

Explanation of Experimentation, Need for Spectrum, Advancement of Radio Art

Overview:

Raytheon Missile Systems (Raytheon) builds and tests various missiles that are used by the US military and other US Government approved customers. Raytheon verifies missile performance in a number of ways including testing the command and control radio systems on the missiles and testing of the telemetry systems which send data back to control points to deliver key information on the missile flight and the health of the missile systems while in flight. The results of the telemetry gathered during flight testing advance the technologies built into the systems, which is of great benefit to the users.

In this Experimental License Application, Raytheon is seeking authority to develop and test new radio systems that will provide enhanced and more efficient telemetry systems, which are essential to developing and testing advanced missile systems and monitoring the flight of the missiles.

World Radio Conference 2007:

At the 2007 World Radio Conference (WRC), there was international agreement to allocate spectrum in the “C Band” for aeronautical telemetry use. The spectrum expected to be used for aeronautical telemetry in the US includes 4400 to 4940 MHz, 5091 to 5150 MHz, and 5925 to 6700 MHz. Although this spectrum allocation has not yet been put into effect in the US, Raytheon is developing advanced systems which require it to begin experimenting with new radio systems that will deliver key telemetry data for the these systems.

Currently, aeronautical mobile telemetry is conducted by Raytheon in the S-Band.¹ The current telemetry operations are vital to the development of aerospace industry products and all the technologies used to control and enhance the safety of aircraft of all kinds. The proposed development of new technologies for use on the frequencies proposed in this application cannot replace the essential communications for which the S-band frequencies are currently used. The new frequencies are intended to augment and enhance the existing telemetry systems.

Purpose of Experimentation:

Raytheon is seeking this experimental license to start developing radio systems that operate in the soon-to-be-available spectrum to advance aeronautical telemetry technology. Raytheon’s engineers and scientists will need to investigate technical properties of the proposed spectrum

¹ The S-Band includes 2200-2290 and 2300-2390 MHz.

and how information is transmitted most efficiently over this spectrum. They will be seeking to optimize use of the spectrum to ensure secure, reliable, timely transmission of the essential telemetry data. This requires developing new radio systems for the proposed spectrum allocation, testing their effectiveness, improving the technology, and integrating the new radio systems into Raytheon's missiles to benefit its customers. Raytheon engineers will examine ways of maximizing telemetry data throughput and data reliability on this spectrum, which will ensure reliable and error-free telemetry in the presence of potential RF interference.

Emission Designators:

Raytheon proposes using a number of different emission designators to test under the proposed license. The purpose of the testing includes exploring ways to optimize the transmission of telemetry over this new spectrum in ways that are efficient and avoid interference.

Intermittent Use:

To ensure that the experiments will produce results that lead to technology development that is sustainable, the test plan includes monitoring the planned transmission spectrum prior to any over-the-air transmitter testing. The goal is to find the least used portions of the proposed spectrum to ensure that new telemetry technologies will have the least potential to cause interference with other existing users while maximizing the throughput of essential aeronautical telemetry data. All experimental transmissions will be sporadic, since each over-the-air test will be followed by extensive laboratory work for performance evaluation.

The experiments will involve both the development of new communication hardware and software that provides the most efficient and secure use of spectrum for aeronautical telemetry. The radio development will include development of specialized antennas and experiments with various signals and modulations to create the best telemetry system possible.

Locations of the testing:

Raytheon is seeking experimental authorization to operate in two locations. The first is at the Raytheon Missile Systems facility in Tucson, Arizona. Most of the development of the new systems will take place in laboratory spaces, but Raytheon intends to perform some testing at its outdoor RF test ranges.

The second location on this application is for airborne, mobile use of the transmit antennas in an area within a 100 mile radius of the Raytheon facility in Tucson, Arizona. Because the new radio development is intended to explore how the spectrum can be most effectively used to transmit telemetry data, it is necessary to test the systems in an airborne captive-carry test-bed using representative antennas and missile bodies to measure and optimize system effectiveness in a real-world environment.

Basis for testing:

Raytheon is currently seeking this authorization for its independent research and development and future contracts with the US government. All over-the-air testing must be done under and in accordance with an FCC experimental license, even if there were a current government contract in place that required the new technology. In response to the WRC action, Raytheon expects the US Government to solicit requests for proposals for either changes to existing missile programs or new development contracts. Raytheon will be better poised to respond to US Government contract work if the experimental license is in place.

Questions:

If there are any questions about this application or the proposed spectrum use, please contact Thomas J. Fagan, Spectrum Manager, Raytheon Missile Systems, 520-794-0227 or tjfagan@raytheon.com, or Anne Linton, Counsel, 520-344-8525 or alc@wfsllc.biz.