Before the
Federal Communications Commission
Washington, DC 20554

In the Matter of	)	
	)	
VIASAT, INC.	)	File No. SAT-LOA- _____________
	)	
Application for Authority to Launch and Operate a Ka-Band Satellite at 89.1º W.L.	)	

APPLICATION FOR AUTHORITY TO LAUNCH AND OPERATE A KA-BAND SATELLITE AT 89.1º W.L.

ViaSat, Inc. ("ViaSat"), pursuant to Section 25.114 of the rules of the Federal Communications Commission ("FCC" or "Commission"),[1] hereby requests authority to launch and operate a Ka-band satellite at the 89.1º W.L. orbital location (the "VIASAT-89W" satellite). In particular, ViaSat seeks authority to serve: (i) CONUS and parts of South America using spectrum at 18.3-18.8 GHz (downlink) and 28.1-28.6 GHz (uplink); and (ii) only parts of South America using spectrum at 19.7-20.2 GHz (downlink) and 29.5-30.0 GHz (uplink). This spectrum is unoccupied in these regions and is currently available for assignment to ViaSat and use by the VIASAT-89W satellite.

Intelsat North America LLC ("Intelsat") currently operates a Ka-band payload on a hybrid satellite (Call Sign S2160) at 89° W.L. using a limited frequency range (19.7-20.2 GHz (downlink) and 29.5-30.0 GHz (uplink)) and providing coverage only of North America.[2] Intelsat has filed an application seeking authority to operate a second Ka-band spacecraft at that

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1 47 C.F.R. § 25.114.

2 S2160 is designed and licensed to use Ka band spectrum only at 19.7-20.2 GHz (downlink) and 29.5-30.0 GHz (uplink) and only to serve North America. *See Loral SpaceCom Corp. and Loral Space and Communications Corp.*, Memorandum Opinion, Order and Authorization, 18 FCC Rcd 6301 (2003).

nominal location using additional portions of the Ka band and broader geographic coverage.[3] ViaSat has coordinated its proposed operations with Intelsat to avoid any potential issues arising from the co-frequency use of spectrum at the same orbital location. As a result of this coordination, Intelsat will soon amend its pending application for the second spacecraft to remove any frequency/coverage overlap and otherwise ensure consistency with this application.

As demonstrated below, ViaSat is legally and technically qualified to launch and operate its proposed satellite. Grant of this application would serve the public interest by facilitating ViaSat's efforts to provide next-generation satellite broadband services throughout CONUS and parts of South America, including in areas that otherwise would be unserved or underserved, consistent with the objectives of the National Broadband Plan. Technical information relating to the proposed satellite is provided on Schedule S and in narrative form in Attachment A hereto.[4]

I. VIASAT IS QUALIFIED TO HOLD THE AUTHORIZATIONS REQUESTED HEREIN

A. Background on ViaSat

ViaSat is a Delaware corporation engaged principally in the business of providing communications solutions, including 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. ViaSat has previously

3 *See* IBFS File No. SAT−LOA−20090227−00029.

4 47 C.F.R. §25.114(c) and (d).

demonstrated its qualifications as a Commission licensee of satellite space stations, earth stations, and VSAT networks.

In particular, ViaSat holds a Commission authorization to serve the United States using a spacecraft to be located at 115.1º W.L. and operated under authority of the government of the Isle of Man, and scheduled for launch in early 2011 ("ViaSat-1"). ViaSat also holds a license issued by the Commission for an unlaunched Ka band spacecraft at 77.3º W.L. ViaSat views the opportunity to deploy a Ka-band satellite at 89.1º W.L. as another important facet in the continuing development and optimization of its satellite broadband services and networks. Among other things, such deployment would provide ViaSat with the opportunity to have in-orbit, redundant coverage of most of the service area of ViaSat-1.

B. Spectrum Availability

In this application, ViaSat seeks authority to serve: (i) CONUS and parts of South America using spectrum at 18.3-18.8 GHz (downlink) and 28.1-28.6 GHz (uplink); and (ii) parts of South America using spectrum at 19.7-20.2 GHz (downlink) and 29.5-30.0 GHz (uplink). No other satellite operates in those parts of the Ka-band in the same geographic area and within two degrees of the proposed orbital location. As noted above, Intelsat's spacecraft at 89° W.L. (Call Sign S2160) serves only North America using spectrum at 19.7-20.2 GHz (downlink) and 29.5-30.0 GHz (uplink). VIASAT-89W would use those bands only to serve parts of South America. The geographic separation between the co-frequency operations of VIASAT-89W and Intelsat's spacecraft would provide adequate isolation to ensure technical compatibility. Therefore, this application is fully consistent with the procedures set forth by the Commission in the *Space Station Licensing Reform Order* regarding processing of GSO-like services.[5]

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[5] *See Amendment of the Commission's Space Station Licensing Rules and Policies, Mitigation of Orbital Debris*, First Report and Order and Further Notice of Proposed

ViaSat acknowledges that the 28.1-28.35 GHz band is allocated for LMDS operations on a primary basis and GSO 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.[6] ViaSat's planned ground network would incorporate a limited number of such gateway earth stations. The gateway terminals operating on a secondary basis would employ interference mitigation techniques, such as shielding, and would be placed in locations that would avoid interference into LMDS stations. The applications for those earth stations would include a technical analysis demonstrating that the proposed operations would not cause harmful interference into any licensed LMDS spectrum.[7]

The Commission has previously authorized secondary gateway-type operations in this band, and has recognized that such operations may coexist with primary LMDS operations.[8] Consistent with the secondary nature of the GSO FSS allocation, earth station transmissions would cease in the event of harmful interference to LMDS operations.

Rulemaking, 18 FCC Rcd 10760, at ¶ 113 (2003) ("*Space Station Licensing Reform Order*").

6 *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*, 12 FCC Rcd 12545, at ¶ 45 (1998) ("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.").

7 *See Teledesic Corporation*, 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).

8 *See id*.

C. Services to be Supported

ViaSat's proposed satellite is designed to provide a wide array of communications services to meet the two-way communication needs of individual and commercial users in the U.S. The continuing demand for high-speed, high-capacity broadband access, particularly in rural areas that are difficult to reach using existing terrestrial technologies, and in unserved and underserved pockets of urban and suburban areas, highlights the demand for the broadband services that ViaSat proposes to provide using the VIASAT-89W satellite. All of the capacity on the VIASAT-89W satellite would be provided on a non-common carrier basis.[9]

ViaSat's proposed Ka-band service promises to bring a new and innovative alternative for broadband services to residential consumers and businesses of all sizes. As discussed above, ViaSat has demonstrated its commitment to developing technologies that make the most efficient use of spectrum, responding to customers' expanding needs for greater bandwidth and capacity. ViaSat's proposed system would play a vital role in providing affordable high-data rate communications services and would make use of underutilized Ka-band spectrum. As an innovative leader in the satellite communications market, ViaSat could avail itself of the efficiencies resulting from the combination of ViaSat's technical design capabilities and ground segment resources with its own satellite capacity.

D. Legal Qualifications

ViaSat is legally qualified to hold the space station authorization requested in this application. The information provided in the attached Form 312 and the attached exhibits demonstrates ViaSat's compliance with the Commission's basic legal qualifications. In addition,

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9 *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 satellite licensees to provide capacity on a common carrier basis) ("*DISCO I*").

ViaSat already holds several Commission satellite licenses, such that its legal qualifications are a matter of record before the Commission.[10] Thus, ViaSat is legally qualified to hold the license requested herein.

E. Technical Qualifications

The Form 312, Schedule S, and Attachment A included in this application demonstrate that ViaSat is technically qualified to hold the authorization requested herein. Specifically, ViaSat provides the information currently required by Section 25.114 of the Commission's rules.[11] In addition, Attachment A provides information on ViaSat's compliance with the orbital debris mitigation rules.[12]

F. Other Requirements

ViaSat also meets all other applicable space station licensing requirements. ViaSat would meet the milestone schedule set forth in Section 25.164 of the Commission's rules (*i.e.*, contract in one year, complete critical design review in two years, begin construction in three years, and launch and operate in five years).[13] Additionally, ViaSat would post a bond as required by Section 25.165 of the Commission's rules.[14]

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[10] *C.f. EchoStar Satellite LLC*, Order and Authorization, 20 FCC Rcd 930, at ¶ 6 (2004) (holding that because EchoStar "holds numerous Commission satellite licenses" and because "its legal qualifications are a matter of record before the Commission," EchoStar is "legally qualified to hold a satellite license").

[11] 47 C.F.R. § 25.114.

[12] *Mitigation of Orbital Debris*, Second Report and Order, 19 FCC Rcd 11567 (2004).

[13] See 47 C.F.R. § 25.164.

[14] See 47 C.F.R. § 25.165.

II. GRANT OF THIS APPLICATION WOULD SERVE THE PUBLIC INTEREST

Grant of this application would serve the public interest in several important respects. ViaSat seeks to offer broadband communications services in the U.S. using underutilized Ka-band spectrum resources. As an innovator of satellite communications network technologies, ViaSat intends to utilize Ka-band spectrum to develop faster, more reliable satellite broadband service to residential and business consumers, particularly those in unserved and underserved areas. Grant of this application thus would help further the Commission's goals of enhancing competition and promoting the growth and development of cost-effective broadband services in rural areas, as well as the unserved and underserved pockets of urban and suburban areas.

III. ITU COST RECOVERY

ViaSat is aware that processing fees are currently charged by the ITU for satellite filings, and that Commission applicants are responsible for any and all fees charged by the ITU.[15] ViaSat is aware of and accepts this requirement to pay any ITU cost recovery fees associated with the ITU filings that the Commission makes on behalf of ViaSat for the satellite proposed in this application, as well as any ITU filings associated with any satellite system for which ViaSat may request authorization at a later date.

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15 *See Public Notice: Implementation of ITU Cost Recovery Charges for Satellite Network Filings*, 16 FCC Rcd 18732 (2001).

IV. 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.[16]

V. CONCLUSION

Based on the foregoing, ViaSat respectfully requests that the Commission grant this satellite application.

Respectfully submitted,

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16 *See* 47 U.S.C. § 304.

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-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-89W satellite will operate at the nominal 89° W.L. orbital location and will provide Ka-band services to CONUS and parts of South America. As explained in section A.12.3, ViaSat proposes to offset the satellite by 0.1° from 89º W.L. and to center the station-keeping box at 89.1° W.L.

For service to CONUS, the satellite will operate in the 28.1-28.6 GHz band (Earth-to-space) and the 18.3-18.8 GHz band (space-to-Earth). For service to parts of South America, the satellite will operate in the 28.1-28.6 GHz and 29.5-30.0 GHz bands (Earth-to-space) and the 18.3-18.8 GHz and 19.7-20.2 GHz bands (space-to-Earth). The satellite uses both left and right hand circular polarization (LHCP and RHCP) together with beam separation to achieve full frequency re-use at acceptable levels of co- and cross-polarized intra-system interference.

The VIASAT-89W satellite will provide broadband services to small user antennas. As well, a limited number of larger, gateway-type antennas will be employed. The gateway antennas will have the capability of transmitting in any channel of the 28.1-28.6 GHz and 29.5-30.0 GHz bands. Uplink transmissions in the 28.1-28.35 GHz band will be limited to the gateway antennas. Uplink transmissions from the smaller user antennas will be restricted to the 28.35-28.6 GHz and 29.5-30.0 GHz bands.

A.3 SPACE STATION TRANSMIT AND RECEIVE CAPABILITY

The VIASAT-89W satellite's beam coverage, for both transmit and receive, will consist of a CONUS beam and a South American beam. Both downlink beams provide a peak downlink EIRP of 61.2 dBW and both uplink beams have a peak G/T of 6.5 dB/K.

A.4 FREQUENCY AND POLARIZATION PLAN

The VIASAT-89W satellite's frequency plan and beam-connectivity is provided in the Schedule S form. There are a total of twenty-four channels, although only sixteen of these can be active at any one time so as to not exceed the available spacecraft power. All channels have a bandwidth of 110 MHz channels.

For the 28.1-28.6 GHz and 18.3-18.8 GHz bands, four transponders are nominally assigned for inter-CONUS traffic and four transponders are nominally assigned for inter-South American traffic, although any of the four CONUS transponders can be switched to downlink to the South American beam and any of the four South American transponders can be switched to downlink to the CONUS beam. For the 29.5-30 GHz and 19.7-20.2 GHz bands, there are eight transponders permanently assigned for inter-South American traffic.

For the 28.1-28.6 GHz and 18.3-18.8 GHz bands, the satellite will employ full frequency re-use through the use of two spatially separated beams: the CONUS and South American beams. Each beam operates in a single polarization and the two beams operate in opposite polarizations from each other. For the 29.5-30 GHz and 19.7-20.2 GHz bands, full frequency re-use is obtained through the use of dual orthogonal polarizations. These satisfy the requirements of §25.210(d) of the Rules.

A.5 SERVICES TO BE PROVIDED

The VIASAT-89W satellite will be capable of providing a variety of FSS services including high capacity, two-way, broadband communications. Representative link budgets, which include details of the transmission characteristics, performance objectives and earth station characteristics, are provided in the associated Schedule S submission. All link budgets assume both the uplink and downlink locations lie on the -3 dB gain contour and with a 35 degree elevation angle between the relevant earth station antenna and the satellite. A rain rate of 58.6 mm/hour has been assumed. All link budgets assume an interference environment of six adjacent satellite networks spaced ±2°, ±4° and ± 6° away from the VIASAT-89W satellite and transmitting at the levels of §25.138. As described in section A.9, the link budgets for the 29.5-30 GHz / 19.7-20.2 GHz bands also take into account worst-case interference levels from the operational and proposed Intelsat satellite networks; both nominally at 89°W.L.

A.6 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. The TT&C sub-system will operate at the edges of the 28/18 GHz frequency bands 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 CONUS beam is used. The TT&C earth station locations have not yet been selected.

A.7 TWO DEGREE COMPATIBILITY

All transmissions of the VIASAT-89W 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.

A.7.1 Frequency Bands Subject to §25.138

For those frequency bands subject to §25.138, compliance with the Commission’s two-degree spacing policy is assured 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 7-1 compares the uplink input power densities derived from the uplink link budgets (uplink locations moved to the -6 dB contour) that are contained in the Schedule S form with the clear sky limits of §25.138 (a)(1) of the Rules. It can be seen that in all cases the clear sky uplink power limits are met. No authorized uplink transmissions towards the VIASAT-89W satellite will exceed the clear sky uplink off-axis EIRP density limits of §25.138(a)(1). In addition, authorized transmitting earth station antennas will meet the requirements of §25.209(a) and (b).

Table 7-1. Demonstration of Compliance with the Uplink Power limits of §25.138 (a)(1)

Uplink Antenna Size (m)	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)
7.3	110MG7D	-63.4	-56.5	6.9
0.95	2M75G7D	-56.6	-56.5	0.1
0.95	2M07G7D	-56.65	-56.5	0.15
0.67	1M38G7D	-56.6	-56.5	0.1
0.67	900KG7D	-56.7	-56.5	0.2

The maximum downlink EIRP density and hence the maximum PFD levels that will be transmitted by the VIASAT-89W satellite occurs with the transponder-saturating single-carrier 110 MHz emission. Tables 7-2 and 7-3 show the maximum PFD levels that will be transmitted by the CONUS and South American beam, respectively, and compare those to the PFD levels of §25.138(a)(6). It can be seen that the maximum PFD levels are below those of §25.138(a)(6) for both beams. No downlink transmissions from the VIASAT-89W satellite will exceed the PFD levels of §25.138(a)(6).

Tables 7-2 and 7-3 also serve to demonstrate compliance with the PFD limits of §25.208(c) and §25.208(d).

Table 7-2. Maximum PFD levels for the CONUS beam.

Maximum EIRP (dBW)	61.2						
Occupied Bandwidth (MHz)	93.62						
Elevation Angle (degrees)	0	5	10	15	20	25	Boresight
Beam Contour (dB)	-24.2	-22.2	-17.6	-13.9	-8.8	-5.2	0
Spreading Loss (dB/ m^2)	163.4	163.3	163.2	163.0	162.9	162.8	162.3
Maximum PFD (dBW/m^2/MHz)	-146.0	-143.9	-139.2	-135.4	-130.2	-126.5	-120.7
FCC PFD Level (dBW/m^2/MHz)	-118	-118	-118	-118	-118	-118	-118
Margin (dB)	28.0	25.9	21.2	17.4	12.2	8.5	2.7

Table 7-3. Maximum PFD levels for the South American beam (applicable to either downlink band).

Maximum EIRP (dBW)	61.2						
Occupied Bandwidth (MHz)	93.62						
Elevation Angle (degrees)	0	5	10	15	20	25	Boresight
Beam Contour (dB)	-12.4	-11.9	-10.3	-8.2	-6.0	-3.9	0
Spreading Loss (dB/ m^2)	163.4	163.3	163.2	163.0	162.9	162.8	162.6
Maximum PFD (dBW/m^2/MHz)	-134.2	-133.6	-131.9	-129.7	-127.4	-125.2	-121.0
FCC PFD Level (dBW/m^2/MHz)	-118	-118	-118	-118	-118	-118	-118
Margin (dB)	16.2	15.6	13.9	11.7	9.4	7.2	3.0

A.7.2 Two-Degree Compatibility Demonstration for the 28.1-28.35 GHz Band

In order to demonstrate two-degree compatibility, the uplink transmission parameters of the gateway antennas have been assumed as both the wanted and victim carriers. Since the uplink input power densities for both the wanted and victim carriers are assumed to be identical, the uplink C/I is simply the difference between the on-axis gain and the off-axis gain. The uplink C/I ratio is calculated as follows:

$$(C/I)_{up} = G_{max} - (29-25*\log(\theta))$$

$$= 64.9 - (29-25*\log(2)) = 43.4 \text{ dB}$$

The calculated C/I ratio is quite large and clearly demonstrates two-degree compatibility. Note the above calculation did not take into account any advantage for topocentric-to-geocentric conversion.

A.8 SHARING WITH LMDS AND NGSO FSS IN THE 28.1-28.35 GHZ BAND

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 earth stations that are located in the Continental 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 primarily through geographic separation between the gateway antennas and the LMDS stations. Shielding may also be used, if necessary. Regarding §2.105(c)(2)(ii), transmitting LMDS stations cannot cause harmful interference into a gateway since the gateway antenna does not receive transmissions in the 28.1-28.35 GHz band. Harmful interference occurring from the aggregation of transmitting LMDS stations into either of the receive satellite beams of the VIASAT-89W 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.

ViaSat expects to deploy gateway antennas at various locations within the U.S. and outside the United States as well. The locations have not yet been selected. The gateway locations will be selected such that sufficient geographical separation from existing LMDS stations is achieved. The applications for those earth stations will need to include a technical analysis to demonstrate that the proposed operations will not cause harmful interference into any licensed LMDS station. The earth station licensee will need to take appropriate actions to protect any future licensed LMDS station that has the potential to receive harmful interference from its gateways, including ceasing transmissions if necessary.

Currently there are no operational NGSO systems authorized by the Commission to use the 28.1-28.35 GHz band, nor are there any pending applications before the Commission for use of the 28.1-28.35 GHz band by a NGSO system. Accordingly, there is no requirement to demonstrate technical compatibility with any NGSO system.

A.9 COMPATABILITY WITH OPERATIONAL AND PROPOSED INTELSAT SATELLITE NETWORKS NOMINALLY AT 89°W.L.

Intelsat operates the GALAXY-28 satellite at 89°W.L. The satellite includes a Ka-band payload which is used to provide service to CONUS. The payload has twenty four uplink beams and four downlink beams as shown in Figure 9-1. The Ka-band payload operates in the 29.5-30 GHz and 19.7-20.2 GHz bands only.

Intelsat has a pending application before the Commission seeking authority to operate the GALAXY KA satellite at 89.1°W.L.[1] ViaSat has coordinated its proposed operations with Intelsat. As a result of this coordination, Intelsat will soon amend its pending application for the GALAXY KA satellite to:

a) remove the 28.35-28.6 GHz and 18.3-18.8 GHz bands, such that there will be no frequency overlap in these bands with the VIASAT-89W satellite; and,

b) remove its South American beam, thereby ensuring there is no coverage overlap with the VIASAT-89W satellite's South American beam.

Intelsat will retain the GALAXY KA satellite's North American beam, which is shown in Figure 9-2. This beam as proposed will utilize the 29.5-30 GHz and 19.7-20.2 GHz bands. Therefore there is frequency overlap with the VIASAT-89W satellite's South American beam.

In order to demonstrate compatibility of the Intelsat networks causing interference into the VIASAT-89W network for this co-frequency, non-co-coverage situation, the South American link budgets embedded in the associated Schedule S form include worst-case interference

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[1] *See* IBFS File No. SAT−LOA−20090227−00029.

calculations from the Intelsat networks. Specifically, the following transmissions associated with the Intelsat North American beams have been assumed as collocated interference sources:

Uplink Input Power Density:	-56.5 dBW/Hz into a 6 meter antenna
Downlink EIRP Density:	-16.3 dBW/Hz

Note that the above interfering uplink input power density assumption is considered to be an unrealistic situation considering this maximum allowable uplink input power density is normally associated with small transmitting antennas, but it leads to a worst-case interference scenario. As well, the downlink EIRP density is the maximum that can be transmitted by either Intelsat satellite. Finally, 30 dB of spatial isolation was assumed between Intelsat's beams and ViaSat's South American beam. The link budgets demonstrate that the VIASAT-89W services can achieve their performance objectives within this assumed interference environment.

ViaSat has successfully coordinated its proposed South American operations with Intelsat and therefore a technical compatibility analysis of the ViaSat-89W satellite network interfering into Intelsat's networks has not been provided herein.

Figure 9-1. GALAXY-28 satellite's Ka-band Beams (uplink beams in red; downlink in yellow).

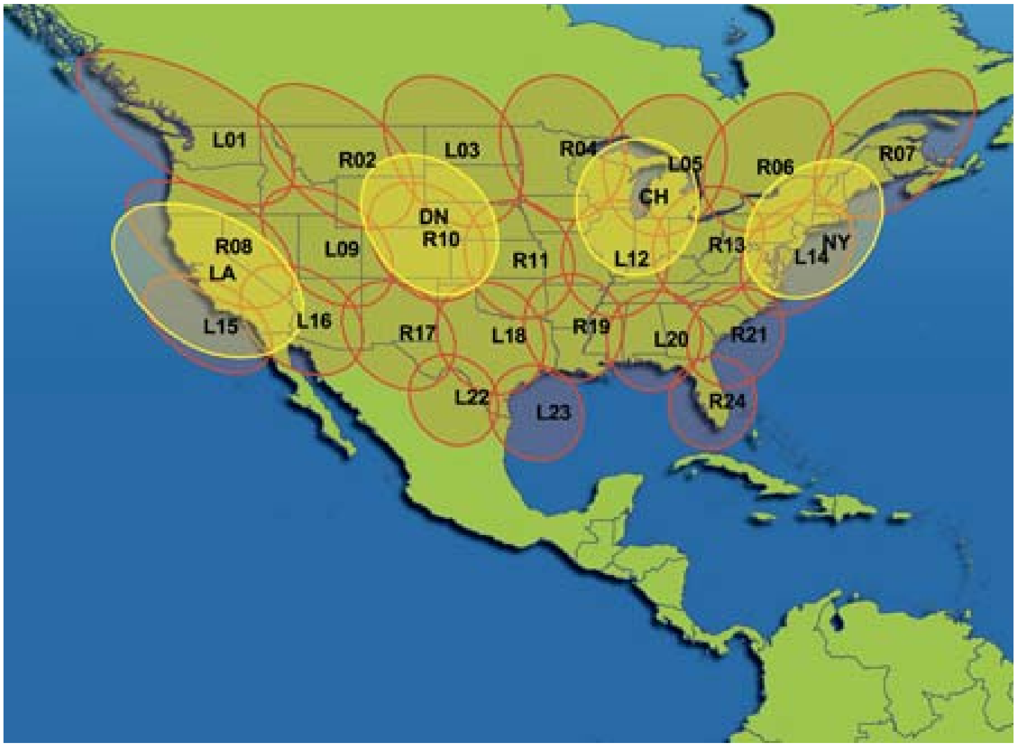
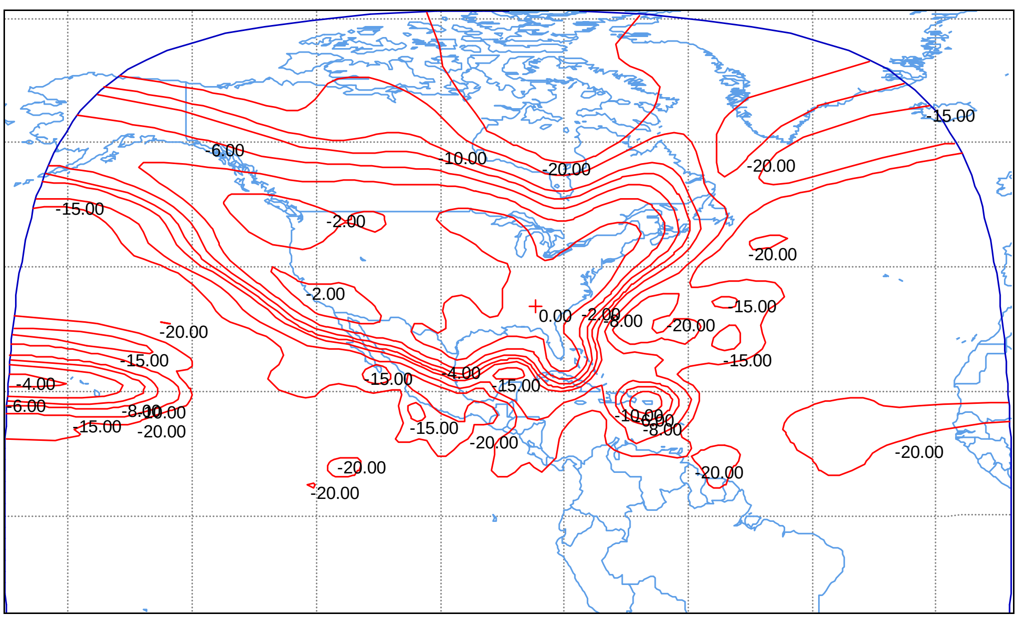


Figure 9-2. GALAXY KA satellite's North American Beam (uplink and downlink).



A.10 SPACECRAFT LIFETIME AND RELIABILITY

The spacecraft manufacturer for the VIASAT-89W satellite has not yet been selected. The payload design of the satellite has been based around the expected characteristics of the 3-axis stabilized spacecraft available from the three major U.S. suppliers (Boeing, Lockheed Martin and Loral).

The VIASAT-89W satellite will be designed for a 15 year lifetime. The spacecraft reliability will be consistent with current manufacturing standards in place for the major suppliers of space hardware. Bus reliability will be greater than 0.8 with an overall spacecraft reliability to EOL of greater than 0.75. TWTA and receiver sparing will be consistent with documented failure rates which allow attaining the overall spacecraft reliability numbers stated above.

ViaSat will provide the Commission with full and precise spacecraft physical and electrical characteristics when the satellite manufacturer has been selected and the satellite fully designed. Estimates of these characteristics are included in the Schedule S form.

A.11 PREDICTED RECEIVER AND TRANSMITTER CHANNEL FILTER RESPONSE CHARACTERISTICS

The predicted receiver and transmitter frequency responses of the 110 MHz channels, as measured between the receive antenna input and transmit antenna, are shown in Table 11-1 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 11-1: Predicted Channel Receiver and Transmitter Frequency Responses

	Attenuation Relative to Peak Level (dB)		
Offset from Channel Center Frequency (MHz)	Receive Section	Transmit Section	Total
±18	0.10	0.12	0.22
±28	0.15	0.29	0.44
±38	0.20	0.59	0.79
±49	0.30	0.96	1.26
±55	0.80	2.54	3.34
±67	15.3	10.2	25.5
±78	30.3	25.2	55.5
±92	35.3	25.2	60.5

A.12 ORBITAL DEBRIS MITIGATION PLAN

The spacecraft manufacturer for the VIASAT-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 and ViaSat will provide the Commission with updated information, as appropriate.

A.12.1 Spacecraft Hardware Design

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

A.12.2 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.12.3 Safe Flight Profiles

In considering current and planned satellites that may have a station-keeping volume that overlaps the VIASAT-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, non-USA networks for which a request for coordination has been published by the ITU within ±0.15° of 89.1° 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°. Intelsat also has a pending application before the Commission to operate the Ka-band GALAXY KA satellite at the 89.1°W.L. orbital location. With respect to published ITU filings, there are two Papua New Guinea ("PNG") networks at 89°W.L. ViaSat can find no evidence that these PNG networks are being progressed towards launch.

Based on the preceding, ViaSat seeks to locate the VIASAT-89W satellite at 89.1° W.L. in order to eliminate the possibility of any station-keeping volume overlap with the GALAXY-28 satellite. Nonetheless, there will be overlap between the station-keeping volumes of the VIASAT-89W satellite and the GALAXY KA satellite. ViaSat will therefore engage in physical coordination with Intelsat to ensure that a physical collision between the two satellites will not occur. There are two possible solutions to be investigated. The first is to have both satellites simultaneously operated ("flown") under common control. In this regard, the controlling operator would use the well-documented eccentricity and inclination collocation strategy for control of the two satellites. Using this approach, two spacecraft can be controlled with the same station-keeping limits of ±0.05 degrees in both latitude and longitude and still maintain a minimum close approach of no smaller than 5 km between satellites. Alternatively, ViaSat would operate at a location offset from 89.1°W.L. In the event that a coordination agreement requires operation offset from 89.1°W.L., ViaSat will seek any necessary modifications to its authorization from the Commission.

A.12.4 Post-Mission Disposal

At the end of the operational life of the VIASAT-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" = 96 m^2

"M" = Dry Mass of Satellite = 3350 kg

"C_R" = Solar Pressure Radiation Coefficient = 2 (worst case)

Therefore the Minimum Disposal Orbit Perigee Altitude is calculated as:

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

= 36,021 km + 1000 x 2 x 96/3350

= 36,078.3 km

= 292.3 km above GSO (35,786 km)

To provide adequate margin, the disposal orbit will be increased to 300 km. This will require approximately 14.8 kg of propellant, taking account of all fuel measurement uncertainties, which will be allocated and reserved in order to perform the final orbit raising maneuver.

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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