SIA
The voice of the satellite industry

Before the Department of Commerce
NATIONAL TELECOMMUNICATIONS AND INFORMATION ADMINISTRATION
Washington, D.C.

In the Matter of	)	
	)	
Development of a National Spectrum Strategy	)	NTIA-2023-0003
	)	Docket No. NTIA-230308-0068
	)	
	)	

COMMENTS OF THE SATELLITE INDUSTRY ASSOCIATION

The Satellite Industry Association ("SIA")[1] submits the following comments on the National Telecommunications and Information Administration's ("NTIA") Request for Comment ("*RFC*") in the above-referenced proceeding, which seeks input on "the development and implementation of a National Spectrum Strategy for the United States."[2] SIA urges NTIA to prioritize the protection and expansion of spectrum allocated to satellite services in order to ensure that the U.S. retains its leadership in this critical sector.

[1] SIA Executive Members include: Amazon; The Boeing Company; DIRECTV; EchoStar Corporation; HawkEye 360; Intelsat S.A.; Iridium Communications Inc.; Kratos Defense & Security Solutions; Ligado Networks; Lockheed Martin Corporation; Northrop Grumman; OneWeb; Planet Labs PBC; SES Americom, Inc.; Spire Global Inc.; and Viasat Inc. SIA Associate Members include: ABS US Corp.; The Aerospace Corporation; Artel, LLC; AST SpaceMobile; Astranis Space Technologies Corp.; Aurora Insight; Blue Origin; Comtech; Eutelsat America Corp.; ExoAnalytic Solutions; Hughes; Inmarsat, Inc.; Kymeta Corporation; Leonardo DRS; Lynk; Omnispace; OneWeb Technologies; Ovzon; Panasonic Avionics Corporation; Skyloom; Telesat; ULA; and XTAR, LLC.

[2] *Development of a National Spectrum Strategy*, Request for Comments, NTIA-2023-003, Docket No. 230308-0068, 88 Fed Reg. 16244 (2023) ("*RFC*").

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I. THE SATELLITE INDUSTRY IS VITAL TO THE U.S. ECONOMY AND U.S. LEADERSHIP GLOBALLY

As the *RFC* recognizes, "[s]ufficient access to spectrum is vital to national security, critical infrastructure, transportation, emergency response, public safety, scientific discovery, economic growth, competitive next-generation communications, and diversity, equity, and inclusion,"[3] and NTIA seeks to "fully address the needs of spectrum reliant services and missions, including . . . [n]ext-generation satellite communications and other space-based systems[.]"[4] The satellite industry is a vital part of each of these areas and of the global and domestic economies as a whole. With $279 billion in revenue, the satellite industry comprised 72% of the global space economy in 2021, and U.S. firms built about 87% of commercially procured satellites launched in 2021.[5] The industry grew by 3% that year in the manufacturing, satellite services, launch industry, and ground equipment sectors.[6] Since 2017, the United States has held an average market share of 38% of the global satellite industry,[7] and the U.S. satellite industry generated $45.2 billion in revenue in 2021.[8]

And the importance of the satellite industry in not limited to the economic realm. The creation of the Office of Space Commerce in the National Oceanic and Atmospheric Administration,

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[3] *Id.* at 16245.

[4] *Id.*

[5] Bryce Tech, *SIA State of the Satellite Industry Report 2022*, at 4, 22, 44 (June 2022).

[6] *Id.* at 4, 42.

[7] *Id.* at 15.

[8] *Id.* at 30.

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Department of Commerce; the Space Force organized under the Air Force, Department of Defense; and the Space Bureau at the Federal Communications Commission ("FCC") are just a few examples of the growing importance of satellite-based communications and technologies to the United States as a whole. Satellite use cases span across sectors and permeate the most vital activities of the U.S. government and private sector, as the examples below demonstrate.

- **5G/6G, Internet of Things, and Machine-to-Machine:** Satellite operations will be a vital part of the future of 5G and, to an even greater extent, 6G. 3GPP recently published Release-17, which supports 5G New Radio for non-terrestrial networks.[9] Not only do satellite systems provide the coverage necessary for ubiquitous 5G, but are also inherently resilient in the face of natural disasters. Satellite systems can provide cellular backhaul to mobile network operators. And due to the density of deployment required by 5G and future generations, coverage for more remote locations will be best and most cost-efficiently addressed by satellite networks. Moreover, satellite systems are perfectly positioned to support Internet of Things and Machine-to-Machine devices and systems, given their flexibility and the pervasive coverage that they offer in remote locations. These applications can include everything from asset tracking of cargo, military equipment, and livestock to monitoring of maritime vessel conditions to operating connected cars.
- **Broadband services:** Both non-geostationary satellite orbit ("NGSO") and geostationary satellite orbit ("GSO") systems are currently providing and working to enhance broadband service, especially to areas that are hard to reach through traditional terrestrial means.[10] In fact, satellite broadband services are currently available in all 50 states, exceeding the FCC's minimum broadband speeds.[11] Additionally, earth stations in motion ("ESIMs") allow satellite systems to provide broadband for users on the move, including on airplanes and vessels.

[9] *See* 3GPP Release 17, *available at* https://www.3gpp.org/specifications-technologies/releases/release-17.

[10] *See Broadband Connectivity*, SIA, https://sia.org/satellites-services/broadband-connectivity/.

[11] *See FCC National Broadband Map*, Federal Communications Commission (June 2022), https://broadbandmap.fcc.gov/home?version=jun2022.

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- **Video service:** Direct Broadcast Satellite ("DBS") systems offer multichannel video and media distribution service to Americans in all fifty states. DBS providers served nearly 20 million subscribers in 2021,[12] and DBS systems offer the same video service to the most remote subscribers that they do to subscribers in urban areas. They also offer competition to incumbent cable operators as well as large online platforms.
- **Remote sensing and imaging:** Earth exploration-satellite service ("EESS") systems provide remote sensing and imaging services that have applications spanning critical defense and security matters, commercial weather forecasts, tracking ship activity on the ocean, aviation safety, imaging vegetation health for agriculture and environmental science, and providing early warnings for famines and other natural disasters. U.S. EESS systems lead the world in EESS technology development, enabling the collection of imagery as sharp as 30 cm and use of a variety of wavelengths to provide different types of imaging and sensing capabilities.
- **GPS and navigation:** The ability to accurately navigate is vital not only to the public, but also to agriculture, maritime, aviation, and government applications, and it is driven by satellite. The sixth of the GPS III satellites, which are three times as accurate and eight time less susceptible to jamming than the previous generation, was launched in January 2023.[13]
- **In-space servicing, assembly, and manufacturing ("ISAM"):** As the FCC acknowledged in its recent Notice of Inquiry on the subject, "ISAM activities are poised to transform the space economy [and] . . . have the potential to build entire industries, create new jobs, mitigate climate change, and advance our nation's economic, scientific, technological, and national security interests."[14] ISAM activities are not only poised to extend the operational life of existing satellites and help to mitigate existing orbital debris, but will also be vital in extending deep-space mission resources to allow for travel outside Earth's orbit, lunar missions, and eventual travel

[12] *See 2022 Communications Marketplace Report*, GN Docket 22-203 (rel. Dec. 30, 2022) https://docs.fcc.gov/public/attachments/FCC-22-103A1.pdf.

[13] *Sixth GPS III Satellite Built By Lockheed Martin Launches As Part Of Constellation Modernization*, Lockheed Martin (Jan. 18, 2023), https://news.lockheedmartin.com/2023-01-18-Sixth-GPS-III-Satellite-Built-by-Lockheed-Martin-Launches-As-Part-of-Constellation-Modernization,1.

[14] *Space Innovation; Facilitating Capabilities for In-space Servicing, Assembly, and Manufacturing*, Notice of Inquiry, IB Docket Nos. 22-271, 22-272, FCC 22-66, ¶ 2 (2022).

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to other celestial objects, which will require careful consideration of what spectrum will be most useful.

- **Emergency response and disaster relief:** Many of the use cases listed above, and others, are employed when speed and resiliency of response are required in disaster and emergency scenarios. Satellite operators have been providing critical voice communications in remote locations via satellite phones for decades, and now provide reliable data services to response and recovery agencies and others cut off from terrestrial internet and Wi-Fi services during disasters. Remote sensing and imaging helps governments to plan weather- and disaster-related evacuations, and broadcast satellites support television news trucks and emergency responders to provide valuable onsite rescue and recovery information and services.

As these examples amply establish, the satellite industry is vital to both the economic and diplomatic leadership of the United States in the 21st century Space Race. As a result, the National Spectrum Strategy should prioritize protecting satellite spectrum from interference as well as taking a long-term view to allocating additional spectrum to satellite services and championing international harmonization around the same.

II. PILLAR #1: A SPECTRUM PIPELINE TO ENSURE U.S. LEADERSHIP IN SPECTRUM-BASED TECHNOLOGIES MUST PROTECT EXISTING SATELLITE SPECTRUM AND PROVIDE ADDITIONAL ALLOCATIONS

Satellite operations require significant amounts of spectrum to stay competitive and to provide the wide variety of critical services described above. Moreover, satellites need different spectrum bands to support different capabilities, and the global harmonization of allocations for these bands is essential due to the global footprint of satellite operations. The table below summarizes the major spectrum bands that are essential for satellite operations, as well as sample use cases occupying that spectrum:

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Spectrum Band	Sample Satellite Use Cases
VHF/UHF (30 MHz-1 GHz)	Telemetry, Tracking, and Command ("TT&C"), IoT, EESS
L-band (1-2 GHz)	Mobile-satellite service ("MSS"), Radionavigation Satellite Services ("RNSS")
S-band (2-2.9 GHz)	MSS, EESS, satellite radio ("DARS"), TT&C
C-band (3.4-6.7 GHz)	Fixed-satellite services ("FSS"), RNSS, TT&C
X-band (8-12 GHz)	EESS, satellite imagery and communications
Ku-band (10.7-18.1 GHz)	Satellite TV/broadcast, high-density FSS broadband, mobility services, TT&C
Ka-band (17.3-21.2 GHz, 24.25-31 GHz)	FSS broadband and inter-satellite links, EESS, TT&C
Q/V-band (33-75 GHz)	High-density FSS, inter-satellite links, EESS
W-band (75-100 GHz)	Next-generation FSS, MSS, EESS

In considering the spectrum pipeline for commercial operations, if NTIA considers sharing in federal satellite bands, commercial satellite uses should be prioritized. Moreover, FSS and EESS systems have proven themselves to be particularly successful in spectrum sharing with government systems.

The spectrum pipeline envisioned under the National Spectrum Strategy must keep in mind these spectrum requirements in order to ensure not only that current services can continue, but that there will be sufficient spectrum for new and innovative use cases. For example, satellite operators have begun offering direct-to-device ("D2D") services, a groundbreaking use case that has the

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potential to revolutionize the delivery of communications services and close the digital divide.[15] Moreover, satellite operators are exploring new inter-satellite link capabilities that have the potential to improve space safety and reduce latency in the delivery of satellite-based products and services. The spectrum pipeline must therefore allow sufficient spectrum for operators to continue pioneering inventive ways to serve their customers.

III. PILLAR #2: LONG-TERM SPECTRUM PLANNING MUST INCLUDE U.S. LEADERSHIP IN INTERNATIONAL WORK THAT ENSURES ACCESS TO SPECTRUM FOR SATELLITE OPERATIONS

Satellite operations are inherently global, and thus satellite spectrum must be harmonized globally in order to allow satellite operations to reach their fullest potential. As a result, U.S. leadership is needed not only domestically, but internationally as well, to ensure access to spectrum for satellite services and competitiveness of the U.S. commercial space sector. International action on spectrum will have reverberating effects on the long-term future of the U.S. satellite industry.

In particular, the United States must practice leadership at multilateral organizations like the International Telecommunication Union ("ITU") and international standards setting bodies. Increasing competition in the space economy by China and Russia was apparent at the second session of the Conference Preparatory Meeting ("CPM23-2") where ITU Member States approved a report summarizing the preparatory studies for the World Radiocommunication Conference 2023

[15] *See generally Single Network Future: Supplemental Coverage from Space*, Notice of Proposed Rulemaking, Docket Nos. 23-65, 22-271, FCC 23-22 (rel. Mar. 17, 2023).

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("WRC-23").[16] Active engagement and coordination by senior U.S. officials within the Department of State, NTIA, and the FCC at WRC-23 will therefore be critical on agenda items including:

- **Agenda Items 1.2 and 9.1(c) and Future Agenda Item 10**, considering the identification of several core satellite frequency bands for IMT use that, if allowed, could risk continued spectrum access and operational flexibility essential for the satellite industry to meet consumer demand;

- **Agenda Item 1.11**, considering changes that would allow for the introduction of uncoordinated systems like the China-backed COMPASS system to provide Global Maritime Distress and Safety Services ("GMDSS");

- **Agenda Item 1.15**, considering allowing ESIM operations in the 12.75-13.25 GHz band that will allow satellite operators to meet the vast growth in demand for these services;

- **Agenda Item 1.16**, considering technical and operational characteristics for NGSO ESIM operations in the 17.7-18.6 GHz,18.8-19.3 GHz, and19.7-20.2 GHz (space to Earth) bands and the 27.5-29.1 GHz and 29.5-30 GHz (Earth to space) bands, similar to the GSO ESIM framework adopted at WRC-19;

- **Agenda Item 1.19**, considering an FSS allocation in the 17.3-17.7 GHz band (space to Earth) in Region 2, currently allocated to the Broadcast Satellite Service (BSS) in the space to Earth direction; and

- **Agenda Item 9 Article 21**, considering changes regarding appropriate spectrum sharing between terrestrial and space services in several frequency bands that include a co-primary satellite service allocation.[17]

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[16] *See Draft CPM Report on technical, operational and regulatory/procedural matters to be considered by the 2023 World Radiocommunication Conference*, Document CPM23-2/1 (Nov. 25, 2022), *available at* https://www.itu.int/md/R19-CPM23.2-C-0001/en. The final report is expected to be released by April 21, 2023.

[17] *See* Resolution 811 (WRC-19), *Agenda for the 2023 world radiocommunication conference*, Agenda Items 1.2, 1.11, 9, and 9.1(c), *available at* https://www.itu.int/en/ITU-R/terrestrial/fmd/Pages/wrc-19_Res_Rec.aspx.

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The outcome of these agenda items will be important for securing continued spectrum access for satellite services, as well as their protection from harmful interference. To maintain U.S. leadership in this important industry, engagement is also needed on agenda items considering proposals that would enable more intensive use of existing satellite spectrum,[18] provide access to new spectrum for satellite services,[19] and develop the agenda for the World Radiocommunication Conference 2027.[20] Because of the four-year cycle of the World Radiocommunication Conference and the pace at which such international standards-setting moves, the United States must approach these conferences and other meetings with an eye toward maintaining U.S. leadership in the decades to come.

IV. PILLAR #3: PRIORITIZING SPECTRUM FOR SATELLITE SERVICES WILL ALLOW UNPRECEDENTED SPECTRUM ACCESS AND MANAGEMENT THROUGH TECHNOLOGY DEVELOPMENT

The *RFC* notes that "[a] key strategy to ensure sufficient access to spectrum for our nation is to embrace innovation and pursue technologies that expand the overall capacity or usability of the radiofrequency spectrum,"[21] and satellite technologies are uniquely suited to meet this need. The industry has seen extraordinary innovation in recent years, and as a result, satellite systems are

[18] *See id.* at Agenda Items 1.6, 1.8, 1.15, 1.16, 7, and 9.1(d).

[19] *See id.* at Agenda Items 1.18 and 1.19.

[20] *See id.* at Agenda Item 10; Resolution 812 (WRC-19), *Preliminary agenda for the 2027 World Radiocommunication Conference*, *available at* https://www.itu.int/en/ITU-R/terrestrial/fmd/Pages/wrc-19_Res_Rec.aspx.

[21] *RFC* at 16247.

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increasingly far-reaching, high-efficiency, and high-capacity. High-throughput satellites employ frequency reuse and spot beam technology to increase capacity more than twenty times what it was prior,[22] and dynamic spectrum use allows for reallocation of spectrum to areas that most need it. Moreover, as described above, satellites allow Mobile Network Operators to provide continuous uninterrupted service to users via cellular backhaul and, increasingly, D2D services. Operators are developing flat panel antennas to enhance communications both at home and on the move, and NGSO constellations have begun to provide broadband worldwide. Software defined satellites replace the hardware components of typical satellites with software-defined components that provide flexibility in their delivery of services. Such a satellite allows dynamic spectrum assignment to beams and allows these beams to be formed as needed, further increasing the agility and efficiency of those systems.

These innovations, and those that are coming in the near future, allow satellites to use and share spectrum efficiently and deliver services that are responsive to customer needs. Protecting and allocating satellite spectrum will only speed the course of this innovation.

V. CONCLUSION

The satellite industry is critical to the success and leadership of the United States, and it is only becoming more so. SIA urges NTIA to prioritize allocating and protecting spectrum for these vital and growing services as it looks to the future in preparing the National Spectrum Strategy.

[22] SIA, *Introduction to the Satellite Industry*, at 9 (2023).

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