Raytheon Missile Systems
Experimental License Application
File Number: 0045-EX-PL-2013

Explanation of Experiment

Overview:

Raytheon Missile Systems (Raytheon) designs and builds missiles that it sells to the US Department of Defense and other agencies of the federal government. Raytheon recently was awarded a contract from the Department of Defense which requires it to test new radio systems on its seeker missiles. Immediately after the contract award, Raytheon sought an STA for the radar testing required under the contract. The FCC granted Raytheon an STA WG9XAR in autumn 2012 so that Raytheon could start delivering test results on time. Raytheon's contractual obligations are ongoing for at least the next five years, and it will need to continue its radar testing throughout the contract.

Raytheon is filing this experimental license application to continue its radar testing under DOTC-12-05-INIT004.

Synopsis:

- Contract Number: DOTC-12-05-INIT004
- Spectrum needed: 15.7-17.8 GHz
- Signal level: maximum power is 6.1 milliwatts ERP, based on use of a 0.1 milliwatt transmitter
- Location: Raytheon Missile Systems facilities in Tucson, AZ, indoor, hooded operations and outdoor operations over 500 foot distance
- Proposed operations will step through frequencies, 0.2 microseconds per step

Nature of the Experimentation:

Raytheon is working on advanced development of its Seeker missile. The nature of this particular missile program is that the missile has a passive radar system incorporated into the missile. The passive radar system is receive-only, which means that it calculates the speed, trajectory, and location of incoming ordinance based on the radar and other signals generated by the incoming threat. The radar to be tested uses the information to identify and then intercept the threat.

Since the Seeker is a receive-only missile, meaning that its radar systems only receive radar, they do not generate a radar signal. The nature of the program has developed in such a way that it is necessary for the program to perform tests of the seeker radar receivers by transmitting signals to assess and improve the receiver performance. That testing is the subject of this experimental license request.

The proposed experimentation will use a low power transmitter to send a directionalized signal to the seeker's radar receiver. Then, the program will evaluate the performance characteristics of the receiving radar to fine tune its response to the received signal. The advancements from that fine

tuning will lead to advancements in the performance of the Seeker, as required by the DOD sponsor.

Locations for the testing:

For operations in the lab, this signal will be transmitted at an extremely low power, and the transmitting antenna will be shielded in a hood that provides 40 dB of signal attenuation. The testing will be conducted on the radar system, on the lab bench, to work on advanced development of the radar system.

Following the laboratory research, the program must also simulate a real-world performance test to ensure that the improvements made to the radar system function properly when incorporated into the missile system. This will require testing of the responsiveness of the radar system when it is installed on the seeker. The program transmits a weak (0.1 mW) signal, that is directionalized to reach the radar being tested. The ERP of the directionalized signal is only 6.1 mW. This test must be conducted outside to allow the various technologies to perform as they might in a real-world scenario. The distance between transmitter and receiver is only 500 feet. This distance is required for the test, but it was minimized to help minimize the amount of RF energy needed to accomplish the goals. Also, the outdoor test site was chosen so that Raytheon's buildings shield the test site.

Indoors at location 1, hooded, operating at low power, with hoods shielding the operations and reducing signal by 30 dB

Outdoors at location 2, operating at .1 milliwatt, but with some antenna gain, the operations will have a peak ERP of 6.1 milliwatts. Azimuth of operations: 0º North, exactly.

Frequencies to be used:

The testing will be sporadic at best. The proposed frequency use will be radar signals – both continuous wave and pulsed operations.

The testing will step through frequencies in the requested bands. Each step will use no more than 200 Hz of bandwidth, and the tests will step in 100 MHz steps – 15.7 GHz, 15.8 GHz, 15.9 GHz, . . . 17.7 GHz, 17.8 GHz.

No likelihood of harmful interference to other users:

Raytheon has undertaken a preliminary search of other users of frequencies in this band in the Tucson, Arizona area. The spectrum, which is used primarily by the FAA, is not in use by the FAA anywhere near Tucson. This was determined by consulting with the FAA's Western Regional Office and by consulting FAA personnel at the Tucson International Airport.

Raytheon is prepared to undertake frequency coordination with any other entities, as required by the FCC.

Stop Buzzer Point of Contact:

To ensure that no instances of harmful inference occur, Raytheon's Stop Buzzer point of contact is:

Thomas J. Fagan, Spectrum Manager
Raytheon Missile Systems
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Conclusion:

Raytheon is seeking an experimental license to continue testing required by a DOD contract to work on advancements to its Seeker missile technology. The program was required to start delivering results before the end of 2012, and it must continue to deliver reports on technology advancement in the radar systems throughout the term of the contract, DOTC 12-05-INIT004.

Raytheon's work will advance the performance of the Seeker improving its responsiveness and its precision. The time of use will be limited. The program of experimentation will step through the frequencies requested, not operate continually on any frequency. The proposed power levels are very low, and there appear to be no other operations in this frequency band in the Tucson area.

If there are any questions about this application or if any additional information is needed, please contact Thomas J. Fagan, see above, or Anne L. Cortez, Washington Federal Strategies, 520-360-0925 or alc@conspecinternational.com.