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January 21, 2005

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JAN 21 2005

Federal Communications Commission
Office of Secretary

BY HAND DELIVERY

Marlene H. Dortch
Secretary
Federal Communications Commission
445 Twelfth Street, S.W.
Washington, D.C. 20554

Re: Intelsat North America LLC
Erratum; File No. SAT-RPL-20041015-00201

Dear Ms. Dortch:

Enclosed please find an Erratum to Intelsat North America LLC's Application for Authority to Launch and Operate a Replacement Satellite at 77° W.L. and Petition for Declaratory Ruling Pursuant to Section 310(b)(4), which was filed on October 15, 2004.

Please direct any questions regarding this Erratum to Humberto Henriques at 202-944-7542 or the undersigned.

Sincerely,

Amy E Bender

Carl R. Frank
Amy E. Bender
Counsel to Intelsat North America LLC

RECEIVED

JAN 21 2005

Federal Communications Commission
Office of Secretary

Before the
Federal Communications Commission
Washington, DC 20554

In the Matter of Intelsat North America LLC Application for Authority to Launch and Operate a Replacement Satellite at 77° W.L. and Petition for Declaratory Ruling Pursuant to Section 310(b)(4)	File No. SAT-RPL-20041015-00201

ERRATUM

On October 15, 2004, Intelsat North America LLC ("Intelsat North America") filed the above captioned application seeking authority to launch and operate a replacement C/Ku-band satellite, to be known as IA-9, at the 77° W.L. orbital location. Intelsat North America hereby submits this Erratum correcting certain information in the Technical Exhibit to that application.

A. Technical Exhibit Corrections:

1. Page 7, section on "C-Band Noise Temperature and G/T", line 4: delete "483°K" and replace with "676K".
2. Page 7, section on "C-Band Saturation Flux Density and Gain Adjustment", second paragraph, line 2: delete "not".
3. Page 7, section on "C-Band Saturation Flux Density and Gain Adjustment", second paragraph, line 3: delete "2.0 dB" and replace with "1.0 dB".
4. Page 8, section on "Ku-Band Noise Temperature and G/T", line 4: delete "of 490°K for the fixed beam and 768°K for the steerable beam" and replace with "of 676K for the fixed and for the steerable beams".

5. Page 9, section on "Ku-Band Saturation Flux Density and Gain Adjustment", second paragraph, line 1: delete "2.0" and replace with "1.0".

6. Page 11: paragraph immediately above Figure C4.12, line 4: delete "all bandwidth transponders" and replace with "C-band and Figure C4.13 for Ku-band transponders".

7. Page 11: delete Figure C4.12 and replace with new Figure C4.12 and new Figure C4.13.

8. Page 11, section on "TRACKING, TELEMETRY, COMMAND (TT&C) SYSTEM", line 2: delete "14001.5 MHz and replace with "5925.5".

9. Page 11, section on "TRACKING, TELEMETRY, COMMAND (TT&C) SYSTEM", line 3: delete "14498.5 MHz and replace with "6424.5".

10. Page 11, section on "TRACKING, TELEMETRY, COMMAND (TT&C) SYSTEM", first paragraph, lines 3 and 4: delete "Table C.14 shows the details of telemetry and beacon frequencies and identifies whether each carrier is used for telemetry or beacon" and replace with: "Tables C4.13 and C4.14 show the details of the command, telemetry and beacon transmissions".

11. Page 12, Table C4.13, title: delete "IA-8" and replace with "IA-9".

12. Page 13: Insert new Table C4.14 after Table C4.13.

13. Page 12, section on "EMISSION DESIGNATIONS AND ALLOCATED BANDWIDTH", first paragraph, line 1: delete "Table C4.14" and replace with "Table C4.15".

14. Page 12, section on "EMISSION DESIGNATIONS AND ALLOCATED BANDWIDTH": delete Table C4.14 and replace with new Table C4.15.

15. Page 14, section on "POWER FLUX DENSITY (PFD) AT THE EARTH'S SURFACE: delete Table C.8 and replace with new Table C.8.

16. Page 15, section on "Telemetry, Tracking, Command & Monitoring Network", line 8 (last): delete "265" and replace with "365".

17. Page 19, section on "Satellite Geographic Coverage Area", first paragraph, line 3: delete "Table D3.1" and replace with "Figure D3.1".

18. Page 24, at the end of the last paragraph, add a new sentence as follows: "Table D4.5 shows the link budget calculations for the analog Television."

19. Page 25: delete Table D4.1 and replace with new Table D4.1.

20. Page 26: delete Table D4.2 and replace with new Table D4.2.

21. Page 27: delete Table D4.3 and replace with new Table D4.3.

22. Page 28: delete Table D4.4 and replace with new Table D4.4.

23. Page 29: delete Table D4.5 and replace with new Table D4.5.

24. Page 31, section on "POWER FLUX DENSITY (PFD) AT THE EARTH'S SURFACE": delete Table D5.1 and replace with new Table D5.1.

25. Page 32, section on "Intra-system interference", first paragraph, line 3: delete "table 15.1 to 15.4" and replace with "tables D4.1 to D4.5".

26. Page 32, section on "Inter-System Interference", first paragraph, line 4: insert "FCC and" between "all" and "ITU Recommendations".

27. Page 32, section on "Inter-System Interference", first bullet after the first paragraph, lines 1, 2 and 3: delete "ITU-R Recommendations S.465 and S.580 which define the maximum off-axis gain in the direction of adjacent satellites" and replace with "FCC Part 25.209 rules for antenna performance standards".

28. Page 32, section on "Inter-System Interference", second bullet after the first paragraph, lines 2, 3 and 4: delete "ITU-R Recommendation S.524 which defines the maximum off-axis e.i.r.p. spectral density" and replace with "Parts 25.204, 25.211 and 25.212".

29. Page 32, section on "Inter-System Interference", third bullet after the first paragraph, lines 1 and 2: delete "the ITU-R (and FCC) PFD limits at the Earth's surface and adjacent satellite networks" and replace with "FCC Parts 25.211 and 25.212 as well as with the PFD limits given in FCC Part 25.208 and Appendix 5 of the Radio Regulations".

30. Annex 1, "Beam Coverage Maps": Add new Figure 7, "O BEAM - TELECOMMAND".

B. Schedule S Corrections:

1. Page S6: Introduction of Service Area ID #3 with Global Beam.

2. Page S7: Corrections introduced in columns "l", "n" and "q".

3. Page S7: Introduction of Beam ID "O"

4. Page S8: Revised Gain Contours provided for all beams in column "f".

5. Page S8: Corrections introduced in columns "g", "h", "i", "j" and "k".

6. Page S8: Introduction of Beam ID "O"

7. Page S9: Corrections introduced in column "b".

8. Page S9: Deletion of carrier TLC and introduction of carriers TLC 1, TLC 2, TLM 5, TLM 6 and TLM 7.

9. Page S10: Corrections introduced in column "b".

10. Page S11: Correction introduced in column "c" for carrier ID #8.

11. Page S11: Corrections introduced in columns "h" and "i" for carries with ID from 9 to 14.

12. Page S12: Addition of new analog carriers ID # 3 and 4.

13. Page S12: Corrections introduced in columns "b" and "o" for carriers ID#1 and ID#2.

14. Page S13: Corrections introduced in all link budgets based on the numbers provided in new Tables D4.1 to D4.5 of the revised Technical Exhibit.

15. Page S14: Introduction of information in column "c".

A conformed copy of the Technical Exhibit and Schedule S as modified by this Erratum is attached for the sake of clarity and convenience. Please direct any questions regarding this Erratum to Humberto Henriques at 202-944-7541.

Respectfully submitted,

Patrick J. Cerra
Vice President
Intelsat North America LLC

Carl R. Frank
Amy E. Bender
WILEY, REIN & FIELDING LLP
1776 K Street, N.W.
Washington, DC 20006

January 21, 2005

TECHNICAL EXHIBIT

In this Technical Exhibit, Intelsat North America LLC ("Intelsat North America") provides the information required by Section 25.114 of the Commission's rules. Intelsat North America notes that due to recent rule changes, certain information previously provided in narrative form under Section 25.114(c) now must be provided: (1) in a narrative that corresponds to Section 25.114(d); and (2) on Form 312 and Schedule S as required by the new Section 25.114(c). This narrative complies with the new Section 25.114(d). The attached Form 312 and Schedule S satisfy new Section 25.114(c). Out of an abundance of caution, however, Intelsat North America also provides the information required by new Section 25.114(c) in this narrative.

25.114(c)

25.114(c)(1) Name, address, and telephone number of the applicant:

See Schedule S and Form 312.

25.114(c)(2) Name, address, and telephone number of the person(s), including counsel, to whom inquiries or correspondence should be directed:

See Form 312.

25.114(c)(3) Type of authorization requested:

See Form 312.

25.114(c)(4) (i) Radio frequencies and polarization plan (including beacon, telemetry, telecommand functions), center frequency and polarization of transponders (both receiving and transmitting frequencies); (ii) Emission designators and allocated bandwidth of emission, final amplifier output power (identify any net losses between output of final amplifier and input of antenna and specify the maximum EIRP for each antenna beam); (iii) Identification of which antenna beams are connected or switchable to each transponder and TT&C function; (iv) Receiving system noise temperature; (v) The relationship between satellite receive antenna gain pattern and gain-to-temperature ratio and saturation flux density for each antenna beam (may be indicated on an antenna gain plot); (vi) The gain of each transponder channel (between output of receiving antenna and input of transmitting antenna) including any adjustable gain step capabilities; and (vii) Predicted receiver and transmitter channel filter response characteristics:

TRANSPONDER FREQUENCY AND POLARIZATION PLAN

The IA-9 spacecraft is designed with the capability to reuse all available spectrum through linear orthogonal polarization independent beams.

Transponder Plan

Figure C4.1 shows the transponder frequency plan for the IA-9 communications subsystem. A transmission channel is established within the satellite repeater by connecting a receiver accessible from one receive coverage area at either 6 or 14 GHz to a transmitter associated with any transmit coverage area at either 4 or 11 GHz. The RF bandwidth of the satellite is divided into segments of 36 MHz and 27 MHz. The center frequency of C-band and Ku-band transponders are shown in Tables C4.1.1 to C4.1.3. All C-Band and Ku-Band transponders shall be operated in loop back mode only. Not all channels will be simultaneously active at a time for all beams. For example, the C-Band beam will nominally have only 12 simultaneously active transponders and is configured as follows:

- One out of the two odd and even channels (e.g. CH1 or CH2, CH3 or CH4, CH5 or CH6) can be activated on a channel-by-channel basis.

The Ku-Band beams will nominally have 32 simultaneously active transponders and is configured as follows:

- For Channels 1 through 12 (NAC beam) and channels 1 through 6 (S1), any two out of three can be activated on a channel-by-channel basis such as:
- 2 of CH1, CH2 of NAC and CH1 of S1
- 2 of CH3, CH4 of NAC and CH2 of S1
- 2 of CH5, CH6 of NAC and CH3 of S1
- 2 of CH7, CH8 of NAC and CH4 of S1
- 2 of CH9, CH10 of NAC and CH5 of S1
- 2 of CH11, CH12 of NAC and CH6 of S1
- For Channels 13 through 32 (NAC beam) all channels can be activated simultaneously.

Figure C4.1 Transponder Frequency and Channelization Plan

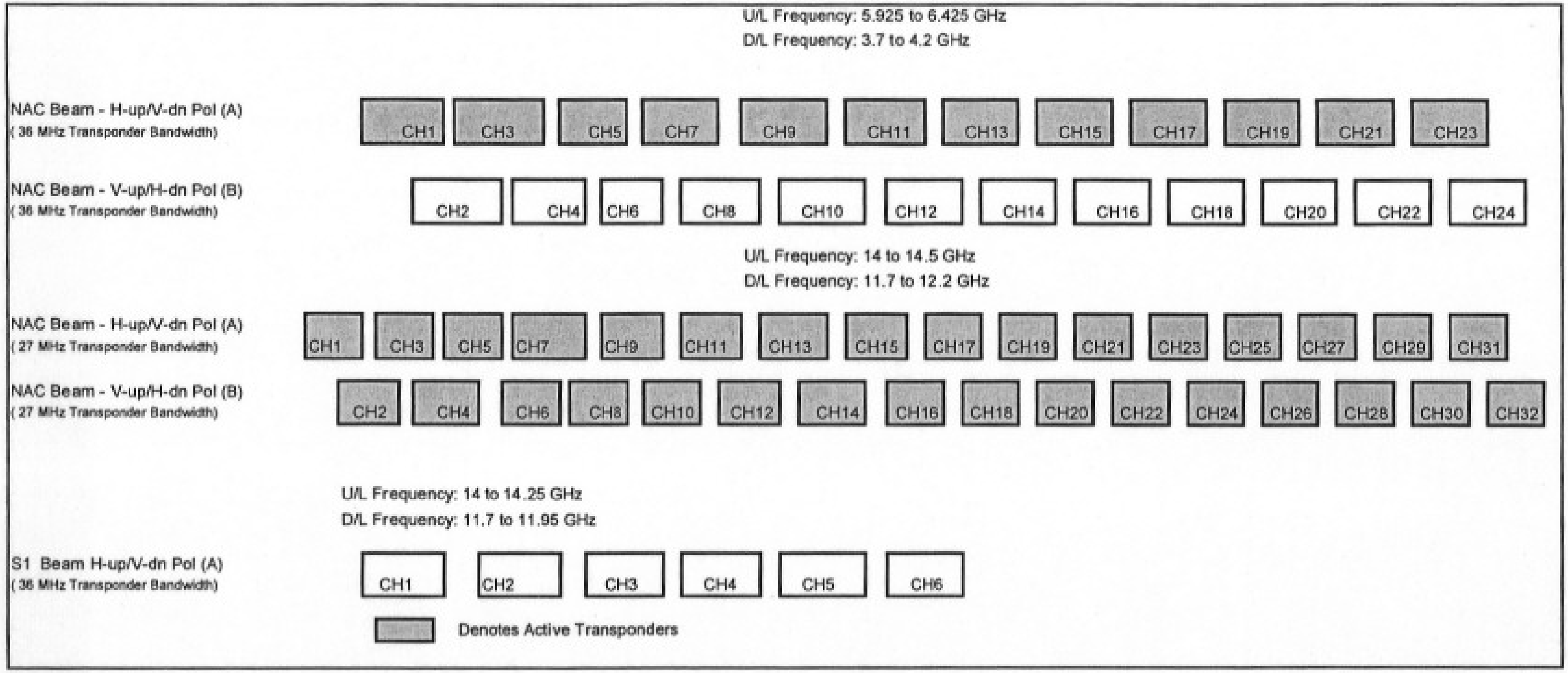


Table C4.1.1 NAC-C-Band Center Frequency

NAC-C-BAND Center Frequency					
U/L			D/L		
Channel No.	Center Freq. (MHz)	Polarization	Center Freq. (MHz)	Polarization	Assigned Bandwidth (MHz)
CH1	5945	H	3720	V	36
CH2	5965	V	3740	H	36
CH3	5985	H	3760	V	36
CH4	6005	V	3780	H	36
CH5	6025	H	3800	V	36
CH6	6045	V	3820	H	36
CH7	6065	H	3840	V	36
CH8	6085	V	3860	H	36
CH9	6105	H	3880	V	36
CH10	6125	V	3900	H	36
CH11	6145	H	3920	V	36
CH12	6165	V	3940	H	36
CH13	6185	H	3960	V	36
CH14	6205	V	3980	H	36
CH15	6225	H	4000	V	36
CH16	6245	V	4020	H	36
CH17	6265	H	4040	V	36
CH18	6285	V	4060	H	36
CH19	6305	H	4080	V	36
CH20	6325	V	4100	H	36
CH21	6345	H	4120	V	36
CH22	6365	V	4140	H	36
CH23	6385	H	4160	V	36
CH24	6405	V	4180	H	36

Table C4.1.2 S1-Ku-Band Center Frequency

S1 KU-BAND Center Frequency					
U/L			D/L		
Channel No.	Center Freq. MHz	Polarization	Center Freq. MHz	Polarization	Assigned Bandwidth MHz
CH1	14025	H	11725	V	36
CH2	14065	H	11765	V	36
CH3	14105	H	11805	V	36
CH4	14145	H	11845	V	36
CH5	14185	H	11885	V	36
CH6	14225	H	11925	V	36

Table C4.1.3 NAC Ku-Band Center Frequency and Bandwidth

NAC-Ku-BAND Center Frequency					
U/L			D/L		
Channel No.	Center Freq. (MHz)	Polarization	Center Freq. (MHz)	Polarization	Assigned Bandwidth (MHz)
CH1	14015	H	11715	V	27
CH2	14021.5	V	11721.5	H	27
CH3	14045	H	11745	V	27
CH4	14051.5	V	11751.5	H	27
CH5	14075	H	11775	V	27
CH6	14081.5	V	11781.5	H	27
CH7	14105	H	11805	V	27
CH8	14111.5	V	11811.5	H	27
CH9	14136	H	11836	V	27
CH10	14142.5	V	1142.5	H	27
CH11	14167	H	11867	V	27
CH12	14173.5	V	11873.5	H	27
CH13	14198	H	11898	V	27
CH14	14204.5	V	11904.5	H	27
CH15	14229	H	11929	V	27
CH16	14235.5	V	11935.5	H	27
CH17	14260	H	11960	V	27
CH18	14266.5	V	11966.5	H	27
CH19	14291	H	11991	V	27
CH20	14297.5	V	11997.5	H	27
CH21	14322	H	12022	V	27
CH22	14328.5	V	12028.5	H	27
CH23	14353	H	12053	V	27
CH24	14359.5	V	12059.5	H	27
CH25	14384	H	12084	V	27
CH26	14390.5	V	12090.5	H	27
CH27	14415	H	12115	V	27
CH28	14421.5	V	12121.5	H	27
CH29	14446	H	12146	V	27
CH30	14452.5	V	12152.5	H	27
CH31	14477	H	12177	V	27
CH32	14483.5	V	12183.5	H	27

C-Band Polarization

The receive and transmit coverage areas shall have the polarization characteristics shown in Table C4.2. The signals shall be linearly polarized. The horizontal polarization shall be defined as being parallel to the spacecraft's roll axis and the vertical polarization shall be identified as being parallel the spacecraft's pitch axis when the antenna boresight is aimed at the sub-satellite point and the spacecraft has zero roll and pitch attitude bias with respect to the earth. The NAC C-band shall include a polarization switch allowing in-orbit reversal of the transmit and receive polarization by ground command

Table C4.2 C-Band Transmit and Receive Polarizations

Receive and Transmit Polarization Chracteristics for C-Band Coverage		
Coverage	Receive Polarization	Transmit Polarization
NAC A-Pol	Horizontal (switchable to V)	Vertical (switchable to H)
NAC B-Pol	Vertical (switchable to H)	Horizontal (switchable to V)

Ku-Band Polarization

The receive and transmit coverage areas for the Ku-band coverages shall have the polarization characteristics shown in Table C4.3. The signals shall be linearly polarized. The horizontal polarization shall be defined as being parallel to the spacecraft's roll axis and the vertical polarization shall be identified as being parallel the spacecraft's pitch axis when the antenna boresight is aimed at the sub-satellite point and the spacecraft has zero roll and pitch attitude bias with respect to the earth.

Table C4.3 Ku-Band Transmit and Receive Polarizations

Receive and Transmit Polarization Chracteristics for Ku-Band Coverage		
Coverage	Receive Polarization	Transmit Polarization
NAC A-Pol	Horizontal	Vertical
NAC B-Pol	Vertical	Horizontal
S1 A-Pol	Horizontal	Vertical

COMMUNICATION PAYLOAD PERFORMANCE

C-Band Equivalent Isotropic Radiated Power (EIRP)

Table C4.4 presents a summary of the available EIRP for the NAC fixed C-Band downlink coverage. The associated transmit gain contour maps are provided in Annex 1 Figure 2 to this appendix.

Table C4.4 C-Band Peak EIRP Derivation

C-Band Payload EIRP Budget				
Beam	Tube Sat Power Watts	Total Loss dB	Max. Antenna Directivity dBi	Max EIRP dBW
NAC	50	3	29.8	43.8

C-Band Noise Temperature and G/T

The gain to noise temperature ratio (G/T) of each transmission channel is defined as the ratio of the receive antenna gain to the total equivalent system noise temperature in degrees Kelvin at the reference antenna/repeater interface. This system temperature of 676K shall include the equivalent received noise of the antenna, the noise of the appropriate preamplifier or mixer, and the noise of all subsequent elements in the transmission channel. The peak G/T values are specified in Table C4.5. The associated receive gain contour maps are provided in Annex 1 Figure 1 to this appendix.

Table C4.5 C-Band Peak G/T Derivation

C-Band Payload G/T Budget			
Beam	Conversion Factor	Max. Antenna Directivity dBi	Max G/T dB/K
NAC	-28.3	29.1	0.8

C-Band Saturation Flux Density and Gain Adjustment

The single-carrier saturation flux density (SFD) of a transmission channel is defined as the power per unit area (in dBW/m^2) in a single unmodulated carrier measured at the aperture of the receive antenna in a plane perpendicular to the line between the source transmitting the carrier and the spacecraft, which is required to produce single-carrier saturation of the high power amplifier (HPA) of the transmission channel.

The gain of each transmission channel shall be individually and independently adjustable by ground command over the range that would be in steps no greater than 1.0 dB such that the single-carrier saturation flux density at the channel center frequency, with a single unmodulated carrier originating from the point on the earth in the corresponding receive coverage for which the antenna gain is the lowest, may be compensated for variations within the range specified in Table C4.6.

Table C4.6 Maximum and Minimum Saturation Flux Density

C-band Coverage		Minimum required range of saturated flux density adjustment at channel frequency	
Receive Coverage	Transmit Coverage	Lowest Flux density dBW/m2	Highest Flux density dBW/m2
NAC	NAC	-92	-71

C-Band Beam Coverage Isolation Requirements

The ratio of the on axis co-polar gain to the cross-polar gain of the antenna in the assigned frequency band over the coverage polygon area are provided in Table C4.7.

Table C4.7: C-Band Cross-Polarization Isolation Values

C-Band Minimum Required XPD Isolation Levels (dB)			
Beams	Transmit		Receive
NAC A	30		30
NAC B	30		30

Ku-Band Equivalent Isotropic Radiated Power (EIRP)

The minimum end-of-life (EOL) transponder EIRP per transmission channel under conditions of single carrier saturation, with respect to the specific transponder output port is listed in Table C4.8. The combination of the transponder output power (dBW), TWTA loss (dB), OMUX and connectivity switching, communication antenna loss (dB) and the antenna directivity result in the downlink equivalent isotropic radiated power (EIRP). The associated transmit gain contour maps are provided in Annex 1 Figures 4 & 6 to this appendix.

Table C4.8 Ku-Band Peak EIRP Derivation

Ku-Band Payload EIRP Budget				
Beam	Tube Power Watts	Total Loss dB	Max Antenna Directivity	Max EIRP dBW
NAC	135	3	31.6	49.9
S1	135	3	37	55.3

Ku-Band Noise Temperature and G/T

The gain to noise temperature ratio (G/T) of each transmission channel is defined as the ratio of the receive antenna gain to the total equivalent system noise temperature in degrees Kelvin at the reference antenna/repeater interface. This system temperature of 676K for the fixed and for the steerable beams shall include equivalent noise received by the antenna, the noise of the appropriate preamplifier or mixer, and the noise of all subsequent elements in the transmission channel The G/T values are specified in Table C4.9. The associated receive gain contour maps are provided in Annex 1 Figures 3 & 5 to this appendix.

Table C4.9. Ku-Band Peak G/T Derivation

Ku-Band Payload G/T Budget			
Beam	Conversion Factor	Max. Antenna Directivity dBi	Max G/T dB/K
NAC	-28.3	31.6	3.3
S1	-28.3	36	7.7

Ku-Band Saturation Flux Density and Gain Adjustment

The single-carrier saturation flux density (SFD) of a transmission channel is defined as the power per unit area (in dBW/m^2) in a single unmodulated carrier measured at the aperture of the receive antenna in a plane perpendicular to the line between the source transmitting the carrier and the spacecraft, which is required to produce single-carrier saturation of the high power amplifier (HPA) of the transmission channel.

The adjustment of gain over the range would be in steps no greater than 1.0 dB. It shall be possible to individually and independently change the gain of any and all transmission channels, either up or down in single step increments. Each of the gain steps shall be associated with a unique designator. The actual saturation flux density corresponding to each gain step shall be fully characterized for any and all transmission channels.

An automatic level control (ALC) circuit shall be provided on all Ku-band transponders, to compensate for rain fade of up to 12 dB on the uplink for each channel for any SFD setting and any nominal operating point from 10 to 0 dB TWTA input back-off. The ALC function shall maintain the TWTA input power to within plus/minus 0.5 dB of the nominal setting and still meet all performance requirements specified herein. The capability to bypass the ALC function shall be provided via ground command and meet all performance requirements specified. Table C4.10 provides the maximum and minimum saturation flux density for Ku-Band transponders.

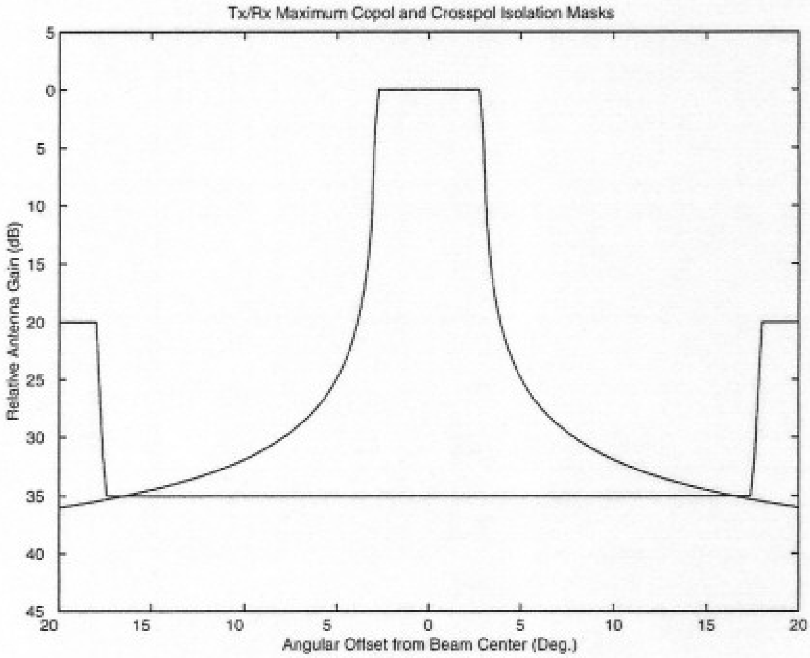
Table C4.10 Ku-Band Maximum and Minimum Saturation Flux Density

Ku-band Coverage		Minimum required range of saturated flux density adjustment at channel frequency	
Receive Coverage	Transmit Coverage	Lowest Flux density dBW/m2	Highest Flux density dBW/m2
NAC	NAC	-96	-75
S1	S1	-96	-75

Ku-Band Beam Coverage Isolation Requirements

The S1 Ku-band Steerable Spot Beam Isolation requirements is defined by the isolation mask shown in Figure C4.11 which specifies the S1 co-polarization and Cross-polarization performance requirements for receive and transmit coverage. The isolation mask definitions are relative to the peak of the antenna beam.

Figure C4.11 Ku-Band S1 Isolation Mask Definition



The fixed Ku-Band NAC shaped beam coverage cross–polarization isolation requirements is provided in Table C4.11.1 below.

TABLE C4.11.1 Ku-Band Cross-Polarization Isolation Values

Ku-band NAC Fixed Beam Minimum Required XPD Isolation Levels (dB)		
Beams	Transmit	Receive
NAC	30	30

Transmission Channel Frequency Response and Unwanted Emission (also §25.202(f))

The satellite transmission channel frequency response is determined by the combined effect of the filters in the satellite communications payload, particularly those associated with the input de-multiplexing ("IMUX") and output multiplexing ("OMUX"). The filters are designed to achieve the following goals:

- negligible bit-error rate ("BER") degradation under all practical conditions;
- protect the satellite receiver front-end amplifiers from overload due to out-of-band signals;
- adequately suppress any unwanted emissions (including out-of-band emissions and spurious emissions) at the output of the satellite.
- Provide the required channelization

IA-9 satellite uses industry-standard state-of-the-art filters in order to meet these requirements.

The combined effects of the natural spreading due to the modulation itself, the modulator spectrum shaping, spectrum spreading in the TWTA, and output filtering will produce out-of-band emissions that will not exceed the masks given in Figure C4.12 for C-band and Figure C4.13 for Ku-band transponders. The break-points in the mask are at 50%, 100% and 250% of the transponder bandwidth.

Figure C4.12 Out-of-Band Emission Mask for IA-9 C-band Transponders

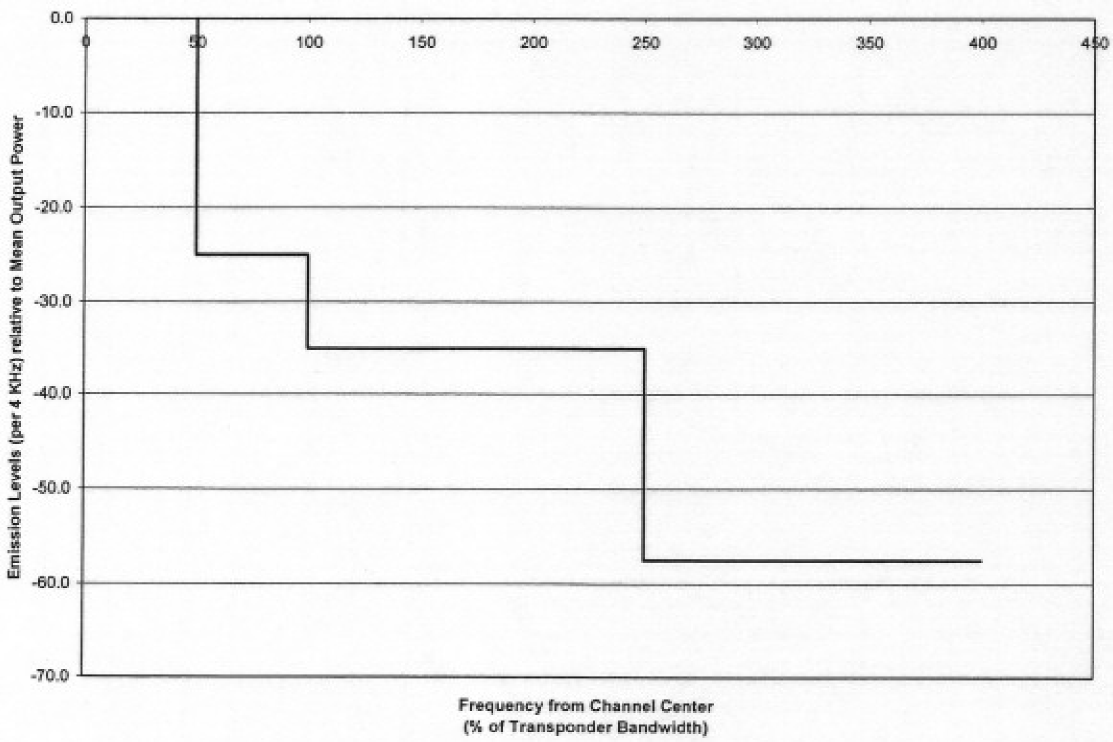
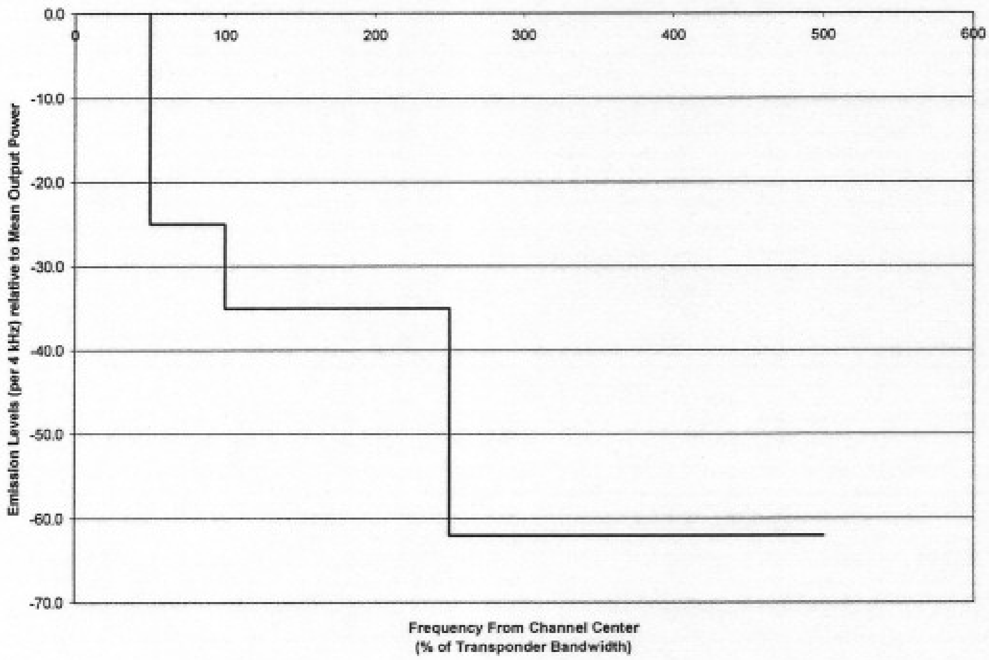


Figure C4.13 Out-of-Band Emission Mask for IA-9 Ku-band Transponders



TRACKING, TELEMETRY, COMMAND (TT&C) SYSTEM

The TT&C uplink transmissions, which are used for telecommanding the satellites and performing ranging measurements, would use 5925.5 MHz and 6424.5 MHz. Tables C4.13 and C4.14 show the details of the command, telemetry and beacon transmissions.

Table C4.13 IA-9 Telemetry and Beacon Downlinks

SPACECRAFT TELEMETRY & BEACON NOMINAL CHARACTERISTIC DOWNLINK LINK BUDGET				
	Telemetry On-station	BEACON	BEACON	BEACON
Antenna Beam	CONUS	CONUS	CONUS	S1 Beam
Frequency MHz	4199.0/4199.5 4198.0 / 4198.5	11702	12198	11702
Polarization	Vertical	Horizontal	Vertical	Vertical
TM Transmit Power dBW	-6	-2	-2	-2
Onboard Losses dB	-7	-8	-8	-8
Input Power to Antenna dBW	-13	-10	-10	-10
Antenna Gain dBi	22.8	24.4	24.4	28.2
Telemetry EIRP dBW SPEC.	9.8	14.4	14.4	18.2
Path Loss	-197.3	-206.4	-206.8	-206.4
Atmospheric Absorption dB (clear weather)	-0.1	-0.3	-0.3	-0.3
Ground E/S G/T dB/K	35.1	32.4	32.4	32.4
Link C/T dBW/k	-152.5	-159.9	-160.3	-156.1
Link C/No dB Hz	76.1	68.7	68.3	72.5
Telemetry Eb/No	39.3			
Bit rate 4800 bps				
80 kHz detection bandwidth, dBHz	49.0	49.0	49.0	49.0
Required Eb/No@ 1*10^7	11.3			
Margin dB	27.1	19.7	19.3	23.5

Table C4.14 IA-9 Command RF link budget

Command RF Budget		
PARAMETER	On-station #1	On-station #2
Frequency MHz	5925.5	6424.5
Polarization	Vertical	Horizontal
Earth Station Transmit Power W	800.0	800.0
Input Loss dB	-1.0	-1.0
OBO dB	-2.0	-2.0
Antenna Input Power dBW	26.0	26.0
Earth Station Transmit Gain (16m)	54.3	54.3
Required Ground earth Station EIRP dBW	80.3	80.3
Required incident flux density	-82.4	-82.4
Isotropic Area dB/m2	-36.9	-37.6
Antenna Gain dBi (Wide Angle Coverage)	3.5	3.5
RF loss to command receiver dB	-8.0	-8.0
Uplink Rain attenuation	-2.0	-2.0
Receiver input power, dBW	-125.8	-126.5
Receiver input power, dBm	-95.8	-96.5
Receiver command threshold dBm	-112.0	-112.0
Margin above receiver command threshold	16.2	15.5

EMISSION DESIGNATIONS AND ALLOCATED BANDWIDTH

Table C4.15 lists the IA-9 system typical emission designations; these are representative of the broad range of transmissions that are carried by the existing and planned transmission on IA-9 satellite. The first four characters of the designation define the allocated bandwidth in each case.

Table C4.15 Typical Emissions Designations

Emission	Emission Designator
Command	1M00F9D
Telemetry/Ranging	100KF9D
Digital SCPC(64kps), QPSK	113KG1W
Digital (512kps), QPSK	788KG1W
Digital (1544kps), QPSK	245KG7W
Digital (2484kps), QPSK	3M13G7W
Digital (63124kps), QPSK	9M70G7W
Digital (8448kps), QPSK	12M9G7W
Digital SCPC(64kps), 8PSK	67K5G1W
Digital (256kps), 8PSK	203KG1W
Digital (1024kps), 8PSK	833KG1W
Digital (1544kps), 8PSK	1M28G7W
Digital (6312kps), 8PSK	4M93G7W
Digital (8448kps), 8PSK	6M55G7W
Digital (32064kps), 8PSK	24M6G7W
Digital (34368kps), 8PSK	26M4G7W
TV/FM, 30MHZ Video	30M0F8W
TV/FM, 20MHZ Video	20M0F8W

25.114(c)(5) (i) For satellites in geostationary-satellite orbit, (i) Orbital location, or locations if alternatives are proposed, requested for the satellite, (ii) The factors that support the orbital assignment or assignments proposed in paragraph (c)(5)(i) of this section, (iii) Longitudinal tolerance or east-west station-keeping capability, and (iv) Inclination incursion or north-south station-keeping capability:

ORBITAL LOCATION

The Intelsat Americas-9 (IA-9) satellite will be in a geostationary orbit with C-Band and Ku-band transponders operating at the 77°W orbital location. The satellite can use spacecraft and antenna bias capability to serve from 77°W to 129°W should there be a catastrophic failure of any of the IA satellites in 89°W, 93°W, 97°W, and 129 °W orbital locations.

Additional information is provided in the attached Schedule S.

25.114(c)(6):

Not Applicable

25.114(c)(7) For satellites in geostationary-satellite orbit, accuracy with which the orbit inclination, the antenna axis attitude and longitudinal drift will be maintained:

STATION-KEEPING AND ANTENNA POINTING ACCURACY

The satellite orbital inclination and longitudinal (drift) position will be maintained within ±0.05° of its designated orbital location. The satellite antenna pointing accuracy will be maintained within ±0.15° of its nominal antenna axis attitude during normal mode and during orbit maneuvers (i.e. station-keeping maneuvers).

ATTITUDE DETERMINATION AND CONTROL

The Attitude control subsystem is a heritage from proven existing satellite. The on-orbit control is provided by 4:3 reaction wheel configuration, orbit-raising control by bipropellant thrusters/Earth sensor, Sun sensor and gyros and Station keeping maneuvers by on-orbit wheel control; Earth sensor, and gyros supply attitude for North/South station keeping and East/West station keeping.

25.114 (c)(8) Calculation of power flux density levels within each coverage area and of the energy dispersal, if any, needed for compliance with 25.208, for angles of arrival of 5°, 10°, 15°, 20°, and 25° above the horizontal:

POWER FLUX DENSITY (PFD) AT THE EARTH'S SURFACE

The analysis in Table C.8 demonstrates that IA-9 meets the PFD limits in accordance with FCC Sec. 25.208. for digital signals.

Table C.8 PFD for saturated transponder EIRP

	NAC-Ku-Band	NAC-C-Band	S1-Beam	Units
Transponder Bandwidth	27	36	36	MHz
Transponder D/L EIRP	49.9	43.8	55.3	dBW
Carrier Bandwidth	74.3	75.6	75.6	dBHz
4 kHz (dB)	36	36	36	dBHz
Spreading Factor	-162.5	-162.5	-162.5	dBW/m2
Cal. Power Flux density	-150.9	-158.2	-146.7	dBW/m2/4kHz
ITU Power Flux density @	5°	5°	20°	
Limit	-148	-152	-140.5	dBW/m2/4kHz
Margin	2.9	6.2	6.2	dB

In the case of analog signals, this sample computation presented cannot be relied upon to demonstrate compliance with the PFD limits because of the uneven distributed of power across the bandwidth. For this reason, Intelsat will only authorize the transmission of analog signals for which a PFD analysis has been performed and compliance with PFD limits has been assured. In some cases this may require the transponder output to be reduced relative to saturation for this type of transmission in order to comply with the PFD limit.

25.114(c)(9) Arrangement for tracking, telemetry, and control:

GROUND FACILITIES, NETWORK MANAGEMENT AND TT&C (also §§ 25.272 and 25.273)

Functions and Responsibilities of SCC

The SCC will be responsible for real-time control and monitoring the satellite. This includes satellite maneuvers and monitoring the satellite subsystems. The operation of the center will be continuous: 24 hours per day, seven days a week. The SCC will also provide the launch support for IA-9 satellite.

Functions and Responsibilities of IOC

The IOC will maintain contact with all users of IA-9 satellite. It will play a critical role in establishing new communication carriers on the satellite and providing troubleshooting assistance to earth stations experiencing carrier degradation. The IOC will be responsible for marinating discipline in all satellite transmissions by measuring the critical parameters of all carriers on IA-9 through the Communication Systems Monitoring (CSM) and the Remote Spectrum Analyzer (RSAN) monitoring systems. It will also investigate complaints, from users related to satellite traffic. In the event of a satellite failure, the IOC will also be tasked with assisting earth stations in restoring communications carriers on the designated in-orbit spare capacity.

Telemetry, Tracking, Command & Monitoring Network

The TTC&M will include earth stations and associated satellite-monitoring systems to assess the health and correct use of the communication payload. The In-Orbit Testing (IOT) capability will be used to perform the initial IA-9 satellite testing immediately following launch. The main users of the TTC&M will be the SCC, which is responsible for keeping the satellites in "good health". By computer control, The SCC can relay commands from the SCC and IOC to equipment located in the TTC&M stations. The SCC will also ensure that TTC&M stations maintain telemetry reception and collect tracking and ranging data 24 hrs a day, seven days a week, 365 days a year.

25.114(c)(10) Physical characteristics of the space station including weight and dimensions of spacecraft, detailed mass (on ground and in-orbit) and power (beginning and end of life) budgets, and estimated operational lifetime and reliability of the space station and the basis for that estimate:

SPACECRAFT DESCRIPTION

The design of the satellite is based on typical Space System Loral 1300 Bus with extensive heritage and fully qualified technology to improve spacecraft capability. Their main subsystems are as follows.

Propulsion subsystem

This flight-proven, high reliable redundant subsystem provides impulses for maneuvering the spacecraft for transfer orbit phase, station keeping and attitude control and wheel unloading. Its liquid system consists of Monomethylhydrazine propellant.

Solar Array

The array would consist of two identical wings extending symmetrically from the north and south panel of the satellite. Each wing would be populated with GaAs cells.

Thermal

The thermal control subsystem provides thermal control of all components throughout all mission phases. The design provides temperature margins of ±10°C on all components. Its features includes a direct radiating traveling Wave Tubes (TWTs), high-power East/West OMUX panel crossing heat pipes to share thermal load between North and South communication panels and North-South equipment panels that is embedded with heat pipes with optical solar radiators.

Battery

Two 40cell X 178-Ahr NiH2 batteries would be provided to power the satellite.

Orbital Maneuver life and Orbital Design Life

The orbital maneuver life and orbital design of the satellite would be 13 years.

Station-Keeping Accuracy

The satellite station keeping accuracy would be plus/minus 0.05°.

Spacecraft Dry Mass

Table C10.1 shows the estimated mass budget of IA-9 spacecraft including 6% contingency.

Table C10.1 Estimated Mass Budget of IA-9

	Mass (kg)	Margin (kg)	
Structure	344.5	7.00%	24.11
Mechanisms	55.0	1.22%	0.67
Propulsion	143.9	3.64%	5.24
Electrical Power	405.4	3.01%	12.18
Solar Array	192.5	4.00%	7.70
Repeater/Transponder	423.9	10.00%	42.39
Communications Antenna	86.8	10.00%	8.68
TT & C	20.6	5.00%	1.03
ADCS	77.0	2.50%	1.92
Data Handling System	77.3	4.44%	3.43
RF Autotrack System	0.0	0.00%	0.00
Thermal Control	169.0	7.00%	11.83
Electrical Integration	102.4	7.00%	7.17
Spacecraft Dry Nominal	**2098**	**6.0%**	**126.4**
Spacecraft Dry Mass 6.0% Margin	**2225**		

Total Spacecraft Power budget

Table C10.2 shows the estimated power budget (watts) of IA-9 spacecraft

Table C10.2 Estimated power budget of IA-9

SUBSYSTEM	Summer Solstice	Autumnal Equinox	Eclipse
Payload	8,355	8,355	8,355
Data Handling Subsystem	213	213	213
Attitude Determination & Control	114	114	114
Telemetry, Comand, & Ranging	51	51	51
Propulsion	6	6	6
Electric Power	191	191	191
RF Auto Track	0	0	0
Thermal	448	625	267
Harness	105	107	103
3.0 % Customer Reserve Power	284	290	280
SUBSYSTEM TOTAL	9,766	9,950	9,598
Battery Charging/Charging Loss	96	1,113	
Discharging Loss			726
Low-Voltage Converter Losses	29	33	33
Battery-PCU Harness Loss			112
SPACECRAFT TOTAL	9,891	11,096	10,469
Solar Array Capability @ 13 yrs,	11,403	12,655	
Solar Array Shadowing (10/0 Strings SS/AE)	356		
Solar Array Capability(with Shadowing)	11,047	12,655	
SOLAR ARRAY N0-FAILURE MARGIN	11.7%	14.0%	
S/A Contigency (5.0% Load & 1 strings)	516	580	
Solar Array Capibility(with Shadowing & Failure)	10,531	12,075	
SOLAR ARRAY WORST-CASE MARGIN	6.5%	8.8%	
Available Battery Power @77.0% DOD, 40c/178 Ahr			11,170
4 Bat.Cell Failure Contingency			581
Batt Cell Failure Contingency (4 cells)			10,589
WORST-CASE BATTERY DOD			DOD 76.1%

25.114(c)(11) A clear and detailed statement of whether the space station is to be operated on a common carrier basis, or whether non-common carrier transactions are proposed. If non-common carrier transactions are proposed, describe the nature of the transactions and specify the number of transponders to be offered on a non-common carrier basis:

See the attached Schedule S and Form 312.

25.114(c)(12) Dates by which construction will be commenced and completed, launch date, and estimated date of placement into service:

See the attached Schedule S.

25.114(c)(13) The polarization information specified in §§25.210(a)(1), (a)(3), and (i), to the extent applicable:

See the attached Schedule S.

25.114(d)

25.114(d)(1) General description of overall system facilities, operations and services:

GENERAL DESCRIPTION

Intelsat Americas-9 (IA-9) satellite is a hybrid communication satellite designed for operation at 77°W orbital location. The spacecraft payload receives uplink signals in the 5.925 to 6.425 GHz and 14 to 14.5 GHz frequency range. Downlink transmission occurs in the 3.7 to 4.2 GHz and 11.7 to 12.2 GHz frequency bands. The satellite would provide coverage over Continental US., Puerto Rico, S. Canada, Mexico, the Caribbean and Latin America. The spacecraft would be capable of providing 32 Ku-band and 12 C-band transponders.

25.114(d)(2) If applicable, the feeder link and inter-satellite service frequencies requested for the satellite, together with any demonstration otherwise required by this chapter for use of those frequencies (see, e.g., §§25.203(j) and (k):

Not Applicable

25.114(d)(3) Predicted space station antenna gain contour(s) for each transmit and each receive antenna beam and nominal orbit location requested. These contour(s) should be plotted on an area map at 2 dB intervals down to 10 dB below the peak value of the parameter and at 5 dB intervals between 10 dB and 20 dB below the peak values, with the peak value and sense of polarization clearly specified on each plotted contour. For geostationary orbit satellites, this information must be provided in the .gxt format:

In addition to the information provided below, please see the attached Schedule S.

COMMUNICATION PAYLOAD BEAM COVERAGE

Satellite Geographic Coverage Area

The spacecraft would be designed to provide coverage for satellite services over the visible surface of the earth's disk as seen from 77°W orbital location. The visible area is depicted in Figure D3.1 showing the 5° elevation look angle.

Figure D3.1 5° Elevation Look Angle from 77°W

Three types of antenna coverage patterns are defined for the IA-9 satellite. They are the NAC C-band fixed Beam (CTF & CRF as defined in Scheduled S), NAC Ku-Band Fixed Beam (KTR & KRF as defined in Scheduled S) and the S1 Ku-Band Steerable Spot Beam (KTR & KRR as defined in Scheduled S). The polygon definitions for the fixed beams are depicted in figures D3.2, and D3.3.1. The corresponding predicted space station antenna gain contours for each transmit and receive are shown in Annex 1.

NAC C-band fixed Beam

Two congruent fixed coverages with orthogonal sense of linear polarization are achieved with a shaped antenna that illuminates Continental US, Puerto Rico, S. Canada, Mexico and the Caribbean. Figure D3.2 shows the NAC beam polygon definitions.

Figure D3.2 NAC C-Band Fixed Beam Polygon Definitions

Ku-Band Beam Coverage

The spacecraft shall operate with 2 different Ku-band beam coverages. An NAC fixed beam and an S1-Steerable Spot beam coverage. Each of these coverages shall be usable for receive and transmit functions.

NAC Fixed Beam Coverage

The NAC fixed beam coverage is defined as those areas on the surface of the earth which are enclosed within defined polygons as depicted in Figure D3.3.1

Figure D3.3.1 NAC Ku-band fixed Beam Polygon Definitions

Steerable, elliptical spot beam coverage (S1)

The Steerable Spot Beam (S1) receive and transmit coverages shall be defined as those areas on the surface of the earth which, in satellite coordinates, are contained within concentric circles. The sizes of the steerable spot diameters are defined below in Table D3.3.2. This beam would be used outside the NAC Fixed Ku-band Beam. It shall be possible to rotate the major axis of the ellipse from -90° to +90° in step sizes no larger than 1.5°

Table D3.3.2 Elliptical Beam Coverage Definitions

Steerable Spot Beam (S1) Coverage Definition	
S1	Ellipse major and minor axis (°)
Inner 1	3.64 x 2.34
Inner 2	4.10 x 2.65
Outer	5.55 x 3.70

25.114 (d)(4): A description of type of services to be provided, and the areas to be served, including a description of the transmission characteristics and performance objectives for each type of proposed service, details of the link noise budget, typical or baseline earth station parameters, modulation parameters and overall link performance analysis (including analysis of the effects of each contributing noise and interference source):

DESCRIPTION OF SERVICES

The IA-9 spacecraft would provide various types of services such as (1) Voice, Internet and data trucking, (2) Corporate networks including VSAT and (3) Video contribution/distribution and direct-to-home by using point-to-point, point to multi-point and broadcast transmissions. Transponders' characteristics (input/output back-off, SFD, etc.) will be optimized to operate in multicarrier environment as well as near saturation for single carrier per transponder. Several modulation techniques (QPSK, 8PSK, etc) and various coding schemes would be employed by small and large carriers in order to support optimum throughput and to meet availability and performance service objectives. As with each of existing satellites, Intelsat would continue to build on past experience while introducing new modulation techniques needed to keep with traffic growth and expanding new services. The transmission characteristics and performance objectives for each type of proposed services are provided in Schedule S.

LINK BUDGET CALCULATIONS

This section presents the typical sample of link analysis, which Intelsat IA-9 satellite would use to support services. The following assumptions and models were used in the link analysis.

1. Rain Margin
   For all services, the uplink rain attenuation and down link degradation were computed using the PARC program that is based on DAH model (Dissanayake, Allnutt, and Haidara). This is the model on which the ITU-R model is based. The uplink attenuation depends on frequency, earth station location (longitude, latitude and altitude), S/C location, polarization, rain statistics and the required link availability. The downlink degradation includes downlink attenuation as well as increase of system noise temperature in the earth station antenna beam. An average of 5 dB and 2 dB system margin were used in the sample calculations for Ku and C-band.

2. Other Losses
   Up to 1 dB losses is allocated to the link budget to account for TI (terrestrial Interference), Uplink/downlink tracking and HPA instability

The results of the sample calculations demonstrate that IA-9 satellite services would be in compliance with all agreements. Tables D4.1 to D4.4 provides the link budget calculations that shows all the carrier power levels for the digital transmission fully comply with not only Section 25.211 and 25.212 but also with our inter-system coordination agreements with an adjacent satellite networks. Table D4.5 shows the link budget calculations for the analog Television.

Table D4.1 Representative Link Budget and ASI analysis for NAC-Ku-band

	IA-9 Link Budget						IA-9 Link Budget					
Carrier Type	64K, 8PSK, R2/3 RS			Beam	NAC-Ku		64K, QPSK, R1/2 RS					
Wanted System Orbital Location	77 deg W											
Interfering System Orbital Location	79 deg W		and 74W (FCC allocation)									
Minimum Orbital Separation (Geo-centric)	1.90 deg ; Note: the calculations take topocentric advantage into account											1.90
Interfering downlink e.i.r.p. density(bp)	-23.0	-23.0	-23.0	-23.0	-23.0	-23.0	-23.0	-23.0	-23.0	-23.0	-23.0	-23.0
Interfering uplink power density	-50.0	-50.0	-50.0	-50.0	-50.0	-50.0	-50.0	-50.0	-50.0	-50.0	-50.0	-50.0
Uplink frequency (GHz)	14.250	14.250	14.250	14.250	14.250	14.250	14.250	14.250	14.250	14.250	14.250	14.250
Downlink frequency (GHz)	11.950	11.950	11.950	11.950	11.950	11.950	11.950	11.950	11.950	11.950	11.950	11.950
Transmit ES Locatio	CONUS	CONUS	S. Canada	S. Canada	Conus	Conus	CONUS	CONUS	S. Canada	S. Canada	Conus	Conus
Receive ES Location	CONUS	CONUS	Conus	Conus	S. Canada	S. Canada	CONUS	CONUS	Conus	Conus	S. Canada	S. Canada
Uplink Range	37650.3	37650.3	40490.6	40490.6	37650.3	37650.3	37650.3	37650.3	40490.6	40490.6	37650.3	37650.3
ES Size at BE	9.0	1.8	9.0	3.0	9.0	1.8	10.0	0.90	10.0	1.20	10.0	0.90
Transmit ES Peak gain	60.3	46.4	60.3	50.8	60.3	46.4	61.3	40.3	61.3	42.8	61.3	40.3
ES Size at beam peak	7.93	1.59	5.61	1.87	7.93	1.59	8.81	0.79	6.24	0.75	8.81	0.79
Downlink Range	37650.3	37650.3	37650.3	37650.3	40490.6	40490.6	37650.3	37650.3	37650.3	37650.3	40490.6	40490.6
ES Size	2.4	9.0	2.4	9.0	3.0	9.0	1.20	10.0	1.20	10.0	1.20	10.0
Receive ES Gain	47.3	58.8	47.3	58.8	49.3	58.8	41.3	59.7	41.3	59.7	41.3	59.7
Receive ES G/T	27.3	38.8	27.3	38.8	29.3	38.8	21.3	39.7	21.3	39.7	21.3	39.7
Carrier Type	64KR2/3	64KR2/3	64KR2/3	64KR2/3	64KR2/3	64KR2/3	64KR1/2	64KR1/2	64KR1/2	64KR1/2	64KR1/2	64KR1/2
Nominal carrier rate (kbit/s)	64.0	64.0	64.0	64.0	64.0	64.0	64	64	64	64	64	64
Occupied bandwidth per carrier (kHz)	34.9	34.9	34.9	34.9	34.9	34.9	69.7	69.7	69.7	69.7	69.7	69.7
Allocated bandwidth per carrier (kHz)	47.1	47.1	47.1	47.1	47.1	47.1	94.1	94.1	94.1	94.1	94.1	94.1
Carrier Noise bandwidth(dB-Hz)	45.42	45.42	45.42	45.42	45.42	45.42	48.43	48.43	48.43	48.43	48.43	48.43
Eb/No	7.90	7.90	7.90	7.90	7.90	7.90	4.9	4.9	4.9	4.9	4.9	4.9
C/N Threshold	10.54	10.54	10.54	10.54	10.54	10.54	4.5	4.5	4.5	4.5	4.5	4.5
System Margin	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
C/N, Threshold + margin	15.54	15.54	15.54	15.54	15.54	15.54	9.53	9.53	9.53	9.53	9.53	9.53
Nominal e/s e.i.r.p. per carrier @be(dBW)	55.8	41.8	55.8	46.2	55.8	41.8	59.7	38.8	59.7	41.3	59.7	38.8
TX ES PSD	-50.0	-50.0	-50.0	-50.0	-50.0	-50.0	-50.0	-50.0	-50.0	-50.0	-50.0	-50.0
ES eirp @ bp-- minimum (dBW)	54.7	40.7	51.7	42.1	54.7	40.7	58.6	37.7	55.6	37.2	58.6	37.7
BE-BP difference	1.1	1.1	4.1	4.1	1.1	1.1	1.1	1.1	4.1	4.1	1.1	1.1
Free space path loss (dB)	207.0	207.0	207.7	207.7	207.0	207.0	207.0	207.0	207.7	207.7	207.0	207.0
G/T satellite (dB/K)	2.2	2.2	-0.8	-0.8	2.2	2.2	2.2	2.2	-0.8	-0.8	2.2	2.2
C/N uplink (dB)	34.1	20.1	30.5	20.9	34.1	20.1	35.0	14.1	31.4	13.0	35.0	14.1
X-pol interf:C/I -uplink (dB)-wanted system	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0
X-pol interf:C/I -uplink (dB)-interfering ES	43.8	29.8	43.8	34.2	43.8	29.8	44.7	23.8	44.7	26.3	44.7	23.8
C/I - copol asi uplink (dB)	38.3	24.3	35.3	25.7	38.3	24.3	39.2	18.3	36.2	17.8	39.2	18.3
C/IM intermodulation (dB)	20.9	28.9	20.9	28.9	20.9	28.9	17.9	25.9	17.9	25.9	17.9	25.9
C/N+I+others, uplink	20.1	17.8	19.9	18.7	20.1	17.8	17.5	12.1	17.4	11.4	17.5	12.1
Downlink BP-BE difference	1.1	1.1	1.1	1.1	4	4	1.1	1.1	1.1	1.1	4	4
Satellite Txpr e.i.r.p. -be (dBW)	47.9	47.9	47.9	47.9	45.9	45.9	47.9	47.9	47.9	47.9	45.9	45.9
Satellite e.i.r.p. per carrier (dBW)-be	19.1	10.8	19.6	9.1	17.0	10.9	21.1	6.1	21.3	8.8	21.1	6.9
Satellite e.i.r.p.d. per carrier (dBW)-be	-26.3	-34.6	-25.8	-36.3	-28.4	-34.5	-27.3	-42.3	-27.1	-39.6	-27.3	-41.5
Satellite e.i.r.p.d. per carrier (dBW)-bp	-25.2	-33.5	-24.7	-35.2	-24.4	-30.5	-26.2	-41.2	-26.0	-38.5	-23.3	-37.5
Earth station pointing loss (dB)	0.30	0.3	0.3	0.3	0.3	0.3	0.30	0.3	0.3	0.3	0.3	0.3
C/N downlink towards BP (dB)	24.9	28.1	24.8	25.8	27.7	31.1	17.9	21.3	17.5	23.4	20.8	25.0
C/N downlink towards ES (dB)	23.8	27.0	23.7	24.7	23.7	27.1	16.8	20.2	16.4	22.3	16.8	21.0
C/N-thermal-total	23.4	19.3	22.9	19.4	23.3	19.3	16.7	13.2	16.2	12.5	16.7	13.3
Geo-centric separation	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90
Topocentric separation	2.09	2.09	2.09	2.09	2.09	2.09	2.09	2.09	2.09	2.09	2.09	2.09
RX ES Offset angle	1.98	2.06	1.98	2.06	2.00	2.06	1.86	2.06	1.86	2.06	1.86	2.06
RX ES Co-pol Gain towards Interfering satellite	21.6	21.2	21.6	21.2	21.5	21.2	21.5	21.1	21.5	21.1	21.5	21.1
C/I downlink frequency reuse (dB)	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
C/I Co-polar downlink interference d/I(dB)	22.1	25.8	22.6	24.1	22.1	25.9	15.2	19.0	15.4	21.7	15.2	19.8
C/I X-polar external interference d/I (dB)	26.6	30.2	27.1	28.5	26.6	30.3	17.0	23.4	17.2	26.1	17.0	24.2
Downlink C/(Nth +I+others) composite with ASI dn	19.1	22.5	19.3	20.6	19.0	22.6	11.5	15.7	11.5	18.2	11.5	16.5
Total C/(Nth +I) composite with ASI tot	16.5	16.5	16.6	16.5	16.5	16.5	10.5	10.6	10.5	10.6	10.5	10.8
Total C/(Nth +others) w/o ASI	18.6	18.5	18.5	18.6	18.6	18.6	14.2	12.9	13.9	12.2	14.2	13.0
ASI uplink, %	0.7	17.1	1.2	11.0	0.7	17.1	0.1	17.1	0.2	17.0	0.1	17.1
ASI downlink, %	29.6	12.9	26.3	19.0	29.9	12.6	44.8	15.3	42.8	8.2	44.8	12.8
ASI-total, %	30.2	29.9	27.6	30.0	30.5	29.6	44.9	32.4	43.0	25.3	44.9	29.8
Other losses(terrestrial, OBE, etc.,)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Available C/N	15.5	15.5	15.6	15.5	15.5	15.5	9.5	9.6	9.5	9.6	9.5	9.8
Available C/N Margin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3

Table D4.2 Representative Link Budget and ASI analysis for NAC C-Band

	IA-9 Link Budget						IA-9 Link Budget					
Carrier Type	64K, 8PSK, R2/3 RS			Beam: NAC-C			64K, QPSK, R1/2 RS					
Wanted System Orbital Location	77 deg W								Beam: NAC-C		UP Freq	6.225
Interfering System Orbital Location	79 deg W	and 74W (FCC allocation)									DN Freq	4
Minimum Orbital Separation (Geo-centric)	1.90 deg ; Note: the calculations take topocentric advantage into account										1.90 deg	
Wanted Satellite U/L PSD Limit	-48.0	-48.0	-48.0	-48.0	-48.0	-48.0	-48.0	-48.0	-48.0	-48.0	-48.0	-48.0
Wanted Satellite e.i.r.p.density limit dBW/Hz)	-32.0	-32.0	-32.0	-32.0	-32.0	-32.0	-32.0	-32.0	-32.0	-32.0	-32.0	-32.0
Interfering downlink e.i.r.p. density(bp)	-32.0	-32.0	-32.0	-32.0	-32.0	-32.0	-32.0	-32.0	-32.0	-32.0	-32.0	-32.0
Interfering uplink power density	-41.0	-41.0	-41.0	-41.0	-41.0	-41.0	-41.0	-41.0	-41.0	-41.0	-41.0	-41.0
Transmit ES Locatio	CONUS	CONUS	S. Canada	S. Canada	Conus	Conus	CONUS	CONUS	S. Canada	S. Canada	Conus	Conus
Receive ES Location	CONUS	CONUS	CONUS	CONUS	S. Canada	S. Canada	CONUS	CONUS	CONUS	CONUS	S. Canada	S. Canada
ES Optimization	Small RX I	Small TX I	Small RX	Small TX I	Small RX	Small TX	mall RX E	mall TX E	mall RX E	mall TX E	mall RX E	mall TX E
Uplink Range	37650.3	37650.3	40490.6	40490.6	37650.3	37650.3	37650.3	37650.3	40490.6	40490.6	37650.3	37650.3
ES Size at BE	10.0	4.5	10.0	9.0	10.0	4.5	10.0	2.4	10.0	3.0	10.0	2.4
Transmit ES Peak gain	54.1	47.1	54.1	53.1	54.1	47.1	54.1	41.7	54.1	43.6	54.1	41.7
ES Size at beam peak	9.66	4.35	6.84	6.16	9.66	4.35	9.66	2.32	6.84	2.05	9.66	2.32
Downlink Range	37650.3	37650.3	37650.3	37650.3	40490.6	40490.6	37650.3	37650.3	37650.3	37650.3	40490.6	40490.6
ES Size	4.5	10.0	4.5	6.0	6.0	10.0	3.0	10.0	3.0	10.0	3.8	10.0
Receive ES Gain	43.3	50.2	43.3	45.8	45.8	50.2	39.8	50.2	39.8	50.2	41.8	50.2
Receive ES G/T	23.3	30.2	23.3	25.8	25.8	30.2	19.8	30.2	19.8	30.2	21.8	30.2
Carrier Type	64KR2/3	64KR2/3	64KR2/3	64KR2/3	64KR2/3	64KR2/3	64KR1/2	64KR1/2	64KR1/2	64KR1/2	64KR1/2	64KR1/2
Nominal carrier rate (kbit/s)	64.0	64.0	64.0	64.0	64.0	64.0	64	64	64	64	64	64
Occupied bandwidth per carrier (kHz)	34.9	34.9	34.9	34.9	34.9	34.9	69.7	69.7	69.7	69.7	69.7	69.7
Eb/No	7.90	7.90	7.90	7.90	7.90	7.90	4.9	4.9	4.9	4.9	4.9	4.9
C/N Threshold	10.54	10.54	10.54	10.54	10.54	10.54	4.5	4.53	4.5	4.53	4.53	4.5
System Margin	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
C/N, Threshold + margin	12.54	12.54	12.54	12.54	12.54	12.546	.53	6.53	6.53	6.53	6.53	6.53
Nominal e/s e.i.r.p. per carrier (dBW)	51.5	44.6	51.5	50.6	51.5	44.6	54.5	42.0	54.5	44.0	54.5	42.0
TX ES PSD	-48.0	-48.0	-48.0	-48.0	-48.0	-48.0	-48.0	-48.1	-48.0	-48.0	-48.0	-48.1
ES eirp @ bp-- minimum (dBW)	51.2	44.3	48.2	47.3	51.2	44.3	54.2	41.7	51.2	40.7	54.2	41.7
BE-BP difference	0.3	0.3	3.3	3.3	0.3	0.3	0.3	0.3	3.3	3.3	0.3	0.3
E/s pointing loss (dB)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Free space path loss (dB)	199.8	199.8	200.5	200.5	199.8	199.8	199.8	199.8	200.5	200.5	199.8	199.8
Rain attenuation (dB)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
G/T satellite (dB/K)	0.5	0.5	-2.5	-2.5	0.5	0.5	0.5	0.5	-2.5	-2.5	0.5	0.5
C/N uplink (dB)	35.3	28.4	31.7	30.8	35.3	28.4	35.3	22.8	31.7	21.2	35.3	22.8
X-pol interf.C/I -uplink (dB)-wanted system	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0
X-pol interf.C/I -uplink (dB)-interfering ES	30.5	23.6	30.5	29.6	30.5	23.6	30.5	18.0	30.5	20.0	30.5	18.0
C/I - copol asi uplink (dB)	25.8	18.9	22.8	21.9	25.8	18.9	25.8	13.3	22.8	12.3	25.8	13.3
C/IM intermodulation (dB)	23.2	35.2	23.2	35.2	23.2	35.2	20.2	32.2	20.2	32.2	20.2	32.2
C/N+I+others, uplink	20.2	17.0	19.0	20.1	20.2	17.0	18.4	11.6	17.6	11.0	18.4	11.6
Downlink BP-BE difference	2	2	2	2	5	5	2	2	2	2	5	5
Satellite Txpr e.i.r.p. -be (dBW)	41.8	41.8	41.8	41.8	38.8	38.8	41.8	41.8	41.8	41.8	38.8	38.8
Satellite e.i.r.p. per carrier (dBW)-be	11.1	6.2	11.4	8.6	8.4	6.2	14.1	2.4	14.3	3.1	8.9	2.4
Satellite e.i.r.p.d. per carrier (dBW)-be	-34.3	-39.2	-34.0	-36.8	-37.0	-39.2	-34.3	-46.0	-34.1	-45.3	-39.5	-46.0
Satellite e.i.r.p.d. per carrier (dBW)-bp	-32.3	-37.2	-32.0	-34.8	-32.0	-34.2	-32.3	-44.0	-32.1	-43.3	-34.5	-41.0
Earth station pointing loss (dB)	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
C/N downlink towards BP (dB)	23.3	25.3	22.9	22.6	26.1	28.3	19.8	18.5	19.3	18.6	19.6	21.5
C/N downlink towards ES (dB)	21.3	23.3	20.9	20.6	21.1	23.3	17.8	16.5	17.3	16.6	14.6	16.5
C/N-thermal-total	21.1	22.1	20.6	20.2	20.9	22.1	17.7	15.6	17.2	15.3	14.6	15.6
C/I Co-polar downlink interference d/I(dB)	18.7	21.3	19.0	19.0	18.8	21.3	10.6	14.5	10.8	15.2	12.4	14.5
C/I X-polar external interference d/I (dB)	23.3	25.8	23.6	23.5	23.3	25.8	16.7	19.0	16.9	19.7	14.6	19.0
Downlink C/(Nth +I+others) composite with ASI dn	15.9	18.3	16.0	15.9	15.9	18.3	9.0	11.5	9.1	12.0	9.0	11.5
Total C/(Nth +I) composite with ASI tot	14.5	14.6	14.2	14.5	14.5	14.6	8.5	8.5	8.6	8.5	8.5	8.5
Total C/(Nth +others) w/o ASI	18.7	21.3	18.4	19.7	18.6	21.3	15.6	15.4	15.3	15.1	13.4	15.4
ASI uplink, %	6.3	31.0	11.0	13.6	6.3	31.0	1.6	28.2	2.8	31.1	1.6	28.2
ASI downlink, %	32.5	18.1	30.3	30.7	32.1	18.0	48.6	21.6	46.4	18.4	41.3	21.6
ASI-total, %	38.8	49.0	41.3	44.3	38.5	48.9	50.2	49.8	49.2	49.4	42.9	49.8
Other losses(terrestrial, OBE, etc.,)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Available C/N	13.5	13.6	13.2	13.5	13.5	13.6	7.5	7.5	7.6	7.5	7.5	7.5
Available C/N Margin	1.0	1.0	0.7	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Table D4.3 Representative Link Budget and ASI analysis for S1-Ku-band

IA-9 Link Budget

Carrier Type	64K, 8PSK, R2/3 RS	Beam	S1	UP Freq	14 GHz
Wanted System Orbital Location	77 deg W			DN Freq	11.95 GHz
Interfering System Orbital Location	79 deg W or 75 or 75W; assumes Brazilian rule				
Minimum Orbital Separation (Geo-centric)	1.90 deg ; Note: the calculations do not take into account any Receive ES contour advantage				

Interfering downlink e.i.r.p. density(bp)	-22.0	-22.0	-22.0	-22.0	-22.0	-22.0	-22.0	-22.0	-22.0	-22.0
Interfering uplink power density	-48.0	-48.0	-48.0	-48.0	-48.0	-48.0	-48.0	-48.0	-48.0	-48.0
Uplink frequency (GHz)	14.250	14.250	14.250	14.250	14.250	14.250	14.250	14.250	14.250	14.250
Downlink frequency (GHz)	11.950	11.950	11.950	11.950	11.950	11.950	11.950	11.950	11.950	11.950
Transmit ES Locatio	Inner-1	Inner-1	Inner-2	Inner-2	Inner-1	Inner-1	Outer	Outer	Inner-1	Inner-1
Receive ES Location	Inner-1	Inner-1	Inner-1	Inner-1	Inner-2	Inner-2	Inner-1	Inner-1	Outer	Outer
Uplink Range	37650.3	37650.3	40490.6	40490.6	37650.3	37650.3	42380.7	42380.7	37650.3	37650.3
ES Size at BE	9.0	1.5	9.0	1.8	9.0	1.5	9.0	3.0	9.0	1.5
Transmit ES Peak gain	60.3	44.8	60.3	46.4	60.3	44.8	60.3	50.8	60.3	44.8
ES Size at beam peak	6.75	1.12	5.06	1.01	6.75	1.12	3.19	1.06	6.75	1.12
Downlink Range	37650.3	37650.3	37650.3	37650.3	40490.6	40490.6	37650.3	37650.3	42380.7	42380.7
Receive ES Size	2.4	9.0	2.4	9.0	3.0	9.0	3.0	9.0	4.5	9.0
Receive ES Gain	47.3	58.8	47.3	58.8	49.3	58.8	49.3	58.8	52.8	58.8
Receive ES G/T	27.3	38.8	27.3	38.8	29.3	38.8	29.3	38.8	32.8	38.8
Carrier Type	64KR2/3	64KR2/3	64KR2/3	64KR2/3	64KR2/3	64KR2/3	64KR2/3	64KR2/3	64KR2/3	64KR2/3
Nominal carrier rate (kbit/s)	64.0	64.0	64.0	64.0	64.0	64.0	64.0	64.0	64.0	64.0
Occupied bandwidth per carrier (kHz)	34.9	34.9	34.9	34.9	34.9	34.9	34.9	34.9	34.9	34.9
Eb/No	7.90	7.90	7.90	7.90	7.90	7.90	7.90	7.90	7.90	7.90
C/N Threshold	10.54	10.54	10.54	10.54	10.54	10.54	10.54	10.54	10.54	10.54
System Margin	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
C/N, Threshold + margin	15.54	15.54	15.54	15.54	15.54	15.54	15.54	15.54	15.54	15.54
Nominal e/s e.i.r.p. per carrier (dBW)	57.5	41.9	57.5	43.5	57.5	41.9	57.5	47.9	57.5	41.9
TX ES PSD	-48.3	-48.3	-48.3	-48.3	-48.3	-48.3	-48.3	-48.3	-48.3	-48.3
ES eirp @ bp-- minimum (dBW)	55.0	39.4	52.5	38.5	55.0	39.4	48.5	38.9	55.0	39.4
BE-BP difference	2.5	2.5	5.0	5.0	2.5	2.5	9.0	9.0	2.5	2.5
G/T satellite (dB/K)	5.2	5.2	2.7	2.7	5.2	5.2	-1.3	-1.3	5.2	5.2
C/N uplink (dB)	38.8	23.2	35.7	21.7	38.8	23.2	31.3	21.7	38.8	23.2
X-pol interf:C/I -uplink (dB)-wanted system	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0
X-pol interf:C/I -uplink (dB)-interfering ES	43.5	27.9	43.5	29.5	43.5	27.9	43.5	33.9	43.5	27.9
C/I - copol asi uplink (dB)	36.6	21.0	34.1	20.1	36.6	21.0	30.1	20.5	36.6	21.0
C/IM intermodulation (dB)	20.9	28.9	20.9	28.9	20.9	28.9	20.9	28.9	20.9	28.9
C/N+I+others, uplink	20.2	17.8	20.1	17.0	20.2	17.8	19.6	17.4	20.2	17.8
Downlink BP-BE difference	3	3	3	3	5.3	5.3	3	3	8.6	8.6
Satellite Txpr e.i.r.p. -be (dBW)	52.3	52.3	52.3	52.3	50	50	52.3	52.3	46.7	46.7
Satellite e.i.r.p. per carrier (dBW)-be	19.7	11.5	20.4	15.9	17.6	11.5	18.6	13.4	14.1	11.5
Satellite e.i.r.p.d. per carrier (dBW)-be	-25.7	-33.9	-25.0	-29.5	-27.8	-33.9	-26.8	-32.0	-31.3	-33.9
Satellite e.i.r.p.d. per carrier (dBW)-bp	-22.7	-30.9	-22.0	-26.5	-22.5	-28.6	-23.8	-29.0	-22.7	-25.3
Earth station pointing loss (dB)	0.30	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
C/N downlink towards BP (dB)	27.4	30.7	27.5	34.5	29.6	33.0	27.2	31.6	32.9	36.3
C/N downlink towards ES (dB)	24.4	27.7	24.5	31.5	24.3	27.7	24.2	28.6	24.3	27.7
C/N-thermal-total	24.3	21.9	24.2	21.3	24.1	21.9	23.5	20.9	24.1	21.9
C/I Co-polar downlink interference d/I(dB)	21.7	25.5	22.4	29.9	21.7	25.5	22.7	27.4	21.9	25.5
C/I X-polar external interference d/I (dB)	26.2	29.9	26.9	34.3	26.2	29.9	27.2	31.8	26.3	29.9
Downlink C/(Nth +I+others) composite with ASI dn	19.0	22.5	19.5	26.7	18.9	22.5	19.6	24.1	19.0	22.5
Total C/(Nth +I) composite with ASI tot	16.5	16.5	16.8	16.6	16.5	16.5	16.6	16.5	16.6	16.5
Total C/(Nth +others) w/o ASI	18.9	20.6	18.9	20.1	18.9	20.6	18.7	19.8	18.9	20.6
ASI uplink, %	0.9	34.3	1.6	39.0	0.9	34.3	3.7	33.4	0.9	34.3
ASI downlink, %	32.4	13.8	27.6	5.0	32.7	13.8	26.0	8.9	31.4	13.8
ASI-total, %	33.4	48.0	29.1	44.0	33.7	48.0	29.7	42.3	32.4	48.0
Other losses(terrestrial, OBE, etc.,)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Available C/N	15.5	15.5	15.8	15.6	15.5	15.5	15.6	15.5	15.6	15.5
Available C/N Margin	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table D4.4 Representative Link Budget and ASI analysis for S1-Ku-band

IA-9 Link Budget

Carrier Type	64K, QPSK, R1/2 RS									
Wanted System Orbital Location	77 deg W									
Interfering System Orbital Location	79 deg W or 75W; assumes Brazilian rule									
Minimum Orbital Separation (Geo-centric)	1.90 deg ; Note: the calculations do not take into account any Receive ES contour advantage									
Interfering downlink e.i.r.p. density(bp)	-22.0	-22.0	-22.0	-22.0	-22.0	-22.0	-22.0	-22.0	-22.0	-22.0
Interfering uplink power density	-48.0	-48.0	-48.0	-48.0	-48.0	-48.0	-48.0	-48.0	-48.0	-48.0
Uplink frequency (GHz)	14.250	14.250	14.250	14.250	14.250	14.250	14.250	14.250	14.250	14.250
Downlink frequency (GHz)	11.950	11.950	11.950	11.950	11.950	11.950	11.950	11.950	11.950	11.950
Transmit ES Locatio	Inner-1	Inner-1	Inner-2	Inner-2	Inner-1	Inner-1	Outer	Outer	Inner-1	Inner-1
Receive ES Location	Inner-1	Inner-1	Inner-1	Inner-1	Inner-2	Inner-2	Inner-1	Inner-1	Outer	Outer
Range	37650.3	37650.3	40490.6	40490.6	37650.3	37650.3	42380.7	42380.7	37650.3	37650.3
ES Size at BE	9.0	0.75	9.0	0.90	9.0	0.75	9.0	1.50	9.0	0.75
Transmit ES Peak gain	60.3	38.8	60.3	40.3	60.3	38.8	60.3	44.8	60.3	38.8
ES Size at beam peak	6.75	0.56	5.06	0.51	6.75	0.56	3.19	0.53	6.75	0.56
Range	37650.3	37650.3	37650.3	37650.3	40490.6	40490.6	37650.3	37650.3	42380.7	42380.7
ES Size	1.20	9.0	1.20	9.0	1.50	9.0	1.20	9.0	2.40	9.0
Receive ES Gain	41.3	58.8	41.3	58.8	43.3	58.8	41.3	58.8	47.3	58.8
Receive ES G/T	21.3	38.8	21.3	38.8	23.3	38.8	21.3	38.8	27.3	38.8
Carrier Type	64KR1/2	64KR1/2	64KR1/2	64KR1/2	64KR1/2	64KR1/2	64KR1/2	64KR1/2	64KR1/2	64KR1/2
Nominal carrier rate (kbit/s)	64	64	64	64	64	64	64	64	64	64
Occupied bandwidth per carrier (kHz)	69.7	69.7	69.7	69.7	69.7	69.7	69.7	69.7	69.7	69.7
Eb/No	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9
C/N Threshold	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
System Margin	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
C/N, Threshold + margin	9.53	9.53	9.53	9.53	9.53	9.53	9.53	9.53	9.53	9.53
Nominal e/s e.i.r.p. per carrier (dBW)	60.5	38.9	60.5	40.5	60.5	38.9	60.5	44.9	60.5	38.8
TX ES PSD	-48.3	-48.3	-48.3	-48.3	-48.3	-48.3	-48.3	-48.3	-48.3	-48.4
ES eirp @ bp-- minimum (dBW)	58.0	36.4	55.5	35.5	58.0	36.4	51.5	35.9	58.0	36.3
BE-BP difference	2.5	2.5	5.0	5.0	2.5	2.5	9.0	9.0	2.5	2.5
G/T satellite (dB/K)	5.2	5.2	2.7	2.7	5.2	5.2	-1.3	-1.3	5.2	5.2
C/N uplink (dB)	38.8	17.2	35.7	15.7	38.8	17.2	31.3	15.7	38.8	17.1
X-pol interf:C/I -uplink (dB)-wanted system	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0
X-pol interf:C/I -uplink (dB)-interfering ES	43.5	21.9	43.5	23.5	43.5	21.9	43.5	27.9	43.5	21.8
C/I - copol asi uplink (dB)	36.6	15.0	34.1	14.1	36.6	15.0	30.1	14.5	36.6	14.9
C/IM intermodulation (dB)	17.9	25.9	17.9	25.9	17.9	25.9	17.9	25.9	17.9	25.9
C/N+I+others, uplink	17.5	12.2	17.5	11.3	17.5	12.2	17.2	11.7	17.5	12.1
BP-BE difference	3	3	3	3	5.3	5.3	3	3	8.6	8.6
Satellite Txpr e.i.r.p. -be (dBW)	52.3	52.3	52.3	52.3	50	50	52.3	52.3	46.7	46.7
Satellite e.i.r.p. per carrier (dBW)-be	21.8	7.5	22.0	10.4	19.6	7.6	22.2	9.2	15.2	7.8
Satellite e.i.r.p.d. per carrier (dBW)-be	-26.6	-40.9	-26.4	-38.0	-28.8	-40.8	-26.2	-39.2	-33.2	-40.6
Satellite e.i.r.p.d. per carrier (dBW)-bp	-23.6	-37.9	-23.4	-35.0	-23.5	-35.5	-23.2	-36.2	-24.6	-32.0
Earth station pointing loss (dB)	0.30	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
C/N downlink towards BP (dB)	20.5	23.7	20.1	26.0	22.5	26.1	19.9	24.4	25.5	29.6
C/N downlink towards ES (dB)	17.5	20.7	17.1	23.0	17.2	20.8	16.9	21.4	16.9	21.0
C/N-thermal-total	17.5	15.6	17.0	14.9	17.2	15.6	16.7	14.7	16.9	15.6
C/I Co-polar downlink interference d/l(dB)	14.9	18.5	15.1	21.4	14.2	18.6	15.3	20.2	14.2	18.8
C/I X-polar external interference d/l (dB)	16.7	22.9	16.9	25.8	18.8	23.0	17.1	24.6	18.7	23.2
Downlink C/(Nth +I+others) composite with ASI dn	11.5	15.5	11.5	18.2	11.5	15.6	11.6	16.9	11.5	15.8
Total C/(Nth +I) composite with ASI tot	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5
Total C/(Nth +others) w/o ASI	14.5	15.1	14.3	14.5	14.4	15.1	14.1	14.2	14.2	15.1
ASI uplink, %	0.2	34.3	0.4	39.0	0.2	34.3	0.9	33.4	0.2	35.0
ASI downlink, %	48.0	17.3	45.8	8.9	46.2	16.9	43.8	11.7	45.7	16.2
ASI-total, %	48.2	51.6	46.2	47.9	46.4	51.2	44.7	45.1	45.9	51.2
Other losses(terrestrial, OBE, etc.,)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Available C/N	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5
Available C/N Margin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table D4.5 Representative Link Budget and ASI analysis for TVFM

	IA-9 Link Budget						IA-9 Link Budget		
Carrier Type	SINGLE TV/FM PER TXPR						TWO TV/FM PER TXPR		
Wanted System Orbital Location	77 deg W						Beam: NAC-C		
Interfering System Orbital Location	79 deg W and 74W (FCC allocation)								
Minimum Orbital Separation (Geo-centric)	1.90 deg ; Note: the calculations take topocentric advantage into account								
Interfering downlink e.i.r.p. density(bp)	-32.0	-32.0	-32.0	-32.0	-32.0	-32.0	-32.0	-32.0	-32.0
Interfering uplink power density	-41.0	-41.0	-41.0	-41.0	-41.0	-41.0	-41.0	-41.0	-41.0
Transmit ES Locatio	CONUS	CONUS	S. CAN	S. CAN	CONUS	CONUS	CONUS	S. CAN	CONUS
Receive ES Location	CONUS	CONUS	CONUS	CONUS	S. CAN	S. CAN	CONUS	CONUS	S. CAN
TX ES Size at BE	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Transmit ES Peak gain	54.1	54.1	54.1	54.1	54.1	54.1	54.1	54.1	54.1
ES Size at beam peak	9.66	9.66	6.84	6.84	9.66	9.66	9.66	6.84	9.66
Downlink Range	37650.3	37650.3	37650.3	37650.3	40490.6	40490.6	37650.3	37650.3	40490.6
ES Size	9.0	7.0	12.0	9.0	12.0	9.0	9.0	9.0	12.0
Receive ES Gain	49.3	47.1	51.8	49.3	51.8	49.3	49.3	49.3	51.8
Receive ES G/T	29.3	27.1	31.8	29.3	31.8	29.3	29.3	29.3	31.8
Carrier Type	1 TV/xpr	1 TV/xpr	1 TV/xpr	1 TV/xpr	1 TV/xpr	1 TV/xpr	2TV/xpr	2TV/xpr	2TV/xpr
Energy Dispersal BW	2000	2000	2000	2000	2000	2000	2000	2000	2000
Occupied bandwidth per carrier (kHz)	30000.0	20000.0	30000.0	20000.0	30000.0	20000.0	18000.0	18000.0	18000.0
Allocated bandwidth per carrier (kHz)	36000.0	36000.0	36000.0	36000.0	36000.0	36000.0	20000.0	20000.0	20000.0
Carrier Noise bandwidth(dB-Hz)	63.01	63.01	63.01	63.01	63.01	63.01	63.01	63.01	63.01
C/N Threshold	17.20	17.2	17.2	17.2	17.2	17.2	15.5	15.5	15.5
System Margin	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
C/N, Threshold + margin	19.20	19.20	19.20	19.20	19.20	19.20	17.50	17.50	17.50
Nominal e/s e.i.r.p. per carrier (dBW)	80.6	80.6	80.6	80.6	80.6	80.6	80.6	80.6	80.6
ES Power	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5
TX ES PSD	-36.5	-36.5	-36.5	-36.5	-36.5	-36.5	-36.5	-36.5	-36.5
BE-BP difference	0.3	0.3	3.3	3.3	0.3	0.3	0.3	3.3	0.3
G/T satellite (dB/K)	0.5	0.5	-2.5	-2.5	0.5	0.5	0.5	-2.5	0.5
C/N uplink (dB)	35.0	36.8	31.4	33.2	35.0	36.8	37.3	33.6	37.3
X-pol interf:C/I -uplink (dB)-wanted system	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0
X-pol interf:C/I -uplink (dB)-interfering ES	30.2	32.0	30.2	32.0	30.2	32.0	32.4	32.4	32.4
C/I - copol asi uplink (dB)	25.5	27.3	22.5	24.3	25.5	27.3	27.7	24.7	27.7
C/N+I+others, uplink	22.9	24.3	20.8	22.3	22.9	24.3	24.6	22.7	24.6
Downlink BP-BE difference	2	2	2	2	4	4	2	2	4
DL ES Pattern Advantage	0	0	0	0	0	0	0	0	0
Satellite Txpr e.i.r.p. -be (dBW)	41.8	41.8	41.8	41.8	39.8	39.8	41.8	41.8	39.8
Output back-off	0	0	0	0	0	0	5.5	5.5	5.5
Satellite e.i.r.p. per carrier (dBW)-be	41.8	41.8	41.8	41.8	39.8	39.8	36.3	36.3	34.3
Free space path loss (dB)	196.0	196.0	196.6	196.6	196.0	196.0	196.0	196.6	196.0
Earth station pointing loss (dB)	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
Earth station G/T (dB/K), T=140K	29.3	27.1	31.8	29.3	31.8	29.3	29.3	29.3	31.8
C/N downlink towards BP (dB)	30.6	30.2	32.5	31.8	33.1	32.4	27.3	26.7	29.8
C/N downlink towards ES (dB)	28.6	28.2	30.5	29.8	29.1	28.4	25.3	24.7	25.8
C/N-thermal-total	27.7	27.6	27.9	28.1	28.1	27.8	25.1	24.2	25.5
C/I Co-polar downlink interference d/I(dB)	26.6	26.0	29.2	28.3	27.2	26.3	23.3	23.3	23.9
C/I X-polar external interference d/I (dB)	31.1	30.5	33.6	32.8	31.6	30.8	27.8	27.8	28.4
Downlink C/(Nth +I+others) composite with ASI dn	23.6	23.1	26.0	25.2	24.2	23.4	20.3	20.1	20.9
Total C/(Nth +I) composite with ASI tot	20.2	20.6	19.7	20.5	20.5	20.8	18.9	18.2	19.4
Total C/(Nth +others) w/o ASI	25.8	23.7	24.0	24.3	23.8	23.8	22.0	21.5	22.4
ASI uplink, %	31.3	20.8	54.5	36.3	31.3	20.8	12.7	22.1	12.7
ASI downlink, %	24.8	28.2	13.6	16.5	21.5	26.2	35.7	35.7	31.0
ASI-total, %	56.1	49.1	68.1	52.9	52.8	47.1	48.4	57.8	43.7
Other losses(terrestrial, OBE, etc.,)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Available C/N	19.2	19.6	18.7	19.5	19.5	19.8	17.9	17.2	18.4
Available C/N Margin	0.0	0.4	-0.5	0.3	0.3	0.6	0.4	-0.3	0.9

EARTH STATION ANTENNA STANDARDS

A wide range of standard earth station types that provide flexibility for a broad range of satellite services currently use and/or will use the IA-9 satellite. The earth stations include both C-band and Ku-band capable facilities. They are categorized primarily in terms of their G/T performance.. Table D4.6 summarizes some of the various earth station categories and includes the approximate antenna dimensions

Table D4.6 Earth Station Antennas

C-Band Earth Stations				Ku-Band Earth Stations			
Diameters Meters	Tx Gain dBi	Rx Gain dBi	G/T dB/K	Diameters Meters	Tx Gain dBi	Rx Gain dBi	G/T dB/K
16	57.8	54.3	35.1	12	62.7	61.1	40.9
12	55.3	51.8	32.6	9	60.2	58.6	38.4
10	53.7	50.2	31	7.2	58.3	56.7	36.5
9	52.8	49.3	30.1	5.6	56.1	54.5	34.3
7	50.6	47.1	27.9	4.5	54.2	52.6	32.4
6	47.7	44.2	26.6	3.8	52.7	51.1	30.9
4.5	46.8	43.3	24	2.4	48.7	47.1	26.9
4	45.8	42.3	23	1.8	46.2	44.6	24.4
3.8	45.1	41.6	22.6	1.2	42.7	41.1	20.9
3	43.3	39.8	20.5	0.9	40.2	38.6	18.4
2.4	41.4	37.9	18.6	0.75	38.6	37.0	16.8

Operational procedures to avoid interference

The INTELSAT Operation Center (IOC), Video Operation center (VOC) and Network Operation center NOC and associated monitoring facilities are key to ensuring interference-free operation in the INTELSAT system. The specifics of the IOC can be found in section 25.114(c)(9). The IOC maintains operational contact with all transmitting earth stations when they are implementing new communications carriers. The IOC also maintains the ability to contact the responsible persons at any time if it determines that an earth station already transmitting to a satellite may be malfunctioning and causing interference.

25.114(d)(5) Calculation of power flux density levels within each coverage area and of the energy dispersal, if any, needed for compliance with §25.208; Calculation of power flux density levels within each coverage area and of the energy dispersal, if any, needed for compliance with §25.208, for angles of arrival other than 5°, 10°, 15°, 20°, and 25° above the horizontal:

POWER FLUX DENSITY (PFD) AT THE EARTH'S SURFACE

The analysis in Table D5.1 demonstrates that IA-9 meets the PFD limits in accordance with FCC Sec. 25.208. for digital signals.

Table D5.1 PFD for saturated transponder EIRP

	NAC-Ku-Band	NAC-C-Band	S1-Beam	Units
Transponder Bandwidth	27	36	36	MHz
Transponder D/L EIRP	49.9	43.8	55.3	dBW
Carrier Bandwidth	74.3	75.6	75.6	dBHz
4 kHz (dB)	36	36	36	dBHz
Spreading Factor	-162.5	-162.5	-162.5	dBW/m2
Cal. Power Flux density	-150.9	-158.2	-146.7	dBW/m2/4kHz
ITU Power Flux density @	5°	5°	20°	
Limit	-148	-152	-140.5	dBW/m2/4kHz
Margin	2.9	6.2	6.2	dB

In the case of analog signals, this sample computation presented cannot be relied upon to demonstrate compliance with the PFD limits because of the uneven distributed of power across the bandwidth. For this reason, Intelsat will only authorize the transmission of analog signals for which a PFD analysis has been performed and compliance with PFD limits has been assured. In some cases this may require the transponder output to be reduced relative to saturation for this type of transmission in order to comply with the PFD limit.

25.114(d)(6) Public interest considerations in support of grant:

See the attached Application.

25.114(d)(7) Applications for authorizations for fixed-satellite space stations shall also include the information specified in §25.140:

LAUNCH VEHICLES (§ 25.140(b))

The IA-9 satellite would be compatible with the mass/performance and payload fairing volume constraints of Ariane 5 ECA, ATLAS V, Sea Launch and Proton M/Breeze M, based on the minimum expected orbital maneuver lifetime of 13 years. A decision on the actual launcher would be made after the program starts.

INTERFERENCE ASSESSMENT (§25.140(b)(2))

Intra-system interference

The IA-9 link budget take full account of all intra-system interference effects to ensure that the required link quality is available. This can be seen from a review of the sample link budgets provided in tables D4.1 to D4.5 of this document. These intra-system interference effects include:

Spacecraft Cross-Polar Beam Isolation: The cross-polar interference arising from the imperfect satellite antenna and the Co-frequency transmissions in the same market area.

Earth Station Cross-Polar Isolation: The cross-polar interference arising from the Imperfect earth station antennas and the Co-frequency transmissions in the same service area.

Polarization Misalignment: the cross-polar interference arising from imperfect alignment of the earth station.

Intermodulation Products: This interference can arise due to the nonlinearity of both the earth station and the satellite high power amplifiers

Inter-System Interference

The IA-9 satellite network is designed and to be operated in a manner so as to minimize the interference caused to adjacent satellite networks and to cope with the necessary interference that will be received from adjacent satellite networks. The IA-9 satellite network is fully consistent with all FCC and ITU Recommendations and Regulations that affect this interference interaction with adjacent satellite networks, as follows:

- The antennas of transmitting and receiving earth stations comply with FCC Part 25.209 rules for antenna performance standards
- The transmit power into the uplink earth station antennas, together with the associated signal spreading bandwidth, is compliant with Parts 25.204, 25.211 and 25.212
- All downlinks from the IA-9 satellite are in compliance with FCC Parts 25.211 and 25.212 as well as with the PFD limits given in FCC Part 25.208 and Appendix 5 of the Radio Regulations
- All link budgets include an allowance for a degradation of the system noise temperature (DeltaT/T) due to the aggregate effect of interference from other satellite networks, consistent with relevant ITU-R Recommendations (e.g., S.1323)

Consistent with the requirements of §25.140(b)(2), an interference analysis is presented for two degree spacing situation.

Interference Analysis

The adjacent satellite networks around 77W are AMC-5 at 79W in Ku-band and Panamsat satellite at 74W in C/Ku-bands with CONUS coverage. In order to resolve the interference situation with 2 deg separation, the transmissions from 77W over USA, Carribeans, Mexico and Canada will comply with the FCC Part 25 rules. The transmit earth station antennas will meet a side lobe performance of 29-25 log(theta) at nominal off-axis angles of 2 degrees. The power densities for digital transmissions at the input of the transmit earth station antennas will not exceed -12 dBW/4kHz in C-band and -14 dBW/4kHz in Ku-band. Additionally, the downlink eirp densities for digital transmissions will not exceed 13dBw/4kHz in Ku-band and -32 dBW/Hz in C-band which are the coordinated densities with the domestic US satellite networks so far. The digital transmission link design takes into account the interference arising from adjacent US networks at 2 degree spacing with similar power densities. With regard to Ku-band digital transmissions over South America, the power densities have been so chosen as to be compatible with Brazilian 2 degree policy. The Ku-band uplink power density and downlink eirp densities will not exceed -48 dBW/Hz and -22 dBW/Hz respectively. With regard to the analog TV transmissions in C-band in the North America beam, they will also be operated as per the conditions given in FCC Part 25 rules. The center frequencies of the analog carriers will be at the center of the 36 MHz transponders and will be operated at frequencies that have been coordinated with the adjacent domestic operators.

25.114(d)(8)-(13): Not Applicable.

25.114(d)(14) ORBITAL DEBRIS MITIGATION PLAN:

Spacecraft hardware design: Control of debris released during normal operations; Selection of a safe operational configuration; Collisions with small debris.

During normal on-station operations no debris will be generated and the spacecraft will be in a stable configuration.

Only normal station-keeping operations within the +/- 0.05 degree N-S and E-W control box are conducted thus ensuring adequate distance from other satellites in the GEO orbit to prevent collisions.

The spacecraft design does not incorporate any devices that generate in-orbit debris.

Minimizing Debris Generated by Accidental Explosions.

The design of the spacecraft is such that during all normal operations there is no risk of explosion.

At the end of operational life, all on-board sources of stored energy will be depleted or secured and batteries will be discharged.

Avoidance of collision with controlled and uncontrolled objects

Regarding avoidance of collisions with controlled objects, in general, if a geosynchronous satellite is controlled within its specified longitude and latitude stationkeeping limits, collision with another controlled object is the direct result of that object entering the allocated space.

As an operator of satellites, Intelsat has a contract with an agency which is monitoring encounters between satellites and other inactive drifting objects. Any close encounters are flagged and investigated in more detail. If required, avoidance maneuvers are performed to eliminate the possibility of collisions.

Post-mission disposal of space structures

Sufficient propellant reserve will be allocated to de-orbit the spacecraft at the end of its operational life to at least 300 km circular orbit higher than the geosynchronous orbit.

Other Rules

FREQUENCY TOLERANCE (§25.202(e))

The on-board frequency references, used to synthesize the satellite transmit carrier frequencies, are designed with a frequency tolerance, over the lifetime of the satellites, of better than approximately 10 parts per million. The net frequency translation error shall not exceed ±22.5 kHz throughout the orbital design life of the spacecraft.

CESSATION OF EMISSIONS (§25.207)

It shall be possible to turn on or off, by ground command, each individual transmission channel and each electronic unit in the communications subsystems. Intelsat has the ability to exercise this capability at any time during the satellite operational life.

ANNEX 1

BEAM COVERAGE MAPS

Figure 1 C-BAND NAC (A&B) BEAM RECEIVE GAIN CONTOURS

Peak Directivity: 29.1 dBi Peak G/T: 0.8 dB/K

Polarization: Linear Horizontal (A) &Vertical (B)

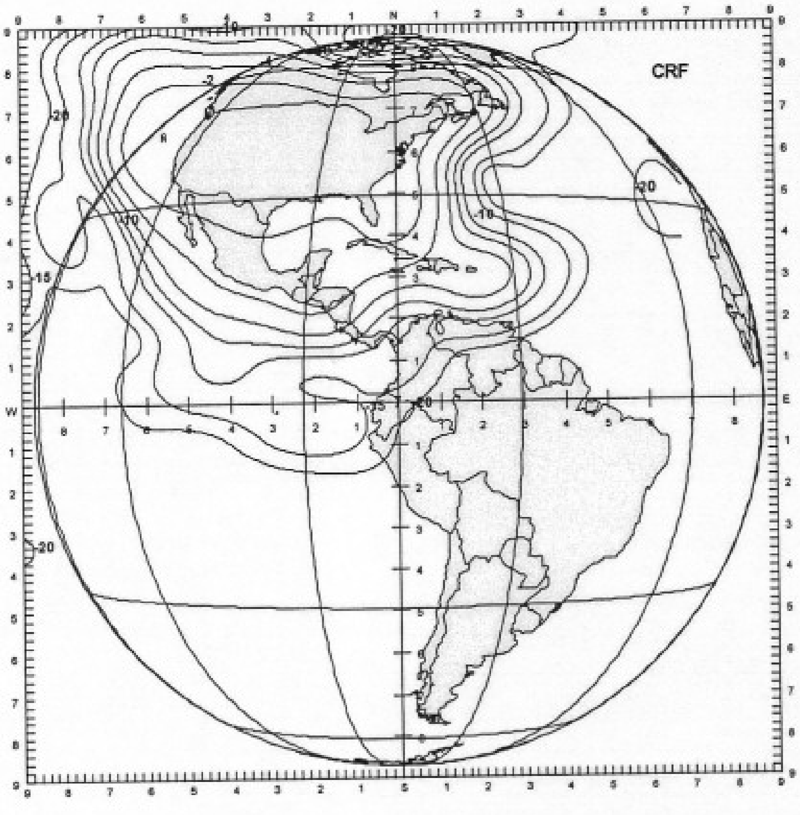


Figure 2 C-BAND NAC(A&B) BEAM TRANSMIT GAIN CONTOURS

Peak Directivity: 29.8dBi Peak EIRP: 43.8 dBW

Polarization: Linear Vertical & Horizontal

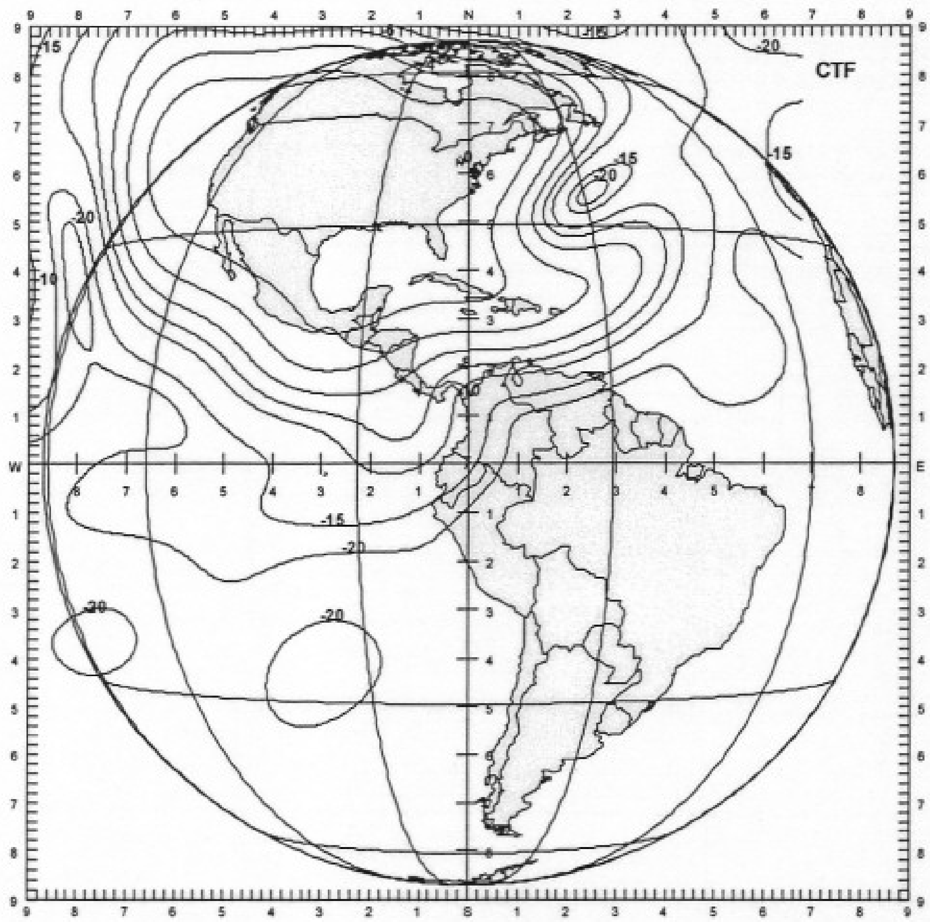


Figure 3 Ku-Band NAC (A&B) BEAM RECIEVE GAIN CONTOURS

Peak Directivity: 31.6dBi Peak G/T:3.3 dB/K

Polarization: Linear Vertical & Horizontal

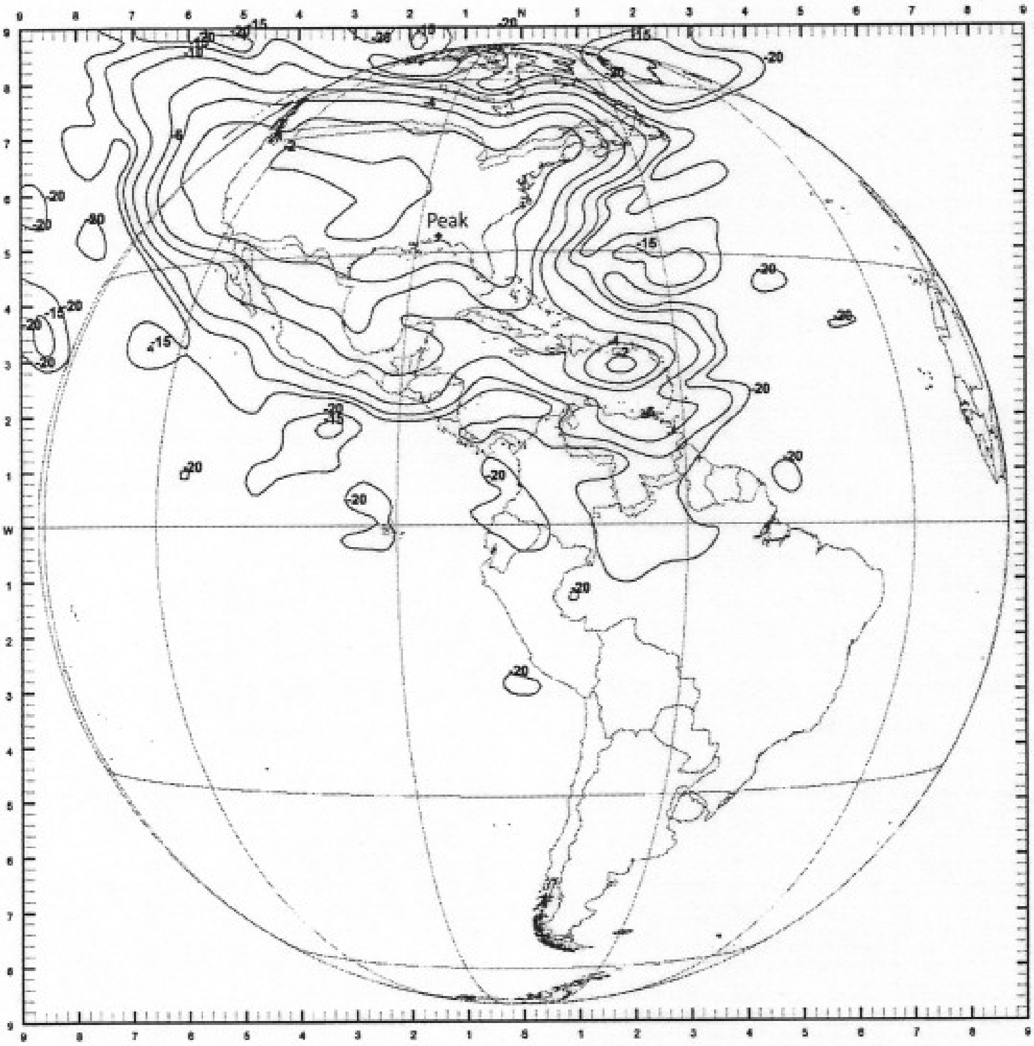


Figure 4 Ku-Band NAC (A&B) BEAM TRANSMIT GAIN CONTOURS

Peak Directivity: 31.6 dBi Peak EIRP:49.9 dBW

Polarization: Linear Vertical & Horizontal

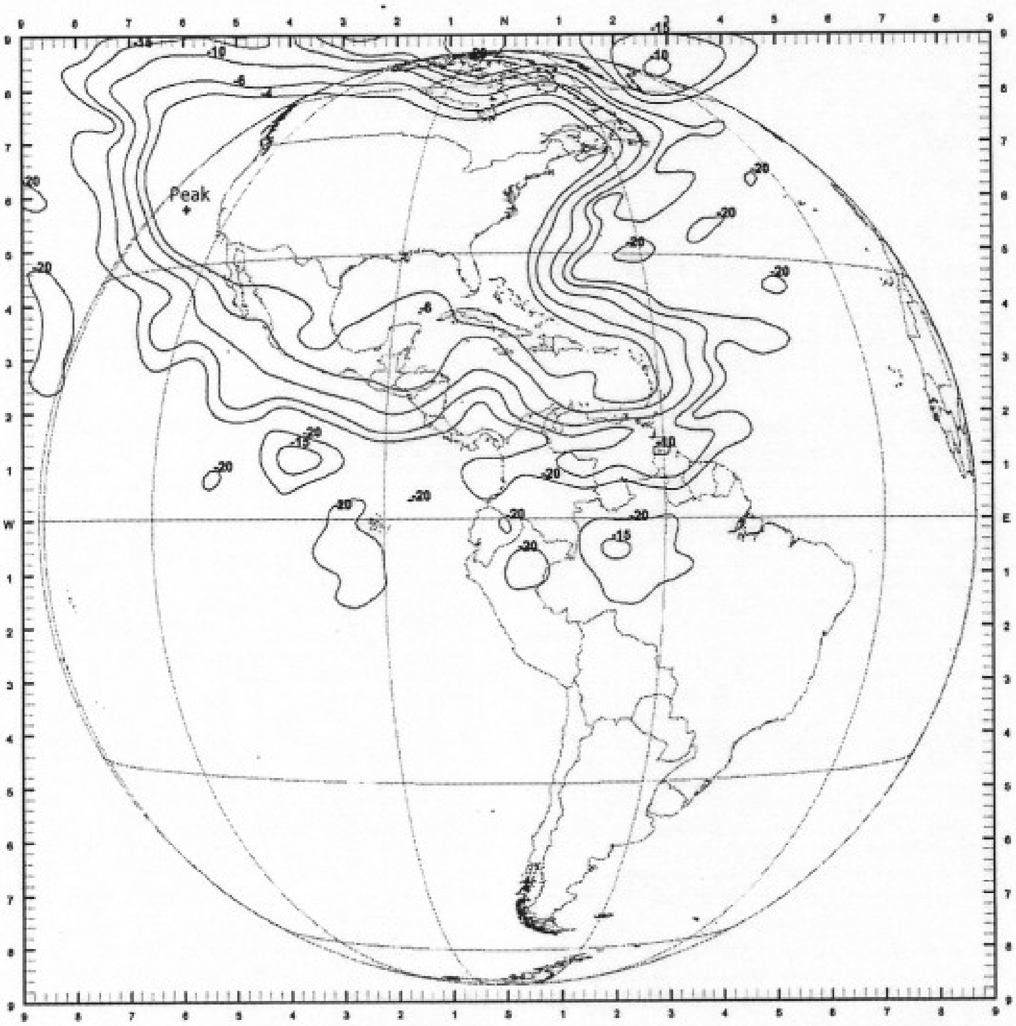


Figure 5 S1 BEAM RECIEVE GAIN CONTOURS

Peak Directivity: 36 dBi Peak G/T: 7.7 dB/K

Polarization: Linear Horizontal

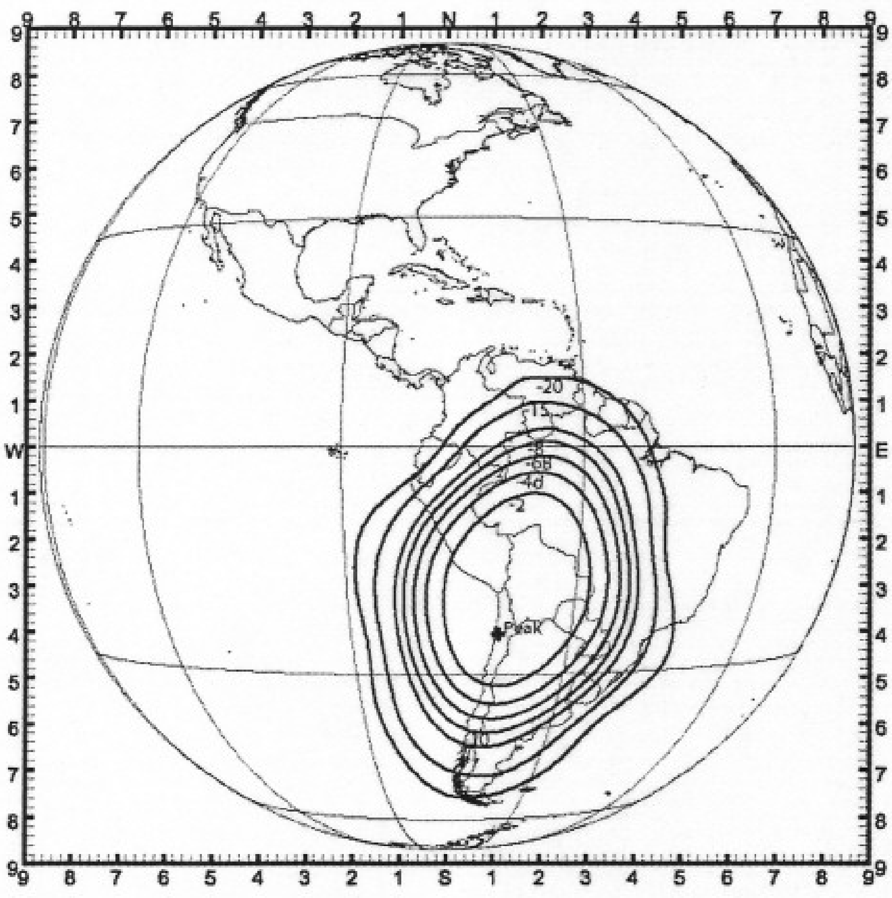


Figure 6 S1 BEAM TRANSMIT GAIN CONTOURS

Peak Directivity: 37 dBi Peak EIRP:55.3 dBW

Polarization: Linear Vertical

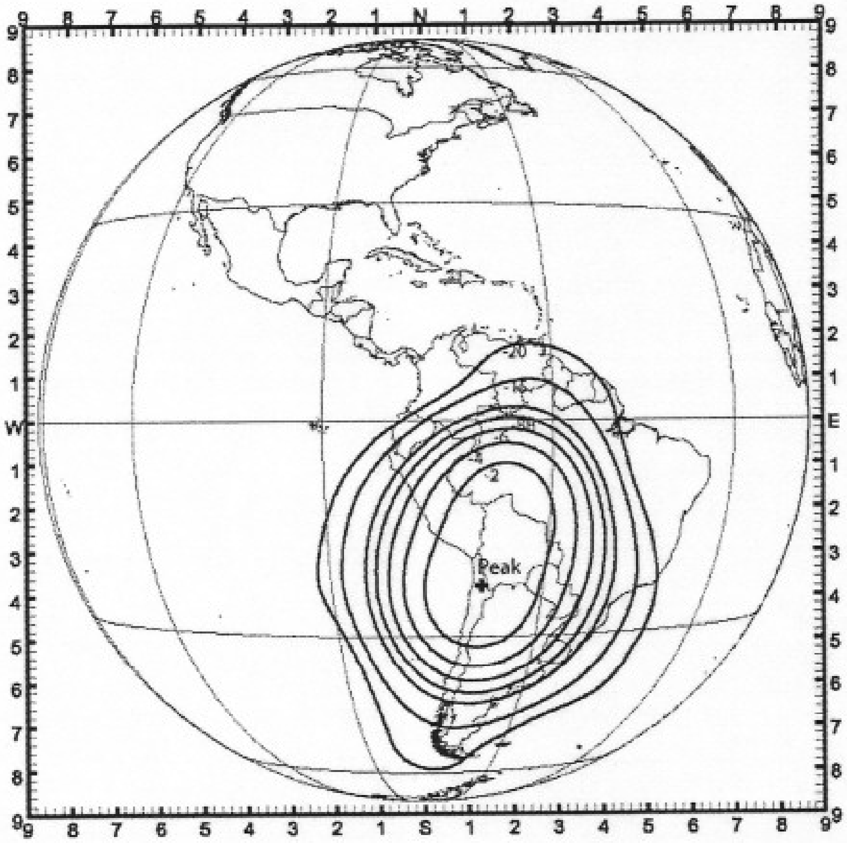
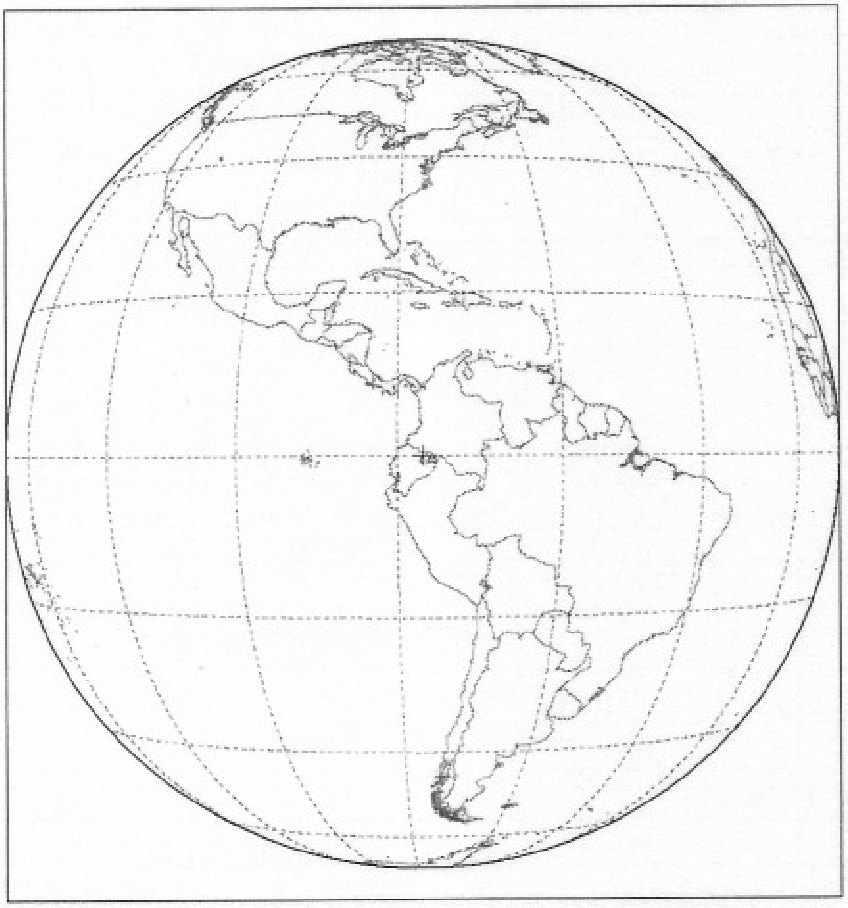


Figure 7 O BEAM - TELECOMMAND

Peak Directivity: 3.5 dBi

Polarization: Linear Vertical & Horizontal



ANNEX 2

ENGINEERING CERTIFICATE

I hereby certify that I am the technically qualified person responsible for the preparation of the engineering information contained in the technical portions of the foregoing application, that I am familiar with Part 25 of the Commission's rules, and that the technical information is complete and accurate to the best of my knowledge and belief.

Humberto Henriques
Intelsat Global Service Corporation
January 21, 2005