Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of

Application of RBC Signals LLC for a 180-Day Special Temporary Authorization ("STA") To Operate an Earth Station To Provide Tracking, Telemetry & Command ("TT&C") to Foreign-Licensed Satellites	)))))	Call Sign: File No.:

REQUEST FOR SPECIAL TEMPORARY AUTHORITY

RBC Signals LLC ("RBC Signals"), pursuant to Section 25.120 of the Commission's rules, 47 C.F.R. § 25.120, respectfully seeks a 180-day special temporary authorization ("STA") to operate a M2 Antenna Systems 3.5m earth station (the "M2 3.5m") at a facility in Deadhorse, Alaska to communicate with three (3) U.K-licensed low-Earth orbit ("LEO") mobile-satellite service ("MSS") cubesats to perform tracking, telemetry and command ("TT&C") for housekeeping, coordination and subsystem control. RBC Signals seeks to perform these TT&C operations – which have been previously approved by the Commission – in the 399.926-399.950 MHz band (Earth-to-space) and 401.05-401.25 MHz band (space-to-Earth). RBC Signals requests this 180-day STA as an extension of its existing TT&C operating authority to allow for continuing TT&C functions for these novel cubesats.

I. BACKGROUND

RBC Signals is a Seattle, Washington-based satellite services company that provides earth station services around the world. The Commission recently granted RBC Signals a 60-day STA to conduct the identical TT&C operations proposed herein[1] and this 180-day STA will enable RBC

[1] *See* RBC Signals Inc., File No. SES-STA-20170613-00643 (expires on Aug. 22, 2017) ("*60-Day STA*").

Signals to continue providing TT&C for three U.K.-licensed 3U cubesats – the Red Diamond, Green Diamond and Blue Diamond (the "3 Diamonds"). The 3 Diamonds, launched on June 23, 2017 with a mission life of between two and five years, are demonstration and proof-of-concept satellites launched in connection with the development of Sky and Space Global (UK) Ltd.'s ("SSG")[2] proposed cubesat constellation to provide affordable narrowband mobile communication services to users in Asia, Africa and Latin America. The SSG constellation will provide lifeline connectivity services to users in the region within +/-15 degrees of the equator.[3] Satellites may be added in the future to expand this initial coverage region.

The 3 Diamonds satellites are closely spaced at an altitude of approximately 500 km, operate service links in MSS spectrum at 2170-2200 MHz (space-to-Earth) and 1980-2010 MHz (Earth-to-space), and have overlapping beams for testing satellite hand-off, link performance and other functionality. Like the original 60-Day STA request, RBC Signals does not seek authority to conduct MSS service link testing or demonstration in this STA request. Pursuant to consultations with the Commission staff, however, RBC Signals plans to file for experimental license authority to continue communications with the 3 Diamonds demonstration satellites and avoid the need for additional STA requests. RBC Signals' experimental license application may include a request for authority to test and demonstrate 3 Diamonds MSS service link operations.

RBC Signals operations have been coordinated with relevant U.S. government agencies and have not caused interference to U.S. government users of the band. Moreover, RBC Signals has examined other operations in the band and will continue to work with FCC, NTIA and NOAA staff

[2] SSG is a wholly owned subsidiary of Sky and Space Global Limited, a publicly traded Australian company (ASX ticker symbol: SAS). RBC Signals has provided a presentation summarizing SSG's novel NGSO system concept, progress to date and future plans in Attachment 1.

[3] The full SSG constellation will operate under the SSG-CSL NGSO system filing submitted to the ITU by the United Kingdom late last year.

to ensure that the proposed operations create no potential for interference to current or future government users and that the interests of the United States are fully accommodated.

II. DISCUSSION

RBC Signals seeks to continue to operate the M2 3.5m with the 3 Diamonds satellites in the 399.926-399.950 MHz band (uplink) and 401.05-401.25 MHz band (downlink). RBC Signals is resubmitting herein the materials previously provided with its 60-Day STA application, including the Technical Appendix, Attachments and draft FCC Form 312 Schedule B, which contain relevant information relating to the proposed TT&C operations, including earth station operational characteristics, satellite technical and orbital parameters, TT&C link budgets and an orbital debris mitigation statement for the 3 Diamonds satellites.[4]

Grant of this STA request is in the public interest because it will facilitate the safe operation of the 3 Diamonds satellites during testing, ensuring no lapse in control. Moreover, a grant of this request will allow for continued early stage analysis of the technical feasibility of the SSG constellation and more thorough demonstrations for these novel and important cubesat operations.

A. TT&C Uplink Operations

The United States Table of Frequency Allocations ("Table of Allocations"), Section 2.106 of the Commission's rules, 47 C.F.R. § 2.106 provides that the 399.9-400.05 MHz band is shared on a co-primary basis between MSS and federal radionavigation-satellite services. RBC Signals seeks to perform limited TT&C uplink operations in frequencies from 399.926-399.950 MHz

[4] The 3 Diamonds satellites will operate under the SSG-CSL and SSG-3D ITU NGSO system filings and the UK licenses for the Red Diamond, Green Diamond and Blue Diamond satellites are included as Attachment 2. RBC Signals acknowledges that authority for TT&C operations does not constitute market access to the United States for the SSG satellites and therefore is not providing the full technical information required by Sections 25.114 and 25.137 of the Commission's rules, 47 C.F.R. §§ 25.114 and 25.137.

consistent with the co-primary MSS allocation in this band.

As discussed above, the 3 Diamonds satellites were launched as demonstration satellites for SSG's MSS constellation and will provide data, voice and messaging services directly to fixed and mobile terminals. These terminals include land, maritime and aeronautical mobile terminals, as well as fixed terminals that may serve as base stations for "bring your own" mobile devices. Additional information regarding the 3 Diamonds mission and SSG's long-term constellation can be found on the SSG web site.[5]

RBC Signals will continue to operate the M2 3.5m earth station at a site in Deadhorse, Alaska and provide TT&C uplink operations for SSG's MSS system consistent with the MSS allocation in the band.[6] Given the altitude and spacing of the 3 Diamonds satellites (with overlapping beams),[7] the proposed TT&C earth station transmit approximately 5% of the time to communicate with the satellites. The limited transmission window, as well as the remote location of the facility (in the North Slope of Alaska), limit the potential for interference from the proposed operations.

RBC Signals understands that there is limited U.S. government use of the band,[8] but

[5] *See* https://www.skyandspace.global/operations-overview/.

[6] The limited, data-only TT&C operations for the 3 Diamonds MSS demonstration satellites are consistent with the Commission's limitation on use of the band for non-voice communications of NGSO satellites. *See* 47 C.F.R. §25.103 ("Definitions…. *Non-Voice, Non-Geostationary (NVNG) Mobile-Satellite Service.* A Mobile-Satellite Service reserved for use by non-geostationary satellites in the provision of non-voice communications which may include satellite links between land earth stations at fixed locations.") *See also* Section II.D, *infra*, requesting, out of an abundance of caution, a waiver to permit TT&C uplink operation in this MSS band.

[7] The rising order of satellites above the horizon was Blue, then Green, then Red. Initial relative orbit phasing between Blue and Green was 0.31735 degrees, and between Blue and Red was 2.53879 degrees. Upon phasing completion, the relative phasing between Blue and Green is 4.44 degrees and between Blue and Red is 8.88 degrees.

[8] *See* https://www.ntia.doc.gov/files/ntia/publications/compendium/0399.90-0400.05_01DEC15.pdf.

acknowledges that there is a pending FCC rulemaking addressing further use of this band,[9] as well as a proceeding developing U.S. preliminary views on a related WRC-19 agenda item.[10] RBC Signals acknowledges that any grant of earth station operating authority would be subject to the outcome of these proceedings and will continue consultations with NTIA and NOAA staff to ensure that the interests of the United States are fully accommodated and that the proposed operations will not cause interference to current or future U.S. government operations.

RBC Signals' TT&C operations thus far have been compatible with spectrum users and have not caused interference in the 399.926-399.950 MHz uplink band. Thus, RBC Signals anticipates no compatibility or potential inference issues as a result of this STA extension request. Consistent with its existing authorization, RBC Signals will conduct its TT&C operations on a non-harmful interference basis and, if RBC Signals learns that its operations are causing harmful interference to other operations, it will modify or suspend operations to immediately resolve such interference.

B. TT&C Downlink Operations

The Table of Allocations provides that the 401-402 MHz band is shared on a co-primary basis between meteorological aids and space operations services. RBC Signals seeks to perform TT&C downlink operations in frequencies from 401.05-401.25 MHz consistent with the co-primary space operations allocation in this band.[11]

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[9] *See generally* Amendment of Part 2 of the Commission's Rules for Federal Earth Stations Communicating with Non-Federal Fixed Satellite Service Space Stations; Federal Space Station Use of the 399.9-400.05 MHz Band; and Allocation of Spectrum for Non-Federal Space Launch Operations, ET Docket No. 13-115, RM-11341; *see also* https://www.fcc.gov/items-on-circulation.

[10] *See* International Bureau Seeks Comment on Recommendations Approved by World Radiocommunication Conference Advisory Committee, Public Notice, IB Docket No. 16-185, DA 17-365 (rel. Apr. 24, 2017).

[11] *See* 47 C.F.R. § 2.1 (defining "space operations" as "a radiocommunication service concerned exclusively with the operation of spacecraft, in particular space tracking, space telemetry, and space telecommand.").

RBC Signals understands that there is no U.S. government use of the 400.05-400.15 MHz sub-band,[12] but there are certain meteorological aids and space research operations conducted in the 400.15-400.25 MHz sub-band.[13] Based on our research and consultations to date, RBC Signals believes the proposed TT&C downlink (earth station receive) operations in this band will continue to present no potential for interference to other users of this band.[14] Of course, if RBC Signals learns that its operations are causing harmful interference to other operations, it will suspend or modify its operations to immediately resolve such interference.

C. The 3 Diamonds Satellites

SSG is developing technology that will permit cubesats to deliver narrowband connectivity services to otherwise unconnected users in remote locations on an extremely cost-effective basis. When fully launched, the SSG constellation will support user voice calls and messaging, machine-to-machine ("M2M") and Internet of Things ("IoT") services, and data storage and forwarding in both fixed and mobile applications in MSS spectrum at 2170-2200 MHz (space-to-Earth) and 1980-2010 MHz (Earth-to-space), subject to coordination with incumbent operations. The 3 Diamonds satellites' TT&C spectrum assignments were approved by the UK Ministry of Defence, representing a substantial validation of SSG's narrow-band satellite communications platform.[15]

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[12] *See* https://www.ntia.doc.gov/files/ntia/publications/compendium/0400.05-0400.15_01DEC15.pdf.

[13] *See* https://www.ntia.doc.gov/files/ntia/publications/compendium/0400.15-0401.00_01DEC15.pdf.

[14] RBC Signals would also note that the downlink PFD of the 3 Diamonds satellites in the 400.15-400.25 MHz sub-band is -134 dBW/(m^2 · 4 kHz), 9 dB lower than the -125 dBW/(m^2 · 4 kHz) limit set forth in Annex 1 of App. 5 of the ITU Radio Regulations. *See* RR 5.264 and 47 C.F.R. § 2.106.

[15] *See* http://www.asx.com.au/asxpdf/20160927/pdf/43bhb4pwhkhym8.pdf.

SSG was awarded Frost & Sullivan's 2016 Global Narrow-Band Nano-Satellite Connectivity Services Technology Innovation Award for its satellite constellation concept.[16] Additionally, SSG signed an agreement with the U.S. Department of Defense ("DOD") for space situational awareness services to help ensure the safe operations of the 3 Diamonds satellites.[17]

Through its partnership with the Indian Space Research Organization ("ISRO"), SSG launched its three UK-licensed cubesats on June 23, 2017. The requested STA is intended to support TT&C operations for SSG's demonstration and proof-of-concept satellites until SSG can obtain experimental license authority for such operations.

D. Public Interest Considerations

Grant of this STA request will further the public interest by ensuring there is no interruption of RBC Signals' TT&C operations for the 3 Diamonds satellites and enabling the continued demonstration of the significant benefits and commercial viability of SSG's satellite communications system. For its part, the 3 Diamonds demonstration mission will continue to help the satellite industry delivery affordable satellite-based connectivity services to remote locations, reaching diverse regions and customers. RBC Signals acknowledges that any action on the requested STA will not affect the Commission's ultimate determination with respect to any application for longer-term TT&C earth station operating authority.

RBC Signals respectfully requests this 180-day STA as an extension of its existing STA authority pursuant to Section 25.120 of the Commission's Rules, 47 C.F.R. § 25.120. Based on consultations with the Commission staff and pursuant to Commission rules, RBC Signals

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[16] *See* https://www.slideshare.net/FrostandSullivan/2016-global-narrowband-nanosatellite-connectivity-services-technology-innovation-award.

[17] *See* https://www.skyandspace.global/sky-space-signs-agreement-us-department-defence/.

understands that this timely filed extension request will effectively extend its existing temporary authority until the Commission acts on the request, affording sufficient time for processing this request and enabling RBS Signals to seek appropriate experimental license authority.[18] However, to the extent the Commission concludes that its rules, policies or procedures may limit the continued effectiveness of temporary authority during the pendency of this STA request, RBC Signals hereby confirms that it will accept a 60-day extension of STA authority to ensure the continuity of operations pursuant to valid Commission authority.

In addition, RBC Signals' original 60-Day STA request included certain requests for waivers, including Sections 25.114, 25.137 and 25.202(g)(1) of the Commission's rules, that were included out of an abundance of caution but do not appear to have been necessary for grant of its existing temporary authority.[19] To the extent necessary to grant this 180-day STA extension request, RBC Signals hereby incorporates those waiver requests by reference.

III. CONCLUSION

In view of the foregoing, including the unique scope of this request and the importance of uninterrupted TT&C operations, the public interest would be served by a grant of a 180-day STA to continue to allow RBC Signals to perform TT&C functions for the U.K.-licensed 3 Diamonds demonstration satellites.

[18] *See* 47 C.F.R. §§ 25.120, 25.161(b) & 25.163(b); Administrative Procedure Act § 9(b). *See also* 47 C.F.R. §1.955(b); *In the Matter of Marc D. Sobel Application for Consent to Assign the License for Conventional 800 MHz SMR Station KKT934, Montrose, California,* Memorandum Opinion & Order, FCC 05-90, ¶¶ 2 & 6.

[19] *See 60-Day STA* at Narrative, Section II.D.