Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
Facilitating the Communications of Earth Stations in Motion with Non-Geostationary Orbit Space Stations	)	IB Docket No. 18-315
	)	
	)	

COMMENTS OF VIASAT, INC.

Viasat, Inc. ("Viasat") submits these comments to the proposals in the Notice of Proposed Rulemaking in the above-captioned proceeding, which seeks to allow the operation of earth stations in motion ("ESIMs") with non-geostationary orbit ("NGSO") satellites operating in the fixed-satellite service ("FSS").[1]

I. INTRODUCTION & SUMMARY

Viasat applauds the Commission's initiation of this proceeding, as Viasat has a keen interest and extensive expertise in mobile applications of the FSS. Viasat has been a leader in the development and deployment of aeronautical satellite broadband service technology, both at Ku band and Ka band, and its experience operating FSS on mobile platforms spans over 15 years. Viasat has leveraged its existing fleet of Ka-band geostationary orbit ("GSO") satellites for mobile applications to deliver to passengers and crew on board aircraft the same high-quality broadband connections that Viasat provides to customers on the ground, including capabilities to stream services such as Netflix and Amazon Video while in flight. These broadband connections

[1] *Facilitating the Communications of Earth Stations in Motion with Non-Geostationary Orbit Space Stations*, IB Docket No. 18-315, Notice of Proposed Rulemaking, FCC 18-160 (rel. Nov. 16, 2018) ("*Notice*").

are being provided to over 1,100 aircraft today, including hundreds of commercial aircraft and many hundreds of business and government aircraft—most notably, Air Force One, and these connections will be provided to over 630 more commercial aircraft in the near future. In total, Viasat currently is connecting over 100 million personal devices per year on airplanes.

Demand for these services is only growing, as confirmed by a recent study by the London School of Economics predicting exponential growth of Wi-Fi service to airplanes in the coming decade: "By 2035, it is likely that inflight connectivity will be ubiquitous across the world."[2] Indeed, in response to these global demands, there has been increased interest internationally for opening the 27.5-30 GHz band more broadly, as well as other frequency bands, for ESIM operations.

In addition, NGSO FSS networks are a key to meeting this global demand. Although Viasat plans to expand its existing capacity with additional GSO satellites featuring even more advanced technical capabilities, Viasat also seeks to augment its GSO networks with the unique advantages and capabilities offered by NGSO technologies. Viasat has pending before the Commission an application for U.S. market access for its planned VIASAT-NGSO satellite network, which will operate using Ka band and V band frequencies.[3] The VIASAT-NGSO satellite network is another step in the evolution of the Viasat's satellite broadband platform, supplementing Viasat's GSO systems with ubiquitous coverage and low latency. Viasat anticipates using this network to provide a wide array of FSS communications services—

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[2] Dr. Alexander Grous, London School of Economics and Political Science, Sky High Economics, "Chapter One: Quantifying the commercial opportunities of passenger connectivity for the global airline industry" at 3, *available at* http://www.lse.ac.uk/business-and-consultancy/consulting/assets/documents/sky-high-economics-chapter-one.pdf.

[3] *See* Viasat, Inc., IBFS File No. SAT-PDR-20161115-00120, Call Sign S2985 (filed Nov. 15, 2016), as amended.

including mobile applications—that would be tailored to meet the specific needs of consumer, enterprise and government users globally.

Extending the Commission's recently adopted ESIM rules to allow ESIMs operating within NGSO FSS networks would provide certainty to operators and technology developers and enable growth of NGSO technologies. In light of the systems authorized and/or pending in the Commission's recent NGSO processing rounds, the time is ripe for adopting such rules. Viasat agrees with the Commission's proposals to allow NGSO ESIMs in the portions of the Ku band and Ka band identified in the *Notice*, but urges the Commission to ensure that NGSO ESIM operations adequately protect primary GSO FSS operations, and are compatible with GSO FSS operations outside of the U.S. in bands where NGSO and GSO are co-primary internationally. Further, given the need to use scarce spectrum resources efficiently and to meet growing demand for ESIMs generally, Viasat urges the Commission to consider allowing NGSO ESIMs greater access in the 27.5-30 GHz band on a shared basis.

II. VIASAT SUPPORTS ALLOWING ESIMS IN BANDS IDENTIFIED IN THE *NOTICE*

In the *Notice*, the Commission proposes to adopt rules allowing ESIMs to communicate with NGSO FSS systems: (i) on a primary basis in the 18.8-19.3 GHz and 28.6-29.1 GHz portions of the Ka band;[4] (ii) on a secondary basis with respect to GSO FSS operations in the 11.7-12.2 GHz and 14.0-14.5 GHz portions of the Ku band, and the 18.3-18.6 GHz, 19.7-20.2 GHz, 28.35-28.6 GHz and 29.5-30 GHz portions of the Ka band;[5] and (iii) to receive signals on a secondary basis with respect to FS stations in the 17.8-18.3 GHz band,[6] and on an unprotected

[4] *Notice* at ¶ 10.

[5] *Id.* at ¶ 9.

[6] *Id.* at ¶ 13.

basis with respect to FS stations in the 10.7-11.7 GHz, 19.3-19.4 GHz and 19.6-19.7 GHz band segments.[7] In a separate proceeding, the Commission is proposing to allow ESIMs to receive signals from GSO FSS systems in each of these downlink bands shared with FS,[8] and thus, the NGSO FSS operations proposed in this proceeding would be required to protected GSO FSS operations in these bands.[9]

Viasat supports these proposals and the relative status of NGSO FSS ESIMs in each of the frequency bands identified above. It is well established that ESIMs can perform within the same technical parameters as fixed earth stations through highly accurate antenna pointing mechanisms and appropriate power limits. In adopting the rules for GSO FSS ESIMs, the Commission acknowledged that this is the case,[10] and it is no different for ESIMs that would operate within NGSO FSS networks. The long history of successful ESIM operations demonstrates that coexistence with other services is readily achievable through network control and monitoring capabilities, and operation of ESIMs within an NGSO network would rely on these same types of mechanisms. As recognized in the *Notice*, the Commission has approved ESIMs in the NGSO FSS network of O3b Limited ("O3b") on a non-protected, non-interference basis.[11] Viasat has operated ESIMs with O3b's network under an experimental license to test

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[7] *Id*. at ¶¶ 11-12.

[8] *See Amendment of Parts 2 and 25 of the Commission's Rules to Facilitate the Use of Earth Stations in Motion Communicating with Geostationary Orbit Space Stations in Frequency Bands Allocated to the Fixed Satellite Service*, IB Docket No. 17-95, Report and Order and Further Notice of Proposed Rulemaking, FCC 18-138 ¶ 91 (rel. Sept. 27, 2018) ("*GSO ESIM Order*").

[9] *Notice* at ¶¶ 11-13.

[10] *See GSO ESIM Order* at ¶ 51 & n.118; ¶ 66.

[11] *See Notice* at ¶¶ 6, 22.

Viasat's own aeronautical earth station antenna technology within an NGSO FSS network,[12] and thus has seen first-hand that ESIMs are capable of communicating with NGSO FSS networks in a manner that is compatible with the sharing environment.

However, the Commission's order adopting NGSO ESIM rules should make clear that, when operating in bands where NGSO FSS must protect GSO operations, these earth stations must comply with applicable EPFD limits established to protect GSO operations. The Commission requires NGSO FSS networks to operate in accordance with the EPFD limits in Article 22.2 of the ITU Radio Regulations. However, these limits are outdated and incomplete. Viasat has sought reconsideration of the Commission's rules governing NGSO FSS services, urging the Commission to reevaluate these EPFD limits, because the current limits are insufficient to protect GSO networks from the types of NGSO networks that have been approved or are currently pending in the Commission's recent processing rounds.[13] Nonetheless, the rules for NGSO ESIMs must be clear that operations are subject to the applicable EPFD limits in order to protect GSO operations. Similarly, any primary NGSO ESIM operations that may be allowed in the 18.8-19.3 GHz and 28.6-29.1 GHz band segments within the U.S. should not impact GSO operations outside of the U.S., where GSO and NGSO systems are co-primary and are subject to ITU coordination requirements.

The Commission generally proposes to extend the rules adopted for GSO FSS ESIMs to NGSO FSS ESIMs, but with conforming technical changes (*e.g.*, excluding NGSO ESIMs from

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[12] *See* Viasat, Inc., OET File No. 0015-EX-CM-2018, Call Sign WH2XTJ (granted Feb. 26, 2018).

[13] *See* Viasat, Inc., Petition for Reconsideration, *Update to Parts 2 and 25 Concerning Non-Geostationary, Fixed-Satellite Service Systems and Related Matters*, IB Docket No. 16-408 (filed Jan. 17, 2018).

rules that pertain to two-degree spacing for GSO FSS space stations).[14] Viasat supports this approach and agrees that the rules should exclude NGSO ESIMs from the application of off-axis EIRP density requirements for two-degree spaced GSO FSS earth stations. In addition, permitting blanket licensing of ESIMs operating with NGSO FSS systems would maintain a consistent framework for streamlined licensing of fixed and ESIM earth stations.[15]

III. VIASAT URGES THE COMMISSION TO EXPAND ESIM OPERATIONS TO ADDITIONAL SPECTRUM BANDS

In the *Notice*, the Commission requests comment on "any other issues regarding the framework discussed for NGSO ESIMs operations that we should consider" and "any possible effects ESIMs communicating with NGSO FSS space stations may have on existing or future services in these bands or adjacent frequency bands."[16] With respect to adjacent frequency bands, as the Commission concluded in the context of GSO FSS ESIMs, operations in any adjacent bands would be protected by the existing out-of-band emission limits in Section 25.202(f) of the Commission's rules, which would apply to any earth stations operating with NGSO FSS systems, whether fixed or mobile.[17] Therefore, introduction of NGSO ESIMs would not change the potential impact to services allocated in adjacent frequency bands.

Moreover, ESIMs can also be compatible with other services—both satellite and terrestrial—even when operating in the same band. Through spatial separation or other sharing techniques, ESIMs can operate co-frequency without constraining other services in the same bands. For instance, the Commission has approved Viasat's aeronautical earth stations operating

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[14] *Notice* at ¶¶ 18-19.

[15] *See id.* at ¶ 15.

[16] *See id.* at ¶ 23.

[17] *See GSO ESIM Order* at ¶ 62.

in the 28.1-28.35 GHz portion of the Ka band that has been designated primarily for terrestrial wireless services. The Commission's grant of a waiver to allow such operations was based on a demonstration that the earth stations, when operated at an altitude of 10,000 feet, would not cause harmful interference into terrestrial wireless stations on the ground.[18] The same would be true of ESIMs operating in the entire 27.5-28.35 GHz segment shared with terrestrial wireless services, namely UMFU. Significantly, operating NGSO ESIMs in this portion of the Ka band at an altitude of 10,000 feet would not exceed the pfd limit of -77.6 dB(mW/(m^2 * MHz)) measured 10 meters above ground level, which establishes the threshold for coordination with UMFU stations in Section 25.136(a) of the Commission rules.[19]

Therefore, Viasat urges the Commission to consider expanding ESIMs into additional segments of the 27.5-30 GHz band where ESIM deployment is demonstrated to be compatible with the primary allocated services. Allowing NGSO FSS ESIMs to access additional spectrum on a shared basis to supplement the specific allocations proposed in the *Notice* would ensure that satellite networks would have the spectrum needed for the increases in capacity required to meet consumers' increasing demand to use video streaming services and other high-bandwidth applications on board aircraft. The Commission has acknowledged that meeting this need for increased capacity requires additional spectrum resources. For instance, in granting access for satellite to additional spectrum in the Spectrum Frontiers proceeding, the Commission cited comments from major U.S. airlines that are Viasat customers "argu[ing] that as demand for in-

[18] *See* Viasat, Inc., IBFS File No. SES-MOD-20160108-00029, Call Sign E120075 (granted June 29, 2016).

[19] *See* 47 C.F.R. § 25.136(a).

flight broadband grows, airlines and their satellite broadband partners will need access to more spectrum to meet consumer demand."[20]

Consideration of NGSO ESIMs in the entire range of the Ka band uplink spectrum, most notably 27.5-28.35 GHz, would also allow the Commission to take the lead on this issue internationally. Stakeholders currently are proposing future agenda items for study in the ITU's next World Radiocommunication Conference (WRC-23), and several parties have proposed to consider NGSO ESIM operations across the entire 27.5-30 GHz range, as well as other spectrum at V band.

Overall, allowing NGSO ESIMs to operate on a shared basis in other segments of the 27.5-30 GHz band would ensure that scarce spectrum resources are used to the fullest extent possible and would further the advancement of broadband solutions to serve underserved consumers, to provide competitive alternatives, and to enable ubiquitous connectivity through mobile applications. As the aeronautical example above illustrates, such sharing could allow spectrum to be used more intensively without having any impact on the primary services.

IV. CONCLUSION

For the foregoing reasons, Viasat supports the Commission's proposals to expand its ESIM rules to allow operations with NGSO FSS networks. In doing so, the Commission should ensure that NGSO ESIM operations are compatible with and adequately protect GSO FSS operations. In order to ensure sufficient spectrum to satisfy the growing demand for aeronautical

[20] *Use of Spectrum Bands Above 24 GHz for Mobile Radio Services*, GN Docket No. 14-177, Second Report and Order, FCC 17-152, at ¶ 188 (rel. Nov. 22, 2017); *see also* American Airlines *Ex Parte* Presentation, GN Docket No. 14-177, *et al*., at 1 (Nov. 9, 2017); JetBlue Airways, *Ex Parte* Presentation, GN Docket No. 14-177, *et al*., at 1 (Nov. 9, 2017).

broadband connectivity, Viasat urges the Commission to consider allowing NGSO ESIMs greater access to the 27.5-30 GHz band on a shared basis.

Respectfully submitted,

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