Raytheon Intelligence, Information and Services
Experimental License Application
File Number: TBD

Exhibit 1 – Overview and Explanation

Overview: Raytheon Intelligence, Information and Services (Raytheon) is filing this application for use of a GPS re-radiation system in its facility at 9020 South Sandy Parkway, Sandy, Utah. This facility utilizes GPS for positioning information and timing technologies for test equipment for ground station receivers. The GPS re-radiation system is required for the testing of GPS technologies that are embedded into the communications systems that Raytheon is developing in this lab.

General compliance with NTIA section 8.3.28: set forth below are Raytheon's responses to the requirements of 8.3.28 as those answers apply for this location.

For any questions about this application, please contact Brian Kavalar, Raytheon IIS Spectrum Manager, 317-517-998, brian_r_kavalar@raytheon.com

Compliance with the Requirements of NTIA Manual Section 8.3.28

1. **Individual authorization is for indoor use only and is required for each device at a specific site.**

   This GPS re-radiation system will be installed indoors in a laboratory with access that is limited to Raytheon authorized personnel only.

2. **Applications for frequency assignment should be applied for as an XT station class with a note indicating the device is to be used as an "Experimental RNSS Test Equipment for the purpose of testing GPS receivers" and describing how the device will be used.**

   Raytheon requests the assistance of the FCC and NTIA to properly classify the frequency authorizations.

3. **Approved application for frequency assignment will be entered in the GMF.**

   Raytheon requests the assistance of NTIA and the FCC in entering this data into the GMF.

4. **The maximum length of the assignment will be two years, with possible renewal.**

   Raytheon is seeking an authorization for two years, and it will seek renewals when required.

5. **The area of potential interference to GPS reception (e.g., military or contractor facility) has to be under the control of the user.**

   The proposed installation will be inside the Raytheon facility at Sandy, Utah. Access to the facility is limited to Raytheon personnel and limited authorized visitors. The building is a secure facility, and no unauthorized visitors can enter.

6. **The maximum equivalent isotropically radiated power (EIRP) must be such that the calculated emissions are no greater than -140 dBm/24 MHz as received by an isotropic antenna at a distance of 100 feet (30 meters) from the building where the test is being conducted. The calculations showing compliance with this requirement must be provided with the application for frequency assignment and should be based on free space propagation with no allowance for additional attenuation (e.g., building attenuation.)**

   Link Budget: The link budget for the L1/L2 re-radiation is attached to this exhibit, and it shows the calculations applicable to this proposed installation of a GPS re-radiation system.

   Location in building: The re-radiation device will be installed inside Raytheon building at Sandy, Utah. The installation is on the third floor of the building. The attached link budget shows that the signal strength *at 100 feet from the re-radiating antenna* is below -140 dBm/24 MHz. Thus, the signal strength at 100 feet from the building is going to be significantly lower still, but Raytheon wanted to ensure that the signal strength was attenuated to the point that there would be no chance of interference.

7. **GPS users in the area of potential interference to GPS reception must be notified that GPS information may be impacted for periods of time.**

   Raytheon will post signs in the lab where the re-radiation system is installed alerting those in the area that there are GPS re-radiation systems in use in that area.

8. **The use is limited to activity for the purpose of testing RNSS equipment/systems.**

Raytheon is requesting authorization to use a re-radiation system specifically for testing of GPS systems on its products.

9. **A "Stop Buzzer" point of contact for the authorized device must be identified and available at all times during GPS re-radiation operation of the device under any condition.**

   The Stop Buzzer point of contact for all these devices is:

   Mark J. Murray, Raytheon IIS

   703-869-6549 (cell)
   Mark_J_Murray@raytheon.com

   Mr. Murray can initiate shut off the GPS re-radiation system at any time.

Raytheon IIS - Sandy, Utah GPS Reradiation Link Budget

GPS Signal Analysis

Frequency - GPS L2	**1227.6**	MHz	Signal Level		
Wavelength	0.24	meters	dBm	Watts	picoWatts
GPS Input Signal Level	-130	dBm	-130	1E-16	0.0001
GPS Receive Antenna gain on roof	33	dB	-97	2E-13	0.20
GPS RF Amplifier gain	20	dB	-77	2E-11	19.95
RF Attenuator	0	dB	77	2E 11	19.95
LMR-400 Coax loss per foot	-0.046	dB			
Coax Length	100	feet			
Total Coax Loss	-4.6	dB	-81.6	6.9E-12	6.918
GPS Transmitting Antenna Gain	3	dB	-78.6	1.4E-11	13.804
Distance from transmit antenna	10	meters			
Distance from transmit antenna in feet	32.81	feet			
Path loss to lab receive active antenna	-54.2	dB	-132.8	5.2E-17	5.22E-05
Signal level at lab receive active antenna EIRP to ERP			-135	3.2E-17	3.19E-05
GPS receive antenna gain in lab	0	dB	-135	3.2E-17	3.19E-05
Signal level at unit under test EIRP to ERP			-137.1	1.9E-17	1.95E-05
Distance from transmit antenna in meters	30.47	meters			
Distance from transmit antenna in feet	100.0	feet			
Freespace path loss to 100 ft	-63.9	dB			
EIRP Signal level at 100 ft from TX antenna			-142.5	5.6E-18	5.62E-06
ERP Signal level at 100 ft from TX antenna			-144.6	3.4E-18	3.44E-06

*Specification per GPS Performance Standard, dated Feb 23, 2007
*33 dB gain GPS Source antenna on roof
*GPS Source L1L2 Metro Repeaters Maximum Amplifier Driver Gain
*No additional attenuation
*Typical loss per foot at GPS frequencies, connector/coupler loss not included
*GPS lab signal radiated power
*GPS Source L1L2 passive antenna

NTIA 8.3.28 compliant if EIRP signal level at 100 ft is less than -140 dBm

GPS Signal Analysis

Frequency - GPS L1	**1575.42**	MHz	Signal Level		
Wavelength	0.19	meters	dBm	Watts	picoWatts
GPS Input Signal Level	-130	dBm	-130	1E-16	0.0001
GPS Receive Antenna gain on roof	33	dB	-97	2E-13	0.20
GPS RF Amplifier gain	20	dB	-77	2E-11	19.95
RF Attenuator	0	dB	-77	2E-11	19.95
LMR-400 Coax loss per foot	-0.051	dB			
Coax Length	100	feet			
Total Coax Loss	-5.1	dB	-82.1	6.2E-12	6.166
GPS Transmitting Antenna Gain	3	dB	-79.1	1.2E-11	12.303
Distance from transmit antenna	10	meters			
Distance from transmit antenna in feet	32.8	feet			
Path loss to lab receive active antenna	-56.4	dB	-135.5	2.8E-17	2.83E-05
Signal level at lab receive active antenna EIRP to ERP			-137.6	1.7E-17	1.73E-05
GPS receive antenna gain in lab	0	dB	-137.6	1.7E-17	1.73E-05
Signal level at unit under test EIRP to ERP			-139.8	1.1E-17	1.05E-05
Distance from transmit antenna in meters	30.47	meters			
Distance from transmit antenna in feet	100.0	feet			
Freespace pathloss to 100 ft	-66.1	dB			
EIRP Signal Level at 100 ft from TX antenna			-145.2	3E-18	3.04E-06
ERP Signal level at 100 ft from TX antenna			-147.3	1.9E-18	1.86E-06

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