

Narrative Describing Experimental License

Description of facilities:

LNG CNG Engineering and Operations employs a remote telemetry system to track our 200+ portable assets. The remote telemetry units on each asset include a GPS antenna to transmit the asset's location to the system. The portable assets are periodically moved indoors for storage or maintenance at two locations where GPS reception is poor, causing the units to go "off the radar" of the remote telemetry system.

Our goal is to improve the location detection of our assets by reradiating the GPS signal from outdoors to the interior of our two indoor facilities using a commercially available GPS L1 Repeater system. The system uses an antenna on the roof of the facility with a low noise amplifier to receive a GPS signal. The antenna is connected to a ceiling-mounted amplifier that retransmits the GPS signal to assets located under the roof of the facility. Additional technical details are available on the manufacturer's website:

<https://www.gps-repeaters.com/technical-data/gps-repeaters/gps-l1-repeater/>

Specific Objectives:

The objective is for the GPS devices on our remote telemetry units to function indoors by reading the GPS signal reradiated by the experimental GPS repeater system. The portable assets' location data should be available at all times, including while indoors at the two designated facilities.

Reasonable Promise of Contribution:

This program extends the functionality and usability of our remote telemetry system and allows for increased utilization of the existing GPS technology on our portable assets.

GPS Roof top - PG&E LNG/CNG Operations Manteca	Signal Level
GPS Roof Antenna Average Receive Power GPS Signal Input (PR.20)	-130
Roof Antenna Gain (GT.20)	38
Roof Antenna Cable (LC.20)(9dB/100FT)	-6.75
Lightening Arrestor (LA.20)	-0.1
Splitter (GSP.20)	0
Amplifier (GAMP.20)	15
PS L1 Repeater Antenna, passive (GRT.20)	3
Total System Gain	49.15
Effective Radiated Power ERIP, GPS Roof Transmit Power	-80.85

PS Re-radiator Signal Strength Calculation for L1	
100 feet free-space calculations from radiation point + distance from radiation point to wall	110
1 mile	5280
Frequency in MHz	1575.42
Effective Radiated Power	-80.85
$20 * \log_{10}(\text{frequency in MHz}) + 20 * \log_{10}(\text{Distance in Miles}) + 36.6\text{dB} = \text{L FS.2}$	-66.92
Free space calculation 110' from radiation point, ERIP @ 100FT FROM bldg	-147.77

Psig_GPSroof-(EIRP)

$= PR.20 + GT.20 + LC.20 + LA.20 + GSP.20 + GAMP.20 + GRT.20 + LFS.20$

$= -130 + 38 - 6.75 - 0.1 + 0 + 15 + 3 - 66.92$

$= -147.77 \text{ dBm/24 MHz}$

GPS Roof top - PG&E LNG/CNG Operations Rocklin	Signal Level
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