

Saturn Antennas:

Exhibit 1 – Description

The GPS re-radiation equipment will be used inside the 1707 E Weber Dr. Tempe, AZ 85281 laboratory, to test GPS receivers and antennas. Said products are either produced by Saturn Antennas for customers use, or customers provide their devices to us for testing, repair, troubleshooting, or modification. The GPS re-rad system will allow synchronization of both time and location for validation testing with various systems.

Exhibit 2 – Section 8.3.28 of NTIA Manual Use of Fixed Devices That Re-Radiate Signals Received from the Global Positioning System

8.3.28 Use of Fixed Devices that Re-Radiate Signals Received from a GPS Antenna 8.3.28 Use of Fixed Devices That Re-Radiate Signals Received from the Global Positioning System Except as otherwise authorized under Part 7.14, federal agencies and departments may, under the following conditions, operate fixed devices that re-radiate signals received from the Global Positioning System (GPS).

1. Individual authorization is for indoor use only and is required for each device at a specific site.

YES

2. 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.

YES

3. Approved applications for frequency assignment will be entered in the GMF.

N/A

4. The maximum length of the assignment will be two years, with possible renewal.

YES

5. The area of potential interference to GPS reception (e.g., military or contractor facility) has to be under the control of the user.

YES

6. The maximum equivalent isotropically 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.)

SEE INCLUDED EXHIBIT 3 FOR ERP CALCULATIONS

7. GPS users in the area of potential interference to GPS reception must be notified that GPS information may be impacted for periods of time.

YES

8. The use is limited to activity for the purpose of testing RNSS equipment/systems.

YES

9. 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.

YES

Contact Information is accurate and up to date.

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Exhibit 3 - New Calculation Compliance with NTIA Guidelines

1707 E Weber Dr. Ste 2	Signal Level	Scale	Product Manufacturer	Part Number
Roof Antenna Avg. Receive Power of GPS Signal Input (P_R)	-130.00	dBm		
Roof Antenna Gain (G_{RX})	29.00	dB	Novatel	GNSS-501
Roof Antenna Cable Loss (L_C)	-3.50	dB	Times Micro	LMR400 DGXZ+15NF
Lightning Arrestor (L_A)	-0.10	dB	Polyphaser	NF-A
Other Losses or Gain: Splitter, etc. (G_{SP})	0.00	dB		
Amplifiers: AGC Microprocessor Amp/Repeater (G_{AMP})	28.50	dB	GPS Source	GLI-METRO
Location Transmitter Antenna Gain (G_{TX})	2.00	dB	Saturn Antennas	MSM-L1
Total Gain 1707 E Weber Dr, Ste 2, Tempe, AZ	55.90	dB		
Equivalent Isotropically Radiated Power IERP, GPS_{Roof}	-74.10	dB		
Effective Radiated Power ERP, GPS_{Roof} , ($ERP = EIRP - 2.15$)	-71.95	dBd		
Effective Radiated Power, ERP-30	-101.95	dBd		
ERP $GPS_{Roof} = 10((ERP-30)/10)$ in P_{Watts}	-1.0195E-07	W		
Transmit Power, GPS_{Roof}	-0.00013	pW		
Frequency Tolerance, 1575 MHz +/- 15 MHz, $FT = (15-1575)*100$	1	%		
Mean/Peak	P			
Modulating Signal	10.23	MHz		
Emission Designator	20M5W7D			
Transmit antenna distance to outside wall	10	ft		

1707 E Weber Dr. Ste 2.

GPS Re-radiator Signal Strength Calculation for L1-Band

100 ft free-space calculations from radiation point + distance from radiation point to outside wall	110	ft
1 Kilometer	3280.9	ft
Frequency	1575.42	MHz
Equivalent Isotropically Radiated Power (EIRP)	-74.10	dB
Free Space Loss: $20 * \text{Log}_{10}(\text{Frequency in MHz}) + 20 * \text{Log}_{10}(\text{Distance in Km}) + 32.44\text{dB} = L_{FS}$	-66.896	dB
P_{sig_GPS} , Free Space Power Calc for total distance from TX Ant to 100ft from bld, EIRP	-141.00	dB

$$P_{sig_GPS} (EIRP) = P_R + G_{RX} + L_C + L_A + G_{SP} + G_{AMP} + G_{TX} + L_{FS} = -130 + 33 - 3.00 - 0.1 + 0 + 24 + 2 - 67.05 = -141.15 \text{ dBm/24 MHz}$$