Raytheon

Conventional Experimental Application

File Number: 1700-EX-CN-2023

Overview and Explanation

Overview: Raytheon is filing this application for a GPS re-radiation system at the Raytheon Facility at 1847 West Main Road, Portsmouth RI 02871, 41°34'29.76"N 71°16'49.79"W 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.

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.

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 Nimitz BLDG. Access to the facility is limited to Raytheon personnel, DoD and authorized visitors.

The maximum equivalent isotropic 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 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.

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.

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:
Sastre-Cordova, Marcos 401 842-2945
sastrem@rtx.com

Location: Raytheon Facility Portsmouth, RI 41°34'29.76"N 71°16'49.79"W

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

Equivalent isotropically radiated power worksheet

Term	Description	Value	Units
A	Receive antenna gain (max)	38	dB
B	Cable insertion loss	-4.5	dB
C	Repeater amplifier gain (max)	18	dB
D	Repeater antenna gain (max)	4	dBi
E	Repeater antenna gain attenuator	0	dB
F	GPS frequency	1575.42	MHz
R	Range (m)	30.5	
RL	Avg. receive power L1 North America	-130	dBm
Calculations			
Total System Gain	A+B+C+D+E	55.5	dB
Radiated power	RL + Total System Gain	-74.5	dBm
Free space loss with isotropic antenna	-(20log(R) + 20log(F) – 27.55)	-66.1	dB
Maximum equivalent isotropic radiated power at 100 ft away	Radiated Power + Free space loss	**-140.6**	**dBm**
Convert dBm to dBW for output power			
Effective radiated power	Radiated Power - 10*Log10(1000)	-104.5	dBW
Convert to Watts	10^(Eff. Radiate power/10)	4E-11	Watts
Transmitted power	10^(Eff. Radiate power - rep. antenna gain)/10))	1.4E-11	Watts