Engineering Statement

1 Introduction

Intelsat License LLC, as debtor in possession ("Intelsat"), seeks authority in this amendment to operate Galaxy 25 (S2154) to 66.13°E.L./293.87° W.L. The characteristics of the satellite, as well as its compliance with the various provisions of Part 25 of the Federal Communications Commission's ("FCC" or "Commission") rules,[1] are provided in this Engineering Statement and the accompanying Schedule S and GXT files.

2 Satellite Overview

Galaxy 25 is capable of operating in C-band and Ku-band frequencies listed below:

Direction	Frequency
Uplink	5925-6425 MHz
	14000-14500 MHz
Downlink	3700-4200 MHz
	11700-12200 MHz

The satellite provides the following coverage:

- C-band: Europe, North Africa, Middle East, and Asia
- Ku-band: Europe, North Africa, Middle East, and Asia

3 Satellite Characteristics

Galaxy 25 is a Space Systems Loral three-axis stabilized type satellite that has a rectangular outer body structure. Galaxy 25 utilizes two deployable solar array wings and a number of deployable and non-deployable antennas.

The Galaxy 25 satellite is composed of the following subsystems: thermal; power; attitude control; propulsion; telemetry, command and ranging ("TC&R"); ulink power control ("UPLC); and communications. These subsystems maintain the correct position and attitude of the satellite; ensure that all internal units are maintained within the required temperature range; and ensure that the satellite can be commanded and controlled with a high level of reliability from launch to the end of its useful life. The satellite design incorporates redundancy in each of the various subsystems in order to avoid single-point failures.

[1] Unless otherwise stated, all references to rule sections in this document refer to sections in Title 47 of the Code of Federal Regulations.

The structural design of Galaxy 25 provides mechanical support for all subsystems. The structure supports the communication antennas, solar arrays, and thrusters. It also provides a stable platform for preserving the alignment of critical elements of the satellite.

3.1 Communication Subsystem

Galaxy 25 provides active communication channels in C- and Ku-band. The frequencies, polarization, channel plans, coverage contours, and performance characteristics for both bands are provided in Schedule S.

Exhibits 1 and 2 provide the beam parameters for the C- and Ku-band uplink and downlink beams, respectively, and Exhibit 4 provides the Schedule S beam designations.

3.2 Telemetry, Command and Ranging Subsystem

The TC&R subsystem provides the following functions:

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

The Galaxy 25 command and telemetry channel frequencies and performance are shown in Exhibit 3 and in Schedule S. The coverage patterns of the 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), contours for these beams are not required to be provided and the associated GXT files have not been included in Schedule S.

3.2.1 TC&R Earth Stations

Intelsat will conduct TC&R operations through one or more of the following earth stations: Kumsan, Korea; Mingenew, Australia; Hartebeeshoek, South Africa and Fucino, Italy. Additionally, Intelsat is capable of remotely controlling Galaxy 25 from its facilities in McLean, VA or in Long Beach, CA.

3.3 Uplink Power Control Subsystem

Galaxy 25 utilizes two Ku-band channels for 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, which results in the gain at 8 dB below the peak falling beyond the edge of the Earth. Therefore, consistent with pursuant to Section 25.114(c)(4)(vi)(A), the associated GXT files have not been included in Schedule S. The Galaxy 25 ULPC frequencies and subsystem performance are summarized in Exhibit 3.

3.4 Satellite Station-Keeping

The satellite will be maintained within 0.05° of its nominal longitudinal position in the east-west direction in compliance with Section 25.210(j).

The attitude of the satellite 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.).

4 Services

Galaxy 25 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 Galaxy 25 can provide a range of communications services, including compressed digital video, high speed digital data, and digital single channel per carrier data channels.

5 Power Flux Density

The power flux density limits for space stations operating in the C- and Ku-band is specified in Section 25.208. As provided in Schedule S, the Galaxy 25 transmissions do not exceed these limits.

6 Emission Compliance

Section 25.202(e) requires that the carrier frequency of each space station transmitter be maintained within 0.002% of the reference frequency. Galaxy 25 is designed to be compliant with the provisions of this rule.

Galaxy 25 will comply with the provisions of Section 25.202(f) with regard to its emissions.

7 Orbital Location

Intelsat requests that it be assigned the 66.125° E.L/293.875°W.L. orbital location for Galaxy 25. This location satisfies Galaxy 25 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. Although 66.125° E.L. was entered into Schedule S, the Schedule S software rounded it to 66.0°E.L.

8 Request for Non-objection

Galaxy 25's operations in the 11700-12200 MHz band will rely on the INTELSAT KUEXT 66E International Telecommunication Union filing of the Administration of the United Kingdom. Intelsat respectfully requests that the U.S. Administration state its non-objection to the United Kingdom's use of Galaxy 25 for purposes of bringing into use the United Kingdom's INTELSAT KUEXT 66E filing at the 66.0° E.L. orbital location.

9 Coordination Statement and Certifications

The downlink effective isotropic radiated power ("EIRP") density of the satellite's transmissions in the conventional C-band will not exceed 3 dBW/4kHz for digital transmissions or

8 dBW/4kHz for analog transmissions; in the Ku-band the downlink EIRP density will not exceed 14 dBW/4kHz for digital transmissions or 17 dBW/4kHz for analog transmissions.

The associated uplink transmissions in both bands will not exceed the applicable EIRP density envelope in Section 25.218 unless the non-routine levels are coordinated.

In all cases, Intelsat will comply with all applicable coordination agreements.

10 Orbital Debris Mitigation Plan

Intelsat is proactive in ensuring safe operation and disposal of all satellites under its control. The four elements of debris mitigation are addressed below.

10.1 Satellite Hardware Design

The satellite is designed such that no debris will be released during normal operations. Intelsat has assessed the probability of collision with meteoroids and other debris. In order to limit the effects of such unlikely collisions critical satellite components are located inside the protective body of the satellite and are properly shielded. The satellite 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 satellite 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 satellite, Intelsat will ensure that 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 Flights 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 Galaxy 25. Intelsat is also not aware of any system with an overlapping station-keeping volume with Galaxy 25 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 intends to dispose of the satellite by moving it to an altitude of at least 300 kilometers above the geostationary arc as previously stated. Intelsat has reserved 78.40 kilograms of bi-propellent for this purpose.[2]

In calculating the disposal orbit, Intelsat has used simplifying assumptions as permitted under the Commission's 2004 Orbital Debris Report and Order.[3] The effective area to mass ratio (Cr*A/M) of the Galaxy 25 satellite is 0.059 m^2/kg, resulting in a minimum perigee disposal altitude under the Inter-Agency Space Debris Coordination Committee formula of 299.8 kilometers above the geostationary arc. Accordingly, the satellite's planned disposal orbit complies with the FCC's rules.

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[2] The reserved propellant figure is an estimate. The figure calculation takes into account the expected mass of the satellite at the end of life and the required delta-velocity to achieve the desired orbit.

[3] *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/ Giselle Creeser Dec 10, 2021

Date

Giselle Creeser
Director, Spectrum Policy and
Engineering, Intelsat US LLC
on behalf of Intelsat License LLC

EXHIBIT 1

COMMUNICATION SUBSYSTEM UPLINK BEAM PARAMETERS

Beam Name	C-band Beam	C-band Beam	Ku-band Beam	Ku-band Beam
Schedule S Beam ID	NCHU	NCVU	NKHU	NKVU
Frequency Band (MHz)	5925-6425	5925-6425	14000-14500	14000-14500
Polarization	Horizontal	Vertical	Horizontal	Vertical
G/T (dB/K)	3.9	3.0	2.5	2.9
Minimum SFD-- (dBW/m^2)	-97.9	-95.8	-98.4	-97.4
Maximum SFD-- (dBW/m^2)	-76.9	-74.8	-77.4	-76.4

EXHIBIT 2

COMMUNICATION SUBSYSTEM DOWNLINK BEAM PARAMETERS

Beam Name	C-band Beam	C-band Beam	Ku-band Beam	Ku-band Beam
Schedule S Beam ID	NCHD	NCVD	NKHD	NKVD
Frequency Band (MHz)	3700-4200	3700-4200	11700-12200	11700-12200
Polarization	Horizontal	Vertical	Horizontal	Vertical
EIRP (dBW)	40.5	40.0	50.3	51.4
Maximum Beam Peak EIRP Density (dBW/4kHz)	1.0	0.5	12.0	13.1

EXHIBIT 3

TC&R SUBSYSTEM CHARACTERISTICS

Beam Name	Command Omni	Command Global
Schedule S Beam ID	CMDC	CMDB
Frequencies (MHz)	5926.5	6423.5
Polarization	Vertical	Horizontal
Peak Flux Density at Command Threshold (dBW/m^2-Hz)	-90.0	-90.0

Beam Name	Telemetry Omni	ULPC Global	Telemetry Global	ULPC Omni
Schedule S Beam ID	TLMC	UPC1	TLMB	UPCC
Frequencies (MHz)	4195.5	11702.0	4199.5	12198.0
Polarization	Vertical	Horizontal	Vertical	Vertical
Maximum Channel EIRP (dBW)	22.4	24.8	21.4	23
Maximum Beam Peak EIRP Density (dBW/4kHz)	1.4	16.8	0.4	15.0

EXHIBIT 4

Beam Polarizations and GXT File Names

	Schedule S Beam Names							
	Linear Polarization				**Circular Polarization**			
Beam Designation	**Uplink (H-Pol.)**	**Uplink (V-Pol.)**	**Downlink (H-Pol.)**	**Downlink (V-Pol.)**	**Uplink (LHCP)**	**Uplink (RHCP)**	**Downlink (LHCP)**	**Downlink (RHCP)**
C-band Beams								
C-band Beam	NCHU	NCVU	NCHD	NCVD	----	----	----	----
Telemetry Omni	----	----	----	TLMC*	----	----	----	----
Telemetry Global	----	----	----	TLMB*	----	----	----	----
Command Global horn	CMDB*	----	----	----	----	----	----	----
Command Omni	----	CMDC*	----	----	----	----	----	----
Ku-band Beams								
Ku-band Beam	NKHU	NKVU	NKHD	NKVD	----	----	----	----
Ku-band ULPC Omni	----	----	----	UPCC*	----	----	----	----
Ku-band Telemetry Global	----	----	UPC1*	----	----	----	----	----

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