Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of

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

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 60-day special temporary authorization ("STA") to operate an existing GomSpace AS100 ground station (the "AS100 Yagi") at a facility in Fairbanks, Alaska to communicate with three U.K-licensed low-Earth orbit ("LEO") mobile-satellite service ("MSS") cubesats (the "3 Diamonds") to perform tracking, telemetry and command ("TT&C") for housekeeping, coordination and subsystem control. RBC Signals seeks to perform these TT&C operations – for which it currently has Commission authority to conduct from a facility in Deadhorse, Alaska[1] – in the 399.926-399.950 MHz band (Earth-to-space) and 401.05-401.25 MHz band (space-to-Earth).

RBC Signals requests grant of this 60-day STA at the earliest practicable time due to extraordinary circumstances that have made it unable to provide reliable TT&C from the Deadhorse, Alaska facility. Specifically, regular and substantial icing on the currently authorized antenna has made communication with the 3 Diamonds spacecraft infeasible. In order to continue TT&C functions for these novel cubesats, RBC Signals seeks this 60-day STA to operate the AS100 Yagi at the Fairbanks, Alaska facility.

[1] *See* RBC Signals, LLC, File Nos. SES-STA-20170613-00643 (60-day STA) and SES-STA-20170731-00848 (180-day STA).

I. BACKGROUND

RBC Signals is based in Seattle, Washington and provides earth station services around the world. The Commission recently granted RBC Signals a 60-day STA and 180-day STA to conduct the identical TT&C operations proposed herein utilizing an M2 Antenna Systems Yagi antenna (the "M2 Yagi") from a facility in Deadhorse, Alaska.[2] Due to unforeseen environmental circumstances, specifically extensive "ice fog" in the region that has caused ice to crystalize on the M2 Yagi, making it inoperable for extended periods of time.

As a result, RBC Signals is unable to reliably provide TT&C from the Deadhorse, Alaska facility and thus requests this critical 60-STA to allow it to operate the existing AS100 Yagi antenna with the 3 Diamonds (the Red Diamond, Green Diamond and Blue Diamond satellites). RBC Signals is preparing an application for regular commercial authority to perform the TT&C operations described herein from the Deadhorse, Alaska facility. This 60-day STA will enable the short-term continuation of services while RBC Signals addresses the issue at Deadhorse.

As the Commission is aware, the 3 Diamonds, launched on June 23, 2017 with a mission life of two to five years, are demonstration and proof-of-concept satellites launched into polar orbit by Sky and Space Global (UK) Ltd.'s ("SSG"),[3] which is developing a cubesat constellation to provide affordable narrowband mobile communication services to users in Asia, Africa and Latin America.[4]

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-

---

[2] *Id.*

[3] 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.

[4] The SSG constellation will provide lifeline connectivity services to users in the region within +/- 15 degrees of the equator. The full SSG constellation will operate under the SSG-CSL NGSO system filing submitted to the ITU by the United Kingdom late last year.

space), and have overlapping beams for testing satellite hand-off, link performance and other functionality. Like the preceding STA requests, 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 also plans to file for longer-term authority to continue communications with the 3 Diamonds demonstration satellites and may include a request for authority to test and demonstrate 3 Diamonds MSS service link operations.

RBC Signals operations have not caused interference to other users of the band. Moreover, RBC Signals will continue to work with FCC, NTIA and NOAA staff 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 AS100 Yagi 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. As demonstrated in the materials, 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) have not changed.[5]

Grant of this STA request is in the public interest because it will facilitate the safe operation

[5] 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.

of the 3 Diamonds satellites during testing by ensuring there is no lapse in control due to the inoperability of the M2 Yagi at Deadhorse, Alaska facility. Moreover, a grant of this request will allow RBC Signals to reliably assist with the early stage analysis of the technical feasibility of the SSG constellation and conduct more thorough demonstrations for these important 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 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.[6]

RBC Signals will operate the AS100 Yagi at a site in Fairbanks, Alaska and provide TT&C uplink operations for SSG's MSS system consistent with the MSS allocation in the band.[7] Given

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

[7] 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.

the altitude and spacing of the 3 Diamonds satellites (with overlapping beams),[8] the proposed TT&C earth station transmit approximately 5% of the time to communicate with the satellites. The limited transmission window will limit the potential for interference from the proposed operations.

RBC Signals understands that there is limited U.S. government use of the band,[9] but acknowledges that there is a pending FCC rulemaking addressing further use of this band,[10] as well as a proceeding developing U.S. preliminary views on a related WRC-19 agenda item.[11] 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 FCC, 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 at the Deadhorse, Alaska facility. RBC Signals anticipates no compatibility or potential inference issues as a result of this STA request at the Fairbanks, Alaska facility. 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

[8] 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.

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

[10] *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.

[11] *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).

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.[12]

RBC Signals understands that there is no U.S. government use of the 400.05-400.15 MHz sub-band,[13] but there are certain meteorological aids and space research operations conducted in the 400.15-400.25 MHz sub-band.[14] 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.[15] 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

---

[12] *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.").

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

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

[15] 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.

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.[16]

SSG was awarded Frost & Sullivan's 2016 Global Narrow-Band Nano-Satellite Connectivity Services Technology Innovation Award for its satellite constellation concept.[17] 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.[18]

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 that RBC Signals' TT&C operations for the 3 Diamonds satellites are active and reliable 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

---

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

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

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

the satellite industry delivery affordable satellite-based connectivity services to remote locations, reaching diverse regions and customers. RBC Signals proposed operations will cause no interference to existing licensees, including University of Alaska, Fairbanks, which RBC Signals is closely working with to ensure no potential co-frequency interference into any university operations. RBC Signals acknowledges that any action on the requested STA will not affect the Commission's ultimate determination with respect to its forthcoming application for longer-term earth station operating authority for this antenna.

RBC Signals respectfully requests this 60-day STA pursuant to Section 25.120 of the Commission's rules, 47 C.F.R. § 25.120. Given the "extraordinary circumstances" surrounding this request, RBC Signals requests that the Commission authorize operations under this STA at the earliest practicable time.[19] Based on consultations with the Commission staff, RBC Signals understands that the exceptional circumstances warrant this temporary authority for near-term TT&C from the Fairbanks, Alaska facility, but that RBC Signals is to file an application for regular authority to provide TT&C for the 3 Diamonds mission. In addition, RBC Signals' original STA requests it 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.[20] To the extent necessary to grant this 60-day STA request, RBC Signals hereby incorporates those waiver requests by reference.

[19] 47 C.F.R. § 25.120(a). The Commission may authorize RBC Signals to commence operations under this STA sooner than 3 working days "upon due showing of extraordinary reasons for the delay." As discussed herein, given the unique and unpredictable circumstances of this request, in addition to the non-interference basis of RBC Signal operations, an expedited grant for this STA is warranted.

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

III. CONCLUSION

In view of the foregoing, including the operational obstacles present at the Deadhorse, Alaska facility and the importance of reliable TT&C operations, the public interest would be served by a grant at the earliest practicable time of a 60-day STA to allow RBC Signals to perform TT&C functions for the 3 Diamonds demonstration satellites using the AS100 Yagi in Fairbanks, Alaska.