Engineering Statement

1 Introduction

Intelsat License LLC ("Intelsat") seeks authority in this application to drift and operate the Galaxy 28 satellite (S2160) from 89.0° W.L. to the 88.7° W.L. orbital location.

Together with the accompanying Schedule S and .gxt files, Intelsat herein provides supporting information relating to this modification and compliance with the various provisions of Part 25 of the Federal Communication Commission's ("FCC or "Commission") rules.[1]

2 Spacecraft Overview

Galaxy 28 is capable of operating in the following C-, Ku-, and Ka-band frequencies:

Direction	Frequency[2]
Uplink	5925-6425 MHz
	14000-14500 MHz
	29500-30000 MHz
Downlink	3700-4200 MHz
	11700-12200 MHz
	19700-20200 MHz

The coverage area of spacecraft is provided in the Schedule S and the .gxt files.

2.1 Spacecraft Characteristics

Galaxy 28 is a Maxar FS1300-0 three-axis stabilized spacecraft with a rectangular outer-body structure. Galaxy 28 utilizes two deployable solar array wings, four mechanically adjustable reflectors to operate in C- and Ku-bands.

The Galaxy 28 spacecraft is composed of the following subsystems:

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[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] Intelsat is not seeking authority to operate the Ka-band payload on Galaxy 28. *See* Legal Narrative at 3, fn. 13.

- 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 28 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 characteristics of the satellite's C- and Ku-band communication subsystem is provided in Schedule S. The Schedule S beam designations are provided in Exhibit 1.

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 provided in Schedule S. 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 are not included in Schedule S.

2.4 ULPC Subsystem

Galaxy 28 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 28's ULPC frequencies and subsystem performance are summarized in the Schedule S.

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 28 is a general-purpose communications satellite and has been designed to support various services offered within the Intelsat satellite system. Depending upon customer needs, the transponders on Galaxy 28 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-bands are specified in Section 25.208. As provided in Schedule S, the Galaxy 28 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 28 is designed to be compliant with the provisions of this rule.

Galaxy 28 will comply with the provisions of Section 25.202(f) with regard to its emissions.

6 Orbital Location

Intelsat requests that Galaxy 28 be assigned the 88.7° W.L. orbital location. The 88.7° W.L. location satisfies Galaxy 28 requirements for optimizing coverage, elevation angles, and service availability.

7 International Telecommunication Union Filing

Galaxy 28's operations in the 3700-4200 MHz, 5925-6425 MHz, and 11700-12200 MHz,14000-145000 MHz frequency bands will use the notified and coordinated USASAT-24E, USASAT-35O and USASAT- 66F filings under the Administration of the United States.

8 Coordination Statement and Certifications

The downlink equivalent isotropically radiated power ("EIRP") density of the satellite's digital transmissions will not exceed 3 dBW/4 kHz in the conventional C-band and 14 dBW/4kHz in the conventional and extended Ku-band.

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 88.7° 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 28 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, 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 28. 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.

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 89.2 kilograms of bi-propellant for that purpose.

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 28 satellite is 0.048 m^2/kg, resulting in a minimum perigee disposal altitude under the Inter-Agency Space Debris Coordination Committee formula of 298.9 kilometers above the geostationary arc. Accordingly, the satellite's 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.

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

10 TT&C Control Earth Stations

Intelsat will conduct TT&C operations through earth stations at one or more of the following teleports: Fillmore, California; Napa, California; Nuevo, California; Castle Rock, Colorado; Ellenwood, Georgia; Haleiwa, Hawaii; Andover, Maine; Hagerstown, Maryland; and Brewster, Washington. Additionally, Intelsat is capable of remotely controlling Galaxy 28 from its facilities in Long Beach, California and McLean, Virginia.

11 Miscellaneous

Intelsat entered the orbital location as 88.7° W.L. into Schedule S, however, the Schedule S software rounded the number to 88.0° W.L.

In the Schedule S form Intelsat is unable to select a response for whether the polarization is switchable for the Ku-band receiving and transmitting beams, as the selections are greyed out and unavailable. The "Polarization Switchable" should be "Yes" for all Ku-band receiving and transmitting beams.

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	March 27, 2024
Giselle Creeser Intelsat US LLC Director, Spectrum Engineering	Date

EXHIBIT 1

C-Band: CAHU, CAVU, CAHD, CAVD

Ku-band: KUHU, KUVU, KUH1, KUV1, KUHD, KUVD, KUH2, KUV2,

Telemetry: TLMD, TLMO, TLMP, TLMM,

Command: CMD1, CMD2, CMD3, CMD4

ULPC: UPC1