Engineering Statement

1 Introduction

Intelsat License LLC ("Intelsat") seeks authority in this application to launch and operate the Intelsat 39 satellite at the 62.0° E.L. orbital location. Intelsat 39 will replace Intelsat 902 (Call Sign S2406), currently operating at 62.0° E.L.

The characteristics of the Intelsat 39 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 39 is a SSL model SSL1300 spacecraft that is capable of operating in C-band and Ku-band frequencies listed in the table below.

Direction	Frequency
Uplink	5850-6425 MHz
	13000-13250 MHz
	13750-14500 MHz
Downlink	3625-4200 MHz
	10700-11700 MHz
	12250- 12750 MHz

The spacecraft provides the following coverage:

Frequency band	Beam	Coverage
C-Band	East Hemi	Asia and parts of Australia
	West Hemi	Africa and Europe
	Europe	Europe
	Mozambique	Mozambique
	Myanmar	Myanmar
	Southeast Asia	Southeast Asia
	Global	Global
Ku-Band	DR	Democratic Republic of Congo
	Europe	Europe
	Middle East	Middle East
	EIOR	East Indian Ocean Region
	WIOR	West Indian Ocean Region
	Steerable Spot Beams	Visible Land Area

2.1 Spacecraft Characteristics

Intelsat 39 is a three-axis stabilized type spacecraft that has a rectangular outer body structure. Intelsat 39 utilizes two deployable solar array wings and a number of deployable and fixed antennas.

The Intelsat 39 spacecraft is composed of the following subsystems:

1) Thermal
2) Power
3) Attitude Control
4) Propulsion
5) Telemetry, Command and Ranging ("TC&R")
6) Uplink Power Control ("ULPC")
7) Communications

These subsystems maintain the correct position and attitude of the spacecraft, ensure that all internal units are maintained within the required temperature range, and ensure that the spacecraft can be commanded and controlled with a high level of reliability from

launch to the end of its useful life. The spacecraft design incorporates redundancy in each of the various subsystems in order to avoid single point failures.

The structural design of Intelsat 39 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 39 utilizes active communication channels at C-band and Ku-band frequencies. The C-band payload utilizes channels with bandwidths of 36 MHz, 41 MHz, 72 MHz, and 76 MHz. The Ku-band payload utilizes channels having bandwidths of 36 MHz, 72 MHz, and 232 MHz. The Intelsat 39 frequency and polarization plan is provided in Schedule S.

There are six C-band beams in addition to the global beam. Similarly, there are five Ku-band beams in addition to three steerable beams. Intelsat has included the Schedule S beam designation for all beams in Exhibit 1.

The performance characteristics of all Intelsat 39 beams are provided in Schedule S. The coverage contours of all Intelsat 39 beams except for those with their -8.0 dB contour extending beyond the edge of the Earth are provided with Schedule S.

Intelsat 39 is equipped with three Ku-band steerable spot beams. Gain contours are provided in Schedule S. The steerable beam may be pointed toward any location on the earth that is visible from 62.0° E.L. Intelsat will ensure that transmissions in this beam are consistent with the Commission's rules and the International Telecommunication Union ("ITU") Radio Regulations as they pertain to the Fixed Satellite Service.

Exhibits 2 and 3 provide the beam parameters for the Intelsat 39 uplink and downlink beams, respectively.

All of the bandwidth in each communications beam can be connected in loopback, wherein uplink channels in each uplink beam are connected to downlink channels in the downlink beam serving the same geographic area. Additionally, some C-band European beam channels can be interconnected with Indian Ocean region beam channels, and some Ku-band European beam channels can be interconnected with steerable beam channels.

2.3 Telemetry, Command and Ranging Subsystem

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

1) Acquisition, processing and transmission of spacecraft telemetry data;

2) Reception and retransmission of ground station generated ranging signals; and

3) Reception, processing and distribution of telecommands.

Intelsat 39 can be commanded through the use of two fixed command channels centered at the frequencies of 6174.7 MHz and 6177.3 MHz. Intelsat 39 is also equipped with a tunable command receiver with center frequency selectable via ground command in 100 kHz steps:

- Selectable center frequencies for tunable command receiver may be calculated as: Frequency (MHz) = 6155 + 0.1*n, where n is an integer from 0 to 400, inclusive.

The spacecraft telemetry is transmitted through telemetry channels centered at the frequencies 3948.5 MHz, 3949 MHz, 3953 MHz, and 3953.5 MHz.

The telemetry and command beams all 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 Commission'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 39 command and telemetry subsystem performance is summarized in Exhibit 4.

2.4 Uplink Power Control Subsystem

Intelsat 39 utilizes two Ku-band channels and one C-band channel 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 Commission'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 39 ULPC subsystem performance is summarized in Exhibit 4.

2.5 Satellite Station-Keeping

The spacecraft will be maintained within ±0.05° of its nominal longitudinal position in the east-west direction. Accordingly, it will comply 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 and Emission Designators

Intelsat 39 will be a general purpose communications satellite and has been designed to support various services offered within Intelsat's satellite system. Depending upon the needs of the users, the transponders on Intelsat 39 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

4 Power Flux Density ("PFD")

The power flux density ("PFD") limits for space stations operating in the 3650-4200 MHz, 10950-11200 MHz, and 11450-11700 MHz are contained in Section 25.208 of the Commission's rules. With respect to the frequency bands 3625-3650 MHz, 10700-10950 MHz, 11200-11450 MHz, and 12250-12750 MHz, there are PFD limits specified in No. 21.16 of the ITU Radio Regulations.

The maximum PFD levels for the Intelsat 39 transmissions were calculated for the 3625-4200 MHz, 10700-11700 MHz, and 12250-12750 MHz frequency bands. The PFD levels were also calculated for the Intelsat 39 telemetry and ULPC carriers. The results are provided in Schedule S and show that the downlink power flux density levels of the Intelsat 39 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 39 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 39 emissions.

6 Orbital Location

Intelsat requests that it be assigned the 62.0° E.L. orbital location for Intelsat 39. The 62.0° E.L. location satisfies Intelsat 39 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 ITU Filings

Intelsat 39's operations in the 3625-4200 MHz, 5850-6425 MHz, 10950-11200 MHz, and 11450-11700 MHz frequency bands have been notified under the Administration of the United States' ITU filings INTELSAT6 62E, INTELSAT7 62E, INTELSAT8 62E and INTELSAT9 62E.

Intelsat 39's operations in the 14000-14500 MHz frequency band have been notified under the Administration of the United States' ITU filings INTELSAT6 62E, INTELSAT7 62E, INTELSAT8 62E and INTELSAT9 62E.

Intelsat 39's operations in the 12250-12750 MHz and 137500-14000 MHz frequency bands have been notified under the Administration of Papua New Guinea's ITU filing NEW DAWN 22.

Intelsat 39's operations in the 10700-10950 MHz, 11200-11450 MHz, and 13000-13250 MHz frequency bands will operate using the Administration of Papua New Guinea's ITU filing NEW DAWN FSS-3 and will be operated in accordance with the Appendix 30B procedure of the ITU Radio Regulations.

Intelsat respectfully requests that the United States Administration state its non-objection to Papua New Guinea's use of Intelsat 39 for purposes of bringing into use and maintaining the NEW DAWN FSS-3 filing and for purposes of bringing back into use and maintaining the NEW DAWN 22 filing.

Additionally, Intelsat may submit ITU filings through the United States Administration at a later date that consolidate all the relevant parameters from the filings supporting the application.

8 Coordination Statement and Certifications

The downlink EIRP density of Intelsat 39's transmissions in the conventional and extended C-band will not exceed 3 dBW/4kHz for digital transmissions or 8 dBW/4kHz for analog transmissions, and associated uplink transmissions will not exceed applicable EIRP density envelopes in Sections 25.218 or 25.221(a)(1) unless the non-routine uplink and/or downlink operation is coordinated with operators of authorized co-frequency space stations at assigned locations within six degrees of Intelsat 39 at 62.0° E.L.

The downlink EIRP density of Intelsat 39's transmissions in the conventional and extended Ku-band will not exceed 14 dBW/4 kHz for digital transmissions or 17 dBW/4 kHz for analog transmissions, and associated uplink transmissions will not exceed applicable EIRP density envelopes in Sections 25.218, 25.222(a)(1), 25.226(a)(1), or 25.227(a)(1) unless the non-routine uplink and/or downlink operation is coordinated with operators of authorized co-frequency space stations at assigned locations within six degrees of Intelsat 39 at 62.0° E.L.

With respect to proposed operation in the 10700-10950 MHz (space-to-Earth), 11200-11450 MHz (space-to-Earth), and/or 13000-13250 MHz (Earth-to-space) bands, the proposed operation will take into account the applicable requirements of Appendix 30B of the ITU Radio Regulations. Further, compatibility with other U.S. ITU filings under Appendix 30B is assured since there are no other U.S. ITU Filings under Appendix 30B within at least 10° of 62.0°E.L.

Intelsat 39 will also operate in a band addressed by Section 25.140(a)(3)(v): the 12250-12750 MHz band. Currently, Intelsat 33 is authorized to operate in the 12500-12600 MHz band at 60°E.L., which is two degrees from the proposed longitude of 62° E.L. for Intelsat 39. Intelsat certifies that the proposed operation of Intelsat 39 in the 12500-12600 MHz band has been internally coordinated. Intelsat 906 is authorized to operate at 64°E.L., but is not equipped to operate in the 12250-12750 MHz band. Section 9 provides an interference analysis demonstrating compatibility with a hypothetical co-frequency space station two degrees away with the same receiving and transmitting characteristics as the proposed space station.

Further, Intelsat will operate Intelsat 39 in compliance with all existing or future coordination agreements for 62.0° E.L.

9 Interference Analysis

The compatibility of the proposed Intelsat 39 emissions in the 12250-12750 MHz band with an adjacent satellite located at 60.0° E.L. was analyzed. The interference analysis was conducted for a representative carrier in beams S1 and S2, the only beams that operate in the 12250-12750 MHz band.

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 Ku-band frequencies rain attenuation predictions are derived using Recommendation ITU-R P.618.
d) At Ku-band frequencies, increase in noise temperature of the receiving earth station due to rain is taken into account.
e) For the cases where the transponder operates in a multi-carrier mode, the effects due to intermodulation interference are taken into account.

All assumptions and the results of the analysis are documented in Exhibit 5. Both of the link budgets demonstrate positive link margin for the representative carrier in the presence of an identical carrier operating via a satellite two degrees away.

10 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.

10.1 Spacecraft Hardware Design

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

10.2 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.

10.3 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 potential exception of co-location during a traffic transition period, Intelsat 39 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.

Intelsat 39 will replace Intelsat 902 at 62.0° E.L. If the Intelsat 39 and Intelsat 902 satellites are nominally collocated during transfer of traffic, Intelsat will ensure that sufficient spatial separation is achieved between these satellites through the use of orbit eccentricity and inclination offsets to minimize the risk of collision. Intelsat is not aware of any other FCC licensed system, or any other system applied for and under consideration by the FCC, having an overlapping station-keeping volume with Intelsat 39. Intelsat is also not aware of any system with an overlapping station-keeping volume with Intelsat 39 that is the subject of an ITU filing and that is either in orbit or progressing towards launch.

10.4 Post Mission Disposal

At the end of the mission, Intelsat will dispose of the spacecraft by moving it to an altitude of at least 264 kilometers above the geostationary arc. Intelsat has reserved 21.4 kilograms of xenon for that purpose.

In calculating the disposal orbit, Intelsat has used simplifying assumptions as permitted under the Commission's Orbital Debris Report and Order.[1] The effective area to mass ratio (Cr*A/M) of the Intelsat 39 spacecraft is 0.026 m^2/kg, resulting in a minimum perigee disposal altitude under the Inter-Agency Space Debris Coordination Committee formula of 264 kilometers above the geostationary arc. Accordingly, the Intelsat 39 planned disposal orbit complies with the FCC's rules.

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.

11 TC&R Control Earth Stations

Intelsat will conduct TC&R operations through one or more of the following earth stations: Fuchsstadt, Germany; Fucino, Italy; Kumsan, Korea; or Mingenew, Australia. Additionally, Intelsat is capable of remotely controlling Intelsat 39 from its facilities in McLean, VA or Long Beach, CA.

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

Certification Statement

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

/s/ Alexander Gerdenitsch	December 5, 2017
Alexander Gerdenitsch Intelsat Manager, Spectrum Policy, Americas	Date

EXHIBIT 1

Beam Polarizations and GXT File Names

	Schedule S Beam GXT File Names							
	Linear Polarization				Circular Polarization			
Beam Description	**Uplink (H-Pol.)**	**Uplink (V-Pol.)**	**Downlink (H-Pol.)**	**Downlink (V-Pol.)**	**Uplink (LHCP)**	**Uplink (RHCP)**	**Downlink (LHCP)**	**Downlink (RHCP)**
C-Band Beams[1]								
Global Beam	----	----	----	----	CGLU*	CGRU*	CGLD*	CGRD*
East Hemi	EHHU	EHVU	EHHD	EHVD	EHLU	EHRU	EHLD	EHRD
West Hemi	----	----	----	----	WHLU	WHRU	WHLD	WHRD
Europe	----	----	----	----	EULU	EURU	EULD	EURD
Mozambique	----	----	----	----	MZLU	MZRU	MZLD	MZRD
Myanmar	----	----	----	----	MYLU MYLV	MYRU MYRV	MYLD MYLE	MYRD MYRE
Southeast Asia	----	----	----	----	SELU	SERU	SELD	SERD
Telemetry Global	----	----	----	TLMV*	----	----	TLML*	----
Command Global	----	CMDV*	----	----	CMDL*	----	----	----
ULPC	----	----	CLHD*	----	----	----	----	----
Ku-Band Beams[2]								
DR	DRHU	DRVU	DRHD	DRVD	----	----	----	----
Europe	EUHU	EUVU	EUHD	EUVD	----	----	----	----
Middle East	MEHU	MEVU	MEHD	MEVD MEVE	----	----	----	----
EIOR	EIVU	----	EIHD	----	----	----	----	----
WIOR	WIVU	----	WIHD	----	----	----	----	----
Steerable Beam	S1HU S2HU S3HU	S1VU S1VV S2HV	S1HD S1HE	S1VD S2VD S2VE S3VD S3VE	----	----	----	----
ULPC	----	----	----	----	----	----	----	KLRD* KLRE*

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

[1&2] Two beam designators within a cell indicate that the beam includes two disjoint frequency ranges.

EXHIBIT 2

COMMUNICATION SUBSYSTEM UPLINK BEAM PARAMETERS

Schedule S Beam ID	Beam Name	Frequency Band (MHz)	Polarization	Beam Peak G/T (dB/K)	Maximum Beam Peak SFD (dBW/m^2)	Minimum Beam Peak SFD (dBW/m^2)
WHLU	West Hemi	5850 - 6425	LHCP	3.6	-82	-107
WHRU	West Hemi	5850 - 6425	RHCP	3.6	-82	-107
MZLU	Mozambique	5850 - 6010	LHCP	10.0	-83	-108
MZRU	Mozambique	5850 - 6010	RHCP	10.0	-83	-108
CGLU	Global	6340 - 6425	LHCP	-4.5	-81	-106
CGRU	Global	6340 - 6425	RHCP	-4.5	-81	-106
EHLU	East Hemi	5850 - 6425	LHCP	3.1	-82	-107
EHRU	East Hemi	5850 - 6425	RHCP	3.2	-82	-107
MYLU	Myanmar	5850 - 5935	LHCP	10.0	-83	-108
MYLV	Myanmar	6175 - 6335	LHCP	10.0	-83	-108
MYRU	Myanmar	5850 - 5935	RHCP	10.0	-83	-108
MYRV	Myanmar	6175 - 6335	RHCP	10.0	-83	-108
SELU	SE Asia	5930 - 6010	LHCP	6.8	-82	-107
SERU	SE Asia	5930 - 6010	RHCP	6.8	-82	-107
EHHU	East Hemi	5850 - 6425	Horizontal	5.3	-83	-108
EHVU	East Hemi	5850 - 6425	Vertical	5.3	-83	-108
MEHU	Middle East	14000 - 14500	Horizontal	6.1	-80	-101
MEVU	Middle East	14000 - 14250	Vertical	6.1	-80	-101
S1HU	S1 Spot	14000 - 14250	Horizontal	12.0	-84	-105
S1VU	S1 Spot	13000 - 13250	Vertical	12.0	-84	-105
S1VV	S1 Spot	13750 - 14250	Vertical	12.0	-84	-105
EUHU	Europe	13750 - 14250	Horizontal	10.1	-81	-102
EUVU	Europe	13750 - 14500	Vertical	10.1	-81	-102
EULU	Europe C	5850 - 5935	LHCP	9.0	-81	-102
EURU	Europe C	5850 - 5935	RHCP	9.0	-81	-102
WIVU	WIOR	14250 - 14500	Vertical	4.4	-76	-91
EIVU	EIOR	14250 - 14500	Vertical	3.3	-76	-91
S2HU	S2 Spot	13000 - 13250	Horizontal	12.0	-84	-105
S2HV	S2 Spot	13750 - 14250	Horizontal	12.0	-84	-105
S3HU	S3 Spot	14000 - 14500	Horizontal	10.0	-82	-103
DRHU	DRC	14000 - 14250	Horizontal	7.0	-79	-100
DRVU	DRC	14000 - 14250	Vertical	7.0	-79	-100

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

EXHIBIT 3

COMMUNICATION SUBSYSTEM DOWNLINK BEAM PARAMETERS

Schedule S Beam ID	Beam Name	Frequency Band (MHz)	Polarization	Maximum EIRP (dBW)	Maximum EIRP Density (dBW/4 kHz)	Maximum EIRP Density (dBW/Hz)
WHRD	West Hemi	3625 - 4200	RHCP	44.1	8.1	-31.4
WHLD	West Hemi	3625 - 4200	LHCP	44.1	8.1	-31.4
MZRD	Mozambique	3625 - 3785	RHCP	51.6	15.5	-27.0
MZLD	Mozambique	3625 - 3785	LHCP	51.6	15.5	-27.0
CGRD	Global	4115 - 4200	RHCP	38.5	2.5	-37.6
CGLD	Global	4115 - 4200	LHCP	38.5	2.5	-37.6
EHRD	East Hemi	3625 - 4200	RHCP	43.9	7.9	-31.6
EHLD	East Hemi	3625 - 4200	LHCP	43.9	7.9	-31.6
MYRD	Myanmar	3625 - 3710	RHCP	50.3	14.3	-28.3
MYRE	Myanmar	3950 - 4110	RHCP	50.3	14.3	-28.3
MYLD	Myanmar	3625 - 3710	LHCP	50.3	14.3	-28.3
MYLE	Myanmar	3950 - 4110	LHCP	50.3	14.3	-28.3
SERD	SE Asia	3705 - 3785	RHP	46.8	10.8	-28.7
SELD	SE Asia	3705 - 3785	LHCP	46.8	10.8	-28.7
EHVD	East Hemi	3625 - 4200	Vertical	43.9	7.9	-31.6
EHHD	East Hemi	3625 - 4200	Horizontal	43.9	7.9	-31.6
MEVD	Middle East	10950 - 11200	Vertical	52.7	16.8	-22.8
MEVE	Middle East	11450 - 11700	Vertical	52.7	16.8	-22.8
MEHD	Middle East	10950 - 11200	Horizontal	52.7	16.8	-22.8
S1VD	S1 Spot	10950 - 11200	Vertical	57.2	21.2	-21.3
S1HD	S1 Spot	10700 - 11700	Horizontal	57.2	21.2	-21.3
S1HE	S1 Spot	12500 - 12750	Horizontal	57.2	21.2	-21.3
EUVD	Europe	10700 - 11450	Vertical	54.2	18.2	-24.3
EUHD	Europe	10700 - 11700	Horizontal	54.2	18.2	-24.3
EULD	Europe C	3625 - 3710	LHCP	49.8	13.8	-29.0
EURD	Europe C	3625 - 3710	RHCP	49.8	13.8	-29.0
WIHD	WIOR	11450 - 11700	Horizontal	48.7	12.7	-26.8
EIHD	EIOR	11450 - 11700	Horizontal	48.4	12.4	-27.1
S2VD	S2 Spot	10700 - 11700	Vertical	57.2	21.2	-21.3
S2VE	S2 Spot	12250 - 12750	Vertical	57.2	21.2	-21.3
S3VD	S3 Spot	10950 - 11200	Vertical	57.0	21.0	-21.5
S3VE	S3 Spot	11450 - 11700	Vertical	57.0	21.0	-21.5
DRVD	DRC	10950 - 11200	Vertical	52.5	16.5	-26.1
DRHD	DRC	10950 - 11200	Horizontal	52.5	16.5	-26.1

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

EXHIBIT 4
TC&R SUBSYSTEM CHARACTERISTICS

Beam Name	Command Tunable On-Station	Command Tunable Transfer Orbit
Schedule S Beam ID	CMDV	CMDL
Center Frequency (MHz)	6175	6175
Occupied Band (MHz)	6154.5-6195.5	6154.5-6195.5
Command Carrier Bandwidth (MHz)	1.0	1.0
Polarization	Vertical	LHCP
Peak Flux Density at Command Threshold (dBW/m^2)	-100	-85

* Tunable in 100 kHz steps

Beam Name	Telemetry On-Station	Telemetry Transfer Orbit
Schedule S Beam ID	TLMV	TLML
Frequencies (MHz)	3948.5, 3949, 3953, & 3953.5	3948.5, 3949, 3953, & 3953.5
Polarization	Vertical	LHCP
Maximum Channel EIRP (dBW)	11.5	7.0
Maximum Beam Peak EIRP Density (dBW/4kHz)	-7.3	-11.8
Maximum Beam Peak EIRP Density (dBW/Hz)	-43.3	-47.8

Beam Name	C-band ULPC	Ku-band ULPC	Ku-band ULPC
Schedule S Beam ID	CLHD	KLRD	KLRE
Frequencies (MHz)	3951	10951	11699.5
Polarization	Horizontal	RHCP	RHCP
Maximum Channel EIRP (dBW)	20.0	22.0	22.0
Maximum Beam Peak EIRP Density (dBW/4kHz)	12.0	14.0	14.0
Maximum Beam Peak EIRP Density (dBW/Hz)	-24.0	-22.0	-22.0

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

EXHIBIT 5
INTERFERENCE ANALYSIS:
Effect of Hypothetical Satellite at 62°E.L on Intelsat 39
Band 12250-13750MHz
Beams: Steerable Spots S1 and S2

UPLINK BEAM INFORMATION		
Uplink Beam Name	S1VV	S2HV
Uplink Frequency (MHz)	13875	13955
Uplink Beam Polarization	Horizontal	Horizontal
Uplink Beam Peak G/T (dB/K)	12.0	12.0
Uplink Beam Peak SFD (dBW/m2)	-87.0	-87.0
Uplink Relative Contour Level (dB)	-4.0	-4.0
DOWNLINK BEAM INFORMATION		
Downlink Beam Name	S1HE	S2VE
Downlink Frequency (MHz)	12625	12455
Downlink Beam Polarization	Vertical	Vertical
Downlink Beam Peak EIRP (dBW)	57.2	57.2
Downlink Relative Contour Level (dB)	-1.0	-1.0
ADJACENT SATELLITE		
Satellite Name	Hypothetical	Hypothetical
Orbital Location	60.0E	60.0E
Uplink Power Density (dBW/Hz)	-54.8	-54.8
Beam Peak Downlink EIRP Density (dBW/Hz)	-30.0	-30.0
CARRIER INFORMATION		
Carrier ID	5M25G7W	5M25G7W
Carrier Modulation	QPSK	QPSK
Information Rate(kbps)	10000	10000
Code Rate	2/3	2/3
Occupied Bandwidth(kHz)	5000	5000
Allocated Bandwidth(kHz)	5250	5250
Minimum C/N, Rain (dB)	6.6	6.6
UPLINK EARTH STATION		
Earth Station Diameter (meters)	2.4	2.4
Earth Station Gain (dBi)	49.1	49.1
DOWNLINK EARTH STATION		
Earth Station Diameter (meters)	2.4	2.4
Earth Station Gain (dBi)	47.0	47.0
Earth Station G/T (dB/K)	27.3	27.3
COMPOSITE LINK PERFORMANCE		
C/N Thermal Uplink (dB)	24.0	24.0
Uplink Interference C/I (dB)	22.6	22.6
Uplink Adjacent Satellite C/I (dB)	23.6	23.6
Intermodulation C/IM (dB)	25.3	25.3
Downlink Thermal C/N (dB)	15.0	15.0
Downlink Interference C/I (dB)	17.9	17.9
Downlink Adjacent Satellite C/I (dB)	23.6	23.6
Subtotal C/N (dB)	11.6	11.6
Antenna Mispointing and Other Losses (dB)	0.3	0.3
Total C/N (dB)	11.3	11.3
Minimum Required C/N (dB)	6.6	6.6
CARRIER DENSITY LEVELS		
Uplink Power Density (dBW/Hz)	-54.8	-54.8
Downlink EIRP Density At Beam Peak (dBW/Hz)	-30.0	-30.0