

Engineering Statement

PanAmSat Licensee Corp. (“PanAmSat”) proposes to operate its Galaxy 11 spacecraft from 55.5° W.L. From that location, the spacecraft will provide service to the Southern United States, Mexico, Central America, the Caribbean and South America. The spacecraft will utilize the C-band frequencies of 5925 – 6425 MHz and 3700 – 4200 MHz and the Ku-band frequencies of 13750 – 14500 MHz, 10950 – 11200 MHz and 11700 – 12200 MHz.

In July 2008, the Commission authorized Galaxy 11 to operate from 32.8° E.L. (*see* FCC File No.: SAT-MOD-20080225-00051). PanAmSat now proposes to relocate Galaxy 11 from 32.8° E.L. to 55.5° W.L. Galaxy 11 will be replacing Intelsat 705, which is currently located at 29.5° W.L. but will be relocated soon to 55.4° W.L.¹ Intelsat 705 is licensed to PanAmSat’s sister company, Intelsat North America LLC (“Intelsat”). After transfer of traffic to Galaxy 11, Intelsat 705 will be de-orbited at the end of its maneuver life.

At the 55.5° W.L. orbital location, Galaxy 11 will be co-located with Intelsat 805, which is licensed to Intelsat, and will serve to supplement the services currently being provided by Intelsat 805.

This engineering statement provides the following technical information for Galaxy 11 at 55.5° W.L.: (1) frequency plan, (2) antenna gain contours, (3) power flux density (“PFD”) levels, (4) link budgets and interference analysis, (5) Schedule S, and (6) orbital debris mitigation plan. In all other respects, the Galaxy 11 characteristics are the same those as described in SAT-AMD-19990615-00067, as updated in SAT-MOD-20080225-00051.

1) Frequency Plan

The Galaxy 11 frequency plan is provided in Exhibit 1.

2) Antenna Gain Contours

The co-polarized coverage patterns of Galaxy 11 operating from 55.5° W.L. are shown in Exhibits 2A through 2P in the format prescribed in Section

¹ *See* FCC File No. SAT-STA-20101013-00216.

25.114(d)(3) of the Commission's rules. These exhibits specify for each beam the maximum antenna gain, the minimum and maximum Saturated Flux Density ("SFD") and maximum G/T for each uplink beam, and the maximum antenna gain and EIRP for each downlink beam. The SFD levels of each uplink beam can be adjusted in 1 dB increments through ground command.

The co-polarized gain contours for the Galaxy 11 telemetry, command and ranging ("TC&R") beams and the uplink power control ("ULPC") beams are provided in Exhibits 2Q through 2Y.

With respect to the command and telemetry bicone antenna, two antenna gain diagrams have been provided in Exhibits 2R and 2U, respectively. Diagram "a" shows the variation in the gain of the antenna at three elevation angles (-20° , 0° and $+20^\circ$) referenced to the antenna axis with the azimuth varying from -180° and $+180^\circ$. Diagram "b" shows the variation in the gain of the antenna at a representative azimuth of 0° referenced to the antenna axis with the elevation angle varying from -180° and $+180^\circ$.

During emergency conditions, the bicone antenna would be used since its field of view is $\pm 20^\circ$ and the Earth disk is only $\pm 8.4^\circ$. From Exhibits 2R and 2U, it is evident that the coverage of the bicone antenna is relatively flat over the entire Earth. Specifically, as shown in Exhibits 2R(a) and 2U(a), the gain of the bicone antenna varies by less than 4 dB at any given elevation angle (within $\pm 20^\circ$) as the azimuth angle varies from -180° to $+180^\circ$. Similarly as shown in Exhibit 2R(b) and 2U(b) at a given azimuth, the gain of the bicone antenna changes by less than 3 dB as the elevation angle varies by $\pm 20^\circ$ about the antenna's peak gain points.

With regard to the pipe and ULPC antennas, the graphs in Exhibits 2S, 2V, 2X and 2Y show the variation in the gain of the antenna at 0° elevation angle, referenced to the (horizontal) plane on the center axis of the antenna aperture, with the azimuth varying from -180° and $+180^\circ$ – generally referred to as the "azimuth cut". Given that the pipe and ULPC antennas are horn antennas having symmetrical gain performance about the center axis of the antenna aperture, the gain variation shown in Exhibits 2S, 2V, 2X and 2Y is also representative of the case where the azimuth angle of the antenna is 0° , referenced to the (vertical) plane located at the center axis of the antenna aperture, with the elevation varying from -180° and $+180^\circ$ – generally referred to as the "elevation cut".

The fields of view of the pipe antennas ($\pm 40^\circ$) and that of the ULPC antennas ($\pm 10^\circ$) envelope the Earth disk ($\pm 8.4^\circ$). From Exhibits 2S, 2V, 2X and 2Y it is evident that the coverage of the pipe and ULPC antennas is relatively flat over the entire Earth and that the variation in gain will be typically less than 5 dB within the antennas' field of view.

The gain diagrams associated with the TC&R bicone and pipe antennas, shown in exhibits 2R, 2S, 2U and 2V, as well as those associated with the ULPC global horn antenna, shown in Exhibits 2X and 2Y, were not prepared in accordance with the parameters specified in Section 25.114(d)(3) of the Commission's rules due to the fact that the satellite manufacturer does not provide the patterns in the required form. Given the specificity of the situation, it is our understanding that Exhibits 2R, 2S, 2U, 2V, 2X and 2Y, together with the descriptive characterization given in the previous paragraphs, fulfill the requirements of Section 25.114(d)(3). However, should the Commission disagree, PanAmSat respectfully requests a waiver of the requirements of Section 25.114(d)(3) of the FCC's rules with respect to the presentation of these antenna patterns.

3) Power Flux Density Levels

The power flux density limits for space stations are specified in Section 25.208 of the Commission's rules. With respect to the 11700 – 12200 MHz band, neither Section 25.208 of the rules nor Article 21 of the Radio Regulations specifies any PFD limits for geo-stationary FSS satellites. However, Sections 25.208(a) and (b) do specify PFD limits for the 3700 – 4200 MHz and 10950 – 11200 MHz frequency bands, respectively.

For the 3700 – 4200 MHz and 10950 – 11200 MHz bands, the power flux density ("PFD") level at the Earth's surface produced by Galaxy 11 was calculated for a 36 MHz digital carrier (with an occupied bandwidth 30133 kHz), a 27 MHz digital carrier (with an occupied bandwidth of 22600 kHz), a 36 MHz TV/FM analog carrier and a 24 MHz TV/FM analog carrier. These carriers typically produce high power flux densities at the earth's surface. The PFD levels were also calculated for the Galaxy 11 ULPC carriers. As shown in Exhibit 3, in the bands 3700 – 4200 MHz and 10950 – 11200 MHz, the downlink PFD levels of Galaxy 11 carriers would not exceed the limits specified in Sections 25.208(a) and (b) of the FCC's rules.

4) Link Budgets and Interference Analysis

At C-band and Ku-band frequencies, link analysis for Galaxy 11 was conducted for a number of representative carriers. For the analyses, it was assumed that the nearest satellites to Galaxy 11 were a hypothetical satellite operating from 53.5° W.L. and a hypothetical satellite operating from 57.5° W.L. The hypothetical satellites were assumed to have the same operational parameters as Galaxy 11.

At C-band, the uplink power density of the emissions to each of the hypothetical satellites was assumed to be -38.7 dBW/Hz, the maximum level specified in Section 25.212(d) of the Commission's rules for digital C-band carriers. The C-band downlink EIRP density of each of the hypothetical satellites was assumed to be -38.6 dBW/Hz or -38.7 dBW/Hz depending on the specific C-band downlink beam being considered.

At Ku-band, the uplink power density of the emissions to each of the hypothetical satellites was assumed to be -50 dBW/Hz, the maximum level specified in Sections 25.212(c) of the Commission's rules for digital Ku-band carriers. At Ku-band, the maximum downlink EIRP density of the emissions from each of the hypothetical satellites was assumed to be -26 dBW/Hz, the maximum level specified in Section 25.212(c) of the Commission's rules.

Other assumptions made for the link budget analysis were as follows:

- a) In the plane of the geostationary satellite orbit, all transmitting and receiving earth station antennas have off-axis co-polar gains that are compliant with the limits specified in Section 25.209(a)(1) of the Commission's rules.
- b) All transmitting and receiving earth stations have a cross-polarization isolation value of at least 30 dB within their main beam lobe.
- c) At C-band frequencies, degradation due to rain is not considered, given that rain (attenuation) effects are insignificant at C-band.
- d) At Ku-band frequencies rain attenuation predictions are derived using Recommendation ITU-R 618-8.
- e) At Ku-band frequencies, increase in noise temperature of the receiving earth station due to rain is taken into account.
- f) For the cases where the transponder operates in a multi-carrier mode, the effects due to intermodulation interference are taken into account.

For both the C- and Ku-band analysis, the impact of the TV/FM carriers from the adjacent satellites on the transmissions of Galaxy 11 was not considered. This is due to the fact that TV/FM carriers are known to be high-density carriers with most of the energy contained within the near vicinity of the carrier center frequency. Operation of sensitive narrow-band carriers is typically precluded within these high power density areas of the TV/FM carrier. Accordingly, placement and operation of TV/FM carriers are normally achieved through internal coordination and/or coordination discussions with the adjacent satellite operators, whichever may be the case, rather than through C/I calculations – since the results of such calculations would show that narrow-band carriers typically could not operate on a co-frequency basis with TV/FM carriers.

The results of the C-band and Ku-band analyses are given in Exhibit 4 and demonstrate that operation of the Galaxy 11 satellite from 55.5° W.L. would permit the intended services to achieve their respective performance objectives while maintaining sufficient link margin. Additionally, the EIRP density levels of the carriers listed in Exhibit 4 comply with the limits contained in Sections 25.212(c) and 25.212(d) of the Commission’s rules.

5) Adjacent Satellite Link Analysis

The impact of the Galaxy 11 emissions on the transmissions of two-degree spaced adjacent satellites was not analyzed because the power density levels of Galaxy 11 transmissions will be limited to those levels contained in Sections 25.212(c) and 25.212(d) of the Commission’s rules. In those cases where PanAmSat may be required to transmit carriers with power levels in excess of those in Sections 25.212(c) and (d), it will coordinate those transmissions internally and/or with operators of other potentially affected adjacent satellites, as the case may be, as part of the normal coordination process.

6) Schedule S Submission

PanAmSat is providing with its application a Schedule S for the operations of Galaxy 11 from 55.5° W.L. It is noted that the antenna gain pattern for the Galaxy 11 TC&R bicone and pipe antennas and the ULPC global horn antenna were included in column “e” (instead of column “f”) of section S8 of the Schedule S, since they are not in GXT format (see section 2).

In column “g” of section S13 of the Schedule S, a link budget file has been included for the first link (*i.e.*, the first row of data) contained in that section. This link budget file is applicable to all of the links listed in section S13 and should have been included with each row of data in that section of the Schedule S. However, given that the link budget file is rather large and its inclusion with each link (or data row) would lead to the Schedule S file having an unmanageable size, all other links (or rows of data) contain a small ASCII file that references the link budget file that is attached to the first link (*i.e.*, the link budget file attached to the first row of data).

7) Orbital Debris Mitigation Plan

PanAmSat 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.

7.1) Spacecraft Hardware Design

The spacecraft is designed such that no debris will be released during normal operations. PanAmSat 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.

7.2) Minimizing Accidental Explosions

PanAmSat 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, PanAmSat will ensure that all active units are turned off and all propellant tanks are depleted. However, due to the design of Galaxy 11, PanAmSat will not be able to vent all pressurized systems. Accordingly, PanAmSat respectfully

requests a waiver of Sections 25.114(d)(14)(ii) and 25.283(c). Galaxy 11 was designed and constructed prior to the adoption of the orbital debris mitigation rules by the FCC. Given that Galaxy 11 is an operating spacecraft and its design cannot be changed, PanAmSat believes that a waiver of section 25.114(d)(14)(ii) and 25.283(c) is justified.

7.3) Safe Flight Profiles

PanAmSat 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. PanAmSat plans to co-locate Galaxy 11 with Intelsat 805 at 55.5° W.L. PanAmSat will coordinate the operations of Galaxy 11 with Intelsat, the operator of Intelsat 805, to minimize the risk of collision between the two spacecraft. With the exception of Intelsat 805, Galaxy 11 will not be located at the same orbital location as another satellite or at an orbital location that has an overlapping station-keeping volume with another satellite.

With regard to Intelsat 805, PanAmSat shall maintain separation between this spacecraft and Galaxy 11 through the manipulation of the orbital inclination and eccentricity of each spacecraft. PanAmSat has successfully implemented such a strategy in the past to ensure that adequate separation is maintained between two co-located spacecraft.

With the exception of Intelsat 805, PanAmSat is not aware of any other FCC licensed system, or any other system applied for and under consideration by the FCC, having an overlapping station-keeping volume with Galaxy 11. PanAmSat is also not aware of any system with an overlapping station-keeping volume with Galaxy 11 that is the subject of an ITU filing and that is either in orbit or progressing towards launch.

7.4) Post Mission Disposal

At the end of the mission, PanAmSat expects to dispose of the spacecraft by moving it to a planned minimum altitude of 300 kilometers (perigee) above the geostationary arc.² Nevertheless, as the Commission is aware, because

² PanAmSat has reserved 30 kilograms of fuel for this purpose. The fuel gauging uncertainty has been taken into account in these calculations. The fuel reserve is higher than previously stated due to updated thruster data provided by the satellite manufacture.

there is no mechanism for precisely calculating the amount of fuel left on the spacecraft once it is in orbit, it is possible that the spacecraft will not meet the planned minimum de-orbit altitude.

In its Second Report and Order in IB Docket 02-54 (FCC Document Number: 04-130), the FCC declared that satellites launched prior to March 18, 2002, such as Galaxy 11, would be designated as grandfathered satellites not subject to a specific disposal altitude. Therefore, the Galaxy 11 planned disposal orbit complies with the FCC's rules.

In addition, PanAmSat provides the following information:

- 1) Planned orbital eccentricity: 0.0003 (This is a best estimate of optimal eccentricity to match the natural eccentricity circle due to Sun and Moon perturbations after decommission.³)
- 2) Planned apogee altitude: 312.8 kilometers above the geostationary orbit.⁴
- 3) Information concerning the methods that will be used to assess and provide adequate margins concerning fuel gauging uncertainty: For the Galaxy 11 spacecraft, in addition to the nominal hold-back and reserves provided to us by the manufacturer, PanAmSat propulsion engineers review the current propellant usage – particularly the mixing ratio – to properly allocate sufficient margin to account for unavailable propellant that may result from a non-optimal mixing ratio. In addition, PanAmSat performs thermal gauging near the spacecraft's end of life by inferring the remaining propellant from the thermal signature when PanAmSat applies heat to different parts of the propellant tank system. This information is considered when determining the additional hold-back and adjustments to book values

³ Because it is extremely difficult to anticipate end-of-life thruster performance and operational conditions, it is extremely difficult to achieve the planned eccentricity. PanAmSat's priority is to achieve the planned minimum perigee of 300 kilometers. In order to achieve the planned eccentricity, not only must there be sufficient propellant reserved but, in addition, individual thrusters must be fired at specific times during satellite decommissioning because the timing of thruster firing will affect eccentricity. Due to difficulties in predicting the thruster end-of-life performance, as well as earth station availability and visibility as the satellite drifts, it may not be possible to fire the right thrusters at the optimal times. Thus, optimal eccentricity may not be achieved, which, in turn, will affect the apogee altitude.

⁴ See n. 2.

to attempt to ensure sufficient propellant to achieve the planned minimum altitude. There are, however, many uncertainties to both methods that could lead to incorrect conclusions regarding remaining fuel.

8) ITU Filing

PanAmSat currently has no filing with the ITU for a satellite network that specifies operation on the frequency bands of 13750 – 14000 MHz and 11950 – 12200 MHz at the nominal orbital location of 55.5° W.L. PanAmSat will submit to the Commission the Advanced Publication Information (“API”) for a new satellite network that utilizes the 13750 – 14000 MHz and 11950 – 12200 MHz bands at the nominal orbital of 55.5° W.L.

Certification Statement

I hereby certify that I am a technically qualified person and am familiar with Part 25 of the Commission's rules and regulations. 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/ Jose Albuquerque

Jose Albuquerque

PanAmSat

Senior Director, Spectrum

Engineering

October 29, 2010

Date

EXHIBIT 1: Galaxy 11 Frequency Assignments

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)	Maximum Transponder Gain (dB)
1C	NORTH AMERICA	VERTICAL	5945	1C	NORTH AMERICA	HORIZONTAL	3720	36	112.7
3C	NORTH AMERICA	VERTICAL	5985	3C	NORTH AMERICA	HORIZONTAL	3760	36	112.7
5C	NORTH AMERICA	VERTICAL	6025	5C	NORTH AMERICA	HORIZONTAL	3800	36	112.7
7C	NORTH AMERICA	VERTICAL	6065	7C	NORTH AMERICA	HORIZONTAL	3840	36	112.7
9C	NORTH AMERICA	VERTICAL	6105	9C	NORTH AMERICA	HORIZONTAL	3880	36	112.7
11C	NORTH AMERICA	VERTICAL	6145	11C	NORTH AMERICA	HORIZONTAL	3920	36	112.7
13C	NORTH AMERICA	VERTICAL	6185	13C	NORTH AMERICA	HORIZONTAL	3960	36	112.7
15C	NORTH AMERICA	VERTICAL	6225	15C	NORTH AMERICA	HORIZONTAL	4000	36	112.7
17C	NORTH AMERICA	VERTICAL	6265	17C	NORTH AMERICA	HORIZONTAL	4040	36	112.7
19C	NORTH AMERICA	VERTICAL	6305	19C	NORTH AMERICA	HORIZONTAL	4080	36	112.7
21C	NORTH AMERICA	VERTICAL	6345	21C	NORTH AMERICA	HORIZONTAL	4120	36	112.7
23C	NORTH AMERICA	VERTICAL	6385	23C	NORTH AMERICA	HORIZONTAL	4160	36	112.7
2C	NORTH AMERICA	HORIZONTAL	5965	2C	NORTH AMERICA	VERTICAL	3740	36	112.8
4C	NORTH AMERICA	HORIZONTAL	6005	4C	NORTH AMERICA	VERTICAL	3780	36	112.8
6C	NORTH AMERICA	HORIZONTAL	6045	6C	NORTH AMERICA	VERTICAL	3820	36	112.8
8C	NORTH AMERICA	HORIZONTAL	6085	8C	NORTH AMERICA	VERTICAL	3860	36	112.8
10C	NORTH AMERICA	HORIZONTAL	6125	10C	NORTH AMERICA	VERTICAL	3900	36	112.8
12C	NORTH AMERICA	HORIZONTAL	6165	12C	NORTH AMERICA	VERTICAL	3940	36	112.8
14C	NORTH AMERICA	HORIZONTAL	6205	14C	NORTH AMERICA	VERTICAL	3980	36	112.8
16C	NORTH AMERICA	HORIZONTAL	6245	16C	NORTH AMERICA	VERTICAL	4020	36	112.8
18C	NORTH AMERICA	HORIZONTAL	6285	18C	NORTH AMERICA	VERTICAL	4060	36	112.8
20C	NORTH AMERICA	HORIZONTAL	6325	20C	NORTH AMERICA	VERTICAL	4100	36	112.8
22C	NORTH AMERICA	HORIZONTAL	6365	22C	NORTH AMERICA	VERTICAL	4140	36	112.8
24C	NORTH AMERICA	HORIZONTAL	6405	24C	NORTH AMERICA	VERTICAL	4180	36	112.8

EXHIBIT 1: Galaxy 11 Frequency Assignments (continued)

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)	Maximum Transponder Gain (dB)
1K	NORTH AMERICA	VERTICAL	14020	1K	NORTH AMERICA	HORIZONTAL	11720	36	128.3
3K	NORTH AMERICA	VERTICAL	14060	3K	NORTH AMERICA	HORIZONTAL	11760	36	128.3
5K	NORTH AMERICA	VERTICAL	14100	5K	NORTH AMERICA	HORIZONTAL	11800	36	128.3
7K	NORTH AMERICA	VERTICAL	14140	7K	NORTH AMERICA	HORIZONTAL	11840	36	128.3
9K	NORTH AMERICA	VERTICAL	14180	9K	NORTH AMERICA	HORIZONTAL	11880	36	128.3
11K	NORTH AMERICA	VERTICAL	14220	11K	NORTH AMERICA	HORIZONTAL	11920	36	128.3
13K	NORTH AMERICA	VERTICAL	14260	13K	NORTH AMERICA	HORIZONTAL	11960	36	128.3
15K	NORTH AMERICA	VERTICAL	14300	15K	NORTH AMERICA	HORIZONTAL	12000	36	128.3
17K	NORTH AMERICA	VERTICAL	14340	17K	NORTH AMERICA	HORIZONTAL	12040	36	128.3
19K	NORTH AMERICA	VERTICAL	14380	19K	NORTH AMERICA	HORIZONTAL	12080	36	128.3
21K	NORTH AMERICA	VERTICAL	14420	21K	NORTH AMERICA	HORIZONTAL	12120	36	128.3
23K	NORTH AMERICA	VERTICAL	14460	23K	NORTH AMERICA	HORIZONTAL	12160	36	128.3
2K	NORTH AMERICA	HORIZONTAL	14040	2K	NORTH AMERICA	VERTICAL	11740	36	128.8
4K	NORTH AMERICA	HORIZONTAL	14080	4K	NORTH AMERICA	VERTICAL	11780	36	128.8
6K	NORTH AMERICA	HORIZONTAL	14120	6K	NORTH AMERICA	VERTICAL	11820	36	128.8
8K	NORTH AMERICA	HORIZONTAL	14160	8K	NORTH AMERICA	VERTICAL	11860	36	128.8
10K	NORTH AMERICA	HORIZONTAL	14200	10K	NORTH AMERICA	VERTICAL	11900	36	128.8
12K	NORTH AMERICA	HORIZONTAL	14240	12K	NORTH AMERICA	VERTICAL	11940	36	128.8
14K	NORTH AMERICA	HORIZONTAL	14280	14K	NORTH AMERICA	VERTICAL	11980	36	128.8
16K	NORTH AMERICA	HORIZONTAL	14320	16K	NORTH AMERICA	VERTICAL	12020	36	128.8
18K	NORTH AMERICA	HORIZONTAL	14360	18K	NORTH AMERICA	VERTICAL	12060	36	128.8
20K	NORTH AMERICA	HORIZONTAL	14400	20K	NORTH AMERICA	VERTICAL	12100	36	128.8
22K	NORTH AMERICA	HORIZONTAL	14440	22K	NORTH AMERICA	VERTICAL	12140	36	128.8
24K	NORTH AMERICA	HORIZONTAL	14480	24K	NORTH AMERICA	VERTICAL	12180	36	128.8
				ULPC 1	NORTH AMERICA	HORIZONTAL	12195	0.025	N/A
COMMAND 1	NORTH AMERICA	VERTICAL	14498.5					1.000	N/A
COMMAND 2	GLOBAL	HORIZONTAL	14498.5					1.000	N/A
COMMAND 3	GLOBAL	LEFT HAND CIRCULAR	14000.5					1.000	N/A
				TELEMETRY 1	NORTH AMERICA	VERTICAL	11701	0.500	N/A
				TELEMETRY 2	NORTH AMERICA	VERTICAL	11702	0.500	N/A
				TELEMETRY 3	GLOBAL	VERTICAL	11701	0.500	N/A
				TELEMETRY 4	GLOBAL	VERTICAL	11702	0.500	N/A
				TELEMETRY 5	GLOBAL	LEFT HAND CIRCULAR	11701	0.500	N/A
				TELEMETRY 6	GLBOAL	LEFT HAND CIRCULAR	11702	0.500	N/A

EXHIBIT 1: Galaxy 11 Frequency Assignments (continued)

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)	Maximum Transponder Gain (dB)
1EK	NORTH AMERICA	HORIZONTAL	13764	1EK	NORTH AMERICA	VERTICAL	10964	27	126.8
					SOUTH AMERICA				127.1
3EK	NORTH AMERICA	HORIZONTAL	13794	3EK	NORTH AMERICA	VERTICAL	10994	27	126.8
					SOUTH AMERICA				127.1
5EK	NORTH AMERICA	HORIZONTAL	13824	5EK	NORTH AMERICA	VERTICAL	11024	27	126.8
					SOUTH AMERICA				127.1
7EK	NORTH AMERICA	HORIZONTAL	13854	7EK	NORTH AMERICA	VERTICAL	11054	27	126.8
					SOUTH AMERICA				127.1
9EK	NORTH AMERICA	HORIZONTAL	13884	9EK	NORTH AMERICA	VERTICAL	11084	27	126.8
					SOUTH AMERICA				127.1
11EK	NORTH AMERICA	HORIZONTAL	13914	11EK	NORTH AMERICA	VERTICAL	11114	27	126.8
					SOUTH AMERICA				127.1
13EK	NORTH AMERICA	HORIZONTAL	13944	13EK	NORTH AMERICA	VERTICAL	11144	27	126.8
					SOUTH AMERICA				127.1
15EK	NORTH AMERICA	HORIZONTAL	13974	15EK	NORTH AMERICA	VERTICAL	11174	27	126.8
					SOUTH AMERICA				127.1
2EK	NORTH AMERICA	VERTICAL	13776	2EK	NORTH AMERICA	HORIZONTAL	10976	27	126.9
					SOUTH AMERICA				127.1
4EK	NORTH AMERICA	VERTICAL	13806	4EK	NORTH AMERICA	HORIZONTAL	11006	27	126.9
					SOUTH AMERICA				127.1
6EK	NORTH AMERICA	VERTICAL	13836	6EK	NORTH AMERICA	HORIZONTAL	11036	27	126.9
					SOUTH AMERICA				127.1
8EK	NORTH AMERICA	VERTICAL	13866	8EK	NORTH AMERICA	HORIZONTAL	11066	27	126.9
					SOUTH AMERICA				127.1
10EK	NORTH AMERICA	VERTICAL	13896	10EK	NORTH AMERICA	HORIZONTAL	11096	27	126.9
					SOUTH AMERICA				127.1
12EK	NORTH AMERICA	VERTICAL	13926	12EK	NORTH AMERICA	HORIZONTAL	11126	27	126.9
					SOUTH AMERICA				127.1
14EK	NORTH AMERICA	VERTICAL	13956	14EK	NORTH AMERICA	HORIZONTAL	11156	27	126.9
					SOUTH AMERICA				127.1
16EK	NORTH AMERICA	VERTICAL	13986	16EK	NORTH AMERICA	HORIZONTAL	11186	27	126.9
					SOUTH AMERICA				127.1

EXHIBIT 1: Galaxy 11 Frequency Assignments (continued)

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)	Maximum Transponder Gain (dB)
1EK	SOUTH AMERICA	HORIZONTAL	14014	1EK	NORTH AMERICA	VERTICAL	10964	27	130.4
					SOUTH AMERICA				130.7
3EK	SOUTH AMERICA	HORIZONTAL	14044	3EK	NORTH AMERICA	VERTICAL	10994	27	130.4
					SOUTH AMERICA				130.7
5EK	SOUTH AMERICA	HORIZONTAL	14074	5EK	NORTH AMERICA	VERTICAL	11024	27	130.4
					SOUTH AMERICA				130.7
7EK	SOUTH AMERICA	HORIZONTAL	14104	7EK	NORTH AMERICA	VERTICAL	11054	27	130.4
					SOUTH AMERICA				130.7
9EK	SOUTH AMERICA	HORIZONTAL	14134	9EK	NORTH AMERICA	VERTICAL	11084	27	130.4
					SOUTH AMERICA				130.7
11EK	SOUTH AMERICA	HORIZONTAL	14164	11EK	NORTH AMERICA	VERTICAL	11114	27	130.4
					SOUTH AMERICA				130.7
13EK	SOUTH AMERICA	HORIZONTAL	14194	13EK	NORTH AMERICA	VERTICAL	11144	27	130.4
					SOUTH AMERICA				130.7
15EK	SOUTH AMERICA	HORIZONTAL	14224	15EK	NORTH AMERICA	VERTICAL	11174	27	130.4
					SOUTH AMERICA				130.7
2EK	SOUTH AMERICA	VERTICAL	14026	2EK	NORTH AMERICA	HORIZONTAL	10976	27	131.7
					SOUTH AMERICA				131.9
4EK	SOUTH AMERICA	VERTICAL	14056	4EK	NORTH AMERICA	HORIZONTAL	11006	27	131.7
					SOUTH AMERICA				131.9
6EK	SOUTH AMERICA	VERTICAL	14086	6EK	NORTH AMERICA	HORIZONTAL	11036	27	131.7
					SOUTH AMERICA				131.9
8EK	SOUTH AMERICA	VERTICAL	14116	8EK	NORTH AMERICA	HORIZONTAL	11066	27	131.7
					SOUTH AMERICA				131.9
10EK	SOUTH AMERICA	VERTICAL	14146	10EK	NORTH AMERICA	HORIZONTAL	11096	27	131.7
					SOUTH AMERICA				131.9
12EK	SOUTH AMERICA	VERTICAL	14176	12EK	NORTH AMERICA	HORIZONTAL	11126	27	131.7
					SOUTH AMERICA				131.9
14EK	SOUTH AMERICA	VERTICAL	14206	14EK	NORTH AMERICA	HORIZONTAL	11156	27	131.7
					SOUTH AMERICA				131.9
16EK	SOUTH AMERICA	VERTICAL	14236	16EK	NORTH AMERICA	HORIZONTAL	11186	27	131.7
					SOUTH AMERICA				131.9
				ULPC 2	GLOBAL	HORIZONTAL	10951	0.025	N/A
				ULPC 3	GLOBAL	VERTICAL	10951	0.025	N/A

EXHIBIT 2A: C-Band North America Receive Beam
(Schedule S Beam ID: CHUL)

Polarization: Horizontal

Peak Antenna Gain: 29.6 dBi

Peak G/T: 2.5 dB/K

Saturated Flux Density @ Peak G/T: -94.0 to -80.0 dBW/m²

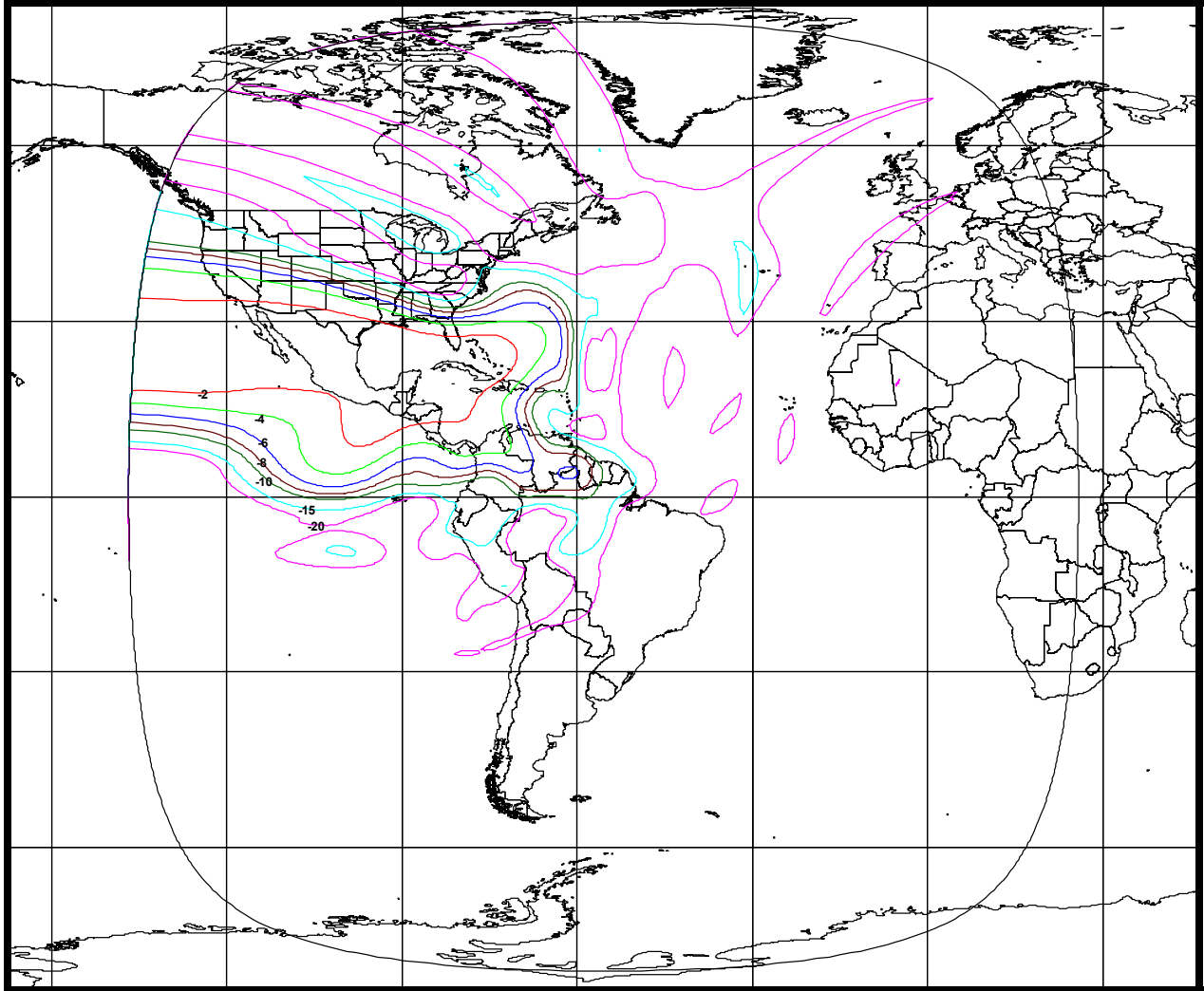


EXHIBIT 2B: C-Band North America Receive Beam
(Schedule S Beam ID: CVUL)

Polarization: Vertical

Peak Antenna Gain: 31.2 dBi

Peak G/T: 4.2 dB/K

Saturated Flux Density @ Peak G/T: -95.2 to -81.2 dBW/m²

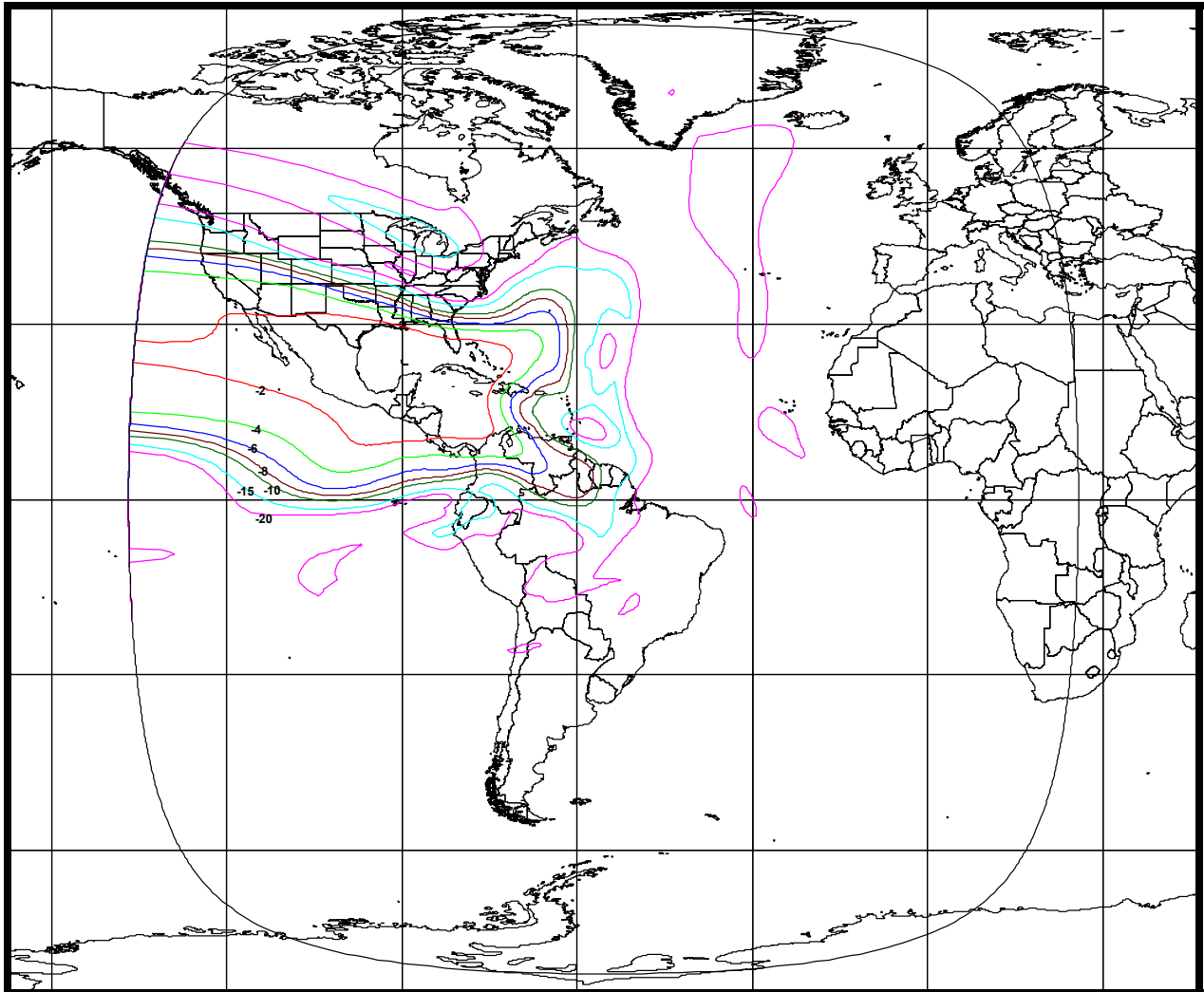


EXHIBIT 2C: C-Band North America Transmit Beam
(Schedule S Beam ID: CHDL)

Polarization: Horizontal
Peak Antenna Gain: 28.8 dBi
Peak EIRP: 40.2 dBW

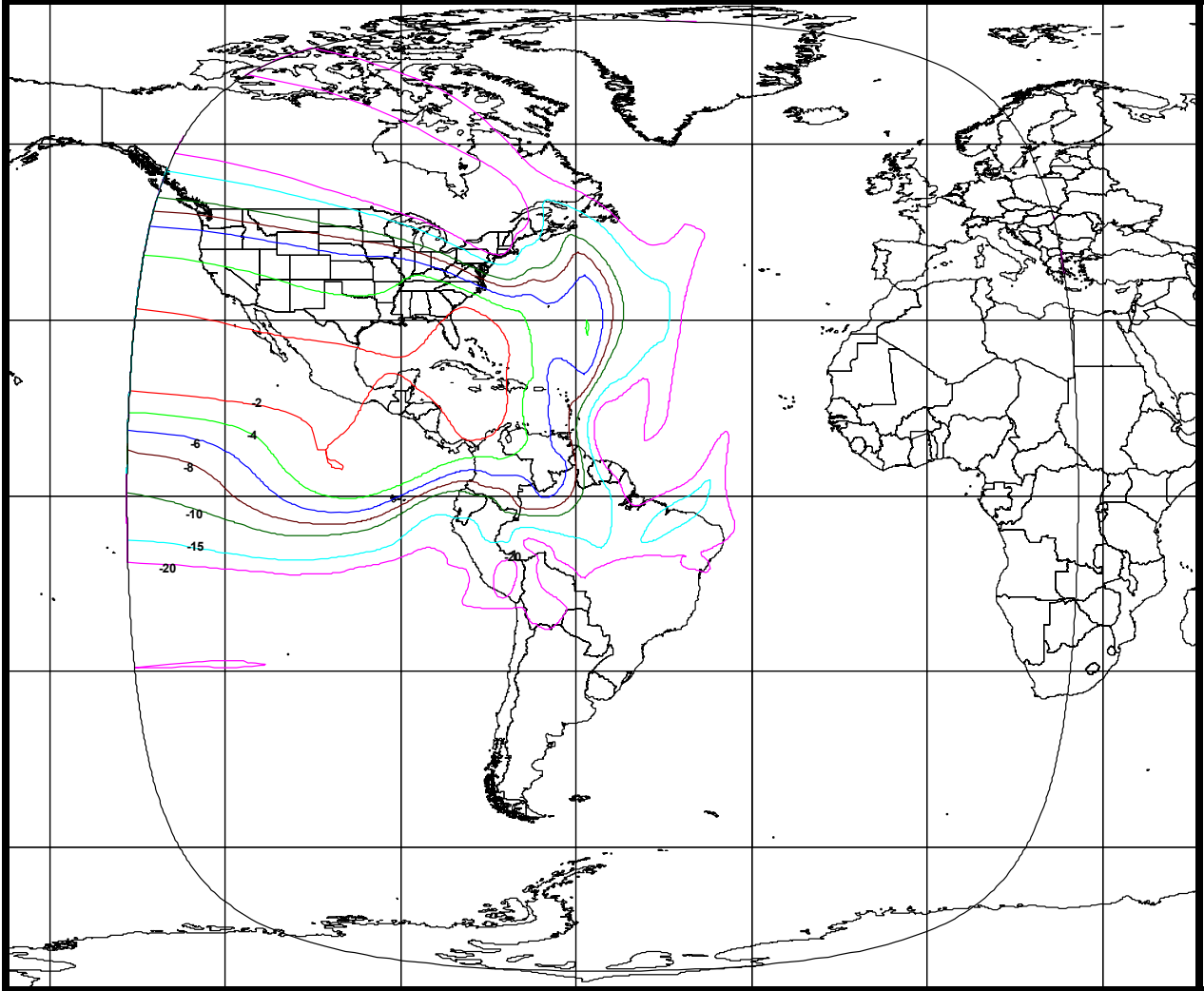


EXHIBIT 2D: C-Band North America Transmit Beam
(Schedule S Beam ID: CVDL)

Polarization: Vertical
Peak Antenna Gain: 29.0 dBi
Peak EIRP: 40.1 dBW

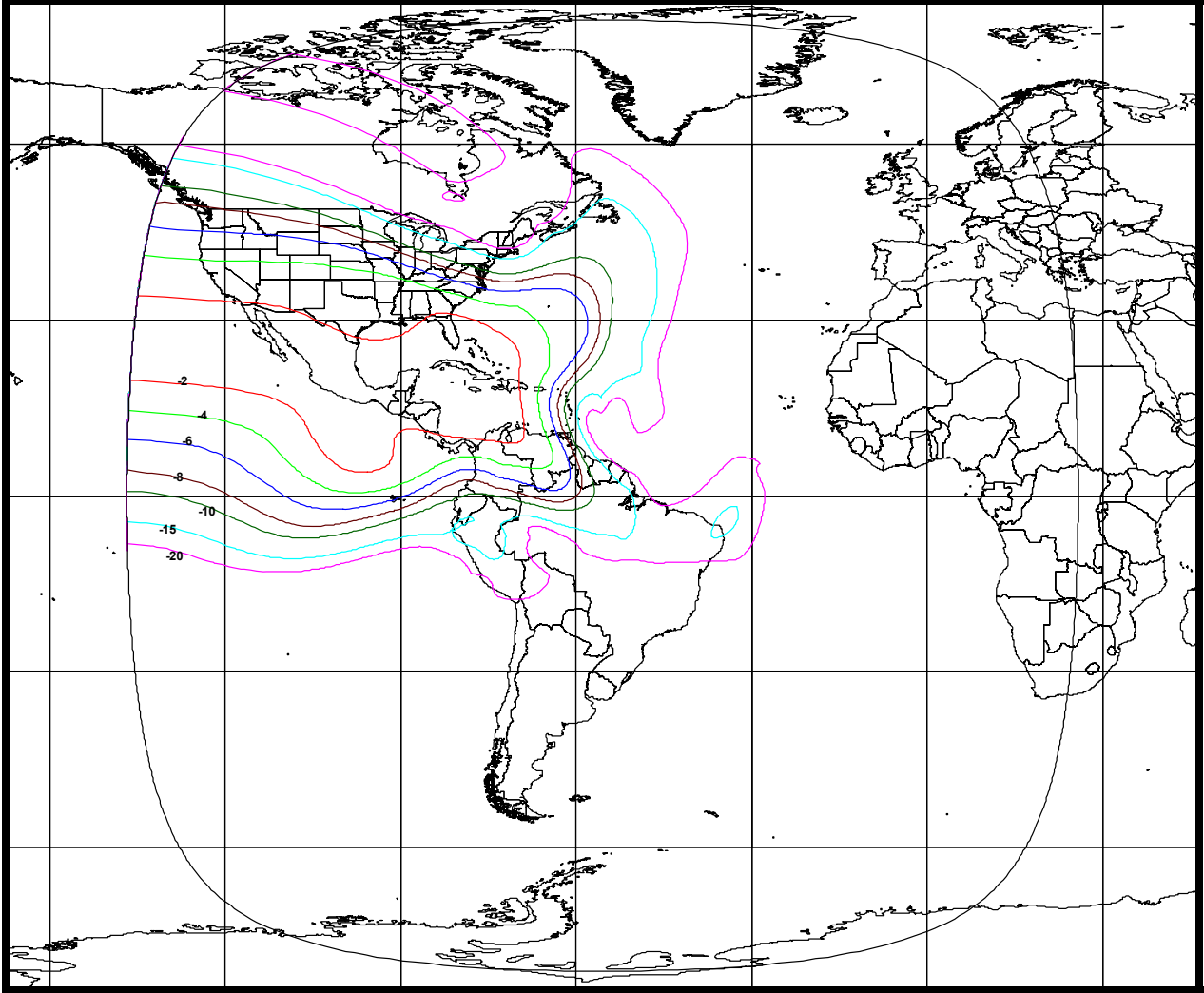


EXHIBIT 2E: Ku-Band North America Receive Beam
(Schedule S Beam ID: KHUL)

Polarization: Horizontal

Peak Antenna Gain: 33.3 dBi

Peak G/T: 6.3 dB/K

Saturated Flux Density @ Peak G/T: -99.8 to -83.8 dBW/m²

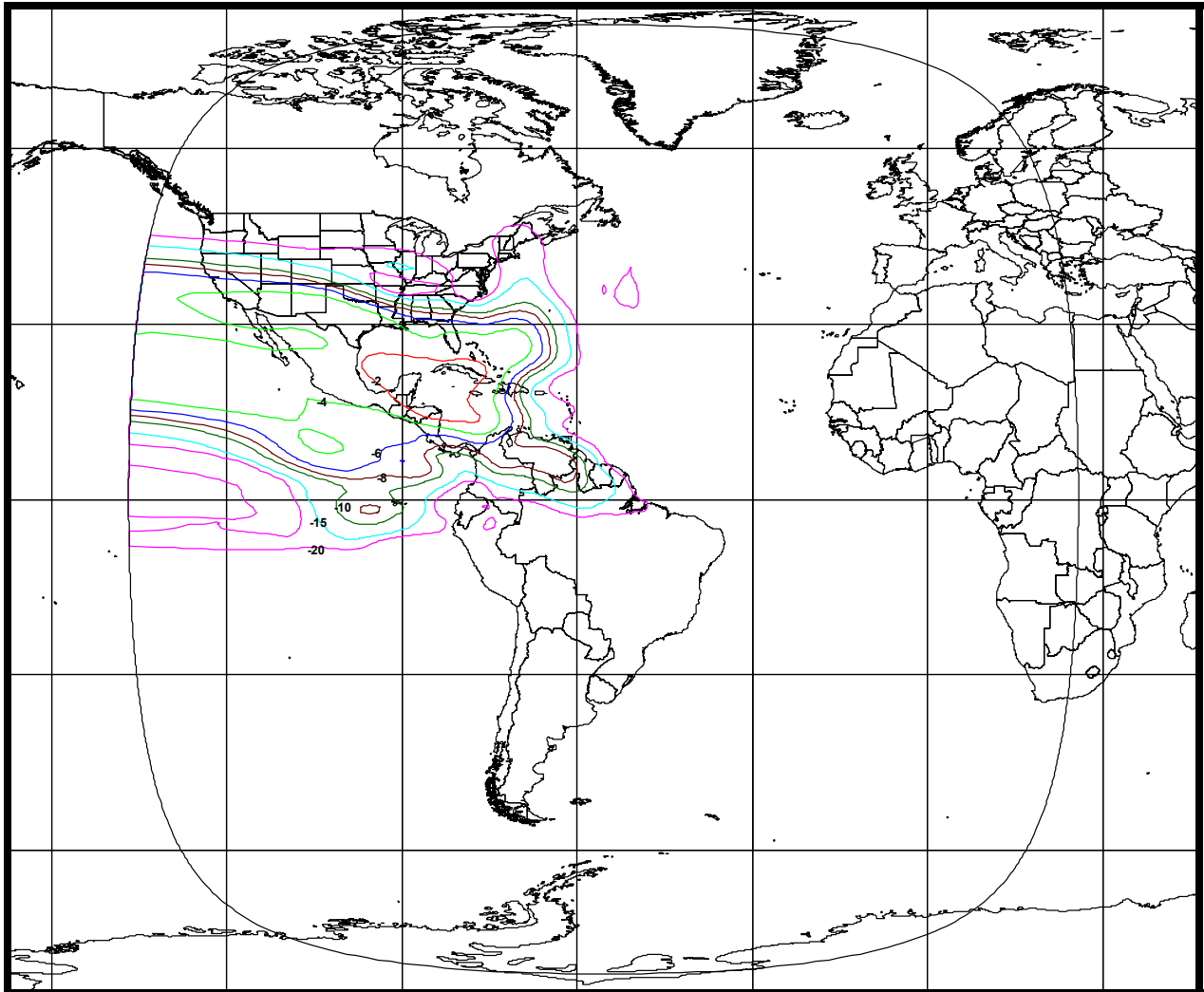


EXHIBIT 2F: Ku-Band North America Receive Beam
(Schedule S Beam ID: KVUL)

Polarization: Vertical

Peak Antenna Gain: 32.0 dBi

Peak G/T: 4.8 dB/K

Saturated Flux Density @ Peak G/T: -98.3 to -82.3 dBW/m²

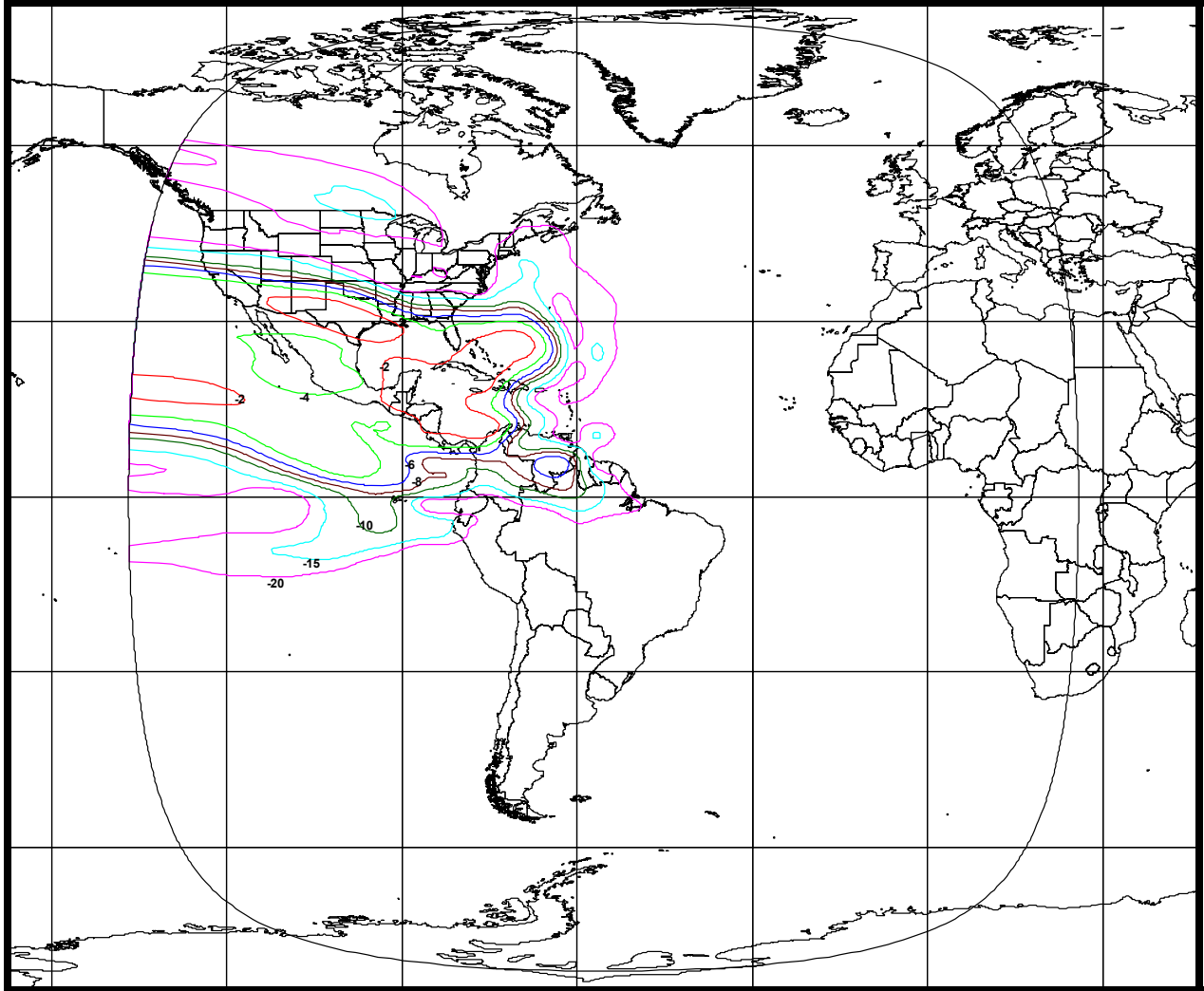


EXHIBIT 2G: Ku-Band North America Transmit Beam
(Schedule S Beam ID: KHDL)

Polarization: Horizontal
Peak Antenna Gain: 32.2 dBi
Peak EIRP: 49.7 dBW

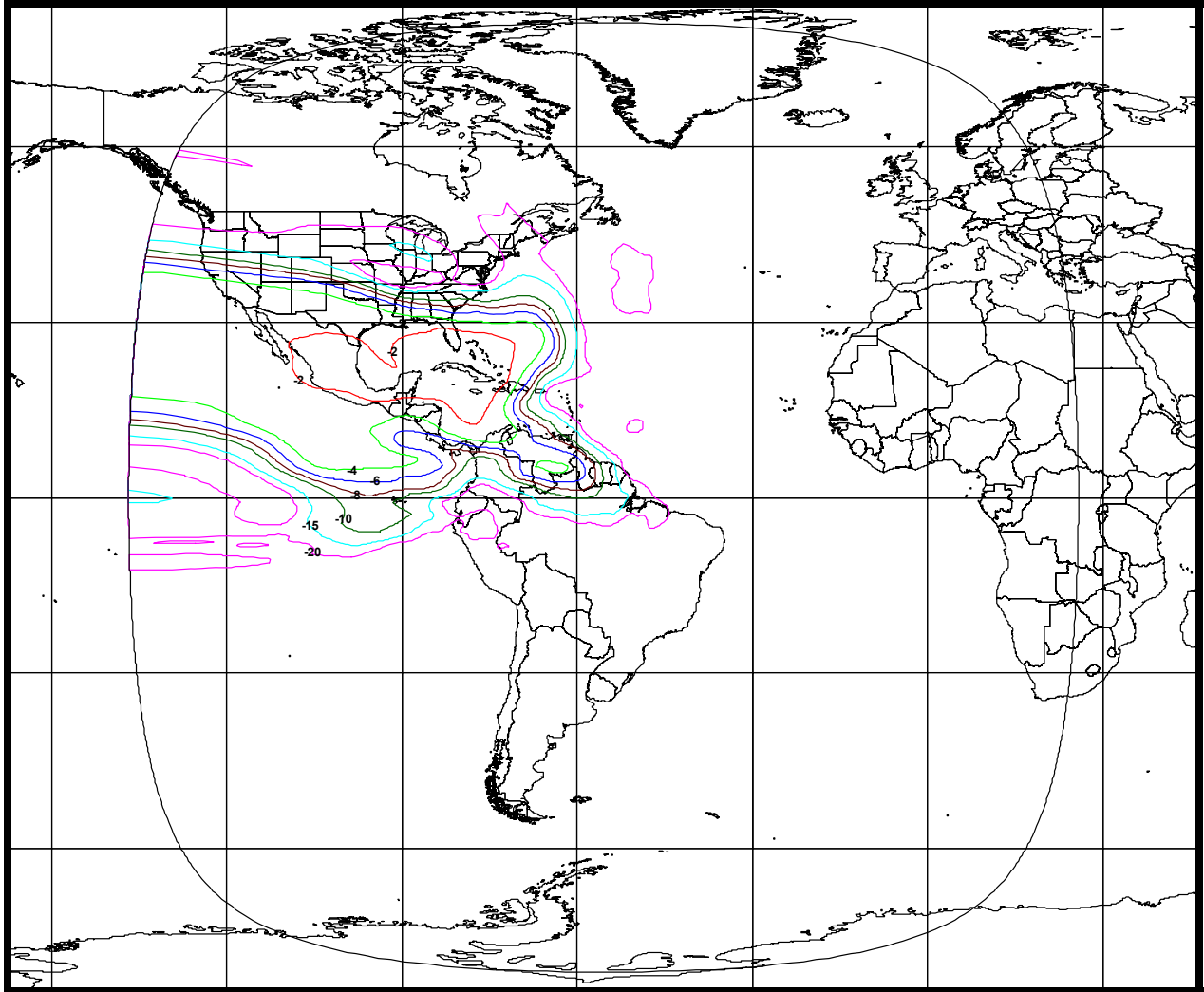


EXHIBIT 2H: Ku-Band North America Transmit Beam
(Schedule S Beam ID: KVDL)

Polarization: Vertical
Peak Antenna Gain: 31.9 dBi
Peak EIRP: 49.7 dBW

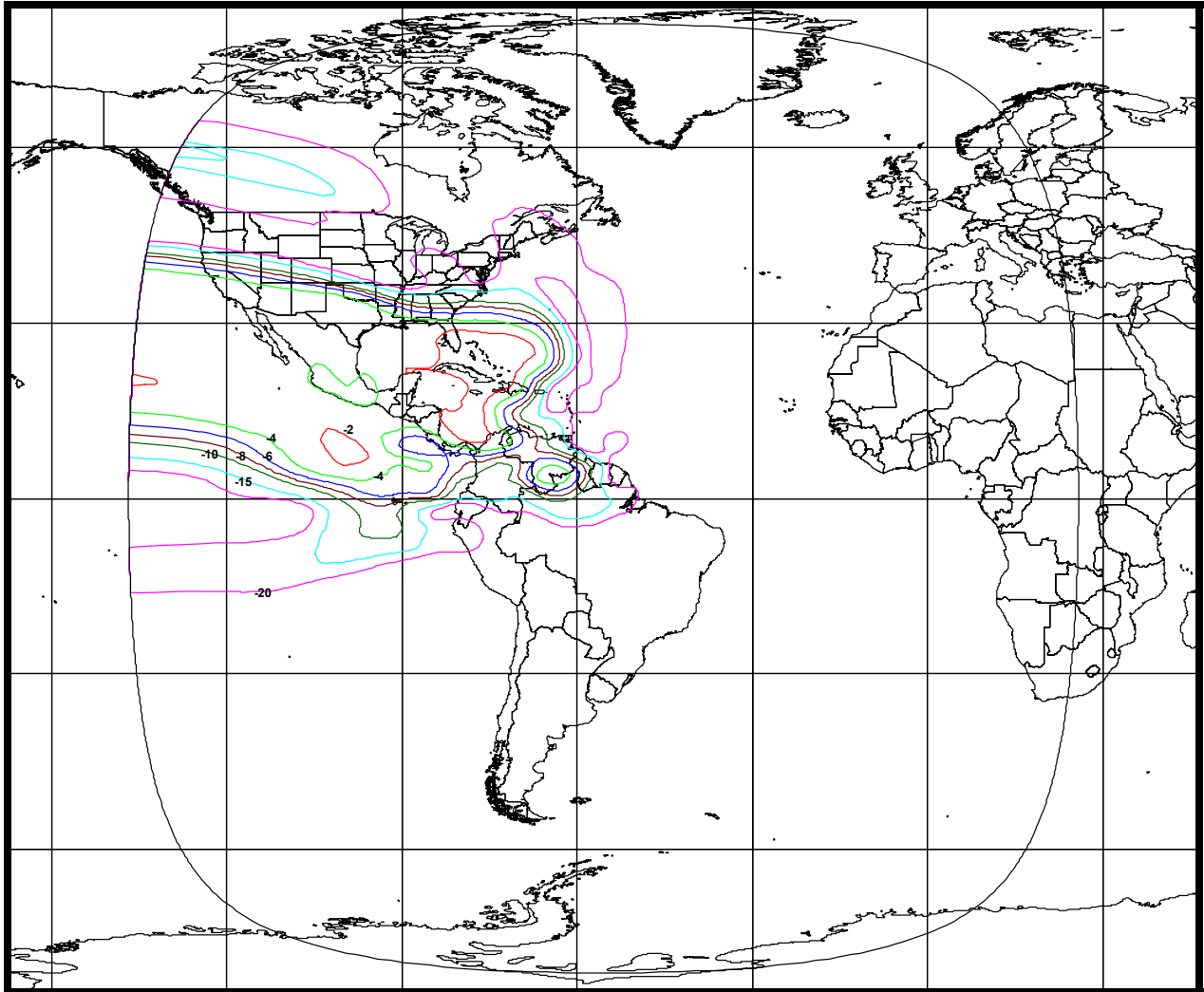


EXHIBIT 2I: Ku-Band South America Receive Beam
(Schedule S Beam ID: BHUL)

Polarization: Horizontal

Peak Antenna Gain: 32.6 dBi

Peak G/T: 5.7 dB/K

Saturated Flux Density @ Peak G/T: -98.3 to -82.3 dBW/m²

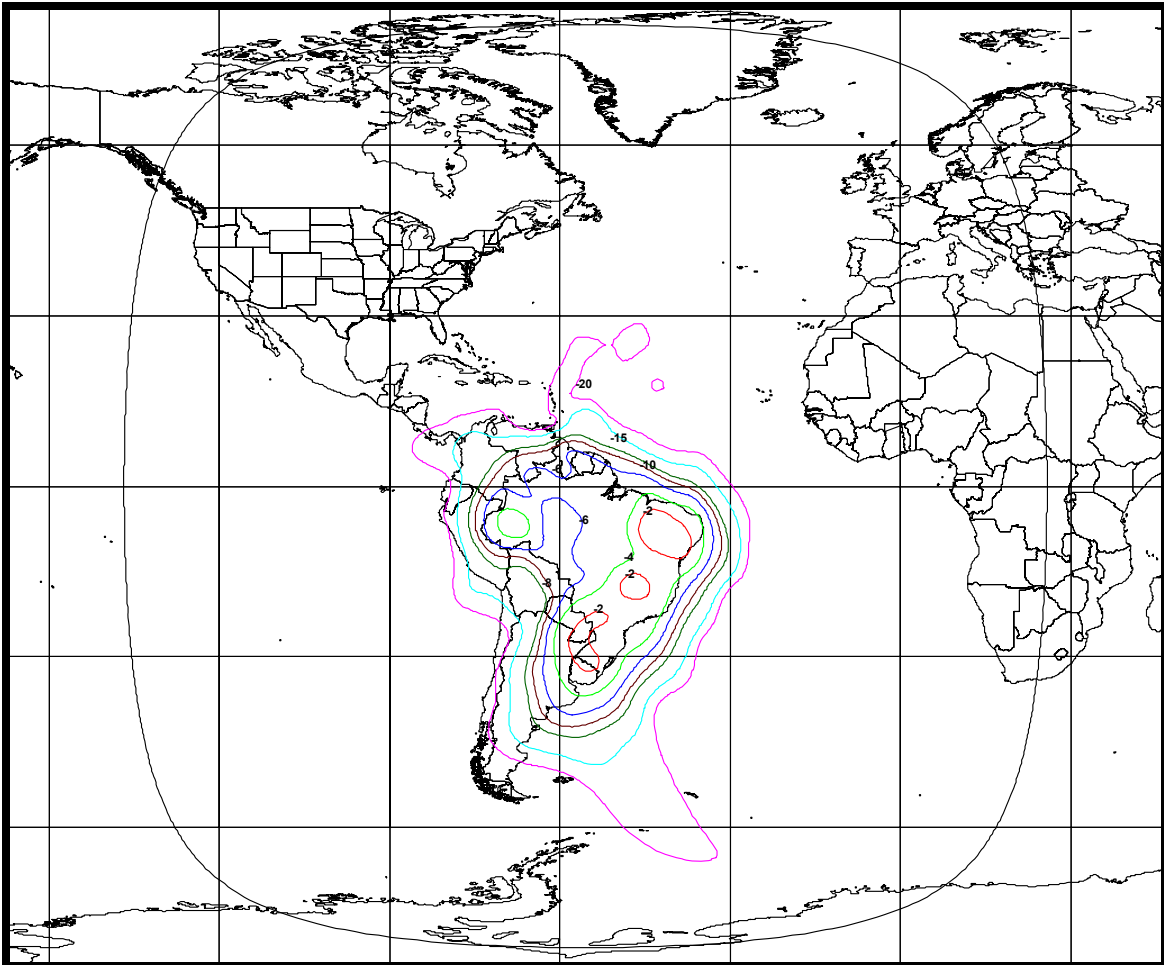


EXHIBIT 2J: Ku-Band South America Receive Beam
(Schedule S Beam ID: BVUL)

Polarization: Vertical

Peak Antenna Gain: 33.3 dBi

Peak G/T: 6.3 dB/K

Saturated Flux Density @ Peak G/T: -99.9 to -83.9 dBW/m²

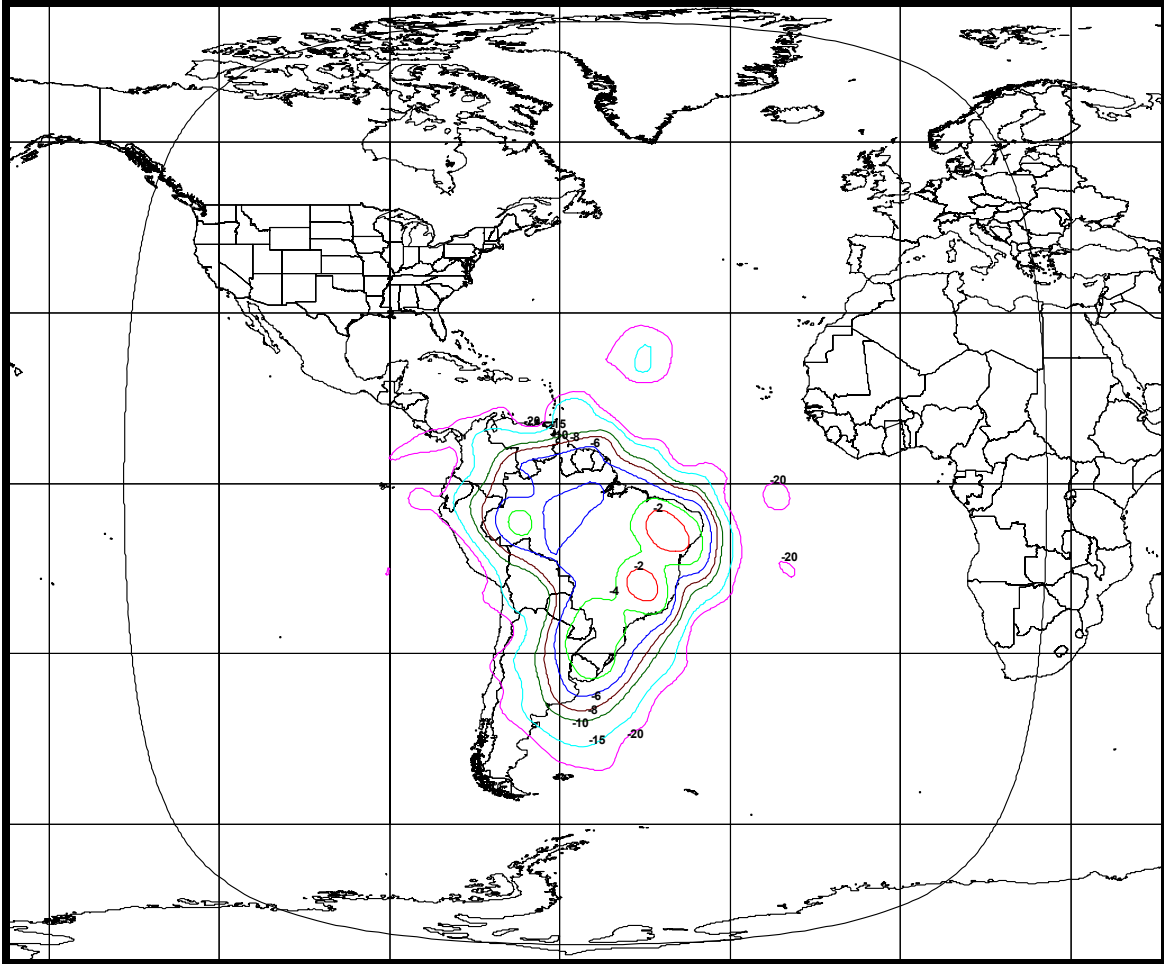


EXHIBIT 2K: Extended Ku-Band South America Transmit Beam
(Schedule S Beam ID: BHDL)

Polarization: Horizontal
Peak Antenna Gain: 31.6 dBi
Peak EIRP: 52.5 dBW

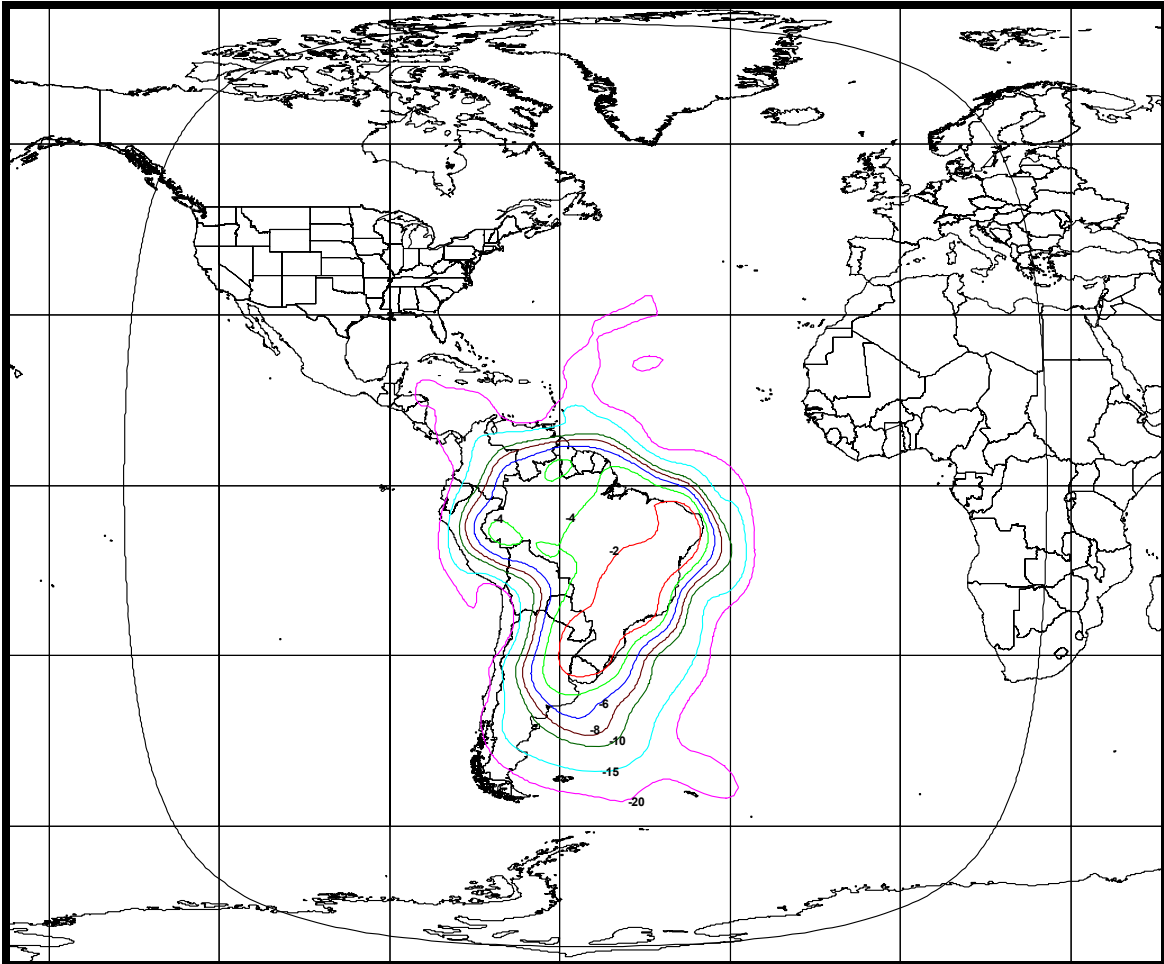


EXHIBIT 2L: Extended Ku-Band South America Transmit Beam
(Schedule S Beam ID: BVDL)

Polarization: Vertical
Peak Antenna Gain: 31.3 dBi
Peak EIRP: 51.9 dBW

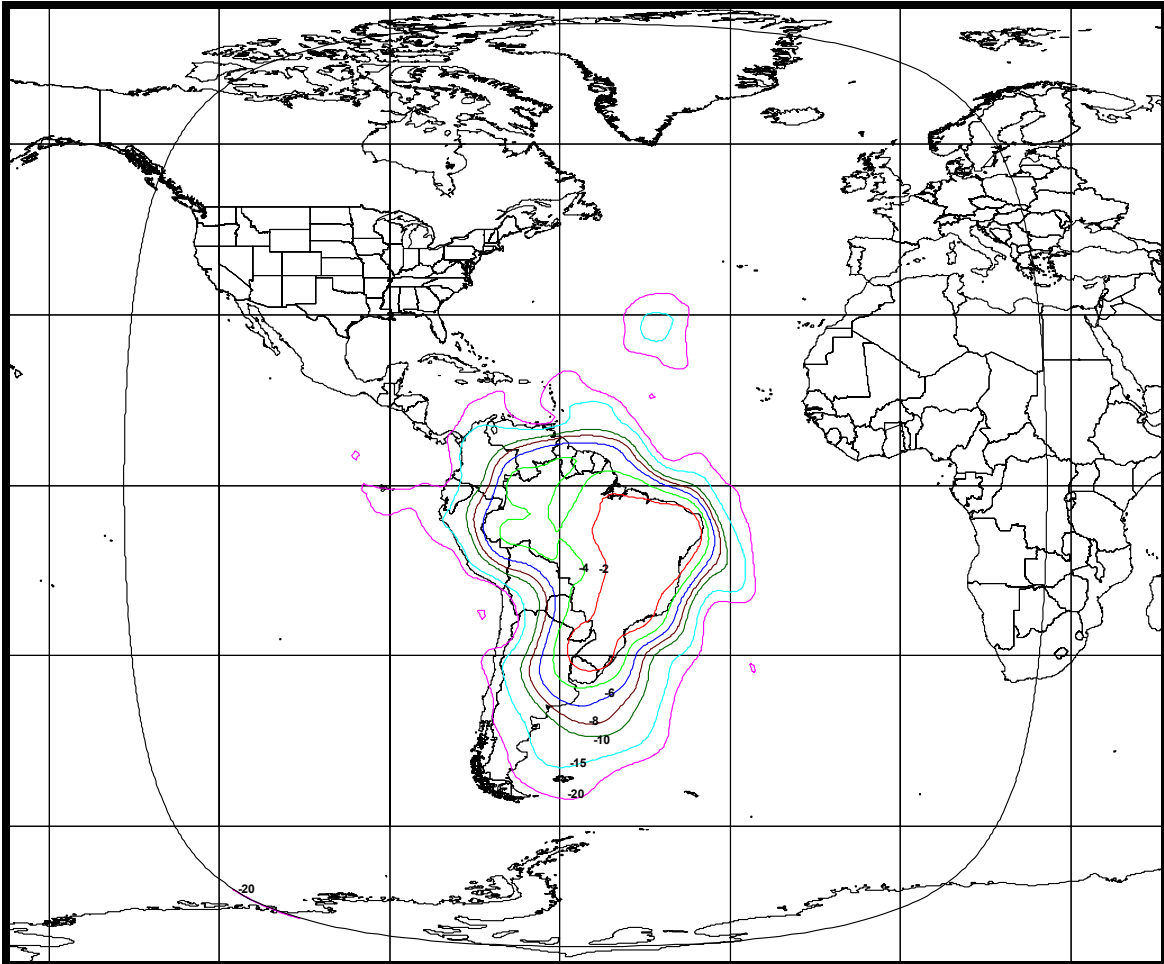


EXHIBIT 2M: Extended Ku-Band North America Receive Beam
(Schedule S Beam ID: EHUL)

Polarization: Horizontal

Peak Antenna Gain: 32.1 dBi

Peak G/T: 5.2 dB/K

Saturated Flux Density @ Peak G/T: -94.3 to -78.3 dBW/m²

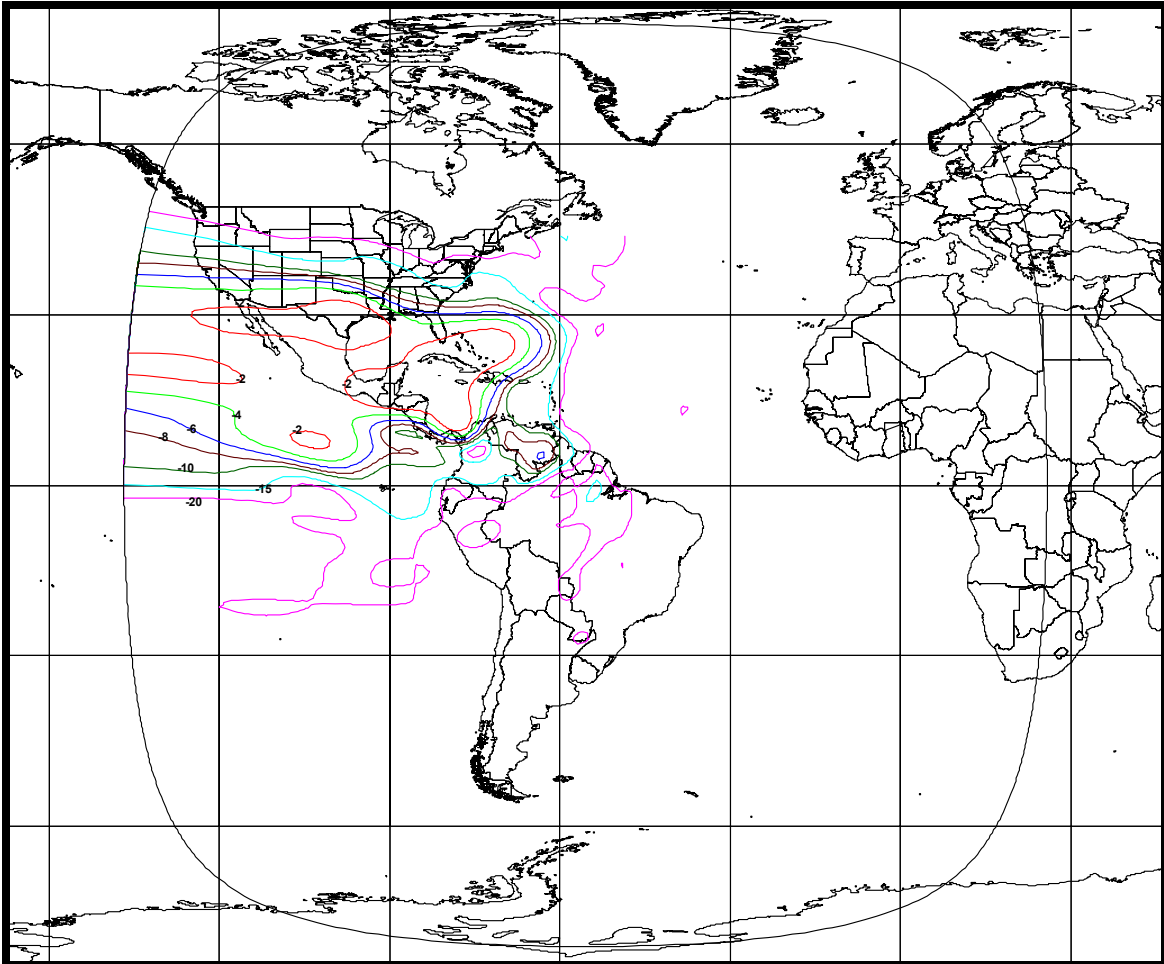


EXHIBIT 2N: Extended Ku-Band North America Receive Beam
(Schedule S Beam ID: EVUL)

Polarization: Vertical
Peak Antenna Gain: 32.3 dBi
Peak G/T: 5.2 dB/K
Saturated Flux Density @ Peak G/T: -94.2 to -78.2 dBW/m²

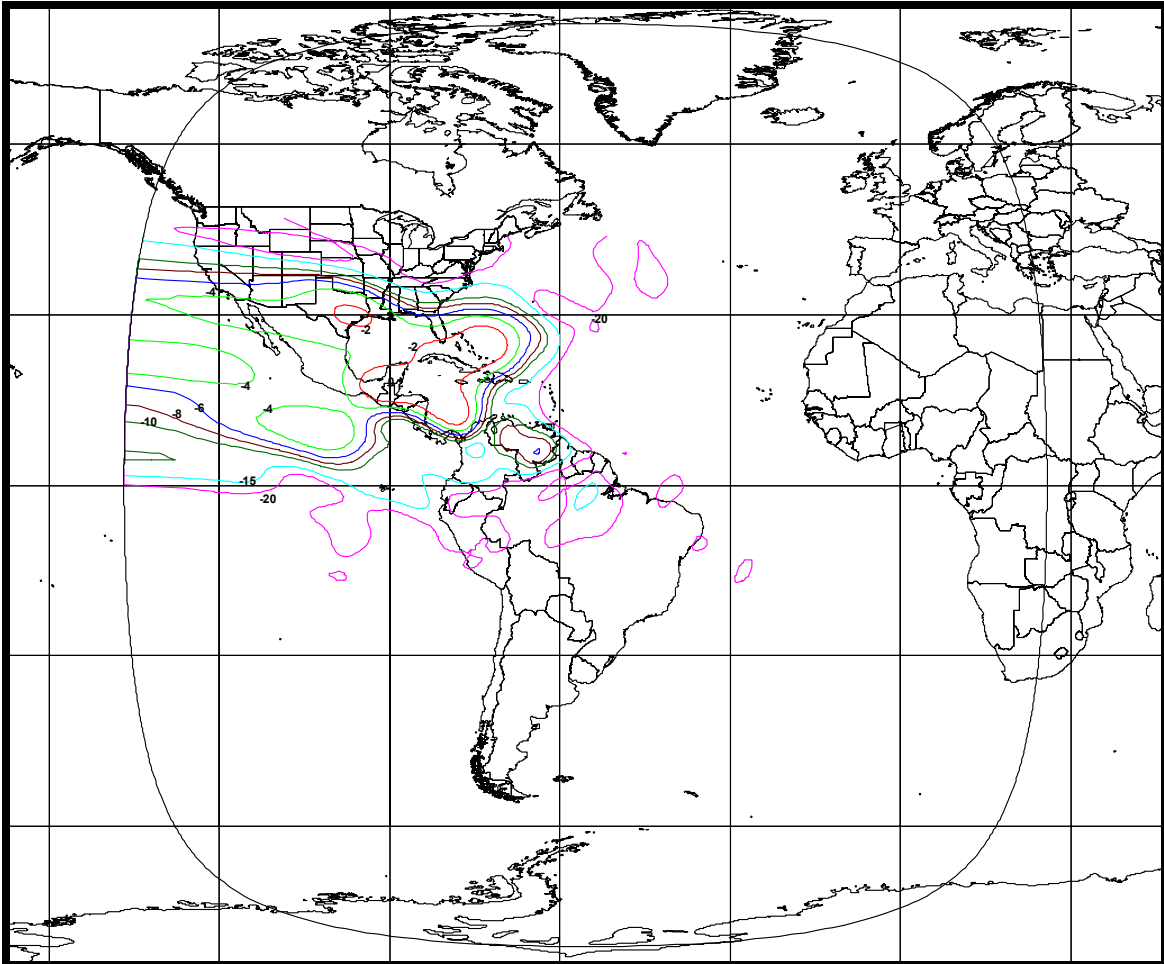


EXHIBIT 20: Extended Ku-Band North America Transmit Beam
(Schedule S Beam ID: EHDL)

Polarization: Horizontal
Peak Antenna Gain: 31.4 dBi
Peak EIRP: 52.1 dBW

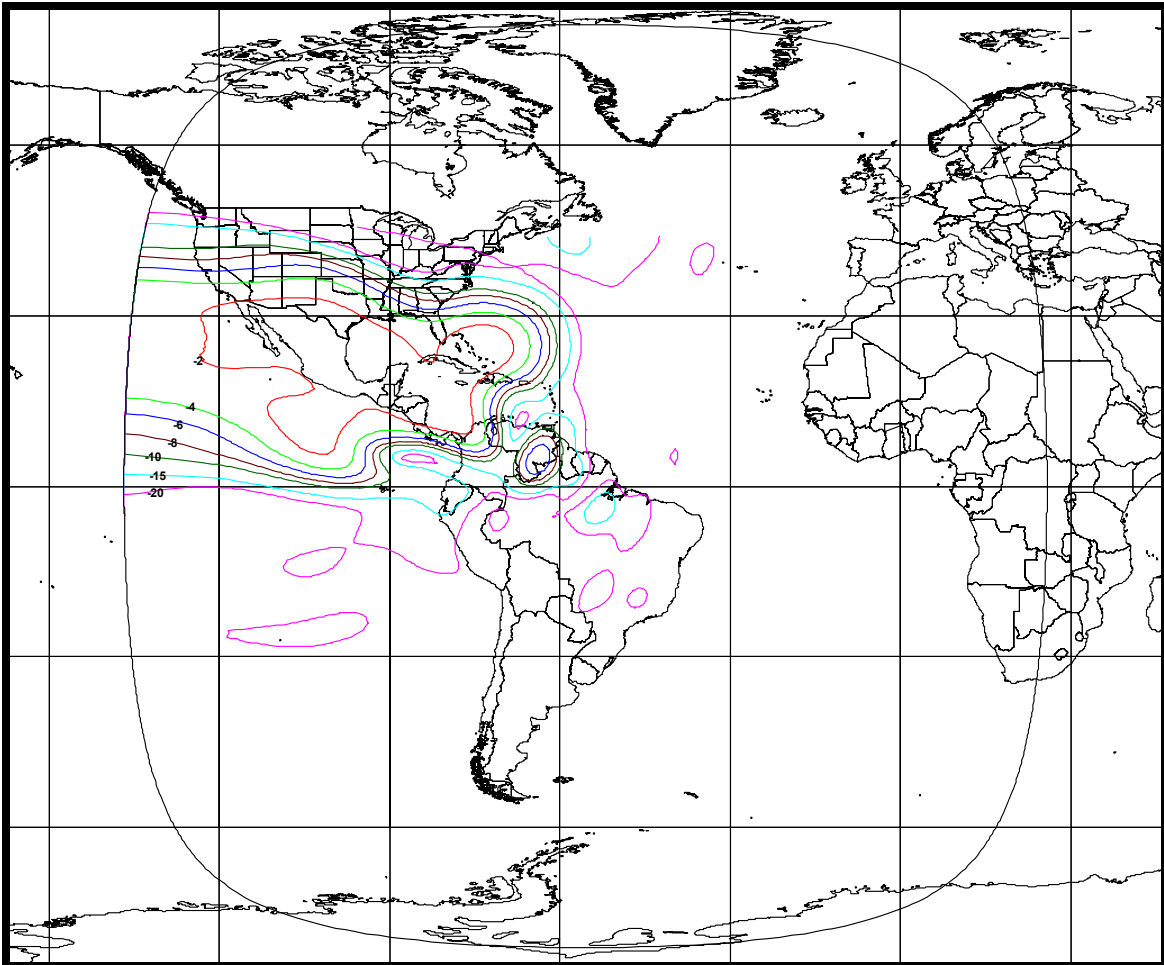


EXHIBIT 2P: Extended Ku-Band North America Transmit Beam
(Schedule S Beam ID: EVDL)

Polarization: Vertical
Peak Antenna Gain: 31.7 dBi
Peak EIRP: 52.0 dBW

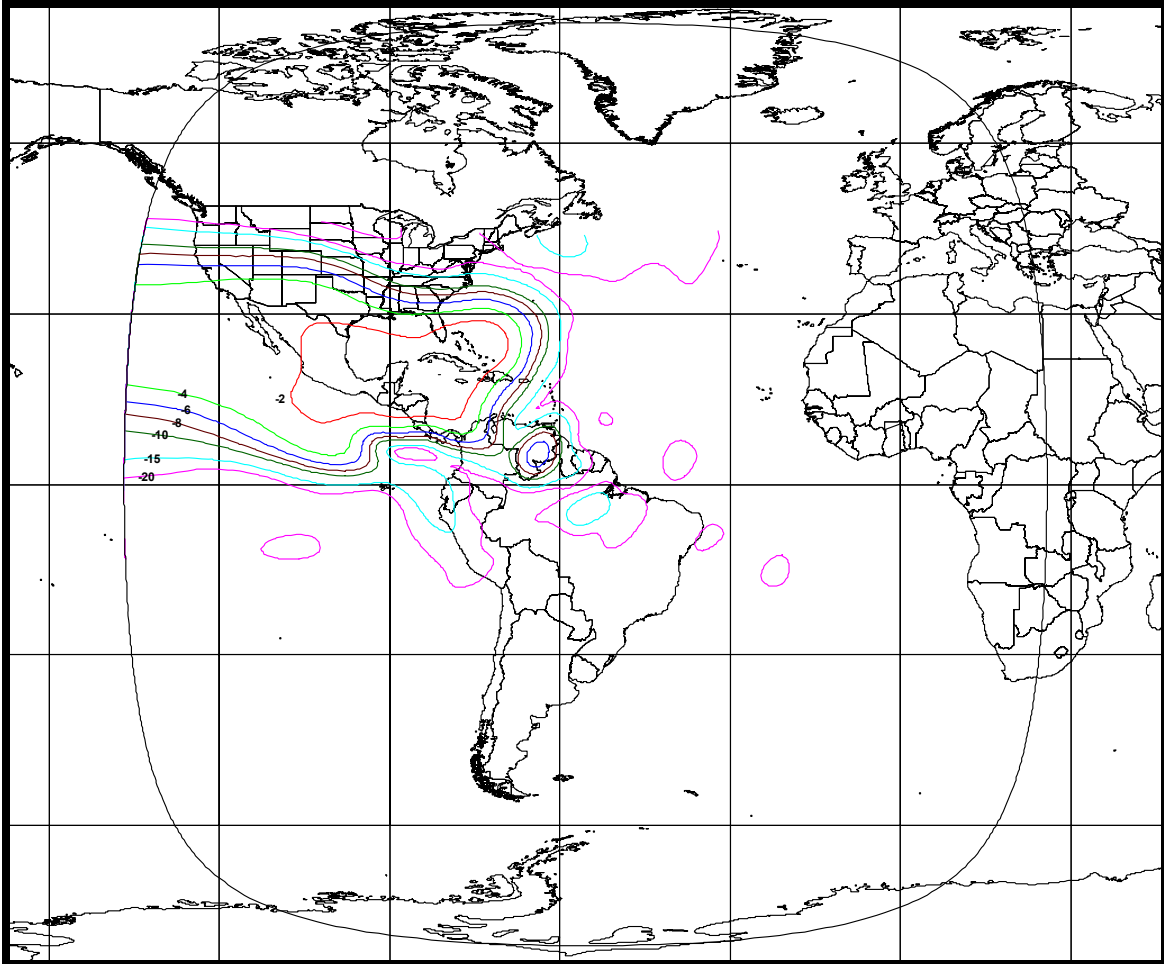


EXHIBIT 2Q: On-Station Command Receive Beam
(Communication Antenna)
(Schedule S Beam ID: CMDC)

Polarization: Vertical
Peak Antenna Gain: 32 dBi
Peak G/T: -3.0 dB/K
Command Threshold @ Peak G/T: -119.6 dBW/m²

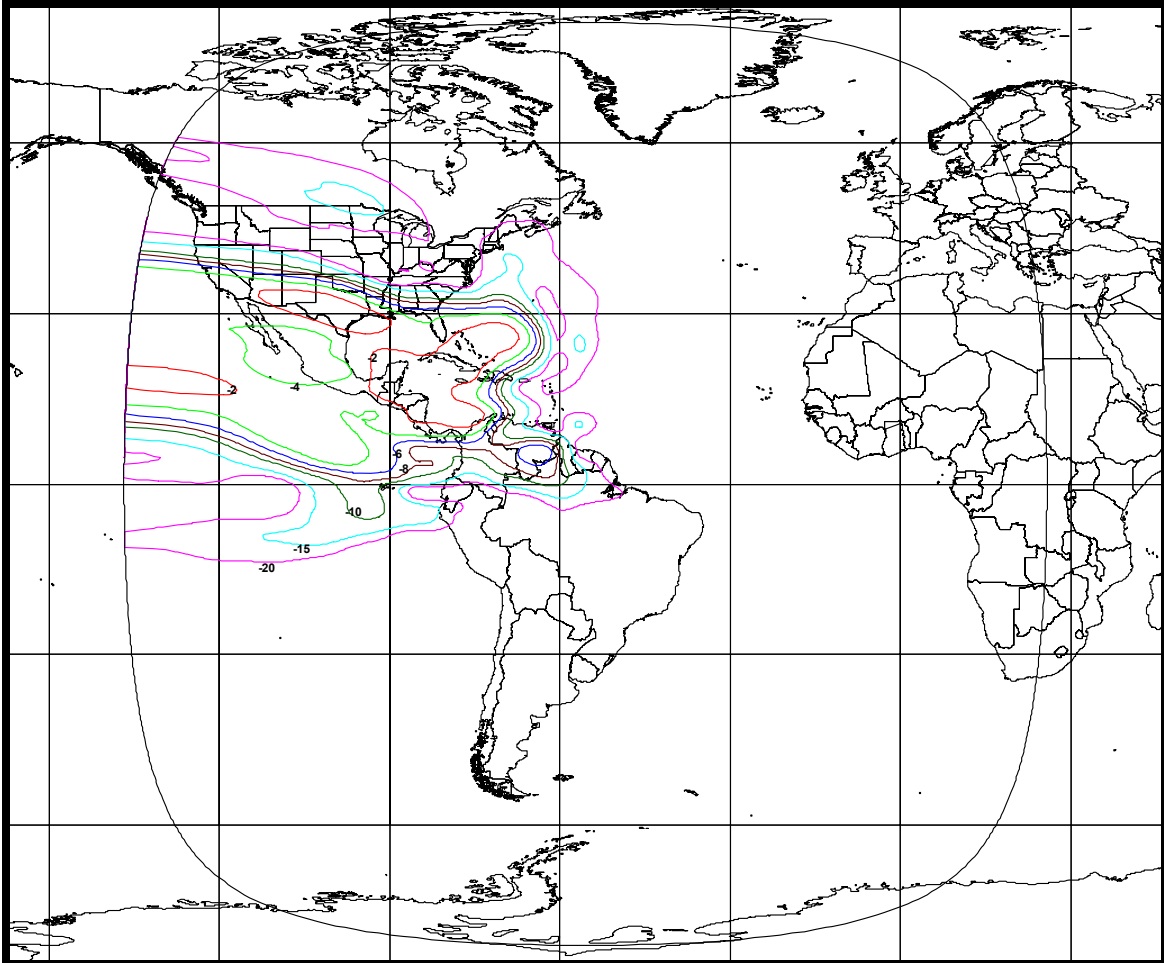
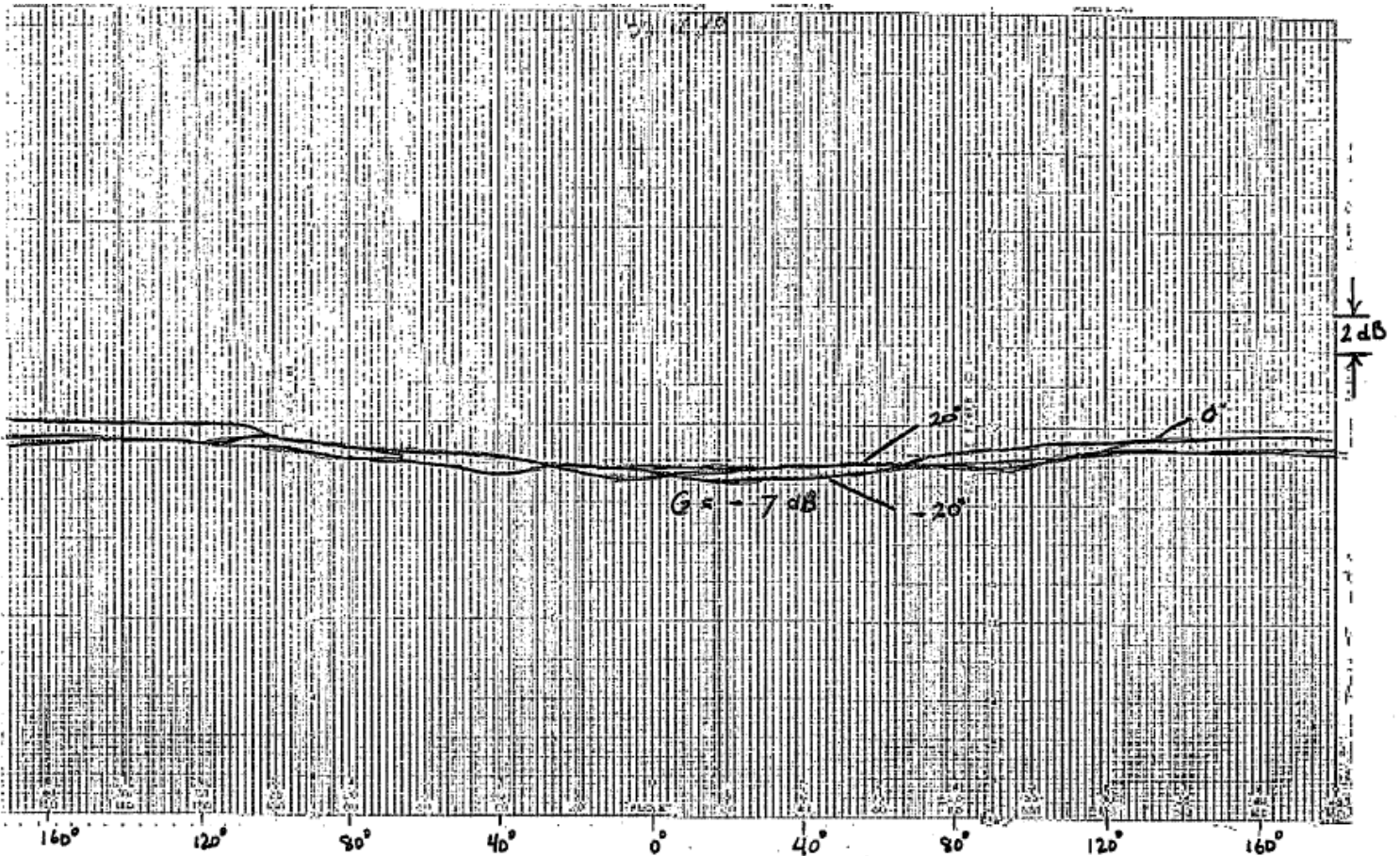


EXHIBIT 2R: Back-Up Command Receive Beam
(Bicone Antenna)
(Schedule S Beam ID: CMDB)

Polarization: Horizontal
Peak Antenna Gain: 2.2 dBi
Peak G/T: -30.8 dB/K
Command Threshold @ Peak G/T: -91.8 dBW/m²

(a) Azimuth Cut Antenna Gain Pattern



Notes:

- 1) Gain variation in azimuth shown for elevation angles of 0° and ±20°.
- 2) The x-axis represents the azimuth angle and spans from -180° to +180°. Each major axis division line represents 20° of azimuth.
- 3) The y-axis represents the antenna gain. Each major axis division line represents 2 dB of gain.

EXHIBIT 2R: Back-Up Command Receive Beam (continued)

(Bicone Antenna)

(Schedule S Beam ID: CMDB)

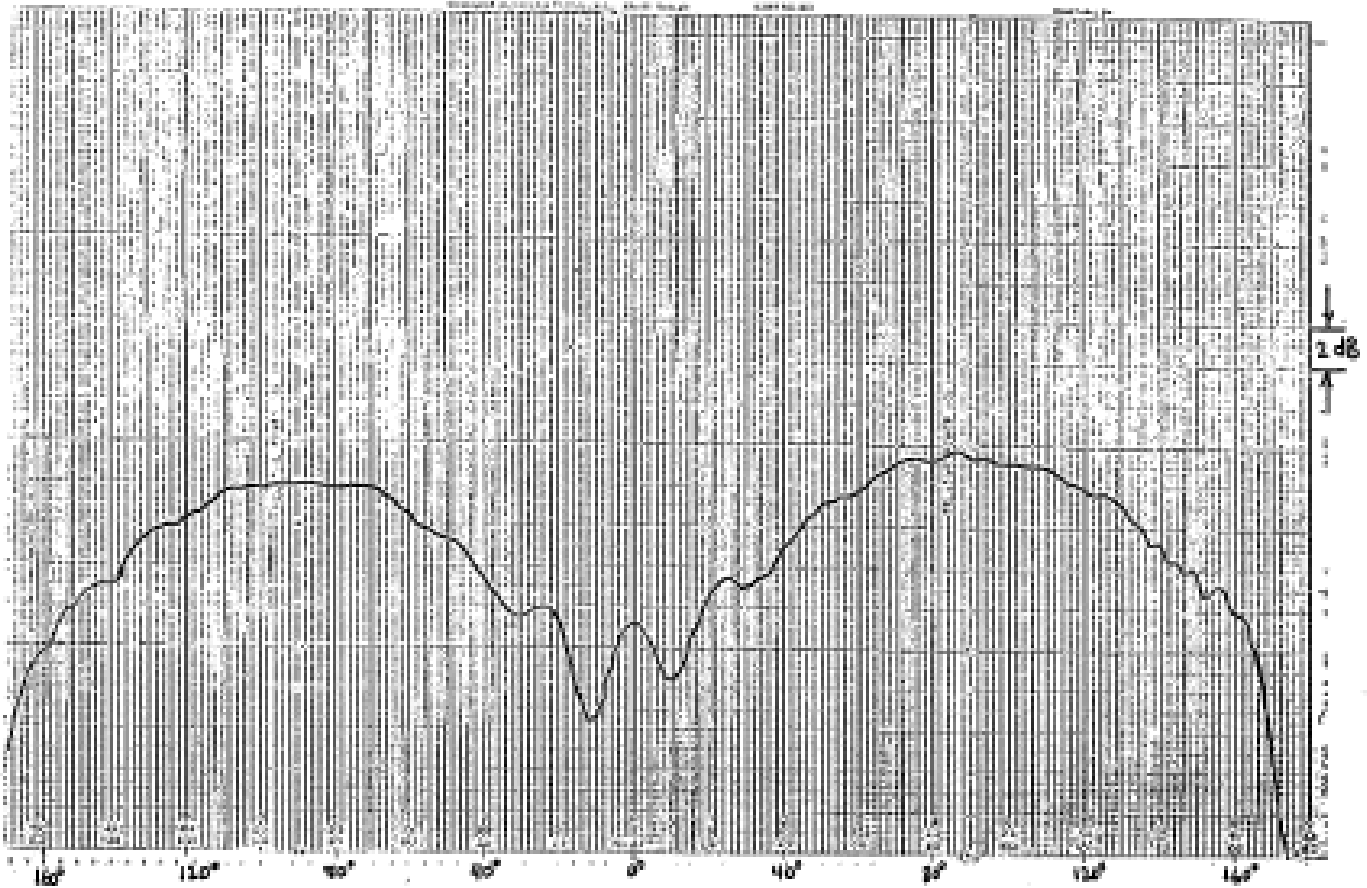
Polarization: Horizontal

Peak Antenna Gain: 2.2 dBi

Peak G/T: -30.8 dB/K

Command Threshold @ Peak G/T: -91.8 dBW/m²

(b) Elevation Cut Antenna Gain Pattern



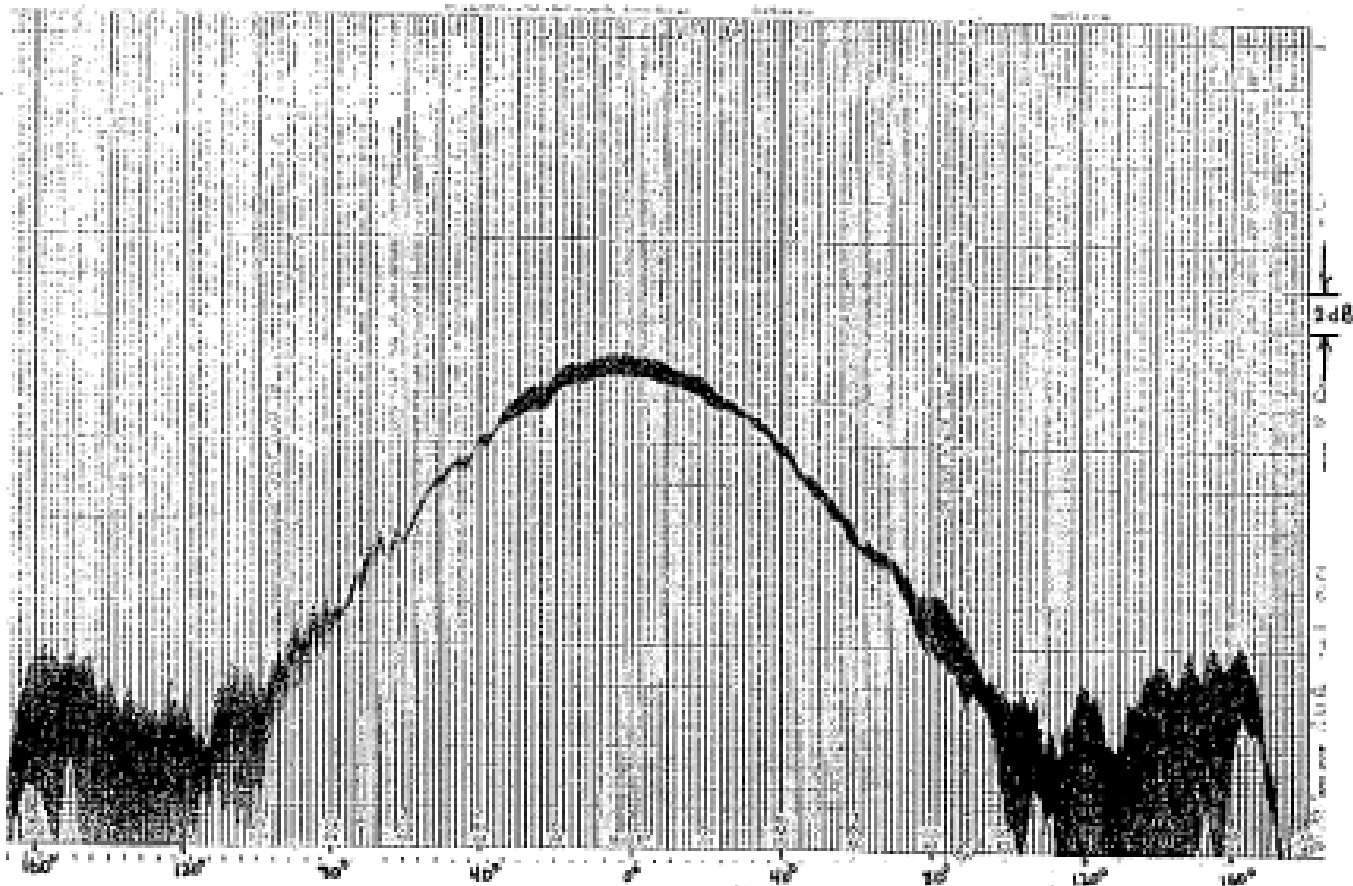
Notes:

- 1) Gain variation in elevation shown for the azimuth angle of 0°.
- 2) The x-axis represents the elevation angle and spans from -180° to +180°. Each major axis division line represents 20° of elevation.
- 3) The y-axis represents the antenna gain. Each major axis division line represents 2 dB of gain.

EXHIBIT 2S: Back-Up Command Receive Beam
(Pipe Antenna)
(Schedule S Beam ID: CMDP)

Polarization: Left Hand Circular
Peak Antenna Gain: 3.8 dBi
Peak G/T: -28.7 dB/K
Command Threshold @ Peak G/T: -94.3 dBW/m²

Azimuth Cut Antenna Gain Pattern



Notes:

- 1) Gain variation in azimuth shown for elevation angle of 0°.
- 2) The x-axis represents the azimuth angle and spans from -180° to +180°. Each major axis division line represents 20° of azimuth.
- 3) The y-axis represents the antenna gain. Each major axis division line represents 2 dB of gain.

EXHIBIT 2T: On-Station Telemetry Transmit Beam
(Communication Antenna)
(Schedule S Beam ID: TLMC)

Polarization: Vertical
Peak Antenna Gain: 31.9 dBi
Peak EIRP: 15.3 dBW

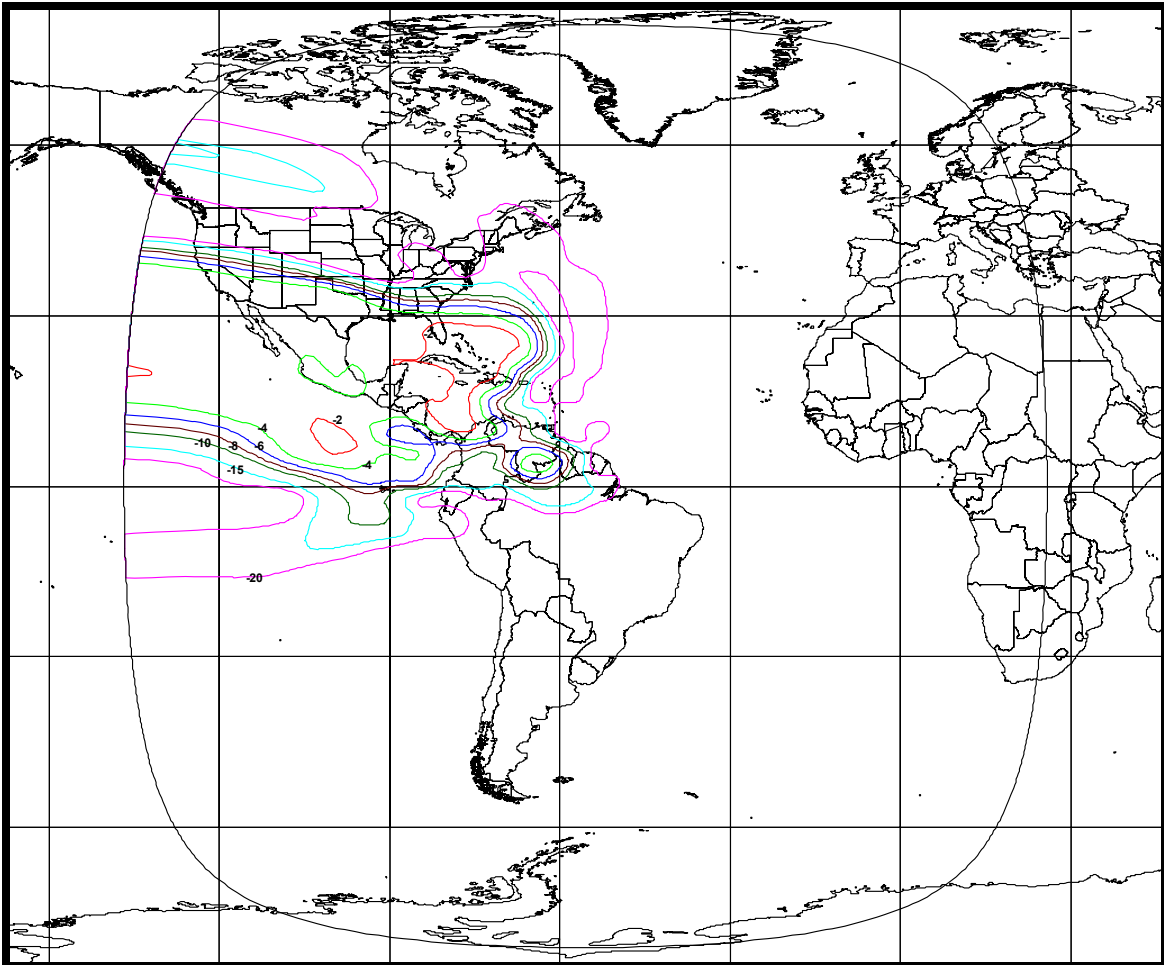
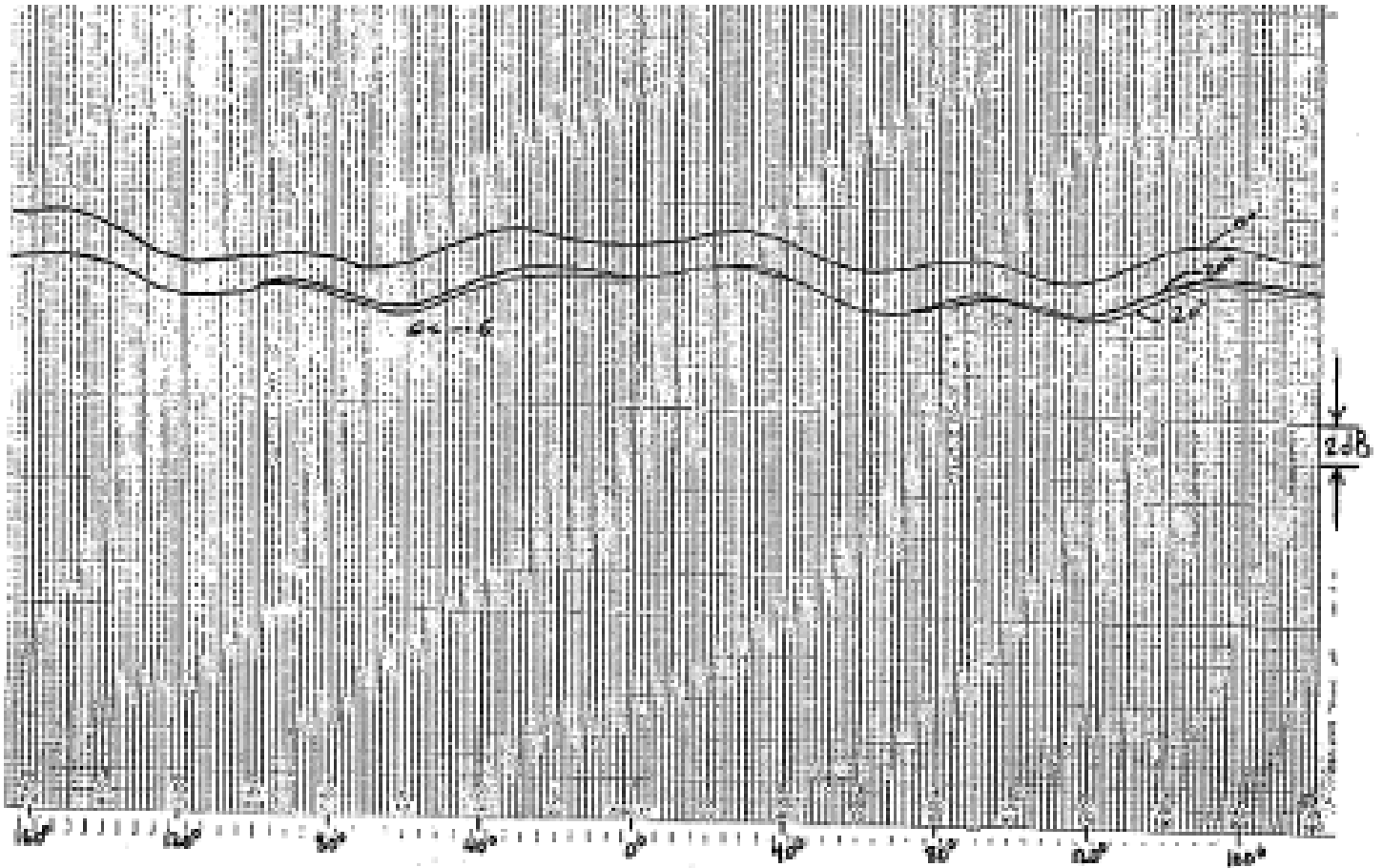


EXHIBIT 2U: Back-Up Telemetry Transmit Beam
(Bicone Antenna)
(Schedule S Beam ID: TLMB)

Polarization: Vertical
Peak Antenna Gain: 2.7 dBi
Peak EIRP: 11.6 dBW

(a) Azimuth Cut Antenna Gain Pattern



Notes:

- 1) Gain variation in azimuth shown for elevation angles of 0° and $\pm 20^\circ$.
- 2) The x-axis represents the azimuth angle and spans from -180° to $+180^\circ$. Each major axis division line represents 20° of azimuth.
- 3) The y-axis represents the antenna gain. Each major axis division line represents 2 dB of gain.

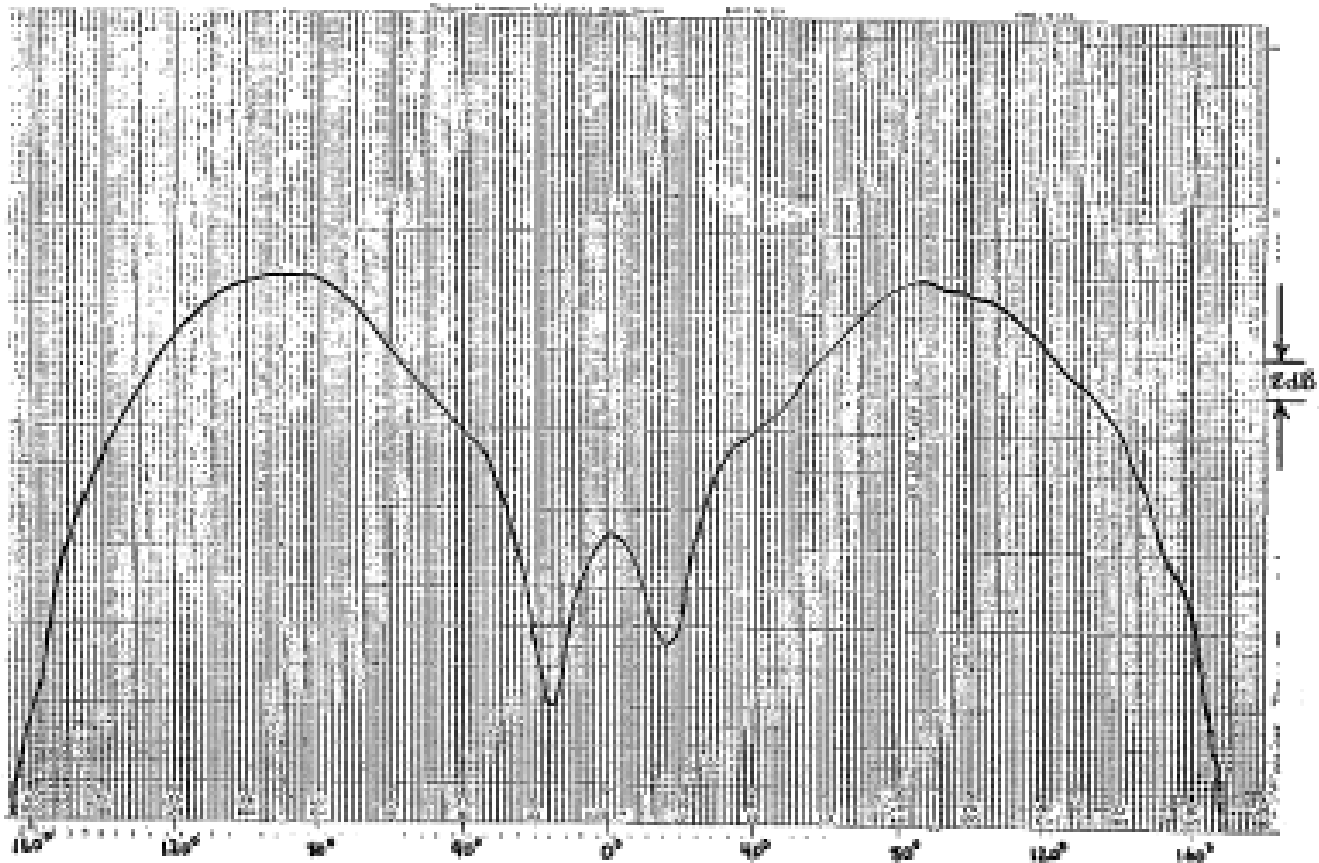
EXHIBIT 2U: Back-Up Telemetry Transmit Beam (continued)

(Bicone Antenna)

(Schedule S Beam ID: TLMB)

Polarization: Vertical
Peak Antenna Gain: 2.7 dBi
Peak EIRP: 11.6 dBW

(b) Elevation Cut Antenna Gain Pattern



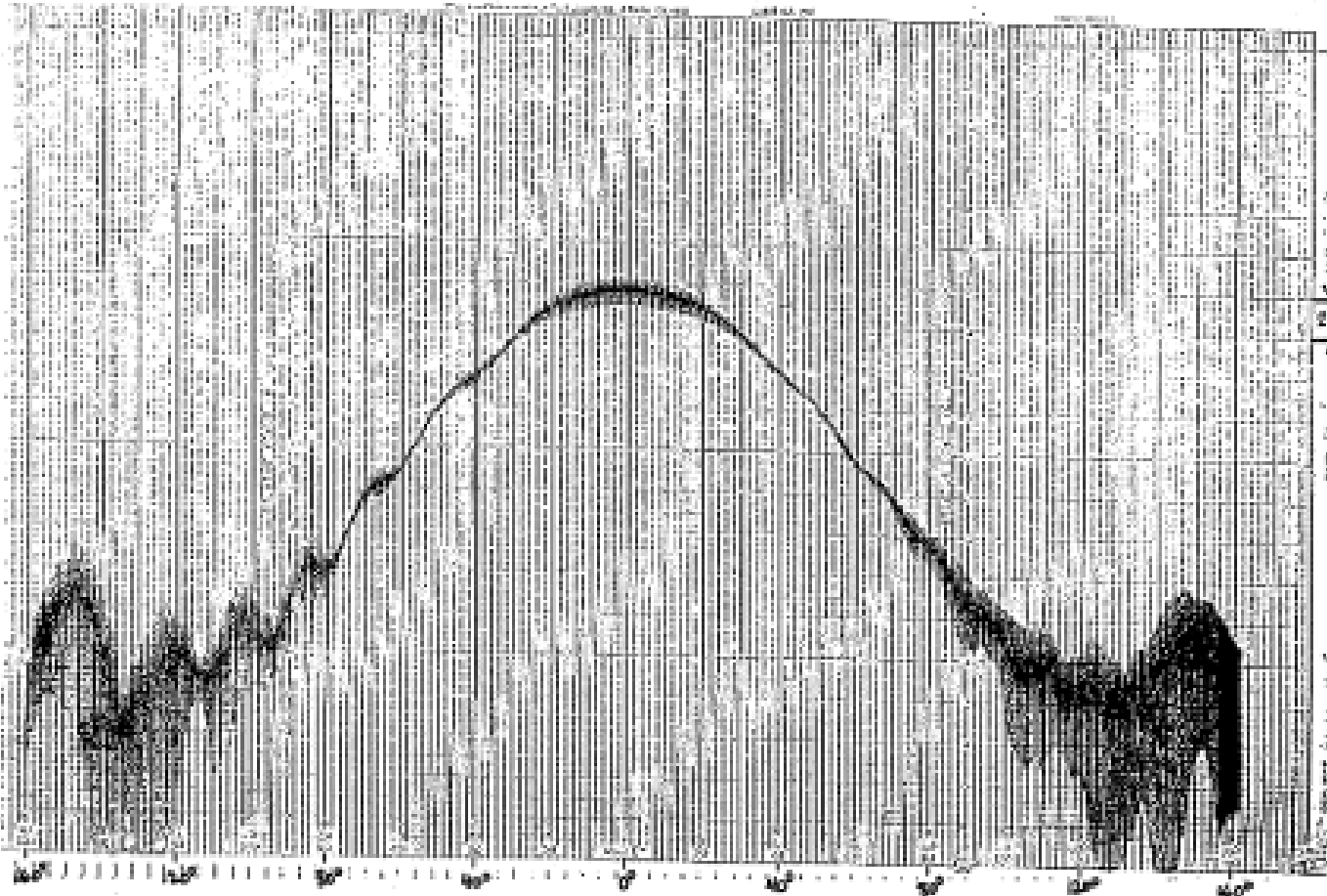
Notes:

- 1) Gain variation in elevation shown for the azimuth angle of 0°.
- 2) The x-axis represents the elevation angle and spans from -180° to +180°. Each major axis division line represents 20° of elevation.
- 3) The y-axis represents the antenna gain. Each major axis division line represents 2 dB of gain.

EXHIBIT 2V: Back-Up Telemetry Transmit Beam
(Pipe Antenna)
(Schedule S Beam ID: TLMP)

Polarization: Left Hand Circular
Peak Antenna Gain: 5.3 dBi
Peak EIRP: 11.6 dBW

Azimuth Cut Antenna Gain Pattern



Notes:

- 1) Gain variation in azimuth shown for elevation angle of 0°.
- 2) The x-axis represents the azimuth angle and spans from -180° to +180°. Each major axis division line represents 20° of azimuth.
- 3) The y-axis represents the antenna gain. Each major axis division line represents 2 dB of gain.

EXHIBIT 2W: ULPC Transmit Beam
(Communication Antenna)
(Schedule S Beam ID: UPCC)

Polarization: Horizontal
Peak Antenna Gain: 32.2 dBi
Peak EIRP: 25.3 dBW

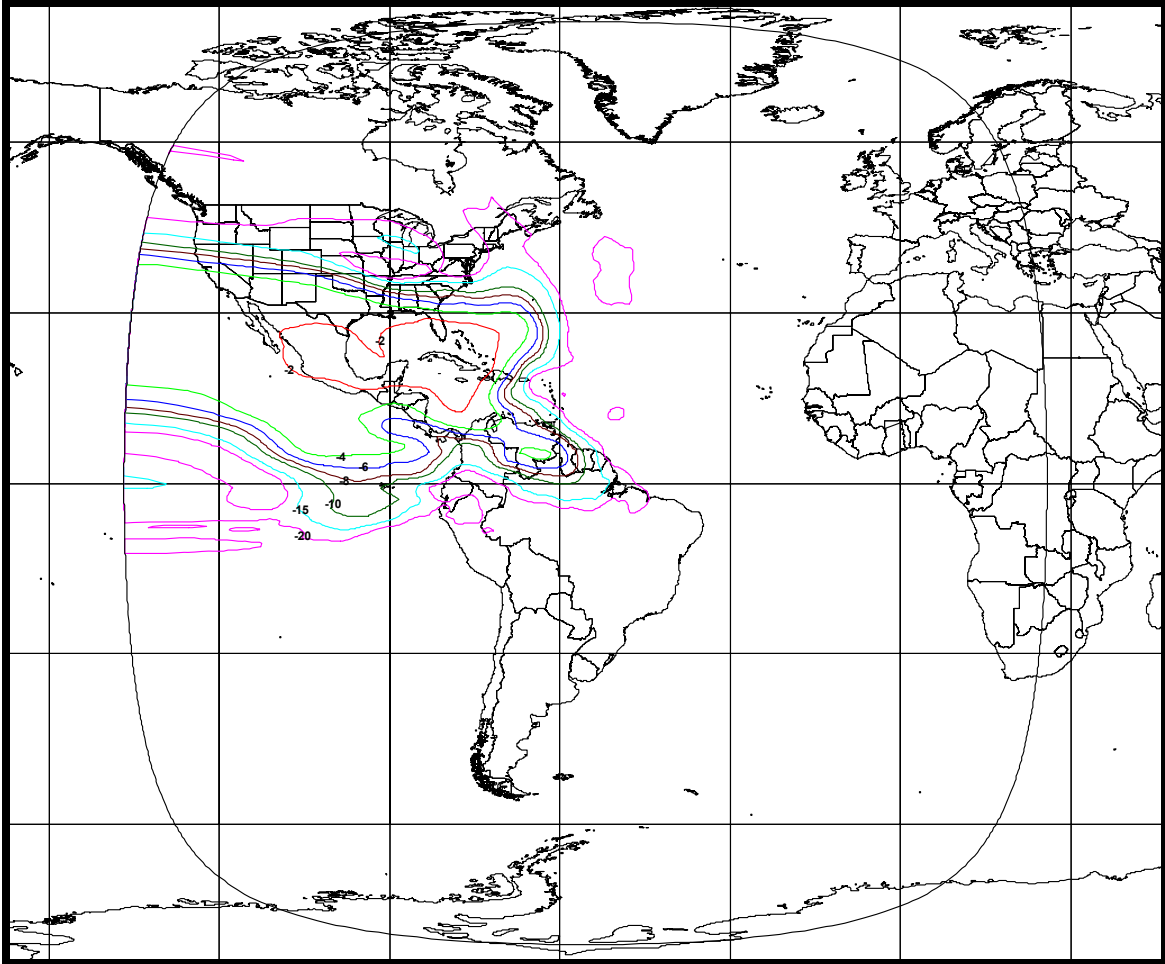
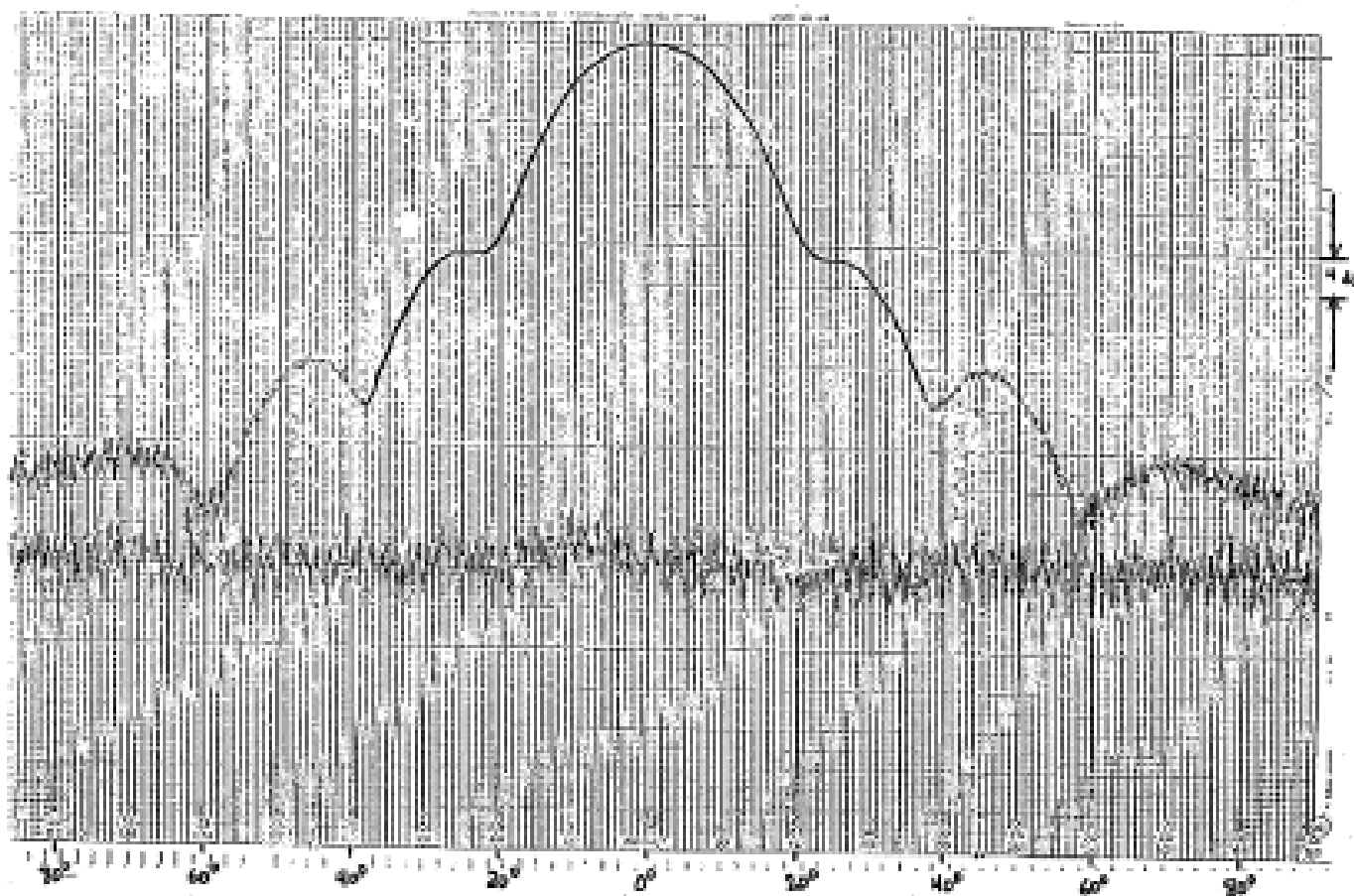


EXHIBIT 2X: ULPC Transmit Beam
(Global Antenna)
(Schedule S Beam ID: UPGH)

Polarization: Horizontal
Peak Antenna Gain: 24.2 dBi
Peak EIRP: 19.1 dBW

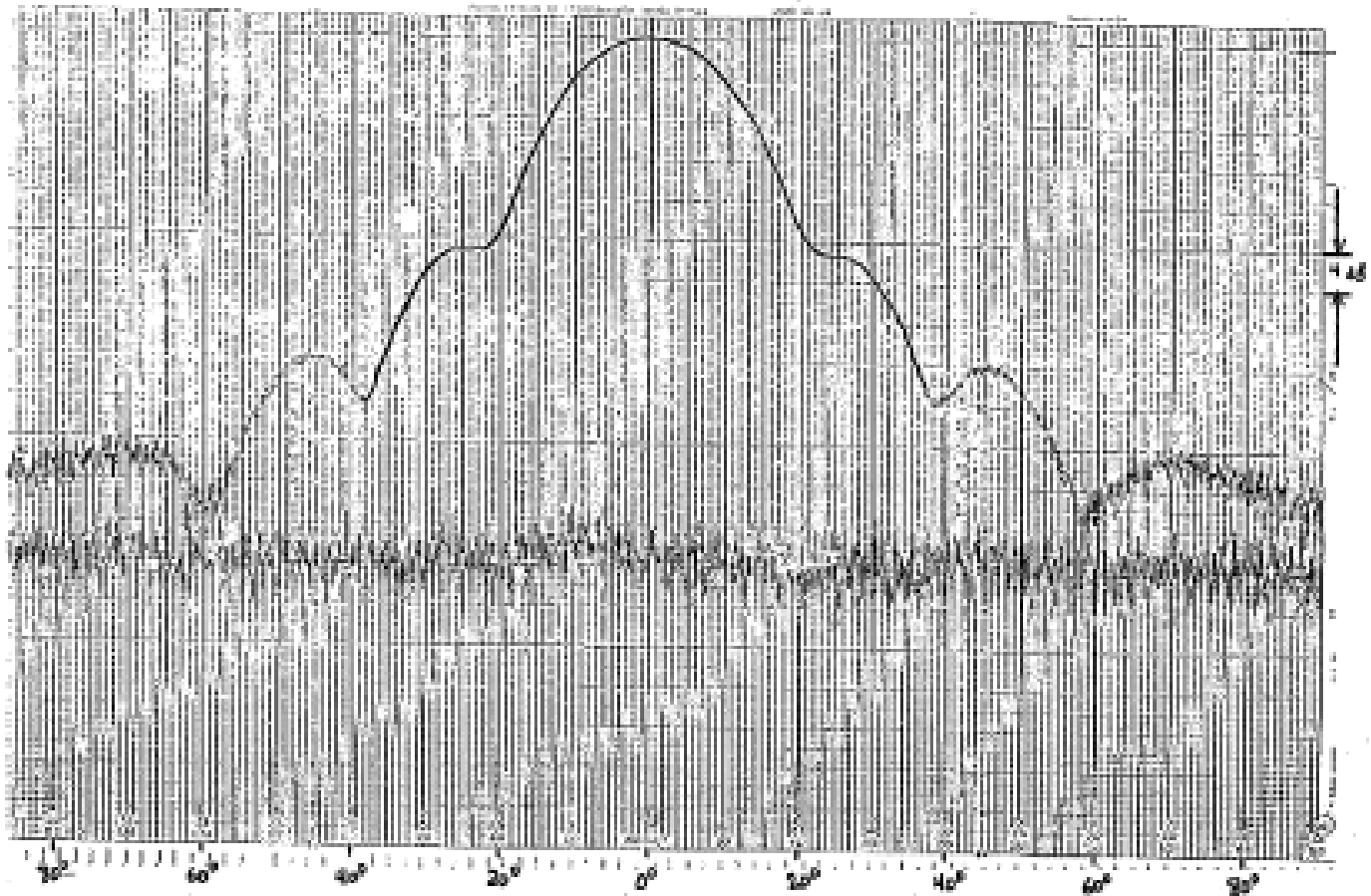


Notes:

- 1) Gain variation in azimuth shown for elevation angle of 0°.
- 2) The x-axis represents the azimuth angle and spans from -90° to +90°. Each major axis division line represents 10° of azimuth.
- 3) The y-axis represents the antenna gain. Each major axis division line represents 4 dB of gain.

EXHIBIT 2Y: ULPC Transmit Beam
(Global Antenna)
(Schedule S Beam ID: UPGV)

Polarization: Vertical
Peak Antenna Gain: 24.2 dBi
Peak EIRP: 19.1 dBW



Notes:

- 1) Gain variation in azimuth shown for elevation angle of 0°.
- 2) The x-axis represents the azimuth angle and spans from -90° to +90°. Each major axis division line represents 10° of azimuth.
- 3) The y-axis represents the antenna gain. Each major axis division line represents 4 dB of gain.

EXHIBIT 3: POWER FLUX DENSITY CALCULATIONS

FREQUENCY BAND : 3700 – 4200 MHz							
North America (H): 36M0F3F							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP (dBW)	40.2	40.2	40.2	40.2	40.2	40.2	40.2
Occupied Bandwidth (kHz)	4000	4000	4000	4000	4000	4000	4000
Spreading Loss (dB/m ²)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density (dBW/m ² /4kHz)	-153.2	-153.1	-153.0	-152.8	-152.7	-152.6	-151.9
PFD Limit (dBW/m ² /4kHz)	-152	-152	-149.5	-147.0	-144.5	-142.0	-142.0
Margin (dB)	1.2	1.1	3.5	5.8	8.2	10.6	9.9
North America (H): 36M0G7W							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP (dBW)	40.2	40.2	40.2	40.2	40.2	40.2	40.2
Occupied Bandwidth (kHz)	30133	30133	30133	30133	30133	30133	30133
Spreading Loss (dB/m ²)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density (dBW/m ² /4kHz)	-162.0	-161.8	-161.7	-161.6	-161.5	-161.4	-160.6
PFD Limit (dBW/m ² /4kHz)	-152	-152	-149.5	-147.0	-144.5	-142.0	-142.0
Margin (dB)	10.0	9.8	12.2	14.6	17.0	19.4	18.6
North America (V): 36M0F3F							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP (dBW)	40.1	40.1	40.1	40.1	40.1	40.1	40.1
Occupied Bandwidth (kHz)	4000	4000	4000	4000	4000	4000	4000
Spreading Loss (dB/m ²)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density (dBW/m ² /4kHz)	-153.3	-153.2	-153.1	-152.9	-152.8	-152.7	-152.0
PFD Limit (dBW/m ² /4kHz)	-152	-152	-149.5	-147.0	-144.5	-142.0	-142.0
Margin (dB)	1.3	1.2	3.6	5.9	8.3	10.7	10.0
North America (V): 36M0G7W							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP (dBW)	40.1	40.1	40.1	40.1	40.1	40.1	40.1
Occupied Bandwidth (kHz)	60251	60251	60251	60251	60251	60251	60251
Spreading Loss (dB/m ²)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density (dBW/m ² /4kHz)	-165.1	-165.0	-164.8	-164.7	-164.6	-164.5	-163.7
PFD Limit (dBW/m ² /4kHz)	-152	-152	-149.5	-147.0	-144.5	-142.0	-142.0
Margin (dB)	13.1	13.0	15.3	17.7	20.1	22.5	21.7
FREQUENCY BAND : 10950 – 11200 MHz							
South America (H): 24M0F3F							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP (dBW)	43.4*	43.3*	45.7*	48.0*	50.4*	52.5	52.5
Occupied Bandwidth (kHz)	4000	4000	4000	4000	4000	4000	4000
Spreading Loss (dB/m ²)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density (dBW/m ² /4kHz)	-150.0	-150.0	-147.5	-145.0	-142.5	-140.3	-139.6
PFD Limit (dBW/m ² /4kHz)	-150	-150	-147.5	-145.0	-142.5	-140.0	-140.0
Margin (dB)	0.0	0.0	0.0	0.0	0.0	0.3	-0.4

EXHIBIT 3: POWER FLUX DENSITY CALCULATIONS (continued)

FREQUENCY BAND : 10950 – 11200 MHz							
South America (H): 27M0G7W							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP (dBW)	50.9*	50.8*	52.5	52.5	52.5	52.5	52.5
Occupied Bandwidth (kHz)	22600	22600	22600	22600	22600	22600	22600
Spreading Loss (dB/m ²)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density (dBW/m ² /4kHz)	-150.0	-150.0	-148.2	-148.1	-148.0	-147.8	-147.1
PFD Limit (dBW/m ² /4kHz)	-150	-150	-147.5	-145.0	-142.5	-140.0	-140.0
Margin (dB)	0.0	0.0	0.7	3.1	5.5	7.8	7.1
South America (V): 24M0F3F							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP (dBW)	43.4*	43.3*	45.7*	48.0*	50.4*	51.9	51.9
Occupied Bandwidth (kHz)	4000	4000	4000	4000	4000	4000	4000
Spreading Loss (dB/m ²)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density (dBW/m ² /4kHz)	-150.0	-150.0	-147.5	-145.0	-142.5	-140.9	-140.2
PFD Limit (dBW/m ² /4kHz)	-150	-150	-147.5	-145.0	-142.5	-140.0	-140.0
Margin (dB)	0.0	0.0	0.0	0.0	0.0	0.9	0.2
South America (V): 27M0G7W							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP (dBW)	50.9*	50.8*	51.9	51.9	51.9	51.9	51.9
Occupied Bandwidth (kHz)	22600	22600	22600	22600	22600	22600	22600
Spreading Loss (dB/m ²)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density (dBW/m ² /4kHz)	-150.0	-150.0	-148.8	-148.7	-148.6	-148.4	-147.7
PFD Limit (dBW/m ² /4kHz)	-150	-150	-147.5	-145.0	-142.5	-140.0	-140.0
Margin (dB)	0.0	0.0	1.3	3.7	6.1	8.4	7.7
North America (H): 24M0F3F							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP (dBW)	43.4*	43.3*	45.7*	48.0*	50.4*	52.1	52.1
Occupied Bandwidth (kHz)	4000	4000	4000	4000	4000	4000	4000
Spreading Loss (dB/m ²)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density (dBW/m ² /4kHz)	-150.0	-150.0	-147.5	-145.0	-142.5	-140.7	-140.0
PFD Limit (dBW/m ² /4kHz)	-150	-150	-147.5	-145.0	-142.5	-140.0	-140.0
Margin (dB)	0.0	0.0	0.0	0.0	0.0	0.7	0.0
North America (H): 27M0G7W							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP (dBW)	50.9*	50.8*	52.1	52.1	52.1	52.1	52.1
Occupied Bandwidth (kHz)	22600	22600	22600	22600	22600	22600	22600
Spreading Loss (dB/m ²)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density (dBW/m ² /4kHz)	-150.0	-150.0	-148.6	-148.5	-148.4	-148.2	-147.5
PFD Limit (dBW/m ² /4kHz)	-150	-150	-147.5	-145.0	-142.5	-140.0	-140.0
Margin (dB)	0.0	0.0	1.1	3.5	5.9	8.2	7.5

EXHIBIT 3: POWER FLUX DENSITY CALCULATIONS (continued)

FREQUENCY BAND : 10950 – 11200 MHz							
North America (V): 24M0F3F							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP (dBW)	43.4*	43.3*	45.7*	48.0*	50.4*	52.0	52.0
Occupied Bandwidth (kHz)	4000	4000	4000	4000	4000	4000	4000
Spreading Loss (dB/m ²)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density (dBW/m ² /4kHz)	-150.0	-150.0	-147.5	-145.0	-142.5	-140.8	-140.1
PFD Limit (dBW/m ² /4kHz)	-150	-150	-147.5	-145.0	-142.5	-140.0	-140.0
Margin (dB)	0.0	0.0	0.0	0.0	0.0	0.8	0.1
North America (V): 27M0G7W							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP (dBW)	50.9*	50.8*	52.0	52.0	52.0	52.0	52.0
Occupied Bandwidth (kHz)	22600	22600	22600	22600	22600	22600	22600
Spreading Loss (dB/m ²)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density (dBW/m ² /4kHz)	-150.0	-150.0	-148.7	-148.6	-148.5	-148.3	-147.6
PFD Limit (dBW/m ² /4kHz)	-150	-150	-147.5	-145.0	-142.5	-140.0	-140.0
Margin (dB)	0.0	0.0	1.2	3.6	6.0	8.3	7.6
ULPC (H)							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP (dBW)	19.1	19.1	19.1	19.1	19.1	19.1	19.1
Occupied Bandwidth (kHz)	25	25	25	25	25	25	25
Spreading Loss (dB/m ²)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density (dBW/m ² /4kHz)	-152.2	-152.1	-152.0	-151.9	-151.8	-151.7	-150.9
PFD Limit (dBW/m ² /4kHz)	-150	-150	-147.5	-145.0	-142.5	-140.0	-140.0
Margin (dB)	2.2	2.1	4.5	6.9	9.3	11.7	10.9
ULPC (V)							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP (dBW)	19.1	19.1	19.1	19.1	19.1	19.1	19.1
Occupied Bandwidth (kHz)	25	25	25	25	25	25	25
Spreading Loss (dB/m ²)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density (dBW/m ² /4kHz)	-152.2	-152.1	-152.0	-151.9	-151.8	-151.7	-150.9
PFD Limit (dBW/m ² /4kHz)	-150	-150	-147.5	-145.0	-142.5	-140.0	-140.0
Margin (dB)	2.2	2.1	4.5	6.9	9.3	11.7	10.9

* This is the maximum allowable EIRP level at the specified elevation angle. The actual EIRP level of the carrier at this particular elevation angle will be made to be equal to or lower than the value listed in the table through reduction in the output power of the channel.

EXHIBIT 4: LINK BUDGETS

UPLINK BEAM INFORMATION				
Uplink Beam Name	North America	North America	North America	North America
Uplink Frequency (GHz)	5.925 – 6.425	5.925 – 6.425	5.925 – 6.425	5.925 – 6.425
Uplink Beam Polarization	Horizontal	Horizontal	Horizontal	Horizontal
Uplink Contour G/T (dB/K)	-1.5	-1.5	-1.5	-1.5
Uplink Contour SFD (dBW/m ²)	-85.0	-90.0	-90.0	-90.0
DOWNLINK BEAM INFORMATION				
Downlink Beam Name	North America	North America	North America	North America
Downlink Frequency (GHz)	3.70 – 4.20	3.70 – 4.20	3.70 – 4.20	3.70 – 4.20
Downlink Beam Polarization	Vertical	Vertical	Vertical	Vertical
Downlink Contour EIRP (dBW)	36.1	36.1	36.1	36.1
ADJACENT SATELLITE 1				
Satellite 1 Orbital Location	53.5 W.L.	53.5 W.L.	53.5 W.L.	53.5 W.L.
Uplink Power Density (dBW/Hz)	-38.7	-38.7	-38.7	-38.7
Downlink EIRP Density (dBW/Hz)	-38.7	-38.7	-38.7	-38.7
ADJACENT SATELLITE 2				
Satellite 2 Orbital Location	57.5 W.L.	57.5 W.L.	57.5 W.L.	57.5 W.L.
Uplink Power Density (dBW/Hz)	-38.7	-38.7	-38.7	-38.7
Downlink EIRP Density (dBW/Hz)	-38.7	-38.7	-38.7	-38.7
CARRIER INFORMATION				
Carrier ID	36M0F3F	36M0G7W	10M3G7W	100KG7W
Information Rate (kbps)	N/A	24575	6000	64
Carrier Modulation	TV/FM	QPSK	QPSK	QPSK
Peak to Peak Bandwidth of EDS (MHz)	4	n/a	n/a	n/a
Code Rate	N/A	1/2 - RS	1/2 - RS	1/2-RS
Occupied Bandwidth (kHz)	36000	30133	6771.1	75.4
Allocated Bandwidth (kHz)	36000	36000	10300	100
Required Minimum C/N (dB)	10.0	3.4	3.9	3.0
UPLINK EARTH STATION				
Earth Station Diameter (meters)	8.1	6.1	6.1	6.1
Earth Station Gain (dBi)	52.8	49.4	49.4	49.4
Earth Station Elevation Angle	20	20	20	20
DOWNLINK EARTH STATION				
Earth Station Diameter (meters)	4.5	3.0	3.0	3.0
Earth Station Gain (dBi)	43.9	39.7	39.7	39.7
Earth Station G/T (dB/K)	23.6	19.2	19.2	19.2
Earth Station Elevation Angle	20	20	20	20
UPLINK PERFORMANCE				
Uplink Earth Station EIRP (dBW)	77.9	72.9	64.6	44.2
Uplink Path Loss, Clear Sky (dB)	-200.2	-200.2	-200.2	-200.2
Satellite G/T (dB/K)	-1.5	-1.5	-1.5	-1.5
Boltzman Constant (dBW/K-Hz)	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-74.8	-68.3	-48.8
Uplink C/N (dB)	29.2	25.0	23.2	22.3
DOWNLINK PERFORMANCE				
Downlink EIRP per Carrier (dBW)	36.1	36.1	28.1	7.7
Antenna Pointing Error (dB)	-0.5	-0.5	-0.5	-0.5
Downlink Path Loss, Clear Sky (dB)	-196.3	-196.3	-196.3	-196.3
Earth Station G/T (dB/K)	23.6	19.2	19.2	19.2
Boltzman Constant (dBW/K-Hz)	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-74.8	-68.3	-48.8
Downlink C/N (dB)	15.9	12.3	10.8	9.9
COMPOSITE LINK PERFORMANCE				
C/N Uplink (dB)	29.2	25.0	23.2	22.3
C/N Downlink (dB)	15.9	12.3	10.8	9.9
C/I Intermodulation (dB)	n/a	n/a	19.5	18.6
C/I Uplink Co-Channel (dB)*	27.0	27.0	27.9	27.6
C/I Downlink Co-Channel (dB)*	27.0	27.0	27.9	27.6
C/I Uplink Adjacent Satellite 1 (dB)	19.0	14.8	13.0	12.1
C/I Downlink Adjacent Satellite 1 (dB)	20.3	11.2	9.7	8.8
C/I Uplink Adjacent Satellite 2 (dB)	19.0	14.8	13.0	12.1
C/I Downlink Adjacent Satellite 2 (dB)	22.8	19.9	18.4	17.5
C/N+I Composite (dB)	11.5	6.6	4.9	4.0
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	10.5	5.6	3.9	3.0
Minimum Required C/N (dB)	-10.0	-3.4	-3.9	-3.0
Excess Link Margin (dB)	0.5	2.2	0.0	0.0
CARRIER DENSITY LEVELS				
Uplink Power Density (dBW/Hz)	-40.9	-51.3	-53.1	-54.0
Downlink EIRP Density At Beam Peak	-25.9	-34.7	-36.2	-37.1
Number of Carriers	1.0	1.0	2.8	311.4

EXHIBIT 4: LINK BUDGETS (continued)

UPLINK BEAM INFORMATION				
Uplink Beam Name	North America	North America	North America	North America
Uplink Frequency (GHz)	5.925 – 6.425	5.925 – 6.425	5.925 – 6.425	5.925 – 6.425
Uplink Beam Polarization	Vertical	Vertical	Vertical	Vertical
Uplink Contour G/T (dB/K)	0.2	0.2	0.2	0.2
Uplink Contour SFD (dBW/m ²)	-86.2	-91.2	-91.2	-91.2
DOWNLINK BEAM INFORMATION				
Downlink Beam Name	North America	North America	North America	North America
Downlink Frequency (GHz)	3.70 – 4.20	3.70 – 4.20	3.70 – 4.20	3.70 – 4.20
Downlink Beam Polarization	Horizontal	Horizontal	Horizontal	Horizontal
Downlink Contour EIRP (dBW)	36.2	36.2	36.2	36.2
ADJACENT SATELLITE 1				
Satellite 1 Orbital Location	53.5 W.L.	53.5 W.L.	53.5 W.L.	53.5 W.L.
Uplink Power Density (dBW/Hz)	-38.7	-38.7	-38.7	-38.7
Downlink EIRP Density (dBW/Hz)	-38.6	-38.6	-38.6	-38.6
ADJACENT SATELLITE 2				
Satellite 2 Orbital Location	57.5 W.L.	57.5 W.L.	57.5 W.L.	57.5 W.L.
Uplink Power Density (dBW/Hz)	-38.7	-38.7	-38.7	-38.7
Downlink EIRP Density (dBW/Hz)	-38.6	-38.6	-38.6	-38.6
CARRIER INFORMATION				
Carrier ID	36M0F3F	36M0G7W	10M3G7W	100KG7W
Information Rate (kbps)	N/A	24575	6000	64
Carrier Modulation	TV/FM	QPSK	QPSK	QPSK
Peak to Peak Bandwidth of EDS (MHz)	4	n/a	n/a	n/a
Code Rate	N/A	1/2 - RS	1/2 - RS	1/2-RS
Occupied Bandwidth (kHz)	36000	30133	6771.1	75.4
Allocated Bandwidth (kHz)	36000	36000	10300	100
Required Minimum C/N (dB)	10.0	3.4	3.9	3.0
UPLINK EARTH STATION				
Earth Station Diameter (meters)	8.1	6.1	6.1	6.1
Earth Station Gain (dBi)	52.8	49.4	49.4	49.4
Earth Station Elevation Angle	20	20	20	20
DOWNLINK EARTH STATION				
Earth Station Diameter (meters)	4.5	3.0	3.0	3.0
Earth Station Gain (dBi)	43.9	39.7	39.7	39.7
Earth Station G/T (dB/K)	23.6	19.2	19.2	19.2
Earth Station Elevation Angle	20	20	20	20
UPLINK PERFORMANCE				
Uplink Earth Station EIRP (dBW)	76.7	71.7	63.8	43.3
Uplink Path Loss, Clear Sky (dB)	-200.2	-200.2	-200.2	-200.2
Satellite G/T (dB/K)	0.2	0.2	0.2	0.2
Boltzman Constant (dBW/K-Hz)	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-74.8	-68.3	-48.8
Uplink C/N (dB)	29.7	25.5	24.0	23.2
DOWNLINK PERFORMANCE				
Downlink EIRP per Carrier (dBW)	36.2	36.2	28.6	8.2
Antenna Pointing Error (dB)	-0.5	-0.5	-0.5	-0.5
Downlink Path Loss, Clear Sky (dB)	-196.3	-196.3	-196.3	-196.3
Earth Station G/T (dB/K)	23.6	19.2	19.2	19.2
Boltzman Constant (dBW/K-Hz)	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-74.8	-68.3	-48.8
Downlink C/N (dB)	16.0	12.4	11.2	10.4
COMPOSITE LINK PERFORMANCE				
C/N Uplink (dB)	29.7	25.5	24.0	23.2
C/N Downlink (dB)	16.0	12.4	11.2	10.4
C/I Intermodulation (dB)	n/a	n/a	19.8	19.0
C/I Uplink Co-Channel (dB)*	27.0	27.0	28.3	28.0
C/I Downlink Co-Channel (dB)*	27.0	27.0	28.3	28.0
C/I Uplink Adjacent Satellite 1 (dB)	17.8	13.6	12.2	11.3
C/I Downlink Adjacent Satellite 1 (dB)	20.3	11.2	10.1	9.2
C/I Uplink Adjacent Satellite 2 (dB)	17.8	13.6	12.2	11.3
C/I Downlink Adjacent Satellite 2 (dB)	22.8	19.9	18.8	17.9
C/(N+I) Composite (dB)	11.1	6.2	4.9	4.0
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	10.1	5.2	3.9	3.0
Minimum Required C/N (dB)	-10.0	-3.4	-3.9	-3.0
Excess Link Margin (dB)	0.1	1.8	0.0	0.0
CARRIER DENSITY LEVELS				
Uplink Power Density (dBW/Hz)	-42.1	-52.5	-53.9	-54.8
Downlink EIRP Density At Beam Peak	-25.8	-34.6	-35.7	-36.6
Number of Carriers	1.0	1.0	2.6	285.4

EXHIBIT 4: LINK BUDGETS (continued)

UPLINK BEAM INFORMATION						
Uplink Beam Name	North America	North America	North America	North America	North America	North America
Uplink Frequency (GHz)	14.00 – 14.50	14.00 – 14.50	14.00 – 14.50	14.00 – 14.50	14.00 – 14.50	14.00 – 14.50
Uplink Beam Polarization	Horizontal	Horizontal	Horizontal	Horizontal	Horizontal	Horizontal
Uplink Contour G/T (dB/K)	0.3	0.3	0.3	0.3	0.3	0.3
Uplink Contour SFD (dBW/m ²)	-82.8	-78.8	-90.8	-90.8	-90.8	-90.8
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0	42.0	42.0
DOWNLINK BEAM INFORMATION						
Downlink Beam Name	North America	North America	North America	North America	North America	North America
Downlink Frequency (GHz)	11.70 – 12.20	11.70 – 12.20	11.70 – 12.20	11.70 – 12.20	11.70 – 12.20	11.70 – 12.20
Downlink Beam Polarization	Vertical	Vertical	Vertical	Vertical	Vertical	Vertical
Downlink Contour EIRP (dBW)	45.7	45.7	45.7	45.7	45.7	45.7
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0	42.0	42.0
ADJACENT SATELLITE 1						
Satellite 1 Orbital Location	53.5 W.L.	53.5 W.L.	53.5 W.L.	53.5 W.L.	53.5 W.L.	53.5 W.L.
Uplink Power Density (dBW/Hz)	-50.0	-50.0	-50.0	-50.0	-50.0	-50.0
Downlink EIRP Density (dBW/Hz)	-26.0	-26.0	-26.0	-26.0	-26.0	-26.0
ADJACENT SATELLITE 2						
Satellite 2 Orbital Location	57.5 W.L.	57.5 W.L.	57.5 W.L.	57.5 W.L.	57.5 W.L.	57.5 W.L.
Uplink Power Density (dBW/Hz)	-50.0	-50.0	-50.0	-50.0	-50.0	-50.0
Downlink EIRP Density (dBW/Hz)	-26.0	-26.0	-26.0	-26.0	-26.0	-26.0
CARRIER INFORMATION						
Carrier ID	36M0F3F	36M0G7W	10M3G7W	100KG7W	1M45G7W	400KG7W
Information Rate (kbps)	N/A	24575	6000	64	512	128
Carrier Modulation	TV/FM	OPSK	OPSK	OPSK	BPSK	BPSK
Peak to Peak Bandwidth of EDS (MHz)	4	n/a	n/a	n/a	n/a	n/a
Code Rate	N/A	1/2 - RS	1/2 - RS	1/2-RS	1/2	1/2
Occupied Bandwidth (kHz)	36000	30133	6771.1	75.4	1229	307
Assumed Allocated Bandwidth (kHz)	36000	36000	10300	100	1450	400
Required Minimum C/N (dB) – Clear Sky	10.0	3.4	3.9	3.0	3.4	3.4
Required Minimum C/N (dB) – Rain	10.0	3.4	3.5	2.8	2.7	2.7
UPLINK EARTH STATION						
Earth Station Diameter (meters)	6.1	6.1	6.1	6.1	6.1	1.8
Earth Station Gain (dBi)	56.9	56.9	56.9	56.9	56.9	46.4
Earth Station Elevation Angle	20	20	20	20	20	20
DOWNLINK EARTH STATION						
Earth Station Diameter (meters)	2.4	1.2	1.8	1.8	1.8	6.1
Earth Station Gain (dBi)	47.5	41.3	44.8	44.8	44.8	55.5
Earth Station G/T (dB/K)	25.0	18.8	22.3	22.3	22.3	33.1
Earth Station Elevation Angle	20	20	20	20	20	20
LINK FADE TYPE						
	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky
UPLINK PERFORMANCE						
Uplink Earth Station EIRP (dBW)	80.1	80.3	59.9	39.7	51.7	43.2
Uplink Path Loss, Clear Sky (dB)	-207.5	-207.5	-207.5	-207.5	-207.5	-207.5
Satellite G/T (dB/K)	0.3	0.3	0.3	0.3	0.3	0.3
Boltzman Constant (dBW/K-Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-74.8	-68.3	-48.8	-60.9	-54.9
Uplink C/N (dB)	26.0	26.9	13.0	12.4	12.3	9.7
DOWNLINK PERFORMANCE						
Downlink EIRP per Carrier (dBW)	45.7	44.8	36.9	16.7	28.7	20.1
Antenna Pointing Error (dB)	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
Downlink Path Loss, Clear Sky (dB)	-205.9	-205.9	-205.9	-205.9	-205.9	-205.9
Earth Station G/T (dB/K)	25.0	18.8	22.3	22.3	22.3	33.1
Boltzman Constant (dBW/K-Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-74.8	-68.3	-48.8	-60.9	-54.9
Downlink C/N (dB)	17.3	10.9	13.0	12.4	12.3	20.5
COMPOSITE LINK PERFORMANCE						
C/N Uplink (dB)	26.0	26.9	13.0	12.4	12.3	9.7
C/N Downlink (dB)	17.3	10.9	13.0	12.4	12.3	20.5
C/I Intermodulation (dB)	n/a	n/a	17.2	16.6	16.5	13.9
C/I Uplink Co-Channel (dB)*	27.0	27.0	28.2	28.2	28.6	25.6
C/I Downlink Co-Channel (dB)*	27.0	27.0	28.2	28.2	28.6	25.6
C/I Uplink Adjacent Satellite 1 (dB)	30.5	31.5	17.6	17.0	16.8	14.3
C/I Downlink Adjacent Satellite 1 (dB)	21.3	13.8	16.8	16.1	16.0	25.0
C/I Uplink Adjacent Satellite 2 (dB)	30.5	31.5	17.6	17.0	16.8	14.3
C/I Downlink Adjacent Satellite 2 (dB)	22.9	17.2	18.9	18.2	18.1	25.6
C/(N+I) Composite (dB)	14.0	8.3	7.2	6.6	6.5	6.2
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	13.0	7.3	6.2	5.6	5.5	5.2
Minimum Required C/N (dB)	-10.0	-3.4	-3.9	3.0	-3.4	-3.4
Excess Link Margin (dB)	3.0	3.9	2.3	2.6	2.1	1.8
Carrier Density Levels						
Uplink Power Density (dBW/Hz)	-42.8	-51.4	-65.3	-65.9	-66.1	-58.1
Downlink EIRP Density At Beam Peak	-16.3	-26.0	-27.4	-28.1	-28.2	-30.7
Number of Carriers	1.0	1.0	2.6	273.6	17.2	90.0

EXHIBIT 4: LINK BUDGETS (continued)

UPLINK BEAM INFORMATION						
Uplink Beam Name	North America	North America	North America	North America	North America	North America
Uplink Frequency (GHz)	14.00 – 14.50	14.00 – 14.50	14.00 – 14.50	14.00 – 14.50	14.00 – 14.50	14.00 – 14.50
Uplink Beam Polarization	Vertical	Vertical	Vertical	Vertical	Vertical	Vertical
Uplink Contour G/T (dB/K)	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2
Uplink Contour SFD (dBW/m ²)	-82.3	-78.3	-90.3	-90.3	-90.3	-90.3
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0	42.0	42.0
DOWNLINK BEAM INFORMATION						
Downlink Beam Name	North America	North America	North America	North America	North America	North America
Downlink Frequency (GHz)	11.70 – 12.20	11.70 – 12.20	11.70 – 12.20	11.70 – 12.20	11.70 – 12.20	11.70 – 12.20
Downlink Beam Polarization	Horizontal	Horizontal	Horizontal	Horizontal	Horizontal	Horizontal
Downlink Contour EIRP (dBW)	45.7	45.7	45.7	45.7	45.7	45.7
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0	42.0	42.0
ADJACENT SATELLITE 1						
Satellite 1 Orbital Location	53.5 W.L.	53.5 W.L.	53.5 W.L.	53.5 W.L.	53.5 W.L.	53.5 W.L.
Uplink Power Density (dBW/Hz)	-50.0	-50.0	-50.0	-50.0	-50.0	-50.0
Downlink EIRP Density (dBW/Hz)	-26.0	-26.0	-26.0	-26.0	-26.0	-26.0
ADJACENT SATELLITE 2						
Satellite 2 Orbital Location	57.5 W.L.	57.5 W.L.	57.5 W.L.	57.5 W.L.	57.5 W.L.	57.5 W.L.
Uplink Power Density (dBW/Hz)	-50.0	-50.0	-50.0	-50.0	-50.0	-50.0
Downlink EIRP Density (dBW/Hz)	-26.0	-26.0	-26.0	-26.0	-26.0	-26.0
CARRIER INFORMATION						
Carrier ID	36M0F3F	36M0G7W	10M3G7W	100KG7W	1M45G7W	400KG7W
Information Rate (kbps)	N/A	24575	6000	64	512	128
Carrier Modulation	TV/FM	QPSK	QPSK	QPSK	BPSK	BPSK
Peak to Peak Bandwidth of EDS (MHz)	4	n/a	n/a	n/a	n/a	n/a
Code Rate	N/A	1/2 - RS	1/2 - RS	1/2-RS	1/2	1/2
Occupied Bandwidth (kHz)	36000	30133	6771.1	75.4	1229	307
Assumed Allocated Bandwidth (kHz)	36000	36000	10300	100	1450	400
Required Minimum C/N (dB) – Clear Sky	10.0	3.4	3.9	3.0	3.4	3.4
Required Minimum C/N (dB) – Rain	10.0	3.4	3.5	2.8	2.7	2.7
UPLINK EARTH STATION						
Earth Station Diameter (meters)	6.1	6.1	6.1	6.1	6.1	1.8
Earth Station Gain (dBi)	56.9	56.9	56.9	56.9	56.9	46.4
Earth Station Elevation Angle	20	20	20	20	20	20
DOWNLINK EARTH STATION						
Earth Station Diameter (meters)	2.4	1.2	1.8	1.8	1.8	6.1
Earth Station Gain (dBi)	47.5	41.3	44.8	44.8	44.8	55.5
Earth Station G/T (dB/K)	25.0	18.8	22.3	22.3	22.3	33.1
Earth Station Elevation Angle	20	20	20	20	20	20
LINK FADE TYPE						
	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky
UPLINK PERFORMANCE						
Uplink Earth Station EIRP (dBW)	80.6	80.9	60.5	40.3	52.3	43.8
Uplink Path Loss, Clear Sky (dB)	-207.5	-207.5	-207.5	-207.5	-207.5	-207.5
Satellite G/T (dB/K)	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2
Boltzman Constant (dBW/K-Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-74.8	-68.3	-48.8	-60.9	-54.9
Uplink C/N (dB)	25.0	26.0	12.1	11.4	11.3	8.8
DOWNLINK PERFORMANCE						
Downlink EIRP per Carrier (dBW)	45.7	44.8	36.9	16.8	28.8	20.2
Antenna Pointing Error (dB)	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
Downlink Path Loss, Clear Sky (dB)	-205.9	-205.9	-205.9	-205.9	-205.9	-205.9
Earth Station G/T (dB/K)	25.0	18.8	22.3	22.3	22.3	33.1
Boltzman Constant (dBW/K-Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-74.8	-68.3	-48.8	-60.9	-54.9
Downlink C/N (dB)	17.3	11.0	13.1	12.4	12.3	20.6
COMPOSITE LINK PERFORMANCE						
C/N Uplink (dB)	25.0	26.0	12.1	11.4	11.3	8.8
C/N Downlink (dB)	17.3	11.0	13.1	12.4	12.3	20.6
C/I Intermodulation (dB)	n/a	n/a	17.3	16.6	16.5	14.0
C/I Uplink Co-Channel (dB)*	27.0	27.0	28.3	28.2	28.6	25.7
C/I Downlink Co-Channel (dB)*	27.0	27.0	28.3	28.2	28.6	25.7
C/I Uplink Adjacent Satellite 1 (dB)	31.0	32.1	18.1	17.5	17.4	14.9
C/I Downlink Adjacent Satellite 1 (dB)	21.3	13.9	16.8	16.2	16.1	25.1
C/I Uplink Adjacent Satellite 2 (dB)	31.0	32.1	18.1	17.5	17.4	14.9
C/I Downlink Adjacent Satellite 2 (dB)	22.9	17.3	18.9	18.3	18.2	25.7
C/(N+I) Composite (dB)	14.0	8.3	7.0	6.4	6.3	5.9
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	13.0	7.3	6.0	5.4	5.3	4.9
Minimum Required C/N (dB)	-10.0	-3.4	-3.9	3.0	-3.4	-3.4
Excess Link Margin (dB)	3.0	3.9	2.1	2.4	1.9	1.5
Carrier Density Levels						
Uplink Power Density (dBW/Hz)	-42.3	-50.8	-64.8	-65.4	-65.5	-57.5
Downlink EIRP Density At Beam Peak	-16.3	-26.0	-27.4	-28.0	-28.1	-30.6
Number of Carriers	1.0	1.0	2.6	270.9	17.1	90.0

EXHIBIT 4: LINK BUDGETS (continued)

UPLINK BEAM INFORMATION						
Uplink Beam Name	Extended Ku N. America	Extended Ku N. America	Extended Ku N. America	Extended Ku N. America	Extended Ku N. America	Extended Ku N. America
Uplink Frequency (GHz)	13.75 – 14.00	13.75 – 14.00	13.75 – 14.00	13.75 – 14.00	13.75 – 14.00	13.75 – 14.00
Uplink Beam Polarization	Horizontal	Horizontal	Horizontal	Horizontal	Horizontal	Horizontal
Uplink Contour G/T (dB/K)	-2.8	-2.8	-2.8	-2.8	-2.8	-2.8
Uplink SFD (dBW/m2)	-85.3	-73.3	-85.3	-85.3	-85.3	-85.3
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0	42.0	42.0
DOWNLINK BEAM INFORMATION						
Downlink Beam Name	Extended Ku N. America	Extended Ku N. America	Extended Ku N. America	Extended Ku N. America	Extended Ku N. America	Extended Ku N. America
Downlink Frequency (GHz)	10.95–11.20	10.95–11.20	10.95–11.20	10.95–11.20	10.95–11.20	10.95–11.20
Downlink Beam Polarization	Vertical	Vertical	Vertical	Vertical	Vertical	Vertical
Downlink Contour EIRP (dBW)	46.0	46.0	46.0	46.0	46.0	46.0
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0	42.0	42.0
ADJACENT SATELLITE 1						
Satellite 1 Orbital Location	53.5 W.L.	53.5 W.L.	53.5 W.L.	53.5 W.L.	53.5 W.L.	53.5 W.L.
Uplink Power Density (dBW/Hz)	-50.0	-50.0	-50.0	-50.0	-50.0	-50.0
Downlink EIRP Density (dBW/Hz)	-26.0	-26.0	-26.0	-26.0	-26.0	-26.0
ADJACENT SATELLITE 2						
Satellite 1 Orbital Location	57.5 W.L.	57.5 W.L.	57.5 W.L.	57.5 W.L.	57.5 W.L.	57.5 W.L.
Uplink Power Density (dBW/Hz)	-50.0	-50.0	-50.0	-50.0	-50.0	-50.0
Downlink EIRP Density (dBW/Hz)	-26.0	-26.0	-26.0	-26.0	-26.0	-26.0
CARRIER INFORMATION						
Carrier ID	24M0F3F	27M0G7W	10M3G7W	100KG7W	1M45G7W	400KG7W
Carrier Modulation	TV/FM	QPSK	QPSK	QPSK	BPSK	BPSK
Peak to Peak Bandwidth of EDS (MHz)	4	N/A	N/A	N/A	N/A	N/A
Information Rate(kbps)	N/A	18432	6000	64	512	128
Code Rate	N/A	1/2x188/204	1/2x188/204	1/2x239/256	R1/2	R1/2
Occupied Bandwidth(kHz)	24000	22600	6771.1	75.4	1229.0	307.0
Allocated Bandwidth(kHz)	24000	27000	10300	100	1450.0	400.0
Minimum C/N, Clear Sky (dB)	10.0	3.4	3.9	3.0	3.4	3.4
Minimum C/N, Rain (dB)	10.0	3.4	3.6	2.8	2.7	2.7
UPLINK EARTH STATION						
Earth Station Diameter (meters)	6.1	6.1	6.1	6.1	6.1	1.8
Earth Station Gain (dBi)	56.7	56.7	56.7	56.7	56.7	46.2
Earth Station Elevation Angle	20	20	20	20	20	20
DOWNLINK EARTH STATION						
Earth Station Diameter (meters)	1.8	1.8	1.8	1.8	1.8	6.1
Earth Station Gain (dBi)	44.1	44.1	44.1	44.1	44.1	54.8
Earth Station G/T (dB/K)	21.6	21.6	21.6	21.6	21.6	32.4
Earth Station Elevation Angle	20	20	20	20	20	20
LINK FADE TYPE						
Link Fade Type	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky
UPLINK PERFORMANCE						
Uplink Earth Station EIRP (dBW)	77.6	79.6	64.4	44.2	56.2	47.1
Uplink Path Loss, Clear Sky (dB)	-207.2	-207.2	-207.2	-207.2	-207.2	-207.2
Uplink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Satellite G/T(dB/K)	-2.8	-2.8	-2.8	-2.8	-2.8	-2.8
Boltzman Constant(dBW/K-Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-73.8	-73.5	-68.3	-48.8	-60.9	-54.9
Uplink C/N(dB)	22.4	24.6	14.7	14.0	13.9	10.8
DOWNLINK PERFORMANCE						
Downlink EIRP per Carrier (dBW)	46.0	41.4	36.2	16.0	28.0	18.9
Antenna Pointing Error (dB)	-.5	-.5	-.5	-.5	-.5	-.5
Downlink Path Loss, Clear Sky (dB)	-205.3	-205.3	-205.3	-205.3	-205.3	-205.3
Downlink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Earth Station G/T (dB/K)	21.6	21.6	21.6	21.6	21.6	32.4
Boltzman Constant(dBW / K - Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-73.8	-73.5	-68.3	-48.8	-60.9	-54.9
Downlink C / N(dB)	16.6	12.3	12.3	11.7	11.6	19.3
COMPOSITE LINK PERFORMANCE						
C/N Uplink (dB)	22.4	24.6	14.7	14.0	13.9	10.8
C/N Downlink (dB)	16.6	12.3	12.3	11.7	11.6	19.3
C/I Intermodulation (dB)	N/A	N/A	15.0	14.3	14.2	11.1
C/I Uplink Co-Channel (dB)*	24.5	24.0	23.0	23.0	23.3	19.8
C/I Downlink Co-Channel (dB)*	24.5	24.0	23.0	23.0	23.3	19.8
C/I Uplink Adjacent Satellite 1 (dB)	27.8	30.1	20.1	19.5	19.3	16.2
C/I Downlink Adjacent Satellite 1 (dB)	19.7	15.3	15.4	14.7	14.6	23.0
C/I Uplink Adjacent Satellite 2 (dB)	27.8	30.1	20.1	19.5	19.3	16.2
C/I Downlink Adjacent Satellite 2 (dB)	21.9	17.5	17.6	16.9	16.8	23.7
C/(N+I) Composite (dB)	12.6	9.2	7.0	6.4	6.3	6.0
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	11.6	8.2	6.0	5.4	5.3	5.0
Minimum Required C/N (dB)	-10.0	-3.4	-3.9	-3.0	-3.4	-3.4
Excess Link Margin (dB)	1.6	4.9	2.1	2.4	1.9	1.6
Number of Carriers	1	1.0	2.6	270.0	18.6	67.5
CARRIER DENSITY LEVELS						
Uplink Power Density (dBW/Hz)	-45.1	-50.6	-60.6	-61.2	-61.3	-53.9
Downlink EIRP Density At Beam Peak (dBW/Hz)	-14.0	-26.1	-26.1	-26.7	-26.9	-30.0

EXHIBIT 4: LINK BUDGETS (continued)

UPLINK BEAM INFORMATION						
Uplink Beam Name	Extended Ku N. America	Extended Ku N. America	Extended Ku N. America	Extended Ku N. America	Extended Ku N. America	Extended Ku N. America
Uplink Frequency (GHz)	13.75 – 14.00	13.75 – 14.00	13.75 – 14.00	13.75 – 14.00	13.75 – 14.00	13.75 – 14.00
Uplink Beam Polarization	Vertical	Vertical	Vertical	Vertical	Vertical	Vertical
Uplink Contour G/T (dB/K)	-2.8	-2.8	-2.8	-2.8	-2.8	-2.8
Uplink SFD (dBW/m2)	-85.2	-73.2	-85.2	-85.2	-85.2	-85.2
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0	42.0	42.0
DOWNLINK BEAM INFORMATION						
Downlink Beam Name	Extended Ku N. America	Extended Ku N. America	Extended Ku N. America	Extended Ku N. America	Extended Ku N. America	Extended Ku N. America
Downlink Frequency (GHz)	10.95–11.20	10.95–11.20	10.95–11.20	10.95–11.20	10.95–11.20	10.95–11.20
Downlink Beam Polarization	Horizontal	Horizontal	Horizontal	Horizontal	Horizontal	Horizontal
Downlink Contour EIRP (dBW)	46.1	46.1	46.1	46.1	46.1	46.1
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0	42.0	42.0
ADJACENT SATELLITE 1						
Satellite 1 Orbital Location	53.5 W.L.	53.5 W.L.	53.5 W.L.	53.5 W.L.	53.5 W.L.	53.5 W.L.
Uplink Power Density (dBW/Hz)	-50.0	-50.0	-50.0	-50.0	-50.0	-50.0
Downlink EIRP Density (dBW/Hz)	-26.0	-26.0	-26.0	-26.0	-26.0	-26.0
ADJACENT SATELLITE 2						
Satellite 1 Orbital Location	57.5 W.L.	57.5 W.L.	57.5 W.L.	57.5 W.L.	57.5 W.L.	57.5 W.L.
Uplink Power Density (dBW/Hz)	-50.0	-50.0	-50.0	-50.0	-50.0	-50.0
Downlink EIRP Density (dBW/Hz)	-26.0	-26.0	-26.0	-26.0	-26.0	-26.0
CARRIER INFORMATION						
Carrier ID	24M0F3F	27M0G7W	10M3G7W	100KG7W	1M45G7W	400KG7W
Carrier Modulation	TV/FM	QPSK	QPSK	QPSK	BPSK	BPSK
Peak to Peak Bandwidth of EDS (MHz)	4	N/A	N/A	N/A	N/A	N/A
Information Rate(kbps)	N/A	18432	6000	64	512	128
Code Rate	N/A	1/2x188/204	1/2x188/204	1/2x239/256	R1/2	R1/2
Occupied Bandwidth(kHz)	24000	22600	6771.1	75.4	1229.0	307.0
Allocated Bandwidth(kHz)	24000	27000	10300	100	1450.0	400.0
Minimum C/N, Clear Sky (dB)	10.0	3.4	3.9	3.0	3.4	3.4
Minimum C/N, Rain (dB)	10.0	3.4	3.6	2.8	2.7	2.7
UPLINK EARTH STATION						
Earth Station Diameter (meters)	6.1	6.1	6.1	6.1	6.1	1.8
Earth Station Gain (dBi)	56.7	56.7	56.7	56.7	56.7	46.2
Earth Station Elevation Angle	20	20	20	20	20	20
DOWNLINK EARTH STATION						
Earth Station Diameter (meters)	1.8	1.8	1.8	1.8	1.8	6.1
Earth Station Gain (dBi)	44.1	44.1	44.1	44.1	44.1	54.8
Earth Station G/T (dB/K)	21.6	21.6	21.6	21.6	21.6	32.4
Earth Station Elevation Angle	20	20	20	20	20	20
LINK FADE TYPE						
Link Fade Type	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky
UPLINK PERFORMANCE						
Uplink Earth Station EIRP (dBW)	77.7	79.7	64.3	44.1	56.1	46.9
Uplink Path Loss, Clear Sky (dB)	-207.2	-207.2	-207.2	-207.2	-207.2	-207.2
Uplink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Satellite G/T(dB/K)	-2.8	-2.8	-2.8	-2.8	-2.8	-2.8
Boltzman Constant(dBW/K-Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-73.8	-73.5	-68.3	-48.8	-60.9	-54.9
Uplink C/N(dB)	22.5	24.7	14.6	13.9	13.8	10.6
DOWNLINK PERFORMANCE						
Downlink EIRP per Carrier (dBW)	46.1	41.5	36.1	15.9	27.9	18.7
Antenna Pointing Error (dB)	-.5	-.5	-.5	-.5	-.5	-.5
Downlink Path Loss, Clear Sky (dB)	-205.3	-205.3	-205.3	-205.3	-205.3	-205.3
Downlink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Earth Station G/T (dB/K)	21.6	21.6	21.6	21.6	21.6	32.4
Boltzman Constant(dBW / K - Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-73.8	-73.5	-68.3	-48.8	-60.9	-54.9
Downlink C / N(dB)	16.7	12.4	12.2	11.6	11.4	19.1
COMPOSITE LINK PERFORMANCE						
C/N Uplink (dB)	22.5	24.7	14.6	13.9	13.8	10.6
C/N Downlink (dB)	16.7	12.4	12.2	11.6	11.4	19.1
C/I Intermodulation (dB)	N/A	N/A	14.8	14.1	14.0	10.8
C/I Uplink Co-Channel (dB)*	24.5	24.0	22.8	22.7	23.1	19.5
C/I Downlink Co-Channel (dB)*	24.5	24.0	22.8	22.7	23.1	19.5
C/I Uplink Adjacent Satellite 1 (dB)	27.9	30.2	20.0	19.4	19.2	16.0
C/I Downlink Adjacent Satellite 1 (dB)	19.8	15.4	15.3	14.6	14.5	22.9
C/I Uplink Adjacent Satellite 2 (dB)	27.9	30.2	20.0	19.4	19.2	16.0
C/I Downlink Adjacent Satellite 2 (dB)	22.0	17.6	17.5	16.8	16.7	23.5
C/(N+I) Composite (dB)	12.7	9.3	6.9	6.2	6.1	5.8
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	11.7	8.3	5.9	5.2	5.1	4.8
Minimum Required C/N (dB)	-10.0	-3.4	-3.9	-3.0	-3.4	-3.4
Excess Link Margin (dB)	1.7	5.0	2.0	2.2	1.7	1.4
Number of Carriers	1	1.0	2.6	270.0	18.6	67.5
CARRIER DENSITY LEVELS						
Uplink Power Density (dBW/Hz)	-45.0	-50.5	-60.7	-61.3	-61.4	-54.1
Downlink EIRP Density At Beam Peak (dBW/Hz)	-13.9	-26.0	-26.2	-26.9	-27.0	-30.2

EXHIBIT 4: LINK BUDGETS (continued)

UPLINK BEAM INFORMATION						
Uplink Beam Name	Extended Ku N. America	Extended Ku N. America	Extended Ku N. America	Extended Ku N. America	Extended Ku N. America	Extended Ku N. America
Uplink Frequency (GHz)	13.75 – 14.00	13.75 – 14.00	13.75 – 14.00	13.75 – 14.00	13.75 – 14.00	13.75 – 14.00
Uplink Beam Polarization	Horizontal	Horizontal	Horizontal	Horizontal	Horizontal	Horizontal
Uplink Contour G/T (dB/K)	-2.8	-2.8	-2.8	-2.8	-2.8	-2.8
Uplink SFD (dBW/m2)	-82.3	-73.3	-83.3	-83.3	-83.3	-83.3
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0	42.0	42.0
DOWNLINK BEAM INFORMATION						
Downlink Beam Name	S. America	S. America	S. America	S. America	S. America	S. America
Downlink Frequency (GHz)	10.95–11.20	10.95–11.20	10.95–11.20	10.95–11.20	10.95–11.20	10.95–11.20
Downlink Beam Polarization	Vertical	Vertical	Vertical	Vertical	Vertical	Vertical
Downlink Contour EIRP (dBW)	45.9	45.9	45.9	45.9	45.9	45.9
Rain Rate (mm/hr)	95.0	95.0	95.0	95.0	95.0	95.0
ADJACENT SATELLITE 1						
Satellite 1 Orbital Location	53.5 W.L.	53.5 W.L.	53.5 W.L.	53.5 W.L.	53.5 W.L.	53.5 W.L.
Uplink Power Density (dBW/Hz)	-50.0	-50.0	-50.0	-50.0	-50.0	-50.0
Downlink EIRP Density (dBW/Hz)	-26.0	-26.0	-26.0	-26.0	-26.0	-26.0
ADJACENT SATELLITE 2						
Satellite 1 Orbital Location	57.5 W.L.	57.5 W.L.	57.5 W.L.	57.5 W.L.	57.5 W.L.	57.5 W.L.
Uplink Power Density (dBW/Hz)	-50.0	-50.0	-50.0	-50.0	-50.0	-50.0
Downlink EIRP Density (dBW/Hz)	-26.0	-26.0	-26.0	-26.0	-26.0	-26.0
CARRIER INFORMATION						
Carrier ID	24M0F3F	27M0G7W	10M3G7W	100KG7W	1M45G7W	400KG7W
Carrier Modulation	TV/FM	QPSK	QPSK	QPSK	BPSK	BPSK
Peak to Peak Bandwidth of EDS (MHz)	4	N/A	N/A	N/A	N/A	N/A
Information Rate(kbps)	N/A	18432	6000	64	512	128
Code Rate	N/A	1/2x188/204	1/2x188/204	1/2x239/256	R1/2	R1/2
Occupied Bandwidth(kHz)	24000	22600	6771.1	75.4	1229.0	307.0
Allocated Bandwidth(kHz)	24000	27000	10300	100	1450.0	400.0
Minimum C/N, Clear Sky (dB)	10.0	3.4	3.9	3.0	3.4	3.4
Minimum C/N, Rain (dB)	10.0	3.4	3.6	2.8	2.7	2.7
UPLINK EARTH STATION						
Earth Station Diameter (meters)	6.1	6.1	6.1	6.1	6.1	1.8
Earth Station Gain (dBi)	56.7	56.7	56.7	56.7	56.7	46.2
Earth Station Elevation Angle	20	20	20	20	20	20
DOWNLINK EARTH STATION						
Earth Station Diameter (meters)	2.4	1.8	1.8	1.8	1.8	6.1
Earth Station Gain (dBi)	46.8	44.1	44.1	44.1	44.1	54.8
Earth Station G/T (dB/K)	24.3	21.6	21.6	21.6	21.6	32.4
Earth Station Elevation Angle	20	20	20	20	20	20
LINK FADE TYPE						
Link Fade Type	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky
UPLINK PERFORMANCE						
Uplink Earth Station EIRP (dBW)	80.6	79.8	66.6	46.4	58.4	48.3
Uplink Path Loss, Clear Sky (dB)	-207.2	-207.2	-207.2	-207.2	-207.2	-207.2
Uplink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Satellite G/T(dB/K)	-2.8	-2.8	-2.8	-2.8	-2.8	-2.8
Boltzman Constant(dBW/K-Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-73.8	-73.5	-68.3	-48.8	-60.9	-54.9
Uplink C/N(dB)	25.4	24.8	16.9	16.2	16.1	12.0
DOWNLINK PERFORMANCE						
Downlink EIRP per Carrier (dBW)	45.9	41.5	36.3	16.1	28.1	18.0
Antenna Pointing Error (dB)	-.5	-.5	-.5	-.5	-.5	-.5
Downlink Path Loss, Clear Sky (dB)	-205.3	-205.2	-205.2	-205.2	-205.2	-205.2
Downlink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Earth Station G/T (dB/K)	24.3	21.6	21.6	21.6	21.6	32.4
Boltzman Constant(dBW / K - Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-73.8	-73.5	-68.3	-48.8	-60.9	-54.9
Downlink C / N(dB)	19.2	12.4	12.4	11.8	11.7	18.4
COMPOSITE LINK PERFORMANCE						
C/N Uplink (dB)	25.4	24.8	16.9	16.2	16.1	12.0
C/N Downlink (dB)	19.2	12.4	12.4	11.8	11.7	18.4
C/I Intermodulation (dB)	N/A	N/A	15.2	14.5	14.4	10.3
C/I Uplink Co-Channel (dB)*	24.5	24.0	23.2	23.2	23.5	19.0
C/I Downlink Co-Channel (dB)*	24.5	24.0	23.2	23.2	23.5	19.0
C/I Uplink Adjacent Satellite 1 (dB)	30.8	30.3	22.3	21.7	21.5	17.4
C/I Downlink Adjacent Satellite 1 (dB)	22.6	15.4	15.5	14.8	14.7	22.1
C/I Uplink Adjacent Satellite 2 (dB)	30.8	30.3	22.3	21.7	21.5	17.4
C/I Downlink Adjacent Satellite 2 (dB)	24.2	17.6	17.6	17.0	16.9	22.7
C/(N+I) Composite (dB)	14.8	9.3	7.6	6.9	6.8	6.1
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	13.8	8.3	6.6	5.9	5.8	5.1
Minimum Required C/N (dB)	-10.0	-3.4	-3.9	-3.0	-3.4	-3.4
Excess Link Margin (dB)	3.8	4.9	2.7	3.0	2.4	1.7
Number of Carriers	1	1.0	2.6	270.0	18.6	67.5
CARRIER DENSITY LEVELS						
Uplink Power Density (dBW/Hz)	-42.1	-50.4	-58.4	-59.0	-59.1	-52.7
Downlink EIRP Density At Beam Peak (dBW/Hz)	-14.1	-26.1	-26.0	-26.7	-26.8	-30.9

EXHIBIT 4: LINK BUDGETS (continued)

UPLINK BEAM INFORMATION						
Uplink Beam Name	Extended Ku N. America	Extended Ku N. America	Extended Ku N. America	Extended Ku N. America	Extended Ku N. America	Extended Ku N. America
Uplink Frequency (GHz)	13.75 – 14.00	13.75 – 14.00	13.75 – 14.00	13.75 – 14.00	13.75 – 14.00	13.75 – 14.00
Uplink Beam Polarization	Vertical	Vertical	Vertical	Vertical	Vertical	Vertical
Uplink Contour G/T (dB/K)	-2.8	-2.8	-2.8	-2.8	-2.8	-2.8
Uplink SFD (dBW/m ²)	-80.2	-73.2	-82.2	-82.2	-82.2	-82.2
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0	42.0	42.0
DOWNLINK BEAM INFORMATION						
Downlink Beam Name	S. America	S. America	S. America	S. America	S. America	S. America
Downlink Frequency (GHz)	10.95–11.20	10.95–11.20	10.95–11.20	10.95–11.20	10.95–11.20	10.95–11.20
Downlink Beam Polarization	Horizontal	Horizontal	Horizontal	Horizontal	Horizontal	Horizontal
Downlink Contour EIRP (dBW)	46.5	46.5	46.5	46.5	46.5	46.5
Rain Rate (mm/hr)	95.0	95.0	95.0	95.0	95.0	95.0
ADJACENT SATELLITE 1						
Satellite 1 Orbital Location	53.5 W.L.	53.5 W.L.	53.5 W.L.	53.5 W.L.	53.5 W.L.	53.5 W.L.
Uplink Power Density (dBW/Hz)	-50.0	-50.0	-50.0	-50.0	-50.0	-50.0
Downlink EIRP Density (dBW/Hz)	-26.0	-26.0	-26.0	-26.0	-26.0	-26.0
ADJACENT SATELLITE 2						
Satellite 1 Orbital Location	57.5 W.L.	57.5 W.L.	57.5 W.L.	57.5 W.L.	57.5 W.L.	57.5 W.L.
Uplink Power Density (dBW/Hz)	-50.0	-50.0	-50.0	-50.0	-50.0	-50.0
Downlink EIRP Density (dBW/Hz)	-26.0	-26.0	-26.0	-26.0	-26.0	-26.0
CARRIER INFORMATION						
Carrier ID	24M0F3F	27M0G7W	10M3G7W	100KG7W	1M45G7W	400KG7W
Carrier Modulation	TV/FM	QPSK	QPSK	QPSK	BPSK	BPSK
Peak to Peak Bandwidth of EDS (MHz)	4	N/A	N/A	N/A	N/A	N/A
Information Rate(kbps)	N/A	18432	6000	64	512	128
Code Rate	N/A	1/2x188/204	1/2x188/204	1/2x239/256	R1/2	R1/2
Occupied Bandwidth(kHz)	24000	22600	6771.1	75.4	1229.0	307.0
Allocated Bandwidth(kHz)	24000	27000	10300	100	1450.0	400.0
Minimum C/N, Clear Sky (dB)	10.0	3.4	3.9	3.0	3.4	3.4
Minimum C/N, Rain (dB)	10.0	3.4	3.6	2.8	2.7	2.7
UPLINK EARTH STATION						
Earth Station Diameter (meters)	9.0	6.1	6.1	6.1	6.1	1.8
Earth Station Gain (dBi)	60.0	56.7	56.7	56.7	56.7	46.2
Earth Station Elevation Angle	20	20	20	20	20	20
DOWNLINK EARTH STATION						
Earth Station Diameter (meters)	1.8	1.8	1.8	1.8	1.8	6.1
Earth Station Gain (dBi)	44.1	44.1	44.1	44.1	44.1	54.8
Earth Station G/T (dB/K)	21.6	21.6	21.6	21.6	21.6	32.4
Earth Station Elevation Angle	20	20	20	20	20	20
LINK FADE TYPE						
Link Fade Type	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky
UPLINK PERFORMANCE						
Uplink Earth Station EIRP (dBW)	82.7	79.2	67.2	46.9	58.9	48.7
Uplink Path Loss, Clear Sky (dB)	-207.2	-207.2	-207.2	-207.2	-207.2	-207.2
Uplink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Satellite G/T(dB/K)	-2.8	-2.8	-2.8	-2.8	-2.8	-2.8
Boltzman Constant(dBW/K-Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-73.8	-73.5	-68.3	-48.8	-60.9	-54.9
Uplink C/N(dB)	27.5	24.2	17.4	16.7	16.6	12.4
DOWNLINK PERFORMANCE						
Downlink EIRP per Carrier (dBW)	46.5	41.5	36.3	16.1	28.1	17.9
Antenna Pointing Error (dB)	-.5	-.5	-.5	-.5	-.5	-.5
Downlink Path Loss, Clear Sky (dB)	-205.3	-205.3	-205.3	-205.3	-205.3	-205.3
Downlink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Earth Station G/T (dB/K)	21.6	21.6	21.6	21.6	21.6	32.4
Boltzman Constant(dBW / K - Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-73.8	-73.5	-68.3	-48.8	-60.9	-54.9
Downlink C / N(dB)	17.1	12.3	12.5	11.8	11.7	18.3
COMPOSITE LINK PERFORMANCE						
C/N Uplink (dB)	27.5	24.2	17.4	16.7	16.6	12.4
C/N Downlink (dB)	17.1	12.3	12.5	11.8	11.7	18.3
C/I Intermodulation (dB)	N/A	N/A	14.6	13.9	13.8	9.6
C/I Uplink Co-Channel (dB)*	24.5	24.0	22.7	22.6	22.9	18.3
C/I Downlink Co-Channel (dB)*	24.5	24.0	22.7	22.6	22.9	18.3
C/I Uplink Adjacent Satellite 1 (dB)	32.9	29.7	22.9	22.2	22.0	17.9
C/I Downlink Adjacent Satellite 1 (dB)	20.2	15.4	15.5	14.8	14.7	22.1
C/I Uplink Adjacent Satellite 2 (dB)	32.9	29.7	22.9	22.2	22.0	17.9
C/I Downlink Adjacent Satellite 2 (dB)	22.4	17.6	17.7	17.0	16.9	22.7
C/(N+I) Composite (dB)	13.5	9.3	7.6	6.9	6.8	5.9
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	12.5	8.3	6.6	5.9	5.8	4.9
Minimum Required C/N (dB)	-10.0	-3.4	-3.9	-3.0	-3.4	-3.4
Excess Link Margin (dB)	2.5	4.9	2.7	2.9	2.4	1.5
Number of Carriers	1	1.0	2.6	270.0	18.6	67.5
CARRIER DENSITY LEVELS						
Uplink Power Density (dBW/Hz)	-43.3	-51.0	-57.8	-58.5	-58.6	-52.3
Downlink EIRP Density At Beam Peak (dBW/Hz)	-13.5	-26.1	-26.0	-26.7	-26.8	-31.0

EXHIBIT 4: LINK BUDGETS (continued)

UPLINK BEAM INFORMATION						
Uplink Beam Name	S. America	S. America	S. America	S. America	S. America	S. America
Uplink Frequency (GHz)	14.0 – 14.25	14.0 – 14.25	14.0 – 14.25	14.0 – 14.25	14.0 – 14.25	14.0 – 14.25
Uplink Beam Polarization	Horizontal	Horizontal	Horizontal	Horizontal	Horizontal	Horizontal
Uplink Contour G/T (dB/K)	-2.3	-2.3	-2.3	-2.3	-2.3	-2.3
Uplink SFD (dBW/m2)	-83.3	-74.3	-83.3	-83.3	-83.3	-83.3
Rain Rate (mm/hr)	95.0	95.0	95.0	95.0	95.0	95.0
DOWNLINK BEAM INFORMATION						
Downlink Beam Name	S. America	S. America	S. America	S. America	S. America	S. America
Downlink Frequency (GHz)	10.95–11.20	10.95–11.20	10.95–11.20	10.95–11.20	10.95–11.20	10.95–11.20
Downlink Beam Polarization	Vertical	Vertical	Vertical	Vertical	Vertical	Vertical
Downlink Contour EIRP (dBW)	45.9	45.9	45.9	45.9	45.9	45.9
Rain Rate (mm/hr)	95.0	95.0	95.0	95.0	95.0	95.0
ADJACENT SATELLITE 1						
Satellite 1 Orbital Location	53.5 W.L.	53.5 W.L.	53.5 W.L.	53.5 W.L.	53.5 W.L.	53.5 W.L.
Uplink Power Density (dBW/Hz)	-50.0	-50.0	-50.0	-50.0	-50.0	-50.0
Downlink EIRP Density (dBW/Hz)	-26.0	-26.0	-26.0	-26.0	-26.0	-26.0
ADJACENT SATELLITE 2						
Satellite 1 Orbital Location	57.5 W.L.	57.5 W.L.	57.5 W.L.	57.5 W.L.	57.5 W.L.	57.5 W.L.
Uplink Power Density (dBW/Hz)	-50.0	-50.0	-50.0	-50.0	-50.0	-50.0
Downlink EIRP Density (dBW/Hz)	-26.0	-26.0	-26.0	-26.0	-26.0	-26.0
CARRIER INFORMATION						
Carrier ID	24M0F3F	27M0G7W	10M3G7W	100KG7W	1M45G7W	400KG7W
Carrier Modulation	TV/FM	QPSK	QPSK	QPSK	BPSK	BPSK
Peak to Peak Bandwidth of EDS (MHz)	4	N/A	N/A	N/A	N/A	N/A
Information Rate(kbps)	N/A	18432	6000	64	512	128
Code Rate	N/A	1/2x188/204	1/2x188/204	1/2x239/256	R1/2	R1/2
Occupied Bandwidth(kHz)	24000	22600	6771.1	75.4	1229.0	307.0
Allocated Bandwidth(kHz)	24000	27000	10300	100	1450.0	400.0
Minimum C/N, Clear Sky (dB)	10.0	3.4	3.9	3.0	3.4	3.4
Minimum C/N, Rain (dB)	10.0	3.4	3.6	2.8	2.7	2.7
UPLINK EARTH STATION						
Earth Station Diameter (meters)	6.1	6.1	6.1	6.1	6.1	2.4
Earth Station Gain (dBi)	56.8	56.8	56.8	56.8	56.8	48.9
Earth Station Elevation Angle	20	20	20	20	20	20
DOWNLINK EARTH STATION						
Earth Station Diameter (meters)	6.1	1.8	2.4	2.4	2.4	6.1
Earth Station Gain (dBi)	54.8	44.1	46.8	46.8	46.8	54.8
Earth Station G/T (dB/K)	32.4	21.6	24.3	24.3	24.3	32.4
Earth Station Elevation Angle	20	20	20	20	20	20
LINK FADE TYPE						
	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky
UPLINK PERFORMANCE						
Uplink Earth Station EIRP (dBW)	79.6	78.8	66.6	46.5	58.5	50.2
Uplink Path Loss, Clear Sky (dB)	-207.4	-207.4	-207.4	-207.4	-207.4	-207.4
Uplink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Satellite G/T(dB/K)	-2.3	-2.3	-2.3	-2.3	-2.3	-2.3
Boltzman Constant(dBW/K -Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-73.8	-73.5	-68.3	-48.8	-60.9	-54.9
Uplink C/N(dB)	24.7	24.2	17.2	16.7	16.5	14.2
DOWNLINK PERFORMANCE						
Downlink EIRP per Carrier (dBW)	45.9	41.5	36.3	16.2	28.2	19.8
Antenna Pointing Error (dB)	-.5	-.5	-.5	-.5	-.5	-.5
Downlink Path Loss, Clear Sky (dB)	-205.3	-205.3	-205.3	-205.3	-205.3	-205.3
Downlink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Earth Station G/T (dB/K)	32.4	21.6	24.3	24.3	24.3	32.4
Boltzman Constant(dBW / K - Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-73.8	-73.5	-68.3	-48.8	-60.9	-54.9
Downlink C / N(dB)	27.4	12.4	15.1	14.6	14.4	20.2
COMPOSITE LINK PERFORMANCE						
C/N Uplink (dB)	24.7	24.2	17.2	16.7	16.5	14.2
C/N Downlink (dB)	27.4	12.4	15.1	14.6	14.4	20.2
C/I Intermodulation (dB)	N/A	N/A	15.1	14.6	14.5	12.2
C/I Uplink Co-Channel (dB)*	24.5	24.0	23.2	23.3	23.6	20.9
C/I Downlink Co-Channel (dB)*	24.5	24.0	23.2	23.3	23.6	20.9
C/I Uplink Adjacent Satellite 1 (dB)	29.8	29.3	22.3	21.8	21.6	19.3
C/I Downlink Adjacent Satellite 1 (dB)	31.1	15.4	18.4	17.9	17.8	24.0
C/I Uplink Adjacent Satellite 2 (dB)	29.8	29.3	22.3	21.8	21.6	19.3
C/I Downlink Adjacent Satellite 2 (dB)	31.7	17.6	20.1	19.6	19.4	24.6
C/(N+I) Composite (dB)	18.0	9.3	9.0	8.5	8.4	8.1
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	17.0	8.3	8.0	7.5	7.4	7.1
Minimum Required C/N (dB)	-10.0	-3.4	-3.9	-3.0	-3.4	-3.4
Excess Link Margin (dB)	7.0	4.9	4.1	4.5	4.0	3.7
Number of Carriers	1	1.0	2.6	270.0	18.6	67.5
CARRIER DENSITY LEVELS						
Uplink Power Density (dBW/Hz)	-43.2	-51.6	-58.6	-59.1	-59.2	-53.6
Downlink EIRP Density At Beam Peak (dBW/Hz)	-14.1	-26.1	-26.0	-26.5	-26.7	-29.0

EXHIBIT 4: LINK BUDGETS (continued)

UPLINK BEAM INFORMATION						
Uplink Beam Name	S. America	S. America	S. America	S. America	S. America	S. America
Uplink Frequency (GHz)	14.0 – 14.25	14.0 – 14.25	14.0 – 14.25	14.0 – 14.25	14.0 – 14.25	14.0 – 14.25
Uplink Beam Polarization	Vertical	Vertical	Vertical	Vertical	Vertical	Vertical
Uplink Contour G/T (dB/K)	-1.7	-1.7	-1.7	-1.7	-1.7	-1.7
Uplink SFD (dBW/m2)	-82.9	-75.9	-82.9	-82.9	-82.9	-82.9
Rain Rate (mm/hr)	95.0	95.0	95.0	95.0	95.0	95.0
DOWNLINK BEAM INFORMATION						
Downlink Beam Name	S. America	S. America	S. America	S. America	S. America	S. America
Downlink Frequency (GHz)	10.95 – 11.20	10.95 – 11.20	10.95 – 11.20	10.95 – 11.20	10.95 – 11.20	10.95 – 11.20
Downlink Beam Polarization	Horizontal	Horizontal	Horizontal	Horizontal	Horizontal	Horizontal
Downlink Contour EIRP (dBW)	46.5	46.5	46.5	46.5	46.5	46.5
Rain Rate (mm/hr)	95.0	95.0	95.0	95.0	95.0	95.0
ADJACENT SATELLITE 1						
Satellite 1 Orbital Location	53.5 W.L.	53.5 W.L.	53.5 W.L.	53.5 W.L.	53.5 W.L.	53.5 W.L.
Uplink Power Density (dBW/Hz)	-50.0	-50.0	-50.0	-50.0	-50.0	-50.0
Downlink EIRP Density (dBW/Hz)	-26.0	-26.0	-26.0	-26.0	-26.0	-26.0
ADJACENT SATELLITE 2						
Satellite 1 Orbital Location	57.5 W.L.	57.5 W.L.	57.5 W.L.	57.5 W.L.	57.5 W.L.	57.5 W.L.
Uplink Power Density (dBW/Hz)	-50.0	-50.0	-50.0	-50.0	-50.0	-50.0
Downlink EIRP Density (dBW/Hz)	-26.0	-26.0	-26.0	-26.0	-26.0	-26.0
CARRIER INFORMATION						
Carrier ID	24M0F3F	27M0G7W	10M3G7W	100KG7W	1M45G7W	400KG7W
Carrier Modulation	TV/FM	QPSK	QPSK	QPSK	BPSK	BPSK
Peak to Peak Bandwidth of EDS (MHz)	4	N/A	N/A	N/A	N/A	N/A
Information Rate(kbps)	N/A	18432	6000	64	512	128
Code Rate	N/A	1/2x188/204	1/2x188/204	1/2x239/256	R1/2	R1/2
Occupied Bandwidth(kHz)	24000	22600	6771.1	75.4	1229.0	307.0
Allocated Bandwidth(kHz)	24000	27000	10300	100	1450.0	400.0
Minimum C/N, Clear Sky (dB)	10.0	3.4	3.9	3.0	3.4	3.4
Minimum C/N, Rain (dB)	10.0	3.4	3.6	2.8	2.7	2.7
UPLINK EARTH STATION						
Earth Station Diameter (meters)	6.1	6.1	6.1	6.1	6.1	2.4
Earth Station Gain (dBi)	56.8	56.8	56.8	56.8	56.8	48.9
Earth Station Elevation Angle	20	20	20	20	20	20
DOWNLINK EARTH STATION						
Earth Station Diameter (meters)	2.4	1.8	2.4	2.4	2.4	6.1
Earth Station Gain (dBi)	46.8	44.1	46.8	46.8	46.8	54.8
Earth Station G/T (dB/K)	24.3	21.6	24.3	24.3	24.3	32.4
Earth Station Elevation Angle	20	20	20	20	20	20
LINK FADE TYPE						
Link Fade Type	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky
UPLINK PERFORMANCE						
Uplink Earth Station EIRP (dBW)	80.0	76.5	66.3	46.1	58.1	49.8
Uplink Path Loss, Clear Sky (dB)	-207.4	-207.4	-207.4	-207.4	-207.4	-207.4
Uplink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Satellite G/T(dB/K)	-1.7	-1.7	-1.7	-1.7	-1.7	-1.7
Boltzman Constant(dBW/K-Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-73.8	-73.5	-68.3	-48.8	-60.9	-54.9
Uplink C/N(dB)	25.7	22.5	17.5	16.9	16.7	14.4
DOWNLINK PERFORMANCE						
Downlink EIRP per Carrier (dBW)	46.5	41.5	36.2	16.0	28.0	19.7
Antenna Pointing Error (dB)	-.5	-.5	-.5	-.5	-.5	-.5
Downlink Path Loss, Clear Sky (dB)	-205.3	-205.3	-205.3	-205.3	-205.3	-205.3
Downlink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Earth Station G/T (dB/K)	24.3	21.6	24.3	24.3	24.3	32.4
Boltzman Constant(dBW / K - Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-73.8	-73.5	-68.3	-48.8	-60.9	-54.9
Downlink C / N(dB)	19.8	12.3	15.0	14.4	14.2	20.1
COMPOSITE LINK PERFORMANCE						
C/N Uplink (dB)	25.7	22.5	17.5	16.9	16.7	14.4
C/N Downlink (dB)	19.8	12.3	15.0	14.4	14.2	20.1
C/I Intermodulation (dB)	N/A	N/A	14.4	13.8	13.7	11.4
C/I Uplink Co-Channel (dB)*	24.5	24.0	22.5	22.5	22.8	20.1
C/I Downlink Co-Channel (dB)*	24.5	24.0	22.5	22.5	22.8	20.1
C/I Uplink Adjacent Satellite 1 (dB)	30.2	27.0	22.0	21.4	21.2	18.9
C/I Downlink Adjacent Satellite 1 (dB)	23.2	15.4	18.3	17.7	17.6	23.9
C/I Uplink Adjacent Satellite 2 (dB)	30.2	27.0	22.0	21.4	21.2	18.9
C/I Downlink Adjacent Satellite 2 (dB)	24.8	17.6	20.0	19.4	19.2	24.5
C/(N+I) Composite (dB)	15.2	9.1	8.7	8.2	8.1	7.7
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	14.2	8.1	7.7	7.2	7.1	6.7
Minimum Required C/N (dB)	-10.0	-3.4	-3.9	-3.0	-3.4	-3.4
Excess Link Margin (dB)	4.2	4.8	3.8	4.2	3.7	3.3
Number of Carriers	1	1.0	2.6	270.0	18.6	67.5
CARRIER DENSITY LEVELS						
Uplink Power Density (dBW/Hz)	-42.8	-53.9	-58.9	-59.4	-59.6	-54.0
Downlink EIRP Density At Beam Peak (dBW/Hz)	-13.5	-26.1	-26.1	-26.7	-26.9	-29.2

EXHIBIT 4: LINK BUDGETS (continued)

UPLINK BEAM INFORMATION						
Uplink Beam Name	S. America	S. America	S. America	S. America	S. America	S. America
Uplink Frequency (GHz)	14.0 – 14.25	14.0 – 14.25	14.0 – 14.25	14.0 – 14.25	14.0 – 14.25	14.0 – 14.25
Uplink Beam Polarization	Horizontal	Horizontal	Horizontal	Horizontal	Horizontal	Horizontal
Uplink Contour G/T (dB/K)	-2.3	-2.3	-2.3	-2.3	-2.3	-2.3
Uplink SFD (dBW/m2)	-80.3	-74.3	-84.3	-84.3	-84.3	-84.3
Rain Rate (mm/hr)	95.0	95.0	95.0	95.0	95.0	95.0
DOWNLINK BEAM INFORMATION						
Downlink Beam Name	Extended Ku N. America	Extended Ku N. America	Extended Ku N. America	Extended Ku N. America	Extended Ku N. America	Extended Ku N. America
Downlink Frequency (GHz)	10.95 – 11.20	10.95 – 11.20	10.95 – 11.20	10.95 – 11.20	10.95 – 11.20	10.95 – 11.20
Downlink Beam Polarization	Vertical	Vertical	Vertical	Vertical	Vertical	Vertical
Downlink Contour EIRP (dBW)	46.0	46.0	46.0	46.0	46.0	46.0
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0	42.0	42.0
ADJACENT SATELLITE 1						
Satellite 1 Orbital Location	53.5 W.L.	53.5 W.L.	53.5 W.L.	53.5 W.L.	53.5 W.L.	53.5 W.L.
Uplink Power Density (dBW/Hz)	-50.0	-50.0	-50.0	-50.0	-50.0	-50.0
Downlink EIRP Density (dBW/Hz)	-26.0	-26.0	-26.0	-26.0	-26.0	-26.0
ADJACENT SATELLITE 2						
Satellite 1 Orbital Location	57.5 W.L.	57.5 W.L.	57.5 W.L.	57.5 W.L.	57.5 W.L.	57.5 W.L.
Uplink Power Density (dBW/Hz)	-50.0	-50.0	-50.0	-50.0	-50.0	-50.0
Downlink EIRP Density (dBW/Hz)	-26.0	-26.0	-26.0	-26.0	-26.0	-26.0
CARRIER INFORMATION						
Carrier ID	24M0F3F	27M0G7W	10M3G7W	100KG7W	1M45G7W	400KG7W
Carrier Modulation	TV/FM	QPSK	QPSK	QPSK	BPSK	BPSK
Peak to Peak Bandwidth of EDS (MHz)	4	N/A	N/A	N/A	N/A	N/A
Information Rate(kbps)	N/A	18432	6000	64	512	128
Code Rate	N/A	1/2x188/204	1/2x188/204	1/2x239/256	R1/2	R1/2
Occupied Bandwidth(kHz)	24000	22600	6771.1	75.4	1229.0	307.0
Allocated Bandwidth(kHz)	24000	27000	10300	100	1450.0	400.0
Minimum C/N, Clear Sky (dB)	10.0	3.4	3.9	3.0	3.4	3.4
Minimum C/N, Rain (dB)	10.0	3.4	3.6	2.8	2.7	2.7
UPLINK EARTH STATION						
Earth Station Diameter (meters)	9.0	6.1	6.1	6.1	6.1	2.4
Earth Station Gain (dBi)	60.1	56.8	56.8	56.8	56.8	48.9
Earth Station Elevation Angle	20	20	20	20	20	20
DOWNLINK EARTH STATION						
Earth Station Diameter (meters)	1.8	1.8	2.4	2.4	2.4	6.1
Earth Station Gain (dBi)	44.1	44.1	46.8	46.8	46.8	54.8
Earth Station G/T (dB/K)	21.6	21.6	24.3	24.3	24.3	32.4
Earth Station Elevation Angle	20	20	20	20	20	20
LINK FADE TYPE						
Link Fade Type	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky
UPLINK PERFORMANCE						
Uplink Earth Station EIRP (dBW)	82.6	78.6	65.5	45.4	57.4	49.5
Uplink Path Loss, Clear Sky (dB)	-207.4	-207.4	-207.4	-207.4	-207.4	-207.4
Uplink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Satellite G/T(dB/K)	-2.3	-2.3	-2.3	-2.3	-2.3	-2.3
Boltzman Constant(dBW/K - Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-73.8	-73.5	-68.3	-48.8	-60.9	-54.9
Uplink C/N(dB)	27.7	24.0	16.1	15.6	15.4	13.5
DOWNLINK PERFORMANCE						
Downlink EIRP per Carrier (dBW)	46.0	41.4	36.3	16.2	28.2	20.2
Antenna Pointing Error (dB)	-.5	-.5	-.5	-.5	-.5	-.5
Downlink Path Loss, Clear Sky (dB)	-205.3	-205.3	-205.3	-205.3	-205.3	-205.3
Downlink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Earth Station G/T (dB/K)	21.6	21.6	24.3	24.3	24.3	32.4
Boltzman Constant(dBW / K - Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-73.8	-73.5	-68.3	-48.8	-60.9	-54.9
Downlink C / N(dB)	16.6	12.3	15.1	14.6	14.4	20.6
COMPOSITE LINK PERFORMANCE						
C/N Uplink (dB)	27.7	24.0	16.1	15.6	15.4	13.5
C/N Downlink (dB)	16.6	12.3	15.1	14.6	14.4	20.6
C/I Intermodulation (dB)	N/A	N/A	15.0	14.5	14.4	12.5
C/I Uplink Co-Channel (dB)*	24.5	24.0	23.1	23.1	23.5	21.2
C/I Downlink Co-Channel (dB)*	24.5	24.0	23.1	23.1	23.5	21.2
C/I Uplink Adjacent Satellite 1 (dB)	32.8	29.1	21.2	20.7	20.5	18.6
C/I Downlink Adjacent Satellite 1 (dB)	19.7	15.3	18.4	17.9	17.8	24.4
C/I Uplink Adjacent Satellite 2 (dB)	32.8	29.1	21.2	20.7	20.5	18.6
C/I Downlink Adjacent Satellite 2 (dB)	21.9	17.5	20.1	19.6	19.4	25.0
C/(N+I) Composite (dB)	13.1	9.2	8.7	8.2	8.0	8.0
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	12.1	8.2	7.7	7.2	7.0	7.0
Minimum Required C/N (dB)	-10.0	-3.4	-3.9	-3.0	-3.4	-3.4
Excess Link Margin (dB)	2.1	4.8	3.8	4.2	3.6	3.6
Number of Carriers	1	1.0	2.6	270.0	18.6	67.5
CARRIER DENSITY LEVELS						
Uplink Power Density (dBW/Hz)	-43.5	-51.8	-59.7	-60.2	-60.3	-54.3
Downlink EIRP Density At Beam Peak (dBW/Hz)	-14.0	-26.1	-26.0	-26.6	-26.7	-28.6

EXHIBIT 4: LINK BUDGETS (continued)

UPLINK BEAM INFORMATION						
Uplink Beam Name	S. America	S. America	S. America	S. America	S. America	S. America
Uplink Frequency (GHz)	14.0 – 14.25	14.0 – 14.25	14.0 – 14.25	14.0 – 14.25	14.0 – 14.25	14.0 – 14.25
Uplink Beam Polarization	Vertical	Vertical	Vertical	Vertical	Vertical	Vertical
Uplink Contour G/T (dB/K)	-1.7	-1.7	-1.7	-1.7	-1.7	-1.7
Uplink SFD (dBW/m2)	-81.9	-75.9	-80.9	-80.9	-80.9	-80.9
Rain Rate (mm/hr)	95.0	95.0	95.0	95.0	95.0	95.0
DOWNLINK BEAM INFORMATION						
Downlink Beam Name	Extended Ku N. America	Extended Ku N. America	Extended Ku N. America	Extended Ku N. America	Extended Ku N. America	Extended Ku N. America
Downlink Frequency (GHz)	10.95 – 11.20	10.95 – 11.20	10.95 – 11.20	10.95 – 11.20	10.95 – 11.20	10.95 – 11.20
Downlink Beam Polarization	Horizontal	Horizontal	Horizontal	Horizontal	Horizontal	Horizontal
Downlink Contour EIRP (dBW)	46.1	46.1	46.1	46.1	46.1	46.1
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0	42.0	42.0
ADJACENT SATELLITE 1						
Satellite 1 Orbital Location	53.5 W.L.	53.5 W.L.	53.5 W.L.	53.5 W.L.	53.5 W.L.	53.5 W.L.
Uplink Power Density (dBW/Hz)	-50.0	-50.0	-50.0	-50.0	-50.0	-50.0
Downlink EIRP Density (dBW/Hz)	-26.0	-26.0	-26.0	-26.0	-26.0	-26.0
ADJACENT SATELLITE 2						
Satellite 1 Orbital Location	57.5 W.L.	57.5 W.L.	57.5 W.L.	57.5 W.L.	57.5 W.L.	57.5 W.L.
Uplink Power Density (dBW/Hz)	-50.0	-50.0	-50.0	-50.0	-50.0	-50.0
Downlink EIRP Density (dBW/Hz)	-26.0	-26.0	-26.0	-26.0	-26.0	-26.0
CARRIER INFORMATION						
Carrier ID	24M0F3F	27M0G7W	10M3G7W	100KG7W	1M45G7W	400KG7W
Carrier Modulation	TV/FM	QPSK	QPSK	QPSK	BPSK	BPSK
Peak to Peak Bandwidth of EDS (MHz)	4	N/A	N/A	N/A	N/A	N/A
Information Rate(kbps)	N/A	18432	6000	64	512	128
Code Rate	N/A	1/2x188/204	1/2x188/204	1/2x239/256	R1/2	R1/2
Occupied Bandwidth(kHz)	24000	22600	6771.1	75.4	1229.0	307.0
Allocated Bandwidth(kHz)	24000	27000	10300	100	1450.0	400.0
Minimum C/N, Clear Sky (dB)	10.0	3.4	3.9	3.0	3.4	3.4
Minimum C/N, Rain (dB)	10.0	3.4	3.6	2.8	2.7	2.7
UPLINK EARTH STATION						
Earth Station Diameter (meters)	7.0	6.1	6.1	6.1	6.1	1.8
Earth Station Gain (dBi)	58.0	56.8	56.8	56.8	56.8	46.3
Earth Station Elevation Angle	20	20	20	20	20	20
DOWNLINK EARTH STATION						
Earth Station Diameter (meters)	1.8	1.8	2.4	1.8	1.8	6.1
Earth Station Gain (dBi)	44.1	44.1	46.8	44.1	44.1	54.8
Earth Station G/T (dB/K)	21.6	21.6	24.3	21.6	21.6	32.4
Earth Station Elevation Angle	20	20	20	20	20	20
LINK FADE TYPE						
Link Fade Type	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky
UPLINK PERFORMANCE						
Uplink Earth Station EIRP (dBW)	81.0	77.0	67.9	49.3	61.2	51.1
Uplink Path Loss, Clear Sky (dB)	-207.4	-207.4	-207.4	-207.4	-207.4	-207.4
Uplink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Satellite G/T(dB/K)	-1.7	-1.7	-1.7	-1.7	-1.7	-1.7
Boltzman Constant(dBW/K-Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-73.8	-73.5	-68.3	-48.8	-60.9	-54.9
Uplink C/N(dB)	26.7	23.0	19.1	20.0	19.8	15.8
DOWNLINK PERFORMANCE						
Downlink EIRP per Carrier (dBW)	46.1	41.5	35.4	16.8	28.7	18.6
Antenna Pointing Error (dB)	-.5	-.5	-.5	-.5	-.5	-.5
Downlink Path Loss, Clear Sky (dB)	-205.3	-205.3	-205.3	-205.3	-205.3	-205.3
Downlink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Earth Station G/T (dB/K)	21.6	21.6	24.3	21.6	21.6	32.4
Boltzman Constant(dBW / K - Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-73.8	-73.5	-68.3	-48.8	-60.9	-54.9
Downlink C / N(dB)	16.7	12.4	14.2	12.4	12.3	19.0
COMPOSITE LINK PERFORMANCE						
C/N Uplink (dB)	26.7	23.0	19.1	20.0	19.8	15.8
C/N Downlink (dB)	16.7	12.4	14.2	12.4	12.3	19.0
C/I Intermodulation (dB)	N/A	N/A	14.1	15.0	14.8	10.7
C/I Uplink Co-Channel (dB)*	24.5	24.0	22.1	23.6	23.9	19.4
C/I Downlink Co-Channel (dB)*	24.5	24.0	22.1	23.6	23.9	19.4
C/I Uplink Adjacent Satellite 1 (dB)	31.2	27.5	23.6	24.5	24.3	20.3
C/I Downlink Adjacent Satellite 1 (dB)	19.8	15.4	16.6	15.5	15.3	22.8
C/I Uplink Adjacent Satellite 2 (dB)	31.2	27.5	23.6	24.5	24.3	20.3
C/I Downlink Adjacent Satellite 2 (dB)	22.0	17.6	18.5	17.7	17.5	23.4
C/(N+I) Composite (dB)	13.1	9.2	8.3	7.9	7.8	7.6
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	12.1	8.2	7.3	6.9	6.8	6.6
Minimum Required C/N (dB)	-10.0	-3.4	-3.9	-3.0	-3.4	-3.4
Excess Link Margin (dB)	2.1	4.8	3.4	4.0	3.4	3.2
Number of Carriers	1	1.0	2.6	270.0	18.6	67.5
CARRIER DENSITY LEVELS						
Uplink Power Density (dBW/Hz)	-43.0	-53.4	-57.2	-56.3	-56.5	-50.1
Downlink EIRP Density At Beam Peak (dBW/Hz)	-13.9	-26.0	-26.9	-26.0	-26.2	-30.3