

**BRIO Satellite Modification**  
**Attachment 1 to Form 442**  
**File #: 0020-EX-CM-2019**

This modification of FCC File # 0220-EX-CN-2018, adds three receive-only ground stations to the BRIO satellite S-Band downlink transmissions. All three ground stations are owned and operated by entities other than SpaceQuest. The Svalbard, Norway Ground Station is owned and operated by KSAT and located in the High-Arctic. The Troll (TrollSat) Ground Station is also owned and operated by KSAT and located in the Antarctic. The Fairbanks, Alaska Ground Station is operated by RBC Signals. The satellite's space-to-Earth frequency band of 2201 MHz will be used to downlink BRIO's data in order to test and evaluate the effectiveness of its experimental program.

## Part A: Space to Earth Downlink Data

## Satellite Transmitter Data

|                                                          |                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Transmit Frequency: 2201 MHz (2200-2220 MHz)</b>      |                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Satellite Name: <b>BRIO</b>                              |                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Data Field</b>                                        | <b>Data Answer</b>                                                                                                                                                                                                                                                 | <b>Description/Comments</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Polarization (XAP)                                       | XAP = R                                                                                                                                                                                                                                                            | POLARIZATIONS INCLUDE:<br>H = HORIZONTAL,<br>V = VERTICAL,<br>S = HORIZONTAL AND VERTICAL,<br>L = LEFT HAND CIRCULAR,<br>R = RIGHT HAND CIRCULAR,<br>T = RIGHT AND LEFT-HAND CIRCULAR,<br>J = LINEAR POLARIZATION                                                                                                                                                                                                                                                                     |
| Orientation (XAZ)                                        | XAZ = NB                                                                                                                                                                                                                                                           | NB= NARROWBEAM EC<br>= EARTH COVERAGE                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Antenna Dimension (XAD)                                  | ANTENNA GAIN 7.0 dBi<br>BEAMWIDTH 30 degrees<br><br>XAD01 = 07G030B                                                                                                                                                                                                | (NTIA format (XAD), EXAMPLE, XAD01 16G030B)                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Type of satellite<br>(State = SP)<br>(City = geo or non) | Type = Nongeostationary                                                                                                                                                                                                                                            | Choose either:<br>Geostationary or<br>Nongeostationary                                                                                                                                                                                                                                                                                                                                                                                                                                |
| For Geostationary                                        | Longitude =                                                                                                                                                                                                                                                        | IF ANY SATELLITES ARE GEOSTATIONARY, REPORT ITS LATITUDE AS 000000N (XLA AND/OR RLA) AND REPORT ITS LONGITUDE (XLG AND/OR RLG).                                                                                                                                                                                                                                                                                                                                                       |
| For Nongeostationary<br>(Orbital Data)                   | INCLINATION ANGLE 97.52,<br>APOGEE IN KILOMETERS 575 km,<br>PERIGEE IN KILOMETERS 575 km,<br>ORBITAL PERIOD IN HOURS 1 AND<br>FRACTIONS OF HOURS IN DECIMAL .60,<br>THE NUMBER OF SATELLITES IN THE<br>SYSTEM 1,<br><br>ORB=<br>97.5IN00575AP00575PE001.60H01NRT01 | IF ANY SATELLITES ARE NONGEOSTATIONARY, REPORT ITS INCLINATION ANGLE, APOGEE IN KILOMETERS, PERIGEE IN KILOMETERS, ORBITAL PERIOD IN HOURS AND FRACTIONS OF HOURS IN DECIMAL, THE NUMBER OF SATELLITES IN THE SYSTEM, THEN T01, EXAMPLE, REM04<br>*ORB,98.0IN00510AP00510PE001.58H01NRT01,<br>AND FOR SPACE-TO-SPACE COMMUNICATIONS WITH ANOTHER NONGEOSTATIONARY SATELLITE ADD AN ADDITIONAL<br>*ORB FOR IT ENDING IN R01, EXAMPLE, REM05<br>*ORB,72.9IN03209AP00655PE013.46H01NRR01 |

| Earth Station Data (Receiver) Owned and operated by KSAT       |                                                                                                                                                                                                                                       |                                                                                                                                                                                                                   |
|----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State (RSC)                                                    | RSC = Norway                                                                                                                                                                                                                          |                                                                                                                                                                                                                   |
| City Name (RAL)                                                | RAL =Svalbard                                                                                                                                                                                                                         |                                                                                                                                                                                                                   |
| Latitude (DDMMSS)                                              | Lat =78.2297°N                                                                                                                                                                                                                        |                                                                                                                                                                                                                   |
| Longitude (DDMMSS)                                             | Lon = 15.3975°E                                                                                                                                                                                                                       |                                                                                                                                                                                                                   |
| Antenna Polarization (RAP)                                     | RAP = T                                                                                                                                                                                                                               | POLARIZATIONS INCLUDE:<br>H = HORIZONTAL,<br>V = VERTICAL,<br>S = HORIZONTAL AND VERTICAL,<br>L = LEFT HAND CIRCULAR,<br>R = RIGHT HAND CIRCULAR,<br>T = RIGHT AND LEFT-HAND CIRCULAR,<br>J = LINEAR POLARIZATION |
| Antenna Azimuth (RAZ)                                          | RAZ = V00                                                                                                                                                                                                                             | THE EARTH STATION RECEIVER ANTENNA AZIMUTH (RAZ), THE MINIMUM ANGLE OF ELEVATION, V00 TO V90, EXAMPLE, RAZ01 V00                                                                                                  |
| Antenna Dimensions (RAD)                                       | ANTENNA GAIN 36.78 dBi,<br>BEAMWIDTH 2.6 degrees,<br>AZIMUTHAL RANGE 0 - 360 degrees,<br>THE SITE ELEVATION ABOVE MEAN SEA LEVEL IN METERS 372,<br>THE ANTENNA HEIGHT ABOVE TERRAIN IN METERS 5<br><br>RAD = 37G003B000-360A00372H005 | EXAMPLE ASSUMING NONGEOSTATIONARY,<br>RAD01 16G030B000-360A00357H006                                                                                                                                              |
| FCC notes:<br>1. Use S-Note S945.<br>2. REM AGN, CubeSat, BRIO |                                                                                                                                                                                                                                       |                                                                                                                                                                                                                   |

| Earth Station Data (Receiver) Owned and operated by KSAT       |                                                                                                                                                                                                                                       |                                                                                                                                                                                                                   |
|----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State (RSC)                                                    | RSC = Norway                                                                                                                                                                                                                          |                                                                                                                                                                                                                   |
| City Name (RAL)                                                | RAL = Troll, Antarctic Treaty Area                                                                                                                                                                                                    |                                                                                                                                                                                                                   |
| Latitude (DDMMSS)                                              | Lat = 72°01'00"S                                                                                                                                                                                                                      |                                                                                                                                                                                                                   |
| Longitude (DDDMMSS)                                            | Lon = 2°32'00"E                                                                                                                                                                                                                       |                                                                                                                                                                                                                   |
| Antenna Polarization (RAP)                                     | RAP = T                                                                                                                                                                                                                               | POLARIZATIONS INCLUDE:<br>H = HORIZONTAL,<br>V = VERTICAL,<br>S = HORIZONTAL AND VERTICAL,<br>L = LEFT HAND CIRCULAR,<br>R = RIGHT HAND CIRCULAR,<br>T = RIGHT AND LEFT-HAND CIRCULAR,<br>J = LINEAR POLARIZATION |
| Antenna Azimuth (RAZ)                                          | RAZ = V00                                                                                                                                                                                                                             | THE EARTH STATION RECEIVER ANTENNA AZIMUTH (RAZ), THE MINIMUM ANGLE OF ELEVATION, V00 TO V90, EXAMPLE, RAZ01 V00                                                                                                  |
| Antenna Dimensions (RAD)                                       | ANTENNA GAIN 36.78 dBi,<br>BEAMWIDTH 2.6 degrees,<br>AZIMUTHAL RANGE 0 - 360 degrees,<br>THE SITE ELEVATION ABOVE MEAN SEA LEVEL IN METERS 156,<br>THE ANTENNA HEIGHT ABOVE TERRAIN IN METERS 5<br><br>RAD = 37G003B000-360A00156H005 | EXAMPLE ASSUMING NONGEOSTATIONARY,<br>RAD01 16G030B000-360A00357H006                                                                                                                                              |
| FCC notes:<br>1. Use S-Note S945.<br>2. REM AGN, CubeSat, BRIO |                                                                                                                                                                                                                                       |                                                                                                                                                                                                                   |

| Earth Station Data (Receiver) Licensed and Operated by RBC Signals |                                                                                                                                                                                                                                    |                                                                                                                                                                                                                   |
|--------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State (RSC)                                                        | RSC = Alaska                                                                                                                                                                                                                       |                                                                                                                                                                                                                   |
| City Name (RAL)                                                    | RAL = Fairbanks                                                                                                                                                                                                                    |                                                                                                                                                                                                                   |
| Latitude (DDMMSS)                                                  | Lat = 64°85'85"N                                                                                                                                                                                                                   |                                                                                                                                                                                                                   |
| Longitude (DDDMMSS)                                                | Lon = 147°83'48                                                                                                                                                                                                                    |                                                                                                                                                                                                                   |
| Antenna Polarization (RAP)                                         | RAP = R                                                                                                                                                                                                                            | POLARIZATIONS INCLUDE:<br>H = HORIZONTAL,<br>V = VERTICAL,<br>S = HORIZONTAL AND VERTICAL,<br>L = LEFT HAND CIRCULAR,<br>R = RIGHT HAND CIRCULAR,<br>T = RIGHT AND LEFT-HAND CIRCULAR,<br>J = LINEAR POLARIZATION |
| Antenna Azimuth (RAZ)                                              | RAZ = V00                                                                                                                                                                                                                          | THE EARTH STATION RECEIVER ANTENNA AZIMUTH (RAZ), THE MINIMUM ANGLE OF ELEVATION, V00 TO V90, EXAMPLE, RAZ01 V00                                                                                                  |
| Antenna Dimensions (RAD)                                           | ANTENNA GAIN 33 dBi,<br>BEAMWIDTH 4.2 degrees,<br>AZIMUTHAL RANGE 0 - 360 degrees,<br>THE SITE ELEVATION ABOVE MEAN SEA LEVEL IN METERS 372,<br>THE ANTENNA HEIGHT ABOVE TERRAIN IN METERS 5<br><br>RAD = 33G004B000-360A00372H005 | EXAMPLE ASSUMING NONGEOSTATIONARY,<br>RAD01 16G030B000-360A00357H006                                                                                                                                              |
| FCC notes:<br>1. Use S-Note S945.<br>2. REM AGN, CubeSat, BRIO     |                                                                                                                                                                                                                                    |                                                                                                                                                                                                                   |