

Explanation of Experiment and Need for STA

Background

Raytheon Missile Systems (Raytheon) develops and tests numerous technologies for its federal customers and for other contractors working jointly on projects for the federal government. Raytheon is currently working in partnership with Orbital ATK to test the impact of rocket plumes on radio signal propagation.

This application seeks temporary authorization for short term testing at an indoor facility to conduct such an analysis.

Need for an STA

Raytheon is seeking an STA from September 11, 2017 to November 30, 2017. There is a rocket test scheduled for September 12, 2017, and it is urgent that Raytheon be able to conduct the signal loss testing on September 12, 2017. If the testing is conducted on that date, there may be a second test in November. The spectrum will not be in use except for 5 minutes of set up and configuration, and then the actual testing of the signal propagation when the rocket plume is active.

August 14, 2017 at midday, Raytheon learned of the firm date for the scheduled testing, and it is filing this request for temporary authorization to meet its contractual obligations as part of the testing program. If testing is not possible in September, Raytheon will test in November, but it will fail to meet its contractual requirements.

Technical Synopsis

- Power levels: 0.07 mW to 5 mW, EIRP reaches a maximum of 100 mW
- Location: test chamber with 6-foot thick concrete walls
- Test time: limited to 10 second sweep through the requested spectrum
- Spectrum request: 2-18 GHz

Explanation of Experiment

Raytheon will be using a Keysight Technologies (Agilent) Network Analyzer to test the radio signal attenuation through a rocket plume. Orbital ATK is testing its rocket on September 12, 2017, and those rocket tests are rare, which makes this a unique opportunity to test the signal loss.

There will be antennas positioned on the sides of the rocket – far enough away to function while the rocket is being tested. The signal will be analyzed by the network analyzer to assess the RF loss through the rocket plume.

Spectrum Use – power levels and time of use:

The power levels proposed are very low, ranging from 5 mW at 2 GHz to 0.07 mW at 18 GHz. The EIRP of the transmissions ranges from 100 mW at 2 GHz to 1.6 mW at 18 GHz. These power levels are low and the transmissions are indoors.

The time of use is also quite short. Raytheon anticipates that it will need to test the setup of the Keysight Technologies equipment. That testing is expected to require less than 15 minutes. Much of that time, the RF signals will not be in use. Raytheon's current best estimate is that it will sweep through the spectrum a maximum of 5 times.

The actual test, measuring signal attenuation through the rocket plume will last 10 seconds. The transmitter will sweep through the spectrum from 2 – 18 GHz in that 10 second period. There will only be one sweep, because there will only be one plume through which to test. So, the testing will be started and completed on September 12, 2017.

Time on a frequency: 16,000 MHz used across 10 seconds = sweep rate of 1600 MHz/sec
This leads to 62.5 microseconds of use per frequency

There is the possibility of measuring during a second test in November, but that would be a backup plan if the September testing is not possible. No other testing will be conducted for this experiment.

Spectrum carveouts are not possible, since there is now way to conduct the sweep without covering all of the spectrum from 2-18 GHz. The signal will not stop at any frequency, it will sweep through all, continuously.

Location of Experiment

Raytheon will be conducting this experiment at the Orbital ATK facilities in Rocket Center, WV. The Orbital ATK facilities are built for rocket testing. All testing is conducted indoors. The indoor location is surrounded by concrete walls that are six feet thick. The estimated attenuation of 6 foot thick walls is a minimum of: -11 dB.

The resulting signal strength outside of the building will range from -4 dBm at 2 GHz to -22 dBm at 18 GHz.

These signals, with a 62.5 microsecond duration per MHz, are not expected to cause harmful interference to any other radio operations in the area.

Stop Buzzer Point of Contact

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Conclusion

Raytheon has just learned that it needs to conduct testing of signal attenuation through a rocket plume. Because rocket testing is a rare occurrence, Raytheon is seeking this STA to test at the Orbital ATK facilities on September 12, 2017. The test time, from set up through completing the tests will require less than 1 minute of spectrum use. The actual plume test will last only 10 seconds. The network analyzer will sweep through the requested 16 GHz of spectrum in that 10 second period, meaning that the signal will last only 62.5 microseconds per MHz.

The proposed testing is to be conducted indoors, in a chamber with walls that are 6 feet thick. The resulting signal outside of the building will be below the radio noise floor.

Should there be any questions about the proposed operations, please contact Bart Turner or Anne Cortez, alc@conspecinternational.com or 520-360-0925.