

Part 2 Current Commission Rules

47 CFR CH. 1, 2.106, CURRENT ALLOCATIONS

International Table		United States Table		FCC Use Designations		
Region 1 - allocation MHz	Region 2 - allocation MHz	Region 3 - allocation MHz	Government Allocation MHz	Non-Government Allocation MHz	Plan part(s)	Special-use frequencies
(1)	(2)	(3)	(4)	(5)	(6)	(7)
3600-3700 FIXED. FIXED-SATELLITE (space-to-Earth). Mobile.			3600-3700 AERONAUTICAL RADIONAVIGATION (ground-to-air). RADIOLOCATION US110 US245 GSB G110	3600-3700 FIXED-SATELLITE (space-to-Earth). Radiolocation. US110 US245		
706						
3700-4200 FIXED. FIXED-SATELLITE (space-to-Earth). MOBILE except aeronautical mobile.			3700-4200	3700-4200 FIXED. FIXED-SATELLITE (space-to-Earth).	DOMESTIC PUBLIC FIXED (21). SATELLITE COMMUNICATIONS (23).	
767				NG41		
5625-7076			5625-7125	5625-6425 FIXED. FIXED-SATELLITE (Earth-to-space).	DOMESTIC PUBLIC FIXED (21). SATELLITE COMMUNICATIONS (23).	
701 800			701 800	NG41 6425-6625 FIXED-SATELLITE (Earth-to-space). MOBILE 701 800	AUXILIARY BROADCAST (74) CABLE TELEVISION (76) DOMESTIC PUBLIC FIXED (21) PRIVATE OPERATIONAL-FIXED MICROWAVE (M4)	
				6523-6976 FIXED. FIXED-SATELLITE (Earth-to-space). 609	PRIVATE OPERATION- FIXED MICROWAVE (M4).	

Part 2 Current Commission Rules (Cont.)

47 CFR CH. 1, 2.106, CURRENT ALLOCATIONS (cont'd)

International Table		United States Table		FCC Use Designation		
Region 1 - allocation GHz	Region 2 - allocation GHz	Region 3 - allocation GHz	Government Allocation GHz	Non-Government Allocation GHz	Part 15(a) Special-use frequencies	
10.55-10.60 (U)	(2) FIXED, MOBILE except aeronautical mobile, Radiolocation	(3) FIXED	(4) 10.55-10.60 FIXED	(5) 10.55-10.60 FIXED	(6) DOMESTIC PUBLIC FIXED (21)	(7)
10.60-10.65	EARTH EXPLORATION- SATELLITE (passive). FIXED, MOBILE except aeronautical mobile, RADIO ASTRONOMY, SPACE RESEARCH (passive). Radiolocation		10.60-10.65 EARTH EXPLORATION- SATELLITE (passive). SPACE RESEARCH (passive)	10.60-10.65 EARTH EXPLORATION- SATELLITE (passive). FIXED, SPACE RESEARCH (passive)	DOMESTIC PUBLIC FIXED (21)	
10.7-11.7	FIXED, FIXED-SATELLITE (space-to-Earth), (Earth-to-space) SSS MOBILE except aeronautical mobile		US285 US277 10.7-11.7	US285 US277 10.7-11.7 FIXED, FIXED-SATELLITE (space-to-Earth)	DOMESTIC PUBLIC FIXED (21)	

Part 2 Proposed Commission Rule Changes

47 CFR CH. 1.2.108, PROPOSED ALLOCATIONS

International Table			United States Table		FCC Use Descriptions	
Region 1 - allocation MHz	Region 2 - allocation MHz	Region 3 - allocation MHz	Government Allocation MHz	Non-Governmental Allocation MHz	Rule part(s)	Special-use frequencies
(1)	(2)	(3)	(4)	(5)	(6)	(7)
3600-3700 FIXED. FIXED-SATELLITE (space-to-Earth). Mobile.			3600-3700 AERONAUTICAL RADIONAVIGATION (ground-based). RADIOLOCATION US119 US246 (59 9119 3700-4200	3600-3700 FIXED-SATELLITE (space-to-Earth). Radio-location. FIXED. US119 US246	DOMESTIC PUBLIC FIXED (21). PRIVATE OPERATIONAL-FIXED MICROWAVE (54).	
3700-4200 FIXED. FIXED-SATELLITE (space-to-Earth). MOBILE except aeronautical mobile. 767				3700-4200 FIXED. FIXED-SATELLITE (space-to-Earth).	DOMESTIC PUBLIC FIXED (21). SATELLITE COMMUNICATIONS (25). PRIVATE OPERATIONAL-FIXED MICROWAVE (54)	
5625-7075			5625-7125	5625-6425 FIXED. FIXED-SATELLITE (Earth-to-space).	DOMESTIC PUBLIC FIXED (21). SATELLITE COMMUNICATIONS (25). PRIVATE OPERATIONAL-FIXED MICROWAVE (54)	
701 800			701 800	701 800 MOBILE 701 800	DOMESTIC PUBLIC FIXED (21). SATELLITE COMMUNICATIONS (25). PRIVATE OPERATIONAL-FIXED MICROWAVE (54)	
				6425-6525 FIXED-SATELLITE (Earth-to-space). MOBILE 701 800	AUXILIARY BROADCAST (74) CABLE TELEVISION (74) DOMESTIC PUBLIC FIXED (21) PRIVATE OPERATIONAL-FIXED MICROWAVE (54)	
				6525-6875 FIXED. FIXED-SATELLITE (Earth-to-space). 800	DOMESTIC PUBLIC FIXED (21) PRIVATE OPERATIONAL-FIXED MICROWAVE (54).	

Part 2
Proposed Commission Rule Changes
(Cont.)

47 CFR CH. 1, 2.106, PROPOSED ALLOCATIONS (cont'd)

International Table		United States Table		FCC Use Designations		
Region 1 - allocation GHz	Region 2 - allocation GHz	Region 3 - allocation GHz	Government Allocation GHz	Non-Government Allocation GHz	Rule part(s)	Special-use frequencies
10.55-10.60 (1)	(2) FIXED. MOBILE except aeronautical mobile. Radiolocation.	(3) FIXED. MOBILE except aeronautical mobile. Radiolocation.	(4) 10.55-10.60	(5) 10.55-10.60 FIXED.	(6) DOMESTIC PUBLIC FIXED (21).	(7)
10.60-10.68	EARTH EXPLORATION-SATELLITE (passive). FIXED. MOBILE except aeronautical mobile. RADIO ASTRONOMY. SPACE RESEARCH (passive). Radiolocation. 631-632 10.7-11.7	EARTH EXPLORATION-SATELLITE (passive). FIXED. MOBILE except aeronautical mobile. RADIO ASTRONOMY. SPACE RESEARCH (passive). Radiolocation.	10.60-10.68 EARTH EXPLORATION-SATELLITE (passive). SPACE RESEARCH (passive).	10.60-10.68 EARTH EXPLORATION-SATELLITE (passive). FIXED. SPACE RESEARCH (passive).	DOMESTIC PUBLIC FIXED (21).	
10.7-11.7 FIXED. FIXED-SATELLITE (space-to-Earth). (Earth-to-space) 635 MOBILE except aeronautical mobile.	FIXED-SATELLITE (space-to-Earth). MOBILE except aeronautical mobile.		US265 US277 10.7-11.7	US265 US277 10.7-11.7 FIXED. FIXED-SATELLITE (space-to-Earth).	DOMESTIC PUBLIC FIXED (21). PRIVATE OPERATIONAL-FIXED MICROWAVE (84)	

4.3 Frequency Diversity Transmission

Under Part 21, common carriers are prohibited from operating a protection channel if less than a specified number of channels are operable. This restriction is not in Part 94. To provide uniformity and promote spectral efficiency, a new Section 94.65 (n) is proposed.

4.3.1 Current Commission Rules

21.100 Frequencies.

- (c) Frequency diversity transmission will not be authorized in these services in the absence of a factual showing that the required communications cannot practically be achieved by other means. Where frequency diversity is deemed to be justified on a protection channel basis, it shall be limited to one protection channel for the band 3,700-4,200 MHz, one protection channel for the band 5,925-6,425 MHz, and a ratio of one protection channel for three working channels for the band 10,700-11,700 MHz. In the bands 3,700-4,200 MHz and 5,925-6,425 MHz no frequency diversity protection channel will be authorized unless there is a minimum of three working channels, except that where a substantial showing is made that a total of three working channels will be required within 3 years, a protection channel may be authorized simultaneously with the first working channel. A protection channel authorized under such exception will be subject to termination if applications for the third working channel are not filed within 3 years of the grant date of the applications for the first working channel. Where equipment employing digital modulation techniques with cross-polarized operation on the same frequency is used, the protection channel authorized under the above conditions may be considered to consist of both polarizations of the protection frequency where such is shown to be necessary.

4.3.2 Proposed Commission Rule Changes

21.100 Frequencies.

- (c) Frequency diversity transmission will not be authorized in these services in the absence of a factual showing that the required communications cannot practically be achieved by other means. Where frequency diversity is deemed to be justified on a protection channel basis, it shall be limited to one protection channel for the bands 3,600-3,700 MHz and 3,700-4,200 MHz, one protection channel for the bands 5,925-6,425 MHz

and 6,525-6,875 MHz and a ratio of one protection channel for three working channels for the bands 10,550-10,630 MHz and 10,700-11,700 MHz. In the bands 3,600-3,700 MHz, 3,700-4,200 MHz, 5,925-6,425 MHz and 6,525-6,875 MHz no frequency diversity protection channel will be authorized unless there is a minimum of three working channels, except that where a substantial showing is made that a total of three working channels will be required within 3 years, a protection channel may be authorized simultaneously with the first working channel. A protection channel authorized under such exception will be subject to termination if applications for the third working channel are not filed within 3 years of the grant date of the applications for the first working channel. Where equipment employing digital modulation techniques with cross-polarized operation on the same frequency is used, the protection channel authorized under the above conditions may be considered to consist of both polarizations of the protection frequency where such is shown to be necessary.

94.65 Frequencies.

- (n) Frequency diversity transmission will not be authorized in these services in the absence of a factual showing that the required communications cannot practically be achieved by other means. Where frequency diversity is deemed to be justified on a protection channel basis, it shall be limited to one protection channel for the bands 3,600-3,700 MHz and 3,700-4,200 MHz, one protection channel for the bands 5,925-6,425 MHz and 6,525-6,875 MHz and a ratio of one protection channel for three working channels for the bands 10,550-10,630 MHz and 10,700-11,700 MHz. In the bands 3,600-3,700 MHz, 3,700-4,200 MHz, 5,925-6,425 MHz and 6,525-6,875 MHz no frequency diversity protection channel will be authorized unless there is a minimum of three working channels, except that where a substantial showing is made that a total of three working channels will be required within 3 years, a protection channel may be authorized simultaneously with the first working channel. A protection channel authorized under such exception will be subject to termination if applications for the third working channel are not filed within 3 years of the grant date of the applications for the first working channel. Where equipment employing digital modulation techniques with cross-polarized operation on the same frequency is used, the protection channel authorized under the above conditions may be considered to consist of both polarizations of the protection frequency where such is shown to be necessary.*

4.4 Antenna characteristics

In the 10.5 GHz band, DEMS operates on a point-to-multipoint basis. In Section 3.7, ANS proposes reallocating the DEMS band for point-to-point use. Thus, applicable antenna standards must be revised, as set forth in Section 4.4.2.

4.4.1 Current Commission Rules

21.108 Antenna Standards.

Frequency (MHz)	Category	Maximum beam-width to 3 dB points (included angle in degrees)	Minimum antenna gain (dBi)	Minimum radiation suppression to angle in degrees from centerline of main beam in decibels						
				5 ⁰ to 10 ⁰	10 ⁰ to 15 ⁰	15 ⁰ to 20 ⁰	20 ⁰ to 30 ⁰	30 ⁰ to 100 ⁰	100 ⁰ to 140 ⁰	140 ⁰ to 180 ⁰
932.5-935	A	14.0	NA		6	11	14	17	20	24
941.5-944	B	20.0	NA			6	10	13	15	20
2,500-5,000	A	NA	36	23	29	33	36	42	55	55
	B	NA	36	20	24	28	32	32	32	32
5,000-10,550	A	NA	38.0	25	29	33	36	42	55	55
	B	NA	38.0	20	24	28	32	35	36	36
10,550-10,565 ⁴	A	3.4	34.0	20	24	28	32	35	55	55
	B	3.4	34.0	20	24	28	32	35	35	39
10,565-10,615	NA	360	NA	NA	NA	NA	NA	NA	NA	NA
10,615-10,630	A	3.4	34.0	20	24	28	32	35	55	55
	B	3.4	34.0	20	24	28	32	35	35	39
10,630-10,680	NA	NA	34.0	20	24	28	32	35	36	36
17,700-18,820	A	NA	38.0	25	29	33	36	42	55	55
	B	NA	38.0	20	24	28	32	35	36	36
18,920-19,700 ¹	A	NA	38.0	25	29	33	36	42	55	55
	B	NA	38.0	20	24	28	32	35	36	36
21,200-23,600	A	NA	38.0	25	29	33	36	42	55	55
	B	NA	38.0	20	24	28	32	35	36	36
31,000-31,300 ^{2 3}	NA	4.0	38.0	NA	NA	NA	NA	NA	NA	NA
Above 31,300	A	NA	38.0	25	29	33	36	42	55	55
	B	NA	38.0	20	24	28	32	35	36	36

- 1 Digital Termination User Station antenna and point-to-point microwave radio station antennas in this band shall meet performance Standard B and have a minimum antenna gain of 34 dBi.
- 2 The minimum front-to-back ratio shall be 38 dBi.
- 3 Mobile, except aeronautical mobile, stations need not comply with these standards.
- 4 Except for such antennas between 140° and 180° authorized or pending on January 1, 1989, for which minimum radiation suppression to angle (in degrees) from centerline of main beam is 36 decibels.

94.75 Antenna Limitations.

(b) Directional antennas shall meet the performance standards (for parallel polarization) indicated in the following table:

<u>decibels</u>	Maximum beam-width to 3 dB	Minimum radiation suppression to angle in degrees from centerline of main beam in								
		points (included angle in degrees)	Minimum antenna gain (dBi)	5 ⁰ to 10 ⁰	10 ⁰ to 15 ⁰	15 ⁰ to 20 ⁰	20 ⁰ to 30 ⁰	30 ⁰ to 100 ⁰	100 ⁰ to 140 ⁰	140 ⁰ to 180 ⁰
932.5-935	A	14.0	NA		6	11	14	17	20	24
941.5-944	B	20.0	NA			6	10	13	15	20
952-960	A	14.0	NA		6	11	14	17	20	24
	B	20.0	NA			6	10	13	15	20
1,850-2,690	A	5.0	NA	12	18	22	25	29	33	39
	B	8.0	NA	5	18	20	20	25	28	36
6,525-6,875	A	1.5	NA	26	29	32	34	38	41	49
	B	2.0	NA	21	25	29	32	35	39	45
10,550-10,565	A	3.4	34.0	20	24	28	32	35	55	55
	B	3.4	34.0	20	24	28	32	35	35	39
10,565-10,615	NA	360	NA	NA	NA	NA	NA	NA	NA	NA
10,615-10,630	A	3.4	34.0	20	24	28	32	35	55	55
	B	3.4	34.0	20	24	28	32	35	35	39
10,630-10,680	NA	NA	34.0	20	24	28	32	35	36	36
12,200-13,250	A	1.0	NA	23	28	35	39	41	42	50
	B	2.0	NA	20	25	28	30	32	37	47
17,700-19,700	A	NA	38.0	25	29	33	36	42	55	55
	B	NA	38.0	20	24	28	32	35	36	36
21,200-23,600	A	NA	38.0	25	29	33	36	42	55	55
	B	NA	38.0	20	24	28	32	35	36	36
31,000-31,300	NA	4.0	38.0	NA	NA	NA	NA	NA	NA	NA
27,500-29,500	A	NA	38.0	25	29	33	36	42	55	55
	B	NA	38.0	20	24	28	32	35	36	36
38,600-40,000	A	NA	38.0	25	29	33	36	42	55	55
	B	NA	38.0	20	24	28	32	35	36	36

4.4.2 Proposed Commission Rule Changes

21.108 Antenna Standards.

Frequency (MHz)	Category	Maximum beam-width to 3 dB points (included angle in degrees)	Minimum antenna gain (dBi)	Minimum radiation suppression to angle in degrees from centerline of main beam in decibels						
				5 ⁰ to 10 ⁰	10 ⁰ to 15 ⁰	15 ⁰ to 20 ⁰	20 ⁰ to 30 ⁰	30 ⁰ to 100 ⁰	100 ⁰ to 140 ⁰	140 ⁰ to 180 ⁰
932.5-935	A	14.0	NA		6	11	14	17	20	24
941.5-944	B	20.0	NA			6	10	13	15	20
2,500-5,000	A	NA	36	23	29	33	36	42	55	55
	B	NA	36	20	24	28	32	32	32	32
5,000-10,550	A	NA	38.0	25	29	33	36	42	55	55
	B	NA	38.0	20	24	28	32	35	36	36
10,550-10,680	A	3.4	34.0	20	24	28	32	35	55	55
	B	3.4	34.0	20	24	28	32	35	35	39
17,700-18,820	A	NA	38.0	25	29	33	36	42	55	55
	B	NA	38.0	20	24	28	32	35	36	36
18,920-19,700 ¹	A	NA	38.0	25	29	33	36	42	55	55
	B	NA	38.0	20	24	28	32	35	36	36
21,200-23,600	A	NA	38.0	25	29	33	36	42	55	55
	B	NA	38.0	20	24	28	32	35	36	36
31,000-31,300 ^{2 3}	NA	4.0	38.0	NA	NA	NA	NA	NA	NA	NA
Above 31,300	A	NA	38.0	25	29	33	36	42	55	55
	B	NA	38.0	20	24	28	32	35	36	36

- 1 Digital Termination User Station antenna and point-to-point microwave radio station antennas in this band shall meet performance Standard B and have a minimum antenna gain of 34 dBi.
- 2 The minimum front-to-back ratio shall be 38 dBi.
- 3 Mobile, except aeronautical mobile, stations need not comply with these standards.
- 4 Except for such antennas between 140° and 180° authorized or pending on January 1, 1989, for which minimum radiation suppression to angle (in degrees) from centerline of main beam is 36 decibels.
- 5 *Reserved*

94.75 Antenna limitations.

(b) Directional antennas shall meet the performance standards (for parallel polarization) indicated in the following table:

<u>decibels</u>	Cate- gory	Maximum beam- width to 3 dB points (included angle in degrees)	Minimum antenna gain (dBi)	Minimum radiation suppression to angle in degrees from centerline of main beam in						
				5 ⁰ to 10 ⁰	10 ⁰ to 15 ⁰	15 ⁰ to 20 ⁰	20 ⁰ to 30 ⁰	30 ⁰ to 100 ⁰	100 ⁰ to 140 ⁰	140 ⁰ to 180 ⁰
932.5-935	A	14.0	NA		6	11	14	17	20	24
941.5-944	B	20.0	NA			6	10	13	15	20
952-960	A	14.0	NA		6	11	14	17	20	24
	B	20.0	NA			6	10	13	15	20
1,850-2,690	A	5.0	NA	12	18	22	25	29	33	39
	B	8.0	NA	5	18	20	20	25	28	36
12,200-13,250	A	1.0	NA	23	28	35	39	41	42	50
	B	2.0	NA	20	25	28	30	32	37	47
17,700-19,700	A	NA	38.0	25	29	33	36	42	55	55
	B	NA	38.0	20	24	28	32	35	36	36
21,200-23,600	A	NA	38.0	25	29	33	36	42	55	55
	B	NA	38.0	20	24	28	32	35	36	36
31,000-31,300	NA	4.0	38.0	NA	NA	NA	NA	NA	NA	NA
27,500-29,500	A	NA	38.0	25	29	33	36	42	55	55
	B	NA	38.0	20	24	28	32	35	36	36
38,600-40,000	A	NA	38.0	25	29	33	36	42	55	55
	B	NA	38.0	20	24	28	32	35	36	36

Note: For the 3,600-3,700 GHz, 3,700-4200 GHz, 5,925-6,425 GHz, 6,525-6,875 GHz, 10,550-10,630 GHz, and 10,700-11,700 GHz point-to-point microwave bands, antenna standards shall be in accordance with Section 21.108.

4.5 Proposed minimum system loading requirements

There are a wide variety of system loading requirements for the 4 and 6 GHz common carrier bands and for the 6 GHz private op-fixed band. Pursuant to Section 21.710, the Commission requires a minimum system loading of 900 voice channels within 5 years or a minimum original data loading of 10 megabits per second for the 4 and 6 GHz common carrier bands. Section 21.122 also specifies a minimum of 1152 digitally encoded voice channels for systems using the full authorized bandwidth. There are currently no comparable system loading or spectral efficiency requirements for the upper 6 GHz private op-fixed band in FCC Part 94. See Section 4.5.1 below.

If the 4 and 6 GHz common carrier bands and the 6 GHz private band are to be shared by the same users, it is important to set uniform standards to promote spectrum conservation and to encourage balanced use of the bands. Consequently, it is proposed that the requirements depicted in Table 7 be adopted in FCC Parts 21 and 94 for digital transmission systems, as set forth in Section 4.5.2 below:

TABLE 7

MINIMUM DIGITAL SYSTEM PERFORMANCE REQUIREMENTS (3.6 GHz, 4 GHz, Lower 6 GHz, Upper 6 GHz)

Nominal Channel Bandwidth (MHz)	Minimum Payload Capacity (Mbits/s)	Minimum Traffic Loading Payload (as per cent of payload capacity)	Typical Utilization
0.400	1.54	N/A	1 DS-1
0.800	3.08	N/A	2 DS-1
1.60	6.17	N/A	4 DS-1
3.20	12.3	N/A	8 DS-1
5.00	18.5	N/A	12 DS-1
10.0*	44.7	50	1xDS-3/1xSTS-1
20.0	89.4	50	2xDS-3/2xSTS-1
30.0*	89.4	50	2xDS-3/2xSTS-1

- * Note that at the higher microwave frequency bands, higher system gain is required due to the rain outage problem. To permit higher system gain (less complex modulation scheme) and encourage the use of higher frequencies, minimum capacity for 11 GHz is 12 DS-1 for 10 MHz channel bandwidth and 1 DS-3 for 30 MHz channel bandwidth.

General Note: Concatenation of multiple contiguous channels is permitted as long as the minimum payload capacity requirements are met.

Current utilization of analog systems is decreasing. The few existing analog systems are for low density applications. Minimum loading requirements for these systems is difficult to establish. Thus, deletion of minimum loading requirements for analog systems is recommended.

4.5.1 Current Commission Rules

21.122 Microwave digital modulation.

- (a) Microwave transmitters employing digital modulation techniques and operating below 15 GHz shall, with appropriate multiplex equipment, comply with the following additional requirements:
 - (1) The bit rate, in bits per second, shall 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 shall not include any authorized guard band.

- (2) *Equipment to be used for voice transmission shall be capable of satisfactory operation within the authorized bandwidth to encode at least the following number of voice channels:*

<i>Frequency range</i>	<i>Number of encoded voice channels</i>
<i>2,110 to 2,130</i>	<i>96</i>
<i>2,160 to 2,180</i>	<i>96</i>
<i>3,700 to 4,200</i>	<i>1,152</i>
<i>5,925 to 6,425</i>	<i>1,152</i>
<i>10,700 to 11,700</i>	<i>1,152</i>

- (3) *The required minimum number of channels shown in paragraph (a)(2) of this section may be reduced by a factor 1/N provided that N transmitters may be operated satisfactorily within an authorized bandwidth less than, or equal to, the maximum authorizable bandwidth over the same radio path (e.g., (i) the 1152 channels requirement may be reduced to 576 if two transmitters can be satisfactorily operated over the same path within a 40 MHz maximum bandwidth for the 11 GHz band, or, (ii) reduced to 288 channels if four transmitters can be satisfactorily accommodated within this bandwidth). Applications submitted for equipment type acceptance designed to operate in this mode must include data which will demonstrate successful operation under typical transmission conditions. 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.*

94.94 Microwave digital modulation.

Microwave transmitters employing digital modulation techniques in the bands 10,550-10,680 and 17,700-19,700 MHz shall 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). In the 17,700-19,700 MHz band, this bps/Hz standard is independent of the antenna (polarization) used,

frequency reuse, or how the system is configured.

4.5.2 Proposed Commission Rule Changes

21.122 Microwave digital modulation.

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

(1) The bit rate, in bits per second, shall 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 shall not include any authorized guard band.

(2) For digital modulation the following requirements must be met:

<i>Nominal Channel Bandwidth (MHz)</i>	<i>Minimum Payload Capacity (Mbits/s)</i>	<i>Minimum Traffic Loading Payload (as per cent of payload capacity)</i>	<i>Typical Utilization</i>
0.400	1.54	N/A	1 DS-1
0.800	3.08	N/A	2 DS-1
1.60	6.17	N/A	4 DS-1
3.20	12.3	N/A	8 DS-1
5.00	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	89.4	50	2 DS-3/STS-1

The minimum capacity for a 11 GHz digital channel is 12 DS-1 for 10 MHz channel bandwidth and 1 DS-3 for 30 MHz channel bandwidth.

For all bands, concatenation of multiple contiguous channels is permitted as long as the minimum payload capacity requirements are met.

(3) *The required minimum payload capacity shown in paragraph (a)(2) of this section may be reduced by a factor 1/N provided that N transmitters may be operated satisfactorily within an authorized bandwidth less than, or equal to, the maximum authorizable*

bandwidth over the same radio path (e.g., the 89.4 Mb/s requirement for a 20 MHz maximum bandwidth may be reduced to 44.7 Mb/s if two transmitters can be satisfactorily operated over the same path within the 20 MHz maximum bandwidth). Applications submitted for equipment type acceptance designed to operate in this mode must include data which will demonstrate successful operation under typical transmission conditions. 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.

94.94 Microwave digital modulation.

Microwave transmitters employing digital modulation techniques in the bands 10,550-10,680 and 17,700-19,700 MHz shall 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). In the 17,700-19,700 MHz band, this bps/Hz standard is independent of the antenna (polarization) used, frequency reuse, or how the system is configured. *For the 3,600-3,700 MHz, 3,700-4200 MHz, 5,925-6,425 MHz, 6,525-6,875 MHz, 10,550-10,630 MHz, and 10,700-11,700 MHz point-to-point microwave bands, standards of Section 21.122 shall be met.*

4.6 Frequency Band Allocations

As a result of ANS' proposed reallocation, various changes are necessary in frequency band allocations. These changes are set forth in Section 4.6.2.

4.6.1 Current Commission Rules

21.701 Frequencies.

(a) Frequencies in the following bands are available for assignment to fixed radio stations in the Point-to-Point Microwave Radio Service.

932.5-935 MHz	17	17,700-18,820	5	10	15			
941.5-944 MHz	17	18	18,920-19,160	5	10	15		
2,110-2,130 MHz	1	3	7	19,260-19,700	5	10	15	
2,160-2,180 MHz	1	2	5	21,200-22,000 MHz	4	11	12	13
3,700-4,200 MHz	5	8	22,000-23,600 MHz	4	11	12		
10,550-10,565 MHz	14	10,615-10,630 MHz	14	27,500-29,500 MHz	5			
10,700-11,700 MHz	8	9	31,000-31,300 MHz	16				
13,200-13,250 MHz	4	38,600-40,000 MHz	4					

94.61 Applicability.

(b) Frequencies in the following bands are available for assignment to stations in the Private Operational-Fixed Service:

Frequency Band (MHz)

928 to 929	(19) and (20)
932 to 932.5	(32)
932.5 to 935	(33)
941 to 941.5	(32)
941.5 to 944	(33) and (34)
952 to 960	(1) and (20)
1850 to 1990	(2)
2130 to 2150	(2) and (21)
2150 to 2160	(3)
2180 to 2200	(2) and (21)
2450 to 2500	(4) and (21)
2500 to 2690	(5) and (22)

6425 to 6525	(30) and (31)
6525 to 6575	(28)
6575 to 6625	(2) and (28)
6625 to 6875	(2) (8) and (28)
10,550 to 10,680	(24)
12,200 to 12,500	(2) (21) (25)
12,500 to 12,700	(2) (6) (21) (25)
12,700 to 13,200	(26)
13,200 to 13,250	(9) (14) (21)
17,700 to 18,580	(6) (8) (10) (21) (27)
18,580 to 18,820	(10) (17) (21)
18,820 to 18,920	(21) (24)
18,920 to 19,160	(10) (17) (21)
19,160 to 19,260	(21) (24)
19,260 to 19,700	(10) (21) (27)
21,200 to 22,000	(10) (11) (12) (13) (23)
22,000 to 23,600	(10) (12) (13) (23)
31,000 to 31,300	(23) (29)
38,600 to 40,000	(9) (18) (23)
Bands above 40,000	(16) (23)

¹³ This frequency band is shared with US Government stations.

4.6.2 Proposed Commission Rule Changes

21.701 Frequencies.

(a) Frequencies in the following bands are available for assignment to fixed radio stations in the Point-to-Point Microwave Radio Service.

932.5-935 MHz	17	13,200-13,250 MHz	4
941.5-944 MHz	17 18	17,700-18,820	5 10 15
2,110-2,130 MHz	1 3 7	18,920-19,160	5 10 15
2,160-2,180 MHz	1 2 5	19,260-19,700	5 10 15
3,600-3,700 MHz		21,200-22,000 MHz	4 11 12 13
3,700-4,200 MHz	5 8	22,000-23,600 MHz	4 11 12
5,925-6,425 MHz		27,500-29,500 MHz	5
6,525-6,875 MHz		31,000-31,300 MHz	16
10,550-10,630 MHz		38,600-40,000 MHz	4
10,700-11,700 MHz	8 9		

94.61 Applicability.

(b) Frequencies in the following bands are available for assignment to stations in the Private Operational-Fixed Service:

Frequency Band (MHz)	
928 to 929	(19) and (20)
932 to 932.5	(32)
932.5 to 935	(33)
941 to 941.5	(32)
941.5 to 944	(33) and (34)
952 to 960	(1) and (20)
1850 to 1990	(2)
2130 to 2150	(2) and (21)
2150 to 2160	(3)
2180 to 2200	(2) and (21)
2450 to 2500	(4) and (21)
2500 to 2690	(5) and (22)
3600 to 3700	(13)
3700 to 4200	
5925 to 6425	
6425 to 6525	(30) and (31)
6525 to 6575	(28)
6575 to 6625	(2) and (28)
6625 to 6875	(2) (8) and (28)
10,550 to 10,680	(24)
10,700 to 11,700	
12,200 to 12,500	(2) (21) (25)
12,500 to 12,700	(2) (6) (21) (25)
12,700 to 13,200	(26)
13,200 to 13,250	(9) (14) (21)
17,700 to 18,580	(6) (8) (10) (21) (27)
18,580 to 18,820	(10) (17) (21)
18,820 to 18,920	(21) (24)
18,920 to 19,160	(10) (17) (21)
19,160 to 19,260	(21) (24)
19,260 to 19,700	(10) (21) (27)
21,200 to 22,000	(10) (11) (12) (13) (23)
22,000 to 23,600	(10) (12) (13) (23)
31,000 to 31,300	(23) (29)
38,600 to 40,000	(9) (18) (23)
Bands above 40,000	(16) (23)

(13) This frequency band is shared with US Government stations.

4.7 Minimum path length requirements

Under Section 21.710 of the Commission's Rules, the minimum allowable path length in the 2 GHz common carrier band is 5 kilometers (3.1 miles) and the minimum path length in the 4 and 6 GHz bands is 17 kilometers (10.6 miles). Similarly, Section 94.79 prescribes a minimum path length of 17 kilometers for the 6 GHz private band. However, Section 94.79 also permits shorter paths if the effective isotropic radiated power (EIRP) of the transmitter is significantly reduced according to a specified formula. Application of this formula allows the use of 6 GHz on short paths when a very high reliability is required (e.g., public safety microwave systems, paths carrying nuclear power plant telemetry data or electronic fund transfer data for banks). See Section 4.7.1 below.

With co-primary use of the 4 and 6 GHz bands by private op-fixed and common carriers, flexible and uniform path length requirements must be applied to both user classes. Thus, as set forth in Section 4.7.2 below, it is proposed that Section 94.79 replace the current inflexible Section 21.710 limitations for the common carrier bands. The new allocations would be added to both bands.

4.7.1 Current Commission Rules

21.710 Limitations on path lengths and channel loading.

(a) *Frequencies in the following bands may not be used on transmission paths shorter than the indicated distances.*

<i>Frequency Band (MHz)</i>	<i>Minimum path distances (in kilometers)</i>
2,110 to 2,130	5
2,160 to 2,180	5
3,700 to 4,200	17
5,925 to 6,425	17
10,700 to 11,700	5

- (b) *Exception to the limits in paragraph (a) of this section may be made by the Commission when a showing (with supporting facts) is made that use of a frequency in conformance with the rule would entail excessive cost in construction or maintenance or would otherwise create substantial difficulties. The alternate frequency proposal must be shown to be consistent with good engineering practice under the circumstances. Stricter adherence to these limitations is expected in areas of general frequency congestion. The distance limitation does not apply to a frequency which is power split if one transmission path utilizing that frequency meets the minimum distance requirement.*
- (c) *Except for video transmission, an application for an initial working channel over a given route will not be accepted for filing where the anticipated loading (within five years or other period subject to reasonable projection) is less than the minimum specified for the following frequency bands. Absent extraordinary circumstances, applications proposing additional frequencies over existing routes will not be granted unless it is shown that the traffic load will shortly exhaust the capacity of the existing equipment. For the 3700-4200 MHz band, all persons intending to utilize baseband frequencies above 7.3 MHz, or to operate with more than 1500 equivalent 4 kHz voice channels per radio channel, must submit evidence of coordination pursuant to 21.100(d). Where no construction of radio facilities is requested, licensees must submit this evidence with their filing of any necessary authority required pursuant to section 214 of the Communications Act and Part 63 of this chapter.*

<i>Frequency Band (MHz)</i>	<i>Minimum number voice channels (4 kHz or equivalent)</i>	<i>Minimum original data loading (in Mb/s)</i>
<i>3,700 to 4,200</i>	<i>900</i>	<i>10</i>
<i>5,925 to 6,425</i>	<i>900</i>	<i>10</i>
<i>10,700 to 11,700 (20 MHz band width or less)</i>	<i>240</i>	<i>5</i>
<i>10,700 to 11,700 (bandwidth more than 20 MHz)</i>	<i>900</i>	<i>10</i>

Where transmitters employing digital modulation techniques are designed to be used so that two may simultaneously operate on the same frequency over the same path, the minimum number of voice channels specified above is reduced from 900 to 500 per transmitter for the bands 3,700-4,200 MHz, 5,925-6,425 MHz, and 10,700-11,700 MHz.

94.79 Minimum path lengths for fixed links.

- (a) The distance between end points of a fixed link 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 2,110	17
6,425 to 7,125	17
12,200 to 13,250	5
Above 17,700	N/A

- (b) For paths shorter than those specified in the Table, the EIRP shall 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.

- (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.

4.7.2 Proposed Commission Rule Changes

21.710 Limitations on path lengths

- (a) *The distance between end points of a fixed link 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 shall not exceed the value derived from the following equation.

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

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 (ATPC) may be used to meet this requirement.

- (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.

94.79 Minimum path lengths for fixed links.

- (a) The distance between end points of a fixed link 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 shall not exceed the value derived from the following equation.

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

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 (ATPC) may be used to meet this requirement.

- (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.

4.8 Frequency planning and coordination criteria

Band sharing between common carriers and private op-fixed users currently is permitted in certain bands, including 18 GHz. Frequency planning and coordination in those shared bands is based upon Part 21 standards. Since all the bands proposed to be reallocated are common carrier, except for the upper 6 GHz band, ANS proposes applying the Part 21 standards across-the-board, as set forth in Section 4.8.2 herein.

4.8.1 Current Commission Rules

94.63 Interference protection criteria for operational fixed stations.

- (a) Before filing an application for new or modified facilities under this part, the applicant must perform a frequency engineering analysis to assure that the proposed facilities will not cause interference to existing or previously applied-for stations in this service of a magnitude greater than that specified in the criteria set forth in paragraph (b) of this section, unless otherwise agreed to in accordance with 94.15(b). As an exception to the above requirement, when the proposed facilities are to be operated in the bands 932-935 MHz, 941-944 MHz, 10,550-10,680 MHz, 17,700-19,700 MHz, 21,200-21,800 MHz, 22,400-23,000 MHz, or 38,600-40,000 MHz (excluding those frequencies set out in 94.189), applicants shall follow the prior coordination procedure specified in 21.100(d) of this chapter. In addition, when the proposed facilities are to be operated in the bands 2655-2690 MHz, or 12,500-12,700 MHz, applications shall also follow the procedures in 21.706(c) and (d) and the technical standards and requirements of part 25 of this chapter as regards licensees in the Communication-Satellite Service. See also 94.77.

4.8.2 Proposed Commission Rule Changes

94.63 Interference protection criteria for operational fixed stations.

- (a) Before filing an application for new or modified facilities under this part, the applicant must perform a frequency engineering analysis to assure that the proposed facilities will not cause interference to existing or previously applied-for stations in this service of a magnitude greater than that specified

in the criteria set forth in paragraph (b) of this section, unless otherwise agreed to in accordance with 94.15(b). As an exception to the above requirement, when the proposed facilities are to be operated in the bands 932-935 MHz, 941-944 MHz, 3,600-3,700 MHz, 3,700-4200 MHz, 5,925-6,425 MHz, 6,525-6,875 MHz, 10,550-10,630 MHz, 10,550-10,680 MHz, 10,700-11,700 MHz, 17,700-19,700 MHz, 21,200-21,800 MHz, 22,400-23,000 MHz, or 38,600-40,000 MHz (excluding those frequencies set out in 94.189), applicants shall follow the prior coordination procedure specified in 21.100(d) of this chapter. In addition, when the proposed facilities are to be operated in the bands 2655-2690 MHz, or 12,500-12,700 MHz, applications shall also follow the procedures in 21.706(c) and (d) and the technical standards and requirements of part 25 of this chapter as regards licensees in the Communication-Satellite Service. See also 94.77.

4.9 Bandwidth limitations

Part 94 must be updated to conform to the proposed channelizations.

4.9.1 Current Commission Rules

94.71 Emission and bandwidth limitations.

- (b) The maximum bandwidth which will be authorized per frequency assigned is set out in the table which follows. Regardless of the maximum authorized bandwidth specified for each frequency band, the Commission reserves the right to issue a license for less than the maximum bandwidth if it appears that a lesser bandwidth would be sufficient to support an applicant's intended communications.

<u>Frequency Band (MHz)</u>	<u>Maximum authorized bandwidth</u>
928-929	12.5, 25 kHz
932-932.5, 941-941.5	12.5 kHz
932.5-935, 941.5-944	12.5, 25, 50, 100, 200 kHz
952-960	12.5, 25, 50, 100, 200 kHz
1850-1990 MHz	5 or 10 MHz
2130-2150 MHz	800 or 1600 kHz
2150-2160	10 MHz
2180-2200	800 or 1800 kHz
2450-2483.5	625 kHz
2483.5-2500	800 kHz
2650-2680 MHz	6 MHz
2686.9375-2688.9375 MHz	125 kHz
6425-6525	25
6525-6875 MHz	5 or 10 MHz
10,550-10,680	5
12,200 to 12,700	10 or 20
13,200 to 13,250	25
17,700 to 18,140	80
18,140 to 18,142	2
18,142 to 18,580	6
18,580 to 18,820	20
18,920 to 19,160	20
19,160 to 19,260	10
19,260 to 19,700	80
21,200 to 23,600	up to 100 MHz
31,000 to 31,300	25 or 50 MHz
38,600 to 40,000 MHz	up to 50 MHz
Bands above 40,000 MHz	