EXHIBIT A

LETTER OF INTENT

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of ViaSat, Inc. Letter of Intent for Authority to Access the U.S. Market Using a Non-U.S. Licensed Ka-Band Geostationary Satellite at the Nominal 109º W.L. Orbital Location	))))))	File No. ________________

LETTER OF INTENT

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LETTER OF INTENT

ViaSat, Inc. ("ViaSat"), pursuant to Section 25.137 of the Commission's rules[1] and the Commission's *Space Station Licensing Reform Order*,[2] hereby files this Letter of Intent seeking to use a geostationary ("GSO") satellite under authority of the government of the United Kingdom (the "VIASAT-109W" satellite) to access the United States market using portions of the Ka band at the nominal 109° W.L. orbital location. Specifically, ViaSat seeks to serve CONUS, Hawaii, Alaska, Puerto Rico and the U.S. Virgin Islands. ViaSat provides in this Letter of Intent information required by 47 C.F.R. § 25.137 for applicants seeking U.S. market access from non-U.S.-licensed spacecraft. Technical information relating to the proposed spacecraft is provided on Schedule S and in narrative form in the associated Attachment A, Technical Information to Supplement Schedule S (the "Technical Annex").

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1 47 C.F.R. § 25.137.

2 *See Amendment of the Commission's Space Station Licensing Rules and Policies*, 18 FCC Rcd 10760, at ¶ 294 (2003) ("*Space Station Licensing Reform Order*").

I. GRANT OF VIASAT'S LETTER OF INTENT WILL SERVE THE PUBLIC INTEREST

ViaSat has previously demonstrated its qualifications as a Commission licensee of spacecraft and earth station networks. ViaSat has a long history and extensive expertise in providing and developing satellite communications technologies for both military and commercial uses, as well as innovating by improving the performance and bandwidth efficiency of satellite networks while reducing their costs. In addition, ViaSat is currently a leading provider of satellite-based broadband services to consumer, enterprise, and government users. ViaSat's broadband satellite network provides service throughout the United States.

Grant of this Letter of Intent will serve the public interest in several important respects. ViaSat seeks to expand the capacity of its broadband communications network in the United States using Ka-band spectrum resources at an additional orbital location. The launch of ViaSat-1 in 2011 has enabled ViaSat to deliver fast and reliable satellite broadband service to residential and business consumers, and also to provide a competitive alternative to less robust and less efficient broadband technologies. More specifically, ViaSat's new Exede® service has revolutionized the broadband industry by offering speeds of up to 25/3 Mbit/s, and is winning customers from terrestrial competitors.

The deployment of this additional spacecraft would further the Commission's goals of enhancing competition and promoting the growth and development of cost-effective broadband services throughout the United States. The spacecraft will expand the capacity of the ViaSat network that provides Exede® service, and thus facilitate the continued growth and development of competitive broadband services.

A. Services to be Supported

The spacecraft is intended to provide a wide array of communications services to meet the needs of individual and commercial users in the United States. Specifically, the spacecraft will help satisfy the continuing demand for high-speed, high-capacity broadband access. ViaSat's deployment of this additional broadband satellite would allow ViaSat to increase the overall capacity of its satellite broadband network, thereby supporting the expected increase in broadband usage by end-users, the demand for faster broadband speeds, and the ability to support additional broadband subscribers. All of the capacity on the satellite will be provided on non-common carrier basis.[3]

ViaSat has demonstrated its commitment to developing technologies that make the most efficient use of spectrum, responding to customers' expanding needs for greater broadband bandwidth and capacity. This satellite system will play a vital role in providing affordable high-data rate communications services and will efficiently employ underutilized Ka-band spectrum in doing so. As an innovative leader in the provision of broadband communications, ViaSat intends to continue to advance satellite technology and design to satisfy the ever-growing demand for those services.

II. *DISCO II* SHOWING – SECTION 25.137(A)

On behalf of ViaSat's wholly-owned subsidiary, ViaSat Satellite Holdings Ltd., the United Kingdom's Office of Communications ("Ofcom") has made International Telecommunication Union ("ITU") filings for a Ka-band satellite at the nominal 109º W.L.

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[3] *See Amendment to the Commission's Regulatory Policies Governing Domestic Fixed Satellites and Separate International Satellite Systems*, 11 FCC Rcd 2429, at ¶¶ 46-50 (1996) (no longer a need to require domestic satellite licenses to provide capacity on a common carrier basis) ("*DISCO I*").

orbital location.[4] Because this spacecraft will operate under the authority of the government of the United Kingdom, the Commission's *DISCO II* framework applies to this Letter of Intent.[5] The *DISCO II* analysis includes consideration of a number of factors, such as the effect on competition in the United States, spectrum availability, eligibility requirements, technical requirements, national security, law enforcement, foreign policy and trade concerns.[6] Each of these factors weighs in favor of granting this Letter of Intent.

A. Effect on Competition in the United States

In *DISCO II*, the Commission established a rebuttable presumption that it will further competition in the United States to allow non-U.S. satellites authorized by WTO Members to provide services covered by the U.S. commitments under the WTO Basic Telecommunications Agreement.[7] The United Kingdom is a member of the WTO. Furthermore, ViaSat seeks to use the requested spectrum to provide satellite services that are covered by the WTO Basic Telecommunications Agreement.[8] Accordingly, the presumption in favor of entry applies to this Letter of Intent.

Grant of this Letter of Intent will enhance competition in the United States for satellite service by permitting ViaSat to expand the available capacity of its satellite broadband

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4 ViaSat will provide a confirmation letter regarding these ITU filings relating to the proposed operations at the nominal 109º W.L. location, as appropriate.

5 *See Amendment of the Commission's Regulatory Policies to Allow Non- U.S. Licensed Satellites Providing Domestic and International Service in the United States*, 12 FCC Rcd 24094, at ¶¶ 30-49 (1997) ("*DISCO II*").

6 *See, e.g.*, *Telesat Canada, Petition for Declaratory Ruling for Inclusion of Anik F2 on the Permitted Space Station List, Petition for Declaratory Ruling to Serve the U.S. Market Using Ka-band Capacity on Anik F2*, 17 FCC Rcd 25287, at ¶ 6 (2002).

7 *DISCO II* at ¶ 39; *see also* 47 C.F.R. § 25.137(a)(2).

8 ViaSat does not seek to provide direct-to-home ("DTH"), direct broadcast satellite ("DBS"), or digital audio radio service ("DARS") in the United States.

network. Grant of this Letter of Intent thus would improve service quality, increase broadband service options, and foster technological innovation. The Commission consistently has relied on these same public interest benefits in granting similar requests.[9]

B. Spectrum Availability

This Letter of Intent proposes market access using the 18.3-19.3 GHz, 19.7-20.2 GHz, 28.1-29.1 GHz and 29.5-30.0 GHz segments of the Ka band.[10] Specifically, ViaSat seeks market access using spectrum (i) on a primary basis in the 18.3-18.8 GHz (downlink), 19.7-20.2 GHz (downlink), 28.35-28.6 GHz (uplink), and 29.5-30.0 GHz (uplink) bands; (ii) on a secondary basis in the 28.1-28.35 GHz (uplink) and 28.6-29.1 GHz (uplink) bands; and (iii) on a non-conforming basis in the 18.8-19.3 GHz (downlink) band. ViaSat requests a waiver of the U.S. Table of Frequency Allocations in Section 2.106 of the Commission's rules in connection

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9 *See, e.g.*, *Digital Broadband Applications Corp.*, 18 FCC Rcd 9455 (2003); *Pegasus Development Corp.*, 19 FCC Rcd 6080 (2004); *DIRECTV Enterprises, LLC, Request for Special Temporary Authority for the DIRECTV 5 Satellite*, 19 FCC Rcd 15529 (2004).

10 TT&C will be provided from facilities outside of the United States within portions of the conventional Ku band. The spacecraft also will be capable of operating across the 17.7-21.2 GHz (space-to-Earth) and the 27.5-31.0 GHz frequency bands (Earth-to-space). Technical information is being provided in this application only for the frequency bands for which authority is being sought to serve the United States: the 18.3-19.3 GHz, 19.7-20.2 GHz, 28.1-29.1 GHz and 29.5-30.0 GHz band segments. *See, e.g.,* Telesat Canada, IBFS File No. SAT-PPL-200605016-00061, at 1 n.2 (filed May 16, 2006; granted Jan. 18, 2007) (disclosing the existence of Ka-band payload on Anik F3 but not seeking market access using the Ka-band payload and providing only technical information regarding the C- and Ku-band operations); *see also Establishment of Policies and Service Rules for the Mobile Satellite Service in the 2 GHz Band*, Report and Order, 15 FCC Rcd 16127 ¶ 86 (2000) (clarifying that market access application requirements apply only to relevant system capabilities for communications to or from the United States, and not to system capabilities for communications wholly outside of the United States). ViaSat will coordinate its operations both within and outside the United States with the existing and planned operations of other operators, as appropriate.

with the proposed operations in the 18.8-19.3 GHz band, which is designated for non-geostationary ("NGSO") fixed satellite service ("FSS") operations.[11]

ViaSat's request for market access using these frequencies at the nominal 109º W.L. does not conflict with any previously granted Commission license regarding a satellite network in these bands. Furthermore, no other GSO spacecraft is authorized by the Commission to operate within two degrees of the proposed orbital location on the frequencies identified above for which market access is sought. Nor do ViaSat's proposed operations conflict with the NGSO operations of O3b Limited ("O3b") authorized by the Commission in the 18.8-19.3 GHz and 28.6-29.1 GHz bands.[12] As discussed below and in the Technical Annex, ViaSat's proposed operations in the United States are compatible with O3b's operations. Moreover, O3b's NGSO operations are secondary to GSO operations in the United States in the GSO primary bands.

For these reasons, this Letter of Intent is fully consistent with the policies articulated in the *Space Station Licensing Reform Order* regarding processing of applications for GSO-like spacecraft.[13] As detailed in the following sections, this request also is consistent with Commission spectrum policies.

1. Primary GSO FSS Allocations

In the 18.3-18.8 GHz (downlink), 19.7-20.2 GHz (downlink), 28.35-28.6 GHz (uplink), and 29.5-30.0 GHz (uplink) band segments designated for the GSO FSS on a primary

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[11] 47 C.F.R. § 2.106.

[12] *See* IBFS File Nos. SES-LIC-20100723-00952 (granted Sept. 25, 2012); SES-LIC-20130124-00089 (granted June 20, 2013); SES-LIC-20130528-00455 (granted May 13, 2014); SES-LIC-20130618-00516 (granted June 24, 2015); SES-LIC-20141001-00781 (granted June 8, 2015); SES-LIC-20141022-00809 (granted June 5, 2015); SES-LIC-20150310-00138 (granted Sept. 30, 2015); SAT-LOI-20141029-00118 (granted Jan. 22, 2015), each as amended and/or modified.

[13] *See Space Station Licensing Reform Order*, at ¶ 113.

basis, the spacecraft will comply with the uplink off-axis EIRP density and downlink PFD levels specified in Section 25.138 of the Commission's rules. Therefore, the use of these frequencies will be compatible with adjacent satellite systems.

2. Secondary GSO FSS Allocations

(i) 28.6-29.1 GHz

The 28.6-29.1 GHz band is designated in the Commission's Ka-band band plan for the NGSO FSS on a primary basis and GSO FSS on a secondary basis. As demonstrated by the Technical Annex, ViaSat's proposed operations in the service area for which market access is requested are compatible with NGSO use of this band segment, including the NGSO system operated by O3b.[14] ViaSat will operate in this band segment in the United States consistent with its obligations of a secondary user of spectrum to avoid harmful interference into, and to accept any interference received from, primary users. Accordingly, ViaSat's use of spectrum at 28.6-29.1 GHz is consistent with the Commission's intended use of the secondary allocation for FSS in this band and with Commission precedent regarding use of these frequencies by GSO FSS systems.[15]

(ii) 28.1-28.35 GHz

The 28.1-28.35 GHz band is designated domestically for LMDS operations on a primary basis and FSS operations on a secondary basis. ViaSat intends to use spectrum in the 28.1-28.35 GHz band is consistent with the Commission's intended use of the secondary

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14 *See, e.g.*, IBFS File No. SES-LIC-20100723-00952 (granted Sept. 25, 2012); SAT-LOI-20141029-00118 (granted Jan. 22, 2015).

15 *See, e.g.*, *Hughes Network Systems, LLC*, 26 FCC Rcd 8521, 8524-25 (2011) (authorizing GSO use of Ka-band NGSO spectrum); *Northrop Grumman Space & Mission Systems Corporation*, 24 FCC Rcd 2330, 2357-60 (2006) (same); *see also* ViaSat, Inc., IBFS File Nos. SAT-LOI-20080107-00006; SAT-AMD-20090213-00023, Call Sign S2747 (granted Aug. 18, 2009).

designation for FSS in this band.[16] The earth stations operating on a secondary basis will employ interference mitigation techniques, such as shielding, to avoid interference into terrestrial operations that are primary in this band.[17] Future applications for those earth stations will include a technical compatibility analysis regarding those terrestrial users.[18] The Commission has previously authorized secondary FSS operations in this band, recognizing that such operations successfully may coexist with LMDS operations.[19] ViaSat's proposed operations in the service area for which market access is requested are consistent with the obligations of a secondary user of spectrum to avoid harmful interference into, and to accept any interference received from, primary users.[20]

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16 *See Rulemaking to Amend Parts 1, 2, 21, and 25 of the Commission's Rules To Redesignate the 27.5-29.5 GHz Frequency Band, To Reallocate the 29.5-30.0 GHz Frequency Band, To Establish Rules and Policies for Local Multipoint Distribution Service and for Fixed Satellite Services*, 11 FCC Rcd 19005 (1996).

17 ViaSat acknowledges the pendency of the Spectrum Frontiers Notice of Proposed Rulemaking, which proposes to make this band segment available for terrestrial mobile services. *See Use of Spectrum Bands Above 24 GHz for Mobile Radio Services*, GN Docket No. 14-177, Notice of Proposed Rulemaking, FCC 15-138 (rel. Oct. 23, 2015).

18 *See Teledesic LLC*, 14 FCC Rcd 2261, at ¶ 19 (1999) (recognizing that in granting space station authority in the LMDS band, issues regarding how earth stations would successfully operate on a secondary, non-interference basis should be resolved as part of future earth station applications).

19 *See, e.g.*, Amended Letter of Intent of ViaSat, Inc., IBFS File No. SAT-AMD-20080623-00131 (granted Aug. 18, 2009); *see also* ViaSat Earth Station IBFS File No. SES-LIC-20110211-00150, as amended, Call Sign E110015 (granted Oct. 21, 2011).

20 O3b is authorized to operate earth stations in Virginia, Hawaii and Texas on a secondary basis in the 28.1-28.35 GHz band segment. *See* IBFS File Nos. SES-LIC-20100723-00952 (granted Sept. 25, 2012); SES-LIC-20130124-00089 (granted June 20, 2013); SES-LIC-20141022-00809 (granted June 5, 2015); SES-LIC-20130618-00516 (granted June 24, 2015); SES-LIC-20150310-00138 (granted Sept. 30, 2015). As explained in the Technical Annex, ViaSat's proposed operations in the 28.1-28.35 GHz band in the United States are compatible with NGSO use of this band segment.

3. Waiver Request for Non-Conforming Spectrum Use

In the United States, the 18.8-19.3 GHz band currently is designated for NGSO downlink operations, without a current secondary allocation for GSO FSS downlinks.[21] ViaSat therefore requests a waiver of Section 2.106 of the Commission's rules, and specifically footnote NG165 thereto, to permit ViaSat to operate its downlinks in this band segment on a non-conforming basis. As demonstrated by the Technical Annex, ViaSat's proposed operations in the United States are compatible with NGSO use of this band segment, including the NGSO system operated by O3b.[22] ViaSat will operate in this band segment in the United States consistent with the obligations of a non-conforming user of spectrum to avoid harmful interference into, and to accept any interference received from, both primary and secondary users.

The Commission has granted similar waivers in the past for GSO FSS operations in this frequency band.[23] Ample good cause continues to exist for granting such a waiver.[24] As noted above, ViaSat seeks to use the spacecraft to supplement the capacity of its existing satellite

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21 47 C.F.R. § 2.106, n.NG165. This band segment is allocated under the International Table of Frequency Allocations to the FSS generally, enabling GSO FSS and NGSO FSS on a co-primary basis.

22 *See* IBFS File Nos. SES-LIC-20100723-00952 (granted Sept. 25, 2012); SES-LIC-20130124-00089 (granted June 20, 2013); SES-LIC-20130528-00455 (granted May 13, 2014); SES-LIC-20130618-00516 (granted June 24, 2015); SES-LIC-20141001-00781 (granted June 8, 2015); SES-LIC-20141022-00809 (granted June 5, 2015); SES-LIC-20150310-00138 (granted Sept. 30, 2015); SAT-LOI-20141029-00118 (granted Jan. 22, 2015), each as amended and/or modified.

23 *See* n.20, *supra*.

24 47 C.F.R. § 1.3. *See also WAIT Radio v. FCC*, 418 F.2d 1153, 1157 (D.C. Cir. 1969) (waiver is appropriate when grant "would better serve the public interest than strict adherence to the general rule"); *Fugro-Chance, Inc.*, 10 FCC Rcd 2860, at ¶ 2 (1995) (waiver of the U.S. Table of Allocations is appropriate "when there is little potential for interference into any service authorized under the Table of Frequency Allocations and when the non-conforming operator accepts any interference from authorized services").

broadband network. Grant of this waiver thus would allow ViaSat to increase the overall capacity of its satellite broadband network, thereby supporting the expected increase in broadband usage by end-users, the demand for faster broadband speeds, and the ability to support additional broadband subscribers, and thereby facilitating competition as well.[25] Moreover, grant of the requested waiver would stimulate the use of spectrum that currently is underutilized.

C. National Security, Law Enforcement, and Public Safety Matters

Grant of this Letter of Intent is consistent with U.S. national security, law enforcement, and public safety considerations. The satellite's authorization from the United Kingdom will be held by ViaSat Satellite Holdings Ltd., a direct, wholly owned subsidiary of ViaSat. ViaSat has a long history of providing satellite communication service to U.S. government and military users.

III. LEGAL AND TECHNICAL INFORMATION – SECTION 25.137(B)

A. Legal Qualifications

ViaSat's legal qualifications are set forth in this Letter of Intent and in the attached Form 312. Specifically, the Letter of Intent and attached Form 312 demonstrate ViaSat's satisfaction of the applicable requirements for space station applicants set forth in Section 25.114 of the Commission's rules.[26] As noted above, ViaSat holds several Commission licenses, and its legal qualifications are a matter of record before the Commission.

B. Technical Qualifications

The attached Form 312, Schedule S, and Technical Annex (including an orbital debris mitigation showing) include the required Part 25 technical information. As discussed in further detail in the Technical Annex, in order to reduce the risk of in-orbit collisions with other

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25 *See* Section I.A, *supra*.

26 *See* 47 C.F.R. § 25.114.

satellites located at the same nominal location, ViaSat proposes to operate at an offset location to eliminate any station-keeping volume overlap with other satellites. No ground spare is currently planned.

C. Orbital Debris Mitigation

Section A.12.2 of the accompanying Technical Annex describes ViaSat's plan for minimizing accidental explosions, as part of ViaSat's strategy for mitigating orbital debris. Section 25.137 of the Commission's rules requires market access applicants to provide an orbital debris mitigation showing.[27] In the case of applications seeking U.S. market access via non-U.S.-licensed space stations, the Commission has concluded that the orbital debris requirement can be satisfied by showing that the satellite system's debris mitigation plans are subject to direct and effective regulatory oversight by the satellite system's national licensing authority.[28] The Commission has determined that this requirement may be satisfied by referencing an English language version of the debris mitigation rules or regulations of the national licensing authority and indicating the current status of the national licensing authority's review of its debris mitigation plans.[29]

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[27] *See id.* §§ 25.114(d)(14), 25.137(b).

[28] *Mitigation of Orbital Debris*, Second Report and Order, 19 FCC Rcd 11567 ¶¶ 94, 95 (2004) ("*Orbital Debris Second Report and Order*").

[29] *Id.* at ¶ 95; *Globalstar Licensee LLC, GUSA Licensee LLC, GCL Licensee LLC*, Order, DA 11-520 ¶¶ 30-32 (rel. Mar. 18, 2011) (concluding that French Space Operations law and technical regulations provide for direct and effective regulation of debris mitigation measures by France, resulting in a finding that Globalstar provided adequate orbital debris mitigation showing); O3b Limited, IBFS File No. SES-LIC-20100723-00952, Call Sign E100088, Condition 90045 (granted Sept. 25, 2012) (determining that O3b's request for a waiver of Section 25.283(c) for unvented pressure vessels was unnecessary, finding that O3b is subject to direct and effective regulation by the United Kingdom concerning orbital debris mitigation) ("*O3b Grant*"*); see also* ViaSat, Inc., IBFS File No. SAT-MOD-20141105-00121, Condition 4 (granted Apr. 15, 2015) ("*ViaSat-2 Modification Grant*").

The VIASAT-109W satellite will be operated under the authority of the United Kingdom, and will be subject to the United Kingdom Outer Space Act 1986 ("Outer Space Act"). The Outer Space Act ensures compliance with the U.K.'s obligations under international treaties and principles covering the use of outer space and specifies that the U.K. licensing authority has the power to require licensees to conduct operations in such a manner as to "prevent the contamination of outer space," to "avoid any breach of the United Kingdom's international obligations," and to impose conditions "governing the disposal of the payload in outer space on the termination of operations under the license."[30] In addition, the UK Space Agency, the U.K. agency charged with licensing activities in outer space, including the launch and operation of space objects, has issued published guidance on the Outer Space Act requirements, which requires applications for a space activities license to provide information regarding the plans for disposal of the space object at the end of life, including whether the propellant and pressurant tanks are vented.[31] The UK Space Agency evaluates such applications pursuant to published standards, including the IADC Space Debris Mitigations Guidelines. ViaSat's future application to the UK Space Agency will describe the end-of-life plan for VIASAT-109W. ViaSat submits that the foregoing demonstration of the U.K.'s authority over VIASAT-109W provides direct and effective regulatory oversight regulation of the space activities of VIASAT-109W, and thus satisfies the requirements of Section 25.114(d)(14) and Section 25.283(c).[32]

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30 Outer Space Act 1986, 1986 Ch. 38, § 5(2)(e) (1986) (U.K.).

31 *See* Revised Guidance for Applicants, Outer Space Act 1986, Annex A, Section 1.3 available at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/320158/Guidance_for_applicants_-_June_2014.pdf.

32 *See O3b Grant; ViaSat-2 Modification Grant.* Out of an abundance of caution, and to the extent necessary, ViaSat respectfully seeks a waiver of this one aspect of Section 25.283(c) as it applies to any residual xenon on VIASAT-109W, given the direct and

IV. ADDITIONAL REQUIREMENTS – SECTION 25.137(D)

A. Milestones and Bond Requirement

ViaSat plans to implement the spacecraft in compliance with the Commission's milestone and surety bond requirements in accordance with the requirements established in the Commission's recent order reforming certain satellite licensing rules.[33]

B. Reporting Requirements

ViaSat will comply with all applicable reporting requirements for the spacecraft.

C. Spectrum Usage

ViaSat currently has authorizations for unbuilt Ka-band satellites at two other orbital locations,[34] and pending market access applications for two additional spacecraft. ViaSat has no other pending or granted spectrum reservation requests involving unbuilt spacecraft to which the limits of Section 25.137(d)(5) of the Commission's rules would apply. Moreover, this limit has been eliminated in the recently adopted *Part 25 Reform Second Report and Order.*[35]

D. Ownership Information

ViaSat is a Delaware corporation and a publicly traded company headquartered at 6155 El Camino Real, Carlsbad, California 92009. As a publicly traded company, the stock of ViaSat is widely held. Based on publicly available SEC filings, the following entity and its affiliates beneficially owned 10 percent or more of ViaSat's voting stock as of December 31, 2015:

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effective oversight of the U.K. and given that the very low pressure in the xenon tank at the satellite's end-of-life and its enclosure in the spacecraft body makes the potential for release of orbital debris extremely unlikely.

33 *See Comprehensive Review of Licensing and Operating Rules for Satellite Services*, IB Docket No. 12-267, Second Report and Order, FCC 15-167 (rel. Dec. 17, 2015) ("*Part 25 Reform Second Report and Order*").

34 See ViaSat, Inc. IBFS File Nos. SAT-LOI-20130319-00040, Call Sign S2902 (granted Dec. 12, 2013), as modified; SAT-LOI-20140204-00013, Call Sign S2917 (granted June 18, 2014), as amended and modified.

35 *Part 25 Second Report and Order* ¶ 337.

Beneficial Owner	Citizenship	Voting Percentage
The Baupost Group, L.L.C. 10 St. James Avenue Suite 1700 Boston, MA 02116	Massachusetts	23.64%
FPR Partners LLC 199 Fremont Street Suite 2500 San Francisco, CA 94105	Delaware	10.8%

No other stockholders are known by ViaSat to hold 10 percent or more of ViaSat's voting stock.

The following are the officers and directors of ViaSat, all of whom can be reached c/o ViaSat, Inc., 6155 El Camino Real, Carlsbad, CA 92009.

<u>Directors</u>

Mark D. Dankberg, Chairman, CEO
Frank J. Biondi Jr.
Robert Bowman
Dr. Robert W. Johnson
B. Allen Lay
Dr. Jeffrey M. Nash
John P. Stenbit
Harvey P. White

<u>Officers/Senior Management</u>

Mark D. Dankberg, Chairman, CEO
Richard A. Baldridge, President, COO
Bruce Dirks, Senior VP, Treasury & Corporate Development
Shawn Duffy, Senior VP, CFO, CAO
Kevin Harkenrider, Senior VP – Broadband Services
H. Stephen Estes, Senior VP – Enterprise Services
Steven R. Hart, Executive VP – Engineering, Chief Technical Officer
Keven K. Lippert, Executive VP, General Counsel, Secretary
Mark J. Miller, Executive VP, Chief Technical Officer
Ken Peterman, Senior VP – Government Systems
John Zlogar, VP – Commercial Networks

V. REQUEST FOR WAIVERS

In addition to the waiver of the U.S. Table of Frequency Allocations and of Section 25.283(c) discussed above, ViaSat requests a limited waiver of Section 25.114(c) of the Commission's rules, which requires certain information to be filed in the Schedule S. VIASAT-109W employs a large number of identical spot beams for two beam types that will be used for communications links. For these two beam types ViaSat is providing the predicted antenna gain contours for one transmit and one receive representative spot beam for each of the two beam types. In addition, ViaSat is providing isoline gain contours, in both uplink and downlink directions, that depict, on a composite basis across the entire coverage area, the maximum gain of all spot beams that may be operated within that area.[36] Similarly, because these antenna beam types are replicated multiple times to form the coverage area of the satellites, ViaSat is providing antenna beam characteristics for these representative beams in lieu of replicating the beam information for each beam. To the extent necessary, ViaSat seeks a waiver of Section 25.114(c)(4) of the Commission's rules and the Schedule S requirements to depict the antenna gain contours and beam characteristics in this manner.[37] The representative beam information in Table S7 of the Schedule S reflects the maximum EIRP for all identical transmit beams, and the maximum G/T and minimum saturation flux density for all identical receive beams. This information regarding the representative beams, taken with the composite isoline diagram identifying the maximum possible gain across the coverage area, provides the Commission with

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[36] 47 C.F.R. § 25.114(c)(4)(vii) (option (iii) for geostationary satellites with large numbers of identical fixed spot beams).

[37] The Commission has granted such a waiver in connection with the ViaSat-2 satellite. *See ViaSat-2 Modification Grant*, Condition 2.

all data required to assess compatibility with adjacent spacecraft, while reducing the type of filing burdens on applicants that the Commission sought in amending the satellite application requirement in the *2013 Part 25 Reform Order*.[38]

ViaSat also requests a technical waiver of the cross-polarization isolation requirement in Section 25.210(i) of the Commission's rules. More specific information supporting this waiver request is contained in the Technical Annex at Section A.13.

VI. WAIVER PURSUANT TO SECTION 304 OF THE COMMUNICATIONS ACT

In accordance with Section 304 of the Communications Act of 1934, as amended, ViaSat hereby waives any claim to the use of any particular frequency or of the electromagnetic spectrum as against the regulatory power of the United States because of the previous use of the same, whether by license or otherwise.

[38] *Comprehensive Review of Licensing and Operating Rules for Satellite Services*, Report and Order, 28 FCC Rcd 12403 (2013).

VII. CONCLUSION

For the foregoing reasons, granting ViaSat's Letter of Intent seeking to access the United States using the proposed Ka-band satellite under the authority of the United Kingdom will serve the public interest, convenience, and necessity. ViaSat respectfully requests that the Commission promptly grant this Letter of Intent.

Respectfully submitted,

/s/

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ATTACHMENT A

Technical Information to Supplement Schedule S

A.1 SCOPE AND PURPOSE

The purpose of this Attachment is to provide the Commission with the technical characteristics of the VIASAT-109W satellite for which market access is being sought. This attachment contains the information required by 47 C.F.R. §25.114 and other sections of the FCC's Part 25 rules that cannot be entered into the Schedule S submission.

A.2 GENERAL DESCRIPTION

The VIASAT-109W satellite will operate at the 109.1° W.L. orbital location.

ViaSat seeks Commission authority to serve CONUS, Hawaii, Alaska, Puerto Rico and the U.S. Virgin Islands in the 28.1-29.1 GHz and 29.5-30.0 GHz bands (Earth-to-space) and the 18.3-19.3 GHz and 19.7-20.2 GHz bands (space-to-Earth).[1] All analyses in this Attachment apply to this service area. The satellite network will provide service to small, fixed, temporary-fixed, and mobile user antennas. In addition, larger gateway-type antennas will be employed.

TT&C operations will be provided from outside of the United States in the Ku band, and thus are not the subject of this application.

The satellite typically uses asymmetric forward and return links. The network will use adaptive coding and modulation to combat rain fades. That is, the modulation type, amount of coding

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[1] The spacecraft will be capable of operating across the 17.7-21.2 GHz band (space-to-Earth) and the 27.5-31.0 GHz band (Earth-to-space), but authority to serve the United States is being sought only for the 18.3-19.3 GHz, 19.7-20.2 GHz, 28.1-29.1 GHz and 29.5-30.0 GHz band segments. Technical information is being provided in this application only for these bands. The satellite's beam coverage, both transmit and receive, consists of multiple spot beams that collectively are capable of providing service to all parts of the Earth visible from 109.1° W.L, but authority to serve the United States is sought only for the areas specified above.

and/or user data rate will be dynamically varied to meet the link requirements during rain events (in addition to employing uplink power control).

A.3 FREQUENCY AND POLARIZATION PLAN

The relevant frequency plan is given in Table A.3-1, indicating channel center, polarization and bandwidth. The table also shows the connectivity between each uplink and downlink band. Circular polarization is used on both the uplink and downlink with the downlink polarization being orthogonal to the uplink polarization. The satellite re-uses the spectrum such that any channel is re-used multiple times by a combination of polarization and spatial isolation. This satisfies the requirements of §25.210(f) of the FCC's Part 25 rules (the "Rules").

Table A.3-1. Frequency Plan for U.S. Market Access

Uplink Center Frequency (MHz)	Uplink Polarization	Corresponding Downlink Center Frequency (MHz)	Downlink Polarization	Bandwidth (MHz)
28350	RHCP, LHCP	18550	LHCP, RHCP	500
28850	RHCP, LHCP	19050	LHCP, RHCP	500
29750	RHCP, LHCP	19950	LHCP, RHCP	500

As explained in section A.11, the 28.6-29.1 GHz and 18.8-19.3 GHz bands will be used in a manner that adequately protects NGSO operations.

A.4 MAXIMUM DOWNLINK EIRP AND EIRP DENSITY

The maximum operational downlink EIRP of all spot beams is 72.7 dBW. The maximum operational downlink EIRP density varies by sub-band. The maximum operational downlink EIRP density towards U.S. territory in the 18.3-18.8 GHz and 19.7-20.2 GHz bands varies slightly depending on the spreading loss. VIASAT-109W will not exceed a PFD on U.S. territory of -118 dBW/m^2/MHz consistent with §25.138 (a)(6). Because PFD is dependent on the slant path and hence spreading loss, the maximum EIRP density from the satellite can vary accordingly. For example, for a spreading loss of 162.1 dB, VIASAT-109W satellite transmissions would not exceed an EIRP density of 44.1 dBW/MHz.

The maximum operational downlink EIRP density towards the U.S. in the 18.8-19.3 GHz band will not exceed 40.9 dBW/MHz.

A.5 SATELLITE ANTENNA BEAMS AND ANTENNA GAIN CONTOURS

The satellite's antenna gain contours are being provided to the Commission in a GIMS container file.

The satellite's payload employs multiple spot beams in both the uplink and downlink directions. There are two types of spot beams: small beams ("A"-type beams) and larger beams ("B"-type beams). For each beam-type, the beams are nominally identical.

ViaSat is providing the Commission with an isoline gain contour, in both uplink and downlink directions, that depict, on a composite basis across the entire coverage area, the maximum gain of all spot beams that may be operated within that area. In addition, the predicted antenna gain contours for one transmit and receive representative spot beam for each of the two beam types, and in both polarizations, is included in the associated GIMS file.

For clarity, the following beams have been included in the associated GIMS file:

1) RXAR and RXAL. These contain a composite beam contour, in both polarizations, for the uplink A-type beams.
2) TXAR and TXAL. These contain a composite beam contour, in both polarizations, for the downlink A-type beams.
3) RXBR and RXBL. These contain a composite beam contour, in both polarizations, for the uplink B-type beams.
4) TXBR and TXBL. These contain a composite beam contour, in both polarizations, for the downlink B-type beams.
5) DNAT. The downlink beam used in support of the autotrack function.
6) RXAR_REP and RXAL_REP. Representative spot beam contours for the uplink A-type beams, in both polarizations.
7) TXAR_REP and TXAL_REP. Representative spot beam contours for the downlink A-type beams, in both polarizations.
8) RXBR_REP and RXBL_REP. Representative spot beam contours for the uplink B-type beams, in both polarizations.
9) TXBR_REP and TXBL_REP. Representative spot beam contours for the downlink B-type beams, in both polarizations

A.6 TT&C INFORMATION

TT&C for the VIASAT-109W spacecraft will not be conducted from U.S. territory, therefore TT&C information is not being provided to the Commission.

In support of the autotrack function, a downlink continuous wave ("CW") signal and a 7.5 MHz pseudo-noise ("PN") modulated downlink signal will both be transmitted at the same center frequency. The CW and PN carriers can be individually "extracted" on the ground, despite the fact that they may be transmitted on the same center frequency. Although the center frequency has not yet been selected, it is anticipated that the carriers will be transmitted at 18109.16 MHz and in vertical polarization.

A.7 CESSATION OF EMISSIONS

All downlink transmissions can be turned on and off by ground telecommand, thereby causing cessation of emissions from the satellite, as required by § 25.207 of the FCC's rules.

A.8 POWER FLUX DENSITY AT THE EARTH'S SURFACE (18.3-19.3 GHZ BAND)

The maximum PFD emitted over U.S. territory by VIASAT-109W will be compliant with the §25.208(c) PFD limits that apply in the 18.3-18.8 GHz band. The PFD limits of §25.208(c) are as follows:

- -115 dB(W/m^2) in any 1 MHz band for angles of arrival between 0 and 5 degrees above the horizontal plane;
- -115+(δ-5)/2 dB(W/m^2) in any 1 MHz band for angles of arrival δ (in degrees) between 5 and 25 degrees above the horizontal plane; and
- -105 dB(W/m^2) in any 1 MHz band for angles of arrival between 25 and 90 degrees above the horizontal plane.

In addition, §25.208(d) contains PFD limits that apply in the 18.6-18.8 GHz band produced by emissions from a space station under assumed free-space propagation conditions as follows:

- -95 dB(W/m^2) for all angles of arrival. This limit may be exceeded by up to 3 dB for no more than 5% of the time.

In the worst case, the PFD limits of §25.208(d) correspond to a PFD of -118 dBW/m^2/MHz (*i.e.*, -95-10*log(200)).

§25.208 does not contain any PFD limits that apply in the 18.8-19.3 GHz band for GSO satellite networks, however it is noted that Article 21 of the ITU Radio Regulations does include PFD limits applicable to GSO satellites using the 18.8-19.3 GHz band. The ITU limits are identical to those in §25.208(c).

As explained in section A.9, ViaSat will operate the satellite such that downlink transmissions in the 18.3-18.8 GHz band will not exceed a PFD level of -118 dBW/m^2/MHz. This PFD level is in compliance with both §25.208(c) and §25.208(d).

As explained in section A.4, the maximum downlink EIRP density transmitted in the 18.8-19.3 GHz band will be lower than that transmitted in the 18.3-18.8 GHz band, therefore downlink transmissions in the 18.8-19.3 GHz band will also meet the applicable PFD limits.

A.9 TWO DEGREE COMPATIBILITY

This section demonstrates that the VIASAT-109W satellite network's transmissions are two-degree compatible in all portions of the Ka-band for which Commission authority is sought.

All transmissions of the VIASAT-109W satellite network will not exceed the uplink off-axis EIRP density and downlink PFD levels of §25.138, regardless of whether the frequency band used is subject to §25.138. ViaSat will ensure that no authorized uplink transmissions towards the VIASAT-109W satellite will exceed the clear sky uplink off-axis EIRP density limits of §25.138(a)(1). In cases where a transmitting earth station does not meet the off-axis gain mask requirements of §25.209(a) and (b), the maximum input power density into the antenna will be correspondingly reduced such that off-axis EIRP density requirements of §25.138(a)(1) are still met. In addition, ViaSat will ensure that no downlink transmissions from the VIASAT-109W satellite towards U.S. territory will exceed the -118 $dBW/m^2/MHz$ limit set forth in §25.138 (a)(6) of the Rules.

There are two operational Ka-band GSO satellites separated by two degrees from the 109.1º W.L. location. Hughes Network Systems, LLC operates the ECHOSTAR XVII satellite at the 107.1° W.L. location.[2] ViaSat, Inc. operates the WILDBLUE-1 satellite at the 111.1° W.L. location.[3] The following subsections demonstrate two-degree compatibility between the VIASAT-109W satellite network and the two immediately adjacent satellite networks.

A.9.1 Two-Degree Compatibility with the ECHOSTAR XVII Satellite Network

Table A.9-1 provides a summary of the typical transmission parameters used by the VIASAT-109W satellite network. These parameters were derived from the link budgets that are embedded in the Schedule S form and were used in the interference analysis. Table A.9-2 summarizes the transmission parameters of the ECHOSTAR XVII satellite network.

Tables A.9-3 and A.9-4 show the results of the interference calculations in terms of the overall C/I margins and demonstrate two-degree compatibility between the two satellite networks. The interference calculations assumed a 1 dB advantage for topocentric-to-geocentric conversion and that all wanted and interfering carriers are co-polarized. The C/I calculations were performed on a per Hz basis.

Table A.9-1. Typical VIASAT-109W transmission parameters.

Carrier ID	Emission Designator	Bandwidth (MHz)	Tx E/S Gain (dBi)	Uplink EIRP (dBW)	Downlink EIRP (dBW)	Rx E/S Gain (dBi)	C/I Criterion (dB)
1	500MG7D	500	65.0	75.0	67.9	49.3	20.5
2	500MG7D	500	65.0	75.0	67.9	40.7	13.8
3	500MG7D	500	65.0	75.0	67.9	40.7	7.4
4	500MG7D	500	65.0	75.0	67.9	33.7	9.3
5	6M25G7D	6.25	44.3	48.8	48.9	61.4	16.4
6	3M13G7D	3.125	44.3	48.8	45.9	61.4	15.1
7	1M56G7D	1.563	44.3	48.8	42.9	61.4	10.1
8	782KG7D	0.7813	44.3	46.6	39.9	61.4	8.9
9	3M87G7D	3.874	37.3	39.9	46.8	61.4	9.3

2 *See* SAT-LOI-20091110-00119 and SAT-LOA-20120424-00075.

3 *See* SES-MFS-20060811-01347.

Table A.9-2. ECHOSTAR XVII transmission parameters.

Carrier ID	Emission Designator	Bandwidth (MHz)	Tx E/S Gain (dBi)	Uplink EIRP (dBW)	Downlink EIRP (dBW)	Rx E/S Gain (dBi)	C/I Criterion (dB)
1	250MG7W	250	58.9	72.0	64.0	42.1	21.5
2	250MG7W	250	58.9	72.0	64.0	42.1	20.4
3	250MG7W	250	58.9	72.0	64.0	42.1	18.8
4	3M67G7W	3.67	45.6	48.6	43.7	55.3	20.4
5	1M22G7W	1.22	45.6	48.6	38.8	55.3	19.3
6	612KG7W	0.612	45.6	45.6	35.8	55.3	18.7
7	612KG7W	0.612	45.6	45.6	35.8	55.3	11.0

Table A.9-3. Overall C/I margins (dB); ECHOSTAR XVII interfering into VIASAT-109W.

		Interfering Carriers						
	Carrier ID	1	2	3	4	5	6	7
Wanted Carriers	1	8.7	8.7	8.7	7.5	4.1	4.1	4.1
	2	7.3	7.3	7.3	8.6	7.4	7.4	7.4
	3	13.7	13.7	13.7	15.0	13.8	13.8	13.8
	4	4.9	4.9	4.9	6.7	6.5	6.5	6.5
	5	14.4	14.4	14.4	6.5	1.8	1.8	1.8
	6	18.5	18.5	18.5	10.9	6.1	6.1	6.1
	7	25.9	25.9	25.9	18.8	14.1	14.1	14.1
	8	27.7	27.7	27.7	20.8	16.2	16.2	16.2
	9	14.6	14.6	14.6	6.8	2.1	2.1	2.1

Table A.9-4. Overall C/I margins (dB); VIASAT-109W interfering into ECHOSTAR XVII.

		Interfering Carriers								
	Carrier ID	1	2	3	4	5	6	7	8	9
Wanted Carriers	1	-0.8	-0.8	-0.8	-0.8	-1.1	-1.5	-2.1	-2.4	-2.4
	2	0.3	0.3	0.3	0.3	0.0	-0.4	-1.0	-1.3	-1.3
	3	1.9	1.9	1.9	1.9	1.6	1.2	0.6	0.3	0.3
	4	10.9	10.9	10.9	10.9	4.6	2.1	-0.7	-1.5	-1.6
	5	12.3	12.3	12.3	12.3	9.0	7.0	4.7	4.0	3.9
	6	12.9	12.9	12.9	12.9	9.6	7.6	5.3	4.6	4.5
	7	20.6	20.6	20.6	20.6	17.3	15.3	13.0	12.3	12.2

From Table A.9-3, it can be seen that all overall C/I margins are positive. Table A.9-4 shows a few small negative margins, but the results are consistent with a two-degree spacing environment where both satellite networks transmit at, or below, the levels of §25.138.

A.9.2 Two-Degree Compatibility with the WILDBLUE-1 Satellite Network

Table A.9-1 above provides a summary of the typical transmission parameters used by the VIASAT-109W satellite network. Table A.9-5 summarizes the transmission parameters of the WILDBLUE-1 satellite network.

Tables A.9-6 and A.9-7 show the results of the interference calculations in terms of the overall C/I margins and demonstrate two-degree compatibility between the two satellite networks. The tables show that the overall C/I margins are positive in all cases. The interference calculations assumed a 1 dB advantage for topocentric-to-geocentric conversion and that all wanted and interfering carriers are co-polarized. The C/I calculations were performed on a per Hz basis.

Table A.9-5. WILDBLUE-1 transmission parameters.

Carrier ID	Emission Designator	Bandwidth (MHz)	Tx E/S Gain (dBi)	Uplink EIRP (dBW)	Downlink EIRP (dBW)	Rx E/S Gain (dBi)	C/I Criterion (dB)
1	27M0G7W	27.0	65.4	70.0	52.9	39.8	15.1
2	800KG7W	0.8	44.0	43.8	35.8	60.9	18.7
3	400KG7W	0.4	44.0	40.6	34.8	60.9	18.7

Table A.9-6. Overall C/I margins (dB); WILDBLUE-1 interfering into VIASAT-109W.

		Interfering Carriers		
	Carrier ID	1	2	3
Wanted Carriers	1	9.8	5.4	5.1
	2	8.7	8.7	7.3
	3	15.0	15.0	13.7
	4	6.3	7.7	5.8
	5	13.4	3.1	3.3
	6	17.6	7.5	7.7
	7	25.3	15.5	15.6
	8	27.2	17.5	17.7
	9	13.7	3.5	3.7

Table A.9-7. Overall C/I margins (dB); VIASAT-109W interfering into WILDBLUE-1.

		Interfering Carriers								
	Carrier ID	1	2	3	4	5	6	7	8	9
Wanted Carriers	1	1.9	1.9	1.9	1.9	1.9	1.8	1.8	1.8	1.8
	2	16.4	16.4	16.4	16.4	8.5	5.8	2.9	2.1	2.0
	3	17.8	17.8	17.8	17.8	8.6	5.7	2.8	2.0	1.9

A.10 SHARING WITH LMDS AND WITH NGSO FSS IN THE 28.1-28.35 GHZ BAND

In the U.S., the 28.1-28.35 GHz band is designated for LMDS on a primary basis and it is designated for the FSS on a secondary basis. Uplinks from gateway-type earth stations that are located in the United States must be operated in a manner such that they do not cause harmful interference to any current or future licensed LMDS station. Technical compatibility will be accomplished through geographic separation between the gateway-type antennas and the LMDS stations and shielding as necessary. Transmitting LMDS stations cannot cause harmful interference into an earth station since the earth station does not receive transmissions in the 28.1-28.35 GHz band. Harmful interference occurring from the aggregation of transmitting LMDS stations into a receiving spot beam of the VIASAT-109W satellite is considered to be unlikely, however ViaSat undertakes to accept this risk and will not seek protection from such interference in the event it occurs.

Applications for earth station antennas communicating with the VIASAT-109W satellite and using the 28.1-28.35 GHz band within the U.S. will include an appropriate demonstration that the proposed operations will not cause harmful interference into any licensed LMDS station. The earth station licensee will take appropriate actions to protect any future licensed LMDS station from harmful interference, including ceasing transmissions in the 28.1-28.35 GHz band if necessary.

O3b Limited ("O3b") has received licenses from the Commission for fixed earth stations located in Hawaii, Texas and Virginia to communicate with O3b's constellation of NGSO satellites using the 28.1-28.35 GHz band on a secondary basis.[4] The analysis in the following section, which demonstrates the compatibility of VIASAT-109W operations in the United States with those O3b earth stations located in the U.S. operating in the 28.6-29.1 GHz and 18.8-19.3 GHz bands, is equally applicable to operations in the 28.1-28.35 GHz band. Currently no other operational NGSO systems are authorized by the Commission to use the 28.1-28.35 GHz band, nor are there any other pending applications before the Commission for use of the 28.1-28.35 GHz band by a NGSO system.

A.11 SHARING WITH NGSO FSS IN THE 28.6-29.1 GHZ AND 18.8-19.3 GHZ BANDS

In the United States, the 28.6-29.1 GHz band is designated for NGSO FSS on a primary basis and it is designated for GSO FSS on a secondary basis. Stations operating in a secondary service cannot cause harmful interference to or claim protection from harmful interference from stations of a primary service. ViaSat's proposed U.S. operations will be consistent with the obligations of a secondary user of spectrum to avoid harmful interference into, and to accept any interference received from, primary users.

The highest interference levels that could occur into NGSO networks from the VIASAT-109W network are when there is an "in-line" event. On the uplink for example, an in-line event occurs when the NGSO satellite, the GSO satellite and the interfering GSO earth station are all in a line. As the NGSO satellite continues to move within its orbit, an angle between the NGSO satellite and the GSO satellite, subtended at the GSO earth station, is created. As long as the GSO earth station does not transmit when the NGSO satellite is within a certain angle, no harmful interference to the NGSO satellite will occur. A similar situation exists on the downlink. The amount of angular separation required will be dependent on the orbital and transmission characteristics of the NGSO FSS networks, their earth station locations, and their interference criteria.

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4 *See* SES-LIC-20100723-00952; SES-LIC-20141022-00809; SES-LIC-20130124-00089; SES-LIC-20130618-00516; SES-LIC-20150310-00138.

O3b has received U.S. market access for its constellation of NGSO satellites. O3b has Commission authorization to use 28.6-29.1 GHz and 18.8-19.3 GHz bands to communicate with fixed earth stations located in Hawaii, Texas, Virginia as well as for earth stations on vessels ("ESV") operating within U.S. waters.[5] O3b also has received Commission authorization for blanket license operation of fixed earth stations (1.2 meter, 1.8 meter, 2.2 meter and 2.4 meter) in CONUS, Hawaii, Puerto Rico and the U.S. Virgin Islands.[6] The interference analysis contained herein demonstrates that no harmful interference between the O3b system's U.S. operations and the VIASAT-109W satellite network will occur.

Currently no other NGSO networks are authorized by the Commission to use the 28.6-29.1 GHz and 18.8-19.3 GHz bands. Northrop Grumman Space and Mission Systems Corp. ("Northrop Grumman") had previously received Commission authorization for its Global EHF Satellite Network ("GESN") and ATCONTACT Communications, LLC ("ATCONTACT") had previously received Commission authorization for its NGSO network. Both networks were to utilize highly elliptical orbits ("HEO"). The interference analysis contained herein demonstrates that the operations of the VIASAT-109W satellite network also would protect the types of HEO satellite systems previously licensed to ATCONTACT and NGST from harmful interference.

A.11.1 Sharing with the O3b System

As described above, O3b has a number of Commission authorizations for operation of land-based fixed earth stations and for the operation of ESVs within U.S. coastal waters. ViaSat has examined all of the O3b scenarios and has found that the highest potential for interference from the VIASAT-109W network into the O3b network would occur into O3b's ESV operations because these are the O3b ground antennas that can be located closest to the equator. Due to its equatorial orbit, the closer to the equator that an O3b earth station is located, the more interference it can receive from a GSO network. Similarly, the closer to the equator that a GSO

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5 *See e.g.*, SES-LIC-20100723-00952; SES-LIC-20141022-00809, SES-LIC-20130124-00089 and SES-LIC-20130618-00516; SES-LIC-20130528-00455; SES-LIC-20150310-00138; *see also* SAT-LOI-20141029-00118.

6 *See* SES-LIC-20141001-00781.

earth station is located, the more interference it can receive from the O3b network. The location closest to the equator that is within U.S. territory, and within the mutual service areas of the VIASAT-109W and O3b satellite networks, is in U.S. waters south of St. Croix, U.S. Virgin Islands (approximately 17.6°N, 64.75°W). The following analysis assumes the VIASAT-109W and O3b networks each have an ESV collocated at these geographic coordinates.

Table A.11-1 shows the pertinent transmission parameters of the VIASAT-109W network and the O3b system.

Table A.11-1. Summary of VIASAT-109W and O3b parameters.

Parameters	VIASAT-109W	O3b System
ESV Uplink Input Power Density	-56.5 dBW/Hz	-53.4 dBW/Hz
Satellite Rx Antenna Gain	53.6 dBi	34.5 dBi
Satellite Rx System Noise Temp	1380 K	1000 K
Satellite Tx EIRP Density	-19.1 dBW/Hz	-28.32 dBW/Hz
Earth Station Rx System Noise Temperature	224 K	307 K

Table A.11-2 shows the interference calculations for the assumed worst case static situation described above. The results show that the O3b system is adequately protected. The calculated $\Delta T/T$ values in all cases are small, indicating the technical compatibility of the VIASAT-109W satellite network with the O3b network and therefore with an O3b earth station located anywhere within the mutual service areas of the two satellite networks. ViaSat makes the following additional observations:

1) In order to be conservative, the interference calculation of uplink interference into ViaSat uses an O3b uplink input power density of -53.4 dBW/Hz. This value is actually for an O3b gateway, not an ESV. The maximum power density for an ESV is approximately 4 dB lower.

2) In order to be conservative, the interference calculation of downlink interference into O3b uses a VIASAT-109W downlink EIRP density of -19.1 dBW/Hz, which is the highest EIRP density that can be transmitted in the 18.8-19.3 GHz band by any VIASAT-

109W downlink beam (*i.e.*, most beams will transmit at a somewhat lower EIRP density level).

3) The interference analysis does not address the mutual interference environment with respect to O3b operations located outside of the relevant service areas. In any such areas, ViaSat will operate in a manner consistent with Ofcom's rules between U.K. registered satellite operators.

Table A.11-2. Interference calculations between VIASAT-109W and O3b.

Victim network Interfering network		O3b VIASAT-109W	VIASAT-109W O3b
Uplink:			
Frequency band	GHz	28.85	28.85
Interfering uplink input power density	dBW/Hz	-56.5	-53.4
Angular separation between interfering E/S and victim satellite	degrees	8.2	8.2
Slant range (Interfering path)	km	10003	38104
Free space path loss (Interfering path)	dB	201.6	213.3
Atmospheric losses	dB	1.2	1.2
Victim satellite receive antenna gain	dBi	34.5	53.6
Victim Satellite's Antenna Discrimination towards Interfering E/S	dB	0	0
Victim satellite Rx system noise temperature	K	1000	1380
No	dBW/Hz	-198.6	-197.2
Io	dBW/Hz	-218.7	-208.2
Io/No	dB	-20.1	-11.0
ΔT/T	%	0.97	8.0
Downlink:			
Frequency band	GHz	19.05	19.05
Interfering satellite downlink EIRP density	dBW/Hz	-19.1	-28.32
Slant range (Interfering path)	dB	38104	10003
Free space path loss (Interfering path)	dB	209.7	198.0
Atmospheric losses	dB	1	1
Angular separation between interfering satellite and victim E/S	degrees	8.2	8.2
Interfering Satellite's Antenna Discrimination towards Victim E/S	dB	0	0
Victim Rx earth station system noise temperature	K	307	224
No	dBW/Hz	-203.7	-205.1
Io	dBW/Hz	-223.6	-221.2
Io/No	dB	-19.9	-16.1
ΔT/T	%	1.03	2.4

A.11.2 Sharing with HEO Systems

This section analyzes the compatibility of the VIASAT-109W satellite network with HEO systems. Table A.11-3 summarizes the salient parameters of the VIASAT-109W network and the GESN and ATCONTACT HEO satellite networks. The HEO network's parameters are identical to those used by Northrop Grumman and ATCONTACT to demonstrate independently that their GSO operations in the 28.6-29.1 GHz and 18.8-19.3 GHz bands were compatible with the other's proposed NGSO operations.[7] The parameters of the two HEO networks are identical, allowing a single interference analysis to be performed with respect to the VIASAT-109W network.

Table A.11-3. Summary of VIASAT-109W and GESN / ATCONTACT Parameters.

Parameters	VIASAT-109W	GESN / ATCONTACT Systems
Minimum Operational Altitude	GSO	16000 km
Earth Station Uplink Input Power Density	-56.5 dBW/Hz	-63.45 dBW/Hz
Satellite Rx Antenna Gain	61.0 dBi	46.5 dBi
Satellite Rx System Noise Temp	1023 K	504 K
Satellite Tx EIRP Density	-19.1 dBW/Hz	-18 dBW/Hz
Earth Station Rx System Noise Temperature	224 K	315 K

In order to demonstrate compatibility with these two NGSO networks, a worst case, static interference analysis is performed. The smallest possible angle will occur when the GSO satellite, the NGSO satellite and the relevant earth station are all on the same longitude and the earth station is at a high latitude. Assuming a minimum 10° elevation angle for the GSO earth station, this sets the latitude to 71.4°N. The GESN and ATCONTACT satellites do not transmit when they are at an altitude below 16000 km, which translates to a latitude of 31.9°N. With this information, the smallest possible angular separation is then calculated to be 27.4 degrees. Both the transmitting GSO earth station (uplink calculation) and the victim NGSO earth station (downlink calculation) have been assumed to be at a latitude of 71.4°N.

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[7] *See* SAT-AMD-20040719-00138 and SAT-AMD-20040719-00141.

Table A.11-4 shows the results of interference calculations from the VIASAT-109W network into the GESN and ATCONTACT networks and vice versa. The calculated $\Delta T/T$ values in all cases are small, indicating the technical compatibility of the VIASAT-109W network with the GESN and ATCONTACT networks.

The compatibility of these networks is largely due to the fact that the two NGSO networks do not communicate with earth stations when their satellites cross the equatorial plane, thus in-line events with a GSO network do not occur. For other types of NGSO constellations that do communicate with earth stations when the satellites pass through the equatorial plane, it is possible that an in-line interference event could occur. In order to protect such systems, ViaSat will cease transmissions from the VIASAT-109W satellite and its associated earth stations such that the required amount of angular separation with the NGSO network is always maintained.

Table A.11-4. Interference calculations between VIASAT-109W and GESN/ATCONTACT.

Victim network		GESN / ATCONTACT	VIASAT-109W
Interfering network		VIASAT-109W	GESN / ATCONTACT
Uplink:			
Frequency band	GHz	28.85	28.85
Interfering uplink input power density	dBW/Hz	-56.5	-63.45
Angular separation	degrees	27.4	27.4
Slant range (Interfering path)	km	21046	40586
Space loss (Interfering path)	dB	208.1	213.8
Atmospheric losses	dB	1.2	1.2
Victim satellite receive antenna gain	dBi	46.5	61
Victim satellite Rx system noise temperature	K	504	1023
No	dBW/Hz	-201.6	-198.5
Io	dBW/Hz	-223.3	-221.4
Io/No	dB	-21.7	-22.9
ΔT/T	%	0.680	0.512
Downlink:			
Frequency band	GHz	19.05	19.05
Interfering satellite downlink EIRP density	dBW/Hz	-19.1	-18
Slant range (Interfering path)	dB	40586	21046
Space loss (Interfering path)	dB	210.2	204.5
Atmospheric losses	dB	1	1
Angular separation	degrees	27.4	27.4
Victim Rx earth station system noise temperature	K	315	224
No	dBW/Hz	-203.6	-205.1
Io	dBW/Hz	-234.2	-227.4
Io/No	dB	-30.6	-22.3
ΔT/T	%	0.087	0.582

A.12 ORBITAL DEBRIS MITIGATION PLAN

ViaSat has conducted a preliminary assessment of orbital debris mitigation for the VIASAT-109W in accordance with the material objectives of §25.114(d)(14) of the Commission's Rules, which will be incorporated into the satellite's Technical Specifications, Statement of Work and Test Plans. The Statement of Work will include provisions to review orbital debris mitigation as part of the preliminary design review ("PDR") and the critical design review ("CDR") and to incorporate its requirements, as appropriate, into its Test Plan, including a formal Failure Mode Verification Analysis ("FMVA") for orbital debris mitigation involving particularly the TT&C, propulsion and energy systems. Any updates to the Orbital Debris Mitigation Plan will be reflected in any modification application needed to conform the satellite to the spacecraft manufacturing contract.

A.12.1 Spacecraft Hardware Design

ViaSat does not expect that the satellite will undergo any release of debris during its operation. Furthermore, all separation and deployment mechanisms, and any other potential source of debris are expected to be retained by the spacecraft or launch vehicle.

ViaSat will assess and limit the probability of the satellite becoming a source of debris by collisions with small debris or meteoroids of less than one centimeter in diameter that could cause loss of control and prevent post-mission disposal. ViaSat will take steps to limit the effects of such collisions through shielding, the placement of components, and the use of redundant systems. ViaSat will incorporate a rugged TT&C system with regard to meteoroids smaller than 1 cm through redundancy, shielding, separation of components and physical characteristics. The VIASAT-109W satellite will include two near omni-directional antennas mounted on opposite sides of the spacecraft. These antennas will be extremely rugged and capable of providing adequate coverage even if struck, bent or otherwise damaged by a small or medium sized particle. ViaSat plans to locate the command receivers and decoders and telemetry encoders and transmitters within a shielded area and provide redundancy and physical separation for each component. The VIASAT-109W satellite will carry a rugged propulsion system capable of withstanding collision with small debris.

A.12.2 Minimizing Accidental Explosions

In conjunction with the satellite manufacturer, ViaSat will assess and limit the probability of accidental explosions during and after completion of mission operations through a failure mode verification analysis. ViaSat and its satellite manufacturer will take steps to ensure that debris generation will not result from the conversion of energy sources on board the satellite into energy that fragments the satellite.

The satellite will be an all-electric satellite with no chemical propulsion onboard. ViaSat anticipates that it will utilize a Xenon Ion Propulsion System ("XIPS") to perform all necessary propulsive maneuvers and will have a single tank. When loaded to its maximum qualified load, the tank will maintain a 4:1 burst pressure ratio. The propellant budget for the spacecraft has allocated adequate xenon for de-orbit maneuvers in order to meet the Commission's de-orbit altitude requirement.

At end-of-life and once the satellite has been placed into its final disposal orbit, ViaSat will leave the batteries in a permanent state of discharge. The only remaining source of stored energy would potentially be the XIPS system. The XIPS system is predicted to have residual xenon that cannot be evacuated from the tank, feedlines and other feed system components, as well as an additional amount in the single xenon propellant tank that may vary depending on factors, such as whether the satellite experiences any failures that require it to be de-orbited prematurely. Any excess xenon propellant will be vented as needed to achieve a pressure of 5% or less of the tank's maximum test pressure prior to decommissioning the satellite.

A.12.3 Safe Flight Profiles

In considering current and planned satellites that may have a station-keeping volume that overlaps the VIASAT-109W satellite, ViaSat has reviewed the lists of FCC licensed satellite networks, as well as those that are currently under consideration by the FCC. In addition, networks for which a request for coordination has been published by the ITU within ±0.15° of 109.1° W.L. have also been reviewed.

Based on these reviews, there are no operational satellites within ±0.15° from 109.1° W.L and there are no pending applications before the Commission to use an orbital location ±0.15° from 109.1° W.L. Further, ViaSat is not aware of any satellite with an overlapping station-keeping volume with the VIASAT-109W satellite that is the subject of an ITU filing and which is either in orbit or progressing towards launch. Accordingly, ViaSat concludes that physical coordination of the VIASAT-109W satellite with another party is not required at the present time.

A.12.4 Post-Mission Disposal

At the end of the operational life of the VIASAT-109W satellite, ViaSat will maneuver the satellite to a disposal orbit with a minimum perigee of 300 km above the normal GSO operational orbit. The post-mission disposal orbit altitude is based on the following calculation, according to §25.283:

Total Solar Pressure Area "A" = 117 m^2

"M" = Dry Mass of Satellite = 5414 kg

"C_R" = Solar Pressure Radiation Coefficient = 1.3

Therefore the Minimum Disposal Orbit Perigee Altitude:

= 36,021 km + 1000 x C_R x A/m

= 36,021 km + 1000 x 1.3 x 117/5414

= 36,049 km

= 263 km above GSO (35,786 km)

Adequate margin has already been accounted for in the calculation of the disposal orbit of 300 km. This will require 2 kg of xenon propellant that will be reserved, taking account of all fuel measurement uncertainties, to perform the final orbit raising maneuver.

A.13 WAIVER REQUEST

Section 25.210(i) of the Rules, 47 C.F.R. § 25.210(i), requires that space station antennas in the FSS be designed to meet a cross-polarization isolation of 30 dB within the primary coverage area of the antenna. The VIASAT-109W satellite's transmit and receive antennas can have a cross-polarization isolation as low as 24 dB. In support of its requested waiver, ViaSat notes the following:

1) The cross-polarization isolation shortfall creates a negligible amount of additional self-interference into the VIASAT-109W satellite network. All intra-system interference

contributions, including the reduced cross-polarization isolation, have been taken into account in the design of the link budgets for the services that the satellite will provide. The link budgets are sufficiently robust to compensate for the negligible degradation caused by the reduced cross-polarization isolation performance.

2) The uplink cross-polarization isolation shortfall is solely an intra-system design issue and has no effect on adjacent satellite networks.

The downlink cross-polarization isolation shortfall creates a negligible amount of additional downlink interference into adjacent satellite networks. This is because the overall interference isolation of adjacent satellites is dominated by the receive earth station antenna off-axis discrimination for co-polar signals, and the contribution from the cross-polar component is negligible. A 24 dB cross-polarization isolation will decrease the downlink C/I into an adjacent satellite network by approximately 0.017 dB. In granting a similar waiver of Section 25.210(i), the Commission has determined that this level of increased interference is considered to be negligible.[8] Thus, grant of the requested waiver is consistent with prior Commission decisions granting similar waivers of Section 25.210(i), in which the Commission determined that cross-polarization performance of the downlink satellite antenna has only a second-order effect on the interference into the neighboring system.[9]

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8 *See EchoStar Satellite Operating Corporation*, DA 06-2590 ¶ 7 n.21 (rel. Dec. 22, 2006) (allowing a cross-polarization isolation of 22 dB, finding that cross-polar interference contribution representing a C/I decrease of 0.03 dB is negligible).

9 *See id.* ¶ 7.

A.14 MAXIMUM SATURATION FLUX DENSITY

The following is the maximum saturation flux density of the satellite, as required by Section 25.114(c)(4)(v) of the Commission's rules:

Beam ID	Max Saturation Flux Density
RXAR	-85 dBW/m2
RXAL	-85 dBW/m2
RXBR	-85 dBW/m2
RXBL	-85 dBW/m2

CERTIFICATION OF PERSON RESPONSIBLE FOR PREPARING ENGINEERING INFORMATION

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

/s/

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