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 GLOBAL VSAT FORUM

The Global VSAT Forum ("GVF")[1] provides these comments in response to the Commission's Further Notice of Proposed Rulemaking ("*Further Notice*") examining the use of

[1] With more than 250 members, GVF brings together organizations engaged in the delivery and use of advanced broadband and narrowband satellite services to consumers, and commercial and government enterprises worldwide.

millimeter wave ("mmW") bands for mobile services and establishing a more flexible framework to facilitate satellite operations.[2]

As a leading voice of the international satellite community, GVF represents the satellite operators and service providers that make available critical services to people around the world. The value of satellite services as a ubiquitous, reliable link cannot be overstated. Both the Commission and the international community recognize that deploying ubiquitous broadband is a key infrastructure goal,[3] and satellites are key to filling this need.[4] Satellite services not only bring connectivity to places where terrestrial services cannot or will not go, they also provide a ubiquitous competitive alternative as well as a crucial backup during emergencies and natural disasters. As an integral part of the global telecommunications infrastructure that complements, extends, and enables wired and wireless services, the future of satellite service must be included in the Commission's plans for the mmW bands.

5G enters into a mmW ecosystem that is already well underway, with billions of dollars in satellite services development and deployment to bring high-speed connectivity to U.S. and global customers. GVF is therefore pleased that the *Further Notice* acknowledges the need to work with various stakeholders to determine where and how different services can coexist to utilize the spectrum as fully and efficiently as possible.[5] Because many of the bands under

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[2] *Use of Spectrum Bands Above 24 GHz For Mobile Radio Services*, et al, GN Docket 14-177, Further Notice of Proposed Rulemaking, FCC 16-89 (2016) ("*Further Notice*" or "*Order*").

[3] Federal Communications Commission, Omnibus Broadband Initiative, *Connecting America: The National Broadband Plan* (2010) ("*National Broadband Plan*"), at 338 (*available at* http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-296935A1.pdf).

[4] Remarks of Chairman Tom Wheeler, 19th Annual Satellite Leadership Dinner (March 7, 2016) (available at https://apps.fcc.gov/edocs_public/attachmatch/DOC-338135A1.pdf) ("*Chairman Wheeler Speech*").

[5] *Further Notice*, ¶¶ 374, 369.

consideration in the *Further Notice* represent the immediate and near term growth bands for the satellite industry, it is crucial that satellite services have access to sufficient spectrum to support existing operations and future growth of satellite service in these bands. GVF provides these comments on several specific bands of interest to its members.

I. TERRESTRIAL WIRELESS USE OF MILLIMETER WAVE SPECTRUM MUST INCLUDE ACCOMMODATIONS FOR SHARING WITH EXISTING AND FUTURE SATELLITE SERVICES

The satellite industry has longstanding allocations in substantial portions of the 24.75-25.25 GHz ("24") GHz, 37.5-40.0 ("37/39") GHz and the 47.2-50.2 ("47") and 50.4-52.4 ("50") GHz bands, and satellite system operators will require reliable and expanded access to these bands in order to bring next generation services to users. Through basic technical measures, satellite system operations can share with potential future terrestrial uses in portions of these spectrum bands without increasing the risk of harmful interference to satellite or terrestrial wireless systems in portions of these bands.

For example, the broadcasting-satellite service ("BSS") operates feeder links in the upper portion of the 24 GHz band (25.05-25.25 GHz), and GVF supports expanding use of the upper 24 GHz band to fixed-satellite service ("FSS") uses besides BSS feeder links, as long as those other uses are technically similar and subject to the same technical rules.

As a second example, FSS is currently allocated for downlink operations in the 37/39 GHz band, but satellite earth stations may not be ubiquitously deployed and may not be used to serve individual consumers in the United States.[6] In the *Further Notice,* the Commission requests comment on the possibility of repealing this prohibition, potentially to permit the use of

[6] *Id.*, ¶ 500.

FSS terminals for downlink reception.[7] GVF concurs with this recommendation. In order to provide the high bandwidth service that the Commission and consumers have come to expect, satellite operators must have access to substantial capacity, and must be able to operate user terminals across the entire allocated band in order to bring the benefits of this capacity to customers. One way to provide the necessary flexibility of spectrum use is to allow satellite user terminals to receive signals in the 37/39 GHz band in addition to the 40.0-42.0 GHz band. This will allow substantial additional value to be created from the spectrum—providing up to terabytes of additional service—without presenting a risk of interference for potential UMFUS operations in the 37/39 GHz band.

The 50 GHz band presents similar opportunities for maximizing spectrum efficiency and service through well-considered sharing accommodations. Half of the 50 GHz band is allocated for Earth-to-space FSS transmissions in the Commission's rules (the 51.4-52.4 GHz portion of the 50 GHz band is not currently allocated to FSS, but the ITU-R is studying a potential FSS allocation in this spectrum), and satellite operators will require access to this entire range to operate transmitting individually-licensed earth station facilities. As has been recognized in other bands, satellite networks and UMFUS systems can share the 50 GHz band in a compatible manner using various technical and regulatory sharing mechanisms.

The 47 GHz band (particularly the upper portion of the band at 48.2-50.2 GHz), however, should remain a primary FSS band to allow for unfettered FSS operations. 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-Earth).[8] The

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[7] *Id.,* ¶ 501.

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

Further Notice acknowledges this international identification and suggests that the 48.2-50.2 GHz band could be used in conjunction with the 40.0-42.0 GHz band for V-band FSS operations.[9] GVF supports this approach, and also observes that the immediately adjacent 47.2-48.2 GHz band 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. Satellite operators will also require the flexibility to locate end user terminals where they are needed by customers. GVF therefore believes that the entire 47 GHz band, and particularly the 48.2-50.2 GHz portion of the band, should remain primarily available for the operation of FSS satellite systems, including uplink transmissions from satellite end user terminals.[10]

The V-band spectrum requirements for broadband satellite systems mean that some of the spectrum sharing proposals raised in the *Further Notice* would not be viable as applied to satellite end user terminals in portions of the 47 GHz band. One option would be for UMFUS terminals to operate on an opportunistic basis, listening for and avoiding FSS transmissions and enjoying full use of the band at locations and times when FSS end user operations were minimal. GVF believes that through these or other sharing strategies, the 47 and 50 GHz bands can be made available for both satellite operations and future UMFUS users.

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[9] *Further Notice*, ¶¶ 411, 421.

[10] In advocating for access to portions of the 47 GHz band for satellite end user terminal Earth-to-space transmissions, GVF acknowledges an approach would have to be developed to address spectrum sharing between satellite end user terminals and individually-licensed satellite earth stations, which will also require access to the 47 GHz band for uplink transmissions.

II. U.S. AND INTERNATIONAL FSS OPERATIONS REQUIRE EFFECTIVE MEASURES TO PROTECT SATELLITES FROM AGGREGATE INTERFERENCE BY TERRESTRIAL SOURCES

One element of the ability of FSS and terrestrial wireless to share spectrum is the assurance that the operation of large numbers of terrestrial stations will not combine to "wash out" FSS earth station uplink transmissions at the satellite's receiver. The Commission has acknowledged this potential for aggregate inference repeatedly throughout this proceeding,[11] but has thus far declined to adopt specific technical limits. The Commission cited a "wide disparity between assumptions" in the technical record regarding the potential for aggregate interference, and also cited mitigating factors such as downtilting, dynamic beamforming, variable power control, and environmental factors as basis for its conclusion that no action is required at this time.[12] If consistently employed by UMFUS licensees, such techniques could reduce the amount of UMFUS emissions directed skyward and limit the potential for aggregate interference to be experienced by satellite receivers. At this time, however, none of these assumptions are enforceable requirements, and neither the Commission nor the satellite community has any assurance that UMFUS deployment will conform to these practices. Although the Commission has wisely acknowledged the need to "revisit" this issue as additional data is developed, GVF urges the Commission that such further inquiry must be undertaken before UMFUS becomes widely deployed.

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[11] *See, e.g.,* Use of Spectrum Bands Above 24 GHz for Mobile Radio Services, *Notice of Proposed Rulemaking*, 30 FCC Rcd 11878, ¶ 299 (2015) ("Perhaps the most likely increased source of interference to satellites (particularly NGSO satellites) would be the large number of backhaul links that will likely be necessary to connect the many small-cell base stations that will be required to support mobile service in the 28 GHz band.").

[12] *Id.*, ¶¶ 65-66.

It is important to bear in mind that the protection of FSS systems from aggregate interference by terrestrial sources is a requirement of the ITU Radio Regulations, which have the force of law in the United States as a U.S. treaty obligation.[13] Although the *Order* concluded that "the risk of aggregate interference is low,"[14] the Commission must continue to closely monitor this issue at each stage of UMFUS development to ensure protection for FSS systems as well as compliance with U.S. treaty obligations.

III. THE USE OF THE UPPER 70, 80, AND ABOVE 90 GHZ BANDS SHOULD NOT BE DECIDED AT THIS TIME

Although many of the bands addressed in the *Further Notice* are targeted for near term deployment of high-speed satellite services, the 70, 80, and above 90 GHz bands do not share the same urgency. There is no question that these bands will eventually become vital components of the high-speed, high-capacity FSS infrastructure, but the technology does not exist today for the satellite or mobile terrestrial industries to begin making firm plans in these bands, as it does in the V-band discussed above. GVF therefore recommends that, in the context of the *Further Notice*, the Commission focus its efforts on the mmW bands with clear near-term use cases. As the mmW ecosystem evolves, the spectrum sharing lessons learned and better understanding of consumer demand can be applied to these higher bands.

IV. CONCLUSION

As the Commission acknowledges in the *Further Notice*, future 5G services will be joining an existing regulatory environment and communications infrastructure. Satellite has been serving customers in the mmW bands for years, and is in the process of rapidly expanding

[13] *Id.*, ¶ 62 n.135

[14] *Id.*

both its capacity and its speeds. Thus, the continued development of the mmW spectrum and the introduction of UMFUS operations should not come at the expense of the current and future satellite operations that play a critical role in the national broadband marketplace. As explained above, the satellite industry is willing and able to work with the Commission and terrestrial wireless providers to agree on reasonable sharing strategies that can ensure that spectrum is used intensively and efficiently to support the maximum number of users as well as serve the Commission's policy goals.

Respectfully submitted,

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