Raytheon IIS
Experimental STA Application
File No: 0794-EX-ST-2015

Explanation of Experiment and Need for STA

Background:

Raytheon IIS is a US defense contractor that develops innovative new technology for the US government. Many of its products rely on the use of radio innovations or the implementation of radios into new technologies that can deliver capabilities needed by the US Department of Defense.

The current application seeks authorization for ***ground based testing*** of a telemetry link and of ground stations. If the ground-based testing proves successful, Raytheon will subsequently apply for an experimental license to incorporate the technology into a satellite. This application is only for ground-based testing.

Need for an STA:

Originally, the program involved in this technology development expected to test only the ground station operations then integrating the technology into the satellite under development. Early testing of the ground stations under STA WI9XDO led the program to realize that it also needs to conduct ground-based testing of the telemetry link as well. Because the ground-station testing is underway, time is of the essence in incorporating this testing into the project. This application seeks to add a new location for ground station testing as well as the telemetry link. The scheduled launch is only five months away, so the ground-based testing schedule is accelerated to ensure that all components and operational parameters are understood well before incorporation into the satellite.

Technical Synopsis:

- Spectrum Needed: 437.425, 427.500, and 2425 MHz
- Power Levels: 437 MHz – 75 W with 933 W ERP; 2425 MHz – only 6 watts output power and ERP
- Time of Use: limited to several hours per day, Monday through Friday, duty cycle of 0.1%
- Location of Use: vicinity of Pike's Peak railway station to Raytheon facility in Aurora, CO

Nature of Experimentation:

The purpose of the testing is to examine whether a moving telemetry station can be effectively tracked to allow for the download of image files when the system is operation. The experiment will put a telemetry transmitter at Pike's Peak, which is one of the highest peaks in the Rocky Mountains near Denver. The mountain peak is south of Denver and the Raytheon plant in Aurora, Colorado. The telemetry transmitter will be aimed at the Raytheon plant site, using an omnidirectional antenna at low power, with the receive site using a high-gain receive antenna. The telemetry antenna will move along the mountain top in across a distance of 2 kilometers or less, so that the receive antenna performance can be tuned to ensure it will track the moving telemetry transmitter and to ensure that any bugs in the telemetry system can be worked out prior to the system being launched on the

satellite. This will allow for fine-tuning of the ground station performance to ensure that the satellite launch will not be in vain. The 437 MHz frequencies will be used to send commands to the telemetry transmitter, testing the command and control link and the integration of the two systems.

At the Raytheon plant site, a high gain receive antenna will be used to detect the telemetry signals. The low power transmitter will transmit files similar to those that would be captured when the satellite is operational. At the telemetry receiver, the program will work to improve signal detection, signal reception, and processing of the data. Use of the telemetry radio system is an essential part of the experiment.

Time of Use:

The proposed operations will take place weekdays during work hours. Testing will be conducted during the day, but transmissions will likely be sporadic during the day, to test real-world conditions. The transmitter will be put in motion and attempt to transmit a designated data set. At a specified time, the transmission will stop and the information transmitted will be assessed to determine the effectiveness of the telemetry link. If there are parameters that need to be changed, then the system configuration will be altered accordingly, and testing will resume. This process will continue during the test period of the STA. The duty cycle of the transmitter is only 0.1%.

Location:

Operations will take place inside a one mile radius centered on the coordinates: 38-50-24 N, 105-02-34 W. The transmitter will move within that area, but transmissions will always be pointed to the north, toward the high-gain receive antenna at the Raytheon plant site. The mountain peak is high above all the surrounding area, and so the radio signals should be above any ground level communications. Thus, the location selected should avoid any interference.

The center point of the operational radius is depicted in *Figure 1* below. The Google Earth image shows also the one mile and two mile radii around the center point. The town of Summerhaven is well outside the one-mile radius of operations.

Stop Buzzer Point of Contact:

To stop operations at any time, please contact the stop buzzer:

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Conclusion:

Raytheon is seeking an STA for ground-based testing of a telemetry link that it is trying to perfect before incorporating the technology into a small satellite that will be launched. The testing will focus on optimizing the data transfer over the telemetry link while the transmitter is in motion.

For more information on this application or if there are any questions, please contact either Brian R. Kavalar, Spectrum Manager, Raytheon IIS or Anne Cortez, Counsel, Washington Federal Strategies, 520-344-8525 or alc@conspecinternational.com.