Engineering Statement

Intelsat License LLC ("Intelsat") proposes to relocate the Galaxy 11 spacecraft to -- and operate it at -- 44.8° W.L. From that location, the spacecraft will provide service to the North and South America. Galaxy 11 is capable of operating in 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. However, from the 44.8° W.L. orbital location, Intelsat proposes to operate only the Ku-band payload of Galaxy 11.

In July 2008, the Commission authorized Galaxy 11 to operate from 32.8° E.L. (*see* FCC File No.: SAT-MOD-20080225-00051). Subsequently, in March 2011, the Commission authorized Galaxy 11 to operate from 55.5° W.L. (*see* FCC File No.: SAT-MOD-20101102-00229). Intelsat now proposes to relocate Galaxy 11 from 55.5° W.L. to 44.8º W.L., where Galaxy 11 would complement the services provided by Intelsat 14 at 45º W.L.

This engineering statement provides the following technical information for Galaxy 11 at 44.8° W.L.: (1) frequency plan, (2) antenna gain contours, (3) emission designators, (4) power flux density ("PFD") levels, (5) link budgets and interference analysis, (6) Schedule S, and (7) orbital debris mitigation plan. In all other respects, the Galaxy 11 characteristics are the same as those described in SAT-AMD-19990615-00067, as updated in SAT-MOD-20080225-00051 and SAT-MOD-20101102-00229.

1) Frequency Plan

The Galaxy 11 frequency plan is provided in Exhibit 1. Although Intelsat does not intend to utilize the C-band capability of Galaxy 11 at 44.8° W.L., both the C-band and Ku-band frequency plans of the spacecraft have been provided in Exhibit 1 for completeness.

With regard to operation in the 10950 – 11200 MHz frequency band, Section 25.202 and footnote NG 104 of Section 2.106 of the Commission's rules specify that operation by the fixed satellite service in the geostationary satellite orbit in the space-to-Earth direction is limited to international systems. The intent of these rules was to not constrain the further development/expansion of terrestrial stations in the U.S. operating in this

band by limiting the number of receive (satellite) Earth stations in this band. Should Intelsat require domestic Ku-band operation in the 10950 – 11200 MHz band, it shall not claim protection from any lawfully authorized fixed terrestrial station. In this regard and to the extent necessary, Intelsat requests a waiver of the provisions of Section 25.202 and footnote NG 104 of Section 2.106 of the Commission's rules with respect to domestic operation in the 10950 – 11200 MHz band.

2) Antenna Gain Contours

The co-polarized coverage patterns of Galaxy 11 operating from 44.8º W.L. are shown in Exhibits 2A through 2P in the format prescribed in Section 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. Although Intelsat does not intend to utilize the C-band beams of Galaxy 11, both the C-band and Ku-band coverage patterns of Galaxy 11 have been provided for completeness.

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 (-20º, 0º and +20º) referenced to the antenna axis with the azimuth varying from -180º and +180º. 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 -180º and +180º.

During emergency conditions, the bicone antenna would be used since its field of view is +/- 20º and the Earth disk is only +/- 8.4º. 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 ±20°) as the azimuth angle varies from -180° to +180°. 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 ±20° 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 -180º to +180º – 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° to +180° – generally referred to as the "elevation cut".

The fields of view of the pipe antennas (±40º) and that of the ULPC antennas (±10º) envelope the Earth disk (±8.4º). 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, Intelsat 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) Emission Designators

Emission designators and allocated bandwidths for representative communication carriers are provided in Exhibit 3.

4) 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, Section 25.208(b) does specify PFD limits for the 10950 – 11200 MHz frequency band.

For the 10950 – 11200 MHz band, 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 4, in the band 10950 – 11200 MHz, the downlink PFD levels of Galaxy 11 carriers would not exceed the limits specified in Section 25.208 (b) of the FCC rules.

No PFD calculations were conducted for the 3700 – 4200 MHz band since Intelsat does not intend to utilize this frequency band at the proposed orbital location of 44.8° W.L.

5.0) Link Budgets and Interference Analysis

Link analysis for Galaxy 11 was conducted for a number of representative carriers at Ku-band frequencies.

In determining the impact of interference into communications links that utilize the 11700 – 12200 MHz band, it was assumed that the nearest co-frequency satellites to Galaxy 11 were a hypothetical satellite located at 43° W.L. and a hypothetical satellite located at 46.8° W.L. The hypothetical satellites were assumed to have the same operational characteristics as Galaxy 11.

For the link analysis involving the 10950 – 11200 MHz band, it was assumed that the nearest co-frequency satellites to Galaxy 11 were Intelsat 11, located at 43° W.L., and a hypothetical satellite located at 46.8° W.L. The hypothetical satellite was assumed to have the same operational characteristics as Galaxy 11.

Intelsat 11 utilizes the 13750 – 14000 MHz and 10950 – 11200 MHz band, along with other frequency bands that are not on the Galaxy 11 satellite. The operating characteristics of Intelsat 11 used in the analysis are contained in FCC file number SAT-MOD-20090108-0004.

For the 10950 – 11200 MHz band, it was assumed that maximum downlink EIRP density of the Intelsat 11 transmissions was -19.4 dBW/Hz, and the maximum downlink EIRP density of the hypothetical satellite located at 46.8° W.L. was -20 dBW/Hz. For the 11700 - 12200 MHz band, it was assumed that maximum downlink EIRP density of the hypothetical satellites located at 43° W.L. and 46.8° W.L. was -20 dBW/Hz. In the 13750 – 14500 MHz band, it was assumed that the maximum power density of the uplink transmissions to each of the adjacent satellites was -45 dBW/Hz.

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 FCC'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 Ku-band frequencies rain attenuation predictions are derived using Recommendation ITU-R P.618.
d) At Ku-band frequencies, increase in noise temperature of the receiving earth station due to rain is taken into account.
e) For the cases where the transponder operates in a multi-carrier mode, the effects due to intermodulation interference are taken into account.

The impact of the TV/FM carriers from the adjacent satellites at 43° W.L and 46.8º W.L on the transmissions of Galaxy 11 was not considered 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 operator, 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.

In order to keep the number the Galaxy 11 link calculations to a manageable number, worst-case performance values were assumed for each beam type. The worst-case beam parameters were derived from the beam parameters listed in Exhibit 2 and chosen in such a manner that would make carrier links utilizing any specific uplink / downlink beam combination as sensitive to adjacent satellite interference as possible. This would ensure that the link performance objectives would be achieved for all possible Galaxy 11 uplink and downlink beam combinations. The worst-case beam performance for each Galaxy 11 beam type is provided below:

Beam Name & Polarization	Aggregate Beam Designation	Worst- Case Beam Peak G/T (dB/K)	Worst-Case Beam SFD Range @ Peak G/T (dBW/m^2)	Worst-Case Beam EIRP (dBW)
North America (H)	North America	6.3	-99.8 to -83.8	49.7
North America (V)				
North America (H) [Extended Ku-band]	North and South America [Extended Ku-band]	6.3	-99.9 to -83.9	51.9
North America (V) [Extended Ku-band]				
South America (H) [Extended Ku-band]				
South America (V) [Extended Ku-band]				

The results of Ku-band analysis are shown in Exhibit 5 and demonstrate that operation of the Galaxy 11 satellite from 44.8º W.L. would permit the intended services to achieve their respective performance objectives while maintaining sufficient link margin. Additionally, the downlink EIRP density and uplink power density levels of the carriers listed in Exhibit 5 comply with the FCC limits contained in Section 25.212(c) of the Commission's rules.

6.0) Adjacent Satellite Link Analysis

At Ku-band, the impact of the Galaxy 11 emissions on a hypothetical satellite located at 46.8º W.L and Intelsat 11 located at 43° W.L and a hypothetical satellite (operating in the 14000 – 14500 MHz and 11700 – 12200 MHz bands) at 43° W.L was analyzed. The hypothetical satellites were assumed to have the same operating characteristics as Galaxy 11 in the applicable frequency bands.

For Intelsat 11, it was assumed that the nearest co-frequency satellites (that utilized the 13750 – 14000 MHz and 10950 – 11200 MHz bands) were a Galaxy 11 at 44.8° W.L and a hypothetical satellite operating at 41° W.L. The hypothetical satellite was assumed to have the same characteristics as Intelsat 11.

For the hypothetical satellite located at 43º W.L (and that utilized the 14000 – 14500 MHz and 11700 – 12200 MHz bands), it was assumed that the nearest co-frequency satellites were a hypothetical satellite operating at 41° W.L and Galaxy 11 operating at 44.8° W.L. The hypothetical satellite at 41° W.L. was assumed to have the same operational parameters as Galaxy 11.

For the hypothetical satellite located at 46.8º W.L, it was assumed that the nearest co-frequency satellites were a hypothetical satellite operating at 48.8° W.L and Galaxy 11 operating at 44.8° W.L. The hypothetical satellite at 48.8° W.L. was assumed to have the same operational parameters as Galaxy 11.

For the 10950 – 11200 MHz band analysis, it was assumed that maximum downlink EIRP density of Galaxy 11 transmissions was -20 dBW/Hz, while the maximum downlink EIRP density of the transmissions of the hypothetical satellite located at 41° W.L. was -19.4 dBW/Hz. For the 11700 – 12200 MHz band analysis, it was assumed that the maximum downlink EIRP density of Galaxy 11 transmissions was -20 dBW/Hz, the maximum downlink EIRP density of the transmissions of the hypothetical satellite at 41° W.L. was -20 dBW/Hz, and the maximum downlink EIRP density of the transmissions of the hypothetical satellite located at 48.8° W.L. was -20 dBW/Hz. In the 13750 – 14500 MHz band, the uplink power density of Galaxy 11, Intelsat 11 and all other adjacent co-frequency hypothetical satellites was assumed to be -45 dBW/Hz.

The assumptions made in Section 5.0 pertaining to earth station off-axis gain performance, earth station cross-polarization performance and rain attenuation were also applied in the Ku-band analysis.

The results of the analysis are given in Exhibits 6 and 7. The Galaxy 11 transmissions will be limited to those levels contained in Section 25.212(c) unless higher levels are coordinated with affected adjacent satellite operators. In any case, pursuant to the results in Exhibits 6 and 7, the uplink power density of the Galaxy 11 digital carriers operating in the 13750 – 14500 MHz band will not exceed -45 dBW/Hz; and within the 10950 – 11200 MHz and 11700 – 1220 MHz bands the downlink EIRP density of the Galaxy 11 digital carriers will not exceed -20.0 dBW/Hz.

7.0) Schedule S Submission

Intelsat is providing with its application a Schedule S for the operations of Galaxy 11 from 44.8º W.L. The Schedule S contains only those Galaxy 11 data items that have changed as a result of the proposed modification and data items whose inclusion was required in order for the software application to function properly.

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).

Although Intelsat does not intend to utilize the C-band portion of the Galaxy 11 communication payload, the C-band related information has been included in the Schedule S for the sake of completeness.

8.0) Orbital Debris Mitigation Plan

Intelsat is proactive in ensuring safe operation and disposal of this and all spacecraft under its control. The four elements of debris mitigation are addressed below.

8.1) Spacecraft Hardware Design: The spacecraft is designed such that no debris will be released during normal operations. Intelsat has assessed the probability of collision with meteoroids and other small debris (<1 cm diameter) and has taken the following steps to limit the effects of such collisions: (1) critical spacecraft components are located inside the protective body of the spacecraft and properly shielded; and (2) all spacecraft subsystems have redundant components to ensure no single-point failures. The spacecraft does not use any subsystems for end-of-life disposal that are not used for normal operations.

8.2) Minimizing Accidental Explosions: Intelsat has assessed the probability of accidental explosions during and after completion of mission operations. The spacecraft is designed in a manner to minimize the potential for such explosions. Propellant tanks and thrusters are isolated using redundant valves and electrical power systems are shielded in accordance with standard industry practices. At the completion of the mission, and upon disposal of the spacecraft, Intelsat will ensure the removal of all stored energy on the spacecraft by depleting all propellant tanks and turning off all active units.

Galaxy 11 is not compliant with Section 25.114(d)(14)(ii) of the rules. Specifically, the pressurized systems aboard Galaxy 11 cannot be completely vented. However, the Commission has granted Galaxy 11 a waiver of this provision of Section 25.114(d)(14)(ii) of the rules. Intelsat requests that this waiver also be applied to Galaxy 11 at the proposed orbital location of 44.8° W.L.

8.3) Safe Flight Profiles: Intelsat has assessed and limited the probability of the space station becoming a source of debris as a result of collisions with large debris or other operational space stations. Intelsat is not aware of any other FCC licensed system, or any other system applied for and under consideration by the FCC, having an overlapping station-keeping volume with Galaxy 11. Intelsat is also not aware of any non-Intelsat 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.

8.4) Post Mission Disposal: At the end of the mission, Intelsat expects to dispose of the spacecraft by moving it to a planned minimum altitude of 300

kilometers (perigee) above the geostationary arc.[1] Nevertheless, as the Commission is aware, because 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, Intelsat provides the following information:

1) Planned orbital eccentricity: 0.000447 (This is a best estimate of optimal eccentricity to match the natural eccentricity circle due to Sun and Moon perturbations after decommission.[2])
2) Planned apogee altitude: 338.016 km[3]
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, Intelsat 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, Intelsat performs thermal gauging near the spacecraft's end of life by inferring the remaining propellant from the thermal signature when Intelsat applies heat to different parts of

[1] Intelsat has reserved 30 kilograms of fuel for this purpose. The fuel gauging uncertainty has been taken into account in these calculations.

[2] Because it is extremely difficult to anticipate end-of-life thruster performance and operational conditions, it is extremely difficult to achieve the planned eccentricity. Intelsat'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.

[3] See n. 2.

the propellant tank system. This information is considered when determining the additional hold-back and adjustments to book values 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.

9.0) Arrangement For Telemetry, Tracking and Control

Intelsat will conduct TC&R operations through one or more of the following earth stations: Fucino, Italy; Pretoria, South Africa; Atlanta, Georgia; Mountainside, Maryland; Riverside, California; and Castle Rock, Colorado. Additionally, Intelsat is capable of remotely controlling Galaxy 11 from its facility in Washington D.C.

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	October 17, 2012
Jose Albuquerque Senior Director Spectrum Strategy	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/m^2

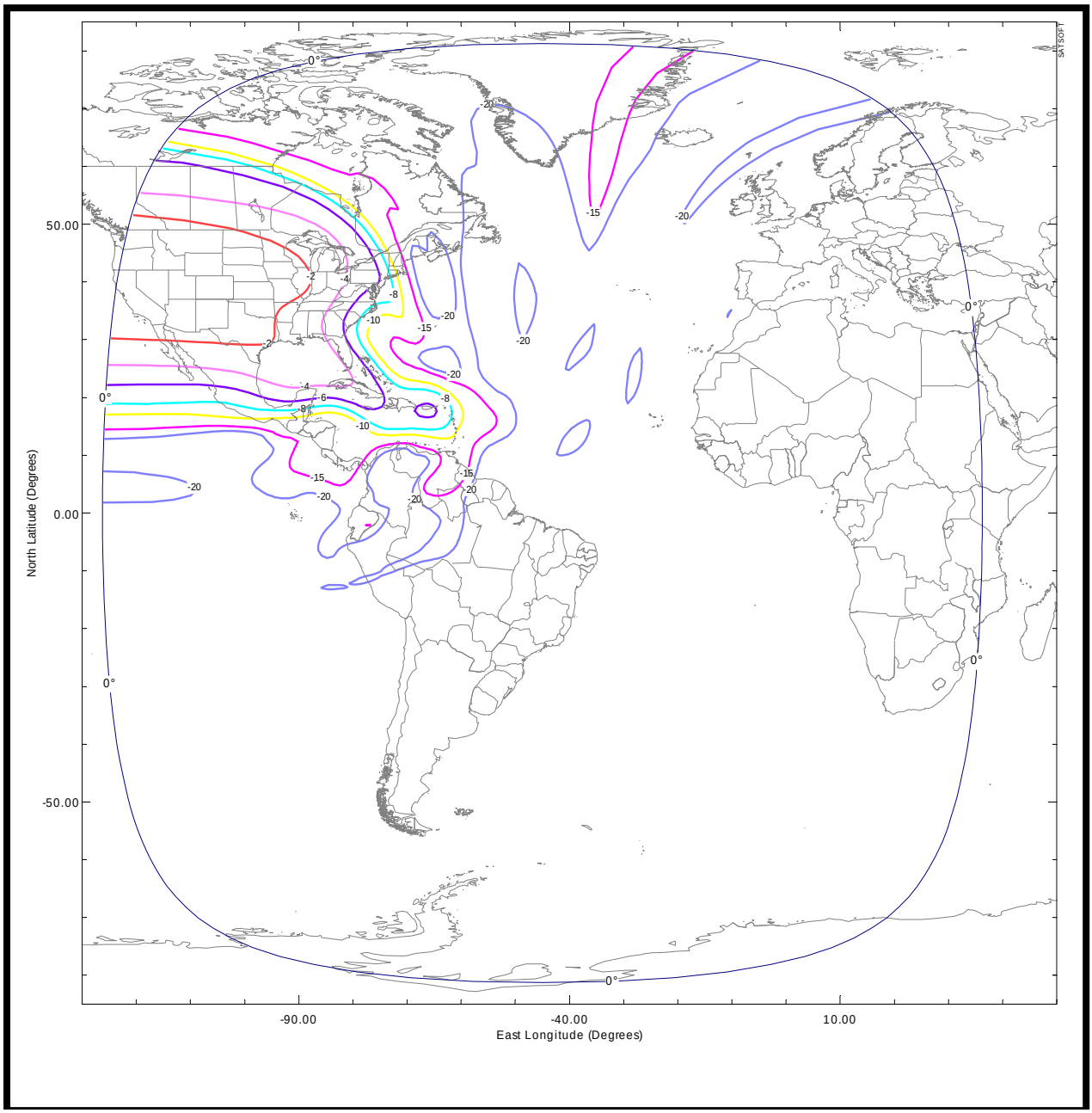


EXHIBIT 2B: C-Band North America Receive Beam
(Schedule S Beam ID: CVUL)

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/m^2

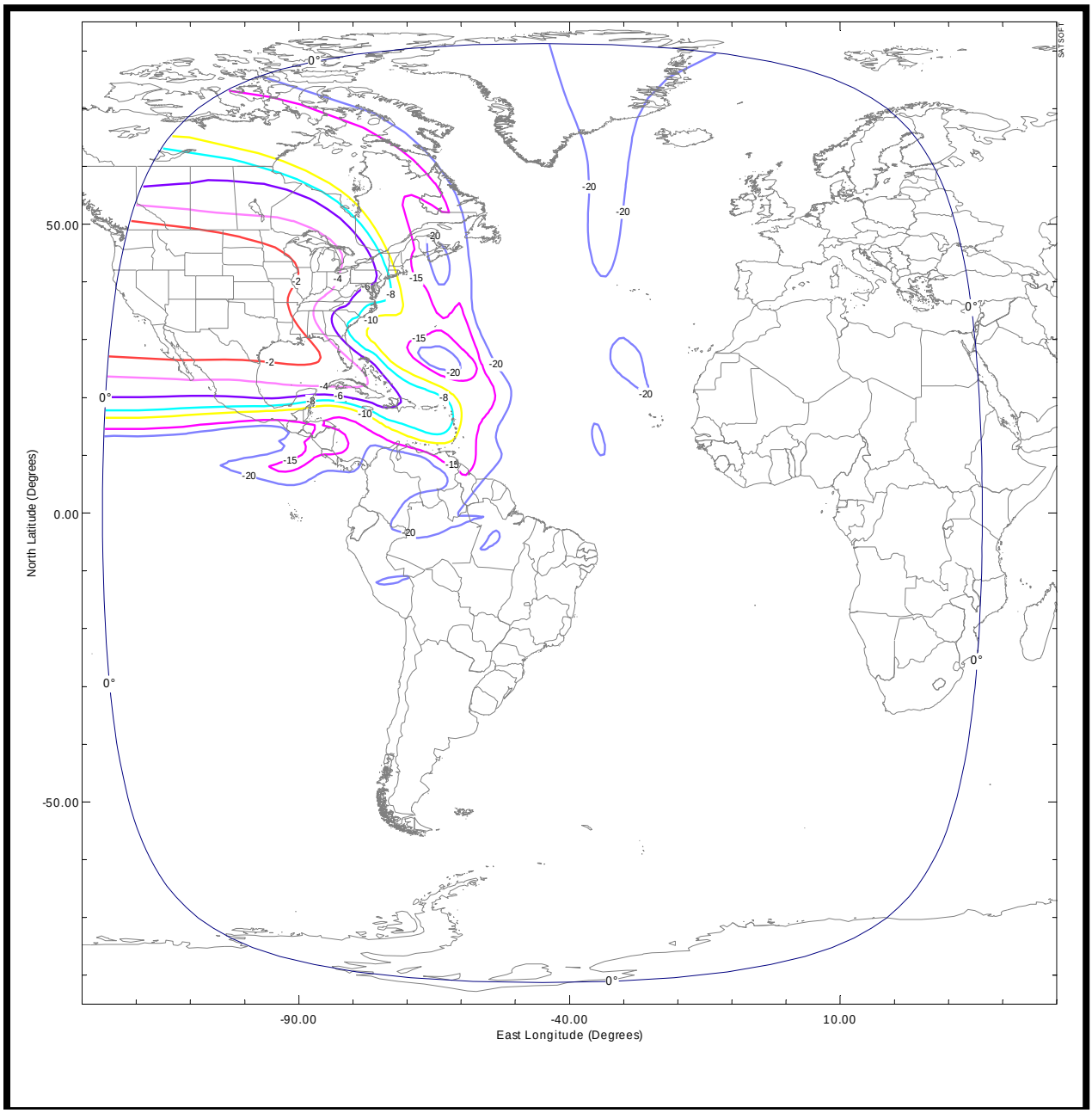


EXHIBIT 2C: C-Band North America Transmit Beam
(Schedule S Beam ID: CHDL)

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

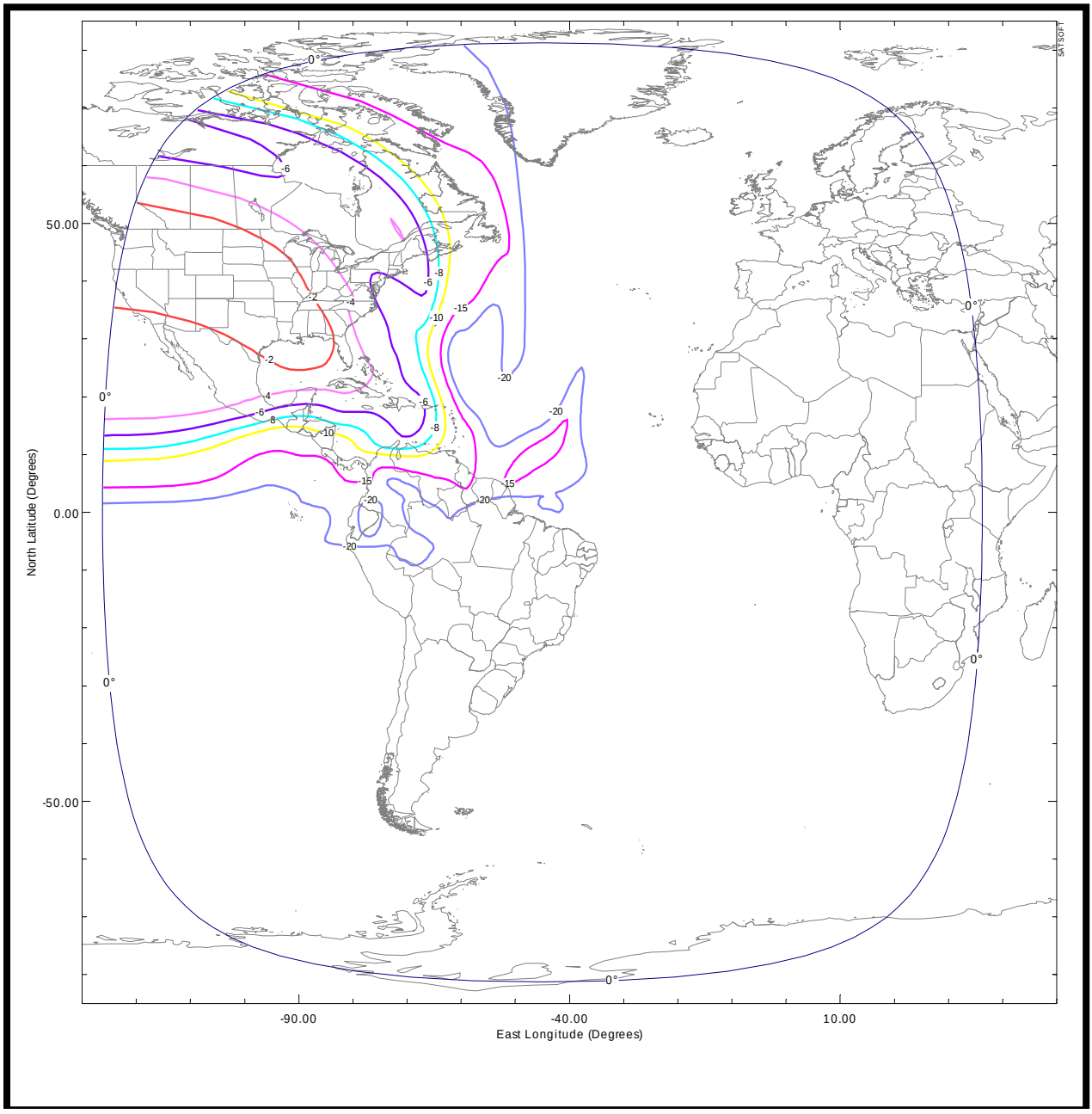


EXHIBIT 2D: C-Band North America Transmit Beam
(Schedule S Beam ID: CVDL)

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

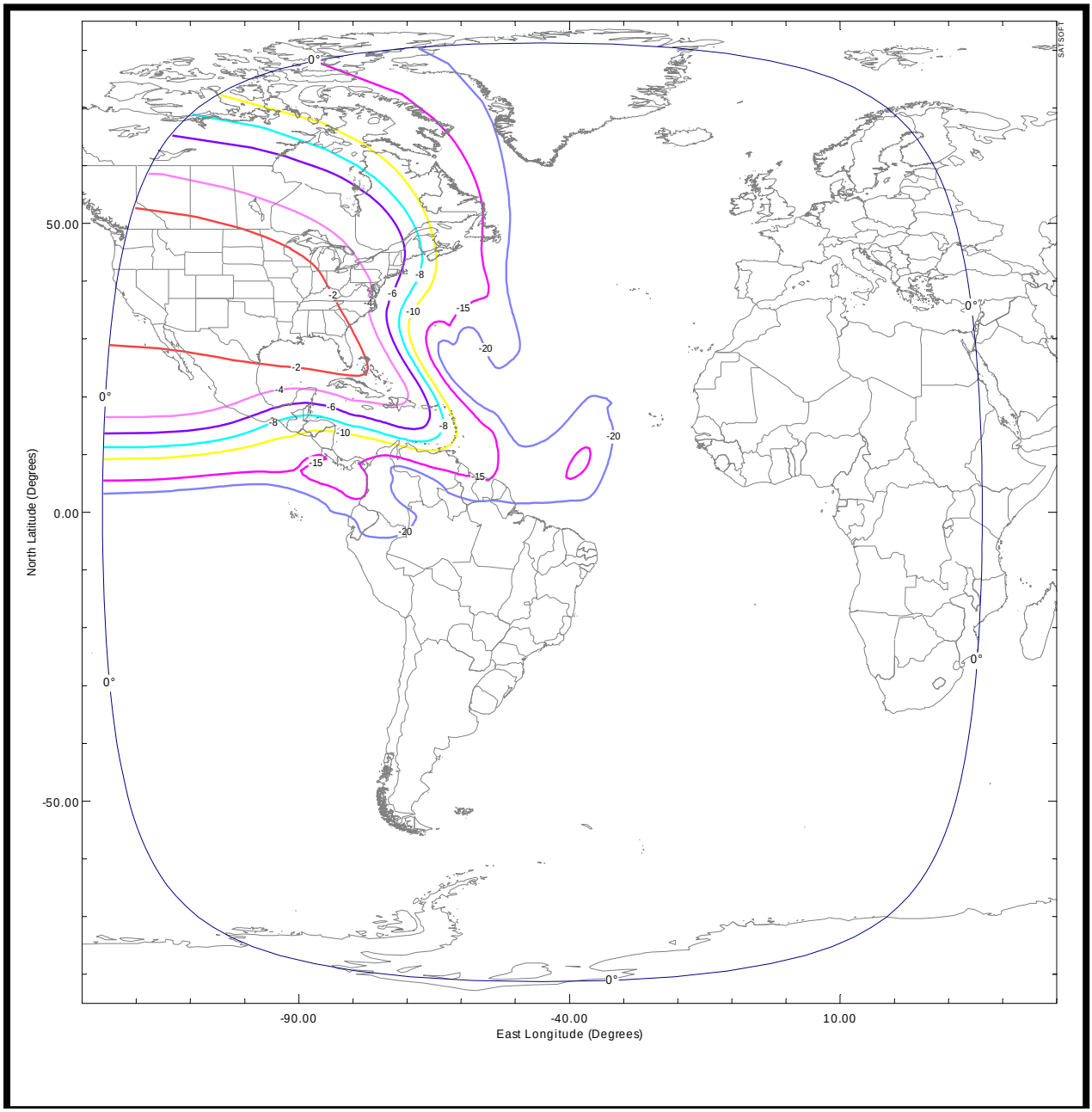


EXHIBIT 2E: Ku-Band North America Receive Beam (Schedule S Beam ID: KHUL)

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/m^2

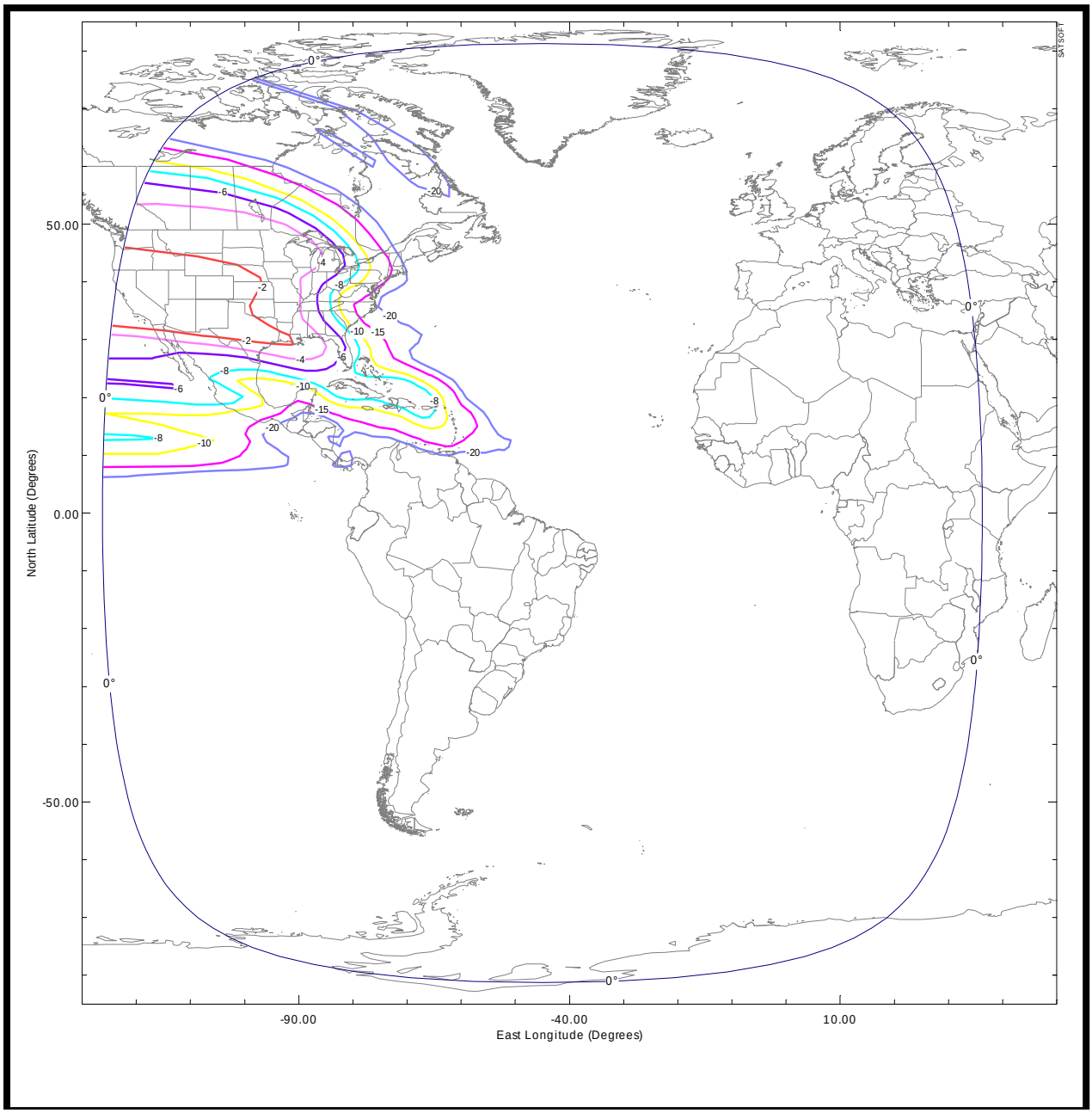


EXHIBIT 2F: Ku-Band North America Receive Beam
(Schedule S Beam ID: KVUL)

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/m^2

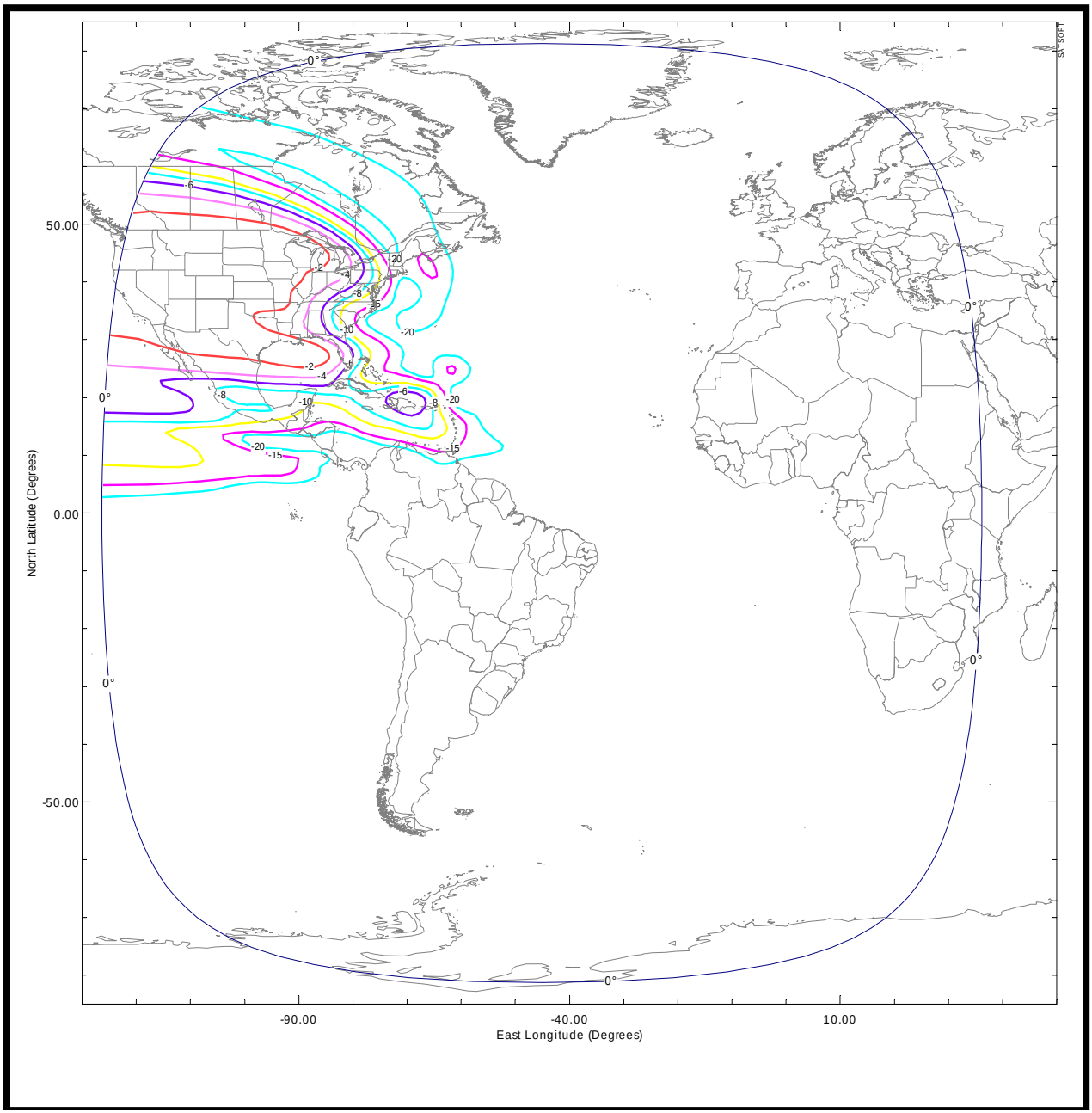


EXHIBIT 2G: Ku-Band North America Transmit Beam
(Schedule S Beam ID: KHDL)

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

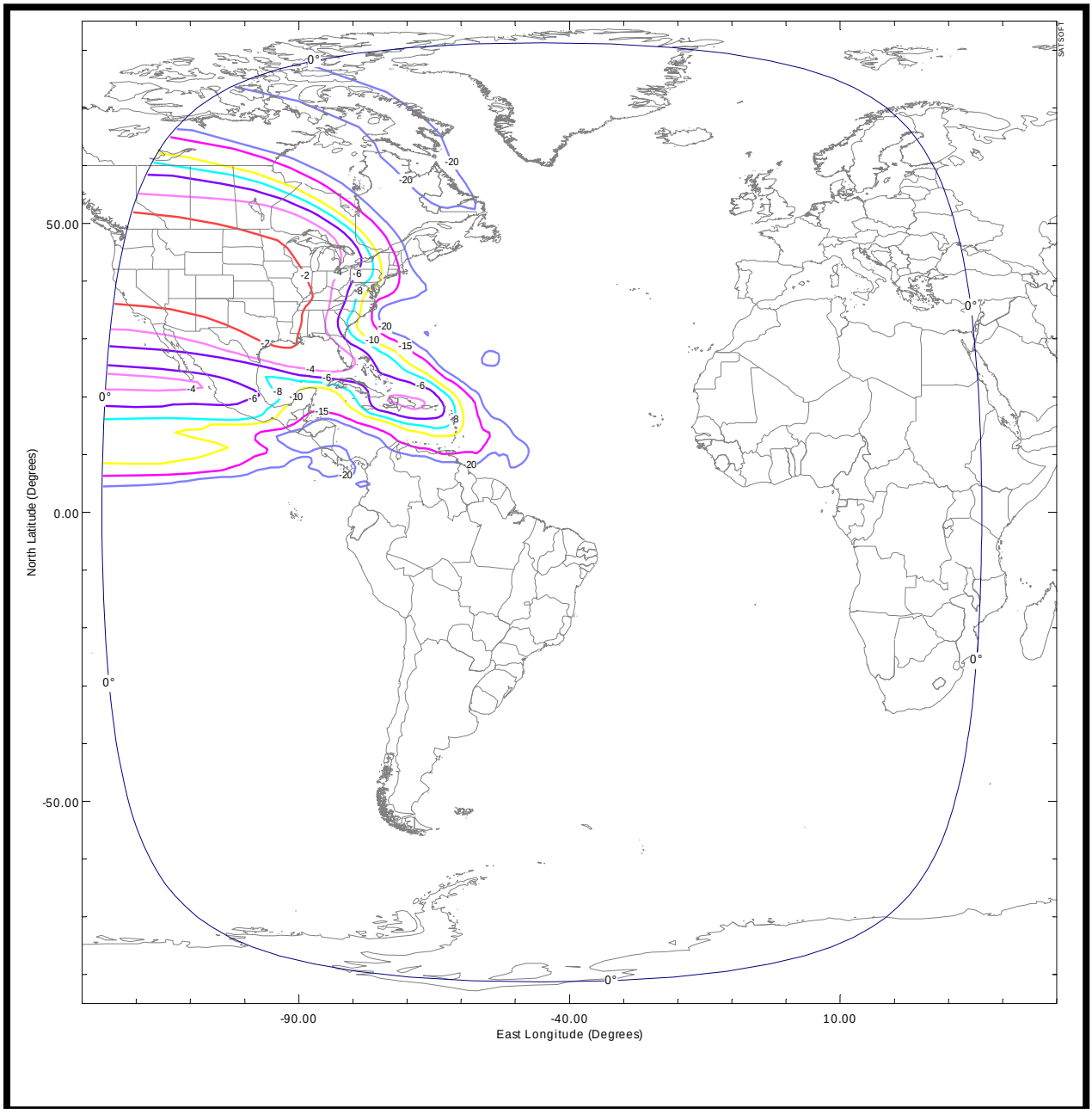


EXHIBIT 2H: Ku-Band North America Transmit Beam
(Schedule S Beam ID: KVDL)

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

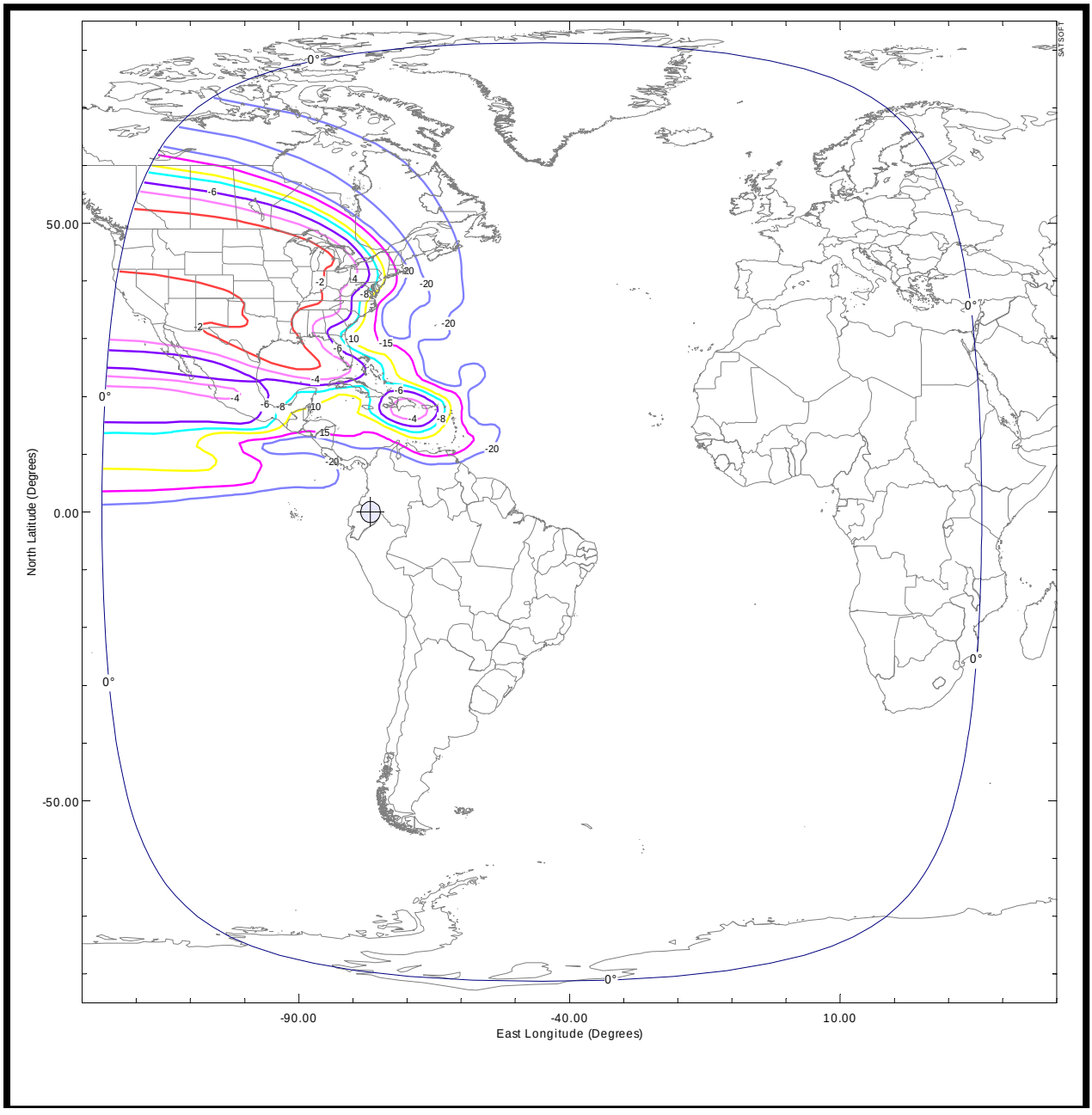


EXHIBIT 2I: Ku-Band South America Receive Beam
(Schedule S Beam ID: BHUL)

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/m^2

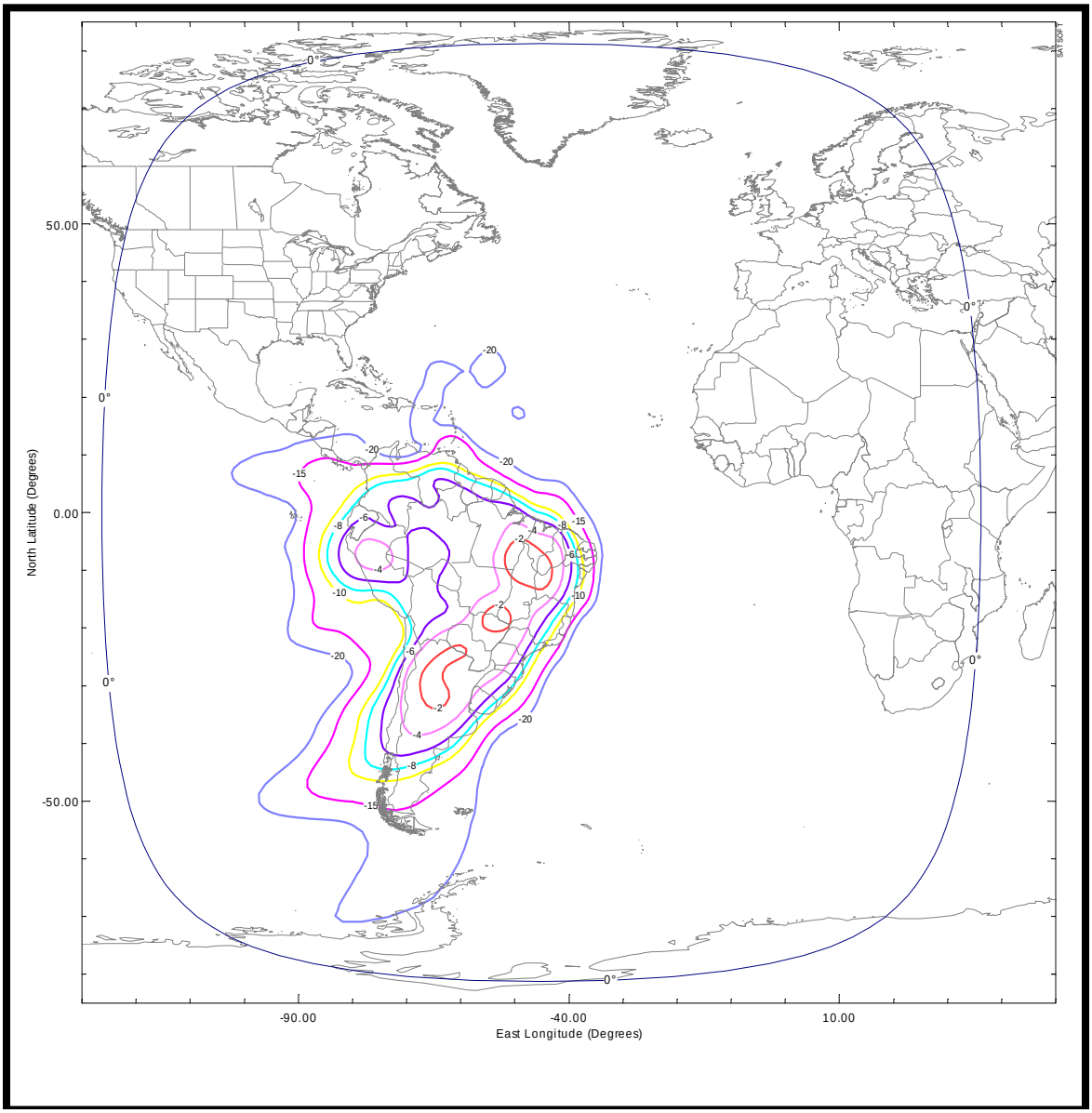


EXHIBIT 2J: Ku-Band South America Receive Beam
(Schedule S Beam ID: BVUL)

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/m^2

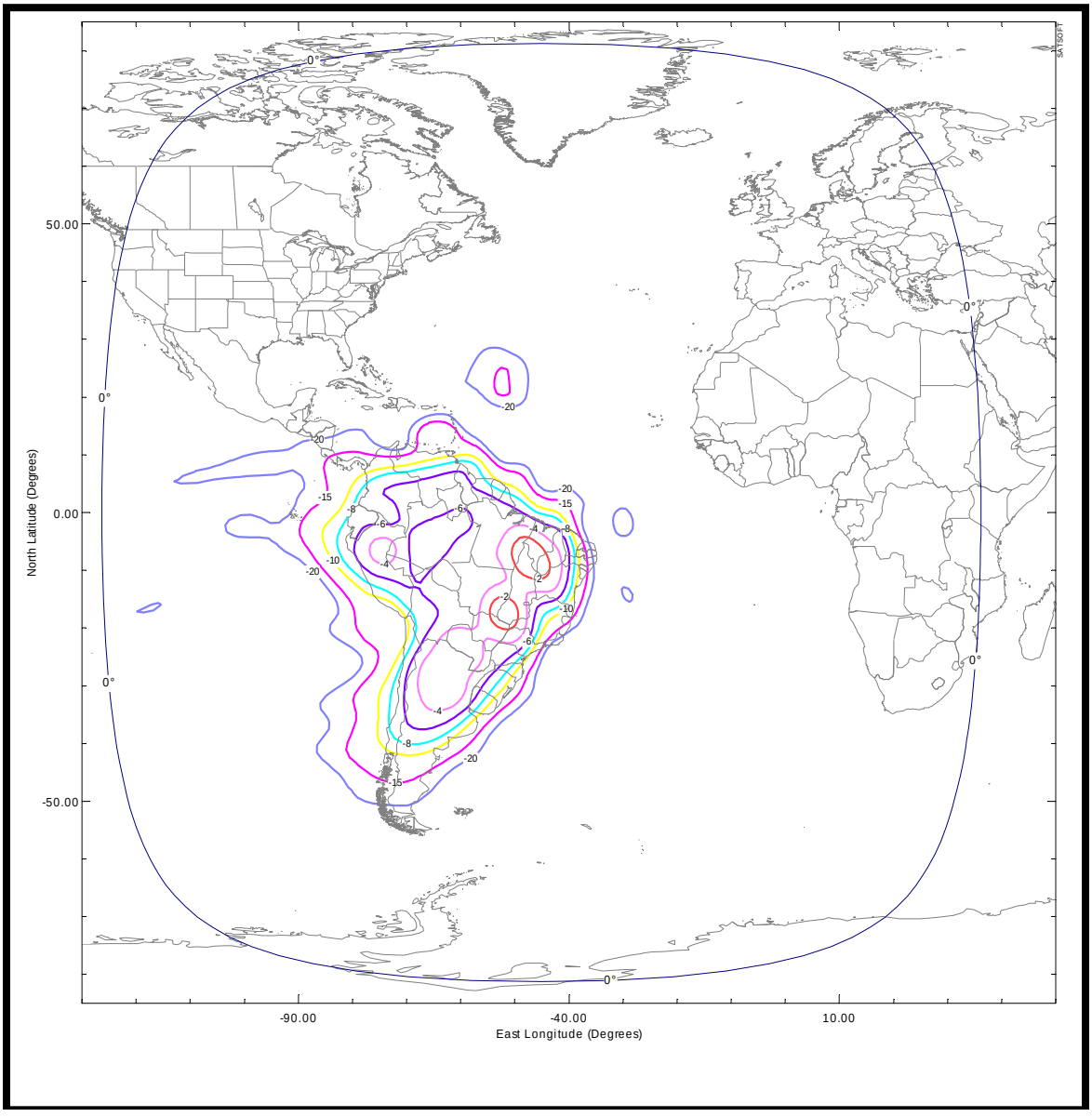


EXHIBIT 2K: Extended Ku-Band South America Transmit Beam (Schedule S Beam ID: BHDL)

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

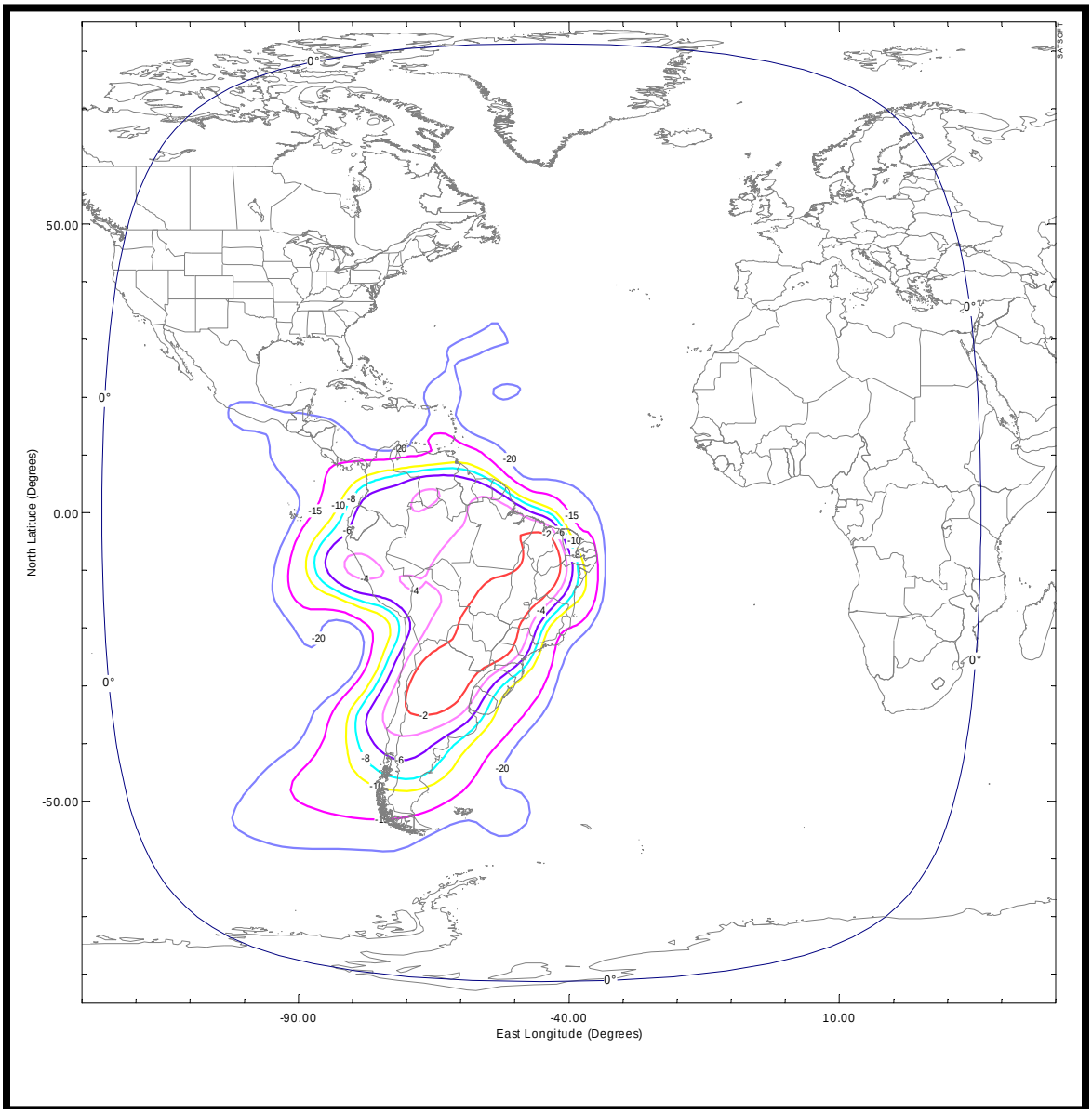


EXHIBIT 2L: Extended Ku-Band South America Transmit Beam (Schedule S Beam ID: BVDL)

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

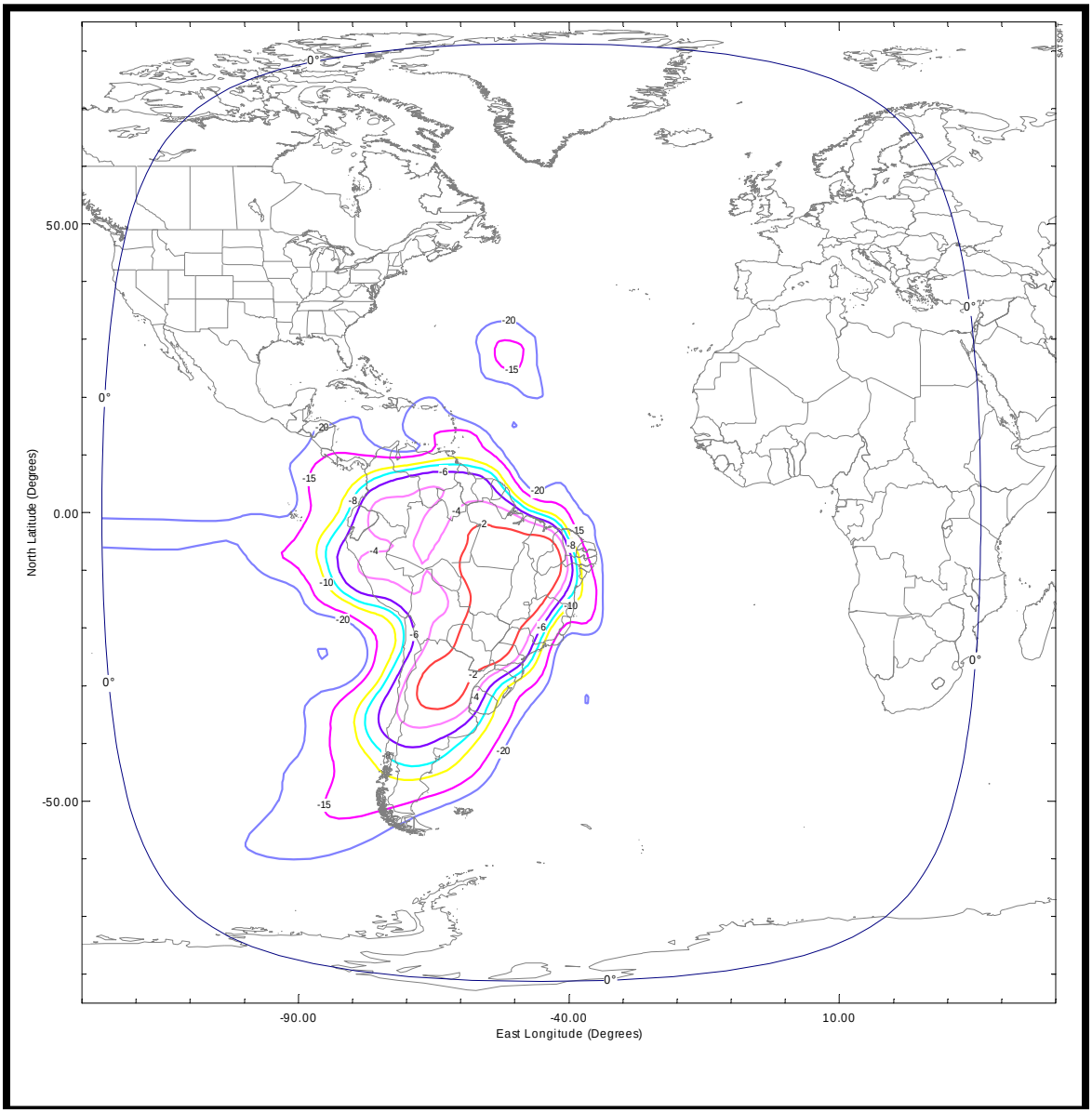


EXHIBIT 2M: Extended Ku-Band North America Receive Beam
(Schedule S Beam ID: EHUL)

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/m^2

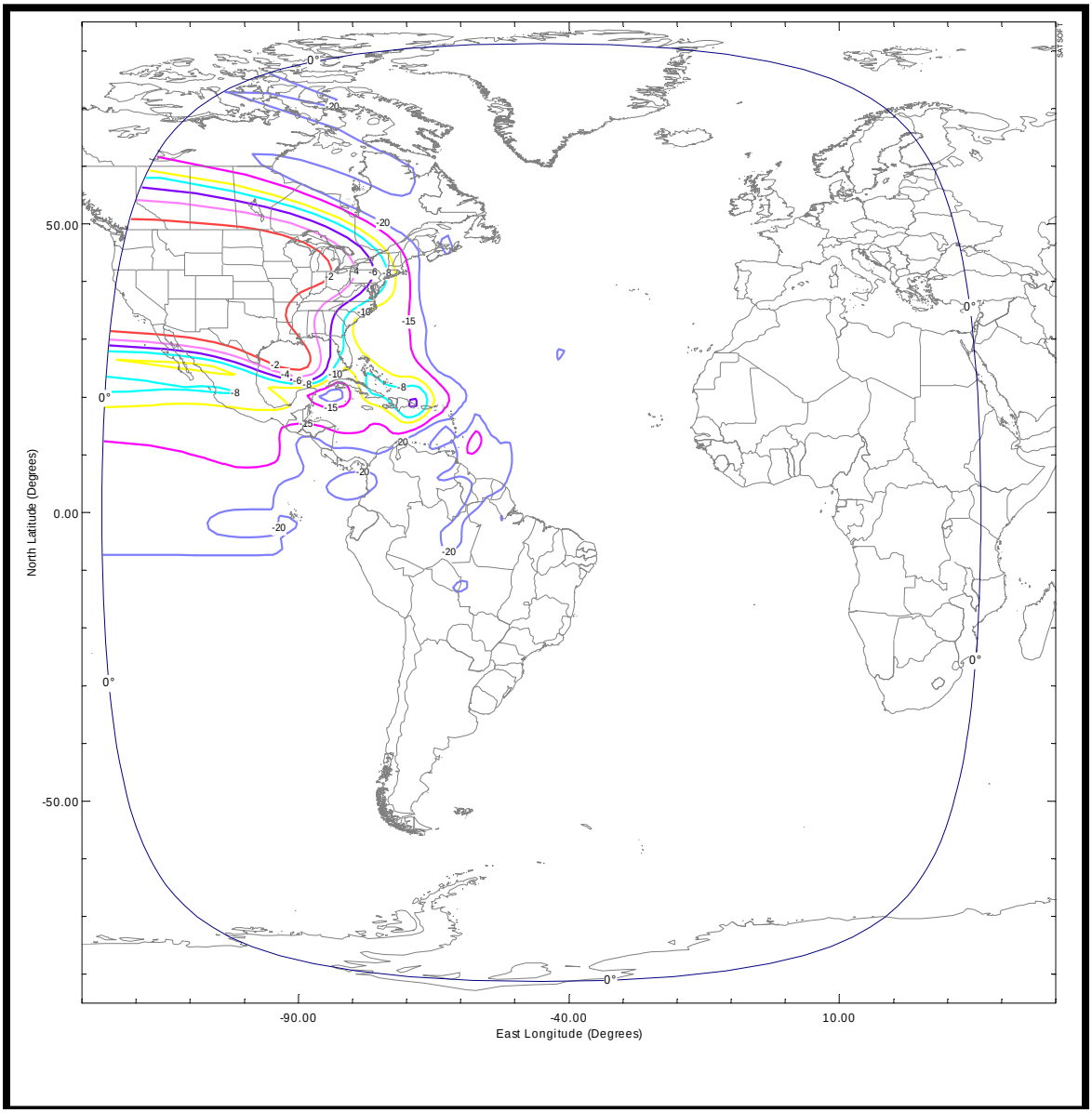


EXHIBIT 2N: Extended Ku-Band North America Receive Beam (Schedule S Beam ID: EVUL)

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/m^2

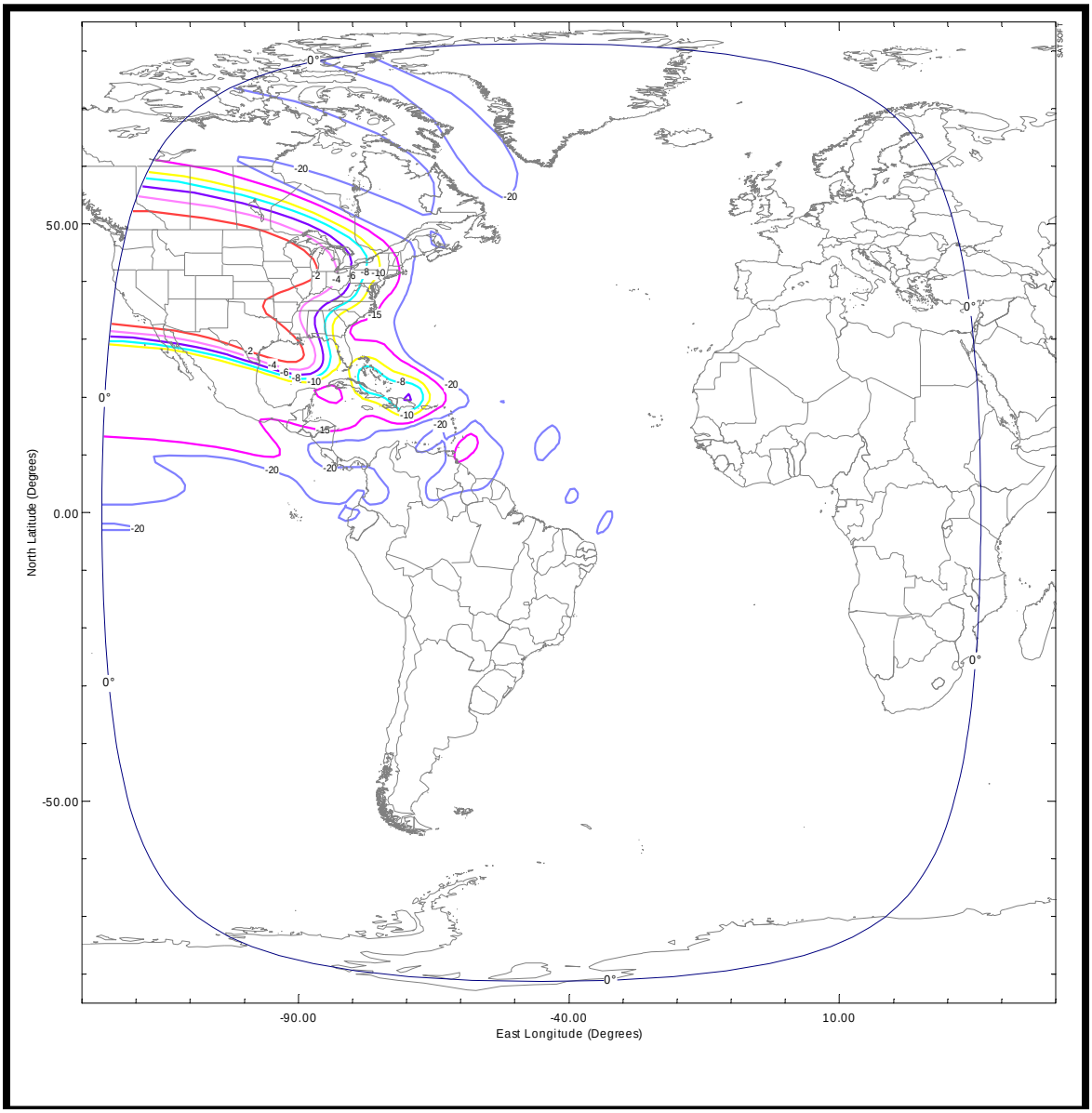


EXHIBIT 2O: Extended Ku-Band North America Transmit Beam (Schedule S Beam ID: EHDL)

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

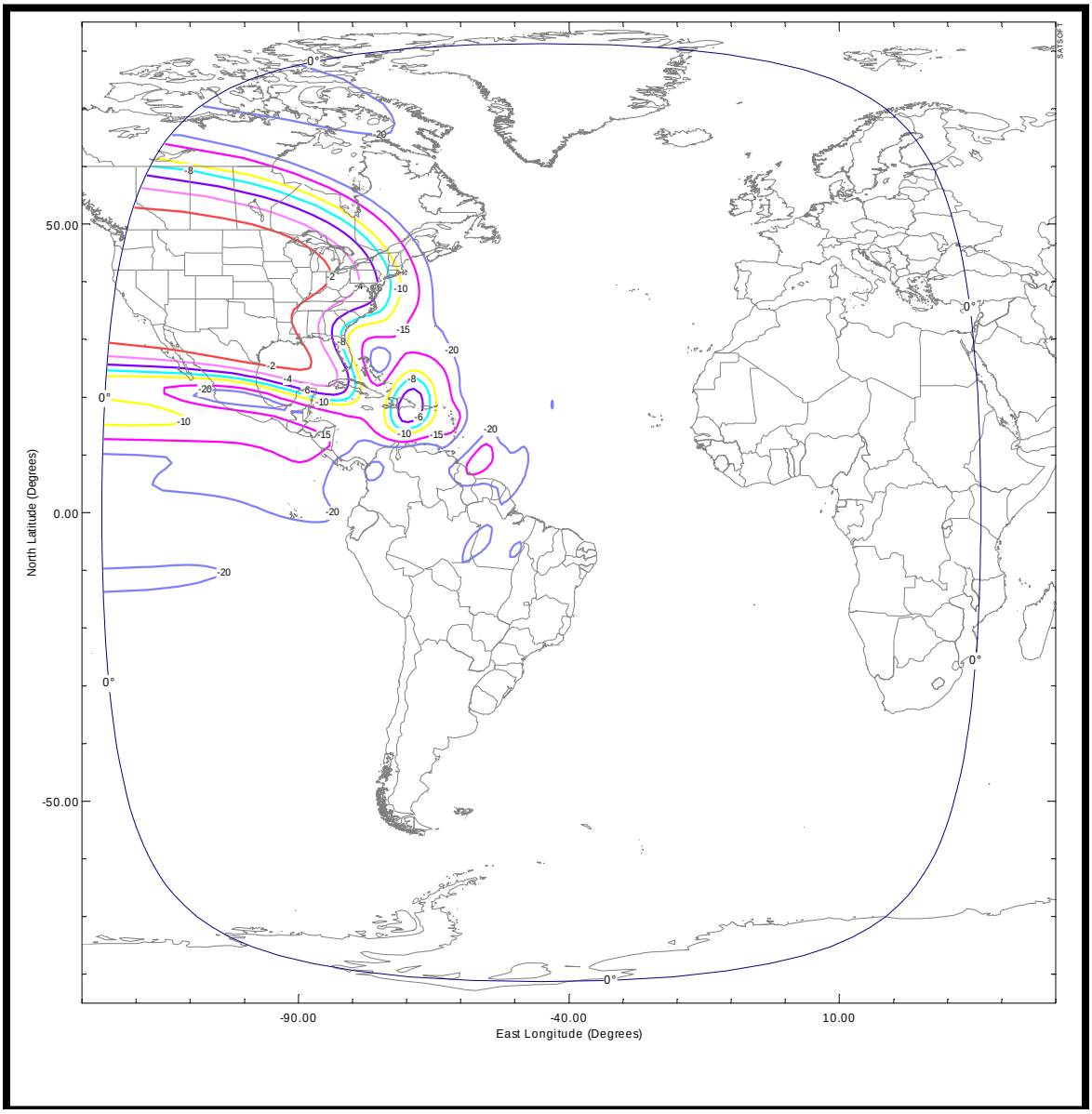


EXHIBIT 2P: Extended Ku-Band North America Transmit Beam (Schedule S Beam ID: EVDL)

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

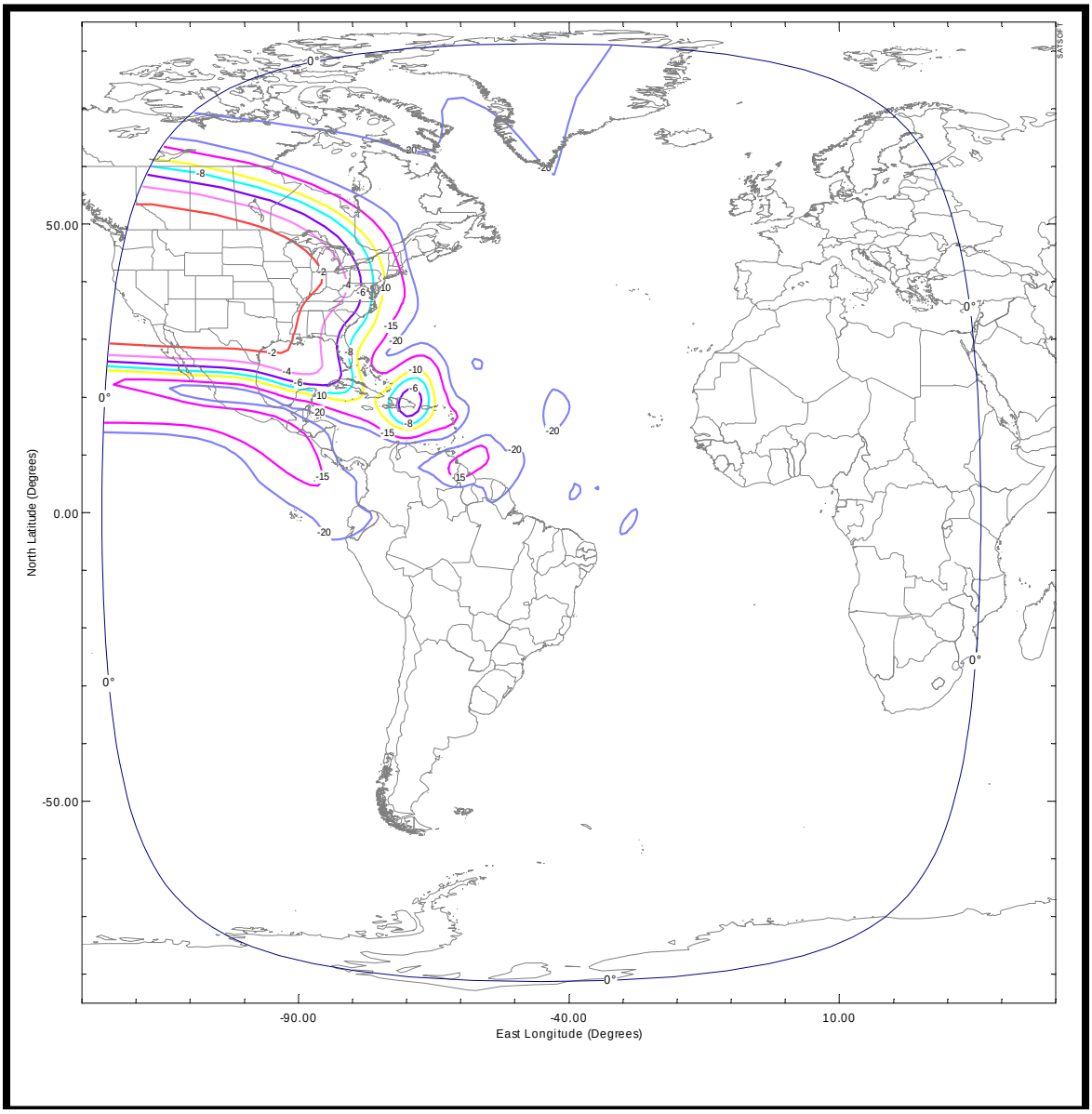


EXHIBIT 2Q: On-Station Command Receive Beam
(Communication Antenna)
(Schedule S Beam ID: CMDC)

Polarization: Vertical
Peak Antenna Gain: 32 dBi
Peak G/T: -3.0 dB/K
Command Threshold @ Peak G/T: -119.6 dBW/m^2

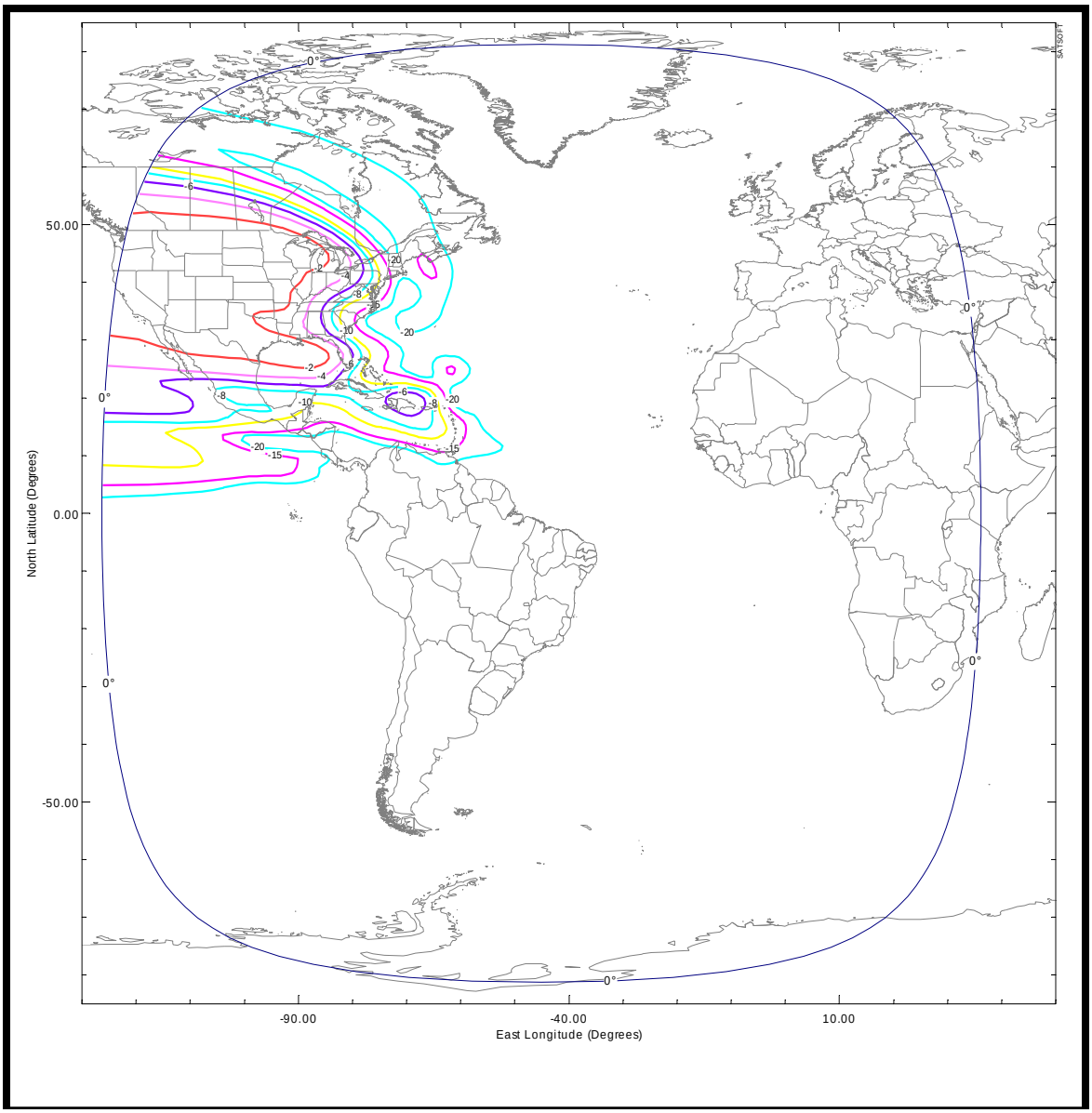
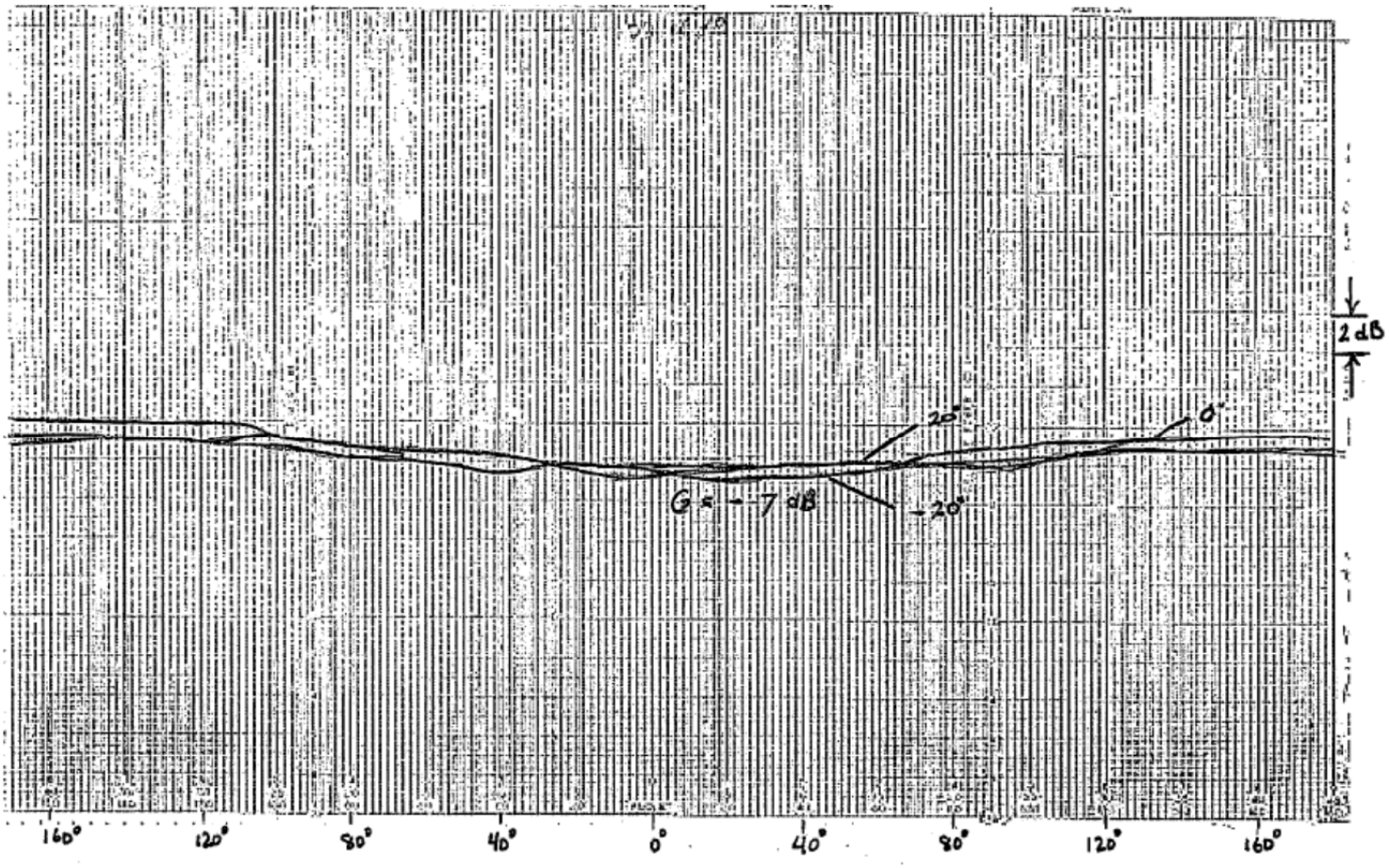


EXHIBIT 2R: Back-Up Command Receive Beam
(Bicone Antenna)
(Schedule S Beam ID: CMDB)

Polarization: Horizontal
Peak Antenna Gain: 2.2 dBi
Peak G/T: -30.8 dB/K
Command Threshold @ Peak G/T: -91.8 dBW/m^2

(a) Azimuth Cut Antenna Gain Pattern

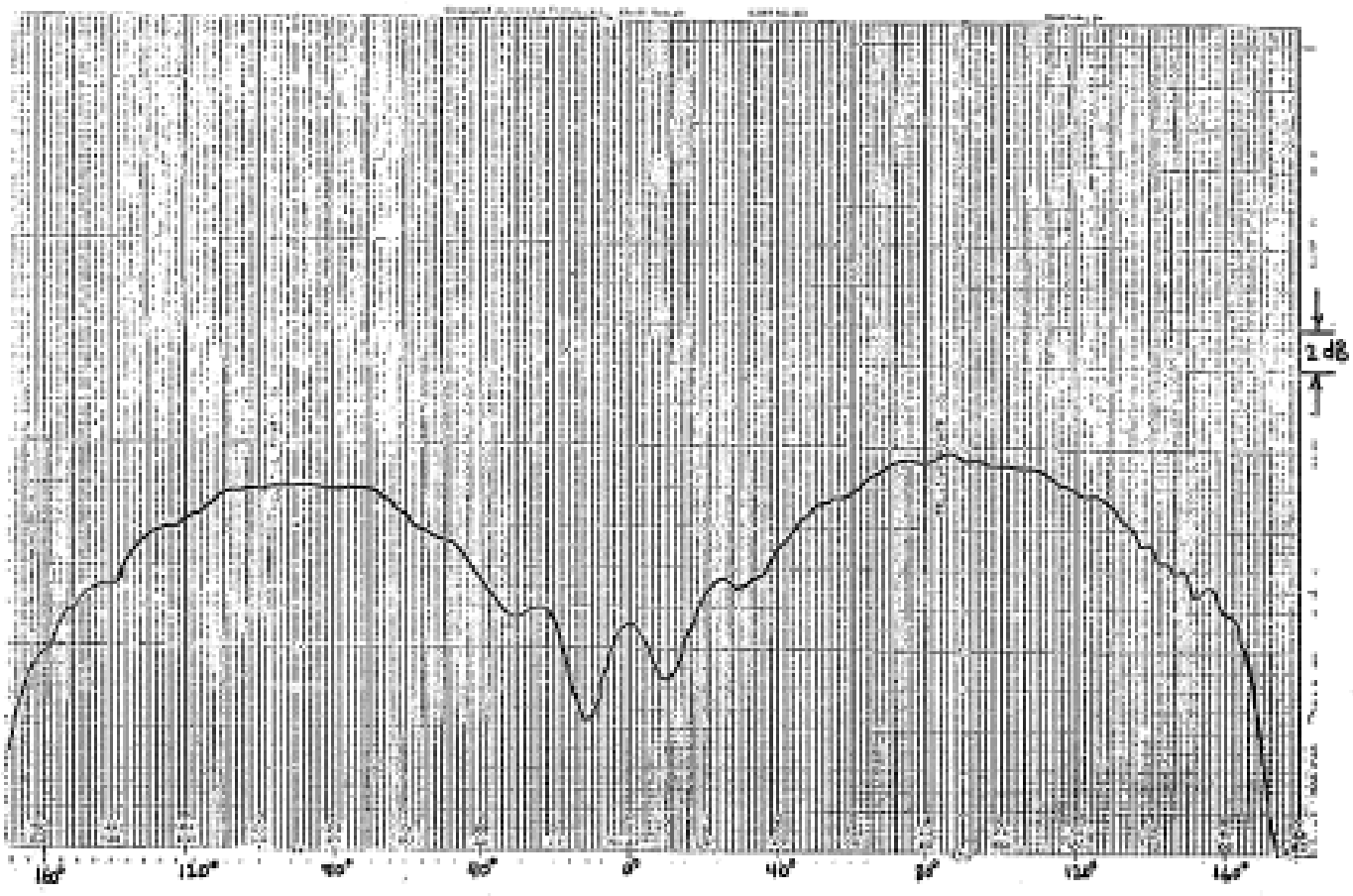


Notes:
1) Gain variation in azimuth shown for elevation angles of 0° and ±20°.
2) The x-axis represents the azimuth angle and spans from -180° to +180°. Each major axis division line represents 20° of azimuth.
3) The y-axis represents the antenna gain. Each major axis division line represents 2 dB of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

(b) Elevation Cut Antenna Gain Pattern

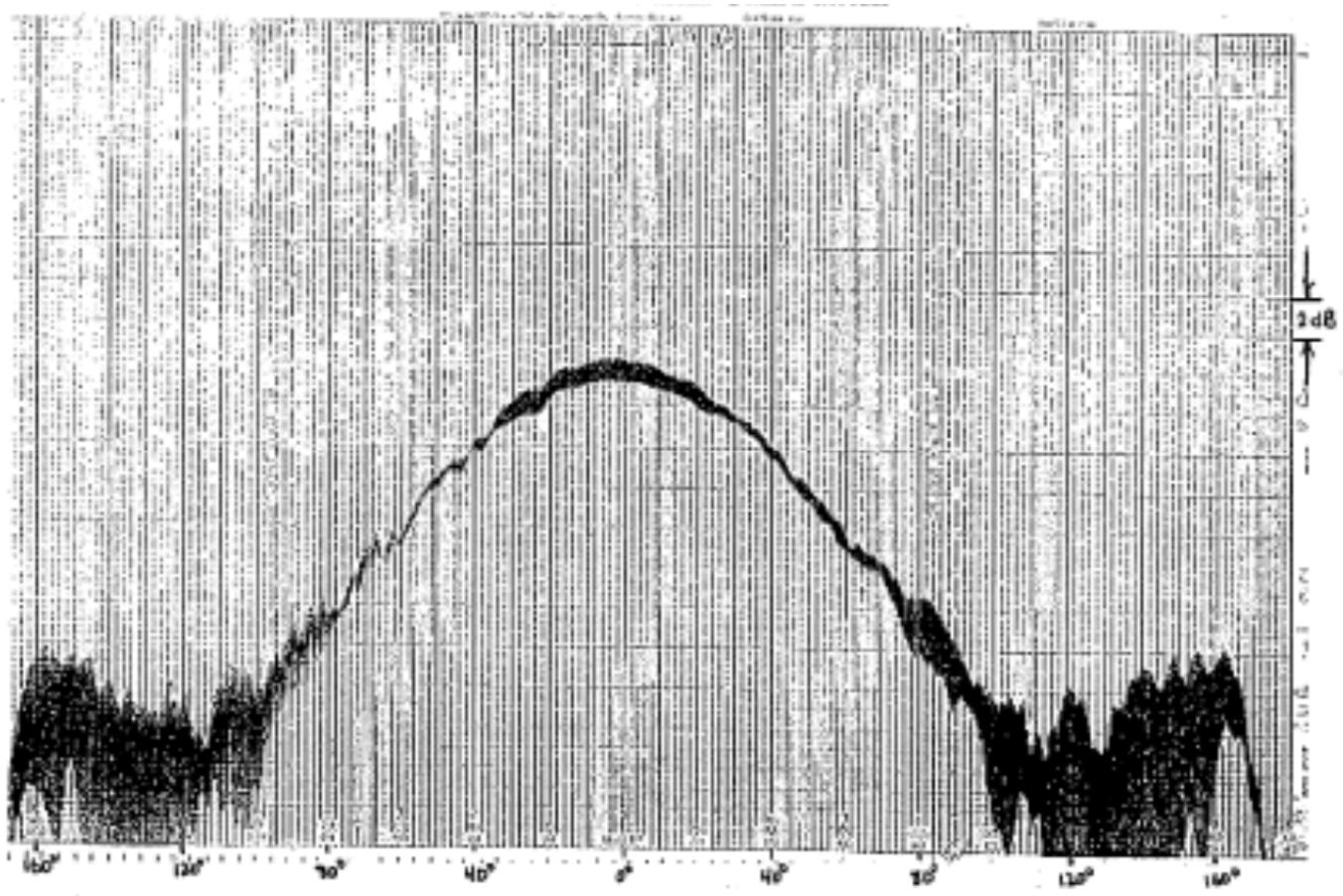


Notes:
1) Gain variation in elevation shown for the azimuth angle of 0°.
2) The x-axis represents the elevation angle and spans from -180° to +180°. Each major axis division line represents 20° of elevation.
3) The y-axis represents the antenna gain. Each major axis division line represents 2 dB of gain.

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/m^2

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

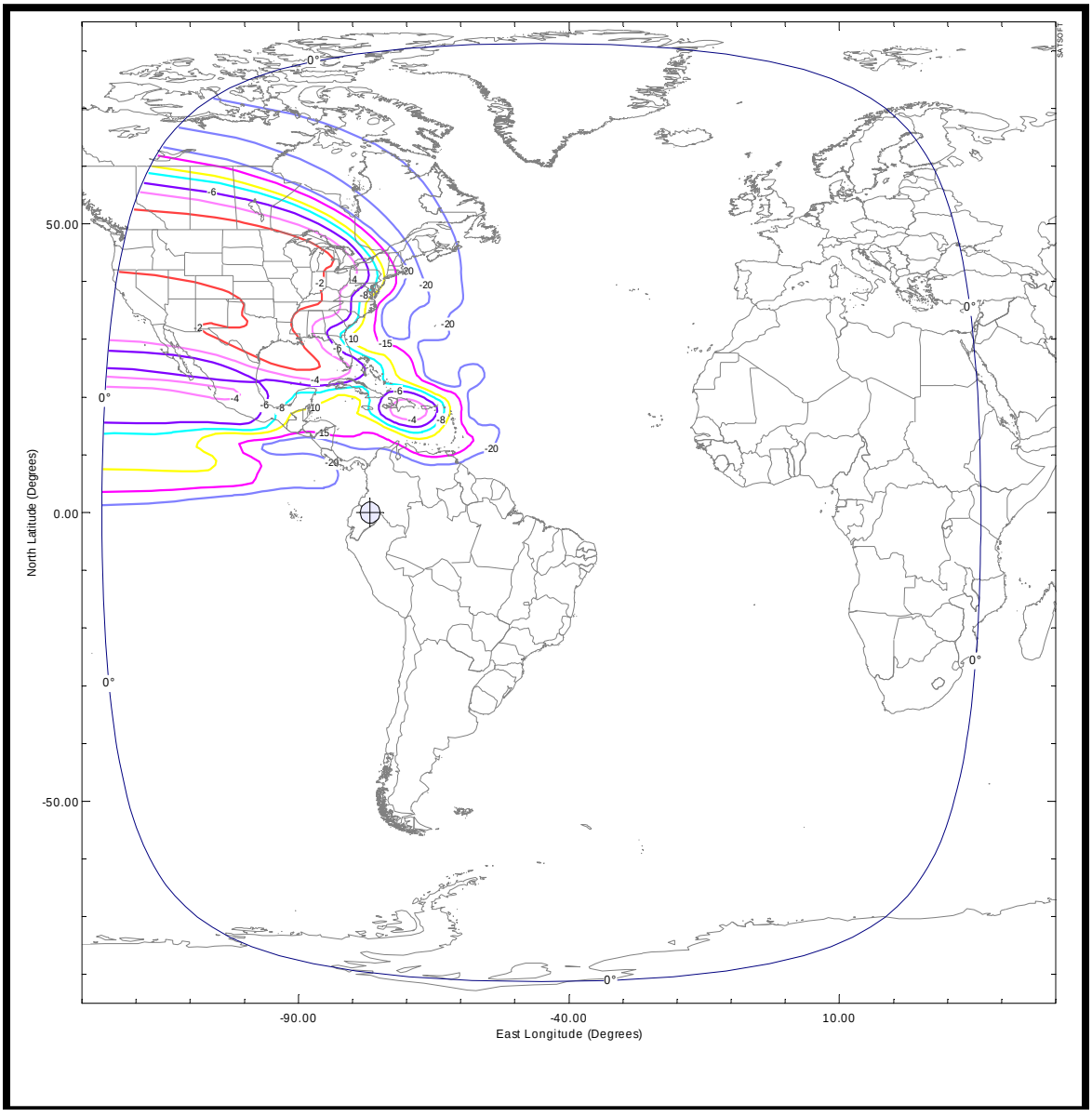
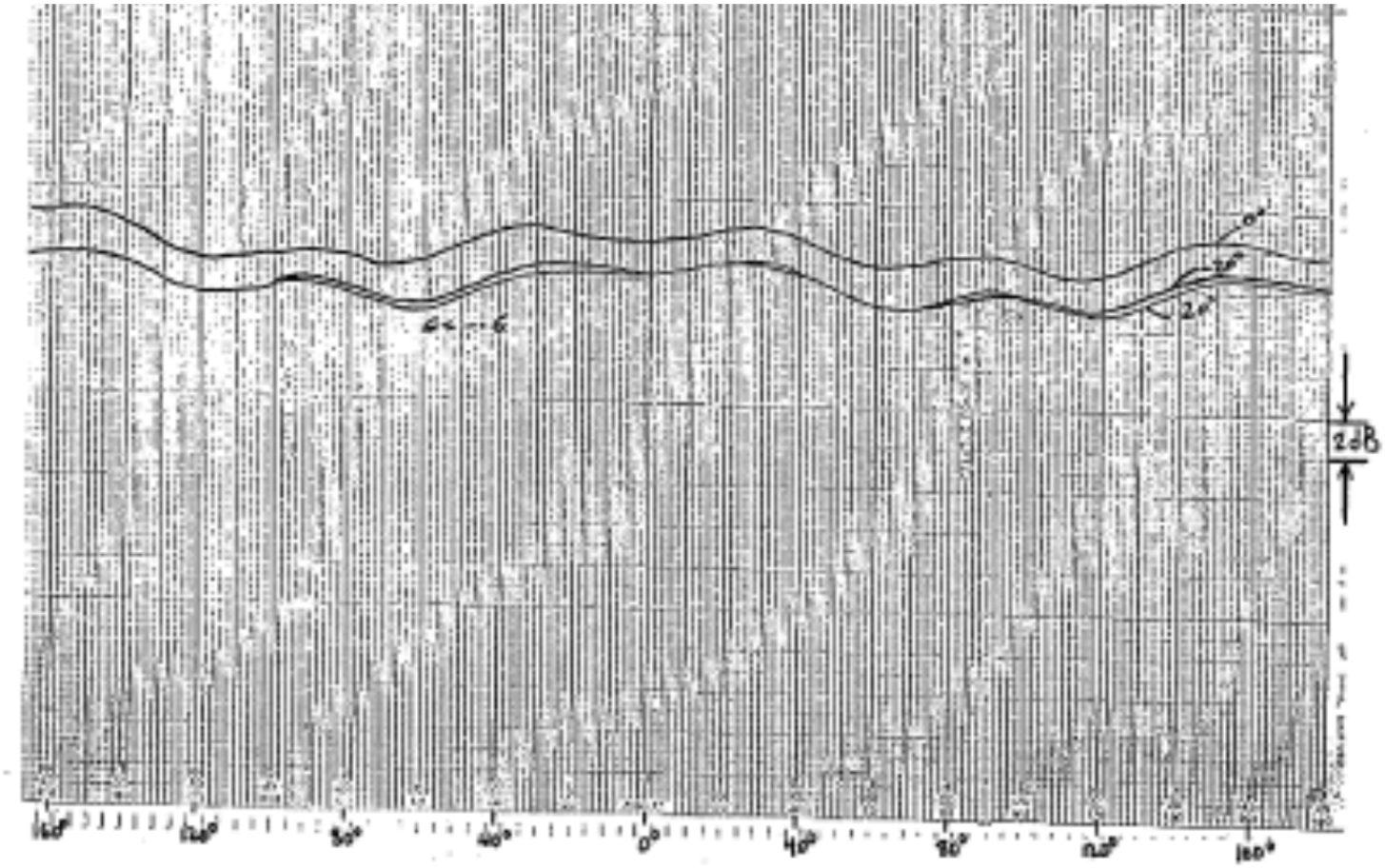


EXHIBIT 2U: Back-Up Telemetry Transmit Beam
(Bicone Antenna)
(Schedule S Beam ID: TLMB)

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

(a) Azimuth Cut Antenna Gain Pattern

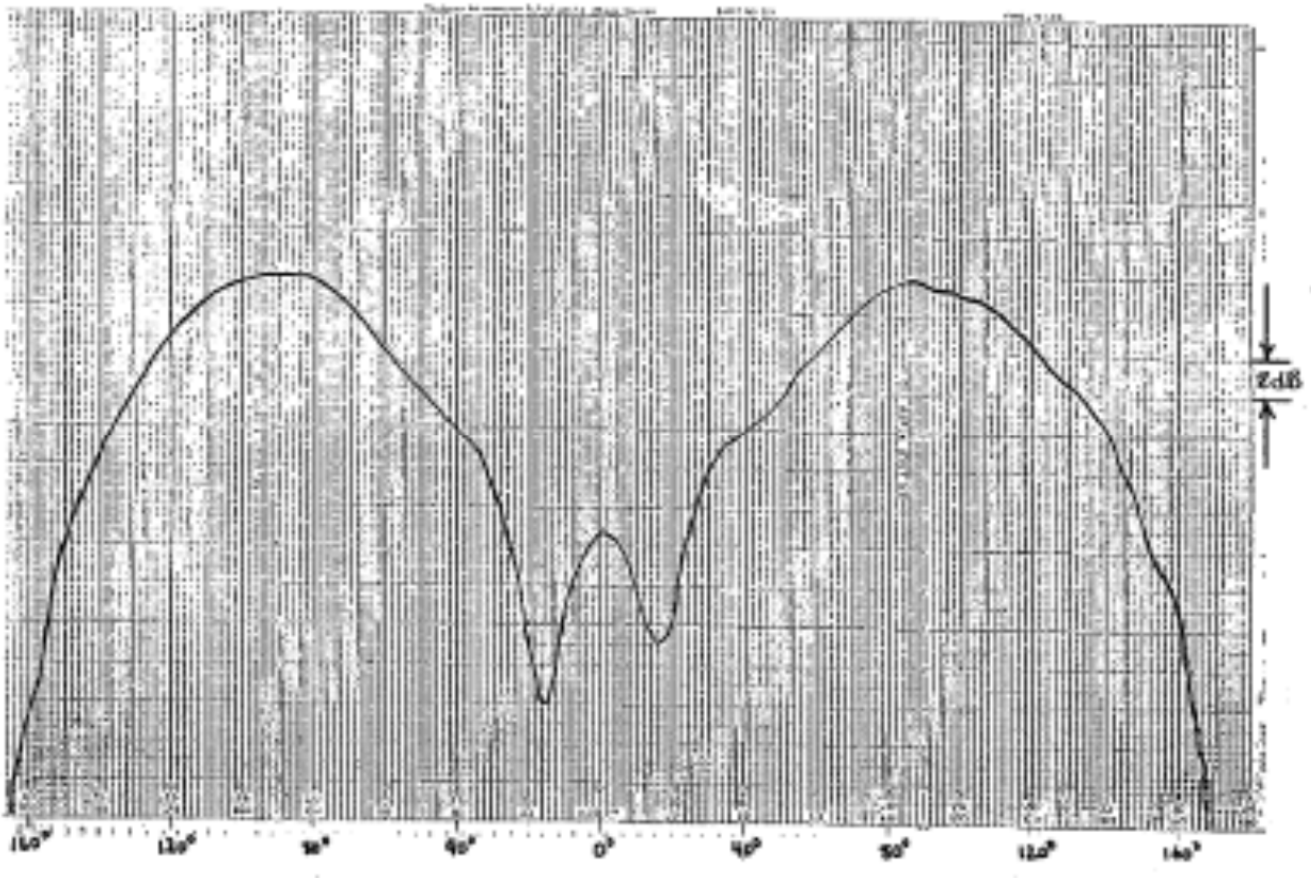


Notes:
1) Gain variation in azimuth shown for elevation angles of 0° and ±20°.
2) The x-axis represents the azimuth angle and spans from -180° to +180°. Each major axis division line represents 20° of azimuth.
3) The y-axis represents the antenna gain. Each major axis division line represents 2 dB of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

EXHIBIT 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

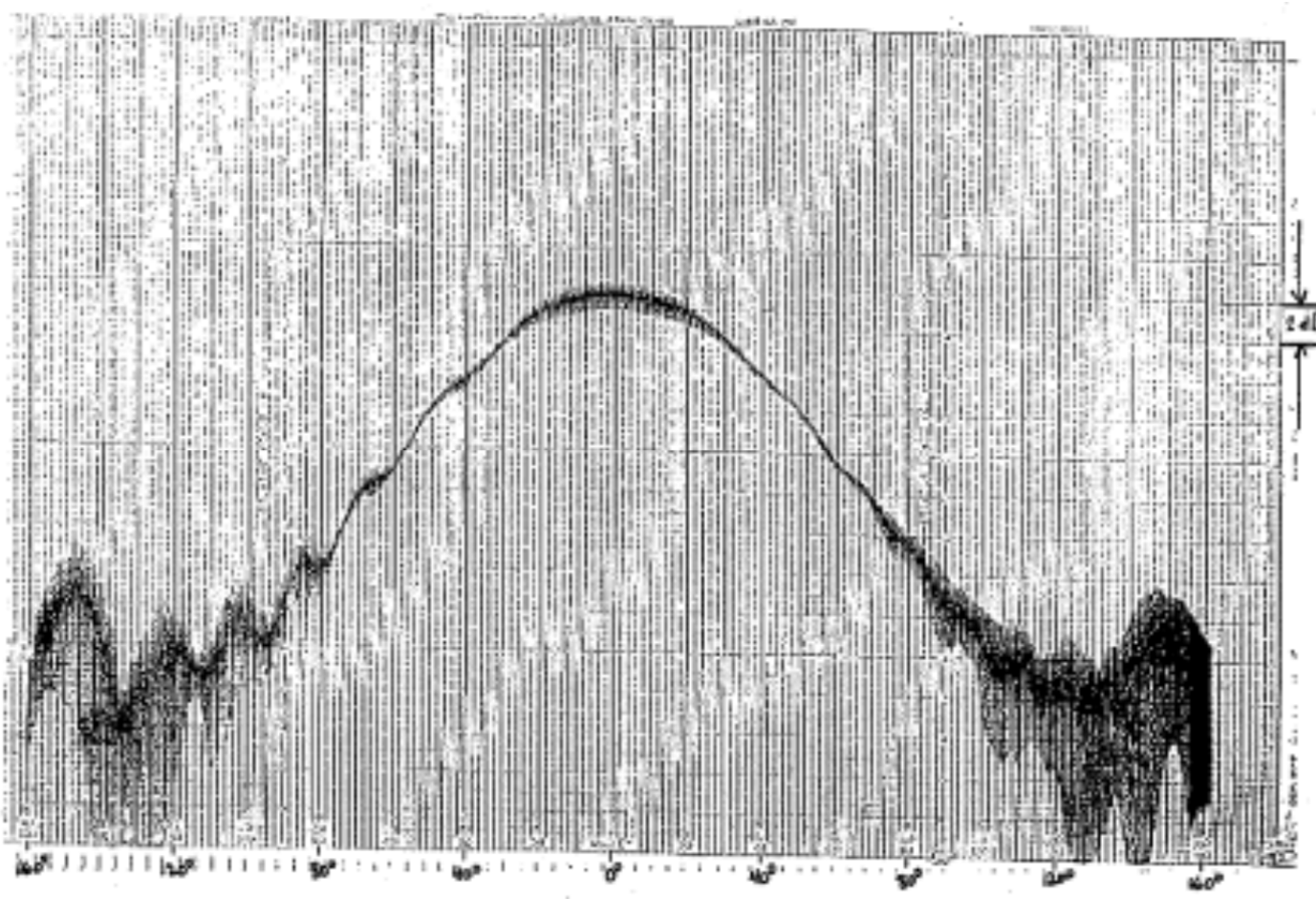


Notes:
1) Gain variation in elevation shown for the azimuth angle of 0°.
2) The x-axis represents the elevation angle and spans from -180° to +180°. Each major axis division line represents 20° of elevation.
3) The y-axis represents the antenna gain. Each major axis division line represents 2 dB of gain.

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

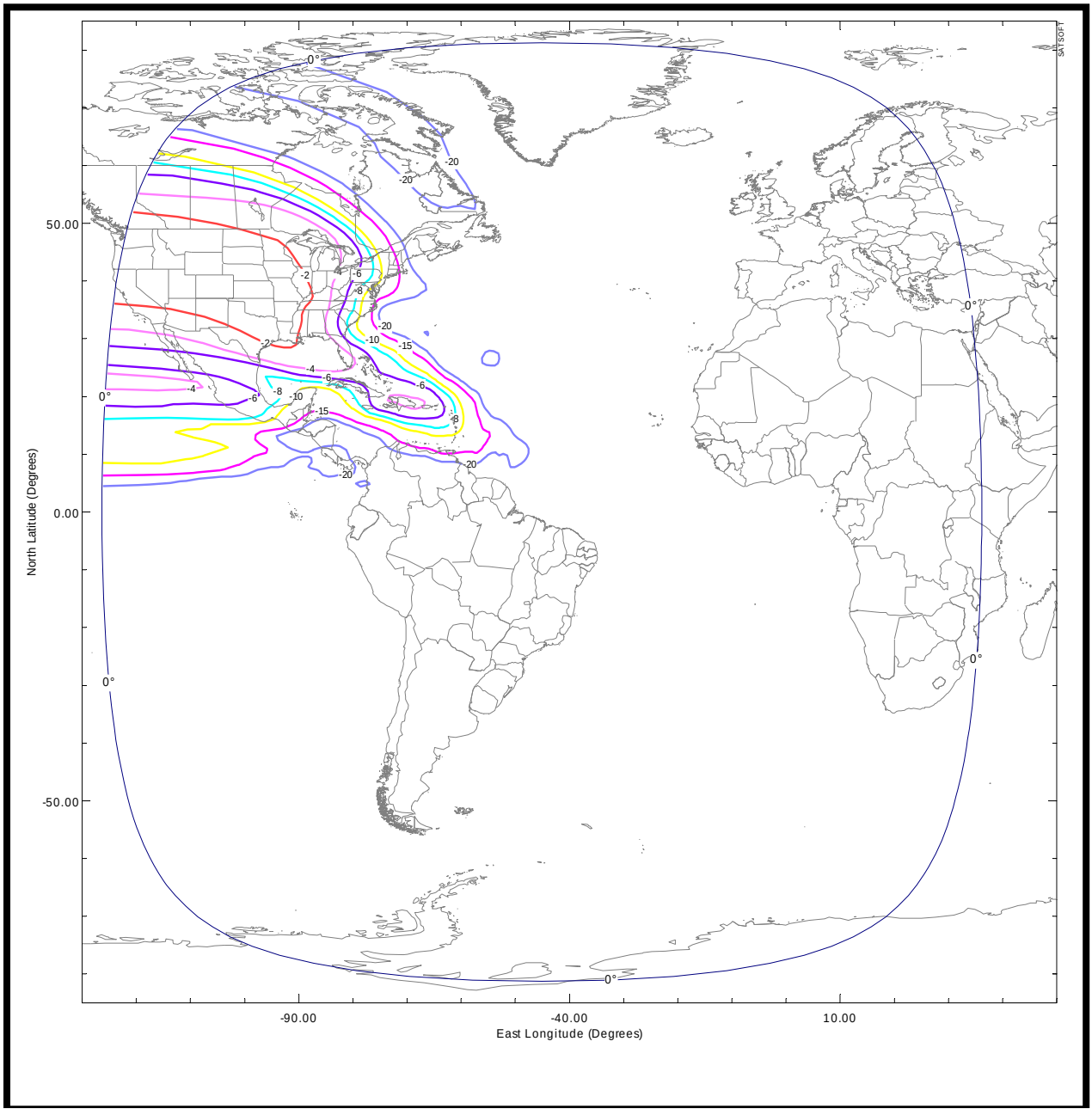
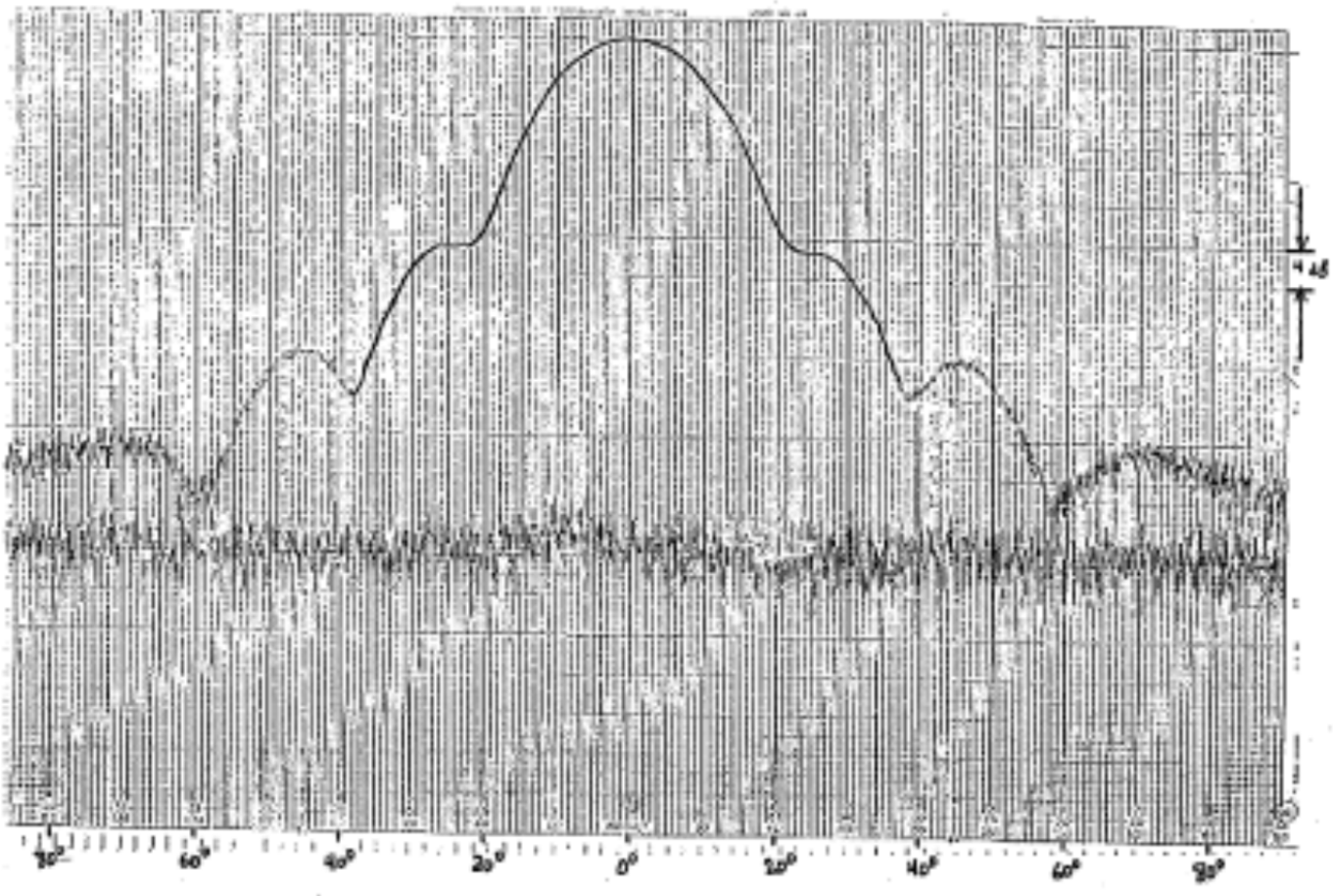


EXHIBIT 2X: ULPC Transmit Beam
(Global Antenna)
(Schedule S Beam ID: UPGH)

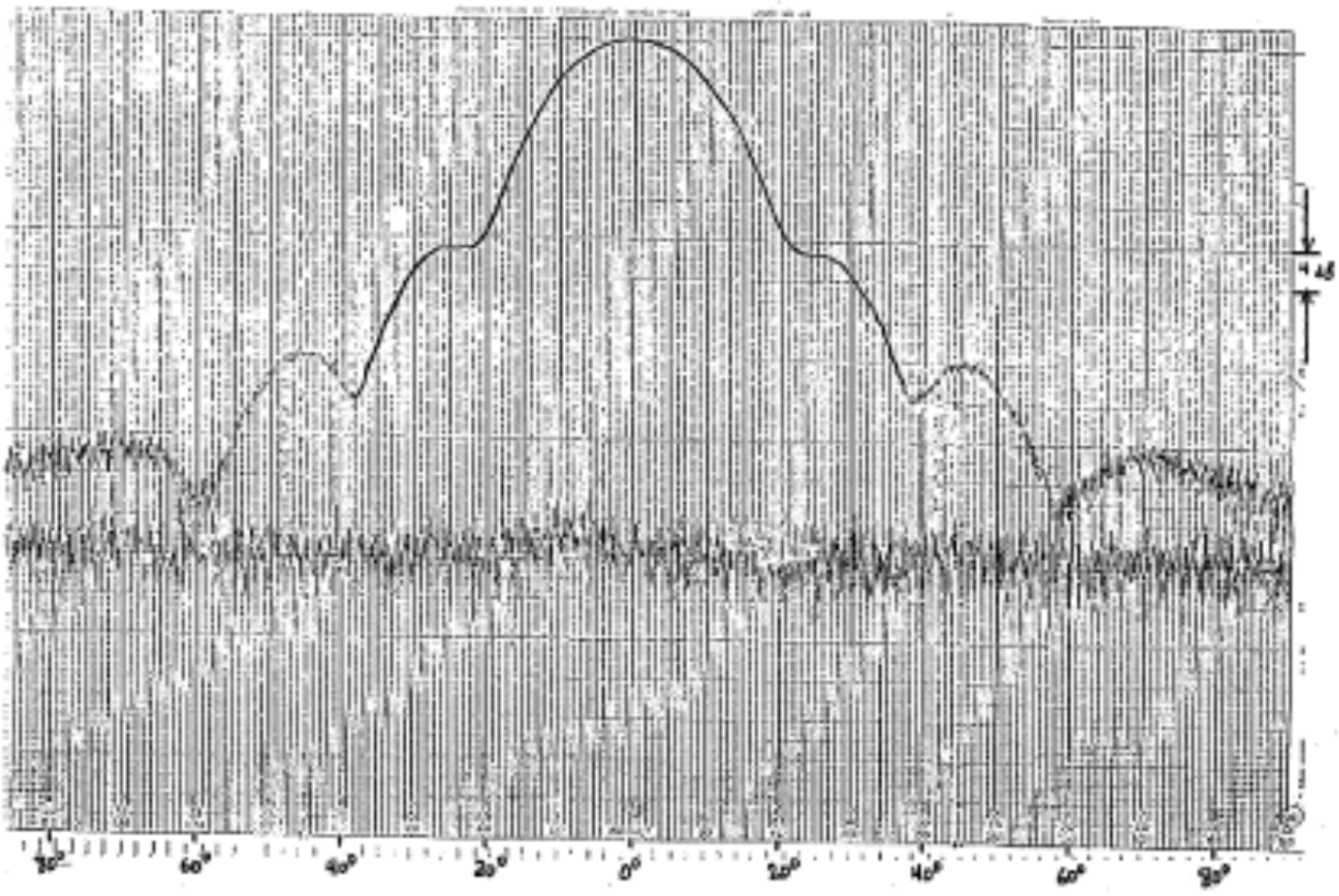
Polarization: Horizontal
Peak Antenna Gain: 24.2 dBi
Peak EIRP: 19.1 dBW



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: EMISSION DESIGNATORS

Signal Type	Emission Designator	Allocated Bandwidth (kHz)
Analog TV/FM Carrier	36M0F3F	36000
Analog TV/FM Carrier	24M0F3F	24000
64 kbps Carrier	100KG7W	100
6000 kbps carrier	10M3G7W	10300
18431 kbps Carrier	27M0G7W	27000
24575 kbps Carrier	36M0G7W	36000

EXHIBIT 4: POWER FLUX DENSITY CALCULATIONS

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	52.1*
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	-140.3	-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	0.3	0.0
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

EXHIBIT 4: POWER FLUX DENSITY CALCULATIONS (continued)

FREQUENCY BAND : 10950 – 11200 MHz							
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
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 5: GALAXY 11 LINK BUDGETS

UPLINK BEAM INFORMATION				
Uplink Beam Name	N. AMERICA	N. AMERICA	N. AMERICA	N. AMERICA
Uplink Frequency (GHz)	14.250	14.250	14.250	14.250
Uplink Beam Polarization	LINEAR	LINEAR	LINEAR	LINEAR
Uplink Relative Contour Level (dB)	-8.0	-8.0	-8.0	-8.0
Uplink Contour G/T (dB/K)	-1.7	-1.7	-1.7	-1.7
Uplink SFD (dBW/m2)	-81.8	-78.8	-85.8	-85.8
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0
DOWNLINK BEAM INFORMATION				
Downlink Beam Name	N. AMERICA	N. AMERICA	N. AMERICA	N. AMERICA
Downlink Frequency (GHz)	11.950	11.950	11.950	11.950
Downlink Beam Polarization	LINEAR	LINEAR	LINEAR	LINEAR
Downlink Relative Contour Level (dB)	-6.0	-6.0	-6.0	-6.0
Downlink Contour EIRP (dBW)	43.7	43.7	43.7	43.7
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0
ADJACENT SATELLITE 1				
Satellite 1 Orbital Location	43.0W	43.0W	43.0W	43.0W
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
Downlink EIRP Density (dBW/Hz)	-26.0	-26.0	-26.0	-26.0
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
ADJACENT SATELLITE 2				
Satellite 1 Orbital Location	46.8W	46.8W	46.8W	46.8W
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
Downlink EIRP Density (dBW/Hz)	-26.0	-26.0	-26.0	-26.0
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
CARRIER INFORMATION				
Carrier ID	36M0F3F	36M0G7W	10M3G7W	100KG7W
Carrier Modulation	TV/FM	QPSK	QPSK	QPSK
Peak to Peak Bandwidth of EDS (MHz)	4	N/A	N/A	N/A
Information Rate(kbps)	N/A	24575	6000	64
Code Rate	N/A	1/2x188/204	1/2x188/204	1/2x239/256
Occupied Bandwidth(kHz)	36000	30133	6771.1	75.4
Allocated Bandwidth(kHz)	36000	36000	10300	100
Minimum C/N, Clear Sky (dB)	10.0	3.36	3.87	2.99
Minimum C/N, Rain (dB)	10.0	3.36	3.57	2.79
UPLINK EARTH STATION				
Earth Station Diameter (meters)	6.1	6.1	6.1	6.1
Earth Station Gain (dBi)	56.9	56.9	56.9	56.9
Earth Station Elevation Angle	20	20	20	20
DOWNLINK EARTH STATION				
Earth Station Diameter (meters)	3.0	1.8	1.8	1.8
Earth Station Gain (dBi)	49.2	44.8	44.8	44.8
Earth Station G/T (dB/K)	26.7	22.3	22.3	22.3
Earth Station Elevation Angle	20	20	20	20
LINK FADE TYPE	Clear Sky	Clear Sky	Clear Sky	Clear Sky
UPLINK PERFORMANCE				
Uplink Earth Station EIRP (dBW)	81.1	80.3	66.1	46.0
Uplink Path Loss, Clear Sky (dB)	-207.5	-207.5	-207.5	-207.5
Uplink Rain Attenuation	0.0	0.0	0.0	0.0
Satellite G/T(dB/K)	-1.7	-1.7	-1.7	-1.7
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)	25.0	24.9	17.3	16.7
DOWNLINK PERFORMANCE				
Downlink EIRP per Carrier (dBW)	43.7	42.8	36.1	16.0
Antenna Pointing Error (dB)	-.5	-.5	-.5	-.5
Downlink Path Loss, Clear Sky (dB)	-205.9	-205.9	-205.9	-205.9
Downlink Rain Attenuation	0.0	0.0	0.0	0.0
Earth Station G/T (dB/K)	26.7	22.3	22.3	22.3
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)	17.0	12.4	12.2	11.7
COMPOSITE LINK PERFORMANCE				
C/N Uplink (dB)	25.0	24.9	17.3	16.7
C/N Downlink (dB)	17.0	12.4	12.2	11.7
C/I Intermodulation (dB)	N/A	N/A	18.4	17.9
C/I Uplink Co-Channel (dB)*	27.0	27.0	29.5	29.5
C/I Downlink Co-Channel (dB)*	27.0	27.0	29.5	29.5
C/I Uplink Adjacent Satellite 1 (dB)	23.3	23.3	15.6	15.1
C/I Downlink Adjacent Satellite 1 (dB)	19.9	14.9	14.7	14.1
C/I Uplink Adjacent Satellite 2 (dB)	24.5	24.5	16.8	16.3
C/I Downlink Adjacent Satellite 2 (dB)	22.4	18.3	18.1	17.5
C/(N+I) Composite (dB)	12.9	9.2	7.2	6.6
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	11.9	8.2	6.2	5.6
Minimum Required C/N (dB)	-10.0	-3.4	-3.9	-3.0
Excess Link Margin (dB)	1.9	4.8	2.3	2.6
Number of Carriers	1	1.0	2.0	202.4
CARRIER DENSITY LEVELS				
Uplink Power Density (dBW/Hz)	-41.8	-51.4	-59.1	-59.6
Downlink EIRP Density At Beam Peak (dBW/Hz)	-16.3	-26.0	-26.2	-26.8

EXHIBIT 5: GALAXY 11 LINK BUDGETS (continued)

UPLINK BEAM INFORMATION				
Uplink Beam Name	N. / S. AMERICA	N. / S. AMERICA	N. / S. AMERICA	N. / S. AMERICA
Uplink Frequency (GHz)	14.000	14.000	14.000	14.000
Uplink Beam Polarization	LINEAR	LINEAR	LINEAR	LINEAR
Uplink Relative Contour Level (dB)	-8.0	-8.0	-8.0	-8.0
Uplink Contour G/T (dB/K)	-1.7	-1.7	-1.7	-1.7
Uplink SFD (dBW/m2)	-82.9	-75.9	-78.9	-78.9
Rain Rate (mm/hr)	95.0	95.0	95.0	95.0
DOWNLINK BEAM INFORMATION				
Downlink Beam Name	N. / S. AMERICA	N. / S. AMERICA	N. / S. AMERICA	N. / S. AMERICA
Downlink Frequency (GHz)	11.075	11.075	11.075	11.075
Downlink Beam Polarization	LINEAR	LINEAR	LINEAR	LINEAR
Downlink Relative Contour Level (dB)	-6.0	-6.0	-6.0	-6.0
Downlink Contour EIRP (dBW)	45.9	45.9	45.9	45.9
Rain Rate (mm/hr)	95.0	95.0	95.0	95.0
ADJACENT SATELLITE 1				
Satellite 1 Orbital Location	43.0W	43.0W	43.0W	43.0W
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
Downlink EIRP Density (dBW/Hz)	-19.4	-19.4	-19.4	-19.4
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
ADJACENT SATELLITE 2				
Satellite 1 Orbital Location	46.8W	46.8W	46.8W	46.8W
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
Downlink EIRP Density (dBW/Hz)	-26.0	-26.0	-26.0	-26.0
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
CARRIER INFORMATION				
Carrier ID	24M0F3F	27M0G7W	10M3G7W	100KG7W
Carrier Modulation	TV/FM	QPSK	QPSK	QPSK
Peak to Peak Bandwidth of EDS (MHz)	4	N/A	N/A	N/A
Information Rate(kbps)	N/A	18432	6000	64
Code Rate	N/A	1/2x188/204	1/2x188/204	1/2x239/256
Occupied Bandwidth(kHz)	24000	22600	6771.1	75.4
Allocated Bandwidth(kHz)	24000	27000	10300	100
Minimum C/N, Clear Sky (dB)	10.0	3.36	3.87	2.99
Minimum C/N, Rain (dB)	10.0	3.36	3.57	2.79
UPLINK EARTH STATION				
Earth Station Diameter (meters)	6.1	6.1	6.1	6.1
Earth Station Gain (dBi)	56.7	56.7	56.7	56.7
Earth Station Elevation Angle	20	20	20	20
DOWNLINK EARTH STATION				
Earth Station Diameter (meters)	3.0	2.4	3.0	3.0
Earth Station Gain (dBi)	48.5	46.8	48.5	48.5
Earth Station G/T (dB/K)	26.0	24.3	26.0	26.0
Earth Station Elevation Angle	20	20	20	20
LINK FADE TYPE	Clear Sky	Clear Sky	Clear Sky	Clear Sky
UPLINK PERFORMANCE				
Uplink Earth Station EIRP (dBW)	80.0	77.3	71.0	51.1
Uplink Path Loss, Clear Sky (dB)	-207.3	-207.3	-207.3	-207.3
Uplink Rain Attenuation	0.0	0.0	0.0	0.0
Satellite G/T(dB/K)	-1.7	-1.7	-1.7	-1.7
Boltzman Constant(dBW/K-Hz)	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-73.8	-73.5	-68.3	-48.8
Uplink C/N(dB)	25.8	23.3	22.3	21.9
DOWNLINK PERFORMANCE				
Downlink EIRP per Carrier (dBW)	45.9	41.5	36.3	16.3
Antenna Pointing Error (dB)	-.5	-.5	-.5	-.5
Downlink Path Loss, Clear Sky (dB)	-205.3	-205.3	-205.3	-205.3
Downlink Rain Attenuation	0.0	0.0	0.0	0.0
Earth Station G/T (dB/K)	26.0	24.3	26.0	26.0
Boltzman Constant(dBW / K - Hz)	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-73.8	-73.5	-68.3	-48.8
Downlink C / N(dB)	20.9	15.1	16.9	16.4
COMPOSITE LINK PERFORMANCE				
C/N Uplink (dB)	25.8	23.3	22.3	21.9
C/N Downlink (dB)	20.9	15.1	16.9	16.4
C/I Intermodulation (dB)	N/A	N/A	15.2	14.7
C/I Uplink Co-Channel (dB)*	27.5	27.0	26.2	26.4
C/I Downlink Co-Channel (dB)*	27.5	27.0	26.2	26.4
C/I Uplink Adjacent Satellite 1 (dB)	24.0	21.6	20.5	20.1
C/I Downlink Adjacent Satellite 1 (dB)	16.5	10.6	12.5	12.0
C/I Uplink Adjacent Satellite 2 (dB)	25.2	22.8	21.7	21.3
C/I Downlink Adjacent Satellite 2 (dB)	25.8	20.1	21.7	21.3
C/(N+I) Composite (dB)	13.4	8.3	8.5	8.1
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	12.4	7.3	7.5	7.1
Minimum Required C/N (dB)	-10.0	-3.4	-3.9	-3.0
Excess Link Margin (dB)	2.4	3.9	3.7	4.1
Number of Carriers	1	1.0	2.6	270.0
CARRIER DENSITY LEVELS				
Uplink Power Density (dBW/Hz)	-42.8	-53.0	-54.0	-54.5
Downlink EIRP Density At Beam Peak (dBW/Hz)	-14.1	-26.0	-26.0	-26.4

EXHIBIT 6: 43° W.L. LINK BUDGETS

UPLINK BEAM INFORMATION				
Uplink Beam Name	N. AMERICA	N. AMERICA	N. AMERICA	N. AMERICA
Uplink Frequency (GHz)	14.250	14.250	14.250	14.250
Uplink Beam Polarization	LINEAR	LINEAR	LINEAR	LINEAR
Uplink Relative Contour Level (dB)	-8.0	-8.0	-8.0	-8.0
Uplink Contour G/T (dB/K)	-1.7	-1.7	-1.7	-1.7
Uplink SFD (dBW/m2)	-81.8	-78.8	-81.5	-81.5
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0
DOWNLINK BEAM INFORMATION				
Downlink Beam Name	N. AMERICA	N. AMERICA	N. AMERICA	N. AMERICA
Downlink Frequency (GHz)	11.950	11.950	11.950	11.950
Downlink Beam Polarization	LINEAR	LINEAR	LINEAR	LINEAR
Downlink Relative Contour Level (dB)	-6.0	-6.0	-6.0	-6.0
Downlink Contour EIRP (dBW)	43.7	43.7	43.7	43.7
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0
ADJACENT SATELLITE 1				
Satellite 1 Orbital Location	41.0W	41.0W	41.0W	41.0W
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
Downlink EIRP Density (dBW/Hz)	-26.0	-26.0	-26.0	-26.0
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
ADJACENT SATELLITE 2				
Satellite 1 Orbital Location	44.8W	44.8W	44.8W	44.8W
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
Downlink EIRP Density (dBW/Hz)	-26.0	-26.0	-26.0	-26.0
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
CARRIER INFORMATION				
Carrier ID	36M0F3F	36M0G7W	10M3G7W	100KG7W
Carrier Modulation	TV/FM	QPSK	QPSK	QPSK
Peak to Peak Bandwidth of EDS (MHz)	4	N/A	N/A	N/A
Information Rate(kbps)	N/A	24575	6000	64
Code Rate	N/A	1/2x188/204	1/2x188/204	1/2x239/256
Occupied Bandwidth(kHz)	36000	30133	6771.1	75.4
Allocated Bandwidth(kHz)	36000	36000	10300	100
Minimum C/N, Clear Sky (dB)	10.0	3.36	3.87	2.99
Minimum C/N, Rain (dB)	10.0	3.36	3.57	2.79
UPLINK EARTH STATION				
Earth Station Diameter (meters)	6.1	6.1	6.1	6.1
Earth Station Gain (dBi)	56.9	56.9	56.9	56.9
Earth Station Elevation Angle	20	20	20	20
DOWNLINK EARTH STATION				
Earth Station Diameter (meters)	3.0	1.8	1.8	1.8
Earth Station Gain (dBi)	49.2	44.8	44.8	44.8
Earth Station G/T (dB/K)	26.7	22.3	22.3	22.3
Earth Station Elevation Angle	20	20	20	20
LINK FADE TYPE	Clear Sky	Clear Sky	Clear Sky	Clear Sky
UPLINK PERFORMANCE				
Uplink Earth Station EIRP (dBW)	81.1	80.4	69.5	49.4
Uplink Path Loss, Clear Sky (dB)	-207.5	-207.5	-207.5	-207.5
Uplink Rain Attenuation	0.0	0.0	0.0	0.0
Satellite G/T(dB/K)	-1.7	-1.7	-1.7	-1.7
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)	25.0	25.0	20.6	20.1
DOWNLINK PERFORMANCE				
Downlink EIRP per Carrier (dBW)	43.7	42.8	35.2	15.1
Antenna Pointing Error (dB)	-.5	-.5	-.5	-.5
Downlink Path Loss, Clear Sky (dB)	-205.9	-205.9	-205.9	-205.9
Downlink Rain Attenuation	0.0	0.0	0.0	0.0
Earth Station G/T (dB/K)	26.7	22.3	22.3	22.3
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)	17.0	12.5	11.3	10.8
COMPOSITE LINK PERFORMANCE				
C/N Uplink (dB)	25.0	25.0	20.6	20.1
C/N Downlink (dB)	17.0	12.5	11.3	10.8
C/I Intermodulation (dB)	N/A	N/A	17.5	17.0
C/I Uplink Co-Channel (dB)*	27.0	27.0	28.6	28.6
C/I Downlink Co-Channel (dB)*	27.0	27.0	28.6	28.6
C/I Uplink Adjacent Satellite 1 (dB)	24.5	24.6	20.2	19.7
C/I Downlink Adjacent Satellite 1 (dB)	22.4	18.3	17.2	16.6
C/I Uplink Adjacent Satellite 2 (dB)	23.3	23.4	19.0	18.4
C/I Downlink Adjacent Satellite 2 (dB)	19.9	14.9	13.8	13.2
C/(N+I) Composite (dB)	12.9	9.2	7.3	6.7
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	11.9	8.2	6.3	5.7
Minimum Required C/N (dB)	-10.0	-3.4	-3.9	-3.0
Excess Link Margin (dB)	1.9	4.9	2.4	2.8
Number of Carriers	1	1.0	2.4	249.9
CARRIER DENSITY LEVELS				
Uplink Power Density (dBW/Hz)	-41.8	-51.3	-55.7	-56.3
Downlink EIRP Density At Beam Peak (dBW/Hz)	-16.3	-26.0	-27.1	-27.7

EXHIBIT 6: 43° W.L. LINK BUDGETS (continued)

UPLINK BEAM INFORMATION				
Uplink Beam Name	AM_EUR	AM_EUR	AM_EUR	AM_EUR
Uplink Frequency (GHz)	14.000	14.000	14.000	14.000
Uplink Beam Polarization	LINEAR	LINEAR	LINEAR	LINEAR
Uplink Relative Contour Level (dB)	-6.0	-6.0	-6.0	-6.0
Uplink Contour G/T (dB/K)	-4.2	-4.2	-4.2	-4.2
Uplink SFD (dBW/m2)	-70.8	-70.8	-78.8	-78.8
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0
DOWNLINK BEAM INFORMATION				
Downlink Beam Name	E. BRAZIL	E. BRAZIL	E. BRAZIL	E. BRAZIL
Downlink Frequency (GHz)	11.075	11.075	11.075	11.075
Downlink Beam Polarization	LINEAR	LINEAR	LINEAR	LINEAR
Downlink Relative Contour Level (dB)	-4.0	-4.0	-4.0	-4.0
Downlink Contour EIRP (dBW)	51.4	51.4	51.4	51.4
Rain Rate (mm/hr)	95.0	95.0	95.0	95.0
ADJACENT SATELLITE 1				
Satellite 1 Orbital Location	41.0W	41.0W	41.0W	41.0W
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
Downlink EIRP Density (dBW/Hz)	-23.4	-23.4	-23.4	-23.4
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
ADJACENT SATELLITE 2				
Satellite 1 Orbital Location	44.8W	44.8W	44.8W	44.8W
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
Downlink EIRP Density (dBW/Hz)	-20.0	-20.0	-20.0	-20.0
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
CARRIER INFORMATION				
Carrier ID	36M0F3F	36M0G7W	10M3G7W	100KG7W
Carrier Modulation	TV/FM	QPSK	QPSK	QPSK
Peak to Peak Bandwidth of EDS (MHz)	4	N/A	N/A	N/A
Information Rate(kbps)	N/A	24575	6000	64
Code Rate	N/A	1/2x188/204	1/2x188/204	1/2x239/256
Occupied Bandwidth(kHz)	36000	30133	6771.1	75.4
Allocated Bandwidth(kHz)	36000	36000	10300	100
Minimum C/N, Clear Sky (dB)	10.0	3.36	3.87	2.99
Minimum C/N, Rain (dB)	10.0	3.36	3.57	2.79
UPLINK EARTH STATION				
Earth Station Diameter (meters)	6.1	6.1	6.1	6.1
Earth Station Gain (dBi)	56.7	56.7	56.7	56.7
Earth Station Elevation Angle	20	20	20	20
DOWNLINK EARTH STATION				
Earth Station Diameter (meters)	4.6	1.8	2.4	2.4
Earth Station Gain (dBi)	52.8	44.1	46.8	46.8
Earth Station G/T (dB/K)	30.3	21.6	24.3	24.3
Earth Station Elevation Angle	20	20	20	20
LINK FADE TYPE	Clear Sky	Clear Sky	Clear Sky	Clear Sky
UPLINK PERFORMANCE				
Uplink Earth Station EIRP (dBW)	80.8	80.0	67.3	47.1
Uplink Path Loss, Clear Sky (dB)	-207.3	-207.3	-207.3	-207.3
Uplink Rain Attenuation	0.0	0.0	0.0	0.0
Satellite G/T(dB/K)	-4.2	-4.2	-4.2	-4.2
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)	22.3	22.3	16.1	15.4
DOWNLINK PERFORMANCE				
Downlink EIRP per Carrier (dBW)	45.6	44.8	38.0	17.7
Antenna Pointing Error (dB)	-.5	-.5	-.5	-.5
Downlink Path Loss, Clear Sky (dB)	-205.3	-205.3	-205.3	-205.3
Downlink Rain Attenuation	0.0	0.0	0.0	0.0
Earth Station G/T (dB/K)	30.3	21.6	24.3	24.3
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)	23.2	14.4	16.8	16.1
COMPOSITE LINK PERFORMANCE				
C/N Uplink (dB)	22.3	22.3	16.1	15.4
C/N Downlink (dB)	23.2	14.4	16.8	16.1
C/I Intermodulation (dB)	N/A	N/A	12.6	11.9
C/I Uplink Co-Channel (dB)*	25.0	25.0	21.7	21.5
C/I Downlink Co-Channel (dB)*	25.0	25.0	21.7	21.5
C/I Uplink Adjacent Satellite 1 (dB)	26.2	26.2	20.0	19.3
C/I Downlink Adjacent Satellite 1 (dB)	25.2	17.1	19.2	18.5
C/I Uplink Adjacent Satellite 2 (dB)	25.0	25.0	18.8	18.1
C/I Downlink Adjacent Satellite 2 (dB)	19.7	10.1	12.9	12.1
C/(N+I) Composite (dB)	14.4	7.7	7.0	6.3
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	13.4	6.7	6.0	5.3
Minimum Required C/N (dB)	-10.0	-3.4	-3.9	-3.0
Excess Link Margin (dB)	3.4	3.3	2.1	2.3
Number of Carriers	1	1.0	3.5	360.0
CARRIER DENSITY LEVELS				
Uplink Power Density (dBW/Hz)	-42.0	-51.5	-57.7	-58.5
Downlink EIRP Density At Beam Peak (dBW/Hz)	-16.4	-26.0	-26.3	-27.0

EXHIBIT 7: 46.8° W.L. LINK BUDGETS

UPLINK BEAM INFORMATION				
Uplink Beam Name	N. AMERICA	N. AMERICA	N. AMERICA	N. AMERICA
Uplink Frequency (GHz)	14.250	14.250	14.250	14.250
Uplink Beam Polarization	LINEAR	LINEAR	LINEAR	LINEAR
Uplink Relative Contour Level (dB)	-8.0	-8.0	-8.0	-8.0
Uplink Contour G/T (dB/K)	-1.7	-1.7	-1.7	-1.7
Uplink SFD (dBW/m2)	-82.8	-78.8	-83.8	-83.8
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0
DOWNLINK BEAM INFORMATION				
Downlink Beam Name	N. AMERICA	N. AMERICA	N. AMERICA	N. AMERICA
Downlink Frequency (GHz)	11.950	11.950	11.950	11.950
Downlink Beam Polarization	LINEAR	LINEAR	LINEAR	LINEAR
Downlink Relative Contour Level (dB)	-6.0	-6.0	-6.0	-6.0
Downlink Contour EIRP (dBW)	43.7	43.7	43.7	43.7
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0
ADJACENT SATELLITE 1				
Satellite 1 Orbital Location	44.8W	44.8W	44.8W	44.8W
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
Downlink EIRP Density (dBW/Hz)	-26.0	-26.0	-26.0	-26.0
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
ADJACENT SATELLITE 2				
Satellite 1 Orbital Location	48.8W	48.8W	48.8W	48.8W
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
Downlink EIRP Density (dBW/Hz)	-26.0	-26.0	-26.0	-26.0
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
CARRIER INFORMATION				
Carrier ID	36M0F3F	36M0G7W	10M3G7W	100KG7W
Carrier Modulation	TV/FM	QPSK	QPSK	QPSK
Peak to Peak Bandwidth of EDS (MHz)	4	N/A	N/A	N/A
Information Rate(kbps)	N/A	24575	6000	64
Code Rate	N/A	1/2x188/204	1/2x188/204	1/2x239/256
Occupied Bandwidth(kHz)	36000	30133	6771.1	75.4
Allocated Bandwidth(kHz)	36000	36000	10300	100
Minimum C/N, Clear Sky (dB)	10.0	3.36	3.87	2.99
Minimum C/N, Rain (dB)	10.0	3.36	3.57	2.79
UPLINK EARTH STATION				
Earth Station Diameter (meters)	6.1	6.1	6.1	6.1
Earth Station Gain (dBi)	56.9	56.9	56.9	56.9
Earth Station Elevation Angle	20	20	20	20
DOWNLINK EARTH STATION				
Earth Station Diameter (meters)	3.0	1.8	1.8	1.8
Earth Station Gain (dBi)	49.2	44.8	44.8	44.8
Earth Station G/T (dB/K)	26.7	22.3	22.3	22.3
Earth Station Elevation Angle	20	20	20	20
LINK FADE TYPE	Clear Sky	Clear Sky	Clear Sky	Clear Sky
UPLINK PERFORMANCE				
Uplink Earth Station EIRP (dBW)	80.1	80.7	67.3	47.2
Uplink Path Loss, Clear Sky (dB)	-207.5	-207.5	-207.5	-207.5
Uplink Rain Attenuation	0.0	0.0	0.0	0.0
Satellite G/T(dB/K)	-1.7	-1.7	-1.7	-1.7
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)	24.0	25.3	18.5	17.9
DOWNLINK PERFORMANCE				
Downlink EIRP per Carrier (dBW)	43.7	42.8	35.3	15.2
Antenna Pointing Error (dB)	-.5	-.5	-.5	-.5
Downlink Path Loss, Clear Sky (dB)	-205.9	-205.9	-205.9	-205.9
Downlink Rain Attenuation	0.0	0.0	0.0	0.0
Earth Station G/T (dB/K)	26.7	22.3	22.3	22.3
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)	17.0	12.5	11.4	10.9
COMPOSITE LINK PERFORMANCE				
C/N Uplink (dB)	24.0	25.3	18.5	17.9
C/N Downlink (dB)	17.0	12.5	11.4	10.9
C/I Intermodulation (dB)	N/A	N/A	17.6	17.1
C/I Uplink Co-Channel (dB)*	27.0	27.0	28.7	28.7
C/I Downlink Co-Channel (dB)*	27.0	27.0	28.7	28.7
C/I Uplink Adjacent Satellite 1 (dB)	23.5	24.9	18.0	17.4
C/I Downlink Adjacent Satellite 1 (dB)	21.2	16.2	15.2	14.6
C/I Uplink Adjacent Satellite 2 (dB)	23.5	24.9	18.0	17.4
C/I Downlink Adjacent Satellite 2 (dB)	22.4	18.3	17.3	16.7
C/(N+I) Composite (dB)	13.0	9.6	7.3	6.7
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	12.0	8.6	6.3	5.7
Minimum Required C/N (dB)	-10.0	-3.4	-3.9	-3.0
Excess Link Margin (dB)	2.0	5.3	2.4	2.7
Number of Carriers	1	1.0	2.4	244.3
CARRIER DENSITY LEVELS				
Uplink Power Density (dBW/Hz)	-42.8	-51.0	-57.9	-58.5
Downlink EIRP Density At Beam Peak (dBW/Hz)	-16.3	-26.0	-27.0	-27.6

EXHIBIT 7: 46.8° W.L. LINK BUDGETS (continued)

UPLINK BEAM INFORMATION				
Uplink Beam Name	N. / S. AMERICA	N. / S. AMERICA	N. / S. AMERICA	N. / S. AMERICA
Uplink Frequency (GHz)	14.000	14.000	14.000	14.000
Uplink Beam Polarization	LINEAR	LINEAR	LINEAR	LINEAR
Uplink Relative Contour Level (dB)	-8.0	-8.0	-8.0	-8.0
Uplink Contour G/T (dB/K)	-1.7	-1.7	-1.7	-1.7
Uplink SFD (dBW/m2)	-82.9	-75.9	-81.9	-81.9
Rain Rate (mm/hr)	95.0	95.0	95.0	95.0
DOWNLINK BEAM INFORMATION				
Downlink Beam Name	N. / S. AMERICA	N. / S. AMERICA	N. / S. AMERICA	N. / S. AMERICA
Downlink Frequency (GHz)	11.075	11.075	11.075	11.075
Downlink Beam Polarization	LINEAR	LINEAR	LINEAR	LINEAR
Downlink Relative Contour Level (dB)	-6.0	-6.0	-6.0	-6.0
Downlink Contour EIRP (dBW)	45.9	45.9	45.9	45.9
Rain Rate (mm/hr)	95.0	95.0	95.0	95.0
ADJACENT SATELLITE 1				
Satellite 1 Orbital Location	44.8W	44.8W	44.8W	44.8W
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
Downlink EIRP Density (dBW/Hz)	-26.0	-26.0	-26.0	-26.0
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
ADJACENT SATELLITE 2				
Satellite 1 Orbital Location	48.8W	48.8W	48.8W	48.8W
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
Downlink EIRP Density (dBW/Hz)	-26.0	-26.0	-26.0	-26.0
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
CARRIER INFORMATION				
Carrier ID	24M0G7W	27M0G7W	10M3G7W	100KG7W
Carrier Modulation	TV/FM	QPSK	QPSK	QPSK
Peak to Peak Bandwidth of EDS (MHz)	4	N/A	N/A	N/A
Information Rate(kbps)	N/A	18432	6000	64
Code Rate	N/A	1/2x188/204	1/2x188/204	1/2x239/256
Occupied Bandwidth(kHz)	24000	22600	6771.1	75.4
Allocated Bandwidth(kHz)	24000	27000	10300	100
Minimum C/N, Clear Sky (dB)	10.0	3.36	3.87	2.99
Minimum C/N, Rain (dB)	10.0	3.36	3.57	2.79
UPLINK EARTH STATION				
Earth Station Diameter (meters)	6.1	6.1	6.1	6.1
Earth Station Gain (dBi)	56.7	56.7	56.7	56.7
Earth Station Elevation Angle	20	20	20	20
DOWNLINK EARTH STATION				
Earth Station Diameter (meters)	2.4	1.8	2.4	2.4
Earth Station Gain (dBi)	46.8	44.1	46.8	46.8
Earth Station G/T (dB/K)	24.3	21.6	24.3	24.3
Earth Station Elevation Angle	20	20	20	20
LINK FADE TYPE	Clear Sky	Clear Sky	Clear Sky	Clear Sky
UPLINK PERFORMANCE				
Uplink Earth Station EIRP (dBW)	80.0	77.3	67.9	47.8
Uplink Path Loss, Clear Sky (dB)	-207.3	-207.3	-207.3	-207.3
Uplink Rain Attenuation	0.0	0.0	0.0	0.0
Satellite G/T(dB/K)	-1.7	-1.7	-1.7	-1.7
Boltzman Constant(dBW/K-Hz)	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-73.8	-73.5	-68.3	-48.8
Uplink C/N(dB)	25.8	23.3	19.1	18.6
DOWNLINK PERFORMANCE				
Downlink EIRP per Carrier (dBW)	45.9	41.5	36.1	16.1
Antenna Pointing Error (dB)	-.5	-.5	-.5	-.5
Downlink Path Loss, Clear Sky (dB)	-205.3	-205.3	-205.3	-205.3
Downlink Rain Attenuation	0.0	0.0	0.0	0.0
Earth Station G/T (dB/K)	24.3	21.6	24.3	24.3
Boltzman Constant(dBW / K - Hz)	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-73.8	-73.5	-68.3	-48.8
Downlink C / N(dB)	19.2	12.4	15.0	14.5
COMPOSITE LINK PERFORMANCE				
C/N Uplink (dB)	25.8	23.3	19.1	18.6
C/N Downlink (dB)	19.2	12.4	15.0	14.5
C/I Intermodulation (dB)	N/A	N/A	15.0	14.5
C/I Uplink Co-Channel (dB)*	27.5	27.0	26.1	26.1
C/I Downlink Co-Channel (dB)*	27.5	27.0	26.1	26.1
C/I Uplink Adjacent Satellite 1 (dB)	25.2	22.8	18.6	18.0
C/I Downlink Adjacent Satellite 1 (dB)	22.6	15.5	18.3	17.8
C/I Uplink Adjacent Satellite 2 (dB)	25.2	22.8	18.6	18.0
C/I Downlink Adjacent Satellite 2 (dB)	24.2	17.7	20.0	19.5
C/(N+I) Composite (dB)	14.8	9.1	8.8	8.3
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	13.8	8.1	7.8	7.3
Minimum Required C/N (dB)	-10.0	-3.4	-3.9	-3.0
Excess Link Margin (dB)	3.8	4.8	3.9	4.3
Number of Carriers	1	1.0	2.6	270.0
CARRIER DENSITY LEVELS				
Uplink Power Density (dBW/Hz)	-42.8	-53.0	-57.2	-57.7
Downlink EIRP Density At Beam Peak (dBW/Hz)	-14.1	-26.0	-26.2	-26.7