



September 26, 2017

FCC Office of Engineering and Technology
445 12th Street SW
Washington, DC 20554

SUBJECT: CubeRRT cubesat mission (FCC application #0714-EX-CN-2017)

Ms. Leann Nguyen,

Please find details on the CubeRRT cubesat mission included below.

Date license is required: **December 1st, 2017**

LV integration date: **February 1st, 2018**

Launch date: **OA-9 March 2018**

Date for initiation of on-orbit operations: **NET 1 month post launch**

Expected mission duration: **12 months**

Principle Investigator for the mission.

Point of Contact Name: Dr. Joel Johnson

Organization Name: Ohio State University

Address: 2015 Neil Avenue, Columbus, OH 43210

E-Mail: johnson.1374@osu.edu

Telephone Number: (614) 292-2571

Technical point of contact for the mission.

Point of Contact Name: Doug Laczkowski

Organization Name: Blue Canyon Technologies

Address: 2425 55th St. Suite A-200, Boulder, CO 80301

E-Mail: dlaczkowski@bluecanyontech.com

Telephone Number: 720-458-0703 x158

*please also include Dr. Joel Johnson on any relevant communications.

Point of contact who can terminate ALL satellite transmissions if interference is detected.

Point of Contact Name: Scott Palo, PhD

Organization Name: Blue Canyon Technologies

Address: 2425 55th St. Suite A-200, Boulder, CO 80301

E-Mail: palo@bluecanyontech.com

Telephone Number: 720-458-0703

*please also include Doug Laczkowski and Dr. Joel Johnson on any relevant communications.



Point of contact who can terminate ALL Boulder CO ground station transmissions if interference is detected.

Point of Contact Name: Scott Palo, PhD
Organization Name: Blue Canyon Technologies
Address: 2425 55th St. Suite A-200, Boulder, CO 80301
E-Mail: palo@bluecanyontech.com
Telephone Number: 720-458-0703
*please also include Doug Laczkowski and Dr. Joel Johnson on any relevant communications.

Point of contact who can terminate ALL Wallops VA ground station transmissions if interference is detected.

Point of Contact Name: Thomas Johnson
Organization Name: NASA/GSFC Wallops Flight Facility
Address: Bldg U25, Wallops Is., VA, 23337
E-Mail: thomas.e.johnson@nasa.gov
Telephone Number: 757-824-2560
*please also include Doug Laczkowski and Dr. Joel Johnson and Dr. Scott Palo on any relevant communications.

Point of contact who can terminate ALL Morehead KY ground station transmissions if interference is detected.

Point of Contact Name: Ben Malphrus
Organization Name: Morehead State University
Address: Space Science Center 235 Martindale Drive, Morehead, KY 40351
E-Mail: b.malphrus@moreheadstate.edu
Telephone Number: 606-783-9596
*please also include Doug Laczkowski and Dr. Joel Johnson and Dr. Scott Palo on any relevant communications.

Point of contact for conjunction alerts.

Point of Contact Name: Doug Laczkowski
Organization Name: Blue Canyon Technologies
Address: 2425 55th St. Suite A-200, Boulder, CO 80301
E-Mail: dlaczkowski@bluecanyontech.com
Telephone Number: 720-458-0703 x158
*please also include Dr. Joel Johnson on any relevant communications.

Project Description

The CubeRRT (CubeSat Radiometer Radio Frequency Interference Technology Validation) mission is developing a 6U CubeSat system to demonstrate radio frequency



interference (RFI) detection and filtering technologies for future microwave radiometer remote sensing missions. CubeRRT will perform observations of Earth brightness temperatures from 6-40 GHz using a 1 GHz bandwidth tuned channel and will demonstrate on-board real-time RFI processing. The maturation of the RFI processor information system from TRL 5 to 7 is a key mission objective that is expected to facilitate the operation of next generation, high bandwidth radiometers in future satellite remote sensing systems.

CubeRRT is a science mission led by Dr. Joel Johnson at the Ohio State University. The CubeSat bus is built and operated by Blue Canyon Technologies.

License Details

The CubeRRT mission will utilize a Utah State University provided UHF Cadet radio that will operate at with a 15kHz uplink at 450MHz and a downlink at 467.5MHz with a bandwidth of 3MHz. We are requesting a 47 CFR Part 5 - EXPERIMENTAL RADIO SERVICE license for our uplink at 450MHz per footnote US87 in the NTIA MANUAL OF REGULATIONS AND PROCEDURES FOR FEDERAL RADIO FREQUENCY MANAGEMENT which states “US87 - The band 449.75-450.25 MHz may be used by Federal and non-Federal stations for space telecommand (Earth-to-space) at specific locations, subject to such conditions as may be applied on a case-by-case basis. Operators shall take all practical steps to keep the carrier frequency close to 450 MHz”. For the downlink, we are requesting operation between 465MHz and 470MHz which is a secondary allocation for the Meteorological-satellite service (space-to-EARTH) in the Federal Table and as such we expect coordination with NTIA is required. Additionally, per footnote 5.289 “Earth exploration-satellite service applications, other than the meteorological-satellite service, may also be used in the bands 460-470 MHz and 1690-1710 MHz for space-to-Earth transmissions subject to not causing harmful interference to stations operating in accordance with the Table”. BCT is aware of footnote US201 and will insure that the CubeRRT power flux-density produced at the Earth’s surface shall not exceed $-152 \text{ dBW/m}^2/4 \text{ kHz}$.

BCT is requesting temporary FCC authorization to use the FCC-approved GSP-1720 (FCC ID: J9CGSSDVM) to transmit from a space-based location. The GSP-1720 will be operating exactly as was approved during the FCC equipment approval process; it will be using exactly the same antenna, protocols, dynamic power control mechanisms, authentication, have exactly the same emissions characteristics, etc. as if it were transmitting from the earth’s surface.

Additional data required for applications requesting use of federal or shared government frequencies.

Spacecraft: CubeRRT

Inclination: 52° [ISS]



Apogee: 400km
Perigee: 400km
Orbital period: 1.62h
Number of satellites in the system: 1
Number of transmitting satellites: 1

Transmitter

Center Frequency: 468MHz
Bandwidth: 3MHz
3dB beamwidth: 100°
Maximum Antenna Gain: 5dBi
Polarization: RCP
Maximum transmit power: 2W
Modulation: OQPSK
ITU emission designator: 3M00G2DAX

Receiver

Center Frequency: 450MHz
Bandwidth: 15kHz
3dB beamwidth: 100°
Maximum Antenna Gain: 5dBi
Polarization: RCP
Receiver Sensitivity: -97dBm
Modulation: FSK
ITU emission designator: 15K0G2DAX

Transmitter #2 Globalstar GSP-1720

Center Frequency: 1615.650MHz to 1618.110MHz
Bandwidth: 1.25MHz
3dB beamwidth: 100°
Maximum Antenna Gain: 0.5dBi
Polarization: LCP
Maximum transmit power: 2W
Modulation: OQPSK
ITU emission designator: 3M00G2DAX

Receiver #2 Globalstar GSP-1720

Center Frequency: 2483.5MHz to 2500MHz



Bandwidth: 1.23MHz
3dB beamwidth: 100°
Maximum Antenna Gain: 0.2dBi
Polarization: LCP
Receiver Sensitivity: -100dBm
Modulation: unknown
ITU emission designator: 15K0G2DAX

Ground Station #1:

Wallops Island, VA 23337
37 51' 21'' N 75 30' 43'' W
Altitude above MSL [m]: 4
Antenna height above ground [m] : 18
Elevation: 5-90°
Azimuth: 0-360°

Transmitter

Center Frequency: 450MHz
Bandwidth: 15kHz
3dB beamwidth: 2.9°
Maximum Antenna Gain: 35dBi
Polarization: RCP
Maximum transmit power: 20W
Modulation: FSK
ITU emission designator: 15K0G2DAX

Receiver

Center Frequency: 468MHz
Bandwidth: 3MHz
3dB beamwidth: 2.9°
Maximum Antenna Gain: 35dBi
Polarization: RCP
Receiver Sensitivity: -114dBm @ 1MHz BW
Modulation: OQPSK
ITU emission designator: 3M00G2DAX

Ground Station #2:



100 Satellite Drive Morehead, KY 40351

38° 11' 30.8" N 83° 26' 19.9" W

Altitude above MSL [m]: 350

Antenna height above ground [m] : 25.6

Elevation: 5-90°

Azimuth: 0-360°

Transmitter

Center Frequency: 450MHz

Bandwidth: 15kHz

3dB beamwidth: 2.6°

Maximum Antenna Gain: 32dBi

Polarization: RCP

Maximum transmit power: 50W

Modulation: FSK

ITU emission designator: 15K0G2DAX

Receiver

Center Frequency: 468MHz

Bandwidth: 3MHz

3dB beamwidth: 2.6°

Maximum Antenna Gain: 32dBi

Polarization: RCP

Receiver Sensitivity: -100dBm

Modulation: OQPSK

ITU emission designator: 3M00G2DAX

Ground Station #3:

2425 55th St, Boulder, CO 80301

40°01'23.8"N 105°13'34.7"W

Altitude above MSL [m]: 1600

Antenna height above ground [m] : 4

Elevation: 5-90°

Azimuth: 0-360°

Transmitter

Center Frequency: 450MHz

Bandwidth: 15kHz

3dB beamwidth: 17°



Blue Canyon Technologies

2425 55th St, STE 200 BLDG A

Boulder, CO 80301

www.bluecanyontech.com

Maximum Antenna Gain: 21dBi

Polarization: RCP

Maximum transmit power: 500W

Modulation: FSK

ITU emission designator: 15K0G2DAX

Receiver

None