

APPLICATION FOR EARTH STATION SPECIAL TEMPORARY AUTHORITY

APPLICANT INFORMATION Enter a description of this application to identify it on the main menu:  
60-Day STA Request

1. Applicant

**Name:** RBC Signals, LLC      **Phone Number:** 404-803-7734  
**DBA Name:**      **Fax Number:**  
**Street:** 2205 152nd Ave NE      **E-Mail:** crichins@rbcsignals.com  
**City:** Redmond      **State:** WA  
**Country:** USA      **Zipcode:** 98052  
**Attention:** Mr. Christopher Richins



**File #** SES-STA-20171015-01165  
**Call Sign**      **Grant Date** 11-8-17  
(or other identifier)  
**Term Dates**  
**From:** 11-8-17      **To:** 1-7-18  
**Approved:** *[Signature]*

Applicant: RBC Signals, LLC  
File No: SES-STA-20171015-01165  
Call Sign: None  
Special Temporary Authority (STA)

**Purpose of Operation:**

RBC Signals, LLC is granted a special temporary authority 60 day, beginning November 8, 2017, to operate a 1.1 meter earth station antenna (“AS100 Yagi”) at a facility in Fairbanks, Alaska to communicate with foreign-licensed low-Earth orbit (“LEO”) mobile-satellite service (“MSS”) cubesats; [“Red Diamond”, “Green Diamond” and “Blue Diamond” (the “3 Diamonds”)] licensed by United Kingdom to perform tracking, telemetry and command (“TT&C”) using the following frequency bands: 399.926-399.950 MHz (Earth-to-space) and 401.05-401.25 MHz (space-to-Earth).

1. Operations shall be on an unprotected, non-interference basis with respect to other authorized stations, including federal stations.
2. This is not a grant of market access to the 3 Diamonds system.
3. Any future requests or extensions will need to submit applications to the FCC to be re-coordinated with NTIA.
4. RBC Signals, LLC will inform NTIA (bmittchell@ntia.doc.gov, 202-482-4487) and the FCC (Paul.Blais@fcc.gov, 202-418-7274) at least 24 hours prior to the planned operations or if delayed beyond the requested beginning date 06/23/2017.
5. RBC Signals, LLC shall be aware that future non-federal launch and early orbit operations will be considered on a case-by-case basis, especially for requests in the band 399-402 MHz, and RBC Signals, LLC shall have no expectations that future operations will be approved.
6. All transmissions in the band 399-402 MHz must comply with national and international power flux-density limits.
7. Any action taken, or expense incurred as a result of operations pursuant to this STA is solely at RBC Signals, LLC’s risk.
8. This grant is issued pursuant to Section 0.261 of the Commission's rules on delegated authority, 47 C.F.R. § 0.261, and is effective upon release.



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Approved: Paul E. Blais

**2. Contact**

<b>Name:</b>	Carlos Nalda	<b>Phone Number:</b>	5713325626
<b>Company:</b>	LMI Advisors	<b>Fax Number:</b>	
<b>Street:</b>	2550 M Street NW Suite 345	<b>E-Mail:</b>	cnalda@lmiadvisors.com
<b>City:</b>	Washington	<b>State:</b>	DC
<b>Country:</b>	USA	<b>Zipcode:</b>	20037 -
<b>Attention:</b>		<b>Relationship:</b>	Other

(If your application is related to an application filed with the Commission, enter either the file number or the IB Submission ID of the related application. Please enter only one.)

3. Reference File Number or Submission ID

4a. Is a fee submitted with this application?

If Yes, complete and attach FCC Form 159. If No, indicate reason for fee exemption (see 47 C.F.R. Section 1.1114).

Governmental Entity  Noncommercial educational licensee

Other (please explain):

4b. Fee Classification CGB – Mobile Satellite Earth Stations

5. Type Request

Use Prior to Grant

Change Station Location

Other

6. Requested Use Prior Date  
10/16/2017

7. CityFairbanks

8. Latitude  
(dd mm ss.s h) 64 51 31.0 N

9. State AK	10. Longitude (dd mm ss.s h) 147 50 7.0 W
11. Please supply any need attachments. Attachment 1: Attachments 1 & 2      Attachment 2: Technical Appendix      Attachment 3: Narrative	
12. Description. (If the complete description does not appear in this box, please go to the end of the form to view it in its entirety.) RBC Signals seeks 60-day STA to operate a yagi antenna to provide TT&C.	
13. By checking Yes, the undersigned certifies that neither applicant nor any other party to the application is subject to a denial of Federal benefits that includes FCC benefits pursuant to Section 5301 of the Anti-Drug Act of 1988, 21 U.S.C. Section 862, because of a conviction for possession or distribution of a controlled substance. See 47 CFR 1.2002(b) for the meaning of "party to the application"; party to the application; for these purposes.	
14. Name of Person Signing Christopher Richins	15. Title of Person Signing CEO
WILLFUL FALSE STATEMENTS MADE ON THIS FORM ARE PUNISHABLE BY FINE AND / OR IMPRISONMENT (U.S. Code, Title 18, Section 1001), AND/OR REVOCATION OF ANY STATION AUTHORIZATION (U.S. Code, Title 47, Section 312(a)(1)), AND/OR FORFEITURE (U.S. Code, Title 47, Section 503).	

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**THE FOREGOING NOTICE IS REQUIRED BY THE PAPERWORK REDUCTION ACT OF 1995, PUBLIC LAW 104-13, OCTOBER 1, 1995, 44 U.S.C. SECTION 3507.**

**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<sup>1</sup> – 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.

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<sup>1</sup> 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.<sup>2</sup> 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”),<sup>3</sup> which is developing a cubesat constellation to provide affordable narrowband mobile communication services to users in Asia, Africa and Latin America.<sup>4</sup>

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-

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<sup>2</sup> *Id.*

<sup>3</sup> 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.

<sup>4</sup> 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.<sup>5</sup>

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

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<sup>5</sup> 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.<sup>6</sup>

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.<sup>7</sup> Given

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<sup>6</sup> See <https://www.skyandspace.global/operations-overview/>.

<sup>7</sup> 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),<sup>8</sup> 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,<sup>9</sup> but acknowledges that there is a pending FCC rulemaking addressing further use of this band,<sup>10</sup> as well as a proceeding developing U.S. preliminary views on a related WRC-19 agenda item.<sup>11</sup> 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

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<sup>8</sup> 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.

<sup>9</sup> See [https://www.ntia.doc.gov/files/ntia/publications/compendium/0399.90-0400.05\\_01DEC15.pdf](https://www.ntia.doc.gov/files/ntia/publications/compendium/0399.90-0400.05_01DEC15.pdf).

<sup>10</sup> 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>.

<sup>11</sup> 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.<sup>12</sup>

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

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<sup>12</sup> 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.”).

<sup>13</sup> See [https://www.ntia.doc.gov/files/ntia/publications/compendium/0400.05-0400.15\\_01DEC15.pdf](https://www.ntia.doc.gov/files/ntia/publications/compendium/0400.05-0400.15_01DEC15.pdf).

<sup>14</sup> See [https://www.ntia.doc.gov/files/ntia/publications/compendium/0400.15-0401.00\\_01DEC15.pdf](https://www.ntia.doc.gov/files/ntia/publications/compendium/0400.15-0401.00_01DEC15.pdf).

<sup>15</sup> 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<sup>2</sup> · 4 kHz), 9 dB lower than the -125 dBW/(m<sup>2</sup> · 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.<sup>16</sup>

SSG was awarded Frost & Sullivan’s 2016 Global Narrow-Band Nano-Satellite Connectivity Services Technology Innovation Award for its satellite constellation concept.<sup>17</sup> 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.<sup>18</sup>

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

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<sup>16</sup> See <http://www.asx.com.au/asxpdf/20160927/pdf/43bhb4pwhkhym8.pdf>.

<sup>17</sup> See <https://www.slideshare.net/FrostandSullivan/2016-global-narrowband-nanosatellite-connectivity-services-technology-innovation-award>.

<sup>18</sup> 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.<sup>19</sup> 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.<sup>20</sup> To the extent necessary to grant this 60-day STA request, RBC Signals hereby incorporates those waiver requests by reference.

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<sup>19</sup> 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.

<sup>20</sup> 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.

**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.:
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<sup>1</sup> See RBC Signals, LLC, File Nos. SES-STA-20170613-00643 (60-day STA) and SES-STA-20170731-00848 (180-day STA).

## I. BACKGROUND

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<sup>4</sup> 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.

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## **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.<sup>5</sup>

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

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<sup>5</sup> 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.<sup>6</sup>

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.<sup>7</sup> Given

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<sup>6</sup> See <https://www.skyandspace.global/operations-overview/>.

<sup>7</sup> 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),<sup>8</sup> 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,<sup>9</sup> but acknowledges that there is a pending FCC rulemaking addressing further use of this band,<sup>10</sup> as well as a proceeding developing U.S. preliminary views on a related WRC-19 agenda item.<sup>11</sup> 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

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<sup>8</sup> 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.

<sup>9</sup> See [https://www.ntia.doc.gov/files/ntia/publications/compendium/0399.90-0400.05\\_01DEC15.pdf](https://www.ntia.doc.gov/files/ntia/publications/compendium/0399.90-0400.05_01DEC15.pdf).

<sup>10</sup> 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>.

<sup>11</sup> 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.<sup>12</sup>

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

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<sup>12</sup> 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.”).

<sup>13</sup> See [https://www.ntia.doc.gov/files/ntia/publications/compendium/0400.05-0400.15\\_01DEC15.pdf](https://www.ntia.doc.gov/files/ntia/publications/compendium/0400.05-0400.15_01DEC15.pdf).

<sup>14</sup> See [https://www.ntia.doc.gov/files/ntia/publications/compendium/0400.15-0401.00\\_01DEC15.pdf](https://www.ntia.doc.gov/files/ntia/publications/compendium/0400.15-0401.00_01DEC15.pdf).

<sup>15</sup> 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<sup>2</sup> · 4 kHz), 9 dB lower than the -125 dBW/(m<sup>2</sup> · 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.<sup>16</sup>

SSG was awarded Frost & Sullivan’s 2016 Global Narrow-Band Nano-Satellite Connectivity Services Technology Innovation Award for its satellite constellation concept.<sup>17</sup> 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.<sup>18</sup>

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

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<sup>16</sup> See <http://www.asx.com.au/asxpdf/20160927/pdf/43bhb4pwhkhym8.pdf>.

<sup>17</sup> See <https://www.slideshare.net/FrostandSullivan/2016-global-narrowband-nanosatellite-connectivity-services-technology-innovation-award>.

<sup>18</sup> 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.<sup>19</sup> 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.<sup>20</sup> To the extent necessary to grant this 60-day STA request, RBC Signals hereby incorporates those waiver requests by reference.

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<sup>19</sup> 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.

<sup>20</sup> 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.

**TECHNICAL APPENDIX**

**RBC Signals LLC  
60-Day Special Temporary Authorization (STA)**

- I. Yagi Antenna Station Radiation Hazard Report
- II. 3 Diamonds Orbital Debris and Deorbit Report
- III. TT&C Link Budgets
- IV. TT&C Contours Map
- V. Draft FCC Form 312 Schedule B
- VI. Technical Certification



## I. Radiation Hazard Study

### 400 MHz Earth Station

This study analyzes the non-ionizing radiation levels for a 400 MHz Yagi tracking earth station. This report is developed in accordance with the prediction methods contained in OET Bulletin No. 65, Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields, Edition 97-01.

Bulletin No. 65 specifies that there are two separate tiers of exposure limits that are depending on the area of exposure and/or the status of the individuals who are subject to the exposure -- the General Population/Uncontrolled Environment and the Controlled Environment, where the general population cannot access.

The maximum level of non-ionizing radiation to which individuals may be exposed is limited to a power density level of 1.33 milliwatts per square centimeter ( $1.33 \text{ mW/cm}^2$ ) averaged over any 6 minute period in a controlled environment, and the maximum level of non-ionizing radiation to which the general public is exposed is limited to a power density level of 0.27 milliwatt per square centimeter ( $0.27 \text{ mW/cm}^2$ ) averaged over any 30 minute period in a uncontrolled environment.

In the normal range of transmit powers for satellite antennas, the power densities at or around the antenna surface are expected to exceed safe levels. The purpose of this study is to determine the power flux density levels for the earth station under study as compared with the MPE limits. This comparison is done in each of the following regions:

1. Far-field region
2. Near-field region
3. Transition region
4. The region between the antenna edge and the ground

#### **Input Parameters**

The following input parameters were used in the calculations:

<u>Parameters:</u>	<u>Value</u>	<u>Unit</u>	<u>Symbol</u>
<i>Antenna Diameter</i>	1.1	m	<i>D</i>
<i>Antenna Transmit Gain</i>	17	dBi	<i>G</i>
<i>Transmit Frequency</i>	400	MHz	<i>f</i>
<i>Power Input to the Antenna</i>	17.4	W	<i>P</i>

#### **Calculated Parameters:**

The following values were calculated using the above input parameters and the

corresponding formulas:

<u>Parameter</u>	<u>Value</u>	<u>Unit</u>	<u>Symbol</u>	<u>Formula</u>
<i>Antenna Surface Area</i>	2.362	m <sup>2</sup>	<i>A</i>	$G\lambda^2/(4\pi)/\lambda$
<i>Antenna Efficiency</i>	0.95		$\eta$	$G\lambda^2/(\pi^2 D^2)$
<i>Gain Factor</i>	50.1		<i>g</i>	$10^{G/10}$
<i>Wavelength</i>	0.75	m	$\lambda$	$300/f$

### **Behavior of EM Fields as a Function of Distance**

The behavior of the characteristics of EM fields varies depending on the distance from the radiating antenna. These characteristics are analyzed in three primary regions: the near-field region, the far-field region and the transition region. Of interest also is the region between the antenna and ground.

For yagi antennas with circular cross sections, such as the antenna under study, the near-field, far-field and transition region distances are calculated as follows:

<u>Parameter</u>	<u>Value</u>	<u>Unit</u>	<u>Formula</u>
<i>Near-Field Distance</i>	0.40	m	$R_{nf} = D^2/(4\lambda)$
<i>Distance to Far-Field</i>	0.97	m	$R_{ff} = 0.60D^2/(\lambda)$
<i>Distance of Transition Region</i>	0.40	m	$R_t = R_{nf}$

The distance in the transition region is between the near and far fields. Thus,  $R_{nf} \leq R_t \leq R_{ff}$ . However, the power density in the transition region will not exceed the power density in the near-field. Therefore, for purposes of the present analysis, the distance of the transition region can equate the distance to the near-field.

### **Power Flux Density Calculations**

The power flux density is considered to be at a maximum through the entire length of the near-field. This region is contained within a cylindrical volume with a diameter, *D*, equal to the diameter of the antenna. In the transition region and the far-field, the power density decreases inversely with the square of the distance. The following equations are used to calculate power density in these regions.

<u>Parameter</u>	<u>Value</u>	<u>Unit</u>	<u>Symbol</u>	<u>Formula</u>
<i>Power Density in the Near-Field</i>	2.80	mW/cm <sup>2</sup>	<i>S<sub>nf</sub></i>	$16.0 \eta P/(\pi D^2)$
<i>Power Density in the Far-Field</i>	7.40	mW/cm <sup>2</sup>	<i>S<sub>ff</sub></i>	$GP/(4\pi R_{ff}^2)$
<i>Power Density in the Transition Region</i>	2.80	mW/cm <sup>2</sup>	<i>S<sub>t</sub></i>	$S_{nf} R_{nf}/(R_t)$

The power density between the antenna and ground, is calculated as follows:

<u>Parameter</u>	<u>Value</u>	<u>Unit</u>	<u>Symbol</u>	<u>Formula</u>
<i>Power Density b/w Reflector and Ground</i>	0.74	mW/cm <sup>2</sup>	<i>S<sub>g</sub></i>	$P/A$

The below table summarizes the calculated power flux density values for each region. In a controlled environment, the only regions that exceed FCC limitations are shown below.

These regions are only accessible by trained technicians who, as a matter of procedure, turn off transmit power before performing any work in these areas.

<u>Power Density</u>	<u>Value</u>	<u>Unit</u>	<u>Controlled Environment</u>
<i>Far Field Calculation</i>	7.40	mW/cm <sup>2</sup>	Exceeds Limits
<i>Near Field Calculation</i>	2.80	mW/cm <sup>2</sup>	Exceeds Limits
<i>Transition Region</i>	2.80	mW/cm <sup>2</sup>	Exceeds Limits
<i>Region b/w Antenna &amp; Ground</i>	0.74	mW/cm <sup>2</sup>	Satisfies FCC MPE

In conclusion, the results show that the antenna, in a controlled environment, may exist in the regions noted above and applicant will take the proper mitigation procedures to ensure it meets the guidelines specified in 47 C.F.R. § 1.1310.

The antenna will be installed at a facility at the University of Alaska, Fairbanks. The facility is located within an enclosed walled courtyard, which restricts any public access. It should be noted that all spaces at least 5.5m away from the antenna satisfy the FCC MPE limits for the general population. The earth station will be marked with the standard radiation hazard warnings, as well as the area in the vicinity of the earth station to inform the general population, who might be working or otherwise present in or near the path of the main beam.

The applicant will ensure that the main beam of the antenna will be pointed at least one diameter away from any building, or other obstacles in those areas that exceed the MPE limits. Since one diameter removed from the center of the main beam the levels are down at least 20 dB, or by a factor of 100, public safety will be ensured.

Finally, the earth station's operational personnel will not have access to areas that exceed the MPE limits while the earth station is in operation. The transmitter will be turned off during periods of maintenance so that the MPE standard of 1.33 mW/cm<sup>2</sup> will be complied with for those regions in close proximity to the antenna, which could be occupied by operating personnel.

## II. Compliance with Orbital Debris and Deorbit Related Requirements

Assessment has been made for the Three Diamond Satellites for compliance with the requirements of §25.114(d)(14):

(i) The Three Diamonds satellite deployment planning and operational design was assessed to determine compliance with orbital debris release requirements. The Three Diamonds satellites are deployed from a qualified ISIS Quadpack system. The operational design of the Three Diamonds satellite does not include release of any debris during operations in any mission phase.

An assessment of the probability of the space station becoming a source of debris by collisions with small debris or meteoroids was performed using the NASA Debris Assessment Software (DAS), version 2.0.2. The Three Diamonds satellite was found to be compliant with the requirement (NS 8719.14 Requirement 4.5-2, Probability of Damage from Small Objects). Figure 1 below shows the DAS summary output screen.

(ii) The Three Diamonds satellite design has been assessed and found that the design limits the probability of accidental explosions during and after completion of mission operations. The only energy sources on board the satellite are the Li-Ion battery and the reaction wheel. Both are planned to be passivated at the end of mission. The Three Diamonds satellites have no propulsion systems, and hence have no residual fuel at end of mission.

(iii) The Three Diamonds satellite design has been assessed and found that the probability of the space station becoming a source of debris by collisions with large debris or other operational space stations is compliant with the requirement (NS 8719.14 Requirement 4.5-1, Probability of Collision with Large Objects). Figure 1 below shows the DAS summary output screen.

The anticipated evolution over time of the orbit of the Three Diamonds satellites has been assessed with DAS. The predicted orbital lifetime of the satellites is 5.3 years until re-entry into the atmosphere. The DAS orbital evolution is shown in Figure 2 below.

(iv) For the Three Diamonds satellites, the post-mission disposal plans at end of life are to rely on the natural orbital evolution, as shown in Figure 2 below, to culminate in atmospheric re-entry. As the satellites have no propulsion system, there is no fuel or other active propulsive means employed during deorbit.

For the Three Diamonds Satellites, a casualty risk assessment was performed because the planned post-mission disposal involves atmospheric re-entry. DAS analysis was performed as shows the satellites to be compliant with the requirement (NS 8719.14 Requirement 4.7-1, Casualty Risk from Reentry Debris).

Assessment of the Three Diamonds Satellites using DAS has shown the design and operational planning to be compliant with all requirements as shown in Figure 1 below. Note that compliance with Requirement 4.3-2, Mission-Related Debris Passing Near GEO, does not pertain to the Three Diamonds Satellites as they will not approach GEO orbits. Figure 1 also

shows compliance with Requirement 4.4-3, Long Term Risk from Planned Breakups, because there are no planned breakups for these satellites. Compliance with Requirement 4.8-1, Collision Hazards with Space Tethers, does not pertain to the Three Diamonds Satellites as they do not employ tethers.

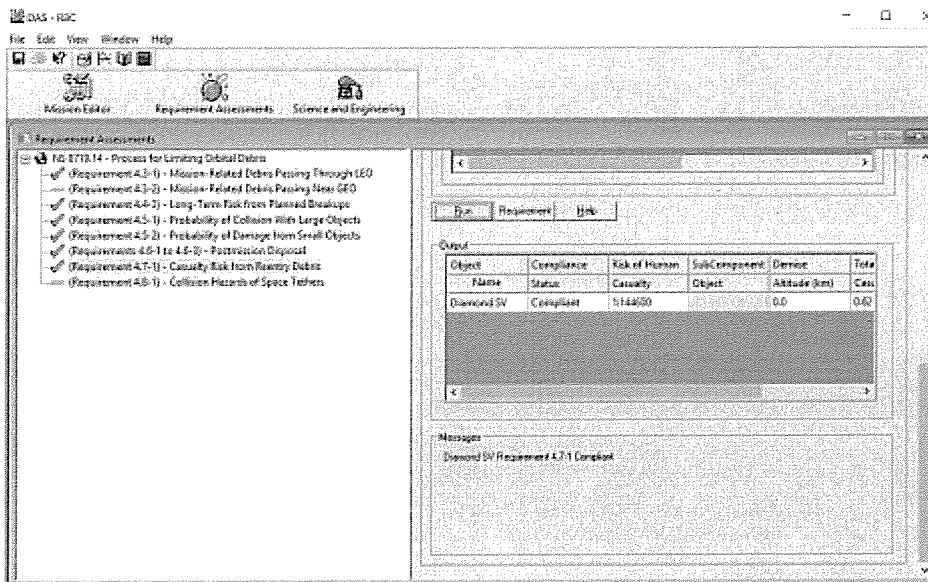


Figure 1 - Debris Assessment Software Requirements Compliance

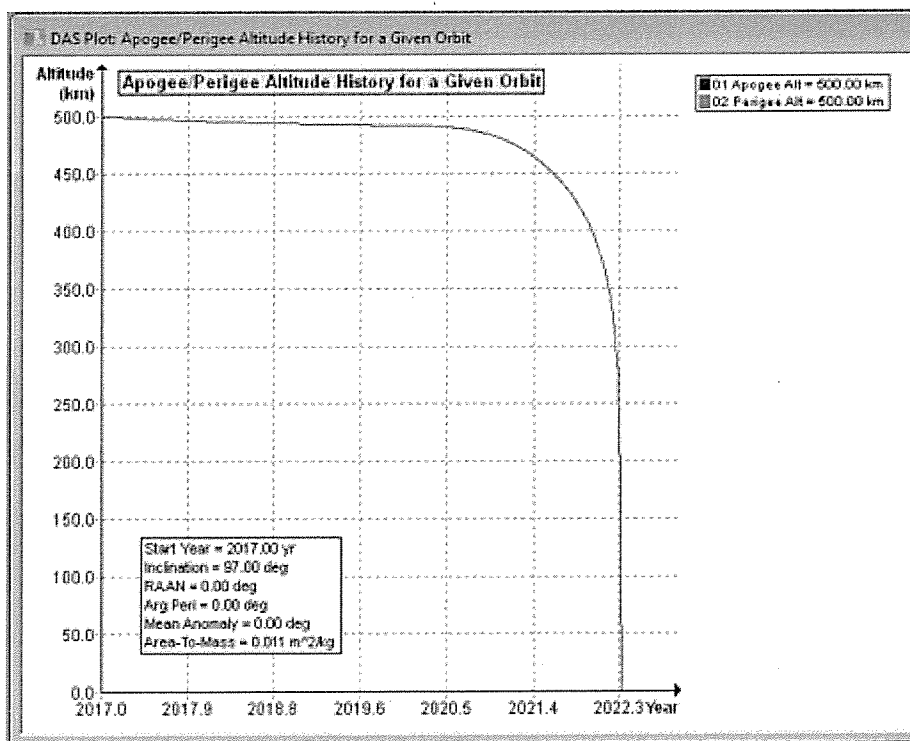


Figure 2 – DAS Orbit Evolution

### III. Link Budgets

#### UHF Link - Uplink

Link parameters		Unit	Notes
Carrier Frequency	399.938	MHz	
Carrier wavelength	0.75	m	
Boltzmann constant	-228.6	dBW/K/Hz	
<b>BASIC PARAMETERS</b>			
Orbit height	500	km	
Earth radius	6371	km	
Horizon height	0	•	
Tx-Rx distance	2573	km	
<b>Ground Segment</b>			
Antenna Gain	17.0	dBi	<i>Dual Crossed Yagis</i>
Tx RF power	25.0	W	
Tx losses	1.6	dB	<i>Cable and connector</i>
Tx EIRP	29.4	dBW	
<b>PROPAGATION</b>			
GS antenna pointing loss	0.5	dB	
Polarization losses	3.0	dB	<i>Worst-case</i>
Free space losses	152.7	dB	
Atmospheric Losses	2.1	dB	
Ionospheric losses	0.4	dB	
<b>Total Propagation Losses</b>	<b>158.7</b>	<b>dB</b>	
<b>Satellite Segment</b>			
Satellite Antenna Pointing Loss	0.0	dB	
Antenna Gain	0.0	dBi	
Spacecraft Tx line losses	0.2	dB	
Antenna Temperature	150	K	<i>Earth is half of F.o.V.</i>
Satellite Noise Temperature	500	K	<i>Estimate</i>
System Noise Temperature	650.0	K	
System Noise Temperature	28.1	dBK	
Rx G/T	-28.3	dB/K	
<b>Final C/No</b>	<b>71.0</b>	<b>dBHz</b>	

Receive Channel Bandwidth	7.2	kHz	<i>typically 1.5x bit rate</i>
Useful bitrate	4.8	kBit	
Required Eb/No	4.8	dB	<i>GMSK, Conv. R=1/2, K=7 &amp; R.S. (255,223)</i>
Receiver Implementation Loss	3.0	dB	<i>Demodulator phase offset</i>
C/No required	46.37	dBHz	
MARGIN A --> B	24.59	dB	

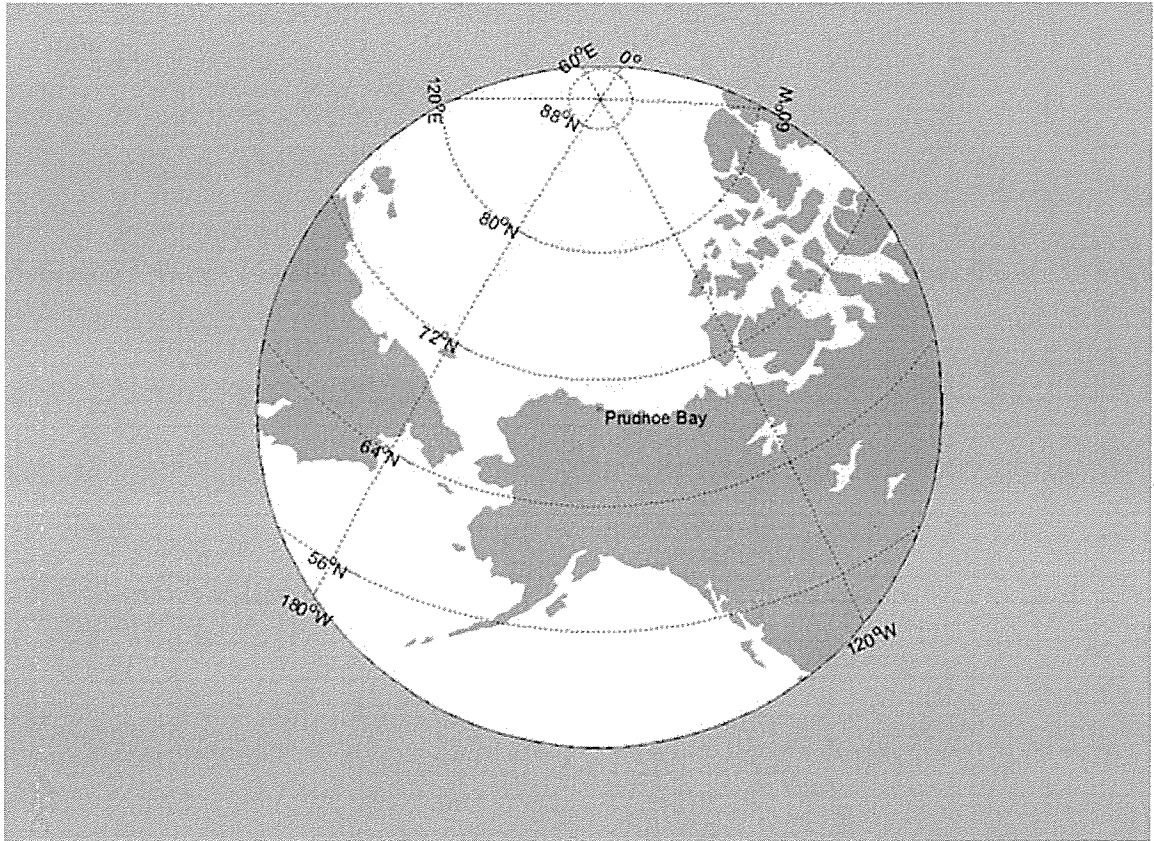
**UHF Link - Downlink**

Link parameters		Unit	Notes
Carrier Frequency	401.50	MHz	401 - 402 MHz
Carrier wavelength	0.75	m	
Boltzmann constant	-228.6	dBW/K/Hz	
<b>BASIC PARAMETERS</b>			
Orbit height	500	km	
Earth radius	6371	km	
Horizon height	0	"	
<b>Tx-Rx distance</b>	<b>2573</b>	<b>km</b>	
<b>Satellite Segment</b>			
Tx antenna gain	0.0	dBi	
Tx RF power	1.0	W	
Tx losses	0.5	dB	Cable and connector
<b>Tx EIRP</b>	<b>-0.5</b>	<b>dBW</b>	
<b>PROPAGATION</b>			
Satellite Antenna Pointing Loss	0.0	dB	
Polarization Loss	3.0	dB	Worst-case
Free space losses	152.7	dB	
Atmospheric Loss	2.1	dB	
Ionospheric Loss	0.4	dB	
<b>Total Propagation Losses</b>	<b>158.2</b>	<b>dB</b>	
<b>Ground Segment</b>			
GS Antenna Pointing Loss	0.5	dB	
Antenna Gain	17.0	dBi	Dual Crossed Yagis
GS Transmission Line Losses	0.5	dB	
Antenna Temperature	170	K	Worst-case at 0° elevation
Ground Noise Temperature	300	K	Estimate
System Noise Temperature	470.0	K	
System Noise Temperature	26.7	dBK	
Rx G/T	-10.7	dB/K	
<b>Final C/No</b>	<b>59.2</b>	<b>dBHz</b>	



Receive Channel Bandwidth	28.8	kHz	<i>typically 1.5x bit rate</i>
Useful bitrate	19.2	kBit	
Required Eb/No	4.80	dB	<i>GMSK, Conv. R=1/2, K=7 &amp; R.S. (255,223) Demodulator phase offset</i>
Receiver Implementation Loss	3.00	dB	
C/No required	52.39	dBHz	
<b>MARGIN A → B</b>	<b>6.76</b>	dB	

#### IV. TT&C Contours Map



Note that the contours at 2 dB below peak fall entirely beyond the edge of the visible Earth.

**V. Draft FCC Form 312 Schedule B**

Approved by OMB  
3060-0678

Date & Time Filed:  
File Number: ---  
Callsign/Satellite ID:

<b>APPLICATION FOR EARTH STATION AUTHORIZATIONS</b>	<b>FCC Use Only</b>
<b>FCC 312 MAIN FORM FOR OFFICIAL USE ONLY</b>	

**APPLICANT INFORMATION**

Enter a description of this application to identify it on the main menu:

**DRAFT APPLICATION (60-Day STA for TT&C)**

<b>1-8. Legal Name of Applicant</b>			
Name:	RBC Signals, LLC	Phone Number:	404-803-7734
DBA Name:		Fax Number:	
Street:	2205 152nd Ave NE	E-Mail:	crichins@rbcsignals.com
City:	Redmond	State:	WA
Country:	USA	Zipcode:	98052 -
Attention: Mr. Christopher Richins			

<b>9-16. Name of Contact Representative</b>			
Name:	Carlos Nalda	Phone Number:	5713325626
Company:	LMI Advisors	Fax Number:	
Street:	2550 M Street NW Suite 345	E-Mail:	cnalda@lmiadvisors.com
City:	Washington	State:	DC
Country:	USA	Zipcode:	20037-
Attention: Mr. Carlos Nalda		Relationship:	Other

**CLASSIFICATION OF FILING**

<p><b>17. Choose the button next to the classification that applies to this filing for both questions a. and b. Choose only one for 17a and only one for 17b.</b></p> <p><b>a.</b></p> <p><input checked="" type="radio"/> a1. Earth Station (N/A) a2. Space Station</p>	<p><b>b.</b></p> <p><input checked="" type="radio"/> b1. Application for License of New Station</p> <p><input type="radio"/> b2. Application for Registration of New Domestic Receive-Only Station</p> <p>(N/A) b3. Amendment to a Pending Application</p> <p>(N/A) b4. Modification of License or Registration</p> <p>(N/A) b5. Assignment of License or Registration</p> <p>(N/A) b6. Transfer of Control of License or Registration</p> <p>(N/A) b7. Notification of Minor Modification</p> <p>(N/A) b8. Application for License of New Receive-Only Station Using Non-U.S. Licensed Satellite</p> <p>(N/A) b9. Letter of Intent to Use Non-U.S. Licensed Satellite to Provide Service in the United States</p> <p><input type="radio"/> b10. Other (Please specify)</p> <p><input type="radio"/> b11. Application for Earth Station to Access a Non-U.S. satellite Not Currently Authorized to Provide the Proposed Service in the Proposed Frequencies in the United States.</p>
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<p><b>17c. Is a fee submitted with this application?</b></p> <p><input checked="" type="radio"/> If Yes, complete and attach FCC Form 159.</p> <p>If No, indicate reason for fee exemption (see 47 C.F.R. Section 1.1114).</p> <p><input type="radio"/> Governmental Entity   <input type="radio"/> Noncommercial educational licensee</p> <p><input type="radio"/> Other (please explain):</p>
---

<p><b>17d.</b></p> <p>Fee Classification BAX - Fixed Satellite Transmit/Receive Earth Station</p>
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<p><b>18. If this filing is in reference to an</b></p>	<p><b>19. If this filing is an amendment to a pending application enter:</b></p>
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existing station, enter: (a) Call sign of station: Not Applicable	(a) Date pending application was filed: Not Applicable	(b) File number of pending application: Not Applicable
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**TYPE OF SERVICE**

20. NATURE OF SERVICE: This filing is for an authorization to provide or use the following type(s) of service(s): Select all that apply:

a. Fixed Satellite  
 b. Mobile Satellite  
 c. Radiodetermination Satellite  
 d. Earth Exploration Satellite  
 e. Direct to Home Fixed Satellite  
 f. Digital Audio Radio Service  
 g. Other (please specify)  
 Space Operations

21. STATUS: Choose the button next to the applicable status. Choose only one.  
 Common Carrier  Non-Common Carrier

22. If earth station applicant, check all that apply.  
 Using U.S. licensed satellites  
 Using Non-U.S. licensed satellites

23. If applicant is providing INTERNATIONAL COMMON CARRIER service, see instructions regarding Sec. 214 filings. Choose one. Are these facilities:  
 Connected to a Public Switched Network  Not connected to a Public Switched Network  N/A

24. FREQUENCY BAND(S): Place an "X" in the box(es) next to all applicable frequency band(s).  
 a. C-Band (4/6 GHz)  b. Ku-Band (12/14 GHz)  
 c. Other (Please specify upper and lower frequencies in MHz.)  
 Frequency Lower: 399.926 Frequency Upper: 401.25

**TYPE OF STATION**

25. CLASS OF STATION: Choose the button next to the class of station that applies. Choose only one.  
 a. Fixed Earth Station  
 b. Temporary-Fixed Earth Station  
 c. 12/14 GHz VSAT Network  
 d. Mobile Earth Station  
 (N/A) e. Geostationary Space Station  
 (N/A) f. Non-Geostationary Space Station  
 g. Other (please specify)

26. TYPE OF EARTH STATION FACILITY: Choose only one.  
 Transmit/Receive  Transmit-Only  Receive-Only  N/A

**PURPOSE OF MODIFICATION**

27. The purpose of this proposed modification is to: (Place an 'X' in the box(es) next to all that apply.)  
 Not Applicable

**ENVIRONMENTAL POLICY**

28. Would a Commission grant of any proposal in this application or amendment have a significant environmental impact as defined by 47 CFR 1.1307? If YES, submit the statement as required by Sections 1.1308 and 1.1311 of the Commission's rules, 47 C.F.R. §§ 1.1308 and 1.1311, as an exhibit to this application. A Radiation Hazard Study must accompany all applications for new transmitting facilities, major modifications, or major amendments.  Yes  No

**ALIEN OWNERSHIP** Earth station applicants not proposing to provide broadcast, common carrier, aeronautical en route or aeronautical fixed radio station services are not required to respond to Items 30-34.

29. Is the applicant a foreign government or the representative of any foreign government?  Yes  No

30. Is the applicant an alien or the representative of an alien?  Yes  No  N/A

31. Is the applicant a corporation organized under the laws of any foreign government?  Yes  No  N/A

32. Is the applicant a corporation of which more than one-fifth of the capital stock is owned of record or voted by aliens or their representatives or by a foreign government or representative thereof or by any corporation organized under the laws of a foreign country?  Yes  No  N/A

33. Is the applicant a corporation directly or indirectly controlled by any other corporation of which more than one-fourth of the capital stock is owned of record or voted by aliens, their representatives, or by a  Yes  No  N/A

foreign government or representative thereof or by any corporation organized under the laws of a foreign country?

34. If any answer to questions 29, 30, 31, 32 and/or 33 is Yes, attach as an exhibit an identification of the aliens or foreign entities, their nationality, their relationship to the applicant, and the percentage of stock they own or vote.

### BASIC QUALIFICATIONS

35. Does the Applicant request any waivers or exemptions from any of the Commission's Rules?  Yes  No  
If Yes, attach as an exhibit, copies of the requests for waivers or exceptions with supporting documents.

36. Has the applicant or any party to this application or amendment had any FCC station authorization or license revoked or had any application for an initial, modification or renewal of FCC station authorization, license, or construction permit denied by the Commission? If Yes, attach as an exhibit, an explanation of circumstances.  Yes  No

37. Has the applicant, or any party to this application or amendment, or any party directly or indirectly controlling the applicant ever been convicted of a felony by any state or federal court? If Yes, attach as an exhibit, an explanation of circumstances.  Yes  No

38. Has any court finally adjudged the applicant, or any person directly or indirectly controlling the applicant, guilty of unlawfully monopolizing or attempting unlawfully to monopolize radio communication, directly or indirectly, through control of manufacture or sale of radio apparatus, exclusive traffic arrangement or any other means or unfair methods of competition? If Yes, attach as an exhibit, an explanation of circumstances.  Yes  No

39. Is the applicant, or any person directly or indirectly controlling the applicant, currently a party in any pending matter referred to in the preceding two items? If yes, attach as an exhibit, an explanation of the circumstances.  Yes  No

40. If the applicant is a corporation and is applying for a space station license, attach as an exhibit the names, address, and citizenship of those stockholders owning a record and/or voting 10 percent or more of the Filer's voting stock and the percentages so held. In the case of fiduciary control, indicate the beneficiary(ies) or class of beneficiaries. Also list the names and addresses of the officers and directors of the Filer.

41. By checking Yes, the undersigned certifies, that neither applicant nor any other party to the application is subject to a denial of Federal benefits that includes FCC benefits pursuant to Section 5301 of the Anti-Drug Act of 1988, 21 U.S.C. Section 862, because of a conviction for possession or distribution of a controlled substance. *See 47 CFR 1.2002(b) for the meaning of "party to the application" for these purposes.*  Yes  No

42a. Does the applicant intend to use a non-U.S. licensed satellite to provide service in the United States? If Yes, answer 42b and attach an exhibit providing the information specified in 47 C.F.R. 25.137, as appropriate. If No, proceed to question 43.  Yes  No

42b. What administration has licensed or is in the process of licensing the space station? If no license will be issued, what administration has coordinated or is in the process of coordinating the space station? U.K.

43. Description. (Summarize the nature of the application and the services to be provided). RBC Signals seeks 60-day special temporary authorization. See Narrative.

43a. Geographic Service Rule Certification  
By selecting A, the undersigned certifies that the applicant is not subject to the geographic service or geographic coverage requirements specified in 47 C.F.R. Part 25.  A

By selecting B, the undersigned certifies that the applicant is subject to the geographic service or geographic coverage requirements specified in 47 C.F.R. Part 25 and will comply with such requirements.  B

By selecting C, the undersigned certifies that the applicant is subject to the geographic service or geographic coverage requirements specified in 47 C.F.R. Part 25 and will not comply with such requirements because it is not feasible as a technical matter to do so, or that, while technically feasible, such services would require so many compromises in satellite design and operation as to make it economically unreasonable. A narrative description and technical analysis demonstrating this claim are attached.  C

### CERTIFICATION

The Applicant waives any claim to the use of any particular frequency or of the electromagnetic spectrum as against the regulatory power of the United States because of the previous use of the same, whether by license or otherwise, and requests an authorization in accordance with this application. The applicant certifies that grant of this application would not cause the applicant to be in violation of the spectrum aggregation limit in 47 CFR Part 20. All statements made in exhibits are a material part hereof and are incorporated herein as if set out in full in this application. The undersigned, individually and for the applicant, hereby certifies that all statements made in this application and in all attached exhibits are true, complete and correct to the best of his or her knowledge and belief, and are made in good faith.

44. Applicant is a (an): (Choose the button next to applicable response.)

- Individual
- Unincorporated Association
- Partnership
- Corporation
- Governmental Entity
- Other (please specify)  
LLC

45. Name of Person Signing  
Christopher Richins

46. Title of Person Signing  
CEO

47. Please supply any need attachments.

Attachment 1:

Attachment 2:

Attachment 3:

**WILLFUL FALSE STATEMENTS MADE ON THIS FORM ARE PUNISHABLE BY FINE AND / OR IMPRISONMENT (U.S. Code, Title 18, Section 1001), AND/OR REVOCATION OF ANY STATION AUTHORIZATION (U.S. Code, Title 47, Section 312(a)(1)), AND/OR FORFEITURE (U.S. Code, Title 47, Section 503).**

**SATELLITE EARTH STATION AUTHORIZATIONS  
FCC Form 312 - Schedule B:(Technical and Operational Description)**

**FOR OFFICIAL USE ONLY**

Location of Earth Station Site

E1: Site Identifier: RBC-FB

E5. Call Sign:

E2: Contact Name Christopher Richins

E6. Phone Number: 650-746-8744

E3. Street:

E7. City: Fairbanks

E4. State AK

E8. County:

E9. Zip Code 99734

E10. Area of Operation:

Fairbanks, Alaska

E11. Latitude: 64 ° 51 ' 31.0 " N

E12. Longitude: 147 ° 50 ' 7.0 " W

E13. Lat/Lon Coordinates are:

NAD-27

NAD-83

N/A

E14. Site Elevation (AMSL):

15.0 meters

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.

Yes  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?

Yes  No  N/A

E17. Is the facility operated by remote control? If YES, provide the location and telephone number of the control point.

Yes  No

E18. Is frequency coordination required? If YES, attach a frequency coordination report as

Yes  No

E19. Is coordination with another country required? If YES, attach the name of the country(ies) and plot of coordination contours as

Yes  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?**

Yes  No

**FAILURE TO COMPLY WITH 47 CFR PARTS 17 AND 25 WILL RESULT IN THE RETURN OF THIS APPLICATION.**

**POINTS OF COMMUNICATION**

Satellite Name: OTHER   OTHER   If you selected OTHER, please enter the following:	
E21. Common Name: 3 Diamonds	E22. ITU Name:
E23. Orbit Location: NGSO MSS	E24. Country: United Kingdom

**POINTS OF COMMUNICATION (Destination Points)**

E25. Site Identifier: RBC-FB	
E26. Common Name:	E27. Country: USA

**ANTENNA**

Site ID	E28. Antenna Id	E29. Quantity	E30. Manufacturer	E31. Model	E32. Antenna Size	E41/42. Antenna Gain Transmint and/or Recieve(____dBi at ____GHz)
RBC-FB	RBC-FB1	1	GomSpace	AS100	1.1	17.0 dBi at 0.400

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 al carriers (dBW)
RBC-FB1	0.0/0.0	25.0	15.0	0.0	12.53	0.0	28.0

**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 EIRP Density per Carrier(dBW/4kHz)
RBC-FB1	401.05 401.25	R	Right Hand Circular	16K5G1D	0.0	0.0

**E50. Modulation and Services TT&C**

RBC-FB1	401.05 401.25	R	Right Hand Circular	1K03G1D	0.0	0.0
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**E50. Modulation and Services TT&C**

RBC-FB1	401.05 401.25	R	Right Hand Circular	4K13G1D	0.0	0.0
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**E50. Modulation and Services TT&C**

RBC-FB1	401.05 401.25	R	Right Hand Circular	8K26G1D	0.0	0.0
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**E50. Modulation and Services TT&C**

RBC-FB1	399.926 399.950	T	Right Hand Circular	16K5G1D	28.0	21.83
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**E50. Modulation and Services TT&C**

RBC-FB1	399.926 399.950	T	Right Hand Circular	1K03G1D	28.0	28.0
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**E50. Modulation and Services TT&C**

RBC-FB1	399.926 399.950	T	Right Hand Circular	4K13G1D	28.0	27.84
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**E50. Modulation and Services TT&C**

RBC-FB1	399.926 399.950	T	Right Hand Circular	8K26G1D	28.0	24.83
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**E50. Modulation and Services TT&C**

E28. Antenna	E51. Satellite Orbit Type	E52/53. Frequency	E54/55. Range	E56. Earth	E57. Antenna	E58. Earth	E59. Antenna	E60. Maximum EIRP Density



<b>Id</b>		<b>Limits(MHz)</b>	<b>of Satellite Arc E/W Limit</b>	<b>Station Azimuth Angle Eastern Limit</b>	<b>Elevation Angle Eastern Limit</b>	<b>Station Azimuth Angle Western Limit</b>	<b>Elevation Angle Western Limit</b>	<b>toward the Horizon(dBW/4kHz)</b>
RBC-FB1	Non-Geostationary	401.05 401.25	0.0/ 0.0	0.0	5.0	360.0	5.0	0.0
	Non-Geostationary	399.926 399.950	0.0/ 0.0	0.0	5.0	360.0	5.0	28.0

**REMOTE CONTROL POINT LOCATION****REMOTE CONTROL POINT LOCATION**

E61. Call Sign  NOTE: Please enter the callsign of the controlling station, not the callsign for which this application is being filed.		E65. Phone Number 650-746-8744	
E62. Street Address 2205 152nd Street NE			
E63. City Redmond		E67. County King	E64/68. State/Country WA/ USA
			E66. Zip Code 98052

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THE FOREGOING NOTICE IS REQUIRED BY THE PAPERWORK REDUCTION ACT OF 1995, PUBLIC LAW 104-13, OCTOBER 1, 1995, 44 U.S.C. SECTION 3507.

## **VI. Technical Certification**

I, David Morse, hereby certify that I am the technically qualified person responsible for the preparation of the technical information contained in the RBC Signals 180-Day STA application for TT&C operating authority and the accompanying Technical Appendix, that I am familiar with Part 25 of the Commission's Rules (47 C.F.R. Part 25), and that I have either prepared or reviewed the technical information submitted in this application and found it to be complete and accurate to the best of my knowledge and belief.

By: /s/David Morse

Title: VP, Communication Systems  
Avaliant, LLC

Date: Oct. 15, 2017