

May 25th, 2016

To Whom It May Concern:

This letter provides detail regarding our experimental license request #0368-EX-PL-2016 for the RAVAN cubesat.

Blue Canyon Technologies (BCT) is building the spacecraft for the Radiometer Assessment using Vertically Aligned Nanotubes (RAVAN) project, which is led by the Johns Hopkins University Applied Physics Laboratory (JHU/APL), with partners L-1 Standards and Technology, Inc. and Draper Laboratory, and funded by NASA's Earth Science Technology Office under a government contract.

The objective of the RAVAN project is to demonstrate a radiometer that is compact, low-cost, and low-uncertainty. The radiometer uses a gallium fixed-point black body as a built-in calibration source and a vertically aligned carbon nanotube (VACNT) absorber. VACNTs are the blackest known substance. Neither the VACNT nor gallium black body has ever been used in an orbiting scientific instrument. Successful demonstration will pave the way for a constellation Earth radiation budget mission that can provide valuable measurements needed to significantly advance our understanding of ongoing and future climate change.

1. We had requested an experimental license to work in the amateur radio service (437MHz) in October 2015 which was denied in February for reasons which were not clear, but likely political. Based on that response we are requesting to an experimental license to operate RAVAN between 449.975MHz and 450.025MHz for both our command uplink and data downlink. The data rate is 9600 bps and the requested bandwidth is 15kHz. In accordance ITU Article No. 4.4 RAVAN shall not cause harmful interference to, and shall not claim protection from harmful interference caused by, a station operating in accordance with the radio regulations.
2. Point of contact for receiving JSpOC conjunction assessments.
John Carvo
Blue Canyon Technologies
#200, 2425 55th St, Boulder, CO 80301
jcarvo@bluecanyontech.com
(720) 458-0703
3. The RAVAN CubeSat does not have propulsion for making orbit adjustments. The spacecraft is deployed into a 600 km circular orbit, where atmospheric drag will cause the spacecraft altitude to decay over time meeting the orbital debris requirements as determined from our orbital debris analysis. The spacecraft is stabilized using the Blue Canyon Technologies XACT attitude determination and control system. We will have the ability to respond to any possible conjunction with a modified attitude state from deployment to reentry.
4. An ITU cost recovery letter from George Stafford, President of Blue Canyon Technologies is attached.
5. An ITU SpaceCap cover letter is attached.
6. An ITU SpaceCap V7 file for RAVAN that has been verified by the ITU SpaceVal software to be error free along with 2 attachments showing the required antenna patterns.
7. A NOAA letter indicating a license is not required is attached.
8. An orbital debris analysis indicating that RAVAN is compliant with UN regulations is attached.
9. Transmitter Antenna information
 - Location LEO Orbit
 - 600km circular, 98.8° inclination
 - Linear polarization

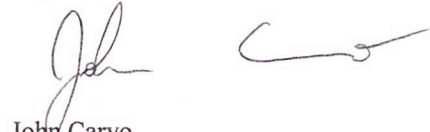
- Orientation: Variable depending on spacecraft attitude
- Dimension:
 - Gain: 0dBi
 - Beamwidth: nearly omnidirectional
 - Azimuth: N/A
 - Elevation: N/A
 - Height: N/A

10. Receiver Antenna information

- Location Boulder CO, 105W 13' 34" 40N 1' 24"
- Polarization: RCP
- Orientation: Variable depending on spacecraft location
- Dimension:
 - Gain: 18dBi
 - Beamwidth: 20°
 - Azimuth: variable
 - Elevation: variable
 - Height: 10' above roof

Please note that while our launch is scheduled for early September the launch integrator has requested our license information be completed by June 30th. We had submitted our initial paperwork sufficiently in advance (12/15/2015) however the late denial of our IARU coordination request has created an unfortunate delay. We are requesting an expedited review of our application based on this anomaly. Please don't hesitate to contact me (jcarvo@bluecanyontech.com) if you have any additional questions.

Regards,



John Carvo
RAVAN Mission Manager
Blue Canyon Technologies