

Raytheon Missile Systems
Experimental License Renewal Application
Call Sign: WD2XKF
File Number: 0454-EX-CR-2019

Explanation and Updated Description of Experimentation

Raytheon Missile Systems (“Raytheon”) develops missiles and other technologies for the US government, and when approved, other governments around the world. Raytheon continues to work with radio spectrum to develop a radio-wave based product that can be used as a non-lethal force in specified circumstances. This application seeks to extend Raytheon’s authority under WF2XKF to continue working on this technology development.

Synopsis:

- System has been under development for some time, but additional testing is needed to refine the product and determine how to develop optimal use of the spectrum.
- These devices operate from 94100-95000 GHz; signals typically attenuate rapidly.
- The application requests nationwide use for demonstration purposes at various locations around the US. There are only two of each type of unit, and so the use at any location – customer site or convention – would be sporadic.
- The proposed units, Unit F and Unit T, are only to be used for demonstration purposes.

Description of Experiment:

Raytheon’s engineers have developed a radio system that concentrates the output of a highly specific type of radio transmitter to create hot spots where the radio beam is directed. The system is a non-lethal use of radio technology that can be applied to crowd control and other defense and law enforcement purposes. The two units operating under this license were designed exclusively for demonstration purposes. They are to be used as models for how the overall technology can be used. The existing antenna on the license is the prototype of a device under development, still the subject of extensive experimentation and testing.

Area of Operations:

The pending modification application requests mobile, nationwide use of the spectrum to accommodate Raytheon’s need to undertake demonstrations of the products under development at customer sites and conferences. Those demonstrations can take place at innumerable government – federal, state, and local – locations across the country. Raytheon gets requests for these

demonstrations from its customers, and it does not know in advance all of the places that it might need to take the technology, so the request is for nationwide use.

The two new devices used under this license are small, Unit T is no larger than a large desktop computer, and Unit F is much smaller, about the size of a typical toaster. These units are typically operated indoors. However, Unit T may be used outdoors to ensure that RF safety requirements are met.

Unit F Operations:

This model unit is being developed for use at tradeshow, where the demonstration unit needs to be compact enough to show in a small booth, and with a power output that is attenuated so that the signal only carries about 12 inches from the unit. The effect can only be felt within inches of the unit. There is no plan to ever have a production model like Unit F. This model was developed because it will be able to safely demonstrate the technology.

Unit F does not actually include an antenna, per se. It uses a waveguide to direct the signal through a ground plane (metal box enclosure). The diagram below, *Figure 1*, shows the wave guide, ground plane and predicted signal pattern once the signal reaches free space. As noted above, the signal dissipates to an immeasurably small level within twelve inches of the ground plane.

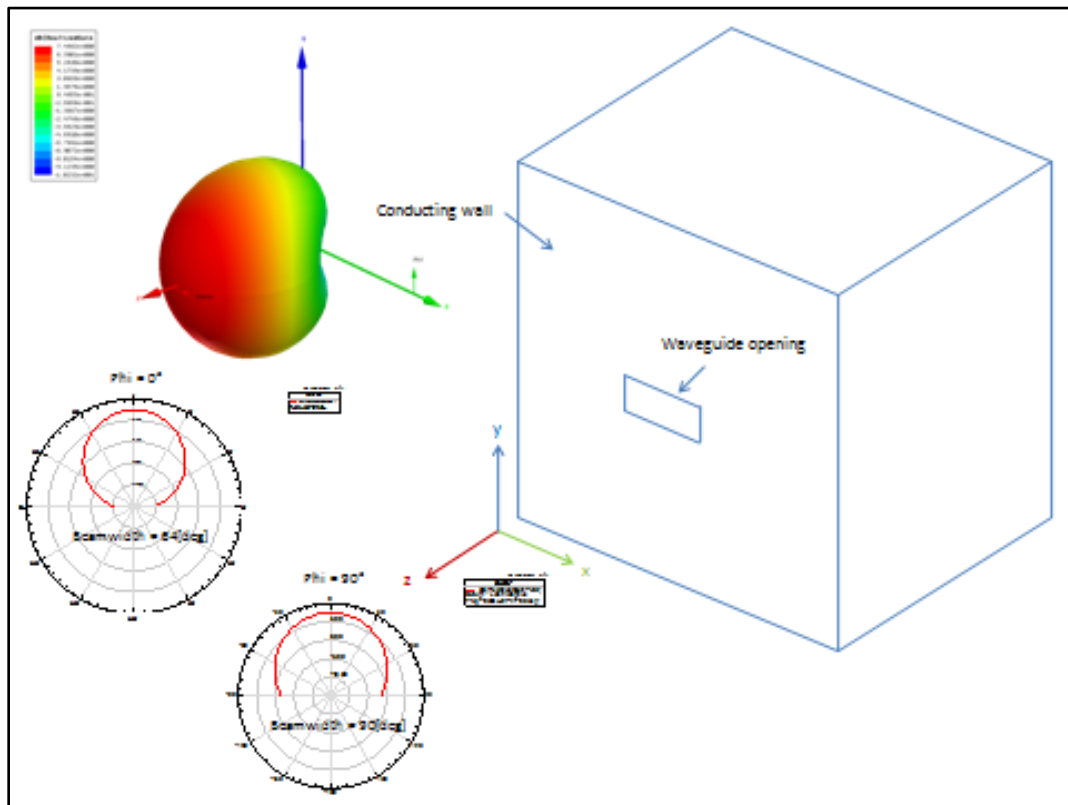


Figure 1: Wave Guide, Ground Plane, and Signal Patterns for Unit F

Power level of Unit F transmission: 200 mW
ERP of Unit F transmission: 485 mW

Unit T Operations:

This unit is also designed for demonstration purposes. When used for a demonstration, this unit will be put on a table, either outside in a cordoned demonstration area or indoors in a space adequate to contain the signal. While the ERP of this unit appears large, at the frequency used, the signal attenuates rapidly, so it can be easily contained. Unit T was created to provide the basis for discussions of how next-stage products could be developed from modifications to the existing technology. The product requires only a short period of time between pulse cycles, which makes it better for use in a demonstration than the unit already licensed.

Power level of Unit T transmission: 13 W
ERP of Unit T transmission: 793 kW

Unit T and Unit F were developed strictly for demonstrations:

Both Unit F and Unit T were developed to be small units, acting as portable samples of what the larger technology under development may be able to do. Through the process of demonstrating the technology and receiving feedback, Raytheon hopes to make additional advancements and customization to the overall technology. The small size and limited range of the signals used in these two demonstration units, along with the attenuated power output, make these units safe for experimentation and will help advance the development of the technology.

Conclusion:

Raytheon is requesting authority to renew its existing license exactly as authorized. The stop buzzer point of contact is:

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Should there be any questions about this application, please contact Anne Linton Cortez, Conspec International, 520-344-8525 or alc@conspecinternational.com.