Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
Amendment of Parts 2 and 25 of the Commission's Rules to Permit Operation of NGSO FSS Systems Co-Frequency with GSO and Terrestrial Systems in the Ku-Band Frequency Range;	)	ET Docket No. 98-206 RM-9147 RM-9245
	)	
Amendment of the Commission's Rules to Authorize Subsidiary Terrestrial Use of the 12.2-12.7 GHz Band by Direct Broadcast Satellite Licensees and Their Affiliates; and	)	
	)	
Applications of Broadwave USA, PDC Broadband Corporation, and Satellite Receivers, Ltd. to Provide A Fixed Service in the 12.2-12.7 GHz Band	)	

FIRST REPORT AND ORDER AND FURTHER NOTICE OF PROPOSED RULE MAKING

Adopted: November 29, 2000 **Released:** December 8, 2000

Comment Date: 45 days from date of publication in the Federal Register
Reply Comment Date: 60 days from date of publication in the Federal Register

By the Commission: Commissioner Furchtgott-Roth approving in part, dissenting in part, and issuing a statement; Commissioner Tristani issuing a statement.

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I. INTRODUCTION

1. In this First Report and Order ("First R&O"), we permit non-geostationary satellite orbit ("NGSO")[1] fixed-satellite service ("FSS") providers to operate in certain segments of the Ku-band,[2] and

[1] NGSO systems are characterized by a constellation of satellites continuously orbiting the earth, rather than remaining stationary relative to an earth station as geostationary satellites do. A geostationary satellite orbits at about 35,900 km (about 22,300 miles) above the Earth in the plane of the Earth's equator. At this altitude above (continued….)

adopt rules and policies to govern such operations. We also adopt technical criteria so that NGSO FSS operations can share spectrum with incumbent services without causing unacceptable interference to them and without unduly constraining future growth of incumbent services or NGSO FSS system flexibility. Finally, we conclude that a new terrestrial fixed Multichannel Video Distribution and Data Service ("MVDDS") can operate in the 12.2-12.7 GHz band on a non-harmful interference basis with incumbent Broadcast Satellite Services ("BSS"), and on a co-primary basis with the NGSO FSS. We also adopt a Further Notice of Proposed Rule Making ("Further NPRM") to address technical and service rules for the MVDDS. By these actions, we provide for the introduction of new advanced services to the public, consistent with our obligations under section 706 of the 1996 Telecommunications Act,[3] and promote increased competition among satellite and terrestrial services.

II. SUMMARY

2. In this First Report and Order/Further Notice of Proposed Rule Making we make the following major determinations and proposals regarding NGSO FSS[4] at Ku-band and the fixed services ("FS") in the 12.2-12.7 GHz band.

- We permit NGSO FSS gateway earth stations to provide, on a primary basis, space-to-Earth transmissions ("downlinks") in the 10.7-11.7 GHz band and Earth-to-space transmissions ("uplinks") in the 12.75-13.15 GHz, 13.2125-13.25 GHz, and 13.75-14.0 GHz bands, thereby providing 1000 megahertz of spectrum for gateway downlink and 687.5 megahertz of spectrum for gateway uplink operations. Further, we permit gateway earth stations to operate in the 11.7-12.7 GHz downlink and 14.0-14.5 GHz uplink bands that will be predominantly used by NGSO FSS service links.
- We permit NGSO FSS to operate service downlinks in the 11.7-12.2 GHz band on a primary basis, and we allocate the 12.2-12.7 GHz band for NGSO FSS service downlinks on a primary basis. We also permit NGSO FSS to operate service uplinks in the 14.0-14.5 GHz band. This provides 1000 megahertz of spectrum for service downlink and 500 megahertz of spectrum for service uplink operations.
- We adopt technical sharing criteria (power flux density ("PFD") limits) for NGSO FSS and FS operations in the 10.7-11.7 GHz band, consistent with decisions taken at the 2000 World Radiocommunication Conference ("WRC-2000"). Although we tentatively conclude that we should identify geographic protection zones for incumbent FS operations in the 10.7-11.7 GHz and 12.75-13.25 GHz bands, we defer until a separate future proceeding a decision on what procedures to use for determining the size and location of such zones. We also defer until a separate future proceeding a decision on coordination procedures between NGSO FSS and FS authorized under Parts 74 and 78 in the 12.75-13.25 GHz band.

(Continued from previous page)
the equator, the satellite revolves around the Earth at a rate of speed synchronous with the Earth's rotation, so that the satellite stays above the same place on the Earth's equator. NGSO satellites generally operate at lower altitudes than 35,900 km and revolve at a rate of speed greater than the Earth's rotation. An NGSO satellite therefore moves from horizon to horizon, and as it does so, transmits radio signals to, and receives radio signals from, those earth stations that are in the coverage area of the satellite.

[2] The Ku-band generally refers to frequencies in the vicinity of 10-14 GHz. The specific bands subject to this proceeding are the 10.7-12.7 GHz, 12.75-13.25 GHz, 13.75-14.5 GHz, and 17.3-17.8 GHz bands. For the purposes of this proceeding, we use the term "Ku-band" to refer generally to all of the frequency bands listed above that are under consideration in this proceeding.

[3] 47 U.S.C. § 157.

[4] NGSO FSS systems will consist of space stations in a satellite constellation, gateway earth stations, and service link earth stations.

- We adopt technical sharing criteria (equivalent power flux density ("EPFD") uplink and downlink limits) for NGSO FSS and geostationary-satellite orbit ("GSO") FSS operations in all bands, consistent with decisions taken at WRC-2000.
- We conclude in the First Report and Order that the new MVDDS can operate in the 12.2-12.7 GHz band under the existing allocation, *i.e*., on a non-harmful interference basis to incumbent BSS and on a co-primary basis to the new NGSO FSS. We also conclude that we can define MVDDS technical requirements that would avoid harmful interference to BSS and establish PFD limits for MVDDS/NGSO FSS sharing.
- We will permit MVDDS operations in the 12.2-12.7 GHz band, and seek comment on technical sharing criteria between the MVDDS and BSS and NGSO FSS, and on MVDDS service, technical, and licensing rules under Part 101 of the Commission's Rules.
- We seek comment on whether to license the 12.2-12.7 GHz band on the basis of geographic areas.
- We seek comment on whether to license MVDDS to one spectrum block of 500 megahertz per geographic area and to allow partitioning of MVDDS; we seek comment on whether to restrict disaggregation.
- We seek comment on the permitted services, eligibility requirements and regulatory status of MVDDS in the 12.2-12.7 GHz band, including whether licensees should be required to meet must-carry obligations and provide all local TV channels to every subscriber.
- We propose to require incumbent non-public safety Private Operational Fixed Service ("POFS") licensees in the 12.2-12.7 GHz band to protect MVDDS and NGSO FSS operations from harmful interference.
- We seek comment on the disposition of pending 12.2-12.7 GHz applications filed by Broadwave USA, PDC Broadband Corporation, and Satellite Receivers, Ltd.
- If we auction MVDDS licenses in the 12.2-12.7 GHz band, we propose to do so in conformity with the general competitive bidding rules set forth in Part 1, Subpart Q, of the Commission's Rules.

III. BACKGROUND

3. In November 1998, the Commission released a *Notice of Proposed Rule Making* ("*NPRM*") in this proceeding, which proposed to permit NGSO FSS operations in certain segments of the Ku-band.[5] NGSO FSS can provide a variety of new services to the public, such as high-speed Internet and on-line access, plus other types of high-speed data, video and telephony services. In the *NPRM*, the Commission proposed to allow NGSO FSS operations to use the 10.7-12.7 GHz band for NGSO downlinks on a co-primary basis and to use the 12.75-13.25 GHz and 13.8-14.5 GHz bands for NGSO uplinks on a co-primary basis.[6] We took this action in response to a Petition for Rule Making ("Petition") filed by SkyBridge L.L.C. ("SkyBridge").[7] The proposals advanced in the *NPRM* were also promoted by actions taken at the 1997 World Radiocommunication Conference ("WRC-97"), which modified the International Telecommunication Union's Radio Regulations ("ITU RR") to permit NGSO FSS operations in various

[5] *Notice of Proposed Rule Making ("NPRM")*, ET Docket No. 98-206, 14 FCC Rcd 1131 (1998). Comments on the *NPRM* were originally due on February 16,1999 and reply comments were originally due on March 15, 1999. However, on February 4, 1999, we extended those dates to March 2, 1999 and March 29, 1999, respectively. *See Order*, 14 FCC Rcd 3335 (1999). We received 33 comments and 24 reply comments in response to the *NPRM*. A list of commenting parties is provided in Appendix D. Supplemental comments and *ex parte* presentations were subsequently filed by numerous parties. Unless otherwise noted, "Comments" and "Reply Comments" refer to the 33 comments and 24 reply comments that were filed in direct response to the *NPRM*.

[6] Except for the 12.2-12.7 GHz band, all of the bands proposed for NGSO FSS use are already allocated to the FSS on a primary or co-primary basis. The *NPRM* proposed a co-primary allocation for NGSO FSS in the 12.2-12.7 GHz band.

[7] SkyBridge Petition, RM-9147, filed July 3, 1997.

segments of the Ku-band. WRC-97 also outlined provisional criteria for NGSO FSS operations to protect existing services in these band segments from unacceptable interference.[8]

4. The *NPRM* also asked for comments on a Petition for Rule Making ("Petition") filed by Northpoint Technology, Ltd. ("Northpoint") that proposed to provide terrestrial retransmission of local television signals and data services on a secondary basis[9] to the incumbent BSS in the 12.2-12.7 GHz band,[10] which is one of the bands in which we proposed to authorize NGSO FSS operations. Finally, the *NPRM* proposed licensing and service rules for NGSO FSS systems. These proposals also will be addressed in a future proceeding.

5. The spectrum proposed in the *NPRM* for NGSO FSS downlink operations – 10.7-12.7 GHz – is exclusively non-Federal Government spectrum; *i.e.*, there are no Federal Government operations in these bands. The bands that comprise 10.7-12.2 GHz are allocated to the fixed-satellite service (space-to-Earth) on a primary basis and the 12.2-12.7 GHz band is allocated to the BSS (also referred to as "Direct Broadcast Satellite" or "DBS")[11] on a primary basis. The FSS downlink segments at 10.7-10.95 GHz and 11.2-11.45 GHz are subject to Appendix 30B/S30B of the ITU RR.[12] Similarly, the BSS downlink segment at 12.2-12.7 GHz is subject to Appendix S30 of the ITU RR. This means that these segments are internationally "planned bands" where each country is assigned frequencies at certain orbital locations in the geostationary orbital arc. The use of the FSS downlink band at 10.7-11.7 GHz[13] is limited to international systems, *i.e.*, other than domestic systems.[14] Prior to WRC-2000, international regulations

[8] The *NPRM* pointed out that WRC-97 developed spectrum sharing criteria for NGSO operations based on the avoidance of "unacceptable" interference to incumbent services. The Commission's Rules define "accepted" interference, rather than "acceptable" interference. The *NPRM* stated, however, that the two terms are substantially the same. "Unacceptable" interference are occurrences exceeding a defined "acceptable" level of interference. We also note that the term "acceptable" interference or "unacceptable" interference happens to be more commonly used for international satellite coordinations.

[9] A given frequency band may be allocated to one or more terrestrial or space radiocommunication services or the radio astronomy service on either a primary or secondary basis. "Stations of a secondary service: a) shall not cause harmful interference to stations of primary services to which frequencies are already assigned or to which frequencies may be assigned at a later date; b) cannot claim protection from harmful interference from stations of a primary service to which frequencies are already assigned or may be assigned at a later date; c) can claim protection, however, from harmful interference from stations of the same or other secondary service(s) to which frequencies may be assigned at a later date." *See* International Telecommunication Union Radio Regulations, Edition of 1998, Article S5, Section II --Categories of services and allocations, S5.28 through S5.31.

[10] Northpoint Petition, RM-9245, filed March 6, 1998. *See NPRM* at ¶¶ 91-98 for a more detailed discussion of the Northpoint proposal and sharing with BSS and NGSO FSS operations.

[11] BSS, by definition, is in the downlink direction only. The corresponding feeder link frequencies for BSS are in FSS uplink allocations. The terms "BSS" and "DBS" have the same meaning, and in this item, we will use the terms interchangeably.

[12] *See* 47 C.F.R. § 2.106, footnote S5.441.

[13] In the 10.7-11.7 GHz band, footnote US211 urges applicants for space station assignments to "take all practicable steps to protect radio astronomy observations in adjacent bands from harmful interference; however, US74 applies." US74 states that the radio astronomy service in the 10.68-10.7 GHz band "shall be protected from extraband radiation only to the extent that such radiation exceeds the level which would be present if the offending station were operating in compliance with the technical standards or criteria applicable to the service in which it operates."

[14] *See* 47 C.F.R. § 2.106, footnote NG104.

stipulated that use of the FSS downlink band at 11.7-12.2 GHz and the BSS band at 12.2-12.7 GHz was limited to national and subregional systems.[15]

6. In addition to space radiocommunication services, the bands comprising 10.7-12.7 GHz are allocated to and used by terrestrial radiocommunication services. Specifically, the 10.7-11.7 GHz band[16] is allocated to the FS on a primary basis and is available for use by both the POFS point-to-point microwave operations (Part 101, Subparts C and H)[17] and the Local Television Transmission Service ("LTTS," Part 101, Subpart J). LTTS use of the 10.7-11.7 GHz band is limited to television studio-to-transmitter links ("STLs").[18] The 11.7-12.1 GHz band is allocated to the FS on a secondary basis,[19] and the 11.7-12.2 GHz band is allocated to mobile except aeronautical mobile service on a secondary basis; *i.e.*, this band is available to the land mobile and maritime mobile services, but not to the aeronautical mobile service. Together, these two secondary services are used by television pickup and television non-broadcast pickup stations in the LTTS.[20] The 12.2-12.7 GHz band is allocated to the FS on a primary basis; however, the service is prohibited from causing harmful interference to the BSS.[21] The band is also available for POFS stations on a non-harmful interference basis. Further, POFS stations are required to make any and all adjustments necessary to prevent harmful interference to operating BSS systems. Table 1, below, summarizes incumbent operations in the proposed NGSO FSS downlink bands.

[15] *See* 47 C.F.R. § 2.106, footnote 839. WRC-2000 revised S5.488 (formerly RR-839) to eliminate the national and subregional restriction.

[16] Footnote NG41 states that frequencies in the 10.7-11.7 GHz band may also be assigned to stations in the international fixed public and international control services located in U.S. Possessions in the Caribbean area.

[17] One of the primary uses of the 10.7-11.7 GHz band is for analog and digital telephone and video transmission. The 10.7-11.7 GHz band is also one of the migration bands that the Commission identified for 2 GHz OFS incumbents that are displaced by Broadband Personal Communications Service ("PCS") operations.

[18] *See* 47 C.F.R. § 101.803(d).

[19] *See* 47 C.F.R. § 2.106, footnote 837, which reads as follows: "Different category of service: in Canada, Mexico and the United States, the allocation of the band 11.7-12.1 GHz to the fixed service is on a secondary basis (see No. 424)." *See* ITU-RR footnote S5.486. This footnote was revised by WRC-95. At that Conference, only Mexico and the United States were associated with that footnote.

[20] *See* 47 C.F.R. § 101.803(a).

[21] *See* 47 C.F.R. § 2.106, footnote 844 and Section 101.147(p).

<table>
<tr><td colspan="4">Table 1: U. S. Incumbent Operations in the Bands Proposed for NGSO FSS Downlinks (Systems operate on a primary basis, except as noted)</td></tr>
<tr><td>Band</td><td>10.7-11.7 GHz</td><td>11.7-12.2 Hz</td><td>12.2-12.7 GHz</td></tr>
<tr><td rowspan="3">Incumbent Operations</td><td colspan="2">FSS (space-to-Earth)</td><td rowspan="2">BSS</td></tr>
<tr><td>International systems only; 10.7-10.95 GHz and 11.2-11.45 GHz are planned bands</td><td></td></tr>
<tr><td>POFS and LTTS STLs</td><td>LTTS TV pickup and TV non-broadcast pickup stations (secondary)</td><td>POFS (secondary to BSS)</td></tr>
<tr><td>NPRM Proposal</td><td>NGSO gateways</td><td colspan="2">NGSO service links</td></tr>
</table>

7. Most of the spectrum proposed in the *NPRM* for NGSO FSS uplinks -- 12.75-13.25 GHz, 13.8-14.2 GHz, and 14.4-14.5 GHz -- is shared between Federal and non-Federal Government uses either on a co-primary or a primary/secondary basis; however, the bands comprising 14.2-14.4 GHz are non-Federal Government exclusive spectrum. All of the spectrum proposed for NGSO FSS uplinks (12.75-13.25 GHz and 13.8-14.5 GHz) is already allocated to the non-Federal Government fixed-satellite service (Earth-to-space) on a primary basis. The FSS uplink band at 12.75-13.25 GHz is limited to international systems and is subject to Appendix S30B of the ITU RR. The Commission has adopted special ITU developed requirements for FSS use of the 13.75-14 GHz band, such as minimum and maximum earth station equivalent isotropically radiated power ("e.i.r.p.") and a minimum antenna diameter in order to ensure compatibility with Federal Government systems. The bands comprising 13.75-14.2 GHz are allocated to the Federal and non-Federal Government space research service on a secondary basis, except for those geostationary space stations in the space research service that were advanced published prior to January 31, 1992, which shall operate on an equal basis with stations in the fixed-satellite service.[22] The bands comprising 13.8-14.2 GHz are also allocated to the Federal and non-Federal Government standard frequency and time signal-satellite service on a secondary basis.[23]

8. Other space radiocommunication services in the proposed NGSO FSS uplink bands are as follows. The 12.75-13.25 GHz band is allocated to the Federal and non-Federal Government space research service (deep space, space-to-Earth) on a primary basis, but its use is limited to Goldstone, California.[24] The bands comprising 14-14.5 GHz are allocated to the non-Federal Government land mobile-satellite service on a secondary basis.[25]

9. In addition to space communication services, the bands proposed for NGSO FSS uplinks are allocated to and used by terrestrial radiocommunication services. The 12.75-13.25 GHz band is allocated

[22] *See* 47 C.F.R. § 2.106, footnote S5.503.

[23] Footnote S5.502 states that "In the band 13.75-14 GHz, the e.i.r.p. of any emission from an earth station in the fixed-satellite service shall be at least 68 dBW, and should not exceed 85 dBW, with a minimum antenna diameter of 4.5 metres. In addition, the e.i.r.p. averaged over one second, radiated by a station in the radiolocation or radionavigation services towards the geostationary orbit shall not exceed 59 dBW." *See also* footnote S5.503, which limits the e.i.r.p. density in the 13.772-13.778 GHz band.

[24] *See* 47 C.F.R. § 2.106, footnote US251.

[25] *See* 47 C.F.R. § 2.106, footnote US287.

to the non-Federal Government FS and mobile[26] services on a co-primary basis. Frequencies throughout the 12.70-13.25 GHz band are available for use by POFS stations and by television broadcast auxiliary service ("BAS") stations.[27] Additionally, frequencies in the 13.2-13.25 GHz segment are available for assignment to LTTS television pickup stations, television non-broadcast pickup stations, and STLs.[28] The 13.8-14 GHz band is allocated to the Federal Government radiolocation service on a primary basis and to the non-Federal Government radiolocation service on a secondary basis. The 14-14.2 GHz band is allocated to the Federal and non-Federal Government radionavigation service on a primary basis, with the caveat that radionavigation stations "shall operate on a secondary basis to the fixed-satellite service."[29] The 14.2-14.4 GHz band is allocated to the non-Federal Government mobile except aeronautical mobile service on a secondary basis and is available for use by LTTS television pickup and television non-broadcast pickup stations. The 14.4-14.5 GHz band is allocated to the Federal Government fixed and mobile services on a secondary basis. Finally, radio astronomy observations may be made in the 14.47-14.5 GHz segment at Federal and non-Federal Government licensed facilities.[30]

10. In making our proposals, we sought to ensure that NGSO FSS operations do not cause unacceptable interference to existing users and do not unduly constrain future growth of incumbent services. In this regard, we noted that sharing between NGSO FSS and incumbent services was not feasible in certain bands sought by SkyBridge for NGSO uplinks. Specifically, we noted that sharing between NGSO FSS uplinks and the National Aeronautics and Space Administration ("NASA") tracking data and relay satellite system ("TDRSS") in the 13.75-13.80 GHz band requested by SkyBridge, and between NGSO FSS uplinks and BSS downlinks and Federal Government radiolocation operations in the 17.3-17.8 GHz band would raise significant interference concerns.[31] Accordingly, we did not propose to permit NGSO FSS uplink operations in those bands. However, at WRC-2000, ITU-RR footnote S5.503 was revised with the consent of the United States to establish e.i.r.p. density limits to protect TDRSS from NGSO FSS interference. Table 2, below, summarizes incumbent operations in the proposed NGSO FSS uplink bands.

[26] In the 12.7-13.15 GHz segment, the Commission has previously specified in footnote NG53 that television pickup stations and CARS pickup stations shall be assigned channels on a co-equal basis and that these pickup stations shall operate on a secondary basis to fixed stations operating in this segment; *see* 47 C.F.R. § 2.106, footnote NG53. The Commission further specified that in the 13.15-13.2 GHz segment, television pickup stations and CARS pickup stations shall be assigned on an exclusive basis in the top one hundred markets, as set out in Section 76.51 of the Commission's Rules.

[27] *See* 47 C.F.R. Part 74, Subpart F.

[28] *See* 47 C.F.R. § 101.803(a) and (d).

[29] *See* 47 C.F.R. § 2.106, footnote US292.

[30] *See* 47 C.F.R. § 2.106, footnotes 862, US203.

[31] *NPRM* at ¶¶ 43, 50, and 51.

<table>
<tr><td colspan="6">Table 2: U. S. Incumbent Operations in the Bands Proposed for NGSO FSS Uplinks (Systems operate on a primary basis, except as noted)</td></tr>
<tr><td>Band</td><td>12.75-13.25 GHz</td><td>13.8-14 GHz</td><td>14-14.2 GHz</td><td>14.2-14.4 GHz</td><td>14.4-14.5 GHz</td></tr>
<tr><td rowspan="5">Incumbent Operations</td><td colspan="5">Non-Govt. FSS uplinks</td></tr>
<tr><td>International systems only and is a planned band</td><td>Special FSS spectrum sharing requirements</td><td colspan="3"></td></tr>
<tr><td>POFS</td><td>Govt. radiolocation</td><td>Govt. and non-Govt. radionavigation (secondary to FSS)</td><td>LTTS TV pickup and TV non-broadcast pickup stations (secondary)</td><td>Govt. fixed and mobile (secondary)</td></tr>
<tr><td>TV BAS; LTTS may use only 13.2-13.4 GHz</td><td>Non-Govt. radiolocation (secondary)</td><td colspan="3">Non-Govt. land mobile-satellite uplinks (secondary)</td></tr>
<tr><td>NASA’s Goldstone deep space receive site</td><td colspan="2">Space research service and standard frequency and time signal-satellite service (secondary, except for some GSO space research space stations)</td><td></td><td>Radio astronomy observations may be made in 14.47-14.5 GHz band</td></tr>
<tr><td>NPRM Proposal</td><td colspan="2">NGSO gateways</td><td colspan="2">NGSO service links</td><td>NGSO gateways</td></tr>
</table>

11. In addition to its Petition, SkyBridge also filed an application for authority to launch and operate an NGSO FSS system.[32] Certain characteristics of the proposed SkyBridge network, such as gateway earth stations, were discussed in the *NPRM* to facilitate the development of a complete record. In November 1998, the Commission issued a Public Notice, which established a cut-off date for filing NGSO FSS system applications in portions of the Ku-band ("*Ku Band Cut-Off Notice*").[33] There are applications pending for eight different NGSO FSS systems requesting access to all or some portion of the proposed bands, including applications from the Boeing Company (“Boeing”) and Denali Telecom, LLC (“Denali”), that were filed in response to other previous cut-off notices.[34] The applicants propose a variety of orbit constellations and network designs, and a wide range of services, including high-speed Internet and on-line access, video conferencing, telephony, and entertainment services. These proposals

[32] SkyBridge Application, File No. 48-SAT-P\LA-97, February 28, 1997; Amendment, File No. 89-SAT-AMEND-97, July 2, 1997; SAT-AMEND-19980630-00056 S2241 (January 1999) (SkyBridge Application). SkyBridge initially proposed 64 NGSO satellites for its system, but subsequently amended its application to increase the number to 80 NGSO satellites.

[33] Report No. SPB-141, released November 2, 1998. The filing cut-off was for NGSO FSS applications in the 10.7-12.7, 12.75-13.25, 13.75-14.5, and 17.3-17.8 GHz frequency bands. In the Public Notice, we stated that “applicants should be aware that because of outstanding Commission proceedings and Government use of certain frequency bands, not all bands proposed by the applicants in this Public Notice will necessarily be available for NGSO FSS use.”

[34] Portions of those prior cut-off notices included frequency bands subject to the *Ku-Band Cut-Off Notice*. Boeing also filed an application for an NGSO FSS system to operate in the Ku-band.

offer an opportunity for competition to both satellite and terrestrial services. A brief description of each system is provided in Appendix C. While this proceeding focuses on NGSO FSS systems in general and discusses certain characteristics of proposed systems as appropriate, the applications will be addressed in a separate proceeding.

12. *WRC-97/2000*. In the *NPRM*, we noted that WRC-97 adopted power limits for certain segments of the Ku and Ka[35] frequency bands to promote spectrum sharing between NGSO FSS systems and other systems and services. Specifically, WRC-97 *provisionally* adopted EPFD and aggregate power flux density ("APFD") limits in certain band segments to protect incumbent GSO FSS and BSS operations. EPFD is the sum of the PFD levels of all potential interfering satellites of a particular NGSO constellation into a particular GSO earth station receiver.[36] EPFD limits are intended to control the level of signal energy on the earth's surface. Because each EPFD limit applies to a particular GSO earth station receiver with a specific antenna diameter and sidelobe pattern, different sized GSO FSS earth station receivers may require different EPFD protection requirements. APFD is the sum of the PFD levels at a location on the GSO arc created by all potentially interfering earth station transmitters of an NGSO FSS system. Because the technical studies justifying these power limits had not been fully considered in the ITU Radiocommunication Sector ("ITU-R") study group process, as is customary, they were deemed provisional until they could be analyzed by the relevant ITU-R study groups and reviewed at WRC-2000. Moreover, the provisional EPFD and APFD limits adopted by WRC-97 applied only to a single NGSO FSS system ("single-entry" limits) and did not consider the impact of multiple NGSO FSS systems for GSO BSS and FSS systems.

13. As we discuss in more detail below, the *NPRM* sought comment on WRC-97's provisional EPFD and APFD limits and on alternative values for these limits. We note that since the *NPRM* was adopted, international working groups have recommended changes to the definition of APFD limits, including referring to them as "$EPFD_{up}$" limits (see discussion below). Consequently, we will adopt that terminology in this First R&O, and we will refer to "$EPFD_{down}$" for power limits applicable to NGSO FSS space stations within an NGSO FSS system and $EPFD_{up}$ for power limits applicable to NGSO FSS earth stations within an NGSO FSS system or GSO BSS and FSS systems.

14. In addition, to protect terrestrial services and facilitate operation of co-primary satellite and terrestrial services, the ITU RR include PFD limits to control the level of satellite signal energy on the Earth's surface. Although the PFD limits currently in use were developed to protect terrestrial services from GSO FSS downlinks, WRC-97 concluded that these limits should also apply to NGSO FSS downlinks. While the PFD limits to protect terrestrial services from NGSO FSS are not provisional, they were subject to review and possible modification at WRC-2000 based on the determination of whether they adequately protect terrestrial services from the aggregate of multiple NGSO FSS systems. As we discuss in more detail below, for protection of terrestrial services the *NPRM* proposed to adopt the WRC-97 PFD limits.[37]

15. As we noted in the *NPRM*, the U.S., with representation from the terrestrial, NGSO FSS and GSO FSS industries, was an active participant in the ITU-R technical study groups tasked with conducting

[35] The Ka-band generally refers to the 17.7-20.2 GHz (downlink) and 27.5-30.0 GHz (uplink) bands.

[36] PFD is a measure of the amount of energy emitted by a transmitter that is present over a unit area at the Earth's surface or at the satellite, and is a critical factor in determining whether satellite systems can successfully share spectrum with other services or satellite systems.

[37] *NPRM* at ¶¶ 18-20.

analyses of these sharing issues in preparation for WRC-2000.[38] ITU-R working groups made significant progress on NGSO FSS sharing issues. Additionally, a WRC-2000 Conference Preparatory Meeting ("CPM") was held in November 1999.[39] The final output of the CPM was a report containing information on technical, operational and regulatory/procedural issues relevant to items on the WRC-2000 agenda. This report reflected among other issues on the WRC-2000 Agenda, input from various ITU-R working parties and study groups, individual Administrations, and international organizations regarding NGSO FSS sharing issues, and provided the technical basis for decisions on these issues taken by WRC-2000. WRC-2000 affirmed the outcomes in the CPM report that are relevant to this proceeding.[40] The CPM report, the ITU-R work, and the decisions taken at WRC-2000 are discussed in more detail below, and relevant documents have been included in the docket file. Nonetheless, as we noted in the *NPRM*, ITU-R deliberations are based on the technical input of many Administrations that often have different domestic spectrum uses than those in the United States.[41] Thus, while the conclusions of the CPM, the ITU-R study groups, and WRC-2000 may have general technical applicability, based on each Administration's input and the resultant compromise, they may not adequately address specific, domestic sharing conditions such as those prevalent in the U.S. Consequently, in the *NPRM* we sought comment on a variety of techniques that could be used to facilitate operation of both NGSO FSS and incumbent services in the U.S. where the Ku-band is extensively used.

16. Throughout this proceeding, we will discuss the impact of new satellite and terrestrial operations in the Ku Band. In some instances, these new operations may cause interference events, but it is our intention to minimize these interference events to an acceptable level for the services at issue. At present, the ITU-R recommends that the GSO FSS network should be designed to accept an aggregate interference equal to 20 percent of the total system noise power from all other GSO FSS networks and a further 10 percent for interference from co-primary terrestrial radio services.[42]

17. The ITU-R further recommends that each adjacent GSO FSS network should not contribute more than 6 percent of the total system noise power. The makeup of the remaining 70 percent includes allocations for uplink and downlink thermal noise, intra-network self interference noise (such as intermodulation and cross-polarization) and earth station equipment noise. The allocation for each noise component depends on the specificity of each network and each type of transmission.

18. On November 29, 1999, the Satellite Home Viewer Improvement Act ("SHVIA") was enacted.[43] The SHVIA legislation generally seeks to place satellite carriers on equal footing with local

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[38] Following WRC-97, ITU-R JTG 4-9-11 was created to analyze NGSO FSS sharing with GSO FSS, fixed service and GSO BSS services in the Ku and Ka bands. The numbers "4," "9," and "11" refer to ITU-R study group designations: 4 – fixed satellite; 9 – fixed service; and 11 – broadcasting (television). Other ITU-R study groups dealing with the issue of NGSO FSS sharing include WP4A (FSS issues, both GSO and NGSO), JWP 10-11S (BSS), and JWP 4-9S (sharing between FSS and terrestrial services).

[39] The CPM was held in Geneva, Switzerland, November 15-26, 1999.

[40] WRC-2000 was held in Istanbul, Turkey, May 8-June 2, 2000.

[41] *NPRM* at ¶ 11.

[42] *See* ITU-R S.523-4 and ITU-R S.735-1.

[43] *See* Act of Nov. 29, 1999, Pub.L. 106-113 Stat. 1501 (enacting S. 1948, including the Satellite Home Viewer Improvement Act of 1999 ("SHVIA"), Title I of the Intellectual Property and Communications Omnibus Reform Act of 1999 ("IPACORA"), relating to copyright licensing and carriage of broadcast signals by satellite carriers, codified in scattered sections of 17 and 47 U.S.C.). *See generally* Implementation of the Satellite Home Viewer Improvement Act of 1999: Application of Network Nonduplication, Syndicated Exclusivity, and Sports Blackout Rules to Satellite Retransmissions, CS Docket No. 00-2, *Notice of Proposed Rule Making*, 65 Fed. Reg. 4927 (Feb. 2, 2000); (continued….)

cable operators concerning the availability of broadcast programming, and thus is intended to give consumers more and better choices in selecting a multichannel video programming distributor ("MVPD").[44] In conjunction with the 1999 SHVIA legislation, Congress passed a provision entitled "Rural Local Broadcast Signal Act."[45] Among other things, this law requires the Commission to make a determination by November 29, 2000, regarding licenses or other authorizations for facilities that will utilize, for delivering local broadcast television signals to satellite television subscribers in unserved and underserved local television markets, spectrum otherwise allocated to commercial use.[46] After an exhaustive analysis and the time-consuming development on the international front of a consensus regarding critical technical issues, we have made a major threshold determination to authorize a new service, MVDDS, that will be capable of delivering local broadcast television station signals to satellite television subscribers in unserved and underserved local television markets.[47] Moreover, we have identified a band for this service – 12.2-12.7 GHz – and have determined that MVDDS can co-exist with the incumbent services and with the newly authorized NGSO-FSS operations. Finally, with the Further NPRM, we have set in motion the final regulatory process for licensing MVDDS. In light of these determinations, we conclude that we have met the deadline for action set forth in the Rural Local Broadcast Signal Act.

(Continued from previous page)
Implementation of the Satellite Home Viewer Improvement Act of 1999, CS Docket No. 99-363, *Notice of Proposed Rule Making*, 14 FCC Rcd 21736 (1999) (*1999 SHVIA Implementation NPRM*).

[44] *See 1999 SHVIA Implementation NPRM*, 14 FCC Rcd 21736 at ¶1.

[45] *See* Act of Nov. 29, 1999, Pub. L. 106-113, 113 Stat. 1501, 1537. (enacting S. 1948, Title II of the Intellectual Property and Communications Omnibus Reform Act of 1999 (IPACORA)), to be codified at 47 U.S.C. § 338.

[46] *Id*. The Rural Local Broadcast Signal Act is written as follows:

(a) In General.- Not later than 1 year after the date of the enactment of this Act, the Federal Communications Commission ("the Commission") shall take all actions necessary to make a determination regarding licenses or other authorizations for facilities that will utilize, for delivering local broadcast television station signals to satellite television subscribers in unserved and underserved local television markets, spectrum otherwise allocated to commercial use.

(b) Rules. –

(1) Form of Business. – To the extent not inconsistent with the Communications Act of 1934 and the Commission's Rules, the Commission shall permit applicants under subsection (a) to engage in partnerships, joint ventures, and similar operating arrangements for the purpose of carrying out subsection (a).

(2) Harmful Interference. – The Commission shall ensure that no facility licensed or authorized under subsection (a) causes harmful interference to the primary users of that spectrum or to public safety spectrum use.

(3) Limitation on Commission. – Except as provided in paragraphs (1) and (2), the Commission may not restrict any entity granted a license or other authorization under subsection (a) from using any reasonable compression, reformatting, or other technology.

(c) Report.- Not later than January 1, 2001, the Commission shall report to the Agriculture, Appropriations, and the Judiciary Committees of the Senate and the House of Representatives, the Senate Committee on Commerce, Science, and Transportation, and the House of Representatives Committee on Commerce, on the extent to which licenses and other authorizations under subsection (a) have facilitated the delivery of local signals to satellite television subscribers in unserved and underserved local television markets. The report shall include –

(1) an analysis of the extent to which local signals are being provided by direct-to-home satellite television providers and by other multichannel video program distributors;

(2) an enumeration of the technical, economic, and other impediments each type of multichannel video programming distributor has encountered; and

(3) recommendations for specific measures to facilitate the provision of local signals to subscribers in unserved and underserved markets by direct-to-home satellite television providers and by other distributors of multichannel video programming service.

[47] *See infra* ¶¶ 213, 290.

IV. FIRST REPORT AND ORDER

19. We conclude that the public interest will be served by permitting NGSO FSS use of the Ku-band. The implementation of NGSO FSS systems will allow new advanced services to be provided to the public, as well as provide increased competition to existing satellite and terrestrial services. Indeed, the NGSO FSS, because of its ability to serve large portions of the earth's surface, can bring advanced services to rural areas.[48] We also conclude that it is possible for the NGSO FSS to share spectrum with incumbent services without causing unacceptable interference to them and without unduly constraining their future growth. Accordingly, we are adopting technical criteria for NGSO FSS operations that will allow this new service to operate on a co-primary basis with incumbent services in the designated bands.

20. The ITU-R, including Joint Task Group ("JTG") 4-9-11 and the CPM in preparation for WRC-2000, reached consensus agreements on a number of NGSO FSS sharing issues.[49] Moreover, interested parties subsequently reached a compromise solution to the outstanding NGSO FSS/GSO FSS and NGSO FSS/BSS sharing issues at the CPM. These results were affirmed by WRC-2000. The numerous technical analyses undertaken by the ITU-R and CPM represent the most comprehensive and current studies on NGSO FSS protection of GSO FSS networks, FS operations and BSS systems available to date. Considering the agreements reached within the international arena and the record developed in response to these international agreements, we find that we have an adequate basis to adopt rules governing co-frequency operation of NGSO FSS systems in certain frequency bands.

21. We conclude that the new MVDDS can operate in the 12.2-12.7 GHz band on a non-harmful interference basis with the incumbent BSS service, and on a co-primary basis with the NGSO FSS. We note that extensive technical information and the results of experimental tests have been filed concerning sharing of the 12.2-12.7 GHz band by NGSO FSS, BSS, and MVDDS operations.[50] We find that we have an adequate record to conclude that the MVDDS can operate in the band on a non-harmful interference basis to the BSS and on a co-primary basis with the NGSO FSS. The *NPRM* did not propose specific technical, service or licensing rules for the MVDDS. These proposed rules will be the subject of the Further NPRM.

A. NGSO FSS Gateway Bands

22. In the *NPRM*, we proposed to allow NGSO FSS gateway downlink operations on a co-primary basis in the 10.7-11.7 GHz band; and to allow NGSO FSS gateway uplink operations on a co-primary basis in the 12.75-13.25 GHz, 13.8-14.0 GHz, and 14.4-14.5 GHz bands. In addition, the *NPRM* proposed to apply the WRC-97 PFD limits, existing coordination procedures and other techniques to facilitate sharing between NGSO operations and terrestrial services. The *NPRM* also sought comment on the WRC-97 provisional EPFD limits for NGSO sharing with GSO operations and requested thorough analysis concerning the adequacy of these limits. The 13.75-13.8 GHz band was not proposed for NGSO FSS gateway uplink operations due to potential interference with Federal Government operations, and the 17.3-17.8 GHz band was not proposed due to a conflict with use of the band for BSS and Federal Government radiolocation services. We will address each of these bands and any relevant issues below.

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[48] *See* February 18, 2000 *ex parte* filing of SkyBridge at 3.

[49] We note that the JTG 4-9-11 had previously reached agreement on NGSO FSS PFD limits to protect fixed services. In addition, while the JTG 4-9-11 was able to reach agreement on appropriate EPFD limits to protect smaller size GSO/FSS and BSS earth station antennas, the JTG did not reach consensus on EPFD limits for larger size earth station antennas. The latter issues were addressed by WRC-2000.

[50] *See, e.g.*, March 17, 2000 and March 22, 2000 *ex parte* filings of Northpoint and Technical Annex to Northpoint March 2, 1999 Comments.

1. Gateway Definition

23. *Proposal.* In order to facilitate the coordination process between NGSO FSS earth stations and terrestrial operations, the *NPRM* proposed to permit only gateway operations in bands shared with terrestrial operations allocated on a co-primary basis. For the purpose of NGSO FSS in the Ku-band, the *NPRM* proposed to define gateway operations as earth station operations that are not intended to originate or terminate traffic but are primarily intended for interconnecting to other networks.[51] The *NPRM* invited comment on whether the Commission should establish minimum antenna size requirements for gateway earth stations. The *NPRM* also asked whether it would be necessary to limit the number of NGSO FSS gateway stations in bands shared with terrestrial operations, and whether gateway operations should meet minimum antenna size requirements.

24. *Comments*. Although many commenters agree that only NGSO FSS gateway earth stations should be permitted to share Ku-band frequencies with terrestrial operations, some argue that there should not be a rigid distinction between gateway and service links. Teledesic LLC ("Teledesic") states that service links should be allowed to share with FS operations as long as they meet certain technical requirements.[52] Similarly, Virtual Geosatellite, L.L.C. ("Virgo") argues that service links should be permitted in the 11.2-11.7 GHz portion as long as they switch to other spectrum if terrestrial interference occurs.[53] FS interests and SkyBridge oppose allowing service links in the gateway bands. In its initial comments, SkyBridge suggests that the Commission clarify that gateways are not intended to handle traffic at user sites so that a gateway station does not act as an intermediary between the NGSO FSS satellite and a group of users connected terrestrially to that user earth station.[54] Boeing and SkyBridge also oppose the proposal that, for coordination purposes, a single gateway must be contained within an area of one second longitude by one second latitude.[55] They argue that this requirement would be overly restrictive and would not allow individual gateway antennas sufficient room to avoid blocking one another's signals.

25. PanAmSat Corporation ("PanAmSat") and Boeing support establishing a minimum antenna size requirement for NGSO FSS gateway stations in the Ku-band as a means of facilitating sharing, but in its initial comments SkyBridge opposes minimum antenna size requirements as arbitrary.[56] Boeing and SkyBridge also advise against establishing limits on the number of satellite earth stations permitted to operate in the Ku-band, asserting that any limit would be arbitrary.[57]

26. PanAmSat argues that the Commission should not subject GSO FSS systems in these frequency bands to the gateway station definition because it is designed as a particular component of an NGSO FSS system and is not relevant to GSO FSS systems. PanAmSat also contends that it would be inequitable to use the gateway definition to limit GSO FSS deployment in these bands.[58]

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[51] *Id.* at ¶ 15.

[52] Teledesic Comments at 7.

[53] Virgo Comments at 13.

[54] SkyBridge Comments at 68, SkyBridge Reply Comments at 47, and FWCC Reply Comments at 13.

[55] Boeing Comments at 80 and SkyBridge Comments at 69.

[56] Boeing Comments at 79, PanAmSat Comments at 16, and SkyBridge Comments at 49.

[57] SkyBridge Comments at 69 and Boeing Reply Comments at 18.

[58] PanAmSat Comments at 20.

27. In November 1999, SkyBridge and the Fixed Wireless Communications Council ("FWCC") filed a joint *ex parte* letter indicating that they had negotiated an agreement on appropriate rules to govern the shared use of the 10.7-11.7 GHz band by the FS and NGSO FSS.[59] In December 1999, SkyBridge and the FWCC submitted the agreement as a proposal in this proceeding.[60] One of the areas addressed in the SkyBridge/FWCC proposal is the definition of an NGSO FSS gateway earth station. SkyBridge and FWCC propose the following definition:

> A Gateway operating in the 10.7-11.7 GHz band shall consist of an earth station complex providing radio frequency resources to NGSO FSS space stations which allow customer-premises earth stations to interconnect with long distance or other intercity networks or other non-collocated customer-premises earth stations; a Gateway shall not connect directly to customer-owned or customer-operated private distribution networks. Gateways shall have no less than three operational earth station antennas, each of which shall be no less than 2.5 meters in diameter; for non-parabolic antenna designs, the mainbeam beamwidth of the antenna shall not exceed the mainbeam beamwidth of a standard 2.5 meter parabolic antenna.[61]

28. In comments regarding this proposed definition, Boeing states that a minimum Gateway antenna size of 4.5 meters would best enhance sharing among inhomogeneous NGSO FSS systems in the Ku-band. However, Boeing states that because sharing between NGSO systems is not at issue in this proceeding, it simply requests that the inclusion of the 2.5 meter minimum Gateway antenna size not foreclose the possibility that we may determine that the inclusion of a 4.5 meter minimum Gateway antenna size best serves sharing among co-frequency NGSO systems.[62]

29. *Decision*. We find that we can permit deployment of NGSO FSS gateway earth stations in the proposed bands and also protect the continued use and growth of those bands by terrestrial operations. However, for reasons discussed in Section A3, we are limiting gateway use of the 12.75-13.25 GHz band to the 12.75-13.15 GHz and 13.2125-13.25 GHz band segments. Further, as discussed in Section A4, we are permitting gateway use of the 13.75-13.8 GHz band. Finally, as discussed in Section A5, we will permit service link, as well as gateway, use of the 14.4-14.5 GHz band. We recognize, however, that deployment of service links in the 10.7-11.7 GHz, 12.75-13.15 GHz, 13.2125-13.25 GHz, and 13.75-14.0 GHz bands could hinder future terrestrial service deployment in those bands. Therefore, we find it appropriate to allow only gateway earth station operations for NGSO FSS in those four bands. This will avoid the ubiquitous deployment of earth stations in those bands. Further, gateway earth stations will be located at sites readily identified to other users of the bands, thus increasing the potential for co-frequency operation. We define NGSO FSS gateway earth stations as those earth stations that do not originate or terminate traffic, but interconnect multiple non-collocated user earth stations operating in frequency bands other than designated gateway bands, through a satellite with other primary networks, such as the public switched telephone network and Internet networks. That is, gateway earth stations will be required to operate in a manner that supports the switching and routing functions of the NGSO FSS system as a whole, as do feeder links for mobile-satellite systems or hub operations for very small aperture terminal ("VSAT") networks.

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[59] *See* November 12, 1999 *ex parte* letter to Dale Hatfield, Chief of the Office of Engineering and Technology from SkyBridge LLC and the FWCC.

[60] *See ex parte* letter filed by SkyBridge and FWCC on December 8, 1999 and supplemented on December 22, 1999.

[61] *See* December 8, 1999 *ex parte* of SkyBridge and FWCC at 3.

[62] Boeing Comments of January 12, 2000 at 2-3.

30. Thus, we are adopting a functional definition for earth station use of this band, which should provide for various NGSO FSS system designs, regardless of what terminology is used by an applicant to describe the facility.[63] We note that this definition is similar to the one proposed by SkyBridge and the FWCC without establishing a limit on the number of earth stations per complex or on the size of the earth stations. Moreover, as discussed below, each NGSO gateway antenna will be required to meet an antenna performance standard of 29-25 log theta (θ) dBi in all directions.[64] We find that adopting this antenna performance standard will ensure that NGSO gateway antennas focus their signals in the desired direction without the need for minimum antenna size requirements, which could hinder innovation and flexibility. Additionally, to facilitate coordination with terrestrial facilities, we adopt our proposal requiring a single gateway complex to be located within an area of one second latitude by one second longitude. This requirement, which also applies to GSO FSS earth station sitings, facilitates earth station and terrestrial coordination in shared bands by specifying very limited areas for gateway antennas. Gateway antennas outside of these areas will be considered as separate gateway complexes for the purposes of coordination with terrestrial services and for licensing purposes. Nevertheless, these interconnected gateway antennas could be under multiple licenses, or considered as a single gateway complex.

31. We do not find it is necessary at this time to limit the number of NGSO FSS earth stations that should be allowed to use the 10.7-11.7 GHz, 12.75-13.15 GHz, 13.2125-13.25 GHz, and 13.75-14.0 GHz bands. The applications that have been filed for Ku-band NGSO FSS systems do not reflect a need for a significant number of gateway stations.[65] Therefore, the gateway earth station definition adopted here should be sufficient to prevent ubiquitous deployment of NGSO FSS earth stations in those bands. Nevertheless, as the NGSO FSS service grows to meet increasing capacity demands, any NGSO FSS network architecture changes resulting in a significant increase in the number of gateway stations can be addressed at that time. Finally, we clarify that this gateway definition applies only to NGSO FSS earth stations and not to GSO FSS operations in these bands. Although GSO FSS systems may operate gateway or hub earth stations that have some of the same characteristics as NGSO FSS gateway earth stations, GSO FSS earth stations operating in these bands are subject to separate requirements, which are discussed further below.

2. NGSO FSS Gateway Downlink Band: 10.7-11.7 GHz

32. The 10.7-11.7 GHz band is currently allocated on a co-primary basis to the FS, licensed under Part 101 of the Commission's Rules; and to the FSS for international systems (downlinks),[66] licensed under Part 25 of the Commission's Rules.[67] The FS links in this band support a wide array of communication

[63] The network design of each proposed NGSO FSS system is unique, but all proposed systems have common elements that may be called by different names.

[64] Theta (θ) is the earth station antenna off-axis angle relative to the main lobe of the antenna. This angle is measured in all directions since the NGSO FSS satellites can be located anywhere above the earth station.

[65] See Appendix C for a brief description of each of the Ku-band NGSO operation applications. While most of the applicants propose to deploy less than 5 NGSO Gateway stations in the U. S., we note that SkyBridge proposed to deploy between 30 and 40 NGSO Gateway stations in the U.S.

[66] *See* 47 C.F.R. § 2.106, footnote NG104.

[67] The GSO FSS operations in the 10.7-10.95 GHz and 11.2-11.45 GHz bands must adhere to the requirements specified in Appendix 30B of the ITU Radio Regulations and are referred to as "planned band" operations. GSO FSS operations are typically less extensively deployed in the Appendix 30B planned bands, as compared to non-planned bands. *See* 47 C.F.R. § 2.106 of the Commission's Rules, footnote 792 A; and ITU RR Footnote No. S5.441 and Appendix 30B of the ITU-R Radio Regulations *Provisions and Associated Plan for the Fixed-Satellite Service in the Frequency Bands 4500-4800 MHz, 6725-7025 MHz, 10.70-10.95 GHz, 11.20-11.45 GHz and 12.75-13.25 GHz*. Use of these frequency bands is also governed by Resolution 130 (WRC-97).

services used by utilities, railroads, telephone companies, state and local governments, public safety agencies, and others.[68] Moreover, this band was identified in 1993 in the Emerging Technologies proceeding and in 1997 in the Mobile-Satellite Service ("MSS") 2 GHz allocation proceeding as a future home for fixed point-to-point operations to be relocated from the 2 GHz band.[69] There are also several GSO FSS earth stations for international systems in this band.[70] Further, this band is also used for telemetry, tracking, and control ("TT&C") functions for GSO FSS satellites.[71]

33. The *NPRM* proposed to allow domestic/regional, as well as international, NGSO FSS gateway downlinks in the 10.7-11.7 GHz band, but to maintain the international systems only requirement for GSO FSS. The *NPRM* stated that NGSO FSS gateway downlink operations should be able to share the 10.7-11.7 GHz band with incumbent FS and GSO FSS operations provided the gateway stations are not extensively deployed and proper coordination is performed.[72] To facilitate this spectrum sharing, the *NPRM* proposed PFD and EPFD limits for NGSO FSS satellites to protect FS and GSO FSS earth station operations, respectively. Additionally, coordination procedures between FS transmitters and NGSO FSS earth stations were proposed, as well as NGSO FSS gateway siting restrictions to protect FS growth in the 50 most populated metropolitan areas. The NPRM also proposed that any gateway siting restrictions have a sunset date.[73] Further, the *NPRM* sought comment on the appropriate means to protect GSO FSS service and TT&C links from new NGSO FSS downlink operations. These issues and others that were raised by commenters in this proceeding are addressed below.

a. NGSO FSS/FS Downlink Sharing

(i) Protection of FS receivers (PFD limits)

34. *Proposal.* The *NPRM* indicated that long-term interference from NGSO FSS downlinks into terrestrial FS receivers could be controlled by requiring that satellite transmissions not exceed the PFD limits adopted at WRC-97.[74] These limits are already in place for GSO FSS systems sharing with terrestrial FS and are included in Article S21 of the ITU Radio Regulations.[75] Because NGSO FSS

[68] *NPRM* at ¶ 16.

[69] *See* Amendment of Section 2.106 of the Commission's Rules to Allocate Spectrum at 2 GHz for Use by the Mobile Satellite Service, ET Docket No. 92-9, Second Report and Order, 8 FCC Rcd 6495 (1993) ("Emerging Technology proceeding"). *See also* First Report and Order & Further Notice of Proposed Rule Making, ET Docket No. 95-18, 12 FCC Rcd 7388 (1997) ("2 GHz MSS allocation proceeding").

[70] Our records indicate that there are approximately 113 authorizations issued for GSO FSS earth stations in the 10.7-11.7 GHz band. These authorizations do not indicate the actual number of antennas that a licensee might deploy.

[71] The GSO FSS operations in this band perform TT&C communications to provide data on the spacecraft's functions via a two-way telemetry link between the satellite and the controlling earth station. TT&C communications are used throughout the satellite's life, including the launch and deployment phase. The TT&C function allows the earth station to control both the physical orbital position and internal functioning of the spacecraft.

[72] *NPRM* at ¶ 17.

[73] *NPRM* at ¶ 25.

[74] *See* Article S21 of the ITU Radio Regulations, *see also* Recommendation ITU-R F-758-1, *Considerations in the Development of criteria for sharing between the Terrestrial Fixed Service and Other Services*. This Recommendation sets an interference criteria for protection of terrestrial stations based on an interference-to-noise ratio of -10 dB for 20% of the time. This recommendation does not contain short-term criteria.

[75] *See* ITU RR S21 at Table S21-4 (1998).

systems have different operating characteristics than GSO FSS systems and because WRC-97 recognized that further studies were needed to assess the impact of multiple NGSO FSS systems, the *NPRM* sought comment on the adequacy of these limits. Additionally, the *NPRM* sought comment regarding whether short-term interference limits are necessary, particularly for FS operations with high look angles.[76]

35. *Comments*. Since the adoption of the *NPRM*, the ITU-R has determined that the PFD limits adopted at WRC-97 are adequate to protect terrestrial FS operations from the aggregate interference from both GSO FSS and NGSO FSS satellite systems.[77] While many commenters generally defer to the decisions of the ITU-R regarding PFD limits,[78] terrestrial FS interests argue that the interference potential from NGSO FSS satellites is greater than that from GSO FSS satellites, even under a common set of PFD limits.[79] In particular, FS proponents are concerned that the proposed PFD limits are not adequate to protect terrestrial FS links operating with a higher elevation angle to the horizon from NGSO FSS interference due to potential mainbeam-to-mainbeam[80] interference.[81] FWCC argues that the mainbeam-to-mainbeam interference issue is complicated because the PFD limits do not adequately account for Automatic Transmitter Power Control ("ATPC") in FS stations, a technique that allows FS stations to operate with minimal interference margins.[82]

36. Boeing replies that FS links that use a high elevation angle will not be affected because these terrestrial link transmission paths are much shorter than those used on flat terrain and the terrestrial signal will be robust enough to overcome any NGSO FSS transmission.[83] SkyBridge contends that mainbeam-to-mainbeam interference to FS links will not occur at less than 6 degrees elevation, which it claims protects

[76] The *NPRM* noted that "some terrestrial fixed links operate over mountains, where the mainbeam of the fixed receiver antenna is point well above the horizon. It appears that mainbeam to mainbeam interference could occur under such circumstances." *See NPRM* at ¶ 20.

[77] SkyBridge Reply Comments at 61.

[78] FWCC Comments at 16; EMS Technologies, Inc. Reply Comments at 5; and Boeing Reply Comments at 17.

[79] *See, e.g.*, FWCC Comments at 16.

[80] In relation to directional antennas, the term mainbeam often refers to the focal point where the antenna directs its signal to achieve signal directionality. Similarly, directional receive antennas generally focus their "mainbeam" in the direction of the desired incoming signal. Signal energy outside of the mainbeam direction are generally suppressed and can be considered undesirable. For the purposes of this section, a mainbeam to mainbeam interference situation would occur when an NGSO satellite's downlink mainbeam signal is aligned with a FS link's receive antenna mainbeam. This results in the amplification of the undesired satellite signal within the FS link receiver.

[81] SBC Comments at 3 and FWCC Comments at 12. Further, FWCC states that the high interference levels for more than 2 seconds can cause carrier group alarms ("CGA") which terminate traffic for a minimum of 20 seconds. Further, this may also require a reboot and it may take 10-30 minutes to recover from a 2 second CGA and several hours to achieve whole operation. FWCC states that interference levels NGSO FSS proponents consider acceptable represent a serious public hazard to many fixed operations.

[82] Fixed systems are coordinated at the maximum power for which they will operate. ATPC allows a link to typically operate at less than maximum power using a minimal margin several decibels below maximum power until the desired signal is impeded (*e.g.*, rain-induced fade). Once the desired signal is impeded, the ATPC allows the link to operate at maximum power in order to maintain communications. ATPC can lower the fixed link's operating power by 10-15 dB in clear sky conditions to allow the link to conserve energy and equipment life. *See* FWCC Comments at 13.

[83] Boeing Reply Comments at 16.

95.7% of all FS receivers.[84] Further, SkyBridge argues that FS receivers at higher elevations will be protected by the short term protection criteria agreed to within the ITU-R,[85] which will result in NGSO FSS transmissions that would never exceed a 20 dB interference to noise ratio.[86] Regarding ATPC in terrestrial FS links, SkyBridge states that the ITU study groups have developed a protection criteria to account for an ATPC range of up to 13 dB and that terrestrial interests have not demonstrated that the PFD limits are not adequate to protect terrestrial operations.[87]

37. FS proponents also argue that promises to protect FS operations will be difficult to enforce because an interfering signal can cause complete loss of synchronization and still not be visible on a spectrum analyzer. They also argue that it is not realistic to expect NGSO FSS licensees to willingly shut down if interference occurs. Therefore, regulations to protect FS operations must be established at the outset.[88] SBC Communications, Inc. ("SBC") claims that FS licensees should not bear any burden for correcting interference caused by NGSO FSS and should be reimbursed for the cost of investigating interference caused by NGSO FSS operations.[89] SkyBridge replies that NGSO FSS licensees will have co-primary status in the bands and, therefore, they should not be solely responsible for fixing problems.[90]

38. *Decision*. We note that the ITU-R studied the necessary criteria and PFD limits to allow NGSO FSS satellite downlinks to share spectrum with terrestrial FS operations.[91] In particular, Working Party 4-9S reached agreement on a set of PFD limits in April 1999 that are adequate for the protection of the FS in the 10.7-12.75 GHz band from the aggregate of interference from GSO FSS systems and multiple NGSO FSS systems. The ITU-R studies considered various sharing issues between FS operations and NGSO FSS operations, including typical FS operation margins with ATPC, the aggregate effect of multiple NGSO satellites, and other factors leading to interference concerns.[92] The PFD limits agreed upon within the ITU-R for the 10.7-11.7 GHz band have been affirmed by WRC-2000[93] and are listed below for various angles above the horizontal plane (δ).

Table 3: ITU-R Recommended PFD Limits for 10.7-11.7 GHz Band	
PFD Limit	Angle of arrival above the horizontal plane
-126 dB(W/m^2/ MHz)	$0^\circ \leq \delta < 5^\circ$
-126 +(δ-5)/2 dB(W/m^2/ MHz)	$5^\circ \leq \delta < 25^\circ$

[84] SkyBridge Reply Comments at 61.

[85] *See* ITU-R F. [Doc. 9A/TEMP/65] entitled "Draft new Recommendation on performance degradation criteria in 11/12 GHz." *See also* section 3.1.4.1.1of the CPM Report.

[86] *Id*.

[87] SkyBridge Reply Comments at 62.

[88] FWCC Comments at 15.

[89] SBC Comments at 4.

[90] SkyBridge Reply Comments at 63.

[91] More specifically, these studies have been carried out within ITU-R Working Party 9A (WP 9A) and Joint Working Party 4-9S (JWP 4-9S). WP 9A is titled the "Performance and availability, interference objectives and analysis, effects of propagation and terminology for the fixed service;" and JWP 4-9S is titled "Frequency sharing between the fixed-satellite service and fixed service."

[92] *See* Section 3.1.4 of the CPM Report to WRC-2000.

[93] *See* WRC-2000 *Provisional Final Acts* at Article S21.

-116	dB(W/m^2/ MHz)	25° $\leq\delta$ <90°

39. These PFD limits were derived based on the operating characteristics of a majority of the FS links in the 10.7-12.75 GHz band.[94] Based on the findings of the ITU-R, the decision taken at WRC-2000, and the record in this proceeding, we find that these PFD limits are adequate to protect the vast majority of terrestrial FS operations in the 10.7-11.7 GHz band from NGSO FSS satellite transmissions. Therefore, we adopt the PFD limits in Table 3 for NGSO FSS systems operating in the 10.7-11.7 GHz band. Additionally, we note that these PFD values are the same as those governing GSO operations in this band, except the NGSO PFD limits must be met in a 1 megahertz rather than a 4 kilohertz reference bandwidth.[95] We are also modifying the GSO PFD limits to protect terrestrial services in Section 25.208(b) of the Commission's Rules[96] to a 1 megahertz reference bandwidth.

40. While the PFD limits discussed above appear to be adequate for most operating situations, we find that these PFD limits may not be adequate to protect terrestrial operations with high elevation look angles and ATPC from receiving unacceptable mainbeam-to-mainbeam interference.[97] We note that the minimum operating angle for each proposed NGSO system varies to as low as 6 degrees above the horizon and each system will have different operating characteristics. Therefore, the impact of each NGSO system on terrestrial operations will vary. Further, we agree with satellite commenters that FS links operating under these circumstances represent a small percentage of the total links in the 10.7-11.7 GHz band. For example, out of the 6612 links authorized in the 10.7-11.7 GHz band, 214 links have receive antennas looking at higher than 5 degrees above the horizon.[98] For the worst case interference to occur, these links: (1) would have to be perfectly aligned with the satellite's mainbeam transmissions; and (2) the FS link must not have adequate margin to compensate for the NGSO FSS interference. We note that FS terrestrial links that have high elevation look angles typically have short transmission paths, and the power margins may be sufficient to overcome rain attenuation of the transmission signals. Therefore, we believe the occurrences of mainbeam-to-mainbeam interference between NGSO FSS and terrestrial FS links would be rare.

41. We conclude that the PFD limits adopted here do not need to be tightened to address mainbeam-to-mainbeam interference situations. Tighter PFD limits might overly constrain the NGSO FSS operations. Instead, any protection needed for the small number of FS links that might suffer from mainbeam interference can be accomplished on a case-by-case basis. For example, depending on the specific circumstances, several techniques may be used to mitigate mainbeam interference situations: (1) the FS link could be modified so that the operating margins or antennas can overcome any satellite interference; (2) NGSO FSS satellites could avoid transmitting mainbeam signals in the direction of the incumbent FS links pointed at their orbital path; (3) FS operations may be moved slightly to avoid

[94] *Id*. at 3.1.4.1.1 (a).

[95] The reference bandwidth is the bandwidth over which emission limits are measured. Converting the reference bandwidth of measurements for pfd limits from four kilohertz to one megahertz does not impact any party because the pfd limits are scaled accordingly.

[96] All references to the Commission's Rules in this item refer to Title 47 of the U.S. Code of Federal Regulations (47 C.F.R.).

[97] Specifically, the record is insufficient to determine whether the ATPC circuitry would lower the fixed operation's margin to a sufficient level to cause an outage from a mainbeam NGSO satellite signal occurrence. *See* SBC Comments at 3 and FWCC Comments at 12.

[98] *See* October 28, 1999 *ex parte* filing of FWCC.

mainbeam interference alignment; and (4) the FS link could be adjusted so that the ATPC level allows sufficient margin to overcome satellite interference.

42. In frequency bands with co-primary services, new entrants in a band must coordinate their operations with incumbent operations in order to minimize the possibility of harmful interference between the sharing services.[99] Therefore, new NGSO FSS applicants that operate in bands used by the FS must ensure that their operations will not result in harmful interference to incumbent operations. In most cases, the PFD limits we are adopting should ensure this result. Because NGSO FSS systems will have different operational characteristics (*e.g.*, different minimum angles of operation), each NGSO FSS licensee will have to determine whether incumbent FS operations with elevation angles more than 5 degrees above the horizon will be affected and will be responsible for avoiding interference to incumbents, including possible mainbeam to mainbeam alignments. Likewise, if FS links are to be licensed after commencement of NGSO FSS operations, the FS applicant will be responsible for designing the link to be compatible with satellite operations, including possible mainbeam to mainbeam alignments. We are particularly concerned with incumbent FS operations that are used for public and other types of safety services. For these types of services, even rare interference occurrences could create an unacceptable public or safety hazard; thus, these operations should be protected from harmful interference.[100]

(ii) Coordination of NGSO FSS with FS stations

43. *Proposal.* The *NPRM* proposed that NGSO FSS gateway receivers in the downlink (10.7-11.7 GHz) band would be protected from terrestrial transmitters through coordination.[101] In the coordination process, new facilities from either service are responsible for determining the location of existing operations within a specified distance and using various techniques, such as antenna directionality, terrain shielding, "RF" shielding, or frequency or geographic separation, to ensure that new operations can be accommodated without causing unacceptable interference to existing operations. The *NPRM* proposed to apply the existing prior coordination procedures used for GSO FSS earth stations and terrestrial stations, as set forth in Parts 25 and 101 of the Commission's Rules, to NGSO FSS operations.[102] The *NPRM* also sought comment on whether we should adopt ITU recommendations, which are now under development, concerning coordination areas for NGSO systems that are generally smaller than coordination areas for GSO systems.[103] This is because interference occurrences between NGSO FSS gateway stations and terrestrial stations are of a time-varying nature due to the continuous motion of the NGSO FSS satellite, as opposed to the constant interference signal level between GSO FSS and terrestrial stations. Finally, the *NPRM* proposed to establish 100 km radius exclusion zones around the 50 most populated U.S. cities, wherein gateways would be excluded for a specified number of years so as not to inhibit FS growth.

44. *Comments*. Comsearch, SkyBridge and Boeing support applying to NGSO FSS gateways the existing coordination procedures for GSO FSS earth stations, with some modifications to account for the technical differences in NGSO FSS systems.[104] For example, Comsearch indicates that our rules on earth

[99] *See e.g.*, 47 C.F.R. §§ 25.203 and 101.103.

[100] Harmful interference is that which endangers the functioning of a radionavigation service or other safety services or seriously degrades, obstructs, or repeatedly interrupts a radiocommunication service operating in accordance with Commission rules. *See* 47 C.F.R. § 2.1.

[101] *NPRM* at ¶ 22.

[102] *See, e.g.*, 47 C.F.R. §§ 25.130, 101.103.

[103] *See* ITU-R Recommendation ITU-R IS.849-1, Determination of the Coordination Area for Earth Stations Operating with Non-Geostationary Spacecraft in Bands Shared with Terrestrial Services.

[104] Comsearch Comments at 2, Boeing Reply Comments at 14, and SkyBridge Reply Comments at 50.

station coordination information, contained in Section 25.203(c)(2), need to consider NGSO FSS system characteristics such as antenna pointing information. Comsearch also suggests that the Commission allow industry groups such as the National Spectrum Managers Association ("NSMA") to suggest the appropriate rule changes and coordination data sufficient to account for NGSO FSS systems. Comsearch also recommends that NGSO FSS coordination contours be calculated using the ITU-R Recommendation IS.849 modification procedure to the ITU-R Recommendation IS.847 method.[105] SkyBridge states that the IS.849 procedure can be used until revisions to the ITU's RR Appendix 28/Appendix S7[106] ("App. S7") coordination method to account for NGSO satellite systems are considered at WRC-2000. SkyBridge notes that although NGSO satellite systems have a greater range of pointing azimuths, the area of coordination for NGSO satellite operations would be smaller than that of GSO satellite operations.[107] SkyBridge predicts that the WRC-2000 revisions to App. S7 will account for the time varying nature of the horizon gain for a given azimuth, thereby resulting in smaller coordination areas for NGSO FSS earth stations. Further, it contends that the size of the coordination area does not necessarily preclude FS operations from a geographic area, but defines the area over which interference analysis needs to be performed and potential interference needs to be addressed among the affected parties.

45. FWCC opposes using GSO FSS coordination procedures for NGSO FSS operations and relying on WRC-2000 changes to the ITU's App. S7 coordination methods. Specifically, FWCC argues that coordination with NGSO FSS operations will require more stringent procedures to account for NGSO transmissions in multiple directions, and should take into account all of the factors likely to affect the actual incidence of interference, such as antenna directionality, terrain shielding, radio frequency ("RF") shielding, and frequency or geographic separation.[108] FWCC also proposes that FS operators be required to coordinate only over the azimuths actually used by the NGSO FSS gateway. FWCC further proposes that, if an NGSO FSS earth station accepts a higher-than-desired interference objective when coordinating, any subsequent FS applicant should be allowed to coordinate to the same higher level.[109] FWCC also urges the adoption of rules to improve the equity of the licensing process between FSS earth stations and FS operations. Specifically, FWCC contends that the Commission often licenses FSS earth stations for a band without inquiry into the actual amount of traffic to be carried.[110] Earth station licensees

[105] Comsearch Comments at 2. *See also*, ITU Recommendation ITU-R IS.847-1, *Determination of the Coordination Area of an Earth Station Operating with a Geostationary Space Station and Using the Same Frequency Band as a System in a Terrestrial Service*; and ITU Recommendation ITU-R IS.849-1, *Determination of the Coordination Area for Earth Stations Operating with Non-Geostationary Spacecraft in Bands Shared with Terrestrial Services*.

[106] WRC-95 changed the ITU RR numbering scheme. Therefore, the ITU RR procedures for determining the coordination distance around an earth station for bands shared between space and terrestrial radiocommunication services that were previously in Appendix 28 are now in Appendix S7. We will modify Section 25.251 of our rules to reflex this change. *See* 1998 ITU RR, Appendix S7, *Method for the determination of the coordination area around an earth station in frequency bands between 1 GHz and 40 GHz shared between space and terrestrial radiocommunication services.*

[107] SkyBridge Reply Comments at 51.

[108] FWCC Reply Comments at 11.

[109] Specifically, FWCC states that if a gateway earth station accepts a higher level of interference because it does not plan to use the frequencies on which the interference is present, it must specify that a future incoming Fixed station need not coordinate on those frequencies. If a gateway accepts a higher level of interference because it is shielded by a local feature such as a building or a hill, it must accept a new Fixed station coordinated at the same higher level, if it is shielded by the same feature. If a gateway station accepts a higher level of interference without explanation, then a future incoming Fixed station located in the same general area can coordinate at the same higher level. *See* FWCC Comments at 20-21.

[110] FWCC Comments at 19.

thus maintain preemption rights for that unused spectrum over many square miles. FWCC also maintains that while the Commission has spectrum efficiency requirements for FS links, no similar requirements exist for satellite operations that share the same spectrum.[111] In addition to raising these issues in this proceeding, FWCC also filed a Request for Declaratory Ruling and Petition for Rule Making ("Petition") requesting similar changes to our rules for other bands where FS operations share with FSS operations.[112]

46. In response to FWCC's concerns, SkyBridge asserts that it will have to coordinate for all azimuths because all azimuths will be used by NGSO FSS gateway stations, even though minimum elevation angles may vary.[113] SkyBridge agrees with FWCC that subsequent coordinations of either service should be able to benefit from prior coordination agreements with higher-than-desired interference objectives. SkyBridge opposes any modulation and efficiency constraints because it claims that higher order modulation techniques to be more spectrum efficient would force satellite systems to increase the power of their operations and make spectrum sharing more difficult.[114]

47. FWCC also asserts that NGSO FSS gateway stations should be required to specify half of the band to be left available for FS growth to improve the equity of the Commission's FSS-FS coordination and licensing process.[115] Similarly, Comsearch argues that authorizing NGSO FSS earth stations to use either the 10.7-10.95/11.2-11.45 GHz or the 10.95-11.2/11.45-11.7 GHz segments, but not both in any given area, would allow new FS systems to gain frequency separation from earth stations in the coordination process.[116] FWCC points out, however, that if neighboring gateway stations choose different bands, they would, between them, foreclose FS operations in a geographic area.[117] SkyBridge opposes limiting NGSO FSS systems to half of the band because it would unnecessarily constrain NGSO FSS systems without any demonstrated benefit for FS systems.[118]

48. FS commenters also urge the Commission to require mandatory RF shielding with a required minimum of 18 dB of shielding in all directions around NGSO FSS gateway stations to facilitate the coordination and sharing process.[119] SkyBridge states that there is no reason to require mandatory 18 dB of shielding for all earth stations, but that shielding should be an option operators consider in order to achieve coordination with either incumbent or new FS facilities. SkyBridge also argues that the cost of shielding must be shared and proposes that NGSO FSS operators pay for shielding to protect incumbent

[111] *Id*. at 10. FWCC proposes that NGSO FSS systems be required to use at least the equivalent of 16-QAM or a spectral efficiency of 4 bits/second/hertz.

[112] *See* Request for Declaratory Ruling and Petition for Rule Making of the Fixed Wireless Communications Coalition, RM-9649, filed May 5, 1999. FWCC's filing was placed on public notice June 11, 1999. *See Public Notice*, Report No. 2334.

[113] SkyBridge Reply Comments at 51.

[114] *Id*. at 53.

[115] FWCC Comments at 19.

[116] Comsearch Comments at 7.

[117] FWCC Reply Comments at 4.

[118] SkyBridge Reply Comments at 53.

[119] FWCC Comments at 9.

operations, but that new FS links in the band pay for any shielding to an NGSO FSS earth station if such shielding is needed to achieve coordination.[120]

49. FWCC states that SkyBridge's shielding proposals could significantly reduce the FS's ability to add new links. FWCC argues that FS entities should be able to benefit from RF shielding in the coordination process.[121] Therefore, FWCC proposes the concept of "virtual shielding" whereby an FS applicant can assume 18 dB of "virtual shielding" around each NGSO FSS gateway, whether it is there or not. Under this proposal, the NGSO provider retains the option to build the shielding or site its gateway facility with natural shielding to meet this 18 dB requirement. FWCC contends that this method would allow FS entities reasonable flexibility in the coordination process and, if necessary, NGSO FSS entities would be allowed to meet the requirement through terrain shielding or actual shielding along the necessary azimuths of the gateway operation.

50. *Decision*. We conclude that coordination is important for sharing between NGSO gateway stations and terrestrial operations, and that both NGSO FSS and terrestrial interests will rely equally on coordination to protect their operations. The coordination procedures for FSS and terrestrial FS operations are specified in Parts 25 and 101 of our rules, respectively.[122] These procedures outline the steps that an applicant must take in the coordination process, and are explained in more detail below. After reviewing the record and current coordination rules, we conclude that the current procedures, with some modification, shall be used to coordinate NGSO FSS and FS operations.

51. The coordination procedures for terrestrial FS operations with satellite operations are set forth in Sections 101.21(f) and 101.103 of the Commission's Rules. Generally, Section 101.103 requires entities to complete coordination prior to filing an application for authorization. The applicant must, through appropriate analysis, select operating characteristics to avoid interference in excess of permissible levels to other spectrum users. Section 101.103 also outlines the notification and response elements of the coordination process, where applicants provide relevant information on their proposed operation to other potentially affected entities. Section 101.21(f) further outlines the coordination process for FS links sharing spectrum with satellite services. The FS applicant must first determine if its proposed link would lie within the coordination contour of existing satellite service earth stations. The applicant must also ensure that its proposed operations would not exceed the permissible level of interference allowed by our rules. We find that the information specified and the process outlined in Part 101 of our rules are adequate for coordination between FS operations and satellite operations and do not need modification.

52. We are revising here some of the Part 25 coordination rules for satellite operations to accommodate new NGSO FSS systems.[123] The *Report and Order* in IB Docket No. 95-117 removed

[120] SkyBridge Reply Comments at 55.

[121] FWCC Comments at 10-11.

[122] We require prior coordination for licensing of FSS earth stations and terrestrial fixed stations. Under these procedures, the earth station applicant must, before filing an application with the Commission, identify all potentially affected terrestrial licensees in the vicinity of their proposed earth stations and resolve all potential interference problems with existing terrestrial licensees in the band. In its application, the applicant must certify that coordination has been achieved with affected licensees. The Commission places the applications on public notice, and existing licensees may file petitions to deny if coordination has not been completed. The earth station license will not be granted until all interference issues are resolved. Similar procedures are followed when a terrestrial station application is filed in shared frequency bands.

[123] We are also taking the opportunity in this proceeding to revise some of the Part 25 rules to comport with previous Commission decisions, including, for example, correcting cross-references to revised coordination rules.

Sections 25.252-25.256 from our rules. Those sections specified the method for determining certain necessary coordination information such as coordination distances, rain scatter coordination distances, permissible interference levels and other coordination parameters.[124] The Commission found that because the international coordination procedures contained in Appendix S7 of the ITU RR changed frequently, it would simply reference Appendix S7 in our rules. Therefore, we amend Section 25.203 to reflect that information regarding calculation of coordination information can be found in Appendix S7 of the ITU RR and to reflect the relevant NGSO gateway station coordination information that must be provided to terrestrial users.

53. Appendix S7 has been modified at WRC-2000 to account for coordination between NGSO FSS operations and FS operations.[125] As noted by several commenters, the ITU has developed modified procedures Recommendation ITU-R IS.849 ("IS.849") to the ITU method of calculating coordination contours to account for the characteristics of NGSO versus GSO systems. If FS entities believe that changes to Appendix S7 are not sufficient to address the coordination situation in the United States, they can request that we revisit the coordination procedures for this band.[126] Therefore, other than amending Part 25 to consider NGSO FSS sharing with FS systems, we will make no other changes in our coordination process for operations in the 10.7-11.7 GHz portion at this time.

54. We recognize that the ITU coordination contour calculation methodologies in App. S7, IS847 and IS849 do not consider the effects of terrain shielding and RF shielding; these issues were raised by FWCC. However, coordination contours are used to identify those operations where further interference analysis must be done. Our rules require licensees and applicants to cooperate fully and make reasonable efforts to resolve technical problems and conflicts that may inhibit efficient use of the spectrum.[127] Therefore, we find that it is unnecessary to consider localized characteristics such as terrain and RF shielding in coordination contour calculations. These issues may be considered in the subsequent coordination analysis to ensure that adequate protection is provided to incumbent operations.

55. Regarding the issues raised in FWCC's Comments and Petition concerning the equity of the licensing and coordination of satellite operations sharing spectrum with FS operations, we will be considering these issues in a separate proceeding because the issues are relevant to several bands where satellite services and the FS share spectrum. On October 24, 2000, the Commission adopted a *Notice of Proposed Rule Making* in IB Docket 00-203 to address the FWCC petition.[128] That item made proposals to address FWCC's concerns about effective and equitable use of spectrum in bands shared by the FS and FSS.

56. Regarding the use of RF shielding, we find that RF and terrain shielding will be useful tools in the coordination and deployment of NGSO FSS gateway stations. However, we find that mandatory shielding requirements would be unnecessarily burdensome on NGSO FSS operations. Further, although "virtual shielding" may encourage NGSO FSS entities to site their gateways to take advantage of natural terrain shielding, it would place the burden solely on the NGSO entity to provide for shielding in order to

[124] *See* Streamlining the Commission's Rules and Regulations for Satellite Application and Licensing Procedures, *Report and Order*, IB Docket No. 95-117, 11 FCC Rcd 21581, at ¶ 52 (1996).

[125] *See Provisional Final Acts of the World Radiocommunication Conference ("Istanbul 2000, WRC-2000")* at Appendix S7.

[126] We note that terrestrial operators have participated in proceedings regarding U.S. preparations for WRC-2000.

[127] *See* 47 C.F.R. §101.103(d)(1).

[128] *Notice of Proposed Rule Making*, IB Docket No. 00-203, FCC 00-369, (released October 24, 2000).

share with FS operations. Our coordination and service rules already require Commission applicants and licensees to deploy their operations in such a manner as to avoid harmful interference to other spectrum users, to cooperate fully and make reasonable efforts to resolve technical problems that may inhibit the most efficient use of the spectrum, and to avoid blocking the growth of systems as prior coordinated.[129] Therefore, we encourage entities that wish to use the 10.7-11.7 GHz band to use various types of shielding to meet these requirements. In particular, because NGSO FSS gateway operations do not focus their signals in a single direction like FS operations, we encourage them to accept shielding by subsequent FS entrants if the FS entity agrees to pay for it, as suggested by SkyBridge.

b. Gateway Siting Restrictions

57. *Proposal*. In the *NPRM*, we proposed to establish exclusion areas around the 50 most populated cities, as defined by the 1990 Census, in which NGSO FSS gateway stations could not be located.[130] Each exclusion area would consist of a 100 km radius around the city center. The exclusion zone proposal was intended to provide a workable compromise to FS growth and NGSO FSS gateway deployment based on the premise that satellite gateway stations did not have the geographical limitations of terrestrial operations and could operate without being located in major metropolitan areas, where most terrestrial operations are deployed. Further, because the relocation of some FS links to the 10.7-11.7 GHz band from other bands was the primary factor in proposing exclusion zones, the *NPRM* proposed that any exclusion area requirement have a sunset date. Specifically, we proposed to require NGSO FSS gateway stations to avoid deployment in the designated areas for a specified number of years (*e.g.*, 5 or 10 years) to permit FS relocation. After this date, new NGSO FSS gateway stations would be able to locate facilities within these areas and standard coordination procedures would apply.[131]

58. While sharing between NGSO FSS and terrestrial interests in the 12.75-13.25 GHz band will be discussed below, we believe that it is appropriate to discuss here comments regarding exclusion zones and their benefit for incumbent terrestrial operations in the 12.75-13.25 GHz band. The 12.75-13.25 GHz band is allocated on a co-primary basis to FS, FSS uplink, and mobile operations, and is used primarily by Part 74 BAS and cable television relay ("CARS") service and Part 101 fixed microwave service. As the commenters point out, exclusion zones in the 10.7 GHz downlink band would act as *de facto* exclusion zones in the 12.75 GHz uplink band because the gateway earth station will typically provide links for all authorized bands.[132] In the NPRM, however, we tentatively concluded that exclusion areas are not needed in the 12.75-13.25 GHz band, given the maturity and use of the spectrum and that it is not targeted for relocated systems.[133] With the information provided in the record, we will address exclusion zones for both the 10.7-11.7 GHz and 12.75-13.25 GHz bands jointly to determine their ability to facilitate spectrum sharing between NGSO FSS gateways and terrestrial operations.

59. *Comments*. In initial comments filed in response to the *NPRM*, terrestrial FS interests argue that exclusion zones are justified and necessary to promote the future growth of terrestrial services. FWCC states that NGSO stations have greater geographic flexibility in the 10.7 GHz band than FS links, whose sites are tied to customer locations and line of site.[134] Comsearch and FWCC state that most new

[129] *Id*.

[130] *NPRM* at ¶¶ 23-25.

[131] I*d*. at ¶¶ 24-25.

[132] Comsearch Comments at 5.

[133] *NPRM* at ¶ 34.

[134] FWCC Reply Comments at 8.

terrestrial fixed stations in the 10.7 GHz band are due to expansion of existing FS operations in the band, not relocation of FS links from other bands, so no sunset date should apply to exclusion zones.[135] Comsearch argues that the 11 GHz band is the only short haul band where the channel bandwidths and available equipment support transmission above 45 megabits per second ("Mb/s") and is extensively used by local telecommunications access providers and cellular companies.[136] FWCC states that normal growth of the FS includes an additional coordination of 2000 frequencies per year.[137]

60. In its initial comments, SkyBridge argues that all exclusion zone proposals are arbitrary and without technical justification. SkyBridge also states that gateway siting restrictions are unnecessary because NGSO FSS gateways will be coordinated and shielding may be applied. SkyBridge further maintains that the proposed exclusion zones do not accurately define those geographic regions that could benefit from an FS head-start and would significantly constrain NGSO FSS operators in selecting the most appropriate gateway sites.[138]

61. As previously discussed, in November 1999 SkyBridge and the FWCC filed a joint *ex parte* letter indicating that they had negotiated an agreement on appropriate rules to govern the shared use of the 10.7-11.7 GHz band by the FS and NGSO FSS.[139] In December 1999, SkyBridge and FWCC submitted the agreement as a proposal in this proceeding. In two *ex parte* communications, SkyBridge/FWCC describe the proposal as differing in several important respects from both the NGSO FSS/FS regulatory scheme set out in the *NPRM* and from the views they expressed in their initial comments. Specifically, SkyBridge and FWCC propose, in lieu of exclusion zones, criteria for identifying FS "growth zones." Under the proposal, the location of NGSO FSS gateway earth stations would not be restricted, but the NGSO FSS operator would assume certain obligations during coordination that would protect incumbent FS facilities from interference on existing and possible future channels in the growth zones.[140] A growth zone would be defined as any county in which, based on a semi-annual determination, at least 30 FS frequencies are licensed to transmit in the 10.7-11.7 GHz band. SkyBridge and FWCC recommend that the Commission issue at 6-month intervals a list of counties that qualify as growth zones. The suggested coordination procedures within growth zones would, for example, protect FS facilities on all transmit channels in the frequency band, even if the facility was not operating on some of the channels at the time of coordination; require NGSO FSS stations to mitigate interference from new FS stations attempting to locate within a growth zone; and require NGSO FSS stations to apply to all fixed stations entering the growth zone the same aggregate level of interference that it agrees to accept on any given azimuth from any one fixed station.[141]

62. In December 1999, the Commission issued a *Public Notice* soliciting comment on the SkyBridge/FWCC proposal.[142] Commenting parties generally support the proposal; however, some

[135] Comsearch Comments at 5 and FWCC Reply Comments at 7.

[136] Comsearch Comments at 3.

[137] FWCC Reply Comments at 8.

[138] SkyBridge Reply Comments at 58.

[139] *See* November 12, 1999 *ex parte* letter to Dale Hatfield, Chief of the Office of Engineering and Technology from SkyBridge LLC and the FWCC.

[140] *See ex parte* letter filed by SkyBridge and FWCC on December 8, 1999 and supplemented on December 22, 1999.

[141] *See* December 8, 1999 and December 22, 1999 *ex partes* from SkyBridge and FWCC.

[142] *See Public Notice*, released December 27, 1999, DA 99-3008.

express concern that county boundaries may not accurately reflect FS use in a particular geographic area. The Association of American Railroads ("AAR") states that it believes that the SkyBridge/FWCC proposal represents a reasonable compromise that balances the continued ability of the FS to use the band with the ability of the NGSO FSS proponents to deploy their earth stations.[143] Nonetheless, AAR, Bell Atlantic, and SBC argue that basing growth zones on county boundaries will produce anomalous results since small counties would require more dense FS use to qualify as growth zones, whereas larger counties would require less dense FS use to qualify.[144] SBC points out that far fewer growth zones would be identified on the East Coast than the West Coast, and is concerned that the plan would not adequately accommodate FS facilities that have to relocate from the 2 GHz band to the 11 GHz band.[145] AAR and Hughes Communications, Inc. ("Hughes") recommend that if we adopt the proposal we should be flexible and entertain favorably requests for waiver of the rules where necessary for the continued viability of FS incumbents.[146] Hughes notes that the agreement does not explain why "30" licensed FS frequencies is the threshold for identifying a growth zone, questions whether this number is appropriate, and asserts that implementing the concept of licensed "frequencies" is unclear since licensed bandwidths vary.[147] Although it applauds the efforts of SkyBridge and FWCC to establish reasonable band sharing arrangements, Bell Atlantic prefers that the coordination procedures suggested for growth zones actually be applied everywhere to protect FS facilities.[148]

63. Comsearch states that the use of growth zones, while somewhat arbitrary in definition and scope, reflects an improvement over exclusion zones. However, Comsearch recommends that private coordinators, rather than the Commission, administer the procedure. Comsearch states that frequency coordinators can readily identify growth zones on a real-time basis at the time of the coordination request, and that this procedure would be more effective at tracking changes in 11 GHz usage than a list issued once every 6 months.[149] SBC also believes that the identification of growth zones should be ongoing and part of the coordination process.[150] Comsearch also claims that some of the suggested coordination procedures for use within growth zones need clarification, and prefers that existing coordination procedures for FSS facilities be improved (*e.g.*, earth station location and mitigation techniques,

[143] AAR Comments of January 12, 2000 at 1.

[144] As an example, Bell Atlantic cites San Bernardino County, CA, which, Bell Atlantic maintains, covers over 20,000 square miles and is equivalent to 61 counties between New York City and Northern Virginia. Bell Atlantic Comments of January 12, 2000 at 1-3. *See also* AAR Comments of January 12, 2000 at 2; SBC Comments of January 12, 2000 at 3-4.

[145] SBC Comments of January 12, 2000 at 3-4. The 10.7-11.7 GHz band was identified for future use by fixed operations that must be relocated from the 2 GHz band. *See* Amendment of Section 2.106 of the Commission's Rules to Allocate Spectrum for Use by the Mobile Satellite Service, *Second Report and Order*, ET Docket No. 92-9, 8 FCC Rcd 6495 (1993) ("Emerging Technology Proceeding"). *See also, First Report and Order and Further Notice of Proposed Rule Making*, ET Docket No. 95-18, 12 FCC Rcd 7388 (1997) ("2 GHz MSS Allocation Proceeding").

[146] AAR Comments of January 12, 2000 at 1-2; Hughes Comments of January 12, 2000 at 7.

[147] Hughes Comments of January 12, 2000 at 6-7.

[148] Bell Atlantic Comments of January 12, 2000 at 1.

[149] Comsearch Comments of January 12, 2000 at 2-3.

[150] SBC Comments of January 12, 2000 at 4.

maximizing antenna discrimination, specifying frequencies actually required, limiting pointing azimuths, disclosing terms of coordination agreements).[151]

64. Although it generally supports the growth zone concept, Virgo contends that limiting the 11 GHz band to gateway earth stations is not justified for all NGSO FSS networks, even though it may be appropriate with respect to sharing among SkyBridge earth stations and FS.[152] Virgo maintains that NGSO FSS systems that employ satellite technology that differs markedly from SkyBridge's sub-geostationary circular orbit model will not pose the same interference threat to fixed operations and should not be constrained by the suggested coordination agreement if it is adopted.[153]

65. The Society of Broadcast Engineers, Inc. ("SBE") also supports the growth zone proposal, but argues that further analysis must be done for gateway uplinks wishing to operate in the 12.75-13.25 GHz portion of the TV Broadcast Auxiliary Services and Community Television Relay Service bands. For example, further analysis would be needed to determine what minimum number of BAS or CARS facilities would trigger a growth zone designation at 13 GHz. Given the presence of mobile or portable BAS operations, SBE recommends that gateway uplinks in the 13.15-13.25 GHz portion of that band be precluded from locating within 50 km of the top 100 TV markets. Since BAS and CARS links may cross county boundaries, SBE also recommends that for a given link that crosses county boundaries, both the transmit and receive facilities count in each county in determining growth zones at 13 GHz.[154]

66. *Decision*. We conclude that the record supports the adoption of some restrictions on NGSO FSS deployment in the 11 GHz and 13 GHz gateway bands in specified geographic areas in order to protect incumbent services' use of the bands. Because any restrictions on gateway stations using downlink bands would apply as a practical matter to their corresponding uplink bands, any regulatory scheme to promote spectrum sharing between NGSO FSS gateway operations and incumbent operations needs to address the needs of incumbent operations in both the uplink and downlink bands. The record indicates that geographic protection zones will not only benefit FS operations in the 11 GHz band, including both incumbent operations and those that will relocate from other bands, but also BAS and CARS operations in the 12.75-13.25 GHz band. TV stations in major metropolitan areas, for example, may need some form of protection in specified geographic areas to ensure that TV stations will be able to deploy new BAS operations to accommodate the transition to digital TV.[155]

67. We agree with the majority of commenters that the growth zone concept, which focuses on coordination procedures to protect incumbent services within specified geographic areas, would provide a more efficient and flexible approach to band sharing than exclusion zones in most cases. We also concur with commenters that the implementation of the growth zone concept would appropriately be included in

[151] Comsearch Comments of January 12, 2000 at 6.

[152] Hughes also argues that the 11 GHz band should not be limited to gateway earth stations, and recommends a numeric limit on FSS earth stations of any type as well as limits on receive antenna gain to protect FS facilities, as requirements that would be easier to administer than other proposals. Hughes Comments of January 12, 2000 at 3-5.

[153] Virgo Comments of January 12, 2000 at 3-4.

[154] SBE states that it hopes to resolve issues relating to the 12.75-13.25 GHz band through negotiations with SkyBridge. SBE Comments of January 12, 2000 at 2-4.

[155] For example, we note that the number of television stations could double with the conversion to digital television, so an increase in TV BAS operations could result. While the date for conversion to digital television is December 31, 2006, there are provisions for extension beyond this date. *See Balanced Budget Act of 1997*, adding new paragraph 47 U.S.C. §309(j)(14)(b).

existing coordination procedures, which would not require direct Commission involvement. Nonetheless, we conclude that, based on the record here, the growth zone concept needs further analysis in order to address better the needs of all affected parties. For example, most commenters would prefer that the boundaries for growth zones be based on a uniform measurement so that density of FS use be the primary factor in identifying growth zones, including the possible relocation of FS facilities from other bands to the 11 GHz band. We also must analyze whether, in order to provide equitable band sharing with mobile and temporary fixed BAS and CARS operations in the 13 GHz band, the growth zone concept has to include some exclusion areas for siting NGSO FSS gateway stations or whether other coordination methods may promote band sharing between these services. Thus, in a future separately docketed proceeding, we will evaluate methods for defining growth zones that serve all interested parties in the NGSO FSS gateway bands (10.7-11.7 GHz, 12.75-13.25 GHz, and 13.8-14.0 GHz bands).

c. Restrictions on GSO FSS Operations

68. *Proposal.* As noted above, the 10.7-11.7 GHz band is allocated on a co-primary basis to the FSS for international systems (downlinks).[156] The international system only requirement is set forth in footnote NG104 of the Table of Allocations,[157] and is designed to limit the number of FSS earth stations to enable sharing of the band with the FS. To further promote sharing, our rules limit FSS operations to the 10.95-11.2 GHz and 11.45-11.7 GHz portions of the band.[158] Although the *NPRM* proposed to remove the international requirement for NGSO FSS gateway downlinks and also proposed to allow such gateways to operate in the entire 10.7-11.7 GHz band, we did not propose any changes for GSO FSS systems in this band.[159]

69. *Comments.* GSO FSS providers argue that NG104 should be modified to also allow GSO FSS systems to operate domestically and in the entire 10.7-11.7 GHz band. Loral Space and Communications Ltd. ("Loral") states that removal of the international system only requirement would allow GSO FSS systems to enhance network productivity and maximize use of the Ku-band.[160] PanAmSat argues that we should not place GSO FSS operations at a competitive disadvantage by allowing domestic NGSO FSS, but not domestic GSO FSS, stations in the Ku-band. PanAmSat further argues that we should not subject GSO FSS systems to the rules proposed for NGSO FSS systems. In particular, PanAmSat contends that the large exclusion zones proposed for NGSO FSS earth stations are not appropriate for GSO FSS stations because the latter may have to be integrated into existing sites, such as video production facilities, corporate offices, or Internet access points. Accordingly, PanAmSat proposes that GSO FSS earth stations be permitted inside NGSO FSS exclusion zones on a case-by-case basis, if a need is demonstrated for a station within a zone and if the station is fully coordinated with existing FS facilities and will not constrain future FS use of the band.[161]

70. Comsearch and FWCC state that allowing GSO operations in the entire 10.7-11.7 GHz band would eliminate coordination by frequency separation and would inhibit new FS installations.[162] FWCC

[156] *See* Table 1 following ¶ 6, *supra*.

[157] *See* 47 C.F.R. §2.106, footnote NG104.

[158] *See* 47 C.F.R. §25.202 (a)(1)

[159] *NPRM* at ¶ 17. We note that in Appendix A of the *NPRM* we inadvertently proposed to amend Section 25.202 to allow GSO FSS systems to operate in the entire 10.7-11.7 GHz band.

[160] Loral Comments at 4.

[161] PANAMSAT Comments at 20-21.

[162] Comsearch Comments at 7 and FWCC Reply Comments at 3.

states that limiting GSO operations to international systems will control the number of earth stations and facilitate sharing of the band.[163] FWCC further states that there is no need to permit GSO operations on a comparable basis to NGSO operations in the band to maintain competitiveness because there are technical, regulatory, and market differences between the two satellite services.[164]

71. *Decision*. We are adopting our proposals to remove the international requirement for NGSO FSS systems in the 10.7-11.7 GHz band and to permit such systems to use the entire band. These proposals were broadly supported, and the record demonstrates that the band can be shared by the NGSO FSS and FS. We also find persuasive the arguments of the FS community that expanded GSO FSS use of this band should not be permitted. We believe that FS growth could be significantly inhibited if we were to authorize domestic and international GSO FSS use of the entire band because of the large number of GSO earth stations that would likely be deployed. Further, we find that other bands that are available for FSS downlink use are adequate to ensure GSO FSS growth.[165] Accordingly, we adopt our proposals and limit domestic and international FSS use of the entire 10.7-11.7 GHz band to NGSO FSS gateways. GSO FSS earth stations will continue to operate internationally in accordance with NG104.

d. NGSO/GSO FSS Downlink Sharing

72. After evaluating the extensive record in this proceeding, including the work of the ITU-R study groups and the results of the WRC-2000, we find that the compromise solutions reached in the international meetings provide the basis to allow NGSO FSS operations to share successfully with GSO FSS networks without causing unacceptable interference.[166] The specific technical conclusions from these meetings, which are included in the record in this proceeding and have been incorporated into the Provisional Final Acts of WRC-2000, represent the most comprehensive and current studies on NGSO FSS and GSO FSS co-frequency operations to date. We conclude that these power limits, which include single-entry $EPFD_{down}$ limits and aggregate $EPFD_{down}$ limits for NGSO FSS operations, adequately protect GSO FSS operations and we will require NGSO FSS systems to comply with each type of limit, as appropriate. In addition, we find that the single-entry and aggregate EPFD limits we are adopting also define the level of acceptable interference from a NGSO FSS system into a GSO FSS system under our rules, as proposed in the *NPRM*.[167]

73. Further, we note that WRC-2000 modified footnotes S5.441 and S5.484A to indicate that NGSO FSS applications are subject to standard ITU coordination under S9.12 with other NGSO FSS systems. These footnotes also state that NGSO FSS systems shall not claim protection from GSO systems operating in accordance with the ITU Radio Regulations and that NGSO FSS systems shall operate in such a way that any unacceptable interference that may occur during their operations shall be rapidly eliminated. We find that the modifications to footnotes S5.441 and S5.484A are consistent with our decisions in this document and, accordingly, adopt the WRC-2000 version of these footnotes in our Table of Frequency Allocations.

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[163] FWCC Reply Comments at 4.

[164] *Id*. at 4-5.

[165] Those other bands are 3.7-4.2 GHz, 11.7-12.2 GHz, 18.3-18.8 GHz, and 19.7-20.2 GHz. *See* 47 C.F.R. §25.202 (a)(1).

[166] In this section, we address only the NGSO FSS downlink bands. Many of the same sharing principles discussed herein are also applicable to the NGSO FSS service uplink band at 14.0-14.5 GHz.

[167] *NPRM* at ¶ 28.

(i) Single-Entry $EPFD_{down}$ Limits

74. Single-entry limits define the $EPFD_{down}$ limits that must be met by each NGSO FSS system resulting from emissions from all satellites in the system. There are 3 elements comprising the single-entry limits that must be met by each NGSO FSS system: (1) "validation" $EPFD_{down}$ limits, as well as more stringent "validation" $EPFD_{down}$ limits for specific size antennas located at high latitudes; (2) "operational" $EPFD_{down}$ limits, which protect against synchronization loss ("sync loss")[168] in GSO FSS earth stations between 3 and 18 meters in diameter; and (3) "additional operational" $EPFD_{down}$ limits, or "operational masks" for 3 meter and 10 meter GSO FSS earth stations. It is the combination of these single entry limits with the aggregate limits discussed below that provides adequate protection of GSO FSS networks from NGSO FSS interference. As discussed in more detail below, the ITU Radiocommunication Bureau ("ITU-BR") will perform an assessment on each NGSO FSS system to verify that the system does not exceed the validation limits. The ITU-BR will not make any similar such finding regarding NGSO FSS system compliance with the operational and additional operational limits; however, these limits must be met by each NGSO FSS system in operation.

75. *Proposal.* In the *NPRM*, we indicated that the $EPFD_{down}$ limits needed to adequately protect GSO FSS operations would probably not vary greatly from the provisional $EPFD_{down}$ limits adopted at WRC-97.[169] We stated that "[i]f no acceptable alternative is developed, we believe these provisional limits would be adopted as the international sharing criteria at WRC-2000." Further, we requested comment on the WRC-97 provisional $EPFD_{down}$ limits.[170]

76. *Comments.* Some commenters initially expressed concern over the adequacy of the WRC-97 provisional limits and during the course of the technical studies the GSO FSS and NGSO FSS proponents proposed different sets of single-entry $EPFD_{down}$ limits.[171] The supplemental filings, however, from members of the GSO FSS and NGSO FSS communities demonstrate support for the single-entry $EPFD_{down}$ limits agreed to at the CPM and eventually adopted by WRC-2000.[172] The commenters recognize that each of the elements of the single-entry $EPFD_{down}$ limits agreed upon at the CPM addresses a separate requirement of NGSO FSS or GSO FSS operators and that it is a combination of these limits, as well as the aggregate limits, that will adequately protect GSO FSS networks.

77. *Decision*. The limits adopted by WRC-2000 were developed using the agreed upon criteria developed by the ITU-R. The JTG 4-9-11 (1) studied the characteristics of the GSO FSS systems to be

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[168] *See* Provisional Final Acts WRC-2000, Article S22 Table S-22-4A. The ITU-R agreed upon sync loss criterion is contained in recommends 3.2 of ITU-R Recommendation S.1323. Sync loss is generally defined as the disruption in the transmission of a digital signal resulting in either lost data or reduced transmission capacity. The impact of sync loss on GSO FSS networks can be significant because the total outage time exceeds the duration of interference due to the additional "recovery" period needed to reacquire the signal. For example, as noted by PanAmSat, sync loss of a radio path in a telephone network could result in a large number of users having to redial dropped connections. Sync loss of a cable or broadcast feed could cause loss of video information to a large viewing audience. *See* PanAmSat Comments at 22.

[169] The WRC-97 provisional limits were incorporated into Article S22 of the ITU Radio Regulations. It should be noted that the WRC-97 provisional EPFD limits are only comprised of the validation EPFD limits.

[170] *NPRM* at ¶ 26.

[171] *See* PanAmSat Comments at 9-13 and Appendix A, GE Comments at 20, and Satellite Coalition Comments of July 29, 1999. *See also* SkyBridge Comments at 32-36, 39; and SkyBridge Reply Comments at 27-28.

[172] *See, e.g.*, Hughes Supplemental Comments at 2, Lockheed Martin Supplemental Comments at 4-5, PanAmSat Supplemental Comments at 2, GE Supplemental Comments at 2, and SkyBridge Supplemental Comments at 12-14.

protected, (2) defined protection criteria for GSO FSS systems,[173] and (3) based on these parameters, determined the level of interference that could be accepted from NGSO FSS systems. We find, based upon the technical work adopted by the WRC-2000 and the record developed in this proceeding, that the international consensus single-entry $EPFD_{down}$ limits for 0.6, 1.2, 3, and 10 meter GSO FSS receive earth station antennas are appropriate for adoption domestically.[174] Specifically, we believe that NGSO FSS adherence to the three elements of the single entry limits (*i.e.*, validation limits, operational limits, and additional operational limits), as well as the aggregate limits discussed below, will adequately protect GSO FSS networks. We adopt these limits as new rule Section 25.208(d), Section 25.208(f), and Section 25.208(g) of the Commission's Rules, contained in Appendix A of this First R&O.[175] Below we discuss the importance of each of the three elements that comprise the single-entry limits.

78. The first set of limits are the "validation" $EPFD_{down}$ limits or validation masks.[176] These validation limits represent the maximum allowed EPFD, for a specific earth station antenna size, at any point on the surface of the Earth resulting from the worst case statistical interference levels of a single NGSO FSS system.[177] The ITU-BR will determine whether an NGSO FSS system meets these limits using software developed in accordance with the ITU agreed upon methodology.[178] NGSO FSS systems that were submitted to the ITU-BR prior to WRC-2000 must submit supplemental information to allow the ITU-BR to assess compliance with the validation limits.[179] Any NGSO FSS system that fails the ITU-BR validation test would receive an unfavorable finding from the ITU-BR, and would therefore not be entitled to international frequency protection. The WRC-2000 adopted more stringent validation limits, also verified by the ITU-BR, to protect GSO FSS earth stations located at extreme latitudes.[180] We find that

[173] The ITU-R reached agreement that aggregate NGSO FSS transmissions not be responsible for more than 10% of the amount of time for which the link C/(N+I) ratio is permitted to fall below the shortest-term performance threshold defined for the considered link. *See* Section 3.1.2.1.2 (b) of the CPM Report to WRC-2000. This criterion is defined in ITU-R Recommendation S.1323. *See* ITU-R Recommendation S.1323, "Maximum Permissible Levels of Interference in a Satellite Network (GSO/FSS; NON-GSO/FSS; NON-GSO/MSS Feeder Links) in the Fixed-Satellite Service Caused by other Co-directional Networks below 30 GHz." Several commenters accept the use of this criterion in developing appropriate $EPFD_{down}$ limits to be met by NGSO FSS systems. *See, e.g.*, SkyBridge Comments at 25-26 and 32; PanAmSat Comments at 5 and 9; Telesat Canada Comments at 4.

[174] We note that in the 11.7-12.2 GHz band, the Commission routinely authorizes GSO FSS earth stations having an antenna diameter of 1.2 meters or greater. Nevertheless, for the 0.6 meter GSO FSS earth stations, the $EPFD_{down}$ limits adopted represent the protection level that would theoretically be required.

[175] *See* Appendix A.

[176] These validation limits must be met by each NGSO FSS system individually and are therefore considered "single-entry" validation limits.

[177] *See* Provisional Final Acts WRC-2000, Table S22-1A.

[178] ITU-R Recommendation BO.1503 contains the specification for the software which the ITU-BR will use to determine whether a NGSO system meets the single-entry $EPFD_{down}$ validation limits. *See* ITU-R Recommendation BO.1503 entitled, "Functional Description to be Used in Developing Software Tools for Determining Conformity of non-GSO FSS Networks With Limits Contained in Article S22 of the Radio Regulations." The output of the software is represented by continuous curves of cumulative density function (CDF) as a function of percentage of time which will be compared to the single-entry validation limits contained in Article S22, Table S22-1A.

[179] *See* Resolution COM 5/31 of the Provisional Final Acts of WRC-2000, which addresses implementation dates for the actions taken at WRC-2000.

[180] The validation limits for NGSO FSS satellites that are above 57.5 degrees Northern latitude and below 57.5 degrees Southern latitude are more stringent because of the increased susceptibility of GSO FSS earth stations operating at these latitudes to receive NGSO FSS interference. The wanted signal level received by GSO FSS earth (continued….)

these validation limits are appropriate for adoption domestically because they provide an upper bound on the NGSO FSS interference received by a GSO FSS earth station anywhere on Earth.

79. The "operational" $EPFD_{down}$ limits protect GSO FSS links from sync loss. Operational $EPFD_{down}$ limits are specified as a maximum $EPFD_{down}$ limit that may never be exceeded into an operational GSO FSS earth station antenna equal to or greater than 3 meters in diameter; that is, these limits are applicable 100% of the time.[181] These limits are more stringent than the validation limits. The ITU-BR, however, does not make a finding with respect to NGSO FSS compliance with operational limits.

80. The "additional operational" $EPFD_{down}$ limits, or as referred to by some parties, "operational masks," afford GSO FSS operators further assurance that NGSO FSS systems will not cause them unacceptable interference. Additional operational limits, which apply only to 3 meter and 10 meter GSO FSS earth station antennas,[182] represent the actual, rather than worst case, interference levels from a NGSO FSS system.[183] These limits are also more stringent than the validation limits and will not be verified by the ITU-BR. However, Administrations implementing NGSO FSS systems are required to commit to the ITU that its system(s) will meet the additional operational $EPFD_{down}$ limits.[184]

(ii) GSO FSS Reference Earth Station Antenna Pattern

81. The GSO FSS earth station antenna pattern is an important component in the assessment of interference from NGSO satellites into GSO FSS earth station receivers. This is because of the highly directional nature of GSO FSS earth station antennas. Indeed, $EPFD_{down}$ is defined as a function of the GSO FSS earth station receive antenna pattern.[185] The ITU-R has also developed a new GSO FSS reference pattern to be used in sharing studies between NGSO FSS and GSO FSS systems, which takes

(Continued from previous page)
stations at extreme latitudes is attenuated significantly due to the increased transmission path (from GSO orbit to earth station location) and the use of edge-of-beam satellite transmissions to serve these geographic areas. In addition, the relatively light population density at these latitudes allows NGSO FSS systems to direct fewer active satellite beams to these areas, thereby, generating less power and reducing the level of interference.

[181] This is because susceptibility to NGSO FSS induced sync loss only occurs during an "in-line" event. An "in-line" event is a physical phenomena in which a GSO FSS satellite, NGSO FSS satellite and GSO FSS earth station are aligned in a straight line. During an in-line event, the GSO FSS earth station would receive the highest interference level from the transmitting NGSO FSS satellite through the mainbeam of the GSO FSS earth station antenna.

[182] Generally, the larger the GSO FSS earth station antenna, the more stringent the required NGSO FSS $EPFD_{down}$ limits. This need for the more stringent limits is due to the higher main beam gain associated with larger GSO earth station antennas. Adopting $EPFD_{down}$ limits for protection of 3 and 10 meter GSO FSS earth station antenna sizes should also protect GSO FSS earth stations between 3 and 10 meters in diameter.

[183] The actual interference from a NGSO FSS system is represented by a continuous curve of $EPFD_{down}$ levels not to be exceeded for percentages of time from 0% to 100%.

[184] Administrations implementing NGSO FSS satellite networks in frequency bands where additional operational limits have been established are required to commit that the NGSO FSS system will meet the additional operational $EPFD_{down}$ limits that are specified in Table S22-4A1 under No. S22.5I. WRC-2000 included this additional requirement in Appendix S4, Item A.15 of the Radio Regulations. *See* Provisional Final Acts of WRC-2000, Appendix S4, Annex 2A. *See also* Resolution COM 5/31.

[185] Section 25.201 of the Commission's Rules, 47 C.F.R. §25.201, is amended to include the definition of EPFD.

into account the time-varying nature of NGSO FSS interference.[186] The new GSO FSS reference pattern differs from the requirement currently specified in Section 25.209 of the Commission's Rules. The Section 25.209 requirement was developed to facilitate GSO to GSO sharing where a constant level of interference is present. The new reference pattern, on the other hand, takes into account the transient nature of NGSO FSS interference by averaging the peaks and nulls of a GSO FSS earth station antenna, rather than conservatively specifying an envelope of the sidelobe peaks. SkyBridge supports the use of the new GSO FSS reference antenna pattern.[187] No parties objected to the use of this new pattern in the international process or within the domestic proceeding.

82. Accordingly, we will incorporate the new GSO FSS reference antenna pattern in the rules for $EPFD_{down}$.[188] This new pattern will be assumed whenever interference assessments between GSO FSS and NGSO FSS systems are performed. We do not see the need, however, to modify the antenna performance standards contained in Section 25.209 of the Commission's Rules. This requirement remains applicable to sharing scenarios involving a constant level of interference (*e.g.*, GSO to GSO sharing) and will continue to be the standard used for FSS earth station licensing.

(iii) Domestic Implementation of Single-Entry Limits

83. Many of the GSO FSS interests emphasize the importance of the Commission adopting detailed rules and procedures to ensure compliance with the appropriate limits of each NGSO FSS system licensed by the Commission or authorized by the Commission to provide service in the United States.[189] GE American Communications, Inc. ("GE") and PanAmSat, in particular are concerned that the $EPFD_{down}$ limits must be accompanied by adequate monitoring and enforcement measures to ensure that NGSO systems comply with the limits.[190] In addition, Hughes, an applicant for two NGSO FSS systems in the Ku-band, states that it will provide the Commission with the available information to help the Commission devise workable validation and enforcement mechanisms for NGSO system compliance with the limits and encourages the Commission to require these same commitments from all NGSO FSS applicants.[191]

84. SkyBridge and Boeing assert that the Commission should conform to the framework of the compromise CPM agreement as it develops additional regulatory measures and should not impose new, excessive burdens that hinder the provision of NGSO FSS services to the public.[192] SkyBridge suggests that the Commission incorporate by reference into its rules the assessment procedures for the operational limits ultimately developed by the ITU-R.[193] Virgo and Lockheed Martin state that the nature of the

[186] *See* ITU-R Recommendation S.1428, "Reference FSS Earth –Station Radiation Patterns for Use in Interference Assessment Involving NON-GSO Satellites in Frequency Bands Between 10.7 GHz and 30 GHz," June 25, 1999.

[187] SkyBridge Comments at 99.

[188] *See* 47 C.F.R. § 25.208(d) (EPFD definition which include reference earth station antenna pattern); s*ee* footnote 1 to Table 1D in Section 25.208(d) (ITU Rec. S.1428 shall be used only for the calculation of interference from non-GSO FSS systems into GSO FSS systems).

[189] Hughes Supplemental Comments at 2, Lockheed Martin Supplemental Comments at 4-5, PanAmSat Supplemental Comments at 2-3, and GE Supplemental Comments at 3.

[190] GE Supplemental Comments at 3 and PanAmSat Supplemental Comments at 11-12.

[191] Hughes Supplemental Comments at 2-3.

[192] Boeing Supplemental Comments at 4 and SkyBridge Supplemental Comments at 3.

[193] SkyBridge Supplemental Comments at 15.

compromise arrangement with its reliance on "operational" and "additional operational" limits that are not subject to verification by the ITU places much of the burden of ensuring compliance with the regulations on each government's Administration.[194]

85. As discussed below, we are adopting implementation procedures for single-entry validation limits and a separate set of procedures for operational and additional operational limits. We believe that the specific implementation measures discussed below will ensure that NGSO FSS systems will indeed adhere to the applicable EPFD limits. In addition to ensuring protection of GSO FSS networks, the implementation framework will assist the Commission in its need to confirm to the ITU that the appropriate limits are being met. Further, it will enable the quick identification of any NGSO FSS operations in excess of the single-entry limits.

(iv) Domestic Implementation of Single-Entry Validation $EPFD_{down}$ limits

86. *Proposal.* In the *NPRM*, we noted the importance of establishing an accepted method for validating within the United States that a NGSO FSS system meets the appropriate EPFD limits, as well as for confirming the information about the NGSO system that is sent to the ITU. We also proposed that the NGSO FSS applicants provide the Commission with sufficient information on their respective NGSO FSS system characteristics to allow proper modeling of the system in computer simulations.[195] We noted that the ITU-R was developing a functional description for software to be used by the ITU-BR to determine whether a NGSO FSS system meets the required limits.

87. *Comments*. SkyBridge and Loral assert that the Commission should incorporate the validation limits agreed to at the CPM into our rules and require all NGSO FSS applicants to provide all of the information required by the ITU-BR for validation.[196] In terms of how compliance could be met, SkyBridge supports the proposal that the Commission either rely on the validation conducted by the ITU-BR or that we undertake such validation using the same software "tool" (specification) as the ITU-BR.[197] PanAmSat asserts that there is no need to incorporate the validation limits into the Commission's Rules. Instead, PanAmSat proposes we impose as a license condition that an NGSO FSS system may not begin operations until the ITU confirms in writing that the licensee has met the validation mask requirement and this determination is forwarded to the Commission.[198]

88. Boeing and STA support the idea of a software simulation tool being used to verify compliance of NGSO FSS systems, however, they discourage the Commission from adopting any one of the currently existing simulation tools, until all of the various software tools that have been developed have undergone further analysis.[199] STA agrees that we should adopt a validation process for domestic use and require NGSO FSS applicants to disclose the requisite system parameters and provide any software

[194] Lockheed Supplemental Comments at 6-7 and Virgo Supplemental Comments at 3-4.

[195] Specifically, we proposed that each NGSO FSS applicant provide its hand-over and satellite switching strategies, satellite beam patterns, and earth station antenna patterns. Further, we proposed that each NGSO FSS applicant provide the orbital parameters required to comply with the U.S. international obligations required in Section A.4 of APS4 of the ITU Radio Regulations. *NPRM* at ¶ 81.

[196] SkyBridge Supplemental Comments at 13 and Loral Supplemental Comments at 5.

[197] SkyBridge Supplemental Comments at 13-14.

[198] PanAmSat Supplemental Comments at 13.

[199] Boeing Comments at 84 and STA Comments at 8.

elements necessary to supplement the core validation software.[200] STA further asserts that the core validation software under development by the ITU-R for use by the ITU Radiocommunication Bureau be used for consistency. Telesat Canada asserts that, in addition to having a software tool to ensure that a NGSO FSS licensee will meet applicable limits, a supplementary procedure is needed to validate the actual hardware performance of an NGSO FSS satellite while in orbit.[201]

89. *Decision*. As the notifying Administration to the ITU for U.S.-licensed NGSO FSS systems, we need to be confident that the NGSO FSS system information we send to the ITU-BR is accurate and that the validation test used domestically is the same as that used by the ITU-BR and other Administrations. These assurances will provide consistency in the output of the validation test and enable these results to be reproduced by all affected Administrations.[202] Therefore, we will require each NGSO FSS applicant to demonstrate *prior to licensing* that it meets the $EPFD_{down}$ validation limits. Further, we agree with commenters that the software used for the validation test should be developed in accordance with the ITU software specification contained in ITU-R Recommendation BO.1503.

90. Specifically, each NGSO FSS applicant shall provide the following information, detailed in Section 25.146(a)(1)[203] of the Commission's Rules, to the Commission: (1) output of the validation test consisting of cumulative density function curves of $EPFD_{down}$ as a function of percentage of time not to be exceeded;[204] (2) comparison of output/results to "validation" $EPFD_{down}$ limits; (3) PFD mask used as input parameter in simulation; *(*4) identification and description of assumptions and conditions used in generating the PFD mask; (5) other NGSO FSS system input parameters required for the execution of the software, and (6) actual software used by the NGSO FSS operator in implementing the ITU-R Recommendation BO.1503 software specification, including the source code and the compiled executable program. The Commission will verify this information. Once we are satisfied that the NGSO FSS applicant has demonstrated its ability to comply with the validation $EPFD_{down}$ limits, we will submit the required information to the ITU-BR. As noted above, the ITU-BR will then use this information to make its own determination of compliance with the validation limits.

(v) Domestic Implementation of Operational and Additional Operational $EPFD_{down}$ Limits

91. During the course of the ITU-R technical discussions, Administrations recognized that the single-entry validation $EPFD_{down}$ limits alone might not adequately protect 3 and 10 meter GSO FSS earth station antennas from unacceptable interference. In an attempt to balance the requirements of both GSO FSS and NGSO FSS operators,[205] WRC-2000 adopted single-entry operational and additional operational

[200] STA Comments at 8.

[201] Telesat comments at 6, citing ITU-R WP4A/TEMP/92 (Rev.1).

[202] Results of the validation process will also be useful, in part, in determining the aggregate interference from multiple NGSO FSS systems operating co-frequency.

[203] *See* Appendix A.

[204] To demonstrate compliance with the validation limits, an NGSO FSS system operator must derive the NGSO FSS $EPFD_{down}$ distribution levels as a function of percentage of time using software developed in accordance with the ITU software specification. This software specification requires the NGSO FSS operator to supply the NGSO satellite PFD mask, which defines an envelope of the maximum power radiated by each individual NGSO space station, independent of the resource allocation scheme used by the NGSO FSS system and the traffic carried by the NGSO FSS system. This PFD mask approach makes some conservative assumptions with regard to the NGSO FSS system's traffic patterns and beam switching strategy.

[205] From the GSO FSS perspective, it is desirable to make a worst-case assessment of the NGSO FSS interference potential in order to provide incumbent operators with a level of assurance that the new interference (continued….)

$EPFD_{down}$ limits that would not be subject to verification by the ITU-BR.[206] Our endorsement of the WRC-2000 operational and additional operational limits essentially transfers the burden of compliance verification with the single-entry limits from the ITU-BR to the U.S. Administration.

92. *Comments*. Representatives from both the GSO FSS and NGSO FSS industries clearly support the operational and additional operational $EPFD_{down}$ limits agreed upon at the CPM.[207] In fact, PanAmSat states that it would not have agreed to the compromise had the operational limits not been included and further states that the operational limits "should form the cornerstone of the Commission's NGSO FSS rules."[208] Commenters specifically addressed: (1) the need for NGSO pre-operational demonstration of compliance with operational limits; (2) the need for NGSO pre-operational demonstration of compliance with additional operational limits; and (3) NGSO post-operational compliance with both the operational and the additional operational limits. We discuss each category below.

93. *Pre-operational Compliance with Operational Limits*. GE states that the Commission, as a pre-grant requirement, must require each NGSO FSS applicant to make a full demonstration that its system is capable of complying with all operational limits.[209] GE asserts that this information should include: a demonstration that the NGSO FSS system will meet the operational masks ($EPFD_{down}$ vs. percentage of time) using a software program provided by the NGSO FSS applicant, and showing the actual expected NGSO downlink power levels from the NGSO satellites' sidelobes under worst-case loading; and documentation showing the probability density functions of the $EPFD_{down}$ for specific geographic locations in the U.S. (chosen by the FCC and GSO FSS operators) under maximum traffic loading.[210] GE further argues that any verification software relied upon by the NGSO FSS entity must be available and the assumptions underlying the program must be adequately described.

94. Boeing argues that it is unnecessary to seek advance verification of the operational limits prior to the operation of the NGSO FSS system.[211] Further, Boeing states that advance verification of operational limits has the potential of creating a long and contentious process between spectrum users. Boeing claims that the operational limits are, by definition, meant to apply to systems in operation and that the purpose of these limits is to prevent harmful interference to GSO FSS systems. Boeing further claims that, if an NGSO FSS system is operating within the verification and operational limits, there will be no unacceptable interference to a GSO network and therefore no need to demonstrate compliance with the

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environment will be acceptable. An NGSO FSS applicant, on the other hand, would prefer a more realistic assessment of the interference potential because that would permit it greater flexibility in implementing its system.

[206] The ITU-R is developing procedures for Administrations and operators implementing NGSO FSS and GSO FSS systems to ensure compliance with the single-entry operational and additional operational limits in Section II of Article S22. *See* Resolution COM 5/23 in the Provisional Final Acts of WRC-2000. If an operating NGSO FSS system exceeds the operational $EPFD_{down}$ or the additional operational $EPFD_{down}$ limits into an operational GSO FSS earth station, the NGSO FSS system would need to take all necessary steps to ensure that the interference is immediately restored to levels at or below the operational $EPFD_{down}$ limits. *See* CPM Report Section 3.1.2.4.7. *See also* S5.441 and S5.484A of the ITU RR.

[207] *See, e.g.*, Hughes Supplemental Comments at 2, Lockheed Supplemental Comments at 4-5, PanAmSat Supplemental Comments at 2, GE Supplemental Comments at 2, and SkyBridge Supplemental Comments at 12-14.

[208] PanAmSat Supplemental Comments at 21.

[209] GE Supplemental Comments at 4.

[210] *Id.* at 4. The probability density function describes the distribution of interference levels as a function of antenna size and the percentage of time.

[211] Boeing Supplemental Comments at 5.

operational limit values using software that needs to be developed and approved. Boeing also asserts that, if the NGSO system exceeds these values and unacceptable interference occurs, the GSO system operator will be aware of that interference without software.[212]

95. *Pre-operational Compliance with Additional Operational Limits*. PanAmSat asserts that the Commission should adopt a software compliance procedure for the additional operational limits. PanAmSat proposes that the Commission adopt criteria for the additional operational software in its rules and require NGSO FSS system applicants and gateway earth station applicants to make a showing of compliance and make the software program available to the public.[213] SkyBridge counters that software cannot be used as a regulatory tool in this case because the actual $EPFD_{down}$ statistics from an NGSO FSS system will change over time.[214] Rather, SkyBridge proposes that the Commission require each NGSO FSS system to commit, as part of the application process, to meeting the additional operational limits once in service. SkyBridge argues that the basis for such commitment will presumably be detailed simulations of the NGSO FSS satellite constellation, employing actual operational parameters. SkyBridge suggests that the Commission require that each NGSO FSS licensee be prepared to demonstrate the technical basis for its commitment to the Commission, on request, in the course of any investigation into an alleged violation of the additional operational limits.[215]

96. *Decision*. We will require each NGSO FSS licensee to demonstrate that it meets the operational and additional operational limits *prior* to the NGSO FSS system being placed into service, as suggested by some commenters. Indeed, much of the critical protection to GSO FSS networks comes from the operational and additional operational limits that will not be subject to ITU verification. We find this demonstration is necessary prior to the NGSO FSS becoming operational because it: (1) provides the FCC assurance that the NGSO FSS system will be built in accordance with FCC rules; (2) provides incumbent operators assurance that they will not receive unacceptable interference; (3) in the case of the additional operational limits, enables the Commission to make the required commitment to the ITU-BR; and (4) reduces the likelihood that the Commission would need to apply remedial measures to bring an operational system into compliance. Moreover, we believe a comprehensive demonstration of compliance with both the operational and additional operational limits is warranted due to the infancy of NGSO FSS systems. Once the Commission and industry gain experience through actual operation of these new systems, the Commission may choose to revisit the requirement for such a detailed demonstration prior to an NGSO FSS system becoming operational.

97. We recognize that the tools required to make this demonstration may not be available to NGSO FSS licensees before they receive their space station authorizations from the Commission. In particular, certain NGSO FSS licensees will need to make use of more accurate system information (*e.g.*, actual measured NGSO FSS satellite antenna performance, expected satellite/earth station resource allocation scheme, spacecraft antenna switching algorithm) that has not yet been finalized at the space station licensing stage.[216] This is why we will not require this demonstration prior to space segment

[212] *Id*. at 6.

[213] PanAmSat Supplemental Comments at 14-15.

[214] SkyBridge Supplemental Comments at 19.

[215] *Id*. at 17.

[216] Since the additional operational limits are more stringent than the validation limits, it is likely that the NGSO FSS operator will need more precise software to verify that its system does not exceed the additional operational limits. Further, more exact system parameters (*e.g.*, satellite antenna performance, satellite/earth station resource allocation scheme, spacecraft antenna beam switching algorithm) will need to be used in order to simulate actual NGSO FSS interference levels. The NGSO FSS licensees may need to submit certain data it believes is proprietary business information. If this is the case, a licensee(s) may request confidential treatment of this specific (continued….)

licensing. Instead, authority to operate the space station segment will be conditioned on the NGSO FSS licensee submitting to the Commission 90 days prior to the initiation of service, a demonstration that its system is expected to meet the operational and additional operational limits.[217]

98. Specifically, each NGSO FSS licensee shall provide the following information as outlined in Section 25.146(b) of the Commission's Rules[218] 90 days prior to the initiation of service: (1) the satellite/earth station resource allocation strategy, spacecraft antenna switching algorithm and the measured spacecraft antenna patterns; (2) a description of how this resource strategy/algorithm and the spacecraft antenna patterns are being used in the software program; (3) the software program used to verify the commitment to meet the operational and additional operational limits and the assumptions used in the structure of the computer program; (4) an identification and description of other input parameters necessary for the execution of the computer program; and, (5) an analysis of the results of the computer simulation and the pass/fail nature of the commitment test. This demonstration should be made at the three worst case test points within the United States and the three worst case test points on each continent, except Antarctica. Once the Commission is satisfied that the NGSO FSS operator has demonstrated its ability to comply with the operational and additional operational $EPFD_{down}$ limits, the U.S. will then be able to certify with confidence to the ITU-BR and other Administrations that U.S. licensed NGSO FSS systems will meet both sets of limits.

99. *NGSO FSS Post-operational Compliance*. Commenters also addressed what procedures and remedies should be taken by the Commission if an NGSO FSS satellite, when in actual operation, exceeds the operational $EPFD_{down}$ limits.[219] PanAmSat argues that the Commission should adopt a fast, reliable process to ensure that the NGSO FSS system's signal is returned to the proper level.[220] GE states that the Commission should determine the elements necessary for a GSO FSS system to make a satisfactory *prima facie* showing that it has been harmed by NGSO FSS operations and establish sanctions for repeated violations by any NGSO FSS system.[221] SkyBridge supports the efforts to develop a means of measuring the actual $EPFD_{down}$ limits generated by an NGSO FSS system into operational GSO FSS earth stations in order to assist operators and Administrations in determining compliance with the operational limits in the event of a dispute.[222]

100. In addition, some commenters argue that we should require each NGSO FSS applicant to provide to the Commission, for public disclosure, all data necessary to determine the location of the satellites in each NGSO FSS constellation at any given time.[223] Boeing disagrees, stating that there is no

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information in accordance with Section 0.459 of the Commission's Rules. *See* 47 C.F.R. § 0.459. We do expect, however, that some information required for the compliance demonstration as well as the results of the compliance demonstration with operational and additional operational limits will be made available to the public.

[217] This demonstration will be included in the milestone requirements of the NGSO FSS space station authorization. Earth station applicants seeking access to a non-U.S. licensed NGSO FSS system will have a similar milestone requirement in its U.S. earth station authorization.

[218] *See* Appendix A.

[219] *See e.g.*, GE Supplemental Comments at 3 and PanAmSat Supplemental Comments at 21.

[220] PanAmSat Supplemental Comments at 21.

[221] GE Supplemental Comments at 6.

[222] SkyBridge Supplemental Comments at 9, citing the CPM-99 Report Sections 3.1.2.4.7 and 3.1.2.4.8. GE agrees that the Commission should take into account the results of WP4A efforts in devising regulatory measures applicable to the measurement of NGSO FSS power levels. *See* GE Supplemental Comments at 5.

[223] GE Supplemental Comments at 5 and PanAmSat Supplemental Comments at 21.

need for NGSO FSS applicants to publish the exact location of their satellite orbital elements on a regular basis. Boeing asserts that, if a GSO network operator suspects that an earth station terminal is receiving unacceptably high levels of interference from a NGSO FSS satellite, that operator can check existing databases to determine the location of all NGSO FSS satellites.[224]

101. *Decision*. We find that there is no need for the Commission to develop additional procedures or remedies in cases where NGSO FSS systems exceed the operational and additional operational $EPFD_{down}$ limits that we are adopting. NGSO FSS operations that exceed these limits will be in violation of Sections 25.208(f) and (g) of the Commission's Rules,[225] as well as in violation of its Commission authorization. Therefore, the NGSO FSS licensee will already be subject to appropriate sanctions by the Commission.[226]

102. We do believe, however, that in the event that a NGSO FSS satellite exceeds the operational or additional operational $EPFD_{down}$ limits, it is important that GSO FSS operators have the information necessary to locate satellites in each NGSO FSS constellation at any given time. Such information will allow the GSO FSS operator to correlate any alleged interference with a specific satellite in an NGSO FSS system. This information, or ephemeris data, is already used by NGSO FSS customers to establish the communications link between the user terminal and the NGSO satellite as it moves across the horizon, and so it should not be an additional burden on NGSO FSS system operators. Therefore, we will require that NGSO FSS licensees publish their satellites' orbital elements in the North American Aerospace Defense Command (NORAD) 2-line element format on an Internet web site maintained by the NGSO FSS licensee. The 2-line element format for many existing satellites is already being generated by NORAD and distributed by NASA via the NASA Prediction Bulletin. Moreover, the 2-line element set can be used together with NORAD's Simplified General Perturbation-4 (SGP4) orbital model, or similar programs, to determine the position and velocity of the associated satellite. We recognize that the NGSO FSS constellation is constantly moving, and so we will require that the NORAD 2-line element data be updated every three days so that the most accurate information is published. These procedures are outlined in new Section 25.271(e) of the Commission's Rules.[227]

(vi) Aggregate $EPFD_{down}$ limits

103. *Proposal.* In the *NPRM*, we stated our concern about the cumulative effect of multiple NGSO FSS systems on sharing with GSO FSS networks, and sought comment as to how the proposed sharing criteria should be applied or adjusted to account for multiple NGSO FSS systems.[228]

104. *Comments*. Among the commenters, there is general consensus that in order to adequately protect GSO FSS networks in the Ku-band, aggregate NGSO FSS $EPFD_{down}$ limits need to be established.[229] PanAmSat proposes that each NGSO FSS applicant provide a demonstration that it meets the aggregate limits contained in the CPM Report. PanAmSat proposes further that the NGSO FSS

[224] Boeing Supplemental Comments at 7.

[225] *See* Appendix A.

[226] *See, e.g.*, 47 C.F.R. §25.160.

[227] *See* Appendix A.

[228] *NPRM* at ¶¶ 73-74.

[229] *See, e.g.,* Satellite Coalition Comments at 5, Boeing Comments at 52-55, PanAmSat Comments at 13, GE Reply Comments at 4-6, and Telesat Canada Comments at 4.

operator provide the software and all of the assumptions used for this demonstration to the Commission.[230] SkyBridge asserts that software validation of the aggregate levels is not appropriate.[231] Boeing argues that the Commission should not require the development of software to be used by NGSO FSS licensees to determine whether the combined interference of their system and previously launched NGSO FSS systems would exceed the aggregate mask limitations as PanAmSat suggests. Boeing adds that such software is unnecessary to determine compliance with aggregate mask limitations for the first three NGSO FSS systems launched because if each of the first three NGSO FSS systems can demonstrate compliance with the single entry mask limits, then the combined interference of all three systems cannot exceed the aggregate mask limitation.[232]

105. SkyBridge argues that compliance with the aggregate levels must be assessed on an international level because the aggregate levels are determined by the combined interference stemming from all of the operating NGSO constellations, including constellations that may not be serving the U.S. SkyBridge urges the Commission to allow the development of the WRC-2000 example aggregate resolution to mature.[233] Virgo contends that the CPM Report does not contain any resolution of the question of how Administrations will ensure that the aggregate interference levels from multiple NGSO FSS systems do not exceed the overall protection criteria that have been identified for co-frequency GSO systems.[234] GE asserts that single-entry limits for individual NGSO FSS systems should be capable of being revised if the aggregate limits will be exceeded by the entry of additional NGSO FSS systems.[235] Lockheed asserts that the Commission should make clear in its rules that any NGSO FSS system will be required to participate in any regime that is established to ensure that aggregate interference, limits set forth in the ITU, are not exceeded for multiple systems.[236] Finally, PanAmSat argues that each NGSO FSS applicant should be required to provide, prior to licensing, a demonstration of compliance with the aggregate additional operational limits.[237]

106. *Decision*. We find that the cumulative level of interference from all co-frequency NGSO FSS systems, *i.e*. the aggregate level, is what must be limited. Therefore, we adopt aggregate validation $EPFD_{down}$ limits in addition to the single-entry $EPFD_{down}$ limits. These limits are contained in Section 25.208(e). In fact, the single-entry $EPFD_{down}$ validation limits contained in Section 25.208(d)[238] were derived from these aggregate validation $EPFD_{down}$ limits using the methodology contained in ITU-R Recommendations and assuming a conversion factor of 3.5.[239] We find use of the 3.5 conversion factor is

[230] PanAmSat Supplemental Comments at 17-18.

[231] SkyBridge Supplemental Comments at 21.

[232] Boeing Comments at 4.

[233] SkyBridge Comments on Results of WRC-2000 at 10-11 (filed July 20, 2000). *See* Resolution [COM 5/6] contained in Provisional Final Acts of WRC-2000, which requests the ITU-R to develop a methodology for calculating the aggregate $EPFD_{down}$ levels produced by multiple NGSO FSS systems.

[234] Virgo Supplemental Comments at 4-5.

[235] GE Comments at 9-10 and GE Reply Comments at 2.

[236] Lockheed Supplemental Comments at 10.

[237] PanAmSat Supplemental Comments at 17.

[238] *See* Appendix A.

[239] The ITU-R agreed that "[a] value of 3.5 for $N_{effective}$ was to be used to determine the final values of single-entry $EPFD_{down}$ versus percentage of time to be applied in bands currently covered under Resolution 130 (WRC-97). This value is to be used solely for the purpose of deriving single-entry $EPFD_{down}$ masks from aggregate (continued….)

appropriate because it takes into account the way in which interference from multiple systems aggregates into a GSO FSS earth station antenna, recognizing that the interference is not strictly additive in a linear or power sense.

107. Although we agree on the importance of requiring NGSO FSS systems to meet aggregate limits, we see many practical difficulties in actually verifying compliance with aggregate limits of any kind. The ITU-R and WRC-2000 also recognized the difficulties, from a regulatory perspective, of checking compliance with an aggregate level. The difficulties include: (1) varying implementation plans do not allow all the number of or the characteristics of the NGSO FSS systems to be known in advance; (2) foreign licensed systems; (3) measurement of aggregates is not technically possible so it must be done through simulation. In addition, since NGSO to NGSO co-frequency sharing has not been thoroughly studied and NGSO FSS licensing rules have not yet been developed, it is unclear at this point how many and in what sequence the qualified NGSO FSS applicants will be licensed. We will not require a demonstration of NGSO FSS compliance with the aggregate limits at this time. Rather, we will require each NGSO FSS licensee to certify to us that it will meet the limits set out in Section 25.208(e). We note that this issue is the subject of further study within the ITU-R.[240] In the future, as these studies progress, we may require each NGSO FSS applicant to demonstrate its ability to meet the aggregate $EPFD_{down}$ limits contained in Section 25.208(e) of the Commission's Rules. We, therefore, place NGSO FSS applicants on notice that the requirement for such a demonstration will be addressed, as necessary in the NGSO FSS to NGSO FSS rule making or, in the NGSO FSS authorization itself.

108. We believe that the aggregate limits issue also needs to be addressed internationally because NGSO FSS systems can be authorized by multiple Administrations. In fact, the WRC-2000 Resolution[241] on the aggregate issue urges Administrations implementing NGSO FSS systems to take all possible steps to ensure that the aggregate $EPFD_{down}$ limits are not exceeded. The United States intends to work with other Administrations to uphold the principles articulated in the WRC-2000 Resolution. We note, however, that there was no international agreement on the need for aggregate additional operational limits to protect GSO FSS operations. Given our adoption of single-entry validation, operational, additional operational, and aggregate $EPFD_{down}$ limits, we find it is not necessary to also adopt aggregate additional operational $EPFD_{down}$ limits, as suggested by PanAmSat.

e. Other Issues

(i) Provision of Ancillary Mobile Services in the Ku-Band

109. Qualcomm Incorporated ("Qualcomm") asserts that the $EPFD_{down}$ limits adopted in this proceeding should protect its incumbent mobile earth stations. Qualcomm is authorized as a non-conforming user to operate mobile satellite earth terminals that receive signals from GSO FSS satellites in the 11.7-12.2 GHz band and transmit signals to GSO FSS satellites on a secondary basis in the 14.0-14.5 GHz band. Qualcomm, however, argues that it should be treated as an incumbent, primary Ku-band GSO

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$EPFD_{down}$ masks and is not a representation of the actual number of non-GSO FSS systems that can share a given frequency band." *See* Sections 3.1.1.1 and 3.1.1.2 of the CPM Report. This conversion factor does not correspond to the number of NGSO FSS systems that can be accommodated due to the different NGSO FSS constellations proposed.

[240] *See* Resolution COM 5/6 from the Provisional Final Acts of WRC-2000 entitled "Protection of GSO FSS and GSO BSS Networks from the Maximum Aggregate Equivalent Power Flux-Density Produced by Multiple NGSO FSS Systems in Frequency Bands where EPFD Limits Have Been Adopted." This Resolution calls for study of "a suitable methodology for calculating the aggregate EPFD produced by all NGSO FSS systems."

[241] *Id*.

service provider for purposes of sharing analysis.[242] Qualcomm claims that its mobile antennas have a gain pattern dramatically different from the rotationally symmetric patterns typically used in NGSO to GSO sharing analyses. To protect its mobile-satellite receive earth station operations, Qualcomm proposes an $EPFD_{down}$ limit of –153.8 dBW/m^2/4kHz (which is equivalent to –143.8 dBW/m^2/40 kHz) never to be exceeded (*i.e.*, not to be exceeded for 100% of the time).[243] SkyBridge and Boeing question the technical analysis performed by Qualcomm, arguing that it is not consistent with the framework accepted in the ITU.[244] One important difference between Qualcomm's operations and most other GSO FSS operations for which we seek protection is that Qualcomm provides "store-and-forward," time-insensitive data communications. For these Qualcomm-type packet services, if a communication signal is damaged it can be retransmitted without degrading the overall quality of the service. Nonetheless, since all of the $EPFD_{down}$ limits (*i.e.*, single-entry validation, single-entry operational, single-entry additional operational, aggregate) we adopt are more stringent, or lower, than the limit of -153.8 dBW/m^2/4kHz that Qualcomm proposes, we find that it is not necessary to address the technical aspects of Qualcomm's analysis or the policy issues regarding protection of secondary or non-conforming services.

(ii) Protection of Very Large Earth Station Antennas

110. *Proposal*. In the NPRM, we proposed that coordination procedures, rather than EPFD limits, be required to protect GSO FSS earth station antennas greater than approximately 10 meters from NGSO FSS interference. We did not propose $EPFD_{down}$ limits in this case because the required limits could preclude NGSO FSS operations altogether. Generally, the larger the GSO FSS earth station, the more stringent the required NGSO FSS $EPFD_{down}$ mask. In the *NPRM*, we also requested comment on the appropriate coordination procedures to be used between these GSO FSS networks and NGSO FSS systems, as well as the specific earth station antenna size that would qualify for special coordination procedures.

111. *Comments*. Although commenters agree in principle with our proposal to require coordination in these special cases, they disagree on the minimum antenna size that would constitute a large antenna and the appropriate triggers to be used for coordination. SkyBridge agrees with the Commission that the existing large earth stations should be protected from NGSO FSS interference, but it notes that the special case of large earth stations first should be carefully assessed in order to prevent unnecessarily burdening NGSO FSS systems.[245] Loral states that statistical analysis is necessary to take into account the geographical variation of the EPFD as well as the geographical distribution of large earth stations.[246] PanAmSat asserts that antennas with diameters between 10 meters and 18 meters should be studied further to determine the conditions where coordination is needed to protect existing and future operations.[247]

112. *Decision*. Agreements reached within the ITU-R and at WRC-2000 have confirmed the need for coordination procedures to protect GSO FSS networks using sensitive receiving earth stations with very large antennas.[248] In the 10.7-12.75 GHz frequency band, these agreements apply only to those

[242] Qualcomm Comments at 3.

[243] *Id.* at 4.

[244] SkyBridge Reply Comments at 25 and Boeing Reply Comments at 43-45.

[245] SkyBridge Comments at 47.

[246] Loral Reply Comments at 3.

[247] PanAmSat Reply Comments at 22.

[248] *See* Appendix S5 of the Provisional Final Acts of WRC-2000.

GSO FSS earth stations with a maximum isotropic gain greater than or equal to 64 dBi (*i.e*., earth station antennas greater than about 18 meters in diameter), with a G/T of 44 dB/K or higher, and an emission bandwidth of 250 megahertz or higher. We recognize that the ITU-R studies in this area are the most extensive to date and find the agreements to be appropriate for adoption domestically as well. Accordingly, coordination will be required between specific GSO FSS earth stations and NGSO FSS systems meeting the conditions specified in Section 25.146(f).

113. While we are not adopting coordination procedures for antennas between 10 and 18 meters, as originally proposed in the *NPRM*, we did adopt operational $EPFD_{down}$ limits which would provide protection to these GSO FSS earth stations.[249] Information from the Commission's earth station database reveals that the number of earth station antennas greater than 10 meters in diameter is very small -- approximately 20 corresponding to 0.5% of the earth stations licensed by the Commission in the 11.7-12.2 GHz band. Further, almost all of the GSO FSS earth station antennas larger than 10 meters in diameter have been in operation for many years, utilize older technology, and are likely to be phased out over time. This is because advances in satellite earth station technology have given way to today's use of smaller, less costly earth station antennas. We believe it would be detrimental to the nascent NGSO FSS service to adopt $EPFD_{down}$ masks or require coordination to protect the limited number of earth stations that are between 10 and 18 meters in diameter. As recognized by the GSO FSS entities, in the unlikely event of NGSO FSS interference into this limited number of earth stations, GSO FSS operators would have the opportunity to mitigate against any interference.

(iii) Protection of Inclined Orbit Operations

114. *Proposal.* In the *NPRM*, we proposed that protection also be extended to GSO FSS earth stations receiving signals from satellites in inclined geostationary orbit.[250] Specifically, we noted that the satellite industry relies on slightly inclined GSO operations to extend the life of a GSO satellite and continue service to customers.[251] For practical purposes, however, we proposed to protect only those GSO FSS satellites that do not exceed a certain degree of inclination and requested comment on what this value of inclination should be.

115. *Comments*. Comments were varied with respect to the maximum degree of inclination that should receive protection. PanAmSat acknowledges that a reasonable limit on the degree of inclination may be necessary.[252] Loral proposes to protect those operations with GSO FSS satellites that are inclined less than or equal to four degrees.[253] Telesat Canada suggests that protection be afforded for inclinations of at least five degrees, and preferably to six degrees.[254] GE submits that any NGSO rules

[249] *See* Appendix A, § 25.208(g), which shows operational $EPFD_{down}$ limits for antenna diameters of 3, 6, 9, and $\geq$ 18 meters. The operational $EPFD_{down}$ limits for antenna diameters of between 10 and 18 meters may be found by using linear interpolation.

[250] In order to preserve station-keeping fuel as a satellite nears its end of life, a satellite operator may stop maintaining station-keeping of the satellite in the north-south direction, thus allowing the satellite to drift at an angle of inclination from the GSO arc (*i.e.*, operate in an inclined orbit). North-south station-keeping fuel is one of the main factors that limits a satellite's life. A satellite in inclined orbit is able to drift within a pre-defined north and south boundary, for example $\pm$ 5 degrees from its nominal orbit location. Non-inclined geostationary satellites are maintain drift by only $\pm$ 0.05 degrees or less in the north-south or the east-west directions of the assigned orbital positions.

[251] *NPRM* at ¶ 27.

[252] PanAmSat Comments at 19.

[253] Loral Comments at 6.

[254] Telesat Canada Comments at 7.

should accommodate GSO FSS satellites that are operating at inclinations of up to 5 degrees.[255] On the other hand, SkyBridge opposes our proposal, claiming that no special requirements are needed for protection of slightly-inclined systems.[256] Again, we note that conclusions have been reached on this issue internationally, both within the ITU-R and at WRC-2000.[257]

116. *Decision*. The ITU-R concluded that no additional protection is needed for earth stations operating with GSO FSS satellites inclined up to 2.5 degrees. Operations with GSO FSS satellites inclined greater than 2.5 degrees and less than or equal to 4.5 degrees would, however, receive additional protection through the operational limits. We believe this is the appropriate approach for adoption domestically and have incorporated these operational $EPFD_{down}$ limits into our Rules.[258] Protection of operations for GSO FSS satellites inclined greater than 4.5 degrees is more difficult because inclined operations basically extend the north-south extension of the geostationary satellite orbit. However, the number of U.S. licensed satellites that continue to provide service while at inclinations greater than 4.5 degrees is extremely limited,[259] and Section 25.280 of the Commission's Rules does not provide additional protection to GSO FSS satellites beyond that provided to GSO FSS satellites that are operating without inclination.[260] Thus, we do not adopt specific protection requirements for GSO operations inclined beyond 4.5 degrees. However, we urge both NGSO and GSO operators to make good faith efforts to coordinate their respective operations.

(iv) Protection of GSO FSS Telemetry, Tracking and Command

117. *Proposal*. In the *NPRM*, we sought comment on the adequacy of the WRC-97 provisional limits to protect GSO FSS TT&C operations in three separate modes of operation; operational (on orbit), transfer orbit (launch phase), and emergency phase.[261] For protection of the operational phase of telemetry downlinks, we noted that although the probability of occurrence of NGSO interference would be low, such an event could have significant and possibly catastrophic impact on TT&C operations. We requested comment on the adequacy of the provisional limits to protect telemetry downlink operations. We proposed that GSO FSS and NGSO FSS licensees consult with each other to avoid interference during GSO FSS transfer orbit operations. Further, we requested comment on how to protect GSO FSS operations in emergency situations.

118. *Comments*. Comments were mixed regarding of protection of the operational phase TT&C. PanAmSat argues that the nature of TT&C operations requires protection not only during the launch phase, but at all other times as well.[262] PanAmSat further proposes that the only solution is to segment the TT&C bands from standard frequencies and to prohibit NGSO FSS operation on these

[255] GE Comments at 23.

[256] *See* SkyBridge Comments at 53 and SkyBridge Reply Comments at 34.

[257] *See* Table S22-4A of the Provisional Final Acts of WRC-2000, which defines single-entry operational $EPFD_{down}$ limits as a function of the orbital inclination of the GSO satellite.

[258] *See* 47 C.F.R. § 25.208.

[259] At the present time, one U.S. GSO FSS satellite operates within the inclination angle of 4.5 degrees and another such satellite operates near this angle.

[260] *See* 47 C.F.R. § 25.280. *See, e.g., AT&T Corp. Application for Modification of TELSTAR 303 Domestic Fixed-Satellite*, Order and Authorization, 11 FCC Rcd 10570 (1999).

[261] *NPRM* at ¶¶ 29-31.

[262] PanAmSat Comments at 24.

frequencies.[263] Loral and SkyBridge believe that the $EPFD_{down}$ and $EPFD_{up}$ limits ultimately adopted will adequately protect GSO TT&C links in operational mode, and no additional measures are required.[264] For protection of "transfer orbit" operations, commenters support the Commission's proposal for consultation between GSO FSS and NGSO FSS licensees.[265] With respect to "emergency" operations, SkyBridge asserts that any operator (GSO or NGSO) should be permitted to use all means at its disposal to reacquire communications and regain control of its spacecraft.[266] In fact GE agrees that in an emergency situation, parties should be able to exceed limits in order to recover control of the spacecraft.[267]

119. *Decision*. Because of the critical nature of transfer orbit operations, we adopt the proposal in the *NPRM* to require consultation between GSO FSS and NGSO FSS licensees to minimize the impact of interference. The impact of NGSO FSS operation on GSO FSS transfer orbit operations will be infrequent and of a short time period, therefore, these events can be coordinated ahead of time in order to avoid unacceptable interference. With respect to emergency TT&C operations, there was agreement within the ITU-R that, during emergency operations in general, any GSO or NGSO FSS operator should be allowed to use any means necessary to regain communications with the satellite. We agree with this position because the measures required to reacquire communications and regain control of the GSO satellite cannot be predetermined. Although we do not adopt any specific measures for NGSO FSS systems to protect GSO FSS systems during emergency TT&C operations, we urge both GSO FSS and NGSO FSS operators to coordinate with each other if such a situation were to occur. The ITU-R, however, was not conclusive with respect to the protection of the operational phase TT&C. There has not been any demonstration that leads us to believe that the telemetry downlinks will not be protected by the $EPFD_{down}$ limits we adopt today. We will not, therefore, adopt specific measures for NGSO FSS protection of GSO FSS telemetry downlink operations at this time. We will closely follow, however, the ongoing work within the ITU-R and consider its conclusions in the development of conditions, if necessary, to be placed on NGSO FSS licensees.[268]

3. NGSO FSS Gateway Uplink Bands: 12.75-13.25 GHz

120. *Current allocations*. The *NPRM* stated that the 12.75-13.25 GHz band requested for NGSO FSS gateway uplinks is allocated on a co-primary basis to fixed, FSS uplink, and mobile operations. This band is primarily used by Part 74 BAS, Part 78 CARS, and Part 101 fixed microwave operations. Television stations use the fixed allocation for BAS studio-transmitter links and the mobile allocation for electronic news gathering ("ENG"). CARS licensees use this band to send video signals between points in their networks. GSO FSS operations in this band must meet the requirements of the ITU Appendix 30B plan, and Part 2 of the Commission's Rules limits these operations to international systems.[269] Similar to

[263] *Id*. at 25. By providing a guardband around these frequencies of 1 megahertz on either side produces an exclusion zone of only 3 megahertz for the command frequencies and 4 megahertz for the telemetry frequencies.

[264] SkyBridge Comments at 54 and Loral Comments at 13.

[265] Loral Comments at 7, GE Comments at 23, SkyBridge Comments at 54, and Telesat Canada Comments at 8.

[266] SkyBridge Comments at 55.

[267] GE Comments at 24.

[268] Preliminary ITU-R studies indicate that: (1) sufficient protection of telemetry downlinks will be provided by $EPFD_{down}$ limits and no special conditions are required; and (2) to not unduly constrain the design of NGSO FSS systems, it may be useful to locate GSO TT&C carriers in specific portions of the band (*i.e.*, near the band edge).

[269] *See* ITU Radio Regulations, Appendix 30B and 47 C.F.R. § 2.106 footnote NG104. We note that there is one licensee using the U.S. Appendix 30B assignment in this band for domestic feeder links for a GSO MSS system.

the 10.7-11.7 GHz band, the international system only requirement for GSO FSS uplink operations has limited the number of earth stations in this band.[270] Further, the band may also be used for vital TT&C functions for GSO FSS satellites.[271]

121. *Proposal.* The *NPRM* indicated that there is significant deployment of terrestrial operations in this band, but concluded that spectrum sharing with NGSO FSS operations was possible. The *NPRM* also proposed to limit NGSO uplink operations in the 12.75-13.25 GHz band to gateway type uplink operations subject to the coordination and the sharing criteria proposed for the 10.7-11.7 GHz downlink operations. Similar to the 10.7-11.7 GHz band, the *NPRM* proposed to amend footnote NG104 in this band to allow domestic NGSO FSS operations, but did not propose to remove the international system only requirement for GSO FSS operations. Additionally, the *NPRM* asked for comment on its tentative conclusion that exclusion zones were not needed for NGSO FSS gateways in the 12.75-13.25 GHz band because the band, already extensively used by terrestrial operations, was not targeted for relocated fixed systems.[272]

122. *Decision*. We will permit NGSO FSS gateway uplink stations to operate in the 12.75-13.25 GHz band on a co-primary basis with incumbent users, except that we will not allow NGSO FSS to operate at 13.15-13.2125 GHz, which is discussed in detail below. We also conclude that although we will permit NGSO FSS operations in this band, we will not remove the requirement that GSO FSS operations be limited to international systems. As we discussed above regarding the 10.7-11.7 GHz band, we believe that the growth of incumbent services would be significantly inhibited if we were to authorize domestic and international GSO FSS use of the 12.75-13.25 GHz band, due to the large number of GSO FSS earth stations that would likely be deployed, and we note that other bands are available for GSO FSS growth.

a. NGSO FSS Gateways Sharing with BAS Operations

123. *Comments*. SBE states that the coordination procedures proposed in the *NPRM* may be sufficient for spectrum sharing between NGSO FSS gateways and fixed, point-to-point BAS links, but no such sharing would be possible with mobile TV pickup stations (*e.g.*, helicopter, blimp, and ENG operations) or stations used at temporary locations with remote steerable antennas.[273] SBE points out that the 12.70-13.25 GHz band is heavily used by BAS operations, particularly in the top TV markets, and the need for additional facilities for digital television use is expected to increase even though the Commission recently reduced the amount of spectrum allocated for BAS in the 2 GHz range.[274] Although SBE contends that a new NGSO FSS gateway station could preclude any additional BAS operations across the entire 12.75-13.25 GHz band over the entire range of angles the gateway antenna uses, SBE states that experiences with other satellite operations attempting to share with BAS operations may exclude NGSO FSS gateway stations due to their inability to protect existing BAS operations. As discussed above, SBE supports the concept of geographic protection areas, such as growth zones, for locating NGSO FSS gateway earth stations to ensure that mobile and temporary fixed BAS can operate in major metropolitan

[270] Our database indicates that there are 9 authorizations issued for GSO FSS earth stations in the 12.75-13.25 GHz band. These authorizations do not indicate the actual number of earth stations or antennas that a licensee might deploy. Additionally, this number may not include several international earth station authorizations issued before 1995 when the IBFS database was created.

[271] *NPRM* at ¶ 32.

[272] *Id*. at ¶¶ 33-36.

[273] SBE Comments at 1.

[274] *Id.* at 2; SBE October 8, 1997 Comments at 4.

areas.[275] SBE also states that NGSO FSS gateway operations must not be allowed to operate on BAS channels A19, A20, B19 and B20 in the 13.15-13.2125 GHz band, which is reserved for TV pickup operations under Section 74.602 of the Commission's Rules.[276]

124. Boeing asserts that its proposed system should not adversely impact BAS operations because it anticipates only two planned gateway stations in the U.S. Boeing states that its proposed 4.5 meter gateway uplink antennas will require unobstructed fields-of-view from elevation angles greater than or equal to 10 degrees from the horizon, reducing the amount of energy transmitted towards the horizon and thus enabling sharing with terrestrial operations with less geographic separation. Boeing states that it will be able to provide data regarding its gateway uplink transmissions to nearby terrestrial service entities and that it will contact nearby television stations to arrange communications paths for BAS operations through periodic information on hourly/daily variations in interference contours.[277] SkyBridge contends that TV pickup operations are secondary in the 12.7-13.25 GHz band, and must accept interference from CARS and STL transmitters. SkyBridge also argues that because of the propagation characteristics of this band, TV stations use it only for short pickup links and often at ground level where the links are shielded from interfering signals by buildings.[278]

125. *Decision*. Because BAS operations have primary allocation status in the 12.75-13.25 GHz band, such incumbent operations are entitled to interference protection from NGSO FSS gateway uplinks. Further, we find that it is important to allow BAS operations to maintain flexibility in establishing temporary links and operating mobile ENG operations. As discussed above, some form of geographic protection area will be developed for locating NGSO FSS gateway earth stations that should prevent NGSO FSS gateways from hindering mobile and temporary fixed BAS use of this band. As we discuss below, we conclude that fixed BAS and CARS operations can coordinate with NGSO FSS gateway stations, and new coordination procedures for use by these services must be developed.

126. Regarding protection of mobile BAS operations, we note that section 74.602 of our rules provides for the exclusive use of channels A19, A20, B19 and B20 in the 13.15-13.2125 GHz band by TV BAS and CARS pickup operations within 50 km of the top 100 television markets.[279] In order to permit BAS and CARS entities to continue remote pickup operations throughout the U.S., we are extending exclusive use of the 13.15-13.2125 GHz band for BAS and CARS pickup operations to all 211 TV markets, thereby precluding NGSO FSS operations from this band segment. We find that this will not have a significant impact on NGSO FSS satellite operations because of the remaining amount of gateway uplink spectrum being made available. We take this action with the expectation that BAS mobile operations, especially those in TV markets where BAS is not extensively deployed, will concentrate their mobile use on the four channels in the 13.15-13.2125 GHz band, thereby leaving the remaining portion of the 12.75-13.25 GHz band spectrum available for NGSO FSS use.

[275] *See* SBE Reply Comments at 2.

[276] *Id.* at 3.

[277] Boeing Reply Comments at 22.

[278] SkyBridge Reply Comments at 55.

[279] *See* 47 C.F.R. § 74.602. TV pickup stations are land mobile stations used for the transmission of material from scenes of events occurring at points removed from the TV broadcast studio to the TV broadcast station, *see* 47 C.F.R. §74.601(a). There are currently 211 television markets in the U.S. Broadcast and Cable Yearbook 1998 at B234.

b. NGSO FSS Gateway Coordination with Terrestrial Operations

127. *Comments*. The issues concerning coordination between NGSO FSS gateway operations and terrestrial fixed operations in the 12.75-13.25 GHz are generally the same as those addressed above for coordination in the 10.7-11.7 GHz band. Basically, commenters support the use of existing coordination procedures for terrestrial fixed operations (including CARS, BAS and FS links) as proposed in the *NPRM*. Comsearch states that the apparent large number of CARS links in this band are due to the Commission's licensing individually each 6 MHz television channel carried by CARS.[280] For example, a CARS path with a full 500 megahertz cable baseband would count as 84 authorized links in the Commission database. However, in terms of transmission paths, Comsearch asserts that the 12.75-13.25 GHz band is not as extensively used as the 10.7-11.7 GHz band, and thus the 12.75-13.25 GHz band has growth potential. Additionally, SBE states that existing coordination procedures would not be sufficient for sharing between NGSO FSS gateways and mobile TV pickup stations or stations used at temporary locations with remote steerable antennas.[281]

128. *Decision*. We conclude that NGSO FSS gateway uplink stations can operate in the 12.75-13.15 GHz and 13.2125-13.25 GHz bands on a co-primary basis with FS operations, using coordination procedures. As an initial matter, we find that Part 74 and Part 78 terrestrial fixed operations should be able to coordinate with NGSO FSS gateway stations under the coordination procedures set forth in Part 101 and Part 25. As we discussed above, NGSO FSS and fixed operations in the 10.7-11.7 GHz band will be able to coordinate their operations under the procedures in Part 101 for fixed operations and Part 25 for satellite operations. The NGSO FSS and fixed operations in the 12.75-13.25 GHz band are technically similar to operations in the 11 GHz band; thus, coordination with fixed links at 13 GHz under existing procedures also is possible. Part 74 BAS operations and Part 78 CARS operations have their own coordination procedures, but these procedures do not provide for sharing with NGSO FSS operations,[282] and existing coordination procedures for FSS operations do not address coordination between satellite and mobile or BAS and CARS operations. For example, BAS is often licensed for the entire 12.7-13.25 GHz range, providing flexibility to coordinate temporary operations locally with other licensees in the band. While these procedures have worked with regard to fixed operations because unused individual channels can be identified and made available on an informally coordinated basis to the mobile BAS operation, we believe that this type of coordination flexibility for BAS could be difficult to achieve with NGSO FSS gateway uplink stations, which may use all available frequencies in an area. Therefore, we conclude that new coordination procedures need to be developed for sharing between NGSO FSS and BAS and CARS operations in the 12.75-13.25 GHz band. Accordingly, we are deferring to a later proceeding a decision on specific coordination procedures that will be used for BAS/CARS and NGSO FSS operations in this band. Further, we will not license any NGSO FSS earth station in the 12.75-13.15 GHz and 13.2125-13.25 GHz bands until appropriate coordination rules are adopted.

c. NGSO FSS Gateways Sharing with GSO FSS Uplinks

129. *Proposal.* As noted in the *NPRM*, WRC-97 adopted a provisional $EPFD_{up}$ limit to protect GSO FSS satellite receivers in the 12.75-13.25 GHz band from transmitting earth stations in a NGSO FSS system. In the *NPRM* we also expressed our belief that the $EPFD_{up}$ limit needed to protect GSO FSS uplink operations would not vary greatly from the WRC-97 provisional limit.[283] Further, we

[280] Comsearch Comments at 5.

[281] SBE Comments at 1.

[282] *See* 47 C.F.R. §§ 74.602, 74.638, 78.36.

[283] *NPRM* at ¶ 36.

asked for technical analysis to support the appropriate $EPFD_{up}$ limit to protect inclined orbit operations and for proposals regarding the level of inclination that merits protection. We also requested comment on whether the $EPFD_{up}$ definition should take into account GSO satellite receive antenna directivity and requested information on the appropriate satellite receive antenna reference pattern(s) that should be considered in developing a modified $EPFD_{up}$ definition.[284]

130. *Comments*. While sharing between NGSO FSS and GSO FSS at 13.75-14.0 GHz, 14.0-14.4 GHz and 14.4-14.5 GHz will be discussed below, we find that it is appropriate to discuss here comments regarding $EPFD_{up}$ limits applicable to all NGSO FSS uplink frequency bands. Many commenters supported the adoption of the WRC-97 provisional limits along with the definitional change to include the GSO satellite receive antenna reference pattern in the $EPFD_{up}$ calculation in a similar manner as the GSO earth station receive antenna pattern is included in the $EPFD_{down}$ calculation.[285] Telesat Canada states that the revised definition would be acceptable as long as the resulting interference into GSO FSS uplinks is less than or the same as the interference with the previous definition.[286] PanAmSat, however, states that the definition of $EPFD_{up}$ should remain to protect more susceptible GSO FSS networks with large beam coverage areas and large beam angles.[287]

131. *Decision*. NGSO FSS systems will have to meet the same $EPFD_{up}$ limit at the geostationary satellite orbit, regardless of whether the NGSO FSS system transmission emanates from a gateway or user earth station facility. In order to protect uplinks to GSO FSS satellites, we adopt the single-entry validation $EPFD_{up}$ limits as adopted by WRC-2000, as new rule Section 25.146(h). The definition of $EPFD_{up}$ includes information regarding the GSO satellite receive antenna directivity for the same reason that the GSO FSS receive earth station antenna pattern is included in the $EPFD_{down}$ definition. Specifically, accounting for GSO FSS satellite antenna directivity limits the number of NGSO FSS earth stations contributing interference in the direction of the GSO satellite and provides a more realistic calculation of the interference level received. Further, the reference GSO FSS space station antenna patterns contained in ITU-R Recommendation S.672 were adopted for the calculation of $EPFD_{up}$.[288] As noted by Boeing, the JTG 4-9-11 reached a consensus agreement that the provisional $EPFD_{up}$ limit is appropriate, even in light of the change in definition.[289] We also find that the $EPFD_{up}$ limits we are adopting will also protect GSO FSS satellites operating in inclined orbits. We also find that the same implementation procedures adopted for the validation $EPFD_{down}$ limits described in paragraphs 88 above are also appropriate for adoption for the $EPFD_{up}$ limits.

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[284] *Id*. at ¶ 37.

[285] Loral Comments at 8, Boeing Comments at 34, SkyBridge Reply Comments at 29, and STA Comments at 4-5.

[286] Telesat Canada Comments at 4.

[287] PanAmSat Comments at 16 and STA Comments at 4-5.

[288] *See* ITU-R Recommendation S.672, "Satellite Antenna Radiation Pattern for use as a Design Objective in the Fixed-Satellite Service Employing Geostationary Satellites." The reference GSO FSS space station antenna patterns used in the calculation of $EPFD_{up}$ are the single-feed patterns defined in this recommendation, assuming a peak gain of 32.4 dBi, a beamwidth of 4 degrees, and a first side lobe level of –20 dB.

[289] *See* Doc. JTG 4-9-11/TEMP/40(Rev.2). The new definition, $EPFD_{up}$ takes into account GSO satellite receive antenna directivity in order to make a more accurate assessment of interference caused by NGSO FSS networks.

d. OpTel Petition

132. *Proposal.* The *NPRM* also requested comment on a request by OpTel, Inc. ("OpTel"), an operator of private cable systems, to amend Parts 78 and 101 of the Commission's Rules to allow licensees in the fixed microwave service to use frequencies in the 12.7-13.25 GHz band to transmit video programming material to end users.[290] Specifically, OpTel requests that Part 78 be amended to make fixed licensees eligible for licenses in the CARS band and that Part 101 be amended to allow fixed licensees to use the 12 GHz band for video programming. The *NPRM* sought comment on whether operations as proposed by OpTel would conflict with potential NGSO FSS operations in the 12.75-13.25 GHz band. Further, on July 14, 1999, the Commission released a Notice of Proposed Rule Making in CS Docket No. 99-250[291] which proposed to allow private cable operators ("PCOs") to use the 12.70-13.25 GHz band to provide MVPD services, under existing technical and operational rules (*e.g.*, one-way, point-to-point,[292] narrow antenna beam transmissions).

133. *Comments*. OpTel argues that if NGSO FSS can share the 13 GHz band with CARS, PCO operations also can share the band with NGSO FSS operations because PCOs are analogous to CARS operations.[293] Similarly, SkyBridge states it can share with PCO operations as long as PCOs comply with the existing terrestrial operational requirements in this band. However, SkyBridge cautions against expanding terrestrial uses of the band to include dissimilar operations, such as point-to-multipoint operations, wide-beam antennas, or the introduction of a different licensing regime, because such uses could inhibit sharing between the FS and NGSO FSS.[294]

134. *Decision*. We find that NGSO FSS gateway stations should be able to share the 12.75-13.15 GHz and 13.2125-13.25 GHz bands with CARS eligibles, provided those operations use technical and operational techniques such as one-way, point-to-point, narrow beam antenna transmissions, as required under existing rules, that facilitate coordination. As indicated above, some issues that might affect operations in the 12.75-13.15 GHz and 13.2125-13.25 GHz bands will be deferred to a future proceeding, such as possible geographic protection areas, some coordination issues, and other NGSO FSS gateway parameters. We also note that the Commission has not yet decided whether to expand CARS eligibility to include PCO operations in the 12.75-13.25 GHz band; this decision will be made in CS Docket No. 99-250.[295] Nonetheless, the sharing potential between NGSO FSS and CARS depends primarily on the technical and operation characteristics of the services, not licensee eligibility. Consequently, we see no need to defer our decision regarding NGSO FSS use of this band.

4. NGSO FSS Gateway Uplink Bands: 13.75-14.0 GHz

135. *Current allocations*. In the *NPRM*, we noted that the 13.75-14.0 GHz band is allocated on a co-primary basis to the FSS and Federal Government radiolocation operations, such as high-powered

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[290] *See* OpTel Petition for Rule Making, RM-9257, filed April 1, 1998.

[291] *See* Petition for Rule Making to Amend Eligibility Requirements in Part 78 Regarding 12 GHz Cable Television Relay Service, *Notice of Proposed Rule Making*, CS Docket No. 99-250, 14 FCC Rcd 11967 (1999).

[292] CARS stations also may transmit in a hub configuration, distributing signals to multiple individually coordinated receiver sites. This "point-to-multipoint" configuration does not include transmissions to multiple, unspecified receiving locations. *See Notice of Proposed Rule Making*, CS Docket No. 99-250, at n.8.

[293] OpTel Comments at 3.

[294] SkyBridge Comments at 76.

[295] *See Notice of Proposed Rule Making*, CS Docket 99-250, 14 FCC Rcd 11967 (1999).

mobile radar systems.[296] The FSS allocation, adopted domestically in 1996, requires that FSS systems meet the following technical constraints agreed internationally and included in footnotes S5.502 (WRC-95), S5.503 (WRC-95), and S5.503A (WRC-95**)**: 1) the e.i.r.p. of any emission from an earth station in the FSS shall be at least 68 dBW, and should not exceed 85 dBW, with a minimum antenna diameter of 4.5 meters; and 2) the e.i.r.p. density of emissions from an earth station in the FSS shall not exceed 71 dBW per 6 megahertz in the 13.772-13.778 GHz frequency range.[297] The *NPRM* indicated that current FSS uplink use of the 13.75-14.0 GHz band is relatively light given the short period of time since this service has been permitted to use the band and the prevalence of Federal Government operations.[298] We further noted in the *NPRM* that the band is allocated on a secondary basis to the standard frequency and time satellite service and space research service,[299] for operations such as the NASA TDRSS and spaceborne sensors that provide weather and other significant data.[300] However, space research service operations authorized prior to January 31, 1992 continue to operate on a co-primary basis.[301] Further, Footnote US337 requires that FSS earth stations in the 13.75-13.80 GHz band be coordinated on a case-by-case basis in order to minimize harmful interference to Federal Government TDRSS operations.[302]

136. *Proposal*. In the *NPRM*, we proposed to allow NGSO FSS gateway uplink operations in the 13.8-14.0 GHz portion of the 13.75-14.0 GHz band. We did not propose to allow such operations in the 13.75-13.80 GHz band segment in order to protect NASA TDRSS operations.[303] To facilitate sharing with incumbent Federal Government operations at 13.80-14.0 GHz, we proposed to apply the e.i.r.p. and minimum antenna diameter limits set forth in footnotes S5.502 and S5.503 and noted above. We further proposed to require coordination of all FSS earth stations located in the United States and insular areas, including NGSO FSS gateway stations, with Federal Government operations through the normal Frequency Assignment Subcommittee ("FAS") process of the Interdepartment Radio Advisory Committee ("IRAC").[304] We noted the concerns of the Department of Defense ("DoD") and NTIA that the operating parameters adopted for FSS operations in the band do not consider NGSO services, and that if such services are permitted, they must do so in accord with the technical constraints for the FSS in the band and must accept interference from the radiolocation service.[305] Additionally, we requested comment and proposals on the appropriate technical requirements to enable NGSO FSS uplinks to share the 13.80-

[296] *NPRM* at ¶ 38.

[297] *See* Amendment of Parts 2, 25, and 90 of the Commission's Rules to Allocate the 13.75-14.0 GHz Band to the Fixed-Satellite Service, ET Docket No. 96-20, *Report and Order,* 11 FCC Rcd 11951 (1996)**.**

[298] *NPRM* at ¶ 38.

[299] The standard frequency and time signal-satellite service is a radiocommunication service using space stations on earth satellites for scientific, technical and other purposes, providing the transmission of specified frequencies, time signals, or both, of stated high precision, intended for general reception. This service may include feeder links necessary for its operation. The space research service is a radiocommunication service in which spacecraft or other objects in space are used for scientific or technological research purposes. See 47 C.F.R. § 2.1.

[300] *Id*.

[301] *See* 47 C.F.R. § 2.106 footnote S5.503.

[302] *See* 47 C.F.R. § 2.106 footnote US337.

[303] *NPRM* at ¶ 39.

[304] *Id*. at ¶ 42.

[305] *Id*. at ¶ 40.

14.0 GHz band with GSO FSS and Federal Government operations.[306] Finally, we stated that if sufficient technical analysis is submitted to demonstrate the feasibility of NGSO FSS sharing with NASA operations at 13.75-13.80 GHz, we would consider permitting NGSO FSS operations in that band segment.[307]

137. *Comments.* Boeing supports our proposal to permit NGSO FSS gateway uplink operations in the 13.80-14.0 GHz band by applying the GSO FSS's e.i.r.p. and minimum antenna diameter limits for the band to NGSO FSS operations.[308] Boeing asserts that uniform rules for all the proposed NGSO FSS gateway uplink bands allow a common design and operational approach for NGSO FSS gateway operations.[309] Specifically, Boeing proposes that, as in the 12.75-13.25 GHz band, we adopt a new definition of $EPFD_{up}$ along with the associated reference Ku-band NGSO FSS satellite receive antenna pattern developed by JTG 4-9-11. Boeing also proposes that we protect inclined GSO satellites by applying to the 13.80-14.0 GHz band the same $EPFD_{up}$ limits as in the 12.75-13.25 GHz band. Boeing states that its proposed $EPFD_{up}$ definition allows multiple NGSO systems to operate with insignificant interference impact to normal GSO FSS and inclined GSO FSS operations. Finally, Boeing proposes that we withhold judgment on whether spectrum sharing is feasible in the 13.75-13.80 GHz band until studies are completed by JTG 4-9-11.[310]

138. GE states that if we decide to permit NGSO FSS gateway uplink operations in the 13.75-14.0 GHz band, we should also permit GSO FSS providers to use that band at the same reduced power level as those proposed for NGSO FSS systems by SkyBridge.[311] GE states that NGSO FSS providers would have a competitive advantage if they can use spectrum that is not also available to GSO FSS providers or are constrained by different regulatory requirements.[312]

139. SkyBridge urges the Commission to permit NGSO FSS systems to use the 13.75-13.80 GHz band segment.[313] SkyBridge proposes that we apply footnote US337[314] to NGSO FSS systems in that band, which would require such systems to coordinate on a case-by-case basis through NTIA's FAS to minimize harmful interference to TDRSS downlinks, thus ensuring that only those systems able to protect TDRSS operations will operate at 13.75-13.80 GHz.[315]

140. NASA disagrees with SkyBridge, contending that technical studies NASA performed and submitted to JTG 4-9-11 and US Working Party 4A indicate that the viability of the 13.75-13.80 GHz link between TDRSS satellites and low orbiting spacecraft, such as the Space Shuttle, would be threatened by

[306] *Id*. at ¶ 44.

[307] *Id*. at ¶ 43.

[308] Boeing Comments at 38.

[309] *Id*. at 39.

[310] *Id*. at 40.

[311] GE Reply Comments at 10.

[312] *Id*.

[313] SkyBridge Comments at 14.

[314] *See* 47 C.F.R. § 2.106 footnote US337.

[315] SkyBridge Reply Comments at 10.

operation of the SkyBridge system.[316] NASA also contends that its studies were based on technical characteristics of the SkyBridge system alone, and thus if other NGSO FSS systems also were permitted to operate at 13.75-13.80 GHz, the TDRSS interference budget would be further compromised.[317]

141. Since these comments were filed, the ITU-R – in preparation for WRC-2000 and with active participation from U.S. Government and industry – has further studied spectrum sharing between NGSO FSS and Federal Government operations and modified footnotes S5.502 and S5.503 at WRC-2000 to accommodate NGSO FSS operations. While retaining the existing antenna size requirement for FSS operations in the 13.75-14.0 GHz band, footnote S5.502 was modified in such a way as to allow FSS earth stations to operate with an e.i.r.p. of less than 68 dBW and to change the e.i.r.p. limit of radiolocation operations to apply in all cases instead of only towards the geostationary orbit. S5.502 (WRC-2000) also added the following language "[t]he protection of assignments to receiving space stations in the fixed-satellite service operating with earth stations that, individually, have an e.i.r.p. of less than 68 dBW shall not impose constraints on the operation of the radiolocation and radionavigation stations operating in accordance with the Radio Regulations. No. S5.43A does not apply." This action effectively allowed FSS earth stations to operate at powers lower than 68 dBW as long as they do not constrain radiolocation operations. Further, footnote S5.503 maintained its e.i.r.p. limits for GSO FSS operations to protect space research in the 13.772-13.778 GHz segment and added the following requirement for NGSO FSS earth stations: "The e.i.r.p. density of emissions from any earth station in the fixed-satellite service operating with a space station in non-geostationary-satellite orbit shall not exceed 51 dBW in the 6 MHz from 13.772-13.778 GHz." This e.i.r.p. limit on NGSO FSS earth stations in the 13.772-13.778 GHz segment was intended to protect NASA TDRSS operations from NGSO FSS operations.[318] However, WRC-2000 could not reach agreement on whether the technical parameters in S5.502 (WRC-2000) and S5.503 (WRC-2000) would enable compatibility between the fixed-satellite, space research, radiolocation, and radionavigation services. Instead, WRC-2000 set up an ITU-R joint task group to further study the sharing conditions between the systems operating in the services allocated to the frequency band 13.75-14.0 GHz and to report its findings to WRC-03.[319]

142. In response to the WRC-2000 changes, NTIA notes that the minimum e.i.r.p. limit of 68 dBW for FSS earth stations contained in S5.502 (WRC-95) was based on ITU-R studies and facilitated the protection of GSO space station receivers.[320] NTIA asserts that GSO space stations receiving from earth stations with an e.i.r.p. of less than 68 dBW and NGSO space station receivers, sharing with the radar operations may prove to be difficult. NTIA states that interference to these space stations will occur under certain scenarios; the only questions are how often and for how long. Based on the operating requirements of Federal Government radar stations, the Federal agencies will not be able to make any modifications to resolve these interference problems. Since the FSS space stations will be susceptible to interference from radiolocation stations in the band 13.75-14 GHz, NTIA contends that the FSS satellite systems that are licensed should be designed and operated such that their operations are compatible with the radiolocation service. Therefore, NTIA requests that all FSS applicants be informed of this situation.

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[316] Letter of April 9, 1999 from David Struba, NASA IRAC Representative to William Hatch, Chairman, IRAC, at 1.

[317] *Id*. at 2.

[318] *See* Provisional Final Acts of WRC-2000, No. S5.503.

[319] *See* Resolution 733(WRC-2000), "Review of sharing conditions between services in the band 13.75-14 GHz."

[320] *See* October 20, 2000 Letter from William T. Hatch, Associate Administrator, Office of Spectrum Management, NTIA, to Dale Hatfield, Chief, Office of Engineering and Technology.

143. *Decision*. We adopt our proposal to allow NGSO FSS Gateway uplink operations in the 13.8-14.0 GHz band and find that the agreements at WRC-2000 justify permitting NGSO FSS Gateway uplink operations in the 13.75-13.80 GHz portion as well. Although DoD and NTIA express some reservations, they are primarily concerned about interference that may be caused to FSS operations from the radiolocation service. Further, NTIA is concerned with WRC-2000 changes to footnote S5.502 would constrain radiolocation operations by limiting the e.i.r.p. of a radiolocation station to 59 dBW in all directions, rather than just in the direction of the geostationary orbital arch, as previously required. While these concerns continue to be an issue that will be addressed at WRC-2003, we see no reason to withhold this band from NGSO FSS use. FSS entities were aware of existing high powered radiolocation operations when they requested access to this spectrum. Therefore, we believe FSS systems can design their satellites to compensate for incumbent operations and find usable spectral capacity in this spectrum. At the same time, FSS entities will not be permitted to claim protection from radiolocation operations.

144. At this time, we are not implementing the specific WRC-2000 changes to footnote S5.502 in our Table of Frequency Allocations due to concerns of NTIA. However, some aspects of the new footnote are worth adopting, such as removing the minimum power requirement on FSS operations in the 13.75-14.0 GHz band. As stated above, FSS licensees are aware of the interference environment in this band due to incumbent radiolocation operations and should be permitted to operate at lower powers if they can achieve communications. Therefore, we are adopting a new footnote US356 that is the same as the old footnote S5.502 regarding limits on radiolocation operations, but it removes the minimum power requirement for FSS operations. Further, to prevent confusion, we will delete S5.502 from our Table of Frequency Allocations. New footnote US356 reads as follows:

US356 In the band 13.75-14 GHz, an earth station in the fixed-satellite service shall have a minimum antenna diameter of 4.5 m and the e.i.r.p. of any emission should be at least 68 dBW and should not exceed 85 dBW. In addition the e.i.r.p., averaged over one second, radiated by a station in the radiolocation service towards the geostationary-satellite orbit shall not exceed 59 dBW. Receiving space stations in the fixed-satellite service shall not claim protection from radiolocation transmitting stations operating in accordance with the United States Table of Frequency Allocations. ITU Radio Regulation No. S5.43A does not apply.

145. Regarding specific concerns with TDRSS operations in the 13.75-13.80 GHz portion and the WRC-2000 changes to footnote S5.503, we note that the 51 dBW/6 megahertz e.i.r.p. density limit was developed considering TDRSS operations and should be adequate. However, NTIA indicates that NASA has requirements for TDRSS protection across a 10 megahertz segment at 13.77-13.78 GHz to accommodate communications with the International Space Station.[321] We find it is important to protect TDRSS operations in this band because they support missions that include manned flight. Therefore, we will extend the e.i.r.p. density limit across the 10 megahertz segment as requested by NTIA by adopting new footnote US357 for all FSS earth stations, which accomplishes the goals of S5.503 (WRC-2000), but protects TDRSS across the 13.77-13.78 GHz band. Accordingly, we remove footnote S5.503 from our Table of Frequency Allocations. We also modify Section 25.204(f) of our Rules to reflect these new power requirements for FSS operations in the 13.75-14.0 GHz band. We believe this limit will protect NASA TDRSS operations from different types of NGSO FSS systems and not only the SkyBridge specific design. Nevertheless, we maintain the requirements of US337 that earth stations in the FSS coordinate on a case-by-case basis with the FAS in order to minimize interference to TDRSS operations. Any further interference concerns regarding NGSO FSS and TDRSS operations can be addressed further in the coordination process. US357 reads as follows:

[321] *See* August 7, 2000 Letter from David P. Struba, NASA IRAC Representative, to Norbert Schroeder, Acting Chairman IRAC.

US357 In the band 13.75-14 GHz, geostationary space stations in the space research service for which information for advance publication has been received by the ITU Radiocommunication Bureau (Bureau) prior to 31 January 1992 shall operate on an equal basis with stations in the fixed-satellite service; after that date, new geostationary space stations in the space research service will operate on a secondary basis. Until those geostationary space stations in the space research service for which information for advance publication has been received by the Bureau prior to 31 January 1992 cease to operate in this band:

a) the e.i.r.p. density of emissions from any earth station in the fixed-satellite service operating with a space station in geostationary-satellite orbit shall not exceed 71 dBW in any 6 MHz band from 13.77 to 13.78 GHz;

b) the e.i.r.p. density of emissions from any earth station in the fixed-satellite service operating with a space station in non-geostationary-satellite orbit shall not exceed 51 dBW in any 6 MHz band from 13.77 to 13.78 GHz.

Automatic power control may be used to increase the e.i.r.p. density in any 6 MHz band in this frequency range to compensate for rain attenuation, to the extent that the power flux-density at the fixed-satellite service space station does not exceed the value resulting from use by an earth station of an e.i.r.p. of 71 dBW or 51 dBW, as appropriate, in any 6 MHz band in clear-sky conditions.

146. We find that the technical requirements adopted are adequate to permit spectrum sharing throughout the 13.75-14.0 GHz band. Further, any additional frequency sharing concerns can be addressed in the coordination process of FSS earth stations in the 13.75-14.0 GHz band with Federal Government operations through NTIA's FAS. FAS coordination will ensure that FSS earth stations do not interfere with receiving radiolocation stations, the TDRSS forward link-to-LEO, and the TDRSS receiving earth stations located at White Sands Complex, NM and Guam. We note that FSS earth stations that share spectrum with Federal Government operations are required to coordinate with the FAS to avoid interference problems to Federal Government receiving stations. Additionally, FSS entities will not be permitted to claim protection from radiolocation operations.

147. Finally, we adopt the same $EPFD_{up}$ limits for the 13.75-14.0 GHz band that we adopt for the 12.75-13.25 and 14-14.5 GHz bands, as contained in Section 25.208(h) of the Commission's Rules.[322] We find these limits are equally applicable to both bands because the sharing environments between NGSO FSS and GSO FSS systems are similar.

5. GSO FSS Gateway Uplink Bands: 14.4-14.5 GHz

148. *Current allocations*. In the *NPRM*, we noted that the 14.4-14.5 GHz band is allocated on a primary basis to FSS uplinks, and is primarily used for GSO operations, including VSATs. We also noted that the band is allocated on a secondary basis for land mobile satellite uplinks and Federal Government fixed and mobile operations, including use by the FAA and Qualcomm's Omnitracs tracking and data service.[323]

149. *Proposal*. In the *NPRM*, we proposed to allow NGSO FSS gateway uplinks to share the 14.4-14.5 GHz band with incumbent services. We requested comment on the appropriate technical requirements to enable such uplinks to share the band with GSO FSS uplinks and on the impact of the

[322] *See* Appendix A.

[323] *NPRM* at ¶ 45.

proposed NGSO FSS uplink operations on secondary uses of the band. We also requested comment as to whether NGSO FSS user terminals could be accommodated in the band.[324]

150. *Comments*. No party opposes NGSO FSS gateway uplink use of the 14.4-14.5 GHz band, and both Loral and SkyBridge support NGSO FSS user terminals being accommodated in the band. SkyBridge states that there is a need for additional spectrum for such user terminals, and notes that the 14.4-14.5 GHz band is neither allocated for co-primary FS use nor used by Federal Government radar operations on a secondary basis.[325] Loral argues that users terminals should be allowed to use the 14.4-14.5 GHz band because the band's current use is similar to that in the 14.0-14.4 GHz band – the only differences relating to secondary services.[326]

151. *Decision*. We find the $EPFD_{up}$ limits that we are adopting for the 12.75-13.15 GHz and 13.2125-13.25 GHz bands to permit sharing between GSO FSS uplinks and NGSO FSS gateway uplinks to be equally appropriate to permit such sharing in the 14.4-14.5 GHz band. We also find that permitting NGSO FSS gateway uplink use of the 14.4-14.5 GHz band will not adversely impact secondary uses of the band. Finally, we find persuasive SkyBridge's and Loral's contentions that also permitting NGSO FSS user terminal use of the band is desirable and will not create an unacceptable interference risk to incumbent users. Accordingly, we will permit NGSO FSS uplink use of the band by both gateways and user terminals.

6. NGSO FSS Gateway Uplink Bands: 17.3-17.8 GHz

152. *Current allocations*. In the *NPRM*, we noted that the 17.3-17.8 GHz band requested by SkyBridge for NGSO FSS gateway uplinks is allocated on a primary basis to FSS uplinks, but that US footnote US271 limits such operations in the United States to BSS[327] feeder link operations.[328] We further noted that the 17.7-17.8 GHz portion of the band is allocated on a primary basis to fixed operations, mobile operations, and FSS downlinks; that the 17.3-17.7 GHz portion is allocated for secondary Federal Government radiolocation operations; and that the entire 17.3-17.8 GHz band is allocated internationally for BSS downlinks in Region 2, but that this BSS allocation does not come into effect until April 1, 2007.[329]

153. *Proposal*. In the *NPRM*, we did not propose to permit NGSO FSS operations in the 17.3-17.8 GHz band.[330] We stated that coordination distances between NGSO FSS user terminals or gateways and ubiquitously deployed BSS receive earth stations would be prohibitively large.[331] Additionally, we stated that NGSO FSS operations at 17.3-17.7 GHz would be subject to extremely high e.i.r.p. radar transmissions from Federal Government radiolocation operations, and that interference from

[324] *Id.* at ¶ 46.

[325] SkyBridge Comments at 21.

[326] Loral Comments at 10.

[327] BSS transmissions are downlinks to subscriber dishes that typically carry video programming. BSS feeder links are uplinks to BSS satellites and are performed in FSS allocations. Feeder links are used to send programming to the satellite for retransmission on BSS downlink frequencies.

[328] *NPRM* at ¶ 47.

[329] *Id*.

[330] *Id*. at ¶ 48.

[331] *Id*. at ¶ 50.

these radiolocation operations could be severe.[332] The *NPRM* also indicated that the Commission proposed to implement the Region 2 BSS downlink allocation in the 17.3-17.7 GHz band domestically effective in 2007.[333]

154. C*omments*. EchoStar Communications Corporation ("EchoStar") states that it agrees with our proposal not to allocate the 17.3-17.8 GHz band to NGSO FSS service because that would jeopardize the flexibility and reliability of future BSS deployment in that band.[334] EchoStar contends that use of the band by NGSO FSS user terminals and gateways is not feasible in view of the international and proposed domestic allocation of that band to BSS downlinks starting in 2007, and that this conclusion is supported by ITU-R Document JTG 4-9-11/312.[335] EchoStar argues that even assuming that all NGSO FSS licensees are limited to a few gateways, with 3-5 NGSO FSS licensees there would still be many gateways located across the country. EchoStar further argues that the number of gateways would be increased by any foreign licensed NGSO FSS systems granted access to the U.S, and that any foreign gateways positioned close to U.S. borders could severely affect the provision of DBS services in the U.S. Additionally, EchoStar argues that the earliest the United States could object on interference grounds to any NGSO FSS gateways filed with the ITU would be 2002 when the ITU would first accept filings for BSS systems in the 17.3-17.8 GHz band. Moreover, EchoStar argues that the existence of gateways in 17.3-17.8 GHz band would also significantly increase the coordination burden on BSS operators, unduly constraining BSS operations, particularly when viewed in light of existing allocations.[336] Finally, EchoStar argues that NGSO FSS operations in the 17.3-17.8 GHz band would appear to interfere unacceptably with the Federal Government radiolocation service.[337]

155. DIRECTV, Inc. ("DIRECTV") strongly disagrees with SkyBridge's conclusion that NGSO FSS gateways can share the 17.3-17.8 GHz band with BSS user terminals.[338] DIRECTV argues that while use of this band may be feasible for BSS uplink use because there are expected to be only 6 BSS uplink sites across the United States, there could be many dozens and perhaps hundreds of gateway earth stations deployed by NGSO FSS operators.[339] DIRECTV contends that ITU-R document JTG 4-9-11/312 concludes that sharing between NGSO FSS and BSS user terminals is not possible, and that JTG 4-9-11 agrees with this assessment.[340]

156. SkyBridge asserts that the 17.3-17.8 GHz band is currently allocated and used for BSS feeder links, and that recent studies conducted by both U.S. and French Administrations as part of the JTG 4-9-11 process have shown that the separation distances between NGSO FSS gateways and BSS

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[332] *Id*. at ¶ 51.

[333] *See* Redesignation of the 17.7-19.7 GHz Frequency Band, Blanket Licensing of Satellite Earth Stations in the 17.7-20.2 GHz and 27.5-30.0 GHz Frequency Bands, and the Allocation of Additional Spectrum in the 17.3-17.8 GHz and 24.75-25.25 GHz Frequency Bands for Broadcast Satellite-Service Use, *Notice of Proposed Rule Making*, IB Docket No. 98-172, 13 FCC Rcd 19923 (1998) (18 GHz NPRM).

[334] EchoStar Comments at ii.

[335] EchoStar Reply Comments at 11.

[336] *Id*. at 12.

[337] *Id.* at 13.

[338] DIRECTV Reply Comments at 37.

[339] *Id*. at 38.

[340] DIRECTV Comments at 12.

receive earth stations will be quite limited -- on the order of tens of kilometers.[341] SkyBridge further asserts that our proposed definition of a "gateway" and tight antenna patterns for gateways will limit their number and facilitate sharing with BSS.[342] SkyBridge also asserts that gateways are generally not located in heavily populated areas, and that in problematic cases natural and artificial shielding can be used to reduce the separation distances to a few kilometers.[343] Finally, SkyBridge asserts that promoting sharing between BSS and NGSO FSS will further Congress' mandate to expand access to interactive broadband services, especially in rural and remote areas.[344]

157. With respect to radiolocation operations, SkyBridge states that no commenter disputes the ability of NGSO FSS systems to coexist with radiolocation in the 17.3-17.8 GHz band.[345] SkyBridge maintains that operational coordination can take place between NGSO FSS and radiolocation systems to avoid prolonged exposure by NGSO FSS satellites to radar beams. SkyBridge states that it has proposed a footnote in the U.S. Table of Allocations, similar in concept to S5.502, that would preclude NGSO FSS systems from claiming protection from Federal Government radiolocation systems in the band, provided that both systems are operating within the requirements of the footnote.[346]

158. *Decision*. In the *Report and Order* in IB Docket No. 98-172, we allocated the 17.3-17.7 GHz band to the BSS on a primary basis, effective April 1, 2007.[347] While the Region 2 BSS allocation covers the entire 17.3-17.8 GHz band, we did not allocate the 17.7-17.8 GHz sub-band to BSS operations because of spectrum incompatibilities with existing terrestrial fixed operations in that band. We agree with EchoStar and DIRECTV that sharing of the 17.3-17.7 GHz band by ubiquitous BSS downlinks and NGSO FSS uplinks would be difficult. The resulting limitation on the location of BSS receive earth stations would be overly restrictive on ubiquitous BSS receivers. We also find that sharing of the 17.3-17.7 GHz band between the radiolocation and NGSO FSS operations would be problematic. Further, NTIA requests that the Commission not authorize any NGSO FSS operations in the 17.3-17.7 GHz band.[348] As we noted in the *NPRM*, the radiolocation service and GSO BSS feeder links are able to share this band only because radiolocation systems operate at powers of less than 51 dBW in the direction of the GSO arc. Satellites in other orbits could receive higher levels of interference, as radiolocation systems will be radiating indiscriminately in directions outside of the plane of the GSO arc in a manner that is not able to be predetermined or constrained in order to fulfill the functions of the radiolocation operation.[349] Accordingly, we decline to allocate the 17.3-17.8 GHz band to the NGSO FSS.

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[341] SkyBridge Comments at 19-20.

[342] *Id*. at 20.

[343] *Id*.

[344] *Id*. at 20-21. Virgo also supports use of the 17.3-17.8 GHz band by NGSO FSS. *See* Virgo Reply Comments, at n.13.

[345] SkyBridge Reply Comments at 11.

[346] *Id*. at 10.

[347] *See* Redesignation of the 17.7-19.7 GHz Frequency Band, Blanket Licensing of Satellite Earth Stations in the 17.7-20.2 GHz and 27.5-30.0 GHz Frequency Bands, and the Allocation of Additional Spectrum in the 17.3-17.8 GHz and 24.75-25.25 GHz Frequency Bands for Broadcast Satellite-Service Use, *Report and Order*, IB Docket No. 98-172, FCC 00-212, 65 FR 54155 (September 7, 2000).

[348] *See* Letter from William T. Hatch, IRAC Chairman, to Dale Hatfield, Chief, Office of Engineering and Technology, dated October 29, 1998.

[349] *NPRM* at ¶ 51.

B. NGSO Service Link Bands

1. NGSO FSS Service Downlink Bands: 11.7-12.2 GHz

159. *Current allocations*. In the *NPRM*, we noted that the 11.7-12.2 GHz band requested by SkyBridge for NGSO FSS service downlinks is allocated in the U.S. on a primary basis for FSS downlinks and is heavily used by television program distribution and VSAT operations. We also noted that mobile operations are permitted in the band on a secondary basis, but there are only a few mobile operations in the band.[350]

160. *Proposal*. In the *NPRM*, we proposed to permit NGSO FSS service downlink operations to share the 11.7-12.2 GHz band with incumbent GSO FSS downlinks, subject to sharing criteria. Specifically, we proposed sharing criteria similar to that proposed for the 10.7-11.7 GHz band, and sought comment on the adequacy of WRC-97 $EPFD_{down}$ limits for NGSO FSS operations to protect incumbent GSO FSS operations. We also requested comment regarding sharing with GSO FSS large aperture earth stations, inclined orbit satellites and TT&C links.[351]

161. *Decision*. As we noted in the *NPRM*, the sharing scenario in the 11.7.-12.2 GHz band raises issues similar to those regarding NGSO FSS gateway downlinks in the 10.7-11.7 GHz band. For the reasons discussed above, we adopt the same $EPFD_{down}$ limits for NGSO FSS service downlinks in the 11.7-12.2 GHz band that we are adopting for NGSO FSS gateway downlinks in the 10.7-11.7 GHz band. While NGSO FSS service downlink stations will be ubiquitously deployed and will have different antenna characteristics than the gateway downlink stations, the $EPFD_{down}$ limits were developed to address both types of operations. We also conclude that since NGSO FSS gateway stations will be operating using the same $EPFD_{down}$ limits as NGSO FSS user earth station, NGSO FSS gateway earth station may operate in this 11.7-12.2 GHz band. In addition, we adopt the same coordination procedures to protect GSO FSS networks using sensitive receiving earth stations with very large antennas, as discussed above.[352]

2. NGSO FSS Service Downlink Bands: 12.2-12.7 GHz

162. *Current allocation*. In the United States, the 12.2-12.7 GHz band is allocated on a primary basis to BSS for use by DBS systems. While the band has a primary allocation for the FS, fixed systems licensed in the band after September 9, 1983 must operate on a non-harmful interference basis to the BSS.[353]

163. *Proposal.* In the *NPRM*, the Commission proposed to allocate the 12.2-12.7 GHz band on a co-primary basis to the NGSO FSS for use by service downlinks.[354] The *NPRM* indicated that it appears that spectrum sharing in this band is possible between BSS and NGSO FSS.[355] In order to ensure protection of DBS, while accommodating new NGSO FSS services, we sought comment on the WRC-97 provisional EPFD limits contained in Table S22-1 of the Radio Regulations.[356] The Commission stated that

[350] *Id.* at ¶ 53.

[351] *Id*. at ¶¶ 53-54.

[352] *See supra*, ¶ 111.

[353] *See* 47 C.F.R. § 101.147(p).

[354] *NPRM* at ¶ 52.

[355] *Id*.

[356] *Id*. at 59.

it was not convinced that the WRC-97 provisional limits were adequate to protect DBS, noting, however, that there was no alternative before us at that time. We also stated that NGSO FSS operations should not hinder the evolution of DBS.

164. The *NPRM* also requested comment on a petition from Northpoint to allow terrestrial retransmission of local television signals and data services to DBS receivers in the 12.2-12.7 GHz band on a non-interference basis to BSS operations.[357] Northpoint argues that its proposed service, which we refer to herein as the MVDDS, would allow DBS subscribers to receive local television programming and data services with minimal additional equipment and thus would permit the DBS service to compete more fully with cable television services.[358] To permit sharing with DBS operations, which features earth stations pointed southward to receive signals from GSO BSS satellites located over the equator, Northpoint would use northward pointing receivers at a DBS subscriber's location to receive signals transmitted from terrestrial towers whose directional antennas point southward. Northpoint indicates that the return link from subscribers to achieve full two-way data services will be achieved on other spectrum or by using existing wireline networks. While recognizing the potential benefits of the Northpoint proposal, we stated that the concerns of DBS licensees require us to approach cautiously this type of operation in the DBS band. The *NPRM* also sought further technical analyses on Northpoint's ability to share spectrum with DBS.[359] Finally, we sought comment on whether a Northpoint-type service is desirable to satisfy DBS subscribers' local programming needs.[360]

165. *Decision*. We note that an extensive record has been filed concerning spectrum sharing in the 12.2-12.7 GHz band by NGSO FSS, BSS and MVDDS operations, and interested parties subsequently reached a compromise solution to NGSO FSS and BSS sharing issues at the CPM, which was ultimately adopted at WRC-2000.[361] We thus find that we have an adequate record to make decisions on future NGSO FSS, MVDDS and BSS operations in the 12.2-12.7 GHz band.

166. As discussed below, we conclude that NGSO FSS operations can share this band with BSS operations on a co-primary basis under certain technical operating parameters, which we adopt herein. Throughout this proceeding, we have focused on the ability of NGSO FSS operations to coexist with existing operations in several spectrum bands without causing unacceptable interference to those services. Although the spectrum management policies concerning spectrum sharing are complex, the results are worthwhile because we can allow the deployment of new services, achieve more and efficient use of a finite amount of spectrum, and ensure the protection of incumbent operations. Accordingly, we are allocating the 12.2-12.7 GHz band to the fixed satellite service for use by non-geostationary orbit

[357] *Id*. at ¶ 8. Northpoint filed its Petition for Rule Making requesting the establishment of this service in March 1998. That petition was designated RM-9245, and was placed on public notice on March 23, 1998. *See Public Notice*, Report No. 2265.

[358] *NPRM* at ¶ 8. We note that Northpoint originally proposed its service as a supplement to DBS operations in the 12.2-12.7 GHz band. Subsequently, on January 8, 1999 Northpoint and its affiliates filed terrestrial license applications for the 12.2-12.7 GHz band covering the entire United States under the name Broadwave. In Northpoint's March 2, 1999 comments it argues that its proposed service and associated applications could provide nationwide video and data services and ignite competition to cable and other multichannel video program distributors. *See* Northpoint Comments at Summary.

[359] *Id*. at ¶ 95.

[360] *Id.* at ¶¶ 91-92.

[361] We note that the 12 GHz DBS service is in an ITU "planned band" and is based on using analog receivers. The ITU-R recommends similar noise allocations as the GSO FSS networks for digital DBS using the planned band assignments.

satellite downlink operations on a co-primary basis. This action will be implemented domestically through the adoption of footnote S5.487A into our Table of Frequency Allocations. This footnote allocation for NGSO FSS operations in the 12.2-12.7 GHz band was established at WRC-1997 and modified at WRC-2000, and we find that it should facilitate the delivery of advanced services to the United States, as well as to other countries.

167. We also conclude that MVDDS can operate in the 12.2-12.7 GHz band under the existing FS allocation. Under this allocation, as discussed below, MVDDS operations would not be permitted to cause harmful interference to the BSS and would operate on a co-primary basis to NGSO FSS. We find that the public interest would be served by allowing MVDDS operations in this band. MVDDS could be used to deliver a wide array of video programming, including local television, and data services on either a competitive or sole source basis in both urban and rural areas. While MVDDS will only be permitted to use the 12.2-12.7 GHz band for transmissions to its subscribers, we find that full two-way services can be achieved using spectrum in other bands or existing wireline networks for the return link. Terrestrial MVDDS systems would intensively reuse available spectrum, allowing for efficient use of the band. Furthermore, it is feasible to avoid or correct harmful interference situations between MVDDS and DBS or between MVDDS and NGSO FSS. As discussed below, spectrum sharing will necessitate some restrictions on MVDDS antenna locations and transmitter power levels in order to avoid interference to DBS, and could require coordination with some NGSO FSS systems. In our Further Notice of Proposed Rule Making, we make several specific proposals regarding MVDDS technical, service and licensing rules.

168. Some commenters question whether the 12.2-12.7 GHz band is appropriate for MVDDS operations.[362] The 12.2-12.7 GHz band is particularly attractive both because MVDDS equipment can take advantage of the economies of scale that already exist for electronics and antennas that use this band[363] and because the band offers sufficient spectrum to offer a service that can compete with cable television and DBS services. Alternative bands, such as the 2596-2644 MHz Multichannel Multipoint Distribution Service and the 27.5-31.3 GHz Local Multipoint Distribution Service, are not as attractive. These bands either do not offer the same amount of spectrum, are encumbered by existing operations, impose higher equipment costs, or have significant propagation constraints. The use of innovative spectrum sharing techniques will facilitate a high level of frequency reuse in this band and provide a variety of broadband services to a vast number of customers.

169. In the discussion below, we first address our decision to provide a co-primary allocation for NGSO FSS in this band and to require certain technical operating parameters for NGSO FSS in order to facilitate spectrum sharing with incumbent BSS operations. We then address our decision to allow MVDDS operations in this band and how this fixed service can share spectrum with incumbent BSS operations and new NGSO FSS operations.

a. NGSO FSS sharing with BSS

170. After evaluating the extensive record in this proceeding, including the work of the ITU-R study groups and WRC-2000, we find that the agreements reached in these international meetings provide the basis to allow NGSO FSS operations to share successfully the 12.2-12.7 GHz band with BSS operations without causing unacceptable interference. The results of the technical studies have been

[362] DIRECTV contends that Northpoint has not demonstrated why it requires the 12.2-12.7 GHz band for its proposed service, and asserts that other spectrum is available. DIRECTV Comments at 4-7.

[363] Northpoint maintains that its technology requires deployment in the 12.2-12.7 GHz band because it was designed specifically to use existing commercially available consumer and transmission equipment in that band. Northpoint Reply Comments at i-iv, 1-2.

included in the Final Acts of WRC-2000 and represent the most comprehensive and current studies on NGSO FSS and BSS co-frequency operations to date. We conclude that these criteria, which provide for both single entry and aggregate $EPFD_{down}$ limits for NGSO FSS operations, are appropriate for protecting GSO BSS operations in the United States, and we will adopt both types of limits. The single-entry $EPFD_{down}$ limits are those that a single NGSO FSS system will have to meet. These single-entry limits, combined with a method to address the aggregate interference from all NGSO FSS systems in the band, will ensure protection of GSO BSS operations from NGSO FSS interference.

171. Both single entry and aggregate $EPFD_{down}$ limits consist of two elements: (1) a set of "validation" $EPFD_{down}$ limits (mask) which include additional latitude-dependent "validation" $EPFD_{down}$ limits not to be exceeded for 100% of the time for 180 cm, 240 cm and 300 cm BSS earth station antennas; and (2) an "operational" $EPFD_{down}$ limit not to be exceeded for 100% of the time for 240 cm BSS earth station antennas located in Alaska. As discussed in more detail below, in order to receive a favorable finding internationally,[364] each NGSO FSS system must not exceed the single-entry validation $EPFD_{down}$ limits using the ITU-BR software.[365] The ITU BR will not verify that NGSO FSS systems comply with the operational limits; rather, individual Administrations and their GSO FSS system operators would determine whether an NGSO FSS system is exceeding the operational $EPFD_{down}$ limits. Also, we are adopting additional technical criteria for NGSO FSS systems to protect 180 cm BSS receivers, although it was not included in the international agreements.

172. We find that the single-entry and aggregate $EPFD_{down}$ limits we are adopting will not unduly hinder the growth of BSS, as proposed in the *NPRM*.[366] As discussed in more detail below, the ITU-R considered future BSS systems and examples of advanced technology BSS links (*e.g.*, 8PSK digital modulation and improved receiver temperature of 80 degrees Kelvin) to develop $EPFD_{down}$ limits for NGSO FSS.[367] In addition, future BSS systems will be able to take into account the NGSO FSS interference environment.[368]

173. In the following sub-sections, we discuss particular issues with respect to NGSO FSS operations in the 12.2-12.7 GHz band, such as single-entry $EPFD_{down}$ limits, verification of compliance with the validation limits, operational $EPFD_{down}$ limits to protect larger BSS receive earth station antennas, and aggregate NGSO FSS interference levels.

(i) Single-Entry $EPFD_{down}$ Limits

174. *Proposal.* In the *NPRM*, we sought comment on the WRC-97 provisional single-entry limits, and also expressed our concern that these limits were not adequate to protect BSS.[369] We indicated

[364] Compliance with the "validation" limits will be checked by the ITU/BR under Radio Regulation No. S9.35 and S11.31. *See also* Section 3.1.2.4.6 of the CPM Report.

[365] ITU-R Recommendation BO.1503 provides the specification for the software that the BR/ITU would use to verify that a NGSO network meets the EPFD limits.

[366] *NPRM* at ¶ 58.

[367] DIRECTV insists that the Commission ensure that any $EPFD_{down}$ limits adopted fully protect the examples of future BSS links contained in the ITU database, in order to preserve the ability of BSS systems to innovate. DIRECTV Reply Comments of at 37.

[368] *See, e.g.,* SkyBridge Comments at 64 (SkyBridge asserts that future systems, as opposed to existing systems, can plan for the NGSO FSS environment, and take such systems into account in developing link budgets for future BSS systems).

[369] *NPRM* at ¶ 59.

that if the record developed in this proceeding demonstrates that these limits are not appropriate to protect DBS services, we would explore alternative limits.

175. *Comments*. Some commenters expressed concern that the WRC-97 provisional limits would not protect the widely deployed 45 cm DBS dishes, or the larger DBS dishes deployed in rural and remote areas, and that the provisional limits would hinder the evolution of DBS operations.[370] Several parties even made various proposals for alternative $EPFD_{down}$ limits. Nonetheless, all parties urge that the ITU-R agreed upon interference criteria and internationally compiled database of GSO BSS links be used to establish BSS protection limits.[371] SkyBridge fully supports the technical agreements reached at the CPM, and no other parties opposed the technical agreements.[372] Boeing urges the Commission to adopt the compromise agreement reached at the CPM without deviation. It argues that this would foster the development of universally-available telecommunications services by creating globally-consistent regulatory requirements.[373]

176. *Decision*. We find, based upon the technical work within the ITU, and the record developed in this proceeding, that the international consensus single-entry $EPFD_{down}$ limits for 30 cm, 45 cm, 60 cm, 90 cm, 120 cm, 180 cm, 240 cm and 300 cm diameter BSS earth station antennas are appropriate for protection of GSO BSS systems in the United States.[374] Specifically, the combination of the two elements comprising these limits (*i.e.*, validation including latitude-dependent, and operational) adequately protect the U.S. BSS systems. We adopt these limits as new rule Section 25.208(i) of the Commission's Rules contained in Appendix A of this First R&O.

177. These limits were developed using the agreed upon criteria and the international database of GSO BSS links both developed by the ITU-R. This was also the approach that the commenters recommended we use to establish the appropriate $EPFD_{down}$ limits.[375] As an initial matter, the ITU-R compiled characteristics of the BSS systems to be taken into account in sharing studies with NGSO FSS systems.[376] The United States submitted characteristics of its existing and planned GSO BSS systems to

[370] EchoStar Reply Comments at 5-6 and Boeing Reply Comments at 13.

[371] *See, e.g.*, SkyBridge Comments at 58-59, DIRECTV Comments at 9, DIRECTV Reply Comments at 35, and EchoStar Reply Comments at 7.

[372] SkyBridge Supplemental Comments at ii-iii. Some commenters, such as DIRECTV, did express concern about certain aspects of the agreement, such as the implementation of operational limits, or proposed additional provisions, such as an additional limit for 180 cm BSS earth station antennas in Alaska. DIRECTV Supplemental Comments at 9, 10-12.

[373] Boeing Supplemental Comments at 3.

[374] We are including $EPFD_{down}$ limits for 30 cm and 300 cm diameter BSS earth station antennas, although there is no requirement for BSS earth station antennas of these sizes in the United States. No representative from the BSS industry proposed $EPFD_{down}$ limits for 30 cm or 300 cm diameter BSS earth station antennas, nor are such antennas in use in the United States. *See, e.g.*, DIRECTV Comments at 9. If a DBS entity wishes to implement BSS earth station antennas of this diameter in the United States, they would have to specify this antenna size in their application for a DBS authorization. The Commission would review the technical information submitted with the application, and determine if such operations can be accommodated within the interference environment in the United States. For example, 30 cm BSS earth station antennas may not be compatible with the BSS Plan assignments of other Administrations.

[375] DIRECTV Reply Comments at 35, 37; and EchoStar Reply Comments at 7.

[376] ITU-R circular letters CR/92 and CR/116 requested that Administrations submit information on their existing and planned GSO BSS systems. The compiled set of GSO BSS system characteristics is contained as an Annex to ITU-R Recommendation BO.1444. Hereinafter, we refer to this set of compiled GSO BSS system characteristics as the "international database of GSO BSS links."

be included in these studies. In addition, the ITU-R developed recommended criteria to be used in developing acceptable $EPFD_{down}$ limits to protect GSO BSS.[377] The ITU agreed upon criteria consists of two parts: (1) the aggregate interference from NGSO FSS systems should be responsible for at most 10% of the time allowance(s) for unavailability of the GSO BSS network; and (2) the aggregate interference from NGSO FSS systems should not lead to the loss of video picture continuity in the GSO BSS network. This criteria will be referred to herein as the "agreed upon criteria." During the development of the $EPFD_{down}$ limits, a proposed set of $EPFD_{down}$ limits was tested against this international database of GSO BSS links to determine if the agreed criteria was met, and therefore whether the proposed $EPFD_{down}$ limits are appropriate. Using the agreed upon criteria and the database of GSO BSS links, the ITU-R was able to reach consensus on both the single-entry and aggregate $EPFD_{down}$ limits.

178. With these $EPFD_{down}$ limits, most BSS links are protected to the agreed upon protection level.[378] For example, all of the links in areas in which 45 cm antennas are used almost exclusively (the majority of the United States), are protected to the agreed upon level.[379] However, as the antenna size increases, there are some BSS links that are not protected to the agreed upon level.[380] In these specific cases where the agreed upon protection level was not provided by the proposed $EPFD_{down}$ limits,[381] the affected Administration agreed to the level of exceedance, prior to these $EPFD_{down}$ limits becoming finalized. This was the process used for any U.S. submitted links where the agreed upon criteria was not met. In addition, the ITU-R ensured that NGSO FSS was not unduly constrained in developing these limits. For example, the shape of the $EPFD_{down}$ curve was chosen to accommodate planned NGSO FSS systems.[382] Also, the use of operational limits in place of validation limits for certain situations, avoids undue constraints on NGSO FSS due to the conservative nature of the ITU validation software. Below we discuss the importance of each of the three elements that comprise these limits.

179. The first set of limits, the "validation" $EPFD_{down}$ limits ensure appropriate protection of smaller GSO BSS earth station antennas, those ranging from 30 cm to 120 cm in diameter. The ITU-BR will test these validation $EPFD_{down}$ limits using the ITU-BR software. To protect larger GSO BSS earth station antennas, the latitude dependent "validation" limits (for 180 cm, 240 cm and 300 cm diameter GSO BSS earth station antennas), and the "operational" limit for 240 cm GSO BSS earth station antennas are needed to supplement the validation $EPFD_{down}$ limits. These limits provide additional protection against loss of video picture continuity, and limit the increase in unavailability, for these larger GSO BSS earth station antennas. Due to their higher on-axis gain, larger earth station antennas are more susceptible to the short term interference[383] that can lead to the loss of video picture continuity.

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[377] The criteria is contained in draft new Recommendation ITU-R BO.1444. In addition, the criteria is described in Section 3.1.3.1 of the CPM report to WRC-2000.

[378] Annex 11 (Preliminary draft new report: Derivation of $EPFD_{down}$ Limit Masks) to Document 10-11s/209-e, dated 16 June 1999, the Chairman's Report of the Third Meeting of JWP 10-11s, Geneva, 19-28 May, 1999.

[379] *Id.*

[380] *Id.* For example for 90 cm diameter GSO BSS earth station antennas, 3 links are not protected to the first criterion, the 10 % increase in BSS link unavailability.

[381] Section 4 ("Further Work") of Annex 1 to Appendix 1 of the Chairman's Report of the Third Meeting of JTG 4-9-11 (Long Beach, USA, 19-29 January 1999) (Document 4-9-11/367-E, dated 5 February 1999).

[382] Section 3.1.3.1.4 (b) of the CPM Report, and *recommends* 3.2 of draft new Recommendation ITU-R BO.1444.

[383] Short term interference occurs for very short periods of time and is caused by NGSO FSS satellite antenna side lobe interfering into the GSO BSS receive earth station antenna mainbeam. The sidelobes of an (continued….)

180. The latitude-dependent "validation" $EPFD_{down}$ limits will provide additional protection to GSO BSS earth stations located in high latitude regions such as Alaska. The latitude-dependent validation $EPFD_{down}$ limits apply to 180 cm, 240 cm and 300 cm BSS earth station antennas. These limits become more stringent on NGSO FSS systems as the latitude of the GSO BSS earth station increases over 57.5 degrees North or South. At a high latitude location, BSS earth stations can be located at the edge of the coverage area of the GSO BSS satellite and receive lower downlink e.i.r.p. and are therefore more susceptible to NGSO FSS interference. In addition, GSO BSS links operating at higher latitudes have lower elevation angles to the GSO BSS satellites and a longer path length that also results in a lower e.i.r.p. at the earth station.[384] Thus, tighter latitude-dependent validation limits provide greater protection to BSS, while not unduly constraining NGSO FSS.

181. The operational $EPFD_{down}$ limit for 240 cm BSS earth station antennas ensures protection of 240 cm diameter BSS earth station antennas currently in use in Alaska. The limit applies to receive BSS earth station antennas located in Alaska that use elevation angles greater than 5° and that point toward BSS satellites at the following orbit locations: 91° W.L., 101° W.L., 110° W.L., 119° W.L. and 148° W.L. We recognize that there are restrictive international power limits on GSO BSS to protect terrestrial services in adjacent countries.[385] These restrictive power limits require a lower e.i.r.p. from BSS satellites towards the geographic areas requiring the use of larger GSO BSS receive earth station antennas in Alaska. These particular links require more stringent $EPFD_{down}$ limits for protection from interference from NGSO FSS systems. This is because of the limited downlink e.i.r.p. and large antenna diameter of these links. More stringent limits, however, are more difficult for NGSO FSS systems to meet.[386] The operational limits were developed to provide additional protection to GSO BSS 240 cm earth station antennas in Alaska, while not unduly constraining NGSO FSS by requiring validation with the ITU software tool.

182. In addition, WRC-2000 indicated that this operational limit may be applied for a transition period.[387] Because the restrictive power limits that result in the use of the larger BSS earth station antennas in Alaska were sufficiently relaxed by WRC-2000, we will also adopt a transition period for the implementation of operational $EPFD_{down}$ limits for the 240 cm earth stations in the United States operating north of 60 degrees latitude, *e.g.*, Alaska. Although DIRECTV argues that the transition period should be 17 years instead of 15,[388] we conclude that 15 years is an appropriate amount of time for the operational

(Continued from previous page)

antenna are areas outside of the mainbeam (*i.e.*, main/desired pointing direction of the antenna) and an antenna has lower gain in its sidelobes than in the mainbeam.

[384] Many NGSO FSS systems are designed in such a way that their power naturally decreases at these high latitudes that are located outside of high population areas. Also, Document 4-9-11/245-E (from France, dated 13 January 1998) demonstrates that F-SATMULTI-1B satellites whose sub-satellite points are greater than 40° latitude will have a much lower PFD versus satellites whose sub-satellite point is less than 40° latitude.

[385] These limits are contained in Section 5c) of Annex 1 to Appendix S30 of the ITU Radio Regulations (Edition 1998). *See* U.S. input document to the CPM, Document CPM99-2/29 and its corrigendum, *see also* Policies and Rules for the Direct Broadcast Satellite Service, *Notice of Proposed Rule Making*, 13 FCC Rcd. 6907, 6934 (1998) ("DBS NPRM").

[386] As noted in the comments, the ITU software validation tool may be overly conservative so that it hinders efforts to arrive at $EPFD_{down}$ limits acceptable to all parties. In particular, NGSO FSS interests may have to add significant margins to the limits to ensure that their systems can pass. DIRECTV Reply Comments at 32. SkyBridge Comments at 38, 94-97. STA Comments at 8.

[387] Footnote 25 to Table S22-4C of the Provisional Final Acts specifies that the operational limit may be implemented for a transition period of 15 years if the PFD limits in Section 5c) of Annex 1 to Appendix S30 are sufficiently relaxed; DIRECTV Supplemental Comments at 9.

[388] DIRECTV Supplemental Comments at 9.

limits to be in effect. Fifteen years is an adequate representation of the life of a satellite today. Further, a 15-year transition period will further promote our goal of encouraging the use of smaller BSS earth station antennas in Alaska. Therefore, the 15-year transition period will be included in our rules and the operational limits will no longer apply to NGSO FSS operators fifteen years from the effective date of the rules in this First R&O.

183. DIRECTV argues that we should not require the $EPFD_{down}$ limit from the international consensus for 180 cm BSS earth station antennas in Alaska, but rather apply a different limit to protect these stations. While the latitude dependent validation $EPFD_{down}$ limits apply to 180 cm BSS earth station antennas, the CPM agreement includes an operational limit only for 240 cm BSS earth station antennas. DIRECTV asserts that the high latitude 100%-of-the-time $EPFD_{down}$ limit of -163.1 dB(W/m^2/40 kHz) does not protect DIRECTV services using 180 cm BSS earth station antennas in the Anchorage area, and requests that the operational limit of –167 dB(W/m^2/40 kHz) be implemented for 180 cm BSS earth station antennas.[389] Further, DIRECTV states that because an NGSO FSS system must meet this limit for 240 cm BSS earth station antennas, it will automatically meet this limit for 180 cm BSS earth station antennas and thus would place no additional constraints on NGSO FSS systems. Boeing urges the Commission not to deviate from the agreements reached at the CPM.[390]

184. As previously noted, we are committed to ensuring the provision of BSS to all of the United States, including Alaska.[391] We are adopting specific rules to protect BSS to Alaska from NGSO FSS interference, such as operational limits for 240 cm BSS earth station antennas in Alaska. This specific provision was based on significant technical work performed in the ITU-R, such as agreements contained in the CPM Report and Final Acts of WRC-2000, and based on the GSO BSS links submitted by the United States for inclusion in the international database of GSO BSS links. We do not find that DIRECTV provides sufficient technical justification for requiring an operational limit of –167 dB(W/m^2/40 kHz) in Alaska.[392] Further, DIRECTV's concerns are alleviated by how we are implementing the operational limits in the United States. We are requiring NGSO FSS applicants to demonstrate that they meet the operational limits at test points that represent the worst case scenario, everywhere in Alaska (or the entire United States, as the case may be) all of the time. Therefore, as DIRECTV points out, the 180 cm BSS earth station antennas will effectively not receive greater interference than the –167 dB(W/m^2/40 kHz) value by virtue of the operational 100%-of-the-time limit we adopt for 240 cm BSS earth station antennas in Alaska. Contrary to the implementation of operational limits internationally, the burden is not entirely placed on the GSO BSS operator to monitor the NGSO FSS interference into its operational earth stations and if the operational limits are exceeded in practice, request that the interference be restored to levels below the operational limits.[393] Considering the foregoing, we conclude that there is not sufficient information in our domestic proceeding to warrant adopting an additional requirement on NGSO FSS systems to protect 180 cm BSS earth station antennas in Alaska.

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[389] *Id*. at 10-12.

[390] Boeing Supplemental Comments at 3.

[391] Section 100.53, 47 C.F.R § 100.53, of the Commission's Rules requires that DBS licensees provide service to Alaska and Hawaii. *See also* Policies and Rules for the Direct Broadcast Satellite Service, *Notice of Proposed Rule Making*, 13 FCC Rcd. 6907, 6926 (1998).

[392] This requirement is not supported by the GSO BSS links that the United States supplied to the ITU-R, nor does DIRECTV provide complete information in its comments on the BSS links to Alaska that justifies this value. In addition, the value of downlink e.i.r.p. to Anchorage that DIRECTV specifies in its comments is not supported by DIRECTV's DBS satellite applications submitted to the Commission.

[393] Section 3.1.2.4.7 of the CPM Report.

185. *Protection of 180 cm BSS earth station antennas in Hawaii.* The international consensus $EPFD_{down}$ limits may not ensure adequate protection to all BSS earth station antennas in Hawaii, as the additional validation and operational limits are only for regions located in high latitudes. We note that EchoStar provides BSS to Hawaii using 180 cm diameter or larger earth station antennas. These links require greater protection than is afforded by the validation limits that we are adopting above.[394] Although the U.S. had proposed a tighter $EPFD_{down}$ limit in the international meetings over Hawaii for 180 cm BSS earth station antennas,[395] two of the interested parties – SkyBridge and EchoStar – agreed that in lieu of a specific international regulation to protect operations in Hawaii, to submit a joint letter to the Commission detailing agreed-upon limits, for inclusion in our domestic rules. Specifically, the joint letter proposes a "never-to-be-exceeded-in-operation" (*i.e.*, operational, not to be exceeded for 100% of the time) $EPFD_{down}$ limit of –162.5 dBW/m^2/40 kHz over Hawaii for GSO BSS receive earth station antennas pointing towards any current EchoStar satellite operating in the 110° W.L., 119° W.L. and 148° W.L. nominal orbital positions, in addition to the $EPFD_{down}$ limits specified in Annex 1 to the letter.[396] The limits in Annex 1 to the letter are the same as those contained in the CPM Report and Final Acts.

186. In addition, it appears upon initial review, that the other NGSO FSS systems on file will not cause such short term interference and therefore should not have any difficulty meeting the limit agreed to by SkyBridge and EchoStar. We will, therefore, adopt the SkyBridge/EchoStar agreement for 180 cm BSS earth station antennas in Hawaii into our rules.[397] We will implement this operational limit in the same manner as the operational limit to protect 240 cm BSS receive earth station antennas.[398] Any NGSO FSS system that provides service to the United States – even systems that are not licensed by the United States – will have to meet this limit over Hawaii.

187. *BSS receive earth station antenna patterns.* The BSS receive earth station antenna pattern is an important component in the assessment of interference from NGSO FSS satellites into GSO BSS earth station antennas. In the *NPRM*, we recognized that off-set feed receive earth station antennas may have different discrimination characteristics in directions other than the plane of the geostationary satellite orbit.[399] The ITU-R studied the appropriate BSS receive earth station antenna patterns to use in its interference studies and developed a recommended antenna pattern, which is used in the definition of the $EPFD_{down}$ limits, to protect BSS earth stations. This pattern was included in the Final Acts of WRC-2000 and will be used in calculating whether or not a given NGSO FSS system complies with a certain $EPFD_{down}$ limit.[400] The antenna pattern takes into account the transient nature of NGSO FSS interference, and reflects an averaging of the peaks and valleys of an actual GSO BSS earth station antenna pattern, instead of providing a conservative envelope of the peaks of the sidelobes. No party has objected to the use of this new antenna pattern in the international process, or within this domestic proceeding. Accordingly, we will include this new receive earth station antenna pattern in the definition of

[394] EchoStar asserts it needs greater protection. See Document CPM99-2/29 + Corr. 1.

[395] Document CPM99-2/29 + Corr. 1.

[396] Letter from Jeffrey Olson, Attorney for SkyBridge L.L.C. to Magalie Roman Salas, Secretary, dated December 30, 1999, and Attachment.

[397] *See* new Section 25.208(i) and (j) in Appendix A.

[398] *See* new Section 25.145(b)(2).

[399] *NPRM* at ¶ 58.

[400] These new antenna patterns are found in Annex 1 to Recommendation ITU-R BO.1443 *See* Table S22-1D and note 14 of Article S22, of the Final Acts. The software functional description is contained in ITU-R Recommendation BO.1503.

$EPFD_{down}$ limits to protect BSS receive earth stations in our rules. We note, however, that BSS earth station antennas whose actual antenna performance is worse than predicted by this antenna pattern will receive more interference from NGSO FSS than antennas that meet or perform better than the recommended pattern. Although we will not require DBS providers to use this new pattern, we strongly encourage DBS licensees and applicants to take this new pattern into account in designing their future systems.

(ii) Domestic Implementation of Single-Entry $EPFD_{down}$ Limits

188. *Proposal.* In the *NPRM*, we recognized that domestically we must ensure that all NGSO FSS licensees satisfy the EPFD limits.[401] We stated that the Commission needs to verify that a proposed system meets the appropriate limits for domestic licensing purposes, as well as to confirm information that will be sent to the ITU. Commenters agree that the single entry PFD limits should be strictly enforced.[402]

189. *Decision.* As discussed below, we are adopting implementation procedures for single-entry validation and latitude-dependent validation limits, and a separate set of procedures for operational limits. In addition to ensuring protection of BSS, this will assist the Commission in its need to confirm to the ITU that the appropriate limits are being met. Many of the implementation procedures we discuss below are similar to the procedures we adopt to protect GSO FSS networks from NGSO FSS.

(iii) Domestic Implementation of Single-Entry Validation and Latitude-Dependent Validation Limits

190. DIRECTV encourages the Commission to carefully consider the functional description of the validation software, as additional problems may be yet uncovered.[403] SkyBridge, Loral, Boeing, and STA support the use of a commonly accepted software tool, such as that being developed by the ITU-R, to ensure compliance with the EPFD limits.[404] Boeing, however, states that the Commission should not adopt any one software tool until all of the various software tools that have been developed have undergone further analysis.[405] STA agrees that we should adopt a validation process for domestic use and require NGSO FSS applicants to disclose the requisite system parameters and provide any software elements necessary to supplement the core validation software.[406]

191. As with the validation limits adopted to protect GSO FSS operations, in order to receive a favorable finding internationally,[407] each NGSO FSS system must not exceed the specified validation $EPFD_{down}$ limits when analyzed using the ITU-BR software. We believe that it is imperative that NGSO FSS compliance with the single entry validation $EPFD_{down}$ limits be verified during the domestic licensing process. For the same reasons discussed in the section above on validation $EPFD_{down}$ limits to protect GSO FSS operations, we will also require an NGSO FSS applicant to demonstrate prior to licensing that it

[401] *NPRM* at ¶ 80.

[402] *See e.g.,* DIRECTV Reply Comments at 34 and DIRECTV Supplemental Comments at 12.

[403] DIRECTV Supplemental Comments at 14.

[404] Loral Comments at 19, SkyBridge Comments at 93, Boeing Comments at 84, and STA Comments at 8.

[405] Boeing Comments at 84.

[406] STA Comments at 8.

[407] Section 3.1.2.4.6 of the CPM Report. Compliance with the "validation" limits will be checked by the ITU/BR under Radio Regulation No. S9.35 and S11.31.

meets the validation $EPFD_{down}$ limits to protect GSO BSS operations.[408] Despite DIRECTV's concern about potential problems with using the functional description of the ITU-BR validation software, we will require the NGSO FSS applicants to use the software developed in accordance with the ITU software specification contained in the ITU-R Recommendation BO.1503. This software has been thoroughly evaluated by the ITU-R, including by U.S. participants in the ITU-R groups.[409] The specific information we will require from the NGSO FSS applicants is described in detail in the GSO FSS section and new rule Section 25.146(a)(1).[410]

(iv) Domestic Implementation of $EPFD_{down}$ Operational Limits

192. The operational limit is included in Article S22 of the ITU-R Radio Regulations and unlike the validation limits, the ITU-BR will not verify compliance of NGSO FSS systems with this limit.[411] Individual Administrations and their GSO system operators would determine whether a NGSO FSS system is exceeding the operational EPFD limit. If an operating NGSO FSS system exceeds the operational limit into an operating GSO BSS receive earth station, the NGSO FSS network would have to take all necessary steps, as expeditiously as possible, to ensure that the interference caused to the GSO BSS receive earth station is restored to levels at or below the operational EPFD limit. WRC-2000 did not adopt specific procedures to ensure compliance with operational limits; instead, these procedures will be developed within the ITU-R and addressed at the next WRC.[412]

193. *Comments.* Commenters addressed both the type of information the Commission should require in order to confirm that an NGSO FSS operator will operate in compliance with the operational limit and the appropriate time for providing this information to the Commission. DIRECTV, while not objecting to the operational limit of –167 dB(W/m^2/40 kHz), urges the Commission, as part of its NGSO licensing procedure, to ascertain through computer simulation that the NGSO FSS system will meet all $EPFD_{down}$ limits, regardless of whether they are considered by the ITU-R to be "validation" limits or "operational" limits.[413] Specifically, DIRECTV submits that NGSO FSS applicants must be required to provide sufficient information to the Commission so that the agency or a third party can perform simulations to verify that the operational limits will be met. PanAmSat states that the international agreement envisions that individual Administrations will determine compliance with, as well as, enforce the operational limits.[414] SkyBridge, on the other hand, believes that requiring NGSO FSS applicants to demonstrate compliance with operational limits as part of the licensing process is not consistent with the principle behind the operational limits.[415] SkyBridge also asserts that the operational limits are intended only to provide a GSO operator with a standard to determine whether its system is receiving unacceptable

[408] These limits are defined in ITU-R Recommendation BO.1503.

[409] The functional description was finalized by the JTG 4-9-11 at its May/June 1999 meeting. JWP 10-11S further reviewed several aspects at its October 1999 and WP4A reviewed it at its February 2000 meeting.

[410] *See* Appendix A

[411] Section 3.1.2.4.7 of the CPM Report to WRC-2000.

[412] Resolution [COM5/6] (WRC-2000). The CPM recognized that in order to implement the operational limit concept, a procedure is needed which: i) identifies non-GSO systems exceeding the operational limits; and ii) ensures immediate reduction of the interference level to the operation limits by any non-GSO system exceeding those limits.

[413] DIRECTV Supplemental Comments at 9, 13.

[414] PanAmSat Supplemental Comments at 21.

[415] SkyBridge Supplemental Comments at 16.

interference. Although Boeing states that it could provide prior verification that its system meets the operation limits, Boeing believes that advance verification of the operational limits prior to the operation of the NGSO FSS system is unnecessary. Instead, Boeing reasons that an NGSO FSS operator once operational, could be required to take appropriate action such as limiting the power to a particular spot beam or switching the frequency used on a particular beam, to eliminate any operational harmful interference.[416] DIRECTV states that waiting until after a system is operational makes it difficult to effect any necessary changes in NGSO FSS operations.[417] Virgo would support a requirement that NGSO FSS systems demonstrate their ability to meet all of the agreed validation and operational limits prior to receipt of any authorization.[418]

194. DIRECTV also requests that the Commission specify precisely the procedure to be followed if an NGSO FSS system licensed for operation in the United States is found to exceed the operational limits. DIRECTV asserts that the Commission must, at a minimum, provide for the immediate cessation of the interference. [419] SkyBridge states that the Commission's Rules already provide procedures for resolving interference complaints.[420]

195. *Decision*. For the same reasons discussed in the section above on implementation of the operational $EPFD_{down}$ limits to protect GSO FSS operations, we will also require an NGSO FSS applicant to demonstrate prior to becoming operational that it meets the operational $EPFD_{down}$ limits to protect GSO BSS operations. In addition, unlike the requirements for the operational limits with the ITU, we will require NGSO FSS applicants to demonstrate that they will meet the operational limits to protect BSS receive earth stations everywhere in Alaska, or Hawaii as appropriate, all of the time.[421] Therefore, any NGSO FSS applicant that is found qualified to hold a space station authorization will be issued a conditional authorization. Specifically, as discussed in the GSO FSS section, each NGSO FSS licensee issued a conditional authorization must submit, 90 days prior to operation, technical information demonstrating compliance with the operational limits in the United States NGSO FSS applicants are fully aware of our requirements well in advance of their actual construction and operation. If the demonstration shows that the limits are not met, we will require NGSO FSS systems to apply all mitigation techniques necessary, including any changes necessary to their system design, to comply with the operational limits. In addition, if an NGSO FSS system exceeds the operational limits, it will be in violation of its obligations under the ITU Radio Regulation No. S22.2, as well as Commission rules.[422] The information that we will require NGSO FSS system licensees to submit is described in detail in the GSO FSS section and in new rule Section 25.146(b)(2).[423]

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[416] Boeing Supplemental Comments at 5.

[417] DIRECTV Supplemental Comments at 14.

[418] Virgo Supplemental Comments at 4.

[419] DIRECTV Supplemental Comments at 14.

[420] SkyBridge Supplemental Comments at 15-16. Specifically, SkyBridge refers to 47 C.F.R. §§ 25.271-25.274 and 25.160.

[421] Compliance of U.S.-licensed NGSO FSS systems with the operational limit to protect BSS receive earth stations outside of the United States is not relevant, as the "operational" limit only applies in Alaska or Hawaii.

[422] See ADD S22.5I in Article S22 of the Provisional Final Acts. No. S22.2 specifies that NGSO FSS systems shall not cause unacceptable interference to GSO FSS and BSS systems operating in accordance with the Radio Regulations.

[423] Specifically, we will require each NGSO FSS licensee to provide the following information: (1) the satellite/earth station resource allocation strategy, spacecraft antenna switching algorithm and the measured (continued….)

(v) Aggregate $EPFD_{down}$ Limits

196. *Proposal.* In the *NPRM*, we stated our concern about the cumulative effect of multiple NGSO FSS systems on sharing with other services, and sought comment as to how the proposed sharing criteria should be applied or adjusted to account for multiple NGSO FSS systems.[424]

197. *Comments*. DIRECTV and EchoStar state that any effective spectrum sharing between NGSO FSS systems and GSO BSS systems will require aggregate and single entry PFD limits that are well-defined and strictly enforced.[425] Further, DIRECTV suggests that if future study demonstrates that the procedure used to go from aggregate to single-entry limits must be revised, or if $N_{effective}$ changes, the single-entry $EPFD_{down}$ limits must be revised accordingly.[426] EchoStar asserts that interference from NGSO FSS systems would only be considered "acceptable" so long as it does not exceed the approved single entry and aggregate (for all NGSO FSS systems) power limits, as aggregate limits are the only way to ensure adequate protection of GSO BSS systems.[427] SkyBridge, however, finds that software validation of the aggregate levels is not appropriate, as the aggregate levels govern emissions of operational NGSO FSS systems at any given time.[428] SkyBridge supports the regulatory approach contained in example Resolution WWW.[429] Further, as the aggregate interference may include non-U.S. systems, SkyBridge asserts that compliance with aggregate levels must be assessed on an international level. Boeing states that the development of software to determine compliance with the aggregate limits serves no purpose except in the case of the fourth and subsequent co-frequency NGSO FSS systems.[430]

198. *Decision*. As we concluded in the GSO FSS section on aggregate EPFD down limits, it is necessary to ensure that the maximum aggregate interference level necessary to protect GSO BSS is not exceeded. Therefore, we will include in our rules the international consensus aggregate $EPFD_{down}$ limits referred to in No. S22.5K and contained in Table [RES COM 5/6]-1D.[431] For the same reasons discussed in the GSO FSS section on aggregate $EPFD_{down}$ limits, however, we will defer a decision on

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spacecraft antenna patterns; (2) a description of how this resource strategy/algorithm and the space craft antenna patterns are being used in the software program; (3) the software program used to verify the commitment that the operational limits and the assumption used in the structure of the computer program; (4) an identification and description of other input parameters necessary for the execution of the computer program and (5) analysis of the results of the computer simulation and the pass/fail nature of the commitment test.

[424] *NPRM* at ¶¶ 73-74.

[425] DIRECTV Reply Comments at 34, DIRECTV Supplemental Comments at 7, and EchoStar Reply Comments at 7. *See also* GE Comments at 10 and PanAmSat Comments at 14.

[426] DIRECTV Supplemental Comments at 6-7.

[427] EchoStar Reply Comments at 9-10.

[428] SkyBridge Supplemental Comments at 21-22.

[429] Resolution WWW is now Resolution [COM5/6](WRC-2000).

[430] Boeing Supplemental Comments at 5. Boeing bases its view on the fact that the single-entry limits were derived from the aggregate levels using a factor of 3.5.

[431] *See* new Section 25.208(j) in Appendix A. Further, Resolution [COM5/6] specifies that Administrations operating or planning to operate NGSO FSS systems take all possible steps, including modifications to their systems if necessary, to ensure that the aggregate interference into GSO networks does not exceed certain aggregate power levels. If these levels are exceeded, Resolution [COM5/6] states that the Administrations with NGSO FSS systems shall expeditiously take all necessary measures to reduce the aggregate EPFD levels to the agreed levels, or to a higher level (*i.e.*, more interfering level) that is acceptable to the affected GSO Administration.

whether NGSO FSS applicants should demonstrate that that they can meet the aggregate $EPFD_{down}$ limits we adopt today, to the forthcoming rule making addressing NGSO to NGSO sharing, or to the licensing proceeding itself.

(vi) Protection of GSO BSS Telemetry, Tracking and Command

199. *Proposal*. In the *NPRM*, we stated that the proposals and questions regarding GSO FSS TT&C operations are also relevant for protection of GSO BSS TT&C operations.[432] Specifically, as we stated in the GSO FSS discussion on protection of TT&C operations, in the *NPRM* we proposed that GSO (FSS and BSS) and NGSO FSS licensees coordinate their transfer orbit operations, and that emergency TT&C operations be protected. For the protection of operational phase telemetry downlinks, we sought comment on whether the provisional limits would adequately protect telemetry downlink operations.[433]

200. *Comments*. SkyBridge asserts that the issues relating to the protection of GSO BSS TT&C operations are the same as for GSO FSS TT&C operations and therefore encourages the Commission to follow SkyBridge's proposal for GSO FSS TT&C operations for BSS TT&C operations.[434] DIRECTV indicates that it has been particularly concerned about the impact of NGSO interference on TT&C operations.[435] DIRECTV supports the proposal that GSO and NGSO operators coordinate their transfer orbit operations, while emergency TT&C operations would be protected.[436]

201. *Decision*. As noted in the *NPRM*, the issues that are specific to the protection of GSO FSS TT&C operations are also relevant for the protection of GSO BSS TT&C operations. Therefore, we adopt the same decisions that are discussed in the section above on GSO FSS TT&C operations for the GSO BSS TT&C operations.

(vii) Other DBS Applications

202. As noted in the *NPRM*, DIRECTV is providing DBS to antennas mounted on aircraft.[437] We stated our belief that this type of mobile operation is consistent with the allocation because the DBS definition in the Commission's Rules does not limit transmissions to fixed receive earth stations.[438] Nevertheless, we requested comment on whether this type of BSS operation is consistent with the Commission's Rules and whether it is appropriate to protect this type of reception. If so, we also requested comment on what EPFD limits would be appropriate to protect aircraft mobile antennas.

203. *Comments*. SkyBridge states that it is not at all clear that this proposal is consistent with the existing allocation for the 12.2-12.7 GHz band.[439] However, SkyBridge goes on to say in its comments

[432] *NPRM* at ¶ 62.

[433] *Id*. at ¶¶ 29-31.

[434] SkyBridge Comments at 65.

[435] DIRECTV Comments at 15.

[436] *Id*. at 15.

[437] *NPRM* at ¶ 61. *See* DIRECTV Application Comments at 15. According to DIRECTV, these antennas tend to have wider beams in elevation than in azimuth, sometimes significantly wider.

[438] *NPRM* at ¶ 61. *See* 47 C.F.R. § 100.3.

[439] SkyBridge Comments at 63.

that it appears that airborne BSS services and NGSO FSS systems could co-exist under the presently proposed technical parameters, at this time.[440] In contrast, DIRECTV states that GSO BSS service to aircraft is encompassed within U.S. domestic and international definitions of DBS and BSS service, as transmissions to aircraft are intended for direct receipt by the general public through community reception.[441] DIRECTV states that, from its initial studies, it appears that the aircraft antenna beam shape can cause an amplification of high short term levels of interference, which could lead to service disruption.[442] However, DIRECTV does not provide additional information in its replies to confirm its initial studies on this issue, or to propose specific measures to ensure protection of this type of DBS reception.

204. *Decision*. No party internationally, or in the domestic proceeding, proposed any additional specific measures or rules to protect this type of DBS receive earth station application. Based on the text of the CPM Report, and the latest round of comments, it appears that this issue has been resolved by the $EPFD_{down}$ limits that we are adopting today. Therefore, we do not find it necessary to adopt any additional measures to protect DBS service to aircraft.

b. MVDDS Sharing with DBS

205. *Background*. The major issue raised by Northpoint's petition with respect to DBS is the ability of the MVDDS to avoid causing harmful interference to DBS during periods of significant precipitation. We note that DBS receivers are digital, and the impact of interference on a digital receiver is different than on an analog receiver. In general, a picture demodulated by an analog receiver deteriorates gradually as the interfering signal level increases. This gradual degradation is reflected in the quality of the video picture on the television screen; when there is no interference there will not be any picture impairment, when some interference is present viewers will notice a gradual degradation of the picture which will get worse as the interference level increases until the picture is totally degraded. For digital receivers, the effect of interference is completely different. A picture demodulated by a digital receiver retains its quality until the desired to undesired signal ratio decreases to a level too low for the receiver demodulator to decode, at which point the picture is completely lost. This is generally referred to as the "cliff effect" of a typical digital video receiver. Because rain attenuates the DBS signal strength, its presence, if sufficiently heavy, could cause a loss of picture. Therefore, in an interference free environment, loss of picture in any given geographic area is dependent on the satellite downlink power budget and the frequency, duration, and intensity of rain in that local geographic area. During a period of significant rain, the presence of interference from a terrestrial fixed service could advance the onset of picture loss and could cause the duration of this picture loss to last longer than experienced from rain alone.

206. We also note that the main source of potential interference to a DBS receiver occurs when an MVDDS signal transmitted from a northerly direction enters the backlobe of a DBS receiver antenna, which is pointed in a southerly direction.[443] Due to this phenomenon, the interference arguments

[440] *Id*. SkyBridge bases this assertion on the fact that the lobes of the antennas are mainly in the azimuth and elevation plane with some discrimination in other directions, and the low directivity of the antennas increases the interference from adjacent GSO satellites, increasing the system noise temperature.

[441] DIRECTV Comments at 16-17.

[442] *Id*. at 18.

[443] Specifically, a three dimensional analysis of the gain of a DBS dish antenna indicates that an MVDDS signal could come over the back and side edge of the antenna and enter directly into the offset feed, resulting in an interfering signal with minimal suppression (gain of approximately –2 dBi). *See* DIRECTV Report of January 27, 2000, at 6.

of the parties have focused on the extent to which buildings, trees, or other obstacles will shield these backlobes. In order to depict worst case deployment scenarios, our analysis assumes no shielding (*i.e.*, backlobes will be exposed to interfering signals). Thus, several potential solutions to the overall problem of interference to DBS receivers center on the reduction or elimination of backlobe interference. We address the comments and related issues below.

207. *Comments.* Northpoint states that it plans to deliver its services in the 12.2-12.7 GHz band through a series of low-cost cascading cells, each with a transmitter serving approximately 100 square miles. Northpoint states that because its technology operates in the same band as DBS and uses the same digital processing, the equipment necessary to deploy its system is commercially available. Northpoint maintains that deployment of its technology would create sufficient capacity in the 12.2-12.7 GHz band to deliver all local television signals in every market, as well as other video programming and high-speed Internet service. Northpoint states that it is widely recognized that DBS providers have limited ability to offer local programming, and that Northpoint's technology will enable such providers to offer local signals and challenge cable television in the MVPD marketplace. Northpoint further states that its ability to provide local programming can either be integrated with DBS or provided directly by Northpoint to DBS customers.[444]

208. Northpoint contends that it can offer simultaneous transmission with DBS to consumers without causing any harmful interference to reception of DBS signals. It states that its technology achieves a carrier to interference (C/I) ratio of 20 dB or greater in 99.8% of its reliable service area, and that its experimental tests reveal that a C/I ratio of only 9 dB is sufficient to avoid harmful interference to DBS subscribers. Northpoint acknowledges that close to its transmitters there will be areas where the Northpoint signals would be strong enough to interfere with DBS receivers, but it contends that this impact can be minimized or mitigated. Northpoint calls this area a mitigation zone because any potential interference can be resolved through engineering techniques. Specifically, Northpoint contends that careful siting of its transmitters, antenna discrimination in the vertical plane, natural shielding and terrain blockage, and other techniques can be used to minimize the size of any potential interference areas and lessen their effect on DBS subscribers. Northpoint asserts that its technology will provide at least 99.7% service availability at the edge of its service area.[445]

209. DBS commenters oppose Northpoint's proposal, arguing that its adoption would create unacceptable interference to the incumbent DBS operations.[446] DIRECTV contends that Northpoint's claim that its technology would not interfere with DBS is unsupported. DIRECTV states that the zone around a Northpoint transmitter where the interference level is unacceptable for DBS operations occupies more than 50% of Northpoint's proposed service area, and that Northpoint's experimental progress reports demonstrate a lack of understanding of the complex technical issues involved with the effects of Northpoint's service on the provision and receipt of high-quality DBS service. Finally, DIRECTV recommends that if MVDDS is authorized in the 12.2-12.7 GHz band, each system should be treated the same as each NGSO FSS system, and therefore be permitted to have no more than a 2-3 percent impact on any DBS system's reliability.[447]

[444] Northpoint Comments at 4, 11-13.

[445] *Id*. at 17-18.

[446] *See, e.g.,* Satellite Broadcasting and Communications Association Comments at 2-3 and EchoStar Comments at 8-14. *See also* DIRECTV/EchoStar filing of July 25, 2000.

[447] DIRECTV *ex parte* presentation of April 8, 1999 at 5.

210. EchoStar states that Northpoint's experimental tests in Washington, DC reveal the occurrence of harmful interference to DBS even though the tests were designed to produce the least possible interference. EchoStar also asserts that Northpoint has improperly averaged its measurements, and argues that even if the average impact of MVDDS on DBS is not large, numerous DBS subscribers will be adversely affected. As an example of the potential adverse impact of MVDDS on its subscribers, EchoStar states that in Washington, DC subscribers who receive signals from its satellite located at 61.5° West Longitude (W.L.) could suffer increased unavailability of 84%, which would be far in excess of the 10% aggregate unavailability that is permitted to be caused by all NGSO FSS systems. EchoStar also contends that in this example the increase in its system noise temperature would be almost ten times as great as the standard criterion for acceptable interference between co-primary services.[448]

211. In reply comments, Northpoint states that many commenters opposing establishment of the MVDDS do so for competitive reasons. Northpoint contends that whether the MVDDS is offered as a supplement to DBS or as a stand-alone competitor is not the issue;[449] rather, Northpoint contends the issue is the ability of the MVDDS to reuse spectrum in the 12.2-12.7 GHz band on a terrestrial basis to deliver local television programming to DBS consumers, as well as to provide multi-channel video programming and high-speed Internet access without causing harmful interference to other services in the band. With respect to DIRECTV's technical analysis, Northpoint asserts that the analysis is flawed both because it treats Northpoint's system as one of five NGSO FSS systems for purposes of determining whether Northpoint will cause harmful interference to DBS and because DIRECTV makes erroneous assumptions regarding Northpoint's technology.[450] Northpoint proposes that to avoid interference to a DBS system, each MVDDS system should satisfy the three following criteria: 1) average unavailability of the DBS system must not increase by more than 0.006%, or about 30 minutes per year; 2) maximum unavailability of the DBS system must not increase by more than 0.06%, or about 5 hours per year; and 3) minimum availability of the DBS system must not drop below 99.7%.[451] Subsequently, Northpoint stated that the impact on DBS subscribers from the total increase in noise from the full deployment of both its service and NGSO FSS should not exceed the larger of a 10% increase in DBS unavailability or 5 minutes of DBS unavailability per month. Further, according to Northpoint, its contribution to increased DBS unavailability will be significantly less than the contribution of NGSO FSS systems because its average C/I ratio exceeds 41.6 dB, a level at which the increase in DBS unavailability is less than 0.05%.[452]

212. The commenting parties also filed extensive analysis and data regarding MVDDS spectrum sharing with DBS in ex parte documents and through our experimental authorization process. Specifically, Northpoint performed tests on its ability to offer service without causing interference to DBS in King's Ranch, TX; Austin, TX; and Washington, DC.[453] Northpoint asserts that its tests prove that terrestrial operations could share the 12.2-12.7 GHz band without causing unacceptable interference to DBS operations. Northpoint also contends that no DBS subscriber suffered any outage, even during

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[448] EchoStar *ex parte* presentation of October 29, 1999 at 1-7.

[449] We note that after the *NPRM* in this proceeding was issued, Northpoint, under the name Broadwave LLC, filed approximately 70 applications for licenses under Part 101 (Fixed Microwave Services) of our rules. In these applications, Northpoint proposes to provide a multichannel video distribution and one-way Internet data service either as a supplementary service to DBS or as a competitor to DBS in this band.

[450] Northpoint *ex parte* presentation of March 17, 2000 at 3-18.

[451] Northpoint *ex parte* presentation of February 9, 2000 at 9.

[452] *Id*. at Attachment 1, final slide.

[453] *See e.g*., Northpoint's December 1998, Progress Report WA2XMY; Northpoint's October, 1999 Progress Report WA2XMY; Technical Annex to their Comments; and other *ex parte* filings.

significant rain events, as a result of its operations in the 12.2-12.7 GHz band.[454] However, DIRECTV and EchoStar respond that Northpoint's tests were designed to depict little impact on DBS operations and actual terrestrial deployment would result in significant interference.[455] DBS proponents also argue that Northpoint's tests did result in measurable harmful interference to DBS operations because the DBS signal margins were decreased due to the interfering terrestrial signal. In response to Northpoint's tests, DIRECTV and EchoStar performed their own analysis of Northpoint's tests, filed their own measured data of Northpoint's tests, and performed rain measurements and simulated terrestrial interference outage during rain events.[456] Further, DIRECTV and EchoStar requested experimental authorization to do their own tests in Denver, CO and Washington, DC of the impact on DBS operations of a terrestrial system as proposed by Northpoint.[457] On July 25, 2000, DIRECTV and EchoStar filed the results of their tests, asserting that their replicated Northpoint-like system caused significant interference to DBS receivers pointed at various satellite locations.[458] DIRECTV and EchoStar also recommend further independent testing to measure possible Northpoint interference to DBS systems.[459] Northpoint responds that even though the DBS proponents designed their tests to depict a hypothetical scenario of worst case interference, they did not demonstrate that a single actual DBS customer was or could have been adversely impacted by the interference DBS proponents claimed to have been created at the Oxon Hill, MD tests.[460]

213. *Decision*. We conclude that MVDDS can operate in the 12.2-12.7 GHz band under the existing primary allocation, which requires that a Fixed Service not cause harmful interference to the co-primary BSS. Section 2.1 of our rules defines "harmful interference" as "interference which endangers the functioning of a radionavigation service or of other safety services or *seriously degrades, obstructs, or repeatedly interrupts a radiocommunication service*….."[461] In some instances, spectrum sharing may result in services causing interference or degradation to or occasional outages of other services. Spectrum management decisions often address this issue by specifying operating requirements to minimize to the greatest extent possible the level to which such impacts occur. In this proceeding, we find that we can develop operating requirements for MVDDS that will ensure that DBS operations are not seriously degraded or subject to repeated interruptions due to MVDDS operations, thus avoiding any harmful interference to DBS.[462] As discussed in the *Further NPRM*, we intend to set technical parameters for MVDDS operations that will limit the permissible level of increased DBS service outage that may be attributable to MVDDS below any level that could be considered harmful interference. Specifically, in the *Further NPRM* we will propose that the maximum permissible increase in outage caused by an MVDDS transmitter to any DBS subscriber be a value such that the increase would generally be unnoticed by the

[454] Northpoint *ex parte* filing of February 10, 2000 at 5.

[455] *See* DIRECTV *ex parte* filing of January 27, 2000; DIRECTV *ex parte* filing of February 3, 2000; and EchoStar *ex parte* filing of October 29, 1999.

[456] DIRECTV ex parte filing of January 27, 2000 at 25.

[457] *See* Experimental Authorization File No. 0094-EX-ST-1999.

[458] DIRECTV and EchoStar *ex parte* filing of July 25, 2000.

[459] *Id*. at 5.

[460] Northpoint *ex parte* filing of July 31, 2000.

[461] *See* 47 C.F.R. § 2.1 (emphasis added).

[462] This is consistent with recent federal legislation that requires that no facility licensed or authorized to deliver local broadcast television signals "causes harmful interference to the primary users of that spectrum or to public safety spectrum use." *See infra* ¶ 264 (Rural Local Broadcast Signal Act).

DBS subscriber. In addition, any MVDDS transmitter that is the source of increased outages to a DBS subscriber beyond the maximum permissible level would have to correct these outages or cease operation. Thus, any impact would not seriously degrade, obstruct, or repeatedly interrupt the provision of DBS and would be evaluated in the same terms as the introduction of NGSO FSS in this frequency band.

214. We note that the ITU BSS Appendix 30 Plan targeted availability of 99.7% (unavailability of 0.3%, which is equal to about 26.3 hours, or 1578 minutes, per year) as acceptable service quality.[463] In actual domestic implementation, the availability level has been substantially exceeded in most areas of the United States, and we are confident that after introduction of the MVDDS, the availability level will remain well in excess of 99.7% for the great majority of DBS subscribers. The subscribers most susceptible to outages would be those in close proximity (1-3 kilometers) to an MVDDS transmitter, where DBS antenna backlobes may be exposed to the transmitter's signal.[464] MVDDS operations could reduce the DBS signal "margin," which is the amount by which the signal strength exceeds the level necessary for a subscriber to receive the DBS signal. This could lengthen an outage that would have occurred without the interfering signal being present or cause an outage if the receiver is already at the threshold without the interfering signal being present. However, in many cases the reflector dish, terrain, or various structures would shield the backlobes, thus mitigating or eliminating the interference from the MVDDS transmitter. Tests conducted in the 12.2-12.7 GHz band by Northpoint under an experimental authorization confirm that the MVDDS could operate without excessively impacting DBS subscribers.[465] Northpoint has also filed extensive technical studies to demonstrate that any impact on DBS operations would be minimal and could be mitigated using existing engineering techniques.

215. As mentioned above, DIRECTV and EchoStar conducted their own joint experimental testing to determine whether DBS subscribers would suffer significant availability losses due to new MVDDS operations, and concluded that they would. For example, DIRECTV and EchoStar contend that the increase in unavailability due to a Northpoint transmitter located in Oxon Hill, MD would range from 7.2-122.4%.[466] However, we note that throughout Northpoint's and DIRECTV/EchoStar's experimental tests, there were no reported DBS outages attributable to the tests. We would expect this result because the level of the potentially interfering terrestrial signal, as proposed by Northpoint, could result in loss-of-picture only if the DBS signal was exposed to a significant rain event sufficient to attenuate the DBS signal close to the threshold at any DBS receiver; *i.e.*, the cliff-effect, and the receiver is aligned in such a fashion to be susceptible to the interfering signal. Further, our engineering staff has thoroughly analyzed the extensive *ex parte* filings, experimental reports, and technical showings filed in the proceeding and finds that harmful interference between MVDDS and DBS operations can be avoided through engineering techniques and regulatory safeguards. We do not find that further independent testing, as suggested by DIRECTV and EchoStar, would yield any further useful information and would only further delay a decision in this proceeding. We note that neither DIRECTV nor EchoStar has identified any specific additional tests that would produce relevant new data. The arguments concerning interference have instead centered on the proper application and interpretation of test results. We find that there is an ample record to analyze the interference scenario between MVDDS and DBS operations.

[463] *See* DIRECTV April 11, 1994 report "Terrestrial Interference in the DBS Downlink Band" at 8.

[464] *See* example contained in Appendix I.

[465] Northpoint was granted an experimental license under the name Diversified Communication Engineering, Inc. in July 1997. It has conducted tests of its technology in Texas and in the Washington, DC metropolitan area to demonstrate that its proposed service can operate without causing harmful interference to incumbent DBS operations.

[466] *See* DIRECTV and EchoStar *ex parte* filing of July 25, 2000.

216. We note that the record in this proceeding demonstrates a variety of techniques that an MVDDS operator may use to protect DBS operations from harmful interference caused by MVDDS operations. Specifically, an MVDDS operator may employ all or some of the following techniques: 1) careful site selection of their transmitters to avoid large concentrations of DBS receive antennas within 1-3 kilometers of the transmitters; 2) beam shaping through customized MVDDS antennas or tilting the beams of their transmitters to avoid DBS receive antennas; 3) adjusting the height of their transmitters; 4) reducing the power of their transmitters during periods of DBS fading due to rain; 5) more accurately pointing DBS receive antennas toward the intended satellite at their expense and with the permission of the DBS subscriber; 6) relocating DBS receive antennas at their expense and with the permission of the DBS subscriber; 7) replacing smaller DBS receive antennas with larger DBS receive antennas at their expense and with the permission of the DBS subscriber; 8) shielding DBS receive antennas from their transmitters at their expense and with the permission of the DBS subscriber; 9) employing planar DBS antennas[467] at their expense and with the permission of the DBS subscriber; and 10) using multiple transmit antennas at each tower with customized beam patterns and lower power. We note, in particular, the possibility that technique 4) may have to be employed by the MVDDS operator in areas where the protection criteria is difficult to meet. In some instances this may result in the MVDDS service being briefly unavailable to some subscribers during rainy periods.

217. Accordingly, we will permit a terrestrial point-to-multipoint video and data distribution service, which we will refer to as the MVDDS, to operate under Part 101 of our Rules in the 12.2-12.7 GHz band. We find, however, that determining an appropriate increased unavailability criterion for MVDDS must take into account the inherent differences between MVDDS and NGSO FSS operations. Because an NGSO FSS system operator cannot readily tailor its operations to BSS/DBS systems in different geographic areas, WRC-2000 developed EPFD values that reflect NGSO FSS impact on BSS/DBS systems over the whole NGSO FSS service area (in this country, the entire continental United States). By contrast, an MVDDS system operator can tailor its operations to avoid causing harmful interference to BSS systems in different areas, as well as to individual DBS subscribers in the same area. Thus, while Northpoint requests that the impact of MVDDS on DBS subscribers be averaged over each MVDDS service area, we find that such averaging would be unnecessarily broad, and conclude that worst case impact to any DBS subscriber is more appropriate. Therefore, we will require each MVDDS operator to mitigate interference to DBS subscribers within an area around each MVDDS transmitter where unavailability to such subscribers would otherwise exceed acceptable levels because of MVDDS transmissions. We recognize that using a worst case unavailability criterion to any DBS subscriber may pose significant constraints on MVDDS deployment, but we conclude that we should minimize any potential decrease in availability to DBS customers located in close proximity to MVDDS transmitters. We find that such an approach is feasible because an MVDDS operator can customize its transmitter deployment. In our companion Further NPRM, we provide options and seek comment regarding the amount of additional DBS unavailability that we will permit an MVDDS system to cause.

218. Finally, we find that, similar to the protection criteria developed by WRC-2000 to permit NGSO FSS/BSS sharing, any DBS protection criteria that MVDDS systems must meet should be based on a standard model using available historical and operational data. Although we recognize that the data used in this model may not perfectly represent future DBS systems operations and that unavailability will vary from year to year due to varying precipitation, the use of a predictive model will enable both DBS and MVDDS users of the 12.2-12.7 GHz band to plan their systems around a known set of parameters. In Appendix H, we have provided a model that can be used to determine yearly and worst month DBS unavailability. This model considers precipitation amounts and the ratio of the MVDDS signal level to the

[467] Planar antennas are flat antennas that eliminate backlobe interference.

DBS signal level (C/I_{limit})[468] at the DBS receiver in order to limit DBS unavailability caused by MVDDS operations to the desired level. Once this C/I_{limit} is known, it can be used to define an interference and/or mitigation contour around each tower (*i.e.*, it can be used to determine a contour line where the actual C/I is below the C/I_{limit}). This static model is similar in principle to the dynamic model used for NGSO FSS/BSS analysis. We note that the size and shape of the zone in which an MVDDS operator will have to mitigate interference will vary based on local conditions, such as rainfall rates, terrain, and the e.i.r.p. of the satellite in the direction of an earth station. We conclude that this model will minimize uncertainty between MVDDS and DBS entities in the calculation of permissible interference. Within this contour, the MVDDS operator would be responsible for ensuring that no DBS subscriber would suffer from such interference and would be responsible for shielding, relocating, or upgrading DBS antennas to ensure that MVDDS operations do not cause unavailability in excess of the permissible level.[469]

c. MVDDS Sharing with NGSO FSS Downlinks

219. *Comments.* Most NGSO FSS proponents challenge Northpoint's proposal arguing that its system would interfere with potential NGSO FSS operations or threaten the viability of their systems.[470] Specifically, NGSO FSS applicants contend that each Northpoint type transmitting tower will create an "exclusion zone" in the immediate area of the tower where NGSO FSS earth station receivers would receive interference.[471] SkyBridge maintains that while there is no reasonable concern regarding interference to Northpoint's proposed system from NGSO FSS systems because existing PFD limits are adequate, NGSO FSS systems will suffer significant interference from Northpoint operations. SkyBridge states that sharing among ubiquitous satellite earth stations and high density point-to-multipoint terrestrial operations is not possible, and that NGSO FSS service would be precluded in significant portions of any market served by Northpoint.[472]

220. Northpoint contends that its system was designed to share spectrum with DBS satellite services and that many of its sharing characteristics would also apply to sharing with NGSO FSS systems.[473] Northpoint states that its system is compatible with most of the proposed NGSO FSS systems in the 12.2-12.7 GHz band, and compatibility with all systems is achievable if modifications are made to some systems and interference avoidance techniques are used. Northpoint indicates that earth stations in the vicinity of its transmitters could be coordinated to enable ubiquitous NGSO FSS operations.[474] Northpoint contends that techniques such as terrestrial arc avoidance, satellite diversity, increased receiver antenna gain and alternative beam assignments by certain NGSO FSS systems can permit sharing between those systems and the MVDDS on a co-primary basis in all areas. Further, Northpoint contends

[468] For our discussion, C is the signal level for DBS and I is the signal level of MVDDS at the DBS receiver site.

[469] We would accept other models for the calculation of the C/I ratio and the construction of the mitigation zone. However, these models must be agreed to by both DBS and MVDDS licensees.

[470] While Virgo originally opposed sharing spectrum with a Northpoint type operation, it later announced that its system could share with Northpoint's proposed system. *See* March 8, 2000 *ex parte* letter from David Castiel, President, Virgo; and Sophia Collier, President, Northpoint.

[471] Boeing April 28, 2000 *ex parte* presentation.

[472] SkyBridge Comments at 114-115.

[473] Specifically, Northpoint contends that directional transmission, maximum altitude transmit antenna placement, transmit beam tilting, antenna radiation discrimination, and natural shielding and terrain blocking will facilitate spectrum sharing with NGSO FSS as well as DBS operations. Northpoint Technical Annex at 34.

[474] Northpoint Comments at 17-28.

that NGSO FSS applicants that propose highly elliptical orbit (HEO) configurations would not need to modify their systems to coexist with the MVDDS.[475]

221. Regarding interference into Northpoint's proposed receivers, Northpoint states that it can share spectrum with NGSO FSS downlink signals if the satellite PFD level is lower at low elevation angles where the terrestrial receiver antennas are pointed. Above we adopt PFD limits to protect incumbent fixed point-to-point links in the 10.7 GHz range from NGSO FSS downlinks, but Northpoint indicates that these PFD limits are not adequate to protect MVDDS links.[476] Specifically, the PFD limits adopted above for fixed point-to-point links are –150 dB(W/m^2/4kHz) for angles of 0-5^o above the horizon, whereas Northpoint requests that NGSO FSS systems meet a PFD limit of –158 dB(W/m^2/4kHz) for angles of 0-2^o above the horizon and –158 + 3.33(δ-2) dB(W/m^2/4kHz) for angles of 2-5^o above the horizon. Northpoint asserts that five of the eight proposed NGSO FSS systems meet its required low elevation PFD limits and that the proposed HughesLINK, HughesNET, and SkyBridge systems could meet the limits with certain modifications.[477]

222. NGSO FSS proponents argue that Northpoint's proposal that NGSO FSS systems use more restrictive PFD limits, satellite diversity, and frequency diversity would reduce the NGSO FSS system capacity. SkyBridge contends that Northpoint's proposed sharing solutions with NGSO FSS operations are "impractical" and would impose technically and economically unjustifiable burdens on NGSO FSS systems.[478] Boeing argues that spectrum sharing with terrestrial operations in the 12.2-12.7 GHz band would be inconsistent with any plan to license all or most of the NGSO FSS applicants because sharing with terrestrial transmitters would require band segmentation. Further, Boeing states that its system is not designed to avoid terrestrial interference and its point-to-multipoint structure would not permit hand-off due to terrestrial interference.[479]

223. SkyBridge indicates that its proposed system could utilize frequency and satellite diversity to avoid interference from various sources (e.g., interference from other satellites, terrestrial blockage of signals, and terrestrial signal interference). However, SkyBridge also states that it plans to deploy an expedited nationwide service with limited capabilities to initiate its service. SkyBridge argues that implementation of any of Northpoint's sharing schemes would jeopardize its expedited nationwide rollout of service.[480] Specifically, SkyBridge states that during its expedited rollout scheme, its system would

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[475] Northpoint Reply Comments at i-iv.

[476] Most likely, this is because MVDDS links have tighter constraints on their operations in order to protect DBS operations and because fixed point-to-point links use larger antennas with greater selectivity (higher gain).

[477] Specifically, Northpoint claims that the proposed SkyBridge, HughesLINK and HughesNET systems present a problem because their satellites transmit low to the horizon, which would increase interference to terrestrial systems, while the other 5 proposed systems have higher elevation operating angles which would limit the amount of signal energy arriving at low elevation angles. Northpoint states that the Hughes and SkyBridge systems could eliminate any potential interference to terrestrial receivers if they reduce their radiated levels towards elevation angles below 5 degrees or alternatively they could use frequency separation or increase their elevation mask. *See* Northpoint Technical Annex at 22.

[478] SkyBridge February 18, 2000 *ex parte* document at 3.

[479] Boeing February 16, 2000 *ex parte* Presentation at 6. Boeing's proposed system utilizes satellite diversity and frequency diversity to avoid interference with other satellite systems, but claims that such techniques could not be used to avoid signal blockage from terrestrial sources. Rather, Boeing uses a minimum elevation angle of 30 degrees.

[480] SkyBridge February 18, 2000 *ex parte* document at 4.

have a limited number of gateway stations and satellites, thereby decreasing capacity and causing SkyBridge to have insufficient satellites to use satellite and frequency diversity to avoid terrestrial transmitters.

224. *Decision*. While Northpoint's proposed technology was designed to share spectrum with DBS operations, sharing with NGSO FSS downlinks is more complicated. Nevertheless, after reviewing the extensive filings in this proceeding, we conclude that NGSO FSS and MVDDS systems can be accommodated in the 12.2-12.7 GHz band if NGSO FSS systems limit their PFD toward MVDDS receivers and the two services avoid mainbeam to mainbeam interference. We acknowledge that this sharing arrangement will require careful planning and engineering, but the public will benefit from these efforts to introduce both of these new services. Further, we note that we are making available to NGSO FSS systems an additional 500 megahertz of service downlink spectrum at 11.7-12.2 GHz that will not be encumbered by MVDDS operations. We believe that current trends in spectrum usage require us to consider more complicated and creative sharing arrangements. In our companion *Further NPRM*, we discuss how this spectrum sharing can be accomplished and make specific proposals.

225. With respect to interference that may be caused by MVDDS transmitters to NGSO FSS earth stations, such interference could occur when an earth station that is in the vicinity of an MVDDS transmitter tracks the NGSO FSS satellite into view of the transmitter, or when energy from the MVDDS transmitter enters the side and back lobes of the earth station at a sufficient signal strength to cause harmful interference.[481] Nevertheless, we are confident that MVDDS transmitters will not threaten the viability of NGSO FSS downlink operations. First, as noted above, the 11.7-12.2 GHz band will also be available for downlink operations. Further, the mitigation zone in front of each MVDDS tower will be relatively small compared to the overall MVDDS coverage area.[482] While the distance at which harmful interference into NGSO FSS earth stations would occur is disputed by the parties in this proceeding, we generally find that a very small percentage of potential NGSO FSS subscribers would have any interference potential from MVDDS deployment.[483] Finally, MVDDS operators will be deploying their transmitters so as to avoid harmful interference to DBS receivers, and this will also protect NGSO FSS earth stations.[484]

[481] NGSO FSS proponents call the area close to a MVDDS tower an "exclusion zone" and Northpoint calls it a "coordination area." For the purposes of this document, we will refer to this area as a mitigation zone because we haven't decided whether coordination is necessary and because potential interference to NGSO FSS earth stations could be mitigated in the area.

[482] A typical proposed Northpoint type service cell would have a diameter of about 16 km (10 miles). Each cell could have an area in front of the tower where NGSO FSS receivers from some systems could receive interference depending on the design of the system. For example, Northpoint provided a sample deployment within a 40 km (25 mile) radius of Washington, DC. That area includes 23 proposed transmitting towers, thereby creating 23 zones where NGSO FSS receivers may have to take steps to avoid interference. Sharing problems are more likely to occur in metropolitan areas where transmitters will have more limited deployment options and may be surrounded by NGSO FSS subscribers. However, we note that the great majority of each zone would not have any potential interference sharing problems because most NGSO FSS receivers would be a sufficient distance away from transmitting towers.

[483] Higher elevation NGSO FSS systems – such as those proposed by Virgo, Denali, and Boeing – would require less separation from MVDDS transmitters than LEO systems – such as those proposed by SkyBridge and Hughes – because higher elevation earth stations would not look at satellites just over the horizon.

[484] For example, an MVDDS operator will have to limit its transmitter power in order to protect DBS operations, and will likely deploy its transmitters in a manner that will minimize the number of residents in DBS remediation zones. Both of these factors will help achieve spectrum sharing with NGSO FSS earth stations.

226. We also note that most planned NGSO FSS systems are designed for flexible deployment because they must track multiple satellites and avoid interference from GSO satellites and blockage from tall buildings and trees. Flexible deployment could also avoid interference from nearby MVDDS transmitters. Further, many instances of backlobe interference could be eliminated through shielding. While some of the proposed NGSO FSS systems are designed with more flexibility than others, we believe that all proposed systems could be successfully deployed with minimal impact from the MVDDS because of the power limitations and deployment characteristics of the MVDDS that we have noted. However, in our companion *Further NPRM*, we will address whether coordination procedures need to be established for NGSO FSS earth stations and MVDDS transmitters to minimize possible interference in the mitigation zones.

227. Finally, band sharing between NGSO FSS earth stations and MVDDS stations will depend to some extent on where their services are marketed and systems deployed. For example, NGSO FSS earth stations may be successfully utilized in rural areas where terrestrial broadband options are not readily available. An MVDDS licensee in a rural area should be able to place its towers so as to avoid any impact on satellite earth stations.

228. Accordingly, we conclude that MVDDS and NGSO FSS can share the 12.2-12.7 GHz band on a co-primary basis. This more intensive use of the band will allow a wide variety of new services to be delivered to the public. NGSO FSS operations will enable the delivery of broadband services to anywhere in the United States, including unserved and underserved areas. MVDDS operations will deliver competition to other video distribution and data services and offer localized service that may not be possible through other services. A future NGSO FSS licensing proceeding will explore the optimal way to assign spectrum in the 12.2-12.7 GHz band to facilitate spectrum sharing between NGSO FSS systems and MVDDS systems.

3. NGSO FSS Service Uplink Bands: 14.0-14.4 GHz

229. *Current allocations*. The 14.0-14.4 GHz band is allocated on a primary basis for FSS uplinks and is heavily used by VSAT operations. In the *NPRM* we noted that the 14.0-14.2 GHz band segment is allocated on a secondary basis to Federal Government radionavigation, non-Federal Government radionavigation, and space research operations, and that there are no significant radionavigation operations in this segment other than for small handheld devices used along certain waterways under Part 90. Additionally, we noted that the 14.2-14.4 GHz band segment is allocated on a secondary basis to the mobile service, for such operations as television pickup links for Part 101 licensees. Finally, we noted that the entire 14.0-14.4 GHz band is available for secondary land mobile satellite uplink operations [485]

230. *Proposal*. In the *NPRM*, we proposed to permit NGSO FSS user terminals to share the 14.0-14.4 GHz band with incumbent GSO FSS user terminals, subject to appropriate sharing criteria.[486] We stated that such sharing appeared feasible, and that secondary operations in the band should suffer no greater impact from NGSO use than from GSO use. We requested the same information for NGSO FSS uplinks in the 14.0-14.4 GHz band as we did for such uplinks in the 12.75-13.25 GHz band, and asked commenters to address whether the WRC-97 APFD levels adequately protect GSO satellites from the aggregate power of an unlimited number of NGSO earth station transmitters.[487]

[485] *NPRM* at ¶ 63. WRC-97 adopted a secondary allocation for maritime-mobile and land-mobile satellite services.

[486] *Id*. at ¶ 64.

[487] *Id*. at ¶¶ 64-65.

231. *Decision*. As we noted in the *NPRM*, the NGSO FSS uplink user terminal sharing scenario in the 14.0-14.4 GHz band raises issues that are similar to those regarding NGSO FSS gateway uplinks in the 12.75-13.25 and 14.4-14.5 GHz bands. For the same reasons stated in the NGSO FSS gateway uplink section, we adopt the $EPFD_{up}$ limits contained in Section 25.208(h) of our rules to protect GSO FSS satellites from NGSO FSS user terminal uplink operations in the 14.0-14.4 GHz band. We also conclude that NGSO FSS gateway earth stations may also operate in the 14.0-14.4 GHz band, since NGSO FSS gateway uplinks are also subject to the same $EPFD_{up}$ limits as NGSO FSS user terminal uplinks.

C. Other Technical Rules

1. GSO FSS Arc Avoidance

232. *Proposal*. As noted in the *NPRM*, GSO arc avoidance is one technique NGSO FSS systems may employ to facilitate sharing with GSO FSS operations. GSO arc avoidance is the method by which an NGSO satellite ceases transmissions as it passes through the straight line communication path between a GSO satellite and an earth station. Likewise, in the uplink direction, the NGSO earth station would cease transmissions to the NGSO satellite. By doing so, the NGSO system is better able to reduce the signal levels that are received by GSO FSS space and earth stations.[488] We did not propose to explicitly include a minimum arc avoidance requirement in our rules, and requested comment on this proposal.

233. *Comments*. SkyBridge and Boeing agreed with our proposal that the only mitigation requirement with respect to GSO FSS protection should be compliance with the operational $EPFD_{down}$ and operational $EPFD_{up}$ limits.[489] On the other hand, PanAmSat suggests that the Commission adopt a GSO FSS arc avoidance angle requirement, but not a "single-number," in light of the differences in NGSO FSS system design.[490] GE requests that the Commission require NGSO FSS systems to implement arc avoidance measures because arc avoidance is a useful tool in minimizing interference dangers.[491]

234. *Decision*. Consistent with our proposal in the *NPRM*, we will not adopt a specific rule that requires NGSO FSS systems to employ GSO arc avoidance. NGSO FSS operators may use various techniques, including GSO arc avoidance, to meet the $EPFD_{up}$ and $EPFD_{down}$ limits we adopt today.[492] Considering that the amount of arc avoidance needed to meet the $EPFD_{up}$ and $EPFD_{down}$ limits is entirely

[488] *Id*. at ¶ 75.

[489] SkyBridge Comments at 87; Boeing argues that the critical issue is not whether arc avoidance is used, but whether NGSO FSS systems are able to avoid producing unacceptable interference into GSO FSS systems and other users of the band, and whether they can operate co-frequency with other NGSO FSS systems. Boeing Comments at 82.

[490] Reply Comments of PANAMSAT at 24; Hughes also urges the Commission to take into account the interference characteristics of the individual NGSO FSS system applications that have been filed, Reply Comments of Hughes at 4.

[491] GE Comments at 26-27. In particular, GE states that GSO arc avoidance avoids NGSO FSS satellite main beam into GSO earth station main beam interference which would be beneficial in the protection of GSO satellites operating in inclined orbits, and can also protect NGSO FSS systems from GSO systems.

[492] For example, several NGSO FSS applicants propose to employ highly elliptical orbit satellites. *See* summary of Virgo and Pentriad's applications at Appendix C of this *First R&O*. Using this constellation design, the satellites would only transmit during a small portion of their orbit (at perigee), where the satellites are separated from the geostationary arc by at least 40 degrees.

dependent on the NGSO system design, we find that imposing an additional GSO arc avoidance requirement would be an unnecessary constraint on the design of NGSO FSS systems.

2. GSO FSS Earth Station Power Limits

235. *Proposal*. WRC-97 adopted, then subsequently suspended, FSS earth station off-axis e.i.r.p. density limits in the 12.75-13.25 GHz, 13.75-14.0 GHz and 14.0-14.5 GHz (uplink) bands.[493] In a GSO/GSO FSS sharing environment, off-axis e.i.r.p. density limits on GSO FSS earth stations minimize the interference that one GSO FSS satellite can cause into adjacent GSO FSS satellites by constraining the combined power and antenna gain transmitted in directions other than the wanted direction. These same limits on GSO FSS earth stations would provide co-frequency NGSO FSS systems with an upper bound to the level of interference that NGSO FSS systems would need to tolerate from GSO FSS systems. In the *NPRM*, we proposed to adopt the WRC-97 suspended limits for GSO FSS earth station antennas,[494] with certain modifications to reflect work performed within the ITU through October 1998.[495] We sought comment on the impact to NGSO FSS systems of not requiring these limits to be met beyond ±3º of the GSO arc. We also sought comment on the necessity of this proposal considering our existing Part 25 rules.[496]

236. *Comments*. SkyBridge urges the Commission to adopt limits that reflect the ultimate outcome of the ITU-R studies.[497] In addition, SkyBridge and Boeing propose that the limits should be applied over the entire hemisphere (*i.e.*, not just within ±3º of the GSO).[498] GE and Loral argue that existing GSO FSS earth station antennas should be grandfathered from any off-axis e.i.r.p. density requirement.[499] SkyBridge and GE suggest that the off-axis e.i.r.p. density limits should apply to NGSO FSS earth station antennas as well.

237. *Decision*. We believe that limiting the signal energy radiated by GSO FSS earth stations could be beneficial to NGSO FSS systems by placing an upper bound on the level of uplink interference that must be tolerated. However, adopting the off-axis e.i.r.p. limits proposed in the *NPRM* for within $\pm$ 3 degrees of the GSO would, in effect, allow GSO FSS earth stations to transmit at a higher level into adjacent GSO FSS satellites than is currently permitted under our rules and would be disruptive to the vast number of GSO FSS satellites and earth stations in operation. The same holds true for the off-axis e.i.r.p.

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[493] These limits, contained in Section VI of Article S22 and Resolution 130, were suspended by WRC-97 due to concerns expressed by many Administrations regarding the impact on older GSO FSS earth stations of including such limits in the Radio Regulations. WRC-97 decided that more time was needed to study the suspended limits.

[494] *NPRM, p*roposed rule Section 25.204(g), Appendix A.

[495] *See Revision of Recommendation ITU-R S.524-5 Maximum Permissible Levels of Off-Axis e.i.r.p. Density From Earth Stations in GSO Networks Operating in the Fixed-Satellite Service Transmitting in the 6, 14 and 30 GHz Frequency Bands*. For example, we proposed to apply the limits only within ±3º of the geostationary orbit, and allow for TT&C operations to exceed the limits.

[496] *See e.g.*, 47 C.F.R. §§ 25.208(b), 25.209, 25.211(d), 25.212(c).

[497] SkyBridge Comments at 87 and SkyBridge Reply Comments at 72.

[498] Comments of Boeing at 82-83; SkyBridge proposes a revised rule that also includes the relaxation of the limits by "Z" dB. "Z" dB refers to some yet to be determined amount. Comments of SkyBridge at 89-90.

[499] Comments of Loral at 18; Comments of GE at 27-28.

density limits that were adopted by WRC-2000.[500] We conclude that the Commission's existing Part 25 Rules are more restrictive on GSO FSS earth stations than both the limits proposed in the NPRM and the limits adopted at WRC-2000.[501] Further, the Commission's Rules limit the signal energy radiated in all off-axis pointing directions, not just within ±3º of the GSO orbit, thus alleviating SkyBridge's and Boeing's concerns. We will continue to require compliance with existing Part 25 rules for off-axis e.i.r.p. limits and not adopt the proposed rule change. In regard to SkyBridge's and GE's suggestion that limits also be placed on NGSO FSS earth station off-axis e.i.r.p. density, we believe it is more appropriate to address this issue in a forthcoming Further Notice of Proposed Rule Making, which also addresses sharing among multiple NGSO FSS systems.

3. NGSO FSS Earth Station Antenna Reference Pattern

a. NGSO FSS User Terminal Earth Station Antenna Reference Pattern

238. *Proposal*. In the *NPRM*, we proposed to require NGSO FSS user terminal antennas to meet the antenna performance requirements of Section 25.209 of our rules.[502] We also asked that commenters who disagreed with our proposal to justify why NGSO FSS systems cannot meet this requirement.

239. *Comments*. Because of the more complex antenna equipment (such as steered, paired beams) needed for NGSO FSS systems as compared to GSO FSS systems, SkyBridge believes that the proposed requirement would unnecessarily constrain NGSO FSS operations.[503] Further, SkyBridge states that the Commission's proposed standard was not developed for antennas as small as those used for its residential user terminals, which are even smaller than those used in BSS.[504] SkyBridge, therefore, proposes a more relaxed antenna reference pattern than required for FSS earth stations in Section 25.209.[505] SkyBridge also opposes the Commission's proposal that the peak gain of an individual sidelobe may not exceed the prescribed envelope.[506]

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[500] WRC-2000 adopted GSO FSS earth station off-axis e.i.r.p. density limits to be included in the Radio Regulations. These limits are 3 [three] dB more relaxed than the WRC-97 limits. *See* Article S22, Section VI of the Provisional Final Acts of WRC-2000.

[501] There are two components to the off-axis e.i.r.p. density of an earth station--the earth station antenna performance in the sidelobe region and the RF transmitter power density. The sidelobe requirements limit the gain of the antenna in directions outside of the mainbeam (wanted direction) of the antenna. The RF transmitter power density limits the magnitude of the power radiated. *See e.g.*, 47 C.F.R. §§ 25.208(b), 25.209, 25.211(d), 25.212(c).

[502] *NPRM* at ¶ 78. In addition, we proposed to modify the rule not to allow the peak gain of an individual sidelobe of a NGSO FSS earth station to exceed the prescribed pattern.

[503] Comments of SkyBridge at 91.

[504] *Id*.

[505] Specifically, SkyBridge proposes to use an antenna gain pattern of $36 - 25 \log(\theta)$ $(100\lambda/D \le \theta < 48°)$; -6 $(\theta \ge 48°)$. Due to the importance of the "lobe effect," SkyBridge suggests that interference analyses use the new GSO FSS earth station antenna reference pattern for the NGSO FSS user terminal as well, instead of its proposed $36 - 25 \log(\theta)$ pattern. The "lobe effect" that SkyBridge refers to is the way the actual sidelobe performance of an antenna is in discrete "lobes" which have peaks and valleys. Because of the motion of the NGSO FSS satellites, NGSO FSS interference will sweep through the "lobes" (peaks and valleys) and interfere with earth station antennas. Comments of SkyBridge at 91-92.

[506] Comments of SkyBridge at 92.

240. *Decision*. As we stated in the *NPRM*, we believe that the use of higher performance earth station antennas will maximize sharing between NGSO FSS and GSO FSS systems and use of the spectrum. However, we recognize that there are physical limitations on the amount of sidelobe suppression achievable in small earth station antennas, both GSO and NGSO. We are confident that the $EPFD_{up}$ limits we adopt today ensure protection of GSO FSS satellites from NGSO FSS earth station transmissions. Further, we are confident that the *Further NPRM* will result in an adequate sharing scenario between NGSO FSS user terminals and MVDDS operations. Therefore, while specifying an NGSO FSS user terminal antenna pattern is not needed for sharing with GSO FSS or with the MVDDS, it may be a factor to consider in sharing with other NGSO FSS systems. We do not see the need at this time to specify an NGSO FSS customer premise earth station reference antenna pattern and defer the issue for consideration, as necessary, in a separate Notice of Proposed Rule Making addressing sharing issues among NGSO FSS systems.

b. NGSO FSS Gateway Earth Station Antenna Reference Pattern

241. *Proposal*. In the *NPRM*, we proposed to apply the antenna reference pattern of 29 - 25 log(θ) to NGSO FSS gateway earth station antennas for all directions.[507] This antenna reference pattern is similar to that currently contained in Section 25.209(a)(1), except that it is tighter for certain off-axis angles, and we are not allowing the peak gain of an individual sidelobe of a NGSO FSS earth station to exceed the prescribed pattern.[508] We recognized that this antenna reference pattern is more stringent than that required by Section 25.209(a)(2) of the Commission's Rules for earth stations operating in directions other than that of the GSO FSS plane, but stated our desire to encourage the use of higher performance earth station antennas to maximize sharing. We also required any commenters who disagreed with our proposal to justify why NGSO FSS systems cannot meet this requirement.

242. *Comments*. Boeing asserts that mandating a strict pattern of 29-25 log (θ) is not justified, and that the Commission should continue to employ the antenna reference pattern in Section 25.209(a)(1) of its rules.[509] SkyBridge supports the Commission's proposed 29-25 log (θ) pattern for NGSO FSS gateway earth station antennas, stating that this pattern is representative of the performance allowed by larger antenna technology.[510] However, SkyBridge could also support Boeing's proposal (use of 25.209(a)(1) pattern), as long as it was applied in all planes.[511] Again, SkyBridge opposes the Commission's proposal that the peak gain of an individual sidelobe may not exceed the prescribed envelope as this requirement is more restrictive than allowing a percentage of the sidelobe to exceed the envelope.[512]

243. *Decision*. We believe that the use of higher performance earth station antennas will maximize inter-system sharing and efficient use of the spectrum. In addition, a higher performance

[507] *NPRM* at ¶ 79.

[508] *See* 47 C.F.R. § 25.209(a)(1).

[509] Comments of Boeing at 80. In their application for a NGSO FSS system, Boeing proposes use of Section 25.209 for its gateway earth station antennas. See Boeing's application at 53.

[510] Reply Comments of SkyBridge at 73-74. SkyBridge states that the antenna reference pattern of its gateway earth stations would comply with the antenna reference pattern of 29 - 25 log(θ). SkyBridge Opposition at 67.

[511] Reply Comments of SkyBridge at 74.

[512] Comments of SkyBridge at 92.

antenna reference pattern will, as SkyBridge points out, facilitate sharing with other services.[513] For example, tighter patterns will reduce separation distances between gateway earth stations and terrestrial stations for certain azimuths around the gateway station. Earth station technology for this size antenna is advanced to the stage where it can meet this requirement. Accordingly, we will require NGSO FSS gateway earth station antennas to meet the reference pattern of $29 - 25 \log(\theta)$ for all directions. We have, however, reconsidered our proposal to not allow 10% of the NGSO FSS earth station sidelobe peaks to exceed the envelope. The design considerations for both GSO and NGSO FSS earth stations are similar and we will allow the same percentage of peak sidelobe exceedance.

4. RF Safety

244. *Proposal*. In the *NPRM*, we requested comment on ways to ensure that NGSO FSS systems comply with the RF safety guidelines in our rules. We noted that some subscriber terminals might be customer installed, and requested commenters to address whether the satellite operator, service provider, or manufacturer should ensure that the radiation hazards provisions are followed. Finally, we requested comment on whether we should require appropriate labeling on those terminals to satisfy the RF safety rules.[514]

245. *Comments*. GE states that NGSO operators should generally be subject to the same environmental and RF safety guidelines as all other Commission licensees. GE proposes, however, that because NGSO antennas are movable they should be surrounded by larger safe zones to take into account their multi-directional capabilities. Finally, GE proposes that licensees of NGSO earth stations should have the responsibility of ensuring that our radio-hazard provisions are followed.[515]

246. Telesat Canada proposes that all transmitting NGSO terminals be installed in an area where access is limited by fencing or similar means; that all such terminals meet safe radiation hazard levels as specified in Part 25 of our rules; and that all such terminals have appropriate environmental clearances, municipal approvals, and radiation hazard labeling applicable to GSO terminals. Telesat Canada further recommends that all such terminals be mounted such that the minimum height of any antenna forming part of the terminal be at least two meters above the surface on which it is installed, and that if the antenna is ground mounted its minimum height be two meters above the highest point on the ground or man-made structure within 30 meters in any direction of the antenna.[516]

247. SkyBridge states that safety concerns are of the utmost importance, and that NGSO operators should be subject to the same environmental and RF safety hazard guidelines as all other Commission licensees. SkyBridge contends, however, that NGSO operators should have the same flexibility as other operators to determine how they meet these requirements, and disagrees with GE's larger safe zone proposal and Telesat Canada's required fencing and minimum height proposals. SkyBridge maintains that no party has demonstrated that any proposed NGSO terminal will exceed already prescribed limits, and that there is no need to adopt any additional rules.[517]

248. *Decision*. As an initial matter, we emphasize that all FCC-regulated transmitters, including the subscriber terminals used in FSS systems, are required to meet the applicable Commission

[513] *Id*.

[514] *NPRM*, at ¶ 83.

[515] GE Comments at 30-31.

[516] Telesat Comments at 8.

[517] SkyBridge Reply Comments at 79-80.

guidelines regarding radiofrequency exposure limits.[518] It is therefore incumbent upon NGSO FSS licensees to exercise reasonable care to protect users and the public from radiofrequency exposure in excess of the Commission's limits.

249. As part of the NGSO FSS licensee's obligation to exercise such reasonable care, we conclude that it must ensure that subscriber antennas are labeled to give notice of the potential radiofrequency safety hazards from these antennas. We have previously adopted labeling requirements for LMDS, MDS, ITFS, and 24 GHz service antennas, which, like NGSO FSS's antennas, can be placed at a subscriber's premises.[519] We see no reason to make a different determination with respect to labeling for NGSO FSS's subscriber antennas than we made for these other subscriber antennas. In addition, we have recently made labeling a condition for invoking protection from restrictions that impair the installation, maintenance, or use of customer-end antennas that are used to transmit fixed wireless service, where the antenna user has a direct or indirect ownership or leasehold interest in the property.[520] Accordingly, we are amending Table 1 in Section 1.1307(b) of the Commission's rules to provide for labeling requirements for NGSO subscriber equipment.[521]

250. Labeling information should include minimum separation distances required between users and radiating antennas to meet the Commission's radiofrequency exposure guidelines. Labels should also include reference to the Commission's applicable radiofrequency exposure guidelines. In addition, the instruction manuals and other information accompanying subscriber transceivers should include a full explanation of the labels, as well as a reference to the applicable Commission radiofrequency exposure guidelines. While we will require licensees to attach labels and provide users with notice of potentially harmful exposure to radiofrequency electromagnetic fields, we will not mandate the specific language to be used. However, we will require use of the ANSI-specified warning symbol for radiofrequency exposure.[522]

251. It is recommended that two-way subscriber equipment, such as that used to connect to NGSO FSS systems, be installed by professional personnel, thereby minimizing the possibility that the

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[518] *See* Guidelines for Evaluating the Environmental Effects of Radiofrequency Radiation, ET Docket No. 93-62, *Report and Order*, 11 FCC Rcd 15123, 15124, 15152 (1996); 47 C.F.R. §§ 1.1307(b)(1), 1.1310.

[519] *See* Rule Making to Amend Parts 1, 2, 21, and 25 of the Commission's Rules to Redesignate the 27.5-29.5 GHz Frequency Band, To Reallocate the 29.5-30.0 GHz Frequency Band, To Establish Rules and Policies for Local Multipoint Distribution Service and for Fixed Satellite Service, CC Docket No. 92-297, *Second Report and Order, Order on Reconsideration, and Fifth Notice of Proposed Rule Making* , 12 FCC Rcd 12545, 12670, ¶ 295 (1997) (*LMDS Order*); Amendment of Parts 21 and 74 to Enable Multipoint Distribution Service and Instructional Television Fixed Service Licensees to Engage in Fixed Two-Way Transmissions, MM Docket No. 97-217, *Report and Order*, 13 FCC Rcd 19112, 19129, ¶ 37 (1998) (*MDS/ITFS Order*); Amendment to Parts 1,2 , 87, and 101 of the Commission's Rules to License Fixed Services at 24 GHz, WT Docket No. 99-327, *Report and Order*, 15 FCC Rcd 16934 (2000) ("*24 GHz Report and Order*"); 47 C.F.R. § 1.1307(b)(1).

[520] *See* Promotion of Competitive Networks in Local Telecommunications Markets, *First Report and Order and Further Notice of Proposed Rule Making in WT Docket No. 99-217, Fifth Report and Order and Memorandum Opinion and Order in CC Docket No. 96-98, and Fourth Report and Order and Memorandum Opinion and Order in CC Docket No. 88-57*, FCC 00-366, at ¶¶ 117-120. (rel. October 25, 2000); 47 C.F.R. § 1.4000. We also note that local governments, associations, and property owners may require professional installation of transmitting antennas without running afoul of Section 1.4000 of our rules. *Id*. at ¶ 119.

[521] Table 1, 47 C.F.R. §1.1307(b)(1).

[522] *See Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields*, FCC Office of Engineering and Technology (OET), OET Bulletin 65, August, 1997, at 53 (available at http://www.fcc.gov/oet/info/documents/bulletins/#65).

antenna will be placed in a location that is likely to expose subscribers or other persons to the transmit signal at close proximity and for an extended period of time.[523] We believe that professional installation, in combination with the labeling requirement, will obviate the need to adopt the proposals made by GE and Telesat Canada with respect to defining safety zones or specifying minimum antenna height. Generally, we expect subscriber antennas to be installed so that neither subscribers nor other persons are easily able to venture into and interrupt the transmit beams. Such interruptions can degrade the quality of service to the subscriber and ultimately reduce the value of the carrier's service. Thus, providers have economic and other incentives to avoid temporary interruptions of signal quality that are likely to motivate them to install antennas in locations where such interruptions are less likely to occur. In addition, we encourage the use of safety interlock features on NGSO FSS subscriber antennas that would prevent a transceiver from continuing to transmit when blocked, to the extent that such features could be made available at a reasonable cost.[524]

252. We also note that the Commission plans to initiate a rule making proceeding to review and, where necessary, harmonize the Commission's regulations concerning transceiver equipment approval for radiofrequency.

5. Emission Limits

253. *Proposal.* In the NPRM, we proposed that the aggregate power flux density from all NGSO satellites in a constellation would have to be below -255 dBW/m^2/Hz to protect Radio Astronomy Service ("RAS") receivers in the 10.6-10.7 GHz band from harmful interference.[525] We requested comment on how NGSO FSS satellite downlinks would avoid causing harmful interference to sensitive radio astronomy operations. Specifically, what additional emission standards, including filtering requirements and operational measures need to be developed to protect radio astronomy operations? We also requested comment on whether the existing emission and frequency tolerance requirements for the FSS in Section 25.202[526] of our rules are sufficient to protect other incumbent Ku-band operations.

254. *Comments.* Three parties filed comments concerning RAS operations. The National Academy of Sciences' Committee on Radio Frequencies ("CORF") contends that the radio emissions received by radio astronomers are extremely weak, often considered to be in the noise floor, and their equipment has been modified to detect these signals. Therefore, RAS operations are especially susceptible to interference from out-of-band users in neighboring bands, as well as harmonic emissions in the RAS band. CORF recommends the Commission make the protection of RAS observations in the 10.6-10.7 GHz band[527] a condition of licensing any NGSO FSS downlink operations. CORF also states

[523] *See, e.g., LMDS Order*, 12 FCC Rcd at 12670. We note that professional installation is in fact required for certain antennas used for MDS and ITFS under the Commission's rules. *See* 47 C.F.R. §§ 21.909(n), 74.939(p).

[524] *See LMDS Order*, 12 FCC Rcd at 12670, ¶ 296; *MDS/ITFS Order*, 13 FCC Rcd at 19129, ¶ 38; *see also* Amendment of Parts 21 and 74 to Enable Multipoint Distribution Service and Instructional Television Fixed Service Licensees to Engage in Fixed Two-Way Transmissions, MM Docket No. 97-217, *Report and Order on Reconsideration*, 14 FCC Rcd 12764, 12779, ¶ 29 (1999) (rules amended to provide for a positive "interlock" feature that prevents inadvertent activation of a newly installed response transmitter when the response antenna is not properly installed so as to receive signals from the associated main or booster transmitters).

[525] *See NPRM* at ¶ 82.

[526] *See* 47 C.F.R. §25.202.

[527] CORF contends that the 10.6-10.7 GHz band is important to the scientific community because it provides a substantial bandwidth at a wavelength long enough to not be substantially impeded by the Earth's atmosphere. Detailed measurements of the cosmic background are conducted in this frequency band, as are (continued….)

that the Commission should require that these downlinks protect radio astronomy observations at the level required under ITU-R Recommendation RA.769-1, namely the out-of-band limit of –255 dBW/m^2/Hz when an NGSO transmitter is within five degrees of the main beam of a radio telescope, as proposed in the NPRM. In addition, CORF requests the Commission consider a further reduction of 10dB, reducing the values present in Table 1 of the NPRM, in the maximum flux densities allowed for gateway downlinks between 10.7-11.2 GHz. Finally, CORF also solicits a modification of Part 25 of the Rules to require NGSO downlinks to gateways use filters that can provide a minimum of 50 dB of suppression in an adjacent band.

255. SkyBridge and Boeing argue that comprehensive specific restrictions are not appropriate in this case. SkyBridge states that no specific rule should be required because the same requirement may not be appropriate for all NGSO FSS systems. In addition, SkyBridge mentions the lack of restrictions on other services in the band as basis for this belief. Boeing counters CORF's interpretation of ITU-R Recommendation RA.769-1, believing it to be a recommendation, not a requirement. In support of this, Boeing also draws attention to the unrestricted use by other services within the 10.6-10.68 GHz band, namely fixed and mobile services. Boeing would like to implement measures other than filtering and reduced in-band space-to-Earth power flux density limits. It wants the Commission to consider enforcing alternatives such as siting gateway facilities away from radio astronomy receivers, using low sidelobe satellite antennas, downlink adaptive power control and providing a wider guard band. Boeing believes the recommendations of CORF are intrusive and excessive.

256. *Decision*. Article S29 of the ITU Radio Regulations outlines general provisions for the protection of the RAS. Specifically, Article S29 acknowledges the sensitivity of RAS operations and encourages administrations to cooperate in protecting RAS operations from interference. Article S29 also identifies various techniques that administrations may use to protect RAS, such as geographic separation, frequency separation, time sharing and power limitations.[528] Article S29 refers to ITU-R RA.769-1, which establishes protection criteria for various radio astronomy frequency bands. ITU-R RA.769-1 also recognizes that interference to radio astronomy operations from geostationary satellites is a special interference case because the signal energy could easily be observed by the RAS receiving antenna. We find that non-geostationary satellite downlink operations also pose a significant interference risk to radio astronomy operations unless parties make an active effort to avoid interference.[529] The interference limits set forth in ITU-R RA.769-1 provide reasonable protection against interference to RAS operations from various operations. We note that the ITU is studying a Draft New Recommendation that would specify, for interference evaluation, a separate criterion for data loss to the RAS due to interference from any one NGSO FSS network, in any frequency band which is allocated to the Radio Astronomy Service on a primary basis.[530] Because the Draft New Recommendation regarding NGSO FSS/RAS sharing is still under consideration, we decline to adopt specific protection limits in our rules. Rather, we will require

(Continued from previous page)
passive radiometric measurements of the sea state and wind directions over oceans, which are important in tracking hurricanes and protecting maritime activities. CORF Comments at 3.

[528] *See Radio Astronomy Service*, ITU-R Article S29.

[529] *See Protection Criteria Used For Radioastronomical Measurements*, Recommendation ITU-R RA.769-1 at 3. Specifically, because NGSO satellites can be anywhere in the sky and have the potential to transmit directly into radio astronomy receivers as they orbit over a certain area, spectrum planning may be necessary to protect the radio astronomy receivers.

[530] *See* September 8, 2000 Letter from The National Science Foundation to Mr. Norbert Schroeder, Acting Chairman, IRAC. Specifically, the Letter indicates that the out-of-band limits of –255 dBW/m^2/Hz within five degrees of the main beam of a radio telescope and -240 dBW/m^2/Hz outside of the mainbeam of the radio telescope (ITU-R RA.769-1) could be exceeded for 2% of the time by a NGSO FSS system without being considered to cause harmful interference.

NGSO FSS applicants to coordinate and reach a mutually acceptable agreement with the RAS facilities that use the 10.6-10.7 GHz band to ensure that these facilities are adequately protected from interference. We find that requiring coordination between NGSO FSS and RAS operations presents both parties with the most flexibility to reach agreement on the protection of RAS.

257. We are not adopting CORF's suggestions that we establish specific filter requirements and lower NGSO FSS $EPFD_{down}$ parameters. We find that various techniques (*e.g.*, filters, power reduction, beam management or guard band techniques) can be identified in the coordination process by individual NGSO FSS systems to ensure they do not harm RAS operations. Accordingly, we adopt footnote US355 into our Table of Frequency Allocations for NGSO FSS downlink operations in the 10.7-11.7 GHz band to protect RAS operations in the 10.6-10.7 GHz band. US355 reads as follows:

> US355 In the band 10.7-11.7 GHz, non-geostationary satellite orbit licensees in the fixed-satellite service (space-to-Earth), prior to commencing operations, shall coordinate with the following radio astronomy observatories to achieve a mutually acceptable agreement regarding the protection of the radio telescope facilities operating in the band 10.6-10.7 GHz.

Observatory	West Longitude	North Latitude	Elevation
Arecibo Obs. ……..	..……66E 45N 110	….18E 20N 460	……..496 m
Green Bank Telescope (GBT)……	……..79E 50N 240	..…38E 25N 590	……..825 m
Very Large Array (VLA)……	..…107E 37N 040	..…34E 04N 440	……2126 m
Very Long Baseline Array (VLBA) Stations:			
Pie Town, NM……...	..…108E 07N 070	..…34E 18N 040	……2371 m
Kitt Peak, AZ…….	..…111E 36N 420	..…31E 57N 220	……1916 m
Los Alamos, NM……...	..…106E 14N 420	..…35E 46N 300	……1967 m
Ft. Davis, TX…….	..…103E 56N 390	..…30E 38N 060	……1615 m
N. Liberty, IA……	……..91E 34N 260	..…41E 46N 170	……..241 m
Brewster, WA……	..…119E 40N 550	..…48E 07N 530	……..255 m
Owens Valley, CA…….	..…118E 16N 340	..…37E 13N 540	……1207 m
St. Croix, VI……...	……..64E 35N 030	..…17E 45N 310	……16 m
Hancock, NH…….	……..71E 59N 120	..…42E 56N 010	……..309 m
Mauna Kea, HI……..	..…155E 27N 290	..…19E 48N 160	……3720 m

258. In a letter dated October 20, 2000, NTIA states *inter alia* that the radio astronomy service will need to be protected from transmitting NGSO FSS space stations in the adjacent band above 10.7 GHz.[531] NTIA expresses concerns about our coordination requirement to protect these radio

[531] *See* Letter from William T. Hatch, Associate Administrator, Office of Spectrum Management, NTIA, to Dale Hatfield, Chief, Office of Engineering and Technology, dated October 20, 2000.

astronomy operations, but concurs based on the understanding that the NTIA and the FCC will work together during the licensing of the NGSO FSS systems to ensure that the radio astronomy service is protected. In this regard, NTIA points out that the ITU-R is developing a methodology to calculate compliance of protection criteria for the radio astronomy service. NTIA also requests that NGSO FSS applicants provide it with the necessary information that shows compliance with the ITU-R developed criteria before the FCC license is granted. We find that it is premature to commit to using the ITU-R methodology before it is finalized in the ITU process and there has been an opportunity for comments and review. Further, we note that licensing rules and procedures for NGSO FSS systems will be addressed in a later proceeding and we will work with NTIA throughout the process.

V. FURTHER NOTICE OF PROPOSED RULE MAKING

259. The Commission has consistently supported and facilitated the emergence of innovative technologies such as those that can share spectrum with existing services.[532] Not all services can easily coexist in the same frequency band, and in many instances creative sharing techniques are necessary in order to accommodate mixed use of the spectrum. FS coordination has achieved spectrum reuse with techniques involving the use of spatial diversity and directional antennas in a common area using transmitting and receiving antennas that point in any direction. Northpoint proposes to share the 12.2-12.7 GHz band with DBS operations by reusing 500 megahertz of spectrum with the use of directional southward pointing transmitting antennas. DBS receiving antennas point southward and upward toward the geostationary satellite arc. Northpoint proposes to reuse the spectrum by utilizing northward pointing receiving antennas to receive its own signal. Hence, Northpoint has presented a creative mechanism by which to receive greater use of a limited amount of spectrum, thus fostering spectrum efficiency.

260. In this *Further NPRM*, we propose and seek comment on a number of issues related to licensing MVDDS in the 12.2-12.7 GHz band. In particular, we seek comment on the technical criteria needed to deploy MVDDS so that the spectrum can be shared successfully with both incumbent BSS and new NGSO FSS operations. We also propose service, licensing, and technical rules for MVDDS that promote effective and efficient licensing in this band.

VI. BACKGROUND

261. On July 3, 1997, SkyBridge filed a Petition for Rule Making requesting modification of our Rules to permit NGSO FSS systems to operate with GSO systems (both FSS and BSS) and terrestrial systems in certain bands, including the 12.2-12.7 GHz band.[533] On March 6, 1998, Northpoint also filed a Petition for Rule Making with the Commission requesting permission to operate a terrestrial service in the 12.2-12.7 GHz band.[534] Specifically, Northpoint asked that we modify Section 101.147(p) of our Rules to authorize DBS licensees and their affiliates to obtain secondary, subsidiary terrestrial communications authorizations to use the 12.2-12.7 GHz band to provide multichannel video distribution of local television

[532] *See, e.g.*, *NPRM* in ET Docket No. 98-206, 14 FCC Rcd 1131 (1999) (proposals to allow NGSO FSS to share spectrum in a number of frequency bands with various incumbent services); *Principles for Reallocation of Spectrum to Encourage the Development of Telecommunications Technologies for the New Millennium, Policy Statement*, 14 FCC Rcd 19,868 (1999).

[533] SkyBridge Petition for Rule Making (filed July 3, 1997) ("SkyBridge Petition").

[534] Northpoint Petition for Rule Making (filed March 6, 1998) ("Northpoint Petition"). On March 23, 1998, the Commission invited comment on the Northpoint Petition. *See Corrected Public Notice*, Report No. 2265 (Mar. 23, 1998). Northpoint explained that the primary benefits of its proposal included reuse of existing spectrum, facilitation of localism, and more effective DBS and cable competition. *Id.*

programs and broadband digital data (*e.g.*, high-speed Internet access).[535] Northpoint has been testing its technology in the 12.2-12.7 GHz band under experimental authorizations and has filed progress reports asserting that the tests demonstrate that its technology can operate without causing harmful interference to incumbent DBS operations.[536]

262. On November 2, 1998, the International Bureau ("IB") established a final cut-off date of January 8, 1999 for applicants to file applications for NGSO FSS in the 12.2-12.7 GHz band.[537] On November 24, 1998, we proposed to permit NGSO FSS operations in certain segments of the Ku-band.[538] The SkyBridge and Northpoint Petitions were incorporated into the *NPRM*.[539]

263. Subsequently, on January 8, 1999, Northpoint, through its subsidiary Broadwave Albany, L.L.C., *et al.*, ("Broadwave USA"),[540] filed waiver requests and applications for licenses for terrestrial use of the 12.2-12.7 GHz band, in response to the *Ku Band Cut-Off Notice*.[541] Northpoint requested waivers of multiple provisions in Part 101 of our Rules, as well as any other rules necessary to process its applications, and asserted that its proposed service would be on a secondary, non-interfering basis to DBS services and on a co-primary basis with any new FSS, such as that proposed by SkyBridge.[542] Thus, in applying for licenses as a non-DBS affiliate, Northpoint shifted its stance from its earlier petition for rule making and also expanded the scope of the suggested video offerings beyond local service to supplement DBS.[543]

264. On October 13, 1999, Northpoint (under the name of Diversified Communications Engineering, Inc.) filed a technical report summarizing the results of its experimental tests in Washington,

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[535] All private operational fixed point-to-point microwave stations in the 12.2-12.7 GHz band operate on a secondary basis to DBS. Specifically, 47 C.F.R. § 101.147(p) states: *12,000-12,700 MHz*. The Commission has allocated the 12.2-12.7 GHz band for use by the broadcasting-satellite service. Private operational fixed point-to-point microwave stations authorized after September 9, 1983, have been licensed on a non-interference basis and are required to make any and all adjustments necessary to prevent interference to operating domestic broadcasting-satellite systems. Notwithstanding any other provision, no private operational fixed point-to-point microwave stations are permitted to cause interference to broadcasting-satellite stations of other countries operating in accordance with the Region 2 plan for the broadcasting-satellite service established at the 1983 WARC.

[536] *See supra* Section IV, B (b).

[537] *See Ku Band Cut-Off Notice*. *See also NPRM*, 14 FCC Rcd at 1169 ¶ 71.

[538] *See NPRM*, 14 FCC Rcd at 1134-42 ¶¶ 4-13.

[539] *See id*. We received 33 comments and 24 reply comments in response to the *NPRM*. *See infra at* Appendix E.

[540] Northpoint states that through its subsidiary BroadwaveUSA, Inc., it has an affiliate relationship with the 68 entities that have applied for licenses to deploy the Northpoint technology nationwide. The applicants refer to themselves as Broadwave, followed by their city of proposed service (*i.e.*, Broadwave Albany, L.L.C.). Broadwave proposed to use the technology developed by Northpoint to enable sharing of this spectrum with existing DBS, geostationary satellite, and fixed microwave services. For the purposes of this *Further NPRM*, we will consider Northpoint and Broadwave to be one and the same and will refer to them both as Northpoint.

[541] *Public Notice*, Wireless Telecommunications Bureau Seeks Comment on Broadwave Albany, L.L.C., *et al*. Requests for Waiver of Part 101 Rules, DA 99-494, 14 FCC Rcd 3937 (1999) (Northpoint Waiver Request). The comment period ended on April 22, 1999.

[542] *Id*.

[543] *Id*.

D.C.[544] On November 29, 1999, the Satellite Home Viewer Improvement Act ("SHVIA") was enacted.[545] The SHVIA legislation generally seeks to place satellite carriers on equal footing with local cable operators concerning the availability of broadcast programming, and thus is intended to give consumers more and better choices in selecting a MVPD.[546] As part of the 1999 SHVIA legislation, Congress passed a provision entitled Rural Local Broadcast Signal Act.[547] Among other things, this law requires the Commission to make a determination by November 29, 2000, regarding licenses or other authorizations for facilities that will utilize, for delivering local broadcast television signals to satellite television subscribers in unserved and underserved local television markets, spectrum otherwise allocated to commercial use.[548] The SHVIA legislation also mandates that we ensure that no facility licensed or authorized to deliver such local broadcast television signals "causes harmful interference to the primary users of that spectrum or to public safety spectrum use."[549]

265. On April 18, 2000, PDC Broadband Corporation ("Pegasus") filed an application for authority to provide terrestrial service in the 12.2-12.7 GHz band to deliver data transmission, Internet services, and MVPD services. Pegasus asserts that its application is mutually exclusive with those filed by Northpoint.[550] On August 23, 2000, Satellite Receivers, Ltd. ("SRL") filed an application for authority

[544] On October 29, 1999, DIRECTV and EchoStar (collectively, DBS licensees) filed comments addressing Northpoint's experimental tests. On January 27, 2000, DIRECTV filed a report and studies asserting that Northpoint's proposal would cause unacceptable interference to DBS operations. On Feb. 4, 2000, we denied an application for review and petitions for reconsideration and for a cease and desist order that DIRECTV and EchoStar filed against Diversified's experimental license. Finally, on February 9, 2000, the Commission granted DIRECTV and EchoStar experimental authorization in Washington, D.C. and Denver, CO to test DBS sensitivity to fixed service transmissions, such as Northpoint's proposal. On July 25, 2000, DIRECTV and EchoStar filed a "Report of the Interference Impact on DBS Systems from Northpoint Transmitter Operating at Oxon Hill, MD, May 22 to June 7, 2000" for the Commission's consideration.

[545] *See* Act of Nov. 29, 1999, Pub.L. 106-113 Stat. 1501 (enacting S. 1948, including the Satellite Home Viewer Improvement Act of 1999 ("SHVIA"), Title I of the Intellectual Property and Communications Omnibus Reform Act of 1999 ("IPACORA"), relating to copyright licensing and carriage of broadcast signals by satellite carriers, codified in scattered sections of 17 and 47 U.S.C.). *See generally* Implementation of the Satellite Home Viewer Improvement Act of 1999: Application of Network Nonduplication, Syndicated Exclusivity, and Sports Blackout Rules to Satellite Retransmissions, CS Docket No. 00-2, *Notice of Proposed Rule Making*, 65 Fed. Reg. 4927 (Feb. 2, 2000); Implementation of the Satellite Home Viewer Improvement Act of 1999, CS Docket No. 99-363, *Notice of Proposed Rule Making*, 14 FCC Rcd 21736 (1999) (*1999 SHVIA Implementation NPRM*).

[546] *See 1999 SHVIA Implementation NPRM*, 14 FCC Rcd 21736 at ¶1.

[547] *See* Act of Nov. 29, 1999, Pub. L. 106-113, 113 Stat. 1501, 1537 (enacting S. 1948, Title II of the Intellectual Property and Communications Omnibus Reform Act of 1999 (IPACORA)), to be codified at 47 U.S.C. § 338.

[548] *Id*. While this provision does not identify the 12.2-12.7 GHz band specifically, Northpoint's proposed service could be one alternative to satisfy this demand in rural and underserved local television markets. *See also* Letter from Senator Ted Stevens, *et al*., Committee on Commerce, Science, and Transportation to Chairman, William E. Kennard, Federal Communications Commission, dated July 27, 2000.

[549] *Id*.

[550] *Id*. Northpoint filed a Motion to Dismiss the Pegasus applications on May 23, 2000. *See* In the Matter of PDC Broadband Corporation Application to Provide Terrestrial Services in the 12.2-12.7 GHz Band, Motion to Dismiss (May 23, 2000). On August 21, 2000, Pegasus Broadband Corporation filed a Petition to Dismiss or Deny against the Northpoint applications. *See* In the Matter of Broadwave Albany, L.L.C., *et al*., Application for License to Provide New Terrestrial Transport Service in the 12.2-12.7 GHz Band, Petition to Dismiss or Deny (Aug. 21, 2000). On September 6, 2000, Northpoint filed an Opposition to the Pegasus Petition to Dismiss or Deny. *See* In the Matter of Broadwave Albany, L.L.C., *et. al.* - Applications for Licenses to Provide Terrestrial Services in the 12.2-
(continued….)

to provide terrestrial television broadcast, Internet and data services in the 12.2-12.7 GHz band in Illinois, Indiana, Iowa, Michigan, Minnesota and Wisconsin.

A. Technical Criteria for Sharing and Operations the 12.2-12.7 GHz Band

1. MVDDS/DBS Sharing

266. As discussed in the *First R&O*, the DBS licensees and Northpoint dispute whether MVDDS can be deployed in this band without causing harmful interference to DBS customers. Both parties conducted experiments purporting to support their assertions.[551] DirecTV and EchoStar argue that the introduction of a signal from a Fixed transmitter would reduce BSS signal strength margins significantly, thereby increasing the incidence of increased outages experienced by DBS customers in large portions of an MVDDS service area, primarily during rain events. DIRECTV and EchoStar state that in the international process they agreed to accept no more than a 10% aggregate increase in unavailability to its operations due to interference from all co-frequency NGSO FSS systems, and that if a new FS is introduced in this band, both NGSO FSS and FS in the aggregate should cause no more than 10% increased unavailability to BSS operations. Northpoint disagrees with the suggestion to treat MVDDS as if it were an NGSO FSS system. Further, Northpoint claims that MVDDS can avoid interference to DBS systems, and it proposes that unavailability criteria be based on either a percentage increase or a specified number of minutes of increased unavailability, whichever is greater.

267. As concluded in the First R&O, MVDDS can be introduced in this band without causing harmful interference to BSS. In doing so, we will define a permissible level of increased DBS service outage that may be attributable to MVDDS that shall not be exceeded. Thus, the impact of introducing both MVDDS and NGSO FSS in this frequency band will be evaluated in terms of an allowable increase in DBS unavailability. We are sensitive to the DBS licensees' concerns that the introduction of additional services in this band could increase BSS unavailability, and our objective in this further proceeding is to avoid unreasonable outages. As discussed in the First R&O, we believe that, with the aid of mitigation techniques, MVDDS operations can be designed so that interference caused by their transmitters will not impair the provision of DBS. In this further proceeding, our objective is to identify an unavailability criterion for MVDDS operations that will achieve this result. The area close to the MVDDS transmitter is where interference that exceeds the unavailability criterion is most likely to occur. The unavailability criterion that we adopt will be used to identify the area (mitigation zone) around the MVDDS transmitter within which the MVDDS licensee must avoid or correct interference to a DBS subscriber to the permissible level. In this way, we can ensure that BSS operations will not be threatened by MVDDS operations.

268. One way to do this would be to base the MVDDS sharing criterion for the 12.2-12.7 GHz band on the criterion used by the ITU to develop the $EPFD_{down}$ limits for NGSO FSS systems. As discussed in the First R&O, the ITU criteria for NGSO FSS and BSS sharing consists in part of the concept that the aggregate interference from NGSO FSS systems should be responsible for at most 10% of the time allowance(s) for unavailability of the GSO BSS network.[552] The 10% sharing criterion was used to develop both aggregate (*i.e.*, all NGSO FSS systems) and single-entry (*i.e.*, single NGSO FSS system) EPFD values. The methodology used to develop the single-entry EPFD values essentially

(Continued from previous page)
12.7 GHz Band, Opposition of Northpoint Technology, Ltd. And BroadwaveUSA to Petition to Dismiss or Deny (Sept. 6, 2000).

[551] *See* ¶ 211, *supra*.

[552] This criterion is contained in draft new Recommendation ITU-R BO.1444. In addition, it is described in Section 3.1.3.1 of the CPM report to WRC-2000.

attributed to each NGSO FSS system a 2.86% increase in unavailability.[553] In the interest of providing DBS subscribers with a high degree of protection, the percentage of DBS unavailability that the MVDDS would be permitted to cause to any DBS subscriber could be the same as a single NGSO FSS system, *i.e.*, 2.86% of current unavailability based on the model contained in Appendices H and I or other models agreed to by both DBS and MVDDS licensees. This approach would effectively treat MVDDS similarly to how the ITU-R assumed an individual NGSO FSS system would be treated, and should not result in increases in unavailability from MVDDS that are perceptible to any DBS subscriber. Under this approach, we would not propose that interference from MVDDS and NGSO FSS in the aggregate cause no more than a 10% increase in BSS unavailability, as suggested by DIRECTV and EchoStar. To do so would undermine the single-entry EPFD values for NGSO FSS systems, which we adopt in the First R&O and which were developed by applying the 10% criterion only to NGSO FSS systems. Thus, under this approach, MVDDS interference could contribute 2.86% unavailability in addition to the aggregate 10% caused by NGSO FSS operations. We believe that this increase in BSS unavailability would be *de minimis* and would not have a significant impact on the BSS.

269. Under this approach, a 2.86% unavailability criterion would be an important factor used to identify the size of the mitigation zone; *i.e.*, the area around the MVDDS transmitter within which the MVDDS licensee must avoid or correct interference to a DBS subscriber. Because of the worst-case assumptions of our proposed mitigation zone calculations, the impact of MVDDS transmissions beyond the mitigation zone would be negligible, and thus we propose that the MVDDS licensee would have no obligation to BSS subscribers outside the mitigation zone. Appendix I contains predicted mitigation zones calculated to meet a 2.86% criterion for three locations: Washington, DC, Houston, TX, and Denver, CO.[554] Commenters may address whether we should consider applying a different percentage criterion, for example in areas where BSS reliability is already high. In particular, should we allow MVDDS to cause up to 10% increased unavailability to BSS, which is the same criterion developed by the ITU-R for interference from all NGSO FSS systems? Would the 10% criterion apply regardless of how many MVDDS licensees are authorized, as is deemed appropriate by the ITU-R for the NGSO FSS? Commenters should specify whether they support using a percentage approach, the specific percentage they favor, and the effect of the percentage approach on BSS unavailability and MVDDS deployment.

270. We note that the implementation of a percentage criterion would affect DBS customers in different areas in different ways. For example, since the sharing criterion would be applied to each MVDDS transmitter, an unavailability criterion based on a percentage increase of current unavailability would permit a much larger number of minutes of increased unavailability in areas where BSS reliability is already low and a much smaller number of minutes of increased unavailability in areas where BSS reliability is already high, and differences would also exist within the same area for different BSS orbital

[553] Based on the agreed upon criteria and the database of representative GSO BSS links (*see* ITU-R Recommendation BO.1444, Annex, for the compiled existing and planned GSO BSS system characteristics that comprise the international database of GSO BSS links), the ITU-R reached consensus on both single-entry and aggregate $EPFD_{down}$ limits for NGSO FSS systems in the Ku-Band. In order to calculate single-entry EPFD values, the ITU agreed to use a factor of 3.5 from the aggregate EPFD masks developed, even though the 3.5 factor does not directly correlate to the number of NGSO FSS systems that may be authorized in the allocated bands. Nonetheless, if the 3.5 factor used to develop single-entry EPFD values did represent actual systems, each NGSO FSS system that met the single-entry EPFD values would cause no more than a 2.86% increase in unavailability of a BSS network.

[554] For example, in order to meet the 2.86% criterion in Denver for the DIRECTV 101° W.L. satellite location (unavailability increase of 1.6 minutes annually), an MVDDS licensee would be required to fix occurrences of unacceptable interference at distances in excess of 6 kilometers from each MVDDS transmitting tower. However, in Houston, the 2.86% criterion for the DIRECTV 101° W.L. satellite location (unavailability increase of 32.7 minutes annually) would result in mitigation zones of only about 4.8 kilometers. Thirty and 60 minute increases in annual unavailability are also shown in Appendix I.

positions.[555] We therefore solicit comment on whether we should permit, as suggested by Northpoint, a MVDDS licensee to cause a fixed increased in the number of minutes, rather than a percentage, of annual outage in each area. For example, rather than a 2.86% increase in annual unavailability, we could permit a specified number of minutes of annual increase in unavailability (*e.g.*, 30 minutes).[556] Under this approach, all DBS systems and their subscribers in all areas would be impacted equally in terms of increased minutes of unavailability. However, we would have to determine the appropriate number of minutes under this approach, and this approach would permit sharply varying percentage increases in DBS unavailability to different subscribers in different areas.[557] Commenters favoring this approach should address the impacts on BSS unavailability and MVDDS deployment, and specify the number of minutes that should be selected for the criterion.[558]

271. Another alternative would be to simply require the MVDDS operator to mitigate harmful interference in response to DBS subscribers' complaints of increased unavailability caused by MVDDS operations. This approach would not rely on any increase in DBS unavailability as a trigger for an MVDDS operator to mitigate harmful interference and would eliminate the mitigation zone concept, replacing an objective criterion with a subjective approach. We seek comment on this alternative, as well as any other alternatives, such as the Commission specifying a minimum C/I ratio between DBS and MVDDS signals that would have to be maintained at all times by the MVDDS operator.

272. We propose to define an analytical model for calculating mitigation zones where there may be an increase in unavailability caused by an MVDDS system to DBS subscribers. This will ensure that parties use consistent methods to analyze potential interference. The model is described in Appendices H and I. The model would be used to calculate the mitigation zone to determine where the MVDDS entity would have the responsibility for ensuring that DBS subscribers do not suffer an impermissible level of increased outage due to MVDDS operations. This model is similar to the approach used by the DBS and NGSO FSS proponents. We request comment on the appropriateness of the model and the parameters we have used in our analysis. Commenting parties proposing alternative calculation methods and parameters should provide sufficient technical analysis to support their proposals.

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[555] For example, in the Miami area, EchoStar subscribers who receive signals from the 119° W.L. satellite and use the standard 45 cm (18 inch) dish antennas can expect about 2,166 minutes of average annual unavailability due to projected precipitation, whereas DIRECTV subscribers in that area who receive signals from the 101° W.L. satellite and use the standard 45 cm antennas can expect about 924 minutes of average annual unavailability due to projected precipitation; *see* Appendix G, *infra*. A 2.86% criterion in Miami would therefore permit a 62 minute increase in annual unavailability to EchoStar subscribers, but only a 26 minute annual increase to DIRECTV subscribers. In the Denver area, EchoStar subscribers who receive signals from the 119° W.L. satellite and use 45 cm antennas experience about 109 minutes of average annual unavailability, whereas DIRECTV subscribers in that area who receive signals from the 101° W.L. satellite and use the standard 45 cm antennas experience about 55 minutes of annual unavailability; *see again* Appendix G, *infra*. A 2.86% criterion in Denver would therefore permit a 3.1 minute annual increase in unavailability to EchoStar subscribers, but only a 1.6 minute annual increase to DIRECTV subscribers.

[556] Although this approach is similar to Northpoint's proposed five minutes increase per month, we find that, because of varying rain characteristics from month to month, a minutes per month calculation can produce unnecessary complexity in calculating mitigation zones.

[557] For example, a 30 minute annual increase in DBS unavailability would be only about 1.4% to Miami EchoStar subscribers who use 45 cm antennas, but would be about 54.5% to Denver DIRECTV subscribers who use 45 cm antennas.

[558] We have included in the docket file a staff analysis that shows the annual increased outage impacts of the 2.86%, 30 minute and 60 minute criteria on the top 30 television markets, based on the Nielsen Media Research Designated Market Areas (DMAs). A summary of this analysis is attached herein as Appendix J.

273. To ensure interference protection for DBS subscribers, we propose to require that at least 30 days before any MVDDS transmitter commences operations, the MVDDS operator must: (1)notify the appropriate DBS providers in their area (*e.g.*, the local DBS reseller, the DBS licensee (DIRECTV and EchoStar), or some other entity) of the location and any relevant technical characteristics of their transmitting facilities; and (2) certify to the Commission and the appropriate DBS providers in their area that it has designed its transmitter facility to avoid impermissible levels of interference to DBS receivers, consistent with any requirements to be adopted in this further proceeding. The MVDDS licensee also would be required to identify the steps it has taken to mitigate potential interference around its transmitter.[559] We believe that these procedures would provide ample opportunity for DBS operators to determine the potential impact on their subscribers and to ensure that any potential interference situation is adequately addressed by the MVDDS operator.

274. We also propose to make the MVDDS operator responsible for correcting any interference beyond that deemed permissible to existing DBS subscribers that occurs within 18 months of the onset of service from an MVDDS transmitter. This should provide existing DBS customers with sufficient time to identify any interference problems that need to be corrected. We also propose that for any new DBS subscribers within the mitigation zone, and for existing subscribers after this 18-month period, the MVDDS operator would be required to provide technical information and advice to assist such DBS subscribers in mitigating interference. This information and advice requirement, for example, will ensure that new DBS customers can tailor their installations to avoid any impact from MVDDS transmissions. This procedure is similar to that used to address blanketing interference in the FM radio service.[560]

275. We believe that this approach should provide both MVDDS and DBS licensees flexibility to identify and resolve any case of impermissible interference. We expect that, in the first instance, the MVDDS licensee will site its transmitter to avoid harmful interference to DBS customers, and we expect that MVDDS and DBS licensees will find mutually agreeable means to identify and mitigate interference to DBS customers. For example, the MVDDS licensee should be able to identify through a site survey DBS receivers that are not properly shielded from MVDDS transmissions, and the DBS licensee might notify the MVDDS licensee of DBS customers that will need interference protection. Alternatively, the MVDDS and DBS licensees might rely on predictive modeling or customer complaints to identify DBS customers who need interference protection. As detailed in the First R&O, the MVDDS operator in each area will have a variety of techniques at its disposal to mitigate interference to DBS subscribers.[561] We expect that the MVDDS and DBS licensees will mutually agree if the MVDDS licensee will act through the DBS licensee or an independent third party or work directly with the DBS customer in addressing mitigation techniques.

276. We seek comment on all aspects of our mitigation proposal for MVDDS operators. Commenters suggesting specific methods for identifying and mitigating interference to DBS customers should support their proposals with thorough analysis on the impact to all relevant parties. We also invite comments on procedures, such as arbitration, that could be used to expeditiously resolve interference disputes between the MVDDS and DBS licensees.

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[559] Alternatively, the MVDDS licensee could maintain the certification in its station file. Under this alternative, the certificate could be made available to the Commission upon request.

[560] 47 C.F.R. §73.318

[561] *See* ¶ 216, *supra*.

2. MVDDS/NGSO FSS Sharing

277. As we noted in our companion First R&O, Northpoint states that it can share spectrum with NGSO FSS downlink signals if the satellite PFD level is lower at low elevation angles where the MVDDS receiver antennas are pointed. Specifically, Northpoint proposes that NGSO FSS systems meet a PFD limit of –158 dB ($W/m^2/4kHz$) for angles of $0\text{-}2^0$ above the horizon and –158 + 3.33 (δ-2) dB ($W/m^2/4kHz$) for angles of $2\text{-}5^0$ above the horizon.[562]

278. SkyBridge states that it can accept Northpoint's proposal, but only if the power of MVDDS signals is also limited. Specifically, SkyBridge states that, in order to prevent an MVDDS transmitter from causing harmful interference to an NGSO FSS receiver, an MVDDS signal must be limited at the input of any NGSO FSS receiver to an EPFD of –132.1 dB ($W/m^2/4$ kHz), with a corresponding power limit of –68 dBm at the output of an operational NGSO earth station with a gain of 31.6 dBi at 12.5 GHz. SkyBridge also requests that MVDDS out-of-band emissions be attenuated by 25 dB below the carrier power in the band 12.188-12.2 GHz; by 35 dB below the carrier power in the band 12.164-12.188 GHz; and by 43 + 10log(p) below the carrier power (p) in the band below 12.164 GHz. SkyBridge further requests that the EPFD caused by a MVDDS signal into a NGSO FSS earth station be limited to –169.1 dB ($W/m^2/4$ kHz) in bands below 12.164 GHz. Additionally, SkyBridge requests that the power received by a NGSO FSS user terminal from an MVDDS transmitter be limited (in 90% of the service area) to a power flux of –106.5 (W/m^2) in a NGSO carrier of 22.6 megahertz bandwidth, or a PFD of –120 dB(W/MHz). Finally, SkyBridge requests that the density of MVDDS transmitters be limited so that an EPFD of –135.1 dB($W/m^2/4$ kHz) is not exceeded in more than 0.2% of the service area of any MVDDS system.[563] Northpoint responds that the limits proposed by SkyBridge are unacceptable for the operation of its proposed system.[564]

279. We note that satellite and terrestrial systems share spectrum on a co-primary basis, but typically not for ubiquitous deployment, as would be the case in the 12.2-12.7 GHz band. Thus, sharing between the NGSO FSS and MVDDS will be complex. Nonetheless, we believe that Northpoint's and SkyBridge's proposals generally set forth a viable sharing scheme. Accordingly, we first propose to reduce the PFD limit for NGSO FSS satellites that transmit at angles of 5 degrees or less above the earth's horizon from the limit of –150 dB ($W/m^2/4kHz$) that we adopted for the 10.7-11.7 GHz band in the First R&O.[565] Without such a reduction, MVDDS coverage areas would likely be more limited than proposed by Northpoint, and the number of MVDDS transmit towers would have to correspondingly increase to compensate for the more limited coverage areas. An increase in MVDDS towers would complicate sharing with both the NGSO FSS and DBS services because the potential for interference from MVDDS transmitters to NGSO FSS and DBS receivers would increase. Therefore, we find it appropriate to require NGSO FSS downlinks in the 12.2-12.7 GHz band to meet a reduced PFD limit of –158 dB($W/m^2/4kHz$) for angles of $0\text{-}2^o$ above the horizon, and a reduced PFD limit of –158 + 3.33(δ-2) dB($W/m^2/4kHz$) for angles of $2\text{-}5^o$ above the horizon. These reduced power limits will affect only those NGSO FSS systems that transmit their signals low to the horizon. We believe that reducing PFD limits for satellites that may transmit at low-earth angles is preferable to establishing a minimum elevation angle for downlinks in the 12.2-12.7 GHz band because those limits would allow LEO systems to operate at a greater range of angles to the earth. We do not believe that a reduced low elevation angle PFD requirement will threaten the viability of such systems, and note that LEO systems can also protect

[562] *See* ¶ 221, *supra*.

[563] SkyBridge July 10, 2000 *ex parte* letter.

[564] Northpoint July 11, 2000 *ex parte* letter at 1-2.

[565] *See* §25.208(b), *infra*.

MVDDS receivers with spatial and frequency diversity.[566] Comments are requested as to the appropriateness of the specific PFD limits that we are proposing.

280. We next propose to limit the interference from MVDDS operations into NGSO FSS receivers by adopting a limit on MVDDS transmitter power. While SkyBridge proposes that specific MVDDS out-of-band emission and EPFD limits be adopted, we do not believe that this proposal is practical because the limits proposed would not be appropriate for other NGSO FSS systems that may use the 12.2-12.7 GHz band. Additionally, under SkyBridge's proposal, EPFD requirements would have to be measured at each NGSO FSS earth station. We believe that an MVDDS transmitter power limit could achieve the protection desired by SkyBridge for NGSO FSS receivers without such measurements. Accordingly, we propose that MVDDS transmitter power be limited to 12.5 dBm in most areas. We believe that this limit will protect NGSO FSS receivers from harmful interference without unduly restricting MVDDS operations. However, we request comment on whether a different limit would be preferable, and discuss this issue in more detail in Section 3c below.

281. We also request comment on whether coordination procedures should be established between NGSO FSS earth stations and MVDDS transmitters, rather than specific EPFD limits.[567] Standard coordination procedures would ensure that the first entity to establish services would be protected from a latter entrant. However, such coordination could limit deployment for either service because the entity wishing to deploy the later facility could be denied due to potential sharing problems, unless the interference could be mitigated. We also request comment on another form of coordination, where a MVDDS operator could notify the NGSO FSS providers in their area of the location and height of their transmitting towers, as we propose above for MVDDS and DBS band sharing. With this information, NGSO FSS installers can minimize the impact of MVDDS on NGSO FSS for new installations after an MVDDS operator begins service. The notification requirement is necessary because the Commission generally does not collect specific site information for every location when a service is licensed on a geographic basis, as would be the case here. Alternatively, we request comment on whether a database of MVDDS transmitter sites and NGSO FSS earth station sites should be established so that licensees could determine problem areas prior to deployment of facilities. At this time we are not proposing to adopt specific EPFD limits on MVDDS operations or coordination procedures between MVDDS and NGSO FSS because such requirements may be overly burdensome on both parties. Rather, we propose to limit the transmitter power of MVDDS operations to minimize any area of potential interference and rely upon the ability of NGSO FSS user terminals to work around static sources of interference in any environment in which they may be placed.

3. MVDDS and Adjacent CARS/BAS Band Considerations

282. Currently, CARS and BAS facilities operate in the upper adjacent 12.7-13.25 GHz band. To ensure that the addition of MVDDS does not interfere with CARS and BAS operations, we seek comment on necessary coordination and interference resolution procedures for MVDDS stations to and from CARS and BAS facilities.

[566] Spatial and frequency diversity, as well as reduced power, is the way that NGSO FSS systems will share spectrum with GSO FSS systems; *e.g.*, when an NGSO FSS satellite is aligned in its orbit between a GSO satellite and a GSO receiver, that NGSO FSS satellite may handoff its communications with an earth station to another satellite in the NGSO constellation that is not aligned between a GSO satellite and a GSO receiver.

[567] In the *First R&O*, we concluded that NGSO FSS gateway stations could use existing coordination procedures in Part 101 of our rules in bands shared with point-to-point FS operations. In the 12.2-12.7 GHz band, however, numerous NGSO FSS user terminals would be operating, making the use of the existing Part 101 coordination procedures impracticable.

B. Multichannel Video Distribution and Data Service Rules

283. In addition to resolving the interference issues between MVDDS/DBS and MVDDS/NGSO FSS, we must establish licensing and service rules. In this section, we will discuss the licensing and service issues that will impact MVDDS operations.

1. Licensing Plan

a. Service Areas

284. We may license MVDDS either on a site-by-site basis, or on a geographic area basis. Licensing MVDDS on a site-by-site basis would be resource intensive for both applicants and the Commission. Historically, when service requires ubiquitous coverage, we have issued licenses on a geographic-area basis, such as regional and nationwide. Given that the MVDDS service will potentially compete with other wide area service providers such as cable and DBS, we favor geographic-area licensing. Consequently, consistent with our approach in similar services,[568] we propose to license the 12.2-12.7 GHz band for MVDDS on the basis of geographic areas. We seek comment on this proposal.

285. In light of our proposal to license MVDDS on the basis of geographic areas, we request comment on the most appropriate geographic area licensing scheme for this service. In the *Markets Modification Final Report and Order*, we concluded that Nielsen's Designated Market Areas ("DMAs") provide the best method of "delineat[ing] television markets based on viewing patterns."[569] Nielsen uses audience survey information from cable and non-cable households to determine the assignment of counties to local television markets, or DMAs.[570] Nielsen determines what constitutes a separate market based on a complex statistical formula based upon viewership and other factors.[571] The station's assignment to a DMA is then made available in Nielsen's *Directory of Stations* publication. In light of the similarities between cable, non-cable and MVDDS services, we seek comment on whether we should authorize terrestrial MVDDS licensees on the basis of Nielsen's 211 DMAs.[572] We believe that this county-based licensing scheme is a viable option in facilitating local access to these services. If we determine that the public interest will be served by licensing MVDDS pursuant to DMAs, we propose that one licensee should be responsible for service in each DMA.

286. The use of DMAs may result in greater economic opportunities for a wide variety of applicants, including small business, rural telephone, and minority-owned and women-owned applicants, as required by Section 309(j)(4)(C) of the Communications Act.[573] For example, the nature of a DMA lends

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[568] 47 U.S.C. § 76.55(e) requires that a commercial broadcast television station's market shall be defined by Nielsen Media Research's designated market areas ("DMAs"). *See* Definition of Markets for Purposes of the Cable Television, Broadcast Signal Carriage Rules, *Order on Reconsideration and Second Report and Order*, CS Docket No. 95-178, 14 FCC Rcd 8366 (1999) (*Market Modification Final Report and Order*).

[569] *Id*.

[570] Nielsen Media Research, *Nielsen Station Index: Methodology Techniques and Data Interpretation.*

[571] For Nielsen's Market-Of-Origin assignment, a broadcast station is designated as "local" and assigned to the Nielsen market of the DMA in which its community of license is located. A broadcast station is "local" to only one Nielsen market. *See 1997-1998 NSI Reference Supplement* at 47. Nielsen "reserves the right not to create a DMA if there is a lack of sufficient financial support of Nielsen Service in that potential DMA." Nielsen Media Research, *Nielsen Station Index: Methodology Techniques and Data Interpretation,* 1994-95 at 2

[572] *See Market Modification Final Report and Order*, 14 FCC Rcd 8366 (1999).

[573] "In prescribing regulations. . . the Commission shall . . . prescribe area designations and bandwidth assignments that promote (i) an equitable distribution of licenses and services among geographic areas, (ii) (continued….)

itself to local business opportunities and services, and creates the opportunity for local groups to form bidding consortia for the purpose of obtaining DMAs through the competitive bidding process. Thus, we seek comment on whether DMAs or some other geographic area would be a better choice for this service. For example, we seek comment on whether to license MVDDS on the basis of nationwide licenses, licenses based upon Metropolitan and Rural Service Areas ("MSAs" and "RSAs"),[574] Economic Areas ("EAs"),[575] Regional Economic Area Groupings ("REAGs"),[576] Major Economic Areas ("MEAs"),[577] DMAs, and other relevant geographic areas. Commenters should specify which licensing methods they support and explain in detail why a particular geographic area category would be appropriate for the MVDDS licensing areas.

b. Frequency Availability and Assignments

287. Currently, the Frequency Availability Table in Section 101.100 of our Rules designates the POFS and the BSS as available services in the 12.2-12.7 GHz frequency band. With the assignment of MVDDS to the 12.2-12.7 GHz frequency band, we seek comment on whether to modify the Frequency Availability Table in Section 101.101 of our Rules under 12.2-12.7 GHz to designate an additional radio service as MVDDS. In addition, we seek comment on whether to amend the Frequency Assignments in Section 101.147 of our Rules to designate MVDDS as an additional radio service for this band. In the *First R&O*, we note that while the FS has a primary allocation in this band, we will allow MVDDS in the band on a non-harmful interference basis only to DBS.[578] Hence, we seek comment on whether to amend Part 101 of our Rules to incorporate these changes. Finally, we note that Section 21.901 of our Rules states the frequencies that are available for FS.[579] Accordingly, we also seek comment on whether to modify Section 21.901 of our Rules, if we determine to regulate MVDDS under Part 21 of our Rules.

(Continued from previous page)
economic opportunity for a wide variety of applicants, including small businesses, rural telephone companies, and businesses owned by members of minority groups and women, and (iii) investment in and rapid deployment of new technologies and services." 47 U.S.C. § 309(j)(4)(C).

[574] An MSA is a geographic area defined by the Office of Management and Budget. There are 306 MSAs, including New England County Metropolitan Areas and the Gulf of Mexico Service Area (water area of the Gulf of Mexico, border is the coastline). An RSA consists of 428 areas, which when combined with the 306 MSAs, comprise the 734 cellular geographic service areas. *See also* Implementation of Section 309(j) of the Communications Act—Competitive Bidding, PP Docket No. 93-253, *Fourth Report and Order*, 9 FCC Rcd 2330, 2333 ¶ 16 (1994).

[575] An EA is a geographic area established by the Bureau of Economic Analysis of the Department of Commerce. There are 172 EAs, plus three EA-like areas, encompassing the Northern Mariana Islands, Guam, American Samoa, the United States Virgin Islands and Puerto Rico. Each EA consists of one or more economic nodes – metropolitan areas or similar areas that serve as centers of economic activity – and the surrounding counties that are economically related to the nodes. *See Final Redefinition of the BEA Economic Areas*, 60 Fed. Reg. 13, 114, 13,114-118 (Mar. 10, 1995).

[576] An REAG is a geographic area based on groupings of 172 EAs and four EA-like areas developed by the Bureau of Economic Analysis of the Department of Commerce.

[577] An MEA is a geographic area developed by the Bureau of Economic Analysis of the Department of Commerce. There are two MEAs, including 46 in the continental United States and six covering Alaska, Hawaii, Guam and the Northern Mariana Islands, Puerto Rico and the U.S. Virgin Islands.

[578] *See First R&O*, ¶¶ 213-218.

[579] 47 C.F.R. § 21.901

c. Channeling Plan

288. The 12.2-12.7 GHz band has a total of 500 megahertz of spectrum per service area. Northpoint has requested that we license one spectrum block of 500 megahertz per service area.[580] We believe that in order to effectively compete with local cable and DBS service operators who routinely provide hundreds of channels to subscribers, MVDDS operators will similarly require 500 megahertz spectrum blocks in order to provide the type of variety that 100 video channels offers. In addition, we believe that licensing one spectrum block will reduce the number of technical and interference problems that would otherwise arise if multiple MVDDS providers were permitted to operate in the same geographic area on several different blocks of spectrum. We seek comment on whether licensing one spectrum block of 500 megahertz per geographic area will facilitate competition between MVDDS, cable TV, DBS, and other broadband video and data providers. Also, how would one 500 megahertz license serve to reduce technical, design, and coordination burdens? We also seek comment on whether MVDDS, as a terrestrial operation, requires the same amount of spectrum as all DBS operations and whether capacity needs for both video and data applications require the full 500 megahertz in each licensed area. In addition, we seek comment on whether other channeling plans, such as 250 megahertz blocks would promote the objectives of Section 309(j)(4)(C)[581] and the public interest.

d. Permissible Operations for MVDDS

289. Based on the record in this proceeding and the First R&O, we expect that the 12.2-12.7 GHz band will likely be used for the delivery of video services as well as one-way high speed data (non-video) services.[582] For two-way services, licensees could find spectrum in other bands or use telephone lines or other means for the return path. Thus, consistent with our general policies of flexible spectrum use, we seek comment on whether MVDDS licensees should be authorized to use spectrum in the 12.2-12.7 GHz band for fixed one-way direct-to-home/business video and data services. Additionally, we propose to preclude mobile and aeronautical operations because of the interference problems they would cause to DBS and the complication of the NGSO allocation. At this juncture, we do not know precisely the types of other services, in addition to video services, that new MVDDS licensees will seek to provide. We envision that MVDDS licensees will have substantial flexibility and a variety of options for using the spectrum to meet market demands within the confines of the technical sharing rules. For example, using Northpoint-type technology, the 500 megahertz of spectrum in the 12.2-12.7 GHz band can provide approximately 96 video channels without advanced compression techniques with other capacity usable for other services such as Internet service.[583] We seek comment on whether this use is the most efficient use of the 12.2-12.7 GHz spectrum, or whether other technologies exist or can be designed to allow MVDDS to provide similar services. Therefore, we propose flexible rules that will encourage the widest variety of services within the technical constraints of our Rules. Consistent with this approach, we invite comment on other possible uses of this frequency band.

290. Our proposed rules also promote Congress' mandate "to make a determination regarding licenses or other authorizations for facilities that will utilize, for delivering local broadcast television station signals to satellite television subscribers in unserved and underserved local television markets, spectrum

[580] Northpoint August 29, 2000 *ex parte* letter at 3-4. *See also,* Broadwave USA March 23, 2000 *ex parte* letter to Julie P. Knapp, Chief, Policy and Rules Division, at 1-2.

[581] *See supra* ¶ 286.

[582] *See, e.g., First R&O,* ¶¶ 212-217.

[583] *See* Opposition to Application of DIRECTV, Inc. for Expedited Review and Request for Immediate Suspension of Testing at 7-8 (filed Jul. 9, 1999) (regarding experimental special temporary authorization, File No. 0094-EX-ST-1999, Call Sign WA2XMY).

otherwise allocated to commercial use."[584] For example, if we use DMA markets for service areas, each terrestrial licensee in the 211 markets will have the capacity to provide all local television channels, whereas a DBS satellite system with one Continental United States footprint, does not have the capacity to retransmit all of the local channels nationwide. We wish to minimize regulatory barriers and costs of operation to usher service, most notably the transmission of local broadcast signals into unserved and underserved markets. We seek comment on ways to ensure that MVDDS licensees provide service to such markets.

291. We also propose to modify Part 101 of our Rules to the extent necessary so that MVDDS licensees may provide flexible service. We seek comment on changes to our existing Part 101 rules that might be useful or necessary for MVDDS licensees in the 12.2-12.7 GHz band. We believe that modifying certain Part 101 provisions to accommodate the MVDDS service is in the public interest because such action will contribute to technological and service innovation, encourage robust competition in the telecommunications service markets, and help provide local broadcast signals to unserved or underserved areas, pursuant to Congress' mandate. We also seek comment on whether any Part 21 service rule should apply to MVDDS.

e. Must-Carry Rules

292. We note that the new MVDDS is in many ways comparable to, and may be competing with, MVPDs, such as cable operators and DBS. Although the Communications Act does not make specific reference to MVDDS, we seek comment on the applicability to MVDDS providers of certain requirements that apply to MVPDs. For example, should the Commission's closed captioning, video description and navigation devices rules apply to MVDDS?[585] Should the network nonduplication, syndicated exclusivity and sports blackout rules apply to MVDDS carriage of broadcast programming?[586] Should we require MVDDS to provide access to alternative commercial providers in the same way that cable systems are required, pursuant to leased access requirements?[587] Additionally, should we require MVDDS to obtain retransmission consent for carriage of broadcast television stations, just as cable, DBS, and Multichannel Multipoint Distribution Services ("MMDS") are required to do?[588] In contrast, there does not appear to be a statutory basis for requiring mandatory carriage of all local broadcast signals.[589] We seek comment on whether to require licensees to provide all local television channels to every subscriber within each individual service area. We also seek comment on what, if any, must-carry obligations should be imposed on MVDDS licensees.[590]

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[584] Section 2002(a) of the Rural Local Broadcast Signal Act.

[585] *See* 47 C.F.R. §§ 76.606 (closed captioning), 76.1200 et seq. (competitive availability of navigation devices).

[586] *See* 47 C.F.R. §§ 76.92 - 76.163, 76.67.

[587] *See* 47 C.F.R. § 76.701.

[588] *See* 47 U.S.C. § 325(b) (retransmission consent required of all MVPDs).

[589] *See* 47 U.S.C. §§ 338 ("must carry" for DBS); 534 (cable "must carry" of commercial stations), and 535 (cable "must carry" of noncommercial educational stations). There is no comparable statutory requirement for MDS, MMDS, or LMDS or for MVPDs in general.

[590] *See* Multichannel Video and Cable Television Service Rules, Subpart D (Carriage of Television Broadcast Signals), 47 C.F.R. §§ 76.51-76.70.

f. Treatment of Incumbent Licensees

293. Presently, incumbent public safety and commercial POFS and DBS operations are authorized in the 12.2-12.7 GHz band. In tandem with our proposal to permit the entry of MVDDS operations in the 12.2-12.7 GHz band on a non-harmful interference basis to DBS operations, we must assess the impact of new MVDDS systems on the POFS incumbents in this spectrum. Previously, the Commission recognized the potential for interference between the POFS and DBS systems sharing the 12.2-12.7 GHz band,[591] and instructed the incumbent POFS licensees to either operate on a secondary basis to DBS operations in the 12.2-12.7 GHz band, or to relocate their operations to other available frequency bands or alternative facilities.[592]

294. Although many incumbent POFS licensees chose to relocate their operations to other frequency bands or alternative facilities, over 200 POFS licensees remain in the 12.2-12.7 GHz band. The Rural Local Broadcast Signal Act mandates that we ensure that no facility licensed or authorized to deliver local broadcast television signals as set forth in the Act, causes harmful interference to the primary users of that spectrum or to public safety spectrum use.[593] As a result of this statutory language, we believe that only incumbent commercial POFS licensees should be required to protect new MVDDS and NGSO FSS licensees in the 12.2-12.7 GHz band from harmful interference. Under this proposal, MVDDS and NGSO FSS licensees will be required to protect incumbent public safety POFS licensees. We emphasize that this proposal would not relieve any POFS and MVDDS licensees of their obligation to protect DBS operations in the 12.2-12.7 GHz frequency band. We believe these proposals further the public interest as they are consistent with the statutory language and Congressional intent. We seek comment on this tentative conclusion.

2. Application, Licensing and Processing Rules

a. Regulatory Status

295. In this *Further NPRM*, we seek comment on an appropriate licensing framework for implementing MVDDS in the 12.2-12.7 GHz band. In particular, we seek comment on whether we should allow an MVDDS licensee to use this spectrum for distribution of video programming and data services, and note that we previously indicated that a licensee may use other spectrum or telephone lines to provide the return line for two-way services.[594] We do not envision MVDDS as a common carrier service,[595] nor do we envision that MVDDS licensees will provide switched voice and data services.[596] We note that

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[591] *See* Inquiry into the Development of Regulatory Policy in Regard to Direct Broadcast Satellites for the Period Following the 1983 Regional Administrative Radio Conference, Gen. Docket No. 80-603, *Report and Order*, 90 FCC 2d 676 (1982).

[592] *Id. See also* Initiation of Direct Broadcast Satellite Service – Effect on 12 GHz Terrestrial Point-to-Point Licensees in the Private Operational Fixed Radio Service, *Public Notice*, 10 FCC Rcd 1211 (1994). The Commission indicated that in the event that DBS service experiences interference from terrestrial point-to-point operations, it is the sole responsibility of terrestrial licensees to eliminate such interference immediately. *Id*.

[593] *See* Act of Nov. 29, 1999, Pub. L. 106-113, 113 Stat. 1501, 1537.

[594] *See supra*, ¶ 289.

[595] *See* 47 U.S.C. § 153(10), 47 C.F.R. § 32.9000. A common carrier is "any person engaged as a common carrier for hire, in interstate or foreign communication by wire or radio or in interstate or foreign radio transmission of energy, except where reference is made to common carriers not subject to this ACT; but a person engaged in radio broadcasting shall not, insofar as such person is so engaged, be deemed a common carrier."

[596] Video programming service will be treated as a non-common carrier service. *See MVDS Second Report and Order*, 12 FCC Rcd at 12639-41, ¶¶ 213-15; Rule Making to Amend Parts 1, 2, 21, and 25 of the Commission's (continued….)

local cable companies and DBS operators provide their services on a non-common carrier basis. We seek comment on whether to limit the scope of MVDDS operations to the provision of service on a non-common carrier basis.

b. License Eligibility

296. Our overall goal in assessing the need to restrict the opportunity of any class of service provider to obtain and use spectrum to provide communications services has been to determine whether the restriction is a necessary step in ensuring that consumers will receive efficient communications services at reasonable charges.[597] Because we are of the view that competitive markets are the most direct and reliable means for ensuring that consumers receive the benefits described in the Communications Act, we have evaluated the need for spectrum licensing restrictions in terms of whether the restrictions are necessary to promote competition in the telecommunications marketplace and whether these restrictions are otherwise consistent with our obligation to promote the public interest.[598]

297. When Congress granted the Commission authority in Section 309(j) to auction spectrum licenses, it acknowledged our authority "to [specify] eligibility and other characteristics of such licenses."[599] Moreover, Section 309(j)(3) specifically directs that we exercise that authority so as to "promot[e] . . . economic opportunity and competition . . . by avoiding excessive concentration of licenses and by disseminating licenses among a wide variety of applicants."[600] Congress also emphasized this pro-competitive policy in Section 257, in which it articulated a "national policy" in favor of "vigorous economic competition" and the elimination of barriers to market entry by a new generation of telecommunications providers.[601]

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Rules to Redesignate the 27.5-29.5 GHz Frequency Band, to Establish Rules and Policies for Local Multipoint Distribution Service and for Fixed Satellite Services, CC Docket No. 92-297, *Second Report and Order, Order on Reconsideration and Fifth Notice of Proposed Rule Making*, 12 FCC Rcd 12545, ¶ 213 (1997) (*LMDS Second R&O*). Thus, any applicant intending to provide a video programming service would appropriately indicate a choice of non-common carrier regulatory status. We note that in other services we adopted a more flexible approach wherein an applicant may elect common carrier status and/or non-common carrier status under its authorization. For instance, in the LMDS proceeding, we permitted licensees to operate exclusively as a common carrier or non-common carrier or to provide services on both bases. *See LMDS Second R&O*, 12 FCC Rcd 12545, ¶¶ 245-251. Similarly, in the 39 GHz proceeding, we adopted a flexible approach where we permitted licensees to service as either a common carrier or a private licensee, permitting licensees that selected to provide common carrier service to private service as well. *See* Amendment of the Commission's Rules Regarding the 37.0-38.6 GHz and 38.6-40.0 GHz Bands, ET Docket No. 95-183, *Report and Order and Second Notice of Proposed Rule Making*, 12 FCC Rcd 18600, 18636 (1997) (*39 GHz R&O*).

[597] *See* 47 U.S.C. § 151.

[598] *Cf., e.g.*, Implementation of Sections 3(n) and 332 of the Communications Act – Regulatory Treatment of Mobile Services, GN Docket No. 93-252, *Second Report and Order*, 9 FCC Rcd 1411, 1420 ¶ 19 (*CMRS Second Report and Order*) ("Success in the marketplace. . . should be driven by technological innovation, service quality, competition-based pricing decisions, and responsiveness to consumer needs – and not by strategies in the regulatory arena.").

[599] *See* 47 U.S.C. § 309(j)(3).

[600] Our use of that authority to "place restrictions on the bidding process in order to ensure that a wide variety of applicants are able to meaningfully participate" in the market for the service being auctioned has been upheld by the courts. *Cincinnati Bell Tel. Co. v. FCC*, 69 F.3d 752, 761-762 (6th Cir. 1995) (*Cincinnati Bell*).

[601] *See* 47 U.S.C. § 257. Section 257 directs the Commission to identify and eliminate, "by regulations pursuant to its authority under this [Act] . . . market entry barriers for entrepreneurs and other small businesses in the provision and ownership of telecommunications services and information services."

298. Toward that end, the Commission has created a standard for determining whether an eligibility restriction is warranted for certain services.[602] Specifically, this standard demands that this regulatory restriction be imposed on MVDDS only when there is a significant likelihood of substantial harm to competition in specific markets and when the restriction will be effective in eliminating that harm.[603] This standard involves much more than examining market power. In addition, the test entails examining other relevant market facts and circumstances: economic incentives, entry barriers, and potential competition.[604] We believe that this approach is appropriate here because it comports with our statutory guidance as discussed above. We seek comment on whether there is a significant likelihood that incumbent cable operators and DBS firms may substantially harm competition by acquiring MVDDS licenses. Based on our initial preliminary analysis, incumbent local cable operators and existing DBS service providers may have both the ability and incentive to acquire MVDDS licenses in order to anti-competitively foreclose entry by a new MVPD competitor. MVDDS licensees will likely be entrants into MVPD markets. While competitive choices continue to develop in these markets, local franchised cable television operators generally continue to hold dominant market shares. Roughly 82% of MVPD households are served by cable companies.[605] In addition, much of the growth in competition is due to the two DBS operators. Together they serve roughly 12% of MVPD households. Other providers are typically fringe competitors.[606] The incumbent cable companies in most markets will have an incentive to acquire the in-region MVDDS license in order to prevent a fourth significant provider from emerging. These incumbent cable companies possess very large market shares and would find it rational to foreclose or at least delay the emergence of new firms that might drive prices down or otherwise increase MVPD competition. While the market share of the DBS firms is far smaller, we have seen fast growth of DBS, and their current subscriber totals may understate their competitive importance. Thus, the incentives facing the DBS firms may be similar to those facing the incumbent cable operators. These cable and DBS firms could also have the financial ability to carry out such competition-precluding behavior.[607] In contrast, other MVPD, such as MDS and "private cable" operators, may lack significant market power

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[602] *See, i.e., 39 GHz R&O,* 12 FCC Rcd 18600, 18619; Rule Making to Amend Parts 1, 2, 21, and 25 of the Commission's Rules to Redesignate the 27.5-29.5 GHz Frequency Band, to Reallocate the 29.5-30.0 GHz Frequency Band, to Establish Rules and Policies for Local Multipoint Distribution Service and for Fixed Satellite Services, Hyperion Communications Long Haul, L.P., Application for Expedited Review, CC Docket No. 92-927, *Third Report and Order and Memorandum Opinion and Order*, 15 FCC Rcd 11857 (2000).

[603] *See 39 GHz R&O*, 12 FCC Rcd at 18619.

[604] In the Matter of Rule Making to Amend Parts 1, 2, 21, and 25 of the Commission's Rules to Redesignate the 27.5-29.5 GHz Frequency Band, to Reallocate the 29.5-30.0 GHz Frequency Band, to Establish Rules and Policies for Local Multipoint Distribution Service and for Fixed Satellite Services, *Third Order on Reconsideration*, CC Docket No. 92-297, 13 FCC Rcd 4856, 4861 ¶ 7, 4863 ¶ 12 (1998).

[605] *See* Annual Assessment of the Status of Competition in Markets for the Delivery of Video Programming, *Sixth Annual Report*, CS Docket No. 99-230, 15 FCC Rcd 978, 981-987, and Table C-1, Appendix C at C-1, Appendix D (2000) (*Sixth Cable Competition Report*).

[606] *Id.*

[607] *Id.* We note that these current market conditions seem closely comparable to those in the wireless telephony market at the time the Commission adopted its original broadband PCS licensing rules, which limited in-region cellular licensees' PCS spectrum holdings. *See* In the Matter of Amendment of the Commission's Rules to Establish New Personal Communications Services, *Second Report and Order*, Gen Docket No. 90-314, 8 FCC Rcd 7700 (1993). We also note that the evidence from the mobile voice marketplace is that the more competitive structure has resulted in public benefits such as lower prices, on average, and improved quality and variety of service. *See In The Matter of Implementation of Section 6002(B) of the Omnibus Budget Reconciliation Act of 1993, Annual Report and Analysis of Competitive Market Conditions With Respect to Commercial Mobile Services, Fifth Report*, 15 FCC Rcd 17660 (2000).

and the financial wherewithal, and thus possess relatively little incentive and ability to anticompetitively acquire an MVDDS license in the region of their current operations. We seek comment on this analysis.

299. We note further that in most geographic markets the rivalry among MVPDs does not appear to adequately make these markets competitive currently. On the other hand, if such rivalry were sufficient, these firms would have nothing to gain from precluding additional entry. While we have found relatively few MVPD markets to be "effectively competitive" pursuant to Section 623(l) of the Act[608] there are markets where effective competition has been found, or is developing. Thus, where we have found (or find) "effective competition" to be present, we would not restrict either the incumbent cable operator or the DBS operators from acquiring the MVDDS license. Accordingly, we seek comment on whether to restrict cable service operators from acquiring an attributable interest within their franchised cable service area, unless such service area has been found by the Commission to be characterized by effective competition. We also seek comment on whether to restrict DBS carriers or distributors from obtaining or investing in a MVDDS license.[609] We also seek comment on whether any alleged harm to competition would be substantial in specific markets and whether such a restriction will be effective in eliminating that harm. On the other hand, we also seek comment on whether there would be any public interest benefits to providing for open (or partially open) eligibility for MVDDS licenses. For example, we note that Northpoint's Petition for Rule Making argued that Northpoint's technology will "enable DBS providers to compete more effectively against cable," "add value to DBS and promote localism by curing the local television signal problem," and "provide DBS providers a method to deliver Noncommercial Broadcasting Services."[610] Northpoint also proposed that both DBS licensees and their affiliates be eligible for terrestrial DBS authorizations "in order to facilitate arrangements whereby DBS providers could engage in equity sharing arrangements with local broadcasters or other entities willing to construct facilities for terrestrial DBS signal carriage."[611] What public interest benefits, if any, would accrue if incumbent cable operators were permitted to acquire or invest in MVDDS licenses?

[608] *See* 47 U.S.C. § 543(l). Section 623(l) of the Communication's Act defines "effective competition" as: A) fewer than 30 percent of the households in the franchise area subscribe to the cable service of a cable system; B) the franchise area is served by a minimum of two unaffiliated multichannel video programming distributors each of which offers comparable video programming to at least 50 percent of the households in the franchise area and the number of households subscribing to programming services offered by multichannel video programming distributors other than the largest multichannel video programming distributor exceeds 15 percent of the households in the franchise area; C) a multichannel video programming distributor operated by the franchising authority for than franchise area offers video programming to at least 50 percent of the households in that franchise area; or D) a local exchange carrier or its affiliate (or any multichannel video programming distributor using the facilities of such carrier or its affiliate) offers video programming services directly to subscribers by any means (other than direct-to-home satellite services) in the franchise area of an unaffiliated cable operator which is providing cable service in that franchise area, but only if the video programming services so offered in that area are comparable to the video programming services provided by the unaffiliated cable operator in that area.

[609] We note that there are no current rules that prevent common ownership in DBS and other MPVD services, including cable and MDS, but we have imposed restrictions in DBS auctions and the U.S. Department of Justice has prevented common cable and DBS ownership in one case. *See* In the Matter of Revision of Rules and Policies for the Direct Broadcast Service, *Report and Order*, IB Docket No. 95-168, 11 FCC Rcd 9712 (1995); *U.S. v. Primestar Partners, L.P.*, 140 L. Ed.2d. 180 (S.D.N.Y. 1994).

[610] *See* Northpoint Petition for Rule Making at 5-13.

[611] *Id*. at 20-21.

c. Foreign Ownership Restrictions

300. Certain foreign ownership and citizenship requirements are imposed in Sections 310(a) and 310(b) of the Communications Act that restrict the issuance of licenses to certain applicants.[612] The statutory provisions are implemented in Section 101.7 of our Rules.[613] Specifically, Section 101.7(a) prohibits the grant of any license to a foreign government or its representative.[614] Section 101.7(b) of our Rules prohibits the grant of any common carrier license to individuals who do not meet the citizenship requirements listed in the rule.[615] We propose that MVDDS licensees be subject to Section 101.7 of our Rules, which closely tracks the language of Section 310 of the Communications Act. As with other licenses granted pursuant to Section 310 of the Communications Act, we propose that these licenses would be granted in accordance with the foreign ownership precedent set forth in our *Foreign Participation Order* and other relevant Commission precedent.[616]

301. We propose that Universal Licensing System ("ULS") forms and procedures contained in the Commission's Rules will apply to MVDDS. In this connection, we expect MVDDS licensees to file appropriate documentation whenever there are changes to foreign ownership information, as well as other legal and financial qualifications. We request comment on these proposals.

d. License Term and Renewal Expectancy

302. We seek comment on whether to license MVDDS for a term of ten years, beginning on the date of the initial authorization grant. We note that a ten-year license term is consistent with the license terms in other wireless services.[617] Congress has signaled a strong interest in quickly deploying local broadcast programming service to unserved and underserved areas and we believe that a ten-year license term would offer sufficient time and flexibility for licensees to establish systems and to deploy valuable services to the public.[618]

303. We also seek comment on providing a renewal expectancy similar to that afforded to 24 GHz and 39 GHz licensees.[619] We seek comment on whether a renewal expectancy based on the substantial service requirement will offer licensees the most flexibility as they determine how best to deploy service. We define substantial service as "a service that is sound, favorable, and substantially

[612] *See* 47 U.S.C. § 310(a)-(b).

[613] *See* 47 C.F.R. § 101.7.

[614] *See* 47 C.F.R. § 101.7(a).

[615] *See* 47 C.F.R. § 101.7(b).

[616] *See* Rules and Policies on Foreign Participation in the U.S. Telecommunications Market, IB Docket No. 97-142, Market Entry and Regulation of Foreign-Affiliated Entities, IB Docket No. 95-22, *Report and Order and Order on Reconsideration*, 12 FCC Rcd 23891, 23951-52, ¶ 144 (1997) (*Foreign Participation Order*); Rules and Policies on Foreign Participation in the U.S. Telecommunications Market, IB Docket No. 97-142 *Order on Reconsideration*, 15 FCC Rcd 18158 (2000).

[617] *See LMDS Second Report and Order*, 12 FCC Rcd 12545; *39 GHz R&O*, 12 FCC Rcd 18600 (1997); Amendment of Part 95 of the Commission's Rules to Provide Regulatory Flexibility in the 218-219 MHz Service, WT Docket No. 98-169, *Report and Order and Memorandum Opinion and Order*, 15 FCC Rcd 1497 (1999); Amendment of the Commission's Rules Regarding Multiple Address Systems, *Report and Order*, WT Docket No. 97-81, 15 FCC Rcd 11956 (2000); *24 GHz Report and Order*, 15 FCC Rcd 16934.

[618] *See* Rural Local Broadcast Signal Act of 1999, Pub. L. 106-113, 113 Stat. 1501, 1537.

[619] *See 24 GHz Report and Order*, 15 FCC Rcd 16934.

above a level of mediocre service which might minimally warrant renewal."[620] In order to determine whether a licensee has provided substantial service upon renewal, we propose to consider factors such as: a) whether the licensee's operations service niche markets or focus on serving populations outside of areas serviced by other licensees; b) whether the licensee's operations serve populations with limited access to communications services; and c) a demonstration of service to a significant portion of the population or land area of the licensed area.[621] As a result of the flexibility that this standard affords, we have, in past proceedings, provided safe harbor examples to provide guidance to licensees in meeting this requirement. Therefore, we seek comment on safe harbor examples for MVDDS. Moreover, we propose to assess the substantial service showing on a case-by-case basis. In addition, we seek comment on whether to require a more aggressive approach such as a five-year build out.

304. We propose that upon license renewal, the application of an MVDDS licensee must include the following showings (at a minimum) in order to request a renewal expectancy: (1) a coverage map depicting the served and unserved areas; (2) a corresponding description of current service in terms of geographic coverage and population served or links installed in the served areas, including a description of how the licensee has complied with the substantial service requirement; and (3) copies of any Commission Orders finding the licensee to have violated the Communications Act or any Commission rule or policy and a list of any pending proceedings that relate to any matter described by the requirements for the renewal expectancy.[622] We seek comment on these proposals, and ask whether alternate showings would more accurately guide a Commission decision on license renewal.

e. Partitioning and Disaggregation

305. *Partitioning.* We propose to allow MVDDS operators to partition their geographic service areas.[623] One of the main goals of the reallocation of spectrum in the 12.2-12.7 GHz band is to further Congress' mandate "to make a determination regarding licenses or other authorizations for facilities that will utilize, for delivering local broadcast television station signals to satellite television subscribers in unserved and underserved local television markets, spectrum otherwise allocated to commercial use."[624] Thus, in keeping with this mandate, we believe that partitioning encourages spectrum efficiency and will enable additional licensees to respond to market demands for services and/or spectrum in unserved and underserved areas. We request comment on this issue. We also seek comment on what additional information parties should be required to file in conjunction with the partitioning process.

306. *Disaggregation.* Furthermore, we seek comment on possible market incentives for disaggregating spectrum in the 12.2-12.7 GHz band.[625] We realize that disaggregation may potentially

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[620] *See* 47 C.F.R. § 22.940(a)(1)(i). *See also LMDS Second Report and Order*, 12 FCC Rcd 12545, 12660; Amendment of the Commission's Rules to Establish Part 27, the Wireless Communications Service, GN Docket No. 96-228, *Report and Order*, 12 FCC Rcd 10785, 10843-10844 (1997) (*WCS Report and Order*); Amendment of Part 95 of the Commission's Rules to Provide Regulatory Flexibility in the 218-219 MHz Service, WT Docket No. 98-169, *Report and Order and Memorandum Opinion and Order*, 15 FCC Rcd 1497, 1537-38 (1999); *MAS Report and Order*, 15 FCC Rcd 11956 (2000).

[621] *See, i.e., 24 GHz Report and Order*, 15 FCC Rcd 16934.

[622] *Cf.* 47 C.F.R. §§ 22.940(a)(2)(i)-(iv).

[623] "Partitioning" is the assignment of geographic portions of a license along geopolitical or other boundaries.

[624] *See* Section 2002(a) of the Rural Local Broadcast Signal Act.

[625] "Disaggregation" is the assignment of discrete portions or "blocks" of spectrum licensed to a geographic licensee or qualifying entity. Disaggregation allows for multiple transmitters in the same area operated (continued….)

cause complications involving interference. However, if the spectrum is developed in the manner in which we currently envision, we believe that such interference will be minimal. Because we do not intend to broaden the interference rights of parties, we propose to hold all terrestrial parties that are a possible source for interference responsible for rectifying the problem should complications arise as a result of spectrum disaggregation. We also seek comment on what additional information parties should be required to file in conjunction with the disaggregation process. In addition, we seek comment on whether the implementation of alternative policies would be more appropriate for this service. On the other hand, we acknowledge that identifying a source of interference becomes more challenging by allowing disaggregation and seek comment on whether we should place a five-year prohibition on disaggregation, or prohibit disaggregation altogether in the 12.2-12.7 GHz band.

f. Annual Report

307. Consistent with other MVPDs, we propose that each MVDDS licensee should file with the Commission two copies of a report no later than March 1 of each year for the preceding calendar year, which must include the following: (a) name and address of licensee; (b) station(s) call letters and primary geographic service area(s); and (c) the following statistical information for the licensee's station (and each channel thereof): (i) the total number of separate subscribers served during the calendar year; (ii) the total hours of transmission service rendered during the calendar year to all subscribers; (iii) the total hours of transmission service rendered during the calendar year involving the transmission of local broadcast signals; and (iv) a list of each period of time during the calendar year in which the station rendered no service as authorized, if the time period was a consecutive period longer than forty-eight hours.[626] We believe that the information compiled in this report will assist us in analyzing trends and competition in the marketplace.

g. Licensing and Coordination of MVDDS Stations

308. Although the low power and directionality of MVDDS systems minimizes interference, we anticipate that 12.2-12.7 GHz terrestrial licensees in adjacent service areas will have concerns about interference. Because of our decision to allow licensees to have flexibility in selecting and deploying equipment, we do not believe that universal sharing criteria can be developed between adjacent licensees. Therefore, because of the advent of this new service and the variable and unique nature of individual MVDDS systems, geographical climate and terrain, we propose to require adjacent licensees to develop their own sharing and protection agreements based on the design and architecture of their systems, in order to ensure that no harmful interference occurs between adjacent service areas. This approach is similar to the approach we took in the 24 GHz proceeding.[627] We seek comment on this proposal.

h. Canadian and Mexican Coordination

309. Section 2.301 of our Rules requires stations using radio frequencies to identify their transmissions with a view to eliminate harmful interference and generally enforce applicable radio treaties, conventions, regulations, arrangements, and agreements.[628] At this time, international coordination between and among the United States, Mexico and Canada concerning the reallocation of this spectrum is not complete. We propose to adopt certain interim requirements for terrestrial licenses along these

(Continued from previous page)
by different companies (thus the possibility of harmful interference increases). With partitioning, one company operates in a licensed area.

[626] *See, e.g.*, 47 C.F.R. § 21.911 ("Annual Reports" for MDS).

[627] *24 GHz Report and Order*, ¶¶ 65-67.

[628] *See* 47 C.F.R. § 2.301.

borders, and provide that these licensees will be subject to the provisions contained within future agreements between and among the three countries.

310. We propose to grant conditional licenses to United States MVDDS systems within fifty-six km (thirty-five miles) of the Canadian and Mexican borders, until final international agreements are signed. These systems may not cause harmful interference to stations in Canada or Mexico. In addition, we note that further modification may be necessary in order to comply with future agreements with Canada and Mexico regarding the use of this band. We seek comments on this proposal.

3. Technical Rules

a. Transmitter Power

311. In 1999, Northpoint demonstrated that it could provide service in the 12.2-12.7 GHz band using an e.i.r.p. of 12.5 dBm at its test sites in Rosslyn, Virginia and Washington, D.C. With a view toward simplifying coordination and reducing potential interference, we propose to limit urban area e.i.r.p. to 12.5 dBm, with two exceptions: (1) those MVDDS systems with service areas containing mountain ridges that are over one kilometer from populated subscriber areas may use higher output power, provided that the increase will not cause the system to exceed the "unavailability criteria" to be established in this proceeding, and (2) those MVDDS systems located on tall manmade structures and natural formations that are adjacent to bodies of water or other significant and clearly unpopulated areas, may use higher output power, provided that the increase will not cause the system to exceed the same "unavailability criteria."

312. We find that the C/I (such as 18 dB at each DBS subscriber unit) and power flux densities (an amount not to be exceeded at any DBS subscriber unit) fluctuate too much from area to area to be used as acceptable standards for the entire United States. Therefore, as discussed above, we seek comment on protection criteria options regarding an amount of yearly increased outage for each DBS system, instead of considering the variable conditions for power flux densities or C/I ratios in each different area of the United States. We seek comment on this issue.

b. RF Safety

313. Although we propose to limit power in the terrestrial use of the 12.2-12.7 GHz band in urban areas, we do not propose to set limits for the excepted areas on tall manmade structures and natural formations adjacent to bodies of water or unpopulated areas. Therefore, we propose that those stations with output powers that equal or exceed 1640 watts e.i.r.p. will be subject to the routine environmental evaluation rules for radiation hazards, as set forth in Section 1.1307 of our Rules.[629] We seek comment on this proposal.

c. Quiet Zone Protection

314. We tentatively conclude to require MVDDS operators to comply with the quiet radio zone criteria set forth in Part 1 of our Rules.[630] As such, we propose that stations authorized by competitive bidding must receive approvals from the relevant quiet zone before commencing operations. We seek comment on these proposals.

[629] *See* 47 C.F.R. § 1.1307.

[630] *See* 47 C.F.R. § 1.924.

d. Antennas

315. We propose to require antennas deployed to receive MVDDS services to be technically similar to home DBS antennas and have a minimum unidirectional gain of 34 dBi. With regard to transmitting antennas, we propose that such antennas not be required to meet the antenna standards specified in Section 101.115 of our Rules, because they may be sectored and not unidirectional antennas. Thus, we propose to require MVDDS transmitting antennas to (1) meet the marking and lighting requirements under Part 17 of our Rules,[631] and (2) generally point southward. The terrestrial licensee of each service area must take into consideration that the DBS satellite receive antennas in the United States generally point southward. In order to minimize harmful interference to DBS satellite dishes, MVDDS licensees must determine for each area of the country, the "look angles" of all DBS antennas to determine appropriate angles that do not place high concentrations of interfering power into DBS antennas.[632] As discussed above, we propose to require MVDDS licensees to mitigate any interference beyond that deemed to be permissible caused by their transmitters into the DBS antennas.[633]

316. In addition, the Over-the-Air Reception Devices Rule ("OTARD") will probably apply to the MVDDS antennas at subscribers' homes or offices.[634] MVDDS antennas will be used to provide wireless services, and therefore, we seek comment on whether to amend or clarify the current OTARD rule to cover MVDDS just as MMDS and LMDS are covered.[635]

e. Transmitting Equipment

317. We propose to amend either Section 101.139 or Section 21.120 of our Rules to require verification of all MVDDS transmitters in the 12.2-12.7 GHz band. We also propose to require MVDDS transmitters with digital modulation and operating bandwidth of 500 megahertz to provide as many video and data channels as possible. We do not believe that MVDDS transmitters should be required to meet the efficiency standards in Section 101.141 of our Rules,[636] because terrestrial licensees will, by necessity, utilize the most efficient technology available. In addition, we propose to require all MVDDS stations to meet the digital emission mask, set forth in Section 101.111(a)(2) of our Rules.[637] Further, we propose to retain the frequency tolerance standard of 0.005% in Section 101.107 of our Rules,[638] changing the maximum bandwidth in Section 101.109 of our Rules to reflect a value of 500 megahertz for MVDDS

[631] *See* 47 C.F.R. Part 17, Subpart C.

[632] A "look angle" is the elevation angle and azimuth of the antenna pointing at the satellite.

[633] *See supra*, ¶ 272.

[634] *See* 47 C.F.R. § 1.4000.

[635] We note that we recently expanded OTARD to apply to fixed wireless services when the antenna is otherwise within the scope of OTARD. *See* Promotion of Competitive Networks in Local Telecommunications Markets, Implementation of the Local Competition Provisions in the Telecommunications Act of 1996, *First Report and Order and Further Notice of Proposed Rule Making in WT Docket No. 99-217, Fifth Report and Order and Memorandum Opinion and Order in CC Docket No. 96-98, and Fourth Report and Order and Memorandum Opinion and Order in CC Docket No. 88-57*, FCC 00-366 (rel. Oct. 25, 2000).

[636] *See* 47 C.F.R. § 101.141.

[637] *See* 47 C.F.R. § 101.11(a)(2).

[638] *See* 47 C.F.R. § 101.107.

systems.[639] As such, the value of 500 megahertz will also be the value for B in the equation for determining the emission mask, set forth in Section 101.111(a)(2) of our Rules.[640]

4. Pending Applications

318. *Background*. As stated earlier, on January 8, 1999, Northpoint filed waiver requests and applications for licenses for terrestrial use of the 12.2-12.7 GHz band, in response to the *Ku Band Cut-Off Notice*.[641] Northpoint requests waivers of Sections 101.105, 101.107, 101.109, 101.111, 101.115, 101.139 and 101.603 of our Rules, and any other fixed microwave radio service rules necessary to permit the Commission to process its applications to deploy service.[642] Northpoint asserts that its proposed service will be on a secondary, non-interfering basis to DBS services and on a co-primary basis with any new FSS entering the subject frequency band.[643] On March 11, 1999, the Bureau sought comment on Northpoint's request for waiver.[644] Requests for waiver of the Commission's Rules are subject, unless otherwise provided, to treatment by the Commission as restricted proceedings for *ex parte* purposes under Section 1.1208 of our Rules.[645] In this case, "because of the policy implications and the potential impact of this proceeding on other proceedings, as well as, persons not parties to the waiver requests" the Bureau decided to treat the matter as a permit-but-disclose proceeding under the *ex parte* rules.[646]

319. Subsequently, on April 18, 2000, Pegasus filed a waiver request and application for authority to provide terrestrial service in the 12.2-12.7 GHz band to deliver data transmission, Internet services, and MVPD services. In its application, Pegasus indicates that its proposed services are not contemplated by our current Rules and are analogous to fixed microwave services.[647] As such, Pegasus requests all waivers of the fixed microwave service rules necessary to allow processing of its application.[648] In its application, Pegasus maintains that its applications are mutually exclusive with those

[639] *See* 47 C.F.R. § 101.109.

[640] *See* 47.C.F.R. § 101.111(a)(2).

[641] *See supra*, ¶ 263. Note that on August 21, 2000, Pegasus filed a *Petition to Dismiss or Deny* the Northpoint applications arguing that the application proceeding is restricted as between Pegasus and Northpoint and as such, Northpoint's *ex parte* presentations violated the Commission's *ex parte* rules. Thus, according to Pegasus, the severity of the *ex parte* violations warrants dismissal of the Northpoint applications. *See* Pegasus Petition to Dismiss or Deny (filed Aug. 21, 2000) at 5-11 (Pegasus Petition). *See also* 47 C.F.R. §§ 1.1202(b), (d); 1.1208(c)(1)(i)(C).

[642] *Id*.

[643] *Id*.

[644] *Public Notice*, Wireless Telecommunications Bureau Seeks Comment on Broadwave Albany, L.L.C., *et al*. Requests for Waiver of Part 101 Rules, DA 99-494 (rel. March 11, 1999).

[645] 47 C.F.R. §1.1208.

[646] *Public Notice*, Wireless Telecommunications Bureau Seeks Comment on Broadwave Albany, L.L.C., *et al*. Requests for Waiver of Part 101 Rules, DA 99-494 (rel. March 11, 1999) at 2. *See* 47 C.F.R. §§ 1.1200(a), 1.1206.

[647] *Id. Public Notice*, Wireless Telecommunications Bureau Sets Permit-but-Disclose Status for PDC Broadband Corporation Requests for Waiver, DA 00-1841 (rel. Aug. 14, 2000).

[648] Specifically, Pegasus sought waiver of 47 C.F.R. §§ 101.101, 101.105, 101.107, 101.111, 101.115. 101.139, 101.603.

filed by Northpoint. On August 14, 2000, the Bureau established a permit-but-disclose *ex parte* status for the Pegasus application.[649]

320. On May 23, 2000, Northpoint filed a *Motion to Dismiss* the Pegasus applications arguing that (1) procedurally, the subject applications were filed over a year after the cut-off deadline established by the *Ku Band Cut-Off Notice* without requesting a waiver of the Commission's cut-off rule; (2) substantively, Pegasus lacks a credible public interest showing and adequate support for grant of the requested waiver; and (3) Pegasus displays an anticompetitive spirit by filing its application at the time the Commission was about to render a final decision.[650] Northpoint avers that this anticompetitive attempt on the part of Pegasus, the largest independent distributor of DIRECTV, will delay the licensing process. On June 7, 2000, Pegasus filed a responsive pleading asserting that Northpoint's arguments hinge on the mistaken premise that it missed an application cut-off deadline when, in fact, the Commission has not established one; and that Northpoint's unsupported assertion of abuse of process was not accompanied by an affidavit specifying allegations of fact.[651]

321. Finally, on August 25, 2000, SRL filed a waiver request and application to provide terrestrial television broadcast, Internet and data services. The SRL application seeks authorization for service in Illinois, Indiana, Iowa, Michigan, Minnesota and Wisconsin. On September 20, 2000, the Bureau established a permit-but-disclose *ex parte* status for the SRL application.[652]

322. *Discussion*. As an initial matter, we note that none of the subject waiver requests and applications submitted to date have been formally accepted for filing. If we decide to grant any of these waiver requests and accept any of these applications, we would need to determine how they should be processed.

323. *Northpoint application*. Northpoint argues that its application should be granted without an auction because it is not mutually exclusive with any other applications.[653] According to Northpoint, we gave adequate notice that we would consider terrestrial use of the 12.2-12.7 GHz band in the *FSS NPRM* and that the *Ku Band Cut-Off Notice* should be construed as inviting applications for any purposed new service in that band, terrestrial or satellite.[654] Thus, Northpoint contends that parties intending terrestrial use of these frequencies were required to file within the announced NGSO FSS window, and no other party seeking to provide terrestrial services besides itself filed an application within the window.[655]

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[649] *Public Notice*, Wireless Telecommunications Bureau Sets Permit-but-Disclose Status for PDC Broadband Corporation Requests for Waiver, DA 00-1841 (rel. Aug. 14, 2000).

[650] Northpoint Motion to Dismiss (filed May 23, 2000) ("Northpoint Motion") at 16.

[651] Pegasus Opposition to Motion to Dismiss (filed June 7, 2000) ("Pegasus Opposition") at 6-13. On June 19, 2000, Northpoint filed a Reply to Opposition ("Northpoint Reply").

[652] *See Wireless Telecommunications Bureau Sets Permit-But-Disclose Status for Satellite Receivers Ltd. Requests For Waiver of Part 101 Rules*, DA No. 00-2134 (released September 20, 2000).

[653] *Ex Parte* Submission of Northpoint (filed Aug. 29, 2000) ("Northpoint *Ex Parte* Submission") at 2.

[654] Northpoint *Ex Parte* Submission at 4-10.

[655] *See id.; see also* Northpoint Motion to Dismiss PDC Broadband Corporation Application to Provide Terrestrial Services in the 12.2-12.7 GHz Band (May 23, 2000) at 7-12. ("Northpoint Motion to Dismiss"). We note that Northpoint's argument that its application is not mutually exclusive with any other assumes that mutual exclusivity may exist between applications for different services.

Northpoint also avers that it has demonstrated that its technology is not mutually exclusive with the NGSO applicants in the band.[656]

324. Northpoint also argues that in order to promote the type of satellite-terrestrial sharing arrangement they have proposed, the two services must be licensed in the same manner simultaneously. According to Northpoint, this arrangement would enable them to effectively negotiate spectrum capacity with the satellite applicants and to facilitate negotiations concerning interference. In this connection, Northpoint sets forth an equity argument explaining that it would be extremely unfair if other terrestrial applicants were allowed to share in the "interference budget" that Northpoint has already negotiated with NGSO applicants.[657] Northpoint argues that granting 12.2-12.7 GHz band satellite applications while submitting terrestrial applications to auction would severely prejudice Northpoint and deny it the ability to effectively negotiate spectrum capacity with satellite applicants.[658] Finally, Northpoint contends that a number of public interest factors would be advanced by granting the applications, including the promotion of spectrum efficiency, prompt service to the public, greater competition for cable television and DBS systems, and delivery of advanced services to rural and other underserved areas.

325. We seek comment on the disposition of Northpoint's waiver request and application. Specifically, we request that commenters address the merits of Northpoint's arguments that its applications should be accepted for filing and granted. We specifically seek comment on whether the *FSS NPRM* and the *Ku Band Cut-Off Notice* gave adequate notice to all parties interested in filing applications for terrestrial use of the 12.2-12.7 GHz band, whether Northpoint's application should be accepted for filing, and whether it is mutually exclusive with any other applications. Based on Northpoint's request for 500 megahertz of spectrum nationwide, grant of its request would mean that it would be the sole provider of terrestrial MVDDS in the 12.2-12.7 GHz band. We seek comment on the advantages and disadvantages associated with grant of Northpoint's request.

326. We note that Northpoint also contends that the Open-Market Reorganization for the Betterment of International Telecommunications Act ("Orbit Act") expressly prohibits the Commission from auctioning any spectrum used for global satellite communications services and that this prohibition extends to all other services that use such spectrum, including terrestrial microwave.[659] We do not agree with Northpoint's construction of the Orbit Act, because the statute does not prohibit the Commission from auctioning licenses for non-satellite services.[660] Thus, where we establish a terrestrial service, as we propose to do here, the Orbit Act is not a bar to auctioning licenses to provide that service merely because the terrestrial service operates on the same frequencies as a satellite service. We note that the 24 GHz band is allocated for terrestrial fixed services and satellite services, and we recently adopted rules for

[656] Northpoint *Ex Parte* Submission at 12-16.

[657] *Id*. at 12-15. Northpoint states that an "interference budget" is the amount of additional noise that Northpoint may generate in addition to the interference caused by NGSO operators, without causing unacceptable interference to incumbent DBS operators.

[658] *Id.* at 10-11.

[659] *Id*. at 16. *See* Open-Market Reorganization for the Betterment of International Telecommunications Act, Pub. L. No. 106-180, 114 Stat. 48 (enacted March 12, 2000).

[660] We note also that the Orbit Act does not prohibit the use of auctions for domestic services. As President Clinton stated in signing the act into law, "in approving S. 376, I state my understanding that section 647 does not limit the Federal Communications Commission from assigning, via competitive bidding, domestic satellite service licenses intended to cover only the United States." Statement by President William J. Clinton upon signing S. 376, 36 WEEKLY COMP. PRES. DOC. 578 (Mar. 17, 2000).

awarding licenses for terrestrial fixed service in that band by competitive bidding.[661] Terrestrial services and satellite services also share the 39 GHz band, and we have auctioned terrestrial fixed service licenses in that band.[662] We have also substituted the 3650-3700 MHz band, in which the fixed satellite service operates, for spectrum that must be auctioned pursuant to the Balanced Budget Act of 1997 ("Balanced Budget Act")[663] and thus plan to auction licenses for fixed and mobile terrestrial services in that band.[664]

327. As noted above, the approach suggested by Northpoint differs from our traditional process for establishing new terrestrial wireless services. When a party or the Commission proposes such a service, we generally initiate rule making proceedings both to allocate spectrum for the new service and establish service rules before we accept any applications for licenses. In the context of these proceedings, we establish rules governing the application and licensing process for the new service. After the completion of such proceedings, parties are provided an opportunity to submit applications in accordance with the adopted service rules. If mutually exclusive applications are accepted, licenses must be assigned by auction, with few exceptions.[665] Because we have not yet established service rules for terrestrial use in this band, if we were to follow the traditional approach in creating terrestrial MVDDS in the 12.2-12.7 GHz band, it would appear that the Northpoint waiver requests and applications would be subject to dismissal. Northpoint would, however, be able to file an application after we have established service rules for terrestrial use of the 12.2-12.7 GHz band and opened a window for licenses to provide the new service. We seek comment on whether we should follow our traditional approach for creating new wireless services in this context and the advantages and disadvantages of such approach.

328. *Pegasus and SRL Applications*. Pegasus and SRL argue that their applications are mutually exclusive with those of Northpoint and that they did not file their applications after the cut-off date for this service because no cut-off date has been established.[666] Before we can address the disposition of the Pegasus and SRL applications, we must determine whether adequate notice that applications for terrestrial service should be filed in the NGSO FSS window was provided in the *Ku Band Cut-Off Notice*. As discussed above, this issue is also involved in evaluating Northpoint's applications.

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[661] *24 GHz Report and Order*, 15 FCC Rcd 16934. We note that the allocation for satellite services in this band will not become effective until April 1, 2007.

[662] *39 GHz R&O*, 12 FCC Rcd 18600; 39 GHz Band Auction Closes, *Public Notice*, DA 00-1035, Report No. AUC-30-E (rel. May 10, 2000).

[663] Pub. L. No. 105-33, Title III, 111 Stat. 251 (1997).

[664] As we stated in our recent order allocating the 3650-3700 MHz band to the fixed and mobile terrestrial services, "the assignment of licenses for terrestrial services by competitive bidding . . . is not prohibited by [the Orbit Act]." Existing international satellite fixed earth stations will be grandfathered in this band and new stations will be secondary to fixed services. Amendment of the Commission's Rules With Regard to the 3650-3700 MHz Government Transfer Band, ET Docket No. 98-237; The 4.9 GHz Band Transferred from Federal Government Use, WT Docket No. 00-32, *First Report and Order and Second Notice of Proposed Rule Making*, FCC 00-363 (rel. Oct. 24, 2000), ¶ 20 n.64. Thus, this *First R&O* allows satellite entities to remain in the band.

[665] *See* 47 U.S.C. § 309(j)(1), (2). Section 309(j)(2) exempts from auctions licenses and construction permits for public safety radio services, digital television service licenses and permits given to existing terrestrial broadcast licensees to replace their analog television service licenses, and licenses and construction permits for noncommercial educational broadcast stations and public broadcast stations.

[666] PDC Broadband Corporation Applications for Licenses to Provide Terrestrial Service in the 12.2-12.7 GHz Band in all DMAs, Exhibit 1 at 2 (filed Apr. 18, 2000); Satellite Receivers, Ltd. Application for Licenses to provide Terrestrial Broadcast and Data Services in the 12.2-12.7 GHz Band in Illinois, Indiana, Iowa, Michigan, Minnesota and Wisconsin, Exhibit 1 at 2 (filed Aug. 25, 2000); Pegasus Opposition at 6-13. *See also*, Northpoint Reply filed June 19, 2000.

Unlike Northpoint, however, which filed prior to the cut-off date of January 8, 1999, established in the *Ku Band Cut-off Notice*, Pegasus and SRL did not file their applications until April 18, 2000, and August 25, 2000, respectively. Thus, even if we ultimately find that the *Ku Band Cut-Off Public Notice* gave adequate notice to all entities interested in filing applications for authorization in the 12.2-12.7 GHz band, we then must determine whether the Pegasus and SRL applications should be dismissed as late-filed. On the other hand, if we ultimately find that the *Ku Band Cut-Off Notice* did not give adequate notice to all entities interested in filing applications for authorization in the 12.2-12.7 GHz band, then it appears that the Pegasus and SRL applications were prematurely filed and should be dismissed without prejudice as defective. We seek comment on these, and other factors upon which we should analyze the Pegasus and SRL applications.

329. We also note that there is another possible scenario under our traditional approach to establishing service and licensing rules for wireless services. We could limit applications under our new rules for terrestrial service in the 12.2-12.7 GHz band and limit eligibility to one or more of the applications for terrestrial service received to date.[667] Under this scenario, we would need to determine whether the terrestrial applications are mutually exclusive. If they are found to be mutually exclusive, such applications would be subject to auction under the Balanced Budget Act. We seek comment on whether we should adopt a rule that would limit applications under the terrestrial service rules we ultimately adopt.

330. We submit –in light of the fact that we have not yet determined whether to process the subject applications– that it is premature at this point to examine whether mutual exclusivity exists between or among any of the applications currently on file. We therefore hold the waiver requests and applications of Northpoint, Pegasus and SRL in abeyance pending further action in this proceeding.[668]

5. Competitive Bidding Procedures

a. Statutory Requirements

331. The Balanced Budget Act revised the Commission's auction authority.[669] Specifically, it amended Section 309(j) of the Act to require the Commission to grant licenses through the use of competitive bidding when mutually exclusive applications for initial licenses are filed, unless certain specific statutory exemptions apply.[670] The Balanced Budget Act also added to Section 309(j)(1) a reference to the Commission's obligation under Section 309(j)(6)(E) to use engineering solutions, negotiation, threshold qualifications, service regulations, or other means to avoid mutual exclusivity where it is in the public interest

[667] In 1987, in order to expedite the MSS rollout, the Commission limited its acceptance of applications to the thirteen applications that were on file, and required those applicants to form a consortium with the result that there was one licensee and no mutual exclusivity. Amendment of Parts 2, 22 and 25 of the Commission's Rules to Allocate Spectrum for, and to Establish Other Rules and Policies Pertaining to the Use of Radio Frequencies in a Land Mobile Satellite Service for the Provision of Various Common Carrier Services, *Second Report and Order*, Gen. Docket No. 84-1234, 2 FCC Rcd 485 (1987).

[668] Generally, a rule making is a better, fairer, and more effective method of implementing a new industry-wide policy than is the ad hoc and potentially uneven application of conditions in an isolated proceedings affecting a single party. *See Stockholders of Renaissance Communications Corp. and Tribune Co*., 12 FCC Rcd. 11866, 11887-88 50 (1997) *citing Community Television of Southern California v. Gottfried*, 459 U.S. 498, 511 (1983).

[669] *See* 47 U.S.C. § 309(j)(1), (2) (as amended by Balanced Budget Act, § 3002).

[670] *Id*. 47 U.S.C. § 309(j)(2) exempts from auctions licenses and construction permits for public safety radio services, digital television service licenses and permits given to existing terrestrial broadcast licensees to replace their analog television service licenses, and licenses and construction permits for noncommercial educational broadcast stations and public broadcast stations.

to do so.[671] The Balanced Budget Act did not amend Section 309(j)(3)'s directive to consider certain public interest objectives in identifying classes of licenses and permits to be issued by competitive bidding.[672]

332. In a recently released *Report and Order and Further Notice of Proposed Rule Making*, the Commission established a framework for exercise of its auction authority, as amended by the Balanced Budget Act.[673] The *Report and Order* affirmed that in identifying which classes of licenses should be subject to competitive bidding, the Commission is required to pursue the public interest objectives set forth in Section 309(j)(3).[674] The *Report and Order* also affirmed that, as part of this public interest analysis, the Commission must continue to consider alternative procedures that avoid or reduce the likelihood of mutual exclusivity.[675] The Commission concluded, however, that its obligation to avoid mutual exclusivity does not preclude it from adopting licensing processes in the non-exempt services that result in the filing of mutually exclusive applications where it determines that such an approach would serve the public interest.[676]

333. In determining whether to assign licenses for MVDDS through competitive bidding, we intend to follow the approach set forth in the Balanced Budget Act proceeding regarding the exercise of our auction authority. We note, too, that subsequent to the adoption of the Balanced Budget Act, the U.S. Court of Appeals for the D.C. Circuit concluded that the Section 309(j)(6)(E) obligation does not foreclose new licensing schemes that are likely to result in mutual exclusivity.[677] The court states that if the Commission finds such schemes to be in the public interest, it may implement them "without regard to [S]ection 309(j)(6)(E) which imposes an obligation only to minimize mutual exclusivity 'in the public interest,' and 'within the framework of existing policies."[678]

334. In this *Further NPRM*, we propose to license the 12.2-12.7 GHz band for MVDDS on the basis of geographic areas. As explained above, we seek comment on whether the use of DMAs in particular is a viable option in facilitating local access to service, and whether the use of DMAs may promote economic opportunities for a wide variety of applicants, including small businesses, rural telephone companies, and minority- and women-owned applicants.[679] If we find that it would serve the public interest to implement a geographic area licensing scheme, under which mutual exclusivity is possible, mutually exclusive applications for initial MVDDS licenses must be resolved through competitive bidding. We note, however, that Northpoint argues that its pending application to provide service in the 12.2-12.7 GHz band is not mutually exclusive with any other application and that the Commission should grant its application without conducting an auction. As discussed above, we therefore seek comment on this argument and on the disposition of Northpoint's and other pending applications.[680]

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[671] *See* 47 U.S.C. §§ 309(j)(1), 309(j)(6)(E).

[672] *See* 47 U.S.C. § 309(j)(3).

[673] *See* Implementation of Sections 309(j) and 337 of the Communications Act of 1934 as Amended, WT Docket No. 99-87, *Report and Order and Further Notice of Proposed Rule Making*, FCC 00-403 (rel. Nov. 20, 2000).

[674] *Id.* at ¶¶ 20-27.

[675] *Id*.

[676] *Id*.

[677] *See Benkelman Telephone Co., et al. v. FCC*, 220 F.3d 601, 606 (D.C. Cir. 2000).

[678] *Id.* (citations omitted) (citing *DIRECTV, Inc. v. FCC*, 110 F.3d 816, 828 (D.C. Cir. 1997)).

[679] *See supra* ¶¶ 284-286.

[680] *See supra* ¶¶ 318-330.

b. Incorporation by Reference of the Part 1 Standardized Auction Rules

335. If we ultimately adopt a licensing scheme under which mutually exclusive applications may be filed, we propose to conduct the auction of MVDDS licenses in the 12.2-12.7 GHz band in conformity with the general competitive bidding rules set forth in Part 1, Subpart Q, of the Commission's Rules, and substantially consistent with the bidding procedures that have been employed in previous auctions.[681] Specifically, we propose to employ the Part 1 rules governing competitive bidding design, designated entities, application and payment procedures, reporting requirements, collusion issues, and unjust enrichment. Under this proposal, such rules would be subject to any modifications that the Commission may adopt in the Part 1 proceeding.[682] In addition, consistent with current practice, matters such as the appropriate competitive bidding design for the auction of MVDDS licenses, as well as minimum opening bids and reserve prices, would be determined by the Wireless Telecommunications Bureau ("Bureau") pursuant to its delegated authority.[683] We seek comment on whether any of our Part 1 rules would be inappropriate in an auction of licenses in the 12.2-12.7 GHz band.

c. Provisions for Designated Entities

336. In authorizing the Commission to use competitive bidding, Congress mandated that the Commission "ensure that small businesses, rural telephone companies, and businesses owned by members of minority groups and women are given the opportunity to participate in the provision of spectrum-based services."[684] In addition, Section 309(j)(3)(B) of the Act provides that in establishing eligibility criteria and bidding methodologies the Commission shall promote "economic opportunity and competition . . . by avoiding excessive concentration of licenses and by disseminating licenses among a wide variety of applicants, including small businesses, rural telephone companies, and businesses owned by members of minority groups and women."[685]

337. In the *Competitive Bidding Second Memorandum Opinion and Order*, the Commission stated that it would define eligibility requirements for small businesses on a service-specific basis, taking into account the capital requirements and other characteristics of each particular service in establishing the

[681] In the *Part 1 Third Report and Order*, the Commission streamlined its auction procedures by adopting general competitive bidding rules applicable to all auctionable services. Amendment of Part 1 of the Commission's Rules -- Competitive Bidding Procedures, WT Docket No. 97-82, Allocation of Spectrum Below 5 GHz Transferred from Federal Government Use, ET Docket No. 94-32, *Third Report and Order and Second Further Notice of Proposed Rule Making*, 13 FCC Rcd 374 (1997) (modified by Erratum, DA 98-419 (rel. March 2, 1998)) ("*Part 1 Third Report and Order*"). In the *Part 1 Recon Order and Part 1 Fifth Report and Order*, the Commission clarified and amended these general competitive bidding rules. Amendment of Part 1 of the Commission's Rules – Competitive Bidding Procedures, WT Docket No. 97-82, *Order on Reconsideration of the Third Report and Order, Fifth Report and Order, and Fourth Further Notice of Proposed Rule Making*, FCC 00-274 (rel. Aug. 14, 2000) ("*Part 1 Recon Order and Part 1 Fifth Report and Order*," "*Fourth Further Notice of Proposed Rule Making*").

[682] *See Fourth Further Notice of Proposed Rule Making*, FCC 00-274 (rel. Aug. 14, 2000); Amendment of Part 1 of the Commission's Rules – Competitive Bidding Procedures, WT Docket No. 97-82, *Third Further Notice of Proposed Rule Making*, 14 FCC Rcd 21558 (1999).

[683] *Part 1 Third Report and Order*, 13 FCC Rcd at 448-49, 454-55, ¶¶ 125, 139 (directing the Bureau to seek comment on specific mechanisms relating to auction conduct pursuant to the Balanced Budget Act).

[684] 47 U.S.C. § 309(j)(4)(D).

[685] 47 U.S.C. § 309(j)(3)(B).

appropriate threshold.[686] The *Part 1 Third Report and Order*, while it standardizes many auction rules, provides that the Commission will continue a service-by-service approach to defining small businesses.[687] In this *Further NPRM* we seek comment on permitting MVDDS licensees to use spectrum in the 12.2-12.7 GHz band for fixed one-way direct-to-home/business video and data services. We also seek comment on other services that might be provided in this band. Thus, we contemplate the use of this spectrum for video services and one-way high speed data services, but we do not know precisely the other types of services that licensees may seek to provide.[688]

338. In light of these circumstances, we tentatively conclude that, if we conduct an auction for licenses in the 12.2-12.7 GHz band, it would be in the public interest to provide bidding credits to three tiers of small businesses. We believe that the use of three small business definitions and three levels of bidding credits would provide a variety of businesses, including local businesses, with opportunities to participate in the auction of licenses for this spectrum, and may also be appropriate to promote opportunities for the provision of services with varying capital costs. Accordingly, we propose to define a very small business as an entity with average annual gross revenues not exceeding $3 million for the preceding three years, a small business as an entity with average annual gross revenues not exceeding $15 million for the preceding three years, and an entrepreneur as an entity with average annual gross revenues not exceeding $40 million for the preceding three years. We further propose to provide very small businesses with a bidding credit of 35%, small businesses with a bidding credit of 25%, and entrepreneurs with a bidding credit of 15%. The bidding credits we propose here are those set forth in the standardized schedule in Part 1 of our Rules.[689] We seek comment on whether our proposed small business definitions and bidding credits are appropriate for the 12.2-12.7 GHz band.

339. We also seek comment on whether the small business provisions we propose today are sufficient to promote participation by businesses owned by minorities and women, as well as rural telephone companies. To the extent that commenters propose additional provisions to ensure participation by minority-owned or women-owned businesses, they should address how such provisions should be crafted to meet the relevant standards of judicial review.[690]

6. Issues Affecting Tribal Governments

340. We seek comment from the public in general concerning the proposals set forth in this Further NPRM, and we specifically seek comment from Indian Tribal governments on the proposals below. As detailed in the *Tribal Government Policy Statement*, adopted earlier this year, the Commission is committed to (1) working with Indian tribes on a government-to-government basis to ensure that Indian tribes have adequate access to communications services, and (2) consulting with Tribal governments prior to implementing any regulatory action or policy that will significantly affect Tribal governments, their land, and

[686] Implementation of Section 309(j) of the Communications Act – Competitive Bidding, *Second Memorandum Opinion and Order*, 9 FCC Rcd 7245, 7269, ¶ 145 (1994) ("*Competitive Bidding Second Memorandum Opinion and Order*").

[687] *Part 1 Third Report and Order*, 13 FCC Rcd at 388, ¶ 18.

[688] *See supra* ¶ 289.

[689] In the *Part 1 Third Report and Order*, we adopted a standard schedule of bidding credits, the levels of which were developed based on our auction experience. *Part 1 Third Report and* Order, 13 FCC Rcd at 403-04, ¶ 47. *See also* 47 C.F.R. § 1.2110(f)(2).

[690] *See Adarand Constructors v. Peña*, 515 U.S. 200 (1995) (requiring a strict scrutiny standard of review for Congressionally mandated race-conscious measures); *United States v. Virginia*, 518 U.S. 515 (1996) (applying an intermediate standard of review to a state program based on gender classification).

resources.[691] We believe the proposals set forth in this Further NPRM have the potential to foster the development and, ultimately, the deployment of new technologies and services to many communities, including tribal communities. In keeping with the principles of the *Tribal Government Policy Statement*, we welcome the opportunity to consult with Tribal governments on the issues raised by this Further NPRM and we seek comment both from Tribal governments and other interested parties on the potential for the spectrum proposals set forth herein to serve the communications needs of tribal communities.

VII. PROCEDURAL INFORMATION

A. Initial Regulatory Flexibility Analysis

341. As required by Section 603 of the Regulatory Flexibility Act, 5 U.S.C. § 603, the Commission has prepared an Initial Regulatory Flexibility Analysis ("IRFA") of the expected impact on small entities of the proposals suggested in this *Further Notice of Proposed Rule Making*. The IRFA is set forth in Appendix F. Written public comments are requested on the IRFA. These comments must be filed in accordance with the same filing deadlines as comments filed in this *Further Notice of Proposed Rule Making ("Further NPRM")*, but they must have a separate and distinct heading designating them as responses to the IRFA.

B. Paperwork Reduction Analysis

342. The *Further Notice of Proposed Rule Making* contains proposed information collections. As part of our continuing effort to reduce paperwork burdens, we invite the general public and the Office of Management and Budget ("OMB") to take this opportunity to comment on the information collections contained in this Notice, as required by the Paperwork Reduction Act of 1995, Pub. L. No. 104-13. Public and agency comments are due at the same time as other comments on this Notice; OMB comments are due 60 days from the date of publication of this Notice in the Federal Register. Comments should address:

- Whether the proposed collection of information is necessary for the proper performance of the functions of the Commission, including whether the information shall have practical utility.
- The accuracy of the Commission's burden estimates.
- Ways to enhance the quality, utility, and clarity of the information collected.
- Ways to minimize the burden of the collection of information on the respondents, including the use of automated collection techniques or other forms of information technology.

343. Written comments by the public on the proposed information collections are due on or before **45 days from date of publication in the Federal Register**. Written comments must be submitted by the OMB on the proposed information collections on or before **60 days after the date of publication in the Federal Register**. In addition to filing comments with the Secretary, a copy of any comments on the proposed information collections contained herein should be submitted to Judy Boley, Federal Communications Commission, Room 1-C804, 445 12th Street, S.W., Washington, D.C. 20554, or via the Internet to jboley@fcc.gov, and to Virginia Huth, OMB Desk Officer, 10236 New Executive Office Building, 725 17th Street, N.W., Washington, D.C. 20503, or via the Internet to fain_t@al.eop.gov.

[691] *See* Statement of Policy on Establishing a Government-to-Government Relationship with Indian Tribes, FCC 00-207 (rel. June 23, 2000) ("*Tribal Government Policy Statement*").

C. Ex Parte Presentations

344. This is a permit-but-disclose notice and comment rule making proceeding. Members of the public are advised that ex parte presentations are permitted, except during the Sunshine Agenda period, provided they are disclosed under the Commission's Rules.[692]

D. Comment Dates

345. Pursuant to Sections 1.415 and 1.419 of the Commission's Rules, 47 C.F.R. §§ 1.415 and 1.419, interested parties may file comments on or before **45 days from date of publication in the Federal Register** and reply comments on or before **60 days from date of publication in the Federal Register**. Comments may be filed using the Commission's Electronic Comment Filing System (ECFS), http://www.fcc.gov/e-file/ecfs.html, or by filing paper copies. *See Electronic Filing of Documents in Rule Making Proceedings*, 63 Fed. Reg. 23,121 (1998).

346. Comments filed through the ECFS can be sent as an electronic file via the Internet to http://www.fcc.gov/e-file/ecfs.html. Generally, only one copy of an electronic submission must be filed. If multiple docket or rule making numbers appear in the caption of this proceeding, however, commenters must transmit one electronic copy of the comments to each docket or rule making number referenced in the caption. In completing the transmittal screen, commenters should include their full name, Postal Service mailing address, and the applicable docket or rule making number. Parties may also submit an electronic comment by Internet e-mail. To get filing instructions for e-mail comments, commenters should send an E-mail to ecfs@fcc.gov, and should including the following words in the body of the message, "get form <your e-mail address." A sample form and directions will be sent in reply.

347. Parties who choose to file by paper must file an original and four copies of each filing. If more than one docket or rule making number appear in the caption of this proceeding, commenters must submit two additional copies for each additional docket or rule making number. All filings must be sent to the Commission's Secretary, Magalie Roman Salas, Office of the Secretary, Federal Communications Commission, 445 12th Street, S.W., TW-A325, Washington, D.C. 20554. Comments and reply comments will be available for public inspection during regular business hours in the FCC Reference Center of the Federal Communications Commission, Room TW-A306, 445 12th Street, S.W., Washington, D.C. 20554.

348. Parties who choose to file by paper should also submit their comments on diskette. Such a submission should be on a 3.5-inch diskette formatted in an IBM compatible format using Microsoft Word or compatible software. The diskette should be accompanied by a cover letter and should be submitted in “read only” mode. The diskette should be clearly labeled with the commenter’s name, proceeding (including the lead docket number, type of pleading (comment or reply comment), date of submission, and the name of the electronic file on the diskette. The label should also include the following phrase “Disk Copy – Not an Original.” Each diskette should contain only the party’s pleading, preferably in a single electronic file. In addition, commenters must send diskette copies to the Commission’s copy contract, International Transcription Service, Inc., 1231 20th Street, NW, Washington, D.C. 20037.

349. Alternative formats (computer diskette, large print, audio cassette and Braille) are available to persons with disabilities by contacting Martha Contee at (202) 418-0260, TTY (202) 418-2555, or via e-mail to mcontee@fcc.gov. This *R&O and Further NPRM* can also be downloaded at http://www.fcc.gov/oet.

[692] *See generally* 47 C.F.R. §§ 1.1202, 1.1203, 1.1206(a).

E. Further Information

350. For further information concerning this *Further NPRM*, contact the following: For MVDDS/DBS and MVDDS/NGSO FSS sharing issues, Office of Engineering and Technology – Rodney Small at (202) 418-2452, Thomas Derenge at (202) 418-2451, or Geraldine Matise at (202) 418-2322. For MVDDS service rules, Wireless Telecommunications Bureau – Michael Pollak, Jennifer Burton, Shellie Blakeney, or Nese Guendelsberger at (202) 418-0680.

F. Final Regulatory Analysis

351. *Final Regulatory Flexibility Analysis*. The analysis regarding the First Report and Order, pursuant to the Regulatory Flexibility Act of 1980, 5 U.S.C. Section 603, is contained in Appendix B.

VIII. ORDERING CLAUSES

352. *Authority*. Accordingly, IT IS ORDERED that pursuant to the authority contained in Sections 1, 4(i), 7(a), 301, 303(c), 303(f), 303(g), 303(r), 308, and 309(j) of the Communications Act of 1934, as amended, 47 U.S.C. Sections 151, 154(i), 157(a), 301, 303(c), 303(f), 303(g), 303(r), 308, and 309(j), this First Report and Order and Further Notice of Proposed Rule Making IS ADOPTED.

353. IT IS FURTHER ORDERED that, pursuant to Sections 4(i) and 303 of the Communications Act of 1934, as amended, 47 U.S.C. §§ 154(i), 303, and Section 1.425 of the Commission's Rules, 47 C.F.R. § 1.425, the Petition for Rule Making filed on March 6, 1998 by Northpoint Technology, Ltd. is GRANTED IN PART, consistent with the decisions set forth herein.

354. IT IS FURTHER ORDERED that Parts 2 and 25 of the Commission's Rules ARE AMENDED as set forth in Appendix A, effective thirty days after publication in the Federal Register; and that NOTICE IS HEREBY GIVEN of the proposed regulatory changes described in the Further Notice of Proposed Rule Making and contained in Appendix E.

355. IT IS FURTHER ORDERED that the Commission’s Consumer Information Bureau, Reference Information Center, SHALL SEND a copy of this First Report and Order and Further Notice of Proposed Rule Making, including the Final Regulatory Flexibility Analysis and Initial Regulatory Flexibility Analysis, in a report to Congress pursuant to the Small Business Regulatory Enforcement Fairness Act of 1996, *see* 5 U.S.C. § 801(a)(1)(A); and shall also send a copy of the First Report and Order and Further Notice of Proposed Rule Making, including the Final Regulatory Analysis and Initial Regulatory Flexibility Analysis, to the Chief Counsel for Advocacy of the Small Business Administration. *See* 5 U.S.C. § 603(a). A summary of the First Report and Order and Further Notice of Proposed Rule Making will be published in the Federal Register. *See* 5 U.S.C. § 605(b).

FEDERAL COMMUNICATIONS COMMISSION

Magalie Roman Salas
Secretary

APPENDIX A: FINAL RULES

For the reasons discussed in the preamble, the Federal Communications Commission amends 47 C.F.R. parts 1, 2, and 25 as follows:

PART 1 – PRACTICE AND PROCEDURE

1. The authority citation for part 1 continues to read as follows:

AUTHORITY: 47 U.S.C. 151, 154(i), 154(j), 155, 225, 303(r), 309.

2. Section 1.1307 is amended as follows:

§ 1.1307 Actions that may have a significant environmental effect, for which Environmental Assessments (EAs) must be prepared.

* * * * *

(b)(1) * * *

Table 1--Transmitters, Facilities and Operations Subject to Routine Environmental Evaluation

Service (title 47 rule part)	Evaluation required if
* * * *	* * *
Satellite Communications (part 25)	All included. In addition, for NGSO subscriber equipment, licensees are required to attach a label to subscriber transceiver antennas that: (1) provides adequate notice regarding potential radiofrequency safety hazards, e.g., information regarding the safe minimum separation distance required between users and transceiver antennas; and (2) references the applicable FCC-adopted limits for radiofrequency exposure specified in §1.1310 of this chapter.
* * * *	* * *

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PART 2 -- FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS

3. The authority citation for part 2 continues to read as follows:

AUTHORITY: 47 U.S.C. 154, 302a, 303, and 336, unless otherwise noted.

4. Section 2.106, the Table of Frequency Allocations, is amended as follows:

a. Pages 63, 64, and 65 are revised.

b. In the list of International Footnotes, footnotes S5.441, S5.484A, S5.487A, S5.488, S5.492, S5.502, and S5.503 are revised.

c. In the list of United States (US) Footnotes, footnotes US355, US356, and US357 are added.

d. In the list of Non-Government (NG) Footnotes, footnotes NG104, NG118, and NG143 are revised.

The revisions and additions read as follows:

§ 2.106 Table of Frequency Allocations.

10-12.7 GHz (SHF)					Page 63
International Table			United States Table		FCC Rule Part(s)
Region 1	Region 2	Region 3	Federal Government	Non-Federal Government	
10-10.45 FIXED MOBILE RADIOLOCATION Amateur S5.479	10-10.45 RADIOLOCATION Amateur S5.479 S5.480	10-10.45 FIXED MOBILE RADIOLOCATION Amateur S5.479	10-10.45 RADIOLOCATION S5.479 US58 US108 G32	10-10.45 Radiolocation Amateur S5.479 US58 US108 NG42	Private Land Mobile (90) Amateur (97)
10.45-10.5 RADIOLOCATION Amateur Amateur-satellite S5.481			10.45-10.5 RADIOLOCATION US58 US108 G32	10.45-10.5 Radiolocation Amateur Amateur-satellite US58 US108 NG42 NG134	
10.5-10.55 FIXED MOBILE Radiolocation	10.5-10.55 FIXED MOBILE RADIOLOCATION		10.5-10.55 RADIOLOCATION US59		Private Land Mobile (90)
10.55-10.6 FIXED MOBILE except aeronautical mobile Radiolocation			10.55-10.6	10.55-10.6 FIXED	Fixed Microwave (101)
10.6-10.68 EARTH EXPLORATION-SATELLITE (passive) FIXED MOBILE except aeronautical mobile RADIO ASTRONOMY SPACE RESEARCH (passive) Radiolocation S5.149 S5.482			10.6-10.68 EARTH EXPLORATION- SATELLITE (passive) SPACE RESEARCH (passive) US265 US277	10.6-10.68 EARTH EXPLORATION- SATELLITE (passive) FIXED SPACE RESEARCH (passive) US265 US277	
10.68-10.7 EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) S5.340 S5.483			10.68-10.7 EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY US74 SPACE RESEARCH (passive) US246 US355		

<table>
<tr><td>10.7-11.7
FIXED
FIXED-SATELLITE (space-to-Earth) S5.441 S5.484A (Earth-to-space) S5.484
MOBILE except aeronautical mobile</td><td colspan="2">10.7-11.7
FIXED
FIXED-SATELLITE (space-to-Earth) S5.441 S5.484A
MOBILE except aeronautical mobile</td><td>10.7-11.7

US211 US355</td><td>10.7-11.7
FIXED NG41
FIXED-SATELLITE (space-to-Earth) S5.441 US211 NG104

US355</td><td>International Fixed (23)
Satellite Communications (25)
Fixed Microwave (101)</td></tr>
<tr><td rowspan="3">11.7-12.5
FIXED
MOBILE except aeronautical mobile
BROADCASTING
BROADCASTING-SATELLITE</td><td>11.7-12.1
FIXED S5.486
FIXED-SATELLITE (space-to-Earth) S5.484A
Mobile except aeronautical mobile

S5.485 S5.488</td><td rowspan="2">11.7-12.2
FIXED
MOBILE except aeronautical mobile
BROADCASTING
BROADCASTING-SATELLITE

S5.487 S5.487A S5.492</td><td>11.7-12.1

S5.486</td><td rowspan="2">11.7-12.2
FIXED-SATELLITE (space-to-Earth) NG143 NG145
Mobile except aeronautical mobile

S5.486 S5.488</td><td rowspan="2">Satellite Communications (25)
Fixed Microwave (101)</td></tr>
<tr><td>12.1-12.2
FIXED-SATELLITE (space-to-Earth) S5.484A

S5.485 S5.488 S5.489</td><td>12.1-12.2</td></tr>
<tr><td>S5.487 S5.487A S5.492</td><td>12.2-12.7
FIXED
MOBILE except aeronautical mobile
BROADCASTING
BROADCASTING-SATELLITE</td><td>12.2-12.5
FIXED
MOBILE except aeronautical mobile
BROADCASTING

S5.484A S5.487 S5.491</td><td rowspan="2">12.2-12.7</td><td rowspan="2">12.2-12.7
FIXED
BROADCASTING-SATELLITE

S5.487A S5.488 S5.490</td><td>International Fixed (23)
Satellite Communications (25)
Direct Broadcast Satellite (100)
Fixed Microwave (101)</td></tr>
<tr><td>12.5-12.75
FIXED-SATELLITE (space-to-Earth) S5.484A (Earth-to-space)

S5.494 S5.495 S5.496</td><td>S5.487A S5.488 S5.490
S5.492

See next page for 12.7-12.75 GHz</td><td>12.5-12.75
FIXED
FIXED-SATELLITE (space-to-Earth) S5.484A
MOBILE except aeronautical mobile
BROADCASTING-SATELLITE S5.493</td><td>S5.490

See next page for 12.7-12.75 GHz</td><td></td><td>See next page for 12.7-12.75 GHz</td></tr>
</table>

12.7-14.5 GHz (SHF)

International Table			United States Table		FCC Rule Part(s)
Region 1	Region 2	Region 3	Federal Government	Non-Federal Government	
See previous page for 12.5-12.75 GHz	12.7-12.75 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE except aeronautical mobile	See previous page for 12.5-12.75 GHz	12.7-12.75	12.7-12.75 FIXED NG118 FIXED-SATELLITE (Earth-to-space) MOBILE NG53	Satellite Communications (25) Auxiliary Broadcasting (74) Cable TV Relay (78) Fixed Microwave (101)
12.75-13.25 FIXED FIXED-SATELLITE (Earth-to-space) S5.441 MOBILE Space research (deep space) (space-to-Earth)			12.75-13.25 US251	12.75-13.25 FIXED NG118 FIXED-SATELLITE (Earth-to-space) S5.441 NG104 MOBILE US251 NG53	
13.25-13.4 EARTH EXPLORATION-SATELLITE (active) AERONAUTICAL RADIONAVIGATION S5.497 SPACE RESEARCH (active) S5.498A S5.499			13.25-13.4 AERONAUTICAL RADIONAVIGATION S5.497 Space research (Earth-to-space)		Aviation (87)
13.4-13.75 EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION SPACE RESEARCH S5.501A Standard frequency and time signal-satellite (Earth-to-space) S5.499 S5.500 S5.501 S5.501B			13.4-13.75 RADIOLOCATION S5.333 US110 G59 Space research Standard frequency and time signal-satellite (Earth-to-space)	13.4-13.75 Radiolocation S5.333 US110 Space research Standard frequency and time signal-satellite (Earth-to-space)	Private Land Mobile (90)
13.75-14 FIXED-SATELLITE (Earth-to-space) S5.484A RADIOLOCATION Standard frequency and time signal-satellite (Earth-to-space) Space research S5.499 S5.500 S5.501 S5.502 S5.503 S5.503A			13.75-14 RADIOLOCATION US110 G59 Standard frequency and time signal-satellite (Earth-to-space) Space research US337 S5.503A US356 US357	13.75-14 FIXED-SATELLITE (Earth-to-space) US337 Radiolocation US110 Standard frequency and time signal-satellite (Earth-to-space) Space research S5.503A US356 US357	Satellite Communications (25) Private Land Mobile (90)

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INTERNATIONAL FOOTNOTES

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I. New "S" Numbering Scheme

* * * * *

S5.441 The use of the bands 4 500-4 800 MHz (space-to-Earth), 6 725-7 025 MHz (Earth-to-space) by the fixed-satellite service shall be in accordance with the provisions of Appendix S30B. The use of the bands 10.7-10.95 GHz (space-to-Earth), 11.2-11.45 GHz (space-to-Earth) and 12.75-13.25 GHz (Earth-to-space) by geostationary-satellite systems in the fixed-satellite service shall be in accordance with the provisions of Appendix S30B. The use of the bands 10.7-10.95 GHz (space-to Earth), 11.2-11.45 GHz (space-to-Earth) and 12.75-13.25 GHz (Earth-to-space) by a non-geostationary-satellite system in the fixed-satellite service is subject to application of the provisions of No. S9.12 for coordination with other non-geostationary-satellite systems in the fixed-satellite service. Non-geostationary-satellite system in the fixed-satellite service shall not claim protection from geostationary-satellite networks in the fixed-satellite service operating in accordance with the Radio Regulations, irrespective of the dates of receipt by the Bureau of the complete coordination or notification information, as appropriate, for the non-GSO FSS systems and of the complete coordination or notification information, as appropriate, for the GSO networks, and No. S5.43A does not apply. Non-geostationary-satellite systems in the fixed-satellite service in the above bands shall be operated in such a way that any unacceptable interference that may occur during their operation shall be rapidly eliminated.

* * * * *

S5.484A The use of the bands 10.95-11.2 GHz (space-to-Earth), 11.45-11.7 GHz (space-to-Earth), 11.7-12.2 GHz (space-to-Earth) in Region 2, 12.2-12.75 GHz (space-to-Earth) in Region 3, 12.5-12.75 GHz (space-to-Earth) in Region 1, 13.75-14.5 GHz (Earth-to-space), 17.8-18.6 GHz (space-to-Earth), 19.7-20.2 GHz (space-to-Earth), 27.5-28.6 GHz (Earth-to-space), 29.5-30 GHz (Earth-to-space) by a non-geostationary-satellite system in the fixed-satellite service is subject to application of the provisions of No. S9.12 for coordination with other non-geostationary-satellite systems in the fixed-satellite service. Non-geostationary-satellite systems in the fixed-satellite service shall not claim protection from geostationary-satellite networks in the fixed-satellite service operating in accordance with the Radio Regulations, irrespective of the dates of receipt by the Bureau of the complete coordination or notification information, as appropriate, for the non-GSO FSS systems and of the complete coordination or notification information, as appropriate, for the GSO networks, and No. S5.43A does not apply. Non-geostationary-satellite systems in the fixed-satellite service in the above bands shall be operated in such a way that any unacceptable interference that may occur during their operation shall be rapidly eliminated.

* * * * *

S5.487A Additional allocation: in Region 1, the band 11.7-12.5 GHz, in Region 2, the band 12.2-12.7 GHz and, in Region 3, the band 11.7-12.2 GHz, are also allocated to the fixed-satellite service (space-to-Earth) on a primary basis, limited to non-geostationary systems and subject to application of the provisions of No. S9.12 for coordination with other non-geostationary-satellite systems in the fixed-satellite service. Non-geostationary-satellite systems in the fixed-satellite service shall not claim protection from geostationary-satellite networks in the broadcasting-satellite service operating in accordance with the Radio Regulations, irrespective of the dates of receipt by the Bureau of the complete coordination or notification information, as appropriate, for the non-GSO FSS systems and of the complete coordination or

notification information, as appropriate, for the GSO networks, and No. S5.43A does not apply. Non-geostationary-satellite systems in the fixed-satellite service in the above bands shall be operated in such a way that any unacceptable interference that may occur during their operation shall be rapidly eliminated.

S5.488 The use of the band 11.7-12.2 GHz by geostationary-satellite networks in the fixed-satellite service in Region 2 is subject to the provisions of Resolution 77 (WRC-2000). For the use of the band 12.2-12.7 GHz by the broadcasting-satellite service in Region 2, see Appendix S30.

* * * * *

S5.492 Assignments to stations of the broadcasting-satellite service which are in conformity with the appropriate regional Plan or included in the Regions 1 and 3 List in Appendix S30 may also be used for transmissions in the fixed-satellite service (space-to-Earth), provided that such transmissions do not cause more interference, or require more protection from interference, than the broadcasting-satellite service transmissions operating in conformity with the Plan or the List, as appropriate.

* * * * *

S5.502 In the band 13.75-14 GHz, an earth station in the fixed-satellite service shall have a minimum antenna diameter of 4.5 m and the e.i.r.p. of any emission should be at least 68 dBW and should not exceed 85 dBW. In addition the e.i.r.p., averaged over one second, radiated by a station in the radiolocation or radionavigation services shall not exceed 59 dBW. The protection of assignments to receiving space stations in the fixed-satellite service operating with earth stations that, individually, have an e.i.r.p. of less than 68 dBW shall not impose constraints on the operation of the radiolocation and radionavigation stations operating in accordance with the Radio Regulations. No. S5.43A does not apply. See Resolution 733 (WRC-2000).

S5.503 In the band 13.75-14 GHz, geostationary space stations in the space research service for which information for advance publication has been received by the Bureau prior to 31 January 1992 shall operate on an equal basis with stations in the fixed-satellite service; after that date, new geostationary space stations in the space research service will operate on a secondary basis. Until those geostationary space stations in the space research service for which information for advance publication has been received by the Bureau prior to 31 January 1992 cease to operate in this band:

a) the e.i.r.p. density of emissions from any earth station in the fixed-satellite service operating with a space station in geostationary-satellite orbit shall not exceed 71 dBW in the 6 MHz band from 13.772 to 13.778 GHz;

b) the e.i.r.p. density of emissions from any earth station in the fixed-satellite service operating with a space station in non-geostationary-satellite orbit shall not exceed 51 dBW in the 6 MHz band from 13.772 to 13.778 GHz.

Automatic power control may be used to increase the e.i.r.p. density in the 6 MHz band in this frequency range to compensate for rain attenuation, to the extent that the power-flux density at the fixed-satellite service space station does not exceed the value resulting from use by an earth station of an e.i.r.p. of 71 dBW or 51 dBW, as appropriate, in the 6 MHz band in clear-sky conditions.

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United States (US) Footnotes

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US355 In the band 10.7-11.7 GHz, non-geostationary satellite orbit licensees in the fixed-satellite service (space-to-Earth), prior to commencing operations, shall coordinate with the following radio astronomy observatories to achieve a mutually acceptable agreement regarding the protection of the radio telescope facilities operating in the band 10.6-10.7 GHz:

Observatory	West Longitude	North Latitude	Elevation
Arecibo Obs. ……..	..……66E 45N 110	..…18E 20N 460	…...……..496 m
Green Bank Telescope (GBT)……	..…...79E 50N 240	..…38E 25N 590	…...……..825 m
Very Large Array (VLA)……	..…107E 37N 040	..…34E 04N 440	…...……2126 m
Very Long Baseline Array (VLBA) Stations:			
Pie Town, NM……...	..…108E 07N 070	..…34E 18N 040	…...……2371 m
Kitt Peak, AZ…….	..…111E 36N 420	..…31E 57N 220	…...……1916 m
Los Alamos, NM……...	..…106E 14N 420	..…35E 46N 300	…...……1967 m
Ft. Davis, TX……	..…103E 56N 390	..…30E 38N 060	…...……1615 m
N. Liberty, IA……	..…...91E 34N 260	..…41E 46N 170	…...……..241 m
Brewster, WA……	..…119E 40N 550	..…48E 07N 530	…...……..255 m
Owens Valley, CA…….	..…118E 16N 340	..…37E 13N 540	…...……1207 m
St. Croix, VI……...	..…...64E 35N 030	..…17E 45N 310	…...……16 m
Hancock, NH…….	..…...71E 59N 120	..…42E 56N 010	…...……..309 m
Mauna Kea, HI……..	..…155E 27N 290	..…19E 48N 160	…...……3720 m

US356 In the band 13.75-14 GHz, an earth station in the fixed-satellite service shall have a minimum antenna diameter of 4.5 m and the e.i.r.p. of any emission should be at least 68 dBW and should not exceed 85 dBW. In addition the e.i.r.p., averaged over one second, radiated by a station in the radiolocation service towards the geostationary-satellite orbit shall not exceed 59 dBW. Receiving space stations in the fixed-satellite service shall not claim protection from radiolocation transmitting stations operating in accordance with the United States Table of Frequency Allocations. ITU Radio Regulation No. S5.43A does not apply.

US357 In the band 13.75-14 GHz, geostationary space stations in the space research service for which information for advance publication has been received by the ITU Radiocommunication Bureau (Bureau) prior to 31 January 1992 shall operate on an equal basis with stations in the fixed-satellite service; after that date, new geostationary space stations in the space research service will operate on a secondary basis. Until those geostationary space stations in the space research service for which information for advance publication has been received by the Bureau prior to 31 January 1992 cease to operate in this band:

a) the e.i.r.p. density of emissions from any earth station in the fixed-satellite service operating with a space station in geostationary-satellite orbit shall not exceed 71 dBW in any 6 MHz band from 13.77 to 13.78 GHz;

b) the e.i.r.p. density of emissions from any earth station in the fixed-satellite service operating with a space station in non-geostationary-satellite orbit shall not exceed 51 dBW in any 6 MHz band from 13.77 to 13.78 GHz.

Automatic power control may be used to increase the e.i.r.p. density in any 6 MHz band in these frequency ranges to compensate for rain attenuation, to the extent that the power flux-density at the fixed-satellite service space station does not exceed the value resulting from use by an earth station of an e.i.r.p. of 71 dBW or 51 dBW, as appropriate, in any 6 MHz band in clear-sky conditions.

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Non-Federal Government (NG) Footnotes

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NG104 The use of the bands 10.7-11.7 GHz (space-to-Earth) and 12.75-13.25 GHz (Earth-to-space) by the fixed-satellite service in the geostationary-satellite orbit shall be limited to international systems, i.e., other than domestic systems.

* * * * *

NG118 In the bands 2025-2110 MHz, 6875-7125 MHz, and 12.7-13.25 GHz, television translator relay stations may be authorized to use frequencies on a secondary basis to other stations in the Television Broadcast Auxiliary Service that are operating in accordance with the Table of Frequency Allocations.

* * * * *

NG143 In the band 11.7-12.2 GHz, protection from harmful interference shall be afforded to transmissions from space stations not in conformance with ITU Radio Regulation S5.488 only if the operations of such space stations impose no unacceptable constraints on operations or orbit locations of space stations in conformance with S5.488.

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PART 25-SATELLITE COMMUNICATIONS

5. The authority citation for Part 25 continues to read as follows:

AUTHORITY: 47 U.S.C. 701-744. Interprets or applies Sections 4, 301, 302, 303; 307, 309 and 332 of the Communications Act, as amended, 47 U.S.C. Sections 154, 301, 302, 303, 307, 309 and 332, unless otherwise noted.

6. Section 25.146 is added to Subpart B – Space Stations – to read as follows:

§ 25.146 Licensing and operating authorization provisions for the non-geostationary satellite orbit fixed-satellite service (NGSO FSS) in the bands 10.7 GHz to 14.5 GHz.

(a) A comprehensive technical showing shall be submitted for the proposed non-geostationary satellite orbit fixed-satellite service (NGSO FSS) system in the bands 10.7 GHz to 14.5 GHz. The technical information shall demonstrate that the proposed NGSO FSS system would not exceed the validation equivalent power flux-density (EPFD) limits as specified in § 25.208 (d), (h), and (i) for $EPFD_{down}$, and $EPFD_{up}$. If the technical demonstration exceeds the validation EPFD limits at any test points within the U.S. for domestic service and at any points outside of the U.S. for international service or at any points in the geostationary satellite orbit, as appropriate, the application would be unacceptable for filing and will be returned to the applicant with a brief statement identifying the non-compliance technical demonstration. The technical showing consists of the following:

(1) Single-entry validation equivalent power flux-density, in the space-to-Earth direction, ($EPFD_{down}$) limits:

(i) Provide a set of power flux-density (pfd) masks, on the surface of the Earth, for each space station in the NGSO FSS system. The pfd masks shall be generated in accordance with the specification stipulated in the ITU-R Recommendation BO.1503, "Functional Description to be used in Developing Software Tools for Determining Conformity of Non-GSO FSS Networks with Limits Contained in Article S22 of the Radio Regulations." In particular, the pfd mask must encompass the power flux-density radiated by the space station regardless of the satellite transmitter power resource allocation and traffic/beam switching strategy that are used at different periods of a NGSO FSS system life. The pfd masks shall also be in an electronic form that can be accessed by the computer program contained in paragraph (a)(1)(iii) of this section.

(ii) Identify and describe in detail the assumptions and conditions used in generating the power flux-density masks.

(iii) Provide a computer program for the single-entry $EPFD_{down}$ validation computation, including both the source code and the executable file. This computer program shall be developed in accordance with the specification stipulated in the ITU-R Recommendation BO.1503.

(iv) Identify and describe in detail the necessary input parameters for the execution of the computer program identified in paragraph (a)(1)(iii) of this section.

(v) Provide the result, the cumulative probability distribution function of EPFD, of the execution of the computer program described in paragraph (a)(1)(iii) of this section by using only the input parameters contained in paragraphs (a)(1)(i) and (a)(1)(iv) of this section. The result must contain the worst three (3) test points in the U.S. for domestic service and the worst three (3) test points on each continent, except Antarctica, outside of the U.S. for international services, and as many points as the number of service areas; i.e., foot-prints. The center of each beam service area should be the test point coordinate.

(2) Single-entry validation equivalent power flux-density, in the Earth-to-space direction, $EPFD_{up}$ limits:

(i) Provide a set of NGSO FSS earth station maximum equivalent isotropically radiated power (e.i.r.p.) mask as a function of the off-axis angle generated by a NGSO FSS earth station. The maximum e.i.r.p. mask shall be generated in accordance with the specification stipulated in the ITU-R Recommendation BO.1503. In particular, the results of calculations encompass what would be radiated regardless of the earth station transmitter power resource allocation and traffic/beam switching strategy are used at different periods of a NGSO FSS system life. The e.i.r.p. masks shall also be in an electronic form that can be accessed by the computer program contained in paragraph (a)(2)(iii) of this section.

(ii) Identify and describe in detail the assumptions and conditions used in generating the maximum earth station e.i.r.p. mask.

(iii) Provide a computer program for the single-entry $EPFD_{up}$ validation computation, including both the source code and the executable file. This computer program shall be developed in accordance with the specification stipulated in ITU-R Recommendation BO.1503.

(iv) Identify and describe in detail the necessary input parameters for the execution of the computer program identified in paragraph (a)(2)(iii) of this section.

(v) Provide the result of the execution of the computer program described in paragraph (a)(2)(iii) of this section by using only the input parameters contained in paragraphs (a)(2)(i) and (a)(2)(iv) of this section. The result must contain an $EPFD_{up}$ for every longitudinal location on the geostationary satellite orbit at every two-degree spacing that is visible to the U.S. for domestic service and every three-degree longitudinal location in the geostationary satellite orbit for service outside of the U.S.

(b) Ninety days prior to the initiation of service to the public, the NGSO FSS system licensee shall submit a comprehensive technical showing for the non-geostationary satellite orbit fixed-satellite service (NGSO FSS) system in the bands 10.7 GHz to 14.5 GHz. The technical information shall demonstrate that the NGSO FSS system is expected not to operate in excess of the additional operational $EPFD_{down}$ limits and the operational $EPFD_{down}$ limits as specified in §25.208 (f), (g) and notes 2 and 3 to the table in paragraph (i). If the technical demonstration exceeds the additional operational $EPFD_{down}$ limits or the operational $EPFD_{down}$ limits at any test points with the U.S. for domestic service and at any test points out side of the U.S. for international service, the NGSO FSS system licensee shall not initiate service to the public until the deficiency has been rectified by reducing satellite transmission power or other adjustments. This must be substantiated by subsequent technical showings. The technical showings consist of the following:

(1) Single-entry additional operational equivalent power flux-density, in the space-to-Earth direction, (additional operational $EPFD_{down}$) limits:

(i) Provide a set of anticipated operational power flux-density (pfd) masks, on the surface of the Earth, for each space station in the NGSO FSS system. The anticipated operational power flux-density masks could be generated by using the method specified in ITU-R Recommendation BO.1503. In particular, the anticipated operational pfd mask shall take into account the expected maximum traffic loading distributions and geographic specific scheduling of the actual measured space station antenna

patterns (see §25.210(k)). The anticipated operational power flux-density masks shall also be in an electronic form that can be accessed by the computer program contained in paragraph (b)(1)(iii) of this section.

(ii) Identify and describe in detail the assumptions and conditions used in generating the anticipated operational power flux-density masks.

(iii) Provide a computer program for the single-entry additional operational $EPFD_{down}$ verification computation, including both the source code and the executable file. This computer program could be developed by using the method specified in ITU-R Recommendation BO.1503.

(iv) Identify and describe in detail the necessary input parameters for the execution of the additional operational $EPFD_{down}$ verification computer program identified in paragraph (b)(1)(iii) of this section.

(v) Provide the result, the cumulative probability distribution function of EPFD, of the execution of the verification computer program described in paragraph (b)(1)(iii) of this section by using only the input parameters contained in paragraphs (b)(1)(i) and (b)(1)(iv) of this section. The result must contains the worst three (3) test points in the U.S. for domestic service and the worst three (3) test points in each continent, excluding Antarctica, out side of the U.S. for international service plus as many points as the number of service areas; i.e., foot-prints. The center of each beam service area should be the test point coordinate.

(2) Operational equivalent power flux-density, space-to-Earth direction, (operational $EPFD_{down}$) limits. Using the information contained in (b)(1) of this section plus the measured space station antenna patterns, provide the result of the execution of the computer simulation for the anticipated in-line operational $EPFD_{down}$ levels for the 3.0, 4.5, 6.2 and 10 m GSO FSS receiving earth station antennas having an efficiency of 65%. The result must contain the worst three (3) test points in the U.S. for domestic service and the worst three (3) test points per continent, exclude Antarctica, out side of the U.S. for international service plus as many points as the number of service areas; i.e., foot-prints. The center of each beam service area should be the test point coordinate. In addition, also using the information contained in (b)(1) of this section plus the measured space station antenna patterns, provide the result of the execution of the computer simulation for the anticipated in-line operational $EPFD_{down}$ levels for the 180 cm GSO BSS receiving earth station antennas in Hawaii, and for 240 cm GSO BSS receiving earth station antennas in Alaska, assuming an efficiency of 65%. The result must contain the worst test point in Alaska and Hawaii, plus as many points as the number of service areas; i.e., foot-prints in these areas, using the center of each beam service area should be the test point coordinate.

(c) The NGSO FSS system licensee shall, on June 30 of each year, file a report with the International Bureau and the Commission's Columbia Operations Center in Columbia, Maryland, certifying the status of the additional operational $EPFD_{down}$ levels into the 3 m and 10 m GSO FSS receiving earth station antennas, the operational $EPFD_{down}$ levels into the 3 m, 4.5 m, 6.2 m and 10 m GSO FSS receiving earth station antennas and the operational $EPFD_{down}$ levels into the 180 cm GSO BSS receiving earth station antennas in Hawaii and 240 GSO BSS receiving earth station antennas Alaska.

(d) The Commission may request at any time additional information from the NGSO FSS system applicant or licensee concerning the EPFD levels and the related technical showings.

(e) A NGSO FSS system licensee operating a system in compliance with the limits specified in §25.208 (d), (f), (g), (h), (i) and (j) shall be considered as having fulfilled its obligations under ITU Radio Regulations provision S22.2 with respect to any GSO network. However, such NGSO FSS system shall not claim protection from GSO FSS and BSS networks operating in accordance with Part 25 or Part 100, respectively, and the ITU Radio Regulations.

(f) Coordination will be required between NGSO FSS systems and GSO FSS earth stations in the frequency band 10.7-12.75 GHz when all of the following threshold conditions are met:

(i) bandwidth overlap; and

(ii) the satellite network using the GSO has specific receive earth stations which meet all of the following conditions: earth station antenna maximum isotropic gain greater than or equal to 64 dBi; G/T of 44 dB/K or higher; and emission bandwidth of 250 MHz; and the $EPFD_{down}$ radiated by the satellite system using the NGSO into the GSO specific receive earth station, either within the U.S. for domestic service or any points outside the U.S. for international service, exceeds -174.5 dB(W/(m^2/40 kHz)) for any

percentage of time for NGSO systems with all satellites only operating at or below 2500 km altitude, or –202 dB(W/(m^2/40 kHz)) for any percentage of the time for NGSO systems with any satellites operating above 2500 km altitude

7. Section 25.201 is amended by adding the following definitions:

§ 25.201 Definitions.

* * * * *

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

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

where:

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

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

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

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

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

d_i is the distance in meters between the transmit station considered in the non-geostationary satellite orbit system and the GSO receive station;

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

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

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

* * * * *

Gateway earth station. A gateway earth station is an earth station complex consisting of multiple interconnecting earth station antennas supporting the communication routing and switching functions of a non-geostationary satellite orbit fixed-satellite service (NGSO FSS) system as a whole. A gateway earth station in the NGSO FSS: (1) does not originate or terminate radiocommunication traffic, but interconnects multiple non-collocated user earth stations operating in frequency bands other than designated gateway bands, through a satellite with other primary terrestrial networks, such as the public switched telephone network (PSTN) and/or Internet networks; (2) is prohibited from connecting directly with a private communication network; (3) may also be used for telemetry, tracking, and command transmissions for the same NGSO FSS system; (4) may include multiple antennas, each required to meet the antenna performance standard in Section 25.209(h), located within an area of one second latitude by one second

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

* * * * *

8. Section 25.202(a)(1) is revised to read as follows:

§ 25.202 Frequencies, frequency tolerance and emission limitations.

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

Space-to-Earth (GHz)	Earth-to-space (GHz)
3.7-4.2 [1]	5.925-6.425 [1]
10.7-10.95 [1, 12]	12.75-13.15 [1, 12]
10.95-11.2 [1, 2, 12]	13.2125-13.25 [1, 12]
11.2-11.45 [1, 12]	13.75-14 [4, 12]
11.45-11.7 [1, 2, 12]	14-14.2 [5]
11.7-12.2 [3]	14.2-14.5
12.2-12.7 [13]	17.3-17.8 [9]
18.3-18.58 [1, 10]	27.5-29.5 [1]
18.58-18.8 [6, 10, 11]	29.5-30
18.8-19.3 [7, 10]	48.2-50.2
19.3-19.7 [8, 10]	
19.7-20.2 [10]	
37.6-38.6	
40-41	

[1] This band is shared coequally with terrestrial radiocommunication services.
[2] Use of this band by geostationary satellite orbit satellite systems in the fixed-satellite service is limited to international systems; i.e., other than domestic systems.
[3] Fixed-satellite transponders may be used additionally for transmissions in the broadcasting-satellite service.
[4] This band is shared on an equal basis with the Government radiolocation service and grandfathered space stations in the Tracking and Data Relay Satellite System.
[5] In this band, stations in the radionavigation service shall operate on a secondary basis to the fixed-satellite service.
[6] The band 18.58-18.8 GHz is shared co-equally with existing terrestrial radiocommunication systems until June 8, 2010.
[7] The band 18.8-19.3 GHz is shared co-equally with terrestrial radiocommunication services, until June 8, 2010. After this date, the sub-band 19.26-19.3 GHz is shared co-equally with existing terrestrial radiocommunication systems.
[8] The use of the band 19.3-19.7 GHz by the fixed-satellite service (space-to-Earth) is limited to feeder links for the mobile-satellite service.
[9] The use of the band 17.3-17.8 GHz by the fixed-satellite service (Earth-to-space) is limited to feeder links for broadcasting-satellite service, and the sub-band 17.7-17.8 GHz is shared co-equally with terrestrial fixed services.
[10] This band is shared co-equally with the Federal Government fixed-satellite service.
[11] The band 18.6-18.8 GHz is shared co-equally with the non-Federal Government and Federal Government Earth exploration-satellite (passive) and space research (passive) services.
[12] Use of this band by non-geostationary satellite orbit systems in the fixed-satellite service is limited to gateway earth station operations.
[13] Use of this band by the fixed-satellite service is limited to non-geostationary satellite orbit systems.

* * * * *

9. Section 25.203 is amended by revising paragraphs (b), (c), and (d) to read as follows:

§ 25.203 Choice of sites and frequencies.

* * * *

(b) An applicant for an earth station authorization in a frequency band shared with equal rights with terrestrial microwave services shall compute the great circle coordination distance contour(s) for the proposed station in accordance with the procedures set forth in § 25.251. The applicant shall submit with the application a map or maps drawn to appropriate scale and in a form suitable for reproduction indicating the location of the proposed station and these contours. These maps, together with the pertinent data on which the computation of these contours is based, including all relevant transmitting and/or receiving parameters of the proposed station that is necessary in assessing the likelihood of interference, an appropriately scaled plot of the elevation of the local horizon as a function of azimuth, and the electrical characteristics of the earth station antenna(s), shall be submitted by the applicant in a single exhibit to the application. The coordination distance contour plot(s), horizon elevation plot, and antenna horizon gain plot(s) required by this section may also be submitted in tabular numerical format at 5° azimuthal increments instead of graphical format. At a minimum, this exhibit shall include the information listed in paragraph (c)(2) of this section. An earth station applicant shall also include in the application relevant technical details (both theoretical calculations and/or actual measurements) of any special techniques, such as the use of artificial site shielding, or operating procedures or restrictions at the proposed earth station which are to be employed to reduce the likelihood of interference, or of any particular characteristics of the earth station site which could have an effect on the calculation of the coordination distance.

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

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

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

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

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

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

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

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

(vi) Horizon elevation plot,

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

(viii) Minimum elevation angle,

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

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

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

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

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

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

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

(d) An applicant for an earth station authorization shall also ascertain whether the great circle coordination distance contours and rain scatter coordination distance contours, computed for those values of parameters indicated in §25.251 (Appendix S7 of the ITU RR) for international coordination, cross the boundaries of another Administration. In this case, the applicant shall furnish the Commission copies of these contours on maps drawn to appropriate scale for use by the Commission in effecting coordination of the proposed earth station with the Administration(s) affected.

* * * * *

10. Section 25.204(f) is amended to read as follows:

§ 25.204 Power limits.

* * * * *

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

11. Section 25.208 is amended by revising paragraph (b) and adding new paragraphs (d), (e), (f), (g), (h), (i), and (j) to read as follows:

§ 25.208 Power flux density limits.

* * * * *

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

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

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

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

* * * * *

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

Table 1D: Single-Entry $EPFD_{down}$ limits for protection of 0.6, 1.2, 3 and 10 meter GSO FSS earth station antennas [1, 2]

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

[1] In addition to the limits shown in this table, the single-entry $EPFD_{down}$ shown in the following table in this paragraph apply to all antenna sizes greater than 60 cm in the frequency bands listed in this table.

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

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

Table 2D: Single-entry $EPFD_{down}$ limits radiated by non-GSO FSS systems at certain latitudes

100% of the time $EPFD_{down}$ dB(W/(m^2/40 kHz))	Latitude (North or South in degrees)
-160	$0 < \|Latitude\| \leq 57.5$
-160 + 3.4(57.5 - |Latitude|)/4	$57.5 < \|Latitude\| \leq 63.75$
-165.3	$63.75 \leq \|Latitude\|$

Note to paragraph d: These limits relate to the equivalent power flux density, which would be obtained under free-space propagation conditions, for all conditions and for all methods of modulation.

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

Table 1E: Aggregate $EPFD_{down}$ limits for protection of 0.6, 1.2, 3, and 10 meter GSO FSS earth station antennas[1]

Frequency band (GHz) For International Allocations	Aggregate $EPFD_{down}$ dB(W/m^2)	Percentage of time during which $EPFD_{down}$ may not be exceeded	Reference bandwidth (kHz)	Reference antenna diameter, and reference radiation pattern[2]
10.7-11.7 in all Regions; 11.7-12.2 in Region 2; 12.2-12.5 in Region 3; and 12.5-12.75 in Regions 1 and 3	–170 –168.6 –165.3 –160.4 –160 –160	0 90 99 99.97 99.99 100	40	60 cm Recommendation ITU-R S.1428
	–176.5 –173 –164 –161.6 –161.4 –160.8 –160.5 –160 –160	0 99.5 99.84 99.945 99.97 99.99 99.99 99.9975 100	40	1.2 m Recommendation ITU-R S.1428
	–185 –184 –182 –168 –164 –162 –160 –160	0 90 99.5 99.9 99.96 99.982 99.997 100	40	3 m Recommendation ITU-R S.1428
	–190 –190 –166 –160 –160	0 99 99.99 99.998 100	40	10 m Recommendation ITU-R S.1428

[1] In addition to the limits shown in this table, the aggregate $EPFD_{down}$ limits shown in the following table in this paragraph apply to all antenna sizes greater than 60 cm in the frequency bands shown in this table.

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

Table 2E: Aggregate $EPFD_{down}$ limits radiated by non-GSO FSS systems at certain latitudes

100% of the time $EPFD_{down}$ dB(W/(m^2/40 kHz))	Latitude (North or South in degrees)
-160	$0 < \|Latitude\| \leq 57.5$
-160 + 3.4(57.5 - |Latitude|)/4	$57.5 < \|Latitude\| \leq 63.75$
-165.3	$63.75 \leq \|Latitude\|$

Note to paragraph e: These limits relate to the equivalent power flux density, which would be obtained under free-space propagation conditions, for all conditions and for all methods of modulation.

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

Additional operational limits on the $EPFD_{down}$ radiated by non-GSO FSS systems into 3 m and 10 m GSO FSS earth station antennas

$EPFD_{down}$ dB(W/(m^2/40 kHz))	Percentage of time during which $EPFD_{down}$ may not be exceeded	Receive GSO earth station antenna diameter (m)
–182	99.9	3
–179	99.94	
–176	99.97	
–171	99.98	
–168	99.984	
–165	99.993	
–163	99.999	
–161.25	99.99975	
–161.25	100	
–185	99.97	10
–183	99.98	
–179	99.99	
–175	99.996	
–171	99.998	
–168	99.999	
–166	99.9998	
–166	100	

Note to paragraph f: These limits relate to the equivalent power flux density, which is obtained under free-space propagation conditions, for all conditions and for all methods of modulation.

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

Operational limits to the $EPFD_{down}$ radiated by non-GSO FSS systems in certain frequency bands[1]

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

[1] The operational limits on the $EPFD_{down}$ radiated by non-GSO FSS systems shall be the values given in note 1 to the table in paragraph (d) or this table, whichever are the more stringent.

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

Note to paragraph g: These limits relate to the operational equivalent power flux-density which would be obtained under free-space propagation conditions, for all conditions, for all methods of modulation and for the specified inclined GSO FSS operations.

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

Limits to the $EPFD_{up}$ radiated by NGSO FSS systems in certain frequency bands				
Frequency band (GHz) for International Allocations	$EPFD_{up}$ $dB(W/m^2)$	Percentage of time during which $EPFD_{up}$ may not be exceeded	Reference bandwidth (kHz)	Reference antenna beamwidth and reference radiation pattern[1]
12.5-12.75 12.75-13.25 13.75-14.5	-160	100	40	4° ITU-R S.672-4, Ls = -20

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

Note to paragraph h: These limits relate to the uplink equivalent power flux density, which would be obtained under free-space propagation conditions, for all conditions and for all methods of modulation.

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

Single-Entry $EPFD_{down}$ limits for protection of 30, 45, 60, 90, 120, 180, 240 and 300 cm GSO BSS earth station antennas [1, 2, 3]

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

	–182.44 –180.69 –179.19 –178.44 –174.94 –173.75 –173 –169.5 –167.8 –164 –161.9 –161 –160.4 –160	0 90 98.9 98.9 99.5 99.68 99.68 99.85 99.915 99.94 99.97 99.99 99.998 100	40	120 cm Recommendation ITU-R BO.1443 Annex1
	–184.941 –184.101 –181.691 –176.25 –163.25 –161.5 –160.35 –160 –160	0 33 98.5 99.571 99.946 99.974 99.993 99.999 100	40	180 cm [3] Recommendation ITU-R BO.1443 Annex 1
	–187.441 –186.341 –183.441 –178 –164.4 –161.9 –160.5 –160 –160	0 33 99.25 99.786 99.957 99.983 99.994 99.999 100	40	240 cm [2] Recommendation ITU-R BO.1443 Annex 1
	–191.941 –189.441 –185.941 –180.5 –173 –167 –162 –160 –160	0 33 99.5 99.857 99.914 99.951 99.983 99.991 100	40	300 cm Recommendation ITU-R BO.1443 Annex 1

[1] For BSS antenna diameters 180 cm, 240 cm and 300 cm, in addition to the single-entry limits shown in this table, the following table for single-entry 100% of the time $EPFD_{down}$ limits also applies in the frequency band listed:

Single-Entry $EPFD_{down}$ limits radiated by non-GSO FSS systems at certain latitudes

100% of the time $EPFD_{down}$ dB(W/(m^2/40 kHz))	Latitude (North or South in degrees)
-160.0	$0 \leq \lvert \text{latitude} \rvert \leq 57.5$
-160.0 + 3.4 * (57.5 – $\lvert$latitude$\rvert$)/4	$57.5 \leq \lvert \text{latitude} \rvert \leq 63.75$
-165.3	$63.75 \leq \lvert \text{latitude} \rvert$

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

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

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

Note to paragraph i: These limits relate to the equivalent power flux density, which would be obtained under free-space propagation conditions, for all conditions and for all methods of modulation.

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

Aggregate $EPFD_{down}$ limits for protection of 30, 45, 60, 90, 120, 180, 240 and 300 cm GSO BSS earth station antennas [1, 2, 3]

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

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

[1] For BSS antenna diameters 180 cm, 240 cm and 300 cm, in addition to the aggregate limit shown in this table, the following table of aggregate 100% of the time $EPFD_{down}$ limit also applies:

100% of the time $EPFD_{down}$ dB($W/(m^2/40$ kHz))	Latitude (North or South in degrees)
-160.0	$0 \leq \lvert \text{latitude} \rvert \leq 57.5$
$-160.0 + 3.4\ (57.5 - \lvert \text{latitude} \rvert)/4$	$57.5 \leq \lvert \text{latitude} \rvert \leq 63.75$
-165.3	$63.75 \leq \lvert \text{latitude} \rvert$

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

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

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

Note to paragraph j: These limits relate to the equivalent power flux density, which would be obtained under free-space propagation conditions, for all conditions and for all methods of modulation.

12. Section 25.209 is amended by revising paragraph (a) and adding new paragraph (h) to read as follows:

§ 25.209 Antenna performance standards.

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

* * * * *

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

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

where θ is the angle in degrees from the axis of the main lobe, and dBi refers to dB relative to an isotropic radiator. For the purposes of this section, the peak gain of an individual sidelobe may not exceed the envelope defined above.

13. Section 25.212, the section heading is revised to read as follows:

§ 25.212 Narrowband transmissions in the 12/14 GHz GSO Fixed-Satellite Service.

* * * * *

14. Section 25.251 is amended by revising paragraphs (a) and (b).

§ 25.251 Special requirements for coordination.

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

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

15. Section 25.271 is amended by adding new paragraph (e).

§ 25.271 Control of transmitting stations.

* * * * *

(e) The licensee of an NGSO FSS system operating in the 10.7-14.5 GHz bands shall maintain an electronic web site bulletin board to list the satellite ephemeris data, for each satellite in the constellation, using the North American Aerospace Defense Command (NORAD) two-line orbital element format. The orbital elements shall be updated at least once every three days.

APPENDIX B: FINAL REGULATORY FLEXIBILITY ANALYSIS

As required by the Regulatory Flexibility Act (RFA),[1] an Initial Regulatory Flexibility Analysis (”IRFA”) was incorporated in the *Notice of Proposed Rule Making* (“*NPRM*”) in ET Docket No. 98-206.[2] The Commission sought written public comment on the proposals in the *NPRM*, including comment on the IRFA. This Final Regulatory Flexibility Analysis (“FRFA”) conforms to the RFA.[3] In addition to the issues discussed below, the IRFA addressed Northpoint Technology Ltd.’s proposal to allow terrestrial operations to use the 12.2-12.7 GHz band for the provision of MVPD services and data services.

A. Need for, and Objectives of, the Report and Order

In this First Report and Order, we permit NGSO FSS operations in certain segments of the 10.7-14.5 GHz frequency band range, and adopt rules and policies to govern such operations. More specifically, we amend Parts 2 and 25 of our rules to permit NGSO FSS space-to-earth links ("downlinks") to operate in the 10.7-12.7 GHz band and for NGSO earth-to-space links ("uplinks") to operate in the 12.75-13.15 GHz, 13.2125-13.25 GHz and 13.8-14.5 GHz bands. These downlink bands are generally used by geostationary-satellite orbit ("GSO") FSS and fixed services. The uplink bands are used by GSO FSS operations, fixed services, mobile services, and Government operations. We also permit a new terrestrial Multichannel Video Distribution and Data Service (MVDDS) to operate in the 12.2-12.7 GHz band, but defer services and technical rules for the MVDDS to our companion Further Notice of Proposed Rule Making.

These new satellite and terrestrial operations can increase competition and provide new advanced services to the public. Specifically, NGSO FSS systems can provide new high-speed data services and offer additional competition to other satellite services, and terrestrial wireless and wireline services. The MVDDS can provide local television and data services and provide additional competition to both cable and Direct Broadcast Satellite (DBS) systems. There is, however, extensive use of the requested frequency bands in the United States and these incumbent operations provide important and valuable services to the public that we must protect. By this action, we provide for the introduction of new advanced services to the public, while permitting incumbent services to operate without harmful interference.

B. Summary of Significant Issues Raised by Public Comments In Response to the IRFA

No comments were submitted in response to the IRFA.

C. Description and Estimate of the Number of Small Entities To Which Rules Will Apply

The RFA generally defines the term "small entity " as having the same meaning as the terms "small business," "small organization," and "small governmental jurisdiction."[4] In addition, the term "small

[1] *See* 5 U.S.C. § 603. The RFA, *see* 5 U.S.C. § 601 *et. seq.*, has been amended by the Contract With America Advancement Act of 1996, Pub. L. No. 104-121, 110 Stat. 847 (1996) (CWAAA). Title II of the CWAAA is the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA).

[2] *See Notice of Proposed Rule Making*, ET Docket No. 98-206, 14 FCC Rcd. 1131, 1194 (1998).

[3] *See* 5 U.S.C. § 604.

[4] *Id*. § 601(6).

business" has the same meaning as the term "small business concern" under the Small Business Act.[5] A small business concern is one which: (1) is independently owned and operated; (2) is not dominant in its field of operation; and (3) satisfies any additional criteria established by the Small Business Administration ("SBA").[6] A small organization is generally "any not-for-profit enterprise which is independently owned and operated and is not dominant in its field."[7]

Regarding incumbent cable television operations in the 12.75-13.25 GHz band, the SBA has developed a definition of small entities for cable and other pay television services, which includes all such companies generating $11 million or less in revenue annually. This definition includes cable systems operators, closed circuit television services, DBS services, multipoint distribution systems, satellite master antenna systems and subscription television services. According to the Census Bureau, there were 1,788 total cable and other pay television services and 1,423 had less than $11 million in revenue.

The Communications Act also contains a definition of a small cable system operator, which is "a cable operator that, directly or through an affiliate, serves in the aggregate fewer than 1 percent of all subscribers in the United States and is not affiliated with any entity or entities whose gross annual revenues in the aggregate exceed $250,000,000." The Commission has determined that there are 61,700,000 subscribers in the United States. Therefore, we found that an operator serving fewer than 617,000 subscribers shall be deemed a small operator, if its annual revenues, when combined with the total annual revenues of all of its affiliates, do not exceed $250 million in the aggregate. Based on available data, we find that the number of cable operators serving 617,000 subscribers or less totals 1,450. We did not request nor did we collect information concerning whether cable system operators are affiliated with entities whose gross annual revenues exceed $250,000,000, and thus are unable at this time to estimate with greater precision the number of cable system operators that would qualify as small cable operators under the definition in the Communications Act.

Regarding incumbent GSO FSS satellite use and the proposed NGSO FSS use in these requested bands, the Commission has not developed a definition of small entities applicable to geostationary or non-geostationary orbit fixed-satellite service applicants or licensees. Therefore, the applicable definition of small entity is the definition under the Small Business Administration (SBA) rules applicable to Communications Services, Not Elsewhere Classified. This definition provides that a small entity is one with $11.0 million or less in annual receipts.[8] According to Census Bureau data, there are 848 firms that fall under the category of Communications Services, Not Elsewhere Classified, which could potentially fall into the geostationary or non-geostationary orbit fixed-satellite service category. Of those, approximately 775 reported annual receipts of $11 million or less and qualify as small entities.[9] Generally, these NGSO and GSO FSS systems cost several millions of dollars to construct and operate. Therefore the NGSO and GSO FSS companies, or their parent companies, rarely qualify under this definition as a small entity.

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[5] *See* 5 U.S.C. § 601(3) (incorporating by reference the definition of "small business concern" in 15 U.S.C. § 632). Pursuant to the RFA, the statutory definition of a small business applies "unless an agency, after consultation with the Office of Advocacy of the Small Business Administration and after opportunity for public comment, establishes one or more definitions of such term which are appropriate to the activities of the agency and publishes such definition(s) in the Federal Register." 5 U.S.C. § 601(3).

[6] *See* Small Business Act, 15 U.S.C. § 632 (1996).

[7] *See* 5 U.S.C. § 601(4).

[8] *See* 13 C.F.R. § 121.201, Standard Industrial Classification (SIC) Code 4899.

[9] U.S. Bureau of Census, U.S. Department of Commerce, 1992 Census of Transportation, Communications, Utilities, UC92-S-1, Subject Series, Establishment and Firm Size, Table 2D, Employment Size of Firms: 1992, SIC Code 4899 (issued May 1995).

Regarding Auxiliary, Special Broadcast and other program distribution services in the Ku-band. This service involves a variety of transmitters, generally used to relay broadcast programming to the public (through translator and booster stations) or within the program distribution chain (from a remote news-gathering unit back to the station). The Commission has not developed a definition of small entities applicable to Broadcast Auxiliary Station (BAS) licensees. Therefore, the applicable definition of small entity is the definition under the Small Business Administration (SBA) rules applicable to radio broadcasting stations (SIC 4832) and television broadcasting stations (SIC 4833). These definitions provide, respectively, that a small entity is one with either $5.0 million or less in annual receipts or $10.5 million in annual receipts. 13 C.F.R. § 121.201, SIC Codes 4832 and 4833. There are currently 3,237 FM translators and boosters, and 2,964 TV translators. The FCC does not collect financial information on any broadcast facility and the Department of Commerce does not collect financial information on these auxiliary broadcast facilities. We believe, however, that most, if not all, of these auxiliary facilities could be classified as small businesses by themselves. We also recognize that most translators and boosters are owned by a parent station which, in some cases, would be covered by the revenue definition of small business entity discussed above. These stations would likely have annual revenues that exceed the SBA maximum to be designated as a small business (as noted, either $5 million for a radio station or $10.5 million for a TV station). Furthermore, they do not meet the Small Business Act's definition of a "small business concern" because they are not independently owned and operated.

Incumbent microwave services in the 10.7-11.7 GHz and 12.75-13.25 GHz bands include common carrier, private operational fixed, and BAS services. At present, there are 22,015 common carrier licensees, approximately 61,670 private operational fixed licensees and broadcast auxiliary radio licensees in the microwave services. Inasmuch as the Commission has not yet defined a small business with respect to microwave services, we will utilize the SBA's definition applicable to radiotelephone companies; *i.e.*, an entity with no more than 1,500 persons. 13 C.F.R. § 121.201, SIC Code 4812. We estimate, for this purpose, that all of the Fixed Microwave licensees (excluding broadcast auxiliary licensees) would qualify as small entities under the SBA definition for radiotelephone companies.

D. Description of Projected Reporting, Recordkeeping, and Other Compliance Requirements

We will apply the Part 25 rules governing reporting requirements for NGSO FSS systems. Specifically, licensees are required to file an annual report with the Commission describing: the status of satellite construction and anticipated launch dates, including any major delays or problems encountered; a listing of any unscheduled satellite outages for more than 30 minutes including the cause(s) of any such outages; and a detailed description of the utilization made of each satellite on each of the in-orbit satellites.

E. Steps Taken to Minimize Significant Economic Impact on Small Entities, and Significant Alternatives Considered

The Commission adopts technical rules to facilitate spectrum sharing between new NGSO FSS systems in the Ku band and existing services in this spectrum. These technical rules are intended to allow new entrants into the spectrum without causing unacceptable interference to existing and future operations of incumbent services. We acknowledge that as the radio spectrum is increasingly used, it becomes more difficult to accommodate all requests for access to the radio spectrum, however, this action applies existing frequency coordination procedures to NGSO FSS systems sharing spectrum with fixed services. Frequency coordination should ensure that new operations of either service will protect existing operations and have access to spectrum if it is technically possible.

The Commission also considered a proposal from the Fixed Service (FS) community to set aside some portion of the spectrum in the 10.7-11.7 GHz band for future FS deployment. The Commission declined this set aside because NGSO FSS and fixed systems should be able to coordinate operations and such an action would not lead to the most effective use of the spectrum. Additionally, in its comments and in a Petition for Rule Making, the fixed community requested that we change some aspects of the coordination

and licensing procedures of FSS operations that share spectrum with fixed services. Because the issues raised by the fixed community address several spectrum bands which are not under consideration in this proceeding, we deferred on these issues to another proceeding that will address all these issues before NGSO FSS systems are licensed for this band.

Regarding sharing between NGSO FSS systems and broadcast auxiliary ("BAS") operations, the Report and Order states that it will adopt some form of geographic protection areas for terrestrial operations in those bands used by NGSO FSS gateway stations. These protection areas will be defined in a future proceeding, but are intended to facilitate the growth of terrestrial operations, while not unnecessarily hindering the deployment of NGSO FSS systems. Further, to ensure BAS operations in all areas can continue to operate unencumbered by new NGSO FSS systems, the Report and Order set aside 4 BAS channels for exclusive use in all areas to ensure continued operations.

Report to Congress: The Commission will send a copy of the Report and Order, including this FRFA, in a report to be sent to Congress pursuant to the Small Business Regulatory Enforcement Fairness Act of 1996, *see* 5 U.S.C. § 801(a)(1)(A). In addition, the Commission will send a copy of the Report and Order including FRFA, to the Chief Counsel for Advocacy of the Small Business Administration. A copy of the Report and Order and FRFA (or summaries thereof) will also be published in the Federal Register. *See* 5 U.S.C. § 604(b).

APPENDIX C: NGSO FSS SYSTEM APPLICATIONS

Boeing **File No.: SAT-LOA-19990108-00006**

Boeing has filed an application for authority to launch and operate a global constellation of NGSO FSS satellites. The proposed Boeing system consists of a twenty-satellite constellation operating at a medium earth orbit of 20,182 kilometers. The constellation consists of four orbital planes with five satellites per plane, inclined 57 degrees relative to the equator. Boeing request authority to operate its NGSO FSS system within the 12.75-13.25 GHz and 13.75-14.5 GHz bands for uplinks and within the 10.7-12.7 GHz band for downlinks. Specifically, Boeing proposes to use 326 MHz of service uplink spectrum and 1000 MHz of service downlink spectrum. Boeing also requests 600 MHz of spectrum for feeder uplinks and 1000 MHz for feeder downlinks. Boeing proposes to provide "bandwidth on demand" communication and data services. In addition, Boeing requests a waiver of Section 2.106 of the Commission's Rules in order to provide, on a secondary, non-interference basis, ancillary two-way data transmission services to user terminals affixed to mobile platforms.

Hughes **File No.: SAT-LOA-19990108-00002**

Hughes has filed an application for authority to launch and operate a global Ku-band broadband satellite system called HughesLINK (H-LINK). The proposed system consists of twenty-two NGSO satellites, operating in medium-earth orbits at an altitude of 15,000 kilometers. Eight satellites are in an equatorial-plane and seven are each of two planes, inclined at 45 degrees. The proposed H-LINK system requests to operate in one gigahertz of spectrum within the 10.7-12.7 GHz band in Region 2 and the 10.7-12.75 GHz band in Regions 1 and 3 for downlinks and one gigahertz within the 12.75-13.25 GHz, 13.75-14.5, and 17.3-17.8 GHz (Regions 1 and 3 only) bands for uplinks. Inter-satellite links are proposed in optical frequency bands. H-LINK proposes to offer a wide variety of two-way, broadband services at data rates from 1.54 Mbps up to 155 Mbps, backbone infrastructure and Virtual Private Network.

Hughes **File No.: SAT-LOA-19990108-00003**

Hughes has filed an application for authority to launch and operate a global Ku-band broadband satellite system called HughesNET (H-Net). The proposed system consists of a seventy NGSO satellite constellation operating at an altitude of 1490 kilometers. The constellation consists of ten planes, with seven satellites each, inclined at 54.5 degrees. H-Net proposes to operate in one gigahertz of spectrum within the 10.7-12.7 GHz band in Region 2 and the 10.70-12.75 GHz band in Regions 1 & 3 for downlinks and one gigahertz within the 12.75-13.25 GHz, 13.75-14.5, and 17.3-17.8 GHz bands (Regions 1 & 3 only) for uplinks. Optical inter-satellite link terminals are proposed for inter-operation with other satellites in the H-Net constellation. H-Net proposes to offer Internet access and support to both packet-switched and circuit-switched operation.

SkyBridge **File Nos.: SAT-AMD-1998-0630-00056**
SAT-AMD-19990108-00004

SkyBridge has filed amendments to its pending applications for authority to launch and operate a global network of NGSO satellites. (*See* Public Notice, Report No. SPB-98, August 28, 1997 (accepting for filing the SkyBridge application, as amended by the 1997 Amendment); Public Notice, Report No. SPB-133, July 20, 1998 (accepting for filing the 1998 Amendment.) SkyBridge proposes several changes and clarifications to the SkyBridge application, as amended by the 1997 Amendment. SkyBridge, among other things, proposes to change the number of satellites in its system from sixty-four to eighty, revises its link budgets, revises frequency usage requirements and states it requires at least 2 GHz of contiguous spectrum for downlinks and at least 1.65 GHz for uplinks. SkyBridge also submitted a series of

simulations that SkyBridge claims demonstrates its amended system's ability to meet the relevant provisional power limits adopted at the WRC-97.[10]

Teledesic **File No.: SAT-LOA-19990108-0005**

Teledesic has filed an application for authority to construct, launch, and operate a global constellation of NGSO FSS satellites. Teledesic's proposed system, to be known as the Ku-Band Supplement (KuBS) system, will be comprised of thirty satellites, in six orbital planes with five satellites operating at an altitude of approximately 10,320 kilometers. Teledesic requests to operate its KuBS satellites in the 12.75-13.25 GHz, 13.75-14.5 GHz, and 17.3-17.8 GHz bands for uplinks and the 10.7-12.7 GHz bands for downlinks. Teledesic also proposes to operate a separate backup TT&C in standard C-band TT&C frequencies. Teledesic proposes to operate the KuBS constellation primarily as a high-bandwidth supplement to its Teledesic Network system authorized in the Ka-band (20/30GHz). Teledesic proposes to provide FSS on a primary basis but requests authority to provide MSS on an ancillary, non-interference basis.

Virgo **File No.: SAT-LOA-19990108-00007**

Virgo has filed an application for authority to launch and operate a global constellation of non-geostationary satellites operating in the FSS. The proposed system, VIRGO, consists of fifteen NGSO satellites operating in highly elliptical orbits operating at an altitude of 27,300 kilometers at apogee. Virgo proposes to operate with user uplinks in 14.0-14.5 GHz band and user downlinks in the 11.2-12.7 GHz band. Gateway links are proposed in the 12.75-13.25 GHz, 13.8-14.0 GHz, 17.3-17.8 GHz, and 5.925-6.725 GHz bands for uplinks and the 10.7-11.2 GHz and 3.7-4.2 GHz bands for downlinks. Inter-satellite links are proposed in optical frequency bands. Virgo proposes to provide high speed Internet access and direct-to-home data and video services to small user terminals in most areas of the world.

In addition, as noted in the *Ku-Band Cut-Off Notice*, the following two applications were filed in response to prior Bureau cut-off notices involving frequency bands different than those identified in the *Ku-band Cut-Off Notice*. One application was filed in response to the cut-off for applications to be considered in the 2 GHz band[11]; the other application was filed in response to the cut-off for applications above 40 GHz.[12]

Denali **File Nos. 160-SAT-P/LA-97/13**
SAT-AMEND-990108-00001

Denali filed an application in response to the Commission's cut-off for additional space station applications and letters of intent in the 36-51.4 GHz Frequency Band. (*See* Public Notice No. Report No. SPB-89 (rel. July 22, 1997)). Denali requests authority to launch and operate thirteen satellites in highly elliptical orbit to provide FSS and MSS for domestic, international and foreign communications. In its initial application, Denali requested, among other things, 200 MHz for downlinks in the band 11.7-12.2 GHz in North America and 12.5-12.7 GHz in Europe and Asia. In response to the Commission's *Ku-Band Cut-Off Notice*, however, Denali amended its application to change some of its spectrum requirements. Specifically, Denali now requests 1000 MHz of spectrum in the 10.7-12.7 GHz band (preferably the band 11.7-12.7 GHz) for downlinks and 750 MHz for uplinks in the 13.75-14.5 GHz band.

[10] By a Public Notice issued August 6, 1998, Report No. SPB-135, the Commission afforded interested parties a period of thirty days after the filing of these simulations within which to comment on its July 1998 Amendment. Submission of SkyBridge's most recent amendment, that included the simulations, effectively renders the August 6, 1998 Public Notice moot.

[11] Report No. SPB-88 (released July 22, 1997).

[12] *Id*.

APPENDIX D: COMMENTING PARTIES

Comments Filed March 2, 1999:

Association of American Railroads ("AAR")
Association of Local Television Stations, Inc
Boeing Company ("Boeing")
Comsearch
Denali Telecom, LLC ("Denali")
DIRECTV, Inc. ("DIRECTV")
EchoStar Communications Corporation ("EchoStar")
Fixed Point-to-Point Communications Section *et al.*
Fixed Wireless Communications Council ("FWCC")
GE American Communications, Inc. ("GE")
Global VSAT Forum
Home Box Office et al.
Hughes Communications, Inc. ("Hughes")
Loral Space and Communications Ltd. ("Loral")
National Association of Broadcasters
National Academy of Sciences' Committee on Radio Frequencies ("CORF")
Northpoint Technology, Ltd. ("Northpoint")
OpTel, Inc. ("OpTel")
PanAmSat Corporation *et al.* ("PanAmSat")
Petroleum Communications, Inc.
Qualcomm Incorporated ("Qualcomm")
Satellite Broadcasting and Communications Association
SBC Communications, Inc. ("SBC")
SkyBridge L.L.C. ("SkyBridge")
Society of Broadcast Engineers, Inc. ("SBE")
Sullivan, Thomas M.
Teledesic LLC ("Teledesic")
Telesat Canada
Tonga - Government of the Kingdom of
United States Satellite Broadcasting Company, Inc.
Virtual Geosatellite, L.L.C. ("Virgo")

Reply Comments Filed April 14, 1999:

Airtouch Communications, Inc.
AAR
Boeing
DIRECTV
Dominion Video Satellite, Inc.
EchoStar
EMS Technologies
Fixed Point-to-Point Communications Section *et al.*
FWCC
GE
Hughes
LNR TrexCom Inc.
Loral
Northpoint
OpTel
PanAmSat
Petroleum Communications, Inc.
SkyBridge
SBE
Teledesic
United States Satellite Broadcasting Company, Inc.
Virgo

APPENDIX E: PROPOSED RULES

For the reasons discussed in the preamble, the FCC proposes to amend 47 C.F.R. Part 101 as follows:

PART 101 - FIXED MICROWAVE SERVICES

1. The authority citation for Part 101 continues to read as follows:

AUTHORITY: 47 U.S.C. 154, 303.

2. Section 101.3 is amended by adding a definition for MVDDS in alphabetical order to read as follows:

§ 101.3 Definitions.

* * * * *

Multichannel Video Distribution and Data Service (MVDDS). A microwave service licensed in the 12.2.-12.7 GHz band that provides various wireless services.

3. Section 101.101 is amended by revising the entry for 12,200-12,700 MHz table to read as follows:

§ 101.101 Frequency availability.

Frequency band (MHz)	Radio Service				
	Common carrier (Part 101)	Private radio (Part 101)	Broadcast auxiliary (Part 74)	Other (Parts 15, 21, 24, 25, 74, 78 & 100)	Notes
* * * * * * *					
12,200-12,700……	MVDDS	MVDDS, POFS		DBS, NGSO	
* * * * * * *					

* * * * *

3. Section 101.103(f) is revised to read as follows:

§101.103 Frequency coordination procedures.

*** * * * ***

(f) When the proposed facilities are to be operated in the band 12,200-12,700 MHz, licensees must follow the procedures, technical standards, and requirements of Section 101.105 in order to protect the stations authorized under Part 100.

4. Section 101.105 is amended by adding paragraph (a)(4) and (a)(5) and revising paragraph (d) by adding the phrase "for incumbent non-MVDDS stations" after the words "12,200-12,700 MHz band" to read as follows:

§101.105 Interference protection criteria.

* * *

OPTION ONE: (a)(4) MVDDS stations must operate on a non-harmful interference basis to Direct Broadcast Satellite (DBS) receivers. Interference to DBS receivers shall not increase the total outage of any system by more than 2.86% per year. 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 Section 101.103(d) of this subpart.

OPTION TWO: (a)(4) MVDDS stations must operate on a non-harmful interference basis to Direct Broadcast Satellite (DBS) receivers. Interference to DBS receivers shall not increase the total outage of any system by not more than 10 minutes in any given month. 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 Section 101.103(d) of this subpart.

(a)(5) All stations operating under this part must protect the radio quiet zones as required by Section 1.924 of the rules. Stations authorized by competitive bidding are cautioned that they must receive the appropriate approvals directly from the relevant quiet zone prior to operating.

* * * * *

(a)(5) All stations operating under this part must protect the radio quiet zones as required by Section 1.924 of the rules. Stations authorized by competitive bidding are cautioned that they must receive the appropriate approvals directly from the relevant quiet zone prior to operating.

* * * * *

5. Section 101.107 is amended by revising footnote 6 to the Table in paragraph (a) to read as follows:

§ 101.107 Frequency tolerance.

(a) * * *

(6) Applicable to private operations fixed point-to-point microwave stations and stations providing MVDDS service.

* * * * *

6. Section 101.109 is amended by revising the entry for 12,200-12,700 MHz and by adding footnote 8 in the Table at the end of the section to read as follows:

§101.109 Bandwidth.

* * * * *

(c) * * *

Frequency band (MHz)	Maximum authorized bandwidth
* * * * * * *	
12,200 to 12,700 [8]	500 MHz
* * * * * * *	

* * *

[8] For incumbent private operational fixed point-to-point stations in this band the maximum bandwidth shall be 20 MHz.

* * * * *

7. Section 101.113 is amended by revising the entry for 12,200-12,700 MHz in the table and adding a new footnote 10 to the table in paragraph (a) to read as follows:

§ 101.113 Transmitter power limitations.

(a) * * *

Frequency Band (MHz)	Maximum allowable EIRP [1, 2]	
	Fixed (dBW)	Mobile (dBW)
* * * * * * *		
12,200 to 12,700 [10]…….	+50	……
* * * * * * *		

* * *

[10] The urban area eirp for MVDDS stations is limited to 12.5 dBm (-17.5 dBw) with two exceptions: (1) those MVDDS systems where the transmitter is mounted on a mountain ridge that is over one kilometer from populated subscriber areas may use a higher eirp up to +10 dBw, provided that the increase will not cause the system to exceed the "unavailability criteria" we develop and (2) MVDDS transmitting systems located on tall structures that are adjacent to bodies of water or other significant and clearly unpopulated areas, may use a higher eirp up to +10 dBw, provided that the increase will not cause the system to exceed the "unavailability criteria." Incumbent point-to-point stations may use up to +50 dBW except for low power systems licensed under Section 101.147(q).

* * * * *

8. Section 101.115 is amended by revising footnote 9 to the table in paragraph (c) to read as follows:

§101.115 Directional antennas.

* * *

(c) * * *

(9) Except for Temporary-fixed operations in the band 13200-13250 MHz with output powers less than 250 mW and as provided in Section 101.147(q), and except for receive antennas in the MVDDS service which shall only be required to have a minimum antenna gain of 34 dBi and may use circular or linear polarization.

* * * * *

9. Section 101.139 is amended by revising the last sentence of paragraph (a) to read as follows:

§ 101.139 Authorization of transmitters.

(a) * * * Transmitters designed for use in the 31.0-31.3 GHz band and transmitters designed for MVDDS use in the 12,200-12,700 MHz band will be authorized under the verification procedure.

* * * * *

11. Section 101.141 is amended by revising the first sentence of paragraph (a) to read as follows:

§ 101.141 Microwave modulation.

(a) Microwave transmitters employing digital modulation techniques and operating below 19.7 GHz must, with appropriate multiplex equipment, comply with the following additional requirements (except for MVDDS stations in the 12,200-12,700 MHz band):

12. Section 101.147 is amended by combining the entries in the frequency assignment table in paragraph (a) for 12,200-12,500 MHz and 12,500-12,700 MHz with a new footnote 28, adding a new sentence to the end of paragraph (p), and adding a new sentence to the beginning of paragraph (q) to read as follows:

§ 101.147 Frequency assignments.

(a) * * *

* * *

12,200-12,700 MHz (28)

* * *

(28) Frequencies in this band are shared with Direct Broadcast Satellites on a secondary non-harmful interference basis and on a co-primary basis with non-geostationary satellites and can be used only for incumbent private operational fixed point-to-point service on a site by site basis and MVDDS. Incumbent public safety licensees shall be afforded protection from MVDDS and NGSO licensees, however all other licensees shall be secondary to MVDDS and NGSO licensees.

* * *

(p) * * * The 12.2-12.7 GHz band is also authorized for MVDDS service on a non-harmful interference basis to DBS receivers in this band and on a co-primary basis with NGSO FSS stations.

OPTION ONE: (q) Applications for low power stations in the 12.2-12.7 GHz band are accepted. Existing stations are grandfathered subject to the following: * * *

OPTION TWO: (q) Applications for low power stations in the 12.2-12.7 GHz band are no longer accepted. Existing stations are grandfathered subject to the following: * * *

10. Section 101.601 is amended by adding a sentence at the end of the introductory paragraph to read as follows:

§ 101.601 Eligibility.

* * * This subpart shall not apply to stations offering MVDDS in the 12.2-12.7 GHz band.

* * * * *

11. A new proposed subpart of the rules under 101.1400 to read as follows:

SUBPART P - MULTICHANNEL VIDEO DISTRIBUTION AND DATA SERVICE RULES FOR THE 12.2-12.7 GHZ BAND

Note: Because the Commission is seeking comment on various proposals in some instances, alternative text is shown under the relevant proposed section headings.

§ 101.1401 Service areas.

OPTION ONE: Multichannel Video Distribution and Data Service (MVDDS) is licensed on the basis of geographic areas. Each geographic area shall be licensed to one licensee.

OPTION TWO: Multichannel Video Distribution and Data Service (MVDDS) is licensed on a site-by-site basis.

§ 101.1403 Must carry rules.

OPTION ONE: Licensees are required to provide all local television channels to subscribers within its area. If a license is partitioned, all relevant parties must provide every customer with all the local television channels in the entire area, not a portion thereof. MVDDS licensees are required to comply with the must-carry rules. *See* Multichannel Video and Cable Television Service Rules, Subpart D

(Carriage of Television Broadcast Signals), 47 C.F.R. §§ 76.51-76.70.

OPTION TWO: Licensees are not required to provide all local television channels to subscribers within its area. MVDDS licensees are not required to comply with the must-carry rules. *See* Multichannel Video and Cable Television Service Rules, Subpart D (Carriage of Television Broadcast Signals), 47 C.F.R. §§ 76.51-76.70.

§ 101.1405 Channeling plan.

OPTION ONE: Each license shall have one spectrum block of 500 megahertz per geographic area that can be divided into any size channels and should provide various digital wireless services to subscribers. Disaggregation is not allowed.

OPTION TWO: Each license shall have one spectrum block of 500 megahertz per geographic area that can be divided into any size channels and should provide various digital wireless services to subscribers. Disaggregation is allowed.

§ 101.1407 Permissible operations for MVDDS.

MVDDS licensees must use spectrum in the 12.2-12.7 GHz band for digital fixed one-way direct-to-home/office wireless service. Mobile and aeronautical services are not authorized. Two-way services may be provided by using other spectrum or media for the return path.

§ 101.1409 Treatment of incumbent licensees.

Terrestrial point-to-point licensees in the 12.2-12.7 GHz band which were licensed prior to MVDDS or NGSO satellite stations are incumbent point-to-point stations and are not entitled to protection from harmful interference caused by later MVDDS or NGSO FSS entrants in the 12.2-12.7 GHz band, except for public safety stations which must be protected. MVDDS and NGSO FSS operators have the responsibility of resolving any harmful interference problems that their operations may cause to these incumbent point-to-point operations in the 12.2-12.7 GHz band. Incumbent public safety terrestrial point-to-point licensees may only make minor changes to their stations without losing this protection. This does not relieve current point-to-point licensees of their obligation to protect BSS operations in the subject frequency band. Point-to-point applications for new licenses, major amendments, or major modifications for the 12.2-12.7 GHz band are no longer accepted, including low-power operations.

§ 101.1411 Regulatory status and eligibility.

OPTION ONE: (a) MVDDS licensees are allowed to provide one-way video programming and data services on a non-common carrier basis. MVDDS is not treated as a common carrier service and is prohibited from providing switched voice and data services.

OPTION TWO: (a) MVDDS licensees are allowed to provide one-way video programming and data services on a non-common carrier basis. MVDDS is treated as a common carrier service and is permitted to provide switched voice and data services.

(b) MVDDS licensees in the 12.2-12.7 GHz band are subject to the requirements set forth in Section 101.7 of the Commission's Rules.

§ 101.1413 License term and renewal expectancy.

(a) The MVDDS license term is ten years, beginning on the date of the initial authorization grant.

(b) Application of a renewal expectancy is based on the substantial service requirement which we define as a service that is sound, favorable, and substantially above a level of mediocre service which might minimally warrant renewal. At the end of the license term, the Commission will consider factors such as:

(1) whether the licensee's operations service niche markets or focus on serving populations outside of areas serviced by other licensees;

(2) whether the licensee's operations serve populations with limited access to telecommunications services; and

(3) a demonstration of service to a significant portion of the population or land area of the licensed area.

(c) The renewal application of a MVDDS licensee must include the following showings in order to claim a renewal expectancy:

(1) a coverage map depicting the served and unserved areas;

(2) a corresponding description of current service in terms of geographic coverage and population served or links installed in the served areas; and

(3) copies of any Commission Orders finding the licensee to have violated the Communications Act or any Commission rule or policy and a list of any pending proceedings that relate to any matter described by the requirements for the renewal expectancy.

§ 101.1415 Partitioning and disaggregation.

OPTION ONE: MVDDS operators are allowed to partition licensed geographic areas. Disaggregation will be permitted by MVDDS licensees in the 12.2-12.7 GHz band. "Partitioning" is the assignment of geographic portions of a license along geopolitical or other boundaries. "Disaggregation" is the assignment of discrete portions or "blocks" of spectrum licensed to a geographic licensee or qualifying entity.

OPTION TWO: MVDDS operators are allowed to partition licensed geographic areas. Disaggregation will not be permitted by MVDDS licensees in the 12.2-12.7 GHz band. "Partitioning" is the assignment of geographic portions of a license along geopolitical or other boundaries. "Disaggregation" is the assignment of discrete portions or "blocks" of spectrum licensed to a geographic licensee or qualifying entity.

§ 101.1417 Annual report.

Each MVDDS licensee shall file with the Commission two copies of a report by March 1 of each year for the preceding calendar year. This report must include the following:

(1) name and address of licensee;

(2) station(s) call letters and primary geographic service area(s); and

(3) the following statistical information for the licensee's station (and each channel thereof):

(i) the total number of separate subscribers served during the calendar year;

(ii) the total hours of transmission service rendered during the calendar year to all subscribers;

(iii) the total hours of transmission service rendered during the calendar year involving the transmission of local broadcast signals; and

(iv) a list of each period of time during the calendar year in which the station rendered no service as authorized, if the time period was a consecutive period longer than 48 hours.

§ 101.1421 Coordination of adjacent area MVDDS stations.

MVDDS licensees in the 12.2-12.7 GHz band are required to develop sharing and protection agreements based on the design and architecture of their systems, in order to ensure that no harmful interference occurs within the same geographic area or between adjacent licensees or between adjacent

areas.

§ 101.1423 Canadian and Mexican coordination.

Pursuant to Section 2.301 of this part, MVDDS systems in the United States within 56 km (35 miles) of the Canadian and Mexican border are granted conditional licenses, until final international agreements are approved. These systems may not cause harmful interference to stations in Canada or Mexico.

§ 101.1425 RF safety.

Stations with output powers that equal or exceed 1640 watts eirp will be subject to the routine environmental evaluation rules for radiation hazards, as set forth in Section 1.1307 of this part.

§ 101.1427 Over-the-air reception devices rule (OTARD).

The Over-the-Air Reception Devices Rule (OTARD) in Section 1.4000 of this part shall apply to the receive-only MVDDS antennas at subscribers' homes or offices.

§ 101.1437 MVDDS licenses subject to competitive bidding.

Mutually exclusive initial applications for MVDDS licenses in the 12.2-12.7 GHz band are subject to competitive bidding procedures. The procedures set forth in part 1, subpart Q, of this chapter will apply unless otherwise provided in this part.

§ 101.1438 Designated entities.

(a) Eligibility for small business provisions.

(1) A very small business is an entity that, together with its controlling interests and affiliates, has average annual gross revenues not exceeding $3 million for the preceding three years.

(2) A small business is an entity that, together with its controlling interests and affiliates, has average annual gross revenues not exceeding $15 million for the preceding three years.

(3) An entrepreneur is an entity that, together with its controlling interests and affiliates, has average annual gross revenues not exceeding $40 million for the preceding three years.

(4) For purposes of determining whether an entity meets any of the definitions set forth in paragraphs (a)(1), (a)(2), or (a)(3) of this section, the gross revenues of the entity, its controlling interests and affiliates shall be considered in the manner set forth in § 1.2110(b) and (c) of this chapter.

(5) A consortium of very small businesses is a conglomerate organization formed as a joint venture between or among mutually independent business firms, each of which individually satisfies the definition in paragraph (a)(1) of this section. A consortium of small businesses is a conglomerate organization formed as a joint venture between or among mutually independent business firms, each of which individually satisfies the definition in paragraph (a)(2) of this section. A consortium of entrepreneurs is a conglomerate organization formed as a joint venture between or among mutually independent business firms, each of which individually satisfies the definition in paragraph (a)(3) of this section. Where an applicant or licensee is a consortium of small businesses (or very small businesses or entrepreneurs), the gross revenues of each small business (or very small business or entrepreneur) shall not be aggregated.

(b) Bidding credits. A winning bidder that qualifies as a very small business or a consortium of very small businesses as defined in this section may use the bidding credit specified in § 1.2110(f)(2)(i) of this chapter. A winning bidder that qualifies as a small business or a consortium of small businesses as defined in this section may use the bidding credit specified in § 1.2110(f)(2)(ii) of this chapter. A winning bidder that qualifies as an entrepreneur or a consortium of entrepreneurs as defined in this section may use the bidding credit specified in § 1.2110(f)(2)(iii) of this chapter.

APPENDIX F – INITIAL REGULATORY FLEXIBILITY ANALYSIS

As required by the Regulatory Flexibility Act (RFA),[13] the Commission has prepared this present Initial Regulatory Flexibility Analysis (IRFA) of the possible significant economic impact on small entities by the policies and rules proposed in this Further Notice of Proposed Rule Making (*FNPRM*). Written public comments are requested on this IRFA. Comments must be identified as responses to the IRFA and must be filed by the deadlines for comments on the *FNPRM* provided above in paragraph 346. The Commission will send a copy of the *FNPRM*, including this IRFA, to the Chief Counsel for Advocacy of the Small Business Administration. *See* 5 U.S.C. §603(a). In addition, the *FNPRM* and IRFA (or summaries thereof) will be published in the Federal Register. *See id*.

A. Need for, and Objectives of, the Proposed Rules

This rule making is being initiated to adopt licensing, service and technical rules for the Multichannel Video Data and Distribution Service (MVDDS) at 12.2-12.7 GHz. Our objectives are: (1) to accommodate the introduction of innovative services; and (2) to facilitate the sharing and efficient use of spectrum.

B. Legal Basis for Proposed Rules

The proposed action is authorized under the Administrative Procedure Act, 5 U.S.C. § 553; and Sections 1, 4(i), 7, 301, 303, 308 and 309(j) of the Communications Act of 1934, as amended, 47 U.S.C. §§ 151, 154(i), 157, 301, 303, 308 and 309(j).

C. Description and Estimate of the Number of Small Entities to Which the Proposed Rules Will Apply

The RFA generally defines the term "small entity" as having the same meaning as the terms "small business," "small organization," and "small governmental jurisdiction."[14] In addition, the term "small business" has the same meaning as the term "small business concern" under the Small Business Act.[15] A small business concern is one which: (1) is independently owned and operated; (2) is not dominant in its field of operation; and (3) satisfies any additional criteria established by the Small Business Administration (SBA).[16] A small organization is generally "any not-for-profit enterprise which is independently owned and operated and is not dominant in its field."[17]

The definition of small entity under the SBA rules for the radiotelephone industry provides that a small

[13] *See* 5 U.S.C. § 603. The RFA, *see* 5 U.S.C. § 601 *et. seq*., has been amended by the Contract With America Advancement Act of 1996 Pub. L. No. 104-121, 110 Stat. 847 (1996) (CWAAA). Title II of the CWAAA is the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA).

[14] 5 U.S.C. § 601(6).

[15] 5 U.S.C. § 601(3) (incorporating by reference the definition of "small business concern" in 15 U.S.C. § 632). Pursuant to the RFA, the statutory definition of a small business applies "unless an agency, after consultation with the Office of Advocacy of the Small Business Administration and after opportunity for public comment, establishes one or more definitions of such term which are appropriate to the activities of the agency and publishes such definition(s) in the Federal Register." 5 U.S.C. § 601(3).

[16] Small Business Act, 15 U.S.C. § 632 (1996).

[17] 5 U.S.C. § 601(4).

entity is a radiotelephone company employing fewer than 1,500 persons.[18] The 1992 Census of Transportation, Communications, and Utilities, conducted by the Bureau of the Census, which is the most recent information available, shows that only 12 radiotelephone firms out of a total of 1,178 such firms that operated during 1992 had 1,000 or more employees.[19] As of 1992, there were approximately 275,801 small organizations nationwide.[20] The definition of "small governmental jurisdiction" is one with populations of fewer than 50,000.[21] There are 85,006 governmental jurisdictions in the nation.[22] This number includes such entities as states, counties, cities, utility districts and school districts. There are no figures available on what portion of this number has populations of fewer than 50,000. However, this number includes 38,978 counties, cities and towns, and of those, 37,556, or 96 percent, have populations of fewer than 50,000.[23] The Census Bureau estimates that this ratio is approximately accurate for all government entities. Thus, of the 85,006 governmental entities, we estimate that 96 percent, or about 81,600, are small entities that may be affected by our rules.

The proposed rules will affect all entities that intend to provide terrestrial MVDDS operations in the 12.2-12.7 GHz band. In the *FNPRM*, the Commission seeks comment on whether to permit MVDDS licensees to use spectrum in the 12.2-12.7 GHz band for fixed one-way direct-to-home/business video and data services, as well as other types of services to which the spectrum may be used. The Commission states that it envisions the use of this spectrum for video service, but concedes that it does not know precisely the other types of services that licensees may seek to provide.

If an auction is conducted for MVDDS, the Commission proposes to define three tiers of small businesses for the purpose of providing bidding credits to small entities. The Commission proposes to define the three tiers of small businesses as follows: an "entrepreneur" would be an entity with average annual gross revenues not exceeding $40 million for the preceding three years; a "small business" would be an entity with average annual gross revenues not exceeding $15 million for the preceding three years; and a "very small business" would be an entity with average annual gross revenues not exceeding $3 million for the preceding three years. The Commission will not know how many auction participants or licensees will qualify under these proposed definitions as entrepreneurs, small businesses, or very small businesses unless and until an auction is held. Even after that, the Commission will not know how many licensees will partition their license areas or disaggregate their spectrum blocks, if partitioning and disaggregation are allowed. In view of our lack of knowledge about the entities that will seek MVDDS licenses, we assume that, for purposes of our evaluations and conclusions in the IRFA, all prospective licensees are entrepreneurs, small businesses, or very small businesses under our proposed definitions. We invite comment on this analysis.

D. Description of Projected Reporting, Recordkeeping, and Other Compliance Requirements

[18] *See* 13 C.F.R. § 121.201, Standard Industrial Classification (SIC) Code 4812.

[19] U.S. Bureau of the Census, U.S. Department of Commerce, 1992 Census of Transportation, Communications, and Utilities, UC92-S-1, Subject Series, Establishment and Firm Size, Table 5, Employment Size of Firms: 1992, SIC Code 4812 (issued May 1995).

[20] 1992 Economic Census, U.S. Bureau of the Census, Table 6 (special tabulation of data under contract to Office of Advocacy of the SBA).

[21] 5 U.S.C. § 601(5).

[22] 1992 Census of Governments, U.S. Bureau of the Census, U.S. Department of Commerce.

[23] *Id*.

Applicants for MVDDS licenses may be required to submit applications. If an auction is held, applicants will be required under our proposed rules to submit an FCC Form 175 short-form application prior to the auction, and auction winners will be required to file an FCC Form 601 license application. Additionally, the Commission proposes to require the filing of certain documents (*e.g.*, coverage maps) to substantiate renewal expectancies with information demonstrating substantial service upon license renewal. We request comment on how these proposed requirements can and/or should be modified to reduce the burden on small entities and still meet the objectives of the proceeding.

E. Steps Taken to Minimize Significant Economic Impact on Small Entities, and Significant Alternatives Considered

The RFA requires an agency to describe any significant alternatives that it has considered in reaching its proposed approach, which may include the following four alternatives: (1) the establishment of differing compliance or reporting requirements or timetables that take into account the resources available to small entities; (2) the clarification, consolidation, or simplification of compliance or reporting requirements under the rule for small entities; (3) the use of performance, rather than design, standards; and (4) an exemption from coverage of the rule, or any part thereof, for small entities.

We have reduced burdens wherever possible. To provide opportunities for small entities to participate in any auction that is held, we propose to provide bidding credits for entrepreneurs, small businesses, and very small businesses as defined in Section C of this IRFA. The bidding credits proposed are 15 percent for entrepreneurs, 25 percent for small businesses, and 35 percent for very small businesses. In the *FNPRM*, the Commission seeks comment on its proposed small business definitions and bidding credits, thus providing interested parties with an opportunity to suggest alternatives. Our proposed partitioning and disaggregation rules are also intended to help small entities acquire licenses. The regulatory burdens we have retained are necessary in order to ensure that the public receives the benefits of innovative new services in a prompt and efficient manner. We will continue to examine alternatives in the future with the objectives of eliminating unnecessary regulations and minimizing any significant economic impact on small entities. We seek comment on significant alternatives commenters believe we should adopt.

F. Federal Rules that May Duplicate, Overlap, or Conflict With the Proposed Rules

None.

APPENDIX G – EXAMPLES OF DBS SERVICE OUTAGES FOR DIFFERENT PERCENTAGES OF SERVICE UNAVAILABILITY (45 cm antenna)

Table 1 EchoStar @ 119 WL					
DBS satellite orbital location	degrees	119.0	119.0	119.0	119.0
Earth station location		Denver, CO	Washington, D.C.	Seattle, WA	Miami, FL
DBS satellite e.i.r.p. towards the Earth station location	dBW	48.8	52.6	46.7	52.6
Earth station elevation above mean sea level	mm	1.58	0.01	0.01	0.0
Earth station elevation angle	degrees	41.8	27.6	35.2	37.7
Free space loss	dB	205.9	206.1	206.0	205.9
Earth station antenna miss-pointing error	dB	0.5	0.5	0.5	0.5
Atmospheric absorption	dB	0.2	0.2	0.2	0.2
Clear-sky receive system noise temperature	Kelvin	85	85	85	85
Clear-sky earth station antenna G/T	dB	14.5	14.5	14.5	14.5
C/I for other assignments in the BSS Plan	dB	20.0	20.0	20.0	20.0
Clear-sky feeder link C/(N+I)	dB	26.2	26.2	26.2	26.2
Clear-sky carrier-to-noise plus interference ratio	dB	10.7	13.6	8.9	13.7
Required C/(N+I) for operating threshold	dB	6.1	6.1	6.1	6.1
Link margin	dB	4.6	7.5	2.8	7.7
Rain margin	dB	1.82	4.1	0.93	4.22
Rain intensity exceeded for 0.01% of an average year	mm/h	30.3	48.2	36.1	95.7
Satellite link availability for an average year	%	99.98	99.92	99.71	99.59
Satellite link unavailability for an average year	%	0.0207	0.0843	0.2873	0.4120
Total link unavailable time for an average year	minutes	108.8	443.1	1510	2165.5
10% of the unavailable time in an average year	minutes	10.9	44.3	151.0	216.6
5% of the unavailable time in an average year	minutes	5.4	22.2	75.5	108.3
2.86% of the unavailable time in an average year	minutes	3.1	12.7	43.2	61.9
Satellite link unavailability for the worst-month	%	0.0978	0.3316	0.9361	1.3177
Total link unavailable time for the worst-month	minutes	42.8	145.2	421.8	577.1
10% of the unavailable time in the worst-month	minutes	4.3	14.5	42.2	57.7
5% of the unavailable time in the worst-month	minutes	2.1	7.26	21.1	28.9
2.86% of the unavailable time in the worst-month	minutes	1.2	4.2	12.1	16.5
Rainy sky C/I for a 2.86% increase in link unavailability	dB	24.2	22.9	25.0	22.3

Table 2 DIRECTV @ 101 WL					
DBS satellite orbital location	degrees	101.0	101.0	101.0	101.0
Earth station location		Denver, CO	Washington, D.C.	Seattle, WA	Miami, FL
DBS satellite e.i.r.p. towards the Earth station location	dBW	49.4	52.4	48.4	53.4
Earth station elevation above mean sea level	km	1.58	0.01	0.01	0.0
Earth station elevation angle	degrees	43.8	38.5	31.5	52.0
Free space loss	dB	205.8	205.9	206.0	205.7
Earth station antenna miss-pointing error	dB	0.5	0.5	0.5	0.5
Atmospheric absorption	dB	0.2	0.2	0.2	0.2
Clear-sky receive system noise temperature	Kelvin	125	125	125	125
Clear-sky earth station antenna G/T	dB	12.9	12.9	12.9	12.9
C/I for other assignments in the BSS Plan	dB	20.7	20.7	20.7	20.7
Clear-sky feeder link C/(N+I)	dB	24.2	24.2	24.2	24.2
Clear-sky carrier-to-noise plus interference ratio	dB	10.0	12.4	8.9	13.3
Required C/(N+I) for operating threshold	dB	5.0	5.0	5.0	5.0
Link margin	dB	5.0	7.4	3.9	8.3
Rain margin	dB	2.47	4.47	1.76	5.42
Rain intensity exceeded for 0.01% of an average year	mm/h	30.3	48.2	36.1	95.7
Satellite link availability for an average year	%	99.99	99.96	99.88	99.82
Satellite link unavailability for an average year	%	0.0104	0.0418	0.1186	0.1758
Total link unavailable time for an average year	minutes	54.7	219.7	623.4	924.0
10% of the unavailable time in an average year	minutes	5.5	22.0	62.3	92.4
5% of the unavailable time in an average year	minutes	2.7	11.0	31.2	46.2
2.86% of the unavailable time in an average year	minutes	1.6	6.3	17.8	26.4
Satellite link unavailability for the worst-month	%	0.0537	0.1802	0.4462	0.6283
Total link unavailable time for the worst-month	minutes	23.5	78.9	195.4	275.2
10% of the unavailable time in the worst-month	minutes	2.4	7.9	19.5	27.5
5% of the unavailable time in the worst-month	minutes	1.2	3.9	9.8	13.8
2.86% of the unavailable time in the worst-month	minutes	0.7	2.3	5.6	7.9
Rainy sky C/I for a 2.86% increase in link unavailability	dB	23.5	22.1	23.6	21.3

APPENDIX H -- A METHOD OF CONVERTING PERCENTAGE OF UNAVAILABLE TIME INTO A CARRIER-TO-INTERFERENCE RATIO

This appendix presents a method for determining the relationship between DBS service outage time and a DBS system's carrier-to-noise plus interference ratio (C/N+I). Specifically, this method can be used to determine the C/I that a terrestrial system needs to meet in relation to a DBS satellite system to keep service disruptions of the satellite system to a certain amount of outage time. In this case the terrestrial system represents the interference and the satellite system represents the desired carrier.

The availability of a satellite space-to-Earth link is defined as the total amount of time that the satellite service is available to the user without disruption. Conversely, the unavailability of that same link is the total time during which the user is without service (outage). Generally, availability and unavailability are expressed in terms of percentage of time of an average year (8766 hours) or the worst month in an average year.[24] These two variables are complementary and always sum to 100 percent. For example if a satellite system has an availability of 99.7%, its unavailability is 0.3% which equates to total outage time of 26.3 hours averaged over a year.

In a shared environment (satellite and terrestrial service), the total unavailability can be attributed to two sources: natural propagation phenomenon such as precipitation (*e.g.*, rain) in the space-to-earth path and external radio interference. In the frequency bands used by DBS for downlink (12.2-12.7 GHz), the predominant propagation impairment is rain attenuation in the space-to-earth slant path.[25] The amount of service outage caused by rain can be estimated using the prediction procedures of ITU-R Recommendation P.618-6. This rain attenuation model predicts, for a given geographic area, the average service outage time over an average year for a specific level of precipitation attenuation along the space-to-earth slant path.

To determine the portion of the total C/I that is attributable to a terrestrial system, we first establish the amount of outage time of the DBS space-to-earth link that is caused by precipitation only. This outage time is directly dependent on the link margin of the space-to-earth link, which is calculated from the system's link power budget. Link margin is the amount of power received at the earth station receiver above its operating threshold that is designed into the satellite link to overcome the effects of rain and other impediments. During rain, the satellite link is affected in two ways: the carrier signal strength is attenuated due to rain and the rain causes an increase in the system's noise temperature. If the rain attenuation and earth station G/T (gain / system noise temperature) degradation cause a reduction to the carrier-to-noise (C/N) power that exceeds the available link margin, the satellite link will experience an outage. The amount of attenuation due to rain that causes an outage is referred to as the rain margin.

The satellite link budget (carrier-to-noise plus interference ratio) and the associated rain margin can be derived from the parameters identified in Table B-1. It is evident from the table that the rain margin depends on the DBS satellite E.I.R.P. in the direction of the receiving earth station, the free space path loss, the earth station antenna gain-to-system noise temperature (G/T) ratio and the operating threshold. Once the link margin is known, one can proceed to determine the rain margin. This is accomplished by adding a rain attenuation term to the equation used to find the clear-sky carrier-to-noise ratio to instead find a rainy-sky carrier-to-noise ratio. Additionally, the G/T must be recalculated to account for the increase in atmospheric noise due to the rain. Thus, the G/T will be reduced during a rain event and the rain margin will be less than the link margin.

[24] A method for converting annual statistics to worst-month statistics is contained in Recommendation ITU-R P.841-1, *Conversion Of Annual Statistics To Worst-Month Statistics*.

[25] In this analysis, we omitted the uplink (earth-to-space) outage contribution.

Once the rain margin is determined, the expected outage time of a satellite link in an average year or in the worst month can be computed using the prediction method contained in ITU-R Recommendation P.618-6. This recommendation entitled "Propagation Data and Prediction Method required for the Design of Earth-Space Telecommunication Systems" provides a procedure to estimate the long-term statistics of the space-to-earth path precipitation attenuation and the associated percentage of outage time.

Now that the percentage of outage time due solely to rain is known, we can reverse the procedure to determine the minimum C/I that a terrestrial system must maintain to effect a specific amount of additional outage time on the satellite system. First, the additional outage time must be determined, either as a percentage of additional outage time or a number of minutes per time period. This additional outage time can then be added to the outage time due to rain only to find the 'equivalent unavailability.' For example, if a satellite space-to-earth link has an unavailability of 0.3% and the minimum C/I for the terrestrial system to cause no more than an additional 10% outage is to be determined, the equivalent unavailability would be 0.33% (0.3 * 1.1). Using the equivalent unavailability, the ITU rain model can be used to find the corresponding 'equivalent rain margin.' That is, the ITU model can be used to find the amount of attenuation associated with the increased outage time. This change in attenuation is attributed to interference from the terrestrial system.

The C/I for the terrestrial system can now be found by modifying the methodology used to determine the satellite link budget (carrier-to-noise plus interference ratio). The terrestrial system is factored into the link budget by adding a term representing its C/I. By using the equivalent rain margin in the link budget, we find an 'equivalent link margin.' We can then find the C/I of the terrestrial system that causes the reduction of the equivalent link margin to zero. This is the minimum C/I that the terrestrial system must maintain to cause no more than the amount of additional outage time chosen.

It is important to note that the above methodology results in the rainy-sky C/I for the terrestrial service interference, which would produce the additional outage time at the DBS earth station. The reason for calculating the rainy-sky C/I is based on the assumption that in a typical satellite path, rain cells in the space-to-earth slant path are generally to the south of the earth station location. Because the terrestrial interfering path generally emanates from the north of the DBS earth station location, it will usually not be in the rain cell. Thus, at the time when a rain cell in the space-to-earth path attenuates a DBS signal, the terrestrial signal will not similarly be attenuated. Therefore, the calculated C/I is performed by not fading the terrestrial signal with rain.

Table B-2 provides an example of the process described above.

Table B-1: Required Parameters for the Determination of DBS Link Rain Margin and Satellite Link Availability and Unavailability

Input Parameters:

1. Satellite longitude;
2. Earth station location (latitude and longitude);
3. Earth station altitude above mean sea level (AMSL);
4. Satellite E.I.R.P. in the direction of the DBS earth station;
5. The operating frequency;
6. The required operating threshold for the DBS earth station receiver;
7. Receiver noise bandwidth;
8. Earth station antenna diameter;
9. Earth station antenna pointing loss towards the DBS satellite;
10. Clear-sky earth station system noise temperature;
11. Atmospheric absorption;
12. Carrier-to-interference ratio from other assignments in the BSS plan;
13. Clear-sky feeder link carrier-to-interference ratio;
14. Boltzman's constant.

Calculation method:

(A) Calculate the distance and elevation angle between satellite and earth station using the satellite longitude (1) and the earth station location (2).
(B) Calculate the free space transmission loss using the distance (A) and the operating frequency (5).
(C) Calculate DBS antenna gain using the operating frequency (5) and the earth station antenna diameter (8).
(D) Calculate the clear-sky G/T ratio using the antenna gain (C) and the clear-sky earth station system noise temperature (10).
(E) Calculate the clear-sky carrier-to-noise ratio using the E.I.R.P. (4), free space transmission loss (B), earth station antenna pointing loss (9), clear-sky G/T (D), receiver noise bandwidth (7), Boltzman's constant (14) and atmospheric absorption (11).
(F) Calculate the clear-sky carrier-to-noise plus interference ratio using the clear-sky carrier-to-noise ratio (E), the carrier-to-interference ration from other assignments in the BSS plan (12), and the clear-sky feeder link carrier-to-interference ratio (13)
(G) Calculate the link and rain margins using the clear-sky carrier-to-noise plus interference ratio (F) and the operating threshold (6).
(H) Calculate the satellite link unavailability using ITU-R Recommendation P.618-6, the rain margin (G), earth station location (2), earth station elevation angle (A), AMSL (3), and operating frequency (5).
(I) Determine the acceptable increase in unavailability due to terrestrial service interference and calculate equivalent unavailability of the satellite by adding the satellite link unavailability (H) and the increase in unavailability due to terrestrial interference.
(J) Determine the equivalent rain margin using the equivalent unavailability (I) and ITU-R Recommendation P.618-6.
(K) Determine the C/I for the terrestrial interference using the equivalent rain margin (J) in the step (G) calculation.

Table B-2: An Example of A Satellite Downlink Power Budget, Rain Margin, Unavailability and Carrier-to-Interference Ratio		
A. Inputs		
Satellite longitude	degrees	119.0
Earth station latitude and longitude (lat/long)	degrees	38.90/77.01
Earth station altitude above mean sea level	km	0.01
Satellite e.i.r.p. in the direction of the DBS earth station	dBW	52.6
Operating frequency	GHz	12.45
Required operating threshold	dB	6.1
Receiver noise bandwidth	MHz	24.0
Earth station antenna diameter	m	0.45
Earth station antenna pointing loss towards the satellite	dB	0.5
Clear-sky earth station antenna system noise temperature	Kelvin	85.0
Atmospheric absorption	dB	0.2
C/I for other assignments in the BSS Plan	dB	20.0
Clear-sky feeder link C/(N+I)	dB	26.2
Boltzman's constant	dB	228.6
B. Calculate		
Distance from GSO satellite to earth station	km	38,825
Earth station antenna elevation angle	degrees	27.6
Free space path loss	dB	206.1
Earth station antenna gain	dBi	33.83
Clear-sky earth station antenna G/T	dB	14.5
Clear-sky carrier-to-thermal noise ratio	dB	15.1
Clear-sky carrier-to-thermal noise plus interference ratio	dB	13.6
Clear-sky link margin	dB	7.5
Rain margin	dB	4.08
Satellite link unavailability due to rain	%	0.0843
Calculated satellite link availability	%	99.9157
Acceptable increase in unavailability due to terrestrial service interference	%	2.86
Equivalent unavailability due to rain and terrestrial interference	%	0.0867
Equivalent rain margin	dB	4.018
Rainy sky C/I for the terrestrial service interference	dB	22.9

APPENDIX I – PROPOSED MVDDS/DBS SHARING ARRANGEMENT AND COMPUTATION OF THE MVDDS/DBS REMEDIATION ZONE

We propose to define "mitigation zones" in each geographic area by describing an interference contour centered around a terrestrial transmitter beyond which rain outages to DBS subscribers in the presence of MVDDS operations do not exceed normal rain outages by more than a predetermined amount. This mitigation zone would be defined by an MVDDS carrier to interference (C/I) ratio, using each MVDDS transmitter site as the center of the plot, and the rain prediction procedures described in ITU-R Recommendation P.618-6. As discussed in the *Further Notice*, the criteria for determining the C/I and thus the size of the mitigation zone can be based on a percentage or minute increase in unavailability in an average year or in the worst-month.

Inside each mitigation zone, the MVDDS provider would be responsible for fixing complaints of outages beyond the parameters defined in the *First R&O* and repeated above. Mitigation of complaints can be accomplished by, but are not limited to, the following techniques: shielding, relocating, or upgrading DBS receive antennas.

As detailed in Appendix H, the acceptable C/I ratio is based on an increase of the unavailability of the DBS link in a rainy environment. This appendix provides an example of constructing the mitigation zone based on a given C/I ratio. The size and the shape of that zone depend on many elements, which are identified below. We note that the record in this proceeding indicates that interested parties have developed similar methods of calculating mitigation zones.[26]

In a static DBS-terrestrial environment, the carrier-to-interference ratio is generally described by:[27]

$$C/I = E.I.R.P._{sat} - BTL_{sat} - ATM - MIS - RAIN + GM_{dbs} - (E.I.R.P._{ts} + G_{ts}(\zeta) - BTL_{ts} + G_{dbs}(\phi) - XP_{dbs}) + 10 \log(BWR) \quad (1)$$

where:

$E.I.R.P._{sat}$ = the DBS satellite E.I.R.P. in the direction of the desired earth station, dBW
BTL_{sat} = the basic transmission loss from the space craft to the desired earth station, dB
ATM = the atmospheric gaseous absorption at 12.45 GHz, dB
MIS = the DBS receiving antenna mispointing loss, dB
RAIN = the rain margin of the DBS service at the desired earth station location, dB
GM_{dbs} = the maximum gain of the DBS receiving antenna, dBi
$E.I.R.P._{ts}$ = the terrestrial service maximum E.I.R.P., dBW
$G_{ts}(\zeta)$ = the terrestrial transmit antenna relative gain (normalized) in the direction of the DBS receiver, dBi
BTL_{ts} = the basic transmission loss from the terrestrial transmitter to the DBS receiver, dB
$G_{dbs}(\phi)$ = the DBS receiving antenna gain in the direction of the terrestrial transmitter, dBi
XP_{dbs} = the DBS receiving antenna sidelobe polarization isolation, dB
BWR = the ratio of the terrestrial emission bandwidth and the DBS emission bandwidth.

The basic transmission loss (*i.e.*, free space propagation loss) is given by the equation:

[26] *Ex Parte* presentation of Northpoint at Exhibit C, March 17, 2000 and DIRECTV Report, January 27, 2000.

[27] It should be noted that this equation is based on direct wave propagation (*i.e.*, line-of-sight or free space) and neglects the contribution of multipath or obstructions.

$$32.44 + 20 \log(F) + 20 \log(D) \quad (2)$$

where:

F = the operating frequency (F) is expressed in megahertz; and
D = the distance between the transmitter and the receiver expressed in kilometers

For the purpose of this example, we assume the following values for parameters identified in equation (1):

F = 12450 MHz, (*i.e.*, the middle of the 12.2-12.7 GHz band);
ATM = 0.2 dB (absorption due to atmospheric gases (oxygen and water vapor));
MIS = 0.5 dB (DBS antenna mispointing loss);
BWR = 1 (bandwidth ratio);
GM_{dbs} = 33.83 dBi (for a typical 45-cm diameter antenna); and
XP_{dbs} = 0 dB (DBS antenna sidelobe polarization isolation).

Therefore, from equations (1) and (2), the separation distance (D_{ts}) between the terrestrial transmitter and the DBS receiver where the C/I equals the acceptable value can be derived:

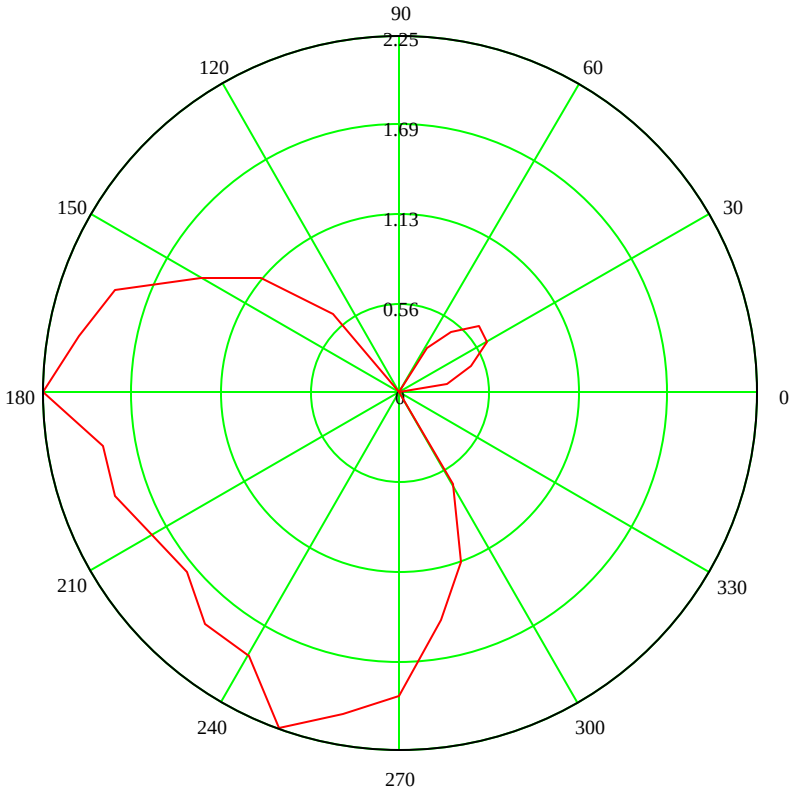
$$20 \log(D_{ts}) = C/I - E.I.R.P._{sat} + G_{dbs}(\phi) + E.I.R.P._{ts} + G_{ts}(\zeta) + 20 \log(D_{sat}) + RAIN - 33.13 \quad (3)$$

Equation (3) reflects the fact that the size and the shape of the mitigation zone are highly dependent on the DBS receiving antenna pattern and the MVDDS transmitter antenna pattern. Using equation 3 and the parameters contained in the following table, we show an example mitigation zone in Figure I-1. This mitigation zone is drawn for a DBS earth station located in Washington, DC receiving a signal from the DBS satellite located at 101° W.L.

Earth station location	Degrees		38.898 Latitude, 77.009 Longitude
Height of the terrestrial antenna	m		100
Carrier-to-interference ratio	dB	C/I	15.9
DBS satellite e.i.r.p.	dBW	$E.I.R.P._{sat}$	52.4
DBS earth station antenna pattern		$G_{dbs}(\phi)$	DIRECTV, April 11, 1994
Terrestrial antenna maximum e.i.r.p.	dBW	$E.I.R.P._{ts}$	-17.5
Terrestrial transmitter antenna pattern		$G_{ts}(\zeta)$	Northpoint, March 17, 2000
Distance to the DBS satellite	km	D_{sat}	37900
Rain attenuation	dB	RAIN	4.47

Figure I-1

Example mitigation zone for Washington, DC from DBS satellite located at 101^{o} WL. It should be noted that, in the detailed calculation, the DBS receiving antenna pattern should include the effect of frequency at 12.2 GHz, 12.45 GHz, and 12.7 GHz. Similarly, the terrestrial antenna relative gain should also include the effect of frequency in both the azimuth and elevation gains.



APPENDIX J: UNAVAILABILITY STATISTICS FOR INCREASES IN DBS OUTAGES OF 2.86%, 60 MINUTES, AND 30 MINUTES ANNUALLY (45 cm antenna)

Unavailability Statistics for DIRECTV Satellite at 101° W.L for Top Markets
(Statistics computed using inputs as listed in Appendix G and the method described in Appendix H)

Market	Average Yearly Statistics		Increased Outage = 2.86%				Increased Minutes of Outage = 60 min.		Increased Minutes of Outage = 30 Min.	
	Percentage of Availability	Minutes of Outage	Percentage of Availability	Minutes of Outage	Increased Minutes of Outage	Change in Percentage of Availability	Change in Percentage of Availability = 0.0114 %		Change in Percentage of Availability = 0.0057 %	
							Percentage of Availability	Minutes of Outage	Percentage of Availability	Minutes of Outage
New York	99.9466	280.7	99.9451	288.6	7.9	0.0015	99.9352	340.7	99.9409	310.7
Los Angeles	99.9731	141.4	99.9723	145.6	4.2	0.0008	99.9617	201.4	99.9674	171.4
Chicago	99.9637	190.8	99.9627	196.2	5.4	0.0010	99.9523	250.8	99.9580	220.8
Philadelphia	99.9567	227.6	99.9555	234.1	6.5	0.0012	99.9453	287.6	99.9510	257.6
San Francisco	99.9364	334.3	99.9346	343.8	9.5	0.0018	99.9250	394.3	99.9307	364.3
Boston	99.9578	221.8	99.9566	228.1	6.3	0.0012	99.9464	281.8	99.9521	251.8
Washington,	99.9582	219.7	99.9570	226.0	6.3	0.0012	99.9468	279.7	99.9525	249.7
Dallas	99.8332	876.7	99.8284	901.8	25.1	0.0048	99.8218	936.7	99.8275	906.7
Detroit	99.9501	262.3	99.9487	269.8	7.5	0.0014	99.9387	322.3	99.9444	292.3
Atlanta	99.9475	275.9	99.9460	283.8	7.9	0.0015	99.9361	335.9	99.9418	305.9
Houston	99.7823	1144.2	99.7761	1177.0	32.8	0.0062	99.7709	1204.2	99.7766	1174.2
Seattle	99.8814	623.4	99.8780	641.2	17.8	0.0034	99.8700	683.4	99.8757	653.4
Cleveland	99.9352	340.6	99.9333	350.3	9.7	0.0019	99.9238	400.6	99.9295	370.6
Minneapolis	99.9506	259.6	99.9492	267.1	7.5	0.0014	99.9392	319.6	99.9449	289.6
Tampa	99.8644	712.7	99.8605	733.1	20.4	0.0039	99.8530	772.7	99.8587	742.7
Miami	99.8242	924.0	99.8192	950.4	26.4	0.0050	99.8128	984.0	99.8185	954.0
Phoenix	99.9385	323.2	99.9367	332.5	9.3	0.0018	99.9271	383.2	99.9328	353.2
Denver	99.9896	54.7	99.9893	56.2	1.5	0.0003	99.9782	114.7	99.9839	84.7
Pittsburgh	99.9576	222.9	99.9564	229.2	6.3	0.0012	99.9462	282.9	99.9519	252.9
Sacramento	99.9229	405.2	99.9207	416.8	11.6	0.0022	99.9115	465.2	99.9172	435.2
St. Louis	99.9570	226.0	99.9558	232.5	6.5	0.0012	99.9456	286.0	99.9513	256.0
Orlando	99.8543	765.8	99.8501	787.7	21.9	0.0042	99.8429	825.8	99.8486	795.8
Portland	99.9122	461.5	99.9097	474.7	13.2	0.0025	99.9008	521.5	99.9065	491.5
Indianapolis	99.9458	284.9	99.9442	293.0	8.1	0.0016	99.9344	344.9	99.9401	314.9
San Diego	99.9817	96.2	99.9812	98.9	2.7	0.0005	99.9703	156.2	99.9760	126.2
Charlotte	99.9577	222.3	99.9565	228.7	6.4	0.0012	99.9463	282.3	99.9520	252.3
Cincinnati	99.9410	310.1	99.9393	319.0	8.9	0.0017	99.9296	370.1	99.9353	340.1
Kansas City	99.9642	188.2	99.9632	193.5	5.3	0.0010	99.9528	248.2	99.9585	218.2
Milwaukee	99.9486	270.2	99.9471	277.9	7.7	0.0015	99.9372	330.2	99.9429	300.2
Nashville	99.9625	197.1	99.9614	202.7	5.6	0.0011	99.9511	257.1	99.9568	227.1
Columbus	99.9634	192.4	99.9624	197.9	5.5	0.0010	99.9520	252.4	99.9577	222.4
Greenville	99.9378	326.9	99.9360	336.3	9.4	0.0018	99.9264	386.9	99.9321	356.9

Unavailability Statistics for EchoStar Satellite at 119° W.L for Top Markets
(Statistics computed using inputs as listed in Appendix G and the method described in Appendix H)

Market	Average Yearly Statistics		Increased Outage = 2.86%				Increased Minutes of Outage = 60 Min.		Increased Minutes of Outage = 30 Min.	
	Percentage of Availability	Minutes of Outage	Percentage of Availability	Minutes of Outage	Increased Minutes of Outage	Change in Percentage of Availability	Change in Percentage of Availability = 0.0114 %		Change in Percentage of Availability = 0.0057 %	
							Percentage of Availability	Minutes of Outage	Percentage of Availability	Minutes of Outage
New York	99.9406	312.2	99.9389	321.1	8.9	0.0017	99.9292	372.6	99.9349	342.2
Los Angeles	99.9293	371.6	99.9273	382.2	10.6	0.0020	99.9179	431.6	99.9236	401.6
Chicago	99.9243	397.9	99.9221	409.3	11.4	0.0022	99.9129	457.9	99.9186	427.9
Philadelphia	99.9328	353.2	99.9309	363.3	10.1	0.0019	99.9214	413.2	99.9271	383.2
San Francisco	99.8544	765.3	99.8502	787.2	21.9	0.0042	99.8430	825.3	99.8487	795.3
Boston	99.9301	367.4	99.9281	377.9	10.5	0.0020	99.9187	427.4	99.9244	397.4
Washington,	99.9157	443.1	99.9133	455.8	12.7	0.0024	99.9043	503.1	99.9100	473.1
Dallas	99.6790	1687.2	99.6698	1735.4	48.2	0.0092	99.6676	1747.2	99.6733	1717.2
Detroit	99.9407	311.7	99.9390	320.6	8.9	0.0017	99.9293	371.7	99.9350	341.7
Atlanta	99.8431	824.7	99.8386	848.3	23.6	0.0045	99.8317	884.7	99.8374	854.7
Houston	99.5827	2193.3	99.5708	2256.1	62.8	0.0119	99.5713	2253.3	99.5770	2223.3
Seattle	99.7127	1510.0	99.7045	1553.2	43.2	0.0082	99.7013	1570.0	99.7070	1540.0
Cleveland	99.9209	415.7	99.9186	427.6	11.9	0.0023	99.9095	475.7	99.9152	445.7
Minneapolis	99.9289	373.7	99.9269	384.4	10.7	0.0020	99.9175	433.7	99.9232	403.7
Tampa	99.6911	1623.6	99.6823	1670.0	46.4	0.0088	99.6797	1683.6	99.6854	1653.6
Miami	99.5880	2165.5	99.5762	2227.4	61.9	0.0118	99.5766	2225.5	99.5823	2195.5
Phoenix	99.8337	874.1	99.8289	899.1	25.0	0.0048	99.8223	934.1	99.8280	904.1
Denver	99.9793	108.8	99.9787	111.9	3.1	0.0006	99.9679	168.8	99.9736	138.8
Pittsburgh	99.9439	294.9	99.9423	303.3	8.4	0.0016	99.9325	354.9	99.9382	324.9
Sacramento	99.8231	929.8	99.8180	956.4	26.6	0.0051	99.8117	989.8	99.8174	959.8
St. Louis	99.8052	1023.9	99.7996	1053.2	29.3	0.0056	99.7938	1083.9	99.7995	1053.9
Orlando	99.6616	1778.6	99.6519	1829.5	50.9	0.0097	99.6502	1838.6	99.6559	1808.6
Portland	99.8769	647.0	99.8734	665.5	18.5	0.0035	99.8655	707.0	99.8712	677.0
Indianapolis	99.8722	671.7	99.8685	690.9	19.2	0.0037	99.8608	731.7	99.8665	701.7
San Diego	99.9490	268.1	99.9475	275.7	7.6	0.0015	99.9376	328.1	99.9433	298.1
Charlotte	99.8933	560.8	99.8902	576.9	16.1	0.0031	99.8819	620.8	99.8876	590.8
Cincinnati	99.9004	523.5	99.8976	538.5	15.0	0.0028	99.8890	583.5	99.8947	553.5
Kansas City	99.8965	544.0	99.8935	559.6	15.6	0.0030	99.8851	604.0	99.8908	574.0
Milwaukee	99.9190	425.7	99.9167	437.9	12.2	0.0023	99.9076	485.7	99.9133	455.7
Nashville	99.9157	443.1	99.9133	455.8	12.7	0.0024	99.9043	503.1	99.9100	473.1
Columbus	99.9091	477.8	99.9065	491.4	13.6	0.0026	99.8977	537.8	99.9034	507.8
Greenville	99.8513	781.6	99.8470	803.9	22.3	0.0043	99.8399	841.6	99.8456	811.6

SEPARATE STATEMENT OF COMMISSIONER HAROLD FURCHTGOTT-ROTH, Approving in Part, Dissenting in Part

Re: Amendment of Parts 2 and 25 of the Commission's Rules to Permit Operation of NGSO FSS Systems Co-Frequency with GSO and Terrestrial Systems in the Ku-Band Frequency Range; et al, ET Docket No. 98-206 (Adopted November 29, 2000).

Today's item is an important milestone in what has been a very long road. Our Order paves the way for implementation of the historic sharing agreement reached between the incumbent geostationary orbit ("GSO") satellite systems and the new non-geostationary orbit ("NGSO") satellite providers. Extensive negotiations carried out over two World Radio Conferences and thousands of hours of public and private talks have paved the way for these new services. The Commission and the parties should take great pride in the final result. Similarly today's Order concludes that sharing between these satellite providers and a terrestrial service is possible in the 12.2-12.7 GHz band. Here too potential licensees have worked for years for this day, and I am pleased that we can move forward to the next stage of our deliberations.

This entire process, however, does raise significant spectrum management issues. Although my concerns in this area do not rise to the level of a dissent, this proceeding should provide a catalyst for an important dialog about the nature and extent of spectrum usage rights granted by FCC licenses.

Finally, I do part ways with my fellow commissioners on some discrete issues related to the Further Notice. I am highly skeptical of any proposal to restrict the ownership of new licenses. Similarly any discussion of mandating a particular kind of service – or importing the regulatory burdens associated with particular services – is inconsistent with the FCC's general policy direction and contrary to my own regulatory philosophy.[1] Due to the majority's decision to consider so actively these restrictive and highly regulatory options, I respectfully dissent in part.

The Commission's Licensing Approach

The questions presented by this proceeding are complicated and difficult. Ultimately the staff has done a good job of balancing these interests. However, I believe it is important to look at some of the larger issues raised by this proceeding.

First, what spectrum usage rights do FCC licensees have? As I noted in our recent secondary markets proceeding, often licensees do not know exactly what rights they have – making it difficult for licensees to sell some or all of those rights to third parties.[2] Here GSO direct broadcast satellite ("DBS") licensees were originally granted certain spectrum usage rights – some of which they paid for at auction – at a time when sharing was not contemplated. Parties sought these licenses, and paid for these licenses,

[1] See Principles for Reallocation of Spectrum to Encourage the Development of Telecommunications Technologies for the New Millennium, Policy Statement (rel. Nov. 22, 1999) (trumpeting the goal of flexibility); Principles for Promoting the Efficient Use of Spectrum by Encouraging the Development of Secondary Markets, Policy Statement (rel. December 1, 2000).

[2] Principles for Promoting the Efficient Use of Spectrum by Encouraging the Development of Secondary Markets, Policy Statement (rel. December 1, 2000)(discussing the need to clarify spectrum usage rights); see also Separate Statement of Commissioner Harold Furchtgott-Roth in that proceeding.

with expectations of certain interference protection and with expectations on the range of technological options with which the spectrum might be developed[3]. The amount these parties were willing to pay for licenses was based on these expectations. Thus GSO DBS licensees paid for one set of rights – exclusive use of space stations in these bands with expectations of certain interference protection – but are now only entitled to a diminished version of those rights. This change has come without compensation for the alterations in interference protection or the reduced range of technological possibilities or the expenses incurred by GSO DBS in acquiring and developing the licenses. By this Order, NGSO licensees will share these rights with GSO DBS. And not only will they share, DBS's system-wide reliability will be diminished by these NGSO systems. Moreover, the FCC determines here that it is technically feasible for DBS to share with a terrestrial system, under parameters yet to be developed.

Perhaps such unpredictability is the best we can do; licensees will inevitably not know how or when the Commission will alter their rights (even those they pay for). But to the extent the Commission maintains complete discretion to alter such core terms of a license, we cannot expect the primary and secondary spectrum markets to function well. Perhaps that is a trade off we should make, but the FCC has never tackled the hard questions that surround such a policy. Instead the Commission wants it both ways – complete discretion to change the terms of a license and a fully functioning primary and secondary market. I am convinced we cannot have both.

Similarly changes in our licensing scheme affects both future auctions and commercial development of licenses. Going forward, we must also recognize that our licensing regime creates reasonable reliance interests that cannot and should not be tossed aside. For example, GSO DBS systems were built in order to maintain a certain degree of reliability for customer service. Thus American DBS providers determined that in order to be a successful commercial operation, their service must be highly reliable.[4] That level of reliability was a commercial decision made by GSO DBS providers based on certain assumptions – I believe reasonably including the "exclusive" rights that were granted pursuant to their original licenses. By today's Order we permit the NGSO systems to increase incrementally the GSO DBS systems' unavailability rate. Our further notice contemplates increasing this outage rate.[5]

Perhaps these increased DBS outages are in the public interest. However, I believe it is licensees, not the FCC, that should be able to determine what availability rates are needed for them to compete effectively in the marketplace. Had DBS known that it would be sharing with two other systems, then excess interference "cushion" could have been added to the system – or not. That should be a business decision, not a government one. We owe it to our licensees to notify them as soon as practicable – preferably before an auction – of major sharing obligations that could be imposed that may impact their system design and spectrum valuation. Perhaps our failure to do so in some instances provides a basis for declining to introduce additional sharing into a band.

The major spectrum issues raised by this proceeding are not limited to the GSO DBS providers. The proposed terrestrial Northpoint service has also traveled a difficult road at the Commission. There is no question that Northpoint has expended substantial resources in navigating the shoals of the U.S. regulators in order to make today's order possible. Despite fighting most of those battles alone, today

[3] In this regard, incumbent GSO FSS operators were granted similar rights with expectations of certain interference protections that are also altered by this order, however these licenses were distributed without an auction.

[4] Order at ¶ 213.

[5] Moreover, such a policy creates a perverse incentive for licensees: build fragile systems that cannot withstand additional interference and you may not have to share. The agency must be wary not to send the wrong signals to its licensees.

additional terrestrial licensees are understandably also interested in the 12.2-12.7 GHz band. This type of regulatory "free rider" problem is far from unique and certainly not improper – but it does significantly diminish the incentive for parties to "pave the way."

In this regard, I am intrigued by the logical consequences of a concept advanced by Northpoint regarding the Commission's licensing process. Northpoint is understandably troubled by having a service-specific DBS licensing proceeding, followed years later by a NGSO "satellite" filing window, and then finally a possible terrestrial auction. Northpoint believes that its terrestrial application, filed in the NGSO satellite window, should have the same rights as its fellow applicants in that filing window.[6]

Northpoint's approach ultimately suggests that the FCC should license all uses for a given band at once. Thus we would have a single integrated 12.2-12.7 GHz band proceeding. That proceeding would open a filing window for all uses of the band – and sort out the scope of each license all at once. But regardless of whom filed, all of the commercial rights in the band could be handed out in one proceeding.[7] Thus, for example, if GSO DBS had been the only party to file in this band – they would have been granted exclusive and comprehensive rights to the band for all services subject only to our interference rules, etc. In this regime, if the NGSO systems or terrestrials subsequently wished to share this band, they would go to the GSO DBS providers and negotiate a commercial sharing arrangement with appropriate compensation. The Commission's role would be limited largely to referee. This provides an intriguing alternative regulatory model.

In the end, this proceeding has been a product of our current rules – not some conceivably more desirable future policies. In that context, the Commission has attempted to balance many interests and concerns – including those described above. However, our challenge rests not just in recognizing these issues, but in crafting prospective policies that will save the Commission from these troubling and countervailing interests in the future.

Distressing Service Rules Proposals

I am troubled by two aspects of today's order: (1) the proposal to prevent GSO DBS operators and incumbent in-region cable operators from acquiring MVDDS licenses,[8] and (2) any effort to require a particular service in a given band or to extend legacy regulations to new services.[9]

Barring certain parties from participating in an auction is a draconian measure that should not be pursued absent extraordinary circumstances. There is little basis for pursuing such a policy here. First we have no clear idea about the types of services that may be offered by multi-channel video distribution and data service (MVDDS) licensees. Perhaps they will offer video, perhaps only data. Therefore today it's not clear whom these licensees will be competing against, making any auction bar purely speculative. Second, there are countless competitors in the video marketplace and several competitors in the niche multi-channel video programming distribution (MVPD) marketplace. It is difficult to imagine that these providers could collude to buy up this spectrum and allow it to remain fallow. Third, in some cases, the

[6] Nonetheless Northpoint's terrestrial sharing arrangements would be substantially different from those of the satellite applicants.

[7] Such an approach would invariably reflect only the technology available at the time of licensing. However, it is not necessarily clear that the Commission can best make available shared spectrum, rather than licensees themselves recognizing the potential value of a new shared use.

[8] Order at ¶¶ 299-301.

[9] Order at ¶¶ 289-292.

contemplated ownership prohibition may eliminate the exact type of competitive entry such restrictions are purportedly designed to foster. For example, barring incumbent cable providers may ultimately undermine competitive cable service. A cable provider may serve only a portion of an auctioned license area and may wish to use MVDDS spectrum and its existing personnel and infrastructure to expand the reach of its service to a neighboring area. Such expansion may create the desired competitive presence. Similarly cable providers may use MVDDS to supply multi-channel video service to portions of their service area that are not economical to reach via wireline cable plant. The FCC should not foreclose these or other business models from taking root in this band.

Finally, I cannot help but recall the Commission's most recent foray into restricted eligibility for a new service: LMDS.[10] There, as here, the FCC anticipated that LMDS would offer certain services. There, as here, the Commission proposed to bar incumbents from participating in the auction. There the FCC adopted the restriction and years later the service had barely gotten off the ground. Here I hope we don't make the same mistake.

I also wish to caution my colleagues against requiring any particular type of service in the 12.2-12.7 GHz band. Although certain applicants have put forth a business model that includes video programming, I am opposed to requiring any particular service. That is a decision best left to the marketplace. Similarly, I would oppose importing regulatory burdens, such as must-carry obligations, onto new service providers in these bands. New entrants should be given maximum flexibility to utilize the spectrum in the way they deem fit with minimal interference from the Commission.

* * *

Today's order strikes a good balance of the interests in these bands. But the Order also reflects many of the challenges that our current spectrum policy has created and that our future spectrum policy will need to resolve.

[10] See e.g. Concurring Statement of Commissioner Harold Furchtgott-Roth in Rulemaking to Amend Parts 1,2 21, and 25 of the Commission's Rules to Redesignate the 27.5-29.5 GHz Frequency Band, to Reallocate the 29.5-30.0 GHz Frequency Band, to Establish Rules and Policies for Local Multipoint Distribution Service and for Fixed Satellite Services, Third Report and Order and Memorandum Opinion and Order, CC Docket No. 92-297 (rel. June 26, 2000); see also See *Dissenting Statement of Commissioner Harold Furchtgott-Roth,* in Third Order on Reconsideration, Sixth Notice of Proposed Rulemaking, CC Docket 92-297 (Dec. 13, 1999)*; Statement of Commissioner Rachelle B. Chong, Dissenting in Part,* Second Report and Order, Order on Reconsideration and Fifth Notice of Proposed Rulemaking, CC Docket No. 92-297 (March 11, 1997).

Separate Statement of Commissioner Gloria Tristani

Re: *Amendment of Parts 2 and 25 of the Commission's Rules to Permit Operation of NGSO FSS Systems Co-Frequency with GSO and Terrestrial Systems in the Ku-Band Frequency Range; Amendment of the Commission's Rules to Authorize Subsidiary Terrestrial Use of the 12.2-12.7 GHz Band by Direct Broadcast Satellite Licensees and Their Affiliates; Applications of Broadwave USA, PDC Broadband Corporation, and Satellite Receivers, Ltd. To Provide A Fixed Service in the 12.2-12.7 GHz band*

I write separately on two counts. First, I support the steps we take today to allow more services into the Ku-band. With the allocations and spectrum sharing approach we undertake here, there will new opportunities to deploy exciting services to consumers across the nation. Interested parties offer great promise for extending the reach of broadband services and providing new alternatives for the delivery of video programming services including local television signals. While today's action represents several important determinations, additional steps are necessary before the promise of these services becomes reality. I look forward to further action in this regard.

Second, I wish to recognize the dedication and commitment of the Commission's engineers, lawyers, and economists who have done extraordinary work in this proceeding. Many of the policies and proposals made here represent extremely complex spectrum sharing arrangements. Throughout the lengthy period of negotiations with the parties, at international fora, and in reviewing the hundreds and hundreds of filings in the record, Commission staff have sought ways to share spectrum that allow deployment of new services without causing any unreasonable intrusion into the services of existing licensees. With this Order and Further Notice, I believe we have set a course to do just that. Our work is far from over, but I commend our staff for their undertakings thus far.