

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

In the Matter of )  
 )  
Amendment of Parts 2, 25 and 97 of the )  
Commission's Rules with Regard to the ) ET Docket No. 98-142  
Mobile-Satellite Service Above 1 GHz )

**REPORT AND ORDER**

**Adopted:** January 28, 2002

**Released:** February 7, 2002

By the Commission:

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## I. INTRODUCTION

1. By this action, we make new spectrum available on a co-primary basis to the fixed-satellite service ("FSS").<sup>1</sup> These FSS allocations will provide necessary feeder link<sup>2</sup> spectrum for a number of commercial Non-Geostationary Satellite Orbit Mobile-Satellite Service ("NGSO MSS") systems.<sup>3</sup> Specifically, we allocate the bands 5091-5250 MHz and 15.43-15.63 GHz for Earth-to-space transmissions ("uplinks") and the band 6700-7025 MHz for space-to-Earth transmissions ("downlinks"). In addition, we grandfather two satellite systems and their associated earth stations at three sites in the downlink band 7025-7075 MHz. In accordance with international regulations, the use of these FSS allocations is limited to feeder links that will be used in conjunction with the service links<sup>4</sup> of NGSO MSS systems. We are also adopting coordination procedures that will enable new NGSO MSS systems to use this spectrum while adequately protecting incumbent terrestrial services.

## II. EXECUTIVE SUMMARY

2. We are allocating 325 megahertz of spectrum on a co-primary basis for NGSO MSS feeder downlinks, with an additional 50 megahertz limited to two grandfathered satellite systems and their associated earth stations at three sites. In addition, we are allocating 359 megahertz of spectrum on a co-primary basis for NGSO MSS feeder uplinks.<sup>5</sup> The need for this amount of feeder link spectrum is based on the amount of NGSO MSS service link spectrum that is available, the frequency reuse of the service link spectrum, the need for NGSO MSS feeder link earth stations ("gateways") to service multiple satellites, and the need to coordinate with incumbent terrestrial operations. These allocations will be used exclusively by commercial NGSO MSS systems for the connection between their satellites and gateways. We have previously allocated spectrum for 2 GHz MSS and Big LEO service links.<sup>6</sup> The adoption of these FSS allocations will allow us to remove conditions placed on Big LEO and 2 GHz MSS licensees' feeder links, which we have previously licensed by waiver.

3. To provide spectrum for NGSO MSS feeder uplinks, we are removing the microwave landing system's ("MLS's") right of precedence over all other uses in the band 5150-5250 MHz, but are

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<sup>1</sup> FSS is a radiocommunication service between earth stations at given points and one or more satellites. *See* 47 C.F.R. § 2.1.

<sup>2</sup> A feeder link is a bi-directional transmission path between a satellite and an earth station at a fixed point. Feeder link earth stations that distribute information to, and receive information from, terrestrial telecommunication networks, *e.g.*, the public switched telephone network and the Internet, are generally known as gateways. *See* 47 C.F.R. § 2.1.

<sup>3</sup> MSS is a radiocommunication service between mobile earth stations and one or more satellites, or between satellites used by this service; or between mobile earth stations by means of one or more satellites. *See* 47 C.F.R. § 2.1. A satellite in geostationary-satellite orbit ("GSO") has a period of revolution that is equal to the period of rotation of the Earth about its axis and a circular orbit that lies generally in the plane of the Earth's equator. GSO satellites remain approximately fixed relative to a point on the Earth; a satellite in any other orbit is an NGSO satellite.

<sup>4</sup> A service link is a bi-directional transmission path between a satellite and subscriber earth stations.

<sup>5</sup> A portion of this primary uplink allocation (59 megahertz) is temporary in nature. *See* paragraph 3, *infra*.

<sup>6</sup> NGSO MSS systems that are licensed to use the MSS uplink allocation in the band 1610-1626.5 MHz and the MSS downlink allocation in the band 2483.5-2500 MHz are known as Big LEOs. GSO MSS, NGSO MSS, and hybrid GSO/NGSO systems that will be licensed to use the MSS uplink allocation in the band 1990-2025 MHz and the MSS downlink allocation in the band 2165-2200 MHz are known as 2 GHz MSS.

maintaining that right in the band 5000-5150 MHz.<sup>7</sup> Consistent with international allocations, no new NGSO MSS feeder link assignments will be made in the band 5091-5150 MHz after January 1, 2008; and two years later, FSS use of this band becomes secondary to the aeronautical radionavigation service ("ARNS"). Together, these actions will accommodate first generation NGSO MSS feeder link requirements, while providing existing MLS stations, which operate in the band 5030-5091 MHz, and gateways, which will operate in the band 5091-5250 MHz, with non-overlapping spectrum. We are also deleting unused and unneeded aeronautical support allocations. Specifically, we are deleting the aeronautical mobile-satellite (R) service ("AMS(R)S") from the bands 5150-5250 MHz and 15.4-15.7 GHz, the inter-satellite service ("ISS") from the bands 5000-5250 MHz and 15.4-15.7 GHz, and the FSS to the extent that it is limited to aeronautical support functions from the bands 5000-5250 MHz and 15.4-15.7 GHz. We are making no changes to the amateur rules.<sup>8</sup>

4. Incumbent terrestrial users of the band 6700-7075 MHz raise several concerns with regard to sharing this band with NGSO MSS feeder downlinks. To resolve these concerns, we adopt the proposed power flux-density ("pfd") limits and establish coordination procedures in the band 6700-6875 MHz using existing Part 25 and 101 rules. We will address coordination requirements in the band 6875-7075 MHz in a future proceeding, but as an interim measure specify that coordination in this band will be on an individual basis using existing Part 25 and 101 procedures.<sup>9</sup> In order to permit (mobile) television pickup ("TVPU") stations to continue to operate freely on two channels in essentially all of the country (in addition to two other channels, which will not share spectrum with gateways), we are limiting the use of the band 7025-7075 MHz to three gateways, two of which are operational and the other of which is undergoing testing. We find that these actions balance competing demands for spectrum and will mitigate interference between satellite and terrestrial services.

5. The actions herein are intended to facilitate the introduction of innovative global radiocommunication services, consistent with international allocations for these frequency bands, and will provide incumbent operations with adequate protection from harmful interference.<sup>10</sup> Table 1, below, summarizes the existing domestic allocations versus the allocations we are adopting in this Order.

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<sup>7</sup> The band 5000-5250 MHz is currently allocated to the aeronautical radionavigation service ("ARNS") and to several aeronautical support services on a primary basis. ARNS is a radionavigation service intended for the safe operation of aircraft. See 47 C.F.R. § 2.1. MLS, an ARNS system, is an all-weather precision approach and landing system that currently operates in the band 5030-5091 MHz. Prior to this action, MLS requirements had unencumbered use of the band 5000-5250 MHz over any other use, including other ARNS systems and other primary services.

<sup>8</sup> In the *Notice of Proposed Rule Making*, we also proposed to repeat an existing Part 2 requirement in the Part 97 rules for the Amateur Radio Service. However, because there were no comments supporting the proposal and because the requirement is listed elsewhere in Part 97, we will not amend the amateur rules.

<sup>9</sup> The focus of that proceeding will be the issues of "growth zones," the protection of incumbent mobile operations in their normal operating area; and the protection of receive earth stations from later-licensed mobile stations. In addition, terrestrial fixed users' concerns about effective and equitable use of spectrum in bands shared by the FSS and the fixed service are being considering in IB Docket No. 00-203.

<sup>10</sup> Harmful interference is that which endangers the function of a radionavigation service or other safety services or seriously degrades, obstructs, or repeatedly interrupts a radiocommunication service operating in accordance with the Commission's Rules. See 47 C.F.R. § 2.1.

<b>Table 1: Existing vs. Adopted Allocations</b> (All services are allocated on a primary basis, unless otherwise stated.)			
<b>Band</b>	<b>Existing Allocations</b>	<b>Adopted Allocations</b>	<b>Summary of Major Changes</b>
<b>359 Megahertz Allocated for Commercial NGSO MSS Feeder Uplinks, 300 of which is permanent</b> (Prior to this action, Federal & non-Federal Gov't allocations were identical in the bands 5000-5250 MHz and 15.4-15.7 GHz)			
5000-5091 MHz	ARNS (MLS takes precedence over other uses; MLS currently operates in the sub-band 5030-5091 MHz)	ARNS (MLS takes precedence over other uses) AMS(R)S	Additional 59 megahertz for commercial NGSO MSS feeder uplinks on a <i>temporary</i> , primary basis.  Maintains MLS's right of precedence in the band 5000-5150 MHz.  Reduction of 150 megahertz for FSS & ISS used for aeronautical support.
5091-5150 MHz	AMS(R)S  FSS & ISS (limited to aeronautical support)	non-Federal Gov't FSS (limited to NGSO MSS feeder uplinks)  ARNS (MLS takes precedence over other uses)  AMS(R)S	
5150-5250 MHz	ARNS (MLS takes precedence over other uses)  AMS(R)S  FSS & ISS (limited to aeronautical support)  RDSS (downlinks in the sub-band 5150-5216 MHz)  (Available for U-NII devices)	non-Federal Gov't FSS (limited to NGSO MSS feeder uplinks)  ARNS  RDSS (downlinks in the sub-band 5150-5216 MHz)  (Available for U-NII devices)	Additional 100 megahertz for commercial NGSO MSS feeder uplinks.  Reduction of 100 megahertz for AMS(R)S and for FSS & ISS used for aeronautical support.  MLS loses right of precedence in 100 megahertz.
15.40-15.43 GHz	ARNS	ARNS	Additional 200 megahertz for commercial NGSO MSS feeder uplinks.  Reduction of 300 megahertz for AMS(R)S and for FSS & ISS used for aeronautical support.
15.43-15.63 GHz	AMS(R)S  FSS & ISS (limited to aeronautical support)	non-Federal Gov't FSS (limited to NGSO MSS feeder uplinks)  ARNS	
15.63-15.70 GHz		ARNS	
<b>325 Megahertz Allocated for Commercial NGSO MSS Feeder Downlinks, with an additional 50 megahertz limited to grandfathered facilities</b> (The band 6700-7075 MHz is non-Federal Government exclusive spectrum.)			
6700-6875 MHz	FSS (uplinks; the sub-band 6725-6875 MHz is part of the internationally planned band that extends from 6725-7025 MHz)  FIXED (half of the band 6525-6875 MHz that is used by common carrier & private operational fixed point-to-point microwave licensees)	FSS (uplinks) (downlinks, limited to NGSO MSS feeder links)  FIXED	Additional 175 megahertz for commercial NGSO MSS feeder downlinks.  Require coordination using Part 25 and Part 101 rules.
6875-7025 MHz	FSS (uplinks; remainder of the internationally planned band that extends from 6725-7025 MHz; the sub-band 7025-7075 MHz is available for SDARS feeder links)	FSS (uplinks) (downlinks, limited to NGSO MSS feeder links)  FIXED & MOBILE	Additional 150 megahertz for commercial NGSO MSS feeder downlinks; case-by-case coordination required on interim basis.
7025-7075 MHz	FIXED & MOBILE (used by BAS and CARS licensees for ENG, STLs, ICR & remote event coverage)	FSS (uplinks) (downlinks, limited to grandfathered NGSO MSS feeder links)  FIXED & MOBILE	Additional 50 megahertz for commercial NGSO MSS feeder downlinks, limited to 2 grandfathered systems and 3 sites.

### III. BACKGROUND

6. At the 1992 World Administrative Radio Conference ("WARC-92"), the band 1610-1626.5 MHz was allocated for MSS uplinks and the band 2483.5-2500 MHz was allocated for MSS downlinks. On December 13, 1993, the Commission allocated these bands domestically and the subsequent applicants for this NGSO MSS service link spectrum became known as Big LEOs.<sup>11</sup>

7. On October 13, 1994, the Commission adopted the rules and policies to govern the Big LEO service.<sup>12</sup> The Commission observed that in addition to the service links connecting mobile subscriber units with the satellites, one or more gateway or central earth stations are needed to complete the transmission paths, process the information being transmitted, and interconnect the system with other communications networks or with other user transceivers. When the *Big LEO Allocation Report and Order* was adopted, however, adequate feeder link spectrum was not yet allocated internationally or domestically, and the Commission was unable to satisfy the feeder link requirements of some of the Big LEO applicants. Therefore, until the feeder link requirements of all qualified applicants could be met, the Commission could only conditionally license Big LEO systems,<sup>13</sup> permitting qualified applicants to construct satellites capable of operating with particular feeder-link frequencies at the applicants' own risk.<sup>14</sup>

8. Subsequently, the Commission licensed L/Q Licensee, Inc. ("L/Q"),<sup>15</sup> Constellation Communications, Inc. ("Constellation"),<sup>16</sup> and Mobile Communications Holdings, Inc. ("MCHI")<sup>17</sup> to construct, launch, and operate Big LEO systems. In doing so, the Commission waived the United States Table of Frequency Allocations ("U.S. Table")<sup>18</sup> in order to provide these Big LEO licensees with feeder link spectrum, but conditioned these licenses on the outcome of this allocation proceeding. On May 30, 2001, the Chief, International Bureau, found that MCHI failed to meet a construction milestone specified

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<sup>11</sup> See *Amendment of Section 2.106 of the Commission's Rules to Allocate the 1610-1626.5 MHz and the 2483.5-2500 MHz Bands for Use by the Mobile-Satellite Service, Including Non-geostationary Satellites*, ET Docket No. 92-28, *Report and Order*, 9 FCC Rcd 536 (1994) ("*Big LEO Allocation Report and Order*").

<sup>12</sup> See *Amendment of the Commission's Rules to Establish Rules and Policies Pertaining to a Mobile Satellite Service in the 1610-1626.5/2483.5-2500 MHz Frequency Bands*, CC Docket No. 92-166, *Report and Order*, 9 FCC Rcd 5936 (1994).

<sup>13</sup> *Id.* at ¶ 166.

<sup>14</sup> This Order provides the allocations that resolve the need for the previous waivers.

<sup>15</sup> See *Application of LORAL/QAULCOMM PARTNERSHIP, L.P. for Authority to Construct, Launch, and Operate Globalstar, a Low Earth Orbit Satellite System to Provide Mobile Satellite Services in the 1610-1626.5 MHz/2483.5-2500 MHz Bands*, File Nos. 19-DSS-P-91 (48), CSS-91-014 and 21-SAT-MISC-95, *Order and Authorization*, 10 FCC Rcd 2333 (1995), *Erratum*, 10 FCC Rcd 3926. See also *L/Q LICENSEE, INC. Application for modification of license to construct, launch, and operate low-Earth-orbit satellites and request for waiver of Table of Allocations*, File Nos. 88-SAT-WAIV-96 and 90-SAT-ML-96, *Order and Authorization*, 11 FCC Rcd 16410 (1996). L/Q's Big LEO system is known as Globalstar.

<sup>16</sup> See *Application of CONSTELLATION COMMUNICATIONS, INC. For authority to construct, launch, and operate a low earth orbit Mobile Satellite System*, File Nos. 17-DSS-P-91(48), CSS-91-013, 9-SAT-LA-95, 10-SAT-AMEND-95, 159-SAT-AMEND-96, *Order and Authorization*, 12 FCC Rcd 9651 (1997).

<sup>17</sup> See *Application of MOBILE COMMUNICATIONS HOLDINGS, INC. For authority to construct, launch, and operate an elliptical low earth orbit Mobile Satellite System*, File Nos. 11-DSS-P-91(6), 18-DSS-P-91(18), 11-SAT-LA-95, 12-SAT-AMEND-95, 158-SAT-AMEND-96, *Order and Authorization*, 12 FCC Rcd 9663 (1997) ("*MCHI Authorization*").

<sup>18</sup> 47 C.F.R. §§ 2.105, 2.106.

in its Big LEO license and consequently, declare its license null and void.<sup>19</sup> Table 2, below, shows the Big LEO licensees' conditional feeder link spectrum.

<b>Table 2: Big LEO Feeder Link Spectrum Waivers</b>		
Big LEO Licensees	Feeder Uplinks	Feeder Downlinks
L/Q (better known as Globalstar)	5091-5250 MHz	6875-7055 MHz
Constellation	5091-5250 MHz	6875-7025 MHz

9. At the 1995 World Radiocommunication Conference ("WRC-95"), the U.S. sought the designation of spectrum for MSS feeder links, additional global spectrum allocations for MSS service links, and a reduction in the technical and operational constraints on current global MSS allocations.<sup>20</sup> In particular, we note that WRC-95 allocated the bands 5091-5250 MHz and 15.45-15.65 GHz for NGSO MSS feeder uplinks and the bands 6700-7075 MHz and 15.4-15.7 GHz for NGSO MSS feeder downlinks. At the 1997 World Radiocommunication Conference ("WRC-97"), the 15 GHz NGSO MSS feeder link allocations were modified such that only the band 15.43-15.63 GHz remained allocated for both uplinks and downlinks, except that grandfathered systems are permitted to operate in the uplink band 15.63-15.65 GHz and in the downlink bands 15.4-15.43 GHz and 15.63-15.7 GHz.<sup>21</sup> Subsequently, at the 2000 World Radiocommunication Conference ("WRC-2000"), the NGSO MSS feeder downlink allocation at 15.43-15.63 GHz was deleted.<sup>22</sup> To implement the international allocations and to satisfy demand for NGSO MSS feeder link spectrum, on July 28, 1998, the Commission adopted a *Notice of Proposed Rule Making* ("Notice") in this proceeding.<sup>23</sup> The Commission received nine comments and eleven reply comments.<sup>24</sup>

10. On March 13, 1997, the Commission allocated 70 megahertz of spectrum at 1990-2025 MHz (uplinks) and 2165-2200 MHz (downlinks) for 2 GHz MSS service links, effective January 1,

<sup>19</sup> See *Application of MOBILE COMMUNICATIONS HOLDINGS, INC. For authority to construct, launch, and operate an elliptical low earth orbit Mobile Satellite System*, File Nos. 11-DSS-P-91(6), 18-DSS-P-91(18), 11-SAT-LA-95, 12-SAT-AMEND-95, 158-SAT-AMEND-96, *Memorandum Opinion and Order*, DA 01-1315, rel. May 31, 2001.

<sup>20</sup> See *United States Proposals for the 1995 World Radiocommunication Conference*, July 1995 ("U.S. WRC-95 Proposals"). See also *Final Acts of the World Radiocommunication Conference (WRC-95)*, Geneva, 1995.

<sup>21</sup> See *United States Proposals for the Work of the Conference*, Document USWRC97.10-E, dated July 24, 1997. See also *Final Acts of the World Radiocommunication Conference (WRC-97)*, Geneva, 1997, at 54-55, wherein the fixed-satellite service (space-to-Earth) was deleted as a direct Table allocation from the bands 15.4-15.43 GHz and 15.63-15.7 GHz, the fixed-satellite service (Earth-to-space) was added as a primary direct Table allocation in the band 15.43-15.63 GHz, footnotes S5.511A and S5.551C were modified, footnote S5.511B was suppressed, and footnote S5.511D was added.

<sup>22</sup> See *United States of America Proposals for the Work of the Conference*, Document 12-E, dated January 12, 2000. See also *Final Acts of the World Radiocommunication Conference (Istanbul, 2000)-(WRC-2000)* ("WRC-2000 Final Acts"). The WRC-2000 Final Acts entered into force on January 1, 2002, except for the WRC-2000 Resolutions listed in S59.6. See *WRC-2000 Final Acts*, Article S59, entitled "Entry into force and provisional applications of the Radio Regulation."

<sup>23</sup> See *Amendment of Parts 2, 25, and 97 of the Commission's Rules with Regard to the Mobile-Satellite Service Above 1 GHz*, ET Docket No. 98-142, *Notice of Proposed Rule Making*, FCC 98-177 (rel. August 4, 1998), 63 FR 44597 (08/20/98), 13 FCC Rcd 17107 (1998); *Erratum*, rel. August 11, 1998; *Order Granting Motion to Extend Reply Comment Date*, DA 98-2011, rel. October 5, 1998.

<sup>24</sup> See Appendix C for the list of parties.

2000.<sup>25</sup> On August 14, 2000, the Commission established policies and service rules for 2 GHz MSS.<sup>26</sup> On July 17, 2001, we granted four 2 GHz NGSO MSS licenses.<sup>27</sup> In doing so, we waived the U.S. Table in order to provide these licensees with feeder link spectrum, but conditioned these licenses on the outcome of this allocation proceeding. Table 3, below, shows the feeder link spectrum conditionally granted to 2 GHz NGSO MSS licensees in the bands under consideration in this rule making.

<b>Table 3: 2 GHz NGSO MSS Feeder Link Spectrum Waivers</b>		
2 GHz Licensees	Feeder Uplinks	Feeder Downlinks
Constellation	5091-5250 MHz and 15.43-15.63 GHz	6700-7075 MHz (7025-7075 MHz on an unprotected, non-harmful interference basis)
Globalstar, L.P.	15.43-15.63 GHz	6700-6800 MHz
ICO Services Limited ("ICO")	5150-5250 MHz	6975-7075 MHz
MCHI	15.43-15.63 GHz	200 of the 300 megahertz at 6775-7075 MHz, as requested by MCHI after the release of this Order

#### IV. DISCUSSION

##### A. NGSO MSS Feeder Uplinks at 5091-5250 MHz

###### 1. Current Use

11. The band 5000-5250 MHz is allocated to ARNS on a primary basis throughout the world, and moreover, MLS<sup>28</sup> operations have precedence over other uses of the band 5030-5150 MHz internationally.<sup>29</sup> That is, MLS operations have unencumbered use of the band 5000-5250 MHz relative

<sup>25</sup> See *Amendment of Section 2.106 of the Commission's Rules to Allocate Spectrum at 2 GHz for Use by the Mobile-Satellite Service*, ET Docket No. 95-18, *First Report and Order and Further Notice of Proposed Rule Making*, 12 FCC Rcd 7388 (1997). These MSS allocations were subsequently reaffirmed. See *Memorandum Opinion and Order and Third Notice of Proposed Rule Making and Order*, 13 FCC Rcd 23949 (1998); *Second Report and Order and Second Memorandum Opinion and Order*, 15 FCC Rcd 12315 ("2 GHz Relocation Order").

<sup>26</sup> See *The Establishment of Policies and Service Rules for the Mobile Satellite Service in the 2 GHz Band*, IB Docket No. 99-81, *Notice of Proposed Rule Making*, 14 FCC Rcd 4843 (1999); *Report and Order*, 15 FCC Rcd 16127 (2000) ("2 GHz Policies and Service Rules R&O").

<sup>27</sup> *Application of Constellation Communications Holdings, Inc. Concerning Use of the 1990-2025/2165-2200 MHz and Associated Frequency Bands for a Mobile-Satellite System*, Order and Authorization, DA 01-1633 (Int'l Bur./OET, rel. July 17, 2001); *Application of Globalstar, L.P. For Authority to Launch and Operate a Mobile-Satellite Service System in the 2 GHz Band*, Order and Authorization, DA 01-1634 (Int'l Bur./OET, rel. July 17, 2001); *ICO Services Limited, Letter of Intent to Provide Mobile-Satellite Service in the 2 GHz Bands*, Order, DA 01-1635 (Int'l Bur./OET, rel. July 17, 2001); *Application of Mobile Communications Holdings, Inc. Concerning Use of the 1990-2025/2165-2200 MHz and Associated Frequency Bands for a Mobile-Satellite System*, Order and Authorization, DA 01-1637 (Int'l Bur./OET, rel. July 17, 2001).

<sup>28</sup> MLS operates on 200 channels in the band 5030-5091 MHz (300 kilohertz centers from 5030 MHz to 5090.7 MHz). MLS stations support navigation and guidance for suitably-equipped aircraft out to a range of 43 kilometers (23 nautical miles) and an altitude of 6096 meters (20,000 feet).

<sup>29</sup> See 47 C.F.R. § 2.106, footnote S5.444. We note that MLS's right of precedence over other uses in the band 5000-5030 MHz was deleted at WRC-2000 (and thus footnote S5.444 was modified) in order to provide spectrum for the new RNSS allocations in footnotes S5.443A and S5.443B. These WRC-2000 actions are outside the scope of this proceeding.

to any other use, including other ARNS systems and other primary services. However, because MLS stations currently operate only in the band 5030-5091 MHz, the remaining spectrum is available for other uses and has been allocated to various space radiocommunication services. Specifically, the band 5091-5250 MHz is allocated for FSS uplinks on a primary basis throughout the world, with its use limited to NGSO MSS feeder links. A portion of this allocation, the band 5091-5150 MHz, is also limited in use (prior to January 1, 2010, NGSO MSS feeder link use shall be in accordance with Resolution 114),<sup>30</sup> in order of precedence (prior to January 1, 2010, MLS requirements that can not be met in the band 5030-5091 MHz shall take precedence over other uses of the band 5091-5150 MHz), in duration (after January 1, 2008, no new NGSO MSS assignments shall be made), and in status (after January 1, 2010, the FSS allocation will become secondary to ARNS).<sup>31</sup> Portions of the band 5000-5250 MHz are also allocated internationally to the following space radiocommunication services: the band 5000-5030 MHz is allocated to the radionavigation-satellite service ("RNSS"), the band 5000-5150 MHz is allocated to the AMS(R)S, and the band 5150-5216 MHz is allocated for FSS and radiodetermination-satellite service ("RDSS") downlinks.<sup>32</sup>

12. In the United States, the band 5000-5250 MHz is shared Federal and non-Federal Government spectrum allocated to ARNS on a primary basis, with MLS requirements taking precedence over all other uses of this band.<sup>33</sup> Currently, only the sub-band 5030-5091 MHz is used for MLS-controlled precision approach and landing of aircraft and the remaining spectrum (5000-5030 MHz and 5091-5250 MHz) is unused.<sup>34</sup> There are currently 90 MLS assignments at 48 airports in the United States, most of which are operated by Federal agencies (Federal Aviation Administration ("FAA") and Air Force).<sup>35</sup> While the FAA has indicated that GPS and the Wide Area Augmentation System are its preferred aeronautical radionavigation technologies in the transition from ILS, the Air Force has indicated that the Department of Defense still plans to use MLS and continues the installation of both air and ground based equipment in this frequency range. Additionally, we have allocated all or some of this spectrum to the following space radiocommunication services: the band 5150-5216 MHz is allocated for

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<sup>30</sup> See 1998 ITU Radio Regulations, Resolution 114, entitled "Use of the band 5091-5150 MHz by the fixed-satellite service (Earth-to-space)(limited to feeder links of the non-geostationary mobile-satellite service)." In particular, we note that resolves 2 states that administrations authorizing NGSO MSS feeder uplinks shall ensure that they do not cause harmful interference to ARNS stations.

<sup>31</sup> This allocation is accomplished by a listing in the Table for band 5150-5250 MHz, limited by footnote S5.447A, and a footnote allocation in the band 5091-5150 MHz. See 47 C.F.R. § 2.106, the band 5000-5250 MHz, and footnotes S5.444A and S5.447A.

<sup>32</sup> All of these allocations are on a primary basis throughout the world, except for the RDSS downlink allocation. See 47 C.F.R. § 2.106, footnotes S5.367, S5.446, S5.447B and Appendix A, footnotes S5.444B and S5.444C.

<sup>33</sup> See 47 C.F.R. § 2.106, footnotes 796, US260. This band is listed in our Aviation Service Rules as being available for MLS use. See 47 C.F.R. § 87.173.

<sup>34</sup> In 1978, the International Civil Aviation Organization ("ICAO") selected MLS as the international standard precision approach system with implementation targeted for 1998. The MLS was expected to gradually replace the Instrument Landing System ("ILS") in national and international civil aviation. In 1995, however, ICAO modified its planning to recognize the emergence of Global Navigation Satellite Systems ("GNSS")-based guidance systems. (The U.S. GPS and Russian Federation GLONASS have been accepted by ICAO as principle elements of GNSS.) The current transition plan to the future of precision approach and landing system emphasizes a direct transition from ILS to GNSS for all phases of precision approach, with MLS deployment allowed only in those instances where other systems are not practical and the deployment of MLS can be economically justified. See RTCA's Aeronautical Spectrum Planning for 1997-2010, Document No. RTCA/DO-237, dated January 27, 1997, at 24, 26.

<sup>35</sup> Specifically, we have licensed 9 MLS assignments at 5 airports, the FAA has licensed 46 MLS assignments at 23 airports, and the Air Force has licensed 35 MLS assignments at 20 airports. This information was extracted from the Government Master File, dated January 6, 2001.



RDSS downlinks;<sup>36</sup> and the band 5000-5250 MHz is allocated for AMS(R)S operations<sup>37</sup> and, when used for aeronautical support purposes, for FSS and ISS operations.<sup>38</sup> Finally, the band 5150-5250 MHz is available for use by Unlicensed National Information Infrastructure ("U-NII") devices, which are to be used for wide bandwidth, high data rate digital operations.<sup>39</sup>

## 2. Proposal

13. In the *Notice*, we proposed to allocate the band 5091-5250 MHz on a primary basis for commercial FSS uplinks, to limit the use of this allocation to NGSO MSS feeder links, and to add this band to Part 25, the Satellite Communications rules.<sup>40</sup> In order to provide spectrum for these NGSO MSS feeder uplinks, we proposed to remove MLS's right of precedence over other uses in the band 5150-5250 MHz (by replacing footnote 796 with S5.367), delete the FSS and ISS allocations that are limited to aeronautical support purposes from the band 5000-5250 MHz (by deleting footnote 797), and delete the AMS(R)S allocation from the band 5150-5250 MHz (by replacing footnote 733 with S5.367). We sought comment on the international "reverse band" FSS downlink allocation in the band 5150-5216 MHz (in footnote S5.447B). These proposals would implement domestically the international allocations agreed to at WRC-95. In addition, we proposed to update our U.S. Table to reflect a previous Federal Government allocation by the National Telecommunications and Information Administration ("NTIA") in the band 5000-5150 MHz for the specific purpose of transmitting differential global positioning system ("DGPS") information intended for aircraft navigation.<sup>41</sup>

## 3. Comments

14. The NGSO MSS parties supported our 5 GHz proposals.<sup>42</sup> Constellation states that all of the proposed NGSO MSS feeder link allocations are essential to the development of the Big LEO and 2 GHz NGSO MSS systems.<sup>43</sup> ICO states that the national allocation of the 5/7 GHz bands for FSS use is in the public interest and is consistent with U.S. international commitments made at recent World

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<sup>36</sup> See 47 C.F.R. § 2.106, footnotes US307 and S5.446. This RDSS allocation has been added to the rules for the Satellite Communications Service. See 47 C.F.R. § 25.202(a)(2). In the *Notice*, we noted that footnotes 797A (subsequently renumbered as S5.446) and US307 held the same requirements.

<sup>37</sup> See 47 C.F.R. § 2.106, footnote 733. At WRC-95, footnote 733 was renumbered as S5.367 and its text was revised by deleting the AMS(R)S allocation from the bands 5150-5250 MHz and 15.4-15.7 GHz.

<sup>38</sup> See 47 C.F.R. § 2.106, footnote 797. At WRC-95, footnote 797 was suppressed.

<sup>39</sup> See *Amendment of the Commission's Rules to Provide for Operation of Unlicensed NII Devices in the 5 GHz Frequency Range*, ET Docket No. 96-102, *Report and Order*, 12 FCC Rcd 1576 (1997); *Memorandum Opinion and Order*, 13 FCC Rcd 14355 (1998), *recon. pending*. The bands 5250-5350 MHz and 5725-5825 MHz were also made available for use by U-NII devices.

<sup>40</sup> The proposed allocation would be accomplished by adding, in the non-Federal Government Table, footnote S5.444A in the band 5000-5150 MHz and, in the band 5150-5250 MHz, a direct Table allocation for the fixed-satellite service (Earth-to-space) as limited by footnotes S5.447A and S5.447C.

<sup>41</sup> NTIA, *inter alia*, establishes policies concerning spectrum assignments and use by radio stations belonging to and operated by the United States Government, and develops, in cooperation with the Commission, a comprehensive long-range plan for improved management of all electromagnetic spectrum resources in the United States. See 47 U.S.C. § 902(b)(2)(K)-(L).

<sup>42</sup> See Constellation Comments at 1; ICO Comments at 2; MCHI Comments at 1-2; and Joint Comments of L/Q Licensee, Inc., Globalstar, L.P, and AirTouch Communications, Inc. ("Globalstar") at 2-3.

<sup>43</sup> See Constellation Comments at 2.

Radiocommunication Conferences.<sup>44</sup> No party commented on the "reverse band" FSS downlink allocation in footnote S5.447B.

15. In its comments to a related proceeding,<sup>45</sup> NTIA recommends that the methodology established in Recommendation ITU-R S.1342 be used for determining the coordination distance between MLS stations and gateways operating in the band 5091-5250 MHz. NTIA also recommends that, to the extent practicable, NGSO MSS licensees locate their tracking and telecommand operations in the middle or at the upper end of the band 5091-5250 MHz in order to better protect MLS operations in the adjacent band 5030-5091 MHz.<sup>46</sup> In that proceeding, we stated that NTIA's requests would be considered in this proceeding.

#### 4. Decision

16. We are allocating the band 5091-5250 MHz for non-Federal Government FSS uplinks,<sup>47</sup> limiting its use to NGSO MSS feeder uplinks,<sup>48</sup> and adding it to the list of FSS bands available in the Satellite Communications Service.<sup>49</sup> Consistent with international allocations, we also limit NGSO MSS feeder uplink use of the band 5091-5150 MHz in duration (no new assignments may be made after January 1, 2008), in order of precedence (MLS requirements that can not be met in the band 5000-5091 MHz take precedence over all other uses of the band 5091-5150 MHz), and in status (the allocation becomes secondary after January 1, 2010).<sup>50</sup> Together, these actions make 100 megahertz of primary spectrum permanently available for commercial NGSO MSS feeder uplinks and temporarily makes another 59 megahertz of spectrum available on a primary basis.

17. To provide spectrum for these NGSO MSS feeder uplinks, we are removing MLS's right of precedence over all other uses in the band 5150-5250 MHz, but are maintaining that right in the band 5000-5150 MHz.<sup>51</sup> As stated in the *U.S. WRC-95 Proposals*, this FSS allocation will accommodate first

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<sup>44</sup> See ICO Comments at 2.

<sup>45</sup> See NTIA Comments, IB Docket No. 99-81, at 6-9 and *2 GHz Policies and Service Rules R&O* at ¶¶ 76-77. In that proceeding, we stated that non-Federal Government applications in the shared bands 5091-5250 MHz and 15.43-15.63 GHz will be coordinated through the Frequency Assignment Subcommittee of the Interdepartment Radio Advisory Committee.

<sup>46</sup> In its comments, NTIA notes that current Commission Rules require U.S. domestic satellites to conduct their Tracking, Telemetry, and Command ("TT&C") functions at either or both edges of the bands used for NGSO MSS feeder links. See 47 C.F.R. § 25.202(g). However, the band 5091-5250 MHz is adjacent to current MLS operations at 5030-5091 MHz. NTIA explains that the TT&C signal typically has a higher power spectral density than the communications links since all weather communication between the earth station and the satellites is crucial in emergency situations. Thus, NTIA asserts that placing the TT&C signal at the lower end of the band 5091-5250 MHz could make coordination with MLS operations more difficult, and may result in additional constraints being placed on gateways. See also Letter from Deputy Associate Administrator, Office of Spectrum Management, NTIA, to FCC IRAC Liaison Representative, dated November 22, 1996.

<sup>47</sup> This FSS uplink allocation is accomplished through a primary direct Table allocation in the band 5150-5250 MHz and through a footnote allocation, S5.444A, in the band 5091-5150 MHz.

<sup>48</sup> See 47 C.F.R. § 2.106, S5.447A, S5.444A.

<sup>49</sup> See Appendix A, § 25.202(a)(1).

<sup>50</sup> See 47 C.F.R. § 2.106, S5.444A.

<sup>51</sup> We note that Constellation, Globalstar, and ICO opposed updating the U.S. Table to reflect a previous NTIA action that authorized DGPS use of the band 5000-5150 MHz (footnote G126). However, this issue is now moot because NTIA recently informed us that the FAA has determined that DGPS use of the band 5000-5150 MHz is not technically feasible. Footnote G126 now reads as follows: "Differential-Global-Positioning-System (DGPS)

generation NGSO MSS feeder link requirements and provide MLS and NGSO MSS feeder uplinks with non-overlapping spectrum.<sup>52</sup> We observe that the phase-out of the NGSO MSS feeder link allocation in the band 5091-5150 MHz is premised on the finding that subsequent generations of NGSO MSS systems can be designed to operate with only 100 megahertz instead of 159 megahertz.<sup>53</sup> We believe that this action will not harm MLS operations because this system currently operates only in the sub-band 5030-5091 MHz and if additional spectrum is needed, MLS stations will continue to be licensed in the band 5091-5150 MHz on a primary basis. We are also deleting unused and unneeded aeronautical support allocations. Specifically, the AMS(R)S allocation is deleted from the band 5150-5250 MHz and the FSS and ISS allocations, which could only be used with ARNS and/or the aeronautical mobile (R) service, are deleted from the band 5000-5250 MHz.

18. Further, per NTIA's suggestion, we will base the required Frequency Assignment Subcommittee ("FAS")<sup>54</sup> coordination on the methodology established in Recommendation ITU-R S.1342.<sup>55</sup> We note that this spectrum sharing methodology is the technical basis for the FSS uplink allocation. We believe that this action will provide clear guidance to our applicants for determining the coordination distance between MLS stations and gateways operating in the band 5091-5250 MHz. We find that the Recommendation ITU-R S.1342 methodology will ensure the spectrum sharing compatibility between Federal and non-Federal Government systems, thereby facilitating the successful coordination of gateways transmitting to NGSO MSS satellites in the band 5091-5250 MHz.

19. We believe that it is unnecessary to preclude tracking and telecommand operations in the band 5091-5150 MHz because FAS coordination using the Recommendation ITU-R S.1342 methodology fully protects MLS operations. Nonetheless, we will add an informational statement recommending that tracking and telecommand operations be conducted in the band 5150-5250 MHz. These requirements will be codified in footnote US344, which will read as follows:

US344 In the band 5091-5250 MHz, non-Government earth stations in the fixed-satellite service (Earth-to-space) shall be coordinated through the Frequency Assignment Subcommittee (see Recommendation ITU-R S.1342). In order to better protect the operation of the international standard system (microwave landing system) in the band

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Stations may be authorized on a primary basis in the bands 108-117.975 MHz and 1559-1610 MHz for the specific purpose of transmitting DGPS information intended for aircraft navigation." We will address the issue of DGPS use of the bands 108-117.975 MHz and 1559-1610 MHz in an upcoming proceeding. See Letter to Acting Chief, Office of Engineering and Technology, FCC, from the Associate Administrator, Office of Spectrum Management, NTIA, dated May 7, 2001 ("NTIA Letter").

<sup>52</sup> See *U.S. WRC-95 Proposals* at 165, 169.

<sup>53</sup> *Id.*

<sup>54</sup> In bands shared between Federal and non-Federal Government services, the Commission and NTIA have long had a coordination agreement. See *NTIA Manual, Basic Coordination Arrangement Between IRAC and the FCC*, at p. 8-39. Specifically, when applications are submitted to the Commission, our staff determines whether the application is for frequencies in shared spectrum. If so, our staff submits the application to the FAS for coordination.

<sup>55</sup> In its preparation for WRC-03, the U.S. states that based upon the application of the coordination procedures in Recommendation ITU-R S.1342 and the operating experience gained to date, existing MLS and NGSO MSS feeder links stations are able to function without interference. The existing coordination process is adequate for protecting MLS. Future deployment of both MLS and NGSO MSS facilities should be possible through coordination under ITU-R S.1342. Continued common use of the band 5091-5150 MHz by both MLS and NGSO MSS stations is dependent upon the extent of future deployment of these systems and the characteristics of any new ARNS systems. There appears to be no justification at this time for the existing relationship (which we are adopting in this proceeding) to be changed. See United States Preliminary View for WRC-03 Agenda Item 1.4, dated May 25, 2001.

5000-5091 MHz, non-Government tracking and telecommand operations should be conducted in the band 5150-5250 MHz.<sup>56</sup>

We are adding notes to the frequency tables in Parts 25 and 87 to refer to footnote US344. Finally, as a ministerial matter, because footnotes S5.446 and US307 hold the same requirements, we are deleting superfluous footnote S5.446 from the U.S. Table.

## **B. NGSO MSS Feeder Downlinks at 6700-7075 MHz**

### **1. Current Use**

20. The band 6700-7075 MHz is allocated to the fixed service, the FSS for both uplinks and downlinks, and the mobile service on a co-primary basis throughout the world.<sup>57</sup> FSS downlink use of the band 6700-7075 MHz is limited to NGSO MSS feeder links<sup>58</sup> and licensees of these downlinks should take all practicable steps to protect adjacent band radio astronomy service ("RAS") observations.<sup>59</sup> Most of the FSS uplink allocation (specifically, the band 6725-7025 MHz) is designated as an internationally planned band and is currently lightly used.<sup>60</sup> GSO FSS uplink use of the band 7025-7075 MHz must be coordinated with NGSO FSS "with a view to facilitate shared operation."<sup>61</sup> In addition, passive microwave sensor measurements may be carried out over the oceans in the band 6700-7075 MHz.<sup>62</sup>

21. In the United States, the band 6700-7075 MHz is non-Federal Government exclusive spectrum,<sup>63</sup> and it is allocated to the fixed service and to the FSS for uplinks on a co-primary basis. We have previously designated most of this FSS uplink band (*i.e.*, the band 6725-7025 MHz) as an internationally planned band.<sup>64</sup> In addition, the band 6875-7075 MHz is allocated to the mobile service on a primary basis.

22. The fixed allocation in the band 6700-6875 MHz is the upper half of a larger fixed allocation that extends from 6525-6875 MHz, and this spectrum is heavily used by common carrier and

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<sup>56</sup> Recommendation ITU-R S.1342 may be purchased at <http://www.itu.int/itudoc/itu-r/rec/s/1342.html>.

<sup>57</sup> The fixed service is a radiocommunication service between fixed points. The mobile service is a radiocommunication service between mobile and land stations, or between mobile stations. *See* 47 C.F.R. § 2.1.

<sup>58</sup> *See* 47 C.F.R. § 2.106, footnote S5.458B.

<sup>59</sup> *See* 47 C.F.R. § 2.106, footnote S5.458A.

<sup>60</sup> We have not yet replaced footnote 792A with S5.441 in the band 6725-7025 MHz. *See* 47 C.F.R. § 2.106, footnote S5.441. *See also* ITU Radio Regulations, Edition of 1998, Appendix S30B, which is entitled "Provisions and associated Plan for the fixed-satellite service in the frequency bands 4500-4800 MHz [downlinks], 6725-7025 MHz [uplinks], 10.70-10.95 GHz [downlinks], 11.20-11.45 GHz [downlinks] and 12.75-13.25 GHz [uplinks]."

<sup>61</sup> *See* 47 C.F.R. § 2.106, footnote S5.458C.

<sup>62</sup> *See* 47 C.F.R. § 2.106, footnote S5.458.

<sup>63</sup> Federal agencies and non-Federal Government licensees may use the 6700-7075 MHz band to carry out passive microwave sensor measurements over the oceans.

<sup>64</sup> Prior to its WRC-95 renumbering and revision and its subsequent WRC-2000 revision, footnote 792A read as follows: "The use of the bands 4500-4800 MHz, 6725-7025 MHz, 10.7-10.95 GHz, 11.2-11.45 GHz and 12.75-13.25 GHz by the fixed-satellite service shall be in accordance with the provisions of Appendix 30B."

private operational fixed point-to-point microwave stations. In particular, we note that point-to-point microwave channels in the band 6525-6700 MHz are paired with channels in the band 6700-6875 MHz.<sup>65</sup>

23. The band 6875-7025 MHz is part of a larger fixed and mobile band that extends from 6875-7125 MHz and this spectrum is used by the Television Broadcast Auxiliary Service ("BAS").<sup>66</sup> In addition, the Cable Television Relay Service ("CARS") may use this band for mobile services.<sup>67</sup> The band 6875-7125 MHz is channelized into ten 25-megahertz channels that are used for electronic news gathering ("ENG"), remote event coverage, intercity relay, studio-to-transmitter links, *etc.*<sup>68</sup> Of particular note in this proceeding, this mobile allocation is used by TVPU stations on land ("ENG trucks") and in the air (airborne TVPU, such as helicopter ENG). While TVPU operations are generally transient in nature, that is, a broadcaster or cablecaster may use a BAS channel for only a few minutes during its coverage of the event, we observe that all available channels may be in use during major news events, especially during the peak news hour.

24. The band 6700-7075 MHz is part of a larger FSS uplink band that extends from 5850-7075 MHz. The Commission has limited commercial FSS uplink use of the band 6725-7025 MHz in accordance with the international plan for this band, and this requirement has resulted in light use in the United States. We have specified that FSS uplink spectrum within the band 7025-7075 MHz is available for feeder links in the Satellite Digital Audio Radio Service ("SDARS").<sup>69</sup>

## 2. Proposal

25. In the *Notice*, we proposed to allocate the band 6700-7075 MHz on a co-primary basis for commercial FSS downlinks, limited to NGSO MSS feeder downlinks, and to add this band to Part 25, the Satellite Communications rules. As a consequence of the NGSO MSS feeder downlink proposal, we also proposed that adjacent band RAS observations be protected from these emissions.<sup>70</sup>

26. We requested comment on these proposals and in particular, on the NGSO MSS feeder downlink pfd limits in Article S21, Table S21-4.<sup>71</sup> We stated that the proposed pfd limits would afford

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<sup>65</sup> The band 6525-6875 MHz has previously been added to the list of frequencies available under the rules for Fixed Microwave Services. *See* 47 C.F.R. §§ 101.101, 101.113, 101.147(l).

<sup>66</sup> *See* 47 C.F.R. Part 74, Subpart F. Television translator relay stations may also be authorized to use frequencies in the band 6875-7075 MHz on a secondary basis to other BAS stations operating in accordance with the Table of Frequency Allocations. *See* 47 C.F.R. § 2.106, footnote NG118.

<sup>67</sup> *See* 47 C.F.R. § 78.18(a)(7).

<sup>68</sup> *See* 47 C.F.R. §§ 74.602, 74.636, 78.101.

<sup>69</sup> *See Establishment of Rules and Policies for the Digital Audio Radio Satellite Service in the 2310-2360 MHz Frequency Band*, IB Docket No. 95-91, *Report and Order, Memorandum Opinion and Order, and Further Notice of Proposed Rulemaking*, 12 FCC Rcd 5754 (1997) ("*SDARS R&O*"), ¶¶ 127-137. We have authorized American Mobile Radio Corporation (now "XM Radio") and Satellite CD Radio, Inc. (now "Sirius") to construct, launch, and operate geostationary SDARS satellites. *See American Mobile Radio Corporation Application for Authority to Construct, Launch, and Operate Two Satellites in the Satellite Digital Audio Radio Service*, File Nos. 72-SAT-AMEND-97, et al., *Order and Authorization*, 13 FCC Rcd 8829 (1997); *Satellite CD Radio, Inc., Application for Authority to Construct, Launch, and Operate Two Satellites in the Satellite Digital Audio Radio Service*, File Nos. 71-SAT-AMEND-97, et al., *Order and Authorization*, 13 FCC Rcd 7971 (1997).

<sup>70</sup> *See* 47 C.F.R. § 2.106, footnotes S5.149 and S5.458A.

<sup>71</sup> Footnote S5.458B also states that the FSS downlink allocation at 6700-7075 MHz is subject to coordination under No. S9.11A. This requirement ultimately leads to Article S21, entitled "Terrestrial and space services sharing

terrestrial fixed and broadcast auxiliary users of the band with adequate protection. Because of the nature of feeder link operations, we assumed that each NGSO MSS system would require only a few gateways, approximately six in number, in the United States.<sup>72</sup> We solicited comment on this assumption, on how many gateways overall are likely to use this band, whether technological advances are likely to significantly increase the number of gateways, and where these gateways are likely to be geographically located, especially whether they will likely be located in rural areas, or in urban areas. In general, we requested comment on the likely impact of NGSO MSS feeder links sharing spectrum with terrestrial users.<sup>73</sup>

### 3. Comments

27. The NGSO MSS parties support the allocation. However, incumbent terrestrial users of the band 6700-7075 MHz oppose allocating the band for NGSO MSS feeder downlinks until it has been demonstrated that the aggregate pfd resulting from all NGSO FSS systems will permit satisfactory operation of incumbent analog and digital radios in terrestrial systems. Incumbent interests are also concerned that the deployment of receive earth stations would constrain future growth of terrestrial services.

#### a. Pfd Limits

28. The NGSO MSS parties argue that they will be able to share the band with incumbent terrestrial operations through the pfd limits established in international fora.<sup>74</sup> ICO states that the 7 GHz pfd limits are adequate to protect fixed operations because the ITU studies were based on a showing that NGSO space station emissions, if constrained to certain pfd's, would not give rise to a given agreed fractional degradation in performance ("FDP") for a given reference digital fixed-service system located at a specific latitude and oriented at the worst possible pointing azimuth.<sup>75</sup>

frequency bands above 1 GHz." In particular, S21.16 states that emissions from a space station in the fixed-satellite service (space-to-Earth) will not be permitted to exceed the following limits at the Earth's surface:

Hard limits extracted from Table S21-4 of the ITU Radio Regulations				
Frequency band	Limit in dB(W/m <sup>2</sup> ) for angles of arrival ( $\delta$ ) above the horizontal plane			Reference bandwidth
	0 <sup>0</sup> -5 <sup>0</sup>	5 <sup>0</sup> -25 <sup>0</sup>	25 <sup>0</sup> -90 <sup>0</sup>	
6700-6825 MHz	-137	-137 + 0.5( $\delta$ -5)	-127	1 MHz
6825-7075 MHz	-154 and -134	-154 + 0.5( $\delta$ -5) and -134 + 0.5( $\delta$ -5)	-144 and -124	4 kHz 1 MHz

<sup>72</sup> See Notice at ¶ 22.

<sup>73</sup> We also proposed to replace old footnote 792A with updated footnote S5.441, which has no material impact upon the FSS allocation at issue here.

<sup>74</sup> Constellation states that there is no reason to question the adequacy of the pfd limits because these limits are "long-standing" ITU sharing criteria between fixed-satellite downlinks and terrestrial stations in this portion of the spectrum. See Constellation Reply Comments at 5. MCHI states that the pfd limits have already been vetted through an ITU study process over the course of two World Radiocommunication Conferences. See MCHI Reply Comments at 4.

<sup>75</sup> See ICO Reply Comments at 3-5. ICO asserts that the calculation of FDP is in effect a time-average I/N ratio taking into account the NGSO constellation orbital dynamics and thus the visibility of NGSO constellations as seen by a given receiving fixed station.

29. The Fixed Point-to-Point Communications Section, Wireless Communications Division, of the Telecommunications Industry Association ("TIA") argues that the pfd limits proposed for the band 6700-7075 MHz will not provide terrestrial systems with the protection they need.<sup>76</sup> Instead, TIA recommends that simulations of both GSO and NGSO interference cases be run. TIA urges that the allocation not be made until it has been demonstrated that the aggregate pfd resulting from all NGSO systems will permit satisfactory operation of analog and digital terrestrial radios.<sup>77</sup> The Association of American Railroads ("AAR") agrees with TIA.<sup>78</sup> UTC, The Telecommunications Association ("UTC") is also concerned about the aggregate interference potential on terrestrial systems from NGSO space stations.<sup>79</sup> The American Petroleum Institute ("API") states the proposed pfd limits in the band 6700-7075 MHz are insufficient to protect terrestrial, point-to-point microwave systems from periodic outages whenever an interfering signal at the proposed pfd emanates from a satellite within 5 degrees of the main beam axis of a microwave receiver antenna.<sup>80</sup>

30. In its comments, the Society of Broadcast Engineers ("SBE") states that it does not object to NGSO MSS feeder downlinks sharing 7 GHz TV BAS frequencies because the proposed pfd limits at the Earth's surface will ensure no harmful interference to analog TV BAS operations, even for worst case air-to-ground links.<sup>81</sup> However, in its reply comments, SBE agrees with TIA that NGSO MSS feeder downlinks pose an interference threat to *digitally*-modulated 7 GHz TV BAS links.<sup>82</sup> The National Association of Broadcasters ("NAB") states that it is not clear whether, in cases where there may be multiple satellites (each individually meeting the pfd limit), the proposed pfd limits will satisfactorily protect *analog* 7 GHz BAS facilities.<sup>83</sup>

#### **b. Coordination**

31. Incumbent terrestrial users are concerned that the deployment of gateways in the band 6700-7075 MHz will constrain future growth of terrestrial services. Specifically, TIA argues that the band 6700-6875 MHz is already heavily used and that it has been identified as one of the major relocation bands for long-haul low capacity use (10 megahertz bandwidth and less) fixed point-to-point microwave links that are being displaced from the 2 GHz band.<sup>84</sup> However, TIA also proposes specific new coordination criteria in case we decide to allocate the band for NGSO MSS feeder downlinks. It argues

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<sup>76</sup> See TIA Comments at 5. Globalstar states that for the Commission to adopt TIA's proposal would essentially undo WRC-95's work and potentially retard the development of MSS services in the United States. See Globalstar Reply Comments at 4-5.

<sup>77</sup> See TIA Reply Comments at 4.

<sup>78</sup> See AAR Comments at 5; AAR Reply Comments at 5-6.

<sup>79</sup> See UTC Comments at 3.

<sup>80</sup> See API Reply Comments at 7.

<sup>81</sup> See SBE Comments at 4.

<sup>82</sup> See SBE Reply Comments at 1. SBE's Reply Comments were late-filed. In order to have a more complete record, we hereby accept these reply comments.

<sup>83</sup> See NAB Reply Comments at 3.

<sup>84</sup> TIA states that there are currently 3,032 common carrier and 25,744 privately used frequencies licensed in the fixed point-to-point band at 6525-6875 MHz. See TIA Comments at 3. (The 2 GHz point-to-point microwave band at 1850-1990 MHz has been reallocated to the Broadband Personal Communications Service and these fixed operations may be relocated to other fixed bands under our Emerging Technologies relocation process.)

that current coordination procedures disadvantage fixed operations.<sup>85</sup> TIA's position is supported by API,<sup>86</sup> AAR,<sup>87</sup> the Association of Public-Safety Communications Officials-International, Inc. ("APCO"), the Commonwealth of Pennsylvania ("Pennsylvania"),<sup>88</sup> and UTC.<sup>89</sup> We note that Constellation agrees with TIA that coordination procedures will have to be adopted, but contends that the requirements and procedures proposed by TIA are outside the scope of this proceeding.

32. In particular, APCO is concerned that gateway deployment in the band 6700-6875 MHz will significantly limit the amount of spectrum available for fixed microwave operations, which is critical to current and future public safety communications. APCO argues that state and local government public safety agencies throughout the nation operate fixed stations in the band 6525-6875 MHz ("6 GHz"), and that these facilities typically provide the "backbone" for wide-area mobile radiocommunication networks used by police, fire, EMS, disaster relief and other public safety agencies. APCO believes that many additional 6 GHz public safety microwave links will be needed in the near future, both to accommodate systems forced to relocate from the 2 GHz bands, and to provide infrastructure for new wide area public safety networks in the 700 MHz band (part of the spectrum reallocated from TV Channels 60-69, *i.e.*, 764-776 MHz and 794-806 MHz). APCO observes that the largest relocation of public safety users from the band 2110-2200 MHz has yet to occur. With 6 GHz fixed spectrum already heavily congested in many parts of the country, APCO states that the proposed satellite allocation could leave public safety 2 GHz operations with no place to go, as higher frequency bands are often impractical due to path length limitations.<sup>90</sup>

33. Broadcast interests oppose that portion of the proposed satellite allocation that requires sharing of the sub-band 6875-7075 MHz, which is used by fixed and mobile BAS operations.<sup>91</sup> SBE,

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<sup>85</sup> TIA's requested criteria is: (1) NGSO MSS feeder systems must not cause objectionable interference to existing or pre-coordinated fixed systems that would be "grandfathered;" (2) interference protection criteria along the lines of those in Section 101.105 should be adopted; (3) applicants for NGSO MSS feeder links must apply for and be authorized only for the bandwidth and arc required for immediate use plus an additional amount, not to exceed 50% of that needed for immediate use, and to justify the bandwidth requested; and (4) NGSO MSS applicants must submit sufficient technical information with every application for a feeder link and gateway station. *See* TIA Comments at 4,6.

<sup>86</sup> *See* API Reply Comments at 7.

<sup>87</sup> AAR states that the railroad industry makes extensive use of fixed microwave links for the operation and control of train movements and that these operational and safety uses are critical to the safe operation of railroads and cannot be jeopardized by interference from other spectrum users, including co-frequency MSS feeder links. *See* AAR Comments at 2.

<sup>88</sup> Pennsylvania urges us not to adopt the proposed rules unless and until we have satisfied ourselves that no operational constraints or interference will be inflicted upon fixed users. Pennsylvania states that it is constructing a statewide public safety mobile communications system for use by public safety agencies throughout the state. This system will facilitate interoperability between various state and local public safety eligibles, local and local public safety eligibles, and possibly, public safety and power radio eligibles throughout the state. This system eventually will serve 50,000 mobile and portable units. Pennsylvania submits that in order for this mobile radio system to operate reliably, the system must utilize fixed microwave frequencies. In its Final Report, Pennsylvania states that the Public Safety Wireless Advisory Committee noted a need for additional point-to-point frequencies to support public safety mobile radio links. *See* Pennsylvania Comments at 3,5.

<sup>89</sup> UTC states that the band 6525-6875 MHz must accommodate many of the approximately 29,000 terrestrial microwave links, which are being displaced from the bands 1850-1990 MHz and 2110-2200 MHz. *See* UTC Comments at 2.

<sup>90</sup> *See* APCO Comments at 2-3.

<sup>91</sup> *See* 47 C.F.R. § 74.602. The band 6875-7125 MHz is channelized into ten 25 megahertz channels. The NGSO MSS feeder downlink proposal thus impacts eight of the ten BAS channels.



which informally coordinates the use of these BAS channels, believes that TVPU transmissions, especially air-to-ground (*e.g.*, helicopter) TVPU links, may be a serious interference threat to earth station reception.<sup>92</sup> Therefore, SBE proposes that gateways not be permitted within 100 kilometers (62 miles) of the top 100 TV markets so that downlink receive facilities would not be allowed in areas where BAS mobile operations (especially airborne operations) are likely to exist. SBE also proposes that there be no restriction on newcomer 7 GHz TVPU stations to protect NGSO MSS downlink receive sites because the existing population of TVPU stations is already deeply embedded throughout the country.

34. In the event that the band is allocated for downlinks, SBE requests that we not allow gateways to "warehouse" frequencies. SBE also requests that we place limits on the number and location of gateways.<sup>93</sup> NAB agrees with SBE and states that, unless the Commission adopts sensible sharing and coordination procedures, BAS (and other fixed terrestrial microwave) users will be "run out" of the 7 GHz band.<sup>94</sup> NAB also requests that TVPU stations be exempt from coordination because there are large numbers of TVPU stations that move within regions and across the country -- sometimes at a moment's notice -- it is impractical to require these stations to coordinate each time they are used.

35. The NGSO MSS entities oppose any regulatory constraints that could hinder gateway deployment. Specifically, NGSO MSS entities oppose SBE's proposal for exclusion areas around television markets, and oppose any limits on the use of this spectrum.<sup>95</sup> ICO opposes TIA's proposal to limit feeder links to the bandwidth and arc required for immediate use because the commercial nature of MSS systems requires MSS operators to implement facilities to accommodate growth in traffic requirements over a period of time consistent with the lifetime of at least one or two generations of the space segment. MCHI argues that it reuses spectrum in its service uplink band so as to create an effective bandwidth of approximately 700-megahertz, which must be delivered to gateways in the feeder downlink band, for which the Ellipso system is currently assigned only 200 megahertz. NGSO MSS entities also argue that incumbents' concerns regarding the future fixed use of the band 6700-7025 MHz are unfounded. They contend that the design of satellite systems and the cost of gateways will significantly limit the number of earth stations. Further NGSO MSS parties state that gateways will likely be located in remote areas, and therefore should not hinder the future growth of terrestrial operations. L/Q Licensee, Inc., Globalstar, L.P, and AirTouch Communications, Inc. (jointly "Globalstar") also argues that giving TVPU stations priority over previously-licensed earth stations is directly contrary to the Commission's rules and policies governing Title III licenses.<sup>96</sup>

36. In its reply, TIA argues that the comments filed by MSS interests provide no meaningful information in support of our tentative conclusion that the band can be shared without interference and without substantial impact on the fixed service. TIA requests that SBE's proposal for earth station exclusion areas also be adopted for the fixed point-to-point microwave band at 6700-6875 MHz in order to preserve spectrum in urban areas for those fixed links that are being displaced at 2 GHz.

37. Sirius requests that the NGSO MSS licensees submit information in this proceeding regarding their ability to coordinate their downlink use of the band 7025-7075 MHz with SDARS feeder

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<sup>92</sup> See SBE Comments at 1-3.

<sup>93</sup> In its Reply Comments, SBE recommends that we adopt rules requiring that no gateway be located within 300 kilometers of a Standard Metropolitan Statistical Area and that each NGSO MSS system be limited to no more than 6 gateways. See SBE Reply Comments at 3.

<sup>94</sup> See NAB Reply Comments at 3.

<sup>95</sup> See Constellation Reply Comments at 4-7, ICO Reply Comments at 3-10, Globalstar Reply Comments at 2-5, MCHI Reply Comments at 3-6.

<sup>96</sup> See *Communications Act of 1934*, as amended, Title III (Provisions Relating to Radio).

uplink use of that segment.<sup>97</sup> The NGSO MSS parties reply that the coordination of satellite systems occurs on an operator-to-operator basis, not in a rulemaking.<sup>98</sup> Nonetheless, Constellation states that operating an NGSO MSS satellite to comply with the terrestrial pfd limit should be sufficient to guarantee compliance with the pfd at the GSO since only a few of the NGSO satellites would have a direct grazing path to any particular point on the GSO at the same instant of time. Constellation also contends that it is premature to address the protection of gateway reception from Sirius' feeder link earth station. In any event, Constellation and MCHI believe that coordination between Sirius and NGSO MSS operators should not be difficult because of the relatively small number of stations involved, making it likely that interference can be avoided through geographic separation.

38. The National Academy of Science, through the National Research Council's Committee on Radio Frequencies ("CORF") requests that NGSO MSS downlinks in the 6700-7075 MHz be coordinated to protect RAS observations in the adjacent band 6650-6675.2 MHz.<sup>99</sup> None of the NGSO MSS parties responded to this late-filed request.

#### 4. Decision

39. We are allocating the band 6700-7025 MHz for non-Federal Government FSS downlinks on a co-primary basis, limiting the use of this spectrum to NGSO MSS feeder downlinks, and adding this band to the list of FSS bands available in the Satellite Communications Service.<sup>100</sup> This action makes 325 megahertz of primary spectrum available for commercial NGSO MSS feeder downlinks. Because the introduction of NGSO MSS feeder downlinks complicates coordination requirements across the band 6700-7075 MHz, and indeed introduces novel mobile coordination requirements, we are limiting gateway use of the band 7025-7075 MHz to three particular "built" facilities. That is, we decline to make this 50 megahertz of spectrum generally available for NGSO MSS feeder downlink licensing. We recognize that some systems are currently operating in the band 7025-7075 MHz and that significant costs would be required to retrofit facilities that have already been constructed. Further, we believe that these satellite frequencies are generally "hard-wired," and thus it is unlikely that the satellites that are in orbit can be tuned out of the band 7025-7075 MHz.<sup>101</sup> Therefore, we are grandfathering the Globalstar and ICO satellites and associated gateways at three locations that have been built or are in the process of being built.<sup>102</sup> We take this action in order to provide TVPU stations, including airborne TVPU stations, with

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<sup>97</sup> See Sirius Comments at 2.

<sup>98</sup> See MCHI Reply Comments at 2, Constellation Reply Comments at 3-4, ICO Reply Comments at 11, and Globalstar Reply Comments at 5.

<sup>99</sup> See Motion to Accept Late-filed Comments of the National Academy of Science's Committee on Radio Frequencies, received on September 29, 1998. CORF requested that we accept its late-filed comments, arguing that such action would not prejudice any party and that its comments contain significant information that will contribute to a reasoned decision. We hereby accept CORF's late-filed comments.

<sup>100</sup> See Appendix A, § 25.202(a)(1). Consequently, we are adding a cross reference to Part 25 in U.S. Table for the band 6875-7075 MHz. (A Part 25 cross reference has previously been added to the band 6700-6875 MHz.)

<sup>101</sup> For example, Globalstar states its frequency plan provides for a direct "hard-wired" translation between service uplink frequencies (1610-1626.5 MHz) and feeder downlink frequencies (6875-7055 MHz). Globalstar states that any reduction in its feeder downlink spectrum would diminish its ability to operate on certain return service beams (creating coverage gaps) or to operate on certain return service uplink frequencies (reducing capacity) throughout the entire gateway service area. See Globalstar *ex parte* filing, received on June 26, 2001.

<sup>102</sup> On May 9, 2001, the Chief, Satellite and Radiocommunication Division, International Bureau granted Verestar, Inc. special temporary authority to operate certain earth stations, located at Brewster, Washington, in support of initial equipment and in-orbit tests of the ICO F-2 satellite. Under the terms of the STA, Verestar may receive feeder link transmission in the band 6975-7075 MHz on a non-harmful-interference basis for testing and integration. Verestar's STA does not authorize transmission for commercial traffic. See Verestar Order and Authorization, DA

near nationwide use of two channels, which are in addition to two channels (7075-7100 MHz and 7100-7125 MHz) that do not share spectrum with NGSO MSS feeder downlinks. We find that four "clear" BAS channels are the minimum number necessary for broadcast and cable TVPU use in this frequency range.<sup>103</sup> Earth stations at the three sites are already coordinated with existing broadcast licensees and thus should not pose an additional constraint to BAS operations.<sup>104</sup>

40. We observe that there are FSS uplinks, fixed point-to-point services, and mobile, including airborne, services currently operating in the band 6700-7075 MHz. Our action today adds NGSO MSS feeder downlinks to this mix. We find that these services can all be accommodated and thus, this spectrum would be used more intensely. However, our plan to accommodate these services requires some compromise on the part of each service in order to minimize the impact on any one service. Specifically, broadcasters and cable operators will be required to share 6 of their 10 channels with gateways and to protect three grandfathered gateways in 2 of their other channels. Fixed point-to-point operators, including Public Safety, will be required to share all of their channels because half of their two-way systems will be overlaid. The NGSO MSS industry will generally have access in the United States to approximately 87 percent of the spectrum internationally allocated in this frequency range.

41. We believe that 325 megahertz of primary spectrum, along with 50 megahertz of primary spectrum limited to grandfathered systems, will accommodate the existing need for feeder downlink spectrum. The need for feeder link spectrum is based on the amount of NGSO MSS service link spectrum that is available, the frequency reuse of the service link spectrum, the need for a single gateway to serve multiple satellites, and on the need to coordinate with incumbent terrestrial operations. At this time, only

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01-1195. On June 19, 2001, ICO successfully launched the first of ten active satellites that it plans for its medium-Earth orbit system.

<sup>103</sup> In addition to preserving sufficient channels for nationwide ENG use, this action is expected to assist in the digital television ("DTV") transition because broadcasters may have need for both analog and digital BAS operations during the DTV build-out.

<sup>104</sup> The following information was extracted from our license database on 6/25/01, the coordinates were converted to NAD83 if NAD27 was specified, and the centroid was determined. This information is used in footnote NG172.

Call Signs	Latitudes	Longitudes
Licensee: Globalstar USA, Inc.; Location: Clifton, Texas; Coordinates given in NAD83		
E970199	31° 48' 00.2" N	97° 36' 44.3" W
E000342	31° 47' 57.5" N	97° 36' 44.7" W
E000343	31° 47' 57.4" N	97° 36' 47.9" W
E000344	31° 48' 00.1" N	97° 36' 48.9" W
E000345	31° 47' 57.4" N	97° 36' 47.9" W
Licensee: Globalstar Caribbean, LTD; Location: Finca Pascual, Puerto Rico; Coordinates given in NAD27		
E990335	17° 58' 50.0" N	67° 08' 13.0" W
E990336	17° 58' 49.0" N	67° 08' 14.0" W
E990337	17° 58' 48.0" N	67° 08' 15.0" W
Applicant: Verestar, Inc.; Location: Brewster, Washington; Coordinates given in NAD27		
E990065	48° 08' 45.6" N	119° 42' 00.4" W
E990066	48° 08' 44.5" N	119° 42' 05.0" W
E990067	48° 08' 47.2" N	119° 42' 07.9" W
E990068	48° 08' 49.8" N	119° 42' 05.0" W
E990069	48° 08' 48.8" N	119° 42' 00.4" W

certain of the Big LEO licensees and 2 GHz MSS applicants are eligible to make use of NGSO MSS feeder downlink spectrum in the band 6700-7075 MHz.<sup>105</sup>

42. We share broadcaster concerns that TVPU transmission may pose a threat to earth station reception. We are also sympathetic to NGSO MSS requests that we avoid regulatory constraints that could hinder deployment. We believe that the approach that we are adopting will minimize any regulatory burdens on both broadcasters and NGSO MSS licensees. In order to implement this decision, we are adopting a non-Federal Government footnote that will read as follows:<sup>106</sup>

NG172 In the band 7025-7075 MHz, the fixed-satellite service (space-to-Earth) is allocated on a primary basis, but the use of this allocation shall be limited to two grandfathered satellite systems. Associated earth stations located within 300 meters of the following locations shall be grandfathered: (1) in the band 7025-7075 MHz, Brewster, Washington (48° 08' 46.7" N, 119° 42' 8.0" W); and, (2) in the band 7025-7055 MHz, Clifton, Texas (31° 47' 58.5" N, 97° 36' 46.7" W) and Finca Pascual, Puerto Rico (17° 58' 41.8" N, 67° 8' 12.6" W). All coordinates are specified in terms of the North American Datum of 1983.

**a. Pfd limits**

43. We are limiting the maximum pfd produced at the surface of the Earth from a NGSO MSS satellite to values that will protect incumbent terrestrial services.<sup>107</sup> These pfd limits were developed after years of technical studies in the ITU process. We find that Recommendation ITU-R SF.1320, which is the underlying basis of the NGSO MSS feeder downlink allocation, is directly applicable to FSS and the terrestrial services sharing the band 6700-7075 MHz in the United States. In particular, we find that Recommendation ITU-R SF.1320 is relevant to NGSO MSS feeder downlink sharing with terrestrial fixed systems. Thus, we believe that the pfd limits derived from this ITU study will ensure that NGSO MSS feeder downlinks do not cause harmful interference to terrestrial fixed and mobile operations in the band 6700-7075 MHz. We observe that the technical analysis in Recommendation ITU-R SF.1320 concludes that, for all cases examined, satellite constellations can share with analog and digital fixed systems in the band 6700-7075 MHz, if each satellite's emissions meet the "hard" limits that have been codified in Table S21-4 of the ITU Radio Regulations.<sup>108</sup>

44. With regard to aggregate interference concerns, we observe that the ITU-R has reached the conclusion that two NGSO MSS feeder link networks using opposite polarizations can share the band 6700-7075 MHz on a "co-coverage, co-frequency basis."<sup>109</sup> As noted in paragraphs 8 and 10, *supra*, there are currently two Big LEO and four 2 GHz NGSO MSS systems that have been granted waivers for feeder downlinks in the band 6700-7075 MHz.<sup>110</sup> The possibility of multiple co-frequency satellites, each

<sup>105</sup> MCHI's Big LEO license has recently been voided. We note that this action reduces the need for inter-system coordination in both service and feeder downlink spectrum.

<sup>106</sup> Constellation's and MCHI's 2 GHz systems are not being grandfathered in the band 7025-7075 MHz as they have not yet launched a satellite, and thus do not have "built" facilities.

<sup>107</sup> This decision will be implemented by copying the hard limits extracted from Table S21-4 of the *ITU Radio Regulations* to a new paragraph (n) to 47 C.F.R. § 25.208. See Appendix A, § 25.208(n).

<sup>108</sup> See Recommendation ITU-R SF.1320, entitled "Maximum allowable values of power flux-density at the surface of the Earth produced by non-geostationary satellites in the fixed-satellite service used by feeder links for the mobile-satellite service and sharing the same frequency bands with radio-relay systems."

<sup>109</sup> See Recommendation ITU-R SF.1320 at ¶ 5.2.4.7.

<sup>110</sup> See Tables 2 & 3, *supra*.

meeting the pfd limit, is the source of the terrestrial users' concern. However, the pfd limits account for multiple satellite systems illuminating a terrestrial fixed receiver.<sup>111</sup> It is possible for more than two satellites to illuminate the same area on Earth from different orbital locations and not cause harmful interference because terrestrial fixed receivers use directional antennas, which will suppress signals coming from directions outside of their mainbeam. In other words, just as satellite systems are able to use spatial diversity and directional antennas to share a common spectral resource, they are similarly able to share the spectrum with terrestrial fixed receivers, as long as appropriate pfd limits are observed. Accordingly, we find that the assumptions used by the ITU to develop pfd limits for NGSO MSS feeder downlink operations are adequate to protect terrestrial operations.

45. We observe that API asserts that the proposed pfd limits in the band 6700-7075 MHz are insufficient to protect terrestrial systems from satellite signals that are within 5 degrees of the main beam axis of a microwave receive antenna. However, API did not provide a technical analysis to either support its assertion or to refute the findings of the ITU-R, which are supported by the technical analysis in Recommendation ITU-R SF.1320. We note that the technical analysis in Recommendation ITU-R SF.1320 considers both satellite signals that are within 5 degrees of the main beam axis of a receive antenna and the effects of multiple satellite transmissions. Accordingly, we find that the pfd limits adopted herein for the protection of terrestrial services from satellite transmission are adequate to allow sharing in the band.

46. We also note that no technical studies have been submitted in the record that indicate that digital technology will require greater protection than analog technology. We nonetheless recognize that digital terrestrial systems could be designed in manner that would improve the receiver's sensitivity and thus, reduce its susceptibility to interference.<sup>112</sup> Accordingly, we find that, with the adoption of the ITU-developed pfd limits in this proceeding, equipment manufacturers and system designers now have a clear standard to which they can design their digital terrestrial systems.<sup>113</sup>

47. We expect that it will be rare for NGSO MSS satellites transmitting in the band 6700-6875 MHz to cause harmful interference to co-frequency fixed point-to-point microwave facilities. However, because of the importance of Public Safety operations in this band to critical safety-of-life

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<sup>111</sup> No more than two satellite signals in the same orbital space can illuminate the same mainbeam of a terrestrial receiver (satellite earth station or fixed service station) on the same frequency without causing interference to the satellite systems. It is through the use of cross polarization technology that two NGSO MSS feeder link co-frequency beams can illuminate a common area on the Earth from the same general direction in space without causing harmful interference to satellite reception. The relative polarization mismatch between Left Hand Circular Polarization ("LHCP") and Right Hand Circular Polarization ("RHCP") is theoretically infinitely, but in actual use, it has been found to be in the range of 10-12 dB over the operating bandwidth, which is sufficient to provide isolation between two satellite systems. A single satellite could employ both LHCP and RHCP. However, the pfd from each of these signals would need to be reduced such that their sum does not exceed the pfd limit from a satellite.

<sup>112</sup> This improved sensitivity would result, *e.g.*, from the use of forward error correction, which results in using less  $E_b/N_0$  to realize the desired bit error rate. We believe that a corresponding improvement in the mitigating aspects of the terrestrial receiver, *e.g.*, reduced antenna sidelobes, a bigger dish (giving greater gain and thus a stronger signal) could overcome this increased susceptibility to interference.

<sup>113</sup> We recently proposed to permit digital modulation of BAS and CARS operations in the band 6875-7125 MHz. *See Revisions to Broadcast Auxiliary Service Rules in Part 74 and Conforming Technical Rules for Broadcast Auxiliary Service, Cable Television Relay Service and Fixed Services in Parts 74, 78 and 101 of the Commission's Rules; Telecommunications Industry Association, Petition for Rule Making Regarding Digital Modulation for the Television Broadcast Auxiliary Service; Alliance of Motion Picture and Television Producers, Petition for Rule Making Regarding Low-Power Video Assist Devices in Portions of the UHF and VHF Television Bands*, ET Docket No. 01-75, *Notice of Proposed Rule Making*, FCC 01-92, rel. March 20, 2001 ("Digital BAS NPRM").

communications, we find that it is necessary to take special precautions to protect existing facilities.<sup>114</sup> Therefore, in the unlikely event that harmful interference does occur, NGSO MSS satellite licensee(s) will be obligated to remedy any Public Safety interference complaint. We are codifying this requirement at Section 25.147.

#### b. Coordination

48. Because of the nature of feeder link operations, we do not believe that very many gateways will be needed (indeed, only three have currently been constructed in the United States) and that this limited number of large, receive earth stations at fixed locations can be successfully coordinated. Further, because of their co-primary status, gateway reception in the band 6700-7025 MHz must be protected from later-licensed terrestrial transmitters through an appropriate coordination process. In the coordination process, applicants for new facilities from either service are responsible for determining the location of existing operations within a specified distance and using various techniques, such as antenna directionality, terrain shielding, "RF" shielding, or frequency or geographic separation, to ensure that new operations can be accommodated without causing unacceptable interference to existing operations. The coordination procedures for gateway receive earth stations and terrestrial fixed operations are specified in Parts 25 and 101 of our rules, respectively. These procedures outline the steps that an applicant must take in the coordination process, and are explained in more detail below.

49. The coordination procedures for terrestrial fixed operations with satellite operations are set forth in Sections 101.21(f) and 101.103 of our rules.<sup>115</sup> Generally, Section 101.103 requires entities to complete coordination prior to filing an application for authorization. The applicant must, through appropriate analysis, select operating characteristics to avoid interference in excess of permissible levels to other spectrum users. Section 101.103 also outlines the notification and response elements of the coordination process, where applicants provide relevant information on their proposed operation to other potentially affected entities. Section 101.21(f) further defines the coordination process for fixed links sharing spectrum with satellite services. This section provides that the fixed service applicant must first determine if its proposed link would lie within the coordination contour of existing satellite service earth stations. The applicant must also ensure that its proposed operations would not exceed the permissible level of interference allowed by our rules.

50. We have recently updated some of the Part 25 coordination rules for satellite operations to accommodate new NGSO FSS systems.<sup>116</sup> Specifically, Section 25.203 of our rules has been amended to reflect that information regarding calculation of coordination information can be found in Appendix S7 of the ITU Radio Regulation, and to reflect the relevant NGSO gateway station coordination information that must be provided to terrestrial users.<sup>117</sup>

51. Regarding the other issues raised by TIA and others regarding spectrum sharing between these services, we note that IB Docket No. 00-203 addresses terrestrial fixed users' concerns about effective and equitable use of spectrum in bands shared by the fixed service and FSS, including the band

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<sup>114</sup> New Public Safety facilities must be built to operate in the new RF environment and thus, do not require special protection.

<sup>115</sup> See 47 C.F.R. §§ 101.21(f), 101.103.

<sup>116</sup> 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*, ET Docket No. 98-206, *First Report and Order and Further Notice of Proposed Rule Making*, FCC 00-418, released December 8, 2000, at ¶¶ 50-52 ("*Ku-band NGSO FSS R&O*").

<sup>117</sup> Appendix S7 was modified at WRC-2000 to account for coordination between NGSO FSS and fixed operations. See *WRC-2000 Final Acts* at Appendix S7.

6425-7125 MHz.<sup>118</sup> Therefore, we will defer consideration of the coordination issues raised by TIA and others in this proceeding to that ongoing proceeding. We believe that this will result in more uniform resolution of these important issues than if these requests were considered separately.

52. We are sympathetic to the concerns of Public Safety interests and others for access to long-haul fixed point-to-point capacity, but find it unnecessary to place arbitrary limits on the number or location of gateways at this time. The architecture and costs of satellite systems, to a large extent, will limit the number of gateways. Specifically, gateways act as the backbone transport for a satellite system to tie the satellites to terrestrial networks. In order to link information from subscriber terminals to terrestrial networks, NGSO MSS satellites must be within view of a gateway. The only reason to have multiple gateways within the coverage area of an NGSO MSS satellite ("footprint") would be to achieve greater frequency reuse of the feeder link spectrum, thereby increasing system capacity. As long as use of this spectrum is limited to NGSO MSS feeder downlinks, the number of gateways should not proliferate and if the need for additional gateways arise, it would be due to the need for increase frequency reuse and spectrum efficiency. Accordingly, we see no need to arbitrarily limit the number of gateways at this time.

53. Further, we note that gateways would be more easily deployed outside of major metropolitan areas where BAS and fixed use is already extensive and we see no need to establish exclusion areas. We do not believe a limited number of gateways will significantly hinder terrestrial deployment. However, we find that continued growth of terrestrial fixed point-to-point microwave services is important in the band 6700-6875 MHz, particularly given our identification of it as a relocation band for displaced fixed links operating in the 2 GHz Emerging Technologies bands. We also find that continued growth of fixed and mobile BAS services is important in the band 6875-7025 MHz, particularly given recent allocation changes at 2 GHz and 13 GHz. In ET Docket 98-206 (NGSO FSS in the Ku-Band), a similar exclusion zone concept was proposed, but ultimately rejected in favor of a "growth zone" concept.<sup>119</sup> As described in that proceeding, the location of NGSO FSS gateway earth stations would not be restricted, but the NGSO FSS operator would assume certain obligations during coordination that would protect incumbent fixed facilities from interference on existing and possible future channels in the growth zones. The growth zone issue has not been decided in ET Docket 98-206, but was deferred to an upcoming proceeding ("Coordination Proceeding"). We believe that the issues in the proceeding before us are similar to those in ET Docket 98-206 and that they should be treated in a common fashion. Accordingly, we defer any consideration of the growth zone issue to the Coordination Proceeding.

54. We conclude that coordination is important for sharing between gateways and fixed operations, and that both NGSO MSS and terrestrial interests will rely equally on coordination to protect their operations. As noted above, there are other proceedings in which we are evaluating issues related to satellite and terrestrial fixed coordination in several frequency bands. We find that existing coordination rules found in Parts 25 and 101 of our rules are adequate to address immediate coordination concerns for the band 6700-6875 MHz for gateways and that the issues raised in the separate proceedings can be applied uniformly across all bands as appropriate. Accordingly, we will employ the existing coordination process found in Parts 25 and 101 of our rules for gateway receive earth stations and the Common Carrier

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<sup>118</sup> See *FWCC Request for Declaratory Ruling on Partial-Band Licensing of Earth Stations in the Fixed-Satellite Service That Share Terrestrial Spectrum, FWCC Petition for Rulemaking to Set Loading Standards for Earth Stations in the Fixed-Satellite Service that Share Terrestrial Spectrum, Onsat Petition for Declaratory Order that Blanket Licensing Pursuant to Rule 25.115 (c) is Available for Very Small Aperture Terminal Satellite Network Operations at C-Band, Onsat Petition for Waiver of Rule 25.212(d) to the Extent Necessary to Permit Routine Licensing of 3.7 Meter Transmit and Receive Stations at C-Band, Ex parte Letter Concerning Deployment of Geostationary Orbit FSS Earth Stations in the Shared Portion of the Ka-band*, IB Docket No. 00-203, *Notice of Proposed Rulemaking*, 15 FCC Rcd 23127 (2000).

<sup>119</sup> See *Ku-band NGSO FSS R&O*, at ¶¶ 61, 67.

and Private Operational Fixed Point-to-Point Microwave Services operating in the band 6700-6875 MHz.<sup>120</sup>

55. In contrast, we believe that sharing the band 6875-7025 MHz is much more difficult because the band is used by the mobile service, including aeronautical mobile use, as well as the fixed service. (Gateway use of the band 7025-7075 MHz is being limited to three grandfathered sites. See ¶ 39, *supra*.) Currently, there are no coordination procedures in Parts 74 and 78 of our rules to accommodate spectrum sharing between BAS and cable operations and receive earth stations. However, this proceeding and ET Docket 98-206 have created sharing scenarios between these two services that requires a proceeding to develop a uniform approach for coordination between satellite services and both fixed and mobile BAS applications. We observe that there are various types of fixed BAS operations (*i.e.*, studio-to-transmitter links, transmitter-to-studio links, TV relay stations, TV translator relay stations, and TV microwave booster stations) that are similar to fixed point-to-point microwave operations. We agree with NAB and SBE that effective coordination is important for sharing between gateways and fixed BAS operations.<sup>121</sup> As an interim measure, we believe that the existing coordination process in Parts 25 and 101 of our rules is sufficient to protect gateway receive earth stations and fixed BAS stations in the band 6875-7025 MHz, and we will require interim coordination on this basis.<sup>122</sup> In this regard, we note that our recent *Notice of Proposed Rule Making* in ET Docket No. 01-75 (Digital BAS Proceeding) proposed to require prospective BAS and CARS applicants for frequencies above 1990 MHz to follow the coordination procedures in Section 101.103(d).<sup>123</sup> Thus, we believe that the existing coordination process in Parts 25 and 101 of our rules is sufficient to protect gateway receive earth stations and fixed point-to-point BAS stations in the band 6875-7025 MHz, and we will employ this coordination process as an interim measure. In order to provide a complete review of these rules and their applicability to BAS operations and in order to evaluate whether any changes to the licensing process of BAS fixed operations are required, we will defer adoption of Part 74 and 78 coordination rules with satellite operations to the Coordination Proceeding.

56. Further, we observe that existing coordination schemes would not be adequate for spectrum sharing between NGSO MSS feeder downlink operations and mobile TVPU operations in the band 6875-7025 MHz. This is because mobile TVPU operations can be deployed on a variety of channels in different locations throughout the country without an established mechanism to notify non-BAS users of the spectrum. Of particular difficulty is the spectrum sharing and coordination of airborne TVPU operations and earth station receivers. Nonetheless, we find that these operations should be able to share spectrum for the following reasons. While we are unaware of the exact deployment of airborne TVPU operations in the band 6875-7125 MHz, we believe the use of this band by such operations is limited and generally confined to major markets. Further, the sharing situation is helped by the limited number of gateways that will be needed and by their ability to be deployed outside of major markets where BAS spectrum is more heavily used. Moreover, because two of the ten BAS channels in this frequency range are not overlapped by the new FSS allocation, we are encouraging TVPU stations, particularly airborne

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<sup>120</sup> We require prior coordination for licensing of earth stations and terrestrial fixed stations. Under these procedures, the earth station applicant must, before filing an application with the Commission, identify all potentially affected terrestrial licensees in the vicinity of their proposed earth stations and resolve all potential interference problems with existing terrestrial licensees in the band. In its application, the applicant must certify that coordination has been achieved with affected licensees. The Commission places the applications on public notice, and existing licensees may file petitions to deny if coordination has not been completed. The earth station license will not be granted until all interference issues are resolved. Similar procedures are followed when a terrestrial station application is filed in shared frequency bands.

<sup>121</sup> See NAB Reply Comments at 3; SBE Comments at 3.

<sup>122</sup> See 47 C.F.R. §§ 25.203, 101.21(f), 101.103(d).

<sup>123</sup> See *Digital BAS NPRM*, note 113, *supra*.



TVPU stations, to use these channels wherever possible.<sup>124</sup> Additionally, our decision to limit gateway use of the band 7025-7075 MHz to three sites means that TVPU stations will have near nationwide use of two additional channels.

57. The Coordination Proceeding will address how coordination is to be achieved between satellite operations and mobile TVPU operations. While the existing coordination procedures were not intended for mobile BAS and cable operations, we find that the basic process is still applicable. In that proceeding, we will determine what changes are necessary to the coordination process and whether changes to BAS licensing procedures will be required.<sup>125</sup> To facilitate the rapid deployment of gateways and MSS services, we will place appropriate *ad hoc* coordination requirements on any gateway authorizations that are requested prior to the completion of the Coordination Proceeding.

58. We note that SBE requests that subsequently-licensed TVPU stations not be required to protect previously licensed gateways. We find that, in co-primary spectrum, the application process that derives from Title III of the Communications Act of 1934 is premised on the protection of incumbent facilities. Accordingly, we reject SBE's request because it would essentially make gateways in the band 6700-7075 MHz secondary to subsequently licensed TVPU stations. In the Coordination Proceeding, we will consider how to protect incumbent TVPU operations in their normal operating area and how to protect gateways from later-licensed TVPU stations. We note that, for instance, SBE may wish to volunteer to maintain information concerning the location of receive gateway earth stations on its web site for ready reference.

59. We find that reverse band sharing issues between SDARS FSS feeder uplinks and NGSO MSS feeder downlinks in the band 7025-7075 MHz can be adequately addressed through the coordination process between satellite operators.<sup>126</sup> We base this finding on the fact that the probability of an NGSO satellite transmitting in the band 6700-7075 MHz causing harmful interference to a SDARS satellite is low. This is because NGSO satellites are significantly below XM Radio's satellites in GSO orbit<sup>127</sup> and Sirius' satellites in geosynchronous<sup>128</sup> orbit and thus, there is an attenuation of approximately an additional 30 dB in the direction of the GSO arc. In addition, the main beams of the NGSO satellites are facing the Earth, and thus generally, only sidelobes are in the direction of the GSO satellites.<sup>129</sup> We observe that the two SDARS licensees each have only one feeder uplink site and thus, it should be simple for the NGSO MSS licensees to coordinate around these locations.<sup>130</sup> Further, our allocation scheme

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<sup>124</sup> We have codified this recommendation in footnote NG171.

<sup>125</sup> For example, some TVPU stations have been licensed to use all of the BAS channels in the band 6875-7125 MHz on a nationwide basis.

<sup>126</sup> We previously stated that the domestic coordination process, in accordance with Section 25.130 of our Rules, would facilitate feeder link earth station licensing of both SDARS and NGSO MSS systems. See *SDARS R&O* at ¶ 137.

<sup>127</sup> We note that the maximum aggregate pfd limit produced by NGSO MSS feeder links at the GSO and including  $\pm 5^\circ$  of inclination around the GSO orbit by a NGSO MSS system is  $-168 \text{ dB(W/m}^2\text{)}$  in any 4 kHz. See *ITU Radio Regulations*, Edition of 1998, Appendix S5, at 2.2. This hard limit should protect XM Radio's feeder link reception.

<sup>128</sup> A geosynchronous satellite has the same period as the Earth and may be in either a circular or elliptical orbit with inclination. GSO satellites are in geosynchronous, circular orbit with a zero inclination. Sirius' geosynchronous orbit is elliptical with an inclination of  $63.4^\circ$ .

<sup>129</sup> There are mitigation techniques (coding and the margin built into the SDARS uplinks) that can be employed that can be employed to make services more robust during periods when fleeting interference might otherwise occur.

<sup>130</sup> Sirius has 4 uplinks located in Vernon Valley, NJ. Sirius' feeder links are in the band 7060-7072.5 MHz. XM Radio has 2 uplinks, one to each of its GSO satellites, located in Washington, D.C. XM Radio's feeder links are within the band 7025-7075 MHz.

restricts use of the band 7025-7075 MHz to two grandfathered NGSO MSS systems: Globalstar in the sub-band 7025-7055 MHz and ICO throughout the entire band 7025-7075 MHz. Therefore, while the protection of Sirius's satellites in elliptical geosynchronous orbits may be more difficult than is the protection of satellites located in the GSO arc, we observe that Sirius' feeder uplinks will operate in the band 7060-7072.5 MHz and thus, will share this spectrum only with ICO's feeder downlinks. In addition, we observe that Sirius has concluded that interference into its feeder uplink network from NGSO MSS feeder downlinks in the band 7025-7075 MHz is negligible.<sup>131</sup>

60. While there is no RAS allocation in the band 6650-6675.2 MHz, this band contains an important spectral line of interstellar methanol at 6668 MHz (rest frequency), which was first detected in 1991. We note that WRC-95 declined to allocate the band 6650-6700 MHz for NGSO MSS feeder downlinks in order to protect in-band RAS observations. In addition, WRC-95 adopted new footnote S5.458C, which urges protection of radio astronomical observations of methanol in the band 6650-6675.2 MHz from out-of-band emissions from the NGSO MSS feeder downlinks in the band 6700-7075 MHz. WRC-95 also modified footnote S5.149, which urges protection of all radio astronomy bands that are shared with other services, including the methanol line at 6668 MHz. In its late-filed comments, CORF states that the radio astronomy observatories located at Arecibo, Puerto Rico; Greenbank, West Virginia; and Socorro, New Mexico have the capability to observe in the band 6650-6675.2 MHz.<sup>132</sup> CORF also states that potential interference problems in this band can likely be remedied by coordination between any satellite company transmitting in the downlink band 6700-7075 MHz and the above listed observatories. As such, CORF recommends that we facilitate this coordination process. None of the NGSO MSS entities responded to this request. Nonetheless, NTIA is concerned about the likelihood that radio astronomy observations would be hindered in the band 6650-6675.2 MHz when the NGSO MSS feeder downlink allocation is brought into use.<sup>133</sup> Accordingly, we are adopting footnotes S5.149 and S5.458C domestically and are encouraging NGSO MSS operators to coordinate their operations with the above listed radio observatories.<sup>134</sup> Finally, as a ministerial matter, in the Non-Federal Government Table, we are updating the numbering scheme of international footnotes by replacing footnote 792A with S5.441.<sup>135</sup>

### C. NGSO MSS Feeder Uplinks at 15.43-15.63 GHz

#### 1. Current Use

61. The band 15.4-15.7 GHz is allocated to the ARNS on a primary basis throughout the world. The band 15.43-15.63 GHz is also allocated for FSS uplinks on a primary basis throughout the world and the use of this allocation limited to NGSO MSS feeder uplinks. In order to share the band 15.43-15.63 GHz between ARNS stations and gateways transmitting to NGSO MSS satellites, coordination and equivalent isotropically radiated power ("e.i.r.p.") limits on ARNS stations as outlined in Recommendation ITU-R S.1340 are required.<sup>136</sup> In addition, NGSO MSS feeder uplink use of the band

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<sup>131</sup> Sirius *ex parte* letter from Robert Briskman to Harry Ng, dated August 5, 1999.

<sup>132</sup> CORF is in the process of updating its on-line observatory list. The current list can be found at [www.nas.edu/bpa/corf/usa97.html](http://www.nas.edu/bpa/corf/usa97.html) and includes U.S. radio astronomy observatory locations, the frequencies that they observe, and their contact person.

<sup>133</sup> See NTIA Letter, note 50, *supra*.

<sup>134</sup> See Appendix A, § 2.106, footnotes S5.149, S5.458A.

<sup>135</sup> In the *Notice*, we had also proposed to replace footnotes 791 and 809 with S5.440 and S5.458, respectively. This action was subsequently taken in the *Table Clean-up Order*. See note 164, *supra*.

<sup>136</sup> See 47 C.F.R. § 2.106, footnote S5.511C. Recommendation ITU-R S.1340 recommends that the effective e.i.r.p. of ARNS stations be limited to elevation-specific values; that NGSO MSS feeder uplinks be designed to operate in

15.63-15.65 GHz is grandfathered for systems that were advanced published as of WRC-97's conclusion.<sup>137</sup> NGSO MSS feeder downlink use of the band 15.4-15.7 GHz is also grandfathered.<sup>138</sup>

62. In the United States, the band 15.4-15.7 GHz is shared Federal and non-Federal Government spectrum. Like the band 5000-5250 MHz, the band 15.4-15.7 GHz is allocated to the ARNS on a primary basis.<sup>139</sup> The band 15.4-15.7 GHz is also allocated for AMS(R)S operations<sup>140</sup> and, when used for aeronautical support purposes, for FSS and ISS operations.<sup>141</sup> The band 15.4-15.7 GHz has been added to the list of frequencies in the rules for Aviation Services as being available for radionavigation land stations.<sup>142</sup> Finally, we require airborne and spaceborne assignments in the band 15.4-15.7 GHz to protect adjacent band RAS observations.<sup>143</sup>

63. While the band 15.4-15.7 GHz is essentially unused by non-Federal Government licensees, Federal agencies make fairly extensive use of this ARNS band for airborne, land and ocean based operations.<sup>144</sup> Specifically, aircraft landing systems ("ALS")<sup>145</sup> and aircraft multipurpose radars ("MPR")<sup>146</sup> operate throughout the band 15.4-15.7 GHz. The radar sensing and measurement system

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the interference environment produced by such ARNS stations; that coordination of ARNS emissions with satellite receiving stations not be required; that the e.i.r.p. transmitted toward the local horizontal plane by a feeder-uplink earth station be required to not exceed 54 dB(W/MHz); that SBR stations be precluded from operating in the band 15.43-15.63 GHz; and that the coordination threshold distances required to protect ARNS stations from feeder uplink emissions be established as 270 kilometers from an aircraft landing surface for radar sensing and measurement systems, as 515 kilometers from an aircraft landing surface for aircraft landing systems, and as 600 kilometers for aircraft using general purpose radars.

<sup>137</sup> See 47 C.F.R. § 2.106, footnote S5.511D.

<sup>138</sup> Specifically, footnote S5.511D also grandfathers NGSO MSS feeder downlink use of the bands 15.4-15.43 GHz and 15.63-15.7 GHz for systems that were advanced published as of WRC-97's conclusion. Footnote S5.511A grandfathers NGSO MSS feeder downlink use of the band 15.43-15.63 GHz for systems that were advanced published as of WRC-2000's conclusion. See Appendix A, § 2.106, footnote S5.511A.

<sup>139</sup> See 47 C.F.R. § 2.106, footnote US260.

<sup>140</sup> See 47 C.F.R. § 2.106, footnote 733. At WRC-95, footnote 733 was renumbered as S5.367 and its text was revised by deleting the AMS(R)S allocation from the bands 15.4-15.7 GHz and 5150-5250 MHz.

<sup>141</sup> See 47 C.F.R. § 2.106, footnote 797. At WRC-95, footnote 797 was suppressed.

<sup>142</sup> See 47 C.F.R. § 87.173(b). The class of station for this band is RL, which is radionavigation land (unspecified). See 47 C.F.R. § 87.171.

<sup>143</sup> See 47 C.F.R. § 2.106, footnotes US211 and US74.

<sup>144</sup> The Navy uses the band 15.4-15.7 GHz for MLS operations onboard its helicopter and aircraft carriers. In addition, the Navy has 40 fixed assignments, NASA has 9 assignments for the space shuttle MLS, the Air Force has 3 assignments, and the Army has one assignment in this band. We have licensed two companies for aeronautical radionavigation maintenance testing in this band. This information was extracted from the Government Master File, dated January 6, 2001.

<sup>145</sup> These ALS are general-purpose systems and are used on ships, as portable or permanent land based systems, and for NASA's space shuttle landings. The microwave scanning beam landing system ("MSBLS") is one such system. (The band 15.4-15.7 GHz was designated but not implemented for the MSBLS. MSBLS was to be a part of the MLS, which mainly operates in the band 5000-5250 MHz.)

<sup>146</sup> The aircraft MPR is a radionavigation, radiolocation and weather radar system.

("RSMS")<sup>147</sup> operates in the band 15.63-15.65 GHz and surface based radars ("SBR")<sup>148</sup> operate in the band 15.65-16.7 GHz.

## 2. Proposal

64. In the *Notice*, we proposed to allocate the band 15.43-15.63 GHz for FSS downlinks and uplinks on a primary basis, to limit the use of these FSS allocations to NGSO MSS feeder links, and to add these bands to Part 25, the Satellite Communications rules.<sup>149</sup> In order to share the band 15.43-15.63 GHz between ARNS stations and gateways transmitting to NGSO MSS satellites, we proposed to require the use of the methodology in Recommendation ITU-R S.1340 (through the adoption of footnote S5.511C).<sup>150</sup> In order to provide spectrum for these NGSO MSS feeder uplinks, we proposed to delete the unused and unneeded FSS and ISS allocations that are limited to aeronautical support purposes from the band 15.4-15.7 GHz (by deleting footnote 797) and the AMS(R)S allocation from the band 15.4-15.7 GHz (by replacing footnote 733 with S5.367). We did not propose to allocate 15 GHz feeder link spectrum outside of the band 15.43-15.63 GHz for internationally grandfathered NGSO MSS systems.<sup>151</sup>

## 3. Comments

65. The NGSO MSS parties supported our 15 GHz proposals.<sup>152</sup> CORF requests that the band 15.43-15.63 GHz not be allocated for FSS downlinks because of the potential for unacceptable interference to RAS observations, and, as a result, the likelihood that this FSS downlink allocation would be deleted on an international basis at WRC-2000. CORF stated that the band 15.35-15.4 GHz is one of the most important bands used by the RAS for continuum observations, which define the frequency variation of radiation in sufficient detail to enable conclusions to be reached concerning the physical mechanisms responsible for such emissions.<sup>153</sup> None of the NGSO MSS parties responded to this late-filed request.

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<sup>147</sup> RSMS technology at 15 GHz is particularly suited to smaller aircraft, including helicopters. RSMS offers the benefits of compact, light, equipment with good antenna directivity and more than adequate performance for many operational radionavigation applications, which are not practicable at lower frequencies due to propagation or other reasons. RSMS is essentially used in low level operations up to a nominal height of around 1500 meters.

<sup>148</sup> Land- and ship-based SBR are used for the detection, location and movement of aircraft and other vehicles on the surface of airports and other aircraft landing areas.

<sup>149</sup> See 47 C.F.R. § 25.106, footnote S5.511A. As a consequence of our proposal to add the band 15.43-15.63 GHz to 47 C.F.R. § 25.202(a)(1), we also proposed to add a cross reference to Part 25 in the Table of Frequency Allocations for band 15.43-15.63 GHz.

<sup>150</sup> Footnote S5.511C reads as follows: "Stations operating in the aeronautical radionavigation service shall limit the effective e.i.r.p. in accordance with Recommendation ITU-R S.1340. The minimum coordination distance required to protect the aeronautical radionavigation stations (No. S4.10 applies) from harmful interference from feeder-link earth stations and the maximum e.i.r.p. transmitted towards the local horizontal plane by a feeder-link earth station shall be in accordance with Recommendation ITU-R S.1340."

<sup>151</sup> In the *Notice*, we described footnote S5.511D, but did not propose to adopt it domestically because the only license granted to operate feeder uplinks at 15.45-15.65 GHz (MCHI's Ellipso system) included a proviso that the authorization was subject to any pertinent shift of this feeder uplink band adopted at WRC-97. That license has since been declared null and void. See footnote 19, *supra*.

<sup>152</sup> See Constellation Comments at 1, Globalstar Comments at 7, MCHI Comments at 1.

<sup>153</sup> CORF also states that the band 15.35-15.40 GHz is also important for monitoring the intensity variability of quasars.

66. In its comments to a related proceeding, NTIA requests that NGSO MSS feeder uplinks be limited to the band 15.43-15.63 GHz in order to minimize the impact on ARNS systems.<sup>154</sup> In addition to supporting our proposal to adopt footnote S5.511C domestically, NTIA recommends that we include guidance that non-Federal Government applicants seeking to implement gateways in the band 15.43-15.63 GHz employ the methodology established in Annex 3 of Recommendation ITU-R S.1340.<sup>155</sup>

#### 4. Decision

67. We are allocating the band 15.43-15.63 GHz for non-Federal Government FSS uplinks on a primary basis, limiting its use to NGSO MSS feeder uplinks, and adding it to the list of FSS bands available to the Satellite Communications Service.<sup>156</sup> In addition, we are adopting footnote S5.511C, which limits ARNS stations in their effective e.i.r.p. and establishes the minimum coordination distances required to protect ARNS stations.<sup>157</sup> In particular, we note that footnote S5.511C references ITU-R S.1340, which is the ITU-developed method for promoting spectrum sharing between ARNS stations and gateways transmitting in the band 15.43-15.63 GHz. As requested by NTIA, we are also including guidance that non-Federal Government applicants employ Recommendation ITU-R S.1340 for coordinating gateways in the band 15.43-15.63 GHz. The NGSO MSS feeder link limitation<sup>158</sup> will be codified in footnote US359, which will read as follows:

US359 In the band 15.43-15.63 GHz, use of the fixed-satellite service (Earth-to-space) is limited to non-Government feeder links of non-geostationary systems in the mobile-satellite service. These non-Government earth stations shall be coordinated through the Frequency Assignment Subcommittee (see Annex 3 of Recommendation ITU-R S.1340).<sup>159</sup>

In conformance with WRC-95 and WRC-97, we are also deleting unneeded and unused aeronautical support allocations from the band 15.4-15.7 GHz in order to provide spectrum for the new NGSO MSS feeder uplink allocation.<sup>160</sup>

68. We observe that, while MCHI's Big LEO system and Constellation's and Globalstar's 2 GHz MSS systems all met the advanced publication deadline for access to the NGSO MSS uplink band at 15.63-15.65 GHz, only Constellation and Globalstar are currently licensed, and they are licensed by

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<sup>154</sup> See *2 GHz Policies and Service Rules R&O* at ¶¶ 76-77.

<sup>155</sup> See NTIA Comments in IB Docket No. 99-81 at 7-8. We note that NTIA also requested that applications for gateways transmitting in the band 15.43-15.63 GHz be subject to FAS coordination. In the *2 GHz Policies and Service Rules R&O*, we required FAS coordination.

<sup>156</sup> 47 C.F.R. § 25.202(a)(1). Consequently, we are adding a cross reference to Part 25 in the U.S. Table for this band.

<sup>157</sup> See 47 C.F.R. § 2.106, footnote S5.511C.

<sup>158</sup> Because we are not grandfathering those NGSO MSS systems specified in footnote S5.511A, the proposed use limitation in that footnote has been transferred to a United States footnote. We have previously required FAS coordination in this band. The Recommendation ITU-R S.1340 coordination requirement in footnote S5.511C is repeated in footnote US359 in order to assist gateway applicants in their coordination efforts.

<sup>159</sup> We are adding notes to the frequency tables in Parts 25 and 87 to refer to footnote US359. Recommendation ITU-R S.1340 may be purchased at <http://www.itu.int/itudoc/itu-r/rec/s/1340.html>.

<sup>160</sup> As previously noted, there are only ARNS assignments in the band 15.4-15.7 GHz. This information was extracted from the Government Master File, dated January 6, 2001.

waiver for 200 megahertz of spectrum at 15.43-15.63 GHz.<sup>161</sup> While WRC-97 grandfathered applicants to the previous allocation, it was never our intention to grant licensees more than 200 megahertz of spectrum in this band. Moreover, NTIA asserts that the shift is necessary to protect Federal Government operations in the sub-band 15.63-15.65 GHz. We find that the shifted allocation meets the needs of the 2 GHz MSS conditional licensees. Furthermore, this approach will facilitate spectrum sharing with ARNS operations, which is a safety-of-life service.

69. As requested by CORF, we are not allocating the band 15.43-15.63 GHz for FSS downlinks. Our action is consistent with WRC-2000, which deleted this allocation, except for grandfathered systems as specified in footnote S5.511A, in order to protect RAS observations in the adjacent band 15.35-15.4 GHz. While it may be feasible to implement applications for grandfathered NGSO MSS feeder downlinks in the band 15.43-15.63 GHz with appropriate protection requirements for the RAS operations in the band 15.35-15.4 GHz, we note no party filed comments supporting the allocation and we have no requests before us to implement such operations in the United States.<sup>162</sup> Given this, and the high levels of suppression of out-of-band emissions that would be required to use the band 15.43-15.63 GHz for such feeder downlinks, we find such an allocation is not supported.

#### D. Big LEO Service Links

70. In the *Notice*, we proposed to relax technical constraints on Big LEO service link spectrum that might otherwise hinder implementation of the service. Specifically, we proposed to specify a "peak" power density limit in those parts of the uplink band 1610-1626.5 MHz that may also be used for airborne electronic aids to air navigation, and to specify a "mean" power density in the remainder of the band (that is, replace footnote 731E with S5.364). In the downlink band 2483.5-2500 MHz, we proposed to provide for a more lenient coordination threshold standard (that is, to replace footnote 753F with S5.402). Also, in order to update international footnotes that had been modified at WRC-95 and that had previously been adopted domestically, we proposed to replace footnotes 732 and 733 with S5.366 and S5.367.<sup>163</sup> Finally, we proposed to delete footnote US306 from the list of United States footnotes because this footnote allocation has previously been made a direct Table listing.

71. Constellation and ICO supported these proposals.<sup>164</sup> No other party commented on these proposals. Accordingly, we are adopting the relaxed technical standards for Big LEO service link operations.<sup>165</sup> We affirm the staff's revisions to the U.S. Table that were originally proposed in this proceeding, but that were subsequently made in *Table Clean-up Order*, except that the omission of footnote S5.149 in the band 1610-1613.8 MHz is herein corrected.<sup>166</sup> Finally, we delete superfluous

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<sup>161</sup> In its comments, MCHI had requested use of the feeder uplink band 15.63-15.65 GHz, since its Big LEO system, including the feeder uplink band at 15.45-15.65 GHz, was advanced published prior to November 21, 1997. This request became moot when MCHI's Big LEO license was declared null and void. *See* footnote 19, *supra*.

<sup>162</sup> With regard to the downlink bands 15.4-15.43 GHz and 15.63-15.7 GHz, we note that there is no application before us that meets WRC-97 advanced publication deadline.

<sup>163</sup> We also proposed to replace footnotes 722, 731F, 732, 733, 733A, 733E, 734, 752, and 753F with S5.341, S5.365, S5.366, S5.367, S5.368, S5.372, S5.149, S5.150, and S5.402, respectively. Subsequently, these footnotes were updated in the *Amendment of Part 2 of the Commission's Rules to Make Non-Substantive Revisions to the Table of Frequency Allocations, Memorandum Opinion and Order*, DA 99-2743, rel. December 20, 1999; 15 FCC Rcd 3459 (2000) ("*Table Clean-up Order*").

<sup>164</sup> *See* Constellation Comments at 4; ICO Comments at 3-4.

<sup>165</sup> We will implement this decision in the U.S. Table by replacing footnote 731E with S5.364 in the band 1610-1626.5 MHz and by replacing footnote 753F with S5.402 in the band 2483.5-2500 MHz.

<sup>166</sup> In the *Notice*, we proposed to replace footnote 734 with S5.149 in the band 1610.6-1613.8 MHz, but footnote S5.149 was inadvertently not added to the U.S. Table in the *Table Clean-up Order*.

footnote US306 from the list of United States footnotes because this RDSS uplink allocation has previously been made a direct Table listing.

72. For informational purposes, we are updating the International Table to reflect a WRC-2000 action that directly impacts the Big LEO service link bands. Specifically, we are adding footnote S5.351A, which references Resolution 225.<sup>167</sup> Resolution 225 resolves that the Big LEO service link bands and other bands may be used by administrations wishing to implement the satellite component of IMT-2000,<sup>168</sup> subject to the regulatory provisions related to the MSS in these bands.<sup>169</sup>

## V. ORDERING CLAUSES

73. Accordingly, IT IS ORDERED that, pursuant to Sections 1, 4(i), 301, 302, 303(e), 303(f), 303(g), 303(r), 304, and 307 of the Communications Act of 1934, as amended, 47 U.S.C. §§ 154(i), 301, 302, 303(e), 303(f), 303(g), 303(r), 304, and 307, this Report and Order IS ADOPTED and Parts 2, 25, and 87 of the Commission's Rules ARE AMENDED as specified in Appendix A.

74. IT IS FURTHER ORDERED that the rule amendments set forth in Appendix A shall be effective 30 days after publication in the Federal Register.

75. IT IS FURTHER ORDERED that the Commission's Consumer Information Bureau, Reference Information Center, SHALL SEND a copy of this Report and Order, including the Final Regulatory Flexibility Certification, to the Chief Counsel for Advocacy of the Small Business Administration.

FEDERAL COMMUNICATIONS COMMISSION

William F. Caton  
Acting Secretary

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<sup>167</sup> See Appendix A, § 2.106, footnote S5.351A. See also *WRC-2000 Final Acts*, Resolution 225, entitled "Use of additional frequency bands for the satellite component of IMT-2000."

<sup>168</sup> IMT-2000 stands for International Mobile Telecommunications-2000 and it is sometimes referred to as 3G, for third generation mobile systems.

<sup>169</sup> In keeping with our long-standing policy of allocating to radio services and not to systems, we will not propose to adopt footnote S5.351A domestically.

**APPENDIX A: FINAL RULES**

Parts 2, 25, and 87 of title 47 of the Code of Federal Regulations are amended as follows:

**PART 2 -- FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS**

1. The authority citation for Part 2 continues to read as follows:

AUTHORITY: 47 U.S.C. 154, 302a, 303, and 336, unless otherwise noted.

2. Section 2.106, the Table of Frequency Allocations, is amended as follows:

a. Revise pages 45, 52, 55, 56, 57, 58, and 67.

b. In the list of International Footnotes under heading I., add footnotes S5.351A and S5.384A; remove footnotes S5.408 and S5.417; and revise footnotes S5.447, S5.448, and S5.511A.

c. In the list of International Footnotes under heading II., remove footnotes 733, 753F, 796, and 797.

d. In the list of United States (US) Footnotes, remove footnote US306 and add footnotes US344, US358 and US359.

e. In the list of Non-Federal Government (NG) Footnotes, add footnotes NG171 and NG172.

**§ 2.106 Table of Frequency Allocations.**

The revisions and additions read as follows:

\* \* \* \* \*



International Table			United States Table		FCC Rule Part(s)
Region 1	Region 2	Region 3	Federal Government	Non-Federal Government	
1610-1610.6 MOBILE-SATELLITE (Earth-to-space) S5.351A AERONAUTICAL RADIONAVIGATION  S5.341 S5.355 S5.359 S5.363 S5.364 S5.366 S5.367 S5.368 S5.369 S5.371 S5.372	1610-1610.6 MOBILE-SATELLITE (Earth-to-space) S5.351A AERONAUTICAL RADIONAVIGATION RADIODETERMINATION- SATELLITE (Earth-to- space)  S5.341 S5.364 S5.366 S5.367 S5.368 S5.370 S5.372	1610-1610.6 MOBILE-SATELLITE (Earth-to-space) S5.351A AERONAUTICAL RADIONAVIGATION Radiodetermination-Satellite (Earth-to-space)  S5.341 S5.355 S5.359 S5.364 S5.366 S5.367 S5.368 S5.369 S5.372	1610-1610.6 MOBILE-SATELLITE (Earth-to-space) US319 AERONAUTICAL RADIONAVIGATION US260 RADIODETERMINATION-SATELLITE(Earth-to-space)  S5.341 S5.364 S5.366 S5.367 S5.368 S5.372 US208		Satellite Communications (25) Aviation (87)
1610.6-1613.8 MOBILE-SATELLITE (Earth-to-space) S5.351A RADIO ASTRONOMY AERONAUTICAL RADIONAVIGATION  S5.149 S5.341 S5.355 S5.359 S5.363 S5.364 S5.366 S5.367 S5.368 S5.369 S5.371 S5.372	1610.6-1613.8 MOBILE-SATELLITE (Earth-to-space) S5.351A RADIO ASTRONOMY AERONAUTICAL RADIONAVIGATION RADIODETERMINATION- SATELLITE (Earth-to- space)  S5.149 S5.341 S5.364 S5.366 S5.367 S5.368 S5.370 S5.372	1610.6-1613.8 MOBILE-SATELLITE (Earth-to-space) S5.351A RADIO ASTRONOMY AERONAUTICAL RADIONAVIGATION Radiodetermination-satellite (Earth-to-space)  S5.149 S5.341 S5.355 S5.359 S5.364 S5.366 S5.367 S5.368 S5.369 S5.372	1610.6-1613.8 MOBILE-SATELLITE (Earth-to-space) US319 RADIO ASTRONOMY AERONAUTICAL RADIONAVIGATION US260 RADIODETERMINATION-SATELLITE (Earth-to-space)  S5.149 S5.341 S5.364 S5.366 S5.367 S5.368 S5.372 US208		
1613.8-1626.5 MOBILE-SATELLITE (Earth-to-space) S5.351A AERONAUTICAL RADIONAVIGATION Mobile-satellite (space-to-Earth)  S5.341 S5.355 S5.359 S5.363 S5.364 S5.365 S5.366 S5.367 S5.368 S5.369 S5.371 S5.372	1613.8-1626.5 MOBILE-SATELLITE (Earth-to-space) S5.351A AERONAUTICAL RADIONAVIGATION RADIODETERMINATION- SATELLITE (Earth-to- space) Mobile-satellite (space-to- Earth)  S5.341 S5.364 S5.365 S5.366 S5.367 S5.368 S5.370 S5.372	1613.8-1626.5 MOBILE-SATELLITE (Earth-to-space) S5.351A AERONAUTICAL RADIONAVIGATION Mobile-satellite (space-to- Earth) Radiodetermination- satellite (Earth-to-space)  S5.341 S5.355 S5.359 S5.364 S5.365 S5.366 S5.367 S5.368 S5.369 S5.372	1613.8-1626.5 MOBILE-SATELLITE (Earth-to-space) US319 AERONAUTICAL RADIONAVIGATION US260 RADIODETERMINATION-SATELLITE (Earth-to-space) Mobile-satellite (space-to-Earth)  S5.341 S5.364 S5.365 S5.366 S5.367 S5.368 S5.372 US208		

2483.5-2500 FIXED MOBILE MOBILE-SATELLITE (space-to-Earth) S5.351A Radiolocation  S5.150 S5.371 S5.397 S5.398 S5.399 S5.400 S5.402	2483.5-2500 FIXED MOBILE MOBILE-SATELLITE (space-to-Earth) S5.351A RADIOLOCATION RADIODETERMINATION-SATELLITE (space-to-Earth) S5.398  S5.150 S5.402	2483.5-2500 FIXED MOBILE MOBILE-SATELLITE (space-to-Earth) S5.351A RADIOLOCATION Radiodetermination-satellite (space-to-Earth) S5.398  S5.150 S5.400 S5.402	2483.5-2500 MOBILE-SATELLITE (space-to-Earth) US319 RADIODETERMINATION-SATELLITE (space-to-Earth) S5.398  S5.150 S5.402 US41	2483.5-2500 MOBILE-SATELLITE (space-to-Earth) US319 RADIODETERMINATION-SATELLITE (space-to-Earth) S5.398  S5.150 S5.402 US41 NG147	ISM Equipment (18) Satellite Communications (25) Private Land Mobile (90) Fixed Microwave (101)
2500-2520 FIXED S5.409 S5.410 S5.411 MOBILE except aeronautical mobile S5.384A MOBILE-SATELLITE (space-to-Earth) S5.403 S5.351A  S5.405 S5.407 S5.412 S5.414	2500-2520 FIXED S5.409 S5.411 FIXED-SATELLITE (space-to-Earth) S5.415 MOBILE except aeronautical mobile S5.384A MOBILE-SATELLITE (space-to-Earth) S5.403 S5.351A  S5.404 S5.407 S5.414 S5.415A		2500-2655	2500-2655 FIXED S5.409 S5.411 US205 FIXED-SATELLITE (space-to-Earth) NG102 MOBILE except aeronautical mobile BROADCASTING-SATELLITE NG101	Domestic Public Fixed (21) Auxiliary Broadcasting (74)
2520-2655 FIXED S5.409 S5.410 S5.411 MOBILE except aeronautical mobile S5.384A BROADCASTING-SATELLITE S5.413 S5.416  S5.339 S5.403 S5.405 S5.412 S5.418	2520-2655 FIXED S5.409 S5.411 FIXED-SATELLITE (space-to-Earth) S5.415 MOBILE except aeronautical mobile S5.384A BROADCASTING-SATELLITE S5.413 S5.416  S5.339 S5.403	2520-2535 FIXED S5.409 S5.411 FIXED-SATELLITE (space-to-Earth) S5.415 MOBILE except aeronautical mobile S5.384A BROADCASTING-SATELLITE S5.413 S5.416  S5.403 S5.415A 2535-2655 FIXED S5.409 S5.411 MOBILE except aeronautical mobile S5.384A BROADCASTING-SATELLITE S5.413 S5.416  S5.339 S5.418	S5.339 US205 US269	S5.339 US269	

International Table			United States Table		FCC Rule Part(s)
Region 1	Region 2	Region 3	Federal Government	Non-Federal Government	
See previous page for 3600-4200 MHz	3700-4200 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile		3700-4200	3700-4200 FIXED NG41 FIXED-SATELLITE (space-to-Earth)	International Fixed (23) Satellite Communications (25) Fixed Microwave (101)
4200-4400 AERONAUTICAL RADIONAVIGATION S5.438 S5.437 S5.439 S5.440			4200-4400 AERONAUTICAL RADIONAVIGATION S5.440 US261		Aviation (87)
4400-4500 FIXED MOBILE			4400-4500 FIXED MOBILE	4400-4500	
4500-4800 FIXED FIXED-SATELLITE (space-to-Earth) S5.441 MOBILE			4500-4800 FIXED MOBILE  US245	4500-4800 FIXED-SATELLITE (space-to-Earth) 792A  US245	
4800-4990 FIXED MOBILE S5.442 Radio astronomy			4800-4940 FIXED MOBILE  S5.149 US203	4800-4940   S5.149 US203	
S5.149 S5.339 S5.443			4940-4990 FIXED MOBILE  S5.149 S5.339 US257	4940-4990   S5.149 S5.339 US257	Note: 4940-4990 MHz became non-Federal Government exclusive spectrum in March 1999
4990-5000 FIXED MOBILE except aeronautical mobile RADIO ASTRONOMY Space research (passive)  S5.149			4990-5000 RADIO ASTRONOMY US74 Space research (passive)  US246		
5000-5150 AERONAUTICAL RADIONAVIGATION  S5.367 S5.444 S5.444A			5000-5250 AERONAUTICAL RADIO- NAVIGATION US260	5000-5150 AERONAUTICAL RADIO- NAVIGATION US260  S5.367 S5.444 S5.444A US211 US344	Satellite Communications (25) Aviation (87)

5150-5250 AERONAUTICAL RADIONAVIGATION FIXED-SATELLITE (Earth-to-space) S5.447A		5150-5250 AERONAUTICAL RADIO- NAVIGATION US260 FIXED-SATELLITE (Earth- to-space) S5.447A US344	
S5.446 S5.447 S5.447B S5.447C	S5.367 S5.444 US211 US307 US344	S5.447C US211 US307	
5250-5255 EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION SPACE RESEARCH S5.447D	5250-5350 RADIOLOCATION S5.333 US110 G59	5250-5350 Radiolocation S5.333 US110	
S5.448 S5.448A			
5255-5350 EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION SPACE RESEARCH (active) S5.448 S5.448A			
5350-5460 EARTH EXPLORATION-SATELLITE (active) S5.448B AERONAUTICAL RADIONAVIGATION S5.449 Radiolocation	5350-5460 AERONAUTICAL RADIO- NAVIGATION S5.449 RADIOLOCATION G56  US48	5350-5460 AERONAUTICAL RADIO- NAVIGATION S5.449 Radiolocation  US48	Aviation (87)
5460-5470 RADIONAVIGATION S5.449 Radiolocation	5460-5470 RADIONAVIGATION S5.449 Radiolocation G56  US49 US65	5460-5470 RADIONAVIGATION S5.449 Radiolocation  US49 US65	
5470-5650 MARITIME RADIONAVIGATION Radiolocation	5470-5600 MARITIME RADIONAVIGATION Radiolocation G56  US50 US65	5470-5600 MARITIME RADIONAVIGATION Radiolocation  US50 US65	Maritime (80)
	5600-5650 MARITIME RADIONAVIGATION METEOROLOGICAL AIDS Radiolocation US51 G56	5600-5650 MARITIME RADIONAVIGATION METEOROLOGICAL AIDS Radiolocation US51	
S5.450 S5.451 S5.452	S5.452 US65	S5.452 US65	

International Table			United States Table		FCC Rule Part(s)	
Region 1	Region 2	Region 3	Federal Government	Non-Federal Government		
5650-5725 RADIOLOCATION Amateur Space research (deep space)  S5.282 S5.451 S5.453 S5.454 S5.455			5650-5925 RADIOLOCATION G2	5650-5830 Amateur	ISM Equipment (18) Amateur (97)	
5725-5830 FIXED-SATELLITE (Earth-to-space) RADIOLOCATION Amateur  S5.150 S5.451 S5.453 S5.455 S5.456	5725-5830 RADIOLOCATION Amateur  S5.150 S5.453 S5.455			S5.150 S5.282		
5830-5850 FIXED-SATELLITE (Earth-to-space) RADIOLOCATION Amateur Amateur-satellite (space-to-Earth)  S5.150 S5.451 S5.453 S5.455 S5.456	5830-5850 RADIOLOCATION Amateur Amateur-satellite (space-to-Earth)  S5.150 S5.453 S5.455			5830-5850 Amateur Amateur-satellite (space-to-Earth)  S5.150		
5850-5925 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE  S5.150	5850-5925 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE Amateur Radiolocation  S5.150	5850-5925 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE Radiolocation  S5.150		5850-5925 FIXED-SATELLITE (Earth-to-space) US245 MOBILE NG160 Amateur  S5.150		ISM Equipment (18) Private Land Mobile (90) Amateur (97)
5925-6700 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE				5925-6425		5925-6425 FIXED NG41 FIXED-SATELLITE (Earth-to-space)
			6425-6525  S5.440 S5.458	6425-6525 FIXED-SATELLITE (Earth-to-space) MOBILE  S5.440 S5.458	Auxiliary Broadcasting (74) Cable TV Relay (78) Fixed Microwave (101)	

S5.149 S5.440 S5.458	6525-6700 FIXED FIXED-SATELLITE (Earth-to-space) S5.149 S5.458	6525-6700 FIXED FIXED-SATELLITE (Earth-to-space) S5.149 S5.458	Satellite Communications (25) Fixed Microwave (101)
6700-7075 FIXED FIXED-SATELLITE (Earth-to-space) (space-to-Earth) S5.441 MOBILE	6700-7125	6700-6875 FIXED FIXED-SATELLITE (Earth-to-space) (space-to-Earth) S5.441 S5.458 S5.458A S5.458B	
S5.458 S5.458A S5.458B S5.458C		6875-7025 FIXED NG118 FIXED-SATELLITE (Earth-to-space) (space-to-Earth) S5.441 MOBILE NG171 S5.458 S5.458A S5.458B	Satellite Communications (25) Auxiliary Broadcasting (74) Cable TV Relay (78)
7075-7250 FIXED MOBILE		7025-7075 FIXED NG118 FIXED-SATELLITE (Earth-to-space) MOBILE NG171 S5.458 S5.458A S5.458B NG172	Auxiliary Broadcasting (74) Cable TV Relay (78)
7075-7250 FIXED MOBILE	S5.458	7075-7125 FIXED NG118 MOBILE NG171 S5.458	
7125-7190 FIXED	7125-7190 FIXED S5.458 US252 G116	7125-7190 S5.458 US252	
S5.458 S5.459 S5.460	7190-7235 FIXED SPACE RESEARCH (Earth-to-space) S5.458 7235-7250 FIXED S5.458	7190-7250 S5.458	

International Table			United States Table		FCC Rule Part(s)
Region 1	Region 2	Region 3	Federal Government	Non-Federal Government	
14.5-14.8 FIXED FIXED-SATELLITE (Earth-to-space) S5.510 MOBILE Space research			14.5-14.7145 FIXED Mobile Space research	14.5-15.1365	
14.8-15.35 FIXED MOBILE Space research			14.7145-15.1365 MOBILE Fixed Space research US310	14.7145-15.1365 US310	
S5.339			15.1365-15.35 FIXED Mobile Space research S5.339 US211	15.1365-15.35 S5.339 US211	
15.35-15.4 EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) S5.340 S5.511			15.35-15.4 EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY US74 SPACE RESEARCH (passive) US246		
15.4-15.43 AERONAUTICAL RADIONAVIGATION S5.511D			15.4-15.43 AERONAUTICAL RADIONAVIGATION US260 US211		Aviation (87)
15.43-15.63 FIXED SATELLITE (Earth-to-space) S5.511A AERONAUTICAL RADIONAVIGATION S5.511C			15.43-15.63 AERONAUTICAL RADIO- NAVIGATION US260 S5.511C US211 US359	15.43-15.63 FIXED SATELLITE (Earth-to-space) AERONAUTICAL RADIO- NAVIGATION US260 S5.511C US211 US359	Satellite Communications (25) Aviation (87)
15.63-15.7 AERONAUTICAL RADIONAVIGATION S5.511D			15.63-15.7 AERONAUTICAL RADIONAVIGATION US260 US211		Aviation (87)
15.7-16.6 RADIOLOCATION S5.512 S5.513			15.7-16.6 RADIOLOCATION US110 G59	15.7-17.2 Radiolocation US110	Private Land Mobile (90)

\* \* \* \* \*

## INTERNATIONAL FOOTNOTES

\* \* \* \* \*

### I. New "S" Numbering Scheme

\* \* \* \* \*

S5.351A For the use of the bands 1525-1544 MHz, 1545-1559 MHz, 1610-1626.5 MHz, 1626.5-1645.5 MHz, 1646.5-1660.5 MHz, 1980-2010 MHz, 2170-2200 MHz, 2483.50-2500 MHz, 2500-2520 MHz and 2670-2690 MHz by the mobile-satellite service, see Resolutions 212 (Rev.WRC-97) and 225 (WRC-2000).

\* \* \* \* \*

S5.384A The bands, or portions of the bands, 1710-1885 MHz and 2500-2690 MHz, are identified for use by administrations wishing to implement International Mobile Telecommunications-2000 (IMT-2000) in accordance with Resolution 223 (WRC-2000). This identification does not preclude the use of these bands by any application of the services to which they are allocated and does not establish priority in the Radio Regulations.

\* \* \* \* \*

S5.447 Additional allocation: in Germany, Austria, Belgium, Denmark, Spain, Estonia, Finland, France, Greece, Israel, Italy, Japan, Jordan, Lebanon, Liechtenstein, Lithuania, Luxembourg, Malta, Norway, Pakistan, the Netherlands, Portugal, Syria, the United Kingdom, Sweden, Switzerland and Tunisia, the band 5150-5250 MHz is also allocated to the mobile service, on a primary basis, subject to agreement obtained under No. S9.21.

S5.448 Additional allocation: in Austria, Azerbaijan, Bulgaria, Libya, Mongolia, Kyrgyzstan, Slovakia, the Czech Republic, Romania and Turkmenistan, the band 5250-5350 MHz is also allocated to the radionavigation service on a primary basis.

\* \* \* \* \*

S5.511A The band 15.43-15.63 GHz is also allocated to the fixed-satellite service (space-to-Earth) on a primary basis. Use of the band 15.43-15.63 GHz by the fixed-satellite service (space-to-Earth and Earth-to-space) is limited to feeder links of non-geostationary systems in the mobile-satellite service, subject to coordination under No. S9.11A. The use of the frequency band 15.43-15.63 GHz by the fixed-satellite service (space-to-Earth) is limited to feeder links of non-geostationary systems in the mobile-satellite service for which advance publication information has been received by the Bureau prior to 2 June 2000. In the space-to-Earth direction, the minimum earth station elevation angle above and gain towards the local horizontal plane and the minimum coordination distances to protect an earth station from harmful interference shall be in accordance with Recommendation ITU-R S.1341. In order to protect the radio astronomy service in the band 15.35-15.4 GHz, the aggregate power flux-density radiated in the 15.35-15.4 GHz band by all the space stations within any feeder-link of a non-geostationary system in the mobile-satellite service (space-to-Earth) operating in the 15.43-15.63 GHz band shall not exceed the level of  $-156 \text{ dB(W/m}^2\text{)}$  in a 50 MHz bandwidth, into any radio astronomy observatory site for more than 2% of the time.

\* \* \* \* \*



## UNITED STATES (US) FOOTNOTES

\*\*\*\*\*

US344 In the band 5091-5250 MHz, non-Government earth stations in the fixed-satellite service (Earth-to-space) shall be coordinated through the Frequency Assignment Subcommittee (see Recommendation ITU-R S.1342). In order to better protect the operation of the international standard system (microwave landing system) in the band 5000-5091 MHz, non-Government tracking and telecommand operations should be conducted in the band 5150-5250 MHz.

\*\*\*\*\*

US359 In the band 15.43-15.63 GHz, use of the fixed-satellite service (Earth-to-space) is limited to non-Government feeder links of non-geostationary systems in the mobile-satellite service. These non-Government earth stations shall be coordinated through the Frequency Assignment Subcommittee (see Annex 3 of Recommendation ITU-R S.1340).

\*\*\*\*\*

## NON-FEDERAL GOVERNMENT (NG) FOOTNOTES

\*\*\*\*\*

NG171 In the band 6875-7125 MHz, the following two channels should be used for airborne TV pickup stations, wherever possible: 7075-7100 MHz and 7100-7125 MHz.

NG172 In the band 7025-7075 MHz, the fixed-satellite service (space-to-Earth) is allocated on a primary basis, but the use of this allocation shall be limited to two grandfathered satellite systems. Associated earth stations located within 300 meters of the following locations shall be grandfathered: (1) in the band 7025-7075 MHz, Brewster, Washington (48° 08' 46.7" N, 119° 42' 8.0" W); and, (2) in the band 7025-7055 MHz, Clifton, Texas (31° 47' 58.5" N, 97° 36' 46.7" W) and Finca Pascual, Puerto Rico (17° 58' 41.8" N, 67° 8' 12.6" W). All coordinates are specified in terms of the North American Datum of 1983.

\*\*\*\*\*

**PART 25--SATELLITE COMMUNICATIONS**

3. The authority citation for Part 25 continues to read as follows:

AUTHORITY: 47 U.S.C. 701-744. Interprets or applies Sections 4, 301, 302, 303, 307, 309 and 332 of the Communications Act, as amended, 47 U.S.C. Sections 154, 301, 302, 303, 307, 309 and 332, unless otherwise noted.

4. Section 25.147 is added to read as follows:

**§ 25.147 Licensing provision for NGSO MSS feeder downlinks in the band 6700-6875 MHz.**

If an NGSO MSS satellite transmitting in the band 6700-6875 MHz causes harmful interference to previously licensed co-frequency Public Safety facilities, then that satellite licensee is obligated to remedy the interference complaint.

5. Section 25.202(a)(1) is revised to read as follows:

**§ 25.202 Frequencies, frequency tolerance and emission limitations.**

(a)(1) Frequency band. The following frequencies are available for use by the fixed-satellite service. Precise frequencies and bandwidths of emission shall be assigned on a case-by-case basis.

Space-to-Earth (GHz)	Earth-to-space (GHz)
3.7-4.2 <sup>1</sup>	5.091-5.25 <sup>12, 14</sup>
6.7-7.025 <sup>12</sup>	5.925-6.425 <sup>1</sup>
10.7-10.95 <sup>1, 12</sup>	12.75-13.15 <sup>1, 12</sup>
10.95-11.2 <sup>1, 2, 12</sup>	13.2125-13.25 <sup>1, 12</sup>
11.2-11.45 <sup>1, 12</sup>	13.75-14 <sup>4, 12</sup>
11.45-11.7 <sup>1, 2, 12</sup>	14-14.2 <sup>5</sup>
11.7-12.2 <sup>3</sup>	14.2-14.5
12.2-12.7 <sup>13</sup>	15.43-15.63 <sup>12, 15</sup>
18.3-18.58 <sup>1, 10</sup>	17.3-17.8 <sup>9</sup>
18.58-18.8 <sup>6, 10, 11</sup>	27.5-29.5 <sup>1</sup>
18.8-19.3 <sup>7, 10</sup>	29.5-30
19.3-19.7 <sup>8, 10</sup>	48.2-50.2
19.7-20.2 <sup>10</sup>	
37.6-38.6	
40-41	

\* \* \*

<sup>14</sup> See 47 C.F.R. § 2.106, footnotes S5.444A and US344, for conditions that apply to this band.

<sup>15</sup> See 47 C.F.R. § 2.106, footnotes S5.511C and US359, for conditions that apply to this band.

\* \* \* \* \*

6. Section 25.208 is amended by adding new paragraph (n) to read as follows:

**§ 25.208 Power flux density limits.**

\* \* \* \* \*

(n) The power-flux density at the Earth's surface produced by emissions from a space station in the fixed-satellite service (space-to-Earth), for all conditions and for all methods of modulation, shall not exceed the limits given in Table N. These limits relate to the power flux-density which would be obtained under assumed free-space conditions.

Table N: Limits of power-flux density from space stations in the band 6700-7075 MHz				
Frequency band	Limit in dB(W/m <sup>2</sup> ) for angle of arrival (δ) above the horizontal plane			Reference bandwidth
	0 <sup>0</sup> -5 <sup>0</sup>	5 <sup>0</sup> -25 <sup>0</sup>	25 <sup>0</sup> -90 <sup>0</sup>	
6700-6825 MHz	-137	-137 + 0.5(δ-5)	-127	1 MHz
6825-7075 MHz	-154 and -134	-154 + 0.5(δ-5) and -134 + 0.5(δ-5)	-144 and -124	4 kHz  1 MHz

\* \* \* \* \*

**PART 87--AVIATION SERVICES**

7. The authority citation for Part 87 continues to read as follows:

AUTHORITY: 48 Stat. 1066, 1082, as amended; 47 U.S.C. 154, 303, 307(e) unless otherwise noted. Interpret or apply 48 Stat. 1064-1068, 1081-1105, as amended; 47 U.S.C. 151-156, 301-609.

8. Section 87.173 is amended by revising paragraph (b) to read as follows:

**§ 87.173 Frequencies.**

\* \* \* \* \*

(b) Frequency table:

Frequency or frequency band	Subpart	Class of station	Remarks
* * *	* * *	* * *	* * *
5000-5250 MHz <sup>1</sup> .....	Q	MA, RLW	Microwave landing system.
* * *	* * *	* * *	* * *
15400-15700 MHz <sup>2</sup> .....	Q	RL	Aeronautical radionavigation.
* * *	* * *	* * *	* * *

<sup>1</sup> See 47 C.F.R. § 2.106, footnotes S5.444A and US344, for conditions that apply to this band.

<sup>2</sup> See 47 C.F.R. § 2.106, footnotes S5.511C and US359, for conditions that apply to this band.

## APPENDIX B: FINAL REGULATORY FLEXIBILITY CERTIFICATION

The Regulatory Flexibility Act ("RFA")<sup>170</sup> requires that a regulatory flexibility analysis be prepared for notice and comment rulemaking proceedings, unless the agency certifies that "the rule will not, if promulgated, have a significant economic impact on a substantial number of small entities." The RFA generally defines "small entity" as having the same meaning as the terms "small business," "small organization," and "small governmental jurisdiction." In addition, the term "small business" has the same meaning as the term "small business concern" under the Small Business Act. A small business concern is one which: (1) is independently owned and operated; (2) is not dominant in its field of operation; and (3) satisfies any additional criteria established by the Small Business Administration (SBA).

This Report and Order allocates the bands 5091-5250 MHz and 15.43-15.63 GHz for FSS uplinks on a primary basis, allocates the band 6700-7025 MHz on a primary basis for FSS downlinks, and limits the use of these FSS allocations to feeder links that would be used in conjunction with the service links of NGSO MSS systems. In addition, two satellite systems and three sites are grandfathered in the downlink band 7025-7075 MHz. We take this action on our own initiative in order to adopt domestically the NGSO MSS feeder link allocations that have been adopted internationally. These allocations will accommodate the growing demand for NGSO MSS services and will provide satellite operators with increased flexibility in the design of their systems.

The Commission has not developed a definition of small entities specifically applicable to the satellite services licensees here at issue. Therefore, the applicable definition of small entity in the satellite services industry is the definition under the Small Business Administration ("SBA") rules applicable to Communications Services "Not Elsewhere Classified."<sup>171</sup> This definition provides that a small entity is expressed as one with \$11.0 million or less in annual receipts. According to Census Bureau data, there are 848 firms that fall under the category of Communications Services, Not Elsewhere Classified. Of those, approximately 775 reported annual receipts of \$11 million or less and qualify as small entities.<sup>172</sup> The Census Bureau category is very broad and commercial satellite services constitute only a subset of its total.

None of the NGSO MSS licensees is a small business because each has revenues in excess of \$11 million annually or has a parent company or investors that have revenues in excess of \$11 million annually.

The Commission did not receive any comments on its the initial regulatory flexibility certification. Nonetheless, we take this opportunity to explain a *de minimus* burden with regards to terrestrial users in the band 6700-7025 MHz. In the *Notice of Proposed Rule Making*, the Commission proposed to allocate the band 6700-7075 MHz to the FSS for satellite transmissions down to earth stations on a primary shared basis with incumbent users. Because such co-primary use implies coordination, the comments of the terrestrial users focused on limiting the impact of the allocation by placing restrictions on earth station use of the band, that is, the terrestrial parties requested that the normal coordination process not apply to this band. In the *Report and Order*, the Commission requires the use of the normal coordination process in the band 6700-6875 MHz, which is used by fixed point-to-point microwave licensees. If gateway applications are filed prior to the completion of an upcoming rule making that will deal with final coordination rules in the band 6875-7025 MHz, then case-by-case

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<sup>170</sup> The RFA, *see* 5 U.S.C. § 601 *et. seq.*, has been amended by the Contract with American Advancement Act of 1996, Public Law 104-121, 110 Stat. 847 (1996) ("CWAAA"). Title II of the CWAAA is the Small Business Regulatory Enforcement Fairness Act of 1996 ("SBREFA").

<sup>171</sup> 13 C.F.R. § 121.201, Standard Industrial Classification (NAICS) Codes 48531, 513322, 51334, 513391.

<sup>172</sup> U.S. Bureau of the Census, U.S. Department of Commerce, 1992 Census of Transportation, Communications, and Utilities, UC92-S-1, Subject Series, Establishment and Firm Size, Table 2D, Employment Size of Firms: 1992.

coordination will be required of the gateway applicants. Our action to limit the number of sites for earth stations in the band 7025-7075 MHz to three will also reduce future coordination costs. The Commission finds that, because of the limited number of receive earth stations to be deployed and their viable locations (that is, in rural areas), there will be minimal impact on potential coordination costs. We therefore certify that this Report and Order will not have a significant economic impact on a substantial number of small entities.

The Commission will send a copy of the Report and Order, including a copy of this final certification, in a report to Congress pursuant to the Small Business Regulatory Enforcement Fairness Act of 1996, *see* 5 U.S.C. § 801(a)(1)(A). In addition, the Report and Order and this certification will be sent to the Chief Counsel for Advocacy of the Small Business Administration, and will be published in the Federal Register. *See* 5 U.S.C. § 605(b).

## APPENDIX C: PARTIES TO THE PROCEEDING

Comments filed on September 21, 1998:

Constellation Communications, Inc. ("Constellation")

ICO Services Limited ("ICO")

L/Q Licensee, Inc., Globalstar, L.P, and AirTouch Communications, Inc., Joint Comments of ("Globalstar")

Mobile Communications Holdings, Inc. ("MCHI")

Satellite CD Radio, Inc. (now "Sirius")

Society of Broadcast Engineers ("SBE")

Telecommunications Industry Association, Fixed Point-to-Point Communications Section, Wireless Communications Division of the ("TIA")

UTC, The Telecommunications Association ("UTC") [not listed in ECFS until March 26, 1999]

Late-filed Comments:

National Academy of Science's Committee on Radio Frequencies ("CORF") received on September 29, 1998

Reply Comments (extended to October 13, 1998):

American Petroleum Institute ("API")

Association of American Railroads ("AAR")

Association of Public-Safety Communications Officials-International, Inc. ("APCO")

Constellation

Globalstar

ICO

MCHI

National Association of Broadcasters ("NAB")

Pennsylvania, Commonwealth of ("Pennsylvania")

TIA

Late-filed Reply Comments:

SBE, received on October 26, 1998

Ex Parte Presentations

Globalstar, received on December 7, 1999

Globalstar, received on February 25, 2000

New ICO Global (Holdings) Ltd., received on May 9, 2001

Globalstar, received on May 14, 2001

Globalstar, received on June 26, 2001

SBE, received on August 7, 2001 (Reply comments in ET Docket No. 01-75)