Before the
NATIONAL TELECOMMUNICATIONS
AND INFORMATION ADMINISTRATION
Washington, D.C. 20230

In the Matter of	)	
	)	
Development of a National Spectrum Strategy	)	Docket No. 230308-0068
	)	
	)	
Request for Comment	)	

COMMENTS OF VIASAT, INC.

Viasat, Inc. ("Viasat") submits these comments in response to the Request for Comment ("RFC") published by the National Telecommunications and Information Administration ("NTIA") with respect to development of a National Spectrum Strategy ("NSS").[1] Viasat has long supported NTIA's efforts to develop a comprehensive spectrum strategy for the United States[2] and applauds NTIA for again taking a hard look at the nation's current and future spectrum needs.

We are in the midst of an exciting new space age. Geostationary orbit ("GSO") satellites have seen 20-30 times increases in capacity, dynamically focus capacity to match areas of greatest demand, and provide levels of cost-efficiency never before possible to both commercial and government users. Non-geostationary orbit ("NGSO") satellite technologies offer new capabilities for remote sensing, science, and position, navigation & timing, among other things.

Viasat is a leading communications solutions provider with a long legacy in both GSO and NGSO, and a rich experience serving consumers, businesses, and government users in the

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1 *See Development of a National Spectrum Strategy*, Request for Comment, 88 FR 16244 (2023).

2 See Comments of Viasat, Docket No. 181130999–8999–01 (filed Jan. 22, 2019).

United States and around the world. Viasat's mission is to connect everyone, everywhere, and Viasat's satellite-powered broadband services are already helping to bridge the digital divide and provide connectivity to more people regardless of where they live, work, or travel.

The tremendous growth of the satellite industry in recent years is the result of innovators like Viasat constantly working to provide new and ever higher-quality services to their customers. But none of this growth would be possible without reliable access to spectrum. Clear and thoughtful leadership from the United States on spectrum policy can ensure that the public can continue to benefit from satellite-based services today and for years to come, and that the U.S. continues as global leader in innovative space technologies and services. The NSS provides an important opportunity to continue that leadership.

To that end, the Viasat recommends that the NSS should:

(i) Prioritize spectrum access for satellite services, including continued access to existing satellite allocations, developing opportunities for satellite access to other frequency bands, and ensuring that opportunities to provide direct-to-device services exist for all satellite technologies, both GSO and NGSO;

(ii) Emphasize the need for default criteria for spectrum sharing between GSO networks and NGSO systems, and among NGSO systems, in all shared frequency bands; and

(iii) Facilitate the use of the most advanced antenna technologies by both GSO and NGSO satellite operators.

By adopting these principles in the NSS, NTIA can help ensure that satellite operators of all types have the continued ability to meet customer demands, innovate, and grow, in the coming years.

I. Pillar 1: We seek input on what requirements such a pipeline needs to address, and which spectrum bands may be best suited for particular purposes.

Viasat supports NTIA's efforts to develop a "pipeline" to guide the United States' current and future spectrum needs. It is essential that the spectrum pipeline prioritize the need for

satellite services domestically and internationally. Satellite service providers, and particularly satellite broadband providers like Viasat, are uniquely positioned to achieve the United States' telecommunications goals, including the expansion of broadband availability anywhere in the United States and around the world. In response to growing consumer broadband needs, spectrum requirements for satellite networks will continue to grow. For next generation satellite networks to maintain and improve their services, the NSS should promote preservation of existing satellite spectrum allocations, particularly the fixed-satellite service ("FSS") and for the mobile-satellite service ("MSS"), and also support the adoption of additional spectrum allocations for these services.

The NSS should also promote flexible use of spectrum so that new and innovative satellite services can be provided to enhance the capabilities currently provided by terrestrial operators. For example, there is significant interest in using satellites to provide service directly to unmodified mobile devices (so-called "direct-to-device" services). Over the next 10 years direct-to-device services over satellite have the potential to unlock a new phase in global connectivity that will ensure that individuals have access to communications networks anywhere at any time. And exciting opportunities exist to provide those services over both GSO and NGSO satellites. Flexible spectrum access is essential to enabling these services to come online in the coming years.[3]

Further, the NSS should recognize the need for satellite operators to have access to a stable spectrum environment to incentivize investment and enable innovation. Given the significant costs and long lead times necessary to deploy new satellite capabilities—from spectrum identification, spectrum allocation, satellite research and design, construction, testing,

[3] This topic is addressed further in Section III.B, below.

launch and operation—any lack of stability or sudden changes in U.S. spectrum policy could chill or strand investment.

II. Pillar 2, Question 5: In considering spectrum authorization broadly (**i.e.,** *to include both licensed and unlicensed models as well as federal frequency assignments), what approaches (* **e.g.,** *rationalization of spectrum bands or so-called "neighborhoods") may optimize the effectiveness of U.S. spectrum allocations?*

In evaluating how to optimize use of U.S. spectrum allocations, the NSS should promote ways to more effectively share satellite spectrum among satellite operators. Spectrum allocated to the FSS is relatively unique compared to many terrestrial services because spectrum sharing is *already* the norm in these bands. Indeed, today spectrum in the Ka band is shared between federal and non-federal satellites, among different non-federal satellite operators, and even among satellite operators with different system architectures (*i.e.,* between GSO networks and NGSO systems). To optimize utilization of satellite spectrum, the NSS should promote targeted improvements to the framework for (A) sharing between NGSO systems and GSO networks and (B) sharing among NGSO systems.

A. Sharing Between NGSO and GSO

The successful sharing of FSS spectrum is enabled primarily by the use of angular separation between different satellite networks. In the case of GSO-GSO sharing, this angular separation occurs at different orbital locations and/or different geographic locations on the Earth. In the case of NGSO-GSO sharing, it is essential that NGSO systems avoid intersecting with operations at the GSO arc, because that is the only place GSO networks can operate; NGSO systems have the ability to operate at latitudes above and below the GSO arc, using the inherent flexibility in their networks to provide continuous service. In many frequency bands, spectrum sharing between GSO and NGSO operators also is facilitated by NGSO systems satisfying internationally established sharing criteria (*e.g.* equivalent power flux density ("EPFD") limits)

that constrain their level of interference into GSO networks. The combination of these techniques and criteria have allowed GSO and NGSO operators to develop a proven operational track record of successfully sharing FSS spectrum for many years without incident, essentially by each one keeping in its own "lane on the highway." The result has been a diverse and thriving satellite ecosystem premised on spectrum sharing.

The existing FSS sharing framework has worked well for many years, but it is showing signs of strain, particularly as increasing numbers of NGSO systems are deployed and some NGSO operators are now proposing to operate their systems as they pass through the GSO arc, and without regard to the impact on GSO networks. To ensure that satellite operators are able to continue effectively sharing FSS spectrum, the NSS should promote the importance of establishing default sharing criteria across *all* FSS frequency band segments shared between GSO networks and NGSO systems, and particularly in the 18.8-19.3 GHz and 28.6-29.1 GHz portion of the Ka band. The presence of such default criteria would provide certainty to all parties that certain core services can be provided by GSO and NGSO operators alike. By promoting widespread use of default sharing standards in frequency bands allocated to the FSS, the NSS can support optimized sharing of this spectrum and ensure that both GSO and NGSO operators continue to offer a range of innovative, high-quality satellite communications services to consumers.

B. Sharing Between NGSO Systems

The NSS should also emphasize the importance of updating the framework for sharing spectrum among NGSO systems to one that provides opportunities for competing systems to enter the market without creating incentives to game the system by deploying large numbers of satellites. For example, the United States currently relies on a default sharing mechanism among commercial NGSO systems during an "in-line event" between two or more NGSO systems.

Commercial NGSO operators "split" available spectrum during such events, which has the unintended effect of rewarding large NGSO systems for the sake of being large, while handicapping smaller NGSO systems that seek to provide essential services themselves with more capable satellites, or that are able to accomplish critical missions with a smaller constellation. This is because larger NGSO systems generate many more of these "in-line" events but do not have to internalize the associated costs because they can simply reroute traffic to other satellites to avoid the in-line event. Smaller systems, by contrast, do not have that ability, and as a result can be "blocked" by larger systems from accessing available spectrum virtually all of the time, resulting in significant reductions in system capacity. This dynamic is depicted in Table 1 below.[4]

		Blocking System Number of Satellites				
		300	**1,000**	**3,000**	**10,000**	**30,000**
Blocked System Satellites	**300**	-	9.4%	36.3%	96.9%	100.0%
	1,000	0.0%	-	9.5%	92.4%	100.0%
	3,000	0.0%	0.0%	-	89.0%	100.0%
	10,000	0.0%	0.0%	0.0%	-	100.0%
	30,000	0.0%	0.0%	0.0%	50.7%	-

Table 1: Percentage of Time Large NGSO System Hinders Smaller NGSO Systems

[4] Representative NGSO systems were modelled with 300, 1,000, 3,000, 10,000, and 30,000 satellites. The probability of blocking (the system being blocked not being able to find one of its satellites with sufficient angular separation from a satellite of the blocking system to avoid interference) was computed by Monte Carlo simulation. The percentages reflect the amount of time near in-line interference events can be expected.

To avoid a "race to the bottom" of operators deploying ever-larger NGSO systems while also enabling competitive entry from other NGSO operators, the NSS should emphasize three goals for any default mechanism for spectrum sharing among NGSO systems:

- Ensuring that larger NGSO systems do not have a disproportionate operational impact on smaller NGSO systems;
- Disincentivizing NGSO operators from deploying larger systems than would otherwise be necessary; and
- Considering the impact of proposed NGSO systems on competitive entry and innovation by other satellite operators.

The United States' current band-splitting framework for commercial satellites plainly fails to achieve these goals today, but there are alternatives that could, such as a framework based on division of azimuth angles. Under an "azimuth angle splitting" framework NGSO systems serving a location would divide the range of satellite azimuths as seen from that location whenever the potential for NGSO-NGSO interference exists. On such occasions one NGSO system would, for example, only operate with satellites to the West of the location while the other NGSO system would only operate with NGSO satellites to the East of the location. As long as each system has a satellite available in its assigned West or East direction from that location that is not within the minimum avoidance angle of a satellite in the other system in its assigned West or East direction from that location, there would be no capacity reduction for either operator.

This "azimuth angle splitting" approach has the significant advantage of applying equally to all NGSO operators regardless of the number of satellites in their respective systems. By default each operator would therefore bear the same burden of sharing in the absence of some other coordinated outcome. The result is that the incentive to deploy excessively large NGSO systems under the band splitting approach is removed. Further, this approach is scalable and can

enable future entry of additional systems on an equitable basis, promoting competition and innovation.

III. Pillar 1, Question 3: As discussed in greater detail in Pillar #3, are there options available for increasing spectrum access in addition to or instead of repurposing spectrum (i.e., improving the technological capabilities of deployed systems, increasing or improving infrastructure build outs)?

The United States can increase spectrum access through a variety of regulatory reforms, beyond changes to spectrum allocations. One proposed improvement would be to update the default criteria for sharing spectrum among commercial FSS operators, as discussed above. Additional improvements would come from ensuring that satellite regulations are updated to keep pace with technological change, including by enabling satellite operators to (A) make use of the most advanced antenna technologies, and (B) develop direct-to-device services.

A. Enabling Use of Advanced Antenna Technology

The United States can increase spectrum utilization by ensuring that all satellite operators have the ability to make use of modern antenna technologies. Today's GSO networks have been subject to antenna performance specifications for decades that are based on the historical capabilities of traditional reflector antennas and that do not readily accommodate modern flat panel, phased array antennas. NGSO systems, by contrast, are not subject to any required antenna performance specifications. As a result, the existing regulations constrain the deployment of GSO antenna technologies in a way that they do not constrain NGSO antenna technologies.

The NSS must be forward looking and recognize that the United States' satellite regulatory framework should keep up with the pace of innovation. The NSS should support updating legacy regulations to enable both GSO and NGSO operators to utilize the most advanced technologies on a technology-neutral basis.

B. Facilitating Development of Direct-to-Device Services

The NSS should also promote development of a regulatory framework in the United States that provides novel direct-to-device satellite services adequate opportunities to develop and grow, regardless whether provided over GSO or NGSO satellites. In addition to ensuring that spectrum is available for such services, the NSS should promote technology-neutral policies, such that both GSO networks and NGSO systems can seek authority to provide such services on an equal basis. The NSS should not prejudge the use of a particular technology.

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The NSS presents a unique opportunity for the United States to prioritize spectrum policy goals for the next decade and beyond. Satellite broadband services have a critical role to play in our nation's spectrum future and the NSS should reflect a commitment to ensuring that all satellite operators—GSO and NGSO—can meet increasing customer and demands and continue to innovate.

Respectfully submitted,

/s/

Christopher J. Murphy
Associate General Counsel, Regulatory & Spectrum Affairs

Christopher D. Bair
Associate General Counsel, Government and Regulatory Affairs

VIASAT, INC.
901 K Street NW, Suite 400
Washington, DC 20001

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