TECHNICAL APPENDIX

Intelsat License LLC
ESAA Blanket License Modification Application

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I. Technical Description

A. Overview

The Intelsat License LLC ("Intelsat") earth station aboard aircraft ("ESAA") and Vehicle-Mounted Earth Stations ("VMES") network (the "Intelsat Nework") is comprised of: (i) terminals mounted on private, commercial, and government aircraft and stationary and in-motion vehicles; (ii) a fleet of commercial Ku-band traditional and HTS satellites that are part of the IntelsatOne® Flex network; and (iii) Intelsat-owned or leased teleport antennas which provide uplink and downlink connectivity to iDirect hubs. Intelsat has fully described the Intelsat Network in prior submissions and hereby incorporates by reference the technical showing regarding the control functionality and other operational characteristics previously submitted.[1]

In this modification application, Intelsat seeks to add two new terminal types – the SkyTech Model BB30Ku ("BB30") and the SkyTech Model BB45Ku ("BB45") to its Blanket License for ESAA and VMES operations with previously authorized satellite points of communication (including any U.S.-licensed or non-U.S. licensed satellite on the Commission's Permitted Space Station List), as well as several new individual satellite points of communication for ESAA operations outside the United States at power levels higher than those allowed for communications with Permitted List satellites. Below, Intelsat provides additional information for its proposed operations, which satisfies the Commission's requirements for both VMES and ESAA operations.

B. Technical Parameters

The BB30 and BB45 terminals are stabilized antenna systems that provide high-quality broadband satellite communications for aeronautical and ground-based satellite mobility applications. They are designed to operate in Ku-band frequencies to provide mission-critical delivery of voice, video, and data communications. Both terminals will operate consistent with the Commission's ESAA rules, 47 C.F.R. §25.227, and VMES rules, 47 C.F.R. §25.226, as well as other applicable Commission rules and policies.

The terminal power levels proposed herein are fully consistent with the Commission's two-degree spacing rules, where applicable, *see, e.g.*, §25.227(a)(1); or with higher coordinated levels of the serving satellite, *see* Technical Appendix at III (Satellite Operator Certification Letter). The FCC has previously reviewed the characteristics and granted ESAA blanket license authority for the BB45 terminal to operate on a long-term commercial basis.[2] In addition, the

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[1] *See* Intelsat License LLC, File Nos. SES-LIC-20170626-00682 and SES-MOD-20180220-00148 Call Sign E170121, Technical Descriptions (the "Blanket License").

[2] *See* UltiSat, Inc., File No. SES-LIC-20180726-02089, Call Sign E181298 (Nov. 21. 2018).

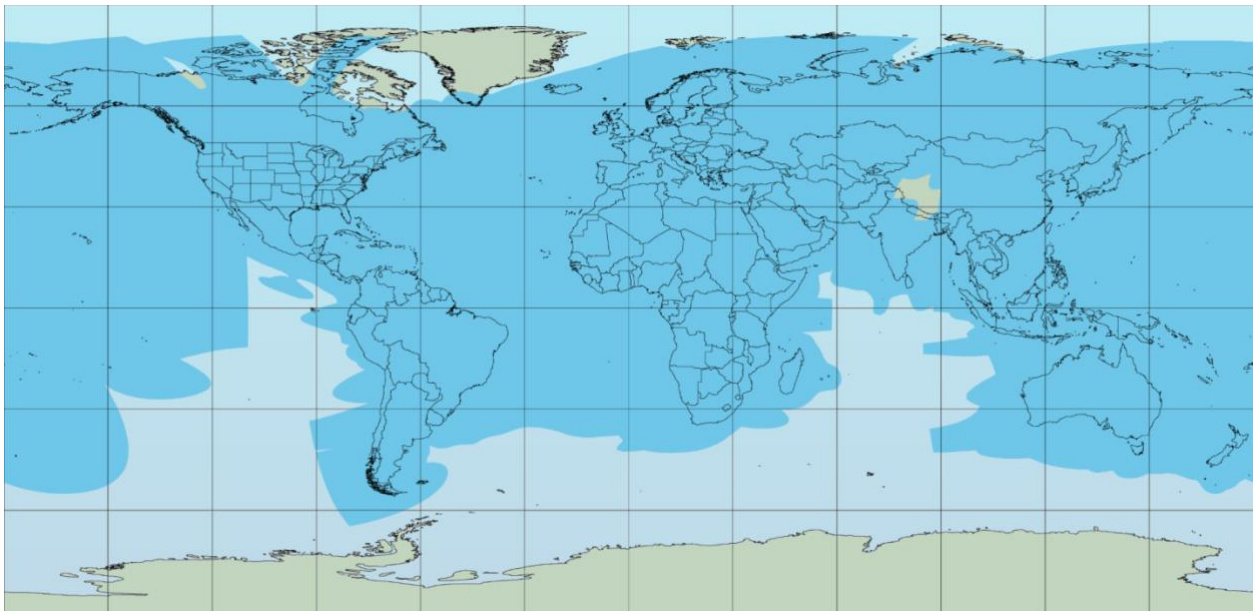
FCC has granted both the BB30 and BB45 special temporary authority to operate on an a commercial and experimental basis.[3] In addition to the operational information submitted herein, Intelsat hereby incorporates by reference the basic technical information regarding the BB30 and BB45 terminals submitted in these prior FCC licensing proceedings.

Intelsat understands that there have been no interference events associated with the authorized operations of the BB30 and BB45 terminals. Thus, in view of this operating history and the information demonstrating compliance with the FCC's VMES and ESAA rules, 47 C.F.R. §§25.226 and 25.227, the FCC can be assured that the operations proposed herein will be fully consistent with applicable rules and policies.

[3] *See* UltiSat, Inc., File Nos. SES-STA-20180621-01477 and SES-STA-20180724-01969; *see also* UltiSat, Inc., File No. 0201-EX-ST-2018; UltiSat, Inc., File No. 1930-EX-ST-2018.

II. Coverage Map

The geographic coverage of the Intelsat ESAA operations is depicted below.



Intelsat will conduct VMES operations only within the United States.

III. Satellite Operator Certification Letter

December 18, 2018

Federal Communications Commission
International Bureau
445 12th Street, SW
Washington, D.C. 20554

Re: Satellite Operator Certification

To Whom It May Concern:

This letter supports Intelsat License LLC's ("Intelsat") application for an earth stations aboard aircraft ("ESAA")/vehicle mounted earth stations ("VMES") blanket license modification from the Federal Communications Commission ("FCC"). Among other things, the application requests authority to operate associated ESAA terminals (including the currently authorized Rantec, TECOM, HR129, and HR 6400 terminals, as well as the new BB30 andBB45 terminals) outside the United States at power levels in excess of FCC two-degree spacing levels.

The ESAA and VMES terminals will be operated with a total of 20 satellites under the blanket license, as specified below in Table 1.

Table 1: List of Satellites

Satellite	Orbital location
IS-29e	310°EL
IS-19	166°EL
IS-34	304.5°EL
IS-14	315°EL
IS-21	302°EL
H-3e	169°EL
IS-33e	60°EL
IS-17	66°EL
IS-22	72.1°EL
IS-37e	342°EL
IS-18	180°EL
IS-20	68.5°EL
G-16	261°EL
G-18	237°EL
IS-905	335.5°EL
IS-23	53°EL
IS-35e	34.5°WL
H-1	127°WL
G-19	97°WL
Sky-B1	43.15°WL

Intelsat confirms and hereby certifies that the power density levels of the proposed operations are consistent with existing satellite coordination agreements between Intelsat and the operators of satellites within +/- 6 degrees of the above-listed satellites' orbit locations, and that the proposed operation of the aircraft-mounted satellite earth station terminals have the potential to create and receive harmful interference from adjacent satellite networks that may be unacceptable.

If the FCC authorizes the operations as proposed, Intelsat will include the power density levels in all future satellite network coordination agreements with operators of future satellites that are adjacent (within +/- 6 degrees) to the satellites addressed by this statement.

Sincerely,

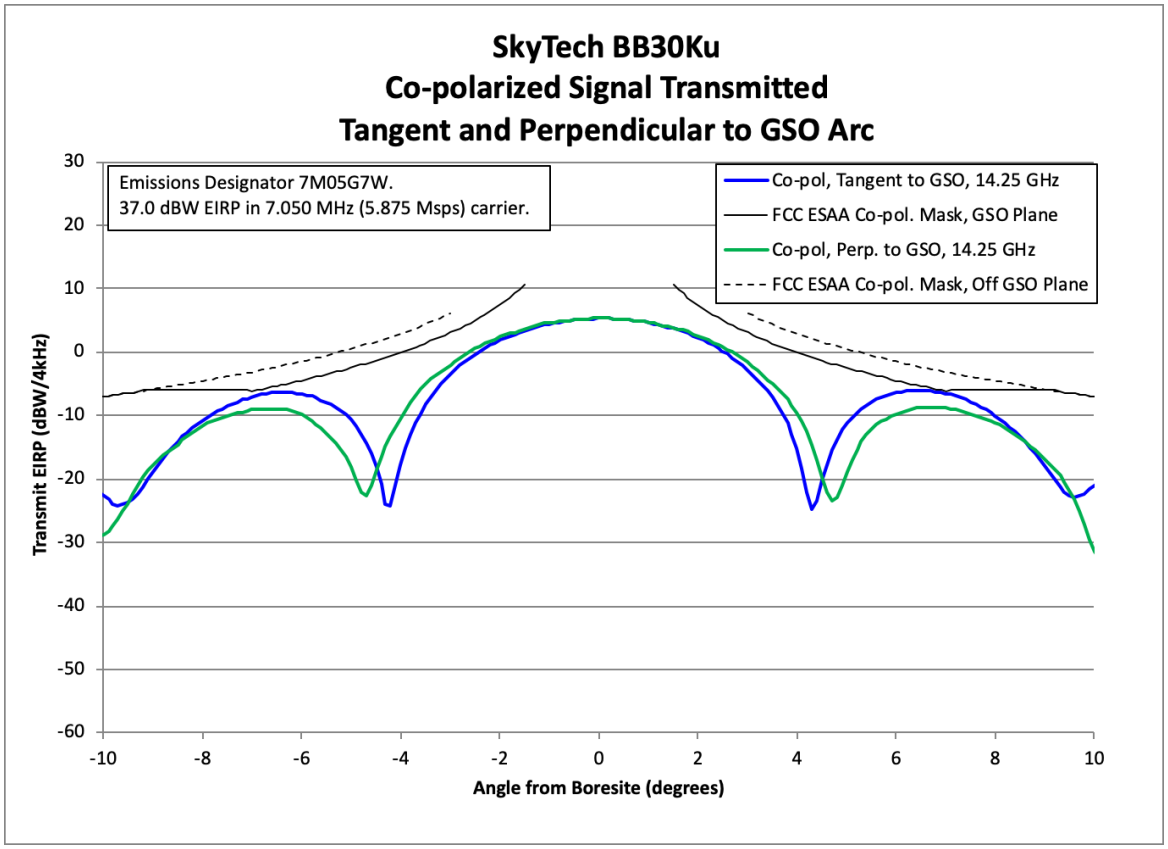
/s/ *Cynthia Grady*
Senior Counsel

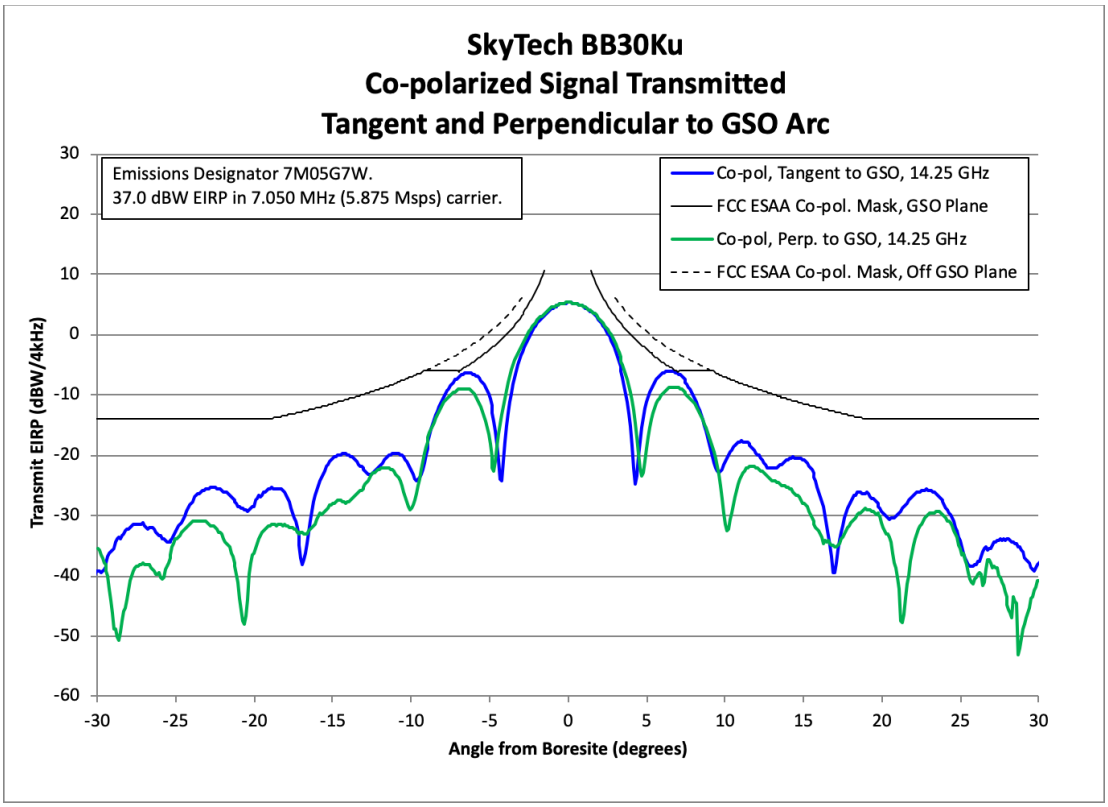
IV. Off-Axis EIRP Spectral Density

For BB30 and BB45 ESAA operations, Intelsat is applying for authority under Sections 25.227(a)(1) and 25.227(a)(2) of the rules, 47 C.F.R. §§25.227(a)(1) and 25.227(a)(2). While the terminals can operate in compliance with the Commission's two-degree spacing mask, they will operate at higher, coordinated power levels with certain satellites. Intelsat has certified these levels are consistent with its coordination agreements with other satellite operators with +/-6° of its serving satellites as contemplated in Section 25.227(b)(2) of the rules, 47 C.F.R. § 25.227(b)(2). For BB30 and BB45 VMES operations, Intelsat is applying for authority only under Section 25.226(a)(1) rules, 47 C.F.R. §§ 25.226(a)(1), because VMES operations will be conducted only in a two-degree spacing envirоinment the United States.

Intelsat will control off-axis ESD emissions from the BB30 and BB45 terminals through limitations on the transmit power spectral density and control of pointing error. Below, Intelsat provides the off-axis ESD plots demonstrating compliance with the FCC's two-degree spacing mask as contemplated by Section 25.115(g)(1) of the Commission's rules, 47 C.F.R. § 25.115(g)(1). The plots show that BB30 and BB45 terminaloff-axis ESD levels remain below permitted limits in all cases.

A. BB30 Off-Axis EIRP Spectral Density Plots




SkyTech BB30Ku
Co-polarized Signal Transmitted
Tangent and Perpendicular to GSO Arc
Emissions Designator 7M05G7W.
37.0 dBW EIRP in 7.050 MHz (5.875 Msps) carrier.
Co-pol, Tangent to GSO, 14.25 GHz
FCC ESAA Co-pol. Mask, GSO Plane
Co-pol, Perp. to GSO, 14.25 GHz
FCC ESAA Co-pol. Mask, Off GSO Plane
Transmit EIRP (dBW/4kHz)
30
20
10
0
-10
-20
-30
-40
-50
-60
-30
-25
-20
-15
-10
-5
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5
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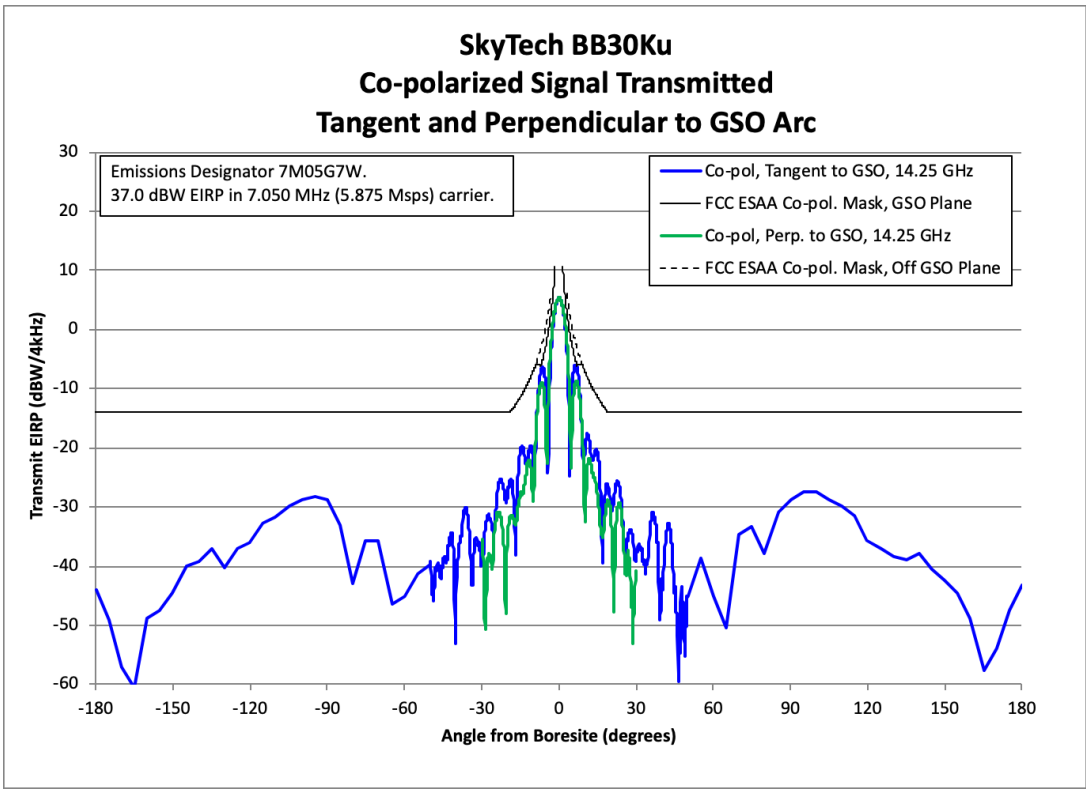
15
20
25
30
Angle from Boresite (degrees)


SkyTech BB30Ku
Co-polarized Signal Transmitted
Tangent and Perpendicular to GSO Arc
Emissions Designator 7M05G7W.
37.0 dBW EIRP in 7.050 MHz (5.875 Msps) carrier.
Co-pol, Tangent to GSO, 14.25 GHz
FCC ESAA Co-pol. Mask, GSO Plane
Co-pol, Perp. to GSO, 14.25 GHz
FCC ESAA Co-pol. Mask, Off GSO Plane
Transmit EIRP (dBW/4kHz)
30
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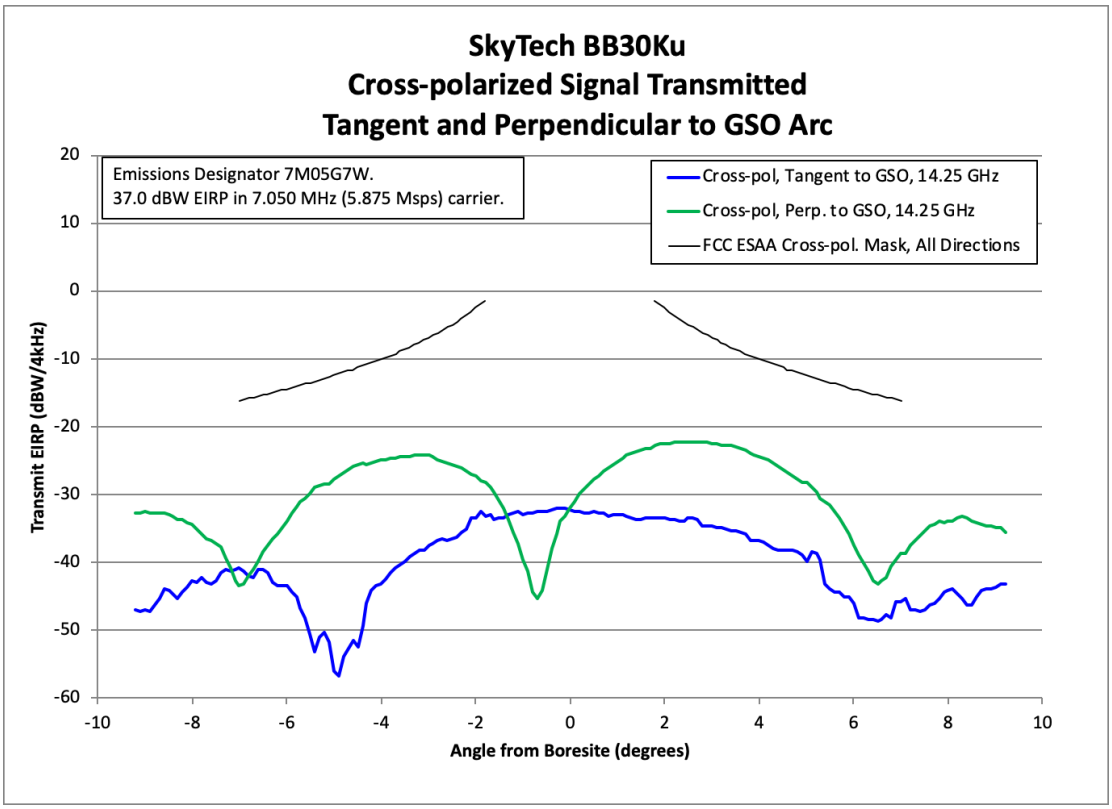
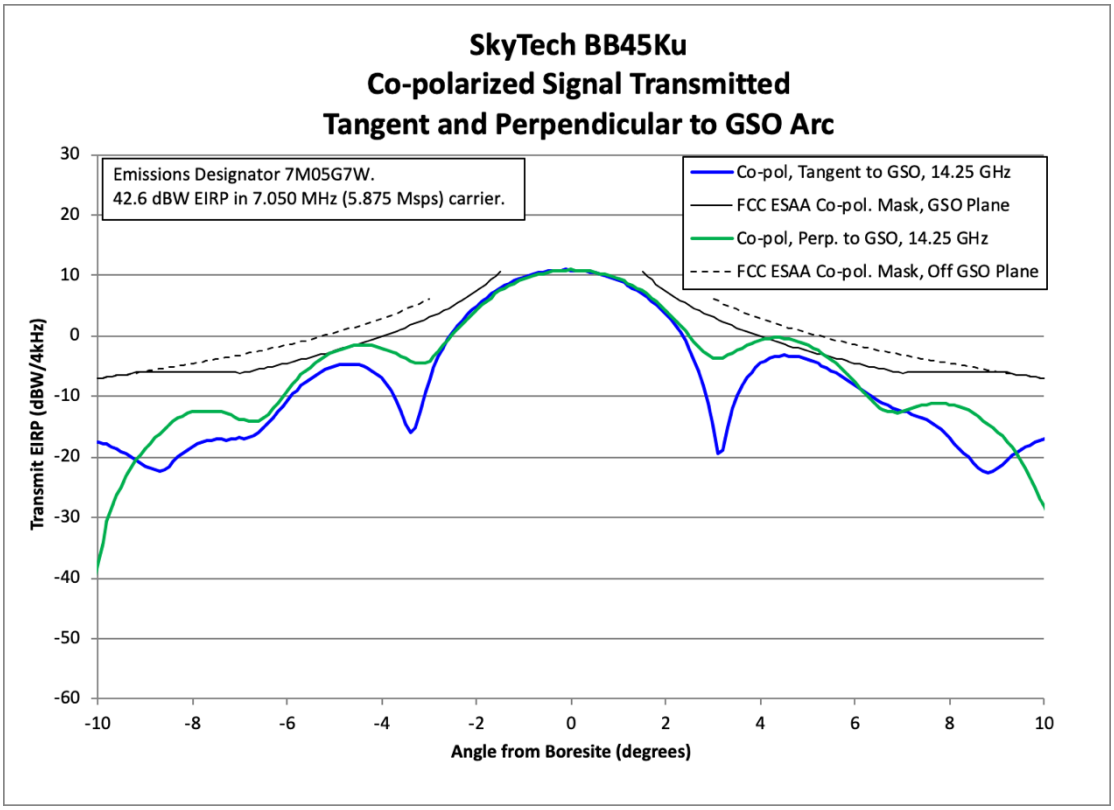
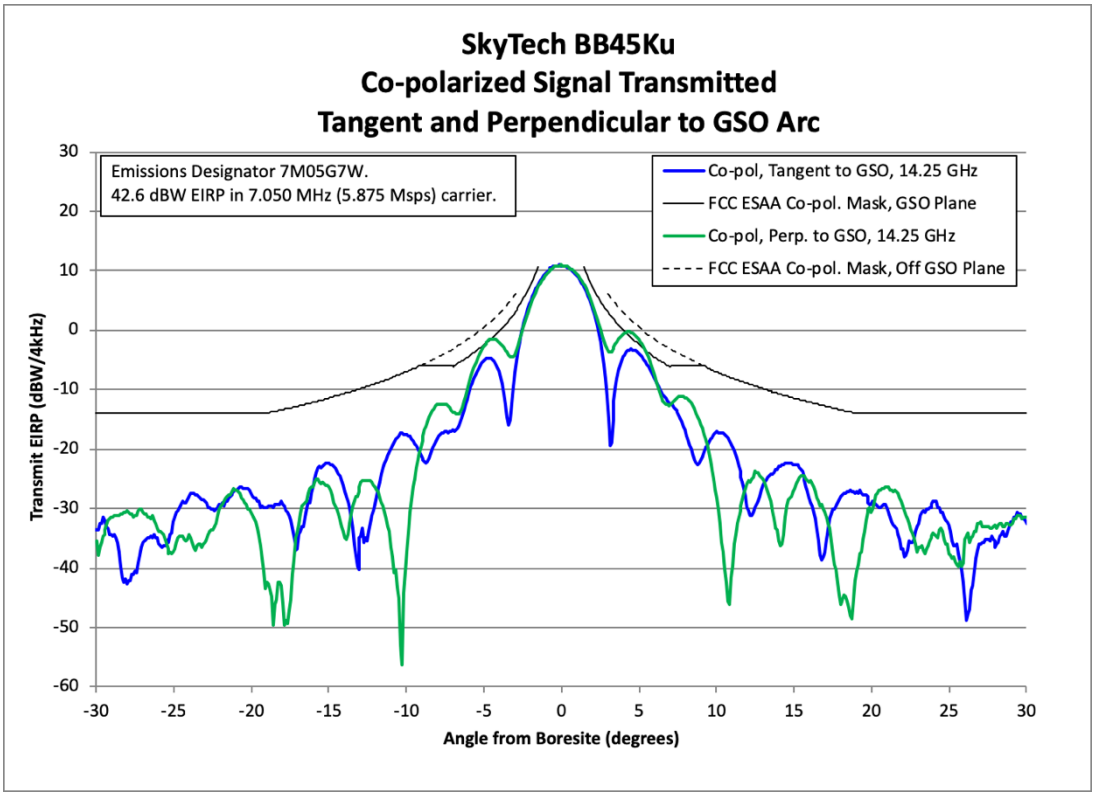
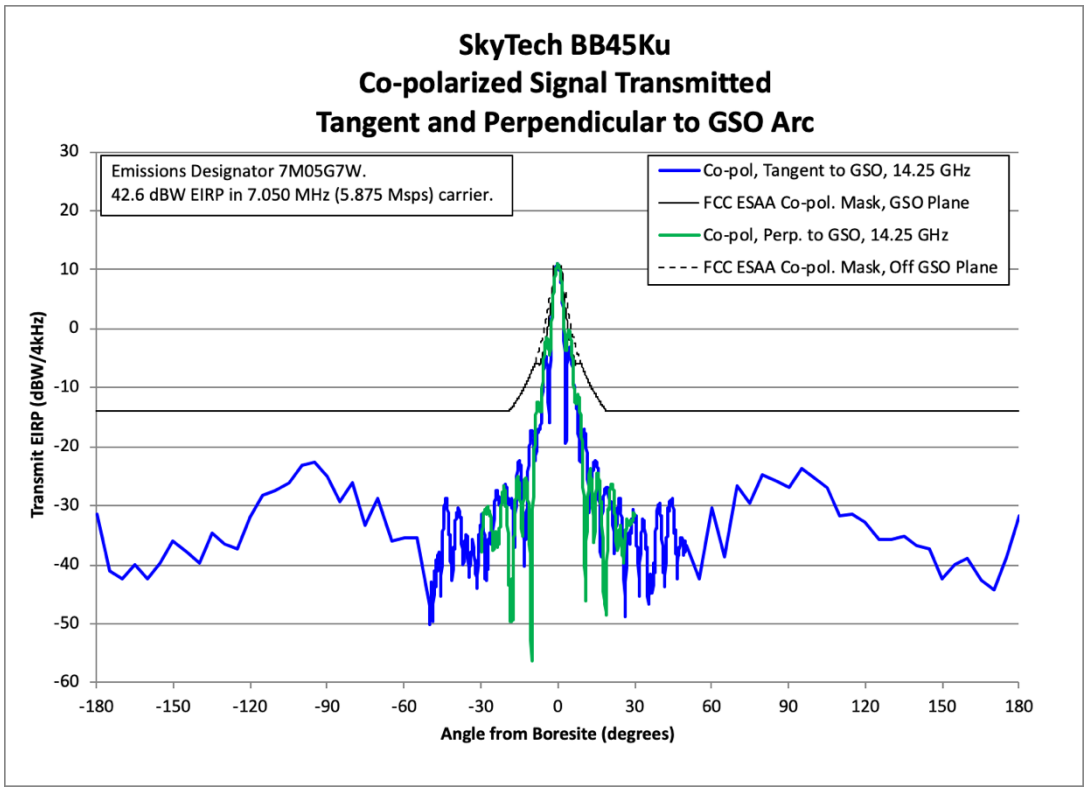
-10
-20
-30
-40
-50
-60
-180
-150
-120
-90
-60
-30
0
30
60
90
120
150
180
Angle from Boresite (degrees)

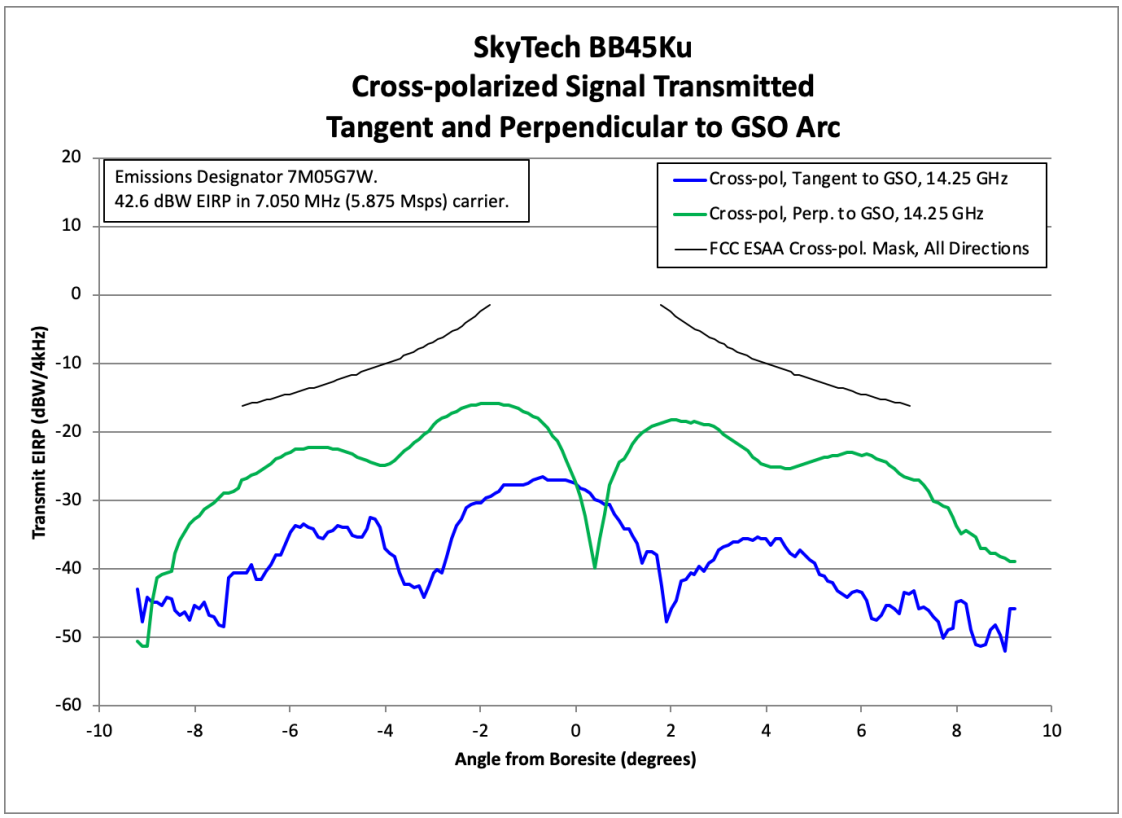


B. BB45 Off-Axis EIRP Spectral Density Plots




SkyTech BB45Ku
Co-polarized Signal Transmitted
Tangent and Perpendicular to GSO Arc
Emissions Designator 7M05G7W.
42.6 dBW EIRP in 7.050 MHz (5.875 Msps) carrier.
Co-pol, Tangent to GSO, 14.25 GHz
FCC ESAA Co-pol. Mask, GSO Plane
Co-pol, Perp. to GSO, 14.25 GHz
FCC ESAA Co-pol. Mask, Off GSO Plane
Transmit EIRP (dBW/4kHz)
30
20
10
0
-10
-20
-30
-40
-50
-60
-30
-25
-20
-15
-10
-5
0
5
10
15
20
25
30
Angle from Boresite (degrees)


SkyTech BB45Ku
Co-polarized Signal Transmitted
Tangent and Perpendicular to GSO Arc
Emissions Designator 7M05G7W.
42.6 dBW EIRP in 7.050 MHz (5.875 Msps) carrier.
Co-pol, Tangent to GSO, 14.25 GHz
FCC ESAA Co-pol. Mask, GSO Plane
Co-pol, Perp. to GSO, 14.25 GHz
FCC ESAA Co-pol. Mask, Off GSO Plane
Transmit EIRP (dBW/4kHz)
30
20
10
0
-10
-20
-30
-40
-50
-60
-180
-150
-120
-90
-60
-30
0
30
60
90
120
150
180
Angle from Boresite (degrees)


SkyTech BB45Ku
Cross-polarized Signal Transmitted
Tangent and Perpendicular to GSO Arc
Emissions Designator 7M05G7W.
42.6 dBW EIRP in 7.050 MHz (5.875 Msps) carrier.
Cross-pol, Tangent to GSO, 14.25 GHz
Cross-pol, Perp. to GSO, 14.25 GHz
FCC ESAA Cross-pol. Mask, All Directions
Transmit EIRP (dBW/4kHz)
20
10
0
-10
-20
-30
-40
-50
-60
-10
-8
-6
-4
-2
0
2
4
6
8
10
Angle from Boresite (degrees)

V. Radiation Hazard Analyses

Radiation Hazard Analysis for SkyTech BB30Ku Parabolic Reflector

This report analyzes the non-ionizing radiation levels for the SkyTech BB30Ku Parabolic Reflector. This report is developed in accordance with the prediction methods contained in OET Bulletin No. 65, Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields, Edition 97-01.

Bulletin No. 65 specifies that there are two separate tiers of exposure limits that are dependent on the situation in which the exposure takes place and/or the status of the individuals who are subject to the exposure -- the General Population/ Uncontrolled Environment and the Controlled Environment, where the general population does not have access.

The maximum level of non-ionizing radiation to which individuals may be exposed is limited to a power density level of 5 milliwatts per square centimeter (5 mW/cm2) averaged over any 6-minute period in a controlled environment, and the maximum level of non-ionizing radiation to which the general public is exposed is limited to a power density level of 1 milliwatt per square centimeter (1 mW/cm2) averaged over any 30 minute period in a uncontrolled environment.

In the normal range of transmit powers for satellite antennas, the power densities at or around the antenna radiating surface is expected to exceed safe levels. This area will not be accessible to the general public. Operators and technicians will receive training specifying this area as a high exposure area. Procedures will be established to ensure that all transmitters are turned off before this area may be accessed by operators, maintenance or other authorized personnel.

Near Field and Transition Region Exposure

Near and far field boundaries are calculated using OET Bulletin No. 65 formulas and the BB30Ku's effective diameter. The effective diameter is calculated based upon a measured efficiency value of 68%.

The BB30Ku Antenna potentially exceeds MPE limits in the near field within the rectangular volume directly in front of the panels (108.48 mW/cm2). For this calculation, it was assumed that all 28.2 watts from the SSPA are uniformly distributed across the surface area of the panel. 28.2 W are required at the aperture flange to achieve the maximum EIRP capability, 46.0 dBW, of the BB30KU.

The BB30KU Antenna potentially exceeds MPE limits at the near field boundary of 1.09m with a power density value 108.48 mW/cm2. The BB30KU Antenna potentially exceeds MPE limits at the far field boundary of 2.61m with a power density value 46.5 mW/cm2.

In normal operation, this antenna is mounted on the top of an aircraft fuselage with the main beam pointed toward the sky at a typical elevation angle of 25 degrees such that human exposure in the near field is not possible.

Additionally, in normal operation, any blockage in the near field (human or otherwise) will cause the transmitter to be disabled within milliseconds seconds as the system does not transmit unless it can receive the downlink carrier from the satellite. Therefore, prolonged exposure in the near field is not possible in normal operation.

Far Field Exposure

At a distance of 7.96 meters, the maximum power density of the BB30KU is 5 mW/cm2. At a distance of 17.8m, the maximum power density is 1.0 mW/cm2, which is within the limits of General Population/Uncontrolled Exposure (MPE) even in the direction of the main beam of the antenna. As noted previously, the antenna will be mounted on the top of an aircraft with the main beam pointed to the sky at a minimum elevation angle of 25 degrees. In this case, maximum far field exposure to humans would be due to a sidelobe which is at least 7 dB below the main beam. At a distance of 17.8 meters, the exposure to humans would be less than 1.0 mW/cm^2.

Table 1: Parameters Used for Determining PFD (SkyTech BB30Ku)

Antenna Width	11.81 in 0.3 m
Antenna Height	11.81 in 0.3 m
Antenna Surface Area	0.0707 m^2
Frequency	14500 MHz
Wavelength	0.02068 m
Transmit Power (at aperture flange)	28.2 W
Antenna Aperture Gain	31.5 dBi
Aperture Efficiency	68%
EIRP (maximum)	46.0 dBW
Power Density at Aperture Surface	159.6 mW/cm^2
Near Field Distance	1.09 m
Near Field Power Density (Azimuth)	108.48 mW/cm^2
Far Field Boundary	2.61 m
Power Density at far field boundary (Azimuth)	46.5 mW/cm^2
Elevation side lobe level (worst case)	-12.1 dB
Power Density at far field boundary (Elevation)	2.87 mW/cm^2
Safe Far Field Distance (Elevation) for 5 mW/cm2	7.96m, the far field boundary Power density is below value
Safe Far Field Distance (Elevation) for 1 mW/cm2	58.4 feet 17.8 m

Conclusions

Intelsat and end users will observe standard safety precautions with respect to operations and maintenance of the BB30KU antenna, including powering the antenna off in advance of maintenance activities. Given the location of the antenna (top of aircraft or vehicle), automatic muting of transmissions with a blockage and other operational limitations (including on-ground, stationary operations in controlled environments only with no access by the general public),

there is no possibility that members of the general public will be located in regions where MPE values may be exceeded.

Based on the result of the analysis with regard to the potential exposure levels in all respects – directly in front of the antenna, to the side of the antenna, and at ground level – and taking into account the access restrictions for both trained and untrained persons and standard safety procedures, the operation of the SkyTech BB30Ku parabolic antenna satisfies the MPE compliance requirements in the FCC regulations.

Radiation Hazard Analysis for SkyTech BB45Ku Parabolic Reflector

This report analyzes the non-ionizing radiation levels for the SkyTech BB45Ku Parabolic Reflector. This report is developed in accordance with the prediction methods contained in OET Bulletin No. 65, Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields, Edition 97-01.

Bulletin No. 65 specifies that there are two separate tiers of exposure limits that are dependent on the situation in which the exposure takes place and/or the status of the individuals who are subject to the exposure -- the General Population/ Uncontrolled Environment and the Controlled Environment, where the general population does not have access.

The maximum level of non-ionizing radiation to which individuals may be exposed is limited to a power density level of 5 milliwatts per square centimeter (5 mW/cm2) averaged over any 6-minute period in a controlled environment, and the maximum level of non-ionizing radiation to which the general public is exposed is limited to a power density level of 1 milliwatt per square centimeter (1 mW/cm2) averaged over any 30 minute period in a uncontrolled environment.

In the normal range of transmit powers for satellite antennas, the power densities at or around the antenna radiating surface is expected to exceed safe levels. This area will not be accessible to the general public. Operators and technicians will receive training specifying this area as a high exposure area. Procedures will be established to ensure that all transmitters are turned off before this area may be accessed by operators, maintenance or other authorized personnel.

Near Field and Transition Region Exposure

Near and far field boundaries are calculated using OET Bulletin No. 65 formulas and the BB45Ku's effective diameter. The effective diameter is calculated based upon a measured efficiency value of 65%.

The BB45Ku Antenna potentially exceeds MPE limits in the near field within the rectangular volume directly in front of the panels (42.24 mW/cm2). For this calculation, it was assumed that all 26.0 watts from the SSPA are uniformly distributed across the surface area of the panel. 26.0 W are required at the aperture flange to achieve the maximum EIRP capability, 48.9 dBW, of the BB45KU.

The BB45KU Antenna potentially exceeds MPE limits at the near field boundary of 2.45m with a power density value 42.24 mW/cm2. The BB45KU Antenna potentially exceeds MPE limits at the far field boundary of 5.88m with a power density value 18.1 mW/cm2.

In normal operation, this antenna is mounted on the top of an aircraft fuselage with the main beam pointed toward the sky at a typical elevation angle of 25 degrees such that human exposure in the near field is not possible.

Additionally, in normal operation, any blockage in the near field (human or otherwise) will cause the transmitter to be disabled within milliseconds seconds as the system does not transmit

unless it can receive the downlink carrier from the satellite. Therefore, prolonged exposure in the near field is not possible in normal operation.

Far Field Exposure

At a distance of 11.18 meters, the maximum power density of the BB45KU is 5 mW/cm2. At a distance of 25.0 meters, the maximum power density is 1.0 mW/cm^2, which is within the limits of General Population/Uncontrolled Exposure (MPE) even in the direction of the main beam of the antenna. As noted previously, the antenna will be mounted on the top of an aircraft with the main beam pointed to the sky at a minimum elevation angle of 25 degrees. In this case, maximum far field exposure to humans would be due to a sidelobe which is at least 7 dB below the main beam. At a distance of 25.0 meters, the exposure to humans would be less than 1.0 mW/cm^2.

Table 1: Parameters Used for Determining PFD (SkyTech BB30Ku)

Antenna Width	17.72 in 0.45 m
Antenna Height	17.72 in 0.45 m
Antenna Surface Area	0.1590 m^2
Frequency	14500 MHz
Wavelength	0.02068 m
Transmit Power (at aperture flange)	26.0 W
Antenna Aperture Gain	34.8 dBi
Aperture Efficiency	65%
EIRP (maximum)	48.9 dBW
Power Density at Aperture Surface	65.4 mW/cm^2
Near Field Distance	2.45 m
Near Field Power Density (Azimuth)	42.24 mW/cm^2
Far Field Boundary	5.88 m
Power Density at far field boundary (Azimuth)	18.1 mW/cm^2
Elevation side lobe level (worst case)	-14.6 dB
Power Density at far field boundary (Elevation)	0.63 mW/cm^2
Safe Far Field Distance (Elevation) for 5 mW/cm2	11.18m, the far field boundary Power density is below value
Safe Far Field Distance (Elevation) for 1 mW/cm2	82.0 feet 25.0 m

Conclusions

Intelsat and end users will observe standard safety precautions with respect to operations and maintenance of the BB45KU antenna, including powering the antenna off in advance of maintenance activities. Given the location of the antenna (top of aircraft or vehicle), automatic muting of transmissions with a blockage and other operational limitations (including on-ground, stationary operations in controlled environments only with no access by the general public), there is no possibility that members of the general public will be located in regions where MPE values may be exceeded.

Based on the result of the analysis with regard to the potential exposure levels in all respects – directly in front of the antenna, to the side of the antenna, and at ground level – and taking into account the access restrictions for both trained and untrained persons and standard safety procedures, the operation of the SkyTech BB45Ku parabolic antenna satisfies the MPE compliance requirements in the FCC regulations.

VI. Satellite and Gateway Tables

Intelsat Network Satellites

Satellite	FCC Call Sign	Orbital Location	Downlink Freq. (GHz)[4]	ITU Region	Service To U.S.
IS-29e	S2913	310° E	10.95-11.2; 11.45-11.7 11.7-12.2	1	Yes
IS-19	S2850	166° E	12.25-12.75	3	Yes
IS-14	S2785	45° W	11.45-11.95	1, 2	Yes
IS-21	S2863	66° E	11.45-11.7;	1, 2	Yes
IS-33e	S2939	60° E	10.95-11.2; 11.45-11.7 11.7-12.2	1, 3	No
IS-17	S2814	166° E	10.95-11.2; 11.45-11.7; 12.50-12.75	1, 3	Yes
IS-22	S2846	68.5° E	11.45-11.7; 12.25-12.75	1, 3	Yes
IS-23	S2831	53° W	11.45-11.7; 11.7-12.2	2	Yes
IS-34[5]	S2915	55.5° W	11.45-11.7	1, 2	Yes
IS-35e	S2959	34.5° W	10.95-11.2; 11.45-11.7	1, 2	Yes
IS-37e	S2972	58° W	10.95-11.2; 11.45-11.7; 11.7-11.95; 12.50-12.75	1, 2, 3	Yes
H-1	S2475	127° W	11.7-12.2	2, 3	Yes
H-3e	S2947	72.1° E	10.95-11.2; 11.45-11.7; 12.20-12.25; 12.50-12.75	2, 3	Yes
IS-18	S2817	53° W	10.95-11.20; 11.45-11.70 12.25-12.75	2, 3	Yes
IS-20	S2847	50° W	10.95-11.20; 11.45-11.70 12.50-12.75	1, 3	Yes
G-16	S2687	43.15° W	11.7-12.2	2	Yes
G-18	S2733	60° E	11.7-12.2	2	Yes

[4] ESAA operations in the 12.2-12.75 GHz band will occur on an unprotected, non-harmful interference basis outside the United States (principally in Regions 1 and 3), subject to any necessary authorizations from foreign administrations. The 12.5-12.75 GHz band is allocated for FSS downlinks in Region 1 and the 12.2-12.75 GHz band is allocated for FSS downlinks in Region 3.

[5] IS-34 uplink operations are limited to the 14.0-14.25 GHz band.

Satellite	FCC Call Sign	Orbital Location	Downlink Freq. (GHz)[4]	ITU Region	Service To U.S.
G-19	S2647	97° W	11.7-12.2	2	Yes
IS-905	S2409	335.5° E	10.95-11.20; 11.45-11.7	1, 2	Yes
Sky-B1	S2922	43.15° W	11.7-12.2	1, 2	Yes

Intelsat Network Gateway Earth Stations

Satellite	Gateway Operator	Gateway Earth Station Location	Country	FCC Call Sign
IS-23	Intelsat	Nuevo, CA	U.S.	E020191
IS-29e	Intelsat	Hagerstown, MD Hagerstown, MD Macae	U.S. U.S. Brazil	E150002 E140121 N/A
IS-19	Intelsat	Napa, CA	U.S.	E980460
IS-34	Intelsat	Hagerstown, MD	U.S.	E070139
IS-14	Intelsat	Atlanta, GA	U.S.	E090093
IS-21	Intelsat	Hagerstown, MD	U.S.	E120051
IS-33e	Intelsat	Fuchsstadt Kumsan Johannesburg	Germany Korea South Africa	N/A N/A N/A
IS-17	Intelsat	Fuchsstadt	Germany	N/A
IS-22	Intelsat	Fuchsstadt	Germany	N/A
IS-35e	Intelsat Intelsat	Hagerstown, MD Fuchsstadt	U.S. Germany	TBD N/A
IS-37e	Intelsat	Fuchsstadt	Germany	N/A
H-1	Intelsat	Atlanta, GA	U.S.	E990092
H-3e	Intelsat	Napa, CA Paumalu, HI Gunma	U.S. U.S. Japan	TBD TBD N/A
IS-18	Intelsat	Oxford Falls	Australia	N/A
IS-20	Intelsat	Fuchsstadt	Germany	N/A
G-16	Intelsat	Hagerstown, MD	U.S.	E030051
G-18	Intelsat	Atlanta, GA	U.S.	E990433
G-19	Intelsat	Hagerstown, MD	U.S.	E040141
IS-905	Intelsat	Fuchsstadt	Germany	N/A

Satellite	Gateway Operator	Gateway Earth Station Location	Country	FCC Call Sign
Sky-B1	Intelsat	Hagerstown, MD	U.S.	TBD

VII. Section 25.226 Certification

Intelsat License LLC ("Intelsat"), pursuant to Section 25.226 of the FCC's rules, hereby certifies the following:

1. In accordance with Section 25.226(b)(7), Intelsat certifies that its proposed operations comply with the following requirements of Section 25.226:

   Per Section 25.226(a)(6), for each VMES transmitter, Intelsat will keep a record of the vehicle location (i.e., latitude/longitude), transmit frequency, channel bandwidth and satellite used shall be time annotated and maintained for a period of not less than one (1) year. Records shall be recorded at time intervals no greater than every five (5) minutes while the VMES is transmitting. Intelsat will make this data available upon request to a coordinator, fixed system operator, Fixed-Satellite Service system operator, NTIA, or the Commission within 24 hours of the request.

By: /s/ *Cynthia Grady*
Cynthia Grady
Senior Counsel
Intelsat Corporation

December 13, 2018

VII. Section 25.227 Certifications

Intelsat License LLC ("Intelsat"), pursuant to Section 25.227 of the FCC's rules, hereby certifies the following:

2. In accordance with Section 25.227(a)(15), as the operator of an ESAA system operating over international waters, Intelsat has confirmed with its target space station operators that its existing and proposed operations are within coordinated parameters for adjacent satellites up to six degrees away (+/- 6°) on the geostationary arc.

3. In accordance with Section 25.227(b)(7), Intelsat certifies that its proposed operations comply with the following requirements of Section 25.227:

   - Per Section 25.227(a)(6), for each ESAA transmitter, Intelsat will time annotate and maintain a record for a period of not less than one year of the vehicle location (i.e., latitude/longitude/altitude), transmit frequency, channel bandwidth and satellite used. Records will be recorded at time intervals no greater than one (1) minute while the ESAA is transmitting. Intelsat will make this data available in the requisite format within 24 hours of a request from the Commission, NTIA, or a frequency coordinator for purposes of resolving harmful interference events.
   - Per Section 25.227(a)(9), each ESAA terminal will automatically cease transmitting within 100 milliseconds upon loss of reception of the satellite downlink signal or when it detects that unintended satellite tracking has happened or is about to happen.
   - Per Section 25.227(a)(10), each ESAA terminal will be subject to the monitoring and control by an NCMC or equivalent facility. Each terminal will be able to receive "enable transmission" and "disable transmission" commands from the NCMC and must automatically cease transmissions immediately on receiving any "parameter change command", which may cause harmful interference during the change, until it receives an "enable transmission" command from its NCMC. In addition, the NCMC will be able to monitor the operation of an ESAA terminal to determine if it is malfunctioning.
   - Per Section 25.227(a)(11), each ESAA terminal shall be self-monitoring and, should a fault which can cause harmful interference to FSS networks be detected, the terminal will automatically cease transmissions.

By: /s/ *Cynthia Grady*
Cynthia Grady
Senior Counsel
Intelsat Corporation

December 13, 2018

IX. Section 25.226 Compliance Matrix

Rule	Text	Application Citations
§25.226	§ 25.226 Blanket licensing provisions for domestic, U.S. VMESs operating with GSO FSS space stations in the 10.95-11.2 GHz, 11.45-11.7 GHz, 11.7-12.2 GHz, and 14.0-14.5 GHz bands.	
§25.226(a)	(a) The following ongoing requirements govern all VMES licensees and operations in the 10.95-11.2 GHz (space-to-Earth), 11.45-11.7 GHz (space-to-Earth), 11.7-12.2 GHz (space-to-Earth) and 14.0-14.5 GHz (Earth-to-space) bands receiving from and transmitting to geostationary orbit satellites in the Fixed-Satellite Service. VMES licensees shall comply with the requirements in either paragraph (a)(1), (a)(2) or (a)(3) of this section and all of the requirements set forth in paragraphs (a)(4) through (a)(9) and paragraphs (c), (d), and (e) of this section. Paragraph (b) of this section identifies items that shall be included in the application for VMES operations to demonstrate that these ongoing requirements will be met.	Intelsat complies.
§25.226(a)(1)	(1) The following requirements shall apply to a VMES that uses transmitters with off-axis EIRP spectral-densities lower than or equal to the levels in paragraph (a)(1)(i) of this section. A VMES, or VMES system, operating under this section shall provide a detailed demonstration as described in paragraph (b)(1) of this section. The VMES transmitter also shall comply with the antenna pointing and cessation of emission requirements in paragraphs (a)(1)(ii) and (a)(1)(iii) of this section.	Intelsat complies.
§25.226(a)(1)(i)(A)	(A) EIRP spectral density emitted in the plane tangent to the GSO arc, as defined in §25.103, must not exceed the following values: $15 - 25 \log_{10}(\theta)$ dBW/4 kHz For $1.5° \leq \theta \leq 7°$ -6 dBW/4 kHz For $7° < \theta \leq 9.2°$ $18 - 25 \log_{10}(\theta)$ dBW/4 kHz For $9.2° < \theta \leq 19.1°$ -14 dBW/4 kHz For $19.1° < \theta \leq 180°$ Where theta (θ) is the angle in degrees from a line from the earth station antenna to the assigned orbital location of the target satellite. The EIRP density levels specified for $\theta > 7°$ may be exceeded by up to 3 dB in up to 10% of the range of theta (θ) angles from ±7-180°, and by up to 6 dB in the region of main reflector spillover energy.	Intelsat complies. *See* Techincal Appendix at IV.
§25.226(a)(1)(i)(B)	(B) The EIRP spectral density of co-polarized signals must not exceed the following values in the plane perpendicular to the GSO arc, as defined in §25.103: $18 - 25 \log(\theta)$ dBW/4 kHz For $3° \leq \theta \leq 19.1°$ -14 dBW/4 kHz For $19.1° < \theta \leq 180°$ Where θ is as defined in paragraph (a)(1)(i)(A) of this section. These EIRP density levels may be exceeded by up to 6 dB in the region of main reflector spillover energy and in up to 10%	Intelsat complies. *See* Techincal Appendix at IV.

	of the range of θ angles not included in that region, on each side of the line from the earth station to the target satellite.	
§25.226(a)(1)(i)(C)	(C) The off-axis EIRP spectral-density of cross-polarized signals must not exceed the following values in the plane tangent to the GSO arc or in the plane perpendicular to the GSO arc 5 - 25 log10(θ) dBW/4 kHz For $1.8° \leq \theta \leq 7°$ Where θ is as defined in paragraph (a)(1)(i)(A) of this section.	Intelsat complies. *See* Techincal Appendix ay IV.
§25.226(a)(1)(ii)	(ii) Each VMES transmitter must meet one of the following antenna pointing error requirements: (A) Each VMES transmitter shall maintain a pointing error of less than or equal to 0.2° between the orbital location of the target satellite and the axis of the main lobe of the VMES antenna, or (B) Each VMES transmitter shall declare a maximum antenna pointing error that may be greater than 0.2° provided that the VMES does not exceed the off-axis EIRP spectral-density limits in paragraph (a)(1)(i) of this section, taking into account the antenna pointing error.	Intelsat complies. *See* Legal Narrative at II.A.
§25.226(a)(1)(iii)	(iii) Each VMES transmitter must meet one of the following cessation of emission requirements: (A) For VMESs operating under paragraph (a)(1)(ii)(A) of this section, all emissions from the VMES shall automatically cease within 100 milliseconds if the angle between the orbital location of the target satellite and the axis of the main lobe of the VMES antenna exceeds 0.5°, and transmission shall not resume until such angle is less than or equal to 0.2°, or (B) For VMES transmitters operating under paragraph (a)(1)(ii)(B) of this section, all emissions from the VMES shall automatically cease within 100 milliseconds if the angle between the orbital location of the target satellite and the axis of the main lobe of the VMES antenna exceeds the declared maximum antenna pointing error and shall not resume transmissions until such angle is less than or equal to the declared maximum antenna pointing error.	Intelsat complies. *See* Techincal Appendix at I, and Legal Narrative at II.A.
§25.226(a)(2)	(2) The following requirements apply to VMES systems that operate with off-axis EIRP spectral-densities in excess of the levels in paragraph (a)(1)(i) or (a)(3)(i) of this section under licenses granted based on certifications filed pursuant to paragraph (b)(2) of this section….	N/A
§25.226(a)(3)	(3) The following requirements apply to a VMES system that uses variable power control of individual VMES earth stations transmitting simultaneously in the same frequencies to the same target satellite, unless the system operates pursuant to paragraph (a)(2) of this section….	N/A
§25.226(a)(4)	(4) An applicant filing to operate an VMES terminal or system and planning to use a contention protocol shall certify that its contention protocol use will be reasonable.	N/A
§25.226(a)(5)	(5) There shall be a point of contact in the United States, with phone number and address, available 24 hours a day, seven days a week, with authority and ability to cease all emissions from the VMESs.	Intelsat complies. *See* Legal Narrative at II.D.

§25.226(a)(6)	(6) For each VMES transmitter, a record of the vehicle location (i.e., latitude/longitude), transmit frequency, channel bandwidth and satellite used shall be time annotated and maintained for a period of not less than one (1) year. Records shall be recorded at time intervals no greater than every five (5) minutes while the VMES is transmitting. The VMES operator shall make this data available upon request to a coordinator, fixed system operator, Fixed-Satellite Service system operator, NTIA, or the Commission within 24 hours of the request.	Intelsat complies. *See* Technical Appendix at VII.
§25.226(a)(7)	(7) In the 10.95-11.2 GHz (space-to-Earth) and 11.45-11.7 GHz (space-to-Earth) frequency bands VMESs shall not claim protection from interference from any authorized terrestrial stations to which frequencies are either already assigned, or may be assigned in the future.	Applicable regulatory status and protection provision. Intelsat complies.
§25.226(a)(8)	(8) A VMES terminal receiving in the 10.95-11.2 GHz (space-to-Earth), 11.45-11.7 GHz (space-to-Earth) and 11.7-12.2 GHz (space-to-Earth) bands shall receive protection from interference caused by space stations other than the target space station only to the degree to which harmful interference would not be expected to be caused to anearth station employing an antenna conforming to the referenced patterns defined in § 25.209(a) and (b) and stationary at the location at which any interference occurred.	Applicable regulatory status and protection provision. Intelsat complies.
§25.226(a)(9)	(9) Each VMES terminal shall automatically cease transmitting upon the loss of synchronization or within 5 seconds upon loss of reception of the satellite downlink, whichever is the shorter time frame.	Intelsat complies. *See* Legal Narrative at II.A.
§25.226(b)	(b) Applications for VMES operation in the 14.0-14.5 GHz (Earth-to-space) band to GSO satellites in the FSS shall include, in addition to the particulars of operation identified on FCC Form 312, and associated Schedule B, the applicable technical demonstrations in paragraphs (b)(1), (b)(2), or (b)(3), and the documentation identified in paragraphs (b)(4) through (b)(8) of this section.	Intelsat complies.
§25.226(b)(1)	(1) An VMES applicant proposing to implement a transmitter under paragraph (a)(1) of this section must provide the information required by §25.115(g)(1). An applicant proposing to implement a transmitter under paragraph (a)(1)(ii)(A) of this section must also provide the certifications identified in paragraph (b)(1)(iii) of this section. An applicant proposing to implement a transmitter under paragraph (a)(1)(ii)(B) of this section must also provide the demonstrations identified in paragraph (b)(1)(iv) of this section. (i)-(ii) [Reserved] (iii) An VMES applicant proposing to implement a transmitter under paragraph (a)(1)(ii)(A) of this section shall: (A) Demonstrate that the total tracking error budget of their antenna is within 0.2° or less between the orbital location of the target satellite and the axis of the main lobe of the VMES antenna. As part of the engineering analysis, the VMES applicant must show that the antenna pointing error is within three sigma () from the mean value, *i.e.*, that there is a 0.997 probability the antenna maintains a pointing error within 0.2°; and	Intelsat complies. *See* Technical Appendix at IV; Legal Narrative at II.A.

	(B) Demonstrate that the antenna tracking system is capable of ceasing emissions within 100 milliseconds if the angle between the orbital location of the target satellite and the axis of the main lobe of the VMES antenna exceeds 0.5°. (iv) An VMES applicant proposing to implement a transmitter under paragraph (a)(1)(ii)(B) of this section shall: (A) Declare, in its application, a maximum antenna pointing error and demonstrate that the maximum antenna pointing error can be achieved without exceeding the off-axis EIRP spectral-density limits in paragraph (a)(1)(i) of this section; and (B) Demonstrate that the VMES transmitter can detect if the transmitter exceeds the declared maximum antenna pointing error and can cease transmission within 100 milliseconds if the angle between the orbital location of the target satellite and the axis of the main lobe of the VMES antenna exceeds the declared maximum antenna pointing error, and will not resume transmissions until the angle between the orbital location of the target satellite and the axis of the main lobe of the VMES antenna is less than or equal to the declared maximum antenna pointing error.	
§25.226(b)(2)	(2) An VMES applicant proposing to operate with off-axis EIRP density in excess of the levels in paragraph (a)(1)(i) or (a)(3)(i) of this section must provide the following in exhibits to its earth station application: (i) Off-axis EIRP density data pursuant to §25.115(g)(1)….	N/A
§25.226(b)(3)	(3) An applicant proposing to implement an VMES system subject to paragraph (a)(3) of this section must provide the following information in exhibits to its earth station application: (i) Off-axis EIRP density data pursuant to §25.115(g)(1)….	N/A
§25.226(b)(4)	(4) There shall be an exhibit included with the application describing the geographic area(s) in which the VMES will operate.	Intelsat complies. *See* Technical Appendix at II.
§25.226(b)(5)	(5) Any VMES applicant filing for an VMES terminal or system and planning to use a contention protocol shall include in its application a certification that will comply with the requirements of paragraph (a)(4) of this section.	N/A
§25.226(b)(6)	6) The point of contact referred to in paragraph (a)(5) of this section shall be included in the application.	Intelsat complies. *See* Legal Narrative at II.D.
§25.226(b)(7)	(7) Any VMES applicant filing for a VMES terminal or system shall include in its application a certification that will comply with the requirements of paragraph (a)(6) of this section.	Intelsat complies. *See* Technical Appendix at VII.
§25.226(b)(8)	(8) All VMES applicants shall submit a radio frequency hazard analysis determining via calculation, simulation, or field measurement whether VMES terminals, or classes of terminals, will produce power densities that will exceed the Commission's radio frequency exposure criteria. VMES applicants with VMES terminals that will exceed the guidelines in § 1.1310 of this chapter for radio frequency radiation exposure shall provide, with their environmental assessment, a plan for mitigation of radiation exposure to the	Intelsat complies. *See* Technical Appendix at V.

	extent required to meet those guidelines. All VMES licensees shall ensure installation of VMES terminals on vehicles by qualified installers who have an understanding of the antenna's radiation environment and the measures best suited to maximize protection of the general public and persons operating the vehicle and equipment. A VMES terminal exhibiting radiation exposure levels exceeding 1.0 mW/cm 2 in accessible areas, such as at the exterior surface of the radome, shall have a label attached to the surface of the terminal warning about the radiation hazard and shall include thereon a diagram showing the regions around the terminal where the radiation levels could exceed 1.0 mW/cm 2. All VMES applicants shall demonstrate that their VMES terminals are capable of automatically ceasing transmissions upon the loss of synchronization or within 5 seconds upon loss of reception of the satellite	
§25.226(b)(9)	(9) Except for VMES systems operating pursuant to paragraphs (a)(2) and (a)(3)(ii) of this section, VMES systems authorized pursuant to this section shall be eligible for a license that lists Permitted List as an authorized point of communication.	Intelsat complies. *See* Legal Narrative at II.C.
§25.226(c)	(c)(1) Operations of VMESs in the 14.0-14.2 GHz (Earth-to-space) frequency band in the radio line-of- sight of the NASA TDRSS facilities on Guam (latitude 13° 36' 55" N, longitude 144° 51' 22" E) or White Sands, New Mexico (latitude 32° 20' 59" N, longitude 106° 36' 31" W and latitude 32° 32' 40" N, longitude 106° 36' 48" W) are subject to coordination with the National Aeronautics and Space Administration (NASA) through the National Telecommunications and Information Administration (NTIA) Interdepartment Radio Advisory Committee (IRAC). Licensees shall notify the International Bureau once they have completed coordination. Upon receipt of such notification from a licensee, the International Bureau will issue a public notice stating that the licensee may commence operations within the coordination zone in 30 days if no party has opposed the operations. (2) When NTIA seeks to provide similar protection to future TDRSS sites that have been coordinated through the IRAC Frequency Assignment Subcommittee process, NTIA will notify the Commission's International Bureau that the site is nearing operational status. Upon public notice from the International Bureau, all Ku- band VMES licensees shall cease operations in the 14.0-14.2 GHz band within radio line-of-sight of the new TDRSS site until the licensees complete coordination with NTIA/IRAC for the new TDRSS facility. Licensees shall notify the International Bureau once they have completed coordination for the new TDRSS site. Upon receipt of such notification from a licensee, the International Bureau will issue a public notice stating that the licensee may commence operations within the coordination zone in 30 days if no party has opposed the operations. The VMES licensee then will be permitted to commence operations in the 14.0-14.2 GHz band within radio line-of-sight of the new TDRSS site, subject to any operational constraints developed in the coordination process.	Intelsat complies. Intelsat will not transmit in the radio line-of-sight of the subject facilities. In the event Intelsat seeks to operate within the relevant zone, it will coordinate as necessary.

§25.226(d)	(d)(1) Operations of VMESs in the 14.47-14.5 GHz (Earth-to-space) frequency band in the radio line-of- sight of radio astronomy service (RAS) observatories observing in the 14.47-14.5 GHz band are subject to coordination with the National Science Foundation (NSF). The appropriate NSF contact point to initiate coordination is Electromagnetic Spectrum Manager, NSF, 4201 Wilson Blvd., Suite 1045, Arlington VA 22203, fax 703-292-9034, email esm@nsf.gov. Licensees shall notify the International Bureau once they have completed coordination. Upon receipt of the coordination agreement from a licensee, the International Bureau will issue a public notice stating that the licensee may commence operations within the coordination zone in 30 days if no party has opposed the operations. (2) Table 1 provides a list of each applicable RAS site, its location, and the applicable coordination zone. (3) When NTIA seeks to provide similar protection to future RAS sites that have been coordinated through the IRAC Frequency Assignment Subcommittee process, NTIA will notify the Commission's International Bureau that the site is nearing operational status. Upon public notice from the International Bureau, all Ku- band VMES licensees shall cease operations in the 14.47-14.5 GHz band within the relevant geographic zone of the new RAS site until the licensees complete coordination for the new RAS facility. Licensees shall notify the International Bureau once they have completed coordination for the new RAS site and shall submit the coordination agreement to the Commission. Upon receipt of such notification from a licensee, the International Bureau will issue a public notice stating that the licensee may commence operations within the coordination zone in 30 days if no party has opposed the operations. The VMES licensee then will be permitted to commence operations in the 14.47-14.5 GHz band within the relevant coordination distance around the new RAS site, subject to any operational constraints developed in the coordination process.	Intelsat complies. Intelsat will not transmit in the radio line-of-sight of the subject facilities. In the event Intelsat seeks to operate, it will coordinate as necessary.
§25.226(e)	(e) VMES licensees shall use Global Positioning Satellite-related or other similar position location technology to ensure compliance with paragraphs (c) and (d) of this section.	Applicable regulatory status and protection provision. Intelsat complies.

X. Section 25.227 Compliance Matrix

Rule	Text	Application Citations
§25.227	§ 25.226 Blanket licensing provisions for domestic, U.S. ESAAs operating with GSO FSS space stations in the 10.95-11.2 GHz, 11.45-11.7 GHz, 11.7-12.2 GHz, and 14.0-14.5 GHz bands.	
§25.227(a)	(a) The following ongoing requirements govern all ESAA licensees and operations in the 10.95-11.2 GHz (space-to-Earth), 11.45-11.7 GHz (space-to-Earth), 11.7-12.2 GHz (space-to-Earth) and 14.0-14.5 GHz (Earth-to-space) bands receiving from and transmitting to geostationary orbit satellites in the Fixed-Satellite Service. ESAA licensees shall comply with the requirements in either paragraph (a)(1), (a)(2) or (a)(3) of this section and all of the requirements set forth in paragraphs (a)(4) through (a)(9) and paragraphs (c), (d), and (e) of this section. Paragraph (b) of this section identifies items that shall be included in the application for ESAA operations to demonstrate that these ongoing requirements will be met.	Intelsat complies.
§25.227(a)(1)	(1) The following requirements shall apply to a ESAA that uses transmitters with off-axis EIRP spectral-densities lower than or equal to the levels in paragraph (a)(1)(i) of this section. A ESAA, or ESAA system, operating under this section shall provide a detailed demonstration as described in paragraph (b)(1) of this section. The ESAA transmitter also shall comply with the antenna pointing and cessation of emission requirements in paragraphs (a)(1)(ii) and (a)(1)(iii) of this section.	Intelsat complies for all terminal operations in two-degree spacing environments.
§25.227(a)(1)(i)(A)	(A) EIRP spectral density emitted in the plane tangent to the GSO arc, as defined in §25.103, must not exceed the following values: $15 - 25 \log10(\theta)$ dBW/4 kHz For $1.5° \leq \theta \leq 7°$ -6 dBW/4 kHz For $7° < \theta \leq 9.2°$ $18 - 25 \log10(\theta)$ dBW/4 kHz For $9.2° < \theta \leq 19.1°$ -14 dBW/4 kHz For $19.1° < \theta \leq 180°$ Where theta (θ) is the angle in degrees from a line from the earth station antenna to the assigned orbital location of the target satellite. The EIRP density levels specified for $\theta > 7°$ may be exceeded by up to 3 dB in up to 10% of the range of theta (θ) angles from ±7-180°, and by up to 6 dB in the region of main reflector spillover energy.	Intelsat complies. *See* Techincal Appendix, IV.
§25.227(a)(1)(i)(B)	(B) The EIRP spectral density of co-polarized signals must not exceed the following values in the plane perpendicular to the GSO arc, as defined in §25.103: $18 - 25 \log(\theta)$ dBW/4 kHz For $3° \leq \theta \leq 19.1°$ -14 dBW/4 kHz For $19.1° < \theta \leq 180°$ Where θ is as defined in paragraph (a)(1)(i)(A) of this section. These EIRP density levels may be exceeded by up to 6 dB in the region of main reflector spillover energy and in up to 10% of the range of θ angles not included in that region, on each side of the line from the earth station to the target satellite.	Intelsat complies. *See* Techincal Appendix, IV.
§25.227(a)(1)(i)(C)	(C) The off-axis EIRP spectral-density of cross-polarized signals must not exceed the following values in the plane tangent to the GSO arc or in the plane perpendicular to the GSO arc $5 - 25 \log10(\theta)$ dBW/4 kHz For $1.8° \leq \theta \leq 7°$ Where θ is as defined in paragraph (a)(1)(i)(A) of this section.	Intelsat complies. *See* Techincal Appendix, IV.

§25.227(a)(1)(ii)	(ii) Each ESAA transmitter must meet one of the following antenna pointing error requirements: (A) Each ESAA transmitter shall maintain a pointing error of less than or equal to 0.2° between the orbital location of the target satellite and the axis of the main lobe of the ESAA antenna, or (B) Each ESAA transmitter shall declare a maximum antenna pointing error that may be greater than 0.2° provided that the ESAA does not exceed the off-axis EIRP spectral-density limits in paragraph (a)(1)(i) of this section, taking into account the antenna pointing error.	Intelsat complies. *See* Legal Narrative, II.A.
§25.227(a)(1)(iii)	(iii) Each ESAA transmitter must meet one of the following cessation of emission requirements: (A) For ESAAs operating under paragraph (a)(1)(ii)(A) of this section, all emissions from the ESAA shall automatically cease within 100 milliseconds if the angle between the orbital location of the target satellite and the axis of the main lobe of the ESAA antenna exceeds 0.5°, and transmission shall not resume until such angle is less than or equal to 0.2°, or (B) For ESAA transmitters operating under paragraph (a)(1)(ii)(B) of this section, all emissions from the ESAA shall automatically cease within 100 milliseconds if the angle between the orbital location of the target satellite and the axis of the main lobe of the ESAA antenna exceeds the declared maximum antenna pointing error and shall not resume transmissions until such angle is less than or equal to the declared maximum antenna pointing error.	Intelsat complies. *See* Legal Narrative, II.A.
§25.227(a)(2)	(2) The following requirements apply to ESAA systems that operate with off-axis EIRP spectral-densities in excess of the levels in paragraph (a)(1)(i) or (a)(3)(i) of this section under licenses granted based on certifications filed pursuant to paragraph (b)(2) of this section. (i) A ESAA or ESAA system licensed based on certifications filed pursuant to paragraph (b)(2) of this section must operate in accordance with the off-axis EIRP density specifications provided to the target satellite operator in order to obtain the certifications. (ii) Any ESAA transmitter operating under a license granted based on certifications filed pursuant to paragraph (b)(2) of this section must be self-monitoring and capable of shutting itself off and must cease or reduce emissions within 100 milliseconds after generating off-axis EIRP-density in excess of the specifications supplied to the target satellite operator. (iii) A system with variable power control of individual ESAA transmitters must monitor the aggregate off- axis EIRP density from simultaneously transmitting ESAA transmitters at the system's network control and monitoring center. If simultaneous operation of two or more ESAA transmitters causes aggregate off-axis EIRP density to exceed the off-axis EIRP density specifications supplied to the target satellite operator, the network control and monitoring center must command those transmitters to cease emissions or reduce the aggregate EIRP density to a level at or below those specifications, and the transmitters must comply within 100 milliseconds of receiving the command.	Intelsat complies. *See* Technical Appendix, I & III; Legal Narrative, II.A
§25.227(a)(3)	(3) The following requirements apply to a ESAA system that uses variable power control of individual ESAA earth stations transmitting simultaneously in the same frequencies ….	N/A

§25.227(a)(4)	(4) An applicant filing to operate an ESAA terminal or system and planning to use a contention protocol shall certify that its contention protocol use will be reasonable.	N/A
§25.227(a)(5)	(5) There shall be a point of contact in the United States, with phone number and address, available 24 hours a day, seven days a week, with authority and ability to cease all emissions from the ESAAs.	Intelsat complies. *See* Legal Narrative, II.D.
§25.227(a)(6)	(6) For each ESAA transmitter, a record of the vehicle location (i.e., latitude/longitude), transmit frequency, channel bandwidth and satellite used shall be time annotated and maintained for a period of not less than one (1) year. Records shall be recorded at time intervals no greater than every five (5) minutes while the ESAA is transmitting. The ESAA operator shall make this data available upon request to a coordinator, fixed system operator, Fixed-Satellite Service system operator, NTIA, or the Commission within 24 hours of the request.	Intelsat complies. *See* Technical Appendix, VIII.
§25.227(a)(7)	(7) In the 10.95-11.2 GHz (space-to-Earth) and 11.45-11.7 GHz (space-to-Earth) frequency bands ESAAs shall not claim protection from interference from any authorized terrestrial stations to which frequencies are either already assigned, or may be assigned in the future.	Applicable regulatory status and protection provision. Intelsat complies.
§25.227(a)(8)	(8) A ESAA terminal receiving in the 10.95-11.2 GHz (space-to-Earth), 11.45-11.7 GHz (space-to-Earth) and 11.7-12.2 GHz (space-to-Earth) bands shall receive protection from interference caused by space stations other than the target space station only to the degree to which harmful interference would not be expected to be caused to anearth station employing an antenna conforming to the referenced patterns defined in § 25.209(a) and (b) and stationary at the location at which any interference occurred.	Applicable regulatory status and protection provision. Intelsat complies.
§25.227(a)(9)	(9) Each ESAA terminal shall automatically cease transmitting upon the loss of synchronization or within 5 seconds upon loss of reception of the satellite downlink, whichever is the shorter time frame.	Intelsat complies. *See* Legal Narrative, II.D.
§25.227(b)	(b) Applications for ESAA operation in the 14.0-14.5 GHz (Earth-to-space) band to GSO satellites in the FSS shall include, in addition to the particulars of operation identified on FCC Form 312, and associated Schedule B, the applicable technical demonstrations in paragraphs (b)(1), (b)(2), or (b)(3), and the documentation identified in paragraphs (b)(4) through (b)(8) of this section.	Intelsat complies.

§25.227(b)(1)	(1) An ESAA applicant proposing to implement a transmitter under paragraph (a)(1) of this section must provide the information required by §25.115(g)(1). An applicant proposing to implement a transmitter under paragraph (a)(1)(ii)(A) of this section must also provide the certifications identified in paragraph (b)(1)(iii) of this section. An applicant proposing to implement a transmitter under paragraph (a)(1)(ii)(B) of this section must also provide the demonstrations identified in paragraph (b)(1)(iv) of this section. (i)-(ii) [Reserved] (iii) An ESAA applicant proposing to implement a transmitter under paragraph (a)(1)(ii)(A) of this section shall: (A) Demonstrate that the total tracking error budget of their antenna is within 0.2° or less between the orbital location of the target satellite and the axis of the main lobe of the ESAA antenna. As part of the engineering analysis, the ESAA applicant must show that the antenna pointing error is within three sigma () from the mean value, *i.e.*, that there is a 0.997 probability the antenna maintains a pointing error within 0.2°; and (B) Demonstrate that the antenna tracking system is capable of ceasing emissions within 100 milliseconds if the angle between the orbital location of the target satellite and the axis of the main lobe of the ESAA antenna exceeds 0.5°. (iv) An ESAA applicant proposing to implement a transmitter under paragraph (a)(1)(ii)(B) of this section shall: (A) Declare, in its application, a maximum antenna pointing error and demonstrate that the maximum antenna pointing error can be achieved without exceeding the off-axis EIRP spectral-density limits in paragraph (a)(1)(i) of this section; and (B) Demonstrate that the ESAA transmitter can detect if the transmitter exceeds the declared maximum antenna pointing error and can cease transmission within 100 milliseconds if the angle between the orbital location of the target satellite and the axis of the main lobe of the ESAA antenna exceeds the declared maximum antenna pointing error, and will not resume transmissions until the angle between the orbital location of the target satellite and the axis of the main lobe of the ESAA antenna is less than or equal to the declared maximum antenna pointing error.	Intelsat complies. *See* Technical Appendix, IV.
§25.227(b)(2)	(2) An ESAA applicant proposing to operate with off-axis EIRP density in excess of the levels in paragraph (a)(1)(i) or (a)(3)(i) of this section must provide the following in exhibits to its earth station application: (i) Off-axis EIRP density data pursuant to §25.115(g)(1); (ii) The certifications required by §25.220(d); and (iii) A detailed showing that each ESAA transmitter in the system will automatically cease or reduce emissions within 100 milliseconds after generating EIRP density exceeding specifications provided to the target satellite operator; and (iv) A detailed showing that the aggregate power density from simultaneously transmitting ESAA transmitters will be monitored at the system's network control and monitoring center; that if simultaneous operation of two or more ESAA transmitters causes the aggregate off-axis EIRP density to exceed the off-axis EIRP density specifications supplied to the target satellite operator, the network control and monitoring center will command those	Intelsat complies.

	transmitters to cease emissions or reduce the aggregate EIRP density to a level at or below those specifications; and that those transmitters will comply within 100 milliseconds of receiving the command.	
§25.227(b)(3)	(3) An applicant proposing to implement an ESAA system subject to paragraph (a)(3) of this section must provide the following information in exhibits to its earth station application…	N/A
§25.227(b)(4)	(4) There shall be an exhibit included with the application describing the geographic area(s) in which the ESAA will operate.	Intelsat complies. *See* Technical Appendix at II.
§25.227(b)(5)	(5) Any ESAA applicant filing for an ESAA terminal or system and planning to use a contention protocol shall include in its application a certification that will comply with the requirements of paragraph (a)(4) of this section.	N/A
§25.227(b)(6)	6) The point of contact referred to in paragraph (a)(5) of this section shall be included in the application.	Intelsat complies. *See* Legal Narrative at II.D.
§25.227(b)(7)	(7) Any ESAA applicant filing for a ESAA terminal or system shall include in its application a certification that will comply with the requirements of paragraph (a)(6) of this section.	Intelsat complies. *See* Technical Appendix at VIII.
§25.227(b)(8)	(8) All ESAA applicants shall submit a radio frequency hazard analysis determining via calculation, simulation, or field measurement whether ESAA terminals, or classes of terminals, will produce power densities that will exceed the Commission's radio frequency exposure criteria. ESAA applicants with ESAAterminals that will exceed the guidelines in § 1.1310 of this chapter for radio frequency radiation exposure shall provide, with their environmental assessment, a plan for mitigation of radiation exposure to the extent required to meet those guidelines. All ESAA licensees shall ensure installation of ESAA terminals on vehicles by qualified installers who have an understanding of the antenna's radiation environment and the measures best suited to maximize protection of the general public and persons operating the vehicle and equipment. A ESAA terminal exhibiting radiation exposure levels exceeding 1.0 mW/cm 2 in accessible areas, such as at the exterior surface of the radome, shall have a label attached to the surface of the terminal warning about the radiation hazard and shall include thereon a diagram showing the regions around the terminal where the radiation levels could exceed 1.0 mW/cm 2. All ESAA applicants shall demonstrate that their ESAA terminals are capable of automatically ceasing transmissions upon the loss of synchronization or within 5 seconds upon loss of reception of the satellite	Intelsat complies. *See* Technical Appendix at V.
§25.227(b)(9)	(9) Except for ESAA systems operating pursuant to paragraphs (a)(2) and (a)(3)(ii) of this section, ESAA systems authorized pursuant to this section shall be eligible for a license that lists Permitted List as an authorized point of communication.	Intelsat complies. *See* Legal Narrative at II.C.

§25.227(c)	(c)(1) Operations of ESAAs in the 14.0-14.2 GHz (Earth-to-space) frequency band in the radio line-of- sight of the NASA TDRSS facilities on Guam (latitude 13° 36' 55" N, longitude 144° 51' 22" E) or White Sands, New Mexico (latitude 32° 20' 59" N, longitude 106° 36' 31" W and latitude 32° 32' 40" N, longitude 106° 36' 48" W) are subject to coordination with the National Aeronautics and Space Administration (NASA) through the National Telecommunications and Information Administration (NTIA) Interdepartment Radio Advisory Committee (IRAC). Licensees shall notify the International Bureau once they have completed coordination. Upon receipt of such notification from a licensee, the International Bureau will issue a public notice stating that the licensee may commence operations within the coordination zone in 30 days if no party has opposed the operations. (2) When NTIA seeks to provide similar protection to future TDRSS sites that have been coordinated through the IRAC Frequency Assignment Subcommittee process, NTIA will notify the Commission's International Bureau that the site is nearing operational status. Upon public notice from the International Bureau, all Ku- band ESAA licensees shall cease operations in the 14.0-14.2 GHz band within radio line-of-sight of the new TDRSS site until the licensees complete coordination with NTIA/IRAC for the new TDRSS facility. Licensees shall notify the International Bureau once they have completed coordination for the new TDRSS site. Upon receipt of such notification from a licensee, the International Bureau will issue a public notice stating that the licensee may commence operations within the coordination zone in 30 days if no party has opposed the operations. The ESAA licensee then will be permitted to commence operations in the 14.0-14.2 GHz band within radio line-of-sight of the new TDRSS site, subject to any operational constraints developed in the coordination process.	Intelsat complies. Intelsat will not transmit in the radio line-of-sight of the subject facilities. In the event Intelsat seeks to operate within the relevant zone, it will coordinate as necessary.
§25.227(d)	(d)(1) Operations of ESAAs in the 14.47-14.5 GHz (Earth-to-space) frequency band in the radio line-of- sight of radio astronomy service (RAS) observatories observing in the 14.47-14.5 GHz band are subject to coordination with the National Science Foundation (NSF). The appropriate NSF contact point to initiate coordination is Electromagnetic Spectrum Manager, NSF, 4201 Wilson Blvd., Suite 1045, Arlington VA 22203, fax 703-292-9034, email esm@nsf.gov. Licensees shall notify the International Bureau once they have completed coordination. Upon receipt of the coordination agreement from a licensee, the International Bureau will issue a public notice stating that the licensee may commence operations within the coordination zone in 30 days if no party has opposed the operations. (2) Table 1 provides a list of each applicable RAS site, its location, and the applicable coordination zone. (3) When NTIA seeks to provide similar protection to future RAS sites that have been coordinated through the IRAC Frequency Assignment Subcommittee process, NTIA will notify the Commission's International Bureau that the site is nearing operational status. Upon public notice from the International Bureau, all Ku- band ESAA licensees shall cease operations in the 14.47-14.5 GHz band within the relevant geographic zone of the new RAS site until the licensees complete coordination for	Intelsat complies. Intelsat will not transmit in the radio line-of-sight of the subject facilities. In the event Intelsat seeks to operate, it will coordinate as necessary.

	the new RAS facility. Licensees shall notify the International Bureau once they have completed coordination for the new RAS site and shall submit the coordination agreement to the Commission. Upon receipt of such notification from a licensee, the International Bureau will issue a public notice stating that the licensee may commence operations within the coordination zone in 30 days if no party has opposed the operations. The ESAA licensee then will be permitted to commence operations in the 14.47-14.5 GHz band within the relevant coordination distance around the new RAS site, subject to any operational constraints developed in the coordination process.	
§25.227(e)	(e) ESAA licensees shall use Global Positioning Satellite-related or other similar position location technology to ensure compliance with paragraphs (c) and (d) of this section.	Applicable regulatory status and protection provision. Intelsat complies.

XI. Technical Certification

I, Christopher M. Hudson, hereby certify that I am the technically qualified person responsible for the preparation of the technical information contained in the Intelsat License LLC license modification application for ESAA and VMES operating authority and the accompanying Technical Appendix, that I am familiar with Part 25 of the Commission's Rules (47 C.F.R. Part 25), and that I have either prepared or reviewed the technical information submitted in this application and found it to be complete and accurate to the best of my knowledge and belief.

By: */s/ Christopher M. Hudson*
Christopher M. Hudson
Senior Technical Advisor
Intelsat General Corporation

December 13, 2018