

Explanation of Modification Request and Description of Experimentation

Raytheon Missile Systems (“Raytheon”) develops missiles and other technologies for the US government, and when approved, other governments around the world. Currently, Raytheon is working with radio spectrum to develop a radio-wave based product that can be used as a non-lethal force in specified circumstances.

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 at frequencies of 95 GHz, so signals typically attenuate rapidly.
- The application requests nationwide use because the systems are used 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 would be quite intermittent and 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 Raytheon would like to add to its license are being designed and built exclusively for demonstration purposes. They are to be used indoors only, 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 two new devices being added to this license are small, Unit T is no larger than a large desktop laptop computer, and Unit F is much smaller, about the size of a typical toaster. This modification application requests mobile, nationwide use of the spectrum to accommodate Raytheon’s need to undertake demonstrations of the products under development. Those demonstrations can take place at innumerable government locations across the country. The proposed use will be indoors.

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 2*, 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.

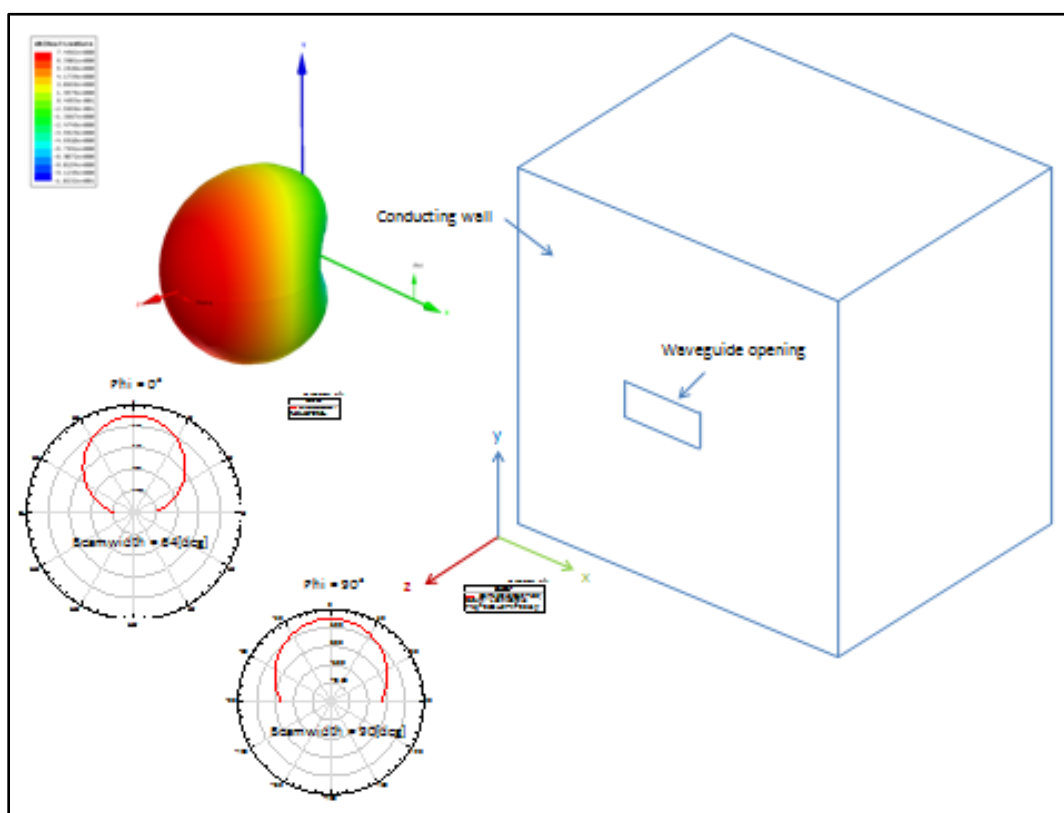


Figure 1: Wave Guide, Ground Plane, and Signal Patterns for Unit F

Unit T Operations:

This unit is also designed for demonstration purposes. When used for a demonstration, this unit will be put on a table. It is intended 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.

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.

Need to expand spectrum for existing operations:

The current license permits the use of only 94,100 to 95,000 MHz for the existing antenna. The advances in technology that Raytheon has made to date have caused it to begin theoretical work across 94,000 to 96,000 MHz. To allow for testing of the current unit in conjunction with the testing to be done on the demonstration units, Raytheon is requesting authorization to expand the bandwidth for its existing equipment to cover 94,000 to 96,000 MHz.

Conclusion:

Raytheon is requesting authority to add two new demonstration devices to its existing license and to expand the frequency band for which it is currently authorized. The stop buzzer point of contact is:

Thomas J. Fagan
520-794-0227

Should there be any questions about this application, please contact Tom Fagan, Spectrum Manager, Raytheon Missile Systems, 520-794-0227 or tjfagan@raytheon.com, or Anne Linton Cortez, Conspec International, 520-344-8525 or alc@conspecinternational.com.