Special Temporary Authority for VSAT Terminal Operations,
30 Day Extension of SES-STA-20100324-00351

04/01/2010

Submitted by

Ronald E Center
The Boeing Company
Frequency Management Services MC: 2T-22
P.O. Box 3707
Seattle, WA 98124-2207
206-544-6044 Office
866-248-1493 Toll Free

This is request for an extension of the Special Temporary Authority SES-STA-20100324-00351, and Boeing requests a start date of April 22, 2010 to allow for uninterrupted operation for an additional 30 days in support of this temporary communications requirement. This STA extension supports temporary use of a C-band satellite terminal using leased satellite service from a U.S. licensed provider, via satellite Galaxy-13/Horizon-1.

The earth terminal to be used is a Prodelin 2.4 Meter dish, Model 1244. The system will be operated from Milford, OH. The specifications of the operation are listed below. The RadHaz study is provided following the technical data.

General Information:

Site Location: 39-10-53.8N; 84-17-2.4W, NAD 83

Ground Elevation AMSL: 176.1 Meters

Satellites: Galaxy-13/Horizon-1, located at 127 Degrees West

Period: April 22, 2010 through May 22, 2010.

Special Temporary Authority for VSAT Terminal Operations,
30 Day Extension of SES-STA-20100324-00351

Antenna Data

Quantity: 1

Antenna Manufacturer: Prodelin

Model: 1244

Antenna Size: 2.4 Meters

Antenna Transmit Gain: 42 dBi at 6137.5 MHz

Antenna Receive Gain: 38 dBi at 3912.5 MHz

Antenna Power Limits

Antenna Height Above Ground Level: 3 Meters

Antenna Height Above Sea Level: 179.1 Meters

Building Height: N/A – Antenna operated at ground level.

Total Input Power at Antenna Flange: 6.4 Watts

Antenna Height Above Rooftop: N/A

Total EIRP for all Carriers: 50.06 dBW

Frequency Limits

Satellite Arc, Eastern Limit: 127 Degrees West

Satellite Arc, Western Limit: 127 Degrees West

Antenna Elevation Angle, Eastern Limit: 27 Degrees

Antenna Elevation Angle, Western Limit: 27 Degrees

Earth Station Azimuth Limit, Eastern Limit: 235.6 Degrees True

Earth Station Azimuth Limit, Western Limit: 235.6 Degrees True

Maximum EIRP density towards the Horizon (dBW/4KHz): -23.77 dBW/4KHz

Special Temporary Authority for VSAT Terminal Operations,
30 Day Extension of SES-STA-20100324-00351

Particulars of Operation

Frequency Band of Operation:
Transmit: 5927 - 5963 MHz   Receive: 3700 - 4200 MHz

Antenna Polarization: Linear

Band MHz	T/R Mode	Emission	Max EIRP dBW	Max EIRP Density dBW/4KHz
3700 - 4200	R	1M28G7D	0	0
5927 - 5963	T	1M28G7D	50.06 dBW	25.01 dBW/4KHz

Analysis of Non-Ionizing Radiation for a 2.4M Prodelin 1244

This report presents an analysis of the non-ionizing radiation levels for a 2.4M Prodelin 1244 system. The calculations used in this analysis were derived from and comply with the procedures outlined in the Federal Communication Commission, Office of Engineering and Technology Bulletin Number 65, which establishes guidelines for human exposure to Radio Frequency Electromagnetic Fields. Bulletin 65 defines exposure levels in two separate categories, the General Population/Uncontrolled Areas limits, and the Occupational/Controlled Area limits. The Maximum Permissible Exposure (MPE) limit of the General Population/Uncontrolled Area is defined in Table (1), and represents a maximum exposure limit averaged over a 30 minute period. The MPE limit of the Occupational/Controlled Area is defined in Table (2), and represents a maximum exposure limit averaged over a 6 minute period. The purpose of this report is to provide an analysis of the earth station power flux densities, and to compare those levels to the specified MPE's. This report provides predicted density levels in the near field, far field, transition region, main reflector surface area, area between the main reflector and sub reflector or feed assembly, as well as the area between the antenna edge and ground.

MPE Limits for General Population/Uncontrolled Area

Frequency Range (MHz)	*Power Density (mW/cm^2)*
1500 – 100,000	1.0

Table 1

MPE Limits for Occupational/Controlled Area

Frequency Range (MHz)	*Power Density (mW/cm^2)*
1500 – 100,000	5.0

Table 2

2.4M Prodelin 1244

Table 3 contains formulas, equations and parameters that were used in determining the Power Flux Density levels for the 2.4M Prodelin 1244:

Data Type	Data Symbol	Data Formula	Data Value	Unit of Measure
Power Input	P	Input	6.4	W
Antenna Size	D	Input	2.4	M
Antenna Area	A	$A = (\Pi D^2) \div 4$	4.52	M^2
Subreflector Size	Sub	Input	12.7	cm
Subreflector Area	A_{sub}	$A_{sub} = (\Pi Sub^2) \div 4$	126.68	cm^2
Gain dBi	G_{dbi}	Input	42	dBi
Gain Factor	G	$G = 10^{Gdbi/10}$	15848.93	Gain Factor
Frequency	f	Input	6175	MHz
Wavelength	λ	$299.79 / f$	0.048549	Meters
Aperture Efficiency	η	$\eta = [(G\lambda^2) \div (4\Pi)] \div A$	.66	n/a
Pi	Π	Input	3.14159	Numeric
Constant	M/Sec	Input	299,792,458	Numeric
Conversion W to mW	mW	mW = $W \times 1000$	n/a	n/a
Conversion M to cm	cm	cm = $M \times 100$	n/a	n/a
Conversion M^2 to cm^2	cm^2	$cm^2 = M^2 \times 10000$	n/a	n/a
Conversion W/M^2 to mW/cm^2	mW/cm^2	$mW/cm^2 = W / M^2 \div 10$	n/a	n/a

Table 3

1. Far Field Analysis

The distance to the far field can be calculated using the following formula:

$$R_{ff} = \frac{0.6D^2}{\lambda} = \quad 71.19 \text{ Meters}$$

The power density in the far field can be calculated using the following formula. Note: this formula requires the use of power in milliwatts and far field distance in centimeters, or requires a post calculation conversion from W/M^2:

$$S_{ff} = \frac{PG}{4\Pi R_{ff}^2} = \quad 0.159 \text{ mW/cm}^2$$

2. Near Field Analysis

The extent of the Near Field region can be calculated using the following formula:

$$R_{nf} = \frac{D^2}{4\lambda} = \quad 29.66 \text{ Meters}$$

The power density of the near field can be calculated using the following formula. Note: this formula requires the use of power in milliwatts and diameter in centimeters, or requires a post calculation conversion from W/M^2:

$$S_{nf} = \frac{16\eta P}{\Pi D^2} = \quad 0.373 \text{ mW/cm}^2$$

3. Transition Region Analysis

The transition region extends from the end of the near field out to the beginning of the far field. The power density in the transition region decreases inversely with distance from the antenna, while power density in the far-field decreases inversely with the square of the distance. However the power density in the transition region will not exceed the density in the near field, and can be calculated for any point in the transition region (R), using the following formula. Note: This formula requires the use of distance in centimeters, or requires a post calculation conversion from W/M^2.

$$S_t = \frac{S_{nf} R_{nf}}{R} = \quad 0.373 \text{ mW/cm}^2$$

4. Main Reflector Surface Area Analysis

The maximum power density at the antenna surface area can be calculated using the following formula. Note: this formula requires the use of Power in milliwatts and Area in centimeters squared, or requires a post calculation conversion from W/M^2.

$$S_{surface} = \frac{4P}{A} = \quad 0.566 \text{ mW/cm}^2$$

5. Subreflector Area Analysis

The area between the sub reflector and main reflector presents a potential hazard, with the highest density being located at the sub reflector area. The power density at the sub reflector can be calculated using the following formula. Note: this formula requires the use of Power in milliwatts and Area in centimeters squared, or requires a post calculation conversion from W/M^2.

$$Sub_{surface} = \frac{4P}{A_{sub}} = 202.084 \text{ mW/cm}^2$$

6. Power Density between Reflector and Ground Analysis

The power density between the reflector and the ground can be calculated using the following formula. Note: this formula requires the use of Power in milliwatts and Area in centimeters squared, or requires a post calculation conversion from W/M^2.

$$S_{ground} = \frac{P}{A} = 0.142 \text{ mW/cm}^2$$

Tables 4 and 5 present a summary of the radiation hazard findings on the 2.4M Prodelin 1244 terminal for both the General Population/Uncontrolled Area, as well as the Occupational/Controlled area environments.

MPE Limits for General Population/Uncontrolled Area

Area	*Range Meters*	*Power Density (mW/cm^2)*	*Finding*
Far Field	71.19	0.159 mW/cm^2	Meets FCC Requirement
Near Field	29.66	0.373 mW/cm^2	Meets FCC Requirement
Transition Region	29.66 – 71.19	0.373 mW/cm^2	Meets FCC Requirement
Main Reflector Surface	N/A	0.566 mW/cm^2	Meets FCC Requirement
Sub-reflector Surface	N/A	202.084 mW/cm^2	Potential Hazard
Area between Reflector and Ground	N/A	0.142 mW/cm^2	Meets FCC Requirement

Table 4

MPE Limits for Occupational/Controlled Area

Area	*Range Meters*	*Power Density (mW/cm^2)*	*Finding*
Far Field	71.19	0.159 mW/cm^2	Meets FCC Requirement
Near Field	29.66	0.373 mW/cm^2	Meets FCC Requirement
Transition Region	29.66 – 71.19	0.373 mW/cm^2	Meets FCC Requirement
Main Reflector Surface	N/A	0.566 mW/cm^2	Meets FCC Requirement
Sub-reflector Surface	N/A	202.084 mW/cm^2	Potential Hazard
Area between Reflector and Ground	N/A	0.142 mW/cm^2	Meets FCC Requirement

Table 5

Based on the above finding there is a potential hazard of radio frequency exposure with use of the 2.4M Prodelin 1244. In order to mitigate the risk of these hazards, this terminal will only be operated in a controlled area. Additionally, the unit will be shut down prior to performing maintenance in any of the occupational hazard areas.