

Engineering Statement

1 Introduction

Intelsat License LLC (“Intelsat”) seeks authority in this application to operate the satellite designated as Intelsat 8 from 168.9° E.L., rather than from 169.0 E.L., its current longitude.

The characteristics of the Intelsat 8 spacecraft, as well as its compliance with the various provisions of Part 25 of the Federal Communication Commission’s (“FCC or “Commission”) rules, are provided in the remainder of this Engineering Statement. This engineering statement updates the gain contours and deletes the TV/FM carrier type. In all other respects, the characteristics of Intelsat 8 are the same as those described in SAT-MOD-20120619-00100 and SAT-AMD-20120815-00131.

Intelsat requests that the waiver previously granted to the Intelsat 8 spacecraft at the 169.0° E.L. orbital location continue to apply at the 168.9° E.L. location, namely, the waiver of Section 2.106 (the “U.S. Table of Frequency Allocation”) of the Commission’s rules to permit Intelsat to operate Intelsat 8 in the 12250 – 12750 MHz frequency band (space-to-Earth) for commercial Fixed-Satellite Service (“FSS”) on a non-interference, non-protected basis in International Telecommunication Union (“ITU”) Region 2.¹

2 Spacecraft Overview

Intelsat 8 is a Space-Systems Loral model LS1300 spacecraft that is capable of operating in C-band and Ku-band frequencies listed below.

C-band	Uplink:	5925 – 6425 MHz
	Downlink:	3700 – 4200 MHz
Ku-band	Uplink:	13997– 14500 MHz ²
	Downlink:	12250 – 12750 MHz

¹ See *Policy Branch Information; Actions Taken*, Report No. SAT-00968, File Nos. SAT-AMD-20120815-00131 and SAT-MOD-20120619-00100 (Aug. 16, 2013) (Public Notice). The satellite’s license term was subsequently extended. See *Policy Branch Information; Actions Taken*, Report No. SAT-00987, File No. SAT-MOD-20130830-00110 (Dec. 20, 2013) (Public Notice).

² The command channel is centered at 13998.0 MHz

The spacecraft provides the following coverage:

C-band:

Pacific Beam	East Asia, Australia, and Western United States
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Ku-band:

Pacific Beam	East Asia, Australia, New Zealand, and Western United States
Australia Beam	Australia and Western United States
Northeast Asia Beam	Northeast Asia
Southeast Asia Beam	Philippines, Indonesia, and Malaysia

2.1 Spacecraft Characteristics

Intelsat 8 is a three-axis stabilized type spacecraft that has a rectangular outer body structure. Intelsat 8 utilizes two deployable solar array wings and a number of deployable and non-deployable antennas.

The Intelsat 8 spacecraft is composed of the following subsystems:

- Thermal
- Power
- Attitude Control
- Propulsion
- Telemetry, Command and Ranging
- Uplink Power Control
- Communications

These subsystems maintain the correct position and attitude of the spacecraft, ensure that all internal units are maintained within the required temperature range, and ensure that the spacecraft can be commanded and controlled with a high level of reliability from launch to the end of its useful life. The spacecraft design incorporates redundancy in each of the various subsystems in order to avoid single point failures.

The structural design of Intelsat 8 provides mechanical support for all subsystems. The structure supports the communication antennas, solar arrays, and the thrusters. It also provides a stable platform for preserving the alignment of critical elements of the spacecraft.

2.2 Communication Subsystem

Intelsat 8 provides active communication channels at C-band and Ku-band frequencies. The C-band and Ku-band payloads employ channels having a bandwidth of 36 MHz. The Intelsat 8 frequencies, polarization, and channel plan are provided in the Schedule S.

The coverage contours and performance characteristics of all Intelsat 8 beams are provided in the Schedule S. Exhibits 1 and 2 provide the beam parameters for the Intelsat 8 uplink and downlink beams, respectively.

2.3 Telemetry, Command and Ranging Subsystem

The telemetry, command and ranging (“TC&R”) subsystem provides the following functions:

- 1) Acquisition, processing and transmission of spacecraft telemetry data;
- 2) Reception and retransmission of ground station generated ranging signals; and
- 3) Reception, processing and distribution of telecommands.

Intelsat 8 can be commanded through the use of the command channel centered at the frequency 13998.0 MHz. The spacecraft telemetry is received through telemetry channels centered at the frequencies 12747.0 MHz and 12748.0 MHz.

The coverage patterns of the command and telemetry beams have gain contours that vary by less than 8 dB across the surface of the Earth and accordingly the gain at 8 dB below the peak falls beyond the edge of the Earth. Therefore, pursuant to Section 25.114(c)(4)(vi)(A) of the FCC’s rules, contours for these beams are not required to be provided and the associated GXT files have not been included in Schedule S. The Intelsat 8 command and telemetry subsystem performance is summarized in Exhibit 3.

2.4 Uplink Power Control Subsystem

Intelsat 8 utilizes one C-band channel, 3702.0 MHz, for uplink power control (“ULPC”), antenna tracking, and ranging. The coverage patterns of the C-band ULPC beam has gain contours that vary by less than 8 dB across the surface of the Earth and accordingly the gain at 8 dB below the peak falls beyond the edge of the Earth. Therefore, pursuant to Section 25.114(c)(4)(vi)(A) of the FCC’s rules, contours for this beam are not required to be provided and the associated GXT file has not been included in Schedule S.

2.5 Satellite Station-Keeping

The spacecraft will be maintained within 0.05° of its nominal longitudinal position in the east-west direction. Accordingly, it is in compliance with Section 25.210(j) of the Commission’s rules.

The attitude of the spacecraft will be maintained with accuracy consistent with the achievement of the specified communications performance, after taking into account all error sources (i.e., attitude perturbations, thermal distortions, misalignments, orbital tolerances and thruster perturbations, etc.).

3 Services

Intelsat 8 is a general purpose communications satellite and has been designed to support various services offered within the Intelsat satellite system. Depending upon the needs of the users, the transponders on Intelsat 8 can accommodate television, radio, voice, and data communications. Typical communication services include:

- a) Compressed digital video
- b) High speed digital data
- c) Digital single channel per carrier (“SCPC”) data channels

Emission designators and allocated bandwidths for representative communication carriers are provided in Schedule S.

4 Power Flux Density

The power flux density (“PFD”) levels contained in Schedule S are identical to those provided in SAT-MOD-20120619-00100 and SAT-AMD-20120815-00131.

5 Emission Compliance

Section 25.202(e) of the rules requires that the carrier frequency of each space station transmitter be maintained within 0.002% of the reference frequency. Intelsat 8 is designed to be compliant with the provisions of this rule.

Intelsat will comply with the provisions of Section 25.202(f) of the Commission’s rules with regard to Intelsat 8 emissions.

6 Orbital Location

Intelsat requests that it be assigned the 168.9° E.L. orbital location for Intelsat 8. The 168.9° E.L. location satisfies Intelsat 8 requirements for optimizing coverage, elevation angles, and service availability. Additionally, the location also ensures that the maximum operational, economic, and public interest benefits will be derived.

7 Interference Analysis

The impact of the proposed Intelsat 8 emissions on the transmissions of adjacent satellites located at 166.9° E.L. and 170.9° E.L. was analyzed. The interference analysis was conducted for a number of representative carriers at C-band and Ku-band frequencies. It was assumed that

there were hypothetical satellites having the same operating characteristics as Intelsat 8 at the 166.9° E.L.³ and 170.9° E.L. orbital locations.

For the satellite located at 166.9° E.L., it was assumed that the adjacent satellites were Intelsat 8, located at 168.9° E.L., and a hypothetical satellite having the same operating characteristics as Intelsat 8 located at 164.9° E.L.⁴ For the satellite located at 170.9° E.L., it was assumed that the adjacent satellites were Intelsat 8, located at 168.9° E.L., and a hypothetical satellite having the same operating characteristics as Intelsat 8 located at 172.9° E.L.⁵

Other assumptions made for the interference analysis were as follows:

- a) In the plane of the geostationary satellite orbit, all transmitting and receiving earth station antennas have off-axis co-polar gains that are compliant with the limits specified in section 25.209(a)(1) and (2) of the FCC 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) Rain attenuation predictions are derived using Recommendation ITU-R P.618.
- d) Increase in noise temperature of the receiving earth station due to rain is taken into account.
- e) For the cases where the transponder operates in a multi-carrier mode, the effects due to intermodulation interference are taken into account.

Results of the analysis are documented in Exhibits 4 and 5. The Intelsat 8 transmissions will be limited to those levels contained in Sections 25.212(c) and (d) of the Commission's rules, as applicable, unless higher levels are coordinated with affected adjacent satellite operators. In any case, the uplink power density of the Intelsat 8 digital carriers will not exceed the levels specified below:

- a) 5925 – 6425 MHz: -38.7 dBW/Hz
- b) 14000 – 14500 MHz: -45.0 dBW/Hz

³At the time of submission of this application, Luch-5A is located at 167° E.L. Its frequency plan overlaps Intelsat 8 in the 12500 – 12750 MHz band. Luch-5A was not included in the interference analysis because it is not licensed by the U.S., nor does it have U.S. market access. Intelsat is coordinating the use of the overlapping frequencies pursuant to ITU rules.

⁴ At the time of submission of this application, Intelsat 19 is located at 166.0°E.L. Intelsat 19 is not included in the interference analysis because it is less than 2° away from 166.9° E.L., and so its use in the interference analysis would be inconsistent with a two-degree orbital separation environment and policy.

⁵ Other satellites in the vicinity of 166.9° E.L. and 170.9° E.L. were not included in the interference analysis because they are not licensed by the U.S., nor do they have U.S. market access. Intelsat is coordinating the use of any overlapping frequencies pursuant to ITU rules.

The downlink EIRP density of Intelsat 8 digital carriers will not exceed the levels specified below:

- a) 3700 – 4200 MHz: -32.0 dBW/Hz
- b) 12250 – 12750 MHz: -18.0 dBW/Hz

8 Orbital Debris Mitigation Plan

Intelsat 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.

8.1 Spacecraft Hardware Design

The spacecraft is designed such that no debris will be released during normal operations. Intelsat 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.

8.2 Minimizing Accidental Explosions

Intelsat 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 and thrusters are isolated using redundant valves and electrical power systems are shielded in accordance with standard industry practices. Intelsat will ensure the removal of all stored energy on the spacecraft by depleting all propellant tanks, venting all pressurized systems, and turning off all active units.

8.3 Safe Flight Profiles

Intelsat has assessed and limited the probability of the space station becoming a source of debris as a result of collisions with large debris or other operational space stations. Once relocated to 168.9° E.L., Intelsat 8 will not be located at the same orbital location as another satellite or at an orbital location that has an overlapping station-keeping volume with another satellite.

During the relocation of Intelsat 8, Intelsat will coordinate the Intelsat 8 transmissions internally with the operations of Intelsat 805. There are no other operators of co-frequency satellites in the drift path. Intelsat is not aware of any other FCC licensed system, or any other system applied for and under consideration by the FCC, that will have an overlapping station-keeping volume with Intelsat 8. Intelsat is also not aware of any system with an overlapping station-keeping volume with Intelsat 8 that is the subject of an ITU filing and that is either in orbit or progressing towards launch.

8.4 Post Mission Disposal

At the end of the mission, Intelsat expects to dispose of the spacecraft by moving it to a planned minimum altitude of 150 kilometers (perigee) above the geostationary arc. Intelsat has reserved 26.1 kilograms of fuel for this purpose. The propellant gauging uncertainty has been taken into account in these calculations. In addition to the nominal hold-back and reserves provided to us by the manufacturer, Intelsat propulsion engineers review the current propellant usage – particularly the mixing ratio – to properly allocate sufficient margin to account for unavailable propellant that may result from a non-optimal mixing ratio. In addition, Intelsat performs thermal gauging near the spacecraft’s end of life by inferring the remaining propellant from the thermal signature. Section 25.283(d) of the Commission’s rules states that satellites launched prior to March 18, 2002, such as Intelsat 8, are not expected to meet the minimum perigee requirement of Section 25.283(a). Therefore, the Intelsat 8 post-mission disposal plan complies with the FCC’s rules.

9 TC&R Control Earth Stations

Intelsat will conduct TC&R operations through one or more of the following earth stations: Fillmore, CA; Paumalu, Hawaii; Lockridge, Australia; or Mingenew, Australia. Additionally, Intelsat is capable of remotely controlling Intelsat 8 from its facilities in McLean, VA or in Long Beach, CA.

Certification Statement

I hereby certify that I am a technically qualified person and am familiar with Part 25 of the Commission's rules. The contents of this engineering statement were prepared by me or under my direct supervision and to the best of my knowledge are complete and accurate.

/s/ Candice DeVane

October 21, 2015

Candice DeVane

Date

Intelsat

Manager, Spectrum Policy

EXHIBIT 1

COMMUNICATION SUBSYSTEM UPLINK BEAM PARAMETERS

Beam Name	C-Band Linear	C-Band Linear	Ku-Band Linear	Ku-Band Linear
Schedule S Beam ID	PCHU	PCVU	PKHU	PHVU
Frequency Band (MHz)	5925 - 6425	5925 - 6425	14000 - 14500	14000 - 14500
Polarization	Horizontal	Vertical	Horizontal	Vertical
Beam Peak Gain (dBi)	29.6	30.5	28.7	28.5
G/T (dB/K)	1.6	2.6	0.4	0.5
Minimum SFD-- (dBW/m ²)	-95.6	-96.6	-98.4	-98.5

EXHIBIT 2

COMMUNICATION SUBSYSTEM DOWNLINK BEAM PARAMETERS

Beam Name	C-Band Linear	C-Band Linear	Ku-Band Linear	Ku-Band Linear	Ku-Band Linear
Schedule S Beam ID	PCHD	PCVD	AKHD	NKHD	SKVD
Frequency Band (MHz)	3700 - 4200	3700 - 4200	12250 - 12750	12250 - 12750	12250 - 12750
Polarization	Horizontal	Vertical	Horizontal	Horizontal	Vertical
Peak Antenna Gain (dBi)	27.2	26.6	34.0	37.1	38.8
EIRP (dBW)	40.4	40.4	52.7	56.1	56.7

EXHIBIT 3

TC&R SUBSYSTEM CHARACTERISTICS

Beam Name	Command - Global
Schedule S Beam ID	CMD
Frequencies (MHz)	13998.0
Polarization	RHCP
Peak Antenna Gain (dBi)	2.0
Minimum Flux Density (dBW/m²)	-93.7

Beam Name	Telemetry Global	Telemetry Global	Telemetry +Z/-Z	Telemetry +Z/-Z	ULPC
Schedule S Beam ID	TMGH	TMGV	TMP	TMP	BNC
Frequencies (MHz)	12747.0	12748.0	12747.0	12748.0	3702.0
Polarization	Horizontal	Vertical	LHCP	LHCP	Horizontal
Peak Antenna Gain (dBi)	22.8	22.8	-2.0	-2.0	22.8
Maximum Channel EIRP (dBW)	17.1	17.1	8.3	8.3	15.5

Note: RHCP: Right Hand Circular Polarization, LHCP: Left Hand Circular Polarization

Exhibit 4: Adjacent Satellite (166.9° E.L.) Link Budgets

UPLINK BEAM INFORMATION			
Uplink Beam Name	PACIFIC	PACIFIC	PACIFIC
Uplink Frequency (GHz)	6.175	6.175	6.175
Uplink Beam Polarization	HORIZONTAL	HORIZONTAL	HORIZONTAL
Uplink Relative Contour Level (dB)	-10.0	-10.0	-10.0
Uplink Contour G/T (dB/K)	-8.4	-8.4	-8.4
Uplink SFD (dBW/m2)	-83.6	-81.6	-81.6
Rain Rate (mm/hr)	42.0	42.0	42.0
DOWNLINK BEAM INFORMATION			
Downlink Beam Name	PACIFIC	PACIFIC	PACIFIC
Downlink Frequency (GHz)	3.95	3.95	3.95
Downlink Beam Polarization	VERTICAL	VERTICAL	VERTICAL
Downlink Relative Contour Level (dB)	-8.0	-8.0	-8.0
Downlink Contour EIRP (dBW)	32.4	32.4	32.4
Rain Rate (mm/hr)	42.0	42.0	42.0
ADJACENT SATELLITE 1			
Satellite 1 Orbital Location	168.9E	168.9E	168.9E
Uplink Power Density (dBW/Hz)	-38.7	-38.7	-38.7
Uplink Polarization Advantage (dB)	0	0	0
Downlink EIRP Density (dBW/Hz)	-40.0	-40.0	-40.0
Downlink Polarization Advantage (dB)	0	0	0
ADJACENT SATELLITE 2			
Satellite 1 Orbital Location	164.9E	164.9E	164.9E
Uplink Power Density (dBW/Hz)	-38.7	-38.7	-38.7
Uplink Polarization Advantage (dB)	0	0	0
Downlink EIRP Density (dBW/Hz)	-40.0	-40.0	-40.0
Downlink Polarization Advantage (dB)	0	0	0
CARRIER INFORMATION			
Carrier ID	36M0G7W	10M3G7W	100KG7W
Carrier Modulation	QPSK	QPSK	QPSK
Information Rate(kbps)	24575	6000	64
Code Rate	1/2x188/204	1/2x188/204	1/2x239/256
Occupied Bandwidth(kHz)	30133	6771.1	75.4
Allocated Bandwidth(kHz)	36000	10300	100
Minimum C/N, Clear Sky (dB)	3.36	3.87	2.99
Minimum C/N, Rain (dB)	3.36	3.57	2.79
UPLINK EARTH STATION			
Earth Station Diameter (meters)	11.0	6.1	6.1
Earth Station Gain (dBi)	55.4	49.4	49.4
Earth Station Elevation Angle	20	20	20
DOWNLINK EARTH STATION			
Earth Station Diameter (meters)	3.0	3.5	3.5
Earth Station Gain (dBi)	39.7	41.1	41.1
Earth Station G/T (dB/K)	19.2	21.0	21.0
Earth Station Elevation Angle	20	20	20
COMPOSITE LINK PERFORMANCE			
C/N Uplink (dB)	24.5	21.1	20.2
C/N Downlink (dB)	8.6	9.7	8.8
C/I Intermodulation (dB)	N/A	20.2	19.3
C/I Uplink Co-Channel (dB)	24.0	25.8	25.5
C/I Downlink Co-Channel (dB)	24.0	25.8	25.5
C/I Uplink Adjacent Satellite 1 (dB)	15.2	11.8	10.9
C/I Downlink Adjacent Satellite 1 (dB)	8.8	13.2	12.3
C/I Uplink Adjacent Satellite 2 (dB)	15.2	11.8	10.9
C/I Downlink Adjacent Satellite 2 (dB)	17.5	18.0	17.1
C/(N+I) Composite (dB)	4.4	4.9	4.0
Required System Margin (dB)	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	3.4	3.9	3.0
Minimum Required C/N (dB)	-3.4	-3.9	-3.0
Excess Link Margin (dB)	.1	0.0	0.0
Number of Carriers	1.0	2.3	257.1
CARRIER DENSITY LEVELS			
Uplink Power Density (dBW/Hz)	-50.9	-48.3	-49.2
Downlink EIRP Density At Beam Peak (dBW/Hz)	-34.4	-35.1	-36.0

Exhibit 4: Adjacent Satellite (166.9° E.L.) Link Budgets (continued)

UPLINK BEAM INFORMATION			
Uplink Beam Name	PACIFIC	PACIFIC	PACIFIC
Uplink Frequency (GHz)	6.175	6.175	6.175
Uplink Beam Polarization	VERTICAL	VERTICAL	VERTICAL
Uplink Relative Contour Level (dB)	-10.0	-10.0	-10.0
Uplink Contour G/T (dB/K)	-7.4	-7.4	-7.4
Uplink SFD (dBW/m2)	-83.6	-81.6	-81.6
Rain Rate (mm/hr)	42.0	42.0	42.0
DOWNLINK BEAM INFORMATION			
Downlink Beam Name	PACIFIC	PACIFIC	PACIFIC
Downlink Frequency (GHz)	3.95	3.95	3.95
Downlink Beam Polarization	HORIZONTAL	HORIZONTAL	HORIZONTAL
Downlink Relative Contour Level (dB)	-8.0	-8.0	-8.0
Downlink Contour EIRP (dBW)	32.4	32.4	32.4
Rain Rate (mm/hr)	42.0	42.0	42.0
ADJACENT SATELLITE 1			
Satellite 1 Orbital Location	168.9E	168.9E	168.9E
Uplink Power Density (dBW/Hz)	-38.7	-38.7	-38.7
Uplink Polarization Advantage (dB)	0	0	0
Downlink EIRP Density (dBW/Hz)	-40.0	-40.0	-40.0
Downlink Polarization Advantage (dB)	0	0	0
ADJACENT SATELLITE 2			
Satellite 1 Orbital Location	164.9E	164.9E	164.9E
Uplink Power Density (dBW/Hz)	-38.7	-38.7	-38.7
Uplink Polarization Advantage (dB)	0	0	0
Downlink EIRP Density (dBW/Hz)	-40.0	-40.0	-40.0
Downlink Polarization Advantage (dB)	0	0	0
CARRIER INFORMATION			
Carrier ID	36M0G7W	10M3G7W	100KG7W
Carrier Modulation	QPSK	QPSK	QPSK
Information Rate(kbps)	24575	6000	64
Code Rate	1/2x188/204	1/2x188/204	1/2x239/256
Occupied Bandwidth(kHz)	30133	6771.1	75.4
Allocated Bandwidth(kHz)	36000	10300	100
Minimum C/N, Clear Sky (dB)	3.36	3.87	2.99
Minimum C/N, Rain (dB)	3.36	3.57	2.79
UPLINK EARTH STATION			
Earth Station Diameter (meters)	11.0	6.1	6.1
Earth Station Gain (dBi)	55.4	49.4	49.4
Earth Station Elevation Angle	20	20	20
DOWNLINK EARTH STATION			
Earth Station Diameter (meters)	3.0	3.5	3.5
Earth Station Gain (dBi)	39.7	41.1	41.1
Earth Station G/T (dB/K)	19.2	21.0	21.0
Earth Station Elevation Angle	20	20	20
COMPOSITE LINK PERFORMANCE			
C/N Uplink (dB)	25.5	22.1	21.2
C/N Downlink (dB)	8.6	9.6	8.7
C/I Intermodulation (dB)	N/A	20.2	19.3
C/I Uplink Co-Channel (dB)	24.0	25.7	25.4
C/I Downlink Co-Channel (dB)	24.0	25.7	25.4
C/I Uplink Adjacent Satellite 1 (dB)	15.2	11.8	10.9
C/I Downlink Adjacent Satellite 1 (dB)	8.8	13.2	12.3
C/I Uplink Adjacent Satellite 2 (dB)	15.2	11.8	10.9
C/I Downlink Adjacent Satellite 2 (dB)	17.5	18.0	17.1
C/(N+I) Composite (dB)	4.4	4.9	4.0
Required System Margin (dB)	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	3.4	3.9	3.0
Minimum Required C/N (dB)	-3.4	-3.9	-3.0
Excess Link Margin (dB)	.1	0.0	0.0
Number of Carriers	1.0	2.3	258.4
CARRIER DENSITY LEVELS			
Uplink Power Density (dBW/Hz)	-50.9	-48.3	-49.2
Downlink EIRP Density At Beam Peak (dBW/Hz)	-34.4	-35.1	-36.0

Exhibit 4: Adjacent Satellite (166.9° E.L.) Link Budgets (continued)

UPLINK BEAM INFORMATION					
Uplink Beam Name	PACIFIC	PACIFIC	PACIFIC	PACIFIC	PACIFIC
Uplink Frequency (GHz)	14.250	14.250	14.250	14.250	14.250
Uplink Beam Polarization	HORIZONTAL	HORIZONTAL	HORIZONTAL	HORIZONTAL	HORIZONTAL
Uplink Relative Contour Level (dB)	-8.0	-8.0	-8.0	-8.0	-8.0
Uplink Contour G/T (dB/K)	-7.6	-7.6	-7.6	-7.6	-7.6
Uplink SFD (dBW/m2)	-69.4	-72.4	-72.4	-72.4	-72.4
Rain Rate (mm/hr)	95.0	95.0	95.0	95.0	95.0
DOWNLINK BEAM INFORMATION					
Downlink Beam Name	SE ASIA	SE ASIA	SE ASIA	SE ASIA	SE ASIA
Downlink Frequency (GHz)	12.500	12.500	12.500	12.500	12.500
Downlink Beam Polarization	VERTICAL	VERTICAL	VERTICAL	VERTICAL	VERTICAL
Downlink Relative Contour Level (dB)	-8.0	-8.0	-8.0	-8.0	-8.0
Downlink Contour EIRP (dBW)	48.7	48.7	48.7	48.7	48.7
Rain Rate (mm/hr)	145.	145.	145.	145.	145.
ADJACENT SATELLITE 1					
Satellite 1 Orbital Location	164.9E	164.9E	164.9E	164.9E	164.9E
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	0	0	0	0	0
Downlink EIRP Density (dBW/Hz)	-26.0	-26.0	-26.0	-26.0	-26.0
Downlink Polarization Advantage (dB)	0	0	0	0	0
ADJACENT SATELLITE 2					
Satellite 1 Orbital Location	168.9E	168.9E	168.9E	168.9E	168.9E
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	3	3	3	0	3
Downlink EIRP Density (dBW/Hz)	-26.0	-26.0	-26.0	-26.0	-26.0
Downlink Polarization Advantage (dB)	3	3	3	0	3
CARRIER INFORMATION					
Carrier ID	36M0G7W	10M3G7W	100KG7W	1M45G7W	400KG7W
Carrier Modulation	QPSK	QPSK	QPSK	BPSK	BPSK
Information Rate(kbps)	24575	6000	64	512	128
Code Rate	1/2x188/204	1/2x188/204	1/2x239/256	R1/2	R1/2
Occupied Bandwidth(kHz)	30133	6771.1	75.4	1229.0	307.0
Allocated Bandwidth(kHz)	36000	10300	100	1450.0	400.0
Minimum C/N, Clear Sky (dB)	3.36	3.87	2.99	3.4	3.4
Minimum C/N, Rain (dB)	3.36	3.57	2.79	2.7	2.7
UPLINK EARTH STATION					
Earth Station Diameter (meters)	6.1	6.1	6.1	6.1	4.6
Earth Station Gain (dBi)	56.9	56.9	56.9	56.9	54.7
Earth Station Elevation Angle	20	20	20	20	20
DOWNLINK EARTH STATION					
Earth Station Diameter (meters)	2.4	6.1	4.6	4.6	6.1
Earth Station Gain (dBi)	47.9	55.9	53.9	53.9	55.9
Earth Station G/T (dB/K)	25.4	33.5	31.4	31.4	33.5
Earth Station Elevation Angle	20	20	20	20	20
COMPOSITE LINK PERFORMANCE					
C/N Uplink (dB)	18.8	17.9	17.6	17.5	17.1
C/N Downlink (dB)	13.1	21.2	18.7	18.7	20.4
C/I Intermodulation (dB)	N/A	11.6	11.2	11.2	10.8
C/I Uplink Co-Channel (dB)	24.0	19.6	19.9	20.3	19.5
C/I Downlink Co-Channel (dB)	24.0	19.6	19.9	20.3	19.5
C/I Uplink Adjacent Satellite 1 (dB)	24.3	23.4	23.0	23.0	22.5
C/I Downlink Adjacent Satellite 1 (dB)	17.6	26.0	23.6	23.6	25.2
C/I Uplink Adjacent Satellite 2 (dB)	27.3	26.4	26.0	23.0	25.5
C/I Downlink Adjacent Satellite 2 (dB)	22.1	29.7	27.4	24.3	28.8
C/(N+I) Composite (dB)	10.1	9.0	8.5	8.4	8.3
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	9.1	8.0	7.5	7.4	7.3
Minimum Required C/N (dB)	-3.4	-3.9	-3.0	-3.4	-3.4
Excess Link Margin (dB)	5.7	4.1	4.5	4.0	3.9
Number of Carriers	1.0	3.5	360.0	24.8	90.0
CARRIER DENSITY LEVELS					
Uplink Power Density (dBW/Hz)	-51.6	-52.5	-52.9	-52.9	-51.2
Downlink EIRP Density At Beam Peak (dBW/Hz)	-26.0	-26.0	-26.4	-26.4	-26.9

Exhibit 4: Adjacent Satellite (166.9° E.L.) Link Budgets (continued)

UPLINK BEAM INFORMATION					
Uplink Beam Name	PACIFIC	PACIFIC	PACIFIC	PACIFIC	PACIFIC
Uplink Frequency (GHz)	14.250	14.250	14.250	14.250	14.250
Uplink Beam Polarization	VERTICAL	VERTICAL	VERTICAL	VERTICAL	VERTICAL
Uplink Relative Contour Level (dB)	-8.0	-8.0	-8.0	-8.0	-8.0
Uplink Contour G/T (dB/K)	-7.5	-7.5	-7.5	-7.5	-7.5
Uplink SFD (dBW/m2)	-72.5	-74.5	-74.5	-74.5	-74.5
Rain Rate (mm/hr)	95.0	95.0	95.0	95.0	95.0
DOWNLINK BEAM INFORMATION					
Downlink Beam Name	AUSTRALIA	AUSTRALIA	AUSTRALIA	AUSTRALIA	AUSTRALIA
Downlink Frequency (GHz)	12.500	12.500	12.500	12.500	12.500
Downlink Beam Polarization	HORIZONTAL	HORIZONTAL	HORIZONTAL	HORIZONTAL	HORIZONTAL
Downlink Relative Contour Level (dB)	-8.0	-8.0	-8.0	-8.0	-8.0
Downlink Contour EIRP (dBW)	44.7	44.7	44.7	44.7	44.7
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0	42.0
ADJACENT SATELLITE 1					
Satellite 1 Orbital Location	168.9E	168.9E	168.9E	168.9E	168.9E
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	0	0	0	0	0
Downlink EIRP Density (dBW/Hz)	-26.0	-26.0	-26.0	-26.0	-26.0
Downlink Polarization Advantage (dB)	0	0	0	0	0
ADJACENT SATELLITE 2					
Satellite 1 Orbital Location	164.9E	164.9E	164.9E	164.9E	164.9E
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	0	0	0	0	0
Downlink EIRP Density (dBW/Hz)	-26.0	-26.0	-26.0	-26.0	-26.0
Downlink Polarization Advantage (dB)	0	0	0	0	0
CARRIER INFORMATION					
Carrier ID	36M0G7W	10M3G7W	100KG7W	1M45G7W	400KG7W
Carrier Modulation	QPSK	QPSK	QPSK	BPSK	BPSK
Information Rate(kbps)	24575	6000	64	512	128
Code Rate	1/2x188/204	1/2x188/204	1/2x239/256	R1/2	R1/2
Occupied Bandwidth(kHz)	30133	6771.1	75.4	1229.0	307.0
Allocated Bandwidth(kHz)	36000	10300	100	1450.0	400.0
Minimum C/N, Clear Sky (dB)	3.36	3.87	2.99	3.4	3.4
Minimum C/N, Rain (dB)	3.36	3.57	2.79	2.7	2.7
UPLINK EARTH STATION					
Earth Station Diameter (meters)	6.1	6.1	6.1	6.1	3.7
Earth Station Gain (dBi)	56.9	56.9	56.9	56.9	52.7
Earth Station Elevation Angle	20	20	20	20	20
DOWNLINK EARTH STATION					
Earth Station Diameter (meters)	2.4	2.4	2.4	4.6	6.1
Earth Station Gain (dBi)	47.9	47.9	47.9	53.9	55.9
Earth Station G/T (dB/K)	25.4	25.4	25.4	31.4	33.5
Earth Station Elevation Angle	20	20	20	20	20
COMPOSITE LINK PERFORMANCE					
C/N Uplink (dB)	20.1	20.0	19.5	16.4	15.9
C/N Downlink (dB)	13.2	13.2	12.6	15.6	17.2
C/I Intermodulation (dB)	N/A	15.7	15.1	12.1	11.6
C/I Uplink Co-Channel (dB)	24.0	23.7	23.8	21.2	20.3
C/I Downlink Co-Channel (dB)	24.0	23.7	23.8	21.2	20.3
C/I Uplink Adjacent Satellite 1 (dB)	25.5	25.4	24.8	21.8	21.3
C/I Downlink Adjacent Satellite 1 (dB)	17.7	17.7	17.2	20.5	22.0
C/I Uplink Adjacent Satellite 2 (dB)	25.5	25.4	24.8	21.8	21.3
C/I Downlink Adjacent Satellite 2 (dB)	19.1	19.1	18.6	21.2	22.6
C/(N+I) Composite (dB)	10.0	8.9	8.4	8.0	8.0
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	9.0	7.9	7.4	7.0	7.0
Minimum Required C/N (dB)	-3.4	-3.9	-3.0	-3.4	-3.4
Excess Link Margin (dB)	5.6	4.0	4.4	3.6	3.6
Number of Carriers	1.0	3.5	360.0	24.8	90.0
CARRIER DENSITY LEVELS					
Uplink Power Density (dBW/Hz)	-50.4	-50.5	-51.1	-54.1	-50.4
Downlink EIRP Density At Beam Peak (dBW/Hz)	-26.0	-26.0	-26.5	-29.6	-30.1

Exhibit 4: Adjacent Satellite (166.9° E.L.) Link Budgets (continued)

UPLINK BEAM INFORMATION					
Uplink Beam Name	PACIFIC	PACIFIC	PACIFIC	PACIFIC	PACIFIC
Uplink Frequency (GHz)	14.250	14.250	14.250	14.250	14.250
Uplink Beam Polarization	VERTICAL	VERTICAL	VERTICAL	VERTICAL	VERTICAL
Uplink Relative Contour Level (dB)	-8.0	-8.0	-8.0	-8.0	-8.0
Uplink Contour G/T (dB/K)	-7.5	-7.5	-7.5	-7.5	-7.5
Uplink SFD (dBW/m2)	-69.5	-72.5	-72.5	-72.5	-72.5
Rain Rate (mm/hr)	95.0	95.0	95.0	95.0	95.0
DOWNLINK BEAM INFORMATION					
Downlink Beam Name	NE ASIA	NE ASIA	NE ASIA	NE ASIA	NE ASIA
Downlink Frequency (GHz)	12.500	12.500	12.500	12.500	12.500
Downlink Beam Polarization	HORIZONTAL	HORIZONTAL	HORIZONTAL	HORIZONTAL	HORIZONTAL
Downlink Relative Contour Level (dB)	-6.0	-6.0	-6.0	-6.0	-6.0
Downlink Contour EIRP (dBW)	50.1	50.1	50.1	50.1	50.1
Rain Rate (mm/hr)	63.0	63.0	63.0	63.0	63.0
ADJACENT SATELLITE 1					
Satellite 1 Orbital Location	168.9E	168.9E	168.9E	168.9E	168.9E
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	0	0	0	0	0
Downlink EIRP Density (dBW/Hz)	-24.0	-24.0	-24.0	-24.0	-24.0
Downlink Polarization Advantage (dB)	0	0	0	0	0
ADJACENT SATELLITE 2					
Satellite 1 Orbital Location	164.9E	164.9E	164.9E	164.9E	164.9E
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	0	0	0	0	0
Downlink EIRP Density (dBW/Hz)	-24.0	-24.0	-24.0	-24.0	-24.0
Downlink Polarization Advantage (dB)	0	0	0	0	0
CARRIER INFORMATION					
Carrier ID	36M0G7W	10M3G7W	100KG7W	1M45G7W	400KG7W
Carrier Modulation	QPSK	QPSK	QPSK	BPSK	BPSK
Information Rate(kbps)	24575	6000	64	512	128
Code Rate	1/2x188/204	1/2x188/204	1/2x239/256	R1/2	R1/2
Occupied Bandwidth(kHz)	30133	6771.1	75.4	1229.0	307.0
Allocated Bandwidth(kHz)	36000	10300	100	1450.0	400.0
Minimum C/N, Clear Sky (dB)	3.36	3.87	2.99	3.4	3.4
Minimum C/N, Rain (dB)	3.36	3.57	2.79	2.7	2.7
UPLINK EARTH STATION					
Earth Station Diameter (meters)	6.1	6.1	6.1	6.1	4.6
Earth Station Gain (dBi)	56.9	56.9	56.9	56.9	54.7
Earth Station Elevation Angle	20	20	20	20	20
DOWNLINK EARTH STATION					
Earth Station Diameter (meters)	1.8	3.7	3.7	4.6	6.1
Earth Station Gain (dBi)	45.2	51.5	51.5	53.9	55.9
Earth Station G/T (dB/K)	22.7	29.0	29.0	31.4	33.5
Earth Station Elevation Angle	20	20	20	20	20
COMPOSITE LINK PERFORMANCE					
C/N Uplink (dB)	19.4	18.4	17.6	17.0	16.8
C/N Downlink (dB)	12.4	18.5	17.8	19.6	21.5
C/I Intermodulation (dB)	N/A	12.0	11.3	10.7	10.5
C/I Uplink Co-Channel (dB)	24.0	20.1	20.0	19.8	19.2
C/I Downlink Co-Channel (dB)	24.0	20.1	20.0	19.8	19.2
C/I Uplink Adjacent Satellite 1 (dB)	24.8	23.7	23.0	22.4	22.2
C/I Downlink Adjacent Satellite 1 (dB)	14.7	21.3	20.6	22.5	24.3
C/I Uplink Adjacent Satellite 2 (dB)	24.8	23.7	23.0	22.4	22.2
C/I Downlink Adjacent Satellite 2 (dB)	16.6	22.3	21.6	23.2	24.9
C/(N+I) Composite (dB)	8.6	8.8	8.2	8.0	7.9
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	7.6	7.8	7.2	7.0	6.9
Minimum Required C/N (dB)	-3.4	-3.9	-3.0	-3.4	-3.4
Excess Link Margin (dB)	4.2	3.9	4.2	3.6	3.5
Number of Carriers	1.0	3.5	360.0	24.8	90.0
CARRIER DENSITY LEVELS					
Uplink Power Density (dBW/Hz)	-51.1	-52.2	-52.9	-53.5	-51.5
Downlink EIRP Density At Beam Peak (dBW/Hz)	-26.0	-26.2	-26.9	-27.6	-27.8

Exhibit 5: Adjacent Satellite (170.9° E.L.) Link Budgets

UPLINK BEAM INFORMATION			
Uplink Beam Name	PACIFIC	PACIFIC	PACIFIC
Uplink Frequency (GHz)	6.175	6.175	6.175
Uplink Beam Polarization	HORIZONTAL	HORIZONTAL	HORIZONTAL
Uplink Relative Contour Level (dB)	-10.0	-10.0	-10.0
Uplink Contour G/T (dB/K)	-8.4	-8.4	-8.4
Uplink SFD (dBW/m ²)	-83.6	-81.6	-81.6
Rain Rate (mm/hr)	42.0	42.0	42.0
DOWNLINK BEAM INFORMATION			
Downlink Beam Name	PACIFIC	PACIFIC	PACIFIC
Downlink Frequency (GHz)	3.95	3.95	3.95
Downlink Beam Polarization	VERTICAL	VERTICAL	VERTICAL
Downlink Relative Contour Level (dB)	-8.0	-8.0	-8.0
Downlink Contour EIRP (dBW)	32.4	32.4	32.4
Rain Rate (mm/hr)	42.0	42.0	42.0
ADJACENT SATELLITE 1			
Satellite 1 Orbital Location	168.9E	168.9E	168.9E
Uplink Power Density (dBW/Hz)	-38.7	-38.7	-38.7
Uplink Polarization Advantage (dB)	0	0	0
Downlink EIRP Density (dBW/Hz)	-40.0	-40.0	-40.0
Downlink Polarization Advantage (dB)	0	0	0
ADJACENT SATELLITE 2			
Satellite 1 Orbital Location	172.9E	172.9E	172.9E
Uplink Power Density (dBW/Hz)	-38.7	-38.7	-38.7
Uplink Polarization Advantage (dB)	0	0	0
Downlink EIRP Density (dBW/Hz)	-40.0	-40.0	-40.0
Downlink Polarization Advantage (dB)	0	0	0
CARRIER INFORMATION			
Carrier ID	36M0G7W	10M3G7W	100KG7W
Carrier Modulation	QPSK	QPSK	QPSK
Information Rate(kbps)	24575	6000	64
Code Rate	1/2x188/204	1/2x188/204	1/2x239/256
Occupied Bandwidth(kHz)	30133	6771.1	75.4
Allocated Bandwidth(kHz)	36000	10300	100
Minimum C/N, Clear Sky (dB)	3.36	3.87	2.99
Minimum C/N, Rain (dB)	3.36	3.57	2.79
UPLINK EARTH STATION			
Earth Station Diameter (meters)	11.0	6.1	6.1
Earth Station Gain (dBi)	55.4	49.4	49.4
Earth Station Elevation Angle	20	20	20
DOWNLINK EARTH STATION			
Earth Station Diameter (meters)	3.0	3.5	3.5
Earth Station Gain (dBi)	39.7	41.1	41.1
Earth Station G/T (dB/K)	19.2	21.0	21.0
Earth Station Elevation Angle	20	20	20
COMPOSITE LINK PERFORMANCE			
C/N Uplink (dB)	24.5	21.1	20.2
C/N Downlink (dB)	8.6	9.7	8.8
C/I Intermodulation (dB)	N/A	20.2	19.3
C/I Uplink Co-Channel (dB)	24.0	25.8	25.5
C/I Downlink Co-Channel (dB)	24.0	25.8	25.5
C/I Uplink Adjacent Satellite 1 (dB)	15.2	11.8	10.9
C/I Downlink Adjacent Satellite 1 (dB)	8.8	13.2	12.3
C/I Uplink Adjacent Satellite 2 (dB)	15.2	11.8	10.9
C/I Downlink Adjacent Satellite 2 (dB)	17.5	18.0	17.1
C/(N+I) Composite (dB)	4.4	4.9	4.0
Required System Margin (dB)	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	3.4	3.9	3.0
Minimum Required C/N (dB)	-3.4	-3.9	-3.0
Excess Link Margin (dB)	.1	0.0	0.0
Number of Carriers	1.0	2.3	257.1
CARRIER DENSITY LEVELS			
Uplink Power Density (dBW/Hz)	-50.9	-48.3	-49.2
Downlink EIRP Density At Beam Peak (dBW/Hz)	-34.4	-35.1	-36.0

Exhibit 5: Adjacent Satellite (170.9° E.L.) Link Budgets (continued)

UPLINK BEAM INFORMATION			
Uplink Beam Name	PACIFIC	PACIFIC	PACIFIC
Uplink Frequency (GHz)	6.175	6.175	6.175
Uplink Beam Polarization	VERTICAL	VERTICAL	VERTICAL
Uplink Relative Contour Level (dB)	-10.0	-10.0	-10.0
Uplink Contour G/T (dB/K)	-7.4	-7.4	-7.4
Uplink SFD (dBW/m ²)	-83.6	-81.6	-81.6
Rain Rate (mm/hr)	42.0	42.0	42.0
DOWNLINK BEAM INFORMATION			
Downlink Beam Name	PACIFIC	PACIFIC	PACIFIC
Downlink Frequency (GHz)	3.95	3.95	3.95
Downlink Beam Polarization	HORIZONTAL	HORIZONTAL	HORIZONTAL
Downlink Relative Contour Level (dB)	-8.0	-8.0	-8.0
Downlink Contour EIRP (dBW)	32.4	32.4	32.4
Rain Rate (mm/hr)	42.0	42.0	42.0
ADJACENT SATELLITE 1			
Satellite 1 Orbital Location	168.9E	168.9E	168.9E
Uplink Power Density (dBW/Hz)	-38.7	-38.7	-38.7
Uplink Polarization Advantage (dB)	0	0	0
Downlink EIRP Density (dBW/Hz)	-40.0	-40.0	-40.0
Downlink Polarization Advantage (dB)	0	0	0
ADJACENT SATELLITE 2			
Satellite 1 Orbital Location	172.9E	172.9E	172.9E
Uplink Power Density (dBW/Hz)	-38.7	-38.7	-38.7
Uplink Polarization Advantage (dB)	0	0	0
Downlink EIRP Density (dBW/Hz)	-40.0	-40.0	-40.0
Downlink Polarization Advantage (dB)	0	0	0
CARRIER INFORMATION			
Carrier ID	36M0G7W	10M3G7W	100KG7W
Carrier Modulation	QPSK	QPSK	QPSK
Information Rate(kbps)	24575	6000	64
Code Rate	1/2x188/204	1/2x188/204	1/2x239/256
Occupied Bandwidth(kHz)	30133	6771.1	75.4
Allocated Bandwidth(kHz)	36000	10300	100
Minimum C/N, Clear Sky (dB)	3.36	3.87	2.99
Minimum C/N, Rain (dB)	3.36	3.57	2.79
UPLINK EARTH STATION			
Earth Station Diameter (meters)	11.0	6.1	6.1
Earth Station Gain (dBi)	55.4	49.4	49.4
Earth Station Elevation Angle	20	20	20
DOWNLINK EARTH STATION			
Earth Station Diameter (meters)	3.0	3.5	3.5
Earth Station Gain (dBi)	39.7	41.1	41.1
Earth Station G/T (dB/K)	19.2	21.0	21.0
Earth Station Elevation Angle	20	20	20
COMPOSITE LINK PERFORMANCE			
C/N Uplink (dB)	25.5	22.1	21.2
C/N Downlink (dB)	8.6	9.6	8.7
C/I Intermodulation (dB)	N/A	20.2	19.3
C/I Uplink Co-Channel (dB)	24.0	25.7	25.4
C/I Downlink Co-Channel (dB)	24.0	25.7	25.4
C/I Uplink Adjacent Satellite 1 (dB)	15.2	11.8	10.9
C/I Downlink Adjacent Satellite 1 (dB)	8.8	13.2	12.3
C/I Uplink Adjacent Satellite 2 (dB)	15.2	11.8	10.9
C/I Downlink Adjacent Satellite 2 (dB)	17.5	18.0	17.1
C/(N+I) Composite (dB)	4.4	4.9	4.0
Required System Margin (dB)	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	3.4	3.9	3.0
Minimum Required C/N (dB)	-3.4	-3.9	-3.0
Excess Link Margin (dB)	.1	0.0	0.0
Number of Carriers	1.0	2.3	258.4
CARRIER DENSITY LEVELS			
Uplink Power Density (dBW/Hz)	-50.9	-48.3	-49.2
Downlink EIRP Density At Beam Peak (dBW/Hz)	-34.4	-35.1	-36.0

Exhibit 5: Adjacent Satellite (170.9° E.L.) Link Budgets (continued)

UPLINK BEAM INFORMATION					
Uplink Beam Name	PACIFIC	PACIFIC	PACIFIC	PACIFICD	PACIFIC
Uplink Frequency (GHz)	14.250	14.250	14.250	14.250	14.250
Uplink Beam Polarization	HORIZONTAL	HORIZONTAL	HORIZONTAL	HORIZONTAL	HORIZONTAL
Uplink Relative Contour Level (dB)	-8.0	-8.0	-8.0	-8.0	-8.0
Uplink Contour G/T (dB/K)	-7.6	-7.6	-7.6	-7.6	-7.6
Uplink SFD (dBW/m2)	-69.4	-72.4	-72.4	-72.4	-72.4
Rain Rate (mm/hr)	95.0	95.0	95.0	95.0	95.0
DOWNLINK BEAM INFORMATION					
Downlink Beam Name	SE ASIA	SE ASIA	SE ASIA	SE ASIA	SE ASIA
Downlink Frequency (GHz)	12.500	12.500	12.500	12.500	12.500
Downlink Beam Polarization	VERTICAL	VERTICAL	VERTICAL	VERTICAL	VERTICAL
Downlink Relative Contour Level (dB)	-8.0	-8.0	-8.0	-8.0	-8.0
Downlink Contour EIRP (dBW)	48.7	48.7	48.7	48.7	48.7
Rain Rate (mm/hr)	145.	145.	145.	145.	145.
ADJACENT SATELLITE 1					
Satellite 1 Orbital Location	168.9E	168.9E	168.9E	168.9E	168.9E
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	0	0	0	0	0
Downlink EIRP Density (dBW/Hz)	-26.0	-26.0	-26.0	-26.0	-26.0
Downlink Polarization Advantage (dB)	0	0	0	0	0
ADJACENT SATELLITE 2					
Satellite 1 Orbital Location	172.9E	172.9E	172.9E	172.9E	172.9E
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	3	3	3	0	3
Downlink EIRP Density (dBW/Hz)	-26.0	-26.0	-26.0	-26.0	-26.0
Downlink Polarization Advantage (dB)	3	3	3	0	3
CARRIER INFORMATION					
Carrier ID	36M0G7W	10M3G7W	100KG7W	1M45G7W	400KG7W
Carrier Modulation	QPSK	QPSK	QPSK	BPSK	BPSK
Information Rate(kbps)	24575	6000	64	512	128
Code Rate	1/2x188/204	1/2x188/204	1/2x239/256	R1/2	R1/2
Occupied Bandwidth(kHz)	30133	6771.1	75.4	1229.0	307.0
Allocated Bandwidth(kHz)	36000	10300	100	1450.0	400.0
Minimum C/N, Clear Sky (dB)	3.36	3.87	2.99	3.4	3.4
Minimum C/N, Rain (dB)	3.36	3.57	2.79	2.7	2.7
UPLINK EARTH STATION					
Earth Station Diameter (meters)	6.1	6.1	6.1	6.1	4.6
Earth Station Gain (dBi)	56.9	56.9	56.9	56.9	54.7
Earth Station Elevation Angle	20	20	20	20	20
DOWNLINK EARTH STATION					
Earth Station Diameter (meters)	2.4	6.1	4.6	4.6	6.1
Earth Station Gain (dBi)	47.9	55.9	53.9	53.9	55.9
Earth Station G/T (dB/K)	25.4	33.5	31.4	31.4	33.5
Earth Station Elevation Angle	20	20	20	20	20
COMPOSITE LINK PERFORMANCE					
C/N Uplink (dB)	18.8	17.9	17.6	17.5	17.1
C/N Downlink (dB)	13.1	21.2	18.7	18.7	20.4
C/I Intermodulation (dB)	N/A	11.6	11.2	11.2	10.8
C/I Uplink Co-Channel (dB)	24.0	19.6	19.9	20.3	19.5
C/I Downlink Co-Channel (dB)	24.0	19.6	19.9	20.3	19.5
C/I Uplink Adjacent Satellite 1 (dB)	24.3	23.4	23.0	23.0	22.5
C/I Downlink Adjacent Satellite 1 (dB)	17.6	26.0	23.6	23.6	25.2
C/I Uplink Adjacent Satellite 2 (dB)	27.3	26.4	26.0	23.0	25.5
C/I Downlink Adjacent Satellite 2 (dB)	22.1	29.7	27.4	24.3	28.8
C/(N+I) Composite (dB)	10.1	9.0	8.5	8.4	8.3
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	9.1	8.0	7.5	7.4	7.3
Minimum Required C/N (dB)	-3.4	-3.9	-3.0	-3.4	-3.4
Excess Link Margin (dB)	5.7	4.1	4.5	4.0	3.9
Number of Carriers	1.0	3.5	360.0	24.8	90.0
CARRIER DENSITY LEVELS					
Uplink Power Density (dBW/Hz)	-51.6	-52.5	-52.9	-52.9	-51.2
Downlink EIRP Density At Beam Peak (dBW/Hz)	-26.0	-26.0	-26.4	-26.4	-26.9

Exhibit 5: Adjacent Satellite (170.9° E.L.) Link Budgets (continued)

UPLINK BEAM INFORMATION					
Uplink Beam Name	PACIFIC	PACIFIC	PACIFIC	PACIFIC	PACIFIC
Uplink Frequency (GHz)	14.250	14.250	14.250	14.250	14.250
Uplink Beam Polarization	VERTICAL	VERTICAL	VERTICAL	VERTICAL	VERTICAL
Uplink Relative Contour Level (dB)	-8.0	-8.0	-8.0	-8.0	-8.0
Uplink Contour G/T (dB/K)	-7.5	-7.5	-7.5	-7.5	-7.5
Uplink SFD (dBW/m2)	-72.5	-74.5	-74.5	-74.5	-74.5
Rain Rate (mm/hr)	95.0	95.0	95.0	95.0	95.0
DOWNLINK BEAM INFORMATION					
Downlink Beam Name	AUSTRALIA	AUSTRALIA	AUSTRALIA	AUSTRALIA	AUSTRALIA
Downlink Frequency (GHz)	12.500	12.500	12.500	12.500	12.500
Downlink Beam Polarization	HORIZONTAL	HORIZONTAL	HORIZONTAL	HORIZONTAL	HORIZONTAL
Downlink Relative Contour Level (dB)	-8.0	-8.0	-8.0	-8.0	-8.0
Downlink Contour EIRP (dBW)	44.7	44.7	44.7	44.7	44.7
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0	42.0
ADJACENT SATELLITE 1					
Satellite 1 Orbital Location	168.9E	168.9E	168.9E	168.9E	168.9E
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	0	0	0	0	0
Downlink EIRP Density (dBW/Hz)	-26.0	-26.0	-26.0	-26.0	-26.0
Downlink Polarization Advantage (dB)	0	0	0	0	0
ADJACENT SATELLITE 2					
Satellite 1 Orbital Location	172.9E	172.9E	172.9E	172.9E	172.9E
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	0	0	0	0	0
Downlink EIRP Density (dBW/Hz)	-26.0	-26.0	-26.0	-26.0	-26.0
Downlink Polarization Advantage (dB)	0	0	0	0	0
CARRIER INFORMATION					
Carrier ID	36MOG7W	10M3G7W	100KG7W	1M45G7W	400KG7W
Carrier Modulation	QPSK	QPSK	QPSK	BPSK	BPSK
Information Rate(kbps)	24575	6000	64	512	128
Code Rate	1/2x188/204	1/2x188/204	1/2x239/256	R1/2	R1/2
Occupied Bandwidth(kHz)	30133	6771.1	75.4	1229.0	307.0
Allocated Bandwidth(kHz)	36000	10300	100	1450.0	400.0
Minimum C/N, Clear Sky (dB)	3.36	3.87	2.99	3.4	3.4
Minimum C/N, Rain (dB)	3.36	3.57	2.79	2.7	2.7
UPLINK EARTH STATION					
Earth Station Diameter (meters)	6.1	6.1	6.1	6.1	3.7
Earth Station Gain (dBi)	56.9	56.9	56.9	56.9	52.7
Earth Station Elevation Angle	20	20	20	20	20
DOWNLINK EARTH STATION					
Earth Station Diameter (meters)	2.4	2.4	2.4	4.6	6.1
Earth Station Gain (dBi)	47.9	47.9	47.9	53.9	55.9
Earth Station G/T (dB/K)	25.4	25.4	25.4	31.4	33.5
Earth Station Elevation Angle	20	20	20	20	20
COMPOSITE LINK PERFORMANCE					
C/N Uplink (dB)	20.1	20.0	19.5	16.4	15.9
C/N Downlink (dB)	13.2	13.2	12.6	15.6	17.2
C/I Intermodulation (dB)	N/A	15.7	15.1	12.1	11.6
C/I Uplink Co-Channel (dB)	24.0	23.7	23.8	21.2	20.3
C/I Downlink Co-Channel (dB)	24.0	23.7	23.8	21.2	20.3
C/I Uplink Adjacent Satellite 1 (dB)	25.5	25.4	24.8	21.8	21.3
C/I Downlink Adjacent Satellite 1 (dB)	17.7	17.7	17.2	20.5	22.0
C/I Uplink Adjacent Satellite 2 (dB)	25.5	25.4	24.8	21.8	21.3
C/I Downlink Adjacent Satellite 2 (dB)	19.1	19.1	18.6	21.2	22.6
C/(N+I) Composite (dB)	10.0	8.9	8.4	8.0	8.0
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	9.0	7.9	7.4	7.0	7.0
Minimum Required C/N (dB)	-3.4	-3.9	-3.0	-3.4	-3.4
Excess Link Margin (dB)	5.6	4.0	4.4	3.6	3.6
Number of Carriers	1.0	3.5	360.0	24.8	90.0
CARRIER DENSITY LEVELS					
Uplink Power Density (dBW/Hz)	-50.4	-50.5	-51.1	-54.1	-50.4
Downlink EIRP Density At Beam Peak (dBW/Hz)	-26.0	-26.0	-26.5	-29.6	-30.1

Exhibit 5: Adjacent Satellite (170.9° E.L.) Link Budgets (continued)

UPLINK BEAM INFORMATION					
Uplink Beam Name	PACIFIC	PACIFIC	PACIFIC	PACIFIC	PACIFIC
Uplink Frequency (GHz)	14.250	14.250	14.250	14.250	14.250
Uplink Beam Polarization	VERTICAL	VERTICAL	VERTICAL	VERTICAL	VERTICAL
Uplink Relative Contour Level (dB)	-8.0	-8.0	-8.0	-8.0	-8.0
Uplink Contour G/T (dB/K)	-7.5	-7.5	-7.5	-7.5	-7.5
Uplink SFD (dBW/m2)	-69.5	-72.5	-72.5	-72.5	-72.5
Rain Rate (mm/hr)	95.0	95.0	95.0	95.0	95.0
DOWNLINK BEAM INFORMATION					
Downlink Beam Name	NE ASIA	NE ASIA	NE ASIA	NE ASIA	NE ASIA
Downlink Frequency (GHz)	12.500	12.500	12.500	12.500	12.500
Downlink Beam Polarization	HORIZONTAL	HORIZONTAL	HORIZONTAL	HORIZONTAL	HORIZONTAL
Downlink Relative Contour Level (dB)	-6.0	-6.0	-6.0	-6.0	-6.0
Downlink Contour EIRP (dBW)	50.1	50.1	50.1	50.1	50.1
Rain Rate (mm/hr)	63.0	63.0	63.0	63.0	63.0
ADJACENT SATELLITE 1					
Satellite 1 Orbital Location	168.9E	168.9E	168.9E	168.9E	168.9E
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	0	0	0	0	0
Downlink EIRP Density (dBW/Hz)	-24.0	-24.0	-24.0	-24.0	-24.0
Downlink Polarization Advantage (dB)	0	0	0	0	0
ADJACENT SATELLITE 2					
Satellite 1 Orbital Location	172.9E	172.9E	172.9E	172.9E	172.9E
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	0	0	0	0	0
Downlink EIRP Density (dBW/Hz)	-24.0	-24.0	-24.0	-24.0	-24.0
Downlink Polarization Advantage (dB)	0	0	0	0	0
CARRIER INFORMATION					
Carrier ID	36M0G7W	10M3G7W	100KG7W	1M45G7W	400KG7W
Carrier Modulation	QPSK	QPSK	QPSK	BPSK	BPSK
Information Rate(kbps)	24575	6000	64	512	128
Code Rate	1/2x188/204	1/2x188/204	1/2x239/256	R1/2	R1/2
Occupied Bandwidth(kHz)	30133	6771.1	75.4	1229.0	307.0
Allocated Bandwidth(kHz)	36000	10300	100	1450.0	400.0
Minimum C/N, Clear Sky (dB)	3.36	3.87	2.99	3.4	3.4
Minimum C/N, Rain (dB)	3.36	3.57	2.79	2.7	2.7
UPLINK EARTH STATION					
Earth Station Diameter (meters)	6.1	6.1	6.1	6.1	4.6
Earth Station Gain (dBi)	56.9	56.9	56.9	56.9	54.7
Earth Station Elevation Angle	20	20	20	20	20
DOWNLINK EARTH STATION					
Earth Station Diameter (meters)	1.8	3.7	3.7	4.6	6.1
Earth Station Gain (dBi)	45.2	51.5	51.5	53.9	55.9
Earth Station G/T (dB/K)	22.7	29.0	29.0	31.4	33.5
Earth Station Elevation Angle	20	20	20	20	20
COMPOSITE LINK PERFORMANCE					
C/N Uplink (dB)	19.4	18.4	17.6	17.0	16.8
C/N Downlink (dB)	12.4	18.5	17.8	19.6	21.5
C/I Intermodulation (dB)	N/A	12.0	11.3	10.7	10.5
C/I Uplink Co-Channel (dB)	24.0	20.1	20.0	19.8	19.2
C/I Downlink Co-Channel (dB)	24.0	20.1	20.0	19.8	19.2
C/I Uplink Adjacent Satellite 1 (dB)	24.8	23.7	23.0	22.4	22.2
C/I Downlink Adjacent Satellite 1 (dB)	14.7	21.3	20.6	22.5	24.3
C/I Uplink Adjacent Satellite 2 (dB)	24.8	23.7	23.0	22.4	22.2
C/I Downlink Adjacent Satellite 2 (dB)	16.6	22.3	21.6	23.2	24.9
C/(N+I) Composite (dB)	8.6	8.8	8.2	8.0	7.9
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	7.6	7.8	7.2	7.0	6.9
Minimum Required C/N (dB)	-3.4	-3.9	-3.0	-3.4	-3.4
Excess Link Margin (dB)	4.2	3.9	4.2	3.6	3.5
Number of Carriers	1.0	3.5	360.0	24.8	90.0
CARRIER DENSITY LEVELS					
Uplink Power Density (dBW/Hz)	-51.1	-52.2	-52.9	-53.5	-51.5
Downlink EIRP Density At Beam Peak (dBW/Hz)	-26.0	-26.2	-26.9	-27.6	-27.8