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

In the Matter of	)	
	)	
The Establishment of Policies and Service Rules for the Broadcasting-Satellite Service at the 17.3-17.7 GHz Frequency Band and at the 17.7-17.8 GHz Frequency Band Internationally, and at the 24.75-25.25 GHz Frequency Band for Fixed Satellite Services Providing Feeder Links to the Broadcasting-Satellite Service and for the Satellite Services Operating Bi-directionally in the 17.3-17.8 GHz Frequency Band	)	IB Docket No. 06-123

NOTICE OF PROPOSED RULEMAKING

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By the Commission:

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I. INTRODUCTION

1. With this Notice of Proposed Rulemaking (*NPRM*), we propose processing and service rules for the 17/24 GHz Broadcasting Satellite Service (BSS).[1] Under the Commission's rules and the International Telecommunication Union (ITU) Region 2 allocation, the allocation for BSS at 17/24 GHz will become effective on April 1, 2007. Our goal in this proceeding is to promote prompt commencement of services in this newly allocated band. The 17/24 GHz BSS will introduce a new generation of broadband services to the public, providing a mix of local and domestic video, audio, data, video-on-demand and multimedia services to residential and business subscribers in the United States. The services will potentially include standard-definition and high-definition formats and, in certain cases, may complement existing direct broadcast satellite (DBS)[2] services. This should provide U.S. consumers with access to a wider variety of services and suppliers. Increased competition may also lead to reduced prices for those services and further technological innovation.

2. In this *NPRM,* we provide a brief background on the development of the 17/24 GHz BSS band allocation by the ITU and Commission. We also provide a short description of the 17/24 GHz BSS applications that have been filed with the Commission. Next, the *NPRM* proposes service rules for

[1] BSS is the international term used for a radiocommunication service in which signals transmitted or retransmitted by space stations are intended for direct reception by the general public. *See, e.g.,* 47 C.F.R. § 2.1. In this item, the term "17/24 GHz BSS band" generally refers to the space-to-Earth (downlink) frequencies at 17.3-17.7 GHz and the corresponding Earth-to-space (uplink) frequencies at 24.75-25.25 GHz.

[2] DBS is the term used in the United States to describe the domestic implementation of BSS in the 12.2-12.7 GHz frequency bands. *See* 47 C.F.R. §§ 25.201, 25.202(a)(7).

operations in the 17/24 GHz BSS bands, including requirements for licensing, service obligations, orbital spacing, adjacent band operations, reverse band operations, and shared band operations. Potential interference from primary adjacent-band radiolocation systems and in-band secondary radiolocation systems is also addressed. In addition, the *NPRM* also considers proposals for use of the 17.7-17.8 GHz BSS spectrum for provision of international services outside the United States.

II. BACKGROUND

A. ALLOCATION

3. Satellite operators have been offering direct-to-home (DTH) video service to U.S. customers since the 1980's. These services were first provided in the C- and Ku-bands allocated to the Fixed-Satellite Service.[3] Later, operators implemented new systems that could use smaller receiving dishes in another portion of the Ku-band. This newer service is commonly referred to as the Direct Broadcast Satellite (DBS) service in the United States.[4] The Commission recently recognized that DTH video service was growing rapidly and that additional spectrum for these types of systems would likely be required within the next decade.[5]

4. In 1992, the World Administrative Radio Conference (WARC-92) of the ITU[6] adopted an additional frequency allocation for BSS in Region 2.[7] Specifically, WARC-92 allocated the 17.3-17.8 GHz band to the BSS on a primary basis in Region 2, effective April 1, 2007.[8] Until this time, the 17.3-17.7 GHz band may be used in Region 2 by the FSS (Earth-to-space) on a primary basis and by the radiolocation service on a secondary basis.[9] The 17.7-17.8 GHz band may be used on a co-primary basis by the FSS (space-to-Earth), the Fixed Service, and the Mobile Service. Pursuant to actions taken at WARC-92, the Mobile Service allocation in this band will revert to a secondary allocation on April 1, 2007.[10] Further, after April 1, 2007, FSS downlink services may not claim protection from and may not

[3] These frequency bands are the C-band at 3700-4200/5925-6425 MHz and the Ku-band at 11.7-12.2/14.0-14.5 GHz.

[4] *See* fn. 2, *supra.*

[5] 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 Rulemaking*, 13 FCC Rcd 19923,19958, para. 79 (1998) ("*18 GHz NPRM").*

[6] The ITU, based in Geneva, Switzerland, is a United Nations specialized organization that deals with international communications issues.

[7] International Telecommunication Union, Final Acts of the World Administrative Radio Conference (Malaga-Torremolinos, 1992). The ITU Radio Regulations divide the world into three regions. Generally, Region 1 includes Africa, Europe, and northern and western portions of Asia; Region 2 includes the Americas and Greenland; Region 3 includes southern portions of Asia, Australia, and the South Pacific. *See* ITU Radio Regulations, Article 5, Section 1.

[8] *See also* 47 C.F.R. § 2.106, footnote 5.517.

[9] The 17.3-17.7 GHz band is also allocated to the fixed and mobile services on a secondary basis in the countries listed in footnote 5.514 of the ITU Radio Regulations. *See also* 47 C.F.R. § 2.106, footnote 5.514.

[10] Specifically, footnote 5.518 of the ITU Radio Regulations reads as follows: "*Different category of service:* in Region 2, the allocation of the band 17.7-17.8 GHz to the mobile service is on a primary basis until 31 March 2007." *See also* 47 C.F.R. § 2.106, footnote 5.518.

cause harmful interference to BSS operations.[11]

5. In the *18 GHz Report and Order,*[12] the Commission implemented, in large part, the ITU Region 2 allocation for BSS domestically.[13] The Commission recognized that although the allocation would not become effective for several years, its action would provide interested parties with sufficient notice and time to design their systems to use this spectrum in the most efficient manner.[14] Specifically, the Commission adopted the following allocation and designation decisions, to take effect on April 1, 2007: (1) The Commission allocated the 17.3-17.7 GHz band, on a primary basis, to the BSS for downlink transmissions.[15] Although the ITU Region 2 allocation apportioned the 17.3-17.8 GHz band for BSS use, the Commission limited the allocation to 17.3-17.7 GHz to retain spectrum for the relocation of fixed service (FS) facilities which were being displaced as a result of the new BSS allocation.[16] (2) The Commission allocated 300 megahertz of spectrum at 24.75-25.05 GHz on a primary basis for the FSS (uplink) and limited FSS use to BSS feeder links.[17] It also allocated 200 megahertz of spectrum at 25.05-25.25 GHz for co-primary use between the 24 GHz Fixed Service, formerly known as Digital Electronic Messaging Service (DEMS), and BSS feeder links.[18] The Commission's objective was to accommodate

[11] *See* footnote 5.517 of the ITU Radio Regulations and 47 C.F.R. § 2.106, footnote 5.517. Two other international footnotes impact the sharing or use of the 17.3-17.8 GHz band. In Region 2, footnote 5.515 of the ITU Radio Regulations provides that "[i]n the band 17.3-17.8 GHz, sharing between the fixed-satellite service (Earth-to-space) and the broadcasting-satellite service shall also be in accordance with the provisions of § 1 of Annex 4 of Appendix 30A." *See also* 47 C.F.R. § 2.106, footnote 5.515. Further, footnote 5.516 of the ITU Radio Regulations provides that in Region 2, "[t]he use of the band 17.3-18.1 GHz by geostationary-satellite systems in the fixed-satellite service (Earth-to-space) is limited to feeder links for the broadcasting-satellite service. The use of the band 17.3-17.8 GHz in Region 2 by systems in the fixed-satellite service (Earth-to-space) is limited to geostationary satellites. For the use of the band 17.3-17.8 GHz in Region 2 by feeder links for the broadcasting-satellite service in the band 12.2-12.7 GHz, *see* Article 11. The use of the bands 17.3-18.1 GHz (Earth-to-space) in Regions 1 and 3 and 17.8-18.1 GHz (Earth-to-space) in Region 2 by non-geostationary-satellite systems in the fixed-satellite service is subject to application of the provisions of No. 9.12 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-geostationary-satellite systems in the fixed-satellite service and of the complete coordination or notification information, as appropriate, for the geostationary-satellite networks, and No. 5.43A 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." *See also* 47 C.F.R. § 2.106, footnote 5.516.

[12] 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,* 15 FCC Rcd 13430 (2000).

[13] *Id.* at 13482.

[14] *1d.* at 13478.

[15] *Id.* at 13476, 13478.

[16] *Id.* at 13477-78.

[17] *18 GHz Report & Order*, 15 FCC Rcd.at 13476, 13479.

[18] *Id.* at 13476, 13479-80.

new satellite services while providing adequate spectrum for existing FS operations.[19]

B. APPLICATIONS TO OPERATE IN THE 17/24 GHz BSS BAND

6. Four entities have filed applications to provide broadcast satellite service in the 17/24 GHz BSS bands. The applications were filed by DIRECTV Enterprises, Inc. (DIRECTV),[20] Pegasus Development DBS Corporation (Pegasus),[21] EchoStar Satellite LLC (EchoStar),[22] and Intelsat North America, LLC (Intelsat).[23] Because these applications represent a wide range of system designs and

[19] *Id.*

[20] In June 1997, DIRECTV filed three applications for authority to construct, launch, and operate a 17/24 GHz BSS system at the 96.5° W.L., 101° W.L., and 105.5° W.L. orbital locations. *See* File Nos. SAT-LOA-19970605-00049 (S2242), SAT-LOA-19970605-00050 (S2243) and SAT-LOA-19970605-00051 (S2244), as amended by SAT-AMD-20051118-00224, SAT-AMD-20051118-00225, SAT-AMD-20051118-00226. (collectively, "*DIRECTV Application*"). DIRECTV proposes to use these satellites to provide direct-to-home and direct-to-business delivery of video, audio, data, and multimedia services. DIRECTV also filed a Petition for Rulemaking concurrently with its application, requesting that the Commission allocate spectrum in the 17.3-17.8 GHz band for BSS downlinks, and in the 24.75-25.25 GHz band to FSS for use as BSS feeder links. DIRECTV's Petition for Rulemaking was partially granted by the *18 GHz Report & Order*, 15 FCC Rcd. at 13477-78, para. 99.

[21] In March 2002, Pegasus filed applications for authority to construct, launch, and operate a BSS system that will operate at the 91º W.L., 101º W.L., and 110º W.L. orbital locations. *See* File Nos. SAT-LOA-20020322-00032, SAT-LOA-20020322-00033, SAT-LOA-20020322-00034. These applications were dismissed in December 2005 for failure to submit the required orbital debris showings. *See* Policy Branch Information, Actions Taken, *Public Notice,* Report No. SAT-00332, DA 05-3152 (rel. Dec. 7, 2005). Pegasus filed a Petition for Reconsideration, which was denied by the Bureau in an Order dated June 6, 2006 (DA 06-1220). In April 2006, Pegasus re-filed its applications seeking authority to construct, launch, and operate a BSS system at the 91º W.L., 101º W.L., and 110º W.L. orbital locations. *See* File Nos. SAT-LOA-20060412-00042, SAT-LOA-20060412-00043, and SAT-LOA-20060412-00044 (collectively, "*Pegasus Application*"). In addition, Pegasus' parent company, Pegasus Development Corporation, filed modification applications to add similar satellite payloads to two of its licensed Ka-band satellites at the 107º W.L. and 117º W.L. orbital locations (SAT-MOD-20020322-00035 (117º W.L.) and SAT-MOD-20020322-00036 (107º W.L.)) (*Pegasus Ka-band Mod. Applications*). These applications were dismissed as moot in November 2004 because Pegasus chose not to develop a Ka-band BSS system. *See* Letter from Fern J. Jarmulnek, Deputy Chief, Satellite Division, Int'l. Bur., FCC to Bruce D. Jacobs, Esq., Shaw Pittman LLP (November 17, 2004).

[22] EchoStar filed an application in March 2002 for authority to construct, launch, and operate three BSS satellites at the 110° W.L., 114.5° W.L., and 119° W.L. orbital locations. EchoStar proposes to use these satellites to supplement its multichannel video program distribution offerings to residential subscribers in the United States, and to offer additional services to business users and international consumers as regulatory approvals are obtained in other countries. *See* File Nos. SAT-LOA-20020328-00050 (S2440), SAT-LOA-20020328-00051 (S2441), and SAT-LOA-20020328-00052 (S2442), as amended by SAT-AMD-20051118-00245, SAT-AMD-20051118-00246, SAT-AMD-20051118-00247 (collectively, "*EchoStar Application"*).

[23] In February 2005, Intelsat filed an application for authority to construct, launch, and operate four BSS satellites at the 67.5° W.L., 89.0° W.L., 97.0° W.L., and 121.0° W.L. orbital locations. Intelsat proposes to use these satellites to provide video, audio, data, and multimedia services to residential subscribers in the United States, as well as Canada, Central America, and South America, subject to obtaining the requisite non-U.S. regulatory approvals to do so. *See* Intelsat North America LLC, Application for Authority to Construct, Launch and Operate a Direct Broadcast Satellite System Comprised of Four Satellites in the 17 GHz and 25 GHz Bands, File Nos. SAT-LOA-20050210-00028 (S2659), SAT-LOA-20050210-00029 (S2660), SAT-LOA-20050210-00030 (S2661) and SAT-LOA-20050210-00031 (S2662) SAT-AMD-20051118-00238, SAT-AMD-20051118-00239, SAT-AMD-20051118-00240, and SAT-AMD-20051118-00241 (collectively, "*Intelsat Application*").

business plans, we will use them as a basis for developing service rules for BSS systems in these bands.

III. DISCUSSION

A. LICENSING AND PROCESSING PROCEDURES

1. LICENSING FRAMEWORK

7. In the *First Space Station Licensing Reform Order*, the Commission adopted various procedural reforms to expedite the licensing process for most satellite services, with an exception for DBS and the Digital Audio Radio Satellite (DARS).[24] The *Reform Order* did not specifically mention how the Commission would treat 17/24 GHz BSS. We could, therefore, conclude that 17/24 GHz BSS is analogous to the direct-to-home fixed-satellite service (DTH FSS), which *is* included in the *Reform Order's* purview. This is because the proposed 17/24 GHz BSS systems would provide services similar those provided by DTH FSS systems and the 17/24 GHz BSS band, like FSS bands, is not planned.[25] Further, the Commission's rules specify that DBS is a service provided in the 12.2-12.7 GHz band.[26] These considerations could lead us to conclude that we should consider 17/24 GHz BSS under the *Space Station Reform* licensing framework. Alternatively, because it is anticipated that 17/24 GHz BSS systems will provide services similar to DBS, we could characterize 17/24 GHz BSS as DBS and include this new service in the limited exception to the *Space Station Reform* licensing rules for DBS. We request comment on the appropriate characterization for 17/24 BSS systems. We discuss below the licensing issues that arise under each of the alternatives.

8. If we ultimately decide that it is more appropriate to treat 17/24 GHz BSS systems under the scope of the *Space Station Reform* proceeding, we propose to treat applications for such systems under the "first-come, first-served" licensing approach for geostationary-satellite orbit (GSO)-like applications. As part of the reforms, the Commission adopted two separate licensing frameworks for satellite systems – a first-come, first-served approach for "GSO-like" applications and a modified processing round approach for "non-geostationary satellite orbit (NGSO)-like" applications. Under the first-come, first-served approach, the Commission will grant an application provided the applicant is qualified and the proposed system is not technically incompatible with a previously licensed satellite or with a satellite proposed in a previously-filed application.[27] All the proposed 17/24 GHz BSS satellites will operate in GSO-orbits and all DTH video services, to date, are provided via GSO satellites.[28] Thus, if we decide to treat 17/24 GHz BSS systems under the scope of the *Space Station Reform* proceeding, we propose to consider 17/24 GHz BSS as "GSO-like" under the first-come, first-served licensing queue. In

[24] Amendment of the Commission's Space Station Licensing Rules and Policies, *First Report and Order and Further Notice of Proposed Rulemaking*, 18 FCC Rcd 10760, 10764, n. 4 (2003) ("*First Space Station Licensing Reform Order"*). These rules became effective on August 27, 2003.

[25] 17/24 GHz BSS is an unplanned band, as opposed to a planned band, which is a band for which the ITU has assigned frequencies at certain orbital locations to each country.

[26] Definition of DBS, *see* fn 2, *supra*. 47 C.F.R. § 25.202 and 25.202(a)(7). *Cf.* definition of BSS, *see* fn. 1, *supra*.

[27] *See* 47 C.F.R. § 25.158. In contrast, under the modified processing round approach for NGSO-like satellite systems, the Commission announces a cut-off date for filing applications and then divides the available spectrum equally among the qualified applicants. *See First Space Station Licensing Reform Order,* 18 FCC Rcd 10760, 10792-10822, paras. 71-159 (2003). *See also* 47 C.F.R. § 25.158.

[28] The Commission determined that in cases where there are no service rules establishing criteria for sharing between GSO and NGSO satellite systems in a particular frequency band, we will consider only applications of the kind that is filed first. In this case, all the 17/24 GHz BSS band applications propose GSO satellites.

addition, we propose that applicants for 17/24 GHz BSS satellites should pay fees associated with the "Space Stations (Geostationary)" service in Section 1.1107 of the Commission's rules.[29] For applications seeking authority to operate earth stations in the 17/24 GHz BSS band, we propose to apply the fees associated with the "Fixed Satellite Transmit/Receive Earth Stations" in Section 1.1107.[30] We seek comment on these proposals.

9. If we decide that it is more appropriate to treat 17/24 GHz BSS outside the scope of the *Space Station Reform Order*, we seek comment on what processing framework we should use for licensing these satellites. We specifically seek comment on whether pursuant to Section 309(j) of the Communications Act[31] a competitive bidding system, or auction, could be designed to assign mutually exclusive license applications for use of the 17/24 GHz service in the United States. In this regard, we note that a U.S. Court of Appeals decision in the *Northpoint* case[32] found the Commission's July 2004 auction of DBS licenses were unauthorized in light of Section 647 of the ORBIT Act,[33] which prohibits the Commission from using competitive bidding to assign orbital locations or spectrum used "for the provision of international or global satellite communications services."[34] We seek comment on whether the Commission could conduct an auction for 17/24 GHz BSS licenses consistent with the *Northpoint* ruling and, if so, how such an auction would be implemented. We also seek comment on what, if any, limitations, the ITU procedures[35] may place on a Commission auction. Further, if future legislative action authorizes the Commission to award 17/24 GHz BSS licenses via competitive bidding, we request comment on how we could structure an auction in this case. Commenters should specify whether, and the extent to which, such an auction would be different from one conducted without such legislation.

2. SAFEGUARDS AGAINST SPECULATION

10. Our first-come, first-served approach for processing space station applications contains a package of safeguards to ensure that licensees remain committed and able to proceed with system implementation in a timely manner. Our rules require all GSO-like applicants awarded a license under this procedure to post a $3 million performance bond with the Commission within 30 days of license grant. They also require licensees to construct and launch the satellite consistent with a specified

[29] 47 C.F.R. § 1.1107, 9.

[30] 47 C.F.R. § 1.1107, 3.

[31] 47 U.S.C. § 309(j).

[32] *See Northpoint Technology, Ltd. and Compass Systems, Inc. v. Federal Communications Commission*, 412 F.3d 145 (D.C. Cir. 2005) (*Northpoint v. FCC*).

[33] Open-Market Reorganization for the Betterment of International Telecommunications Act, Pub. L. No. 106-180, 114 Stat. 48 (2000), *as amended*, Pub. L. No. 107-233, 116 Stat. 1480 (2002), *as amended* Pub. L. No. 108-228, 118 Stat. 644 (2004), *as amended,* Pub. L. No. 108-371, 118 Stat. 1752 (2004). The ORBIT Act amended the Satellite Communications Act of 1962, 47 U.S.C. § 701 *et seq.* (Satellite Act) and is *codified at* 47 U.S.C. § 761 *et seq.* Section 647 of the ORBIT Act states that "[n]otwithstanding any other provision of law, the Commission shall not have the authority to assign by competitive bidding orbital locations or spectrum used for the provision of international or global satellite communications services. The President shall oppose in the International Telecommunication Union and in other bilateral and multilateral fora any assignment by competitive bidding of orbital locations or spectrum used for the provision of such services." *See* 47 U.S.C. § 765f.

[34] *Id*.

[35] For example, the ITU first in time filing policy applies to the 17/24 GHz service. Thus, a country filing first at the ITU obtains superior international coordination rights at that orbital location. *See* ITU Radio Regulations, Articles 7, 8, 9, and 11.

milestone schedule.[36] If the licensee fails to meet an implementation milestone, the license becomes null and void and the bond is executed.[37] The rules also limit applicants to a total of five pending applications and licenses for unbuilt satellites in a specific frequency band at any one time.[38] If we decide to include 17/24 GHz BSS in the processing rules and requirements of the *Space Station Licensing Reform Orders*, we propose to apply these accompanying safeguards, including applying the standard milestone schedule in Section 25.164 of the Commission's rules to 17/24 GHz BSS systems. We request comment on these proposals. Additionally, we seek comment on whether there are any public interest rationales for imposing a higher performance bond and/or whether we should impose tighter limits on the number of pending applications and licenses that applicants for 17/24 GHz systems may have for unbuilt satellites at any one time.

3. ANNUAL REPORTING REQUIREMENT

11. Most space station operators are subject to annual reporting requirements on June 30 of each year. These reports must include, among other things, the status of space station construction and anticipated launch dates.[39] We believe that these reports help to keep us apprised of whether operators are taking all necessary action to meet their milestones. We seek comment on whether 17/24 GHz BSS U.S.-licensees and 17/24 GHz BSS non-U.S. operators that are authorized to access the United States should be required to submit similar annual reports, regardless of the licensing mechanism we ultimately adopt in this proceeding.

4. LICENSE TERMS

12. Section 25.121 of the Commission's rules currently provides that licenses for space stations will be issued for a period of 15 years, except licenses for DBS space stations.[40] DBS space stations licensed as broadcast facilities are issued licenses for eight year terms, and those DBS space stations not licensed as broadcast facilities have 10 year terms.[41] These rules are governed by the Communications Act, which provides for a maximum licensing term of 8 years for broadcasting facilities and allows the Commission to determine license terms for particular classes of stations, including satellite space and earth stations.[42]

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[36] 47 C.F.R. § 25.164. Under this milestone schedule, the licensee must enter into a binding, non-contingent construction contract within one year of grant; complete critical design review within two years; begin construction within three years; and launch and operate the satellite within five years of grant.

[37] 47 C.F.R. § 25.165.

[38] 47 C.F.R. § 25.159.

[39] *See, e.g.*, 47 C.F.R. §§ 25.143(e) (reporting requirements for 1.6/2.4 GHz mobile-satellite service (MSS) and 2 GHz MSS; 25.144(c) (reporting requirements for satellite digital audio radio service (SDARS); 25.145(f) (reporting requirements for fixed-satellite service in the 20/30 GHz bands); 25.10(l) (reporting requirements for FSS in the 4/6 GHz band). Other elements of the annual reports include a listing of non-scheduled transponder outages that last more than 30 minutes and identification of transponders not available for service or not performing to specifications. *See id*.

[40] 47 C.F.R. § 25.121(a).

[41] *Id*. Changes in the license terms for DBS space stations were initially addressed in the *DBS Auction Order*, which adopted a ten-year license term for non-broadcast DBS space stations. *See DBS Auction Order*, 11 FCC Rcd at 9762, para. 130.

[42] The Telecommunications Act of 1996 granted the Commission authority to "prescribe the period or periods for which licenses shall be granted and renewed … ." Telecommunications Act of 1996, Pub. L. No. 104-104, Title II, (continued....)

13. We propose to adopt a ten-year license term for all non-broadcast 17/24 GHz BSS licenses. For 17/24 GHz BSS satellites that will operate as broadcast facilities, we propose an eight-year license term, as provided under Section 307(c)(1) of the Communications Act. We seek comment on these proposals.

5. REPLACEMENT SATELLITES

14. The Commission has previously stated that, given the huge costs of building and operating GSO space stations, operators should have some assurance that they will be able to continue to serve their customers.[43] Therefore, the Commission has stated that, when an orbit location remains available for a U.S. satellite with the technical characteristics of the proposed replacement satellite, it will generally authorize the replacement satellite at the same location.[44] In 2003, the Commission adopted a streamlined procedure for processing replacement satellite applications. Unopposed replacement satellite applications with technical characteristics consistent with those of the satellite to be retired are processed under a grant-stamp procedure.[45] Upon Commission review and finding that the technical characteristics of the replacement satellite are consistent with the satellite to be retired, the Commission stamps the application as "granted" and returns a copy to the applicant. In order to keep track of these actions, the Commission issues a public notice announcing such action.[46] We believe that the grant-stamp procedure has proven to be an efficient method of processing replacement satellite applications, and therefore we propose to employ this procedure to process unopposed replacement BSS applications in the 17.3-17.7 GHz band. We seek comment on this proposal.

6. NON-U.S.-LICENSED SATELLITE OPERATORS

15. In the 1997 *DISCO II Order*,[47] the Commission established a framework under which it would consider requests to serve the U.S. market from non-U.S.-licensed satellites. In establishing this

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§ 203, 110 Stat. 56, 112, (1996) (amending Section 307 of the Communications Act to eliminate ten-year term and creating new Section 307(c)(1)).

[43] Amendment of the Commission's Space Station Licensing Rules and Policies, *First Order on Reconsideration and Fifth Report and Order*, 19 FCC Rcd 12673, 12657, at para. 54 (2004) ("*Fifth Space Station Reform Order"*), *citing* Amendment of the Commission's Space Station Licensing Rules and Policies, *Notice of Proposed Rulemaking*, 17 FCC Rcd 3847, 3887, at para. 119 (2002) ("*Space Station Reform NPRM")*; *citing* Assignment of Orbital Locations to Space Stations in the Domestic Fixed-Satellite Service, *Memorandum Opinion and Order*, 3 FCC Rcd 6972, 6976 n. 31 (1988); Hughes Communications Galaxy, Inc., *Order and Authorization*, 6 FCC Rcd 72, 74 n. 7 (1991); GE American Communications, Inc., *Order and Authorization*, 10 FCC Rcd 13775, 13775-76, at para. 6 (1995). The Commission's rules define a "replacement" satellite as one that is authorized to operate at the same orbit location, in the same frequency bands, and with the same coverage area as one of the licensees existing satellites and will be brought to use at "approximately the same time as … the existing satellite is retired." *See, e.g.*, 47 C.F.R. § 25.143(c).

[44] *Fifth Space Station Reform Order*, 19 FCC Rcd at 12657, para. 54, *citing Space Station Reform NPRM*, 17 FCC Rcd at 3887, para. 119, *citing 1988 Orbit Assignment Order*, 3 FCC Rcd at 6976 n. 31; *GE Americom Replacement Order*, 10 FCC Rcd at 13775-76, para. 6.

[45] *Fifth Space Station Reform Order*, 19 FCC Rcd at 12657, para. 54, *citing First Space Station Reform Order*, 18 FCC Rcd at 10856, paras. 253-54.

[46] *First Space Station Reform Order*, 18 FCC Rcd at 10856, para. 253.

[47] *See* Amendment of the Commission's Regulatory Policies to Allow Non-U.S. Licensed Satellites to Provide Domestic and International Service in the United States, *Report and Order*, IB Docket No. 96-111, 12 FCC Rcd 24094 (1997) ("*DISCO II"* or *"DISCO II Order"*).

framework, the Commission implemented market-opening commitments that the United States made in the 1997 World Trade Organization (WTO) Agreement on Basic Telecommunications Services (WTO Basic Telecomm Agreement).[48] The United States made its market access commitments for satellite services in this Agreement on a service-by-service basis. The commitments include FSS and mobile-satellite service (MSS), but specifically exclude DTH service, DBS service, and digital audio radio service (DARS). The U.S. commitments do not reference 17/24 GHz BSS. We propose to consider requests for U.S. access by foreign-licensed 17/24 GHz BSS systems on a service-specific basis consistent with the framework established in *DISCO II* and the United States' WTO commitments.[49]

16. Thus, under the *DISCO II* framework, we will evaluate the legal and technical qualifications of the non-U.S.-licensed 17/24 GHz BSS satellite operator in each request to serve the U.S.-market. Further, we will assess the competitive effects of this entry. In cases where systems licensed by WTO-member countries seek to provide non-DTH FSS to U.S. customers from their 17/24 GHz BSS systems, we will presume that entry will further competition. In cases where non-WTO-member countries seek to use these systems to serve the United States or where WTO-member countries seek to provide services such as DTH over 17/24 GHz BSS systems, we will apply the effective competitive opportunities test (ECO-SAT) to ensure that entry will not distort competition in the U.S market. Under this test, the Commission examines whether there are effective competitive opportunities for U.S.-licensed satellites to serve the home market of the satellite seeking U.S. access. In particular, the Commission examines whether there are any *de jure* or *de facto* barriers to entry in the foreign country for the provision of analogous services and whether any such barriers cause competitive distortions in the U.S. market.

17. As in all cases where an operator seeks authority to serve the U.S.-market from a non-U.S. satellite, the foreign operator must provide the same information concerning the 17/24 GHz BSS satellite as U.S. applicants must provide when applying for a space station license.[50] In addition, foreign entities must include an ECO-SAT analysis where applicable.

18. Once authorized to serve the United States, we propose to impose the same technical and regulatory requirements as contained in our existing rules and rules established as a result of this proceeding (*e.g.*, bond requirement, geographic service requirements, spacecraft end-of-life disposal requirements). We seek comment on any reason we should deviate from this approach.

B. PUBLIC INTEREST AND OTHER STATUTORY OBLIGATIONS

1. PUBLIC INTEREST OBLIGATIONS

19. In 1992, Congress directed the Commission to initiate a rulemaking and impose public

[48] *DISCO II*, 12 FCC Rcd at 24112, para. 39. The WTO came into being on January 1, 1995, pursuant to the Marrakesh Agreement Establishing the World Trade Organization (the Marrakesh Agreement). 33 I.L.M. 1125 (1994). The Marrakesh Agreement includes multilateral agreements on trade in goods, services, intellectual property, and dispute settlement. The General Agreement on Trade in Services (GATS) is Annex 1B of the Marrakesh Agreement. 33 I.L.M. 1167 (1994). The WTO Basic Telecom Agreement was incorporated into the GATS by the Fourth Protocol to the GATS (April 11, 1997), 36 I.L.M. 354 (1997) (Fourth Protocol to the GATS). The WTO Basic Telecom Agreement also contains specific commitments with respect to market access and national treatment commitments made by WTO members.

[49] *DISCO II*, 12 FCC Rcd at 24134, para. 92.

[50] *First Space Station Reform Order,* 18 FCC Rcd at 10776, para. 30. *See* 47 C.F.R. § 25.137. Thus, foreign entities must file a Schedule S, providing all the information required in Section 25.114 (c)of the Commission's rules. 47 C.F.R. § 25.114(c).

interest obligations on providers of direct broadcast satellite service.[51] Section 335 of the Communications Act defines DBS providers as either licensees for a Ku-band satellite system under Part 100 of the Commission's rules or as distributors who control a minimum number of channels using a Ku-band fixed-satellite service satellite for the provision of video programming directly to the home and are licensed under Part 25 of the Commission's rules.[52] In 1998, the Commission adopted rules[53] to implement Section 335. The Commission's rules apply to entities licensed to operate satellites in the 12.2 to 12.7 GHz DBS frequency bands;[54] entities licensed pursuant to Part 25 of the Commission's rules to provide FSS, via the Ku-band,[55] that sell or lease transponder capacity to a video program distributor who offers the specified number of direct-to-home video channels to consumers; and non-U.S. licensed satellites providing DBS or DTH-FSS services in the United States.[56] Section 25.701 of our rules requires these providers to meet certain political broadcast requirements, compliance with children's television advertising limits, and to set aside four percent of channel capacity for noncommercial, educational or informational programming.

20. Section 335 was enacted in 1992 and does not expressly identify satellite licensees in the 17/24 GHz band because this band was not then allocated domestically for BSS.[57] To the extent that 17/24 GHz band licensees provide DBS-like services, we propose that they should be subject to the public interest obligations contained in Section 25.701 of our rules. We seek comment on this proposal.

21. In addition, we request comment on whether licensees in the 17/24 GHz BSS band qualify to use the compulsory copyright licenses granted under Sections 119 and 122 of the Copyright Act.[58] These licenses permit satellite carriers, as defined in the Copyright Act, to provide broadcast television service to subscribers. Section 119 defines the term "satellite carrier" as an entity that uses a satellite operating in the FSS or in the DBS service for point-to-multipoint distribution of television signals.[59] This section allows satellite carriers to offer distant broadcast signals under certain circumstances. Section 122 defines the term "satellite carrier" by reference to the definition in Section

[51] Section 25 of the 1992 Cable Act is codified at Section 335 of the Communications Act of 1934, 47 U.S.C. § 335.

[52] 47 U.S.C. § 335(b)(5). Definitions set by other statutes or rules may apply in different settings. *See, e.g.,* Section 1012 of the Local TV Act (Prevention of Interference to Direct Broadcast Satellite Services), which defines "Direct Broadcast Satellite Service" as "any direct broadcast satellite system operating in the direct broadcast satellite frequency band," which this statute defines as "the band of frequencies at 12.2 to 12.7 gigahertz." 47 U.S.C. § 1110(c).

[53] Implementation of Section 25 of the Cable Television Consumer Protection and Competition Act of 1992, Direct Broadcast Satellite Public Interest Obligations*, Report and Order*, 13 FCC Rcd 23254 (1998) (*"First Report and Order"*).

[54] In 2002, the Commission released a *Report and Order* eliminating Part 100 of the Commission's Rules. The Commission moved Section 100.5 to Section 25.701 and eliminated the reference to entities licensed pursuant to Part 100. Instead, the new rule in section 25.701 (a)(1)defines DBS Providers as entities licensed to operate satellites in the 12.2-12.7 DBS frequency bands. *See* Policies and Rules for the Direct Broadcast Satellite Service, *Report and Order,* 17 FCC Rcd 11331 at paras. 22-24 (2002) (*"Part 100 Report & Order"*). For purposes of this section of the *NPRM*, any reference to Part 100 licensees means entities defined in Section 25.701(a)(1).

[55] The Ku-band frequencies referenced in the statute are 11.7 GHz-12.2 GHz and 14.0 GHz-14.5 GHz.

[56] 47 C.F.R. § 25.701(a).

[57] *See 18 GHz Report & Order*, 15 FCC Rcd at 13475, paras. 96-99.

[58] 17 U.S.C. §§ 119 &122.

[59] 17 U.S.C. § 119 (d)(6).

119 and provides a copyright license for local-into-local broadcast television service.[60] We ask commenters to address whether 17/24 GHz licensees should be considered "satellite carriers" within the meaning of these statutory provisions. If so, do broadcast carriage requirements apply to these licensees?[61] Should the Commission apply these requirements to the extent that the licensees using this new allocation provide services similar to other satellite carriers? Or, if these licensees are not within the Copyright Act definition, how would they obtain permission to retransmit material subject to copyright?

2. EQUAL EMPLOYMENT OPPORTUNITIES

22. Section 25.601 of the Commission's rules require an entity that uses an owned or leased FSS or DBS service facility for video programming directly to the public on a subscription basis to comply with the equal employment opportunity (EEO) requirements set forth in Part 76 of the Commission's rules if such entity exercises control over the video programming it distributes.[62] Notwithstanding other EEO provisions within these rules, a licensee or permittee of a DBS station operating as a broadcaster must comply with the equal employment opportunity requirements set forth in Part 73.[63] Consequently, to the extent that 17/24 GHz BSS band licensees provide DBS-like services, we propose to apply Section 25.601 to those licensees. In addition, we propose to require 17/24 GHz BSS licensees to comply with any other EEO requirements that may be subsequently adopted or enforced by the Commission for broadcasters and multichannel video service providers (MVPDs). We seek comment on these proposals.

3. GEOGRAPHIC SERVICE RULES

23. The Commission is committed to establishing policies and rules that will promote service to all regions in the United States, particularly to traditionally underserved areas, such as Alaska and Hawaii, and other remote and underserved areas in the United States. In order to achieve these goals, we propose to apply geographic service rules for the states of Alaska and Hawaii in the 17/24 GHz BSS band. Specifically, to the extent that 17/24 GHz BSS band licensees provide DBS-like services, we propose to adopt rules analogous to those in effect for DBS satellites in Section 25.148(c) of the Commission's rules.[64] These rules require licensees to provide service to Alaska and Hawaii where such service is technically feasible from the authorized orbit location. Applicants who do not propose to provide service to Alaska and Hawaii must provide technical analyses to the Commission demonstrating that such service is not feasible as a technical matter or that, while technically feasible, such service would require so many compromises in satellite design and operation as to make it economically unreasonable. We seek comment on this proposal.

24. We anticipate that many of the satellite operators in the 17/24 GHz BSS bands will operate multiple satellites in their system or fleet. If a 17/24 GHz BSS licensee has multiple satellites, should the Commission consider applying geographic service rules at each orbit location or should we apply rules on a per licensee basis?[65] We also anticipate that many 17/24 GHz BSS satellites will be used

[60] 17 U.S.C. § 122. *See also* 47 U.S.C. § 338.

[61] *See* 47 U.S.C. § 338.

[62] *See* 47 C.F.R. § 25.601.

[63] 47 C.F.R. Part 73.

[64] 47 C.F.R. § 25.148(c).

[65] *See* In the Matter of EchoStar Satellite LLC, *Memorandum Opinion and Order*, 19 FCC Rcd 6075 (2004) (In this Order, the International Bureau granted EchoStar's request for a waiver of the geographic service rule for its EchoStar 4 satellite at the 157° W.L. orbital location because service to Alaska and Hawaii was not technically (continued....)

to provide local-into-local broadcast television stations via small-footprint spot beams. As discussed previously, we are seeking comment on whether 17/24 GHz licensees are "satellite carriers" for Copyright Act purposes.[66] If so, those licensees that provide any local broadcast stations to subscribers residing in a particular market pursuant to the compulsory copyright license must also provide all otherwise qualified local stations to subscribers in that market.[67] We seek comment on any special considerations we should take into account because of the different business models and system designs that are envisioned for 17/24 GHz BSS bands if licensees are subject to carry-one, carry-all copyright requirements. We also note that Section 210 of the Satellite Home Viewer Extension and Reauthorization Act[68] amends Section 338(a) of the Communications Act of 1934, as amended,[69] and requires satellite carriers with more than five million subscribers to carry both the analog and digital signals of television broadcast stations in local markets in noncontiguous states. This legislation further requires that satellite carriers provide these signals to substantially all of their subscribers in each station's local market. We seek comment on whether satellite operators in the 17/24 GHz BSS bands are "satellite carriers" within the meaning of Section 338 and if they are thus subject to this requirement.[70]

25. Commenters should also address issues concerning international coordination with neighboring satellites. 17/24 GHz BSS satellites are subject to the ITU's first-in-time filing policy to satellite coordination and notification outlined in Articles 9 and 11 of the International Radio Regulations.[71] The final operating parameters of the satellite, including its coverage area, power levels, and even perhaps, orbital location, are subject to the completion of these coordination requirements which may conclude many years after the Commission has licensed the satellite to operate. We seek comment on how the Commission should take into account the uncertainty imposed by this international regulatory system when considering various approaches to ensure service to traditionally underserved areas in the United States.

4. EMERGENCY ALERT SYSTEM

26. In the Commission's August, 2004 Emergency Alert System (EAS) Notice of Proposed

(...continued from previous page)
feasible from that satellite at that particular orbital location, and EchoStar was providing service to Alaska and Hawaii from its satellites at the 119° orbital location.); In re EchoStar Satellite Corporation, DIRECTSAT Corporation, EchoStar DBS Corporation, *Memorandum Opinion and Order,* 13 FCC Rcd 8595 (1998) (In this Order, the International Bureau granted EchoStar's request for a waiver of the geographic service rule for its EchoStar 1 satellite at the 148° W.L. orbital location because service to Hawaii was not technically feasible from that satellite at that particular orbital location, and EchoStar pledged to provide service to Hawaii from its satellite at the 119.2° W.L. orbital location.).

[66] 17 U.S.C. §§ 119, 122. *See* para. 21 *supra.*

[67] 47 U.S.C. § 338.

[68] The Satellite Home Viewer Extension and Reauthorization Act of 2004 ("SHVERA"), Pub. L. No. 108-447, §210, 118 Stat 2809 (2004).

[69] 47 U.S.C. § 338.

[70] *See* In the Matter of Implementation of Section 210 of the Satellite Home Viewer Extension and Reauthorization Act of 2004 to Amend Section 338 of the Communications Act, Notice of Proposed Rulemaking, MB Docket No.181, FCC 05-92 (released May 2, 2005).

[71] *See* ITU Radio Regulations, Article 9 and Article 11.

rulemaking,[72] the Commission sought comment on whether the Commission should require digital providers, including DBS providers, to comply with the Commission's EAS Rules.[73] In November, 2005, the Commission released the *EAS First Report and Order and Further Notice*,[74] in which it noted that consumers are adopting digital technologies as replacements to analog broadcast and cable systems that are currently required to implement EAS, and as such, an increasingly large percentage of television viewers and radio listeners receive their programming from systems that may have no independent duty to provide EAS.[75] Consequently, the Commission amended Part 11 of its rules to require participation in the EAS by digital broadcast stations, digital cable systems, wireless cable systems, DBS services, and DARS. In the Further Notice of Proposed Rulemaking that accompanied the *EAS First Report and Order and Further Notice*, the Commission sought comment on how DBS providers might deliver regionally targeted alerts in a next generation alert and warning system.[76]

27. In the *EAS First Report and Order and Further Notice*, the Commission defined DBS broadly to include the "vast majority of DTH services, particularly those which viewers may have expectations as to available warnings based on experience with broadcast television services."[77] We believe the same concerns the Commission addressed in the *EAS First Report and Order and Further Notice* are presented with the introduction of services by 17/24 GHz providers. The customers of the new 17/24 GHz services would likely have similar expectations regarding these services as they would towards those in the 12.2 to 12.7 GHz and Ku bands, if for no other reason than the particular band in which DTH services are offered has no relevance to customers' expectations regarding their ability to receive warnings. Accordingly, to the extent that 17/24 GHz BSS band licensees provide DBS-like services, we propose to apply the EAS requirements to providers of those services. We seek comment on this proposal. Finally, we propose to incorporate herein by reference all comments regarding the application of EAS requirements to DBS providers in the EAS Notice and Further Notice of Proposed Rulemaking. We seek further comment on this issue in this docket.

C. USE OF BSS SPECTRUM AT 17.7-17.8 GHz

28. In the *18 GHz Report and Order*, the Commission stopped the domestic allocation to the BSS at 17.7 GHz.[78] Although the international allocation for Region 2 BSS in the space-to-Earth

[72] *See* Review of the Emergency Alert System, *Notice of Proposed Rulemaking*, EB Docket No. 04-296, 19 FCC Rcd 15775 (2004) (*EAS NPRM*).

[73] *Id.*, at 15786, para 29.

[74] *See* Review of the Emergency Alert System, *First Report and Order and Further Notice of Proposed Rulemaking*, EB Docket No. 04-296, FCC 05-191 (rel. Nov. 10, 2005) (*EAS First Report and Order and Further Notice*).

[75] *Id*. at para. 2.

[76] *Id*. at para 68.

[77] *Id*. at para 49. In the *EAS First Report and Order and Further Notice*, the Commission defined DBS providers for EAS purposes to include: (1) entities licensed to operate satellites in the 12.2 to 12.7 GHz DBS frequency bands; (2) entities licensed to operate satellites in the Ku band fixed satellite service (FSS) and that sell or lease capacity to a video programming distributor that offers service directly to consumers providing a sufficient number of channels so that four percent of the total applicable programming channels yields a set aside of at least one channel of non commercial programming pursuant to section 25.701(e) of the Commission's rules, or (3) non U.S. licensed satellite operators in the Ku band that offer video programming directly to consumers in the United States pursuant to an earth station license issued under part 25 of this title and that offer a sufficient number of channels to consumers so that four percent of the total applicable programming channels yields a set aside of one channel of non commercial programming pursuant to section 25.701(e) of the Commission's rules. *Id.*

[78] *See 18 GHz Report & Order,* 15 FCC Rcd at 13475, paras. 95-99.

direction extends from 17.3-17.8 GHz, the Commission believed that it was important to keep as much spectrum available to the terrestrial fixed services as possible, for as long as possible, in order to assist in relocating displaced facilities. In making this decision, the Commission took into account the ubiquitous nature of BSS services which we believed would preclude successful coordination with a terrestrial service that was similarly widely deployed, and the amount of terrestrial fixed spectrum being lost as a result of that proceeding.[79]

29. The Commission now has received several applications seeking authority to launch and operate satellites in the 17.3-17.8 GHz band. DIRECTV, Pegasus, EchoStar and Intelsat all propose to operate their satellites in the full 500 MHz of spectrum from 17.3-17.8 GHz.[80] In their applications, EchoStar and Intelsat request that the Commission re-examine the availability of the 17.7-17.8 GHz band in the future.[81] EchoStar states that if the Commission extends the BSS allocation to cover the full 500 MHz of spectrum allocated in the ITU Radio Regulations, it intends to use the 17.7-17.8 GHz band to provide U.S. service; but at a minimum it plans to use the band for international BSS service to other portions of North America, including Canada, Mexico and the Caribbean.[82] Similarly, Pegasus is hopeful that the Commission will re-examine the availability of spectrum in the 17.3-17.8 GHz band and includes the 17.7-17.8 GHz band in its application. However Pegasus states that it will modify its technical design should only 400 MHz of spectrum be available.[83] Intelsat states that its proposed satellites have the capability to provide both U.S. and foreign service in the 17.7-17.8 GHz band should the spectrum become available, and seeks authority to operate in the band.[84]

30. The intent of this proceeding is to establish service rules for use of the 17/24 GHz BSS allocation that becomes effective on April 1, 2007, so that applicants may have sufficient time to design their systems in a manner that will conform to our rules. Recognizing the significant technical challenges posed by the question of BSS/FS band-sharing at 17.7-17.8 GHz, we believe that this goal would be disserved by engaging in the protracted rulemaking process that would inevitably result. Moreover, although 17/24 GHz BSS applicants seek to use the 17.7-17.8 GHz band, none has provided evidence that terrestrial fixed service spectrum relocation requirements are less demanding than predicted. Nor has any applicant provided a convincing argument that coordination of widely deployed terrestrial services with ubiquitously located 17/24 GHz BSS receivers would be readily feasible. For these reasons, we do not find compelling motivation to reexamine the Commission's earlier decision with regard to BSS use of the 17.7-17.8 GHz band in the United States. Therefore, we do not propose to authorize or to protect the reception of BSS (space-to-Earth) transmissions into the United States and its possessions in the 17.7-

[79] *Id. See also* 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, *First Order on Reconsideration,* 16 FCC Rcd 19808, 19822-23, paras. 30-31 (2001).

[80] *See DIRECTV Application* at 7; *EchoStar Application* at 4 and 23; *Pegasus Application* at 3; and *Intelsat Application* at 3.

[81] *See EchoStar Application* at 4 and 23; and *Intelsat Application* at 3. The application of DIRECTV was filed in 1997 prior to the Commission's decision to stop the BSS allocation at 17.7 GHz.

[82] *See EchoStar Application* at 4 and 23.

[83] *See Pegasus Application* at 3.

[84] *See Intelsat Application* at 3.

17.8 GHz band.[85]

31. We recognize however, that U.S. satellite operators may wish to use the 17.7-17.8 GHz band to provide service to receiving earth stations located within Region 2, but outside of the United States. The operation of 17/24 GHz BSS receiving earth stations outside of the United States and its possessions does not present the same coordination difficulties with regard to U.S.-licensed terrestrial fixed service stations, nor would it hinder the re-location of these services in the 18 GHz band.[86] We propose to permit U.S. operators to use the international allocation to the BSS in the 17.7-17.8 GHz band,[87] but to limit use of that allocation to international service only, *i.e*., to receiving earth stations located outside of the U.S. and its possessions.[88] We seek comment on this proposal.

32. We seek comment on other changes to our rules which might be necessary should we allow use of the 17.7-17.8 GHz band to provide non-U.S. BSS service. We are proposing to permit transmissions in the 17.7-17.8 GHz band only to receiving earth stations located outside of the United States and its possessions. However, we recognize that the footprint of satellite beams serving near-by Region 2 countries could illuminate portions of the United States and that U.S. terrestrial service stations may be subject to interference from such space-to-Earth satellite transmissions, particularly at low elevation angles. Historically, the Commission has adopted power flux density (pfd) limits to protect terrestrial service antennas from interference from co-frequency space station transmissions.[89] At present, neither the Commission's rules nor the ITU define any pfd limits for BSS systems operating in the 17.7-17.8 GHz band. Prior to adoption of the *18 GHz Report and Order* in 2002,[90] Section 25.208(c) of the Commission's rules imposed pfd limits for the FSS in the entire 17.7-19.7 GHz band[91] and Article 21 of the ITU Radio Regulations imposes the same pfd limits on the FSS operating in the 17.7-19.7 GHz band in order to protect terrestrial stations.[92] We propose to extend these same pfd limits to the BSS service

[85] In the United States and its possessions, reception of BSS (space-to-Earth) transmissions in the 17.7-17.8 GHz band from foreign-licensed satellites would similarly not be authorized or protected.

[86] The relocation of FS in the 18 GHz band in Docket 04-143 is currently under review by the Commission. *See* Rechannelization of the 17.7-19.7 GHz Frequency Band for Fixed Microwave Services under Part 101 of the Commission's Rules, WT Docket No. 04-143, *Notice of Proposed Rulemaking*, FCC 04-77 (rel. April 19, 2004).

[87] *See* Article 5 of the ITU Radio Regulations and footnote 5.517, which reads as follows: In Region 2, the allocation to the broadcasting-satellite service in the band 17.3-17.8 GHz shall come into effect on 1 April 2007. *See also* 47 C.F.R. § 2.106, footnote 5.517.

[88] We note that licensing of earth stations in a foreign country does not fall within the purview of the Commission. Authorization for any such earth stations would be granted by the relevant foreign administration.

[89] *See, e.g.*, 47 C.F.R. § 25.208.

[90] *See* note 12 *supra*.

[91] In the 17.7-19.7 GHz band these pfd limits were as follows: (1) -115 dB (W/m\2\) in any 1 MHz band for angles of arrival between 0 and 5 degrees above the horizontal plane; (2) -115+0.5 (δ-5) 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; (3) -105 dB (W/m\2\) in any 1 MHz band for angles of arrival between 25 and 90 degrees above the horizontal plane.

[92] *See* Table 21-4 of the ITU Radio Regulations. These limits are:

-115 dBW/m^2/MHz	for $0^\circ \le \delta \le 5^\circ$
-115 + 0.5(δ-5) dBW/m^2/MHz	for $5^\circ \le \delta \le 25^\circ$
-105 dBW/m^2/MHz	for $25^\circ \le \delta \le 90^\circ$

where δ is the angle of arrival above the horizontal plane.

(space-to-Earth) in the 17.7-17.8 GHz band. We seek comment on this proposal, and ask whether these pfd limits are sufficient to protect U.S. terrestrial operations in the band, or whether some other limits should be adopted. We note that these pfd limits were adopted to facilitate sharing between co-primary FS and FSS services. Recognizing that we do not intend to authorize receipt of (space-to-Earth) BSS transmissions in the United States and its possessions in the 17.7-17.8 GHz band, we ask whether more stringent pfd limits might be appropriate, particularly in areas of the U.S. located farther from the borders.

33. We also seek comment on tracking, telemetry and command (TT&C) operations in the 17.7-17.8 GHz band. Section 25.202(g) of our rules requires that TT&C functions for all U.S. domestic satellites be conducted at either or both edges of the allocated band(s).[93] The Commission has previously recognized that TT&C functions for U.S.-licensed satellites are best performed at facilities located within the United States, and that locating such facilities in a foreign country could adversely affect an operator's ability to maintain control of its spacecraft.[94] Accordingly, we ask how best to accommodate TT&C functions for 17/24 GHz BSS satellites seeking to use the 17.7-17.8 GHz band to provide international service. We ask whether there is sufficient spectrum available at the lower edge of the band (*i.e.*, above 17.3 GHz) for TT&C transmissions, particularly recognizing that this same portion of the band will be used for reverse-band telecommand transmissions from DBS satellites. We seek comment on whether TT&C transmissions can be carried out at the band edge just below 17.7 GHz.

D. ORBITAL SPACING AND MINIMUM ANTENNA DIAMETER AND PERFORMANCE STANDARDS

1. ORBITAL SPACING

34. In this proceeding, we seek to establish service rules for use of the 17/24 GHz BSS allocation that become effective on April 1, 2007. To date we have received only applications to operate GSO satellites in the 17/24 GHz band.[95] Because we envision the service as a GSO service, we are not considering rules for NGSO satellite systems in this proceeding. However, we seek comment on the appropriateness of this approach and ask whether we should allow for the possibility of both GSO and NGSO 17/24 GHz BSS systems. If so, we ask commenters to elaborate on how such GSO/NGSO sharing might be effected, and what additional or different rules might be necessary to accommodate both types of systems in the band.

35. In developing operating rules for the 17/24 GHz BSS allocation, the Commission must consider whether a GSO orbital spacing policy is needed, and if so, what separation is appropriate. Historically, the Commission has adopted orbital spacing policies in other frequency bands as a means of accommodating the largest number of spacecraft in an environment that minimizes harmful interference between adjacent satellite operators. For example, the Commission's licensing policy for C-, Ku- and Ka-band GSO FSS networks is predicated upon two-degree orbital spacing.[96] In contrast, in the 12 GHz BSS (DBS) band, U.S.-licensed satellites now operate from allotted orbital positions that are spaced at least

[93] *See* 47 C.F.R. § 25.202(g).

[94] *See* In the Matter of EchoStar Satellite LLC Application for Authority to Construct, Launch and Operate a Geostationary Satellite Using the Extended Ku-band Frequencies in the Fixed-Satellite Service at the 109° W.L. Orbital Location, *Order and Authorization,* 20 FCC Rcd 930 at para. 17 (2004).

[95] *See DIRECTV Application, EchoStar Application, Pegasus Application and Intelsat Application.*

[96] *See* Licensing of Space Stations in the Domestic Fixed- Satellite Service and Related Revisions of Part 25 of the Rules and Regulations, *Report and Order*, CC Docket No. 81-704, FCC 83-184, 54 Rad. Reg. 2d577 (rel. Aug. 16, 1983); summary printed in Licensing Space Stations in the Domestic Fixed-Satellite Service, 48 F.R. 40233 (Sept. 6, 1983) (*Two-Degree Spacing Order*). *See also 18 GHz Report & Order*, 15 FCC Rcd.at 13479.

nine degrees apart.[97] This nine-degree spacing environment was established by the ITU Region 2 Plan outlined in Appendices 30 and 30A of the Radio Regulations.[98] DBS operators have taken advantage of this orbital separation to deploy small-diameter subscriber receiving antennas[99] and to operate with the relatively high-transmit powers associated with modern multi spot-beam DBS space station antennas.

36. Many of the economic and technical concerns associated with 17/24 GHz BSS operations may be either exacerbated or mitigated by the degree of orbital spacing. These can include the size, cost and design of receiving antennas, the degree of interference from and into adjacent satellites, which in turn affects quality and availability of service, the equipment cost required to mitigate adjacent-satellite interference, the total orbital capacity available for use by operators, the degree of design and operational flexibility afforded to satellite operators and the ability to adapt to future advances in technology. Carefully conceived GSO orbital spacing policies can permit satellite operators to design their systems in a manner that best balances these technical and economic concerns, and affords some assurance that subscriber receiving antennas will be protected from interference from other U.S.-licensed transmissions. In the FSS bands, our ability to license GSO satellites in an efficient and equitable manner has been facilitated by our two-degree orbital spacing policy. We believe that the establishment of a well-considered orbital spacing policy in the 17/24 GHz band will be equally valuable in achieving these goals.

37. In addition, we acknowledge the unique opportunity and advantages available in adopting an orbital spacing policy before the frequency band becomes populated with operating satellites. However, we also recognize that administrations other than the United States now have 17.3-17.8 GHz (space-to-Earth) BSS filings at the ITU[100] and it is reasonable to anticipate that others will file in the future. Any orbital spacing policy that the Commission might adopt would be applicable only to U.S.-licensed satellites and to foreign satellites seeking authority to serve the U.S. Because coordination between U.S. and foreign-licensed satellites is governed by procedures set forth in the ITU Radio Regulations, there is no assurance that a particular orbital spacing designed for service to the United States could be achieved and maintained across significant portions of the Western Hemisphere. Moreover, there may be a loss of operating flexibility associated with any orbital spacing policy, as well as certain economic and technical costs. Accordingly, we seek comment on whether an orbital spacing policy should be adopted for the 17/24 GHz BSS service. We ask commenters to consider and comment on whether some other approach might be preferred in order to maximize orbital capacity and minimize interference to operators of small-diameter antenna receivers. We also seek comment on how any such policy should take into account co-existence and coordination with foreign satellites that are not subject to U.S. rules, or foreign satellites seeking to provide service to the U.S.

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[97] Under the terms of the Region 2 BSS and Feeder-Link Plans, the United States is assigned eight orbit locations for providing broadcasting-satellite service to the United States. The eight U.S. orbital positions, proceeding from east to west (all West Longitude), are 61.5°, 101°, 110°, 119°, 148°, 157°, 166°, and 175°. Requests to serve the United States from DBS orbital locations not in the ITU Region 2 Plan are now under consideration in separate proceedings. *See, e.g.,* para. 43 *infra*.

[98] The International Telecommunication Union's (ITU) Regional Administration Radio Conference for the Planning in Region 2 of the Broadcasting-Satellite Service (BSS) in the Frequency Bands 12.2-12.7 GHz and Associated Feeder links in the Frequency Band 17.3-17.8 GHz (Geneva) (1983) ("RARC Sat-R2"), adopted the plan for the broadcasting-satellite service in the frequency band 12.2-12.7 GHz in Region 2 (the "Region 2 Plan").

[99] In ITU Regions 1 and 3 (Europe/Africa and Asia/Oceana) a separate allotment plan exists with orbital separations for Ku-band BSS satellites of six degrees in order to protect receiving antennas as small as 60 cm in diameter.

[100] At this time, advance publication information and/or coordination information has been submitted by the Administrations of Canada, Luxembourg, Malaysia, and United Kingdom.

38. Two 17/24 GHz BSS applicants, DIRECTV and EchoStar, propose satellite fleets that are located at orbital separations of 4.5 degrees.[101] Moreover, in its comments in response to the *18 GHz NPRM,* DIRECTV specifically proposed that the Commission adopt a separation of 4.5 degrees instead of the nine-degree spacing characteristic of the 12 GHz DBS band.[102] DIRECTV asserts that this value would at least double the spectrum resources available in this band relative to the 12 GHz DBS band, and permit operators to locate BSS satellites not only at current U.S. DBS locations, but also at many additional locations.[103] DIRECTV also argues that due to the characteristics of the higher frequency band, customers will be able to receive a quality of service to 45-cm (18-inch) receive antennas comparable to that now available in the 12 GHz DBS band. Finally, DIRECTV maintains that any orbital spacing policy we adopt should, when possible, be consistent with the U.S. assignments in the ITU Region 2 BSS Plan.[104] A third applicant, Intelsat, asserts that from the point of view of mutual interference, an orbital spacing of four-degrees is the minimum separation required for adequate provision of service to receiving earth stations larger than 18 inches (45 cm) at these frequencies.[105] In its application, Pegasus proposes to operate its fleet at orbital separations of nine or ten degrees, although the interference analysis submitted with its application is based on a 4.5-degree orbital separation.[106] Finally we note that Pegasus also filed an application proposing to add 17/24 GHz BSS service to its Ka-band FSS DTH satellites that would operate at an orbital separation of ten degrees.[107]

39. The Commission recognizes that there is merit in considering an orbital spacing policy for the 17/24 GHz BSS band that is different from either two or nine degrees. The current two-degree FSS spacing requirement, if applied to 17/24 GHz BSS systems, would necessitate deployment of subscriber antennas with diameters that may be unacceptably large for the direct-to-home market. Moreover, two-degree spacing would increase relative to that now afforded to operations subject to nine-degree spacing, without sacrificing quality of service to consumers. The question we must consider is what orbital spacing best advances the competing goals of permitting small-diameter receiving antennas and relatively high-power transmissions, while simultaneously allowing for the greatest occupancy of the geostationary satellite orbit.

40. Both DIRECTV and EchoStar propose to operate their satellites at 4.5-degrees of orbital separation.[108] We recognize that such a spacing scheme offers the advantages of accommodating relatively small-diameter subscriber antennas, while simultaneously permitting operators to co-locate with 12 GHz DBS satellites at up to three existing U.S. GSO locations from which service is possible to all 50 states.[109] We note, however, that other orbital separations (*e.g.*, three-degrees) could similarly facilitate

[101] *See DIRECTV Application* and *EchoStar Application*.

[102] *See 18 GHz Report & Order*, 15 FCC Rcd at 13475-76, para. 96, *citing DIRECTV Comments* at 6, n.12.

[103] *See* In the Matter of Petition of DIRECTV Enterprises, Inc. to Amend Parts 2, 25 and 100 of the Commission's Rules to Allocate Spectrum for the Fixed-Satellite Service and the Broadcasting-Satellite Service, Petition for Rulemaking, RM No. 9118 (filed June 5, 1997). This Petition for Rulemaking was filed response to the *18 GHz NPRM.*

[104] *Id.*

[105] *See Intelsat Application* at 7.

[106] *See Pegasus Application* at 1 and 27.

[107] *See Pegasus Ka-band Mod. Applications* (File Nos. SAT-MOD-20020322-00035, SAT-MOD-20020322-00036). *See also* note 21 *supra*.

[108] *See DIRECTV Application* at 3 and *EchoStar Application* at 3.

[109] These locations are 101º W.L., 110º W.L., and 119º W.L.

co-location with 12 GHz DBS satellites. There are other advantages and associated trade-offs with other spacing schemes that we might consider. For example a two-degree or three-degree separation scheme would afford increased orbital capacity, albeit at the expense of smaller antenna diameters. Separation values such as six-degrees, eight-degrees, or even nine-degrees would permit even smaller subscriber antennas to be deployed, however, the choice and flexibility of sites available to operators would decrease accordingly. The primary differences in these spacing schemes would be the resulting minimum receiving antenna diameter possible, and the total number of orbital positions made available to operators. Accordingly, we seek comment on whether there is a spacing scheme different from the current FSS two-degrees or DBS nine-degrees (*i.e.*, 3º, 4º, 4.5º, etc.), that would better maximize orbital capacity, accommodate small-diameter antennas, be compatible with the ITU Appendices 30 and 30A Plans, and optimize operator flexibility.

41. In addition, we note that U.S. licensed 12 GHz DBS satellites now operate at only those GSO locations allotted to the U.S. in the Region 2 Plan. While a few 17/24 GHz BSS applicants may be able to take initial advantage of co-location with these 12 GHz DBS satellites at select positions, subsequent applicants, or those seeking to offer service from other portions of the GSO arc, may not have this co-location option available. Moreover, there are numerous unresolved technical and operational difficulties associated with co-locating 17/24 GHz BSS and DBS satellites, particularly problems associated with space-path interference, which may make this arrangement less attractive than originally envisioned by certain applicants. For these reasons, we consider it likely that many operators may choose to co-locate 17/24 GHz BSS satellites with Ku-band or Ka-band FSS satellites[110] that are also authorized to provide DTH services, in particular to capitalize on the possibility of marketing a single antenna with dual-band receivers. In such instances, an orbital separation that is compatible with current FSS satellite spacing regimen might be preferable. Accordingly, adoption of a 17/24 GHz BSS orbital separation that is some multiple of two degrees might best facilitate our goals of maximizing orbital capacity and operator flexibility while providing sufficient protection for small-diameter subscriber antennas. It is also possible that different spacing schemes could be adopted in different portions of the GSO arc. For example, recognizing the stated desire of many applicants to co-locate or interleave with DBS satellites operating between 101º W.L. and 119º W.L.,[111] we could adopt a 3-degree or 4.5-degree spacing policy in this segment of the GSO arc, and a different spacing scheme (*e.g.*, 4 degrees) in other portions of the arc.

42. We seek comment on what minimum orbital separation should be effected in the 17/24 GHz BSS band. Specifically, we ask how to best balance the goals of providing maximum GSO orbital capacity while simultaneously minimizing interference into small receiving antennas. We seek comment on what parameters we should give priority to when formulating such a policy, including what minimum-diameter antenna we should seek to accommodate, what service availability[112] we should seek to protect,

[110] *See Intelsat Application* at 7. Intelsat proposes to locate two of its 17/24 GHz BSS satellites at locations where it is already authorized to provide C/Ku-band services, *i.e.*, 89º W.L. and 97º W.L. *See also Pegasus Ka-band Mod. Applications* (File Nos. SAT-MOD-20020322-00035, SAT-MOD-20020322-00036). Pegasus proposed to modify two of its Ka-band authorizations at the orbital locations, 107° W.L. and 117° W.L. to include 17/24 GHz BSS payloads. However, these applications were dismissed in November 2004. *See* note 21 *supra*.

[111] We note that at least two DBS locations, 110º W.L. and 119º W.L., lie in a region of the GSO arc where the U.S. is precluded from operating 12/14 GHz Ku-band satellites by virtue of the Trilateral Agreement between the U.S., Canada and Mexico. *See* Trilateral Arrangement Regarding Use of the Geostationary Orbit Reached by Canada, Mexico, and the United States, *Public Notice* (September 2, 1988) ("*Trilateral Agreement"*).

[112] "Service availability" is defined as the amount of time that the quality of a telecommunication service or communications link equals or exceeds a specified minimum value. For satellite communication links, the availability is usually expressed as a percentage of the average year.

and what degree of orbital capacity and flexibility in system design we should seek to make available. We ask whether any orbital spacing scheme must include the ability to co-locate with U.S. Region 2 BSS Plan assignments, as DIRECTV suggests. In addition, we ask whether there are other factors that we should consider, such as the ability to co-exist with foreign BSS networks, the technical difficulties associated with reverse-band operation in the 17 GHz band, geographic service requirements, and frequency sharing with other services. We seek comment on whether a single orbital separation for 17/24 GHz BSS satellites will best accomplish the objectives we seek to promote, or whether a hybrid orbital spacing scheme might better achieve these objectives. We also seek comment on whether an orbital spacing scheme should be applied to only certain portions of the GSO arc, or whether it should apply uniformly across the entire hemisphere. We ask for comments on what orbital spacing regime, if any, might be best adopted in the eastern or far-western regions of the arc, *i.e.*, 61.5º W.L., 148º W.L., 157º W.L., 166º W.L., and 175º W.L., where DBS channels are allotted to the United States in the ITU Region 2 BSS and Feeder Link Plans.

43. Finally, we recognize that several petitions are now before the Commission asking us to consider various proposals to permit operation of 12 GHz DBS satellites at orbital separations less than nine degrees.[113] The Commission has reached no conclusions with regard to these petitions, nor has it limited the proceeding to consideration of a single possible spacing scheme (*e.g.*, 4.5 degrees). Although it is not the purpose of this document to influence that proceeding, we recognize that any decision the Commission ultimately reaches with regard to less than nine-degree spacing for 12 GHz DBS satellites may have bearing upon the preferred orbital spacing for the 17 GHz BSS band. Accordingly, parties should consider all possible outcomes when formulating their comments in this proceeding. In addition, we invite comment on how the possibility of reduced orbital spacing in the 12 GHz DBS band might influence the choice of orbital spacing in the 17/24 GHz BSS band. We also invite commenters to address what measures the Commission should consider when formulating its decision on 17/24 GHz BSS spacing in the broader context of accommodating the current FSS and DBS orbital spacing schemes, as well as the possibility of reduced orbital spacing in the 12 GHz DBS band.

2. MINIMUM ANTENNA DIAMETER AND PERFORMANCE STANDARDS

44. Because of the inverse relationship between antenna diameter and antenna off-axis discrimination performance, the orbital separation scheme will largely determine the minimum antenna diameter that can be accommodated in the 17/24 GHz BSS band. As the receiving antenna diameter decreases, greater orbital separation is required to compensate for the increase in off-axis interference received from neighboring satellites. However, because antenna off-axis discrimination performance for a given size antenna improves at shorter received-signal wavelengths, comparably-sized 17/24 GHz BSS-band receive-antennas may be able to deliver a quality of service comparable to 12 GHz DBS-band systems, while operating with satellites at smaller orbital separations.

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[113] *See, e.g.,* In the matter of SES Americom, Inc., Petition for Declaratory Ruling to Serve the U.S. Market Using BSS Spectrum from the 105.5° W.L. Orbital Location, FCC File No. SAT-PDR-200220425-00071; Petition of DIRECTV Enterprises LLC for a Rulemaking on the Feasibility of Reduced Orbital Spacing in the U.S. Direct Broadcast Satellite Service, filed December 5, 2003; Application of EchoStar Satellite Corporation for Authority to Construct, Launch and Operate a Direct Broadcast Satellite in the 12.2-12.7 GHz and 17.3-17.8 GHz Frequency Bands at the 86.5° W.L. Orbit Location, File No. SAT-LOA-20030606-00113; and In the Matter of Spectrum Five LLC, Petition for Declaratory Ruling to Serve the U.S. Market Using BSS Spectrum from the 114.5º W.L. Orbital Location, File Nos. SAT-LOI-20050312-00062 and SAT-LOI-20050312-00063. *See also* submissions made in response to *International Bureau Seeks Comment on Proposals to Permit Reduced Orbital Spacing Between U.S. Direct Broadcast Satellites,* Public Notice, Report No. SPB-196, DA 03-3903 (rel. Dec. 16, 2003).

45. Figure 1 shows the antenna off-axis discrimination as a function of off-axis angle for three different diameters of antenna.[114] The antenna patterns are based on ITU-R Recommendation BO.1213-1.[115] Assuming that orbital separation must be large enough to place adjacent satellites outside the receiving antenna's main beam, and that minimum off-axis rejection values on the order of 20 dB[116] are desired, some observations can be made regarding the relationship between antenna diameter and orbital spacing. For example, based upon this figure, antenna diameters of 0.45 m may be accommodated with orbital spacing of about four degrees. A spacing of three degrees or less would demand antennas of 0.6 meters in diameter or greater, and two-degree spacing would require receiving antennas on the order of 1 meter – a size that is likely to be unacceptable to a large percentage of U.S. consumers.

[114] This graph does not take into account topocentric off-set or antenna pointing error.

[115] *See* Recommendation ITR-R BO.1213-1. We note that that ITU-R BO.1213 was recently updated at the November 2005 meeting of ITU-R Study Group 6. This most recent version (ITU-R BO.1213-1) includes new language recommending that the co-polar and cross-polar antenna patterns given by the formulae therein should be recognized as reference earth station antenna patterns for the BSS in the 11.7-12.75 GHz band. This change does not preclude use of these formulae in other frequency bands *(e.g.*, 17 GHz) and we believe that for the purposes of this NPRM these formulae may be reasonably applied to the 17 GHz band.

[116] The Commission's rules provide for routine licensing of Ku-band earth stations with antenna diameters of greater than 1.2 meters in a two-degree spacing environment. At the 14 GHz uplink and 11.7 GHz downlink frequencies, this translates to off-axis discrimination values of 22 dB and 20.5 dB respectively.

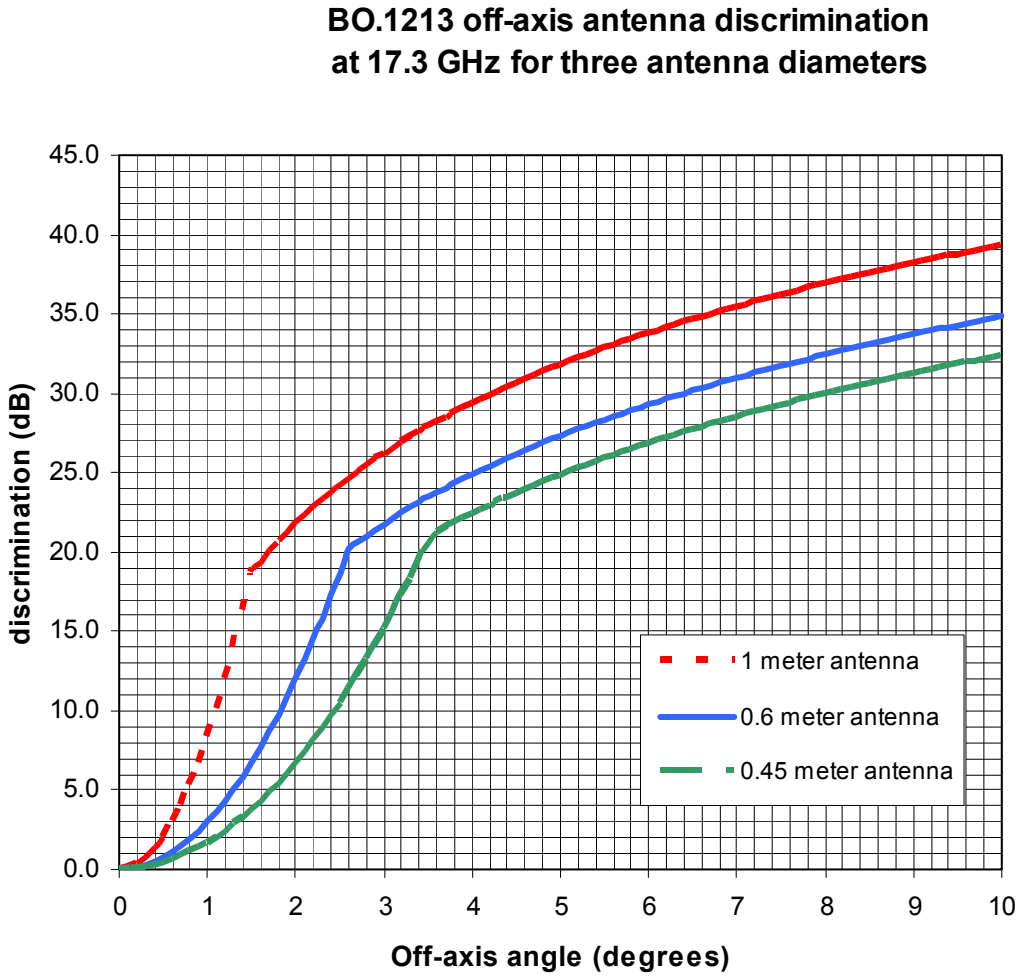

Figure 1.

46. At present, four parties have filed applications with the Commission to operate BSS satellites in the 17/24 GHz bands.[117] All of these applicants propose to operate direct-to-home (DTH) satellite services with receiving antennas as small as 45 cm in diameter. In the DBS band, consumers commonly purchase receive antennas on the order of 45 cm in diameter, and we recognize the desire to continue marketing this size dish to U.S. customers. However, we ask whether 45 cm is an appropriate minimum size antenna to accommodate when considering a GSO orbital spacing policy. Many customers have shown a willingness to purchase larger dishes, particularly those receiving enhanced programming packages requiring multi-feed antennas.[118] In other regions of the world, the 60-cm antenna is the

[117] *See DIRECTV Application, Pegasus Application, EchoStar Application,* and *Intelsat Application*.

[118] In recent years, triple-feed 18" x 20" elliptical-dish antennas capable of receiving signals from satellites at 101º W.L., 110º W.L., and 119º W.L. have been deployed by DIRECTV. DIRECTV also markets an 18"-diameter dual-feed circular antenna designed to receive signals from the 101º W.L. orbital location, and dual-feed 20"-diameter round antennas capable of receiving signals from the satellites at both 110º W.L. and 119º W.L. orbital locations. DISH Network has also deployed two versions of a 26" x 18" "SuperDish" elliptical antenna which is capable of (continued....)

accepted standard, and in some portions of the U.S. where 45-cm antennas are infeasible, consumers have become accustomed to larger diameter dishes.[119] In addition, we note that the increased gain achieved at larger diameters is helpful in mitigating certain technical difficulties, such as those due to rain-fade effects. We ask what minimum earth station size the Commission should seek to accommodate when formulating its rules. Is 45 cm reasonable, or should some other size be considered, especially in light of the increased orbital capacity that could be afforded with closer satellite spacing?

47. Historically, the Commission has opted not to regulate explicitly the diameter or other technical characteristics of receive-only antennas.[120] Rather, the Commission has typically chosen to establish limits on other system characteristics such as power flux density (pfd) levels or orbital spacing and has left the choice of receive-antenna characteristics to the operator with the understanding that receiver size has a bearing on availability, quality of service and the ability to market the service to consumers; however, the operator must then accept any resulting interference from other systems that are operating within the permitted levels. We believe that this approach has afforded operators maximum technical flexibility, especially considering that earth station receive antenna size is a very important factor to potential consumers of DTH service. However, the Commission also seeks to ensure that U.S.-licensed BSS systems receive sufficient interference protection and that subscribers' receive antennas will work effectively in current and future radio frequency interference environments. In particular, the receive earth station antenna off-axis discrimination performance will affect the amount of interference into BSS receivers from other systems. We note that, in implementing its two-degree spacing policy with respect to the FSS, the Commission has adopted certain earth station antenna performance requirements.[121] Accordingly, we request comment on whether the Commission should afford interference protection to 17/24 GHz BSS systems only to the extent that they meet certain receive antenna performance standards. Specifically, we request comment on what type of regulation might be appropriate, such as adopting side-lobe suppression or minimum gain requirements, or some other parameter.

E. TECHNICAL REQUIREMENTS FOR INTRA-SERVICE OPERATIONS

1. UPLINK POWER LEVELS

48. In order to implement the two-degree spacing policy for C- and Ku-band FSS satellites, the Commission established rules that define uplink power density limits and antenna performance standards.[122] In combination, these power density limits and antenna performance standards ensure that conforming FSS satellite systems will not emit power at off-axis angles at levels high enough to cause unacceptable interference to adjacent co-frequency satellites spaced at two-degree intervals. Similarly, in the Ka-band the Commission adopted a two-degree blanket licensing requirement that included uplink off-axis equivalent isotropically radiated power (e.i.r.p.) density limits and a single-entry power flux density (pfd) limit in the downlink.[123] Successful implementation of any orbital spacing regime for the

(...continued from previous page)
receiving signals from DBS satellites at both 110º W.L. and 119º W.L. orbital locations, as well as signals from FSS satellites at either the 105º W.L. or 121º W.L. orbital locations that transmit DTH signals with DISH Network programming.

[119] Larger antennas, up to 2.4 meters in diameter, are required to receive DBS signals in Alaska and Hawaii.

[120] *See, e.g.*, *Part 100 Report & Order,* 17 FCC Rcd 11331 (2002).

[121] *See, e.g.*, 47 C.F.R. § 25.209.

[122] *See* 47 C.F.R. §§ 25.134, 25.208, 25.209.

[123] *See* 47 C.F.R. § 25.138.

17/24 GHz BSS service will likely require that the Commission develop analogous criteria. However, we recognize that in the 17/24 GHz BSS band the choice of orbital spacing will be determined in large measure by the operator's desire to serve its customers with a certain size of receiving antenna, and that 17/24 GHz BSS satellites may operate in an orbital spacing environment with greater than two-degrees of separation. Moreover, we recognize that feeder link earth stations typically operate with large diameter antennas that exhibit good off-axis rejection properties. For these reasons, the problem of off-axis interference into adjacent satellites may not be as significant in the 17/24 GHz band as it is in the FSS bands. Accordingly, we seek comment on our assumption regarding the need to establish off-axis uplink power limits for this service. In addition, the Commission's rules provide for routine licensing of FSS earth stations in situations where (in combination with the antenna performance standards of § 25.209) specific minimum equivalent antenna diameters and maximum uplink power limits are met.[124] We seek comment on whether analogous criteria might be developed for expedited licensing of feeder link earth stations in the 24 GHz band, and if so, what equivalent antenna diameters and power limits, or other technical characteristics might be appropriate.

49. The antenna performance standards of Section 25.209 apply to any antenna transmitting from an earth station operating with a geostationary satellite in the FSS.[125] Because by definition BSS feeder-links operate in the FSS, these antenna standards are applicable to the 17/24 GHz BSS feeder-link earth stations. At present there are no uplink power or power-density requirements established for Earth-to-space transmissions in the 24 GHz FSS band. A review of the current 17/24 GHz BSS applications reveals that applicants propose to operate with clear-sky[126] uplink e.i.r.p levels that range between 76.1 dBW and 79.4 dBW[127]; associated e.i.r.p. density levels ranging between 2.3 dBW/Hz and 5.6 dBW/Hz.[128] We propose to accommodate the highest clear-sky power density levels planned thus far, *i.e.*, 5.6 dBW/Hz. Applying the current GSO FSS antenna performance standard of Section 25.209, the resulting e.i.r.p density values at various off-axis angles are shown in Table 1 below.[129]

[124] *See* 47 C.F.R. § 25.211(d), and § 25.212(c)-(d).

[125] Section 25.209 establishes an envelope, below which the antenna gain, as a function of off-axis angle, must lie. Separate envelopes are established for the plane of the GSO arc and for all other directions. This rule also protects receiving antennas from harmful interference on the basis of conformance to these same standards. Separate requirements for NGSO antennas are also defined. *See* 47 C.F.R. § 25.209.

[126] The clear-sky value is taken to be the condition when the intrinsic atmospheric attenuation due to gasses and water vapor are applicable, without additional attenuation due to tropospheric precipitation, such as rain or snow. *See* Recommendation ITU-R PN.676-1.

[127] One recent application included spot beam peak e.i.r.p. levels as high as 103.2 dBW, however it was not clear from the application that these were clear sky values. *See Pegasus Application* at 20.

[128] *See DIRECTV Application* at 42, *Intelsat Application* at 22.

[129] These values are the product of the off-axis the earth station antenna gain values given in §25.209 and an antenna input e.i.r.p. density of 79.4 dBW/24MHz , with a peak gain of 65.1 dBi. They do not take into account topocentric gain.

E.I.R.P. Density as Function of Off-Axis Angle

Off-axis angle (degrees)	e.i.r.p density (dBW/Hz)
2	-38.0
3	-42.4
4	-45.5
4.5	-46.8
6	-50.0
8	-51.5
9	-51.5

Table 1

50. We recognize that absent a clearly defined orbital separation, the interference contribution resulting from uplink transmissions to adjacent satellites cannot be fully determined. However, we seek comment on whether the proposed clear-sky earth station antenna off-axis e.i.r.p. density values might be appropriate down to some minimum orbital separation value, and whether they would provide sufficient protection to adjacent GSO BSS satellites. We have chosen to propose accommodating the highest power level proposed by an applicant, but we seek comment on whether some mid-range or other value might be preferable, or whether a higher level might be better to allow for future higher-power systems. We seek further comment on whether there are other factors that should be considered when determining an off-axis e.i.r.p. density value, such as the potential for interference to/from other services sharing the band, including 24 GHz FS systems, or the radiolocation service. We also ask what form an uplink power density rule should take, whether it is most appropriate to specify some input power or power density level in combination with the antenna performance requirements of Section 25.209, or to specify a composite curve of off-axis e.i.r.p. density levels as is done for blanket licensing of Ka-band GSO FSS earth stations.[130]

51. We anticipate that some future systems may wish to operate at higher e.i.r.p. density values than those proposed at this time. Our current FSS service rules provide a mechanism for licensing such non-conforming systems.[131] These rules place the burden on the applicant to provide a technical showing to the Commission, and to coordinate its non-conforming operations with adjacent operators. We propose to adopt a similar approach to accommodate satellite systems in the 17/24 GHz BSS band wishing to uplink with higher power levels. We seek comment on this issue and ask whether this approach is appropriate or whether different rules should be adopted. Non-conforming FSS operators are required to coordinate with adjacent satellites at 2º, 4º and 6º away.[132] Recognizing that 17/24 GHz BSS satellites may not be operating in a two-degree spacing environment, we seek comment on the angular distance over which coordination should be required.

52. The uplink off-axis e.i.r.p. density limits discussed above are for clear-sky operations only. GSO satellites operating in the 24 GHz band can suffer significant signal attenuation in the presence of precipitation and may likely need to transmit at higher powers during such weather conditions in order to overcome the effects of rain fade. Applicants have indicated a need to employ uplink adaptive power control to provide transmit power levels sufficient to meet the desired link performance during unfavorable weather events, while simultaneously ensuring that threshold power levels are not excessive

[130] *See* 47 C.F.R. § 25.138(a).

[131] *See* 47 C.F.R. §§ 25.220, 25.138(b),(c).

[132] *See* 47 C.F.R. §§ 25.220, 25.138(c).

at other times.[133] In the *28 GHz First Report and Order*, we recognized that uplink power control limits would facilitate operations in the 27.5-30.0 GHz band, and we amended Section 25.204 of our rules to require that all Ka-band FSS earth stations employ adaptive uplink power control or other methods of fade compensation.[134] In the *18 GHz Report and Order,* we adopted rules for Ka-band FSS earth stations employing uplink power control which limit transmissions during conditions of uplink fading to 20 dB above those permitted under clear-sky conditions.[135] We seek comment on whether it is necessary to adopt a rule requiring 17/24 GHz BSS feeder link earth stations to employ uplink power control, similar to the FSS requirement of Section 25.204. We also seek comment on what values or conditions might be applied to the use of 17/24 GHz BSS uplink adaptive power control, including: a minimum signal attenuation required before uplink transmit power may be increased; an upper limit on permissible transmit power increase; an accuracy requirement over the range of path attenuations; or other possible parameters such as the control-loop response time or limits on system overshoot.[136]

2. DOWNLINK POWER LIMITS

53. The downlink power levels transmitted by adjacent co-frequency satellites, in combination with the sidelobe performance characteristics of the receiving earth station antenna, will determine the carrier-to-interference ratio that an operator experiences at the receive antenna as a result of adjacent satellite interference. At present, neither the Commission nor the ITU have established power flux density requirements or other downlink power limits for BSS systems operating in the 17.3-17.7 GHz band. Article 21 of the ITU Radio Regulations does define pfd limits for the FSS in the 17.7-17.8 GHz band in its Table 21-4.[137]

54. In other frequency bands, the Commission has frequently adopted downlink power limits for space stations transmissions in order to facilitate both inter-service and intra-service sharing. For example, our rules define power flux density limits in the 4/6 GHz and 20/30 GHz FSS bands in Section 25.208,[138] and impose additional pfd requirements for blanket licensing of Ka-band earth stations.[139] However, in other bands, no downlink power limits exist.[140] We note that one advantage of imposing a downlink power limit is to establish a relatively homogeneous transmitting environment, and to ensure that established receiving antennas are not subject to unforeseen levels of adjacent satellite interference, particularly as newer generation satellites are brought into service. Moreover, application of downlink power limits may also influence the ability of 17/24 GHz BSS systems to operate in the vicinity of co-frequency receiving DBS satellites. However, adopting such limits can to some extent restrict the ability of future satellites to increase their power levels in response to improvements in technology, or to

[133] Applicants typically propose operating with 10 to 20 dB of excess power during rain events.

[134] *See* 47 C.F.R. § 25.204(g) and *28 GHz First Report and Order.*

[135] *See* 47 C.F.R. § 25.138(a)(5).

[136] The term control-loop refers to a circuit that feeds back some of the output to the input of a system. This feedback allows for self-correction and adjusts the system operation on the basis of the difference between the actual and the desired output. The term overshoot refers to a transient rise in power beyond the final value. Overshoot occurs when a system transitions from a steady state to some higher value in response to a change in some factor, *e.g.*, electrical potential.

[137] *See* footnote 95, *supra*.

[138] *See* 47 C.F.R. § 25.208(a), (c), (d), (e).

[139] *See* 47 C.F.R. § 25.137(a)(6).

[140] *E.g.*, standard Ku-band (11.7-12.2 GHz).

compensate for interference from other sources (*e.g.*, foreign satellites or adjacent-band radars).

55. A review of the 17/24 GHz BSS filings submitted to the Commission, indicates that applicants plan to operate digital systems with downlink maximum e.i.r.p. levels that range between 58.6 dBW and 64.7 dBW. It appears that worst case pfd levels are less than -117 dBW/MHz/m^2 for all systems, with the exception of certain Intelsat spot beams that may have maximum saturated pfd levels of -115 dBW/MHz/m^2 at the Earth's surface.[141] Accordingly, we seek comment on whether the Commission should adopt pfd or other downlink power level values in the 17.3-17.7 GHz band. We ask what level of downlink power would be appropriate, and in particular whether the ITU's FSS pfd limits,[142] with an upper limit of -115 dBW/MHz/m^2, should be applied in the 17.3-17.7 GHz band.[143] We ask whether a different, perhaps higher power level is preferable in order to provide for future generation satellites, or to compensate for anticipated interference sources. The present operating downlink transmitted power levels proposed by applicants assume an orbital spacing environment of either 4-degrees or 4.5-degrees. We seek comment on what pfd limit would be preferable if the Commission were to establish an orbital spacing regime different from either 4-degrees or 4.5-degrees.

F. REVERSE BAND OPERATIONS

56. When the Region 2 BSS allocation at 17.3-17.8 GHz becomes effective in 2007, it will be shared with the current 17.3-17.8 GHz DBS feeder-link allocation in the Earth-to-space direction.[144] This operating scenario, in which the same frequency band is used for both Earth-to-space and space-to-Earth transmissions, is known as "reverse band" and results in additional interference paths which are different from those found in a conventional GSO satellite sharing situation. In the typical GSO satellite sharing scenario, interference paths occur between the earth stations of one system and the satellites of another, and vice versa. In such cases, co-frequency sharing is facilitated primarily through antenna off-axis discrimination at each end of the interference path, in combination with limits on spatial proximity (orbital separation) and transmission power. The reverse-band sharing scenario is different in that two new and distinct interference paths occur: (1) between the earth stations of different systems; and (2) between the space stations of different systems. In effect, reverse-band operations create two additional interference paths: an earth station-into-earth station path (ground path), and a space station-into-space station path (space path).

1. GROUND PATH INTERFERENCE

57. Ground path interference[145] will occur when the signals from transmitting DBS feeder-link earth stations operating in the 17.3-17.7 GHz band are detected at the receiving earth stations of 17/24 GHz BSS subscribers. This interference situation will be the most severe in areas surrounding the DBS feeder uplink stations. In addition, 17/24 GHz BSS operators who choose to co-locate their TT&C

[141] Transmission bandwidths range from 24 MHz to 48 MHz. *See DIRECTV Application* at Table D-2, *Pegasus Application* at 20, *EchoStar Application* at 16, and *Intelsat Application* at Table C.8.

[142] *See* footnote 95, *supra*.

[143] In the 17.7-17.8 GHz band, we propose to adopt the ITU pfd limits in order to protect terrestrial services operating in the band. *See* para. 32 *supra*.

[144] The U.S. BSS allocation extends only from 17.3-17.7 GHz and becomes effective on the same date. The problem of reverse-band interference in the 17.7-17.8 GHz band, particularly into victim DBS satellites via the space-path, will result from foreign satellite transmissions, and also possibly from U.S. satellites transmitting to foreign administrations.

[145] In this Section III. H. 1., the terms "DBS" or "DBS earth station" refer to earth stations that are DBS feeder links.

earth stations with DBS TT&C earth stations systems may experience difficulty in receiving the downlinked telemetry signal from the 17/24 GHz BSS spacecraft.

58. At present there are a relatively small number of DBS feeder-link earth stations. If the current situation were to remain unchanged, the ground path interference problem into 17/24 GHz BSS subscriber antennas might not pose a significant problem. However, we recognize that local programming is being uplinked from a growing number of metropolitan areas.[146] We must anticipate that DBS feeder-link earth stations that transmit in the Earth-to-space direction may become increasingly common in populated areas, thereby escalating the potential for interference into 17/24 GHz BSS subscriber antennas. In addition, future entrants such as short-spaced DBS systems, or non-U.S. DBS satellites serving the U.S. market, could result in the deployment of an even greater number of feeder-link earth stations at multiple sites within the United States. The interference problem may be further exacerbated by the proliferation of small-diameter 17/24 GHz BSS subscriber receiving antennas with relatively poor off-axis discrimination properties.

59. There is no procedure established in the Commission's rules regarding coordination of co-frequency, DBS feeder-link satellite earth stations with BSS subscriber terminals. Instead, we note that Appendix 7 of the ITU Radio Regulations describes a procedure for determining the coordination area for an earth station transmitting in a frequency band allocated to space services in both Earth-to-space and space-to-Earth directions.[147] In other sharing situations, the Commission has successfully relied upon the ITU Appendix 7 coordination methodologies to effect coordination between the co-frequency earth stations of different services. Specifically, Section 25.203 in combination with Section 25.251 of our rules define a mechanism for coordination between terrestrial microwave stations and satellite earth stations that share frequency bands with equal rights.[148] This mechanism is based upon the procedures set forth in Appendix 7 of the ITU Radio Regulations. Similarly, in the case of coordination between co-frequency reverse-band DBS feeder-link and BSS receiving earth stations operating in the 17.3-17.7 GHz band, we propose to make use of the coordination methodology defined in Annex 3 of Appendix 7 of the ITU Radio Regulations. We seek comment on this proposal and ask whether this coordination methodology may be appropriately applied in this situation.

60. In summary, the ITU methodologies described in Section 3 of Appendix 7 define techniques for calculating a coordination area around a transmitting earth station for two propagation modes: (1) propagation phenomena in clear air; and (2) hydrometeor (*i.e.*, rain) scatter. These two methodologies are elaborated in Annex 5 (Sections 2 and 3) and make use of additional parameters defined in Table 9b to Appendix 7, which include the modulation type of the receiving earth station, various receiving earth station interference parameters and criteria, receiving earth station physical characteristics, reference bandwidth and permissible interference power levels. Unfortunately, an examination of Table 9b[149] reveals that in the case of a transmitting earth station in the FSS that operates in reverse-band mode relative to a receiving station in the BSS at 17.3-17.8 GHz, the table lacks all of the requisite data. Accordingly, we seek comment on the appropriate values to use for the coordination parameters in Table 9b as follows:

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[146] *See, e.g.*, In the Matter of DIRECTV Enterprises, LLC for Authority to Launch and Operate DIRECTV 7S (USABSS-18), *Order and Authorization,* 19 FCC Rcd 7754 (2004). DIRECTV sought authority to operate uplink earth stations at sites in Los Angeles, CA, Castle Rock, CO, Winchester, VA and St. Paul, MN.

[147] *See* Section 3 of Appendix 7 of the ITU Radio Regulations.

[148] *See* 47 C.F.R. §§ 25.203(b)-(d), 25.251(b). *See also* 47 C.F.R. §§ 101.21(f), 101.103.

[149] *See* Table 9b of Annex 7 to Appendix 7 (rev. WRC-03) of the ITU Radio Regulations.

Table 9b

Parameters required for the determination of coordination distance for a transmitting earth station in bands shared bidirectionally with receiving earth stations

Parameter(s)		Value	Description
Orbit		GSO	Orbit in which the space service in which receiving earth station operates (GSO or NGSO)
Modulation at receiving earth station			Analog or digital
Receiving earth station interference parameters and criteria	p_0 (%)		Percentage of the time during which interference from all sources may exceed the threshold value
	n		Number of equivalent, equal level, equal probability entries of interference, assumed to be uncorrelated for small percentages of the time
	p(%)		Percentage of the time during which the interference from one source may exceed the permissible interference power value; since the entries of interference are not likely to occur simultaneously, $p=p_0/n$
	N_L (dB)		Link noise contribution
	M_s (dB)		Link performance margin
	W (dB)		A thermal noise equivalence factor for interfering emissions in the reference bandwidth; it is positive when the interfering emissions would cause more degradation than thermal noise
Receiving earth station parameters	G_m (dBi) [150]		On-axis gain of the receive earth station antenna
	G_r		Horizon antenna gain for the receive earth station
	ε_{min}		Minimum elevation angle of operation in degrees
	T_e (K)	300K[151]	The thermal noise temperature of the receiving system at the terminal of the receiving antenna
Reference Bandwidth	B (Hz)		Reference bandwidth (Hz), *i.e.,* the bandwidth in the receiving station that is subject to the interference and over which the power of the interfering emission can be averaged
Permissible interference power	$P_r(p)$ (dBW) in B		Permissible interference power of the interfering emission (dBW) in the reference bandwidth to be exceeded no more than p% of the time at the receiving antenna terminal of a station subject to interference, from a single source of interference, using the general formula: $P_r(p) = 10 \log (k T_e B) + N_L + 10 \log (10^{Ms/10} - 1) - W$

61. We also seek comment on the types of technical information DBS feeder-link earth station operators should make available to 17/24 GHz BSS operators for the purposes of earth station coordination. In the case of satellite and terrestrial earth station coordination, Commission rules now require that all transmitting satellite earth station applicants submit an interference analysis as required by

[150] This value may be calculated using the procedure of Annex 5 to Appendix 7 of the ITU Radio Regulations. If no value of G_m is specified, 42 dBi may be used.

[151] *See* § 2.1 of Annex 7 to Appendix 7 of the ITU Radio Regulations which provides a default value for two earth stations operating in opposite directions of transmission at frequencies greater than 17/24 GHz.

Section 25.203 of the Commission's rules.[152] Section 25.203(c)(2) requires that the earth station applicant provide each terrestrial station licensee with specific technical details. Similarly, we propose that DBS feeder-link earth station applicants provide the following information to licensees and prior-filed applicants in the 17/24 GHz broadcasting-satellite service:

(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 an 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 the procedure in Section 2.1 of Annex 5 to Appendix 7 of the ITU Radio Regulations;

(viii) Minimum elevation angle;

(ix) Maximum equivalent isotropically radiated power (e.i.r.p.) density in the main beam in any [TBD] Hz[153] band;

(x) Maximum available RF transmit power density in any [TBD] Hz[154] band at the input terminals of the antenna(s);

(xi) Maximum permissible RF interference power level as determined in accordance with Annex 7 to Appendix 7 for all applicable percentages of time; and

(xii) A plot of the coordination distance contour(s) and rain scatter coordination distance contour(s) as determined by Table 2 of Section 3 to Appendix 7.

We ask what reference bandwidths would be appropriate in items (ix) and (x). In addition seek comment on whether these parameters listed here or other technical information would be appropriate to provide in order to facilitate coordination between DBS feeder-link earth stations and receiving 17/24 GHz BSS antennas.

62. In addition, we envision that both the DBS feeder links and 17/24 GHz BSS services will be deploying new earth stations over time, so that new stations of one service will continually be established among existing stations from the other. The Commission wants to ensure that U.S.-licensed 17/24 GHz BSS systems receive sufficient interference protection and that subscribers' receive antennas

[152] *See* 47 C.F.R. § 25.203(b)(2) (which requires that the earth station applicant provide each terrestrial station licensee with certain specific technical details).

[153] We note that Section 25.203 stipulates a reference bandwidth of 4 kHz for frequency bands below 15 GHz and 1 MHz for frequency bands above 15 GHz.

[154] Section 25.203 stipulates reference bandwidths of both 1 MHz and 4 kHz.

will work effectively in both current and future radio frequency interference environments. However, we are also committed to preserving the prospect for growth and expansion of the DBS service, and to providing for future DBS market entrants. Therefore, we seek to adopt service rules that achieve an appropriate balance between accommodating both present and future DBS feeder-link operations and ensuring protection of 17/24 GHz BBS receiving systems from interference.

63. In the *MVDDS Second R&O*,[155] the Commission addressed a frequency sharing situation that presented ground path interference issues and temporal build-out of interspersed earth stations, similar to those we envision resulting from reverse band satellite operations in the 17.3-17.7 GHz band. In the 12 GHz band, two co-primary, co-frequency services sought to operate in a sharing scenario where ubiquitous and ongoing deployment of stations from both services was anticipated. The Commission recognized that the incumbent DBS receive-only antennas were subject to interference from the introduction of transmitting MVDDS stations. In the *MVDDS Second R&O,* the Commission concluded that careful MVDDS system design and the use of various mitigation techniques could achieve successful sharing of the 12 GHz frequency band by both services. To accomplish this goal, the Commission adopted *inter alia* a coordination procedure that requires that an MVDDS operator entering a market where DBS receivers are already established must satisfy certain requirements in order to protect these customers.[156] In addition, a mechanism is established for information exchange between the operators of both services, in particular to take into account recently acquired DBS customers.[157] Once the time period prescribed for this information exchange has passed, any new DBS receive antennas must be installed in a manner to avoid interference from the MVDDS signal. These later-installed DBS earth stations have no right of complaint against the notified MVDDS transmitting antenna.

64. We seek comment on whether we should adopt a similar approach to sharing between DBS feeder-link earth stations and 17/24 GHz BSS receiving earth stations. Under such an approach, DBS operators planning new feeder-link earth stations would be required to provide the technical information discussed above to 17/24 GHz BSS licensees, at least 90 days prior to commencing operations of the new DBS feeder-link earth station. Within 30 days after receipt of the new DBS feeder-link earth station technical information, the 17/24 GHz BSS licensees would be required to provide the DBS feeder-link earth station operator with a list of potentially-affected 17/24 GHz BSS customer locations within the coordination area described above. Before beginning operations, the new DBS feeder-link earth station operator would be required to take into account these 17/24 GHz BSS customers and to ensure that its operations do not cause them harmful interference.[158] Once the 30-day time period

[155] *See* 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; 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. *Memorandum Opinion and Order and Second Report and Order*, 17 FCC Rec 9614 (2002) ("*MVDDS Second R&O"*).

[156] *See* 47 C.F.R. § 101.1440(d).

[157] *See MVDDS Second R&O*, 17 FCC Rcd at 9652, para. 88. MVDDS operators are required to provide DBS operators with specific technical information concerning their planned operation. After receipt of the MVDDS system information, the DBS licensee must provide the MVDDS licensee with a list of any new DBS customer locations that have been installed following the MVDDS notification. Before beginning operations, the MVDDS operator must take into account existing as well as the new DBS customers of record, and ensure that its operations do not cause interference. DBS licensees should also provide the MVDDS operator with information regarding affected customer locations, comment on the analysis provided, or indicate its agreement.

[158] At this time, 17/24 GHz BSS licensees may also provide the DBS operator with additional information regarding affected customer locations, or comment on its analysis, including its agreement.

prescribed for this information exchange has passed, any new 17/24 GHz BSS receiving earth stations would be required to accept or mitigate any interference from the DBS feeder-link transmissions. These later-installed 17/24 GHz BSS receiving earth stations would have no right of complaint against the new DBS feeder-link transmitting earth station. We seek comment on this proposal. We recognize that there may be reluctance on the part of 17/24 GHz BSS operators to reveal their customer data, particularly to another DBS or BSS operator, and we seek comment on alternate approaches to coordinating DBS feeder-link and 17/24 GHz BSS earth station operations. We also ask whether some different approach would better facilitate sharing in the 17/24 GHz band.

65. In the *MVDDS Second R&O*, the Commission took additional steps to ensure successful sharing in the 12 GHz band and adopted various equivalent power flux density (epfd) and power density limits for MVDDS systems, as well as rules governing their application.[159] The Commission's existing rules do not specify transmitting epfd or of-axis e.i.r.p. density limits for DBS feeder-link earth stations, except in the band 17.7-17.8 GHz, which is shared co-equally with terrestrial services.[160] Interference into 17/24 GHz BSS receivers could be reduced if the e.i.r.p. levels emitted towards the horizon by DBS feeder link antennas were minimized. Limiting DBS feeder link off-axis transmit power levels may facilitate co-existence of 17/24 GHz BSS subscriber earth stations and DBS feeder link earth stations, while decreasing the coordination burden on both services. Accordingly, we ask whether off-axis e.i.r.p. density or other transmitting power limits should be applied to DBS feeder-link bands in order to protect 17/24 GHz BSS receiving earth stations from interference.

66. Section 25.204(b) of the Commission's rules places limits on earth station e.i.r.p. in bands above 15 GHz shared coequally with terrestrial radiocommunication services, in order to facilitate sharing with these services.[161] This rule was not intended to facilitate sharing among DBS and BSS earth stations, and it is applicable to DBS feeder link earth stations only in the band segment 17.7-17.8 GHz that is shared with terrestrial services. We seek comment on whether the Commission should extend this requirement to DBS feeder link earth stations operating in the entire 17.3-17.8 GHz band or adopt some other, more stringent off-axis e.i.r.p. requirement. We also seek comment on whether a different approach, such as requiring DBS feeder link antenna shielding, would be more appropriate. Similarly, we

[159] Specifically, the Commission adopted: (1) a prescribed methodology and predictive model to calculate epfd values in order to ascribe an unavailability allowance to MVDDS in the 12.2-12.7 GHz band; (2) epfd limits for each of four regions across the United States; (3) an additional maximum MVDDS power density limit; (4) required MVDDS operators to ensure that the prescribed epfd limits were not exceeded at DBS customer of record locations; if the epfd limit is exceeded, MVDDS operations must be discontinued until such time as the limits can be met; and (5) an epfd "safety valve," so that if due to an anomalous situation a DBS provider can demonstrate a tangible detrimental impact on DBS caused by MVDDS operations, the Commission may consider adjustments to the epfd limit for that specific location. *See MVDDS Second R&O,* 17 FCC Rcd at 9641-9642, para 68.

[160] *See* 47 C.F.R. § 25.204(b)-(e). These limits are: +64 dBW in any 1 MHz band for $\theta < 0^\circ$; +64+3θ dBW in any 1 MHz band for $0^\circ < \theta < 5^\circ$; where θ is the elevation angle of above the horizon viewed from the center of radiation of the antenna and measured in degrees.

[161] Section 25.204(b) states that "in bands shared coequally with terrestrial radio-communication services, the equivalent isotropically radiated power transmitted in any direction towards the horizon by an earth station operating in frequency bands above 15 GHz shall not exceed the following limits except as provided for in paragraph (c) of this section:

+64 dBW in any 1 MHz band for $\theta<0^\circ$

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

where θ is as defined in paragraph (a) of this section."

request comment on whether the Commission should afford interference protection to 17/24 GHz BSS systems only to the extent that they meet certain receive antenna performance standards. Specifically, we request comment on what type of regulation, if any, would be appropriate, such as adopting antenna off-axis discrimination requirements or minimum gain requirements. We seek comment on whether the e.i.r.p density limits of Section 25.204 (b)-(e) would be sufficient to protect 17/24 GHz BSS earth stations if applied to the 17.3-17.7 GHz band, or whether some other limits would be more appropriate. We seek comment on whether it is necessary to adopt another approach, such as stipulating epfd limits, in order to facilitate coordination between DBS feeder-link earth stations and 17/24 GHz subscriber receivers, and if so, which methodology should be used in determining such limits. We also seek comment on whether we should impose any additional requirements on either DBS feeder-link earth station operators or on 17/24 GHz BSS operators in order to mitigate interference into 17/24 GHz BSS subscriber receiving antennas.

a. GROUND PATH INTERFERENCE INTO BSS TELEMETRY EARTH STATIONS

67. Ground path interference may also occur between transmitting DBS feeder-links and the receiving TT&C stations of 17/24 GHz BSS systems that choose to co-locate their TT&C earth stations at existing DBS feeder-link earth station sites. Choice of facility site is a system design parameter that is under the control of the operator, and does not necessarily require a Commission action to remedy. Moreover, given the large financial investment required to launch and operate a satellite, we believe that BSS operators have strong incentive to make correct technical decisions with regard to their choice of TT&C facility sites and equipment design. However, we also recognize that interference into TT&C systems can present a serious problem due to the potential for loss of satellite control. Accordingly, we seek comment on whether the Commission should adopt requirements to guard against such interference scenarios.

68. We propose to require earth station applicants planning to co-locate their 17/24 GHz BSS TT&C stations with DBS feeder-links earth stations to make a technical showing to the Commission demonstrating their ability to maintain sufficient margin in their telemetry links in the presence of the interfering DBS signal. Additionally, we propose to require DBS feeder link earth station applicants planning to co-locate with their 17/24 GHz BSS telemetry earth stations to make a similar technical showing to the Commission. We seek comment on this proposal and ask what parameters would be appropriate in such a showing. We ask whether we should preclude co-location of 17/24 GHz BSS TT&C and DBS feeder-link facilities altogether, or whether perhaps we should require some minimum separation between such facilities. Finally, we seek comment on other interference measures we might consider such as mandating a level of equipment performance (*e.g.*, filter rejection).

b. INCREASED FLEXIBILITY OF SPECTRUM

69. Footnote NG 167 of the Domestic Table of Frequency Allocations[162] limits use of the FSS allocation (Earth-to-space) in the 24.75-25.25 GHz band to use by feeder links for the BSS operating in the band 17.3-17.7 GHz. In the *18 GHz Report & Order,* we noted that, although we were allocating 500 megahertz for BSS feeder links at 24.75-25.25 GHz for 400 megahertz of BSS uplinks at 17.3-17.7 GHz, we declined to reduce the amount of spectrum available for feeder links for the BSS.[163] We stated

[162] Amendment of the Commission's Regulatory Policies to Allow Non-U.S.-Licensed Space Stations to Provide Domestic and International Satellite Service in the United States, *First Order on Reconsideration*, 15 FCC Rcd 7207 (1999).

[163] *18 GHz Report & Order,* 15 FCC Rcd at 13475-77, para. 96.

that the flexibility that this additional 100 MHz of feeder link spectrum afforded might prove useful to 17/24 GHz BSS operators in some situations including occasional difficulties that might be encountered during coordination. The ability to use spectrum in the 24 GHz band for feeder-links operating with other BSS services, such as DBS, might afford operators increased flexibility in system design and spectrum use. Providing this increased flexibility might also assist operators in designing their systems so as to avoid ground path interference problems associated with reverse band operations in the 17.3-17.8 GHz band. The benefit of alternative feeder link spectrum might be particularly useful in situations where DBS feeder-link earth stations must be located in populated areas with a high density of 17/24 GHz BSS receiving antennas, or when 17/24 GHz BSS telemetry receiving facilities are close by. We propose to modify footnote NG167 of the Domestic Table of Frequency Allocations in order to permit use of the 24.75-25.25 GHz FSS allocation (Earth-to-space) by feeder links operating with the BSS in frequency bands other than 17 GHz, *e.g*., the 12 GHz DBS band. We seek comment on this proposal.

70. The 24.75-25.05 GHz band is shared on a co-primary basis with the radionavigation service and the 25.05-25.25 GHz band is similarly shared on a co-primary basis with the fixed service. Permitting migration of BSS feeder link operations from other bands (such as 17.3-17.7 GHz) into the 24 GHz band could place an increased burden on these two services, and may hinder their ability to operate or to deploy additional stations. General requirements for sharing with the radionavigation service and the fixed service in the 24 GHz band are discussed in paragraphs 91-93 of this *NPRM*. However, we seek specific comment on any impact to these other co-primary services from our proposal to permit more flexible use of the 24 GHz band by BSS feeder links. In the *18 GHz Report & Order,* we noted our belief[164] that the feasibility of the sharing between these 17/24 GHz BSS feeder links and the fixed service at 24 GHz is based in part on the limited number of expected 17/24 GHz BSS feeder links. We ask whether these additional feeder link operations can be accommodated in the 24.75-25.25 GHz band, or whether they will unduly restrict operation and deployment of either new radionavigation or fixed service systems. We ask whether our existing FSS/FS coordination procedures set forth in Section 25.203 of the Commission's rules are sufficient to facilitate co-existence of additional BSS feeder link earth stations with the 24 GHz Fixed Service, or whether some additional requirement(s) should be imposed.

2. SPACE PATH INTERFERENCE

71. Space path interference will occur when the signals from transmitting 17/24 GHz BSS satellites are detected by the receiving antennas of DBS satellites. The amount of interference received by the victim DBS satellite will depend on the specific orientation between the transmitting and receiving satellites, the extent of physical separation, the transmit power (e.i.r.p.) levels, and the off-axis gain discriminations of both transmitting and receiving antennas on the adjacent satellites. This problem is expected to be particularly problematic when satellites are nominally co-located, *i.e*., a receiving DBS satellite is located at the same nominal GSO orbital longitude as a transmitting 17/24 GHz BSS satellite.

72. The Commission has received several applications from operators seeking to locate BSS satellites transmitting in the 17 GHz band at nominal orbital locations now occupied by DBS satellites.[165] Currently operating U.S. DBS satellites are located at nominal orbital locations defined in the Region 2 BSS and feeder-link Plans of Appendices 30 and 30A of the ITU Radio Regulations, which apportion spectrum and orbit locations for the 12 GHz BSS. The Region 2 Plans are based on grouping of the space stations in clusters; satellites are spaced at locations of ± 0.2º from the cluster center, or nominal orbital

[164] *Id.* at para. 106.

[165] *See DIRECTV Application*, *Pegasus Application* and *EchoStar Application*. DIRECTV seeks to operate at the 101° W.L. orbit location , Pegasus seeks to operate at the 101° W.L. and 110° W.L. orbit location, and EchoStar seeks to operate at 110° W.L. and 119° W.L. orbit location.

location.[166] In the Region 2 BSS and feeder-link Plans, channels at a given orbital location are specified such that oppositely polarized channels (right hand circular polarization or left hand circular polarization) are located at opposite edges of the cluster, or 0.4 degrees apart.[167] By seeking to operate at the nominal DBS location (center of the cluster) 17/24 GHz BSS applicants will be located at separations somewhere between 0.0º and 0.2º from co-frequency, reverse-band DBS satellites.[168]

73. While some applicants acknowledge the difficulty in co-locating 17/24 GHz BSS satellites with DBS satellites, none presents a detailed interference analysis nor offers a comprehensive method for preventing space path interference between the nominally co-located satellites operating in the two services. Pegasus comments that interference to co-located or nearby satellites in other service bands can only be evaluated in specific circumstances and should be resolved during the normal coordination process.[169] DIRECTV cites a number of factors that it believes will mitigate potential interference including physical separation of the satellites, antenna directivity and off-axis rejection, and the recessed design of existing DBS spacecraft feeder-link receiving antennas.[170] EchoStar notes that it will be necessary to maintain some minimal physical separation and specific orientation between the two satellites and notes that this would be greatly facilitated by having both satellites under control of the same operator.[171]

74. The ITU-R Working Party 6S is examining the question of required separation distance between a transmitting 17/24 GHz BSS space station and a receiving DBS satellite.[172] One relevant ITU-R study includes a parametric analysis which varies the amount of off-axis discrimination for transmit and receive satellite antennas, the transmitting e.i.r.p., and the amount of allowable interference. The study concludes that required geocentric angular separations ranges between 0.02º and 5.67º in order to achieve $\Delta T/T$ values of either 4% or 6%. We note however that this study makes certain simplifying assumptions (*i.e.*, a constant angle relative to boresight between transmitting and receiving satellites of approximately 90°) and does not take significant account of other complicating factors such as stationkeeping excursions. Although the study suggests that under certain conditions spacing as close as 0.2º may be possible, it does not provide a sufficiently in-depth analysis upon which a set of regulations permitting co-clustered DBS and 17/24 GHz BSS satellites can be based.

75. The Region 2 BSS and feeder-link Plans are based on cross-polarized, adjacent channels

[166] *See* Section B of Annex 7 to Appendix 30 and Section 4.13.1 of Annex 3 to Appendix 30A of the ITU Radio Regulations.

[167] *Id.*

[168] Although the United States initially followed the ITU cluster separation scheme when assigning channels at a given orbit location, DBS licensees increasingly indicated a desire for greater flexibility regarding the placement of their satellites within the cluster. Moreover, the ITU rules allow Administrations to locate their satellites at any orbital position within the cluster, provided they obtain the agreement of Administrations having assignments to space stations in the same cluster. At locations where all 32 channels are assigned to a single operator, the Commission has been willing to allow the operator considerable freedom to locate the spacecraft anywhere within the cluster boundaries. As a result, location of U.S. DBS satellites no longer strictly adheres to a 0.4 degree even/odd channel separation scheme.

[169] *See Pegasus Application* at 27.

[170] *See DIRECTV Application* at 44.

[171] *See* EchoStar Application at 23.

[172] *See* Document WP6S/106-E, 13 January 2001, Interference Analysis Concerning Transmitting BSS Satellites in Region 2 Interfering with Receiving Feeder-link Satellite in Regions 1 and 3 in the 17.3 to 17.8 GHz Band.

that overlap in frequency[173] that are also the basis for our domestic channelization scheme. At a given DBS orbit location these channels may be assigned to different DBS operators. Interference between overlapping channels is avoided by transmitting in opposite polarizations.[174] In turn, the satellite antenna must radiate or receive power in its reference polarization, and avoid radiating or receiving significant amounts of power in the opposite, or cross-polarization.[175] For satellites located in the same cluster, the angle between transmitting and receiving antennas relative to boresight is on the order of 90º. While antenna cross-polarization discrimination is normally sufficient to provide adequate signal isolation on-axis, cross-polarization isolation at large off-axis angles is typically quite poor.[176] For this reason too, we question whether there will be sufficient polarization discrimination between the transmitted signals of 17/24 GHz BSS space stations and the feeder-link receiving antennas of DBS satellites to permit reverse band operations on a channel-by-channel basis. Moreover, 17/24 GHz BSS operators may not necessarily design a satellite system that operates with a channelization scheme (*i.e*., same center frequencies, bandwidths and polarizations) consistent with the one specified in the Region 2 Plans, and applicable to DBS systems.

76. Recognizing the significant difficulties in preventing harmful interference in the case of co-clustered satellites, we ask whether transmitting 17/24 GHz BSS satellites should be precluded from locating in the same cluster with receiving *co-frequency* DBS satellites. We seek comment on this issue. We also ask whether co-clustering of 17/24 GHz BSS and receiving *co-frequency* DBS satellites might be possible in instances where both spacecraft are controlled by the same operator. However, we also seek comment on methods we might employ to facilitate co-location, or co-clustering of DBS and 17/24 GHz BSS satellites.

77. We seek further comment on the feasibility in general of locating transmitting 17/24 GHz BSS satellites at close distances (*i.e*., within the same cluster, or at nearby adjacent locations) as receiving DBS satellites operating with 17 GHz feeder-links. We ask whether there is a minimum separation distance that we should mandate for the two co-frequency satellites, and if so, what that separation distance should be. We also ask whether we should impose an off-axis antenna discrimination requirement on satellites in the 17/24 GHz BSS service, the DBS service, or both, and if so what the requirement(s) should be. We ask whether we should impose either an absolute e.i.r.p. limit on transmitting BSS satellites, and if so, what that value might be, or whether an e.i.r.p. mask might be more appropriate. If the latter, we seek comment on the angular range over which such a mask should be

[173] *See, e.g.,* Downlink Channel 1 extends from 12.212 – 12.236 GHz, Channel 2 extends from 12.22658 – 12.25058 GHz, and Channel 3 extends from 12.24116 – 12.26516 GHz. Thus there is a 9.42 MHz overlap between Channels 1 and 2, and a similar overlap between Channels 2 and 3. *See* Table 4, of Appendix 30 for the Region 2 BSS channel assignments.

[174] "Polarization" is the property of an electromagnetic wave that describes the time-varying direction and amplitude of the electric field vector (*i.e*., orientation). States of polarization are described in terms of the figures traced as a function of time by the projection of the extremity of a representation of the electric vector onto a fixed plane in space that is perpendicular to the direction of propagation. In general, the polarization is elliptical and is traced in a clockwise or counterclockwise sense, as viewed in the direction of propagation. If the major and minor axes of the ellipse are equal, the polarization is said to be "circular." If the minor axis of the ellipse is zero, the polarization is said to be "linear." Rotation of the electric vector in a clockwise sense is designated "right-hand polarization," and rotation in a counterclockwise sense is designated "left-hand polarization."

[175] The ratio of power transferred by an antenna radiating in the reference polarization to another antenna receiving in the cross-polarization is known as the cross-polarization isolation ratio and is normally measured in decibels ("dB").

[176] *See, e.g.,* Section 3.13.3 of Annex 5 to Appendix 30 of the ITU Radio Regulations.

applied, and what power limits would be most appropriate at different angular values. Finally, we seek comment on whether there are any other requirements we should consider in order to prevent reverse-band adjacent satellite interference in the 17 GHz band. Specifically, we ask applicants how they plan to address the problem of space path interference with the co-located satellites they have proposed.

78. Space path interference from transmitting 17/24 GHz BSS satellites has the potential to cause loss of the telecommand signal at the receiving DBS satellite. As in the ground path telemetry case, we are aware that interference into TT&C systems can present a serious problem due to the potential loss of satellite control, and we seek comment on what requirements the Commission should adopt to guard against such interference scenarios. As in the ground path case, we propose to require space station applicants planning to co-locate their 17/24 GHz BSS space stations within cluster locations occupied by DBS space stations to make a technical showing to the Commission demonstrating their ability to sufficiently minimize interference into nearby DBS systems, such that adequate margin is maintained in the DBS telecommand links in the presence of the interfering BSS signal. Similarly, we will ask DBS operators planning to locate their satellites at an orbital location already occupied by a transmitting 17/24 GHz BSS satellite to make a technical showing to the Commission demonstrating how they plan to maintain sufficient margin in their telecommand links in the presence of the interfering BSS signal. We seek comment on this proposal and ask what parameters would be appropriate in such a showing.

79. Section 25.202(g) of the Commission's rules requires that TT&C functions for U.S. domestic satellites be conducted at either or both edges of the allocated band.[177] The Region 2 BSS and Feeder-link Plans provide 12 MHz of guardband spectrum at both the upper and lower bounds of the frequency band where DBS TT&C operations are typically conducted. We note that although both the DBS and the 17/24 GHz BSS services may transmit in the lower guardband (just above 17.3 GHz) the upper guardband of the DBS feeder-link plan falls outside of the present 17/24 GHz BSS allocation, in the 12 MHz of spectrum just below 17.8 GHz. We ask whether sufficient advantage can be taken of this situation (in combination with the shared 12 MHz of frequency at the lower edge of the band) to avoid interference into DBS telecommand links, and what effect our proposal to permit limited use of the 17.7-17.8 GHz band might have on this issue.[178] We ask whether we should preclude 17/24 GHz BSS satellites that co-locate at DBS locations from transmitting in the lower band-edge DBS guardbands, or whether we should limit such BSS transmission to TT&C functions and require coordination between the two services. We seek comment on these issues.

G. OTHER TECHNICAL REQUIREMENTS

80. We note that TT&C issues have been raised in some of the 17/24 GHz applications filed with the Commission, and below, seek comment on need to establish requirements for these activities. Also, discussed below, we seek comment on the need for polarization and frequency re-use requirements. In addition to these issues, we invite parties to comment on other technical matters that the Commission should address in this rulemaking, and seek comment on any further changes to our rules that should be adopted for 17/24 GHz BSS systems.

1. TRACKING, TELEMETRY AND COMMAND (TT&C) FREQUENCIES

81. Several applicants have indicated plans to use other frequency bands for certain tracking, telemetry and command (TT&C) activities during various phases of the satellite's operation. DIRECTV

[177] *See* 47 C.F.R. § 25.202(g).

[178] This situation could change if the Commission should decide to permit 17/24 GHz BSS operations for international service in the 17.7-17.8 GHz band segment.

requests to use the 12.2-12.7 GHz and 14.0-14.5 GHz band for both transfer orbit and on-station TT&C, citing the need to avoid interference between DBS feeder-links in the 17.3-17.8 GHz band at sites where these TT&C stations are co-located. DIRECTV also seeks to operate transfer orbit command frequencies in the Ku-band to avoid the risk presented by the greater atmospheric attenuation during this critical phase, and cites the lack of ground facilities in the 24 GHz band. DIRECTV further argues that on-station Ku-band TT&C is necessary to avoid flying two sets of command receivers as well as the need to prevent the loss of reliability associated with switching, as well as the need to compensate for decreased command link availability due to atmospheric effects.[179] EchoStar proposes various options for its TT&C operations with uplink telecommand in the 17.3-17.8 GHz band (reverse band) and telemetry in the 12.2-12.7 GHz band for both the launch, early operations and on-orbit operations, or switching to in-band TT&C operations during on-station operations. EchoStar also notes the problem of potential interference from DBS uplink earth stations into 17/24 GHz BSS receiving earth station.[180] In contrast, Pegasus plans to use frequencies in the 17/24 GHz BSS bands for its TT&C operations, noting the availability of ground facilities following the deployment of Ka-band FSS satellites.[181] Intelsat proposes multiple options for operating its TT&C links in both the C-band and Ka-band, with some launch and early operations links also planned for the Ku-band.[182]

82. Section 25.202(g) of the Commission's rules requires that tracking, telemetry and telecommand functions for U.S. domestic satellites be conducted at either or both edges of the allocated band(s).[183] In this *NPRM,* we are not proposing to change our requirement for satellites operating in the 17/24 GHz BSS service but we seek comment on this issue. We recognize the present lack of 24 GHz ground facilities needed to support launch, transfer, and testing operations, however we note that this issue has been faced in the past by other new services, typically through the use of case-by-case waivers.[184] We seek comment on the feasibility of employing such a case-by-case approach until ground facilities become more widely available. We ask whether a permanent rule change is necessary to accommodate what may only be a temporary situation. We also seek comment on the issue of atmospheric attenuation in the 24 GHz band and the associated loss of uplink command reliability. We ask whether this difficulty presents a significant problem for all operators and if so, during what phase of operations. Specifically, we ask if the problem is limited to certain "critical phases" such as the launch phase, and we seek comment on methods that might be adopted to mitigate loss of command link reliability.

83. Finally, we note that several applicants anticipate difficulties with interference into their 17/24 GHz BSS telemetry links from DBS feeder uplinks, both of which operate in the 17.3-17.7 GHz bands. This earth-station-into-earth station interference is encountered when the DBS uplink facility is co-located with (or located in close proximity to) the 17/24 GHz BSS TT&C facility. This problem is part of the larger issue of reverse band operation in the 17 GHz band, which is discussed previously in Section H.1.a of this item. However, we seek comment on its ramifications specific to TT&C operations. We ask whether there are means to avoid reverse band interference into telemetry receivers such as site

[179] *See DIRECTV Application* at 6.

[180] *See EchoStar Application* at 17.

[181] *See Pegasus Application* at 21.

[182] *See Intelsat Application* at Table C.4.

[183] *See* 47 C.F.R. § 25.202(g).

[184] *See, e.g.,* In the Matter of EchoStar L.L.C. for Modification of its License to Select TT&C Frequencies for its Ka-Band GSO Satellite at 117º W.L., *Order and Authorization*, DA 05-536, paras. 4-10 (released March 2, 2005).

separation, antenna shielding or frequency/polarization isolation.

84. The DBS service is subject to the channelization scheme outlined in the Region 2 Plan of Appendix 30 and 30A of the Radio Regulations. The Plan provides guardbands with 12 MHz of spectrum which are used only for DBS TT&C (command) uplinks at both the upper and lower bounds of the allocated band.[185] We believe that there is sufficient spectrum available in the guardbands to accommodate the TT&C transmissions of multiple satellites.[186] With careful planning, it may be possible to use these guardbands for both 17/24 GHz BSS telemetry and DBS command signals, in particular if both transmissions are from satellites licensed to the same operator. We seek comment on whether advantage can be taken of these guardbands, especially at the lower edge of the band,[187] in order to avoid ground path interference between the TT&C transmissions of co-located DBS and 17/24 GHz BSS systems.

85. EchoStar has proposed using standard DBS frequency bands for all or part of its TT&C operations; command uplinks would be in the 17.3-17.8 GHz band, and telemetry downlinking would be in the 12.2-12.7 GHz band.[188] We recognize that this approach may have some merit in cases where a single operator has both DBS and 17/24 GHz BSS satellites at the same nominal orbital longitude. In these cases the operator is already authorized to use DBS guardband spectrum, however, we question whether such an approach would provide sufficient TT&C spectrum for other DBS operators that may be operating at the same nominal position. We seek comment on this issue, and ask whether a case-by-case approach to licensing such TT&C operations would be sufficient, or whether a Commission rule change is needed.

86. Finally, we ask whether the Commission should consider other changes to its rules in order to facilitate reverse band operations in the 17.3-17.7 GHz band, specifically with regard to TT&C operations. We note that a significant number of 17/24 GHz BSS applicants are also DBS operators, and recognizing that these parties have likely given considerable thought to addressing these same problems, we invite comment on possible solutions.

2. POLARIZATION AND FULL FREQUENCY RE-USE REQUIREMENTS

87. We seek comment on what polarization requirements, if any should be established for 17/24 GHz BSS systems. We recognize that most operators prefer to operate with circularly polarized signals in the space-to-Earth direction because this facilitates installation of receiving antennas in the direct-to-home market. In the Earth-to-space direction, applicants have indicated plans to use both linearly and circularly polarized transmissions.[189] In the FSS, the Commission mandates use of orthogonal linearly polarized signals for standard C-band[190] operations, limits Ka-band transmissions to

[185] *See* Section 3.9 of Annex 5 to Appendix 30 and Section 4.1 of Annex 3 to Appendix 30A.

[186] Typical TT&C transmissions are on the order of 1 MHz in bandwidth.

[187] The upper edge of the 17/24 GHz BSS allocation lies just below 17.7 GHz and is not coincident with the upper edge of the DBS feeder link band, *i.e.*, 17.8 GHz. BSS downlink transmissions in this guardband would fall within DBS channel 26 (17.6765-17.7005 MHz).

[188] *See EchoStar Application* at 17.

[189] *See DIRECTV Application* at Table D-1, *Pegasus Application* at 6, *EchoStar Application* at Table A.4-1, and *Intelsat Application* at Table C.4.1.1.

[190] *See* 47 C.F.R. § 25.210(a)(1).

either orthogonal linear or circular transmissions,[191] and permits any type of orthogonal polarization for extended C-band and Ku-band transmissions.[192] For 12 GHz DBS systems the Commission requires that they conform to the technical characteristics contained in Appendices 30 and 30A of the ITU Radio Regulations (the BSS and feeder link Plans), which specify circularly polarized transmissions in both the uplink and downlink directions.[193] In addition, Appendices 30 and 30A precisely define all 32 channels at a given orbital location. Adjacent channels overlap partially in frequency and interference is avoided in part by specifying opposite polarizations (Right-hand circular polarization or "Left-hand circular polarization) on overlapping channels.[194]

88. At this time we do not plan to impose channelization or polarization requirements on 17/24 GHz BSS transmissions other than requiring that orthogonally polarized signals be employed. Nor do we intend to require that 17/24 GHz receivers be interoperable with the 17/24 GHz networks of other operators. We seek comment on this approach. We ask whether there is a need to establish more specific polarization requirements for satellites in this service. We prefer to leave as many aspects of system design to the discretion of the operator as possible. However, we seek comment on whether there is a need to institute a standardized convention with regard to transponder bandwidth, center frequency or signal polarization throughout the allocated band. In particular, we ask whether co-location or adjacent-location of reverse-band operating satellites may be facilitated by harmonization of the frequency and polarization schemes employed by the space stations in the two services. We seek comment on whether other technical goals such as facilitating an orbital spacing regime or interference mitigation might be improved through adopting more stringent channel and polarization requirements.

89. We also propose to require that space stations operating in the 17/24 GHz BSS service employ full frequency re-use either through the use of orthogonal polarizations in the same beam and/or the use of spatially independent beams. This requirement is in keeping with past Commission practice for other GSO satellite services,[195] and is based on our goal of encouraging the highest and best use of limited spectrum resources. We seek comment on our proposal in general. We seek comment on whether this requirement is appropriate for the 17/24 GHz BSS band or whether some other requirement should be adopted. We ask if issues unique to this service such as reverse band operations, and in particular the possibility of location in the vicinity of co-frequency DBS systems might affect the means or ability of operators to fully use the allocated spectrum. If so, we ask what requirement might better ensure full use of the resource. Although we do not propose adopting a transponder-by-transponder polarization plan or mandating polarization switching capability, we also seek comment on the need for these or other possible polarization requirements.

90. We seek comment on the need for a cross-polarization requirement in the 17/24 GHz BSS service, and if adopted, how stringent such requirement should be. We recognize that in order to achieve full frequency re-use, some degree of polarization isolation is necessary. The Commission now

[191] *See* 47 C.F.R. § 25.210(b).

[192] *See* 47 C.F.R. § 25.210(f).

[193] Other polarizations may be permitted if a Plan modification has been submitted to the ITU and an adequate technical showing is made to the Commission. *See* 47 C.F.R. § 25.148(f). *See also* Annex 5 (Section 3.2) of Appendix 30 and Annex 3 (Section 4.8) of Appendix 30A of the ITU Radio Regulations.

[194] In addition, spatial separation is employed by locating even and odd channels at opposite edges of a cluster centered around the nominal orbital position. *See* Article 10 of Appendix 30 and Article 9 of Appendix 30A of the ITU Radio Regulations.

[195] *See* 47 C.F.R. § 25.210(a), (b), (f).

requires that both FSS and DBS space stations operate with antennas designed to provide 30 dB of cross-polarization isolation in the primary coverage area.[196] Because BSS feeder-links operate in the FSS, this requirement can be assumed to apply to the uplink already. However, most of our present rules were written prior to the widespread use of shaped antenna beams or multi-spot beam satellites. Moreover, we recognize that cross-polarization interference has historically been viewed as primarily an intra-system problem and did not typically cause significant levels of harmful interference to adjacent operators. However, the possibility of space-to-space interference scenarios between 17/24 GHz BSS and DBS satellites requires a closer examination of our existing approach to cross-polarization requirements. Accordingly, we ask whether we should adopt a cross-polarization isolation requirement, and if so, should 30 dB or some other ratio of co-polar to cross-polar gain be imposed.

H. TECHNICAL REQUIREMENTS FOR INTER-SERVICE OPERATIONS

1. SHARING IN THE 24 GHz BAND

91. In 1997, the Commission modified the Domestic Table of Frequency Allocations to provide a primary allocation in the frequency band 25.05-25.25 GHz to support the 24 GHz Fixed Service, formerly known as the Digital Electronic Messaging Service (DEMS).[197] This band is now allocated on a co-primary basis to both the FS and to the FSS (Earth-to-space). Several 24 GHz FS systems have already been licensed and we must therefore consider the likelihood that additional systems will be deployed in the future. The potential exists for 17/24 GHz BSS feeder-link earth stations operating in the 25.05-25.25 GHz band to interfere with existing and future 24 GHz FS hub and user stations that operate in the same frequency band. When we adopted this shared allocation at 24 GHz, we stressed that while the full extent of the interference was unknown at that time, our belief in the feasibility of sharing was based on limitations on the number of expected 17/24 GHz BSS feeder link facilities and on the fact that potential interference to the 24 GHz service would be limited to hub stations. It was noted that the rules relevant to the 24 GHz service are subject to the outcome of the 24 GHz service rules proceeding.[198] We noted that the successful implementation of this allocation would require the development of sharing criteria that will be considered in a future rulemaking.[199] In light of the proposed expansion in this band for 12 GHz BSS feeder links in this *NPRM*[200] and the nature of the 24 GHz service, we seek to develop sharing criteria that would assure successful implementation of BSS feeder links and the 24 GHz service and request comment on what these criteria should be. Accordingly, we request comment on the feasibility of operating BSS feeder-links in this band on a co-frequency basis with 24 GHz FS systems and whether existing power levels and coordination procedures are sufficient given that 24 GHz FS systems have been licensed by geographic area and are not required to file site specific data.

92. At present, Section 25.203 of the Commissions rules provides a coordination mechanism for minimizing interference between satellite earth stations and FS stations, in bands where both services

[196] *See* 47 C.F.R. §§ 25.210(i), 25.215.

[197] *See* Amendment of the Commission's Rules to Relocate the Digital Electronic Message Service from the 18 GHz Band to the 24 GHz Band and to Allocate the 24 GHz Band for Fixed Service, *Order,* 15 FCC Rcd 3471 (1997).

[198] *18 GHz Report & Order,* 15 FCC Rcd at 13479, para. 105 (referring to Amendments to Parts 1, 2, 87 and 101 of the Commission's Rules to License Fixed Services at 24 GHz, *Report and Order,* 15 FCC Rcd 16934 (2000)).

[199] *Id.* at 13477, para. 98.

[200] *See* para. 69 *supra.*

share equal rights.[201] In addition, Section 25.204 sets forth power limits for satellite earth stations in bands shared co-equally with terrestrial radiocommunication services.[202] Moreover, the antenna pattern requirements of Section 25.209 (*i.e.*, $29\text{-}25*\log_{10}\theta$) apply to BSS feeder-link stations because these antennas operate by definition in the FSS. We seek comment on whether these rules provide sufficient protection to hub and user stations of 24 GHz FS systems. We ask whether other requirements such as different power limits, or perhaps some other changes in our rules, may be necessary to facilitate sharing in the band. We also recognize that BSS feeder-link antennas may be less widely deployed than BSS receiving antennas. In addition, BSS feeder-link earth stations will typically employ relatively large diameter antennas with antenna off-axis rejection characteristics sufficient to minimize interference into 24 GHz FS systems. These factors should help decrease the likelihood of interference events with 24 GHz FS receiving stations. For these reasons we also seek comment on whether the existing rules are appropriate, or might be relaxed in some manner in order to relieve the coordination burden on either or both services.

93. In Region 2, the International Table of Frequency Allocations provides only the FSS with primary status in the frequency band 24.75-25.05 GHz. In the Domestic Table of frequency allocations however, primary status is shared by both the FSS and the radionavigation service.[203] At this time we are aware of no operational radionavigation systems in the band. However, it is not inconceivable that future radionavigation systems might be deployed. Furthermore, we are aware of no specific sharing criteria or rules governing co-frequency operation of FSS and radionavigation systems. We seek comment on the feasibility of operating BSS feeder-links (Earth-to-space) in this band on a co-primary basis with potential future radionavigation systems. We seek comment on what are the most likely interference scenarios, and ask what measures might best provide for future operation of both services. We ask whether any changes to our rules such as power limits, coordination requirements, or antenna performance requirements might be considered in order to minimize inter-service interference in the 24.75-25.05 GHz band. We seek comment on technical or operational measures that might be adopted by either satellite system operators or by radionavigation system operators in order to facilitate co-frequency operation of these two services.

2. SHARING IN THE 17 GHz BAND

94. In the Domestic table of Frequency Allocations, the Radiolocation Service is allocated use of the 15.7-17.3 GHz band on a primary basis for U.S. Government systems.[204] Military services are the largest users of the band and have a considerable investment in radiolocation operations in this frequency range, which include a large number of radar systems that perform ground-mapping, terrain-following maritime and target-identification functions.[205] Numerous high-powered synthetic aperture

[201] *See* 47 C.F.R. § 25.203.

[202] *See* 47 C.F.R. § 25.204. Specifically, for bands above 15 GHz the e.i.r.p towards the horizon is limited to +64 dBW in any 1 MHz band for $\theta<0^{o}$, and $+64 + 3\theta$ in any 1 MHz band for $0< \theta<5^{o}$, where θ is the elevation angle of the horizon as viewed from the center of radiation of the earth station antenna, and measured in degrees as positive above the horizontal plane and negative below it. Section 25.204(b) provides for the use of uplink power control in the presence of rain-fade.

[203] *See* 47 C.F.R. § 2.106. In addition, the International Table permits *all* FSS operations in the 24.75-25.25 GHz band, with priority given to use by BSS feeder-links; the associated downlink band is not specified. By contrast, the domestic allocation limits use of the FSS allocation only to feeder-links for the broadcasting-satellite service operating in the band 17.3-17.7 GHz.

[204] *See* 47 C.F.R. §2.106.

[205] These radiolocation systems include land-based, transportable, shipborne and airborne platforms.

radars (SARs) operate near the band edge adjacent to 17.3 GHz. At present, these SARs are largely airborne, and are employed primarily for ground mapping and detection of airborne objects.[206] The National Telecommunications and Information Administration (NTIA) has stated that future radar systems are likely to resemble existing radars, including the capability to operate differently in different azimuth and elevation sectors, and that future designs may seek to operate in a wide band extending to the edge of the authorized allocation.[207] Future radar systems will likely employ electronically-steerable antennas, and the NTIA maintains that the introduction of newer phase-steered radars could facilitate electromagnetic compatibility in some circumstances. In addition, newer radar systems are expected to have average-power capabilities at least as high as those of current systems, although the NTIA expects that future designs will strive to reduce wideband noise emissions through the use of solid-state transmitter/antenna systems. These would employ longer pulse transmissions with substantially higher duty cycles, but probably at lower peak power levels, as compared to tube-type radar transmitters.[208]

95. We anticipate that unwanted emissions from high-power, adjacent-band radiolocation systems, especially those on board aircraft, may pose a significant harmful interference threat to 17/24 GHz BSS subscriber earth stations. The NTIA has expressed to the Commission its concern that interference from these high-powered radars into 17/24 GHz BSS receivers may occur even though the radiolocation systems meet current regulations[209] with respect to unwanted emissions.[210] Recognizing the long lead development and life cycle of radiolocation and BSS systems, the NTIA requests that the BSS and radiolocation communities begin discussions that would include the possibility of mitigation techniques in both services, in order to ensure adjacent band compatibility.[211] The Commission acknowledged the NTIA's concerns, and agreed that discussions between the radiolocation and BSS communities at an early stage would be beneficial to ensuring adjacent band compatibility.[212] The Commission has traditionally encouraged operator-to-operator discussions as a means to resolve interference issues, and we seek comment on this approach in this context, and ask how best to address the issue of potential adjacent-band interference into 17/24 GHz BSS receivers.

96. The NTIA has provided the Commission with information concerning technical and operating characteristics of certain adjacent-band radiolocation systems that it considers likely to impact 17/24 GHz BSS receiving earth stations and sufficient for general calculations to asses the compatibility

[206] *See* Letter to Edmond J. Thomas, Chief, Office of Engineering and Technology, Federal Communications Commission, from Fredrick R. Wentland, Associate Administrator, Office of Spectrum Management, National Telecommunications and Information Administration, (April 8, 2005) ("*April 8 NTIA Letter*"). *See also* U.S. Department of Commerce, NTIA Special Publication 00-40, Federal Radar Spectrum Requirements, May 2000.

[207] *See April 8 NTIA Letter*.

[208] *Id*.

[209] Standards for levels of unwanted emission for government radio determination systems are addressed in Section 5.5 of the NTIA Manual of Regulations & Procedures for Federal Radio Frequency Management (May 2003 Edition, September 2004 Revisions).

[210] *See* Letter from Karl Nebbia, Deputy Associate Administrator, Office of Spectrum Management, NTIA, United States Department of Commerce, to Donald Abelson, Chief, International Bureau, Federal Communications Commission, dated June 21 2002 ("*June 21 NTIA Letter").*

[211] *See June 21 NTIA Letter*.

[212] *See* Letter to Karl Nebbia, Deputy Associate Administrator, Office of Spectrum Management, NTIA, from Donald Abelson, Chief, International Bureau, Federal Communications Commission, (July 15, 2002).

between these radars and BSS systems.[213] The technical characteristics of the radiolocation systems operating in the 15.7-17.3 GHz band are provided in Appendix C. The NTIA has also identified two interference coupling scenarios that it believes are likely to exist between radiolocation systems and BSS receiving antennas in the 17 GHz band: earth station receiver front-end overload[214] and out-of-band interference from high-power pulsed emissions.[215] With regard to adjacent band interference due to high power pulsed emissions, the NTIA cites measurements that it performed[216] on a 4 GHz digital earth station receiver that employed error correction signal processing.[217] However, as the NTIA also notes, the applicability of these results to 17 GHz systems requires further study. Accordingly, we seek comment on the interference scenarios that are most likely to be encountered between adjacent-band radiolocation systems and BSS receiving antennas, and on the general applicability of the NTIA's findings. Specifically, we ask what differences in 17/24 GHz BSS receiver design and signal processing should be taken into account when assessing interference from adjacent-band radiolocation systems. We also ask 17/24 GHz BSS operators for comment on their systems' sensitivity to unwanted adjacent-band emissions, and on the level of protection they may require.

97. We also seek comment on what measures 17/24 GHz BSS operators might adopt in order to mitigate such interference. In its April 8, 2005 letter to the Commission, the NTIA suggested various mitigation techniques that BSS operators might implement to mitigate adjacent-band radiolocation transmission interference.[218] The NTIA also recommends that BSS operators at least employ adequate radio frequency filtering to avoid front-end overload from adjacent-band radar signals, and that BSS operators investigate altering inter-leaving[219] and/or other error correction techniques to improve survivable pulsed interference-to-carrier levels.[220] We seek comment on the feasibility of the NTIA's recommendations, particularly with regard to their effects upon BSS system performance and cost. We ask what other mitigation techniques might be considered to diminish adjacent-band radiolocation transmission interference. We also seek comment on what limits or other measures the Commission might adopt in order to protect receiving earth stations from harmful interference caused by unwanted

[213] *See April 8 NTIA Letter.*

[214] Front-end overload is a condition that occurs when out of band energy is captured and amplified. Front-end overload typically results when the receiver's front-end amplifier filtering is overly broad, and allows energy outside of the desired receiving band to enter the first amplifier stage. Front-end overload can also occur when strong interfering signals are present inside the desired receiving band.

[215] *See April 8 NTIA Letter*.

[216] *See* National Telecommunications and Information Administration, NTIA Report 02-393, *Measurements of Pulsed Co-Channel Interference in a 4 GHz Digital Earth Station Receiver* (May 2002). This receiver employed error correction signal processing. The measurements show that degradation of performance is directly related to the carrier-to-peak interference ratio (C/I). These measurements also show that the potential interference impact is a function of the pulsed characteristics (pulse width, pulse repetition frequency, duty cycle) of the radar systems.

[217] In digital communication systems, error correction is the process of detecting bit errors and correcting them. Error correction is employed to ensure the accuracy and integrity of the received data.

[218] These include antenna shielding techniques to reduce side-lobes, auxiliary side-lobe blanking in receive antennas upon detection of interference, or frequency diversity *(i.e*., adaptive selection of operating frequencies in response to detected interference). *See April 8 NTIA Letter.*

[219] Interleaving is a component of many digital communication systems used in conjunction with forward error correction coding. Interleaving the encoded symbols provides a form of time diversity to guard against localized corruption or bursts of errors.

[220] *See April 8 NTIA Letter*.

adjacent-band emissions, and we ask in particular whether the Commission should adopt requirements to limit 17/24 GHz BSS receiver susceptibility to unwanted emissions, and specifically what requirements might be appropriate.

98. The Commission's rules do not establish unwanted emission limits for radiolocation systems operating in the 15.7-17.3 GHz band. Appendix 3 of the ITU Radio Regulations defines limits for an attenuation value used to calculate maximum permitted power levels of unwanted emissions[221] in the spurious domain in Table II of Section II. For the Radiolocation Service[222] this attenuation below the radiated emission power level is defined as $43 + 10\text{Log}_{10}(\text{PEP})$, where PEP is the peak envelope power in watts.[223] We seek comment on the suitability of this value to protect 17/24 GHz BSS receivers from interference caused by unwanted emissions from adjacent-band radars.

99. In addition, the band 17.3-17.7 GHz is allocated on a secondary basis to the Radiolocation Service for use by Federal Government systems.[224] Numerous types of radiolocation stations have been operated in this band, including ship, ground and airborne equipment. There may be future radiolocations systems that seek to operate in this spectrum on a secondary basis, and the potential for interference into 17/24 GHz BSS subscriber receiving antennas exists. We intend to ensure that 17/24 GHz BSS receivers are adequately protected. However, the Commission is also committed to encouraging efficient use of spectrum whenever possible. Accordingly, we seek comment on approaches we might adopt to accommodate future secondary radiolocation operations in this band. We ask what types of interference scenarios may be anticipated and what criteria might be adopted to ensure protection of BSS systems while allowing for future secondary operation of radiolocation systems in the 17.3-17.7 GHz band. We also ask 17/24 GHz BSS operators to address the level of protection required for their receiving earth stations and whether 17/24 GHz BSS and secondary radiolocation services could co-exist if appropriate protection criteria were in place. Finally, we note that Footnote US259 to the United States Table of Frequency Allocations requires that stations in the radiolocation service in the 17.3-17.7 GHz band be restricted to operating powers of less than 51 dBW e.i.r.p. after feeder-link stations for the broadcasting-satellite service are authorized and brought into use.[225] This requirement was developed to protect GSO satellites operating with feeder-link transmissions defined by the Region 2 planned bands, and was not designed with protection of small-diameter 17/24 GHz BSS receiving earth stations in mind. Nonetheless, we seek comment on whether this restriction is adequate to protect 17/24 GHz BSS subscriber earth stations from harmful interference caused by transmitting radiolocation systems.

100. The allocation to the radiolocation service is secondary relative to the BSS in the 17.3-17.7 GHz band. Accordingly, secondary radiolocation stations are precluded from causing harmful

[221] Unwanted emissions include both spurious and out-of-band emissions.

[222] The requirement is defined for the Radiodetermination Service as a whole. Radiolocation is a particular type of Radiodetermination.

[223] *See* Appendix 3, Section II, Table II of the ITU Radio Regulations. This value is applicable to transmitters installed after January 1, 2003, and for all transmitters after January 1, 2012. The limits of Appendix 3, Section I, Table I apply for transmitters installed on or before January 1, 2003, and are valid until January 1, 2012. The ITU does not specify emission limits for the out-of-band domain.

[224] Prior to the 1979 World Administrative Radio Conference (WARC), the 15.7-17.7 GHz band was allocated to the radiolocation service on a primary basis. At WARC 79, the band 17.3-17.8 GHz was reallocated to the fixed satellite-service (Earth-to-space) limited to feeder links for the BSS, and the radiolocation service was downgraded to a secondary allocation in the 17.3-17.7 GHz band in all three International Telecommunication Union regions.

[225] *See* 47 C.F.R. § 2.106, footnote US259.

interference to the stations of a primary service such as the 17/24 GHz BSS.[226] However, we recognize that Federal radiolocation systems are now operating in this band and have been in operation for some time. Further, in its March 29, 2000 letter to the Commission, NTIA stated that radiolocation systems continuing to operate in the 17.3-17.7 GHz band after April 1, 2007 may have to be accommodated, notwithstanding their allocation status with respect to BSS stations.[227] Recently, NTIA again noted that it anticipates continued operation of Federal radiolocation systems in certain portions of the 17.3-17.7 GHz band, in a limited number of geographic areas after April 1, 2007.[228] The Commission is committed to protecting 17/24 GHz BSS consumers from harmful interference. However we also wish to accommodate national defense interests and appreciate the Defense Department's need to continue operating a limited number of existing radars in the 17.3-17.7 GHz band after April 1, 2007. Accordingly, we seek comment on what methods or criteria might be adopted to accommodate continued operation of these currently operating Federal radiolocation systems. Specifically, we seek comment on the typical interference scenarios that could occur between receiving 17/24 GHz BSS earth stations and existing Federal radiolocation systems. We ask whether case-by-case coordination or some other approach might best permit continued operation of Federal radiolocation systems in portions of the 17.3-17.7 GHz band following the introduction of 17/24 GHz BSS systems after April 1, 2007.

VI. CONCLUSION

101. The proposed licensing and service rules described above for the 17/24 GHz BSS bands reflect our interest in facilitating the deployment of new and enhanced services. The proposals set forth in this *NPRM* are designed to address: 1) issues regarding licensing; 2) service obligations; 3) facilitating service to the states of Alaska and Hawaii; 4) allocation issues; 5) orbital spacing; 6) reverse band operations; and 7) sharing with other services. Based on the considerations discussed above, we conclude that the proposals set forth in this *NPRM* will facilitate the implementation of service in the 17/24 BSS GHz bands. We seek comment on all aspects of these rules and anticipate an extensive record on which to base decisions on final policies and rules.

V. PROCEDURAL MATTERS

A. EX PARTE

102. This proceeding shall be treated as a "permit-but-disclose" proceeding in accordance with the Commission's ex parte rules.[229] Persons making oral ex parte presentations are reminded that memoranda summarizing the presentations must contain summaries of the substance of the presentations and not merely a listing of the subjects discussed. More than a one- or two-sentence description of the views and arguments presented is generally required.[230] Other rules pertaining to oral and written presentations are set forth in Section 1.1206(b) of the Commission's rules as well.

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[226] *See* 47 C.F.R. § 2.105c)(2)(i).

[227] *See* Letter to Dale M. Hatfield, Chief, Office of Engineering and Technology, Federal Communications Commission, from William T. Hatch, Associate Administrator, Office of Spectrum Management, National Telecommunications and Information Administration, (March 29, 2000).

[228] *See April 8 NTIA Letter*.

[229] 47 C.F.R. §§ 1.1200, 1.1206; Amendment of 47 C.F.R. § 1.1200 *et seq*. Concerning Ex Parte Presentations in Commission Proceedings, GC Docket No. 95-21, *Report and Order*, 12 FCC Rcd 7348 (1997).

[230] 47 C.F.R. § 1.1206(b)(2).

B. INITIAL REGULATORY FLEXIBILITY ANALYSIS

103. Pursuant to the Regulatory Flexibility Act (RFA),[231] the Commission has prepared an Initial Regulatory Flexibility Analysis (IRFA) of the possible significant economic impact on small entities by the proposals considered in this *NPRM*. The text of the IRFA is set forth in Appendix A. Written public comments are requested on this IRFA. Comments must be filed in accordance with the same filing deadlines for comments on the *NPRM*, and they should have a separate and distinct heading designating them as responses to the IRFA. The Commission will send a copy of the *NPRM*, including the IRFA, to the Chief Counsel for Advocacy of the Small Business Administration.[232]

C. INITIAL PAPERWORK REDUCTION ACT OF 1995 ANALYSIS

104. *Paperwork Reduction Act.* This NPRM contains proposed new and modified information collections. The Commission, as part of its continuing effort to reduce paperwork burdens, invites the general public and the Office of Management and Budget (OMB) to comment on the information collections contained in this NPRM, as required by the Paperwork Reduction Act of 1995, Public Law No. 104-13. Public and agency comments are due 60 days from the date of publication of the NPRM in the Federal Register. Comments should address: (a) 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; (b) the accuracy of the Commission's burden estimates; (c) ways to enhance the quality, utility, and clarity of the information collected; and (d) 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. In addition, pursuant to the Small Business Paperwork Relief Act of 2002, Public Law No. 107-198, *see* 44 U.S.C. § 3506(c)(4), we seek specific comment on how we might "further reduce the information collection burden for small business concerns with fewer than 25 employees."

105. A copy of any comments on the information collections contained herein should be submitted to Judy Boley Herman, Federal Communications Commission, Room 1-C804, 445 12th Street, S.W., Washington, DC 20554, or via the Internet to jbHerman@fcc.gov and to Kristy L. LaLonde, OMB Desk Officer, Room 10234 NEOB, 725 17th Street, N.W., Washington, DC 20503, or via the Internet to Kristy_L.LaLonde@omb.eop.gov, or via fax at 202-395-5167.

D. COMMENT FILING PROCEDURES

106. Pursuant to Sections 1.415 and 1.419 of the Commission's rules, *47 C.F.R. §§ 1.415, 1.419,* interested parties may file comments in response to this *NPRM* no later than on or before 75 days after Federal Register publication. Reply comments to these comments may be filed no later than on or before 105 days after Federal Register publication. All pleadings are to reference **IB Docket No. 06-123**. Comments may be filed using the Commission's Electronic Comment Filing System (ECFS) or by filing paper copies. Parties are strongly encouraged to file electronically. *See Electronic Filing of Documents in Rulemaking Proceedings, 63 Fed. Reg. 24,121 (1998).*

107. Comments filed through the ECFS can be sent as an electronic file via the Internet to http://www.fcc/gov/e-file/ecfs.html. Parties should transmit one copy of their comments to the docket in

[231] *See* 5 U.S.C. § 603. The RFA 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).

[232] 5 U.S.C. § 603(a).

the caption of this rulemaking. In completing the transmittal screen, commenters should include their full name, U.S. Postal Service mailing address, and the applicable docket or rulemaking number. Parties may also submit an electronic comment by Internet e-mail. To get filing instructions for e-mail comments, commenters should send and e-mail to ecfs@fcc.gov and should include 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.

108. Parties choosing to file by paper must file an original and four copies of each filing in IB Docket No. 06-123. Filings can be sent by hand or messenger delivery, by commercial overnight courier, or by first-class or overnight U.S. Postal Service mail (although we continue to experience delays in receiving U.S. Postal Service mail). If more than one docket or rulemaking number appears in the caption of this proceeding, commenters must submit two additional copies for each additional docket or rulemaking number. The Commission's mail contractor, Vistronix, Inc. will receive hand-delivered or messenger-delivered paper filings for the Commission's Secretary at 236 Massachusetts Avenue, N.E., Suite 110, Washington, D.C. 20002. The filing hours at this location are 8:00 a.m. to 7:00p.m. All hand deliveries must be held together with rubber bands or fasteners. Any envelopes must be disposed of before entering the building. Commercial overnight mail (other than U.S. Postal Service Express Mail and Priority Mail) must be sent to 9300 East Hampton Drive, Capitol Heights, MD 20743. U.S. Postal Service first-class mail, Express Mail, and Priority Mail should be addressed to 445 12th Street, S.W., Washington, D.C. 20554. All filings must be addressed to the Commission's Secretary, Office of the Secretary, Federal Communications Commission.

109. Comments submitted on diskette should be on a 3.5 inch diskette formatted in an IBM-compatible format using Word for Windows or compatible software. The diskette should be clearly labeled with the commenter's name, proceeding (including the docket number, in this case, IB Docket No. 06-123), 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 one party's pleadings, preferably in a single electronic file.

110. All parties must file one copy of each pleading electronically or by paper to each of the following: (1) The Commission's duplicating contractor, Best Copy and Printing, Inc., 445 12th Street, S.W., Room CY-B402, Washington, D.C. 20554, telephone (202) 488-5300, facsimile (202) 488-5563, or via e-mail at FCC@BCPIWEB.COM.

111. Comments and reply comments and any other filed documents in this matter may be obtained from Best Copy and Printing, Inc., in person at 445 12th Street, S.W., Room CY-B402, Washington, D.C. 20554, via telephone at (202) 488-5300, via facsimile (202) 488-5563, or via e-mail at FCC@BCPIWEB.COM. The pleadings will be also available for public inspection and copying during regular business hours in the FCC Reference Information Center, Room CY-A257, 445 Twelfth Street, S.W., Washington, D.C. 20554 and through the Commission's Electronic Filing System (ECFS) accessible on the Commission's World Wide Website, www.fcc.gov.

112. Comments and reply comments must include a short and concise summary of the substantive arguments raised in the pleading. Comments and reply comments must also comply with Section 1.49 and all other applicable sections of the Commission's rules.[233] All parties are encouraged to utilize a table of contents, and to include the name of the filing party and the date of the filing on each page of their submission. We also strongly encourage that parties track the organization set forth in this *NPRM* in order to facilitate our internal review process.

[233] 47 C.F.R. § 1.49.

113. Commenters who file information that they believe is proprietary may request confidential treatment pursuant to Section 0.459 of the Commission's rules. Commenters should file both their original comments for which they request confidentiality and redacted comments, along with their request for confidential treatment. Commenters should not file proprietary information electronically. *See* Examination of Current Policy Concerning the Treatment of Confidential Information Submitted to the Commission, *Report and Order*, 13 FCC Rcd 24816 (1998), *Order on Reconsideration*, 14 FCC Rcd 20128 (1999). Even if the Commission grants confidential treatment, information that does not fall within a specific exemption pursuant to the Freedom of Information Act (FOIA) must be publicly disclosed pursuant to an appropriate request. *See* 47 C.F.R. § 0.461; 5 U.S.C. § 552. We note that the Commission may grant requests for confidential treatment either conditionally or unconditionally. As such, we note that the Commission has the discretion to release information on public interest grounds that does fall within the scope of a FOIA exemption.

VI. ORDERING CLAUSES

114. Accordingly, IT IS ORDERED that, pursuant to the authority contained in Sections 1, 4(i), 4(j), 7(a), 301, 303(c), 303(f), 303(g), 303(r), 303(y), and 308 of the Communications Act of 1934, as amended, 47 U.S.C. Sections 151, 154(i), 154(j), 157(a), 301, 303(c), 303(f), 303(g), 303(r), 303(y), 308, this Notice of Proposed Rulemaking IS ADOPTED.

115. IT IS FURTHER ORDERED that the Commission's Consumer and Governmental Affairs Bureau, Reference Information Center shall send a copy of this NOTICE OF PROPOSED RULEMAKING, including the initial regulatory flexibility analysis, to the Chief Counsel for Advocacy of the Small Business Administration, in accordance with Section 603(a) of the Regulatory Flexibility Act, *5 U.S.C. § 601, et seq.* (1981).

FEDERAL COMMUNICATIONS COMMISSION

Marlene H. Dortch
Secretary

APPENDIX A

INITIAL REGULATORY FLEXIBILITY ANALYSIS

As required by the Regulatory Flexibility Act of 1980, as amended (RFA),[234] the Commission has prepared this present Initial Regulatory Flexibility Analysis (IRFA) of the possible significant economic impact on a substantial number of small entities by the policies and rules proposed in this item, the Establishment of Policies and Service Rules for the Broadcasting-Satellite Service at the 17.3-17.7 GHz Frequency Band and at the 17.7-17.8 GHz Frequency Band Internationally, and at the 24.75-25.25 GHz Frequency Band for Fixed Satellite Services Providing Feeder Links to the Broadcasting-Satellite Service and for the Satellite Services Operating Bi-Directionally in the 17.3-17.8 GHz Frequency Band, Notice of Proposed Rulemaking (*NPRM*).[235] 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 *NPRM* provided in paragraph 106 of this *NPRM*. The Commission will send a copy of the *NPRM*, including this IRFA, to the Chief Counsel for Advocacy of the Small Business Administration (SBA).[236] In addition, the *NPRM* and IRFA (or summaries thereof) will be published in the Federal Register.[237]

A. Need for, and Objectives of, the Proposed Rules

In this NPRM the Commission makes proposals and seeks comment on service rules that will apply to U.S. licensees authorized to operate in the 17/24 GHz BSS band. Our objective in this proceeding is to promote prompt commencement of services in the 17/24 GHz BSS band. This newly allocated band is expected to introduce a new generation of broadband services to the public, providing a mix of local and domestic video, audio, data, video-on-demand, and multimedia services to residential and business subscribers in the United States. As discussed in greater detail below, the Commission is provisionally considering a rulemaking which proposes rules and procedures for operation in the 17/24 GHz BSS band, including requirements for licensing, service obligations, orbital spacing, adjacent band operations, reverse band operations, and shared band operations. Potential interference from primary adjacent-band radiolocation systems and in-band secondary radiolocation systems is also addressed. In addition, the *NPRM* also considers proposals for use of the 17.7-17.8 GHz BSS spectrum for provision of international services outside the United States.

The Commission is provisionally considering whether to apply the processing rules and requirements set forth in the *Space Station Licensing Reform Orders* to the 17/24 GHz BSS or whether to adopt another licensing mechanism, such as competitive bidding. If the Commission decides to apply the *Space Station Licensing Reform* framework, it is provisionally considering that the 17/24 GHz BSS will be classified as a "GSO-like" service and therefore a "first-come, first-served" licensing framework will

[234] *See* 5 U.S.C. § 603. The RFA (*see* 5 U.S.C. § 601 – 612), has been amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA), Pub. L. No. 104-121, Title II, 110 Stat. 857 (1996).

[235] *See* The Establishment of Policies and Service Rules for the Broadcasting-Satellite Service at the 17.3-17.7 GHz Frequency Band and at the 17.7-17.8 GHz Frequency Band Internationally, and at the 24.75-25.25 GHz Frequency Band for Fixed Satellite Services Providing Feeder Links to the Broadcasting-Satellite Service and for the Satellite Services Operating Bi-Directionally in the 17.3-17.8 GHz Frequency Band, IB Docket No. 06-123, FCC 06-90, *Notice of Proposed Rulemaking* (*NPRM*), *rel*. June 23, 2006.

[236] *See* 5 U.S.C. § 603(a).

[237] *See* 5 U.S.C. § 603(a).

apply to the service. Under this processing option, the Commission is considering applying the package of safeguards that are contained within the first-come, first-served processing scheme. These safeguards include a requirement that all GSO-like applicants awarded a license under this procedure to post a $3 million performance bond with the Commission within 30 days of license grant. They also require licensees to construct and launch the satellite consistent with a specified milestone schedule. If the licensee fails to meet an implementation milestone, the license becomes null and void and the bond is executed. The rules also limit applicants to a total of five pending applications and licenses for unbuilt satellites in a specific frequency band at any one time. In addition, the Commission is considering making 17/24 GHz BSS licensees subject to the same annual reporting requirements as most of our current space station licensees are subject to. These reports include, among other things, the status of space station construction and anticipated launch dates.

The Commission is also provisionally considering the adoption of a ten-year license term for all non-broadcast 17/24 GHz BSS licensees and an eight-year license term for 17/24 GHz BSS satellites that will operate as broadcast facilities. In addition, the Commission is provisionally considering the adoption of the grant-stamp procedure to process unopposed replacement 17/24 GHz BSS applications with technical characteristics consistent with those of the satellite to be retired.

Regarding non-U.S.-licensed satellite operators, the Commission is provisionally considering to evaluate requests for U.S. access by foreign-licensed 17/24 GHz BSS systems on a service-specific basis consistent with the framework established in the 1997 *DISCO II Order*. Thus, if this approach is adopted, in cases where systems licensed by World Trade Organization (WTO)-member countries seek to provide FSS to U.S. customers from their 17/24 GHz BSS systems, we will presume that entry will further competition. In cases where non-WTO-member countries seek to use these systems to serve the United States or where WTO-member countries seek to provide services such as DTH and DBS over 17/24 GHz BSS systems, we will apply the effective competitive opportunities test (ECO-SAT) to ensure that entry will not distort competition in the U.S market.

The Commission is also provisionally considering whether 17/24 GHz BSS licensees should be subject to public interest obligations, such as those currently imposed on providers of direct broadcast satellite services. Under these obligations, these providers are required to meet certain political broadcast requirements, compliance with children's television advertising limits, and to set aside four percent of channel capacity for noncommercial, educational or informational programming. Also, the Commission is provisionally considering rules that would result in the equal employment opportunity requirements set forth in Part 76 of the Commission's rules being applied to 17/24 GHz BSS licensees. In addition, the Commission is provisionally considering adopting rules that would require 17/24 GHz BSS licensees to provide service to Alaska and Hawaii where such service is technically feasible from the authorized orbit location. In addition, the Commission is provisionally considering applying EAS requirements on 17/24 GHz BSS operators.

The Commission is also provisionally considering rules that may apportion a specific frequency band for tracking, telemetry and command operations for 17/24 GHz BSS satellites. Also, the Commission is provisionally considering the adoption of rules for orbital spacing for 17/24 GHz BSS satellites.

The Commission is also provisionally considering rules regarding adjacent band operations, reverse band operations, and shared band operations. If adopted, these rules would:

- Require Direct Broadcast Satellite (DBS) service applicants seeking to operate within [TBD] degrees of a geostationary orbital location where a space station has already been authorized to operate in the Broadcasting Satellite Service (BSS) in the 17.3-17.8 GHz

band (space-to-Earth) to submit a technical showing demonstrating their ability to maintain sufficient telecommand link margin in the presence of the interfering BSS signal.

- Require 17/24 GHz BSS applicants seeking to operate within [TBD] degrees of a geostationary orbital location where a space station has already been authorized to operate in the DBS service in the 17.3-17.8 GHz band (Earth-to-space) to submit a technical showing demonstrating their ability to avoid causing harmful interference to the existing DBS telecommand link.
- Require applicants proposing to co-locate DBS feeder link earth stations at sites where they are already authorized to operate earth stations receiving telemetry signals from space stations operating in the 17/24 GHz BSS service to submit a technical showing demonstrating their ability to maintain sufficient margin in their 17 GHz band telemetry links in the presence of the interfering DBS signal.
- Require applicants proposing to co-locate 17/24 GHz BSS TT&C earth stations at sites where they are already authorized to operate DBS feeder link earth stations to submit a technical showing demonstrating their ability to maintain sufficient margin in their 17 GHz band telemetry links in the presence of the interfering DBS signal.
- Require applicants for feeder-link earth station licenses that propose to transmit with e.i.r.p. spectral density levels in excess of 5.6 dBW/Hz, under clear sky conditions, to submit a showing demonstrating that their higher power levels will not cause harmful interference to nearby satellites.

Establishing service rules for the 17/24 GHz BSS bands will facilitate the delivery of a new generation of satellite services to the public, thus stimulating competition in the communications marketplace. The delivery of these services is anticipated to include standard-definition and high-definition formats and may complement existing DBS service offered by applicants. Operation in the 17/24 GHz BSS band is anticipated to provide a mix of local and national video, audio, data, and video-on-demand to residential and business subscribers in the United States.

B. Legal Basis

This *NPRM* is adopted pursuant to Sections 1, 4(i), 4(j), 7(a), 301, 303(c), 303(f), 303(g), 303(r), 303(y), and 308 of the Communications Act of 1934, as amended, 47 U.S.C. Sections 151, 154(i), 154(j), 157(a), 301, 303(c), 303(f), 303(g), 303(r), 303(y), 308.

C. Description and Estimate of the Number of Small Entities to Which the Proposals will Apply

The RFA directs agencies to provide a description of and, where feasible, an estimate of the number of small entities that may be affected by the proposed rules, if adopted.[238] The RFA generally defines the term "small entity" as having the same meaning as the terms "small business," "small organization," and "small governmental jurisdiction."[239] In addition, the term "small business" has the same meaning as the term "small business concern" under the Small Business Act.[240] A small business

[238] 5 U.S.C. § 603(b)(3).

[239] *Id.* § 601(6).

[240] 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 (continued....)

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).[241] Below, we further describe and estimate the number of small entity licensees that may be affected by the adopted rules.

Satellite Telecommunications. The SBA has developed a small business size standard for Satellite Telecommunications, which consists of all such companies having $13.5 million or less in annual receipts.[242] According to Census Bureau data for 2002, there were 536 firms in the category Satellite Telecommunications, total that operated for the entire year.[243] Of this total, 49 firms had annual receipts of $5 million to $9,999,999 and an additional 99 firms had annual receipts of $10 million or more.[244] Thus, under this size standard, the majority of firms can be considered small.

Space Stations (Geostationary). Commission records reveal that there are 44 space station licensees. We do not request nor collect annual revenue information concerning such licensees, and thus are unable to estimate the number of geostationary space stations that would constitute a small business under the SBA definition cited above, or apply any rules providing special consideration for Space Station (Geostationary) licensees that are small businesses.

Fixed Satellite Transmit/Receive Earth Stations. Currently there are approximately 1142 operational fixed-satellite transmit/receive earth stations authorized for use in the Ku-bands. The Commission does not request or collect annual revenue information, and thus is unable to estimate the number of earth stations that would constitute a small business under the SBA definition.[245]

Cellular and Other Wireless Telecommunications. The SBA has developed a small business size standard for Cellular and Other Wireless Telecommunications, which consists of all such firms having 1,500 or fewer employees.[246] According to Census Bureau data for 2002, in this category there was a total of 8,863 firms that operated for the entire year.[247] Of this total, 401 firms had 100 or more employees, and the remainder had fewer than 100 employees.[248]

(...continued from previous page)
the Office of Advocacy of the Small Business Administration and after the 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).

[241] Small Business Act, 15 U.S.C. § 632 (1996).

[242] 13 C.F.R. § 121.201, NAICS code 517410.

[243] U.S. Census Bureau, 2002 Economic Census, Subject Series: Information, "Receipt Size of Firms Subject to Federal Income Tax: 2002," Table 1, NAICS code 517410 (issued Nov. 2005).

[244] *Id*.

[245] The SBA has developed a small business size standard for Satellite Telecommunications, which consists of all such companies having $13.5 million or less in annual receipts. 13 C.F.R. § 121.201, NAICS code 517410.

[246] 13 C.F.R. § 121.201, NAICS code 517212.

[247] U.S. Census Bureau, 2002 Economic Census, Subject Series: Information, "Employment Size of Establishments for the United States: 2002," Table 2, NAICS code 517212 (issued Nov. 2005).

[248] *Id.*

D. Description of Projected Reporting, Recordkeeping, and Other Compliance Requirements

The proposed rules would, if adopted, require a Direct Broadcast Satellite (DBS) service applicant seeking to operate within [TBD] degrees of a geostationary orbital location where a space station has already been authorized to operate in the broadcasting-satellite service in the 17.3-17.8 GHz band (space-to-Earth) to submit a technical showing which demonstrates its ability to maintain sufficient telecommand link margin in the presence of the interfering Broadcasting-Satellite Service (BSS) signal. This requirement will aid in ensuring that DBS operators seeking to operate in these locations will be able to maintain their telecommand link in order to maintain control of their satellites.

Also, a 17/24 GHz BSS applicant seeking to operate within [TBD] degrees of a geostationary orbital location where a space station has already been authorized to operate in the DBS service in the 17.3-17.8 GHz band (Earth-to-space), will be required, under the proposed rules, to submit a technical showing which demonstrates its ability to maintain sufficient telecommand link margin in the presence of the interfering DBS service signal. This requirement will aid in ensuring that BSS operators seeking to operate in these locations will be able to maintain their telecommand link in order to maintain control of their satellites

The proposed rules would also require that applicants proposing to co-locate DBS feeder link earth stations at sites where they are already authorized to operate earth stations receiving telemetry signals from space stations operating in the 17/24 GHz BSS service, must submit a technical showing demonstrating their ability to maintain sufficient margin in the 17 GHz band telemetry links in the presence of an interfering DBS signal. This requirement will aid in ensuring that DBS earth station operators can monitor the health and status of their satellites in the presence of an interfering signal from the DBS feeder link.

The proposed rules would also require that applicants proposing to co-locate 17/24 GHz BSS TT&C earth stations at sites where they are already authorized to operate DBS feeder link earth stations must submit to the Commission a technical showing which demonstrates their ability to maintain sufficient margin in their 17 GHz band telemetry links in the presence of an interfering DBS signal. This requirement will aid in ensuring that the BSS TT&C earth station operators will be able to maintain their telecommand link in order to maintain control of their satellites.

Finally, the proposed rules would require that each applicant for a feeder-link earth station license that proposes to transmit with e.i.r.p. spectral density levels in excess of 5.6 dBW/Hz, under clear sky conditions, shall submit (1) link budget analyses of its proposed operations, along with a detailed written explanation of how each uplink and each transmitted satellite carrier density figure is derived, and (2) a narrative summary which indicates whether there are margin shortfalls in any of the current baseline services as a result of the addition of the applicant's higher power service. If there are such shortfalls, each applicant must submit an explanation of how the applicant intends to resolve the margin shortfalls. In addition, such applicants shall certify that all potentially affected parties acknowledge, and do not object to, the applicant's use of the higher power densities. This requirement will aid in ensuring that earth station operators proposing to operate in excess of the level described above will not cause harmful interference to adjacent co-frequency satellites.

The Commission does not expect significant costs to be associated with these proposals, if adopted. Therefore, we do not anticipate that the burden of compliance would be greater for smaller entities.

E. Steps Taken to Minimize Significant Economic Impact on Small Entities, and Significant Alternatives Considered

The RFA requires that, to the extent consistent with the objectives of applicable statutes, the analysis shall discuss significant alternatives such as: (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 and 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.[249]

The proposed rules are necessary for the efficient operation of the 17/24 GHz BSS band, which is expected to introduce a new generation of broadband services to the public. We are provisionally considering rules and procedures for operation in the 17/24 GHz BSS band, including requirements for a licensing framework , service obligations, license terms, non-U.S.-licensed satellite operators, public interest obligations, equal employment opportunity requirements, geographic service requirements, , tracking, telemetry and command operations, and orbital spacing requirements. We seek comment on alternatives to these provisionally considered rules and procedures that would minimize the economic impact on small entities. We also seek comment on the establishment of differing compliance or reporting requirements that take into account the resources available to small entities.

In addition, the Commission is provisionally considering the adoption of rules that would facilitate adjacent band operations, reverse band operations, and shared band operations. We believe that these proposed rules, which may require a technical showing demonstrating the licensee's ability to operate without causing interference to other satellites, are necessary for the efficient administration of bandwidth because they will ensure that operators in the 17/24 GHz BSS band and the DBS service can operate compatibly. We have considered alternatives and believe these are the most equitable solutions to the potential interference problems posed by the operation of the 17/24 GHz BSS service. For example, one alternative is to require that technical showings be made after operation has begun. We rejected this alternative because we concluded that it would not be as efficient as requiring that technical showings be made before operation. This is because, in many instances, harmful interference will invariably occur, which will lead to disruptions in service. By requiring that technical showings be made prior to operation, we anticipate that there will be far fewer instances of harmful interference. We seek comment on viable alternatives to these rules or their reporting requirements that would lessen the economic impact on small entities. We also seek comment on the establishment of differing compliance or reporting requirements that take into account the resources available to small entities.

The *NPRM* seeks comment on these proposals, including the effectiveness and utility of the proposals, and also seeks comment on how to minimize undue burdens on small business.

F. Federal Rules that May Duplicate, Overlap, or Conflict With the Proposed Rules

None.

[249] 5 U.S.C. § 603(c)(1), (c)(4).

APPENDIX B

PROPOSED RULES

a. § 2.106 Table of Frequency Allocations.

International Table			United States Table		FCC Rule Part(s)
Region 1	**Region 2**	**Region 3**	**Federal Government**	**Non-Federal Government**	
17.3-17.7 FIXED SATELLITE (Earth-to-Space) 5.516 Radiolocation 5.514	17.3-17.7 FIXED SATELLITE (Earth-to-Space) 5.516 BROADCASTING-SATELLITE Radiolocation 5.514 5.515 5.517	17.3-17.7 FIXED SATELLITE (Earth-to-Space) 5.516 Radiolocation 5.514	17.3-17.7 Radiolocation US259 G59	17.3-17.7 FIXED-SATELLITE (Earth-to-Space) US271 BROADCASTING-SATELLITE NG163 US259	Satellite Communications (25)
17.7-18.1 FIXED FIXED-SATELLITE (Space-to-Earth) 5.484A (Earth-to-Space) 5.516 MOBILE .	17.7-17.8 FIXED FIXED-SATELLITE (Space-to-Earth) (Earth-to-Space) 5.516 BROADCASTING- SATELLITE Mobile . 5.515 5.517	17.7-18.1 .FIXED FIXED-SATELLITE (Space-to-Earth) 5.484A (Earth-to-Space) 5.516 MOBILE	17.7-17.8 . .	17.7-17.8 FIXED FIXED-SATELLITE (Earth-to-Space) US271 NG144	Satellite Communications (25 Auxiliary Broadcasting (74) Cable TV Relay (78) Fixed Microwave (101)
	17.8-18.1 FIXED FIXED-SATELLITE (Space-to-Earth) 5.484A (Earth-to-Space) 5.516 MOBILE		17.8-18.3 FIXED-SATELLITE (Space-to-Earth) G117 5.519 US334	17.8-18.3 FIXED 5.519 US334 US271	Auxiliary Broadcasting (74) Cable TV Relay (78) Fixed Microwave (101)

International Table			United States Table		FCC Rule Part(s)
Region 1	**Region 2**	**Region 3**	**Federal Government**	**Non-Federal Government**	
24.75-25.25 FIXED	24.75-25.25 FIXED SATELLITE (Earth-to-Space) 5.535	24.75-25.25 FIXED FIXED SATELLITE (Earth-to-Space) 5.535 Mobile 5.534	24.75-25.05 RADIONAVIGATION	24.75-25.05 FIXED-SATELLITE (Earth-to-Space) NG167 RADIONAVIGATION	Satellite Communications (25) Aviation (87)
			25.05-25.25	25.05-25.25 24.75-25.05 FIXED-SATELLITE (Earth-to-Space) NG167 FIXED	Satellite Communications (25) Fixed Microwave (101)

NG163 The allocation to the broadcasting-satellite service in the band 17.3–17.7 GHz shall come into effect on 1 April 2007. Use of the 17.3-17.7 GHz band by the broadcasting-satellite service is limited to geostationary satellite orbit systems.

NG167 The use if the fixed-satellite service (Earth-to-space) in the band 24.75-25.25 GHz is limited to feeder links for the broadcasting-satellite service. The allocation to the fixed-satellite service (Earth-to-space) in the band 24.75-25.25 GHz shall come into effect on 1 April 2007.

§ 25.114 Applications for space station authorizations.

(d) The following information in narrative form shall be contained in each application:

(15) For satellite applications in the Direct Broadcast Satellite service seeking to operate within [TBD] degrees of a geostationary orbital location where a space station has already been authorized to operate in the broadcasting-satellite service in the 17.3-17.7 GHz band (space-to-Earth), a technical showing with regard to its telecommand link margin in accordance with 25.148(g).

(16) For satellite applications in the 17/24 GHz broadcasting-satellite service seeking to operate within [TBD] degrees of a geostationary orbital location where a direct broadcast satellite (DBS) space

station has already been authorized to operate that has feeder links in the in the 17.3-17.8 GHz band (Earth-to-space), a technical showing with regard to the DBS system's telecommand link margin as in accordance with 25.xxx(1).

(17) A description of the design and operational strategies that will be used to mitigate orbital debris, including the following information:

Revise § 25.121(a) to read as follows:

§ 25.121 License term and renewals.

(a) *License Term*. Except for licenses for DBS and 17/24 GHz facilities, licenses for facilities governed by this part will be issued for a period 15 years. Licenses for DBS and 17/24 GHz space stations licensed as broadcast facilities will be issued for a period of 8 years. Licenses for DBS and 17/24 GHz space stations not licensed as broadcast facilities will be issued for a period of 10 years.

§ 25.148 Licensing Provisions for the Direct Broadcast Satellite Service

(g) *Co-location with 17/24 GHz BSS space stations.* A DBS applicant seeking to operate within [TBD] degrees of a geostationary orbital location where a space station has already been authorized to operate in the broadcasting-satellite service in the 17.3-17.7 GHz band (space-to-Earth), must submit to the Commission a technical showing demonstrating its ability to maintain sufficient telecommand link margin in the presence of the interfering BSS signal.

(h) *Co-location of DBS feeder links and 17/24 GHz BSS TT&C earth stations.* Applicants proposing to co-locate their DBS feeder link earth stations at sites where they are already authorized to operate earth stations receiving telemetry signals from space stations operating in the 17/24 GHz BSS service, must submit to the Commission a technical showing demonstrating their ability to maintain sufficient margin in their 17 GHz band telemetry links in the presence of the interfering DBS feeder-link signal.

§ 25.2xx Licensing requirements for 24 GHz band feeder link earth stations transmitting to space stations in the broadcasting-satellite service
[new rule for subpart B – Applications and Licenses, Earth Stations]

(a) All applications for an FSS feeder-link earth station license in the 24.75-25.25 GHz, band shall meet the following requirements:

(1) The feeder link earth station antenna shall not transmit with e.i.r.p. spectral density levels in excess of 5.6 dBW/Hz, under clear sky conditions, except as otherwise provided by this part.

(2) Each applicant for feeder-link earth station license(s) that proposes levels in excess of those defined in paragraph (a)(1) of this section shall submit link budget analyses of the operations proposed along with a detailed written explanation of how each uplink and each transmitted satellite carrier density figure is derived. Applicants shall also submit a narrative summary which must indicate whether there are margin shortfalls in any of the current baseline services as a result of the addition of the applicant's higher power service, and if so, how the applicant intends to resolve those margin short falls. Applicants shall certify that all potentially affected parties (*i.e.,* those 17/24 GHz GSO BSS satellite networks that are

[TBD] degrees apart) acknowledge and do not object to the use of the applicant's higher power densities.

(3) Licensees authorized pursuant to paragraph (a)(2) of this section shall bear the burden of coordinating with any future applicants or licensees whose proposed compliant operations at **[TBD]** degrees or smaller orbital spacing, as defined by paragraph (a)(1) of this section, is potentially or actually adversely affected by the operation of the non-compliant licensee. If no good faith agreement can be reached, however, the non-compliant licensee shall reduce its earth station power density levels to be compliant with those specified in paragraph (a)(1) of this section.

(b) Applicants proposing to co-locate their 17/24 GHz BSS TT&C earth stations at sites where they are already authorized to operate DBS feeder link earth stations, must submit to the Commission a technical showing demonstrating their ability to maintain sufficient margin in their 17 GHz band telemetry links in the presence of the interfering DBS signal.

§ 25.1xx Licensing Provisions for the 17/24 GHz Broadcasting Satellite Service
[new rule for subpart B – Applications and Licenses, Space Stations]

(a) *License terms*. License terms for 17/24 GHz facilities are specified in § 25.121(a).
(b) *Due Diligence*.
(c) *Geographic service requirements*.
(d) *Bond Requirement.*
(e) *Co-location with DBS space stations.* A 17/24 GHz BSS applicant seeking to operate within [TBD] degrees of a geostationary orbital location where a space station has already been authorized to operate in the direct broadcast satellite (DBS) service in the 12.2-12.7 GHz band that is authorized to use feeder links in the 17.3-17.8 GHz band (Earth-to-space), must submit to the Commission a technical showing demonstrating its ability to avoid causing harmful interference to the DBS operator, such that the DBS system is able to maintain sufficient margin in its telecommand link in the presence of the interfering BSS signal.
(f) *Limit on pending applications.*
(g) *Milestone requirements.*
(h) *Replacement satellites.*
(i) *Non-U.S.-licensed satellites.*
(j) *Public interest.*
(k) *Equal employment opportunity.*

§ 25.201 Definitions

Broadcasting-Satellite Service. A radiocommunication service in which signals transmitted or retransmitted by space stations are intended for direct reception by the general public.

Note: In the broadcasting-satellite service, the term *direct reception* shall encompass both individual reception and community reception.

§. 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. The Table follows:

Space-to-Earth (GHz)	Earth-to-space (GHz)
3.7-4.2 \1\	5.925-6.425 \1\
10.7-10.95 \1\12	12.75-13.25 \1\ 12\ 14
10.95-11.2 \1\2\12	13.75-14 \4\12
11.2-11.45 \1\12	14-14.2 \5\
11.45-11.7 \1\2\12	14.2-14.5
11.7-12.2 \3	17.3-17.8 \9
12.2-12.7 \13	24.75-25.25 \17
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	\1\ 47.2-50.2
19.3-19.7 \8\10	
19.7-20.2 \10	
37.5-40 \15\16	
37.6-38.6	
40-42 \16	

\17\ Use of the band 24.75-25.25 GHz by the fixed-satellite service (Earth-to-space) is limited to feeder links for space stations in the broadcasting-satellite service. The allocation to the fixed-satellite service (Earth-to-space) in the band 24.75-25.25 GHz shall come into effect on 1 April 2007.

(8) The following frequencies are available for use by the Broadcasting-Satellite Service after 1 April 2007:

17.3-17.7 GHz (space-to-Earth) \1\
17.7-17.8 GHz (space-to-Earth) \2\

\1\ Use of the 17.3-17.7 GHz band by the broadcasting-satellite service is limited to geostationary satellite orbit systems.
\2\ Use of the 17.7-17.8 GHz band (space-to-Earth) by the broadcasting-satellite service is limited to transmissions from geostationary satellite orbit systems to receiving earth stations located outside of the United States and its Possessions.

§ 25.208 Power flux density limits.

(c) In the **[**17.7-17.8 GHz**]**, 18.3-18.8 GHz, 19.3-19.7 GHz, 22.55-23.00 GHz, 23.00-23.55 GHz, and 24.45-24.75 GHz frequency bands, the power flux-density at the Earth's surface produced by emissions from a space station for all conditions for all methods of modulation shall not exceed the following values:

(1) -115 dB (W/m\2\) in any 1 MHz band for angles of arrival between 0 and 5 degrees above the horizontal plane.

(2) -115 + 0.5 (d-5) dB (W/m\2\) in any 1 MHz band for angles of arrival d (in degrees) between 5 and 25 degrees above the horizontal plane.

(3) -105 dB (W/m\2\) in any 1 MHz band for angles of arrival between 25 and 90 degrees above the horizontal plane.

§25.2xx Technical requirements for space stations operating in the 17/24 GHz broadcasting-

satellite service
[new requirement for Subpart C – Technical Standards]

(a) All space stations operating in the 17/24 GHz broadcasting-satellite service shall employ state-of-the art full frequency re-use either through the use of orthogonal polarizations within the same beam and/or the use of spatially independent beams

§ 25.2xx Special coordination requirements for DBS feeder link earth stations to protect 17/24 GHz BSS receiving earth stations
[new requirement for Subpart C – Technical Standards]

(a) *Coordination with 17/24 GHz BSS receiving earth stations.* Feeder-link earth station applicant planning to operate in the 17.3-17.8 GHz band shall coordinate the proposed frequency usage with 17/24 GHz BSS receiving earth stations, including 17/24 GHz BSS TT&C earth stations, in accordance with the procedures set forth in Sec. 25.251.

(b) In computing the coordination distance for the transmitting DBS feeder-link earth station, the applicant shall use the following technical parameters:

Parameter(s)		Value	Description
Orbit		GSO	Orbit in which the space service in which receiving earth station operates (GSO or NGSO)
Modulation at receiving earth station		[TBD]	Analog or digital
Receiving earth station interference parameters and criteria	p_0 (%)	[TBD]	Percentage of the time during which interference from all sources may exceed the threshold value
	n	[TBD]	Number of equivalent, equal level, equal probability entries of interference, assumed to be uncorrelated for small percentages of the time
	p(%)	[TBD]	Percentage of the time during which the interference from one source may exceed the permissible interference power value; since the entries of interference are not likely to occur simultaneously, $p=p_0/n$
	N_L (dB)	[TBD]	Link noise contribution
	M_s (dB)	[TBD]	Link performance margin
	W (dB)	[TBD]	A thermal noise equivalence factor for interfering emissions in the reference bandwidth; it is positive when the interfering emissions would cause more degradation than thermal noise
Receiving earth station parameters	G_m (dBi)	[TBD]	On-axis gain of the receive earth station antenna
	G_r	[TBD]	Horizon antenna gain for the receive earth station
	ε_{min}	[TBD]	Minimum elevation angle of operation in degrees
	T_e (K)	[TBD]	The thermal noise temperature of the receiving system at the terminal of the receiving antenna
Reference Bandwidth	B (Hz)	[TBD]	Reference bandwidth (Hz), *i.e.,* the bandwidth in the receiving station that is subject to the interference and over which the power of the interfering emission can be averaged
Permissible interference power	$P_r(p)$ (dBW) in B	[TBD]	Permissible interference power of the interfering emission (dBW) in the reference bandwidth to be exceeded no more than p% of the time at the receiving antenna terminal of a station subject to interference, from a single source of interference, using the general formula: $P_r(p) = 10 \log (k T_e B) + N_L + 10 \log (10^{Ms/10} - 1) - W$

(c) The feeder-link earth station applicant shall provide each such 17/24 GHz BSS licensee, and prior-filed applicant with the technical details of the proposed earth station and the relevant coordination distance calculations that were made. At a minimum, the earth station applicant shall provide the 17/24 GHz BSS licensee, and/or prior filed applicants 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 the procedure in Section 2.1

of Annex 5 to Appendix 7;

(viii) Minimum elevation angle;

(ix) Maximum equivalent isotropically radiated power (e.i.r.p.) density in the main beam in any **[TBD]** Hz band;

(x) Maximum available RF transmit power density in any **[TBD]** Hz band at the input terminals of the antenna(s);

(xi) Maximum permissible RF interference power level as determined in accordance with Annex 7 to Appendix 7 for all applicable percentages of time; and

(xii) A plot of the coordination distance contour(s) and rain scatter coordination distance contour(s) as determined by Table 2 of Section 3 to Appendix 7.

§ 25.251 Special requirements for coordination.

(a) The administrative aspects of the coordination process are set forth in Sec. 101.103 of this chapter in the case of coordination of terrestrial stations with earth stations, and in Sec. 25.203 in the case of coordination of earth stations with terrestrial stations.

(b) The administrative aspects of the coordination process in the case of coordination of DBS feeder-link earth stations with 17/24 GHz BSS receiving earth stations are set forth in Section 25.xxx of this chapter in combination with the additional technical parameters set forth in [**TBD**]

(c) The technical aspects of coordination are based on Appendix 7 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).

APPENDIX C

TECHNICAL CHARACTERISTICS OF RADIOLOCATION SYSTEMS IN THE 15.7-17.3 GHZ BAND

Table C-1 shows technical characteristics of radar systems that will likely impact the BSS earth station receivers, namely, the airborne ground-mapping radars. The lower power radars of "System 1" are included because of wider antenna beamwidths (e.g., mainbeam and sidelobe), which could increase the potential for interference. These systems currently tend to operate in the sub-band 16.2-17.3 GHz by provision of National Telecommunications and Information Administration Manual of Regulations and Procedures for Federal Radio Frequency Management Section 8.2.46, but this could change at any time to also allow ground-based radars. The airborne radar systems tend to have antenna pointing capabilities such that mainbeam-to-mainbeam coupling can occur with BSS subscriber earth station antennas. The information provided in Table C-1 should be sufficient for general calculation to assess the compatibility between these radars and BSS systems.

Table C-1. Characteristics of Radar Systems Operating in the 16.2-17.3 GHz Frequency Range

Characteristics	System 1	System 2
Function	Search, track and ground-mapping radar (multi-function)	Search, track and ground-mapping radar (multi-function)
Platform type	Airborne, low power	Airborne, high power
Tuning range (GHz)	16.2-17.3	16.29-17.21
Modulation	Linear FM pulse	Linear and non-Linear FM pulse
Transmit peak power (W)	< 80	< 3260
Pulse width (μs)	18.2; 49	120-443
Pulse rise/fall time (ns)	20	4
Pulse repetition rate (pps)	2041; 5495	900-1600
Duty Cycle	4-25%	< 50%
Output device	Travelling wave tube	Travelling wave tube
Antenna pattern type	Fan/pencil	Fan
Antenna type	Slotted waveguide	Phased array
Antenna polarization	Linear vertical	Linear vertical
Mainbeam Antenna gain (dBi)	25.6	38.0
Antenna elevation beamwidth (deg)	9.7	2.5
Antenna azimuthal beamwidth (deg)	6.2	2.2

Characteristics	System 1	System 2
Antenna horizontal scan rate	0-30 deg/s	0-5 deg/s
Antenna horizontal scan type (continuous, random, sector, etc.)	±45 deg to ±135 deg (mechanical)	±30 deg (electronic, conical)
Antenna vertical scan rate	0-30 deg/s	0-5 deg/s
Antenna vertical scan type.(*)	–10 to –50 deg (mechanical)	0 to –90 deg (electronic, conical)
Antenna 1st side-lobe gain level	10 dBi @ 31 deg	18 dBi @ 1.7 deg
Antenna height	Aircraft altitude	Aircraft altitude
Chirp bandwidth (MHz)	< 640	< 1200
Transmitter RF emission bandwidth (MHz).(**) –3 dB –20 dB -40 dB -60 dB	 < 622 < 725 < 868 < 1040	 < 1200 < 1220 < 1300 < 1400

(*) 0 degrees represents a horizontal orientation. Angles below horizontal are negative.

(**) The radar center frequency is lowered if necessary to ensure that the -20 dB bandwidth is contained below 17.3 GHz. This may cause radar emissions to fall below 16.2 GHz, but they will still be within the allocated band.