Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Use of Spectrum Bands Above 24 GHz For Mobile Radio Services	)	GN Docket No. 14-177
	)	
Establishing a More Flexible Framework to Facilitate Satellite Operations in the 27.5-28.35 GHz and 37.5-40 GHz Bands	)	IB Docket No. 15-256
	)	
Petition for Rulemaking of the Fixed Wireless Communications Coalition to Create Service Rules for the 42-43.5 GHz Band	)	RM-11664
	)	
Amendment of Parts 1, 22, 24, 27, 74, 80, 90, 95, and 101 To Establish Uniform License Renewal, Discontinuance of Operation, and Geographic Partitioning and Spectrum Disaggregation Rules and Policies for Certain Wireless Radio Services	)	WT Docket No. 10-112
	)	
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

COMMENTS OF THE SATELLITE INDUSTRY ASSOCIATION

Tom Stroup
President
Satellite Industry Association
1200 18th Street N.W., Suite 1001
Washington, D.C. 20036
(202) 503-1560

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SUMMARY

The Satellite Industry Association welcomes the opportunity to help shape the future of advanced broadband services in the millimeter wave bands. Many of the bands addressed in the Commission's Spectrum Frontiers Further Notice of Proposed Rulemaking ("*Further Notice*") are current satellite service bands as well as near-term future growth bands. Therefore, any plan for these bands necessarily should include provisions for sufficient spectrum and geographic flexibility to enable satellite services to continue to grow and innovate in order to provide high-speed broadband to all Americans, regardless of where they live.

The state of terrestrial communications services has not reduced the need for broadband satellite services, but rather demonstrates the need for a robust competitive alternative. Indeed, the satellite industry has invested years of technical development and billions of dollars to provide not only a competitive alternative to terrestrial services but also, in some areas, to provide the only option for an affordable, reliable, high-capacity Internet connection. Satellite providers are already providing satellite broadband services that meet and will soon exceed the Commission's broadband benchmark of 25 Mbps down/3 Mbps up, ensuring that all Americans have access to the advanced telecommunications services that are now a staple of business and personal life. To ensure that satellite services can continue to fulfill this role, grow, and provide expanded services in the future, the Commission must provide for sufficient spectrum and take reasonable measures to provide for the coexistence of current and future satellite systems with the Upper Microwave Flexible Use Service ("UMFUS"). SIA members provide individual comments on several fixed-satellite service ("FSS") bands, and consensus comments on the following bands:

37/39/42/50 GHz Bands. Broadband satellite systems must have access to sufficient V-band spectrum and geographic flexibility to support consumer demand for two-way broadband services. These bands have substantial existing allocations for FSS, and the Commission's rules for these bands should take into account not only the massive spectrum needs of satellite-based nationwide high-speed broadband service, but also the significant potential for coexistence with future UMFUS systems in certain portions of this spectrum through reasonable spectrum sharing measures.

47 GHz Band. Broadband satellite systems must have unfettered primary access in the 47 GHz band, particularly with respect to the 48.2-50.2 GHz portion of the band, for the operation of transmitting satellite end user terminals that will be deployed ubiquitously to customer locations. SIA therefore questions whether spectrum sharing with UMFUS would be feasible or appropriate in this spectrum.

24 GHz Band. Broadcasting-satellite service ("BSS") feeder links in the 24 GHz band are critical to direct-to-home programming for millions of customers, and are projected to provide service to tens of millions more. The Commission should allow use of this band for FSS uplink earth stations, subject to the same FCC technical rules, consistent with the primary FSS allocation throughout this spectrum and in order to provide a balance between satellite access to the band and introduction of mobile services. Potential future UMFUS operations can be accommodated through basic technical measures. By avoiding the 24.75-25.25 GHz frequencies when in close proximity to a satellite uplink facility, UMFUS can avoid the possibility of interference from the transmitting earth station. Existing uplink earth stations should be grandfathered, and satellite operators should have latitude to deploy future earth stations to meet growth requirements.

70, 80, and above 90 GHz Bands. As there is little use of these bands yet, and the technology to fully use them has not been developed either for satellite or mobile terrestrial services, the Commission need not, and should not, attempt to definitively address these bands at this time. Instead, the Commission should wait and see how terrestrial and satellite technologies, sharing techniques, and consumer demand develop before crafting regulations for the 70, 80, and above 90 GHz bands.

Use or Share. SIA supports adoption of a "use or share" approach that would permit siting of FSS earth stations in portions of an UMFUS license area in which the licensed spectrum is unused. The Commission should not consider allowing other services to operate in the 28 GHz band until the impact of newly authorized UMFUS operations on FSS uplinks has been fully evaluated and it is clear that UMFUS operations themselves will not degrade FSS service. Only then can the Commission reasonably evaluate the impact of additional terrestrial services on FSS satellites.

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COMMENTS OF THE SATELLITE INDUSTRY ASSOCIATION

The Satellite Industry Association ("SIA")[1] hereby submits these comments in response to the Commission's Further Notice of Proposed Rulemaking ("*Further Notice*") in the above referenced proceeding.[2]

[1] These comments are supported by all SIA members except for DIRECTV, which abstains from participation.

INTRODUCTION

The satellite industry has long been a critical participant in national and international communications infrastructure. By its nature, satellite service provides ubiquitous coverage, including to difficult-to-serve areas. In areas that are also served by terrestrial wired and wireless communications system, satellite provides a competitive alternative, backhaul capacity, and a critical backup during emergencies and following natural disasters.

The growth of terrestrial communications services has not reduced the need for satellite services, but rather has made satellite broadband even more important as a competitive force. In fact, as the satellite industry reported in comments to the Commission's recent Twelfth Broadband Progress Notice of Inquiry, the satellite segment continues to grow and to introduce important new services, including increasingly faster broadband and direct-to-home services that are necessary components of the communications marketplace. For example, ViaSat currently offers 25/3 Mbps coverage in many areas of the country and plans to increase its coverage and speed with new satellites being launched beginning in 2017.[3] Intelsat's EpicNG High Throughput Satellite ("HTS") series will provide an improved throughput on current generation platforms, delivering immediate efficiency benefits to American customers with throughput improvements of up to 2.5 times above the efficiency of wide beam capacity and current platforms, further demonstrating the increased value of HTS satellites. O3b provides very high speed, low-latency broadband connectivity comparable to terrestrial fiber services; indeed, O3b's

[2] Use of Spectrum Bands Above 24 GHz For Mobile Radio Services, GN Docket No. 14-177, et al., Report and Order and Further Notice of Proposed Rulemaking, FCC 16-89 (Jul. 14, 2016) ("*Further Notice*" or "*Order*").

[3] Comments of ViaSat, Inc., GN Docket No. 16-245 (Sep. 6, 2016).

networks are used as middle-mile connectivity by many large service providers.[4] Earlier this year, Inmarsat began worldwide operation of its Global Xpress network, which is capable of bringing broadband at speeds of up to 50 Mbps to users in the air, on land, and at sea.[5] With the launch of Echostar XIX later this year, Hughes will also be able to provide nationwide satellite broadband coverage at speeds of more than 25 Mbps.[6] In addition, Boeing recently announced an NGSO satellite system that proposes to deliver services well in excess of the Commission's 25/3 Mbps benchmark, anywhere in the United States.[7] Satellite service will also be an integral component of future 5G infrastructure, providing not only direct service to end users, but also backhaul, machine-to-machine connectivity, and resiliency from disasters.

The satellite industry is also a success story for American industrial and innovation leadership that is unique in the communications sector. Unlike some other segments of the communications industry, in which network technologies and user equipment predominantly are developed, designed, and manufactured by foreign companies, U.S. firms are market leaders and innovators in the satellite sector. Whether it is the construction of next generation satellite spacecraft, the development of innovative user terminals, or breaking new ground in the commercial space launch industry, U.S. entrepreneurs are global leaders in satellite innovation. This is why many satellite communications service providers – including major non-U.S. operators – seek out U.S. firms to design, manufacture, and deploy the space and ground-based components of their satellite communications systems. Accordingly, the satellite sector is

[4] Comments of O3b Limited, GN Docket No. 16-245 (Sep. 6, 2016).

[5] Comments of Inmarsat Mobile Networks, Inc., GN Docket No. 14-177, at 2 (Jan. 28, 2016).

[6] Comments of Hughes Network Systems, LLC, GN Docket No. 16-245, at 2 (Sep. 6, 2016).

[7] Comments of The Boeing Company, GN Docket No. 16-245, at 3 (Sep. 6, 2016).

responsible for creating tens of thousands of high-quality, skilled engineering and manufacturing jobs in the United States.

In order to continue this growth and the satellite industry's important contributions to broadband consumers, satellite operators must have sufficient protected access to greenfield spectrum bands in millimeter wave ("mmW") spectrum that enable higher speeds and more intensive broadband capabilities. Most of the bands identified in the *Further Notice* for consideration for the Upper Microwave Flexible Use Service ("UMFUS") include existing co-primary allocations for the fixed-satellite service ("FSS").[8] These bands are critical growth bands for satellite services and protected FSS access to these bands must be preserved for both current operations and future expansion.

In furtherance of its public interest obligations, the Commission must adopt reasonable measures to ensure that satellite systems have the ability both to locate individually-licensed earth stations on a coordinated basis and to deploy user terminals in portions of the upper mmW bands in order to facilitate the growth of satellite service and its continued contributions to consumers. In raising these points, SIA emphasizes the significant potential for coexistence with future UMFUS systems in certain portions of this spectrum, provided appropriate protections for satellite operations are maintained. As shown in the examples discussed below, reasonable spectrum sharing measures can be crafted to address the unique conditions of specific spectrum

[8] The 24 GHz band (24.25-24.45 GHz and 24.75-25.25 GHz) has an FSS allocation in the upper half gigahertz. In the three gigahertz comprising the 37/39 GHz bands (37-38.6 GHz and 38.6-40 GHz, respectively), FSS is allocated in two and a half gigahertz. The 47 GHz band (47.2-50.2 GHz) includes a co-primary allocation for FSS throughout the entire band. The 50 GHz band (50.4-52.6 GHz) has an FSS allocation in approximately half of this range, from 50.4-51.4 GHz. FSS is allocated in all ten gigahertz comprising the 70/80 GHz bands (71-76 GHz and 81-86 GHz, respectively.

bands and anticipated use by satellite system operators and UMFUS licensees, while ensuring efficient use of the spectrum resource.

I. TO FOSTER THE DEVELOPMENT OF BROADBAND SATELLITE SYSTEMS CAPABLE OF PROVIDING COMPETITIVE SERVICE NATIONWIDE, THE COMMISSION MUST PROVIDE SUFFICIENT V-BAND SPECTRUM FOR FSS

The Spectrum Frontiers proceeding, and indeed much of the Commission's policy in recent years, has been driven by the basic acknowledgement that the market demand for broadband data capacity is effectively insatiable. Countless technologies, services, and businesses all rely on the free and fast flow of data, and future innovation will surely require even greater capacity. As the *Order* observes, regulators around the world are preparing to accommodate an eventual 1,000-fold increase in traffic demand and speeds in excess of 10 gigabits per second.[9] Fixed broadband customers today use an average of 57.4 GB of data per month per household,[10] and this number can only be expected to grow.

In the past, the Commission has questioned whether broadband satellite systems have sufficient capacity to accommodate this trend, both with respect to satisfying speed requirements[11] and overall consumer demand.[12] SIA has explained that satellite broadband is

[9] *Further Notice*, ¶ 9.

[10] Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996, as Amended by the Broadband Data Improvement Act, GN Docket No. 15-191, 2016 Broadband Progress Report, FCC 16-6, ¶37, 120-124 (2016) ("*2016 Broadband Progress Report"*) (citing Sandvine Global Internet Phenomenon Report 1H 2014 at 5, Sandvine Inc., available at https://www.sandvine.com/downloads/general/global-internet-phenomena/2014/1h-2014-global-internet-phenomena-report.pdf ("*Sandvine Report*").

[11] *See 2016 Broadband Progress Report*, ¶¶ 3, 48.

[12] *See id.*, ¶ 47 n.162.

part of the U.S. broadband solutions and satellite operators have evolving networks capable of meeting the demands of the future. Recently, the Commission has acknowledged that satellite broadband systems can meet this demand[13] and, with higher capacity networks on their way, that satellite networks will be an essential part of the broadband ecosystem. The Commission must ensure that satellite systems licensed to operate in the V-band and in other mmW bands have protected access to adequate spectrum resources to ensure they have sufficient capacity to provide high speed, competitive services to consumers, and offer a competitive alternative to terrestrial broadband service. Achieving this will require access to both sufficient downlink and uplink spectrum resources for both individually-licensed earth stations and blanket-licensed user terminals.

Many broadband satellite communications systems are two-way networks directly serving end users. In order to support these connections, the spectrum available for gateways must be sufficient to support the traffic on the user link. Without sufficient gateway capacity to support user requirements, the system simply cannot deliver the high speeds that users demand.

To satisfy consumer expectations, broadband satellite systems also require access to sufficient V-band spectrum to operate satellite end user terminals, and they also require the flexibility to locate these terminals as needed by their customers. The Commission must therefore ensure that V-band satellite systems have access to sufficient uplink and downlink spectrum for individually-licensed earth stations and end user terminals. The 37/39 GHz, 47 GHz, 50 GHz; and 70/80 GHz bands all have substantial existing FSS allocations, and the

[13] *See id.*, ¶ 46; *see also* Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996, as Amended by the Broadband Data Improvement Act, GN Docket No. 16-245, *Twelfth Broadband Progress Notice of Inquiry*, FCC 16-100, ¶¶ 12, 60 (Aug. 4, 2016).

satellite industry plans to make intensive use of this spectrum with individually-licensed earth stations and user terminals, as appropriate, throughout the country.

II. EXISTING AND FUTURE SATELLITE UPLINK FACILITIES REQUIRE PROTECTED ACCESS TO THE 24 GHz BAND

As the *Further Notice* acknowledges, the 24.75-25.25 GHz portion of the 24 GHz band is allocated on a primary basis for FSS and is used for feeder links to support broadcasting-satellite services ("BSS").[14] These facilities are currently in service and are anticipated to grow to support direct-to-home services to potentially tens of millions of consumers. The Commission's plans for the 24.75-25.25 GHz band therefore must include protection for these feeder links and the associated gateway earth stations. It is expected that the number of BSS feeder link facilities in the 24 GHz band across the country will be modest and readily accommodated.

Furthermore, the Commission should specify that satellite use of the 24.75-25.25 GHz band is not limited BSS feeder links. In the ITU Radio Regulations, priority is given to BSS feeder link usage, but other types of FSS operations are allowed.[15] Consistent with the international designation, the Commission has made clear that use of the 24.75-25.05 GHz band segment for any type of FSS operation is permitted.[16] SIA supports making the whole 24.75-

[14] *Further Notice*, ¶ 380.

[15] ITU Radio Regulations No. 5.535.

[16] *See* Amendment of Parts 1, 2, 15, 25, 27, 74, 78, 80, 87, 90, 97, and 101 of the Commission's Rules Regarding Implementation of the Final Acts of the World Radiocommunication Conference (Geneva, 2007) (WRC-07), *Report and Order, Order, and Notice of Proposed Rulemaking*, 30 FCC Rcd 4183 at 4212, ¶ 71 (2015). This flexibility was codified in current footnote NG535 to the U.S. Table of Allocations. *See id.* (revising what had previously been footnote NG167 to provide for FSS operations in the 24.75-25.05 GHz band, subject to protection of BSS feeder links and renumbering the updated footnote as NG535). The *Further Notice* incorrectly states that use of the 24.75-25.25 GHz band is limited to BSS feeder links, based on the language of footnote NG167, which is no longer in effect. *See Further Notice*, ¶ 380 & n.1021, *citing* 47 C.F.R. § 2.106 footnote NG167.

25.25 GHz band available for all FSS uplink earth station operations with characteristics similar to those of currently licensed BSS feeder links and subject to the same technical rules in Part 25 applicable to use of the band by BSS feeder links. In order to do that, the Commission should revise the applicable footnote to the Table of Allocations to track No. 5.535 of the ITU Radio Regulations.[17]

Consistent with their primary status in the 24.75-25.25 GHz band, existing and future BSS feeder links and other FSS uplink earth stations should not be required to limit their operations in order to protect future mobile terrestrial operations. Instead, the Commission should allow new UMFUS operations and other terrestrial uses only on a secondary basis.[18]

At a minimum, BSS feeder links and other FSS uplink earth stations licensed by the date of a Second Order in this proceeding should be grandfathered and the Commission should permit reasonable alteration or expansion of such facilities. If the Commission decides to authorize introduction of UMFUS or other terrestrial services on a co-primary basis, it should provide significant flexibility for deployment of new earth stations, subject to common sense sharing approaches as discussed herein. This will facilitate more spectrally-efficient use of the band

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[17] Specifically, the Commission should modify footnote NG535 as follows:

NG535 ~~The following provisions shall apply to the use of the 24.75-25.25 GHz range by the fixed-satellite service (Earth-to-space):~~

~~(a)~~ In the band 24.75-25.25 ~~25.05~~ GHz, feeder links to stations of the broadcasting-satellite service have priority over other uses in the fixed-satellite service (Earth-to-space). Such other uses must protect and may not claim protection from existing and future operating feeder-link networks to such broadcasting satellite stations. ~~(b) The use of the band 25.05-25.25 GHz is restricted to feeder links for the broadcasting-satellite service.~~

[18] The Commission specifically seeks comment on whether terrestrial fixed or mobile services should be secondary to FSS. *See Further Notice,* ¶ 383.

while allowing introduction of additional terrestrial uses of the band that the Commission envisions in the *Further Notice*.

BSS feeder links are a critical component of satellite infrastructure that currently serves millions of customers and will serve millions more in the future. Additionally, consumers would benefit from increased access to broadband service through the addition of FSS operations in the band. Through the basic steps outlined herein, the Commission can and should ensure that BSS and FSS operations and potential future UMFUS systems can coexist in the 24 GHz band.

III. REASONABLE SHARING STRATEGIES EXIST FOR THE OPERATION OF FSS AND UMFUS IN CERTAIN SPECTRUM

The spectrum sharing potential for each band is a function of the proposed uses of the band—such as the location, density, and directionality of transceivers associated with proposed services—and the technological and regulatory strategies available to mitigate interference in that band. SIA presents below several examples of the sharing options available in various bands considered in this proceeding. As also explained below, however, certain spectrum in the V-band is critical to the future growth of satellite services and should be designated as core FSS spectrum bands where UMFUS should not operate. More detailed discussions will be presented by individual SIA members in their comments in this proceeding.

A. Individually-Licensed Satellite Uplink Earth Stations Bands Can Operate on a Shared Basis With UMFUS Systems in Certain Spectrum Bands

FSS has a primary allocation in all of the 24.75-25.25 GHz band, two-thirds of the 47 GHz band and half of the 50 GHz band. SIA proposes that individually-licensed FSS earth stations retain their primary status in the 24 GHz band and be given co-primary status with UMFUS licensees in the 47.2-48.2 GHz portion of the 47 GHz band and in all of the 50 GHz band in order to ensure the most efficient use of this spectrum. The very different use cases and

deployment characteristics of individually-licensed earth stations and terrestrial mobile stations in these bands will allow the two services to share the above-identified portions of these bands and make productive use of valuable spectrum under an appropriate regulatory regime.

The wireless industry has made clear that "the primary opportunity for mmW deployment is in areas with the greatest population density . . . due to the fact that mmW spectrum is unlikely to deliver extensive coverage in a market but instead will be best suited to providing capacity via small cells and backhaul, particularly in densely populated areas."[19] As the Commission has similarly recognized with respect to other spectrum above 24 GHz, short transmission paths and high propagation losses facilitate spectrum reuse by limiting interference between transmitters and receivers in adjacent areas.[20]

Individually-licensed FSS earth stations use high-gain antennas that direct emissions towards their associated satellites, which significantly limits any potential interference toward terrestrial 5G deployments. As a result, there is only a small area around each earth station facility in which UMFU operations might experience interference.

The operation of individually-licensed satellite uplinks will therefore not prevent use by UMFUS systems in shared spectrum bands. Given the large number of individually-licensed earth stations that will be needed to support very high data rate services, however, it would not be possible for the satellite industry to locate its individually-licensed earth stations using the Commission's proposed restriction of affecting no more than 0.1 percent of the population in any PEA or county. Nevertheless, reasonable approaches to spectrum sharing with UMFUS systems are available and achievable.

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[19] *See* Letter from Scott K. Bergmann (CTIA) to Marlene H. Dortch, GN Docket No. 14-177 *et al.*, at 2 (May 20, 2016).

[20] *See Further Notice*, ¶ 6.

For example, it likely would be possible to require satellite operators to maintain a database of individually-licensed earth station locations so that UMFUS system operators can take operational measures to avoid interference from individually-licensed earth station transmissions. For example, if an UMFUS mobile user terminal receives unwanted energy from an individually-licensed satellite earth station, the terminal could be directed to transmit back to its base station on return link frequencies that are outside the affected bands. It is anticipated that all or most UMFUS end user terminals will be able to transmit on multiple bands, likely including legacy cellular bands. This capability will be needed to address numerous situations in which UMFUS user terminals will be able to receive UMFUS signals using the V-band, but will not be able to close a return link back to the serving base station due to such factors as building attenuation, foliage, rain fade or countless other factors. Using this type of approach, intensive spectrum sharing can be achieved between UMFUS systems and broadband satellite systems in the 24 GHz band, the 47.2-48.2 GHz portion of the 47 GHz band, and the 50 GHz band, without burdening appreciably either type of spectrum use. Other approaches may also be appropriate, including through coordination.

B. FSS Operations that Only Receive in the 37/39 GHz and 42 GHz Bands Could Maximize the Use of Spectrum Without Creating a Risk of Interference to Terrestrial Wireless

As the Commission acknowledges in its Further Notice, technical analysis submitted in the docket has shown that satellite end user terminals can successfully receive satellite downlink transmissions in the 37/39 GHz band despite the presence of UMFUS systems.[21] This spectrum is already available for downlink transmissions to satellite gateways and it should also be

[21] *See id.*, ¶ 498 (explaining that "we recognize that Boeing has submitted a study which shows that coexistence is possible, even at the higher PFD level").

available for downlink transmissions on an opportunistic basis to satellite end user terminals. The same narrow beamforming that makes UMFUS communications possible in mmW spectrum facilitates sharing with satellite earth station user terminals.

Likewise, in the 42 GHz band, the operation of individually-licensed earth stations and end user terminals to receive satellite downlink transmissions would not create any risk of interference to potential UMFUS users. Opportunistic satellite user terminal operations in the receive band is perhaps the simplest spectrum sharing technique, and can ensure that valuable spectrum is being used intensively in a way that maximizes its value to all services and maximizes the number of people that can be served.

IV. SATELLITE END USER TERMINALS REQUIRE ACCESS TO UPLINK SPECTRUM IN THE 47 GHZ BAND AND GEOGRAPHIC FLEXIBILITY TO LOCATE USER TERMINALS

The Commission has previously designated the 48.2-50.2 GHz and 40-42.0 GHz bands for FSS operations, noting the need for FSS to be able to operate in its own spectrum, unimpeded by terrestrial operations, and to provide certainty for business planning purposes[22] Consistent with this, ITU footnote 5.516B identifies two gigahertz of uplink spectrum for high-density FSS operations in the V-band, 48.2-50.2 GHz (Earth-to-space), paired with 40.0-42.0 GHz (space-to-

[22] 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, *Second Report and Order*, 18 FCC Rcd 25428 (2003); 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, *First Report and Order*, 13 FCC Rcd 24649, ¶¶ 10, 17-18 (1999).

Earth).[23] The *Further Notice* acknowledges this international identification and recognizes that the 48.2-50.2 GHz band is intended to be used in conjunction with the 40.0-42.0 GHz band for V-band FSS operations.[24] Indeed, some SIA members have been making next-generation system plans based on these longstanding primary satellite designations under the Commission's existing band plan. SIA also emphasizes that the 47.2-48.2 GHz band immediately adjacent to this range is also allocated for FSS Earth-to-space operations in the United States and internationally, and provides valuable spectrum capacity and additional sharing capabilities for FSS operators. Thus, SIA requests that the Commission consider the entire range of 47.2-50.2 GHz in evaluating ways to address FSS end user uplink operations in the V-band.[25]

The 48.2-50.2 GHz segment of the V-band is designated in the U.S. primarily for FSS uplink use, including for ubiquitously-deployed user terminals. That is, today, any number of earth stations can be located anywhere, on a primary, protected basis in this band, and without being constrained by current or future terrestrial operations. This band segment, and the associated downlink band at 40.0-42.0 GHz, is critical for the V-band FSS networks being planned for the near term.

In the *Further Notice*, the Commission considers opening the 48.2-50.2 GHz band segment for fixed and mobile operation to allow a three-gigahertz swath of spectrum for such terrestrial operations when paired with the adjacent 47.2-48.2 GHz band segment. To

[23] ITU Footnote 5.516B, *see* 47 C.F.R. § 2.106 n.5.516B.

[24] *Further Notice*, ¶¶ 411, 421.

[25] In advocating for access to the 47.2-48.2 GHz portion of the 47 GHz band for satellite end user terminal Earth-to-space transmissions, SIA acknowledges an approach would have to be developed to address spectrum sharing between satellite end user terminals and individually-licensed satellite earth stations, which, as discussed above in Section III.A. of these comments, will also require access to the 47.2-48.2 GHz portion of the 47 GHz band for uplink transmissions.

accommodate such expanded terrestrial use, the Commission proposes to restrict individually-licensed earth stations in the 48.2-50.2 GHz band to one protected location in each Partial Economic Area ("PEA") – totaling only 416 individually-licensed earth stations to be deployed nationwide – and to impose the type of licensing framework adopted for individually-licensed earth stations in the 28 GHz band.[26] That framework would significantly restrict siting of individually-licensed earth stations in certain locations, including any major event venue, arterial street, interstate or U.S. highway, urban mass transit route, passenger railroad and cruise ship port.[27] SIA opposes the proposal to fundamentally change the terms on which the FSS currently may use the 48.2-50.2 GHz band, because this band, like the companion 40.0-42.0 GHz downlink band, is critical to FSS expansion.

V. THE IMPACT ON SPACE STATION RECEIVERS OF AGGREGATE INTERFERENCE BY TERRESTRIAL SOURCES IN THE 24, 47, AND 50 GHZ BANDS MUST BE ADDRESSED

The satellite community has repeatedly raised the concern that the aggregate emissions of potentially millions of UMFUS devices toward the sky could create an interference threat to space-based FSS receivers.[28] This concern also exists with respect to the 24, 47 and 50 GHz bands if UMFUS systems are ultimately permitted and deployed. The Commission has repeatedly acknowledged the potential for aggregate interference to satellite receivers in the

[26] *Further Notice*, ¶ 412.

[27] *See Order*, ¶ 54.

[28] *Further Notice,* ¶ 61 (citing filings from O3b, SES Americom, ViaSat, EchoStar, Inmarsat, Intelsat, OneWeb).

context of the 28 GHz band,[29] and has put a process in place to allow the issue to be examined more fully.[30]

SIA appreciates the Commission's consideration of various technical assumptions regarding UMFUS, such as downtilting, dynamic beamforming, and variable power control, as well as environmental factors such as indoor and in-vehicle use.[31] Under ideal circumstances, such measures, if consistently employed by UMFUS licensees, could reduce the amount of UMFUS emissions directed skyward and limit the level of interference expected to be experienced by satellite receivers. Nonetheless, the Commission did not incorporate any of these assumptions into enforceable requirements, and actual usage patterns may well deviate from these assumptions. Thus, the Commission should, at minimum, identify aggregate interference to satellites as a potential risk in its rules for UMFUS in the 24, 47, and 50 GHz bands and commit to addressing it much as it has done on the 28 GHz context.

As SIA and members of the satellite community have previously noted, the potential for aggregate interference to FSS systems is a matter of U.S. treaty obligation that requires the United States to prevent harmful interference to non-U.S. space stations operating in conformance with the ITU Radio Regulations.[32] In the *Order,* the Commission recognizes that the United States has an international obligation to protect FSS networks and explains that in the

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[29] *Id.*, ¶¶ 61, 288.

[30] *Id.*, ¶ 65.

[31] *Id*., ¶¶ 65-66.

[32] Letter from Tom Stroup, President, Satellite Industry Association, to Marlene Dortch, Secretary, Federal Communications Commission, GN Docket No. 14-177 (Jun. 17, 2016); Letter from Jennifer Warren, Vice President, Technology Policy and Regulation, Lockheed Martin, to Marlene Dortch, Secretary, Federal Communications Commission, GN Docket No. 14-177, at 2-4 (Jun. 24, 2016).

event there is interference, the Commission will address it accordingly.[33] The *Further Notice* continues this approach therefore the proposal for UMFUS in the bands under consideration therein runs the risk of violating U.S. treaty obligations. As noted above, the Commission's assessment in this regard is based on a series of assumptions that may or may not be borne out in practice, and SIA believes a more proactive approach would be appropriate in the bands under consideration in the *Further Notice.* SIA urges the Commission to adopt network configuration and operational requirements for UMFUS systems in the 24, 47, and 50 GHz bands to ensure the avoidance of aggregate interference into international satellite systems. Such measures would be much easier to adopt and implement now, while UMFUS is still in a conceptual stage, rather than later, when UMFUS systems may already be in operation and any interference would be difficult or impossible to effectively address.

VI. ADDITIONAL FSS EARTH STATIONS SHOULD BE PERMITTED ON A "USE OR SHARE" BASIS

The *Further Notice* acknowledges that some terrestrial use cases for the mmW bands could result in spectrum remaining unused in significant portions of UMFUS geographic license areas.[34] It therefore asks whether UMFUS licensees should be required to share unused portions of their license areas, including in the 28 GHz and 39 GHz bands.[35]

SIA supports adoption of a "use or share" approach that would permit siting of FSS earth stations in portions of an UMFUS license area in which the licensed spectrum is unused. The *Report and Order* permits deployment of a limited number of protected FSS earth stations in the

[33] *Order,* ¶ 62 n.135.

[34] *Id.*, ¶ 473.

[35] *Id.*, ¶ 474.

28 GHz band subject to multiple restrictions.[36] The *Report and Order* concludes that certain protected deployments of earth stations in the 28 GHz band could constrain terrestrial use of the band by UMFUS licensees.[37] In other words, the Commission was focused on ensuring that the flexibility of UMFUS licensees to build out their networks would not be constrained by the deployment of protected FSS earth stations.

The *Further Notice* appropriately recognizes that UMFUS deployment in some use cases will be limited to relatively small geographic areas,[38] and asks whether other services should be permitted in areas in which the UMFUS licensees do not provide service.[39] Areas in which any UMFUS licensee does not provide service should be available for deployment of additional protected FSS earth stations. The 28 GHz band provides a prime opportunity for maximizing spectrum use through such a "use or share" paradigm.

The *Report and Order* recognizes that "FSS earth stations in the 28 GHz band can share the band with minimal impact on terrestrial operations"[40] and FSS operators have shown that they can make highly efficient and productive use of the 28 GHz band with a small terrestrial interference footprint. The FCC's rules should permit and encourage deployment of earth stations under these circumstances, and any earth stations deployed on a use or share basis should be fully protected.

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[36] *Order*, ¶¶ 53-55.

[37] *See, e.g., id.*, ¶ 50.

[38] *Further Notice*, ¶ 473.

[39] *Id.,* ¶ 474.

[40] *Order*, ¶ 45.

The FNPRM appears to contemplate authorization of non-FSS services, including "dynamic opportunistic"[41] and unlicensed[42] uses, and (apparently) other licensed, protected services, on a use or share basis. For the reasons set forth below, it is premature for the FCC to consider authorizing services other than UMFUS and FSS in the 28 GHz band. Should the Commission nevertheless authorize other services, those services must protect, and must not unduly constrain further deployment of, FSS earth stations, which have licensing priority over all non-UMFUS services authorized in the 28 GHz band. When the FCC adopted the 28 GHz licensing priorities in 1996, it clearly stated that services then-treated by rule as secondary (specifically including FSS) would have "licensing priority vis-à-vis any third service allocated domestically or internationally in the band."[43] Although the *Report and Order* rejects arguments that granting mobile rights to Local Multipoint Distribution Service ("LMDS" now UMFUS) licensees constitutes a reversal of the FCC's longstanding policy of treating FSS as secondary only to LMDS,[44] that decision leaves the FCC's 20-year-old priority for FSS over all other services in place.

The Commission should not consider authorization of additional services in the 28 GHz band on a "use or share" or any other basis at this time. The NPRM record reflects the FSS operators' concern that UMFUS operations could cause harmful interference to existing and

[41] *Further Notice*, ¶ 477.

[42] *Id.*, ¶ 480.

[43] Rulemaking to Amend Parts 1, 2, 21, and 25 of the Commission's Rules to Redesignate the 27.5-29.5 GHz Frequency Band, to Reallocate the 29.5-30.0 GHz Frequency Band, to Establish Rules and Policies for Local Multipoint Distribution Service and for Fixed Satellite Services, CC Docket No. 92-297, *First Report and Order*, 11 FCC Rcd 19005, 19024 ¶ 44 (1996) ("*28 GHz First Report and Order*") (*emphasis added*).

[44] *Order*, ¶¶ 62-64.

future FSS satellites unless steps are taken to control aggregate skyward emissions from all UMFUS operations. The *Report and Order* directed the staff to open a separate docket to receive additional evidence and reserved the right to revisit this issue.[45] Notably, this decision was based exclusively on studies modeling interference from UMFUS operations.[46]

Only after the impact of newly authorized UMFUS operations on FSS uplinks has been fully evaluated, and it is clear that UMFUS operations themselves will not degrade FSS service, can commenters address and the FCC reasonably evaluate the impact of additional terrestrial services on FSS satellites. With the possible exception of some indoor emissions, many terrestrial transmissions at 28 GHz can increase the noise floor for satellite uplinks, potentially degrading service. Moreover, with existing and foreseeable technology it would be impossible to determine, in the event of harmful interference, the extent to which the interference was caused by third services as opposed to UMFUS operations. At a minimum, the aggregate impact of UMFUS on 28 GHz FSS uplinks in all likely scenarios must be thoroughly understood before the Commission considers authorizing additional terrestrial services in the 28 GHz band.

VII. THE COMMISSION SHOULD PRESERVE THE ABILITY TO OPERATE FSS SYSTEMS IN THE 70/80 GHZ BANDS AND ABOVE 90 GHZ

The 70/80 GHz and above 90 GHz bands are important future growth options for the satellite industry. SIA urges the Commission to adopt measures that will allow FSS operations in this spectrum. As the Commission acknowledged in the *Further Notice*, there is limited interest from mobile operators for use of these bands, likely due to combination of terrestrial

[45] *Id.*, ¶ 69.

[46] *Id.*, ¶¶ 65-67.

coordination/partitioning, protection of Federal satellite and radio astronomy operations,[47] and lack of available technology for terrestrial mobile use. Thus, there is ample reason and time for the Commission to allow flexibility while technology and consumer demand for higher frequency mmW band services develop over the next several years, and to consider this new data when revisiting these bands. In particular, the Commission should take into account studies and technological developments on the 70, 80 or above 90 GHz bands, including the outcome of ITU spectrum sharing studies that are currently underway in advance of WRC-19.[48]

VIII. CONCLUSION

SIA urges the Commission to ensure that its plans for the mmW spectrum take into account current satellite services as well as near-term growth of high-capacity satellite broadband. In order to provide the ubiquitous service and competitive broadband alternative that millions of Americans require, broadband satellite systems require access to sufficient spectrum

[47] *Id.*, ¶ 428 (*citing* In the Matter of Use of Spectrum Bands Above 24 GHz for Mobile Radio Services, *Notice of Proposed Rulemaking*, FCC 15-138, ¶ 86 (2015) ("*NPRM*")).

[48] Final Acts WRC-15, Resolution 238, "Studies on frequency-related matters for International Mobile Telecommunications identification including possible additional allocations to the mobile services on a primary basis in portion(s) of the frequency range between 24.25 and 86 GHz for the future development of International Mobile Telecommunications for 2020 and beyond" (designated as WRC-19 Agenda Item 1.13).

and geographic flexibility to locate both satellite end user terminals and individually-licensed earth stations.

Respectfully submitted,

THE SATELLITE INDUSTRY ASSOCIATION

By: /s/ Tom Stroup
Tom Stroup
President
Satellite Industry Association
1200 18th Street N.W., Suite 1001
Washington, D.C. 20036
(202) 503-1560

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