Engineering Statement

1) Introduction

Intelsat License LLC ("Intelsat") seeks authority in this application to launch and operate a new satellite designated as Intelsat 20. This spacecraft will operate from the 68.5° E.L. orbital location. Intelsat 20 will replace the Intelsat 7 and Intelsat 10 spacecraft, which are currently operating from 68.65º E.L and 68.5° E.L., respectively. The characteristics of the Intelsat 20 spacecraft, as well as its compliance with Part 25 of the Commission's rules, are provided in the remainder of this Engineering Statement.

2) Spacecraft Overview

Intelsat 20 is a Space Systems Loral model SS/L-1300E spacecraft that operates on the C-band frequencies of 5925 – 6675 MHz, 3700 – 4200 MHz; Ku-band frequencies of 13750 – 14500 MHz, 10950 – 11200 MHz, 11450 – 11700 MHz and 12500 – 12750 MHz; and Ka-band frequencies of 29500 – 30000 MHz and 19700 – 20200 MHz. The spacecraft utilizes 24 C-band channels, 54 Ku-band channels and one Ka-band channel to provide service to Europe, Africa, Asia and Australia.

Intelsat 20 is a 3-axis stabilized type spacecraft, with a rectangular main body that supports the antennas and electronics for the various subsystems. It utilizes two, six-panel deployable solar array wings as well as a hybrid Electric/bi-propellant propulsion system. A summary of the basic spacecraft characteristics is provided in Exhibit 1.

2.1) Structure

The structural design of Intelsat 20 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.

The primary structure of the spacecraft is composed of the following subassemblies: 1) Central cylinder, 2) Support System Module ("SSM") panel, 3) anti-Earth panel, 4) Earth panel, 5) Communications module, 6) Antenna tower module structure, 7) Battery panels, 8) pressurant and stationary plasma thruster ("SPT") tank support structure, 9) east and west feed support structures, 10) momentum wheel support structures, 11) east

and west access panels, 12) main thruster support structure, 13) solar wings, and 14) communication antenna (reflectors).

The central cylinder serves as the spacecraft's primary load carrying structure to which a number of other structural panels are attached. It houses two propellant tanks and provides the spacecraft's interface to the launch vehicle.

The SSM panel is attached to the central cylinder near the aft end of the spacecraft. This panel provides interfaces for a number of propulsion subsystem components as well as components associated with the Attitude Control Subsystem ("ACS") and Data Handling Subsystem ("DHS").

The anti-Earth panel is attached to the central cylinder at the aft end of the spacecraft. This panel receives the thrusters and propulsion lines at this level of the assembly. It also provides the mounting surface for the placement of a number of sensors, thrusters, and Telemetry, Command and Ranging ("TC&R") antennas.

The Earth panel is attached to the central cylinder at the front end of the spacecraft. This panel supports a number of thrusters, propulsion lines and propulsion units, as well as a number of components associated with the spacecraft's communications and TC&R subsystems. It also provides mounting interfaces for the antenna support structure.

The communications module consists of the north and south communication panels, the east and west Output Multiplexer ("OMUX") panels and the shear web panels. These panels support the various components associated with the communications subsystem, the power subsystem and the DHS.

The antenna tower module structure is composed of an antenna support structure to which the following components have been integrated: C-band transmit/receive antenna, Ka-band global horn antennas and Ku-band sub-reflectors, Earth sensor assembly, C- and Ku-band Uplink Power Control ("ULPC") antennas and TC&R antennas. The antenna support structure interfaces with the main body structure at attach points on the Earth panel.

The battery panels are composed of an east and west panel that are located near the aft end of the spacecraft. The battery panels provide the necessary support platform for the batteries.

The pressurant tank support structure is composed of two platforms, one located on the east side and the other located on the west side of the spacecraft, which are connected to the core cylinder via a series of struts. A similar set of support platforms is also provided for the SPT tanks. These structures provide mounting and support surfaces for the pressurant and SPT tanks.

The east and west feed support structures are attached near the front (nadir) section of the central cylinder on the east and west sides of the spacecraft. They provide the requisite mounting surfaces for the antenna feeds.

Four reaction wheel support structures provide the component mounting interface and the support structure for the four reaction wheels used aboard the spacecraft. These four reaction wheel support structures are located between the SSM and the anti-earth panels, near the aft end of the spacecraft, and attached directly to the central cylinder.

The east and west access panels are located on the east and west sides of the spacecraft, respectively. These panels stabilize the free edges of the north and south communication panel, the Earth panel and the SSM panel. The east and west access panels are easily removed and provide access to the interior of the spacecraft during assembly, integration and test.

The main thruster support structure is located in the aft section of the spacecraft and is mechanically fastened to the inside of the central cylinder. This structure provides the mounting surface for the main thruster.

The spacecraft utilizes two deployable solar wings, which are extended during transfer orbit. One solar wing is located on the north side of the spacecraft and the other is located on the south side of the spacecraft. The solar wings provide the mounting surfaces for the solar cells. Each solar wing is connected to the corresponding communication panel through the Solar Array Drive Assembly ("SADA").

Intelsat 20 utilizes four deployable reflector antennas. The antennas are supported by four main reflector support structures, located on the east and west sides of the spacecraft. These supporting structures are connected directly onto the central cylinder via a network of struts and secondary connecting platforms. The earth deck antenna assembly and support tower also support a number of communication, TC&R and ULPC antennas.

The Intelsat 20 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 and heat rejection surfaces. Heat pipes are embedded in the north and south communication panels, the SSM panel and the battery panel radiators. High thermal dissipation components are located directly on the north and south communication/radiator panels. Optical Solar Reflectors ("OSRs") are used on the outer faces of these panels as well as of the OMUX panels. Multilayer Insulation ("MLI") blankets are used on the external east, west, Earth and anti-Earth surfaces and on the Earth deck antenna tower module structure.

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 and Ka-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 that are attached to protruding battery radiators.

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 20 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 six main 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 20 utilizes four 20-cell Lithium ion batteries. The batteries are located on the east and west battery panels.

The Intelsat 20 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 20 are provided in Exhibit 3.

2.4) Attitude Determination and Control Subsystem

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

The ADCS is composed of primary and redundant sun and earth sensors, two gyros, 4-for-3 redundant reaction wheels, bipropellant 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 bipropellant and/or SPT thrusters by the ADCS.

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) two high pressure helium tanks, 2) pressurant control module comprised of series-redundant pressure regulators and service components for the helium pressurant, 3) dual propellant tanks, 4) propellant control module containing pressure transducers, isolation, service, filtration and flow control components for the propellants, 5) a single 455-N main satellite thruster ("MST"), 6) twelve 22-N Attitude and Orbit Control ("AOC") thrusters, 7) parallel-redundant pyrotechnic valves, 8) two pressurized xenon gas tanks, 9) two Stationary Plasma Thruster("SPT") modules, and 10) SPT propellant management assembly and associated electronics.

The spacecraft employs a combination of bipropellant and SPT systems. The bipropellant system is used during transfer orbit operations; and when on-station, for East-West station-keeping. The SPT system is used during on-station operations for north-south station-keeping, eccentricity control and momentum management.

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

Following separation from the launch vehicle, the 22-N AOC thrusters are opened to vent residual gas. The pyrotechnic valves in the propellant control module are then fired, allowing propellants to fill the fuel and oxidizer lines to the MST and AOC thrusters. The pressurant control module latching valve is opened and one of the redundant pressurant module pyrotechnic valves is fired, initiating helium gas flow, thus pressurizing the propellant tanks. The MST is then fired as necessary during the transfer orbit operation to inject the spacecraft into a geosynchronous orbit. Upon completion of the transfer orbit, the MST is isolated from the rest of the propulsion system by closing the pressurant control latching valve and the isolation latching valves, and the AOC thrusters are then operated in a blow-down mode for the balance of the mission. During on-station operations, momentum wheels are used in conjunction with the AOC thrusters and the SPT system to maintain correct positioning and pointing of the spacecraft.

The architecture of the bi-propellant and SPT systems are based on a low risk approach which has been flight proven (*e.g.*, bi-propellant system is currently used by Intelsat 14 and the SPT system is in use on Intelsat 10-02). The system utilizes space qualified components and incorporates full redundancy for all critical components.

2.6) Communication Subsystem

2.6.1) Overview

Intelsat 20 provides 24 active communication channels at C-band frequencies, 54 active channels at Ku-band frequencies and one active channel at Ka-band frequencies. The C-band payload employs channels having bandwidths of 27 MHz, 36 MHz, 54 MHz and 60 MHz. The Ku-band payload employs channels having bandwidths of 36 MHz and 72 MHz. The Ka-band payload employs a channel with bandwidth of 500 MHz. The

Intelsat 20 frequency and polarization plans are provided in Exhibits 4A and 4B.

At C-band, the Intelsat 20 receive and transmit beams provide coverage of Europe, Africa, Asia and Australia. At Ku-band, the spacecraft provides coverage of southern Africa, Europe, Russia, Central Asia and the Middle East. At Ka-band, the spacecraft's spot beam provides coverage of Pakistan and Afghanistan.

At C- and Ku-band frequencies, Intelsat 20 employs full frequency reuse through the use of orthogonal polarization within the same beam and/or through the use of spatially independent beams. Accordingly, Intelsat 20 is compliant with the provisions of Section 25.210(f) of the Commission's rules.

At Ka-band, full frequency reuse is achieved through the use of orthogonal circular polarization. Accordingly, Intelsat 20 is compliant with the Section 25.210(b) of the Commission's rules.

From the 68.5º E.L. orbital location, Intelsat 20 will not be able to provide service to the United States. Accordingly, the provisions of Section 25.210(a) of the Commission's rules do not apply.

With respect to the use of the 6425 – 6675 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 for non-federal fixed satellite service. It is noted that the service area of Intelsat 20 does not encompass the United States and transmissions to Intelsat 20 within the 6425 – 6675 MHz band will be from areas outside of the United States.

2.6.2) Antennas and Beam Coverage

Intelsat 20 utilizes a C-band transmit/receive dual gridded reflector antenna, four deployable Ku-band transmit/receive Gregorian reflector antennas, a Ka-band global horn transmit antenna and a Ka-band global horn receive antenna. The coverage beams of the Intelsat 20 antennas are shown in Exhibits 5A-1 through 5A-24, in the format prescribed in Section 25.114(d)(3) of the Commission's rules.

The performance characteristics for each beam and the maximum beam gain are provided in Exhibits 5A-1 through 5A-24. 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 35 dB for C-band channels, from 0 to 32 dB for the C-to-Ku band cross-connect channels, from 0 to 26 dB for Ku-band channels and from 0 to 14 dB for the Ka-band channel.

Exhibit 6 provides a detailed calculation of the EIRP, G/T and SFD of the Intelsat 20 uplink and downlink beams.

With the exception of the Ka-band receive and transmit beams, the communication beams of Intelsat 20 are predicted to be compliant with the provisions of Section 25.210(i)(1) of the Commission's rules, whereby the cross-polarization isolation ratio of the on axis co-polar gain to the cross-polar gain of the antenna is at least 30 dB within its primary coverage area.

Exhibits 5D-1 through 5D-4 depict the cross-polarization isolation contours for the Intelsat 20 Ka-band receive and transmit beams. These beams do not fully comply with the antenna-cross-polarization requirement 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 20 dB or greater. Accordingly, Intelsat requests a waiver of the provisions of section 25.210(i)(1) with respect to the Ka-band receive and transmit beams.

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 20.

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. The reduction in Intelsat 20's cross-polarization isolation in the affected portions of its coverage area will slightly increase the interference to Intelsat 20 carriers from its own oppositely polarized carriers. By controlling the power level of Intelsat 20'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 support the waiver Intelsat is requesting in this application. Accordingly, Commission precedent supports a grant of this Intelsat's waiver request.

2.6.3) Transponder description

2.6.3.1) C-Band

The output of each C-band (transmit/receive) antenna is directed to a diplexer which filters or separates the receive signals from the transmit signals. Each (receive) input signal is fed through an input test coupler and then to a preselect 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 preselect filter is connected to a redundancy switching network and then to one of four redundant Low Noise Amplifiers ("LNAs"). The C-band LNAs are configured in a 4-for-2 redundancy ring.

From the LNA the signal is sent to a bank of hybrids and then to a C-band frequency down-converter, which converts the uplink frequency to the appropriate downlink frequency. Intelsat 20 C-band frequency down-converters are arranged in a 4-for-2 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 20 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 20 is compliant with the provisions of Section 25.202(e) of the Commission's rules.

The output of the 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 two interconnected redundancy rings of 15-for-12. Each LCAMP/TWTA is comprised of an LCAMP that feeds a 65 Watt, conduction cooled, C-band TWTA.

The LCAMP provides high gain, and amplitude and gain expansion to compensate for the selected TWTA. The LCAMP may only be operated in the Fixed Gain Mode ("FGM"), whereby the output of the LCAMP may be adjusted by ground command from 0 to 35 dB in 1.16 dB increments, and is compliant with Section 25.210(c) of the Commission's rules

The output of each LCAMP/TWTA is then routed through a bank of switches to a set of Output Multiplexers ("OMUXs"). 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 band-pass filter, a test coupler, a diplexer 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 OMJ ("Ortho-mode Junction"). Each receive signal is fed through a diplexer, an input test coupler and then to a preselect 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 preselect filter is connected to one of eight Low Noise Amplifiers ("LNAs"). The Ku-band LNAs are configured in two interconnected 6-for-4 redundancy rings.

From the LNA, the signal is sent to a hybrid and/or band-pass filter and then to a frequency down-converter, which converts the uplink frequency to the

appropriate downlink frequency. Intelsat 20 utilizes three sets of down-converters. One set, which is in a 4-for-2 redundancy configuration, down-converts the signal by 1748 MHz. The second set is configured in a 6-for-4 redundancy scheme and down-converts the signal by 2550 MHz. The third set is configured in a 9-for-6 redundancy ring and down-converts the signal by 2804 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 20 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 20 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 hybrid and/or filter 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 three LCAMP/TWTA banks. On bank which utilizes 113 Watt TWTAs configured into two interconnected 16-for-12 redundancy rings. The second bank utilizes 150 Watt TWTAs arranged into two interconnected 8-for-6 redundancy rings. The third bank, utilizes 150 TWTAs configured into two interconnected 12-for-9 redundancy rings. The 113 Watt and 150 Watt TWTAs are radiation cooled amplifiers.

The LCAMP provides high gain, and amplitude and gain expansion to compensate for the selected TWTA. The LCAMP may be operated in the fixed gain mode 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 26 dB in 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. When operating in the ALC mode, the dynamic range of the LCAMP is 37 dB, with the gain being adjustable in increments of 1 dB.

The output of each LCAMP/TWTA is routed to the appropriate OMUX. The output of each OMUX is fed to a test coupler, a diplexer and then into

the OMJ. From there the signal is sent to the antenna feed for transmission to Earth.

For those channels that operate in frequency cross-strap configuration, where the uplink beam is the C-band landmass beam and the downlink is the Ku-band Southern Africa beam, the C-band signal is extracted from the hybrid that follows the C-band LNA (*see* section 2.6.3.1). From there the signal is routed to a band-pass filter and then to one of two frequency up-converters. The frequency up-converters are arranged in a to 4-for-2 redundant ring. The signal is then sent to the appropriate IMUX and thereafter follows the same path as described above for the other Ku-band channels.

Given that the up-converter converts the received signal to the necessary frequency required for transmission, the frequency stability of the transmitted signal is due entirely to the up-converter. The Intelsat 20 Ku-band frequency up-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 20 is compliant with the provisions of Section 25.202(e) of the Commission's rules.

2.6.3.3) Ka-Band

The signal is received by a dual circularized horn antenna and forwarded to a polarization switch, whereby either the incoming right hand or left hand circularly polarized signal can be selected. The receive signal is fed through an input test coupler and then to a preselect 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 preselect filter is connected to a 2-for-1 redundant LNA.

From the LNA the signal is sent to a 2-for-1 frequency down-converter, which converts the uplink frequency to the appropriate downlink frequency. 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 20 Ka-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 20 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 band-pass filter and then to a 2-for-1 redundant LCAMP/TWTA pair. The TWTA has a maximum output power of 122 Watts and is a radiation cooled amplifier.

The LCAMP provides high gain, and amplitude and gain expansion to compensate for the selected TWTA. The LCAMP may be operated in either the FGM or ALC modes. In the FGM mode, the output of the LCAMP may be adjusted by ground command from 0 to 14 dB in 0.25 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. When operating in the ALC mode, the dynamic (gain) range of the LCAMP is 16 dB, with the gain being adjustable in increments of 0.25 dB.

The output of the LCAMP/TWTA is then routed in succession to a filter, a test coupler, a polarization switch and then to a dual circularized horn antenna for transmission to Earth.

2.7) Telemetry, Command and Ranging Subsystem

The telemetry, command and ranging 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) two omni-directional command antennas located on the nadir side of the spacecraft, 2) two omni-directional command antennas located on the aft side of the spacecraft, 3) two omni-directional telemetry antennas located on the nadir side of the spacecraft, 4) two omni-directional telemetry antennas located on the aft side of the spacecraft, 5) Ku-band global horn antenna 6) two single frequency command receivers, 7) one dual frequency command receiver, 8) two dual frequency telemetry transmitters, 9) two 35 Watt TWTAs, 10) Data Handling Subsystem ("DHS"), 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. When on-station, command and telemetry signals are received and transmitted through Intelsat 20's main Ku-band global horn transmit/receive 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 a set of omni-directional antennas. For command, two omni antennas are located on the front (nadir) section of the spacecraft and two are located in the aft section of the spacecraft. Similarly, for telemetry, two omni-directional antennas are located on the front section of the spacecraft and two are located on the aft section. Representative gain graphs for the command and telemetry omni-directional antennas are provided in Exhibits 5B-2, 5B-3, 5B-5 and 5B-6.

The field of view of the omni antennas located on the nadir side of the spacecraft is ±110º in the East-West (or azimuth) direction and ±50º in the North-South (or elevation) direction. The omni antennas located in the aft section of the spacecraft have a field of view of ±50º in both the North-South and East-West directions. During emergency conditions, when the spacecraft's main communication antenna is not pointing towards Earth, the omni-directional antennas would be used since their field of view is at least +/- 50º and the earth disk is only +/- 8.4º.

During extreme on-station emergencies and during transfer orbit operations, it is assumed that the spacecraft is not properly oriented and communication with the spacecraft cannot be established through the global horn antenna. The antenna plots in Exhibits 5B-2, 5B-3, 5B-5 and 5B-6 show the variation in the gain of the omni antennas at 0° roll angle referenced to the antenna axis with the azimuth varying from –180º and +180º (*see* plot "a" in each exhibit); as well as the variation in the gain of the omni antenna at 0° azimuth angle referenced to the antenna axis with the roll angle varying from –180º and +180º (*see* plot "b" in each exhibit). Given that the omni antennas are horn type antennas and their gain characteristics are symmetrical about the main axis of the antenna aperture, the gain variations shown in Exhibits 5B-2, 5B-3, 5B-5 and 5B-6 are also representative of roll and azimuth angles other than 0°.

The gain diagrams of the omni antennas (Exhibits 5B-2, 5B-3, 5B-5 and 5B-6) were not prepared in accordance with the specifications in Section 25.114(d)(3) of the Commission's rules due to the fact that the satellite manufacturer does not provide the patterns in the required form as the pointing of these antennas with respect to the Earth will vary during an emergency situation. In this respect, it is Intelsat's understanding that, given the specificity of the situation, Exhibits 5B-2, 5B-3, 5B-5 and 5B-6 together with the descriptive characterization given in the previous paragraphs of this section, fulfill the requirements of Section 25.114(d)(3). However, to the extent the Commission disagrees, a waiver of the requirements of Section 25.114(d)(3) of the FCC's rules with respect to the presentation of the omni antenna patterns is requested.

2.7.2) Command

The Intelsat 20 command subsystem performance summary is provided in Exhibit 8. Detailed calculation of the G/T and SFD for each command beam is provided in Exhibit 9.

During on-station operations, commands are sent to the spacecraft by transmission of two independent, linearly polarized, FM signals on the frequencies of 14498 MHz and 13750.5 MHz. The command signals are received by the spacecraft through the main Ku-band global horn transmit/receive antenna. The coverage pattern of this antenna is provided in Exhibit 5B-1. The command signals are then routed to a set of diplexers and hybrids to three command receivers. 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 DHS, 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 omni-directional antennas.

2.7.3) Telemetry

The Intelsat 20 telemetry subsystem performance summary is provided in Exhibit 8. Detailed calculation of the EIRP for each telemetry beam is provided in Exhibit 9.

During on-station operations, telemetry is transmitted by the spacecraft on two independent, linearly polarized, PM signals on two frequencies that may be selected from the following set: 12746.5 MHz, 12747 MHz, 12748 MHz or 12748.5 MHz. The telemetry baseband functions are implemented in the DHS, where data from the various spacecraft units are collected, processed, multiplexed, formatted and encoded onto subcarriers. The output of the DHS is then routed to the telemetry transmitters where the signal is modulated onto the main carrier frequencies.

Intelsat 20 utilizes two dual frequency transmitters. One transmitter can operate at either 12746.5 MHz or 12747 MHz, and the other can operate at either 12748 MHz or 12748.5 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 on-station operations, the signal from the high power output port of each telemetry transmitter is routed to a hybrid with the resultant signal sent to a test coupler and then to the global horn transmit/receive antenna for transmission to Earth.

During transfer orbit or emergency operations, the telemetry subsystem may be operated in the high power mode or in the low power mode, depending on the circumstance. In the high power mode, the low power output of each telemetry transmitter is routed to a 35 Watt TWTA for additional amplification. The signal is then sent to a directional coupler and transmitted to Earth through the Omni-directional antennas. In the low power mode, the high power output of each telemetry transmitter is routed to the Omni-directional antennas located in the nadir side of the spacecraft for transmission to Earth.

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 20 command, telemetry and ranging subsystems are provided in Exhibit 8.

2.8) Uplink Power Control Subsystem ("ULPC")

2.8.1 Antennas

Intelsat 20 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 and 5C-2, respectively.

2.8.2 ULPC System Description

Intelsat 20 provides three 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 circularly polarized and operates on the frequency of 3694 MHz. The Ku-Band ULPC beacons are circularly polarized and operate on the frequencies of 11198 MHz, 11699.5 MHz and 12749 MHz. Detailed calculation of the EIRP for each ULPC beam is provided in Exhibit 6.

The Intelsat 20 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 20 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 band-pass filter, a test coupler, an OMJ 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 three port OMUX and then to a test coupler. From there the signal is directed to an OMJ 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 is 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 20 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 Ka-band payloads are 97.4% 88.9% and 95.9%, respectively. The projected reliability of the bus system

is 81.0%. The overall reliability of the Intelsat 20 spacecraft is projected to be 67.2%. The subsystem reliability assessments were based upon the use of failure rates, modeling assumptions from previous spacecraft programs and those specific to Intelsat 20. Failure rates for spacecraft equipment have been calculated using actual electrical stress and operating temperature conditions for each part. Failure rate for standby un-powered electronic items were assessed at one-tenth of the failure rates for active units. Failure rate for standby non-operating mechanical items were assessed at one hundredth of their operating failure rate.

3.0) Services and Emission Designators

Intelsat 20 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 20 can accommodate television, radio, voice or data communications. Typical 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 10.

4.0) Power Flux Density ("PFD")

The power flux density ("PFD") limits for space stations operating in the 3700 – 4200 MHz, 10950 – 11200 MHz and 11450 – 11700 MHz bands are contained in Section 25.208 of the Commission's rules. With respect to the 12500 – 12750 MHz band, the PFD limits are specified in No. 21.16 of the ITU Radio Regulations. For the 19700 – 20200 MHz band, the PFD limit is specified in section 25.138(a)(6) of the Commission's rules.

The maximum PFD levels for the Intelsat 20 transmissions were calculated for a number of TV/FM and/or digital carriers listed in Exhibit 10 operating in the 3700 – 4200 MHz, 10950 – 11200 MHz, 11450 – 11700 MHz and 12500 – 12750 MHz bands. These carriers were chosen because they generally produce high PFD levels on the Earth's surface. For the 19700 – 20200 MHz band, the maximum PFD levels were calculated only for digital

carriers. Intelsat does not contemplate using non-digital carriers (*e.g.* TV/FM) within the 19700 – 20200 MHz band. The PFD levels were also calculated for the Intelsat 20 telemetry and ULPC carriers. The results are provided in Exhibit 11 and show that the downlink power flux density levels of the Intelsat 20 carriers do not exceed limits specified in Sections 25.208 and 25.138 of the Commission's rules or the limits specified in No. 21.16 of the ITU Radio Regulations.

5.0) Emission Limitations

The Intelsat 20 receiver and transmitter channel filter response characteristics are provided in Exhibit 7, as required under Section 25.114 (4)(vii) of the Commission's rules.

Intelsat will comply with the provisions of Section 25.202(f) of the Commission's rules with regard to Intelsat 20 emissions.

6.0) Service Area

The primary service area of Intelsat 20 is Europe, Africa, Asia and Australia.

7.0) Orbital Location

Intelsat requests that it be assigned the 68.5° E.L. orbital location for Intelsat 20. Intelsat 20 will replace the Intelsat 7 and 10 spacecraft, which currently operate from 68.65º E.L. and 68.5° E.L, respectively, allowing continued use of the C-band and Ku-band channels by the existing customers of Intelsat 7 and Intelsat 10. It also introduces Ka-band operation at this orbital location, which is not currently provided by Intelsat 7 or Intelsat 10. The 68.5° E.L. location satisfies Intelsat 20 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 20 is intended to provide video, audio and data services to satellite users within its coverage area. The 68.5° E.L. position affords reasonable earth station angles to the region. The attractiveness of Intelsat 20 to this market would be severely diminished if service to this area is not possible.

9.0) Intelsat 20 Link Budgets and Interference Analysis

Link analysis for Intelsat 20 was conducted for a number of representative carriers, at C-, Ku- and Ka-band. Except for the two satellites that will be replaced by Intelsat 20 (Intelsat 7, located at 68.65º E.L. and Intelsat 10, located at 68.5º E.L.), the nearest co-frequency satellites to Intelsat 20 are Eutelsat W5, located at 70.5º E.L., and Intelsat 17, located at 66º E.L.

At C-band, it was assumed that the nearest co-frequency satellites to Intelsat 20 were two hypothetical satellites – one located at 66.5º E.L. and the other located at 70.5º E.L. The hypothetical satellites were assumed to have the same operational parameters as Intelsat 20. It was further assumed that each of the hypothetical satellites utilizes digital carriers having a maximum uplink power density of -38.7 dBW/Hz, as specified in Section 25.212(d) of the Commission's rules, and a maximum downlink (beam peak) EIRP density -32 dBW/Hz.

At Ku-band, it was assumed that the nearest co-frequency satellites to Intelsat 20 were Eutelsat W5, located at 70.5º E.L., and a hypothetical satellite operating from 66.5° E.L. The hypothetical satellite was assumed to have the same operational parameters as Intelsat 20.

Eutelsat W5 operates on the frequency bands of 13.75 – 14.50 GHz, 10.95 – 11.20 GHz, 11.45 – 11.70 GHz and 12.50 – 12.75 GHz, and employs 72 MHz wide channels. It utilizes a steerable global beam and a stationary wide coverage beam that covers Europe, Middle East, India and northern Africa. It was assumed that the beam peak EIRP of the Eutelsat W5 steerable global beam and the wide coverage beam was 54 dBW and 49 dBW, respectively.

At Ku-band, Eutelsat W5 was assumed to operate digital carriers with a maximum uplink power density of -45 dBW/Hz. On downlink, it was assumed that Eutelsat W5 operated digital carriers with a maximum downlink (beam peak) EIRP density of -23.8 dBW/Hz or -28.8 dBW/Hz, depending on the specific Intelsat 20 downlink beam being analyzed.

At Ku-band, the hypothetical satellite at 66.5º E.L was assumed to operate digital carriers with a maximum uplink power density of -45 dBW/Hz. On downlink, it was assumed that hypothetical satellite operated digital carriers with a maximum downlink EIRP density of -18.8 dBW/Hz or -20 dBW/Hz, depending on the specific Intelsat 20 downlink beam being analyzed.

At Ka-band, it was assumed that the nearest co-frequency satellites to Intelsat 20 were two hypothetical satellites – one located at 66.5º E.L. and the other located at 70.5º E.L. The hypothetical satellites were assumed to have the same operational parameters as Intelsat 20. It was further assumed that each of the hypothetical satellites utilizes digital carriers having a maximum uplink power density of -45 dBW/Hz. On downlink, it was assumed that the hypothetical satellites utilize digital carriers that operated with a maximum (beam peak) EIRP density of -15.9 dBW/Hz, which corresponds to the limit contained in Section 25.138(a)(6) of the Commission's rules for an angle of arrival of 90º E.L.

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

a) In the plane of the geostationary satellite orbit, all C-, Ku-, and Ka-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 25.209(a)(2) of the FCC's rules, as applicable.
b) All transmitting and receiving earth stations have a cross-polarization isolation value of at least 30 dB within their main beam.
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- and Ka-band frequencies rain attenuation predictions are derived using Recommendation ITU-R 618-8.
e) At Ku- and Ka-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 66.5° E.L. and 70.5° E.L. on the transmissions of Intelsat 20 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.

At Ka-band frequencies, it was assumed that only digital carriers would be transmitted by Intelsat 20 and the hypothetical satellites located at 66.5° E.L. and 70.5° E.L. Accordingly, the impact of Ka-band TV/FM transmissions from the adjacent satellites on Intelsat 20 transmissions was not considered.

In order to keep the number the Intelsat 20 link calculations to a manageable number, worst-case performance values were assumed for each beam type. The worst-case beam parameters were derived from the beam parameters listed in Exhibit 5 and chosen in such a manner that would make carrier links utilizing any specific uplink / downlink beam combination as sensitive to adjacent satellite interference as possible. This would ensure that the link performance objectives would be achieved for all possible Intelsat 20 uplink and downlink beam combinations. The worst-case beam performance for each Intelsat 20 beam type is provided below:

Beam Name	Aggregate Beam Designation	Worst-Case Beam Peak G/T (dB/K)	Worst-Case Beam SFD Range @ Peak G/T (dBW/m^2)	Worst-Case Beam EIRP (dBW)
Landmass (H)	Landmass	0.4	-111.9 to -76.9	40.9
Landmass (V)				
Southern Africa (H)	Southern Africa	10.6	-107.4 to -81.4	55.9
Southern Africa (V)				
Europe-Middle East (H)	Europe-Middle East	4.1	-102.3 to -76.3	50.0
Europe-Middle East (V)				
Russia (H)	Russia	3.6	-98.7 to -72.7	50.1
Russia (V)				
Africa-Europe (H)	Africa-Europe	1.9	-99.4 to -73.4	49.0
Africa-Europe (V)				
Ka (RHCP / LHCP)	Ka	5.1	-90.8 to -76.8	51.3

As shown in Exhibits 4A and 4B, Intelsat 20 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 not performed for

each channel size, but rather for only one channel size. The channel size chosen for each beam was based upon the level of adjacent satellite downlink interference. As an example, if a channel having a bandwidth of 72 MHz and a channel having a bandwidth of 36 MHz have the same associated adjacent satellite downlink interfering EIRP density, then link budgets were performed only for emissions that were transmitted through the 72 MHz channel, since power density levels would typically be smaller (uplink and downlink) in comparison to those which would be transmitted through the 36 MHz channel; and thus the impact of the adjacent satellite interference would be greater on the former. As a second example, if the level of downlink interfering EIRP density to which the 36 MHz channel was subjected was larger than that for the 72 MHz channel, and if this additional level of interference was larger than ten times the logarithmic ratio of the two channel bandwidths (*i.e.*, 10log[72/36]), then link calculations were performed only for the emissions of the 36 MHz channel, since the impact of adjacent satellite interference is greater on emissions of this channel (in comparison to those being transmitted through the 72 MHz channel).

The results of the C-, Ku- and Ka-band analysis are shown in Exhibit 12 and demonstrate that operation of the Intelsat 20 satellite from 68.5° 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 25.138(a)(1), 25.138(a)(6), 25.212(c) and 25.212(d) of the Commission's rules.

10.0) Adjacent Satellite Link Analysis

At C-band, the impact of the proposed Intelsat 20 emissions on the transmissions of hypothetical adjacent satellites located at 66.5º E.L. and 70.5º E.L. was analyzed. It was assumed that each of these satellites had the same operating characteristics as the proposed Intelsat 20 spacecraft.

For the satellite located at 66.5º E.L., it was assumed that the adjacent satellites were Intelsat 20, located at 68.5º E.L., and a hypothetical satellite having the same operating characteristics as Intelsat 20 located at 64.5º E.L. For the satellite located at 70.5º E.L., it was assumed that the adjacent satellites were Intelsat 20, located at 68.5º E.L., and Intelsat 706, located at 72.1º E.L. The Intelsat 706 satellite was assumed to be operating with the parameters specified in FCC filing SAT-MOD-20100511-00098.

At Ku-band, the impact of the proposed Intelsat 20 emissions on the transmissions of hypothetical satellites located at 66.5º E.L. and 70.5º E.L., and of Eutelsat W5, located at 70.5º E.L., was analyzed. It was assumed that the satellite at 66.5º E.L. had the same operating characteristics as the proposed Intelsat 20 spacecraft. The hypothetical satellite at 70.5º E.L. was assumed to have the same operating characteristics as Intelsat 20 but operated only in the C-to-Ku beam cross-strapping configuration, where the C-band Landmass uplink beam is connected to the Ku-band Southern Africa downlink beam.

Eutelsat W5 was assumed to operate with the characteristics described in section 9.0, above. Given that no information on the Saturated Flux Density ("SFD") performance of the Eutelsat W5 spacecraft could be readily found, it was assumed that the beam peak SFD of the Eutelsat W5 wide-beam receive beam could be adjusted anywhere from -76.3 dBW/m^2 to -102.3 dBW/m^2 – the same as that for the Intelsat 20 Europe-Middle East-Central Asia beam. Similarly, for the Eutelsat W5 narrow-beam uplink beam, it was assumed that the beam peak SFD could be adjusted anywhere from –81.4 dBW/m^2 to –107.4 dBW/m^2 – the same as that for the Intelsat 20 Southern Africa beam. For both receive beams, it was assumed that the SFD could be adjusted in 1 dB increments.

For the satellite located at 66.5º E.L., it was assumed that the adjacent satellites were Intelsat 20, located at 68.5º E.L., and a hypothetical satellite having the same operating characteristics as Intelsat 20 located at 64.5º E.L. For Eutelsat W5 satellite located at 70.5º E.L., it was assumed that the adjacent satellites were Intelsat 20, located at 68.5º E.L., and Intelsat 706, located at 72.1º E.L. The Intelsat 706 satellite was assumed to be operating with the parameters specified in FCC filing SAT-MOD-20100511-00098.

For the C-to-Ku band beam cross-strapping analysis at 70.5º E.L., it was assumed that the adjacent satellites were Intelsat 20, located at 68.5º E.L., and Intelsat 706 located at 72.1º E.L.

At Ka-band, the impact of the proposed Intelsat 20 emissions on the transmissions of hypothetical adjacent satellites located at 66.5º E.L. and 70.5º E.L. was analyzed. It was assumed that each of these satellites had the same operating characteristics as the proposed Intelsat 20 spacecraft.

For the hypothetical satellite located at 66.5º E.L., it was assumed that the adjacent satellites were Intelsat 20, located at 68.5º E.L., and a hypothetical satellite having the same operating characteristics as Intelsat 20 located at

64.5º E.L. For the satellite located at 70.5º E.L., it was assumed that the adjacent satellites were Intelsat 20, located at 68.5º E.L., and a hypothetical satellite having the same operating characteristics as Intelsat 20 located at 72.5º E.L.

The impact of Intelsat 20 emissions on the TV/FM carriers of the adjacent satellites at 66.5º E.L. and 70.5º 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 given in Exhibits 13 and 14. The Intelsat 20 transmissions will be limited to those levels contained in Sections 25.138(a)(1), 25.138(a)(6), 25.212(c) and 25.212(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 and downlink EIRP density of the Intelsat 20 digital carriers will not exceed the levels listed in the table below:

Frequency Band (MHz)	**Maximum Uplink Power Density (dBW/Hz)**	**Maximum Downlink EIRP Density (dBW/Hz)**
5925 – 6675	-38.7	-
14000 – 14500	-45.0	-
29500-30000	-45.0	
3700 – 4200	-	-32.0
10950 – 11200 Excluding Southern Africa Beam	-	-20.0
10950 – 11200 Southern Africa Beam Only	-	-18.8
11450 – 11700 Excluding Southern Africa Beam	-	-20.0
11450 – 11700 Southern Africa Beam Only	-	-18.8
12500 - 12750	-	-20.0

11.0) Schedule S Submission

Intelsat is providing with its application a Schedule S for the operations of Intelsat 20 from 68.5º E.L. It is noted that the antenna gain patterns for the Intelsat 20 omni-directional command and telemetry (+Z and –Z) antennas were included in column "e" (instead of column "f") of Section S8 of the Schedule S, since they are not in GXT format (*see* Sections 2.7.1 and 2.8.1).

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

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 10, Intelsat 20 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.

The proposed orbital location for Intelsat 20 is 68.5° E.L. Currently Intelsat 10 operates from 68.5° E.L. Following transfer of traffic to Intelsat 20, Intelsat 10 shall be relocated to another orbital position such that its station keeping volume shall not overlap with that of Intelsat 20. During the brief period in which communication traffic is being transferred from Intelsat 10 to Intelsat 20, Intelsat will take all the necessary steps, *e.g.*, "pass-in-the-night maneuver" or slight temporary relocation of Intelsat 10 and/or Intelsat 20, to minimize the risk of collision between the two spacecraft.

With the exception of Intelsat 10, 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 20. Intelsat is also not aware of any system with an overlapping station-keeping volume with Intelsat 20 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 55 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 20 spacecraft is 0.045 m^2/kg, resulting in a minimum perigee disposal altitude under the IADC formula of at most 284.5 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 20 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 operates on the frequency bands of 29500 – 30000 MHz and 19700 – 20200 MHz at the nominal orbital location of 68.5° E.L. Intelsat will submit to the Commission the Advanced Publication Information ("API"), for a new satellite network that utilizes these frequency bands at the nominal orbital of 68.5° E.L.

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	October 7, 2010
Jose Albuquerque Intelsat Senior Director Spectrum Strategy	Date

EXHIBIT 1: SUMMARY OF SPACECRAFT CHARACTERISTICS

GENERAL	
Spacecraft Name	Intelsat 20
Orbital Location	68.5° E.L.
Spacecraft Manufacturer	Space Systems Loral
Spacecraft Model	SS/L 1300E
Spacecraft Type	3-axis stabilized
Spacecraft Dimensions	
Length	32.4 meters
Width	8.1 meters
Depth	9.3 meters
Spacecraft Expected Lifetime	15 years
Eclipse Capability	100%
Station-keeping	
North-South	±0.05°
East-West	±0.05°
Antenna Pointing Accuracy	
North-South	0.16°
East-West	0.20°
Rotational	0.45°
Spacecraft Reliability	67.2%
Payload Reliability	83.0%
C-Band	97.4%
Ku-Band	88.9%
Ka-Band	95.9%
Bus Reliability	81.0%
Propulsion Type	Bi-propellant and SPT
Deployed Area of Solar Array	89.2 sq. meters
Ranging Accuracy	≤ 30 meters

EXHIBIT 2: SPACECRAFT MASS BUDGET

Mass of Spacecraft without Fuel (kg)	3065
Mass of Fuel and Disposables (kg)	
Bi-Propellant (kg)	2405[See Note 1]
Xenon (kg)	230
Launch Mass (kg)	5700
Mass of Fuel, in orbit, at Beginning of Life (kg)	
Bi-Propellant (kg)	69[See Note 2]
Xenon (kg)	229

Notes:

1) The listed mass is sum of the mass of fuel, oxidizer and pressurant.
2) The listed mass is the mass of fuel only, i.e. it does not include the mass of the oxidizer or pressurant.

EXHIBIT 3: SPACECRAFT POWER BUDGET

	BEGINNING OF LIFE		END OF LIFE	
	AUTUMN EQUINOX	SUMMER SOLSTICE	AUTUMN EQUINOX	SUMMER SOLSTICE
PAYLOAD (WATTS)	13750	13750	13750	13750
BUS (WATTS)	3262	1753	3262	1753
TOTAL POWER (WATTS)	17012	15503	17012	15503
SOLAR ARRAY POWER (WATTS)	18891	17048	18717	16891
DEPTH OF BATTERY DISCHARGE (%)	71.6%	N/A	74.4%	N/A

EXHIBIT 4A: FREQUENCY PLAN

C-Band Frequency Plan

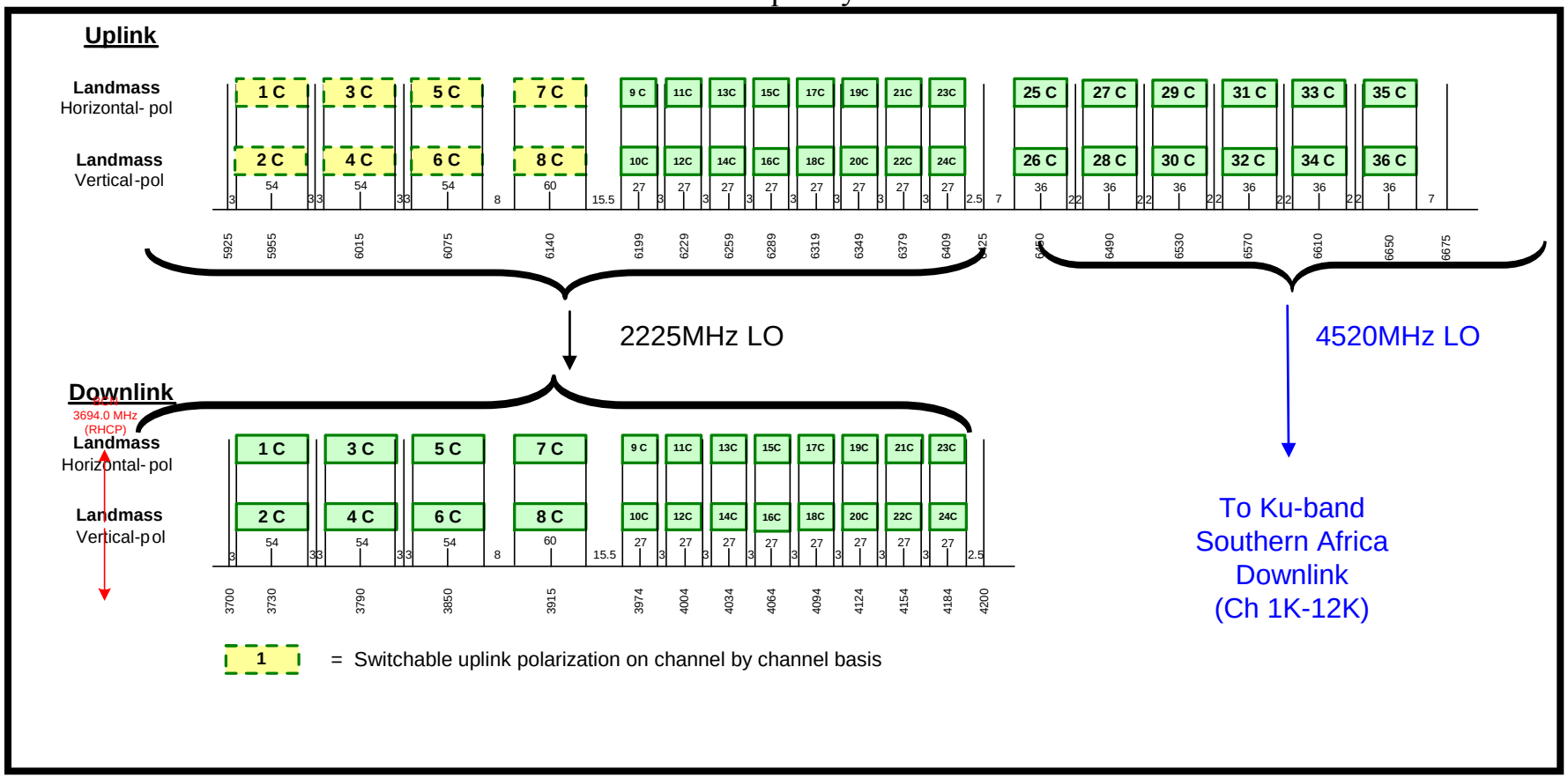


EXHIBIT 4A: FREQUENCY PLAN (continued)

Ku-Band Frequency Plan

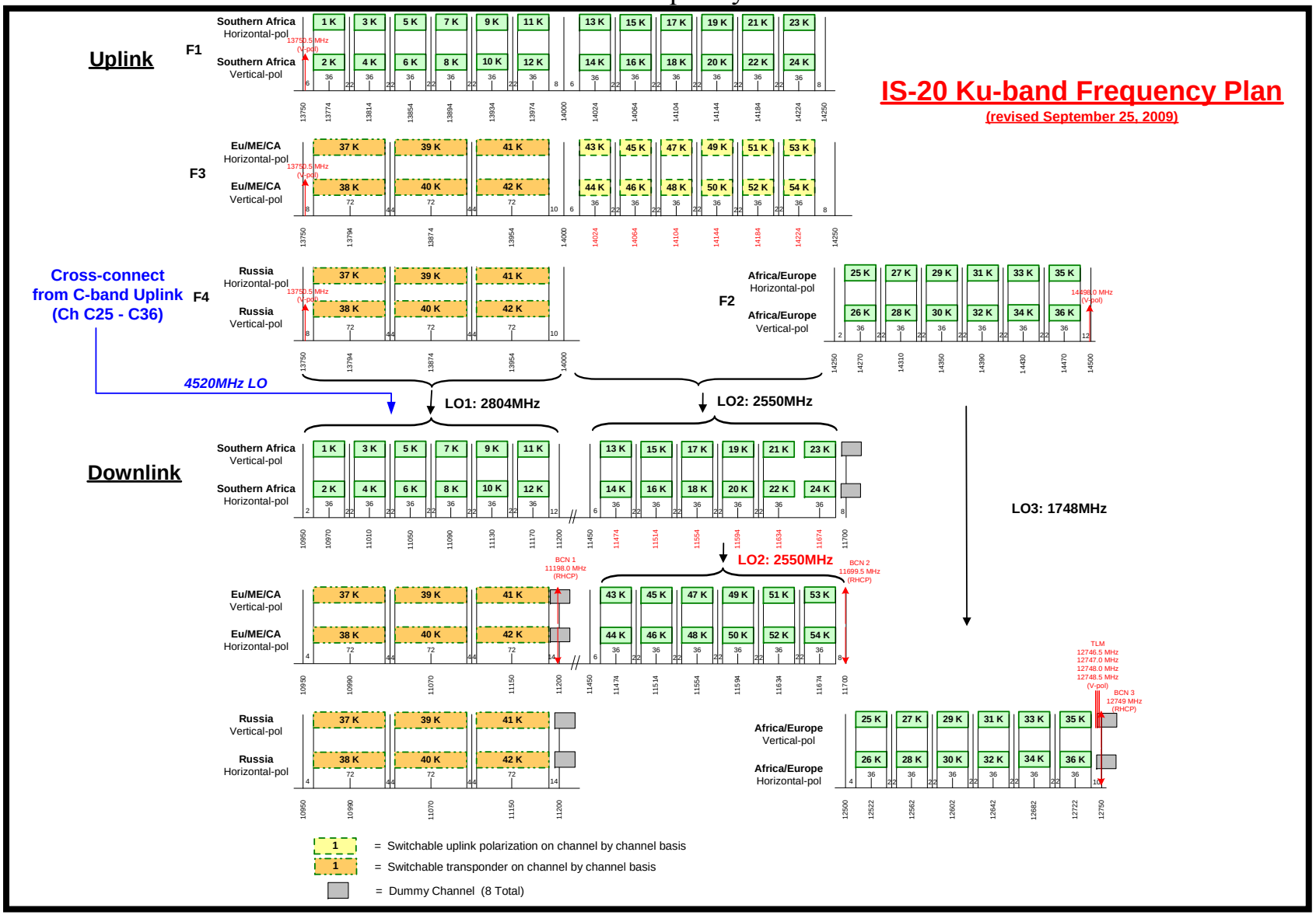


EXHIBIT 4A: FREQUENCY PLAN (continued)

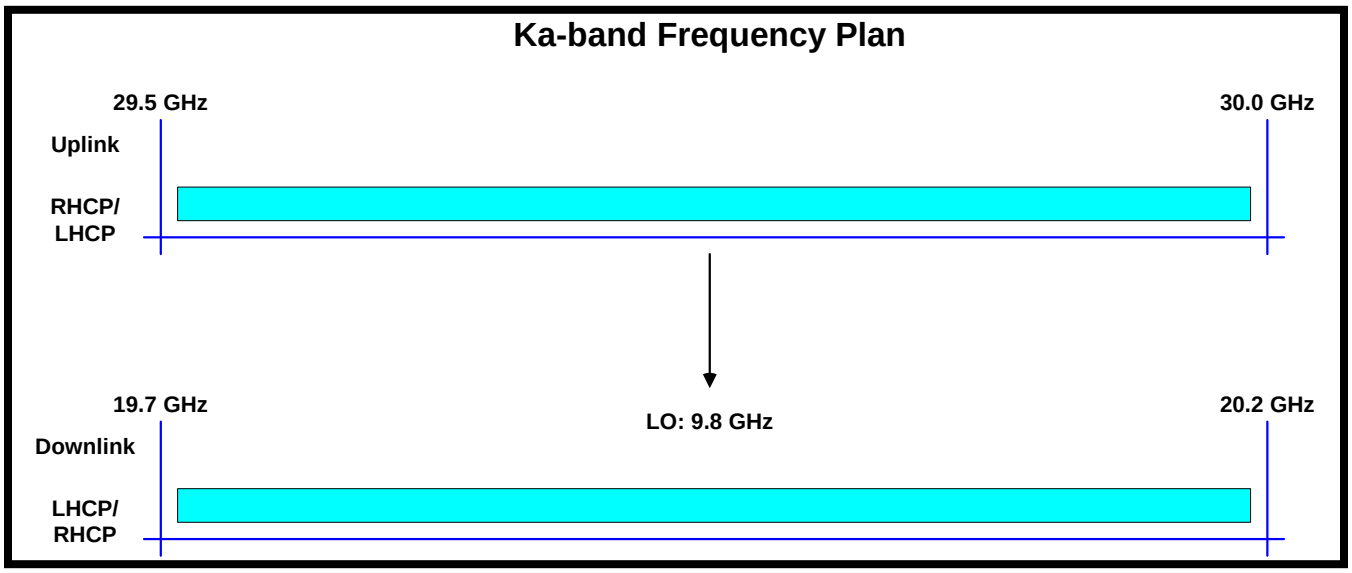


EXHIBIT 4B: FREQUENCY ASSIGNMENTS

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	Landmass	Horizontal	5955	1C	Landmass	Horizontal	3730	54	136.5
2C	Landmass	Vertical	5955	1C	Landmass	Horizontal	3730	54	136.4
3C	Landmass	Horizontal	6015	3C	Landmass	Horizontal	3790	54	136.5
4C	Landmass	Vertical	6015	3C	Landmass	Horizontal	3790	54	136.4
5C	Landmass	Horizontal	6075	5C	Landmass	Horizontal	3850	54	136.5
6C	Landmass	Vertical	6075	5C	Landmass	Horizontal	3850	54	136.4
7C	Landmass	Horizontal	6140	7C	Landmass	Horizontal	3915	60	136.5
8C	Landmass	Vertical	6140	7C	Landmass	Horizontal	3915	60	136.4
9C	Landmass	Horizontal	6199	9C	Landmass	Horizontal	3974	27	136.5
11C	Landmass	Horizontal	6229	11C	Landmass	Horizontal	4004	27	136.5
13C	Landmass	Horizontal	6259	13C	Landmass	Horizontal	4034	27	136.5
15C	Landmass	Horizontal	6289	15C	Landmass	Horizontal	4064	27	136.5
17C	Landmass	Horizontal	6319	17C	Landmass	Horizontal	4094	27	136.5
19C	Landmass	Horizontal	6349	19C	Landmass	Horizontal	4124	27	136.5
21C	Landmass	Horizontal	6379	21C	Landmass	Horizontal	4154	27	136.5
23C	Landmass	Horizontal	6409	23C	Landmass	Horizontal	4184	27	136.5
25C	Landmass	Horizontal	6450	1K	Southern Africa	Vertical	10970	36	135.9
27C	Landmass	Horizontal	6490	3K	Southern Africa	Vertical	11010	36	135.9
29C	Landmass	Horizontal	6530	5K	Southern Africa	Vertical	11050	36	135.9
31C	Landmass	Horizontal	6570	7K	Southern Africa	Vertical	11090	36	135.9
33C	Landmass	Horizontal	6610	9K	Southern Africa	Vertical	11130	36	135.9
35C	Landmass	Horizontal	6650	11K	Southern Africa	Vertical	11170	36	135.9
1C	Landmass	Horizontal	5955	2C	Landmass	Vertical	3730	54	136.6
2C	Landmass	Vertical	5955	2C	Landmass	Vertical	3730	54	136.5
3C	Landmass	Horizontal	6015	4C	Landmass	Vertical	3790	54	136.6
4C	Landmass	Vertical	6015	4C	Landmass	Vertical	3790	54	136.5
5C	Landmass	Horizontal	6075	6C	Landmass	Vertical	3850	54	136.6
6C	Landmass	Vertical	6075	6C	Landmass	Vertical	3850	54	136.5
7C	Landmass	Horizontal	6140	8C	Landmass	Vertical	3915	60	136.6
8C	Landmass	Vertical	6140	8C	Landmass	Vertical	3915	60	136.5
10C	Landmass	Vertical	6199	10C	Landmass	Vertical	3974	27	136.5
12C	Landmass	Vertical	6229	12C	Landmass	Vertical	4004	27	136.5
14C	Landmass	Vertical	6259	14C	Landmass	Vertical	4034	27	136.5
16C	Landmass	Vertical	6289	16C	Landmass	Vertical	4064	27	136.5
18C	Landmass	Vertical	6319	18C	Landmass	Vertical	4094	27	136.5
20C	Landmass	Vertical	6349	20C	Landmass	Vertical	4124	27	136.5
22C	Landmass	Vertical	6379	22C	Landmass	Vertical	4154	27	136.5
24C	Landmass	Vertical	6409	24C	Landmass	Vertical	4184	27	136.5
26C	Landmass	Vertical	6450	2K	Southern Africa	Horizontal	10970	36	135.8
28C	Landmass	Vertical	6490	4K	Southern Africa	Horizontal	11010	36	135.8
30C	Landmass	Vertical	6530	6K	Southern Africa	Horizontal	11050	36	135.8
32C	Landmass	Vertical	6570	8K	Southern Africa	Horizontal	11090	36	135.8
34C	Landmass	Vertical	6610	10K	Southern Africa	Horizontal	11130	36	135.8
36C	Landmass	Vertical	6650	12K	Southern Africa	Horizontal	11170	36	135.8

EXHIBIT 4B: FREQUENCY ASSIGNMENTS (continued)

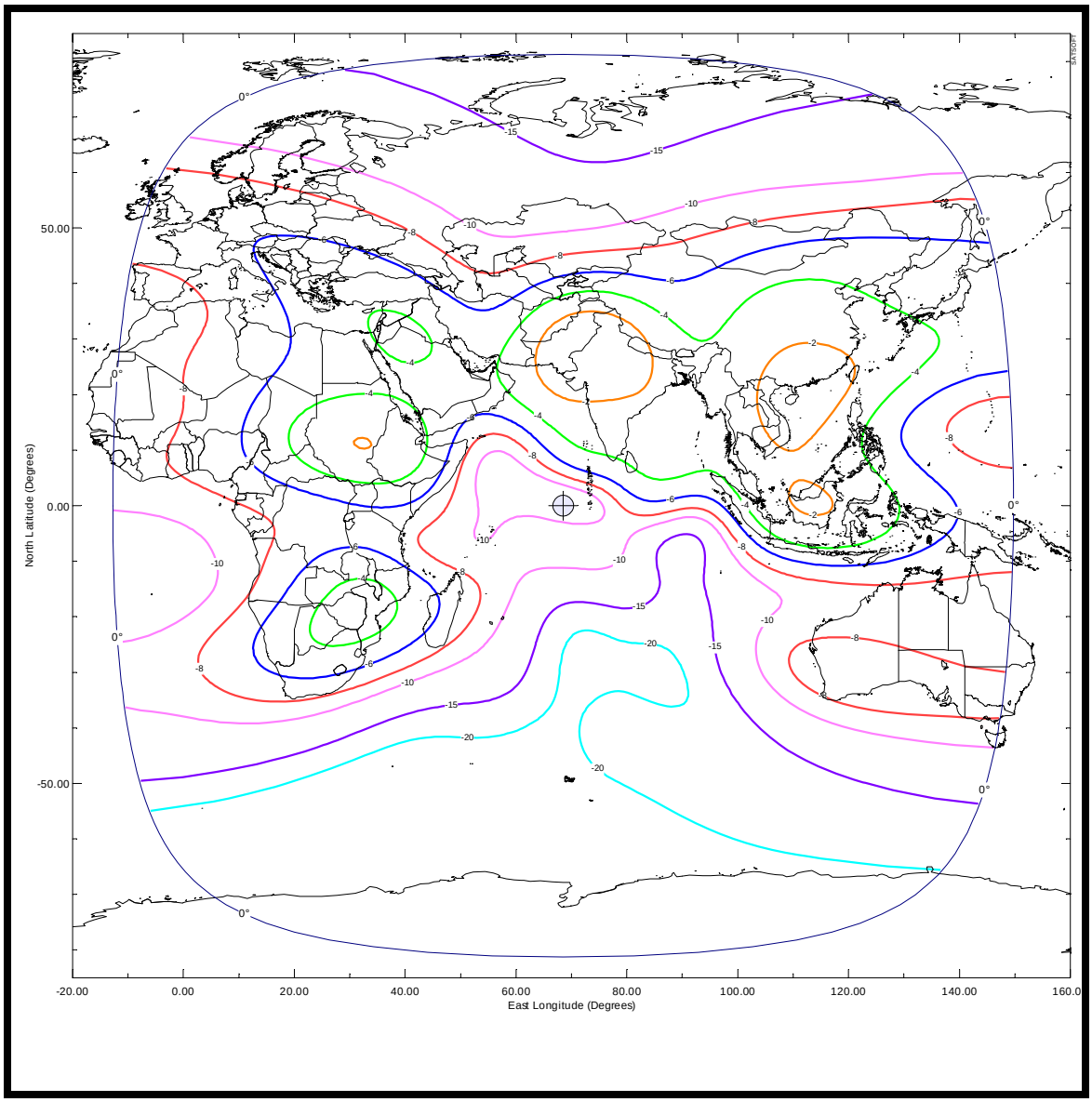
Uplink Transponder Designation	Uplink Beam Name	Uplink Polarization	Uplink Center Frequency (MHz)	Downlink Transponder Designation	Downlink Beam Name	Downlink Polarization	Downlink Center Frequency (MHz)	Channel Bandwidth (MHz)	Maximum Channel Gain (dB)
1K	Southern Africa	Horizontal	13774	1K	Southern Africa	Vertical	10970	36	129.9
3K	Southern Africa	Horizontal	13814	3K	Southern Africa	Vertical	11010	36	129.9
5K	Southern Africa	Horizontal	13854	5K	Southern Africa	Vertical	11050	36	129.9
7K	Southern Africa	Horizontal	13894	7K	Southern Africa	Vertical	11090	36	129.9
9K	Southern Africa	Horizontal	13934	9K	Southern Africa	Vertical	11130	36	129.9
11K	Southern Africa	Horizontal	13974	11K	Southern Africa	Vertical	11170	36	129.9
13K	Southern Africa	Horizontal	14024	13K	Southern Africa	Vertical	11474	36	129.9
15K	Southern Africa	Horizontal	14064	15K	Southern Africa	Vertical	11514	36	129.9
17K	Southern Africa	Horizontal	14104	17K	Southern Africa	Vertical	11554	36	129.9
19K	Southern Africa	Horizontal	14144	19K	Southern Africa	Vertical	11594	36	129.9
21K	Southern Africa	Horizontal	14184	21K	Southern Africa	Vertical	11634	36	129.9
23K	Southern Africa	Horizontal	14224	23K	Southern Africa	Vertical	11674	36	129.9
25K	Africa/Europe	Horizontal	14270	25K	Africa/Europe	Vertical	12522	36	132.1
27K	Africa/Europe	Horizontal	14310	27K	Africa/Europe	Vertical	12562	36	132.1
29K	Africa/Europe	Horizontal	14350	29K	Africa/Europe	Vertical	12602	36	132.1
31K	Africa/Europe	Horizontal	14390	31K	Africa/Europe	Vertical	12642	36	132.1
33K	Africa/Europe	Horizontal	14430	33K	Africa/Europe	Vertical	12682	36	132.1
35K	Africa/Europe	Horizontal	14470	35K	Africa/Europe	Vertical	12722	36	132.1
37K	Eu/ME/CA	Horizontal	13794	37K	Eu/ME/CA	Vertical	10990	72	132.9
39K	Eu/ME/CA	Horizontal	13874	39K	Eu/ME/CA	Vertical	11070	72	132.9
41K	Eu/ME/CA	Horizontal	13954	41K	EU/ME/CA	Vertical	11150	72	132.9
37K	Eu/ME/CA	Horizontal	13794	37K	Russia	Vertical	10990	72	133.1
39K	Eu/ME/CA	Horizontal	13874	39K	Russia	Vertical	11070	72	133.1
41K	Eu/ME/CA	Horizontal	13954	41K	Russia	Vertical	11150	72	133.1
37K	Russia	Horizontal	13794	37K	Russia	Vertical	10990	72	129.8
39K	Russia	Horizontal	13874	39K	Russia	Vertical	11070	72	129.8
41K	Russia	Horizontal	13954	41K	Russia	Vertical	11150	72	129.8
37K	Russia	Horizontal	13794	37K	Eu/ME/CA	Vertical	10990	72	129.6
39K	Russia	Horizontal	13874	39K	Eu/ME/CA	Vertical	11070	72	129.6
41K	Russia	Horizontal	13954	41K	EU/ME/CA	Vertical	11150	72	129.6
43K	Eu/ME/CA	Horizontal	14024	43K	Eu/ME/CA	Vertical	11474	36	132.9
44K	Eu/ME/CA	Vertical	14024	43K	Eu/ME/CA	Vertical	11474	36	133.0
45K	Eu/ME/CA	Horizontal	14064	45K	Eu/ME/CA	Vertical	11514	36	132.9
46K	Eu/ME/CA	Vertical	14064	45K	Eu/ME/CA	Vertical	11514	36	133.0
47K	Eu/ME/CA	Horizontal	14104	47K	Eu/ME/CA	Vertical	11554	36	132.9
48K	Eu/ME/CA	Vertical	14104	47K	Eu/ME/CA	Vertical	11554	36	133.0
49K	Eu/ME/CA	Horizontal	14144	49K	Eu/ME/CA	Vertical	11594	36	132.9
50K	Eu/ME/CA	Vertical	14144	49K	Eu/ME/CA	Vertical	11594	36	133.0
51K	Eu/ME/CA	Horizontal	14184	51K	Eu/ME/CA	Vertical	11634	36	132.9
52K	Eu/ME/CA	Vertical	14184	51K	Eu/ME/CA	Vertical	11634	36	133.0
53K	Eu/ME/CA	Horizontal	14224	53K	Eu/ME/CA	Vertical	11674	36	132.9
54K	Eu/ME/CA	Vertical	14224	53K	Eu/ME/CA	Vertical	11674	36	133.0
2K	Southern Africa	Vertical	13774	2K	Southern Africa	Horizontal	10970	36	129.9
4K	Southern Africa	Vertical	13814	4K	Southern Africa	Horizontal	11010	36	129.9
6K	Southern Africa	Vertical	13854	6K	Southern Africa	Horizontal	11050	36	129.9
8K	Southern Africa	Vertical	13894	8K	Southern Africa	Horizontal	11090	36	129.9
10K	Southern Africa	Vertical	13934	10K	Southern Africa	Horizontal	11130	36	129.9
12K	Southern Africa	Vertical	13974	12K	Southern Africa	Horizontal	11170	36	129.9
14K	Southern Africa	Vertical	14024	14K	Southern Africa	Horizontal	11474	36	129.9
16K	Southern Africa	Vertical	14064	16K	Southern Africa	Horizontal	11514	36	129.9
18K	Southern Africa	Vertical	14104	18K	Southern Africa	Horizontal	11554	36	129.9
20K	Southern Africa	Vertical	14144	20K	Southern Africa	Horizontal	11594	36	129.9
22K	Southern Africa	Vertical	14184	22K	Southern Africa	Horizontal	11634	36	129.9
24K	Southern Africa	Vertical	14224	24K	Southern Africa	Horizontal	11674	36	129.9

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)
26K	Africa/Europe	Vertical	14270	26K	Africa/Europe	Horizontal	12522	36	132.2
28K	Africa/Europe	Vertical	14310	28K	Africa/Europe	Horizontal	12562	36	132.2
30K	Africa/Europe	Vertical	14350	30K	Africa/Europe	Horizontal	12602	36	132.2
32K	Africa/Europe	Vertical	14390	32K	Africa/Europe	Horizontal	12642	36	132.2
34K	Africa/Europe	Vertical	14430	34K	Africa/Europe	Horizontal	12682	36	132.2
36K	Africa/Europe	Vertical	14470	36K	Africa/Europe	Horizontal	12722	36	132.2
38K	Eu/ME/CA	Vertical	13794	38K	Eu/ME/CA	Horizontal	10990	72	133.1
40K	Eu/ME/CA	Vertical	13874	40K	Eu/ME/CA	Horizontal	11070	72	133.1
42K	Eu/ME/CA	Vertical	13954	42K	EU/ME/CA	Horizontal	11150	72	133.1
38K	Eu/ME/CA	Vertical	13794	38K	Russia	Horizontal	10990	72	133.2
40K	Eu/ME/CA	Vertical	13874	40K	Russia	Horizontal	11070	72	133.2
42K	Eu/ME/CA	Vertical	13954	42K	Russia	Horizontal	11150	72	133.2
38K	Russia	Vertical	13794	38K	Russia	Horizontal	10990	72	129.7
40K	Russia	Vertical	13874	40K	Russia	Horizontal	11070	72	129.7
42K	Russia	Vertical	13954	42K	Russia	Horizontal	11150	72	129.7
38K	Russia	Vertical	13794	38K	Eu/ME/CA	Horizontal	10990	72	129.6
40K	Russia	Vertical	13874	40K	Eu/ME/CA	Horizontal	11070	72	129.6
42K	Russia	Vertical	13954	42K	EU/ME/CA	Horizontal	11150	72	129.6
43K	Eu/ME/CA	Horizontal	14024	44K	Eu/ME/CA	Horizontal	11474	36	133.0
44K	Eu/ME/CA	Vertical	14024	44K	Eu/ME/CA	Horizontal	11474	36	133.1
45K	Eu/ME/CA	Horizontal	14064	46K	Eu/ME/CA	Horizontal	11514	36	133.0
46K	Eu/ME/CA	Vertical	14064	46K	Eu/ME/CA	Horizontal	11514	36	133.1
47K	Eu/ME/CA	Horizontal	14104	48K	Eu/ME/CA	Horizontal	11554	36	133.0
48K	Eu/ME/CA	Vertical	14104	48K	Eu/ME/CA	Horizontal	11554	36	133.1
49K	Eu/ME/CA	Horizontal	14144	50K	Eu/ME/CA	Horizontal	11594	36	133.0
50K	Eu/ME/CA	Vertical	14144	50K	Eu/ME/CA	Horizontal	11594	36	133.1
51K	Eu/ME/CA	Horizontal	14184	52K	Eu/ME/CA	Horizontal	11634	36	133.0
52K	Eu/ME/CA	Vertical	14184	52K	Eu/ME/CA	Horizontal	11634	36	133.1
53K	Eu/ME/CA	Horizontal	14224	54K	Eu/ME/CA	Horizontal	11674	36	133.0
54K	Eu/ME/CA	Vertical	14224	54K	Eu/ME/CA	Horizontal	11674	36	133.1
1KA	KA	Right Hand Circular	29750	1KA	KA	Left Hand Circular	19950	500	122.8
1KA	KA	Right Hand Circular	29750	2KA	KA	Right Hand Circular	19950	500	122.8
2KA	KA	Left Hand Circular	29750	1KA	KA	Left Hand Circular	19950	500	122.8
2KA	KA	Left Hand Circular	29750	2KA	KA	Right Hand Circular	19950	500	122.8
				BCN1	Global	Right Hand Circular	3694	0.025	
				BCN2	Global	Right Hand Circular	11198	0.025	
				BCN3	Global	Right Hand Circular	11699.5	0.025	
				BCN4	Global	Right Hand Circular	12749	0.025	
CMD1	Global	Vertical	13750.5					1	
CMD2	Global	Vertical	14498					1	
CMD3	Global	Left Hand Circular	13750.5					1	
CMD4	Global	Left Hand Circular	14498					1	
				TLM1	Global	Vertical	12746.5	0.5	
				TLM2	Global	Vertical	12747.0	0.5	
				TLM3	Global	Vertical	12748.0	0.5	
				TLM4	Global	Vertical	12748.5	0.5	
				TLM1	Global	Left Hand Circular	12746.5	0.5	
				TLM2	Global	Left Hand Circular	12747.0	0.5	
				TLM3	Global	Left Hand Circular	12748.0	0.5	
				TLM4	Global	Left Hand Circular	12748.5	0.5	

EXHIBIT 5A-1: LANDMASS RECEIVE BEAM
(Schedule S Beam ID: LHUL)

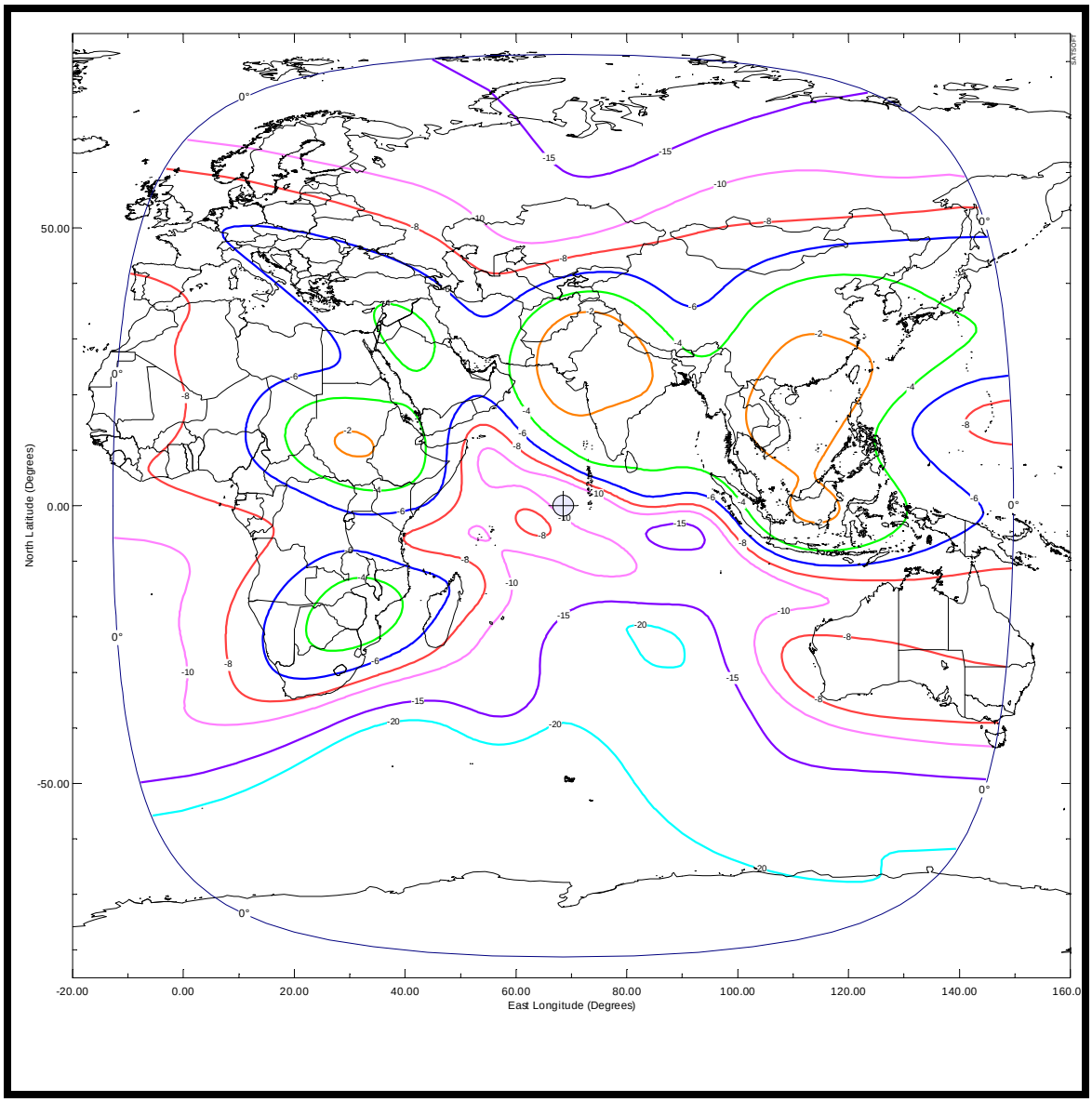
Beam Polarization: Horizontal
Peak Beam Gain: 28.0 dBi
Peak Beam G/T: 0.4 dB/K
Saturated Flux Density @ Peak Beam G/T: -111.9 to -76.9 dBW/m^2



Note: In C-to-Ku band cross-strapping mode the beam peak G/T is 0.7 dB/K and the beam peak SFD ranges from -108.6 to -76.6 dBW/m^2.

EXHIBIT 5A-2: LANDMASS RECEIVE BEAM
(Schedule S Beam ID: LVUL)

Beam Polarization: Vertical
Peak Beam Gain: 27.8 dBi
Peak Beam G/T: 0.3 dB/K
Saturated Flux Density @ Peak Beam G/T: -111.6 to -76.6 dBW/m^2



Note: In C-to-Ku band cross-strapping mode the beam peak G/T is 0.4 dB/K and the beam peak SFD ranges from -108.3 to -76.3 dBW/m^2.

EXHIBIT 5A-3: SOUTHERN AFRICA RECEIVE BEAM
(Schedule S Beam ID: SHUL)

Beam Polarization: Horizontal
Peak Beam Gain: 39.4 dBi
Peak Beam G/T: 10.6 dB/K
Saturated Flux Density @ Peak Beam G/T: -107.4 to -81.4 dBW/m^2

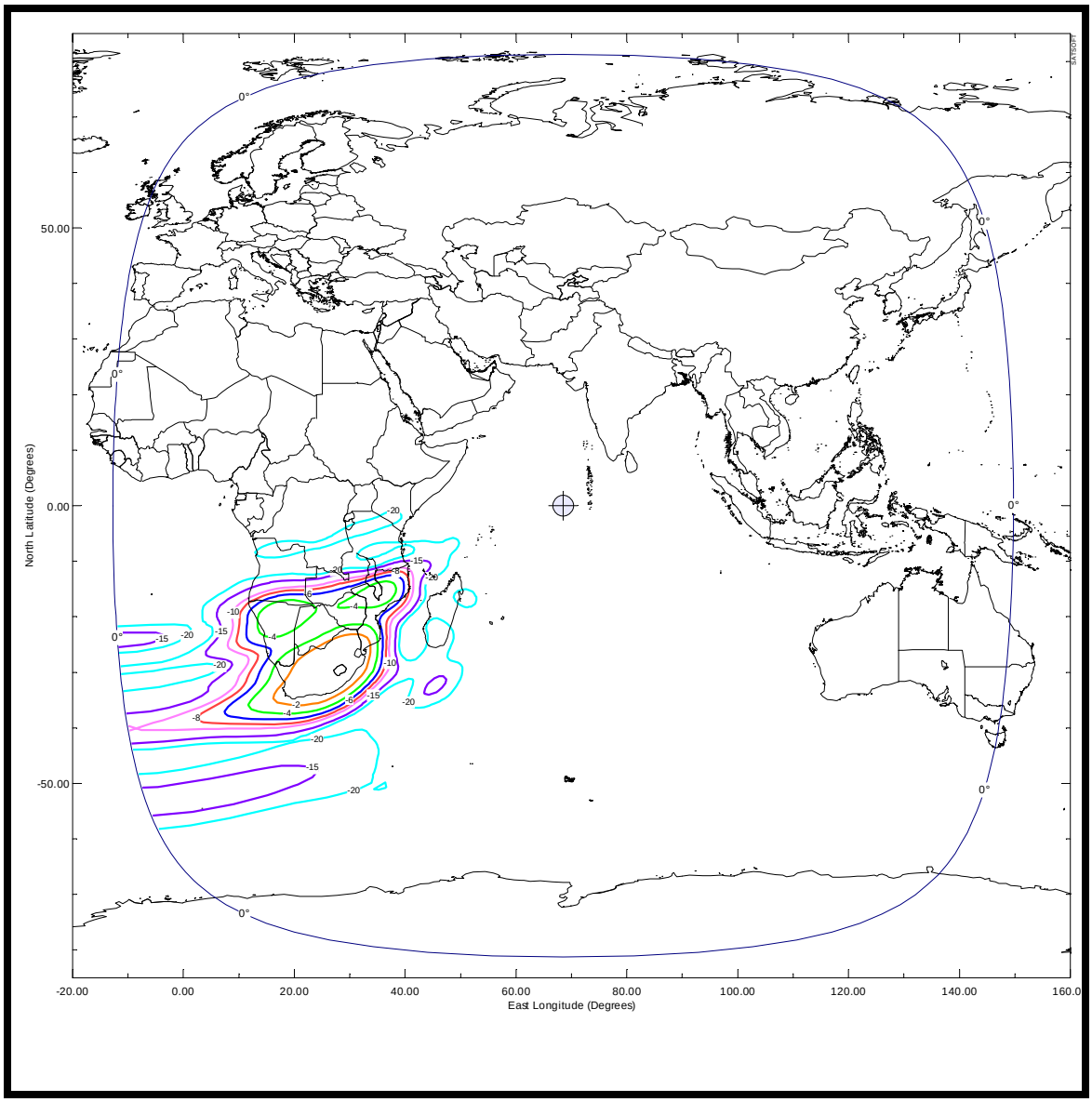


EXHIBIT 5A-4: SOUTHERN AFRICA RECEIVE BEAM
(Schedule S Beam ID: SVUL)

Beam Polarization: Vertical
Peak Beam Gain: 39.4 dBi
Peak Beam G/T: 10.6 dB/K
Saturated Flux Density @ Peak Beam G/T: -107.4 to -81.4 dBW/m^2

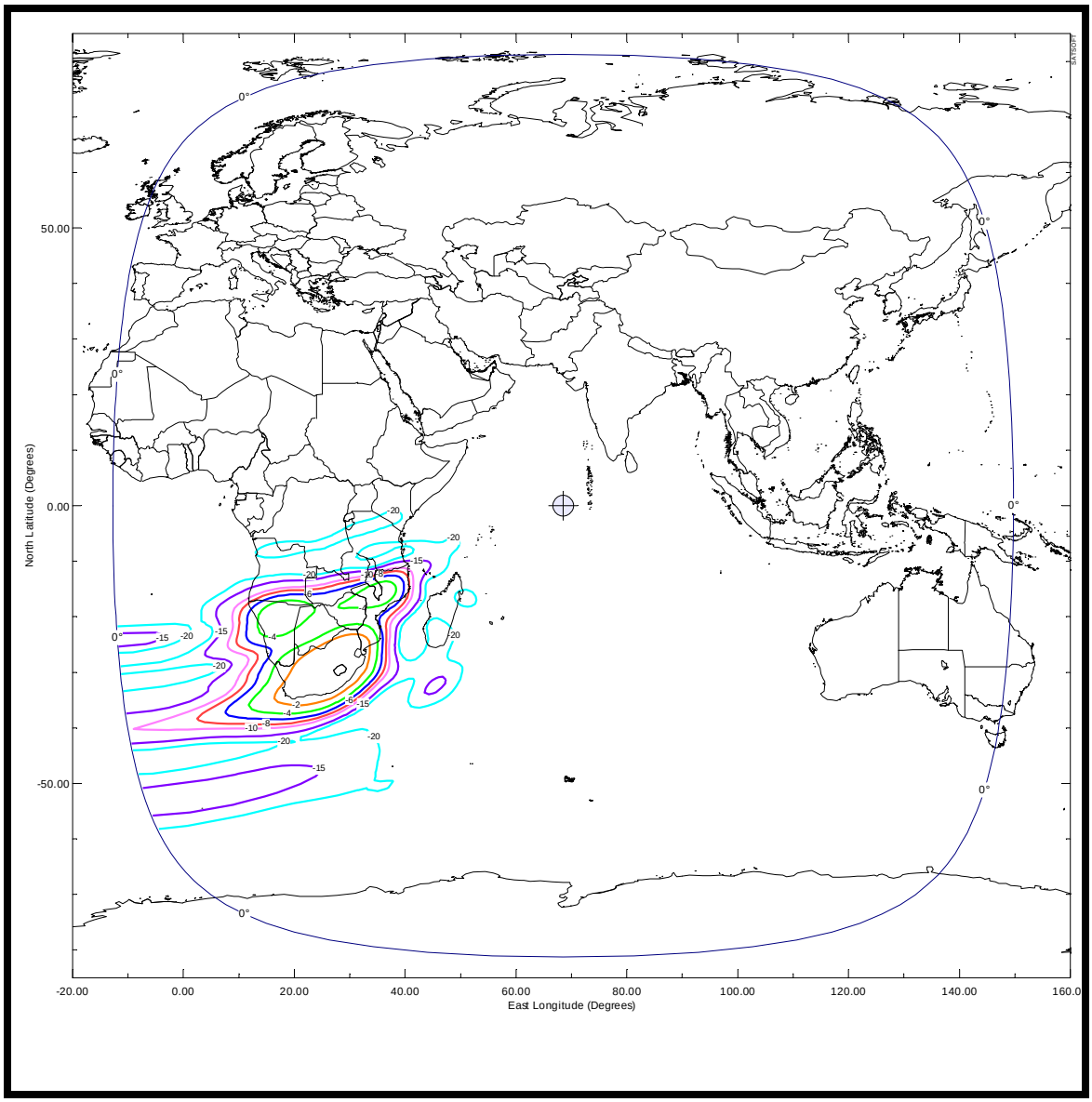


EXHIBIT 5A-5: EUROPE-MIDDLE EAST-CENTRAL ASIA RECEIVE BEAM
(Schedule S Beam ID: EHUL)

Beam Polarization: Horizontal
Peak Beam Gain: 32.5 dBi
Peak Beam G/T: 4.1 dB/K
Saturated Flux Density @ Peak Beam G/T: -102.3 to -76.3 dBW/m^2

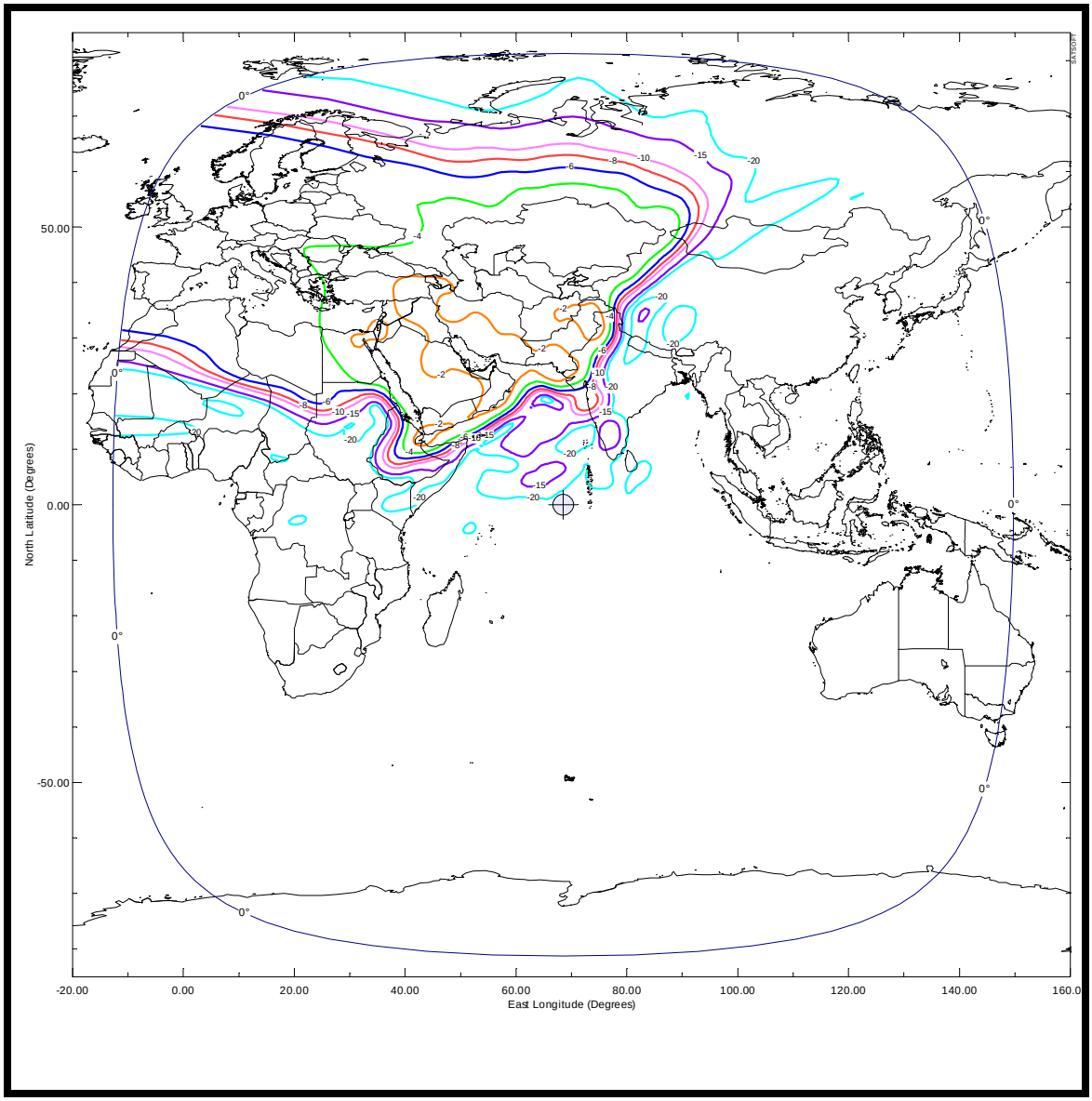


EXHIBIT 5A-6: EUROPE-MIDDLE EAST-CENTRAL ASIA RECEIVE BEAM
(Schedule S Beam ID: EVUL)

Beam Polarization: Vertical
Peak Beam Gain: 32.4 dBi
Peak Beam G/T: 4.0 dB/K
Saturated Flux Density @ Peak Beam G/T: -102.3 to -76.3 dBW/m^2

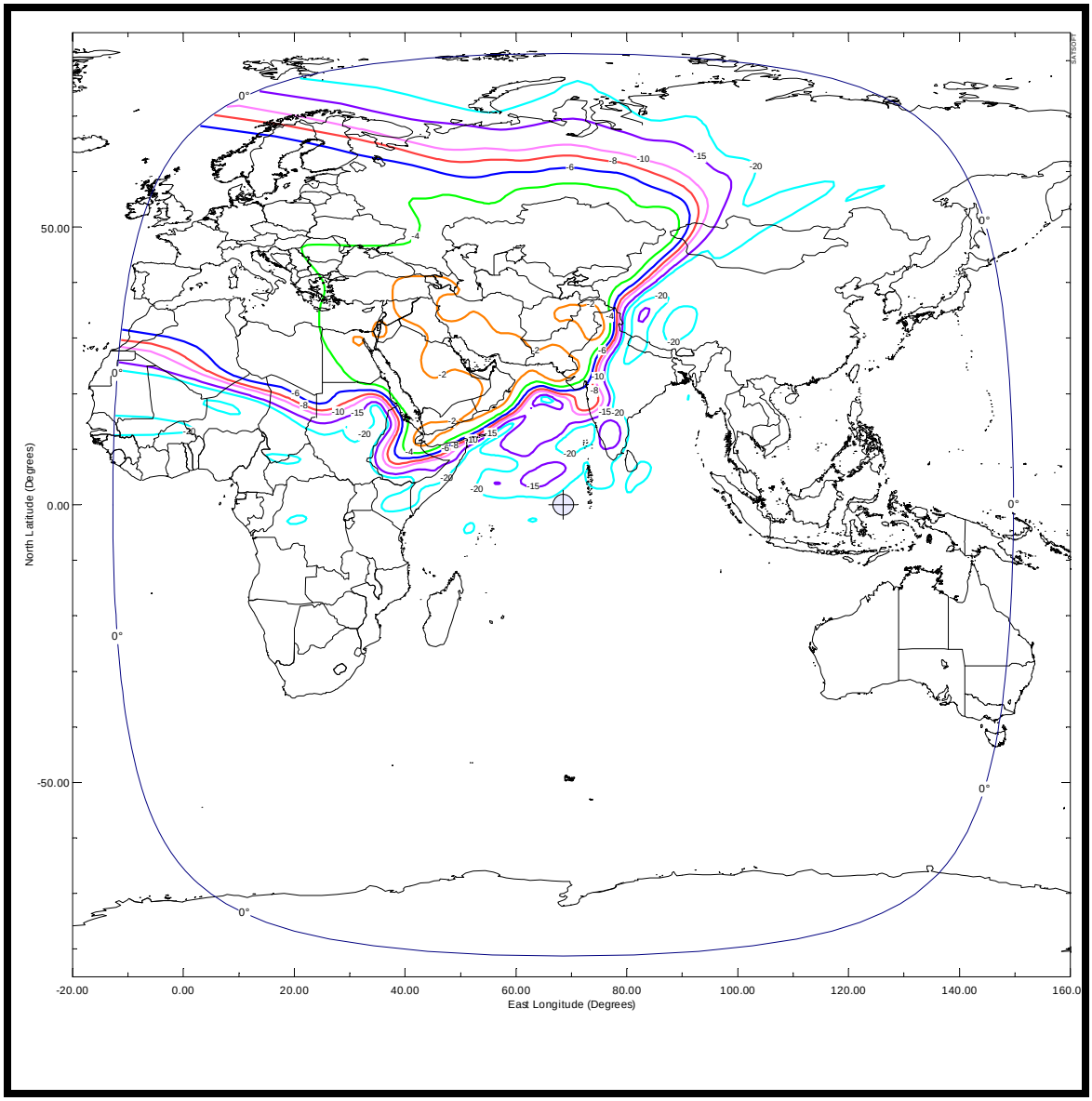


EXHIBIT 5A-7: RUSSIA RECEIVE BEAM
(Schedule S Beam ID: RHUL)

Beam Polarization: Horizontal
Peak Beam Gain: 32.1 dBi
Peak Beam G/T: 3.6 dB/K
Saturated Flux Density @ Peak Beam G/T: -98.7 to -72.7 dBW/m^2

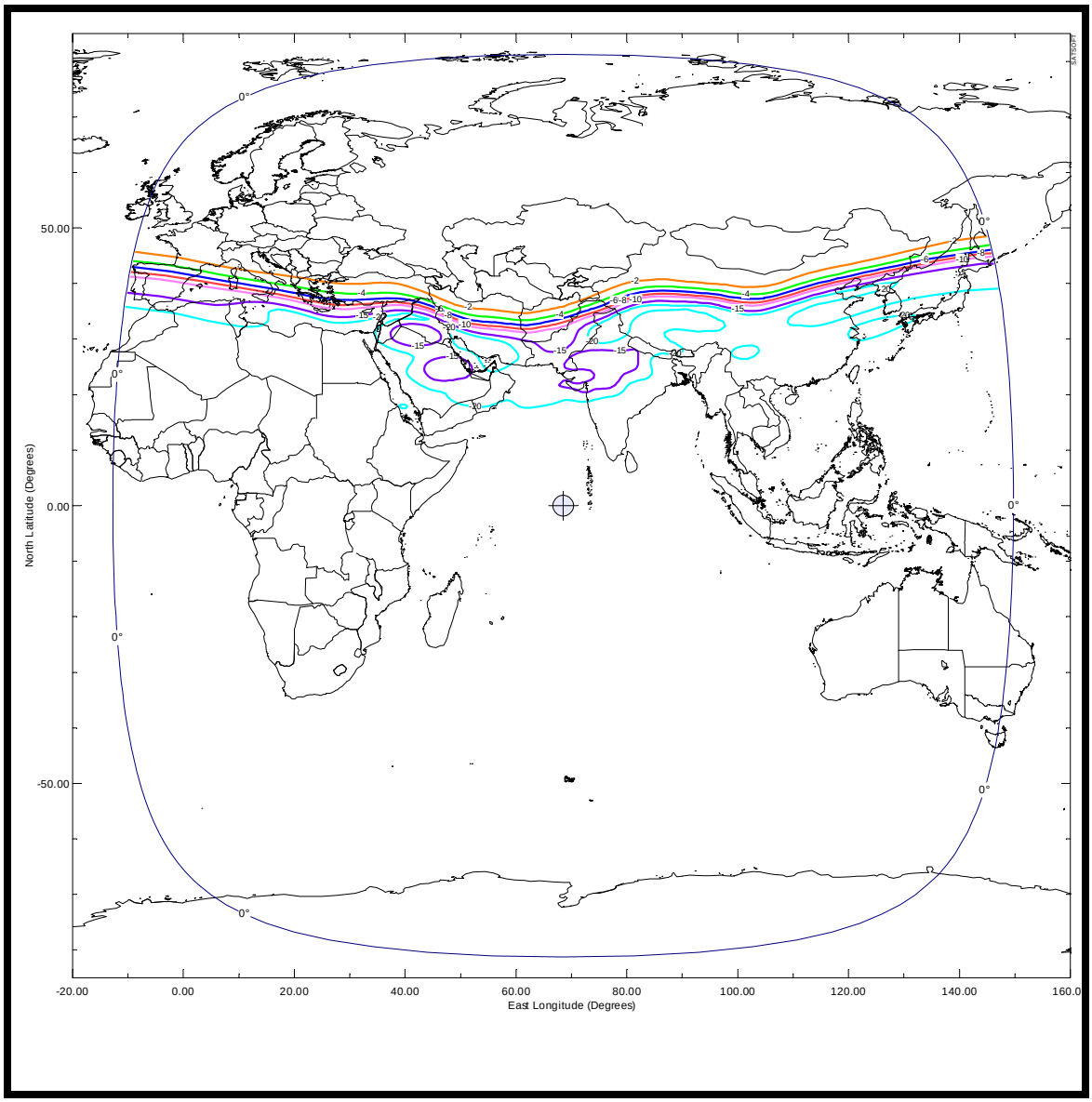


EXHIBIT 5A-8: RUSSIA RECEIVE BEAM
(Schedule S Beam ID: RVUL)

Beam Polarization: Vertical
Peak Beam Gain: 32.2 dBi
Peak Beam G/T: 3.6 dB/K
Saturated Flux Density @ Peak Beam G/T: -98.7 to -72.7 dBW/m^2

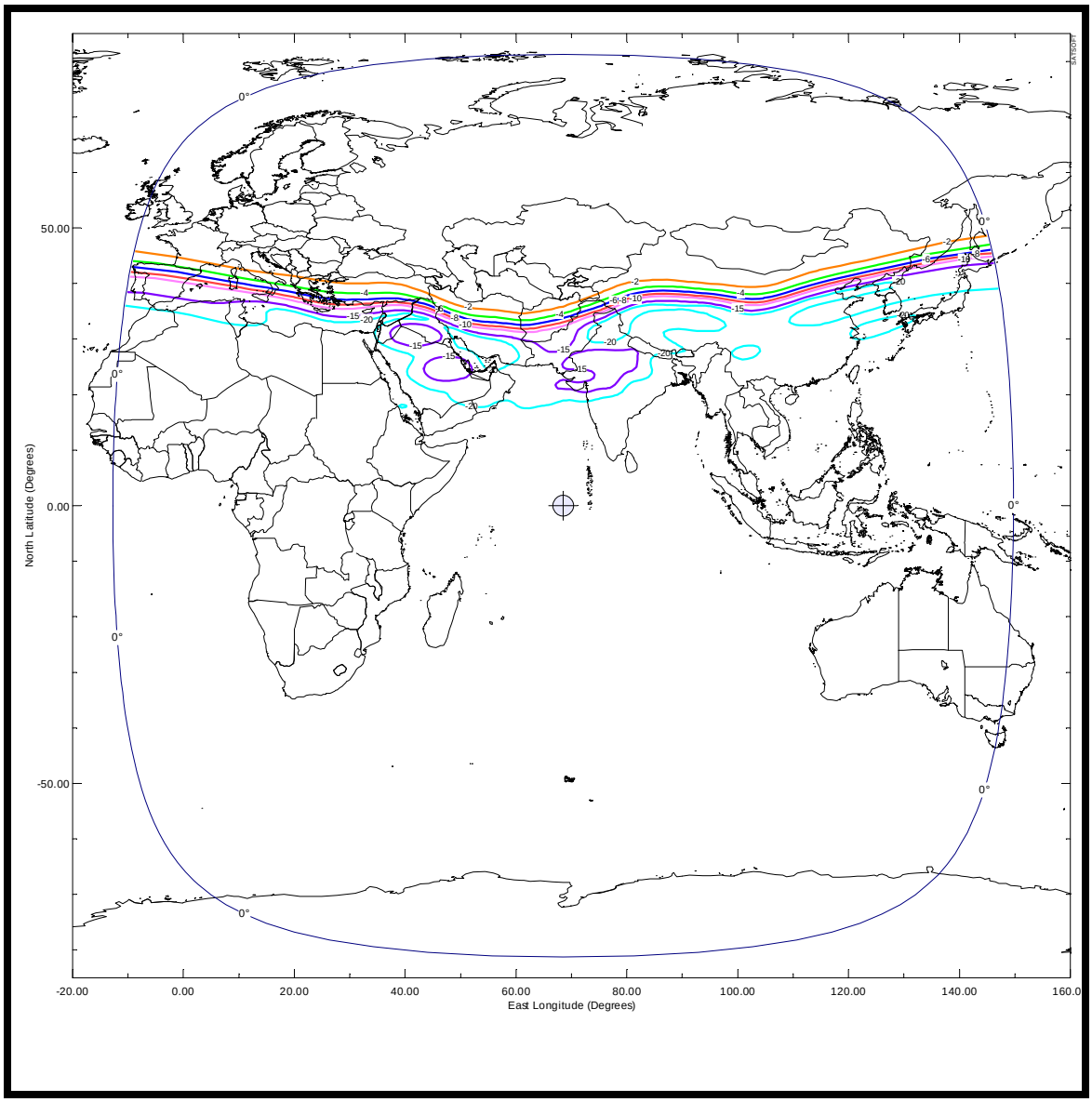


EXHIBIT 5A-9: AFRICA-EUROPE RECEIVE BEAM
(Schedule S Beam ID: AHUL)

Beam Polarization: Horizontal
Peak Beam Gain: 30.4 dBi
Peak Beam G/T: 1.9 dB/K
Saturated Flux Density @ Peak Beam G/T: -99.4 to -73.4 dBW/m^2

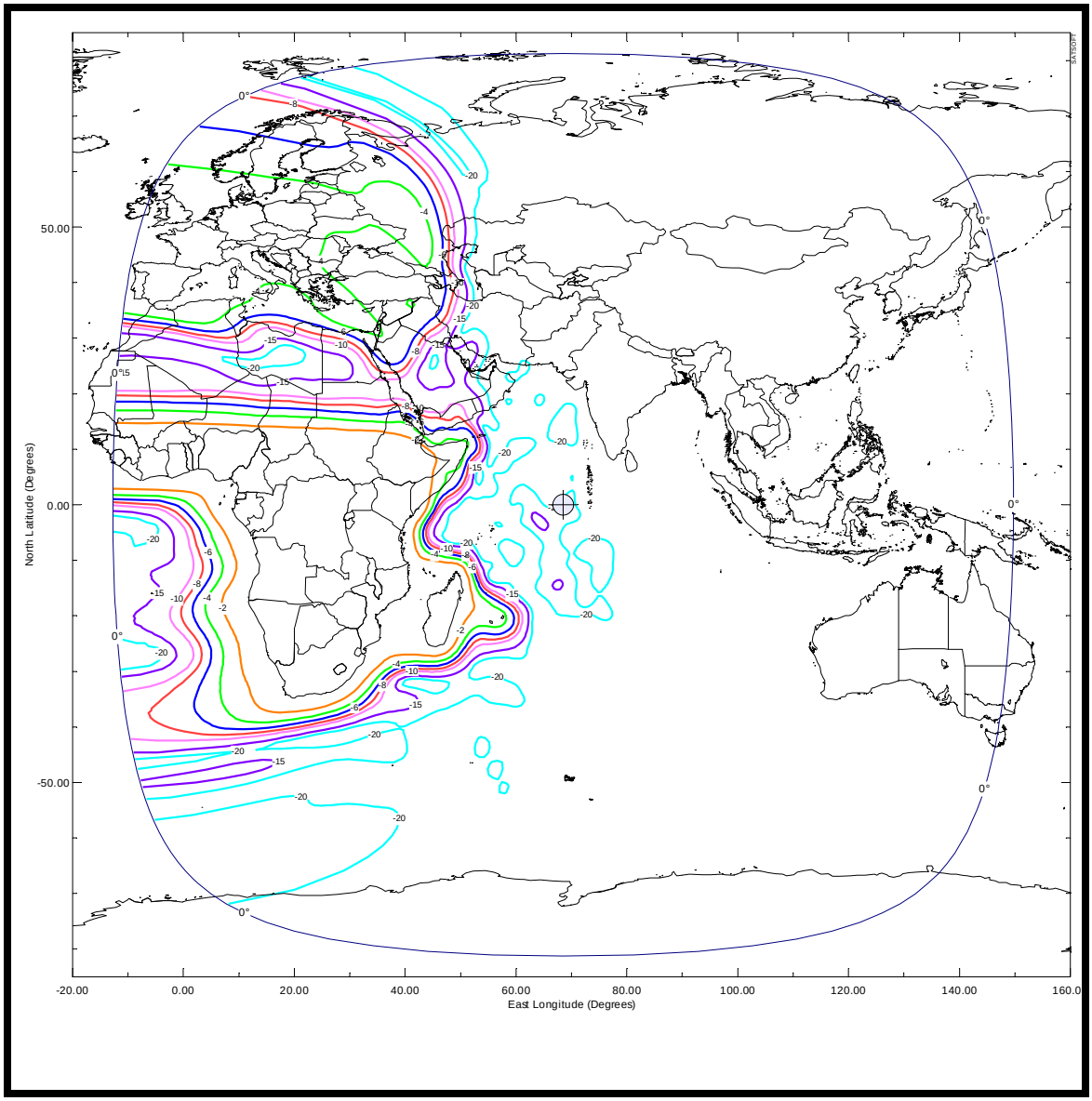


EXHIBIT 5A-10: AFRICA-EUROPE RECEIVE BEAM
(Schedule S Beam ID: AVUL)

Beam Polarization: Vertical
Peak Beam Gain: 30.3 dBi
Peak Beam G/T: 1.8 dB/K
Saturated Flux Density @ Peak Beam G/T: -99.4 to -73.4 dBW/m^2

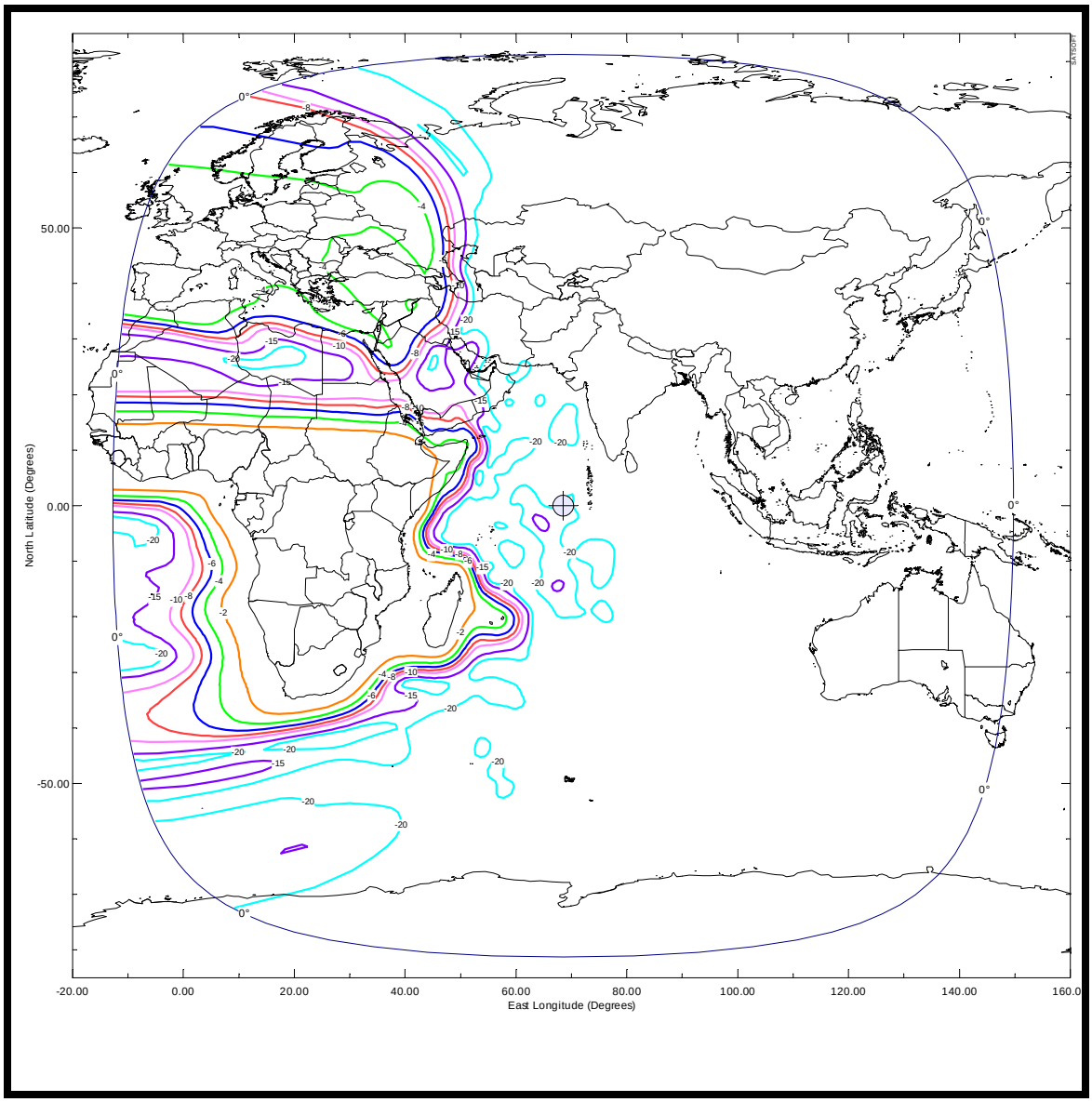


EXHIBIT 5A-11: KA RECEIVE BEAM
(Schedule S Beam ID: KRUL)

Beam Polarization: Right Hand Circular
Peak Beam Gain: 36.7 dBi
Peak Beam G/T: 5.1 dB/K
Saturated Flux Density @ Peak Beam G/T: -90.8 to -76.8 dBW/m^2

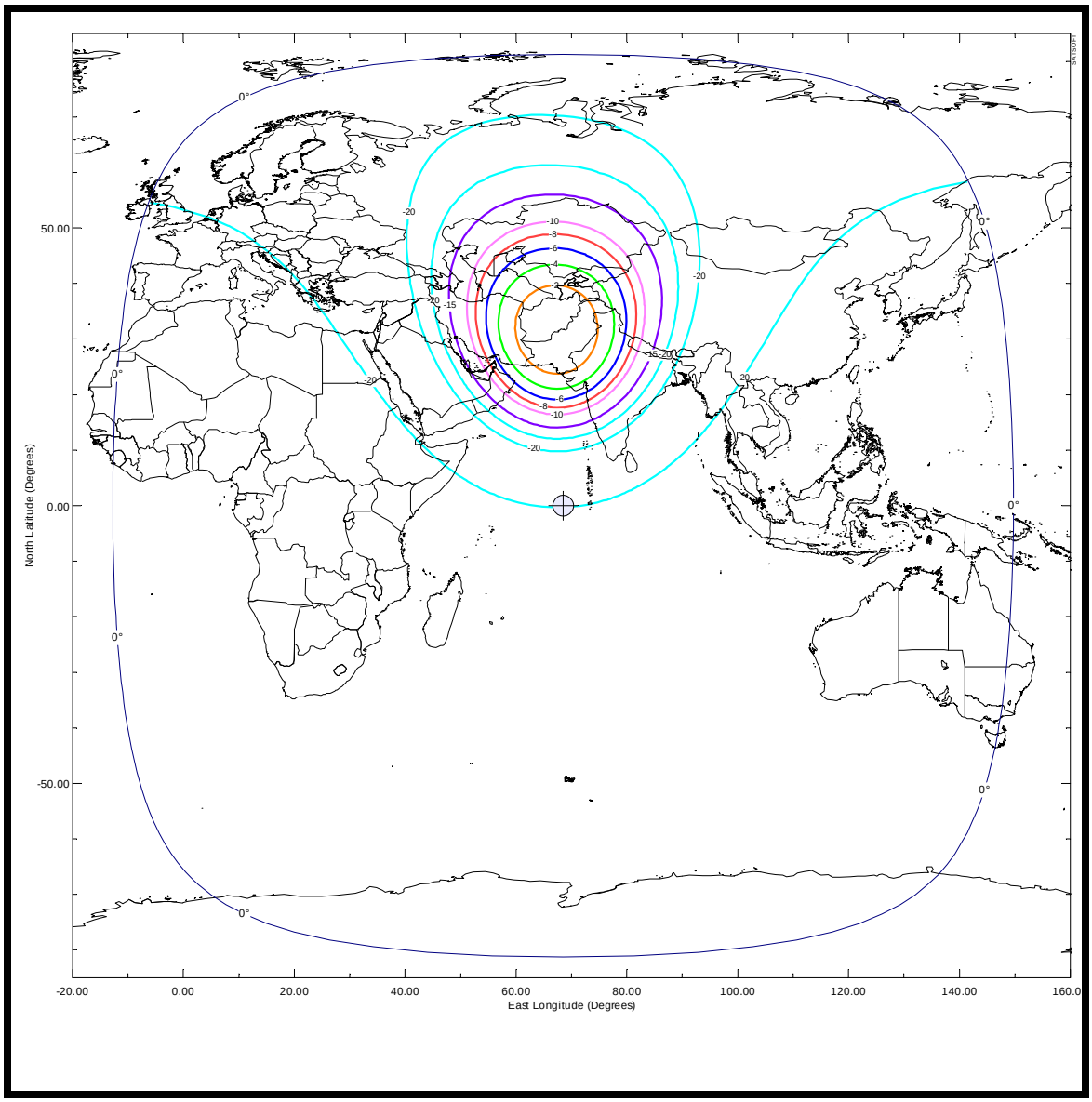


EXHIBIT 5A-12: KA RECEIVE BEAM
(Schedule S Beam ID: KLUL)

Beam Polarization: Left Hand Circular
Peak Beam Gain: 36.7 dBi
Peak Beam G/T: 5.1 dB/K
Saturated Flux Density @ Peak Beam G/T: -90.8 to -76.8 dBW/m^2

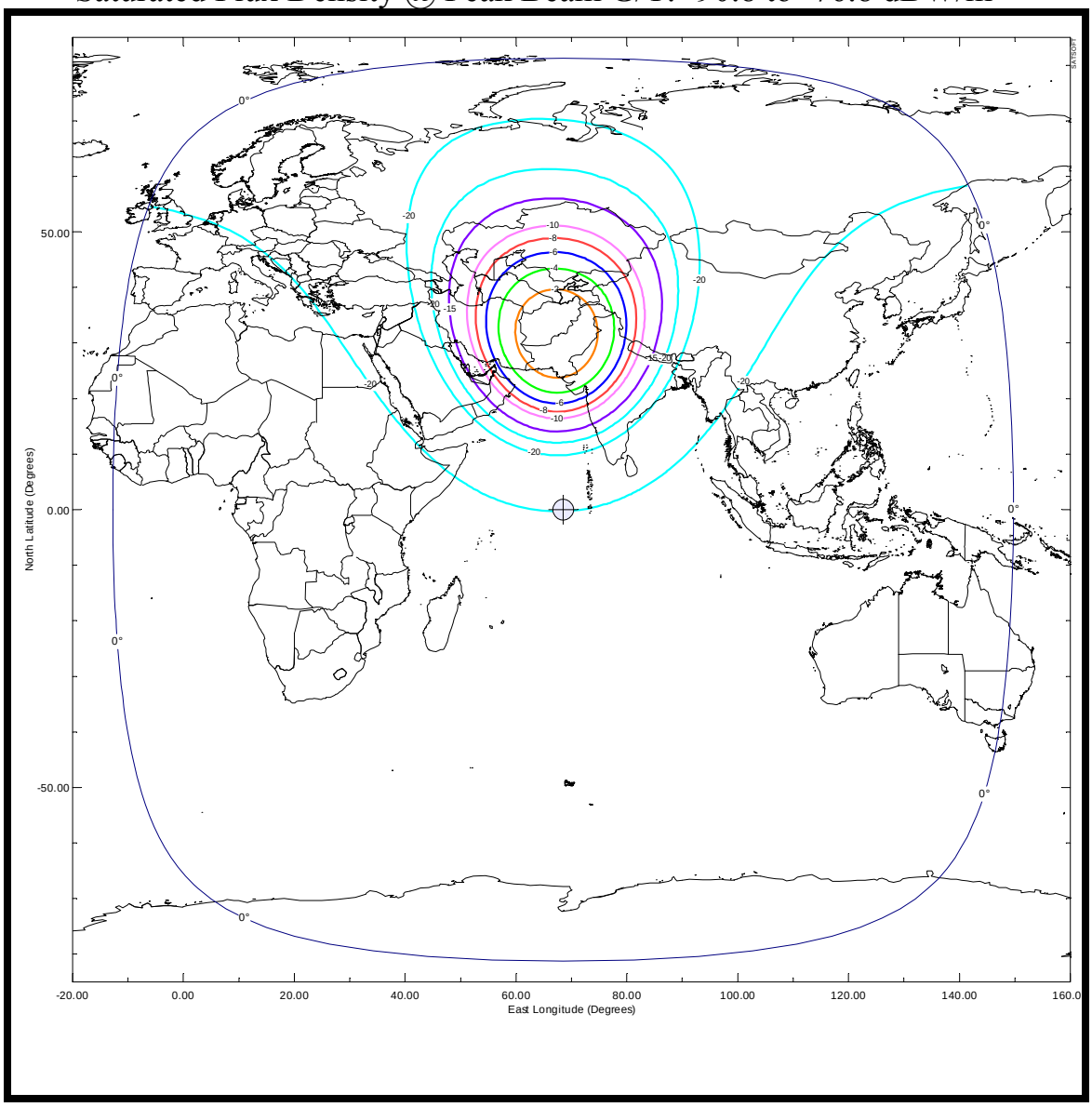


EXHIBIT 5A-13: LANDMASS TRANSMIT BEAM
(Schedule S Beam ID: LHDL)

Beam Polarization: Horizontal
Peak Beam Gain: 25.6 dBi
Peak Beam EIRP: 40.9 dBW

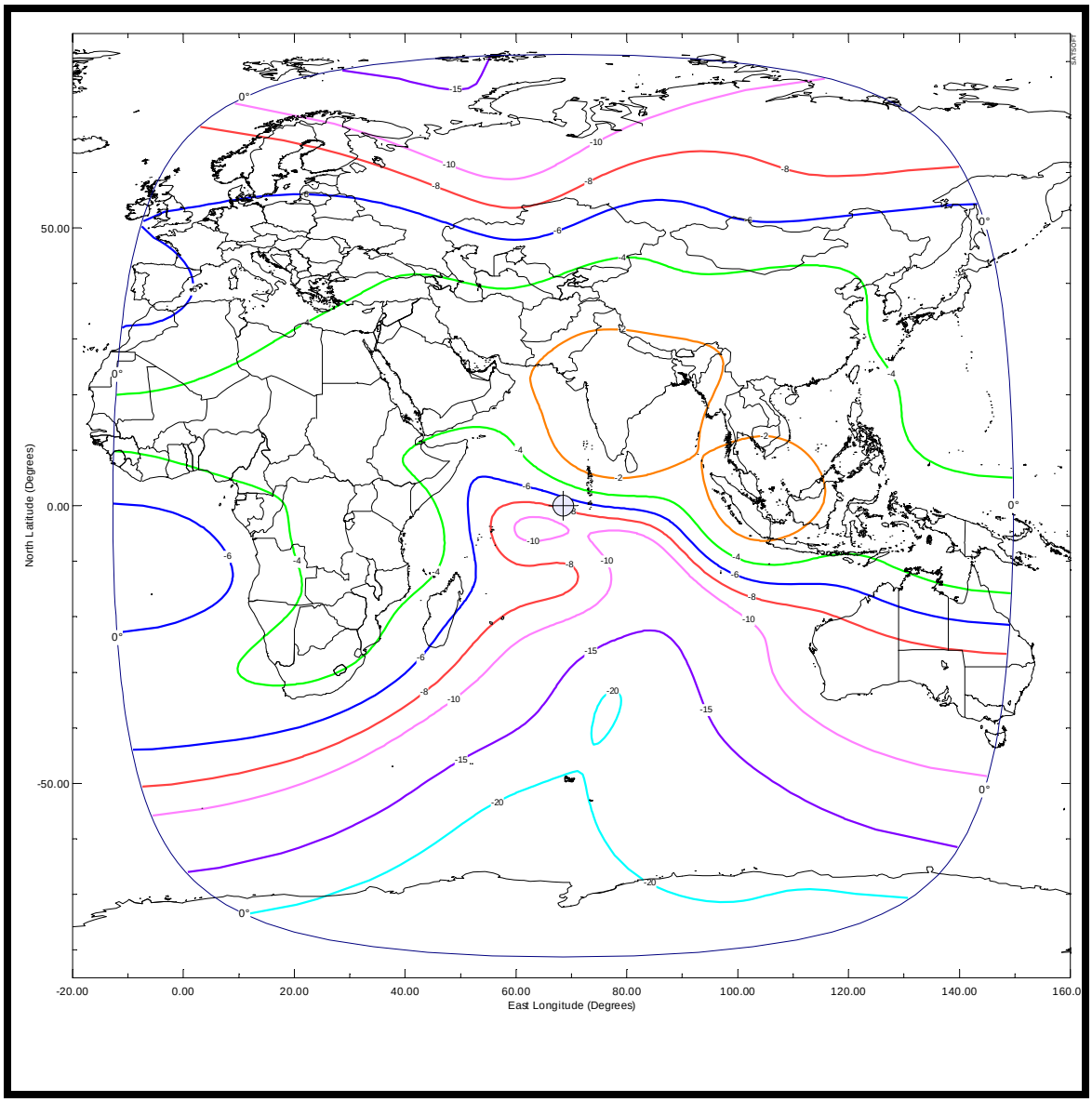


EXHIBIT 5A-14: LANDMASS TRANSMIT BEAM
(Schedule S Beam ID: LVDL)

Beam Polarization: Vertical
Peak Beam Gain: 25.8 dBi
Peak Beam EIRP: 41.2 dBW

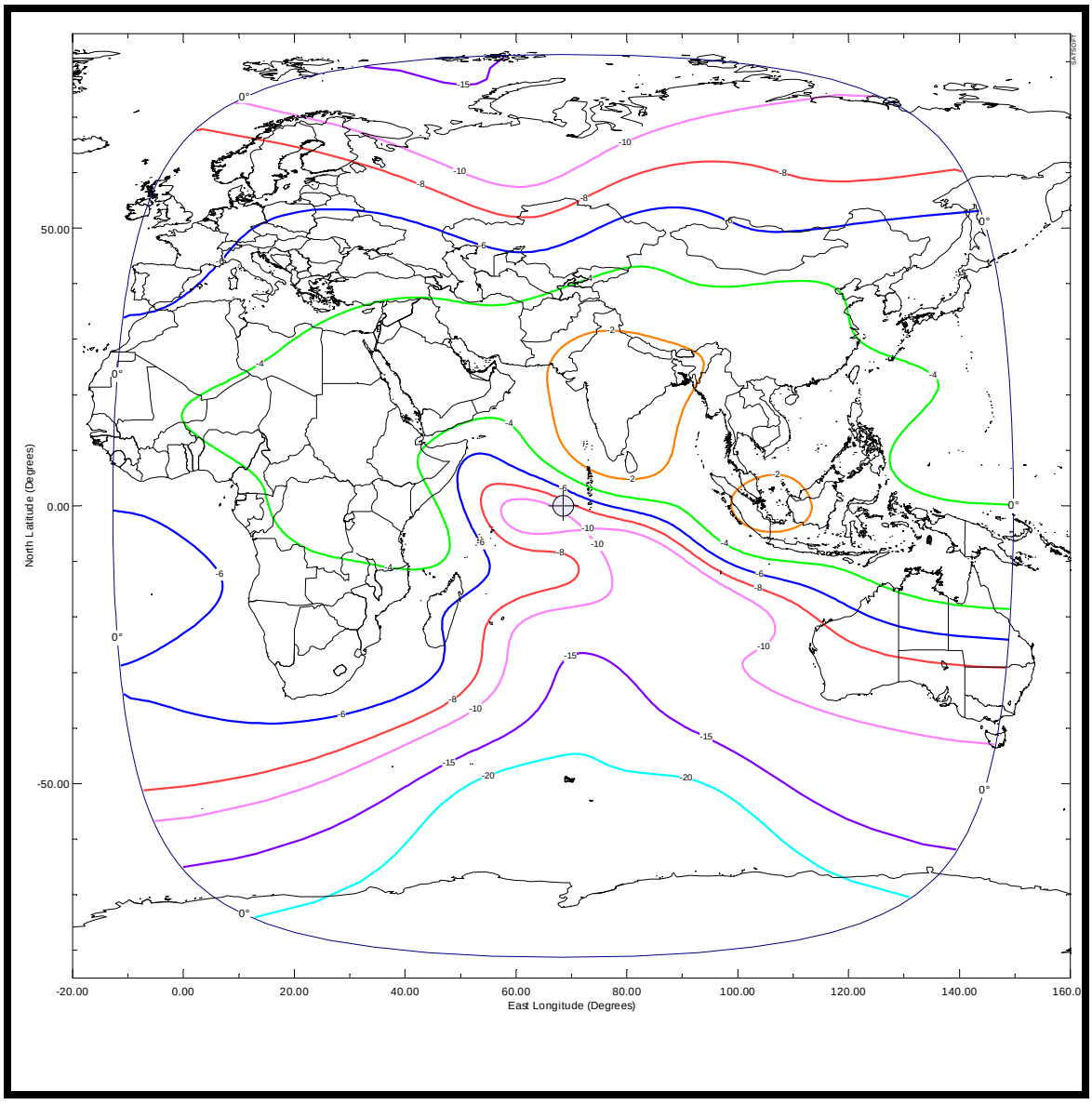


EXHIBIT 5A-15: SOUTHERN AFRICA TRANSMIT BEAM
(Schedule S Beam ID: SHDL)

Beam Polarization: Horizontal
Peak Beam Gain: 38.4 dBi
Peak Beam EIRP: 55.9 dBW

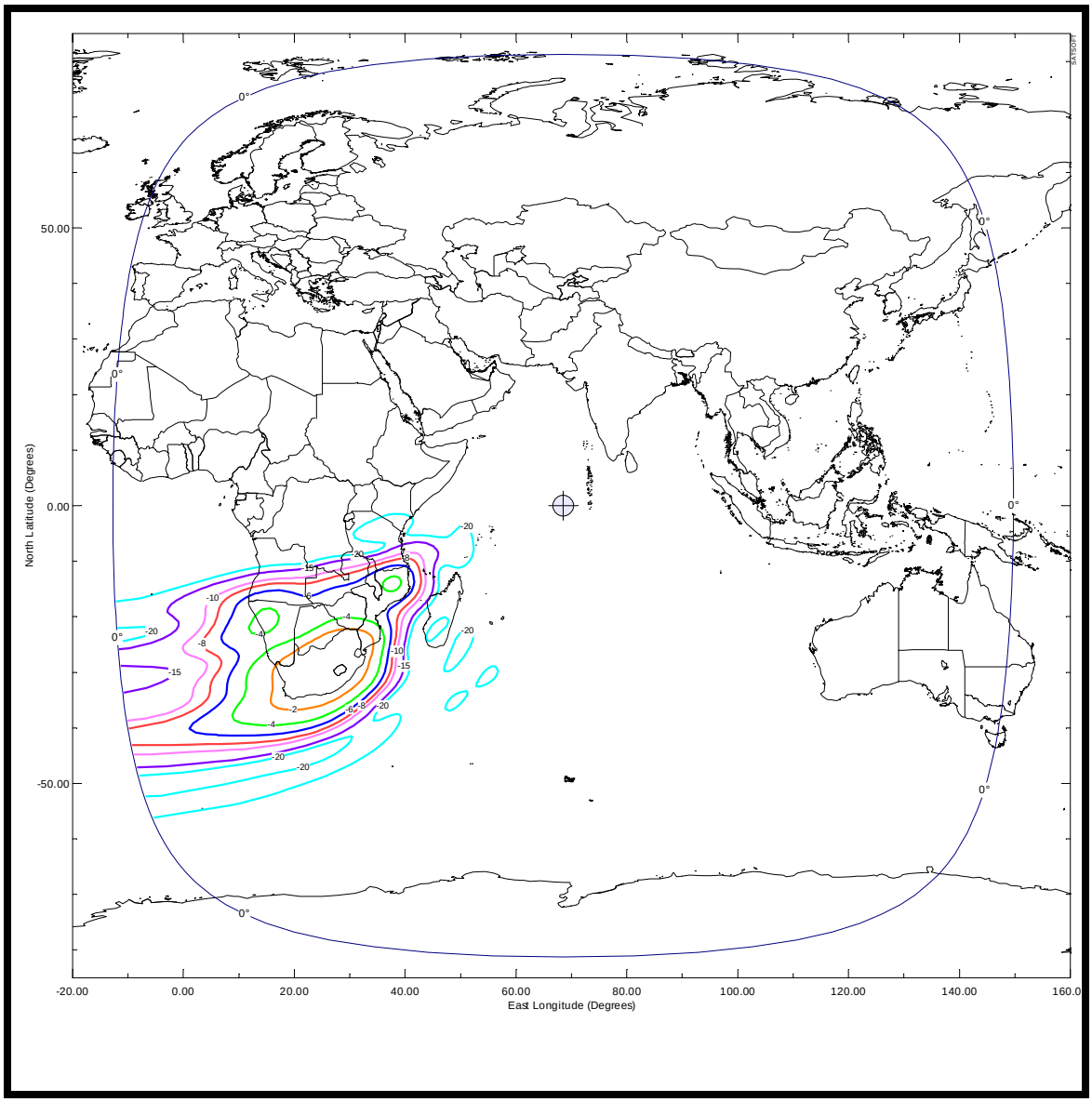


EXHIBIT 5A-16: SOUTHERN AFRICA TRANSMIT BEAM
(Schedule S Beam ID: SVDL)

Beam Polarization: Vertical
Peak Beam Gain: 38.4 dBi
Peak Beam EIRP: 55.9 dBW

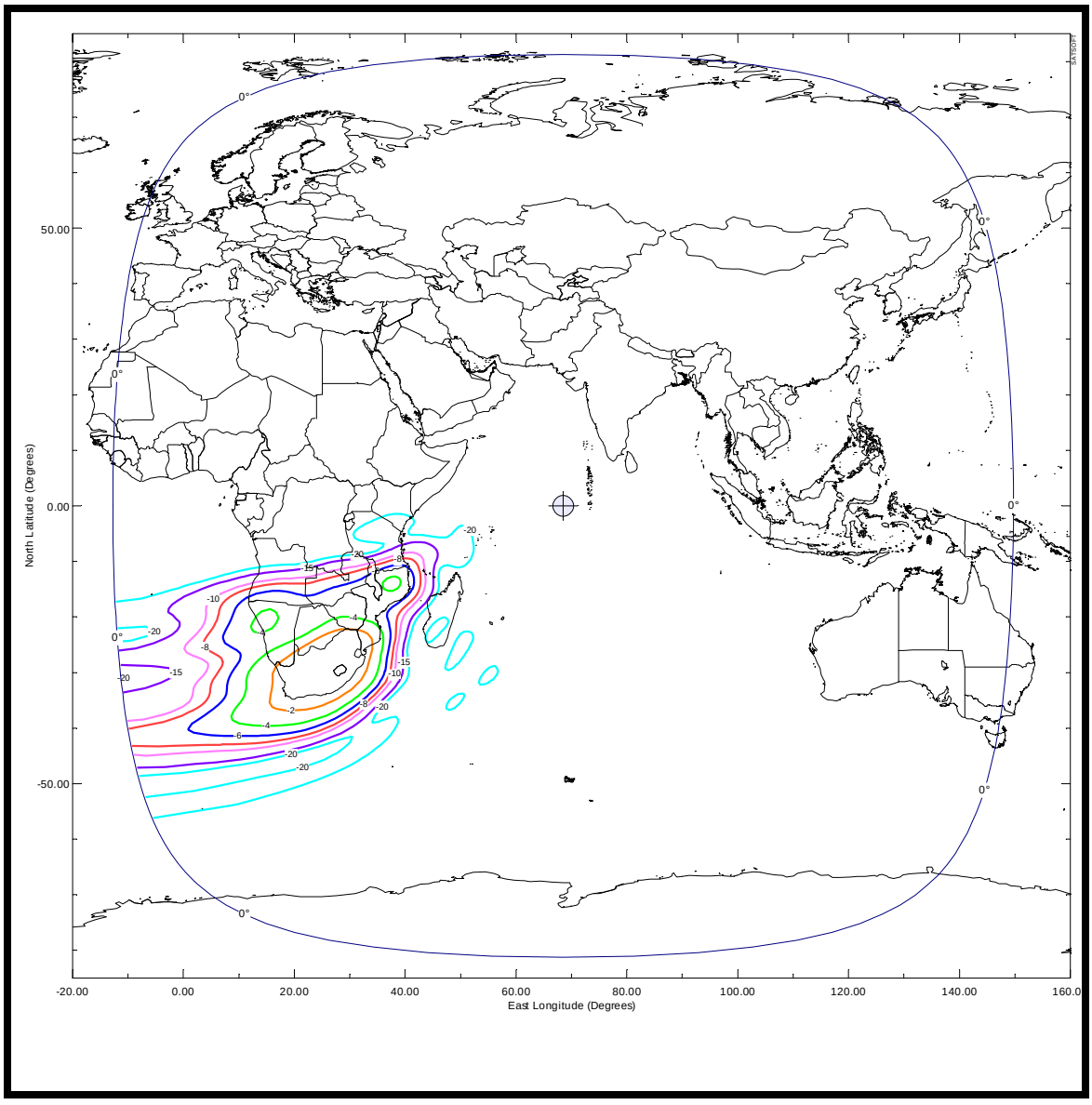


EXHIBIT 5A-17: EUROPE-MIDDLE EAST-CENTRAL ASIA TRANSMIT BEAM
(Schedule S Beam ID: EHDL)

Beam Polarization: Horizontal
Peak Beam Gain: 31.3 dBi
Peak Beam EIRP: 50.1 dBW

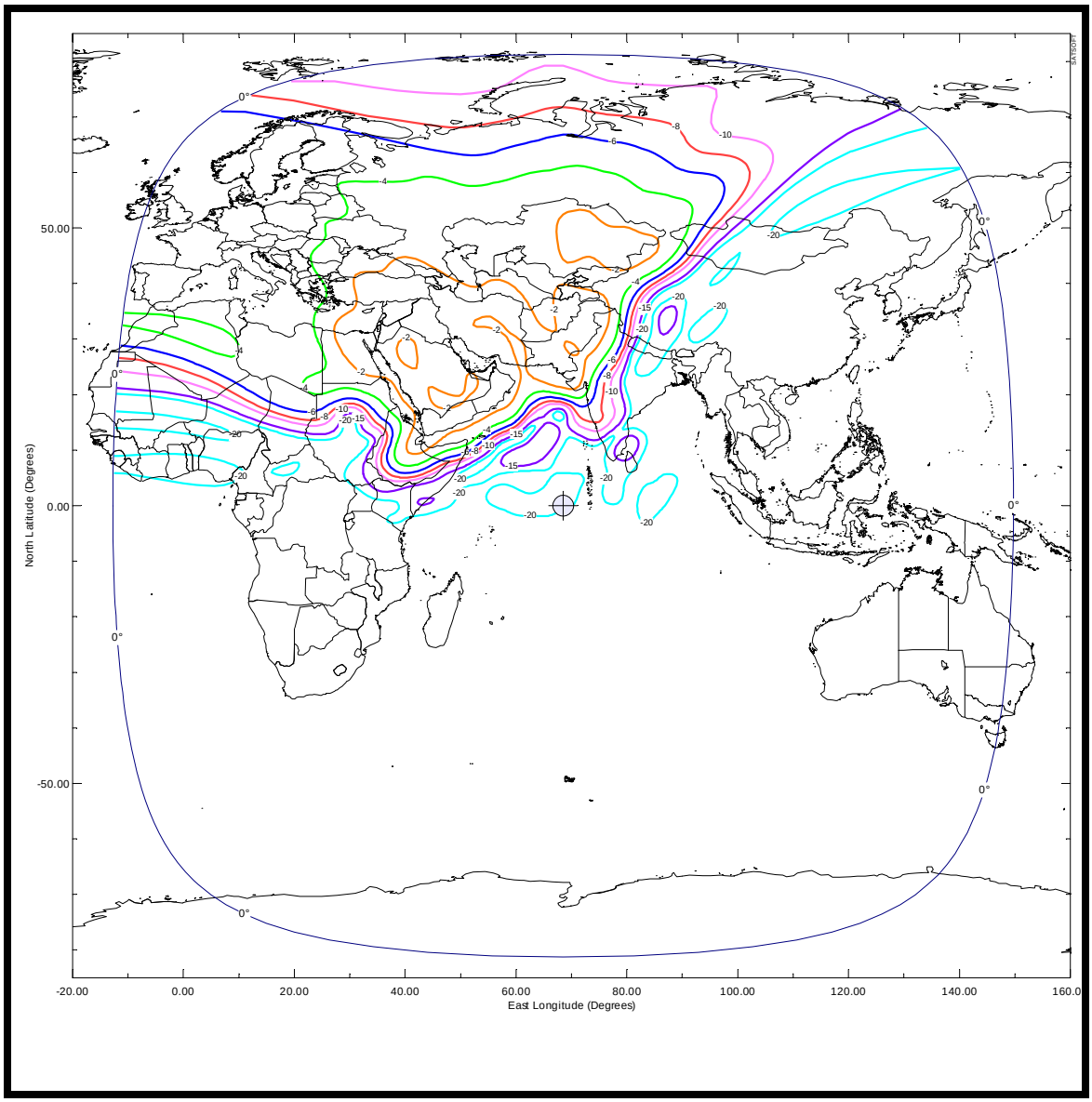


EXHIBIT 5A-18: EUROPE-MIDDLE EAST-CENTRAL ASIA TRANSMIT BEAM
(Schedule S Beam ID: EVDL)

Beam Polarization: Vertical
Peak Beam Gain: 31.3 dBi
Peak Beam EIRP: 50.0 dBW

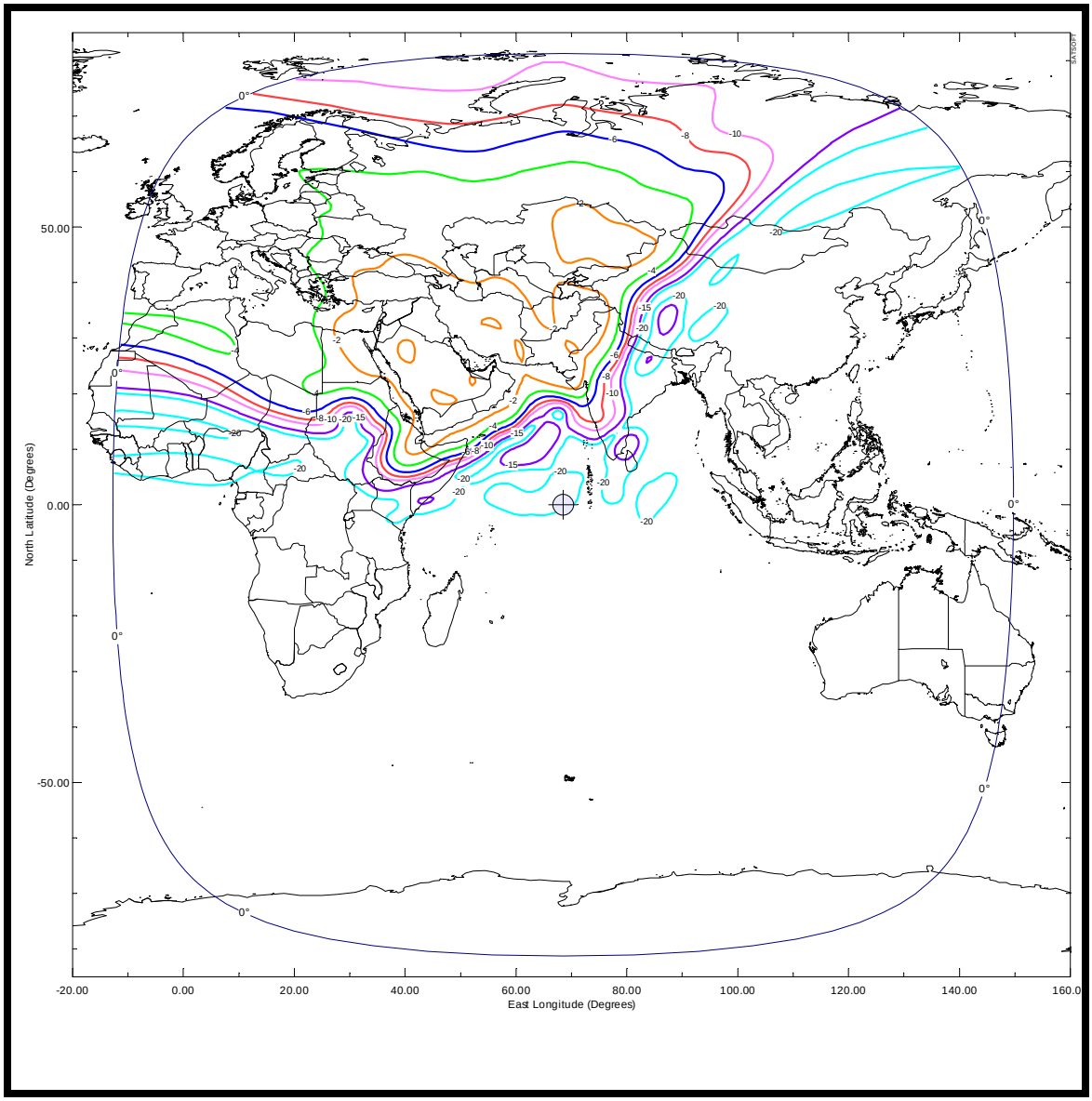


EXHIBIT 5A-19: RUSSIA TRANSMIT BEAM
(Schedule S Beam ID: RHDL)

Beam Polarization: Horizontal
Peak Beam Gain: 31.3 dBi
Peak Beam EIRP: 50.2 dBW

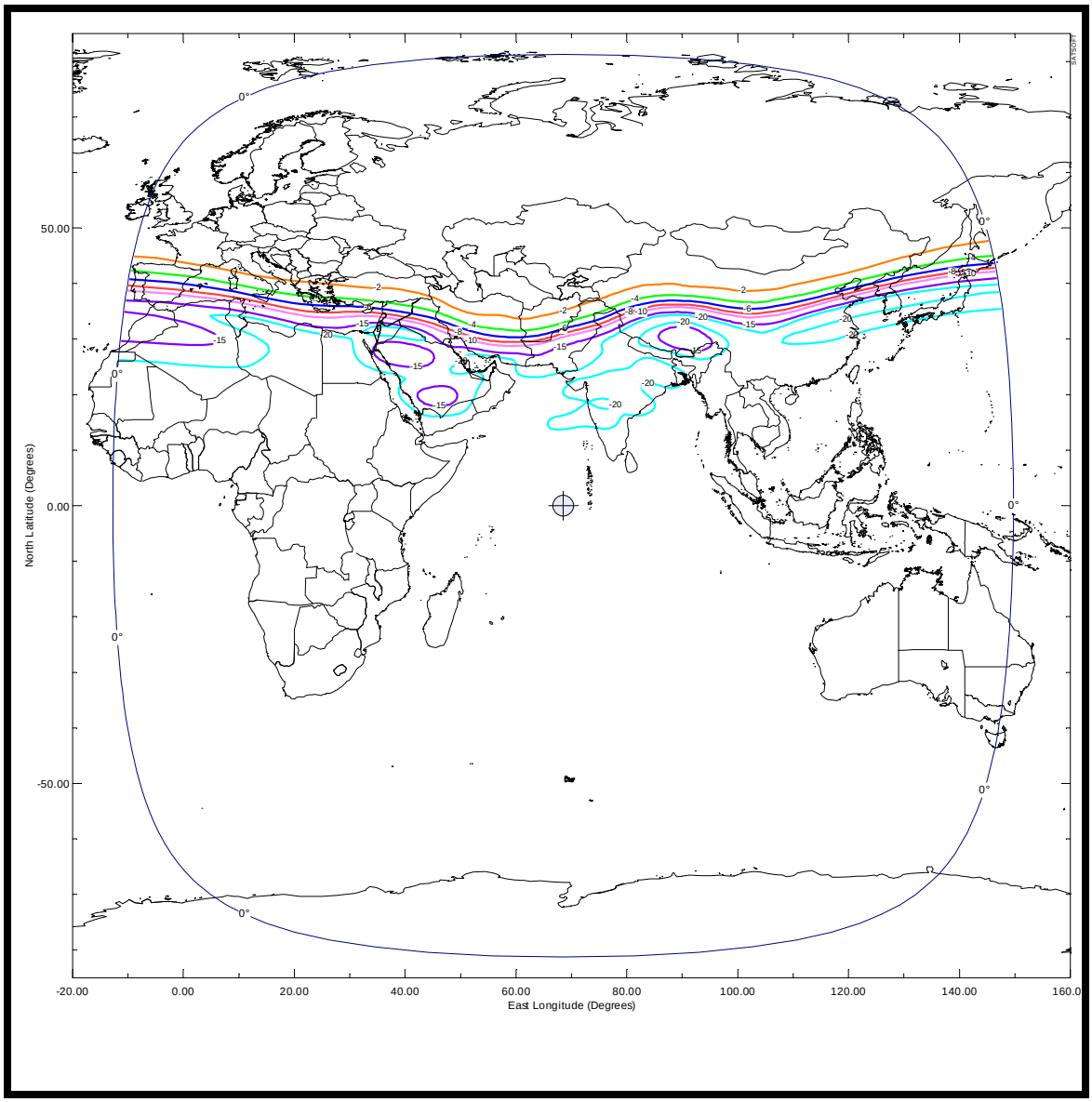


EXHIBIT 5A-20: RUSSIA TRANSMIT BEAM
(Schedule S Beam ID: RVDL)

Beam Polarization: Vertical
Peak Beam Gain: 31.2 dBi
Peak Beam EIRP: 50.1 dBW

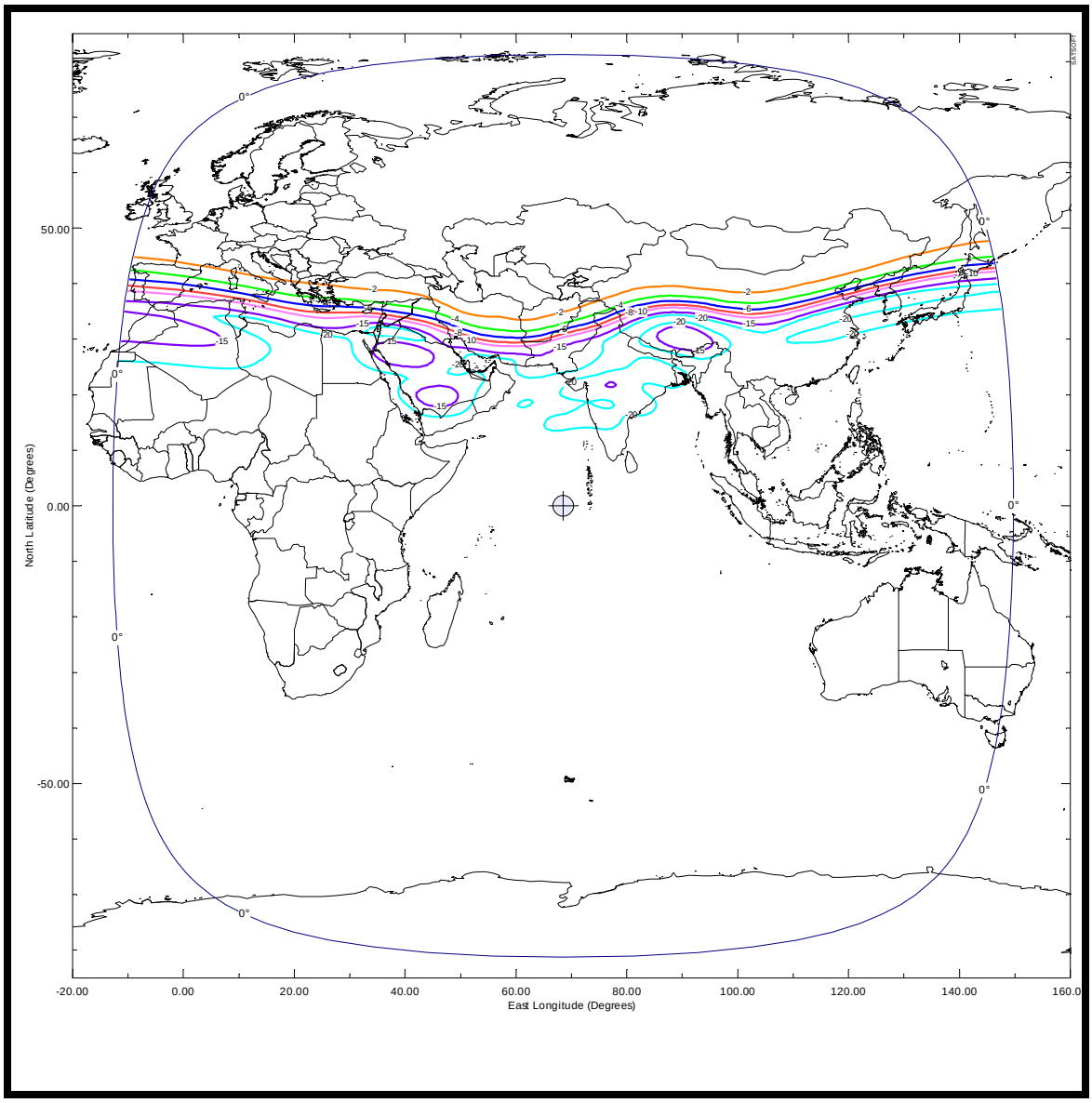


EXHIBIT 5A-21: AFRICA-EUROPE TRANSMIT BEAM
(Schedule S Beam ID: AHDL)

Beam Polarization: Horizontal
Peak Beam Gain: 30.6 dBi
Peak Beam EIRP: 49.1 dBW

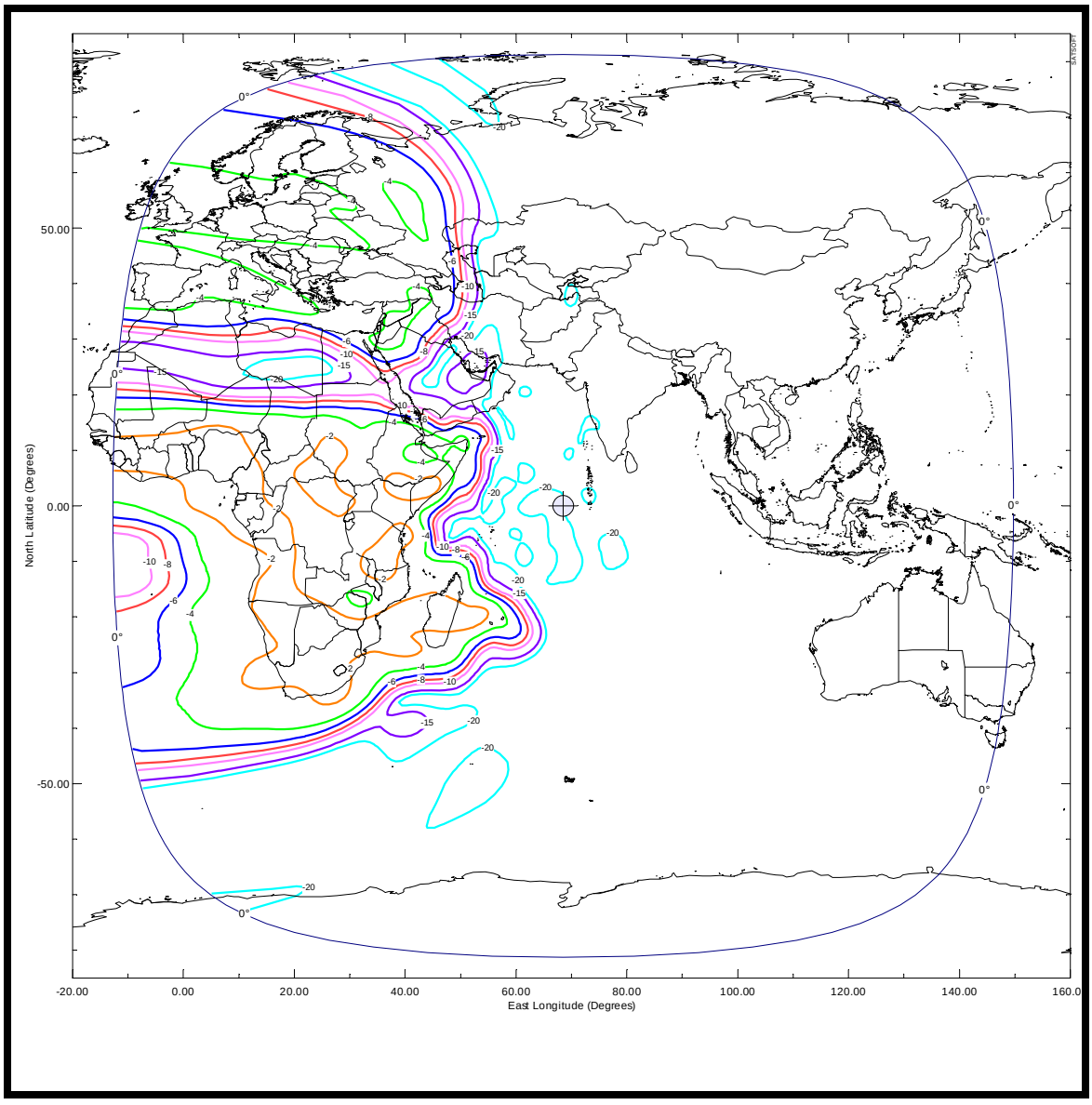


EXHIBIT 5A-22: AFRICA-EUROPE TRANSMIT BEAM
(Schedule S Beam ID: AVDL)

Beam Polarization: Vertical
Peak Beam Gain: 30.5 dBi
Peak Beam EIRP: 49.0 dBW

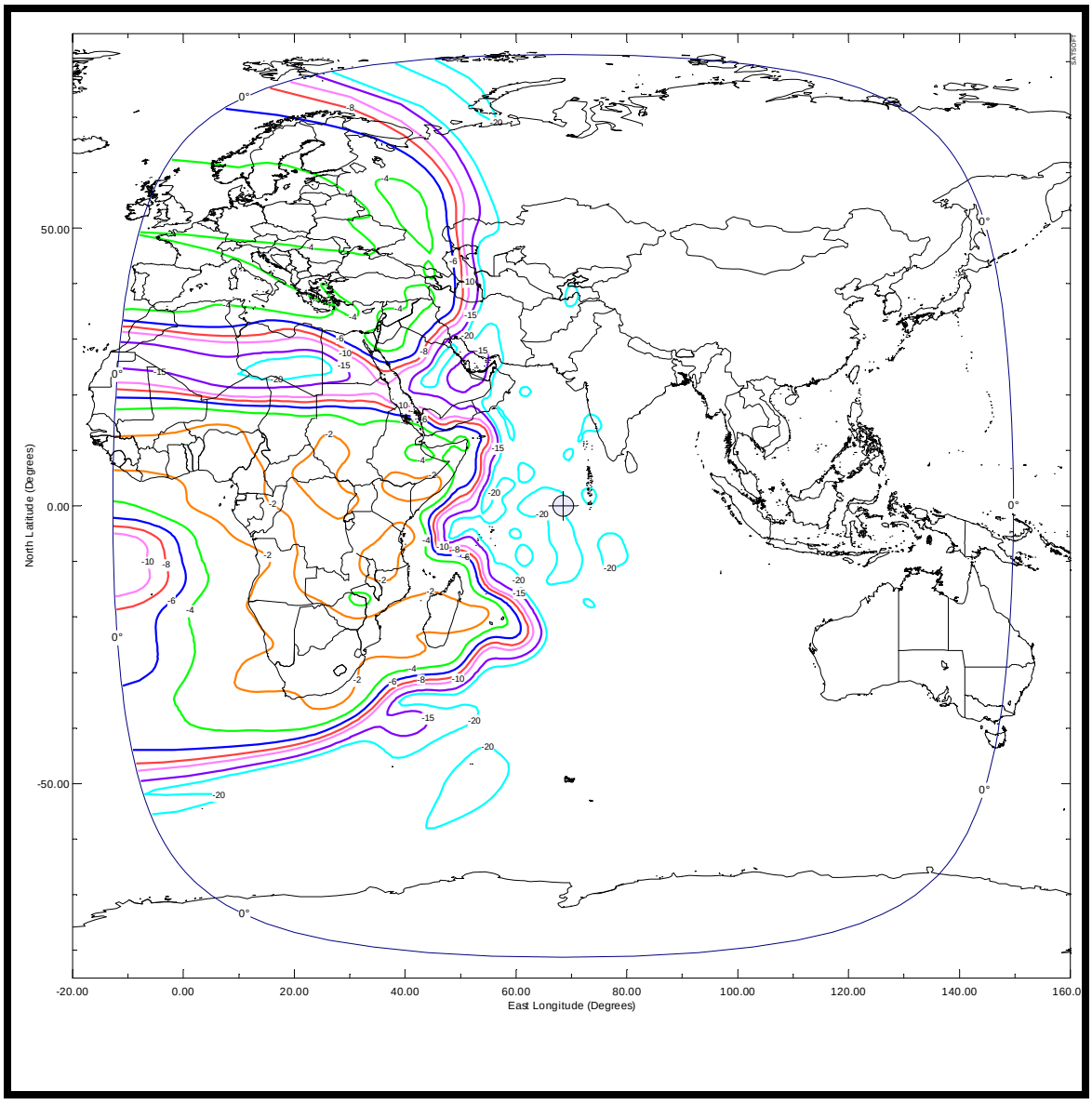


EXHIBIT 5A-23: KA TRANSMIT BEAM
(Schedule S Beam ID: KRDL)

Beam Polarization: Right Hand Circular
Peak Beam Gain: 33.5 dBi
Peak Beam EIRP: 51.3 dBW

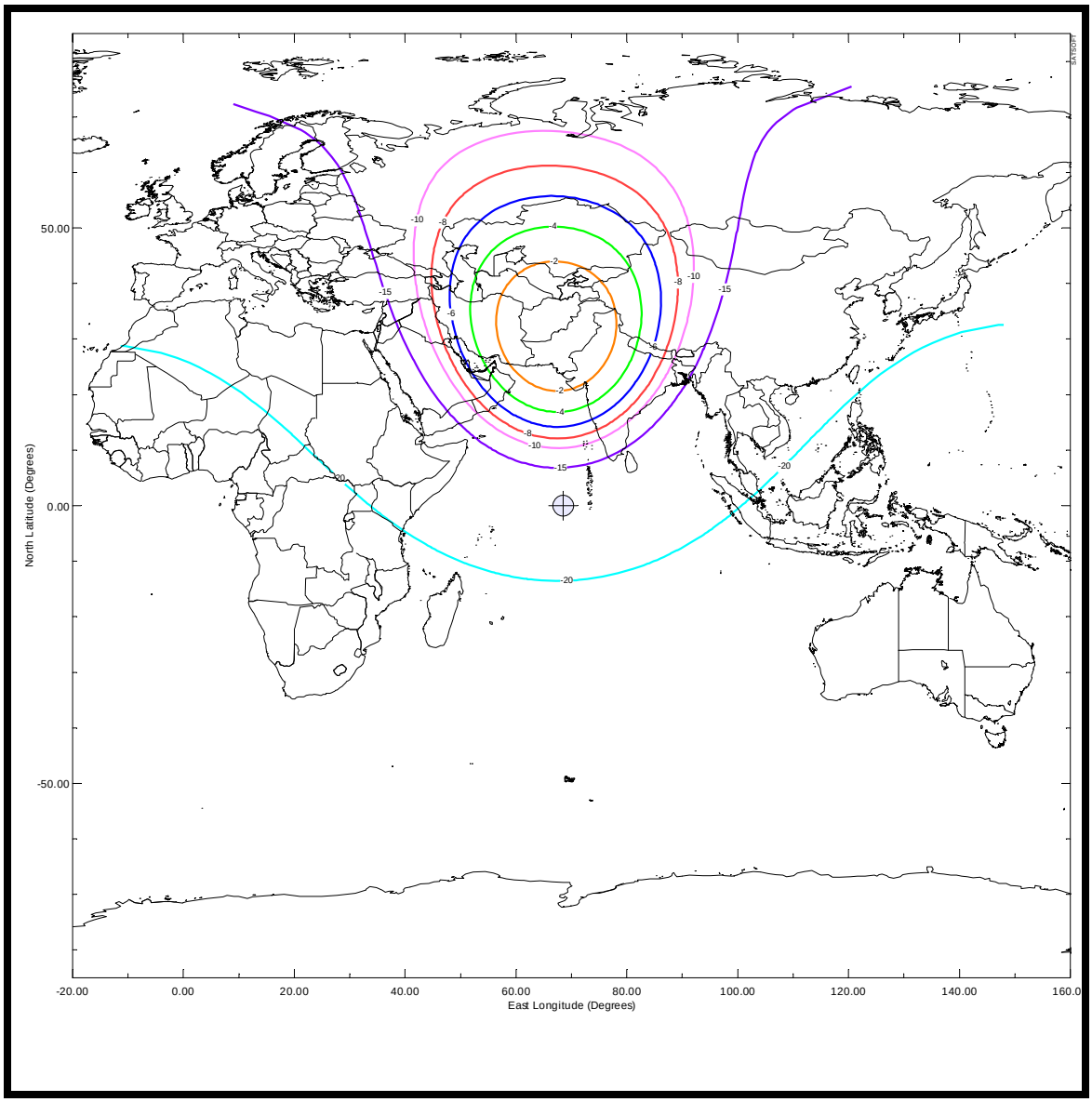


EXHIBIT 5A-24: KA TRANSMIT BEAM
(Schedule S Beam ID: KLDL)

Beam Polarization: Left Hand Circular
Peak Beam Gain: 33.5 dBi
Peak Beam EIRP: 51.3 dBW

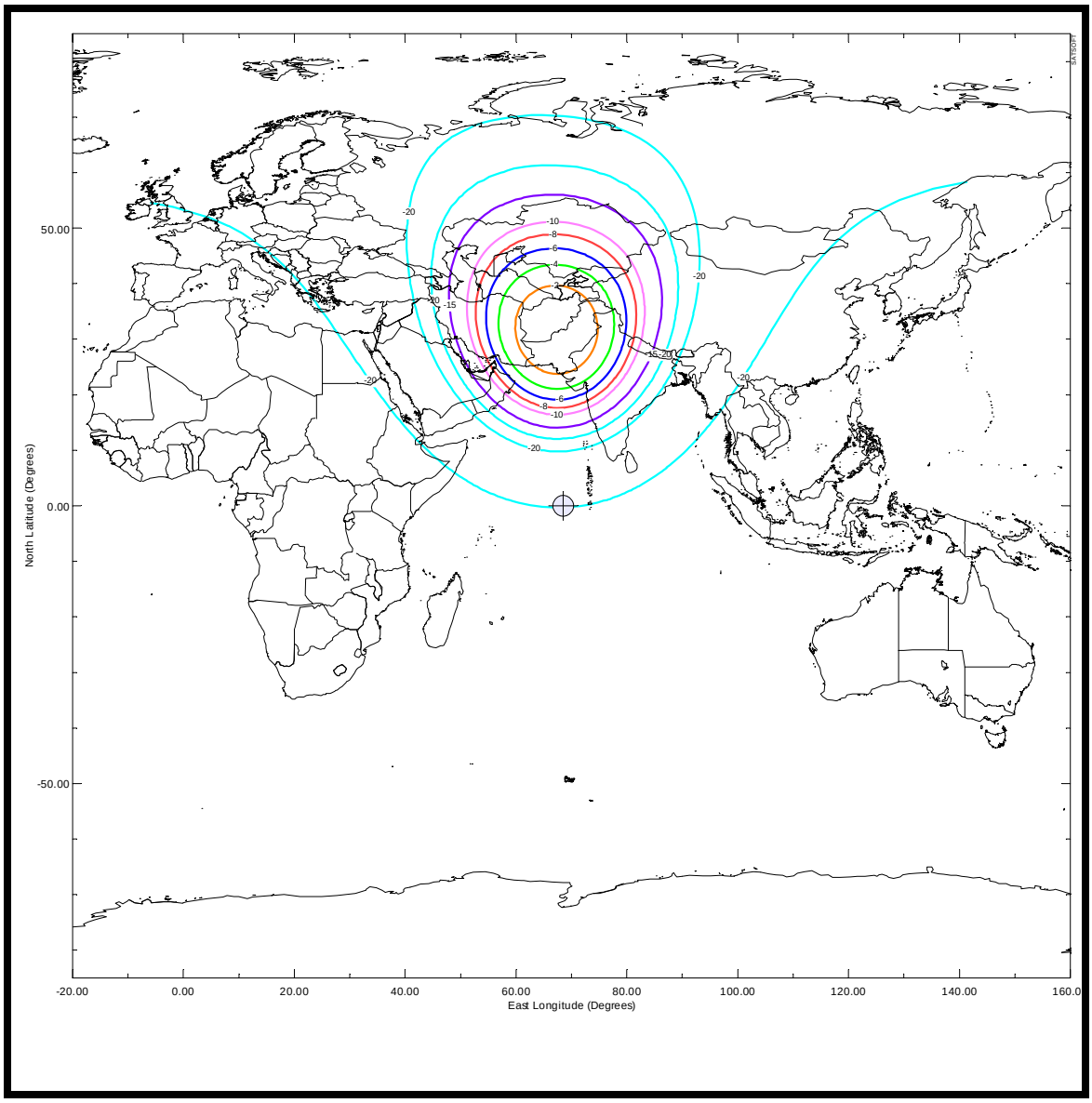


EXHIBIT 5B-1: COMMAND RECEIVE BEAM (on-station)
(Global Horn Antenna)
(Schedule S Beam ID: CGV)

Beam Polarization: Vertical
Peak Beam Gain: 22.5 dBi
Peak Beam G/T: -13.1 dB/K
Command Threshold Flux Density @ Peak Beam G/T: -111.8 dBW/m^2

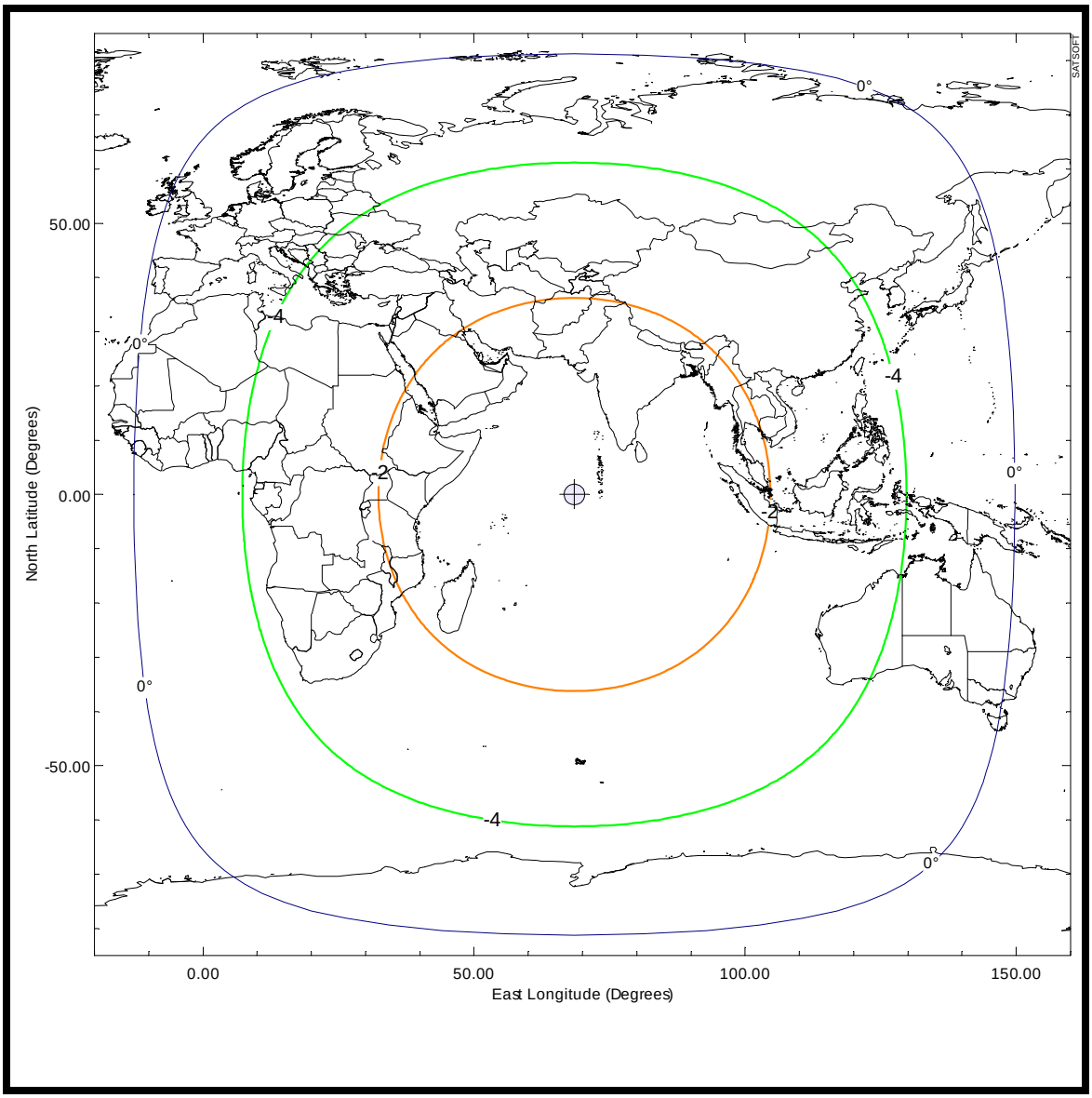
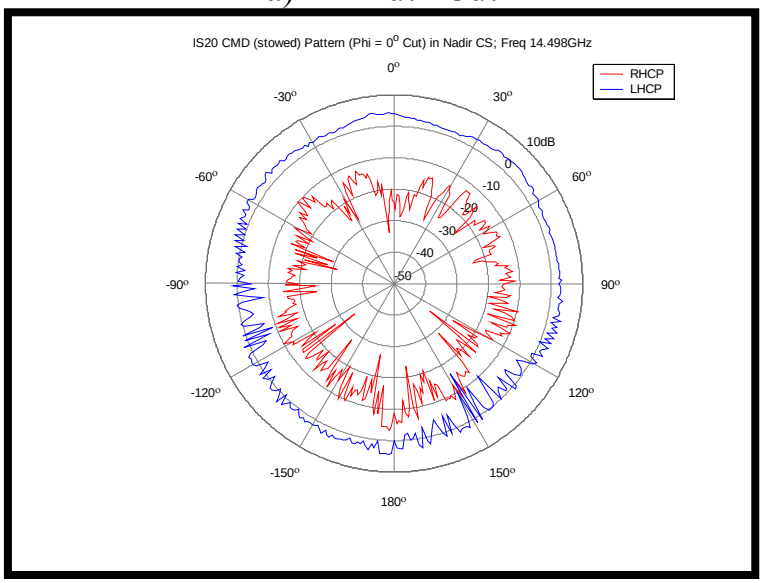


EXHIBIT 5B-2: COMMAND RECEIVE BEAM (back-up)
(+Z Antenna)
(Schedule S Beam ID: CZ1L)

Beam Polarization: Left Hand Circular
Peak Beam Gain: 3 dBi
Peak Beam G/T: -31.7 dB/K
Command Threshold Flux Density @ Peak Beam G/T: -93.2 dBW/m^2

a) Azimuth Cut



b) Elevation Cut

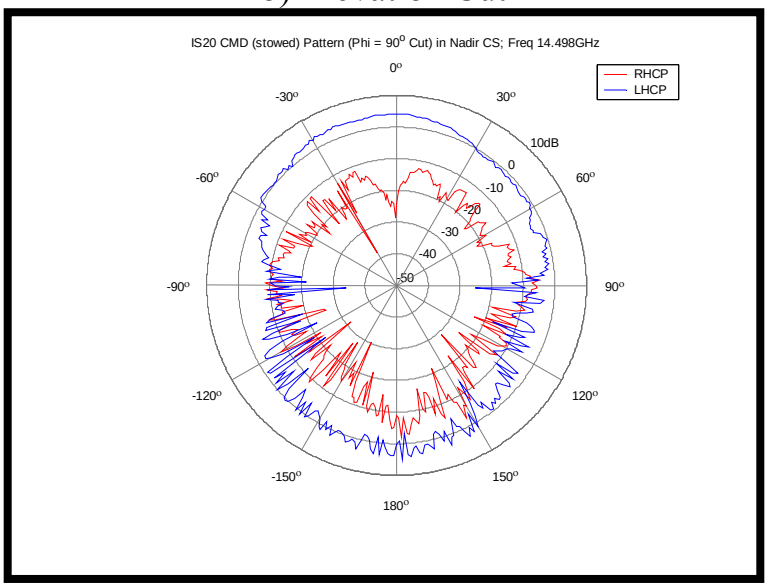
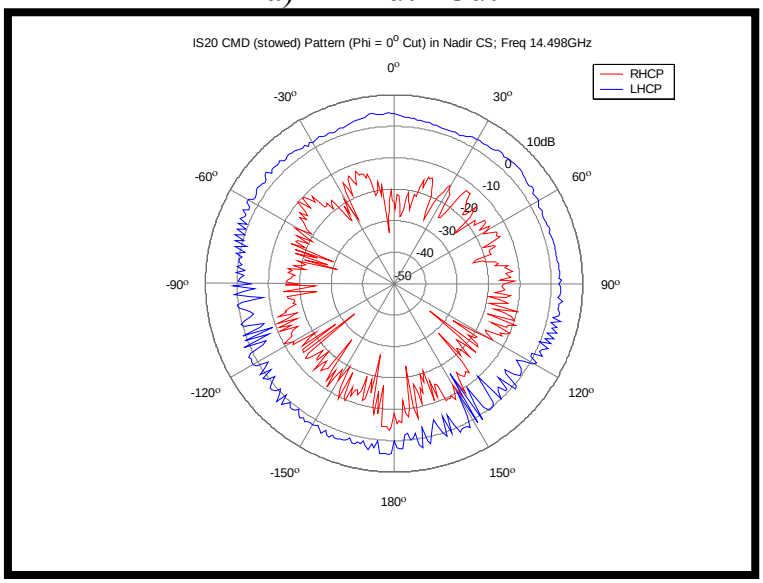


EXHIBIT 5B-3: COMMAND RECEIVE BEAM (back-up)
(-Z Antenna)
(Schedule S Beam ID: CZ2L)

Beam Polarization: Left Hand Circular
Peak Beam Gain: 8 dBi
Peak Beam G/T: -32.1 dB/K
Command Threshold Flux Density @ Peak Beam G/T: -92.8 dBW/m^2

a) Azimuth Cut



b) Elevation Cut

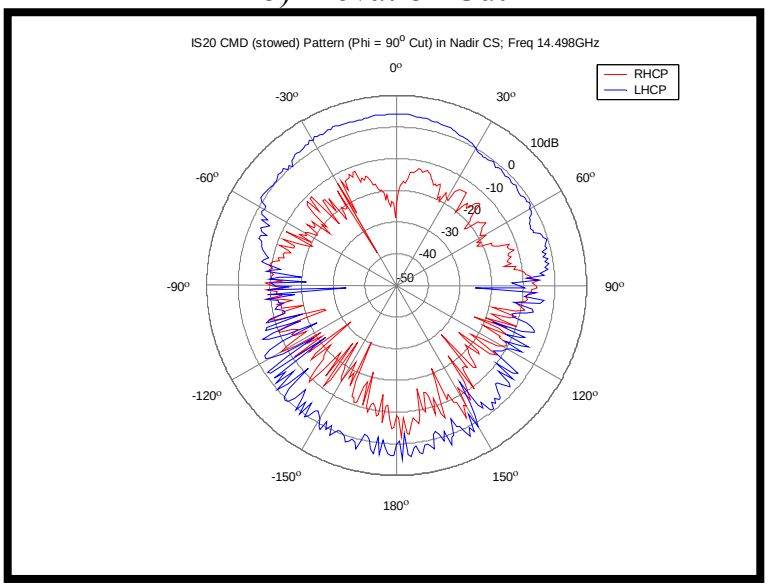


EXHIBIT 5B-4: TELEMETRY TRANSMIT BEAM (on-station)
(Global Horn Antenna)
(Schedule S Beam ID: TGV)

Beam Polarization: Vertical
Peak Beam Gain: 22.1 dBi
Peak Beam EIRP: 13.9 dBW

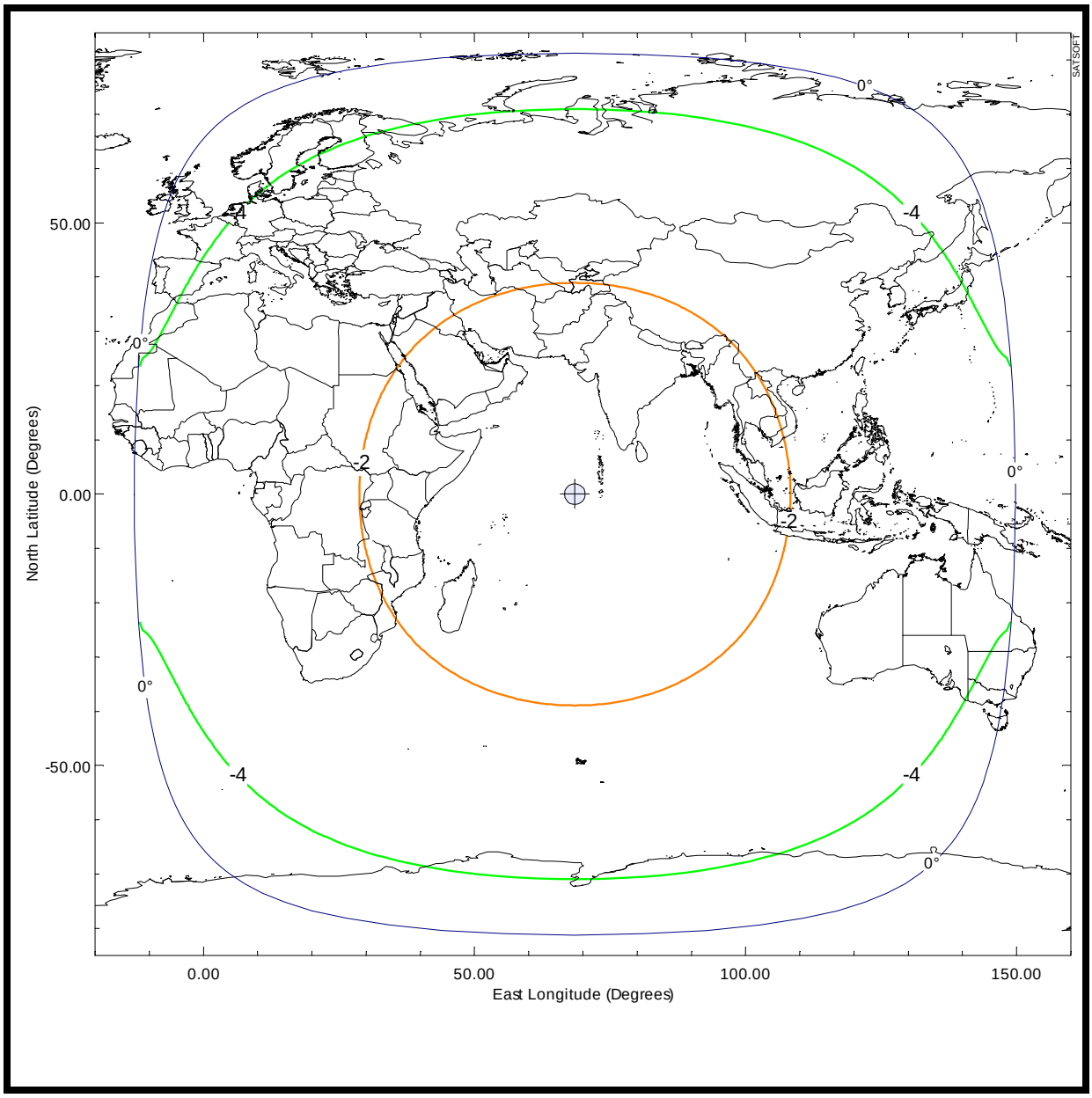
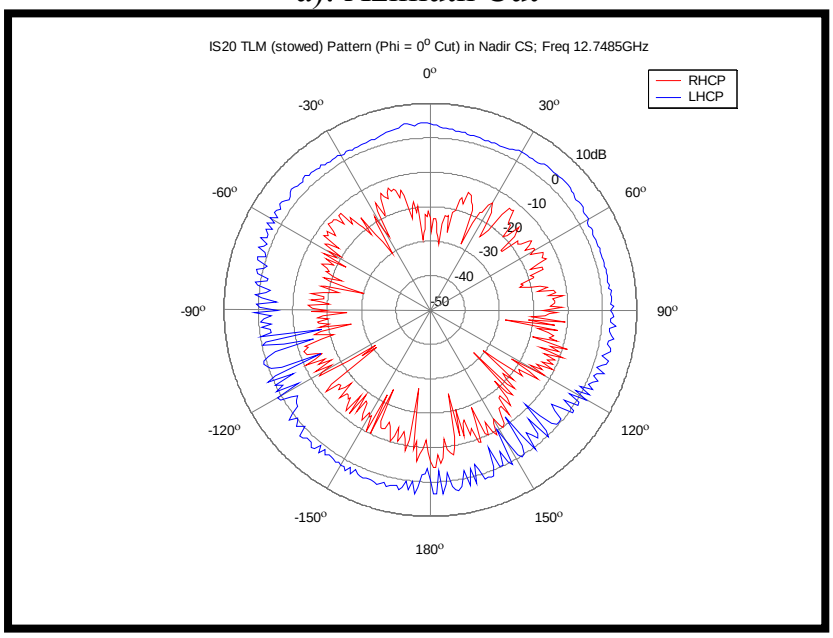


EXHIBIT 5B-5: TELEMETRY TRANSMIT BEAM (back-up)
(+Z Horn Antenna)
(Schedule S Beam ID: TZ1L)

Beam Polarization: Left Hand Circular
Peak Beam Gain: 3.0 dBi
Peak Beam EIRP: 15.6 dBW

a): Azimuth Cut



b) Elevation Cut

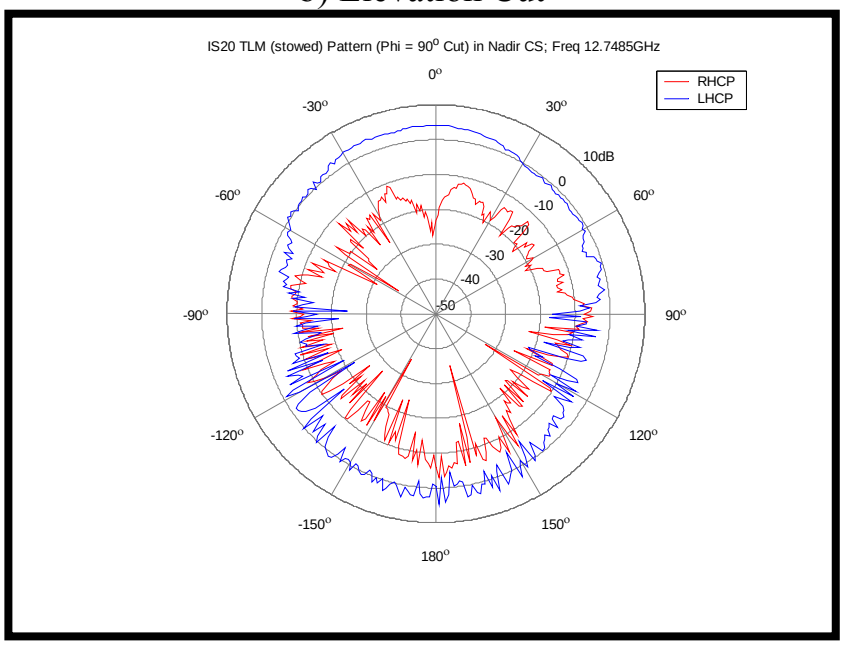
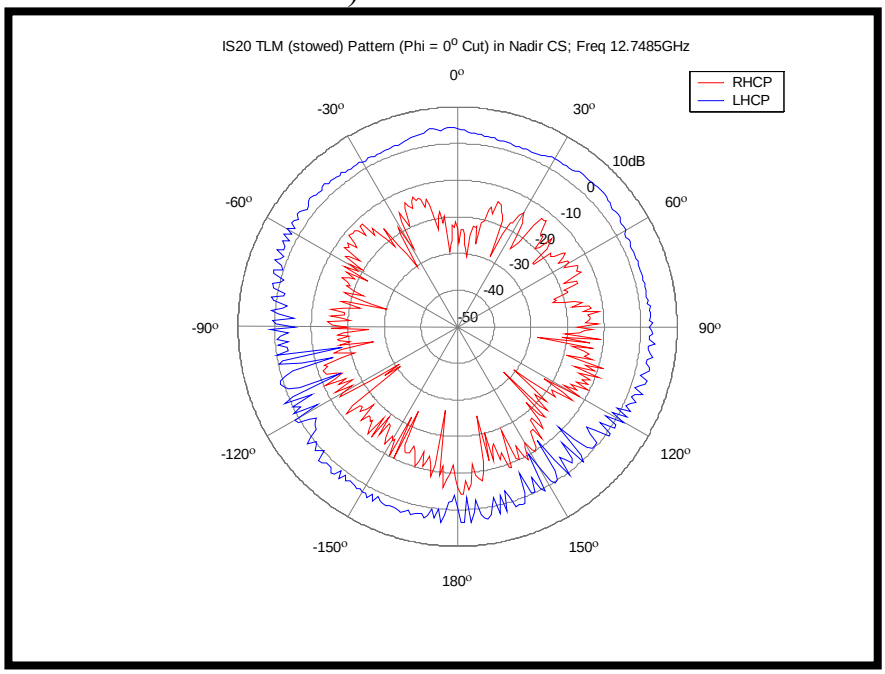


EXHIBIT 5B-6: TELEMETRY TRANSMIT BEAM (back-up)
(-Z Horn Antenna)
(Schedule S Beam ID: TZ2L)

Beam Polarization: Left Hand Circular
Peak Beam Gain: 8.0 dBi
Peak Beam EIRP: 15.4 dBW

a) Azimuth cut



b) Elevation Cut

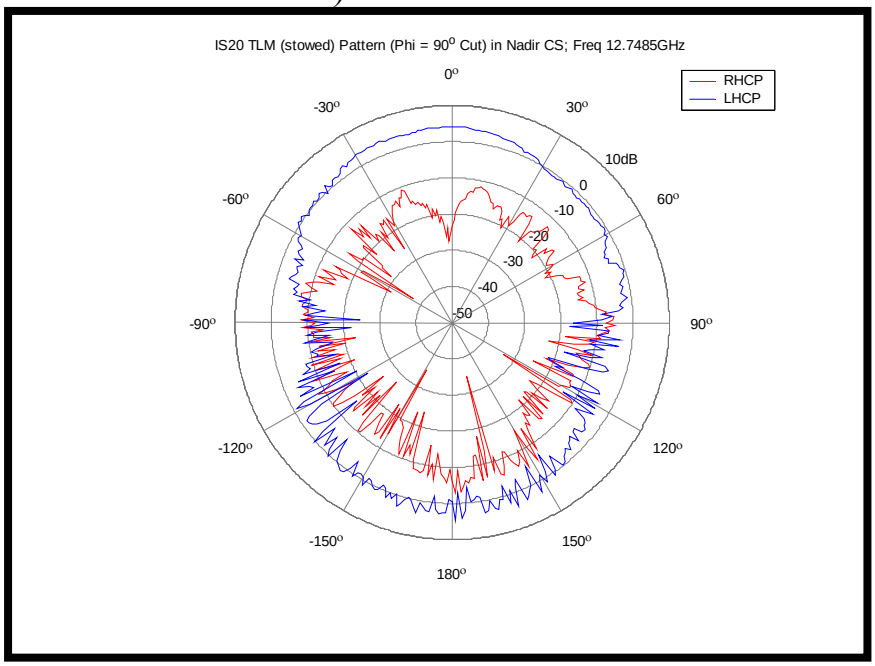


EXHIBIT 5C-1: C-BAND ULPC TRANSMIT BEAM
(Schedule S Beam ID: UPCR)

Beam Polarization: Right Hand Circular
Peak Beam Gain: 19.2 dBi
Peak Beam EIRP: 11.0 dBW

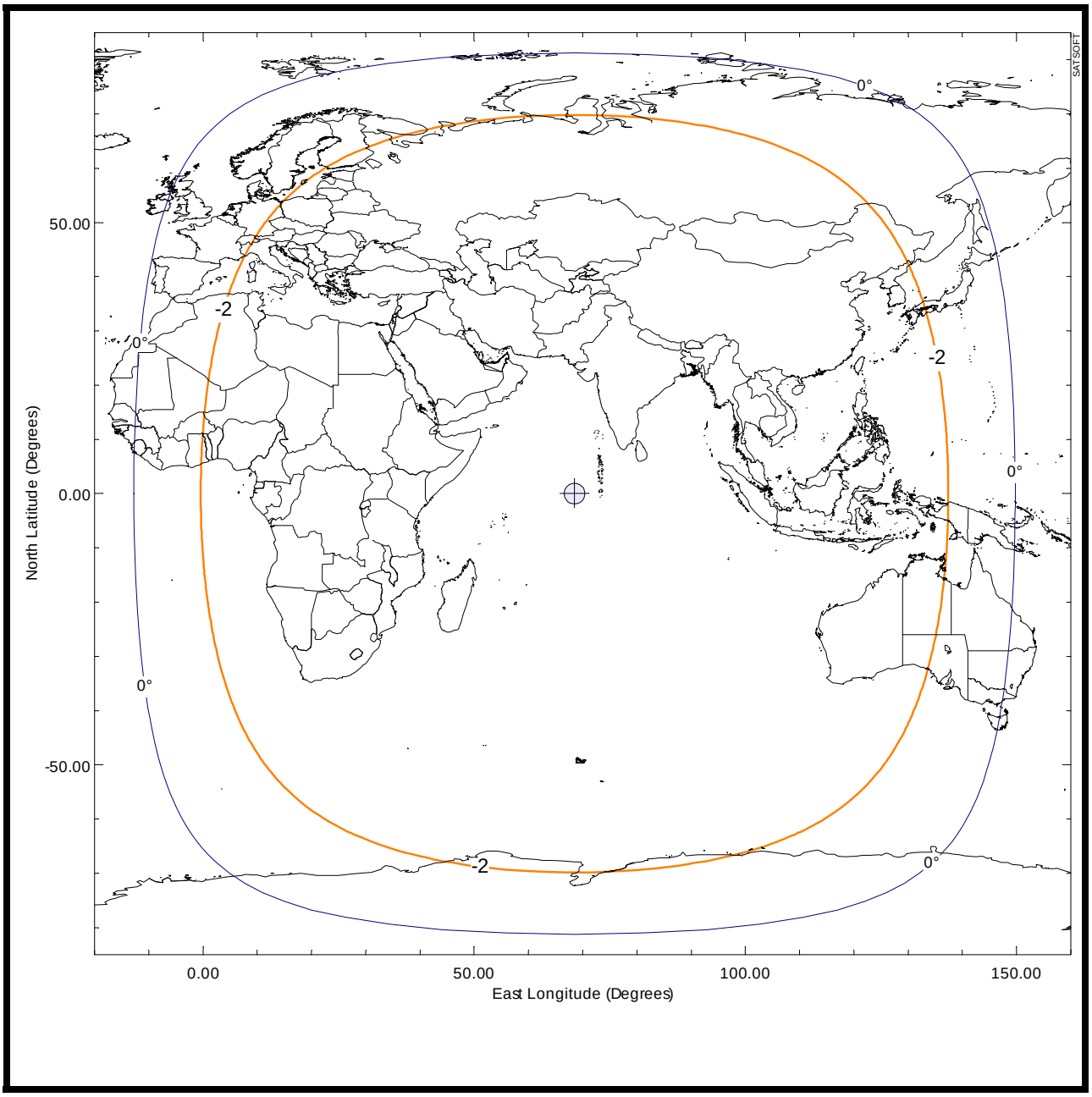


EXHIBIT 5C-2: Ku-BAND ULPC TRANSMIT BEAM
(Schedule S Beam ID: UPKR)

Beam Polarization: Right Hand Circular
Peak Beam Gain: 23.1 dBi
Peak Beam EIRP: 19.5 dBW

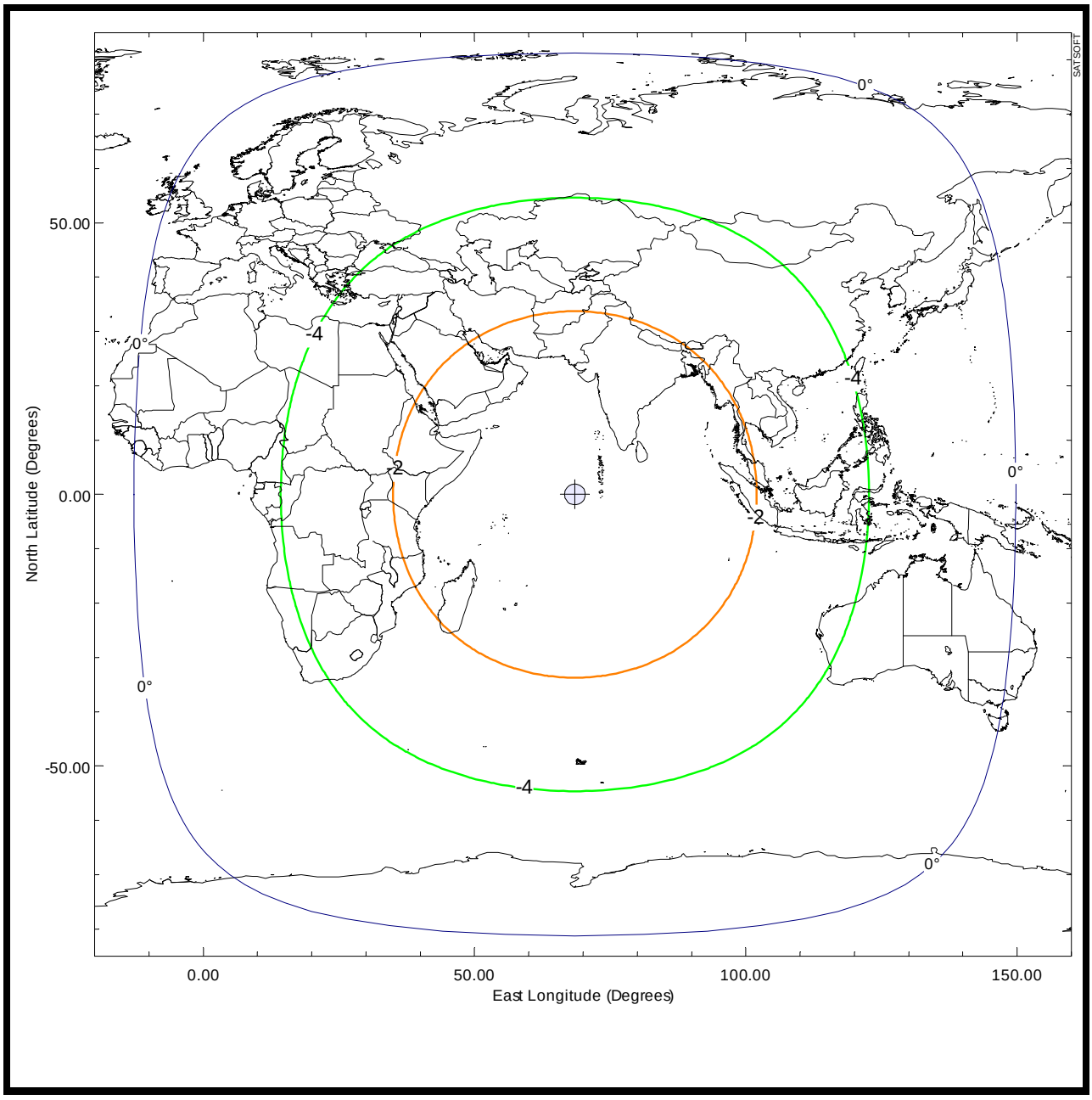
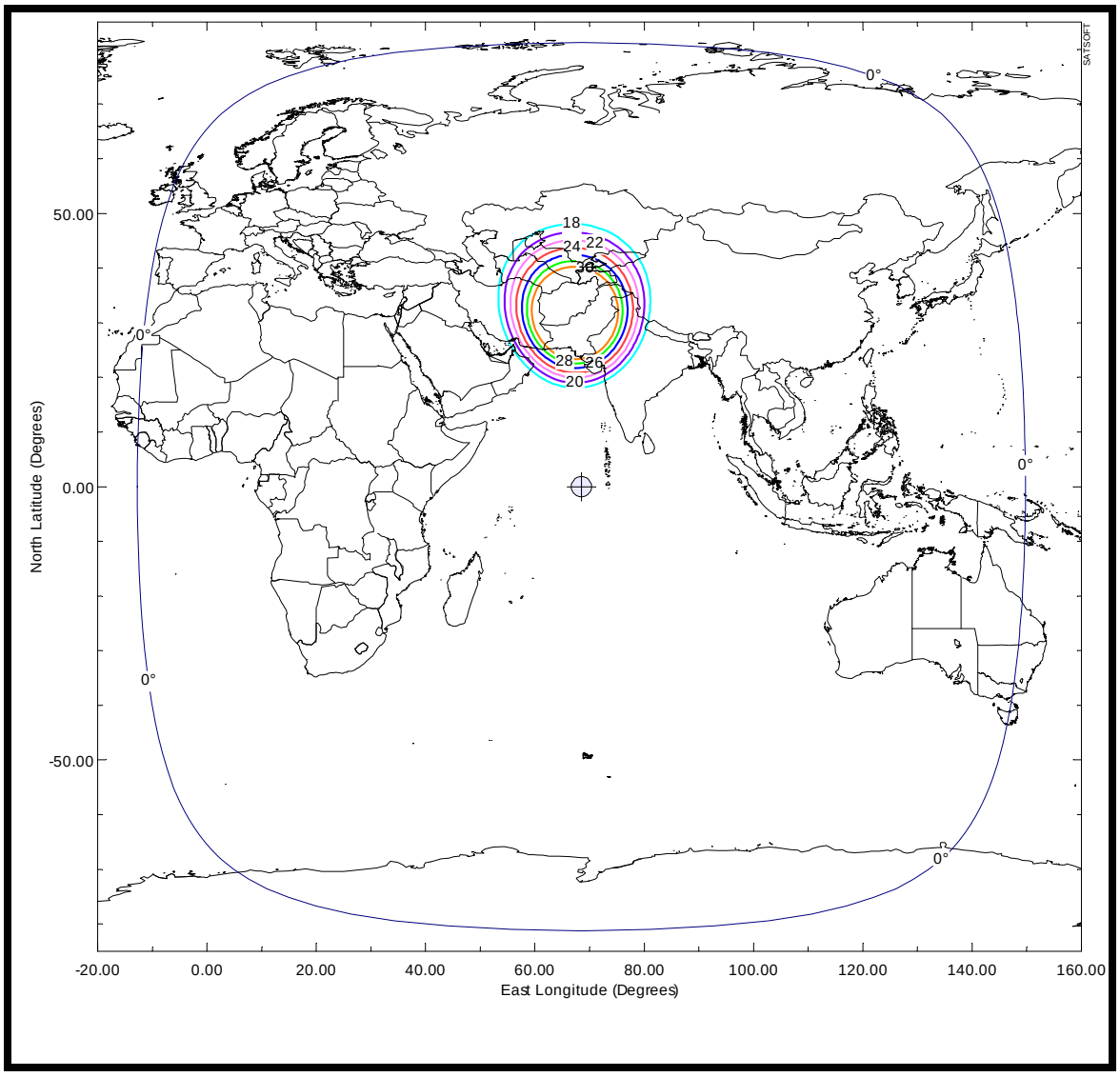


EXHIBIT 5D-1: KA RECEIVE BEAM CROSS POLARIZATION CONTOURS (Schedule S Beam ID: KRUX)

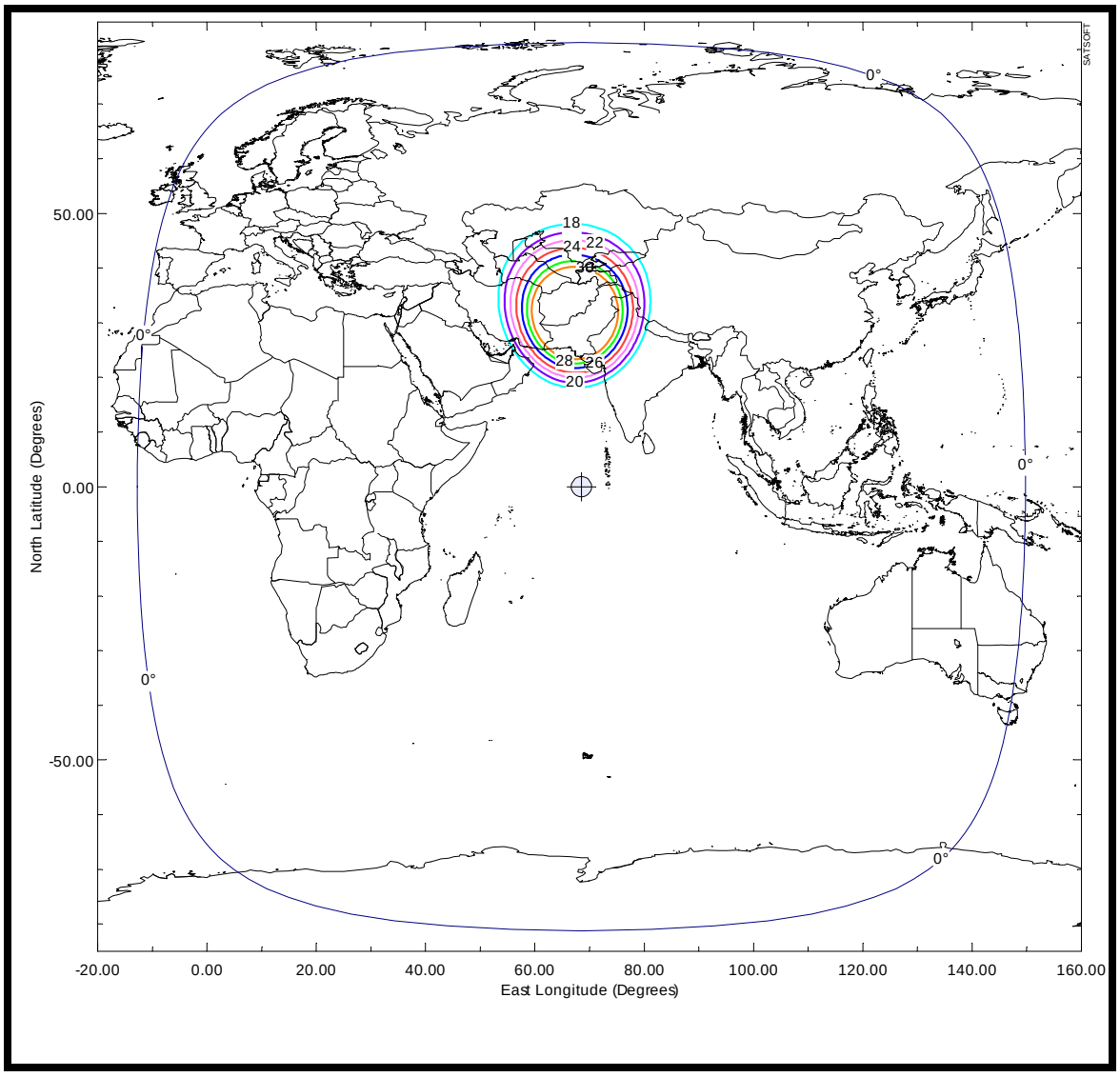
Beam Polarization: Right Hand Circular



Absolute cross-polarization contours shown: 30, 28, 26, 24, 22, 20 and 18 dB.

EXHIBIT 5D-2: KA RECEIVE BEAM CROSS POLARIZATION CONTOURS (Schedule S Beam ID: KLUX)

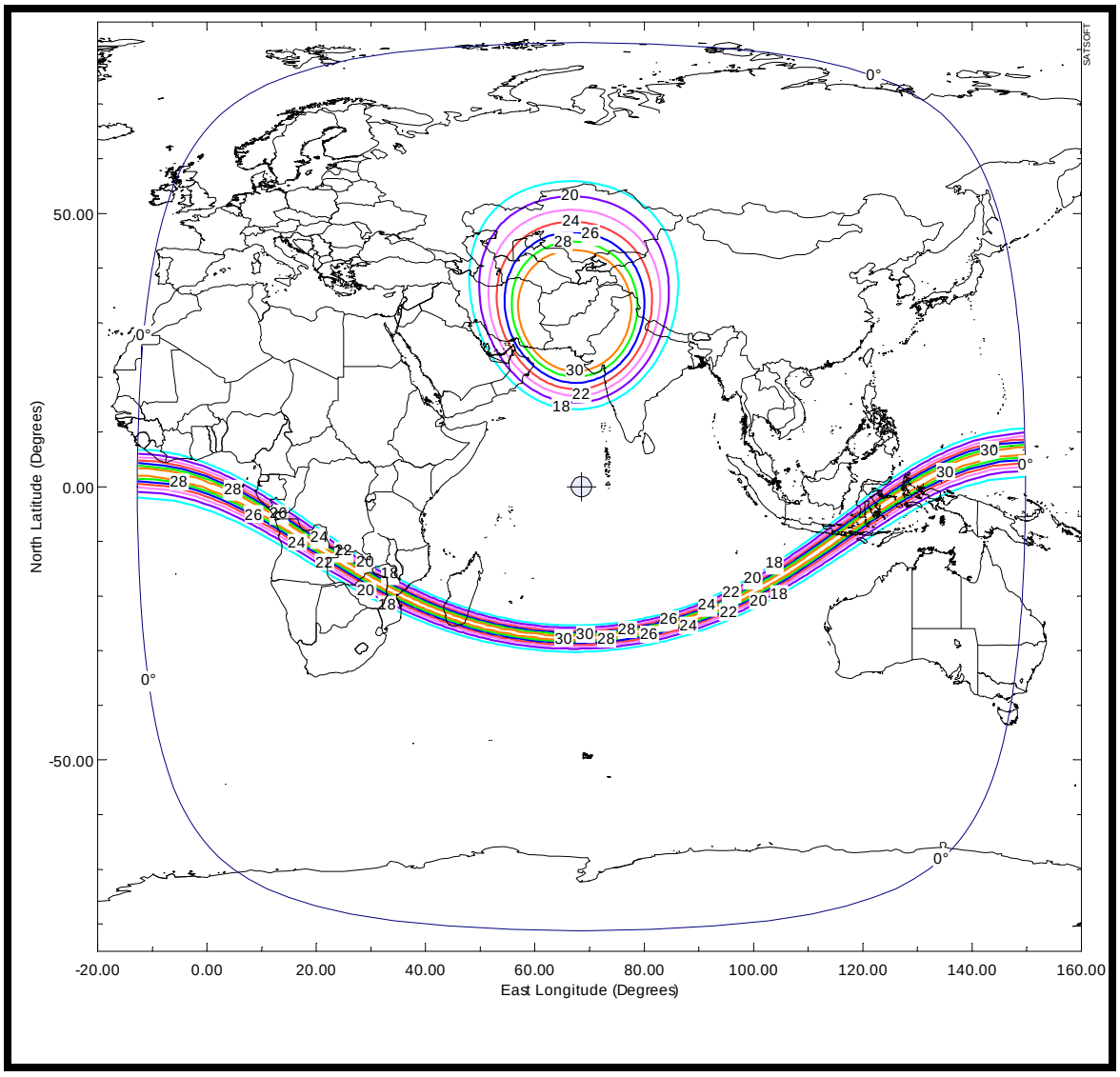
Beam Polarization: Left Hand Circular



Absolute cross-polarization contours shown: 30, 28, 26, 24, 22, 20 and 18 dB.

EXHIBIT 5D-3: KA TRANSMIT BEAM CROSS POLARIZATION CONTOURS (Schedule S Beam ID: KRDX)

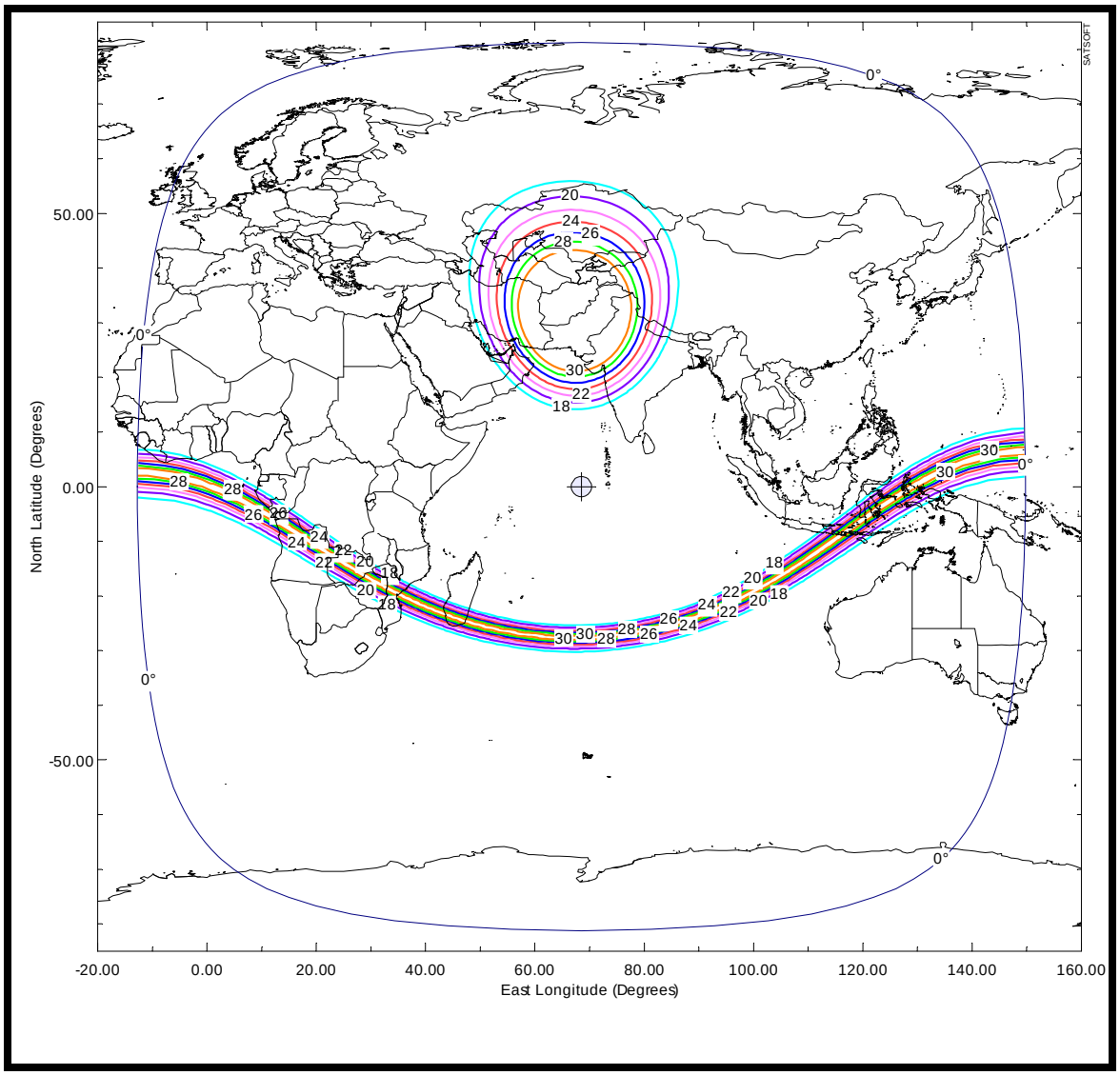
Beam Polarization: Right Hand Circular



Absolute cross-polarization contours shown: 30, 28, 26, 24, 22, 20 and 18 dB.

EXHIBIT 5D-4: KA TRANSMIT BEAM CROSS POLARIZATION CONTOURS (Schedule S Beam ID: KLDX)

Beam Polarization: Left Hand Circular



Absolute cross-polarization contours shown: 30, 28, 26, 24, 22, 20 and 18 dB.

EXHIBIT 6: COMMUNICATION SUBSYSTEM
EIRP AND G/T BUDGETS

Beam Name	Landmass	Landmass	Landmass	Landmass
Frequency Band (MHz)	5925 – 6425	5925 - 6425	6425 – 6675	6425 - 6725
Polarization	Horizontal	Vertical	Horizontal	Vertical
Channel Bandwidth (MHz)	27 / 54 / 60	27 / 54 / 60	36	36
Antenna Noise Temperature (°Kelvin)	169	172	169	172
Receiver Noise Temperature (°Kelvin)	405	382	368	378
Total System Noise Temperature (°Kelvin)	574	554	537	550
Total System Noise Temperature (dB/K)	27.6	27.5	27.3	27.4
Peak Gain of Satellite Receive Antenna (dBi)	28.0	27.8	28.0	27.8
Peak G/T (dB/K)	0.4	0.3	0.7	0.4
Minimum SFD [G/T: Peak, Attn: 0 dB] -- (dBW/m^2)	-111.9	-111.6	-108.6	-108.3
Beam Name	S. Africa	S. Africa	Eur./ME/CA	Eur./ME/CA
Frequency Band (MHz)	13750 - 14250	13750 - 14250	13750 – 14250	13750 - 14250
Polarization	Horizontal	Vertical	Horizontal	Vertical
Channel Bandwidth (MHz)	36	36	36 / 72	36 / 72
Antenna Noise Temperature (°Kelvin)	220	220	245	245
Receiver Noise Temperature (°Kelvin)	533	538	441	446
Total System Noise Temperature (°Kelvin)	753	758	686	691
Total System Noise Temperature (dB/K)	28.8	28.8	28.4	28.4
Peak Gain of Satellite Receive Antenna (dBi)	39.4	39.4	32.5	32.4
Peak G/T (dB/K)	10.6	10.6	4.1	4.0
Minimum SFD [G/T: Peak, Attn: 0 dB] -- (dBW/m^2)	-107.4	-107.4	-102.3	-102.3
Beam Name	Russia	Russia	Africa-Europe	Africa-Europe
Frequency Band (MHz)	13750 – 14000	13750 – 14000	14250 – 14500	14250 - 14500
Polarization	Horizontal	Vertical	Horizontal	Vertical
Channel Bandwidth (MHz)	72	72	36	36
Antenna Noise Temperature (°Kelvin)	250	250	245	245
Receiver Noise Temperature (°Kelvin)	469	465	467	462
Total System Noise Temperature (°Kelvin)	719	715	712	707
Total System Noise Temperature (dB/K)	28.5	28.6	28.5	28.5
Peak Gain of Satellite Receive Antenna (dBi)	32.1	32.2	30.4	30.3
Peak G/T (dB/K)	3.6	3.6	1.9	1.8
Minimum SFD [G/T: Peak, Attn: 0 dB] -- (dBW/m^2)	-98.7	-98.7	-99.4	-99.4
Beam Name	Ka	Ka		
Frequency Band (MHz)	29500 – 30000	29500 - 30000		
Polarization	Right Hand Circular	Left Hand Circular		
Channel Bandwidth (MHz)	500	500		
Antenna Noise Temperature (°Kelvin)	290	290		
Receiver Noise Temperature (°Kelvin)	1164	1164		
Total System Noise Temperature (°Kelvin)	1454	1454		
Total System Noise Temperature (dB/K)	31.6	31.6		
Peak Gain of Satellite Receive Antenna (dBi)	36.7	36.7		
Peak G/T (dB/K)	5.1	5.1		
Minimum SFD [G/T: Peak, Attn: 0 dB] -- (dBW/m^2)	-90.8	-90.8		

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

Beam Name	Landmass	Landmass	S. Africa	S. Africa
Frequency Band (MHz)	3700 – 4200	3700 – 4200	10950 – 11200 11450 – 11700	10950 – 11200 11450 – 11700
Polarization	Horizontal	Vertical	Horizontal	Vertical
Channel Bandwidth (MHz)	27 / 54 / 60	27 / 54 / 60	36	36
Maximum Power At The Output of Last Stage Amplifier (dBW)	18.1	18.1	20.5	20.5
Loss From Last Stage Amplifier To Transmit Antenna Interface (dB)	2.8	2.7	3.0	3.0
Power Into Transmit Antenna (dBW)	15.3	15.4	17.5	17.5
Power Into Transmit Antenna (Watts)	33.9	34.7	56.2	56.2
Peak Gain of Satellite Transmit Antenna (dBi)	25.6	25.8	38.4	38.4
Maximum Downlink EIRP (dBW)	40.9	41.2	55.9	55.9
Beam Name	Eur./ME/CA	Eur./ME/CA	Russia	Russia
Frequency Band (MHz)	10950 – 11200 11450 – 11700	10950 – 11200 11450 – 11700	10950 - 11200	10950 – 11200
Polarization	Horizontal	Vertical	Horizontal	Vertical
Channel Bandwidth (MHz)	36 / 72	36 / 72	72	72
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)	3.0	3.1	2.9	2.9
Power Into Transmit Antenna (dBW)	18.8	18.7	18.9	18.9
Power Into Transmit Antenna (Watts)	75.9	74.1	77.6	77.6
Peak Gain of Satellite Transmit Antenna (dBi)	31.3	31.3	31.3	31.2
Maximum Downlink EIRP (dBW)	50.1	50.0	50.2	50.1
Beam Name	Africa-Europe	Africa-Europe	Ka	Ka
Frequency Band (MHz)	12500 – 12750	12500 – 12750	19700 – 20200	19700 – 20200
Polarization	Horizontal	Vertical	Right Hand Circular	Left Hand Circular
Channel Bandwidth (MHz)	36	36	500	500
Maximum Power At The Output of Last Stage Amplifier (dBW)	21.8	21.8	20.9	20.9
Loss From Last Stage Amplifier To Transmit Antenna Interface (dB)	3.3	3.3	3.1	3.1
Power Into Transmit Antenna (dBW)	18.5	18.5	17.8	17.8
Power Into Transmit Antenna (Watts)	70.8	70.8	60.3	60.3
Peak Gain of Satellite Transmit Antenna (dBi)	30.6	30.5	33.5	33.5
Maximum Downlink EIRP (dBW)	49.1	49.0	51.3	51.3
Beam Name	C-Band ULPC	Ku-Band ULPC		
Frequency Band (MHz)	3694	11198 11699.5 12749		
Polarization	Right Hand Circular	Right Hand Circular		
Channel Bandwidth (MHz)	0.025	0.025		
Maximum Power At The Output of Last Stage Amplifier (dBW)	-2.9	1.1		
Loss From Last Stage Amplifier To Transmit Antenna Interface (dB)	5.3	4.7		
Power Into Transmit Antenna (dBW)	-8.2	-3.6		
Power Into Transmit Antenna (Watts)	0.2	0.4		
Peak Gain of Satellite Transmit Antenna (dBi)	19.2	23.1		
Maximum Downlink EIRP (dBW)	11.0	19.5		

EXHIBIT 7: C-BAND and KU-BAND CHANNEL'S 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: 27 MHz Channel			
±6	0.28	0.22	0.45
±9	0.37	0.32	0.61
±11	0.39	0.43	0.72
±12	0.46	0.71	1.05
±14	0.83	1.53	2.24
C-Band: 54 MHz Channel			
±12	0.31	0.22	0.46
±18	0.38	0.31	0.58
±21	0.44	0.39	0.71
±24	0.51	0.54	0.92
±27	0.59	1.07	1.51
C-Band: 60 MHz Channel			
±13	0.31	0.24	0.48
±20	0.38	0.33	0.61
±23	0.44	0.43	0.74
±27	0.51	0.59	0.96
±30	0.59	1.12	1.56

EXHIBIT 7: C-BAND and KU-BAND CHANNEL'S RECEIVE AND TRANSMIT SECTION FILTER RESPONSE CHARACTERISTICS (continued)

	Attenuation Relative To Peak Level (dB)		
Frequency Offset Relative to Channel Center Frequency (MHz)	Input Section	Output Section	Total
Ku-Band: 36 MHz Channel			
±8	0.21	0.27	0.40
±12	0.26	0.51	0.65
±14	0.36	0.65	0.89
±16	0.65	1.16	1.68
±18	1.45	3.27	4.57
Ku-Band: 72 MHz Channel			
±16	0.39	0.20	0.57
±24	0.43	0.31	0.71
±28	0.42	0.71	0.89
±32	0.46	1.21	1.41
±36	0.80	3.06	3.59
Ka-Band: 500 MHz Channel			
±125	1.48	0.57	1.89
±200	1.68	0.60	2.18
±225	1.75	0.61	2.35
±250	2.01	0.66	2.65

EXHIBIT 8: TC&R SUBSYSTEM CHARACTERISTICS

	Spacecraft Antenna		
	Global Horn	**+Z Omni**	**-Z Omni**
Command Frequency (MHz) / Polarization (see note)			
Transfer Orbit / Emergency	n/a	13750.5 (LHCP) 14498.0 (LHCP)	13750.5 (LHCP) 14498.0 (LHCP)
On-Station	13750.5 (V) 14498.0 (V)	n/a	n/a
Command Modulation	FM	FM	FM
Bandwidth of Command Carrier (kHz)			
Occupied Bandwidth	850	850	850
Allocated Bandwidth	1000	1000	1000
Command Threshold (dBW/m^2)			
Beam Peak	-111.8	-93.2	-92.8
Edge of Coverage	-105.8	-87.2	-86.8
Command G/T (dB/K)			
Beam Peak	-13.1	-31.7	-32.1
Edge of Coverage	-19.1	-37.7	-38.1
Telemetry Frequency (MHz) / Polarization (see note)			
Transfer Orbit / Emergency	n/a	12746.5 (LHCP) 12747.0 (LHCP) 12748.0 (LHCP) 12748.5 (LHCP)	12746.5 (LHCP) 12747.0 (LHCP) 12748.0 (LHCP) 12748.5 (LHCP)
On-Station	12746.5 (V) 12747.0 (V) 12748.0 (V) 12748.5 (V)	n/a	n/a
Telemetry Modulation	PM	PM	PM
Bandwidth of Telemetry Carrier (kHz)			
Occupied	250	250	250
Allocated	500	500	500
Telemetry EIRP			
Beam Peak	13.9	15.6	15.4
Edge of Coverage	7.9	9.6	9.4
On-Station Ranging Accuracy (meters)	30	30	30

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

EXHIBIT 9: TC&R SUBSYSTEM EIRP and G/T BUDGETS

Operating Mode	On-Station	Back-up	Back-up
Antenna Type	Global Horn	+Z Omni	-Z Omni
Frequency (MHz)	14498 / 13750.5	14498 / 13750.5	14498 / 13750.5
Polarization	Vertical	Left Hand Circular	Left Hand Circular
Antenna Noise Temperature (°Kelvin)	290	290	290
Receiver Noise Temperature (°Kelvin)	3361	2678	10000
Total System Noise Temperature (°Kelvin)	3651	2968	10290
Total System Noise Temperature (dB/K)	35.6	34.7	40.1
Peak Gain of Satellite Receive Antenna (dBi)	22.5	3	8
Peak G/T (dB/K)	-13.1	-31.7	-32.1
SFD Threshold at Peak G/T (dBW/m^2)	-111.8	-93.2	-92.8
Operating Mode	On-Station	Back-up	Back-up
Antenna Type	Global Horn	+Z Omni	-Z Omni
Frequency (MHz)	12746.5 12747.0 12748.0 12748.5	12746.5 12747.0 12748.0 12748.5	12746.5 12747.0 12748.0 12748.5
Polarization	Vertical	Left Hand Circular	Left Hand Circular
Maximum Power At The Output of Last Stage Amplifier (dBW)	-2.7	15.4	15.4
Loss From Last Stage Amplifier To Transmit Antenna Interface (dB)	5.5	2.8	8.0
Power Into The Transmit Antenna (dBW)	-8.2	12.6	7.4
Power Into The Transmit Antenna (Watts)	0.2	18.4	5.5
Peak Gain of Satellite Transmit Antenna (dBi)	22.1	3.0	8.0
Maximum Downlink EIRP (dBW)	13.9	15.6	15.4

EXHIBIT 10: EMISSION DESIGNATORS

Signal Type	Emission Designator	Allocated Bandwidth (kHz)
Analog TV/FM Carrier	36M0F3F	36000
Analog TV/FM Carrier	24M0F3F	24000
64 kbps Carrier	100KG7W	100
128 kbps Carrier	400KG7W	400
512 kbps Carrier	1M45G7W	1450
6000 kbps carrier	10M3G7W	10300
18432 kbps Carrier	27M0G7W	27000
24575 kbps Carrier	36M0G7W	36000
36862 kbps Carrier	54M0G7W	54000
40958 kbps Carrier	60M0G7W	60000
49138 kbps Carrier	72M0G7W	72000
341318 kbps Carrier	500MG7W	500000

EXHIBIT 11: POWER FLUX DENSITY CALCULATIONS

FREQUENCY BAND : 3700 - 4200 MHz							
Landmass Beam (H-Pol.) - 24M0F3F							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP	40.9	40.9	40.9	40.9	40.9	40.9	40.9
Carrier Occupied Bandwidth (kHz)	4000	4000	4000	4000	4000	4000	4000
Spreading Loss (dB/m^2)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density (dBW/m^2/4kHz)	-152.5	-152.4	-152.3	-152.1	-152.0	-151.9	-151.2
FCC Limit (dBW/m^2/4Hz)	-152.0	-152.0	-149.5	-147.0	-144.5	-142.0	-142.0
Margin (dB)	0.5	0.4	2.8	5.1	7.5	9.9	9.2
Landmass Beam (H-Pol.) - 27M0G7W							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP	40.9	40.9	40.9	40.9	40.9	40.9	40.9
Carrier Occupied Bandwidth (kHz)	22600	22600	22600	22600	22600	22600	22600
Spreading Loss (dB/m^2)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density (dBW/m^2/4kHz)	-160.0	-159.9	-159.8	-159.7	-159.6	-159.4	-158.7
FCC Limit (dBW/m^2/4Hz)	-152.0	-152.0	-149.5	-147.0	-144.5	-142.0	-142.0
Margin (dB)	8.0	7.9	10.3	12.7	15.1	17.4	16.7

EXHIBIT 11: POWER FLUX DENSITY CALCULATIONS (continued)

FREQUENCY BAND : 3700 - 4200 MHz							
Landmass Beam (V-Pol.) - 24M0F3F							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP	41.2	41.2	41.2	41.2	41.2	41.2	41.2
Carrier Occupied Bandwidth (kHz)	4000	4000	4000	4000	4000	4000	4000
Spreading Loss (dB/m^2)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density (dBW/m^2/4kHz)	-152.2	-152.1	-152.0	-151.8	-151.7	-151.6	-150.9
FCC Limit (dBW/m^2/4Hz)	-152.0	-152.0	-149.5	-147.0	-144.5	-142.0	-142.0
Margin (dB)	0.2	0.1	2.5	4.8	7.2	9.6	8.9
Landmass Beam (V-Pol.) - 27M0G7W							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP	41.2	41.2	41.2	41.2	41.2	41.2	41.2
Carrier Occupied Bandwidth (kHz)	22600	22600	22600	22600	22600	22600	22600
Spreading Loss (dB/m^2)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density (dBW/m^2/4kHz)	-159.7	-159.6	-159.5	-159.4	-159.3	-159.1	-158.4
FCC Limit (dBW/m^2/4Hz)	-152.0	-152.0	-149.5	-147.0	-144.5	-142.0	-142.0
Margin (dB)	7.7	7.6	10.0	12.4	14.8	17.1	16.4

EXHIBIT 11: POWER FLUX DENSITY CALCULATIONS (continued)

FREQUENCY BAND : 3700 - 4200 MHz							
ULPC (RHCP-Pol.) - 25K0G7W							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP	11.0	11.0	11.0	11.0	11.0	11.0	11.0
Carrier Occupied Bandwidth (kHz)	25	25	25	25	25	25	25
Spreading Loss (dB/m^2)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density (dBW/m^2/4kHz)	-160.3	-160.2	-160.1	-160.0	-159.9	-159.8	-159.0
FCC Limit (dBW/m^2/4Hz)	-152.0	-152.0	-149.5	-147.0	-144.5	-142.0	-142.0
Margin (dB)	8.3	8.2	10.6	13.0	15.4	17.8	17.0
FREQUENCY BAND : 10950 - 11200 MHz and 11450 – 11700 MHz							
Southern Africa Beam (H-Pol.) - 36M0F3F							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP	43.4*	43.3*	45.7*	48.0*	50.4*	52.8*	52.1*
Carrier Occupied Bandwidth (kHz)	4000	4000	4000	4000	4000	4000	4000
Spreading Loss (dB/m^2)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density (dBW/m^2/4kHz)	-150.0	-150.0	-147.5	-145.0	-142.5	-140.0	-140.0
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	0.0	0.0

EXHIBIT 11: POWER FLUX DENSITY CALCULATIONS (continued)

FREQUENCY BAND : 10950 - 11200 MHz and 11450 – 11700 MHz							
Southern Africa Beam (H-Pol.) – 36M0G7W							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP	52.2*	52.0*	54.4*	55.9	55.9	55.9	55.9
Carrier Occupied Bandwidth (kHz)	30133	30133	30133	30133	30133	30133	30133
Spreading Loss (dB/m^2)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density (dBW/m^2/4kHz)	-150.0	-150.0	-147.5	-145.9	-145.8	-145.7	-144.9
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	0.9	3.3	5.7	4.9
Southern Africa Beam (V-Pol.) – 36M0F3F							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP	43.4*	43.3*	45.7*	48.0*	50.4*	52.8*	52.1*
Carrier Occupied Bandwidth (kHz)	4000	4000	4000	4000	4000	4000	4000
Spreading Loss (dB/m^2)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density (dBW/m^2/4kHz)	-150.0	-150.0	-147.5	-145.0	-142.5	-140.0	-140.0
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	0.0	0.0

EXHIBIT 11: POWER FLUX DENSITY CALCULATIONS (continued)

FREQUENCY BAND : 10950 - 11200 MHz and 11450 – 11700 MHz							
Southern Africa Beam (V-Pol.) - 36M0G7W							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP	52.2*	52.0*	54.4*	55.9	55.9	55.9	55.9
Carrier Occupied Bandwidth (kHz)	30133	30133	30133	30133	30133	30133	30133
Spreading Loss (dB/m^2)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density (dBW/m^2/4kHz)	-150.0	-150.0	-147.5	-145.9	-145.8	-145.7	-144.9
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	0.9	3.3	5.7	4.9
EU-ME-CA Beam (H-Pol.) - 36M0F3F							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP	43.4*	43.3*	45.7*	48.0*	50.1	50.1	50.1
Carrier Occupied Bandwidth (kHz)	4000	4000	4000	4000	4000	4000	4000
Spreading Loss (dB/m^2)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density (dBW/m^2/4kHz)	-150.0	-150.0	-147.5	-145.0	-142.8	-142.7	-142.0
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	0.3	2.7	2.0

EXHIBIT 11: POWER FLUX DENSITY CALCULATIONS (continued)

FREQUENCY BAND : 10950 - 11200 MHz and 11450 – 11700 MHz							
EU-ME-CA Beam (H-Pol.) - 36M0G7W							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP	50.1	50.1	50.1	50.1	50.1	50.1	50.1
Carrier Occupied Bandwidth (kHz)	30133	30133	30133	30133	30133	30133	30133
Spreading Loss (dB/m^2)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density (dBW/m^2/4kHz)	-152.1	-151.9	-151.8	-151.7	-151.6	-151.5	-150.7
FCC Limit (dBW/m^2/4Hz)	-150.0	-150.0	-147.5	-145.0	-142.5	-140.0	-140.0
Margin (dB)	2.1	1.9	4.3	6.7	9.1	11.5	10.7
EU-ME-CA Beam (V-Pol.) - 36M0F3F							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP	43.4*	43.3*	45.7*	48.0*	50.0	50.0	50.0
Carrier Occupied Bandwidth (kHz)	4000	4000	4000	4000	4000	4000	4000
Spreading Loss (dB/m^2)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density (dBW/m^2/4kHz)	-150.0	-150.0	-147.5	-145.0	-142.9	-142.8	-142.1
FCC Limit (dBW/m^2/4Hz)	-150.0	-150.0	-147.5	-145.0	-142.5	-140.0	-140.0
Margin (dB)	0.0	0.0	0.0	0.0	0.4	2.8	2.1

EXHIBIT 11: POWER FLUX DENSITY CALCULATIONS (continued)

FREQUENCY BAND : 10950 - 11200 MHz and 11450 – 11700 MHz							
EU-ME-CA Beam (V-Pol.) - 36M0G7W							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP	50.0	50.0	50.0	50.0	50.0	50.0	50.0
Carrier Occupied Bandwidth (kHz)	30133	30133	30133	30133	30133	30133	30133
Spreading Loss (dB/m^2)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density (dBW/m^2/4kHz)	-152.2	-152.0	-151.9	-151.8	-151.7	-151.6	-150.8
FCC Limit (dBW/m^2/4Hz)	-150.0	-150.0	-147.5	-145.0	-142.5	-140.0	-140.0
Margin (dB)	2.2	2.0	4.4	6.8	9.2	11.6	10.8
Russia Beam (H-Pol.) - 36M0F3F							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP	43.4*	43.3*	45.7*	48.0*	50.2	50.2	50.2
Carrier Occupied Bandwidth (kHz)	4000	4000	4000	4000	4000	4000	4000
Spreading Loss (dB/m^2)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density (dBW/m^2/4kHz)	-150.0	-150.0	-147.5	-145.0	-142.7	-142.6	-141.9
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	0.2	2.6	1.9

EXHIBIT 11: POWER FLUX DENSITY CALCULATIONS (continued)

FREQUENCY BAND : 10950 - 11200 MHz and 11450 – 11700 MHz							
Russia Beam (H-Pol.) - 36M0G7W							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP	50.2	50.2	50.2	50.2	50.2	50.2	50.2
Carrier Occupied Bandwidth (kHz)	30133	30133	30133	30133	30133	30133	30133
Spreading Loss (dB/m^2)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density (dBW/m^2/4kHz)	-152.0	-151.8	-151.7	-151.6	-151.5	-151.4	-150.6
FCC Limit (dBW/m^2/4Hz)	-150.0	-150.0	-147.5	-145.0	-142.5	-140.0	-140.0
Margin (dB)	2.0	1.8	4.2	6.6	9.0	11.4	10.6
Russia Beam (V-Pol.) - 36M0F3F							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP	43.4*	43.3*	45.7*	48.0*	50.1	50.1	50.1
Carrier Occupied Bandwidth (kHz)	4000	4000	4000	4000	4000	4000	4000
Spreading Loss (dB/m^2)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density (dBW/m^2/4kHz)	-150.0	-150.0	-147.5	-145.0	-142.8	-142.7	-142.0
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	0.3	2.7	2.0

EXHIBIT 11: POWER FLUX DENSITY CALCULATIONS (continued)

FREQUENCY BAND : 10950 - 11200 MHz and 11450 – 11700 MHz							
Russia Beam (V-Pol.) - 36M0G7W							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP	50.1	50.1	50.1	50.1	50.1	50.1	50.1
Carrier Occupied Bandwidth (kHz)	30133	30133	30133	30133	30133	30133	30133
Spreading Loss (dB/m^2)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density (dBW/m^2/4kHz)	-152.1	-151.9	-151.8	-151.7	-151.6	-151.5	-150.7
FCC Limit (dBW/m^2/4Hz)	-150.0	-150.0	-147.5	-145.0	-142.5	-140.0	-140.0
Margin (dB)	2.1	1.9	4.3	6.7	9.1	11.5	10.7
ULPC Beam (RHCP-Pol.) - 25K0G7W							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP	19.5	19.5	19.5	19.5	19.5	19.5	19.5
Carrier Occupied Bandwidth (kHz)	25	25	25	25	25	25	25
Spreading Loss (dB/m^2)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density (dBW/m^2/4kHz)	-151.8	-151.7	-151.6	-151.5	-151.4	-151.3	-150.5
FCC Limit (dBW/m^2/4Hz)	-150.0	-150.0	-147.5	-145.0	-142.5	-140.0	-140.0
Margin (dB)	1.8	1.7	4.1	6.5	8.9	11.3	10.5

EXHIBIT 11: POWER FLUX DENSITY CALCULATIONS (continued)

FREQUENCY BAND : 12500 - 12750 MHz							
Africa-Europe Beam (H-Pol.) - 36M0F3F							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP	45.4*	45.3*	47.7*	49.1	49.1	49.1	49.1
Carrier Occupied Bandwidth (kHz)	4000	4000	4000	4000	4000	4000	4000
Spreading Loss (dB/m^2)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density (dBW/m^2/4kHz)	-148.0	-148.0	-145.5	-143.9	-143.8	-143.7	-143.0
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	0.9	3.3	5.7	5.0
Africa-Europe Beam (H-Pol.) - 36M0G7W							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP	49.1	49.1	49.1	49.1	49.1	49.1	49.1
Carrier Occupied Bandwidth (kHz)	30133	30133	30133	30133	30133	30133	30133
Spreading Loss (dB/m^2)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density (dBW/m^2/4kHz)	-153.1	-152.9	-152.8	-152.7	-152.6	-152.5	-151.7
ITU Limit (dBW/m^2/4Hz)	-148.0	-148.0	-145.5	-143.0	-140.5	-138.0	-138.0
Margin (dB)	5.1	4.9	7.3	9.7	12.1	14.5	13.7

EXHIBIT 11: POWER FLUX DENSITY CALCULATIONS (continued)

FREQUENCY BAND : 12500 - 12750 MHz							
Africa-Europe Beam (V-Pol.) - 36M0F3F							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP	45.4*	45.3*	47.7*	49.0	49.0	49.0	49.0
Carrier Occupied Bandwidth (kHz)	4000	4000	4000	4000	4000	4000	4000
Spreading Loss (dB/m^2)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density (dBW/m^2/4kHz)	-148.0	-148.0	-145.5	-144.0	-143.9	-143.8	-143.1
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	1.0	3.4	5.8	5.1
Africa-Europe Beam (V-Pol.) - 36M0G7W							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP	49.0	49.0	49.0	49.0	49.0	49.0	49.0
Carrier Occupied Bandwidth (kHz)	30133	30133	30133	30133	30133	30133	30133
Spreading Loss (dB/m^2)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density (dBW/m^2/4kHz)	-153.2	-153.0	-152.9	-152.8	-152.7	-152.6	-151.8
ITU Limit (dBW/m^2/4Hz)	-148.0	-148.0	-145.5	-143.0	-140.5	-138.0	-138.0
Margin (dB)	5.2	5.0	7.4	9.8	12.2	14.6	13.8

EXHIBIT 11: POWER FLUX DENSITY CALCULATIONS (continued)

FREQUENCY BAND : 12500 - 12750 MHz							
Telemetry [Global Horn] (V-Pol.) - 250KG7W							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP	13.9	13.9	13.9	13.9	13.9	13.9	13.9
Carrier Occupied Bandwidth (kHz)	250	250	250	250	250	250	250
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)	-167.4	-167.3	-167.2	-167.1	-167.0	-166.9	-166.1
ITU Limit (dBW/m^2/4Hz)	-148.0	-148.0	-145.5	-143.0	-140.5	-138.0	-138.0
Margin (dB)	19.4	19.3	21.7	24.1	26.5	28.9	28.1
Telemetry [+Z Antenna] (LHCP-Pol.) - 250KG7W							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP	15.6	15.6	15.6	15.6	15.6	15.6	15.6
Carrier Occupied Bandwidth (kHz)	250	250	250	250	250	250	250
Spreading Loss (dB/m^2)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density (dBW/m^2/4kHz)	-165.7	-165.6	-165.5	-165.4	-165.3	-165.2	-164.4
ITU Limit (dBW/m^2/4Hz)	-148.0	-148.0	-145.5	-143.0	-140.5	-138.0	-138.0
Margin (dB)	17.7	17.6	20.0	22.4	24.8	27.2	26.4

EXHIBIT 11: POWER FLUX DENSITY CALCULATIONS (continued)

FREQUENCY BAND : 12500 - 12750 MHz							
Telemetry [-Z Antenna] (LHCP-Pol.) - 250KG7W							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP	15.4	15.4	15.4	15.4	15.4	15.4	15.4
Carrier Occupied Bandwidth (kHz)	250	250	250	250	250	250	250
Spreading Loss (dB/m^2)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density (dBW/m^2/4kHz)	-165.9	-165.8	-165.7	-165.6	-165.5	-165.4	-164.6
ITU Limit (dBW/m^2/4Hz)	-148.0	-148.0	-145.5	-143.0	-140.5	-138.0	-138.0
Margin (dB)	17.9	17.8	20.2	22.6	25.0	27.4	26.6
ULPC Beam (RHCP-Pol.) - 25K0G7W							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP	19.5	19.5	19.5	19.5	19.5	19.5	19.5
Carrier Occupied Bandwidth (kHz)	25	25	25	25	25	25	25
Spreading Loss (dB/m^2)	163.4	163.3	163.2	163.0	162.9	162.8	162.1
Maximum EIRP Spectral Density (dBW/m^2/4kHz)	-151.8	-151.7	-151.6	-151.5	-151.4	-151.3	-150.5
ITU Limit (dBW/m^2/4Hz)	-148.0	-148.0	-145.5	-143.0	-140.5	-138.0	-138.0
Margin (dB)	3.8	3.7	6.1	8.5	10.9	13.3	12.5

EXHIBIT 11: POWER FLUX DENSITY CALCULATIONS (continued)

FREQUENCY BAND : 19700 - 20200 MHz							
KA (RHCP-Pol.) – 500MG7W							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP	51.3	51.3	51.3	51.3	51.3	51.3	51.3
Carrier Occupied Bandwidth (kHz)	418514	418514	418514	418514	418514	418514	418514
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/MHz)	-138.3	-138.2	-138.1	-138.0	-137.9	-137.7	-137.0
FCC Limit (dBW/m^2/MHz)	-118.0	-118.0	-118.0	-118.0	-118.0	-118.0	-118.0
Margin (dB)	20.3	20.2	20.1	20.0	19.9	19.7	19.0
KA (LHCP-Pol.) – 500MG7W							
Elevation Angle (degrees)	0	5	10	15	20	25	90
Assumed EIRP	51.3	51.3	51.3	51.3	51.3	51.3	51.3
Carrier Occupied Bandwidth (kHz)	418514	418514	418514	418514	418514	418514	418514
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/MHz)	-138.3	-138.2	-138.1	-138.0	-137.9	-137.7	-137.0
FCC Limit (dBW/m^2/MHz)	-118.0	-118.0	-118.0	-118.0	-118.0	-118.0	-118.0
Margin (dB)	20.3	20.2	20.1	20.0	19.9	19.7	19.0

* 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 12: INTELSAT 20 LINK BUDGETS

UPLINK BEAM INFORMATION				
Uplink Beam Name	LANDMASS	LANDMASS	LANDMASS	LANDMASS
Uplink Frequency (GHz)	6.175	6.175	6.175	6.175
Uplink Beam Polarization	LINEAR	LINEAR	LINEAR	LINEAR
Uplink Relative Contour Level (dB)	-10.0	-10.0	-10.0	-10.0
Uplink Contour G/T (dB/K)	-9.6	-9.6	-9.6	-9.6
Uplink SFD (dBW/m2)	-78.7	-81.0	-78.7	-78.7
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0
DOWNLINK BEAM INFORMATION				
Downlink Beam Name	LANDMASS	LANDMASS	LANDMASS	LANDMASS
Downlink Frequency (GHz)	3.950	3.950	3.950	3.950
Downlink Beam Polarization	LINEAR	LINEAR	LINEAR	LINEAR
Downlink Relative Contour Level (dB)	-10.0	-10.0	-10.0	-10.0
Downlink Contour EIRP (dBW)	30.9	30.9	30.9	30.9
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0
ADJACENT SATELLITE 1				
Satellite 1 Orbital Location	66.5E	66.5E	66.5E	66.5E
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)	-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	70.5E	70.5E	70.5E	70.5E
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)	-42.0	-42.0	-42.0	-42.0
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
CARRIER INFORMATION				
Carrier ID	30M0F3F	60M0G7W	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	40958	6000	64
Code Rate	N/A	1/2x188/204	1/2x188/204	1/2x239/256
Occupied Bandwidth(kHz)	30000	50222	6771.1	75.4
Allocated Bandwidth(kHz)	30000	60000	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)	15.2	15.2	6.1	6.1
Earth Station Gain (dBi)	58.4	58.4	49.4	49.4
Earth Station Elevation Angle	20	20	20	20
DOWNLINK EARTH STATION				
Earth Station Diameter (meters)	13.1	3.5	4.5	4.5
Earth Station Gain (dBi)	53.5	41.1	43.9	43.9
Earth Station G/T (dB/K)	33.0	21.0	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)	81.2	81.9	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)	-9.6	-9.6	-9.6	-9.6
Boltzman Constant(dBW/K-Hz)	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-74.8	-77.0	-68.3	-48.8
Uplink C/N(dB)	25.2	23.7	20.4	19.5
DOWNLINK PERFORMANCE				
Downlink EIRP per Carrier (dBW)	26.7	30.9	21.3	.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)	33.0	21.0	23.6	23.6
Boltzman Constant(dBW / K - Hz)	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-74.8	-77.0	-68.3	-48.8
Downlink C / N(dB)	16.7	6.7	8.3	7.5
COMPOSITE LINK PERFORMANCE				
C/N Uplink (dB)	25.2	23.7	20.4	19.5
C/N Downlink (dB)	16.7	6.7	8.3	7.5
C/I Intermodulation (dB)	N/A	N/A	20.0	19.1
C/I Uplink Co-Channel (dB)*	27.0	27.0	28.5	28.2
C/I Downlink Co-Channel (dB)*	27.0	27.0	28.5	28.2
C/I Uplink Adjacent Satellite 1 (dB)	17.1	15.6	12.3	11.4
C/I Downlink Adjacent Satellite 1 (dB)	25.5	12.2	16.0	15.2
C/I Uplink Adjacent Satellite 2 (dB)	17.1	15.6	12.3	11.4
C/I Downlink Adjacent Satellite 2 (dB)	26.3	17.0	18.5	17.7
C/(N+I) Composite (dB)	11.4	4.4	4.9	4.0
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	10.4	3.4	3.9	3.0
Minimum Required C/N (dB)	-10.0	-3.4	-3.9	-3.0
Excess Link Margin (dB)	.4	.1	0.0	0.0
Number of Carriers	2	1.0	4.1	450.4
CARRIER DENSITY LEVELS				
Uplink Power Density (dBW/Hz)	-43.2	-53.5	-47.8	-48.7
Downlink EIRP Density At Beam Peak (dBW/Hz)	-29.3	-36.1	-37.0	-37.9

EXHIBIT 12: INTELSAT 20 LINK BUDGETS (continued)

UPLINK BEAM INFORMATION				
Uplink Beam Name	LANDMASS	LANDMASS	LANDMASS	LANDMASS
Uplink Frequency (GHz)	6.550	6.550	6.550	6.550
Uplink Beam Polarization	LINEAR	LINEAR	LINEAR	LINEAR
Uplink Relative Contour Level (dB)	-10.0	-10.0	-10.0	-10.0
Uplink Contour G/T (dB/K)	-9.3	-9.3	-9.3	-9.3
Uplink SFD (dBW/m2)	-68.6	-74.6	-74.6	-74.6
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0
DOWNLINK BEAM INFORMATION				
Downlink Beam Name	S_AFRICA	S_AFRICA	S_AFRICA	S_AFRICA
Downlink Frequency (GHz)	11.075	11.075	11.075	11.075
Downlink Beam Polarization	LINEAR	LINEAR	LINEAR	LINEAR
Downlink Relative Contour Level (dB)	-6.0	-6.0	-6.0	-6.0
Downlink Contour EIRP (dBW)	49.9	49.9	49.9	49.9
Rain Rate (mm/hr)	22.0	22.0	22.0	22.0
ADJACENT SATELLITE 1				
Satellite 1 Orbital Location	66.5E	66.5E	66.5E	66.5E
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)	-24.8	-24.8	-24.8	-24.8
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
ADJACENT SATELLITE 2				
Satellite 1 Orbital Location	70.5E	70.5E	70.5E	70.5E
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)	-23.8	-23.8	-23.8	-23.8
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
CARRIER INFORMATION				
Carrier ID	36M0F3F	36M0G7W	10M3G7W	100KG7W
Carrier Modulation	TV/FM	QPSK	QPSK	QPSK
Peak to Peak Bandwidth of EDS (MHz)	4	N/A	N/A	N/A
Information Rate(kbps)	N/A	24575	6000	64
Code Rate	N/A	1/2x188/204	1/2x188/204	1/2x239/256
Occupied Bandwidth(kHz)	36000	30133	6771.1	75.4
Allocated Bandwidth(kHz)	36000	36000	10300	100
Minimum C/N, Clear Sky (dB)	10.0	3.36	3.87	2.99
Minimum C/N, Rain (dB)	10.0	3.36	3.57	2.79
UPLINK EARTH STATION				
Earth Station Diameter (meters)	15.2	7.0	6.1	6.1
Earth Station Gain (dBi)	58.9	51.5	49.9	49.9
Earth Station Elevation Angle	20	20	20	20
DOWNLINK EARTH STATION				
Earth Station Diameter (meters)	3.7	1.8	1.8	1.8
Earth Station Gain (dBi)	50.4	44.1	44.1	44.1
Earth Station G/T (dB/K)	27.9	21.6	21.6	21.6
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)	82.5	75.3	69.9	49.6
Uplink Path Loss, Clear Sky (dB)	-200.7	-200.7	-200.7	-200.7
Uplink Rain Attenuation	0.0	0.0	0.0	0.0
Satellite G/T(dB/K)	-9.3	-9.3	-9.3	-9.3
Boltzman Constant(dBW/K-Hz)	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-74.8	-68.3	-48.8
Uplink C/N(dB)	25.5	19.1	20.2	19.4
DOWNLINK PERFORMANCE				
Downlink EIRP per Carrier (dBW)	44.0	42.8	36.2	15.9
Antenna Pointing Error (dB)	-.5	-.5	-.5	-.5
Downlink Path Loss, Clear Sky (dB)	-205.3	-205.3	-205.3	-205.3
Downlink Rain Attenuation	0.0	0.0	0.0	0.0
Earth Station G/T (dB/K)	27.9	21.6	21.6	21.6
Boltzman Constant(dBW / K - Hz)	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-74.8	-68.3	-48.8
Downlink C / N(dB)	19.2	12.4	12.3	11.6
COMPOSITE LINK PERFORMANCE				
C/N Uplink (dB)	25.5	19.1	20.2	19.4
C/N Downlink (dB)	19.2	12.4	12.3	11.6
C/I Intermodulation (dB)	N/A	N/A	13.7	12.9
C/I Uplink Co-Channel (dB)*	27.0	27.0	22.3	22.1
C/I Downlink Co-Channel (dB)*	27.0	27.0	22.3	22.1
C/I Uplink Adjacent Satellite 1 (dB)	17.6	11.2	12.3	11.6
C/I Downlink Adjacent Satellite 1 (dB)	21.6	14.3	14.2	13.4
C/I Uplink Adjacent Satellite 2 (dB)	17.6	11.2	12.3	11.6
C/I Downlink Adjacent Satellite 2 (dB)	21.7	15.5	15.4	14.6
C/(N+I) Composite (dB)	11.7	5.4	5.1	4.4
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	10.7	4.4	4.1	3.4
Minimum Required C/N (dB)	-10.0	-3.4	-3.9	-3.0
Excess Link Margin (dB)	.7	1.0	.3	.4
Number of Carriers	1	1.0	3.5	360.0
CARRIER DENSITY LEVELS				
Uplink Power Density (dBW/Hz)	-42.4	-51.0	-48.3	-49.1
Downlink EIRP Density At Beam Peak (dBW/Hz)	-16.0	-26.0	-26.1	-26.9

EXHIBIT 12: INTELSAT 20 LINK BUDGETS (continued)

UPLINK BEAM INFORMATION						
Uplink Beam Name	S_AFRICA	S_AFRICA	S_AFRICA	S_AFRICA	S_AFRICA	S_AFRICA
Uplink Frequency (GHz)	14.000	14.000	14.000	14.000	14.000	14.000
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)	4.6	4.6	4.6	4.6	4.6	4.6
Uplink SFD (dBW/m2)	-75.4	-75.4	-81.4	-81.4	-81.4	-81.4
Rain Rate (mm/hr)	22.0	22.0	22.0	22.0	22.0	22.0
DOWNLINK BEAM INFORMATION						
Downlink Beam Name	S_AFRICA	S_AFRICA	S_AFRICA	S_AFRICA	S_AFRICA	S_AFRICA
Downlink Frequency (GHz)	11.325	11.325	11.325	11.325	11.325	11.325
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)	49.9	49.9	49.9	49.9	49.9	49.9
Rain Rate (mm/hr)	22.0	42.0	42.0	42.0	42.0	42.0
ADJACENT SATELLITE 1						
Satellite 1 Orbital Location	66.5E	66.5E	66.5E	66.5E	66.5E	66.5E
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)	-24.8	-24.8	-24.8	-24.8	-24.8	-24.8
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0	0.0
ADJACENT SATELLITE 2						
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
CARRIER INFORMATION						
Carrier ID	36M0F3F	36M0G7W	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	1.8
Earth Station Gain (dBi)	56.7	56.7	56.7	56.7	56.7	46.2
Earth Station Elevation Angle	20	20	20	20	20	20
DOWNLINK EARTH STATION						
Earth Station Diameter (meters)	3.7	1.8	1.8	1.8	1.8	6.1
Earth Station Gain (dBi)	50.6	44.3	44.3	44.3	44.3	55.0
Earth Station G/T (dB/K)	28.1	21.8	21.8	21.8	21.8	32.6
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)	75.7	74.5	63.1	42.8	54.8	45.7
Uplink Path Loss, Clear Sky (dB)	-207.3	-207.3	-207.3	-207.3	-207.3	-207.3
Uplink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Satellite G/T(dB/K)	4.6	4.6	4.6	4.6	4.6	4.6
Boltzman Constant(dBW/K-Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-74.8	-68.3	-48.8	-60.9	-54.9
Uplink C/N(dB)	26.0	25.6	20.7	20.0	19.8	16.7
DOWNLINK PERFORMANCE						
Downlink EIRP per Carrier (dBW)	44.0	42.8	36.2	15.9	27.9	18.8
Antenna Pointing Error (dB)	-.5	-.5	-.5	-.5	-.5	-.5
Downlink Path Loss, Clear Sky (dB)	-205.5	-205.5	-205.5	-205.5	-205.5	-205.5
Downlink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Earth Station G/T (dB/K)	28.1	21.8	21.8	21.8	21.8	32.6
Boltzman Constant(dBW / K - Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-74.8	-68.3	-48.8	-60.9	-54.9
Downlink C / N(dB)	19.2	12.4	12.3	11.6	11.5	19.1
COMPOSITE LINK PERFORMANCE						
C/N Uplink (dB)	26.0	25.6	20.7	20.0	19.8	16.7
C/N Downlink (dB)	19.2	12.4	12.3	11.6	11.5	19.1
C/I Intermodulation (dB)	N/A	N/A	13.7	13.0	12.8	9.7
C/I Uplink Co-Channel (dB)*	27.0	27.0	22.3	22.1	22.5	18.9
C/I Downlink Co-Channel (dB)*	27.0	27.0	22.3	22.1	22.5	18.9
C/I Uplink Adjacent Satellite 1 (dB)	21.1	20.7	15.8	15.1	15.0	11.8
C/I Downlink Adjacent Satellite 1 (dB)	21.8	14.5	14.4	13.6	13.5	21.9
C/I Uplink Adjacent Satellite 2 (dB)	21.1	20.7	15.8	15.1	15.0	11.8
C/I Downlink Adjacent Satellite 2 (dB)	21.9	15.7	15.6	14.8	14.7	21.5
C/(N+I) Composite (dB)	13.3	8.4	6.2	5.5	5.4	5.1
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	12.3	7.4	5.2	4.5	4.4	4.1
Minimum Required C/N (dB)	-10.0	-3.4	-3.9	-3.0	-3.4	-3.4
Excess Link Margin (dB)	2.3	4.1	1.4	1.5	1.0	.7
Number of Carriers	1	1.0	3.5	360.0	24.8	90.0
CARRIER DENSITY LEVELS						
Uplink Power Density (dBW/Hz)	-47.1	-57.0	-61.9	-62.7	-62.8	-55.4
Downlink EIRP Density At Beam Peak (dBW/Hz)	-16.0	-26.0	-26.1	-26.8	-27.0	-30.1

EXHIBIT 12: INTELSAT 20 LINK BUDGETS (continued)

UPLINK BEAM INFORMATION						
Uplink Beam Name	EU_ME_CA	EU_ME_CA	EU_ME_CA	EU_ME_CA	EU_ME_CA	EU_ME_CA
Uplink Frequency (GHz)	13.875	13.875	13.875	13.875	13.875	13.875
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)	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9
Uplink SFD (dBW/m2)	-79.3	-83.3	-82.3	-82.3	-82.3	-82.3
Rain Rate (mm/hr)	22.0	22.0	22.0	22.0	22.0	22.0
DOWNLINK BEAM INFORMATION						
Downlink Beam Name	EU_ME_CA	EU_ME_CA	EU_ME_CA	EU_ME_CA	EU_ME_CA	EU_ME_CA
Downlink Frequency (GHz)	11.075	11.075	11.075	11.075	11.075	11.075
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)	44.0	44.0	44.0	44.0	44.0	44.0
Rain Rate (mm/hr)	22.0	22.0	22.0	22.0	22.0	22.0
ADJACENT SATELLITE 1						
Satellite 1 Orbital Location	66.5E	66.5E	66.5E	66.5E	66.5E	66.5E
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)	-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
ADJACENT SATELLITE 2						
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
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)	56.7	56.7	56.7	56.7	56.7	48.8
Earth Station Elevation Angle	20	20	20	20	20	20
DOWNLINK EARTH STATION						
Earth Station Diameter (meters)	6.1	1.8	2.4	2.4	2.4	6.1
Earth Station Gain (dBi)	54.8	44.1	46.8	46.8	46.8	54.8
Earth Station G/T (dB/K)	32.4	21.6	24.3	24.3	24.3	32.4
Earth Station Elevation Angle	20	20	20	20	20	20
LINK FADE TYPE	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky
UPLINK PERFORMANCE						
Uplink Earth Station EIRP (dBW)	80.6	79.6	65.5	45.3	57.3	46.8
Uplink Path Loss, Clear Sky (dB)	-207.2	-207.2	-207.2	-207.2	-207.2	-207.2
Uplink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Satellite G/T(dB/K)	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9
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)	24.5	21.3	16.7	16.0	15.9	11.4
DOWNLINK PERFORMANCE						
Downlink EIRP per Carrier (dBW)	39.8	44.0	33.6	13.4	25.4	14.9
Antenna Pointing Error (dB)	-.5	-.5	-.5	-.5	-.5	-.5
Downlink Path Loss, Clear Sky (dB)	-205.3	-205.3	-205.3	-205.3	-205.3	-205.3
Downlink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Earth Station G/T (dB/K)	32.4	21.6	24.3	24.3	24.3	32.4
Boltzman Constant(dBW / K - Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-77.8	-68.3	-48.8	-60.9	-54.9
Downlink C / N(dB)	19.5	10.6	12.4	11.7	11.6	15.3
COMPOSITE LINK PERFORMANCE						
C/N Uplink (dB)	24.5	21.3	16.7	16.0	15.9	11.4
C/N Downlink (dB)	19.5	10.6	12.4	11.7	11.6	15.3
C/I Intermodulation (dB)	N/A	N/A	20.0	19.3	19.2	14.7
C/I Uplink Co-Channel (dB)*	27.0	27.0	28.6	28.5	28.9	23.9
C/I Downlink Co-Channel (dB)*	27.0	27.0	28.6	28.5	28.9	23.9
C/I Uplink Adjacent Satellite 1 (dB)	26.0	22.8	18.2	17.5	17.4	12.9
C/I Downlink Adjacent Satellite 1 (dB)	17.3	7.7	9.8	9.1	9.0	13.0
C/I Uplink Adjacent Satellite 2 (dB)	26.0	22.8	18.2	17.5	17.4	12.9
C/I Downlink Adjacent Satellite 2 (dB)	21.7	13.7	15.2	14.6	14.4	17.5
C/(N+I) Composite (dB)	13.1	4.9	5.9	5.2	5.1	5.0
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	12.1	3.9	4.9	4.2	4.1	4.0
Minimum Required C/N (dB)	-10.0	-3.4	-3.9	-3.0	-3.4	-3.4
Excess Link Margin (dB)	2.1	.6	1.0	1.2	.7	.6
Number of Carriers	2	1.0	4.9	512.3	32.2	180.0
CARRIER DENSITY LEVELS						
Uplink Power Density (dBW/Hz)	-42.1	-54.9	-59.4	-60.1	-60.2	-56.9
Downlink EIRP Density At Beam Peak (dBW/Hz)	-20.2	-27.8	-28.7	-29.4	-29.5	-34.0

EXHIBIT 12: INTELSAT 20 LINK BUDGETS (continued)

UPLINK BEAM INFORMATION						
Uplink Beam Name	EU_ME_CA	EU_ME_CA	EU_ME_CA	EU_ME_CA	EU_ME_CA	EU_ME_CA
Uplink Frequency (GHz)	13.875	13.875	13.875	13.875	13.875	13.875
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)	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9
Uplink SFD (dBW/m2)	-82.3	-82.3	-74.3	-74.3	-74.3	-74.3
Rain Rate (mm/hr)	22.0	22.0	22.0	22.0	22.0	22.0
DOWNLINK BEAM INFORMATION						
Downlink Beam Name	RUSSIA	RUSSIA	RUSSIA	RUSSIA	RUSSIA	RUSSIA
Downlink Frequency (GHz)	11.075	11.075	11.075	11.075	11.075	11.075
Downlink Beam Polarization	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR
Downlink Relative Contour Level (dB)	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0
Downlink Contour EIRP (dBW)	46.1	46.1	46.1	46.1	46.1	46.1
Rain Rate (mm/hr)	22.0	22.0	22.0	22.0	22.0	22.0
ADJACENT SATELLITE 1						
Satellite 1 Orbital Location	66.5E	66.5E	66.5E	66.5E	66.5E	66.5E
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)	-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
ADJACENT SATELLITE 2						
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
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	307.0
Allocated Bandwidth(kHz)	36000	72000	10300	100	1450	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	1.8
Earth Station Gain (dBi)	56.7	56.7	56.7	56.7	56.7	46.2
Earth Station Elevation Angle	20	20	20	20	20	20
DOWNLINK EARTH STATION						
Earth Station Diameter (meters)	4.6	1.8	1.8	1.8	1.8	6.1
Earth Station Gain (dBi)	52.8	44.1	44.1	44.1	44.1	54.8
Earth Station G/T (dB/K)	30.3	21.6	21.6	21.6	21.6	32.4
Earth Station Elevation Angle	20	20	20	20	20	20
LINK FADE TYPE	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky
UPLINK PERFORMANCE						
Uplink Earth Station EIRP (dBW)	77.6	80.6	73.4	53.2	65.8	51.0
Uplink Path Loss, Clear Sky (dB)	-207.2	-207.2	-207.2	-207.2	-207.2	-207.2
Uplink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Satellite G/T(dB/K)	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9
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)	21.5	22.3	24.6	23.9	24.4	15.6
DOWNLINK PERFORMANCE						
Downlink EIRP per Carrier (dBW)	41.9	46.1	35.6	15.4	26.5	13.2
Antenna Pointing Error (dB)	-.5	-.5	-.5	-.5	-.5	-.5
Downlink Path Loss, Clear Sky (dB)	-205.3	-205.3	-205.3	-205.3	-205.3	-205.3
Downlink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Earth Station G/T (dB/K)	30.3	21.6	21.6	21.6	21.6	32.4
Boltzman Constant(dBW / K - Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-77.8	-68.3	-48.8	-60.9	-54.9
Downlink C / N(dB)	19.5	12.7	11.7	11.0	10.0	13.5
COMPOSITE LINK PERFORMANCE						
C/N Uplink (dB)	21.5	22.3	24.6	23.9	24.4	15.6
C/N Downlink (dB)	19.5	12.7	11.7	11.0	10.0	13.5
C/I Intermodulation (dB)	N/A	N/A	19.9	19.2	26.2	10.9
C/I Uplink Co-Channel (dB)*	27.0	27.0	28.5	28.4	29.4	20.1
C/I Downlink Co-Channel (dB)*	27.0	27.0	28.5	28.4	29.4	20.1
C/I Uplink Adjacent Satellite 1 (dB)	23.0	23.8	26.1	25.4	26.0	17.1
C/I Downlink Adjacent Satellite 1 (dB)	17.2	9.8	8.8	8.1	7.0	11.3
C/I Uplink Adjacent Satellite 2 (dB)	23.0	23.8	26.1	25.4	26.0	17.1
C/I Downlink Adjacent Satellite 2 (dB)	21.9	15.8	14.8	14.1	13.0	15.7
C/(N+I) Composite (dB)	12.4	6.9	5.9	5.3	4.4	5.1
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	11.4	5.9	4.9	4.3	3.4	4.1
Minimum Required C/N (dB)	-10.0	-3.4	-3.9	-3.0	-3.4	-3.4
Excess Link Margin (dB)	1.4	2.6	1.1	1.3	0.0	.7
Number of Carriers	2	1.0	5.0	526.1	28.5	180.0
CARRIER DENSITY LEVELS						
Uplink Power Density (dBW/Hz)	-45.1	-53.9	-51.6	-52.3	-51.7	-50.1
Downlink EIRP Density At Beam Peak (dBW/Hz)	-20.1	-27.7	-28.7	-29.4	-30.4	-37.7

EXHIBIT 12: INTELSAT 20 LINK BUDGETS (continued)

UPLINK BEAM INFORMATION						
Uplink Beam Name	RUSSIA	RUSSIA	RUSSIA	RUSSIA	RUSSIA	RUSSIA
Uplink Frequency (GHz)	13.875	13.875	13.875	13.875	13.875	13.875
Uplink Beam Polarization	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR
Uplink Relative Contour Level (dB)	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0
Uplink Contour G/T (dB/K)	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4
Uplink SFD (dBW/m2)	-84.7	-84.7	-75.7	-75.7	-75.7	-75.7
Rain Rate (mm/hr)	22.0	22.0	22.0	22.0	22.0	22.0
DOWNLINK BEAM INFORMATION						
Downlink Beam Name	RUSSIA	RUSSIA	RUSSIA	RUSSIA	RUSSIA	RUSSIA
Downlink Frequency (GHz)	11.075	11.075	11.075	11.075	11.075	11.075
Downlink Beam Polarization	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR
Downlink Relative Contour Level (dB)	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0
Downlink Contour EIRP (dBW)	46.1	46.1	46.1	46.1	46.1	46.1
Rain Rate (mm/hr)	22.0	22.0	22.0	22.0	22.0	22.0
ADJACENT SATELLITE 1						
Satellite 1 Orbital Location	66.5E	66.5E	66.5E	66.5E	66.5E	66.5E
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)	-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
ADJACENT SATELLITE 2						
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
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	1.8
Earth Station Gain (dBi)	56.7	56.7	56.7	56.7	56.7	46.2
Earth Station Elevation Angle	20	20	20	20	20	20
DOWNLINK EARTH STATION						
Earth Station Diameter (meters)	4.6	1.8	1.8	1.8	1.8	6.1
Earth Station Gain (dBi)	52.8	44.1	44.1	44.1	44.1	54.8
Earth Station G/T (dB/K)	30.3	21.6	21.6	21.6	21.6	32.4
Earth Station Elevation Angle	20	20	20	20	20	20
LINK FADE TYPE	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky
UPLINK PERFORMANCE						
Uplink Earth Station EIRP (dBW)	75.2	78.2	72.0	51.8	63.8	49.5
Uplink Path Loss, Clear Sky (dB)	-207.2	-207.2	-207.2	-207.2	-207.2	-207.2
Uplink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Satellite G/T(dB/K)	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4
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
Uplink C/N(dB)	20.6	21.4	24.6	24.0	23.9	15.6
DOWNLINK PERFORMANCE						
Downlink EIRP per Carrier (dBW)	41.9	46.1	35.6	15.4	27.4	13.1
Antenna Pointing Error (dB)	-.5	-.5	-.5	-.5	-.5	-.5
Downlink Path Loss, Clear Sky (dB)	-205.3	-205.3	-205.3	-205.3	-205.3	-205.3
Downlink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Earth Station G/T (dB/K)	30.3	21.6	21.6	21.6	21.6	32.4
Boltzman Constant(dBW / K - Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-77.8	-68.3	-48.8	-60.9	-54.9
Downlink C / N(dB)	19.5	12.7	11.7	11.0	10.9	13.5
COMPOSITE LINK PERFORMANCE						
C/N Uplink (dB)	20.6	21.4	24.6	24.0	23.9	15.6
C/N Downlink (dB)	19.5	12.7	11.7	11.0	10.9	13.5
C/I Intermodulation (dB)	N/A	N/A	19.9	19.2	19.1	10.8
C/I Uplink Co-Channel (dB)*	27.0	27.0	28.4	28.4	28.8	20.1
C/I Downlink Co-Channel (dB)*	27.0	27.0	28.4	28.4	28.8	20.1
C/I Uplink Adjacent Satellite 1 (dB)	22.6	23.4	26.7	26.0	25.9	17.6
C/I Downlink Adjacent Satellite 1 (dB)	17.2	9.8	8.8	8.1	8.0	11.2
C/I Uplink Adjacent Satellite 2 (dB)	22.6	23.4	26.7	26.0	25.9	17.6
C/I Downlink Adjacent Satellite 2 (dB)	21.9	15.8	14.7	14.1	14.0	15.7
C/(N+I) Composite (dB)	12.2	6.9	5.9	5.3	5.2	5.1
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	11.2	5.9	4.9	4.3	4.2	4.1
Minimum Required C/N (dB)	-10.0	-3.4	-3.9	-3.0	-3.4	-3.4
Excess Link Margin (dB)	1.2	2.5	1.1	1.3	.8	.7
Number of Carriers	2	1.0	5.0	527.5	33.2	180.0
CARRIER DENSITY LEVELS						
Uplink Power Density (dBW/Hz)	-47.5	-56.3	-53.0	-53.7	-53.8	-51.5
Downlink EIRP Density At Beam Peak (dBW/Hz)	-20.1	-27.7	-28.7	-29.4	-29.5	-37.8

EXHIBIT 12: INTELSAT 20 LINK BUDGETS (continued)

UPLINK BEAM INFORMATION						
Uplink Beam Name	RUSSIA	RUSSIA	RUSSIA	RUSSIA	RUSSIA	RUSSIA
Uplink Frequency (GHz)	13.875	13.875	13.875	13.875	13.875	13.875
Uplink Beam Polarization	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR
Uplink Relative Contour Level (dB)	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0
Uplink Contour G/T (dB/K)	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4
Uplink SFD (dBW/m2)	-80.7	-82.7	-82.7	-82.7	-82.7	-82.7
Rain Rate (mm/hr)	22.0	22.0	22.0	22.0	22.0	22.0
DOWNLINK BEAM INFORMATION						
Downlink Beam Name	EU_ME_CA	EU_ME_CA	EU_ME_CA	EU_ME_CA	EU_ME_CA	EU_ME_CA
Downlink Frequency (GHz)	11.075	11.075	11.075	11.075	11.075	11.075
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)	44.0	44.0	44.0	44.0	44.0	44.0
Rain Rate (mm/hr)	22.0	22.0	22.0	22.0	22.0	22.0
ADJACENT SATELLITE 1						
Satellite 1 Orbital Location	66.5E	66.5E	66.5E	66.5E	66.5E	66.5E
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)	-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
ADJACENT SATELLITE 2						
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
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)	56.7	56.7	56.7	56.7	56.7	48.8
Earth Station Elevation Angle	20	20	20	20	20	20
DOWNLINK EARTH STATION						
Earth Station Diameter (meters)	6.1	1.8	2.4	2.4	2.4	6.1
Earth Station Gain (dBi)	54.8	44.1	46.8	46.8	46.8	54.8
Earth Station G/T (dB/K)	32.4	21.6	24.3	24.3	24.3	32.4
Earth Station Elevation Angle	20	20	20	20	20	20
LINK FADE TYPE	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky
UPLINK PERFORMANCE						
Uplink Earth Station EIRP (dBW)	79.3	80.3	65.0	44.8	56.8	45.7
Uplink Path Loss, Clear Sky (dB)	-207.2	-207.2	-207.2	-207.2	-207.2	-207.2
Uplink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Satellite G/T(dB/K)	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4
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
Uplink C/N(dB)	24.7	23.5	17.6	16.9	16.8	11.8
DOWNLINK PERFORMANCE						
Downlink EIRP per Carrier (dBW)	39.8	44.0	33.4	13.1	25.1	14.1
Antenna Pointing Error (dB)	-.5	-.5	-.5	-.5	-.5	-.5
Downlink Path Loss, Clear Sky (dB)	-205.3	-205.3	-205.3	-205.3	-205.3	-205.3
Downlink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Earth Station G/T (dB/K)	32.4	21.6	24.3	24.3	24.3	32.4
Boltzman Constant(dBW / K - Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-77.8	-68.3	-48.8	-60.9	-54.9
Downlink C / N(dB)	19.5	10.6	12.2	11.5	11.4	14.5
COMPOSITE LINK PERFORMANCE						
C/N Uplink (dB)	24.7	23.5	17.6	16.9	16.8	11.8
C/N Downlink (dB)	19.5	10.6	12.2	11.5	11.4	14.5
C/I Intermodulation (dB)	N/A	N/A	19.8	19.1	19.0	14.0
C/I Uplink Co-Channel (dB)*	27.0	27.0	28.3	28.2	28.6	23.2
C/I Downlink Co-Channel (dB)*	27.0	27.0	28.3	28.2	28.6	23.2
C/I Uplink Adjacent Satellite 1 (dB)	26.7	25.5	19.7	19.0	18.9	13.9
C/I Downlink Adjacent Satellite 1 (dB)	17.3	7.7	9.5	8.8	8.7	12.3
C/I Uplink Adjacent Satellite 2 (dB)	26.7	25.5	19.7	19.0	18.9	13.9
C/I Downlink Adjacent Satellite 2 (dB)	21.7	13.7	15.0	14.3	14.2	16.7
C/(N+I) Composite (dB)	13.1	5.0	5.9	5.2	5.1	5.0
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	12.1	4.0	4.9	4.2	4.1	4.0
Minimum Required C/N (dB)	-10.0	-3.4	-3.9	-3.0	-3.4	-3.4
Excess Link Margin (dB)	2.1	.7	1.1	1.2	.7	.6
Number of Carriers	2	1.0	5.1	542.7	34.1	180.0
CARRIER DENSITY LEVELS						
Uplink Power Density (dBW/Hz)	-43.4	-54.2	-60.0	-60.7	-60.8	-57.9
Downlink EIRP Density At Beam Peak (dBW/Hz)	-20.2	-27.8	-28.9	-29.6	-29.7	-34.7

EXHIBIT 12: INTELSAT 20 LINK BUDGETS (continued)

UPLINK BEAM INFORMATION						
Uplink Beam Name	AFRICA_EUROPE	AFRICA_EUROPE	AFRICA_EUROPE	AFRICA_EUROPE	AFRICA_EUROPE	AFRICA_EUROPE
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)	-4.1	-4.1	-4.1	-4.1	-4.1	-4.1
Uplink SFD (dBW/m2)	-80.4	-81.4	-84.4	-84.4	-84.4	-84.4
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0	42.0	42.0
DOWNLINK BEAM INFORMATION						
Downlink Beam Name	AFRICA_EUROPE	AFRICA_EUROPE	AFRICA_EUROPE	AFRICA_EUROPE	AFRICA_EUROPE	AFRICA_EUROPE
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)	43.0	43.0	43.0	43.0	43.0	43.0
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0	42.0	42.0
ADJACENT SATELLITE 1						
Satellite 1 Orbital Location	66.5E	66.5E	66.5E	66.5E	66.5E	66.5E
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)	-26.0	-26	-26	-26	-26	-26
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0	0.0
ADJACENT SATELLITE 2						
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
CARRIER INFORMATION						
Carrier ID	36M0F3F	36M0G7W	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)	9.0	6.1	6.1	6.1	6.1	1.8
Earth Station Gain (dBi)	60.3	57.0	57.0	57.0	57.0	46.5
Earth Station Elevation Angle	20	20	20	20	20	20
DOWNLINK EARTH STATION						
Earth Station Diameter (meters)	3.0	1.8	1.8	1.8	1.8	6.1
Earth Station Gain (dBi)	49.7	45.3	45.3	45.3	45.3	56.0
Earth Station G/T (dB/K)	27.2	22.8	22.8	22.8	22.8	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)	82.5	78.1	66.2	46.1	58.1	48.0
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)	-4.1	-4.1	-4.1	-4.1	-4.1	-4.1
Boltzman Constant(dBW/K-Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-74.8	-68.3	-48.8	-60.9	-54.9
Uplink C/N(dB)	23.9	20.3	14.8	14.3	14.1	10.1
DOWNLINK PERFORMANCE						
Downlink EIRP per Carrier (dBW)	43.0	42.8	35.4	15.3	27.3	17.2
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)	27.2	22.8	22.8	22.8	22.8	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	-74.8	-68.3	-48.8	-60.9	-54.9
Downlink C / N(dB)	16.3	12.5	11.5	10.9	10.8	17.5
COMPOSITE LINK PERFORMANCE						
C/N Uplink (dB)	23.9	20.3	14.8	14.3	14.1	10.1
C/N Downlink (dB)	16.3	12.5	11.5	10.9	10.8	17.5
C/I Intermodulation (dB)	N/A	N/A	19.8	19.2	19.1	15.0
C/I Uplink Co-Channel (dB)*	27.0	27.0	28.3	28.3	28.7	24.2
C/I Downlink Co-Channel (dB)*	27.0	27.0	28.3	28.3	28.7	24.2
C/I Uplink Adjacent Satellite 1 (dB)	27.9	24.3	18.9	18.3	18.2	14.1
C/I Downlink Adjacent Satellite 1 (dB)	21.0	16.8	15.8	15.2	15.1	22.4
C/I Uplink Adjacent Satellite 2 (dB)	27.9	24.3	18.9	18.3	18.2	14.1
C/I Downlink Adjacent Satellite 2 (dB)	25.0	21.6	20.6	20.0	19.9	25.9
C/(N+I) Composite (dB)	13.4	9.8	7.5	6.9	6.8	6.2
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	12.4	8.8	6.5	5.9	5.8	5.2
Minimum Required C/N (dB)	-10.0	-3.4	-3.9	-3.0	-3.4	-3.4
Excess Link Margin (dB)	2.4	5.4	2.6	2.9	2.4	1.8
Number of Carriers	1	1.0	2.6	264.3	16.7	90.0
CARRIER DENSITY LEVELS						
Uplink Power Density (dBW/Hz)	-43.8	-53.7	-59.1	-59.7	-59.8	-53.4
Downlink EIRP Density At Beam Peak (dBW/Hz)	-17.0	-26.0	-26.9	-27.5	-27.6	-31.7

EXHIBIT 12: INTELSAT 20 LINK BUDGETS (continued)

UPLINK BEAM INFORMATION					
Uplink Beam Name	KA	KA	KA	KA	KA
Uplink Frequency (GHz)	29.750	29.750	29.750	29.750	29.750
Uplink Beam Polarization	CIRCULAR	CIRCULAR	CIRCULAR	CIRCULAR	CIRCULAR
Uplink Relative Contour Level (dB)	-6.0	-6.0	-6.0	-6.0	-6.0
Uplink Contour G/T (dB/K)	-0.9	-0.9	-0.9	-0.9	-0.9
Uplink SFD (dBW/m2)	-74.8	-73.8	-73.8	-73.8	-73.8
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0	42.0
DOWNLINK BEAM INFORMATION					
Downlink Beam Name	KA	KA	KA	KA	KA
Downlink Frequency (GHz)	19.950	19.950	19.950	19.950	19.950
Downlink Beam Polarization	CIRCULAR	CIRCULAR	CIRCULAR	CIRCULAR	CIRCULAR
Downlink Relative Contour Level (dB)	-4.0	-4.0	-4.0	-4.0	-4.0
Downlink Contour EIRP (dBW)	47.3	47.3	47.3	47.3	47.3
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0	42.0
ADJACENT SATELLITE 1					
Satellite 1 Orbital Location	66.5E	66.5E	66.5E	66.5E	66.5E
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0
Downlink EIRP Density (dBW/Hz)	-19.9	-19.9	-19.9	-19.9	-19.9
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0
ADJACENT SATELLITE 2					
Satellite 1 Orbital Location	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
Uplink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0
Downlink EIRP Density (dBW/Hz)	-19.9	-19.9	-19.9	-19.9	-19.9
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0
CARRIER INFORMATION					
Carrier ID	500MG7W	10M3G7W	100KG7W	1M45G7W	400KG7W
Carrier Modulation	QPSK	QPSK	QPSK	BPSK	BPSK
Peak to Peak Bandwidth of EDS (MHz)	N/A	N/A	N/A	N/A	N/A
Information Rate(kbps)	341318.0	6000	64	512	128
Code Rate	1/2x188/204	1/2x188/204	1/2x239/256	R1/2	R1/2
Occupied Bandwidth(kHz)	418514.0	6771.1	75.4	1229.0	307.0
Allocated Bandwidth(kHz)	500000.0	10300	100	1450.0	400.0
Minimum C/N, Clear Sky (dB)	3.36	3.87	2.99	3.4	3.4
Minimum C/N, Rain (dB)	3.36	3.57	2.79	2.7	2.7
UPLINK EARTH STATION					
Earth Station Diameter (meters)	3.5	3.5	3.5	3.0	2.8
Earth Station Gain (dBi)	58.9	58.9	58.9	57.5	56.9
Earth Station Elevation Angle	49.7	49.7	49.7	49.7	49.7
DOWNLINK EARTH STATION					
Earth Station Diameter (meters)	3.0	2.7	2.7	2.8	3.0
Earth Station Gain (dBi)	54.2	53.2	53.3	53.4	54.1
Earth Station G/T (dB/K)	31.8	30.8	30.9	31.0	31.7
Earth Station Elevation Angle	49.7	49.7	49.7	49.7	49.7
LINK FADE TYPE	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky
UPLINK PERFORMANCE					
Uplink Earth Station EIRP (dBW)	87.6	70.2	49.8	61.7	55.1
Uplink Path Loss, Clear Sky (dB)	-213.3	-213.3	-213.3	-213.3	-213.3
Uplink Rain Attenuation	0.0	0.0	0.0	0.0	0.0
Satellite G/T(dB/K)	-0.9	-0.9	-0.9	-0.9	-0.9
Boltzman Constant(dBW/K-Hz)	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-86.2	-68.3	-48.8	-60.9	-54.9
Uplink C/N(dB)	15.4	16.0	15.1	14.9	14.3
DOWNLINK PERFORMANCE					
Downlink EIRP per Carrier (dBW)	47.3	30.9	10.5	22.5	15.8
Antenna Pointing Error (dB)	-0.5	-0.5	-0.5	-0.5	-0.5
Downlink Path Loss, Clear Sky (dB)	-209.8	-209.8	-209.8	-209.8	-209.8
Downlink Rain Attenuation	0.0	0.0	0.0	0.0	0.0
Earth Station G/T (dB/K)	31.8	30.8	30.9	31.0	31.7
Boltzman Constant(dBW / K - Hz)	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-86.2	-68.3	-48.8	-60.9	-54.9
Downlink C / N(dB)	10.8	11.3	10.5	10.5	10.5
COMPOSITE LINK PERFORMANCE					
C/N Uplink (dB)	15.4	16.0	15.1	14.9	14.3
C/N Downlink (dB)	10.8	11.3	10.5	10.5	10.5
C/I Intermodulation (dB)	N/A	16.0	16.0	16.0	16.0
C/I Uplink Co-Channel (dB)*	N/A	N/A	N/A	N/A	N/A
C/I Downlink Co-Channel (dB)*	N/A	N/A	N/A	N/A	N/A
C/I Uplink Adjacent Satellite 1 (dB)	25.0	25.5	24.6	24.4	23.8
C/I Downlink Adjacent Satellite 1 (dB)	13.8	14.3	13.5	13.4	13.5
C/I Uplink Adjacent Satellite 2 (dB)	25.6	26.1	25.2	25.0	24.4
C/I Downlink Adjacent Satellite 2 (dB)	14.4	14.9	14.1	14.0	14.1
C/(N+I) Composite (dB)	7.0	7.0	6.3	6.2	6.1
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	6.0	6.0	5.3	5.2	6.1
Minimum Required C/N (dB)	-3.4	-3.9	-3.0	-3.4	-3.4
Excess Link Margin (dB)	2.6	2.1	2.3	1.8	1.7
Number of Carriers	1.0	43.0	4757.0	305.0	1250.0
CARRIER DENSITY LEVELS					
Uplink Power Density (dBW/Hz)	-57.5	-57.0	-57.9	-56.7	-56.7
Downlink EIRP Density At Beam Peak (dBW/Hz)	-34.9	-33.4	-34.2	-34.4	-35.1

EXHIBIT 13: ADJACENT SATELLITE (70.5º E.L.) LINK BUDGETS

UPLINK BEAM INFORMATION				
Uplink Beam Name	LANDMASS	LANDMASS	LANDMASS	LANDMASS
Uplink Frequency (GHz)	6.175	6.175	6.175	6.175
Uplink Beam Polarization	LINEAR	LINEAR	LINEAR	LINEAR
Uplink Relative Contour Level (dB)	-10.0	-10.0	-10.0	-10.0
Uplink Contour G/T (dB/K)	-9.6	-9.6	-9.6	-9.6
Uplink SFD (dBW/m2)	-78.7	-81.0	-71.7	-71.7
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0
DOWNLINK BEAM INFORMATION				
Downlink Beam Name	LANDMASS	LANDMASS	LANDMASS	LANDMASS
Downlink Frequency (GHz)	3.950	3.950	3.950	3.950
Downlink Beam Polarization	LINEAR	LINEAR	LINEAR	LINEAR
Downlink Relative Contour Level (dB)	-10.0	-10.0	-10.0	-10.0
Downlink Contour EIRP (dBW)	30.9	30.9	30.9	30.9
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)	-32.0	-32.0	-32.0	-32.0
Downlink Polarization Advantage (dB)				
ADJACENT SATELLITE 2	IS706	IS706	IS706	IS706
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)	-32.0	-32.0	-32.0	-32.0
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
CARRIER INFORMATION				
Carrier ID	36M0F3F	60M0G7W	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	40958	6000	64
Code Rate	N/A	1/2x188/204	1/2x188/204	1/2x239/256
Occupied Bandwidth(kHz)	36000	50222	6771.1	75.4
Allocated Bandwidth(kHz)	36000	60000	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	9.0	9.0
Earth Station Gain (dBi)	60.2	58.4	53.4	53.4
Earth Station Elevation Angle	20	20	20	20
DOWNLINK EARTH STATION				
Earth Station Diameter (meters)	18.3	7.0	8.1	7.0
Earth Station Gain (dBi)	56.0	47.5	49.3	47.5
Earth Station G/T (dB/K)	35.5	26.6	28.4	26.6
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)	84.2	81.9	75.9	57.0
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)	-9.6	-9.6	-9.6	-9.6
Boltzman Constant(dBW/K-Hz)	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-77.0	-68.3	-48.8
Uplink C/N(dB)	27.4	23.7	26.4	27.1
DOWNLINK PERFORMANCE				
Downlink EIRP per Carrier (dBW)	29.4	30.9	20.3	1.4
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)	35.5	26.6	28.4	26.6
Boltzman Constant(dBW / K - Hz)	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-77.0	-68.3	-48.8
Downlink C / N(dB)	21.1	12.3	12.2	11.0
COMPOSITE LINK PERFORMANCE				
C/N Uplink (dB)	27.4	23.7	26.4	27.1
C/N Downlink (dB)	21.1	12.3	12.2	11.0
C/I Intermodulation (dB)	N/A	N/A	19.0	19.7
C/I Uplink Co-Channel (dB)*	29.2	27.0	27.5	28.8
C/I Downlink Co-Channel (dB)*	29.2	27.0	27.5	28.8
C/I Uplink Adjacent Satellite 1 (dB)	19.3	15.6	18.3	19.0
C/I Downlink Adjacent Satellite 1 (dB)	20.6	12.7	12.4	11.4
C/I Uplink Adjacent Satellite 2 (dB)	16.8	13.0	15.7	16.4
C/I Downlink Adjacent Satellite 2 (dB)	17.4	8.3	8.3	7.1
C/(N+I) Composite (dB)	11.5	4.6	4.9	4.0
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	10.5	3.6	3.9	3.0
Minimum Required C/N (dB)	-10.0	-3.4	-3.9	-3.0
Excess Link Margin (dB)	.5	.2	0.0	0.0
Number of Carriers	1	1.0	5.1	394.0
CARRIER DENSITY LEVELS				
Uplink Power Density (dBW/Hz)	-42.0	-53.5	-45.8	-45.1
Downlink EIRP Density At Beam Peak (dBW/Hz)	-26.6	-36.1	-38.0	-37.3

EXHIBIT 13: ADJACENT SATELLITE (70.5º E.L.) LINK BUDGETS (continued)

UPLINK BEAM INFORMATION				
Uplink Beam Name	LANDMASS	LANDMASS	LANDMASS	LANDMASS
Uplink Frequency (GHz)	6.550	6.550	6.550	6.550
Uplink Beam Polarization	LINEAR	LINEAR	LINEAR	LINEAR
Uplink Relative Contour Level (dB)	-10.0	-10.0	-10.0	-10.0
Uplink Contour G/T (dB/K)	-9.3	-9.3	-9.3	-9.3
Uplink SFD (dBW/m2)	-79.6	-71.6	-73.6	-73.6
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0
DOWNLINK BEAM INFORMATION				
Downlink Beam Name	SOUTHERN_AFRICA	S_AFRICA	S_AFRICA	S_AFRICA
Downlink Frequency (GHz)	11.075	11.075	11.075	11.075
Downlink Beam Polarization	LINEAR	LINEAR	LINEAR	LINEAR
Downlink Relative Contour Level (dB)	-6.0	-6.0	-6.0	-6.0
Downlink Contour EIRP (dBW)	49.9	49.9	49.9	49.9
Rain Rate (mm/hr)	22.0	22.0	22.0	22.0
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)	-24.8	-24.8	-24.8	-24.8
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)	-20.0	-20.0	-20.0	-20.0
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
CARRIER INFORMATION				
Carrier ID	36M0F3F	36M0G7W	10M3G7W	100KG7W
Carrier Modulation	TV/FM	QPSK	QPSK	QPSK
Peak to Peak Bandwidth of EDS (MHz)	4	N/A	N/A	N/A
Information Rate(kbps)	N/A	24575	6000	64
Code Rate	N/A	1/2x188/204	1/2x188/204	1/2x239/256
Occupied Bandwidth(kHz)	36000	30133	6771.1	75.4
Allocated Bandwidth(kHz)	36000	36000	10300	100
Minimum C/N, Clear Sky (dB)	10.0	3.36	3.87	2.99
Minimum C/N, Rain (dB)	10.0	3.36	3.57	2.79
UPLINK EARTH STATION				
Earth Station Diameter (meters)	18.3	10.0	6.1	6.1
Earth Station Gain (dBi)	60.7	54.6	49.9	49.9
Earth Station Elevation Angle	20	20	20	20
DOWNLINK EARTH STATION				
Earth Station Diameter (meters)	2.4	1.8	2.4	2.4
Earth Station Gain (dBi)	46.8	44.1	46.8	46.8
Earth Station G/T (dB/K)	24.3	21.6	24.3	24.3
Earth Station Elevation Angle	20	20	20	20
LINK FADE TYPE	Clear Sky	Clear Sky	Clear Sky	Clear Sky
UPLINK PERFORMANCE				
Uplink Earth Station EIRP (dBW)	83.3	78.3	71.0	50.7
Uplink Path Loss, Clear Sky (dB)	-200.7	-200.7	-200.7	-200.7
Uplink Rain Attenuation	0.0	0.0	0.0	0.0
Satellite G/T(dB/K)	-9.3	-9.3	-9.3	-9.3
Boltzman Constant(dBW/K-Hz)	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-74.8	-68.3	-48.8
Uplink C/N(dB)	26.3	22.1	21.3	20.5
DOWNLINK PERFORMANCE				
Downlink EIRP per Carrier (dBW)	49.9	42.8	36.3	16.0
Antenna Pointing Error (dB)	-.5	-.5	-.5	-.5
Downlink Path Loss, Clear Sky (dB)	-205.3	-205.3	-205.3	-205.3
Downlink Rain Attenuation	0.0	0.0	0.0	0.0
Earth Station G/T (dB/K)	24.3	21.6	24.3	24.3
Boltzman Constant(dBW / K - Hz)	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-74.8	-68.3	-48.8
Downlink C / N(dB)	21.5	12.4	15.1	14.3
COMPOSITE LINK PERFORMANCE				
C/N Uplink (dB)	26.3	22.1	21.3	20.5
C/N Downlink (dB)	21.5	12.4	15.1	14.3
C/I Intermodulation (dB)	N/A	N/A	13.8	13.0
C/I Uplink Co-Channel (dB)*	27.0	27.0	22.3	22.1
C/I Downlink Co-Channel (dB)*	27.0	27.0	22.3	22.1
C/I Uplink Adjacent Satellite 1 (dB)	18.4	14.2	13.4	12.6
C/I Downlink Adjacent Satellite 1 (dB)	23.6	14.3	17.3	16.5
C/I Uplink Adjacent Satellite 2 (dB)	15.9	11.6	10.8	10.0
C/I Downlink Adjacent Satellite 2 (dB)	18.1	9.4	11.8	11.0
C/(N+I) Composite (dB)	11.3	4.9	5.1	4.4
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	10.3	3.9	4.1	3.4
Minimum Required C/N (dB)	-10.0	-3.4	-3.9	-3.0
Excess Link Margin (dB)	.3	.5	.3	.4
Number of Carriers	1	1.0	3.5	360.0
CARRIER DENSITY LEVELS				
Uplink Power Density (dBW/Hz)	-43.4	-51.1	-47.2	-48.0
Downlink EIRP Density At Beam Peak (dBW/Hz)	-10.1	-26.0	-26.0	-26.8

EXHIBIT 13: ADJACENT SATELLITE (70.5º E.L.) LINK BUDGETS (continued)

UPLINK BEAM INFORMATION						
Uplink Beam Name	WIDEBEAM	WIDEBEAM	WIDEBEAM	WIDEBEAM	WIDEBEAM	WIDEBEAM
Uplink Frequency (GHz)	14.250	14.250	14.250	14.250	14.250	14.250
Uplink Beam Polarization	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR
Uplink Relative Contour Level (dB)	-9.0	-9.0	-9.0	-9.0	-9.0	-9.0
Uplink Contour G/T (dB/K)	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0
Uplink SFD (dBW/m2)	-74.3	-82.3	-75.3	-75.3	-75.3	-75.3
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)	11.825	11.825	11.825	11.825	11.825	11.825
Downlink Beam Polarization	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR
Downlink Relative Contour Level (dB)	-9.0	-9.0	-9.0	-9.0	-9.0	-9.0
Downlink Contour EIRP (dBW)	40.0	40.0	40.0	40.0	40.0	40.0
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)	-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
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)	11.0	6.1	6.1	6.1	6.1	6.1
Earth Station Gain (dBi)	61.7	56.9	56.9	56.9	56.9	56.9
Earth Station Elevation Angle	20	20	20	20	20	20
DOWNLINK EARTH STATION						
Earth Station Diameter (meters)	11.0	3.7	4.6	4.6	6.1	6.1
Earth Station Gain (dBi)	60.3	51.0	53.4	53.4	55.4	55.4
Earth Station G/T (dB/K)	37.9	28.5	30.9	30.9	33.0	33.0
Earth Station Elevation Angle	20	20	20	20	20	20
LINK FADE TYPE	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky
UPLINK PERFORMANCE						
Uplink Earth Station EIRP (dBW)	85.6	80.6	72.5	52.4	63.0	57.0
Uplink Path Loss, Clear Sky (dB)	-207.5	-207.5	-207.5	-207.5	-207.5	-207.5
Uplink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Satellite G/T(dB/K)	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0
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)	27.2	19.9	21.4	20.7	19.2	19.3
DOWNLINK PERFORMANCE						
Downlink EIRP per Carrier (dBW)	35.8	40.0	29.6	9.5	20.1	14.1
Antenna Pointing Error (dB)	-.5	-.5	-.5	-.5	-.5	-.5
Downlink Path Loss, Clear Sky (dB)	-205.9	-205.9	-205.9	-205.9	-205.9	-205.9
Downlink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Earth Station G/T (dB/K)	37.9	28.5	30.9	30.9	33.0	33.0
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
Downlink C / N(dB)	20.4	12.9	14.5	13.8	14.5	14.5
COMPOSITE LINK PERFORMANCE						
C/N Uplink (dB)	27.2	19.9	21.4	20.7	19.2	19.3
C/N Downlink (dB)	20.4	12.9	14.5	13.8	14.5	14.5
C/I Intermodulation (dB)	N/A	N/A	20.0	19.4	17.9	17.9
C/I Uplink Co-Channel (dB)*	27.0	27.0	28.6	28.6	27.6	27.2
C/I Downlink Co-Channel (dB)*	27.0	27.0	28.6	28.6	27.6	27.2
C/I Uplink Adjacent Satellite 1 (dB)	28.0	20.8	22.2	21.6	20.1	20.1
C/I Downlink Adjacent Satellite 1 (dB)	18.9	11.2	12.8	12.2	12.4	12.4
C/I Uplink Adjacent Satellite 2 (dB)	25.5	18.2	19.7	19.0	17.6	17.6
C/I Downlink Adjacent Satellite 2 (dB)	16.7	9.8	11.2	10.6	10.6	10.6
C/(N+I) Composite (dB)	12.7	5.7	7.0	6.3	6.2	6.2
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	11.7	4.7	6.0	5.3	5.2	5.2
Minimum Required C/N (dB)	-10.0	-3.4	-3.9	-3.0	-3.4	-3.4
Excess Link Margin (dB)	1.7	1.3	2.1	2.4	1.8	1.8
Number of Carriers	2	1.0	4.8	502.5	43.5	173.4
CARRIER DENSITY LEVELS						
Uplink Power Density (dBW/Hz)	-42.1	-54.1	-52.7	-53.3	-54.8	-54.8
Downlink EIRP Density At Beam Peak (dBW/Hz)	-21.2	-28.8	-29.7	-30.3	-31.8	-31.8

EXHIBIT 14: ADJACENT SATELLITE (70.5º E.L.) LINK BUDGETS

UPLINK BEAM INFORMATION						
Uplink Beam Name	NARROWBEAM	NARROWBEAM	NARROWBEAM	NARROWBEAM	NARROWBEAM	NARROWBEAM
Uplink Frequency (GHz)	13.875	13.875	13.875	13.875	13.875	13.875
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)	4.0	4.0	4.0	4.0	4.0	4.0
Uplink SFD (dBW/m2)	-81.4	-75.4	-82.4	-82.4	-82.4	-82.4
Rain Rate (mm/hr)	22.0	22.0	22.0	22.0	22.0	22.0
DOWNLINK BEAM INFORMATION						
Downlink Beam Name	NARROWBEAM	NARROWBEAM	NARROWBEAM	NARROWBEAM	NARROWBEAM	NARROWBEAM
Downlink Frequency (GHz)	11.325	11.325	11.325	11.325	11.325	11.325
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)	48.0	48	48.0	48.0	48.0	48.0
Rain Rate (mm/hr)	22.0	22.0	22.0	22.0	22.0	22.0
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)	-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
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	2.4
Earth Station Gain (dBi)	56.7	56.7	56.7	56.7	56.7	48.8
Earth Station Elevation Angle	20	20	20	20	20	20
DOWNLINK EARTH STATION						
Earth Station Diameter (meters)	4.6	2.4	2.4	2.4	2.4	6.1
Earth Station Gain (dBi)	53.0	47.0	47.0	47.0	47.0	55.0
Earth Station G/T (dB/K)	30.5	24.5	24.5	24.5	24.5	32.6
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)	78.5	79.7	63.9	43.7	55.7	46.1
Uplink Path Loss, Clear Sky (dB)	-207.2	-207.2	-207.2	-207.2	-207.2	-207.2
Uplink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Satellite G/T(dB/K)	4.0	4.0	4.0	4.0	4.0	4.0
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)	28.3	27.3	21.0	20.3	20.2	16.5
DOWNLINK PERFORMANCE						
Downlink EIRP per Carrier (dBW)	43.8	45.8	36.1	15.9	27.9	18.2
Antenna Pointing Error (dB)	-.5	-.5	-.5	-.5	-.5	-.5
Downlink Path Loss, Clear Sky (dB)	-205.5	-205.5	-205.5	-205.5	-205.5	-205.5
Downlink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Earth Station G/T (dB/K)	30.5	24.5	24.5	24.5	24.5	32.6
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)	21.4	15.1	14.9	14.2	14.1	18.6
COMPOSITE LINK PERFORMANCE						
C/N Uplink (dB)	28.3	27.3	21.0	20.3	20.2	16.5
C/N Downlink (dB)	21.4	15.1	14.9	14.2	14.1	18.6
C/I Intermodulation (dB)	N/A	N/A	18.5	17.8	17.7	14.1
C/I Uplink Co-Channel (dB)*	27.0	27.0	27.1	27.0	27.4	23.3
C/I Downlink Co-Channel (dB)*	27.0	27.0	27.1	27.0	27.4	23.3
C/I Uplink Adjacent Satellite 1 (dB)	23.9	22.9	16.6	15.9	15.8	12.2
C/I Downlink Adjacent Satellite 1 (dB)	18.1	11.5	11.3	10.6	10.5	15.4
C/I Uplink Adjacent Satellite 2 (dB)	21.4	20.3	14.1	13.3	13.2	9.6
C/I Downlink Adjacent Satellite 2 (dB)	17.7	12.0	11.8	11.1	11.0	14.7
C/(N+I) Composite (dB)	12.5	7.3	5.9	5.1	5.0	5.0
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	11.5	6.3	4.9	4.1	4.0	4.0
Minimum Required C/N (dB)	-10.0	-3.4	-3.9	-3.0	-3.4	-3.4
Excess Link Margin (dB)	1.5	3.0	1.0	1.2	.6	.6
Number of Carriers	2	1.0	6.9	720.0	45.7	180.0
CARRIER DENSITY LEVELS						
Uplink Power Density (dBW/Hz)	-44.2	-54.8	-61.0	-61.8	-61.9	-57.6
Downlink EIRP Density At Beam Peak (dBW/Hz)	-16.2	-26.0	-26.2	-26.9	-27.0	-30.6

EXHIBIT 14: ADJACENT SATELLITE (70.5º E.L.) LINK BUDGETS (continued)

UPLINK BEAM INFORMATION						
Uplink Beam Name	NARROWBEAM	NARROWBEAM	NARROWBEAM	NARROWBEAM	NARROWBEAM	NARROWBEAM
Uplink Frequency (GHz)	13.875	13.875	13.875	13.875	13.875	13.875
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)	4.0	4.0	4.0	4.0	4.0	4.0
Uplink SFD (dBW/m2)	-78.4	-82.4	-78.4	-78.4	-78.4	-78.4
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)	11.850	11.850	11.850	11.850	11.850	11.850
Downlink Beam Polarization	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR
Downlink Relative Contour Level (dB)	-9.0	-9.0	-9.0	-9.0	-9.0	-9.0
Downlink Contour EIRP (dBW)	40.0	40.0	40.0	40.0	40.0	40.0
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)	-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
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)	7.0	6.1	6.1	6.1	6.1	4.6
Earth Station Gain (dBi)	57.9	56.7	56.7	56.7	56.7	54.5
Earth Station Elevation Angle	20	20	20	20	20	20
DOWNLINK EARTH STATION						
Earth Station Diameter (meters)	11.0	3.7	4.6	4.6	4.6	6.1
Earth Station Gain (dBi)	60.3	51.0	53.4	53.4	53.4	55.4
Earth Station G/T (dB/K)	37.9	28.5	30.9	30.9	30.9	33.0
Earth Station Elevation Angle	20	20	20	20	20	20
LINK FADE TYPE	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky
UPLINK PERFORMANCE						
Uplink Earth Station EIRP (dBW)	81.5	80.5	69.2	49.0	61.0	53.4
Uplink Path Loss, Clear Sky (dB)	-207.2	-207.2	-207.2	-207.2	-207.2	-207.2
Uplink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Satellite G/T(dB/K)	4.0	4.0	4.0	4.0	4.0	4.0
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)	31.3	28.1	26.3	25.6	25.5	23.9
DOWNLINK PERFORMANCE						
Downlink EIRP per Carrier (dBW)	35.8	40.0	29.4	9.2	21.2	13.6
Antenna Pointing Error (dB)	-.5	-.5	-.5	-.5	-.5	-.5
Downlink Path Loss, Clear Sky (dB)	-205.9	-205.9	-205.9	-205.9	-205.9	-205.9
Downlink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Earth Station G/T (dB/K)	37.9	28.5	30.9	30.9	30.9	33.0
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
Downlink C / N(dB)	20.4	12.9	14.2	13.6	13.5	14.0
COMPOSITE LINK PERFORMANCE						
C/N Uplink (dB)	31.3	28.1	26.3	25.6	25.5	23.9
C/N Downlink (dB)	20.4	12.9	14.2	13.6	13.5	14.0
C/I Intermodulation (dB)	N/A	N/A	19.8	19.2	19.0	17.4
C/I Uplink Co-Channel (dB)*	27.0	27.0	28.4	28.3	28.7	26.7
C/I Downlink Co-Channel (dB)*	27.0	27.0	28.4	28.3	28.7	26.7
C/I Uplink Adjacent Satellite 1 (dB)	26.9	23.7	21.9	21.3	21.2	19.6
C/I Downlink Adjacent Satellite 1 (dB)	18.9	11.2	12.6	12.0	11.8	12.3
C/I Uplink Adjacent Satellite 2 (dB)	24.4	21.1	19.3	18.7	18.6	17.0
C/I Downlink Adjacent Satellite 2 (dB)	16.7	9.8	11.0	10.3	10.2	10.5
C/(N+I) Composite (dB)	12.7	6.0	6.8	6.2	6.1	6.1
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	11.7	5.0	5.8	5.2	5.1	5.1
Minimum Required C/N (dB)	-10.0	-3.4	-3.9	-3.0	-3.4	-3.4
Excess Link Margin (dB)	1.7	1.7	2.0	2.2	1.7	1.7
Number of Carriers	2	1.0	5.1	531.2	33.5	180.0
CARRIER DENSITY LEVELS						
Uplink Power Density (dBW/Hz)	-42.4	-54.0	-55.8	-56.4	-56.5	-55.9
Downlink EIRP Density At Beam Peak (dBW/Hz)	-21.2	-28.8	-29.9	-30.5	-30.7	-32.3

EXHIBIT 14: ADJACENT SATELLITE (70.5º E.L.) LINK BUDGETS (continued)

UPLINK BEAM INFORMATION					
Uplink Beam Name	KA	KA	KA	KA	KA
Uplink Frequency (GHz)	29.750	29.750	29.750	29.750	29.750
Uplink Beam Polarization	CIRCULAR	CIRCULAR	CIRCULAR	CIRCULAR	CIRCULAR
Uplink Relative Contour Level (dB)	-6.0	-6.0	-6.0	-6.0	-6.0
Uplink Contour G/T (dB/K)	-0.9	-0.9	-0.9	-0.9	-0.9
Uplink SFD (dBW/m2)	-74.8	-73.8	-73.8	-73.8	-73.8
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0	42.0
DOWNLINK BEAM INFORMATION					
Downlink Beam Name	KA	KA	KA	KA	KA
Downlink Frequency (GHz)	19.950	19.950	19.950	19.950	19.950
Downlink Beam Polarization	CIRCULAR	CIRCULAR	CIRCULAR	CIRCULAR	CIRCULAR
Downlink Relative Contour Level (dB)	-4.0	-4.0	-4.0	-4.0	-4.0
Downlink Contour EIRP (dBW)	47.3	47.3	47.3	47.3	47.3
Rain Rate (mm/hr)	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
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0
Downlink EIRP Density (dBW/Hz)	-19.9	-19.9	-19.9	-19.9	-19.9
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0
ADJACENT SATELLITE 2					
Satellite 1 Orbital Location	72.5E	72.5E	72.5E	72.5E	72.5E
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0
Downlink EIRP Density (dBW/Hz)	-19.9	-19.9	-19.9	-19.9	-19.9
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0
CARRIER INFORMATION					
Carrier ID	500MG7W	10M3G7W	100KG7W	1M45G7W	400KG7W
Carrier Modulation	QPSK	QPSK	QPSK	BPSK	BPSK
Peak to Peak Bandwidth of EDS (MHz)	N/A	N/A	N/A	N/A	N/A
Information Rate(kbps)	341318.0	6000	64	512	128
Code Rate	1/2x188/204	1/2x188/204	1/2x239/256	R1/2	R1/2
Occupied Bandwidth(kHz)	418514.0	6771.1	75.4	1229.0	307.0
Allocated Bandwidth(kHz)	500000.0	10300	100	1450.0	400.0
Minimum C/N, Clear Sky (dB)	3.36	3.87	2.99	3.4	3.4
Minimum C/N, Rain (dB)	3.36	3.57	2.79	2.7	2.7
UPLINK EARTH STATION					
Earth Station Diameter (meters)	3.5	3.5	3.5	3.0	2.8
Earth Station Gain (dBi)	58.9	58.9	58.9	57.5	56.9
Earth Station Elevation Angle	49.7	49.7	49.7	49.7	49.7
DOWNLINK EARTH STATION					
Earth Station Diameter (meters)	3.0	2.7	2.7	2.8	3.0
Earth Station Gain (dBi)	54.2	53.2	53.3	53.4	54.1
Earth Station G/T (dB/K)	31.8	30.8	30.9	31.0	31.7
Earth Station Elevation Angle	49.7	49.7	49.7	49.7	49.7
LINK FADE TYPE	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky
UPLINK PERFORMANCE					
Uplink Earth Station EIRP (dBW)	87.6	70.2	49.8	61.7	55.1
Uplink Path Loss, Clear Sky (dB)	-213.3	-213.3	-213.3	-213.3	-213.3
Uplink Rain Attenuation	0.0	0.0	0.0	0.0	0.0
Satellite G/T(dB/K)	-0.9	-0.9	-0.9	-0.9	-0.9
Boltzman Constant(dBW/K-Hz)	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-86.2	-68.3	-48.8	-60.9	-54.9
Uplink C/N(dB)	15.4	16.0	15.1	14.9	14.3
DOWNLINK PERFORMANCE					
Downlink EIRP per Carrier (dBW)	47.3	30.9	10.5	22.5	15.8
Antenna Pointing Error (dB)	-0.5	-0.5	-0.5	-0.5	-0.5
Downlink Path Loss, Clear Sky (dB)	-209.8	-209.8	-209.8	-209.8	-209.8
Downlink Rain Attenuation	0.0	0.0	0.0	0.0	0.0
Earth Station G/T (dB/K)	31.8	30.8	30.9	31.0	31.7
Boltzman Constant(dBW / K - Hz)	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-86.2	-68.3	-48.8	-60.9	-54.9
Downlink C / N(dB)	10.8	11.3	10.5	10.5	10.5
COMPOSITE LINK PERFORMANCE					
C/N Uplink (dB)	15.4	16.0	15.1	14.9	14.3
C/N Downlink (dB)	10.8	11.3	10.5	10.5	10.5
C/I Intermodulation (dB)	N/A	16.0	16.0	16.0	16.0
C/I Uplink Co-Channel (dB)*	N/A	N/A	N/A	N/A	N/A
C/I Downlink Co-Channel (dB)*	N/A	N/A	N/A	N/A	N/A
C/I Uplink Adjacent Satellite 1 (dB)	25.0	25.5	24.6	24.4	23.8
C/I Downlink Adjacent Satellite 1 (dB)	13.8	14.3	13.5	13.4	13.5
C/I Uplink Adjacent Satellite 2 (dB)	25.6	26.1	25.2	25.0	24.4
C/I Downlink Adjacent Satellite 2 (dB)	14.4	14.9	14.1	14.0	14.1
C/(N+I) Composite (dB)	7.0	7.0	6.3	6.2	6.1
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	6.0	6.0	5.3	5.2	6.1
Minimum Required C/N (dB)	-3.4	-3.9	-3.0	-3.4	-3.4
Excess Link Margin (dB)	2.6	2.1	2.3	1.8	1.7
Number of Carriers	1.0	43.0	4757.0	305.0	1250.0
CARRIER DENSITY LEVELS					
Uplink Power Density (dBW/Hz)	-57.5	-57.0	-57.9	-56.7	-56.7
Downlink EIRP Density At Beam Peak (dBW/Hz)	-34.9	-33.4	-34.2	-34.4	-35.1

EXHIBIT 14: ADJACENT SATELLITE (66.5º E.L.) LINK BUDGETS

UPLINK BEAM INFORMATION				
Uplink Beam Name	LANDMASS	LANDMASS	LANDMASS	LANDMASS
Uplink Frequency (GHz)	6.175	6.175	6.175	6.175
Uplink Beam Polarization	LINEAR	LINEAR	LINEAR	LINEAR
Uplink Relative Contour Level (dB)	-10.0	-10.0	-10.0	-10.0
Uplink Contour G/T (dB/K)	-9.6	-9.6	-9.6	-9.6
Uplink SFD (dBW/m2)	-78.7	-81.0	-78.7	-78.7
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0
DOWNLINK BEAM INFORMATION				
Downlink Beam Name	LANDMASS	LANDMASS	LANDMASS	LANDMASS
Downlink Frequency (GHz)	3.950	3.950	3.950	3.950
Downlink Beam Polarization	LINEAR	LINEAR	LINEAR	LINEAR
Downlink Relative Contour Level (dB)	-10.0	-10.0	-10.0	-10.0
Downlink Contour EIRP (dBW)	30.9	30.9	30.9	30.9
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)	-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	64.5E	64.5E	64.5E	64.5E
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)	-42.0	-42.0	-42.0	-42.0
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
CARRIER INFORMATION				
Carrier ID	30M0F3F	60M0G7W	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	40958	6000	64
Code Rate	N/A	1/2x188/204	1/2x188/204	1/2x239/256
Occupied Bandwidth(kHz)	30000	50222	6771.1	75.4
Allocated Bandwidth(kHz)	30000	60000	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)	15.2	15.2	6.1	6.1
Earth Station Gain (dBi)	58.4	58.4	49.4	49.4
Earth Station Elevation Angle	20	20	20	20
DOWNLINK EARTH STATION				
Earth Station Diameter (meters)	13.1	3.5	4.5	4.5
Earth Station Gain (dBi)	53.5	41.1	43.9	43.9
Earth Station G/T (dB/K)	33.0	21.0	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)	81.2	81.9	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)	-9.6	-9.6	-9.6	-9.6
Boltzman Constant(dBW/K-Hz)	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-74.8	-77.0	-68.3	-48.8
Uplink C/N(dB)	25.2	23.7	20.4	19.5
DOWNLINK PERFORMANCE				
Downlink EIRP per Carrier (dBW)	26.7	30.9	21.3	.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)	33.0	21.0	23.6	23.6
Boltzman Constant(dBW / K - Hz)	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-74.8	-77.0	-68.3	-48.8
Downlink C / N(dB)	16.7	6.7	8.3	7.5
COMPOSITE LINK PERFORMANCE				
C/N Uplink (dB)	25.2	23.7	20.4	19.5
C/N Downlink (dB)	16.7	6.7	8.3	7.5
C/I Intermodulation (dB)	N/A	N/A	20.0	19.1
C/I Uplink Co-Channel (dB)*	27.0	27.0	28.5	28.2
C/I Downlink Co-Channel (dB)*	27.0	27.0	28.5	28.2
C/I Uplink Adjacent Satellite 1 (dB)	17.1	15.6	12.3	11.4
C/I Downlink Adjacent Satellite 1 (dB)	25.5	12.2	16.0	15.2
C/I Uplink Adjacent Satellite 2 (dB)	17.1	15.6	12.3	11.4
C/I Downlink Adjacent Satellite 2 (dB)	26.3	17.0	18.5	17.7
C/(N+I) Composite (dB)	11.4	4.4	4.9	4.0
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	10.4	3.4	3.9	3.0
Minimum Required C/N (dB)	-10.0	-3.4	-3.9	-3.0
Excess Link Margin (dB)	.4	.1	0.0	0.0
Number of Carriers	2	1.0	4.1	450.4
CARRIER DENSITY LEVELS				
Uplink Power Density (dBW/Hz)	-43.2	-53.5	-47.8	-48.7
Downlink EIRP Density At Beam Peak (dBW/Hz)	-29.3	-36.1	-37.0	-37.9

EXHIBIT 14: ADJACENT SATELLITE (66.5º E.L.) LINK BUDGETS (continued)

UPLINK BEAM INFORMATION				
Uplink Beam Name	LANDMASS	LANDMASS	LANDMASS	LANDMASS
Uplink Frequency (GHz)	6.550	6.550	6.550	6.550
Uplink Beam Polarization	LINEAR	LINEAR	LINEAR	LINEAR
Uplink Relative Contour Level (dB)	-10.0	-10.0	-10.0	-10.0
Uplink Contour G/T (dB/K)	-9.3	-9.3	-9.3	-9.3
Uplink SFD (dBW/m2)	-68.6	-75.6	74.6	-74.6
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0
DOWNLINK BEAM INFORMATION				
Downlink Beam Name	S_AFRICA	S_AFRICA	S_AFRICA	S_AFRICA
Downlink Frequency (GHz)	11.075	11.075	11.075	11.075
Downlink Beam Polarization	LINEAR	LINEAR	LINEAR	LINEAR
Downlink Relative Contour Level (dB)	-6.0	-6.0	-6.0	-6.0
Downlink Contour EIRP (dBW)	49.9	49.9	49.9	49.9
Rain Rate (mm/hr)	22.0	22.0	22.0	22.0
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)	-24.8	-24.8	-24.8	-24.8
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
ADJACENT SATELLITE 2				
Satellite 1 Orbital Location	64.5E	64.5E	64.5E	64.5E
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)	-24.8	-24.8	-24.8	-24.8
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0
CARRIER INFORMATION				
Carrier ID	30M0F3F	36M0G7W	10M3G7W	100KG7W
Carrier Modulation	TV/FM	QPSK	QPSK	QPSK
Peak to Peak Bandwidth of EDS (MHz)	4	N/A	N/A	N/A
Information Rate(kbps)	N/A	24575	6000	64
Code Rate	N/A	1/2x188/204	1/2x188/204	1/2x239/256
Occupied Bandwidth(kHz)	36000	30133	6771.1	75.4
Allocated Bandwidth(kHz)	36000	36000	10300	100
Minimum C/N, Clear Sky (dB)	10.0	3.36	3.87	2.99
Minimum C/N, Rain (dB)	10.0	3.36	3.57	2.79
UPLINK EARTH STATION				
Earth Station Diameter (meters)	15.2	6.1	6.1	6.1
Earth Station Gain (dBi)	58.9	49.9	49.9	49.9
Earth Station Elevation Angle	20	20	20	20
DOWNLINK EARTH STATION				
Earth Station Diameter (meters)	3.7	1.8	1.8	1.8
Earth Station Gain (dBi)	51.1	44.1	44.1	44.1
Earth Station G/T (dB/K)	27.9	21.6	21.6	21.6
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)	82.5	74.3	69.9	49.5
Uplink Path Loss, Clear Sky (dB)	-200.7	-200.7	-200.7	-200.7
Uplink Rain Attenuation	0.0	0.0	0.0	0.0
Satellite G/T(dB/K)	-9.3	-9.3	-9.3	-9.3
Boltzman Constant(dBW/K-Hz)	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-74.8	-68.3	-48.8
Uplink C/N(dB)	25.5	18.1	20.1	19.3
DOWNLINK PERFORMANCE				
Downlink EIRP per Carrier (dBW)	44.0	42.8	36.1	15.8
Antenna Pointing Error (dB)	-.5	-.5	-.5	-.5
Downlink Path Loss, Clear Sky (dB)	-205.3	-205.3	-205.3	-205.3
Downlink Rain Attenuation	0.0	0.0	0.0	0.0
Earth Station G/T (dB/K)	27.9	21.6	21.6	21.6
Boltzman Constant(dBW / K - Hz)	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-74.8	-68.3	-48.8
Downlink C / N(dB)	19.2	12.4	12.3	11.5
COMPOSITE LINK PERFORMANCE				
C/N Uplink (dB)	25.5	18.1	20.1	19.3
C/N Downlink (dB)	19.2	12.4	12.3	11.5
C/I Intermodulation (dB)	N/A	N/A	13.6	12.9
C/I Uplink Co-Channel (dB)*	27.0	27.0	22.2	22.0
C/I Downlink Co-Channel (dB)*	27.0	27.0	22.2	22.0
C/I Uplink Adjacent Satellite 1 (dB)	17.6	10.2	12.2	11.5
C/I Downlink Adjacent Satellite 1 (dB)	21.6	14.3	14.1	13.3
C/I Uplink Adjacent Satellite 2 (dB)	17.6	10.2	12.2	11.5
C/I Downlink Adjacent Satellite 2 (dB)	22.7	16.5	16.3	15.5
C/(N+I) Composite (dB)	11.8	4.9	5.1	4.4
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	10.8	3.9	4.1	3.4
Minimum Required C/N (dB)	-10.0	-3.4	-3.9	-3.0
Excess Link Margin (dB)	0.8	0.5	.3	.4
Number of Carriers	1	1.0	3.5	360.0
CARRIER DENSITY LEVELS				
Uplink Power Density (dBW/Hz)	-42.4	-50.4	-50	-50.7
Downlink EIRP Density At Beam Peak (dBW/Hz)	-16.0	-26.0	-26.2	-27.0

EXHIBIT 14: ADJACENT SATELLITE (66.5º E.L.) LINK BUDGETS (continued)

UPLINK BEAM INFORMATION						
Uplink Beam Name	S_AFRICA	S_AFRICA	S_AFRICA	S_AFRICA	S_AFRICA	S_AFRICA
Uplink Frequency (GHz)	14.000	14.000	14.000	14.000	14.000	14.000
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)	4.6	4.6	4.6	4.6	4.6	4.6
Uplink SFD (dBW/m2)	-75.4	-75.4	-82.4	-82.4	-82.4	-82.4
Rain Rate (mm/hr)	22.0	22.0	22.0	22.0	22.0	22.0
DOWNLINK BEAM INFORMATION						
Downlink Beam Name	S_AFRICA	S_AFRICA	S_AFRICA	S_AFRICA	S_AFRICA	S_AFRICA
Downlink Frequency (GHz)	11.325	11.325	11.325	11.325	11.325	11.325
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)	49.9	49.9	49.9	49.9	49.9	49.9
Rain Rate (mm/hr)	22.0	22.0	22.0	22.0	22.0	22.0
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)	-24.8	-24.8	-24.8	-24.8	-24.8	-24.8
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0	0.0
ADJACENT SATELLITE 2						
Satellite 1 Orbital Location	64.5E	64.5E	64.5E	64.5E	64.5E	64.5E
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)	-24.8	-24.8	-24.8	-24.8	-24.8	-24.8
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0	0.0
CARRIER INFORMATION						
Carrier ID	30M0F3F	36M0G7W	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	1.8
Earth Station Gain (dBi)	56.7	56.7	56.7	56.7	56.7	46.2
Earth Station Elevation Angle	20	20	20	20	20	20
DOWNLINK EARTH STATION						
Earth Station Diameter (meters)	3.7	1.8	1.8	1.8	1.8	6.1
Earth Station Gain (dBi)	50.6	44.3	44.3	44.3	44.3	55.0
Earth Station G/T (dB/K)	28.1	21.8	21.8	21.8	21.8	32.6
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)	75.7	74.5	62.1	41.8	53.8	45.1
Uplink Path Loss, Clear Sky (dB)	-207.3	-207.3	-207.3	-207.3	-207.3	-207.3
Uplink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Satellite G/T(dB/K)	4.6	4.6	4.6	4.6	4.6	4.6
Boltzman Constant(dBW/K-Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-74.8	-68.3	-48.8	-60.9	-54.9
Uplink C/N(dB)	26.0	25.6	19.6	18.9	18.8	16.1
DOWNLINK PERFORMANCE						
Downlink EIRP per Carrier (dBW)	44.0	42.8	36.1	15.9	27.9	19.2
Antenna Pointing Error (dB)	-.5	-.5	-.5	-.5	-.5	-.5
Downlink Path Loss, Clear Sky (dB)	-205.5	-205.5	-205.5	-205.5	-205.5	-205.5
Downlink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Earth Station G/T (dB/K)	28.1	21.8	21.8	21.8	21.8	32.6
Boltzman Constant(dBW / K - Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-74.8	-68.3	-48.8	-60.9	-54.9
Downlink C / N(dB)	19.2	12.4	12.3	11.5	11.4	19.6
COMPOSITE LINK PERFORMANCE						
C/N Uplink (dB)	26.0	25.6	19.6	18.9	18.8	16.1
C/N Downlink (dB)	19.2	12.4	12.3	11.5	11.4	19.6
C/I Intermodulation (dB)	N/A	N/A	13.6	12.9	12.8	10.2
C/I Uplink Co-Channel (dB)*	27.0	27.0	22.2	22.0	22.4	19.4
C/I Downlink Co-Channel (dB)*	27.0	27.0	22.2	22.0	22.4	19.4
C/I Uplink Adjacent Satellite 1 (dB)	21.1	20.7	14.8	14.0	13.9	11.3
C/I Downlink Adjacent Satellite 1 (dB)	21.8	14.5	14.3	13.6	13.5	22.4
C/I Uplink Adjacent Satellite 2 (dB)	21.1	20.7	14.8	14.0	13.9	11.3
C/I Downlink Adjacent Satellite 2 (dB)	22.9	16.7	16.5	15.8	15.7	23.0
C/(N+I) Composite (dB)	13.4	8.6	6.0	5.3	5.2	5.0
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	12.4	7.6	5.0	4.3	4.2	4.0
Minimum Required C/N (dB)	-10.0	-3.4	-3.9	-3.0	-3.4	-3.4
Excess Link Margin (dB)	2.4	4.2	1.1	1.3	.8	.6
Number of Carriers	1	1.0	3.5	360.0	24.8	90.0
CARRIER DENSITY LEVELS						
Uplink Power Density (dBW/Hz)	-47.1	-57.0	-63.0	-63.7	-63.9	-56.0
Downlink EIRP Density At Beam Peak (dBW/Hz)	-16.0	-26.0	-26.2	-26.9	-27.0	-29.7

EXHIBIT 14: ADJACENT SATELLITE (66.5º E.L.) LINK BUDGETS (continued)

UPLINK BEAM INFORMATION						
Uplink Beam Name	EUMECA	EUMECA	EUMECA	EUMECA	EUMECA	EUMECA
Uplink Frequency (GHz)	13.875	13.875	13.875	13.875	13.875	13.875
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)	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9
Uplink SFD (dBW/m2)	-81.3	-82.3	-80.3	-80.3	-80.3	-80.3
Rain Rate (mm/hr)	22.0	22.0	22.0	22.0	22.0	22.0
DOWNLINK BEAM INFORMATION						
Downlink Beam Name	EUMECA	EUMECA	EUMECA	EUMECA	EUMECA	EUMECA
Downlink Frequency (GHz)	11.075	11.075	11.075	11.075	11.075	11.075
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)	44.0	44.0	44.0	44.0	44.0	44.0
Rain Rate (mm/hr)	22.0	22.0	22.0	22.0	22.0	22.0
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)	-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	64.5E	64.5E	64.5E	64.5E	64.5E	64.5E
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)	-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	1M450G7W	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	1.8
Earth Station Gain (dBi)	56.7	56.7	56.7	56.7	56.7	46.2
Earth Station Elevation Angle	20	20	20	20	20	20
DOWNLINK EARTH STATION						
Earth Station Diameter (meters)	4.6	1.8	1.8	1.8	1.8	6.1
Earth Station Gain (dBi)	52.8	44.1	44.1	44.1	44.1	54.8
Earth Station G/T (dB/K)	30.3	21.6	21.6	21.6	21.6	32.4
Earth Station Elevation Angle	20	20	20	20	20	20
LINK FADE TYPE	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky
UPLINK PERFORMANCE						
Uplink Earth Station EIRP (dBW)	78.6	80.6	67.4	47.2	59.2	47.0
Uplink Path Loss, Clear Sky (dB)	-207.2	-207.2	-207.2	-207.2	-207.2	-207.2
Uplink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Satellite G/T(dB/K)	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9
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)	22.5	22.3	18.5	17.8	17.7	11.6
DOWNLINK PERFORMANCE						
Downlink EIRP per Carrier (dBW)	39.8	44.0	33.5	13.2	25.3	13.1
Antenna Pointing Error (dB)	-.5	-.5	-.5	-.5	-.5	-.5
Downlink Path Loss, Clear Sky (dB)	-205.3	-205.3	-205.3	-205.3	-205.3	-205.3
Downlink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Earth Station G/T (dB/K)	30.3	21.6	21.6	21.6	21.6	32.4
Boltzman Constant(dBW / K - Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-77.8	-68.3	-48.8	-60.9	-54.9
Downlink C / N(dB)	17.4	10.6	9.6	8.9	8.8	13.4
COMPOSITE LINK PERFORMANCE						
C/N Uplink (dB)	22.5	22.3	18.5	17.8	17.7	11.6
C/N Downlink (dB)	17.4	10.6	9.6	8.9	8.8	13.4
C/I Intermodulation (dB)	N/A	N/A	19.9	19.2	19.1	12.9
C/I Uplink Co-Channel (dB)*	27.0	27.0	28.4	28.3	28.7	22.1
C/I Downlink Co-Channel (dB)*	27.0	27.0	28.4	28.3	28.7	22.1
C/I Uplink Adjacent Satellite 1 (dB)	24.0	23.8	20.1	19.4	19.3	13.1
C/I Downlink Adjacent Satellite 1 (dB)	21.1	15.0	12.7	12.0	11.8	17.2
C/I Uplink Adjacent Satellite 2 (dB)	24.0	23.8	20.1	19.4	19.3	13.1
C/I Downlink Adjacent Satellite 2 (dB)	22.0	16.9	14.8	14.1	14.0	17.8
C/(N+I) Composite (dB)	13.0	8.0	6.1	5.4	5.3	5.1
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	12.0	7.0	5.1	4.4	4.3	4.1
Minimum Required C/N (dB)	-10.0	-3.4	-3.9	-3.0	-3.4	-3.4
Excess Link Margin (dB)	2.0	3.7	1.3	1.4	.9	.7
Number of Carriers	2	1.0	5.0	530.2	33.3	180.0
CARRIER DENSITY LEVELS						
Uplink Power Density (dBW/Hz)	-44.1	-53.9	-57.6	-58.3	-58.4	-54.1
Downlink EIRP Density At Beam Peak (dBW/Hz)	-20.2	-27.8	-28.8	-29.5	-29.6	-35.8

EXHIBIT 14: ADJACENT SATELLITE (66.5º E.L.) LINK BUDGETS (continued)

UPLINK BEAM INFORMATION						
Uplink Beam Name	EUMECA	EUMECA	EUMECA	EUMECA	EUMECA	EUMECA
Uplink Frequency (GHz)	13.875	13.875	13.875	13.875	13.875	13.875
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)	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9
Uplink SFD (dBW/m2)	-79.3	-82.3	-84.3	-84.3	-84.3	-84.3
Rain Rate (mm/hr)	22.0	22.0	22.0	22.0	22.0	22.0
DOWNLINK BEAM INFORMATION						
Downlink Beam Name	RUSSIA	RUSSIA	RUSSIA	RUSSIA	RUSSIA	RUSSIA
Downlink Frequency (GHz)	11.075	11.075	11.075	11.075	11.075	11.075
Downlink Beam Polarization	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR
Downlink Relative Contour Level (dB)	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0
Downlink Contour EIRP (dBW)	46.1	46.1	46.1	46.1	46.1	46.1
Rain Rate (mm/hr)	22.0	22.0	22.0	22.0	22.0	22.0
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)	-24.0	-24.0	-24.0	-24.0	-24.0	-24.0
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0	0.0
ADJACENT SATELLITE 2						
Satellite 1 Orbital Location	64.5E	64.5E	64.5E	64.5E	64.5E	64.5E
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)	-24.0	-24.0	-24.0	-24.0	-24.0	-24.0
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0	0.0
CARRIER INFORMATION						
Carrier ID	36M0F3F	72M0G7W	10M3G7W	100KG7W	1M450G7W	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	1.8
Earth Station Gain (dBi)	56.7	56.7	56.7	56.7	56.7	46.2
Earth Station Elevation Angle	20	20	20	20	20	20
DOWNLINK EARTH STATION						
Earth Station Diameter (meters)	3.7	1.8	1.8	1.8	1.8	6.1
Earth Station Gain (dBi)	50.4	44.1	44.1	44.1	44.1	54.8
Earth Station G/T (dB/K)	27.9	21.6	21.6	21.6	21.6	32.4
Earth Station Elevation Angle	20	20	20	20	20	20
LINK FADE TYPE	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky
UPLINK PERFORMANCE						
Uplink Earth Station EIRP (dBW)	80.6	80.6	63.3	43.1	55.1	45.4
Uplink Path Loss, Clear Sky (dB)	-207.2	-207.2	-207.2	-207.2	-207.2	-207.2
Uplink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Satellite G/T(dB/K)	-1.9	-1.9	-1.9	-1.9	-1.9	-1.9
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)	24.5	22.3	14.5	13.8	13.7	9.9
DOWNLINK PERFORMANCE						
Downlink EIRP per Carrier (dBW)	41.9	46.1	35.5	15.3	27.3	17.5
Antenna Pointing Error (dB)	-.5	-.5	-.5	-.5	-.5	-.5
Downlink Path Loss, Clear Sky (dB)	-205.3	-205.3	-205.3	-205.3	-205.3	-205.3
Downlink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Earth Station G/T (dB/K)	27.9	21.6	21.6	21.6	21.6	32.4
Boltzman Constant(dBW / K - Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-77.8	-68.3	-48.8	-60.9	-54.9
Downlink C / N(dB)	17.1	12.7	11.7	10.9	10.8	17.9
COMPOSITE LINK PERFORMANCE						
C/N Uplink (dB)	24.5	22.3	14.5	13.8	13.7	9.9
C/N Downlink (dB)	17.1	12.7	11.7	10.9	10.8	17.9
C/I Intermodulation (dB)	N/A	N/A	19.8	19.1	19.0	15.3
C/I Uplink Co-Channel (dB)*	27.0	27.0	28.4	28.3	28.7	24.5
C/I Downlink Co-Channel (dB)*	27.0	27.0	28.4	28.3	28.7	24.5
C/I Uplink Adjacent Satellite 1 (dB)	26.0	23.8	16.0	15.3	15.2	11.5
C/I Downlink Adjacent Satellite 1 (dB)	18.7	13.8	12.7	12.0	11.9	19.7
C/I Uplink Adjacent Satellite 2 (dB)	26.0	23.8	16.0	15.3	15.2	11.5
C/I Downlink Adjacent Satellite 2 (dB)	19.8	16.0	14.9	14.2	14.1	20.3
C/(N+I) Composite (dB)	12.5	8.6	6.0	5.3	5.2	5.0
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	11.5	7.6	5.0	4.3	4.2	4.0
Minimum Required C/N (dB)	-10.0	-3.4	-3.9	-3.0	-3.4	-3.4
Excess Link Margin (dB)	1.5	4.2	1.1	1.3	.8	.6
Number of Carriers	2	1.0	5.1	537.5	33.8	180.0
CARRIER DENSITY LEVELS						
Uplink Power Density (dBW/Hz)	-42.1	-53.9	-61.6	-62.3	-62.5	-55.7
Downlink EIRP Density At Beam Peak (dBW/Hz)	-20.1	-27.7	-28.8	-29.5	-29.6	-33.3

EXHIBIT 14: ADJACENT SATELLITE (66.5º E.L.) LINK BUDGETS (continued)

UPLINK BEAM INFORMATION						
Uplink Beam Name	RUSSIA	RUSSIA	RUSSIA	RUSSIA	RUSSIA	RUSSIA
Uplink Frequency (GHz)	13.875	13.875	13.875	13.875	13.875	13.875
Uplink Beam Polarization	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR
Uplink Relative Contour Level (dB)	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0
Uplink Contour G/T (dB/K)	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4
Uplink SFD (dBW/m2)	-80.7	-82.7	-84.7	-84.7	-84.7	-84.7
Rain Rate (mm/hr)	22.0	22.0	22.0	22.0	22.0	22.0
DOWNLINK BEAM INFORMATION						
Downlink Beam Name	RUSSIA	RUSSIA	RUSSIA	RUSSIA	RUSSIA	RUSSIA
Downlink Frequency (GHz)	11.075	11.075	11.075	11.075	11.075	11.075
Downlink Beam Polarization	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR
Downlink Relative Contour Level (dB)	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0
Downlink Contour EIRP (dBW)	46.1	46.1	46.1	46.1	46.1	46.1
Rain Rate (mm/hr)	22.0	22.0	22.0	22.0	22.0	22.0
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)	-24.0	-24.0	-24.0	-24.0	-24.0	-24.0
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0	0.0
ADJACENT SATELLITE 2						
Satellite 1 Orbital Location	64.5E	64.5E	64.5E	64.5E	64.5E	64.5E
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)	-24.0	-24.0	-24.0	-24.0	-24.0	-24.0
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0	0.0
CARRIER INFORMATION						
Carrier ID	36M0F3F	72M0G7W	10M3G7W	100KG7W	1M450G7W	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	1.8
Earth Station Gain (dBi)	56.7	56.7	56.7	56.7	56.7	46.2
Earth Station Elevation Angle	20	20	20	20	20	20
DOWNLINK EARTH STATION						
Earth Station Diameter (meters)	3.7	1.8	1.8	1.8	1.8	6.1
Earth Station Gain (dBi)	50.4	44.1	44.1	44.1	44.1	54.8
Earth Station G/T (dB/K)	27.9	21.6	21.6	21.6	21.6	32.4
Earth Station Elevation Angle	20	20	20	20	20	20
LINK FADE TYPE	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky
UPLINK PERFORMANCE						
Uplink Earth Station EIRP (dBW)	79.2	80.2	62.6	42.3	54.3	43.9
Uplink Path Loss, Clear Sky (dB)	-207.2	-207.2	-207.2	-207.2	-207.2	-207.2
Uplink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Satellite G/T(dB/K)	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4
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
Uplink C/N(dB)	24.6	23.4	15.2	14.5	14.4	10.0
DOWNLINK PERFORMANCE						
Downlink EIRP per Carrier (dBW)	41.9	46.1	35.1	14.9	26.9	16.5
Antenna Pointing Error (dB)	-.5	-.5	-.5	-.5	-.5	-.5
Downlink Path Loss, Clear Sky (dB)	-205.3	-205.3	-205.3	-205.3	-205.3	-205.3
Downlink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Earth Station G/T (dB/K)	27.9	21.6	21.6	21.6	21.6	32.4
Boltzman Constant(dBW / K - Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-77.8	-68.3	-48.8	-60.9	-54.9
Downlink C / N(dB)	17.1	12.7	11.3	10.5	10.4	16.9
COMPOSITE LINK PERFORMANCE						
C/N Uplink (dB)	24.6	23.4	15.2	14.5	14.4	10.0
C/N Downlink (dB)	17.1	12.7	11.3	10.5	10.4	16.9
C/I Intermodulation (dB)	N/A	N/A	19.4	18.7	18.6	14.3
C/I Uplink Co-Channel (dB)*	27.0	27.0	28.0	27.9	28.3	23.5
C/I Downlink Co-Channel (dB)*	27.0	27.0	28.0	27.9	28.3	23.5
C/I Uplink Adjacent Satellite 1 (dB)	26.6	25.4	17.3	16.5	16.4	12.1
C/I Downlink Adjacent Satellite 1 (dB)	18.7	13.8	12.3	11.6	11.5	18.7
C/I Uplink Adjacent Satellite 2 (dB)	26.6	25.4	17.3	16.5	16.4	12.1
C/I Downlink Adjacent Satellite 2 (dB)	19.8	16.0	14.5	13.8	13.7	19.3
C/(N+I) Composite (dB)	12.6	8.7	6.0	5.3	5.2	5.0
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	11.6	7.7	5.0	4.3	4.2	4.0
Minimum Required C/N (dB)	-10.0	-3.4	-3.9	-3.0	-3.4	-3.4
Excess Link Margin (dB)	1.6	4.3	1.1	1.3	.8	.6
Number of Carriers	2	1.0	5.6	589.0	37.0	180.0
CARRIER DENSITY LEVELS						
Uplink Power Density (dBW/Hz)	-43.5	-54.3	-62.4	-63.1	-63.2	-57.1
Downlink EIRP Density At Beam Peak (dBW/Hz)	-20.1	-27.7	-29.2	-29.9	-30.0	-34.4

EXHIBIT 14: ADJACENT SATELLITE (66.5º E.L.) LINK BUDGETS (continued)

UPLINK BEAM INFORMATION						
Uplink Beam Name	RUSSIA	RUSSIA	RUSSIA	RUSSIA	RUSSIA	RUSSIA
Uplink Frequency (GHz)	13.875	13.875	13.875	13.875	13.875	13.875
Uplink Beam Polarization	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR	LINEAR
Uplink Relative Contour Level (dB)	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0
Uplink Contour G/T (dB/K)	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4
Uplink SFD (dBW/m2)	-80.7	-82.7	-80.7	-80.7	-80.7	-80.7
Rain Rate (mm/hr)	22.0	22.0	22.0	22.0	22.0	22.0
DOWNLINK BEAM INFORMATION						
Downlink Beam Name	EUMECA	EUMECA	EUMECA	EUMECA	EUMECA	EUMECA
Downlink Frequency (GHz)	11.075	11.075	11.075	11.075	11.075	11.075
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)	44.0	44.0	44.0	44.0	44.0	44.0
Rain Rate (mm/hr)	22.0	22.0	22.0	22.0	22.0	22.0
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)	-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	64.5E	64.5E	64.5E	64.5E	64.5E	64.5E
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)	-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	1M450G7W	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	1.8
Earth Station Gain (dBi)	56.7	56.7	56.7	56.7	56.7	46.2
Earth Station Elevation Angle	20	20	20	20	20	20
DOWNLINK EARTH STATION						
Earth Station Diameter (meters)	4.6	1.8	1.8	1.8	1.8	6.1
Earth Station Gain (dBi)	52.8	44.1	44.1	44.1	44.1	54.8
Earth Station G/T (dB/K)	30.3	21.6	21.6	21.6	21.6	32.4
Earth Station Elevation Angle	20	20	20	20	20	20
LINK FADE TYPE	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky
UPLINK PERFORMANCE						
Uplink Earth Station EIRP (dBW)	79.2	80.2	66.8	46.6	58.6	45.9
Uplink Path Loss, Clear Sky (dB)	-207.2	-207.2	-207.2	-207.2	-207.2	-207.2
Uplink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Satellite G/T(dB/K)	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4
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
Uplink C/N(dB)	24.6	23.4	19.5	18.8	18.7	12.0
DOWNLINK PERFORMANCE						
Downlink EIRP per Carrier (dBW)	39.8	44.0	33.3	13.1	25.1	12.4
Antenna Pointing Error (dB)	-.5	-.5	-.5	-.5	-.5	-.5
Downlink Path Loss, Clear Sky (dB)	-205.3	-205.3	-205.3	-205.3	-205.3	-205.3
Downlink Rain Attenuation	0.0	0.0	0.0	0.0	0.0	0.0
Earth Station G/T (dB/K)	30.3	21.6	21.6	21.6	21.6	32.4
Boltzman Constant(dBW / K - Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-77.8	-68.3	-48.8	-60.9	-54.9
Downlink C / N(dB)	17.4	10.6	9.5	8.7	8.6	12.8
COMPOSITE LINK PERFORMANCE						
C/N Uplink (dB)	24.6	23.4	19.5	18.8	18.7	12.0
C/N Downlink (dB)	17.4	10.6	9.5	8.7	8.6	12.8
C/I Intermodulation (dB)	N/A	N/A	19.7	19.0	18.9	12.2
C/I Uplink Co-Channel (dB)*	27.0	27.0	28.3	28.2	28.6	21.5
C/I Downlink Co-Channel (dB)*	27.0	27.0	28.3	28.2	28.6	21.5
C/I Uplink Adjacent Satellite 1 (dB)	26.6	25.4	21.5	20.8	20.7	14.0
C/I Downlink Adjacent Satellite 1 (dB)	21.1	13.7	12.5	11.8	11.7	16.6
C/I Uplink Adjacent Satellite 2 (dB)	26.6	25.4	21.5	20.8	20.7	14.0
C/I Downlink Adjacent Satellite 2 (dB)	22.0	15.9	14.7	14.0	13.9	17.2
C/(N+I) Composite (dB)	13.5	7.7	6.2	5.5	5.4	5.1
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	12.5	6.7	5.2	4.5	4.4	4.1
Minimum Required C/N (dB)	-10.0	-3.4	-3.9	-3.0	-3.4	-3.4
Excess Link Margin (dB)	2.5	3.4	1.3	1.5	1.0	.7
Number of Carriers	2	1.0	5.2	548.7	34.5	180.0
CARRIER DENSITY LEVELS						
Uplink Power Density (dBW/Hz)	-43.5	-54.3	-58.1	-58.8	-58.9	-55.1
Downlink EIRP Density At Beam Peak (dBW/Hz)	-20.2	-27.8	-29.0	-29.7	-29.8	-36.5

EXHIBIT 14: ADJACENT SATELLITE (66.5º E.L.) LINK BUDGETS (continued)

UPLINK BEAM INFORMATION						
Uplink Beam Name	AFRICA_EUROPE	AFRICA_EUROPE	AFRICA_EUROPE	AFRICA_EUROPE	AFRICA_EUROPE	AFRICA_EUROPE
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)	-4.1	-4.1	-4.1	-4.1	-4.1	-4.1
Uplink SFD (dBW/m2)	-82.4	-79.4	-83.4	-83.4	-83.4	-83.4
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0	42.0	42.0
DOWNLINK BEAM INFORMATION						
Downlink Beam Name	AFRICA_EUROPE	AFRICA_EUROPE	AFRICA_EUROPE	AFRICA_EUROPE	AFRICA_EUROPE	AFRICA_EUROPE
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)	43.0	43.0	43.0	43.0	43.0	43.0
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)	-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	64.5E	64.5E	64.5E	64.5E	64.5E	64.5E
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)	-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	30M0F3F	36M0G7W	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	1.8
Earth Station Gain (dBi)	57.0	57.0	57.0	57.0	57.0	46.5
Earth Station Elevation Angle	20	20	20	20	20	20
DOWNLINK EARTH STATION						
Earth Station Diameter (meters)	3.0	1.8	1.8	1.8	1.8	6.1
Earth Station Gain (dBi)	49.7	45.3	45.3	45.3	45.3	56.0
Earth Station G/T (dB/K)	27.2	22.8	22.8	22.8	22.8	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)	80.5	80.0	67.1	47.0	59.0	48.3
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)	-4.1	-4.1	-4.1	-4.1	-4.1	-4.1
Boltzman Constant(dBW/K-Hz)	228.6	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-75.6	-74.8	-68.3	-48.8	-60.9	-54.9
Uplink C/N(dB)	21.9	22.2	15.7	15.2	15.0	10.4
DOWNLINK PERFORMANCE						
Downlink EIRP per Carrier (dBW)	43.0	42.8	35.3	15.2	27.2	16.5
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)	27.2	22.8	22.8	22.8	22.8	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	-74.8	-68.3	-48.8	-60.9	-54.9
Downlink C / N(dB)	16.3	12.5	11.4	10.8	10.7	16.9
COMPOSITE LINK PERFORMANCE						
C/N Uplink (dB)	21.9	22.2	15.7	15.2	15.0	10.4
C/N Downlink (dB)	16.3	12.5	11.4	10.8	10.7	16.9
C/I Intermodulation (dB)	N/A	N/A	19.7	19.1	19.0	14.4
C/I Uplink Co-Channel (dB)*	27.0	27.0	28.2	28.3	28.6	23.6
C/I Downlink Co-Channel (dB)*	27.0	27.0	28.2	28.3	28.6	23.6
C/I Uplink Adjacent Satellite 1 (dB)	25.9	26.2	19.8	19.2	19.1	14.5
C/I Downlink Adjacent Satellite 1 (dB)	21.0	16.8	15.7	15.1	15.0	21.8
C/I Uplink Adjacent Satellite 2 (dB)	25.9	26.2	19.8	19.2	19.1	14.5
C/I Downlink Adjacent Satellite 2 (dB)	22.2	18.7	17.7	17.1	17.0	22.4
C/(N+I) Composite (dB)	12.7	9.7	7.5	6.9	6.8	6.2
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	11.7	8.7	6.5	5.9	5.8	5.2
Minimum Required C/N (dB)	-10.0	-3.4	-3.9	-3.0	-3.4	-3.4
Excess Link Margin (dB)	1.7	5.4	2.6	3.0	2.4	1.8
Number of Carriers	1	1.0	2.6	269.6	17.0	90.0
CARRIER DENSITY LEVELS						
Uplink Power Density (dBW/Hz)	-42.5	-51.8	-58.2	-58.8	-58.9	-53.0
Downlink EIRP Density At Beam Peak (dBW/Hz)	-17.0	-26.0	-27.0	-27.6	-27.7	-32.4

EXHIBIT 14: ADJACENT SATELLITE (66.5º E.L.) LINK BUDGETS (continued)

UPLINK BEAM INFORMATION					
Uplink Beam Name	KA	KA	KA	KA	KA
Uplink Frequency (GHz)	29.750	29.750	29.750	29.750	29.750
Uplink Beam Polarization	CIRCULAR	CIRCULAR	CIRCULAR	CIRCULAR	CIRCULAR
Uplink Relative Contour Level (dB)	-6.0	-6.0	-6.0	-6.0	-6.0
Uplink Contour G/T (dB/K)	-0.9	-0.9	-0.9	-0.9	-0.9
Uplink SFD (dBW/m2)	-74.8	-73.8	-73.8	-73.8	-73.8
Rain Rate (mm/hr)	42.0	42.0	42.0	42.0	42.0
DOWNLINK BEAM INFORMATION					
Downlink Beam Name	KA	KA	KA	KA	KA
Downlink Frequency (GHz)	19.950	19.950	19.950	19.950	19.950
Downlink Beam Polarization	CIRCULAR	CIRCULAR	CIRCULAR	CIRCULAR	CIRCULAR
Downlink Relative Contour Level (dB)	-4.0	-4.0	-4.0	-4.0	-4.0
Downlink Contour EIRP (dBW)	47.3	47.3	47.3	47.3	47.3
Rain Rate (mm/hr)	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
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0
Downlink EIRP Density (dBW/Hz)	-19.9	-19.9	-19.9	-19.9	-19.9
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0
ADJACENT SATELLITE 2					
Satellite 1 Orbital Location	64.5E	64.5E	64.5E	64.5E	64.5E
Uplink Power Density (dBW/Hz)	-45.0	-45.0	-45.0	-45.0	-45.0
Uplink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0
Downlink EIRP Density (dBW/Hz)	-19.9	-19.9	-19.9	-19.9	-19.9
Downlink Polarization Advantage (dB)	0.0	0.0	0.0	0.0	0.0
CARRIER INFORMATION					
Carrier ID	500MG7W	10M3G7W	100KG7W	1M45G7W	400KG7W
Carrier Modulation	QPSK	QPSK	QPSK	BPSK	BPSK
Peak to Peak Bandwidth of EDS (MHz)	N/A	N/A	N/A	N/A	N/A
Information Rate(kbps)	341318.0	6000	64	512	128
Code Rate	1/2x188/204	1/2x188/204	1/2x239/256	R1/2	R1/2
Occupied Bandwidth(kHz)	418514.0	6771.1	75.4	1229.0	307.0
Allocated Bandwidth(kHz)	500000.0	10300	100	1450.0	400.0
Minimum C/N, Clear Sky (dB)	3.36	3.87	2.99	3.4	3.4
Minimum C/N, Rain (dB)	3.36	3.57	2.79	2.7	2.7
UPLINK EARTH STATION					
Earth Station Diameter (meters)	3.5	3.5	3.5	3.0	2.8
Earth Station Gain (dBi)	58.9	58.9	58.9	57.5	56.9
Earth Station Elevation Angle	49.7	49.7	49.7	49.7	49.7
DOWNLINK EARTH STATION					
Earth Station Diameter (meters)	3.0	2.7	2.7	2.8	3.0
Earth Station Gain (dBi)	54.2	53.2	53.3	53.4	54.1
Earth Station G/T (dB/K)	31.8	30.8	30.9	31.0	31.7
Earth Station Elevation Angle	49.7	49.7	49.7	49.7	49.7
LINK FADE TYPE	Clear Sky	Clear Sky	Clear Sky	Clear Sky	Clear Sky
UPLINK PERFORMANCE					
Uplink Earth Station EIRP (dBW)	87.6	70.2	49.8	61.7	55.1
Uplink Path Loss, Clear Sky (dB)	-213.3	-213.3	-213.3	-213.3	-213.3
Uplink Rain Attenuation	0.0	0.0	0.0	0.0	0.0
Satellite G/T(dB/K)	-0.9	-0.9	-0.9	-0.9	-0.9
Boltzman Constant(dBW/K-Hz)	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-86.2	-68.3	-48.8	-60.9	-54.9
Uplink C/N(dB)	15.4	16.0	15.1	14.9	14.3
DOWNLINK PERFORMANCE					
Downlink EIRP per Carrier (dBW)	47.3	30.9	10.5	22.5	15.8
Antenna Pointing Error (dB)	-0.5	-0.5	-0.5	-0.5	-0.5
Downlink Path Loss, Clear Sky (dB)	-209.8	-209.8	-209.8	-209.8	-209.8
Downlink Rain Attenuation	0.0	0.0	0.0	0.0	0.0
Earth Station G/T (dB/K)	31.8	30.8	30.9	31.0	31.7
Boltzman Constant(dBW / K - Hz)	228.6	228.6	228.6	228.6	228.6
Carrier Noise Bandwidth (dB-Hz)	-86.2	-68.3	-48.8	-60.9	-54.9
Downlink C / N(dB)	10.8	11.3	10.5	10.5	10.5
COMPOSITE LINK PERFORMANCE					
C/N Uplink (dB)	15.4	16.0	15.1	14.9	14.3
C/N Downlink (dB)	10.8	11.3	10.5	10.5	10.5
C/I Intermodulation (dB)	N/A	16.0	16.0	16.0	16.0
C/I Uplink Co-Channel (dB)*	N/A	N/A	N/A	N/A	N/A
C/I Downlink Co-Channel (dB)*	N/A	N/A	N/A	N/A	N/A
C/I Uplink Adjacent Satellite 1 (dB)	25.0	25.5	24.6	24.4	23.8
C/I Downlink Adjacent Satellite 1 (dB)	13.8	14.3	13.5	13.4	13.5
C/I Uplink Adjacent Satellite 2 (dB)	25.6	26.1	25.2	25.0	24.4
C/I Downlink Adjacent Satellite 2 (dB)	14.4	14.9	14.1	14.0	14.1
C/(N+I) Composite (dB)	7.0	7.0	6.3	6.2	6.1
Required System Margin (dB)	-1.0	-1.0	-1.0	-1.0	-1.0
Net C/(N+I) Composite (dB)	6.0	6.0	5.3	5.2	6.1
Minimum Required C/N (dB)	-3.4	-3.9	-3.0	-3.4	-3.4
Excess Link Margin (dB)	2.6	2.1	2.3	1.8	1.7
Number of Carriers	1.0	43.0	4757.0	305.0	1250.0
CARRIER DENSITY LEVELS					
Uplink Power Density (dBW/Hz)	-57.5	-57.0	-57.9	-56.7	-56.7
Downlink EIRP Density At Beam Peak (dBW/Hz)	-34.9	-33.4	-34.2	-34.4	-35.1