience or necessity.

(c) Frequencies allocated to the service toward which such development is directed will be assigned for developmental operation on the basis that no interference will be caused to the regular services of stations operating in accordance with the Commission's Table of Frequency Allocations (Sec. 2.106 of this chapter).

(d) The rendition of communication service for hire is not permitted under any developmental authorizations unless specifically authorized by the Commission.

(e) The grant of a developmental authorization carries with it no assurance that the developmental program, if successful, will be authorized on a permanent basis either as to the service involved or the use of the frequencies assigned or any other frequencies.

§ 101.411 Supplementary showing required.

(a) Authorizations for development of a proposed radio service in the services included in this part will be issued only upon a showing that the applicant has a definite program of research and development, the details of which must be set forth, which has reasonable promise of substantial contribution to these services within the term of such authorization. A specific showing should be made as to the factors which qualify the applicant technically to conduct the research and development program, including a description of the nature and extent of engineering facilities that the applicant has available for such purposes.

(b) Expiring developmental authorizations may be renewed only upon the applicant's compliance with the applicable requirements of § 101.413(a) and (b) relative to the authorization sought to be renewed and upon a factual showing that further progress in the program of research and development requires further radio transmission and that the public interest, convenience or necessity would be served by renewal of such authorization.

§ 101.413 Developmental report required.

(a) Upon completion of the program of research and development, or, in any event, upon the expiration of the instrument of station authorization under which such investigations were permitted, or at such times during the term of the station authorization as the Commission may deem necessary to evaluate the progress of the developmental program, the licensee must submit, in duplicate, a comprehensive report on the following items, in the order designated:

- (1) Report on the various phases of the project which were investigated.
- (2) Total number of hours of operation on each frequency assigned.
- (3) Copies of any publication on the project.

(4) Detailed analysis of the result obtained.

(5) Any other pertinent information.

(b) In addition to the information required by paragraph (a) of this section, the developmental report of a station authorized for the development of a proposed radio service must include comprehensive information on the following items:

(1) Probable public support and methods of its determination.

(2) Practicability of service operations.

(3) Interference encountered.

(4) Pertinent information relative to merits of the proposed service.

(5) Propagation characteristics of frequencies used, particularly with respect to the service objective.

(6) Frequencies believed to be more suitable and reasons therefor.

(7) Type of signals or communications employed in the experimental work.

(c) Developmental reports will be made a part of the Commission's public records, except upon the applicant's specific request for confidentiality and Commission approval in accordance with Section 0.459 of this Chapter. Information determined confidential by the Commission will not be publicly disclosed.

Subpart G - Digital Electronic Message Service

§ 101.501 Eligibility.

Applications will be granted only in cases in which the applicant establishes it is legally, technically, financially and otherwise qualified to render the services proposed and that the public interest, convenience and necessity would be served by such a grant. Each application will identify the Standard Metropolitan Statistical Area (SMSA) within which boundaries the Digital Electronic Message Service (DEMS) nodal station will be constructed and which the facility will serve.

§ 101.503 Digital Electronic Message Service Nodal Stations.

DEMS Nodal Stations may be authorized only as a part of an integrated communication system wherein DEMS User Stations associated therewith also are licensed to the DEMS Nodal Station licensee. Applications for DEMS Nodal Station licenses should specify the maximum number of DEMS User Stations to be served by that nodal station. Any increase in that number must be applied for pursuant to § 101.15.

§ 101.505 Frequencies.

(a) Frequencies in the 17,700-19,700 MHz band are available for assignment for all DEMS applicants. Assignment will consist of a pair of channels as set out in paragraph (c) of this section plus internodal channels as set out in paragraph (d) of this section.

(b) Licensees may apply for an additional channel pair in an SMSA only when it is operating its previously authorized DEMS at or near the expected capacity and the service to be provided will fully utilize all spectrum requested.

(c) DEMS assignments will be made according to the following plan, except that systems licensed, in operation, or applied for in the 10,565-10,615 and 10,630-10,680 MHz bands prior to July 15, 1993 are permitted to use frequencies in those bands if they prior coordinate with 10 GHz point-to-point licensees:

Channel No.	Nodal station frequency band (MHz)	User station frequency band (MHz)
30.....	18,870-18,880	19,210-19,220
31.....	18,880-18,890	19,220-19,230
32.....	18,890-18,900	19,230-19,240
33.....	18,900-18,910	19,240-19,250
34.....	18,910-18,920	19,250-19,260

These channel pairs will be assigned in each SMSA and may be subdivided as desired by the licensee.

(d) Internodal link assignments are to be made in accordance with the provisions of Subpart I, applying to point-to-point operations.

§ 101.507 Frequency stability

The frequency stability of each DEMS Nodal Station transmitter authorized for this service in the 17,700-

19,700 MHz band must be $\pm 0.001\%$. The frequency stability of each DEMS User Station transmitter authorized for this service in this band must be $\pm 0.003\%$.

§ 101.509 Interference protection criteria.

(a) All harmful interference to other users and blocking of adjacent channel use in the same city and cochannel use in nearby Standard Metropolitan Statistical Areas is prohibited. In areas where SMSA's are in close proximity, careful consideration should be given to minimum power requirements and to the location, height, and radiation pattern of the transmitting antenna. Licensees and applicants are expected to cooperate fully in attempting to resolve problems of potential interference before bringing the matter to the attention of the Commission.

(b) As a condition for use of frequencies in this service each carrier is required to:

(1) Engineer the system to be reasonably compatible with adjacent channel operations in the same city; and

(2) Cooperate fully and in good faith to resolve whatever potential interference and transmission security problems may be present in adjacent channel operation.

(c) The following interference studies, as appropriate, must be included with each application for a new or major modification in a DEMS Nodal Station:

(1) An analysis of the potential for harmful interference with other stations if the coordinates of any proposed station are located within 80 kilometers (50 miles) of the coordinates of any authorized, or previously proposed station(s) that utilizes, or would utilize, the same frequency or an adjacent potentially interfering frequency; and

(2) An analysis concerning possible adverse impact upon Canadian communications if the station's transmitting antenna is to be located within 55 kilometers (35 miles) of the Canadian border.

(d) In addition a copy of the interference analysis submitted in response to paragraph (c)(1) of this section must be served on all applicants and/or grantees concerned within 5 days of its submission to the Commission.

§ 101.511 Purpose and permissible service.

(a) The DEMS is intended to provide for the exchange of digital information among and between subscribers using one or more DEMS Systems.

(b) Unless otherwise directed or conditioned in the applicable instrument of authorization, DEMS may be used to exchange any type of digital information consistent with the Commission's Rules and the applicable tariff of the carrier.

(c) The carrier's tariff must fully describe the parameters of the service to be provided, including the degree of communications security a subscriber can expect in ordinary service.

§ 101.513 Transmitter power.

The transmitter power will be governed by § 101.113 of this rule part. Further, each application must contain an analysis demonstrating compliance with § 101.113(a).