

proceeding in which the Commission may adopt specific service or other sharing rules for the V band.¹

Grant of ViaSat’s Petition would serve the public interest in several important respects—including by facilitating ViaSat’s ongoing efforts to provide high-quality, innovative satellite-based broadband services to users in the United States. No commenter questions the significant benefits that would arise from the implementation of ViaSat’s proposed system, or seeks denial of ViaSat’s Petition.

Rather, the comments filed by SES and SpaceX address narrow aspects of ViaSat’s Petition, and Hughes, SES and Telesat comment more generally regarding issues affecting all NGSO applicants in the V-band processing round. ViaSat’s Petition makes clear that the VIASAT-NGSO system will operate in a manner that protects GSO V-band operations. Furthermore, ViaSat intends to comply with any NGSO rules applicable to V-band systems that the Commission may adopt in the future. Therefore, there is no need for ViaSat to provide any additional technical information or be subject to any special conditions, as some commenters request. Accordingly, the Commission should grant the Petition.

I. VIASAT’S PETITION ESTABLISHES THAT ITS NGSO SYSTEM WILL PROTECT V-BAND GSO OPERATIONS

SES asserts that ViaSat’s Petition “does not sufficiently address or acknowledge the need to protect future V-band GSO systems.”² This simply is not correct. ViaSat’s Petition explicitly states that the VIASAT-NGSO system will be fully compatible with subsequently granted GSO

¹ See Consolidated Comments of ViaSat, Inc., IBFS File Nos. SAT-LOA-20161115-00117, SAT-AMD-20170301-00029, SAT-LOI-20170301-00031, at 6-7 (July 17, 2017) (“ViaSat Consolidated Comments”).

² Comments of SES S.A. and O3b Limited, SAT-PDR-20161115-00120, at 4 (July 17, 2017) (“SES Comments”).

networks and will not preclude entry by GSO applicants in any V-band segments.³ The Technical Annex included with the Petition also notes that ViaSat's NGSO satellites will fully protect GSO networks through: (i) GSO arc avoidance; (ii) compliance with applicable EPFD limits; and (iii) coordination consistent with ITU requirements.⁴ For the avoidance of doubt, ViaSat confirms that these statements apply, with equal force, to both the Ka-band and V-band portions of ViaSat's Petition.

Although the Technical Annex to the Petition provides a more detailed NGSO-GSO sharing analysis for the Ka band than for the V band, this simply reflects that: (i) EPFD limits have been developed for the Ka band but not the V band; and (ii) the ITU has developed EPFD analysis software for the Ka band but not the V band. Notably, SES itself acknowledges that the Commission has not yet specified GSO-NGSO sharing criteria (including EPFD limits) for the V band.⁵

It is not feasible to supply a V-band EPFD analysis, as SES suggests, because there currently are no EPFD limits (either single-entry or aggregate) for these spectrum bands. For purposes of illustration, however, the attached Technical Exhibit provides a representative analysis that explains how the VIASAT-NGSO is compatible with co-frequency V-band GSO networks. In short, ViaSat's Technical Analysis to the Petition, and this Consolidated Response, confirm that the VIASAT-NGSO system will suitably protect V-band GSO networks.

³ ViaSat, Inc., File No. SAT-PDR-20161115-00120, at 25 (filed Nov. 11, 2016).

⁴ *Id.*, Technical Annex at 21-22.

⁵ *See* SES Comments at 3.

II. THE SPECIAL CONDITIONS AND SUPPLEMENTAL INFORMATION SPACE X REQUESTS ARE UNWARRANTED

In its comments, SpaceX suggests that ViaSat should be required to provide additional technical information regarding the VIASAT-NGSO system, including the proposed Ka-band satellite-to-satellite links, and that grant of ViaSat's Petition should be conditioned upon a requirement to share certain proprietary information with other NGSO system operators. As demonstrated below, SpaceX's requests are unjustified.

First, SpaceX "applauds" ViaSat for incorporating narrow steerable beams into the design of the VIASAT-NGSO system but requests that ViaSat's authorization be conditioned upon a requirement to disclose real-time pointing data for these beams to other NGSO operators to let them know where ViaSat's beams are pointed at any given time.⁶ As an initial matter, real-time pointing data of this type is highly sensitive and competitive business information. A requirement to provide such data would provide competitors with insight into the location of ViaSat's customers and areas being targeted under ViaSat's business plans. Competitors could use this information to either target those areas (harming ViaSat's competitive position) or target *other* areas (undermining competition).⁷

In any event, there is no basis for requiring ViaSat to disclose proprietary data of this type. ViaSat will ensure that its operation of steerable beams will comply with any NGSO sharing criteria that the Commission may adopt for the V band—be it band-splitting at the outset or band-splitting during in-line events. As long as ViaSat complies with those obligations, there

⁶ Comments of Space Exploration Holdings, LLC, File No. SAT-PRD-20161115-00120, at 10 (July 17, 2017) ("SpaceX Comments").

⁷ For this reason, the Commission routinely affords confidential treatment to such information when it is provided to the Commission. *See* 47 C.F.R. §§ 0.457(d) (FOIA exemption for trade secrets); 0.457(d)(vii)(B) (FOIA exemption for coordination-related information).

is no legitimate need for SpaceX to have information about the particulars of ViaSat's beam pointing at any given instance.

Second, contrary to what SpaceX suggests,⁸ ViaSat's Petition provides all of the information about earth station performance that is required in the context of a space station application. In any event, illustrative transmit characteristics of a representative earth station are included in the attached Technical Exhibit. More detailed information with respect to the performance of ViaSat's NGSO earth stations will be made available in due course, in subsequent applications for earth station authorizations.⁹

Third, SpaceX suggests that the NGSO-GSO links proposed in ViaSat's Petition should be entitled to no protection outside of the GSO arc.¹⁰ As an initial matter, because ViaSat's Petition proposes to operate NGSO-GSO links only in the Ka band, SpaceX's comments are untimely and non-responsive to the matters that the Public Notice addresses. In any event, ViaSat has addressed its NGSO-GSO links extensively in the pleading cycle on the Ka-band aspects of its Petition and, in that context, has explained that links between its NGSO satellites and any GSO satellites will fit within the operating environment created by a traditional VSAT operating within a GSO spacecraft's coverage area on the Earth's surface.¹¹

⁸ SpaceX Comments at 12.

⁹ *See, e.g., Teledesic LLC for Minor Modification of License to Construct, Launch and Operate a Non-Geostationary Fixed Satellite Service System*, Order and Authorization, 14 FCC Rcd 2261, at ¶¶ 18-19 (1999) (granting NGSO system authorization and deferring consideration of earth station transmission characteristics to future earth station applications).

¹⁰ SpaceX Comments at 13.

¹¹ *See, e.g., Consolidated Opposition and Reply Comments of ViaSat, Inc., File No. SAT-PDR-20161115-00120*, at 3-6 (July 7, 2017) ("ViaSat Ka-band Consolidated Opposition").

SpaceX acknowledges that “this arrangement does not necessarily present interference concerns for other NGSO system operators.”¹² Still, SpaceX suggests that:

“the Commission should clarify that these proposed links are entitled to no special interference protections beyond the equivalent power flux-density (“EPFD”) limits that . . . generally protect GSO satellites operating within the GSO arc. They do not, however, provide any sort of protection for these inter-satellite links that involve a ViaSat MEO operating outside that region of space. Instead, these NGSO operations will be subject to the same coexistence regime as other NGSO operations, including the need to coordinate with other operators to resolve any potential interference.”¹³

It is unclear what SpaceX is arguing. In some band segments in which ViaSat’s satellite-to-satellite links would operate, there are no EPFD limits. To the extent SpaceX is addressing the level of interference protection to be afforded to the reception of signals by GSO networks with which a ViaSat NGSO satellite would operate, that is a matter defined by the operating environment within which the GSO networks exist and have coordinated (as appropriate). And, as ViaSat has demonstrated, these satellite-to-satellite links simply will not adversely affect the operating environment for any adjacent GSO networks.¹⁴

To the extent SpaceX is addressing the level of interference protection to be afforded to the transmission of signals by the ViaSat NGSOs outside the GSO arc, that is a matter to be addressed by the rules the Commission adopts for NGSO sharing in the pending NGSO rulemaking.

Fourth, SpaceX suggests, in a footnote, that ViaSat’s system design “raises questions about whether ViaSat will be able to achieve sufficient adjacent-channel performance to

¹² SpaceX Comments at 13.

¹³ *Id.*

¹⁴ ViaSat Ka-band Consolidated Opposition at 6-7, Exhibit A at A-3, A-4.

facilitate band splitting.”¹⁵ SpaceX does not explain the basis for this comment, nor does it identify what aspect of the adaptive channelizer that VIASAT-NGSO will use to route uplink traffic into the appropriate downlink channels gives rise to its unspecified concerns. ViaSat certified in the Schedule S filed with its Petition that the out-of-band emission limits of Section 25.202(f) would be satisfied. In addition, ViaSat intends to comply with any new rules the Commission may adopt in the pending NGSO rulemaking proceeding that would address adjacent channel interference issues during band-splitting. Notably, SpaceX did not raise any issues regarding adjacent-channel performance either in connection with the Ka-band portion of ViaSat’s Petition, or more broadly in the NGSO rulemaking proceeding.

III. NGSO AUTHORIZATIONS SHOULD BE SUBJECT TO NGSO RULES THAT MAY BE ADOPTED IN THE FUTURE

Hughes, SES and Telesat each raise issues regarding aspects of V-band NGSO system operations for which there currently are not settled Commission rules. Hughes and SES echo ViaSat’s concern that the Commission does not have rules to address NGSO-GSO sharing at V band. SES, like ViaSat, acknowledges that Article 22.2 of the ITU Radio Regulations applies in the V band to require that NGSO systems not to cause unacceptable interference to, or claim protection from GSO systems,¹⁶ and asks the Commission to adopt single-entry and aggregate EPFD compliance requirements for the V band. Hughes asks the Commission to subject V-band NGSO systems to EPFD limits comparable to the Article 22 EPFD limits for Ku and Ka band and to initiate a rulemaking proceeding to adopt NGSO-GSO sharing rules. Hughes acknowledges that studies at the ITU regarding such limits and other parameters to facilitate NGSO-GSO sharing are underway, and requests that the Commission undertake its own

¹⁵ SpaceX Comments at 12 n.15.

¹⁶ SES Comments at 3.

assessment of such limits for V band.¹⁷ Moreover, Telesat and SES acknowledge that the Commission is considering rules addressing sharing among NGSO systems in the pending NGSO rulemaking proceeding.¹⁸ Each urges the Commission to address V-band NGSO system sharing in that proceeding as well.

As reflected in its submissions described above, ViaSat supports the adoption of suitable EPFD limits for the V band, and agrees that the terms for NGSO/NGSO co-frequency spectrum sharing should be addressed in the pending NGSO rulemaking proceeding, which expressly seeks comment on whether the proposed sharing mechanism for NGSO systems during in-line events should apply in frequency bands other than the Ku and Ka bands.¹⁹ Hughes's suggestion that such matters be addressed in a rulemaking is consistent with ViaSat's comments on other V-band NGSO applications in this processing round that the Commission develop EPFD limits and other mechanisms to facilitate NGSO-GSO sharing in the V band. However, ViaSat believes that the Commission could address these issues in the pending NGSO rulemaking proceeding, and does not agree with Hughes that a new rulemaking proceeding is required.

As ViaSat has urged in the context of other V-band NGSO applications, any grant of V-band NGSO system authority should be appropriately conditioned to ensure that future GSO

¹⁷ Letter from Hughes Networks Systems, LLC to FCC, File No. SAT-PDR-20161115-00120, at 2 (July 17, 2017).

¹⁸ See SES Comments at 5; Consolidated Comments of Telesat Canada, File No. SAT-PDR-20161115-00120, at 2-3 (July 17, 2017). Telesat asserts (in conclusory fashion) that the NGSO systems of Audacy, OneWeb, and ViaSat would interfere with that of Telesat. Tellingly, Telesat provides no technical analysis to support this claim, and no demonstration of why it cannot share V-band spectrum with other operators (even if through band segmentation on an as-needed basis).

¹⁹ See ViaSat Consolidated Comments at 6-7; *Update to Parts 2 and 25 Concerning Non-Geostationary, Fixed-Satellite Service Systems and Related Matters*, IB Docket No. 16-408, Notice of Proposed Rulemaking, FCC 16-170, at ¶ 23 (2016).

systems can be accommodated, and that NGSO-to-NGSO sharing can be facilitated. ViaSat intends to comply with any sharing criteria or other requirements applicable to V-band NGSO systems that the Commission may adopt in the future.

IV. CONCLUSION

ViaSat's Petition establishes that granting the VIASAT-NGSO system access to the United States would serve the public interest, convenience, and necessity. No party has suggested—let alone demonstrated—otherwise. Accordingly, the Commission should authorize the VIASAT-NGSO system access to the United States, without the special conditions or requests for additional information suggested by any of the commenters. ViaSat agrees that any NGSO systems authorized in this processing round be subject to any V-band NGSO rules that may be adopted to ensure coexistence with future GSO systems and other V-band NGSO networks.

Respectfully submitted,

Christopher J. Murphy
Associate General Counsel, Regulatory Affairs
Daryl T. Hunter
Senior Director, Regulatory Affairs
VIASAT, INC.
6155 El Camino Real
Carlsbad, CA 92009

/s/
John P. Janka
Elizabeth R. Park
Jarrett S. Taubman
LATHAM & WATKINS LLP
555 Eleventh Street, N.W.
Suite 1000
Washington, DC 20004

Counsel for ViaSat, Inc.

August 1, 2017

TECHNICAL EXHIBIT

The VIASAT-NGSO network will protect GSO network operations in the V-band frequencies in which it will operate.

Currently there are neither Commission rules for sharing between V-band NGSO and GSO networks, nor are there any ITU EPFD limits for the V-band. ViaSat notes ITU Resolution 159 (WRC-15) and encourages the development of appropriate EPFD limits for the V-band within the ITU forum. ViaSat also encourages the Commission to adopt appropriate sharing rules for NGSO and GSO networks in the V-band. One possible mechanism for facilitating such sharing is through the EPFD limits which are currently being studied at the ITU.

The design of the VIASAT-NGSO network allows it to operate within any reasonable V-band EPFD limits that might apply in the future. Further, ViaSat will meet any adopted aggregate V-band EPFD limits through coordination with other V-band NGSO operators and through compliance with any applicable rules the Commission may adopt.

The VIASAT-NGSO network adjusts its uplink and downlink EIRP levels depending on the network's geometry relative to the GSO arc. This applies to both Ka-band and V-band operations.

With respect to the need to protect GSO networks, the VIASAT-NGSO network can operate essentially unconstrained when its NGSO satellites are at higher latitudes (*e.g.*, 45° latitude) because of the large separation angles with the GSO arc. Therefore, this analysis examines a scenario in which the NGSO satellite is located close to the GSO arc. As an individual VIASAT-NGSO satellite approaches the equatorial plane, the geometry is such that there may be a need to reduce the network's uplink and downlink EIRP levels, as reduced separation angles increase the off-axis gain in the direction of the GSO satellites, or to earth stations receiving from a GSO satellite; the closer the satellite is to the equatorial plane, the greater the reduction in transmit power levels. A review of the Ka-band EPFD masks provided to the Commission for the VIASAT-NGSO network demonstrates this fact. The identical approach can be taken by the VIASAT-NGSO network for its V-band operations. That is, V-band uplink and downlink transmit power levels would be adjusted depending on the geometry with respect to the GSO arc.

For purposes of illustrating the calculation for a GSO-NGSO compatibility demonstration, ViaSat uses as an example a separation angle of 3° between the NGSO satellite and the GSO arc. When the geometry is such that the angular separation is 3° or less, the VIASAT-NGSO network does not transmit; this applies in both uplink and downlink directions. In general, when the minimum angular separation is not met, the VIASAT-NGSO earth station switches to a different VIASAT-NGSO satellite, thereby increasing the separation angle relative to the GSO arc.

Table 1 below shows a representative situation where the angular separation with the GSO arc is slightly greater than the minimum angle of 3°. The table calculates interference into a GSO network in terms of $\Delta T/T$. The calculated $\Delta T/T$ values on both the uplink and downlink are small, indicating the technical compatibility of the VIASAT-NGSO network with GSO networks. Note that the GSO uplink receive gain of 61 dBi and the receive beam's noise temperature of 1660 K used in Table 1 are derived from Hughes Networks Systems, LLC's recent GSO V-band Commission application.²⁰

While Table 1 demonstrates that the VIASAT-NGSO network can operate compatibility in the V-band with GSO networks, ViaSat reiterates the need for the Commission to adopt appropriate GSO-NGSO sharing rules for the V band.

²⁰ See File No. SAT-LOA-20170621-00092.

Table 1. Representative interference scenario between the VIASAT-NGSO network and a GSO network.

Victim network		GSO Network
Interfering network		VIASAT-NGSO
Uplink:		
Frequency band	GHz	48.2
Interfering uplink input power density	dBW/Hz	-76
Angular separation	degrees	3.01
Slant range (Interfering path)	km	36391
Free space path loss (Interfering path)	dB	217.3
Atmospheric losses	dB	1.3
Victim satellite receive antenna gain	dB _i	61
Victim satellite Rx system noise temperature	K	1660
No	dBW/Hz	-196.4
I _o	dBW/Hz	-216.6
I _o /No	dB	-20.2
ΔT/T	%	0.958
Downlink:		
Frequency band	GHz	41
Interfering satellite downlink EIRP density	dBW/Hz	-26
Slant range (Interfering path)	dB	36391
Free space path loss (Interfering path)	dB	215.9
Atmospheric losses	dB	0.5
Angular separation	degrees	3.01
Victim Rx earth station system noise temperature	K	225
No	dBW/Hz	-205.1
I _o	dBW/Hz	-225.4
I _o /No	dB	-20.3
ΔT/T	%	0.933

DECLARATION

I hereby declare that I am the technically qualified person responsible for preparation of the engineering information contained in the foregoing Consolidated Response of ViaSat, Inc., that I am familiar with Part 25 of the Commission's rules, that I have either prepared or reviewed the engineering information submitted with this pleading, and that it is complete and accurate to the best of my knowledge, information and belief.



Daryl T. Hunter

Daryl T. Hunter, P.E.
Senior Director, Regulatory Affairs
ViaSat, Inc.
6155 El Camino Real
Carlsbad, CA 92009

August 1, 2017

CERTIFICATE OF SERVICE

I, Kayla Ernst, hereby certify that on this 1st day of August, 2017, I served true and correct copies of the foregoing Consolidated Response of ViaSat, Inc. via first-class mail upon the following:

Elizabeth Neasmith
David Wendling
TELESAT CANADA
1601 Telesat Court
Ottawa, Ontario
Canada, K1B 5P4

Gerald E. Oberst
SES S.A.
1129 20th Street, N.W., Suite 1000
Washington, D.C. 20036

Suzanne H. Malloy
O3B LIMITED
900 17th Street, N.W., Suite 300
Washington, DC 20006

Karis A. Hastings
SATCOM LAW LLC
1317 F Street, N.W., Suite 400
Washington, D.C. 20004
Counsel to SES S.A. and O3b Limited

Tim Hughes
Patricia Cooper
SPACE EXPLORATION TECHNOLOGIES
CORP.
1030 15th Street, N.W., Suite 220E
Washington, D.C. 20005

William M. Wiltshire
Paul Caritj
HARRIS, WILTSHIRE & GRANNIS LLP
1919 M Street, N.W., Suite 800
Washington, D.C. 20036
Counsel to Space Exploration Technologies Corp.

Jennifer A. Manner
Brennan Price
HUGHES NETWORK SYSTEMS, LLC
11717 Exploration Lane
Germantown, MD 20876

_____/s/_____
Kayla Ernst