Raytheon Company
Conventional Experimental Application
File Number: 0794-EX-CN-2022

Overview and Explanation

Overview: Raytheon Company is filing this application for renewal a GPS re-radiation system at Camp Lejeune near Onslow Beach at building BA-134 for preliminary indoor testing prior to outdoor operations.

General compliance with NTIA section 8.3.27: set forth below are Raytheon's responses to the requirements of 8.3.28 as those answers apply for this location.

Compliance with the Requirements of NTIA Manual Section 8.3.27

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.

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.

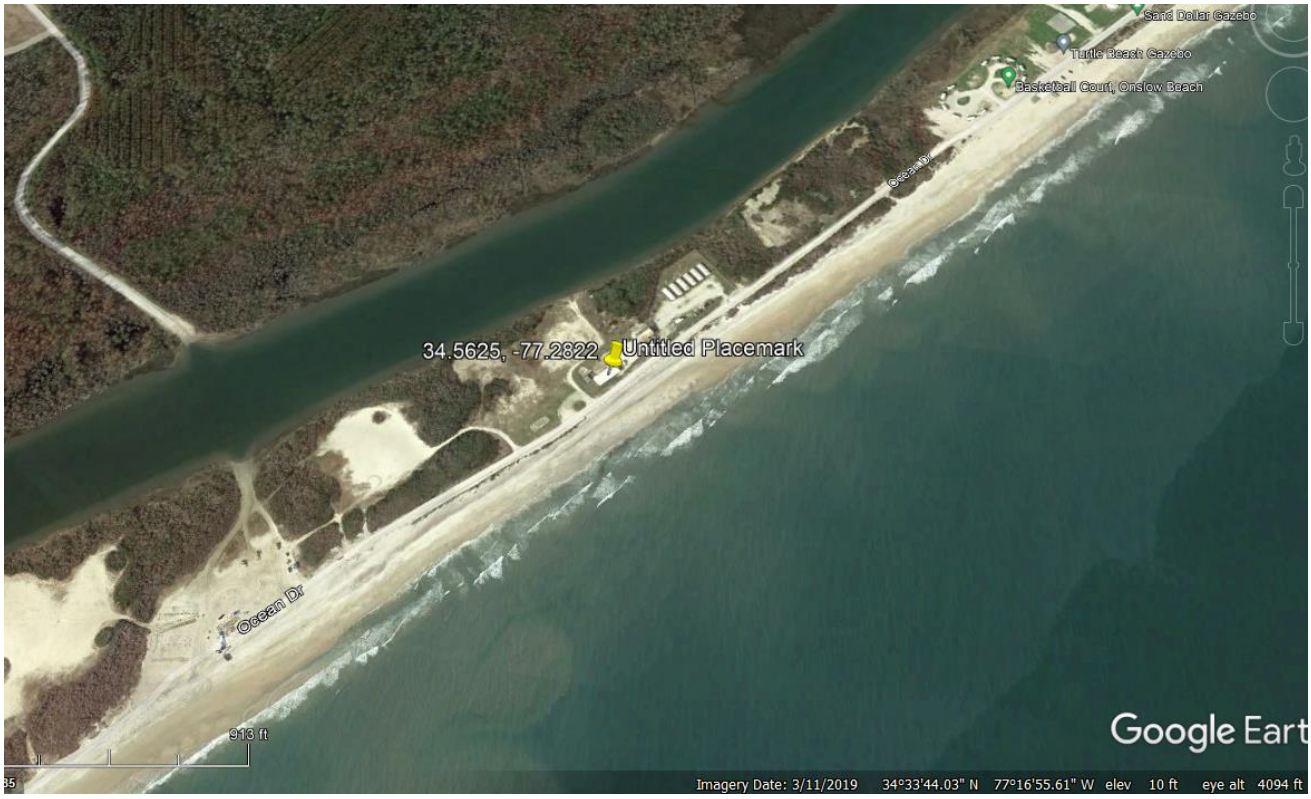
The area of potential interference to GPS reception (e.g., military or contractor facility) has to be under the control of the user.

The proposed installation will be inside the BLDG BA-134. Access to the facility is limited to Raytheon personnel, DOD personnel and authorized visitors.

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. The installation is within the building, far from any outside wall. 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 so much that there would be no chance of interference. The building is in a remote area of VSFB.



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.

The use is limited to activity for the purpose of testing RNSSequipment/systems.

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

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 this re-radiation system is:
Jim Ortega 520-262-1757
James.e.ortega@raytheon.com

Location: Camp Lejune BLDG BA-134 34.5625, -77.2822

Use: Re-radiation system used 100% for testing installed antennas installed: indoors Manufacturer: all components are part of GPS Source Re-radiation kit

GPS Signal Analysis - L1 Link Budget

Frequency	1575.42	MHz	Signal Level		
Wavelength	0.19042541	meters	dBm	Watts	picoWatts
GPS Input Signal Level	-130	dBm	-130	1E-16	0.0001
GPS Receive Antenna amplifier gain	38	dB	-92	6.3E-13	0.63
GPS RF Amplifier gain	23	dB	-69	1.3E-10	125.89
GPS RF Attenuator	-22	dB	-91	7.9E-13	0.79
LMR400 Coax loss per foot	-0.067	dB			
Coax Length	100	feet			
Total Coax Loss	-6.7	dB	-97.7	1.7E-13	0.170
GPS Transmitting Antenna Gain	3	dB	-94.7	3.4E-13	0.339
Distance from transmit antenna	1	meters			
Distance from transmit antenna	3.2808399	feet			
Pathloss to unit under test	-36.38969194	dB	-131.1	7.8E-17	7.78E-05
Signal level at unit under test EIRP to ERP			-133.2	4.8E-17	4.75E-05
Distance from transmit antenna	30.48	meters			
Distance from transmit antenna	100.0000002	feet			
Pathloss to 100 ft	-66.06999119	dB	-160.8	8.4E-20	8.38E-08
Signal level at 100 ft ERP			-162.9	5.1E-20	5.12E-08

GPS Signal Analysis - L2 Link Budget

Frequency	1227.6	MHz	Signal Level		
Wavelength	0.244379277	meters	dBm	Watts	picoWatts
GPS Input Signal Level	-130	dBm	-130	1E-16	0.0001
GPS Receive Antenna amplifier gain	38	dB	-92	6.3E-13	0.63
GPS RF Amplifier gain	23	dB	-69	1.3E-10	125.89
GPS RF Attenuator	-22	dB	-91	7.9E-13	0.79
LMR400 Coax loss per foot	-0.067	dB			
Coax Length	100	feet			
Total Coax Loss	-6.7	dB	-97.7	1.7E-13	0.170
GPS Transmitting Antenna Gain	3	dB	-94.7	3.4E-13	0.339
Distance from transmit antenna	1	meters			
Distance from transmit antenna	3.2808399	feet			
Pathloss to unit under test	-34.22290244	dB	-128.9	1.3E-16	0.000128
Signal level at unit under test EIRP to ERP			-131.1	7.8E-17	7.83E-05
Distance from transmit antenna	30.48	meters			
Distance from transmit antenna	100.0000002	feet			
Pathloss to 100 ft	-63.9032017	dB	-158.6	1.4E-19	1.38E-07
Signal level at 100 ft ERP			-160.7	8.4E-20	8.43E-08