Engineering Statement

1 Introduction

Intelsat License LLC ("Intelsat") seeks authority in this application to redeploy the satellite designated as Intelsat 5 (Call Sign S2704) to 137.0° W.L. (223° E.L). The characteristics of the Intelsat 5 spacecraft, as well as its compliance with the various provisions of Part 25 of the Federal Communications Commission's ("FCC or "Commission") rules, are provided in this Engineering Statement, which also updates the beam gain contours. In all other respects, the characteristics of Intelsat 5 are the same as those described in SAT-MOD-20140829-00097.

2 Spacecraft Overview

Intelsat 5 is a Boeing model 601HP spacecraft that is capable of operating in the C-band and Ku-band frequencies listed below and that will provide service to Asia Pacific and West USA.

Direction	Frequency
Uplink	5925-6425 MHz
	12750-13250 MHz
	14000-14250 MHz
Downlink	3700-4200 MHz
	10700-10950 MHz
	11200-11450 MHz
	11450-11700 MHz

In addition, the frequencies 11451 MHz, 11452 MHz, 11454 MHz, 13999 MHz and 14498 MHz will be used for telemetry, command and ranging ("TC&R").

Although Intelsat 5 is capable of operating in the 12750-13250 MHz, 10700-10950 MHz and 11200-11450 MHz bands, Intelsat is not seeking authority to operate in those bands at 137.0º W.L.

2.1 Spacecraft Characteristics

Intelsat 5 is a Boeing model 601HP three-axis stabilized type spacecraft that has a rectangular outer body structure. Intelsat 5 utilizes two deployable solar array wings and a number of deployable and non-deployable antennas.

The Intelsat 5 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 all of the various subsystems in order to avoid single-point failures.

The structural design of Intelsat 5 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

Intelsat 5 provides active communication channels at C-band and Ku-band frequencies, each having a bandwidth of 36 MHz. The Intelsat 5 frequencies, polarization, and channel plan are provided in the Schedule S. An explanation of how uplink frequency bands are connected to downlink frequency bands is provided in Exhibit 5.

The coverage contours and performance characteristics of all Intelsat 5 beams except for the global beams are provided in the Schedule S. The global 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. Intelsat has included the Schedule S beam designation for all beams in Exhibit 1. Exhibits 2 and 3 provide the beam parameters for the Intelsat 5 uplink and downlink beams, respectively.

2.3 Telemetry, Command and Ranging Subsystem

The 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 Intelsat 5 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 Intelsat 5 command and telemetry subsystem performance is summarized in Exhibit 4.

2.4 Uplink Power Control Subsystem

Intelsat 5 utilizes two Ku-band channels 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 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 Intelsat 5 ULPC frequencies and subsystem performance are summarized in Exhibit 4.

2.5 Satellite Station-Keeping

The spacecraft will be maintained within ±0.05º 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

Intelsat 5 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 Intelsat 5 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

The power flux density ("PFD") limits for space stations operating in the 3700-4200 MHz and 11450-11700 MHz bands are contained in Section 25.208 of the Commission's rules.

The maximum PFD levels for the Intelsat 5 transmissions were calculated for a number of digital carriers listed in Exhibit 3 operating in the 3700-4200 MHz and 11450-11700 MHz bands. These carriers were chosen because they generally produce high PFD levels on the Earth's surface. The PFD levels were also calculated for the Intelsat 5 telemetry and ULPC carriers. The results are provided in Exhibit 4 and show that the downlink power flux density levels of the Intelsat 5 carriers

do not exceed limits specified in Section 25.208 of the Commission's rules or in the International Telecommunications Union ("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 5 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 5 emissions.

6 Orbital Location

Intelsat requests that it be assigned the 137.0° W.L. orbital location for Intelsat 5. The 137.0° W.L. location satisfies Intelsat 5 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 5's operations in the 3700-4200 MHz and 5925-6425 MHz frequency bands have been notified and coordinated under the Administration of the United States' ITU filings USASAT-22G and USASAT-22J.

Intelsat currently has no United States ITU filing with for a satellite network that specifies operation in the frequency bands 11450-11700 MHz and 14000-14250 MHz at the nominal orbital location of 137° W.L. Intelsat will submit herewith Unites States filing USASAT-60A-1 that includes these frequency bands at the nominal orbital of 137° W.L., to be forwarded to the ITU.

8 Coordination Statement and Certifications

The downlink EIRP density of Intelsat 5 transmissions in the conventional 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 5 at 137.0° W.L.

The downlink EIRP density of Intelsat 5 transmissions in the conventional or extended Ku-bands will not exceed 14 dBW/4kHz for digital transmissions or 17 dBW/4kHz 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 5 at 137.0° 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

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.

9.2 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 do the best within the spacecraft and operation capability to remove the stored energy on the spacecraft by depleting all propellant tanks and turning off all active units.

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. Subject to receipt of FCC approval, Intelsat 5 will be drifted to 137.0°W.L.

During the relocation of Intelsat 5, Intelsat will take all the necessary steps to coordinate the move with other operators to minimize the risk of collision or interference between Intelsat 5 and any other satellite. 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 Intelsat 5 at 137.0° W.L. Intelsat is also not aware of any system with an overlapping station-keeping volume with Intelsat 5 that is the subject of an ITU filing and that is either in orbit or progressing towards launch.

9.4 Post Mission Disposal

At the end of the mission, Intelsat intends to dispose of the spacecraft by moving it to an altitude of at least 150 kilometers (perigee) above the geostationary arc. Intelsat has reserved 25.1 kilograms of bi-propellant fuel for this purpose. The fuel gauging uncertainty of remaining propellant has been taken into account in these calculations.

The FCC's rules state that satellites launched prior to March 18, 2002, such as Intelsat 5, would be designated as grandfathered satellites not subject to a specific disposal altitude (47 C.F.R. § 25.283(d). Therefore, the Intelsat 5 planned disposal orbit complies with the FCC's rules.

10 TC&R Control Earth Stations

Intelsat will conduct TC&R operations through one or more of the following earth stations: Castle Rock, Colorado; Riverside, California; Mountainside, Maryland; and Regency Park, Australia. Additionally, Intelsat is capable of remotely controlling Intelsat 5 from its facilities in McLean, Virginia or in Long Beach, California.

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	5/1/2018
Alexander Gerdenitsch Intelsat Manager, Spectrum Policy, Americas	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	PCHU	PCVU	PCHD	PCVD	----	----	----	----
Ku-Band Beams								
Pacific	PKHV		----	----	----	----	----	----
Steerable	----	----	----	S1VD	----	----	----	----
Telemetry Global Horn	----	----	TLMG*	----	----	----	----	----
Telemetry Pipe	----	----	----	----	----	----	----	TLMP*
Telemetry Bicone	----	----	----	TLMB*	----	----	----	----
Command Global horn	CMDG*	----	----	----	----	----	----	----
Command Pipe	----	----	----	----	----	CMDP*	----	----
Command Bicone	CMDB*	----		----	----	----	----	----
ULPC	----	----	----	----	----	----	UPCL*	UPCR*

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

EXHIBIT 2

COMMUNICATION SUBSYSTEM UPLINK BEAM PARAMETERS

Beam Name	C-Band Asia Pacific, West USA	
Schedule S Beam ID	PCHU	PCVU
Frequency Band (MHz)	5925 - 6425	5925 - 6425
Polarization	Horizontal	Vertical
G/T (dB/K)	0.6	0.2
Minimum SFD-- (dBW/m^2)	-96.6	-96.2
Maximum SFD-- (dBW/m^2)	-81.6	-81.2

Beam Name	Ku-Band Pacific
Schedule S Beam ID	PKHV
Frequency Band (MHz)	14000-14250
Polarization	Horizontal
G/T (dB/K)	-12
Minimum SFD-- (dBW/m^2)	-91.9
Maximum SFD-- (dBW/m^2)	-76.9

EXHIBIT 3

COMMUNICATION SUBSYSTEM DOWNLINK BEAM PARAMETERS

Beam Name	C-Band Asia Pacific, West USA	
Schedule S Beam ID	PCHD	PCVD
Frequency Band (MHz)	3700 - 4200	3700 - 4200
Polarization	Horizontal	Vertical
Maximum Beam Peak EIRP (dBW)	41.6	41
Maximum Beam Peak EIRP Density (dBW/4kHz)	2.06	1.46

Beam Name	Ku-Band Steerable
Schedule S Beam ID	S1VD
Frequency Band (MHz)	11450-11700
Polarization	Vertical
Maximum Beam Peak EIRP (dBW)	52.6
Maximum Beam Peak EIRP Density (dBW/4kHz)	13.06

EXHIBIT 4

TC&R SUBSYSTEM CHARACTERISTICS

Beam Name	Command Global Horn	Command Pipe
Schedule S Beam ID	CMDG & CMDB	CMDP
Frequencies (MHz)	14498	13999
Polarization	Horizontal	RHCP
Peak Flux Density at Command Threshold (dBW/m^2-Hz)	-104.8	-92.5

Beam Name	Telemetry Global Horn	Telemetry Pipe	Telemetry Bicone	ULPC1	ULPC2
Schedule S Beam ID	TLMG	TLMP	TLMB	UPCR	UPCL
Frequencies (MHz)	11451 & 11452	11451 & 11452	11451 & 11452	11454	11454
Polarization	Horizontal	RHCP	Vertical	RHCP	LHCP
Maximum Channel EIRP (dBW)	9.2	10.2	9	11.4	11.4
Maximum Beam Peak EIRP Density (dBW/4kHz)	-11.8	-10.77	-11.97	-9.57	-9.57

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

EXHIBIT 5
Uplink Band to Downlink Band Connections

Uplink Transponder Designation	Uplink Beam Name	Uplink Polarization	Uplink Center Frequency (MHz)	Downlink Transponder Designation	Downlink Beam Name	Downlink Polarization	Downlink Center Frequency (MHz)	Channel Bandwidth (MHz)
CU01	PCVU	Vertical	5945	CD01	PCHD	Horizontal	3720	36
CU02	PCVU	Vertical	5985	CD02	PCHD	Horizontal	3760	36
CU03	PCVU	Vertical	6025	CD03	PCHD	Horizontal	3800	36
CU04	PCVU	Vertical	6065	CD04	PCHD	Horizontal	3840	36
CU05	PCVU	Vertical	6105	CD05	PCHD	Horizontal	3880	36
CU06	PCVU	Vertical	6145	CD06	PCHD	Horizontal	3920	36
CU07	PCVU	Vertical	6185	CD07	PCHD	Horizontal	3960	36
CU08	PCVU	Vertical	6225	CD08	PCHD	Horizontal	4000	36
CU09	PCVU	Vertical	6265	CD09	PCHD	Horizontal	4040	36
CU10	PCVU	Vertical	6305	CD10	PCHD	Horizontal	4080	36
CU11	PCVU	Vertical	6345	CD11	PCHD	Horizontal	4120	36
CU12	PCVU	Vertical	6385	CD12	PCHD	Horizontal	4160	36
CU01	PCHU	Horizontal	5945	CD01	PCVD	Vertical	3720	36
CU02	PCHU	Horizontal	5985	CD02	PCVD	Vertical	3760	36
CU03	PCHU	Horizontal	6025	CD03	PCVD	Vertical	3800	36
CU04	PCHU	Horizontal	6065	CD04	PCVD	Vertical	3840	36
CU05	PCHU	Horizontal	6105	CD05	PCVD	Vertical	3880	36
CU06	PCHU	Horizontal	6145	CD06	PCVD	Vertical	3920	36
CU07	PCHU	Horizontal	6185	CD07	PCVD	Vertical	3960	36
CU08	PCHU	Horizontal	6225	CD08	PCVD	Vertical	4000	36
CU09	PCHU	Horizontal	6265	CD09	PCVD	Vertical	4040	36
CU10	PCHU	Horizontal	6305	CD10	PCVD	Vertical	4080	36
CU11	PCHU	Horizontal	6345	CD11	PCVD	Vertical	4120	36
CU12	PCHU	Horizontal	6385	CD12	PCVD	Vertical	4160	36
KU01	PKHV	Horizontal	14019	KD01	S1VD	Vertical	11476	36
KU03	PKHV	Horizontal	14101	KD03	S1VD	Vertical	11558	36
KU17	PKHV	Horizontal	14183	KD05	S1VD	Vertical	11640	36
KU02	PKHV	Horizontal	14060	KD02	S1VD	Vertical	11517	36
KU04	PKHV	Horizontal	14142	KD04	S1VD	Vertical	11599	36
KU06	PKHV	Horizontal	14224	KD06	S1VD	Vertical	11681	36