

Explanation of Experimentation and Need for an STA

Overview:

As the FCC is aware, 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. For this application, the relevant contract requiring compliance with this standard is: HQ0276-11-C-0002.

STA and Experimental License Required:

Raytheon is seeking this STA because its on-going contractual obligations require testing to be conducted within the next several months. Raytheon will be seeking an experimental license for on-going testing, which will be sporadic across the year, as the program requirements demand EMI testing.

Previously, Raytheon held a federal frequency assignment for the proposed operations. The operations being proposed in this STA request are not new. Now, Raytheon must seek an experimental authorization from the FCC rather than a federal frequency assignment. This is because the testing takes place at the Raytheon facility rather than at a military installation. Additionally, Raytheon will need FCC authorization for some independent research and development testing that will examine the EMI effects of introducing technological advances onto the SM3 platform.

Synopsis:

- Spectrum required: 14 kHz to 40 GHz
- Purpose: EMI testing, per MIL-STD-461
- Power: up to 200 W
- Test Time: only 1 test per year, during a 3 week period, 10 seconds per frequency
- 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:

“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 3 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 SM3 meets these requirements. The standard requires examination of the EMI from 2 MHz to 40 GHz, based on the technology that is employed in the SM3 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

Raytheon is seeking this experimental licensing to get authorization for testing of the EMI characteristics of its Standard Missile 3 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 standard. A copy of the relevant portion of the testing standard is attached to the application as a supplemental exhibit.

Raytheon's Standard Missile 3 program will be testing the effects of electromagnetic interference on its missiles. 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 proposed testing will be inside a metal-skinned building that is situated in the center of Raytheon's Tucson campus. The testing will employ 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. Table A-1 below shows the frequency, scan rate, and projected time of use on particular spectrum for the proposed testing. The time that this test system will operate on any frequency is measured in seconds.

TABLE A-1. Scan Rates and Testing times.

<u>Frequency Range</u>	<u>Maximum Scan Rate</u>	<u>Actual Scan Time – across range</u>
30 Hz - 100 Hz	1.0 Hz/sec	1.2 min
100 HZ - 1 kHz	3.33 Hz/sec	4.5 min
1 kHz - 10 kHz	33.3 Hz/sec	4.5 min
10 kHz - 100 kHz	333 Hz/sec	4.5 min
100 kHz - 1 MHz	3.33 kHz/sec	4.5 min
1 MHz - 5 MHz	6.67 kHz/sec	10 min
5 MHz - 30 MHz	33.3 kHz/sec	12.5 min
30 MHz - 100 MHz	100 kHz/sec	11.7 min
100 MHz - 200 MHz	333 kHz/sec	5.0 min
200 MHz - 400 MHz	667 kHz/sec	5.0 min
400 MHz - 1 GHz	1.33 MHz/sec	7.5 min
1 GHz - 2 GHz	0.667 MHz/sec	25.0 min
2 GHz - 4 GHz	1.33 MHz/sec	25.0 min
4 GHz - 8 GHz	2.67 MHz/sec	25.0 min
8 GHz - 12 GHz	2.67 MHz/sec	25.0 min
12 GHz - 18 GHz	4 MHz/sec	25.0 min
18 GHz - 30 GHz	6 MHz/sec	33.3 min
30 GHz - 40 GHz	10 MHz/sec	16.7 min

Limited number of tests per year:

Raytheon will only be operating the test bed for three weeks per year. However, the testing is essential to its 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.

Stop Buzzer:

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Conclusion:

Raytheon is seeking an experimental authorization for operation of an electromagnetic interference test bed for one of its missile programs. The EMI testing is required under a contract awarded to Raytheon by the US Department of Defense, 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.