

On-Ramp Wireless

Experimental License for GPS Radiator for System Testing and Lab Use

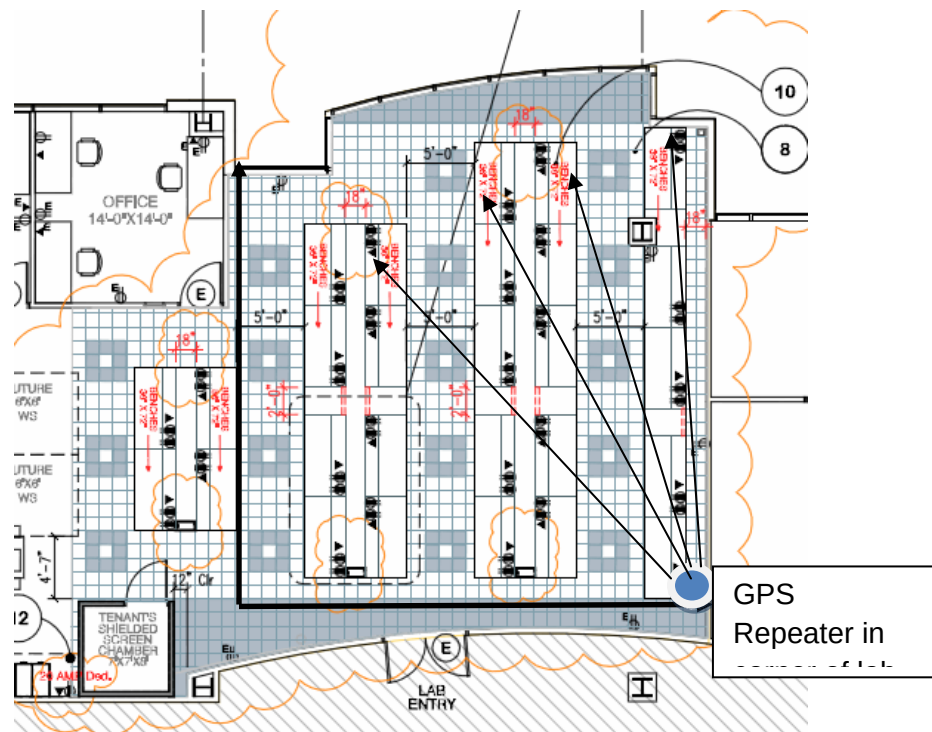
On-Ramp Wireless designs and manufactures the Ultra-Link Processing™ (ULP) wide area wireless networking system. ULP operates in the unlicensed 2.4 GHz ISM band and enables wireless sensor communications for Smart Grid, Energy Efficiency, Industrial Condition Based maintenance, and security and location tracking applications. Deployments of a ULP network can be inside a factory or building enabling tracking of critical sensors for predictive maintenance or in a metro or regional type network for wide area coverage.

In the wide area deployments the ULP Access Points use GPS timing (1 PPS signal) to maintain a common time reference between the Access Points on the network.

The experimental license is requested for a GPS signal repeater to be used only in On-Ramp Wireless's system test lab. This will provide On-Ramp's engineers the GPS L1 timing signal for use in design and testing of our products.

The following are additional details used in the submittal:

1) On-Ramp Lab



The On-Ramp lab is 40 feet by 40 feet. The diagonal for the lab is 57 feet. For the NTIA regulations the calculation of $57 \text{ ft} + 100 \text{ ft} = 157 \text{ ft}$ was used to ensure the signal was less than the required power 100 feet from the building.

- 2) The cable run from the lab to the top of the building is 150 feet. The cable is LMR400 and the associated cable loss is 9.3 dB

Attenuation & Power Handling Calculator

<http://www.timesmicrowave.com/cgi-bin/calculate.pl>

Coaxial Cable Attenuation & Power Handling Calculator

Product	Frequency (MHz)	Attenuation (db/100 feet)	Attenuation (db/100 mtrs)	Average Power (kW)
LLSB-400	1575	6.197	20.335	0.36
Calculate		Run Length (feet)	Total Run Attenuation(dB)	Efficiency (%)
		150	9.3	11.8

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(Instructions Below)

- 3) The cable loss and distance from the GPS radiator was included in the spreadsheet below to ensure that the Repeated Signal Power was <-140 dBm 100 feet from building.

GPS Repeater Link Calculations_051509.xls

http://www.gpssource.com/calc_005/calc_005.htm

GPS Source, Inc. Repeater Budget Calculator

Change the values in the yellow boxes to calculate required readings

-140 dBm at 100 feet from the building to meet NTIA regulations

Receive Ant Gain	Ant Cable Insertion Loss	Repeater Amp Gain	Repeater Ant Gain (Best Case)	Range in Feet	Repeated Signal Power @ Range In dBm	Total Signal Power @ Range in Watts
35	-8.3	30	3	157	-141.31	7.4e-18
GPS Carrier Frequency (MHz)		Free Space loss with Isotropic Antennas	Total System Gain	Range in Miles	Effective Radiated Power dBm	Effective Radiated Power (dBW)
1575		-70.01	55.7	0.03	-73.45	-103.45
Avg Receive Power L1 dBm North America		Reference Dipole Gain	Transmitted Power (W)	Range in Kilometers	Effective Isotropic Radiated Power (dBm)	Effective Isotropic Radiated Power (dBW)
-130		2.15	2.3e-11	0.05	-71.30	-101.30
				Range in Meters		Effective Radiated Power (W)
				47.8536		4.5e-11