Engineering Statement

1 Introduction

Intelsat License LLC ("Intelsat") seeks authority in this application to redeploy the satellite designated as Intelsat 805 (call sign S2404) ("IS-805") from 169.0° E.L to 169.1° E L. The characteristics of the IS-805 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 this Engineering Statement.

2 Spacecraft Overview

IS-805 is a Lockheed-Martin model LM7000 spacecraft that is capable of operating in the C-band and Ku-band frequencies listed below.

Direction	Frequency
Uplink	5850–6650 MHz
	14000–14250 MHz
Downlink	3400–4200 MHz
	12500–12750 MHz

The spacecraft provides the following coverage:

Band	Beam
C-band	Regional Beam/Asia Pacific, USA/West Coast
Ku-band	Steerable Spot Beam

2.1 Spacecraft Characteristics

IS-805 is a three-axis stabilized type spacecraft that has a rectangular outer body structure. IS-805 utilizes two deployable solar array wings and deployable and non-deployable antennas.

The IS-805 spacecraft is composed of the following subsystems:

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

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

The structural design of IS-805 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

IS-805 provides active communication channels at C-band and Ku-band frequencies. The C-band payload employs channels having bandwidths of 36 MHz, 41 MHz, and 72 MHz. The Ku-band payload employs channels having bandwidths of 72 MHz and 77 MHz. The IS-805 frequency, polarization, and channel plan is provided in Schedule S.

The coverage contours and performance characteristics of all IS-805 beams are provided in Schedule S. Exhibit 1 provides Schedule S beam designation for all beams. Exhibits 2 and 3 provide the beam parameters for the IS-805 uplink and downlink beams, respectively.

All of the bandwidth in each communication beam can be configured in loopback mode, whereby uplink channels in each uplink beam are connected to downlink channels in the downlink beam serving the same geographic area. Additionally, some C- or Ku-band channels

in each beam can be interconnected with some C- or Ku-band channels in each of the other beams.

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 IS-805 command and telemetry channel frequencies are shown in Exhibit 4.

The coverage patterns of the command and telemetry beams have gain contours that vary by less than 8 dB across the surface of the Earth and accordingly the gain at 8 dB below the peak falls beyond the edge of the Earth. Therefore, pursuant to Section 25.114(c)(4)(vi)(A) of the FCC's rules, contours for these beams are not required to be provided and the associated GXT files have not been included in Schedule S. The IS-805 command and telemetry subsystem performance is summarized in Exhibit 4.

2.4 Uplink Power Control Subsystem

IS-805 utilizes one C-band channel, 3950.0 MHz, and one Ku-band channel, 12501.0 MHz, for uplink power control ("ULPC"), antenna tracking, and ranging.

The coverage patterns of the C-band ULPC beam has gain contours that vary by less than 8 dB across the surface of the Earth and accordingly the gain at 8 dB below the peak falls beyond the edge of the Earth. Therefore, pursuant to Section 25.114(c)(4)(vi)(A) of the FCC's rules, contours for this beam are not required to be provided and the associated GXT file has not been included in Schedule S. The Ku-band ULPC channel is transmitted through the Ku-band Spot beam for which the associated GXT file is included in Schedule S. The IS-805 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 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

IS-805 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 IS-805 can accommodate television, radio, voice, and data communications. Typical communication services include:

a) Compressed digital video,

b) High speed digital data, and

c) Digital single channel per carrier ("SCPC") data channels.

4 Power Flux Density

The power flux density ("PFD") limits for space stations operating in the 3650–4200 MHz bands are contained in Section 25.208 of the Commission's rules. With respect to the frequency bands 3400–3650 MHz and 12500–12750 MHz, there are PFD limits specified in No. 21.16 of the International Telecommunication Union ("ITU") Radio Regulations.

The maximum PFD levels for the IS-805 transmissions were calculated for the 3400–4200 MHz and 12500–12750 MHz bands. The PFD levels were also calculated for the IS-805 telemetry and ULPC carriers. The results are provided in Schedule S and show that the downlink PFD levels of the IS-805 carriers do not exceed the limits specified in Section 25.208 of the Commission's rules or No. 21.16 of the ITU Radio Regulations.

5 Emission Compliance

Section 25.202(e) of the FCC's rules requires that the carrier frequency of each space station transmitter be maintained within 0.002% of the reference frequency. IS-805 is designed to be compliant with the provisions of this rule.

Intelsat will ensure that IS-805 emissions comply with the provisions of Section 25.202(f) of the Commission's rules.

6 Orbital Location

Intelsat requests that it be assigned the 169.1° E.L. orbital location for IS-805. The 169.1° E.L. location satisfies IS-805 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 Filing

IS-805's operations in the 3700–4200 MHz, 5925–6425 MHz, 12500–12750 MHz, and 14000–14250 MHz bands have been coordinated and notified under the Administration of the United States' ITU filing USASAT-60J.

IS-805's operation in the frequency bands 3400–3700 MHz, 5850–5925 MHz, and 6425–6650 MHz have been coordinated under the Administration of the United States' ITU filing USASAT-60V.

8 Coordination Statement and Certifications

The downlink Effective Isotropic Radiated Power ("EIRP") density of IS-805'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. 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 IS-805 at 169.1° E.L.

IS-805 will also operate in several bands addressed by Section 25.140(a)(3)(v).
As there are no previously authorized co-frequency space stations located within two degrees of IS-805, 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.

9 Interference Analysis

The compatibility of the proposed IS-805 emissions in the 3400-3600 MHz and 12500–12750 MHz bands with adjacent satellites located at 167.1° W.L. and 171.1° W.L. was analyzed. The interference analysis was conducted for a representative carrier in each beam type.

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) Rain attenuation predictions are derived using Recommendation ITU-R P.618.

d) Increase in noise temperature of the receiving earth station due to rain is taken into account.
e) For the cases where the transponder operates in a multi-carrier mode, the effects due to intermodulation interference are taken into account.

All assumptions and the results of the analysis are documented in Exhibit 5. Each 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 that all active units are turned off and propellant tanks are depleted. However, due to the design of IS-805, Intelsat-will not be able to vent all pressurized systems. IS-805 has two helium tanks with a volume of 68.63 liters each; the value of pressurant in each tank corresponds to the pressure data before the pressure drop began, namely 3639.74222 kPa (527.9 psia) at 17.3° C. The corresponding mass of helium in each tank is 414.0 grams.

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.

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 IS-805. Intelsat is also not aware of any system with an overlapping station-keeping volume with IS-805 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 expects to dispose of the spacecraft by moving it to a planned minimum altitude of 150 kilometers (perigee) above the geostationary arc. Intelsat has reserved 15.97 kilograms of fuel for this purpose. The propellant gauging uncertainty has been taken into account in these calculations. In addition to the nominal hold-back and reserves provided to us by the manufacturer, Intelsat propulsion engineers review the current propellant usage – particularly the mixing ratio – to properly allocate sufficient margin to account for unavailable propellant that may result from a non-optimal mixing ratio. In addition, Intelsat performs thermal gauging near the spacecraft's end of life by inferring the remaining propellant from the thermal signature. Section 25.283(d) of the Commission's rules states that satellites launched prior to March 18, 2002, such as IS-805, are not expected to meet the minimum perigee requirement of Section 25.283(a). Therefore, the IS-805 post-mission disposal plan complies with the FCC's rules.

11 TC&R Control Earth Stations

Intelsat will conduct TC&R operations through one or more of the following earth stations: Fillmore, CA; Paumalu, HI; or Mingenew, Australia. Additionally, Intelsat is capable of remotely controlling IS-805 from its facilities in McLean, VA or Long Beach, CA.

Certification Statement

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

/s/ *Alan Yates* /	August 7, 2018
Alan Yates Intelsat Senior Manager, Spectrum Engineering	Date

EXHIBIT 1

Beam Polarizations and GXT File Names

	Schedule S Beam Names							
	Linear Polarization				Circular Polarization			
Beam Designation	**Uplink**	**Uplink**	**Downlink**	**Downlink**	**Uplink**	**Uplink**	**Downlink**	**Downlink**
	(H-Pol.)	**(V-Pol.)**	**(H-Pol.)**	**(V-Pol.)**	**(LHCP)**	**(RHCP)**	**(LHCP)**	**(RHCP)**
C-Band Beams								
Asia Pacific, USA/ West Coast	HAHU	HBVU	HBHD	HAVD	----	----	----	----
Telemetry Global Horn	----	----	----	----	----	----	----	TGRD
Telemetry Omni	----	----	----	----	----	----	----	TORD
Command Global horn	----	----	----	----	CGLU	CGRU	----	----
Command Omni	----	----		----	COLU	CORU	----	----
ULPC	----	----	BGHD	----	----	----	----	----
Ku-Band Beams								
Steerable	S1HU	-----	----	S1VD	----	----	----	----
ULPC	----	----	----	BSVD	----	----	----	----

EXHIBIT 2

COMMUNICATION SUBSYSTEM UPLINK BEAM PARAMETERS

Beam Name	C-Band Linear	C-Band Linear	Ku-Band Linear
Schedule S Beam ID	HAHU	HBVU	S1HU
Frequency Band (MHz)	5850-6650	5850-6650	14000 - 14250
Polarization	Horizontal	Vertical	Horizontal
Beam Peak Gain (dBi)	24.4	24.4	33.9
G/T (dB/K)	-4.1	-4.1	6.1
Minimum SFD-- (dBW/m^2)	-96.1	-96.0	-101.6
Maximum SFD-- (dBW/m^2)	-76.1	-76.0	-79.6

EXHIBIT 3

COMMUNICATION SUBSYSTEM DOWNLINK BEAM PARAMETERS

Beam Name	C-Band Linear	C-Band Linear	Ku-Band Linear
Schedule S Beam ID	HAVD	HBHD	S1VD
Frequency Band (MHz)	3400 - 4200	3400 - 4200	12500 - 12750
Polarization	Vertical	Horizontal	Vertical
Peak Antenna Gain (dBi)	24.9	24.9	31.8
EIRP (dBW)	42.8	42.8	53.6

EXHIBIT 4

TC&R SUBSYSTEM CHARACTERISTICS

Beam Name	Command - Global	Command – Omni	Command – Omni
Schedule S Beam ID	CGLU	CORU	COLU
Frequencies (MHz)	6173.7	6176.3	6173.7
Polarization	LHCP	RHCP	LHCP
Peak Antenna Gain (dBi)	10.3	12.0	13.0
Minimum Flux Density (dBW/m^2)	-90.0	-90.0	-90.0
Maximum Flux Density (dBW/m^2)	-65.0	-65.0	-65.0

Beam Name	Telemetry - Global	Telemetry – Omni	ULPC	ULPC
Schedule S Beam ID	TGRD	TORD	BGHD	BSVD
Frequencies (MHz)	3947.5, 3948.0	3952.0, 3952.5	3950.0	12501.0
Polarization	RHCP	RHCP	Linear 45°	Vertical
Peak Antenna Gain (dBi)	11.3	12.5	13.0	31.8
Maximum Channel EIRP (dBW)	6.9	7.0	9.6	12.8

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

EXHIBIT 5

HYPOTHETICAL 167.1°E SATELLITE INTERFERENCE ANALYSIS

UPLINK BEAM INFORMATION				
Uplink Beam Name	HAHU & HBVU	HAHU & HBVU	HAHU & HBVU	HAHU & HBVU
Uplink Frequency (MHz)	5850-6650	5850-6650	5850-6650	5850-6650
Uplink Beam Polarization	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical
Uplink Beam Peak G/T (dB/K)	-4.1	-4.1	-4.1	-4.1
Uplink Beam Peak SFD (dBW/m2)	-82.1	-82.1	-82.1	-82.1
Uplink Relative Contour Level (dB)	-5	-5	-5	-5
DOWNLINK BEAM INFORMATION				
Downlink Beam Name	HAVD & HBHD	HAVD & HBHD	HAVD & HBHD	HAVD & HBHD
Downlink Frequency (MHz)	3400-4200	3400-4200	3400-4200	3400-4200
Downlink Beam Polarization	Vertical/Horizontal	Vertical/Horizontal	Vertical/Horizontal	Vertical/Horizontal
Downlink Beam Peak EIRP (dBW)	42.8	42.8	42.8	42.8
Downlink Relative Contour Level (dB)	-5	-5	-5	-5
ADJACENT SATELLITE 1				
Satellite Name	Hypothetical 165E	Hypothetical 165E	Hypothetical 165E	Hypothetical 165E
Orbital Location	165E	165E	165E	165E
Uplink Power Density (dBW/Hz)	-38.7	-38.7	-38.7	-38.7
Beam Peak Downlink EIRP Density (dBW/Hz)	-32.0	-32.0	-32.0	-32.0
ADJACENT SATELLITE 2				
Satellite Name	IS 805@169.1E	IS 805@169.1E	IS 805@169.1E	IS 805@169.1E
Orbital Location	169.1E	169.1E	169.1E	169.1E
Uplink Power Density (dBW/Hz)	-38.7	-38.7	-38.7	-38.7

Beam Peak Downlink EIRP Density (dBW/Hz)	-32.0	-32.0	-32.0	-32.0
CARRIER INFORMATION				
Carrier ID	36M0G7W	8M25G7W	1M43G7W	861KG7W
Carrier Modulation	QPSK	QPSK	QPSK	BPSK
Information Rate(kbps)	36860	8448	1024	272
Code Rate	3/4x188/204	3/4x188/204	1/2	0.431
Occupied Bandwidth(kHz)	26664.7	6111.3	1024	717
Allocated Bandwidth(kHz)	36000	8250.5	1434	861
Minimum C/N, Rain (dB)	7.3	7.3	1.8	0.8
UPLINK EARTH STATION				
Earth Station Diameter (meters)	11.0	7.5	3.7	2.4
Earth Station Gain (dBi)	54.5	51.2	45.1	41.4
Earth Station Elevation Angle	8.2	8.2	8.2	8.2
DOWNLINK EARTH STATION				
Earth Station Diameter (meters)	7.5	5.5	5.5	5.5
Earth Station Gain (dBi)	48.1	45.4	45.4	45.4
Earth Station G/T (dB/K)	29.0	27.0	27.0	27.0
Earth Station Elevation Angle	5.3	5.3	5.3	5.3
COMPOSITE LINK PERFORMANCE				
Uplink Earth Station HPA Intermodulation C/N (dB)	30.6	33.4	28.0	26.5
C/N Thermal Uplink (dB)	23.5	26.3	20.9	19.5
Uplink Interference C/I (dB)	26.4	28.8	24.2	22.0
Uplink Adjacent Satellite C/I (dB)	14.5	17.3	11.9	10.4
Intermodulation C/IM (dB)	34.9	22.2	15.0	15.1
Downlink Thermal C/N (dB)	19.7	20.2	14.5	13.1
Downlink Interference C/I (dB)	23.9	24.3	25.0	18.1

Downlink Adjacent Satellite C/I (dB)	12.8	12.4	6.8	5.3
Subtotal C/N (dB)	9.6	10.0	4.5	3.0
Antenna Mispointing and Other Losses (dB)	1.5	1.5	1.5	1.5
Total C/N (dB)	8.1	8.5	3.0	1.5
Minimum Required C/N (dB)	7.3	7.3	1.8	0.8
Number of Carriers	2	3	13	23
CARRIER DENSITY LEVELS				
Uplink Power Density (dBW/Hz)	-51.5	-45.4	-44.7	-42.5
Downlink EIRP Density At Beam Peak (dBW/Hz)	-36.9	-34.5	-40.1	-41.5

UPLINK BEAM INFORMATION				
Uplink Beam Name	S1HU	S1HU	S1HU	S1HU
Uplink Frequency (MHz)	14000-14250	14000-14250	14000-14250	14000-14250
Uplink Beam Polarization	Horizontal	Horizontal	Horizontal	Horizontal
Uplink Beam Peak G/T (dB/K)	6.1	6.1	6.1	6.1
Uplink Beam Peak SFD (dBW/m2)	-85.6	-85.6	-85.6	-85.6
Uplink Relative Contour Level (dB)	-3	-3	-3	-3
DOWNLINK BEAM INFORMATION				
Downlink Beam Name	S1VD	S1VD	S1VD	S1VD
Downlink Frequency (MHz)	12500-12750	12500-12750	12500-12750	12500-12750
Downlink Beam Polarization	Vertical	Vertical	Vertical	Vertical
Downlink Beam Peak EIRP (dBW)	53.6	53.6	53.6	53.6
Downlink Relative Contour Level (dB)	-4	-4	-4	-4
ADJACENT SATELLITE 1				
Satellite Name	Hypothetical 165E	Hypothetical 165E	Hypothetical 165E	Hypothetical 165E
Orbital Location	165E	165E	165E	165E
Uplink Power Density (dBW/Hz)	-50.0	-50.0	-50.0	-50.0

Beam Peak Downlink EIRP Density (dBW/Hz)	-20.0	-20.0	-20.0	-20.0
ADJACENT SATELLITE 2				
Satellite Name	IS805@169.1 E	IS805@169.1 E	IS805@169.1 E	IS805@169.1 E
Orbital Location	169.1E	169.1E	169.1E	169.1E
Uplink Power Density (dBW/Hz)	-50.0	-50.0	-50.0	-50.0
Beam Peak Downlink EIRP Density (dBW/Hz)	-20.0	-20.0	-20.0	-20.0
CARRIER INFORMATION				
Carrier ID	36M0G7W	8M25G7W	1M43G7W	861KG7W
Carrier Modulation	QPSK	QPSK	QPSK	BPSK
Information Rate(kbps)	36860	8448	1024	272
Code Rate	3/4x188/204	3/4	1/2	0.431
Occupied Bandwidth(kHz)	26664.7	6111.3	1024	717
Allocated Bandwidth(kHz)	36000	8250.5	1434	861
Minimum C/N, Rain (dB)	7.3	7.3	1.8	0.8
UPLINK EARTH STATION				
Earth Station Diameter (meters)	4.0	4.0	2.4	1.8
Earth Station Gain (dBi)	53.1	53.1	48.7	46.2
Earth Station Elevation Angle	8.5	8.5	8.5	8.5
DOWNLINK EARTH STATION				
Earth Station Diameter (meters)	4.0	4.0	2.4	2.4
Earth Station Gain (dBi)	51.4	51.4	47.0	47.0
Earth Station G/T (dB/K)	29.0	29.0	25.0	25.0
Earth Station Elevation Angle	7.9	7.9	7.9	7.9
COMPOSITE LINK PERFORMANCE				
Uplink Earth Station HPA Intermodulation C/N (dB)	26.7	25.2	24.0	22.5
C/N Thermal Uplink (dB)	21.6	20.0	18.9	17.4
Uplink Interference C/I (dB)	200.0	200.0	200.0	200.0
Uplink Adjacent Satellite C/I (dB)	21.9	20.4	19.3	17.8
Intermodulation C/IM (dB)	37.8	26.2	25.1	24.7
Downlink Thermal C/N (dB)	19.6	17.8	12.6	11.1

Downlink Interference C/I (dB)	28.6	28.2	25.6	25.3
Downlink Adjacent Satellite C/I (dB)	15.1	14.1	8.4	6.9
Subtotal C/N (dB)	12.3	11.0	6.4	4.9
Antenna Mispointing and Other Losses (dB)	1.5	1.5	1.5	1.5
Total C/N (dB)	10.8	9.5	4.9	3.4
Minimum Required C/N (dB)	7.3	7.3	1.8	0.8
Number of Carriers	2	4	14	15
CARRIER DENSITY LEVELS				
Uplink Power Density (dBW/Hz)	-53.6	-55.1	-51.9	-50.9
Downlink EIRP Density At Beam Peak (dBW/Hz)	-26.7	-27.9	-29.1	-30.5

HYPOTHETICAL 171.1°E SATELLITE INTERFERENCE ANALYSIS

UPLINK BEAM INFORMATION				
Uplink Beam Name	HAHU & HBVU	HAHU & HBVU	HAHU & HBVU	HAHU & HBVU
Uplink Frequency (MHz)	5850-6650	5850-6650	5850-6650	5850-6650
Uplink Beam Polarization	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical	Horizontal/Vertical
Uplink Beam Peak G/T (dB/K)	-4.1	-4.1	-4.1	-4.1
Uplink Beam Peak SFD (dBW/m2)	-82.2	-82.2	-82.2	-82.2
Uplink Relative Contour Level (dB)	-5	-5	-5	-5
DOWNLINK BEAM INFORMATION				
Downlink Beam Name	HAVD & HBHD	HAVD & HBHD	HAVD & HBHD	HAVD & HBHD
Downlink Frequency (MHz)	3400-4200	3400-4200	3400-4200	3400-4200
Downlink Beam Polarization	Vertical/Horizontal	Vertical/Horizontal	Vertical/Horizontal	Vertical/Horizontal
Downlink Beam Peak EIRP (dBW)	42.8	42.8	42.8	42.8

Downlink Relative Contour Level (dB)	-5	-5	-5	-5
ADJACENT SATELLITE 1				
Satellite Name	Hypothetical 173E	Hypothetical 173E	Hypothetical 173E	Hypothetical 173E
Orbital Location	173E	173E	173E	173E
Uplink Power Density (dBW/Hz)	-38.7	-38.7	-38.7	-38.7
Beam Peak Downlink EIRP Density (dBW/Hz)	-32.0	-32.0	-32.0	-32.0
ADJACENT SATELLITE 2				
Satellite Name	IS 805@169.1E	IS 805@169.1E	IS 805@169.1E	IS 805@169.1E
Orbital Location	169.1E	169.1E	169.1E	169.1E
Uplink Power Density (dBW/Hz)	-38.7	-38.7	-38.7	-38.7
Beam Peak Downlink EIRP Density (dBW/Hz)	-32.0	-32.0	-32.0	-32.0
CARRIER INFORMATION				
Carrier ID	36M0G7W	8M25G7W	1M43G7W	861KG7W
Carrier Modulation	QPSK	QPSK	QPSK	BPSK
Information Rate(kbps)	36860	8448	1024	272
Code Rate	3/4x188/204	3/4x188/204	1/2	0.431
Occupied Bandwidth(kHz)	26664.7	6111.3	1024	717
Allocated Bandwidth(kHz)	36000	8250.5	1434	861
Minimum C/N, Rain (dB)	7.3	7.3	1.8	0.8
UPLINK EARTH STATION				
Earth Station Diameter (meters)	11.0	7.5	3.7	2.4
Earth Station Gain (dBi)	54.5	51.2	45.1	41.4
Earth Station Elevation Angle	8.2	8.2	8.2	8.2
DOWNLINK EARTH STATION				
Earth Station Diameter (meters)	7.5	5.5	5.5	5.5
Earth Station Gain (dBi)	48.1	45.4	45.4	45.4
Earth Station G/T (dB/K)	29.0	27.0	27.0	27.0

Earth Station Elevation Angle	5.3	5.3	5.3	5.3
COMPOSITE LINK PERFORMANCE				
Uplink Earth Station HPA Intermodulation C/N (dB)	30.6	33.4	28.0	26.5
C/N Thermal Uplink (dB)	23.5	26.3	20.9	19.5
Uplink Interference C/I (dB)	26.4	28.8	24.2	22.0
Uplink Adjacent Satellite C/I (dB)	14.5	17.3	11.9	10.4
Intermodulation C/IM (dB)	34.9	22.2	15.0	15.1
Downlink Thermal C/N (dB)	19.7	20.2	14.5	13.1
Downlink Interference C/I (dB)	23.9	24.3	25.0	18.1
Downlink Adjacent Satellite C/I (dB)	12.8	12.4	6.8	5.3
Subtotal C/N (dB)	9.6	10.0	4.5	3.0
Antenna Mispointing and Other Losses (dB)	1.5	1.5	1.5	1.5
Total C/N (dB)	8.1	8.5	3.0	1.5
Minimum Required C/N (dB)	7.3	7.3	1.8	0.8
Number of Carriers	2	3	13	23
CARRIER DENSITY LEVELS				
Uplink Power Density (dBW/Hz)	-51.5	-45.4	-44.7	-42.5
Downlink EIRP Density At Beam Peak (dBW/Hz)	-36.9	-34.5	-40.1	-41.5

UPLINK BEAM INFORMATION				
Uplink Beam Name	S1HU	S1HU	S1HU	S1HU
Uplink Frequency (MHz)	14000-14250	14000-14250	14000-14250	14000-14250
Uplink Beam Polarization	Horizontal	Horizontal	Horizontal	Horizontal
Uplink Beam Peak G/T (dB/K)	6.1	6.1	6.1	6.1
Uplink Beam Peak SFD (dBW/m2)	-85.6	-85.6	-85.6	-85.6
Uplink Relative Contour Level (dB)	-3	-3	-3	-3
DOWNLINK BEAM INFORMATION				
Downlink Beam Name	S1VD	S1VD	S1VD	S1VD
Downlink Frequency (MHz)	12500-12750	12500-12750	12500-12750	12500-12750
Downlink Beam Polarization	Vertical	Vertical	Vertical	Vertical
Downlink Beam Peak EIRP (dBW)	53.6	53.6	53.6	53.6
Downlink Relative Contour Level (dB)	-4	-4	-4	-4
ADJACENT SATELLITE 1				
Satellite Name	Hypothetical 173E	Hypothetical 173E	Hypothetical 173E	Hypothetical 173E
Orbital Location	173E	173E	173E	173E
Uplink Power Density (dBW/Hz)	-50.0	-50.0	-50.0	-50.0
Beam Peak Downlink EIRP Density (dBW/Hz)	-20.0	-20.0	-20.0	-20.0
ADJACENT SATELLITE 2				
Satellite Name	IS 805@169.1E	IS 805@169.1E	IS 805@169.1E	IS 805@169.1E
Orbital Location	169.1E	169.1E	169.1E	169.1E
Uplink Power Density (dBW/Hz)	-50.0	-50.0	-50.0	-50.0
Beam Peak Downlink EIRP Density (dBW/Hz)	-20.0	-20.0	-20.0	-20.0
CARRIER INFORMATION				
Carrier ID	36M0G7W	8M25G7W	1M43G7W	861KG7W
Carrier Modulation	QPSK	QPSK	QPSK	BPSK
Information Rate(kbps)	36860	8448	1024	272
Code Rate	3/4x188/204	3/4	1/2	0.431
Occupied Bandwidth(kHz)	26664.7	6111.3	1024	717

Allocated Bandwidth(kHz)	36000	8250.5	1434	861
Minimum C/N, Rain (dB)	7.3	7.3	1.8	0.8
UPLINK EARTH STATION				
Earth Station Diameter (meters)	4.0	4.0	2.4	1.8
Earth Station Gain (dBi)	53.1	53.1	48.7	46.2
Earth Station Elevation Angle	8.5	8.5	8.5	8.5
DOWNLINK EARTH STATION				
Earth Station Diameter (meters)	4.0	4.0	2.4	2.4
Earth Station Gain (dBi)	51.4	51.4	47.0	47.0
Earth Station G/T (dB/K)	29.0	29.0	25.0	25.0
Earth Station Elevation Angle	7.9	7.9	7.9	7.9
COMPOSITE LINK PERFORMANCE				
Uplink Earth Station HPA Intermodulation C/N (dB)	26.7	25.2	24.0	22.5
C/N Thermal Uplink (dB)	21.6	20.0	18.9	17.4
Uplink Interference C/I (dB)	200.0	200.0	200.0	200.0
Uplink Adjacent Satellite C/I (dB)	21.9	20.4	19.3	17.8
Intermodulation C/IM (dB)	37.8	26.2	25.1	24.7
Downlink Thermal C/N (dB)	19.6	17.8	12.6	11.1
Downlink Interference C/I (dB)	28.6	28.2	25.6	25.3
Downlink Adjacent Satellite C/I (dB)	15.1	14.1	8.4	6.9
Subtotal C/N (dB)	12.3	11.0	6.4	4.9
Antenna Mispointing and Other Losses (dB)	1.5	1.5	1.5	1.5
Total C/N (dB)	10.8	9.5	4.9	3.4
Minimum Required C/N (dB)	7.3	7.3	1.8	0.8
Number of Carriers	2	4	14	15
CARRIER DENSITY LEVELS				
Uplink Power Density (dBW/Hz)	-53.6	-55.1	-51.9	-50.9
Downlink EIRP Density At Beam Peak (dBW/Hz)	-26.7	-27.9	-29.1	-30.5