Approved by OMB
3060–0678

APPLICATION FOR EARTH STATION SPECIAL TEMPORARY AUTHORITY

APPLICANT INFORMATIONEnter a description of this application to identify it on the main menu:
Oil Comm STA – 30 days (Aug 2014)

1. Applicant

Name:	O3b Limited	**Phone Number:**	202–813–4026
DBA Name:		**Fax Number:**	
Street:	900 17th Street, NW, #300	**E–Mail:**	joslyn.read@o3bnetworks.com
City:	Washington	**State:**	
Country:	USA	**Zipcode:**	–
Attention:	Ms Joslyn Read		

GRANTED
International Bureau

File # SES-STA-20140819-00666
Call Sign none Grant Date 10-27-14
(or other identifier)
Term Dates
From 10-27-14 To: 11-26-14
Approved:

Applicant: O3b Limited
No Call Sign
File No.: SES-STA-20140819-00666

O3b Limited is granted special temporary authority (STA), for 30 days, beginning on October 27, 2014, to operate a fixed earth station located at the Oil Comm 2014 convention in Houston, TX, to communicate with its NGSO FSS system licensed by the United Kingdom. Operations pursuant to this STA are limited to testing and demonstration purposes only and is subject to the terms of its application, the Commission's Rules, and the following conditions.

1. Operations are limited to the following frequency bands and emissions:

Frequency Band	Emissions	Maximum E.I.R.P.	Maximum E.I.R.P. Density
28.35-28.4 GHz	54MG7D	61.5 dBW	21 dBW/4kHz
18.3-18.6 GHz	54MG7D		

2. Operations are on a secondary basis and O3b must not cause harmful interference to stations operating on a primary basis and must not claim protection from stations operating on a primary basis.

3. Grant of this authorization is without prejudice to any determination that the Commission may make regarding any pending or future application to communicate with O3b's NGSO FSS system.

4. Any action taken or expense incurred as a result of operations pursuant to this special temporary authority is solely at O3b's risk.

5. This action is issued pursuant to Section 0.261 of the Commission's rules on delegated authority, 47 C.F.R. § 0.261, and is effective immediately.

GRANTED
International Bureau

File # SES-STA-20140819-00666
Call Sign None Grant Date 10-27-14
(or other identifier)
Term Dates
From 10-27-14 To: 11-26-14
Approved

2. Contact

Name:	Joseph A. Godles	**Phone Number:**	202-429-4900
Company:	Goldberg Godles Wiener & Wright LLP	**Fax Number:**	202-429-4912
Street:	1229 19th Street, NW	E-Mail:	jgodles@g2w2.com
City:	Washington	**State:**	DC
Country:	USA	**Zipcode:**	20036 -2413
Attention:		**Relationship:**	Legal Counsel

(If your application is related to an application filed with the Commission, enter either the file number or the IB Submission ID of the related application. Please enter only one.)
3. Reference File Number or Submission ID

4a. Is a fee submitted with this application?

◉ If Yes, complete and attach FCC Form 159. If No, indicate reason for fee exemption (see 47 C.F.R.Section 1.1114).

○ Governmental Entity ○ Noncommercial educational licensee

○ Other(please explain):

4b. Fee Classification CGX – Fixed Satellite Transmit/Receive Earth Station

5. Type Request

○ Use Prior to Grant ○ Change Station Location ◉ Other

6. Requested Use Prior Date	
10/24/2014	

7. CityHouston	8. Latitude (dd mm ss.s h) 29 45 0.14 N
9. State TX	10. Longitude (dd mm ss.s h) 95 21 37.74 W

11. Please supply any need attachments.

Attachment 1: STA request Attachment 2: Attachment 3:

12. Description. (If the complete description does not appear in this box, please go to the end of the form to view it in its entirety.)

O3b Limited hereby requests special temporary authority to operate an earth station to be located at the Oil Comm 2014 convention in Houston, TX for the 30-day period between October 24, 2014 and November 23, 2014.

13. By checking Yes, the undersigned certifies that neither applicant nor any other party to the application is subject to a denial of Federal benefits that includes FCC benefits pursuant to Section 5301 of the Anti–Drug Act of 1988, 21 U.S.C. Section 862, because of a conviction for possession or distribution of a controlled substance. See 47 CFR 1.2002(b) for the meaning of "party to the application" for these purposes.

◉ Yes ○ No

14. Name of Person Signing Joslyn Read	15. Title of Person Signing Vice President, Regulatory Affairs

WILLFUL FALSE STATEMENTS MADE ON THIS FORM ARE PUNISHABLE BY FINE AND / OR IMPRISONMENT (U.S. Code, Title 18, Section 1001), AND/OR REVOCATION OF ANY STATION AUTHORIZATION (U.S. Code, Title 47, Section 312(a)(1)), AND/OR FORFEITURE (U.S. Code, Title 47, Section 503).

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THE FOREGOING NOTICE IS REQUIRED BY THE PAPERWORK REDUCTION ACT OF 1995, PUBLIC LAW 104–13, OCTOBER 1, 1995, 44 U.S.C. SECTION 3507.

REQUEST FOR SPECIAL TEMPORARY AUTHORITY

O3b Limited ("O3b"), pursuant to Section 25.120 of the Commission's rules, hereby respectfully requests special temporary authority ("STA") to operate an earth station to be located at the Oil Comm 2014 convention in Houston, TX ("Oil Comm Earth Station"). In this filing, O3b seeks a 30-day STA for the period between October 24, 2014 and November 23, 2014.

The Oil Comm Earth Station will be used for non-commercial testing and demonstration purposes, so that the capabilities of O3b's system can be exhibited at the Oil Comm 2014 trade show to a large number of representatives from the U.S. energy industry. The Oil Comm Earth Station will simulate diverse data applications on the O3b satellite system, including interactive video and audio teleconferencing, access to enterprise cloud services and very large file transfers. As discussed below, grant of the requested authority is in the public interest as it will allow O3b to test and demonstrate O3b services that could benefit the U.S. energy industry.

Test Details and Public Interest Showing

The Oil Comm Earth Station will communicate with O3b's Ka-band, Medium Earth Orbit, non-geostationary orbit ("NGSO") satellite system[1] and O3b's gateway earth station in Vernon, TX.[2]

The frequencies to be used by the Oil Comm Earth Station are:

- 28.35-28.4 GHz (uplink)
- 18.3-18.6 GHz (downlink)

The Oil Comm Earth Station will consist of two (2) 1.2m antennas manufactured by Orbit, and will operate with a ViaSat MEOLink modem. This Orbit 1.2m terminal is the same Orbit 1.2m terminal for which O3b has previously been granted authority to operate at the Coda Lab location in San Diego, California[3] and for which authority has been requested in the pending O3b application for a 30-day STA at the Data Technology Solution ("DTS") facility in Breaux Bridge, Louisiana.[4]

The Oil Comm Earth Station antennas will be mounted on a fixed pedestal in the parking lot of George R. Brown Convention Center in Houston. Although the pointing angle of the antennas will change as O3b's in-orbit satellites are tracked, the pedestal will remain stationary during the demonstration.

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[1] O3b's first four satellites were launched on June 25, 2013. O3b's second batch of four satellites was launched on July 10, 2014.

[2] *See* O3b Limited, Call Sign E130021, File No. SES-LIC-20130124-00089, granted June 20, 2013 ("O3b Texas License").

[3] *See* O3b Limited, File No. SES-STA-20131228-01209, filed December 23, 2013 ("O3b CODA STA Application"), and which was placed on Public Notice on April 2, 2014 and granted on April 29, 2014.

[4] *See* O3b Limited, File No. SES-STA-20140731-00627, filed July 31, 2014 ("O3b DTS STA Application").

Grant of this application will serve the public interest, convenience, and necessity by allowing O3b to show how its system can effectively deliver low latency, high throughput service to and from isolated resource extraction operations, such as offshore oil platforms.[5] This capability will allow for better connectivity and living conditions at these remote facilities while supporting the data flow for the safe and efficient extraction of important energy resources. O3b will demonstrate the system's capabilities for providing a variety of valuable communications, including voice and video conferencing and enterprise data applications.

The O3b System

O3b Limited operates a U.K.-authorized, non-geostationary orbit ("NGSO") Fixed-Satellite Service ("FSS") system in the Ka-band. In its initial FCC application, which sought authority for a gateway earth station located in Hawaii, O3b stated that it planned to operate eight NGSO satellites that would be spaced equally, *i.e.*, at 45° intervals.[6] The Commission granted this application.[7]

O3b filed a modification to its Hawaii application on August 14, 2014.[8] On August 15, 2014 the FCC granted O3b the flexibility to operate up to two of its eight NGSO satellites as in-orbit spares. The remaining satellites would be equally spaced in O3b's authorized orbital plane, and each in-orbit spare would be co-located with a non-spare satellite.[9]

Technical Parameters

O3b is attaching the following documents with the technical details of the operations proposed under the requested STA:

- Annex 1: FCC Form 312, Schedule B. O3b proposes to operate the Oil Comm Earth Station during this 30-day term in accordance with the parameters specified in the attached Schedule B.[10]
- Annex 2: Link Budgets. Representative links for the Oil Comm Earth Station are provided.

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[5] The Oil Comm Earth Station will not, for purposes of the STA, communicate with any offshore platforms or other offsite facilities. The only other points of communication will be O3b's space stations and O3b's gateway earth station in Vernon, Texas.

[6] *See* Application for Hawaii Earth Station, File No. SES-LIC-20100723-00952, Legal Narrative, Section III and Attachment A thereto (Technical Statement), Section A.2.

[7] *See* O3b Limited, Call Sign E100088, File No. SES-LIC-20130124-00089, granted Sept. 25, 2012 ("O3b Hawaii License").

[8] *See* O3b Limited, Call Sign E100088, File No. SES-STA-20140814-00656.

[9] No changes are being sought to the technical parameters identified in the licenses and STAs held by O3b and its customers. No changes are being made to O3b's Schedule S, either, but O3b notes that the number of satellites and phase angles in Section S4 and S5 of Schedule S will vary to the extent that O3b operates one or more in-orbit spare satellites.

[10] Although O3b is not currently seeking a regular license for the Oil Comm Earth Station, O3b is providing a Schedule B containing technical parameters for the Commission's ease of reference.

- Annex 3: Characteristics of the 1.2m Orbit Antenna are provided for the Commission's convenience. O3b previously submitted this information to the Commission.[11]

Further, O3b incorporates by reference the following technical parameters previously provided by O3b:

- Schedule S. In its application for a gateway earth station in Hawaii, O3b submitted a Schedule S describing its satellite system's technical characteristics.[12] The Schedule S correctly described the O3b satellite system for that application, and numerically enveloped all of the necessary parameters for future earth station applications. In order to assist the Commission in processing present and future applications, however, O3b subsequently provided a modified Schedule S that incorporates additional information submitted to the Commission since the Hawaii application was filed.[13] O3b will operate its Oil Comm Earth Station within the parameters described in O3b's modified Schedule S.
- U.S. Government Coordination. O3b has completed all necessary coordination with U.S. government satellite networks operating in Ka-band, including GSO and non-GSO networks, as well as their associated specific earth stations filed under 9.7A and 9.7B of the ITU Radio Regulations through other administrations. O3b has also completed coordination, according to US footnote 334 of the FCC table of frequency allocations, with the U.S. government, and this US334 coordination agreement specifically provides for additional earth stations in U.S. territory operating with O3b's satellites, such as the Oil Comm Earth Station. As a result, O3b's existing US334 coordination agreement covers the use of the Oil Comm Earth Station as requested in this application.
- Antenna Patterns. O3b previously submitted measured 30 GHz band antenna performance data for the 1.2m Orbit antenna to the Commission in the Coda Lab STA request[14] and the pending DTS STA request.[15]

Proposed Spectrum Use

O3b's proposed operations pose no risk of harmful interference to other lawfully authorized stations. As demonstrated below, the Oil Comm Earth Station will provide the requisite protection to geostationary orbit ("GSO") FSS stations operating in the bands proposed by O3b. Transmissions by O3b under the proposed STA will occur on a secondary, non-harmful interference basis, and O3b acknowledges that it will not be entitled to interference protection.

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[11] *See* O3b maritime earth station application, File No. SES-LIC-20130528-00455, Technical Attachment at A.6. *See also* O3b DTS STA Application.

[12] *See* Hawaii License.

[13] *See* Maritime Earth Station Answers, Call Sign E130098, File No. SES-AMD-20131025-01138, answer to question 6.

[14] *See* O3b Limited, File No. SES-STA-20131228-01209, filed December 23, 2013 ("O3b CODA STA Application"), and which was placed on Public Notice on April 2, 2014 and granted on April 29, 2014.

[15] *See* O3b DTS STA Application.

UPLINK

28.35-28.4 GHz – Secondary uplink band shared with primary GSO FSS stations.

In the 28.35–28.4 GHz band, there is a primary allocation for GSO FSS systems and a secondary allocation for NGSO FSS systems. O3b's Oil Comm Earth Station transmissions in this band will be consistent with their secondary status vis-à-vis GSO FSS transmissions. The Commission has allowed similar secondary use of frequencies in the Ka-band uplink allocated to GSO FSS on a primary basis where applicants are prepared to accept interference from primary operations and can demonstrate that their proposed operations are not likely to cause harmful interference to primary operations.[16] O3b agrees to both of these standards.

As a secondary user of the 28.35-28.4 GHz band in the United States, O3b makes no claim of protection from interference from U.S.-licensed GSO FSS networks in this band segment. Regarding O3b's uplink operations in the 28.35-28.4 GHz band, the ITU has developed uplink equivalent power flux density limits ("$EPFD_{up}$") limits to protect co-frequency GSO FSS operations from unacceptable interference from NGSO FSS systems operating in the same frequencies. Specifically, in accordance with Article 22 of the ITU Radio Regulations, if the applicable $EPFD_{up}$ limits are met, the NGSO FSS satellite system is considered to have met its obligations to protect GSO FSS networks from unacceptable interference. O3b demonstrated that its gateway located at Hawaii operating at the authorized power levels will meet the applicable ITU $EPFD_{up}$ limits in all frequency ranges where these limits apply, due to the inherent angular separation between the O3b and geostationary orbits when viewed from the Earth at latitudes away from the equator.[17]

The Oil Comm Earth Station is located further north in latitude than the Hawaii gateway,[18] which results in an even greater angular separation between the O3b and geostationary orbits as viewed from the Earth and an even greater assurance that the applicable ITU $EPFD_{up}$ limits will be met by O3b's proposed operations. The proposed Oil Comm Earth Station operations, therefore, also will meet the applicable ITU $EPFD_{up}$ limits. In any event, O3b confirms that its operations will be on a secondary basis relative to U.S.-licensed GSO FSS networks in the same band.

DOWNLINK

18.3-18.6 GHz – Non-conforming downlink band shared with primary GSO FSS stations.

The 18.3-18.6 GHz band is allocated in the United States on a primary basis to GSO FSS. In the 18.3-18.6 GHz downlink band, the ITU has developed downlink equivalent power flux density ("$EPFD_{down}$") limits to protect GSO FSS networks from unacceptable interference from NGSO FSS systems operating in the same frequencies. Specifically, in accordance with Article 22 of the ITU Radio Regulations, if the applicable $EPFD_{down}$ limits are met, the NGSO FSS satellite system is considered to

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[16] *Northrop Grumman Space & Missions Systems Corporation*, 24 FCC Rcd 2330, at ¶¶ 72-73 (Int'l Bur. 2009); *contactMEO Communications*, LLC, 21 FCC Rcd 4035, at ¶¶ 23-24, (Int'l Bur., 2006).

[17] O3b Hawaii License Application, FCC File No. SES-LIC-20100723-00952, *Technical Attachment* at A.10.1.

[18] The O3b Hawaii gateway latitude is 21° 40' 17.8" N; the Oil Comm Earth Station latitude is 29° 45'0.14" N.

have met its obligations to protect GSO FSS networks from unacceptable interference. O3b confirms that its system will meet the applicable ITU $EPFD_{down}$ limits in all frequency ranges where these limits apply.[19]

As an example of how these limits will be satisfied, O3b provided $EPFD_{down}$ calculations for transmissions to its Hawaii gateway earth station.[20] O3b also showed how the $EPFD_{down}$ limits can be satisfied at all latitudes.[21] Compliance with the $EPFD_{down}$ limits is more easily achieved in the case of transmissions to O3b's Oil Comm Earth Station than it is in the case of transmissions to O3b's Hawaii earth station. O3b is able to satisfy the limits by taking advantage of the inherent angular separation between the O3b and GSO orbits when viewed from the surface of the Earth at latitudes away from the equator,[22] and O3b's Oil Comm Earth Station will be located further from the equator than O3b's Hawaii earth station. The Oil Comm Earth Station location, therefore, presents an even stronger case for non-interference to GSO FSS networks than the Hawaii gateway location.

Conclusion

The requested STA will allow O3b to evaluate and demonstrate the O3b system's operational capabilities and will not result in harmful interference to other authorized spectrum users. Accordingly, and for good cause shown, O3b respectfully requests that its STA be granted in time for it to commence testing under this 30-day STA request on October 24, 2014.

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[19] *See* ITU Radio Regulations, Article 22. *See* also O3b Hawaii License Application, FCC File No. SES-LIC-20100723-00952, *Technical Attachment* at A.10.1 for a discussion of O3b's compliance with the operational limits in Article 22 of the ITU Radio Regulations. *See* also Letter from Brian D. Weimer, to Marlene H. Dortch, in re O3b Application for Hawaii Earth Station, File No. SES-LIC-20100723-00952 (Apr. 22, 2011), Annex A.

[20] O3b Hawaii License Application, FCC File No. SES-LIC-20100723-00952, *Technical Attachment* at A.10.1.

[21] *See id.*

[22] *See id.*

ANNEX 1 – Form 312, Schedule B

The Form 312, Schedule B is provided on the following pages.

SATELLITE EARTH STATION AUTHORIZATIONS
FCC Form 312 - Schedule B:(Technical and Operational Description)

Location of Earth Station Site

E1: Site Identifier: George R. Brown Convention Center Parking Lot		E5. Call Sign: N/A	
E2: Contact Name: Mike Quiroz		E6. Phone Number: 337-332-4347	
E3. Street:1300 Chenevert Street		E7. City: Houston	
		E8. County: Harris	
E4. State	TX	E9. Zip Code: 77010	
E10. Area of Operation:	Fixed		
E11. Latitude:	29 ° 45 ' 0.14 " N		
E12. Longitude:	95 ° 21 ' 37.74 " W		
E13. Lat/Lon Coordinates are:		○ NAD-27	◉ NAD-83
E14. Site Elevation (AMSL):		14 meters	N/A

E15. If the proposed antenna(s) operate in the Fixed Satellite Service (FSS) with geostationary satellites, do(es) the proposed antenna(s) comply with the antenna gain patterns specified in Section 25.209(a) and (b) as demonstrated by the manufacturer's qualification measurement? If NO, provide a technical analysis showing compliance with two-degree spacing policy.	○ Yes	No	N/A
E16. If the proposed antenna(s) do not operate in the Fixed Satellite Service (FSS), or if they operate in the Fixed Satellite Service (FSS) with non-geostationary satellites, do(es) the proposed antenna(s) comply with the antenna gain patterns specified in Section 25.209(a2) and (b) as demonstrated by the manufacturer's qualification measurements?	◉ Yes	No	N/A
E17. Is the facility operated by remote control? If YES, provide the location and telephone number of the control point.	○ Yes		◉ No
E18. Is frequency coordination required? If YES, attach a frequency coordination report as	Yes		◉ No
E19. Is coordination with another country required? If YES, attach the name of the country(ies) and plot of coordination contours as	Yes		◉ No
E20. FAA Notification - (See 47 CFR Part 17 and 47 CFR part 25.113(c)) Where FAA notification is required, have you attached a copy of a completed FCC Form 854 and or the FAA's study regarding the potential hazard of the structure to aviation? FAILURE TO COMPLY WITH 47 CFR PARTS 17 AND 25 WILL RESULT IN THE RETURN OF THIS APPLICATION.	○ Yes		◉ No

POINTS OF COMMUNICATION

Satellite Name:O3B-A | O3B-A | Eq. NGSO If you selected OTHER, please enter the following:	
E21. Common Name:	E22. ITU Name:
E23. Orbit Location:	E24. Country:

POINTS OF COMMUNICATION (Destination Points)

E25. Site Identifier:

E26. Common Name:	E27. Country:	

ANTENNA

Site ID	E28. Antenna Id	E29. Quantity	E30. Manufacturer	E31. Model	E32. Antenna Size	E41/42. Antenna Gain Transmit and/or Receive (___dBi at_____GHz)
Oil Comm Convention	Orbit 1.2m	2	Orbit Communications	AL-7103-Ka	1.2	45 dBi at 19.2
						48.0 dBi at 28.3 GHz

E28. Antenna Id	E33/34. Diameter Minor/Major(meters)	E35. Above Ground Level (meters)	E36. Above Sea Level (meters)	E37. Building Height Above Ground Level (meters)	E38. Total Input Power at antenna flange (Watts)	E39. Maximum Antenna Height Above Rooftop (meters)	E40. Total EIRP for al carriers (dBW)
Orbit 1.2m	1.2/1.2	14	16	0.0	20.0	2.0	60.5

FREQUENCY

E28. Antenna Id	E43/44. Frequency Bands(MHz)	E45. T/R Mode	E46. Antenna Polarization(H,V,L,R)	E47. Emission Designator	E48. Maximum EIRP per Carrier(dBW)	E49. Maximum EIRP Density per Carrier(dBW/4kHz)
Orbit 1.2m	18300 - 18600	R	Left and Right Circular	54MG7D	45.6	4.3
E50. Various Modulations up to 32APSK; Digital Data Link						
Orbit 1.2m	28350 - 28400	T	Left and Right Circular	54MG7D	61.5	21
E50. Various Modulations up to 32APSK; Digital Data Link						

FREQUENCY COORDINATION

E28. Antenna Id	E51. Satellite Orbit Type	E52/53. Frequency Limits(MHz)	E54/55. Range of Satellite Arc E/W Limit	E56. Earth Station Azimuth Angle Eastern Limit	E57. Antenna Elevation Angle Eastern Limit	E58. Earth Station Azimuth Angle Western Limit	E59. Antenna Elevation Angle Western Limit	E60. Maximum EIRP Density toward the Horizon(dBW/4kHz)
Orbit 1.2	Non-Geostationary	18300 - 18600	NON-GEO	118.7	10.0	205.5	10	--
Orbit 1.2	Non-Geostationary	28350 - 28400	NON-GEO	118.7	10.0	205.5	10	-39.8

REMOTE CONTROL POINT LOCATION

E61. Call Sign NOTE: Please enter the callsign of the controlling station, not the callsign for which this application is being filed.			E65. Phone Number
E62. Street Address			
E63. City	E67. County	E64/68. State/Country	E66. Zip Code

ANNEX 2 – Link Budgets

Representative link budgets for the 1.2m Orbit antenna at the DTS Earth Station are provided on the following two pages. Please see the chart below for reference.

Link Description	**Carrier**	**MODCOD**	**Table #**
1.2m in Houston	54MHz by 54 MHz	16APSK 2/3rds FWD QPSK 2/3rds RTN	1,2

O3b Network Link Analysis - Tier 1 Service For Houston, United States			
Link Budget Creator - Rev 3.2.9: July 17, 2014		**Tier 1**	**Tier 1**
Ground Parameter		**Teleport**	**Telco**
Location		Vernon (RHCP), United States	Houston, United States
Latitude	(°)	34.2	29.8
Longitude (East)	(°)	260.7	264.6
E/S Range to SV	(km)	10824.6	10792.4
E/S Elevation to SV	(°)	21.5	21.9
E/S Altitude	(km)	0.3	0.0
SV Beam Identifier	(#)	14	
Minutes Into Pass (Sample #1)	(Min)	0:0	
Telco Spot Beam Off-Angle	(°)	0.20	
Telco Spot Beam Diameter	(km)	66.00	
Maximum Roundtrip Latency	(msec)	144.21	
Modulation Parameters		**Forward**	**Return**
Enter Receiver	Type	DVB-S2	
Modem Overhead	(%)	1.0%	
Number of Carriers per Channel	(#)	1	
Available Bandwidth	(Hz)	54,000,000	
Channel Symbol Rate	(sps)	45,000,000	
Channel Modulation Type		16APSK	
Channel FEC Rate		0.75	
Channel Spectral Efficiency	(bits/Sym)	3.00	
Channel Throughput (100% / 100% of Full Rate)	(bps)	133,650,000	
Uplink		**Forward**	**Return**
E/S Tx Channels per HPA	(#)	5	
E/S Tx Carrier Frequency	(MHz)	28,709	
E/S Tx HPA Power Level	(W)	125	
E/S Tx OBO	(dB)	-14.00	
E/S Tx Post-HPA Losses	(dB)	-2.24	
E/S Tx Antenna Gain (7.3 m / 1.2 m)	(dB)	65.03	
E/S Tx EIRP Per Channel	(dBW)	62.77	
E/S Tx Pointing Loss	(dB)	-0.50	
E/S Tx RF Link Availability	(%)	75.000	
E/S Tx Atmospheric Losses	(dB)	-1.66	
E/S Tx Spreading Loss	(dB)	-151.68	
Satellite		**Forward**	**Return**
SV Number of Channels per HPA	(#)	1	
SV Rx G/T	(dB/K)	5.58	
SV Rx Power Per Tier	(dBW)	-136.12	
SV Rx Flux Density Per Tier	(dBW/m^2)	-91.08	
SV Tx OBO (ALC / FGM)	(dB)	-3.80	
SV Tx Post-TWTA Losses	(dB)	-1.50	
SV Tx Antenna Gain	(dBi)	31.92	
SV Tx EIRP Per Channel/Carrier	(dBW)	44.75	
SV Tx Pointing Loss	(dB)	0.00	
Downlink		**Forward**	**Return**
E/S Rx Carrier Frequency	(MHz)	18,909	
E/S Rx Wavelength	(m)	0.015854	
E/S Rx RF Link Availability	(%)	70	
E/S Rx Atmospheric Losses	(dB)	-1.35	
E/S Rx Pointing Loss	(dB)	-1.00	
E/S Rx Antenna Gain (1.2 m / 7.3 m)	(dBi)	42.7	
E/S Rx Effective G/T	(dB/K)	18.8	
E/S Rx Power Per Channel	(dBW)	-113.5	
E/S Rx Flux Density Per Channel	(dBW/m^2)	-109.3	
Total Link		**Forward**	**Return**
Carrier / Noise Bandwidth	(dB)	76.53	
Carrier / Noise Uplink	(dB)	15.95	
Carrier / Noise Downlink	(dB)	14.67	
Carrier / Intermodulation Im (C/Im)	(dB)	29.35	
(C/N) - Total Actual	(dB)	11.95	
(C/N) - Total Required	(dB)	11.40	
(E_b/N_o) - Total Actual	(dB)	7.18	
(E_b/N_o) - Total Required	(dB)	6.63	
Excess Margin	**(dB)**	**0.55**	
Fade Margin	**(dB)**	**14.55**	

#2

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.

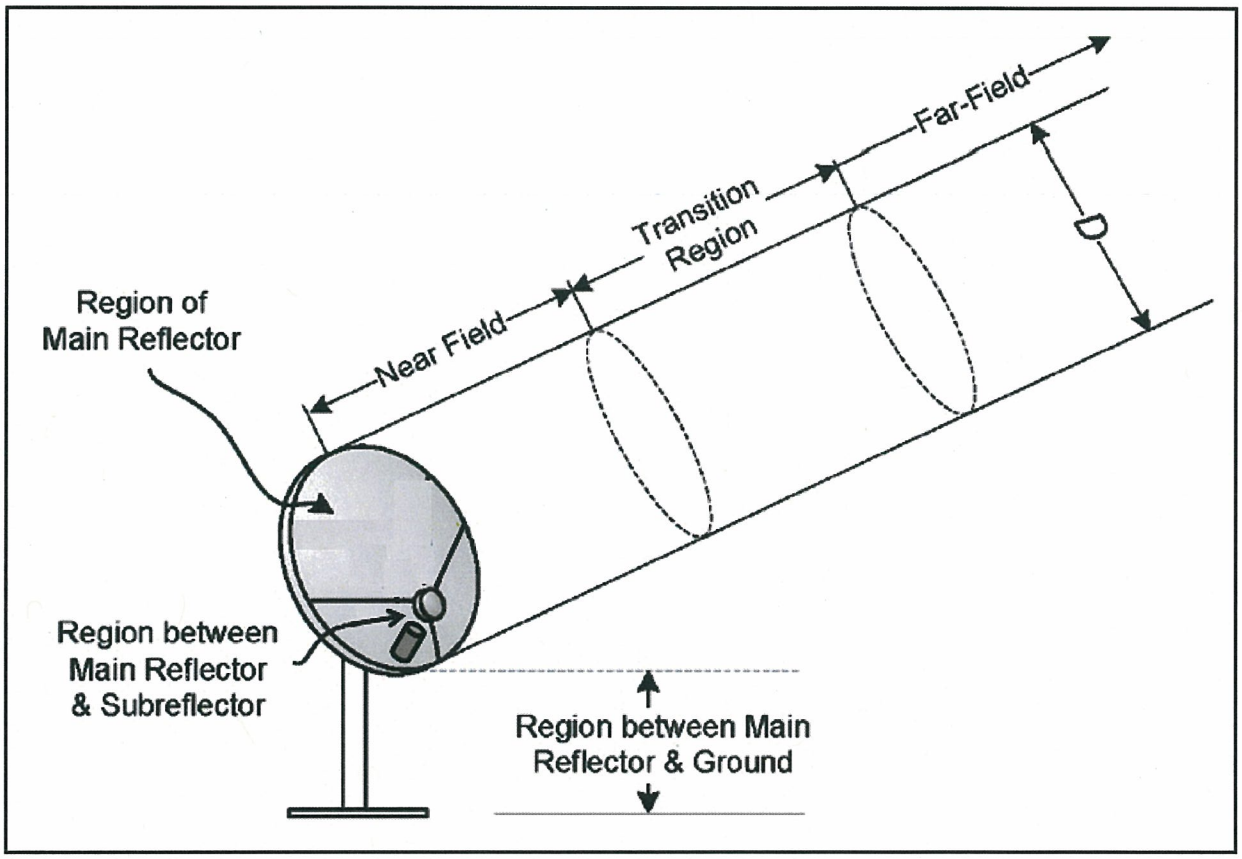

Figure 1. Electro-Magnetic Fields as a Function of Distance

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/cm^2	Environment	Environment
		≤ 1 mW/cm^2	≤ 5 mW/cm^2
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.