

Request for Special Temporary Authority

O3b Limited (“O3b”), pursuant to Section 25.120 of the Commission’s rules,¹ hereby respectfully requests special temporary authority (“STA”) to operate an earth station to be located at Haleiwa, Hawaii (“Hawaii 2.4m Earth Station”) that will communicate with the satellite system operated by O3b. In this filing, O3b seeks a 60-day STA for the period between December 15, 2014 and February 13, 2015. O3b proposes to operate the Hawaii 2.4m Earth Station during this term in accordance with the parameters specified in Schedule B of the license application for the Hawaii 2.4m Earth Station that O3b is filing concurrently with this STA request (“2.4m Hawaii Earth Station License Application”).²

The Hawaii 2.4m Earth Station will be used to support the telemetry, tracking and command (“TT&C”) that are handled by the O3b gateway earth station in Haleiwa, HI (“Hawaii Gateway Earth Station”). As discussed below, grant of the requested authority is in the public interest as it will allow O3b to make its network more resilient.

Test Details and Public Interest Showing

The Hawaii 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.³

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

- 27.6-28.4 GHz, 28.6-29.1 GHz (uplink)
- 17.8-18.6 GHz, 18.8-19.3 GHz (downlink)

The Hawaii 2.4m Earth Station antennas will be mounted on a fixed platform. Although the pointing angle of the antennas will change as O3b’s in-orbit satellites are tracked, the platform will remain stationary during operation.

The Hawaii 2.4m Earth Station will consist of two (2) 2.4m General Dynamics Satcom antennas. O3b has previously been granted an STA to operate the same 2.4m earth station model at the O3b facility in Bristow, Virginia⁴ and has filed an application for a license to operate this earth station model at the same location.⁵

Grant of this application will serve the public interest, convenience and necessity by allowing O3b to enhance its system’s resiliency. The Hawaii 2.4m Earth Station will communicate with O3b’s system and provide support and redundancy for the telemetry, tracking and command (“TT&C”) and data feed functions that are handled by O3b’s previously-licensed gateway, which is located at the same

¹ 47 C.F.R. § 25.120.

² IBFS Submission IB2014002096.

³ O3b’s first four satellites were launched on June 25, 2013. O3b’s next batch of four satellites was launched on July 10, 2014.

⁴ See O3b Limited, Call Sign E130107, File No. SES-STA-20130617-00497, granted August 27, 2013 (“O3b Bristow STA”).

⁵ See O3b Limited, Call Sign E130107, File No. SES-LIC-20130618-00516, filed June 18, 2013 (“O3b Bristow License Application”), and which was placed on Public Notice on December 18, 2013.

facility as the Hawaii 2.4m Earth Station.⁶ The Hawaii 2.4m Earth Station will also permit O3b to conduct customer demonstrations should the need arise. The Hawaii 2.4m Earth Station will make the O3b system more resilient and ensure that its customers around the globe continue to receive high quality service from O3b.

The O3b Satellite System

In its initial FCC application, which sought authority for the Hawaii Gateway Earth Station, O3b stated that it planned to operate eight NGSO satellites that would be spaced equally, *i.e.*, at 45° intervals.⁷ The Commission granted this application.⁸

O3b has filed an application seeking to modify its Hawaii Gateway Earth Station license to give it the flexibility to operate up to two of its eight NGSO satellites as in-orbit spares.⁹ 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.¹⁰ O3b has been granted an STA pending action on its modification application.¹¹

Earth Station Technical Parameters

The following documents containing technical details of the operations proposed under the requested STA are included in the 2.4m Hawaii Earth Station License Application, which is incorporated herein by reference:

- FCC Form 312, Schedule B. O3b proposes to operate the Hawaii 2.4m Earth Station during this 30-day term in accordance with the parameters specified in the 2.4m Hawaii Earth Station Application's Schedule B.
- Link Budgets. Representative links for the Hawaii 2.4m Earth Station are provided.
- Antenna Characteristics. Characteristics of the 2.4m General Dynamics Antenna are provided for the Commission's convenience.
- Radiation Hazard Study. The radiation hazard analysis for the 2.4m General Dynamics antenna is provided. As described in Annex 3 of the O3b 2.4m Hawaii Earth Station License Application, O3b will follow procedures to mitigate potential radiation hazards to personnel in controlled and uncontrolled environments.

⁶ See File No. SES-LIC-20100723-00952.

⁷ See Application for Hawaii Gateway Earth Station, File No. SES-LIC-20100723-00952, Legal Narrative, Section III and Attachment A thereto (Technical Statement), Section A.2.

⁸ See O3b Limited, Call Sign E100088, File No. SES-LIC-20130124-00089, granted Sept. 25, 2012 ("O3b Hawaii License").

⁹ See O3b Limited, Call Sign E100088, File No. SES-STA-20140814-00656. See also O3b Limited, Call Sign E100088, File No. SES-MOD-20140814-00652.

¹⁰ No changes were sought to the technical parameters identified in the licenses and STAs held by O3b and its customers. No changes were made to O3b's Schedule S, either, but O3b noted 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.

¹¹ See O3b Limited, Call Sign E100088, File No. SES-STA-20140814-00656.

- Comsearch Reports. Comsearch Reports are provided for bands in which terrestrial frequencies have primary allocations. Comsearch notified operators within a coordination zone calculated using the ITU RR Appendix 7 guidelines.
 - 27.6-28.35 GHz band. As stated in the attached Frequency Coordination Report, Comsearch has notified all existing and proposed LMDS licensees that are within the coordination contours of the Hawaii 2.4m Earth Station and that potentially could be affected by O3b's transmissions in the 27.6-28.35 GHz portion of the Ka-band. No objections were received from any of these parties.
 - 18.3-18.6 GHz band. As stated in the attached Interference Analysis Report, for operations in the 18.3-18.6 GHz band, the Hawaii 2.4m Earth Station will operate satisfactorily within the 18 GHz microwave environment, and there will be no restrictions of its operation due to interference considerations.
- Comsearch and O3b Field Strength Analysis. O3b is aware that there is a FCC monitoring station at Waipahu, Hawaii. To demonstrate compliance with Section 25.203(g)(1) of the Commission's rules, O3b is providing the attached Field Strength Analysis conducted by Comsearch and a more recent analysis conducted by O3b to demonstrate that the monitoring station at Waipahu will be adequately protected.

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

- Schedule S. In its application for the Hawaii Gateway Earth Station, 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, O3b subsequently provided a modified Schedule S that incorporates additional information submitted to the Commission since the Hawaii Gateway Earth Station application was filed.¹³ O3b will operate its Hawaii 2.4m 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 NGSO 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 Hawaii 2.4m Earth Station. As a result, O3b's existing US334 coordination agreement covers the use of the Hawaii 2.4m Earth Station as requested in this application.

¹² See O3b Limited, Call Sign E100088, File No. SES-LIC-20100723-00952, granted Sept. 25, 2012.

¹³ See O3b Limited, Call Sign E130098, File No. SES-AMD-20131025-01138 ("O3b ESV Answers").

- Antenna Patterns. O3b previously submitted measured 30 GHz band antenna performance data for the 2.4m General Dynamics Satcom antenna to the Commission in the pending Bristow License Application.¹⁴

Proposed Spectrum Use

O3b's proposed Hawaii 2.4m Earth Station operations 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 LMDS.

The 27.6-28.35 GHz uplink band is allocated to the local multipoint distribution service ("LMDS") 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 LMDS stations.

The Comsearch coordination report submitted with O3b's 2.4m Hawaii Earth Station License Application demonstrates that O3b can operate its Hawaii 2.4m Earth Station on a secondary basis in this band without causing harmful interference to LMDS licensees. Comsearch sent a coordination notice to all existing and proposed terrestrial licensees within the Comsearch coordination contours of the Hawaii 2.4m Earth Station site. No objections were received from any of the incumbent licensees.

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 Hawaii 2.4m 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.¹⁵ O3b satisfies 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. As for 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 Hawaii Gateway Earth Station operating at the authorized

¹⁴ See O3b Bristow License Application, Response to IB Questions, filed Nov. 22, 2013.

¹⁵ *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).

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.¹⁶

The Hawaii 2.4m Earth Station will be located at the same site as the Hawaii Gateway Earth Station,¹⁷ which results in the same angular separation between the O3b and geostationary orbits as viewed from the Earth and an equal assurance that the applicable ITU EPFD_{up} limits will be met by O3b's proposed operations. The proposed Hawaii 2.4m 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.

28.6-29.1 GHz – Primary uplink band for licensed NGSO FSS Systems.

Under the Commission's Ka-band frequency plan, the frequencies 28.6-29.1 GHz may be used on a primary basis by licensed NGSO FSS systems.¹⁸ O3b recognizes, however, that operations under an STA for the Hawaii 2.4m Earth Station operations will be on a secondary, non-harmful interference basis. As shown below, the Hawaii 2.4m Earth Station operations will provide the requisite protection to allocated services operating in this band.

Avoidance of interference to GSO FSS systems. The proposed operations will not cause any interference into, or require protection from, any co-frequency GSO satellites. As previously shown,¹⁹ there is an inherent angular separation between the O3b and GSO arcs from the perspective of earth stations located away from the equator. The Hawaii 2.4m Earth Station will be located at the same site as the Hawaii Gateway Earth Station,²⁰ which results in the same angular separation between the O3b and geostationary orbits as viewed from the Earth. This means that the angular separation between the O3b and GSO arcs from the Hawaii 2.4m Earth Station will be equal to the 7 degree separation accepted by the Commission when it approved O3b's Hawaii Gateway Earth Station. This ensures that GSO FSS systems will be adequately protected.

Avoidance of interference to or from Fixed Service (i.e., terrestrial) stations. Interference from the O3b Hawaii 2.4m Earth Station transmissions into U.S. terrestrial Fixed Service ("FS") receivers in the 28 GHz band is a non-issue because there is no allocation in the Commission's Ka-band Frequency Plan for FS stations operating in the 28.6-29.1 GHz band in the United States.²¹

¹⁶ O3b Hawaii License Application, FCC File No. SES-LIC-20100723-00952, Technical Attachment at A.10.1.

¹⁷ The O3b Hawaii Gateway Earth Station latitude is 21° 40' 17.8" N.

¹⁸ See *In the Matter of Rulemaking to Amend Parts 1, 2, 21, and 25 of the Commission's Rules to Redesignate the 27.5-29.5 GHz Frequency Band, to Reallocate the 29.5-30.0 GHz Frequency Band, to Establish Rules and Policies for Local Multipoint Distribution Service and for Fixed Satellite Services*, 11 FCC Rcd. 19005, ¶¶59-62 and 79 (1996). See also *In the Matter of Redesignation of the 17.7-19.7 GHz Frequency Band, Blanket Licensing of Satellite Earth Stations in the 17.7-20.2 GHz and 27.5-30.0 GHz Frequency Bands, and the Allocation of Additional Spectrum in the 17.3-17.8 GHz and 24.75-25.25 GHz Frequency Bands for Broadcast Satellite-Service Use*, 15 FCC Rcd 13430, ¶ 28 (2000).

¹⁹ O3b Hawaii License Application, FCC File No. SES-LIC-20100723-00952, Technical Attachment at A.10.1.

²⁰ See n. 17, *supra*.

²¹ See *In the Matter of Verizon Washington D.C., Application for Renewal of License for Common Carrier Fixed Point to Point Microwave Station KGC79*, 26 FCC Rcd 13511, 13516 (WTB 2011).

DOWNLINK

17.8-18.3 GHz – Primary downlink band for licensed FS Systems.

This frequency band is allocated on a primary basis to FS, and there is no secondary allocation for NGSO FSS in the band. Accordingly, O3b requests a waiver of the Ka-Band Plan and Section 2.106 of the Commission's rules to permit O3b to operate its NGSO FSS system in the 17.8-18.3 GHz band for downlink operations on a non-conforming, non-interference basis. As noted above, in analyzing requests for non-conforming spectrum uses, the Commission has indicated it will generally grant such waivers where there is not potential for interference into any service authorized under the Table of Frequency Allocations and when the non-conforming operator accepts any interference from allocated services.

In this case, O3b's proposed non-conforming use of the 17.8-18.3 GHz frequency band for downlink operations will not cause harmful interference to FS operations in the same band. This is because O3b will meet the PFD limits at the earth's surface prescribed by the ITU for the protection of terrestrial services in this band. In addition, as a non-conforming user, O3b will accept interference from FS operations in the band.

In addition, an Interference Analysis Report from Comsearch submitted with O3b's 2.4m Hawaii Earth Station License Application indicates that there will be no restrictions of O3b's operations due to interference considerations.

In light of the foregoing, a waiver of Section 2.106 of the Commission's rules and the Ka-Band Plan is warranted because no harmful interference will result to incumbent FS operations, O3b can operate satisfactorily within the 18 GHz microwave environment, and the public interest is otherwise served by permitting O3b to support its commercial operations.

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 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.²²

As an example of how these limits will be satisfied, O3b provided EPFD_{down} calculations for transmissions to its Hawaii Gateway Earth Station.²³ O3b also showed how the EPFD_{down} limits can be

²² 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.

²³ O3b Hawaii License Application, FCC File No. SES-LIC-20100723-00952, Technical Attachment at A.10.1.

satisfied at all latitudes.²⁴ O3b is able to satisfy the limits by taking advantage of the inherent angular separation of the O3b and the GSO orbits when viewed from the surface of the Earth at latitudes away from the equator.²⁵ Based on these prior showings, it can be seen that transmissions to O3b's Hawaii 2.4m Earth Station will be within the EPFD_{down} limits.

18.8-19.3 GHz – Primary downlink band for licensed NGSO FSS Systems.

Under the Commission's Ka-band frequency plan, the frequencies 18.8-19.3 GHz may be used on a primary basis by licensed NGSO FSS systems.²⁶ O3b recognizes, however, that operations under an STA for the Hawaii 2.4m Earth Station operations will be on a secondary, non-harmful interference basis. The Hawaii 2.4m Earth Station operations will provide the requisite protection to GSO FSS networks and terrestrial stations operating in this band.

Avoidance of interference to GSO FSS systems. This band is not allocated for GSO FSS networks.²⁷ Nevertheless, the proposed operations will not cause any interference into, or require protection from, any co-frequency GSO satellites. As previously shown,²⁸ there is an inherent angular separation between the O3b and GSO arcs from the perspective of earth stations located away from the equator. As mentioned above, the Hawaii 2.4m Earth Station is located at the same site as the Hawaii Gateway Earth Station, which results in the same angular separation between the O3b and geostationary orbits as viewed from the Earth. This means that the angular separation between the O3b and GSO arcs from the Hawaii 2.4m Earth Station will be equal to the 7 degree separation accepted by the Commission when it approved O3b's Hawaii Gateway Earth Station. This ensures that GSO FSS systems will be adequately protected.

However, because the operations O3b proposes in this STA request will be conducted on a secondary basis, O3b agrees to accept any interference that its Hawaii 2.4m Earth Station may receive from 18.8-19.3 GHz band GSO FSS networks

Avoidance of interference to or from Fixed Service (i.e., terrestrial) stations. FS stations operating in the 18.8-19.3 GHz band are no longer co-primary with FSS users in this band.²⁹ However, because the operations O3b proposes in this STA request will be conducted on a secondary basis, O3b agrees to accept any interference that its Hawaii 2.4m Earth Station may receive from 18.8-19.3 GHz band FS

²⁴ See id.

²⁵ See id.

²⁶ See *In the Matter of Rulemaking to Amend Parts 1, 2, 21, and 25 of the Commission's Rules to Redesignate the 27.5-29.5 GHz Frequency Band, to Reallocate the 29.5-30.0 GHz Frequency Band, to Establish Rules and Policies for Local Multipoint Distribution Service and for Fixed Satellite Services*, 11 FCC Rcd. 19005, ¶¶59-62 and 79 (1996). See also *In the Matter of Redesignation of the 17.7-19.7 GHz Frequency Band, Blanket Licensing of Satellite Earth Stations in the 17.7-20.2 GHz and 27.5-30.0 GHz Frequency Bands, and the Allocation of Additional Spectrum in the 17.3-17.8 GHz and 24.75-25.25 GHz Frequency Bands for Broadcast Satellite-Service Use*, 15 FCC Rcd 13430, ¶ 28 (2000).

²⁷ See id.

²⁸ O3b Hawaii License Application, FCC File No. SES-LIC-20100723-00952, Technical Attachment at A.10.1.

²⁹ See 47 C.F.R. § 101.85(b)(2).

stations. O3b will protect the 18.8-19.3 GHz band FS stations by complying with the space station PFD limits specified in Section 25.208 of the FCC rules.

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 60-day STA on December 15, 2014.