

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 in Ceiba, Puerto Rico (“PR 2.4m Earth Station”) that will communicate with its satellite system, which has been authorized to serve the U.S. market.¹ In this filing, O3b seeks a 30-day STA for the period between October 11, 2017 and November 10, 2017.

The PR 2.4m Earth Station will be integrated into a temporary system with other operators to help restore local wireless service in Puerto Rico. As discussed below, grant of the requested authority is in the public interest as it will allow O3b to provide services that will benefit the population in Puerto Rico as it recovers from the recent hurricanes and rebuilds its telecommunications infrastructure.

Operational Details and Public Interest Showing

The PR 2.4m Earth Station will communicate with O3b’s UK-authorized, Ka-band, Medium Earth Orbit, non-geostationary satellite orbit (“NGSO”) Fixed-Satellite Service (“FSS”) system and O3b’s gateway earth station in Hortlandia, Brazil.

The frequencies to be used by the PR 2.4m Earth Station are:

- 27.6-28.4 GHz (uplink)
- 17.8-18.6 GHz (downlink)

The PR 2.4m Earth Station will consist of two (2) 2.4-m AvL antennas. O3b has previously been granted a license to operate an identical 2.4-m earth station at the O3b facility in Manassas, Virginia.²

In the aftermath of Hurricane Maria, Puerto Rico lost most of its wireless coverage across the island, leaving residents without cellphone service.³ In recent reports, the Commission estimates that the vast majority of cell sites remain out of service.⁴ Grant of this STA request will serve the public interest because the PR 2.4m Earth Station will be used to bring local wireless networks in Puerto Rico online while the terrestrial infrastructure is being repaired.

¹ See Applications of O3b Limited, Call Sign S2935, IBFS File Nos. SAT-LOI-20141029-00118 and SAT-AMD-20150115-00004 (the “U.S. Market Access Petition”), granted Jan. 22, 2015 (the “Market Access Grant”).

² *O3b Limited*, Call Sign E160129, File Nos. SES-LIC-20160712-00640 (granted Nov. 7, 2016) (the “Manassas AvL Earth Station”).

³ See Elizabeth Weise, *Puerto Rico is nearly entirely cut off from cellphone service, leading to low tech solutions*, (Sept. 28, 2017), <https://www.usatoday.com/story/tech/2017/09/28/puerto-rico-cell-phone-service-tmobile-att-hurricane/710775001/>.

⁴ See, e.g., “Communications Status Report for Areas Impacted by Hurricane Maria,” (rel. Oct. 7, 2017), available at: https://apps.fcc.gov/edocs_public/attachmatch/DOC-347131A1.pdf.

Earth Station Technical Parameters

The following documents containing technical details of the operations proposed under the requested STA are attached:

- Annex 1: FCC Form 312, Schedule B. O3b proposes to operate the PR 2.4m Earth Station during this 30-day term in accordance with the parameters specified in the attached Schedule B.⁵
- Annex 2: Characteristics of the 2.4m AvL Antenna are provided for the Commission's convenience. O3b previously submitted this information to the Commission.⁶

Further, O3b incorporates by reference the information regarding the technical parameters of the O3b satellite system that O3b submitted with its U.S. Market Access Petition as well as the 28 GHz band antenna performance data for the 2.4m antenna O3b supplied to the Commission in a previous application.⁷

Proposed Spectrum Use

Operations of O3b's proposed PR 2.4m Earth Station in shared bands are consistent with the Commission's rules and policies. O3b addresses each of these bands below.

Uplink

27.6 - 28.35 GHz – Secondary uplink band shared with primary terrestrial stations

The 27.6 - 28.35 GHz uplink band is allocated to the Upper Microwave Flexible Use Service ("UMFUS") on a primary basis. FSS operations are allocated on a secondary basis in the same band. Accordingly, O3b's proposed operations in this band must not cause harmful interference to primary UMFUS stations.

O3b does not seek a protected interference zone for its operations in this band. O3b will operate the PR 2.4m Earth Station on a secondary basis and immediately shut down transmit transmissions in the event of harmful interference to primary terrestrial operations.

However, as noted below, O3b requests a waiver of the coordination requirements articulated in 47 C.F.R. 25.136(c)(4) and 47 C.F.R. 101.103(d). The required coordination report would take a significant amount of time to procure, and delivering the O3b service in a timely manner is critical to the population of Puerto Rico. Additionally, due to the state of the terrestrial infrastructure in Puerto Rico, it is unlikely that there are any in-band terrestrial operations at this time with which O3b transmissions could interfere.

⁵ O3b is providing a Schedule B containing technical parameters for the Commission's convenience.

⁶ See Application for Manassas AvL Earth Station, Annex 2.

⁷ See Application for Manassas AvL Earth Station, Annex 6.

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

The U.S. Market Access Grant authorized the O3b satellite system to use the 28.35 - 28.4 GHz band, which has a primary allocation for GSO FSS systems, pursuant to the secondary allocation for NGSO FSS systems. O3b's PR 2.4m Earth Station transmissions in this band will be consistent with their secondary status vis-à-vis GSO FSS transmissions.

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. O3b's uplink operations in the 28.35 - 28.4 GHz band comply with applicable ITU equivalent power flux density ("EPFD_{up}") limits designed to protect co-frequency GSO FSS operations from unacceptable interference from NGSO FSS systems operating in the same frequencies. O3b previously demonstrated that earth stations operating above 17.9°N when 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.⁸ The PR 2.4m Earth Station is located further north in latitude than 17.9°N,⁹ 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.

Downlink

17.8 - 18.6 GHz

The 17.8 - 18.3 GHz frequency band is allocated on a primary basis to the terrestrial fixed service. The 18.3 - 18.6 GHz band is allocated in the United States on a primary basis to GSO FSS. O3b's space stations transmit in this band pursuant to the Market Access Grant, and operations of the space stations with the PR 2.4m Earth Station will comply with the conditions specified in that authorization.¹⁰

Waivers Requested

Waiver of Coordination Requirements in Sections 25.136(c)(4) and 101.103(d)

FSS earth stations in the 27.6-28.35 GHz band are typically required to coordinate with primary terrestrial licensees pursuant to 47 C.F.R. §§ 25.136 and 101.103(d). O3b requests a temporary waiver of this requirement in order to provide its service in the above-mentioned time frame.

It is in the public interest for the Commission to waive the coordination requirement for short term O3b operations in Puerto Rico in the 27.5-28.35 GHz band. Local terrestrial operators are not likely to be providing service in Puerto Rico during the term of this STA under the current circumstances. O3b

⁸ See *O3b Limited*, Call Sign E140101, File No. SES-LIC-20141001-00781 (granted June 8, 2015) ("O3b Blanket License Application"), Technical Annex at A7 (demonstrating that earth stations communicating with the O3b system can protect GSO systems down to 17.9° N).

⁹ The PR 2.4m Earth Station latitude is 18° 14' 24" N.

¹⁰ Market Access Grant, Paragraph 4.

is in the process of seeking a coordination report for extended operations in Puerto Rico, and will cease transmissions in the event that it receives a complaint of harmful interference.

Conclusion

The requested STA will allow O3b to help connect wireless services for the people of Puerto Rico as the local terrestrial networks are being repaired. 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 on October 11, 2017.

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: Ceiba E2: Contact Name: Network Operations Center E3: Street: 12811 Randolph Ridge Lane	E5. Call Sign: E6. Phone Number: 703-366-1500 E7. City: Ceiba
E4. State: PR E10. Area of Operation: Fixed E11. Latitude: 18° 14' 24" N E12. Longitude: 65° 37' 48"W E13. Lat/Lon Coordinates are: E14. Site Elevation (AMSL): 7'	E8. County: NA E9. Zip Code: 00735 <input type="radio"/> NAD-27 <input checked="" type="radio"/> NAD-83 <div style="text-align: right;">N/A</div>
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.	<input type="radio"/> Yes <input type="radio"/> 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?	<input checked="" type="radio"/> Yes <input type="radio"/> No N/A
E17. Is the facility operated by remote control? If YES, provide the location and telephone number of the control point.	<input type="radio"/> Yes <input checked="" type="radio"/> No
E18. Is frequency coordination required? If YES, attach a frequency coordination report as	<input checked="" type="radio"/> Yes <input type="radio"/> No
E19. Is coordination with another country required? If YES, attach the name of the country(ies) and plot of coordination contours as	<input type="radio"/> Yes <input checked="" type="radio"/> 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.	<input type="radio"/> Yes <input checked="" type="radio"/> No

POINTS OF COMMUNICATION

Satellite Name: Eq. 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:
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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)		
Randolph Ridge	AvL2.4m	2	AvL Technologies	2.4MO3 B	2.4m	Receive Gain (51.0 dBi at 18.56 GHz)		
						Transmit Gain (54.7 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 all carriers (dBW)
AvL2.4m	2.4/2.4		1.0	2	0	40	0	73.0

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 ERIP Density per Carrier(dBW/4kHz)
AvL2.4m	17800 18600	R	Left and Right Circular	1M00G7D	0.0	0.0
E50. Modulation and Services QPSK, 8PSK, 16PSK, 32PSK and Internet						
AvL2.4m	18800 19300	R	Left and Right Circular	1M00G7D	0.0	0.0
E50. Modulation and Services QPSK, 8PSK, 16PSK, 32PSK and Internet						
AvL2.4m	17800 18600	R	Left and Right Circular	216MG7D	0.0	0.0
E50. Modulation and Services QPSK, 8PSK, 16PSK, 32PSK and Internet						
AvL2.4m	18800 19300	R	Left and Right Circular	216MG7D	0.0	0.0
E50. Modulation and Services QPSK, 8PSK, 16PSK, 32PSK and Internet						
AvL2.4m	27600 28400	T	Left and Right Circular	1M00G7D	70.0	38.9
E50. Modulation and Services QPSK, 8PSK, 16PSK, 32PSK and Internet						
AvL2.4m	28600 29100	T	Left and Right Circular	1M00G7D	70.0	38.9
E50. Modulation and Services QPSK, 8PSK, 16PSK, 32PSK and Internet						
AvL2.4m	27600 28400	T	Left and Right Circular	216MG7D	70.0	22.7
E50. Modulation and Services QPSK, 8PSK, 16PSK, 32PSK and Internet						
AvL2.4m	28600 29100	T	Left and Right Circular	216MG7D	70.0	22.7
E50. Modulation and Services QPSK, 8PSK, 16PSK, 32PSK and Internet						

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)
AvL2.4m	Non-Geostationary	17800 18600	0.0	121.0	7.0	239.0	7.0	0.0
AvL2.4m	Non-Geostationary	18800 19300	0.0	121.0	7.0	239.0	7.0	0.0
AvL2.4m	Non-Geostationary	27600 28400	0.0	121.0	7.0	239.0	7.0	-23.3
AvL2.4m	Non-Geostationary	28600 29100	0.0	121.0	7.0	239.0	7.0	-23.3

REMOTE CONTROL POINT LOCATION

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

ANNEX 2 –Terminal Characteristics

Model 2470

2.4 m Motorized FlyAway Antenna



The AvL 2.4 m MEO Tracking Ka-Band Antenna offers the power of O3b's high throughput, low latency connectivity in a transportable design.

Overview

AvL's 2.4 m MEO tracking Ka-Band antenna is a transportable, rapid-deploy, tactical terminal with a geared drive for continuous operation. The antennas operate in tandem pairs with make-before-break communications, and are designed to be transported in durable transit cases and to be set-up and on-the-air within 120 minutes.

Features

- Designed for high duty cycle MEO satellite tracking
- Make-before-break handover on two antenna systems
- Within 120 minutes set-up
- Standard RX/TX feed
 - 2-Port Ka-Band Commercial (CP)
- Optional RX/TX feeds
 - 2- or 4-Port Ka-Band (MIL or Commercial) (CP or LP) (WGS)
 - 2 or 4-Port Ku-Band Precision (standard Cross-Pol comp.)
 - 2 or 4-Port Ku-Band Mode-Match (enhanced Cross-Pol comp.)
 - 2- or 4-Port C-Band CP
 - 2- or 4-Port C-Band LP
 - 2-Port C-Band Troposcatter
 - 2-Port X-Band with optional RX/TX reject filter kit
- 2.4 m segmented 9-piece carbon fiber reflector
- Other options
 - Single or Dual antenna systems available
 - Vehicle or Trailer or Pole Mount options available
 - BUC/LNB integration
- Standard colorization (optional colors available):
 - White
 - OD Green
 - Desert Tan
- Antenna size options:
 - 1.8 m, 2.0 m, 2.4 m
- Operates with O3b Networks, virtually all GEO SatCom systems



Mechanical

Az/El Drive	Motorized Dual Slew Drive Positioner
Polarization Drive System	Motorized rotation of feed (LP only)
Reflector Construction	Segmented 9-piece carbon fiber
Axis Travel	
Azimuth	350 degrees
Elevation (operational)	5-90 degrees
Polarization	±95° Adjustable to within 1° (LP – Feeds)
Az/El Speed	
Slewing/Deploying/ Tracking	4 degrees/second. Az; 1 degree/second El
Motors	24VDC variable speed, constant torque
Interfaces	
TX Input	Waveguide flange (cover) @ Feed; 50 ohm connector @ Lower I/O panel
RX Input	Waveguide flange (cover) @ Feed; 50 ohm connector @ Lower I/O panel
BUC (& other CFE) Mounting	Directly to feed OMT or on the feed boom
Electrical	48VDC Input (28VDC optional) (Power supply and cord optional)
Manual/Emergency Drive	Manual adjustment with hand crank for each axis available

Configuration	Five rugged, weather-resistant plastic cases
Motorized Positioner and Cables	30.1 x 30.1 x 16.4 inches, 170 lbs. (77 x 77 x 42 cm, 77 kg)
Feed Mast, Ref. Supports	62.3 x 27.3 x 21.6 inches, 150 lbs. (158 x 69 x 55 cm, 68 kg)
Tripod	62.3 x 27.3 x 30.6 inches, 170 lbs. (158 x 69 x 78 cm, 77 kg)
Feed, Boom, and BUC*	62.3 x 27.3 x 21.6 inches, 145 lbs. (158 x 69 x 55 cm, 66 kg), *weight varies based on SSPA or BUC
Reflector Panels	38.7 x 38.7 x 25.0 inches, 155 lbs. (99 x 99 x 64 cm, 70 kg)

Environmental

Wind – Survival (anchored)	80 mph in zenith stowed position				
Wind – Operational					
Without Anchoring	15 mph				
With Anchoring	35 mph gusting to 45 mph				
Pointing Loss:					
Ka-Band RX	<table border="1"> <tr> <th>Typical</th> <th>Max</th> </tr> <tr> <td>1.0 dB</td> <td>2.0 dB</td> </tr> </table>	Typical	Max	1.0 dB	2.0 dB
Typical	Max				
1.0 dB	2.0 dB				
Temperature:					
Operational	-22 °F to 125 °F (-30 °C to 52 °C)				
Survival	-40 °F to 140 °F (-40 °C to 60 °C)				

RF/Electrical

Feed Type ⇨	Std. 2-Port Ka-Band Commercial		Opt. 2-Port Precision Ku-Band (DBS-Bands available upon request)		Opt. 2-Port C-Band		Opt. 2-Port X-Band (Military/WGS)		Opt. 2-Port Ka-Band (Commercial/Military)	
	Receive	Transmit	Receive	Transmit	Receive	Transmit	Receive	Transmit	Receive	Transmit
RF Parameter ⇩										
Frequency Range (GHz)	17.85-19.30	27.65-29.07	10.95-12.75	13.75-14.5	3.625 - 4.20	5.85 - 6.425	7.25 7.75	7.9 - 8.4	19.2 - 21.2 (military) or 17.7 - 20.2 (commercial)	29.0 - 31.0 (military) or 27.5 - 30.0 (commercial)
Polarization Configuration	RHCP or LHCP Co-pol		Orthogonal Linear, Optional Co-pol Linear		Linear or Circular Options		Circular RHCP or LHCP		Circular or Linear	
Gain (dBi @ mid-band or GHz)	51.0	54.5	47.3	48.8	37.7	41.6	43.3*	44.1*	51.5 @ 19.7 52.0 @ 20.7	54.9 @ 29.5 55.2 @ 30.5
VSWR	1.30:1	1.30:1	1.30:1	1.30:1	1.30:1	1.30:1	1.30:1	1.30:1	1.30:1	
-3dB Beam width (mid-band)	0.5'	0.3'	0.8'	0.6'	2.3'	1.5'	1.2'	1.1'	0.4'	0.3'
Radiation Pattern Compliance	FCC 25.209, ITU-R 5.580-6		FCC 25.209, ITU-R 5.580-6, IESS 208		FCC 25.209, ITU-R 5.580-6, IESS 207		MIL-STD-188-164A		FCC 25.209, MIL-STD-188-164A	
Ant. Noise Temp. (mid-band or GHz, 20° el)	104° K	-	61° K	-	49° K	-	59° K	-	104° K @ 20.7	-
Power Handling Capability	-	250 watts per port	-	500 watts per port	-	1000 watts per port	-	1000 watts per port	-	250 watts per port
G/T (dB/°K) with LNB, @ Mid-band, clear horizon	27.9 (with 100° K LNB)	-	26.5 (with 50° K LNB)	-	19.3 (with 20° K LNB)	-	22.7 (with 55° K LNB)	-	28.9 @ 20.7 (with 100° K LNB)	
Axial Ratios										
On Axis (minimum)	1.8 dB (CP only)	1.8 dB (CP only)	-	-	2.3 dB (CP only)	1.3 dB (CP only)	1.21 dB (CP only)	2.0 dB (CP only)	1.5 dB (CP only)	1.0 dB (CP only)
Cross-Pol Isolation										
On-axis	-	-	35 dB	35 dB	35 dB / 30 dB	35 dB / 30 dB	-	-	-	-
Within Pointing Cone	-	-	28 dB standard	30 dB standard	-	-	-	-	-	-
Within Pointing Cone	-	-	25 dB MM option	35 dB MM option	-	-	-	-	-	-
Feed Port Isolation – TX to RX (dB)	30	80 (incl. filter)	35	80 (incl. filter)	65	105 (incl. filter)	115 (incl. filter)	115 (incl. filter)	30	80 (incl. filter)

Controller

Controller ⇨	AvL AAQ
Features	AvL one button auto-acquisition of selected satellites, including peaking and optimization of cross pol. Internal movement detector and automatic stow. Optional hand-held control and separate power supply. Certified for auto-commissioning on most satellite services.
Size	Embedded ACU with separate 1 Rack Unit Controller Interface Panel (CIP) power supply with LCD and keypad. 250 W and 500 W (1.6m and larger antennas) versions available.
CIP Input Power	120/240 VAC 60/50 Hz, 6/3 A Max. Power consumption is antenna size dependent: During acquisition 150 W or 300 W is typical, ~ 50 W Idle

Available options, upgrades and services

- Optional feeds and filters available
- BUC/HPA mounting
- Optional 75 ohm coax
- Waveguide interconnect options
- Beacon receiver
- Grounding options (lightning conductor)
- Anchoring kit options
- Custom logo on reflector face (1- or 2-color; per AvL & O3b logo policy)
- DVB-S2 Receiver kit
- Spare parts kit

AVL TECHNOLOGIES

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* excludes filter