

APPLICATION FOR EXPERIMENTAL SPECIAL TEMPORARY AUTHORIZATION

Pursuant to Sections 5.54(a)(1) and 5.61 of the rules of the Federal Communication Commission (the “FCC” or “Commission”),¹ UltiSat Inc. (“UltiSat”) respectfully requests experimental special temporary authorization (“STA”) for a period of six (6) months, commencing on October 1, 2018 or as soon as practicable thereafter, to perform stationary, ground-based testing and demonstration of an earth station aboard aircraft (“ESAA”) terminal that will provide state-of-the-art solutions for United States Government (“USG”) military and security operations. UltiSat seeks this STA to demonstrate the functionality and performance of up to five (5) terminals – the Skytech Model BB45 – in the 7.25-7.75 GHz (space-to-Earth) and 7.90-8.40 GHz (Earth-to-space) bands (the “X-band”), and the 19.20-21.20 GHz (space-to-Earth) and 29.0-31.0 GHz (Earth-to-space) bands (the “Ka-band”). As described herein, grant of this application is consistent with Commission rules and precedent and will serve the public interest.

I. BACKGROUND

UltiSat provides diverse satellite-based communications services for government and commercial customers. The BB45 terminal is a stabilized antenna system that provides high-quality broadband satellite communications for aeronautical application and is designed to operate in fixed-satellite service (“FSS”) frequencies to provide mission-critical delivery of voice, video and data communications. The antenna is mechanically steerable and is intended for tail or fuselage-mounting. UltiSat successfully tested the Ku-band version of the BB45 terminal under a prior experimental STA for USG intelligence, surveillance and reconnaissance

¹ 47 C.F.R. §§ 5.54(a)(1) & 5.61.

(“ISR”) operations.² UltiSat subsequently obtained a commercial STA to operate the terminal during the pendency of its application for a Ku-band ESAA blanket license.³

The BB45 terminal is also capable of operating in Ka-band and X-band frequencies and is the first mobile terminal in the world to support multi-band mode in Federal and non-Federal spectrum. UltiSat seeks this experimental STA to test and demonstrate the X/Ka-band version of the BB45 terminal to fulfill an existing USG contract for specific military and security use cases. UltiSat seeks to perform these tests at two (2) locations within the eastern United States, as described in Exhibit 1.⁴

UltiSat provides the attached Technical Appendix and FCC Form 442 for information relating to the operational parameters and other technical specifications of its proposed stationary test and demonstration operations, including radiation hazard analyses, off-axis EIRP spectral density (“ESD”) performance and antenna gain patterns.⁵ UltiSat will operate the BB45 in accordance with the Commission’s rules, Table of Allocations and Ka-band Plan or, to the extent necessary, seeks a waiver of the Commission’s rules. Moreover, at all times, UltiSat will adhere to its obligations under Part 5 of the Commission’s rules to avoid interference to existing authorized spectrum users and will operate on an unprotected, non-interference basis during the

² The BB45 terminal was previously authorized for testing and demonstration in the Ku-band. See UltiSat, Inc., File No. 0201-EX-ST-2018, Call Sign WM9XHN (“*Experimental STA*”).

³ See UltiSat, Inc., File Nos. SES-STA-20180621-01477 & SES-STA-20180724-01969 (“*Commercial STA*”); see also UltiSat, Inc., File No. SES-LIC-20180726-02089, Call Sign E181298. The ESAA application was placed on public notice on September 5, 2018.

⁴ Due to the highly sensitive nature and security implications of the proposed operations, UltiSat requests certain information relating to its government contract be treated as confidential. See Confidential Treatment Request and Exhibit 1.

⁵ To the extent the Commission wishes to review the underlying data tables, UltiSat reserves the right to supplement this application with additional performance information. Off-axis ESD and gain calculations were performed at 0.1° increments over an angular range of -180° to 180°.

term of the STA.⁶ Grant of this experimental STA will enable the demonstration and evaluation of UltiSat's next-generation services utilizing innovative satellite technologies for more efficient management and use of critical USG resources.

II. DISCUSSION

This STA will allow UltiSat and its partners to begin the initial assessment and demonstration of the BB45 terminal in Ka-band and X-band frequencies. Although the proposed operations will support USG operations, UltiSat is a commercial applicant and this request includes authority to use Federal military spectrum not allocated for non-Federal use. During the STA term, the terminals will be owned and controlled by UltiSat, and thus it seeks this STA to ensure appropriate Commission authority during experimental operations. UltiSat requests the necessary waivers herein and provides the attached Letter of Support from its USG customer describing critical nature of the proposed experimental activities.⁷

The control point operator will maintain control of all transmissions and will cease transmission immediately upon request of a satellite operator or in the unlikely event of harmful interference. UltiSat personnel will be on-site at all times during testing and have the ability to immediately cease operations as appropriate. The stop buzzer contact during experimental operations is:

⁶ If UltiSat learns its experimental operations are causing interference into existing spectrum users, it will not resume transmissions until the it establishes to the satisfaction of the Commission that further harmful interference will not be caused to any authorized radio service. 47 C.F.R. § 5.84.

⁷ See Exhibit 1.

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UltiSat seeks to operate the BB45 terminal in the 7.25-7.75 GHz (space-to-Earth) and 7.90-8.40 GHz (Earth-to-space) bands, and the 19.20-21.20 GHz (space-to-Earth) and 29.0-31.0 GHz (Earth-to-space) bands. Although UltiSat seeks authority for transmit operations only (experimental authority is limited to transmit operations), information regarding receive operations is included herein to ensure the Commission has a full understanding of the proposed operations. Further, although UltiSat acknowledges that its temporary experimental operations have no regulatory status vis-à-vis other authorized users of the band, the various Commission allocations in each spectrum band are summarized below to help assess spectrum compatibility.

A. Commercial Ka-Band Operations

During the STA term, UltiSat seeks authority to operate in Federal and non-Federal Ka-band frequencies. UltiSat's non-Federal (or "commercial") Ka-band operations will occur in the 19.2-20.2 GHz (space-to-Earth) and 29.0-30.0 GHz (Earth-to-space) bands. UltiSat will operate the BB45 terminal in these bands consistent with United States Table of Frequency Allocations ("Table of Allocations")⁸ and the Commission's Ka-band Plan ("Ka-band Plan"),⁹ or requests a waiver as necessary to permit the proposed operations.

⁸ 47 C.F.R. §2.106.

⁹ See *In the Matter of Use of Spectrum Bands Above 24 GHz for Mobile Radio Servs.*, FCC 16-89 (2016) ("Spectrum Frontiers Order") (modifying allocation of other sections of Ka-band but leaving 19.2 – 20.2 GHz and 29.0 – 30.0 GHz as allocated by previous orders); *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, ¶¶ 40-49 (1996) ("Ka-band

At all times while operating in the commercial Ka-band, UltiSat will operate the BB45 terminal with the Inmarsat-5 F2 satellite.¹⁰ The Inmarsat-5 F2 satellite, located at 55° W.L., is a U.K.-licensed satellite that has been previously authorized by the Commission to serve the U.S. market.¹¹ As noted, UltiSat will operate the BB45 terminal in a stationary environment only and within the off-axis EIRP spectral density limits specified in Section 25.138 of the Commission's rules, and otherwise comply with the Commission's two-degree spacing policy.¹² Below, UltiSat provides an overview of its proposed commercial Ka-band spectrum use.

1. Receive Frequencies

UltiSat seeks to operate in commercial Ka-band receive frequencies from 19.2-20.2 GHz (space-to-Earth). In the 19.2-19.3 GHz band, NGSO FSS operations are primary with no allocation for GSO FSS stations.¹³ In the 19.3-19.7 GHz band, mobile-satellite service ("MSS") feeder link operations are co-primary with local multipoint distribution service ("LMDS") and

Plan R&O)). 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 and 34 (2000) ("*Redesignation of Ka-band Plan R&O*").

¹⁰ During Ka-band testing, the forward link (gateway-to-remote) carrier will originate from Inmarsat's teleport in Lino Lakes, Minnesota.

¹¹ See *In the Matter of Inmarsat Mobile Networks, Inc., Application to Operate a Fixed-Satellite Service Gateway Earth Station in Lino Lakes, Minnesota with the Inmarsat-5 F2 Space Station*, Order of Authorization and Declaratory Ruling, File No. SES-LIC-20120426-00397, Call Sign E120072 ("*Inmarsat-5 F2 Market Access*") (granting U.S. market access for the Inmarsat-5 F2 satellite in the 17.7-20.2 GHz (space-to-Earth) and 27.5-30.0 GHz (Earth-to-space) bands in the context of a gateway earth station application).

¹² See 47 C.F.R. § 25.138; Technical Appendix, Section III.

¹³ See *Redesignation of Ka-band Plan R&O* ¶ 28; see also 47 C.F.R. §2.106, footnote NG165.

there is no allocation for GSO FSS operations.¹⁴ Finally, in the 19.7-20.2 GHz band, GSO FSS systems operate on a primary basis.¹⁵

In the 19.2-19.7 GHz band, UltiSat will operate the BB45 terminal on a non-conforming basis and, in the 19.7-20.2 GHz band, UltiSat will operate the BB45 terminal consistent with the primary allocation for GSO FSS operations. The Commission has concluded that the Inmarsat-5 F2 satellite can conduct downlink operations in these bands without adversely impacting other spectrum users.¹⁶ The proposed receive frequencies are not included in this STA request and are described herein for informational purposes only.

2. Transmit Frequencies

UltiSat seeks to operate in commercial Ka-band transmit frequencies from 29.0-30.0 GHz (Earth-to-space). In the 29.0-29.1 GHz band, GSO FSS operations are secondary to NGSO FSS systems.¹⁷ In the 29.1-29.25 GHz band, MSS feeder link operations are co-primary with LMDS with no allocation for GSO FSS operations.¹⁸ Finally, in the 29.25-30.0 GHz (Earth-to-space) band, GSO FSS systems operate on a primary basis.¹⁹

When operating in the 29.0-29.1 GHz band, UltiSat will not cause harmful interference to NGSO FSS systems and it will accommodate any existing or future authorized NGSO FSS licensees to the extent necessary to avoid harmful interference. Currently, O3b Limited (“O3b”)

¹⁴ See *Redesignation of Ka-band Plan R&O* ¶ 28; see also 47 C.F.R. §2.106, footnote NG165-66.

¹⁵ *Id.*

¹⁶ See *Inmarsat-5 F2 Market Access*, ¶1, *supra* note 11.

¹⁷ See *Ka-band Plan R&O* at ¶ 40.

¹⁸ *Id.*

¹⁹ *Id.*

operates the only commercial Ka-band NGSO FSS system.²⁰ Inmarsat established compatibility between O3b and U.S. earth station operations with the Inmarsat 5- F2 in its U.S. market access request. UltiSat's operations will be similarly compatible.²¹

In the 29.1-29.25 GHz band, UltiSat will operate the BB45 terminal without causing harmful interference to authorized MSS feeder links or LMDS systems operating in conformance with the Table of Allocations. Iridium has three feeder-link earth stations in the United States that are currently authorized to operate in the band: one in Tempe, Arizona; one in Fairbanks, Alaska; and one in Wahiawa, Hawaii.²² The geographic separation between these MSS feeder link earth stations and UltiSat's proposed experimental test sites is measured in the thousands of miles, so there is no potential for interference into MSS feeder link operations.

With respect to LMDS, review of the Commission's Universal Licensing System ("ULS") reveals there are no co-frequency LMDS links within 30 km of the UltiSat test sites. Given terrain blockage, frequency characteristics, high elevation angle (approximately 40°), antenna performance of the BB45 terminal and other factors, there is no potential for interference into LMDS operations.

In the 29.25-30.0 GHz band, GSO FSS operations have a primary allocation and the 29.25-29.5 GHz band is designated on a co-primary basis with MSS feeder links.²³ As noted

²⁰ See O3b Limited, File No. SAT-LOI-20141029-00118 and related amendments and modifications, Call Sign S2935 ("*O3b License*").

²¹ See *supra* note 11.

²² These earth stations are licensed by the Commission under call signs E960131 (Tempe, AZ), E050282 and E060300 (Fairbanks, AK), which are licensed to Iridium, and E980049 (Wahiawa, HI), which is licensed to General Dynamics Satellite Communication Services, LLC.

²³ See *Ka-band Plan R&O* ¶ 40; see also 47 C.F.R. §2.106, footnotes NG62, NG166.

above, there is no potential for interference into existing MSS feeder link operations given the large geographic separation presented here.

B. Federal Ka-band Operations

UltiSat also seeks to operate in certain Ka-band frequencies from 20.2-21.2 GHz (space-to-Earth) and 30.0-31.0 GHz (Earth-to-space), which are allocated for Federal use with no allocation for non-Federal commercial uses.²⁴ UltiSat will be supporting Federal military operations in these bands but is a non-Federal operator. Although the proposed experimental operations have no regulatory status and thus do not operate pursuant to specific service allocation in the U.S. Table of Allocations, out of an abundance of caution UltiSat respectfully requests a waiver of 47 C.F.R. §2.106 to the extent necessary to permit its non-conforming use of the 30.0-31.0 GHz band.

At all times, UltiSat will operate the BB45 terminal on an unprotected, non-interference basis vis-a-vis authorized Federal users and agrees to accept any harmful interference from other users. In the Technical Appendix, UltiSat demonstrates that it will operate the BB45 terminal in compliance with the relevant Military Communications System Technical Standards (“MIL-STD-188-164B”).²⁵ The BB45 will be used for solely for the purposes of testing the capabilities of the terminal in collaboration with the USG and is not intended for regular or permanent use.

UltiSat will operate the BB45 terminal with the Inmarsat-5 F2 satellite. In addition to its commercial Ka-band capabilities, the Inmarsat-5 F2 spacecraft also operates in the 20.2-21.2

²⁴ See United States Table of Frequency Allocations, 47 C.F.R. § 2.106, footnote G117 (“in the bands 7.25-7.75 GHz, 7.9-8.4 GHz, 17.375-17.475 GHz, 17.6-21.2 GHz, 30-31 GHz, 33-36 GHz, 39.5-41 GHz, 43.5-45.5 GHz, and 50.4-51.4 GHz, the Federal fixed-satellite and mobile-satellite services are limited to military systems.”).

²⁵ See Department of Defense, Interface Standard, Interoperability of Super High Frequency Satellite Communications Terminals, § 4.4 (defining the ESD limits for earth station terminals operating over military Ka-band channels).

GHz (space-to-Earth) and 30.0-31.0 GHz (Earth-to-space) bands, for which U.S. market access authority was not authorized.²⁶ Still, the Inmarsat-5 F2 satellite has been fully coordinated with the relevant parties in the USG for the 55° W.L. orbital location, grant of such authority is consistent with Commission precedent for limited and temporary use of these bands by a private applicant.²⁷

C. X-Band Operations

UltiSat also seeks to conduct temporary operations in certain X-band frequencies from 7.25-7.75 GHz (space-to-Earth) and 7.90-8.40 GHz (Earth-to-space), which are allocated for Federal use (i.e., military systems) with no allocation for non-Federal commercial uses.²⁸ Although UltiSat will be supporting Federal military operations in these bands, because it is a non-Federal commercial operator, it understands that Commission authorization is required to conduct the subject operations. Although the proposed experimental operations have no regulatory status and thus do not operate pursuant to specific service allocation in the U.S. Table of Allocations, out of an abundance of caution UltiSat respectfully requests a waiver of 47 C.F.R. §2.106 to the extent necessary to permit non-conforming use of the 7.90-8.40 GHz band.

At all times, UltiSat will operate the BB45 terminal on an unprotected basis to authorized Federal users and agrees to accept any harmful interference from other services. In the Technical Appendix, UltiSat demonstrates that it will operate the BB45 terminal in the X-band in

²⁶ Operations in these bands occur under the authority of Norway, pursuant to ITU filings submitted by the Norwegian Administration. *See Inmarsat-5 F2 Market Access*, Exhibit A.

²⁷ *See* ISAT US Inc., File No. SES-STA-20160121-00076 (permitting the short-term operations in the 30.0-31.0 and 20.2-21.2 GHz bands with the Inmarsat-5 F2 satellite).

²⁸ 47 C.F.R. §2.106.

compliance with MIL-STD-188-164B.²⁹ The BB45 will be used for solely for the purposes of testing the capabilities of the terminal in collaboration with the USG and is not intended for regular or permanent use.

During X-band operations, UltiSat will operate the BB45 terminal with the XTAR-LANT payload, operated by XTAR and located on the Spainsat spacecraft.³⁰ XTAR-LANT is located at 30° W.L. and currently serves the USG with a variety of commercial X-band services for homeland security and military satellite applications.³¹ Accordingly, although the Spainsat satellite has not been granted U.S. market access, its capabilities are well known to the USG and this request is consistent with Commission precedent to permit a commercial applicant to conduct short-term experimental operations with the XTAR-LANT payload.³²

III. WAIVER REQUESTS

To the extent necessary to grant this experimental STA request, UltiSat respectfully seeks a waiver of the U.S. Table of Frequency Allocations, 47 C.F.R. § 2.106, and the Commission's Ka-band Plan, to permit non-conforming operation of the BB45 terminal in certain Ka-band and X-band transit frequencies. It is not clear such waivers are necessary because the proposed experimental operations have no regulatory status and thus do not operate pursuant to specific

²⁹ See Department of Defense, Interface Standard, Interoperability of Super High Frequency Satellite Communications Terminals, § 4.5 (defining the ESD limits for earth station terminals operating over military X-band channels).

³⁰ During X-band testing, the forward link (gateway-to-remote) carrier will originate from XTAR's teleport in Hamilton, Ontario Canada.

³¹ See, e.g., *XTAR's X-band Technology Provides Military Support Through Various Applications*, <https://gmcstream.com/GMCstreamTV/xtar.html>; *Robust Satellite Capacity Grows*, <https://www.afcea.org/content/robust-satellite-capacity-grows>.

³² See Skyport Global Communications Inc., File No. 0085-EX-ST-2010, Call Sign WE9XGH.

service allocation in the U.S. Table of Allocations, but UltiSat includes this request out of an abundance of caution.

In considering requests for non-conforming uses, the Commission has indicated it would grant such waivers when there is little potential for interference into any service authorized under the Table of Allocations and when the non-conforming operator accepts any interference from authorized services.³³ Moreover, the Commission will grant a waiver when “good cause” exists for a grant of such a waiver.³⁴

In the foregoing sections and the attached Technical Appendix, UltiSat addresses spectrum compatibility on a band-by-band basis and establishes it can operate the BB45 terminal without adversely affecting other spectrum users. UltiSat will operate the BB45 terminal in accordance with off-axis EIRP limits and/or other technical specifications applicable to each transmit band and will otherwise comply with the Commission’s Part 5 rules. UltiSat will immediately alter, suspend or terminate its operations upon notification that such operations are causing harmful interference to any authorized radio system operating in conformance with the Table of Allocations.

Accordingly, grant of the requested waivers “would better serve the public interest than strict adherence to the general rule,”³⁵ because they will facilitate the USG’s ability to have

³³ See *Northrop Grumman Space & Mission Systems Corp.*, 24 FCC Rcd 2330, at ¶¶ 76, 90 (2009) (“*Northrop Grumman Order*”); *Hughes Network Systems, LLC*, 26 FCC Rcd 8521, at ¶ 13 (2011); *Contactmeo Communications, LLC*, Order and Authorization, 21 FCC Rcd 4035, 4044 (IB 2006); *ViaSat AMSS Order*, File No. SES-MFS-20090624-00789.

³⁴ See 47 C.F.R. § 1.3.

³⁵ See *WAIT Radio v. FCC*, 418 F.2d 1153, 1157 (D.C. Cir. 1969).

access to new and innovative high-data rate broadband satellite services that can support critical military operations and improve the USG's ability to apply next-generation technology solutions.

IV. PUBLIC INTEREST CONSIDERATIONS

In accordance with Section 5.63(c)(1), UltiSat anticipates that its proposed experimental operations will contribute greatly to the radio art and serve the public interest. The proposed evaluations will help demonstrate the capabilities of an innovative satellite terminal in military and security applications and promote potential solutions for multi-band operations examined in the trials. In addition, grant of the requested authority will allow UltiSat and its partners to develop important information about equipment capabilities, customer acceptance, and integration of its equipment with other government applications and operations.

The public interest will also be served by grant of any necessary waivers to permit UltiSat to conduct the temporary experimental operations proposed herein. Operation in the identified commercial and Federal bands will support USG military applications and facilitate the provision of advanced, versatile and easily deployable satellite terminal solutions for USG entities to the benefit of the public.

V. Conclusion

Based on the foregoing, UltiSat respectfully requests that the Commission grant this request for a six-month experimental STA to perform stationary, ground-based testing and evaluation of the BB45 terminal in certain Ka-band and X-band frequencies to support the USG, commencing on October 1, 2018, or as soon as practicable thereafter.