Engineering Statement

1 Introduction

Intelsat License LLC ("Intelsat") seeks authority in this application to operate the Galaxy 17 satellite (S2715) at the 85.0° W.L. orbital location. 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.

2 Spacecraft Overview

Galaxy 17 has the capability to operate in the following C- and Ku-band frequencies at 85.0° W.L.

Direction	Frequency
Uplink	5925-6425 MHz
	14000-14500 MHz
Downlink	3700-4200 MHz[2]
	11700-12200 MHz

The spacecraft provides the following coverage at 85.0 °W.L.:

Beam Name	Coverage Area	Frequency Band
C- CONUS	CONUS, Alaska, Hawaii, Canada, Mexico, and Caribbean	C-band
Ku- CONUS	CONUS, Alaska, Hawaii, Canada, Mexico, and Caribbean	Ku-band

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

[2] Following completion of the C-band transition, the Galaxy 17 satellite will not downlink in the 3700-4000 MHz frequency band to fixed earth stations in the contiguous United States, except as allowed at two consolidated TT&C/Gateway locations in Brewster, Washington and Andover, Maine. *See Expanding Flexible Use of the 3.7 to 4.2 GHz Band*, Report and Order and Order of Proposed Modification, 35 FCC Rcd 2343, ¶ 134 (2020).

2.1 Spacecraft Characteristics

Galaxy 17 is a Thales SB3000 three-axis stabilized spacecraft with a rectangular outer-body structure. Galaxy 17 utilizes two deployable solar array wings and two mechanically adjustable reflectors (East, West).

The Galaxy 17 satellite is composed of the following subsystems:

- thermal;
- power;
- attitude control;
- propulsion;
- telemetry, tracking, and command ("TT&C");
- uplink power control ("ULPC"); and
- 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 subsystems in order to avoid single-point failures.

The structural design of Galaxy 17 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 spacecraft.

2.2 Communication Subsystem

The Galaxy 17 C- and Ku-band frequencies, polarization, channel plans, coverage contours, and performance characteristics 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.

2.3 TT&C Subsystem

The TT&C 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 satellite's command and telemetry channel frequencies and performance are shown in Exhibit 3. 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 visible 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.

2.4 ULPC Subsystem

Galaxy 17 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 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 with Schedule S. Galaxy 17 ’s ULPC frequencies and subsystem performance are summarized in Exhibit 3.

2.5 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 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

Galaxy 17 is a general-purpose communications satellite and has been designed to support various services offered within the Intelsat communications system. Depending upon the needs of the users, the transponders on Galaxy 17 can provide a range of communications services, including compressed digital video, high speed digital data, and digital single carrier per channel data channels.

4 Power Flux Density

The power flux density limits for space stations operating in the C- and Ku-band specified in Section 25.208. As provided in Schedule S, the Galaxy 17 transmissions do not exceed these limits.

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. Galaxy 17 is designed to be compliant with the provisions of this rule.

Galaxy 17 will comply with the provisions of Section 25.202(f) with regard to its emissions.

6 Orbital Location

Intelsat requests that Galaxy 17 be assigned the 85.0° W.L. orbital location. The 85.0° W.L. location satisfies Galaxy 17 requirements for optimizing coverage, elevation angles, and service availability.

7 International Telecommunication Union Filing

Galaxy 17 's operations in the 3700-4200 MHz, 5925-6425 MHz, frequency bands will use the notified USASAT-24U and USASAT-35Q filings under the Administration of the United States.

Galaxy 17 's operations in the 11700-12200 MHz, 14000-14500 MHz, frequency will use the notified USASAT-24U, USASAT-35Q, USASAT-9C filings under the Administration of the United States.

8 Coordination with Co-frequency Space Stations

The downlink equivalent isotropically radiated power ("EIRP") density of the satellite's transmissions in the conventional C-band will not exceed 3 dBW/4 kHz for digital transmissions or 8 dBW/4 kHz for analog transmissions. The associated uplink transmissions will not exceed applicable EIRP density envelopes in Section 25.218 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 Galaxy 17 at 85.0° W.L.

The downlink EIRP density of the satellite's transmissions in the conventional 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 Section 25.218 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 Galaxy 17 at 85.0° W.L.

9 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.

9.1 Spacecraft Hardware Design

Galaxy 17 is designed such that no debris will be released during normal operations. Intelsat has assessed the probability of collision with meteoroids and small 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.

9.2 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 the removal of all stored energy on the spacecraft by depleting all propellant tanks to the extent possible,[3] venting all pressurized systems, and by leaving the batteries in a permanent discharge state.

9.3 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 Commission, having an overlapping station-keeping volume with Galaxy 17. Intelsat is also not aware of any system with an overlapping station-keeping volume with the satellite that is the subject of an International Telecommunication Union filing and that is either in orbit or progressing towards launch.

---

[3] Intelsat intends to vent the fuel and oxidizer tanks in the end-of-life shutdown procedure. It is prevented technically, however, from venting the helium tanks, which were sealed by firing pyrotechnic valves shortly after launch in 2007. *See* Legal Narrative at Section IV (waiver request).

9.4 Post Mission Disposal

At the end of the mission, Intelsat will dispose of the spacecraft by moving it to an altitude of at least 300 kilometers above the geostationary arc. Intelsat has reserved 44.21 kilograms of propellant for that purpose.

In calculating the disposal orbit, Intelsat has used simplifying assumptions as permitted under the Commission's Orbital Debris Report and Order.[4] The effective area to mass ratio (Cr*A/M) of Galaxy 17 spacecraft is 0.053 m^2/kg, resulting in a minimum perigee disposal altitude under the Inter-Agency Space Debris Coordination Committee formula of 292.4 kilometers above the geostationary arc. Accordingly, the Galaxy 17 planned disposal orbit complies with the FCC's rules.

The reserved propellant figure is an estimate. This figure is 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.

10 TT&C Control Earth Stations

Intelsat will conduct TT&C operations through earth stations at one or more of the following teleports: Napa, California; Riverside, California; Castle Rock, Colorado; Hagerstown, Maryland; Atlanta, Georgia; Fillmore, California; Andover, Maine and Brewster, Washington. Additionally, Intelsat is capable of remotely controlling Galaxy 17 from its facilities in McLean, Virginia or in Long Beach, California.

[4] *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	May 19, 2023
Giselle Creeser Intelsat US LLC Director, Spectrum Policy and Engineering	Date

EXHIBIT 1

COMMUNICATION SUBSYSTEM UPLINK BEAM PARAMETERS

Beam Name	C-band	C-band	Ku-band	Ku-band
Schedule S Beam ID	CAVU	CAHU	NKHU	NKVU
Frequency Band (MHz)	5925-6425	5925-6425	14000-14500	14000-14500
Polarization	Vertical	Horizontal	Horizontal	Vertical
G/T (dB/K)	5.4	5.4	7.1	7.2
Minimum SFD--(dBW/m^2)	-117.0	-116.8	-117.2	-116.5
Maximum SFD--(dBW/m^2)	-69.7	-69.5	-69.1	-68.4

EXHIBIT 2

COMMUNICATION SUBSYSTEM DOWNLINK BEAM PARAMETERS

Beam Name	C-band	C-band	Ku-band	Ku-band
Schedule S Beam ID	CAHD	CAVD	NKVD	NKHD
Frequency Band (MHz)	3700-4200	3700-4200	11700-12200	11700-12200
Polarization	Horizontal	Vertical	Vertical	Horizontal
Maximum Beam Peak EIRP Density (dBW/Hz)	-30.7	-31.2	-23.4	-23.9
Maximum Beam Peak EIRP (dBW)	44.9	44.4	52.2	51.7
Maximum Beam Peak EIRP Density (dBW/4kHz)	5.4	4.9	12.7	12.2

EXHIBIT 3

TT&C SUBSYSTEM CHARACTERISTICS

Beam Name	Command 1 dish	Command 1 Omni	Command 2 dish	Command 2 Omni
Schedule S Beam ID	CMD1	CMD2	CMD3	CMD4
Frequencies (MHz)	5925.5	5925.5	6424.5	6424.5
Polarization	Horizontal	LHCP	Vertical	RHCP
Peak Flux Density at Command Threshold (dBW/m^2)	-104.8	-104.8	-92.5	-92.5

Beam Name	Telemetry 1 dish	Telemetry 1 Omni	Telemetry 2 dish	Telemetry 2 Omni	ULPC1	ULPC2
Schedule S Beam ID	TLMA	TLMB	TLMD	TLME	UPC1	UPC2
Frequencies (MHz)	4197.125	4197.125	4198.875	4198.875	11701	12195
Polarization	Horizontal	LHCP	Horizontal	LHCP	Vertical	Horizontal
Maximum Channel EIRP (dBW)	19.5	19.5	19.5	19.5	21.0	21.4
Maximum Beam Peak EIRP Density (dBW/4kHz)	0.1	0.1	0.1	0.1	13.0	13.4
Maximum Beam Peak EIRP Density (dBW/Hz)	-35.9	-35.9	-35.9	-35.9	-22.0	-22.6

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

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-CONUS	CAHU	CAVU	CAHD	CAVD	----	----	----	----
Ku-band Beams								
Ku-CONUS	NKHU	NKVU	NKHD	NKVD	----	----	----	----
Telemetry Dish	----	----	TLMA* TLMD*	----	----	----	----	----
Telemetry Omni	----	----	----	----	----	----	TLMB* TLME*	----
Command Dish	CMD1*	CMD3*	----	----	----	----	----	----
Command Omni	----	----	----	----	CMD2*	CMD4*	----	----
Ku-band ULPC	----	----	UPC2*	UPC1*	----	----	----	----

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