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

MAY 5 1997

Federal Communications Commission
Office of Secretary

In the Matter of)
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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 Bands for)
Government Operations.)

IB Docket No. 97-95

RM-8811

To: The Commission

COMMENTS

FIXED POINT-TO-POINT COMMUNICATIONS
SECTION, NETWORK EQUIPMENT DIVISION, OF
THE TELECOMMUNICATIONS INDUSTRY
ASSOCIATION

DENIS COUILLARD, CHAIRMAN
ERIC SCHIMMEL, VICE PRESIDENT OF TIA
2500 Wilson Boulevard, Suite 300
Arlington, Virginia 22201
(703) 907-7700

Of Counsel:

Robert J. Miller
Emily S. Barbour
Gardere & Wynne, L.L.P.
1601 Elm Street, Suite 3000
Dallas, Texas 75201
(214) 999-3000

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SUMMARY

In the captioned Notice of Proposed Rulemaking ("NPRM"), the Commission proposes several major changes to the millimeter wave bands above 30 GHz. The Commission has developed a proposed overall policy and framework for services in the 36-51.4 GHz band. This plan is designed to accommodate the competing needs of terrestrial fixed point-to-point microwave service ("FS") users, Geostationary ("GSO") and non-Geostationary ("NGSO") Fixed-Satellite Service ("FSS") users, and Mobile-Satellite Service ("MSS") users. Under the proposal, the 36-51.4 GHz band is segmented so that FS, FSS and MSS users can have sufficient available spectrum; co-primary band sharing is minimized; spectrum for GSO and NGSO FSS users is allocated; and non-Government and Government sharing is promoted.

Herein, the Fixed Point-to-Point Communications Section, Network Equipment Division, of the Telecommunications Industry Association ("TIA"), generally supports the Commission's decision to eliminate unnecessary or impractical band sharing and to develop a comprehensive plan for future use of the 36-51.4 GHz band. However, to minimize ongoing controversy over band sharing between FS and satellite users, and to avoid retarding development of the bands above 30 GHz, TIA proposes revising the Commission's segmentation plan to satisfy the equally compelling spectrum needs of FS and satellite users.

Specifically, in the NPRM, the Commission proposes designating the non-contiguous 38.5-40.5 and 41.5-42.5 GHz bands for FS and the non-contiguous 37.5-38.5 and 40.5-41.5 GHz bands for FSS. Under its compromise, TIA proposes that the Commission designate the entire 37-40 GHz band for FS and the entire 40.5-42.5 GHz band for FSS. Thus, FS and FSS users each would get adequate spectrum in bands which are contiguous and which are consistent with international allocations.

TIA's proposed band segmentation plan clearly is in the public interest. It affords adequate flexibility to accommodate the needs of FS and satellite users. Furthermore, the TIA plan is coherent and has contiguous bands allocated for the same services, unlike the non-contiguous bands proposed in the NPRM.

TIA emphasizes that any decisions made by the Commission in the NPRM must protect FS users. Given the short-haul, wideband characteristics of the 36-51.4 GHz band, this spectrum is useful for a wide range of wireless network applications. Moreover, these frequencies support the other telecommunications services that private and common carrier FS users provide, such as emergency, public health and safety services, and they support services for local exchange carriers, cellular licensees, utilities, railroads, petroleum companies, and financial institutions. Finally, the short-haul FS frequencies in the 36-51.4 GHz band also are used for private LAN-to-LAN interconnection, surveillance, and other related applications. These needs are demonstrated by the number of businesses and governmental entities already employing these frequencies for such services. The fundamental role of FS, including the High Density Fixed Services ("HDFS") emerging in the bands above 30 GHz, must be recognized.

Finally, as TIA demonstrates, any new allocations made in the NPRM need to be harmonized with international allocations. The band segmentation must be consistent with international and with domestic needs. Harmonization with global allocations would increase export opportunities for domestic equipment manufacturers, reduce development and product costs, and encourage innovation.

The Commission's band segmentation proposals in the NPRM are a good first step towards ensuring that FS and satellite users will be able to continue serving the public. However, as detailed herein, certain refinements to this proposal must be integrated into this band plan.

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COMMENTS

In the above-captioned Notice of Proposed Rulemaking ("NPRM"), the Commission proposes several major changes to the millimeter wave bands above 30 GHz. To accommodate the competing needs of terrestrial fixed point-to-point microwave service ("FS") users, Geostationary ("GSO") and non-Geostationary ("NGSO") Fixed-Satellite Service ("FSS") users, and Mobile-Satellite Service ("MSS") users, the Commission has developed a proposed overall policy and framework for services in the 36-51.4 GHz band.

Specifically, this new approach would involve segmenting the 36-51.4 GHz band so that FS, FSS and MSS users can have sufficient available spectrum; minimizing the need for co-primary band sharing; designating spectrum for GSO and NGSO FSS users; and developing standards so that non-Government and Government operations can share these bands.¹ Pursuant to Section 1.415 of the

¹NPRM at ¶ 1.

Commission's Rules,² the Fixed Point-to-Point Communications Section, Network Equipment Division, of the Telecommunications Industry Association ("TIA"),³ hereby declares its support for these Commission initiatives proposed in the NPRM.

Controversy over band sharing between FS and satellite users dominates the allocation issues raised in the NPRM. The satellite users claim co-primary band sharing with FS users is feasible; the FS users disagree. Resolution of this issue is, at best, problematic. Allocating the 36-51.4 GHz band, so that the equally compelling spectrum needs of FS and satellite users can be satisfied, must not be buried by this uncertainty.

Instead of continuing to promote incompatible band plans, the FS and FSS industries should attempt to reach a compromise so that the Commission's band segmentation plan can proceed. Herein, TIA suggests a framework for this compromise. Under this proposed compromise: (i) FS users get less spectrum than needed, but they benefit from more efficient and cost effective use of that spectrum and from increased international harmonization; and (ii) FSS users maintain the same amount of spectrum, but their frequencies are located in higher bands.

While TIA generally supports the Commission's decision to eschew unnecessary or impractical band sharing and to develop a comprehensive blueprint for future use of the 36-51.4 GHz band, certain specific revisions must be made to the proposed band segmentation plan so that FS and FSS users are protected and treated equitably:

²47 C.F.R. §1.415 (1997). The NPRM was published in the Federal Register on April 4, 1997. 62 FR 16129.

³TIA is the principal industry association representing all telecommunications equipment manufacturers, including fixed point-to-point microwave radio equipment. TIA members serve, among others, companies, including telephone carriers, utilities, railroads, state and local governments, and cellular carriers, licensed by the Commission to use private and common carrier bands for provision of important and essential telecommunications services.

- **Revised band segmentation plan** -- The proposed band segmentation plan must afford adequate flexibility to accommodate the needs of FS and satellite users. Furthermore, the band plan must be coherent and must have contiguous bands allocated for the same services, instead of the non-contiguous bands proposed in the NPRM. The Commission proposes designating the non-contiguous 38.5-40.5 and 41.5-42.5 GHz bands for FS and the non-contiguous 37.5-38.5 and 40.5-41.5 GHz bands for FSS. Recognizing the equal need for FSS and FS spectrum, TIA proposes a different approach, which is depicted in Appendix A hereto: (i) the existing 37-40 GHz band allocation for FS must be maintained; and (ii) the 40.5-42.5 GHz band must be designated for FSS. However, TIA, which initiated ongoing discussions on these issues with the satellite industry, remains open for further industry negotiations provided that, at a minimum, FS users maintain their current level of spectrum.
- **FS users must be protected** -- The fundamental role that FS, including the High Density Fixed Services ("HDFS")⁴ emerging in the bands above 30 GHz, will play in supporting wireless networks and the National Information Infrastructure ("NII") must be recognized. Optimizing unfettered availability of FS frequencies in the 36-51.4 GHz band thus must be a priority. Given the short-haul, wideband characteristics of the 36-51.4 GHz band, this spectrum is useful for a wide range of wireless network applications. Moreover, these frequencies support the other telecommunications services that private and common carrier FS users provide, such as emergency, public health and safety services, and they support services for local exchange carriers, cellular licensees, utilities, railroads, petroleum companies, and financial institutions. Finally, the short-haul FS frequencies in the 36-51.4 GHz band also are used for private LAN-to-LAN interconnection, surveillance, and other related applications. These needs are demonstrated by the number of businesses and governmental entities already employing these frequencies for such services.
- **Band sharing issues must be addressed** -- The controversy between FS and satellite users over band sharing must be mediated. Satellite users claim that, with imposition of certain technical standards (e.g., International Telecommunications Union ("ITU") pfd limits and

⁴HDFS is a form of fixed point-to-point microwave service operating at high frequencies and short paths. It is differentiated from more conventional fixed terrestrial service by its large scale deployment, utilization of wide bandwidth, and use of many different network topologies and path geometries.

Automatic Transmitter Power Control ("ATPC")), sharing is feasible. In contrast, FS users maintain that these standards are inapplicable to their domestic operations and would not provide adequate protection against harmful interference or would not promote expansion of their networks. The development of new FS applications under the proposed "underlay" approach might facilitate resolution of this issue.

- New allocations must be harmonized with international allocations -- The band segmentation must be consistent with international and with domestic needs. Harmonization with global allocations would increase export opportunities for domestic equipment manufacturers, reduce development and product costs, and encourage innovation.

THE PUBLIC INTEREST COMPELS ALLOCATION OF ADEQUATE SPECTRUM FOR FS

It is well-established that private and common carrier FS users provide essential telecommunications services. Thus, maximizing available spectrum for FS users clearly is in the public interest and is consistent with the goals articulated by the Commission in the NPRM:

Consistent with our mandate to make available to the public rapid and efficient radiocommunications services, we seek to manage spectrum in a manner that promotes open entry, appropriate flexibility, technical innovation, and seamless satellite and terrestrial networks. Seamless global networks are facilitated by global allocation of spectrum for the same or similar services. This not only supports a compatible technical environment and minimizes potential harmful interference, but creates economies of scale for equipment manufacturers and ease of use for consumers. We recognize, however, that there is inherent tension between flexible use of spectrum and the promotion of seamless networks through global allocations since worldwide allocations can restrict the manner in which spectrum may be used in a particular country. Our overall plan for the 36-51.4 GHz spectrum, therefore, attempts to balance our goal of encouraging seamless communications with our goal of affording service providers appropriate flexibility to meet their customers' needs.⁵

⁵NPRM at ¶ 12 (footnote omitted).

A. FS Users Provide Essential Services.

Public health and safety users depend upon reliable and available FS frequencies for delivery of their services to the public. Local exchange carriers and new Competitive Access Providers ("CAPs"), cellular telephone companies, utilities, railroads, petroleum companies, financial institutions, and federal, state and local governments use FS to support their network operations. Emerging wireless telecommunications, especially PCS, rely upon FS users for spectrum to provide their services and rely upon FS facilities in other bands to support their operations. These FS users frequently are the cornerstone of supervisory and operational programs designed to deliver essential products and services to the public. Indeed, FS users serve specific industrial, public safety, and commercial requirements of many companies and public agencies that constitute much of this nation's infrastructure.

B. Inadequate Spectrum Is Available for FS Users.

Unfortunately, as demand for these essential FS services increases, available spectrum to support these services has not. This recent erosion began when FS users were required to clear the 2 GHz band for PCS and to relocate in bands above 3 GHz.⁶

The bands designated for the relocating 2 GHz FS users, primarily the 6 and 11 GHz bands, already are quite congested, and no relief is anticipated.⁷ In addition, use of all FS frequencies at

⁶Redevelopment of Spectrum to Encourage Innovation In the Use of New Telecommunications Technologies, Second Report and Order, ET Docket No. 92-9, 8 FCC Rcd 6495, 6519-20 (1993), modified, Memorandum Opinion and Order, 9 FCC Rcd 1943 (1994).

⁷These bands are becoming largely unusable since the upper 6 and 18 GHz bands were reallocated at WRC-95 so that FS users are co-primary with NGSO MSS feeder links. Final Acts of the World Radiocommunication Conference (WRC-95), Geneva, 1995 at Article 55. Needed relief from this spectrum congestion is not provided in other recent Commission allocation decisions. Conditions for FS users will deteriorate further, as a result of the Commission's recent decision to reallocate portions of the 2 GHz band for MSS service links, because additional incumbent relocation will be required.

18 GHz is jeopardized by a proliferation of satellite based systems, and many of these satellite systems are incompatible with future FS usage of this band.⁸

C. Substantial Demand Exists For FS Spectrum in the 37-40 GHz Band.

Extensive FS operations in the 38.6-40.0 GHz band (the "38 GHz Band") support new wireless and other competitive networks. Demand for these FS is growing significantly. The Commission unequivocally has recognized this need and has recognized the merits of making the entire 37-40 GHz band available for such services.⁹ Regardless of how the Commission arbitrates spectrum designations in the 36-51.4 GHz band, it must protect FS operations in the 37-40 GHz band as it implements the proposals made in the NPRM.

Amendment of Section 2.106 of the Commission's Rules to Allocate Spectrum at 2 GHz for Use by the Mobile-Satellite Service, First Report and Order and Further Notice of Proposed Rule Making, ET Dkt. No. 95-18 (FCC 97-93, released March 14, 1997) ("MSS Order"). Newly available spectrum in the 4 GHz band from the federal government was not allocated so that this band could be feasible as a substitute for the FS users being migrated off the 2 GHz band. Allocation of Spectrum Below 5 GHz Transferred from Federal Government Use, Second Report and Order, 11 FCC Rcd 624 (1995). Both the 23 GHz and 26 GHz bands are much less available to FS users due to restrictive demands of Inter-Satellite Link and Data Relay Satellite Services. The 27.5-29.5 GHz band will not be available for co-primary FS users because the Commission recently reallocated the 28 GHz band only for LMDS systems, FSS, and MSS system feeder links. 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 Band, to Establish Rules and Policies for Local Multipoint Distribution Service and for Fixed Satellite Services, First Report and Order and Fourth Notice of Proposed Rulemaking, 3 Comm. Reg. (P&F) 857 (1996).

⁸Availability of the 18 GHz band is being diminished as the result of the recent reallocation resulting in it being shared with government users. Amendment of Part 2 of the Commission's Rules to Allocate Spectrum for the Fixed-Satellite Service in the 17.8-20.2 GHz Band for Government Use, Memorandum Opinion and Order, 10 FCC Rcd 9931 (1995). Exacerbating this problem is the Commission's recent decision to license Teledesic's 18 GHz NGSO FSS operations, which will significantly decrease FS use of that band. Teledesic Corporation, Order and Authorization, File Nos. 22-DSS-P/LA-94, etc. (DA 97-527, released March 14, 1997).

⁹In 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, Notice of Proposed Rulemaking and Order, 11 FCC Rcd 4930 (1995) ("37 GHz Rulemaking").

Demand for 38 GHz Band FS users is well-established. Approximately 1,300 wide-area terrestrial FS system 38 GHz Band authorizations, which have been issued by the Commission in the last several years, are, or soon will be, in operation utilizing one or more paired 50 MHz channels. These FS networks are area-licensed to serve a contiguous geographic region up to about 160 x 160 km, and in some cases far larger service areas, to facilitate the flexible, rapid deployment of large quantities of radios and to facilitate re-deployment of existing user stations. These systems provide customers with a full range of digital local broadband voice, data, and video distribution services (including mobile network backhaul) and readily can be interconnected with national and international networks.¹⁰

Maintaining the 37-40 GHz band for FS also is important because of related global activities. Many advanced systems for operation in these bands are likely to utilize more spectrally efficient modulation schemes and network architectures. According to manufacturer estimates and other sources, in addition to the substantial deployments and pending equipment orders in the United States, there are as many as 50,000 links currently operating in the 37.0-40.5 GHz band in Europe. Similar implementations are in various stages in other parts of the world. The vast majority of equipment utilized in millimeter wave FS systems internationally is manufactured by U.S. companies.

Rapidly escalating activity in the bands between 30 and 50 GHz is a strong indication that spectrum in bands above 50 GHz is the next growth area for the FS. Just as in the lower millimeter

¹⁰A vast majority of the applications for these services require a 99.999% minimum threshold system availability to satisfy customer demand for fiber-like service. Many currently operational systems are delivering even better performance. The deployment density of wide-area licensed FS systems is determined by a number of factors, including extent of self-interference, interference to and from other systems, and natural and man-made blockage that is present in the operating environment.

wave bands, technology developed for the United States government for above 50 GHz terrestrial fixed systems is expected to soon be adapted for commercial applications.¹¹

Indeed, in the 37 GHz Rulemaking, the Commission declared unequivocally:

We continue to believe that broadband PCS will provide a broad range of benefits and services and will be of vital importance to American business and consumers. Consequently, we believe it important that we provide every opportunity for broadband PCS to develop, including providing adequate spectrum to meet its infrastructure needs. We are concerned, however, that the current demand for spectrum in the 39 GHz band may preclude use of that band to provide adequate support spectrum for broadband PCS and that additional spectrum ... will be needed to meet this demand. Further, in addition to providing spectrum for broadband PCS infrastructure, it appears that [additional spectrum] may be needed to support cellular and other commercial and private mobile radio operations.¹²

D. Emerging HDFS Technologies Must Be Accommodated.

Without question, the most important technology for supporting new wireless networks in the bands above 30 GHz will be the HDFS.¹³ These HDFS will be essential building blocks for wireless network platforms. Such applications include local access, inter-cell links for mobile and wireless local loop networks, fiber backdrop, local TV distribution, broadband GII access, intelligent transport,

¹¹In fact, 50 GHz and 58 GHz bands have been used for several years in the United Kingdom. See ITU-R Recommendation F. 1100. At least one (1) U.S.-based radio manufacturer produces equipment for these bands.

¹²37 GHz Rulemaking, 11 FCC Rcd at 4937.

¹³Current HDFS data rates over individual circuit paths range from about 1.5 Mbit/s to 45 Mbit/s, and are expected to reach at least 310 Mbit/s within the next several years, as radios utilizing higher order modulation schemes become available. See draft revision of Rec. ITU-R F.758 [Doc.9/18 (Rev. 1)]. To further increase spectral efficiency and service flexibility, advanced HDFS systems are likely to employ various techniques that may include dynamic allocation of bit rate, modulation, and antenna beamwidth. Finally, HDFS links may operate at elevation angles of up to about 45 degrees in dense urban environments.

SDH access, RLANs and ATM compatible transport. Thus, it is essential that adequate spectrum is made available for HDFS in the 36-51.4 GHz bands.

Local access and other high density radio-relay service planning and system deployments have rapidly accelerated globally in the last several years. This acceleration is due, in large part, to the worldwide trend towards deregulation and increased competition in the provision of local telecommunications and video distribution services. Driven by cost and speed of deployment considerations, these advancements are placing a major new focus on the provision of services directly to end-users via fixed wireless systems. As a result, the number of FS users in the bands above 17 GHz worldwide is currently close to 200,000 and growing at a rapid rate.

Such unprecedented growth is generating a new and pressing emphasis on the national, regional, and international designation of spectrum for the implementation of HDFS systems. Unfortunately, HDFS and satellite deployment would be severely impeded under envisioned co-primary space and satellite service sharing constraints.

Applications for HDFS in the bands above 30 GHz are maturing rapidly from the existing point-to-point and point-to-multipoint implementations toward a greater variety of advanced systems that can better satisfy evolving service demands. This evolution includes: (i) expanding services, such as SDH/ATM access, RLANs, GII access, etc.; (ii) transmission rate increases from the current 1.5 - 45 Mbit/s range to multiples of 52 or 155 Mbit/s; (iii) spectral efficiency increases through the use of higher level modulation methods; (iv) greater operational flexibility and user friendliness (e.g., bandwidth on demand); (v) reductions of size, weight and primary power consumption; and (vi) introduction of stratospheric repeaters.

The vast majority of current worldwide deployment above 30 GHz is in the 37-40 GHz band, serving primarily subscribers in urban and suburban business and industrial areas and interconnecting

mobile service cell sites. Future HDFS deployment is expected to extend to residential areas, spearheaded by local distribution of television programs in competition with cable TV and other new broadband service offerings to the home.¹⁴ These networks include "last mile" services (short-haul communication links) to broadband PCS operators and to private companies that might need high-speed broad bandwidth links among offices, residences and mobile units.

To support cellular, PCS, LMDS and other emerging wireless technologies, adequate spectrum must be available for HDFS applications. Capacity can be increased by adding cell sites placed closer together, which requires additional point-to-point links to interconnect cells. As the distance between cell sites decreases, the frequency band of choice to interconnect cell sites has shifted from 2 GHz to 18 GHz. As cell sites continue to move closer together, licensees will show substantial interest in the bands above 30 GHz. Action by the Commission in the NPRM must not sidetrack development of these increasingly important HDFS technologies.

**THE COMMISSION APPROPRIATELY RECOGNIZES
THE DIFFICULTIES INHERENT IN SPECTRUM
SHARING BETWEEN FS AND SATELLITE USERS**

Before a viable band segmentation plan can be implemented, the threshold issue concerning spectrum sharing between FS and satellite users must be addressed. This issue has been raised recently by the proposed Motorola Satellite Systems, Inc. ("Motorola Satellite") M-Star system.¹⁵

¹⁴High density deployment of independent point-to-point links similarly results in clusters that assume the essential characteristics of point-to-multipoint deployment. The deployment densities have reached the range of as many as 10 stations per square kilometer, and are expected to increase several-fold within a few years.

¹⁵See Motorola Satellite's Application to Construct, Launch and Operate the M-Star System, File No. 157-SAT-P/LA-96(72) (filed September 4, 1996); Motorola Satellite Communications, Inc., Petition for Rulemaking seeking allocation of 37.5-38.6 GHz to FSS (space-to-Earth) on a co-primary basis (RM-8811, filed March 4, 1996).

Among the 1997 World Radio Conference ("WRC 97") agenda items is the identification of spectrum above 30 GHz for HDFS applications.¹⁶ The Commission's WRC-97 Advisory Committee Ad Hoc Millimeter Wave ("AHMW") group has been studying whether FS and satellite users could share these bands:

In that regard, the AHMW group has discussed, among other things, the possibility of satellite and fixed terrestrial, and other terrestrial services operating from alternative delivery platforms sharing spectrum in this band. Motorola contends that sharing is possible between its NGSO FSS system and point-to-point fixed services in the 37.5-40.5 GHz band if the fixed service operators use specified peak effective isotropically radiated power ("EIRP") density limits and [ATPC]. In the AHMW group, representatives for the terrestrial fixed services argue that Motorola's proposed peak EIRP density limit would prevent, absent severe geographic restrictions on both services, the possibility of either a viable, ubiquitous NGSO FSS or a viable, ubiquitous high-density fixed service. Moreover, they maintain that ATPC to the degree specified by Motorola is not available, is not technically feasible, and is not applicable to high-density equipment currently in manufacturers' production pipelines.¹⁷

The Commission must not make spectrum allocation decisions, premised on band sharing, that will compromise FS needs, until it is demonstrated that such sharing is likely to be achievable. TIA remains committed to resolving the band sharing issue. However, as detailed herein, such sharing is highly unlikely.

THE COMMISSION'S BAND SEGMENTATION PLAN IS AN APPROPRIATE APPROACH

Need for spectrum in the 36-51.4 GHz band has been increasing significantly. To accommodate this need, the Commission has initiated several allocation rule makings or other

¹⁶See WRC 97, Agenda Item 1.9.6 (identification of suitable frequency bands above 30 GHz for use by the fixed service for high-density applications).

¹⁷NPRM at ¶8.

proceedings to address the 37-40 GHz band,¹⁸ the bands above 40 GHz,¹⁹ stratospheric telecommunications systems,²⁰ and satellite systems, such as Motorola Satellite's M-Star proposal. Against this domestic backdrop, international allocation decisions must be made, including action on the WRC-97 Agenda Item 1.9.6 regarding HDFS in the bands above 30 GHz.

A. TIA Supports the Band Segmentation Plan Concept.

Given the interrelationship of these domestic and international proceedings, the Commission wisely has decided to step back and change course. Rather than attempting to cobble together new allocations for the 36-51.4 GHz band from separate proceedings, the Commission has concluded that:

In light of the competing proposals involving frequencies between 36 and 51 GHz, the two ongoing rulemakings involving frequencies in this range and the comments received therein, the difficulty in sharing between ubiquitous terrestrial and satellite licensees in the same bands, and the AHMW Group's consideration of this spectrum as a whole, we believe it useful to describe an initial overall policy and framework that we intend to follow in developing services using this spectrum. We believe that presenting the plan for the entire band will help clarify the relationship among individual proceedings, assist in planning for WRC-97, and assure that all proposed uses are given due consideration. Providing the public with an overview of our overall band plan will foster better business planning and expedite the commercial development of the 36-51.4 GHz spectrum. Furthermore, we suggest the associated changes that would be necessary in the domestic and international allocations were we to adopt the band plan. Service and licensing rules for specific

¹⁸37 GHz Rulemaking, 11 FCC Rcd at 4930.

¹⁹In the Matter of Amendment of Parts 2 and 15 of the Commission's Rules to Permit Use of Radio Frequencies Above 40 GHz for New Radio Applications, Notice of Proposed Rulemaking, 9 FCC Rcd 7078 (1994) and First Report and Order and Second Notice of Proposed Rulemaking, 11 FCC Rcd 4481 (1995).

²⁰See Sky Station Request to Establish New GSTS 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 December 24, 1996).

subbands in the 36-51.4 GHz band, and specific designations for terrestrial services, are the subject of separate ongoing and future proceedings.

* * * * *

In developing the framework for the 36-51.4 GHz spectrum, we considered a wide range of factors. First, we considered the requirements of existing licensees and the effect of their outstanding authorizations on potential uses of the bands. We also considered requirements for both fixed and satellite services as expressed in applications now pending before us. These include a number of fixed terrestrial services, the Sky Station proposal, and the M-Star application. We also took into account other expressions of interest in providing services in these bands, including expressions made in domestic proceedings, as well as interest in international fora and by other administrations. Furthermore, noting that many of the bands under consideration are also allocated on a co-primary basis for Government use, we have attempted to make reasonable provision for anticipated Government requirements in these bands.²¹

B. The Commission Correctly Avoids Damaging Band Sharing In Its Segmentation Plan.

In the NPRM, the Commission proposes a specific band segmentation plan. Development of this segmentation plan is based upon the correct underlying premise that band sharing between FS and satellite users should be avoided:

Given the ubiquitous nature of some of the services proposed, it is not likely that satellite and terrestrial systems will be able to share the same spectrum without significant technical constraints on the operations of one or the other, or both, types of systems. Indeed, frequency sharing is an issue of some contention. Consequently, we believe a band plan, with frequencies designated for different types of high-density services, would provide the various proposed systems with the best opportunity to succeed. While we anticipate that frequencies will be designated for a predominant use in a band (e.g., FSS), we will consider licensing a second, co-primary service, where possible.²²

²¹NPRM at ¶¶ 9-10 (footnote omitted).

²²NPRM at ¶ 12 (footnote omitted).

Such sharing will not work. In lower frequency bands, terrestrial FS links are approximately horizontal and satellite links are approximately vertical. Both deployments are relatively far removed from each other geographically. In theory, under such conditions, these services might be able to share frequencies. At high frequencies, including the 36-51.4 GHz bands, these simplifying assumptions do not apply. Satellite and terrestrial FS users deploy many systems in urban areas. Both systems could implement paths with high elevation angles. These considerations make frequency band sharing impractical.

In particular, sharing between FS and FSS users is not feasible for the following reasons:

- Satellite transmitters into FS receivers -- Satellite users rely upon ITU coordination criteria, but they are not relevant to domestic terrestrial fixed coordination. The Commission's requirements are different than international requirements. For example, Part 25 of the Commission's Rules only applies to analog FS, whereas digital FS requires at least 25 dB more protection. While industry standards (i.e., TIA Bulletin 10)²³ are being revised to account for FSS NGSO/GSO coordination, current ITU standards are inapplicable to TIA, National Spectrum Managers Association and Commission Part 25 standards. If ITU coordination criteria are used, the reliability of FS, which is its most prominent and valuable attribute, would be compromised significantly.
- FS transmitters into NGSO satellite earth stations -- Satellite licensees require coordination of the entire band, requiring co-channel licensees to provide earth stations protection for the entire bandwidth. This required protection results in obstructing entry for new FS transmitters into the same geographic area.
- NGSO earth station transmitters into FS receivers -- NGSO uplinks transmit at all azimuths, increasing the likelihood for interference into FS receivers. There are no applicable coordination criteria to avoid this problem.

²³TIA has completed its "Telecommunications Systems Bulletin No. 10-F, Interference Criteria for Microwave Systems" ("Bulletin 10"), which prescribes standards for implementing the new channel plan for the bands above 3 GHz and for establishing criteria regarding 2 GHz band PCS-to-microwave interference protection.

TIA fully appreciates the legitimate need for the developing satellite services. Nevertheless, as demonstrated by the abundant number 38 GHz Band operational systems,²⁴ the need for high frequency FS is both large and imminent. Before adopting any proposals as part of this NPRM, the Commission must find a compromise which serves the legitimate needs of both FS and FSS users.

THE PROPOSED BAND SEGMENTATION PLAN SHOULD BE REVISED

Accommodating the disparate needs of FS and satellite users in the 36-51.4 GHz band is a delicate juggling act. Proposing a band segmentation plan as a platform for ensuring that FS and satellite licensees can meet the exploding demand for their services is a necessary first step. However, as discussed above, FS user spectrum systematically has been destroyed by recent Commission allocation decisions. Any band plan that is adopted must stem this erosion of FS spectrum.

A. TIA Proposes Variations On The Commission's Band Segmentation Plan.

The Commission's proposed reallocation of the 36-51.4 GHz band, as set forth in Appendix C of the NPRM, contains many concepts (e.g., band segmentation) that are necessary for expansion of FS and FSS. However, the specific proposed spectrum designations in this plan cannot be supported.

If adopted, the Commission's band plan would: (i) maintain the 38 GHz Band for FS; (ii) implement the Region 2 FSS downlink 37.5-38.5 GHz allocation by adding it to the domestic table in Section 2.106 of its rules; (iii) adopt a new allocation for FSS downlinks at 40.5-41.5 GHz; and (iv) upgrade the status of FS and mobile services in the 40.5-42.5 GHz band to primary.²⁵ While maintaining the 38 GHz Band for FS is in the public interest, this proposal does not otherwise

²⁴It is estimated that over \$3 billion in actual or committed capital supports these 38 GHz Band systems.

²⁵NPRM at ¶¶ 26-29.

promote efficient spectrum utilization and does not fairly meet FS and FSS needs because it would: (i) establish uneven portions of non-contiguous spectrum for FS and for other users; (ii) conflict with allocations for ITU Regions 1-3, and with all existing 38 GHz Band usage outside the U.S. and Canada; (iii) leave 100 MHz (46.9-47.0 GHz) without any paired channels; and (iv) create undesirable large transmit/receive ("T/R") spacings between the paired 37.0-37.5 and 40.0-40.5 GHz bands, which also could create undesirable asymmetric link performance.²⁶

To avoid these critical problems, TIA proposes that the Commission consider the alternative band plan depicted in Appendix A. In Appendix A, TIA suggests an approach which supports its original proposal to provide technical rules permitting expansion of FS to bands below 38.6 GHz.²⁷ TIA, in Appendix A, also requests that satellite users move to frequencies above their current allocation. Under this proposed framework, FS and FSS users will have sufficient spectrum without being handicapped by unnecessary band sharing constraints.

TIA's proposals build on the economies of existing frequency allocations. They would create a match between allocation bandwidth and appropriate channel T/R spacings. Terrestrial and satellite services would be separated into contiguous bands. Retention of existing allocations would allow for immediate exploitation of allocations using existing or planned technology. The new allocations would satisfy the demonstrated need for growth in both the FS and satellite service. At the same time, open spectrum would be identified for auction.

Of equal importance, TIA's proposal would provide strong potential for harmonization with ITU frequency plans in Regions 1-3. Contiguous NGSO and GSO FSS allocations, located near open

²⁶Practical T/R spacings are in the order of 500 MHz to 1.5 GHz. Standard T/R spacings for the 38 GHz Band currently are 70 MHz and 1.25 GHz.

²⁷See 37 GHz Band Rulemaking, 11 FCC Rcd at 4934 n.10.

spectrum, would provide powerful flexibility to other administrations considering adoption of the U.S. model. Complete harmonization of the 38 GHz Band FS allocation in all ITU Regions would address the problem by mitigating existing dense deployment in Europe. Meanwhile, the near absence of a broadcast satellite deployment in the 40.5-42.5 GHz band provides opportunities for a worldwide FSS allocation. This 40.5-42.5 GHz band FSS allocation also could facilitate transfer of the 43 GHz band military satellite technology to the private sector.

B. While the Proposed "Underlay" Concept Might Not Be Usable At This Time, Further Studies Are Needed.

A new licensing concept -- "underlay" services -- is proposed by the Commission in the NPRM as a surrogate for co-primary sharing:

We use the term "underlay" service to describe a concept which would explore the possibility of licensing second service in the FSS bands, in a manner that would not interfere with the predominant use. An underlay service would be a type of service that fits within existing or subsequently modified spectrum allocations, but is not our designated predominant use of a particular frequency band.²⁸

The Commission seeks comment "on whether [it] should consider issuing 'underlay' licenses in bands where [it has] designated FSS as the primary use, but where that use does not exhaust the potential uses of the spectrum."²⁹

The "underlay" concept is interesting and may have application for some services. However, FS and FSS at high frequencies are mutually exclusive. They both plan to use the same geographic area, roughly the same transmission paths, and high density deployment with little or no coordination. Consequently, the "underlay" concept would serve no purpose for existing FS. However, yet to be

²⁸NPRM at ¶ 23.

²⁹NPRM at ¶ 23.

developed technologies or applications (e.g., in-building use) might be able to exploit an "underlay" FS allocation in the future. Thus, TIA urges further study of this "underlay" concept.

C. Government and Non-Government Band Sharing Must Be Minimized.

The 36-51.4 GHz band includes a high percentage of spectrum that is allocated to Government and non-Government operation on a shared co-primary basis.³⁰ Such band sharing historically has been problematic. The Commission, in the NPRM, appropriately recognizes the need to address these problems as part of its segmentation plan:

In devising a band segmentation plan, we recognize that much of the 36-51.4 GHz spectrum is allocated, in the United States, to both Government and non-Government operations, on a shared co-primary basis. It appears that Government operations, particularly FSS operations, and commercial FSS may be better sharing candidates than commercial wireless and Government operations, in part, because of technical considerations. In either case, open-ended spectrum sharing with co-primary Government users would create uncertainty about the amount of spectrum within a licensed block that would be available for future commercial use. This uncertainty may adversely affect licensees' ability to raise the capital needed to deploy their services. However, in the FSS bands, it may be possible to fashion technical sharing rules that would allow sharing between Government and commercial licensees without significantly reducing the amount of spectrum available for commercial use. Such rules may be less feasible in terrestrial bands where a wider range of commercial systems and services may be permitted.³¹

To resolve this issue, the Commission proposes that it and the National Telecommunications and Information Administration ("NTIA") should be co-arbiters on how this spectrum sharing could be implemented.³² In the NPRM, the Commission identifies three (3) possible approaches to implementing such sharing: (i) allocating exclusive band segments to Government use and to non-

³⁰NPRM at ¶18.

³¹NPRM at ¶18 (footnote omitted).

³²NPRM at ¶19.

Government use; (ii) establishing areas of geographic exclusivity; and (iii) granting the non-Government licensee exclusive rights to use a certain band in a specific geographic area.³³

In general, TIA is not convinced that allocating co-primary shared spectrum to Government and non-Government users is feasible. Sharing between non-Government and Government users has been quite difficult for the private sector. Prior coordination for non-Government frequencies in these high frequency bands typically is completed in a matter of hours or days, while coordination between non-Government and Government users typically takes months. These delays are increasingly counter-productive for the U.S. in the context of rapidly shortening business and technology cycles.

Certain of the NTIA proposals set forth in the NPRM, however, could be accommodated. NASA has proposed frequency sharing for stations in remote rural locations.³⁴ In this case, Space-to-Earth paths could be shared without coordination activity; merely geographic avoidance should be adequate. In contrast, Earth-to-Space paths would require complicated coordination or pointing/power restrictions, which would unduly constrain FS implementations. Frequencies for Earth-to-Space links thus should not be shared.

**THE COMMISSION'S BAND PLAN MUST BE
HARMONIZED WITH INTERNATIONAL ALLOCATIONS**

Establishing a band plan for the 36-51.4 GHz band cannot be implemented in isolation. Consistency between domestic and international allocations is absolutely essential. While "[m]ost of the 36-51.4 GHz band spectrum is allocated internationally and domestically on a co-primary basis

³³NPRM at ¶19.

³⁴See NPRM at ¶¶ 31-32.

to the fixed, mobile, FSS, and mobile-satellite services,"³⁵ any decision the Commission makes with respect to the proposals in the NPRM will reverberate in international markets.

Compelling reasons exist for the Commission to conform its 36-51.4 GHz band allocation with international allocations. If the Commission intends opening foreign markets for devices operating in these bands, it must allow interoperability with international standards. Microwave systems are natural platforms for new technology development. Successful exploitation of U.S. microwave technology is linked directly to harmonization with European and other international allocation standards.³⁶

Conformity with international allocations thus would have myriad benefits. Equipment standardization would be promoted. Access to global markets, which is essential for U.S. technologies and economic development, would be improved. Export of U.S.-made telecommunications equipment, including FS and HDFS systems, would increase. Innovation would be encouraged, which would help justify high costs incurred in developing millimeter wave equipment and other new technologies. Domestic manufacturers would remain competitive with overseas manufacturers. Equipment costs would be reduced.

Taking action that could make the U.S. the sole dissident to otherwise global standards must be avoided by the Commission.³⁷ In the NPRM, the Commission recognizes the value of

³⁵NPRM at ¶ 2.

³⁶Export of high quality, high frequency point-to-point microwave products by U.S. manufacturers has been quite successful. Numerous U.S.-based companies presently are exporting microwave radios in the 18-50 GHz range. U.S.-based companies presently lead the 38 GHz Band worldwide business with a 75% market share.

³⁷Matching international allocations and corresponding international standards has been, and must continue to be, an essential ingredient in domestic telecommunications and trade policy. For example, NTIA, in its 1993 "Agenda for Action" for the NII, stated that one of its goals is to "[c]oordinate with

harmonizing its band plan with international allocations.³⁸ Otherwise, by requiring different sets of procedures, export opportunities for domestic companies would be jeopardized and manufacturing costs would be increased.

Under these circumstances, it is especially necessary that the Commission's actions in this proceeding reflect the importance that FS networks are accorded internationally. For example, the ITU Working Party 1B has declared that:

Long-haul technologies such as satellite, microwave and fiber will be major components of the information superhighway, however, an economical and effective "last mile" distribution service will be necessary to make sophisticated interactive telecommunications applications available. Some subscribers will connect by coaxial cable, some by fiber and still others by [millimeter] links. The choice would be made on the basis of technical and economic considerations. Without this interface organizations will not be able to take advantage of the multitude of resources (both Federal and non-Federal) that require high-bandwidth access.

* * * * *

One major application that will depend heavily on the [millimeter] spectrum to connect to the information superhighway is "premises communications." Premises communications is defined as short range, high-capacity, point-to-point and network communications. Such technology will make adding, moving, and changing computer network connections far easier. It will also enabl[e] personnel to remotely connect to their office, bringing the concept of virtual offices closer to a reality. Ultimately, premises communications will

other levels of government and with other nations" and "to avoid needless obstacles and prevent unfair policies that handicap U.S. industry." The National Information Infrastructure: Agenda for Action, Dept. of Commerce, National Telecommunications and Information Administration, Dkt. No. 930940-3240, 58 FR 49025 (Sept. 21, 1993). Similarly, the Commission consistently attempts to ensure that its domestic spectrum allocations are compatible with international spectrum allocations. See MSS Order at ¶¶ 13-14.

³⁸NPRM at ¶ 11.