

RBC Signals , LLC  
Experimental License Application  
File No.: 1862-EX-CN-2023  
FCC Station Call Sign: E230151

### **Explanation of Experiment**

RBC Signals LLC is seeking an experimental license for a transmitting ground station to support the operations of a rapid revisit cloud imaging satellite, known as RROCI-2<sup>1</sup>. This satellite is an experiment being conducted for the US Space Force to determine how the satellite can improve in-theater weather imagery over the currently available technologies. The RROCI-2 satellite is a 12U satellite which is scheduled to launch in March 2024 on SpaceX's Transporter 10.

The Atmospheric And Space Technology Research Associates (Atmospheric) will own, operate, and control RROCI-2 for the duration of its mission.

### **Background**

In 2021, Atmospheric submitted an almost identical for the operation of its RROCI satellite, to serve the same purpose as is being proposed for RROCI-2. The original satellite application was granted experimental license WM2XEU in August 2022, and modified to correct the orbital elevation in November 2022. The first RROCI satellite launched on Transporter 6 on January 3, 2023, but it was never deployed from the launch vehicle, so RROCI is not on orbit. It met its demise when the launch vehicle returned to earth.

This application seeks authorization for RBC Signals to use its Deadhorse Alaska based 3.7 Meter S and X band antenna to communicate with RROCI-2 as described in the supporting documentation of Atmospheric's application number 0634-EX-CN-2023.

---

<sup>1</sup> Pronounced "Rocky".

## Technical Synopsis For Ground Station Operation

- Spectrum Needed: 8025-8225 MHz – primary downlink, 100 Mbps data rate  
2217 MHz – backup downlink, 2 Mbps data rate, and  
2085.5 MHz- primary uplink, 512 Khz bandwidth (RBC Signals Transmission from 3.7 meter antenna)
- Time of Use: downlink transmissions expected once per orbit
- Orbital Period: about 95 minutes, sun-synchronous, polar orbit
- Satellite Elevation: 525 KM
- Orbital Inclination: 97.4 °
- Federal Contract #: SSC FA8808-23-9-0001
- Emission Designators: X band: 200MG1D – downlink of payload data  
S band: 4M00G1D – downlink of payload data, back up link  
Beacon: 35K0G1D – beacon transmissions

## Information Regarding Federal Contract

Federal Contract Number: SSC FA8808-23-9-0001

Federal Contracting Agency: US Space Force

Point of Contact on Contract: Lieutenant Allen Shadan

ALLEN G. SHADAN, 2LT, USSF  
DCIA | EO/IR Weather System  
Space Systems Command  
Los Angeles AFB, CA  
C: 949-690-5112  
Email: [allen.shadan.1@spaceforce.mil](mailto:allen.shadan.1@spaceforce.mil)

## Description of Experiment

Atmospheric has been developing advanced capabilities of imaging weather. This technology is of great interest to the US Air Force and US Space Force as they plan for future in-theater weather imagery support. After several successful rounds of research and development working under SBIR grants, Atmospheric developed the RROCI system to advance the science of cloud imagery for weather predictions. RROCI-2 is a 12U satellite which has been designed to incorporate multiple cameras with a satellite downlink and an electronic propulsion system. RROCI-2 will be orbiting the earth in a sun-synchronous orbit and capture still imagery at a rapid framerate. Atmospheric secured an imagery license from CRSRA at the Department of Commerce on September 1, 2021, which allows it to use its earth sensing imaging equipment. A modified imagery license that covers the operations of RROCI-2 will be submitted to the FCC shortly. Because the FCC review process can require more time than the imagery license application review, and because time is short, it is necessary to submit the spacecraft and supporting ground station experimental license application to the FCC before the NOAA imagery license modification has been completed.

RROCI-2 is scheduled to launch on SpaceX Transporter 10, which will release its satellite payloads at 525 km.

Atmospheric's instructions to the satellite will be sent over secure VPN from Atmospheric's headquarters (mission control) to the station in Deadhorse, Alaska. Those instructions will be uplinked to RROCI-2. RBC Signals will operate this uplink to its satellite. Atmospheric is seeking license for downlink operations only, with RBC Signals seeking this license for uplink. The downlink operations are an essential component of the technology demonstration Atmospheric is conducting for the US Space Force. The uplink frequency will be 2085.5 MHz with a bandwidth of 512 KHz.

RROCI-2 has been designed with a backup downlink capability. That link operates in the S band with a center frequency at 2217 MHz. The capacity of the link is much lower, making it less appealing as a downlink solution. Nevertheless, the radio was incorporated into RROCI-2 to ensure that there is a failsafe system that can show the performance of the satellite if the X band link does not work properly. RROCI-2 is only expected to use the S band link about 20 times during the life of the experiment, presuming the X band link works as expected. The S band link is expected to send information down to the ground stations as well.

#### Length of Satellite Operations

Atmospheric has a contract to operate this satellite for a year after launch. The application seeks authorization for a full two-year experimental license to match the satellite application. The reason that Atmospheric is seeking a 2- year license is that there is some possibility that its DoD customers will want to extend the contract for some additional period, whether a few weeks or months and RBC Signals would like to be in a position to support this system without additional licensure in the event of an extension of operations.

The satellite mission is engineered so that the satellite can function properly, maintaining its designated orbit for a full two years. Further, the satellite's propulsion system is adequate to support any necessary collision avoidance maneuvers during the operational period and still have sufficient capacity to deorbit the satellite at the end of its mission, whether that will be at the one-year mark or beyond.

#### Time of Use is Limited; Area of Operations is Limited

The satellite will orbit over the north pole every 95 minutes. The X band downlink may be in use 4-6 times per day over the ground station as needed. The X band radio will only be in use for about 5 minutes of each pass over a ground station. RROCI-2 will not downlink images on each pass over the ground station, and its X band radios will be turned off when it is not passing over a ground station. The ground stations were selected to give RROCI-2 the best opportunity to demonstrate that it is capturing key information and sharing that information promptly.

## Ground Station Information

As noted above, Atmospheric has entered into contracts with RBC Signals for Deadhorse Alaska based ground station operations. The ground stations that Atmospheric will use are listed in Table 2, below, with the caveat that Svalbard and Troll will only be used for commissioning the satellite.

| <b>Name of station, city and country</b> | <b>Lat</b> | <b>Long</b> | <b>X band</b>                         | <b>S band</b>                         | <b>#of contacts w/satellite per day, time of each</b>    |
|--|------------|-------------|---------------------------------------|---------------------------------------|--|
| Svalbard, Norway                         | 78-13-47 N | 15-23-53 E  | Beamwidth = 0.69 °<br>Gain: 47.01 dBi | Beamwidth = 2.56 °<br>Gain: 37.13 dBi | Contacts = ~ 14 x / day<br>Duration - ~ 10 min / contact |
| Awarua, New Zealand                      | 46-31-45 S | 168-22-52 E | Beamwidth = 0.69 °<br>Gain: 47.01 dBi | Beamwidth = 2.56 °<br>Gain: 37.13 dBi | Contacts = ~ 1 x / day<br>Duration - ~ 10 min / contact  |
| Punta Arenas, Chile                      | 52-56-17 S | 70-51-28 W  | Beamwidth = 0.69 °<br>Gain: 47.01 dBi | Beamwidth = 2.56 °<br>Gain: 37.13 dBi | Contacts = ~ 1 x / day<br>Duration - ~ 10 min / contact  |
| TrollSat, Queen Maud Land, Antarctica    | 72-00-06 S | 2-31-32 E   | Beamwidth = 0.69 °<br>Gain: 47.01 dBi | Beamwidth = 2.56 °<br>Gain: 37.13 dBi | Contacts = ~ 2 x / day<br>Duration - ~ 10 min / contact  |
| Long Beach, California USA               | 33-49-27 N | 118-08-47 W | Beamwidth = 0.69 °<br>Gain: 47.01 dBi | Beamwidth = 2.56 °<br>Gain: 37.13 dBi | Contacts = ~ 2 x / day<br>Duration - ~ 10 min / contact  |
| Deadhorse, Alaska, USA                   | 70-11-27 N | 148-26-07 W | Beamwidth = 0.69 °<br>Gain: 47.01 dBi | Beamwidth = 2.56 °<br>Gain: 37.13 dBi | Contacts = 10 x / day<br>Duration - ~ 10 min / contact   |

*Table 1. Ground Station details*

## Stop Buzzer POC

Zachary Reich  
+1 336 327 8699  
[Zach@RBCSignals.com](mailto:Zach@RBCSignals.com)  
2205 152<sup>nd</sup> Ave NE  
Redmond WA  
98052

## Conclusion

RBC Signals is seeking a new experimental license for its 3.7 meter ground station in Deadhorse Alaska to support the RROCI-2 satellite for operations at an orbital elevation of 525 km in a circular, sun synchronous orbit.

Atmospheric holds an imagery license from NOAA. The existing imagery license will be modified to cover the operations of RROCI-2. The modified license will be submitted promptly once it is granted by NOAA.

RROCI-2 will be deorbited at the end of its mission. The deorbit planning shows that the satellite will burn up completely upon reentry. The deorbiting plan has been reviewed and was approved with the grant of WM2XEU, and there are no changes.

For questions about this application, please contact Zachary Reich, [Zach@RBCSignals.com](mailto:Zach@RBCSignals.com), 336-327-8699.