Engineering Statement

Intelsat License LLC ("Intelsat") proposes to relocate the Intelsat 10 satellite to operate from the 47.5° E.L. orbital location. The spacecraft will utilize the frequency bands 5925 – 6425 MHz, 14000 – 14500 MHz, 3700 – 4200 MHz, 11450 – 11700 MHz, 12250 – 12500 MHz, and 12500 – 12750 MHz to provide service to Africa, Asia, and Europe. Intelsat 10 will replace Intelsat 709, which is currently licensed to operate at 47.5° E.L. (*see* FCC file number: SAT-MOD-20120605-00094).

In November 1999, the Commission authorized Intelsat 10 to operate at 68.5° E.L. (*see* FCC File No.: SAT-LOA-19991119-00112). Intelsat now requests that the license for Intelsat 10 be modified to specify operation at 47.5° E.L.

This engineering statement provides, and in some cases updates, the following technical information:

1) Frequency Plan
2) Beam Performance and Gain Contours
3) Emission Designators
4) Power Flux Density Calculations
5) Intelsat 10 Link Budgets and Interference Analysis
6) Adjacent Satellite Link Budgets and Interference Analysis
7) Schedule S Information
8) Orbital Debris Mitigation Plan
9) Telemetry, Tracking and Control

In all other respects, the characteristics of Intelsat 10 are the same as those specified in FCC File No.: SAT-LOA-19991119-00112.

1 Frequency Plan

The Intelsat 10 frequency and polarization plan is provided in Exhibit 1. The plan details all the transponder combinations, channel bandwidths and channel gains.

Intelsat notes that there were certain inconsistencies in the Intelsat 10 frequency/channelization plan as contained in SAT-LOA-19991119-00112. The frequency plan contained in this Engineering Statement corrects those inconsistencies.

2 Beam Performance and Gain Contours

The coverage patterns for Intelsat 10 operating from 47.5° E.L are contained in Exhibit 2. The peak antenna gain, G/T, Saturation Flux Density ("SFD") and EIRP levels for each uplink and

downlink beam, as appropriate, are also provided in this exhibit. The beam performance information provided herein updates that which is contained in SAT-LOA-19991119-00112.

3 Emission Designators

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

4 Power Flux Density Levels

The power flux density ("PFD") limits for space stations operating in the 3700 – 4200 MHz and 11450 – 11700 MHz bands are contained in section 25.208 of the Commission's rules. With respect to the 12200 – 12500 MHz and 12500 – 12750 MHz bands, the PFD limits are specified in No. 21.16 of the ITU Radio Regulations.

The maximum PFD levels for the Intelsat 10 transmissions were calculated for TV/FM carriers and wide-band digital carriers listed in Exhibit 3 operating in the 3700 – 4200 MHz, 11450 – 11700 MHz, 12200 – 12500 MHz, and 12500 – 12750 MHz bands. These carriers were chosen because they generally produce high PFD levels on the Earth's surface. The maximum PFD levels for the Intelsat 10 telemetry and uplink power control beacons were also calculated. The results are provided in Exhibit 4 and show that the downlink power flux density levels of the Intelsat 10 carriers do not exceed the limits specified in Section 25.208 of the Commission's rules or No. 21.16 of the ITU Radio Regulations.

5 Intelsat 10 Link Budgets and Interference Analysis

Link analysis for Intelsat 10 was conducted for a number of representative carriers at C- and Ku-band frequencies. For the analysis it was assumed that the nearest satellites to Intelsat 10 in C-band were Africasat-1 at 46.0°E.L. and Yamal-202 at 49.0°E.L. At Ku-band, it was assumed that the nearest satellites to Intelsat 10 were Africasat-1 at 46.0°E.L. and a hypothetical satellite operating at 49.5° E.L.[1]

In C-band, the uplink power density of emissions for Africasat-1 and Yamal-202 was assumed to be -38.7 dBW/Hz, the maximum level specified in Section 25.212(d)(2) of the Commission's rules for digital C-band carriers. The maximum downlink EIRP density for Africasat-1 and Yamal-

[1] Eutelsat 48C operating at 48.0°E.L. and Eutelsat 48A operating at 48.2° E.L. were not considered in the analysis given that they are less than 1° away from Intelsat 10 and would not accurately reflect interference in a 2° spacing environment.

202 were assumed to be -33.3 dBW/Hz and -33.8 dBW/Hz, respectively[2]. Based on the coverages of the satellites, it was assumed that there was no beam isolation with respect to either of the adjacent satellites and therefore the peak EIRP densities were used in the link budgets of Intelsat 10.

For Ku-band, the uplink power density of emissions for the adjacent satellites, Africasat-1 and a hypothetical satellite at 49.5°E.L. was assumed to be -45 dBW/Hz. The maximum downlink EIRP densities of Africasat-1 and the hypothetical satellite at 49.5°E.L. were assumed to be -17.5 dBW/Hz and -20 dBW/Hz, respectively. The hypothetical satellite at 49.5°E.L. was assumed to have the same operational parameters as Intelsat 10. Based on the coverages of the satellites, it was assumed that there was no beam isolation with respect to either of the adjacent satellites and therefore the peak EIRP densities were used in the link budgets of Intelsat 10.

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

1) 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 Sections 25.209(a)(1) and 25.209(a)(2) of the FCC's rules.
2) All transmitting and receiving earth stations have a cross-polarization isolation value of at least 30 dB within their main beam lobe.
3) At C-band frequencies, degradation due to rain is not considered, given that rain (attenuation) effects are insignificant at C-band.
4) At Ku-band frequencies, rain attenuation predictions are derived using Recommendation ITU-R P.618.
5) At Ku-band frequencies, increase in noise temperature of the receiving earth station due to rain is taken into account.
6) 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 46.0°E.L. and 49.5°E.L. on the transmissions of Intelsat 10 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

[2] The downlink EIRP densities for Africasat-1(formerly Measat-1), and Yamal-202 were calculated from information provided on the operators' websites (http://www.measat.com/satellite_46e_africasat1.html, http://www.gascom.ru/en/infrastructure/space/yamal_202/background/). The Satellite Encyclopedia page for Africasat-1 (http://www.tbs-satellite.com/tse/online/sat_measat_1.html) was used to provide supplemental information for calculations that could not be based only on the operator's website.

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.

As shown in Exhibit 1, the Intelsat 10 beam connectivities are extensive. In order to keep the number of Intelsat 10 link calculations to a manageable number, worst-case performance values were assumed for each beam type. In Ku-band, an aggregate beam combining the coverage of all of the Ku-band beams was assumed. 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 Intelsat 10 uplink/downlink beam combinations. The worst-case beam performance for each Intelsat 10 beam type is provided in Table 1.

Beam Name	Beam Designation	Beam Peak G/T (dB/K)	SFD Range at Beam Peak G/T (dBW/m^2)	Beam EIRP (dBW)
Global (Horizontal)	**C-Band**	0.4	-104.4 to -79.4	41.4
Global (Vertical)				
Asia	**Ku-Band**	6.4	-101.4 to -76.4	47.4
Europe/ Africa (Horizontal)				
Europe/Africa (Vertical)				
Europe/Middle East				
Europe/Asia				
India				

Table 1: Worst-Case Beam Performance

As shown in Exhibit 1, Intelsat 10 utilizes C-band beam channels having varying bandwidths. In an effort to keep the number of link calculations to a manageable level, link calculations were not performed for each channel size. The channel size chosen for each beam was based upon the level of adjacent satellite downlink interference. As an example, if a channel having a bandwidth of 54 MHz and a channel having a bandwidth of 27 MHz have the same associated adjacent satellite downlink interfering EIRP density, then link budgets were performed only for emissions that were transmitted through the 54 MHz channel, since power density levels would typically be smaller (uplink and downlink) in comparison to those which would be transmitted through the 27 MHz channel; and thus the impact of the adjacent satellite interference would be greater on the former.

At Ku-band, Intelsat 10 can utilize the downlink frequency bands of 11450 - 11700 MHz, 12250 – 12500 MHz, and 12500 – 12750 MHz. In order to keep the number the Intelsat 10 link calculations to a manageable number, all Ku-band calculations were conducted at the single

representative uplink frequency of 14250 MHz and downlink frequency of 11950 MHz. At C-band, link calculations were conducted at the single representative uplink frequency of 6175 MHz for the uplink and 3950 MHz for the downlink.

The results of the C-band and Ku-band analyses are shown in Exhibit 5 and demonstrate that operation of the Intelsat 10 satellite from 47.5° E.L. would permit the intended services to achieve their respective performance objectives while maintaining sufficient link margin. The Intelsat 10 transmissions considered in these calculations comply with the limits contained in Sections 25.212(c) and (d) of the FCC's rules.

6 Adjacent Satellite Link Budgets and Interference Analysis

The impact of the Intelsat 10 emissions on Africasat-1, Yamal-202, and a hypothetical satellite located 49.5° E.L. were analyzed. For the C-band analysis, all calculations were conducted at the single representative frequency of 6175 MHz for the uplink and 3950 MHz for the downlink. For the Ku-band analysis, all calculations were conducted at 14250 MHz for the uplink and 11950 MHz for the downlink in Ku-band. The results of the analysis are found in Exhibits 6, 7, and 8.

Africasat-1 is a C- and Ku-band satellite operating at 46.0°E.L. At C-band the satellite has a maximum uplink beam peak G/T of 4 dB/K and a maximum downlink beam peak EIRP of 41.5 dBW. At Ku-band, Africasat-1 has a maximum uplink beam peak G/T of 11.6 dB/K and a maximum downlink beam peak EIRP of 59 dBW. The Africasat-1 channel bandwidths are 36 MHz in C-band and 54 MHz in Ku-band[3]. No information was available for the range of saturation flux densities (SFDs) available on the satellite. It was assumed that the SFDs for Africasat-1 were the same as those used for Intelsat 10's link budgets in C- and Ku-bands. For the interference analysis, it was assumed the nearest co-frequency satellites were Intelsat 10 at 47.5°E.L. and a hypothetical satellite at 44.0°E.L. The hypothetical satellite was assumed to have the same operational parameters as Africasat-1.

For the Africasat-1 adjacent satellite parameters in C-band, the maximum uplink power density of the carriers transmitted to Intelsat 10 and the hypothetical satellite at 44.0° E.L. was assumed to be -38.7 dBW/Hz, the maximum level specified in section 25.212(d)(2) of the Commission's rules for digital C-band carriers. On the downlink, the Intelsat 10 transmissions and those of the hypothetical satellite located at 44.0° E.L. were assumed to have maximum EIRP densities of -31.7 dBW/Hz and -33.3 dBW/Hz, respectively. For the analysis, a 2 dB beam isolation advantage was assumed with respect to Intelsat 10. Since the hypothetical satellite at 44.0°E.L. is assumed to have the same coverage as Africasat-1, the level of interference assumed was 8 dB below the peak EIRP of the hypothetical satellite at the Africasat-1 -8 dB contour.

[3] The operational details for Africasat-1 were found on the operator's website: http://www.measat.com/satellite_46e_africasat1.html.

In Ku-band, the maximum uplink power density of the carriers transmitted to Intelsat 10 and the hypothetical satellite at 44.0° E.L. was assumed to be -45 dBW/Hz. On the downlink, the Intelsat 10 transmissions and those of the hypothetical satellite located at 44.0° E.L. were assumed to have maximum EIRP densities of -20 dBW/Hz and -17.5 dBW/Hz, respectively. Based on the coverage of the satellites, it was assumed that there was no beam isolation advantage with respect to either of the adjacent satellites and therefore the peak EIRP densities were used in the link budgets of Africasat-1. The link budget results for Africasat-1 can be found in Exhibit 6.

Yamal-202 is a C-band satellite operating at 49.0°E.L. The satellite has a beam peak G/T of 2 dB/K and a beam peak EIRP of 44 dBW. The channel bandwidth is 72 MHz[4]. The range of SFDs available are -98 dBW/m^2 to -78 dBW/m^2. For the interference analysis, it was assumed the nearest co-frequency satellites were Intelsat 10 at 47.5°E.L. and NSS-5 at 50.5°E.L. The operational parameters for NSS-5 were used to calculate the EIRP density of the NSS-5.[5]

For the Yamal-202 adjacent satellite analysis, it was assumed that the maximum uplink power density of the carriers transmitted to Intelsat 10 and NSS-5 was assumed to be -38.7 dBW/Hz, the maximum level specified in Section 25.212(d)(2) of the Commission's rules for digital C-band carriers. On the downlink, the Intelsat 10 transmissions and those of NSS-5 were assumed to have a maximum EIRP density of -31.7 dBW/Hz and -32.0 dBW/Hz, respectively. Based on the coverages of the satellites, it was assumed that there was no beam isolation with respect to the adjacent satellites. The link budget results for Yamal-202 can be found in Exhibit 7.

The hypothetical satellite at 49.5°E.L. was assumed to be a Ku-band satellite with the same operational parameters as Intelsat 10. For the interference analysis, it was assumed the nearest co-frequency satellites were Intelsat 10 at 47.5°E.L. and a hypothetical satellite operating at 51.5°E.L. The operational parameters for the hypothetical satellite at 51.5°E.L. are assumed to be the same as those for the hypothetical satellite at 49.5°E.L. which is identical to Intelsat 10. The maximum uplink power density of the carriers transmitted to Intelsat 10 and the hypothetical satellite at 51.5° E.L. was assumed to be -45 dBW/Hz. On the downlink, the Intelsat 10 transmissions and those of the hypothetical satellite located at 51.5° E.L. were assumed to have a maximum EIRP density of -20 dBW/Hz. Due to the identical coverage of the satellites, the EIRP density from the adjacent satellites in the link budgets was assumed to be -26 dBW/Hz at the -6 dB contour of the hypothetical satellite at 49.5°E.L.. The link budget results for the hypothetical satellite at 49.5°E.L. can be found in Exhibit 8.

[4] The operational details for Yamal-202 were found on the operator's website: http://www.gascom.ru/en/infrastructure/space/yamal_202/background/

[5] The operational details for NSS-5 were found on the operator's website (http://www.ses.com/4628509/nss-5) and the satellite encyclopedia (http://www.tbs-satellite.com/tse/online/sat_intelsat_803.html).

The results of the C- and Ku-band analyses are shown in Exhibits 6, 7, and 8. The EIRP density levels of the interfered-with carriers considered in these exhibits comply with the FCC limits contained in Sections 25.212(c) and 25.212(d) of the Commission's rules.

The Intelsat 10 transmissions will be limited to those levels contained in Sections 25.212(c) and (d), unless higher levels are coordinated with affected adjacent satellite operators. In any case, the uplink power density of the Intelsat 10 digital carriers operating in the 5925 – 6425 MHz and 14000 – 14500 MHz band will not exceed -38.7 dBW/Hz and -45 dBW/Hz, respectively; and within the 3700 – 4200 MHz band the downlink EIRP density of the Intelsat 10 digital carriers will not exceed -31.7 dBW/Hz; and within the 11450 – 11700 MHz, 12250 – 12500 MHz, and 12500 – 12750 MHz bands the downlink EIRP density of the Intelsat 10 digital carriers will not exceed -20 dBW/Hz.

7 Schedule S Submission

Intelsat is providing with its application a Schedule S for the operations of Intelsat 10 from 47.5° E.L. The Schedule S contains only those Intelsat 10 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, one of two link budget files has been included. There is a file showing all of the C-band link budgets and a file showing all the Ku-band link budgets. The C-Band link budget file has been attached to the rows for C-band emissions and the Ku-band file has been attached for the Ku-band emissions.

8 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 Orbital Debris Mitigation Plan

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. However, due to the design of Intelsat 10, Intelsat will not be able to vent all pressurized systems. Accordingly, Intelsat requests a waiver of Sections 25.114(d)(14)(ii) and 25.283(c) of the Commission's rules. Intelsat 10 was designed and constructed prior to the adoption of the orbital debris mitigation rules by the FCC. Given that Intelsat 10 is an operating spacecraft and its design cannot be changed, Intelsat believes that a waiver of Sections 25.114(d)(14)(ii) and 25.283(c) is justified.

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 Intelsat 10. Intelsat is also not aware of any non-Intelsat system with an overlapping station-keeping volume with Intelsat 10 that is the subject of an ITU filing and that is either in orbit or progressing towards launch[6].

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.[7] 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 Intelsat 10, would be designated as grandfathered satellites not subject to a specific disposal altitude. Therefore, the Intelsat 10 planned disposal orbit complies with the FCC's rules.

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[6] The Intelsat 10 station-keeping boundary is adjacent to – but not overlap – that of Yahsat 1B, which is located at 47.6° E.L. Intelsat and Yahsat have coordinated the operation of their respective spacecraft in order to minimize the risk of collision.

[7] Intelsat has reserved 38.9 kg of propellant for this purpose. The propellant uncertainty has been taken into account in these calculations.

In addition, Intelsat provides the following information:

1) Planned orbital eccentricity: 1.7846×10^{-4} (This is a best estimate of optimal eccentricity to match the natural eccentricity circle due to Sun and Moon perturbations after decommission.)[8]
2) Planned apogee altitude: 314 km
3) Information concerning the methods that will be used to assess and provide adequate margins concerning fuel gauging uncertainty is given below. 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.
    a. 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 to the nominal hold-back and reserves provided to us by the manufacturer.
    b. 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 the propellant tank system.

8.5 Telemetry, Tracking and Control

A global horn antenna is used by both the command and telemetry functions as their primary antenna. As a backup the command and telemetry functions have forward and aft pipe antennas as well as a bicone antenna available. In this document, the forward and aft pipe antennas have been grouped together and referred to as the pipe antenna. Intelsat will conduct telemetry, tracking, and control operations through one or more of the following earth stations: Fuchsstadt, Germany; Fucino, Italy; and Hartebeesthoek, South Africa.

[8] 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 km. 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.

Certification Statement

I hereby certify that I am a technically qualified person and am familiar with Part 25 of the Commission's rules. The contents of this engineering statement were prepared by me or under my direct supervision and to the best of my knowledge are complete and accurate.

/s/ Jose Albuquerque	February 22, 2013
Jose Albuquerque Intelsat Senior Director Spectrum Strategy	Date

Exhibit 1- Frequency and Beam Assignments

Exhibit 1-1: C-Band

Uplink				Downlink				Channel	
Transponder Designation	Beam Name	Polarization	Center Freq. (MHz)	Transponder Designation	Beam Name	Polarization	Center Freq. (MHz)	Bandwidth (MHz)	Gain (dB)
G1C	Global	Horizontal	5955	G1C	Global	Horizontal	3730	54	128.5
G2C	Global	Horizontal	6015	G2C	Global	Horizontal	3790	54	128.5
G3C	Global	Horizontal	6075	G3C	Global	Horizontal	3850	54	128.5
G4C	Global	Horizontal	6143	G4C	Global	Horizontal	3918	54	128.5
G5C	Global	Horizontal	6199	G5C	Global	Horizontal	3974	27	128.5
G6C	Global	Horizontal	6229	G6C	Global	Horizontal	4004	27	128.5
G7C	Global	Horizontal	6259	G7C	Global	Horizontal	4034	27	128.5
G8C	Global	Horizontal	6289	G8C	Global	Horizontal	4064	27	128.5
G9C	Global	Horizontal	6319	G9C	Global	Horizontal	4094	27	128.5
G10C	Global	Horizontal	6349	G10C	Global	Horizontal	4124	27	128.5
G11C	Global	Horizontal	6379	G11C	Global	Horizontal	4154	27	128.5
G12C	Global	Horizontal	6409	G12C	Global	Horizontal	4184	27	128.5
G13C	Global	Vertical	5955	G13C	Global	Vertical	3730	54	128.2
G14C	Global	Vertical	6015	G14C	Global	Vertical	3790	54	128.2
G15C	Global	Vertical	6075	G15C	Global	Vertical	3850	54	128.2
G16C	Global	Vertical	6143	G16C	Global	Vertical	3918	54	128.2
G17C	Global	Vertical	6199	G17C	Global	Vertical	3974	27	128.2
G18C	Global	Vertical	6229	G18C	Global	Vertical	4004	27	128.2
G19C	Global	Vertical	6259	G19C	Global	Vertical	4034	27	128.2
G20C	Global	Vertical	6289	G20C	Global	Vertical	4064	27	128.2
G21C	Global	Vertical	6319	G21C	Global	Vertical	4094	27	128.2
G22C	Global	Vertical	6349	G22C	Global	Vertical	4124	27	128.2
G23C	Global	Vertical	6379	G23C	Global	Vertical	4154	27	128.2
G24C	Global	Vertical	6409	G24C	Global	Vertical	4184	27	128.2

Exhibit 1-2: KU-BAND

Uplink				Downlink				Channel	
Transponder Designation	Beam Name	Polarization	Center Freq. (MHz)	Transponder Designation	Beam Name	Polarization	Center Freq. (MHz)	Bandwidth (MHz)	Gain (dB)
ES1K	Europe/ Asia	Horizontal	14020	ES1K	Europe/ Asia	Horizontal	11477	36	121.0
ES2K	Europe/ Asia	Horizontal	14060	ES2K	Europe/ Asia	Horizontal	11517	36	121.0
ES3K	Europe/ Asia	Horizontal	14100	ES3K	Europe/ Asia	Horizontal	11557	36	121.0
ES4K	Europe/ Asia	Horizontal	14140	ES4K	Europe/ Asia	Horizontal	11597	36	121.0
ES5K	Europe/ Asia	Horizontal	14180	ES5K	Europe/ Asia	Horizontal	11637	36	121.0
ES6K	Europe/ Asia	Horizontal	14220	ES6K	Europe/ Asia	Horizontal	11677	36	121.0
EM7K	Europe/ Mid East	Vertical	14020	EM7K	Europe/ Mid East	Vertical	11477	36	120.2
EM8K	Europe/ Mid East	Vertical	14060	EM8K	Europe/ Mid East	Vertical	11517	36	120.2
EM9K	Europe/ Mid East	Vertical	14100	EM9K	Europe/ Mid East	Vertical	11557	36	120.2
EM10K	Europe/ Mid East	Vertical	14140	EM10K	Europe/ Mid East	Vertical	11597	36	120.2
EM11K	Europe/ Mid East	Vertical	14180	EM11K	Europe/ Mid East	Vertical	11637	36	120.2
EM12K	Europe/ Mid East	Vertical	14220	EM12K	Europe/ Mid East	Vertical	11677	36	120.2
EM10K	Europe/ Mid East	Vertical	14140	IN28K	India	Horizontal	12392	36	120.4
EM11K	Europe/ Mid East	Vertical	14180	IN29K	India	Horizontal	12432	36	120.4
EM12K	Europe/ Mid East	Vertical	14220	IN30K	India	Horizontal	12472	36	120.4
EM13K	Europe/ Mid East	Vertical	14270	EF13K	Europe/ Africa	Horizontal	12522	36	121.4
EM14K	Europe/ Mid East	Vertical	14310	EF14K	Europe/ Africa	Horizontal	12562	36	121.4
EM15K	Europe/ Mid East	Vertical	14350	EF15K	Europe/ Africa	Horizontal	12602	36	121.4
EM16K	Europe/ Mid East	Vertical	14390	EF16K	Europe/ Africa	Horizontal	12642	36	121.4
EM17K	Europe/ Mid East	Vertical	14430	EF17K	Europe/ Africa	Horizontal	12682	36	121.4
EM18K	Europe/ Mid East	Vertical	14470	EF18K	Europe/ Africa	Horizontal	12722	36	121.4
EM13K	Europe/ Mid East	Vertical	14270	IN13K	India	Horizontal	12522	36	120.4

Uplink				Downlink				Channel	
Transponder Designation	Beam Name	Polarization	Center Freq. (MHz)	Transponder Designation	Beam Name	Polarization	Center Freq. (MHz)	Bandwidth (MHz)	Gain (dB)
EM14K	Europe/ Mid East	Vertical	14310	IN14K	India	Horizontal	12562	36	120.4
EM15K	Europe/ Mid East	Vertical	14350	A21K	Asia	Vertical	12602	36	120.3
EM16K	Europe/ Mid East	Vertical	14390	A22K	Asia	Vertical	12642	36	120.3
EM17K	Europe/ Mid East	Vertical	14430	A23K	Asia	Vertical	12682	36	120.3
EM18K	Europe/ Mid East	Vertical	14470	A24K	Asia	Vertical	12722	36	120.3
EF13K	Europe/ Africa	Vertical	14270	EF13K	Europe/ Africa	Horizontal	12522	36	122.7
EF14K	Europe/ Africa	Vertical	14310	EF14K	Europe/ Africa	Horizontal	12562	36	122.7
EF15K	Europe/ Africa	Vertical	14350	EF15K	Europe/ Africa	Horizontal	12602	36	122.7
EF16K	Europe/ Africa	Vertical	14390	EF16K	Europe/ Africa	Horizontal	12642	36	122.7
EF17K	Europe/ Africa	Vertical	14430	EF17K	Europe/ Africa	Horizontal	12682	36	122.7
EF18K	Europe/ Africa	Vertical	14470	EF18K	Europe/ Africa	Horizontal	12722	36	122.7
EF19K	Europe/ Africa	Horizontal	14270	EF19K	Europe/ Africa	Vertical	12522	36	121.4
EF20K	Europe/ Africa	Horizontal	14310	EF20K	Europe/ Africa	Vertical	12562	36	121.4
EF21K	Europe/ Africa	Horizontal	14350	EF21K	Europe/ Africa	Vertical	12602	36	121.4
EF22K	Europe/ Africa	Horizontal	14390	EF22K	Europe/ Africa	Vertical	12642	36	121.4
EF23K	Europe/ Africa	Horizontal	14430	EF23K	Europe/ Africa	Vertical	12682	36	121.4
EF24K	Europe/ Africa	Horizontal	14470	EF24K	Europe/ Africa	Vertical	12722	36	121.4
EF13K	Europe/ Africa	Vertical	14270	IN13K	India	Horizontal	12522	36	121.7
EF14K	Europe/ Africa	Vertical	14310	IN14K	India	Horizontal	12562	36	121.7
EF15K	Europe/ Africa	Vertical	14350	A21K	Asia	Vertical	12602	36	121.6
EF16K	Europe/ Africa	Vertical	14390	A22K	Asia	Vertical	12642	36	121.6
EF17K	Europe/ Africa	Vertical	14430	A23K	Asia	Vertical	12682	36	121.6
EF18K	Europe/ Africa	Vertical	14470	A24K	Asia	Vertical	12722	36	121.6

Uplink				Downlink				Channel	
Transponder Designation	Beam Name	Polarization	Center Freq. (MHz)	Transponder Designation	Beam Name	Polarization	Center Freq. (MHz)	Bandwidth (MHz)	Gain (dB)
A7K	Asia	Vertical	14020	ES1K	Europe/ Asia	Horizontal	11477	36	120.8
A8K	Asia	Vertical	14060	ES2K	Europe/ Asia	Horizontal	11517	36	120.8
A9K	Asia	Vertical	14100	ES3K	Europe/ Asia	Horizontal	11557	36	120.8
A7K	Asia	Vertical	14020	IN25K	India	Horizontal	12272	36	120.7
A8K	Asia	Vertical	14060	IN26K	India	Horizontal	12312	36	120.7
A9K	Asia	Vertical	14100	IN27K	India	Horizontal	12352	36	120.7
A10K	Asia	Vertical	14140	EM10K	Europe/ Mid East	Vertical	11597	36	120.5
A11K	Asia	Vertical	14180	EM11K	Europe/ Mid East	Vertical	11637	36	120.5
A12K	Asia	Vertical	14220	EM12K	Europe/ Mid East	Vertical	11677	36	120.5
A10K	Asia	Vertical	14140	IN28K	India	Horizontal	12392	36	120.7
A11K	Asia	Vertical	14180	IN29K	India	Horizontal	12432	36	120.7
A12K	Asia	Vertical	14220	IN30K	India	Horizontal	12472	36	120.7
A13K	Asia	Vertical	14270	EF13K	Europe/ Africa	Horizontal	12522	36	121.7
A14K	Asia	Vertical	14310	EF14K	Europe/ Africa	Horizontal	12562	36	121.7
A13K	Asia	Vertical	14270	IN13K	India	Horizontal	12522	36	120.7
A14K	Asia	Vertical	14310	IN14K	India	Horizontal	12562	36	120.7
A15K	Asia	Vertical	14350	A21K	Asia	Vertical	12602	36	120.6
A16K	Asia	Vertical	14390	A22K	Asia	Vertical	12642	36	120.6
A17K	Asia	Vertical	14430	A23K	Asia	Vertical	12682	36	120.6
A18K	Asia	Vertical	14470	A24K	Asia	Vertical	12722	36	120.6
A15K	Asia	Vertical	14350	EF15K	Europe/ Africa	Horizontal	12602	36	121.7
A16K	Asia	Vertical	14390	EF16K	Europe/ Africa	Horizontal	12642	36	121.7
A17K	Asia	Vertical	14430	EF17K	Europe/ Africa	Horizontal	12682	36	121.7
A18K	Asia	Vertical	14470	EF18K	Europe/ Africa	Horizontal	12722	36	121.7

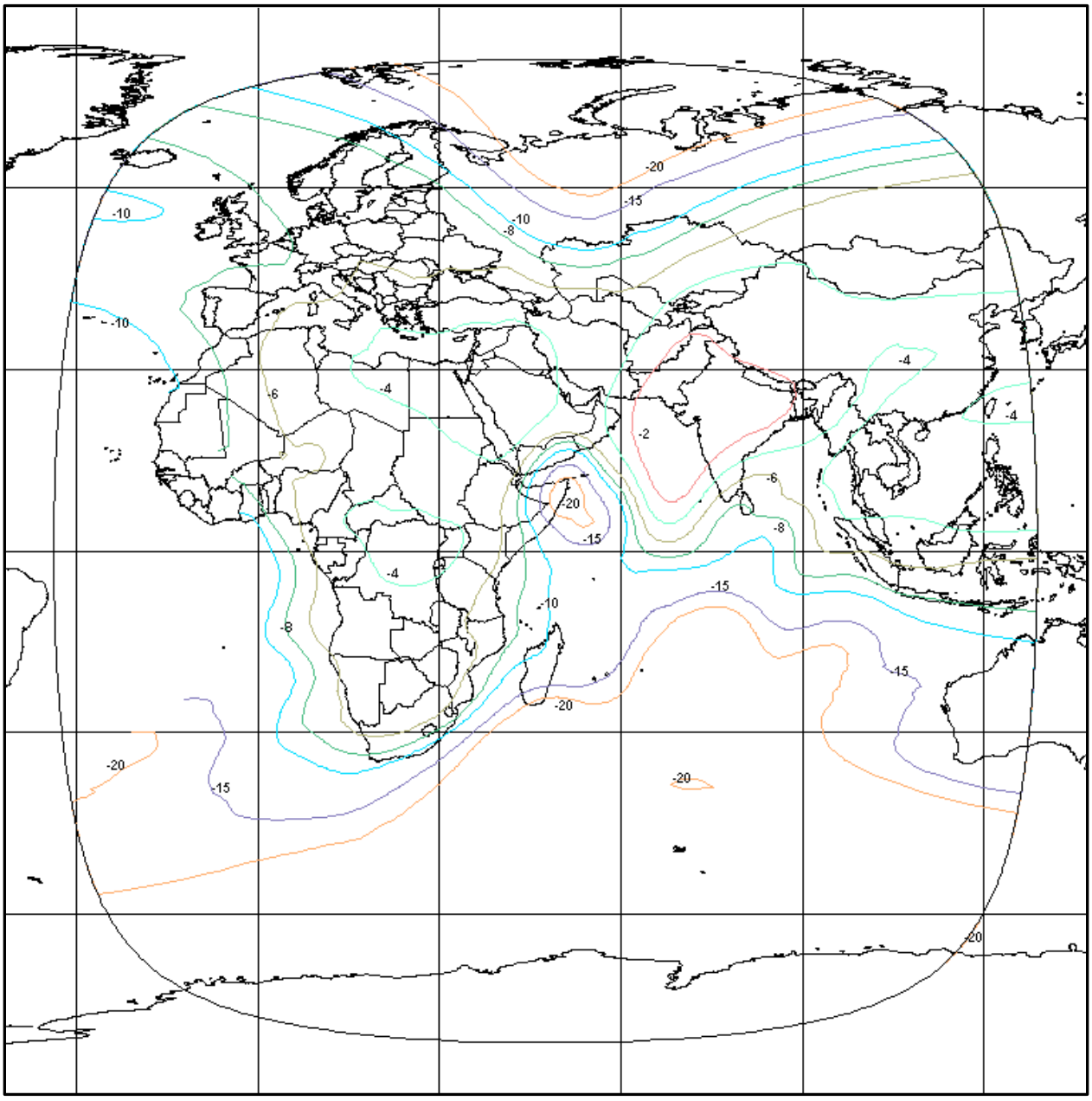
Exhibit 1-3: Telemetry, Tracking and Command

Uplink				Downlink				Carrier
Transponder Designation	Beam Name	Polarization	Center Freq. (MHz)	Transponder Designation	Beam Name	Polarization	Center Freq. (MHz)	Bandwidth (MHz)
CMD	Global TTC	Horizontal	14499.5	-	-	-	-	1.0
CMDP	Pipe	RHCP*	14000.5	-	-	-	-	1.0
CMDB	Bicone	Horizontal	14499.5	-	-	-	-	1.0
-	-	-	-	TM1	Global TTC	Horizontal	12747.5	0.12
-	-	-	-	TM2	Global TTC	Horizontal	12748.5	0.12
-	-	-	-	TM1P	Pipe	RHCP*	12747.5	0.12
-	-	-	-	TM2P	Pipe	RHCP*	12748.5	0.12
-	-	-	-	TM1B	Bicone	Horizontal	12747.5	0.12
-	-	-	-	TM2B	Bicone	Horizontal	12748.5	0.12
-	-	-	-	ULPC1	ULPC	Vertical	11699	0.025
-	-	-	-	ULPC2	ULPC	Vertical	11699	0.025
-	-	-	-	ULPC3	ULPC	Horizontal	12749.5	0.025
-	-	-	-	ULPC4	ULPC	Horizontal	12749.5	0.025

* RHCP = Right Hand Circular Polarization

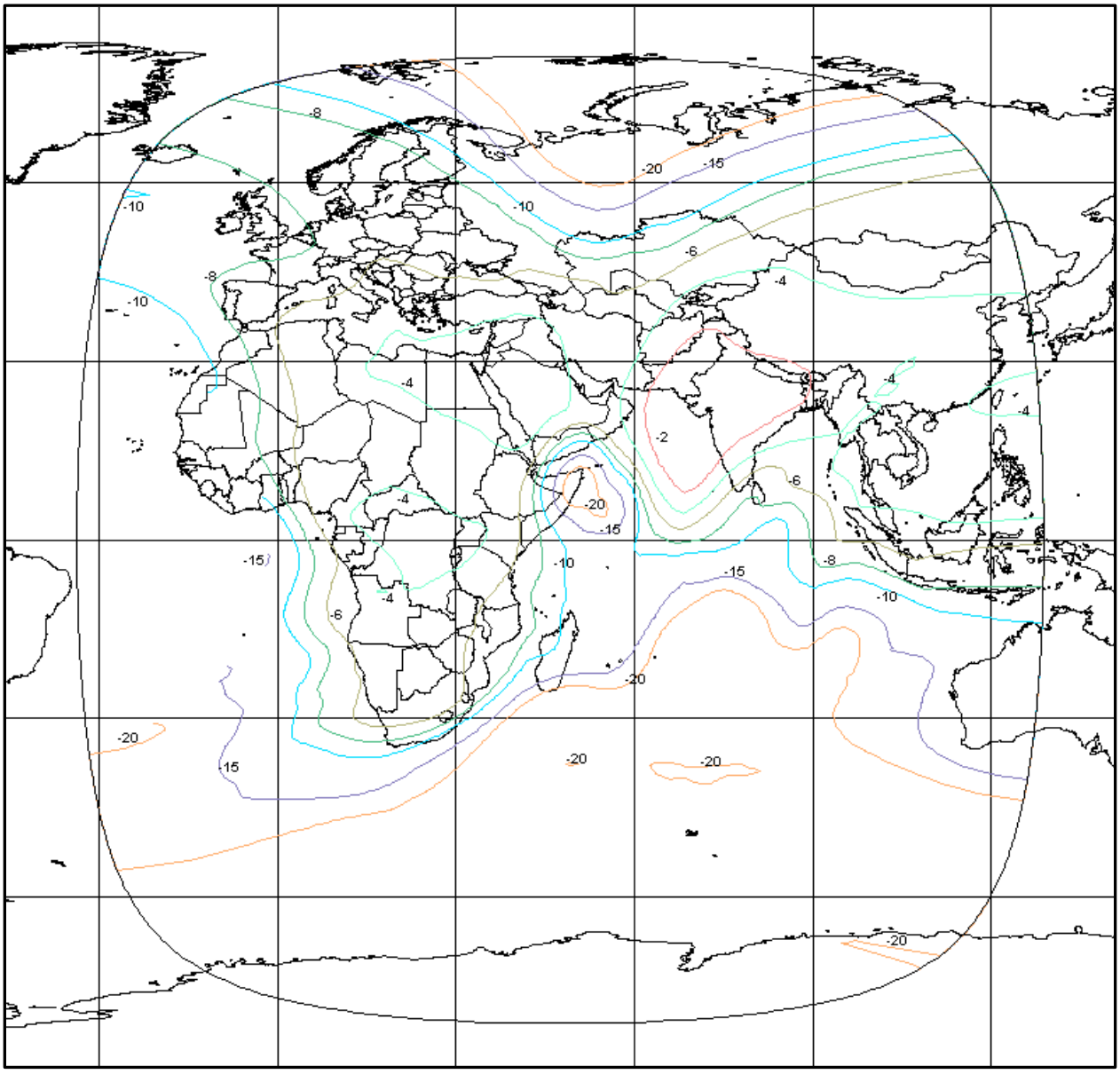
Exhibit 2-Beam Contours

Exhibit 2-1: C-Band Global Horizontal Downlink Beam



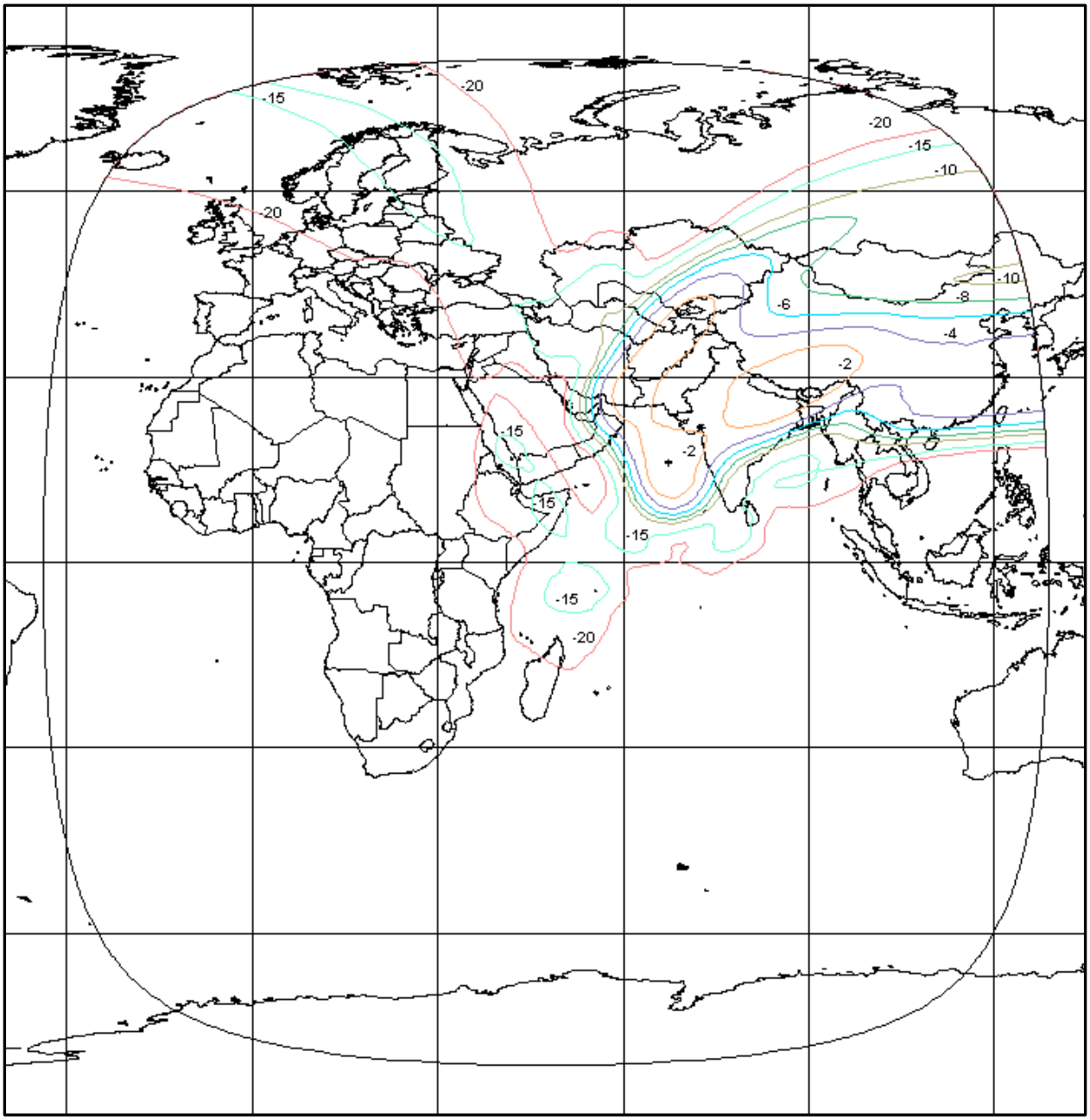
Polarization	Peak Beam Gain (dBi)	Peak EIRP (dBW)	Schedule S Beam Designation
Linear-Horizontal	26.4	41.4	GHCD

Exhibit 2-2: C-Band Global Vertical Downlink Beam



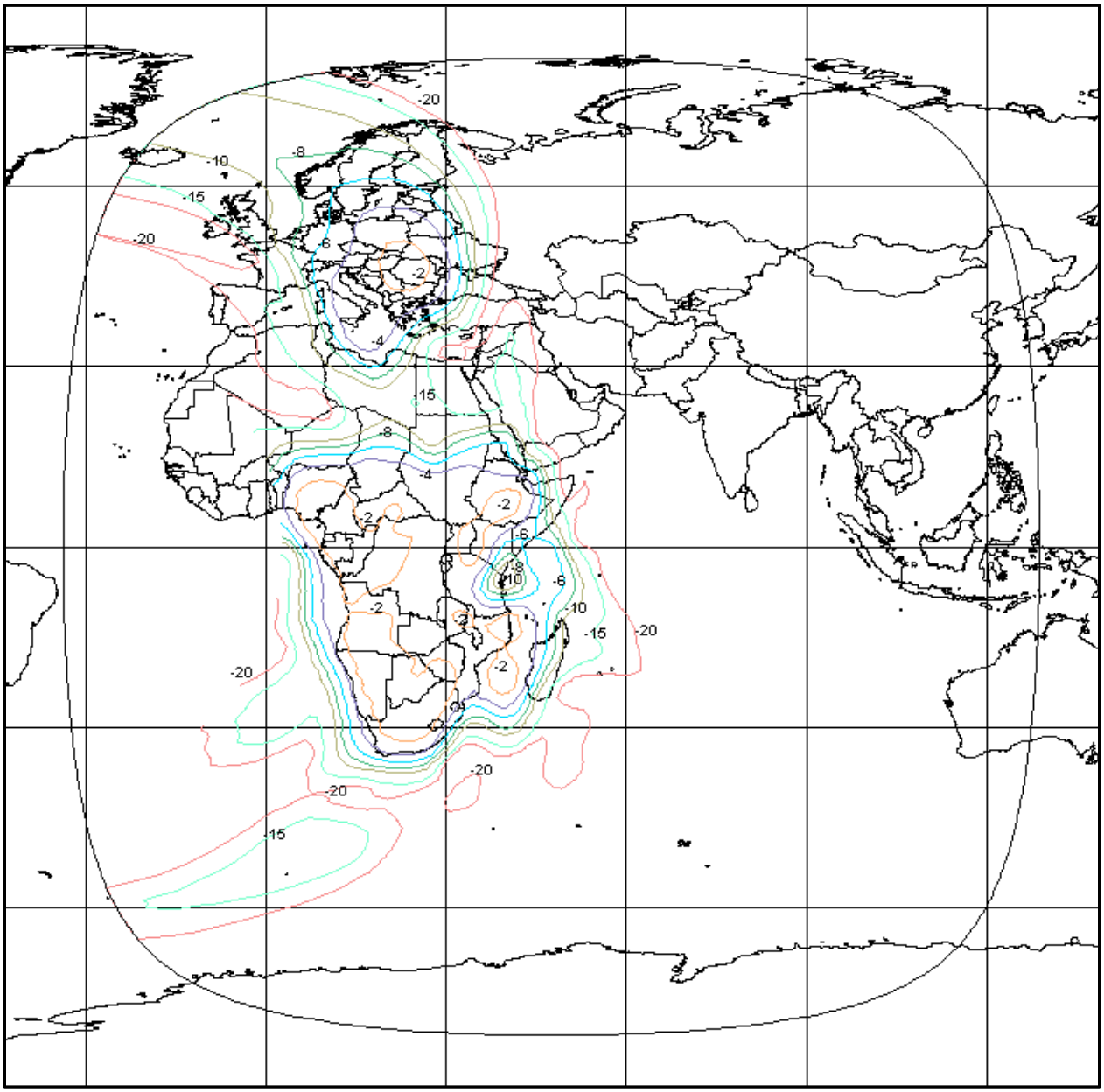
Polarization	Peak Beam Gain (dBi)	Peak EIRP (dBW)	Schedule S Beam Designation
Linear-Vertical	26.8	41.8	GVCD

Exhibit 2-3: Ku-Band Asia Downlink Beam



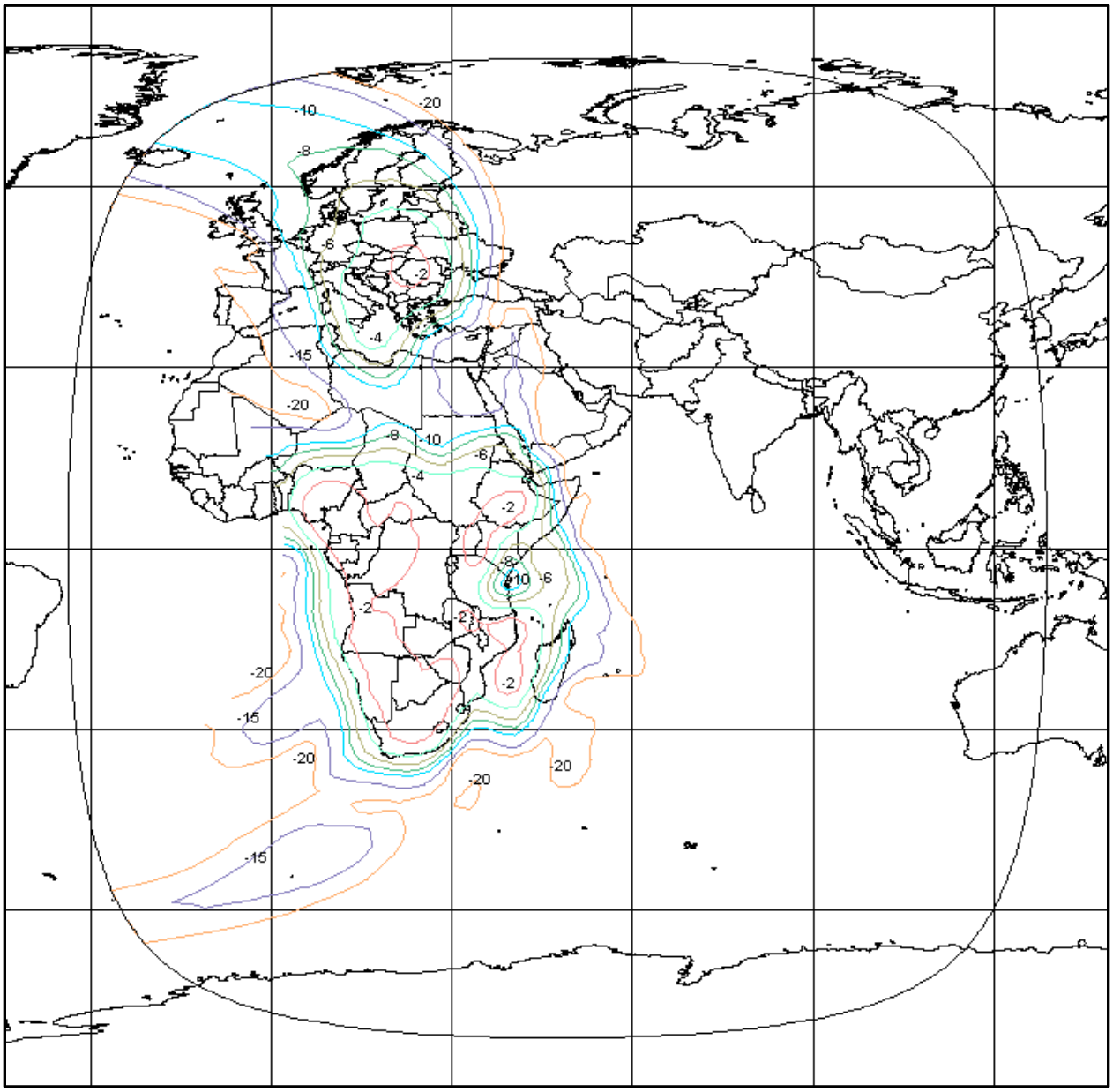
Polarization	Peak Beam Gain (dBi)	Peak EIRP (dBW)	Schedule S Beam Designation
Linear-Vertical	32.2	49.0	AVKD

Exhibit 2-4: Ku-Band Europe/Africa Horizontal Downlink Beam



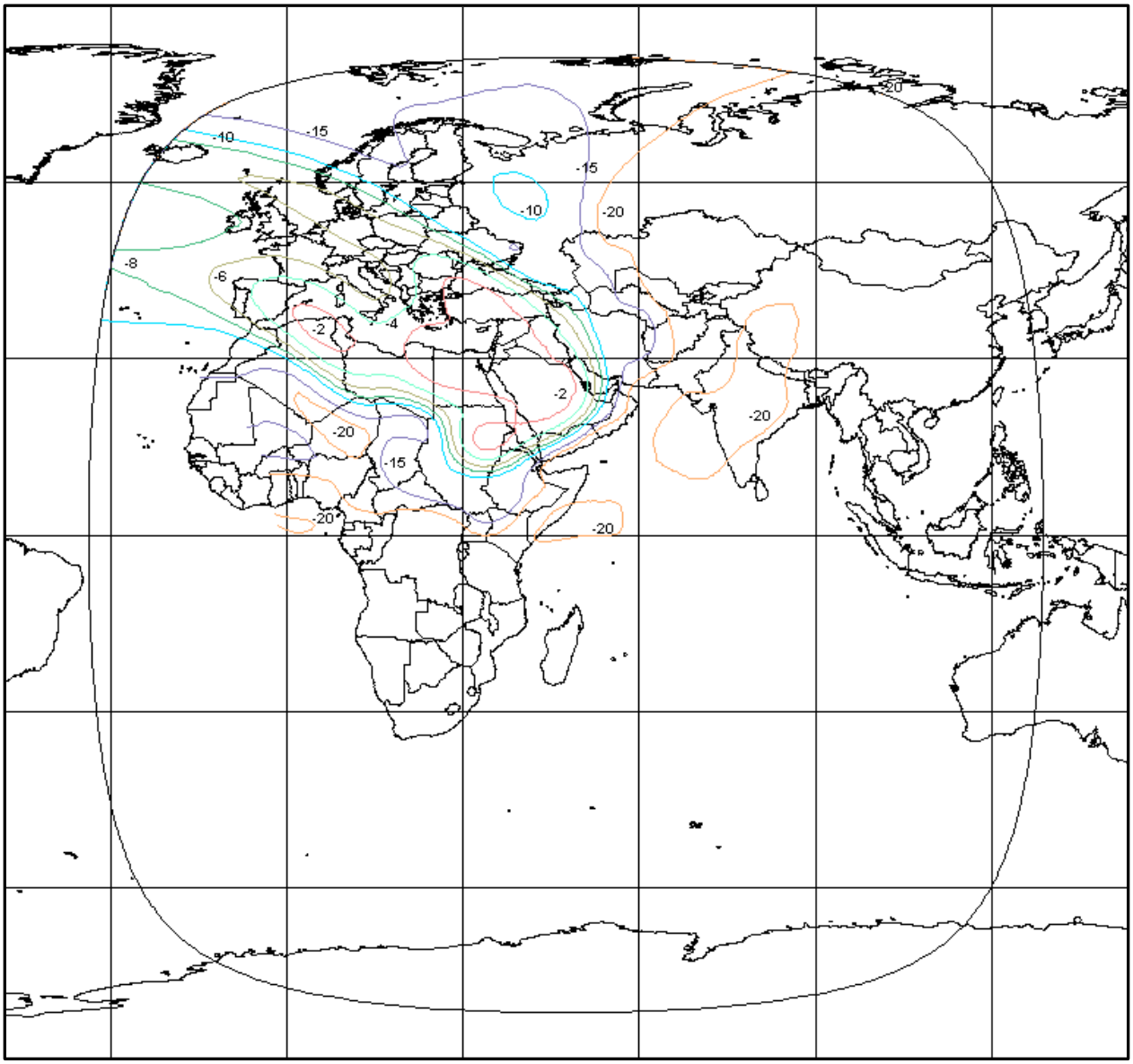
Polarization	Peak Beam Gain (dBi)	Peak EIRP (dBW)	Schedule S Beam Designation
Linear-Horizontal	29.5	47.4	EHKD

Exhibit 2-5: Ku-Band Europe/Africa Vertical Downlink Beam



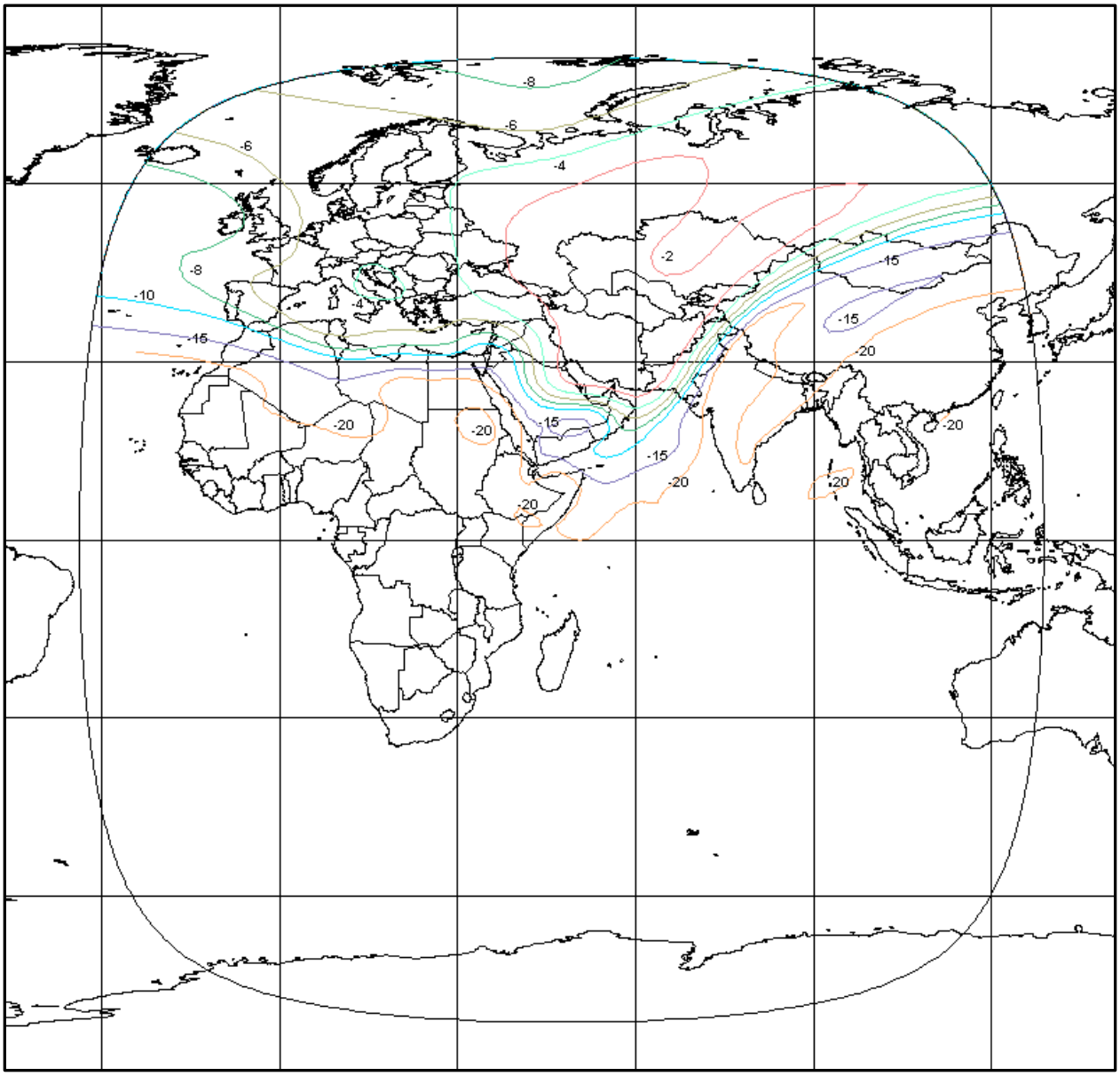
Polarization	Peak Beam Gain (dBi)	Peak EIRP (dBW)	Schedule S Beam Designation
Linear-Vertical	30.2	47.6	EVKD

Exhibit 2-6: Ku-Band Europe/Middle East Downlink Beam



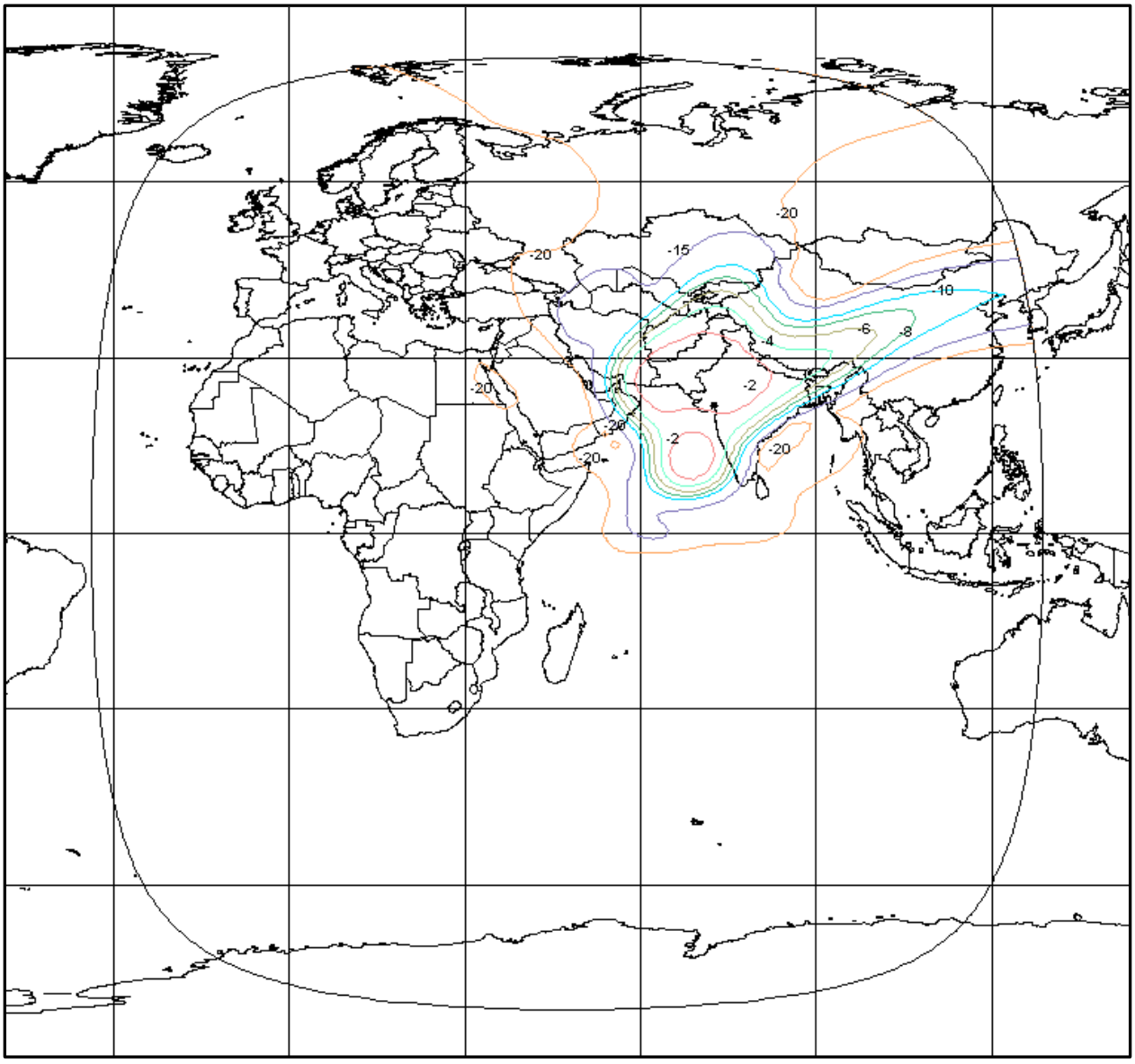
Polarization	Peak Beam Gain (dBi)	Peak EIRP (dBW)	Schedule S Beam Designation
Linear-Vertical	32.6	49.3	EMKD

Exhibit 2-7: Ku-Band Europe/Asia Downlink Beam



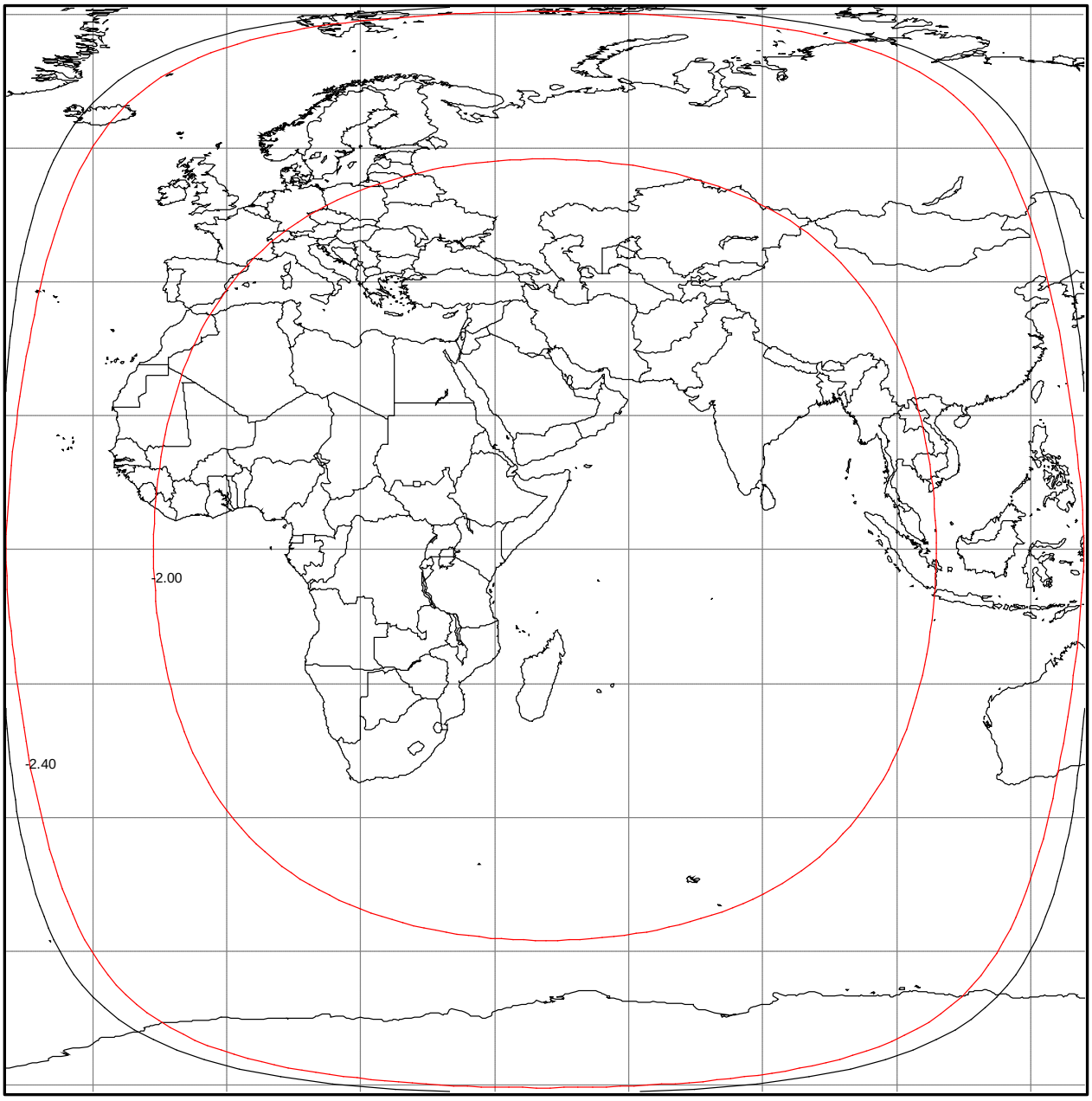
Polarization	Peak Beam Gain (dBi)	Peak EIRP (dBW)	Schedule S Beam Designation
Linear-Horizontal	32.1	49.1	ESKD

Exhibit 2-8: Ku-Band India Downlink Beam



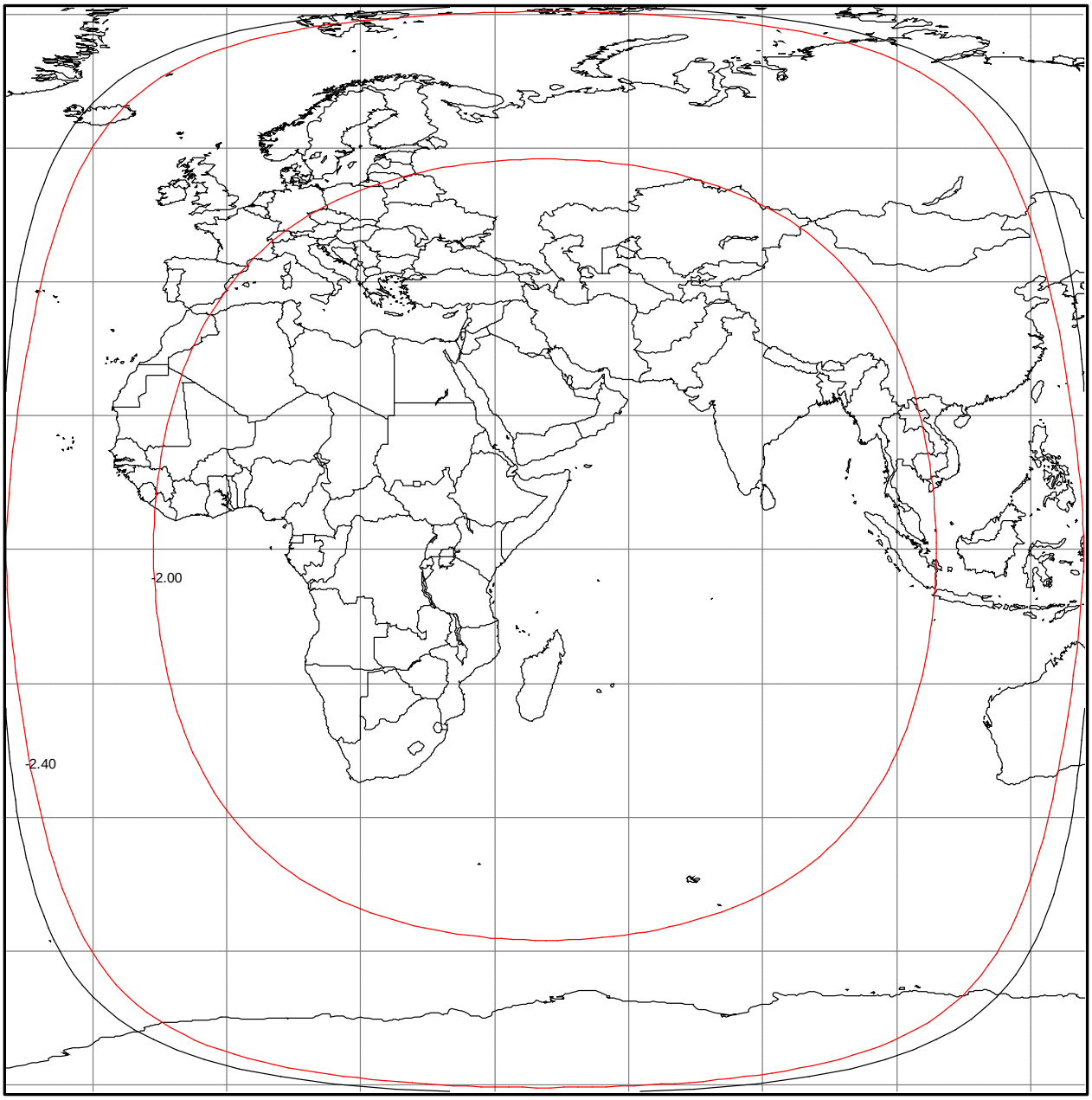
Polarization	Peak Beam Gain (dBi)	Peak EIRP (dBW)	Schedule S Beam Designation
Linear-Horizontal	35.1	52.0	INKD

Exhibit 2-9: Ku-Band Global TT&C Downlink Beam



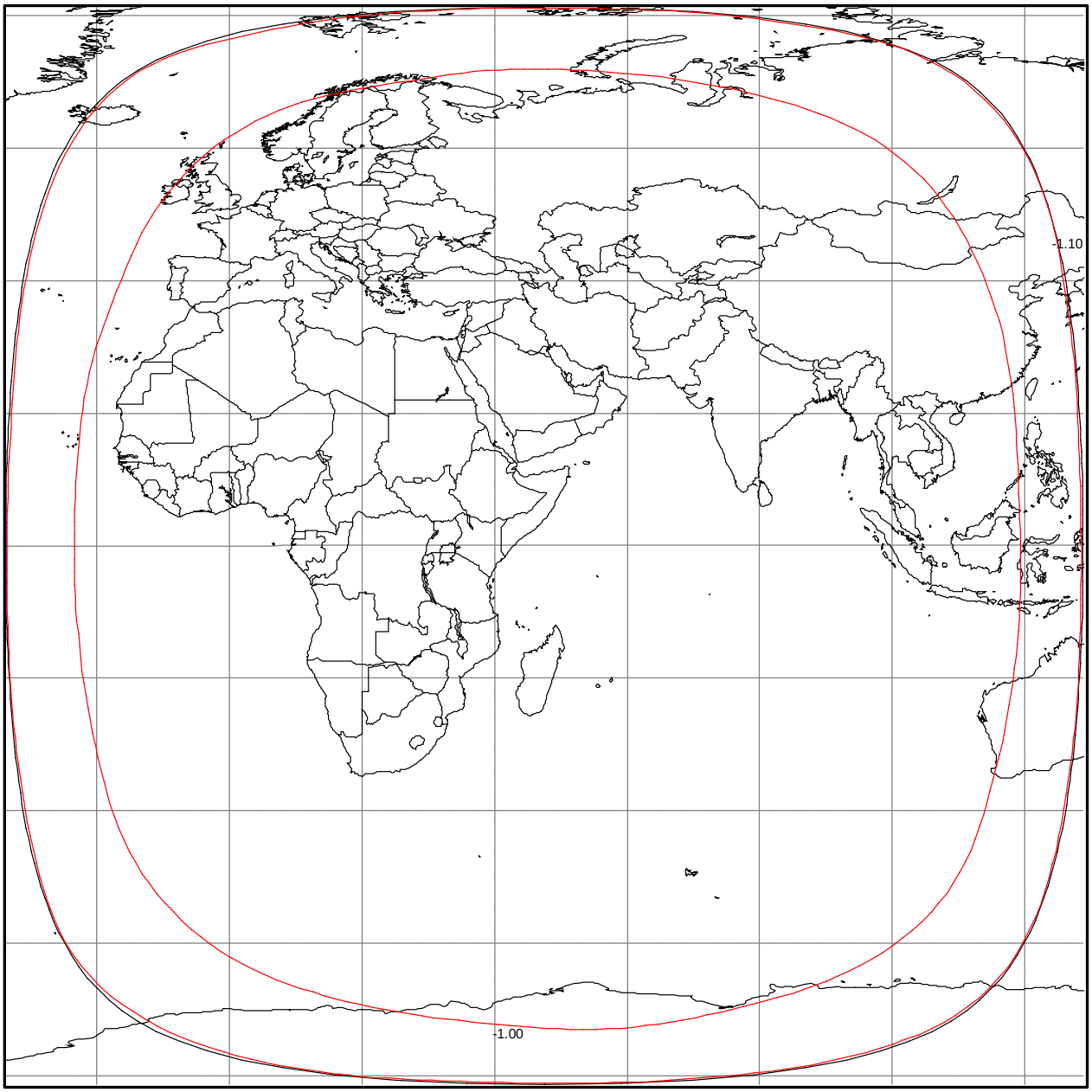
Polarization	Peak Beam Gain (dBi)	Peak EIRP (dBW)	Schedule S Beam Designation
Linear-Horizontal	23.0	6.4	TGKD

Exhibit 2-10: Ku-Band Pipe TT&C Downlink Beam



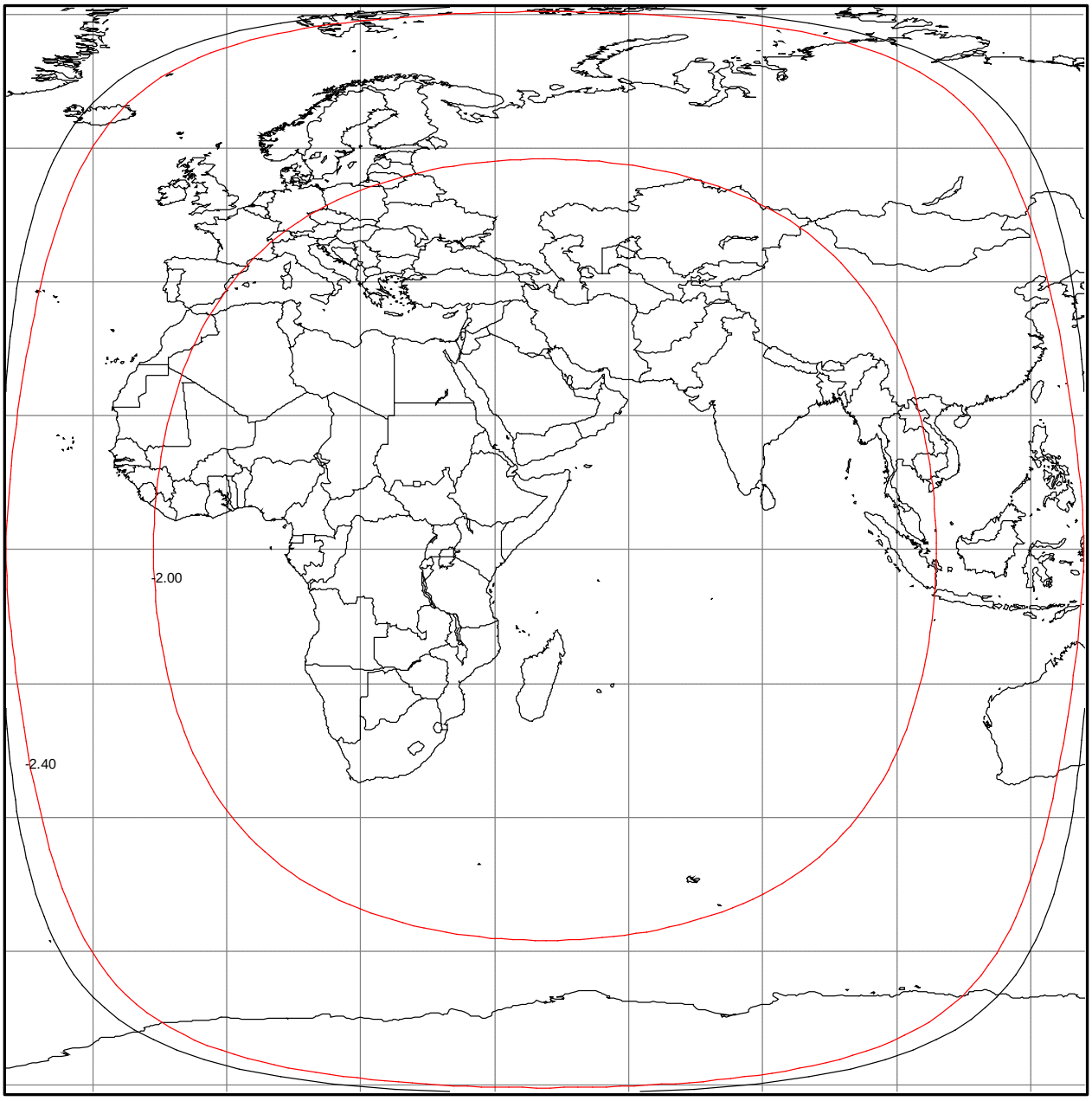
Polarization	Peak Beam Gain (dBi)	Peak EIRP (dBW)	Schedule S Beam Designation
Circular-Right Hand	-1.1	2.1	TPKD

Exhibit 2-11: Ku-Band Bicone TT&C Downlink Beam



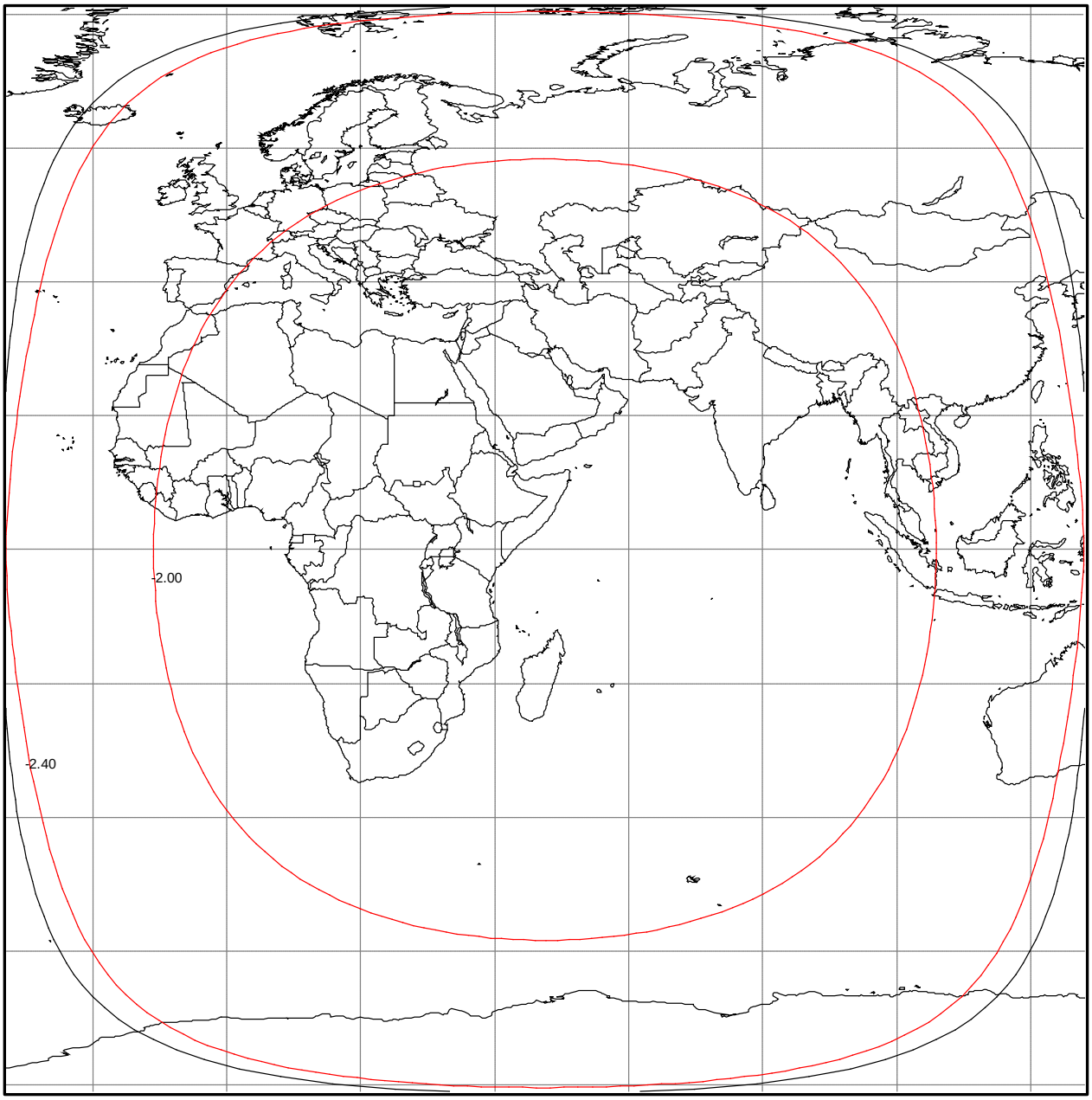
Polarization	Peak Beam Gain (dBi)	Peak EIRP (dBW)	Schedule S Beam Designation
Circular-Right Hand	-5.3	1.4	TBKD

Exhibit 2-12: Ku-Band ULPC Vertical Downlink Beam



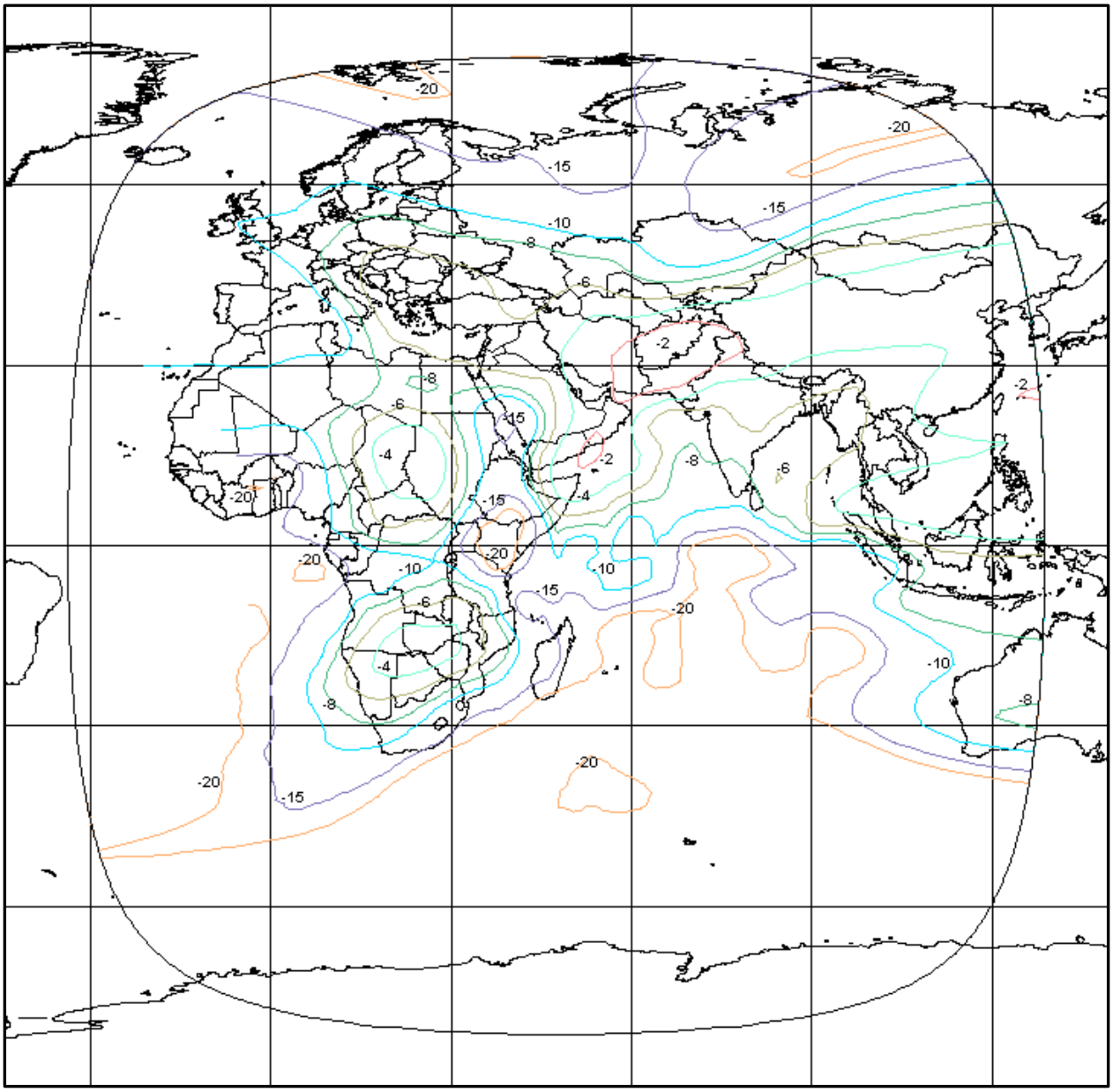
Polarization	Peak Beam Gain (dBi)	Peak EIRP (dBW)	Schedule S Beam Designation
Linear-Vertical	18.4	11.3	UVKD

Exhibit 2-13: Ku-Band ULPC Horizontal Downlink Beam



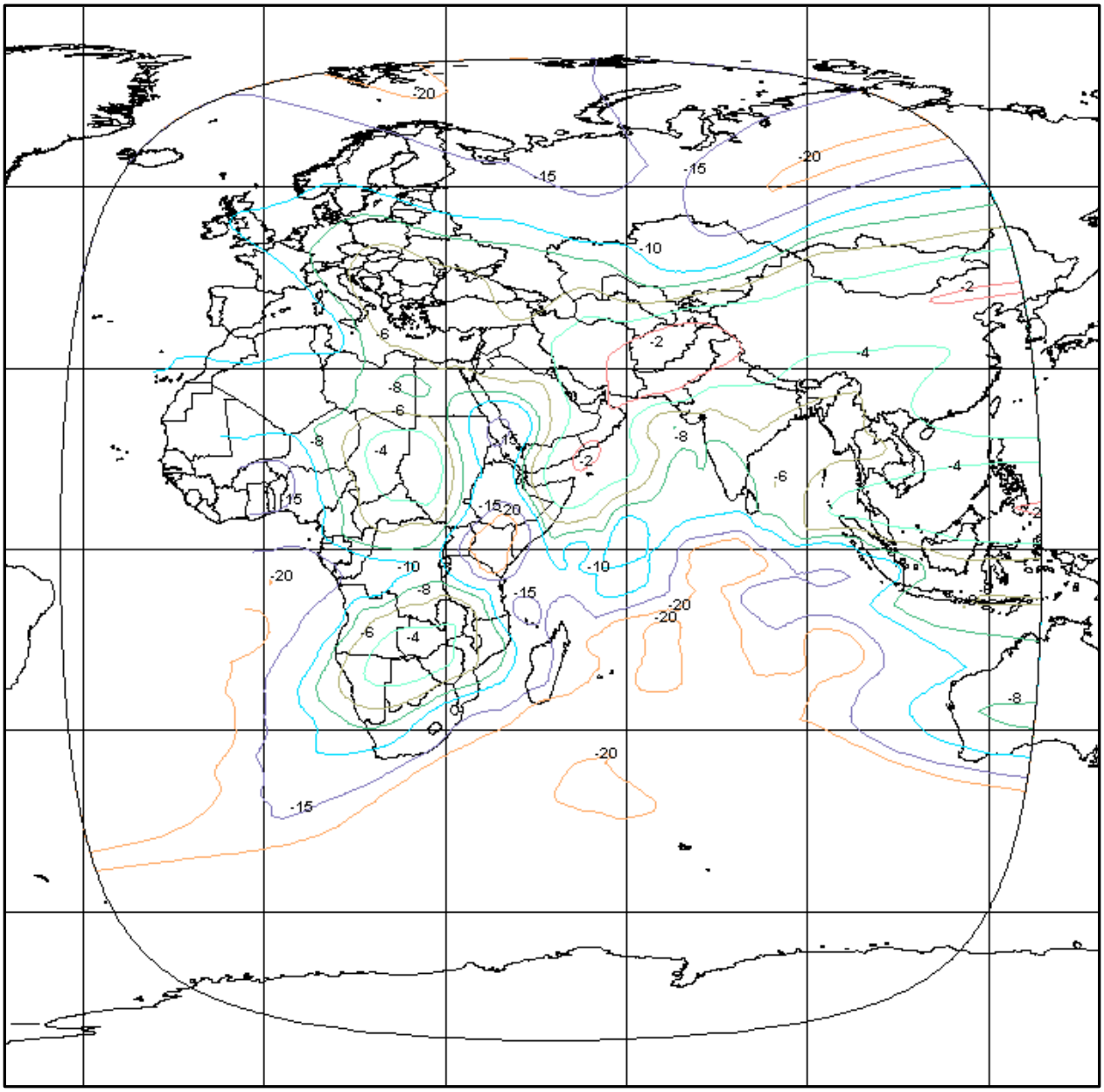
Polarization	Peak Beam Gain (dBi)	Peak EIRP (dBW)	Schedule S Beam Designation
Linear-Horizontal	18.4	11.2	UHKD

Exhibit 2-14: C-Band Global Horizontal Uplink Beam



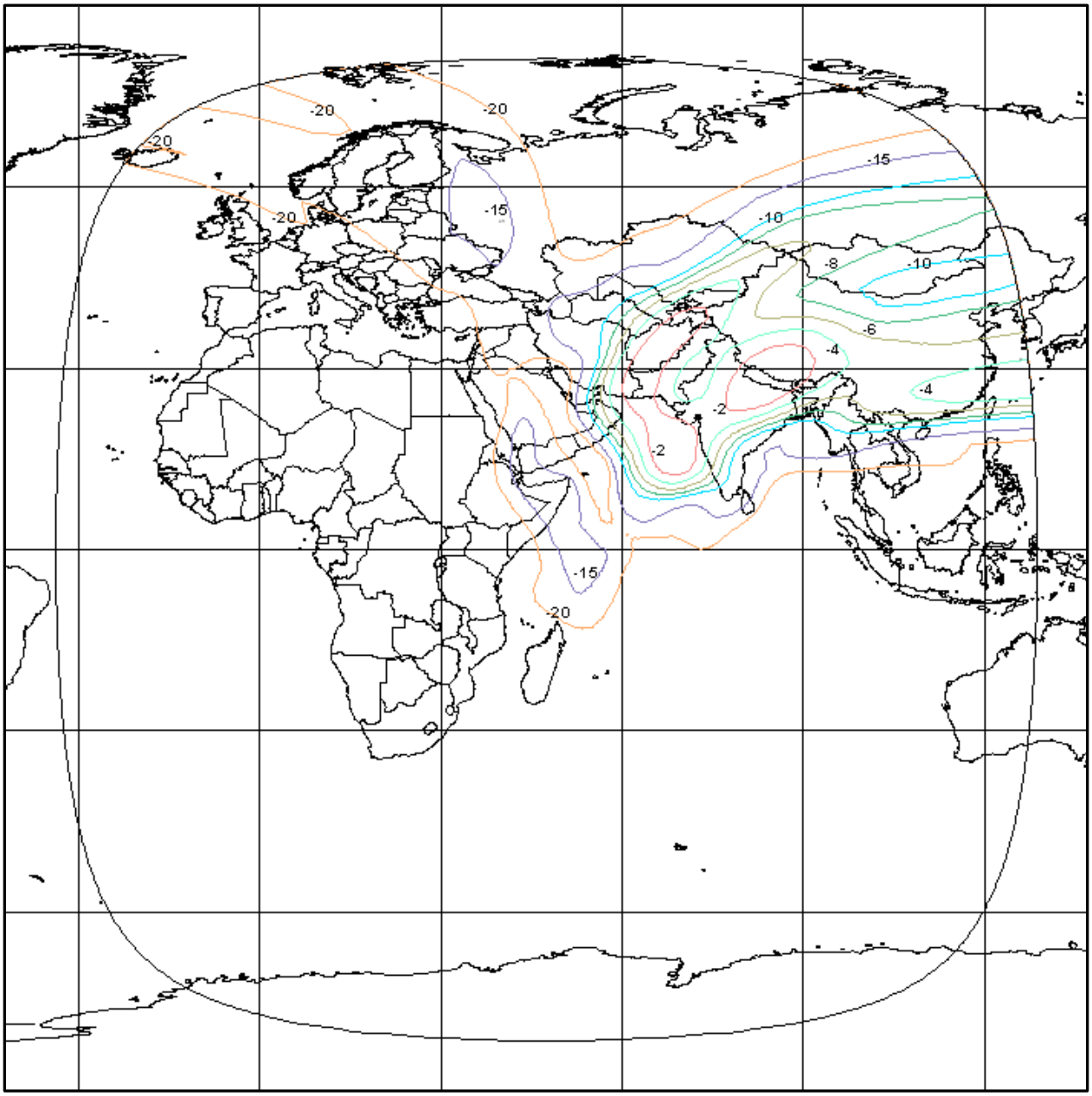
Polarization	Peak Beam Gain (dBi)	Peak G/T (dB/K)	Saturation Flux Density @ Peak G/T (dBW/m^2)	Schedule S Beam Designation
Linear-Horizontal	28.2	0.4	-104.4 to -79.4	GHCU

Exhibit 2-15: C-Band Global Vertical Uplink Beam



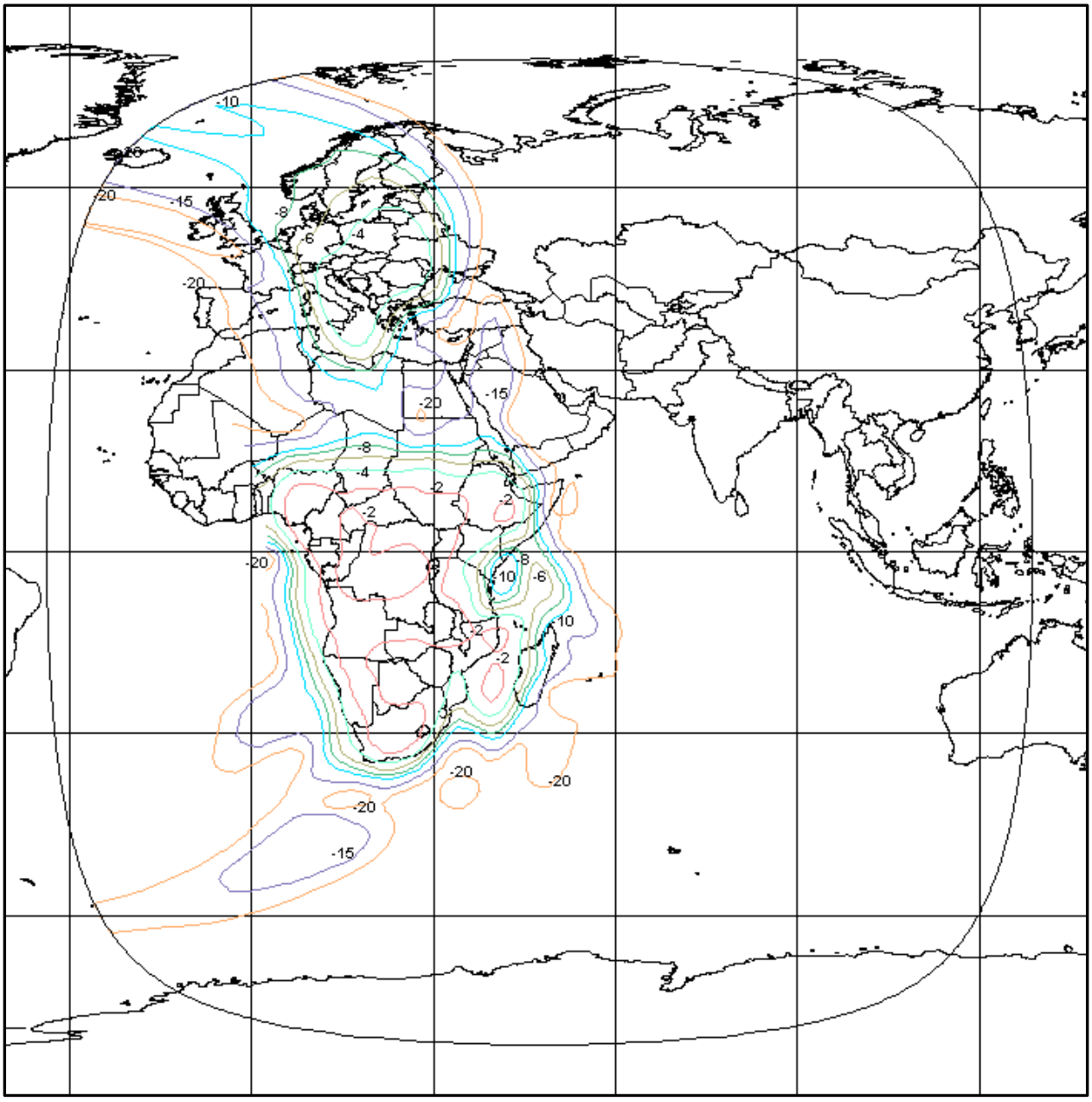
Polarization	Peak Beam Gain (dBi)	Peak G/T (dB/K)	Saturation Flux Density @ Peak G/T (dBW/m^2)	Schedule S Beam Designation
Linear-Vertical	27.7	-0.4	-103.6 to -78.6	GVCU

Exhibit 2-16: Ku-Band Asia Uplink Beam



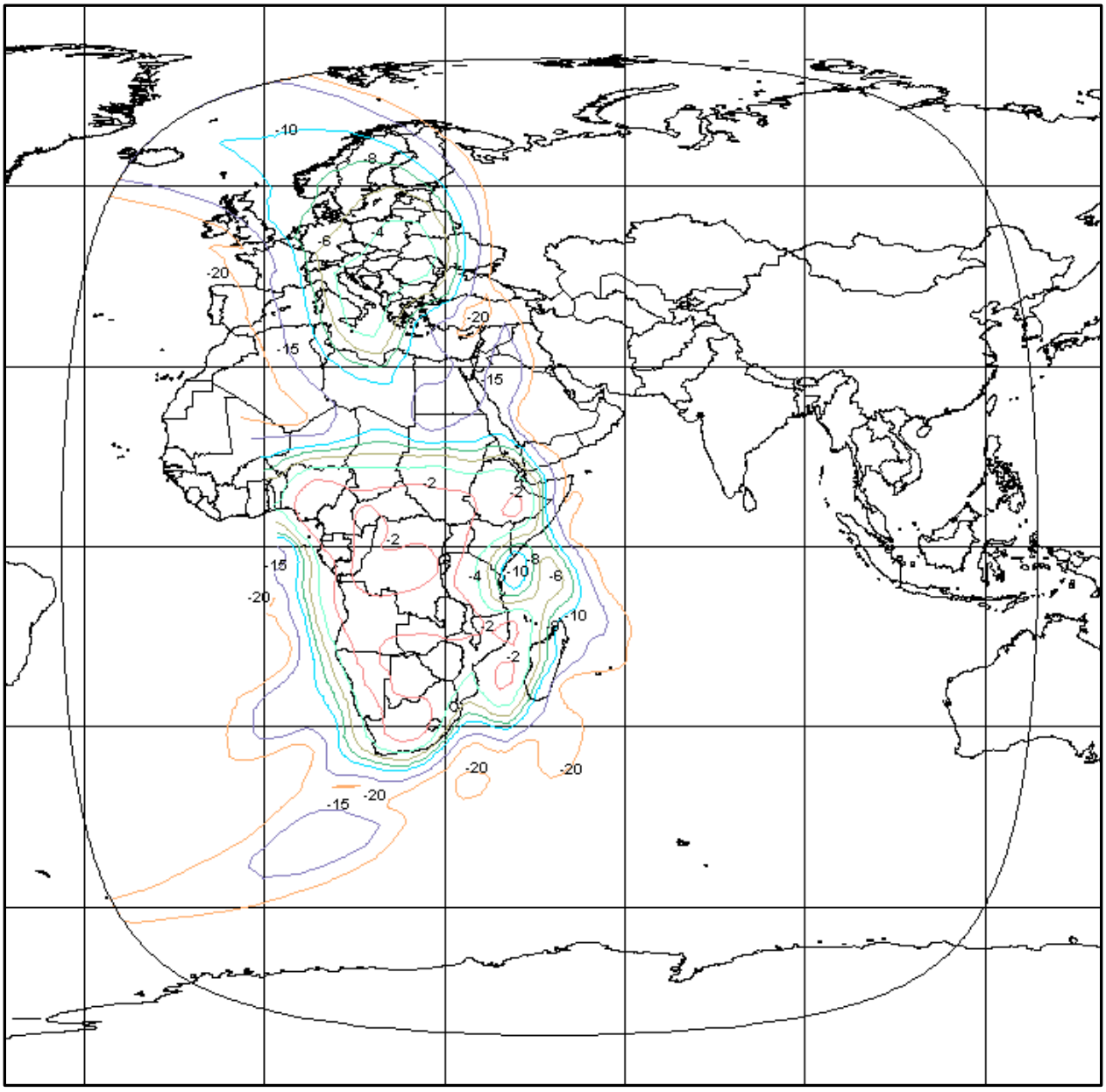
Polarization	Peak Beam Gain (dBi)	Peak G/T (dB/K)	Saturation Flux Density @ Peak G/T (dBW/m^2)	Schedule S Beam Designation
Linear-Vertical	32.9	4.4	-99.4 to -74.4	AVKU

Exhibit 2-17: Ku-Band Europe/Africa Horizontal Uplink Beam



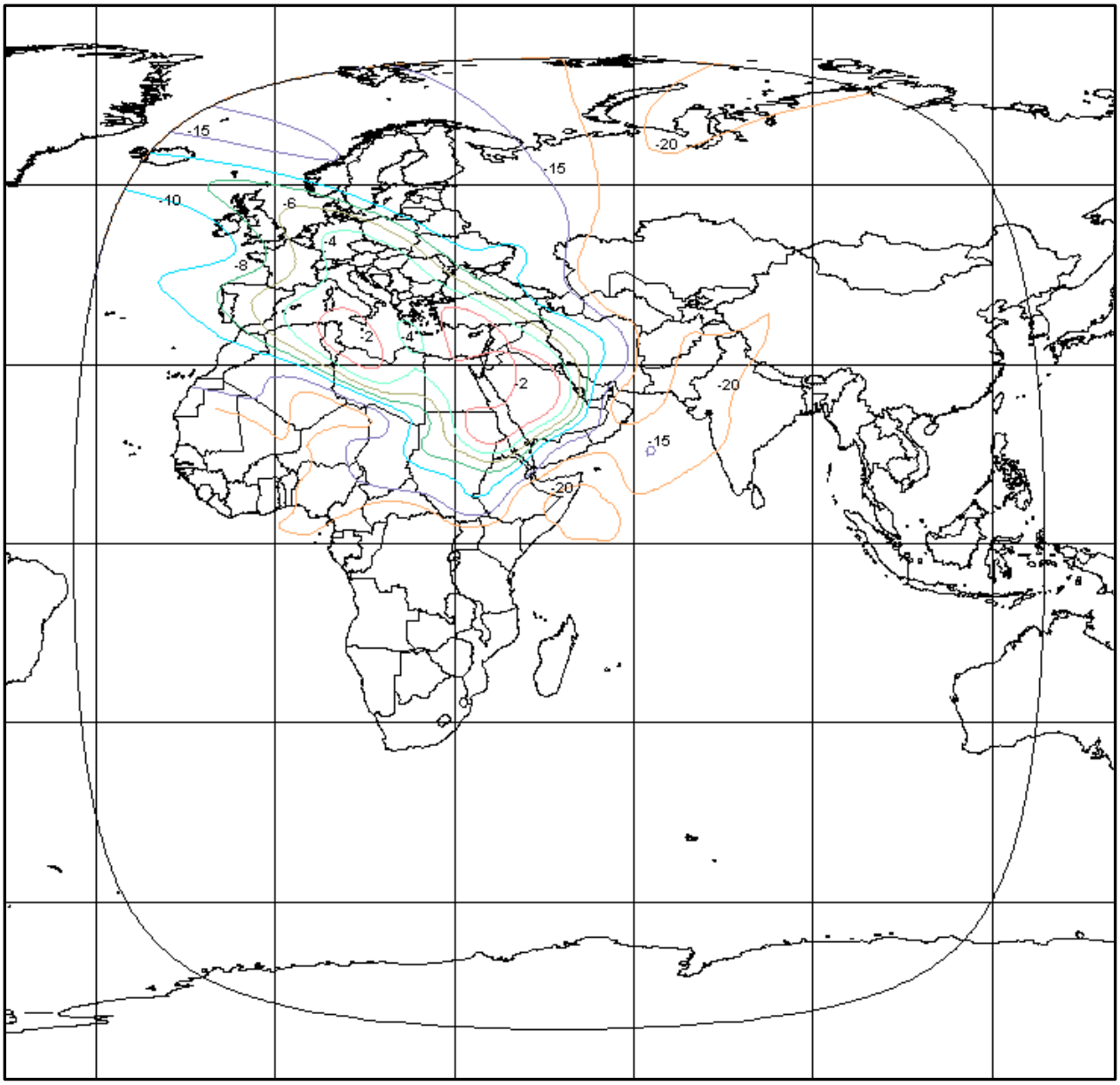
Polarization	Peak Beam Gain (dBi)	Peak G/T (dB/K)	Saturation Flux Density @ Peak G/T (dBW/m^2)	Schedule S Beam Designation
Linear-Horizontal	30.4	2.1	-97.1 to -72.1	EHKU

Exhibit 2-18: Ku-Band Europe/Africa Vertical Uplink Beam



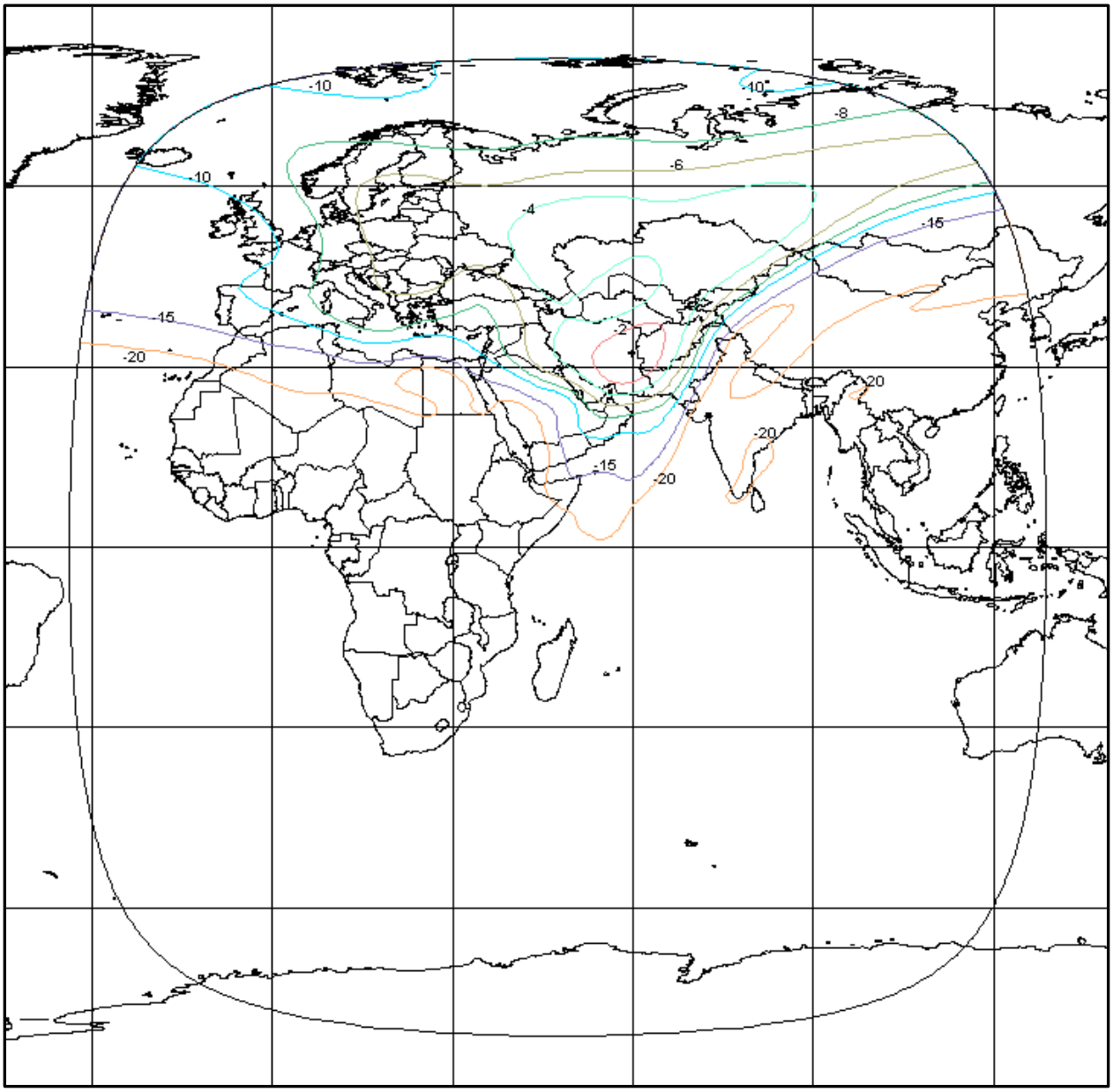
Polarization	Peak Beam Gain (dBi)	Peak G/T (dB/K)	Saturation Flux Density @ Peak G/T (dBW/m^2)	Schedule S Beam Designation
Linear-Vertical	29.8	2.3	-97.3 to -72.3	EVKU

Exhibit 2-19: Ku-Band Europe/Middle East Uplink Beam



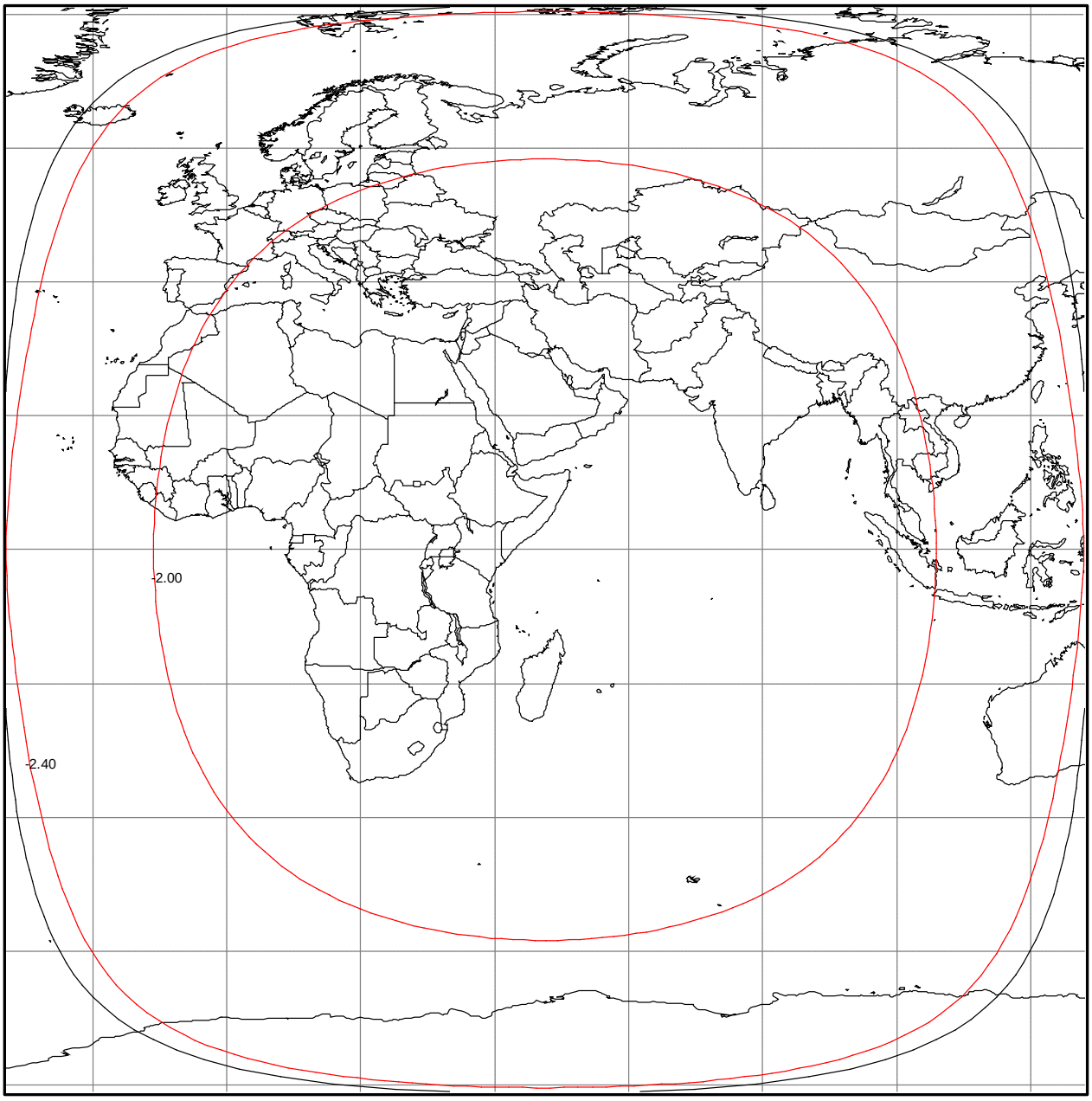
Polarization	Peak Beam Gain (dBi)	Peak G/T (dB/K)	Saturation Flux Density @ Peak G/T (dBW/m^2)	Schedule S Beam Designation
Linear-Vertical	33.6	4.8	-99.8 to -74.8	EMKU

Exhibit 2-20: Ku-Band Europe/Asia Uplink Beam



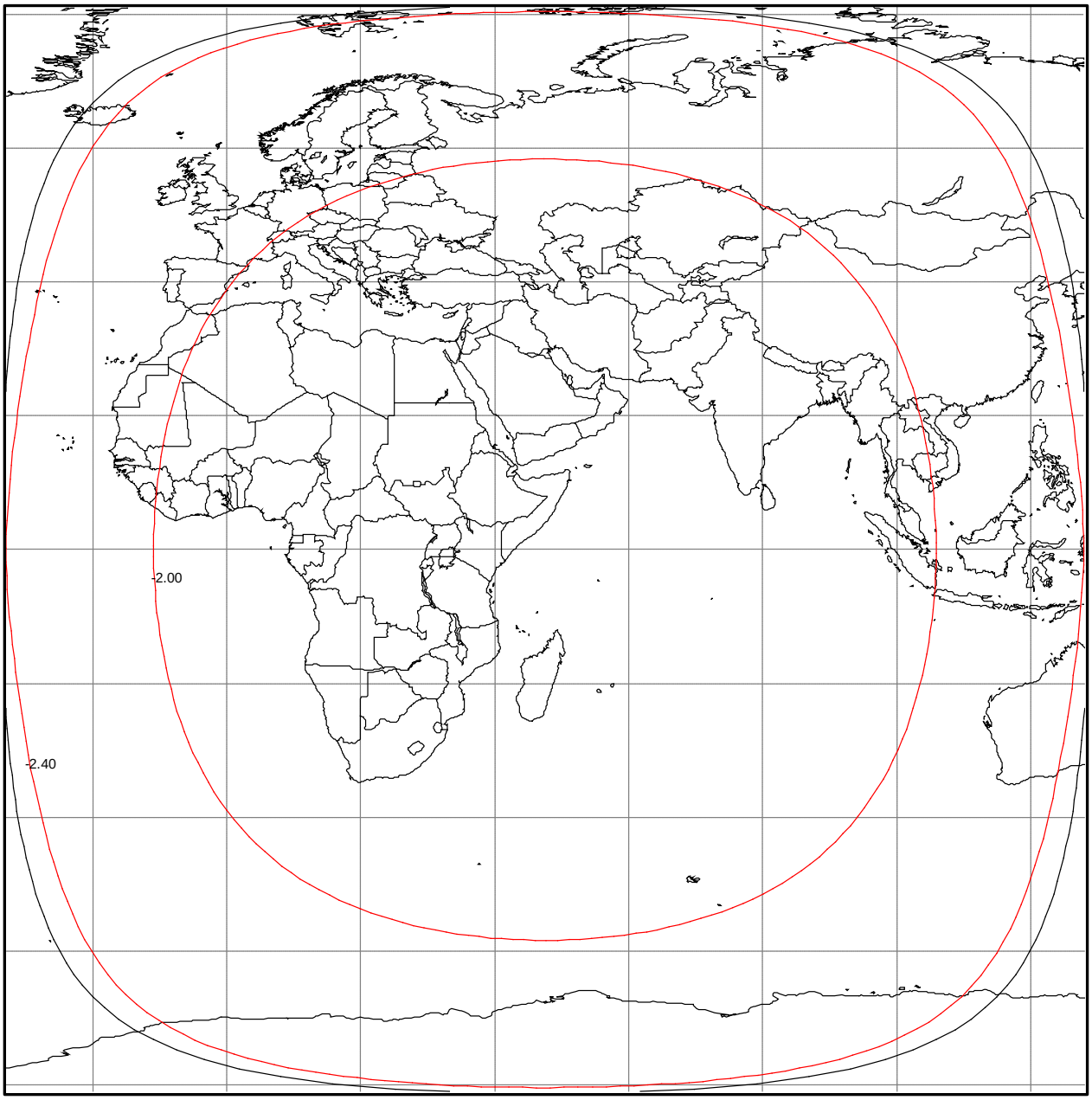
Polarization	Peak Beam Gain (dBi)	Peak G/T (dB/K)	Saturation Flux Density @ Peak G/T (dBW/m^2)	Schedule S Beam Designation
Linear-Horizontal	34.7	6.4	-101.4 to -76.4	ESKU

Exhibit 2-21: Ku-Band Global TT&C Uplink Beam



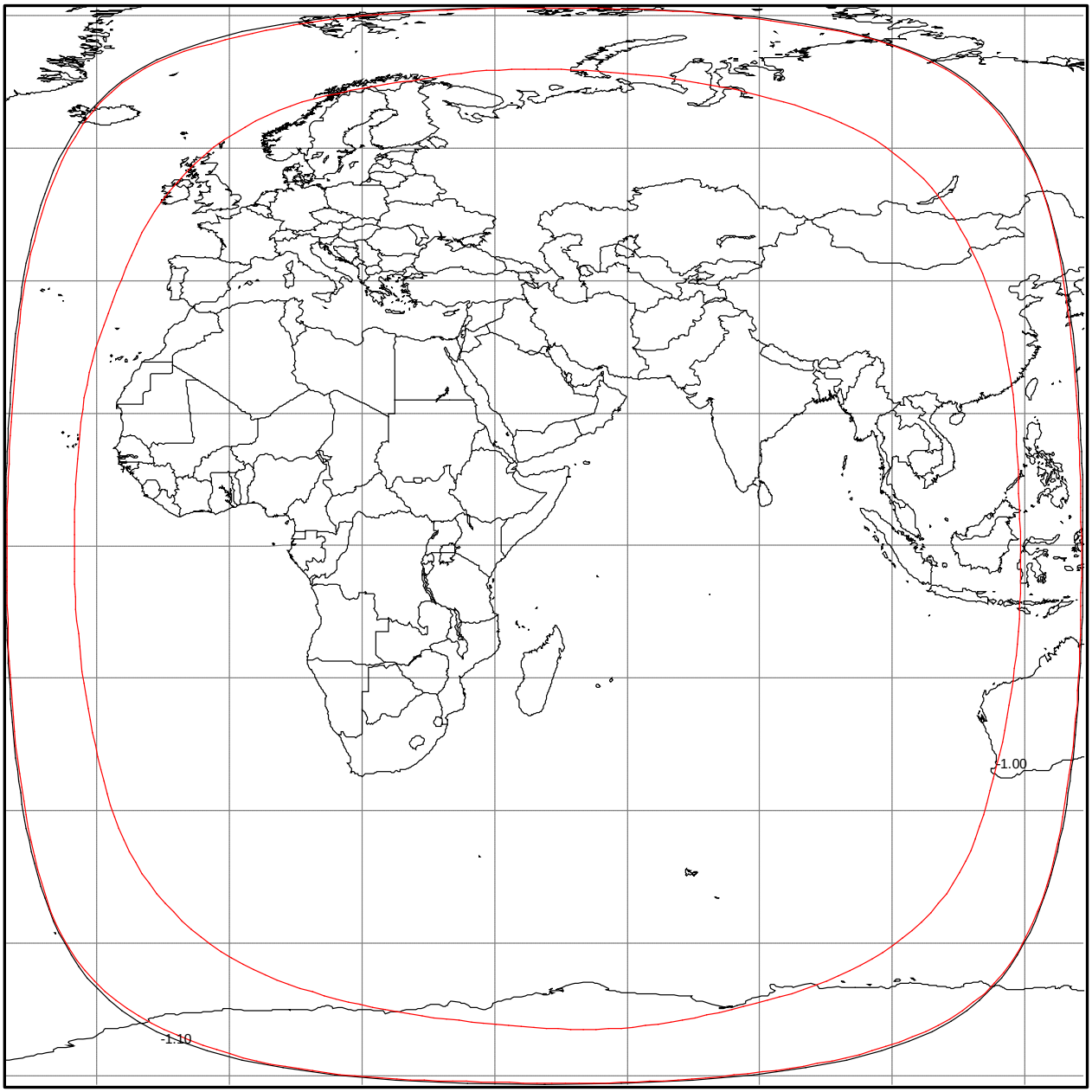
Polarization	Peak Beam Gain (dBi)	Peak G/T (dB/K)	Flux Density @ Command Threshold @ Beam G/T (dBW/m^2)	Schedule S Beam Designation
Linear-Horizontal	23.7	-11.8	-105.1	TGKU

Exhibit 2-22: Ku-Band Pipe TT&C Uplink Beam



Polarization	Peak Beam Gain (dBi)	Peak G/T (dB/K)	Flux Density @ Command Threshold @ Peak G/T (dBW/m^2)	Schedule S Beam Designation
Linear-Horizontal	-1.2	-32.8	-84.4	TPKU

Exhibit 2-23: Ku-Band Bicone TT&C Uplink Beam



Polarization	Peak Beam Gain (dBi)	Peak G/T (dB/K)	Flux Density @ Command Threshold @ Peak G/T (dBW/m^2)	Schedule S Beam Designation
Linear-Horizontal	-0.5	-31.9	-85.0	TBKU

Exhibit 3 - Emission Designators

Designator	Carrier Mode	Occupied Bandwidth (kHz)	Allocated Bandwidth (kHz)
200KG7W	BPSK	153.6	200.0
1M45G7W	BPSK	1229.0	1450.0
400KG7W	QPSK	301.6	400.0
3M07G7W	QPSK	2413.0	3075
27M0G7W	QPSK	19848	27000
36M0G7W	QPSK	26467	36000
54M0G7W	QPSK	45200	54000
72M0G7W	QPSK	53333	72000
36M0F7W	TV/FM	36000	36000

Exhibit 4 – Power Flux Density Calculations

Exhibit 4-1: C-Band 3.7 – 4.2 GHz Power Flux Density

Global Beam (Horizontal) - 36M0F7W							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP	41.4	41.3*	41.4	41.4	41.4	41.4	41.4
Carrier Occupied Bandwidth (kHz)	4000	4000	4000	4000	4000	4000	4000
Spreading Loss (dB/m^2) = (4π*(Slant Range)^2)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density (dBW/m^2/4kHz)	-152.0	-152.0	-151.8	-151.6	-151.5	-151.4	-150.7
FCC Limit (dBW/m^2/4Hz)	-152.0	-152.0	-149.5	-147.0	-144.5	-142.0	-142.0
Margin (dB)	0.0	0.0	2.3	4.6	7.0	9.4	8.7

Global Beam (Horizontal) - 27M0G7W							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP	41.4	41.4	41.4	41.4	41.4	41.4	41.4
Carrier Occupied Bandwidth (kHz)	19848	19848	19848	19848	19848	19848	19848
Spreading Loss (dB/m^2) = (4π*(Slant Range)^2)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density (dBW/m^2/4kHz)	-158.9	-158.8	-158.7	-158.6	-158.5	-158.4	-157.6
FCC Limit (dBW/m^2/4Hz)	-152.0	-152.0	-149.5	-147.0	-144.5	-142.0	-142.0
Margin (dB)	6.9	6.8	9.2	11.6	14.0	16.4	15.6

Global Beam (Vertical) - 36M0F7W							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP	41.4*	41.3*	41.8	41.8	41.8	41.8	41.8
Carrier Occupied Bandwidth (kHz)	4000	4000	4000	4000	4000	4000	4000
Spreading Loss (dB/m^2) = (4π*(Slant Range)^2)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density (dBW/m^2/4kHz)	-152.0	-152.0	-151.4	-151.2	-151.1	-151.0	-150.3
FCC Limit (dBW/m^2/4Hz)	-152.0	-152.0	-149.5	-147.0	-144.5	-142.0	-142.0
Margin (dB)	0.0	0.0	1.9	4.2	6.6	9.0	8.3

** This is the maximum allowable EIRP level at the specified elevation angle. The actual EIRP level of the beam 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 and/or*

restriction on the movement/placement of the beam.

Global Beam (Vertical) - 27M0G7W							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP	41.8	41.8	41.8	41.8	41.8	41.8	41.8
Carrier Occupied Bandwidth (kHz)	19848	19848	19848	19848	19848	19848	19848
Spreading Loss (dB/m^2) = (4π*(Slant Range)^2)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density ($dBW/m^2/4kHz$)	-158.5	-158.4	-158.3	-158.2	-158.1	-158.0	-157.2
FCC Limit ($dBW/m^2/4Hz$)	-152.0	-152.0	-149.5	-147.0	-144.5	-142.0	-142.0
Margin (dB)	6.5	6.4	8.8	11.2	13.6	16.0	15.2

** This is the maximum allowable EIRP level at the specified elevation angle. The actual EIRP level of the beam 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 and/or restriction on the movement/placement of the beam.*

Exhibit 4-2: Ku-Band 11.45-11.7GHz Power Flux Density

Europe/Asia Beam - 36M0F7W							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP	43.4*	43.3*	45.7*	48.0*	49.1	49.1	49.1
Carrier Occupied Bandwidth (kHz)	4000	4000	4000	4000	4000	4000	4000
Spreading Loss (dB/m^2) = ($4\pi*(Slant\ Range)^2$)	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	-143.9	-143.8	-143.1
FCC Limit ($dBW/m^2/4Hz$)	-150.0	-150.0	-147.5	-145.0	-142.5	-140.0	-140.0
Margin (dB)	0.0	0.0	0.0	0.0	1.3	3.7	3.0

Europe/Asia Beam - 36M0G7W							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP	49.1	49.1	49.1	49.1	49.1	49.1	49.1
Carrier Occupied Bandwidth (kHz)	26467	26467	26467	26467	26467	26467	26467
Spreading Loss (dB/m^2) = ($4\pi*(Slant\ Range)^2$)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density ($dBW/m^2/4kHz$)	-152.5	-152.4	-152.3	-152.2	-152.0	-151.9	-151.2
FCC Limit ($dBW/m^2/4Hz$)	-150.0	-150.0	-147.5	-145.0	-142.5	-140.0	-140.0
Margin (dB)	2.5	2.4	4.8	7.2	9.5	11.9	11.2

Europe/Middle East Beam - 36M0F7W							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP	43.4*	43.3*	45.7*	48.0*	49.3	49.3	49.3
Carrier Occupied Bandwidth (kHz)	4000	4000	4000	4000	4000	4000	4000
Spreading Loss (dB/m^2) = ($4\pi*(Slant\ Range)^2$)	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	-143.6	-143.5	-142.8
FCC Limit ($dBW/m^2/4Hz$)	-150.0	-150.0	-147.5	-145.0	-142.5	-140.0	-140.0
Margin (dB)	0.0	0.0	0.0	0.0	1.1	3.5	2.8

Europe/Middle East Beam - 36M0G7W							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP	49.3	49.3	49.3	49.3	49.3	49.3	49.3
Carrier Occupied Bandwidth (kHz)	26467	26467	26467	26467	26467	26467	26467
Spreading Loss (dB/m^2) = ($4\pi*(Slant\ Range)^2$)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density ($dBW/m^2/4kHz$)	-152.3	-152.2	-152.1	-152.0	-151.8	-151.7	-151.0
FCC Limit ($dBW/m^2/4Hz$)	-150.0	-150.0	-147.5	-145.0	-142.5	-140.0	-140.0
Margin (dB)	2.3	2.2	4.6	7.0	9.3	11.7	11.0

** This is the maximum allowable EIRP level at the specified elevation angle. The actual EIRP level of the beam 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 and/or restriction on the movement/placement of the beam.*

Exhibit 4-3: Ku-Band 12.2-12.5 GHz and 12.5-12.75GHz Power Flux Density

India Beam - 36M0F7W							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP	45.4*	45.3*	47.7*	50.0*	52.0	52.0	52.0
Carrier Occupied Bandwidth (kHz)	4000	4000	4000	4000	4000	4000	4000
Spreading Loss (dB/m^2) = (4π*(Slant Range)^2)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density (dBW/m^2/4kHz)	-148.0	-148.0	-145.5	-143.0	-140.9	-140.8	-140.1
FCC Limit (dBW/m^2/4Hz)	-148.0	-148.0	-145.5	-143.0	-140.5	-138.0	-138.0
Margin (dB)	0.0	0.0	0.0	0.0	0.4	2.8	2.1

India Beam - 36M0G7W							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP	52.0	52.0	52.0	52.0	52.0	52.0	52.0
Carrier Occupied Bandwidth (kHz)	26467	26467	26467	26467	26467	26467	26467
Spreading Loss (dB/m^2) = (4π*(Slant Range)^2)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density (dBW/m^2/4kHz)	-149.6	-149.5	-149.4	-149.3	-149.1	-149.0	-148.3
FCC Limit (dBW/m^2/4Hz)	-148.0	-148.0	-145.5	-143.0	-140.5	-138.0	-138.0
Margin (dB)	1.6	1.5	3.9	6.3	8.6	11.0	10.3

Europe/Africa Beam (Horizontal) - 36M0F7W							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP	45.4*	45.3*	47.4	47.4	47.4	47.4	47.4
Carrier Occupied Bandwidth (kHz)	4000	4000	4000	4000	4000	4000	4000
Spreading Loss (dB/m^2) = (4π*(Slant Range)^2)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density (dBW/m^2/4kHz)	-148.0	-148.0	-145.8	-145.6	-145.5	-145.4	-144.7
FCC Limit (dBW/m^2/4Hz)	-148.0	-148.0	-145.5	-143.0	-140.5	-138.0	-138.0
Margin (dB)	0.0	0.0	0.3	2.6	5.0	7.4	6.7

Europe/Africa Beam (Horizontal) - 36M0G7W							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP	47.4	47.4	47.4	47.4	47.4	47.4	47.4
Carrier Occupied Bandwidth (kHz)	26467	26467	26467	26467	26467	26467	26467
Spreading Loss (dB/m^2) = (4π*(Slant Range)^2)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density (dBW/m^2/4kHz)	-154.2	-154.1	-154.0	-153.9	-153.7	-153.6	-152.9
FCC Limit (dBW/m^2/4Hz)	-148.0	-148.0	-145.5	-143.0	-140.5	-138.0	-138.0
Margin (dB)	6.2	6.1	8.5	10.9	13.2	15.6	14.9

** This is the maximum allowable EIRP level at the specified elevation angle. The actual EIRP level of the beam 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 and/or restriction on the movement/placement of the beam.*

Europe/Africa Beam (Vertical) - 36M0F7W							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP	45.4*	45.3*	47.6	47.6	47.6	47.6	47.6
Carrier Occupied Bandwidth (kHz)	4000	4000	4000	4000	4000	4000	4000
Spreading Loss (dB/m^2) = ($4\pi*(Slant\ Range)^2$)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density ($dBW/m^2/4kHz$)	-148.0	-148.0	-145.6	-145.4	-145.3	-145.2	-144.5
FCC Limit ($dBW/m^2/4Hz$)	-148.0	-148.0	-145.5	-143.0	-140.5	-138.0	-138.0
Margin (dB)	0.0	0.0	0.1	2.4	4.8	7.2	6.5

Europe/Africa Beam (Vertical) - 36M0G7W							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP	47.6	47.6	47.6	47.6	47.6	47.6	47.6
Carrier Occupied Bandwidth (kHz)	26467	26467	26467	26467	26467	26467	26467
Spreading Loss (dB/m^2) = ($4\pi*(Slant\ Range)^2$)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density ($dBW/m^2/4kHz$)	-154.0	-153.9	-153.8	-153.7	-153.5	-153.4	-152.7
FCC Limit ($dBW/m^2/4Hz$)	-148.0	-148.0	-145.5	-143.0	-140.5	-138.0	-138.0
Margin (dB)	6.0	5.9	8.3	10.7	13.0	15.4	14.7

Asia Beam - 36M0F7W							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP	43.1*	43.0*	45.4*	47.7*	49.0	49.0	49.0
Carrier Occupied Bandwidth (kHz)	4000	4000	4000	4000	4000	4000	4000
Spreading Loss (dB/m^2) = ($4\pi*(Slant\ Range)^2$)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density ($dBW/m^2/4kHz$)	-150.3	-150.3	-147.8	-145.3	-143.9	-143.8	-143.1
FCC Limit ($dBW/m^2/4Hz$)	-148.0	-148.0	-145.5	-143.0	-140.5	-138.0	-138.0
Margin (dB)	2.3	2.3	2.3	2.3	3.4	5.8	5.1

Asia Beam - 36M0G7W							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP	49.0	49.0	49.0	49.0	49.0	49.0	49.0
Carrier Occupied Bandwidth (kHz)	26467	26467	26467	26467	26467	26467	26467
Spreading Loss (dB/m^2) = ($4\pi*(Slant\ Range)^2$)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density ($dBW/m^2/4kHz$)	-152.6	-152.5	-152.4	-152.3	-152.1	-152.0	-151.3
FCC Limit ($dBW/m^2/4Hz$)	-148.0	-148.0	-145.5	-143.0	-140.5	-138.0	-138.0
Margin (dB)	4.6	4.5	6.9	9.3	11.6	14.0	13.3

** This is the maximum allowable EIRP level at the specified elevation angle. The actual EIRP level of the beam 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 and/or restriction on the movement/placement of the beam.*

Exhibit 4-4: TT&C Power Flux Density

Global TT&C Beam - TM1/TM2							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP	6.4	6.4	6.4	6.4	6.4	6.4	6.4
Carrier Occupied Bandwidth (kHz)	120	120	120	120	120	120	120
Spreading Loss (dB/m^2) = (4π*(Slant Range)^2)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density (dBW/m^2/4kHz)	-171.8	-171.6	-171.5	-171.4	-171.3	-171.2	-170.4
FCC Limit (dBW/m^2/4Hz)	-148.0	-148.0	-145.5	-143.0	-140.5	-138.0	-138.0
Margin (dB)	23.8	23.6	26.0	28.4	30.8	33.2	32.4

Pipe TT&C Beam - TM1P/TM2P							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Carrier Occupied Bandwidth (kHz)	120	120	120	120	120	120	120
Spreading Loss (dB/m^2) = (4π*(Slant Range)^2)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density (dBW/m^2/4kHz)	-176.1	-175.9	-175.8	-175.7	-175.6	-175.5	-174.7
FCC Limit (dBW/m^2/4Hz)	-148.0	-148.0	-145.5	-143.0	-140.5	-138.0	-138.0
Margin (dB)	28.1	27.9	30.3	32.7	35.1	37.5	36.7

Bicone TT&C Beam - TM1B/TM2B							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Carrier Occupied Bandwidth (kHz)	120	120	120	120	120	120	120
Spreading Loss (dB/m^2) = (4π*(Slant Range)^2)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density (dBW/m^2/4kHz)	-176.8	-176.6	-176.5	-176.4	-176.3	-176.2	-175.4
FCC Limit (dBW/m^2/4Hz)	-148.0	-148.0	-145.5	-143.0	-140.5	-138.0	-138.0
Margin (dB)	28.8	28.6	31.0	33.4	35.8	38.2	37.4

ULPC Vertical Beam - ULPC1/ULPC2							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP	11.3	11.3	11.3	11.3	11.3	11.3	11.3
Carrier Occupied Bandwidth (kHz)	25	25	25	25	25	25	25
Spreading Loss (dB/m^2) = (4π*(Slant Range)^2)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density (dBW/m^2/4kHz)	-160.0	-159.9	-159.8	-159.7	-159.6	-159.5	-158.7
FCC Limit (dBW/m^2/4Hz)	-150.0	-150.0	-147.5	-145.0	-142.5	-140.0	-140.0
Margin (dB)	10.0	9.9	12.3	14.7	17.1	19.5	18.7

** This is the maximum allowable EIRP level at the specified elevation angle. The actual EIRP level of the beam 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 and/or restriction on the movement/placement of the beam.*

ULPC Horizontal Beam - ULPC3/ULPC4							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP	11.2	11.2	11.2	11.2	11.2	11.2	11.2
Carrier Occupied Bandwidth (kHz)	25	25	25	25	25	25	25
Spreading Loss (dB/m^2) = (4π*(Slant Range)^2)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density (dBW/m^2/4kHz)	-160.1	-160.0	-159.9	-159.8	-159.7	-159.6	-158.8
FCC Limit (dBW/m^2/4Hz)	-148.0	-148.0	-145.5	-143.0	-140.5	-138.0	-138.0
Margin (dB)	12.1	12.0	14.4	16.8	19.2	21.6	20.8

Exhibit 5 – INTELSAT 10 LINK BUDGETS

Exhibit 5-1*: C-Band*

UPLINK BEAM INFORMATION				
Uplink Beam Name	C-Band	C-Band	C-Band	C-Band
Uplink Frequency (GHz)	6.175	6.175	6.175	6.175
Uplink Beam Polarization	Horizontal	Horizontal	Horizontal	Horizontal
Uplink Relative Contour Level (dB)	-6.0	-6.0	-6.0	-6.0
Uplink Contour G/T (dB/K)	-5.6	-5.6	-5.6	-5.6
Uplink SFD (dBW/m2)	-82.4	-89.4	-80.4	-80.4
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0
DOWNLINK BEAM INFORMATION				
Downlink Beam Name	C-Band	C-Band	C-Band	C-Band
Downlink Frequency (GHz)	3.95	3.95	3.95	3.95
Downlink Beam Polarization	Horizontal	Horizontal	Horizontal	Horizontal
Downlink Relative Contour Level (dB)	-6.0	-6.0	-6.0	-6.0
Downlink Contour EIRP (dBW)	35.4	35.4	35.4	35.4
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0
ADJACENT SATELLITE 1	Africasat-1	Africasat-1	Africasat-1	Africasat-1
Satellite 1 Orbital Location	46E	46E	46E	46E
Uplink Power Density (dBW/Hz)	-38.7	-38.7	-38.7	-38.7
Uplink Polarization Advantage (dB)	0	0	0	0
Downlink EIRP Density (dBW/Hz)	-33.3	-33.3	-33.3	-33.3
Downlink Polarization Advantage (dB)	0	0	0	0
ADJACENT SATELLITE 2	Yamal-202	Yamal-202	Yamal-202	Yamal-202
Satellite 2 Orbital Location	49E	49E	49E	49E
Uplink Power Density (dBW/Hz)	-38.7	-38.7	-38.7	-38.7
Uplink Polarization Advantage (dB)	0	0	0	0
Downlink EIRP Density (dBW/Hz)	-33.8	-33.8	-33.8	-33.8
Downlink Polarization Advantage (dB)	0	0	0	0
CARRIER INFORMATION				
Carrier ID	36M0F7W	54M0G7W	3M07G7W	400KG7W
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	36860	2048	256
Code Rate	N/A	1/2x188/204	1/2x239/256	1/2x239/256
Occupied Bandwidth(kHz)	36000	39997	2413.0	301.6
Allocated Bandwidth(kHz)	36000	54000	3075	400
Minimum C/N, Clear Sky (dB)	10.0	3.36	2.99	2.99
Minimum C/N, Rain (dB)	10.0	3.36	2.79	2.79
UPLINK EARTH STATION				
Earth Station Diameter (meters)	15.2	15.2	3.0	3.0
Earth Station Gain (dBi)	58.4	58.4	43.2	43.2
Earth Station Elevation Angle	20	20	20	20
DOWNLINK EARTH STATION				
Earth Station Diameter (meters)	13.1	8.1	8.1	8.1
Earth Station Gain (dBi)	53.5	49.3	49.3	49.3
Earth Station G/T (dB/K)	33.0	28.4	28.4	28.4
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)	80.5	73.5	61.7	52.7
Uplink Path Loss, Clear Sky (dB)	-200.2	-200.2	-200.2	-200.2
Uplink Rain Attenuation	0.0	0.0	0.0	0.0
Satellite G/T(dB/K)	-5.6	-5.6	-5.6	-5.6
Boltzman Constant(dBW/K-Hz)	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-76.0	-63.8	-54.8
Uplink C/N(dB)	27.7	20.3	20.7	20.7
DOWNLINK PERFORMANCE				
Downlink EIRP per Carrier (dBW)	35.4	35.4	19.6	10.6
Antenna Pointing Error (dB)	-.5	-.5	-.5	-.5
Downlink Path Loss, Clear Sky (dB)	-196.3	-196.3	-196.3	-196.3
Downlink Rain Attenuation	0.0	0.0	0.0	0.0
Earth Station G/T (dB/K)	33.0	28.4	28.4	28.4
Boltzman Constant(dBW / K - Hz)	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-76.0	-63.8	-54.8
Downlink C / N(dB)	24.6	19.6	16.0	16.0
COMPOSITE LINK PERFORMANCE				
C/N Uplink (dB)	27.7	20.3	20.7	20.7
C/N Downlink (dB)	24.6	19.6	16.0	16.0
C/I Intermodulation (dB)	N/A	N/A	18.4	18.4
C/I Uplink Co-Channel (dB)*	25.8	24.0	24.1	24.0
C/I Downlink Co-Channel (dB)*	25.8	24.0	24.1	24.0
C/I Uplink Adjacent Satellite 1 (dB)	16.3	8.9	9.3	9.3
C/I Downlink Adjacent Satellite 1 (dB)	21.2	16.2	12.6	12.6
C/I Uplink Adjacent Satellite 2 (dB)	16.3	8.9	9.3	9.3
C/I Downlink Adjacent Satellite 2 (dB)	22.9	18.5	14.9	15.0
C/(N+I) Composite (dB)	11.6	4.9	4.2	4.2
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	10.6	3.9	3.2	3.2
Minimum Required C/N (dB)	-10.0	-3.4	-3.0	-3.0
Excess Link Margin (dB)	.6	.5	.2	.2
Number of Carriers	1	1.0	17.0	135.0
CARRIER DENSITY LEVELS				

Uplink Power Density (dBW/Hz)	-43.9	-60.9	-45.3	-45.3
Downlink EIRP Density At Beam Peak (dBW/Hz)	-24.6	-34.6	-38.2	-38.2

Exhibit 5-2: Ku-Band

UPLINK BEAM INFORMATION						
Uplink Beam Name	Ku-Band	Ku-Band	Ku-Band	Ku-Band	Ku-Band	Ku-Band
Uplink Frequency (GHz)	14.25	14.25	14.25	14.25	14.25	14.25
Uplink Beam Polarization	Vertical	Vertical	Vertical	Vertical	Vertical	Vertical
Uplink Relative Contour Level (dB)	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0
Uplink Contour G/T (dB/K)	.4	.4	.4	.4	.4	.4
Uplink SFD (dBW/m2)	-84.4	-91.4	-84.4	-84.4	-84.4	-84.4
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0	42.0	42.0
DOWNLINK BEAM INFORMATION						
Downlink Beam Name	Ku-Band	Ku-Band	Ku-Band	Ku-Band	Ku-Band	Ku-Band
Downlink Frequency (GHz)	11.95	11.95	11.95	11.95	11.95	11.95
Downlink Beam Polarization	Horizontal	Horizontal	Horizontal	Horizontal	Horizontal	Horizontal
Downlink Relative Contour Level (dB)	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0
Downlink Contour EIRP (dBW)	41.4	41.4	41.4	41.4	41.4	41.4
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0	42.0	42.0
ADJACENT SATELLITE 1	Africa	Africa	Africa	Africa	Africa	Africa
Satellite 1 Orbital Location	46E	46E	46E	46E	46E	46E
Uplink Power Density (dBW/Hz)	-45	-45	-45	-45	-45	-45
Uplink Polarization Advantage (dB)	0	0	0	0	0	0
Downlink EIRP Density (dBW/Hz)	-17.5	-17.5	-17.5	-17.5	-17.5	-17.5
Downlink Polarization Advantage (dB)	0	0	0	0	0	0
ADJACENT SATELLITE 2	HYP49.5E	HYP49.5E	HYP49.5E	HYP49.5E	HYP49.5E	HYP49.5E
Satellite 2 Orbital Location	49.5E	49.5E	49.5E	49.5E	49.5E	49.5E
Uplink Power Density (dBW/Hz)	-45	-45	-45	-45	-45	-45
Uplink Polarization Advantage (dB)	0	0	0	0	0	0
Downlink EIRP Density (dBW/Hz)	-26	-26	-26	-26	-26	-26
Downlink Polarization Advantage (dB)	0	0	0	0	0	0
CARRIER INFORMATION						
Carrier ID	36M0F7W	36M0G7W	3M07G7W	400KG7W	1M45G7W	200KG7W
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	24575	2048	256	512	64
Code Rate	N/A	1/2x188/204	1/2x239/256	1/2x239/256	R1/2	R1/2
Occupied Bandwidth(kHz)	36000	30133	2413.0	301.6	1229.0	153.6
Allocated Bandwidth(kHz)	36000	36000	3075	400	1450.0	200.0
Minimum C/N, Clear Sky (dB)	10.0	3.36	2.99	2.99	3.4	3.4
Minimum C/N, Rain (dB)	10.0	3.36	2.79	2.79	2.7	2.7
UPLINK EARTH STATION						
Earth Station Diameter (meters)	3.7	3.7	1.8	1.8	1.8	1.8
Earth Station Gain (dBi)	52.7	52.7	46.4	46.4	46.4	46.4
Earth Station Elevation Angle	20	20	20	20	20	20
DOWNLINK EARTH STATION						
Earth Station Diameter (meters)	7.0	3.0	4.6	4.6	6.1	4.6
Earth Station Gain (dBi)	57.0	49.2	53.5	53.5	55.5	53.5
Earth Station G/T (dB/K)	34.6	26.7	31.0	31.0	33.1	31.0
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)	78.5	71.5	59.6	50.5	55.5	47.4
Uplink Path Loss, Clear Sky (dB)	-207.5	-207.5	-207.5	-207.5	-207.5	-207.5
Uplink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Satellite G/T(dB/K)	.4	.4	.4	.4	.4	.4
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	-63.8	-54.8	-60.9	-51.9
Uplink C/N(dB)	24.5	18.2	17.3	17.2	16.1	17.1
DOWNLINK PERFORMANCE						
Downlink EIRP per Carrier (dBW)	41.4	41.4	27.5	18.4	23.4	15.3
Antenna Pointing Error (dB)	-.5	-.5	-.5	-.5	-.5	-.5
Downlink Path Loss, Clear Sky (dB)	-205.9	-205.9	-205.9	-205.9	-205.9	-205.9
Downlink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Earth Station G/T (dB/K)	34.6	26.7	31.0	31.0	33.1	31.0
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	-63.8	-54.8	-60.9	-51.9
Downlink C / N(dB)	22.6	15.4	16.8	16.7	17.8	16.6
COMPOSITE LINK PERFORMANCE						
C/N Uplink (dB)	24.5	18.2	17.3	17.2	16.1	17.1
C/N Downlink (dB)	22.6	15.4	16.8	16.7	17.8	16.6
C/I Intermodulation (dB)	N/A	N/A	18.1	18.0	17.0	17.9
C/I Uplink Co-Channel (dB)*	27.0	27.0	27.3	27.0	26.4	27.0
C/I Downlink Co-Channel (dB)*	27.0	27.0	27.3	27.0	26.4	27.0
C/I Uplink Adjacent Satellite 1 (dB)	20.6	14.4	13.4	13.3	12.3	13.3
C/I Downlink Adjacent Satellite 1 (dB)	15.2	7.6	9.3	9.2	10.3	9.1
C/I Uplink Adjacent Satellite 2 (dB)	23.9	17.7	16.8	16.7	15.6	16.6
C/I Downlink Adjacent Satellite 2 (dB)	27.6	20.9	22.1	22.0	22.8	21.9
C/(N+I) Composite (dB)	12.4	5.5	6.0	5.9	6.0	5.8
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0

Net C/(N+I) Composite (dB)	11.4	4.5	5.0	4.9	5.0	4.8
Minimum Required C/N (dB)	-10.0	-3.4	-3.0	-3.0	-3.4	-3.4
Excess Link Margin (dB)	1.4	1.1	2.0	1.9	1.6	1.4
Number of Carriers	1	1.0	11.0	90.0	24.8	180.0
CARRIER DENSITY LEVELS						
Uplink Power Density (dBW/Hz)	-40.2	-56.0	-50.6	-50.7	-51.8	-50.8
Downlink EIRP Density At Beam Peak (dBW/Hz)	-18.6	-27.4	-30.3	-30.4	-31.5	-30.5

Exhibit 6– AFRICASAT-1 46.0°E LINK BUDGETS

Exhibit 6-1: C-Band

UPLINK BEAM INFORMATION				
Uplink Beam Name	C-Band	C-Band	C-Band	C-Band
Uplink Frequency (GHz)	6.175	6.175	6.175	6.175
Uplink Beam Polarization	Horizontal	Horizontal	Horizontal	Horizontal
Uplink Relative Contour Level (dB)	-8.0	-8.0	-9.6	-8.0
Uplink Contour G/T (dB/K)	-4	-4	-5.6	-4
Uplink SFD (dBW/m2)	-82.4	-90.4	-80.4	-80.4
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0
DOWNLINK BEAM INFORMATION				
Downlink Beam Name	C-Band	C-Band	C-Band	C-Band
Downlink Frequency (GHz)	3.95	3.95	3.95	3.95
Downlink Beam Polarization	Horizontal	Horizontal	Horizontal	Horizontal
Downlink Relative Contour Level (dB)	-8.0	-8.0	-8.0	-8.0
Downlink Contour EIRP (dBW)	33.5	33.5	33.5	33.5
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0
ADJACENT SATELLITE 1	IS-10	IS-10	IS-10	IS-10
Satellite 1 Orbital Location	47.5E	47.5E	47.5E	47.5E
Uplink Power Density (dBW/Hz)	-38.7	-38.7	-38.7	-38.7
Uplink Polarization Advantage (dB)	0	0	0	0
Downlink EIRP Density (dBW/Hz)	-33.7	-33.7	-33.7	-33.7
Downlink Polarization Advantage (dB)	0	0	0	0
ADJACENT SATELLITE 2	Hyp44E	Hyp44E	Hyp44E	Hyp44E
Satellite 2 Orbital Location	44E	44E	44E	44E
Uplink Power Density (dBW/Hz)	-38.7	-38.7	-38.7	-38.7
Uplink Polarization Advantage (dB)	0	0	0	0
Downlink EIRP Density (dBW/Hz)	-41.3	-41.3	-41.3	-41.3
Downlink Polarization Advantage (dB)	0	0	0	0
CARRIER INFORMATION				
Carrier ID	36M0F7W	36M0G7W	3M07G7W	400KG7W
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	2048	256
Code Rate	N/A	1/2x188/204	1/2x239/256	1/2x239/256
Occupied Bandwidth(kHz)	36000	30133	2413.0	301.6
Allocated Bandwidth(kHz)	36000	36000	3075	400
Minimum C/N, Clear Sky (dB)	10.0	3.36	2.99	2.99
Minimum C/N, Rain (dB)	10.0	3.36	2.79	2.79
UPLINK EARTH STATION				
Earth Station Diameter (meters)	18.3	11.0	3.7	3.0
Earth Station Gain (dBi)	60.2	55.4	44.6	43.2
Earth Station Elevation Angle	20	20	20	20
DOWNLINK EARTH STATION				
Earth Station Diameter (meters)	13.1	9.2	8.1	6.1
Earth Station Gain (dBi)	53.5	50.3	49.3	46.5
Earth Station G/T (dB/K)	33.0	29.4	28.4	26.2
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)	80.5	72.5	63.6	54.5
Uplink Path Loss, Clear Sky (dB)	-200.2	-200.2	-200.2	-200.2
Uplink Rain Attenuation	0.0	0.0	0.0	0.0
Satellite G/T(dB/K)	-4	-4	-5.6	-4
Boltzman Constant(dBW/K-Hz)	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-74.8	-63.8	-54.8
Uplink C/N(dB)	29.3	22.1	22.5	24.1
DOWNLINK PERFORMANCE				
Downlink EIRP per Carrier (dBW)	33.5	33.5	19.6	10.5
Antenna Pointing Error (dB)	-.5	-.5	-.5	-.5
Downlink Path Loss, Clear Sky (dB)	-196.3	-196.3	-196.3	-196.3
Downlink Rain Attenuation	0.0	0.0	0.0	0.0
Earth Station G/T (dB/K)	33.0	29.4	28.4	26.2
Boltzman Constant(dBW / K - Hz)	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-74.8	-63.8	-54.8
Downlink C / N(dB)	22.7	19.9	16.0	13.7
COMPOSITE LINK PERFORMANCE				
C/N Uplink (dB)	29.3	22.1	22.5	24.1
C/N Downlink (dB)	22.7	19.9	16.0	13.7
C/I Intermodulation (dB)	N/A	N/A	18.5	18.4
C/I Uplink Co-Channel (dB)*	24.0	24.0	24.3	24.0
C/I Downlink Co-Channel (dB)*	24.0	24.0	24.3	24.0
C/I Uplink Adjacent Satellite 1 (dB)	14.3	7.1	7.5	9.0
C/I Downlink Adjacent Satellite 1 (dB)	19.7	17.0	13.0	9.7
C/I Uplink Adjacent Satellite 2 (dB)	17.6	10.4	10.9	12.4
C/I Downlink Adjacent Satellite 2 (dB)	31.6	29.4	25.5	22.9
C/(N+I) Composite (dB)	11.0	4.8	4.4	4.4
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	10.0	3.8	3.4	3.4
Minimum Required C/N (dB)	-10.0	-3.4	-3.0	-3.0
Excess Link Margin (dB)	0.0	.4	.4	.4
Number of Carriers	1	1.0	11.0	90.0
CARRIER DENSITY LEVELS				

Uplink Power Density (dBW/Hz)	-45.7	-57.7	-44.8	-43.5
Downlink EIRP Density At Beam Peak (dBW/Hz)	-24.5	-33.3	-36.2	-36.3

Exhibit 6-2: Ku-Band

UPLINK BEAM INFORMATION						
Uplink Beam Name	Ku-Band	Ku-Band	Ku-Band	Ku-Band	Ku-Band	Ku-Band
Uplink Frequency (GHz)	14.25	14.25	14.25	14.25	14.25	14.25
Uplink Beam Polarization	Vertical	Vertical	Vertical	Vertical	Vertical	Vertical
Uplink Relative Contour Level (dB)	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0
Uplink Contour G/T (dB/K)	5.6	5.6	5.6	5.6	5.6	5.6
Uplink SFD (dBW/m2)	-87.4	-84.4	-79.4	-79.4	-79.4	-79.4
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0	42.0	42.0
DOWNLINK BEAM INFORMATION						
Downlink Beam Name	Ku-Band	Ku-Band	Ku-Band	Ku-Band	Ku-Band	Ku-Band
Downlink Frequency (GHz)	11.95	11.95	11.95	11.95	11.95	11.95
Downlink Beam Polarization	Horizontal	Horizontal	Horizontal	Horizontal	Horizontal	Horizontal
Downlink Relative Contour Level (dB)	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0
Downlink Contour EIRP (dBW)	53	53	53	53	53	53
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0	42.0	42.0
ADJACENT SATELLITE 1	IS-10	IS-10	IS-10	IS-10	IS-10	IS-10
Satellite 1 Orbital Location	47.5E	47.5E	47.5E	47.5E	47.5E	47.5E
Uplink Power Density (dBW/Hz)	-45	-45	-45	-45	-45	-45
Uplink Polarization Advantage (dB)	0	0	0	0	0	0
Downlink EIRP Density (dBW/Hz)	-20	-20	-20	-20	-20	-20
Downlink Polarization Advantage (dB)	0	0	0	0	0	0
ADJACENT SATELLITE 2	HYP44E	HYP44E	HYP44E	HYP44E	HYP44E	HYP44E
Satellite 2 Orbital Location	44E	44E	44E	44E	44E	44E
Uplink Power Density (dBW/Hz)	-45	-45	-45	-45	-45	-45
Uplink Polarization Advantage (dB)	0	0	0	0	0	0
Downlink EIRP Density (dBW/Hz)	-17.5	-17.5	-17.5	-17.5	-17.5	-17.5
Downlink Polarization Advantage (dB)	0	0	0	0	0	0
CARRIER INFORMATION						
Carrier ID	36M0F7W	54M0G7W	3M07G7W	400KG7W	1M45G7W	200KG7W
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	36860	2048	256	512	64
Code Rate	N/A	1/2x188/204	1/2x239/256	1/2x239/256	R1/2	R1/2
Occupied Bandwidth(kHz)	36000	39997	2413.0	301.6	1229.0	153.6
Allocated Bandwidth(kHz)	36000	54000	3075	400	1450.0	200.0
Minimum C/N, Clear Sky (dB)	10.0	3.36	2.99	2.99	3.4	3.4
Minimum C/N, Rain (dB)	10.0	3.36	2.79	2.79	2.7	2.7
UPLINK EARTH STATION						
Earth Station Diameter (meters)	3.7	3.7	1.2	1.2	1.2	1.2
Earth Station Gain (dBi)	52.7	52.7	42.9	42.9	42.9	42.9
Earth Station Elevation Angle	20	20	20	20	20	20
DOWNLINK EARTH STATION						
Earth Station Diameter (meters)	2.4	4.6	4.6	4.6	4.6	4.6
Earth Station Gain (dBi)	47.5	53.5	53.5	53.5	53.5	53.5
Earth Station G/T (dB/K)	25.0	31.0	31.0	31.0	31.0	31.0
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)	75.5	69.1	56.7	47.6	53.7	44.7
Uplink Path Loss, Clear Sky (dB)	-207.5	-207.5	-207.5	-207.5	-207.5	-207.5
Uplink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Satellite G/T(dB/K)	5.6	5.6	5.6	5.6	5.6	5.6
Boltzman Constant(dBW/K-Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-76.0	-63.8	-54.8	-60.9	-51.9
Uplink C/N(dB)	26.7	19.8	19.6	19.5	19.5	19.5
DOWNLINK PERFORMANCE						
Downlink EIRP per Carrier (dBW)	53.0	43.6	31.2	22.1	28.2	19.2
Antenna Pointing Error (dB)	-.5	-.5	-.5	-.5	-.5	-.5
Downlink Path Loss, Clear Sky (dB)	-205.9	-205.9	-205.9	-205.9	-205.9	-205.9
Downlink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Earth Station G/T (dB/K)	25.0	31.0	31.0	31.0	31.0	31.0
Boltzman Constant(dBW / K - Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-76.0	-63.8	-54.8	-60.9	-51.9
Downlink C / N(dB)	24.6	20.7	20.5	20.4	20.5	20.5
COMPOSITE LINK PERFORMANCE						
C/N Uplink (dB)	26.7	19.8	19.6	19.5	19.5	19.5
C/N Downlink (dB)	24.6	20.7	20.5	20.4	20.5	20.5
C/I Intermodulation (dB)	N/A	56.9	12.0	11.9	11.9	11.9
C/I Uplink Co-Channel (dB)*	28.8	17.6	21.1	20.9	21.4	21.0
C/I Downlink Co-Channel (dB)*	28.8	17.6	21.1	20.9	21.4	21.0
C/I Uplink Adjacent Satellite 1 (dB)	17.6	10.8	10.6	10.5	10.5	10.5
C/I Downlink Adjacent Satellite 1 (dB)	19.0	15.7	15.5	15.4	15.4	15.4
C/I Uplink Adjacent Satellite 2 (dB)	20.9	14.1	13.9	13.8	13.8	13.8
C/I Downlink Adjacent Satellite 2 (dB)	21.7	17.5	17.3	17.2	17.2	17.2
C/(N+I) Composite (dB)	12.8	6.5	5.6	5.5	5.6	5.6
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0

Net C/(N+I) Composite (dB)	11.8	5.5	4.6	4.5	4.6	4.6
Minimum Required C/N (dB)	-10.0	-3.4	-3.0	-3.0	-3.4	-3.4
Excess Link Margin (dB)	1.8	2.2	1.6	1.5	1.2	1.2
Number of Carriers	1	1.0	17.6	135.0	37.2	270.0
CARRIER DENSITY LEVELS						
Uplink Power Density (dBW/Hz)	-43.2	-59.6	-50.0	-50.1	-50.1	-50.1
Downlink EIRP Density At Beam Peak (dBW/Hz)	-7.0	-26.4	-26.6	-26.7	-26.7	-26.7

Exhibit 7 – YAMAL-202 49.0°E LINK BUDGETS

Exhibit 7-1: Yamal-202

UPLINK BEAM INFORMATION				
Uplink Beam Name	C-Band	C-Band	C-Band	C-Band
Uplink Frequency (GHz)	6.175	6.175	6.175	6.175
Uplink Beam Polarization	Horizontal	Horizontal	Horizontal	Horizontal
Uplink Relative Contour Level (dB)	-6.0	-6.0	-6.0	-6.0
Uplink Contour G/T (dB/K)	-4	-4	-4	-4
Uplink SFD (dBW/m2)	-83	-83	-75	-75
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0
DOWNLINK BEAM INFORMATION				
Downlink Beam Name	C-Band	C-Band	C-Band	C-Band
Downlink Frequency (GHz)	3.95	3.95	3.95	3.95
Downlink Beam Polarization	Horizontal	Horizontal	Horizontal	Horizontal
Downlink Relative Contour Level (dB)	-6.0	-6.0	-6.0	-6.0
Downlink Contour EIRP (dBW)	38	38	38	38
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0
ADJACENT SATELLITE 1	IS-10	IS-10	IS-10	IS-10
Satellite 1 Orbital Location	47.5E	47.5E	47.5E	47.5E
Uplink Power Density (dBW/Hz)	-38.7	-38.7	-38.7	-38.7
Uplink Polarization Advantage (dB)	0	0	0	0
Downlink EIRP Density (dBW/Hz)	-31.7	-31.7	-31.7	-31.7
Downlink Polarization Advantage (dB)	0	0	0	0
ADJACENT SATELLITE 2	NSS-5	NSS-5	NSS-5	NSS-5
Satellite 2 Orbital Location	50.5E	50.5E	50.5E	50.5E
Uplink Power Density (dBW/Hz)	-38.7	-38.7	-38.7	-38.7
Uplink Polarization Advantage (dB)	0	0	0	0
Downlink EIRP Density (dBW/Hz)	-32	-32	-32	-32
Downlink Polarization Advantage (dB)	0	0	0	0
CARRIER INFORMATION				
Carrier ID	36M0F7W	72M0G7W	2M87G7W	375KG7W
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	73725	2048	256
Code Rate	N/A	3/4	1/2	1/2
Occupied Bandwidth(kHz)	36000	53333	2293.8	286.7
Allocated Bandwidth(kHz)	36000	72000	2875	375
Minimum C/N, Clear Sky (dB)	10.0	8.0	7.11	7.11
Minimum C/N, Rain (dB)	10.0	8.0	6.01	6.01
UPLINK EARTH STATION				
Earth Station Diameter (meters)	15.2	15.2	3.0	3.0
Earth Station Gain (dBi)	58.4	58.4	43.2	43.2
Earth Station Elevation Angle	20	20	20	20
DOWNLINK EARTH STATION				
Earth Station Diameter (meters)	13.1	11.0	15.2	13.1
Earth Station Gain (dBi)	53.5	51.9	55.0	53.5
Earth Station G/T (dB/K)	33.0	31.0	34.5	33.0
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)	79.9	79.9	65.9	57.1
Uplink Path Loss, Clear Sky (dB)	-200.2	-200.2	-200.2	-200.2
Uplink Rain Attenuation	0.0	0.0	0.0	0.0
Satellite G/T(dB/K)	-4	-4	-4	-4
Boltzman Constant(dBW/K-Hz)	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-77.3	-63.6	-54.6
Uplink C/N(dB)	28.7	27.0	26.7	26.9
DOWNLINK PERFORMANCE				
Downlink EIRP per Carrier (dBW)	38.0	38.0	21.0	12.2
Antenna Pointing Error (dB)	-.5	-.5	-.5	-.5
Downlink Path Loss, Clear Sky (dB)	-196.3	-196.3	-196.3	-196.3
Downlink Rain Attenuation	0.0	0.0	0.0	0.0
Earth Station G/T (dB/K)	33.0	31.0	34.5	33.0
Boltzman Constant(dBW / K - Hz)	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-77.3	-63.6	-54.6
Downlink C / N(dB)	27.2	23.5	23.7	22.4
COMPOSITE LINK PERFORMANCE				
C/N Uplink (dB)	28.7	27.0	26.7	26.9
C/N Downlink (dB)	27.2	23.5	23.7	22.4
C/I Intermodulation (dB)	N/A	N/A	16.2	16.4
C/I Uplink Co-Channel (dB)*	27.0	24.0	24.0	24.0
C/I Downlink Co-Channel (dB)*	27.0	24.0	24.0	24.0
C/I Uplink Adjacent Satellite 1 (dB)	15.7	14.0	13.7	13.9
C/I Downlink Adjacent Satellite 1 (dB)	22.2	18.8	18.8	17.4
C/I Uplink Adjacent Satellite 2 (dB)	15.7	14.0	13.7	13.9
C/I Downlink Adjacent Satellite 2 (dB)	23.7	20.5	20.1	18.8
C/(N+I) Composite (dB)	11.5	9.4	8.3	8.2
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	10.5	8.4	7.3	7.2
Minimum Required C/N (dB)	-10.0	-8.0	-7.1	-7.1
Excess Link Margin (dB)	.5	.4	.2	.1
Number of Carriers	1	1.0	25.0	192.0
CARRIER DENSITY LEVELS				

Uplink Power Density (dBW/Hz)	-44.5	-55.8	-40.9	-40.7
Downlink EIRP Density At Beam Peak (dBW/Hz)	-22.0	-33.3	-36.6	-36.4

Exhibit 8– HYPOTHETICAL 49.5°E LINK BUDGETS

Exhibit 8-1: Hypothetical 49.5°E.L.

UPLINK BEAM INFORMATION						
Uplink Beam Name	Ku-Band	Ku-Band	Ku-Band	Ku-Band	Ku-Band	Ku-Band
Uplink Frequency (GHz)	14.25	14.25	14.25	14.25	14.25	14.25
Uplink Beam Polarization	Vertical	Vertical	Vertical	Vertical	Vertical	Vertical
Uplink Relative Contour Level (dB)	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0
Uplink Contour G/T (dB/K)	.4	.4	.4	.4	.4	.4
Uplink SFD (dBW/m2)	-87.4	-90.4	-83.4	-83.4	-83.4	-83.4
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0	42.0	42.0
DOWNLINK BEAM INFORMATION						
Downlink Beam Name	Ku-Band	Ku-Band	Ku-Band	Ku-Band	Ku-Band	Ku-Band
Downlink Frequency (GHz)	11.95	11.95	11.95	11.95	11.95	11.95
Downlink Beam Polarization	Horizontal	Horizontal	Horizontal	Horizontal	Horizontal	Horizontal
Downlink Relative Contour Level (dB)	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0
Downlink Contour EIRP (dBW)	41.4	41.4	41.4	41.4	41.4	41.4
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0	42.0	42.0
ADJACENT SATELLITE 1	IS-10	IS-10	IS-10	IS-10	IS-10	IS-10
Satellite 1 Orbital Location	47.5E	47.5E	47.5E	47.5E	47.5E	47.5E
Uplink Power Density (dBW/Hz)	-45	-45	-45	-45	-45	-45
Uplink Polarization Advantage (dB)	0	0	0	0	0	0
Downlink EIRP Density (dBW/Hz)	-26	-26	-26	-26	-26	-26
Downlink Polarization Advantage (dB)	0	0	0	0	0	0
ADJACENT SATELLITE 2	HYP51.5E	HYP51.5E	HYP51.5E	HYP51.5E	HYP51.5E	HYP51.5E
Satellite 2 Orbital Location	51.5E	51.5E	51.5E	51.5E	51.5E	51.5E
Uplink Power Density (dBW/Hz)	-45	-45	-45	-45	-45	-45
Uplink Polarization Advantage (dB)	0	0	0	0	0	0
Downlink EIRP Density (dBW/Hz)	-26	-26	-26	-26	-26	-26
Downlink Polarization Advantage (dB)	0	0	0	0	0	0
CARRIER INFORMATION						
Carrier ID	36M0F7W	36M0G7W	2M87G7W	1M45G7W	375KG7W	200KG7W
Carrier Modulation	TV/FM	QPSK	QPSK	BPSK	QPSK	BPSK
Peak to Peak Bandwidth of EDS (MHz)	4	N/A	N/A	N/A	N/A	N/A
Information Rate(kbps)	N/A	36590	2048	512	256	64
Code Rate	N/A	R3/4	1/2	R1/2	1/2	R1/2
Occupied Bandwidth(kHz)	36000	26467	2293.8	1229.0	286.7	153.6
Allocated Bandwidth(kHz)	36000	36000	2875	1450.0	375	200.0
Minimum C/N, Clear Sky (dB)	10.0	8.0	7.11	3.4	7.11	3.4
Minimum C/N, Rain (dB)	10.0	8.0	6.01	2.7	6.01	2.7
UPLINK EARTH STATION						
Earth Station Diameter (meters)	3.7	3.0	1.8	1.8	1.8	1.8
Earth Station Gain (dBi)	52.7	49.7	46.4	46.4	46.4	46.4
Earth Station Elevation Angle	20	20	20	20	20	20
DOWNLINK EARTH STATION						
Earth Station Diameter (meters)	4.6	3.0	4.6	2.4	4.6	2.4
Earth Station Gain (dBi)	53.5	49.2	53.5	47.5	53.5	47.5
Earth Station G/T (dB/K)	31.0	26.7	31.0	25.0	31.0	25.0
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)	75.5	72.5	60	57.2	51	48.2
Uplink Path Loss, Clear Sky (dB)	-207.5	-207.5	-207.5	-207.5	-207.5	-207.5
Uplink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Satellite G/T(dB/K)	.4	.4	.4	.4	.4	.4
Boltzman Constant(dBW/K-Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-74.2	-63.6	-60.9	-54.6	-51.9
Uplink C/N(dB)	21.5	19.8	17.9	17.8	17.9	17.9
DOWNLINK PERFORMANCE						
Downlink EIRP per Carrier (dBW)	41.4	41.4	27.1	24.1	18.1	15.3
Antenna Pointing Error (dB)	-.5	-.5	-.5	-.5	-.5	-.5
Downlink Path Loss, Clear Sky (dB)	-205.9	-205.9	-205.9	-205.9	-205.9	-205.9
Downlink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Earth Station G/T (dB/K)	31.0	26.7	31.0	25.0	31.0	25.0
Boltzman Constant(dBW / K - Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-74.2	-63.6	-60.9	-54.6	-51.9
Downlink C / N(dB)	19.0	16.0	16.6	10.3	16.6	10.6
COMPOSITE LINK PERFORMANCE						
C/N Uplink (dB)	21.5	19.8	17.9	17.8	17.9	17.9
C/N Downlink (dB)	19.0	16.0	16.6	10.3	16.6	10.6
C/I Intermodulation (dB)	N/A	N/A	18.0	17.7	18.0	17.9
C/I Uplink Co-Channel (dB)*	27.0	27.0	27.2	27.1	27.0	27.0
C/I Downlink Co-Channel (dB)*	27.0	27.0	27.2	27.1	27.0	27.0
C/I Uplink Adjacent Satellite 1 (dB)	20.9	19.3	17.6	17.3	17.6	17.6
C/I Downlink Adjacent Satellite 1 (dB)	23.4	20.2	21.1	14.4	21.1	14.7
C/I Uplink Adjacent Satellite 2 (dB)	20.9	19.3	17.6	17.3	17.6	17.6
C/I Downlink Adjacent Satellite 2 (dB)	24.2	21.5	21.9	16.0	21.9	16.2
C/(N+I) Composite (dB)	13.2	11.0	9.8	6.4	9.7	6.7
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	12.2	10.0	8.8	5.4	8.7	5.7
Minimum Required C/N (dB)	-10.0	-8.0	-7.1	-3.4	-7.1	-3.4
Excess Link Margin (dB)	2.2	2.0	1.6	2.0	1.6	2.3
Number of Carriers	1	1.0	12.0	24.0	96.0	180.0
CARRIER DENSITY LEVELS						

Uplink Power Density (dBW/Hz)	-43.2	-51.4	-50	-50.1	-50	-50
Downlink EIRP Density At Beam Peak (dBW/Hz)	-18.6	-26.8	-30.5	-30.8	-30.5	-30.5