SES | Networks

August 10, 2018

VIA ELECTRONIC FILING

Anthony Serafini
Experimental Licensing Branch Chief, Office of Engineering and Technology
Federal Communications Commission
445 12th Street, SW
Washington, D.C. 20554

Re: Request for Further Information; Call Sign WN9XBH; File No. SAT-1076-EX-ST-2018

Dear Mr. Serafini:

O3b Limited ("O3b") files this letter in response to a request for further information regarding its pending application for special temporary authority to conduct tests of a new GetSat MicroSat terminal at the SES facility in Manassas, VA. SES has provided its answers to the Commission's inquiries below:

1) Please submit a radiation hazard for the proposed antennas

Please see attached Annex A for a radiation hazard report for the proposed antenna.

2) Please demonstrate that your proposed operations in the 27.5-30 GHz will meet the equivalent power Flux-density (epfd) levels in the Table 22-2 of Article 22, Section II, and Resolution 76 of the ITU Radio Regulations.

Please see Annex B for a demonstration that the proposed operations will meet the EPFD levels in Table 22-2 of Article 22, Section II, and Resolution 76 of the ITU Radio Regulations.

3) Please certify that your proposed operations are in compliance with all existing or future coordination agreements between O3b and other GSO and NGSO satellite networks, or demonstrate that your proposed operations will not cause interference to terrestrial, iridium NGSO, and GSO satellite networks.

O3b certifies that its proposed operations will comply with all existing or future coordination agreements between O3b and other satellite operators and will abide by all the

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Company Register No. B 81 267
Identification No. LU18953352

terms and conditions of the O3b Market Access Grant.[1] In addition, as stated in its application, O3b will coordinate with local terrestrial operators prior to transmitting in any bands that are shared with terrestrial services.

Respectfully submitted,

SES Networks

/s/ Will Lewis
Will Lewis
Senior Legal Counsel
900 17th Street NW
Suite 300
Washington D.C. 20006
(202) 813-4033

cc: Paul Blais

Attachment

[1] *O3b Limited,* Order and Declaratory Ruling, Call Sign S2935, FCC 18-70 at ¶ 20 (rel. June 6, 2018).

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Annex A – Radiation Hazard Report

Radiation Hazard Analysis

0.24 Meter -
Manassas, Virginia 20136

Introduction

A radiation hazard anaylsis is presented for a 0.24 meter Ka band aperture antenna to be installed in Manassas, Virginia at the SES Networks SES Facility. This Radiation Analysis calculates the non-ionizing radiation levels expected to be emitted from the earth station on a worse cases basis and is performed in accordance with the Federal Communications Commissions Office of Engineering and Technology (OET) Bulletin, No. 65.

Requirements

OET 65 outlines the maximum permissible exposure limits in two cases for operation in this frequency range.

1. The first case is the maximum level that a person may be exposed to in the general population. The exposure limit is defined as a non-ionizing power level equal to 1 milliwatt per centimeter squared averaged over a thirty minute period.
2. The second case is a controlled environment where the maximum permissible exposure limit must not exceed 5 milliwatts per centimeter squared averaged over any six minute period.

Summary

The results indicate that no significant hazard will be presented to the general population and will be fully mitigated in the controlled area by the use of procedures that require the removal of transmit power before accessing the area around the main reflector.

Analysis

This analysis was performed on seven zones. The results of this is shown in Radiation Hazard Zones. The Table labeled Input Values provides the input data used to perform the analysis. The table labeled OET 65 Calculated Values provides the intermediate calculation used to perform the assessment in accordance with OET 65. The Analysis is performed for each of the seven radiation zones as shown in figure 1 – Analysis Zones. These zones are:

1. Point between the feed and the sub-reflector
2. The power at the surface of the antenna
3. The power level between the main reflector and ground
4. The near-field or Fresnel region in which the maxima can be reached before the field starts to diminish with distance
5. The Transition region where power begins to decrease inversely with distance from the antenna
6. The Far Field or Fraunhofer region where power decreases inversely with the square of the distance. This is the point at which the antenna beam is fully collimated
7. The off axis level in the near field. This is defined as the area outside of the main beam removed and at least one antenna diameter removed from the main beam

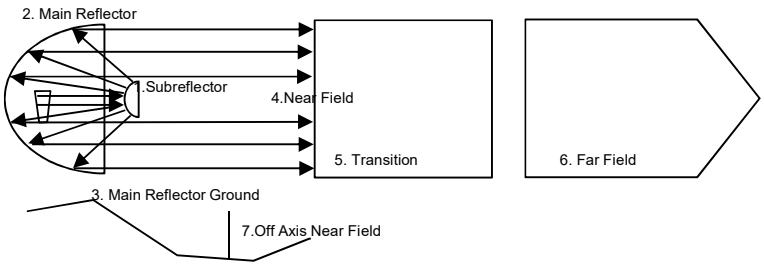


Figure 1 – Analysis Zones

Radiation Hazard Analysis

Operator:	**SES Networks**		
Location Designation:	**SES Facility**	FCC ID:	
County:	**Prince William**	SES ID:	
Town:	**Manassas,**	STA:	
State/Zip:	**Virginia**	**20136**	

Input Values	Value	Unit
D = Aperture Diameter	0.24	Meters
d = Subreflector Diameter	0	Meters
η = Apperture Efficeny	60%	percentage
FCC Designation	Ka	Band
F = Frequency	29500	MHz
P = Transmitter Power Watts:	25	Watts
p = Number Transmitters:	1	
R_{ua} = closest point to uncontrolled area	10	meters
Elevation angle at closest point R_{ua}	20	Degrees

Band	Frequency GHz
L	1000-2000
S	2000-4000
C	4000-8000
X	8000-12500
Ku	12500-18000
K	18000-25500
Ka	26500-40000
O	40000-50000
V	50000-75000

OET 65 Calculated Values	Formula	Value	Unit
λ= Wavelength	c / F	0.0102	meters
P_1 = Total Antenna Input Power	P*p	25	watts
G = Antenna Gain	$G=\frac{4\pi\eta A}{\lambda^2}$	3294.84169	linear
Antenna Gain dB	$10\log_{10}(G)$	35.17834552	dBi
A = Area of reflector	$\pi(\frac{D}{2})^2$	0.045216	meters ^{2}
a = area of subreflector	$\pi(\frac{d}{2})^2$	0	meters ^{2}
R_{nf} = Near-Field Region	$R_{nf}=\frac{D^2}{4\lambda}$	1.42	meters
Transition Region	$>R_{nf}<R_{ff}$	1.416 3.3984	>meters <meters
R_{ff} = Far Field Region	$R_{ff}=\frac{0.6\,D^2}{\lambda}$	3.3984	meters
		1	Meters AGL

	Radiation Analysis Zone	Formula	Level	Value	Exposure Limits: General Public <1mW/cm ^{2}	Exposure Limits: Occupational <5mW/cm ^{2}
1	Power Subreflector	$\frac{4P_t}{a}$	N/A	mW/cm ^{2}	N/A	N/A
2	Antenna Surface	$\frac{4P_t}{A}$	221.161	mW/cm ^{2}	>FCC MPE See Note 1	>FCC MPE See Note 2
3	Main Reflector Ground	$\frac{P_t}{A}$	55.290	mW/cm ^{2}	>FCC MPE See Note 1	>FCC MPE See Note 2
4	Snf =Near-Field Power Density	$S_{nf}=\frac{16\eta P_t}{p\pi D^2}=4\eta(\frac{P_t}{A})$	265.393	mW/cm ^{2}	>FCC MPE See Note 1	>FCC MPE See Note 2
5	Max Transition Power Density	$S_t=\frac{S_{nf}R_{nf}}{R_{nf}}$	265.393	mW/cm ^{2}	>FCC MPE See Note 1	>FCC MPE See Note 2
6	Max Far field Power Density	$S_{ff}=\frac{P_tG}{4\pi R^2}$	56.785	mW/cm ^{2}	>FCC MPE See Note 3	>FCC MPE See Note 2
7	Off Access Level Near Field	$S_{ua}=S_{nf}-20dB$	2.65393	mW/cm ^{2}	CC MPE See Not	<FCC MPE

Notes

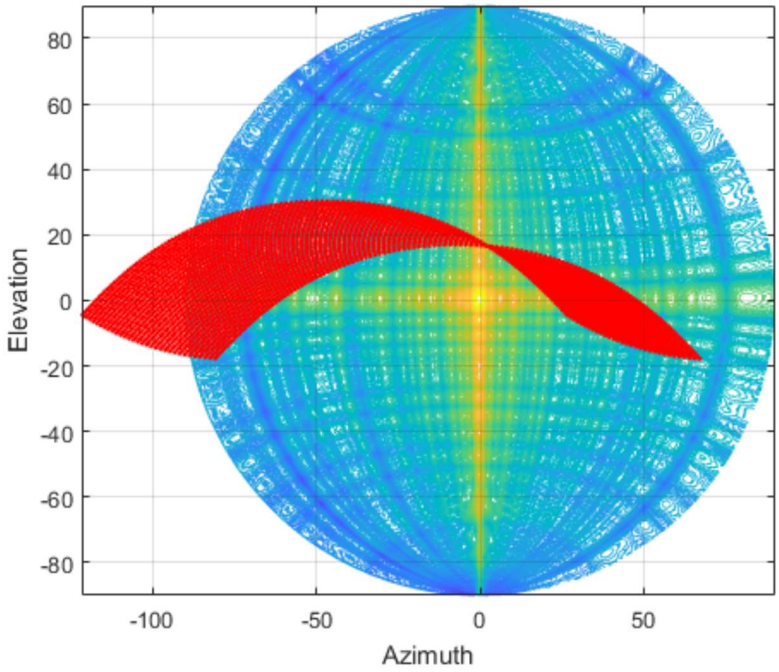
1. The antenna is installed in a controlled location access is restricted to authorized personnel only. The area is marked with RF Radiation Hazard signage. Area not accessible to the general public.
2. Inside the controlled area, MPE levels exceed the MPE exposure for occupational levels. The levels will be reduced to safe MPE by removing power to the transmitters when work is performed on or around the antenna. This area can only be accessed by qualified personnel.
3. The far field develops 1 meters above ground level at the minimum elevation angle which is not accessable to the general public.

Annex B – Demonstration of Compliance with EPFD Limits

The following plot illustrates the GETSAT antenna pattern in azimuth and elevation dimensions.

The below analysis shows the GSO arc, as it appears from the location where the GETSAT antenna will be operating, is superimposed on to the antenna pattern. There are multiple instances of the GSO arc shown because the GETSAT antenna will be moving to follow O3b satellites. At each increment along the O3b orbit, the GSO arc is correspondingly superimposed onto the GETSAT antenna pattern.

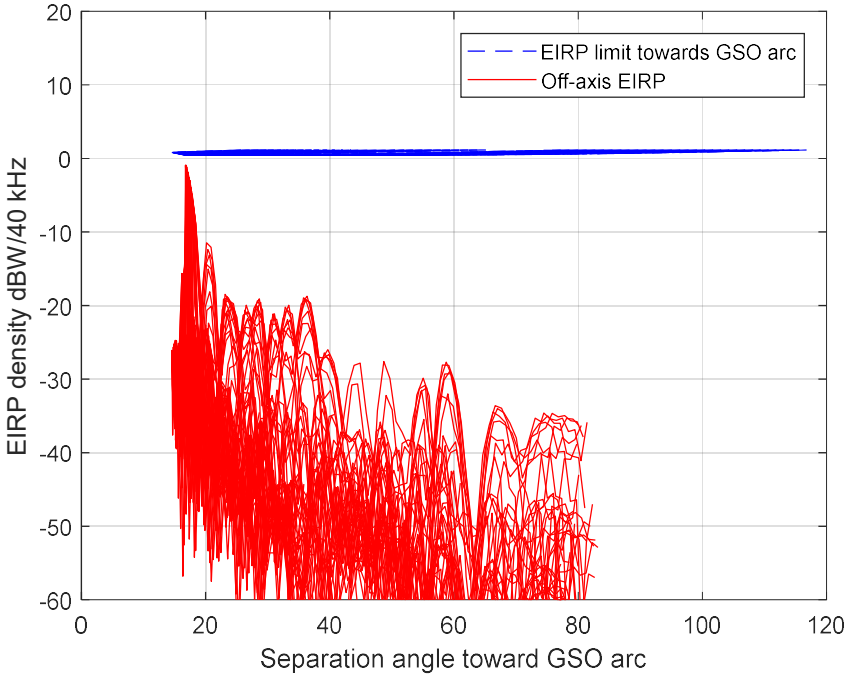
This analysis determines the GETSAT antenna gain in the direction of the GSO arc as the antenna moves to follow the O3b satellite.



The EPFD ↑ limit is −162 dBW/m^2/40 kHz. The spreading loss determined by the equation

$$spreading\ loss\ (dB) = 10log_{10}(4\pi d^2)$$

where *d* is the distance to a point on the GSO arc from the location on the Earth of the transmitting earth station, in one instance it is around 37,422 km. The resulting spreading loss is 162.4 dB-m^2. From this, the allowed off-axis EIRP from the GETSAT antenna can be determined by adding the spreading loss to the EPFD limit. The following plot illustrates both the EPFD limit in the form of an off-axis EIRP density limit and the corresponding EIRP density from the GETSAT antenna that, when controlling the input power spectral density, is below the limit.



As seen by the plot above, the GETSAT operations are compliant with the EPFD↑ limits.