

John Kennedy

From: Hankins, Danny [dhankins@cessna.textron.com]
Sent: Wednesday, September 28, 2005 10:44 AM
To: John Kennedy
Subject: 0217-EX-PL-2004 Modifications

Importance: High



Greensboro System
Diagram.pdf ...



Greensboro
e-radiated Power C.



Greensboro CSC
Information.pdf...



Greensboro POCs
for Stop Buzze...



gpssource A11 Amp
Product data...



gpssource L1 Active
Antennas.p...



gpssource L1P2
Passive Antenna...

John,

Have determined that the power radiated from the antenna is less than the 72 pW requested on the application, and these systems meet the -140 dBm criteria for 100 ft outside the building. Please modify the Greensboro location/antenna per the following:

- * Remove frequency 1227.6 MHz. Their system re-radiates only the L1 frequency.
- * Correct the coordinates to be 36-05-31.2 N Lat, 79-56-19.8 W Lon.
(The first coordinates were taken from an old license and were not correct.)
- * Keep the attachment for Question 7, Description of Experiment.
- * Change Question 10 to list the following items:
 - * GPS Source L1ACE receiving antenna, 1 ea
 - * GPS Source A11 amplifier, 1 ea
 - * GPS Source L1P2 re-radiating antenna, 1 ea
 - * GPS Networking ATTEPNDC attenuator, 1 ea
- * Delete the old attachments with equipment specs for several models of equipment and antenna radiation patterns that were uploaded prior to the application reinstatement. This may confuse whomever does the analysis. Please add the following attachments: <<Greensboro System Diagram.pdf>> <<Greensboro Re-radiated Power Calculations.pdf>> <<Greensboro CSC Information.pdf>> <<Greensboro POCs for Stop Buzzer.doc>> <<gpssource A11 Amp Product data.pdf>> <<gpssource L1 Active Antennas.pdf>> <<gpssource L1P2 Passive Antenna.pdf>>

I will be sending the info for Orlando later today.

Thanks,

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L1 Antennas

Part Number: L1ACE



Performance Specifications:

- Frequency Range: 1575.42+-5MHz
- VSWR: 2.5:1 (max.)
- Amplifier Gain: 38dB (min.)
- Noise Figure: 1.5dB (max.)
- Voltage: 4.5 to 5.5 VDC
- Polarization: Right-Hand Circular
- Impedance: 50 Ohms
- Temperature: -40 to +80 C
- Connector: TNC, Female

Part Number: L1ANTC



Performance Specifications:

- Frequency L1: (1575.42+-10) MHz
- VSWR: 1.5:1
- DC Grounding: Yes (lightening protection)
- LNA Noise Figure: less than 2.4dB
- LNA Gain: 33.0+-3.0dB
- LNA Current Draw: less than 30mA
- LNA Voltage: +3.5 to +24VDC
- Rejection: 2 2-Pole Filters
- Polarization: Right-Hand Circular
- Impedance: 50 Ohms
- Temperature: -55 to +85 C
- Connector: SMA, Female

Part Number: L1ARINC



Design Specifications:

- FAA TSO-C144
- DO-160D, D0-228
- MIL-C-5541, MIL-E-5400
- MIL-I-45208A, MIL-STD-810

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Greensboro Re-radiated Power Calculations

$$(1) P_{\text{Rerad}} = P_{\text{Rec}} + G_1 + G_2 + A_1 - C_1 - C_2 - Z - \text{FL}$$

Where:

- P_{Rerad} = Re-radiated signal strength 100 ft outside the building
- P_{Rec} = Received Power from Satellites = -130 dBm
- G_1 = Roof Antenna Gain = 38 dBi
- G_2 = Re-radiating Antenna Gain = 3 dBic
- A_1 = Amplifier Gain = 30 dB
- C_1 = Coax Attenuation, Roof Antenna to Amplifier
= 6.5 dB/100 ft X 50 ft
= 3.25 dB
- C_2 = Coax Attenuation, Amplifier to Re-radiating Antenna
= 6.5 dB/100 ft X 80 ft
= 5.2 dB
- Z = Attenuator Value = 5 dB
- FL = Freespace Loss

$$(2) \text{FL} = 20\text{Log}F + 20\text{Log}D + 36.56$$

Where:

- F = Frequency in MHz = 1575.42
- D = Distance in Miles
= (Distance from antenna to outer wall in feet + 100)/5280
= (25 ft + 100 ft)/5280

Inserting the values for F and D into equation (2) yields

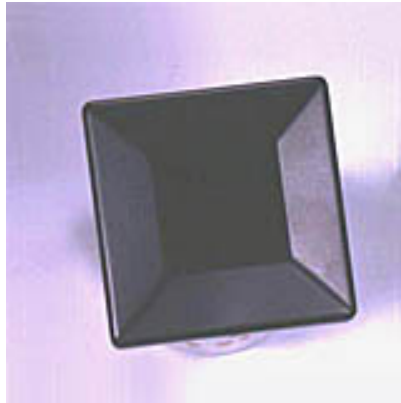
$$\begin{aligned}\text{FL} &= 20\text{Log}(1575.42) + 20\text{Log}((25+100)/5280) + 36.56 \\ &= 67.99 \text{ dB}\end{aligned}$$

Inserting these values into equation (1) then becomes:

$$\begin{aligned}P_{\text{Rerad}} &= -130 + 38 + 3 + 30 - 3.25 - 5.2 - 5 - 67.99 \\ &= -140.44 \text{ dBm}\end{aligned}$$

L1 Passive Antennas

Part Number: L1P2



Performance Specifications:

- **Frequency:** 1.575 GHz
- **VSWR:** 1.5:1
- **Bandwidth:** 20Mhz (min.)
- **Peak Gain:** 3 dBic (min.)
- **Polarization:** Right-Hand Circular
- **Impedance:** 50 Ohms
- **Temperature:** -40 to +85 C
- **Connector:** SMA, Female

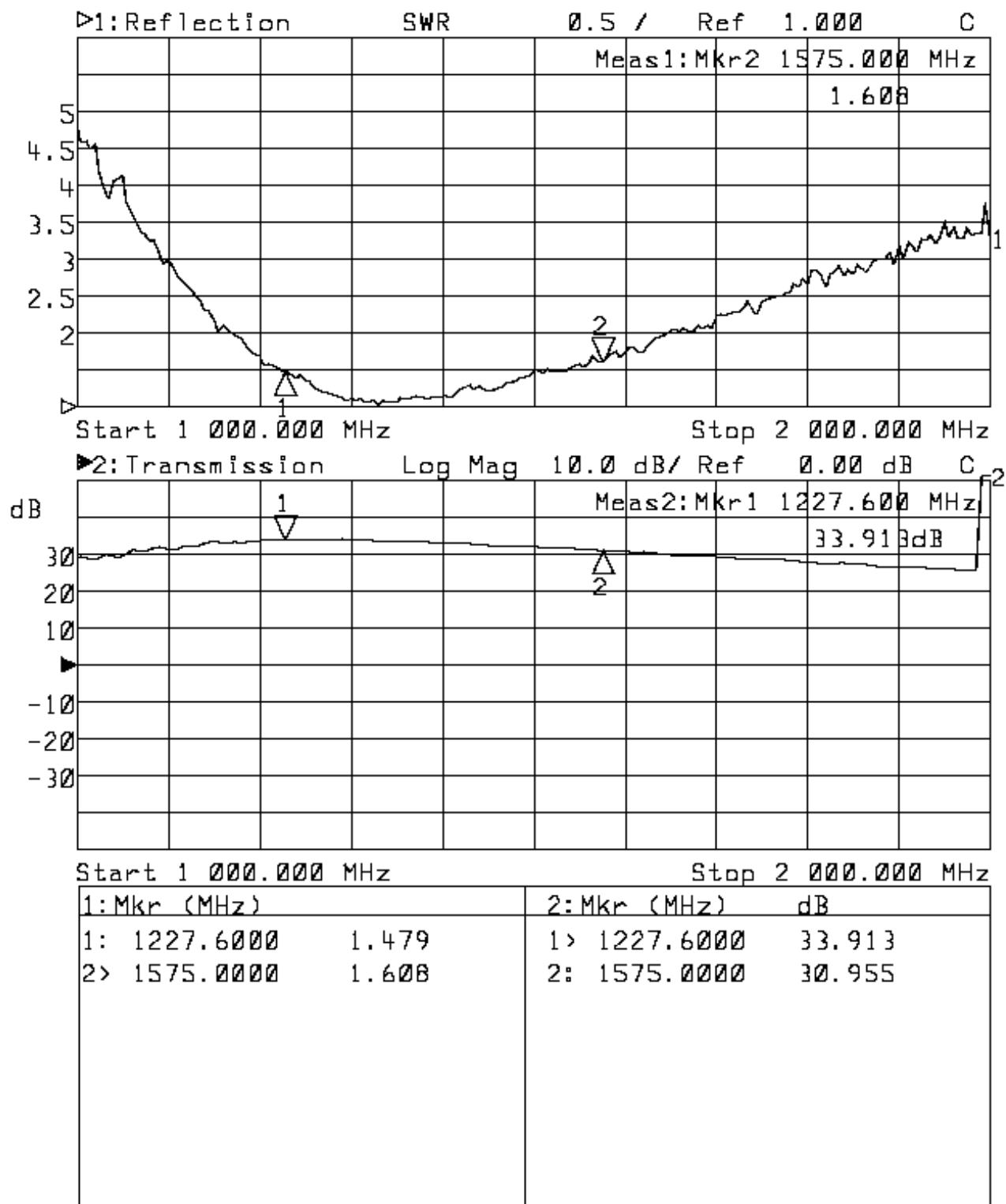
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A11 Product Data



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Electrical Specifications:

- **Frequency response for GPS L1/L2 and GLONASS**
 - 1GHz to 2GHz
 - Flatness less than 3.5dB
 - Noise figure less than 1.8dB
- **All ports can either pass DC or block DC voltage**
 - 30dB gain
 - 50 ohm impedance on both ports
 - Input & Output SWR less than 2.0:1
 - Reverse Isolation greater than 49dB
 - Required DC input 3.1 to 15VDC
 - Current draw less than 14mA @ 3V DC input

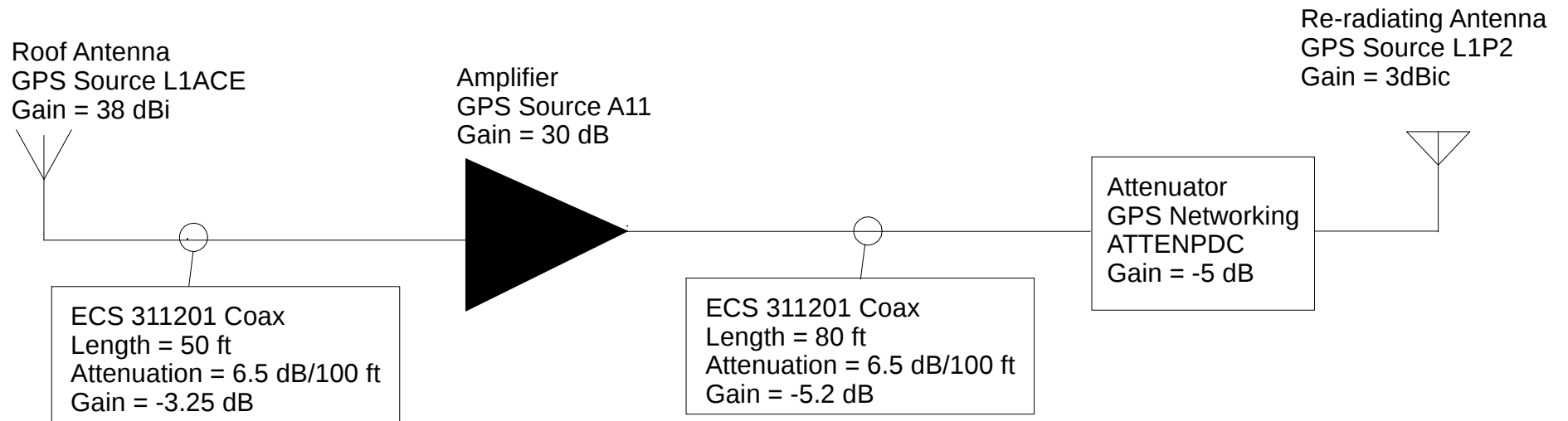
Mechanical Specifications:

- **Dimension**
 - Length 2.5"
 - Width 2.5"
 - Height 1.25"
 - Base Plate 3.25"x2.5"
- **Operating Temperature**
 - -40 to 75 degrees C

GPS Re-radiating Information & Calculations	
Site Information	
1) Facility Name and Address	Greensboro Citation Service Center, Cessna Aircraft Company, 615 Service Center Drive, Greensboro, NC 27410
2) Point Of Contact Name & Phone	Kevin Auel, Avionics Supervisor; Work: 336-605-7000; Mobile: 336-312-4133
3) Location of switch & shutoff instructions	Avioincs Lab; Unplug AC adapter from outlet.
4) Coordinates, NAD 83, ddd-mm-ss.s	36-05-31.2N; 79-56-19.8W
5) Coordinate Description	Northwest corner of building.
6) Ground Elevation (ft)	891
Antenna - Receiving (RX)	
7) Make and Model	GPS Source L1ACE
8) Gain (dBi)	38
Antenna - Re-radiating (TX)	
9) Make and Model	GPS Source L1P2
10) Gain (dBi)	3
11) Distance to nearest outer wall (ft)	25
12) Location Description	Hangar Bay
13) Antenna Height AGL (ft)	25
Free Space Loss	67.99
Amplifier	
14) Make and Model	GPS Source A11 Amplifier
15) Gain (max rating in dB)	30
Coax - RX Antenna to Amp	
16) Type or Description	ECS 311201
17) Attenuation @1575 MHz (dB/100 ft)	6.5
18) Length (ft)	50
Coax Loss - RX Antenna to Amp	3.25
Coax - Amp to TX Antenna	
19) Type or Description	ECS 311201
20) Attenuation @1575 MHz (dB/100 ft)	6.5
21) Length (ft)	80
Coax Loss - Amp to TX Antenna	5.2
Attenuator	
22) Make & Model	GPS Networking ATTEPNDC-B (5)
23) Attenuation @1575 MHz (dB)	5
Calculated Signal Strength 100 ft Outside Building (dBm)*	-140.44

* This value MUST be less than negative 140 dBm

Greensboro System Description



**Stop Buzzer POCs - Cessna Aircraft Company
Greensboro Citation Service Center**

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