

Raytheon Missile Systems  
Experimental License Application  
File No: 0266-EX-CN-2017

### **Explanation of Experiment**

#### **Background:**

Raytheon Missile Systems (Raytheon) is a US defense contractor that develops sophisticated technologies for the US government and governments around the world. Some of the development of new technologies is conducted under contracts with federal agencies; however other technology development is done for independent research and development (IRAD) which leads to innovation and new products.

The Advanced Security and Directed Energy Systems product line at Raytheon is focused on developing security solutions for critical infrastructure protection, homeland security, high value target security, etc. The system projects a narrow energy beam towards a target. This application is being submitted to allow for extended testing, now authorized under WK9XSA, on inanimate carbon-loaded Teflon targets to advance the development of the technology.

This proposed testing is being conducted under a US Army Contract: H94003-04-D-0006, Delivery Order 0331

#### **New Testing is required to meet contractual requirements of the US Army**

Raytheon has been working on the development of its active denial technology using carbon-loaded Teflon targets for years. The US Army is requesting that Raytheon undertake additional testing of this system. The relevant contract number is: H94003-04-D-0006, Delivery Order 0331.

The application being filed here is a request ongoing authorization to conduct testing, with parameters that focus on developing test data that the Army has requested. The testing will strictly adhere to RF safety standards.

The currently proposed testing will use infrared imaging of patterns on a target. There will be NO HUMAN TESTING conducted under the requested license.

The purpose of the testing is to develop additional data on how the directed RF energy affects the black targets, how to build safety controls into the directed energy device while giving the device the flexibility to work in ways that might be useful, and to learn more about the characteristics of directed radio waves and how they propagate and perform under a variety of circumstances.

### Technical Synopsis:

In the development of this unit, the energy will be highly directed.

- Frequencies: 92.0 to 96.0 GHz, primary use is on 92.75 GHz
- ERP: 7 kW
- Azimuth: limited at each location
- Beamwidth: Variable

### Operations are similar to those authorized under Raytheon's experimental license WG2XHU

The proposed testing is an adaptation of testing that is currently authorized under WG2XHU. The key differences from the existing authorization include:

- Spectrum: this application requests use of 4 GHz of spectrum from 92-96 GHz
- Lower power: the previous ERP is 50 MW, the current request is for an ERP of *only* 7 kW
- Two additional locations: This application requests the ability to test at another location on the Raytheon plant site and at a location near Florence, AZ.

The operations are otherwise consistent with those that are currently authorized.

### Time of Use:

The unit will be used at location 1 from 5 pm to 5 am.

The unit will be used at locations 2 and 3 from 5 am to 5 pm after all testing at location 1 is complete.

### Locations of Experimentation:

Raytheon is requesting authorization to test at three locations.

**Location 1:** a Raytheon facility at 3292 E. Hemisphere Loop, Tucson, AZ. At this location, all operations will be conducted indoors. The operations will be in a 20-degree arc from azimuth 170 to azimuth 190.

**Location 2:** Raytheon plant site test area, this is the current site of testing for this device under WG2XHU. The testing is outdoors, between buildings, across a 15-degree arc from azimuth 225 to azimuth 240. The energy is directed across unpopulated desert.

**Location 3:** Area adjacent to the Florence Military Range. The operations will be outdoors, directed across unpopulated desert. Operations will be across an arc between azimuth 0 and azimuth 90. In this instance, the operations will be directed across a range of elevation from 0 to 60 degrees. This will test the tracking of the system to see if it can acquire and target flying unmanned objects.

The experiments will only be conducted in a very limited area which will be cordoned off with signs posted in advance of testing.

Raytheon is seeking authorization to transmit across an arc at each location because the program needs to explore the tracking ability of the technology. The ability to track a target is an important component to the developed product, but it is impossible to determine how to use the tracking, and effectively test the focus and defocus of the device, unless it is tracking moving target.

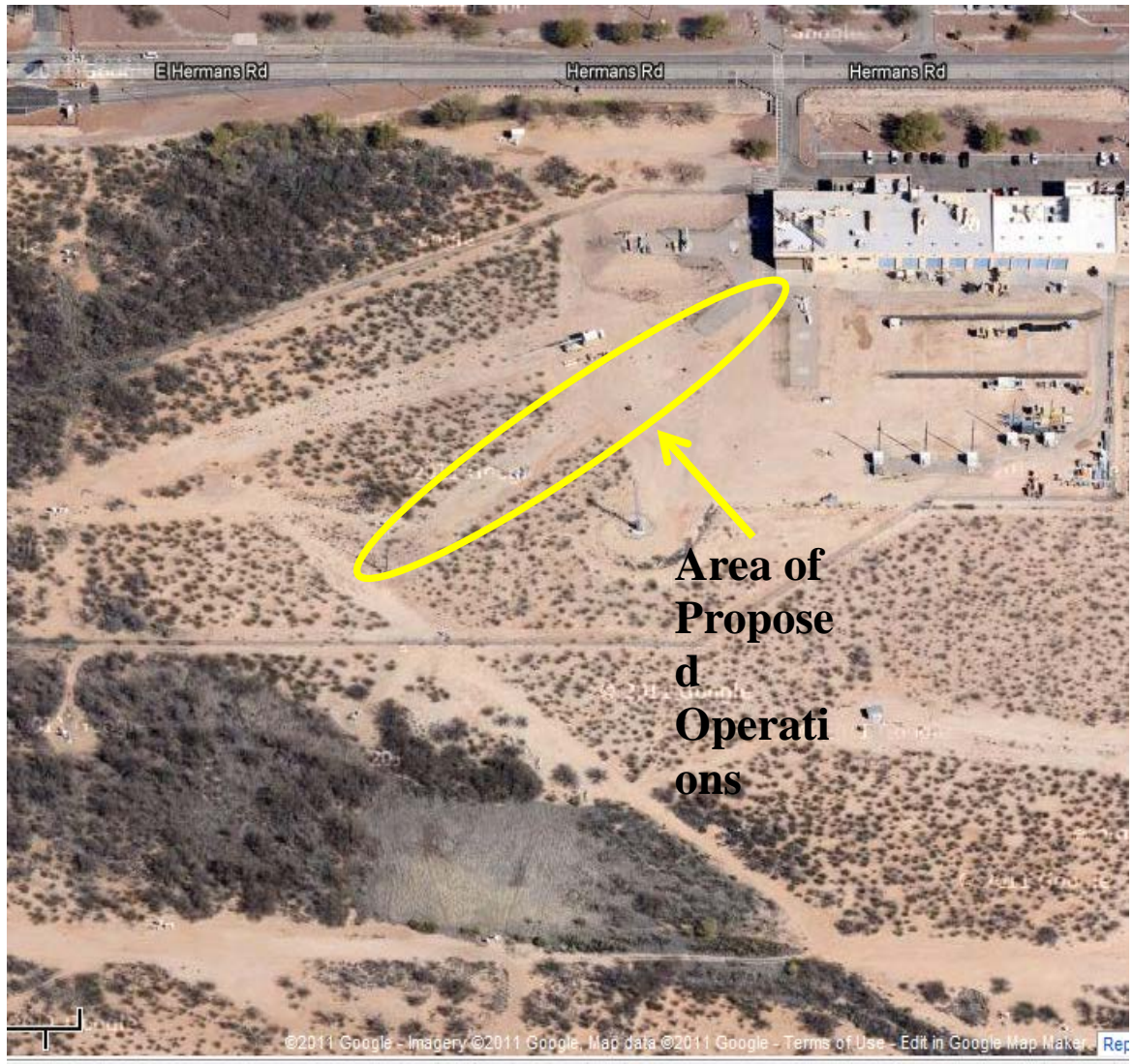


Figure 1: Area of proposed testing on RF test range at Location 2

RF Safety is of paramount importance in moving forward with testing:

Raytheon's RF Safety team has been thoroughly briefed on the proposed experimentation, and they have written a proprietary and confidential plan for the protection of the Raytheon workforce to ensure that Raytheon is in compliance with all RF safety requirements.

The RF Safety plan includes: cordoning off areas from all unauthorized personnel prior to activation of the directed energy device. The cordoned areas have signs posted at the perimeter to ensure that unauthorized personnel stay out of the area. A copy of the warning sign is attached to this exhibit.

The program has designated a RF safety officer who is responsible for ensuring that any and all operations by the program are fully compliant with the RF Safety plan. The safety officer has stop buzzer authority.

Stop Buzzer Point of Contact

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Conclusion:

Raytheon is proposing additional experiments with its directed radio energy technology. The experimentation is being conducted to comply with Raytheon's US Army Contract: H94003-04-D-0006, Delivery Order 0331.

The beam must be coherent, discrete, and controllable. Development of such devices requires advanced engineering and extensive testing across a wide set of parameters to ensure the safety of the device.

As Raytheon stated above, the proposed testing is to be on targets only; there will be no human testing under this proposed license.

For further information, please contact Thomas J. Fagan, Spectrum Manager, Raytheon Missile Systems, 520-794-0227 or [tjfagan@raytheon.com](mailto:tjfagan@raytheon.com) or Anne Linton-Cortez, WFS, 520-360-0925, [alc@conspecinternational.com](mailto:alc@conspecinternational.com).

RF Safety Warning Sign

