

Raytheon Missile Systems  
Application for Experimental License  
File Number: 0094-EX-PL-2016

### **Explanation of Experiment**

Raytheon Missile Systems (Raytheon) is a US defense contractor that develops innovative technologies that can be used by the military. Raytheon's innovation labs in Rancho Cucamonga, California have been working on the development of a new broadband technology. This application proposes to continue its experimentation at two new locations to meet customer requirements both to meet the demands of a US Department of Defense customer and to test the technology for adaptability for the commercial marketplace. The early research has shown significant results in improving data flow over the new solid-state technology using high frequencies. This application seeks to continue the operations authorized under WJ9XHM.

#### Technical Synopsis:

- Spectrum Needed: 71-76 GHz, 81-86 GHz, 92-94 GHz
- Power level: 30 W output power, 1.83 MW ERP
- Antenna gain: 50 dBi, sends a pencil beam that is high capacity and can travel 10 mi.

Raytheon has worked on development of a small, stable antenna that can be used for high speed point-to-point communications that can reach a distance of up to 10 miles. A range of customers have expressed interest in this technology, including federal and commercial entities.

#### Description of Experiment:

Raytheon has been working on a new product that uses high bandwidth solid state W-band (71-76 GHz, 81-86 GHz, and 92-94 GHz bands) technology, making it possible to deliver compact, secure communications systems with orders of magnitude reductions in size, weight and power. This application seeks authorization to conduct testing between two locations: Sunset Ridge, California and Rancho Cucamonga, California. The experimentation will explore how to optimize operations of the technology over great distances with high data integrity.

Raytheon's is developing this system for both military and commercial customers. As a result, it is testing the system at power levels that will be required by its military customers. When Raytheon is ready to develop a strictly commercial product, it will develop its system in compliance with the FCC's power limitations for operation in these bands. However, for now the testing requires the power levels requested.

Reducing the size, weight and power needed by broadband data links is essential when working in harsh climates, from aircraft to the ground, or among aircraft. Traditional point to point technologies operating in this frequency band use large antennas that are buffeted by wind. The buffeting causes a significant drop in data rates, which leads to inefficient communications, lowering of available bandwidth, slowing of vital communications, and wasted power by the transmitters. Buffeting is a particular problem when one or both antennas are in motion. The technology under development offers significant advances in power consumption, rapid deployment, and effective high-speed data transmissions under all conditions, particularly addressing the challenges of mobile operations.

The advanced development will enhance the feasibility of using the technology for robust communications systems that are portable and rapidly deployable. This testing will include measuring the performance of prototype 50 Gbps, high frequency (71-76, 81-86, and 92-94 GHz), static communication links.

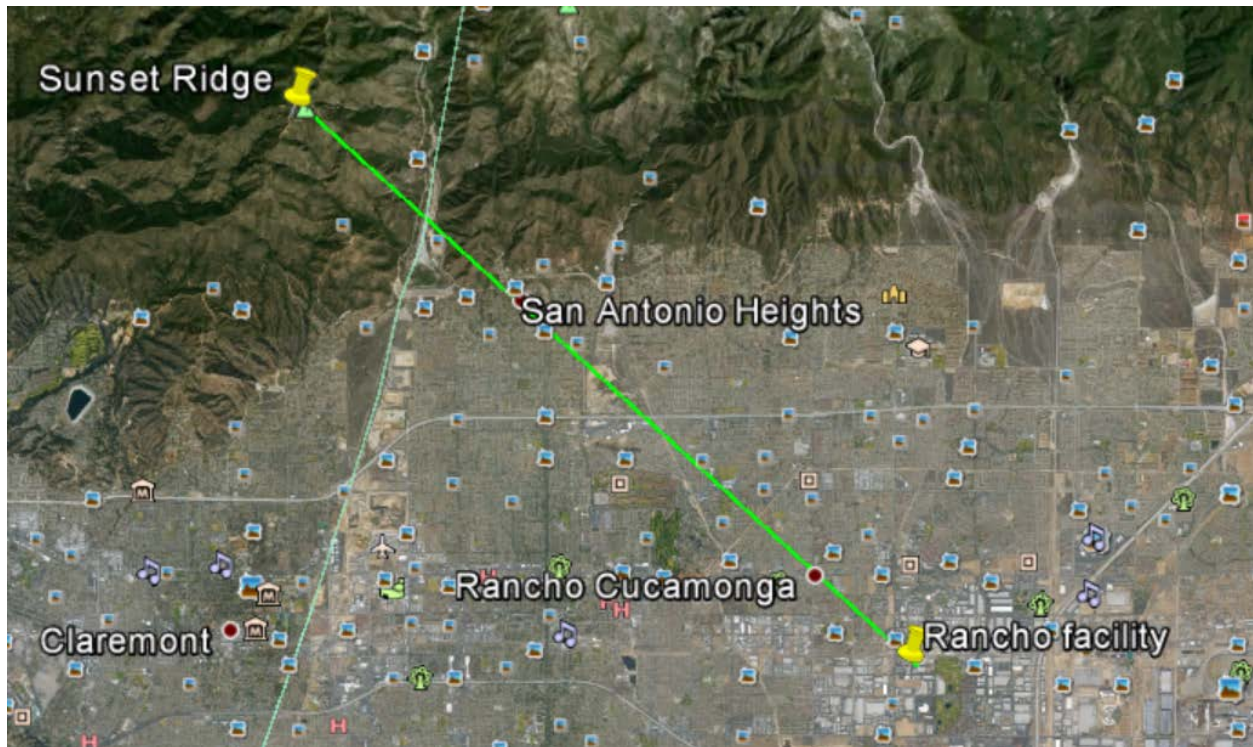
#### Location of Testing:

The image below shows the location of the proposed point-to-point test link. The radio energy is concentrated into a very narrow beam with no sidelobes. The link is 10 miles long, which allows the system to be tested at the maximum specified distance. That ensures that the technology will perform in the field as required for the upcoming customer demonstration. The at the northwestern point, Sunset Ridge, the elevation is 5202 feet AMSL. At the southeastern point, Rancho Facility, the elevation is 1095 feet AMSL. The Rancho antenna is directed upward to account for the over 4000 feet of elevation change. The Sunset Ridge antenna has downtilt to account for the elevation change.

Coordinates of operation shown in image below:

Northwestern end: 34-11-10.68 N, 117-42-12.21

W Southeastern end: 34-05-19.2 N, 117-34-25.3 W



Stop Buzzer Point of Contact:

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Conclusion:

Raytheon's advanced solid state data link research program needs to continue these operations to see if the technology under development can be used across 10 mile distances effectively, to expand the utility of the system.

If there are any questions about this application or the proposed use of the spectrum, 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, Washington Federal Strategies, 520-360-0925 or [alc@conspecinternational.com](mailto:alc@conspecinternational.com).