

Explanation of Experimentation

Overview:

Raytheon Missile Systems (Raytheon) is a contractor providing technology and weapons, including missile systems, to the US Department of Defense, other federal agencies, and approved foreign government entities. Raytheon's work in developing advanced technologies and missile systems requires development of sophisticated radio command and control systems, advanced radio navigation systems, testing of antennas, development of radar systems, and experimentation with and development of many other radio-related technologies that are essential to the advancement of its products and services. The current application is for the use of radio signals to undertake testing required by the Department of Defense under MIL-STD-461, which requires electromagnetic interference testing on all products sold to DoD. One of the contracts requiring compliance with this standard is: HQ0276-11-C-0002. This application seeks to extend the temporary authorization granted under 0144-EX-ST-2013 Call Sign WG9XZW.

Experimental License Required:

Raytheon holds STA WG9XZW which it used for EMI testing for the Standard Missile (SM) program in 2013. Raytheon is seeking this experimental authorization to continue the testing it started under WG9XZW to meet the military's compliance requirements for the Standard Missile program.

Previously, Raytheon held a federal frequency assignment for the proposed operations. Now, Raytheon must seek an experimental authorization from the FCC rather than a federal frequency assignment. This FCC license is required because the testing takes place at the Raytheon facility and under Raytheon control rather than at a military installation. Additionally, Raytheon may need an FCC authorization for some independent research and development testing that will examine the EMI effects of introducing technological advances onto the SM platform.

Synopsis:

- Spectrum required: 14 kHz to 40 GHz, only 10 seconds of use per frequency
- Purpose: EMI testing, per MIL-STD-461
- Power: up to 200 W
- Test Time: Maximum of four weeks per year, intermittent use one week at a time
- Location: Raytheon plant site, inside building,
- Transmitter: Directed at azimuth 237, directed away from Tucson Airport.

General purpose of the testing - EMI testing per MIL-STD-461:

Raytheon is seeking this experimental license to authorize its testing of EMI characteristics of its Standard Missile program, as required under the military standard MIL-STD-461, which every

Department of Defense procurement must meet. Raytheon, as a defense contractor, must show that its products meet the standard, and, to meet the standard, Raytheon must conduct the testing specified in the DoD standard. A copy of the relevant portion of the testing standard Version E is attached to the application as a supplemental exhibit.

“MIL-STD-461, Section 5.19.3.1 Purpose. This test procedure is used to verify the ability of the EUT [equipment under test] and associated cabling to withstand electric fields.” The standard requires all branches of the military to ensure that the products they procure meet the standard. Raytheon’s Standard Missile program sells missiles to all branches of the military, and so its missiles must be in compliance with the military standard. Thus, the testing must be conducted to show that the SM meets these requirements. The standard requires examination of the EMI from 14 kHz to 40 GHz¹, based on the technology that is employed in the SM products.

“The purpose of the test is to show that the SM3 does not exhibit any malfunction, degradation of performance, or deviation from specified indications, beyond the tolerances indicated in the individual equipment or subsystem specification, when subjected to the radiated electric fields listed in Table VII and modulated as specified below. Up to 30 MHz, the requirement shall be met for vertically polarized fields. Above 30 MHz, the requirement shall be met for both horizontally and vertically polarized fields. Circular polarized fields are not acceptable.” MIL-STD-461 at Section 5.19.3

Some of the missiles or their support equipment are too large to fit into an anechoic chamber, or they are otherwise barred from testing inside of the chamber due to safety concerns. As a result, the testbed has been established inside a metal-skinned building that is situated in the center of Raytheon’s Tucson campus. The testing employs the minimum power required by the Military Standard.

Raytheon has taken great steps to avoid the potential for interference:

Raytheon has not only established an indoor laboratory for the testing, that will use the attenuation of a metal-skinned building to help mitigate the prospects of any interference, but it has also chosen a location in the center of Raytheon’s campus, to use the attenuating effects of additional structures to assist in interference protection. Further, the testing will use a directionalized antenna. Raytheon has designed the test to direct the radio energy at azimuth 237 – which is away from the nearby Tucson International Airport and it is pointed away from downtown Tucson. In fact, azimuth 237 points toward unoccupied desert that is south and west of the Raytheon facilities.

Time of Use is Very Limited:

Further mitigating any potential for interference, Raytheon has designed its testing to minimize the time of use of any radio frequency. The time that this test system will operate on any frequency is approximately ten (10) seconds per frequency per test. This means that the time of spectrum use

¹ There are a number of revisions of MIL-STD-461. Raytheon is contractually bound to comply with numerous revisions, because its DOD contracts span many years. Even though the most recent revision only requires EMI testing from 2 MHz to 40 GHz, the older revisions require testing from 14 kHz to 40 GHz, and so that is the spectrum requested here.

will be exceedingly limited.

Limited number of tests per year:

Raytheon expected to be operating the test bed for three weeks per year; although to allow for contingencies, it is presented, prospectively, as four weeks. This testing is essential to Raytheon's ability to deliver under its contract with the Department of Defense, so the test bed use will need to continue through the life of the Standard Missile Program. The program will identify a component that needs testing, conduct a week of testing, and then the test bed will be dormant for many weeks until the next test is required.

Stop Buzzer:

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Conclusion:

Raytheon is seeking an experimental authorization for operation of an electromagnetic interference test bed for its Standard Missile program. The EMI testing is required under multiple contracts awarded to Raytheon by the US Department of Defense including HQ0276-11-C-0002. Raytheon previously conducted this testing under a federal frequency assignment, however new procedural rules now require Raytheon to seek an FCC authorization for the operations on its plant site. The specific nature of the testing is outlined in MIL-STD-461; relevant portions are attached to the application. This testing is essential to Raytheon's effective performance under the contract.

For additional information about this application, please contact Tom Fagan, Spectrum Manager, Raytheon Missile Systems, or Anne Linton Cortez, WFS, alc@conspecinternational.com or (520) 360-0925.