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

In the Matter of)
)
Amendment of Part 2 of the Commission's)
Rules to Allocate Additional Spectrum to the)
Inter-Satellite, Fixed, and Mobile Services) ET Docket No. 99-261
and to Permit Unlicensed Devices to Use)
Certain Segments in the 50.2-50.4 GHz and)
51.4-71.0 GHz Bands)

NOTICE OF PROPOSED RULE MAKING

Adopted: July 16, 1999

Released: July 23, 1999

Comment Date: September 7, 1999

Reply Comment Date: September 22, 1999

By the Commission:

I. INTRODUCTION

1. By this action, we propose to amend the United States Table of Frequency Allocations¹ with respect to the 50.2-50.4 GHz and 51.4-71.0 GHz bands. The allocations² proposed in this instant proceeding would provide additional spectrum to the inter-satellite service ("ISS")³ and

¹ 47 C.F.R. § 2.106.

² The allocation of a frequency band is the entry in the Table of Frequency Allocations of a given frequency band for the purpose of its use by one or more terrestrial or space radiocommunication services or the radio astronomy service under specified conditions. There are two categories of allocations: primary and secondary. Stations of a secondary service: (1) may not cause harmful interference to stations of primary services to which frequencies are already assigned or to which frequencies may be assigned at a later date; (2) cannot claim protection from harmful interference from stations of a primary service to which frequencies are already assigned or may be assigned at a later date; and (3) can claim protection, however, from harmful interference from stations of the same or other secondary service(s) to which frequencies may be assigned at a later date. *See* 47 C.F.R. §§ 2.1(c), 2.104(d)(1)(i) and (iii), and 2.104(d)(4).

³ The ISS is a radiocommunication service providing links between satellites. *See* 47 C.F.R. § 2.1(c).

to the fixed and mobile services⁴ while continuing to provide an acceptable environment for passive spaceborne sensor measurements of atmospheric temperature.⁵ Specifically, we propose:

- to provide a net gain of 900 megahertz of spectrum allocated on a primary basis for non-Government ISS by allocating the 65-71 GHz band to that service and by deleting non-Government ISS allocations from the 56.9-57.0 GHz and 59-64 GHz bands;
- to allocate the 64-65 GHz band to the Government ISS on a primary basis;
- to require that the existing Government and non-Government ISS allocations in the 54.25-56.90 GHz and 57.0-58.2 GHz bands and the existing Government ISS allocation in the 59.0-59.3 GHz band⁶ be used exclusively for geostationary satellite-to-geostationary satellite communications, subject to a power flux-density ("p.f.d.") limit designed to protect passive sensor operations;
- to provide a net gain of 2.27 gigahertz of spectrum allocated on a primary basis for Government and non-Government fixed and mobile services by allocating the 51.4-52.6 GHz, 58.2-59.0 GHz, and 64-65 GHz bands to these services, by deleting the unused fixed and mobile service allocations from the 50.2-50.4 GHz and 54.25-55.78 GHz bands, and by upgrading the allocation status of these services in the 65-66 GHz band from secondary to primary;⁷

⁴ The fixed service is a radiocommunication service between specified fixed points. The mobile service is a radiocommunication service between mobile and land stations, or between mobile stations. *Id.*

⁵ A passive sensor is a measuring instrument in the earth exploration-satellite service ("EESS") or in the space research service by means of which information is obtained by reception of radio waves of natural origin. The EESS is a radiocommunication service between earth stations and one or more space stations, which may include links between space stations in which: (1) Information relating to the characteristics of the Earth and its natural phenomena is obtained from active or passive sensors on earth satellites; (2) Similar information is collected from air-borne or earth-based platforms; (3) Such information may be distributed to earth stations within the system concerned; (4) Platform interrogation may be included. Note: This service may also include feeder links necessary for its operation. The space research service is a radiocommunication service in which spacecraft or other objects in space are used for scientific or technological research purposes. *Id.*

⁶ As previously mentioned, we are proposing to delete the non-Government ISS allocation from the 59-64 GHz band. Thus, the ISS allocation at 59.0-59.3 GHz would be available exclusively for Federal Government use. Also, we are proposing that Government ISS operations in the 56.9-57.0 GHz band operate under less restrictive rules. See ¶ 11, *infra*.

⁷ The proposed primary mobile service allocations in both the 64-65 GHz and 65-66 GHz bands are more specifically "mobile except aeronautical mobile service" allocations, *i.e.*, only land mobile and maritime mobile operations would be permitted.

- to specify that the 57-59 GHz and 64-66 GHz bands will be available for use by Government and non-Government unlicensed devices;⁸ and
- to allocate the 59.0-59.3 GHz band to the Government and non-Government earth exploration-satellite (passive) and space research (passive) services and to delete unneeded passive sensor allocations from the 51.4-52.6 GHz and 64-65 GHz bands.

2. The above proposals are part of the Commission's continuing effort to facilitate the commercialization of "millimeter wave" spectrum,⁹ and are consistent with the international allocation changes that the United States sought and obtained for this frequency range at the 1997 World Radiocommunication Conference ("WRC-97").¹⁰ Adoption of these proposals would allocate the spectrum that Government and non-Government satellite users require to interconnect their satellites within their respective networks. More specifically, the ISS proposals are expected to provide a wide range of fixed-satellite service ("FSS")¹¹ and mobile-satellite service ("MSS")¹²

⁸ The 59-64 GHz band is already available for use by unlicensed devices. See ¶ 15, *infra*. Non-Government use of unlicensed devices is authorized under 47 C.F.R. Part 15 - Radio Frequency Devices. Government use of unlicensed devices is authorized in the *NTIA Manual* under Annex K - Technical Standards for "Non-Licensed" Devices. See *Manual of Regulations and Procedures for Federal Radio Frequency Management*, September 1995 Edition, with Revisions for September 1996, January and May 1997 ("*NTIA Manual*").

⁹ The term "millimeter wave" is taken from the fact that the wavelength of radio signals for frequencies between 30 GHz and 300 GHz ranges from 10 millimeters down to 1 millimeter. The propagation of millimeter wave radio signals is more limited than that of radio signals at lower frequencies. Signals in the millimeter wave bands are significantly affected by the presence of oxygen and water vapor within the atmosphere. Absorption and scattering caused by oxygen and water vapor limit the range of millimeter wave transmissions to a few kilometers almost regardless of the power used. The amount of signal attenuation due to absorption and scattering varies with frequency and other factors. Attenuation caused by oxygen is significant throughout the millimeter wave spectrum, but increases dramatically at frequencies around 60 GHz and 120 GHz. Attenuation caused by water vapor varies based on temperature and relative humidity but generally increases with frequency. Rain, snow, hail, and fog can all affect the range of millimeter wave transmissions. See "Attenuation by Atmospheric Gases," International Telecommunication Union ("ITU"), *Reports of the CCIR, 1990*, Vol. V, Report 719-3, at pp. 189, for a more detailed discussion of atmospheric attenuation in the millimeter wave spectrum.

¹⁰ See *International Telecommunication Union Final Acts of the World Radiocommunication Conference 1997*, Geneva, 1997 ("*WRC-97 Final Acts*").

¹¹ The fixed-satellite service is a radiocommunication service between earth stations at given points, when one or more satellites are used; the given position may be a specified point or any point within specified areas; in some cases this service includes satellite-to-satellite links, which may also be operated in the inter-satellite service; the fixed-satellite service may also include feeder links for other space radiocommunication services. See 47 C.F.R. § 2.1(c).

¹² The mobile-satellite service is a radiocommunication service: (1) Between mobile earth stations and one or more space stations, or between space stations used by this service; or (2) Between mobile earth stations by means of one or more space stations. Note: This service may also include feeder links necessary for its

systems, including both geostationary orbit ("GSO")¹³ and non-geostationary orbit ("NGSO") systems, with the additional spectrum needed to complete their end-to-end communications service. For example, using the ISS allocations proposed herein, Ka-band¹⁴ FSS licensees could inter-link their broadband multimedia satellites, thereby permitting the provision of innovative high-speed Internet-like services on a regional and global basis. Our proposals also provide the spectrum that new licensed fixed and mobile services and unlicensed devices are anticipated to require. For example, Personal Communication Service ("PCS") and cellular licensees could use unlicensed spectrum in the 57-59 GHz frequency range to connect nearby base stations to one another, which would be especially useful in high-density urban areas. We tentatively find that these additional allocations can be made while, at the same time, ongoing passive sensor operations -- used to obtain weather and climate data in all weather conditions -- are fully protected. We also tentatively find that these proposals would further our efforts towards achieving the overarching goal of Section 706 of the Telecommunications Act of 1996, to "encourage the deployment on a reasonable and timely basis of advanced telecommunications capability to all Americans . . . by utilizing . . . measures that promote competition in the local telecommunications market."¹⁵

II. BACKGROUND

3. The 50.2-50.4 GHz and 51.4-71.0 GHz bands are Government/non-Government shared spectrum, and the Government and non-Government allocations in these bands are identical. Currently, only Government inter-satellite and passive satellite services make use of this spectrum. Table 1, below, summarizes the current allocations.¹⁶

operation. *Id.*

¹³ A geostationary satellite is a geosynchronous satellite whose circular and direct orbit lies in the plane of the Earth's equator and which thus remains fixed relative to the Earth; by extension, a satellite which remains approximately fixed relative to the Earth. *Id.*

¹⁴ The satellite industry used the term "Ka-band" to refer to the Earth-to-space ("uplink") frequencies at 27.5-30.0 GHz and the corresponding space-to-Earth ("downlink") frequencies at 17.7-20.2 GHz.

¹⁵ Pub.L. 104-104, Title VII, § 706, Feb. 8 1996, 110 Stat. 153, reproduced in the notes under 47 U.S.C. § 157 ("Section 706"). Section 706(c)(1) defines "advanced telecommunications capability . . . without regard to any transmission media or technology, as high-speed, switched, broadband telecommunications capability that enables users to originate and receive high-quality voice, data, graphics, and video telecommunications using any technology." See generally *Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996*, CC Docket 98-146, *Notice of Inquiry*, FCC 98-187, 13 FCC Rcd 15280 (1998) ("Section 706 NOI"); *Report*, FCC 99-005, released February 2, 1999.

¹⁶ See 47 C.F.R. § 2.106 - Table of Frequency Allocations.

| Table 1: Existing Allocations (All allocations are primary except those that are listed as secondary) | | | |
|---|---|----------------------------------|--|
| Band (GHz) | Satellite Services and Radio Astronomy | Terrestrial Services | Comments |
| 50.2-50.4 | EESS (passive) Space Research (passive) | Fixed Mobile | EESS and space research do not receive protection from fixed and mobile services |
| 51.40-54.25 | EESS (passive) Space Research (passive) Radio Astronomy | | No station may transmit in this band |
| 54.25-58.20 | EESS (passive) Space Research (passive) ISS | Fixed Mobile | EESS and space research do not receive protection from fixed and mobile services; aeronautical mobile stations may not cause harmful interference to ISS |
| 58.2-59.0 | EESS (passive) Space Research (passive) Radio Astronomy | | No station may transmit in this band |
| 59-64 | ISS | Fixed Mobile Radiolocation | 59-64 GHz available for unlicensed devices; aeronautical mobile stations may not cause harmful interference to ISS; 61.0-61.5 GHz designated for ISM equipment |
| 64-65 | EESS (passive) Space Research (passive) Radio Astronomy | | No station may transmit in this band |
| 65-66 | EESS Space Research | Fixed Mobile | Fixed and mobile services are secondary |
| 66-71 | MSS Radionavigation-Satellite | Mobile Radionavigation | Land mobile stations will not cause harmful interference to space services; satellite links connecting land stations permitted if part of MSS or radionavigation-satellite systems |

4. In May 1995, the National Telecommunications and Information Administration ("NTIA") of the U.S. Department of Commerce¹⁷ suggested allocation modifications to better accommodate existing Government and proposed non-Government satellite systems.¹⁸ Specifically, NTIA pointed out that Government agencies operate satellites in the 60 GHz region of the spectrum in the inter-satellite and passive satellite services (*i.e.*, the earth exploration-satellite service (passive) and space research service (passive)) and that a non-Government satellite applicant had requested the use of spectrum in this frequency range for inter-satellite links. To assure acceptable operations among the Government services at 60 GHz and proposed non-Government inter-satellite links, NTIA urged the Commission to initiate a rulemaking to allocate the 65-71 GHz band to the Government and non-Government inter-satellite services. In addition, NTIA stated that, while the 54.25-58.20 GHz band is allocated to both the inter-satellite and space-based passive services, co-channel sharing between these services would be difficult, particularly in cases involving inter-satellite links between low-earth orbiting ("LEO") satellites.

5. In July 1996, we adopted a band plan that enables GSO and NGSO FSS systems, feeder links for NGSO Mobile Satellite Service systems, and Local Multipoint Distribution Service ("LMDS") systems to operate in the Ka-band.¹⁹ We have subsequently licensed an NGSO FSS Ka-band system²⁰ and 13 GSO FSS Ka-band systems.²¹ Nine of these licensees have

¹⁷ 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).

¹⁸ See Letter to Chief, Office of Engineering and Technology, from the Associate Administrator, Office of Spectrum Management, NTIA, dated May 4, 1995.

¹⁹ See *Rulemaking to Amend Parts 1, 2, 21, and 25 of the Commission's Rules to Redesignate the 27.5-29.5 GHz Frequency Band, to Reallocate the 29.5-30.0 GHz Frequency Band, to Establish Rules and Policies for Local Multipoint Distribution Service and for Fixed Satellite Services*, CC Docket No. 92-297, *First Report and Order and Fourth Notice of Proposed Rulemaking*, 11 FCC Rcd 19005 (1996); *Order on Reconsideration*, 12 FCC Rcd 6424 (1997); *Second Report and Order, Order on Reconsideration, and Fifth Notice of Proposed Rulemaking*, 12 FCC Rcd 12545 (1997); *Second Order on Reconsideration*, 12 FCC Rcd 15082 (1997); *Third Report and Order*, 12 FCC Rcd 22310 (1997) ("*28 GHz Third Report and Order*"); *Third Order on Reconsideration*, 13 FCC Rcd 4856 (1998); *Fourth Report and Order*, 13 FCC Rcd 11655 (1998).

²⁰ In March 1997, we authorized Teledesic L.L.C. to construct, launch, and operate an NGSO satellite system to provide domestic and international fixed-satellite services. See Ka-band authorization of Teledesic (File Nos. 22-DSS-P/LS-94, 43-SAT-AMEND-95, 127-SAT-AMEND-95). This Authorization Order did not include operating authority for any inter-satellite links.

²¹ In May 1997, the Commission granted licenses to 13 companies for 73 satellites to provide broadband GSO FSS services in the Ka-band. These broadband GSO FSS licensees intend to provide high-speed, Internet-like services, beginning around year 2000, at startup costs in the billions of dollars. These GSO FSS systems eventually may connect to portable, even miniature, user terminals and compete with Big LEOs for telephone customers. See Ka-band authorizations of Comm, Inc. (File Nos. 163/166-SAT-P/LA-95, 201-SAT-MISC-95); EchoStar Satellite Corporation ("EchoStar") (File Nos. 167/168-SAT-P/LA-95, 54-SAT-AMEND-96); GE

requests pending for ISS spectrum that we have been unable to grant due to lack of spectrum allocated for this purpose. In June 1998, the Commission's International Bureau requested that the eight Ka-band licensees affected by the WRC-97 ISS decisions update their ISS spectrum requests in order to conform to these new international requirements. As requested, the eight Ka-band licensees updated their requests for ISS spectrum on October 9, 1998.²² In addition, there are on file pending applications for ISS spectrum from four applicants in the second Ka-band processing round, from one 2 GHz applicant, and from five applicants in the 40 GHz processing round.²³ The amount of spectrum that pending applicants will have for ISS use will be determined in the licensing process.

6. In July 1997, the United States proposals for WRC-97 were adopted, including those for the 50.2-50.4 GHz and 51.4-71.0 GHz bands.²⁴ The effect of the U.S. proposals for the 50.2-50.4 GHz and 51.4-71.0 GHz bands was to realign spectrum allocations in this region of the spectrum in a way that provides additional spectrum for the inter-satellite, fixed, and mobile services, while fully protecting existing and future spaceborne passive sensor operations. In November 1997, WRC-97 adopted the U.S. proposals for these bands with minor adjustments.²⁵ In this instant proceeding, we are proposing to adopt these WRC-97 allocation decisions domestically.

American Communications, Inc. ("GE Americom") (File Nos. 169/173-SAT-P/LA-95, 54-SAT-AMEND-97); Hughes Communications Galaxy, Inc. ("Hughes") (File Nos. 3/4-DSS-P/LA-94, CSS-94-021 through CSS-94-025, 174 through 181-SAT-P/LA-95, 36-SAT-AMEND-96); KaStar Satellite Communications Corp. ("KaStar") (File Nos. 128-SAT-P/LA-95, 203-SAT-P/LA-95); Lockheed Martin Corporation ("Lockheed Martin") (File Nos. 182 through 186-SAT-P/LA-95); Loral Space & Communications Ltd. ("Loral") (File Nos. 109-SAT-P/LA-95, 110-SAT-P-95, 187-SAT-AMEND-95, 188/189-SAT-P/LA-95, 102/103-SAT-AMEND-96); Morning Star Satellite Company, L.L.C. (File Nos. 190/193-SAT-P/LA-95); Motorola (File Nos. 163/166-SAT-P/LA-95, 201-SAT-MISC-95), NetSat 28 Company, L.L.P. (File No. 184-SAT-P/LA-95); Orion Network Systems, Inc. ("Orion Network") (File Nos. 195 through 197-SAT-P/LA-95); Orion Atlantic, L.P., which is controlled by Orion Network (File No. 204-SAT-ML-95); PanAmSat Licensee Corp. ("PanAmSat") (File Nos. 198/199-SAT-P/LA-95, 202-SAT-AMEND-95); and VisionStar, Inc. (File Nos. 200-SAT-P/LA-95).

²² See Appendix B.

²³ *Id.* The 2 GHz service links are at 1990-2025 MHz and 2165-2200 MHz. The 40 GHz service links are in segments contained in the 36.0-51.4 GHz band.

²⁴ See *United States Proposals for the Work of the [WRC-97] Conference*, Document USWRC-97.10-E, dated July 24, 1997, Proposals for Agenda Item 1.9.4.3, entitled "The Existing Frequency Allocations Near 60 GHz and, if Necessary, Their Respective Allocation, with a View to Protecting the Earth Exploration-Satellite (passive) Service Systems Operating in the Unique Oxygen Absorption Frequency Band from About 50 GHz to About 70 GHz. (A Consequential Allocation to the Inter-Satellite Service in the 65-71 GHz Bands)(JPDP 12)."

²⁵ See note 10, *supra*.

7. During that same period, we adopted in October 1997 licensing qualification requirements and service rules for a new generation of FSS systems in the Ka-band.²⁶ In that order, we observed that many system proponents in the Ka-band had requested the use of ISS frequencies to interconnect satellites within their respective networks.²⁷ Specially, we stated:²⁸

The 54.25-58.2 GHz band is allocated domestically and internationally on a co-primary basis to the earth exploration-satellite service ("EESS") (passive), fixed, mobile, space research (passive) and inter-satellite services. Use of these bands is shared on a co-equal basis between U.S. Government and non-Government operations. Studies carried out in the ITU-Radiocommunication Sector have determined that NGSO ISS operations in this band would cause unacceptable interference into the EESS. Thus, non-Government NGSO ISS operations will not be permitted in this band. Studies have also shown that GSO ISS operations are feasible in this band provided that a power flux density limit is met at all altitudes from 0 to 1000 km to protect passive NGSO satellite system operations.²⁹ The appropriate power flux-density ("pfd") limit has been the subject of study within the ITU Radiocommunication Sector and will be finalized at WRC-97. Further, the U.S. Government has existing and planned ISS systems in the 56.9-57 GHz band segment. All GSO FSS inter-satellite link operations in the 54.25-58.2 GHz band would be required to coordinate with U.S. Government systems through the FAS [Frequency Assignment Subcommittee]. At this time, however, we do not know the number of commercial GSO ISS systems that can simultaneously operate in this band, nor do we know whether all of the GSO FSS licensees requesting spectrum for ISS operations can be accommodated in 54.25-58.2 GHz. Any GSO inter-satellite link operation in the bands would be subject to coordination with U.S. Government operations in the band and subject to the pfd limit that is to be determined at WRC-97.

Finally, other licensees propose to use the 59-64 GHz band for inter-satellite links. This band is allocated domestically and internationally on a co-primary basis to the inter-satellite service, the fixed service, the mobile service, and the radiolocation service. Use of these bands is also shared on a co-equal basis between Government and non-Government operations. There appear to be

²⁶ See 28 GHz Third Report and Order, note 19, *supra*.

²⁷ *Id.* at ¶ 51.

²⁸ *Id.* at ¶¶ 53-54.

²⁹ See ITU-R Recommendation S.1339 on the "Feasibility of Sharing Between Spaceborne Passive Sensors of the Earth Exploration-Satellite Service and Inter-Satellite Links of Geostationary-Satellite Networks in the Range 50 to 65 GHz; see also ITU-R Recommendation S.1327, "Requirements and Suitable Bands for Operation of the Inter-Satellite Service within the Range 50.2-71 GHz" (18 September 1997).

significant interference problems associated with potential non-Government GSO and NGSO operations and Government operations at 59-64 GHz.

8. In May 1998, NTIA requested that the Commission initiate a rulemaking to implement the *WRC-97 Final Acts* with respect to the 50.2-71.0 GHz bands.³⁰ In its letter to the Commission, NTIA observed that WRC-97 modified the International Table of Frequency Allocations in the frequency range 50.2-71.0 GHz consistent with U.S. proposals to the conference. Based on the outcome of WRC-97 and pressing U.S. Government and non-Government requirements, we initiate this rulemaking in order to respond to Government and commercial needs in this frequency range.

III. DISCUSSION

A. Inter-Satellite Service

9. We propose, in accordance with international allocation decisions taken at WRC-97, to allocate the 64-71 GHz band to the ISS domestically. We tentatively find that the feasibility of ISS and existing services sharing the 64-71 GHz band has been clearly shown by various studies.³¹ At the request of NTIA, we further propose to delete the non-Government ISS allocation from the 56.9-57.0 GHz and 59-64 GHz bands and to allocate the 64-65 GHz segment for exclusive Government ISS use and the 65-71 GHz segment for exclusive non-Government ISS use. This domestic allocation split addresses two concerns. First, there is a well-established and pressing demand for commercial inter-satellite link spectrum, which we believe necessitates a substantial ISS allocation that can be used by all commercial satellite systems. Furthermore, although commercial systems have requested spectrum below 65 GHz, NTIA asserts that Federal Government ISS operations in the 59-64 GHz band are not compatible with proposed commercial ISS uses of this band. Second, an allocation at 64-65 GHz for Government only use would compensate Federal users for the loss of flexibility in the 59-64 GHz ISS band that will occur as a result of the WRC-97 decision to limit the use of the 59.0-59.3 GHz band to geostationary

³⁰ See Letter to Chief, Office of Engineering and Technology, from the Acting Associate Administrator, Office of Spectrum Management, NTIA, dated May 18, 1998. We have previously dealt with the 50.4-51.4 GHz band. See *Allocation and Designation of Spectrum for Fixed-Satellite Services in the 37.5-38.5 GHz, 40.5-41.5 GHz, and 48.2-50.2 GHz Frequency Bands; Allocation of Spectrum to Upgrade Fixed and Mobile Allocations in the 40.5-42.5 GHz Frequency Band; Allocation of Spectrum in the 46.9-47.0 GHz Frequency Band for Wireless Services; and Allocation of Spectrum in the 37.0-38.0 GHz and 40.0-40.5 GHz for Government Operations*; IB Docket No. 97-95, *Report and Order*, FCC 98-336, 64 FR 2585 (Jan. 15, 1999). Other results of WRC-97 will be implemented in a separate proceeding.

³¹ These studies were carried out by ITU-R Working Party 4A in response to Resolution 643. These studies also conclude that a new ISS allocation in the 64-71 GHz band, combined with limiting ISS use of the 54.25-56.90 GHz and 57.0-58.2 GHz bands to GSO satellites, would fully satisfy the known requirements of the inter-satellite links in this frequency range. See, e.g., note 29, *supra*.

satellite-to-geostationary satellite communications.³² The net result of these proposals is that commercial satellite operators would have exclusive use of 6 gigahertz of primary ISS spectrum at 65-71 GHz and Federal agencies would have exclusive use of 6.1 gigahertz of primary ISS spectrum at 56.9-57.0 GHz and 59-65 GHz. We observe that the shared³³ and commercial exclusive ISS spectrum could be used, for example, by Ka-band licensees for satellite-to-satellite communications, making their systems more efficient and enabling them to provide some of the advanced telecommunications capabilities that Section 706 of the Communications Act envisions.³⁴

10. We also propose to adopt international footnote S5.556A domestically.³⁵ This footnote limits use of the 54.25-56.90 GHz, 57.0-58.2 GHz, and 59.0-59.3 GHz ISS bands to GSO satellite transmissions that comply with a maximum p.f.d. limit at altitudes of 1000 kilometers (approximately 621.4 miles) or less above the Earth's surface of -147 dBW per square meter per 100 megahertz for all angles of arrival.³⁶ This proposal reflects the results of studies³⁷ that have shown these technical restrictions to be necessary to prevent ISS transmissions in these bands from causing harmful interference to passive sensor reception in the 54.25-58.20 GHz band. We tentatively find that, although adoption of footnote S5.556A explicitly precludes NGSO networks from accessing this 4.15 gigahertz of ISS spectrum, the 6 gigahertz we are proposing to allocate at 65-71 GHz for exclusive commercial use is sufficient to accommodate all pending requests by NGSO licensees for ISS spectrum.³⁸ We request comment on this tentative conclusion.

³² See ¶ 10, *infra*.

³³ Government and commercial users will continue to have shared use of 3.85 gigahertz of primary ISS spectrum at 54.25-56.90 GHz and 57.0-58.2 GHz.

³⁴ For example, some Ka-band licensees have indicated that they intend to provide high-speed Internet services.

³⁵ Specifically, the text of footnote S5.556A reads as follows: "Use of the bands 54.25-56.9 GHz, 57-58.2 GHz and 59-59.3 GHz by the inter-satellite service is limited to satellites in the geostationary-satellite orbit. The single-entry power flux-density at all altitudes from 0 km to 1000 km above the Earth's surface produced by a station in the inter-satellite service, for all conditions and for all methods of modulation, shall not exceed -147 dB (W/m²/100 MHz) for all angles of arrival."

³⁶ We observe that the United States' WRC-97 proposals for footnote S5.556A did not include the 59.0-59.3 GHz band. However, NTIA has requested that the Commission adopt this requirement in the 59.0-59.3 GHz Government-only ISS band. See note 30, *supra*. The 56.9-57.0 GHz Government ISS band is discussed in ¶ 11.

³⁷ See ITU-R Draft New Recommendation SA[7/153] - "Spectrum Sharing between Spaceborne Passive Sensors and Inter-satellite Links in the Range 50.2-61.3 GHz."

³⁸ See Appendix B and note 31, *supra*.

11. With regard to the 56.9-57.0 GHz band, we observe that WRC-97 limited ISS use of this spectrum through footnote S5.558A, which permits only GSO inter-satellite links and transmissions from NGSO satellites in high-Earth orbit to those in low-Earth orbit.³⁹ However, Federal agencies, which currently operate in the band, have determined that these restrictions must be loosened slightly by also permitting transmissions between satellites in geostationary orbit and those in high-Earth orbit and between satellites in geostationary orbit and those in low-Earth orbit. Since we have previously proposed that the use of the ISS allocation in the 56.9-57.0 GHz band be limited exclusively to Federal agencies, this expanded use would be authorized under a new Government footnote.⁴⁰ We request comment on all of the above proposals. Table 2, below, summarizes the spectrum that would be available for ISS use if these proposals are adopted.

| ISS Band | ISS Availability | Comments |
|-----------------|-----------------------------------|---|
| 54.25-56.90 GHz | Federal Government and Commercial | GSO with p.f.d. limit |
| 56.9-57.0 GHz | Federal Government only | Footnote Gxxx |
| 57.0-58.2 GHz | Federal Government and Commercial | GSO with p.f.d. limit |
| 59-65 GHz | Federal Government only | GSO with p.f.d. limit in the 59.0-59.3 GHz segment; GSO and NGSO in the 59.3-65.0 GHz segment |
| 65-71 GHz | Commercial only | GSO and NGSO |

³⁹ Specifically, the text of footnote S5.558A reads as follows: "Use of the band 56.9-57 GHz by inter-satellite systems is limited to links between satellites in geostationary-satellite orbit and to transmissions from non-geostationary satellites in high-Earth orbit to those in low-Earth orbit. For links between satellites in the geostationary-satellite orbit, the single-entry power flux-density at all altitudes from 0 km to 1000 km above the Earth's surface, for all conditions and for all methods of modulation, shall not exceed -147 dB (W/m²/100 MHz) for all angles of arrival."

⁴⁰ Specifically, the text of proposed Government footnote Gxxx reads as follows: "Use of the band 56.9-57 GHz by inter-satellite systems is limited to transmissions between satellites in geostationary orbit, to transmissions between satellites in geostationary satellite orbit and those in high-Earth orbit, to transmissions from satellites in geostationary satellite orbit to those in low-Earth orbit, and to transmissions from non-geostationary satellites in high-Earth orbit to those in low-Earth orbit. For links between satellites in the geostationary satellite orbit, the single entry power flux-density at all altitudes from 0 km to 1000 km above the Earth's surface, for all conditions and for all methods of modulation, shall not exceed -147 dB (W/m²/100 MHz) for all angles of arrival."

B. Fixed and Mobile Services/Unlicensed Devices

12. We propose to allocate the 51.4-52.6 GHz⁴¹ and 58.2-59.0 GHz bands⁴² to Government and non-Government fixed and mobile services on a primary basis. We also propose to make the 64-66 GHz band available to the Government and non-Government fixed and mobile (except aeronautical mobile) services on a primary basis by allocating the 64-65 GHz segment for these purposes and by upgrading the status of the secondary fixed and mobile services in the 65-66 GHz segment.⁴³ In order to protect ongoing passive sensor reception in the 50.2-50.4 GHz and 54.25-55.78 GHz bands from future disruption, we propose to delete the unused Government and non-Government fixed and mobile service allocations from these bands.⁴⁴ We also propose to delete the requirement that aeronautical mobile station transmissions not cause harmful interference to ISS operations in the 54.25-55.78 band and to add this requirement in the 66-71 GHz band.⁴⁵ Finally, we observe that any future land mobile services in the 66-71 GHz band will

⁴¹ The proposed deletion of the earth exploration-satellite and space research service allocations from the 51.4-52.6 GHz band means that the fixed and mobile services would not have to share the band with any other service, except possibly the radio astronomy service. See ¶¶ 20-21, *infra*.

⁴² The 58.2-59.0 GHz band is currently allocated to the earth exploration-satellite (passive), space research (passive), and radio astronomy services. Our proposal maintains these allocations and adds the fixed and mobile services to the band.

⁴³ The 64-65 GHz segment is currently allocated to the earth exploration-satellite (passive), space research (passive), and radio astronomy services on a co-primary basis. The 65-66 GHz segment is currently allocated to the earth exploration-satellite and space research services on a co-primary basis and to the fixed and mobile services on a secondary basis. In ¶ 20, *infra*, we propose to delete the earth exploration-satellite (passive) and space research (passive) service allocations from the 64-65 GHz band. In ¶ 21, *infra*, we propose to delete the radio astronomy service allocation from the 64-65 GHz segment and to permit radio astronomy observations in this segment under a national arrangement.

⁴⁴ Since the fixed and mobile service allocations in 50.2-50.4 GHz band are unused in the United States, we do not propose to adopt footnote S5.555A, which provides for a short transition period, *i.e.*, internationally, the fixed and mobile services remain allocated on a primary basis until July 1, 2000. Instead, in the United States, the fixed and mobile service allocations will be deleted as of the effective date of the Report and Order in this proceeding. We also note that, in Japan, the 54.25-55.78 GHz band will continue to be allocated to the mobile service on a primary basis for low-density use. See Appendix A, footnote S5.556B.

⁴⁵ Currently, the 54.25-58.20 GHz band is allocated, *inter alia*, to the Government and non-Government ISS and mobile services. The mobile service is limited by footnote 909, which states that aeronautical mobile stations may be operated in the 54.25-58.20 GHz band only if they do not cause harmful interference to the ISS. Our proposal would delete the mobile service from the 54.25-55.78 GHz segment, which moots the need for the aeronautical restriction in this segment, and maintains the restriction in the 55.78-58.20 GHz segment. Specifically, footnote 909 reads as follows: "In the bands 54.25-58.2 GHz, 59-64 GHz, 116-134 GHz, 170-182 GHz and 185-190 GHz, stations in the aeronautical mobile service may be operated subject to not causing harmful interference to the inter-satellite service (see No. 435)." WRC-97 re-numbered Footnote 909 as footnote S5.558 and revised its text by changing "54.25-58.2 GHz" to "55.78-58.2 GHz," and by adding "66-71 GHz." The non-Government ISS allocation at 65-71 GHz is proposed in this instant rulemaking. See ¶ 9, *supra*. (Footnote S5.558 does include the 65-66 GHz segment because it is proposed to be allocated to the mobile

be required to protect the new non-Government ISS service -- as well as the existing space radiocommunication services -- from harmful interference.⁴⁶

13. These fixed and mobile service proposals have been enabled by: (1) NTIA's finding that the 51.4-52.6 GHz and 64-65 GHz bands are no longer required for Government passive sensor operations,⁴⁷ and (2) ITU-R studies⁴⁸ that have shown that passive sensors can share with fixed and mobile services at frequencies above 55.78 GHz due to the high atmospheric attenuation that exists. These studies found that, at lower frequencies, undesirable constraints would be required on the fixed and mobile services and the meteorological community would still receive interference that could effect weather forecasts and give false results to measurements of warming of the Earth. Thus, our related proposal to delete the fixed and mobile service allocations from the 50.2-50.4 GHz and 54.25-55.78 GHz bands will provide exclusive spectrum for the measurement of atmospheric temperature using passive spaceborne sensors in bands where sharing with other services is not feasible. In sum, these proposals, if adopted, would result in a net gain of 2.27 gigahertz of primary spectrum for fixed and mobile services, while eliminating the need for constraints on the parameters of fixed and mobile systems since these services would not share allocations with the passive services below 55.78 GHz. We request comment on all of the above proposals.

except aeronautical mobile service.)

⁴⁶ See 47 C.F.R. § 2.106, footnote 902 (re-numbered as footnote S5.553). See Appendix A.

⁴⁷ See note 24, *supra*.

⁴⁸ See ITU-R Draft New Recommendation SA[7/23] - "Feasibility of Sharing between Spaceborne Passive Sensors and the Fixed Service from 50 to 60 GHz." We also note that the European Radiocommunications Committee ("ERO") within the European Conference of Postal and Telecommunications Administrations ("CEPT") has concluded that in frequencies above 55.78 GHz "the Fixed Service can operate without any risk of causing interference to passive sensors." See ERC Report 45, entitled "Sharing Between the Fixed and Earth Exploration-Satellite (Passive) Services in the Band 50.2-66 GHz," Sesimbra, January 1997.

14. We also observe that WRC-97 adopted new footnote S5.547,⁴⁹ which makes the 51.4-52.6 GHz, 55.78-59.00 GHz and 64-66 GHz bands "available for high-density applications in the fixed service" ("HDFS").⁵⁰ We request comment on whether footnote S5.547 should be adopted domestically, what the ramifications of such an action would be, and whether, in order to assure spectrum availability for HDFS, the bands should *not* be allocated to the mobile service.⁵¹

⁴⁹ The text of footnote S5.547 reads as follows: "The bands 31.8-33.4 GHz, 51.4-52.6 GHz, 55.78-59 GHz and 64-66 GHz are available for high-density applications in the fixed service (see Resolution 726 (WRC-97))." See also *WRC-97 Final Acts* at Resolution 726 (WRC-97), entitled "Frequency bands above 30 GHz available for high-density applications in the fixed service," pp. 646-647. Resolution 726, *inter alia*, states that there is a dramatically increasing demand for HDFS resulting from the deployment of new mobile networks and from the rapid worldwide deregulation in the provision of local broadband services, that there are incompatible services in certain bands, and that there is a need for global harmonization of services. Therefore, WRC-97 resolved that administrations should take into account that the 51.4-52.6 GHz, 55.78-59.00 GHz, and 64-66 GHz bands are available for high-density fixed applications. Resolution 726 goes on to state that there is a need for global harmonization of new and existing allocations of radio frequency bands in order to facilitate coordination among administrations and to encourage development of competitive products, through economies of scale and the worldwide introduction of new telecommunication services, including the provision of reliable global information infrastructure access at an affordable cost.

⁵⁰ High density systems and usages in the fixed service are generally characterized by applications requiring the ability to: (1) operate on a point-to-point or point-to-multipoint basis, or a combination of both; (2) flexibly achieve, over short periods of time, a concentration of links on the same channel(s) within an area; (3) increase frequency reuse; and (4) decrease terminal size and cost of equipment. The term "high density fixed service" does not refer to a particular application or band in the fixed service, but does describe the phenomena of maximized deployment densities, spectrum reuse and spectral efficiencies realized by concentrated deployments. Often these deployment density, spectrum reuse and spectral efficiency factors become more pronounced in the higher bands. Use of the term "high density" can be applied in the same fashion to any radio service that may be widely utilized for commercial or other purposes. Some fixed service high density systems and usages are deployed in license areas where the operator enjoys an exclusive license which allows flexible deployment within a defined geographic area. Known current high density systems and usages in the fixed service include narrowband wireless access, fixed wireless access, and wideband applications ranging in bands up to 66 GHz. It is likely that HDFS applications will also become operational above 66 GHz. See *Proposed Expanded Element of the CPM-99 Report*, Addendum 1 to ITU-R Document 9B/66-E, Document 7D-9D/32-E, dated October 5, 1998.

⁵¹ ITU-R Recommendation SA.1259 describes the sharing situation and lists the threshold levels of interference considered detrimental to EESS. One of the conclusions reached in ITU-R Recommendation SA.1259 is that sharing is feasible with no restrictions on the fixed service for the 55.78-58.20 GHz band. However, ITU-R Recommendation SA.1259 did not consider the implementation of HDFS systems and the resulting potential for increased harmful interference to passive sensors operating in the same band. In particular, while sharing is still considered feasible with spaceborne passive sensors across the band, the possibility of interference is higher in the 55.78-56.26 GHz segment. Therefore, in order to maintain the same sharing feasibility within the 55.78-56.26 GHz segment, a limit may need to be placed on the radiated power of HDFS stations toward zenith. There are no restrictions for sharing within the remaining portion of the band (56.26-59.00 GHz). There is currently no known usage for the space research service allocation with the 55.78-59.00 GHz band and no studies on potential sharing have been done to date. See ITU-R Document 7D-9D/30-E, dated August 11, 1998.

15. *Unlicensed Devices.* In 1996, we made the 59-64 GHz band available for unlicensed devices under Part 15 of Commission's Rules.⁵² We observe that the 55.78-59 GHz and 64-66 GHz bands are adjacent to this unlicensed band, that both of these bands would, if our proposals are adopted, be allocated to the fixed and mobile services on a primary basis,⁵³ and that, furthermore, both of these bands could be made available for use by HDFS.

16. We also observe that the European Radiocommunications Committee ("ERO") has adopted a Recommendation entitled "Radio Frequency Channel Arrangement for Fixed Services Operating in the Band 57.0-59.0 GHz Which Do Not Require Frequency Planning,"⁵⁴ but that this Recommendation has not yet been implemented. This Recommendation states, *inter alia*, "that the high frequency reuse achievable in the oxygen absorption band reduces the requirement for frequency planning techniques and offers the possibility of deregulated telecommunications environment within CEPT [the European Conference of Postal and Telecommunications Administrations] for various low power, low cost and short range radio-relays." In addition, it is our understanding that there are ongoing discussions in Europe concerning unlicensed broadband HDFS use of the 57-59 GHz band. We anticipate a similar need in the United States. Specifically, we believe that PCS, cellular, and other mobile service licensees will require unlicensed spectrum in the 57-59 GHz frequency range to connect nearby base stations to one another, especially in high-density urban areas, *i.e.*, "hot spots."

17. We tentatively find that the 57-59 GHz and 64-66 GHz bands are well suited for use by unlicensed devices, and accordingly, we propose to make these bands available for use by unlicensed devices under Part 15 of Commission's Rules. We base this proposal on the propagation characteristics of the bands,⁵⁵ and on the technical material previously presented by

⁵² See *Amendment of Parts 2, 15, and 97 of the Commission's Rules to Permit Use of Radio Frequencies Above 40 GHz for New Radio Applications*, ET Docket No. 94-124, RM-8308, *First Report and Second Notice of Proposed Rule Making*, 11 FCC Rcd 4481 (1996), at ¶¶ 28-36. In that proceeding, the Commission made the 59-64 GHz band available for unlicensed use under the existing fixed and mobile service allocations and stated that it would not adopt service rules for licensed services in the 59-64 GHz band at that time. See also 47 C.F.R. § 15.255.

⁵³ With regard to the 64-66 GHz band, the proposed mobile service allocation would be more specifically a "mobile except aeronautical mobile service" allocation, *i.e.*, the band would be allocated for land mobile and maritime mobile services, but not for aeronautical mobile services.

⁵⁴ See CEPT/ERC Recommendation 12-09 (The Hague 1998). The Recommendation channelizes the 57-59 GHz band into twenty 100 MHz unpaired channels or forty 50 MHz unpaired channels, with the first and last 100 megahertz of the band (57.0-57.1 GHz and 58.9-59.0 GHz) not used at this time, and limits e.i.r.p. to 15 dBW.

⁵⁵ See FCC's *Millimeter Wave Propagation: Spectrum Management Implications*, OET Bulletin Number 70, July 1997; <http://fcc.gov/oet/info/documents/bulletins/#70>. See also *SPP 5/98: Fixed Services in the Band 57.2-58.2 GHz*, October 1998, in which the Australian Communications Authority states that the 57.2-58.2 GHz band lies very close to the peak of the 60 GHz Oxygen (O₂) absorption curve, resulting in lower-atmosphere losses exceeding 12 dB per kilometer. (ITU-R Rec P.676-2, pp 44-45.) This high atmospheric attenuation

the Millimeter Wave Communications Working Group ("MWCWG") in the Above 40 GHz proceeding.⁵⁶ We tentatively find that licensing is not necessary because of the limited potential for interference due to oxygen absorption and the narrow beamwidth of point-to-point antennas likely to be operating in this range. We also tentatively find that low-power⁵⁷ unlicensed use of 57-59 GHz and 64-66 GHz bands is an ideal use of this Government/non-Government shared spectrum because this proposed use further reduces the chance of harmful interference to in-band sensors. We request comment on these proposals. We also request comment on whether the 55.78-57.00 GHz segment should be made available for use by unlicensed devices or whether this segment should be made available for licensed fixed and mobile services.

18. We are not proposing technical rules for unlicensed use of the 57-59 GHz and 64-66 GHz bands in this proceeding, except that operation in the 57-59 GHz band would not be permitted on aircraft or satellites.⁵⁸ Instead, we intend to initiate a separate rulemaking to address appropriate technical rules. Nonetheless, we invite comment looking toward this further rulemaking on the technical rules needed for the spectrally efficient operation of unlicensed devices in these bands. For example, should we simply employ the existing technical rules and etiquette from the 59-64 GHz band⁵⁹ throughout an extended 57-66 GHz unlicensed band, or should we develop different technical rules for the 57-59 GHz and 64-66 GHz bands? If we

allows for co-channel fixed links to be established at intervals of about 5 kilometers and at much closer intervals with additional isolation provided by high antenna discrimination. Conversely, the band is not suitable for reliable point-to-point communications over path lengths exceeding about 1-2 kilometers, as the high propagation loss resulting from the O₂ absorption characteristic is accentuated by strong signal fade in even light rain. The band therefore is most suitable for high re-use, short range communications with a correspondingly low probability of co-channel interference. The gain of an antenna is proportional to its effective aperture, or size with respect to wavelength. As the wavelength at 58 GHz is in the order of 5 millimeters, an antenna of relatively small physical size is large compared to wavelength and will have correspondingly good gain, narrow beamwidth and be highly directional. In fixed point-to-point systems this means the likelihood of co-channel interference is even further reduced.

⁵⁶ See *Amendment of Parts 2, 15, and 97 of the Commission's Rules to Permit Use of Radio Frequencies Above 40 GHz for New Radio Applications*, ET Docket No. 94-124, RM-8308, *Memorandum Opinion and Order and Fourth Notice of Proposed Rule Making*, FCC 97-267, released August 14, 1997, at ¶¶ 23-26. See also *Report and Recommendations of the Millimeter Wave Communications Working Group to the Federal Communications Commission*, December 13, 1996.

⁵⁷ For products other than field disturbance sensors, Part 15 use of the 59-64 GHz band is limited to an average power density of 9 microwatts per square centimeter and a peak spectral power density of 18 microwatts per square centimeter, both as determined at a distance of 3 meters. See 47 C.F.R. § 15.255(b)(1).

⁵⁸ This proposal parallels 47 C.F.R. § 15.255(a)(1) and is in response to the requirement in footnote S5.558, which states, *inter alia*, that aeronautical mobile stations may be operated in the 55.78-58.2 GHz and 59-64 GHz bands subject to not causing harmful interference to ISS.

⁵⁹ See 47 C.F.R. § 15.255 - Operation within the band 59.0-64.0 GHz. Please note that 47 C.F.R. §§ 15.31, 15.215(a), and 15.255(a),(b) were amended by a recent Commission action; see note 52, *supra*.

adopt different technical rules, should either of the bands be channelized,⁶⁰ and should the use of listen-before-transmit etiquette be required on all or some of these channels?⁶¹

19. We request comment on all of the above proposals. Table 3, below, summarizes the spectrum that would be available for fixed and mobile services and unlicensed devices if these proposals are adopted.

| Table 3: Fixed and Mobile Services/Unlicensed Devices Overview | |
|---|--|
| Band | Comments |
| 51.4-52.6 GHz | Allocated to the fixed and mobile services |
| 55.78-57.00 GHz | Allocated to the fixed and mobile services, with the aeronautical mobile service prohibited from causing harmful interference to ISS |
| 57-59 GHz and 64-66 GHz | Available for unlicensed fixed, land mobile, and maritime mobile devices |
| 66-71 GHz | Allocated to the mobile service, with the aeronautical mobile service prohibited from causing harmful interference to ISS, and the land mobile service prohibited from causing harmful interference to all in-band space radiocommunication services |

C. Passive Sensors

20. Satellite-borne passive microwave sensors are used to obtain atmospheric temperature profiles that are of utmost importance to weather forecasting and to climate studies, and these sensor measurements can only be obtained in the vicinity of unique molecular oxygen resonance frequencies located between 50 GHz and 70 GHz.⁶² WRC-97 allocated the 59.0-59.3 GHz band

⁶⁰ See note 54, *supra*.

⁶¹ We note that the Australian Communications Authority has proposed that the 57.2-58.2 GHz band be channelized into ten 100 MHz channels and that systems that do not employ a listen-before-transmit etiquette be restricted to only two of these ten channels. This plan may allow up to 20 hops per square kilometer per channel, which for ten channels, equates to 200 hops per square kilometer. See note 55, *supra*.

⁶² Atmospheric temperature profiles are among the essential parameters which are routinely used by meteorological services for operational weather forecasting, and by the scientific community involved in climate and environmental monitoring studies. Atmospheric temperature profiles are currently obtained from spaceborne sounding instruments working in the infrared spectrum and in the microwave spectrum, including oxygen absorption around 60 GHz. As compared to infrared techniques, the all-weather capability (the ability for a

to the earth exploration-satellite (passive) and space research (passive) services on a primary basis and deleted unneeded earth exploration-satellite (passive) and space research (passive) service allocations from the 51.4-52.6 GHz and 64-65 GHz bands. WRC-97 also modified the text of footnote 907 (re-numbered as footnote S5.340) in order to delete the prohibition on emissions from the 51.40-54.25 GHz, 58.2-59.0 GHz, and 64-65 GHz bands and to add the prohibition on emissions to the 50.2-50.4 GHz and 52.60-54.25 GHz bands.⁶³ In order to implement domestically the WRC-97 revision of footnote S5.340, NTIA requests that the text of footnote US246 be modified to reflect these international rule changes. Similarly, NTIA requests that the text of footnote US263 be modified to specify that passive sensor operations in the 56.26-58.20 GHz band (rather than the 50.2-50.4 GHz and 54.25-58.20 GHz bands) will not receive protection from fixed and mobile services operating in accordance with the Table of Frequency Allocations.⁶⁴ We agree that these WRC-97 amendments and the consequential changes to United States footnotes adequately provide for passive sensor operations and therefore propose to implement these changes domestically. We request comment on all of the above proposals. Table 4, below, summarizes the net effect of our proposals in this instant proceeding on passive sensor operations.

spaceborne sensor to "see" through most clouds) is probably the most important feature that is offered by microwave techniques. This is fundamental for operation weather forecasting and atmospheric science applications, because more than 60% of the Earth's surface, on average, is totally obscured by clouds, and only 5% of any 20x20 kilometer spot (corresponding to the typical spatial resolution of the infrared sounders) is completely cloud-free. This situation severely hampers operation of infrared sounders, which have very little or no access to large, meteorologically active regions. The next O₂ absorption spectrum around 118 GHz has a lower potential due to its particular structure (monochromatic, as compared to the rich multi-line structure around 60 GHz) and is more heavily affected by the attenuation caused by atmospheric humidity. It appears that the 50-70 GHz region offers a unique possibility to perform all-weather measurements of the vertical atmospheric temperature profiles from a satellite's orbit. See note 48, *supra*.

⁶³ At WRC-95, footnote 907 and several other footnotes were combined and re-numbered as footnote S5.340. However, we have not previously considered this international decision and thus our Rules contain footnote 907. The text of footnote 907 reads as follows: "In the bands 51.4-54.25 GHz, 58.2-59 GHz, 64-65 GHz, 86-92 GHz, 105-116 GHz and 217-231 GHz, all emissions are prohibited." 47 C.F.R. § 2.106.

⁶⁴ In its May 1998 letter, NTIA originally requested that the text of footnote US263 be modified to specify that passive sensors in the 55.78-58.20 GHz band -- rather than the 56.26-58.20 GHz band -- would not receive protection from the fixed and mobile services operating in accordance with the Table of Frequency Allocations. Subsequently, NTIA requested that the text of footnote US263 be modified so that only passive sensors operating in the 56.26-58.20 GHz segment would not receive such protection. NTIA made this request because there have been studies within ITU Working Party 7C regarding compatibility between HDFS and passive satellite operations. These studies have identified potential sharing problems in the 55.78-56.26 GHz segment that may necessitate limiting the power and antenna pattern of HDFS systems in order to adequately protect critical passive sensor operations in this band. NTIA stated that further study within the ITU-R may be required. See Letter to Chief, Office of Engineering and Technology from Acting Associate Administrator, Office of Spectrum Management, NTIA, dated April 30, 1999. See also Appendix A, footnote US263 and 47 C.F.R. § 2.106. As discussed in ¶¶ 12-14, *supra*, we are proposing to delete the fixed and mobile service allocations in the 50.2-50.4 GHz and 54.25-55.78 GHz bands and to allocate the 51.4-52.6 GHz and 58.2-59.0 GHz bands to the fixed and mobile services on a primary basis.

| Table 4: Passive Sensor Overview | |
|-----------------------------------|---|
| Band | Comments |
| 50.2-50.4 GHz and 52.60-54.25 GHz | Bands allocated exclusively for passive sensor use, except that radio astronomy observations may also be made in the 52.60-54.25 GHz band under national arrangements; no stations will be authorized to transmit in these bands |
| 54.25-59.30 GHz | Shared spectrum, including unlicensed devices in the 57-59 GHz segment; passive sensor reception in the 55.78-58.20 GHz segment will not be protected from fixed and mobile services operating in accordance with the U.S. Table of Allocations |
| 65-66 GHz | Shared spectrum, including unlicensed devices |

D. Other Matters

21. Internationally, radio astronomy observations may be carried out under national arrangements in the 51.40-54.25 GHz, 58.2-59.0 GHz, and 64-65 GHz bands per footnote 906 (revised and re-numbered as footnote S5.556).⁶⁵ In the United States, these bands are allocated to the Government and non-Government radio astronomy ("RA") service on a primary basis.⁶⁶ Recently, the coordinator for Task 2 of ITU-R Joint Rapporteurs Group 7D-9D stated that:

there is no known usage of [the 51.4-52.6 GHz, 55.78-59.00 GHz, and 64-66 GHz bands] by the RA community (potentially due to atmospheric absorption) and no studies on potential sharing have been done to date. Even if radio astronomical use were to develop, there should not be any problems with radio astronomy stations sharing [these] band[s] with HDFS since RA use of these bands must

⁶⁵ See 47 C.F.R. § 2.106, footnote 906, which reads as follows: "In the bands 51.4-54.25 GHz, 58.2-59 GHz, 64-65 GHz, and 72.77-72.91 GHz, radio astronomy observations may be carried out under national arrangements. Administrations are urged to take all practicable steps to protect radio astronomy observations in these bands from harmful interference." Footnote 906 has been re-numbered as S5.556 and revised by adding the 93.07-93.27 GHz band and by deleting the second sentence. We note that emissions would be permitted in much of this radio astronomy spectrum (51.4-52.6 GHz, 58.2-59.0 GHz, and 64-66 GHz), if we adopt footnote S5.340, as proposed in ¶ 20, *supra*.

⁶⁶ We have proposed to allocate the 51.4-52.6 GHz, 58.2-59.0 GHz, and 64-66 GHz bands to the fixed and mobile services on a primary basis. See ¶¶ 12-19, *supra*. In order to permit these services to transmit, we have proposed to revise footnote US246, as discussed in ¶ 20, *supra*.

already be coordinated with the fixed service within individual Administrations. Therefore, sharing between HDFS and RA is a domestic issue.⁶⁷

NTIA requests that the radio astronomy service allocation be deleted from the 51.40-54.25 GHz and 64-65 GHz bands and that international footnote S5.556 be added to these bands. NTIA did not propose any change to the radio astronomy service allocation at 58.2-59.0 GHz.⁶⁸ We tentatively find that radio astronomy use of the 51.40-54.25 GHz and 64-65 GHz bands is a domestic issue that is best authorized under a national arrangement. Accordingly, we propose to delete radio astronomy service allocation from the 51.40-54.25 GHz and 64-65 GHz bands and to add international footnote S5.556 to these bands. We solicit comment on these proposals and on the specifics of such national arrangements. For example, should RA observatories that may need protection in the future be listed in a US footnote?

22. Finally, we propose to correct a typographical error in the Allocation Table by adding a reference to footnote S5.559 in the 59-64 GHz band. This reference has inadvertently been dropped from the Table.⁶⁹

IV. PROCEDURAL INFORMATION

23. Initial Regulatory Flexibility Analysis. Section 603 of the Regulatory Flexibility Act, as amended,⁷⁰ requires that the Commission prepare an Initial Regulatory Flexibility Analysis in notice and comment rulemaking proceedings, unless we certify that "the rule will not, if

⁶⁷ See ITU-R Document 7D-9D/30-E, dated August 11, 1998.

⁶⁸ During consultations with the National Science Foundation, it was confirmed that the RA community does not currently make use of the RA allocation at 58.2-59.0 GHz. Moreover, due to the propagation characteristics of the band, if this RA allocation is subsequently used, it would necessarily be limited to radio astronomy observations aboard spacecraft. See ¶¶ 15-19, *supra*, wherein we propose to make the 57-59 GHz band available for unlicensed use. We note that the technical rules for unlicensed devices in the 59-64 GHz band preclude operation aboard aircraft and spacecraft and are proposing a similar prohibition in this proceeding for unlicensed devices operating in the 57-59 GHz band. (The 64-66 GHz band is proposed to be allocated to the mobile except aeronautical mobile service.)

⁶⁹ The Commission had previously added a reference to footnote 910 (re-numbered as S5.559) in the 59-64 GHz band. See *Amendment of Parts 2, 15, and 97 of the Commission's Rules to Permit Use of Radio Frequencies Above 40 GHz for New Radio Applications*, ET Docket No. 94-124, *First Report and Order and Second Notice of Proposed Rule Making*, 11 FCC Rcd 4481 (1996). The text of footnote 910 reads as follows: "In the bands 59-64 GHz and 126-134 GHz, airborne radars in the radiolocation service may be operated subject to not causing harmful interference to the inter-satellite service (see No. 435)." When footnote 910 was re-numbered as S5.559, the cross reference in the text was updated to "(see No. S5.43)."

⁷⁰ See 47 U.S.C. § 603.

promulgated, have a significant economic impact on a significant number of small entities."⁷¹ In this *Notice of Proposed Rule Making*, we propose, *inter alia*, to reallocate spectrum that will result in net gain of 2.27 gigahertz of primary spectrum for fixed and mobile services, and to also designate 4 gigahertz of spectrum at 57-59 GHz and 64-66 GHz for unlicensed devices. We believe that this net increase in fixed and mobile spectrum and the designation of new unlicensed bands will provide new opportunities for small entities, without any known harmful effects. Accordingly, we hereby certify that the proposed reallocations will not, if promulgated, have significant economic impact on a significant number of small entities. The Secretary shall send a copy of this *Notice of Proposed Rule Making*, including the Initial Regulatory Flexibility Analysis, to the Chief Counsel for Advocacy of the Small Business Administration in accordance with Section 603(a) of the Regulatory Flexibility Act, 5 U.S.C. § 603(a).

24. Ex Parte Rules -- Permit-But-Disclose Proceedings. This is a permit-but-disclose notice and comment rule making proceeding. *Ex parte* presentations are permitted, except during any Sunshine Agenda period, provided they are disclosed as provided in the Commission's rules. See generally 47 C.F.R. Sections 1.1202(a), 1.1203, and 1.1206.

25. Authority. This action is taken pursuant to Sections 4(i), 7(a), 303(c), 303(f), 303(g), and 303(r) of the Communications Act of 1934, as amended, 47 U.S.C. Sections 154(i), 157(a), 303(c), 303(f), 303(g), and 303(r).

26. Comment. Pursuant to applicable procedures set forth in Sections 1.415 and 1.419 of the Commission's Rules, interested parties may file comments on or before **September 7, 1999**, and reply comments on or before **September 22, 1999**. All relevant and timely comments will be considered by the Commission before final action is taken in this proceeding. To file formally in this proceeding, participants must file an original and four copies of all comments, reply comments, and supporting comments. If participants want each Commissioner to receive a personal copy of their comments, an original plus nine comments must be filed. Comments and reply comments should be sent to Office of Secretary, Federal Communications Commission, 445 12th Street, SW, Washington, DC 20554. Comments and reply comments will be available for public inspection during regular business in the FCC Reference Center (Room TW-A306), 445 12th Street, SW, Washington, DC 20554.

⁷¹ *Id.* at § 605(b).

27. Additional Information. For further information concerning this rule making proceeding contact Tom Mooring at (202) 418-2450, internet: tmoothing@fcc.gov. Office of Engineering and Technology, Federal Communications Commission, Washington, DC 20554.

FEDERAL COMMUNICATIONS COMMISSION

Magalie Roman Salas
Secretary

Appendix A: Proposed Rules

Part 2 of title 47 of the Code of Federal Regulations is proposed to be 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: Sec. 4, 302, 303, and 307 of the Communications Act of 1934, as amended, 47 U.S.C. Sections 154, 302, 303 and 307, unless otherwise noted.

2. Section 2.106, the Table of Frequency Allocations, is amended as follows:
 - a. Remove the existing entries for the 50.2-50.4 GHz and 51.4-71.0 GHz band.
 - b. Add entries in numerical order for the 50.2-50.4 GHz and 51.4-71.0 GHz band.
 - c. In the International Footnotes under heading I., add footnotes S5.138, S5.340, S5.547, S5.553, S5.554, S5.555A, S5.556, S5.556A, S5.556B, S5.557, S5.557A, S5.558, and S5.559.
 - d. In the International Footnotes under heading II., remove footnote 911.
 - e. Revise footnotes US246 and US263.
 - f. Add footnote Gxxx.

§ 2.106 Table of Frequency Allocations

* * * * *

| International table | | | United States table | | FCC use designators | |
|--|----------------------------|----------------------------|---|---|---------------------|-------------------------|
| Region 1 -- allocation GHz | Region 2 -- allocation GHz | Region 3 -- allocation GHz | Government | Non-Government | Rule part(s) | Special-use frequencies |
| (1) | (2) | (3) | Allocation GHz (4) | Allocation GHz (5) | (6) | (7) |
| * | * | * | * | * | * | * |
| 50.2 – 50.4 EARTH EXPLORATION-SATELLITE (passive) SPACE RESEARCH (passive) S5.340 S5.555A | | | 50.2 – 50.4 EARTH EXPLORATION-SATELLITE (passive) SPACE RESEARCH (passive) S5.340 US246 | 50.2 – 50.4 EARTH EXPLORATION-SATELLITE (passive) SPACE RESEARCH (passive) S5.340 US246 | | |
| 51.4 – 52.6 FIXED MOBILE S5.547 S5.556 | | | 51.4 – 52.6 FIXED MOBILE S5.556 | 51.4 – 52.6 FIXED MOBILE S5.556 | | |
| 52.6 – 54.25 EARTH EXPLORATION-SATELLITE (passive) SPACE RESEARCH (passive) S5.340 S5.556 | | | 52.6 – 54.25 EARTH EXPLORATION-SATELLITE (passive) SPACE RESEARCH (passive) S5.556 US246 | 52.6 – 54.25 EARTH EXPLORATION-SATELLITE (passive) SPACE RESEARCH (passive) S5.556 US246 | | |
| 54.25 – 55.78 EARTH EXPLORATION-SATELLITE (passive) INTER-SATELLITE S5.556A SPACE RESEARCH (passive) S5.556B | | | 54.25 – 55.78 EARTH EXPLORATION-SATELLITE (passive) INTER-SATELLITE S5.556A SPACE RESEARCH (passive) | 54.25 – 55.78 EARTH EXPLORATION-SATELLITE (passive) INTER-SATELLITE S5.556A SPACE RESEARCH (passive) | | |

| International table | | | United States table | | FCC use designators | |
|--|-------------------------------|-------------------------------|--|--|---------------------------------|----------------------------|
| Region 1 -- allocation GHz | Region 2 -- allocation GHz | Region 3 -- allocation GHz | Government | Non-Government | Rule part(s) | Special-use frequencies |
| (1) | (2) | (3) | Allocation GHz (4) | Allocation GHz (5) | (6) | (7) |
| 55.78 – 56.9 EARTH EXPLORATION-SATELLITE (passive) FIXED INTER-SATELLITE S5.556A MOBILE S5.558 SPACE RESEARCH (passive) | | | 55.78 – 56.9 EARTH EXPLORATION-SATELLITE (passive) FIXED INTER-SATELLITE S5.556A MOBILE S5.558 SPACE RESEARCH (passive) | 55.78 – 56.9 EARTH EXPLORATION-SATELLITE (passive) FIXED INTER-SATELLITE S5.556A MOBILE S5.558 SPACE RESEARCH (passive) | | |
| S5.547 S5.557 | | | US263 | US263 | | |
| 56.9 – 57 EARTH EXPLORATION-SATELLITE (passive) FIXED INTER-SATELLITE S5.558A MOBILE S5.558 SPACE RESEARCH (passive) | | | 56.9 – 57 EARTH EXPLORATION-SATELLITE (passive) FIXED INTER-SATELLITE Gxxx MOBILE S5.558 SPACE RESEARCH (passive) | 56.9 – 57 EARTH EXPLORATION-SATELLITE (passive) FIXED MOBILE S5.558 SPACE RESEARCH (passive) | | |
| S5.547 S5.557 | | | US263 | US263 | | |
| 57 – 58.2 EARTH EXPLORATION-SATELLITE (passive) FIXED INTER-SATELLITE S5.556A MOBILE S5.558 SPACE RESEARCH (passive) | | | 57 – 58.2 EARTH EXPLORATION-SATELLITE (passive) FIXED INTER-SATELLITE S5.556A MOBILE S5.558 SPACE RESEARCH (passive) | 57 – 58.2 EARTH EXPLORATION-SATELLITE (passive) FIXED INTER-SATELLITE S5.556A MOBILE S5.558 SPACE RESEARCH (passive) | Radio Frequency Devices (15) | |
| S5.547 S5.557 | | | US263 | US263 | | |

| International table | | | United States table | | FCC use designators | |
|---|----------------------------|----------------------------|---|--|------------------------------|--|
| Region 1 -- allocation GHz | Region 2 -- allocation GHz | Region 3 -- allocation GHz | Government | Non-Government | Rule part(s) | Special-use frequencies |
| (1) | (2) | (3) | Allocation GHz (4) | Allocation GHz (5) | (6) | (7) |
| 58.2 – 59 EARTH EXPLORATION-SATELLITE (passive) FIXED MOBILE SPACE RESEARCH (passive) S5.547 S5.556 | | | 58.2 – 59 EARTH EXPLORATION-SATELLITE (passive) FIXED MOBILE RADIO ASTRONOMY SPACE RESEARCH (passive) | 58.2 – 59 EARTH EXPLORATION-SATELLITE (passive) FIXED MOBILE RADIO ASTRONOMY SPACE RESEARCH (passive) | Radio Frequency Devices (15) | |
| 59 – 59.3 EARTH EXPLORATION-SATELLITE (passive) FIXED INTER-SATELLITE S5.556A MOBILE S5.558 RADIOLOCATION S5.559 SPACE RESEARCH (passive) | | | 59 – 59.3 EARTH EXPLORATION-SATELLITE (passive) FIXED INTER-SATELLITE S5.556A MOBILE S5.558 RADIOLOCATION S5.559 SPACE RESEARCH (passive) | 59 – 59.3 EARTH EXPLORATION-SATELLITE (passive) FIXED MOBILE S5.558 RADIOLOCATION S5.559 SPACE RESEARCH (passive) | Radio Frequency Devices (15) | |
| 59.3 – 64 FIXED INTER-SATELLITE MOBILE S5.558 RADIOLOCATION S5.559 S5.138 | | | 59.3 – 64 FIXED INTER-SATELLITE MOBILE S5.558 RADIOLOCATION S5.559 S5.138 | 59.3 – 64 FIXED MOBILE S5.558 RADIOLOCATION S5.559 S5.138 | Radio Frequency Devices (15) | 61.25 GHz + 250 MHz: Industrial, scientific, and medical frequency |

| International table | | | United States table | | FCC use designators | |
|---|----------------------------|----------------------------|---|---|------------------------------|-------------------------|
| Region 1 -- allocation GHz | Region 2 -- allocation GHz | Region 3 -- allocation GHz | Government | Non-Government | Rule part(s) | Special-use frequencies |
| (1) | (2) | (3) | Allocation GHz (4) | Allocation GHz (5) | (6) | (7) |
| 64 - 65 FIXED INTER-SATELLITE MOBILE except aeronautical mobile S5.547 S5.556 | | | 64 - 65 FIXED INTER-SATELLITE MOBILE except aeronautical mobile S5.556 | 64 - 65 FIXED MOBILE except aeronautical mobile S5.556 | Radio Frequency Devices (15) | |
| 65 - 66 EARTH EXPLORATION-SATELLITE FIXED INTER-SATELLITE MOBILE except aeronautical mobile SPACE RESEARCH S5.547 | | | 65 - 66 EARTH EXPLORATION-SATELLITE FIXED MOBILE except aeronautical mobile SPACE RESEARCH | 65 - 66 EARTH EXPLORATION-SATELLITE FIXED INTER-SATELLITE MOBILE except aeronautical mobile SPACE RESEARCH | Radio Frequency Devices (15) | |
| 66 - 71 INTER-SATELLITE MOBILE S5.553 S5.558 MOBILE-SATELLITE RADIONAVIGATION RADIONAVIGATION-SATELLITE S5.554 | | | 66 - 71 MOBILE S5.553 S5.558 MOBILE-SATELLITE RADIONAVIGATION RADIONAVIGATION-SATELLITE S5.554 | 66 - 71 INTER-SATELLITE MOBILE S5.553 S5.558 MOBILE-SATELLITE RADIONAVIGATION RADIONAVIGATION-SATELLITE | | |
| . | . | . | . | . | . | . |

INTERNATIONAL FOOTNOTES

* * * * *

I. New "S" Numbering Scheme.

* * * * *

S5.138 The following bands:

6765-6795 kHz (centre frequency 6780 kHz),
 433.05-434.79 MHz (centre frequency 433.92 MHz) in Region 1 except in the
 countries mentioned in No. S5.280,
 61-61.50 GHz (centre frequency 61.25 GHz),
 122-123 GHz (centre frequency 122.5 GHz), and
 244-246 GHz (centre frequency 245 GHz)

are designated for industrial, scientific and medical (ISM) applications. The use of these frequency bands for ISM applications shall be subject to special authorization by the administration concerned, in agreement with other administrations whose radiocommunication services might be affected. In applying this provision, administrations shall have due regard to the latest relevant ITU-R Recommendations

* * * * *

S5.340 All emissions are prohibited in the following bands:

1400-1427 MHz,
 2690-2700 MHz, except those provided for by Nos. S5.421 and S5.422,
 10.68-10.7 GHz, except those provided for by No. S5.483,
 15.35-15.4 GHz, except those provided for by No. S5.511,
 23.6-24 GHz,
 31.3-31.5 GHz,
 31.5-31.8 GHz, in Region 2,
 48.94-49.04 GHz, from airborne stations,
 50.2-50.4 GHz,² except those provided for by No. S5.555A,
 52.6-54.25 GHz,
 86-92 GHz,
 105-116 GHz,
 140.69-140.98 GHz, from airborne stations and from space stations in the space-to-Earth direction,

² S5.340.1 The allocation to the earth exploration-satellite service (passive) and the space research service (passive) in the band 50.2-50.4 GHz should not impose undue constraints on the use of the adjacent bands by the primary allocated services in those bands.

182-185 GHz, except those provided for by No. S5.563,
217-231 GHz.

* * * * *

S5.547 The bands 31.8-33.4 GHz, 51.4-52.6 GHz, 55.78-59 GHz and 64-66 GHz are available for high-density applications in the fixed service (see Resolution 726 (WRC-97)).

* * * * *

S5.553 In the bands 43.5-47 GHz, 66-71 GHz, 95-100 GHz, 134-142 GHz, 190-200 GHz and 252-265 GHz, stations in the land mobile service may be operated subject to not causing harmful interference to the space radiocommunication services to which these bands are allocated (see No. S5.43).

S5.554 In the bands 43.5-47 GHz, 66-71 GHz, 95-100 GHz, 134-142 GHz, 190-200 GHz and 252-265 GHz, satellite links connecting land stations at specified fixed points are also authorized when used in conjunction with the mobile-satellite service or the radionavigation-satellite service.

* * * * *

S5.555A The band 50.2-50.4 GHz is also allocated, on a primary basis, to the fixed and mobile services until 1 July 2000.

S5.556 In the bands 51.4-54.25 GHz, 58.2-59 GHz, 64-65 GHz, 72.77-72.91 GHz and 93.07-93.27 GHz, radio astronomy observations may be carried out under national arrangements.

S5.556A Use of the bands 54.25-56.9 GHz, 57-58.2 GHz and 59-59.3 GHz by the inter-satellite service is limited to satellites in the geostationary-satellite orbit. The single-entry power flux-density at all altitudes from 0 km to 1000 km above the Earth's surface produced by a station in the inter-satellite service, for all conditions and for all methods of modulation, shall not exceed -147 dB(W/m²/100 MHz) for all angles of arrival.

S5.556B Additional allocation: in Japan, the band 54.25-55.78 GHz is also allocated to the mobile service on a primary basis for low-density use.

S5.557 Additional allocation: in Japan, the band 55.78-58.2 GHz is also allocated to the radiolocation service on a primary basis.

S5.558 In the bands 55.78-58.2 GHz, 59-64 GHz, 66-71 GHz, 116-134 GHz, 170-182 GHz and 185-190 GHz, stations in the aeronautical mobile service may be operated subject to not causing harmful interference to the inter-satellite service (see No. S5.43).

S5.558A Use of the band 56.9-57 GHz by inter-satellite systems is limited to links between satellites in geostationary-satellite orbit and to transmissions from non-geostationary satellites in high-Earth orbit to those in low-Earth orbit. For links between satellites in the geostationary-satellite orbit, the single-entry power flux-density at all altitudes from 0 km to 1000 km above the Earth's surface, for all conditions and for all methods of modulation, shall not exceed -147 dB(W/m²/100 MHz) for all angles of arrival.

S5.559 In the bands 59-64 GHz and 126-134 GHz, airborne radars in the radiolocation service may be operated subject to not causing harmful interference to the inter-satellite service (see No. S5.43).

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UNITED STATES (US) FOOTNOTES

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US246 No stations will be authorized to transmit in the bands 608-614 MHz, 1400-1427 MHz, 1660.5-1668.4 MHz, 2690-2700 MHz, 4990-5000 MHz, 10.68-10.70 GHz, 15.35-15.40 GHz, 23.6-24.0 GHz, 31.3-31.8 GHz, 50.2-50.4 GHz, 52.6-54.25 GHz, 86-92 GHz, 100-102 GHz, 105-116 GHz, 164-168 GHz, 182-185 GHz and 217-231 GHz.

* * * * *

US263 In the frequency bands 21.2-21.4, 22.21-22.5, 36-37, 56.26-58.2, 116-126, 150-151, 174.5-176.5, 200-202 and 235-238 GHz, the space research and the earth exploration-satellite services shall not receive protection from the fixed and mobile services operating in accordance with the Table of Frequency Allocations.

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GOVERNMENT (G) FOOTNOTES

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Gxxx Use of the band 56.9-57 GHz by inter-satellite systems is limited to transmissions between satellites in geostationary orbit, to transmissions between satellites in geostationary satellite orbit and those in high-Earth orbit, to transmissions from satellites in geostationary

satellite orbit to those in low-Earth orbit, and to transmissions from non-geostationary satellites in high-Earth orbit to those in low-Earth orbit. For links between satellites in the geostationary satellite orbit, the single entry power flux-density at all altitudes from 0 km to 1000 km above the Earth's surface, for all conditions and for all methods of modulation, shall not exceed -147 dB (W/m²/100 MHz) for all angles of arrival.

* * * * *

Appendix B: Demand for Commercial ISS Spectrum

1. On October 9, 1998, at the request of Commission staff, the following Ka-band licensees submitted revised requests for specific ISS bands:

| Table 1: ISS Spectrum Requested by Ka-band Licensees | |
|---|--|
| Licensee | ISS Band(s) Requested |
| Comm, Inc. | 65-71 GHz |
| GE Americom | 54.25-55.00 GHz, 55.25-55.50 GHz, 57.00-57.25 GHz, and 57.50-58.25 GHz |
| Hughes | 54.25-58.20 GHz and 65-71 GHz |
| KaStar | 65-71 GHz |
| Lockheed Martin | 54.25-54.85 GHz, 55.925-56.525 GHz, and 57.6-58.2 GHz |
| Loral | 65-66, 67.5-68.5, and 70-71 GHz |
| PanAmSat | 54-58 and 65-71 GHz |
| Teledesic | 65-71 GHz |

2. We also have pending applications on file for ISS spectrum from four applicants in the second Ka-band processing round, from one 2 GHz applicant, and from five applicants in the 40 GHz processing round:

| Table 2: ISS Spectrum Requested by Second Round Ka-Band Applicants | |
|---|--|
| Applicant | ISS Band(s) Requested |
| Directcom Networks, Inc. | 54.25-58.20 GHz or 65-71 GHz |
| Lockheed Martin | 54.25-58.20 GHz or 65-71 GHz |
| PanAmSat | 22.55-23.55 GHz, 32-33 GHz, 54.25-58.20 GHz, and 65-71 GHz |
| Pegasus Development Corporation | 50-70 GHz |

Table 3: ISS Spectrum Requested by 2 GHz Applicant

| Applicant | ISS Band(s) Requested |
|------------------|-----------------------|
| Globalstar, L.P. | 59-64 GHz |

Table 4: ISS Spectrum Requested by 40 GHz Applicants

| Applicant | ISS Band(s) Requested |
|------------------|--|
| Lockheed Martin | 54.25-58.20 GHz, 59-64 GHz, or 65-71 GHz |
| Loral | 54.25-58.20 GHz or 59-64 GHz |
| Motorola | 59-64 GHz and 65-71 GHz |
| Orbital Sciences | 65-71 GHz |
| PanAmSat | 22.50-23.55 GHz, 32-33 GHz, 54.25-58.20 GHz, and 59-64 GHz |

The 40 GHz applicants filed the above applications for ISS spectrum prior to WRC-97. The International Bureau expects to issue a public notice requesting, *inter alia*, that the 40 GHz applicants file conforming amendments to their applications to bring their spectrum requests up to date.

