

Explanation of Experimental License Application

Overview:

Raytheon Missile Systems builds and sells missiles to the US military. As a part of the engineering development and production process, Raytheon tests communications systems in its products to make sure they meet customer specifications. Additionally, from time to time, Raytheon needs to test its products in demonstrations for its customers.

This application seeks authorization for testing of the products that are developed and tested in the laboratory or on the production line. The proposed testing will take place at Eglin AFB, and the time of any operation will be approximately 10 seconds.

Previously missile flight testing was conducted at government test and training ranges using federal frequency assignments. In this case, Raytheon has agreed to seek an experimental license for the proposed operations.

Synopsis:

- Time of use is limited – just about 10 seconds of spectrum use on days of tests
- Testing will be conducted only sporadically.

Description of spectrum use for production line preparation for missile test:

L (1435-1525 MHz), UHF (420-430 MHz), C (5400 to 5900 MHz) and S (2200-2390 MHz) band transmitters are installed on the missile to allow for control and monitoring of the missile while it is in flight. Most missile flight tests are very short in nature, about 5 minutes.

Frequencies in use:

UHF frequencies: The UHF (420-430 MHz) Flight Terminate Receiver on the missile receives information on a very specific frequency that can be used to steer the missile and/or destroy it in the unlikely event that the range deems the missile a safety hazard.

For development engineering and or production testing, a test transmitter is used to test all of the functions of the Flight Terminate Receiver and its antenna.

S-band frequencies: The S-band telemetry transmitter operates on a very narrow frequency in one of three frequency bands; 2200-2290 MHz, 2310-2360, 2360-2390 MHz. Power output is 2 to 40 watts of power. For purposes of the application filed here, Raytheon has again requested authorization to use the full 40 W of power, which is only rarely required. Most of the testing continues to be done at a power level of approximately 5 watts. For these flight tests, missile telemetry data is sent to the test center to provide information such as temperature, altitude, speed, voltages, and vibration levels as the missile is in flight.

The telemetry data received over these frequencies helps the controllers determine the health and status of the missile in flight.

C band frequencies: The C-band transponder system, operating at 5400-5900 MHz, is used for tracking the missile in flight. Raytheon has agreed to notch out operation in the 5600-5650 MHz band. This system includes an interrogator radar fixed on the ground and a transponder on the missile. In actual use, the power output can be up to 100 watts. In an actual flight test, the government range radar (AN/FPS-16) interrogates the missile transponder with a single or dual pulse. The transponder receives coded or single pulse interrogation from ground stations and transmits a single-pulse reply in the same frequency band. The radar ground stations determine the position of the vehicle C-band transponder by measuring range, azimuth angle, and elevation angle. Range is derived from pulse travel time, and angle tracking is accomplished by amplitude-comparison monopulse techniques. As many as four radar stations may track the missile simultaneously. The interrogation responses use an ERP of 76.6 W to ensure the proper functioning of the C Band system on the missile.

For Raytheon's use, a lab test of the interrogator, set with the following characteristics, is used to test the missile transponder:

RF power output: -5 DBM to -65 DBM $\pm$ 1.5 DB into a 50 OHM LOAD, N-Type Connector

RF frequency: 5.4 TO 5.9 GHz, synthesized in 1 MHz Steps, 5600-5650 use is notched out

Pulse width: 0.25 TO 1.0 MICROSECONDS

Pulse spacing: 3 TO 12 MICROSECONDS

PRF: 100 TO 2600 HZ

Operating modes: CW, automatic test, Repeating pulse, Manual, Cal

Analysis results: GO/NO GO, returned pulse count, Transponder power returned

The transponder on the missile in test flight.

For development engineering and/or production testing, a test transmitter is used to test the operation of the C-Band Transponder and its antenna.

Spectrum Use Coordination:

Raytheon will submit a frequency coordination request to AFTRCC for the use of the telemetry frequencies. Raytheon will request that AFTRCC send its response to both Raytheon and the FCC after it has completed consideration of the formal request. Informal consultation with AFTRCC has shown that they are likely to approve this request. A copy of the AFTRCC response will be submitted to the FCC as soon as it is available.

Expected Effect of Spectrum Use:

Over the past 50 years, Raytheon has tested its products during engineering, development and production.

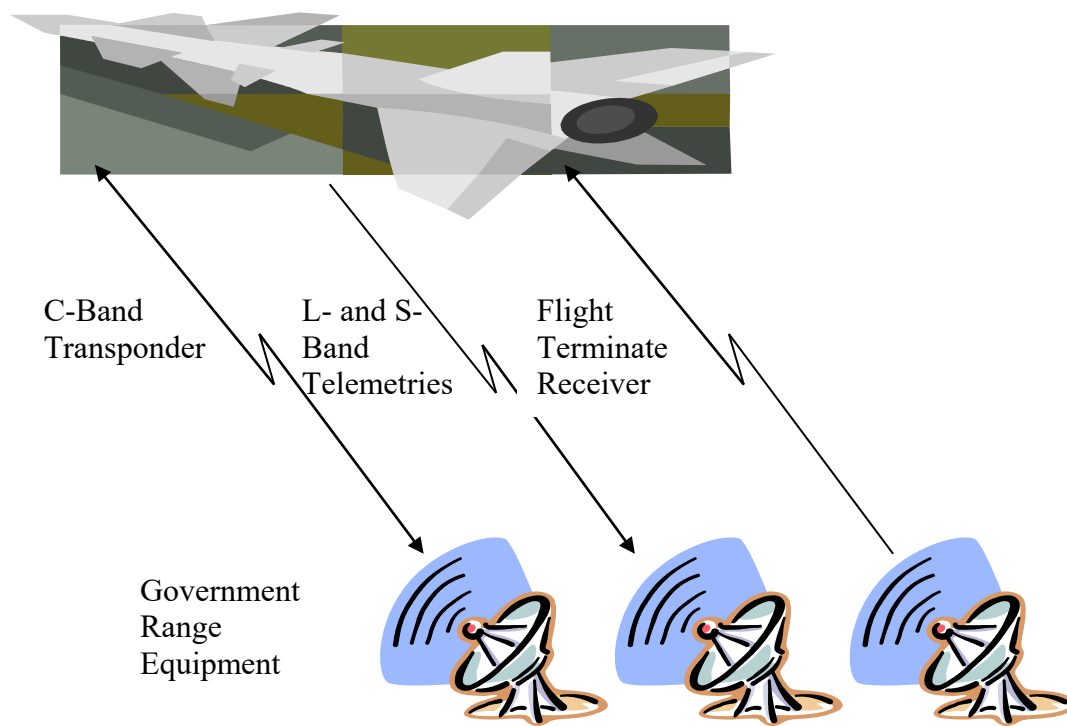
Additionally, in reviewing the FCC's regulations, we noted that the S band frequencies are not to be used for flight test of manned aircraft. The testing being conducted is simply for product testing in the lab and on the production line.

Stop Buzzer Point of Contact:

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Conclusion:

As noted above, this application is being filed to secure experimental authorization for testing conducted by Raytheon at Eglin AFB. The frequencies proposed are those required by the customer, because the systems being tested are not in actual flight testing that will take place at DOD facilities.



Flight Test Configuration