SUPPLEMENT

O3b Limited ("O3b") hereby supplements its request for special temporary authority ("STA") to demonstrate compliance with the Commission's RF radiation requirements.

O3b is attaching to this supplement a radiation hazard study for the 1.2-m antenna O3b will operate pursuant to the STA. As appropriate, O3b will use fencing, signage, and other measures to limit access to the relevant area. Procedures will be in place requiring that transmit power be turned off before work on the 1.2-m antenna is performed.

Radiation Hazard Study

The study in this section analyzes the potential RF human exposure levels caused by the Electro Magnetic (EM) fields of an Orbit AL-7103-Ka, 1.20 m antenna, operating with a maximum power at the flange of 20 Watts. The mathematical analysis performed below complies with the methods described in the FCC Office of Engineering and Technology (OET) Bulletin No. 65 (1985 rev. 1997) R&O 96-3 26 in "Evaluating Compliance with FCC Guideliness for Human Exposure to RF EM Fields, OET Bulletin 65 (Edition 97-01), Supplement B, FCC Office of Engineering & Technology, November 1997".

Maximum Permissible Exposure

There are two separate levels of exposure limits. The first applies to persons in the general population who are in an uncontrolled environment. The second applies to trained personnel in a controlled environment. According to 47 C.F.R. § 1.1310, the Maximum Permissible Exposure (MPE) limits for frequencies above 1.5 GHz are as follows:

* General Population / Uncontrolled Exposure: 1.0 mW/cm^2
* Occupational / Controlled Exposure: 5.0 mW/cm^2

The purpose of this study is to determine the power flux density levels for the earth station under study as compared with the MPE limits. This comparison is done in each of the following regions:

1. Far-field region
2. Near-field region
3. Transition region
4. The region between the feed and the antenna surface
5. The main reflector region
6. The region between the antenna edge and the ground

Input Parameters

The following input parameters were used in the calculations:

Input Parameter	Value	Unit	Symbol
Antenna Diameter	1.20	m	D
Antenna Transmit Gain	48.50	dBi	G
Transmit Frequency	29100.0	MHz	f
Antenna Feed Flange Diam.	6.00	cm	d
Power Input to the Antenna	20.00	Watts	P

Calculated Parameters

The following values were calculated using the above input parameters and the corresponding formula:

Calculated Parameter	Value	Unit	Symbol	Formula
Antenna Surface Area	1.13	m^2	A	$\pi D^2/4$
Area of Antenna Flange	28.3	cm^2	a	$\pi d^2/4$
Antenna Efficiency	0.53	real	η	$g\lambda^2/(\pi^2 D^2)$
Gain Factor	70795	real	g	10^(G/10)
Wavelength	0.010	m	λ	300/f

Behavior of EM Fields as a Function of Distance

The behavior of the characteristics of EM fields varies depending on the distance from the radiating antenna. These characteristics are analyzed in three primary regions: the near-field region, the far-field region and the transition region. Of interest also are the region between the antenna main reflector and the subreflector, the region of the main reflector area and the region between the main reflector and ground.

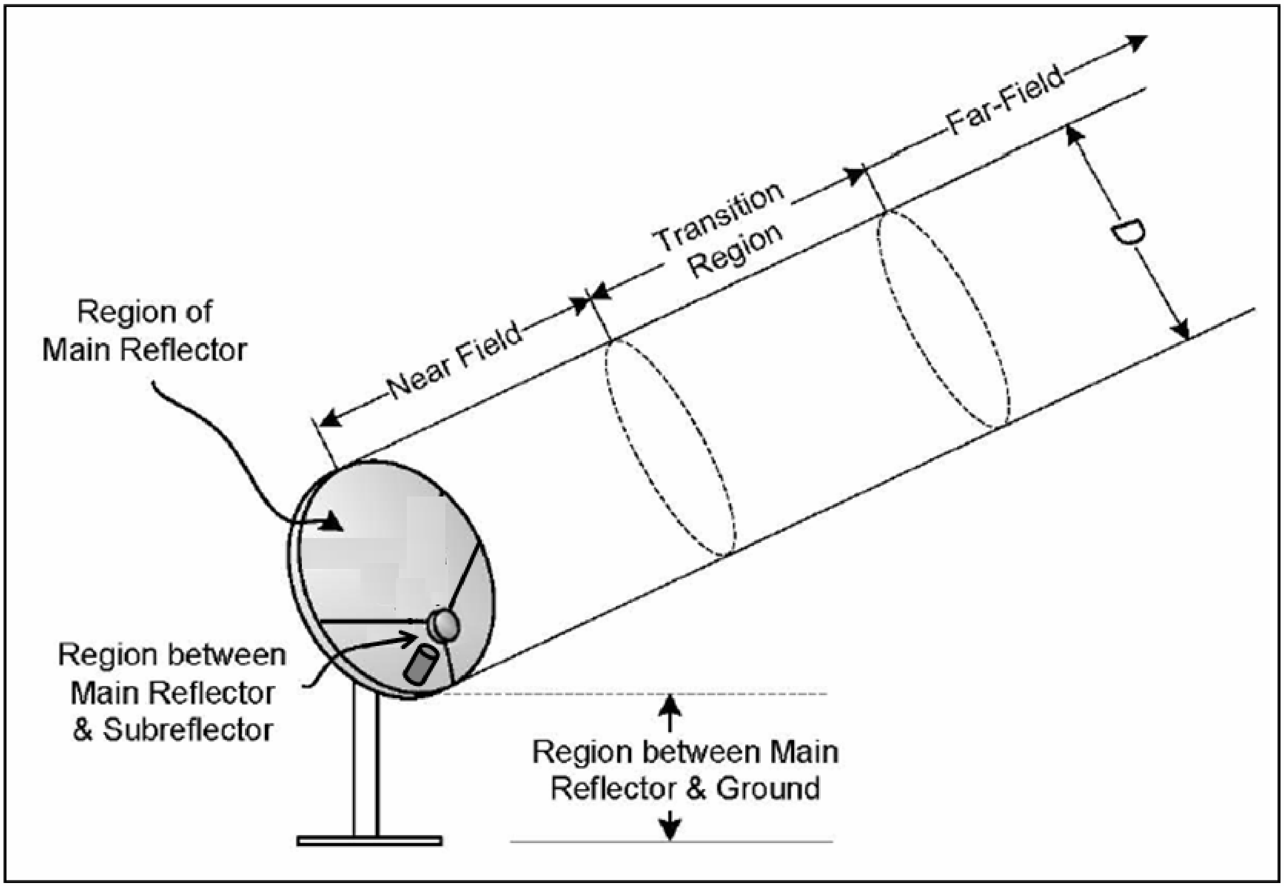

Figure 1. Electro-Magnetic Fields as a Function of Distance

For parabolic aperture antennas with circular cross sections, such as the antenna under study, the near-field, far-field and transition region distances are calculated as follows:

Calculated Parameter	Value	Unit	Symbol	Formula
Near-Field Distance	34.92	m	Rnf	$D^2/(4\lambda)$
Distance to Far-Field	83.81	m	Rff	$0.6D^2/\lambda$
Distance of Transition Region	34.92	m	Rt	Rt=Rnf

The distance in the transition region is between the near and far fields. Thus, Rnf ≤ Rt ≤ Rff . However, the power density in the transition region will not exceed the power density in the near-field. Therefore, for purposes of the present analysis, the distance of the transition region can equate the distance to the near-field.

Power Flux Density Calculations

The power flux density is considered to be at a maximum through the entire length of the near-field. This region is contained within a cylindrical volume with a diameter, *D*, equal to the diameter of the antenna. In the transition region and the far-field, the power density decreases inversely with the square of the distance. The following equations are used to calculate power density in these regions:

Calculated Parameter	Value	Unit	Symbol	Formula
Power Density in the Near-Field	3.74	mW/cm^2	Snf	$16\eta P/(\pi D^2)$
Power Density in the Far-Field	1.60	mW/cm^2	Sff	$gP/(4\pi Rff^2)$
Power Density in the Transition Region	3.74	mW/cm^2	St	Snf*Rnf/Rt

The region between the main reflector and the subreflector is confined to within a conical shape defined by the feed assembly. The most common feed assemblies are waveguide flanges. This energy is determined as follows:

Calculated Parameter	Value	Unit	Symbol	Formula
Power Density at the Feed Flange	2829.4	mW/cm^2	Sfa	4P/a

The power density in the main reflector is determined similarly to the power density at the feed flange; except that the area of the reflector is used.

Calculated Parameter	Value	Unit	Symbol	Formula
Power Density at Main Reflector	7.07	mW/cm^2	Ssurface	4P/A

The power density between the reflector and ground, assuming uniform illumination of the reflector surface, is calculated as follows:

Calculated Parameter	Value	Unit	Symbol	Formula
Power Density between Reflector & Gnd	1.77	mW/cm^2	Sg	P/A

Summary of Calculations

Table 1 below summarizes the calculated power flux density values for each region. In a controlled environment, the only regions that exceed FCC limitations are the regions between the main reflector and the sub-reflector as well as the main reflector region. These regions are only accessible by trained technicians who, as a matter of procedure, turn off transmit power before performing any work in these areas.

Table 1. Power Flux Density for Each Region:

Calculated Parameter	Unit	Exposure Limit	Exposure Limit
		Uncontrolled	Controlled
Power Densities	mW/cm²	Environment	Environment
		≤ 1 mW/cm²	≤ 5 mW/cm²
Far Field Calculation	1.60	Exceeds limitations	Satisfies FCC MPE
Near Field Calculation	3.74	Exceeds limitations	Satisfies FCC MPE
Transition Region	3.74	Exceeds limitations	Satisfies FCC MPE
Region between Main & Subreflector	2829.4	Exceeds limitations	Exceeds limitations
Main Reflector Region	7.07	Exceeds limitations	Exceeds limitations
Region between Main Reflector & Gnd	1.77	Exceeds limitations	Satisfies FCC MPE

In conclusion, the results show that the antenna, in a controlled environment, and under the proper mitigation procedures, meets the guidelines specified in § 1.1310 of the Regulations.