

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554**

In the Matter of))
))
Allocation and Designation of Spectrum) IB Docket No. 97-95
for Fixed-Satellite Services))
in the 37.5-38.5 GHz, 40.5-41.5 GHz,) RM-8811
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.))

REPORT AND ORDER

Adopted: December 17, 1998

Released: December 23, 1998

By the Commission:

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I. INTRODUCTION

1. In this Report and Order ("*Order*") we adopt a plan for non-Government operations in the 36.0-51.4 GHz portion of the V-band. Although most of this band is currently allocated¹ on a co-primary² basis for the fixed, mobile, fixed-satellite ("FSS") and mobile-satellite ("MSS") services, and for non-Government as well as Government operations, there has been little commercial use of this band to date except for the 38.6-40.0 GHz band, which is being used on a point-to-point and point-to-multipoint basis. In the band plan adopted today, we provide separate primary designations³ for non-Government wireless⁴ and FSS services

¹ An allocation is an entry in the Table of Frequency Allocations of a service or services for use of a specific frequency band.

² A service that is primary is the only service given priority status to operate in a frequency band. A service that is co-primary must share operations with other services specified as co-primary in the frequency band on a co-equal basis. A service that is secondary is allowed to use the band as long as its operations do not cause interference to any primary operations, and it must accept any interference caused by a primary service. If a secondary service operation causes interference to a primary service, the secondary service provider must eliminate the interference or cease operation. *See generally* 47 C.F.R. § 2.105(c).

³ A designation provides an allocated service or services use of a specific frequency band for which other services may also be allocated. *See supra* note 1. Designations are generally only needed where bands are allocated to more than one service and sharing between these services may be difficult.

throughout the 36.0-51.4 GHz band.⁵ Our goal is to provide an overall framework for commercial development of this band and to help such development to occur without the technical constraints that result from ubiquitous wireless and satellite services sharing the same spectrum on a co-primary basis.

2. In the new band plan we: (1) designate a total of 4 gigahertz of spectrum for FSS use on a primary basis in the 37.6-38.6 GHz, 40.0-41.0 GHz and 48.2-50.2 GHz bands; (2) provide a total of 5.6 gigahertz of spectrum for wireless services use on a primary basis, by retaining the existing wireless designations in the 38.6-40.0 GHz and 47.2-48.2 GHz bands, and adding new wireless designations on a primary basis in the 37.0-37.6 GHz, 41.0-42.5 GHz, 46.9-47.0 GHz and 50.4-51.4 GHz bands; and (3) retain the existing designations for unlicensed commercial vehicular radar in the 46.7-46.9 GHz band and for amateur services in the 47.0-47.2 GHz band. The 36.0-37.0 GHz, 42.5-46.7 GHz, and 50.2-50.4 GHz bands remain undesignated.

3. This band plan is the same as that proposed in the *Notice of Proposed Rulemaking* with three exceptions.⁶ First, while the *NPRM* proposed to designate the 37.5-37.6 GHz (100 megahertz) and 41.0-41.5 GHz (500 megahertz) bands for FSS, and the 38.5-38.6 GHz (100 megahertz) and 40.0-40.5 GHz (500 megahertz) bands for wireless services, in this *Order* we reverse these service designations and instead designate the 37.5-37.6 GHz and 41.0-41.5 GHz bands for wireless services, and the 38.5-38.6 GHz and 40.0-40.5 GHz bands for FSS. Second, while the *NPRM* proposed to provide separate designations for Geostationary Orbit fixed-satellite service ("GSO/FSS") and Non-Geostationary Orbit fixed-satellite service ("NGSO/FSS") operations, in this *Order* we decide not to make such additional designations at

⁴ We anticipate that the bands designated for wireless services will be used for terrestrial fixed and mobile services. As discussed below, we note that the bands designated today will be the subject of further proceedings to develop service, licensing and auction rules for the wireless services. During those proceedings we will also address the relationship between the wireless services and other services currently sharing those allocations, bearing in mind our objective to give licensees the flexibility required to provide their desired services. See *infra* para. 36.

⁵ Pre-existing primary designations for wireless, unlicensed commercial vehicular radar and amateur services are not changed by this *Order*, which provides designations only for several previously undesignated bands.

⁶ See In the Matter of 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, *Notice of Proposed Rule Making*, 12 FCC Rcd 10130 (1997) (hereafter "*NPRM*").

this time, because we do not yet know the extent to which GSO and NGSO operations will occupy the bands designated for FSS. Third, while the *NPRM* proposed to allow "underlay" licenses, *i.e.*, the licensing of a second service in the bands designated for FSS,⁷ in this *Order* we find that underlay licenses could make it more difficult to administer the various services and could increase the potential for interference between satellite and wireless services. Accordingly, we do not adopt underlay licensing in this proceeding.

4. We also revise the non-Government column of the U.S. Table of Frequency Allocations to accommodate the band plan.⁸ We add primary allocations for FSS in the 37.6-38.6 GHz and 40.5-41.0 GHz bands to accommodate the new FSS designations in these bands. We also upgrade the fixed and mobile allocations in the 41.0-42.5 GHz band from secondary to primary status to accommodate the new wireless services designation in this band. In addition, we add a primary allocation for fixed service to the existing mobile service allocation in the 46.9-47.0 GHz band, again to accommodate a new wireless services designation.

5. Finally, we revise the U.S. Table of Allocations to address Government operations in the 36.0-51.4 GHz band. Specifically, at the request of the National Telecommunications and Information Administration ("NTIA"), we add the following allocations to the Government column of the U.S. Table: (1) space research (space-to-Earth) on a primary basis in the 37.0-38.0 GHz band; (2) space research (Earth-to-space) and earth exploration-satellite ("EES") (Earth-to-space), both on a primary basis, in the 40.0-40.5 GHz band; and (3) EES (space-to-Earth) on a secondary basis in the 40.0-40.5 GHz band.⁹ These allocations will allow certain additional Government operations in the band. In addition, we also reallocate the 42.5-43.5 GHz band for exclusive Government use, except for radio astronomy, and the 47.2-48.2 GHz band for exclusive non-Government use to better meet the needs of Government and commercial operators in this band.¹⁰

II. BACKGROUND

⁷ As described in the *NPRM*, an underlay would involve licensing a second service in a manner that would not interfere with the predominant use in the band. Under the *NPRM* proposal, underlay operations would have more rights than those afforded to secondary operations, but the exact nature of underlay licenses was not further defined in the *NPRM*.

⁸ See U.S. Table of Frequency Allocations at Section 2.106 of the Commission's Rules, 47 C.F.R. § 2.106.

⁹ See Memorandum of March 21, 1995, from William Gamble, Chairman, NTIA's Interdepartment Radio Advisory Committee ("IRAC") to William Torak, FCC Representative to IRAC.

¹⁰ See Letter of September 24, 1998, from William T. Hatch of NTIA, to Dale Hatfield, Chief, Office of Engineering and Technology.

6. Spectrum between 30 and 300 GHz is known as the millimeter wave band.¹¹ Prior to 1994, most millimeter wave technology was funded by the Government for military and scientific applications. Thus, while most of the 36.0-51.4 GHz spectrum is allocated for both Government and non-Government operations, there has been little commercial use of the band.¹² Since 1994, the Commission has initiated three proceedings that seek to make spectrum above 30 GHz available for commercial use.

7. First, in 1994, the Commission initiated a rulemaking proceeding, ET Docket No. 94-124, to open 18 gigahertz of spectrum between 40.5 GHz and 153 GHz for commercial use on a shared basis with existing and future Government operations ("Millimeter Wave" proceeding).¹³ In this proceeding, the Commission proposed to allocate the 40.5-42.5 GHz and the 47.2-48.2 GHz bands for new millimeter wave technology. The Commission also allocated the 46.7-46.9 GHz band for unlicensed vehicular radar use. We are currently developing service, licensing and auction rules for the 47.2-48.2 GHz band.¹⁴

8. Second, in December 1995, the Commission adopted a *Notice of Proposed Rulemaking and Order* in ET Docket No. 95-183 that proposed to provide additional spectrum between 37.0-38.6 GHz for terrestrial point-to-point operations ("39 GHz" proceeding).¹⁵ In this

¹¹ The term millimeter wave connotes the wavelength of radio signals which, for this band, is between 1 and 10 millimeters.

¹² Spectrum above 40 GHz has been used by the Government for experimental and operational systems for several years. However, other than satellite systems and radio astronomy observatories, there are relatively few Government operational systems at present.

¹³ See In the Matter of Amendment of Parts 2, 15, and 21 of the Commission's Rules to Permit Use of Radio Frequencies Above 40 GHz for New Radio Applications, ET Doc. No. 94-124, *Notice of Proposed Rulemaking*, 9 FCC Rcd 7078 (1994).

¹⁴ See In the Matter of 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 Doc. No. 94-124, *First Report and Order and Second Notice of Proposed Rulemaking*, 11 FCC Rcd 44871 (1995) concerning the 46.7-46.9 GHz band for vehicle radar, and *Memorandum Opinion and Order on Reconsideration and Notice of Proposed Rulemaking*, 13 FCC Rcd _____ (1998) [1998WL426179(F.C.C.)] concerning service, licensing, and competitive auction rules for the 47.2-48.2 GHz band. In this band stratospheric platforms are considered terrestrial operations.

¹⁵ See In the Matter of Amendment of the Commission's Rules Regarding the 37.0-38.6 GHz and 38.6-40.0 GHz Band – Implementation of Section 309(j) of the Communications Act, ET Docket No. 95-183 *Notice of Proposed Rulemaking and Order*, 11 FCC Rcd 4930 (1995).

proceeding, the Commission also proposed to modify existing rules governing fixed point-to-point operations in the 38.6-40.0 GHz band to permit competitive wireless operations. We are currently developing service, licensing and auction rules for the 38.6-40.0 GHz band.¹⁶

9. After release of Notices in the Millimeter Wave and 39 GHz proceedings, new technological developments led to the filing of applications for new systems in the 36.0-51.4 GHz band.¹⁷ In addition, on March 4, 1996, Motorola Satellite Communications, Inc. ("Motorola") filed a Petition for Rulemaking seeking allocation of the 37.5-38.6 GHz band to FSS (space-to-Earth) on a co-primary basis.¹⁸ Motorola's petition was placed on public notice, and comments were filed.¹⁹

10. In March 1997, the Commission issued the *NPRM* in this proceeding, proposing a band plan that would establish an overall framework for operations in the 36.0-51.4 GHz band.²⁰ The Commission considered such a framework necessary because of the various competing proposals involving frequencies in this band,²¹ the two ongoing rulemaking proceedings, and the difficulties inherent in sharing between ubiquitous wireless and satellite

¹⁶ ***See* in the Matter of Amendment of the Commission's Rules Regarding the 37.0-38.6 GHz and 38.6-40.0 GHz Bands -- Implementation of Section 309(j) of the Communications Act -- Competitive Bidding, 37.0-38.6 GHz and 38.6-40.0 GHz, ET Docket No. 95-183, *Report and Order and Second Notice of Proposed Rule Making*, 12 FCC Rcd 18600 (1997), where service, licensing, and competitive auction rules are being developed. In that *Report and Order*, the Commission facilitated additional flexibility in the 38.6-40.0 GHz band consistent with the allocation to fixed and mobile services. *Id.* at para. 2. While fixed services were expanded to include point-to-multipoint operations, mobile operations were not permitted until inter-licensee and inter-service standards and criteria were adopted. *Id.* at para. 20-25.**

¹⁷ ***See, e.g.*, Sky Station Request to Establish New GETS Service, Additional Comments and Petition for Rulemaking, ET Docket No. 94-124, RM-8784, and Application of Sky Station International, Inc. for Authority to Construct, Deploy and Operate a Global Stratospheric Telecommunications System, File No. 96-SAT-P/LA-96 (both filed, March 20, 1996) and Further Comments of Sky Station International, Inc., (filed, Dec. 24, 1996). *See also* Motorola Satellite Systems, Inc.'s Application to Construct, Launch and Operate the M-Star System, File No. 157-SAT-P/LA-96(72) (filed, September 4, 1996).**

¹⁸ ***See NPRM* note 5.**

¹⁹ ***Id.* In the *NPRM*, we stated that we were granting Motorola's petition to the extent that it was consistent with the proposals in the *NPRM*. *Id.* at note 5 and para. 45.**

²⁰ *See supra* note 6.

²¹ ***See supra* para. 9.**

services. The Commission stated that a band plan would clarify the relationship among the various ongoing proceedings, ensure that all proposed uses were given due consideration, and help to foster better business planning and expeditious development of this spectrum.²² In the *NPRM*, the Commission proposed to designate 4 gigahertz of spectrum for FSS on a primary basis and 5.6 gigahertz for wireless services on a primary basis out of a total of 15.4 gigahertz of spectrum in the band.²³ The Commission also proposed to revise the U.S. Table of Frequency Allocations, as necessary, to accommodate the proposed designations. In response to a request by NTIA,²⁴ the Commission also proposed to adopt new Government allocations in the 37.0-38.0 GHz and 40.0-40.5 GHz bands.²⁵

11. In developing the proposed band plan, the Commission considered the requirements of existing licensees as well as the requirements for both wireless and satellite services as stated in pending applications and proposals, such as those from Sky Station and Motorola.²⁶ Furthermore, noting that much of the band is allocated on a co-primary basis for both Government and non-Government use, the Commission requested comment on the practicality of sharing with Government users.²⁷ The Commission also stated that service and licensing rules for specific bands and specific designations for wireless services would be the subject of separate ongoing or future rulemaking proceedings. In response to the *NPRM*, 16 comments²⁸ and 15 reply comments were filed.²⁹ The Commission subsequently opened a satellite filing window for the 36.0-51.4 GHz band, during which 15 satellite applications were filed.³⁰

²² See *NPRM* para. 9.

²³ See *NPRM* para. 14.

²⁴ See *supra* note 9.

²⁵ **At WARC-92 the international Table of Frequency Allocations was amended with the addition of the space research service to the 37.0-38.0 GHz band and the space research and earth exploration-satellite services to the 40.0-40.5 GHz band.**

²⁶ See *supra* para. 9 and note 17.

²⁷ See *NPRM* para. 20.

²⁸ Cellular Phone Taskforce, in its comments, suggests that we place a moratorium on licensing new spectrum to wireless and satellite systems pending the final resolution of environmental issues it raised in another Commission action; however, this request is beyond the scope of this proceeding.

²⁹ See Appendix A for a list of commenters.

³⁰ The satellite filing window was from July 22, 1997 through September 26, 1997.

12. On September 24, 1998, NTIA filed a letter proposing that the 42.5-43.5 GHz band be reallocated for exclusive Government use and the 47.2-48.2 GHz band be reallocated for exclusive non-Government use.³¹ NTIA stated that these reallocations would address Government spectrum requirements in the 40 GHz band, while assuring commercial bidders that the 47 GHz band would remain usable for commercial operations. The request was placed on Public Notice and 4 comments were filed.³²

III. DISCUSSION

A. Band Plan

1. Overview of Band Plan

13. In developing the band plan, we considered the feasibility of sharing between FSS and wireless services and the amount of spectrum needed by these services. As discussed further below, we conclude that the public interest is best served by providing separate primary designations for FSS and wireless services because of the technical difficulties involved in sharing. We also conclude that designation of 4 gigahertz for FSS on a primary basis and 5.6 gigahertz for wireless services on a primary basis, as proposed in the *NPRM*, strikes a reasonable balance of spectrum resources between the needs of these services and will provide the users with the opportunity to meet their current and future needs in this band.

14. The following chart illustrates the band plan (*i.e.*, designations) proposed in the *NPRM* and the band plan adopted in this *Order*. A blank space in the rows of the chart labeled "NPRM Band Plan" and "R&O Band Plan" indicates that there is no commercial designation for that band segment, while parentheses indicate pre-existing designations.³³ The chart also shows

³¹ See *supra* note 10.

³² See Appendix A for a list of commenters. The Public Notice was dated Oct. 1, 1998.

³³ This *Order* provides designations only for certain previously undesignated bands. Pre-existing designations

the current domestic allocations for non-Government services in the 36.0-51.4 GHz band and the changes to these allocations adopted in this *Order*.³⁴ A blank space in the row labeled "R & O Allocation Changes" indicates that we have made no change to the existing allocation for that band segment.³⁵

are not changed by this *Order*.

³⁴ *See supra* note 8.

³⁵ In addition, primary allocations are specified in capital letters and secondary allocations are specified in lower case letters. *See supra* note 2.

Non-Government Allocations and Designations in the 36.0-51.4 GHz Band

Current Allocations	EES, SPACE RESEARCH, FIXED, MOBILE	FIXED, MOBILE	FIXED, MOBILE	FIXED, MOBILE FSS, MSS(39.5-40)	FSS, MSS	BSS, fixed, mobile, BROADCASTING	BSS, fixed, mobile, BROADCASTING	BSS, fixed, mobile, BROADCASTING	
R&O Allocation Changes		¹	add FSS ¹		²	add FSS	change fixed, mobile to FIXED, MOBILE	change fixed, mobile to FIXED, MOBILE	
NPRM Band Plan³		Wireless Services (37.0-37.5)	FSS/NGSO (37.5-38.5) Wireless Services (38.5-38.6)	(Wireless Services)	Wireless Services	FSS/GSO	FSS/GSO	Wireless Services	
R&O Band Plan³	1000 MHz	Wireless Services 600 MHz	FSS 1000 MHz	(Wireless Services) 1400 MHz	FSS, MSS 500 MHz	FSS, BSS 500 MHz	Wireless Services 500 MHz	Wireless Services 1000 MHz	
	36.0	37.0	37.6	38.6	40.0	40.5	41.0	41.5	42.5

Current Allocations	FIXED, MOBILE, FSS, RADIO ASTRONOMY	None - Exclusive Government	MOBILE, MSS, RNSS	MOBILE, MSS, RNSS	MOBILE, MSS, RNSS	AMATEUR, AMATEUR-SATELLITE	FIXED, FSS, MOBILE	FIXED, FSS, MOBILE	
R&O Allocation Changes	Exclusive Government ⁴				add FIXED		Exclusive Non-Government		
NPRM Band Plan³				(Unlicensed Commercial Vehicular Radar)	Wireless Services	(Amateur)	(Wireless Services)	FSS/NGSO	
R&O Band Plan³	1000 MHz	2000 MHz	1200 MHz	200 MHz	100 MHz	200 MHz	1000 MHz	1000 MHz	
	42.5	43.5	45.5	46.7	46.9	47.0	47.2	48.2	49.2

Current Allocations	FIXED, FSS, MOBILE	FIXED, MOBILE, EES, SPACE RESEARCH	FIXED, FSS, MOBILE, MSS
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1 Space Research is added to the 37.0-38.0 GHz band to the Government column of the U.S. Table.

2 Space Research and Earth Exploration-Satellite are added to the 40.0-40.5 GHz band to the Government column of the U.S. Table.

3 Blank indicates no commercial designation in that band. Parentheses indicate pre-existing designations. Pre-existing designations are not changed by this R&O, which provides designations only for previously undesignated bands.

R&O Allocation Charges			
NPRM Band Plan³	FSS/GSO		Wireless Services
R&O Band Plan³	FSS 1000 MHz	200 MHz	Wireless Services 1000 MHz
	49.2	50.2	50.4 51.4

4 Except for non-Government radio astronomy.

15. As shown in the chart, there are 15.4 gigahertz of spectrum in the 36.0-51.4 GHz band, with much of it currently allocated to wireless services and FSS on a co-primary basis. In this *Order*, we designate a total of 4 gigahertz of spectrum for FSS on a primary basis at 37.6-38.6 GHz (1000 megahertz) and 40.0-41.0 GHz (1000 megahertz) for downlinks, and 48.2-50.2 GHz (2000 megahertz) for uplinks. We also provide a total of 5.6 gigahertz of spectrum for wireless services on a primary basis by retaining the existing wireless services designations at 38.6-40.0 GHz (1400 megahertz) and 47.2-48.2 GHz (1000 megahertz) and adding designations for wireless services at 37.0-37.6 GHz (600 megahertz), 41.0-42.5 GHz (1500 megahertz), 46.9-47.0 GHz (100 megahertz), and 50.4-51.4 GHz (1000 megahertz). We also retain the existing designation for unlicensed commercial vehicular radar at 46.7-46.9 GHz (200 megahertz) and amateur services at 47.0-47.2 GHz (200 megahertz). Three gigahertz of spectrum at 42.5-45.5 GHz is allocated for exclusive Government use. There are no current commercial designations in the remaining 2.4 gigahertz of the band, *i.e.*, the 36.0-37.0 GHz, 45.5-46.7 GHz and 50.2-50.4 GHz bands, and we do not adopt any in this *Order*. The band plan is the same as that proposed in the *NPRM*, except that: (1) the proposed FSS service designations in the 37.5-37.6 GHz and 41.0-41.5 GHz bands and the proposed wireless service designations in the 38.5-38.6 GHz and 40.0-40.5 GHz bands are reversed; (2) we do not provide separate designation for GSO/FSS and NGSO/FSS; and (3) we do not provide for "underlay" licenses in the FSS designated bands.

2. Sharing Issues

a. FSS and Wireless Services

16. Background In the *NPRM*, the Commission proposed separate designations for FSS and wireless services because of the technical difficulties involved in sharing between ubiquitous wireless and satellite systems.³⁶ The Commission noted that frequency sharing was an issue of some contention and concluded that a band plan, with discrete sub-bands designated for different types of high-density services,³⁷ would provide the various proposed systems with the best opportunity to succeed.³⁸ The Commission also concluded that there was sufficient spectrum in the band to accommodate current and proposed uses without the need for sharing.³⁹

³⁶ Some FSS and fixed service systems have been able to share spectrum in instances where there have been few satellite earth terminals and primarily fixed, point-to-point terrestrial operations. In these instances, coordination of specific sites and facilities is required to obtain interference-free operations by both services.

³⁷ Generally, "high density services" refer to services in which the user population (or terminal population) is very high for a particular area.

³⁸ See *NPRM* para. 12.

³⁹ See *NPRM* para. 13.

17. Discussion The majority of commenters supported separate designations for FSS and wireless services, with many arguing that band sharing would not be feasible.⁴⁰ Teledesic states that separate frequency bands, in which each service can develop without constraint, will provide operators with the flexibility and freedom for technical innovation needed to succeed, while sharing would limit flexibility and impose additional cost burdens.⁴¹ ART argues that sharing would result in interference requiring impractical or unduly expensive methods to mitigate.⁴² Several satellite commenters, however, assert that it is premature to foreclose sharing without further exploration.⁴³ Lockheed argues that the question is not whether sharing is feasible, but to what degree, and what burdens are appropriate,⁴⁴ while SkyBridge L.L.C. ("SkyBridge") states that its system can share with terrestrial and other satellite systems and that sharing is feasible if state-of-the-art sharing techniques and system design are used.⁴⁵

18. Our review of the record leads us to concur with the majority of commenters that sharing the same spectrum between ubiquitous wireless and satellite systems is not currently feasible. Although there are technical sharing studies underway in international fora,⁴⁶ sharing is not possible at this time without significant technical constraints on both satellite and terrestrial system operations. Further, due to the low density of systems deployed in these bands at present, we can designate spectrum for particular services without having to work around or relocate existing operations. We conclude that designating separate spectrum for FSS and wireless services will provide the various proposed systems with the best opportunity to operate free of interference and will encourage commercial development of this band. Accordingly, we find that the public interest is best served by providing separate designations for FSS and wireless services, as proposed in the *NPRM*.

⁴⁰ See Advanced Radio Telecom Corp. ("ART") Comments at 5; Alcatel Network Systems, Inc. ("Alcatel") Comments at 2; BizTel, Inc. ("BizTel") Comments at 5; Commco, L.L.C. ("Commco") Reply Comments at 2-3; the Fixed Point-to-Point Communications Section, Network Equipment Division, of the Telecommunications Industry Association ("TIA") Comments at 13; and Teledesic Corporation ("Teledesic") Comments at 4.

⁴¹ See Teledesic Comments at 4.

⁴² See ART Comments at 6.

⁴³ See GE American Communications, Inc. ("GE Americom") Reply Comments at 8; Lockheed Martin Corporation ("Lockheed") Comments at 13; Motorola Comments at 18; and TRW Inc. ("TRW") Comments at 15-16.

⁴⁴ See Lockheed Reply Comments at 7.

⁴⁵ See SkyBridge Comments at 3-4.

⁴⁶ ITU-R Working Parties 4A and 4/9-S are considering sharing issues, including power flux density limits, between FSS and terrestrial services in accordance with WRC-97 Resolutions 129, 133, and 134.

b. GSO/FSS and NGSO/FSS

19. Background In the *NPRM*, the Commission proposed to designate separate spectrum for GSO/FSS and NGSO/FSS systems because it envisioned use of the band by both types of systems.⁴⁷ The Commission wanted to maximize the number of satellite systems to facilitate wider service options at reasonable rates for consumers and believed that separate designations would be the best way to accomplish this goal.

20. Discussion Satellite industry commenters were divided on whether GSO/FSS and NGSO/FSS systems should share the same spectrum or whether separate designations should be provided. SkyBridge argues that the ability of NGSO systems to share spectrum with GSO systems is largely a function of NGSO system design and states that its satellite application in the Ku-band is an example of how a broadband NGSO system, designed from the start to be capable of sharing with existing systems, can share with GSO systems.⁴⁸ Hughes Communications, Inc. ("HCI"), Lockheed, and TRW argue that it is premature to divide the proposed FSS bands further for GSO or NGSO operations because not enough is known about the services that may be proposed in these bands.⁴⁹ On the other hand, Motorola and Teledesic favor separate designations because this would avoid sharing burdens on their proposed systems.⁵⁰

21. Based on our review of the record, we agree with those commenters arguing that it would be premature to make separate GSO and NGSO designations now. When the *NPRM* was developed, the Commission had no precedent for GSO/NGSO sharing. Subsequently, SkyBridge filed its satellite application for the Ku-band arguing that this type of sharing was now a possibility.⁵¹ Furthermore, two applications filed during the 1997 satellite filing window proposed GSO/NGSO hybrid systems, something not contemplated by the *NPRM*. While GSO and NGSO designations ultimately may be necessary to allow the most efficient and cost-effective use of the spectrum by both types of systems, we will need to determine how much

⁴⁷ See *NPRM* para. 21.

⁴⁸ See SkyBridge Comments at 2-3.

⁴⁹ See HCI Comments at 18-19; Lockheed Comments at 13; and TRW Reply Comments at 6.

⁵⁰ See Motorola Comments at 7-9; and Teledesic Comments at 2-3.

⁵¹ See In the Matter of Amendment of Parts 2 and 25 of the Commission's Rules to Permit Operation of NGSO FSS Systems Co-Frequency with GSO and Terrestrial Systems in the Ku Band Frequency Range and Amendment of the Commission's Rules to Authorize Subsidiary Terrestrial Use of the 12.2-12.7 GHz Band by Direct Broadcast Satellite Licensees and Their Affiliates, *Notice of Proposed Rulemaking*, FCC No. 98-310 (adopted Nov. 19, 1998).

spectrum is needed by the proposed satellite systems, as well as the trade-offs concerning the possibilities of sharing the same spectrum, before deciding on such specific designations. By not designating spectrum now for GSO and NGSO for FSS, we allow for maximum flexibility during later satellite proceedings, where compatibility of the applications received can be assessed, and any other service rule issues can be addressed. Accordingly, we do not provide separate GSO and NGSO FSS designations in this *Order*, and we will further consider this issue in future satellite proceedings.

c. Underlay Licenses in FSS Bands

22. Background In the *NPRM*, the Commission requested comment on whether it should consider issuing "underlay" licenses in bands designated for FSS, but where that use did not exhaust the potential uses of the spectrum in that band. An underlay would involve licensing a second service in a manner that would not interfere with the FSS use. Under the *NPRM* proposal, underlay operations would have more rights than those afforded to secondary operations, but the exact nature of underlay licenses was not defined.⁵² The Commission sought comment on service types within existing allocations and on technical parameters and protection mechanisms that would facilitate the underlay concept.

23. Discussion All of the commenters addressing this issue either opposed or questioned the use of underlays.⁵³ For example, GE Americom asserts that the concept is vague and would complicate the long-term planning and investment necessary for any successful satellite service.⁵⁴ Teledesic states that underlays would undercut the Commission's policy of identifying separate bands for satellite and wireless services and would lead to operational constraints that could inhibit technical innovations.⁵⁵ Motorola states that underlays would create unresolvable interference situations and would also cause significant confusion outside the U.S. because International Telecommunication Union regulations do not recognize underlay licenses.⁵⁶ TIA opposes the underlay concept for existing fixed service applications and asserts that an underlay plan would create the same problems as sharing because fixed service and FSS are mutually exclusive at these frequencies. TIA notes that both services plan to use the same

⁵² See *supra* note 2.

⁵³ See ART Comments at 15-16; Alcatel Reply Comments at 3; GE Americom Comments at 6 and Reply Comments at 11; Harris Reply Comments at 2; HCI Reply Comments at 21; ICE-G Comments at 4; Lockheed Comments at 18; Motorola Comments at 16 and Reply Comments at 14; Teledesic Comments at 5; TIA Comments at 17 and Reply Comments at 16; and TRW Comments at 18 and Reply Comments at 5.

⁵⁴ See GE Americom Comments at 7.

⁵⁵ See Teledesic Comments at 5.

⁵⁶ See Motorola Comments at 15-17 and Reply Comments at 14.

geographic area, roughly the same transmission paths, and high density deployment with little or no coordination.⁵⁷

24. In the *NPRM*, the Commission proposed to allow underlay licensing of additional services in the FSS designated bands. On further consideration, we agree with the commenters that underlay licensing would be confusing and could undermine the benefits to be derived from providing separate spectrum for satellite and wireless services, including freedom from technical constraints, avoidance of complicated interference problems and the flexibility for technical innovation. We also find that underlay licensing offers no advantages sufficient to outweigh these concerns. Accordingly, we do not adopt underlay licensing in this *Order*.

3. Amounts of Spectrum for FSS and Wireless Services

25. Background In the *NPRM*, the Commission proposed to designate 4 gigahertz of spectrum for FSS on a primary basis and 5.6 gigahertz of spectrum for wireless services on a primary basis. In making this proposal, the Commission considered the needs of existing licensees and the needs of both wireless and satellite services as expressed in pending applications, including applications for terrestrial fixed services, the Sky Station proposal and the M-Star satellite application filed by Motorola. Fifteen additional satellite applications were filed for this band during the 1997 satellite filing window.⁵⁸

26. Discussion Several wireless commenters express general support for the Commission's proposed band plan.⁵⁹ TIA proposes some adjustments, with its "preferred band plan" providing blocks of spectrum for both FSS (4 gigahertz) and commercial wireless services (4.6 gigahertz)⁶⁰ that are more contiguous than those proposed in the *NPRM* band plan, a modification supported by other commenters as well.⁶¹ In addition, because TIA proposes that we designate 1 gigahertz of spectrum as "open" for future auctions (for fixed service, FSS, MSS and broadcast-satellite service ("BSS")), the total amount of spectrum specifically designated for wireless services in the TIA plan is 4.6 gigahertz, rather than the 5.6 gigahertz proposed in the

⁵⁷ See TIA Comments at 17 and Reply Comments at 15.

⁵⁸ See *supra* para. 11.

⁵⁹ See ART Comments at i; BizTel Comments at 6; Commco Reply Comments at 2; and TIA Comments at 2.

⁶⁰ TIA uses the term "CWS" for commercial wireless services in its proposed band plan.

⁶¹ See Alcatel Comments at 2; Digital Microwave Corporation Reply Comments at 2; Harris Reply Comments at 2; and TIA Comments at 13 and Appendix A.

NPRM.⁶² In its reply comments, TIA proposes an "alternate band plan" that provides a lower frequency designation for FSS than in its preferred plan.⁶³ TIA made this change in response to a request by Motorola that new FSS allocations be located as low as possible in the band.⁶⁴

27. The majority of satellite commenters argue that they need more spectrum designated for long term satellite use than the 4 gigahertz proposed in the *NPRM*.⁶⁵ For example, HCI argues that at least 8 gigahertz (4 gigahertz for uplinks and 4 gigahertz for downlinks) is needed for the next-generation of broadband satellite systems, TRW proposes a mix of global and regional satellite allocations totaling 7 gigahertz, GE Americom requests 8 gigahertz and Motorola requests 6 gigahertz.⁶⁶ In contrast, Teledesic supports the specific FSS designations proposed in the *NPRM*.⁶⁷ Several satellite industry commenters state that the Commission can not adequately determine satellite spectrum needs until it opens a satellite filing window for this band and reviews the applications received.⁶⁸ Several satellite commenters also argue that because satellite systems take longer to develop and implement, terrestrial systems usually enter new bands first and restrict future satellite use of such bands.⁶⁹

28. After considering the various proposals in the record, we conclude that designating 4 gigahertz for FSS and 5.6 gigahertz for wireless services best serves the public interest. While this proposal may not provide all the spectrum desired by the various commenters, we find that it strikes a reasonable balance among the competing services and provides service providers the opportunity to meet their current and projected future needs in this band. In arriving at this decision, we considered the current and future projected needs of both wireless and satellite services, including the applications filed during the recent satellite filing

⁶² In the *NPRM*, the Commission proposed a designation of 5.6 gigahertz, with no "open" designations.

⁶³ TIA Reply Comments at Attachment C.

⁶⁴ See Motorola Comments at 9.

⁶⁵ See GE Americom Comments at 3; HCI Comments at 10; Lockheed Comments at 8; Motorola Comments at 5-6; PanAmSat Corporation Reply Comments at 1-2; Satellite Industry Association Comments at 2; and TRW Comments at 3.

⁶⁶ See HCI Reply Comments at 24-25; TRW Reply comments at 7-10; GE Americom Reply Comments at 11; and Motorola Comments at 6. HCI and TRW each propose a band plan without separate GSO/FSS and NGSO/FSS designations.

⁶⁷ See Teledesic Comments at 3.

⁶⁸ See Lockheed Comments at 11-12; Motorola Comments at 13; and TRW Comments at 14-15.

⁶⁹ See HCI Comments at 9, Lockheed Comments at 10-11, and TRW Comments at 11-12.

window. In addition, while we note that under existing allocations, FSS potentially has access to more spectrum on a shared basis, by designating 4 gigahertz of spectrum exclusively for FSS (*i.e.*, without sharing or underlays)⁷⁰ we ensure that this spectrum will be available for satellite licensing. While it may be difficult to compare an amount of dedicated spectrum with an amount of shared spectrum, we believe that the 4 gigahertz of spectrum designated exclusively for FSS will ultimately permit more effective deployment of satellite systems than does the current shared allocation scheme, especially considering the ubiquitous nature of both wireless and satellite services and the ability of terrestrial systems to enter shared bands first and potentially restrict later satellite access to such bands. Furthermore, while we are designating a somewhat larger amount of spectrum for wireless services, we note that some of these bands may ultimately be auctioned for any allocated service, which could encompass a broad range of services.⁷¹

29. We also reject the band plans proposed by HCI and TRW because several of their specific spectrum designations are not in accord with Commission decisions regarding the 36.0-51.4 GHz band made in other ongoing proceedings.⁷² In addition, we consider the "open" designations proposed by TIA⁷³ in both of its band plans to be overly broad and not in accord with our overall framework for the 36.0-51.4 GHz band. We believe that it is necessary, in order to achieve our goals in these bands, to identify specific designations rather than adopting the TIA "open" designations approach. Based upon our review of the record, we find that the public interest is best served by designating these bands for wireless services, with specific operations to be considered when service and licensing rules are developed in ongoing and future proceedings.

4. Specific Designations

a. FSS Designations

30. Background In the *NPRM*, the Commission proposed to designate the 37.5-38.5 GHz (space-to-Earth or downlink) band and the 48.2-49.2 GHz (Earth-to-space or uplink) band

⁷⁰ See *supra* para. 24.

⁷¹ The various bands being designated for wireless services currently include allocations for fixed, mobile, BSS, FSS, MSS, radionavigation-satellite ("RNSS") and broadcasting services.

⁷² For example, HCI's band plan designates 39.5-40.0 GHz and 47.2-48.2 GHz for satellites, and TRW's band plan designates 47.45-47.95 GHz to FSS, whereas the Commission has already designated these bands for wireless services. See *supra* notes 15 and 17.

⁷³ TIA proposes these designations for future auctions for fixed, FSS, MSS and BSS services.

for NGSO/FSS operations.⁷⁴ The Commission also proposed to designate the 40.5-41.5 GHz (downlink) band⁷⁵ and the 49.2-50.2 GHz (uplink) band for GSO/FSS operations. The Commission noted that before implementing FSS at 40.5-41.5 GHz we would need to obtain modification of the international frequency allocations table, a modification which was subsequently adopted by WRC-97.⁷⁶ The Commission also proposed to apply the requirements contained in Part 25 of our rules concerning fixed-satellites to FSS systems operating in these bands designated for FSS use in this proceeding. Accordingly, the Commission proposed to amend Section 25.202(a)(1) of its rules to add the 37.5-38.5 GHz (space-to-Earth), 40.5-41.5 GHz (space-to-Earth) and 48.2-50.2 GHz (Earth-to-space) bands to the listed FSS frequencies.⁷⁷

31. Discussion The three commenters proposing specific band plans supported the use of the 37.5-38.5 GHz (downlink) and the 48.2-50.2 GHz (uplink) bands for FSS,⁷⁸ and there were no objections from the other commenters. NTIA, however, stated that certain FSS operations in the 37.5-38.5 GHz band might cause problems with Government operations in the 37.0-38.0 GHz band and requested that the FSS allocation be shifted upward 100 megahertz (to 37.6-38.6 GHz) to lessen such potential interference problems.⁷⁹ We consider the 100 megahertz shift requested by NTIA to be in the public interest because it will avoid potential interference problems with Government operations, it should have no adverse impact on potential licensees, and the 37.6-38.6 GHz band is already allocated internationally for FSS use. We also note that this shift merely moves the FSS and wireless services designations and does not change the amount of spectrum designated to FSS or wireless services. Accordingly, we designate the 37.6-38.6 GHz and 48.2-50.2 GHz bands for FSS in our final band plan.

⁷⁴ These bands were allocated internationally to FSS at WARC-79. However, the Commission has not yet implemented that allocation domestically for the 37.5-38.5 GHz band.

⁷⁵ Because this band was previously allocated on an international basis to BSS and because GSO/FSS and BSS operations often have similar technical characteristics, the Commission concluded that FSS downlinks could be accommodated in this band.

⁷⁶ At WRC-97 a provisional FSS downlink in the 40.5-42.5 GHz band was added for ITU Regions 2 and 3 and several countries in Region 1. The allocation is subject to provisions that require the protection of radio astronomy stations in the 42.5-43.5 GHz band from FSS operating in the adjacent 41.5-42.5 GHz band, and which make the allocation provisional as of January 1, 2001 for Regions 1 and 3.

⁷⁷ 47 C.F.R. § 25.202(a)(1)

⁷⁸ See TIA Comments at Appendix A; TIA Reply Comments at Attachment C; HCI Reply Comments at Appendix 1; and TRW Reply Comments at Table 1.

⁷⁹ See Letter of August 27, 1998, from William T. Hatch of NTIA to Dale N. Hatfield, Chief, Office of Engineering and Technology.

32. With regard to the 40.5-41.5 GHz (downlink) band, there was unanimous support from the commenters proposing specific band plans for designating the 40.5-41.0 GHz segment for FSS, and only ICE-G was against the proposal.⁸⁰ We disagree with the assertion of ICE-G that the FSS designation in the 40.5-41.5 GHz band will stifle the growth of wireless networks in the 40 GHz band. TIA, in its alternate band plan, suggests that we reverse the proposed service designations for the 40.0-40.5 GHz and the 41.0-41.5 GHz bands. Specifically, while we proposed to designate the 40.0-40.5 GHz band for wireless services and the 41.0-41.5 GHz band for FSS, TIA recommends that we reverse this and designate the 40.0-40.5 GHz band for FSS and the 41.0-41.5 GHz band for wireless services. TIA states that these changes will provide a lower part of the band for FSS and will provide more contiguous designations for both FSS and wireless services than those proposed in the *NPRM*. We find merit in TIA's proposal because it moves half (500 megahertz) of the FSS designated band from a provisional international allocation (41.0-41.5 GHz) to a fully worldwide allocation (40.0-40.5 GHz) and because it would also provide the wireless services designation with 1.5 gigahertz of contiguous spectrum instead of the 1 gigahertz of contiguous spectrum proposed in the *NPRM*. We, therefore, designate the 40.0-41.0 GHz band for FSS in our final band plan. We note that the 40.0-40.5 GHz band is also allocated to MSS (downlink),⁸¹ that 40.5-41.0 GHz band is also allocated to BSS and that some of the applicants who filed applications during the 36.0-51.4 GHz band satellite filing window seek to provide MSS operations in addition to FSS. It is not our intention to preclude other allocated satellite services in these particular FSS designated bands. We, therefore, designate these other allocated satellite services in the band plan. Service and licensing rules for the use of these bands by these designated satellite services can be determined in future proceedings.

33. Furthermore, because we intend that the requirements contained in Part 25 of our rules concerning fixed-satellites apply to FSS systems operating in the bands designated for FSS in this proceeding, and there were no objections to this proposal, we amend Section 25.202(a)(1) of our rules to add the 37.6-38.6 GHz (space-to-Earth), 40.0-41.0 GHz (space-to-Earth), and 48.2-50.2 GHz (Earth-to-space) bands to the listed FSS frequencies.

b. Wireless Services Designations

34. Background In the *NPRM*, the Commission proposed to designate the 37.0-37.5 GHz, 38.5-40.5 GHz, 41.5-42.5 GHz, 46.9-47.0 GHz, 47.2-48.2 GHz and 50.4-51.4 GHz bands for wireless services. The Commission noted that it had already received comment on the 38.6-40.0 GHz band in the 39 GHz proceeding, and on the 41.5-42.5 GHz, and 47.2-48.2 GHz bands

⁸⁰ See ICE-G Comments at 2.

⁸¹ A corresponding uplink band is not designated in this proceeding. However, we note that the 45.5-47.0 GHz band contains an uplink allocation for MSS. If it is necessary, an uplink designation can be made in future satellite proceedings.

in the Millimeter Wave proceeding.

35. Discussion All of the commenters proposing specific band plans support designating the 37.0-37.5 GHz, 38.5-40.0 GHz, 46.9-47.0 GHz and 50.4-51.4 GHz bands for wireless services.⁸² Accordingly, we make these designations with certain minor modifications needed to correspond to the FSS designations discussed above. First, because of the FSS bands being shifted upward 100 MHz, to 37.6-38.6 GHz,⁸³ the bands for wireless services will include the 37.0-37.6 and 38.6-40.0 GHz bands. Also as discussed previously, the 40.0-40.5 GHz band that was proposed for wireless services in the *NPRM* is being designated in the final band plan for FSS, while the 41.0-41.5 GHz band that was proposed for FSS is being designated for wireless services. Furthermore, because the proposed 41.5-42.5 GHz and 47.2-48.2 GHz designations have already been proposed or allocated for wireless services in other on-going proceedings,⁸⁴ they are also designated for wireless services in our final band plan.

36. We currently anticipate that the bands being designated for wireless services will be used primarily for terrestrial fixed and mobile services. Further proceedings to develop service and auction rules for these bands will be necessary, however, before operations are authorized. We note that such future proceedings may further define the specific services to be assigned by auction and to operate in particular bands consistent with the U.S. Table of Frequency Allocations.

B. Changes to the Table of Frequency Allocations

1. Exclusive Government and Non-Government Bands

37. Background In the *NPRM*, the Commission noted that most of the spectrum in the 36.0-51.4 GHz band is allocated in the United States on a co-primary basis to both Government and non-Government operations.⁸⁵ The Commission requested comment on the feasibility of sharing between Government and non-Government systems in this band and noted

⁸² TIA in its preferred band plan proposes to designate the 37.0-37.5 GHz and 46.9-47.0 GHz bands for wireless services, however, it proposes an "open" designation in its alternate band plan. As previously discussed, we reject TIA's open designations and instead designate wireless services.

⁸³ See *supra* para 32.

⁸⁴ See *supra* notes 14 and 15.

⁸⁵ Except for the 38.6-39.5 GHz, 40.5-42.5 GHz, and 47.0-47.2 GHz bands which are reserved for exclusive non-Government operations, and the 43.5-45.5 GHz band which is reserved for exclusive Government operations. Current and proposed Government operations in the 36.0-51.4 GHz band include radionavigation-satellite, radio astronomy, space research, earth exploration-satellite, vehicle radar services, and satellite operations.

that joint occupancy of the band could be handled by developing sharing criteria or by providing bands for exclusive Government and non-Government use.⁸⁶ The Commission also stated that NTIA would be the co-arbiter with the Commission in deciding how spectrum sharing would be implemented and that current Government operations and requests by the Government for future frequency assignments would be handled in the same manner as they are now.⁸⁷

38. On September 24, 1998, NTIA filed a letter proposing that the 47.2-48.2 GHz band be reallocated for exclusive non-Government use, and the 42.5-43.5 GHz band be reallocated for exclusive Government use.⁸⁸ NTIA states that sharing between Government and non-Government users is generally better than band reallocation because it offers increased flexibility for all users. However, in cases where wide-area systems are authorized where sharing is difficult, band reallocation may be the better choice. In support of its proposal, NTIA states that bidders for licenses in the 47.2-48.2 GHz band will want some assurance as to the usability of the licenses they will bid on *vis-a-vis* future Government operations in the band. Furthermore, NTIA states that there is a general federal requirement for about one gigahertz of spectrum in this band, including future requirements that cannot be satisfied in the 38 GHz band and any possible future expansion of federal satellite systems currently operating in the 43.5-45.5 GHz band. NTIA also states that federal agencies have no operational frequency assignments in the 47.2-48.2 GHz band and that the FCC has no service rules for the 42.5-43.5 GHz band. NTIA's proposal was placed on public notice and comments were filed.⁸⁹

39. Discussion In response to the *NPRM*, Motorola and TRW indicated they favored sharing, where feasible, to maximize spectrum use.⁹⁰ TIA, however, states that sharing between Government and non-Government users should be minimized because coordination with Government users often takes months rather than the hours or days typical of commercial users.⁹¹ GE Americom and HCI assert that more information on existing and proposed

⁸⁶ The Commission also suggested that it might be easier for Government FSS and non-Government FSS systems to share than for Government operations to share with non-Government wireless services, in part, because it may be possible to develop FSS sharing criteria without significantly reducing the amount of spectrum available for non-Government use. *See NPRM* para. 18.

⁸⁷ Currently, all Government and non-Government proposed assignments in shared bands are coordinated with NTIA through the IRAC Frequency Assignment Subcommittee.

⁸⁸ *See supra* note 10.

⁸⁹ *See supra* note 32.

⁹⁰ *See* Motorola Comments at 10; and TRW Comments at 16.

⁹¹ *See* TIA Comments at 19.

Government use of these bands is needed to avoid uncertainty that would be harmful to the satellite industry's ability to develop services in these bands.⁹² NTIA submitted current and proposed Government requirements for the band and proposed general sharing criteria.⁹³ NTIA also deemed the proposed band plan acceptable, subject to NTIA/FCC consultations on band sharing criteria, which included protection of specific NASA/NSF sites⁹⁴ and coordination. NTIA subsequently indicated that sharing should generally be feasible in the band and requested that we continue to coordinate proposed uses and develop specific band sharing criteria, if necessary, when domestic rules and auction criteria are developed for individual bands.

40. In response to NTIA's reallocation proposal, Sky Station International, Inc. filed comments supporting the proposal while Lockheed said it did not specifically object, but stated that the proposal would further reduce the amount of spectrum available for FSS.⁹⁵ TIA supports the separation of Government and non-Government spectrum as well as the reallocation of the 47.2-48.2 GHz band for exclusive commercial use. TIA, however, questions the Government need for one gigahertz of additional exclusive spectrum and asks the Commission to work with NTIA to limit the amount of spectrum to that which NTIA realistically expects to use.⁹⁶

41. We adopt NTIA's proposal concerning reallocation of the 42.5-43.5 GHz and 47.2-48.2 GHz bands. We note that NTIA has identified the 42.5-43.5 GHz band for future expansion of federal systems and that this band is not part of the spectrum designated for FSS or wireless services in our band plan and thus should have no adverse impact on non-Government FSS and wireless services. In addition, while the radio astronomy service is allocated to the 42.5-43.5 GHz band and is used for both Government and non-Government operations, NTIA has agreed that it would be desirable to continue these allocations. Because we have no commercial designations for the 42.5-43.5 GHz band except for radio astronomy, and because it will allow commercial operators in the 47 GHz band freedom to operate without being encumbered by future Government systems, we hereby reallocate the 42.5-43.5 GHz band for exclusive Government use, except for non-Government radio astronomy and the 47.2-48.2 GHz band for exclusive non-Government use. We, therefore, amend the U.S. Table of Frequency Allocations accordingly.

⁹² See HCI Comments at 15-16; and GE Americom Reply Comments at 9.

⁹³ See Letter of April 30, 1997, from Richard D. Parlow of NTIA to Richard Smith, Chief, Office of Engineering and Technology.

⁹⁴ The NASA/NSF sites are at Goldstone, CA; Socorro, N.M., and Greenbank, W.V.

⁹⁵ See Sky Station Comments to the Public Notice at 1; and Lockheed Comments at 2.

⁹⁶ See TIA Comments to the Public Notice at 2-3.

42. We conclude that it is premature to adopt any additional band designations for exclusive Government or non-Government use in the 36.0-51.4 GHz band at this time. It appears that sharing will generally be feasible and that further decisions about sharing can best be addressed in subsequent proceedings concerning individual bands. In addition, NTIA has agreed to provide specific information regarding location, parameters, and operational limitations of Government operations in a timely manner, to allow the development of domestic rules for such individual bands. To alleviate concerns about lengthy coordination between Government and non-Government users, NTIA has also agreed to encourage federal agencies to satisfy their fixed and mobile requirements in the 36.0-51.4 GHz band through the use of commercial services, or by using the 36.0-37.0 GHz band, which has no commercial designation, and the 42.5-43.5 GHz band, which is designated for exclusive government use in this *Order*.

2. New Non-Government Allocations

43. Background In the *NPRM*, the Commission proposed certain changes to the non-Government column of the U.S. Table of Frequency Allocations to accommodate the proposed band plan. These changes primarily concerned new allocations for FSS, with proposed downlinks at 37.5-38.5 GHz and 40.5-41.5 GHz.⁹⁷ The Commission also proposed to upgrade the fixed and mobile services allocation in the 40.5-42.5 GHz band from secondary to primary status in order to accommodate the proposed wireless underlay in the 40.5-41.5 GHz band and the proposed wireless designation in the 41.5-42.5 GHz band. The gCommission also proposed to add a primary fixed service allocation to the 46.9-47.0 GHz band to accommodate the proposed wireless designation for that band.

44. Discussion No commenter objected to modifying the allocations table to accommodate the band plan. Because our final band plan differs from that proposed in the *NPRM*, however, our changes to the allocations table differ somewhat from those originally proposed. Thus we modify the non-Government column of the U.S. Table of Frequency Allocations as follows:⁹⁸ first, we add primary FSS downlink allocations to the 37.6-38.6 GHz band and 40.5-41.0 GHz band to accommodate the new FSS designations in these bands; second, we upgrade the fixed and mobile allocations in the 41.0-42.5 GHz band from secondary to primary status to accommodate the new wireless services designation in this band; and third, we add a primary allocation for fixed service to the existing mobile service designation in the 46.9-47.0 GHz band to accommodate the wireless services designation in this band.

3. New Government Allocations

⁹⁷ See *supra* para. 30.

⁹⁸ Changes to the international table of allocations resulting from implementing decisions made at WRC-97 will be addressed in a separate proceeding.

45. Background In the *NPRM*, the Commission, at NTIA's request, proposed certain changes to the Government column of the U.S. Table of Frequency Allocations to permit additional Government operations.⁹⁹ First, the Commission proposed to add space research (space-to-Earth) on a primary basis to the Government column at 37.0-38.0 GHz. Second, the Commission proposed to add space research (Earth-to-space) and earth exploration-satellite (Earth-to-space) allocations, both on a primary basis, to the Government column at 40.0-40.5 GHz. Third, the Commission proposed a secondary earth exploration-satellite (space-to-Earth) allocation at 40.0-40.5 GHz. This spectrum was allocated worldwide at WARC-92, but it has not been allocated domestically.

46. Discussion No commenters objected to the proposed Government allocations. TIA states that terrestrial sharing with the NASA stations¹⁰⁰ in remote rural locations is feasible in the space-to-Earth direction through geographic avoidance, but that sharing is not feasible in the Earth-to-space direction because complicated coordination or pointing/power restrictions would be necessary, which would unduly constrain wireless services.¹⁰¹

47. Currently, the only space research sharing with wireless services is in the 37.0-38.0 GHz band, in the space-to-Earth direction, and we agree with TIA that sharing in this band should cause little or no inconvenience to wireless services. The allocation of space research and earth exploration-satellite at 40.0-40.5 GHz in the Government column will have to share with FSS which is designated in the non-Government column. Sharing criteria for this band can be developed during future satellite proceedings.¹⁰² Accordingly, we adopt the allocation changes to the Government column as proposed in the *NPRM*.

IV. ORDERING CLAUSES

48. 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 and 25 of the Commission's Rules ARE AMENDED as specified in

⁹⁹ See *supra* note 9.

¹⁰⁰ See *supra* para. 39 and note 94.

¹⁰¹ See TIA Comments at 19.

¹⁰² NTIA also suggests that sharing between space research and commercial satellites (FSS) in the 37.5-38.0 GHz band would be less problematic if the band is designated for GSO rather than NGSO systems. While we are not providing designations for GSO and NGSO systems at this time, we will consider this request in future satellite proceedings.

Appendix C.

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

50. Pursuant to the Regulatory Flexibility Act, *see* 5 U.S.C. § 604, a Final Regulatory Flexibility Analysis ("FRFA") has been performed regarding the rules adopted in this Report and Order. The FRFA is contained in Appendix B. IT IS FURTHER ORDERED that the Commission's Office of Public Affairs, Reference Operations Division, SHALL SEND a copy of this Report and Order, including the FRFA, to the Chief Counsel for Advocacy of the Small Business Administration.

FEDERAL COMMUNICATIONS COMMISSION

Magalie Roman Salas
Secretary

APPENDIX A

COMMENTS IN RESPONSE TO NPRM

COMMENTERS

Advanced Radio Telecom Corp. (ART)
Alcatel Network Systems, Inc. (Alcatel)
BizTel, Inc. (BizTel)
Cellular Phone Taskforce (Taskforce)
GE American Communications, Inc. (GE Americom)
Hughes Communications, Inc. (HCI)
ICE-G, Inc. dba International Communications Electronics Group (ICE-G)
Lockheed Martin Corporation (Lockheed)
Motorola Satellite Systems, Inc. (Motorola)
Satellite Industry Association (SIA)
SkyBridge L.L.C. (SkyBridge)
Teledesic Corporation (Teledesic)
Fixed Point-to-Point Communications Section, Network Equipment Division of the
Telecommunications Industry Association (TIA)
TRW Inc. (TRW)
Winstar Communications, Inc. (Winstar)
National Telecommunications and Information Administration (NTIA)

REPLY COMMENTERS

Advanced Radio Telecom Corp. (ART)
Alcatel Network Systems, Inc. (Alcatel)
Commco, L.L.C. (Commco)
Digital Microwave Corporation (DMC)
GE American Communications, Inc. (GE Americom)
Harris Corporation - Farinon Division (Harris)
Hughes Communications, Inc. (HCI)
Lockheed Martin Corporation (Lockheed)
Motorola Satellite Systems, Inc. (Motorola)
PanAmSat Corporation (PanAmSat)
Sky Station International, Inc. (SSI)
Teledesic Corporation (Teledesic)
Fixed Point-to-Point Communications Section, Network Equipment Division, of the
Telecommunications Industry Association (TIA)
TRW Inc. (TRW)
Winstar Communications, Inc. (Winstar)

COMMENTS IN RESPONSE TO OCTOBER 1, 1998 PUBLIC NOTICE

Fixed Point-to-Point Communications Section, Network Equipment Division, of the
Telecommunications Industry Association (TIA)
Sky Station International, Inc. (SSI)
Lockheed Martin Corporation (Lockheed)
Winstar Communications, Inc. (Winstar)

APPENDIX B

FINAL REGULATORY FLEXIBILITY ANALYSIS

As required by the Regulatory Flexibility Act ("RFA"),¹⁰³ an Initial Regulatory Flexibility Analysis ("IRFA") was incorporated in the *Notice of Proposed Rule Making* ("NPRM") in IB Docket No. 97-95.¹⁰⁴ The Commission sought written public comment on the proposals in the *NPRM*, including comment on the IRFA. This present Final Regulatory Flexibility Analysis ("FRFA") conforms to the RFA.¹⁰⁵

Need for and Objective of the Rules. In this Report and Order the Commission provides a broad plan for use of the 36.0-51.4 GHz band that we intend to follow in developing domestic services using this spectrum in order to foster better business planning and expeditious commercial development of this spectrum. We allocate spectrum for fixed-satellite uses, and wireless services in a manner that minimizes disruption to existing services.

Summary of Significant Issues Raised by Public Comments in Response to the IRFA. No comments were submitted in direct response to the IRFA.

Description and Estimates of the Number of Small Entities to Which the Rules Will Apply. The RFA generally defines the term "small entity" as having the same meaning as the terms "small business," "small organization," and "small governmental jurisdiction."¹⁰⁶ In addition, the term "small business" has the same meaning as the term "small business concern" under the Small Business Act.¹⁰⁷ 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").

¹⁰³ See 5 U.S.C. § 603. The RFA, *see* 5 U.S.C. § 601 *et. seq.*, has been amended by the Contract With America Advancement Act of 1996, Pub. L. No. 104-121, 110 Stat. 847 (1996) (CWAAA). Title II of the CWAAA is the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA).

¹⁰⁴ See 12 FCC Rcd 10130, 10149 (1997).

¹⁰⁵ See 5 U.S.C. § 604.

¹⁰⁶ *Id.* § 601(6).

¹⁰⁷ 5 U.S.C. § 601(3) (incorporating by reference the definition of "small business concern" in 15 U.S.C. § 632). Pursuant to the RFA, the statutory definition of a small business applies "unless an agency, after consultation with the Office of Advocacy of the Small Business Administration and after opportunity for public comment, establishes one or more definitions of such term which are appropriate to the activities of the agency and publishes such definition(s) in the Federal Register." 5 U.S.C. § 601(3).

The Commission has not developed a definition of small entities specifically applicable to FSS licensees. Therefore, the applicable definition of small entity is the definition under the Small Business Administration ("SBA") rules applicable to Communications services, Not Elsewhere Classified. This definition provides that a small entity is one with no more than \$11.0 million in annual receipts.¹⁰⁸ 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.¹⁰⁹ We note that new services will be permitted under the adopted designations for FSS, and we are unable at this time to provide a more precise estimate of how many potential small entities will be providing these services.

As described, the designations we hereby adopt will also permit wireless services to use this spectrum. The Commission has not developed a definition of small entities applicable to wireless services licensees. Therefore, the applicable definition of small entity is the definition under the SBA rules applicable to radiotelephone (wireless) companies. This provides that a small entity is a radiotelephone company employing no more than 1,500 persons.¹¹⁰ According to the Bureau of the Census, only twelve radiotelephone firms out of a total of 1,178 such firms which operated during 1992 had 1,000 or more employees.¹¹¹ We note that new services will be permitted under the adopted designations for wireless services, and we are unable at this time to provide a more precise estimate of how many potential small entities will be providing these services, or which wireless services will be utilized.

Description of Projected Reporting, Recordkeeping and Other Compliance Requirements. The Commission has adopted rules in this Order that involve no reporting requirements at this time. Final service and licensing rules will be proposed at a later date.

Steps Taken to Minimize Significant Economic Impact on Small Entities, and Significant Alternatives Considered. The *NPRM* solicited comment on other alternatives such as other mechanisms of Government/non-Government sharing in those bands proposed primarily for FSS uses. The *NPRM* also requested comment on whether a sufficient amount of spectrum had been designated for wireless and satellite services or whether a different split would be better.

¹⁰⁸ 13 C.F.R. § 121.201, Standard Industrial Classification (SIC) Code 4899.

¹⁰⁹ 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, SIC Code 4899 (issued May 1995).

¹¹⁰ 13 C.F.R. § 121.201, SIC code 4812.

¹¹¹ 1992 Census, Series UC92-S-1, at Table 5, SIC code 4812.

This Order should positively impact both large and small businesses by providing additional spectrum in which to provide services. Our decisions do not displace incumbent operators. We will be able to address small business concerns regarding specific sub-bands as we proceed to establish licensing and service rules for those bands in other proceedings.

Report to Congress. The Commission will send a copy of the Report and Order including this FRFA, in a report to be sent to Congress pursuant to the Small Business Regulatory Enforcement Fairness Act of 1996, *see* 5 U.S.C. § 801(a)(1)(A). In addition, the Commission will send a copy of the Report and Order, including FRFA, to the Chief Counsel for Advocacy of the Small Business Administration. A copy of the Report and Order and FRFA (or summaries thereof) will also be published in the Federal Register. *See* 5 U.S.C. § 604(b).

APPENDIX C -- Final Rules

Parts 2 and 25 of title 47 of the Code of Federal Regulations are 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: Sections 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 36.0-51.4 GHz.
- b. Add entries in numerical order for 36.0-51.4 GHz.
- c. In the International Footnotes under heading I., add footnotes S5.340, S5.552, S5.553, S5.554, and S5.555 in numerical order.
- d. In the International Footnotes under heading II., remove footnotes 898, 899, 900, and 901.
- e. Add footnote US342.

The revisions and additions read as follows:

§ 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)
*	*	*	*	*	*	*
36 – 37 EARTH EXPLORATION- SATELLITE (passive) FIXED MOBILE SPACE RESEARCH (passive) S5.149	36 – 37 EARTH EXPLORATION- SATELLITE (passive) FIXED MOBILE SPACE RESEARCH (passive) S5.149	36 – 37 EARTH EXPLORATION- SATELLITE (passive) FIXED MOBILE SPACE RESEARCH (passive) S5.149	36 – 37 EARTH EXPLORATION- SATELLITE (passive) FIXED MOBILE SPACE RESEARCH (passive) US263 US342	36 – 37 EARTH EXPLORATION- SATELLITE (passive) FIXED MOBILE SPACE RESEARCH (passive) US263 US342		
37 – 37.5 FIXED MOBILE SPACE RESEARCH (space-to-Earth)	37 – 37.5 FIXED MOBILE SPACE RESEARCH (space-to-Earth)	37 – 37.5 FIXED MOBILE SPACE RESEARCH (space-to-Earth)	37 – 37.5 FIXED MOBILE SPACE RESEARCH (space-to-Earth)	37 – 37.5 FIXED MOBILE SPACE RESEARCH (space-to-Earth)		
37.5 – 37.6 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE SPACE RESEARCH (space-to-Earth) Earth Exploration-Satellite (space-to-Earth)	37.5 – 37.6 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE SPACE RESEARCH (space-to-Earth) Earth Exploration-Satellite (space-to-Earth)	37.5 – 37.6 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE SPACE RESEARCH (space-to-Earth) Earth Exploration-Satellite (space-to-Earth)	37.5 – 37.6 FIXED MOBILE SPACE RESEARCH (space-to-Earth)	37.5 – 37.6 FIXED MOBILE		
37.6 – 38 FIXED FIXED-SATELLITE	37.6 – 38 FIXED FIXED-SATELLITE	37.6 – 38 FIXED FIXED-SATELLITE	37.6 – 38 FIXED MOBILE	37.6 – 38 FIXED MOBILE		

(space-to-Earth) MOBILE SPACE RESEARCH (space-to-Earth) Earth Exploration-Satellite (space-to-Earth)	(space-to-Earth) MOBILE SPACE RESEARCH (space-to-Earth) Earth Exploration-Satellite (space-to-Earth)	(space-to-Earth) MOBILE SPACE RESEARCH (space-to-Earth) Earth Exploration-Satellite (space-to-Earth)	SPACE RESEARCH (space-to-Earth)	FIXED-SATELLITE (space-to-Earth)	SATELLITE COMMUNICATIONS (25)	
38 – 38.6 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE Earth Exploration-Satellite (space-to-Earth)	38 – 38.6 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE Earth Exploration-Satellite (space-to-Earth)	38 – 38.6 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE Earth Exploration-Satellite (space-to-Earth)	38 – 38.6 FIXED MOBILE	38 – 38.6 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE	SATELLITE COMMUNICATIONS (25)	

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)
38.6 – 39.5 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE Earth Exploration-Satellite (space-to-Earth)	38.6 – 39.5 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE Earth Exploration-Satellite (space-to-Earth)	38.6 – 39.5 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE Earth Exploration-Satellite (space-to-Earth)	38.6 – 39.5 US291	38.6 – 39.5 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE US291	FIXED MICROWAVE SERVICES (101) Auxiliary Broadcasting (74)	
39.5 – 40 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE MOBILE-SATELLITE (space-to-Earth) Earth Exploration-Satellite (space-to-Earth)	39.5 – 40 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE MOBILE-SATELLITE (space-to-Earth) Earth Exploration-Satellite (space-to-Earth)	39.5 – 40 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE MOBILE-SATELLITE (space-to-Earth) Earth Exploration-Satellite (space-to-Earth)	39.5 – 40 FIXED-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) US291 G117	39.5 – 40 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE MOBILE-SATELLITE (space-to-Earth) US291	FIXED MICROWAVE SERVICES (101) Auxiliary Broadcasting (74)	
40 – 40.5 EARTH EXPLORATION- SATELLITE (Earth-to-space) FIXED FIXED-SATELLITE (space-to-Earth) MOBILE MOBILE-SATELLITE (space-to-Earth) SPACE RESEARCH (Earth-to-space)	40 – 40.5 EARTH EXPLORATION- SATELLITE (Earth-to-space) FIXED FIXED-SATELLITE (space-to-Earth) MOBILE MOBILE-SATELLITE (space-to-Earth) SPACE RESEARCH (Earth-to-space)	40 – 40.5 EARTH EXPLORATION- SATELLITE (Earth-to-space) FIXED FIXED-SATELLITE (space-to-Earth) MOBILE MOBILE-SATELLITE (space-to-Earth) SPACE RESEARCH (Earth-to-space)	40 – 40.5 EARTH EXPLORATION- SATELLITE (Earth-to-space) FIXED-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) SPACE RESEARCH (Earth-to-space) Earth Exploration-Satellite (space-to-Earth)	40 – 40.5 FIXED-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth)	SATELLITE COMMUNICATIONS (25)	

Earth Exploration-Satellite (space-to-Earth)	Earth Exploration-Satellite (space-to-Earth)	Earth Exploration-Satellite (space-to-Earth)	G117			
40.5 – 41.0 BROADCASTING- SATELLITE BROADCASTING Fixed Mobile	40.5 – 41.0 BROADCASTING- SATELLITE BROADCASTING Fixed Mobile	40.5 – 41.0 BROADCASTING- SATELLITE BROADCASTING Fixed Mobile	40.5 – 41.0 US211	40.5 – 41.0 BROADCASTING- SATELLITE BROADCASTING FIXED-SATELLITE (space-to-Earth) Fixed Mobile US211	SATELLITE COMMUNICATIONS (25)	

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)
41.0 – 42.5 BROADCASTING- SATELLITE BROADCASTING Fixed Mobile	41.0 – 42.5 BROADCASTING- SATELLITE BROADCASTING Fixed Mobile	41.0 – 42.5 BROADCASTING- SATELLITE BROADCASTING Fixed Mobile	41.0 – 42.5 US211	41.0 – 42.5 BROADCASTING- SATELLITE BROADCASTING FIXED MOBILE US211		
42.5 – 43.5 FIXED FIXED-SATELLITE (Earth-to-space) S5.552 MOBILE except aeronautical mobile RADIO ASTRONOMY S5.149	42.5 – 43.5 FIXED FIXED-SATELLITE (Earth-to-space) S5.552 MOBILE except aeronautical mobile RADIO ASTRONOMY S5.149	42.5 – 43.5 FIXED FIXED-SATELLITE (Earth-to-space) S5.552 MOBILE except aeronautical mobile RADIO ASTRONOMY S5.149	42.5 – 43.5 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE except aeronautical mobile RADIO ASTRONOMY US342	42.5 – 43.5 RADIO ASTRONOMY		
43.5 – 45.5 MOBILE S5.553 MOBILE-SATELLITE RADIONAVIGATION RADIONAVIGATION- SATELLITE S5.554	43.5 – 45.5 MOBILE S5.553 MOBILE-SATELLITE RADIONAVIGATION RADIONAVIGATION- SATELLITE S5.554	43.5 – 45.5 MOBILE S5.553 MOBILE-SATELLITE RADIONAVIGATION RADIONAVIGATION- SATELLITE S5.554	43.5 – 45.5 FIXED-SATELLITE (Earth-to-space) MOBILE-SATELLITE (Earth-to-space) G117	43.5 – 45.5		
45.5 – 46.9 MOBILE S5.553 MOBILE-SATELLITE	45.5 – 46.9 MOBILE S5.553 MOBILE-SATELLITE	45.5 – 46.9 MOBILE S5.553 MOBILE-SATELLITE	45.5 – 46.9 MOBILE MOBILE-SATELLITE	45.5 – 46.9 MOBILE MOBILE-SATELLITE	RADIO FREQUENCY	

RADIONAVIGATION RADIONAVIGATION- SATELLITE	RADIONAVIGATION RADIONAVIGATION- SATELLITE	RADIONAVIGATION RADIONAVIGATION- SATELLITE	(Earth-to-space) RADIONAVIGATION- SATELLITE	(Earth-to-space) RADIONAVIGATION- SATELLITE	DEVICES (15)	
S5.554	S5.554	S5.554	S5.554	S5.554		
46.9 – 47 MOBILE S5.553 MOBILE-SATELLITE RADIONAVIGATION RADIONAVIGATION- SATELLITE	46.9 – 47 MOBILE S5.553 MOBILE-SATELLITE RADIONAVIGATION RADIONAVIGATION- SATELLITE	46.9 – 47 MOBILE S5.553 MOBILE-SATELLITE RADIONAVIGATION RADIONAVIGATION- SATELLITE	46.9 – 47 MOBILE MOBILE-SATELLITE (Earth-to-space) RADIONAVIGATION- SATELLITE	46.9 – 47 FIXED MOBILE MOBILE-SATELLITE (Earth-to-space) RADIONAVIGATION- SATELLITE		
S5.554	S5.554	S5.554	S5.554	S5.554		

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)
47 – 47.2 AMATEUR AMATEUR-SATELLITE	47 – 47.2 AMATEUR AMATEUR-SATELLITE	47 – 47.2 AMATEUR AMATEUR-SATELLITE	47 – 47.2	47 – 47.2 AMATEUR AMATEUR-SATELLITE	AMATEUR (97)	
47.2 – 48.2 FIXED FIXED-SATELLITE (Earth-to-space) S5.552 MOBILE S5.149 S5.340 S5.555	47.2 – 48.2 FIXED FIXED-SATELLITE (Earth-to-space) S5.552 MOBILE S5.149 S5.340 S5.555	47.2 – 48.2 FIXED FIXED-SATELLITE (Earth-to-space) S5.552 MOBILE S5.149 S5.340 S5.555	47.2 – 48.2	47.2 – 48.2 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE S5.555 US264 US297 US342		
48.2 – 50.2 FIXED FIXED-SATELLITE (Earth-to-space) S5.552 MOBILE S5.149 S5.340 S5.555	48.2 – 50.2 FIXED FIXED-SATELLITE (Earth-to-space) S5.552 MOBILE S5.149 S5.340 S5.555	48.2 – 50.2 FIXED FIXED-SATELLITE (Earth-to-space) S5.552 MOBILE S5.149 S5.340 S5.555	48.2 – 50.2 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE S5.555 US264 US297 US342	48.2 – 50.2 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE S5.555 US264 US297 US342	SATELLITE COMMUNICATIONS (25)	
50.2 – 50.4 EARTH EXPLORATION- SATELLITE (passive) FIXED MOBILE SPACE RESEARCH (passive)	50.2 – 50.4 EARTH EXPLORATION- SATELLITE (passive) FIXED MOBILE SPACE RESEARCH (passive)	50.2 – 50.4 EARTH EXPLORATION- SATELLITE (passive) FIXED MOBILE SPACE RESEARCH (passive)	50.2 – 50.4 EARTH EXPLORATION- SATELLITE (passive) FIXED MOBILE SPACE RESEARCH (passive) US263	50.2 – 50.4 EARTH EXPLORATION- SATELLITE (passive) FIXED MOBILE SPACE RESEARCH (passive) US263		

50.4 – 51.4 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE Mobile-Satellite (Earth-to-space)	50.4 – 51.4 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE Mobile-Satellite (Earth-to-space)	50.4 – 51.4 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE Mobile-Satellite (Earth-to-space)	50.4 – 51.4 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE MOBILE-SATELLITE (Earth-to-space) G117	50.4 – 51.4 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE MOBILE-SATELLITE (Earth-to-space)		
*	*	*	*	*	*	*

INTERNATIONAL FOOTNOTES

* * * * *

I. New "S" Numbering Scheme

* * * * *

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,

51.4-54.25 GHz,

58.2-59 GHz,

64-65 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,

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

217-231 GHz.

* * * * *

S5.552 The allocation of the spectrum for the fixed-satellite service in the bands 42.5-43.5 GHz and 47.2-50.2 GHz for Earth-to-space transmission is greater than that in the band 37.5-39.5 GHz for space-to-Earth transmission in order to accommodate feeder links to broadcasting satellites. Administrations are urged to take all practicable steps to reserve the band 47.2-49.2 GHz for feeder links for the broadcasting-satellite service operating in the band 40.5-42.5 GHz.

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.

S5.555 *Additional allocation:* the bands 48.94-49.04 GHz, 97.88-98.08 GHz, 140.69-140.98 GHz, 144.68-144.98 GHz, 145.45-145.75 GHz, 146.82-147.12 GHz, 250-251 GHz and 262.24-

262.76 GHz are also allocated to the radio astronomy service on a primary basis.

* * * * *

UNITED STATES (US) FOOTNOTES

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US342 In making assignments to stations of other services to which the bands:

13360-13410 kHz	4825-4835 MHz*	48.94-49.04 GHz*
37.5-38.25 MHz	14.47-14.5 GHz*	97.88-98.08 GHz*
322-328.6 MHz*	22.01-22.21 GHz*	140.69-140.98 GHz*
1330-1400 MHz*	22.21-22.5 GHz	144.68-144.98 GHz*
1610.6-1613.8 MHz*	22.81-22.86 GHz*	145.45-145.75 GHz*
1660-1670 MHz	23.07-23.12 GHz*	146.82-147.12 GHz*
3260-3267 MHz*	31.2-31.3 GHz	262.24-262.76 GHz*
3332-3339 MHz*	36.43-36.5 GHz*	265-275 GHz
3345.8-3352.5 MHz*	42.5-43.5 GHz	

are allocated (* indicates radio astronomy use for spectral line observations), all practicable steps shall be taken to protect the radio astronomy service from harmful interference. Emissions from spaceborne or airborne stations can be particularly serious sources of interference to the radio astronomy service (see Nos. 343/S4.5 and 344/S4.6 and Article 36/S29 of the ITU Radio Regulations).

* * * * *

PART 25--SATELLITE COMMUNICATIONS

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

AUTHORITY: Secs. 25.101 to 25.601 issued under Sec. 4, 48 Stat. 1066, as amended; 47 U.S.C. 154. Interpret or apply secs. 101-104, 76 Stat. 419-427; 47 U.S.C. 701-744; 47 U.S.C. 554.

2. The table and footnotes in paragraph 25.202(a)(1) are revised to read as follows:

§ 25.202 Frequencies, frequency tolerance and emission limitations.

(a)(1) *Frequency bands.* The following frequencies are available for use by the fixed-satellite

service. Precise frequencies and bandwidths of emission shall be assigned on a case-by-case basis.

Space-to-Earth (GHz)	Earth-to-space (GHz)
3.7-4.2 ¹	5.925-6.425 ¹
10.95-11.2 ^{1,2}	13.75-14.0 ⁴
11.45-11.7 ^{1,2}	14.0-14.2 ⁵
11.7-12.2 ³	14.2-14.5
17.7-19.7 ¹	27.5-29.5 ¹
19.7-20.2	29.5-30.0
37.6-38.6	48.2-50.2
40.0-41.0	

¹ This band is shared coequally with terrestrial radiocommunication services.

² Use of this band by the fixed-satellite service is limited to international systems, *i.e.*, other than domestic systems.

³ Use of this band by the fixed-satellite service in Region 2 is limited to national and subregional systems. Fixed-satellite transponders may be used additionally for transmissions in the broadcasting-satellite service.

⁴ This band is shared on an equal basis with the Government radiolocation service, grandfathered space stations in the Tracking and Data Relay Satellite System, and until January 1, 2000, spaceborne sensors.

⁵ In this band, stations in the radionavigation service shall operate on a secondary basis to the fixed-satellite service.

* * * * *