Globecomm License Sub LLC

Technical Annex

A. Technical Information to Supplement Schedule S

B. Radiation Hazard Report for 9.3 Meter Earth Station

C. Frequency Coordination and Interference Analysis Report

D. FCC Letter to ANATEL

ATTACHMENT A

Technical Information to Supplement Schedule S

1 PURPOSE AND SCOPE

The purpose of this Attachment is to provide the Commission with the technical characteristics of the EUTELSAT 65 WEST A ("E65WA") satellite. This attachment contains information required by the Commission that cannot be entered into the Schedule S submission.

2 GENERAL DESCRIPTION

Eutelsat do Brasil LTDA ("Eutelsat") operates the E65WA satellite at the nominal 65° W.L. location. The satellite is capable of providing a wide range of FSS services using the C-, Ku- and Ka-bands. For purposes of this application, U.S. market access is being sought only for the Ku-bands. Accordingly, only the characteristics of the Ku-band payload are described herein and in the associated Schedule S form.

The Ku-bands used by the satellite are the Appendix 30B Ku-bands: 12.75-13.25 GHz uplink band and the 10.75-10.95 GHz and 11.2-11.45 GHz downlink bands. The satellite employs twenty-four 36 MHz Ku-band transponders. There are two Ku-bands beams in both the uplink and downlink directions: the "South American" beam, which includes coverage of eastern United States, and the Brazil beam. Twelve transponders are switchable between the South American and Brazil beams.

3 FREQUENCY AND POLARIZATION PLAN

The E65WA satellite's Ku-band frequency and polarization plan, including beam connectivity options, are provided in the associated Schedule S form. The satellite provides full frequency reuse as required by Section 25.210(f) of the Commission's rules.

4 SPACE STATION TRANSMIT AND RECEIVE CAPABILITIES

The transmit and receive antenna gain contours of the satellite's Ku-band beams are provided in GXT format and are embedded in the associated Schedule S form.

The maximum EIRP and EIRP densities for each of the downlink beams are listed in Table 1. Also listed are the maximum and minimum saturating flux-density ("SFD") levels, referenced at the beam peak, for each of the uplink beams.

Table 1. Maximum Downlink EIRP and EIRP Densities. Maximum and Minimum SFD's.

Beam	Maximum Downlink EIRP (dBW)	Maximum Downlink EIRP Density (dBW/Hz)	Maximum SFD (dBW/m^2)	Minimum SFD (dBW/m^2)
Brazil	51.9	-23.0	-70	-92
South America	50.4	-23.0	-70	-92

In addition, authorized uplink transmissions towards the E65WA satellite will not exceed an input power density of -47 dBW/Hz. The E65WA satellite network will be operated in a manner consistent with ITU coordination agreements reached by Brazil.

5 ARRANGEMENT FOR TT&C

TT&C will not be conducted from U.S. territory. The satellite control center and primary TT&C site is located in Brazil. The backup TT&C site is located in Portugal. Information for the satellite control center and TT&C stations is provided below:

Satellite Control Center and Primary TT&C Station:

Avenida Valville, 450 – Sítio Tanquinho – Santana do Parnaíba
SP CEP 06532-010, Brazil
24/7 contact phone numbers: +55 11 2110-3365 / +55 11 2110-3353 / +55 11 4196-5594

Backup TT&C Station Location:

Zona Franca Industrial da Madeira – Lote 27 B/C 9200-047 Caniçal, Madeira,
Portugal

6 POWER FLUX DENSITY ANALYSIS

The Commission's Part 25 rules do not contain PFD limits applicable to the Appendix 30B 10.7-10.95 GHz and 11.2-11.45 GHz bands. However it is noted that Article 21 of the ITU Radio Regulations includes PFD limits that are applicable to GSO satellites using these bands. The ITU limits are identical to those of Section 25.208(b) of the Commission's rules.

Tables 1 and 2 show the PFD levels that will occur at various angles of arrival for the two downlink beams when transmitting with a maximum downlink EIRP density of -23 dBW/Hz. These two tables demonstrate compliance with the ITU's Article 21 PFD limits.

Table 2. Maximum PFD Levels of Beam SADH

Angle of Arrival	Applicable PFD Limit for Angle of Arrival (dBW/m²/4 kHz)	Spreading Loss (dBW/m²)	Gain Contour (dB)	Worst Case PFD Level at Angle of Arrival (dBW/m²/4 kHz)	PFD Margin (dB)
0°	-150.0	-163.4	-20	-170.4	20.4
5°	-150.0	-163.3	-19	-169.3	19.3
10°	-147.5	-163.2	-17	-167.1	19.6
15°	-145.0	-163.0	-14.8	-164.8	19.8
20°	-142.5	-162.9	-14.6	-164.5	22.0
25°	-140.0	-162.8	-14.2	-164.0	24.0
72.4° (Peak)	-140.0	-162.1	0.0	-149.1	9.1

Table 3. Maximum PFD Levels of Beams BDH and BDV

Angle of Arrival	Applicable PFD Limit for Angle of Arrival (dBW/m²/4 kHz)	Spreading Loss (dBW/m²)	Gain Contour (dB)	Worst Case PFD Level at Angle of Arrival (dBW/m²/4 kHz)	PFD Margin (dB)
0°	-150.0	-163.4	-20	-170.4	20.4
5°	-150.0	-163.3	-19	-166.1	19.3
10°	-147.5	-163.2	-19	-165.3	21.6
15°	-145.0	-163.0	-18	-164.2	23.0
20°	-142.5	-162.9	-17	-163.1	24.4
25°	-140.0	-162.8	-16	-160.0	25.8
66.4° (Peak)	-140.0	-162.2	0.0	-149.2	9.2

7 TWO-DEGREE COMPATIBILITY ANALYSIS

This section demonstrates that the E65WA satellite network's operations are two-degree compatible.

Currently there are no operational Ku-band satellites two degrees away from the nominal 65° W.L. location using the Appendix 30B bands, nor are there any pending applications before the Commission requesting to use the Ku-bands at a location two degrees or less from the nominal 65° W.L. location. In order to demonstrate two-degree compatibility, the transmission parameters of the E65WA satellite network have been used as both the wanted and interfering transmissions.

Table 4 provides a summary of the typical transmission parameters used by the E65WA satellite network and which were used in the interference analysis.

Table 5 shows the results of the interference calculations in terms of the overall C/I margins. The interference calculations assume a 1 dB advantage for topocentric-to-geocentric conversion, all wanted and interfering carriers are co-polarized and all earth station antennas conform to a sidelobe pattern of 29-25 log(θ). The C/I calculations were performed on a per Hz basis.

It can be seen that all the C/I margins are positive, thereby demonstrating the two-degree compatibility of the E65WA satellite network.

Table 4. Typical Transmission Parameters

Carrier ID	Emission Designator	Bandwidth (MHz)	Tx E/S Gain (dBi)	Uplink EIRP (dBW)	Downlink EIRP (dBW)	Rx E/S Gain (dBi)	C/I Criterion (dB)
1	49K0G7W	0.0486	42.4	41.0	12.3	56.5	16.5
2	1M34G7W	1.34	53.9	59.7	30.8	47.2	16.5
3	6M33G7W	6.33	53.9	67.1	38.2	44.7	17.7
4	10M0G7W	10.0	57.3	70.1	40.9	44.7	16.5
5	36M0G7W	36.0	57.3	79.1	48.9	41.1	20.5

Table 5. Summary of the overall link C/I margins (dB).

		Interfering Carriers				
	Carrier ID	1	2	3	4	5
Wanted Carriers	1	5.4	10.9	10.2	11.3	8.3
	2	8.5	9.4	8.8	8.4	5.9
	3	7.2	6.7	6.1	5.6	3.1
	4	9.3	8.8	8.1	7.5	5.1
	5	6.3	3.9	3.3	2.6	0.1

8 ORBITAL DEBRIS MITIGATION PLAN

8.1 Spacecraft Hardware Design

Eutelsat can confirm that the satellite will not undergo any planned release of debris during its operation. Furthermore, all separation and deployment mechanisms, and any other potential source of debris will be retained by the spacecraft.

In conjunction with Space Systems/Loral, Eutelsat has assessed and limited the probability of the satellite becoming a source of debris by collisions with small debris or meteoroids of less than one centimeter in diameter that could cause loss of control and prevent post-mission disposal. Eutelsat has taken steps to limit the effects of such collisions through shielding, the placement of components, and the use of redundant systems.

The E65WA satellite includes separate TT&C and propulsion subsystems that are necessary for end-of-life disposal. The spacecraft TT&C system, vital for orbit raising, is extremely rugged with regard to meteoroids smaller than 1 cm, by virtue of its redundancy, shielding, separation of components and physical characteristics. Omni-directional antennas are mounted on opposite sides of the spacecraft. These antennas are extremely rugged and capable of providing adequate coverage even if struck, bent or otherwise damaged by a small or medium sized particle. Either one of the two omni-directional antennas, for both command and telemetry, will be sufficient to enable orbit raising. The redundant command receivers and decoders and redundant telemetry encoders and transmitters are located within a shielded area. A single rugged thruster and shielded propellant tank provides the energy for orbit-raising. Otherwise, there are no single points of failure in the system.

8.2 Minimizing Accidental Explosions

In conjunction with Space Systems/Loral, Eutelsat has assessed and limited the probability of accidental explosions during and after completion of mission operations. The satellite manufacturer has taken steps to ensure that debris generation will not result from the conversion of energy sources on board the satellite into energy that fragments the satellite. In particular, the

satellite manufacturer advises that burst tests are performed on all pressure vessels during qualification testing to demonstrate a margin of safety against burst. Bipropellant mixing is prevented by the use of valves that prevent backwards flow in propellant lines and pressurization lines. All batteries and fuel tanks are monitored for pressure and temperature. Excessive battery charging or discharging is limited by a monitoring and control system which will automatically limit the possibility of fragmentation. Corrective action, if not automatically undertaken, will be immediately undertaken by the spacecraft operator to avoid destruction and fragmentation. Thruster temperatures, impulse and thrust duration are carefully monitored, and any thruster may be turned off via redundant valves. Consequently, there is no possibility of explosion during the operating mission. Space Systems/Loral has also conducted a failure mode effects and criticality analysis as part of the design process.

In order to ensure that the spacecraft has no explosive risk after it has been successfully de-orbited, all stored energy onboard the spacecraft will be removed. Upon successful de-orbit of the spacecraft, all propulsion lines and latch valves will be vented and left open. Battery chargers will be turned off and all batteries will be left in a permanent discharge state.

Regarding the residual helium pressurant, and taking into account that the E65WA satellite is based on the Space Systems/Loral 1300 model spacecraft, although the helium will be vented as part of the retirement procedures for the satellite, a regulator on the tanks will prevent complete expulsion of the helium. The E65WA propulsion subsystem design, in particular the regulator and downstream check valve characteristics, will ensure that the minimum pressure in the three interconnected helium tanks (65 liters each) will be no higher than 1.6psia (0.11 bar). The specification for the minimum inlet pressure below which that regulator cuts off the flow of helium is 400 psia. Based on that pressure, and assuming a temperature of 298K, the residual helium after depletion is estimated to be approximately 3.5 grams. The tank pressure of 1.6 psia will be a fraction of the tanks' maximum expected operating pressure, which is 4000 psia.

Globecomm seeks a waiver of Section 25.283(c) of the Commission's Rules with respect to the residual helium that will remain on the E65WA satellite at end of life to the extent necessary to grant this application. That section requires that space station operators take steps as part of the retirement procedures to discharge energy sources on board the satellite, including "relieving

pressure vessels." 47 C.F.R. § 25.283(c). As discussed above, although the helium will be substantially depleted as part of the retirement process and virtually undetectable, thus "relieving" the pressure in these tanks, once the inlet pressure drops below the set point of the regulator it is impossible to continue to expel the helium. This limitation is part of the design of the spacecraft. In addition, E65WA is already in orbit. Under these circumstances, grant of a waiver would be consistent with Commission precedents[1,2].

8.3 Safe Flight Profiles

In considering current and planned satellites that may have a station-keeping volume that overlaps the E65WA satellite, Eutelsat has reviewed the lists of FCC licensed satellite networks, as well as those that are currently under consideration by the FCC. In addition, satellite networks for which a request for coordination has been published by the ITU within ±0.2 degrees of 65.2° W.L. have also been reviewed.

The Brazilian satellite operator Star One operates the STAR ONE C1 satellite at the 65.0° W.L orbital location. The satellite operates with an east-west station-keeping tolerance of ±0.05°. The E65WA satellite operates at 65.2° W.L, and with an east-west station-keeping tolerance of ±0.05°, thereby eliminating the possibility of any station-keeping volume overlap with the STAR ONE C1 satellite.

There are no pending applications before the Commission requesting authorization to use an orbital location within ±0.2° of 65.2° W.L. and Eutelsat is not aware of any satellite with an overlapping station-keeping volume with the E65WA satellite that is the subject of an ITU filing and that is either in orbit or progressing towards launch.

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[1] See Gogo LLC Section 1.65 Letter, File No. SES-MFS-20151022-00735 (Call Sign E120106).

[2] See United Teleports Inc. – Section 1.65 Submission, File No. SES-LIC-20160513-00427 (Call Sign E160081)

Based on the preceding, Eutelsat concludes that physical coordination of the E65WA satellite with another party is not required at the present time.

8.4 Post Mission Disposal Plan

At the end of the operational life of the E65WA satellite, it will be maneuvered to a disposal orbit with a minimum perigee of 300 km above the normal GSO operational orbit. This proposed disposal orbit altitude is based on the following calculation, as required by Section 25.283:

Total Solar Pressure Area "A" = 97.5 m^2

"M" = Dry Mass of Satellite = 2757.5 kg

"C_R" = Solar Pressure Radiation Coefficient = 1.24

Therefore the Minimum Disposal Orbit Perigee Altitude:

= 36,021 km + 1000 x C_R x A/M

= 36,021 km + 1000 x 1.24 x 97.5/2757.5

= 36,035 km

= 279 km above GSO (35,786 km)

To provide margin, the nominal disposal orbit will be increased to 300 km. This will require 10.8 kg of propellant that will be reserved, taking account of all fuel measurement uncertainties, to perform the final orbit raising maneuvers.

9 ITU FILINGS

The E65WA satellite network operates under the following two Appendix 30B ITU filings:

B-SAT-3R – AP30B/A6A/254 published in IFIC 2744.

B-SAT-3R-1 – AP30B/A6A/333 published in IFIC 2774.

CERTIFICATION OF PERSON RESPONSIBLE FOR PREPARING ENGINEERING INFORMATION

I hereby certify that I am the technically qualified person responsible for preparation of the engineering information contained in this "Attachment A Technical Information to Supplement Schedule S", that I am familiar with Part 25 of the Commission's rules that I have either prepared or reviewed the engineering information submitted in this "Attachment A Technical Information to Supplement Schedule S", and that it is complete and accurate to the best of my knowledge and belief.

/s/ Adrián Pérez Zúñiga
Adrián Pérez Zúñiga
Satellite Coordination Manager
Eutelsat
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Analysis of Non-Ionizing Radiation for a 9.3-Meter Earth Station System

This report analyzes the non-ionizing radiation levels for a 9.3-meter earth station system. The analysis and calculations performed in this report comply with the methods described in the FCC Office of Engineering and Technology Bulletin, No. 65 first published in 1985 and revised in 1997 in Edition 97-01. The radiation safety limits used in the analysis are in conformance with the FCC R&O 96-326. Bulletin No. 65 and the FCC R&O specifies that there are two separate tiers of exposure limits that are dependant on the situation in which the exposure takes place and/or the status of the individuals who are subject to the exposure. The Maximum Permissible Exposure (MPE) limits for persons in a General Population/Uncontrolled environment are shown in Table 1. The General Population/Uncontrolled MPE is a function of transmit frequency and is for an exposure period of thirty minutes or less. The MPE limits for persons in an Occupational/Controlled environment are shown in Table 2. The Occupational MPE is a function of transmit frequency and is for an exposure period of six minutes or less. The purpose of the analysis described in this report is to determine the power flux density levels of the earth station in the far-field, near-field, transition region, between the subreflector or feed and main reflector surface, at the main reflector surface, and between the antenna edge and the ground and to compare these levels to the specified MPEs.

Table 1. Limits for General Population/Uncontrolled Exposure (MPE)

Frequency Range (MHz)	Power Density (mW/cm^2)
30-300	0.2
300-1500	Frequency (MHz)*(0.8/1200)
1500-100,000	1.0

Table 2. Limits for Occupational/Controlled Exposure (MPE)

Frequency Range (MHz)	Power Density (mW/cm^2)
30-300	1.0
300-1500	Frequency (MHz)*(4.0/1200)
1500-100,000	5.0

Table 3. Formulas and Parameters Used for Determining Power Flux Densities

Parameter	Symbol	Formula	Value	Units
Antenna Diameter	D	Input	9.3	m
Antenna Surface Area	$A_{surface}$	$\pi D^2 / 4$	67.93	m^2
Subreflector Diameter	D_{sr}	Input	116.8	cm
Area of Subreflector	A_{sr}	$\pi D_{sr}{}^2/4$	10714.59	cm^2
Frequency	F	Input	13000	MHz
Wavelength	λ	300 / F	0.023077	m
Transmit Power	P	Input	616.50	W
Antenna Gain (dBi)	G_{es}	Input	60.8	dBi
Antenna Gain (factor)	G	$10^{Ges/10}$	1202264.4	n/a
Pi	π	Constant	3.1415927	n/a
Antenna Efficiency	η	$G\lambda^2/(\pi^2D^2)$	0.75	n/a

1. Far Field Distance Calculation

The distance to the beginning of the far field can be determined from the following equation:

Distance to the Far Field Region

$$R_{ff} = 0.60\ D^2 / \lambda \quad (1)$$
$$= 2248.7\ \text{m}$$

The maximum main beam power density in the far field can be determined from the following equation:

On-Axis Power Density in the Far Field

$$S_{ff} = G\ P / (4\ \pi\ R_{ff}^{\ 2}) \quad (2)$$
$$= 11.664\ \text{W/m}^2$$
$$= 1.166\ \text{mW/cm}^2$$

2. Near Field Calculation

Power flux density is considered to be at a maximum value throughout the entire length of the defined Near Field region. The region is contained within a cylindrical volume having the same diameter as the antenna. Past the boundary of the Near Field region, the power density from the antenna decreases linearly with respect to increasing distance.

The distance to the end of the Near Field can be determined from the following equation:

Extent of the Near Field

$$R_{nf} = D^2 / (4\ \lambda) \quad (3)$$
$$= 937.0\ \text{m}$$

The maximum power density in the Near Field can be determined from the following equation:

Near Field Power Density

$$S_{nf} = 16.0\ \eta\ P / (\pi\ D^2) \quad (4)$$
$$= 27.229\ \text{W/m}^2$$
$$= 2.723\ \text{mW/cm}^2$$

3. Transition Region Calculation

The Transition region is located between the Near and Far Field regions. The power density begins to decrease linearly with increasing distance in the Transition region. While the power density decreases inversely with distance in the Transition region, the power density decreases inversely with the square of the distance in the Far Field region. The maximum power density in the Transition region will not exceed that calculated for the Near Field region. The power density calculated in Section 1 is the highest power density the antenna can produce in any of the regions away from the antenna. The power density at a distance R_t can be determined from the following equation:

Transition Region Power Density

$$S_t = S_{nf}\ R_{nf} / R_t \quad (5)$$
$$= 2.723\ \text{mW/cm}^2$$

4. Region between the Main Reflector and the Subreflector

Transmissions from the feed assembly are directed toward the subreflector surface, and are reflected back toward the main reflector. The most common feed assemblies are waveguide flanges, horns or subreflectors. The energy between the subreflector and the reflector surfaces can be calculated by determining the power density at the subreflector surface. This can be determined from the following equation:

Power Density at the Subreflector

$$S_{sr} = 4000\ P / A_{sr} \quad (6)$$
$$= 230.153\ mW/cm^2$$

5. Main Reflector Region

The power density in the main reflector is determined in the same manner as the power density at the subreflector. The area is now the area of the main reflector aperture and can be determined from the following equation:

Power Density at the Main Reflector Surface

$$S_{surface} = 4\ P / A_{surface} \quad (7)$$
$$= 36.303\ W/m^2$$
$$= 3.630\ mW/cm^2$$

6. Region between the Main Reflector and the Ground

Assuming uniform illumination of the reflector surface, the power density between the antenna and the ground can be determined from the following equation:

Power Density between Reflector and Ground

$$S_g = P / A_{surface} \quad (8)$$
$$= 9.076\ W/m^2$$
$$= 0.908\ mW/cm^2$$

7. Summary of Calculations

Table 4. Summary of Expected Radiation levels for Uncontrolled Environment

Region		Calculated Maximum Radiation Power Density Level (mW/cm^2)	Hazard Assessment
1. Far Field (R_{ff} = 2248.7 m)	S_{ff}	1.166	Potential Hazard
2. Near Field (R_{nf} = 937.0 m)	S_{nf}	2.723	Potential Hazard
3. Transition Region ($R_{nf} < R_t < R_{ff}$)	S_t	2.723	Potential Hazard
4. Between Main Reflector and Subreflector	S_{sr}	230.153	Potential Hazard
5. Main Reflector	$S_{surface}$	3.630	Potential Hazard
6. Between Main Reflector and Ground	S_g	0.908	Satisfies FCC MPE

Table 5. Summary of Expected Radiation levels for Controlled Environment

Region		Calculated Maximum Radiation Power Density Level (mW/cm^2)	Hazard Assessment
1. Far Field (R_{ff} = 2248.7 m)	S_{ff}	1.166	Satisfies FCC MPE
2. Near Field (R_{nf} = 937.0 m)	S_{nf}	2.723	Satisfies FCC MPE
3. Transition Region ($R_{nf} < R_t < R_{ff}$)	S_t	2.723	Satisfies FCC MPE
4. Between Main Reflector and Subreflector	S_{sr}	230.153	Potential Hazard
5. Main Reflector	$S_{surface}$	3.630	Satisfies FCC MPE
6. Between Main Reflector and Ground	S_g	0.908	Satisfies FCC MPE

It is the applicant's responsibility to ensure that the public and operational personnel are not exposed to harmful levels of radiation.

8. Conclusions

Based on the above analysis it is concluded that the FCC MPE guidelines have been exceeded (or met) in the regions of Table 4 and 5. The applicant proposes to comply with the MPE limits by one or more of the following methods.

Radiation hazard signs will be posted while this earth station is in operation.

Due to the secure location of the proposed earth station antenna at the Hauppauge Teleport, the area of operation around the antenna will be limited to those that have knowledge of the potential for radiation exposure. The applicant will ensure that no buildings or other obstacles will be in the areas that exceed the MPE levels.

Means of Compliance Controlled Areas

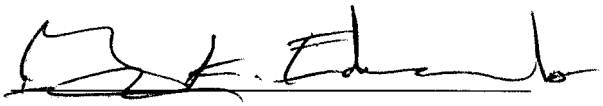
The earth station's operational staff will not have access to the areas that exceed the MPE levels while the earth station is in operation.

The transmitters will be turned off during antenna maintenance

The applicant agrees to abide by the conditions specified in Condition 5208 provided below:

> *Condition 5208 - The licensee shall take all necessary measures to ensure that the antenna does not create potential exposure of humans to radiofrequency radiation in excess of the FCC exposure limits defined in 47 CFR 1.1307(b) and 1.1310 wherever such exposures might occur. Measures must be taken to ensure compliance with limits for both occupational/controlled exposure and for general population/uncontrolled exposure, as defined in these rule sections. Compliance can be accomplished in most cases by appropriate restrictions such as fencing. Requirements for restrictions can be determined by predictions based on calculations, modeling or by field measurements. The FCC's OET Bulletin 65 (available on-line at www.fcc.gov/oet/rfsafety) provides information on predicting exposure levels and on methods for ensuring compliance, including the use of warning and alerting signs and protective equipment for worker.*

I HEREBY CERTIFY THAT I AM THE TECHNICALLY QUALIFIED PERSON RESPONSIBLE FOR THE PREPARATION OF THE RADIATION HAZARD REPORT, AND THAT IT IS COMPLETE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF.

BY: _ 

Gary K. Edwards
Senior Manager
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19700 Janelia Farm Boulevard
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DATED: August 3, 2018

ATTACHMENT C

FREQUENCY COORDINATION AND INTERFERENCE ANALYSIS REPORT

Prepared for
Globecomm License Sub LLC
HAUPPAUGE, NY
(AOT10)
Satellite Earth Station

Prepared By:
COMSEARCH
19700 Janelia Farm Boulevard
Ashburn, VA 20147
September 11, 2018

TABLE OF CONTENTS

1. CONCLUSIONS

An interference study considering all existing, proposed and prior coordinated microwave facilities within the coordination contours of the proposed earth station demonstrates that this site will operate satisfactorily with the common carrier microwave environment. Further, there will be no restrictions of its operation due to interference considerations.

2. SUMMARY OF RESULTS

A number of great circle interference cases were identified during the interference study of the proposed earth station. Each of the cases, which exceeded the interference objective on a line-of-sight basis, was profiled and the propagation losses estimated using NBS TN101 (Revised) techniques. The losses were found to be sufficient to reduce the signal levels to acceptable magnitudes in every case.

The following companies reported potential great circle interference conflicts that did not meet the objectives on a line-of-sight basis. When over-the-horizon losses are considered on the interfering paths, sufficient blockage exists to negate harmful interference from occurring with the proposed transmit-only earth station.

Company

<Companies Responding with Cases>

No other carriers reported potential interference cases.

3. SUPPLEMENTAL SHOWING

Pursuant to Part 25.203(c) of the FCC Rules and Regulations, the satellite earth station proposed in this application was coordinated by Comsearch using computer techniques and in accordance with Part 25 of the FCC Rules and Regulations.

Coordination data for this earth station was sent to the below listed carriers with a letter dated 07/23/2018.

Company
3G Wireless, LLC
AERIAL VIDEO SYSTEMS
Alascom Inc
Albany, County of
Algonquin Gas Transmission, LLC
American Broadcasting Companies, Inc.
AMFM Radio Licenses, LLC
AQ2AT LLC
Archdiocese of New York Dept of Educatio
Ascent Media Network Services, LLC
AT&T Corp.
Atlantic Telecommunications
Bellsouth Telecommunications, Inc.
Bergen, County of
Bethel CT Police Department
BFI Licenses, LLC
BJ'S Wholesale Club, Inc
Blueline Communications
Borgeson, Tom R.
Broadcast Sports Inc.
Bucks County Dept. of Emergency Comm
Business Only Broadband, LLC
Cablevision Systems of Long Island Corp.
Capital Communications of America
Capital District Trans. Authority
Carolina Telephone and Telegraph Co
Casper, John
CBS Broadcasting Inc
CBS Communications Services Inc
CBS Radio East, LLC.
Cellco Partnership - (W-NY)
Cellco Partnership-Northern New Jersey
Central Hudson Gas & Electric Corp.
Central Massachusetts Emergency Medical
CenturyTel of the Southwest, Inc.
Chicago Comnet Corp
Cincinnati Bell Wireless LLC
City of Albany
City of Bethlehem
City of Bristol Mayor's Office
City of Jersey City

City of New York
City of Providence RI Public Safety Comm
City of Springfield Police Department
City of Westfield
City of Worcester Emergency Comm Dept
Citywide News Network, Inc.
Citywisper LLC
Clarity Connect, Inc.
Clearwire Spectrum Holdings III, LLC
CMEEC
Columbia, County of
Community Products, LLC
Comprehensive Wireless LLC
Connecticut Public Broadcasting Inc
Connecticut, State of
Conterra Ultra Broadband, LLC
County of Burlington
County of Burlington, Public Safety Cntr
County of Camden
County of Hunterdon
County of Mercer
County of Pike
County of Warren, NJ
Cowboys Stadium LP
Cox Radio Inc
DCI II, INC.
Direct Broadcast Services, Inc.
DSRC Networks
Dutchess County Emergency Response
East Brunswick, Township of, NJ
East Hampton Town Police Department
Eastern MLG LLC
ECW Wireless, LLC
Electric Railroad, LLC
ESPN Inc.
Essex County Sheriff's Office (NJ)
Eversource Energy Service Company
Exelon Generation Company, LLC
FELHC, Inc.
Fishers Island Telephone
Fordham University(WFUV)
Fox Television Stations LLC - WNYW TV
Fox Television Stations, LLC
Frascogna, Carl
Frontier California Inc.
Fundamental Broadcasting LLC
Garden State Transmissions
GAW High-Speed Internet
Geodesic Networks LLC
Glastonbury Police Department
Global Crossing Telecommunications, Inc.
Global Telecom & Technology Americas
Gloucester Township
Goosetown Network Services, LLC
Greenwich, Town of (CT)
GTT America LLC

Hallco Unlimited, Inc.
Hamilton, Township of
Hammarlund Research LLC
HARRIS CORPORATION
Hawaiian Telcom, Inc.
Heiden, William
HF Enterprises, Inc
High Voltage Communications LLC (CFN)
Highway Networks, LLC
Holy Name Hospital
Hopewell Radiology Group
Hudson County Prosecutors Office
HUDSON VALLEY WIRELESS
Illinois Bell Telephone Company
Indiana Bell Telephone Company
Industrial Tower and Wireless, LLC
Information & Display Systems, Inc.
Information Super Station, LLC
International Communications Group, Inc.
iSignal
Jackson Twp. Police Department
Jefferson Microwave, LLC
Kentucky RSA #3 Cellular General Partner
Kentucky RSA #4 Cellular General Partner
Kryptick Technologies
Lackawanna County Dept. of Emergency Ser
Lackawanna, County of
Lake Mohegan Fire District
Lakewood Municipal Utilities Authority
LANline Communications, Inc.
Lehigh, County of
Local Media TV Philadelphia
Local TV Pennsylvania License, LLC
Manchester, Township of
Marcus Communications
Massachusetts Commonwealth of
Massachusetts Water Resources Authority
Massachusetts, Commonwealth of
MERCURY COMMUNICATIONS
Meredith Corporation
Michigan Bell Telephone Company
Middlesex, County of
Middletown, City of
Mid-Hudson Cablevision
Mid-Hudson Data Corp
Monmouth, County of
Monroe County Control Center (PA)
Montgomery County Of
Moreen, Steven K
Morris, County of
Nassau County Police Department
National Grid USA Service Company, Inc
National Tower Company LLC
Navajo Communications Company
NBC Telemundo License LLC
NCN Data,LLC

New Britain, City of
New Cingular Wireless PCS LLC - NJ
New Cingular Wireless PCS LLC - MA
New Cingular Wireless PCS LLC-DE/NH/RI
New Cingular Wireless PCS, LLC - PA
New Cingular Wireless PCS, LLC (NY)
NEW ENGLAND DIGITAL DISTRIBUTION, INC.
New Jersey Public Broadcasting Authority
New Jersey State Police
New Jersey Transit Rail Operations, Inc.
New Jersey Turnpike Authority-Pkwy Div
New Jersey, State of -NJ Transit
New Line Networks, LLC
New York City Police Department
New York City Police TARU
New York City Transit Authority
New York Communications Co., Inc
New York Presbyterian Hospital
New York SMSA Limited Partnership
New York SMSA LP (Northern NJ)
Newark Police Department
NEXSTAR BROADCASTING, INC.
Norcom Communications Corp.
Norfolk County Fire Dispatch
Northrop Grumman Systems Corp.
NorthWest Suburbs Community Access Corp
Norton, Douglas R
NSM Surveillance
Nstar Electric Company
NW Technologies, LLC
NY Dept of Health and Mental Hygiene
NYC DOT Staten Island Ferry
Ocean County of - Div of Wireless Tech.
Ocean, County of
Office of Emergency Telecom Services, NJ
Ohio Bell GTelephone Company
Onboard Images
Optiver GT US, LLC
Orange and Rockland Utilities, Inc.
Orange County Dept of Emergency Services
Orangetown, Town of
Pacific Bell Tel Com dba AT&T California
Peco Energy Company
Penn Service Microwave Co., Inc.
Pennsylvania Turnpike Commission
PhillieCo, L.P.
Pierce Broadband, LLC
Pines Pantry, Inc.
Piscataway, Township Of
Plateau Telecommunications, Inc.
Plum TV, LLC
Pocono Mountain School District
Port Authority of New York & New Jersey
Production & Satellite Services, Inc.
PSEG Services Corporation
Putnam County Bureau of Emerg. Services

Qoncept Holdings LLC
Quick Link Connections Inc.
Qwest Corporation
Radiofone, Inc.
Randy Hermes Production
RCC Minnesota Inc. - MN NE ND SD
Remote Broadcasts, Inc.
REMOTE FACILITIES CONSULTING SERVICES
Rensselaer County
RF Central, LLC
RF Film, Inc
Ridgefield Police Department
Rockland, County of
Sanofi Pasteur
Saratoga County Office of Emergency Svcs
Schenectady County Unified Communication
Setauket Fire District
Somerset County (M.I.S.)
Southeastern Pennsylvania Transit Auth
Southington Town of CT
Southwestern Bell Telephone L.P.
Speedshotz, Inc
Spot On Networks
Sprint Spectrum L.P.
Sprintcom, Inc
St Lukes Hospital
Stamford, City of
Standard Backhaul Communications LLC
Startouch, Inc.
State of New Jersey
State of New Jersey Infomation Technolog
State of New York, Div of State Police
State of Rhode Island, EMA
Suffolk County Police Department
Suffolk, County of
Sullivan County DPW
Susquehanna County
Sussex County Sheriffs Office
SW Networks
Telecom Transport Management, Inc
T-Mobile License LLC
Toms River Police Department
Toms River, Township of
Towerstream Corp.
Town of Colonie Police Department
Town of Holden
Town of Narragansett, Rhode Island
Town of Smithtown Dept of Public Safety
Town of Wethersfield
Town of Woodbridge, Police Department
Township of Middletown
Township of Old Bridge
Townsquare Media Atlantic City III Licen
Townsquare Media Monmouth-Ocean License
Townsquare Media Oneonta License, LLC
Transcontinental Gas Pipeline Corp.

Transwave Communication Systems, Inc.
TTWN Networks, LLC
Ulster County of
Union County New Jersey
Unisat, Inc.
United Telephone - Southeast
Uniti Fiber PEG, LLC
Verizon Maryland, Inc.
Verizon New England Inc.
Verizon New Jersey, Inc.
Verizon New York, Inc.
Verizon North Inc.
Verizon Northwest Inc.
Verizon Pennsylvania, Inc.
VERIZON SOUTH INC.
Verizon Virginia, Inc.
Verizon Washington DC, Inc.
Verizon Wireless (VAW) LLC - Northern NJ
Verizon Wireless (VAW) LLC (NY)
Verizon Wireless (VAW) LLC-Pennsylvania
VTel Wireless, Inc.
Vyvx, LLC
Wallingford Police Department
Walpole, Town of
Wayne County - DHS-EM
Wayne, Township of
Webline Holdings LLC
Westar Satellite Services LP
Westchester, County of
Westwood, Town of
Winged Vision Inc
Wireless Internetwork LLC
Wisconsin Bell Telephone Company
WNET
Wolfe Air Aviation
World Class Wireless, LLC
WPIX, LLC
WXTV License Partnership, G.P.
xWave Engineering LLC

4. EARTH STATION COORDINATION DATA

This section presents the data pertinent to frequency coordination of the proposed earth station that was circulated to all carriers within its coordination contours.

COMSEARCH

Earth Station Data Sheet

19700 Janelia Farm Boulevard, Ashburn, VA 20147
(703)726-5500 http://www.comsearch.com

Date:	07/23/2018
Job Number:	180723COMSGE05

Administrative Information	
Status	ENGINEER PROPOSAL
Call Sign	E990402
Licensee Code	SWSITE
Licensee Name	Globecomm License Sub LLC

Site Information	**HAUPPAUGE, NY**
Venue Name	AOT 10
Latitude (NAD 83)	40° 48' 54.1" N
Longitude (NAD 83)	73° 14' 17.8" W
Climate Zone	A
Rain Zone	2
Ground Elevation (AMSL)	33.5 m / 109.9 ft

Link Information	
Satellite Type	Geostationary
Mode	TR - Transmit-Receive
Modulation	Digital
Satellite Arc	65° W to 65° West Longitude
Azimuth Range	167.5° to 167.5°
Corresponding Elevation Angles	42.1° / 42.1°
Antenna Centerline (AGL)	5.49 m / 18.0 ft

Antenna Information		**Receive - FCC32**		**Transmit - FCC32**
Manufacturer		Vertex		Vertex
Model		9.3 KPK		9.3 KPK
Gain / Diameter		59.3 dBi / 9.3 m		60.8 dBi / 9.3 m
3-dB / 15-dB Beamwidth		0.20° / 0.40°		0.16° / 0.32°
Max Available RF Power	(dBW/4 kHz)			-15.3
	(dBW/MHz)			8.7
Maximum EIRP	(dBW/4 kHz)			45.5
	(dBW/MHz)			69.5
Interference Objectives:	Long Term	-156.0 dBW/MHz	20%	-154.0 dBW/4 kHz 20%
	Short Term	-146.0 dBW/MHz	0.01%	-131.0 dBW/4 kHz 0.0025%

Frequency Information	**Receive 12.0 GHz**	**Transmit 13.0 GHz**
Emission / Frequency Range (MHz)	36M0G7W / 10701.0 – 10944.5	36M0G7W / 12751 – 12994.5
Max Great Circle Coordination Distance	233.3 km / 145.0 mi	123.5 km / 76.7 mi
Precipitation Scatter Contour Radius	100.0 km / 62.1 mi	100.0 km / 62.1 mi

COMSEARCH

Earth Station Data Sheet

19700 Janelia Farm Boulevard, Ashburn, VA 20147
(703)726-5500 http://www.comsearch.com

Coordination Values	**HAUPPAUGE, NY**			
Licensee Name	Globecomm License Sub LLC			
Latitude (NAD 83)	40° 48' 54.1" N			
Longitude (NAD 83)	73° 14' 17.8" W			
Ground Elevation (AMSL)	33.5 m / 109.9 ft			
Antenna Centerline (AGL)	5.49 m / 18.0 ft			
Antenna Model	Vertex 9.3 meter			
Antenna Mode	Receive 12.0 GHz		Transmit 14.0 GHz	
Interference Objectives: Long Term	-156.0 dBW/MHz	20%	-154.0 dBW/4 kHz	20%
Short Term	-146.0 dBW/MHz	0.01%	-131.0 dBW/4 kHz	0.0025%
Max Available RF Power		-15.3 (dBW/4 kHz)		

			Receive 12.0 GHz		Transmit 14.0 GHz	
Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Horizon Gain (dBi)	Coordination Distance (km)	Horizon Gain (dBi)	Coordination Distance (km)
0	0.00	136.46	-10.00	227.19	-10.00	119.95
5	0.00	135.08	-10.00	227.19	-10.00	119.95
10	0.00	133.31	-10.00	227.19	-10.00	119.95
15	0.00	131.20	-10.00	227.19	-10.00	119.95
20	0.00	128.78	-10.00	227.19	-10.00	119.95
25	0.00	126.10	-10.00	227.19	-10.00	119.95
30	0.00	123.20	-10.00	227.19	-10.00	119.95
35	0.00	120.11	-10.00	227.19	-10.00	119.95
40	0.00	116.88	-10.00	227.19	-10.00	119.95
45	0.00	113.52	-10.00	227.19	-10.00	119.95
50	0.00	110.06	-10.00	227.19	-10.00	119.95
55	0.00	106.52	-10.00	227.19	-10.00	119.95
60	0.00	102.91	-10.00	227.19	-10.00	119.95
65	0.00	99.26	-10.00	227.19	-10.00	119.95
70	0.00	95.57	-10.00	227.19	-10.00	119.95
75	0.00	91.87	-10.00	227.19	-10.00	119.95
80	0.00	88.15	-10.00	227.19	-10.00	119.95
85	0.26	84.43	-10.00	221.80	-10.00	115.60
90	0.35	80.71	-10.00	212.63	-10.00	107.92
95	0.45	77.02	-10.00	204.84	-10.00	101.07
100	0.23	73.44	-10.00	223.81	-10.00	117.23
105	0.00	69.96	-10.00	227.19	-10.00	119.95
110	0.00	66.50	-10.00	227.19	-10.00	119.95
115	0.00	63.14	-10.00	227.19	-10.00	119.95
120	0.63	59.58	-10.00	196.60	-10.00	100.00
125	0.64	56.44	-10.00	195.82	-10.00	100.00
130	0.32	53.71	-10.00	215.87	-10.00	110.67
135	0.41	50.94	-10.00	207.93	-10.00	103.83
140	0.25	48.62	-10.00	222.08	-10.00	115.83
145	0.00	46.70	-9.73	228.36	-9.73	120.63
150	0.00	44.92	-9.31	230.20	-9.31	121.69
155	0.00	43.55	-8.97	231.71	-8.97	122.54
160	0.00	42.60	-8.74	232.78	-8.74	123.15
165	0.00	42.12	-8.61	233.33	-8.61	123.46
170	0.00	42.12	-8.61	233.34	-8.61	123.46
175	0.43	42.17	-8.63	211.37	-8.63	105.39
180	0.62	42.95	-8.82	201.51	-8.82	100.00
185	0.78	44.21	-9.14	192.26	-9.14	100.00

COMSEARCH

Earth Station Data Sheet

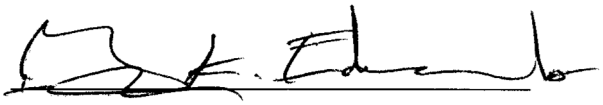
19700 Janelia Farm Boulevard, Ashburn, VA 20147
(703)726-5500 http://www.comsearch.com

Coordination Values	**HAUPPAUGE, NY**			
Licensee Name	Globecomm License Sub LLC			
Latitude (NAD 83)	40° 48' 54.1" N			
Longitude (NAD 83)	73° 14' 17.8" W			
Ground Elevation (AMSL)	33.5 m / 109.9 ft			
Antenna Centerline (AGL)	5.49 m / 18.0 ft			
Antenna Model	Vertex 9.3 meter			
Antenna Mode	Receive 12.0 GHz		Transmit 14.0 GHz	
Interference Objectives: Long Term	-156.0 dBW/MHz	20%	-154.0 dBW/4 kHz	20%
Short Term	-146.0 dBW/MHz	0.01%	-131.0 dBW/4 kHz	0.0025%
Max Available RF Power		-15.3 (dBW/4 kHz)		

			Receive 12.0 GHz		Transmit 14.0 GHz	
Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Horizon Gain (dBi)	Coordination Distance (km)	Horizon Gain (dBi)	Coordination Distance (km)
190	0.94	45.89	-9.54	182.72	-9.54	100.00
195	1.04	47.98	-10.00	175.75	-10.00	100.00
200	0.86	50.60	-10.00	184.55	-10.00	100.00
205	0.69	53.45	-10.00	193.25	-10.00	100.00
210	1.08	56.17	-10.00	174.69	-10.00	100.00
215	1.43	59.15	-10.00	160.44	-10.00	100.00
220	0.93	62.70	-10.00	180.71	-10.00	100.00
225	0.70	66.21	-10.00	193.05	-10.00	100.00
230	0.69	69.72	-10.00	193.57	-10.00	100.00
235	0.79	73.27	-10.00	188.30	-10.00	100.00
240	0.89	76.91	-10.00	182.82	-10.00	100.00
245	0.90	80.61	-10.00	182.60	-10.00	100.00
250	0.90	84.35	-10.00	182.74	-10.00	100.00
255	1.01	88.11	-10.00	176.79	-10.00	100.00
260	0.89	91.87	-10.00	183.32	-10.00	100.00
265	0.89	95.63	-10.00	183.28	-10.00	100.00
270	0.67	99.34	-10.00	194.51	-10.00	100.00
275	0.71	103.04	-10.00	192.20	-10.00	100.00
280	0.83	106.72	-10.00	186.47	-10.00	100.00
285	0.62	110.24	-10.00	196.94	-10.00	100.00
290	0.39	113.65	-10.00	209.94	-10.00	105.58
295	0.21	116.96	-10.00	226.07	-10.00	119.06
300	0.00	120.10	-10.00	227.19	-10.00	119.95
305	0.00	123.18	-10.00	227.19	-10.00	119.95
310	0.00	126.08	-10.00	227.19	-10.00	119.95
315	0.00	128.76	-10.00	227.19	-10.00	119.95
320	0.00	131.18	-10.00	227.19	-10.00	119.95
325	0.00	133.30	-10.00	227.19	-10.00	119.95
330	0.00	135.08	-10.00	227.19	-10.00	119.95
335	0.00	136.45	-10.00	227.19	-10.00	119.95
340	0.00	137.40	-10.00	227.19	-10.00	119.95
345	0.00	137.88	-10.00	227.19	-10.00	119.95
350	0.00	137.88	-10.00	227.19	-10.00	119.95
355	0.00	137.40	-10.00	227.19	-10.00	119.95

5. CERTIFICATION

I HEREBY CERTIFY THAT I AM THE TECHNICALLY QUALIFIED PERSON RESPONSIBLE FOR THE PREPARATION OF THE FREQUENCY COORDINATION DATA CONTAINED IN THIS APPLICATION, THAT I AM FAMILIAR WITH PARTS 101 AND 25 OF THE FCC RULES AND REGULATIONS, THAT I HAVE EITHER PREPARED OR REVIEWED THE FREQUENCY COORDINATION DATA SUBMITTED WITH THIS APPLICATION, AND THAT IT IS COMPLETE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF.

BY: _  _____

Gary K. Edwards
Senior Manager
COMSEARCH
19700 Janelia Farm Boulevard
Ashburn, VA 20147

DATED: September 11, 2018

ATTACHMENT D
FCC Letter to ANATEL

FEDERAL COMMUNICATIONS COMMISSION
INTERNATIONAL BUREAU
WASHINGTON, D.C. 20554

fax: +1 202 418 1208; TWX: 710 822 0160

In reply,refer to:
800C2/SEB16174

Telefax message:

To: Agência Nacional de Telecomunicações - ANATEL
Assessoria Internacional
SAUS-Quadra 6 - Bloco H - 4th Floor
70070-940 BRASILIA, DF
Brazil
TELEFAX NO.: 011 + 55 61 23122244 C

CC: ITU Radiocommunication Bureau
Geneva, Switzerland
Telefax no.: 41 22 730 5785

Date: 27 April 2016

Subject: Agreement under §6.6 of Article 6 of Appendix 30B

References: 1) Special Section AP30B/A6A/333, BRIFIC 2744 dated 22.07.2014, concerning the B-SAT-3R-1 satellite network.
2) Our letter 800C2/SEB14393, dated 30.10.2014
3) Your letter CT. n°163/ORER-Anatel dated 25.09.2015

The US administration thanks the administration of Brazil for its request for agreement regarding the operation of the B-SAT-3R-1 satellite network in the 6725-7025 MHz (Earth to space) and 4500-4800 MHz (space to Earth), 10.70-10.95 GHz (space to Earth), 11.20-11.45 GHz (space to Earth) and 12.75-13.25 GHz (Earth to space) planned bands of APP30B. The US administration is pleased to provide its agreement under the provision §6.6 of Appendix 30B for inclusion of its territory in the service area of the B-SAT-3R-1 satellite network. However, this agreement does not guarantee market access to the US. Any earth station located within US territory seeking to communicate with the B-SAT-3R-1 satellite network must first be licensed in accordance with US laws and regulations. Any operation of the satellites would be in accordance with international Radio Regulations and relevant provisions. Any such license application may or may not be granted.

REGARDS
FEDCOMCOM
SATELLITE DIVISION
Direct Fax No.: +1 202 418 1208 (preferred)
or +1 202 418 0398 (alternative)
Email: IBmail@fcc.gov

Authorized: J. Payton
International Bureau/SD

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