EXHIBIT A

LETTER OF INTENT

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

In the Matter of	)	
	)	
ViaSat, Inc.	)	
	)	File No. __________________
Letter of Intent for Authority to Access the U.S. Market Using a Non-U.S. Licensed Ka-Band Geostationary Satellite at the Nominal 89º W.L. Orbital Location	))	

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-KA 89W" satellite) to access the United States market using portions of the Ka band at the nominal 89° W.L. orbital location. 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. ViaSat is a major producer of VSAT communications systems and has proven itself to be an innovator in satellite communications 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, particularly those in unserved and underserved areas, 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 12/3 Mbit/s, and is winning customers from terrestrial competitors.[3]

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

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[3] *See* Letter to FCC from ViaSat, Inc., WC Docket No. 10-90, Att. at 6-8 (Sept. 19, 2012).

development of competitive broadband services, while also promoting job opportunities and economic recovery.[4]

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, including in areas that are difficult to reach, or cannot be efficiently served, using terrestrial technologies. 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.[5] All of the capacity on the satellite will be provided on non-common carrier basis.[6]

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 satellite communications market,

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[4] *See* Comments of ViaSat, Inc., *Connect America Fund*, WC Docket No. 10-90, at 12 (Apr. 18, 2011), including Exh. A, Dr. Charles L. Jackson, *Satellite Service Can Help to Effectively Close the Broadband Gap* (Apr. 18, 2011) ("Jackson Paper").

[5] *See, e.g.*, Jackson Paper.

[6] *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*").

ViaSat intends to continue to advance satellite technology and design to satisfy the ever-growing demand for broadband services.

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

ViaSat's wholly-owned subsidiary, ViaSat Satellite Holdings Ltd., currently is pursuing an authorization from the United Kingdom's Office of Communications ("Ofcom") for a Ka-band satellite at the nominal 89º W.L. orbital location.[7] 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.[8] 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.[9] 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.[10] The United Kingdom is a member of the WTO. Further,

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7 ViaSat will provide a confirmation letter regarding filings submitted by Ofcom to the International Telecommunication Union on ViaSat's behalf relating to the proposed operations at the nominal 89º W.L. location, as appropriate.

8 *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*").

9 *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).

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

ViaSat seeks to use the requested spectrum to provide satellite services that are covered by the WTO Basic Telecommunications Agreement.[11] 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 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.[12]

B. Spectrum Availability

This Letter of Intent proposes to access the U.S. market 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.[13] Specifically, ViaSat seeks authority to access the U.S. market 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 with the proposed operations in the 18.8-19.3 GHz band, which is designated for non-geostationary ("NGSO") fixed satellite service ("FSS") operations.[14]

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

[12] *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).

[13] As described in the Technical Annex and Schedule S, the satellite also will be capable of serving South America.

[14] 47 C.F.R. § 2.106.

ViaSat's proposed operations at 88.9º W.L. do not conflict with any previously granted Commission license regarding a satellite network in these bands. ViaSat has coordinated its proposed operations with Intelsat, the existing GSO FSS licensee in the 29.5-30.0 GHz and 19.7-20.2 GHz band segments, who operates Galaxy-28 at 89.0º W.L. Intelsat has provided a letter evidencing its consent to ViaSat's application for these portions of the Ka band, attached hereto as Attachment B. As the Commission previously has indicated, "if the parties reach an agreement, we will entertain a request that involves co-frequency operations."[15] Indeed, the Commission generally defers to spectrum coordination agreements between satellite operators.[16]

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15 *Mobile Satellite Ventures Subsidiary, LLC, Application for Authority to Launch and Operate an L-band Mobile Satellite Service Satellite at 101° W.L.*, 20 FCC Rcd 9752, at ¶ 16 n.45 (2005); *see also EchoStar Satellite LLC, Application for Authority to Construct, Launch, and Operate a Geostationary Satellite Using the Extended Ku-band Frequencies in the Fixed-Satellite Service at the 101° W.L. Orbital Location*, 20 FCC Rcd 12027, at ¶ 2 n.7 (2005).

16 *See, e.g.*, *SkyTerra Subsidiary, LLC, Modification Authority for an Ancillary Terrestrial Component*, 25 FCC Rcd 3043, at ¶¶ 29-30 (2010) (deferring to the terms of a coordination agreement negotiated by satellite operators, citing the public interest benefits arising from commercially negotiated coordination agreements, including spectrum efficiency and facilitation of new services).

As a separate matter, this request is consistent with Commission practice regarding applications for new or modified facilities filed during the pendency of a request to assign the license of an existing facility in order to facilitate the timely deployment of new technology by the proposed transferee. *See, e.g.*, *Hughes Communications Galaxy, Inc.*, 3 FCC Rcd 6989 (1988) (granting Hughes authority for a replacement satellite recently authorized to be assigned to Hughes, for which the predecessor sought replacement authority); *see also DBSD North America, Inc., Debtor-in-Possession; TerreStar Licensee Inc., Debtor-in-Possession; DISH Network Corporation*, 27 FCC Rcd 2250, at ¶ 29 (2012) (considering rule waivers and modifications to ATC authority requested to accommodate business plans by DISH as the potential acquirer of such authorizations). Currently pending is an application to assign to ViaSat the portion of the Intelsat license associated with the Ka-band payload on Galaxy-28 (IBFS File No. SAT-ASG-20130515-00070). Such "accommodation" applications are routinely processed in the broadcast context as well. *See* 47 C.F.R. § 73.3517(a) (allowing "contingent applications" for new stations or changes in facilities filed by a proposed assignee or transferee of the station intended to be implemented upon the assignment or transfer of control of the license that is pending approval or consummation).

Furthermore, no other GSO spacecraft is authorized by the Commission to operate within two degrees of 88.9º W.L. on a co-frequency, co-coverage basis. Nor do ViaSat's proposed operations conflict with the operations of O3b Limited ("O3b") authorized by the Commission in the 18.8-19.3 GHz and 28.6-29.1 GHz bands.[17] 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 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.[18] 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 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 allocated to the NGSO FSS on a primary basis and GSO FSS on a secondary basis. As demonstrated by the Technical Annex, ViaSat's proposed

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17 *See* IBFS File Nos. SES-LIC-20100723-00952 (granted Sept. 25, 2012); SES-LIC-20130124-00089 (granted June 20, 2013); *see also* IBFS File Nos. SES-LIC-20130528-00455; SES-LIC-20130618-00516.

18 *See Space Station Licensing Reform Order*, at ¶ 113.

operations in the United States are compatible with NGSO use of this band segment, including the NGSO system operated by O3b.[19] 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.[20]

(ii) 28.1-28.35 GHz

The 28.1-28.35 GHz band is allocated 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 to support gateway-type uplink operations, which are consistent with the Commission's intended use of the secondary allocation for FSS in this band.[21] The terminals operating on a secondary basis will employ interference mitigation techniques, such as shielding, to avoid interference into LMDS stations. The applications for those earth stations will include a technical analysis demonstrating that the proposed operations will not cause harmful interference

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19 *See* IBFS File No. SES-LIC-20100723-00952 (granted Sept. 25, 2012).

20 *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).

21 *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, at ¶ 45 (1996) ("At 27.5-28.35 GHz[,] we designate 850 MHz for LMDS on a primary basis. GSO/FSS … will be permitted on a non-interference basis … for the purpose of providing limited gateway-type services.").

into any licensed LMDS spectrum user.[22] The Commission has previously authorized secondary FSS operations in this band, thus recognizing that such operations successfully may coexist with LMDS operations.[23] ViaSat's proposed operations in the United States 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.[24]

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.[25] 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.[26] ViaSat will operate in this band segment in the United States

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[22] *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).

[23] *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).

[24] O3b is authorized to operate earth stations in 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). 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.

[25] 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.

[26] *See* IBFS File Nos. SES-LIC-20100723-00952 (granted Sept. 25, 2012); SES-LIC-20130124-00089 (granted June 20, 2013); *see also* IBFS File Nos. SES-LIC-20130528-

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.[27] Ample good cause continues to exist for granting such a waiver.[28] As noted above, ViaSat seeks to use the spacecraft to supplement the capacity of its existing satellite 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.[29] 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.

00455; SES-LIC-20130618-00516.

[27] *See* n.20, *supra*.

[28] 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").

[29] *See* Section I.A, *supra*.

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.[30] 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 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.

IV. ADDITIONAL REQUIREMENTS – SECTION 25.137(D)

A. Milestones and Bond Requirement

ViaSat plans to implement the spacecraft in compliance with the Commission's milestones established in the *Satellite Licensing Reform Order*:[31] (i) execute a binding contract for construction of the spacecraft within one year of grant of authority; (ii) complete the Critical Design Review for the spacecraft within two years; (iii) commence physical construction within three years; and (iv) launch the satellite and begin operations within five years. ViaSat acknowledges that it also will be subject to the bond requirement for GSO satellites.

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[30] *See* 47 C.F.R. § 25.114.

[31] *See id.* § 25.137(d)(4); *see also Space Station Licensing Reform Order*, at ¶ 311.

B. Reporting Requirements

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

C. Spectrum Usage

ViaSat currently has an authorization for an unbuilt Ka-band satellite at one other orbital location. ViaSat has one pending application for spectrum reservation rights at the nominal 89º W.L. orbital location.[32] 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.

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 entities and their respective affiliates beneficially owned 10 percent or more of ViaSat's voting stock as of July 26, 2013:

Beneficial Owner	Citizenship	Voting Percentage
The Baupost Group, L.L.C. 10 St. James Avenue Suite 1700 Boston, MA 02116	Massachusetts	24.2%
FPR Partners LLC 199 Fremont Street 25th Floor San Francisco, CA 94105-2261	Delaware	13.2%

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

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32 *See* IBFS File No. SAT-LOI-20140201-00011.

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
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, VP, CFO
Shawn Duffy, VP, Corporate Controller, Chief Accounting Officer
Kevin Harkenrider, Sr. VP – Broadband Services
H. Stephen Estes, VP – Enterprise Services
Steven R. Hart, VP – Engineering and Chief Technical Officer
Keven Lippert, VP, General Counsel, Secretary
Mark J. Miller, VP, Chief Technical Officer
Ken Peterman, 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 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 understands that it is not feasible to submit a receive system noise temperature of greater than approximately 32800 K. Because the receive system noise temperature for certain receive beams of the satellite exceed 32800 K, ViaSat has instead left the field blank. More specific information supporting this waiver request is contained in the Technical Annex at Section A.14.

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.15.

In addition, ViaSat is submitting gain contours for the spacecraft in a GIMS container file, rather than in GXT files, consistent with the Commission's interim waiver of Section 25.114(d)(3).[33] ViaSat is availing itself of the waiver because it understands that it currently is not feasible to embed in the Schedule S form the large number of GXT files that ViaSat is providing with this application. ViaSat therefore is providing the GIMS container file in accordance with the International Bureau's instructions, by uploading the GIMS container in a ZIP file as an attachment to Question 43 of the attached Form 312.

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.

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[33] *See* Public Notice, International Bureau Adopts Policy of Granting Interim Waiver of Certain Requirements for Space Station Applications, Report No. SPB-255, DA 14-90, at 4 n.9 (rel. Jan. 28, 2014).

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/ John P. Janka

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ATTACHMENT A

Technical Information to Supplement Schedule S

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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-KA 89W satellite. 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-KA 89W satellite will operate at the nominal 89° W.L. orbital location. As explained in section A.11.3, ViaSat proposes to offset the satellite by 0.1° from 89º W.L. and to center the station-keeping box at 88.9° W.L.

The satellite will serve the United States 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). The satellite network will provide service to small user antennas. In addition, a limited number of larger gateway antennas will be employed. The gateway antennas will have the capability of transmitting in any channel within the 28.1-29.1 GHz and 29.5-30.0 GHz bands. Uplink transmissions from the smaller user terminals will be restricted to the 28.35-29.1 GHz and 29.5-30.0 GHz bands.

The satellite will use a bent-pipe architecture with asymmetric forward (gateway-to-subscriber) and return (subscriber-to-gateway) links. Forward links will consist of a single TDM 500 MHz wide carrier (416.67 Msym/s), while the return links will use MF-TDMA with a variety of bandwidths/data rates employed. The network will use adaptive coding and modulation to combat rain fades. That is, the modulation type, amount of coding and/or user data rate will be dynamically varied to meet the link requirements during rain events (in addition to employing uplink power control). The forward links will vary between 16-APSK, 8PSK and QPSK modulations, depending on the amount of rain fade, while the return links will use 8PSK, QPSK and BPSK modulation schemes.

The VIASAT-KA 89W satellite essentially has two separate payloads: one to provide service to parts of the United States and one to provide service to parts of South America. For each of these two payloads, there are 9 beams serving ground antennas that link to the Internet/PSTN ("A-Type Spot Beams") and are connected to 36 beams that will be used principally to provide service to end users ("B-Type Spot Beams"). For each "payload", the 9 A-Type spot beams are dedicated to serving the 36 B-Type spot beams located within their respective hemisphere. The South American payload is wholly separate and independent from the U.S. payload, however connectivity between the United States and South America will be provided through two dedicated, inter-connected A-Type spot beams: one located within the United States and the other located within South America. A description of this connectivity is provided within this application.

All on-station TT&C functions will occur via one of two of the U.S. A-Type spot beams (*i.e.*, primary plus backup beam).

A.3 FREQUENCY AND POLARIZATION PLAN

The VIASAT-KA 89W satellite's frequency plan for normal operating mode is given in Table A.3-1, indicating channel center, polarization and bandwidth. Circular polarization is used on both the uplink and downlink with the downlink polarization being orthogonal to the uplink polarization. The satellite will employ a four-frequency re-use pattern such that any channel is re-used multiple times by a combination of polarization and spatial isolation. This satisfies the requirements of §25.210(d) of the Rules.

Table A.3-1. Frequency Plan (Normal Mode)

Uplink Center Frequency (MHz)	Polarization	Downlink Center Frequency (MHz)	Polarization	Bandwidth (MHz)
28600	RHCP, LHCP	18800	LHCP, RHCP	1000
29750	RHCP, LHCP	19950	LHCP, RHCP	500

The 1000 MHz channel, which includes 500 MHz of NGSO FSS spectrum, will be reduced to a single 500 MHz channel (*i.e.*, only the GSO band portion) in the event that there is a need to cease operating in order to protect an NGSO network. In such an event, and during the short period of time that the reduced bandwidth mode is in use, the frequency plan for this mode is given in Table A.3-2.

Table A.3-2. Frequency Plan (Reduced Bandwidth Mode)

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

For purposes of clarity, the transponder bandwidth configuration represented in the Schedule S is for normal mode configuration reflected in Table A.3-1 above.

A.4 SERVICES TO BE PROVIDED

The VIASAT-KA 89W satellite will be capable of providing a variety of services, including broadband access. Representative link budgets, which include details of the transmission characteristics, performance objectives and earth station characteristics, are provided in the associated Schedule S submission.

A.5 TT&C CHARACTERISTICS

The information provided in this section complements that provided in the associated Schedule S submission.

The TT&C sub-system provides for communications during pre-launch, transfer orbit and on-station operations, as well as during spacecraft emergencies. Beacon transmissions are used to control on-station spacecraft attitude, gateway uplink power control and the pointing of the satellite's antennas. The TT&C sub-system will operate at the edges of the uplink and downlink frequency ranges during all phases of the mission. All transmissions will operate in a circular polarization mode.

During transfer orbit and on-station emergencies the TT&C subsystem employs a dual omni-directional antenna configuration. During normal on-station operation, the telecommand transmissions will be received via one of two uplink beams located within the United States (primary plus backup). The TT&C earth station locations have not yet been selected. Each TT&C station will be capable of transmitting at either command frequency and either RHCP or LHCP. The frequency and polarization used will depend upon which command receiver is active at the satellite at that time. A summary of the TT&C subsystem's characteristics is given in Table A.5-1.

Table A.5-1. Summary of the TT&C Subsystem Characteristics

Parameter	Transfer Orbit and Emergency	On-Station
Command/Ranging Frequencies and Polarizations	29,500.5 MHz – LHCP/RHCP 29,503 MHz – RHCP/LHCP	29,500.5 MHz – LHCP/RHCP 29,503 MHz – RHCP/LHCP
Uplink Flux Density	-76 dBW/m^2	-115 dBW/m^2
Uplink Antenna Beam	Omni	A-Type Spot
Telemetry/Ranging Frequencies and Polarizations	19,701 MHz - LHCP 19,703 MHz - RHCP	19,701 MHz - LHCP 19,703 MHz - RHCP
Downlink Antenna Beam	Omni	A-Type Spot
Maximum Downlink EIRP	14 dBW	25 dBW

A.6 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.7 POWER FLUX DENSITY AT THE EARTH'S SURFACE

§25.208(c) contains 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.

§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).

Compliance with the applicable FCC and ITU PFD limits is demonstrated below using a simple worst-case methodology. The maximum downlink EIRP that the VIASAT-KA 89W satellite can transmit is 66.7 dBW in 500 MHz. The shortest distance from the satellite to the Earth is 35,786 km, corresponding to a spreading loss of 162.06 dB. Therefore the maximum possible PFD at the Earth's surface could not exceed -95.3 dBW/m^2 in this 500 MHz (*i.e.*, 66.7 -162.06). When the system is operating in normal mode (*i.e.*, using a 1000 MHz channel in the 18.3-19.3 GHz and 28.1-29.1 GHz frequencies), the two 500 MHz channels within the 1000 MHz channel will each meet the PFD performance described here. Allowing for the use of digital modulation with an almost flat spectrum, the corresponding maximum PFD at an elevation angle of 90° measured in a 1 MHz band would not exceed -122.3 dBW/m^2. The -122.3 dBW/m^2/MHz level is less than the -

115 dBW/m^2/MHz PFD limit value that applies at elevation angles of 5° and below. Therefore, compliance with the PFD limits is ensured.

In addition, §25.208(d) provides an additional aggregate PFD limit in the 200 MHz wide band 18.6-18.8 GHz of -95 dBW/m^2. In the worst case, this would correspond to a PFD limit of -118 dBW/m^2/MHz (*i.e.*, -95-10*log(200)). As demonstrated in the previous paragraph, downlink transmissions from the VIASAT-KA 89W satellite cannot exceed -122.3 dBW/m^2/MHz at any angle of arrival and therefore compliance with §25.208(d) is also ensured.

A.8 TWO DEGREE COMPATIBILITY

No transmissions of the VIASAT-KA 89W satellite network will 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.

A.8.1 Frequency Bands Subject to §25.138

For those frequency bands subject to §25.138, compliance with the Commission's two-degree spacing policy is ensured provided:

1) The uplink off-axis EIRP density levels of §25.138(a)(1) of the Rules for blanket licensing are not exceeded;

2) The maximum PFD levels are lower than the PFD values given in §25.138(a)(6) of the Rules.

The clear sky uplink off-axis EIRP density limits of §25.138(a)(1) are equivalent to a maximum uplink input power density of -56.5 dBW/Hz. Table A.8-1 compares the uplink input power densities derived from the uplink link budgets that are contained in the Schedule S form with the clear sky limits of §25.138 (a)(1) of the Rules.[1] It can be seen that in all cases the clear sky uplink power limits are met. No authorized uplink transmissions towards the VIASAT-KA 89W satellite will exceed the clear sky uplink off-axis EIRP density limits of §25.138(a)(1).

Table A.8-1. Demonstration of Compliance with the Uplink Power Limits of §25.138(a)(1) (assuming the transmitting earth station antenna meets the off-axis gain mask requirements of §25.209(a) and (b))

Uplink Antenna Size	Emission	Maximum Clear Sky Uplink Input Power Density (dBW/Hz)	Clear Sky Uplink Input Power Density Limit of §25.138 (a)(1) (dBW/Hz)	Excess Margin (dB)
67 cm	6M25G7D	-63.5	-56.5	7.0
67 cm	3M13G7D	-60.5	-56.5	4.0
67 cm	1M57G7D	-57.5	-56.5	1.0
67 cm	782KG7D	-56.6	-56.5	0.1
7.3 m	25M0G7D	-64.3	-56.5	7.8
7.3 m	500MG7D	-76.9	-56.5	20.4

Further, Section A.7 above demonstrates that the maximum PFD that could be transmitted by the VIASAT-KA 89W satellite, at a 90° elevation angle, is -122.3 dBW/m^2/MHz and therefore the PFD levels at other elevation angles will necessarily be somewhat lower. No downlink transmissions from the VIASAT-KA 89W satellite will exceed the -118 dBW/m^2/MHz limit set forth in §25.138 (a)(6) of the Rules.

A.8.2 Frequency Bands Not Subject to §25.138

This section demonstrates that uplink transmissions in the 28.1-28.35 GHz and 28.6-29.1 GHz bands and downlink transmissions in the 18.8-19.3 GHz band are two-degree compatible.

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[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.

Currently no operational GSO Ka-band satellites use the 28.1-28.35 GHz, 28.6-29.1 GHz or 18.8-19.3 GHz bands within two degrees of the 88.9º W.L. location, and no pending applications before the Commission seek to use these bands by a GSO satellite within two degrees of 88.9° W.L. Therefore, in order to demonstrate two-degree compatibility, the transmission parameters of the VIASAT-KA 89W satellite have been assumed as both the wanted and victim transmissions.

Table A.8-2 provides a summary of the uplink and downlink transmission parameters. These parameters were derived from the VIASAT-KA 89W link budgets that are embedded in the Schedule S form and were used in the interference analysis. The interference calculations assumed a 1 dB advantage for topocentric-to-geocentric conversion, all wanted and interfering carriers are co-polarized and all earth station antennas conform to a sidelobe pattern of 29-25 log(θ). The C/I calculations were performed on a per Hz basis.

Table A.8-3 shows the results of the interference calculations in terms of the overall C/I margins. It can be seen that the C/I margins are positive in all cases.

Table A.8-2. VIASAT-KA 89W 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	64.9	75.0	62.0	49.7	20.3
2	500MG7D	500	64.9	75.0	62.0	41.1	13.6
3	500MG7D	500	64.9	75.0	62.0	41.1	7.2
4	6M25G7D	6.25	44.4	48.9	39.2	61.5	16.2
5	3M13G7D	3.125	44.4	48.9	36.2	61.5	14.9
6	1M57G7D	1.563	44.4	48.9	33.1	61.5	9.9
7	782KG7D	0.7813	44.4	46.7	30.1	61.5	8.7
8	25M0G7D	25	64.5	74.2	45.2	60.8	20.8
9	500MG7D	500	64.9	75.0	65.7	61.5	20.3

Table A.8-3. Summary of the overall C/I margins (dB).

		Interfering Carriers								
	Carrier ID	1	2	3	4	5	6	7	8	9
Wanted Carriers	1	8.9	8.9	8.9	9.1	6.9	4.3	3.5	9.7	6.5
	2	7.1	7.1	7.1	11.1	10.2	8.8	8.3	11.2	4.7
	3	13.4	13.4	13.4	17.4	16.5	15.1	14.7	17.6	11.0
	4	17.4	17.4	17.4	7.6	4.7	1.7	0.9	8.4	15.8
	5	19.8	19.8	19.8	11.9	9.0	6.0	5.2	12.7	17.9
	6	25.4	25.4	25.4	19.8	16.9	14.0	13.2	20.5	23.2
	7	26.7	26.7	26.7	21.8	18.9	16.0	15.2	22.5	24.5
	8	14.5	14.5	14.5	17.8	16.5	14.8	14.2	18.1	12.1
	9	20.6	20.6	20.6	10.7	7.7	4.7	3.9	11.5	19.1

A.9 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 allocated to LMDS on a primary basis and it is allocated to the FSS on a secondary basis. §2.105(c)(2) states, in part, that stations of a secondary service:

> (i) Shall not cause harmful interference to stations of primary services to which frequencies are already assigned or to which frequencies may be assigned at a later date;
>
> (ii) Cannot claim protection from harmful interference from stations of a primary service to which frequencies are already assigned or may be assigned at a later date;

Regarding §2.105(c)(2)(i), 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. Regarding §2.105(c)(2)(ii), 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-KA 89W satellite is considered to be unlikely. Nonetheless, ViaSat undertakes to accept this risk and will not seek protection from such interference in the event it occurs.

The antennas deployed in this band segment will operate in the A-Type Spot Beams and the B-Type Spot Beams. The locations for these antennas have not yet been selected.

The applications for those earth stations 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 that has the potential to receive 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 gateway earth stations located in Hawaii and Texas to communicate with O3b's constellation of NGSO satellites using the 28.1-28.35 GHz band on a secondary basis.[2] In addition, O3b has pending an application for gateway earth station to be located in Virginia proposing to use the 28.1-28.35 GHz band on a secondary basis.[3] The analysis in the following section regarding the compatibility of VIASAT-KA 89W operations in the United States with those O3b gateways in the 28.6-29.1 GHz and 18.8-19.3 GHz bands is equally applicable to the 28.1-28.35 GHz band segment. Currently no other 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.10 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 allocated to NGSO FSS on a primary basis and it is allocated to 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

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[2] *See* SES-LIC-20100723-00952; SES-LIC-20130124-00089.

[3] *See* SES-LIC-20130618-00516. O3b's pending ESV application referenced below does not propose to use these frequencies.

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-KA 89W 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 parameters of the NGSO FSS networks, their earth station locations, and their interference criteria.

O3b Limited ("O3b") has received U.S. market access for its constellation of NGSO satellites, including Commission authorization to communicate with gateway earth stations located in Hawaii and Texas using the 28.6-29.1 GHz and 18.8-19.3 GHz bands.[4] O3b also has a pending application for a gateway earth station to be located in Virginia and a pending application for earth stations on vessels ("ESV") for operation within U.S. waters.[5] The interference analysis provided herein demonstrates that no harmful interference between O3b's system and the VIASAT-KA 89W 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

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4 *See* SES-LIC-20100723-00952 and SES-LIC-20130124-00089.

5 *See* SES-LIC-20130618-00516 and SES-LIC-20130528-00455.

that the operations of the VIASAT-KA 89W satellite network also would protect the HEO satellite systems previously licensed to ATCONTACT and NGST from harmful interference.

A.10.1 Sharing with the O3b System

Table A.10-1 shows the pertinent transmission parameters of the VIASAT-KA 89W network and the O3b system.

Table A.10-1. Summary of VIASAT-KA 89W and O3b parameters.

Parameters	VIASAT-KA 89W	O3b System
Earth Station Uplink Input Power Density	-56.6 dBW/Hz	-53.4 dBW/Hz
Satellite Rx Antenna Gain	52.8 dBi	34.5 dBi
Satellite Rx System Noise Temp	1290 K	1000 K
Satellite Tx EIRP Density	-20.3 dBW/Hz	-26.32 dBW/Hz
Earth Station Rx System Noise Temperature	224 K	225 K

As described above, O3b has Commission authorization for operation of gateways in Hawaii and Texas. O3b also has pending applications for operation of a gateway in Virginia and for operation of ESVs within U.S. coastal waters. ViaSat has examined all four of these O3b scenarios and has found that the highest potential for interference from the VIASAT-KA 89W network into the O3b network would occur into O3b's proposed ESV operations because these are the O3b ground antennas that can be located the furthest south. Due to its equatorial orbit, the further south that an O3b earth station is located, the more interference it can receive from a GSO network. Similarly, the further south that a GSO earth station is located, the more interference it can receive from the O3b network.

For interference calculation purposes, it has been assumed that the ESV is located at the approximate southernmost location within U.S. waters. The ESV has been assumed to be located at 24°N, 80.5°W, which is approximately halfway between the southern coast of Florida and the northern coast of Cuba. Note that both Hawaii (*i.e.*, gateway) and the U.S. waters around Puerto Rico (*i.e.*, ESV) are further south than this location, but Hawaii and Puerto Rico are well outside the coverage of the VIASAT-KA 89W satellite. The ViaSat uplink subscriber antenna has been assumed to be located in southern Florida at 25.1°N, 80.4°W. Table A.10-2 shows the calculated interference levels to the O3b system due to operation of the VIASAT-KA 89W network and vice versa given these location assumptions. 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-KA 89W and O3b networks. ViaSat makes the following additional observations:

1) In order to be conservative, the interference calculation of downlink interference into O3b assumes 0 dB VIASAT-KA 89W satellite antenna discrimination towards the victim ESV, but the actual discrimination is more than 20 dB. A similar situation applies for the case of the calculated uplink interference into ViaSat.

2) 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 for an ESV is approximately 4 dB lower.

3) The preceding analysis does not address the mutual interference environment with respect to O3b operations located outside of the U.S. For non-U.S. locations, ViaSat will operate in a manner consistent with Ofcom's rules between U.K. registered satellite operators.

Table A.10-2. Interference calculations between VIASAT-KA 89W and O3b.

Victim network Interfering network		O3b VIASAT-KA 89W	VIASAT-KA 89W O3b
Uplink:			
Frequency band	GHz	28.85	28.85
Interfering uplink input power density	dBW/Hz	-56.6	-53.4
Angular separation between interfering E/S and victim satellite	degrees	13.0	12.6
Slant range (Interfering path)	km	9128	36502
Free space path loss (Interfering path)	dB	200.9	212.9
Atmospheric losses	dB	0.5	0.5
Victim satellite receive antenna gain	dBi	34.5	52.5
Victim Satellite's Antenna Discrimination towards Interfering E/S	dB	0	0
Victim satellite Rx system noise temperature	K	1000	1230
No	dBW/Hz	-198.6	-197.7
Io	dBW/Hz	-219.3	-209.8
Io/No	dB	-20.7	-12.1
ΔT/T	%	0.85	6.14
Downlink:			
Frequency band	GHz	19.05	19.05
Interfering satellite downlink EIRP density	dBW/Hz	-20.3	-26.32
Slant range (Interfering path)	dB	36502	9128
Free space path loss (Interfering path)	dB	209.3	197.2
Atmospheric losses	dB	0.4	0.4
Angular separation between interfering satellite and victim E/S	degrees	12.6	13.0
Interfering Satellite's Antenna Discrimination towards Victim E/S	dB	0	0
Victim Rx earth station system noise temperature	K	225	224
No	dBW/Hz	-205.1	-205.1
Io	dBW/Hz	-225.5	-219.8
Io/No	dB	-20.4	-14.7
ΔT/T	%	0.91	3.37

A.10.2 Sharing with HEO Systems

This section analyzes compatibility of the VIASAT-KA 89W satellite network with HEO systems. Table A.10-3 summarizes the salient parameters of the VIASAT-KA 89W 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.[6] The parameters of the two HEO networks are identical, allowing a single interference analysis to be performed with respect to the VIASAT-KA 89W network.

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

Table A.10-3. Summary of VIASAT-KA 89W and GESN / ATCONTACT Parameters.

Parameters	VIASAT-KA 89W	GESN / ATCONTACT Systems
Minimum Operational Altitude	N/A	16000 km
Earth Station Uplink Input Power Density	-56.6 dBW/Hz	-63.45 dBW/Hz
Satellite Rx Antenna Gain	52.8 dBi	46.5 dBi
Satellite Rx System Noise Temp	1290 K	504 K
Satellite Tx EIRP Density	-20.3 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.

Table A.10-4 shows the results of interference calculations from the VIASAT-KA 89W network into the GESN and ATCONTACT networks and vice versa. The calculated $\Delta T/T$ values in all cases are very small, indicating the technical compatibility of the VIASAT-KA 89W 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-KA 89W satellite and its associated earth stations such that the required amount of angular separation with the NGSO network is always maintained.

Table A.10-4. Worst case interference calculations.

Victim network		GESN / ATCONTACT	VIASAT-KA 89W
Interfering network		VIASAT-KA 89W	GESN / ATCONTACT
Uplink:			
Frequency band	GHz	28.85	28.85
Interfering uplink input power density	dBW/Hz	-56.6	-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	0.5	0.5
Victim satellite receive antenna gain	dBi	46.5	52.8
Victim satellite Rx system noise temperature	K	504	1290
No	dBW/Hz	-201.6	-197.5
Io	dBW/Hz	-222.7	-228.9
Io/No	dB	-21.1	-31.4
ΔT/T	%	0.781	0.072
Downlink:			
Frequency band	GHz	19.05	19.05
Interfering satellite downlink EIRP density	dBW/Hz	-20.3	-18
Slant range (Interfering path)	dB	40586	21046
Space loss (Interfering path)	dB	210.2	204.5
Atmospheric losses	dB	0.4	0.4
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	-234.9	-226.8
Io/No	dB	-31.2	-21.7
ΔT/T	%	0.075	0.668

A.11 ORBITAL DEBRIS MITIGATION PLAN

The spacecraft manufacturer for the VIASAT-KA 89W satellite has not yet been selected and therefore ViaSat's Orbital Debris Mitigation Plan is necessarily forward looking. ViaSat will incorporate the material objectives of §25.114(d)(14) of the Commission's Rules into the design of the satellite through 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. During this process, some changes to the Orbital Debris Mitigation Plan may occur, in which case ViaSat would provide the Commission with updated information, as appropriate.

A.11.1 Spacecraft Hardware Design

Although the VIASAT-KA 89W satellite has not been fully designed, 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-KA 89W 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-KA 89W satellite will carry a rugged propulsion system capable of withstanding collision with small debris.

A.11.2 Minimizing Accidental Explosions

ViaSat and its spacecraft manufacturer will assess and limit the probability of accidental explosions during and after completion of mission operations. The satellite will be designed 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 propulsion subsystem pressure vessels will be designed with high safety margins. Bipropellant mixing is prevented by the use of valves that prevent backwards flow in propellant lines and pressurization lines. All pressures, including those of the batteries, will be monitored by telemetry. At end-of-life and once the satellite has been placed into its final disposal orbit, ViaSat will remove all stored energy from the spacecraft by depleting any residual fuel, leaving all fuel line valves open, venting the pressure vessels and the batteries will be left in a permanent state of discharge.

A.11.3 Safe Flight Profiles

In considering current and planned satellites that may have a station-keeping volume that overlaps the VIASAT-KA 89W 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 88.9° W.L. have also been reviewed.

Intelsat operates the C-/Ku-/Ka-band GALAXY-28 satellite at 89° W.L. with an east-west station-keeping tolerance of ±0.05°. There are no pending applications before the Commission for a satellite at a location within ±0.15° of 88.9° W.L. With respect to published ITU filings, there are a number of USA filings at 89° W.L. which are used in support of the GALAXY-28 satellite. There is also a USA Ka-band filing at 89° W.L. which was previously submitted on behalf of ViaSat. ViaSat is not aware of any satellite with an overlapping station-keeping volume with the VIASAT-KA 89W satellite that is the subject of an ITU filing and which is either in orbit or progressing towards launch.

Based on the preceding, ViaSat seeks to locate the VIASAT-KA 89W satellite at 88.9° W.L. in order to eliminate the possibility of any station-keeping volume overlap with the GALAXY-28 satellite. ViaSat therefore concludes that physical coordination of the VIASAT-KA 89W satellite with another party is not required at the present time.

A.11.4 Post-Mission Disposal

At the end of the operational life of the VIASAT-KA 89W 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" = 105.1 m^2

"M" = Dry Mass of Satellite = 3168 kg

"C_R" = Solar Pressure Radiation Coefficient = 1.9

Therefore the Minimum Disposal Orbit Perigee Altitude:

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

= 36,021 km + 1000 x 1.9 x 105.1/3168

= 36,084 km

= 298 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 11 kg of propellant that will be reserved, taking account of all fuel measurement uncertainties, to perform the final orbit raising maneuver.

A.12 PREDICTED RECEIVER AND TRANSMITTER CHANNEL FILTER RESPONSE CHARACTERISTICS

The predicted receiver and transmitter frequency responses of each 500 MHz or 1000 MHz channel, as measured between the receive antenna input and transmit antenna, fall within the limits shown in Table A.12-1 below. In addition, the frequency tolerances of §25.202(e) and the out-of-band emission limits of §25.202(f) (1), (2) and (3) will be met.

Table A.12-1: Predicted Channel Receiver and Transmitter Frequency Responses

Frequency Rx/Tx (MHz)	Receiver Frequency Response (dB) (without NGSO)	Receiver Frequency Response (dB) (with NGSO)	Transmit Frequency Response (dB) (without NGSO)	Transmit Frequency Response (dB) (with NGSO)
28000/18200	<-20.0	<-20.0	<-20.0	<-20.0
28100/18300	> -3.0	>-3.0	>-3.0	>-3.0
28200/18400	> -1.7	>-2.0	>-1.5	>-1.5
28300/18500	> -1.5	>-1.7	>-0.75	>-0.75
28400/18600	>-1.5	>-1.5	>-0.5	>-0.5
28500/18700	>-1.7	>-1.5	>-0.5	>-0.5
28600/18800	>-3.0	>-1.5	>-0.5	>-0.5
28700/18900	<-20.0	>-1.5	>-0.5	>-0.5
28800/19000	<-20.0	>-1.5	>-0.5	>-0.5
28900/19100	<-20.0	>-1.7	>-0.5	>-0.5
29000/19200	<-20.0	>-2.0	>-0.5	>-0.5
29100/19300	<-20.0	>-3.0	>-0.5	>-0.5
29200/19400	<-20.0	<-20.0	N/A	N/A
29300/19500	<-20.0	<-20.0	N/A	N/A
29400/19600	<-20.0	<-20.0	N/A	N/A
29500/19700	>-3.0	<-20.0	>-0.5	>-0.5
29600/19800	>-1.7	<-20.0	>-0.5	>-0.5
29700/19900	>-1.5	<-20.0	>-0.5	>-0.5
29800/20000	>-1.5	<-20.0	>-0.75	>-0.75
29900/20100	>-1.7	<-20.0	>-1.5	>-1.5
30000/20200	>-3.0	<-20.0	>-3.0	>-3.0
30100/20300	<-20.0	<-20.0	<-20.0	<-20.0

Note: "N/A" indicates that transmit frequency response is not applicable because signal is attenuated by the input frequency response.

A.13 SPACECRAFT LIFETIME AND RELIABILITY

The VIASAT-KA 89W satellite will be designed for a 15 year life once on station. The probability of the entire satellite successfully operating throughout this period is 0.55 with the probability of the payload and bus operating throughout this period is 0.71 and 0.77, respectively. These numbers are based on documented failure rates of all critical components in the satellite bus and payload.

A.14 SCHEDULE S SECTION S7(N)

In response to section S7 (n) of the Schedule S form, the receive system noise temperature is 218776 K for beams TCR and TCL (on-station telecommand) and 416869 K for beam BNR (autotrack beacon). The Schedule S software does not allow a receive system noise temperature of greater than approximately 32800 K to be entered into the form. Because the receive system noise temperatures for receive beams TCR, TCL and BNR are greater than 32800 K, the Schedule S fields for the receive system noise temperatures of these beams have been left blank. ViaSat requests a limited waiver of Section 25.114(c) the Commission's rules to the extent necessary.

A.15 WAIVER REQUEST

ViaSat requests a waiver of the requirement in Section 25.210(i) of the Commission's Rules, 47 C.F.R. § 25.210(i), which 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-KA 89W satellite's uplink spot beam receive antennas (both A-Type and B-Type Spot Beams) provide a minimum cross-polarization of 26 dB. In support of its requested waiver, ViaSat notes that the small cross-polarization shortfall is in the uplink direction only and therefore will have no adverse effect on adjacent satellite networks.[7] Further, the satellite's cross-polarization isolation performance has been fully 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 slightly reduced cross-polarization isolation performance. Grant of the requested waiver is also consistent with prior Commission decisions granting similar waivers of Section 25.210(i).[8]

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7 Receive cross-polarization interference is an intra-system design issue, and does not affect adjacent satellite networks.

8 *See, e.g.*, ViaSat, Inc., File Nos. SAT-LOI-20080107-00006, SAT-AMD-20080623-00131, SAT-AMD-20090213-00023, Call Sign S2747, Attachment – Conditions for Letter of Intent at ¶ 5 (granted Aug. 18, 2009).

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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Telecomm Strategies Canada, Inc.
Ottawa, Ontario, Canada
(613) 270-1177

ATTACHMENT B

Intelsat Consent Letter

January 27, 2014

Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

Attn: International Bureau

Re: Consent of Intelsat License LLC to ViaSat, Inc. Application for a Ka-band Satellite at 89° W.L.

Intelsat License LLC ("Intelsat") holds a license from the Commission to operate the Galaxy-28 satellite at the nominal 89° W.L. orbital location in the 19.7-20.2 GHz and 29.5-30.0 GHz segments of the Ka-band, as well as in portions of the C-band and Ku-band (Call Sign S2160) (the "Galaxy-28 License"). Intelsat and ViaSat, Inc. ("ViaSat") have filed with the Commission an application to assign to ViaSat the Ka-band payload on the Galaxy-28 satellite and the Ka-band portion of the Galaxy-28 License (the "Ka-band License"). *See* IBFS File No. SAT-ASG-20130515-00070. Intelsat consents to ViaSat's filing of an application seeking authority from the Commission with respect to a new Ka-band satellite at the nominal 89° W.L. orbital location notwithstanding Intelsat's holding the Ka-band License.

Respectfully submitted,

Jean Flavien Bachabi
Deputy Chairman
Intelsat License LLC