

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of)	
)	
Spectrum Horizons)	ET Docket No. 18-21
)	
Battelle Memorial Institute Petition for)	RM-11713
Rulemaking to Adopt Fixed Service Rules in)	(Terminated)
the 102-109.5 GHz Band)	
)	
Request for Waiver of ZenFi Networks, Inc. and)	WT Docket No. 15-245
Geneva Communications LLC)	(Terminated)
)	
James Edwin Whedbee Petition for Rulemaking)	RM-11795
to Allow Unlicensed Operation in the 95-1,000)	
GHz Band)	

To: The Commission

**COMMENTS OF THE
SATELLITE INDUSTRY ASSOCIATION**

May 2, 2018

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SUMMARY

The frequency bands above 95 GHz present significant opportunities for future innovation, growth and development for broadband communications and for other important RF-dependent applications. The Commission should therefore exercise caution and seek to achieve an appropriate balance in making spectrum available for communications services above 95 GHz, while protecting critically important passive and satellite services that already operate in portions of this spectrum, and also conserving large portions of this spectrum for the introduction of new services in the future that have not yet been identified.

Consistent with this, the Satellite Industry Association does not object to making up to 36 GHz of spectrum available for fixed services (“FS”) in the bands that are not shared with satellite communications services. The 36 GHz of spectrum identified in the NPRM will be sufficient to provide adequate capacity for the future growth of FS in a wide range of relatively higher and lower frequency bands above 95 GHz. The Commission could also base its rules for FS above 95 GHz on its rules for the 70 and 80 GHz bands.

Given the substantial opportunities that would be available for FS in this initial 36 GHz of spectrum, no reason exists to adopt service rules or introduce FS in the 66.2 GHz of spectrum above 95 GHz that is shared between FS and either the fixed satellite service (“FSS”) or the mobile satellite service (“MSS”). FS operators clearly do not require access to these frequency resources and considerations for sharing this spectrum should be addressed at a later date.

It would also be inappropriate to introduce mobile services into any portion of the frequency bands above 95 GHz, particularly in those bands that have shared allocations to support satellite communications services or other important satellite applications used for Earth sensing and other purposes. Consistent with this, it would be entirely inappropriate to inject

into the bands above 95 GHz the Commission's highly restrictive rules for the placement of individually-licensed satellite earth stations operating in the 28 and 37/39 GHz bands. The bands above 95 GHz are unlikely to be used for wide-area mobile networks, which is what the Commission sought to protect in the 28 and 37/39 GHz bands. Further, the Commission does not need to impose burdensome restrictions on the placement of individually-licensed earth stations to protect FS, which successfully employs site-by-site coordination with satellite services in other frequency bands.

The Commission should also identify frequency bands above 95 GHz that will be made primarily available to support ubiquitously deployed satellite end user terminals. Satellite networks operating above 95 GHz will be able to ensure that whatever new communications services are developed in these much higher frequency bands can be made available to all people regardless of where they are located, including in rural and remote areas that are largely unserved by terrestrial broadband networks. For example, the Commission should identify at least seven gigahertz of spectrum (possibly within the range of 209-226 GHz) that would be suitable for Earth-to-space uplink communications from satellite end user terminals on a paired basis with the existing primary downlink allocation for FSS and MSS in the 123-130 GHz band, which is not shared with the FS or MS services. Such an allocation would ensure the continued growth and development of new satellite services for consumers without impeding the future spectrum requirements of other communications services.

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The Satellite Industry Association (“SIA”)¹ submits these comments in response to the Commission’s Notice of Proposed Rulemaking (“*NPRM*”) in the above-referenced proceeding.² SIA concurs with the Commission’s view that frequency bands above 95 GHz can accommodate a wide range of new and innovative spectrum uses that can often operate on a shared basis with other services. Significant advancements in beam pointing and other technologies are enabling the productive use of increasingly higher frequency bands for important new services, including services provided by broadband satellite networks.³

¹ These comments are supported by all SIA members except for AT&T and Ligado, which abstain from participation.

² In the Matter of Spectrum Horizons, *et al.*, ET Docket No. 18-21, *Notice of Proposed Rulemaking*, FCC 18-17 (Feb. 28, 2018) (“*NPRM*”).

³ *See id.*, ¶ 25.

Although SIA agrees that significant spectrum resources above 95 GHz should be made available for experimentation and development of new communications services, SIA observes that the frequency bands between 95 and 275 GHz likely constitute the last remaining green fields for innovation in radiofrequency spectrum use. Therefore, it would be prudent to conserve large portions of this spectrum for future spectrum assignments and services that we cannot now envision. SIA therefore finds reassuring the Commission's repeated statement that it must exercise caution to ensure that any rule it adopts in this proceeding do not impair the future use of higher frequency bands by different federal and non-federal services alike, including satellite communications services.⁴

In order to discover the full scope of potential services and devices that may operate in higher frequency bands, it is vital that the Commission promulgate rules for these frequencies that encourage innovation, spur growth, and increase investment in all technologies in these bands, while ensuring that substantial portions of this spectrum remain available for future services that will be conceived by subsequent generations.

I. THE COMMISSION CAN FULLY ACCOMMODATE THE FUTURE GROWTH AND DEVELOPMENT OF THE FIXED SERVICE USING THE IDENTIFIED 36 GHZ OF SPECTRUM THAT IS NOT SHARED WITH SATELLITE SERVICES

SIA has no objection to the immediate adoption of service rules for fixed services ("FS") in the 36 GHz of spectrum above 95 GHz that is not shared with satellite communications services.⁵ Because the communications architecture of FS links is relatively uncomplicated (constituting a line-of-sight link between two fixed points), it is likely that FS will be among the

⁴ See *id.*, ¶¶ 2, 3, 51.

⁵ *Id.*, ¶ 31. These frequency bands include the 95-100 GHz, 102-109.5 GHz, 111.8-114.25 GHz, 122.25-123 GHz, 130-134 GHz, 141-148.5 GHz, 151.5-158.5 GHz, 174.5-174.8 GHz, 231.5-232 GHz, and 240-241 GHz bands.

first communications technology to be able to productively use the frequency bands above 95 GHz for commercial services. The Commission's belief, therefore, that large portions of the 95-275 GHz spectrum range are suitable for deploying FS may be correct.⁶

The 36 GHz of spectrum identified in the NPRM will not only provide adequate spectrum resources for the future growth of FS, but it will also provide a wide variety of spectrum resources to support fixed link innovation. Although most of the 36 GHz of spectrum is in the lower end of the range between 95 and 275 GHz (where its near term productive use may be most achievable), portions of the 36 GHz are spread throughout the 95 to 275 GHz range, thus facilitating innovation in these higher spectrum segments.

SIA also has no objection to basing the FS service rules in this 36 GHz of unshared spectrum on the rules for FS in the 70 and 80 GHz bands.⁷ Although 5.05 GHz of the 36 GHz of spectrum in the bands identified for FS is shared with the inter-satellite service ("ISS"), SIA anticipates that the two services will be able to share these frequency bands without necessitating regulatory constraints on either technology.⁸

In proposing to employ the rules from the 70/80/90 GHz proceeding as a basis for FS rules above 95 GHz, the Commission requests comment on a number of possible technical changes that may provide FS operators more flexibility in designing and operating their networks.⁹ SIA urges the Commission to adopt such changes only after the completion of technical studies intended to ensure that FS operations using these more flexible requirements do

⁶ *Id.*, ¶ 31.

⁷ *Id.*, ¶¶ 31-38.

⁸ *Id.*, ¶ 50.

⁹ *Id.*, ¶¶ 33-38.

not result in harmful interference to critically important passive services that share some of this 36 GHz of spectrum, including satellites operating in the Earth Exploration Satellite Service to support weather forecasting and storm monitoring by the National Weather Service.

II. THE COMMISSION SHOULD REFRAIN FROM ADOPTING SERVICE RULES FOR THE 66.2 GHZ OF SPECTRUM ABOVE 95 GHZ THAT IS SHARED BETWEEN TERRESTRIAL AND SATELLITE SERVICES

No justification has been identified for adopting service rules or introducing FS in the 66.2 GHz of spectrum above 95 GHz that is shared between FS and either the fixed satellite service (“FSS”) or the mobile satellite service (“MSS”). FS operators clearly do not require access to this spectrum. As discussed above, the NPRM already proposes to make 36 GHz of new spectrum available for FS in the bands above 95 GHz. Further, FS operators are only modestly using their existing millimeter wave allocations in the 71-76 and 81-86 GHz bands, even though the Commission adopted FS service rules for these frequencies nearly 15 years ago. As the Commission acknowledged in its first Spectrum Frontiers order, “the [71-76 and 81-86 GHz bands] are relatively lightly used both in terms of the number of registered sites (especially on a large geographic scale) and with respect to the quantity of spectrum available” and “the great majority of existing links in the bands are concentrated in just a few localities.”¹⁰ Therefore, the newly proposed 36 GHz of spectrum above 95 GHz combined with existing allocations below 95 GHz will provide FS interests with ample opportunities for innovation and growth in capacity for the foreseeable future and well beyond.

If, however, the Commission concludes that FS operators nonetheless require near term access to any portion of the 66.2 GHz of spectrum that is shared between terrestrial and satellite

¹⁰ In the Matter of Use of Spectrum Bands Above 24 GHz For Mobile Radio Services, *et al.*, GN Docket No. 14-177, *Report and Order and Further Notice of Proposed Rulemaking*, FCC 16-89, ¶ 432 (Jul. 14, 2016).

services, the Commission should address the question of how to share these portions of spectrum with satellite services in the identical manner that it used for the 70 and 80 GHz bands. Specifically, when the Commission adopted its FS service rules for the 70 and 80 GHz bands, the Commission explained that

all terrestrial 71-76 GHz and 81-86 GHz band entities are hereby made aware that future operations of satellite and satellite earth stations could be permitted in the 71-76 GHz and 81-86 GHz bands. Once the Commission considers and adopts technical standards for terrestrial and satellite operations to share this spectrum, all licensees will be expected to satisfy these and any other Part 101 requirements.¹¹

The Commission should employ this same approach for any frequency segments that are made available for FS in the bands above 95 GHz that are shared between terrestrial and satellite services. The use of such an approach would be consistent with the Commission's cautionary approach expressed in the NPRM of ensuring that its actions in this proceeding do not impair spectrum sharing with other services in the future.¹² This approach would also be consistent with the FS services rules that the Commission adopted (and proposes to emulate in this proceeding) in the 70/80/90 GHz proceeding.¹³

Consistent with this, SIA would also support the adoption of a new US footnote in the table of allocations to clarify that, among co-primary federal and non-federal services, first-in-time licensing does not necessarily impart priority relative to other current and future licensed or

¹¹ In the Matter of Allocations and Service Rules for the 71-76 GHz, 81-86 GHz and 92-95 GHz Bands, WT Docket No. 02-146, *Report and Order*, FCC 03-248, ¶ 63 (Nov. 4, 2003) (“70/80/90 GHz Order”).

¹² See NPRM, ¶ 39, *contra* ¶ 47.

¹³ 70/80/90 GHz Order, ¶ 63.

unlicensed services.¹⁴ The adoption of such a footnote, however, should not be permitted to disturb any coordination agreements that are entered into between operators of FS and satellite network systems regarding the placement and operation of fixed links and satellite earth station facilities. Further, such a footnote should not be interpreted to require the physical relocation of any fixed link or satellite network earth station in the future unless full compensation is provided to address the actual and opportunity costs of such relocation.

III. IT IS PREMATURE TO CONSIDER THE INTRODUCTION OF MOBILE SERVICES IN ANY PORTION OF THE FREQUENCY BANDS ABOVE 95 GHZ

The Commission should not at this time introduce mobile services into any portion of the frequency bands above 95 GHz, particularly not in any portion of the spectrum that is shared with satellite services.¹⁵ No apparent need for access to these frequencies has been expressed by mobile network operators and the introduction of mobile services in these higher bands would likely impede the innovation and growth of other services – including FS – which may be able to make productive use of portions of these frequency bands in the foreseeable future.

A decision to not introduce mobile services in the bands above 95 GHz would be consistent with the Commission's treatment of the 70 and 80 GHz bands in its recently concluded Spectrum Frontiers proceeding. In that proceeding, the Commission generated a substantial record supporting its decision to refrain from authorizing mobile use in the 70 and 80 GHz bands. The record contains two primary reasons for the Commission's rejection of mobile services. First, the Commission acknowledged that there were far too many uncertainties

¹⁴ *NPRM*, ¶ 42.

¹⁵ *Id.*, ¶ 41.

surrounding the possible characteristics of mobile services in these higher frequencies.¹⁶ Second, the FCC anticipated the inability of mobile services to protect FS operations in the frequencies, including FS links intended to support terrestrial 5G backhaul.¹⁷ These identical concerns are relevant to the possible introduction of mobile services in frequency bands above 95 GHz. Thus, the Commission’s conclusion logically should be the same; mobile services should not be introduced at this time in any frequency bands above 95 GHz.

The Commission speculates in its Spectrum Horizons NPRM that the lack of specific proposals that were identified by parties in the Spectrum Frontiers proceeding for the use of frequency bands above 95 GHz may have resulted from “the general nature of the questions about these bands posed in the [Spectrum Frontiers] Further Notice.”¹⁸ SIA believes, however, that the lack of specificity was not a product of the Commission’s Further Notice, but instead reflects the considerable uncertainties within the radiocommunications industry regarding the realistic near term prospects for commercial use of the bands above 95 GHz for any widely deployed purpose. The mobile industry exercised candor in acknowledging their lack of a near term need or desire for access to the 70 and 80 GHz bands for mobile services.¹⁹ Consistent with this, the Commission should continue to exercise caution in adopting service rules for

¹⁶ In the Matter of Use of Spectrum Bands Above 24 GHz For Mobile Radio Services, *et al.*, GN Docket No. 14-177, *Second Report and Order, Second Further Notice of Proposed Rulemaking, Order on Reconsideration, and Memorandum Opinion and Order*, FCC 17-152, ¶ 198 (Nov. 22, 2017) (“*Spectrum Frontiers Second Order*”) (observing that commenting parties “initially raised considerable doubt about the advisability and desirability of introducing mobile services into the 70/80/90 GHz bands in the near future”).

¹⁷ *See id.*, ¶¶ 200-201 (concluding that “there is little consensus among the proponents of mobile use as to how to coexist with fixed links”).

¹⁸ *NPRM*, ¶ 10.

¹⁹ *See Spectrum Frontiers Second Order*, ¶ 198 n.536.

specific services in the bands above 95 GHz until a demonstrated need has been documented for near term access to this spectrum.

If, however, the Commission concludes that some amount of spectrum above 95 GHz needs to be made available for mobile innovation, it should limit such designations to discrete frequency segments and avoid making designations that create the potential for spectrum sharing difficulties. For example, to avoid future spectrum sharing concerns, any mobile service designations above 95 GHz should be limited to portions of the 102-109.5 GHz, 111.8-114.25 GHz, 130-134 GHz, or the 151.5-158.5 GHz bands, which are not shared with satellite or other non-FS terrestrial services. Further, any such designation should be approached with caution and should not impair critically important passive services the share certain of these frequency bands or inhibit the introduction of FS networks used for backhaul.

IV. UNDER NO CIRCUMSTANCES SHOULD THE COMMISSION EMPLOY ITS SITING RESTRICTIONS FOR INDIVIDUALLY-LICENSED SATELLITE EARTH STATIONS IN THE 28 AND 37/39 GHZ BANDS TO SATELLITE ALLOCATIONS ABOVE 95 GHZ

The Commission's restrictions for the siting of individually-licensed satellite earth stations operating in the 28 and 37/39 GHz bands should not be used for any of the frequency bands above 95 GHz.²⁰ The assumptions that drove the regulatory decisions for the 28 and 37/39 GHz bands are inapposite when considering appropriate guidelines for the bands above 95 GHz. First, in identifying restrictions for the placement of satellite earth stations operating in the 28 and the 37/39 GHz bands, the Commission assumed that these bands would likely be used by licensees in the Upper Microwave Flexible User Service for the operation of wide-area mobile networks. As the Commission explained in its second Spectrum Frontiers order, "[t]he

²⁰ *NPRM*, ¶ 46.

wide bandwidths that are available to terrestrial services in the 28 GHz and 37.5-40 GHz bands will support vital new terrestrial services on roads, railroads, and mass transit routes, and at ports, major event venues, homes and offices.”²¹

The fundamental physics for bands above 95 GHz, however, largely preclude such wide area mobile spectrum use. Signal propagation characteristics, and thus signal attenuation, are affected by atmospheric oxygen and water vapor. As a result, the spectrum above 95 GHz presents significantly different physics-based considerations including greater signal propagation losses and a requirement for relatively narrow antenna beams. By their nature, the signals in bands above 95 GHz will only support technologies with limited ranges and within reasonably controlled conditions. Because wide-area signal transmission in these very high frequencies will be difficult if not physically infeasible, technologies operating in these higher frequency bands will more appropriately involve short-range applications.²² Significant restrictions on the siting of satellite earth stations are not necessary to support or enable short-range communications devices. Therefore, spectrum sharing arrangements and/or earth station placement restrictions are not necessary for successful implementation of current or future technologies, even in shared bands where mobile services may be authorized.

Second, the severe restrictions adopted for individually-licensed earth stations operating in the 28 and 37/39 GHz bands are not justified by the potential operation of FS in any portion of the 66.2 GHz of spectrum that is shared between FS and satellite services above 95 GHz. FSS earth stations and FS links have long employed site-by-site coordination measures in lower frequency bands in order to share scarce spectrum resources. As the NPRM observes, this site-

²¹ *Spectrum Frontiers Second Order*, ¶ 130.

²² *NPRM*, ¶ 22.

by-site coordination approach has been successfully employed in the 10.7-11.7 GHz and the 12.7-13.25 GHz bands.²³ Given the significantly reduced transmission distances available in spectrum above 95 GHz, such site-by-site coordination measures should be even easier to administer between FS and satellite services in these higher frequency bands, thereby making the proposed restrictions on satellite earth station siting entirely unnecessary.²⁴

Instead, as noted previously in these comments, to the extent that the Commission adopts service rules for FS or mobile services in any of the 66.2 GHz of spectrum above 95 GHz that is allocated on a shared basis with satellite services, the Commission should simply employ the approach that was adopted for 70/80/90 GHz band, *i.e.*, placing terrestrial licensees on notice that sharing with satellite services will likely be required in the future, without specifying prematurely the parameters of those sharing conditions.

V. BROADBAND SATELLITE SERVICES WILL REQUIRE PREFERENTIAL ACCESS TO A SIGNIFICANT AMOUNT OF SPECTRUM ABOVE 95 GHZ

The Spectrum Horizons NPRM seeks to consider the needs of all major communications services for access to spectrum resources above 95 GHz. The NPRM, however, inadvertently overlooks a critical factor in the communications environment. Broadband satellite communications networks must be able to locate and operate ubiquitously deployed end user terminals to provide very high data rate communications services to consumers in all locations, regardless of where they are located. Thus, although the NPRM proposes restrictive (and demonstrably unnecessary) rules for the placement of individually-licensed satellite earth stations in frequency bands above 95 GHz, the NPRM is silent on the identification of spectrum

²³ *Id.*, ¶ 39.

²⁴ *Id.*

for satellite end user terminals. This omission threatens the long term access of consumers in rural and remote areas to future communications services that will be developed using frequency bands above 95 GHz.

As the Commission is aware, the technological facilitator to end the digital divide and bring broadband connectivity to all people is right above us – satellites. Satellite broadband coverage is ubiquitous. Because of its intrinsic technology, reach potential, and inherent capabilities, satellite broadband is uniquely capable to resolve the most complex connectivity problems. Billions of people remain disconnected from the global information pipeline that provides the rest of the world with taken-for-granted resources: news, education, medicine, communication tools, jobs, education, and public safety. Because satellite technology does not require infrastructure such as landlines or fiber optics, satellite broadband can bring essential Internet access to the parts of the globe removed from the fiber optic network or unreached by cell phone towers.

Broadband satellite communications networks, however, require access to sufficient spectrum resources to provide end user services to consumers both in the United States and worldwide. First, satellite networks require access to spectrum for individually-licensed earth stations that effectively serve as the feeder link or backhaul to the satellites, just as all cell towers require a wired or wireless backhaul link to the public switched telecommunications network or Internet backbone. The NPRM does address the needs of satellite networks for spectrum to support these individually-licensed earth stations, albeit in an unnecessarily restrictive manner.

Second, satellite networks require access to separate spectrum to send and receive broadband communications to and from ubiquitously deployed end user terminals at customer locations. These end user terminals can – and routinely are – located at countless diverse

locations, including building rooftops, in small business establishments, at individual homes, and affixed to large multi-passenger and individually-owned transportation vehicles. Unfortunately, the NPRM neglects to address this second requirement in considering the various anticipated future uses of the bands above 95 GHz.

To address the future spectrum requirements for satellite end user terminals in the bands above 95 GHz, the Commission should designate a significant amount of spectrum as preferentially available for satellite end user terminals. Although it may be possible for satellite end user terminals to share the uplink portion of this spectrum with certain other services, no justification exists to attempt to identify the spectrum sharing conditions at this time. Instead, the Commission should simply acknowledge that certain frequency bands will likely be used primarily for satellite end user terminals and will not be made available at this time on a shared basis for fixed or mobile uses.

For example, it would be appropriate for the Commission to identify in this proceeding at least seven gigahertz of spectrum that would be suitable for Earth-to-space uplink communications from satellite end user terminals on a paired basis with the existing primary downlink allocation for FSS and MSS in the 123-130 GHz band, which is not shared with the FS or MS services. An appropriate candidate for the seven gigahertz of uplink spectrum that would be primarily available for satellite earth station Earth-to-space operations could be identified within the lower portion of the existing primary FSS allocation in the 209-226 GHz band. This allocation would ensure fertile opportunity for satellite service development without impeding the future spectrum requirements of other communications services.

VI. CONCLUSION

Innovation should not be stifled by unnecessary restriction or premature prohibitions in green field spectrum bands. SIA urges the Commission to consider carefully the long term potential of the Spectrum Horizons proceeding and to adopt rules to encourage the future use of higher frequency bands by all communications technologies, including satellites. Broadband satellite networks are uniquely capable of solving some of the world's most difficult broadband accessibility challenges. The boundaries of satellite technology are not yet known and the possibilities for broadband communications links in the bands above 95 GHz are both realistic and achievable. In order to maximize this potential, satellite networks will require access to spectrum that is free from interference and provides very flexible opportunities for sharing. Thus, SIA asks the Commission to protect the existing satellite allocations and to recognize the potential of the satellite industry to use these higher frequency segments.

Respectfully submitted,

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