

# Engineering Statement

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## 1 Introduction

Intelsat License LLC (“Intelsat”) seeks authority in this application to launch and operate a C/Ku-band satellite to be known as Intelsat 35e at the 34.5° W.L. orbital location. Intelsat 35e will replace Intelsat 903, which currently operates at 34.5° W.L.

The characteristics of the Intelsat 35e 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.

## 2 Spacecraft Overview

Intelsat 35e is a Boeing 702MP spacecraft that is capable of operating in C-band and Ku-band frequencies listed below.

| Direction | Frequency         |
|-----------|-------------------|
| Uplink    | 5850 – 6425 MHz   |
|           | 13750 – 14500 MHz |
| Downlink  | 3625 – 4200 MHz   |
|           | 10950 – 11200 MHz |
|           | 11450 – 11700 MHz |

The spacecraft provides the following coverage:

| Beam                 | Coverage   |
|----------------------|--|
| Caribbean            | Caribbean  |
| Europe/Mediterranean | Europe and Mediterranean Area                                |
| Europe/Africa        | Europe and West Africa                                       |
| C-Band Spot Beams    | South America, Caribbean, Greenland, Europe, and West Africa |
| Global               | Global   |

### 2.1 Spacecraft Characteristics

Intelsat 35e is a three-axis stabilized type spacecraft that has a rectangular outer body structure. Intelsat 35e utilizes two deployable solar array wings and a number of deployable and non-deployable antennas.

The Intelsat 35e 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 all of the various subsystems in order to avoid single-point failures.

The structural design of Intelsat 35e 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 35e provides active communication channels at C-band and Ku-band frequencies. The C-band payload employs channels having bandwidths of 36 MHz, 108 MHz, and 216 MHz. The Ku-band payload employs channels having bandwidths of 36 MHz and 54 MHz. The Intelsat 35e frequency and polarization plan are provided in the Schedule S. Due to the extensive number of channel combinations, the uplink channels and downlink channels have been listed separately in the Schedule S S10 “Space Station Transponders” table.

Intelsat 35e utilizes a multiple spot-beam architecture in C-band in which each spot beam has an identical design. Therefore, the coverage contours and performance characteristics for only a single representative spot beam are provided in the Schedule S. The latitude and longitude of each C-band spot beam’s maximum gain point on the Earth is provided in Exhibit 1 in conformance with Section 25.114(c)(4)(vii)(B) of the Commission’s rules. Additionally, Intelsat has included the Schedule S beam designation for all beams in Exhibit 5.

The coverage contours and performance characteristics of all Intelsat 35e beams are provided with Schedule S. Exhibits 2 and 3 provide the beam parameters for the Intelsat 35e 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.

The Intelsat 35e command and telemetry channel frequencies are shown in Exhibit 4. The coverage patterns of the on-station command and telemetry beams as well as the pipe and hemi emergency 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 35e command and telemetry subsystem performance is summarized in Exhibit 4.

#### **2.4 Uplink Power Control Subsystem**

Intelsat 35e utilizes one C-band and two Ku-band channels for uplink power control ("ULPC"), antenna tracking, and ranging. The coverage patterns of the ULPC 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 this beam are not required to be provided and the associated GXT file has not been included in Schedule S. The Intelsat 35e ULPC frequencies and subsystem performance are summarized in Exhibit 4.

#### **2.5 Cross-polarization Isolation**

The level of cross-polarization isolation of all Intelsat 35e beams is equal to or greater than 22 dB. This level was the best that the satellite manufacturer could achieve without causing excessive degradation in the performance of the beam and/or in the size of the beams' coverage area. Intelsat has taken this level of isolation into account in its planned operations.

#### **2.6 Satellite Station-Keeping**

The spacecraft will be maintained within 0.05° of its nominal longitudinal position in the east-west direction. Accordingly, it will be 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 35e 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 35e 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”) limits for space stations operating in the 3650 – 4200 MHz, 10950 – 11200 MHz, and 11450 -11700 MHz bands are specified in Section 25.208 of the Commission’s rules. The power flux density (“PFD”) limits for space stations operating in the 3625 – 3650 MHz are specified in No. 21.16 of the ITU Radio Regulations.

The maximum PFD levels for the Intelsat 35e transmissions were calculated for the 3625 – 4200 MHz, 10950 – 11200 MHz, and 11450 -11700 MHz bands. The results are provided in Schedule S and show that the downlink power flux density levels of the Intelsat 35e carriers do not exceed the limits specified in Sections 25.208 of the Commission’s rules or the limits specified in No. 21.16 of the ITU Radio Regulations.

#### **5 Emission Compliance**

Section 25.202(e) of the Commission’s rules requires that the carrier frequency of each space station transmitter be maintained within 0.002% of the reference frequency. Intelsat 35e 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 35e emissions.

#### **6 Orbital Location**

Intelsat requests that it be assigned the 34.5° W.L. orbital location for Intelsat 35e. The 34.5° W.L. location satisfies Intelsat 35e 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 Coordination with Co-frequency Space Stations**

The impact of the Intelsat 35e emissions on adjacent satellites located at 32.5°W.L. and 36.5° W.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 35e at the 30.5° W.L. and 38.5° W.L. orbital locations.

For the satellite located at 32.5° W.L., it was assumed that the adjacent satellites were Intelsat 35e, located at 34.5° W.L., and a hypothetical satellite having the same operating characteristics as Intelsat 35e located at 30.5° W.L.<sup>1</sup> For the satellite located at 36.5° W.L., it was assumed that the adjacent satellites were Intelsat 35e, located at 34.5° W.L., and a hypothetical satellite having the same operating characteristics as Intelsat 35e located at 38.5° W.L.<sup>2</sup>

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) 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 is not considered, given that rain (attenuation) effects are insignificant at C-band.
- d) At Ku-band frequencies rain attenuation predictions are derived using Recommendation ITU-R P.618.
- e) At Ku-band frequencies, increase in noise temperature of the receiving earth station due to rain is taken into account.
- f) For the cases where the transponder operates in a multi-carrier mode, the effects due to intermodulation interference are taken into account.

All assumptions and the results of the analysis are documented in Exhibits 6 and 7. The Intelsat 35e transmissions will comply with the levels contained in Sections 25.212(c) and (d) and Section 25.138 of the Commission's rules, as applicable, unless higher levels are coordinated with affected adjacent satellite operators within  $\pm 6^\circ$ .

## **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**

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<sup>1</sup> At the time of submission of this application, there are no satellites located at 30.5°W.L. The use of satellites at other locations the interference analysis would be inconsistent with a two-degree orbital separation environment and policy.

<sup>2</sup> At the time of submission of this application, there are no satellites located at 38.5°W.L. The use of satellites at other locations the interference analysis would be inconsistent with a two-degree orbital separation environment and policy.

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. At the completion of the mission and upon disposal of the spacecraft, Intelsat will ensure the removal of all stored energy on the spacecraft by depleting all propellant tanks, venting all pressurized systems and by leaving the batteries in a permanent discharge state.

## **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. With the exception of Intelsat 903 during the transition of traffic, Intelsat 35e 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 drift of Intelsat 35e, Intelsat will take all the necessary steps to coordinate the move with other operators to minimize the risk of collision or interference between Intelsat 35e and any other satellite. 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 35e. Intelsat is also not aware of any system with an overlapping station-keeping volume with Intelsat 35e 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 intends to dispose of the spacecraft by moving it to an altitude of 300 kilometers above the geostationary arc. Intelsat has reserved 3.3 kilograms of hydrazine for this purpose. The reserved fuel figure was determined by the spacecraft manufacturer and provided for in the propellant budget. This figure was calculated taking into account the expected mass of the satellite at the end of life and the required delta-velocity to achieve the desired orbit. The fuel gauging uncertainty has been taken into account in these calculations.

In calculating the disposal orbit, Intelsat has used simplifying assumptions as permitted under the Commission's Orbital Debris Report and Order.<sup>3</sup> For reference, the effective area to mass ratio ( $C_r \cdot A/M$ ) of the Intelsat 35e spacecraft is 0.032 m<sup>2</sup>/kg, resulting in a minimum perigee disposal altitude under the Inter-Agency Space Debris Coordination Committee formula of at most 271.8 kilometers above the geostationary arc. Accordingly, the Intelsat 35e planned disposal orbit complies with the FCC's rules.

## **9 ITU Filing**

Intelsat 35e's operations in all bands have been coordinated under Administration of the United States International Telecommunication Union ("ITU") filings. Therefore, no new ITU filings are required.

## **10 TC&R Control Earth Stations**

Intelsat will conduct TC&R operations through one or more of the following earth stations: Castle Rock, Colorado and Fillmore, California. Additionally, Intelsat is capable of remotely controlling Intelsat 35e from its facilities in McLean, VA.

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<sup>3</sup> *Mitigation of Orbital Debris*, Second Report and Order, IB Docket No. 02-54, FCC 04-130 (rel. June 21, 2004).

# Certification Statement

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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

April 8, 2016

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Candice DeVane

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Date

Intelsat

Manager, Spectrum Policy



**EXHIBIT 1**  
**Coordinates of C-Band Spot Beams Maximum Gain Points**

| <b>Beam Designation</b> | <b>Latitude (°N)</b> | <b>Longitude (°E)</b> |
|-------------------------|----------------------|-----------------------|
| C1                      | 47.4                 | 1.3                   |
| C2                      | 11.5                 | -9.3                  |
| C3                      | 11.9                 | 8.6                   |
| C4                      | 0.6                  | 2.2                   |
| C5                      | -0.5                 | 19.5                  |
| C6                      | -13.0                | 17.2                  |
| C7                      | -26.0                | 17.4                  |
| C8                      | 41.3                 | -79.1                 |
| C9                      | 21.8                 | -77.1                 |
| C10                     | 3.3                  | -77.6                 |
| C11                     | 7.8                  | -62.9                 |
| C12                     | -8.7                 | -70.0                 |
| C13                     | -18.0                | -60.2                 |
| C14                     | -23.0                | -47.3                 |
| C15                     | -3.4                 | -52.0                 |
| C16                     | -9.8                 | -40.4                 |
| C17                     | 59.5                 | -40.6                 |

## EXHIBIT 2

### COMMUNICATION SUBSYSTEM UPLINK BEAM PARAMETERS

| Beam Name                           | C-band Spot | C-band Spot | C-band Global | C-band Global |
|-------------------------------------|-------------|-------------|---------------|---------------|
| Schedule S Beam ID                  | CSLU        | CSRU        | CGLU          | CGRU          |
| Frequency Band (MHz)                | 5850-6340   | 5850-6340   | -6330-6425    | 6330-6425     |
| Polarization                        | LHCP        | RHCP        | LHCP          | RHCP          |
| Beam Peak G/T (dB/K)                | 11.0        | 11.0        | -5.1          | -5.1          |
| Minimum SFD-- (dBW/m <sup>2</sup> ) | -108.0      | -108.0      | -102.9        | -102.9        |
| Maximum SFD-- (dBW/m <sup>2</sup> ) | -83.0       | -83.0       | -77.9         | -77.9         |

| Beam Name                           | Ku-band Caribbean | Ku-band Caribbean | Ku-band Europe/Med | Ku-band Europe/Med | Ku-band Africa/EU |
|-------------------------------------|-------------------|-------------------|--------------------|--------------------|-------------------|
| Schedule S Beam ID                  | KCHU              | KCVU              | KMHU               | KMVU               | KAHU              |
| Frequency Band (MHz)                | 14000 - 14500     | 14000 - 14500     | 13750 - 14500      | 13750 - 14500      | 14000 - 14500     |
| Polarization                        | Horizontal        | Vertical          | Horizontal         | Vertical           | Horizontal        |
| Beam Peak G/T (dB/K)                | 10.4              | 10.4              | 10.8               | 10.8               | 5.7               |
| Minimum SFD-- (dBW/m <sup>2</sup> ) | -110.4            | -110.4            | -110.8             | -110.8             | -106.7            |
| Maximum SFD-- (dBW/m <sup>2</sup> ) | -82.4             | -82.4             | -82.8              | -82.8              | -78.7             |

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

### EXHIBIT 3

#### COMMUNICATION SUBSYSTEM DOWNLINK BEAM PARAMETERS

| Beam Name                                 | C-band Spot | C-band Spot | C C-band Spot | C-band Spot |
|---|-------------|-------------|---------------|-------------|
| Schedule S Beam ID                        | CSLD        | CSRD        | CGLD          | CGRD        |
| Frequency Band (MHz)                      | 3625-4115   | 3625-4115   | 4105-4200     | 4105-4200   |
| Polarization                              | LHCP        | RHCP        | LHCP          | RHCP        |
| Maximum Beam Peak EIRP (dBW)              | 51.0        | 51.0        | 37.3          | 37.3        |
| Maximum Beam Peak EIRP Density (dBW/4kHz) | 8.7         | 8.7         | 2.8           | 2.8         |

| Beam Name                                 | Ku-band Caribbean             | Ku-band Caribbean             | Ku-band Europe/Med            | Ku-band Europe/Med            | Ku-band Africa/EU             |
|---|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|
| Schedule S Beam ID                        | KCHD                          | KCVD                          | KMHD                          | KMVD                          | KAVD                          |
| Frequency Band (MHz)                      | 10950 – 11200 & 11450 - 11700 | 10950 – 11200 & 11450 - 11700 | 10950 – 11200 & 11450 - 11700 | 10950 – 11200 & 11450 - 11700 | 10950 – 11200 & 11450 - 11700 |
| Polarization                              | Horizontal                    | Vertical                      | Horizontal                    | Vertical                      | Vertical                      |
| Maximum Beam Peak EIRP (dBW)              | 53.7                          | 56.0                          | 55.3                          | 55.7                          | 49.5                          |
| Maximum Beam Peak EIRP Density (dBW/4kHz) | 12.4                          | 14.7                          | 14.0                          | 14.4                          | 8.2                           |

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

## EXHIBIT 4

### TC&R SUBSYSTEM CHARACTERISTICS

| Beam Name          | Command Global Horn | Command Hemi | Command Pipe |
|--------------------|---------------------|--------------|--------------|
| Schedule S Beam ID | CGVU                | CHLU         | CPLU         |
| Frequencies (MHz)  | 6424.5              | 6424.5       | 5853.0       |
| Polarization       | Vertical            | LHCP         | LHCP         |

| Beam Name                  | Telemetry Global Horn              | Telemetry Hemi | Telemetry Pipe | ULPC     | ULPC                |
|----------------------------|------------------------------------|----------------|----------------|----------|---------------------|
| Schedule S Beam ID         | TGHD                               | THLD           | TPLD           | CLVD     | KLRD                |
| Frequencies (MHz)          | 4197.75, 4198.75, 4198.25, 4199.25 |                |                | 4199.75  | 11198.0&<br>11451.5 |
| Polarization               | Horizontal                         | LHCP           | LHCP           | Vertical | RHCP                |
| Maximum Channel EIRP (dBW) | 10.1                               | 11.5           | 15.4           | 13.0     | 15.6                |

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

## EXHIBIT 5

### Beam Polarizations and GXT File Names

| Schedule S Beam Names |                     |                    |                      |                      |                       |                  |                    |                    |
|-----------------------|---------------------|--------------------|----------------------|----------------------|-----------------------|------------------|--------------------|--------------------|
| Beam Designation      | Linear Polarization |                    |                      |                      | Circular Polarization |                  |                    |                    |
|                       | Uplink<br>(H-Pol.)  | Uplink<br>(V-Pol.) | Downlink<br>(H-Pol.) | Downlink<br>(V-Pol.) | Uplink<br>(LHCP)      | Uplink<br>(RHCP) | Downlink<br>(LHCP) | Downlink<br>(RHCP) |
| <b>C-Band Beams</b>   |                     |                    |                      |                      |                       |                  |                    |                    |
| Spot Beams            | ----                |                    |                      | ----                 | CSLU                  | CSRU             | CSLD               | CSRD               |
| Global Beam           | ----                | ----               | ----                 | ----                 | CGLU                  | CGRU             | CGLD               | CGRD               |
| C-band ULPC           | ----                | ----               | ----                 | CLVD*                | ----                  | ----             | ----               | ----               |
| Telemetry Global      | ----                | ----               | TGHD*                | ----                 | ----                  | ----             | ----               | ----               |
| Command Global        | ----                | CGVU*              | ----                 | ----                 | ----                  | ----             | ----               | ----               |
| Telemetry Pipe        | ----                | ----               | ----                 | ----                 | ----                  | ----             | TPLD*              | ----               |
| Telemetry Hemi        | ----                | ----               | ----                 | ----                 | ----                  | ----             | THLD*              | ----               |
| Command Pipe          | ----                | ----               | ----                 | ----                 | CPLU*                 | ----             | ----               | ----               |
| Command Hemi          | ----                | ----               | ----                 | ----                 | CHLU*                 | ----             | ----               | ----               |
| <b>Ku-Band Beams</b>  |                     |                    |                      |                      |                       |                  |                    |                    |
| Caribbean Beam        | KCHU                | KCVU               | KCHD                 | KCVD                 | ----                  | ----             | ----               | ----               |
| Europe/Mediterranean  | KMHU                | KMVU               | KMHD                 | KMVD                 | ----                  | ----             | ----               | ----               |
| Africa/EU Beam        | KAHU                | ----               | ----                 | KAVD                 | ----                  | ----             | ----               | ----               |
| Ku-band ULPC          | ----                | ----               | ----                 | ----                 | ----                  | ----             | ----               | KLRD*              |

*\* GXT files are not provided for the indicated beams because their -8 dB gain contours extend beyond the edge of the Earth.*

## EXHIBIT 6

### HYPOTHETICAL 32.5°W SATELLITE INTERFERENCE ANALYSIS

| <b>UPLINK BEAM INFORMATION</b>              |                        |             |             |             |
|---|------------------------|-------------|-------------|-------------|
| Uplink Beam Name                            | CSLU / CSRU            | CSLU / CSRU | CSLU / CSRU | CSLU / CSRU |
| Uplink Frequency (MHz)                      | 5850-6340              | 5850-6340   | 5850-6340   | 5850-6340   |
| Uplink Beam Polarization                    | LHCP / RHCP            | LHCP / RHCP | LHCP / RHCP | LHCP / RHCP |
| Uplink Beam Peak G/T (dB/K)                 | 11.0                   | 11.0        | 11.0        | 11.0        |
| Uplink Beam Peak SFD (dBW/m2)               | -83.0                  | -83.0       | -83.0       | -83.0       |
| Uplink Relative Contour Level (dB)          | -6.7                   | -6.7        | -6.7        | -6.7        |
| <b>DOWNLINK BEAM INFORMATION</b>            |                        |             |             |             |
| Downlink Beam Name                          | CSRD / CSLD            | CSRD / CSLD | CSRD / CSLD | CSRD / CSLD |
| Downlink Frequency (MHz)                    | 3625-4115              | 3625-4115   | 3625-4115   | 3625-4115   |
| Downlink Beam Polarization                  | RHCP / LHCP            | RHCP / LHCP | RHCP / LHCP | RHCP / LHCP |
| Downlink Beam Peak EIRP (dBW)               | 51.0                   | 51.0        | 51.0        | 51.0        |
| Downlink Relative Contour Level (dB)        | -6.4                   | -6.4        | -6.4        | -6.4        |
| <b>ADJACENT SATELLITE 1</b>                 |                        |             |             |             |
| Satellite Name                              | Intelsat 35e           |             |             |             |
| Orbital Location                            | 34.5 W.L.              | 34.5 W.L.   | 34.5 W.L.   | 34.5 W.L.   |
| Uplink Power Density (dBW/Hz)               | -38.7                  | -38.7       | -38.7       | -38.7       |
| Beam Peak Downlink EIRP Density (dBW/Hz)    | -33.0                  | -33.0       | -33.0       | -33.0       |
| <b>ADJACENT SATELLITE 2</b>                 |                        |             |             |             |
| Satellite Name                              | Hypothetical 30.5 W.L. |             |             |             |
| Orbital Location                            | 30.5 W.L.              | 30.5 W.L.   | 30.5 W.L.   | 30.5 W.L.   |
| Uplink Power Density (dBW/Hz)               | -38.7                  | -38.7       | -38.7       | -38.7       |
| Beam Peak Downlink EIRP Density (dBW/Hz)    | -33.0                  | -33.0       | -33.0       | -33.0       |
| <b>CARRIER INFORMATION</b>                  |                        |             |             |             |
| Carrier ID                                  | 36M0G7W                | 9M00G7W     | 1M43G7W     | 820KG7W     |
| Carrier Modulation                          | QPSK                   | QPSK        | QPSK        | QPSK        |
| Information Rate(kbps)                      | 36860                  | 8448        | 1024        | 256         |
| Code Rate                                   | 3/4x188/204            | 3/4         | 1/2         | 1/2         |
| Occupied Bandwidth(kHz)                     | 26664.7                | 7500        | 1024        | 630.7       |
| Allocated Bandwidth(kHz)                    | 36000                  | 9000        | 1434        | 820         |
| Minimum C/N, Rain (dB)                      | 7.3                    | 4.3         | 3.3         | 1.3         |
| <b>UPLINK EARTH STATION</b>                 |                        |             |             |             |
| Earth Station Diameter (meters)             | 7.5                    | 2.4         | 1.8         | 1.8         |
| Earth Station Gain (dBi)                    | 51.2                   | 41.4        | 38.9        | 38.9        |
| <b>DOWNLINK EARTH STATION</b>               |                        |             |             |             |
| Earth Station Diameter (meters)             | 5.0                    | 3.7         | 3.7         | 3.7         |
| Earth Station Gain (dBi)                    | 44.6                   | 41.9        | 41.9        | 41.9        |
| Earth Station G/T (dB/K)                    | 22.7                   | 22.7        | 22.7        | 22.7        |
| <b>COMPOSITE LINK PERFORMANCE</b>           |                        |             |             |             |
| C/N Thermal Uplink (dB)                     | 29.7                   | 27.4        | 28.0        | 27.7        |
| Uplink Interference C/I (dB)                | 39.0                   | 34.7        | 35.6        | 39.0        |
| Uplink Adjacent Satellite C/I (dB)          | 13.7                   | 9.4         | 10.0        | 9.7         |
| Intermodulation C/IM (dB)                   | ---                    | 20.5        | 22.1        | 22.5        |
| Downlink Thermal C/N (dB)                   | 15.6                   | 15.1        | 16.0        | 15.7        |
| Downlink Interference C/I (dB)              | 24.5                   | 24.2        | 24.8        | 24.9        |
| Downlink Adjacent Satellite C/I (dB)        | 13.2                   | 9.8         | 10.5        | 10.2        |
| Subtotal C/N (dB)                           | 9.1                    | 5.8         | 6.5         | 6.2         |
| Antenna Mispointing and Other Losses (dB)   | 1.5                    | 0.3         | 0.3         | 0.3         |
| Total C/N (dB)                              | 7.6                    | 5.5         | 6.2         | 5.9         |
| Minimum Required C/N (dB)                   | 7.3                    | 4.3         | 3.3         | 1.3         |
| <b>CARRIER DENSITY LEVELS</b>               |                        |             |             |             |
| Uplink Power Density (dBW/Hz)               | -53.0                  | -57.4       | -55.0       | -56.4       |
| Downlink EIRP Density At Beam Peak (dBW/Hz) | -28.3                  | -26.2       | -28.1       | -29.5       |

| <b>UPLINK BEAM INFORMATION</b>              |                        |             |             |             |
|---|------------------------|-------------|-------------|-------------|
| Uplink Beam Name                            | CGLU/CGRU              | CGLU/CGRU   | CGLU/CGRU   | CGLU/CGRU   |
| Uplink Frequency (MHz)                      | 6339 - 6415            | 6339 - 6415 | 6339 - 6415 | 6339 - 6415 |
| Uplink Beam Polarization                    | LHCP / RHCP            | LHCP / RHCP | LHCP / RHCP | LHCP / RHCP |
| Uplink Beam Peak G/T (dB/K)                 | -5.1                   | -5.1        | -5.1        | -5.1        |
| Uplink Beam Peak SFD (dBW/m2)               | -77.9                  | -77.9       | -77.9       | -77.9       |
| Uplink Relative Contour Level (dB)          | -6.7                   | -6.7        | -6.7        | -6.7        |
| <b>DOWNLINK BEAM INFORMATION</b>            |                        |             |             |             |
| Downlink Beam Name                          | CGRD/CGLD              | CGRD/CGLD   | CGRD/CGLD   | CGRD/CGLD   |
| Downlink Frequency (MHz)                    | 4114 - 4190            | 4114 - 4190 | 4114 - 4190 | 4114 - 4190 |
| Downlink Beam Polarization                  | RHCP / LHCP            | RHCP / LHCP | RHCP / LHCP | RHCP / LHCP |
| Downlink Beam Peak EIRP (dBW)               | 37.3                   | 37.3        | 37.3        | 37.3        |
| Downlink Relative Contour Level (dB)        | -6.4                   | -6.4        | -6.4        | -6.4        |
| <b>ADJACENT SATELLITE 1</b>                 |                        |             |             |             |
| Satellite Name                              | Intelsat 35e           |             |             |             |
| Orbital Location                            | 34.5 W.L.              | 34.5 W.L.   | 34.5 W.L.   | 34.5 W.L.   |
| Uplink Power Density (dBW/Hz)               | -38.7                  | -38.7       | -38.7       | -38.7       |
| Beam Peak Downlink EIRP Density (dBW/Hz)    | -33.0                  | -33.0       | -33.0       | -33.0       |
| <b>ADJACENT SATELLITE 2</b>                 |                        |             |             |             |
| Satellite Name                              | Hypothetical 30.5 W.L. |             |             |             |
| Orbital Location                            | 30.5 W.L.              | 30.5 W.L.   | 30.5 W.L.   | 30.5 W.L.   |
| Uplink Power Density (dBW/Hz)               | -38.7                  | -38.7       | -38.7       | -38.7       |
| Beam Peak Downlink EIRP Density (dBW/Hz)    | -33.0                  | -33.0       | -33.0       | -33.0       |
| <b>CARRIER INFORMATION</b>                  |                        |             |             |             |
| Carrier ID                                  | 36M0G7W                | 9M00G7W     | 1M43G7W     | 820KG7W     |
| Carrier Modulation                          | QPSK                   | QPSK        | QPSK        | QPSK        |
| Information Rate(kbps)                      | 36860                  | 8448        | 1024        | 256         |
| Code Rate                                   | 3/4x188/204            | 3/4         | 1/2         | 1/2         |
| Occupied Bandwidth(kHz)                     | 26664.7                | 7500        | 1024        | 630.7       |
| Allocated Bandwidth(kHz)                    | 36000                  | 9000        | 1434        | 820         |
| Minimum C/N, Rain (dB)                      | 7.3                    | 4.3         | 3.3         | 1.3         |
| <b>UPLINK EARTH STATION</b>                 |                        |             |             |             |
| Earth Station Diameter (meters)             | 7.5                    | 3.7         | 1.8         | 1.8         |
| Earth Station Gain (dBi)                    | 51.2                   | 45.1        | 38.9        | 38.9        |
| <b>DOWNLINK EARTH STATION</b>               |                        |             |             |             |
| Earth Station Diameter (meters)             | 7.5                    | 7.5         | 5.5         | 5.0         |
| Earth Station Gain (dBi)                    | 48.1                   | 48.1        | 45.4        | 44.6        |
| Earth Station G/T (dB/K)                    | 29.0                   | 29.0        | 27.0        | 22.7        |
| <b>COMPOSITE LINK PERFORMANCE</b>           |                        |             |             |             |
| C/N Thermal Uplink (dB)                     | 17.5                   | 16.3        | 17.2        | 16.9        |
| Uplink Interference C/I (dB)                | 28.6                   | 25.9        | 27.7        | 32.4        |
| Uplink Adjacent Satellite C/I (dB)          | 15.0                   | 13.9        | 14.7        | 14.4        |
| Intermodulation C/I (dB)                    | ---                    | 23.9        | 26.7        | 26.5        |
| Downlink Thermal C/N (dB)                   | 17.1                   | 13.2        | 11.9        | 7.3         |
| Downlink Interference C/I (dB)              | 33.4                   | 23.4        | 24.7        | 21.9        |
| Downlink Adjacent Satellite C/I (dB)        | 13.3                   | 9.2         | 7.1         | 5.9         |
| Subtotal C/N (dB)                           | 9.3                    | 6.1         | 5.0         | 2.9         |
| Antenna Mispointing and Other Losses (dB)   | 1.5                    | 0.3         | 0.3         | 0.3         |
| Total C/N (dB)                              | 7.8                    | 5.8         | 4.7         | 2.6         |
| Minimum Required C/N (dB)                   | 7.3                    | 4.3         | 3.3         | 1.3         |
| <b>CARRIER DENSITY LEVELS</b>               |                        |             |             |             |
| Uplink Power Density (dBW/Hz)               | -53.0                  | -57.4       | -55.0       | -56.4       |
| Downlink EIRP Density At Beam Peak (dBW/Hz) | -28.3                  | -26.2       | -28.1       | -29.5       |

| <b>UPLINK BEAM INFORMATION</b>              |                                  |                                  |                                  |                                  |
|---|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| Uplink Beam Name                            | KCHU / KCVU<br>KMHU / KMVU       | KCHU / KCVU<br>KMHU / KMVU       | KCHU / KCVU<br>KMHU / KMVU       | KCHU / KCVU<br>KMHU / KMVU       |
| Uplink Frequency (MHz)                      | 13750 14500                      | 13750 14500                      | 13750 14500                      | 13750 14500                      |
| Uplink Beam Polarization                    | Linear H/V                       | Linear H/V                       | Linear H/V                       | Linear H/V                       |
| Uplink Beam Peak G/T (dB/K)                 | 10.4                             | 10.4                             | 10.4                             | 10.4                             |
| Uplink Beam Peak SFD (dBW/m2)               | -82.4                            | -82.4                            | -82.4                            | -82.4                            |
| Uplink Relative Contour Level (dB)          | -6.7                             | -6.7                             | -6.7                             | -6.7                             |
| <b>DOWNLINK BEAM INFORMATION</b>            |                                  |                                  |                                  |                                  |
| Downlink Beam Name                          | KCHD / KCVD<br>KMHD / KMVD       | KCHD / KCVD<br>KMHD / KMVD       | KCHD / KCVD<br>KMHD / KMVD       | KCHD / KCVD<br>KMHD / KMVD       |
| Downlink Frequency (MHz)                    | 10950 – 11200 &<br>11450 - 11700 | 10950 – 11200 &<br>11450 - 11700 | 10950 – 11200 &<br>11450 - 11700 | 10950 – 11200 &<br>11450 - 11700 |
| Downlink Beam Polarization                  | Linear V/H                       | Linear V/H                       | Linear V/H                       | Linear V/H                       |
| Downlink Beam Peak EIRP (dBW)               | 55.7                             | 55.7                             | 55.7                             | 55.7                             |
| Downlink Relative Contour Level (dB)        | -6.4                             | -6.4                             | -6.4                             | -6.4                             |
| <b>ADJACENT SATELLITE 1</b>                 |                                  |                                  |                                  |                                  |
| Satellite Name                              | Intelsat 35e                     |                                  |                                  |                                  |
| Orbital Location                            | 34.5 W.L.                        | 34.5 W.L.                        | 34.5 W.L.                        | 34.5 W.L.                        |
| Uplink Power Density (dBW/Hz)               | -50.0                            | -50.0                            | -50.0                            | -50.0                            |
| Beam Peak Downlink EIRP Density (dBW/Hz)    | -22.0                            | -22.0                            | -22.0                            | -22.0                            |
| <b>ADJACENT SATELLITE 2</b>                 |                                  |                                  |                                  |                                  |
| Satellite Name                              | Hypothetical 30.5 W.L.           |                                  |                                  |                                  |
| Orbital Location                            | 30.5 W.L.                        | 30.5 W.L.                        | 30.5 W.L.                        | 30.5 W.L.                        |
| Uplink Power Density (dBW/Hz)               | -50                              | -50                              | -50.0                            | -50.0                            |
| Beam Peak Downlink EIRP Density (dBW/Hz)    | -26.0                            | -26.0                            | -26.0                            | -26.0                            |
| <b>CARRIER INFORMATION</b>                  |                                  |                                  |                                  |                                  |
| Carrier ID                                  | 36M0G7W                          | 8M25G7W                          | 1M73G7W                          | 382KG7W                          |
| Carrier Modulation                          | QPSK                             | QPSK                             | QPSK                             | QPSK                             |
| Information Rate(kbps)                      | 36860                            | 8448                             | 1024                             | 256                              |
| Code Rate                                   | 3/4x188/204                      | 3/4                              | 1/2                              | 1/2                              |
| Occupied Bandwidth(kHz)                     | 26664.7                          | 6111.3                           | 1284                             | 273                              |
| Allocated Bandwidth(kHz)                    | 36000                            | 8250.5                           | 1733                             | 382                              |
| Minimum C/N, Rain (dB)                      | 7.3                              | 7.3                              | 1.8                              | 1.2                              |
| <b>UPLINK EARTH STATION</b>                 |                                  |                                  |                                  |                                  |
| Earth Station Diameter (meters)             | 6.5                              | 2.4                              | 1.8                              | 1.8                              |
| Earth Station Gain (dBi)                    | 57.4                             | 48.7                             | 46.2                             | 46.2                             |
| <b>DOWNLINK EARTH STATION</b>               |                                  |                                  |                                  |                                  |
| Earth Station Diameter (meters)             | 6.5                              | 6.5                              | 2.4                              | 1.8                              |
| Earth Station Gain (dBi)                    | 55.6                             | 55.6                             | 47.0                             | 44.5                             |
| Earth Station G/T (dB/K)                    | 34.0                             | 34.0                             | 25.0                             | 23.3                             |
| <b>COMPOSITE LINK PERFORMANCE</b>           |                                  |                                  |                                  |                                  |
| C/N Thermal Uplink (dB)                     | 19.9                             | 19.9                             | 19.1                             | 19.7                             |
| Uplink Interference C/I (dB)                | 28.1                             | 27.6                             | 26.9                             | 32.6                             |
| Uplink Adjacent Satellite C/I (dB)          | 14.0                             | 13.9                             | 13.2                             | 13.7                             |
| Intermodulation C/IM (dB)                   | ---                              | 43.0                             | 42.3                             | 44.3                             |
| Downlink Thermal C/N (dB)                   | 23.8                             | 22.9                             | 13.2                             | 12.0                             |
| Downlink Interference C/I (dB)              | 28.4                             | 24.8                             | 23.3                             | 24.0                             |
| Downlink Adjacent Satellite C/I (dB)        | 17.3                             | 17.2                             | 7.7                              | 5.6                              |
| Subtotal C/N (dB)                           | 11.2                             | 11.0                             | 5.5                              | 4.0                              |
| Antenna Mispointing and Other Losses (dB)   | 1.5                              | 0.3                              | 0.3                              | 0.3                              |
| Total C/N (dB)                              | 9.7                              | 10.7                             | 5.2                              | 3.7                              |
| Minimum Required C/N (dB)                   | 7.3                              | 7.3                              | 1.8                              | 1.2                              |
| <b>CARRIER DENSITY LEVELS</b>               |                                  |                                  |                                  |                                  |
| Uplink Power Density (dBW/Hz)               | -53.0                            | -57.4                            | -55.0                            | -56.4                            |
| Downlink EIRP Density At Beam Peak (dBW/Hz) | -28.3                            | -26.2                            | -28.1                            | -29.5                            |



| <b>UPLINK BEAM INFORMATION</b>              |                               |                               |                               |                               |
|---|-------------------------------|-------------------------------|-------------------------------|-------------------------------|
| Uplink Beam Name                            | KAHU                          | KAHU                          | KAHU                          | KAHU                          |
| Uplink Frequency (MHz)                      | 13750 14500                   | 13750 14500                   | 13750 14500                   | 13750 14500                   |
| Uplink Beam Polarization                    | Horizontal                    | Horizontal                    | Horizontal                    | Horizontal                    |
| Uplink Beam Peak G/T (dB/K)                 | 5.7                           | 5.7                           | 5.7                           | 5.7                           |
| Uplink Beam Peak SFD (dBW/m2)               | -78.7                         | -78.7                         | -78.7                         | -78.7                         |
| Uplink Relative Contour Level (dB)          | -6.7                          | -6.7                          | -6.7                          | -6.7                          |
| <b>DOWNLINK BEAM INFORMATION</b>            |                               |                               |                               |                               |
| Downlink Beam Name                          | KAVD                          | KAVD                          | KAVD                          | KAVD                          |
| Downlink Frequency (MHz)                    | 10950 – 11200 & 11450 - 11700 | 10950 – 11200 & 11450 - 11700 | 10950 – 11200 & 11450 - 11700 | 10950 – 11200 & 11450 - 11700 |
| Downlink Beam Polarization                  | Vertical                      | Vertical                      | Vertical                      | Vertical                      |
| Downlink Beam Peak EIRP (dBW)               | 49.5                          | 49.5                          | 49.5                          | 49.5                          |
| Downlink Relative Contour Level (dB)        | -6.4                          | -6.4                          | -6.4                          | -6.4                          |
| <b>ADJACENT SATELLITE 1</b>                 |                               |                               |                               |                               |
| Satellite Name                              | Intelsat 35e                  |                               |                               |                               |
| Orbital Location                            | 34.5 W.L.                     | 34.5 W.L.                     | 34.5 W.L.                     | 34.5 W.L.                     |
| Uplink Power Density (dBW/Hz)               | -50.0                         | -50.0                         | -50.0                         | -50.0                         |
| Beam Peak Downlink EIRP Density (dBW/Hz)    | -22.0                         | -22.0                         | -22.0                         | -22.0                         |
| <b>ADJACENT SATELLITE 2</b>                 |                               |                               |                               |                               |
| Satellite Name                              | Hypothetical 30.5 W.L.        |                               |                               |                               |
| Orbital Location                            | 30.5 W.L.                     | 30.5 W.L.                     | 30.5 W.L.                     | 30.5 W.L.                     |
| Uplink Power Density (dBW/Hz)               | -50                           | -50                           | -50.0                         | -50.0                         |
| Beam Peak Downlink EIRP Density (dBW/Hz)    | -26.0                         | -26.0                         | -26.0                         | -26.0                         |
| <b>CARRIER INFORMATION</b>                  |                               |                               |                               |                               |
| Carrier ID                                  | 36M0G7W                       | 8M25G7W                       | 1M73G7W                       | 382KG7W                       |
| Carrier Modulation                          | QPSK                          | QPSK                          | QPSK                          | QPSK                          |
| Information Rate(kbps)                      | 36860                         | 8448                          | 1024                          | 256                           |
| Code Rate                                   | 3/4x188/204                   | 3/4                           | 1/2                           | 1/2                           |
| Occupied Bandwidth(kHz)                     | 26664.7                       | 6111.3                        | 1284                          | 273                           |
| Allocated Bandwidth(kHz)                    | 36000                         | 8250.5                        | 1733                          | 382                           |
| Minimum C/N, Rain (dB)                      | 7.3                           | 7.3                           | 1.8                           | 1.2                           |
| <b>UPLINK EARTH STATION</b>                 |                               |                               |                               |                               |
| Earth Station Diameter (meters)             | 6.5                           | 2.4                           | 1.8                           | 1.8                           |
| Earth Station Gain (dBi)                    | 57.4                          | 48.7                          | 46.2                          | 46.2                          |
| <b>DOWNLINK EARTH STATION</b>               |                               |                               |                               |                               |
| Earth Station Diameter (meters)             | 6.5                           | 6.5                           | 2.4                           | 1.8                           |
| Earth Station Gain (dBi)                    | 55.6                          | 55.6                          | 47.0                          | 44.5                          |
| Earth Station G/T (dB/K)                    | 34.0                          | 34.0                          | 25.0                          | 23.3                          |
| <b>COMPOSITE LINK PERFORMANCE</b>           |                               |                               |                               |                               |
| C/N Thermal Uplink (dB)                     | 15.2                          | 15.2                          | 14.4                          | 15.0                          |
| Uplink Interference C/I (dB)                | 28.1                          | 27.6                          | 26.9                          | 32.6                          |
| Uplink Adjacent Satellite C/I (dB)          | 14.0                          | 13.9                          | 13.2                          | 13.7                          |
| Intermodulation C/IM (dB)                   | ---                           | 43.0                          | 42.3                          | 44.3                          |
| Downlink Thermal C/N (dB)                   | 23.8                          | 22.9                          | 13.2                          | 12.0                          |
| Downlink Interference C/I (dB)              | 28.4                          | 24.8                          | 23.3                          | 24.0                          |
| Downlink Adjacent Satellite C/I (dB)        | 17.3                          | 17.2                          | 7.7                           | 5.6                           |
| Subtotal C/N (dB)                           | 10.2                          | 10.0                          | 5.1                           | 3.8                           |
| Antenna Mispointing and Other Losses (dB)   | 1.5                           | 0.3                           | 0.3                           | 0.3                           |
| Total C/N (dB)                              | 8.7                           | 9.7                           | 4.8                           | 3.5                           |
| Minimum Required C/N (dB)                   | 7.3                           | 7.3                           | 1.8                           | 1.2                           |
| <b>CARRIER DENSITY LEVELS</b>               |                               |                               |                               |                               |
| Uplink Power Density (dBW/Hz)               | -53.0                         | -57.4                         | -55.0                         | -56.4                         |
| Downlink EIRP Density At Beam Peak (dBW/Hz) | -28.3                         | -26.2                         | -28.1                         | -29.5                         |

## EXHIBIT 7

### HYPOTHETICAL 36.5°W SATELLITE INTERFERENCE ANALYSIS

| <b>UPLINK BEAM INFORMATION</b>              |                        |             |             |             |
|---|------------------------|-------------|-------------|-------------|
| Uplink Beam Name                            | CSLU / CSRU            | CSLU / CSRU | CSLU / CSRU | CSLU / CSRU |
| Uplink Frequency (MHz)                      | 5850-6340              | 5850-6340   | 5850-6340   | 5850-6340   |
| Uplink Beam Polarization                    | LHCP / RHCP            | LHCP / RHCP | LHCP / RHCP | LHCP / RHCP |
| Uplink Beam Peak G/T (dB/K)                 | 11.0                   | 11.0        | 11.0        | 11.0        |
| Uplink Beam Peak SFD (dBW/m2)               | -83.0                  | -83.0       | -83.0       | -83.0       |
| Uplink Relative Contour Level (dB)          | -6.7                   | -6.7        | -6.7        | -6.7        |
| <b>DOWNLINK BEAM INFORMATION</b>            |                        |             |             |             |
| Downlink Beam Name                          | CSRD / CSLD            | CSRD / CSLD | CSRD / CSLD | CSRD / CSLD |
| Downlink Frequency (MHz)                    | 3625-4115              | 3625-4115   | 3625-4115   | 3625-4115   |
| Downlink Beam Polarization                  | RHCP / LHCP            | RHCP / LHCP | RHCP / LHCP | RHCP / LHCP |
| Downlink Beam Peak EIRP (dBW)               | 51.0                   | 51.0        | 51.0        | 51.0        |
| Downlink Relative Contour Level (dB)        | -6.4                   | -6.4        | -6.4        | -6.4        |
| <b>ADJACENT SATELLITE 1</b>                 |                        |             |             |             |
| Satellite Name                              | Intelsat 35e           |             |             |             |
| Orbital Location                            | 34.5 W.L.              | 34.5 W.L.   | 34.5 W.L.   | 34.5 W.L.   |
| Uplink Power Density (dBW/Hz)               | -38.7                  | -38.7       | -38.7       | -38.7       |
| Beam Peak Downlink EIRP Density (dBW/Hz)    | -33.0                  | -33.0       | -33.0       | -33.0       |
| <b>ADJACENT SATELLITE 2</b>                 |                        |             |             |             |
| Satellite Name                              | Hypothetical 38.5 W.L. |             |             |             |
| Orbital Location                            | 38.5 W.L.              | 38.5 W.L.   | 38.5 W.L.   | 38.5 W.L.   |
| Uplink Power Density (dBW/Hz)               | -38.7                  | -38.7       | -38.7       | -38.7       |
| Beam Peak Downlink EIRP Density (dBW/Hz)    | -33.0                  | -33.0       | -33.0       | -33.0       |
| <b>CARRIER INFORMATION</b>                  |                        |             |             |             |
| Carrier ID                                  | 36M0G7W                | 9M00G7W     | 1M43G7W     | 820KG7W     |
| Carrier Modulation                          | QPSK                   | QPSK        | QPSK        | QPSK        |
| Information Rate(kbps)                      | 36860                  | 8448        | 1024        | 256         |
| Code Rate                                   | 3/4x188/204            | 3/4         | 1/2         | 1/2         |
| Occupied Bandwidth(kHz)                     | 26664.7                | 7500        | 1024        | 630.7       |
| Allocated Bandwidth(kHz)                    | 36000                  | 9000        | 1434        | 820         |
| Minimum C/N, Rain (dB)                      | 7.3                    | 4.3         | 3.3         | 1.3         |
| <b>UPLINK EARTH STATION</b>                 |                        |             |             |             |
| Earth Station Diameter (meters)             | 7.5                    | 2.4         | 1.8         | 1.8         |
| Earth Station Gain (dBi)                    | 51.2                   | 41.4        | 38.9        | 38.9        |
| <b>DOWNLINK EARTH STATION</b>               |                        |             |             |             |
| Earth Station Diameter (meters)             | 5.0                    | 3.7         | 3.7         | 3.7         |
| Earth Station Gain (dBi)                    | 44.6                   | 41.9        | 41.9        | 41.9        |
| Earth Station G/T (dB/K)                    | 22.7                   | 22.7        | 22.7        | 22.7        |
| <b>COMPOSITE LINK PERFORMANCE</b>           |                        |             |             |             |
| C/N Thermal Uplink (dB)                     | 29.7                   | 27.4        | 28.0        | 27.7        |
| Uplink Interference C/I (dB)                | 39.0                   | 34.7        | 35.6        | 39.0        |
| Uplink Adjacent Satellite C/I (dB)          | 13.7                   | 9.4         | 10.0        | 9.7         |
| Intermodulation C/IM (dB)                   | ---                    | 20.5        | 22.1        | 22.5        |
| Downlink Thermal C/N (dB)                   | 15.6                   | 15.1        | 16.0        | 15.7        |
| Downlink Interference C/I (dB)              | 24.5                   | 24.2        | 24.8        | 24.9        |
| Downlink Adjacent Satellite C/I (dB)        | 13.2                   | 9.8         | 10.5        | 10.2        |
| Subtotal C/N (dB)                           | 9.1                    | 5.8         | 6.5         | 6.2         |
| Antenna Mispointing and Other Losses (dB)   | 1.5                    | 0.3         | 0.3         | 0.3         |
| Total C/N (dB)                              | 7.6                    | 5.5         | 6.2         | 5.9         |
| Minimum Required C/N (dB)                   | 7.3                    | 4.3         | 3.3         | 1.3         |
| <b>CARRIER DENSITY LEVELS</b>               |                        |             |             |             |
| Uplink Power Density (dBW/Hz)               | -53.0                  | -57.4       | -55.0       | -56.4       |
| Downlink EIRP Density At Beam Peak (dBW/Hz) | -28.3                  | -26.2       | -28.1       | -29.5       |

| <b>UPLINK BEAM INFORMATION</b>              |                        |             |             |             |
|---|------------------------|-------------|-------------|-------------|
| Uplink Beam Name                            | CGLU/CGRU              | CGLU/CGRU   | CGLU/CGRU   | CGLU/CGRU   |
| Uplink Frequency (MHz)                      | 6339 - 6415            | 6339 - 6415 | 6339 - 6415 | 6339 - 6415 |
| Uplink Beam Polarization                    | LHCP / RHCP            | LHCP / RHCP | LHCP / RHCP | LHCP / RHCP |
| Uplink Beam Peak G/T (dB/K)                 | -5.1                   | -5.1        | -5.1        | -5.1        |
| Uplink Beam Peak SFD (dBW/m2)               | -77.9                  | -77.9       | -77.9       | -77.9       |
| Uplink Relative Contour Level (dB)          | -6.7                   | -6.7        | -6.7        | -6.7        |
| <b>DOWNLINK BEAM INFORMATION</b>            |                        |             |             |             |
| Downlink Beam Name                          | CGRD/CGLD              | CGRD/CGLD   | CGRD/CGLD   | CGRD/CGLD   |
| Downlink Frequency (MHz)                    | 4114 - 4190            | 4114 - 4190 | 4114 - 4190 | 4114 - 4190 |
| Downlink Beam Polarization                  | RHCP / LHCP            | RHCP / LHCP | RHCP / LHCP | RHCP / LHCP |
| Downlink Beam Peak EIRP (dBW)               | 37.3                   | 37.3        | 37.3        | 37.3        |
| Downlink Relative Contour Level (dB)        | -6.4                   | -6.4        | -6.4        | -6.4        |
| <b>ADJACENT SATELLITE 1</b>                 |                        |             |             |             |
| Satellite Name                              | Intelsat 35e           |             |             |             |
| Orbital Location                            | 34.5 W.L.              | 34.5 W.L.   | 34.5 W.L.   | 34.5 W.L.   |
| Uplink Power Density (dBW/Hz)               | -38.7                  | -38.7       | -38.7       | -38.7       |
| Beam Peak Downlink EIRP Density (dBW/Hz)    | -33.0                  | -33.0       | -33.0       | -33.0       |
| <b>ADJACENT SATELLITE 2</b>                 |                        |             |             |             |
| Satellite Name                              | Hypothetical 38.5 W.L. |             |             |             |
| Orbital Location                            | 38.5 W.L.              | 38.5 W.L.   | 38.5 W.L.   | 38.5 W.L.   |
| Uplink Power Density (dBW/Hz)               | -38.7                  | -38.7       | -38.7       | -38.7       |
| Beam Peak Downlink EIRP Density (dBW/Hz)    | -33.0                  | -33.0       | -33.0       | -33.0       |
| <b>CARRIER INFORMATION</b>                  |                        |             |             |             |
| Carrier ID                                  | 36M0G7W                | 9M00G7W     | 1M43G7W     | 820KG7W     |
| Carrier Modulation                          | QPSK                   | QPSK        | QPSK        | QPSK        |
| Information Rate(kbps)                      | 36860                  | 8448        | 1024        | 256         |
| Code Rate                                   | 3/4x188/204            | 3/4         | 1/2         | 1/2         |
| Occupied Bandwidth(kHz)                     | 26664.7                | 7500        | 1024        | 630.7       |
| Allocated Bandwidth(kHz)                    | 36000                  | 9000        | 1434        | 820         |
| Minimum C/N, Rain (dB)                      | 7.3                    | 4.3         | 3.3         | 1.3         |
| <b>UPLINK EARTH STATION</b>                 |                        |             |             |             |
| Earth Station Diameter (meters)             | 7.5                    | 3.7         | 1.8         | 1.8         |
| Earth Station Gain (dBi)                    | 51.2                   | 45.1        | 38.9        | 38.9        |
| <b>DOWNLINK EARTH STATION</b>               |                        |             |             |             |
| Earth Station Diameter (meters)             | 7.5                    | 7.5         | 5.5         | 5.0         |
| Earth Station Gain (dBi)                    | 48.1                   | 48.1        | 45.4        | 44.6        |
| Earth Station G/T (dB/K)                    | 29.0                   | 29.0        | 27.0        | 22.7        |
| <b>COMPOSITE LINK PERFORMANCE</b>           |                        |             |             |             |
| C/N Thermal Uplink (dB)                     | 17.5                   | 16.3        | 17.2        | 16.9        |
| Uplink Interference C/I (dB)                | 28.6                   | 25.9        | 27.7        | 32.4        |
| Uplink Adjacent Satellite C/I (dB)          | 15.0                   | 13.9        | 14.7        | 14.4        |
| Intermodulation C/IM (dB)                   | ---                    | 23.9        | 26.7        | 26.5        |
| Downlink Thermal C/N (dB)                   | 17.1                   | 13.2        | 11.9        | 7.3         |
| Downlink Interference C/I (dB)              | 33.4                   | 23.4        | 24.7        | 21.9        |
| Downlink Adjacent Satellite C/I (dB)        | 13.3                   | 9.2         | 7.1         | 5.9         |
| Subtotal C/N (dB)                           | 9.3                    | 6.1         | 5.0         | 2.9         |
| Antenna Mispointing and Other Losses (dB)   | 1.5                    | 0.3         | 0.3         | 0.3         |
| Total C/N (dB)                              | 7.8                    | 5.8         | 4.7         | 2.6         |
| Minimum Required C/N (dB)                   | 7.3                    | 4.3         | 3.3         | 1.3         |
| <b>CARRIER DENSITY LEVELS</b>               |                        |             |             |             |
| Uplink Power Density (dBW/Hz)               | -53.0                  | -57.4       | -55.0       | -56.4       |
| Downlink EIRP Density At Beam Peak (dBW/Hz) | -28.3                  | -26.2       | -28.1       | -29.5       |

| <b>UPLINK BEAM INFORMATION</b>              |                                  |                                  |                                  |                                  |
|---|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| Uplink Beam Name                            | KCHU / KCVU<br>KMHU / KMVU       | KCHU / KCVU<br>KMHU / KMVU       | KCHU / KCVU<br>KMHU / KMVU       | KCHU / KCVU<br>KMHU / KMVU       |
| Uplink Frequency (MHz)                      | 13750 14500                      | 13750 14500                      | 13750 14500                      | 13750 14500                      |
| Uplink Beam Polarization                    | Linear H/V                       | Linear H/V                       | Linear H/V                       | Linear H/V                       |
| Uplink Beam Peak G/T (dB/K)                 | 10.4                             | 10.4                             | 10.4                             | 10.4                             |
| Uplink Beam Peak SFD (dBW/m2)               | -82.4                            | -82.4                            | -82.4                            | -82.4                            |
| Uplink Relative Contour Level (dB)          | -6.7                             | -6.7                             | -6.7                             | -6.7                             |
| <b>DOWNLINK BEAM INFORMATION</b>            |                                  |                                  |                                  |                                  |
| Downlink Beam Name                          | KCHD / KCVU<br>KMHD / KMVD       | KCHD / KCVU<br>KMHD / KMVD       | KCHD / KCVU<br>KMHD / KMVD       | KCHD / KCVU<br>KMHD / KMVD       |
| Downlink Frequency (MHz)                    | 10950 – 11200 &<br>11450 - 11700 | 10950 – 11200 &<br>11450 - 11700 | 10950 – 11200 &<br>11450 - 11700 | 10950 – 11200 &<br>11450 - 11700 |
| Downlink Beam Polarization                  | Linear V/H                       | Linear V/H                       | Linear V/H                       | Linear V/H                       |
| Downlink Beam Peak EIRP (dBW)               | 55.7                             | 55.7                             | 55.7                             | 55.7                             |
| Downlink Relative Contour Level (dB)        | -6.4                             | -6.4                             | -6.4                             | -6.4                             |
| <b>ADJACENT SATELLITE 1</b>                 |                                  |                                  |                                  |                                  |
| Satellite Name                              | Intelsat 35e                     |                                  |                                  |                                  |
| Orbital Location                            | 34.5 W.L.                        | 34.5 W.L.                        | 34.5 W.L.                        | 34.5 W.L.                        |
| Uplink Power Density (dBW/Hz)               | -50.0                            | -50.0                            | -50.0                            | -50.0                            |
| Beam Peak Downlink EIRP Density (dBW/Hz)    | -22.0                            | -22.0                            | -22.0                            | -22.0                            |
| <b>ADJACENT SATELLITE 2</b>                 |                                  |                                  |                                  |                                  |
| Satellite Name                              | Hypothetical 38.5 W.L.           |                                  |                                  |                                  |
| Orbital Location                            | 38.5 W.L.                        | 38.5 W.L.                        | 38.5 W.L.                        | 38.5 W.L.                        |
| Uplink Power Density (dBW/Hz)               | -50                              | -50                              | -50.0                            | -50.0                            |
| Beam Peak Downlink EIRP Density (dBW/Hz)    | -26.0                            | -26.0                            | -26.0                            | -26.0                            |
| <b>CARRIER INFORMATION</b>                  |                                  |                                  |                                  |                                  |
| Carrier ID                                  | 36M0G7W                          | 8M25G7W                          | 1M73G7W                          | 382KG7W                          |
| Carrier Modulation                          | QPSK                             | QPSK                             | QPSK                             | QPSK                             |
| Information Rate(kbps)                      | 36860                            | 8448                             | 1024                             | 256                              |
| Code Rate                                   | 3/4x188/204                      | 3/4                              | 1/2                              | 1/2                              |
| Occupied Bandwidth(kHz)                     | 26664.7                          | 6111.3                           | 1284                             | 273                              |
| Allocated Bandwidth(kHz)                    | 36000                            | 8250.5                           | 1733                             | 382                              |
| Minimum C/N, Rain (dB)                      | 7.3                              | 7.3                              | 1.8                              | 1.2                              |
| <b>UPLINK EARTH STATION</b>                 |                                  |                                  |                                  |                                  |
| Earth Station Diameter (meters)             | 6.5                              | 2.4                              | 1.8                              | 1.8                              |
| Earth Station Gain (dBi)                    | 57.4                             | 48.7                             | 46.2                             | 46.2                             |
| <b>DOWNLINK EARTH STATION</b>               |                                  |                                  |                                  |                                  |
| Earth Station Diameter (meters)             | 6.5                              | 6.5                              | 2.4                              | 1.8                              |
| Earth Station Gain (dBi)                    | 55.6                             | 55.6                             | 47.0                             | 44.5                             |
| Earth Station G/T (dB/K)                    | 34.0                             | 34.0                             | 25.0                             | 23.3                             |
| <b>COMPOSITE LINK PERFORMANCE</b>           |                                  |                                  |                                  |                                  |
| C/N Thermal Uplink (dB)                     | 19.9                             | 19.9                             | 19.1                             | 19.7                             |
| Uplink Interference C/I (dB)                | 28.1                             | 27.6                             | 26.9                             | 32.6                             |
| Uplink Adjacent Satellite C/I (dB)          | 14.0                             | 13.9                             | 13.2                             | 13.7                             |
| Intermodulation C/IM (dB)                   | --                               | 43.0                             | 42.3                             | 44.3                             |
| Downlink Thermal C/N (dB)                   | 23.8                             | 22.9                             | 13.2                             | 12.0                             |
| Downlink Interference C/I (dB)              | 28.4                             | 24.8                             | 23.3                             | 24.0                             |
| Downlink Adjacent Satellite C/I (dB)        | 17.3                             | 17.2                             | 7.7                              | 5.6                              |
| Subtotal C/N (dB)                           | 11.2                             | 11.0                             | 5.5                              | 4.0                              |
| Antenna Mispointing and Other Losses (dB)   | 1.5                              | 0.3                              | 0.3                              | 0.3                              |
| Total C/N (dB)                              | 9.7                              | 10.7                             | 5.2                              | 3.7                              |
| Minimum Required C/N (dB)                   | 7.3                              | 7.3                              | 1.8                              | 1.2                              |
| <b>CARRIER DENSITY LEVELS</b>               |                                  |                                  |                                  |                                  |
| Uplink Power Density (dBW/Hz)               | -53.0                            | -57.4                            | -55.0                            | -56.4                            |
| Downlink EIRP Density At Beam Peak (dBW/Hz) | -28.3                            | -26.2                            | -28.1                            | -29.5                            |

| <b>UPLINK BEAM INFORMATION</b>              |                                  |                                  |                                  |                                  |
|---|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| Uplink Beam Name                            | KAHU                             | KAHU                             | KAHU                             | KAHU                             |
| Uplink Frequency (MHz)                      | 13750 14500                      | 13750 14500                      | 13750 14500                      | 13750 14500                      |
| Uplink Beam Polarization                    | Horizontal                       | Horizontal                       | Horizontal                       | Horizontal                       |
| Uplink Beam Peak G/T (dB/K)                 | 5.7                              | 5.7                              | 5.7                              | 5.7                              |
| Uplink Beam Peak SFD (dBW/m2)               | -78.7                            | -78.7                            | -78.7                            | -78.7                            |
| Uplink Relative Contour Level (dB)          | -6.7                             | -6.7                             | -6.7                             | -6.7                             |
| <b>DOWNLINK BEAM INFORMATION</b>            |                                  |                                  |                                  |                                  |
| Downlink Beam Name                          | KAVD                             | KAVD                             | KAVD                             | KAVD                             |
| Downlink Frequency (MHz)                    | 10950 – 11200 &<br>11450 - 11700 | 10950 – 11200 &<br>11450 - 11700 | 10950 – 11200 &<br>11450 - 11700 | 10950 – 11200 &<br>11450 - 11700 |
| Downlink Beam Polarization                  | Vertical                         | Vertical                         | Vertical                         | Vertical                         |
| Downlink Beam Peak EIRP (dBW)               | 49.5                             | 49.5                             | 49.5                             | 49.5                             |
| Downlink Relative Contour Level (dB)        | -6.4                             | -6.4                             | -6.4                             | -6.4                             |
| <b>ADJACENT SATELLITE 1</b>                 |                                  |                                  |                                  |                                  |
| Satellite Name                              | Intelsat 35e                     |                                  |                                  |                                  |
| Orbital Location                            | 34.5 W.L.                        | 34.5 W.L.                        | 34.5 W.L.                        | 34.5 W.L.                        |
| Uplink Power Density (dBW/Hz)               | -50.0                            | -50.0                            | -50.0                            | -50.0                            |
| Beam Peak Downlink EIRP Density (dBW/Hz)    | -22.0                            | -22.0                            | -22.0                            | -22.0                            |
| <b>ADJACENT SATELLITE 2</b>                 |                                  |                                  |                                  |                                  |
| Satellite Name                              | Hypothetical 38.5 W.L.           |                                  |                                  |                                  |
| Orbital Location                            | 38.5 W.L.                        | 38.5 W.L.                        | 38.5 W.L.                        | 38.5 W.L.                        |
| Uplink Power Density (dBW/Hz)               | -50                              | -50                              | -50.0                            | -50.0                            |
| Beam Peak Downlink EIRP Density (dBW/Hz)    | -26.0                            | -26.0                            | -26.0                            | -26.0                            |
| <b>CARRIER INFORMATION</b>                  |                                  |                                  |                                  |                                  |
| Carrier ID                                  | 36M0G7W                          | 8M25G7W                          | 1M73G7W                          | 382KG7W                          |
| Carrier Modulation                          | QPSK                             | QPSK                             | QPSK                             | QPSK                             |
| Information Rate(kbps)                      | 36860                            | 8448                             | 1024                             | 256                              |
| Code Rate                                   | 3/4x188/204                      | 3/4                              | 1/2                              | 1/2                              |
| Occupied Bandwidth(kHz)                     | 26664.7                          | 6111.3                           | 1284                             | 273                              |
| Allocated Bandwidth(kHz)                    | 36000                            | 8250.5                           | 1733                             | 382                              |
| Minimum C/N, Rain (dB)                      | 7.3                              | 7.3                              | 1.8                              | 1.2                              |
| <b>UPLINK EARTH STATION</b>                 |                                  |                                  |                                  |                                  |
| Earth Station Diameter (meters)             | 6.5                              | 2.4                              | 1.8                              | 1.8                              |
| Earth Station Gain (dBi)                    | 57.4                             | 48.7                             | 46.2                             | 46.2                             |
| <b>DOWNLINK EARTH STATION</b>               |                                  |                                  |                                  |                                  |
| Earth Station Diameter (meters)             | 6.5                              | 6.5                              | 2.4                              | 1.8                              |
| Earth Station Gain (dBi)                    | 55.6                             | 55.6                             | 47.0                             | 44.5                             |
| Earth Station G/T (dB/K)                    | 34.0                             | 34.0                             | 25.0                             | 23.3                             |
| <b>COMPOSITE LINK PERFORMANCE</b>           |                                  |                                  |                                  |                                  |
| C/N Thermal Uplink (dB)                     | 15.2                             | 15.2                             | 14.4                             | 15.0                             |
| Uplink Interference C/I (dB)                | 28.1                             | 27.6                             | 26.9                             | 32.6                             |
| Uplink Adjacent Satellite C/I (dB)          | 14.0                             | 13.9                             | 13.2                             | 13.7                             |
| Intermodulation C/IM (dB)                   | --                               | 43.0                             | 42.3                             | 44.3                             |
| Downlink Thermal C/N (dB)                   | 23.8                             | 22.9                             | 13.2                             | 12.0                             |
| Downlink Interference C/I (dB)              | 28.4                             | 24.8                             | 23.3                             | 24.0                             |
| Downlink Adjacent Satellite C/I (dB)        | 17.3                             | 17.2                             | 7.7                              | 5.6                              |
| Subtotal C/N (dB)                           | 10.2                             | 10.0                             | 5.1                              | 3.8                              |
| Antenna Mispointing and Other Losses (dB)   | 1.5                              | 0.3                              | 0.3                              | 0.3                              |
| Total C/N (dB)                              | 8.7                              | 9.7                              | 4.8                              | 3.5                              |
| Minimum Required C/N (dB)                   | 7.3                              | 7.3                              | 1.8                              | 1.2                              |
| <b>CARRIER DENSITY LEVELS</b>               |                                  |                                  |                                  |                                  |
| Uplink Power Density (dBW/Hz)               | -53.0                            | -57.4                            | -55.0                            | -56.4                            |
| Downlink EIRP Density At Beam Peak (dBW/Hz) | -28.3                            | -26.2                            | -28.1                            | -29.5                            |