Documents attached with this application

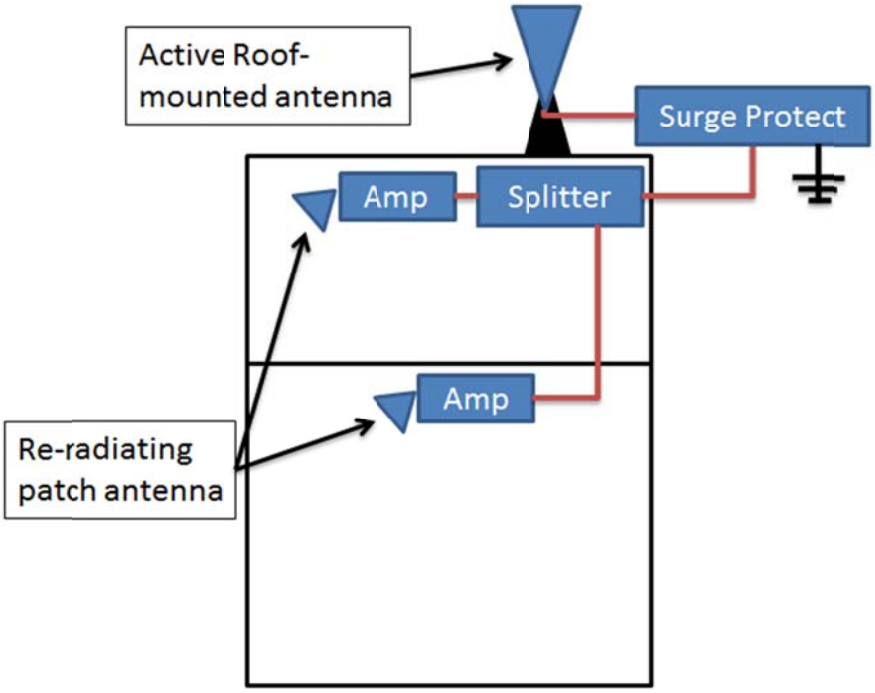
Name	Purpose
MITLL_FCC442_main.pdf	this document, system description
MITLL_upstairs.xls	calculations for top floor
MITLL_downstairs.xls	calculations for bottom floor
MITLL_gpsnetworking_quote.pdf	quote of all parts to be purchased for the system
VGL1L2HNRRKIT.pdf	data sheet for 1st kit to be purchased
VGL1L2PNRRKIT.pdf	data sheet for 2nd kit to be purchased

Introduction

MIT Lincoln Laboratory is often home to prototype payloads during testing that require, or could greatly benefit from receiving GPS signal. Moving the payloads outside can range from being a time consuming task to being unfeasible, depending on the project. In addition, some prototypes cannot easily accept a wired GPS feed. This leaves re-radiating the GPS signal as the only good option. MIT Lincoln Laboratory would like to permanently install two GPS re-radiating systems for complete indoor coverage in one of our labs. A complete system has been specified and approved by a vendor of such systems.

System Description

The diagram below shows the desired system configuration to be able to re-radiate GPS signals in the full lab space. Each floor is approximately 30'x50' in size, and have 10' or 15' ceilings. The roof mounted active antenna receives the GPS signal but does not transmit any signals. The signal is split into two feeds, and sent to a pair of variable gain amplifiers. These re-radiate the GPS signal inside the lab space. Gain can be adjusted to meet FCC requirements on re-radiated power.



Radiated Power Calculations

The vendor of the system provided a spreadsheet of calculations to help estimate the power being re-radiated. Note that the cable length from the roof to the upstairs amplifier is approximately 65ft, and to the downstairs unit 105ft. The excel documents from the vendor are attached to this application, but the results are shown here for convenience.

Upstairs

GPS Networking
Global Positioning Solutions

Change the values in the yellow boxes to calculate required readings
-140 or less at a range of 100 feet 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
38	-3	25	3	59	-128.51

GPS Carrier Frequency MHz 1575	Total System Gain 63	Range in Miles 0.01	Total Signal Power @ Range in Watts 140.9E-18
Avg Receive Power L1 dBm North America -130		Range in Meters 18.39	Radiated Power dBm -67
Free Space loss with Isotropic Antennas -61.51		Range in Kilometers 0.02	Transmitted Power (W) 100.0E-12
			Effective Radiated Power (W) 199.5E-12
			Effective Radiated Power (dBW) -97

Downstairs

GPS Networking
Global Positioning Solutions

Change the values in the yellow boxes to calculate required readings
-140 or less at a range of 100 feet 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
38	-5	25	3	59	-130.51

GPS Carrier Frequency MHz 1575	Total System Gain 61	Range in Miles 0.01	Total Signal Power @ Range in Watts 88.9E-18
Avg Receive Power L1 dBm North America -130		Range in Meters 18.39	Radiated Power dBm -69
Free Space loss with Isotropic Antennas -61.51		Range in Kilometers 0.02	Transmitted Power (W) 63.1E-12
			Effective Radiated Power (W) 125.9E-12
			Effective Radiated Power (dBW) -99

Bill of Materials

The below components are specified from vendor: *gpsnetworking.com*. Quote for parts from this vendor is also attached to this application.

#	Item	Description
1	L1/L2VGHNRRKIT	Kit of active antenna, variable gain amplifier and re-radiating antenna
2	L1/L2VGPNRRKIT	Kit of variable gain amplifier and re-radiating antenna
3	HIALDCBS1X2	Antenna splitter 1x2 (with high isolation)
4	L1/L2RAMB	Roof antenna mounting bracket
5	WRUMT	(2x) Re-radiating antenna mounting bracket
6	SURGEPRO	Lighting surge protector for antenna
7	PCABLE	(145ft) LMR400 Coaxial cable to connect various components