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

To: The Commission

REPLY COMMENTS OF THE SATELLITE INDUSTRY ASSOCIATION

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SUMMARY

The Satellite Industry Association ("SIA") welcomes the opportunity to address spectrum sharing with terrestrial services in bands above 24 GHz, including the 27.5-28.35 GHz band ("28 GHz band"), 37.5-38.6 GHz band ("37 GHz band"), 38.6-40.0 GHz band ("39 GHz band"), and the 71-76 GHz/81-86 GHz bands. The future of broadband depends on developing a realistic plan for sharing this spectrum between the existing satellite users and the new proposed terrestrial mobile services. The nascent nature of the proposed terrestrial mobile services provides an opportunity for the FCC to consider innovative regulatory solutions in this proceeding.

SIA acknowledges the promise of future 5G service, but reminds the Commission that satellite operators are already efficiently and effectively using portions of the spectrum above 24 GHz to provide robust broadband service today to millions of U.S. consumers, and are relying on access to that spectrum for a number of networks under construction and development. Satellite broadband plays a critical and growing role in the nation's broadband infrastructure, in populated areas as well as in less densely populated areas that terrestrial broadband providers cannot or will not serve. In addition to providing service to end user customers, satellite broadband is a key component of future terrestrial 5G services, extending coverage and reliability by providing backhaul and continuity of operations in the event of terrestrial disasters.

Given the demonstrated performance and future promise of satellite services, the plan for the millimeter wave bands must include adequate protection for current and future satellite operations. Although sharing may well be possible in some of the bands under discussion, any revised band plan that marginalizes satellite operations or limits their future growth is an incomplete and unacceptable solution for the envisioned 5G future. Ultimately, the promotion

of future 5G operations in the spectrum above 24 GHz should not come at the expense of the continued growth of satellite services.

SIA and its members stand ready to work with the Commission and terrestrial wireless proponents to craft workable sharing plans in those bands where coexistence between terrestrial 5G and satellite operations may be feasible. The 28 GHz and 42.0-42.5 GHz bands are closely identified with current satellite operations and are critical near-term expansion bands for the Fixed Satellite Service ("FSS"). Thus, any decision on sharing with terrestrial services in these bands must ensure that satellite service is reasonably protected for current operations and future growth. SIA believes that the initial focus in this proceeding can be on FSS equipment at fixed locations. SIA also urges the Commission to recognize the needs and plans of the satellite industry to also use the 28 GHz band for satellite earth stations on moving platforms and at end-user premises, both domestically and internationally.

In other bands within the U.S. domestic spectrum environment, such as the 37 and 39 GHz, 71-76 GHz, and 81-86 GHz bands, the Commission should facilitate efforts between terrestrial and satellite operators to implement a spectrum sharing environment that enables the co-primary use of FSS with future 5G services.

Although SIA files these comments on behalf of its members and to express the general position of the industry with regard to the need to protect adequately satellite operations, the satellite networks of individual members may vary significantly and many SIA members have filed separate comments to ensure that the record reflects the necessary characteristics and interference environment for their services.

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REPLY COMMENTS OF THE SATELLITE INDUSTRY ASSOCIATION

The Satellite Industry Association ("SIA") submits this reply to the comments filed in response to the Commission's Notice of Proposed Rulemaking ("*NPRM*") in the above-referenced proceeding.[1]

[1] Use of Spectrum Bands Above 24 GHz For Mobile Radio Services, et al., GN Docket No. 14-177, *Notice of Proposed Rulemaking*, FCC 15-138 (Oct. 23, 2015) ("*NPRM*").

I. INTRODUCTION

Satellite operators today are key suppliers of broadband and advanced video services to tens of millions of U.S. subscribers. Through their nationwide footprint, satellite operators are able to offer additional broadband options to all U.S. consumers and also to connect underserved and otherwise unserved areas and populations. Without satellites, millions of U.S. consumers would not have access to advanced communications services at competitive rates, if at all. Satellite also enables terrestrial networks, by providing critical backhaul as well as the ubiquity, security, and reliability required for future 5G networks and Internet of Things applications. In addition, satellite networks remain uniquely capable of providing mission-critical national security and emergency communications, even when the terrestrial infrastructure is unavailable.

To meet the ever growing demand of consumers and carriers for satellite broadband, satellite networks continue to grow in size, number, and sophistication. The satellite industry is constantly constructing and launching new advanced communications and broadband satellites, expanding the speed and offerings available to all U.S. consumers. This investment in the future, however, requires regulatory certainty and assurance of access to adequate spectrum and interference protection.

Given the satellite industry's need for access to current and additional spectrum to facilitate next generation satellite broadband, SIA fully appreciates the goals of this proceeding. SIA recognizes that administrations around the world may implement terrestrial 5G services differently and potentially in different frequency bands. At the same time, however, the Commission must not needlessly sacrifice the demonstrated value and future potential of advanced satellite services in its pursuit of terrestrial 5G. Instead, SIA urges the Commission to seek a mutually workable regulatory environment in the bands above 24 GHz.

Below, SIA describes the critical telecommunications services provided by satellites, the satellite industry's trajectory of growth and innovation, and the significant risks that the NPRM could pose to both commercial and government users that rely on satellite communications if the Commission's proposals fail to take into account the requirements of the satellite services using these bands today and in the future. SIA identifies several spectrum bands that could allow both emerging terrestrial services and existing and emerging satellite services to thrive in millimeter wave spectrum, and reaffirms its commitment to work with terrestrial operators towards a consensus for efficient and predictable spectrum sharing.

II. SATELLITE IS ALREADY USING SPECTRUM ABOVE 24 GHZ TO PROVIDE BROADBAND SERVICE TODAY AND HAS A CRITICAL ROLE IN THE NEXT-GENERATION SERVICES OF TOMORROW

Many commenters describe the substantial promise of terrestrial 5G for providing wireless broadband service in the near future.[2] The record, however, demonstrates that satellite is already providing high-capacity broadband service across the nation.[3] The NPRM correctly acknowledges that satellite technology is "particularly important" for service in "remote areas

[2] *See, e.g.*, Comments of CTIA, GN Docket No. 14-177 et al., at 2 (Jan. 28, 2016) ("*CTIA Comments*") (touting the benefits of forthcoming 5G services to "enhance high-capacity and high-speed services, increase quality of service for consumers, and enable new technologies and services"); Comments of AT&T, GN Docket No. 14-177 et al., at 2 (Jan. 28, 2016) ("*AT&T Comments*") (noting the potential for 5G services to "revolutionize the mobile experience as consumers know it today").

[3] Comments of SIA, GN Docket No. 14-177 et al., at 3-6 (Jan. 29, 2016) ("*SIA Comments*"); *see also*, Comments of ViaSat, GN Docket No. 14-177 et al., at 2, 6 (Jan. 29, 2016) ("*ViaSat Comments*") (Viasat serves nearly 700,000 customers in addition to millions of aircraft passengers each month, surpassing DSL and cable as a provider of choice for broadband); Comments of Inmarsat, GN Docket No. 14-177 et al., at 3 (Jan. 29, 2016) ("*Inmarsat Comments*") (noting that Global Xpress provides global coverage with 50 Mbps speed), Comments of SES Americom, GN Docket No. 14-177 et al., at 4 (Jan. 29, 2016) ("*SES Comments*") (reporting that SES-15, for launch in 2017, will provide high-throughput that will greatly increase the capacity and data speed available to satellite broadband consumers in the United States, including for aeronautical, VSAT, maritime and government customers).

that are unserved or underserved" by terrestrial communication facilities, and also provides "vital connectivity for first responders in emergencies and natural disasters."[4] Far from being solely a service of last resort in emergencies or in unserved or remote areas, satellite service today plays a key role in the broadband market by offering more broadband options to all U.S. customers as well as bringing service to places that terrestrial broadband cannot or will not go.[5]

For instance, Hughes describes how it has leveraged its nationwide reach to help rural schools across the country to "bridge the digital divide left by terrestrial networks" by providing high-speed broadband capacity that enables students to access the Internet in areas where it is not physically or economically feasible to bring wired or terrestrial wireless.[6] Indeed, as the largest satellite broadband provider in North America, Hughes delivers broadband access to approximately one million subscribers across North America.[7] ViaSat describes in its comments its provision of satellite broadband to approximately 700,000 customers at fixed locations, as well as in-flight connectivity on more than 400 commercial aircraft and an equal number of government aircraft.[8] O3b describes in its comments how it has dramatically increased the broadband speeds and availability for American Samoa using its 28 GHz service, and the advanced trials being conducted by U.S. government agencies such as the U.S. Navy and the

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[4] *Notice*, ¶ 33 (citing Comprehensive Review of Licensing and Operating Rules for Satellite Services, Report and Order, IB Docket No. 12-267, 28 FCC Rcd 12403, 12405 ¶ 2 (2013)).

[5] *ViaSat Comments* at 2.

[6] Comments of EchoStar Satellite Operating Corporation, Hughes Network Systems, LLC, and Alta Wireless, Inc., Docket No. 14-177 et al., at 5 (Jan. 29, 2016) *("Echostar Comments")*

[7] *Id.* at 4

[8] *ViaSat Comments* at 2, 4.

National Oceanic and Atmospheric Agency.[9] In December 2015, Inmarsat began worldwide commercial operation of its Global Xpress network, a Ka-band satellite service capable of bringing broadband connectivity at speeds of up to 50 Mbps to nearly any location in the air, on land, and at sea.[10] Offering national coverage, the reliability of a space-based network, and speeds in the range of 15/2 Mbps,[11] satellite broadband is firmly a part of the national broadband infrastructure and the competitive marketplace for broadband service.

Satellite service will also be a critical component of future terrestrial 5G infrastructure by providing backhaul and continuity of operations that can withstand terrestrial disasters.[12] As Inmarsat explains, "[b]y supplying high bandwidth backhaul to remote environments, fixed satellite services allow terrestrial networks to widen their reach" and "through offloading, satellite networks increase the capacity of terrestrial networks."[13] When terrestrial networks become "overloaded or compromised by storm, earthquake, or man-made disaster, satellite networks inevitably step in as a last line of communications."[14]

Terrestrial 5G service, when it is deployed, will no doubt bring new and powerful capabilities to end users. 5G does not, however, represent either the beginning or the end of the wireless broadband infrastructure. Nor, as CTIA acknowledges, are the spectrum

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[9] *Comments of O3b Limited, Docket No. 14-177 et al., at 4-5 (Jan. 29, 2016) ("O3b Comments").*

[10] *Inmarsat Comments* at 1.

[11] *SIA Comments* at 3.

[12] *Inmarsat Comments* at 3; *O3b Comments* at 2 (explaining that "O3b uses spot beams in to provide middle mile capacity that enables large service providers to provide high-data rate, low latency connectivity to their customers").

[13] *Inmarsat Comments* at 3.

[14] *Id.*

characteristics of bands above 24 GHz suitable to provide a "stand-alone solution" for wireless broadband delivery.[15] The above 24 GHz bands must instead be viewed as part of a multifaceted solution for delivering 5G, to be complemented and supplemented by other existing and future terrestrial and satellite technologies. Thus, rather than "clearing spectrum", as some 5G proponents advocate,[16] to accommodate future 5G operations, the needs of satellite operators must be accommodated. The service rules for the bands above 24 GHz should reflect the current and continuing role of satellite in the nation's broadband marketplace and infrastructure by establishing a regulatory framework that protects existing satellite service and provides the interference protection and regulatory certainty required for growth.

III. THE PLAN FOR THE MILLIMETER WAVE BANDS MUST INCLUDE ADEQUATE PROTECTIONS FOR SATELLITE SERVICES

To promote growth and investment in the higher band spectrum, the Commission's rules for these bands must provide regulatory certainty to the services that will use them and the customers depending on critical services. Such certainty requires judicious decisions about how and where sharing is feasible and where it is not.[17] The 28 GHz band is intensively used for current satellite operations, and the 42.0-42.5 GHz band is a critical near-term expansion band for FSS. In these bands, the Commission should fully embrace and commit to the potential of satellite service and protect individually licensed earth stations from the impact of new terrestrial services.

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[15] *CTIA Comments* at 7.

[16] *CTIA Comments* at 2; Comments of T-Mobile, Docket No. 14-177 et al., at 4 (Jan. 29, 2016) ("*T-Mobile Comments*") (recommending that the Commission "[l]imit further use of the millimeter wave bands by satellite stations").

[17] *Echostar Comments* at 12.

Any plan to introduce new terrestrial mobile services in the 28 GHz band must include reliable interference protection and a clear path to primary status for earth stations, without requiring the auction of satellite spectrum. The Commission should also ensure that the operating parameters of terrestrial 5G services adequately protect all spacecraft from the aggregate interference from 5G operations.

In other bands considered in this proceeding, such as the 37 and 39 GHz bands and the 71-76 GHz and 81-86 GHz bands, the Commission should facilitate efforts between terrestrial and satellite operators to develop workable co-primary sharing plans allowing both satellite and terrestrial 5G services to blossom. Ultimately, the promotion of future 5G operations in the spectrum above 24 GHz should not come at the expense of the growth of satellite services.

A. The 28 GHz Band

The Flexible Use Service ("FUS") rules proposed for the 28 GHz band do not provide the clarity and regulatory certainty necessary to ensure protection of current and future Ka-band satellite operations. Although the proposed rules nominally provide a path for some FSS earth stations to gain a full primary license and commensurate protections, the proposed process is inadequate, unnecessarily cumbersome and legally suspect.[18] Because it is one of the bands most clearly suitable for near-term satellite expansion, 28 GHz band service rules must ensure adequate protection for current and future satellite operations, whether or not the earth station was authorized before the release of the NPRM.

As an initial matter, FSS operations in the 28 GHz band have primary status and are secondary only with respect to fixed LMDS networks.[19] It is therefore disingenuous for some

[18] *SES Comments* at 3, *Echostar Comments* at 12.

[19] *ViaSat Comments* at 14.

commenters to argue that satellite networks do not have any right to or legitimate expectation of protection in the 28 GHz band.[20] T-Mobile, for instance, suggests that "in order for satellite stations to enjoy primary protection in the 28 GHz band, they must hold the same type of rights as terrestrial licensees."[21] With respect to all services but LMDS, FSS services are already co-primary in the 28 GHz band and thus already receive primary protection vis-a-vis proposed future terrestrial 5G operations. Likewise, CTIA asserts that "[e]xisting FSS licensees were aware when they acquired their licenses that they were authorized only on a secondary basis."[22] Again, in accordance with the allocation table and the existing band plan, FSS operators have planned their operations and investment on the basis of co-primary status with respect to all services other than LMDS, including priority over ubiquitous terrestrial mobile.[23] The Commission's rules for the 28 GHz band should not diminish this longstanding expectation or the future growth of satellite in the band.

Similarly, the suggestion by some commenters that satellite operations in the 28 GHz band should be marginalized on the basis of spectrum efficiency is baseless and should be rejected. The technical analysis comparing the spectrum efficiency of satellite and 5G

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[20] *T-Mobile Comments* at 16, *CTIA Comments* at 32, Comments of Cisco Systems, Inc., Docket No. 14-177 et al., at 5-6 (Jan. 29, 2016) ("*Cisco Comments*").

[21] *T-Mobile Comments* at 16.

[22] *CTIA Comments* at 32.

[23] *See* Rulemaking to Amend Parts 1, 2, 21, and 25 of the Commission's Rules to Redesignate the 27.5-29.5 GHz Frequency Band, to Reallocate the 29.5-30.0 GHz Frequency Band, to Establish Rules and Policies for Local Multipoint Distribution Service and for Fixed Satellite Services, *First Report and Order*, 11 FCC Rcd 19005, 19024 ¶ 44 (1996) ("*28 GHz First Report and Order*") (designated the FSS as having "licensing priority vis-à-vis any third service allocated domestically or internationally in the band").

terrestrial wireless services offered by Straight Path is simplistic and flawed.[24] Straight Path's general argument seems to be that the use of small cell sites, such as those promised by terrestrial 5G, promotes spectral efficiency through spectrum reuse.[25] The principle of spectrum reuse through cellularization is not unique to terrestrial wireless. Satellites apply the same technique through the use of multiple spot beams. All communications technologies, be they satellite or terrestrial, use this technique to maximize the number of customers that can be served with finite spectrum. Satellite networks have been employing such techniques just as the terrestrial industry has done.

Moreover, the comments of Straight Path appear to disregard an essential difference between FSS operations and terrestrial wireless. Unlike terrestrial wireless systems, FSS networks employ end user terminals with precise antenna pointing to permit multiple competing satellite networks to provide broadband services using the same spectrum to each location. Straight Path does not take into account the substantial spectrum re-use capabilities of FSS resulting from the Commission's longstanding two-degree spacing rule for geostationary satellites, along with the additional spectrum sharing capabilities enabled by non-geostationary satellite networks. Under the two-degree spacing rule, satellite networks must operate so as to permit operation of co-frequency satellites within two degrees of the target satellite.[26] Thus, multiple satellite operators can and do use the same spectrum to provide competing broadband services to the same geographic areas, even potentially to customers in the same building.

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[24] *See* Comments of Straight Path Communications, Docket No. 14-177 et al., at 28 (Jan. 29, 2016) ("*Straight Path Comments*").

[25] *Id.*

[26] *See* Comprehensive Review of Licensing and Operating Rules for Satellite Services, IB Docket No. 12-267, Second Report and Order, FCC 14-167 ¶ 92 (2015).

In the 28.35-28.6 GHz band (immediately adjacent to the 28 GHz band), for example, at least eight satellite network operators already use overlapping portions of the band to provide service to all or portions of the continental United States, North America, and international waters,[27] and additional networks are in development that will have substantially greater capacity than earlier generation satellites. Thus, the co-frequency and geographic coexistence possible through FSS operations results in spectrum efficiency far higher than that accounted for in Straight Path's analysis.

Straight Path is also incorrect in asserting that the cost of satellite networks is "comparatively high" compared to infrastructure for terrestrial services.[28] In making this argument, Straight Path disingenuously compares the cost of a single cell site against the cost of a satellite capable of serving the entire continental United States and beyond.[29] A far more apt calculation would be to compare the cost necessary to achieve nationwide coverage using these alternative approaches. Straight Path suggests that a "reasonable assumption" for terrestrial coverage would be 300,000 5G cell sites, costing "less than one hundred thousand dollars per cell site."[30] This highly simplified assumption nonetheless produces an estimated cost of less than, but potentially approaching 30 *billion* dollars. Individual satellites can achieve the same coverage, and are already doing so today, at a fraction of the cost of a terrestrial network.

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[27] *See* International Bureau Filing System, Record Summary for Applications between 28,350-29,600 MHz (showing active licenses held by ViaSat, Inc., DIRECTV Enterprises, LLC, Echostar/Hughes Network Systems, Inmarsat, O3b Limited, Telesat Canada, Hispamar Satelites, S.A., and New Skies/SES Americom).

[28] *Straight Path Comments* at 29.

[29] *Id.*

[30] *Id.*

The satellite industry is also in the process of improving its networks to serve the United States, with the recent launch of new high-capacity broadband satellites by Echostar, ViaSat, and Inmarsat, as well as $460 million in new financing for O3b, which will be used to manufacture and launch eight more satellites.[31] Thus, in addition to offering proven, cost-effective coverage and near term growth, satellite services also provide the advantage of uniquely intensive spectrum re-use, redundancy, and increased competition through the overlapping service areas enabled by two degree spacing.

Given the substantial technical, economic, and international regulatory basis for protecting satellite use of the 28 GHz band, SIA urges the Commission to ensure that any plan adopted for this band provides regulatory certainty and full protection for existing and future satellite services in the band, in particular for that of satellite receivers and individually licensed earth stations. The most straightforward means of ensuring the necessary protection is to commit to the growth of satellite service by elevating individually-licensed FSS earth stations to full co-primary status in the 28 GHz band.[32] As ESOA explains, full co-primary status for FSS earth stations would "acknowledge[] well-established satellite use of the band in the U.S., and a flexible licensing regime that accommodates existing and future FSS earth station deployment in the U.S. will protect space assets that rely on this band globally."[33] AT&T at least partially concurs, indicating that "the Commission can and should protect incumbent FSS licensees by

[31] *See SIA Comments* at 4; *Echostar Comments* at 4; *ViaSat Comments* at 4-5, *Inmarsat Comments* at 2-3; *O3b Comments* at 3.

[32] Comments of the EMEA Satellite Operators Association, GN Docket No. 14-177 et al., at 5 (Jan. 29, 2016) ("*ESOA Comments*"); *Echostar Comments* at 15, *O3b Comments* at 26; *SES Comments* at I, 8-12.

[33] *ESOA Comments* at 5.

according them co-primary status throughout the band."[34] To unlock the full value of the band for satellite services, the Commission should also recognize the needs and plans of the satellite industry to additionally use the 28 GHz band for satellite earth stations on moving platforms and at end-user premises, both domestically and internationally.

B. The 39 GHz Band

Like the 28 GHz band, the 38.6-40.0 GHz ("39 GHz") band is considered a "natural expansion band for broadband satellite system gateways."[35] Accordingly, FSS operators have been making substantial investments to develop the technology necessary to harness the 39 GHz band to satisfy increasing consumer demand.[36] Unfortunately, the NPRM's proposal to authorize terrestrial mobile services in the 39 GHz band under the FUS rules is substantially similar to the approach proposed for the 28 GHz band[37] and presents the same regulatory uncertainty that is likely to retard investment in the band.

Satellite operators "cannot commit the substantial financial resources required to plan, construct, and launch satellite space stations and ground infrastructure on the basis of the limited, and inherently uncertain, waiver process proposed for the 39 GHz band."[38] Nor can satellite operators proceed with the massive investments required based on the hope that they will be able to secure rights on the secondary market from a terrestrial carrier.[39] Thus, the satellite industry

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[34] *AT&T Comments* at 12.

[35] *Echostar Comments* at 24, *see also Inmarsat Comments* at 9; *ViaSat Comments* at 19.

[36] *Inmarsat Comments* at 9.

[37] *NPRM*, ¶ 93.

[38] *Inmarsat Comments* at 10.

[39] *Id*.

urges the Commission to develop a clearer and more certain path to interference protection that will provide satellite operators the confidence to continue their expansion into this spectrum.

In addition, ViaSat notes that the Commission should reconsider certain existing rules for the 39 and 37 GHz band, in particular the power limits and the prohibition of user earth station terminals.[40] SIA concurs that the optimum rules for the 39 GHz band will provide for co-primary sharing of the spectrum while also providing satellite networks reliable protection employing minimum protection zones and the ability to operate user terminals in the band.

C. The 37 GHz Band

The 37.0-38.6 GHz ("37 GHz") band is another natural growth band for satellite services. As Echostar notes, the relative "greenfield" status of this band as compared to other more intensively used bands affords the Commission the opportunity and the time to consider a range of sharing approaches to achieve co-existence between several co-primary services in the United States.[41]

Unfortunately, the "hybrid" licensing regime proposed for this band in the NPRM does not appear to provide the necessary regulatory certainty to justify continued investment.[42] The cumbersome process of granting rights to certain private users by rule, terrestrial carriers by auction, and FSS operators by waiver provides unnecessary complication and no meaningful certainty that satellite operators would be able use the 37 GHz band for expansion.[43] Moreover,

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[40] *ViaSat Comments* at 20.

[41] *Echostar Comments* at 32.

[42] *NPRM*, ¶ 102-103.

[43] *SIA Comments* at 17-18; *Echostar Comments* at 31.

major terrestrial 5G advocates are also dissatisfied with the "overlay" or "hybrid licensing" proposals.[44]

Thus, SIA recommends that the Commission refrain from adopting the hybrid schedule described in the NPRM. Ultimately, the Commission should strive to arrive at a viable sharing scheme that protects FSS by maintaining the existing co-primary allocation and employing small coordination zones to protect individually-licensed earth stations.[45]

D. The 42.0-42.5 GHz Band

The 42.0-42.5 GHz band should be identified for use by FSS. As the NPRM acknowledges, this band is not well suited to 5G because it is a relatively small block encumbered with the obligation to protect radioastronomy operations in the adjacent 42.5-43.5 GHz spectrum.[46] In part for these reasons, this band was not identified by the United States or CITEL for further study for 5G mobile.[47] For FSS, however, the 42.0-42.5 GHz shows particular promise. It is contiguous with the existing FSS allocation at 40.0-42.0 GHz, permitting FSS operations to make more efficient use of an otherwise small spectrum block. Additionally, FSS operators have extensive experience and demonstrated capability of protecting radioastronomy operations, which can be done reliably through the use of exclusion zones.[48]

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[44] Comments of Verizon, GN Docket No. 14-177 et al., at 6 (Jan. 29, 2016); *Intel Comments* at 13; Comments of XO Communications, LLC, GN Docket No. 14-177 et al., at 10 (Jan. 29. 2016); Comments of PCIA, GN Docket No. 14-177 et al., at 10-11 (Jan. 29, 2016); *Ericsson Comments* at 7.

[45] *SES Comments* at 6, *ViaSat Comments* at 19-20, *Echostar Comments* at 30, *Inmarsat Comments* at 9-10.

[46] *NPRM*, ¶ 26.

[47] *Id.*, ¶ 79.

[48] *Boeing Comments* at 9.

E. The 71-76 GHz and 81-86 GHz Bands

The 71-76 GHz and 81-86 GHz bands are additional bands that are suitable for sharing between co-primary satellite services and either co-primary terrestrial 5G or unlicensed use. As the NPRM observes, unlicensed operations may be preferable to licensed terrestrial 5G in these bands because the coordination environment will be "considerably more complicated" due to the fact that these bands permit multiple fixed licensees in a given area.[49] Nonetheless, the relative lack of development of services in these bands provides a good opportunity to learn from the experiences of more near-term bands as to how and to what extent terrestrial 5G or unlicensed use can be introduced without compromising its use for other allocated services. Assuming service rules sufficient to secure for FSS the interference protections expected of a co-primary service, SIA believes that these bands could accommodate growth of both FSS and terrestrial services. SIA therefore believes that it remains premature to make any decisions that would close out options for future development of these bands.

IV. CONCLUSION

SIA urges the FCC to judiciously consider the sharing potential of the spectrum bands in this proceeding. The future of any wireless communications service depends on reliable access to spectrum. Satellite network operators already play a crucial role in the nation's broadband infrastructure, and the service rules for the bands above 24 GHz should reflect the current and continuing role of satellite in the nation's broadband marketplace and infrastructure. With continued and certain access to millimeter wave spectrum, satellite services will support, complement, and compete with terrestrial networks, expand the capabilities of 5G services, and remain a critical feature of the U.S. telecommunications infrastructure well after terrestrial 5G

[49] *NPRM*, ¶ 86.

networks are deployed. In order to facilitate these critical satellite services, SIA urges the Commission to protect satellite receivers and individually-licensed earth stations from the impact of new terrestrial services, and to recognize the needs and plans of the satellite industry to also use the 28 GHz band for satellite earth stations on moving platforms and at end-user premises.

Respectfully submitted,

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