

Raytheon Missile Systems  
Experimental License Renewal Application  
Call Sign: WG2XMV  
File Number: 0087-EX-CR-2017

## **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 to renew its authorization to continue its testing of new radio systems on its seeker missiles.

This renewal application seeks authorization to continue its operations as currently authorized.

### **Synopsis:**

- Spectrum needed: 15.7-17.8 GHz
- Signal level: maximum power is 14.3 kW ERP, based on use of a 100 Watt radar transmitter
- Locations: Raytheon Missile Systems facilities in Tucson, AZ, indoor, hooded/shielded operations and outdoor operations across 500 meters between Raytheon buildings.

### **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. Thus, the program is seeking to renew its authorization.

### **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 100 Watt signal that is directionalized to reach

the radar system being tested. The ERP of the directionalized signal is 14.3 kW. 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, Azimuth of operations: 180 ° South, radar operations

**Transmission characteristics and emissions to be used:**

The testing is sporadic at best. The transmissions will be radar signals – both continuous wave and pulsed operations.

Testing uses frequencies to optimize radar system operations.

For the active radar transmission, the emission is 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.

Since this system was licensed in 2013, there have been no instances of any interference to other users, and no interference is anticipated from the renewal of this authorization.

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](mailto:tjfagan@raytheon.com)

**Conclusion:**

Raytheon is seeking to renew its experimental license WG2XMV to expand its research and development of the radar systems used by the Seeker missile program. Renewed authorization will allow 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 renewal is granted.

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@conspicinternational.com](mailto:alc@conspicinternational.com).