

Raytheon Missile Systems
Experimental License Modification Application
Call Sign: WG2XMV
File Number: 0109-EX-ML-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 is seeking authorization to modify this license to expand its testing of new radio systems on its seeker missiles.

This modification application seeks authorization to expand its experimentation to allow for independent research and development of the radar technologies in addition to the work that it is currently conducting under a DoD contract. This modification application also seeks to add an additional transmitter location. The expanded testing will advance the development of active radar in target acquisition.

Synopsis:

- Spectrum needed: 15.7-17.8 GHz
- Signal level: maximum power is 550 Watts ERP, based on use of a 2 Watt radar transmitter
- Locations: Raytheon Missile Systems facilities in Tucson, AZ, indoor, hooded/shielded operations and outdoor operations across 500 meters between Raytheon buildings.
- Station Class requested: XT or XD, rather than XC

Station Class:

Raytheon is seeking authorization to operate under the provisions of 47 C.F.R. Section 5.3 (i): “Development of radio technique, equipment, operational data or engineering data related to an existing or proposed radio service.” This is a change from the current authorization, which only allows operations under a government contract.

Raytheon is requesting this change to allow the missile program to conduct independent research and development

Nature of the Experimentation:

Raytheon is working on advanced development of its Seeker missile. Initially, this particular missile program was designed to use only a passive radar system. After initial testing and radar development, the program has learned quickly that the missile program needs to incorporate both an active and a semi-active radar system onto the missile to improve its performance. The radar systems now under development calculate the speed, trajectory, and location of incoming ordinance based on the radar and other signals generated by the incoming threat. The radar systems also use

their own signal reflections to enhance performance. The radars being tested use this information to identify and then intercept threats. In the initial testing conducted under the authority of WG2XMV, the program determined that there are numerous other advancements that it could test to improve radar performance, but it needs to do so as independent research and development, rather than under the provisions of the existing DoD contract. Therefore, this modification request seeks authorization for additional testing under a new station class.

Locations for the testing:

For operations in the lab, the radar transmissions will be either hooded or in a shielded enclosure which will provide signal attenuation greater than 40 dB. 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. Outdoor operations will use a 2 Watt signal that is directionalized to reach the radar system being tested. The ERP of the directionalized signal is 550 W. This test must be conducted outside to allow the various technologies to perform as they might in a real-world scenario. Operations using the semi-active radar will continue as currently licensed.

Indoors:

Location 2, hooded or shielded operations, which attenuate the signal by 40 dB.

Outdoors:

Location 1, Azimuth of operations: 0 ° North, low power signal generator.

Location 3, Azimuth of operations: 90 ° East, low power signal generator,

Location 4, Azimuth of operations: either 180 ° South or 270 ° west, radar operations

Location 5, new, azimuth of operations: 180 ° South, radar operations

Transmission characteristics and emissions to be used:

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

Testing will use frequencies to optimize radar system operations.

For the active radar transmission, the emission will be N0N. The radar pulse is approximately 30 MHz wide. The pulse may use any portion of the licensed spectrum. The duty cycle of the active radar system ranges up to 33%.

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.

In undertaking this study for the earlier license modification request, Raytheon surveyed the prospective impact of transmissions to the south, across the plant site. The addition of location 5 will not add any new prospect of interference because the location is farther north on the Raytheon plant site

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
520-794-0227 (office)
520-465-7087 (cell)
tjfagan@raytheon.com

Conclusion:

Raytheon is seeking to modify its experimental license WG2XMV to expand its research and development of the radar systems used by the Seeker missile program. This testing expands beyond the scope of the currently authorized operations because the existing contract does not allow for as many operational parameters to be tested. The program has been working quickly, and the work it has accomplished to date shows great promise for advancing the radar technologies if this modification is granted.

In addition to expanding its work to include research and development, Raytheon is seeking to add an additional transmitter site, location 5, which will improve its ability to test the radar under development.

Raytheon's work will advance the performance of the Seeker improving its responsiveness and its precision. The time of use for these frequencies will be limited. The proposed power levels are as low as possible to achieve the goals of the system, 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.