Approved by OMB
3060-0678

Date & Time Filed: Feb 7 2007 3:14:48:743PM
File Number: SAT-MOD-20070207-00027

S2237 Intelsat 11 @ 43.1 W Lc

FCC APPLICATION FOR SPACE AND EARTH STATION:MOD OR AMD - MAIN FORM FCC 312 MAIN FORM FOR OFFICIAL USE ONLY	FCC Use Only

APPLICANT INFORMATION
Enter a description of this application to identify it on the main menu:
Modification of Authority To Launch and Operate a C/Ku-band Satellite at 169 E.L.

1-8. Legal Name of Applicant

Name:	PanAmSat Licensee Corp.	**Phone Number:**	202-944-7848
DBA Name:		**Fax Number:**	202-944-7870
Street:	3400 International Drive, N.W.	**E-Mail:**	susan.crandall@intelsat.com
City:	Washington	**State:**	DC
Country:	USA	**Zipcode:**	20008 -3006
Attention:	Susan H. Crandall		

1

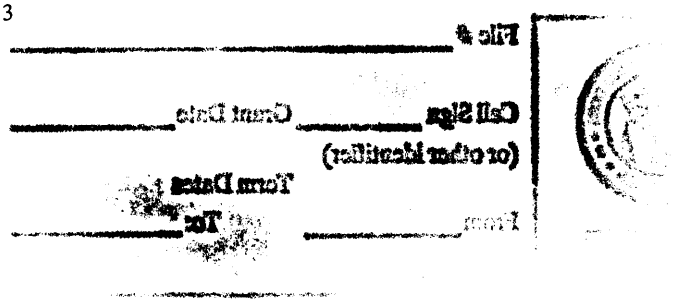
GRANTED

File # SAT-MOD-20070207-00027
Call Sign [redacted] Grant Date 10/4/07
(or other identifier)
Term Dates
From To
Approved:

w/conditions

Policy Branch Chief

17c. Is a fee submitted with this application? ● If Yes, complete and attach FCC Form 159. If No, indicate reason for fee exemption (see 47 C.F.R.Section 1.1114). ○ Governmental Entity ○ Noncommercial educational licensee ○ Other(please explain):	
17d. Fee Classification BFY – Space Station Modification(Geostationary)	
18. If this filing is in reference to an existing station, enter: (a) Call sign of station: S2237	19. If this filing is an amendment to a pending application enter both fields, if this filing is a modification please enter only the file number: (a) Date pending application was filed: (b) File number: SATLOA1996041900059



Attachment
Conditions of Authorization
IBFS File Nos. SAT-MOD-20070207-00027, SAT-AMD-20070716-00102
Call Sign: S2237
October 4, 2007

PanAmSat Licensee Corp.'s (PanAmSat)'s request to modify its authority to construct, launch, and operate a C and Ku-band satellite, INTELSAT 11,[1] IBFS File No. SAT-MOD-20070207-00027 as amended by SAT-AMD-20070716-00102 (Call Sign: S2237), at the 43.1° W.L orbital location IS GRANTED. Accordingly, PanAmSat is authorized to provide Fixed Satellite Services (FSS) in the 3700-4200 MHz (space-to-Earth), 5925-6425 MHz (Earth-to-space), 10.70-11.45 GHz (space-to-Earth), 12.75-13.25 GHz (Earth-to-space) and 13.75-14.00 GHz (Earth-to-space) frequency bands[2] using the INTELSAT 11 satellite at the 43.1° W.L orbital location, in accordance with the technical specifications set forth in application, this Attachment, and the Commission's Rules and subject to the following conditions:

1. PanAmSat shall operate the INTELSAT 11 satellite at the 43.1° W.L orbital location in compliance with all existing or future coordination agreements for that location.
2. PanAmSat shall prepare the necessary information, as may be required, for submission to the International Telecommunication Union (ITU) to initiate and complete the advance publication, international coordination, due diligence, and notification process of this space station, in accordance with the ITU Radio Regulations. PanAmSat shall be held responsible for all cost-recovery fees associated with these ITU filings. We also note that no protection from interference caused by radio stations authorized by other administrations is guaranteed unless coordination and notification procedures are timely completed or, with respect to individual administrations, by successfully completing coordination agreements. Any radio station authorization for which coordination has not been completed may be subject to additional terms and conditions as required to effect coordination of the frequency assignments of other administrations. *See* 47 C.F.R. §25.111(b).
3. INTELSAT 11 must begin providing service at the 43.1° W.L orbital location in the C- and Ku-bands before the satellites it is replacing discontinue service.[3] Failure to meet this milestone shall render this authorization null and void.

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[1] As part of its modification request, PanAmSat changed the name of the satellite from PAS-4R to INTELSAT 11.

[2] We note that PanAmSat's modification application for INTELSAT 11 does not include a request for the request for the 11.7-12.2 GHz, 12.5-12.75 GHz, and 14.0-14.5 GHz frequency bands. These bands are authorized for use on the PAS-2R satellite at the 43° W.L orbital location.

[3] Among other things, a replacement satellite is one that is scheduled to be launched so that it will be brought into use at approximately the same time as, but no later than, the existing satellites are retired. 47 C.F.R. § 25.165(e)(2).

4. PanAmSat's request for waiver of Section 25.210(i), of the Commission's rules, 47 C.F.R. § 25.210(i), IS GRANTED as conditioned. Section 25.210(i) directs, "Space station antennas in the Fixed-Satellite Service must be designed to provide a cross-polarization isolation such that the ratio of the on axis co-polar gain to the cross-polar gain of the antenna in the assigned frequency band shall be at least 30 dB within its primary coverage area." PanAmSat indicates that the cross-polarization isolation ratio for INTELSAT 11 C-band receive antenna is at least 30 dB in its primary coverage area, except Southern Chile and a small area in the northeast section of South America, where it is greater than 25 dB; in small sections of the northeast United States where the cross-polarization isolation ratio ranges from 18 to 30dB; and northern regions of Great Britain and Ireland where the cross-polarization is greater than 24 dB. Similarly, the cross-polarization isolation ratio for INTELSAT 11's C-band transmit antenna is at least 30 dB in its primary coverage area, except for west central South America and southern sections of Chile and Argentina, where the cross-polarization isolation ratio is equal to or greater than 24 dB; and northern sections of Europe, where the cross-polarization isolation ratio is greater then 25 dB. Also, INTELSAT 11's Ku-band receive antenna provides a cross-polarization isolation ratio of at least 30 dB in its primary coverage area, except for small sections of the southern and northern United States, where it is equal to or greater than 26 dB. We find that these shortfalls will not produce a significant increase in interference, except to the applicant itself, and will not adversely affect any other operator. As a condition of the grant of this waiver, PanAmSat must accommodate future satellite networks serving the United States that are two-degree compliant. Grant of this waiver request is consistent with our precedent.[4]

5. PanAmSat's request for a waiver of Section 25.210(a)(3) of the Commission's rules, 47 C.F.R. § 25.210(a)(3), IS GRANTED as conditioned. Section 25.210(a)(3) of the Commission's rules requires all space stations in the Fixed-Satellite Service in the C-band to be capable of switching polarization sense upon ground command.[5] PanAmSat acknowledges that the polarization of INTELSAT 11's C-band and Ku-band channels cannot be switched. The only operating co-frequency spacecraft located within 2 degrees of 43.1° W.L. is the IS-1R satellite operated by Intelsat. PanAmSat indicates that it will minimize any impact to IS-1R through coordination. As a condition of the grant of this waiver, PanAmSat must accommodate future satellite networks serving the United States that are compliant with section 25.210(a)(3). Grant of this waiver request is consistent with our precedent.[6]

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[4] Star One S.A.; Petition for Declaratory Ruling to Add The Star One C1 Satellite at 65° W.L. to the Permitted Space Station List, *Order*, 19 FCC Rcd 16334 (Int'l Bur., Sat. Div. 2004) (finding that the impact on neighboring satellite systems of a 3-5dB difference from the required cross polarization isolation ratio would be negligible).

[5] 47 C.F.R. § 25.210(a)(3).

[6] Telesat Canada; Petition for Declaratory Ruling for of Inclusion of ANIK F2 on the Permitted Space Station List, *Order*, 22 FCC Rcd (Int'l Bur., Sat. Div. 2007) (finding that harmful interference had been mitigated with conditions).

6. PanAmSat's request for waiver of Section 25.114(d)(3) of the Commission's rules, 47 C.F.R. § 25.114(d)(3), IS GRANTED. Section 25.114(d)(3) requires predicted space station antenna gain contour(s) for each transmit and each receive antenna beam and nominal orbital location requested. PanAmSat's application indicates that the wide coverage area, global horn, and omni antenna diagrams (Exhibits 6M through 6Q) and the ULPC horn antenna diagrams (Exhibits 6I and 6J) were not prepared in accordance with the parameters specified in Section 25.114(d)(3) of the Commission's Rules because the satellite manufacturer did not provide contours in the required format. We find, however, that Exhibits 6M through 6Q and Exhibits 6I and 6J, together with the descriptive characterization provided in Sections 2.8.1 and 2.9 of the application, respectively,[7] fulfill the requirements of Section 25.114(d)(3). Grant of this waiver request is consistent with our precedent.[8]

7. PanAmSat's request for a partial waiver of Section 25.283(c) of the Commission's rules, 47 C.F.R. 25.283(c), is granted. Section 25.283(c) specifies that space stations must discharge all stored energy sources at end-of-life of the space station. PanAmSat indicates that due to its design, INTELSAT 11's oxidizer tanks cannot be completely depleted but will retain approximately 13 kilograms of the oxidizer (less than a 3% fill fraction) after the oxidizer tanks are isolated from the Liquid Apogee Motor (LAE) and Dual Mode Thrusters (DMTs) immediately following the last orbit-raising maneuver. This waiver is granted because modification of the spacecraft would present an undue hardship, given the late stage of satellite construction. In making this determination, we note that, the information submitted in the application is not sufficient to support a finding that the intent of the rule would be satisfied by the described procedure for sealing the oxidizer tank.

8. The license term for the space station is 15 years and will begin on the date PanAmSat certifies to the Commission that the satellite has been successfully placed into orbit and its operation fully conforms to the terms and conditions of this authorization. 47 C.F.R. § 25.121(d)(1). PanAmSat shall file its certification with the Chief, Satellite Division, International Bureau within 5 business days of the satellite being placed into operation at the 43.1° W.L. orbital location.

9. PanAmSat is afforded thirty days from the date of release of this grant and authorization to decline this authorization as conditioned. Failure to respond within this period will constitute formal acceptance of the authorization as conditioned.

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[7] *See* PanAmSat Licensee Corp. Application for Modification of Authority to Launch and Operate a C/Ku-band satellite at 169° E.L., SAT-MOD-20070207-00027 (Call Sign: S2237), Engineering Statement at 15 and 18.

[8] *See* SES Americom, Inc., Application for Modification of Space Station Authorization, DA 04-1581, *Order and Authorization*, 19 FCC Rcd. 20,377, 20,377-78 (paras. 4-8) (rel. May 27, 2004) (finding that the main purpose of the contour map is to allow evaluation of the potential for harmful interference with other operators and services in the frequency band).

10. This action is issued pursuant to Section 0.261 of the Commission's rules on delegated authority, 47 C.F.R. § 0.261, and is effective immediately. Petitions for reconsideration under Section 1.106 or applications for review under Section 1.115 of the Commission's rules, 47 C.F.R. §§ 1.106, 1.115, may be filed within 30 days of the date of the public notice indicating that this action was taken.

See also
SAT-AMD-20070716-00102

w/conditions

File # SAT-MOD-20070730-00107

Call Sign S2237 Grant Date 10/4/07
(or other identifier)

Term Dates
From launch operations To: + 15 years

Approved: Policy Branch Chief

37. Has the applicant, or any party to this application or amendment, or any party directly or indirectly controlling the applicant ever been convicted of a felony by any state or federal court? If Yes, attach as an exhibit, an explination of circumstances.	○ Yes ◉ No
38. Has any court finally adjudged the applicant, or any person directly or indirectly controlling the applicant, guilty of unlawfully monopolizing or attemptiing unlawfully to monopolize radio communication, directly or indirectly, through control of manufacture or sale of radio apparatus, exclusive traffic arrangement or any other means or unfair methods of competition?If Yes, attach as an exhibit, an explanation of circumstances	○ Yes ◉ No
39. Is the applicant, or any person directly or indirectly controlling the applicant, currently a party in any pending matter referred to in the preceding two items? If yes, attach as an exhinit, an explanation of the circumstances.	○ Yes ◉ No
40. If the applicant is a corporation and is applying for a space station license, attach as an exhibit the names, address, and citizenship of those stockholders owning a record and/or voting 10 percent or more of the Filer's voting stock and the percentages so held. In the case of fiduciary control, indicate the beneficiary(ies) or class of beneficiaries. Also list the names and addresses of the officers and directors of the Filer.	

CERTIFICATION

The Applicant 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, and requests an authorization in accordance with this application. The applicant certifies that grant of this application would not cause the applicant to be in violation of the spectrum aggregation limit in 47 CFR Part 20. All statements made in exhibits are a material part hereof and are incorporated herein as if set out in full in this application. The undersigned, individually and for the applicant, hereby certifies that all statements made in this application and in all attached exhibits are true, complete and correct to the best of his or her knowledge and belief, and are made in good faith.

44. Applicant is a (an): (Choose the button next to applicable response.)

- ○ Individual
- ○ Unincorporated Association
- ○ Partnership
- ◉ Corporation
- ○ Governmental Entity
- ○ Other (please specify)

45. Name of Person Signing	46. Title of Person Signing
Susan H. Crandall	Asst. Gen. Counsel, Intelsat Corporation

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WILLFUL FALSE STATEMENTS MADE ON THIS FORM ARE PUNISHABLE BY FINE AND / OR IMPRISONMENT (U.S. Code, Title 18, Section 1001), AND/OR REVOCATION OF ANY STATION AUTHORIZATION (U.S. Code, Title 47, Section 312(a)(1)), AND/OR FORFEITURE (U.S. Code, Title 47, Section 503).

43. Description. (Summarize the nature of the application and the services to be provided).

PanAmSat Licensee Crop. herein requests modification of its authority to launch and operate a C/Ku-band satellite at 169 E.L. currently known as PAS-4R (call sign S2237). The modified satellite, to be known as Intelsat 11, is scheduled for launch in the third quarter of 2007. PanAmSat seeks to revise the satellite's technical parameters and change the oribtal location to 43 W.L.

Before the
Federal Communications Commission
Washington, DC 20554

In the Matter of PanAmSat Licensee Corp. Application for Modification of Authority to Launch and Operate	File Nos. SAT-MOD-_____ SAT-LOA-19960419-00059; SAT-AMD-19971119-00188; SAT-AMD-20030411-00064; SAT-AMD-20030818-00154; SAT-AMD-20031103-00321; SAT-AMD-20040227-00023

APPLICATION FOR MODIFICATION OF AUTHORITY TO LAUNCH AND OPERATE

PanAmSat Licensee Corp. ("PanAmSat"), pursuant to Sections 25.117 and 25.114 of the Federal Communications Commission's ("FCC" or "Commission") rules,[1] hereby requests modification of its authority to launch and operate a C/Ku-band satellite at 169° E.L. currently known as PAS-4R (call sign S2237). Specifically, by this modification application, PanAmSat seeks to revise the satellite's technical parameters and change the orbital location to 43° W.L. The modified satellite, to be known as Intelsat 11 ("IS 11"), is scheduled for launch in the third quarter of 2007 and will replace the Ku-band satellite commercially known as IS 6B[2] currently operating at 43.1° W.L and the C/Ku-band satellite IS 3R[3] currently operating at 43° W.L. IS 6B and IS 3R are both projected to reach the end of their useful lives in 2008. Grant of this modification will serve the public interest by ensuring continuity of service to U.S. consumers at

[1] *See* 47 C.F.R. § 25.117 and § 25.114.

[2] The call sign for the satellite commercially known as IS 6B is S2359. This satellite was commercially known as PAS-6B but effective February 1, 2007, its name was changed to IS 6B. Letter to Marlene H. Dortch, Secretary, FCC from Susan H. Crandall, Assistant General Counsel, Intelsat Corp. (dated Jan. 8, 2007).

[3] The call sign for the satellite commercially known as IS 3R is PAS-2R. This satellite was commercially known as PAS-3 but effective February 1, 2007, its name was changed to IS 3R. Letter to Marlene H. Dortch, Secretary, FCC from Susan H. Crandall, Assistant General Counsel, Intelsat Corp. (dated Jan. 8, 2007).

II. PROPOSED MODIFICATIONS

A. Technical Modifications

In the attached Form 312, Schedule S, and Engineering Statement, PanAmSat provides the technical information currently required by Section 25.114 of the Commission's rules that is changing as a result of this proposed modification. In addition, PanAmSat's Engineering Statement provides information on its compliance with the Commission's orbital debris mitigation rules.[9]

B. Legal Requirements

PanAmSat will meet the milestone schedule set forth in Section 25.164 of the Commission's rules for its proposed modified satellite.[10] Indeed, PanAmSat already has taken steps toward completing these milestones in that its indirect parent -- Intelsat Corporation (formerly PanAmSat Corporation) -- has contracted with Orbital Sciences Corporation to build the satellite and construction is well under way.

PanAmSat notes that its current license contains a continuity of service condition in lieu of milestones. Specifically, condition 3 of the license requires PanAmSat "to begin providing service at the 169° E.L. orbital location before the satellite it is replacing discontinues service...." PanAmSat requests that the Commission modify this license condition to specify the 43° W.L. orbital location.

PanAmSat's satellite license as modified is not subject to the bond posting requirements of Section 25.165 of the Commission's rules because the satellite to be known as IS 11 will serve

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

[10] 47 C.F.R. § 25.164.

In this case, PanAmSat holds a replacement expectancy for the 43° W.L. orbital location because the Commission authorized PanAmSat to operate PAS-2, PAS-8, IS 6B and IS 3R at the 43° W.L. location. As demonstrated in the Engineering Statement, IS 11 is technically consistent with existing and future satellites operating in a two-degree environment. In addition, operation of IS 11 will be conducted within the international coordination obligations that derive from the ITU Radio Regulations.[14]

The Commission has stated that granting replacement applications ensures that service will be provided to consumers as efficiently as possible because the current licensee will be familiar with the service requirements and, given its experience, should be able to deploy a replacement satellite in the shortest possible time.[15] In the case of satellites reaching the end of their useful lives, the Commission has determined that ensuring continuity of service to customers by granting authority to replace these satellites is in the public interest.[16]

Memorandum Opinion and Order, 3 FCC Rcd 6972, n.31 (1988) and GE American Communications, Inc., Order and Authorization, 10 FCC Rcd 13775, ¶ 6 (Int'l Bur. 1995)).

[14] *Amendment of the Commission's Space Station Licensing Rules and Policies*, 18 FCC Rcd 10760 ¶ 257 (2003) ("We do not require replacement satellites to be technically 'identical' to the existing satellite. We recognize that next-generation satellites will incorporate satellites with technical advancements made since the previous generation satellite was launched. We do not intend to change this policy, which facilitates state-of-the-art systems. Rather, we will continue to assess only whether operations of the replacement satellite will be consistent with our international coordination obligations pursuant to regulations promulgated by the International Telecommunication Union.") (internal citations omitted).

[15] *See* Flexibility for Delivery of Communications by Mobile Satellite Service Providers in the 2 GHz Band, the L-Band, and the 1.6/2.4 GHz Bands, 18 FCC Rcd 1962, ¶ 83 (2003) ("Repairing or even replacing a malfunctioning satellite, for all its complexity, requires less time than designing and constructing a new system. Even in the worst case where a satellite is destroyed, a licensee can ordinarily replace a lost satellite with a ground spare at the next available launch window, or procure a technically identical satellite in an expedient manner since it would have already completed the complex design process.").

[16] GE American Communications, Inc. and Alascom, Inc. for Authorization to Launch and Operate a C-Band Replacement Satellite, Memorandum Opinion, Order and Authorization, 15 FCC Rcd. 23583, ¶ 18 (Int'l Bur. 2000).

Exhibit A
FCC Form 312, Response to Question 34: Foreign Ownership

The Commission previously approved the foreign ownership in PanAmSat Licensee Corp. *See Constellation, LLC, Carlyle PanAmSat I, LLC, Carlyle PanAmSat II, LLC, PEP PAS, LLC, and PEOP PAS, LLC, Transferors and Intelsat Holdings, Ltd., Transferee, Consolidated Application for Authority to Transfer Control of PanAmSat Licensee Corp. and PanAmSat H-2 Licensee Corp.*, Memorandum Opinion and Order, FCC 06-85 (rel. June 19, 2006) ("*Intelsat-PAS Order*"). There have been no material changes to the foreign ownership since the date of the *Intelsat-PAS Order*.

Exhibit C
FCC Form 312, Response to Question 40:
Officers, Directors, and Ten Percent or Greater Shareholders

Following are the officers of PanAmSat Licensee Corp.:

James B. Frownfelter, President & COO
Patricia Casey, General Counsel & Secretary
Anita Beier, Controller
Linda Kokal, Treasurer

The address of all PanAmSat Licensee Corp. officers is:

3400 International Drive NW
Washington, DC 20008-3006

PanAmSat Licensee Corp. is wholly owned by PanAmSat International Systems LLC, which in turn is wholly owned by Intelsat Corporation (formerly known as PanAmSat Corporation). Intelsat Corporation holds 59% of its interest in PanAmSat International Systems LLC directly and 41% indirectly. (Specifically, Intelsat Corporation wholly owns 100% of PanAmSat International Holdings LLC, which wholly owns USHI, LLC, which in turn holds a direct, 41% interest in PanAmSat International Systems LLC.) Intelsat Corporation is wholly owned by Intelsat Holding Corporation (formerly known as PanAmSat Holding Corporation). Intelsat Holding Corporation is wholly owned by Intelsat (Poland) Sp. z.o.o., which is in turn wholly owned by Intelsat (Luxembourg) Sarl, which is in turn wholly owned by Intelsat (Gibraltar), Ltd., which is in turn wholly owned by Intelsat (Bermuda), Ltd. Intelsat (Bermuda), Ltd. is wholly owned by Intelsat, Ltd. Intelsat, Ltd., in turn, is wholly owned by Intelsat Holdings, Ltd.

Following are the officers and directors of Intelsat Holdings, Ltd.:

Officers

Joseph Wright, Chairman
David P. McGlade, Chief Executive Officer
Andrew D. Africk, Deputy Chairman
Jeffrey Freimark, Executive Vice President and Chief Financial Officer
Phillip Spector, Executive Vice President, General Counsel and Assistant Secretary
Gloria Dill, Secretary

Directors

Andrew D. Africk
Douglas Grissom
Richard A. Haight
David P. McGlade

Engineering Statement

1) Introduction

PanAmSat Licensee Corp. ("PanAmSat") seeks authority in this application to operate a new satellite, designated as Intelsat 11 ("IS 11"), from the 43° W.L. orbital location. IS 11 would replace the Ku-band satellite commercially known as IS 6B (previously known as PAS-6B, FCC call sign S2359) currently operating at 43.1° W.L and the C/Ku-band satellite IS 3R (formerly known as PAS-3, FCC call sign PAS-2R) currently operating at 43° W.L. The characteristics of the IS 11 spacecraft as well as its compliance with the various provisions of Part 25 of the Commission's rules are provided in the remainder of this Engineering Statement.

2) Spacecraft Overview

IS 11 is an Orbital Star-2.4 spacecraft that operates on the C-band frequencies of 5925 – 6425 MHz and 3700 – 4200 MHz and Ku-band frequencies of 12750 – 13250 MHz, 13750 – 14000 MHz and 10700 – 11450 MHz. It utilizes 16 C-band transponders to provide service to North and South America and Europe, and 18 Ku-band transponders to provide service to North and South America, Europe and East Brazil.

IS 11 is a 3-axis stabilized type spacecraft, with a rectangular cube main body that supports the antennas and electronics for the various subsystems. It utilizes two deployable reflector antennas, two 4-panel deployable solar array wings and a bi-propellant propulsion system. The on-station configuration of the spacecraft is provided in Exhibit 1. A summary of the basic spacecraft characteristics is provided in Exhibit 2.

2.1) Structure

The structural design of IS 11 provides mechanical support for all subsystems. The structure externally supports the communication antennas, command and telemetry antennas, solar arrays, and thrusters. It also provides a stable platform for preserving the alignment of critical elements of the spacecraft.

The spacecraft takes advantage of a modular design for ease of manufacturing and integration. The primary structure consists of two

gusset and bulkhead panels provide mechanical support to the earth panel and the payload module; and, in conjunction with the other core module panels, act to transfer loads from the payload module to the central cylinder.

In addition to the above described core module panels, there are two pairs of access panels – one pair located on the east side of the spacecraft and another pair located on the west side – that run vertically from the aft section of the structure to the nadir section. These panels close out the east and west sections of the spacecraft. They can be easily removed after the core and payload modules have been mated to permit easy access to the payload or bus equipment.

The payload module consists of the north and south equipment panels and the earth panel. These panels provide mounting surfaces for the payload equipment. The high heat dissipating payload equipment, e.g., output multiplexers, traveling wave tube amplifiers, are generally mounted on the north and south equipment panels. The north and south equipment panels also support the global horn antenna and the wide coverage antennas ("WCAs") of the telemetry, command and ranging systems ("TC&R") and the uplink power control ("ULPC") antenna. The earth panel generally provides mounting surfaces for the lower heat dissipating payload equipment, e.g., C-band receivers, input multiplexers. It also supports the feed horns for the main communication antennas. The earth panel is located at the nadir section of the spacecraft and attaches to the nadir section of the north and south equipment panels. The north and south equipment panels attach to the north and south bus panels. The north and south equipment panels are embedded with heat pipes. A limited heat pipe network is included in the earth panel primarily to transfer heat between the earth panel and the radiator panels – which are attached to the outer face of the north and south equipment and bus panels, thus improving the thermal balance of the satellite.

Attached to the earth panel is the nadir antenna mounting assembly and feed tower. This assembly provides the mounting surface for the nadir communication antenna. The feeds for the nadir antenna are attached on the upper section of the feed tower. The telemetry, command ranging system's omni-directional toroidal antenna (hereafter referred to as the Omni antenna) is mounted atop nadir antenna feed tower.

The battery assemblies are mounted on dedicated panels located on the north

in the panels. Additionally, the earth deck heat pipes provide cross-coupling between the north and south panels for heat load sharing and increase the heat rejection capability of the spacecraft. Multilayer Insulation ("MLI") blankets cover all external areas, except radiative areas. Heaters are used to limit the lower temperature extremes of the electronics as well as the propulsion thrusters and propellant lines.

2.3) Power Subsystem

The Electrical Power Subsystem ("EPS") generates, stores, conditions and protects the satellite's electrical power. It provides the energy required to operate the satellite during all modes of operation. The EPS consists of the solar arrays, batteries, associated power electronics, and power harnesses that integrate and regulate the systems.

IS 11 utilizes two deployable solar array wings, with one wing located on the north side of the spacecraft and the other located on the south side of the spacecraft. Each solar wing is composed of four equal-sized main panels. Each panel supports an array of multi-junction solar cells. During launch, the solar array wings are in the stowed position. However, once on station, the solar wings are deployed, with each wing extending out on the north and south sides of the spacecraft. The solar array is designed to provide power to the spacecraft for at least 15 years.

Power from the solar arrays is transferred to the spacecraft through the use of two Solar Array Drive Assemblies ("SADAs") – one for each solar wing. The SADAs also control the rotation of the solar wings.

During eclipse periods, the primary source of power to the spacecraft is through two 36 cell Lithium Ion batteries. The battery packs are located near the aft section of the spacecraft and are mounted on the north and south battery panels below the base panel.

The IS 11 EPS has been designed so that no single failure in the subsystem will cause a spacecraft failure. The EPS will provide sufficient power to the spacecraft throughout its design life to support all active communication channels as well as all necessary housekeeping loads. The beginning of life ("BOL") and end of life ("EOL") power budgets for IS 11 are provided in Exhibit 4.

the propulsion system in a monopropellant blow-down configuration. On-orbit operation is performed through the use of 0.9N, 0.48N and 22N thrusters.

The architecture of the propulsion systems is based on a low risk approach and is patterned after successful designs used throughout the industry utilizing space-proven (e.g., Indostar, Galaxy and BSAT-2 satellites) or space-qualified components. The system incorporates full redundancy for all critical components. All thrusters have been flight qualified to 1.5 times the required throughput to complete the mission life.

2.7) Communication Subsystem

2.7.1) Overview

IS 11 provides 12 active communication channels at C-band frequencies. However, the number of channels may be expanded to 16 channels depending on customer and spacecraft (redundancy) requirements. Twelve of the (maximum 16) channels have a channel bandwidth of 54 MHz and four channels have a channel bandwidth of 64 MHz. The spacecraft also provides for 18 active communication channels at Ku-band frequencies. The bandwidth of each Ku-band channel is 36 MHz. The IS 11 frequency and polarization plans are provided in Exhibits 5A and 5B.

The IS 11 C-band receive and transmit beams as well as the Ku-band receive beams provide coverage of North and South America and Europe. The Ku-band transmit beams provide coverage of East Brazil.

IS 11 employs full frequency reuse through the use of orthogonal polarization within the same beam. The C-band and Ku-band beams utilize linear (horizontal and vertical) polarization, whereby the polarization of the uplink is opposite that of the downlink. The electric field component of the linear horizontally polarized signal is parallel to the equatorial plane and the electric field component of the linear vertically polarized signal is orthogonal to the equatorial plane. Accordingly, IS 11 is compliant with the provisions of sections 25.210(a)(1), 25.210(a)(2) and 21.510(f) of the Commission's rules.

The polarization sense of the C-band and Ku-band channels cannot be switched. Accordingly, IS 11 is not compliant with the provisions of section

The peak G/T of the C-band receive beams is 3.7 dB/K. The minimum saturation flux density ("SFD") corresponding to the peak G/T point of the C-band receive beams is -103.7 dBW/m^2. The peak G/T of the Ku-band receive beams is 1.8 dB/K. The minimum saturation flux density ("SFD") corresponding to the peak G/T point of the Ku-band receive beams is -98.8 dBW/m^2.

The SFD at any G/T contour may be determined using the following formula:

$$SFD_D = SFD_P + [(G/T)_P - (G/T)_D] + A$$

where

SFD_D: SFD at desired G/T level (dBW/m^2)
SFD_P: Minimum SFD at peak G/T (dBW/m^2)
$(G/T)_D$: Desired G/T level (dB/K)
$(G/T)_P$: Peak G/T (dB/K)
A = Transponder attenuator setting (dB), ranging from 0 to 25 dB

Exhibit 7 provides a detailed calculation of the EIRP, G/T and SFD of the IS 11 uplink and downlink beams.

IS 11 does not fully comply with the antenna cross-polarization criteria of section 25.210(i) of the Commission's rules. Specifically, the ratio of the on-axis co-polar gain to cross-polar gain (i.e., the cross-polarization isolation) is less than 30 dB over very limited portions of the primary coverage area of the C-band receive and transmit beams and the Ku-band receive beam. Accordingly, PanAmSat requests a waiver of section 25.210(i) of the Commission's rules with regard to these beams.

The cross-polarization contours of the IS 11 C-band and Ku-band communication beams are provided in Exhibits 6R through 6Y. In each exhibit, the contour value listed with each contour represents the absolute level of cross-polarization isolation.

The IS 11 C-band receive antenna provides a cross-polarization isolation of 30 dB or greater over its primary coverage area with the exception of Southern Chile and a small area in the northeast section of South America,

carriers as well as from emissions (of other operators) generated by adjacent satellites. By controlling the power level of IS 11's carriers, however, Intelsat can compensate for this factor, thereby meeting its transmission objectives and the requirements of its customers.

The Commission previously has granted waivers of the requirement in section 25.210(i) based on the same factors that support the waiver PanAmSat is requesting in this application.[2] Accordingly, Commission precedent supports a grant of PanAmSat's waiver request.

2.7.3) Transponder description

2.7.3.1) C-Band

Signals in the 5925 – 6425 MHz frequency band are received by the appropriate (horizontally polarized or vertically polarized) receive antenna. The output of the receive antenna is routed through a diplexer, a test coupler, a band-pass filter and then to a set of 500 MHz wide receivers.

The receivers are arranged in a 4:2 redundancy ring. Each uplink can access one of four receivers by ground command. The receivers establish the system noise figure and downconvert the received signal to the transmit frequency band. Each receiver operates over the entire 5925 – 6425 MHz band in linear mode and is designed to have high sensitivity (i.e., good noise performance) and low cross-talk coefficients (i.e., good linearity characteristics). Given that the receiver downconverts the received signal to the necessary frequency required for transmission, the frequency stability of the transmitted signal is controlled entirely by the receiver itself. The IS 11 C-band receiver is able to maintain over the life of the spacecraft the frequency of the transmitted (downcoverted) signal to within 0.002% of the desired value. Accordingly, IS 11 is compliant with the provisions of section 25.202(e) of the Commission's rules.

The output of the receivers is then distributed to a bank of Input Multiplexers ("IMUXs"). The IMUXs are filters that provide frequency

[2] See waivers granted to: Intelsat North America LLC on June 17, 2005 in SAT-MOD-20050203-00019; SES Americom, Inc, on July 13, 2004; New Skies Satellites, N.V. on May 24, 2002, in 17 FCC Rcd 10369; Star One S.A. on August 24, 2004, in 19 FCC Rcd 16334; DIRECTV Enterprises, LLC on October 4, 2005, in SAT-A/O-20050504-00093 and SAT-STA-20050518-00105.

The output of the LNA is routed to three groups of frequency down-converters. Each group consists of four down-converters arranged in a 4-for-2 redundancy ring. One group of down-converters translates the specific uplink frequency down by 2804 MHz, the second group down-converts the uplink signal by 2050 MHz; and third group down-converts the uplink signal by 1800 MHz. Given that the down-converters translate the received signal to the necessary frequency required for transmission, the frequency stability of the transmitted signal is controlled entirely by the down-converter itself. Each of the IS 11 Ku-band down-converters is able to maintain over the life of the spacecraft the frequency of the transmitted (downcoverted) signal to within 0.002% of the desired value. Accordingly, IS 11 is compliant with the provisions of section 25.202(e) of the Commission's rules.

The outputs of the downconverters are distributed to a bank of IMUXs. The IMUXs are filters that provide frequency band separation for each channel.

The output of each IMUX is connected to a dedicated LCTWTA through a bank of redundancy switches. The redundancy switching permits the output of the IMUX to be routed to a redundant LCTWTA pair should the primary unit fail or malfunction.

The LCTWTA has two modes of operation: Fixed Gain Mode ("FGM") and Automatic Level Control ("ALC") Mode. In the Fixed Gain Mode, the gain of each channel (and its associated transponder saturation flux density) may be independently adjusted by changing the attenuation of its designated LCAMP by ground command. Consequently, in the Fixed Gain Mode, the output of each LCAMP may be varied by ground command over a range of 25 dB in 1 dB increments. Accordingly, the Ku-band channels of IS 11 are compliant with the provisions of section 25.210(c) of the Commission's rules. In the ALC mode, the output power of the LCAMP can be set by ground command and the LCAMP provides dynamic gain control over an input range of 25 dB to maintain the output power constant at the commanded level.

Each LCTWTA produces 110 Watts of output power. The LCTWTAs are configured into two 12-for-9 redundancy rings.

The output of each LCTWTA amplifier is routed through a bank of switches to one of two banks of OMUXs. The switching network allows the output of

The graphs in Exhibits 6M and 6P show the variation in the gain of the WCA at 0° roll angle, referenced to the (horizontal) plane on the center axis of the antenna aperture, with the azimuth (or pitch angle) varying from -180° and +180° -- generally referred to as the "azimuth cut". Given that the WCAs are horn antennas having symmetrical gain performance about the center axis of the antenna aperture, the gain variations shown in Exhibits 6M and 6P are also representative of the case where the pitch angle of the antenna is 0°, referenced to the (vertical) plane located at the center axis of the antenna aperture, with the elevation (or roll angle) varying from -180° and +180° -- generally referred to as the "elevation cut".

For the Omni antenna, the gain patterns associated with the azimuth cut and elevation cut are provided in Exhibits 6N and 6Q. As evident from this exhibit, the Omni antenna has two primary (gain) lobes located at ±90° relative to the center axis of the antenna.

During emergency conditions, when the spacecraft's main communication antennas and the global horn antenna are not pointing towards Earth, the WCAs and/or Omni antenna would be used since their field of view is greater than +/- 20° and the Earth disk is only +/- 8.4°. From Exhibits 6M, 6N, 6P and 6Q, it is evident that the coverage of these antennas is relatively flat over the entire Earth and that the variation in gain will be typically less than 2.5 dB within +/-20° of the peak gain point. The peak gain of the Omni antenna is 3 dBi for command and 3 dBi for telemetry. The peak gain of the WCA is 13 dBi for command and 13 dBi for telemetry.

The WCAs, the global horn antenna and Omni antenna diagrams (in Exhibits 6M through 6Q) were not prepared in accordance with the parameters specified in Section 25.114(d) (3) of the Commission's rules due to the fact that the satellite manufacturer does not provide the patterns in the required format. In this respect, it is our understanding that, given the specificity of the situation, Exhibits 6M through 6Q, together with the descriptive characterization given in the two previous paragraphs, fulfill the requirements of Section 25.114(d)(3). However, in case the Commission has a different understanding in this respect, a waiver of the requirements of Section 25.114(d) (3) of the FCC rules with respect to the presentation of the global horn antenna, WCA and the Omni antenna patterns is requested.

fed to the global horn antenna for transmission to Earth. The telemetry transmitter is able to maintain over the life of the spacecraft the frequency of the transmitted signal to within 0.002% of the desired value; hence it is compliant with the provisions of section 25.202(e) of the Commission's rules.

During transfer orbit or emergency operations, each telemetry transmitter is set to operate in the high power mode. The output of each transmitter is routed to the WCAs and the Omni antenna, as appropriate, via a dedicated power hybrid and filter for transmission back to Earth.

Exhibit 5B provides the frequency and polarization plan for the IS 11 telemetry channels.

2.8.4) Ranging

During all phases of the mission, the slant range of the spacecraft can be determined to a relatively high level of accuracy through the use of a multiple tone ranging system. Through ground command, the telemetry transmitters and command receivers may be configured for ranging operation.

The ranging tones selected are modulated onto the command carrier and transmitted to the spacecraft. Once received by the spacecraft through the appropriate receiving antenna, the signal is routed directly to the spacecraft's telemetry transmitter. From the telemetry transmitter, the ranging signal is transmitted to Earth through the appropriate spacecraft transmitting antenna. On the ground, the ranging tones are demodulated and their phase compared with that of the transmitted signal to determine the range of the satellite.

Because the ranging subsystem uses the command and telemetry subsystems, the descriptions of the operation of these two latter systems during on-station, transfer orbit and emergency conditions are applicable to the ranging subsystem as well. The performance summary of the IS 11 command, telemetry and ranging subsystems is provided in Exhibit 9.

2.9) Uplink Power Control

IS 11 provides two C-band beacons which can be used for uplink power control ("ULPC") by customers transmitting at C-band frequencies to the

determined by a conservative evaluation of the effect of the synchronous orbit environment on the solar array, the amount of fuel aboard the spacecraft, the effect of the charge-discharge cycling on the life of the battery, and the wear out of the amplifiers and other active units. The mass allocation of propellant for spacecraft station-keeping is optimized to achieve at least 15 years of operation. To enhance the probability of survival, equipment/unit redundancy is incorporated into the spacecraft design where possible. Materials and processes have been selected so that aging or wearing effects will not adversely affect spacecraft performance over the estimated life.

2.12) Spacecraft Reliability

IS 11 is designed for an operational and mission life of 15 years. Life and reliability are maximized by incorporating flight proven or flight qualified units and designs to the greatest extent possible. All subsystems and units have a minimum design life of 15 years. Redundancy concepts are applied to all critical components. All avoidable single-point failure modes have been eliminated.

The projected reliability of the combined C-band and Ku-band payloads is 89.3%. The projected reliability of the bus system is 87%. The overall reliability of the IS 11 spacecraft is projected to be 77.7%. The subsystem reliability assessments were based upon the use of failure rates, modeling assumptions from previous spacecraft programs and those specific to IS 11.

3.0) Power Flux Density ("PFD")

The power flux density limits for space stations are specified in section 25.208 of the Commission's rules. With respect to the 10700 - 10950 MHz and 11200 – 11450 MHz bands, section 25.208 of the rules does not specify any PFD limits for geo-stationary FSS satellites. However, section 25.208 does specify PFD limits for the 3700 – 4200 MHz and 10950 – 11200 MHz bands.

In the 3700 – 4200 MHz band, the maximum PFD level at the Earth's surface produced by IS 11 was calculated for a 44.8 MHz digital carrier and a 24 MHz analog TV/FM carrier. The results are provided in Exhibit 11 and show that the downlink power flux density levels of the IS 11 carriers do not exceed limits specified in section 25.208 of the Commission's rules.

8.0) Services and Emission Designators

IS 11 is to be a general purpose communications satellite and has been designed to support a wide variety of services. Depending upon the needs of the users, the transponders on IS 11 can accommodate television, radio, voice or data communications. Typical types of communication services to be offered include:

a) Frequency modulated television (TV/FM)
b) Compressed digital video
c) High speed digital data
d) Digital single channel per carrier ("SCPC") data channels

Emission designators and allocated bandwidths for representative communication carriers, telemetry and command signals are provided in Exhibit 12.

9.0) IS 11 Carrier Link Analysis

The operational co-frequency satellites nearest to the 43° W.L. orbital slot are IS 1R, located at 45° W.L., and NSS-806, located at 40.5° W.L.. IS 1R is operated by Intelsat and overlaps in C-band and in the non-planned Ku-band. NSS-806 is operated by SES-New Skies, a company based in Luxembourg, and has frequency overlap only in C-band.

At C-band and non-planned Ku-band frequencies, link analysis for IS 11 was conducted for a number of representative carriers. For the analysis, it was assumed that the nearest satellites to IS 11 were IS 1R (45° W.L.) and a hypothetical satellite operating from 41° W.L.. The hypothetical satellite was assumed to have the same operational parameters as IS 11. The characteristics of IS 1R are contained in FCC filing SAT-LOA-19990126-00018.

Other assumptions made for the link budget analysis were as follows:

a) In the plane of the geostationary satellite orbit, all transmitting and receiving earth stations have off-axis co-polar gains that are compliant with the limits specified in section 25.209(a)(1) of the FCC's rules.
b) All transmitting and receiving earth stations have a cross-polarization isolation value of at least 30 dB within their main beam lobe.
c) At C-band frequencies, degradation due to rain was not considered,

The FCC license application for IS 1R, SAT-LOA-19990126-00018, did not contain any interference analysis. Hence, for IS 1R link calculations were performed for the same carriers as those specified for IS 11. Similarly, for the hypothetical satellites, link calculations were performed for the same carriers as those specified for IS 11. The assumptions made for the IS 11 link analysis (as stated section 9.0 of this Engineering Statement) were also applied for the link studies of IS 1R and the hypothetical satellite.

In these studies, adjacent satellite interference to IS 1R at C-band is generated by IS 11 at 43° W.L. and a hypothetical satellite located at 47° W.L. with the same characteristics as IS 1R. At Ku-band, adjacent satellite interference to IS 1R is generated by IS 11 at 43° W.L. and a hypothetical satellite located at 47° W.L. with the same characteristics as IS 1R.

Adjacent satellite C-band and Ku-band interference to the hypothetical satellite at 41° W.L. is generated by IS 11 at 43° W.L. and another hypothetical satellite located at 39° W.L. with the same characteristics as IS 11.

The C-band and Ku-band link analysis only considered the impact of IS 11 digital carriers. At C-band it was assumed that the maximum IS 11 uplink power density was one of three levels – -48.3 dBW/Hz, -49.1 dBW/Hz or -68.3 dBW/Hz – depending on the channel bandwidth and beam. For downlink, the maximum IS 11 downlink EIRP density was assumed to be either –33.8 dBW/Hz or -34.2 dBW/Hz depending on the channel bandwidth.

At Ku-band, it was assumed that the maximum IS 11 uplink power density was -47.7 dBW/Hz. For downlink, the maximum IS 11 EIRP density was assumed to be -19.4 dBW/Hz.

The impact of the IS 11 TV/FM carrier, as listed in Exhibits 13 and 14, on the transmissions of IS 1R and the hypothetical satellites was not considered because TV/FM carriers are known to be high-density carriers with most of the energy contained within the near vicinity of the carrier center frequency. Operation of sensitive narrow-band carriers is typically precluded within these high power density areas of the TV/FM carrier. Accordingly, placement and operation of TV/FM carriers are normally achieved through coordination discussions with the adjacent satellite operator, rather than

section S8 of the Schedule S, since they are not in GXT format (see section 2.7.1).

In column "g" of section S13 of the Schedule S, a link budget file has been included for the first link (i.e., the first row of data) contained in that section. This link budget file is applicable to all of the links listed in section S13 and should be included with each row of data in that section of the Schedule S. However, given that the link budget file is rather large and its inclusion with each link (or data row) would lead to the Schedule S file having an unmanageable size, all other links (or rows of data) contain a small ASCII file that references the link budget file that is attached to the first link (i.e., the link budget file attached to the first row of data).

11.0) Orbital Debris Mitigation Plan

PanAmSat is proactive in ensuring safe operation and disposal of this and all spacecraft under its control. The four elements of debris mitigation are addressed below:

11.1) Spacecraft Hardware Design

The spacecraft is designed such that no debris will be released during normal operations. PanAmSat has assessed the probability of collision with meteoroids and other small debris (<1 cm diameter) and has taken the following steps to limit the effects of such collisions: (1) critical spacecraft components are located inside the protective body of the spacecraft and properly shielded; and (2) all spacecraft subsystems have redundant components to ensure no single-point failures. The spacecraft does not use any subsystems for end-of-life disposal that are not used for normal operations.

11.2) Minimizing Accidental Explosions

PanAmSat has assessed the probability of accidental explosions during and after completion of mission operations. The spacecraft is designed in a manner to minimize the potential for such explosions. Propellant tanks are thrusters are isolated using redundant valves and electrical power systems are shielded in accordance with standard industry practices. At the completion of the mission, and upon disposal of the spacecraft, PanAmSat will ensure the removal of all stored energy on the spacecraft by depleting

altitude specified by Intelsat in this filing. Accordingly, the IS 11 planned disposal orbit complies with the FCC's rules.

EXHIBIT 1: SPACECRAFT CONFIGURATION

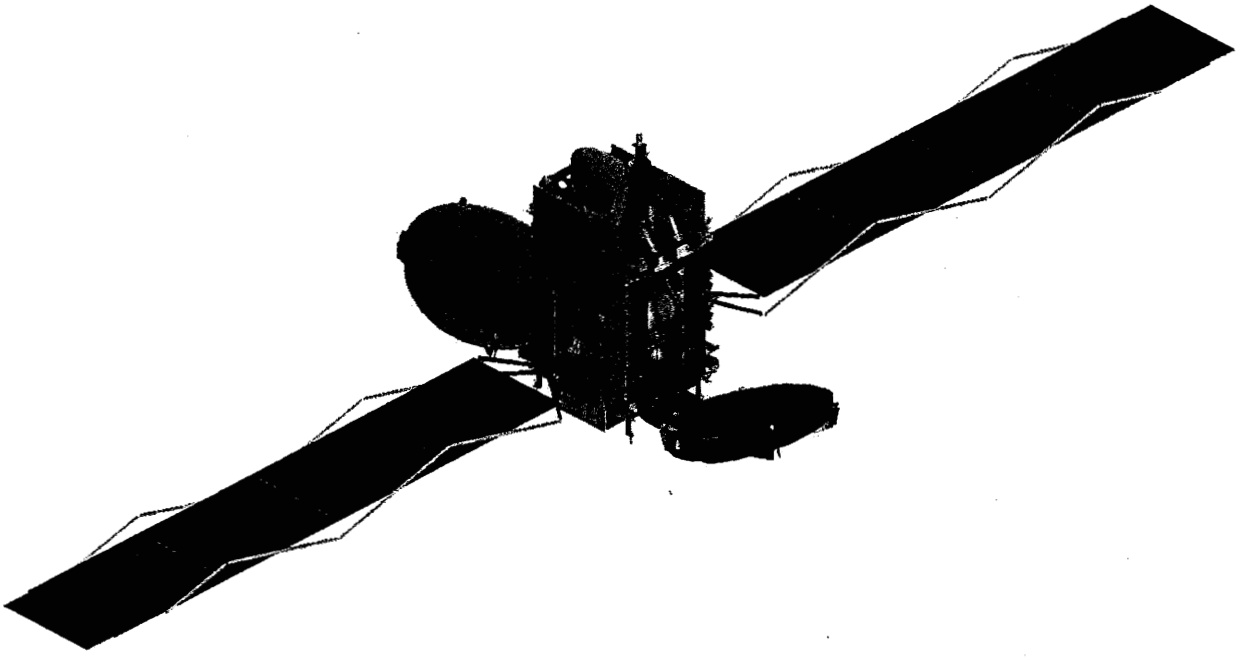


EXHIBIT 2: SUMMARY OF SPACECRAFT CHARACTERISTICS (continued)

COMMUNICATION	
Frequency Bands	
C-band Uplink	5925 – 6425 MHz
C-band Downlink	3700 – 4200 MHz
Ku-Band Uplink	12750 – 13250 MHz, 13750 – 14000 MHz
Ku-Band Downlink	10700 – 11450 MHz
Polarization	
C-band Uplink	Linear Horizontal / Linear Vertical
C-band Downlink	Linear Horizontal / Linear Vertical
Ku-band Uplink	Linear Horizontal / Linear Vertical
Ku-band Downlink	Linear Horizontal / Linear Vertical
Coverage Area	
C-band Uplink	Americas and Europe
C-band Downlink	Americas and Europe
Ku-band Uplink	Americas and Europe
Ku-band Downlink	East Brazil
Beam Cross-Polarization Isolation	
C-band Uplink	$\geq$ 18 dB
C-band Downlink	$\geq$ 24 dB
Ku-band Uplink	$\geq$ 26 dB
Ku-band Downlink	$\geq$ 30 dB
Number of Channels	
C-Band	16
Ku-Band	18
Communication Channel Bandwidth	
C-Band	54 MHz and 64 MHz
Ku-Band	36 MHz
Maximum Downlink EIRP	
C-Band – Horizontal Polarization	42.7 dBW
C-Band – Vertical Polarization	42.7 dBW
Ku-Band – Horizontal Polarization	55.4 dBW
Ku-Band – Vertical Polarization	55.4 dBW

EXHIBIT 2: SUMMARY OF SPACECRAFT CHARACTERISTICS (continued)

TELEMETRY, COMMAND & RANGING	
Command Frequency	
Transfer Orbit / Emergency	13246.5 / 13995.5 MHz
On-Station	13246.5 / 13995.5 MHz
Command Polarization	
Transfer Orbit	
Wide Coverage Antennas	Left Hand Circular
Omni Antenna	Left Hand Circular
On-Station	Horizontal / Vertical
Command Carrier Modulation	FM
Command Carrier Bandwidth	
Occupied Bandwidth	860 kHz
Allocated Bandwidth	1000 kHz
Command Antennas	
Transfer Orbit	Omni Antenna and Wide Coverage Antennas
On-Station	Communications Reflector
Command Threshold at Beam Peak	
Transfer Orbit / Emergency	
Wide Coverage Antennas	-96.4 dBW/m^2
Omni Antenna	-91.3 dBW/m^2
On-Station	-117.3 dBW/m^2
Command G/T at Beam Peak	
Transfer Orbit / Emergency	
Wide Coverage Antennas	-29.3 dB/K
Omni Antenna	-34.4 dB/K
On-Station	-8.3 dB/K
Telemetry Frequency	
Transfer Orbit / Emergency	11448 / 11449 MHz
On-Station	11448 / 11449 MHz
Telemetry Polarization	
Transfer Orbit / Emergency	
Wide Coverage Antennas	Right Hand Circular
Omni Antenna	Right Hand Circular
On-Station	Horizontal

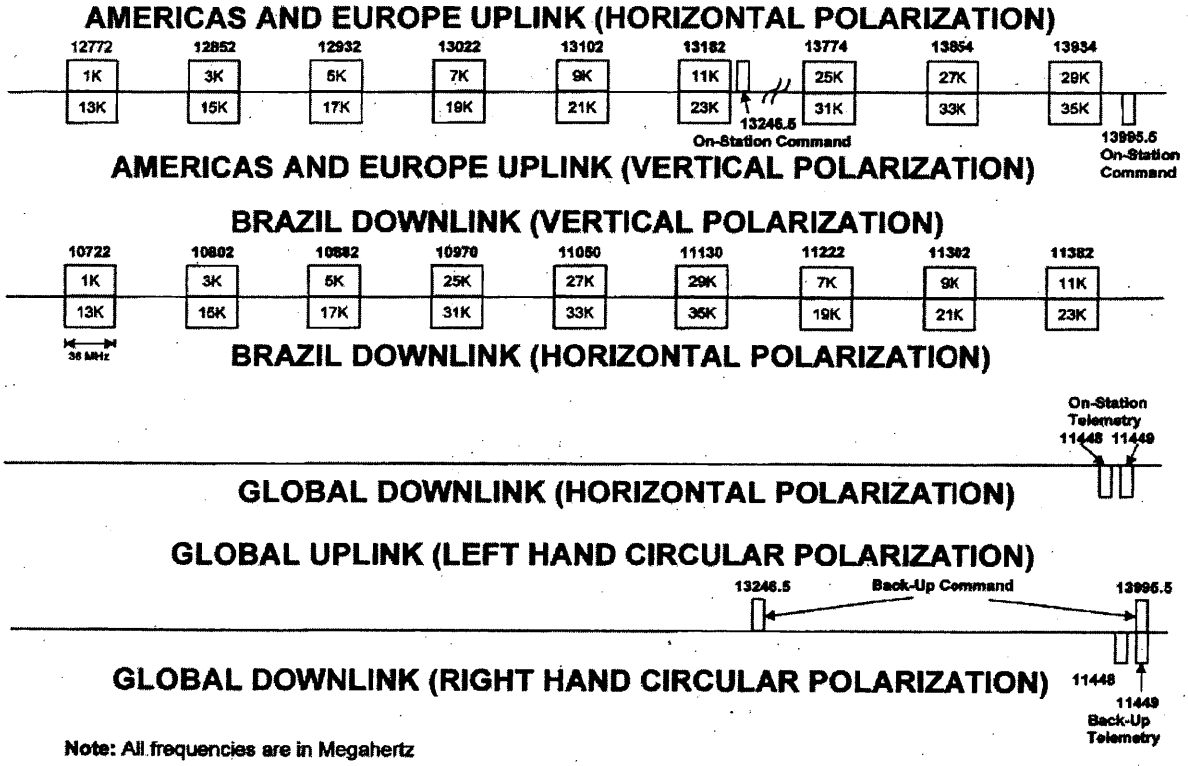
EXHIBIT 2: SUMMARY OF SPACECRAFT CHARACTERISTICS
(continued)

ULPC	
Frequency	3701 / 4199.5 MHz
Polarization	Vertical / Horizontal
Coverage Area	Global
Number of channels	2
Channel Bandwidth	< 25 kHz
Maximum Downlink EIRP	
Horizontal Polarization	16.2 dBW
Vertical Polarization	16.2 dBW
Frequency Stability	< 0.002%

EXHIBIT 4: SPACECRAFT POWER BUDGET

	BEGINNING OF LIFE		END OF LIFE	
	AUTUMN EQUINOX	SUMMER SOLSTICE	AUTUMN EQUINOX	SUMMER SOLSTICE
PAYLOAD (WATTS)	4847	4847	4465	4465
BUS (WATTS)	1206	785	1148	756
TOTAL POWER (WATTS)	6053	5632	5613	5221
SOLAR ARRAY POWER (WATTS)	7256	6510	6687	6147
DEPTH OF BATTERY DISCHARGE (%)	75.3	N/A	75.6	N/A

EXHIBIT 5A: FREQUENCY PLAN (continued)



Note: All frequencies are in Megahertz

EXHIBIT 5B: FREQUENCY ASSIGNMENTS (continued)

Uplink Transponder Designation	Uplink Beam Name	Uplink Polarization	Uplink Center Frequency (MHz)	Downlink Transponder Designation	Downlink Beam Name	Downlink Polarization	Downlink Center Frequency (MHz)	Channel Bandwidth (MHz)	Maximum Transponder Gain (dB)
1K	AMERICAS AND EUROPE	HORIZONTAL	12772	1K	EAST BRAZIL	VERTICAL	10722	36	131.2
3K	AMERICAS AND EUROPE	HORIZONTAL	12852	3K	EAST BRAZIL	VERTICAL	10802	36	131.2
5K	AMERICAS AND EUROPE	HORIZONTAL	12932	5K	EAST BRAZIL	VERTICAL	10882	36	131.2
7K	AMERICAS AND EUROPE	HORIZONTAL	13022	7K	EAST BRAZIL	VERTICAL	11222	36	131.2
9K	AMERICAS AND EUROPE	HORIZONTAL	13102	9K	EAST BRAZIL	VERTICAL	11302	36	131.2
11K	AMERICAS AND EUROPE	HORIZONTAL	13182	11K	EAST BRAZIL	VERTICAL	11382	36	131.2
25K	AMERICAS AND EUROPE	HORIZONTAL	13774	25K	EAST BRAZIL	VERTICAL	10970	36	131.2
27K	AMERICAS AND EUROPE	HORIZONTAL	13854	27K	EAST BRAZIL	VERTICAL	11050	36	131.2
29K	AMERICAS AND EUROPE	HORIZONTAL	13934	29K	EAST BRAZIL	VERTICAL	11130	36	131.2
13K	AMERICAS AND EUROPE	VERTICAL	12772	13K	EAST BRAZIL	HORIZONTAL	10722	36	131.2
15K	AMERICAS AND EUROPE	VERTICAL	12852	15K	EAST BRAZIL	HORIZONTAL	10802	36	131.2
17K	AMERICAS AND EUROPE	VERTICAL	12932	17K	EAST BRAZIL	HORIZONTAL	10882	36	131.2
19K	AMERICAS AND EUROPE	VERTICAL	13022	19K	EAST BRAZIL	HORIZONTAL	11222	36	131.2
21K	AMERICAS AND EUROPE	VERTICAL	13102	21K	EAST BRAZIL	HORIZONTAL	11302	36	131.2
23K	AMERICAS AND EUROPE	VERTICAL	13182	23K	EAST BRAZIL	HORIZONTAL	11382	36	131.2
31K	AMERICAS AND EUROPE	VERTICAL	13774	31K	EAST BRAZIL	HORIZONTAL	10970	36	131.2
33K	AMERICAS AND EUROPE	VERTICAL	13854	33K	EAST BRAZIL	HORIZONTAL	11050	36	131.2
35K	AMERICAS AND EUROPE	VERTICAL	13934	35K	EAST BRAZIL	HORIZONTAL	11130	36	131.2
COMMAND 1	AMERICAS AND EUROPE	HORIZONTAL	13246.5					1	N/A
COMMAND 2	AMERICAS AND EUROPE	VERTICAL	13995.5					1	N/A
COMMAND 3	GLOBAL	LEFT HAND CIRCULAR	13246.5					1	N/A
COMMAND 4	GLOBAL	LEFT HAND CIRCULAR	13995.5					1	N/A
				TELEMETRY 1	GLOBAL	HORIZONTAL	11448	0.5	N/A
				TELEMETRY 2	GLOBAL	HORIZONTAL	11449	0.5	N/A
				TELEMETRY 3	GLOBAL	RIGHT HAND CIRCULAR	11448	0.5	N/A
				TELEMETRY 4	GLOBAL	RIGHT HAND CIRCULAR	11449	0.5	N/A

EXHIBIT 6B: C-BAND RECEIVE BEAM
[VERTICAL POLARIZATION]
(Schedule S Beam ID: CVUL)

PAS 11: C-BAND UPLINK BEAM (VERTICAL POLARIZATION)
PEAK ANTENNA GAIN: 30.6 dBi
PEAK G/T: 3.7 dB/K
SATURATED FLUX DENSITY @ PEAK G/T: -103.7 TO -78.7 dBW/m2

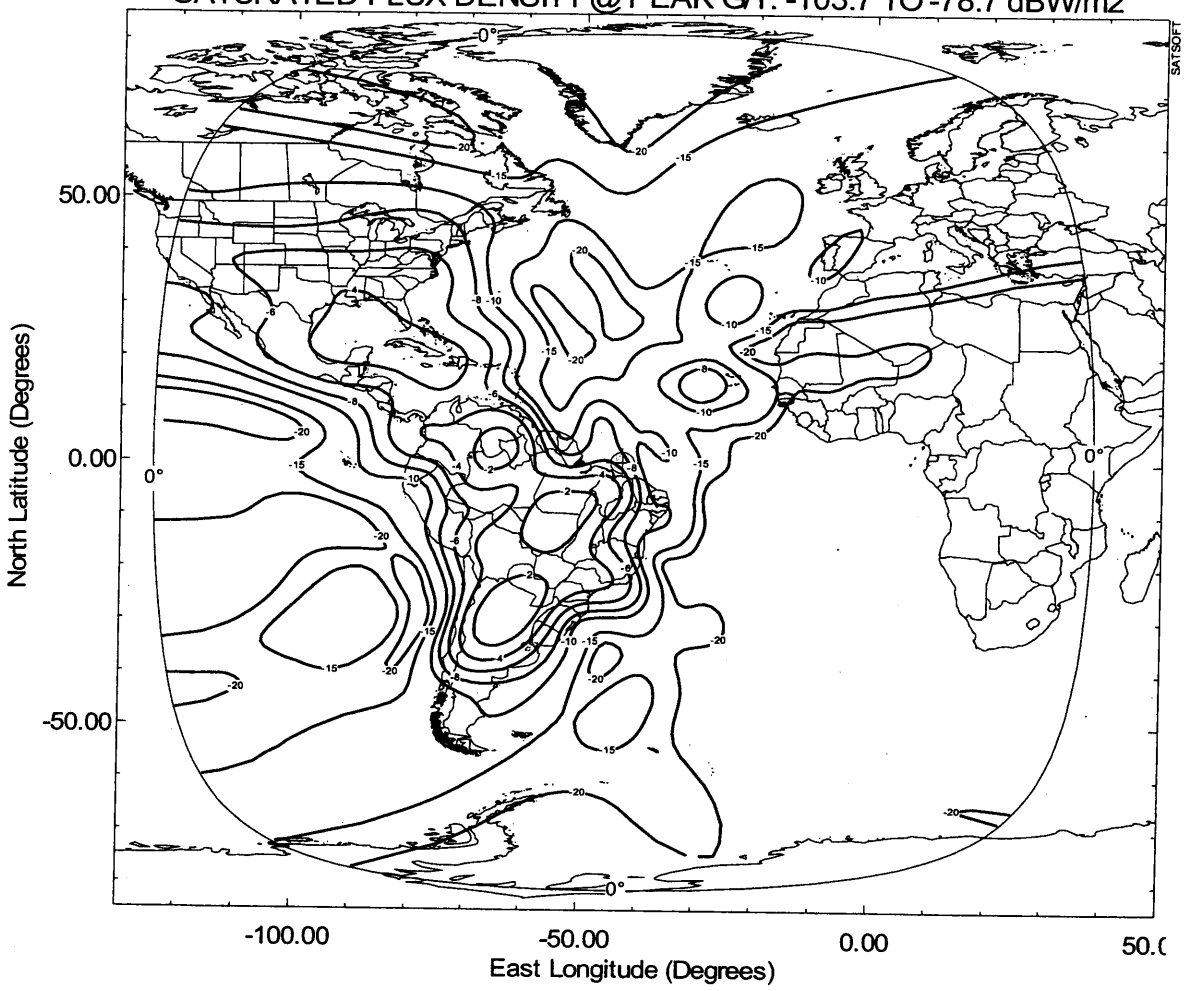


EXHIBIT 6D: C-BAND TRANSMIT BEAM
[VERTICAL POLARIZATION]
(Schedule S Beam ID: CVDL)

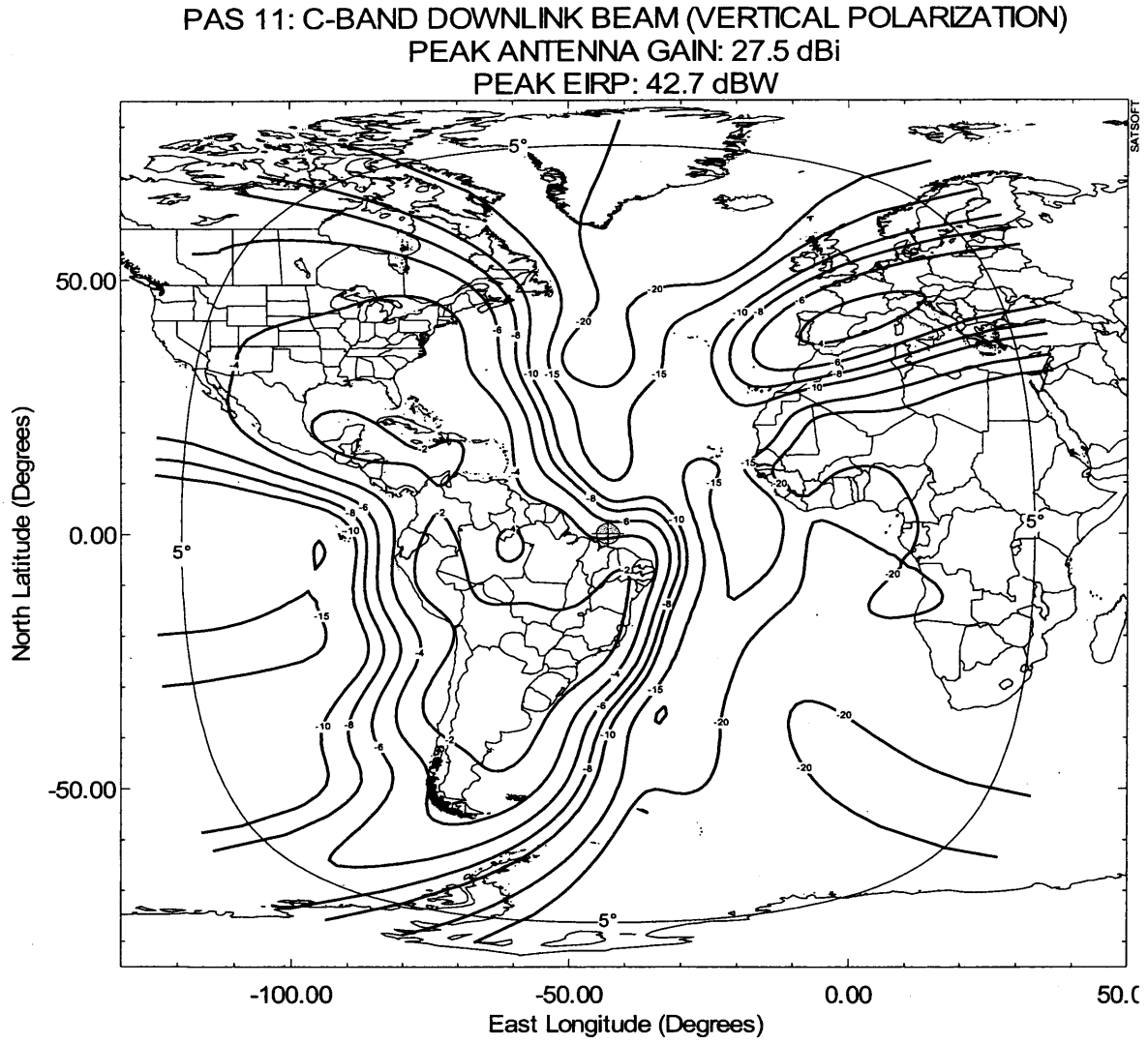


EXHIBIT 6F: Ku-BAND RECEIVE BEAM
[VERTICAL POLARIZATION]
(Schedule S Beam ID: KVUL)

PAS 11: Ku-BAND UPLINK BEAM (VERTICAL POLARIZATION)
PEAK ANTENNA GAIN: 29.2 dBi
PEAK G/T: 1.8 dB/K
SATURATED FLUX DENSITY @ PEAK G/T: -98.8 TO -73.8 dBW/m2

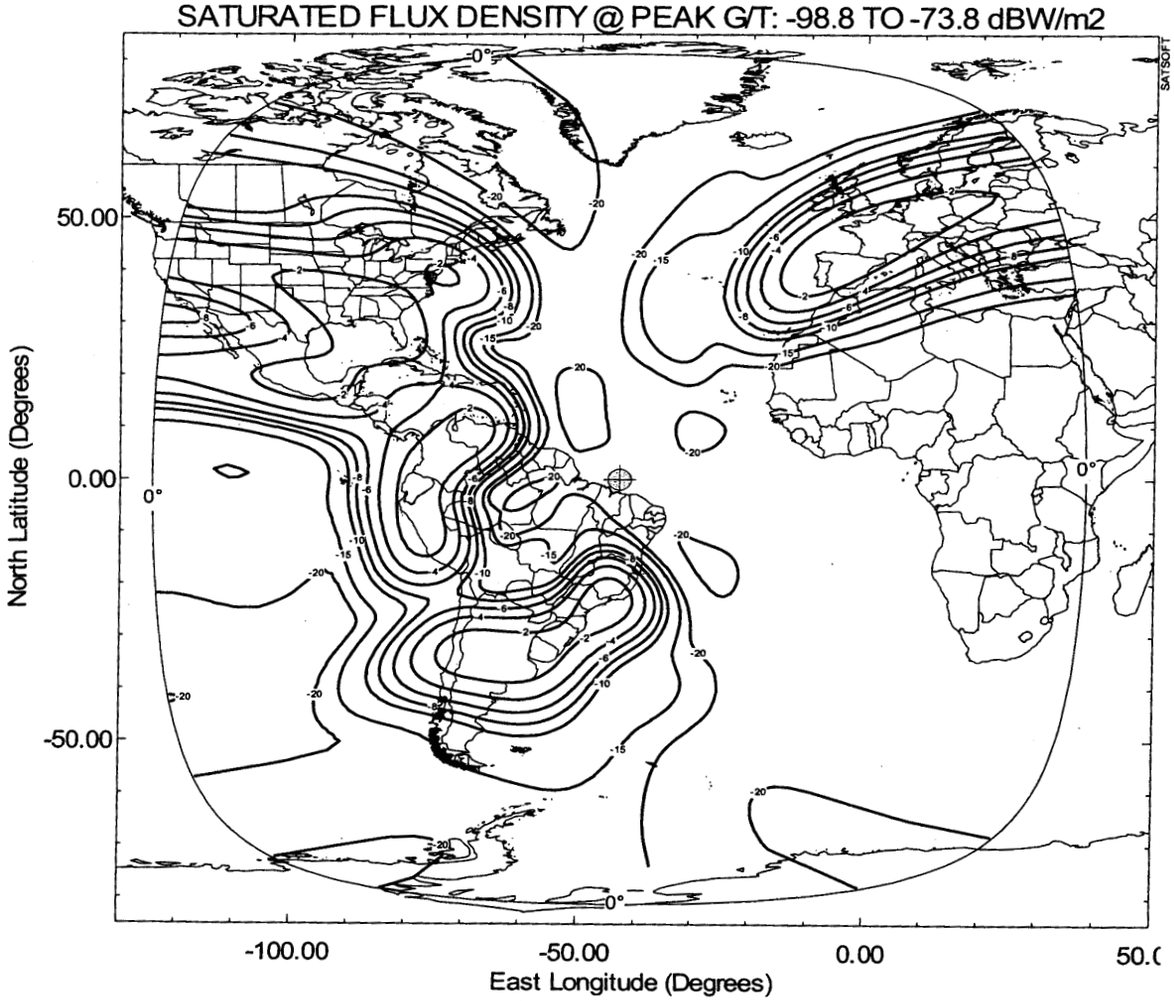


EXHIBIT 6H: Ku-BAND TRANSMIT BEAM
[VERTICAL POLARIZATION]
(Schedule S Beam ID: KVDL)

PAS 11: Ku-BAND DOWNLINK BEAM (VERTICAL BEAM)
PEAK ANTENNA GAIN: 37.5 dBi
PEAK EIRP: 55.4 dBW

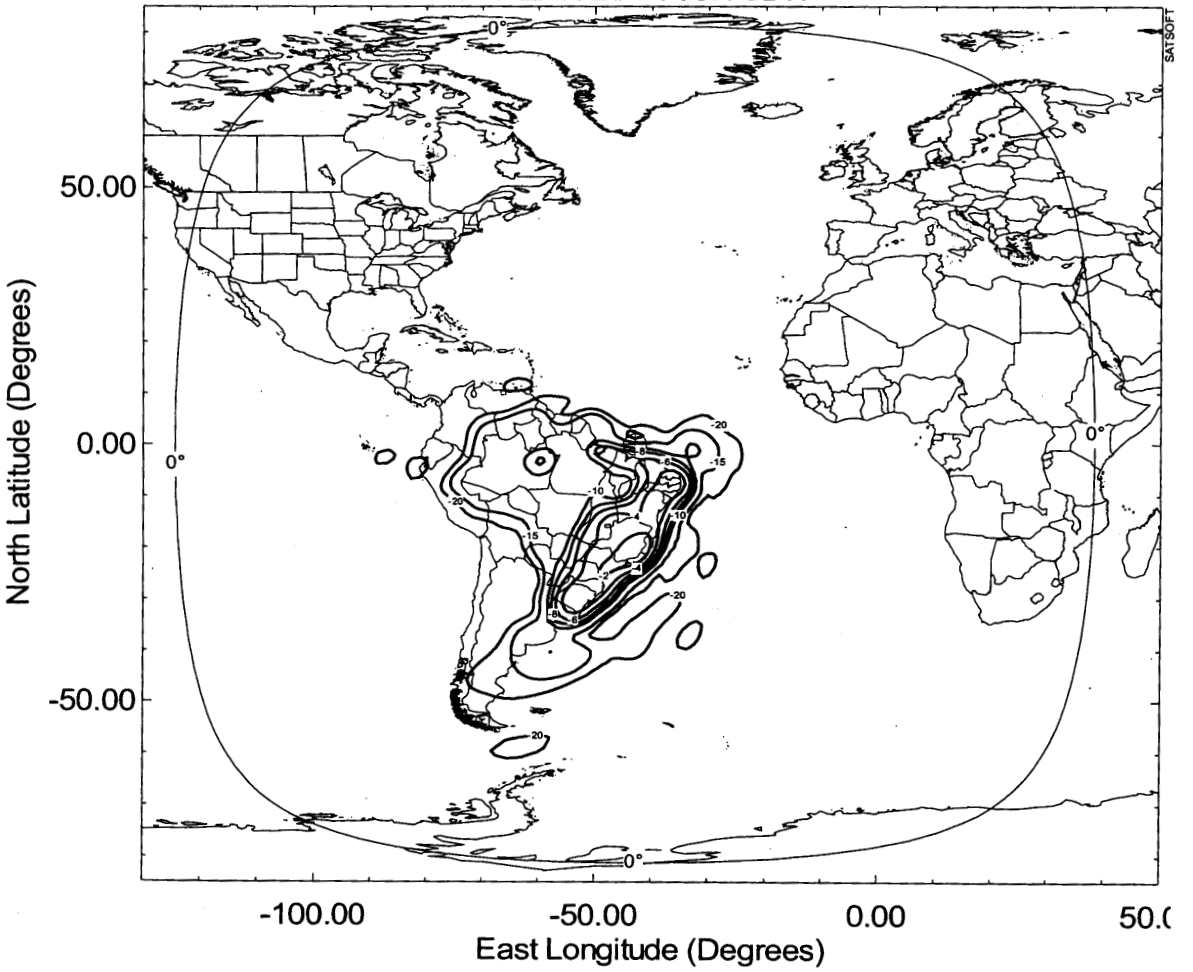
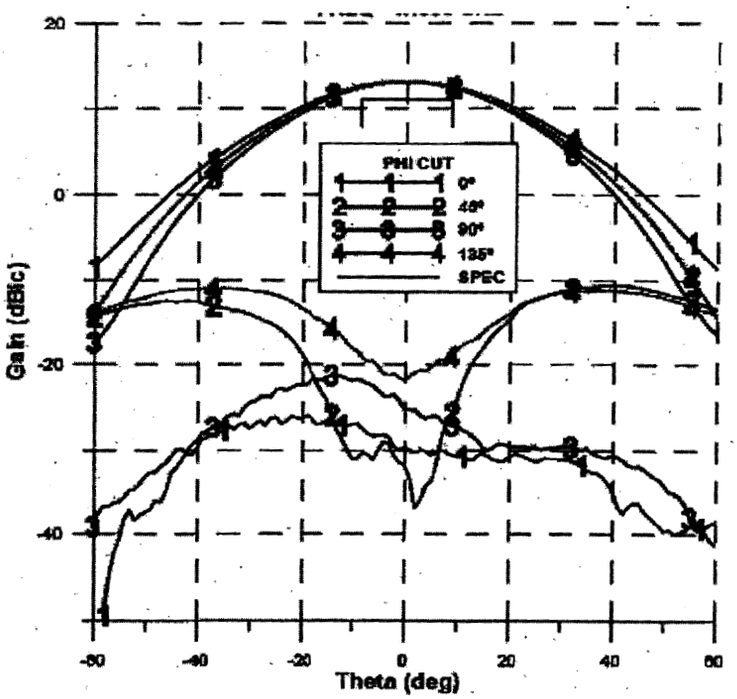


EXHIBIT 6J: Ku-BAND ULPC BEAM
[VERTICAL POLARIZATION]
(Schedule S Beam ID: UPCV)



Peak Antenna Gain: 13.0 dBi
Peak EIRP: 16.2 dBW
Beam Polarization: Linear Vertical

EXHIBIT 6L: Ku-BAND COMMAND BEAM (ON-STATION)
[VERTICAL POLARIZATION]
(Schedule S Beam ID: CMDV)

PAS 11: Ku-BAND COMMAND BEAM (VERTICAL POLARIZATION)
PEAK ANTENNA GAIN: 29.2 dBi
PEAK G/T: -8.3 dB/K
COMMAND THRESHOLD FLUX DENSITY @ PEAK G/T: -117.3 dBW/m2

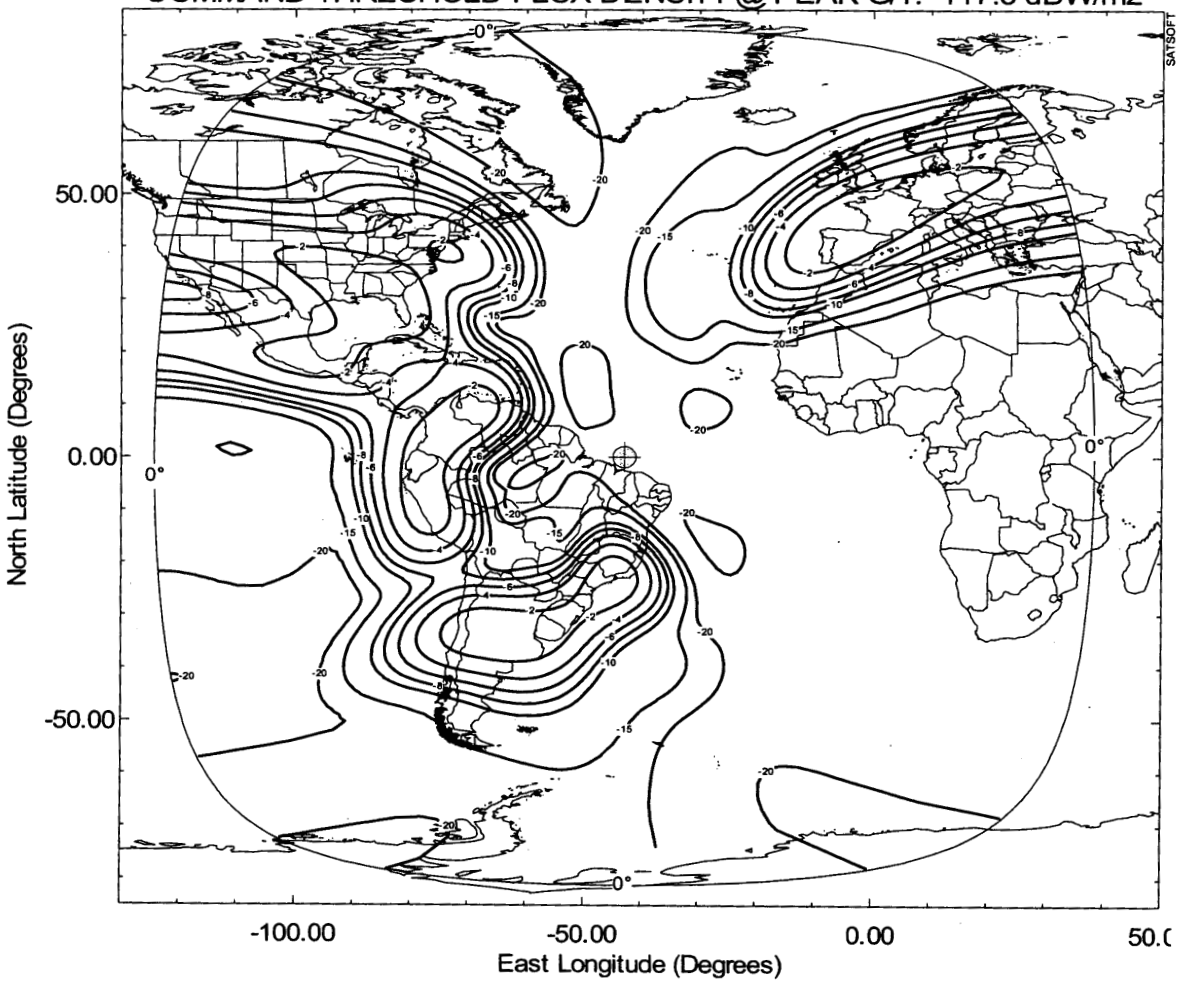
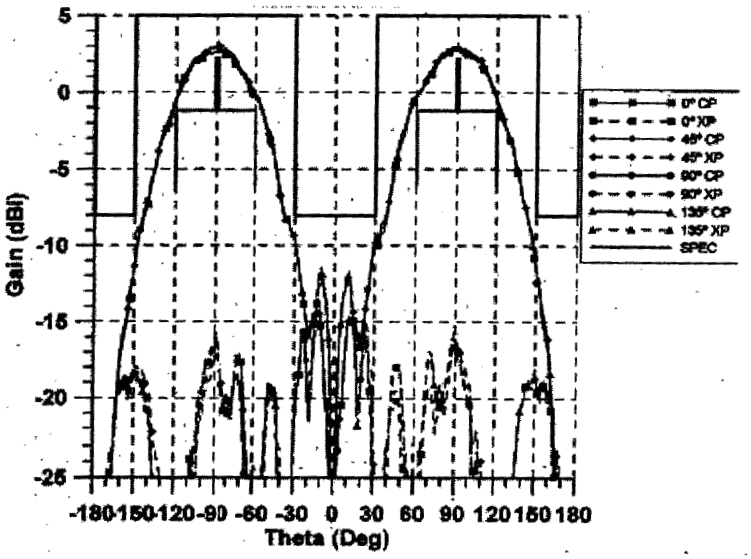
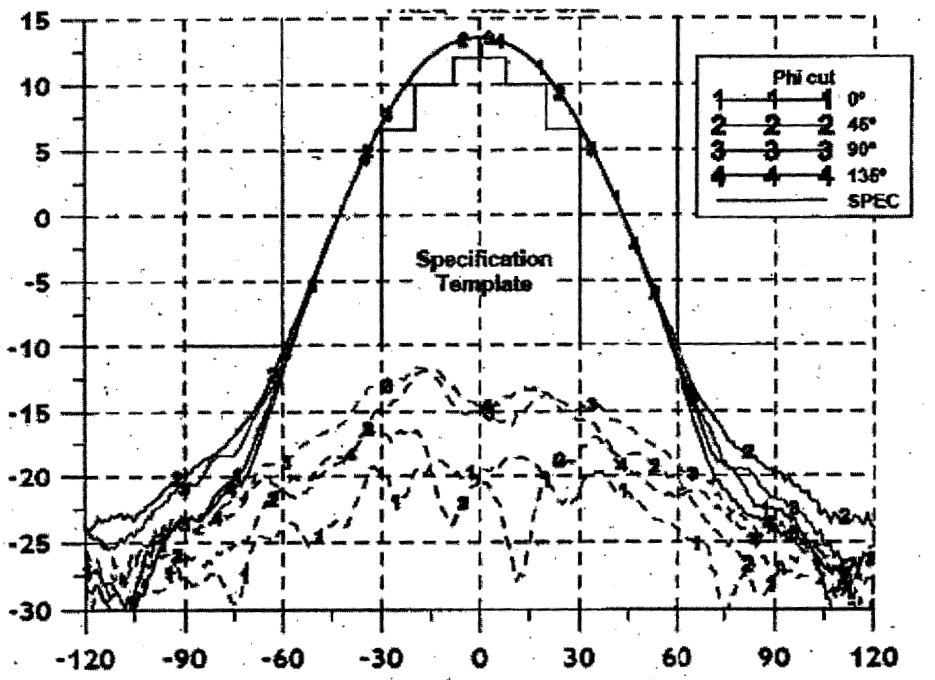


EXHIBIT 6N: Ku-BAND COMMAND BEAM
(OMNI ANTENNA)
[LEFT HAND CIRCULAR POLARIZATION]
(Schedule S Beam ID: CMDO)



Peak Antenna Gain: 3.0 dBi
Peak G/T: -34.4 dB/K
Command Threshold at Peak G/T: -91.3 dBW/m^2
Beam Polarization: Left Hand Circular

EXHIBIT 6P: Ku-BAND TELEMETRY BEAM
(WCA)
[RIGHT HAND CIRCULAR POLARIZATION]
(Schedule S Beam ID: TLMW)



Note: Y-axis is gain (dBi) and X-axis is angle (degrees)

Peak Antenna Gain: 13.0 dBi
Peak EIRP: 13.4 dBW
Beam Polarization: Right Hand Circular

EXHIBIT 6R: C-BAND RECEIVE BEAM CROSS-POLARIZATION ISOLATION [HORIZONTAL POLARIZATION] (Schedule S Beam ID: CHUX)

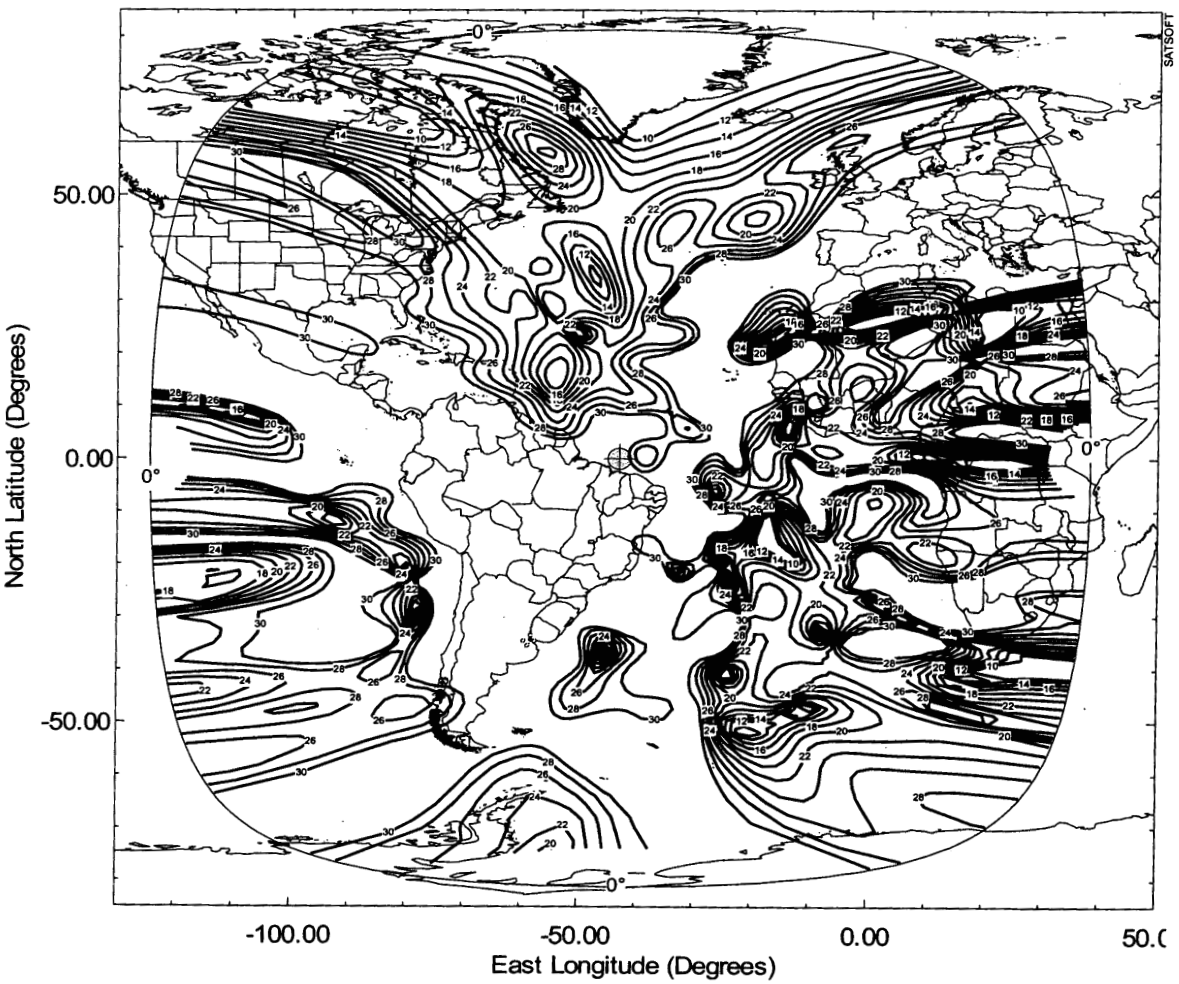


EXHIBIT 6T: C-BAND TRANSMIT BEAM
CROSS-POLARIZATION ISOLATION
[HORIZONTAL POLARIZATION]
(Schedule S Beam ID: CHDX)

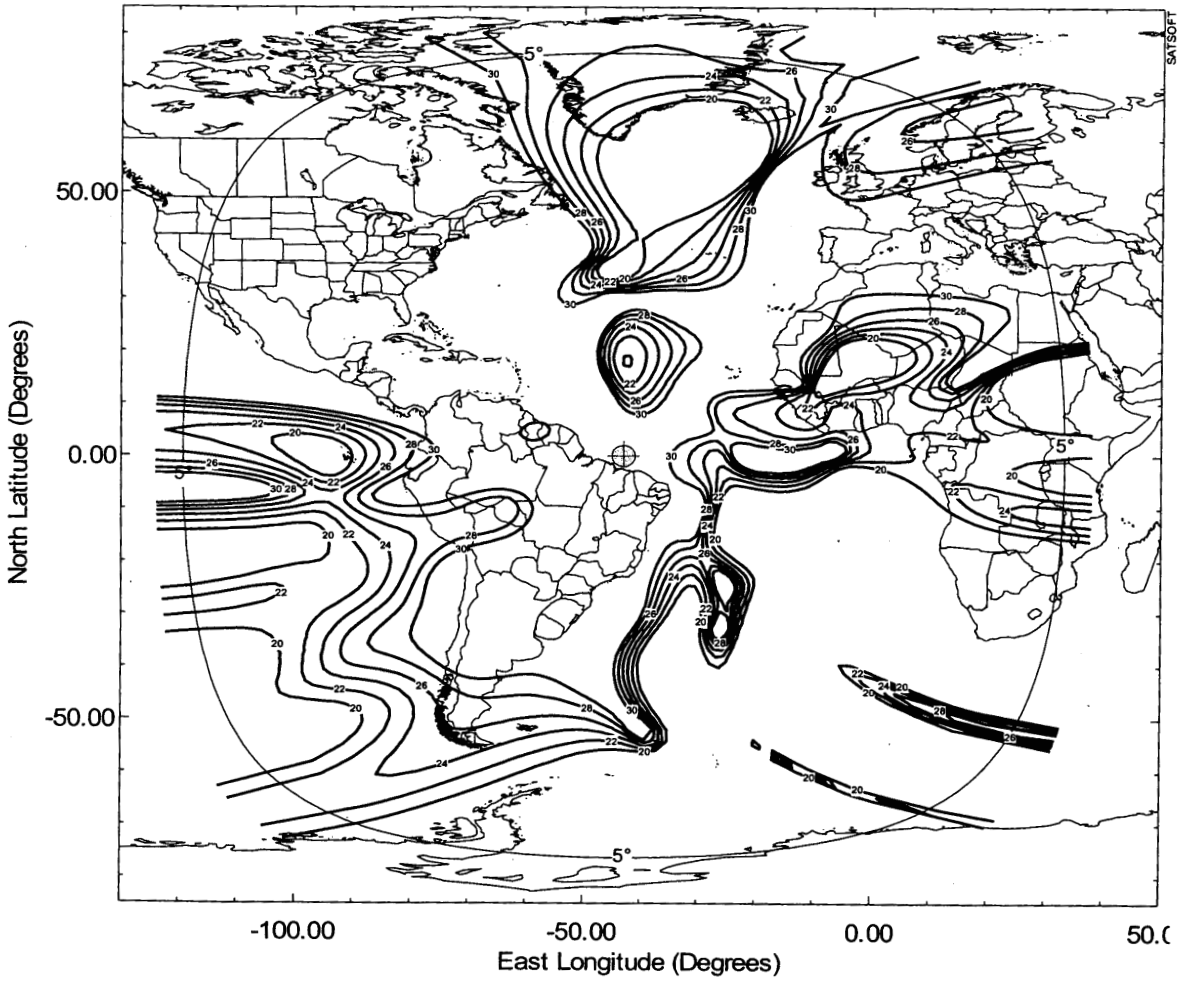


EXHIBIT 6V: Ku-BAND RECEIVE BEAM CROSS-POLARIZATION ISOLATION [HORIZONTAL POLARIZATION] (Schedule S Beam ID: KHUX)

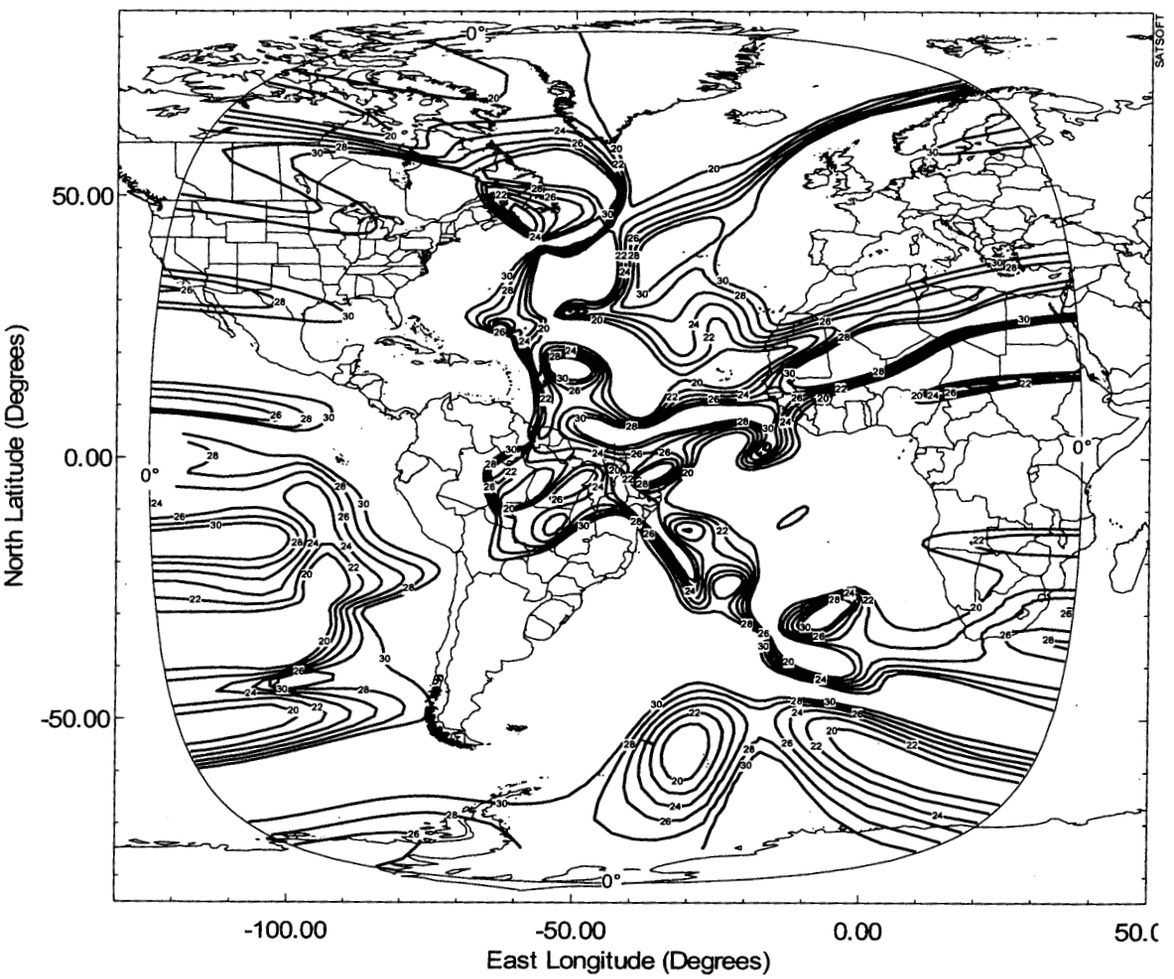


EXHIBIT 6X: Ku-BAND RECEIVE BEAM CROSS-POLARIZATION ISOLATION [HORIZONTAL POLARIZATION] (Schedule S Beam ID: KHDX)

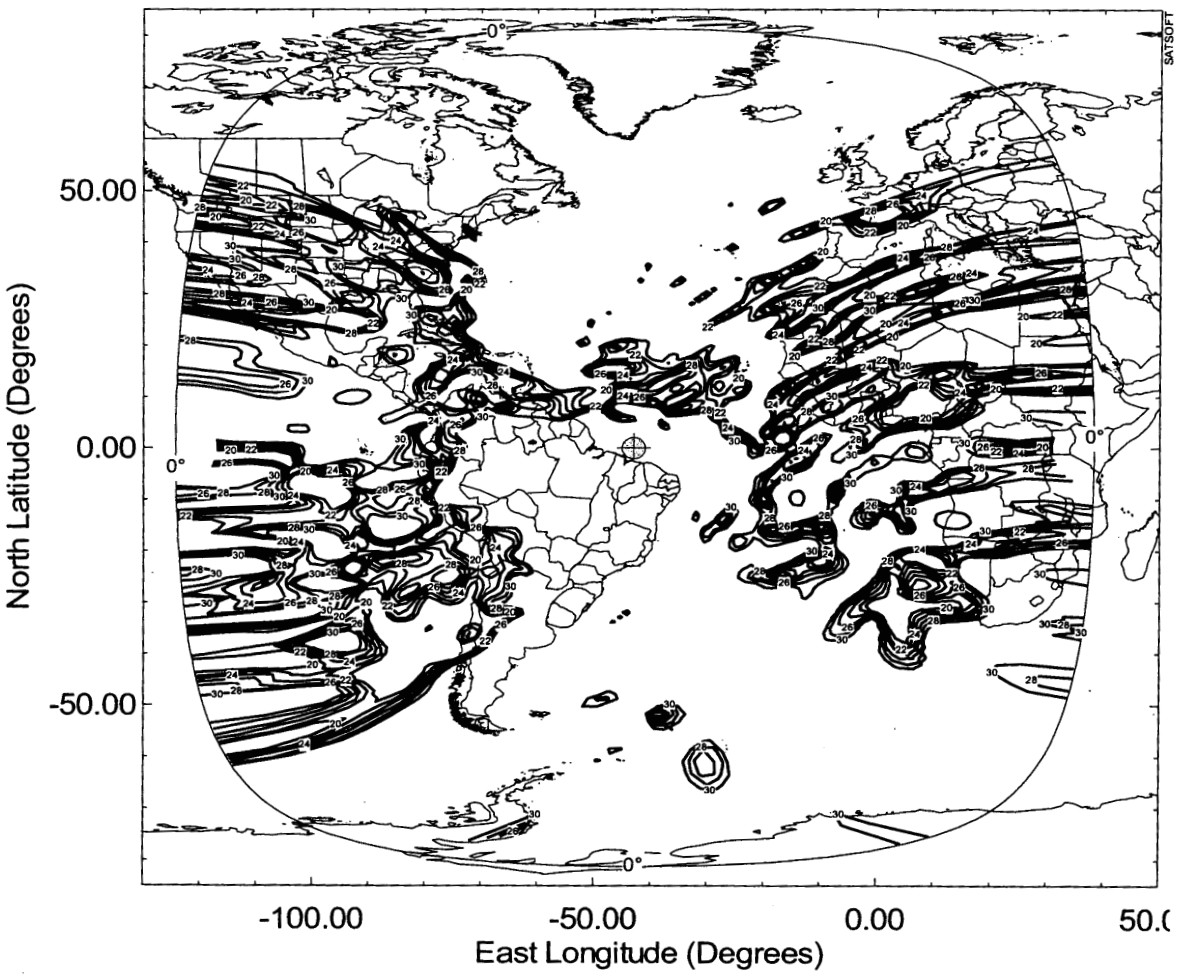
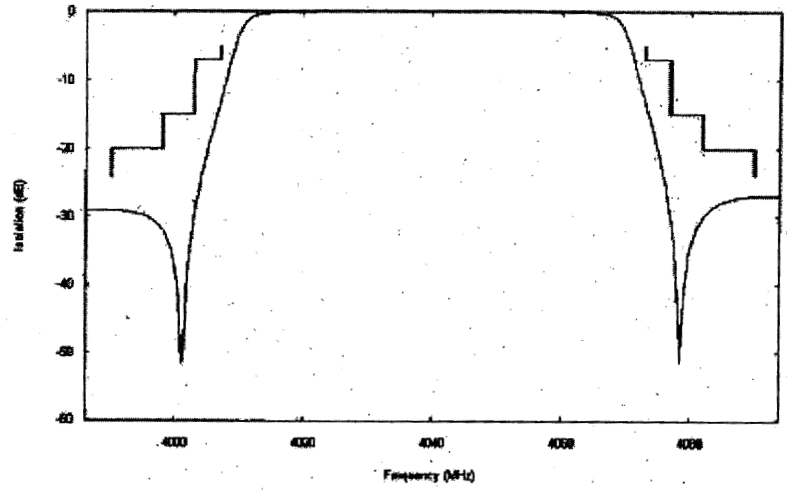


EXHIBIT 7: COMMUNICATION SUBSYSTEM
EIRP AND G/T BUDGETS

Beam Name	Americas and Europe	East Brazil	ULPC
Frequency Band (MHz)	3700 - 4200	10700 - 11450	3701 / 4199.5
Polarization	Horizontal / Vertical	Horizontal / Vertical	Horizontal / Vertical
Maximum Power At The Output of Last Stage Amplifier (dBW)	17.4	20.4	4.8
Loss From Last Stage Amplifier To Transmit Antenna Interface (dB)	2.2	2.5	1.6
Peak Gain of Satellite Transmit Antenna (dBi)	27.5	37.5	13.0
Maximum Downlink EIRP (dBW)	42.7	55.4	16.2
Beam Name	Americas and Europe	Americas and Europe	
Frequency Band (MHz)	5925 – 6425	12750 - 14000	
Polarization	Horizontal / Vertical	Horizontal / Vertical	
Antenna Noise Temperature (°Kelvin)	175	145	
Receiver Noise Temperature (°Kelvin)	313	405	
Total System Noise Temperature (°Kelvin)	488	550	
Total System Noise Temperature (dBK)	26.9	27.4	
Peak Gain of Satellite Receive Antenna (dBi)	30.6	29.2	
Peak G/T (dB/K)	3.7	1.8	
Minimum SFD [Peak G/T, Attn: 0 dB] – (dBW/m^2)	-103.7	-98.8	

EXHIBIT 8B: C-BAND CHANNEL FREQUENCY OUTPUT RESPONSE CHARACTERISTICS

Output Multiplexer Response (54 MHz Channel)



Output Multiplexer Response (64 MHz Channel)

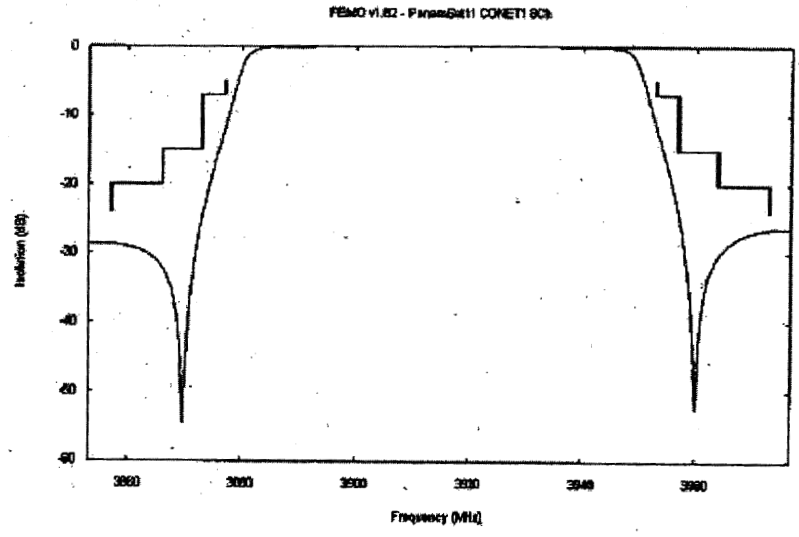


EXHIBIT 8D: Ku-BAND CHANNEL FREQUENCY OUTPUT RESPONSE CHARACTERISTICS

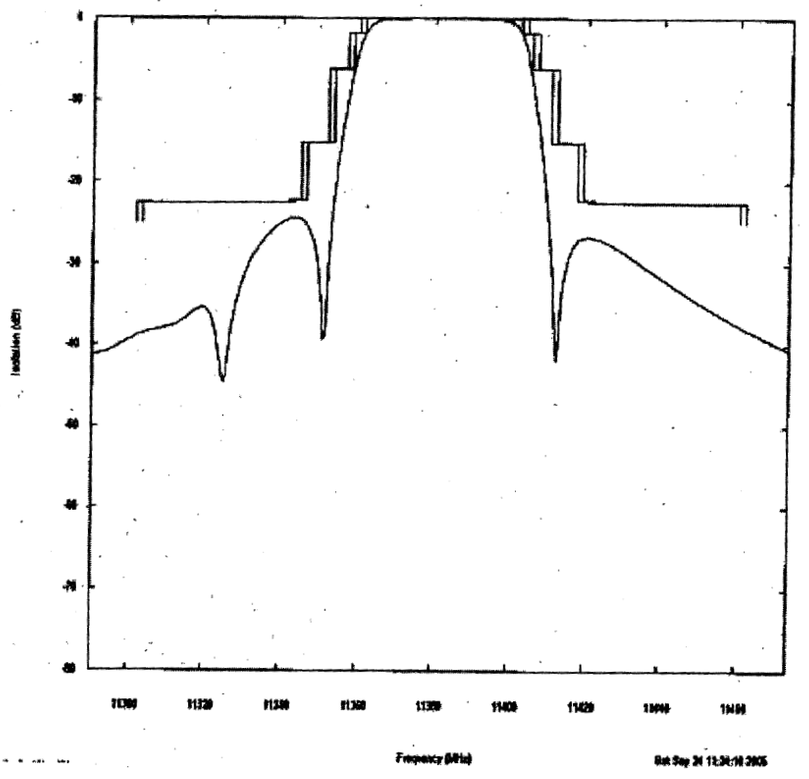


EXHIBIT 10: TC&R SUBSYSTEM EIRP and G/T BUDGETS

Antenna Type	Global Horn	WCA	Omni
Frequency Band (MHz)	11448 / 11449	11448 / 11449	11448 / 11449
Polarization (see note)	H	LHCP	LHCP
Maximum Power At The Output of Last Stage Amplifier (dBW)	-4	9.3	9.3
Loss From Last Stage Amplifier To Transmit Antenna Interface (dB)	4.6	8.9	5.7
Peak Gain of Satellite Transmit Antenna (dBi)	21.0	13.0	3.0
Maximum Downlink EIRP (dBW)	12.4	13.4	6.6
Antenna Type	Comm. Reflector	WCA	Omni
Frequency Band (MHz)	13246.5 / 13995.5	13246.5 / 13995.5	13246.5 / 13995.5
Polarization (see Note)	H / V	RHCP	RHCP
Antenna Noise Temperature (°Kelvin)	145	290	290
Receiver Noise Temperature (°Kelvin)	5510	16748	5211
Total System Noise Temperature (°Kelvin)	5655	17038	5501
Total System Noise Temperature (dBK)	37.5	42.3	37.4
Peak Gain of Satellite Receive Antenna (dBi)	29.2	13.0	3.0
Peak G/T (dB/K)	-8.3	-29.3	-34.4
SFD Threshold at Peak G/T (dBW/m^2)	-117.3	-96.4	-91.3

Note:
H: Linear Horizontal Polarization
V: Linear Vertical Polarization
LHCP: Left Hand Circular Polarization
RHCP: Right Hand Circular Polarization

EXHIBIT 11: POWER FLUX DENSITY CALCULATIONS (continued)

Uplink Power Control Carrier (3700 – 4200 MHz)

Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP (dBW)	16.2	16.2	16.2	16.2	16.2	16.2	16.2
Spreading Loss (dB/m^2)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum PFD (dBW/m^2/4kHz) (0.025 MHz Digital Carrier)	-155.1	-155.0	-154.9	-154.8	-154.7	-154.6	-153.8
PFD Limit (dBW/m^2/4kHz)	-152.0	-152.0	-149.5	-147.0	-144.5	-142.0	-142.0
Margin (dB)	3.1	3.0	5.4	7.8	10.2	12.6	11.8

EXHIBIT 13: IS 11 C-Band Link Budgets
[Channel Bandwidth: 54 MHz]

Uplink Beam Name	Americas	Americas	Americas	Americas	Americas
Uplink Frequency (MHz)	5925 – 6425	5925 – 6425	5925 – 6425	5925 – 6425	5925 – 6425
Uplink Beam Polarization	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical
Uplink Beam Relative Contour (dB)	-10	-10	-10	-10	-10
Uplink Contour G/T (dB/K)	-6.3	-6.3	-6.3	-6.3	-6.3
Uplink SFD (dBW/m^2)	-76.7	-88.7	-78.7	-78.7	-78.7
Downlink Beam Name	Americas & Europe	Americas & Europe	Americas & Europe	Americas & Europe	Americas & Europe
Downlink Frequency (MHz)	3700 – 4200	3700- 4200	3700 -4200	3700 – 4200	3700 - 4200
Downlink Beam Polarization	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical
Downlink Beam Relative Contour (dB)	-8	-8	-8	-8	-8
Downlink Contour EIRP (dBW)	34.7	34.7	34.7	34.7	34.7
Satellite 1 Orbital Location	45 W.L.	45 W.L.	45 W.L.	45 W.L.	45 W.L.
Uplink Power Density (dBW/Hz)	-45	-45	-45	-45	-45
Uplink Polarization Advantage (dB)	0	0	0	0	0
Downlink EIRP Density (dBW/Hz)	-33.7	-33.7	-33.7	-33.7	-33.7
Downlink Polarization Advantage (dB)	0	0	0	0	0
Satellite 2 Orbital Location	41 W.L.	41 W.L.	41 W.L.	41 W.L.	41 W.L.
Uplink Power Density (dBW/Hz)	-45	-45	-45	-45	-45
Uplink Polarization Advantage (dB)	0	0	0	0	0
Downlink EIRP Density (dBW/Hz)	-33.7	-33.7	-33.7	-33.7	-33.7
Downlink Polarization Advantage (dB)	0	0	0	0	0
Carrier ID	24M0F3F	44M8G7W	4M15G7W	1M21G7W	75K4G7W
Information Rate (kbps)	N/A	34368	6000	1544	64
Carrier Modulation	TV/FM	OPSK	OPSK	OPSK	OPSK
Peak to Peak Bandwidth of EDS (MHz)	4	n/a	n/a	n/a	n/a
Code Rate	N/A	1/2 - RS	3/4 - RS	3/4-RS	1/2-RS
Occupied Bandwidth (kHz)	24000	44751.5	4154	1212.8	75.4
Allocated Bandwidth (kHz)	24000	52583.0	6875	1550	100
Minimum C/N, Rain (dB)	10.0	3.1	6.7	5.7	3.0
Earth Station Diameter (meters)	7.0	7.0	7.0	7.0	7.0
Earth Station Gain (dBi)	51.0	51.0	51.0	51.0	51.0
Earth Station Elevation Angle	20	20	20	20	20
Earth Station Diameter (meters)	11	3.5	6.1	6.1	4.5
Earth Station Gain (dBi)	51.9	41.1	46.5	46.5	43.9
Earth Station G/T (dB/K)	31.0	21.0	26.2	26.2	23.6
Earth Station Elevation Angle	20	20	20	20	20
Uplink Earth Station EIRP (dBW)	75.2	74.2	68.9	62.4	49.9
Uplink Path Loss, Clear Sky (dB)	-200.2	-200.2	-200.2	-200.2	-200.2
Satellite G/T (dB/K)	-6.3	-6.3	-6.3	-6.3	-6.3
Boltzman Constant (dBW/K-Hz)	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-73.8	-76.5	-66.2	-60.8	-48.8
Uplink C/N (dB)	23.5	19.8	24.8	23.6	23.2
Downlink EIRP per Carrier (dBW)	30.2	34.7	21.4	14.9	2.4
Antenna Pointing Error (dB)	-0.5	-0.5	-0.5	-0.5	-0.5
Downlink Path Loss, Clear Sky (dB)	-196.3	-196.3	-196.3	-196.3	-196.3
Earth Station G/T (dB/K)	31.0	-21.0	26.2	26.2	23.6
Boltzman Constant (dBW/K-Hz)	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-73.8	-76.5	-66.2	-60.8	-48.8
Downlink C/N (dB)	19.2	11.0	13.2	12.0	9.0
C/N Uplink (dB)	23.5	19.8	24.8	23.6	23.2
C/N Downlink (dB)	19.2	11.0	13.2	12.0	9.0
C/I Intermodulation (dB)	n/a	n/a	28.0	26.9	26.5
C/I Uplink Co-Channel (dB)*	20.5	20.1	21.6	21.6	21.0
C/I Downlink Co-Channel (dB)*	23.5	23.1	24.6	24.6	24.0
C/I Uplink Adjacent Satellite 1 (dB)	18.4	14.7	19.7	18.6	18.1
C/I Downlink Adjacent Satellite 1 (dB)	20.0	8.2	12.9	11.8	8.4
C/I Uplink Adjacent Satellite 2 (dB)	18.4	14.7	19.7	18.6	18.1
C/I Downlink Adjacent Satellite 2 (dB)	21.0	13.0	14.8	13.7	10.9
C/(N+I) Composite (dB)	11.1	4.3	7.7	6.7	4.0
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	10.1	3.3	6.7	5.7	3.0
Minimum Required C/N (dB)	-10.0	-3.1	-6.7	-5.7	-3.0
Excess Link Margin (dB)	0.1	0.2	0.0	0.0	0.0
Uplink Power Density (dBW/Hz)	-41.8	-53.3	-48.3	-49.4	-49.9
Downlink EIRP Density At Beam Peak	-27.8	-33.8	-36.8	-37.9	-38.4
Number of Carriers	2.0	1.0	5.4	24.0	424.8

*The C/I level is adjusted depending on the signal level and transponder mode of operation

EXHIBIT 14: IS 11 Ku-Band Link Budgets

UPLINK BEAM INFORMATION						
Uplink Beam Name	Americas & Europe	Americas & Europe	Americas & Europe	Americas & Europe	Americas & Europe	Americas & Europe
Uplink Frequency (MHz)	13750 -14000	13750 -14000	13750 – 14000	13750 – 14000	13750 – 14000	13750 - 14000
Uplink Beam Polarization	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical
Uplink Beam Relative Contour (dB)	-6	-6	-6	-6	-6	-6
Uplink Contour G/T (dB/K)	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2
Uplink SFD (dBW/m^2)	-82.8	-82.8	-82.8	-82.8	-82.8	-82.8
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0	42.0	42.0
DOWNLINK BEAM INFORMATION						
Downlink Beam Name	East Brazil	East Brazil	East Brazil	East Brazil	East Brazil	East Brazil
Downlink Frequency (MHz)	10950 – 11200	10950 – 11200	10950 – 11200	10950 - 11200	10950 – 11200	10950 - 11200
Downlink Beam Polarization	Vertical/Horizontal	Vertical/Horizontal	Vertical/Horizontal	Vertical/Horizontal	Vertical/Horizontal	Vertical/Horizontal
Downlink Beam Relative Contour (dB)	-4	-4	-4	-4	-4	-4
Downlink Contour EIRP (dBW)	51.4	51.4	51.4	51.4	51.4	51.4
Rain Rate (mm/hr)	95.0	95.0	95.0	95.0	95.0	95.0
ADJACENT SATELLITE 1						
Satellite 1 Orbital Location	45 W.L.	45 W.L.	45 W.L.	45 W.L.	45 W.L.	45 W.L.
Uplink Power Density (dBW/Hz)	-45	-45	-45	-45	-45	-45
Uplink Polarization Advantage (dB)	0	0	0	0	0	0
Downlink EIRP Density (dBW/Hz)	-23.8	-23.8	-23.8	-23.8	-23.8	-23.8
Downlink Polarization Advantage (dB)	0	0	0	0	0	0
ADJACENT SATELLITE 2						
Satellite 2 Orbital Location	41 W.L.	41 W.L.	41 W.L.	41 W.L.	41 W.L.	41 W.L.
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	0	0	0	0	0	0
Downlink EIRP Density (dBW/Hz)	-19.3	-19.3	-19.3	-19.3	-19.3	-19.3
Downlink Polarization Advantage (dB)	0	0	0	0	0	0
CARRIER INFORMATION						
Carrier ID	36M0F3F	36M0F3F	36M0F3F	30M1G7W	30M1G7W	30M1G7W
Information Rate (kbps)	n/a	n/a	n/a	36863	36863	36863
Carrier Modulation	TV/FM	TV/FM	TV/FM	QPSK	QPSK	QPSK
Peak to Peak Bandwidth of EDS (MHz)	4	4	4	n/a	n/a	n/a
Code Rate	n/a	n/a	n/a	3/4 - RS	3/4 - RS	3/4 - RS
Occupied Bandwidth (kHz)	36000	36000	36000	30133	30133	30133
Allocated Bandwidth (kHz)	36000	36000	36000	36000	36000	36000
Minimum C/N (dB)	10.0	10.0	10.0	6.1	6.1	6.1
UPLINK EARTH STATION						
Earth Station Diameter (meters)	6.1	6.1	6.1	6.1	6.1	6.1
Earth Station Gain (dBi)	56.7	56.7	56.7	56.7	56.7	56.7
Earth Station Elevation Angle	20	20	20	20	20	20
DOWNLINK EARTH STATION						
Earth Station Diameter (meters)	1.8	1.8	1.8	1.2	1.2	1.2
Earth Station Gain (dBi)	44.1	44.1	44.1	40.6	40.6	40.6
Earth Station G/T (dB/K)	21.6	21.6	18.9	18.1	18.1	14.9
Earth Station Elevation Angle	20	20	20	20	20	20
LINK FADE TYPE	Clear Sky	Uplink Fade	Downlink Fade	Clear Sky	Uplink Fade	Downlink Fade
UPLINK PERFORMANCE						
Uplink Earth Station EIRP (dBW)	80.1	80.1	80.1	80.1	80.1	80.1
Uplink Path Loss, Clear Sky (dB)	-207.2	-207.2	-207.2	-207.2	-207.2	-207.2
Uplink Rain Attenuation (dB)	0.0	-3.6	0.0	0.0	-6.1	0.0
Satellite G/T (dB/K)	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2
Boltzman Constant (dBW/K-Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-75.6	-75.6	-74.8	-74.8	-74.8
Uplink C/N (dB)	21.7	18.1	21.7	22.5	16.4	22.5
DOWNLINK PERFORMANCE						
Downlink EIRP per Carrier (dBW)	51.4	50.5	51.4	51.4	48.7	51.4
Antenna Pointing Error (dB)	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
Downlink Path Loss, Clear Sky (dB)	-205.3	-205.3	-205.3	-205.3	-205.3	-205.3
Downlink Rain Attenuation (dB)	0.0	0.0	-3.5	0.0	0.0	-5.3
Earth Station G/T, Clear Sky (dB/K)	21.6	21.6	18.9	18.1	18.1	14.9
Boltzman Constant (dBW/K-Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-75.6	-75.6	-74.8	-74.8	-74.8
Downlink C/N (dB)	20.3	19.4	14.1	17.5	14.9	9.0
COMPOSITE LINK PERFORMANCE						
C/N Uplink (dB)	21.7	18.1	21.7	22.5	16.4	22.5
C/N Downlink (dB)	20.3	19.4	14.1	17.5	14.9	9.0
C/I Intermodulation (dB)	n/a	n/a	n/a	n/a	n/a	n/a
C/I Uplink Co-Channel (dB)*	23.0	19.4	23.0	23.0	16.9	23.0
C/I Downlink Co-Channel (dB)*	27.0	26.1	27.0	27.0	24.3	27.0
C/I Uplink Adjacent Satellite 1 (dB)	25.5	21.9	25.5	26.3	20.2	26.3
C/I Downlink Adjacent Satellite 1 (dB)	21.1	20.2	21.1	15.3	12.6	15.3
C/I Uplink Adjacent Satellite 2 (dB)	25.5	21.9	25.5	26.3	20.2	26.3
C/I Downlink Adjacent Satellite 2 (dB)	18.8	17.9	18.8	16.6	13.9	16.6
C/(N+I) Composite (dB)	13.0	11.0	11.0	10.6	7.1	7.1
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	12.0	10.0	10.0	9.6	6.1	6.1
Minimum Required C/N (dB)	-10.0	-10.0	-10.0	-6.1	-6.1	-6.1
Excess Link Margin (dB)	2.0	0.0	0.0	3.5	0.0	0.0
Carrier Density Levels						
Uplink Power Density (dBW/Hz)	-42.6	-42.6	-42.6	-51.4	-51.4	-51.4
Downlink EIRP Density At Beam Peak	-10.6	-11.5	-10.6	-19.4	-22.1	-19.4
Number of Carriers	1.0	1.0	1.0	1.0	1.0	1.0

*** Note:** The C/I level is adjusted depending on the signal level and transponder mode of operation.

EXHIBIT 14: IS 11 Ku-Band Link Budgets (continued)

UPLINK BEAM INFORMATION						
Uplink Beam Name	Americas & Europe	Americas & Europe	Americas & Europe	Americas & Europe	Americas & Europe	Americas & Europe
Uplink Frequency (MHz)	13750- 14000	12750 – 13250	12750- 13250	12750 – 13250	12750 – 13250	13750- 14000
Uplink Beam Polarization	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical
Uplink Beam Relative Contour (dB)	-6	-6	-6	-6	-6	-6
Uplink Contour G/T (dB/K)	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2
Uplink SFD (dBW/m^2)	-77.8	-77.8	-77.8	-77.8	-77.8	-77.8
Rain Rate (mm/hr)	95.0	95.0	95.0	95.0	95.0	95.0
DOWNLINK BEAM INFORMATION						
Downlink Beam Name	East Brazil	East Brazil	East Brazil	East Brazil	East Brazil	East Brazil
Downlink Frequency (MHz)	10950 - 11200	10950 - 11200	10950 - 11200	10950 - 11200	10950 - 11200	10950- 11200
Downlink Beam Polarization	Vertical/Horizontal	Vertical/Horizontal	Vertical/Horizontal	Vertical/Horizontal	Vertical/Horizontal	Vertical/Horizontal
Downlink Beam Relative Contour (dB)	-4	-4	-4	-4	-4	-4
Downlink Contour EIRP (dBW)	51.4	51.4	51.4	51.4	51.4	51.4
Rain Rate (mm/hr)	95.0	95.0	95.0	95.0	95.0	95.0
ADJACENT SATELLITE 1						
Satellite 1 Orbital Location	45 W.L.	45 W.L.	45 W.L.	45 W.L.	45 W.L.	45 W.L.
Uplink Power Density (dBW/Hz)	-45	-45	-45	-45	-45	-45
Uplink Polarization Advantage (dB)	0	0	0	0	0	0
Downlink EIRP Density (dBW/Hz)	-23.8	-23.8	-23.8	-23.8	-23.8	-23.8
Downlink Polarization Advantage (dB)	0	0	0	0	0	0
ADJACENT SATELLITE 2						
Satellite 2 Orbital Location	41 W.L.	41 W.L.	41 W.L.	41 W.L.	41 W.L.	41 W.L.
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	0	0	0	0	0	0
Downlink EIRP Density (dBW/Hz)	-19.3	-19.3	-19.3	-19.3	-19.3	-19.3
Downlink Polarization Advantage (dB)	0	0	0	0	0	0
CARRIER INFORMATION						
Carrier ID	1M23G7W	1M23G7W	1M23G7W	307KG7W	307KG7W	307KG7W
Information Rate (kbps)	512	512	512	128	128	128
Carrier Modulation	BPSK	BPSK	BPSK	BPSK	BPSK	BPSK
Peak to Peak Bandwidth of EDS (MHz)	n/a	n/a	n/	n/a	n/a	n/a
Code Rate	1/2	1/2	1/2	1/2	1/2	1/2
Occupied Bandwidth (kHz)	1229	1229	1229	307	307	307
Allocated Bandwidth (kHz)	1450	1450	1450	400	400	400
Minimum C/N (dB)	3.4	2.7	2.7	3.4	2.7	2.7
UPLINK EARTH STATION						
Earth Station Diameter (meters)	6.1	6.1	6.1	1.8	1.8	1.8
Earth Station Gain (dBi)	56.7	56.7	56.7	46.2	46.2	46.2
Earth Station Elevation Angle	20	20	20	20	20	20
DOWNLINK EARTH STATION						
Earth Station Diameter (meters)	1.8	1.8	1.8	6.1	6.1	6.1
Earth Station Gain (dBi)	44.1	44.1	44.1	54.8	54.8	54.8
Earth Station G/T (dB/K)	21.6	21.6	18.2	32.4	32.4	28.5
Earth Station Elevation Angle	20	20	20	20	20	20
LINK FADE TYPE	Clear Sky	Uplink Fade	Downlink Fade	Clear Sky	Uplink Fade	Downlink Fade
UPLINK PERFORMANCE						
Uplink Earth Station EIRP (dBW)	63.1	63.1	63.1	53.4	53.4	53.4
Uplink Path Loss, Clear Sky (dB)	-207.2	-207.2	-207.2	-207.2	-207.2	-207.2
Uplink Rain Attenuation (dB)	0.0	-4.5	0.0	0.0	-4.2	0.0
Satellite G/T (dB/K)	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2
Boltzman Constant (dBW/K-Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-60.9	-60.9	-60.9	-54.9	-54.9	-54.9
Uplink C/N (dB)	19.3	14.9	19.3	15.7	11.5	15.7
DOWNLINK PERFORMANCE						
Downlink EIRP per Carrier (dBW)	31.9	27.4	31.9	22.2	18.0	22.2
Antenna Pointing Error (dB)	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
Downlink Path Loss, Clear Sky (dB)	-205.3	-205.3	-205.3	-205.3	-205.3	-205.3
Downlink Rain Attenuation (dB)	0.0	0.0	-6.7	0.0	0.0	-12.9
Earth Station G/T, Clear Sky (dB/K)	21.6	21.6	18.2	32.4	32.4	28.5
Boltzman Constant (dBW/K-Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-60.9	-60.9	-60.9	-54.9	-54.9	-54.9
Downlink C/N (dB)	15.4	11.0	5.2	22.6	18.4	5.7
COMPOSITE LINK PERFORMANCE						
C/N Uplink (dB)	19.3	14.9	19.3	15.7	11.5	15.7
C/N Downlink (dB)	15.4	11.0	5.2	22.6	18.4	5.7
C/I Intermodulation (dB)	15.4	11.1	15.4	11.8	7.6	11.8
C/I Uplink Co-Channel (dB)*	20.9	16.4	20.9	16.8	12.7	16.8
C/I Downlink Co-Channel (dB)*	24.9	20.5	24.9	20.8	16.7	20.8
C/I Uplink Adjacent Satellite 1 (dB)	23.2	18.7	23.2	19.5	15.3	19.5
C/I Downlink Adjacent Satellite 1 (dB)	16.3	11.8	16.3	24.1	20.0	24.1
C/I Uplink Adjacent Satellite 2 (dB)	23.2	18.7	23.2	19.5	15.3	19.5
C/I Downlink Adjacent Satellite 2 (dB)	13.9	9.5	13.9	20.2	16.1	20.2
C/(N+I) Composite (dB)	8.1	3.7	3.7	7.8	3.7	3.7
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	7.1	2.7	2.7	6.8	2.7	2.7
Minimum Required C/N (dB)	-3.4	-2.7	-2.7	-3.4	-2.7	-2.7
Excess Link Margin (dB)	3.7	0.0	0.0	3.4	0.0	0.0
Carrier Density Levels						
Uplink Power Density (dBW/Hz)	-54.5	-54.5	-54.5	-47.7	-47.7	-47.7
Downlink EIRP Density At Beam Peak	-25.0	-29.5	-25.0	-28.7	-32.9	-28.7
Number of Carriers	24.8	24.8	24.8	90.0	90.0	90.0

*** Note:** The C/I level is adjusted depending on the signal level and transponder mode of operation.

EXHIBIT 15: Hypothetical Satellite (41° W.L.) C-Band Link Budgets
[Channel Bandwidth: 54 MHz]

Uplink Beam Name	Americas	Americas	Americas	Americas	Americas
Uplink Frequency (MHz)	5925 – 6425	5925 – 6425	5925 – 6425	5925 – 6425	5925 – 6425
Uplink Beam Polarization	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical
Uplink Beam Relative Contour (dB)	-10	-10	-10	-10	-10
Uplink Contour G/T (dB/K)	-6.3	-6.3	-6.3	-6.3	-6.3
Uplink SFD (dBW/m^2)	-75.7	-88.7	-80.7	-80.7	-80.7
Downlink Beam Name	Americas & Europe	Americas & Europe	Americas & Europe	Americas & Europe	Americas & Europe
Downlink Frequency (MHz)	3700 – 4200	3700- 4200	3700 -4200	3700 – 4200	3700 – 4200
Downlink Beam Polarization	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical
Downlink Beam Relative Contour (dB)	-8	-8	-8	-8	-8
Downlink Contour EIRP (dBW)	34.7	34.7	34.7	34.7	34.7
Satellite 1 Orbital Location	43 W.L.	43 W.L.	43 W.L.	43 W.L.	43 W.L.
Uplink Power Density (dBW/Hz)	-48.3	-48.3	-48.3	-48.3	-48.3
Uplink Polarization Advantage (dB)	0	0	0	0	0
Downlink EIRP Density (dBW/Hz)	-33.8	-33.8	-33.8	-33.8	-33.8
Downlink Polarization Advantage (dB)	0	0	0	0	0
Satellite 2 Orbital Location	39 W.L.	39 W.L.	39 W.L.	39 W.L.	39 W.L.
Uplink Power Density (dBW/Hz)	-45	-45	-45	-45	-45
Uplink Polarization Advantage (dB)	0	0	0	0	0
Downlink EIRP Density (dBW/Hz)	-33.8	-33.8	-33.8	-33.8	-33.8
Downlink Polarization Advantage (dB)	0	0	0	0	0
Carrier ID	24M0F3F	44M8G7W	4M15G7W	1M21G7W	75K4G7W
Information Rate (kbps)	N/A	34368	6000	1544	64
Carrier Modulation	TV/FM	OPSK	OPSK	OPSK	OPSK
Peak to Peak Bandwidth of EDS (MHz)	4	n/a	n/a	n/a	n/a
Code Rate	N/A	1/2 - RS	3/4 - RS	3/4-RS	1/2-RS
Occupied Bandwidth (kHz)	24000	44751.5	4154	1212.8	75.4
Allocated Bandwidth (kHz)	24000	52583.0	6875	1550	100
Minimum C/N, Rain (dB)	10.0	3.1	6.7	5.7	3.0
Earth Station Diameter (meters)	7.0	7.0	7.0	7.0	7.0
Earth Station Gain (dBi)	51.0	51.0	51.0	51.0	51.0
Earth Station Elevation Angle	20	20	20	20	20
Earth Station Diameter (meters)	9.0	3.5	6.1	6.1	4.5
Earth Station Gain (dBi)	50.3	41.1	46.5	46.5	43.9
Earth Station G/T (dB/K)	29.4	21.0	26.2	26.2	23.6
Earth Station Elevation Angle	20	20	20	20	20
Uplink Earth Station EIRP (dBW)	76.2	74.2	67.0	60.5	47.9
Uplink Path Loss, Clear Sky (dB)	-200.2	-200.2	-200.2	-200.2	-200.2
Satellite G/T (dB/K)	-6.3	-6.3	-6.3	-6.3	-6.3
Boltzman Constant (dBW/K-Hz)	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-73.8	-76.5	-66.2	-60.8	-48.8
Uplink C/N (dB)	24.5	19.8	22.9	21.7	21.3
Downlink EIRP per Carrier (dBW)	30.2	34.7	21.5	15.0	2.4
Antenna Pointing Error (dB)	-0.5	-0.5	-0.5	-0.5	-0.5
Downlink Path Loss, Clear Sky (dB)	-196.3	-196.3	-196.3	-196.3	-196.3
Earth Station G/T (dB/K)	29.4	21.0	26.2	26.2	23.6
Boltzman Constant (dBW/K-Hz)	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-73.8	-76.5	-66.2	-60.8	-48.8
Downlink C/N (dB)	17.6	11.0	13.3	12.1	9.1
C/N Uplink (dB)	24.5	19.8	22.9	21.7	21.3
C/N Downlink (dB)	17.6	11.0	13.3	12.1	9.1
C/I Intermodulation (dB)	n/a	n/a	28.1	27.0	26.5
C/I Uplink Co-Channel (dB)*	20.5	20.1	21.7	21.7	21.1
C/I Downlink Co-Channel (dB)*	23.5	23.1	24.7	24.7	24.1
C/I Uplink Adjacent Satellite 1 (dB)	22.7	18.1	21.1	20.0	19.5
C/I Downlink Adjacent Satellite 1 (dB)	17.8	8.3	13.1	12.0	8.6
C/I Uplink Adjacent Satellite 2 (dB)	19.4	14.7	17.8	16.7	16.2
C/I Downlink Adjacent Satellite 2 (dB)	19.1	13.1	15.0	13.9	11.1
C/(N+I) Composite (dB)	11.0	4.5	7.7	6.7	4.0
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	10.0	3.5	6.7	5.7	3.0
Minimum Required C/N (dB)	-10.0	-3.1	-6.7	-5.7	-3.0
Excess Link Margin (dB)	0.0	0.4	0.0	0.0	0.0
Uplink Power Density (dBW/Hz)	-40.8	-53.3	-50.2	-51.4	-51.8
Downlink EIRP Density At Beam Peak	-27.8	-33.8	-36.7	-37.8	-38.3
Number of Carriers	2.0	1.0	5.3	23.5	422.0

*The C/I level is adjusted depending on the signal level and transponder mode of operation

EXHIBIT 16: Hypothetical Satellite (41° W.L.) Ku-Band Link Budgets

UPLINK BEAM INFORMATION						
Uplink Beam Name	Americas & Europe	Americas & Europe	Americas & Europe	Americas & Europe	Americas & Europe	Americas & Europe
Uplink Frequency (MHz)	13750 - 14000	13750 - 14000	13750 - 14000	12750 – 13250	12750 – 13250	12750 - 13250
Uplink Beam Polarization	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical
Uplink Beam Relative Contour (dB)	-6	-6	-6	-6	-6	-6
Uplink Contour G/T (dB/K)	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2
Uplink SFD (dBW/m^2)	-82.8	-82.8	-82.8	-82.8	-82.8	-82.8
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0	42.0	42.0
DOWNLINK BEAM INFORMATION						
Downlink Beam Name	Brazil	Brazil	Brazil	Brazil	Brazil	Brazil
Downlink Frequency (MHz)	10950 - 11200	10950 – 11200	10950 – 11200	10950 – 11200	10950 - 11200	10950 - 11200
Downlink Beam Polarization	Vertical/Horizontal	Vertical/Horizontal	Vertical/Horizontal	Vertical/Horizontal	Vertical/Horizontal	Vertical/Horizontal
Downlink Beam Relative Contour (dB)	-4	-4	-4	-4	-4	-4
Downlink Contour EIRP (dBW)	51.4	51.4	51.4	51.4	51.4	51.4
Rain Rate (mm/hr)	95.0	95.0	95.0	95.0	95.0	95.0
ADJACENT SATELLITE 1						
Satellite 1 Orbital Location	43 W.L.	43 W.L.	43 W.L.	43 W.L.	43 W.L.	43 W.L.
Uplink Power Density (dBW/Hz)	-47.7	-47.7	-47.7	-47.7	-47.7	-47.7
Uplink Polarization Advantage (dB)	0	0	0	0	0	0
Downlink EIRP Density (dBW/Hz)	-19.4	-19.4	-19.4	-19.4	-19.4	-19.4
Downlink Polarization Advantage (dB)	0	0	0	0	0	0
ADJACENT SATELLITE 2						
Satellite 2 Orbital Location	39 W.L.	39 W.L.	39 W.L.	39 W.L.	39 W.L.	39 W.L.
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	0	0	0	0	0	0
Downlink EIRP Density (dBW/Hz)	-19.4	-19.4	-19.4	-19.4	-19.4	-19.4
Downlink Polarization Advantage (dB)	0	0	0	0	0	0
CARRIER INFORMATION						
Carrier ID	36M0F3F	36M0F3F	36M0F3F	30M1G7W	30M1G7W	30M1G7W
Information Rate (kbps)	n/a	n/a	n/a	36863	36863	36863
Carrier Modulation	TV/FM	TV/FM	TV/FM	QPSK	QPSK	QPSK
Peak to Peak Bandwidth of EDS (MHz)	4	4	4	n/a	n/a	n/a
Code Rate	n/a	n/a	n/a	3/4 - RS	3/4 - RS	3/4 - RS
Occupied Bandwidth (kHz)	36000	36000	36000	30133	30133	30133
Allocated Bandwidth (kHz)	36000	36000	36000	36000	36000	36000
Minimum C/N (dB)	10.0	10.0	10.0	6.1	6.1	6.1
UPLINK EARTH STATION						
Earth Station Diameter (meters)	6.1	6.1	6.1	6.1	6.1	6.1
Earth Station Gain (dBi)	56.3	56.3	56.3	56.3	56.3	56.3
Earth Station Elevation Angle	20	20	20	20	20	20
DOWNLINK EARTH STATION						
Earth Station Diameter (meters)	2.4	2.4	2.4	1.2	1.2	1.2
Earth Station Gain (dBi)	46.8	46.8	46.8	40.6	40.6	40.6
Earth Station G/T (dB/K)	24.3	24.3	21.0	18.1	18.1	15.5
Earth Station Elevation Angle	20	20	20	20	20	20
LINK FADE TYPE	Clear Sky	Uplink Fade	Downlink Fade	Clear Sky	Uplink Fade	Downlink Fade
UPLINK PERFORMANCE						
Uplink Earth Station EIRP (dBW)	80.1	80.1	80.1	80.1	80.1	80.1
Uplink Path Loss, Clear Sky (dB)	-206.9	-206.9	-206.9	-206.9	-206.9	-206.9
Uplink Rain Attenuation (dB)	0.0	-4.6	0.0	0.0	-4.0	0.0
Satellite G/T (dB/K)	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2
Boltzman Constant (dBW/K-Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-74.8	-75.6	-75.6	-74.8	-74.8	-74.8
Uplink C/N (dB)	22.0	17.4	22.0	22.8	18.7	22.8
DOWNLINK PERFORMANCE						
Downlink EIRP per Carrier (dBW)	51.4	50.0	51.4	51.4	50.3	51.4
Antenna Pointing Error (dB)	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
Downlink Path Loss, Clear Sky (dB)	-205.3	-205.3	-205.3	-205.3	-205.3	-205.3
Downlink Rain Attenuation (dB)	0.0	0.0	-6.1	0.0	0.0	-3.5
Earth Station G/T, Clear Sky (dB/K)	24.3	24.3	21.0	18.1	18.1	15.5
Boltzman Constant (dBW/K-Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-75.6	-75.6	-74.8	-74.8	-74.8
Downlink C/N (dB)	23.0	21.5	13.6	17.5	16.4	11.4
COMPOSITE LINK PERFORMANCE						
C/N Uplink (dB)	22.0	17.4	22.0	22.8	18.7	22.8
C/N Downlink (dB)	23.0	21.5	13.6	17.5	16.4	11.4
C/I Intermodulation (dB)	n/a	n/a	n/a	n/a	n/a	n/a
C/I Uplink Co-Channel (dB)*	23.0	18.4	23.0	23.0	19.0	23.0
C/I Downlink Co-Channel (dB)*	27.0	25.6	27.0	27.0	25.9	27.0
C/I Uplink Adjacent Satellite 1 (dB)	28.2	23.7	28.2	29.0	25.0	29.0
C/I Downlink Adjacent Satellite 1 (dB)	19.7	18.3	19.7	10.9	9.8	10.9
C/I Uplink Adjacent Satellite 2 (dB)	25.5	21.0	25.5	26.3	22.3	26.3
C/I Downlink Adjacent Satellite 2 (dB)	21.4	19.9	21.4	16.7	15.6	16.7
C/(N+I) Composite (dB)	13.9	11.0	11.0	8.7	7.1	7.2
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	12.9	10.0	10.0	7.7	6.1	6.2
Minimum Required C/N (dB)	-10.0	-10.0	-10.0	-6.1	-6.1	-6.1
Excess Link Margin (dB)	2.9	0.0	0.0	1.5	0.0	0.1
Carrier Density Levels						
Uplink Power Density (dBW/Hz)	-42.3	-42.8	-42.8	-51.0	-51.0	-51.0
Downlink EIRP Density At Beam Peak	-10.6	-12.0	-10.6	-19.4	-20.5	-19.4
Number of Carriers	1.0	1.0	1.0	1.0	1.0	1.0

*** Note:** The C/I level is adjusted depending on the signal level and transponder mode of operation.

EXHIBIT 16: Hypothetical Satellite (41° W.L.) Ku-Band Link Budgets (continued)

UPLINK BEAM INFORMATION						
Uplink Beam Name	Americas & Europe	Americas & Europe	Americas & Europe	Americas & Europe	Americas & Europe	Americas & Europe
Uplink Frequency (MHz)	13750 – 14000	13750 – 14000	13750 – 14000	13750 – 14000	13750 – 14000	13750 - 14000
Uplink Beam Polarization	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical
Uplink Beam Relative Contour (dB)	-6	-6	-6	-6	-6	-6
Uplink Contour G/T (dB/K)	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2
Uplink SFD (dBW/m^2)	-86.8	-86.8	-86.8	-86.8	-86.8	-86.8
Rain Rate (mm/hr)	95.0	95.0	95.0	95.0	95.0	95.0
DOWNLINK BEAM INFORMATION						
Downlink Beam Name	Brazil	Brazil	Brazil	Brazil	Brazil	Brazil
Downlink Frequency (MHz)	10950 – 11200	10950 – 11200	10950 – 11200	10950 – 11200	10950 - 11200	10950 - 11200
Downlink Beam Polarization	Vertical/Horizontal	Vertical/Horizontal	Vertical/Horizontal	Vertical/Horizontal	Vertical/Horizontal	Vertical/Horizontal
Downlink Beam Relative Contour (dB)	-4	-4	-4	-4	-4	-4
Downlink Contour EIRP (dBW)	51.4	51.4	51.4	51.4	51.4	51.4
Rain Rate (mm/hr)	95.0	95.0	95.0	95.0	95.0	95.0
ADJACENT SATELLITE 1						
Satellite 1 Orbital Location	43 W.L.	43 W.L.	43 W.L.	43 W.L.	43 W.L.	43 W.L.
Uplink Power Density (dBW/Hz)	-47.7	-47.7	-47.7	-47.7	-47.7	-47.7
Uplink Polarization Advantage (dB)	0	0	0	0	0	0
Downlink EIRP Density (dBW/Hz)	-19.4	-19.4	-19.4	-19.4	-19.4	-19.4
Downlink Polarization Advantage (dB)	0	0	0	0	0	0
ADJACENT SATELLITE 2						
Satellite 2 Orbital Location	39 W.L.	39 W.L.	39 W.L.	39 W.L.	39 W.L.	39 W.L.
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	0	0	0	0	0	0
Downlink EIRP Density (dBW/Hz)	-19.4	-19.4	-19.4	-19.4	-19.4	-19.4
Downlink Polarization Advantage (dB)	0	0	0	0	0	0
CARRIER INFORMATION						
Carrier ID	1M23G7W	1M23G7W	1M23G7W	307KG7W	307KG7W	307KG7W
Information Rate (kbps)	512	512	512	128	128	128
Carrier Modulation	BPSK	BPSK	BPSK	BPSK	BPSK	BPSK
Peak to Peak Bandwidth of EDS (MHz)	n/a	n/a	n/a	n/a	n/a	n/a
Code Rate	1/2	1/2	1/2	1/2	1/2	1/2
Occupied Bandwidth (kHz)	1229	1229	1229	307	307	307
Allocated Bandwidth (kHz)	1450	1450	1450	400	400	400
Minimum C/N (dB)	3.4	2.7	2.7	3.4	2.7	2.7
UPLINK EARTH STATION						
Earth Station Diameter (meters)	6.1	6.1	6.1	1.8	1.8	1.8
Earth Station Gain (dBi)	56.3	56.3	56.3	45.8	45.8	45.8
Earth Station Elevation Angle	20	20	20	20	20	20
DOWNLINK EARTH STATION						
Earth Station Diameter (meters)	1.8	1.8	1.8	6.1	6.1	6.1
Earth Station Gain (dBi)	44.1	44.1	44.1	54.8	54.8	54.8
Earth Station G/T (dB/K)	21.6	21.6	18.0	32.4	32.4	28.4
Earth Station Elevation Angle	20	20	20	20	20	20
LINK FADE TYPE	Clear Sky	Uplink Fade	Downlink Fade	Clear Sky	Uplink Fade	Downlink Fade
UPLINK PERFORMANCE						
Uplink Earth Station EIRP (dBW)	56.4	56.4	56.4	48.1	48.1	48.1
Uplink Path Loss, Clear Sky (dB)	-206.9	-206.9	-206.9	-206.9	-206.9	-206.9
Uplink Rain Attenuation (dB)	0.0	-3.6	0.0	0.0	-3.4	0.0
Satellite G/T (dB/K)	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2
Boltzman Constant (dBW/K-Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-60.9	-60.9	-60.9	-54.9	-54.9	-54.9
Uplink C/N (dB)	13.0	9.3	13.0	10.7	7.3	10.7
DOWNLINK PERFORMANCE						
Downlink EIRP per Carrier (dBW)	34.2	30.6	34.2	25.9	22.5	25.9
Antenna Pointing Error (dB)	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
Downlink Path Loss, Clear Sky (dB)	-205.3	-205.3	-205.3	-205.3	-205.3	-205.3
Downlink Rain Attenuation (dB)	0.0	0.0	-8.2	0.0	0.0	-15.9
Earth Station G/T, Clear Sky (dB/K)	21.6	21.6	18.0	32.4	32.4	28.4
Boltzman Constant (dBW/K-Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-60.9	-60.9	-60.9	-54.9	-54.9	-54.9
Downlink C/N (dB)	17.7	14.1	5.9	26.3	22.9	6.3
COMPOSITE LINK PERFORMANCE						
C/N Uplink (dB)	13.0	9.3	13.0	10.7	7.3	10.7
C/N Downlink (dB)	17.7	14.1	5.9	26.3	22.9	6.3
C/I Intermodulation (dB)	17.7	14.4	17.7	15.5	12.1	15.5
C/I Uplink Co-Channel (dB)*	23.2	19.6	23.2	20.5	17.1	20.5
C/I Downlink Co-Channel (dB)*	27.2	23.6	27.2	24.5	21.1	24.5
C/I Uplink Adjacent Satellite 1 (dB)	19.2	15.6	19.2	16.9	13.5	16.9
C/I Downlink Adjacent Satellite 1 (dB)	14.2	10.6	14.2	23.5	20.0	23.5
C/I Uplink Adjacent Satellite 2 (dB)	16.5	12.9	16.5	14.2	10.8	14.2
C/I Downlink Adjacent Satellite 2 (dB)	16.4	12.8	16.4	24.1	20.7	24.1
C/(N+I) Composite (dB)	7.3	3.7	3.7	7.1	3.7	3.7
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	6.3	2.7	2.7	6.1	2.7	2.7
Minimum Required C/N (dB)	-3.4	-2.7	-2.7	-3.4	-2.7	-2.7
Excess Link Margin (dB)	2.9	0.0	0.0	2.7	0.0	0.0
Carrier Density Levels						
Uplink Power Density (dBW/Hz)	-60.9	-60.9	-60.9	-52.6	-52.6	-52.6
Downlink EIRP Density At Beam Peak	-22.7	-26.3	-22.7	-25.0	-28.4	-25.0
Number of Carriers	23.5	23.5	23.5	90.0	90.0	90.0

*** Note:** The C/I level is adjusted depending on the signal level and transponder mode of operation.

EXHIBIT 17: IS 1R (45° W.L.) C-Band Link Budgets

Uplink Beam Name	US-Latin America	US – Latin America	US-Latin America	US-Latin America	US-Latin America
Uplink Frequency (MHz)	5925 – 6425	5925 – 6425	5925 – 6425	5925 – 6425	5925 – 6425
Uplink Beam Polarization	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical
Uplink Beam Relative Contour (dB)	-7	-7	-7	-7	-7
Uplink Contour G/T (dB/K)	-8	-8	-8	-8	-8
Uplink SFD (dBW/m^2)	-88	-88	-88	-88	-88
Downlink Beam Name	US-Latin America	US – Latin America	US-Latin America	US-Latin America	US-Latin America
Downlink Frequency (MHz)	3700 – 4200	3700- 4200	3700 -4200	3700 – 4200	3700 – 4200
Downlink Beam Polarization	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical
Downlink Beam Relative Contour (dB)	-7	-7	-7	-7	-7
Downlink Contour EIRP (dBW)	34	34	34	34	34
Satellite 1 Orbital Location	43 W.L.	43 W.L.	43 W.L.	43 W.L.	43 W.L.
Uplink Power Density (dBW/Hz)	-48.3	-48.3	-48.3	-48.3	-48.3
Uplink Polarization Advantage (dB)	0	0	0	0	0
Downlink EIRP Density (dBW/Hz)	-33.8	-33.8	-33.8	-33.8	-33.8
Downlink Polarization Advantage (dB)	0	0	0	0	0
Satellite 2 Orbital Location	47 W.L.	47 W.L.	47 W.L.	47 W.L.	47 W.L.
Uplink Power Density (dBW/Hz)	-45	-45	-45	-45	-45
Uplink Polarization Advantage (dB)	0	0	0	0	0
Downlink EIRP Density (dBW/Hz)	-33.8	-33.8	-33.8	-33.8	-33.8
Downlink Polarization Advantage (dB)	0	0	0	0	0
Carrier ID	36M0F3F	30M1G7W	4M15G7W	1M21G7W	75K4G7W
Information Rate (kbps)	N/A	36863	6000	1544	64
Carrier Modulation	TV/FM	QPSK	QPSK	QPSK	QPSK
Peak to Peak Bandwidth of EDS (MHz)	4	n/a	n/a	n/a	n/a
Code Rate	N/A	3/4 - RS	3/4 - RS	3/4-RS	1/2-RS
Occupied Bandwidth (kHz)	36000	30133.0	4154	1212.8	75.4
Allocated Bandwidth (kHz)	36000	36000.0	6875	1550	100
Minimum C/N, Rain (dB)	10.0	6.1	6.7	5.7	3.0
Earth Station Diameter (meters)	7.0	7.0	7.0	7.0	7.0
Earth Station Gain (dBi)	51.0	51.0	51.0	51.0	51.0
Earth Station Elevation Angle	20	20	20	20	20
Earth Station Diameter (meters)	8.1	4.5	4.5	4.5	3.5
Earth Station Gain (dBi)	49.3	43.9	43.9	43.9	41.1
Earth Station G/T (dB/K)	28.4	23.6	23.6	23.6	21.0
Earth Station Elevation Angle	20	20	20	20	20
Uplink Earth Station EIRP (dBW)	74.9	74.9	63.9	57.5	45.5
Uplink Path Loss, Clear Sky (dB)	-200.2	-200.2	-200.2	-200.2	-200.2
Satellite G/T (dB/K)	-8.0	-8.0	-8.0	-8.0	-8.0
Boltzman Constant (dBW/K-Hz)	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-74.8	-66.2	-60.8	-48.8
Uplink C/N (dB)	19.7	20.5	18.1	17.6	17.1
Downlink EIRP per Carrier (dBW)	34.0	34.0	24.5	18.1	6.1
Antenna Pointing Error (dB)	-0.5	-0.5	-0.5	-0.5	-0.5
Downlink Path Loss, Clear Sky (dB)	-196.3	-196.3	-196.3	-196.3	-196.3
Earth Station G/T (dB/K)	28.4	23.6	23.6	23.6	21.0
Boltzman Constant (dBW/K-Hz)	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-74.8	-66.2	-60.8	-48.8
Downlink C/N (dB)	18.6	14.6	13.7	12.6	10.1
C/N Uplink (dB)	19.7	20.5	18.1	17.0	17.1
C/N Downlink (dB)	18.6	14.6	13.7	12.6	10.1
C/I Intermodulation (dB)	n/a	n/a	20.6	19.5	19.6
C/I Uplink Co-Channel (dB)*	27.0	27.0	28.2	28.2	28.2
C/I Downlink Co-Channel (dB)*	27.0	27.0	28.2	28.2	28.2
C/I Uplink Adjacent Satellite 1 (dB)	22.6	23.4	21.1	19.9	20.1
C/I Downlink Adjacent Satellite 1 (dB)	19.3	14.1	13.2	12.1	7.5
C/I Uplink Adjacent Satellite 2 (dB)	19.3	20.1	17.8	16.6	16.8
C/I Downlink Adjacent Satellite 2 (dB)	20.7	16.6	15.7	14.6	12.3
C/(N+I) Composite (dB)	11.8	9.1	7.7	6.7	4.0
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	10.8	8.1	6.7	5.7	3.0
Minimum Required C/N (dB)	-10.0	-6.1	-6.7	-5.7	-3.0
Excess Link Margin (dB)	0.8	2.0	0.0	0.0	0.0
Uplink Power Density (dBW/Hz)	-42.1	-50.9	-53.3	-54.4	-54.2
Downlink EIRP Density At Beam Peak	-25.0	-33.8	-34.7	-35.8	-35.6
Number of Carriers	1.0	1.0	4.0	17.5	273.7

*The C/I level is adjusted depending on the signal level and transponder mode of operation

EXHIBIT 17: IS 1R (45° W.L.) C-Band Link Budgets (continued)

Uplink Beam Name	US-Latin America	US-Latin America	US-Latin America	US-Latin America	US-Latin America
Uplink Frequency (MHz)	5925 – 6425	5925 – 6425	5925 – 6425	5925 – 6425	5925 – 6425
Uplink Beam Polarization	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical
Uplink Beam Relative Contour (dB)	-7	-7	-7	-7	-7
Uplink Contour G/T (dB/K)	-8	-8	-8	-8	-8
Uplink SFD (dBW/m^2)	-88	-88	-88	-88	-88
Downlink Beam Name	Africa-Europe	Africa-Europe	Africa-Europe	Africa-Europe	Africa-Europe
Downlink Frequency (MHz)	3700 – 4200	3700 – 4200	3700 – 4200	3700 – 4200	3700 – 4200
Downlink Beam Polarization	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical
Downlink Beam Relative Contour (dB)	-6	-6	-6	-6	-6
Downlink Contour EIRP (dBW)	34	34	34	34	34
Satellite 1 Orbital Location	43 W.L.	43 W.L.	43 W.L.	43 W.L.	43 W.L.
Uplink Power Density (dBW/Hz)	-48.3	-48.3	-48.3	-48.3	-48.3
Uplink Polarization Advantage (dB)	0	0	0	0	0
Downlink EIRP Density (dBW/Hz)	-33.8	-33.8	-33.8	-33.8	-33.8
Downlink Polarization Advantage (dB)	0	0	0	0	0
Satellite 2 Orbital Location	47 W.L.	47 W.L.	47 W.L.	47 W.L.	47 W.L.
Uplink Power Density (dBW/Hz)	-45	-45	-45	-45	-45
Uplink Polarization Advantage (dB)	0	0	0	0	0
Downlink EIRP Density (dBW/Hz)	-34.8	-34.8	-34.8	-34.8	-34.8
Downlink Polarization Advantage (dB)	0	0	0	0	0
Carrier ID	36M0F3F	30M1G7W	4M15G7W	1M21G7W	75K4G7W
Information Rate (kbps)	N/A	36863	6000	1544	64
Carrier Modulation	TV/FM	OPSK	OPSK	OPSK	OPSK
Peak to Peak Bandwidth of EDS (MHz)	4	n/a	n/a	n/a	n/a
Code Rate	N/A	3/4 - RS	3/4 - RS	3/4-RS	1/2 -RS
Occupied Bandwidth (kHz)	36000	30133.0	4154	1212.8	75.4
Allocated Bandwidth (kHz)	36000	36000.0	6875	1550	100
Minimum C/N, Rain (dB)	10.0	6.1	6.7	5.7	3.0
Earth Station Diameter (meters)	7.0	7.0	7.0	7.0	7.0
Earth Station Gain (dBi)	51.0	51.0	51.0	51.0	51.0
Earth Station Elevation Angle	20	20	20	20	20
Earth Station Diameter (meters)	8.1	4.5	4.5	4.5	3.5
Earth Station Gain (dBi)	49.3	43.9	43.9	43.9	41.1
Earth Station G/T (dB/K)	28.4	23.6	23.6	23.6	21.0
Earth Station Elevation Angle	20	20	20	20	20
Uplink Earth Station EIRP (dBW)	74.9	74.9	63.8	57.3	45.4
Uplink Path Loss, Clear Sky (dB)	-200.2	-200.2	-200.2	-200.2	-200.2
Satellite G/T (dB/K)	-8.0	-8.0	-8.0	-8.0	-8.0
Boltzman Constant (dBW/K-Hz)	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-74.8	-66.2	-60.8	-48.8
Uplink C/N (dB)	19.7	20.5	18.0	16.9	17.0
Downlink EIRP per Carrier (dBW)	34.0	34.0	24.4	17.9	6.0
Antenna Pointing Error (dB)	-0.5	-0.5	-0.5	-0.5	-0.5
Downlink Path Loss, Clear Sky (dB)	-196.3	-196.3	-196.3	-196.3	-196.3
Earth Station G/T (dB/K)	28.4	23.6	23.6	23.6	21.0
Boltzman Constant (dBW/K-Hz)	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-74.8	-66.2	-60.8	-48.8
Downlink C/N (dB)	18.6	14.6	13.6	12.5	10.0
C/N Uplink (dB)	19.7	20.5	18.0	16.9	17.0
C/N Downlink (dB)	18.6	14.6	13.6	12.5	10.0
C/I Intermodulation (dB)	n/a	n/a	20.5	19.4	19.5
C/I Uplink Co-Channel (dB)*	27.0	27.0	28.1	28.1	28.1
C/I Downlink Co-Channel (dB)*	27.0	27.0	28.1	28.1	28.1
C/I Uplink Adjacent Satellite 1 (dB)	22.6	23.4	20.9	19.8	19.9
C/I Downlink Adjacent Satellite 1 (dB)	19.3	14.1	13.1	12.0	7.4
C/I Uplink Adjacent Satellite 2 (dB)	19.3	20.1	17.6	16.5	16.6
C/I Downlink Adjacent Satellite 2 (dB)	21.7	17.6	16.6	15.5	13.1
C/(N+I) Composite (dB)	11.9	9.3	7.7	6.7	4.0
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	10.9	8.3	6.7	5.7	3.0
Minimum Required C/N (dB)	-10.0	-6.1	-6.7	-5.7	-3.0
Excess Link Margin (dB)	0.9	2.1	0.0	0.0	0.0
Uplink Power Density (dBW/Hz)	-42.1	-50.9	-53.4	-54.5	-54.4
Downlink EIRP Density At Beam Peak	-26.0	-34.8	-35.8	-36.9	-36.8
Number of Carriers	1.0	1.0	4.1	18.1	282.3

*The C/I level is adjusted depending on the signal level and transponder mode of operation

EXHIBIT 17: IS 1R (45° W.L.) C-Band Link Budgets (continued)

Uplink Beam Name	Global	Global	Global	Global	Global
Uplink Frequency (MHz)	5925 – 6425	5925 – 6425	5925 – 6425	5925 – 6425	5925 – 6425
Uplink Beam Polarization	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical
Uplink Beam Relative Contour (dB)	-3	-3	-3	-3	-3
Uplink Contour G/T (dB/K)	-12	-12	-12	-12	-12
Uplink SFD (dBW/m^2)	-88	-88	-88	-88	-88
Downlink Beam Name	Africa-Europe	Africa-Europe	Africa-Europe	Africa-Europe	Africa-Europe
Downlink Frequency (MHz)	3700 – 4200	3700 – 4200	3700 – 4200	3700 – 4200	3700 – 4200
Downlink Beam Polarization	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical
Downlink Beam Relative Contour (dB)	-6	-6	-6	-6	-6
Downlink Contour EIRP (dBW)	34	34	34	34	34
Satellite 1 Orbital Location	43 W.L.	43 W.L.	43 W.L.	43 W.L.	43 W.L.
Uplink Power Density (dBW/Hz)	-48.3	-48.3	-48.3	-48.3	-48.3
Uplink Polarization Advantage (dB)	0	0	0	0	0
Downlink EIRP Density (dBW/Hz)	-33.8	-33.8	-33.8	-33.8	-33.8
Downlink Polarization Advantage (dB)	0	0	0	0	0
Satellite 2 Orbital Location	47 W.L.	47 W.L.	47 W.L.	47 W.L.	47 W.L.
Uplink Power Density (dBW/Hz)	-45	-45	-45	-45	-45
Uplink Polarization Advantage (dB)	0	0	0	0	0
Downlink EIRP Density (dBW/Hz)	-34.8	-34.8	-34.8	-34.8	-34.8
Downlink Polarization Advantage (dB)	0	0	0	0	0
Carrier ID	36M0F3F	30M1G7W	4M15G7W	1M21G7W	75K4G7W
Information Rate (kbps)	N/A	36863	6000	1544	64
Carrier Modulation	TV/FM	QPSK	QPSK	QPSK	QPSK
Peak to Peak Bandwidth of EDS (MHz)	4	n/a	n/a	n/a	n/a
Code Rate	N/A	3/4 - RS	3/4 - RS	3/4-RS	1/2 -RS
Occupied Bandwidth (kHz)	36000	30133.0	4154	1212.8	75.4
Allocated Bandwidth (kHz)	36000	36000.0	6875	1550	100
Minimum C/N, Rain (dB)	10.0	6.1	6.7	5.7	3.0
Earth Station Diameter (meters)	7.0	7.0	7.0	7.0	7.0
Earth Station Gain (dBi)	51.0	51.0	51.0	51.0	51.0
Earth Station Elevation Angle	20	20	20	20	20
Earth Station Diameter (meters)	8.1	4.5	4.5	4.5	3.5
Earth Station Gain (dBi)	49.3	43.9	43.9	43.9	41.1
Earth Station G/T (dB/K)	28.4	23.6	23.6	23.6	21.0
Earth Station Elevation Angle	20	20	20	20	20
Uplink Earth Station EIRP (dBW)	74.9	74.9	64.0	57.6	45.5
Uplink Path Loss, Clear Sky (dB)	-200.2	-200.2	-200.2	-200.2	-200.2
Satellite G/T (dB/K)	-12.0	-12.0	-12.0	-12.0	-12.0
Boltzman Constant (dBW/K-Hz)	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-74.8	-66.2	-60.8	-48.8
Uplink C/N (dB)	15.7	16.5	14.2	13.1	13.1
Downlink EIRP per Carrier (dBW)	34.0	34.0	24.6	18.2	6.1
Antenna Pointing Error (dB)	-0.5	-0.5	-0.5	-0.5	-0.5
Downlink Path Loss, Clear Sky (dB)	-196.3	-196.3	-196.3	-196.3	-196.3
Earth Station G/T (dB/K)	28.4	23.6	23.6	23.6	21.0
Boltzman Constant (dBW/K-Hz)	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-74.8	-66.2	-60.8	-48.8
Downlink C/N (dB)	18.6	14.6	13.8	12.7	10.1
C/N Uplink (dB)	15.7	16.5	14.2	13.1	13.1
C/N Downlink (dB)	18.6	14.6	13.8	12.7	10.1
C/I Intermodulation (dB)	n/a	n/a	20.7	19.6	19.6
C/I Uplink Co-Channel (dB)*	27.0	27.0	28.3	28.3	28.2
C/I Downlink Co-Channel (dB)*	27.0	27.0	28.3	28.3	28.2
C/I Uplink Adjacent Satellite 1 (dB)	26.6	27.4	25.1	24.0	24.0
C/I Downlink Adjacent Satellite 1 (dB)	19.3	14.1	13.3	12.2	7.5
C/I Uplink Adjacent Satellite 2 (dB)	23.3	24.1	21.8	20.7	20.7
C/I Downlink Adjacent Satellite 2 (dB)	21.7	17.6	16.8	15.7	13.2
C/(N+I) Composite (dB)	11.6	9.1	7.7	6.7	4.0
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	10.6	8.1	6.7	5.7	3.0
Minimum Required C/N (dB)	-10.0	-6.1	-6.7	-5.7	-3.0
Excess Link Margin (dB)	0.6	2.0	0.0	0.0	0.0
Uplink Power Density (dBW/Hz)	-42.1	-50.9	-53.2	-54.3	-54.3
Downlink EIRP Density At Beam Peak	-26.0	-34.8	-35.6	-36.7	-36.7
Number of Carriers	1.0	1.0	3.9	17.2	274.8

*The C/I level is adjusted depending on the signal level and transponder mode of operation

EXHIBIT 18: IS 1R (45° W.L.) Ku-Band Link Budgets (continued)

UPLINK BEAM INFORMATION						
Uplink Beam Name	US-Latin America	US-Latin America	US-Latin America	US-Latin America	US-Latin America	US-Latin America
Uplink Frequency (MHz)	13750 -14000	13750 -14000	13750 -14000	13750 -14000	13750 -14000	13750 -14000
Uplink Beam Polarization	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical
Uplink Beam Relative Contour (dB)	-3	-3	-3	-3	-3	-3
Uplink Contour G/T (dB/K)	1	1	1	1	1	1
Uplink SFD (dBW/m^2)	-91	-91	-91	-91	-91	-91
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0	42.0	42.0
DOWNLINK BEAM INFORMATION						
Downlink Beam Name	Brazil	Brazil	Brazil	Brazil	Brazil	Brazil
Downlink Frequency (MHz)	10950 – 11200	10950 – 11200	10950 – 11200	10950 – 11200	10950 – 11200	10950 – 11200
Downlink Beam Polarization	Vertical/Horizontal	Vertical/Horizontal	Vertical/Horizontal	Vertical/Horizontal	Vertical/Horizontal	Vertical/Horizontal
Downlink Beam Relative Contour (dB)	-4	-4	-4	-4	-4	-4
Downlink Contour EIRP (dBW)	47	47	47	47	47	47
Rain Rate (mm/hr)	95.0	95.0	95.0	95.0	95.0	95.0
ADJACENT SATELLITE 1						
Satellite 1 Orbital Location	43 W.L.	43 W.L.	43 W.L.	43 W.L.	43 W.L.	43 W.L.
Uplink Power Density (dBW/Hz)	-47.7	-47.7	-47.7	-47.7	-47.7	-47.7
Uplink Polarization Advantage (dB)	0	0	0	0	0	0
Downlink EIRP Density (dBW/Hz)	-19.4	-19.4	-19.4	-19.4	-19.4	-19.4
Downlink Polarization Advantage (dB)	0	0	0	0	0	0
ADJACENT SATELLITE 2						
Satellite 2 Orbital Location	47 W.L.	47 W.L.	47 W.L.	47 W.L.	47 W.L.	47 W.L.
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	0	0	0	0	0	0
Downlink EIRP Density (dBW/Hz)	-23.8	-23.8	-23.8	-23.8	-23.8	-23.8
Downlink Polarization Advantage (dB)	0	0	0	0	0	0
CARRIER INFORMATION						
Carrier ID	4M15G7W	4M15G7W	4M15G7W	1M21G7W	1M21G7W	1M21G7W
Information Rate (kbps)	6000	6000	6000	1544	1544	1544
Carrier Modulation	QPSK	QPSK	QPSK	QPSK	QPSK	QPSK
Peak to Peak Bandwidth of EDS (MHz)	n/a	n/a	n/	n/a	n/a	n/a
Code Rate	3/4 - RS	3/4 - RS	3/4 - RS	3/4 – RS	3/4 - RS	3/4 - RS
Occupied Bandwidth (kHz)	4154	4154	4154	1212.8	1212.8	1212.8
Allocated Bandwidth (kHz)	6875	6875	6875	1550	1550	1550
Minimum C/N (dB)	6.7	6.3	6.3	5.7	5.5	5.5
UPLINK EARTH STATION						
Earth Station Diameter (meters)	6.1	6.1	6.1	6.1	6.1	6.1
Earth Station Gain (dBi)	56.7	56.7	56.7	56.7	56.7	56.7
Earth Station Elevation Angle	20	20	20	20	20	20
DOWNLINK EARTH STATION						
Earth Station Diameter (meters)	2.4	2.4	2.4	2.4	2.4	2.4
Earth Station Gain (dBi)	46.8	46.8	46.8	46.8	46.8	46.8
Earth Station G/T (dB/K)	24.3	24.3	21.2	24.3	24.3	21.1
Earth Station Elevation Angle	20	20	20	20	20	20
LINK FADE TYPE	Clear Sky	Uplink Fade	Downlink Fade	Clear Sky	Uplink Fade	Downlink Fade
UPLINK PERFORMANCE						
Uplink Earth Station EIRP (dBW)	60.2	60.2	60.2	54.0	54.0	54.0
Uplink Path Loss, Clear Sky (dB)	-207.2	-207.2	-207.2	-207.2	-207.2	-207.2
Uplink Rain Attenuation (dB)	0.0	-2.5	0.0	0.0	-2.5	0.0
Satellite G/T (dB/K)	1.0	1.0	1.0	1.0	1.0	1.0
Boltzman Constant (dBW/K-Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-66.2	-66.2	-66.2	-60.8	-60.8	-60.8
Uplink C/N (dB)	16.3	13.8	16.3	15.5	13.1	15.5
DOWNLINK PERFORMANCE						
Downlink EIRP per Carrier (dBW)	37.8	35.5	37.8	31.6	29.2	31.6
Antenna Pointing Error (dB)	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
Downlink Path Loss, Clear Sky (dB)	-205.3	-205.3	-205.3	-205.3	-205.3	-205.3
Downlink Rain Attenuation (dB)	0.0	0.0	-5.1	0.0	0.0	-5.3
Earth Station G/T, Clear Sky (dB/K)	24.3	24.3	21.2	24.3	24.3	21.1
Boltzman Constant (dBW/K-Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-66.2	-66.2	-66.2	-60.8	-60.8	-60.8
Downlink C/N (dB)	18.7	16.4	10.5	17.9	15.5	9.5
COMPOSITE LINK PERFORMANCE						
C/N Uplink (dB)	16.3	13.8	16.3	15.5	13.1	15.5
C/N Downlink (dB)	18.7	16.4	10.5	17.9	15.5	9.5
C/I Intermodulation (dB)	20.4	19.2	20.4	19.6	17.5	19.6
C/I Uplink Co-Channel (dB)*	28.5	26.0	28.5	28.8	26.3	28.8
C/I Downlink Co-Channel (dB)*	28.5	26.2	28.5	28.8	26.4	28.8
C/I Uplink Adiacent Satellite 1 (dB)	20.7	18.2	20.7	19.9	17.4	19.9
C/I Downlink Adiacent Satellite 1 (dB)	15.5	13.2	14.7	14.7	12.2	14.7
C/I Uplink Adiacent Satellite 2 (dB)	18.0	15.5	18.0	17.2	14.7	17.2
C/I Downlink Adiacent Satellite 2 (dB)	21.5	19.2	21.5	20.7	18.3	20.7
C/(N+I) Composite (dB)	9.6	7.3	7.3	8.9	6.5	6.5
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	8.6	6.3	6.3	7.9	5.5	5.5
Minimum Required C/N (dB)	-6.7	-6.3	-6.3	-5.7	-5.5	-5.5
Excess Link Margin (dB)	1.9	0.0	0.0	2.2	0.0	0.0
Carrier Density Levels						
Uplink Power Density (dBW/Hz)	-62.7	-62.7	-62.7	-63.5	-63.5	-63.5
Downlink EIRP Density At Beam Peak	-24.4	-26.7	-24.4	-25.2	-27.6	-25.2
Number of Carriers	3.7	3.7	3.7	15.4	15.4	15.4

*** Note:** The C/I level is adjusted depending on the signal level and transponder mode of operation.

EXHIBIT 18: IS 1R (45° W.L.) Ku-Band Link Budgets (continued)

UPLINK BEAM INFORMATION			
Uplink Beam Name	US-Latin America	US-Latin America	US-Latin America
Uplink Frequency (MHz)	13750 -14000	13750 -14000	13750 -14000
Uplink Beam Polarization	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical
Uplink Beam Relative Contour (dB)	-3	-3	-3
Uplink Contour G/T (dB/K)	1	1	1
Uplink SFD (dBW/m^2)	-91	-91	-91
Rain Rate (mm/hr)	42.0	42.0	42.0
DOWNLINK BEAM INFORMATION			
Downlink Beam Name	Brazil	Brazil	Brazil
Downlink Frequency (MHz)	10950 – 11200	10950 – 11200	10950 – 11200
Downlink Beam Polarization	Vertical/Horizontal	Vertical/Horizontal	Vertical/Horizontal
Downlink Beam Relative Contour (dB)	-4	-4	-4
Downlink Contour EIRP (dBW)	47	47	47
Rain Rate (mm/hr)	95.0	95.0	95.0
ADJACENT SATELLITE 1			
Satellite 1 Orbital Location	43 W.L.	43 W.L.	43 W.L.
Uplink Power Density (dBW/Hz)	-47.7	-47.7	-47.7
Uplink Polarization Advantage (dB)	0	0	0
Downlink EIRP Density (dBW/Hz)	-19.4	-19.4	-19.4
Downlink Polarization Advantage (dB)	0	0	0
ADJACENT SATELLITE 2			
Satellite 2 Orbital Location	47 W.L.	47 W.L.	47 W.L.
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	0	0	0
Downlink EIRP Density (dBW/Hz)	-23.8	-23.8	-23.8
Downlink Polarization Advantage (dB)	0	0	0
CARRIER INFORMATION			
Carrier ID	75K4G7W	75K4G7W	75K4G7W
Information Rate (kbps)	64	64	64
Carrier Modulation	QPSK	QPSK	QPSK
Peak to Peak Bandwidth of EDS (MHz)	n/a	n/a	n/
Code Rate	1/2 - RS	1/2 - RS	1/2 - RS
Occupied Bandwidth (kHz)	75.4	75.4	75.4
Allocated Bandwidth (kHz)	100.0	100.0	100.0
Minimum C/N (dB)	3.0	2.8	2.8
UPLINK EARTH STATION			
Earth Station Diameter (meters)	6.1	6.1	6.1
Earth Station Gain (dBi)	56.7	56.7	56.7
Earth Station Elevation Angle	20	20	20
DOWNLINK EARTH STATION			
Earth Station Diameter (meters)	1.8	1.8	1.8
Earth Station Gain (dBi)	44.1	44.1	44.1
Earth Station G/T (dB/K)	21.6	21.6	18.6
Earth Station Elevation Angle	20	20	20
LINK FADE TYPE	Clear Sky	Uplink Fade	Downlink Fade
UPLINK PERFORMANCE			
Uplink Earth Station EIRP (dBW)	41.0	41.0	41.0
Uplink Path Loss, Clear Sky (dB)	-207.2	-207.2	-207.2
Uplink Rain Attenuation (dB)	0.0	-2.6	0.0
Satellite G/T (dB/K)	1.0	1.0	1.0
Boltzman Constant (dBW/K-Hz)	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-48.8	-48.8	-48.8
Uplink C/N (dB)	14.6	12.0	14.6
DOWNLINK PERFORMANCE			
Downlink EIRP per Carrier (dBW)	18.6	16.0	18.6
Antenna Pointing Error (dB)	-0.5	-0.5	-0.5
Downlink Path Loss, Clear Sky (dB)	-205.3	-205.3	-205.3
Downlink Rain Attenuation (dB)	0.0	0.0	-4.7
Earth Station G/T, Clear Sky (dB/K)	21.6	21.6	18.6
Boltzman Constant (dBW/K-Hz)	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-48.8	-48.8	-48.8
Downlink C/N (dB)	14.2	11.7	6.5
COMPOSITE LINK PERFORMANCE			
C/N Uplink (dB)	14.6	12.0	14.6
C/N Downlink (dB)	14.2	11.7	6.5
C/I Intermodulation (dB)	18.7	16.1	18.7
C/I Uplink Co-Channel (dB)*	27.6	25.1	27.6
C/I Downlink Co-Channel (dB)*	27.6	25.1	27.6
C/I Uplink Adiacent Satellite 1 (dB)	18.9	16.3	18.9
C/I Downlink Adiacent Satellite 1 (dB)	10.7	8.1	10.7
C/I Uplink Adiacent Satellite 2 (dB)	16.2	13.6	16.2
C/I Downlink Adiacent Satellite 2 (dB)	17.3	14.7	17.3
C/(N+I) Composite (dB)	6.4	3.8	3.8
Required System Margin (dB)	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	5.4	2.8	2.8
Minimum Required C/N (dB)	-3.0	-2.8	-2.8
Excess Link Margin (dB)	2.4	0.0	0.0
Carrier Density Levels			
Uplink Power Density (dBW/Hz)	-64.5	-64.5	-64.5
Downlink EIRP Density At Beam Peak	-26.2	-28.8	-26.2
Number of Carriers	310.9	310.9	310.9

* **Note:** The C/I level is adjusted depending on the signal level and transponder mode of operation.

EXHIBIT 18: IS 1R (45° W.L.) Ku-Band Link Budgets (continued)

UPLINK BEAM INFORMATION						
Uplink Beam Name	S. America or Africa	S. America or Africa	S. America or Africa	S. America or Africa	S. America or Africa	S. America or Africa
Uplink Frequency (MHz)	13750 -14000	13750 -14000	13750 -14000	13750 -14000	13750 -14000	13750 -14000
Uplink Beam Polarization	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical
Uplink Beam Relative Contour (dB)	-6	-6	-6	-6	-6	-6
Uplink Contour G/T (dB/K)	-3	-3	-3	-3	-3	-3
Uplink SFD (dBW/m^2)	-83	-83	-83	-83	-83	-83
Rain Rate (mm/hr)	95.0	95.0	95.0	95.0	95.0	95.0
DOWNLINK BEAM INFORMATION						
Downlink Beam Name	South America	South America	South America	South America	South America	South America
Downlink Frequency (MHz)	10950 – 11200	10950 – 11200	10950 – 11200	10950 – 11200	10950 – 11200	10950 – 11200
Downlink Beam Polarization	Vertical/Horizontal	Vertical/Horizontal	Vertical/Horizontal	Vertical/Horizontal	Vertical/Horizontal	Vertical/Horizontal
Downlink Beam Relative Contour (dB)	-4	-4	-4	-4	-4	-4
Downlink Contour EIRP (dBW)	47	47	47	47	47	47
Rain Rate (mm/hr)	95.0	95.0	95.0	95.0	95.0	95.0
ADJACENT SATELLITE 1						
Satellite 1 Orbital Location	43 W.L.	43 W.L.	43 W.L.	43 W.L.	43 W.L.	43 W.L.
Uplink Power Density (dBW/Hz)	-47.7	-47.7	-47.7	-47.7	-47.7	-47.7
Uplink Polarization Advantage (dB)	0	0	0	0	0	0
Downlink EIRP Density (dBW/Hz)	-19.4	-19.4	-19.4	-19.4	-19.4	-19.4
Downlink Polarization Advantage (dB)	0	0	0	0	0	0
ADJACENT SATELLITE 2						
Satellite 2 Orbital Location	47 W.L.	47 W.L.	47 W.L.	47 W.L.	47 W.L.	47 W.L.
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	0	0	0	0	0	0
Downlink EIRP Density (dBW/Hz)	-23.8	-23.8	-23.8	-23.8	-23.8	-23.8
Downlink Polarization Advantage (dB)	0	0	0	0	0	0
CARRIER INFORMATION						
Carrier ID	4M15G7W	4M15G7W	4M15G7W	1M21G7W	1M21G7W	1M21G7W
Information Rate (kbps)	6000	6000	6000	1544	1544	1544
Carrier Modulation	QPSK	QPSK	QPSK	QPSK	QPSK	QPSK
Peak to Peak Bandwidth of EDS (MHz)	n/a	n/a	n/	n/a	n/a	n/a
Code Rate	3/4 - RS	3/4 - RS	3/4 - RS	3/4 – RS	3/4 - RS	3/4 - RS
Occupied Bandwidth (kHz)	4154	4154	4154	1212.8	1212.8	1212.8
Allocated Bandwidth (kHz)	6875	6875	6875	1550	1550	1550
Minimum C/N (dB)	6.7	6.3	6.3	5.7	5.5	5.5
UPLINK EARTH STATION						
Earth Station Diameter (meters)	6.1	6.1	6.1	6.1	6.1	6.1
Earth Station Gain (dBi)	56.7	56.7	56.7	56.7	56.7	56.7
Earth Station Elevation Angle	20	20	20	20	20	20
DOWNLINK EARTH STATION						
Earth Station Diameter (meters)	2.4	2.4	2.4	3.0	3.0	3.0
Earth Station Gain (dBi)	46.8	46.8	46.8	48.5	48.5	48.5
Earth Station G/T (dB/K)	24.3	24.3	21.0	26.0	26.0	22.5
Earth Station Elevation Angle	20	20	20	20	20	20
LINK FADE TYPE	Clear Sky	Uplink Fade	Downlink Fade	Clear Sky	Uplink Fade	Downlink Fade
UPLINK PERFORMANCE						
Uplink Earth Station EIRP (dBW)	68.2	68.2	68.2	61.1	61.1	61.1
Uplink Path Loss, Clear Sky (dB)	-207.2	-207.2	-207.2	-207.2	-207.2	-207.2
Uplink Rain Attenuation (dB)	0.0	-4.2	0.0	0.0	-4.1	0.0
Satellite G/T (dB/K)	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0
Boltzman Constant (dBW/K-Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-66.2	-66.2	-66.2	-60.8	-60.8	-60.8
Uplink C/N (dB)	20.4	16.2	20.4	18.6	14.5	18.6
DOWNLINK PERFORMANCE						
Downlink EIRP per Carrier (dBW)	37.8	33.9	37.8	30.7	26.7	30.7
Antenna Pointing Error (dB)	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
Downlink Path Loss, Clear Sky (dB)	-205.3	-205.3	-205.3	-205.3	-205.3	-205.3
Downlink Rain Attenuation (dB)	0.0	0.0	-6.2	0.0	0.0	-7.0
Earth Station G/T, Clear Sky (dB/K)	24.3	24.3	21.0	26.0	26.0	22.5
Boltzman Constant (dBW/K-Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-66.2	-66.2	-66.2	-60.8	-60.8	-60.8
Downlink C/N (dB)	18.7	14.9	9.2	18.7	14.7	8.2
COMPOSITE LINK PERFORMANCE						
C/N Uplink (dB)	20.4	16.2	20.4	18.6	14.5	18.6
C/N Downlink (dB)	18.7	14.9	9.2	18.7	14.7	8.2
C/I Intermodulation (dB)	20.5	18.2	20.5	18.7	15.0	18.7
C/I Uplink Co-Channel (dB)*	28.5	24.3	28.5	27.9	23.8	27.9
C/I Downlink Co-Channel (dB)*	28.5	24.6	28.5	27.9	23.8	27.9
C/I Uplink Adjacent Satellite 1 (dB)	25.7	21.5	25.7	24.0	19.9	24.0
C/I Downlink Adjacent Satellite 1 (dB)	15.5	11.6	15.5	15.6	11.6	15.6
C/I Uplink Adjacent Satellite 2 (dB)	23.0	18.8	23.0	21.3	17.2	21.3
C/I Downlink Adjacent Satellite 2 (dB)	21.5	17.7	21.5	21.4	17.3	21.4
C/(N+I) Composite (dB)	11.1	7.3	7.3	10.4	6.5	6.5
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	10.1	6.3	6.3	9.4	5.5	5.5
Minimum Required C/N (dB)	-6.7	-6.3	-6.3	-5.7	-5.5	-5.5
Excess Link Margin (dB)	3.4	0.0	0.0	3.8	0.0	0.0
Carrier Density Levels						
Uplink Power Density (dBW/Hz)	-54.7	-54.7	-54.7	-56.4	-56.4	-56.4
Downlink EIRP Density At Beam Peak	-24.4	-28.3	-24.4	-26.1	-30.1	-26.1
Number of Carriers	3.7	3.7	3.7	19.1	19.1	19.1

* **Note:** The C/I level is adjusted depending on the signal level and transponder mode of operation.

EXHIBIT 18: IS 1R (45° W.L.) Ku-Band Link Budgets (continued)

UPLINK BEAM INFORMATION			
Uplink Beam Name	S. America or Africa	S. America or Africa	S. America or Africa
Uplink Frequency (MHz)	13750 -14000	13750 -14000	13750 -14000
Uplink Beam Polarization	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical
Uplink Beam Relative Contour (dB)	-6	-6	-6
Uplink Contour G/T (dB/K)	-3	-3	-3
Uplink SFD (dBW/m^2)	-83	-83	-83
Rain Rate (mm/hr)	95.0	95.0	95.0
DOWNLINK BEAM INFORMATION			
Downlink Beam Name	South America	South America	South America
Downlink Frequency (MHz)	10950 – 11200	10950 – 11200	10950 – 11200
Downlink Beam Polarization	Vertical/Horizontal	Vertical/Horizontal	Vertical/Horizontal
Downlink Beam Relative Contour (dB)	-4	-4	-4
Downlink Contour EIRP (dBW)	47	47	47
Rain Rate (mm/hr)	95.0	95.0	95.0
ADJACENT SATELLITE 1			
Satellite 1 Orbital Location	43 W.L.	43 W.L.	43 W.L.
Uplink Power Density (dBW/Hz)	-47.7	-47.7	-47.7
Uplink Polarization Advantage (dB)	0	0	0
Downlink EIRP Density (dBW/Hz)	-19.4	-19.4	-19.4
Downlink Polarization Advantage (dB)	0	0	0
ADJACENT SATELLITE 2			
Satellite 2 Orbital Location	47 W.L.	47 W.L.	47 W.L.
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	0	0	0
Downlink EIRP Density (dBW/Hz)	-23.8	-23.8	-23.8
Downlink Polarization Advantage (dB)	0	0	0
CARRIER INFORMATION			
Carrier ID	75K4G7W	75K4G7W	75K4G7W
Information Rate (kbps)	64	64	64
Carrier Modulation	QPSK	QPSK	QPSK
Peak to Peak Bandwidth of EDS (MHz)	n/a	n/a	n/
Code Rate	1/2 - RS	1/2 - RS	1/2 - RS
Occupied Bandwidth (kHz)	75.4	75.4	75.4
Allocated Bandwidth (kHz)	100.0	100.0	100.0
Minimum C/N (dB)	3.0	2.8	2.8
UPLINK EARTH STATION			
Earth Station Diameter (meters)	6.1	6.1	6.1
Earth Station Gain (dBi)	56.7	56.7	56.7
Earth Station Elevation Angle	20	20	20
DOWNLINK EARTH STATION			
Earth Station Diameter (meters)	1.8	1.8	1.8
Earth Station Gain (dBi)	44.1	44.1	44.1
Earth Station G/T (dB/K)	21.6	21.6	18.3
Earth Station Elevation Angle	20	20	20
LINK FADE TYPE	Clear Sky	Uplink Fade	Downlink Fade
UPLINK PERFORMANCE			
Uplink Earth Station EIRP (dBW)	49.6	49.6	49.6
Uplink Path Loss, Clear Sky (dB)	-207.2	-207.2	-207.2
Uplink Rain Attenuation (dB)	0.0	-4.2	0.0
Satellite G/T (dB/K)	-3.0	-3.0	-3.0
Boltzman Constant (dBW/K-Hz)	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-48.8	-48.8	-48.8
Uplink C/N (dB)	19.2	15.0	19.2
DOWNLINK PERFORMANCE			
Downlink EIRP per Carrier (dBW)	19.2	15.0	19.2
Antenna Pointing Error (dB)	-0.5	-0.5	-0.5
Downlink Path Loss, Clear Sky (dB)	-205.3	-205.3	-205.3
Downlink Rain Attenuation (dB)	0.0	0.0	-6.2
Earth Station G/T, Clear Sky (dB/K)	21.6	21.6	18.3
Boltzman Constant (dBW/K-Hz)	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-48.8	-48.8	-48.8
Downlink C/N (dB)	14.8	10.7	5.4
COMPOSITE LINK PERFORMANCE			
C/N Uplink (dB)	19.2	15.0	19.2
C/N Downlink (dB)	14.8	10.7	5.4
C/I Intermodulation (dB)	19.3	15.1	19.3
C/I Uplink Co-Channel (dB)*	28.2	24.1	28.2
C/I Downlink Co-Channel (dB)*	28.2	24.1	28.2
C/I Uplink Adjacent Satellite 1 (dB)	24.5	20.3	24.5
C/I Downlink Adjacent Satellite 1 (dB)	11.3	7.1	11.3
C/I Uplink Adjacent Satellite 2 (dB)	21.8	17.6	21.8
C/I Downlink Adjacent Satellite 2 (dB)	17.9	13.7	17.9
C/(N+I) Composite (dB)	8.0	3.8	3.8
Required System Margin (dB)	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	7.0	2.8	2.8
Minimum Required C/N (dB)	-3.0	-2.8	-2.8
Excess Link Margin (dB)	4.0	0.0	0.0
Carrier Density Levels			
Uplink Power Density (dBW/Hz)	-55.9	-55.9	-55.9
Downlink EIRP Density At Beam Peak	-25.6	-29.8	-25.6
Number of Carriers	270.2	270.2	270.2

* **Note:** The C/I level is adjusted depending on the signal level and transponder mode of operation.