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[Revised as of October 1, 2008]  
From the U.S. Government Printing Office via GPO Access  
[CITE: 47CFR101.105]

## TITLE 47--TELECOMMUNICATION

### CHAPTER I--FEDERAL COMMUNICATIONS COMMISSION (CONTINUED)

#### PART 101\_FIXED MICROWAVE SERVICES--Table of Contents

##### Subpart C\_Technical Standards

#### Sec. 101.105 Interference protection criteria.

(a) The interference protection criteria for fixed stations subject to this part are as follows:

(1) To long-haul analog systems, employing frequency modulated radio and frequency division multiplexing to provide multiple voice channels, the allowable interference level per exposure:

(i) Due to co-channel sideband-to-sideband interference must not exceed 5 pwp0 (Picowatts of absolute noise power psophometrically weighted (pwp0), appearing in an equivalent voice band channel of 300-3400 Hz); or

(ii) Due to co-channel carrier-beat interference must not exceed 50 pwp0.

(2) To short-haul analog systems employing frequency modulated radio and frequency division multiplexing to provide multiple voice channels, the allowable interference level per exposure:

(i) Due to co-channel sideband-to-sideband interference must not exceed 25 pwp0 except in the 952-960 MHz band interference into single link fixed relay and control stations must not exceed 250 pwp0 per exposure; or

(ii) Due to co-channel carrier-beat interference must not exceed 50 pwp0 except in the 952-960 MHz band interference into single link fixed relay and control stations must not exceed 1000 pwp0 per exposure.

(3) FM-TV. In analog systems employing frequency modulated radio that is modulated by a standard, television (visual) signal, the allowable interference level per exposure may not exceed the levels which would apply to long-haul or short-haul FM-FDM systems, as outlined in paragraphs (b) (1) and (2) of this section, having a 600-1200 voice channel capacity.

(4) 12.2-12.7 GHz band. (i) To accommodate co-primary NGS0 FSS earth stations in the 12.2-12.7 GHz band, the PFD of an MVDDS transmitting system must not exceed  $-135 \text{ dBW/m}^2$  in any 4 kHz band at a reference point at the surface of the earth at a distance greater than 3 kilometers from the MVDDS transmitting antenna.

(ii) To accommodate co-primary Direct Broadcast Satellite Service

earth stations, an MVDDS transmitting system must not exceed the EPFD levels specified in paragraph (a)(4)(ii)(B) of this section at any DBS subscriber location in accordance with the procedures listed in Sec. 101.1440 of this part.

(A) Definition of equivalent power flux density: The equivalent power flux density (EPFD) is the power flux density produced at a direct broadcast service (DBS) receive earth station, taking into account shielding effects and the off-axis discrimination of the receiving antenna assumed to be pointing at the appropriate DBS satellite(s) from the transmitting antenna of a multichannel video distribution and data service (MVDDS) transmit station. The EPFD in  $\text{dBW/m}^2$  in the reference bandwidth is calculated using the following formula:  
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Where:

$P_{out}$  = Total output power of the MVDDS transmitter (watts) into antenna

$G_m$  ( $[\theta]_m, [\phi]_m$ ) = Gain of the MVDDS antenna in the direction of the DBS earth station

$G_e$  ( $[\theta]_e, [\phi]_e$ ) = Gain of the earth station in the direction of the MVDDS antenna

$I$  = Interference scaling factor for the earth station (1 dB for MVDDS transmitters employing the modulation discussed in Section 3.1.5 of the MITRE Report (i.e., a QPSK modulated signal passed through a square-root raised cosine filter). For other modulation and filtering schemes, the interference scaling factor can be measured using the procedures described in Appendix A of the MITRE Report available at <http://www.fcc.gov/oet/info/mitrereport/mitrereport--4--01.pdf>).

$G_{e, \max}$  = Maximum gain of the DBS earth station

$d$  = the distance between the MVDDS transmitting antenna and the DBS earth station (meters)

(B) Regional equivalent power flux density levels:

(1)  $-168.4 \text{ dBW/m}^2/4\text{kHz}$  in the Eastern region consisting of the District of Columbia and the following states: Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, West Virginia, Kentucky, Tennessee, North Carolina, South Carolina, Georgia, Alabama, Mississippi, Louisiana, and Florida;

(2)  $-169.8 \text{ dBW/m}^2/4\text{kHz}$  in the Midwestern region consisting of the following states: Ohio, Michigan, Indiana, Wisconsin, Illinois, Minnesota, Iowa, Missouri, Arkansas, South Dakota, Nebraska, Kansas, Oklahoma, and Texas;

(3)  $-171.0 \text{ dBW/m}^2/4\text{kHz}$  in the Southwestern region consisting of the following states: Wyoming, Colorado, New Mexico, Utah, Arizona, Nevada, and California (south of  $37^\circ$  North Latitude);

(4)  $-172.1 \text{ dBW/m}^2/4\text{kHz}$  in the Northwestern region consisting of the following states: Washington, Oregon, California (north of  $37^\circ$  North Latitude), Idaho, Montana, North Dakota, Alaska, and Hawaii.

(iii) Except for public safety entities, harmful interference protection from MVDDS stations to incumbent point-to-point 12 GHz fixed stations is not required. Incumbent point-to-point private operational fixed 12 GHz stations, except for public safety entities, are required to protect MVDDS stations under the process described in Sec.

101.103(d) of this part.

(5) 71,000-76,000 MHz; 81,000-86,000 MHz. In these bands the following interference criteria shall apply:

(i) For receivers employing digital modulation: based upon manufacturer data and following TSB 10-F or other generally acceptable good engineering practice, for each potential case of interference a threshold-to-interference ratio (T/I) shall be determined that would cause 1.0 dB of degradation to the static threshold of the protected receiver. For the range of carrier power levels (C) between the clear-air (unfaded) value and the fully-faded static threshold value, in no case shall interference cause C/I to be less than the T/I so determined unless it can be shown that the availability of the affected receiver would still be acceptable despite the interference.

(ii) For receivers employing analog modulation: manufacturer data or industry criteria will specify a baseband signal-to-noise requirement (S/N) of the receiver that will result in acceptable signal quality for continuous operation. Following TSB 10-F or other generally acceptable good engineering practice, for each potential case of interference a C/I objective shall be calculated to ensure that this S/N will not be degraded by more than 1.0 dB. For the range of carrier power levels (C) between the clear-air (unfaded) value and the fully-faded threshold value, in no case shall interference cause the C/I to be less than the objective so determined unless it can be shown that the signal quality and availability of the affected receiver would still be acceptable despite the interference.

(6) 92,000-94,000 MHz; 94,100-95,000 MHz. In these bands prior links shall be protected to a threshold-to-interference ratio (T/I) level of 1.0 dB of degradation to the static threshold of the protected receiver. Any new link shall not decrease a previous link's desired-to-undesired (D/U) signal ratio below a minimum of 36 dB, unless the earlier link's licensee agrees to accept a lower D/U.

(7) All stations operating under this part must protect the radio quiet zones as required by Sec. 1.924 of this chapter. Stations authorized by competitive bidding are cautioned that they must receive the appropriate approvals directly from the relevant quiet zone entity prior to operating.

(b) In addition to the requirements of paragraph (a) of this section the adjacent channel interference protection criteria to be afforded, regardless of system length, or type of modulation, multiplexing, or frequency band, must be such that the interfering signal does not produce more than 1.0 dB degradation of the practical threshold of the protected receiver. The ``practical threshold'' of the protected receiver can be based upon the definition in TSB 10, referenced in paragraph (c) of this section, or upon alternative generally acceptable good engineering standards.

(c) Applying the criteria. (1) Guidelines for applying the interference protection criteria for fixed stations subject to this part are specified in the Telecommunications Industry Association's Telecommunications Systems Bulletin TSB 10, ``Interference Criteria for Microwave Systems'' (TSB 10). Other procedures that follow generally acceptable good engineering practices are also acceptable to the Commission.

(2) If TSB 10 guidelines cannot be used, the following interference protection criteria may be used by calculating the ratio in dB between the desired (carrier signal) and the undesired (interfering) signal (C/I ratio) appearing at the input to the receiver under investigation

(victim receiver). Except as provided in Sec. 101.147 where the applicant's proposed facilities are of a type not included in paragraphs (a) and (b) of this section or where the development of the carrier-to-interference (C/I) ratio is not covered by generally acceptable procedures, or where the applicant does not wish to develop the carrier-to-interference ratio, the applicant must, in the absence of criteria or a developed C/I ratio, employ the following C/I protection ratios:

(i) Co-Channel Interference. Both side band and carrier-beat, applicable to all bands; the existing or previously authorized system must be afforded a carrier to interfering signal protection ratio of at least 90 dB, except in the 952-960 MHz band where it must be 75dB, and in the 71,000-76,000 MHz and 81,000-86,000 MHz bands where the criteria in paragraph (a)(5) of this section applies, and in the 92,000-94,000 MHz and 94,100-95,000 MHz bands, where the criteria in paragraph (a)(6) of this section applies; or

(ii) Adjacent Channel Interference. Applicable to all bands; the existing or previously authorized system must be afforded a carrier to interfering signal protection ratio of at least 56 dB, except in the 71,000-76,000 MHz and 81,000-86,000 MHz bands where the criteria in paragraph (a)(5) of this section applies, and in the 92,000-94,000 MHz and 94,100-95,000 MHz bands, where the criteria in paragraph (a)(6) of this section applies.

(3) Applicants for frequencies listed in Sec. 101.147(b)(1) through (4) must make the following showings that protection criteria have been met over the entire service area of existing systems. Such showings may be made by the applicant or may be satisfied by a statement from a frequency coordinator.

(i) For site-based multiple address stations in the 928-929/952-960 MHz and the 932-932.5/941-941.5 MHz bands, a statement that the proposed system complies with the following co-channel separations from all existing stations and pending applications:

Fixed-to-fixed--145 km;

Fixed-to-mobile--113 km;

Mobile-to-mobile--81 km

Note to paragraph (c)(3)(i): Multiple address systems employing only remote stations will be treated as mobile for the purposes of determining the appropriate separation. For mobile operation, the mileage is measured from the reference point specified on the license application. For fixed operation on subfrequencies in accordance with Sec. 101.147 the mileage also is measured from the reference point specified on the license application.

(ii) In cases where the geographic separation standard in paragraph (c)(3)(i) of this section is not followed, an engineering analysis must be submitted to show the coordination of the proposed assignment with existing systems located closer than those standards. The engineering analyses will include:

(A) Specification of the interference criteria and system parameters used in the interference study;

(B) Nominal service areas of each system included in the interference analysis;

(C) Modified service areas resulting from the proposed system. The propagation models used to establish the service boundary limits must be

specified and any special terrain features considered in computing the interference impact should be described; and

(D) A statement that all parties affected have agreed to the Engineering analysis and will accept the calculated levels of interference.

(iii) MAS EA licensees shall provide protection in accordance with Sec. 101.1333.

(4) Multiple address systems operating on subfrequencies in accordance with Sec. 101.147 that propose to operate master stations at unspecified locations must define the operating area by a radius about a geographical coordinate and describe how interference to co-channel users will be controlled.

(5) Multiple address frequencies in the 956.25-956.45 MHz bands may be assigned for use by mobile master stations on a primary basis. Multiple address frequencies in the 941.0-941.5 MHz bands that are licensed on a site-by-site basis and the 952 MHz bands may be assigned for use by primary mobile master stations on a case-by-case basis if the 956.25-956.45 MHz frequencies are unavailable. Multiple address mobile (master and remote) operation is permitted on frequencies licensed by geographic area subject to the interference protection criteria set forth in Sec. 101.1333, i.e., adjacent channel site-based licensees and co-channel operations in adjacent EAs. Mobile operation in the 959.85-960 MHz band is not permitted.

(6) Each application for new or modified nodal station on channels numbered 4A, 4B, 7, 9, and 19/20 in the 10.6 GHz band must demonstrate that all existing co-channel stations are at least 56 kilometers from the proposed nodal station site. Applicants for these channels must certify that all licensees and applicants for stations on the adjacent channels within 56 kilometers of the proposed nodal station have been notified of the proposed station and do not object. Alternatively, or if one of the affected adjacent channel interests does object, the applicant may show that all affected adjacent channel parties are provided a C/I protection ratio of 0 dB. An applicant proposing to operate at an AAT greater than 91 meters must reduce its EIRP in accordance with the following table; however, in no case may EIRP exceed 70 dBm on the 10.6 GHz channels:

AAT (meters)	EIRP dBm
Above 300.....	+38
251 to 300.....	41
201 to 250.....	43
151 to 200.....	49
101 to 150.....	55
100 and below.....	85

(7) Each application for new or modified nodal station on channels numbered 21, 22, 23, and 24 in the 10.6 GHz band must include an analysis of the potential for harmful interference to all other licensed and previously applied for co-channel and adjacent channel stations located within 80 kilometers of the location of the proposed station. The criteria contained in Sec. 101.103(d)(2) must be used in this analysis. Applicants must certify that copies of this analysis have been served on all parties which might reasonably be expected to receive

interference above the levels set out in Sec. 101.103(d)(2) within 5 days of the date the subject application is filed with the Commission.

(8) If the potential interference will exceed the prescribed limits, a statement shall be submitted with the application for new or modified stations to the effect that all parties have agreed to accept the higher level of interference.

(d) Effective August 1, 1985, when a fixed station that conforms to the technical standards of this subpart (or, in the case of the 12,200-12,700 MHz band, for an incumbent non-MVDDS station or a direct broadcast satellite station) receives or will receive interference in excess of the levels specified in this section as a result of an existing licensee's use of non-conforming equipment authorized between July 20, 1961 and July 1, 1976, and the interference would not result if the interfering station's equipment complied with the current technical standards, the licensee of the non-conforming station must take whatever steps are necessary to correct the situation up to the point of installing equipment which fully conforms to the technical standards of this subpart. In such cases, if the engineering analysis demonstrates that:

(1) The conforming station would receive interference from a non-conforming station in excess of the levels specified in this section; and

(2) The interference would be eliminated if the non-conforming equipment were replaced with equipment which complies with the standards of this subpart, the licensee (or prospective licensee) of the station which would receive interference must provide written notice of the potential interference to both the non-conforming licensee and the Commission's office in Gettysburg, PA. The non-conforming licensee must make all required equipment changes within 180 days from the date of official Commission notice informing the licensee that it must upgrade its equipment, unless an alternative solution has been agreed to by all parties involved in the interference situation. If a non-conforming licensee fails to make all required changes within the specified period of time, the Commission may require the licensee to suspend operation until the changes are completed.

(e) Interference dispute resolution procedures. Should a licensee licensed under this part receive harmful interference from another licensee licensed under this chapter, the parties involved shall comply with the dispute resolution procedures set forth herein:

(1) The licensee experiencing the harmful interference shall notify the licensee believed to be causing the harmful interference and shall supply information describing its problem and supporting its claim;

(2) Upon receipt of the harmful interference notice, the licensee alleged to be causing the harmful interference shall respond immediately and make every reasonable effort to identify and resolve the conflict; and

(3) Licensees are encouraged to resolve the harmful interference prior to contacting the Commission.

[61 FR 26677, May 28, 1996, as amended at 63 FR 68983, Dec. 14, 1998; 65 FR 17449, Apr. 3, 2000; 65 FR 38329, June 20, 2000; 65 FR 59358, Oct. 5, 2000; 66 FR 35110, July 3, 2001; 67 FR 43038, June 28, 2002; 69 FR 31746, June 7, 2004; 70 FR 29996, May 25, 2005]