GPS Booster Station Signal Strength Calculation High Bay 8F Reference file # 0266-EX-PL-2009

This GPS booster station re-radiates the GPS L1 (1575.42 MHz) signal. Calculations are performed per Section 8.3.28 of the NTIA regulations [1]. The re-radiated power is limited by requirement 6 which states "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." Also, any attenuation by the building will be neglected. This worksheet shows that the re-radiated signal for the High Bay 8F location is in compliance with the NTIA requirement.

The signal strength is defined by:

$$P_{sig} = P_{rec} + G_{roof} + L_{cable} + G_{lna} + G_{ant} + L_{space} \qquad eq. 1 [2]$$

Where

P _{sig}	= The Re-Radiated signal strength at 30 meters from the building.
P _{rec}	= The power of the received GPS signal, $L1 = -130 \text{ dBm}$
G _{roof}	= Gain of the active receiving antenna of the GPS re-rad system, 35 dB [3]
L _{cable}	= Losses for the RF cabling of the re-rad system @5 dB/100 ft, $1 = 128$ ft [3]
G _{lna}	= Gain of the LNA of the re-rad system. 23 dB (typical) [3]
Gant	= Gain of the re-radiating antenna, -10 dBi [3]
L_{space}	= Free space loss of the re-radiated signal

The free space loss is dependent upon the distance from the re-radiating antenna to the exterior wall and from the exterior wall to the designated measurement distance, 30 meters.

$L_{\text{space}} = 20 \text{ Log}(\lambda/4\pi D)$	eq. 2 [2]
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Where $\lambda =$ Wavelength of the GPS signal, L1 = .1904 meters $\pi =$ Pi D = The distance from antenna to exterior wall plus 30 meter required distance

Using the measured distance from the re-radiating antenna to exterior wall of High Bay 8F, and the 30 meter margin, the Path Loss is:

 $L_{\text{space}} = 20*Log(.1904/(4*\pi*(30))) = -65.9 \text{ dB}$

The power of the re-radiated signal at the specified distance is:

 $P_{sig} = -130 + 35 + -6.4 + 23 + -10 + -65.9 = -154.3$. dBm

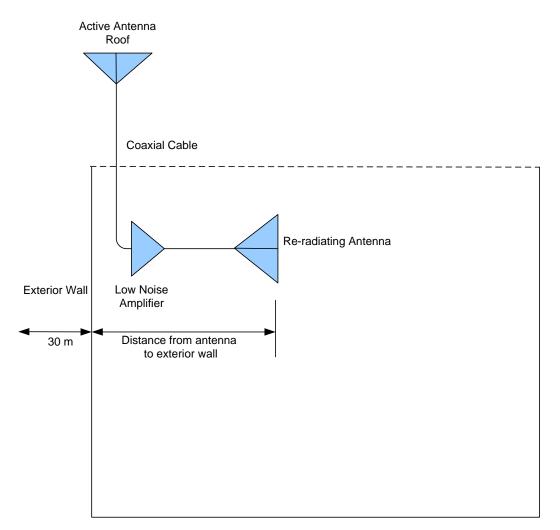
Maximum Power -140 dBm

Margin 14.3 dB

Reference # 0266-EX-PL-2009		
L1 Frequency (MHz)	1575.42	
Wavelength (m)	0.1904	
Distance (m)	0.00	
(re-rad antenna to exterior wall)		
GPS Signal Strength	-130	dBm
Roof Antenna/LNA Gain	35.0	dB
	2210	42
RF Cable Loss	-6.4	dB
Ki Cable Loss	-0.4	uD
LNA Gain	23.0	dB
LINA Gain	23.0	uD
Re-Rad Antenna Gain	-10.0	JD:
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Power at Re-Rad Antenna	-88.4	dBm
Space Loss to Distance	-65.9	dB
Power at Specified Distance	-154.3	dBm
Specified Maximum	-140.0	dBm
L.		
Margin	14.3	dB
11441 Bur	1117	uD

GPS Booster Station (Re-Radiation System) Link Margin Evaluation High Bay 8F Reference # 0266-EX-PL-2009

GPS Booster Station Illustration High Bay 8F



High Bay