Engineering Statement

1) Introduction

Intelsat License LLC ("Intelsat") seeks authority in this application to launch and operate a new satellite designated as Intelsat 22. This spacecraft will operate from 72.1° E.L and will replace Intelsat 709, which currently operates at this orbital location.[1] The characteristics of the Intelsat 22 spacecraft as well as its compliance with the various provisions of Part 25 of the Commission's rules are provided in the remainder of this Engineering Statement.

2) Spacecraft Overview

Intelsat 22 is a Boeing model 702 MP spacecraft that operates on the C-band frequencies of 5850 – 6425 MHz, 3625 – 4200 MHz; and Ku-band frequencies of 14000 – 14500 MHz, 11450 – 11700 MHz and 12250 – 12750 MHz; and UHF-band frequencies of 292.835 – 317.33 MHz and 243.52 – 268.160 MHz.[2] The spacecraft utilizes 24 C-band channels to provide service to Europe, Africa, Eastern Asia and Australia; 18 Ku-band channels to provide service to eastern Africa, Middle East, Europe, southeastern Asia, and Western Australia; and 9 UHF-band channels to provide global service.

2.1) Structure

Intelsat 22 is a 3-axis stabilized type spacecraft that has a rectangular outer body structure. Internally, the spacecraft is comprised of a central cylinder to which a number of panels are attached. Intelsat 22 utilizes two three-panel deployable solar array wings and four deployable communication antenna reflectors and a deployable bicone antenna.

The structural design of Intelsat 22 provides mechanical support for all subsystems. The structure externally supports the communication antennas, solar arrays, and the thrusters. It also provides a stable platform for preserving the alignment of critical elements of the spacecraft.

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[1] Intelsat currently operates Intelsat 706 from 72.0° E.L. and Intelsat 709 from 72.1º E.L. However, Intelsat plans to relocate Intelsat 706 prior to the launch of Intelsat 22.

[2] As noted in the legal narrative, the UHF payload will be owned and operated by the Australian Defence Force. Intelsat does not seek a U.S. license for the UHF payload, but includes its technical information herein for the Commission's information.

A summary of the basic spacecraft characteristics is provided in Exhibit 1. The Intelsat 22 mass budget is provided in Exhibit 2.

2.2) Thermal Subsystem

Thermal control is accomplished through the use of thermal control coatings, blankets, shields, heaters, heat pipes, special paint/coating and heat rejection surfaces. Heat pipes are embedded in a number of key equipment panels. High thermal dissipation components are located directly on the north and south communication panels. Optical Solar Reflectors ("OSRs") are used on the outer faces of these panels. Multilayer Insulation ("MLI") blankets are used on the external east, west, and aft surfaces of the spacecraft. Special paint/coating is applied to the surface of the nadir panel.

The traveling wave tube amplifiers ("TWTAs") of the Ku-band communication subsystem are equipped with radiators protruding from the spacecraft body which radiate a large percentage of the TWTA heat directly to space. The TWTAs supporting the C-band communications subsystem are conduction cooled via direct contact with the spacecraft panels and heat pipe network. Heaters are employed throughout the spacecraft in order to ensure that temperature variations of the bus and communication units are maintained within appropriate limits throughout the operational life of the satellite. Battery temperatures are maintained within limits through the combined use of heat pipes, heaters, blankets and OSRs.

2.3) Power Subsystem

The Electrical Power Subsystem ("EPS") generates, stores, conditions and protects the satellite's electrical power. It provides the energy required to operate the satellite during all modes of operation. The EPS consists of the solar array, batteries, associated power electronics, and power harnesses that integrate and regulate the systems.

Intelsat 22 utilizes two deployable solar array wings, with one wing located on the north side of the spacecraft and the other located on the south side of the spacecraft. Each solar wing is composed of three electrically interconnected panels. The panels support the requisite solar cells. During launch, the solar array wings are in the stowed position. However, during transfer orbit the solar wings are deployed, with each wing extending out on the north and south sides of the spacecraft. The solar array is designed to provide power to the spacecraft for at least 15 years.

During eclipse periods, the primary source of power to the spacecraft is through batteries. Intelsat 22 utilizes a single 24 "virtual" cell Lithium ion battery.

The Intelsat 22 EPS has been designed so that no single failure in the subsystem will cause a spacecraft failure. The EPS will provide sufficient power to the spacecraft throughout its design life to support all active communication channels as well as all necessary housekeeping loads. The beginning of life ("BOL") and end of life ("EOL") power budgets for Intelsat 22 are provided in Exhibit 3.

2.4) Attitude Control Subsystem

The Attitude Control Subsystem ("ACS") maintains the spacecraft attitude during the transfer orbit, initial acquisition period, and on-station geostationary operations. Additionally, the ACS is responsible for re-acquisition of the spacecraft in case of emergency and its placement into a safe configuration.

The ACS is composed of primary and redundant sun sensors, 2-for-1 star trackers, 4-for-3 scalable space inertial reference units, 4-for-3 redundant reaction wheels, bipropellant thrusters, monopropellant thrusters and associated electronics. Control of the spacecraft attitude and orientation is accomplished through the use of reaction wheels and by pulsed or continuous firing of selected monopropellant thrusters by the ACS.

2.5) Propulsion Subsystem

The propulsion subsystem provides impulse for the spacecraft maneuvering during all phases of the mission beginning with launch vehicle separation through the operational lifetime of the satellite. The major components of the propulsion subsystem are as follows: 1) one high pressure helium tank, 2) four fuel tanks, 3) one oxidizer tank, 4) a single 445-N thruster, 5) six 22-N bi-propellant thrusters, 6) four 22-N monopropellant thrusters, 7) twelve 4-N monopropellant thrusters, 8) associated pressure regulators, filters, flow control components, and pressure transducers.

The bipropellant system utilizes a combination of Nitrogen Tetroxide and Hydrazine as propellants. The system utilizes Helium gas to pressurize the propellant tanks.

During transfer orbit operations, the propulsion system will be operated in both bi-propellant and monopropellant modes. During normal on-station operations, the spacecraft will be operated in blow-down, monopropellant mode.

The architecture of the dual mode systems are based on a low risk approach with many of the units having been flight proven. The system utilizes space qualified components and incorporates full redundancy for all critical components.

2.6) Communication Subsystem

2.6.1) Overview

Intelsat 22 provides 24 active communication channels at C-band frequencies, 18 active channels at Ku-band frequencies and 9 active channels at UHF-band frequencies. The C-band payload employs channels having a bandwidth of 72 MHz. The Ku-band payload employs channels having bandwidths of 36 MHz and 72 MHz. The UHF-band payload employs channels with bandwidths of 340 kHz, 380 kHz, 700 kHz, 720 kHz, 728 kHz, 1.425 MHz, 2.065 MHz and 2.39 MHz. The Intelsat 22 frequency and polarization plans are provided in Exhibits 4A and 4B.

At C-band, the Intelsat 22 receive and transmit beams provide coverage of Europe, Africa, Eastern Asia and Australia. At Ku-band, the spacecraft provides coverage of eastern Africa, Middle East, Europe, southeastern Asia, and Western Australia. At UHF-band, the spacecraft provides global coverage.

At C- and Ku-band frequencies, Intelsat 22 employs full frequency reuse through the use of orthogonal polarization within the same beam and/or through the use of spatially isolated beams. Accordingly, Intelsat 22 is compliant with the provisions of Section 25.210(f) of the Commission's rules. Given that the spacecraft will not provide service to the United States, the provisions of Section 25.210(a) are not applicable.

With respect to the use of the 11450 – 11700 MHz band, the United States Table of Frequency Allocations, contained in Section 2.106 of the Commission's rules, permits the use of this band by non-federal fixed satellite service for international systems only (see note NG 104). Intelsat 22 will provide service to areas outside of the United States; hence, it will be

compliant with the United States Table of Frequency Allocations in the band 11450-11700 MHz.

Section 25.211(a) of the Commissions rules requires that the downlink analog video transmissions in the band 3700 – 4200 MHz be transmitted only on a center frequency of 3700+20N MHz, where N=1 to 24. Intelsat requests a waiver of this rule. Intelsat has already successfully coordinated its operation at the nominal orbital location of 72º E.L with other adjacent, co-frequency satellite operators. Accordingly, Intelsat requests that within the 3700 – 4200 MHz band, it be permitted to place its analog video carriers at those center frequencies that it has coordinated with other adjacent operators rather than those specified in Section 25.211(a).

The UHF payload will be licensed by the Australian administration.

2.6.2) Antennas and Beam Coverages

Intelsat 22 utilizes two deployable C-band transmit/receive reflector antenna, two deployable Ku-band transmit/receive reflector antennas, and a four-element helix array UHF-band antenna. The coverage beams of the Intelsat 22 antennas are shown in Exhibits 5A-1 through 5A-18 in the format prescribed in Section 25.114(d) (3) of the Commission's rules.

The performance characteristics for each beam are provided in Exhibits 5A-1 through 5A-18. For the uplink beams, the SFD at any G/T contour may be determined using the following formula:

$$SFD_D = SFD_P + [(G/T)_P - (G/T)_D] + A$$

where

SFD_D: SFD at desired G/T level (dBW/m^2)
SFD_P: Minimum SFD at peak G/T (dBW/m^2)
$(G/T)_D$: Desired G/T level (dB/K)
$(G/T)_P$: Peak G/T (dB/K)
A = Transponder attenuator setting (dB), ranging from 0 to 34 dB for C- and Ku-band channels. Variable attenuators are not incorporated with the UHF channels.

Exhibit 6 provides a detailed calculation of the EIRP, G/T and SFD of the Intelsat 22 uplink and downlink beams.

The UHF band antenna will be designed to have cross-polarization isolation of at least 25 dB. The Commission has no rules concerning cross-polarization limits for UHF antennas implemented on satellites.

A number of the C- and Ku-band communication beams of Intelsat 22 are not predicted to be compliant with the minimum cross-polarization requirements of Section 25.210(i)(1) of the Commission's rules. Exhibits 5D-1 through 5D-13 depict the cross-polarization isolation contours of those Intelsat 22 beams that do not fully comply with the provisions of Section 25.210(i)(1) of the Commission's rules. Specifically, the minimum cross-polarization isolation within the primary coverage area of these beams is as listed in the table below:

Beam Name	**Beam Polarization**	**Minimum Cross Polarization Isolation (dB)**
West Hemi Uplink	Right Hand Circular	28
East Hemi Uplink	Left Hand Circular	25
East Hemi Uplink	Right Hand Circular	25
Mobility IOR Uplink	Horizontal	24
Mobility IOR Uplink	Vertical	24
West Hemi Downlink	Left Hand Circular	24
West Hemi Downlink	Right Hand Circular	27
East Hemi Downlink	Left Hand Circular	26
East Hemi Downlink	Right Hand Circular	24
Middle East – Africa Downlink	Horizontal	26
Middle East – Africa Downlink	Vertical	26
Mobility IOR Downlink	Horizontal	26
Mobility IOR Downlink	Vertical	28

Accordingly, Intelsat requests a waiver of the provisions of Section 25.210(i)(1) with respect to the C- and Ku-band communication beams of Intelsat 22 specified in the above table.

The level of cross-polarization isolation achieved for the non-compliant beams was the best that the satellite manufacturer could achieve without causing excessive degradation in the co-polarized gain of the beam and/or in the size of its coverage area. As a result, a reduction in the cross-polarization isolation with respect to the 30 dB requirement was considered

to be the best approach for making efficient use of the orbit/spectrum resources by Intelsat 22.

Moreover, as the Commission has previously recognized, "failure to meet the cross-polarization isolation requirements will not adversely impact any other operator, and the only party to suffer an increase in interference" is the applicant itself.[3]

Further, in the case of Intelsat 22, deviation from the 30 dB requirement has minimal impact on potential self-interference. The reduction in Intelsat 22's cross-polarization isolation in the affected portions of its coverage area will slightly increase the interference to Intelsat 22 carriers from its own oppositely polarized carriers. By controlling the power level of Intelsat 22's carriers, however, Intelsat can compensate for this factor, thereby meeting its transmission objectives and the requirements of its customers.

The Commission previously has granted waivers of the requirement in Section 25.210(i) based on the same reasoning that supports the waiver Intelsat is requesting in this application. Accordingly, Commission precedent supports a grant of Intelsat's waiver request.

2.6.3) Transponder description

2.6.3.1) C-Band

The output of the East Hemi receive antenna is sent to a diplexer that filters or separates the receive signals from the transmit signals. The receive signal is then divided into its polarization specific components through the use of an Orthomode Transducer ("OMT"). The (receive) input signal is fed through an input test coupler and then to a transmit reject filter that is designed to further reject the transmit frequency band and other undesired signals and prevent the overloading of the receive section. The output of the transmit reject filter is connected to one of four redundant Low Noise Amplifiers ("LNAs"), which are arranged in a 4-for-2 redundancy ring.

Similarly, for the West Hemi receive beam, the output of the OMT is routed to an input test coupler, a transmit reject filter, a directional filter and then to the LNA. The directional filter is used to extract the spacecraft command signal.

[3] See ¶5 of the Terms and Conditions of the Authorization granted to SES on August 18, 2004 in SAT-LOA-20030219-00013.

From the LNA, the signal is sent to a band-pass filter and then to one of 7 frequency down-converters which convert the uplink frequency to the appropriate downlink frequency. The C-band frequency down-converters are arranged in a 7-for-4 redundancy ring.

Given that the down-converter converts the received signal to the necessary frequency required for transmission, the frequency stability of the transmitted signal is due entirely to the down-converter. The Intelsat 22 C-band frequency down-converters are able to maintain over the life of the spacecraft the frequency of the transmitted (down converted) signal to within +/- 0.002% of the desired value. Accordingly, Intelsat 22 is compliant with the provisions of Section 25.202(e) of the Commission's rules.

The output of each down-converter is routed to a set of hybrids and then to a bank of Input Multiplexers ("IMUXs"). The IMUXs are filters that provide frequency band separation for each channel.

The output of each IMUX channel is connected to a corresponding Linearized Channel Amplifier / Traveling Wave Tube Amplifier ("LCAMP/TWTA") pair through a redundancy switching network. The switching network allows for the output of each IMUX to be routed to a redundant LCAMP/TWTA should the primary unit fail.

The LCAMP/TWTAs are configured in a single 32-for-24 redundancy ring. Each LCAMP/TWTA is comprised of an LCAMP that feeds a 70 Watt, conduction cooled, C-band TWTA.

The LCAMP provides high gain, and amplitude and gain expansion to compensate for TWTA nonlinearity. The LCAMP is operated in the Fixed Gain Mode ("FGM"), whereby the output of the LCAMP may be adjusted by ground command from 0 to 34 dB in 1dB increments.

The output of each LCAMP/TWTA is then routed through a bank of switches to an Output Multiplexer ("OMUX"). The switching network allows the output of a redundant LCAMP/TWTA to be forwarded to the appropriate OMUX should the primary LCAMP/TWTA unit fail. The output of each OMUX is fed in succession to a receive reject filter, a test coupler, the OMT and diplexer mentioned above, and the antenna feed for transmission to Earth.

2.6.3.2) Ku-Band

The output of each Ku-band (receive) antenna is divided into its polarization specific receive signal components through the use of an OMT. For two of the receive beams, the input receive signal is fed through a diplexer, an input test coupler and then to a transmit reject filter that is designed to reject the transmit frequency band and other undesired signals, and prevent overloading of the receive section.

The output of the transmit reject filter is connected to a Low Noise Amplifier ("LNA"). Intelsat 22 utilizes two 4-for-2 redundant Ku-band LNAs.

From the LNA, the signal is sent to a band-pass filter or to a band-pass filter/hybrid combination, as appropriate, and then to a frequency down-converter, which converts the uplink frequency to the appropriate downlink frequency. Intelsat 22 utilizes three sets of 4-for-2 redundant frequency down-converters. One set down-converts the signal by 1500 MHz. The second set down-converts the signal by 2000 MHz. The third down-converts the signal by 2800 MHz.

Given that the down-converter converts the received signal to the necessary frequency required for transmission, the frequency stability of the transmitted signal is due entirely to the down-converter. The Intelsat 22 Ku-band frequency down-converters are able to maintain over the life of the spacecraft the frequency of the transmitted (down-converted) signal to within +/- 0.002% of the desired value. Accordingly, Intelsat 22 is compliant with the provisions of Section 25.202(e) of the Commission's rules.

The output of the down-converter is routed through a set of hybrids and then sent to an IMUX. The IMUX is a filter that provides frequency band separation for each channel.

The output of each IMUX channel is connected to a corresponding LCAMP/TWTA pair. The LCAMP/TWTAs are arranged into two interconnected 12-for-9 redundancy rings. Intelsat 22 utilizes 150 Watt radiation cooled Ku-band TWTAs.

The LCAMP provides high gain, and amplitude and gain expansion to compensate for the selected TWTA nonlinearity. The LCAMP may be operated in the Fixed Gain Mode ("FGM") or in the Automatic Level

Control ("ALC") mode. In the FGM mode, the output of the LCAMP may be adjusted by ground command from 0 to 34 dB in (nominal) 1 dB increments and is compliant with Section 25.210(c) of the Commission's rules. In the ALC mode, the LCAMP automatically adjusts its gain depending on the power level of the input signal in order to maintain a constant output power in the presence of varying uplink power. When operating in the ALC mode, the amplifier operating point may be adjusted (by ground command) over a 15 dB range with a minimum of 31 steps using a nominal 0.5 dB step size.

The output of each LCAMP/TWTA is routed to a switch bank which permits connection of the channel to the appropriate downlink beam. From the switch bank, the signal is directed to the appropriate OMUX. The output of each OMUX is fed to a receive reject filter, a test coupler, and then to the diplexer and OMT mentioned above. From there the signal is sent to the antenna feed for transmission to Earth.

2.6.3.3) UHF-Band

The signal is received by the four-element helix array antenna then separated by diplexers prior to being fed to a receive beam forming network. The signal is then sent to an input transmit reject filter assembly that is comprised of an input test coupler, a diplexer, a receive band-pass filter and C- and Ku-band low-pass filters. The output of the input transmit reject filter assembly is connected to a dual LNA assembly. From the LNA, the signal is sent to a hybrid and then to two Digital Receiver Units ("DRUs").

The DRU provides frequency down conversion, channelization, channel gain adjustment, channel filtering and finally frequency up conversion of the received signal. The DRU is able to subdivide the 25-MHz wide receive signal into either twenty 25 kHz channels, forty-two 5kHz channels or a combination of both 5kHz and 25kHz channels. The Intelsat 22 DRU is able to maintain over the life of the spacecraft the frequency of the transmitted (down-converted) signal to within +/- 0.002% of the desired value.

The output of each DRU is routed in sequence to a hybrid, a switch bank and then to a Solid State Power Amplifier ("SSPA"). Intelsat 22 utilizes a combination of medium power and high power SSPAs. The medium power SSPAs have a maximum power output of 50 Watts and the high power SSPAs have a maximum output power of 100 Watts. The UHF SSPAs are arranged in a 12-for-9 redundancy ring. The UHF amplifiers are operated in

such a manner so as to achieve a minimum EIRP of 26 dBW for each 25 kHz channel and of 20 dBW for each 5 kHz channel.

The output of each SSPA is routed in succession to an OMUX, a test coupler, the transmit beam forming network unit and then to the four UHF helix element array, mentioned above, for transmission to Earth.

2.7) Telemetry, Command and Ranging Subsystem

The telemetry, command and ranging (TC&R") subsystem provides the following functions:

1) Acquisition, processing and transmission of spacecraft telemetry data.
2) Reception and retransmission of ground station generated ranging signals.
3) Reception, processing and distribution of telecommands.

The TC&R subsystem consists of the following elements: 1) one pipe command antenna located on the nadir side of the spacecraft, 2) one pipe command antenna located on the aft side of the spacecraft, 3) one pipe telemetry antenna located on the nadir side of the spacecraft, 4) one pipe telemetry antenna located on the aft side of the spacecraft, 5) one bicone command antenna, 6) one bicone telemetry antenna, 7) West Hemi beam transmit/receive reflector antenna, 8) three command receivers, 9) two dual frequency telemetry transmitters, 10) baseband digital data handling system, and 11) microwave components including filters, switches, couplers, isolators, cables and waveguide.

2.7.1) Antennas

The coverage patterns of the command and telemetry beams are provided in Exhibits 5B-1 through 5B-6, in the format prescribed in Section 25.114(d)(3) of the Commission's rules. When on-station, command and telemetry signals are received and transmitted through Intelsat 22's main C-band West Hemi beam antenna. The coverage pattern of the on-station command and telemetry beams are shown in Exhibits 5B-1 and 5B-4, respectively.

During emergencies and transfer orbit operations, command and telemetry signals are received and transmitted through the bicone antenna or through the pipe antennas. Intelsat 22 utilizes 2 pipe antennas for command and 2 for telemetry – one command and telemetry antenna pair located on the nadir side of the spacecraft and the other pair located on the aft side.

Representative receive and transmit gain graphs for the bicone antenna are provided in Exhibits 5B-2 and 5B-5, respectively. Representative receive and transmit gain graphs for the pipe antennas are provided in Exhibits 5B-3 and 5B-6, respectively.

2.7.2) Command

The Intelsat 22 command subsystem performance summary is provided in Exhibit 7. Detailed calculation of the G/T and SFD for each command beam is provided in Exhibit 8.

During on-station operations, commands are sent to the spacecraft by transmission of two independent FM signals on the frequencies of 5850.5 MHz and 6424.5 MHz. The command frequencies are compliant with the provisions of Section 25.202(g) of the Commission's rules. The 5850.5 MHz command signal is received through the main C-band West Hemi beam antenna, and the 6424.5 MHz signal is received by the pipe antennas. The command signals are routed to three command receivers through a series of hybrids and diplexers. The receivers amplify and demodulate the signal, and convert the command signal into a digital stream. The output of the command receivers are forwarded to the Central Telemetry and Command Unit ("CTCU"), where the commands are decoded and sent to the appropriate unit.

During transfer orbit and emergency operations, the operation of the command subsystem is similar to that for on-station operations, except that the transmitted command signals are received by the bicone and pipe antennas.

2.7.3) Telemetry

The Intelsat 22 telemetry subsystem performance summary is provided in Exhibit 7. Detailed calculation of the EIRP for each telemetry beam is provided in Exhibit 8.

During on-station operations, telemetry is transmitted by the spacecraft on two independent, linearly polarized, PM signals on one of two frequency pairs: 4197.25/4198.25 MHz or 4197.75/4198.75 MHz. The telemetry frequencies are compliant with the provisions of Section 25.202(g) of the Commission's rules. The telemetry baseband functions are implemented in the CTCU, where data from the various spacecraft units are collected,

processed, multiplexed, formatted and encoded onto subcarriers. The output of the CTCU is routed to the telemetry transmitters where the signal is modulated onto the main carrier frequencies.

Intelsat 22 utilizes two dual frequency transmitters. One transmitter can operate on the frequencies of 4197.25 MHz and 4198.25 MHz; and the other transmitter can operate at 41971.75 MHz and 4198.75 MHz. The telemetry transmitters are able to maintain the downlink transmit frequency to within +/- 0.002% of the desired frequency over the life of the spacecraft.

Each telemetry transmitter has a low power output port and a high power output port. During emergency operations, the signal from the high power output port of each telemetry transmitter is routed to either the bicone or pipe antennas through a switch. During on-station operations, the signal from the low power output port of the transmitter is routed to a hybrid and then to the appropriate C-band payload OMUX for transmission back to Earth through the West Hemi transmit beam antenna.

2.7.4) Ranging

During all phases of the mission, the slant range of the spacecraft can be determined to a relatively high level of accuracy through the use of a multiple tone ranging system. The ranging tones selected are combined with the normal command data and modulated onto the command carrier and transmitted to the spacecraft. Once received by the spacecraft through the appropriate receiving antenna, the signal is routed to the command receiver where it is separated from the normal command data and routed directly to the spacecraft's telemetry transmitter. At the telemetry transmitter, the ranging signal is combined with other telemetry data and modulated onto the main telemetry carrier and transmitted to Earth through the appropriate spacecraft transmitting antenna. On the ground, the ranging tones are separated from the telemetry data, demodulated and their phase compared with that of the transmitted signal to determine the range of the satellite.

Because the ranging subsystem uses the command and telemetry subsystems, the descriptions of the operation of these two latter systems during on-station, transfer orbit and emergency conditions are applicable to the ranging subsystem as well. The performance summary of the Intelsat 22 command, telemetry and ranging subsystems are provided in Exhibit 7.

2.8) Uplink Power Control Subsystem ("ULPC")

2.8.1 Antennas

Intelsat 22 utilizes a dedicated global horn antenna to generate the C-band global ULPC beam. Similarly, at Ku-band, a dedicated Ku-band global horn antenna is utilized to generate the Ku-band global ULPC beam. The coverage patterns of the C-band and Ku-band ULPC beams are provided in Exhibits 5C-1 through 5C-3.

2.8.2 ULPC System Description

Intelsat 22 provides two Ku-band beacons and one C-band beacon which can be used for uplink power control by customers transmitting to the spacecraft. The C-Band ULPC beacon is linearly polarized and operates on the frequency of 4196.75 MHz. The Ku-Band ULPC beacons are circularly polarized and operate on the frequencies of 11699 MHz and 12499 MHz. Detailed calculation of the EIRP for each ULPC beam is provided in Exhibit 6.

The Intelsat 22 C-band and Ku-band ULPC beacon transmitters are able to maintain the downlink transmit frequency to within +/- 0.002% of the desired frequency over the life of the spacecraft. Accordingly, Intelsat 22 is compliant with the provisions of Section 25.202(e) of the Commission's rules.

The C-band ULPC subsystem utilizes a dedicated 2-for-1 redundant transmitter to generate the beacon signal. The output signal from the ULPC transmitter is directed, in sequence, to a low-pass filter, a test coupler, and then to the C-band global horn antenna for transmission to Earth.

For the generation of each Ku-band ULPC frequency, dedicated 2-for-1 redundant transmitters are utilized. The output of each transmitter is directed to a low-pass filter, a test coupler, an OMT and then to the Ku-band global horn antenna for transmission to Earth.

2.9) Satellite Station-Keeping

The spacecraft will be maintained within 0.05° of its nominal longitudinal position in the east-west direction as well as in the north-south direction. Accordingly, it will be in compliance with the provisions of Section 25.210(j) of the Commission's rules.

The attitude of the spacecraft will be maintained with accuracy consistent with the achievement of the specified communications performance, after taking into account all error sources (i.e., attitude perturbations, thermal distortions, misalignments, orbital tolerances and thruster perturbations).

2.10) Satellite Useful Lifetime

The design lifetime of the satellite in orbit is 15 years. This has been determined by a conservative evaluation of the effect of the synchronous orbit environment on the solar array, the amount of fuel aboard the spacecraft, the effect of the charge-discharge cycling on the life of the battery, and the wear-out of the amplifiers and other active units. The mass allocation of propellant for spacecraft station keeping is 15 years. To enhance the probability of survival, equipment/unit redundancy is incorporated into the spacecraft design where possible. Materials and processes have been selected so that aging or wearing effects will not adversely affect spacecraft performance over the estimated life.

2.11) Spacecraft Reliability

Intelsat 22 is designed for an operational and mission life of 15 years. Life and reliability are maximized by incorporating flight proven or flight qualified units and designs to the greatest extent possible. All subsystems and units have a minimum design life of 15 years. Redundancy concepts are applied to all critical components. All avoidable single-point failure modes have been eliminated.

The projected reliability of the C-, Ku- and UHF-band payloads is 91.2%. The projected reliability of the bus system is 85.4%. The overall reliability of the Intelsat 22 spacecraft is projected to be 77.9%. The subsystem reliability assessments were based upon the use of failure rates, modeling assumptions from previous spacecraft programs and those specific to Intelsat 22. Failure rates for spacecraft equipment have been calculated using actual electrical stress and operating temperature conditions for each part.

3.0) Services and Emission Designators

Intelsat 22 is to be a general purpose communications satellite and has been designed to support various services offered within Intelsat's satellite system. Depending upon the needs of the users, the transponders on Intelsat 22 can accommodate television, radio, voice or data communications. Typical types of communication services to be offered include:

a) Frequency modulated television (TV/FM)
b) Compressed digital video
c) High speed digital data
d) Digital single channel per carrier ("SCPC") data channels
e) Digital SCPC with 64 kbps and T1 data rates

Emission designators and allocated bandwidths for representative communication carriers are provided in Exhibit 9.

4.0) Power Flux Density ("PFD")

The power flux density ("PFD") limits for space stations operating in the 3650 – 4200 MHz and 11450 - 11700 MHz bands are contained in Section 25.208 of the Commission's rules. With respect to the 12250 – 12750 MHz band, the PFD limits are specified in No. 21.16 of the ITU Radio Regulations. For the 243.52 – 268.16 MHz band, there are no PFD limits specified in the Commission's rules or in the Radio Regulations.

The maximum PFD levels for the Intelsat 22 transmissions were calculated for a number of TV/FM and/or digital carriers listed in Exhibit 9 operating in the 3650 – 4200 MHz, 11450 – 11700 MHz and 12250 – 12750 MHz bands. These carriers were chosen because they generally produce high PFD levels on the Earth's surface. The PFD levels were also calculated for the Intelsat 22 telemetry and ULPC carriers. The results are provided in Exhibit 10 and show that the downlink power flux density levels of the Intelsat 22 carriers do not exceed limits specified in Sections 25.208 of the Commission's rules or the limits specified in No. 21.16 of the ITU Radio Regulations.

5.0) Emission Limitations

The Intelsat 22 receiver and transmitter channel filter response characteristics are provided in Exhibit 11, as required under Section 25.114 (4)(vii) of the Commission's rules.

Intelsat shall comply with the provisions of Section 25.202(f) of the Commission's rules with regard to Intelsat 22 emissions.

6.0) Service Area

At C-band, the primary service area of Intelsat 22 is Europe, Africa, Eastern Asia and Australia. At Ku-band, the primary service area is eastern Africa,

Middle East, Europe, southeastern Asia, and Western Australia. At UHF, the primary service area is the visible Earth.

7.0) Orbital Location

Intelsat requests that it be assigned the 72.1° E.L orbital location for Intelsat 22. Intelsat 22 will replace Intelsat 709. The 72.1° E.L location satisfies Intelsat 22 requirements for optimizing coverage, elevation angles and service availability and ensures that maximum operational, economic and public interest benefits will be derived.

8.0) Orbital Arc Limitations

Intelsat 22 is intended to provide video, audio and data services to satellite users within its coverage area. The 72.1° E.L position affords reasonable earth station angles to the region. The attractiveness of Intelsat 22 to this market would be severely diminished if service to this area is not possible.

9.0) Intelsat 22 Link Budgets and Interference Analysis

Link analysis for Intelsat 22 was conducted for a number of representative carriers, at C- and Ku-band.

The nearest operating satellites to Intelsat 22 are Eutelsat W5, located at 70.5º E.L, and Insat 4CR, located at 74º E.L. There is also the C-band Insat 3C satellite located at 74º E.L, however, due to the relatively large beam isolation between this spacecraft and Intelsat 22, the impact from INSAT 3C was not considered.

Eutelsat W5 operates on the frequency bands of 13.0 – 13.25 / 13.75 – 14.5 / 10.95 – 11.70 / 12.50 – 12.75 GHz. On downlink, it utilizes a globally steerable beam and a non-steerable beam that provides service to Europe, northern Africa, Middle East and India. The maximum EIRPs of the steerable and non-steerable downlink beams were assumed to be 54 dBW and 49 dBW, respectively. On uplink, Eutelsat operates a globally steerable beam and a non-steerable beam that provides service to Europe, northern Africa, Middle East and India. The maximum G/T of the steerable and non-steerable beams were assumed to be 10 dB/K and 5 dB/K, respectively. The bandwidth of each Eutelsat W5 channel is 72 MHz.

Insat 4CR provides service to India on the frequency bands of 14.25 – 14.50 GHz and 11.45 – 11.70 GHz. The beam peak EIRP of the INSAT 4CR

downlink beam was assumed to be 56 dBW. The maximum G/T of the INSAT 4CR uplink beam was assumed to be 10 dB/K. The bandwidth of each Insat 4CR channel is 36 MHz.

At C-band, it was assumed that the nearest co-frequency satellites to Intelsat 22 were two hypothetical satellites – one located at 70.1º E.L and the other located at 74.1º E.L. The hypothetical satellites were assumed to have same operational parameters as Intelsat 22. It was further assumed that each of the hypothetical satellites utilized digital carriers having a maximum uplink power density and downlink (beam peak) EIRP density of -38.7 dBW/Hz, as specified in Section 25.212(d) of the Commission's rules, and -32 dBW/Hz, respectively.

At the Ku-band frequency of 11450 – 11700 MHz, it was assumed that the nearest co-frequency satellites to Intelsat 22 were Eutelsat W5, located at 70.5º E.L, and Insat 4CR, located at 74º E.L.

At the Ku-band frequency of 12250 – 12500 MHz, it was assumed that the nearest co-frequency satellites to Intelsat 22 were two hypothetical satellites – one located at 70.1º E.L and the other located at 74.1º E.L. The hypothetical satellites were assumed to have same operational parameters as Intelsat 22. It was further assumed that each of the hypothetical satellites utilized digital carriers having a maximum uplink power density and downlink (beam peak) EIRP density of -45 dBW/Hz and -20 dBW/Hz, respectively.

At the Ku-band frequency of 12500 – 12750 MHz, it was assumed that the nearest co-frequency satellites were Eutelsat W5, located at 70.1º E.L, and a hypothetical satellite, located at 74.1º E.L. The hypothetical satellite was assumed to have the same operational parameters as Intelsat 22.

As explained above, the UHF payload will be operated in non-commercial frequencies that will be licensed by the Australian administration. Accordingly, no link analysis was conducted for the Intelsat 22 UHF channels.

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

a) In the plane of the geostationary satellite orbit, all C- and Ku-band 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) or (a)(2) of the FCC's rules, depending on the frequency band under consideration.

b) All transmitting and receiving earth stations have a cross-polarization isolation value of at least 30 dB within their main beam lobe.
c) At C-band frequencies, degradation due to rain is not considered, given that rain attenuation effects are insignificant at C-band.
d) At Ku-band frequencies rain attenuation predictions are derived using Recommendation ITU-R 618-8.
e) At Ku-band frequencies, increase in noise temperature of the receiving earth station due to rain is taken into account.
f) For the cases where the transponder operates in a multi-carrier mode, the effects due to intermodulation interference are taken into account.

At C- and Ku-band frequencies, the impact of the TV/FM carriers from the adjacent satellites at 70.1° E.L, 70.5° E.L., 74º E.L and 74.1° E.L on the transmissions of Intelsat 22 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.

As shown in Exhibits 4A and 4B, at Ku-band, Intelsat 22 employs with each beam channels having varying bandwidths. In an effort to keep the number of link calculations to a manageable level, link calculations were performed only for the 72 MHz-wide channels, since the power level of a carrier is typically lower than that which would be transmitted through the 36 MHz wide channel. Consequently, the impact of adjacent satellite interference would typically be expected to be greater on a carrier being transmitted through a 72 MHz channel.

The results of the C-band and Ku-band analysis are shown in Exhibit 12 and demonstrate that operation of the Intelsat 22 satellite from 72.1° E.L. would permit the intended services to achieve their respective performance objectives while maintaining sufficient link margin. Additionally, the power and EIRP density levels of the carriers listed in Exhibit 12 comply with the limits contained in Sections 25.212(c) and (d) of the Commission's rules.

10.0) Adjacent Satellite Link Analysis

At C- and Ku-band, the impact of the proposed Intelsat 22 emissions on the transmissions of the following satellites was analyzed: a satellite with the characteristics of Eutelsat W5 (70.1º E.L), Insat 4CR (74º E.L), a hypothetical satellite located at 70.1º E.L and a hypothetical satellite located at 74.1º E. The operating characteristics Eutelsat W5 and Insat 4CR satellites are provided in section 9.0, above. The hypothetical satellites were assumed to have the same operating characteristics as Intelsat 22.

For the C-band analysis at 70.1º E.L, it was assumed that a hypothetical satellite having the same characteristics as Intelsat 22 operated from that location. Furthermore, that the nearest adjacent co-frequency satellites to 70.1º E.L were Intelsat 22, Intelsat 7, located at 68.65º E.L, and Intelsat 10, located at 68.5º E.L. The characteristics of Intelsat 7 are contained in FCC file number SAT-LOA-19960202-00017, SAT-AMD-19991217-00129 and SAT-MOD-20040405-00078. The characteristics of Intelsat 10 are contained in FCC file number SAT-LOA-19991119-00112.

For the Ku-band analysis of the 11450 – 11700 MHz and 12500 – 12750 MHz bands at 70.1º E.L, it was assumed that a satellite with the characteristics of Eutelsat W5 operated at that orbital location. Furthermore, it was assumed that the nearest adjacent co-frequency satellites were Intelsat 22 and Intelsat 10.

For the Ku-band analysis of the 12250 – 12500 MHz band at 70.1º E.L, it was assumed that a hypothetical satellite having the same characteristics as Intelsat 22 operated from that location. Furthermore, it was assumed that the nearest adjacent co-frequency satellites were Intelsat 22 and Intelsat 10.

For the C-band analysis at 74.1º E.L, it was assumed that a hypothetical satellite having the same characteristics as Intelsat 22 operated from that location. Furthermore, it was assumed that the nearest adjacent co-frequency satellites to 74.1º E.L were Intelsat 22 and a hypothetical satellite at 76.1º E.L The hypothetical satellite at 76.1º E.L was assumed to have the same operating characteristics as Intelsat 22.

For the analysis of the 11450 – 11700 MHz band, it was assumed that Insat 4CR operate at 74º E.L. Furthermore, it was assumed that the nearest adjacent co-frequency satellites were Intelsat 22 and a hypothetical satellite at 76º E.L The hypothetical satellite at 76º E.L was assumed to have the same operating characteristics as Intelsat 22.

For the analysis of the 12250 – 12750 MHz band at 74.1º E.L, it was assumed that a hypothetical satellite having the same characteristics as Intelsat 22 operated at that orbital location. Furthermore it was assumed that the nearest adjacent co-frequency satellites were Intelsat 22 and a hypothetical satellite located at 76.1º E.L The hypothetical satellite at 76.1º E.L was assumed to have the same operating characteristics as Intelsat 22.

The impact of Intelsat 22 emissions on the TV/FM carriers of the adjacent satellites at 70.1º E.L, 74º E.L and 74.1º E.L was not considered for the reasons articulated in section 9.0, above. The assumptions made in section 9.0 pertaining to Earth station off-axis gain performance, Earth station cross-polarization performance and rain attenuation were also applied in the analysis.

The results of the analysis are listed in Exhibits 13 and 14. The Intelsat 22 transmissions will be limited to those levels contained in Sections 25.212(c) and (d), as applicable, unless higher levels are coordinated with affected adjacent satellite operators. In any case, pursuant to the results in Exhibits 13 and 14, the uplink power density of the Intelsat 22 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. Within the 3700 – 4200 MHz band the downlink EIRP density of the Intelsat 22 digital carriers will not exceed -32 dBW/Hz; and within the 11450 – 11700 MHz and 12250 – 12750 MHz bands the downlink EIRP density of the Intelsat 22 digital carriers will not exceed -20 dBW/Hz.

11.0) Schedule S Submission

Intelsat is providing with its application a Schedule S for the operations of Intelsat 22 from 72.1º E.L. 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 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).

12.0) 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.

12.1) 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.

12.2) 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, venting all pressurized systems and by leaving the batteries in a permanent discharge state.

12.3) 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. With the exception of Intelsat 709 during the transition of traffic period, Intelsat 22 will not be located at the same orbital location as another satellite or at an orbital location that has an overlapping station-keeping volume with another satellite.

During the transition of traffic from Intelsat 709, Intelsat will take all the necessary steps, e.g., “pass-in-the-night maneuver” or slight relocation of Intelsat 709 and/or Intelsat 22, to minimize the risk of collision between Intelsat 22 and Intelsat 709.

With the exception of Intelsat 709, 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 22. Intelsat is also not aware of any system with an overlapping station-keeping volume with Intelsat 22 that is the subject of an ITU filing and that is either in orbit or progressing towards launch.

12.4) Post Mission Disposal

At the end of the mission, Intelsat will dispose of the spacecraft by moving it to a minimum altitude of 300 kilometers above the geostationary arc. This exceeds the minimum altitude established by the IADC formula. Intelsat has reserved 120.4 kilograms of fuel for this purpose. The reserved fuel figure was determined by the spacecraft manufacturer and provided for in the propellant budget. To calculate this figure, the "rocket equation" was used, taking into account the expected mass of the satellite at the end of life and the required delta-velocity to achieve the desired orbit. The fuel gauging uncertainty has been taken into account in these calculations.

In calculating the disposal orbit, Intelsat has used simplifying assumptions as permitted under the Commission's Orbital Debris Report and Order. For reference, the effective area to mass ratio (Cr*A/M) of the Intelsat 22 spacecraft is 0.045 m^2/kg, resulting in a minimum perigee disposal altitude under the IADC formula of at most 285 kilometers above the geostationary arc, which is lower than the 300 kilometer above geostationary disposal altitude specified by Intelsat in this filing. Accordingly, the Intelsat 22 planned disposal orbit complies with the FCC's rules.

13) ITU Filing

Intelsat currently has no filing with the ITU for a satellite network that includes the frequency bands of 5850 – 5925 MHz and 3625 – 3700 MHz. Intelsat will submit to the Commission an ITU filing that contains these C-band frequencies.

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	September 26, 2011
Jose Albuquerque Intelsat Senior Director Spectrum Strategy	Date

EXHIBIT 1: SUMMARY OF SPACECRAFT CHARACTERISTICS

GENERAL	
Spacecraft Name	Intelsat 22
Orbital Location	72.1° E.L.
Spacecraft Manufacturer	Boeing
Spacecraft Model	702 MP
Spacecraft Type	3-axis stabilized
Spacecraft Dimensions	
Length	36.9 meters
Width	9.3 meters
Depth	7.6 meters
Spacecraft Expected Lifetime	15 years
Eclipse Capability	100%
Station-keeping	
North-South	±0.05°
East-West	±0.05°
Antenna Pointing Accuracy	
North-South, East-West, Rotational (C and Ku-band channels)	0.08°, 0.08º, 0. 18º
North-South, East-West, Rotational (UHF-band channels)	0.30°, 0.30º, 0.1º
Spacecraft Reliability	77.9%
Payload Reliability	91.2%
Bus Reliability	85.4%
Propulsion Type	Dual mode
Deployed Area of Solar Array	51.9 sq. meters
Ranging Accuracy	≤ 30 meters

EXHIBIT 2: SPACECRAFT MASS BUDGET

Mass of Spacecraft without Fuel (kg)	2789
Mass of Fuel and Disposables (kg)	3669
Launch Mass (kg)	6458
Mass of Fuel/Oxidizer, in orbit, at Beginning of Life (kg)	676/506

EXHIBIT 3: SPACECRAFT POWER BUDGET

	BEGINNING OF LIFE		END OF LIFE	
	AUTUMN EQUINOX	SUMMER SOLSTICE	AUTUMN EQUINOX	SUMMER SOLSTICE
PAYLOAD (WATTS)	8365	8365	8365	8365
BUS (WATTS)	2004	1165	2009	986
TOTAL POWER (WATTS)	10369	9530	10374	9351
SOLAR ARRAY POWER (WATTS)	13277	11660	11580	10323
DEPTH OF BATTERY DISCHARGE (%)	65.5%	N/A	73.9%	N/A

EXHIBIT 4A: FREQUENCY PLAN

C-Band Frequency Plan

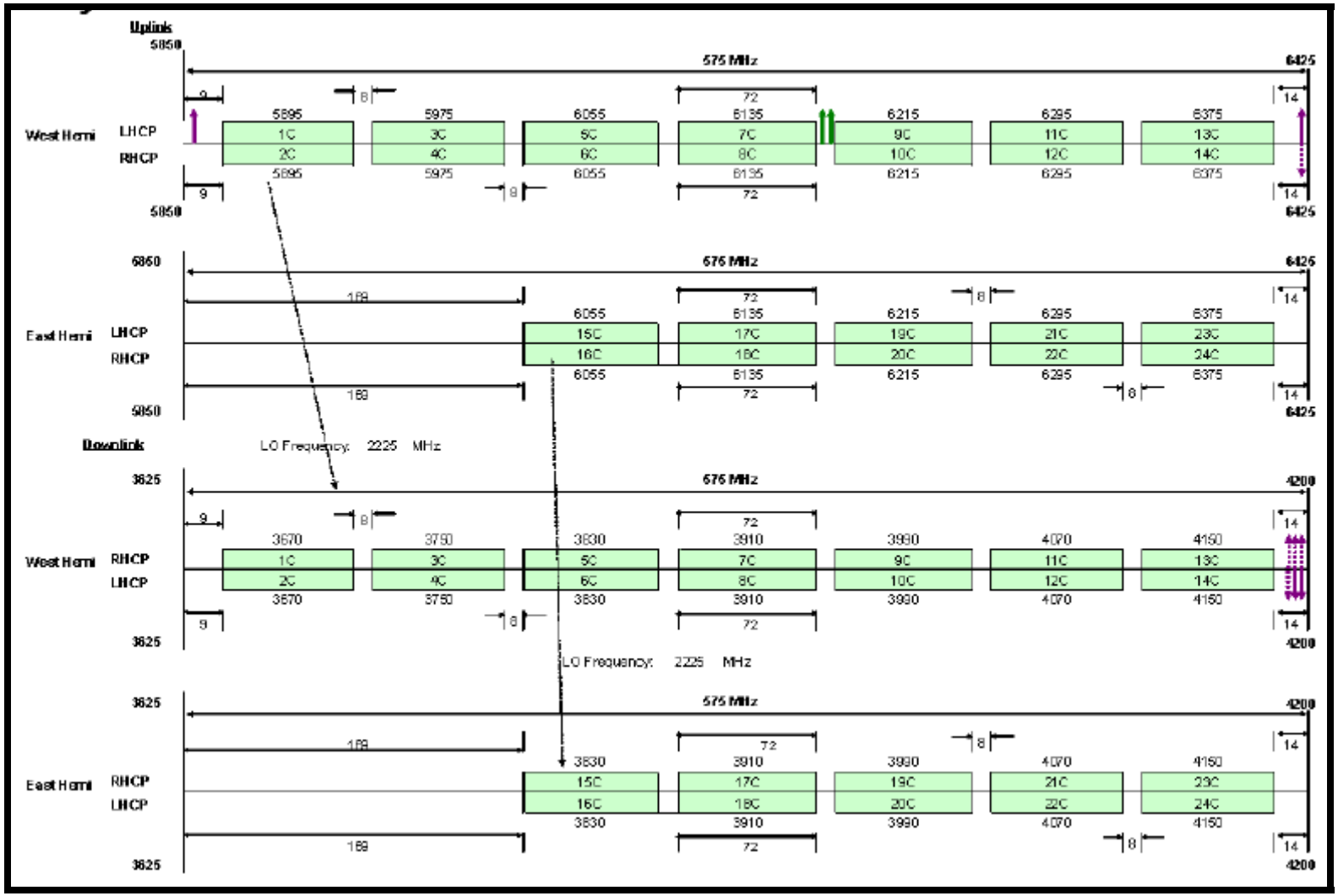


EXHIBIT 4A: FREQUENCY PLAN (continued)

Ku-Band Frequency Plan

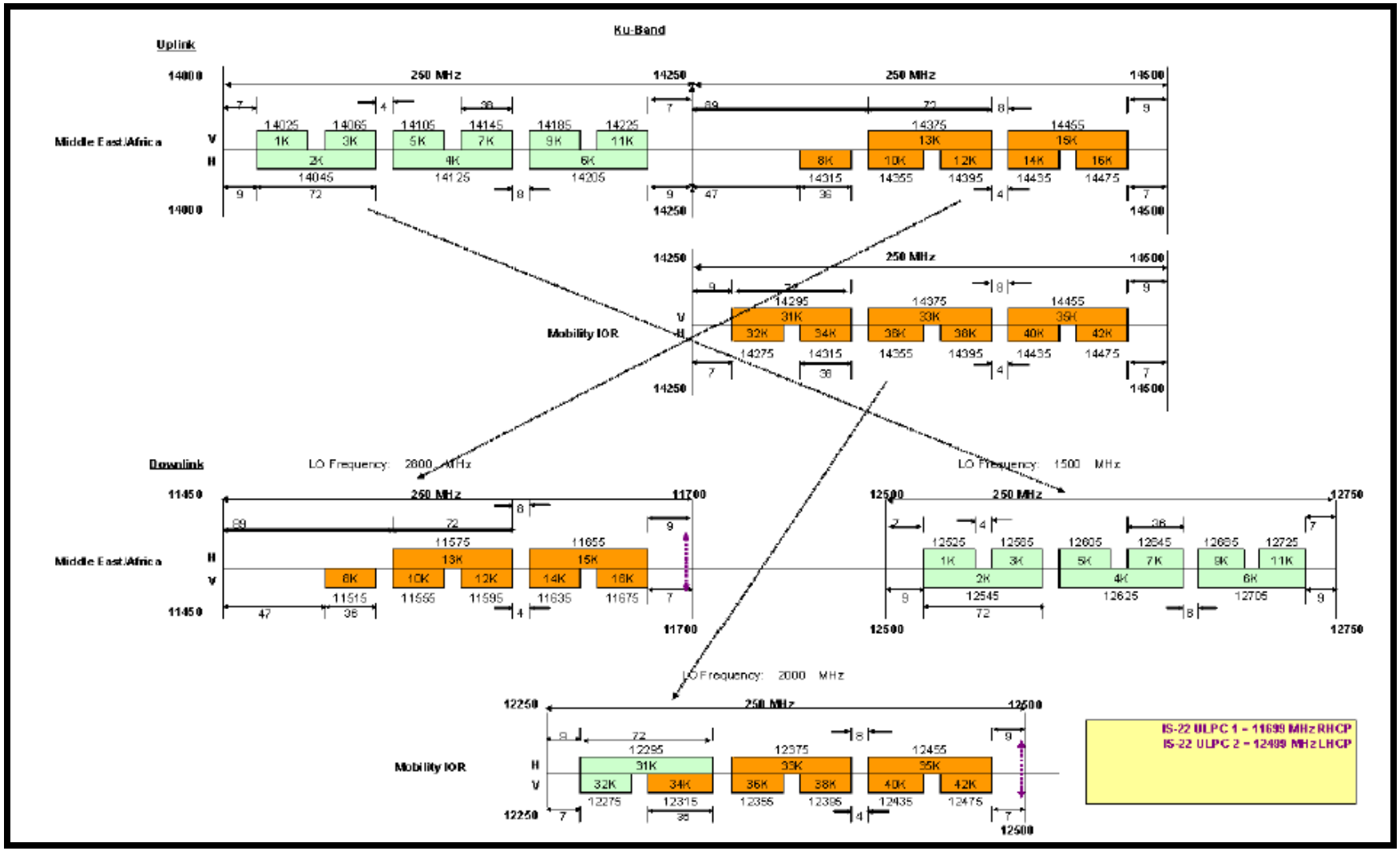
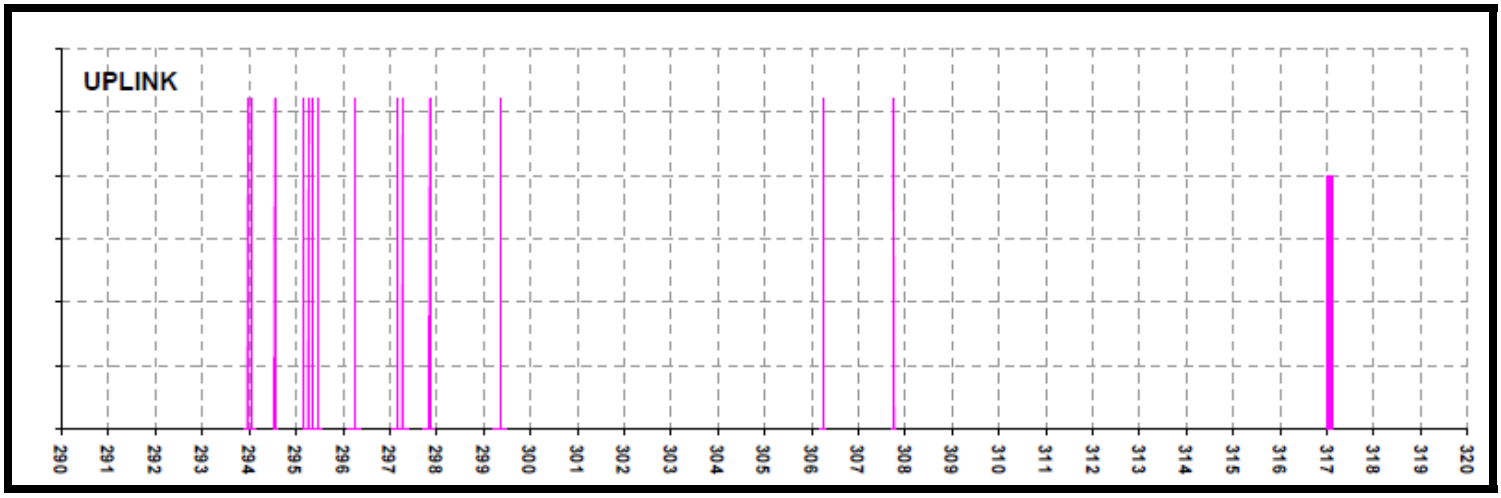
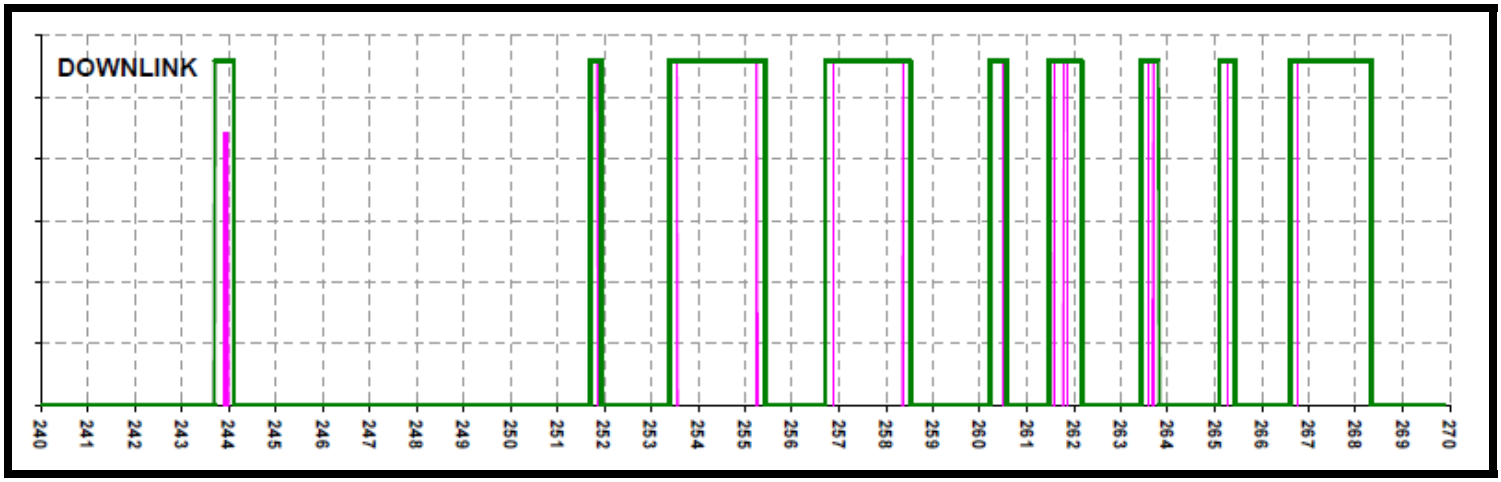


EXHIBIT 4A: FREQUENCY PLAN (continued)

(a) Uplink UHF Frequency Plan



(b) Downlink UHF Frequency Plan



*__Note__: The uplink frequency of a UHF carrier can be placed anywhere within the uplink frequency band of 292.835 MHz to 317.330 MHz. The downlink frequency of a UHF carrier will be placed within the pass-band of the specific UHF downlink channels listed. Each UHF downlink channel can be subdivided into 5 kHz or 25 kHz sub-channels or a combination of the two. When transmitting only 5 kHz wide sub-channels, the total number of sub-channels is limited to 42. When transmitting only 25 kHz wide sub-channels, the total number of sub-channels is limited to 20. When transmitting a mix of 5 kHz and 25 kHz wide sub-channels, the total number of sub-channels is limited to 33.

EXHIBIT 4B: 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 Channel Gain (dB)
1C	West Hemi	Left Hand Circular	5895	1C	West Hemi	Right Hand Circular	3670	72	135.8
3C	West Hemi	Left Hand Circular	5975	3C	West Hemi	Right Hand Circular	3750	72	135.8
5C	West Hemi	Left Hand Circular	6055	5C	West Hemi	Right Hand Circular	3830	72	135.8
7C	West Hemi	Left Hand Circular	6135	7C	West Hemi	Right Hand Circular	3910	72	135.8
9C	West Hemi	Left Hand Circular	6215	9C	West Hemi	Right Hand Circular	3990	72	135.8
11C	West Hemi	Left Hand Circular	6295	11C	West Hemi	Right Hand Circular	4070	72	135.8
13C	West Hemi	Left Hand Circular	6375	13C	West Hemi	Right Hand Circular	4150	72	135.8
2C	West Hemi	Right Hand Circular	5895	2C	West Hemi	Left Hand Circular	3670	72	135.8
4C	West Hemi	Right Hand Circular	5975	4C	West Hemi	Left Hand Circular	3750	72	135.8
6C	West Hemi	Right Hand Circular	6055	6C	West Hemi	Left Hand Circular	3830	72	135.8
8C	West Hemi	Right Hand Circular	6135	8C	West Hemi	Left Hand Circular	3910	72	135.8
10C	West Hemi	Right Hand Circular	6215	10C	West Hemi	Left Hand Circular	3990	72	135.8
12C	West Hemi	Right Hand Circular	6295	12C	West Hemi	Left Hand Circular	4070	72	135.8
14C	West Hemi	Right Hand Circular	6375	14C	West Hemi	Left Hand Circular	4150	72	135.8
15C	East Hemi	Left Hand Circular	6055	15C	East Hemi	Right Hand Circular	3830	72	134.4
17C	East Hemi	Left Hand Circular	6135	17C	East Hemi	Right Hand Circular	3910	72	134.4
19C	East Hemi	Left Hand Circular	6215	19C	East Hemi	Right Hand Circular	3990	72	134.4
21C	East Hemi	Left Hand Circular	6295	21C	East Hemi	Right Hand Circular	4070	72	134.4
23C	East Hemi	Left Hand Circular	6375	23C	East Hemi	Right Hand Circular	4150	72	134.4
16C	East Hemi	Right Hand Circular	6055	16C	East Hemi	Left Hand Circular	3830	72	134.4
18C	East Hemi	Right Hand Circular	6135	18C	East Hemi	Left Hand Circular	3910	72	134.4
20C	East Hemi	Right Hand Circular	6215	20C	East Hemi	Left Hand Circular	3990	72	134.4
22C	East Hemi	Right Hand Circular	6295	22C	East Hemi	Left Hand Circular	4070	72	134.4
24C	East Hemi	Right Hand Circular	6375	24C	East Hemi	Left Hand Circular	4150	72	134.4
CMD1	West Hemi	Left Hand Circular	5850.5					1	
CMD2	Global (bicone)	Horizontal	5850.5					1	
CMD3	Global (pipe)	Left Hand Circular	6424.5					1	
				TLM1	West Hemi	Left Hand Circular	4197.25	0.5	
				TLM2	West Hemi	Left Hand Circular	4197.75	0.5	
				TLM3	West Hemi	Left Hand Circular	4198.25	0.5	
				TLM4	West Hemi	Left Hand Circular	4198.75	0.5	
				TLM5	Global (bicone)	Vertical	4197.25	0.5	
				TLM6	Global (bicone)	Vertical	4197.75	0.5	
				TLM7	Global (bicone)	Vertical	4198.25	0.5	
				TLM8	Global (bicone)	Vertical	4198.75	0.5	
				TLM9	Global (pipe)	Left Hand Circular	4197.25	0.5	
				TLM10	Global (pipe)	Left Hand Circular	4197.75	0.5	
				TLM11	Global (pipe)	Left Hand Circular	4198.25	0.5	
				TLM12	Global (pipe)	Left Hand Circular	4198.75	0.5	
				UPC	Global	Vertical	4196.75	0.025	

EXHIBIT 4B: 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 Channel Gain (dB)
1K	Middle East-Africa	Vertical	14025	1K	Middle East-Africa	Horizontal	12525	36	145.1
3K	Middle East-Africa	Vertical	14065	3K	Middle East-Africa	Horizontal	12565	36	145.1
5K	Middle East-Africa	Vertical	14105	5K	Middle East-Africa	Horizontal	12605	36	145.1
7K	Middle East-Africa	Vertical	14145	7K	Middle East-Africa	Horizontal	12645	36	145.1
9K	Middle East-Africa	Vertical	14185	9K	Middle East-Africa	Horizontal	12685	36	145.1
11K	Middle East-Africa	Vertical	14225	11K	Middle East-Africa	Horizontal	12725	36	145.1
13K	Middle East-Africa	Vertical	14375	13K	Middle East-Africa	Horizontal	11575	72	145.1
15K	Middle East-Africa	Vertical	14455	15K	Middle East-Africa	Horizontal	11655	72	145.1
2K	Middle East-Africa	Horizontal	14045	2K	Middle East-Africa	Vertical	12545	72	145.1
4K	Middle East-Africa	Horizontal	14125	4K	Middle East-Africa	Vertical	12625	72	145.1
6K	Middle East-Africa	Horizontal	14205	6K	Middle East-Africa	Vertical	12705	72	145.1
8K	Middle East-Africa	Horizontal	14315	8K	Middle East-Africa	Vertical	11515	36	145.1
10K	Middle East-Africa	Horizontal	14355	10K	Middle East-Africa	Vertical	11555	36	145.1
12K	Middle East-Africa	Horizontal	14395	12K	Middle East-Africa	Vertical	11595	36	145.1
14K	Middle East-Africa	Horizontal	14435	14K	Middle East-Africa	Vertical	11635	36	145.1
16K	Middle East-Africa	Horizontal	14475	16K	Middle East-Africa	Vertical	11675	36	145.1
31K	Mobility IOR	Vertical	14295	31K	Mobility IOR	Horizontal	12295	72	145.5
33K	Mobility IOR	Vertical	14375	33K	Mobility IOR	Horizontal	12375	72	145.5
35K	Mobility IOR	Vertical	14455	35K	Mobility IOR	Horizontal	12455	72	145.5
32K	Mobility IOR	Horizontal	14275	32K	Mobility IOR	Vertical	12275	36	145.5
34K	Mobility IOR	Horizontal	14315	34K	Mobility IOR	Vertical	12315	36	145.5
36K	Mobility IOR	Horizontal	14355	36K	Mobility IOR	Vertical	12355	36	145.5
38K	Mobility IOR	Horizontal	14395	38K	Mobility IOR	Vertical	12395	36	145.5
40K	Mobility IOR	Horizontal	14435	40K	Mobility IOR	Vertical	12435	36	145.5
42K	Mobility IOR	Horizontal	14475	42K	Mobility IOR	Vertical	12475	36	145.5
				UPK1	Global	Right Hand Circular	11699	0.025	
				UPK2	Global	Left Hand Circular	12499	0.025	
1*	Global	Right Hand Circular	292.835 to 317.330	1	Global	Right Hand Circular	251.3675	2.065	161.3
				2	Global	Right Hand Circular	254.73	2.390	161.3
				3	Global	Right Hand Circular	257.8675	2.065	161.3
				4	Global	Right Hand Circular	265.599	0.728	161.3
				5	Global	Right Hand Circular	267.4475	1.425	161.3
				7	Global	Right Hand Circular	260.53	0.340	161.3
				8	Global	Right Hand Circular	261.95	0.700	161.3
				9	Global	Right Hand Circular	263.75	0.380	161.3
				10	Global	Right Hand Circular	243.88	0.720	161.3

***Note**: The uplink frequency of a UHF carrier can be placed anywhere within the uplink frequency band of 292.835 MHz to 317.330 MHz. The downlink frequency of a UHF carrier will be placed within the pass-band of the specific UHF downlink channels listed. Each UHF downlink channel can be subdivided into 5 kHz or 25 kHz sub-channels or a combination of the two. When transmitting only 5 kHz wide sub-channels, the total number of sub-channels is limited to 42. When transmitting only 25 kHz wide sub-channels, the total number of sub-channels is limited to 20. When transmitting a mix of 5 kHz and 25 kHz wide sub-channels, the total number of sub-channels is limited to 33.

EXHIBIT 5A-1: WEST HEMI RECEIVE BEAM
(Schedule S Beam ID: WHLU)

Beam Polarization: Left Hand Circular
Peak Beam Gain: 27.8 dBi
Peak Beam G/T: 1.8 dB/K
Saturated Flux Density @ Peak Beam G/T: -109.2 to -75.2 dBW/m^2

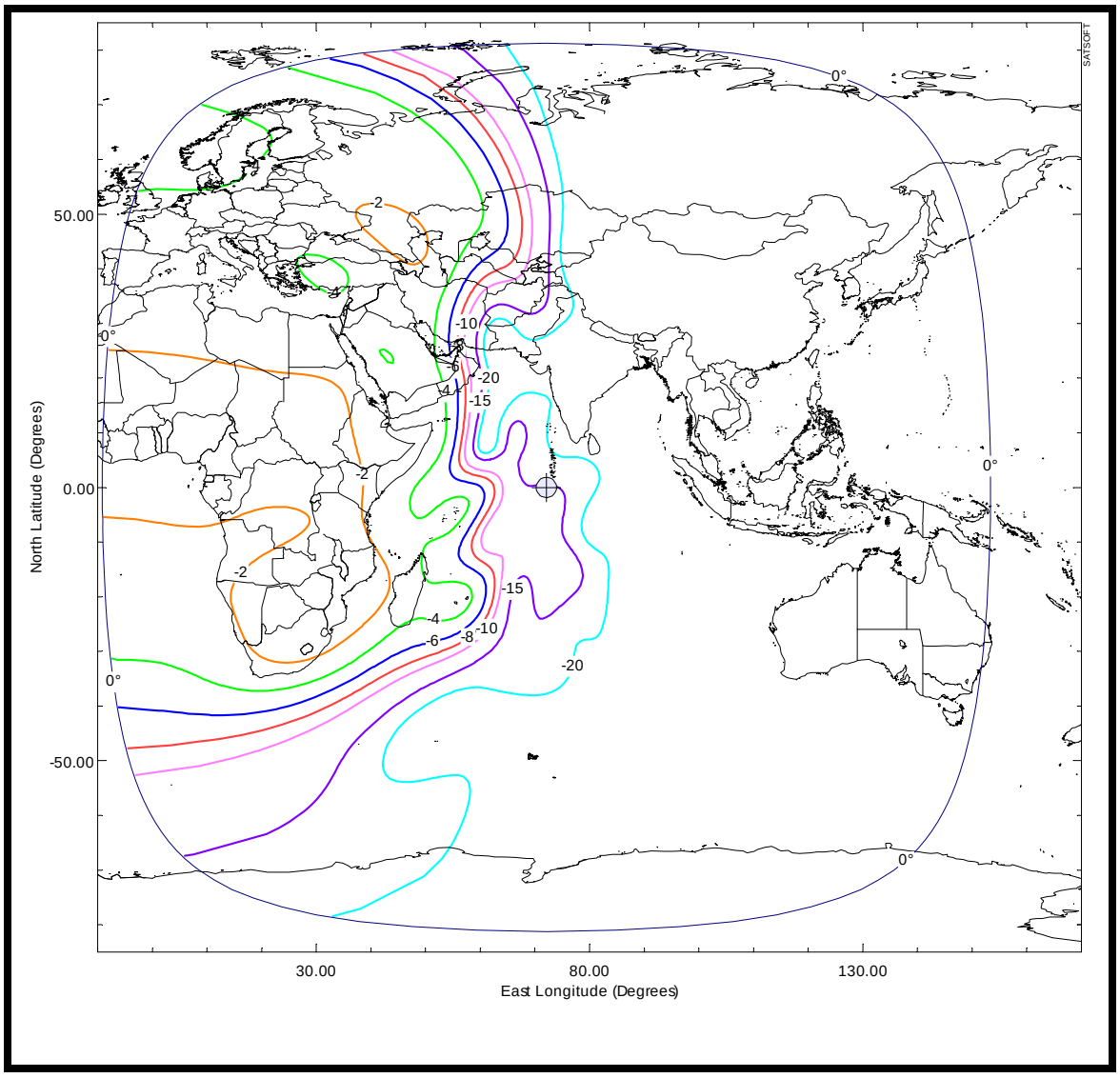


EXHIBIT 5A-2: WEST HEMI RECEIVE BEAM
(Schedule S Beam ID: WHRU)

Beam Polarization: Right Hand Circular
Peak Beam Gain: 27.8 dBi
Peak Beam G/T: 1.8 dB/K
Saturated Flux Density @ Peak Beam G/T: -109.2 to -75.2 dBW/m^2

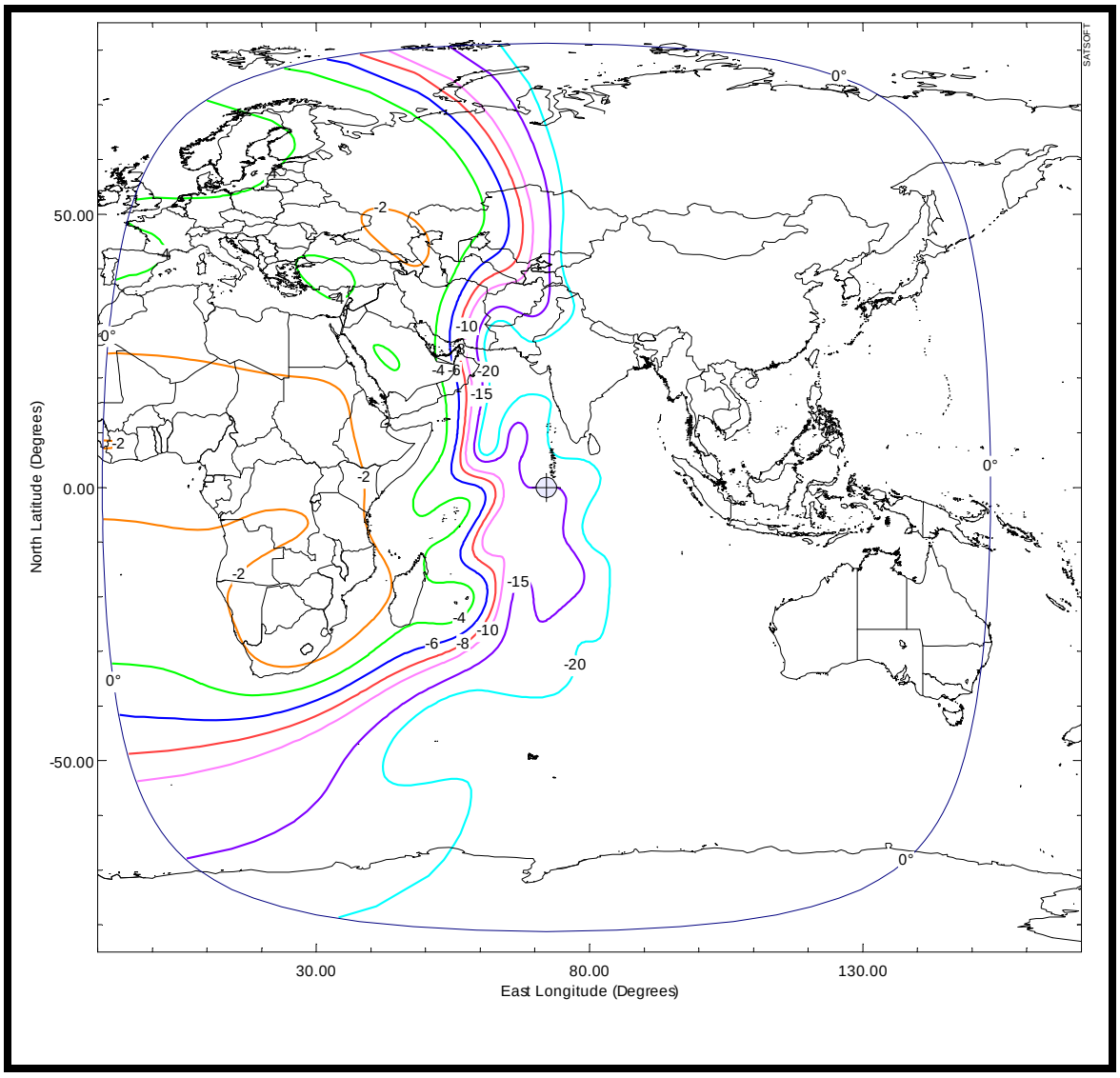


EXHIBIT 5A-3: EAST HEMI RECEIVE BEAM
(Schedule S Beam ID: EHLU)

Beam Polarization: Left Hand Circular
Peak Beam Gain: 29.8 dBi
Peak Beam G/T: 3.7 dB/K
Saturated Flux Density @ Peak Beam G/T: -109.8 to -75.8 dBW/m^2

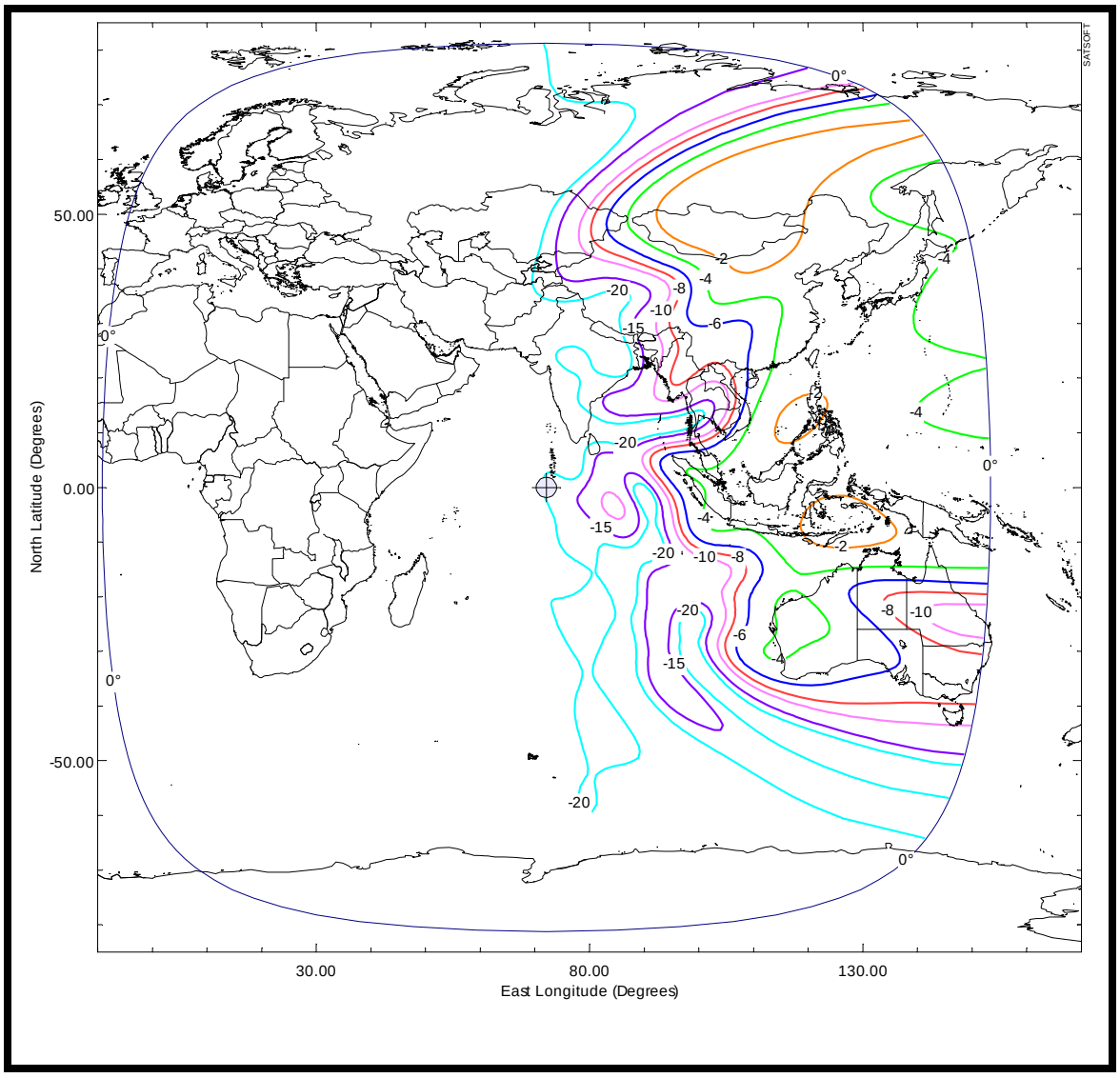


EXHIBIT 5A-4: EAST HEMI RECEIVE BEAM
(Schedule S Beam ID: EHRU)

Beam Polarization: Right Hand Circular
Peak Beam Gain: 29.8 dBi
Peak Beam G/T: 3.7 dB/K
Saturated Flux Density @ Peak Beam G/T: -109.8 to -75.8 dBW/m^2

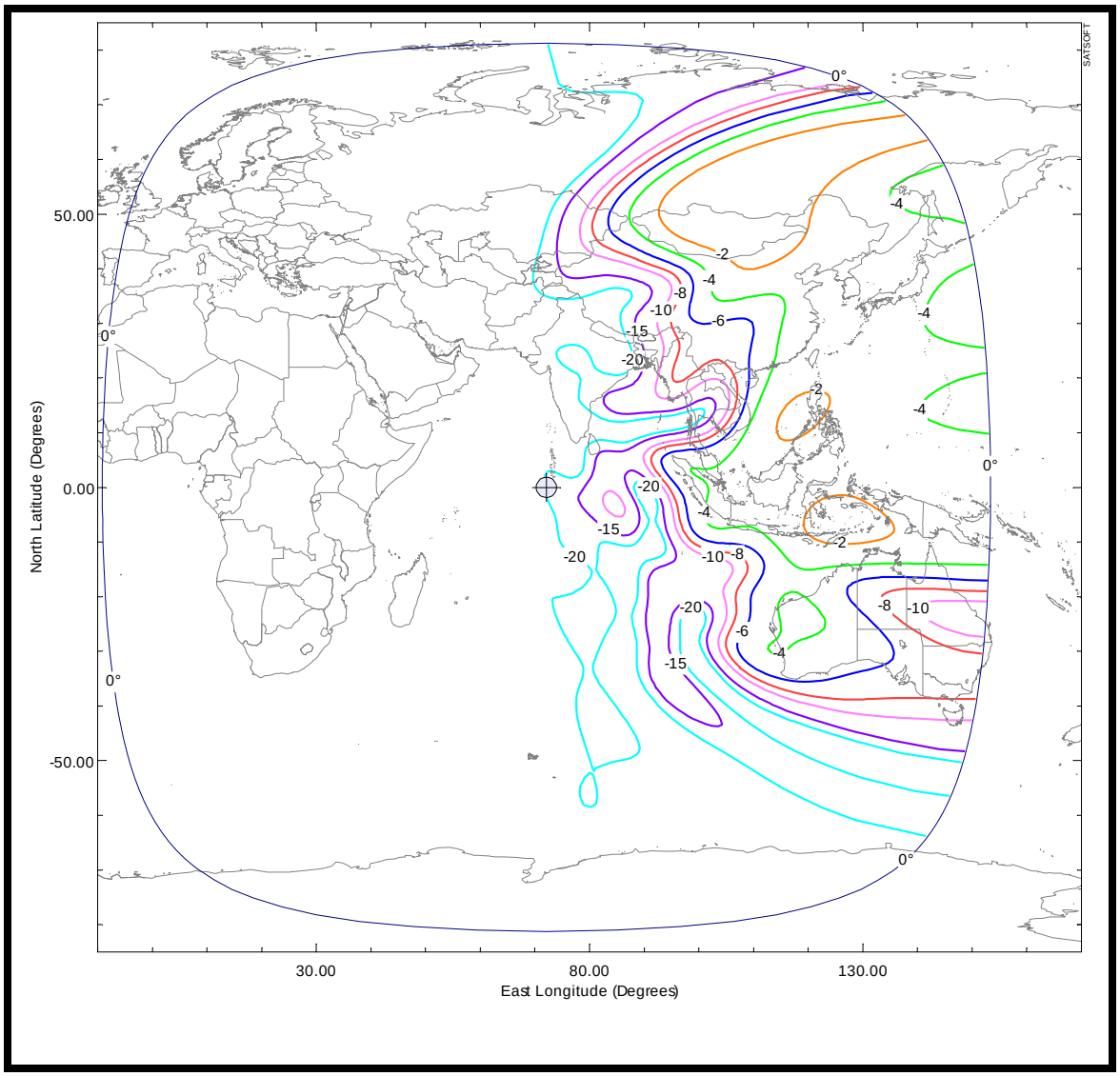


EXHIBIT 5A-5: MIDDLE EAST-AFRICA RECEIVE BEAM
(Schedule S Beam ID: MAHU)

Beam Polarization: Horizontal
Peak Beam Gain: 32.5 dBi
Peak Beam G/T: 6.7 dB/K
Saturated Flux Density @ Peak Beam G/T: -113.1 to -79.1 dBW/m^2

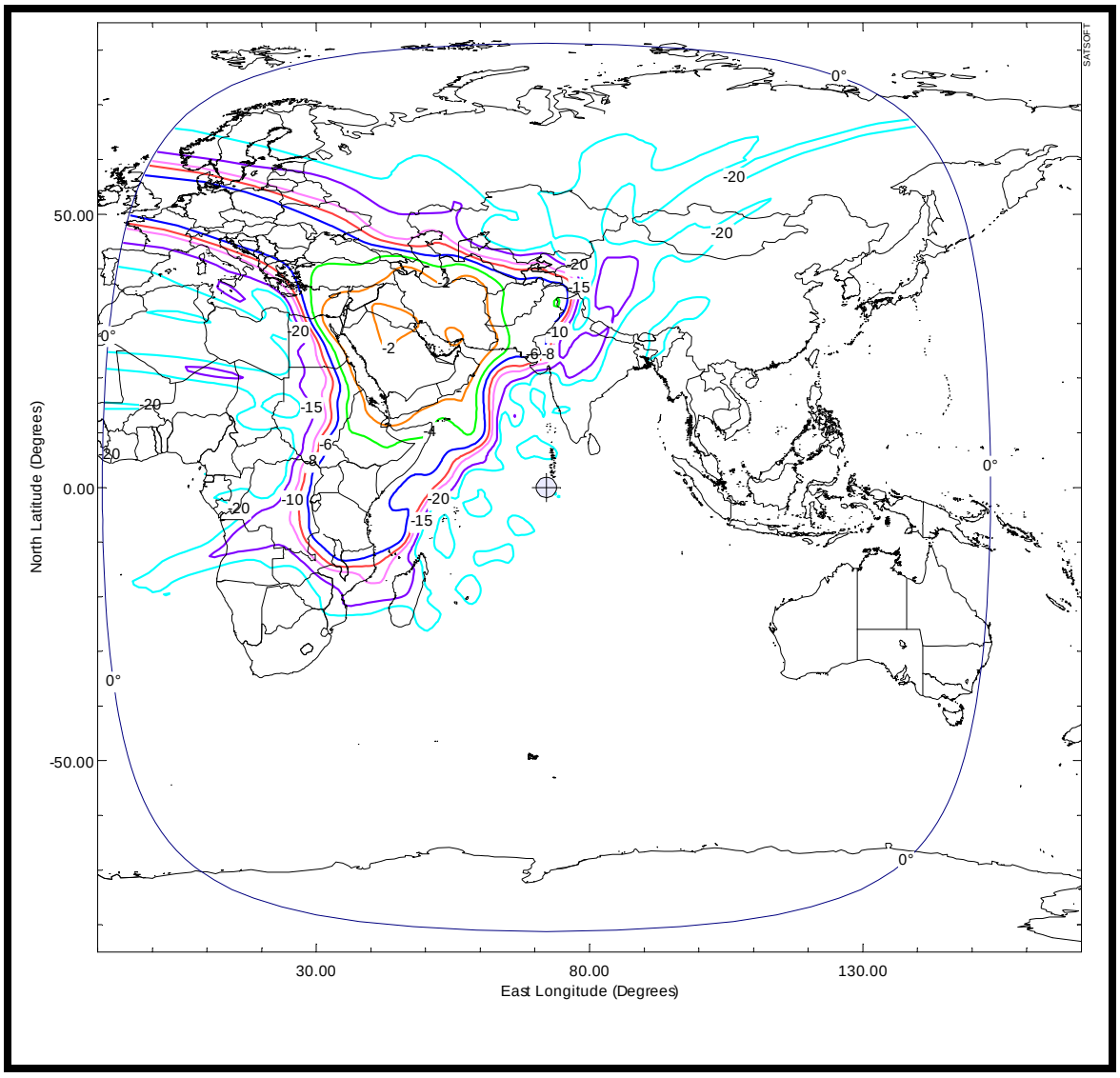


EXHIBIT 5A-6: MIDDLE EAST-AFRICA RECEIVE BEAM
(Schedule S Beam ID: MAVU)

Beam Polarization: Vertical
Peak Beam Gain: 32.5 dBi
Peak Beam G/T: 6.7 dB/K
Saturated Flux Density @ Peak Beam G/T: -113.1 to -79.1 dBW/m^2

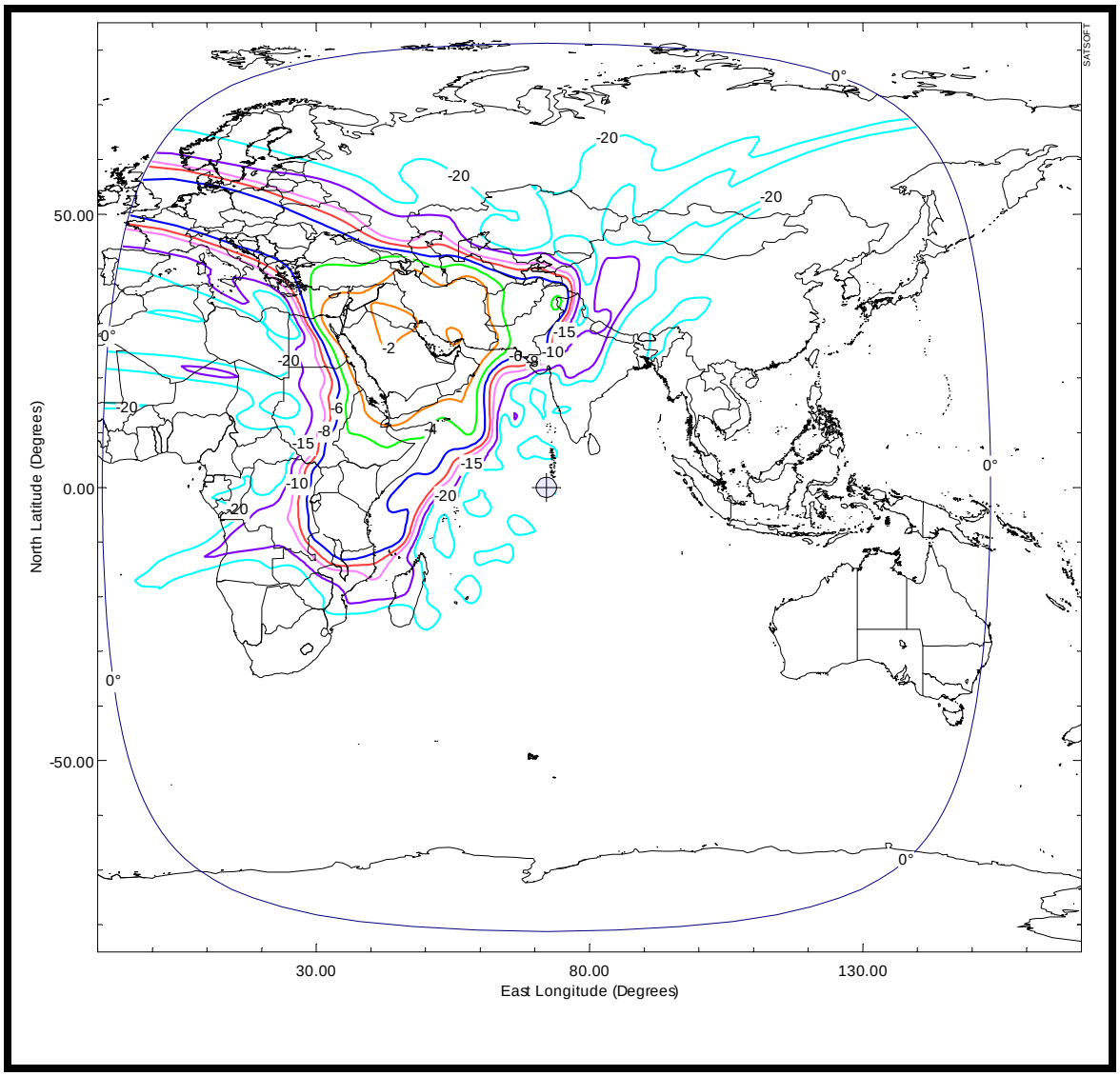


EXHIBIT 5A-7: MOBILITY IOR RECEIVE BEAM
(Schedule S Beam ID: MOHU)

Beam Polarization: Horizontal
Peak Beam Gain: 30.4 dBi
Peak Beam G/T: 4.7 dB/K
Saturated Flux Density @ Peak Beam G/T: -111 to -77 dBW/m^2

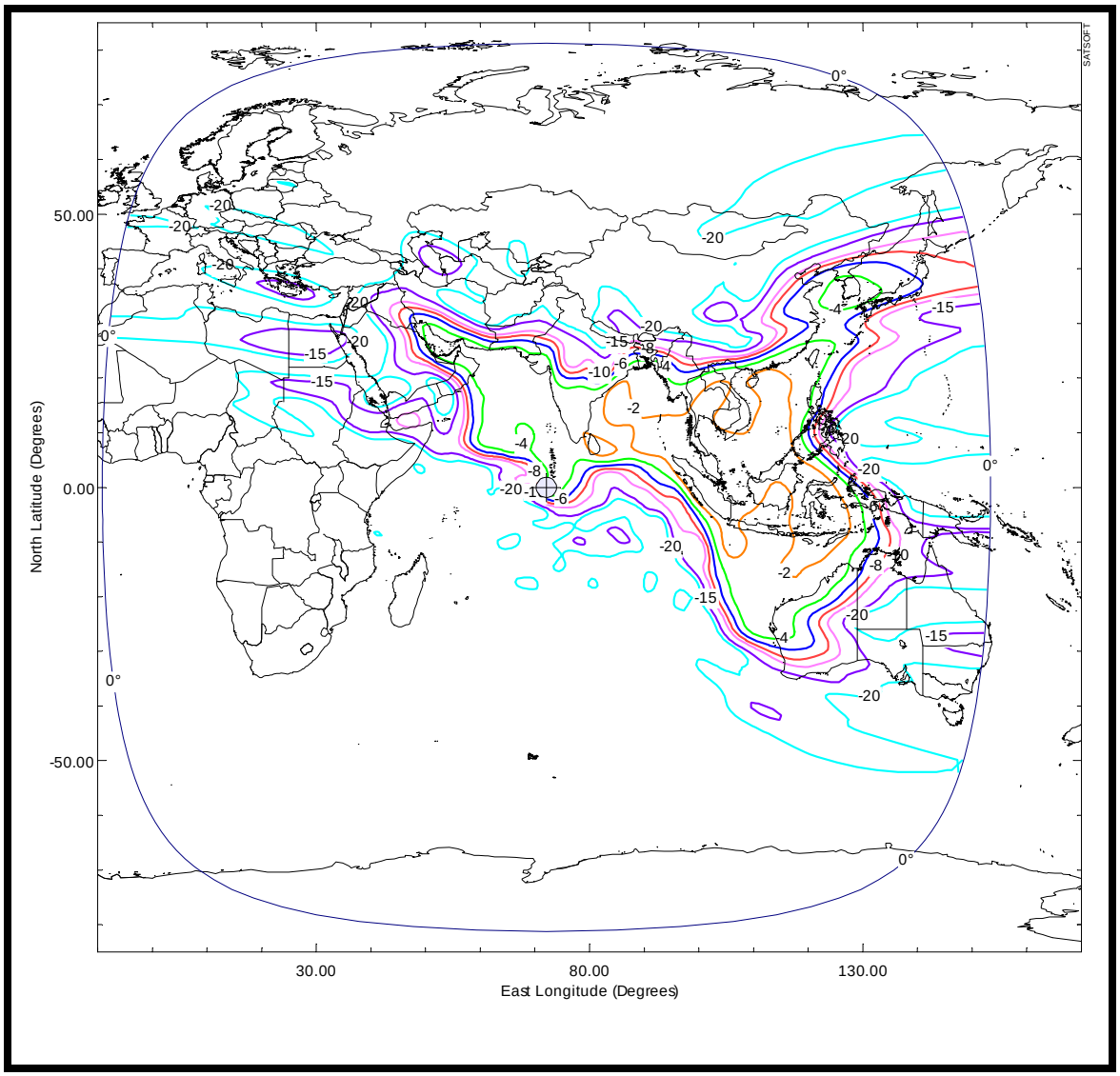


EXHIBIT 5A-8: MOBILITY IOR RECEIVE BEAM
(Schedule S Beam ID: MOVU)

Beam Polarization: Vertical
Peak Beam Gain: 30.4 dBi
Peak Beam G/T: 4.7 dB/K
Saturated Flux Density @ Peak Beam G/T: -111 to -77 dBW/m^2

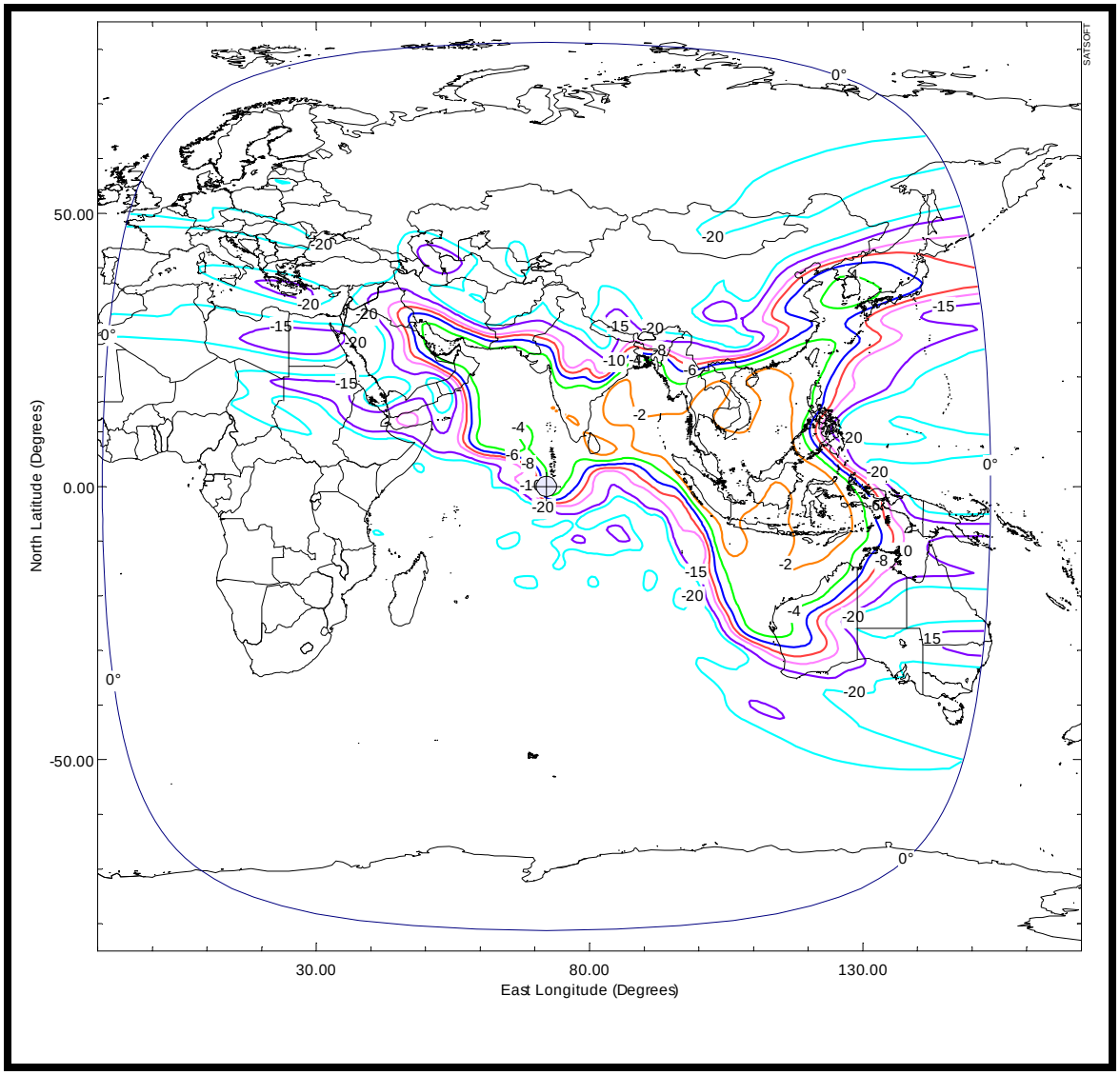


EXHIBIT 5A-9: UHF RECEIVE BEAM
(Schedule S Beam ID: URUL)

Beam Polarization: Right Hand Circular
Peak Beam Gain: 17.2 dBi
Peak Beam G/T: -10.8 dB/K
Saturated Flux Density @ Peak Beam G/T: -155 to -118 dBW/m^2

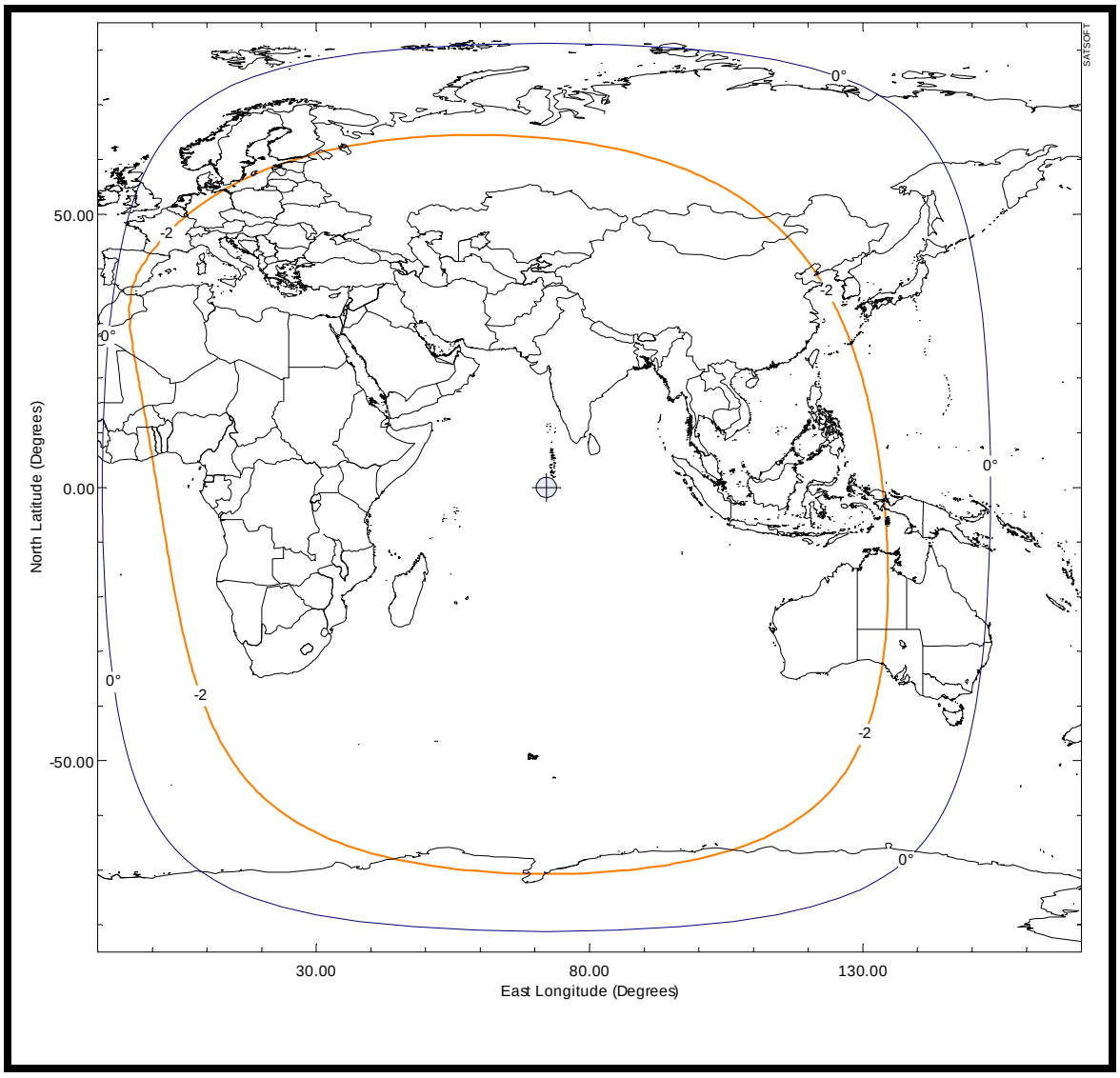


EXHIBIT 5A-10: WEST HEMI TRANSMIT BEAM
(Schedule S Beam ID: WHLD)

Beam Polarization: Left Hand Circular
Peak Beam Gain: 27.2 dBi
Peak Beam EIRP: 44.3 dBW

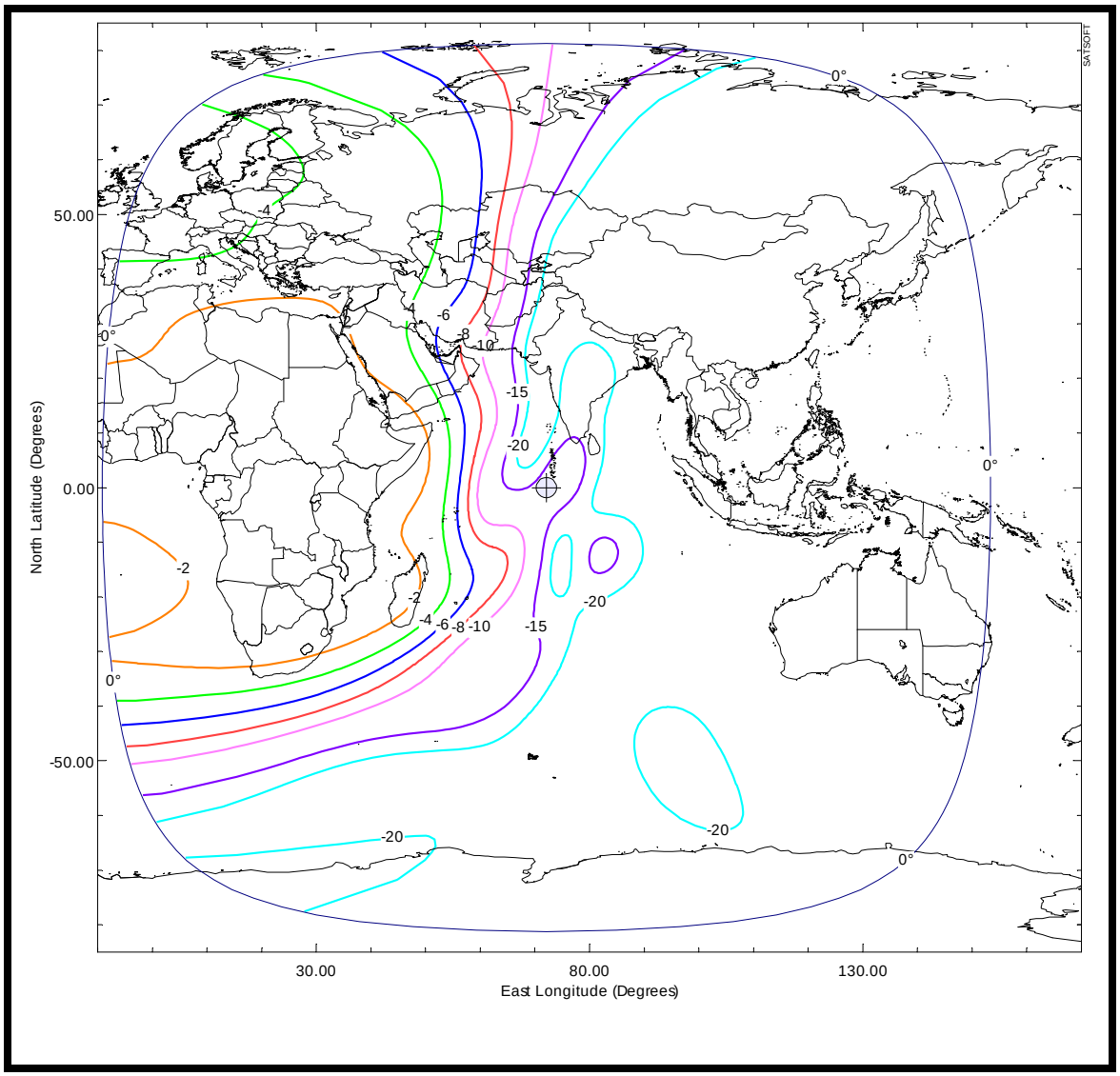


EXHIBIT 5A-11: WEST HEMI TRANSMIT BEAM
(Schedule S Beam ID: WHRD)

Beam Polarization: Right Hand Circular
Peak Beam Gain: 27.2 dBi
Peak Beam EIRP: 44.3 dBW

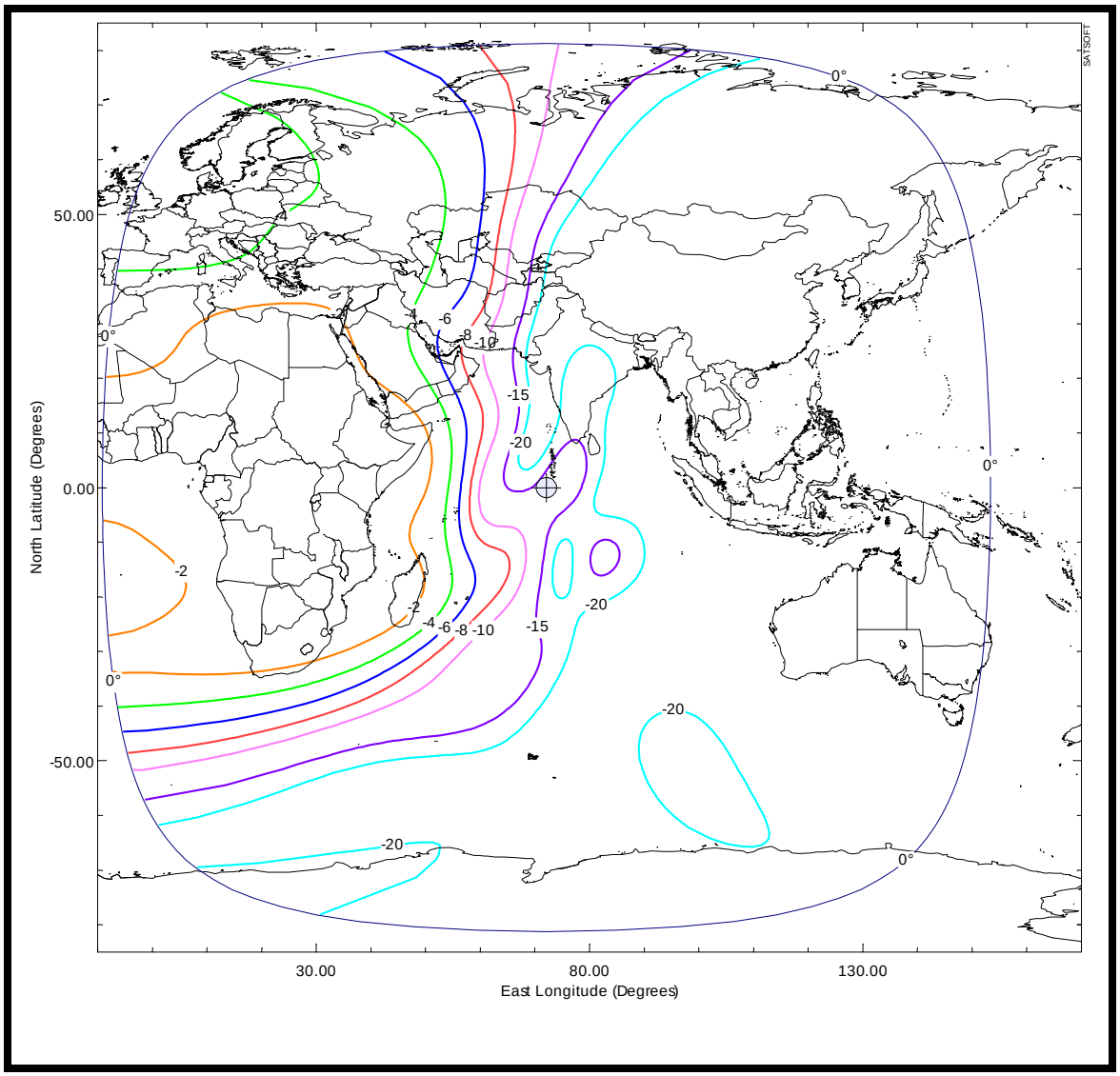


EXHIBIT 5A-12: EAST HEMI TRANSMIT BEAM
(Schedule S Beam ID: EHLD)

Beam Polarization: Left Hand Circular
Peak Beam Gain: 27.6 dBi
Peak Beam EIRP: 44.7 dBW

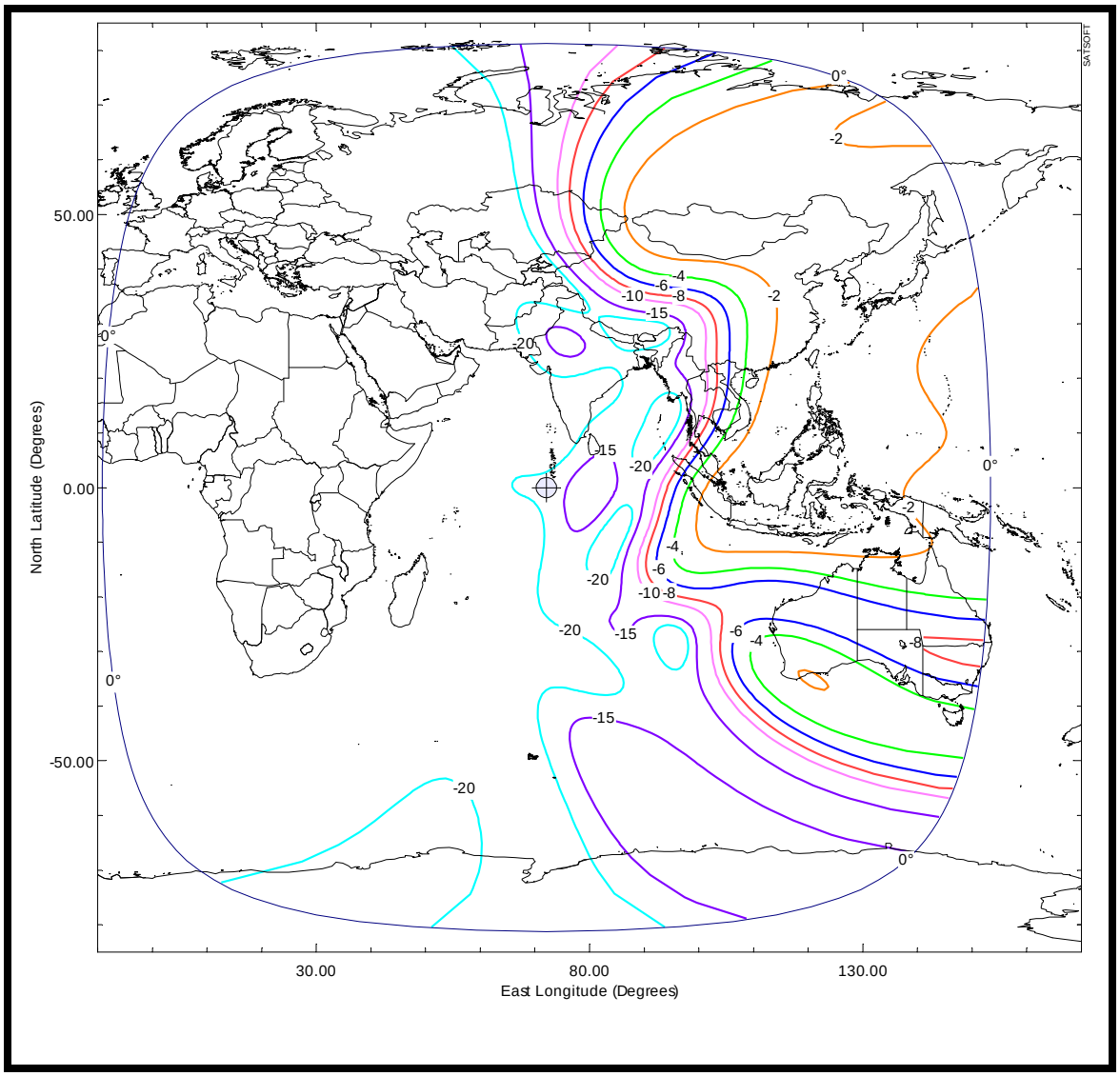


EXHIBIT 5A-13: EAST HEMI TRANSMIT BEAM
(Schedule S Beam ID: EHRD)

Beam Polarization: Right Hand Circular
Peak Beam Gain: 27.6 dBi
Peak Beam EIRP: 44.7 dBW

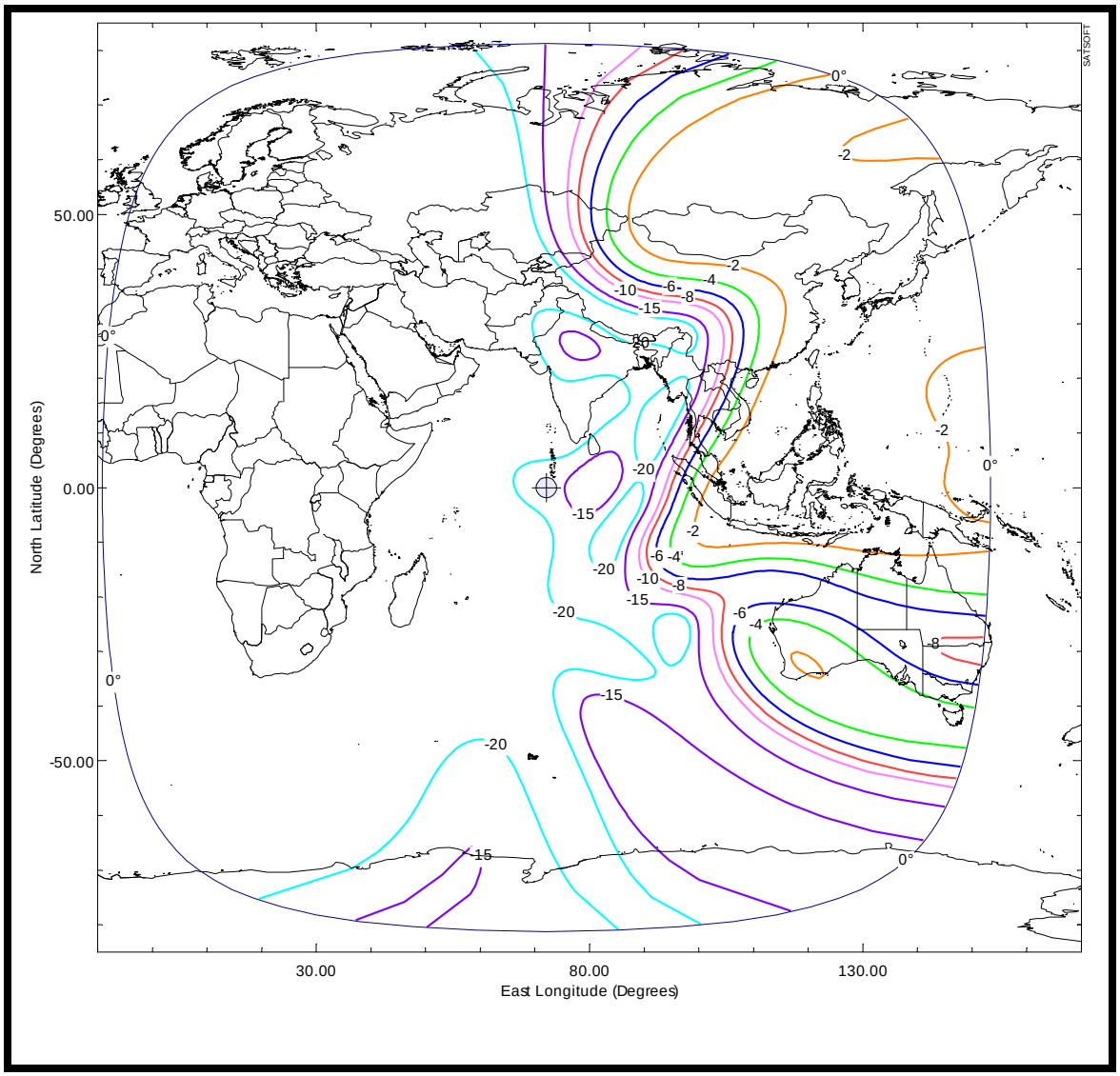


EXHIBIT 5A-14: MIDDLE EAST-AFRICA TRANSMIT BEAM (Schedule S Beam ID: MAHD)

Beam Polarization: Horizontal
Peak Beam Gain: 30.4 dBi
Peak Beam EIRP: 50.4 dBW

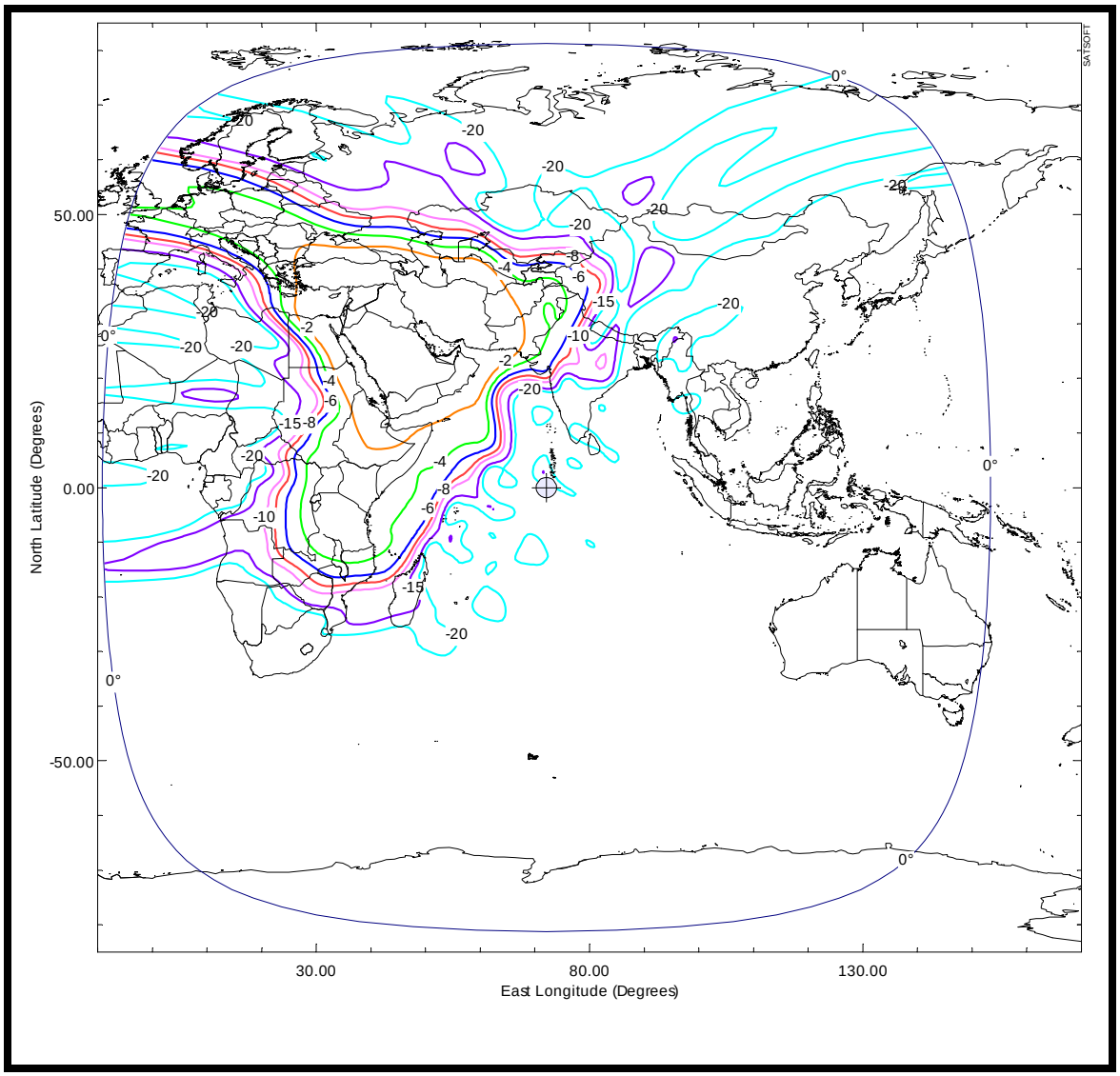


EXHIBIT 5A-15: MIDDLE EAST-AFRICA TRANSMIT BEAM (Schedule S Beam ID: MAVD)

Beam Polarization: Vertical
Peak Beam Gain: 30.4 dBi

Peak Beam EIRP: 50.4 dBW

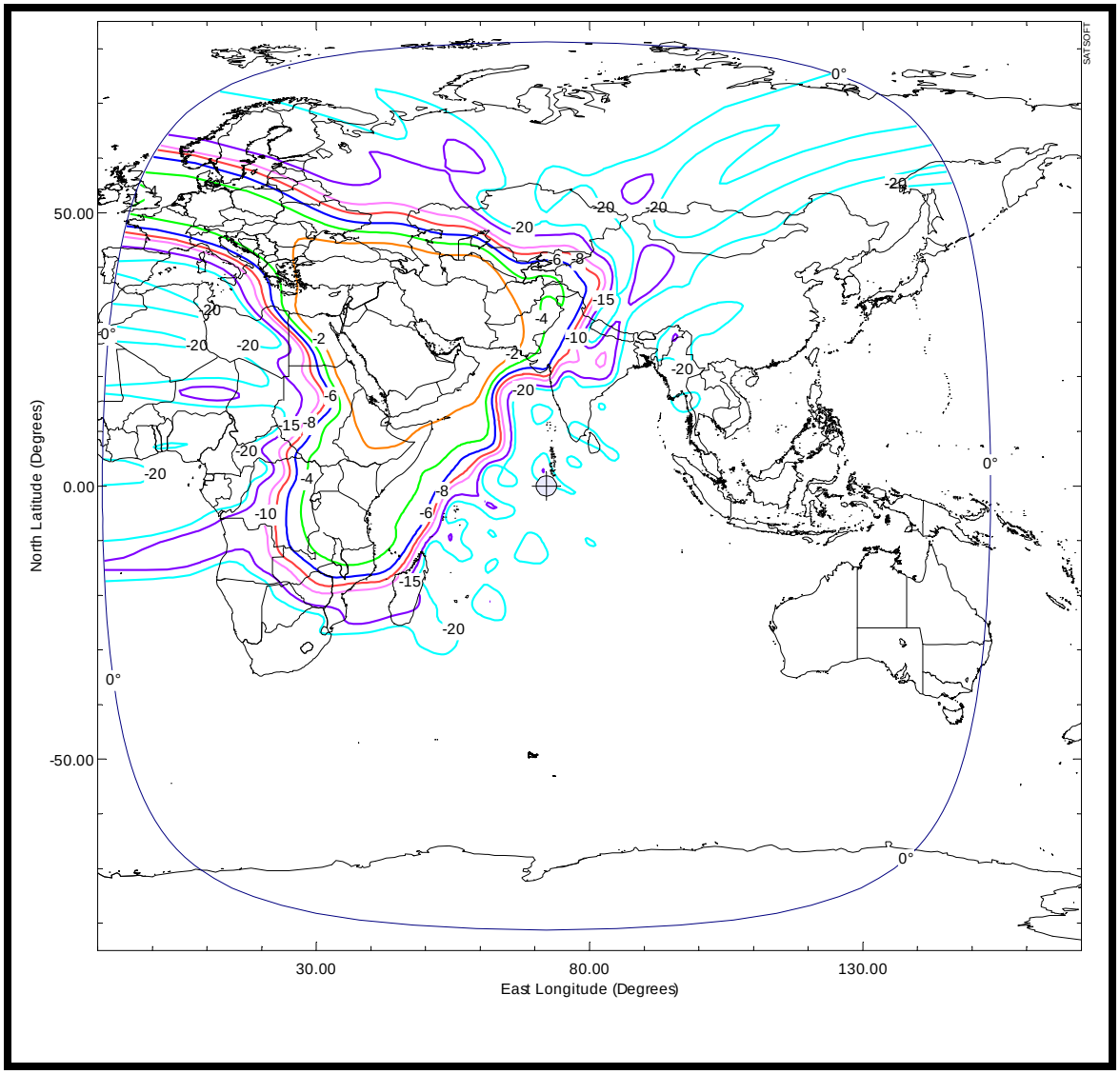


EXHIBIT 5A-16: MOBILITY IOR TRANSMIT BEAM
(Schedule S Beam ID: MOHD)

Beam Polarization: Horizontal
Peak Beam Gain: 29.4 dBi
Peak Beam EIRP: 49.7 dBW

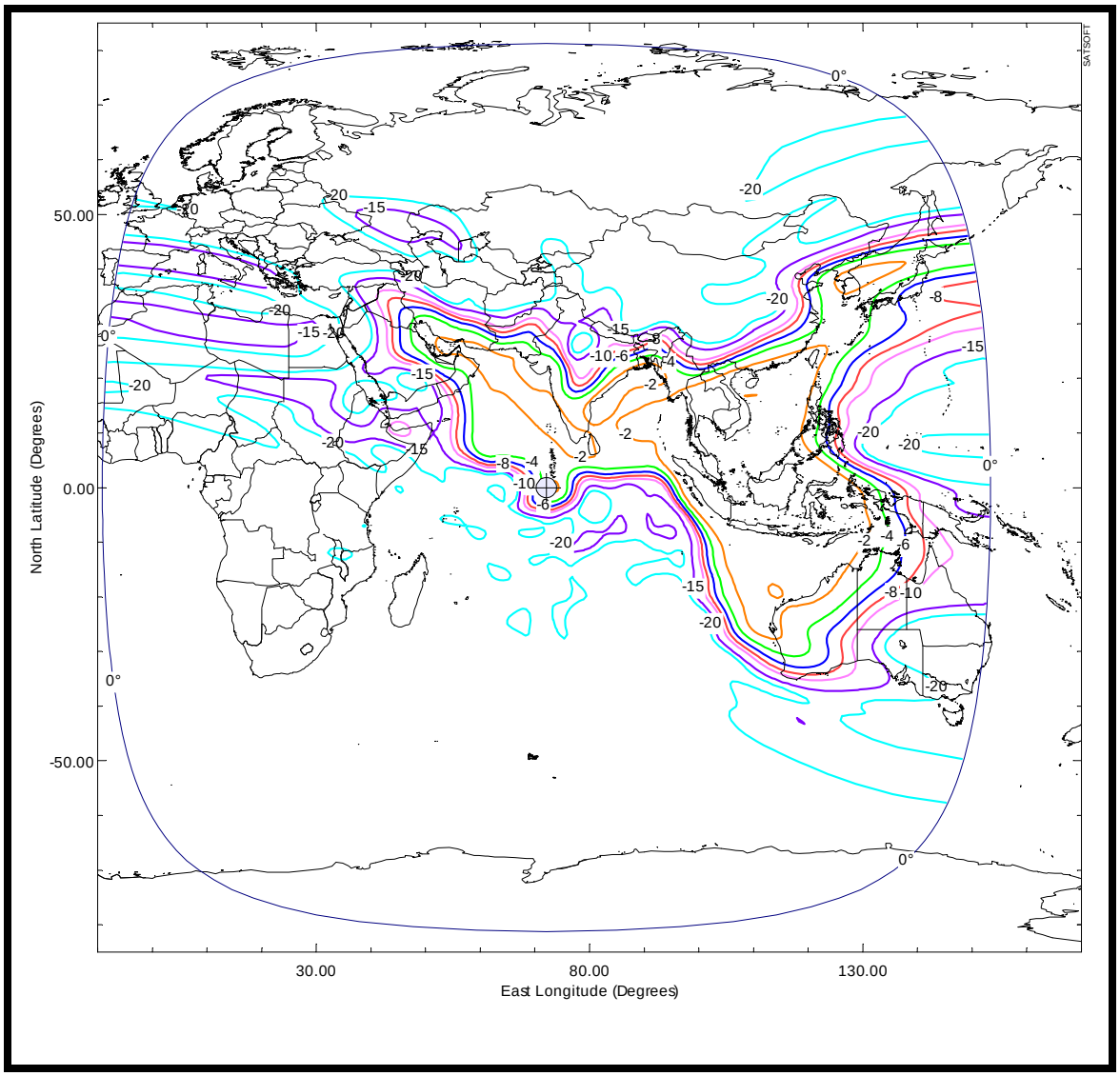


EXHIBIT 5A-17: MOBILITY IOR TRANSMIT BEAM
(Schedule S Beam ID: MOVD)

Beam Polarization: Vertical
Peak Beam Gain: 29.4 dBi
Peak Beam EIRP: 49.7 dBW

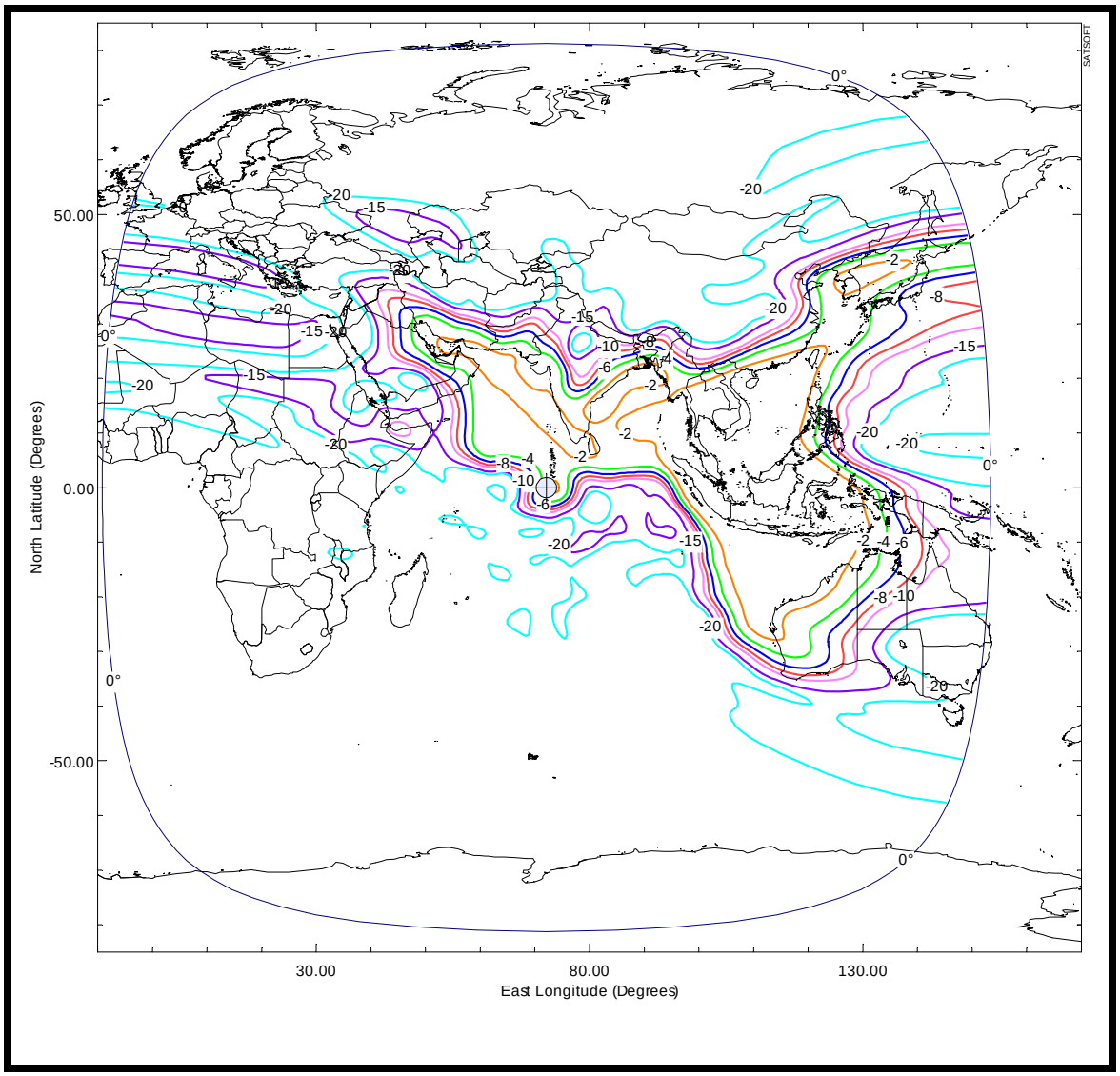


EXHIBIT 5A-18: UHF TRANSMIT BEAM
(Schedule S Beam ID: UHFD)

Beam Polarization: Right Hand Circular
Peak Beam Gain: 16.5 dBi
Peak Beam EIRP: 28.9 dBW

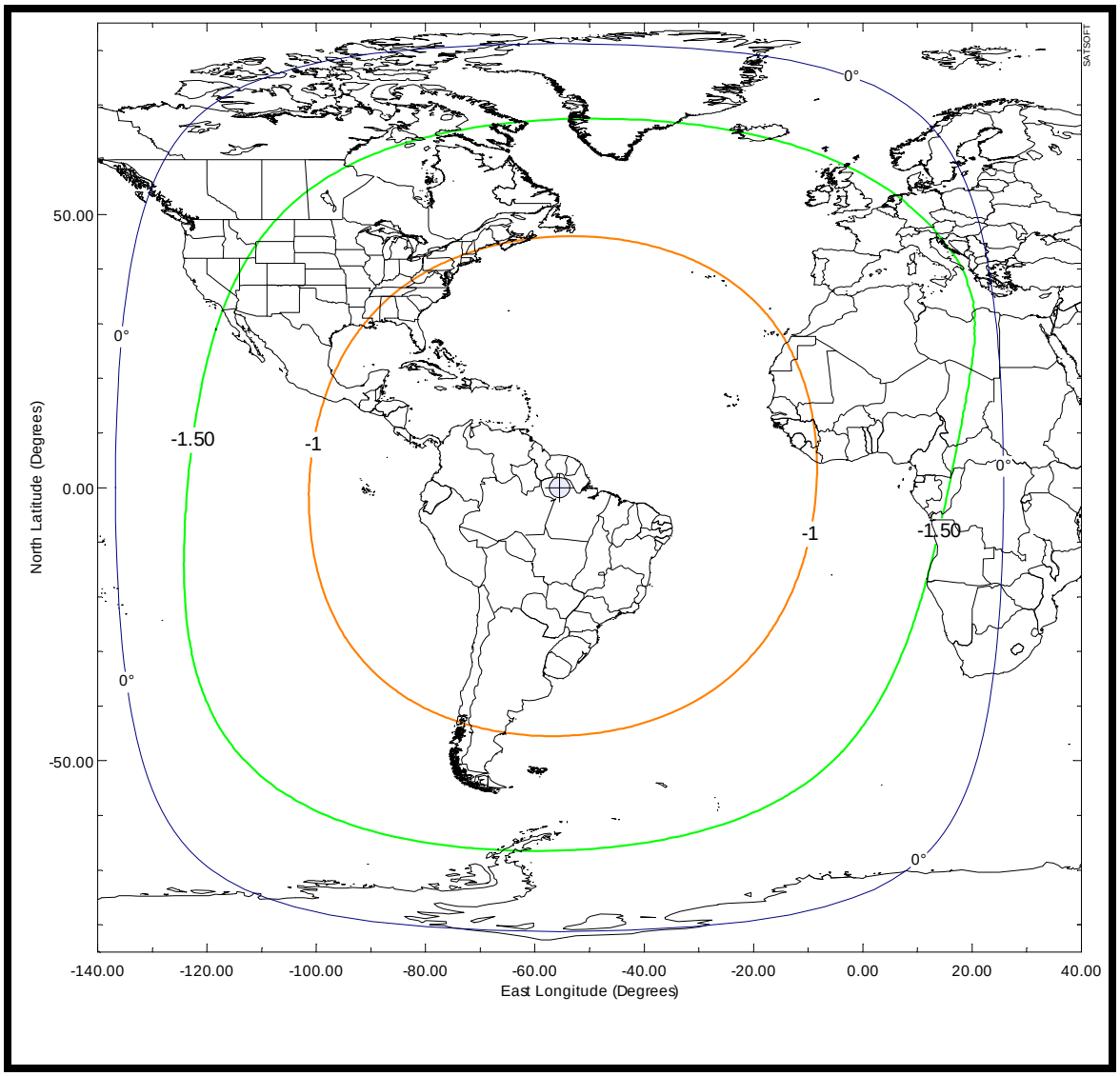


EXHIBIT 5B-1: COMMAND RECEIVE BEAM (on-station)
(Schedule S Beam ID: CMDR)

Beam Polarization: Left Hand Circular
Peak Beam Gain: 27.8 dBi
Peak Beam G/T: -17.2 dB/K
Command Threshold Flux Density @ Peak Beam G/T: -109.1 dBW/m^2

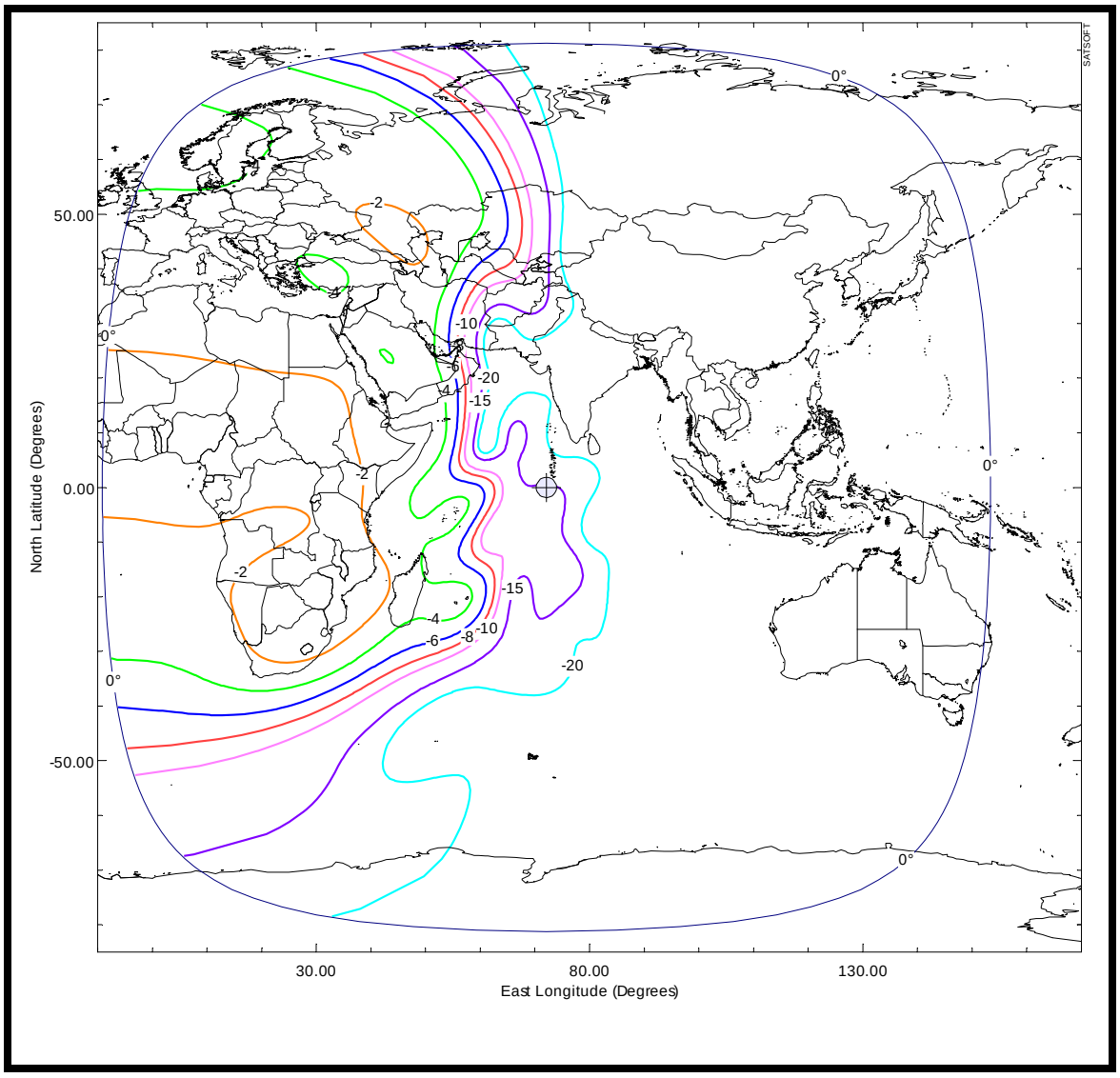
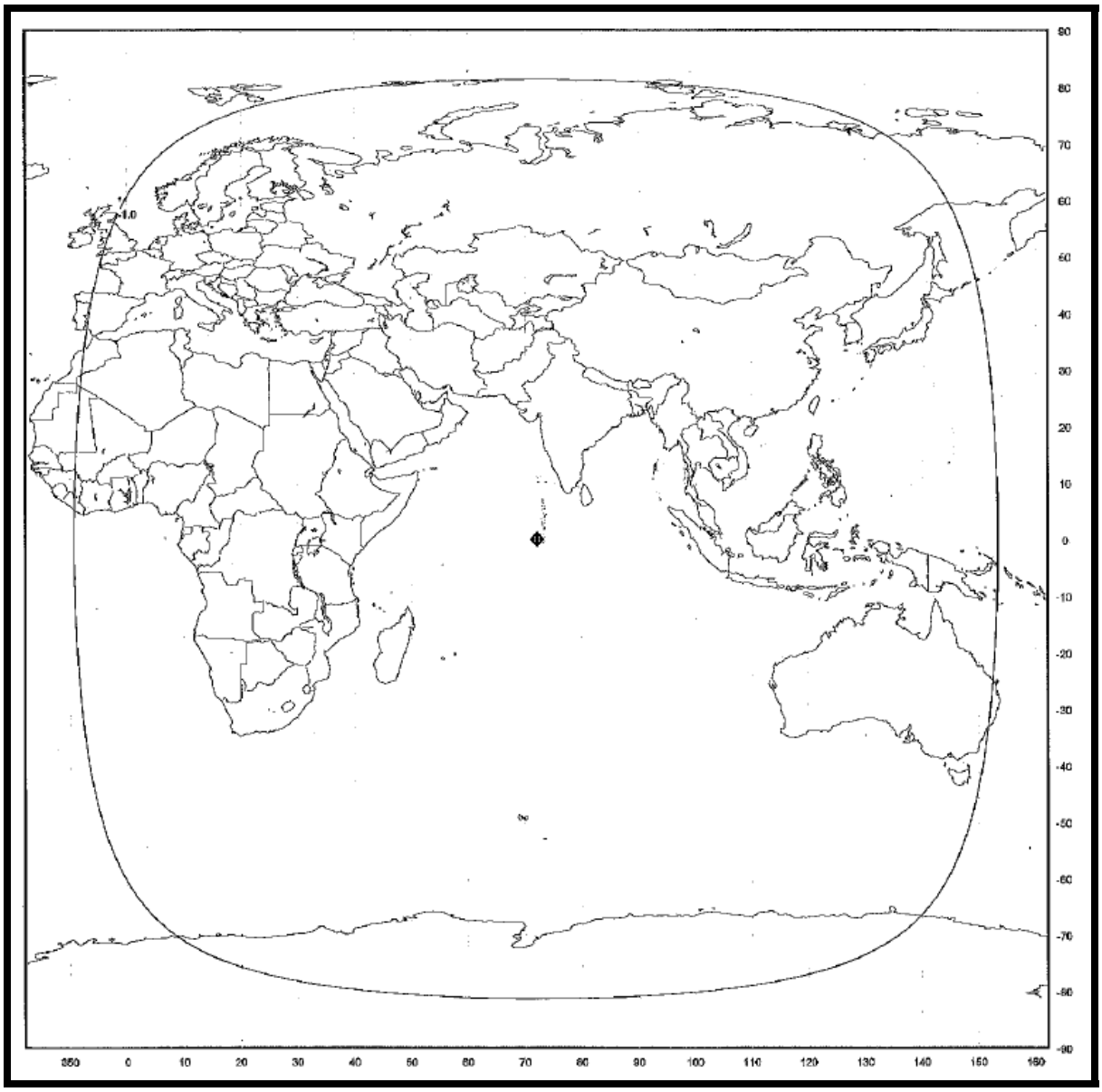


EXHIBIT 5B-2: COMMAND RECEIVE BEAM (back-up)
(Bicone Antenna)
(Schedule S Beam ID: CMDB)

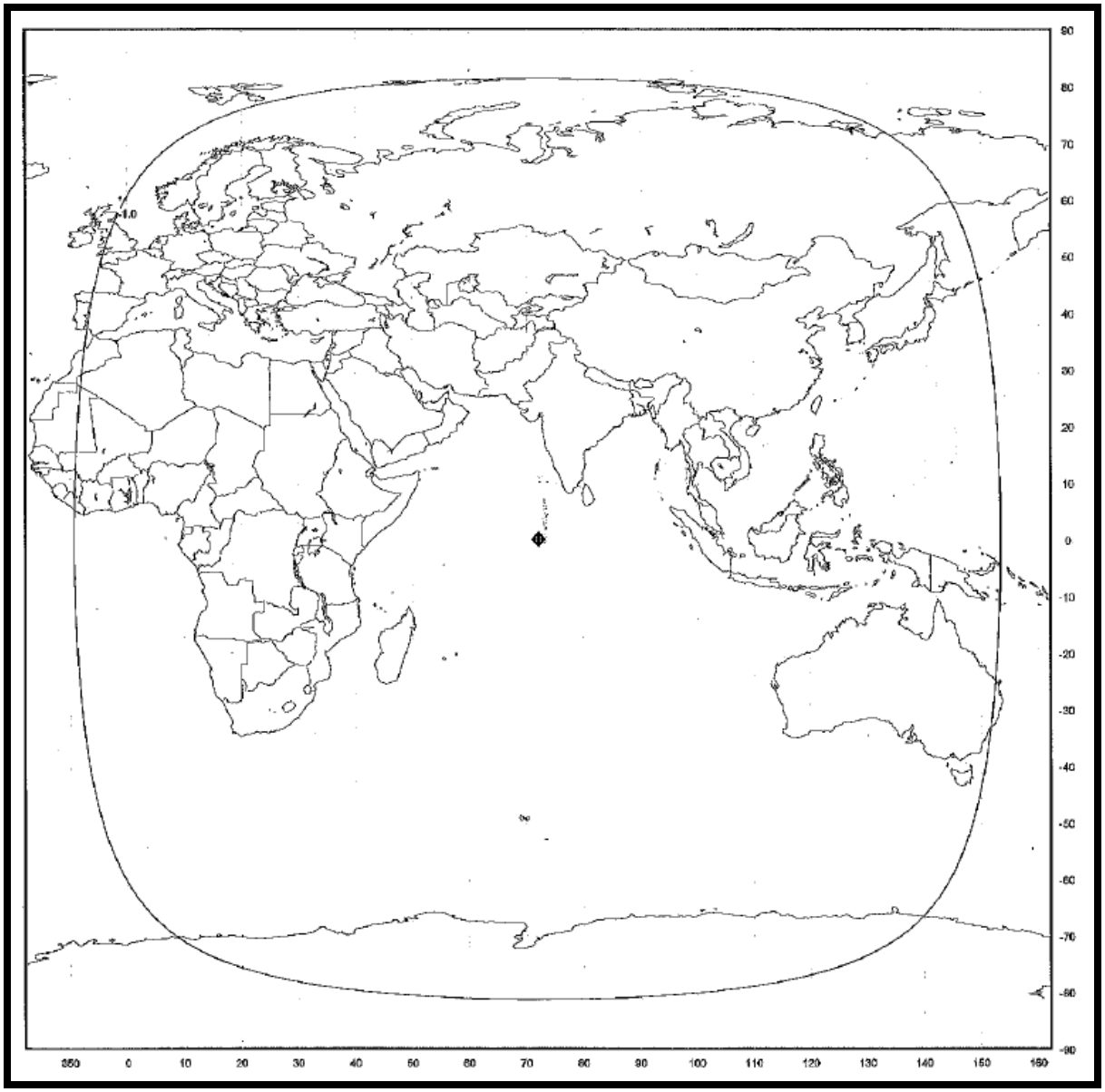
Beam Polarization: Horizontal
Peak Beam Gain: -0.8 dBi
Peak Beam G/T: -41.2 dB/K
Command Threshold Flux Density @ Peak Beam G/T: -85.4 dBW/m^2



Relative Gain Contour Shown In Figure: -1 dB

EXHIBIT 5B-3: COMMAND RECEIVE BEAM (back-up)
(Pipe Antennas)
(Schedule S Beam ID: CMDP)

Beam Polarization: Left Hand Circular
Peak Beam Gain: 2.4 dBi
Peak Beam G/T: -37.4 dB/K
Command Threshold Flux Density @ Peak Beam G/T: -88.1 dBW/m^2



Relative Gain Contour Shown In Figure: -1 dB

EXHIBIT 5B-4: TELEMETRY TRANSMIT BEAM (on-station)
(Schedule S Beam ID: TLMR)

Beam Polarization: Left Hand Circular
Peak Beam Gain: 27.2 dBi
Peak Beam EIRP: 20.0 dBW

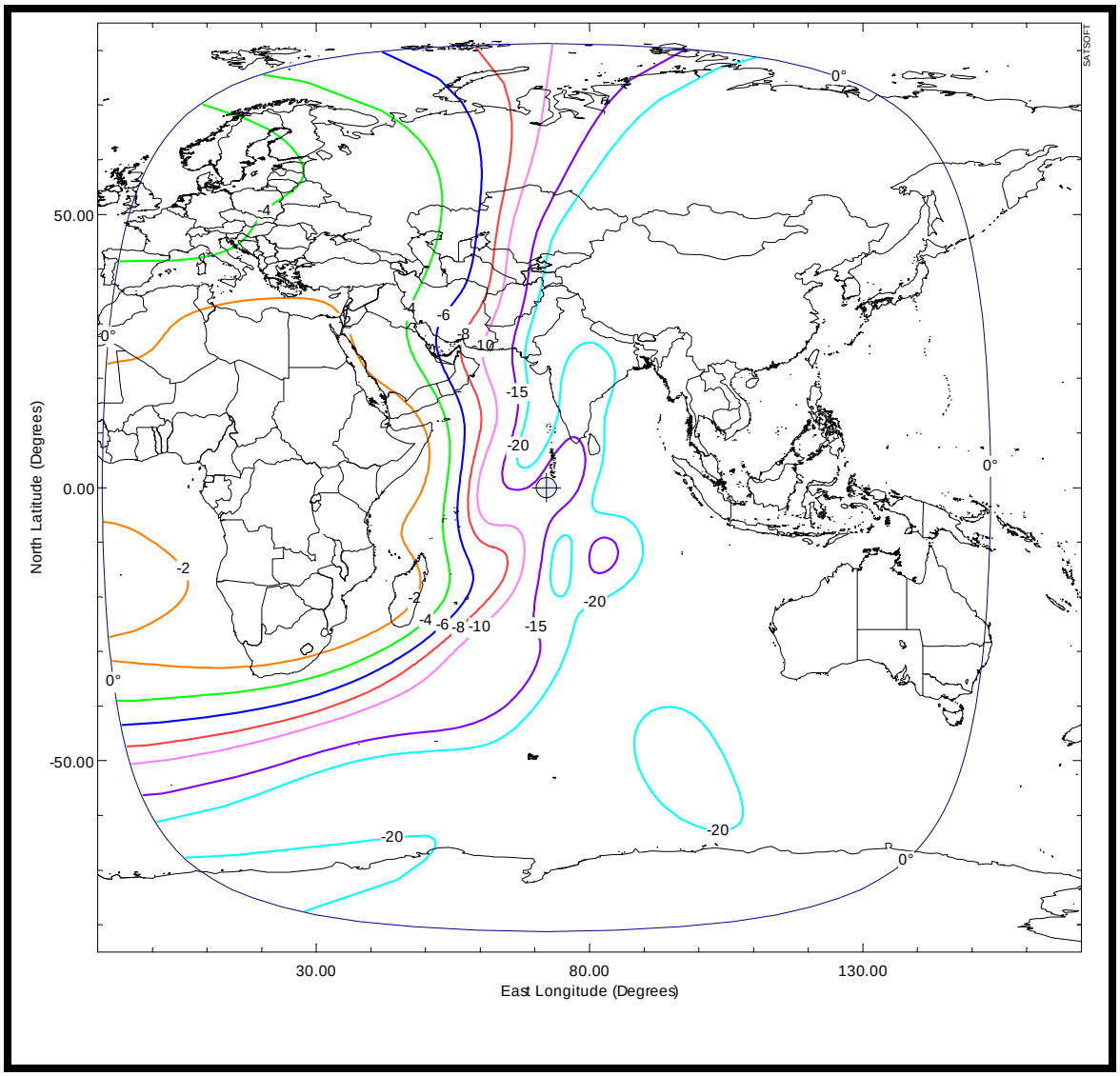
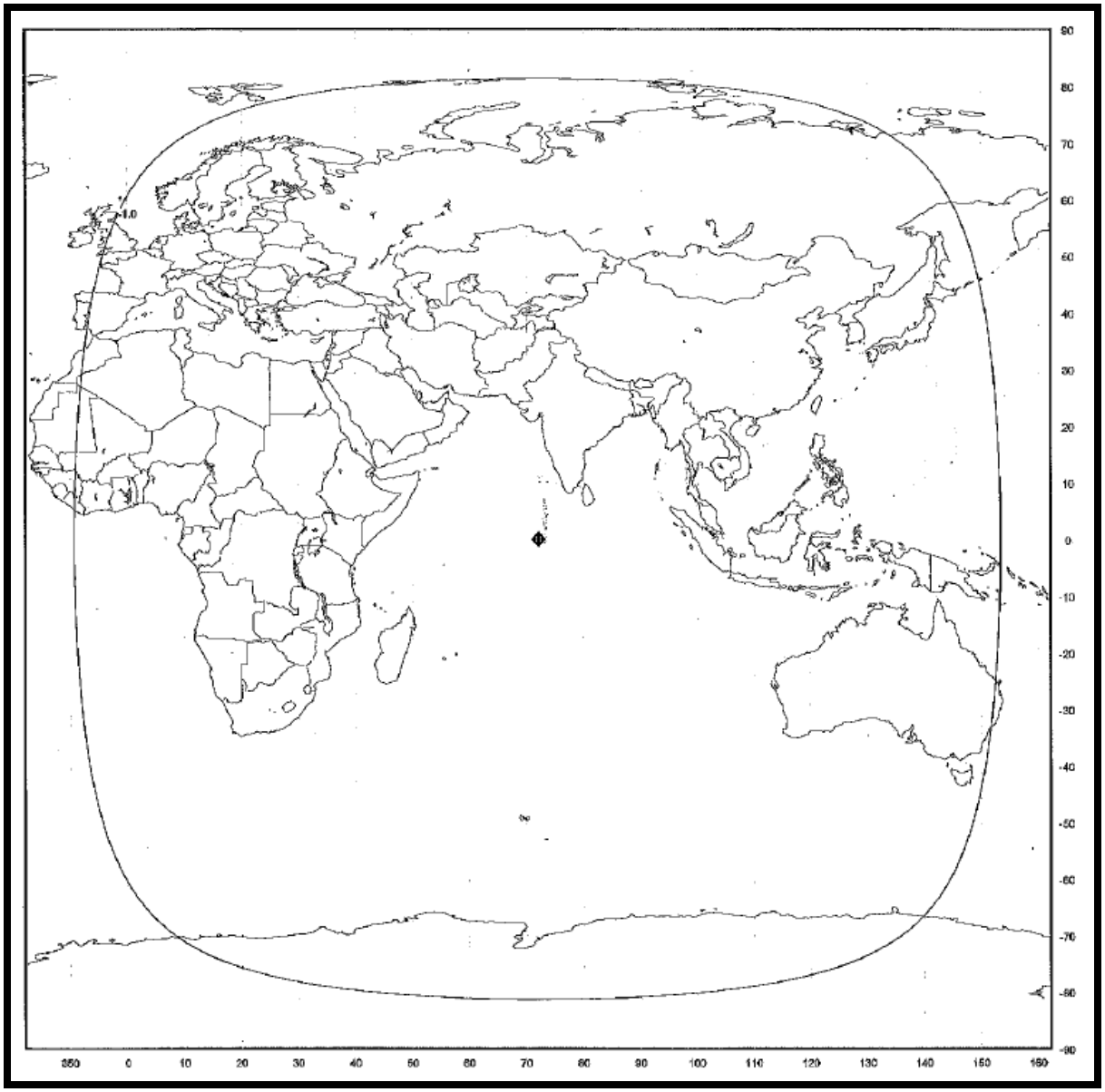


EXHIBIT 5B-5: TELEMETRY TRANSMIT BEAM (back-up)
(Bicone Antenna)
(Schedule S Beam ID: TLMB)

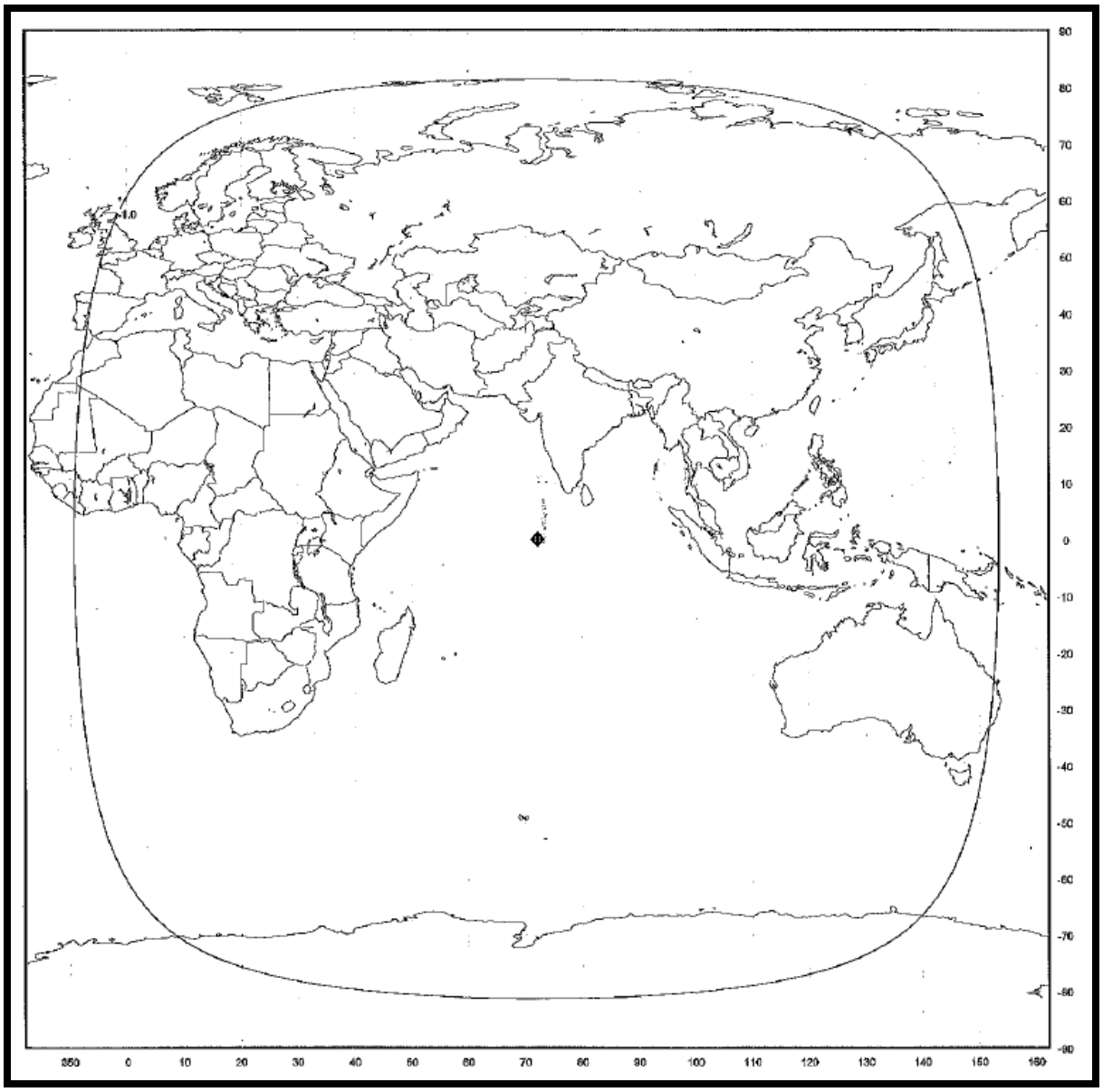
Beam Polarization: Vertical
Peak Beam Gain: 5.0 dBi
Peak Beam EIRP: 10.5 dBW



Relative Gain Contour Shown In Figure: -1 dB

EXHIBIT 5B-6: TELEMETRY TRANSMIT BEAM (back-up)
(Pipe Antennas)
(Schedule S Beam ID: TLMP)

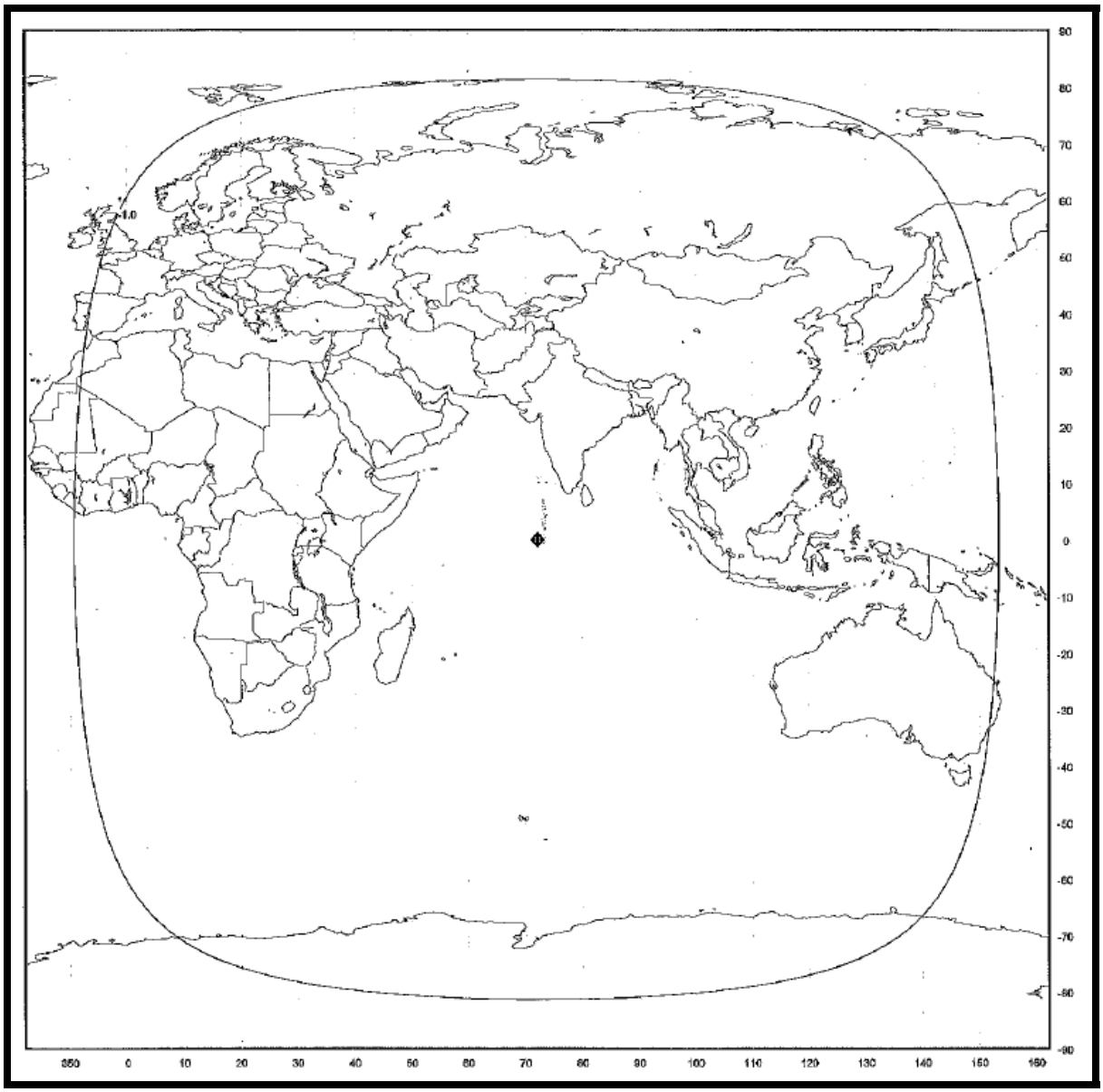
Beam Polarization: Left Hand Circular
Peak Beam Gain: 8.0 dBi
Peak Beam EIRP: 12.4 dBW



Relative Gain Contour Shown In Figure: -1 dB

EXHIBIT 5C-1: C-BAND ULPC TRANSMIT BEAM
(Schedule S Beam ID: UPCV)

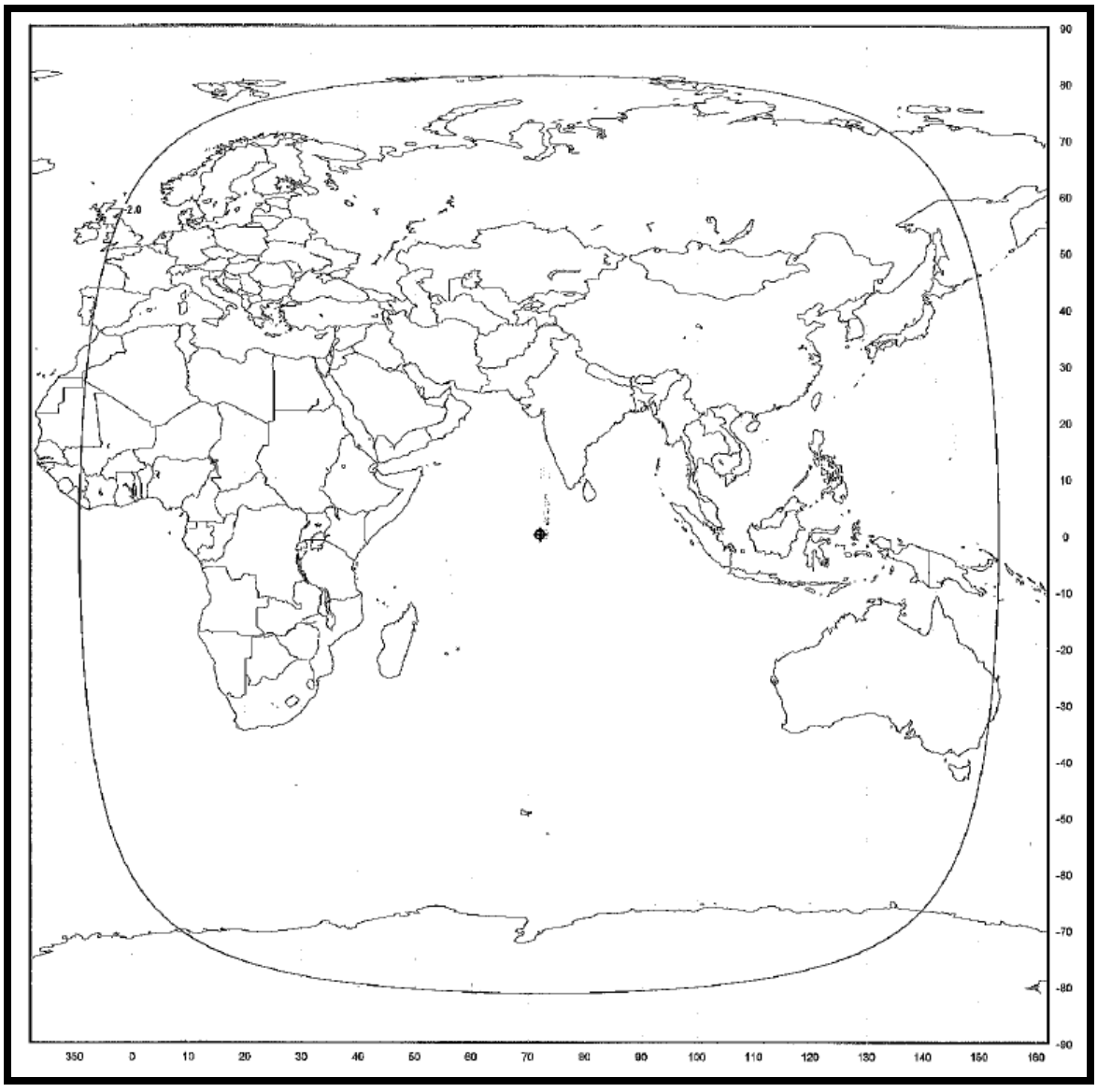
Beam Polarization: Vertical
Peak Beam Gain: 12.5 dBi
Peak Beam EIRP: 8.8 dBW



Relative Gain Contour Shown In Figure: -1 dB

EXHIBIT 5C-2: Ku-BAND ULPC TRANSMIT BEAM
(Schedule S Beam ID: UPKR)

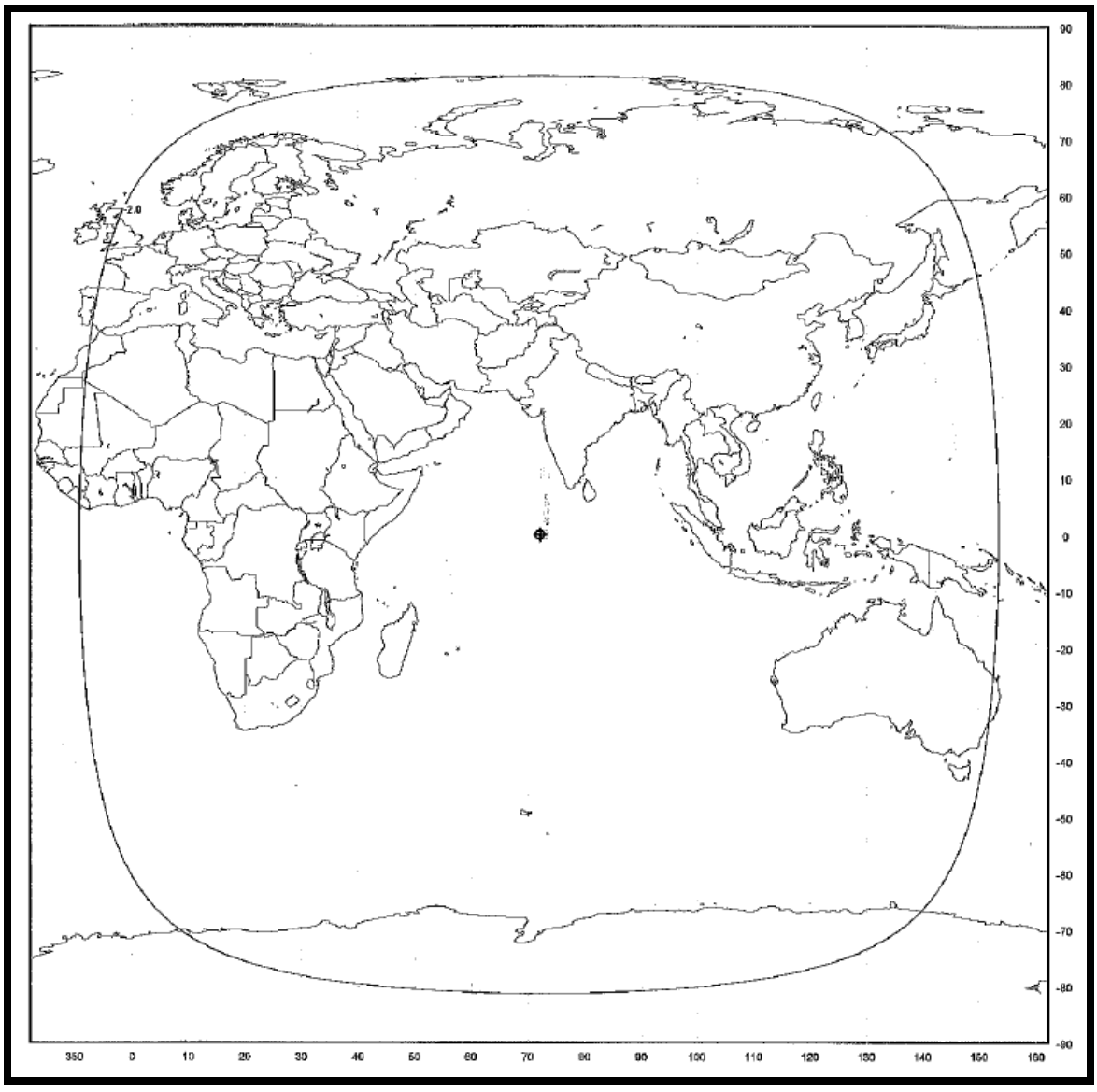
Beam Polarization: Right Hand Circular
Peak Beam Gain: 18.5 dBi
Peak Beam EIRP: 16.5 dBW



Relative Gain Contour Shown In Figure: -2 dB

EXHIBIT 5C-3: Ku-BAND ULPC TRANSMIT BEAM
(Schedule S Beam ID: UPKL)

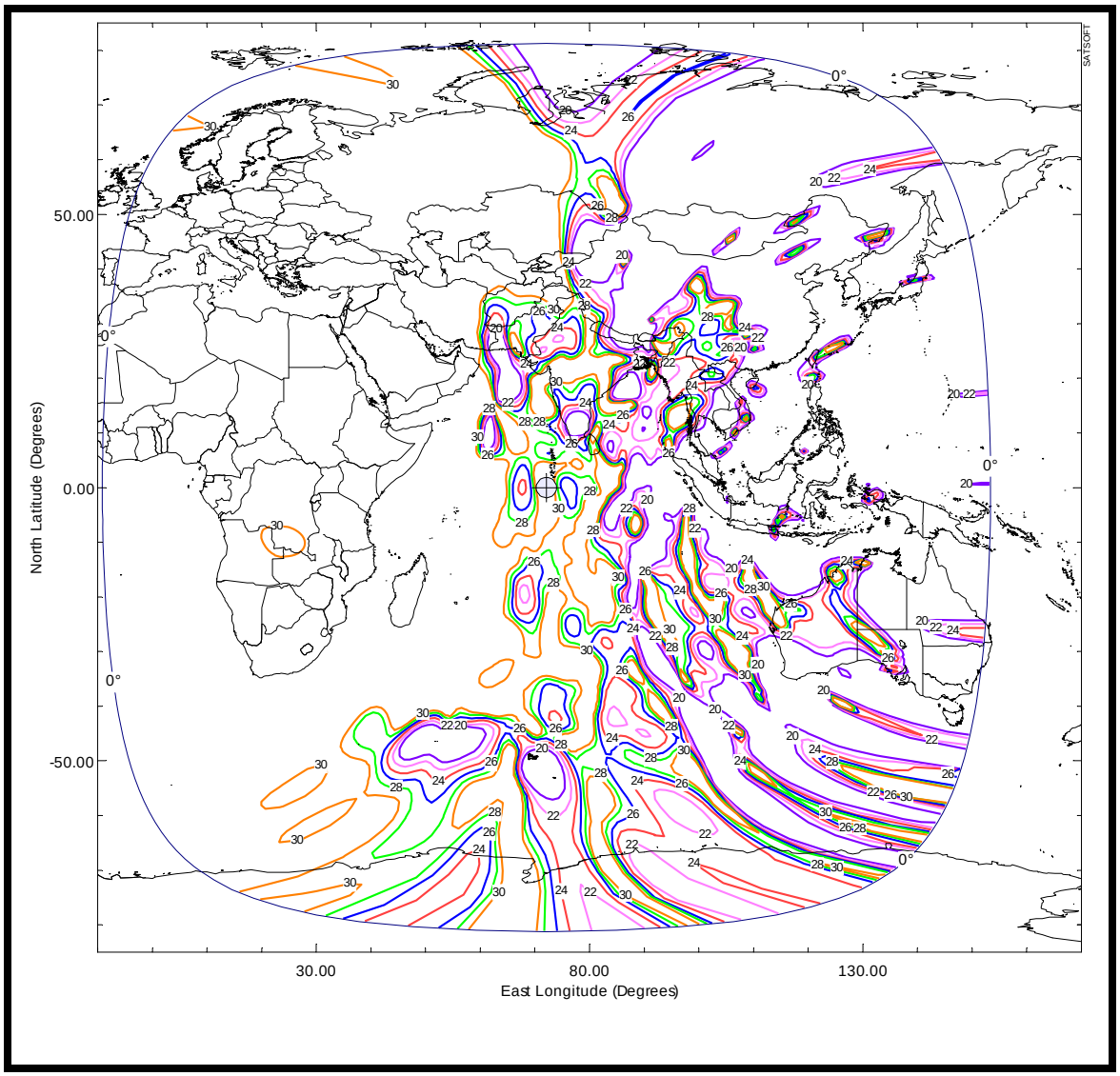
Beam Polarization: Left Hand Circular
Peak Beam Gain: 19.0 dBi
Peak Beam EIRP: 16.9 dBW



Relative Gain Contour Shown In Figure: -2 dB

EXHIBIT 5D-1: WEST HEMI RECEIVE BEAM
(Schedule S Beam ID: WRUX)

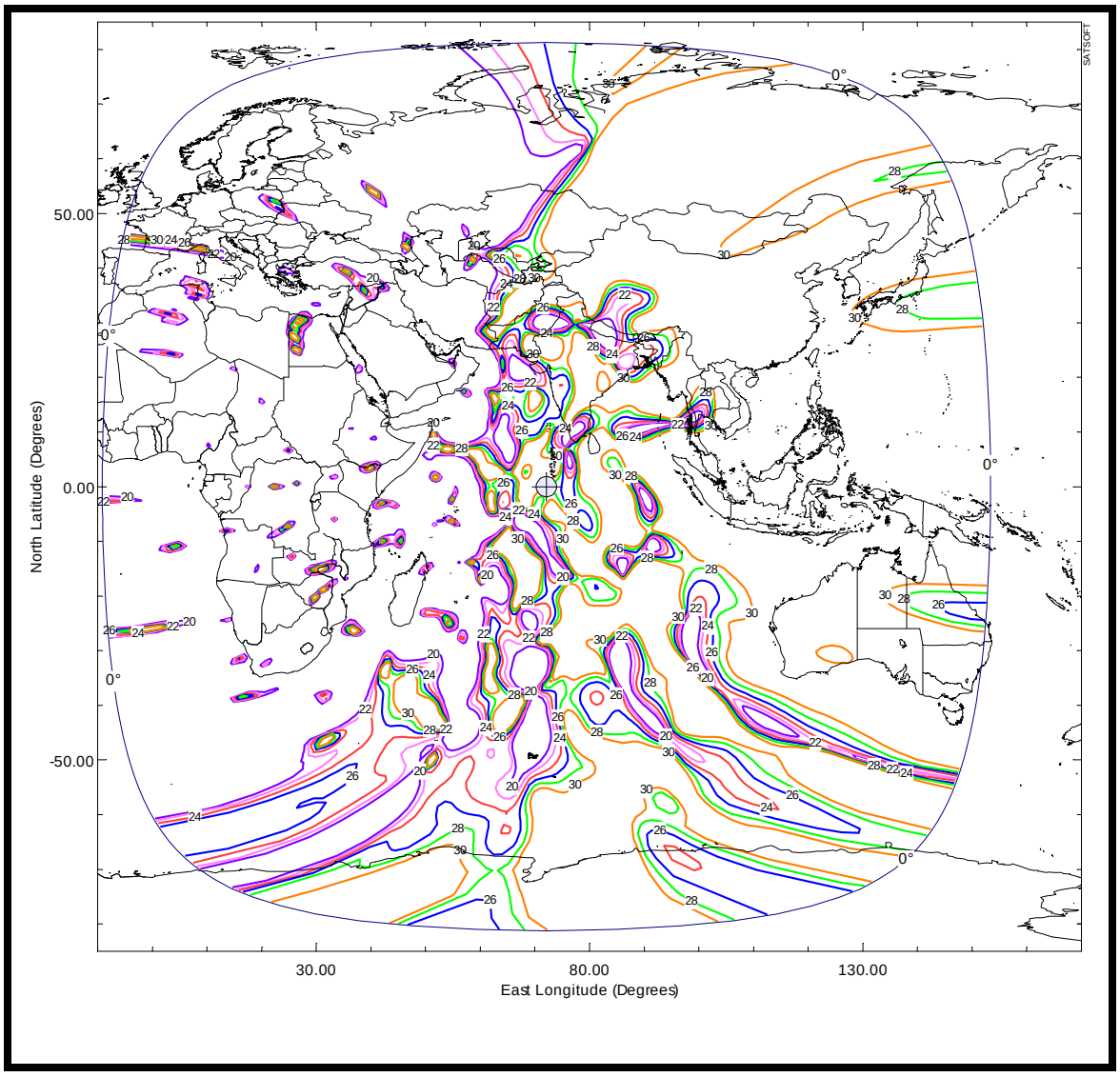
Beam Polarization: Right Hand Circular



Absolute Cross Polarization Contours Shown: 30, 28, 26, 24, 22 and 20 dB

EXHIBIT 5D-2: EAST HEMI RECEIVE BEAM
(Schedule S Beam ID: ELUX)

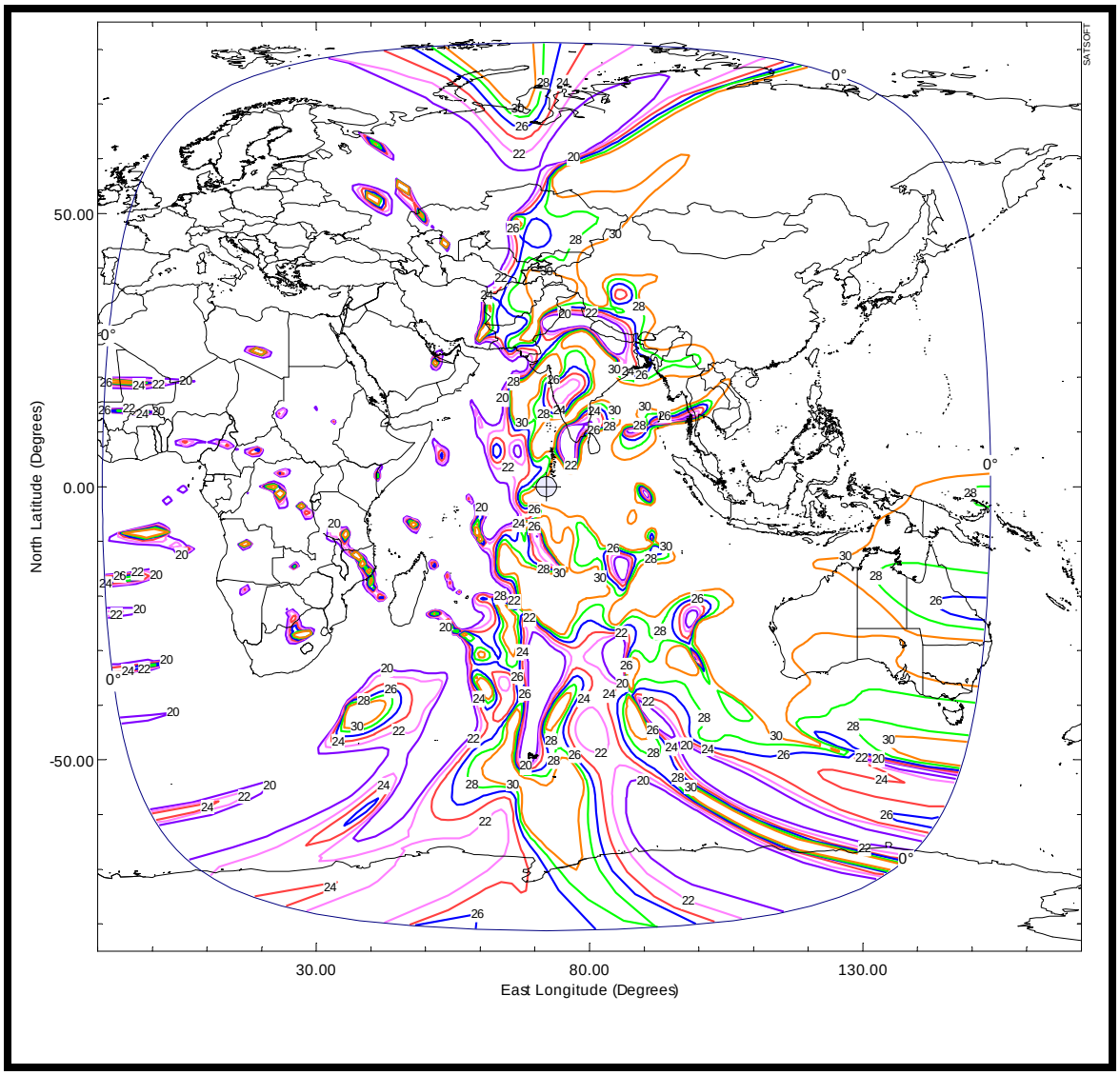
Beam Polarization: Left Hand Circular



Absolute Cross Polarization Contours Shown: 30, 28, 26, 24, 22 and 20 dB

EXHIBIT 5D-3: EAST HEMI RECEIVE BEAM
(Schedule S Beam ID: ERUX)

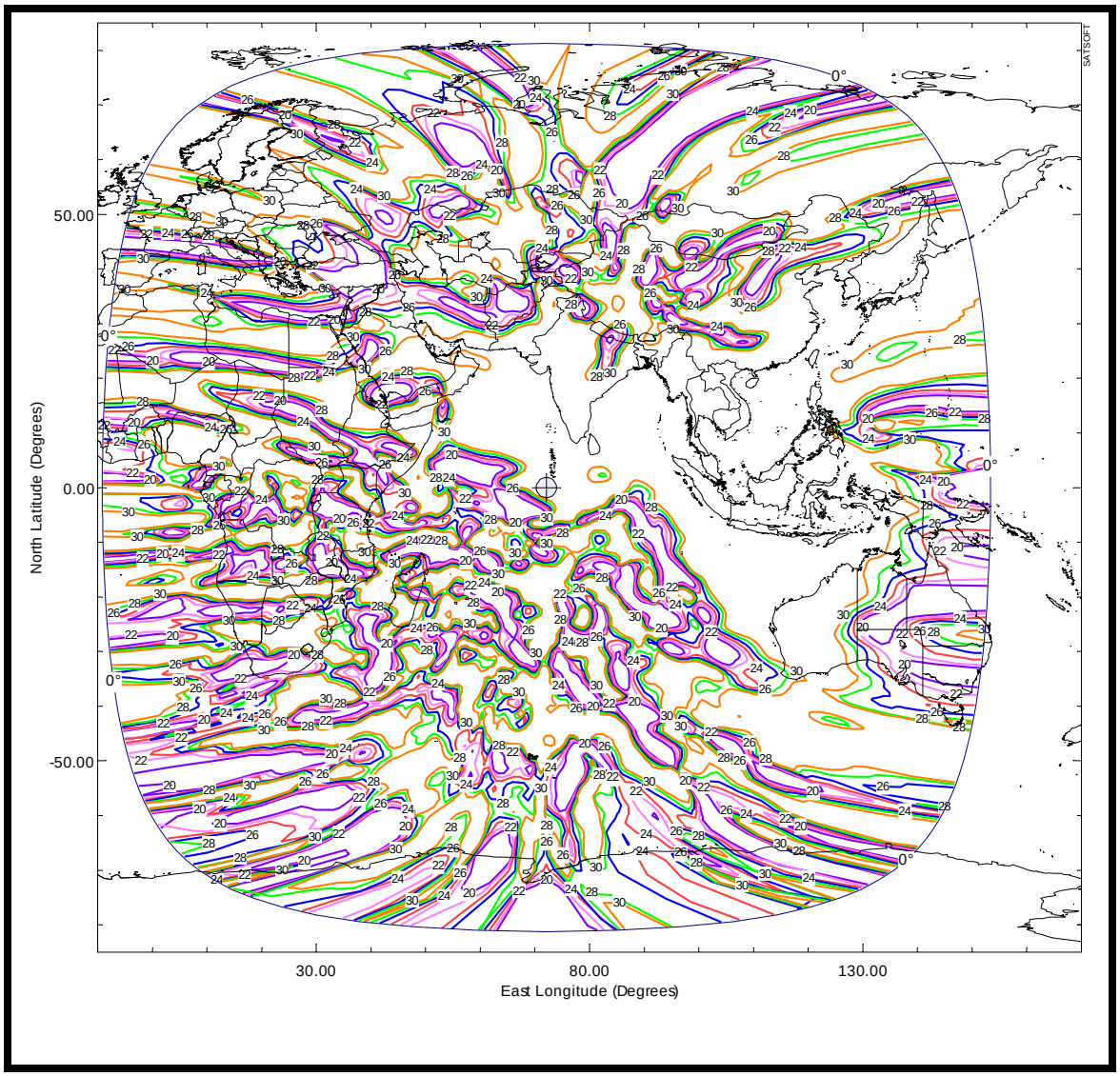
Beam Polarization: Right Hand Circular



Absolute Cross Polarization Contours Shown: 30, 28, 26, 24, 22 and 20 dB

EXHIBIT 5D-4: MOBILITY IOR RECEIVE BEAM
(Schedule S Beam ID: MHUX)

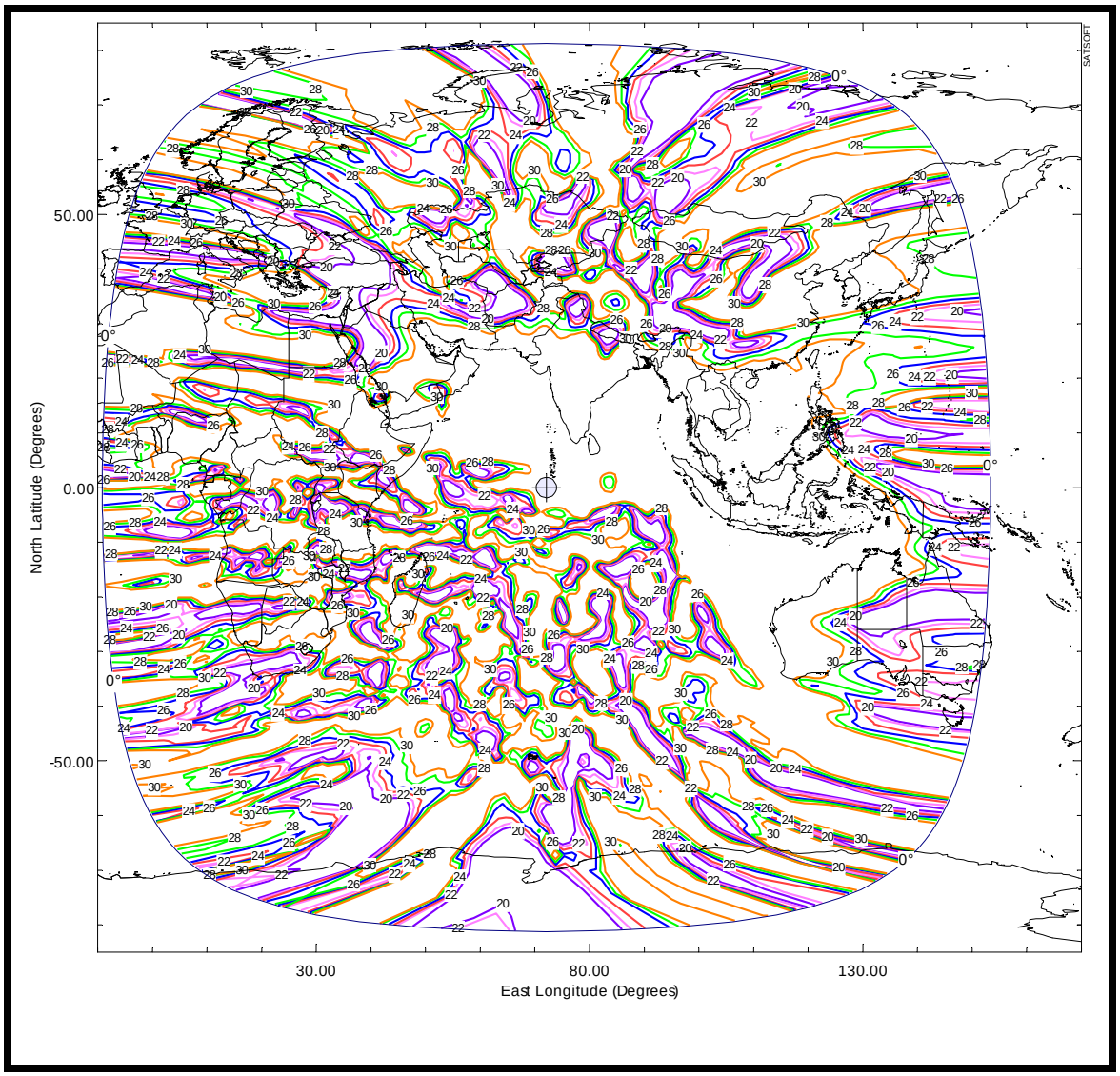
Beam Polarization: Horizontal



Absolute Cross Polarization Contours Shown: 30, 28, 26, 24, 22 and 20 dB

EXHIBIT 5D-5: MOBILITY IOR RECEIVE BEAM
(Schedule S Beam ID: MVUX)

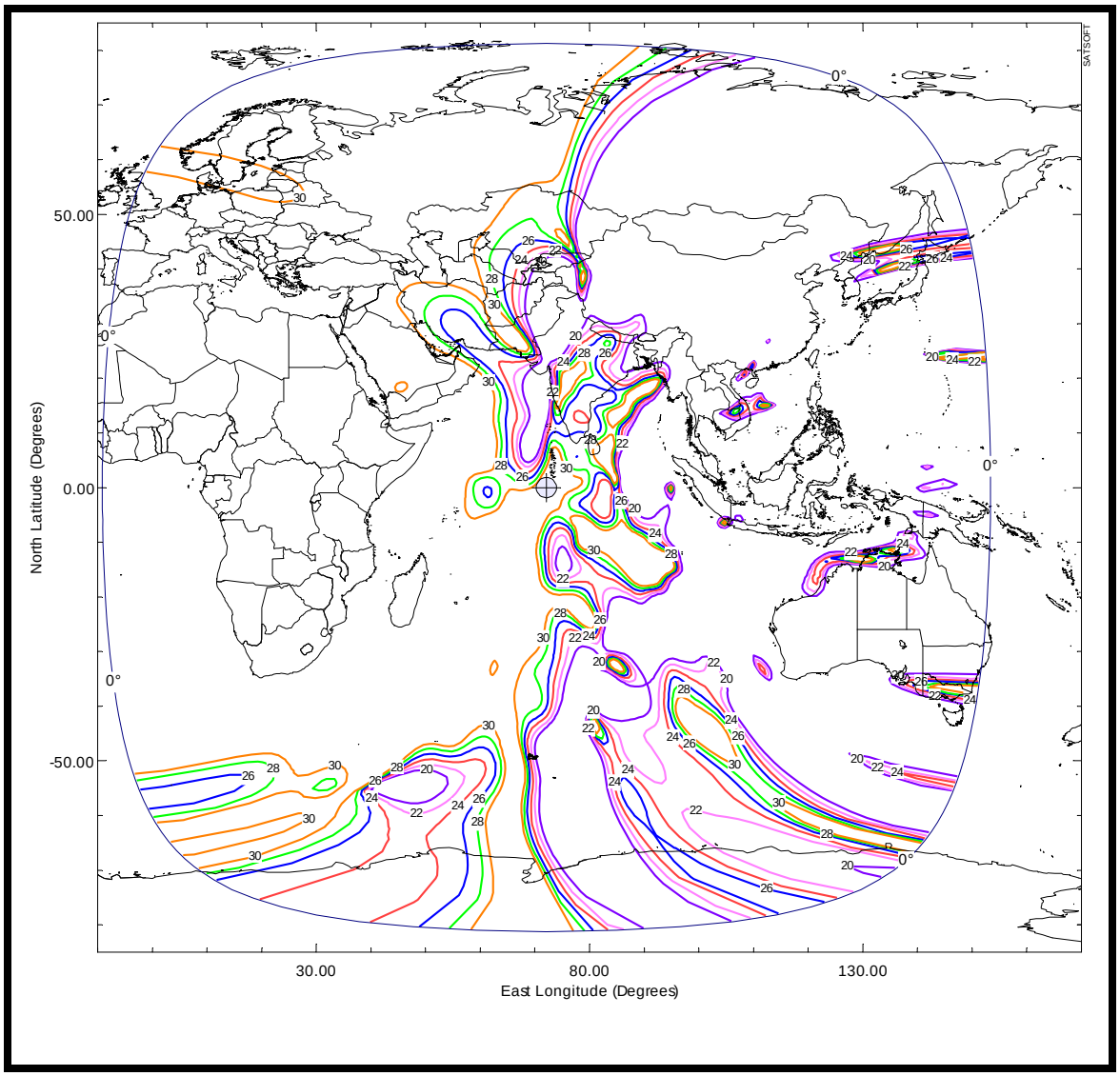
Beam Polarization: Vertical



Absolute Cross Polarization Contours Shown: 30, 28, 26, 24, 22 and 20 dB

EXHIBIT 5D-6: WEST HEMI TRANSMIT BEAM
(Schedule S Beam ID: WLDX)

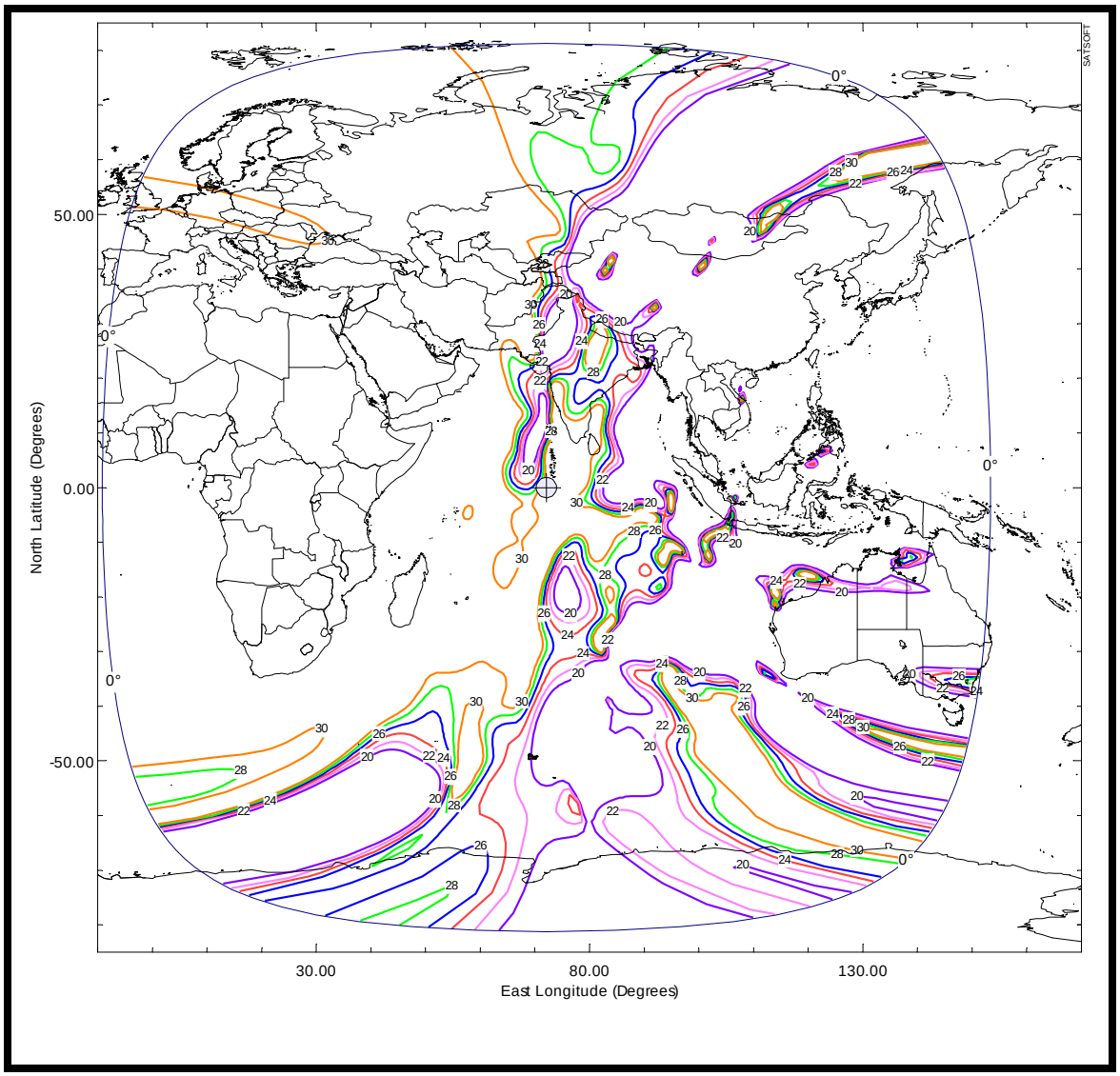
Beam Polarization: Left Hand Circular



Absolute Cross Polarization Contours Shown: 30, 28, 26, 24, 22 and 20 dB

EXHIBIT 5D-7: WEST HEMI TRANSMIT BEAM
(Schedule S Beam ID: WRDX)

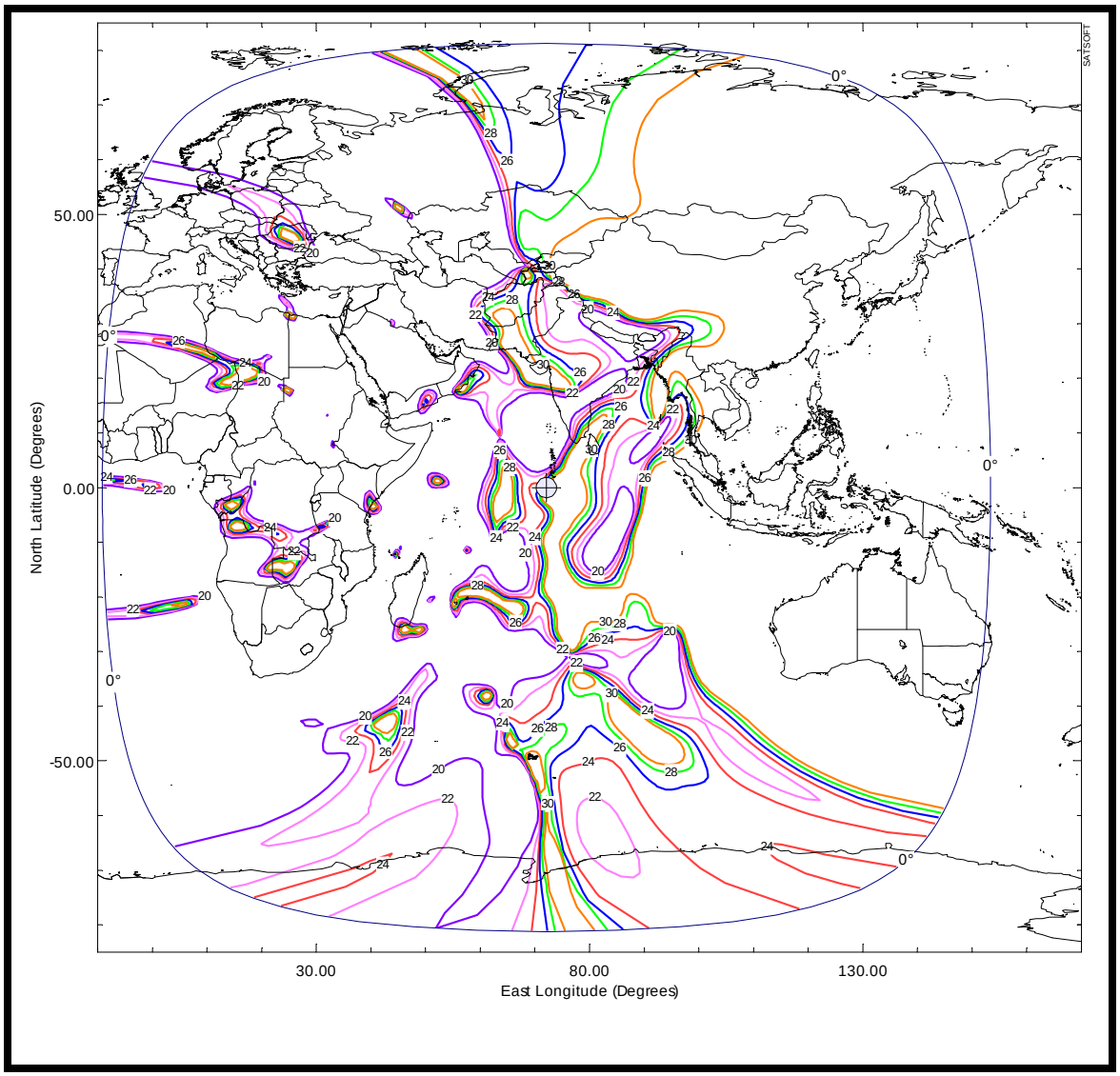
Beam Polarization: Right Hand Circular



Absolute Cross Polarization Contours Shown: 30, 28, 26, 24, 22 and 20 dB

EXHIBIT 5D-8: EAST HEMI TRANSMIT BEAM
(Schedule S Beam ID: ELDX)

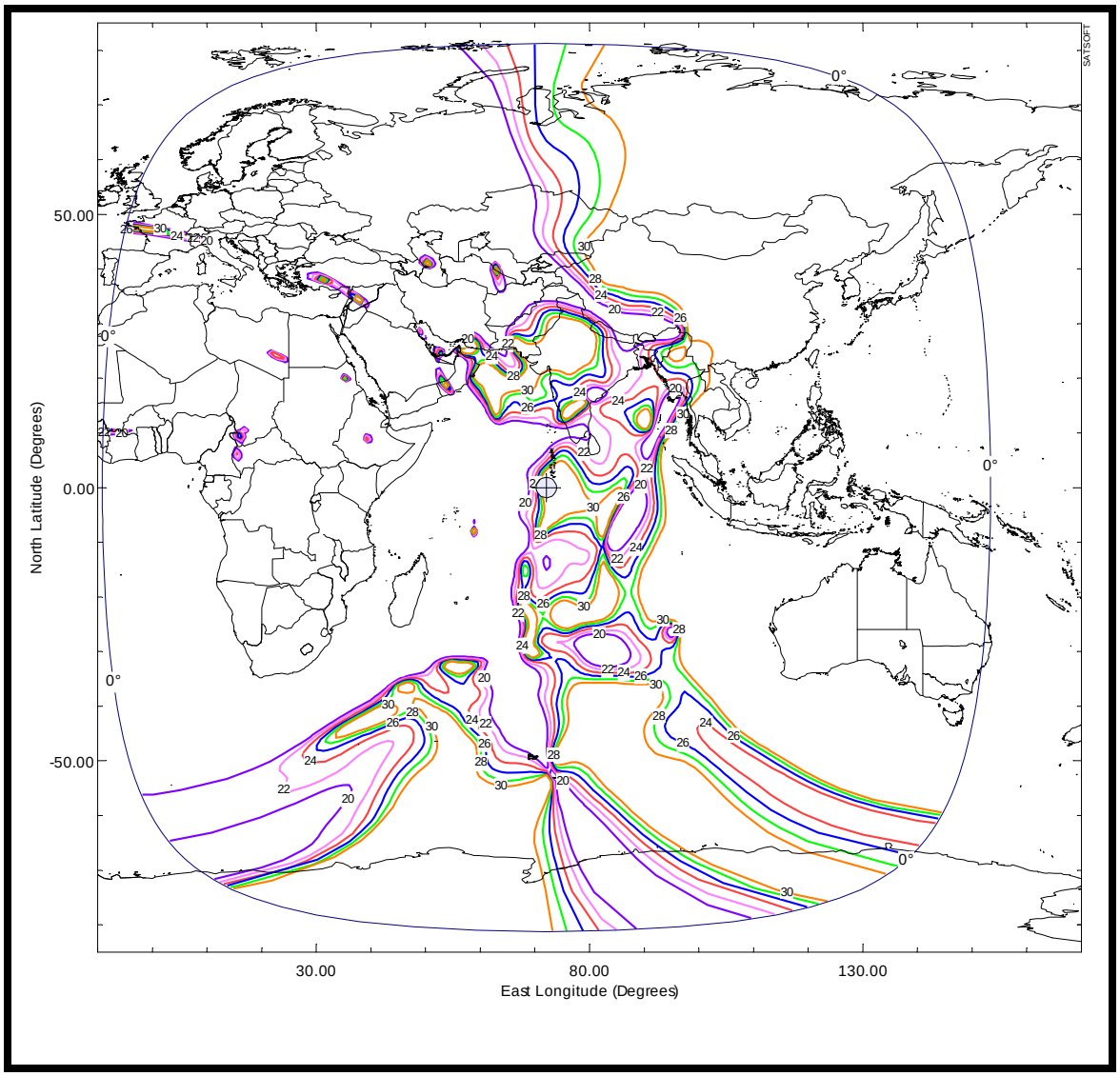
Beam Polarization: Left Hand Circular



Absolute Cross Polarization Contours Shown: 30, 28, 26, 24, 22 and 20 dB

EXHIBIT 5D-9: EAST HEMI TRANSMIT BEAM
(Schedule S Beam ID: ERDX)

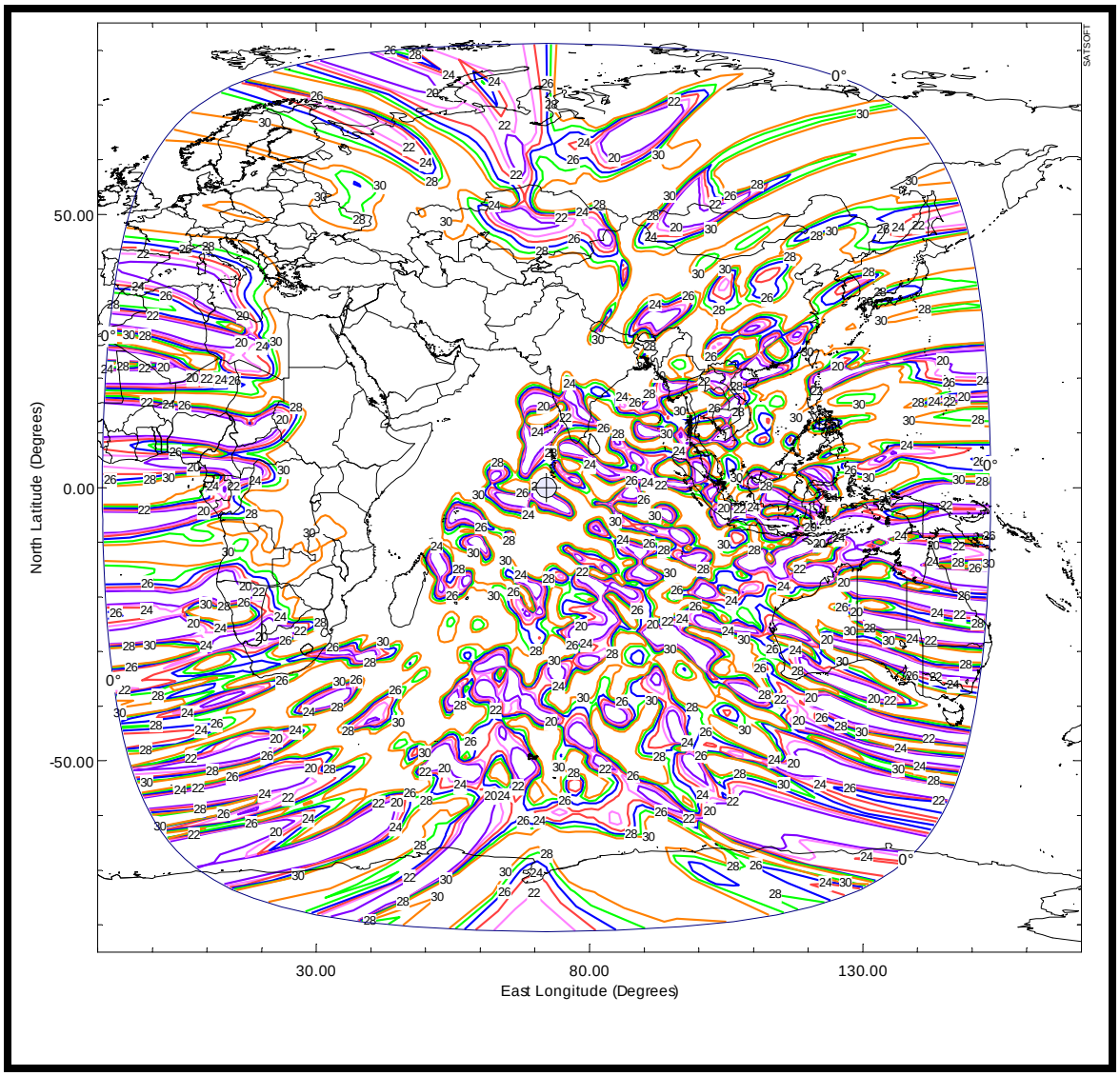
Beam Polarization: Right Hand Circular



Absolute Cross Polarization Contours Shown: 30, 28, 26, 24, 22 and 20 dB

EXHIBIT 5D-10: MIDDLE EAST - AFRICA TRANSMIT BEAM (Schedule S Beam ID: AHDX)

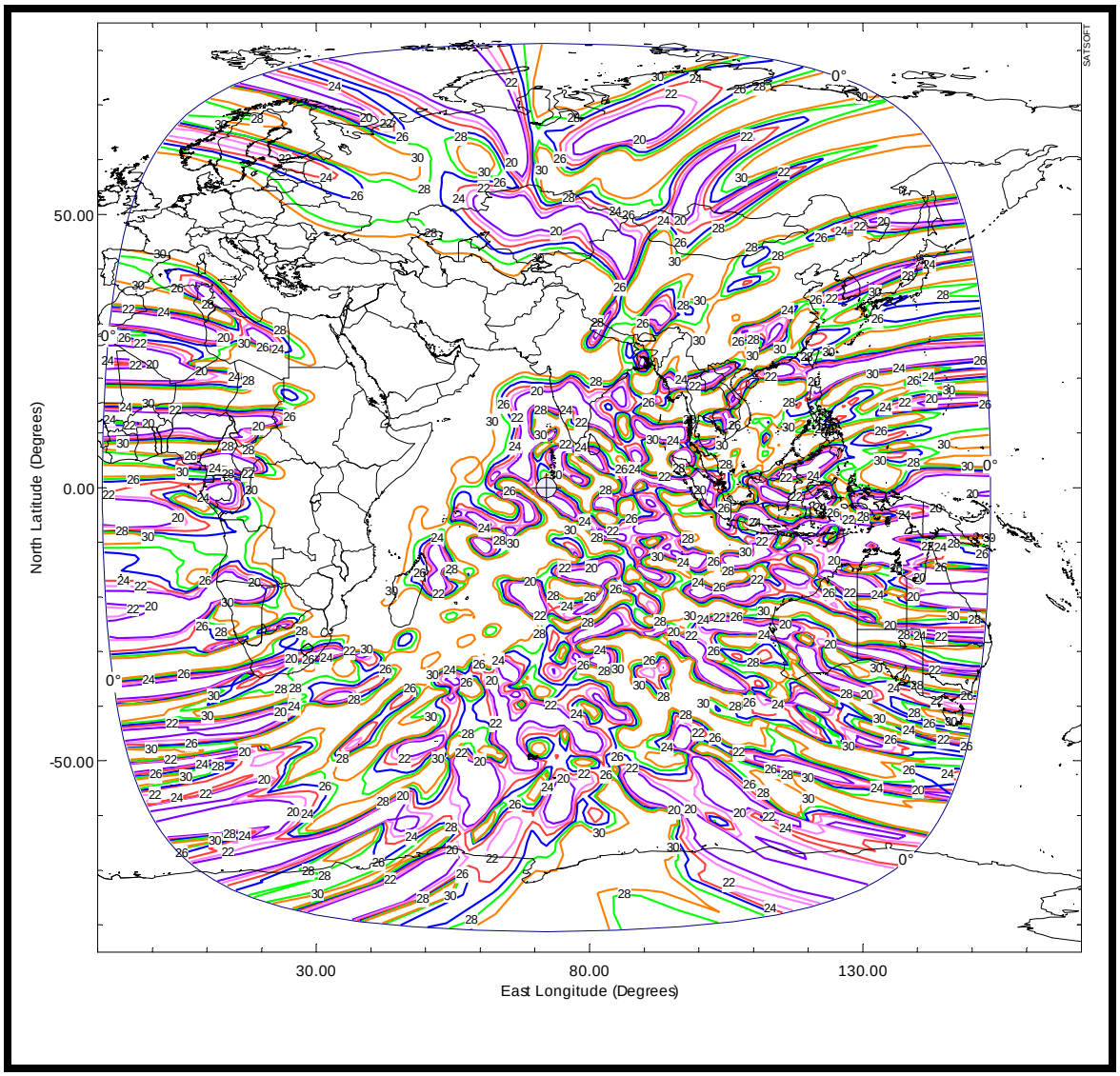
Beam Polarization: Horizontal



Absolute Cross Polarization Contours Shown: 30, 28, 26, 24, 22 and 20 dB

EXHIBIT 5D-11: MIDDLE EAST - AFRICA TRANSMIT BEAM (Schedule S Beam ID: AVDX)

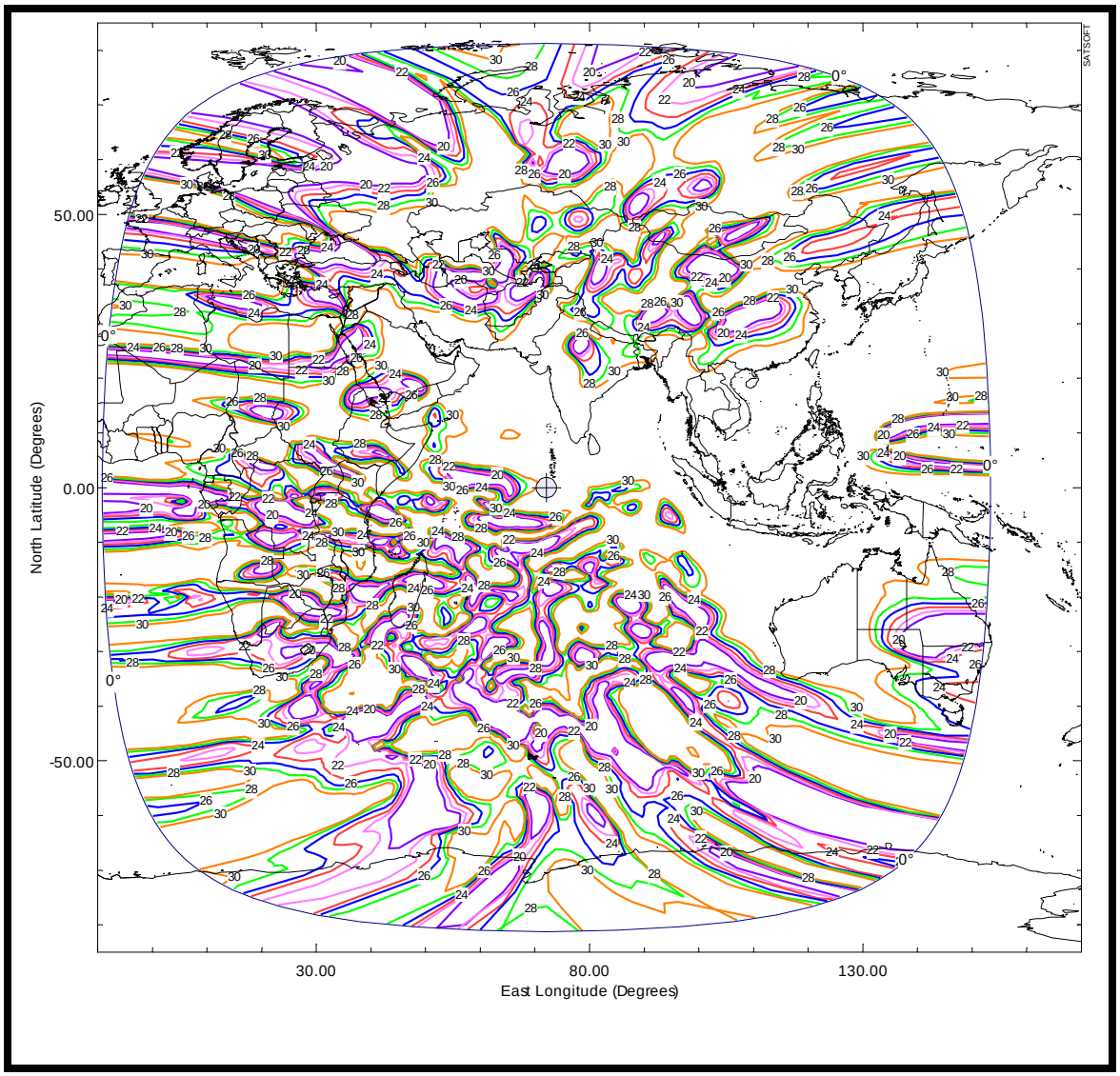
Beam Polarization: Vertical



Absolute Cross Polarization Contours Shown: 30, 28, 26, 24, 22 and 20 dB

EXHIBIT 5D-12: MOBILITY IOR TRANSMIT BEAM
(Schedule S Beam ID: MHDX)

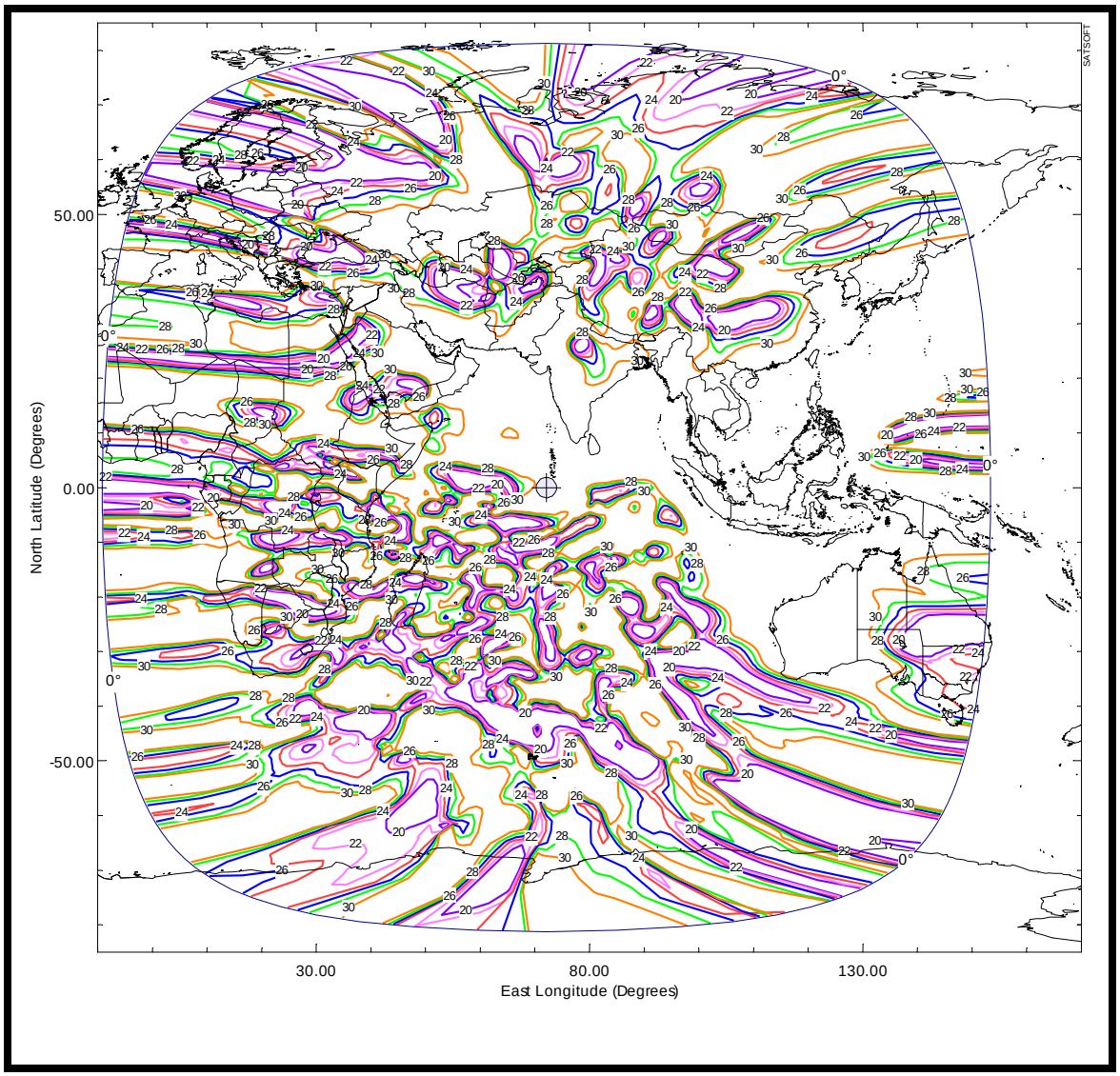
Beam Polarization: Horizontal



Absolute Cross Polarization Contours Shown: 30, 28, 26, 24, 22 and 20 dB

EXHIBIT 5D-13: MOBILITY IOR TRANSMIT BEAM
(Schedule S Beam ID: MVDX)

Beam Polarization: Vertical



Absolute Cross Polarization Contours Shown: 30, 28, 26, 24, 22 and 20 dB

EXHIBIT 6: COMMUNICATION SUBSYSTEM
EIRP AND G/T BUDGETS

Beam Name	West Hemi	West Hemi	East Hemi	East Hemi
Frequency Band (MHz)	5850 – 6425	5850 - 6425	6015 – 6425	6015 - 6425
Polarization	Left Hand Circular	Right Hand Circular	Left Hand Circular	Right Hand Circular
Channel Bandwidth (MHz)	72	72	72	72
Antenna Noise Temperature (°Kelvin)	155	155	150	150
Receiver Noise Temperature (°Kelvin)	243	243	257	257
Total System Noise Temperature (°Kelvin)	398	398	407	407
Total System Noise Temperature (dB/K)	26.0	26.0	26.1	26.1
Peak Gain of Satellite Receive Antenna (dBi)	27.8	27.8	29.8	29.8
Peak G/T (dB/K)	1.8	1.8	3.7	3.7
Minimum SFD [G/T: Peak, Attn: 0 dB] -- (dBW/m^2)	-109.2	-109.2	-109.8	-109.8
Beam Name	Middle East - Africa	Middle East - Africa	Mobility IOR	Mobility IOR
Frequency Band (MHz)	14000 - 14500	14000 - 14500	14250 - 14500	14250 – 14500
Polarization	Horizontal	Vertical	Horizontal	Vertical
Channel Bandwidth (MHz)	36 / 72	36 / 72	36	72
Antenna Noise Temperature (°Kelvin)	176	176	167	167
Receiver Noise Temperature (°Kelvin)	204	204	205	205
Total System Noise Temperature (°Kelvin)	380	380	372	372
Total System Noise Temperature (dB/K)	25.8	25.8	25.7	25.7
Peak Gain of Satellite Receive Antenna (dBi)	32.5	32.5	30.4	30.4
Peak G/T (dB/K)	6.7	6.7	4.7	4.7
Minimum SFD [G/T: Peak, Attn: 0 dB] -- (dBW/m^2)	-113.1	-113.1	-111.0	-111.0
Beam Name	UHF			
Frequency Band (MHz)	292.835 – 317.33			
Polarization	Right Hand Circular			
Channel Bandwidth (MHz)	0.005 / 0.025			
Antenna Noise Temperature (°Kelvin)	266 / 266			
Receiver Noise Temperature (°Kelvin)	368 / 264			
Total System Noise Temperature (°Kelvin)	634 / 530			
Total System Noise Temperature (dB/K)	28.0 / 27.2			
Peak Gain of Satellite Receive Antenna (dBi)	17.2			
Peak G/T (dB/K)	-10.8 / -10.0			
Minimum SFD [G/T: Peak, Attn: 0 dB] -- (dBW/m^2)	-155 to -118			

EXHIBIT 6: COMMUNICATION SUBSYSTEM
EIRP AND G/T BUDGETS (continued)

Beam Name	West Hemi	West Hemi	East Hemi	East Hemi
Frequency Band (MHz)	3625 - 4200	3625 - 4200	3790 – 4200	3790 - 4200
Polarization	Left Hand Circular	Right Hand Circular	Left Hand Circular	Right Hand Circular
Channel Bandwidth (MHz)	72	72	72	72
Maximum Power At The Output of Last Stage Amplifier (dBW)	18.5	18.5	18.5	18.5
Loss From Last Stage Amplifier To Transmit Antenna Interface (dB)	1.4	1.4	1.4	1.4
Power Into Transmit Antenna (dBW)	17.1	17.1	17.1	17.1
Power Into Transmit Antenna (Watts)	51.3	51.3	51.3	51.3
Peak Gain of Satellite Transmit Antenna (dBi)	27.2	27.2	27.6	27.6
Maximum Downlink EIRP (dBW)	44.3	44.3	44.7	44.7
Beam Name	Middle East – Africa	Middle East – Africa	Mobility IOR	Mobility IOR
Frequency Band (MHz)	11450 – 11700 12500 - 12750	11450 – 11700 12500 - 12750	12250 – 12500	12250 – 12500
Polarization	Horizontal	Vertical	Horizontal	Vertical
Channel Bandwidth (MHz)	36 / 72	36 / 72	72	36
Maximum Power At The Output of Last Stage Amplifier (dBW)	21.8	21.8	21.8	21.8
Loss From Last Stage Amplifier To Transmit Antenna Interface (dB)	1.8	1.8	1.5	1.5
Power Into Transmit Antenna (dBW)	20.0	20.0	20.3	20.3
Power Into Transmit Antenna (Watts)	100	100	107.2	107.2
Peak Gain of Satellite Transmit Antenna (dBi)	30.4	30.4	29.4	29.4
Maximum Downlink EIRP (dBW)	50.4	50.4	49.7	49.7
Beam Name	UHF	C-Band ULPC	Ku-Band ULPC	Ku-Band ULPC
Frequency Band (MHz)	243.52 – 268.16	4196.75	11699	12499
Polarization	Right Hand Circular	Vertical	Right Hand Circular	Left Hand Circular
Channel Bandwidth (MHz)	0.005 / 0.025	0.025	0.025	0.025
Maximum Power At The Output of Last Stage Amplifier (dBW)	14.0 / 7.5	-2.5	-1.0	-1.0
Loss From Last Stage Amplifier To Transmit Antenna Interface (dB)	1.6 / 0.9	1.2	1.0	1.1
Power Into Transmit Antenna (dBW)	12.4 / 6.6	-3.7	-2.0	-2.1
Power Into Transmit Antenna (Watts)	17.4 / 4.6	0.4	0.6	0.6
Peak Gain of Satellite Transmit Antenna (dBi)	16.5	12.5	18.5	19.0
Maximum Downlink EIRP (dBW)	28.9 / 23.1	8.8	16.5	16.9

EXHIBIT 7: TC&R SUBSYSTEM CHARACTERISTICS

	Spacecraft Antenna		
	West Hemi	**Bicone**	**Pipe**
Command Frequency (MHz) / Polarization (see note)			
Transfer Orbit / Emergency	n/a	5850.5 (H)	6424.5 (LHCP)
On-Station	5850.5 (LHCP)	n/a	6424.5 (LHCP)
Command Modulation	FM	FM	FM
Bandwidth of Command Carrier (kHz)			
Occupied Bandwidth	800	800	800
Allocated Bandwidth	1000	1000	1000
Command Threshold (dBW/m^2)			
Beam Peak	-109.1	-85.4	-88.1
Edge of Coverage	-99.1	-81.4	-84.1
Command G/T (dB/K)			
Beam Peak	-17.2	-41.2	-37.4
Edge of Coverage	-27.2	-45.2	-41.4
Telemetry Frequency (MHz) / Polarization (see note)			
Transfer Orbit / Emergency	n/a	4197.25 (V) 4197.75 (V) 4198.25 (V) 4198.75 (V)	4197.25 (LHCP) 4197.75 (LHCP) 4198.25 (LHCP) 4198.75 (LHCP)
On-Station	4197.25 (LHCP) 4197.75 (LHCP) 4198.25 (LHCP) 4198.75 (LHCP)	n/a	n/a
Telemetry Modulation	PM	PM	PM
Bandwidth of Telemetry Carrier (kHz)			
Occupied	300	300	300
Allocated	500	500	500
Telemetry EIRP			
Beam Peak	20.0	10.5	12.4
Edge of Coverage	10.0	6.5	8.4
On-Station Ranging Accuracy (meters)	≤ 30	≤ 30	≤ 30

Note:
H: Linear Horizontal Polarization
V: Linear Vertical Polarization
RHCP: Right Hand Circular Polarization
LHCP: Left Hand Circular Polarization

EXHIBIT 8: TC&R SUBSYSTEM EIRP and G/T BUDGETS

Operating Mode	On-Station	Back-up	Back-up/on-Station
Antenna Type	West Hemi	Bicone	Pipe
Frequency (MHz)	5850.5	5850.5	6424.5
Polarization	Left Hand Circular	Horizontal	Left Hand Circular
Antenna Noise Temperature (°Kelvin)	155	290	290
Receiver Noise Temperature (°Kelvin)	31728	10584	9291
Total System Noise Temperature (°Kelvin)	31883	10874	9581
Total System Noise Temperature (dB/K)	45.0	40.4	39.8
Peak Gain of Satellite Receive Antenna (dBi)	27.8	-0.8	2.4
Peak G/T (dB/K)	-17.2	-41.2	-37.4
SFD Threshold at Peak G/T (dBW/m^2)	-109.1	-85.4	-88.1
Operating Mode	On-Station	Back-up	Back-up
Antenna Type	West Hemi	Bicone	Pipe
Frequency (MHz)	4197.25 4197.75 4198.25 4198.75	4197.25 4197.75 4198.25 4198.75	4197.25 4197.75 4198.25 4198.75
Polarization	Left Hand Circular	Vertical	Left Hand Circular
Maximum Power At The Output of Last Stage Amplifier (dBW)	-1.0	10.5	10.5
Loss From Last Stage Amplifier To Transmit Antenna Interface (dB)	6.2	5.0	6.1
Power Into The Transmit Antenna (dBW)	-7.2	5.5	4.4
Power Into The Transmit Antenna (Watts)	0.2	3.5	2.7
Peak Gain of Satellite Transmit Antenna (dBi)	27.2	5.0	8.0
Maximum Downlink EIRP (dBW)	20.0	10.5	12.4

EXHIBIT 9: EMISSION DESIGNATORS

Signal Type	Emission Designator	Allocated Bandwidth (kHz)
Analog TV/FM Carrier	36M0F3F	36000
64 kbps Carrier	100KG7W	100
128 kbps Carrier	400KG7W	400
512 kbps Carrier	1M45G7W	1450
6000 kbps carrier	10M3G7W	10300
24575 kbps Carrier	36M0G7W	36000
49150 kbps Carrier	72M0G7W	72000

EXHIBIT 10: POWER FLUX DENSITY CALCULATIONS

FREQUENCY BAND : 3700 - 4200 MHz							
West Hemi Beam (LHCP) - 36M0F3F							
Elevation Angle (degrees)	0.0	5.0	10.0	15.0	20.0	25.0	90.0
Assumed EIRP	41.4*	41.3*	43.7*	44.3	44.3	44.3	44.3
Carrier Occupied Bandwidth (kHz)	4000.0	4000.0	4000.0	4000.0	4000.0	4000.0	4000.0
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)	-152.0	-152.0	-149.5	-148.7	-148.6	-148.5	-147.8
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	0.0	1.7	4.1	6.5	5.8
West Hemi Beam (LHCP) - 72M0G7W							
Elevation Angle (degrees)	0.0	5.0	10.0	15.0	20.0	25.0	90.0
Assumed EIRP	44.3	44.3	44.3	44.3	44.3	44.3	44.3
Carrier Occupied Bandwidth (kHz)	30133.0	30133.0	30133.0	30133.0	30133.0	30133.0	30133.0
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)	-157.9	-157.7	-157.6	-157.5	-157.4	-157.3	-156.5
FCC Limit (dBW/m^2/4Hz)	-152.0	-152.0	-149.5	-147.0	-144.5	-142.0	-142.0
Margin (dB)	5.9	5.7	8.1	10.5	12.9	15.3	14.5

EXHIBIT 10: POWER FLUX DENSITY CALCULATIONS (continued)

FREQUENCY BAND : 3700 – 4200 MHz							
West Hemi Beam (RHCP) - 36M0F3F							
Elevation Angle (degrees)	0.0	5.0	10.0	15.0	20.0	25.0	90.0
Assumed EIRP	41.4*	41.3*	43.7*	44.3	44.3	44.3	44.3
Carrier Occupied Bandwidth (kHz)	4000.0	4000.0	4000.0	4000.0	4000.0	4000.0	4000.0
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)	-152.0	-152.0	-149.5	-148.7	-148.6	-148.5	-147.8
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	0.0	1.7	4.1	6.5	5.8
West Hemi Beam (RHCP) - 72M0G7W							
Elevation Angle (degrees)	0.0	5.0	10.0	15.0	20.0	25.0	90.0
Assumed EIRP	44.3	44.3	44.3	44.3	44.3	44.3	44.3
Carrier Occupied Bandwidth (kHz)	30133.0	30133.0	30133.0	30133.0	30133.0	30133.0	30133.0
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)	-157.9	-157.7	-157.6	-157.5	-157.4	-157.3	-156.5
FCC Limit (dBW/m^2/4Hz)	-152.0	-152.0	-149.5	-147.0	-144.5	-142.0	-142.0
Margin (dB)	5.9	5.7	8.1	10.5	12.9	15.3	14.5

EXHIBIT 10: POWER FLUX DENSITY CALCULATIONS (continued)

FREQUENCY BAND : 3700 – 4200 MHz							
East Hemi Beam (LHCP) - 36M0F3F							
Elevation Angle (degrees)	0.0	5.0	10.0	15.0	20.0	25.0	90.0
Assumed EIRP	41.4*	41.3*	43.7*	44.7	44.7	44.7	44.7
Carrier Occupied Bandwidth (kHz)	4000.0	4000.0	4000.0	4000.0	4000.0	4000.0	4000.0
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)	-152.0	-152.0	-149.5	-148.3	-148.2	-148.1	-147.4
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	0.0	1.3	3.7	6.1	5.4
East Hemi Beam (LHCP) - 72M0G7W							
Elevation Angle (degrees)	0.0	5.0	10.0	15.0	20.0	25.0	90.0
Assumed EIRP	44.7	44.7	44.7	44.7	44.7	44.7	44.7
Carrier Occupied Bandwidth (kHz)	30133.0	30133.0	30133.0	30133.0	30133.0	30133.0	30133.0
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)	-157.5	-157.3	-157.2	-157.1	-157.0	-156.9	-156.1
FCC Limit (dBW/m^2/4Hz)	-152.0	-152.0	-149.5	-147.0	-144.5	-142.0	-142.0
Margin (dB)	5.5	5.3	7.7	10.1	12.5	14.9	14.1

EXHIBIT 10: POWER FLUX DENSITY CALCULATIONS (continued)

FREQUENCY BAND : 3700 – 4200 MHz							
East Hemi Beam (RHCP) - 36M0F3F							
Elevation Angle (degrees)	0.0	5.0	10.0	15.0	20.0	25.0	90.0
Assumed EIRP	41.4*	41.3*	43.7*	44.7	44.7	44.7	44.7
Carrier Occupied Bandwidth (kHz)	4000.0	4000.0	4000.0	4000.0	4000.0	4000.0	4000.0
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)	-152.0	-152.0	-149.5	-148.3	-148.2	-148.1	-147.4
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	0.0	1.3	3.7	6.1	5.4
East Hemi Beam (RHCP) - 72M0G7W							
Elevation Angle (degrees)	0.0	5.0	10.0	15.0	20.0	25.0	90.0
Assumed EIRP	44.7	44.7	44.7	44.7	44.7	44.7	44.7
Carrier Occupied Bandwidth (kHz)	30133.0	30133.0	30133.0	30133.0	30133.0	30133.0	30133.0
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)	-157.5	-157.3	-157.2	-157.1	-157.0	-156.9	-156.1
FCC Limit (dBW/m^2/4Hz)	-152.0	-152.0	-149.5	-147.0	-144.5	-142.0	-142.0
Margin (dB)	5.5	5.3	7.7	10.1	12.5	14.9	14.1

EXHIBIT 10: POWER FLUX DENSITY CALCULATIONS (continued)

FREQUENCY BAND : 3700 – 4200 MHz							
ULPC (RHCP-Pol.) - 25K0G7W							
Elevation Angle (degrees)	0.0	5.0	10.0	15.0	20.0	25.0	90.0
Assumed EIRP	8.8	8.8	8.8	8.8	8.8	8.8	8.8
Carrier Occupied Bandwidth (kHz)	25.0	25.0	25.0	25.0	25.0	25.0	25.0
Spreading Loss (dB/m^2)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density (dBW/m^2/4kHz)	-162.5	-162.4	-162.3	-162.2	-162.1	-162.0	-161.2
FCC Limit (dBW/m^2/4Hz)	-152.0	-152.0	-149.5	-147.0	-144.5	-142.0	-142.0
Margin (dB)	10.5	10.4	12.8	15.2	17.6	20.0	19.2
Telemetry (LHCP - Reflector Antenna) - 500K0G7W							
Elevation Angle (degrees)	0.0	5.0	10.0	15.0	20.0	25.0	90.0
Assumed EIRP	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Carrier Occupied Bandwidth (kHz)	300.0	300.0	300.0	300.0	300.0	300.0	300.0
Spreading Loss (dB/m^2)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density (dBW/m^2/4kHz)	-162.1	-162.0	-161.9	-161.8	-161.7	-161.6	-160.8
FCC Limit (dBW/m^2/4Hz)	-152.0	-152.0	-149.5	-147.0	-144.5	-142.0	-142.0
Margin (dB)	10.1	10.0	12.4	14.8	17.2	19.6	18.8

EXHIBIT 10: POWER FLUX DENSITY CALCULATIONS (continued)

FREQUENCY BAND : 3700 – 4200 MHz							
Telemetry (V - Bicone Antenna) - 500K0G7W							
Elevation Angle (degrees)	0.0	5.0	10.0	15.0	20.0	25.0	90.0
Assumed EIRP	10.5	10.5	10.5	10.5	10.5	10.5	10.5
Carrier Occupied Bandwidth (kHz)	300.0	300.0	300.0	300.0	300.0	300.0	300.0
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)	-171.6	-171.5	-171.4	-171.3	-171.2	-171.1	-170.3
FCC Limit (dBW/m^2/4Hz)	-152.0	-152.0	-149.5	-147.0	-144.5	-142.0	-142.0
Margin (dB)	19.6	19.5	21.9	24.3	26.7	29.1	28.3
Telemetry (LHCP - Pipe Antennas) - 500K0G7W							
Elevation Angle (degrees)	0.0	5.0	10.0	15.0	20.0	25.0	90.0
Assumed EIRP	12.4	12.4	12.4	12.4	12.4	12.4	12.4
Carrier Occupied Bandwidth (kHz)	300.0	300.0	300.0	300.0	300.0	300.0	300.0
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)	-169.7	-169.6	-169.5	-169.4	-169.3	-169.2	-168.4
FCC Limit (dBW/m^2/4Hz)	-152.0	-152.0	-149.5	-147.0	-144.5	-142.0	-142.0
Margin (dB)	17.7	17.6	20.0	22.4	24.8	27.2	26.4

EXHIBIT 10: POWER FLUX DENSITY CALCULATIONS (continued)

FREQUENCY BAND : 11450 - 11700 MHz							
Middle East - Africa Beam (H) - 36M0F3F							
Elevation Angle (degrees)	0.0	5.0	10.0	15.0	20.0	25.0	90.0
Assumed EIRP	43.4*	43.3*	45.7*	48.0*	50.4	50.4	50.4
Carrier Occupied Bandwidth (kHz)	4000.0	4000.0	4000.0	4000.0	4000.0	4000.0	4000.0
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	-142.4	-141.7
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	0.0	2.4	1.7
Middle East - Africa Beam (H) - 36M0G7W							
Elevation Angle (degrees)	0.0	5.0	10.0	15.0	20.0	25.0	90.0
Assumed EIRP	50.4	50.4	50.4	50.4	50.4	50.4	50.4
Carrier Occupied Bandwidth (kHz)	30133.0	30133.0	30133.0	30133.0	30133.0	30133.0	30133.0
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)	-151.8	-151.6	-151.5	-151.4	-151.3	-151.2	-150.4
FCC Limit (dBW/m^2/4Hz)	-150.0	-150.0	-147.5	-145.0	-142.5	-140.0	-140.0
Margin (dB)	1.8	1.6	4.0	6.4	8.8	11.2	10.4

EXHIBIT 10: POWER FLUX DENSITY CALCULATIONS (continued)

FREQUENCY BAND : 11450 - 11700 MHz							
Middle East - Africa Beam (V) - 36M0F3F							
Elevation Angle (degrees)	0.0	5.0	10.0	15.0	20.0	25.0	90.0
Assumed EIRP	43.4*	43.3*	45.7*	48.0*	50.4	50.4	50.4
Carrier Occupied Bandwidth (kHz)	4000.0	4000.0	4000.0	4000.0	4000.0	4000.0	4000.0
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	-142.4	-141.7
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	0.0	2.4	1.7
Middle East - Africa Beam (V) - 36M0G7W							
Elevation Angle (degrees)	0.0	5.0	10.0	15.0	20.0	25.0	90.0
Assumed EIRP	50.4	50.4	50.4	50.4	50.4	50.4	50.4
Carrier Occupied Bandwidth (kHz)	30133.0	30133.0	30133.0	30133.0	30133.0	30133.0	30133.0
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)	-151.8	-151.6	-151.5	-151.4	-151.3	-151.2	-150.4
FCC Limit (dBW/m^2/4Hz)	-150.0	-150.0	-147.5	-145.0	-142.5	-140.0	-140.0
Margin (dB)	1.8	1.6	4.0	6.4	8.8	11.2	10.4

EXHIBIT 10: POWER FLUX DENSITY CALCULATIONS (continued)

FREQUENCY BAND : 11450 - 11700 MHz							
ULPC Beam (RHCP) - 25K0G7W							
Elevation Angle (degrees)	0.0	5.0	10.0	15.0	20.0	25.0	90.0
Assumed EIRP	16.5	16.5	16.5	16.5	16.5	16.5	16.5
Carrier Occupied Bandwidth (kHz)	25.0	25.0	25.0	25.0	25.0	25.0	25.0
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)	-154.8	-154.7	-154.6	-154.5	-154.4	-154.3	-153.5
FCC Limit (dBW/m^2/4Hz)	-150.0	-150.0	-147.5	-145.0	-142.5	-140.0	-140.0
Margin (dB)	4.8	4.7	7.1	9.5	11.9	14.3	13.5
FREQUENCY BAND : 12250 - 12750 MHz							
Middle East - Africa Beam (H) - 36M0F3F							
Elevation Angle (degrees)	0.0	5.0	10.0	15.0	20.0	25.0	90.0
Assumed EIRP	45.4*	45.3*	47.7*	50.0*	50.4	50.4	50.4
Carrier Occupied Bandwidth (kHz)	4000.0	4000.0	4000.0	4000.0	4000.0	4000.0	4000.0
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)	-148.0	-148.0	-145.5	-143.0	-142.5	-142.4	-141.7
ITU 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	2.0	4.4	3.7

EXHIBIT 10: POWER FLUX DENSITY CALCULATIONS (continued)

FREQUENCY BAND : 12250 - 12750 MHz							
Middle East - Africa Beam (H) - 36M0G7W							
Elevation Angle (degrees)	0.0	5.0	10.0	15.0	20.0	25.0	90.0
Assumed EIRP	50.4	50.4	50.4	50.4	50.4	50.4	50.4
Carrier Occupied Bandwidth (kHz)	30133.0	30133.0	30133.0	30133.0	30133.0	30133.0	30133.0
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)	-151.8	-151.6	-151.5	-151.4	-151.3	-151.2	-150.4
ITU Limit (dBW/m^2/4Hz)	-148.0	-148.0	-145.5	-143.0	-140.5	-138.0	-138.0
Margin (dB)	3.8	3.6	6.0	8.4	10.8	13.2	12.4
Middle East - Africa Beam (V) - 36M0F3F							
Elevation Angle (degrees)	0.0	5.0	10.0	15.0	20.0	25.0	90.0
Assumed EIRP	45.4*	45.3*	47.7*	50.0*	50.4	50.4	50.4
Carrier Occupied Bandwidth (kHz)	4000.0	4000.0	4000.0	4000.0	4000.0	4000.0	4000.0
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)	-148.0	-148.0	-145.5	-143.0	-142.5	-142.4	-141.7
ITU 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	2.0	4.4	3.7

EXHIBIT 10: POWER FLUX DENSITY CALCULATIONS (continued)

FREQUENCY BAND : 12250 - 12750 MHz							
Middle East - Africa Beam (V) - 36M0G7W							
Elevation Angle (degrees)	0.0	5.0	10.0	15.0	20.0	25.0	90.0
Assumed EIRP	50.4	50.4	50.4	50.4	50.4	50.4	50.4
Carrier Occupied Bandwidth (kHz)	30133.0	30133.0	30133.0	30133.0	30133.0	30133.0	30133.0
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)	-151.8	-151.6	-151.5	-151.4	-151.3	-151.2	-150.4
ITU Limit (dBW/m^2/4Hz)	-148.0	-148.0	-145.5	-143.0	-140.5	-138.0	-138.0
Margin (dB)	3.8	3.6	6.0	8.4	10.8	13.2	12.4
Mobility IOR Beam (H) - 36M0F3F							
Elevation Angle (degrees)	0.0	5.0	10.0	15.0	20.0	25.0	90.0
Assumed EIRP	45.4*	45.3*	47.7*	49.7	49.7	49.7	49.7
Carrier Occupied Bandwidth (kHz)	4000.0	4000.0	4000.0	4000.0	4000.0	4000.0	4000.0
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)	-148.0	-148.0	-145.5	-143.3	-143.2	-143.1	-142.4
ITU 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	0.3	2.7	5.1	4.4

EXHIBIT 10: POWER FLUX DENSITY CALCULATIONS (continued)

FREQUENCY BAND : 12250 - 12750 MHz							
Mobility IOR Beam (H) - 36M0G7W							
Elevation Angle (degrees)	0.0	5.0	10.0	15.0	20.0	25.0	90.0
Assumed EIRP	49.7	49.7	49.7	49.7	49.7	49.7	49.7
Carrier Occupied Bandwidth (kHz)	30133.0	30133.0	30133.0	30133.0	30133.0	30133.0	30133.0
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)	-152.5	-152.3	-152.2	-152.1	-152.0	-151.9	-151.1
ITU Limit (dBW/m^2/4Hz)	-148.0	-148.0	-145.5	-143.0	-140.5	-138.0	-138.0
Margin (dB)	4.5	4.3	6.7	9.1	11.5	13.9	13.1
Mobility IOR Beam (V) - 36M0F3F							
Elevation Angle (degrees)	0.0	5.0	10.0	15.0	20.0	25.0	90.0
Assumed EIRP	45.4*	45.3*	47.7*	49.7	49.7	49.7	49.7
Carrier Occupied Bandwidth (kHz)	4000.0	4000.0	4000.0	4000.0	4000.0	4000.0	4000.0
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)	-148.0	-148.0	-145.5	-143.3	-143.2	-143.1	-142.4
ITU 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	0.3	2.7	5.1	4.4

EXHIBIT 10: POWER FLUX DENSITY CALCULATIONS (continued)

FREQUENCY BAND : 12250 - 12750 MHz							
Mobility IOR Beam (V) - 36M0G7W							
Elevation Angle (degrees)	0.0	5.0	10.0	15.0	20.0	25.0	90.0
Assumed EIRP	49.7	49.7	49.7	49.7	49.7	49.7	49.7
Carrier Occupied Bandwidth (kHz)	30133.0	30133.0	30133.0	30133.0	30133.0	30133.0	30133.0
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)	-152.5	-152.3	-152.2	-152.1	-152.0	-151.9	-151.1
ITU Limit (dBW/m^2/4Hz)	-148.0	-148.0	-145.5	-143.0	-140.5	-138.0	-138.0
Margin (dB)	4.5	4.3	6.7	9.1	11.5	13.9	13.1
ULPC Beam (LHCP) - 25K0G7W							
Elevation Angle (degrees)	0.0	5.0	10.0	15.0	20.0	25.0	90.0
Assumed EIRP	16.9	16.9	16.9	16.9	16.9	16.9	16.9
Carrier Occupied Bandwidth (kHz)	25.0	25.0	25.0	25.0	25.0	25.0	25.0
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)	-154.4	-154.3	-154.2	-154.1	-154.0	-153.9	-153.1
FCC Limit (dBW/m^2/4Hz)	-148.0	-148.0	-145.5	-143.0	-140.5	-138.0	-138.0
Margin (dB)	6.4	6.3	8.7	11.1	13.5	15.9	15.1

* 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 and/or restriction on the movement/placement of the beam.

EXHIBIT 11: RECEIVE AND TRANSMIT SECTION FILTER RESPONSE CHARACTERISTICS

	Attenuation Relative To Peak Level (dB)		
Frequency Offset Relative to Channel Center Frequency (MHz)	Input Section	Output Section	Total
C-Band: 72 MHz Channel			
±16	0.28	0.26	0.44
±24	0.37	0.38	0.60
±28	0.45	0.47	0.76
±32	0.55	0.67	1.02
±36	0.67	1.67	2.10
Ku-Band: 36 MHz Channel			
±8	0.22	0.24	0.39
±12	0.29	0.48	0.66
±14	0.42	0.75	1.04
±16	0.81	1.27	1.94
±18	1.80	3.65	5.30
Ku-Band: 72 MHz Channel			
±16	0.28	0.26	0.43
±24	0.39	0.47	0.69
±28	0.45	0.61	0.87
±32	0.62	1.17	1.57
±36	1.02	3.12	3.89
UHF-Band: 5 kHz Channel			
±2	0.27	0.30	0.48
±2.4	0.27	0.30	0.48
UHF-Band: 25 kHz Channel			
±10	0.27	0.30	0.48
±12	0.27	0.30	0.48

EXHIBIT 12: INTELSAT 22 LINK BUDGETS

UPLINK BEAM INFORMATION				
Uplink Beam Name	WEST-HEMI	WEST-HEMI	WEST-HEMI	WEST-HEMI
Uplink Frequency (GHz)	6.175	6.175	6.175	6.175
Uplink Beam Polarization	CIRCULAR	CIRCULAR	CIRCULAR	CIRCULAR
Uplink Relative Contour Level (dB)	-10.0	-10.0	-10.0	-10.0
Uplink Contour G/T (dB/K)	-8.2	-8.2	-8.2	-8.2
Uplink SFD (dBW/m2)	-76.2	-79.2	-77.2	-77.2
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0
DOWNLINK BEAM INFORMATION				
Downlink Beam Name	WEST_HEMI	WEST_HEMI	WEST_HEMI	WEST_HEMI
Downlink Frequency (GHz)	3.950	3.950	3.950	3.950
Downlink Beam Polarization	CIRCULAR	CIRCULAR	CIRCULAR	CIRCULAR
Downlink Relative Contour Level (dB)	-10.0	-10.0	-10.0	-10.0
Downlink Contour EIRP (dBW)	34.3	34.3	34.3	34.3
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0
ADJACENT SATELLITE 1				
Satellite 1 Orbital Location	70.1E	70.1E	70.1E	70.1E
Uplink Power Density (dBW/Hz)	-38.7	-38.7	-38.7	-38.7
Uplink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
Downlink EIRP Density (dBW/Hz)	-42.0	-42.0	-42.0	-42.0
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
ADJACENT SATELLITE 2				
Satellite 1 Orbital Location	74.1E	74.1E	74.1E	74.1E
Uplink Power Density (dBW/Hz)	-38.7	-38.7	-38.7	-38.7
Uplink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
Downlink EIRP Density (dBW/Hz)	-42.0	-42.0	-42.0	-42.0
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
CARRIER INFORMATION				
Carrier ID	36M0F3F	72M0G7W	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	49150	6000	64
Code Rate	N/A	1/2x188/204	1/2x188/204	1/2x239/256
Occupied Bandwidth(kHz)	36000	60266	6771.1	75.4
Allocated Bandwidth(kHz)	36000	72000	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)	18.3	18.3	6.1	6.1
Earth Station Gain (dBi)	60.2	60.2	49.4	49.4
Earth Station Elevation Angle	20	20	20	20
DOWNLINK EARTH STATION				
Earth Station Diameter (meters)	8.1	3.0	3.5	3.5
Earth Station Gain (dBi)	49.3	39.7	41.1	41.1
Earth Station G/T (dB/K)	28.4	19.2	21.0	21.0
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)	83.7	83.7	70.6	50.1
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)	-8.2	-8.2	-8.2	-8.2
Boltzman Constant(dBW/K-Hz)	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-77.8	-68.3	-48.8
Uplink C/N(dB)	28.3	26.1	22.4	21.5
DOWNLINK PERFORMANCE				
Downlink EIRP per Carrier (dBW)	30.1	34.3	23.8	3.4
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)	28.4	19.2	21.0	21.0
Boltzman Constant(dBW / K - Hz)	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-77.8	-68.3	-48.8
Downlink C / N(dB)	14.7	7.5	8.3	7.4
COMPOSITE LINK PERFORMANCE				
C/N Uplink (dB)	28.3	26.1	22.4	21.5
C/N Downlink (dB)	14.7	7.5	8.3	7.4
C/I Intermodulation (dB)	N/A	N/A	19.9	19.1
C/I Uplink Co-Channel (dB)*	24.0	24.0	25.5	25.2
C/I Downlink Co-Channel (dB)*	24.0	24.0	25.5	25.2
C/I Uplink Adjacent Satellite 1 (dB)	18.8	16.6	12.9	12.1
C/I Downlink Adjacent Satellite 1 (dB)	23.6	9.7	13.9	13.0
C/I Uplink Adjacent Satellite 2 (dB)	18.8	16.6	12.9	12.1
C/I Downlink Adjacent Satellite 2 (dB)	25.0	18.4	18.6	17.7
C/(N+I) Composite (dB)	11.1	4.5	4.9	4.0
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	10.1	3.5	3.9	3.0
Minimum Required C/N (dB)	-10.0	-3.4	-3.9	-3.0
Excess Link Margin (dB)	.1	.1	0.0	0.0
Number of Carriers	2	1.0	4.9	545.6
CARRIER DENSITY LEVELS				
Uplink Power Density (dBW/Hz)	-42.5	-54.3	-47.2	-48.0
Downlink EIRP Density At Beam Peak (dBW/Hz)	-25.9	-33.5	-34.5	-35.4

EXHIBIT 12: INTELSAT 22 LINK BUDGETS (continued)

UPLINK BEAM INFORMATION				
Uplink Beam Name	EAST-HEMI	EAST-HEMI	EAST-HEMI	EAST-HEMI
Uplink Frequency (GHz)	6.175	6.175	6.175	6.175
Uplink Beam Polarization	CIRCULAR	CIRCULAR	CIRCULAR	CIRCULAR
Uplink Relative Contour Level (dB)	-10.0	-10.0	-10.0	-10.0
Uplink Contour G/T (dB/K)	-6.3	-6.3	-6.3	-6.3
Uplink SFD (dBW/m2)	-76.8	-81.8	-77.8	-77.8
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0
DOWNLINK BEAM INFORMATION				
Downlink Beam Name	EAST_HEMI	EAST_HEMI	EAST_HEMI	EAST_HEMI
Downlink Frequency (GHz)	3.950	3.950	3.950	3.950
Downlink Beam Polarization	CIRCULAR	CIRCULAR	CIRCULAR	CIRCULAR
Downlink Relative Contour Level (dB)	-10.0	-10.0	-10.0	-10.0
Downlink Contour EIRP (dBW)	34.7	34.7	34.7	34.7
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0
ADJACENT SATELLITE 1				
Satellite 1 Orbital Location	70.1E	70.1E	70.1E	70.1E
Uplink Power Density (dBW/Hz)	-38.7	-38.7	-38.7	-38.7
Uplink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
Downlink EIRP Density (dBW/Hz)	-42.0	-42.0	-42.0	-42.0
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
ADJACENT SATELLITE 2				
Satellite 1 Orbital Location	74.1E	74.1E	74.1E	74.1E
Uplink Power Density (dBW/Hz)	-38.7	-38.7	-38.7	-38.7
Uplink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
Downlink EIRP Density (dBW/Hz)	-42.0	-42.0	-42.0	-42.0
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
CARRIER INFORMATION				
Carrier ID	36M0F3F	72M0G7W	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	49150	6000	64
Code Rate	N/A	1/2x188/204	1/2x188/204	1/2x239/256
Occupied Bandwidth(kHz)	36000	60266	6771.1	75.4
Allocated Bandwidth(kHz)	36000	72000	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)	18.3	15.2	6.1	6.1
Earth Station Gain (dBi)	60.2	58.4	49.4	49.4
Earth Station Elevation Angle	20	20	20	20
DOWNLINK EARTH STATION				
Earth Station Diameter (meters)	8.1	3.0	3.5	3.5
Earth Station Gain (dBi)	49.3	39.7	41.1	41.1
Earth Station G/T (dB/K)	28.4	19.2	21.0	21.0
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)	83.1	81.1	69.9	49.5
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)	-6.3	-6.3	-6.3	-6.3
Boltzman Constant(dBW/K-Hz)	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-77.8	-68.3	-48.8
Uplink C/N(dB)	29.6	25.4	23.7	22.8
DOWNLINK PERFORMANCE				
Downlink EIRP per Carrier (dBW)	30.5	34.7	24.2	3.8
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)	28.4	19.2	21.0	21.0
Boltzman Constant(dBW / K - Hz)	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-77.8	-68.3	-48.8
Downlink C / N(dB)	15.1	7.9	8.6	7.7
COMPOSITE LINK PERFORMANCE				
C/N Uplink (dB)	29.6	25.4	23.7	22.8
C/N Downlink (dB)	15.1	7.9	8.6	7.7
C/I Intermodulation (dB)	N/A	N/A	19.9	19.0
C/I Uplink Co-Channel (dB)*	24.0	24.0	25.4	25.1
C/I Downlink Co-Channel (dB)*	24.0	24.0	25.4	25.1
C/I Uplink Adjacent Satellite 1 (dB)	18.2	14.0	12.3	11.4
C/I Downlink Adjacent Satellite 1 (dB)	24.0	10.1	14.2	13.3
C/I Uplink Adjacent Satellite 2 (dB)	18.2	14.0	12.3	11.4
C/I Downlink Adjacent Satellite 2 (dB)	25.4	18.8	19.0	18.1
C/(N+I) Composite (dB)	11.1	4.4	4.9	4.0
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	10.1	3.4	3.9	3.0
Minimum Required C/N (dB)	-10.0	-3.4	-3.9	-3.0
Excess Link Margin (dB)	.1	0.0	0.0	0.0
Number of Carriers	2	1.0	5.0	552.9
CARRIER DENSITY LEVELS				
Uplink Power Density (dBW/Hz)	-43.1	-55.1	-47.8	-48.7
Downlink EIRP Density At Beam Peak (dBW/Hz)	-25.5	-33.1	-34.1	-35.0

EXHIBIT 12: INTELSAT 22 LINK BUDGETS (continued)

UPLINK BEAM INFORMATION						
Uplink Beam Name	ME_AFRICA	ME_AFRICA	ME_AFRICA	ME_AFRICA	ME_AFRICA	ME_AFRICA
Uplink Frequency (GHz)	14.375	14.375	14.375	14.375	14.375	14.375
Uplink Beam Polarization	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR
Uplink Relative Contour Level (dB)	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0
Uplink Contour G/T (dB/K)	.7	.7	.7	.7	.7	.7
Uplink SFD (dBW/m2)	-75.1	-82.1	-79.1	-79.1	-79.1	-79.1
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0	42.0	42.0
DOWNLINK BEAM INFORMATION						
Downlink Beam Name	ME_AFRICA	ME_AFRICA	ME_AFRICA	ME_AFRICA	ME_AFRICA	ME_AFRICA
Downlink Frequency (GHz)	11.575	11.575	11.575	11.575	11.575	11.575
Downlink Beam Polarization	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR
Downlink Relative Contour Level (dB)	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0
Downlink Contour EIRP (dBW)	44.4	44.4	44.4	44.4	44.4	44.4
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0	42.0	42.0
ADJACENT SATELLITE 1						
Satellite 1 Orbital Location	70.5E	70.5E	70.5E	70.5E	70.5E	70.5E
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0	0.0
Downlink EIRP Density (dBW/Hz)	-23.8	-23.8	-23.8	-23.8	-23.8	-23.8
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0	0.0
ADJACENT SATELLITE 2						
Satellite 1 Orbital Location	74.0E	74.0E	74.0E	74.0E	74.0E	74.0E
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0	0.0
Downlink EIRP Density (dBW/Hz)	-18.8	-18.8	-18.8	-18.8	-18.8	-18.8
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0	0.0
CARRIER INFORMATION						
Carrier ID	36M0F3F	72M0G7W	10M3G7W	100KG7W	1M45G7W	400KG7W
Carrier Modulation	TV/FM	QPSK	QPSK	QPSK	BPSK	BPSK
Peak to Peak Bandwidth of EDS (MHz)	4	N/A	N/A	N/A	N/A	N/A
Information Rate(kbps)	N/A	49150	6000	64	512	128
Code Rate	N/A	1/2x188/204	1/2x188/204	1/2x239/256	R1/2	R1/2
Occupied Bandwidth(kHz)	36000	60266	6771.1	75.4	1229.0	307.0
Allocated Bandwidth(kHz)	36000	72000	10300	100	1450.0	400.0
Minimum C/N, Clear Sky (dB)	10.0	3.36	3.87	2.99	3.4	3.4
Minimum C/N, Rain (dB)	10.0	3.36	3.57	2.79	2.7	2.7
UPLINK EARTH STATION						
Earth Station Diameter (meters)	9.0	6.1	6.1	6.1	9.0	3.0
Earth Station Gain (dBi)	60.3	57.0	57.0	57.0	60.3	49.8
Earth Station Elevation Angle	20	20	20	20	20	20
DOWNLINK EARTH STATION						
Earth Station Diameter (meters)	6.1	2.4	3.0	3.0	3.0	6.1
Earth Station Gain (dBi)	55.2	47.2	48.9	48.9	48.9	55.2
Earth Station G/T (dB/K)	32.8	24.7	26.4	26.4	26.4	32.8
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)	84.8	80.8	68.4	48.3	60.3	50.2
Uplink Path Loss, Clear Sky (dB)	-207.6	-207.6	-207.6	-207.6	-207.6	-207.6
Uplink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Satellite G/T(dB/K)	.7	.7	.7	.7	.7	.7
Boltzman Constant(dBW/K-Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-77.8	-68.3	-48.8	-60.9	-54.9
Uplink C/N(dB)	31.0	24.7	21.9	21.2	21.1	17.1
DOWNLINK PERFORMANCE						
Downlink EIRP per Carrier (dBW)	40.2	44.4	33.7	13.5	25.5	15.5
Antenna Pointing Error (dB)	-.5	-.5	-.5	-.5	-.5	-.5
Downlink Path Loss, Clear Sky (dB)	-205.7	-205.7	-205.7	-205.7	-205.7	-205.7
Downlink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Earth Station G/T (dB/K)	32.8	24.7	26.4	26.4	26.4	32.8
Boltzman Constant(dBW / K - Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-77.8	-68.3	-48.8	-60.9	-54.9
Downlink C / N(dB)	19.9	13.7	14.2	13.6	13.5	15.9
COMPOSITE LINK PERFORMANCE						
C/N Uplink (dB)	31.0	24.7	21.9	21.2	21.1	17.1
C/N Downlink (dB)	19.9	13.7	14.2	13.6	13.5	15.9
C/I Intermodulation (dB)	N/A	N/A	19.7	19.1	19.0	15.0
C/I Uplink Co-Channel (dB)*	24.0	24.0	25.3	25.2	25.6	21.2
C/I Downlink Co-Channel (dB)*	24.0	24.0	25.3	25.2	25.6	21.2
C/I Uplink Adjacent Satellite 1 (dB)	27.7	21.4	18.6	17.9	17.8	13.8
C/I Downlink Adjacent Satellite 1 (dB)	19.2	12.5	13.2	12.6	12.5	15.2
C/I Uplink Adjacent Satellite 2 (dB)	29.6	23.4	20.5	19.9	19.8	15.8
C/I Downlink Adjacent Satellite 2 (dB)	16.9	11.3	11.7	11.0	10.9	12.9
C/(N+I) Composite (dB)	12.6	7.1	7.0	6.4	6.3	6.2
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	11.6	6.1	6.0	5.4	5.3	5.2
Minimum Required C/N (dB)	-10.0	-3.4	-3.9	-3.0	-3.4	-3.4
Excess Link Margin (dB)	1.6	2.7	2.1	2.4	1.9	1.8
Number of Carriers	2	1.0	5.2	542.8	34.3	180.0
CARRIER DENSITY LEVELS						
Uplink Power Density (dBW/Hz)	-41.5	-54.0	-56.9	-57.5	-60.9	-54.4
Downlink EIRP Density At Beam Peak (dBW/Hz)	-19.8	-27.4	-28.6	-29.2	-29.4	-33.4

EXHIBIT 12: INTELSAT 22 LINK BUDGETS (continued)

UPLINK BEAM INFORMATION						
Uplink Beam Name	ME_AFRICA	ME_AFRICA	ME_AFRICA	ME_AFRICA	ME_AFRICA	ME_AFRICA
Uplink Frequency (GHz)	14.125	14.125	14.125	14.125	14.125	14.125
Uplink Beam Polarization	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR
Uplink Relative Contour Level (dB)	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0
Uplink Contour G/T (dB/K)	.7	.7	.7	.7	.7	.7
Uplink SFD (dBW/m2)	-80.1	-82.1	-84.1	-84.1	-84.1	-84.1
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0	42.0	42.0
DOWNLINK BEAM INFORMATION						
Downlink Beam Name	ME_AFRICA	ME_AFRICA	ME_AFRICA	ME_AFRICA	ME_AFRICA	ME_AFRICA
Downlink Frequency (GHz)	12.625	12.625	12.625	12.625	12.625	12.625
Downlink Beam Polarization	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR
Downlink Relative Contour Level (dB)	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0
Downlink Contour EIRP (dBW)	44.4	44.4	44.4	44.4	44.4	44.4
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0	42.0	42.0
ADJACENT SATELLITE 1						
Satellite 1 Orbital Location	70.5E	70.5E	70.5E	70.5E	70.5E	70.5E
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0	0.0
Downlink EIRP Density (dBW/Hz)	-28.8	-28.8	-28.8	-28.8	-28.8	-28.8
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0	0.0
ADJACENT SATELLITE 2						
Satellite 1 Orbital Location	74.1E	74.1E	74.1E	74.1E	74.1E	74.1E
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0	0.0
Downlink EIRP Density (dBW/Hz)	-26.0	-26.0	-26.0	-26.0	-26.0	-26.0
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0	0.0
CARRIER INFORMATION						
Carrier ID	36M0F3F	72M0G7W	10M3G7W	100KG7W	1M45G7W	400KG7W
Carrier Modulation	TV/FM	QPSK	QPSK	QPSK	BPSK	BPSK
Peak to Peak Bandwidth of EDS (MHz)	4	N/A	N/A	N/A	N/A	N/A
Information Rate(kbps)	N/A	49150	6000	64	512	128
Code Rate	N/A	1/2x188/204	1/2x188/204	1/2x239/256	R1/2	R1/2
Occupied Bandwidth(kHz)	36000	60266	6771.1	75.4	1229.0	307.0
Allocated Bandwidth(kHz)	36000	72000	10300	100	1450.0	400.0
Minimum C/N, Clear Sky (dB)	10.0	3.36	3.87	2.99	3.4	3.4
Minimum C/N, Rain (dB)	10.0	3.36	3.57	2.79	2.7	2.7
UPLINK EARTH STATION						
Earth Station Diameter (meters)	6.1	6.1	6.1	6.1	6.1	2.4
Earth Station Gain (dBi)	56.8	56.8	56.8	56.8	56.8	48.9
Earth Station Elevation Angle	20	20	20	20	20	20
DOWNLINK EARTH STATION						
Earth Station Diameter (meters)	4.6	1.8	2.4	2.4	2.4	6.1
Earth Station Gain (dBi)	54.0	45.3	48.0	48.0	48.0	56.0
Earth Station G/T (dB/K)	31.5	22.8	25.5	25.5	25.5	33.6
Earth Station Elevation Angle	20	20	20	20	20	20
LINK FADE TYPE	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky
UPLINK PERFORMANCE						
Uplink Earth Station EIRP (dBW)	79.8	80.8	63.6	43.4	55.4	46.8
Uplink Path Loss, Clear Sky (dB)	-207.4	-207.4	-207.4	-207.4	-207.4	-207.4
Uplink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Satellite G/T(dB/K)	.7	.7	.7	.7	.7	.7
Boltzman Constant(dBW/K-Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-77.8	-68.3	-48.8	-60.9	-54.9
Uplink C/N(dB)	26.1	24.9	17.2	16.5	16.4	13.8
DOWNLINK PERFORMANCE						
Downlink EIRP per Carrier (dBW)	40.2	44.4	33.9	13.6	25.7	17.1
Antenna Pointing Error (dB)	-.5	-.5	-.5	-.5	-.5	-.5
Downlink Path Loss, Clear Sky (dB)	-206.4	-206.4	-206.4	-206.4	-206.4	-206.4
Downlink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Earth Station G/T (dB/K)	31.5	22.8	25.5	25.5	25.5	33.6
Boltzman Constant(dBW / K - Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-77.8	-68.3	-48.8	-60.9	-54.9
Downlink C / N(dB)	17.8	11.0	12.7	12.0	11.9	17.4
COMPOSITE LINK PERFORMANCE						
C/N Uplink (dB)	26.1	24.9	17.2	16.5	16.4	13.8
C/N Downlink (dB)	17.8	11.0	12.7	12.0	11.9	17.4
C/I Intermodulation (dB)	N/A	N/A	19.9	19.2	19.1	16.5
C/I Uplink Co-Channel (dB)*	24.0	24.0	25.5	25.3	25.7	22.7
C/I Downlink Co-Channel (dB)*	24.0	24.0	25.5	25.3	25.7	22.7
C/I Uplink Adjacent Satellite 1 (dB)	22.7	21.4	13.7	13.0	12.9	10.3
C/I Downlink Adjacent Satellite 1 (dB)	22.9	15.3	17.3	16.6	16.5	22.5
C/I Uplink Adjacent Satellite 2 (dB)	25.2	24.0	16.3	15.6	15.5	12.9
C/I Downlink Adjacent Satellite 2 (dB)	23.5	17.3	18.8	18.1	17.9	23.0
C/(N+I) Composite (dB)	13.4	8.3	7.3	6.6	6.5	6.1
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	12.4	7.3	6.3	5.6	5.5	5.1
Minimum Required C/N (dB)	-10.0	-3.4	-3.9	-3.0	-3.4	-3.4
Excess Link Margin (dB)	2.4	3.9	2.4	2.6	2.1	1.7
Number of Carriers	2	1.0	5.0	528.5	33.3	180.0
CARRIER DENSITY LEVELS						
Uplink Power Density (dBW/Hz)	-43.0	-53.8	-61.5	-62.2	-62.3	-57.0
Downlink EIRP Density At Beam Peak (dBW/Hz)	-19.8	-27.4	-28.4	-29.1	-29.2	-31.8

EXHIBIT 12: INTELSAT 22 LINK BUDGETS (continued)

UPLINK BEAM INFORMATION						
Uplink Beam Name	MOBILITY	MOBILITY	MOBILITY	MOBILITY	MOBILITY	MOBILITY
Uplink Frequency (GHz)	14.375	14.375	14.375	14.375	14.375	14.375
Uplink Beam Polarization	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR
Uplink Relative Contour Level (dB)	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0
Uplink Contour G/T (dB/K)	-3.3	-3.3	-3.3	-3.3	-3.3	-3.3
Uplink SFD (dBW/m2)	-75.0	-80.0	-77.0	-77.0	-77.0	-77.0
Rain Rate (mm/hr)	95.0	95.0	95.0	95.0	95.0	95.0
DOWNLINK BEAM INFORMATION						
Downlink Beam Name	MOBILITY	MOBILITY	MOBILITY	MOBILITY	MOBILITY	MOBILITY
Downlink Frequency (GHz)	12.375	12.375	12.375	12.375	12.375	12.375
Downlink Beam Polarization	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR
Downlink Relative Contour Level (dB)	-7.0	-7.0	-7.0	-7.0	-7.0	-7.0
Downlink Contour EIRP (dBW)	42.7	42.7	42.7	42.7	42.7	42.7
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0	42.0	42.0
ADJACENT SATELLITE 1						
Satellite 1 Orbital Location	70.1E	70.1E	70.1E	70.1E	70.1E	70.1E
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0	0.0
Downlink EIRP Density (dBW/Hz)	-27.0	-27.0	-27.0	-27.0	-27.0	-27.0
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0	0.0
ADJACENT SATELLITE 2						
Satellite 1 Orbital Location	74.1E	74.1E	74.1E	74.1E	74.1E	74.1E
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0	0.0
Downlink EIRP Density (dBW/Hz)	-27.0	-27.0	-27.0	-27.0	-27.0	-27.0
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0	0.0
CARRIER INFORMATION						
Carrier ID	36M0F3F	72M0G7W	10M3G7W	100KG7W	1M45G7W	400KG7W
Carrier Modulation	TV/FM	QPSK	QPSK	QPSK	BPSK	BPSK
Peak to Peak Bandwidth of EDS (MHz)	4	N/A	N/A	N/A	N/A	N/A
Information Rate(kbps)	N/A	49150	6000	64	512	128
Code Rate	N/A	1/2x188/204	1/2x188/204	1/2x239/256	R1/2	R1/2
Occupied Bandwidth(kHz)	36000	60266	6771.1	75.4	1229.0	307.0
Allocated Bandwidth(kHz)	36000	72000	10300	100	1450.0	400.0
Minimum C/N, Clear Sky (dB)	10.0	3.36	3.87	2.99	3.4	3.4
Minimum C/N, Rain (dB)	10.0	3.36	3.57	2.79	2.7	2.7
UPLINK EARTH STATION						
Earth Station Diameter (meters)	11.0	9.0	6.1	6.1	6.1	3.0
Earth Station Gain (dBi)	61.8	60.3	57.0	57.0	57.0	49.8
Earth Station Elevation Angle	20	20	20	20	20	20
DOWNLINK EARTH STATION						
Earth Station Diameter (meters)	6.1	1.8	3.0	3.0	3.0	6.1
Earth Station Gain (dBi)	55.8	45.1	49.5	49.5	49.5	55.8
Earth Station G/T (dB/K)	33.4	22.6	27.0	27.0	27.0	33.4
Earth Station Elevation Angle	20	20	20	20	20	20
LINK FADE TYPE	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky
UPLINK PERFORMANCE						
Uplink Earth Station EIRP (dBW)	84.9	82.9	70.6	50.5	62.4	53.0
Uplink Path Loss, Clear Sky (dB)	-207.6	-207.6	-207.6	-207.6	-207.6	-207.6
Uplink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Satellite G/T(dB/K)	-3.3	-3.3	-3.3	-3.3	-3.3	-3.3
Boltzman Constant(dBW/K-Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-77.8	-68.3	-48.8	-60.9	-54.9
Uplink C/N(dB)	27.1	22.8	20.0	19.4	19.3	15.9
DOWNLINK PERFORMANCE						
Downlink EIRP per Carrier (dBW)	38.5	42.7	32.1	12.0	23.9	14.5
Antenna Pointing Error (dB)	-.5	-.5	-.5	-.5	-.5	-.5
Downlink Path Loss, Clear Sky (dB)	-206.2	-206.2	-206.2	-206.2	-206.2	-206.2
Downlink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Earth Station G/T (dB/K)	33.4	22.6	27.0	27.0	27.0	33.4
Boltzman Constant(dBW / K - Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-77.8	-68.3	-48.8	-60.9	-54.9
Downlink C / N(dB)	18.2	9.3	12.6	12.0	11.9	14.9
COMPOSITE LINK PERFORMANCE						
C/N Uplink (dB)	27.1	22.8	20.0	19.4	19.3	15.9
C/N Downlink (dB)	18.2	9.3	12.6	12.0	11.9	14.9
C/I Intermodulation (dB)	N/A	N/A	19.8	19.2	19.0	15.6
C/I Uplink Co-Channel (dB)*	24.0	24.0	25.3	25.3	25.7	21.9
C/I Downlink Co-Channel (dB)*	24.0	24.0	25.3	25.3	25.7	21.9
C/I Uplink Adjacent Satellite 1 (dB)	28.3	24.1	21.3	20.7	20.6	17.2
C/I Downlink Adjacent Satellite 1 (dB)	23.9	14.5	18.2	17.6	17.5	20.6
C/I Uplink Adjacent Satellite 2 (dB)	28.3	24.1	21.3	20.7	20.6	17.2
C/I Downlink Adjacent Satellite 2 (dB)	24.5	16.4	19.3	18.7	18.6	21.2
C/(N+I) Composite (dB)	14.5	7.1	9.1	8.5	8.4	8.1
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	13.5	6.1	8.1	7.5	7.4	7.1
Minimum Required C/N (dB)	-10.0	-3.4	-3.9	-3.0	-3.4	-3.4
Excess Link Margin (dB)	3.5	2.7	4.2	4.5	4.0	3.7
Number of Carriers	2	1.0	5.2	528.3	33.5	180.0
CARRIER DENSITY LEVELS						
Uplink Power Density (dBW/Hz)	-42.9	-55.2	-54.7	-55.3	-55.4	-51.6
Downlink EIRP Density At Beam Peak (dBW/Hz)	-20.5	-28.1	-29.2	-29.8	-30.0	-33.4

EXHIBIT 13: ADJACENT SATELLITE (70.1º E.L) LINK BUDGETS

UPLINK BEAM INFORMATION				
Uplink Beam Name	WEST_HEMI	WEST_HEMI	WEST_HEMI	WEST_HEMI
Uplink Frequency (GHz)	6.175	6.175	6.175	6.175
Uplink Beam Polarization	CIRCULAR	CIRCULAR	CIRCULAR	CIRCULAR
Uplink Relative Contour Level (dB)	-10.0	-10.0	-10.0	-10.0
Uplink Contour G/T (dB/K)	-8.2	-8.2	-8.2	-8.2
Uplink SFD (dBW/m2)	-75.2	-81.2	-72.2	-72.2
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0
DOWNLINK BEAM INFORMATION				
Downlink Beam Name	WEST_HEMI	WEST_HEMI	WEST_HEMI	WEST_HEMI
Downlink Frequency (GHz)	3.950	3.950	3.950	3.950
Downlink Beam Polarization	CIRCULAR	CIRCULAR	CIRCULAR	CIRCULAR
Downlink Relative Contour Level (dB)	-10.0	-10.0	-10.0	-10.0
Downlink Contour EIRP (dBW)	34.3	34.3	34.3	34.3
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0
ADJACENT SATELLITE 1				
Satellite 1 Orbital Location	68.65E	68.65E	68.65E	68.65E
Uplink Power Density (dBW/Hz)	-38.7	-38.7	-38.7	-38.7
Uplink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
Downlink EIRP Density (dBW/Hz)	-31.8	-31.8	-31.8	-31.8
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
ADJACENT SATELLITE 2				
Satellite 1 Orbital Location	72.1E	72.1E	72.1E	72.1E
Uplink Power Density (dBW/Hz)	-38.7	-38.7	-38.7	-38.7
Uplink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
Downlink EIRP Density (dBW/Hz)	-42.0	-42.0	-42.0	-42.0
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
CARRIER INFORMATION				
Carrier ID	36M0F3F	72M0G7W	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	49150	6000	64
Code Rate	N/A	1/2x188/204	1/2x188/204	1/2x239/256
Occupied Bandwidth(kHz)	36000	60266	6771.1	75.4
Allocated Bandwidth(kHz)	36000	72000	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)	18.3	15.2	6.1	6.1
Earth Station Gain (dBi)	60.2	58.4	49.4	49.4
Earth Station Elevation Angle	20	20	20	20
DOWNLINK EARTH STATION				
Earth Station Diameter (meters)	15.2	4.5	4.5	4.5
Earth Station Gain (dBi)	55.0	43.9	43.9	43.9
Earth Station G/T (dB/K)	34.5	23.6	23.6	23.6
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)	84.7	81.7	75.7	55.3
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)	-8.2	-8.2	-8.2	-8.2
Boltzman Constant(dBW/K-Hz)	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-77.8	-68.3	-48.8
Uplink C/N(dB)	29.3	24.1	27.6	26.7
DOWNLINK PERFORMANCE				
Downlink EIRP per Carrier (dBW)	30.1	34.3	24.0	3.6
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)	34.5	23.6	23.6	23.6
Boltzman Constant(dBW / K - Hz)	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-77.8	-68.3	-48.8
Downlink C / N(dB)	20.8	11.9	11.1	10.2
COMPOSITE LINK PERFORMANCE				
C/N Uplink (dB)	29.3	24.1	27.6	26.7
C/N Downlink (dB)	20.8	11.9	11.1	10.2
C/I Intermodulation (dB)	N/A	N/A	20.1	19.2
C/I Uplink Co-Channel (dB)*	24.0	24.0	25.7	25.4
C/I Downlink Co-Channel (dB)*	24.0	24.0	25.7	25.4
C/I Uplink Adjacent Satellite 1 (dB)	16.1	10.9	14.4	13.5
C/I Downlink Adjacent Satellite 1 (dB)	16.6	8.6	7.8	6.9
C/I Uplink Adjacent Satellite 2 (dB)	19.8	14.6	18.1	17.2
C/I Downlink Adjacent Satellite 2 (dB)	29.7	19.6	18.8	17.9
C/(N+I) Composite (dB)	11.2	4.7	4.9	4.0
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	10.2	3.7	3.9	3.0
Minimum Required C/N (dB)	-10.0	-3.4	-3.9	-3.0
Excess Link Margin (dB)	.2	.3	0.0	0.0
Number of Carriers	2	1.0	4.8	524.1
CARRIER DENSITY LEVELS				
Uplink Power Density (dBW/Hz)	-41.5	-54.5	-42.0	-42.9
Downlink EIRP Density At Beam Peak (dBW/Hz)	-25.9	-33.5	-34.3	-35.2

EXHIBIT 13: ADJACENT SATELLITE (70.1º E.L) LINK BUDGETS (continued)

UPLINK BEAM INFORMATION				
Uplink Beam Name	EAST_HEMI	EAST_HEMI	EAST_HEMI	EAST_HEMI
Uplink Frequency (GHz)	6.175	6.175	6.175	6.175
Uplink Beam Polarization	CIRCULAR	CIRCULAR	CIRCULAR	CIRCULAR
Uplink Relative Contour Level (dB)	-10.0	-10.0	-10.0	-10.0
Uplink Contour G/T (dB/K)	-6.3	-6.3	-6.3	-6.3
Uplink SFD (dBW/m2)	-75.8	-78.8	-76.8	-76.8
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0
DOWNLINK BEAM INFORMATION				
Downlink Beam Name	EAST_HEMI	EAST_HEMI	EAST_HEMI	EAST_HEMI
Downlink Frequency (GHz)	3.950	3.950	3.950	3.950
Downlink Beam Polarization	CIRCULAR	CIRCULAR	CIRCULAR	CIRCULAR
Downlink Relative Contour Level (dB)	-10.0	-10.0	-10.0	-10.0
Downlink Contour EIRP (dBW)	34.7	34.7	34.7	34.7
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0
ADJACENT SATELLITE 1				
Satellite 1 Orbital Location	68.5E	68.5E	68.5E	68.5E
Uplink Power Density (dBW/Hz)	-38.7	-38.7	-38.7	-38.7
Uplink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
Downlink EIRP Density (dBW/Hz)	-31.8	-31.8	-31.8	-31.8
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
ADJACENT SATELLITE 2				
Satellite 1 Orbital Location	72.1E	72.1E	72.1E	72.1E
Uplink Power Density (dBW/Hz)	-38.7	-38.7	-38.7	-38.7
Uplink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
Downlink EIRP Density (dBW/Hz)	-42.0	-42.0	-42.0	-42.0
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
CARRIER INFORMATION				
Carrier ID	36M0F3F	72M0G7W	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	49150	6000	64
Code Rate	N/A	1/2x188/204	1/2x188/204	1/2x239/256
Occupied Bandwidth(kHz)	36000	60266	6771.1	75.4
Allocated Bandwidth(kHz)	36000	60266	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)	18.3	18.3	6.1	6.1
Earth Station Gain (dBi)	60.2	60.2	49.4	49.4
Earth Station Elevation Angle	20	20	20	20
DOWNLINK EARTH STATION				
Earth Station Diameter (meters)	15.2	4.6	6.1	6.1
Earth Station Gain (dBi)	55.0	43.9	46.5	46.5
Earth Station G/T (dB/K)	34.5	23.6	26.2	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)	84.1	84.1	70.9	50.5
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)	-6.3	-6.3	-6.3	-6.3
Boltzman Constant(dBW/K-Hz)	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-77.8	-68.3	-48.8
Uplink C/N(dB)	30.6	28.4	24.7	23.8
DOWNLINK PERFORMANCE				
Downlink EIRP per Carrier (dBW)	30.5	34.7	24.2	3.8
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)	34.5	23.6	26.2	26.2
Boltzman Constant(dBW / K - Hz)	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-77.8	-68.3	-48.8
Downlink C / N(dB)	21.2	12.3	13.9	13.0
COMPOSITE LINK PERFORMANCE				
C/N Uplink (dB)	30.6	28.4	24.7	23.8
C/N Downlink (dB)	21.2	12.3	13.9	13.0
C/I Intermodulation (dB)	N/A	N/A	19.9	19.0
C/I Uplink Co-Channel (dB)*	24.0	24.8	25.5	25.2
C/I Downlink Co-Channel (dB)*	24.0	24.8	25.5	25.2
C/I Uplink Adjacent Satellite 1 (dB)	16.7	14.4	10.7	9.8
C/I Downlink Adjacent Satellite 1 (dB)	17.2	6.7	8.9	8.0
C/I Uplink Adjacent Satellite 2 (dB)	19.2	17.0	13.3	12.4
C/I Downlink Adjacent Satellite 2 (dB)	30.8	22.4	23.8	22.9
C/(N+I) Composite (dB)	11.6	4.7	4.9	4.0
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	10.6	3.7	3.9	3.0
Minimum Required C/N (dB)	-10.0	-3.4	-3.9	-3.0
Excess Link Margin (dB)	.6	.3	0.0	0.0
Number of Carriers	2	1.0	5.0	551.7
CARRIER DENSITY LEVELS				
Uplink Power Density (dBW/Hz)	-42.1	-53.9	-46.8	-47.7
Downlink EIRP Density At Beam Peak (dBW/Hz)	-25.5	-33.1	-34.0	-34.9

EXHIBIT 13: ADJACENT SATELLITE (70.1º E.L) LINK BUDGETS (continued)

UPLINK BEAM INFORMATION						
Uplink Beam Name	WIDEBEAM	WIDEBEAM	WIDEBEAM	WIDEBEAM	WIDEBEAM	WIDEBEAM
Uplink Frequency (GHz)	14.125	14.125	14.125	14.125	14.125	14.125
Uplink Beam Polarization	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR
Uplink Relative Contour Level (dB)	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0
Uplink Contour G/T (dB/K)	0.0	0.0	0.0	0.0	0.0	0.0
Uplink SFD (dBW/m2)	-80.0	-82.0	-83.0	-83.0	-83.0	-83.0
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0	42.0	42.0
DOWNLINK BEAM INFORMATION						
Downlink Beam Name	WIDEBEAM	WIDEBEAM	WIDEBEAM	WIDEBEAM	WIDEBEAM	WIDEBEAM
Downlink Frequency (GHz)	11.575	11.575	11.575	11.575	11.575	11.575
Downlink Beam Polarization	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR
Downlink Relative Contour Level (dB)	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0
Downlink Contour EIRP (dBW)	44.0	44.0	44.0	44.0	44.0	44.0
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0	42.0	42.0
ADJACENT SATELLITE 1						
Satellite 1 Orbital Location	68.5E	68.5E	68.5E	68.5E	68.5E	68.5E
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0	0.0
Downlink EIRP Density (dBW/Hz)	-25.5	-25.5	-25.5	-25.5	-25.5	-25.5
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0	0.0
ADJACENT SATELLITE 2						
Satellite 1 Orbital Location	72.1E	72.1E	72.1E	72.1E	72.1E	72.1E
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0	0.0
Downlink EIRP Density (dBW/Hz)	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0	0.0
CARRIER INFORMATION						
Carrier ID	36M0F3F	72M0G7W	10M3G7W	100KG7W	1M45G7W	400KG7W
Carrier Modulation	TV/FM	QPSK	QPSK	QPSK	BPSK	BPSK
Peak to Peak Bandwidth of EDS (MHz)	4	N/A	N/A	N/A	N/A	N/A
Information Rate(kbps)	N/A	49150	6000	64	512	128
Code Rate	N/A	1/2x188/204	1/2x188/204	1/2x239/256	R1/2	R1/2
Occupied Bandwidth(kHz)	36000	60266	6771.1	75.4	1229.0	307.0
Allocated Bandwidth(kHz)	36000	72000	10300	100	1450.0	400.0
Minimum C/N, Clear Sky (dB)	10.0	3.36	3.87	2.99	3.4	3.4
Minimum C/N, Rain (dB)	10.0	3.36	3.57	2.79	2.7	2.7
UPLINK EARTH STATION						
Earth Station Diameter (meters)	6.1	6.1	6.1	6.1	6.1	3.0
Earth Station Gain (dBi)	56.8	56.8	56.8	56.8	56.8	49.6
Earth Station Elevation Angle	20	20	20	20	20	20
DOWNLINK EARTH STATION						
Earth Station Diameter (meters)	6.1	2.4	3.0	3.0	3.0	6.1
Earth Station Gain (dBi)	55.2	47.2	48.9	48.9	48.9	55.2
Earth Station G/T (dB/K)	32.8	24.7	26.4	26.4	26.4	32.8
Earth Station Elevation Angle	20	20	20	20	20	20
LINK FADE TYPE	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky
UPLINK PERFORMANCE						
Uplink Earth Station EIRP (dBW)	79.9	80.9	64.7	44.5	56.5	47.4
Uplink Path Loss, Clear Sky (dB)	-207.4	-207.4	-207.4	-207.4	-207.4	-207.4
Uplink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Satellite G/T(dB/K)	0.0	0.0	0.0	0.0	0.0	0.0
Boltzman Constant(dBW/K-Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-77.8	-68.3	-48.8	-60.9	-54.9
Uplink C/N(dB)	25.5	24.3	17.6	16.9	16.8	13.7
DOWNLINK PERFORMANCE						
Downlink EIRP per Carrier (dBW)	39.8	44.0	33.4	13.3	25.3	16.1
Antenna Pointing Error (dB)	-.5	-.5	-.5	-.5	-.5	-.5
Downlink Path Loss, Clear Sky (dB)	-205.7	-205.7	-205.7	-205.7	-205.7	-205.7
Downlink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Earth Station G/T (dB/K)	32.8	24.7	26.4	26.4	26.4	32.8
Boltzman Constant(dBW / K - Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-77.8	-68.3	-48.8	-60.9	-54.9
Downlink C / N(dB)	19.5	13.3	14.0	13.3	13.2	16.5
COMPOSITE LINK PERFORMANCE						
C/N Uplink (dB)	25.5	24.3	17.6	16.9	16.8	13.7
C/N Downlink (dB)	19.5	13.3	14.0	13.3	13.2	16.5
C/I Intermodulation (dB)	N/A	N/A	19.9	19.2	19.1	16.0
C/I Uplink Co-Channel (dB)*	25.0	25.0	26.4	26.3	26.7	23.2
C/I Downlink Co-Channel (dB)*	25.0	25.0	26.4	26.3	26.7	23.2
C/I Uplink Adjacent Satellite 1 (dB)	23.8	22.5	15.8	15.1	15.0	11.9
C/I Downlink Adjacent Satellite 1 (dB)	21.3	15.8	16.3	15.6	15.5	18.3
C/I Uplink Adjacent Satellite 2 (dB)	26.3	25.1	18.4	17.7	17.6	14.5
C/I Downlink Adjacent Satellite 2 (dB)	17.6	11.1	11.9	11.3	11.1	14.7
C/(N+I) Composite (dB)	12.9	7.7	7.0	6.3	6.2	6.1
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	11.9	6.7	6.0	5.3	5.2	5.1
Minimum Required C/N (dB)	-10.0	-3.4	-3.9	-3.0	-3.4	-3.4
Excess Link Margin (dB)	1.9	3.4	2.1	2.3	1.8	1.7
Number of Carriers	2	1.0	5.1	528.4	33.3	180.0
CARRIER DENSITY LEVELS						
Uplink Power Density (dBW/Hz)	-42.9	-53.7	-60.5	-61.1	-61.2	-57.1
Downlink EIRP Density At Beam Peak (dBW/Hz)	-21.2	-28.8	-29.9	-30.5	-30.6	-33.7

EXHIBIT 13: ADJACENT SATELLITE (70.1º E.L) LINK BUDGETS (continued)

UPLINK BEAM INFORMATION						
Uplink Beam Name	WIDEBEAM	WIDEBEAM	WIDEBEAM	WIDEBEAM	WIDEBEAM	WIDEBEAM
Uplink Frequency (GHz)	14.125	14.125	14.125	14.125	14.125	14.125
Uplink Beam Polarization	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR
Uplink Relative Contour Level (dB)	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0
Uplink Contour G/T (dB/K)	0.0	.0	0.0	0.0	0.0	0.0
Uplink SFD (dBW/m2)	-79.0	-83.0	-83.0	-83.0	-83.0	-83.0
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0	42.0	42.0
DOWNLINK BEAM INFORMATION						
Downlink Beam Name	WIDEBEAM	WIDEBEAM	WIDEBEAM	WIDEBEAM	WIDEBEAM	WIDEBEAM
Downlink Frequency (GHz)	12.625	12.625	12.625	12.625	12.625	12.625
Downlink Beam Polarization	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR
Downlink Relative Contour Level (dB)	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0
Downlink Contour EIRP (dBW)	44.0	44.0	44.0	44.0	44.0	44.0
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0	42.0	42.0
ADJACENT SATELLITE 1						
Satellite 1 Orbital Location	68.5E	68.5E	68.5E	68.5E	68.5E	68.5E
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0	0.0
Downlink EIRP Density (dBW/Hz)	-23.8	-23.8	-23.8	-23.8	-23.8	-23.8
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0	0.0
ADJACENT SATELLITE 2						
Satellite 1 Orbital Location	72.1E	72.1E	72.1E	72.1E	72.1E	72.1E
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0	0.0
Downlink EIRP Density (dBW/Hz)	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0	0.0
CARRIER INFORMATION						
Carrier ID	36M0F3F	72M0G7W	10M3G7W	100KG7W	1M45G7W	400KG7W
Carrier Modulation	TV/FM	QPSK	QPSK	QPSK	BPSK	BPSK
Peak to Peak Bandwidth of EDS (MHz)	4	N/A	N/A	N/A	N/A	N/A
Information Rate(kbps)	N/A	49150	6000	64	512	128
Code Rate	N/A	1/2x188/204	1/2x188/204	1/2x239/256	R1/2	R1/2
Occupied Bandwidth(kHz)	36000	60266	6771.1	75.4	1229.0	307.0
Allocated Bandwidth(kHz)	36000	72000	10300	100	1450.0	400.0
Minimum C/N, Clear Sky (dB)	10.0	3.36	3.87	2.99	3.4	3.4
Minimum C/N, Rain (dB)	10.0	3.36	3.57	2.79	2.7	2.7
UPLINK EARTH STATION						
Earth Station Diameter (meters)	6.1	6.1	6.1	6.1	6.1	3.0
Earth Station Gain (dBi)	56.8	56.8	56.8	56.8	56.8	49.6
Earth Station Elevation Angle	20	20	20	20	20	20
DOWNLINK EARTH STATION						
Earth Station Diameter (meters)	6.1	2.4	3.0	3.0	3.0	6.1
Earth Station Gain (dBi)	56.0	48.0	49.7	49.7	49.7	56.0
Earth Station G/T (dB/K)	33.6	25.5	27.2	27.2	27.2	33.6
Earth Station Elevation Angle	20	20	20	20	20	20
LINK FADE TYPE	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky
UPLINK PERFORMANCE						
Uplink Earth Station EIRP (dBW)	80.9	79.9	64.7	44.5	56.5	47.4
Uplink Path Loss, Clear Sky (dB)	-207.4	-207.4	-207.4	-207.4	-207.4	-207.4
Uplink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Satellite G/T(dB/K)	0.0	.0	0.0	0.0	0.0	0.0
Boltzman Constant(dBW/K-Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-77.8	-68.3	-48.8	-60.9	-54.9
Uplink C/N(dB)	26.5	23.3	17.6	16.9	16.8	13.7
DOWNLINK PERFORMANCE						
Downlink EIRP per Carrier (dBW)	39.8	44.0	33.5	13.3	25.3	16.2
Antenna Pointing Error (dB)	-.5	-.5	-.5	-.5	-.5	-.5
Downlink Path Loss, Clear Sky (dB)	-206.4	-206.4	-206.4	-206.4	-206.4	-206.4
Downlink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Earth Station G/T (dB/K)	33.6	25.5	27.2	27.2	27.2	33.6
Boltzman Constant(dBW / K - Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-77.8	-68.3	-48.8	-60.9	-54.9
Downlink C / N(dB)	19.5	13.3	14.0	13.3	13.2	16.6
COMPOSITE LINK PERFORMANCE						
C/N Uplink (dB)	26.5	23.3	17.6	16.9	16.8	13.7
C/N Downlink (dB)	19.5	13.3	14.0	13.3	13.2	16.6
C/I Intermodulation (dB)	N/A	N/A	19.9	19.2	19.1	16.0
C/I Uplink Co-Channel (dB)*	25.0	25.0	26.4	26.4	26.8	23.2
C/I Downlink Co-Channel (dB)*	25.0	25.0	26.4	26.4	26.8	23.2
C/I Uplink Adjacent Satellite 1 (dB)	24.8	21.5	15.8	15.1	15.0	12.0
C/I Downlink Adjacent Satellite 1 (dB)	20.3	14.8	15.3	14.6	14.5	17.4
C/I Uplink Adjacent Satellite 2 (dB)	27.3	24.1	18.4	17.7	17.6	14.5
C/I Downlink Adjacent Satellite 2 (dB)	18.4	11.9	12.8	12.1	12.0	15.5
C/(N+I) Composite (dB)	13.1	7.8	7.1	6.4	6.3	6.1
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	12.1	6.8	6.1	5.4	5.3	5.1
Minimum Required C/N (dB)	-10.0	-3.4	-3.9	-3.0	-3.4	-3.4
Excess Link Margin (dB)	2.1	3.4	2.2	2.4	1.9	1.7
Number of Carriers	2	1.0	5.0	526.7	33.2	180.0
CARRIER DENSITY LEVELS						
Uplink Power Density (dBW/Hz)	-41.9	-54.7	-60.4	-61.1	-61.2	-57.1
Downlink EIRP Density At Beam Peak (dBW/Hz)	-21.2	-28.8	-29.8	-30.5	-30.6	-33.7

EXHIBIT 13: ADJACENT SATELLITE (70.1º E.L) LINK BUDGETS (continued)

UPLINK BEAM INFORMATION						
Uplink Beam Name	MOBILITY	MOBILITY	MOBILITY	MOBILITY	MOBILITY	MOBILITY
Uplink Frequency (GHz)	14.375	14.375	14.375	14.375	14.375	14.375
Uplink Beam Polarization	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR
Uplink Relative Contour Level (dB)	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0
Uplink Contour G/T (dB/K)	-3.3	-3.3	-3.3	-3.3	-3.3	-3.3
Uplink SFD (dBW/m2)	-75.0	-82.0	-75.0	-75.0	-78.0	-75.0
Rain Rate (mm/hr)	95.0	95.0	95.0	95.0	95.0	95.0
DOWNLINK BEAM INFORMATION						
Downlink Beam Name	MOBILITY	MOBILITY	MOBILITY	MOBILITY	MOBILITY	MOBILITY
Downlink Frequency (GHz)	12.375	12.375	12.375	12.375	12.375	12.375
Downlink Beam Polarization	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR
Downlink Relative Contour Level (dB)	-7.0	-7.0	-7.0	-7.0	-7.0	-7.0
Downlink Contour EIRP (dBW)	42.7	42.7	42.7	42.7	42.7	42.7
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0	42.0	42.0
ADJACENT SATELLITE 1						
Satellite 1 Orbital Location	68.5E	68.5E	68.5E	68.5E	68.5E	68.5E
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0	0.0
Downlink EIRP Density (dBW/Hz)	-23.8	-23.8	-23.8	-23.8	-23.8	-23.8
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0	0.0
ADJACENT SATELLITE 2						
Satellite 1 Orbital Location	72.1E	72.1E	72.1E	72.1E	72.1E	72.1E
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0	0.0
Downlink EIRP Density (dBW/Hz)	-27.0	-27.0	-27.0	-27.0	-27.0	-27.0
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0	0.0
CARRIER INFORMATION						
Carrier ID	36M0F3F	72M0G7W	10M3G7W	100KG7W	1M45G7W	400KG7W
Carrier Modulation	TV/FM	QPSK	QPSK	QPSK	BPSK	BPSK
Peak to Peak Bandwidth of EDS (MHz)	4	N/A	N/A	N/A	N/A	N/A
Information Rate(kbps)	N/A	49150	6000	64	512	128
Code Rate	N/A	1/2x188/204	1/2x188/204	1/2x239/256	R1/2	R1/2
Occupied Bandwidth(kHz)	36000	60266	6771.1	75.4	1229.0	307.0
Allocated Bandwidth(kHz)	36000	72000	10300	100	1450.0	400.0
Minimum C/N, Clear Sky (dB)	10.0	3.36	3.87	2.99	3.4	3.4
Minimum C/N, Rain (dB)	10.0	3.36	3.57	2.79	2.7	2.7
UPLINK EARTH STATION						
Earth Station Diameter (meters)	9.0	6.1	6.1	6.1	6.1	3.7
Earth Station Gain (dBi)	60.3	57.0	57.0	57.0	57.0	52.8
Earth Station Elevation Angle	20	20	20	20	20	20
DOWNLINK EARTH STATION						
Earth Station Diameter (meters)	7.0	2.4	3.7	3.7	3.7	6.1
Earth Station Gain (dBi)	57.3	47.8	51.4	51.4	51.4	55.8
Earth Station G/T (dB/K)	34.9	25.3	28.9	28.9	28.9	33.4
Earth Station Elevation Angle	20	20	20	20	20	20
LINK FADE TYPE	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky
UPLINK PERFORMANCE						
Uplink Earth Station EIRP (dBW)	84.9	80.9	71.9	51.8	61.4	55.2
Uplink Path Loss, Clear Sky (dB)	-207.6	-207.6	-207.6	-207.6	-207.6	-207.6
Uplink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Satellite G/T(dB/K)	-3.3	-3.3	-3.3	-3.3	-3.3	-3.3
Boltzman Constant(dBW/K-Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-77.8	-68.3	-48.8	-60.9	-54.9
Uplink C/N(dB)	27.1	20.8	21.4	20.8	18.3	18.1
DOWNLINK PERFORMANCE						
Downlink EIRP per Carrier (dBW)	38.5	42.7	31.4	11.3	23.9	14.7
Antenna Pointing Error (dB)	-.5	-.5	-.5	-.5	-.5	-.5
Downlink Path Loss, Clear Sky (dB)	-206.2	-206.2	-206.2	-206.2	-206.2	-206.2
Downlink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Earth Station G/T (dB/K)	34.9	25.3	28.9	28.9	28.9	33.4
Boltzman Constant(dBW / K - Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-77.8	-68.3	-48.8	-60.9	-54.9
Downlink C / N(dB)	19.7	12.0	13.8	13.3	13.8	15.1
COMPOSITE LINK PERFORMANCE						
C/N Uplink (dB)	27.1	20.8	21.4	20.8	18.3	18.1
C/N Downlink (dB)	19.7	12.0	13.8	13.3	13.8	15.1
C/I Intermodulation (dB)	N/A	N/A	19.1	18.5	19.0	15.8
C/I Uplink Co-Channel (dB)*	24.0	24.0	24.7	24.7	25.7	22.0
C/I Downlink Co-Channel (dB)*	24.0	24.0	24.7	24.7	25.7	22.0
C/I Uplink Adjacent Satellite 1 (dB)	25.8	19.5	20.1	19.5	17.0	16.8
C/I Downlink Adjacent Satellite 1 (dB)	20.3	13.3	14.8	14.2	14.7	15.7
C/I Uplink Adjacent Satellite 2 (dB)	28.3	22.1	22.6	22.0	19.5	19.3
C/I Downlink Adjacent Satellite 2 (dB)	25.5	17.4	19.5	19.0	19.5	20.8
C/(N+I) Composite (dB)	14.3	7.9	9.0	8.4	8.2	8.1
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	13.3	6.9	8.0	7.4	7.2	7.1
Minimum Required C/N (dB)	-10.0	-3.4	-3.9	-3.0	-3.4	-3.4
Excess Link Margin (dB)	3.3	3.6	4.1	4.4	3.8	3.7
Number of Carriers	2	1.0	6.0	614.7	33.6	180.0
CARRIER DENSITY LEVELS						
Uplink Power Density (dBW/Hz)	-41.4	-53.9	-53.3	-53.9	-56.4	-52.5
Downlink EIRP Density At Beam Peak (dBW/Hz)	-20.5	-28.1	-29.9	-30.5	-30.0	-33.2

EXHIBIT 14: ADJACENT SATELLITE (74.0/74.1º E.L) LINK BUDGETS

UPLINK BEAM INFORMATION				
Uplink Beam Name	WEST-HEMI	WEST-HEMI	WEST-HEMI	WEST-HEMI
Uplink Frequency (GHz)	6.175	6.175	6.175	6.175
Uplink Beam Polarization	CIRCULAR	CIRCULAR	CIRCULAR	CIRCULAR
Uplink Relative Contour Level (dB)	-10.0	-10.0	-10.0	-10.0
Uplink Contour G/T (dB/K)	-8.2	-8.2	-8.2	-8.2
Uplink SFD (dBW/m2)	-76.2	-79.2	-77.2	-77.2
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0
DOWNLINK BEAM INFORMATION				
Downlink Beam Name	WEST_HEMI	WEST_HEMI	WEST_HEMI	WEST_HEMI
Downlink Frequency (GHz)	3.950	3.950	3.950	3.950
Downlink Beam Polarization	CIRCULAR	CIRCULAR	CIRCULAR	CIRCULAR
Downlink Relative Contour Level (dB)	-10.0	-10.0	-10.0	-10.0
Downlink Contour EIRP (dBW)	34.3	34.3	34.3	34.3
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0
ADJACENT SATELLITE 1				
Satellite 1 Orbital Location	72.1E	72.1E	72.1E	72.1E
Uplink Power Density (dBW/Hz)	-38.7	-38.7	-38.7	-38.7
Uplink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
Downlink EIRP Density (dBW/Hz)	-42.0	-42.0	-42.0	-42.0
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
ADJACENT SATELLITE 2				
Satellite 1 Orbital Location	76.1E	76.1E	76.1E	76.1E
Uplink Power Density (dBW/Hz)	-38.7	-38.7	-38.7	-38.7
Uplink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
Downlink EIRP Density (dBW/Hz)	-42.0	-42.0	-42.0	-42.0
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
CARRIER INFORMATION				
Carrier ID	36M0F3F	72M0G7W	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	49150	6000	64
Code Rate	N/A	1/2x188/204	1/2x188/204	1/2x239/256
Occupied Bandwidth(kHz)	36000	60266	6771.1	75.4
Allocated Bandwidth(kHz)	36000	72000	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)	18.3	18.3	6.1	6.1
Earth Station Gain (dBi)	60.2	60.2	49.4	49.4
Earth Station Elevation Angle	20	20	20	20
DOWNLINK EARTH STATION				
Earth Station Diameter (meters)	8.1	3.0	3.5	3.5
Earth Station Gain (dBi)	49.3	39.7	41.1	41.1
Earth Station G/T (dB/K)	28.4	19.2	21.0	21.0
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)	83.7	83.7	70.6	50.1
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)	-8.2	-8.2	-8.2	-8.2
Boltzman Constant(dBW/K-Hz)	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-77.8	-68.3	-48.8
Uplink C/N(dB)	28.3	26.1	22.4	21.5
DOWNLINK PERFORMANCE				
Downlink EIRP per Carrier (dBW)	30.1	34.3	23.8	3.4
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)	28.4	19.2	21.0	21.0
Boltzman Constant(dBW / K - Hz)	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-77.8	-68.3	-48.8
Downlink C / N(dB)	14.7	7.5	8.3	7.4
COMPOSITE LINK PERFORMANCE				
C/N Uplink (dB)	28.3	26.1	22.4	21.5
C/N Downlink (dB)	14.7	7.5	8.3	7.4
C/I Intermodulation (dB)	N/A	N/A	19.9	19.1
C/I Uplink Co-Channel (dB)*	24.0	24.0	25.5	25.2
C/I Downlink Co-Channel (dB)*	24.0	24.0	25.5	25.2
C/I Uplink Adjacent Satellite 1 (dB)	18.8	16.6	12.9	12.1
C/I Downlink Adjacent Satellite 1 (dB)	23.6	9.7	13.9	13.0
C/I Uplink Adjacent Satellite 2 (dB)	18.8	16.6	12.9	12.1
C/I Downlink Adjacent Satellite 2 (dB)	25.0	18.4	18.6	17.7
C/(N+I) Composite (dB)	11.1	4.5	4.9	4.0
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	10.1	3.5	3.9	3.0
Minimum Required C/N (dB)	-10.0	-3.4	-3.9	-3.0
Excess Link Margin (dB)	.1	.1	0.0	0.0
Number of Carriers	2	1.0	4.9	545.6
CARRIER DENSITY LEVELS				
Uplink Power Density (dBW/Hz)	-42.5	-54.3	-47.2	-48.0
Downlink EIRP Density At Beam Peak (dBW/Hz)	-25.9	-33.5	-34.5	-35.4

EXHIBIT 14: ADJACENT SATELLITE (74.0/74.1º E.L) LINK BUDGETS (continued)

UPLINK BEAM INFORMATION				
Uplink Beam Name	EAST-HEMI	EAST-HEMI	EAST-HEMI	EAST-HEMI
Uplink Frequency (GHz)	6.175	6.175	6.175	6.175
Uplink Beam Polarization	CIRCULAR	CIRCULAR	CIRCULAR	CIRCULAR
Uplink Relative Contour Level (dB)	-10.0	-10.0	-10.0	-10.0
Uplink Contour G/T (dB/K)	-6.3	-6.3	-6.3	-6.3
Uplink SFD (dBW/m2)	-76.8	-81.8	-77.8	-77.8
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0
DOWNLINK BEAM INFORMATION				
Downlink Beam Name	EAST_HEMI	EAST_HEMI	EAST_HEMI	EAST_HEMI
Downlink Frequency (GHz)	3.950	3.950	3.950	3.950
Downlink Beam Polarization	CIRCULAR	CIRCULAR	CIRCULAR	CIRCULAR
Downlink Relative Contour Level (dB)	-10.0	-10.0	-10.0	-10.0
Downlink Contour EIRP (dBW)	34.7	34.7	34.7	34.7
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0
ADJACENT SATELLITE 1				
Satellite 1 Orbital Location	72.1E	72.1E	72.1E	72.1E
Uplink Power Density (dBW/Hz)	-38.7	-38.7	-38.7	-38.7
Uplink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
Downlink EIRP Density (dBW/Hz)	-42.0	-42.0	-42.0	-42.0
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
ADJACENT SATELLITE 2				
Satellite 1 Orbital Location	76.1E	76.1E	76.1E	76.1E
Uplink Power Density (dBW/Hz)	-38.7	-38.7	-38.7	-38.7
Uplink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
Downlink EIRP Density (dBW/Hz)	-42.0	-42.0	-42.0	-42.0
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
CARRIER INFORMATION				
Carrier ID	36M0F3F	72M0G7W	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	49150	6000	64
Code Rate	N/A	1/2x188/204	1/2x188/204	1/2x239/256
Occupied Bandwidth(kHz)	36000	60266	6771.1	75.4
Allocated Bandwidth(kHz)	36000	72000	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)	18.3	15.2	6.1	6.1
Earth Station Gain (dBi)	60.2	58.4	49.4	49.4
Earth Station Elevation Angle	20	20	20	20
DOWNLINK EARTH STATION				
Earth Station Diameter (meters)	8.1	3.0	3.5	3.5
Earth Station Gain (dBi)	49.3	39.7	41.1	41.1
Earth Station G/T (dB/K)	28.4	19.2	21.0	21.0
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)	83.1	81.1	69.9	49.5
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)	-6.3	-6.3	-6.3	-6.3
Boltzman Constant(dBW/K-Hz)	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-77.8	-68.3	-48.8
Uplink C/N(dB)	29.6	25.4	23.7	22.8
DOWNLINK PERFORMANCE				
Downlink EIRP per Carrier (dBW)	30.5	34.7	24.2	3.8
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)	28.4	19.2	21.0	21.0
Boltzman Constant(dBW / K - Hz)	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-77.8	-68.3	-48.8
Downlink C / N(dB)	15.1	7.9	8.6	7.7
COMPOSITE LINK PERFORMANCE				
C/N Uplink (dB)	29.6	25.4	23.7	22.8
C/N Downlink (dB)	15.1	7.9	8.6	7.7
C/I Intermodulation (dB)	N/A	N/A	19.9	19.0
C/I Uplink Co-Channel (dB)*	24.0	24.0	25.4	25.1
C/I Downlink Co-Channel (dB)*	24.0	24.0	25.4	25.1
C/I Uplink Adjacent Satellite 1 (dB)	18.2	14.0	12.3	11.4
C/I Downlink Adjacent Satellite 1 (dB)	24.0	10.1	14.2	13.3
C/I Uplink Adjacent Satellite 2 (dB)	18.2	14.0	12.3	11.4
C/I Downlink Adjacent Satellite 2 (dB)	25.4	18.8	19.0	18.1
C/(N+I) Composite (dB)	11.1	4.4	4.9	4.0
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	10.1	3.4	3.9	3.0
Minimum Required C/N (dB)	-10.0	-3.4	-3.9	-3.0
Excess Link Margin (dB)	.1	0.0	0.0	0.0
Number of Carriers	2	1.0	5.0	552.9
CARRIER DENSITY LEVELS				
Uplink Power Density (dBW/Hz)	-43.1	-55.1	-47.8	-48.7
Downlink EIRP Density At Beam Peak (dBW/Hz)	-25.5	-33.1	-34.1	-35.0

EXHIBIT 14: ADJACENT SATELLITE (74.0/74.1º E.L) LINK BUDGETS (continued)

UPLINK BEAM INFORMATION						
Uplink Beam Name	INDIA	INDIA	INDIA	INDIA	INDIA	INDIA
Uplink Frequency (GHz)	14.375	14.375	14.375	14.375	14.375	14.375
Uplink Beam Polarization	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR
Uplink Relative Contour Level (dB)	-6.3	-6.3	-6.3	-6.3	-6.3	-6.3
Uplink Contour G/T (dB/K)	3.7	3.7	3.7	3.7	3.7	3.7
Uplink SFD (dBW/m2)	-82.8	-72.8	-77.8	-77.8	-77.8	-77.8
Rain Rate (mm/hr)	95.0	95.0	95.0	95.0	95.0	95.0
DOWNLINK BEAM INFORMATION						
Downlink Beam Name	INDIA	INDIA	INDIA	INDIA	INDIA	INDIA
Downlink Frequency (GHz)	11.575	11.575	11.575	11.575	11.575	11.575
Downlink Beam Polarization	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR
Downlink Relative Contour Level (dB)	-4.5	-4.5	-4.5	-4.5	-4.5	-4.5
Downlink Contour EIRP (dBW)	51.5	51.5	51.5	51.5	51.5	51.5
Rain Rate (mm/hr)	95.0	95.0	95.0	95.0	95.0	95.0
ADJACENT SATELLITE 1						
Satellite 1 Orbital Location	72.1E	72.1E	72.1E	72.1E	72.1E	72.1E
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0	0.0
Downlink EIRP Density (dBW/Hz)	-22.0	-22.0	-22.0	-22.0	-22.0	-22.0
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0	0.0
ADJACENT SATELLITE 2						
Satellite 1 Orbital Location	76.0E	76.0E	76.0E	76.0E	76.0E	76.0E
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0	0.0
Downlink EIRP Density (dBW/Hz)	-23.2	-23.2	-23.2	-23.2	-23.2	-23.2
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0	0.0
CARRIER INFORMATION						
Carrier ID	36M0F3F	72M0G7W	10M3G7W	100KG7W	1M45G7W	400KG7W
Carrier Modulation	TV/FM	QPSK	QPSK	QPSK	BPSK	BPSK
Peak to Peak Bandwidth of EDS (MHz)	4	N/A	N/A	N/A	N/A	N/A
Information Rate(kbps)	N/A	24575	6000	64	512	128
Code Rate	N/A	1/2x188/204	1/2x188/204	1/2x239/256	R1/2	R1/2
Occupied Bandwidth(kHz)	36000	30133	6771.1	75.4	1229.0	307.0
Allocated Bandwidth(kHz)	36000	36000	10300	100	1450.0	400.0
Minimum C/N, Clear Sky (dB)	10.0	3.36	3.87	2.99	3.4	3.4
Minimum C/N, Rain (dB)	10.0	3.36	3.57	2.79	2.7	2.7
UPLINK EARTH STATION						
Earth Station Diameter (meters)	6.1	6.1	6.1	6.1	6.1	2.4
Earth Station Gain (dBi)	57.0	57.0	57.0	57.0	57.0	49.1
Earth Station Elevation Angle	20	20	20	20	20	20
DOWNLINK EARTH STATION						
Earth Station Diameter (meters)	1.8	1.8	3.0	3.0	2.4	6.1
Earth Station Gain (dBi)	44.5	44.5	48.9	48.9	47.2	55.2
Earth Station G/T (dB/K)	22.0	22.0	26.4	26.4	24.7	32.8
Earth Station Elevation Angle	20	20	20	20	20	20
LINK FADE TYPE	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky
UPLINK PERFORMANCE						
Uplink Earth Station EIRP (dBW)	80.1	77.0	66.8	46.6	59.2	51.2
Uplink Path Loss, Clear Sky (dB)	-207.6	-207.6	-207.6	-207.6	-207.6	-207.6
Uplink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Satellite G/T(dB/K)	3.7	3.7	3.7	3.7	3.7	3.7
Boltzman Constant(dBW/K-Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-74.8	-68.3	-48.8	-60.9	-54.9
Uplink C/N(dB)	29.3	27.0	23.2	22.6	23.1	21.1
DOWNLINK PERFORMANCE						
Downlink EIRP per Carrier (dBW)	51.5	44.3	37.8	17.7	30.3	22.3
Antenna Pointing Error (dB)	-.5	-.5	-.5	-.5	-.5	-.5
Downlink Path Loss, Clear Sky (dB)	-205.7	-205.7	-205.7	-205.7	-205.7	-205.7
Downlink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Earth Station G/T (dB/K)	22.0	22.0	26.4	26.4	24.7	32.8
Boltzman Constant(dBW / K - Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-74.8	-68.3	-48.8	-60.9	-54.9
Downlink C / N(dB)	20.4	13.9	18.4	17.7	16.5	22.7
COMPOSITE LINK PERFORMANCE						
C/N Uplink (dB)	29.3	27.0	23.2	22.6	23.1	21.1
C/N Downlink (dB)	20.4	13.9	18.4	17.7	16.5	22.7
C/I Intermodulation (dB)	N/A	N/A	13.7	13.1	13.6	11.7
C/I Uplink Co-Channel (dB)*	25.0	25.0	20.3	20.3	21.3	18.9
C/I Downlink Co-Channel (dB)*	25.0	25.0	20.3	20.3	21.3	18.9
C/I Uplink Adjacent Satellite 1 (dB)	24.7	22.3	18.6	17.9	18.4	16.5
C/I Downlink Adjacent Satellite 1 (dB)	21.4	15.0	19.0	18.4	17.3	22.9
C/I Uplink Adjacent Satellite 2 (dB)	25.2	22.9	19.2	18.5	19.0	17.1
C/I Downlink Adjacent Satellite 2 (dB)	21.1	14.6	19.5	18.9	17.5	24.1
C/(N+I) Composite (dB)	14.2	9.0	8.9	8.3	8.3	8.0
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	13.2	8.0	7.9	7.3	7.3	7.0
Minimum Required C/N (dB)	-10.0	-3.4	-3.9	-3.0	-3.4	-3.4
Excess Link Margin (dB)	3.2	4.6	4.0	4.3	3.9	3.6
Number of Carriers	1	1.0	3.5	360.0	24.8	90.0
CARRIER DENSITY LEVELS						
Uplink Power Density (dBW/Hz)	-42.9	-54.8	-58.5	-59.2	-58.7	-52.7
Downlink EIRP Density At Beam Peak (dBW/Hz)	-10.0	-26.0	-26.0	-26.6	-26.1	-28.0

EXHIBIT 14: ADJACENT SATELLITE (74.0/74.1º E.L) LINK BUDGETS (continued)

UPLINK BEAM INFORMATION						
Uplink Beam Name	ME_AFRICA	ME_AFRICA	ME_AFRICA	ME_AFRICA	ME_AFRICA	ME_AFRICA
Uplink Frequency (GHz)	14.125	14.125	14.125	14.125	14.125	14.125
Uplink Beam Polarization	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR
Uplink Relative Contour Level (dB)	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0
Uplink Contour G/T (dB/K)	.7	.7	.7	.7	.7	.7
Uplink SFD (dBW/m2)	-80.1	-82.1	-85.1	-85.1	-85.1	-85.1
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0	42.0	42.0
DOWNLINK BEAM INFORMATION						
Downlink Beam Name	ME_AFRICA	ME_AFRICA	ME_AFRICA	ME_AFRICA	ME_AFRICA	ME_AFRICA
Downlink Frequency (GHz)	12.625	12.625	12.625	12.625	12.625	12.625
Downlink Beam Polarization	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR
Downlink Relative Contour Level (dB)	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0
Downlink Contour EIRP (dBW)	44.4	44.4	44.4	44.4	44.4	44.4
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0	42.0	42.0
ADJACENT SATELLITE 1						
Satellite 1 Orbital Location	72.1E	72.1E	72.1E	72.1E	72.1E	72.1E
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0	0.0
Downlink EIRP Density (dBW/Hz)	-26.0	-26.0	-26.0	-26.0	-26.0	-26.0
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0	0.0
ADJACENT SATELLITE 2						
Satellite 1 Orbital Location	76.1E	76.1E	76.1E	76.1E	76.1E	76.1E
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0	0.0
Downlink EIRP Density (dBW/Hz)	-26.0	-26.0	-26.0	-26.0	-26.0	-26.0
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0	0.0
CARRIER INFORMATION						
Carrier ID	36M0F3F	72M0G7W	10M3G7W	100KG7W	1M45G7W	400KG7W
Carrier Modulation	TV/FM	QPSK	QPSK	QPSK	BPSK	BPSK
Peak to Peak Bandwidth of EDS (MHz)	4	N/A	N/A	N/A	N/A	N/A
Information Rate(kbps)	N/A	49150	6000	64	512	128
Code Rate	N/A	1/2x188/204	1/2x188/204	1/2x239/256	R1/2	R1/2
Occupied Bandwidth(kHz)	36000	60266	6771.1	75.4	1229.0	307.0
Allocated Bandwidth(kHz)	36000	72000	10300	100	1450.0	400.0
Minimum C/N, Clear Sky (dB)	10.0	3.36	3.87	2.99	3.4	3.4
Minimum C/N, Rain (dB)	10.0	3.36	3.57	2.79	2.7	2.7
UPLINK EARTH STATION						
Earth Station Diameter (meters)	6.1	6.1	6.1	6.1	6.1	2.4
Earth Station Gain (dBi)	56.8	56.8	56.8	56.8	56.8	48.9
Earth Station Elevation Angle	20	20	20	20	20	20
DOWNLINK EARTH STATION						
Earth Station Diameter (meters)	4.6	1.8	2.4	2.4	2.4	6.1
Earth Station Gain (dBi)	54.0	45.3	48.0	48.0	48.0	56.0
Earth Station G/T (dB/K)	31.5	22.8	25.5	25.5	25.5	33.6
Earth Station Elevation Angle	20	20	20	20	20	20
LINK FADE TYPE	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky
UPLINK PERFORMANCE						
Uplink Earth Station EIRP (dBW)	79.8	80.8	62.6	42.3	54.3	45.7
Uplink Path Loss, Clear Sky (dB)	-207.4	-207.4	-207.4	-207.4	-207.4	-207.4
Uplink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Satellite G/T(dB/K)	.7	.7	.7	.7	.7	.7
Boltzman Constant(dBW/K-Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-77.8	-68.3	-48.8	-60.9	-54.9
Uplink C/N(dB)	26.1	24.9	16.2	15.5	15.3	12.7
DOWNLINK PERFORMANCE						
Downlink EIRP per Carrier (dBW)	40.2	44.4	33.9	13.6	25.6	17.0
Antenna Pointing Error (dB)	-.5	-.5	-.5	-.5	-.5	-.5
Downlink Path Loss, Clear Sky (dB)	-206.4	-206.4	-206.4	-206.4	-206.4	-206.4
Downlink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Earth Station G/T (dB/K)	31.5	22.8	25.5	25.5	25.5	33.6
Boltzman Constant(dBW / K - Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-77.8	-68.3	-48.8	-60.9	-54.9
Downlink C / N(dB)	17.8	11.0	12.7	12.0	11.9	17.4
COMPOSITE LINK PERFORMANCE						
C/N Uplink (dB)	26.1	24.9	16.2	15.5	15.3	12.7
C/N Downlink (dB)	17.8	11.0	12.7	12.0	11.9	17.4
C/I Intermodulation (dB)	N/A	N/A	19.9	19.2	19.0	16.4
C/I Uplink Co-Channel (dB)*	24.0	24.0	25.4	25.3	25.7	22.7
C/I Downlink Co-Channel (dB)*	24.0	24.0	25.4	25.3	25.7	22.7
C/I Uplink Adjacent Satellite 1 (dB)	25.2	24.0	15.3	14.6	14.4	11.8
C/I Downlink Adjacent Satellite 1 (dB)	22.7	15.3	17.3	16.6	16.5	22.3
C/I Uplink Adjacent Satellite 2 (dB)	25.2	24.0	15.3	14.6	14.4	11.8
C/I Downlink Adjacent Satellite 2 (dB)	23.5	17.3	18.7	18.0	17.9	22.9
C/(N+I) Composite (dB)	13.7	8.4	7.3	6.6	6.5	6.1
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	12.7	7.4	6.3	5.6	5.5	5.1
Minimum Required C/N (dB)	-10.0	-3.4	-3.9	-3.0	-3.4	-3.4
Excess Link Margin (dB)	2.7	4.0	2.4	2.6	2.1	1.7
Number of Carriers	2	1.0	5.0	532.7	33.6	180.0
CARRIER DENSITY LEVELS						
Uplink Power Density (dBW/Hz)	-43.0	-53.8	-62.6	-63.3	-63.4	-58.1
Downlink EIRP Density At Beam Peak (dBW/Hz)	-19.8	-27.4	-28.5	-29.2	-29.3	-31.9

EXHIBIT 14: ADJACENT SATELLITE (74.0/74.1º E.L) LINK BUDGETS (continued)

UPLINK BEAM INFORMATION						
Uplink Beam Name	MOBILITY	MOBILITY	MOBILITY	MOBILITY	MOBILITY	MOBILITY
Uplink Frequency (GHz)	14.375	14.375	14.375	14.375	14.375	14.375
Uplink Beam Polarization	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR
Uplink Relative Contour Level (dB)	-8.0	-8.0	-8.0	-8.0	-8.0	-8.0
Uplink Contour G/T (dB/K)	-3.3	-3.3	-3.3	-3.3	-3.3	-3.3
Uplink SFD (dBW/m2)	-75.0	-80.0	-77.0	-77.0	-77.0	-77.0
Rain Rate (mm/hr)	95.0	95.0	95.0	95.0	95.0	95.0
DOWNLINK BEAM INFORMATION						
Downlink Beam Name	MOBILITY	MOBILITY	MOBILITY	MOBILITY	MOBILITY	MOBILITY
Downlink Frequency (GHz)	12.375	12.375	12.375	12.375	12.375	12.375
Downlink Beam Polarization	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR
Downlink Relative Contour Level (dB)	-7.0	-7.0	-7.0	-7.0	-7.0	-7.0
Downlink Contour EIRP (dBW)	42.7	42.7	42.7	42.7	42.7	42.7
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0	42.0	42.0
ADJACENT SATELLITE 1						
Satellite 1 Orbital Location	72.1E	72.1E	72.1E	72.1E	72.1E	72.1E
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0	0.0
Downlink EIRP Density (dBW/Hz)	-27.0	-27.0	-27.0	-27.0	-27.0	-27.0
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0	0.0
ADJACENT SATELLITE 2						
Satellite 1 Orbital Location	76.1E	76.1E	76.1E	76.1E	76.1E	76.1E
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0	0.0
Downlink EIRP Density (dBW/Hz)	-27.0	-27.0	-27.0	-27.0	-27.0	-27.0
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0	0.0
CARRIER INFORMATION						
Carrier ID	36M0F3F	72M0G7W	10M3G7W	100KG7W	1M45G7W	400KG7W
Carrier Modulation	TV/FM	QPSK	QPSK	QPSK	BPSK	BPSK
Peak to Peak Bandwidth of EDS (MHz)	4	N/A	N/A	N/A	N/A	N/A
Information Rate(kbps)	N/A	49150	6000	64	512	128
Code Rate	N/A	1/2x188/204	1/2x188/204	1/2x239/256	R1/2	R1/2
Occupied Bandwidth(kHz)	36000	60266	6771.1	75.4	1229.0	307.0
Allocated Bandwidth(kHz)	36000	72000	10300	100	1450.0	400.0
Minimum C/N, Clear Sky (dB)	10.0	3.36	3.87	2.99	3.4	3.4
Minimum C/N, Rain (dB)	10.0	3.36	3.57	2.79	2.7	2.7
UPLINK EARTH STATION						
Earth Station Diameter (meters)	11.0	9.0	6.1	6.1	6.1	3.0
Earth Station Gain (dBi)	61.8	60.3	57.0	57.0	57.0	49.8
Earth Station Elevation Angle	20	20	20	20	20	20
DOWNLINK EARTH STATION						
Earth Station Diameter (meters)	6.1	1.8	3.0	3.0	3.0	6.1
Earth Station Gain (dBi)	55.8	45.1	49.5	49.5	49.5	55.8
Earth Station G/T (dB/K)	33.4	22.6	27.0	27.0	27.0	33.4
Earth Station Elevation Angle	20	20	20	20	20	20
LINK FADE TYPE	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky
UPLINK PERFORMANCE						
Uplink Earth Station EIRP (dBW)	84.9	82.9	70.6	50.5	62.4	53.0
Uplink Path Loss, Clear Sky (dB)	-207.6	-207.6	-207.6	-207.6	-207.6	-207.6
Uplink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Satellite G/T(dB/K)	-3.3	-3.3	-3.3	-3.3	-3.3	-3.3
Boltzman Constant(dBW/K-Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-77.8	-68.3	-48.8	-60.9	-54.9
Uplink C/N(dB)	27.1	22.8	20.0	19.4	19.3	15.9
DOWNLINK PERFORMANCE						
Downlink EIRP per Carrier (dBW)	38.5	42.7	32.1	12.0	23.9	14.5
Antenna Pointing Error (dB)	-.5	-.5	-.5	-.5	-.5	-.5
Downlink Path Loss, Clear Sky (dB)	-206.2	-206.2	-206.2	-206.2	-206.2	-206.2
Downlink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Earth Station G/T (dB/K)	33.4	22.6	27.0	27.0	27.0	33.4
Boltzman Constant(dBW / K - Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-77.8	-68.3	-48.8	-60.9	-54.9
Downlink C / N(dB)	18.2	9.3	12.6	12.0	11.9	14.9
COMPOSITE LINK PERFORMANCE						
C/N Uplink (dB)	27.1	22.8	20.0	19.4	19.3	15.9
C/N Downlink (dB)	18.2	9.3	12.6	12.0	11.9	14.9
C/I Intermodulation (dB)	N/A	N/A	19.8	19.2	19.0	15.6
C/I Uplink Co-Channel (dB)*	24.0	24.0	25.3	25.3	25.7	21.9
C/I Downlink Co-Channel (dB)*	24.0	24.0	25.3	25.3	25.7	21.9
C/I Uplink Adjacent Satellite 1 (dB)	28.3	24.1	21.3	20.7	20.6	17.2
C/I Downlink Adjacent Satellite 1 (dB)	23.9	14.5	18.2	17.6	17.5	20.6
C/I Uplink Adjacent Satellite 2 (dB)	28.3	24.1	21.3	20.7	20.6	17.2
C/I Downlink Adjacent Satellite 2 (dB)	24.5	16.4	19.3	18.7	18.6	21.2
C/(N+I) Composite (dB)	14.5	7.1	9.1	8.5	8.4	8.1
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	13.5	6.1	8.1	7.5	7.4	7.1
Minimum Required C/N (dB)	-10.0	-3.4	-3.9	-3.0	-3.4	-3.4
Excess Link Margin (dB)	3.5	2.7	4.2	4.5	4.0	3.7
Number of Carriers	2	1.0	5.2	528.3	33.5	180.0
CARRIER DENSITY LEVELS						
Uplink Power Density (dBW/Hz)	-42.9	-55.2	-54.7	-55.3	-55.4	-51.6
Downlink EIRP Density At Beam Peak (dBW/Hz)	-20.5	-28.1	-29.2	-29.8	-30.0	-33.4