

Raytheon Missile Systems  
Experimental License Renewal Application  
Call Sign: WH2XYX  
File Number: 0221-EX-CR-2020

## **Explanation of Experiment & Procedural & Coordination Information**

### **Background:**

Raytheon Missile Systems (Raytheon) is a company that develops innovative technologies that have both defense and civilian uses. Raytheon draws on the expertise of its varied engineering departments to develop technologies that address previously unsolvable problems.

This application is for renewed authorization for the launch and operation of a micro-satellite that incorporates a number of commercial-off-the-shelf technologies to prove a concept of how one could build and quickly launch an inexpensive satellite to address short-term, immediate imaging needs. The launch has been delayed, so that this filing is needed to keep Raytheon authorized for when it may finally be able to launch. The proposed operations have not changed to the best of our current knowledge.

### **Procedural and Coordination Information:**

#### **IARU Coordination:**

In accordance with FCC requirements, Raytheon, as part of its initial filing, conducted prior coordination of its proposed operations with the International Amateur Radio Union (IARU).

#### **NOAA Imagery Licensing:**

On October 22, 2015, Raytheon received a license for satellite imaging from the NOAA office of commercial remote sensing requesting a license for satellite imaging. That license remains in effect.

#### **Orbital Debris Assessment Report:**

As part of its initial filing, Raytheon has submitted its Orbital Debris Assessment Report, containing information about the projected effects of the launch of this satellite.

### **Explanation of Experiment**

In the sections below, Raytheon provides an explanation of the experimentation.

#### **Satellite System**

System Name: SeeMe Satellite System; Number of Satellites: 1

Number of Ground Stations: one primary command and control station based in Aurora, Colorado. Raytheon is also seeking authorization for operation of backup command and control stations at other locations.

Figures 1 and 2 below show the anticipated signal coverage for the transmitters on the satellite.

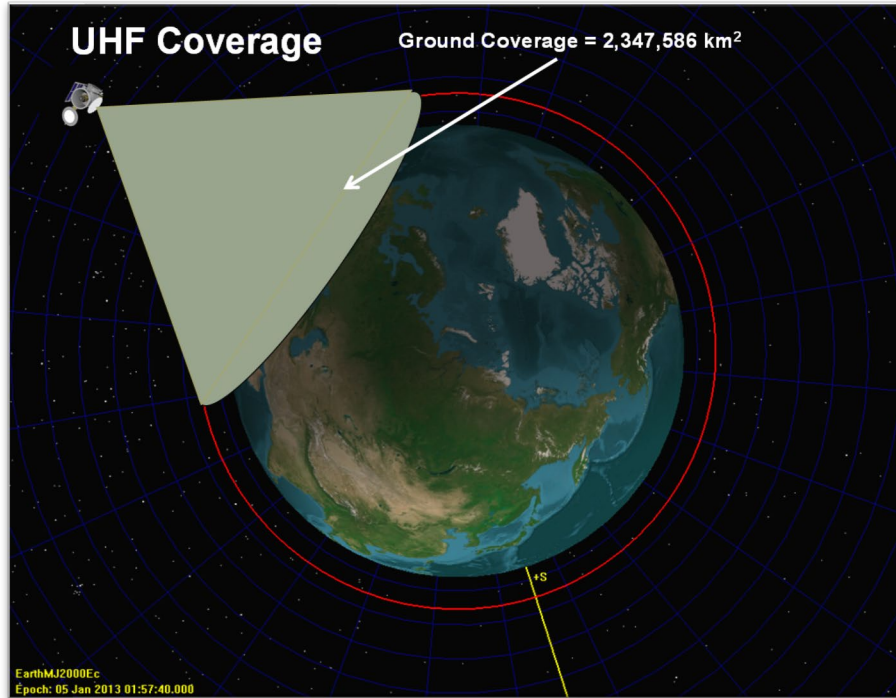


Figure 1: Satellite UHF Frequency coverage

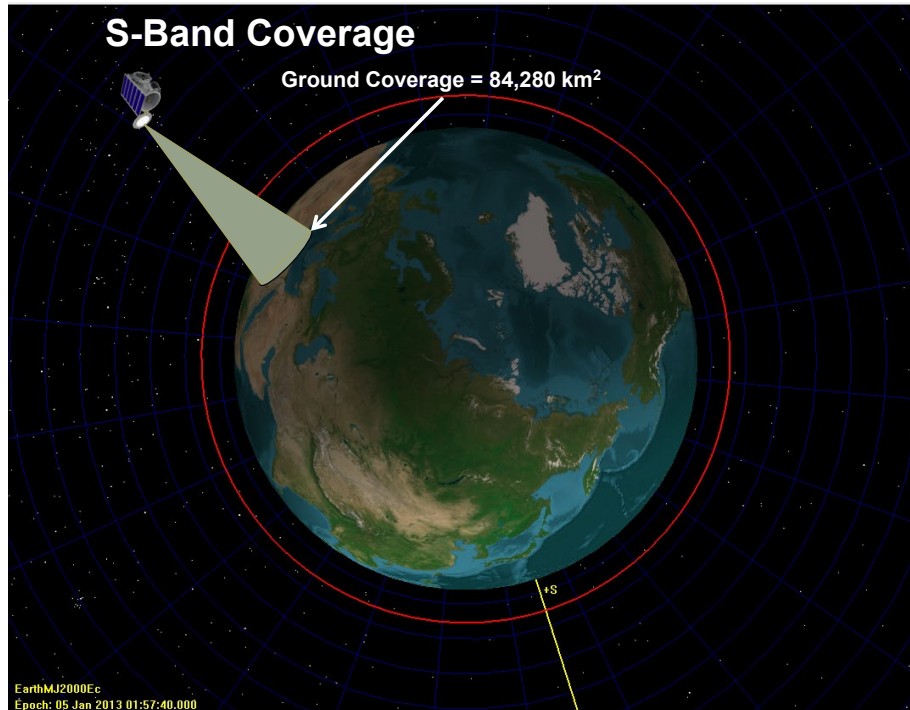


Figure 2: Downlink Beam Coverage at 2425 MHz; Downlink data rate: ranges between 1 MBPS and 2 MBPS (more likely 1 Mbps)

### **Explanation of Operations**

This project was intended to demonstrate the capabilities of a small, quickly deployable satellite to provide advanced imaging and communications. It uses an inclined low earth orbit to be able to make multiple passes each day. The demonstration model is attempting to show how the images can be captured, downloaded, and moved to a central point to be of use. The demonstration is planned to be short-lived, and the controls built in to the satellite and network ultimately will disable the satellite if there are any technology failures.

Communication between the control ground station in Aurora, Colorado and the satellite would have used the 437 MHz half duplex links.

The satellite was launched in December 2018. Unfortunately, the system in which SeeMe was embedded had a malfunction. The radios on the satellite were never turned on. As a result, SeeMe is still in orbit, but not functioning. Raytheon seeks to renew this license because the satellite remains in orbit. NOAA requires the imagery license to be current, and presumably, the FCC requires the spectrum license to remain in effect, even though there are no operations. There is some, remote, chance that a second satellite might be launched in 2021, operating with the same parameters.

### **Time of Use**

As explained above, while the satellite is on orbit, it is not functioning, and the spectrum is not in use.

**Conclusion:**

Raytheon has been developing technology for a small, temporarily deployable satellite system. The system is intended to provide customers with quickly deployable capabilities. The small satellite being tested here, is known as SeeMe. It is on orbit but not functioning.

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