

**COMPLIANCE WORLDWIDE INC.
TEST REPORT 217-12R1**

In Accordance with the Requirements of
FCC PART 27:2011 Subparts C & L

Issued to

**Cellular Specialties, Inc.
670 North Commercial Street
Manchester, NH 03010
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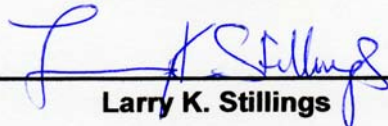
for

**Co-Pilot Beacon AWS
Model: CSI-CPBRW-AWS**

FCC ID: NVRCSI-CPBRW-AWS


**Report Issued on May 10, 2012
Revision R1 Issued May 24, 2012**

Tested by



Larry K. Stillings

Reviewed By



Brian F. Breault

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1. Scope

This test report certifies that the Cellular Specialties Co-Pilot Beacon AWS, as tested, meets the FCC Part 27 Subparts C & L requirements. The scope of this test report is limited to the test sample provided by the client, only in as much as that sample represents other production units. If any significant changes are made to the unit, the changes shall be evaluated and a retest may be required. Revision R1 updates test equipment list and adds spurious emissions data above 1 GHz in section 6.5 and temperature stability measurements in section 6.6

2. Product Details

- 2.1. Manufacturer:** Cellular Specialties
- 2.2. Model Number:** Co-Pilot Beacon AWS CSI-CPBRW-AWS
- 2.3. Serial Number:** Pre-Production Prototype
- 2.4. Description:** The Co-Pilot Beacon AWS is the first viable location based solution for simulcast CDMA Distributed Antenna Systems (DASs). It is designed to improve location accuracy of cell phones and wireless devices outdoors and within buildings.
- 2.5. Power Source:** 120 VAC, 60 Hz
- 2.6. EMC Modifications:** None

3. Product Configuration

3.1. Support Equipment

Device	Manufacturer	Model	Serial No.	Comment
Power Supply	APX Technologies	SP130P966ER	06987823	
Notebook PC	Dell	Latitude D610	19472301901	Configuring Unit

3.2. Cables

Cable Type	Length	Shield	From	To
RF, 50 Ω, N male – N male	1M	Yes	DUT	AWS Antenna
Pulse In	1M	Yes	DUT	Unterminated
EST Out	1M	Yes	DUT	Unterminated
GPS	5M	No	DUT	Garmin GPS Antenna
Power Supply	2M + 2M	Yes	DUT	120 VAC, 60 Hz
Serial 1 & Serial 2	2M	Yes	DUT	Notebook PC
USB 1 & USB 2	2M	Yes	DUT	Notebook PC
Ethernet	2M	No	DUT	Notebook PC

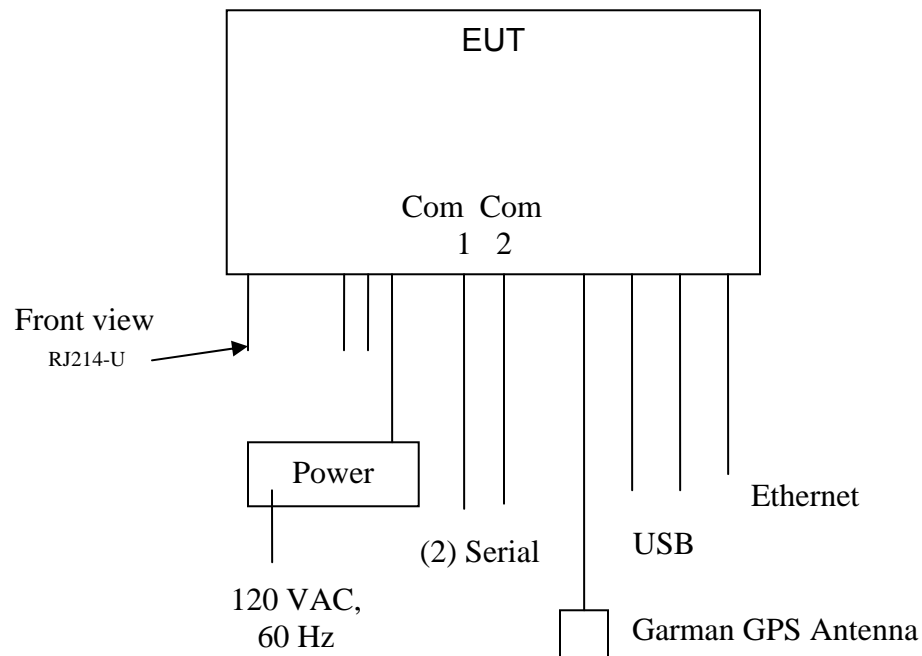
Notebook PC is connected only during setup

3. Product Configuration (continued)

3.3. Operational Characteristics & Software

- (1) The unit was allowed to power up normally and go through its configuration cycle.
- (2) Using the laptop as control the unit was configured to operate on individual channels and all channels as required.

3.4. Block Diagram



4. Measurements Parameters

4.1. Measurement Equipment Used to Perform Test

Device	Manufacturer	Model No.	Serial No.	Cal Due
Spectrum Analyzer	Agilent Technologies	E4407B	MY45104493	12/22/2012
Spectrum Analyzer	Rohde & Schwarz	FSV40	100899	5/31/2013
EMI Receiver	Hewlett Packard	8546A	3330A00115	10/28/2012
Microwave Preamp	Hewlett Packard	8449B	3008A01323	12/01/2012
Bilog Antenna	Com-Power	AC-220	25509	8/31/2012
Horn Antenna	Electro-Metrics	EM-6961	6337	10/19/2012
Horn Antenna	Com-Power	AH-826	080151	6/30/2012
DMM / Temperature	Fluke	187	79690058	1/5/2013
Thermal Chamber	Associated Testing Labs	SLHU-1-CRLC	N/A	N/A
Barometric Pressure / Humidity / Temperature	Extech Instruments	SD700	Q590483	11/21/2012
AC Power Source	Combinova	AC Source 330	3475	UWCE

4.2. Measurement & Equipment Setup

Test Date: 4/18 to 5/9 2012
 Test Engineer: Larry Stillings
 Normal Site Temperature (15 – 35°C): 21.6
 Relative Humidity (20 -75%RH): 25

4.3. Test Procedure

The test measurements contained in this report are based on the requirements detailed in FCC Parts 2 & Part 27, Subparts C & L.

The test methods used to generate the data in this test report are in accordance with ANSI C63.4:2009, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

Measurements were made in accordance with TIA-603-C:2004 Land Mobile FM or PM Communications Equipment Measurement and Performance Standard.

5. Measurement Summary

Section Description or Test Requirement	FCC Part Reference	Test Report Section	Result	Comment
Power and Antenna height limits, Output Power	27.50 (d)	6.1	Compliant	
Occupied Bandwidth	Part 2.1049	6.2	Compliant	
Spurious Emissions at Antenna Terminals	27.53 (h)	6.3	Compliant	
Spurious Emissions at the Antenna Terminals Additional Requirements	27.53 (h)	6.4	Compliant	
Field Strength of Spurious Emissions	27.53 (h)	6.5	Compliant	
Frequency Stability	27.54 per Section 2.1055	6.6	Compliant	Must stay in frequency block
Public Exposure to Radio Frequency Energy Levels	27.52 per Section 1.1307 (b)(1)	6.7	Compliant	

6. Measurement Data

6.1. Power and Antenna Height Limits 27.50 (d)

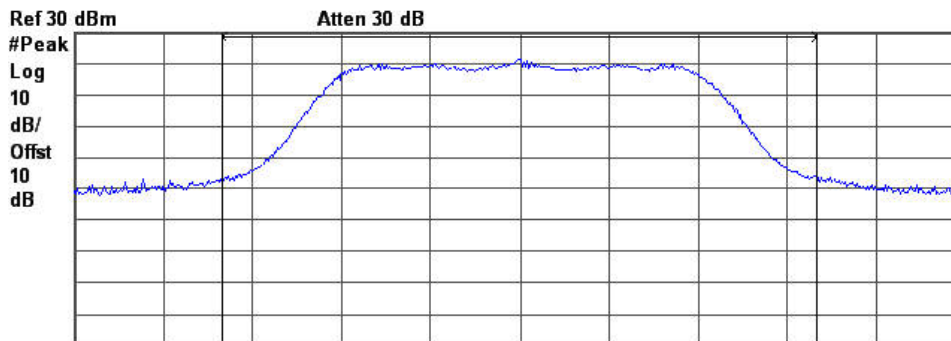
Requirement: An equivalent isotropically radiated power (EIRP) of 1640 watts / MHz when transmitting with an emissions bandwidth greater than 1 MHz

6.1.1. Peak Transmitter Output Power, Transmitter Only

Channels	Frequency	Output Power		Result
	(MHz)	(W)	(dBm)	
Low Channel 25	2111.25	0.243	23.85	Compliant
Mid Channel 450	2132.50	0.208	23.17	Compliant
High Channel 875	2153.25	0.170	22.31	Compliant
All Channels	2111.25 – 2153.25	0.256	24.08	Compliant

Low Channel 25

Agilent 16:20:13 May 9, 2012 R T



Center 2.111 GHz #Res BW 100 kHz #VBW 1 MHz Sweep 6 ms (601 pts)

Channel Power 23.85 dBm / 2.0000 MHz Power Spectral Density -39.16 dBm/Hz



6. Measurement Data

6.1. Power and Antenna Height Limits 27.50 (d) (cont)

Mid Channel 450

Agilent 16:17:24 May 9, 2012 R T



Start 2.131 GHz Stop 2.134 GHz
#Res BW 100 kHz #VBW 1 MHz Sweep 6 ms (601 pts)

Channel Power

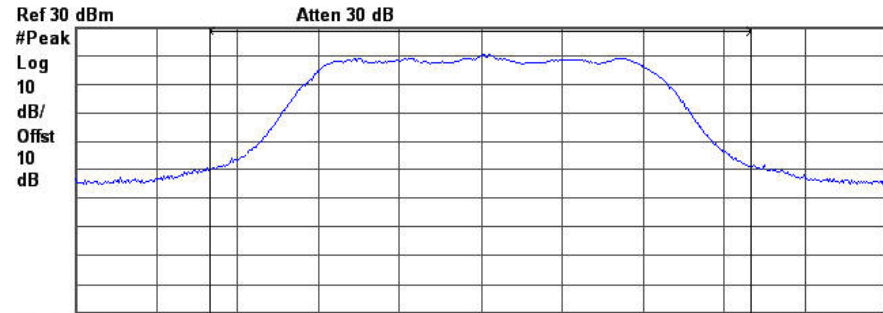
23.17 dBm /2.0000 MHz

Power Spectral Density

-39.84 dBm/Hz

High Channel 875

Agilent 16:33:04 May 9, 2012 R T



Center 2.154 GHz Span 3 MHz
#Res BW 100 kHz #VBW 1 MHz Sweep 6 ms (601 pts)

Channel Power

22.31 dBm /2.0000 MHz

Power Spectral Density

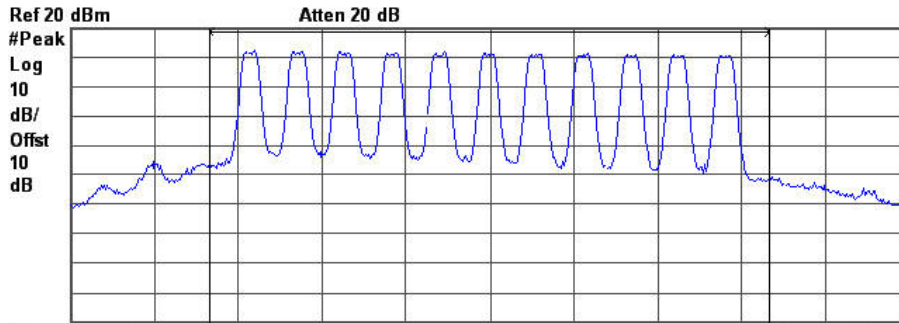
-40.70 dBm/Hz

6. Measurement Data

6.1. Power and Antenna Height Limits 27.50 (d) (cont)

All Channels

Agilent 15:59:39 May 9, 2012 R T



Start 2.095 GHz Stop 2.17 GHz
#Res BW 300 kHz #VBW 3 MHz Sweep 6 ms (601 pts)

Channel Power

24.08 dBm / 50.0000 MHz

Power Spectral Density

-52.91 dBm/Hz



6. Measurement Data

6.1. Power and Antenna Height Limits 27.50 (d) (continued)

6.1.2. Maximum ERP

ERP is defined in FCC Title 47, Chapter I, Part 2, Subpart A, Section 2.1 as "Effective Radiated Power. The product of the power supplied to the antenna and its gain relative to a half-wave dipole in a given direction."

$$\text{ERP} = \text{Transmitter Power (dBm)} - \text{Cable Loss (dB)} + \text{Antenna Gain (dBi)}$$

The manufacturer of the device under test recommends 2 antennas for use with their product. The following table provides the worst case effective radiated power based on the measured transmitter output power and the antenna gain:

Channel	Frequency	Transmitter Power ¹	Cable Insertion Loss	Antenna Gain ²	Total Output Power	
	(MHz)				(dBm)	(dBm)
Low	2111.25	23.85	0.00	+3	26.85	0.484
Mid	2132.50	23.17	0.00	+3	26.17	0.414
High	2153.25	22.31	0.00	+3	25.31	0.340
All	2111.25 – 2153.25	24.08	0.00	+3	27.08	0.511
Low	2111.25	23.85	0.00	+14	37.85	6.10
Mid	2132.50	23.17	0.00	+14	37.17	5.21
High	2153.25	22.31	0.00	+14	36.31	4.28
All	2111.25 – 2153.25	24.08	0.00	+14	38.08	6.43

¹ Measured. See section 6.1.1.

² Customer supplied. 3 dBi for Indoor Applications, 14 dBi for Outdoor Applications

6. Measurement Data (continued)

6.2. Bandwidth Limitations (FCC Part 2.1049)

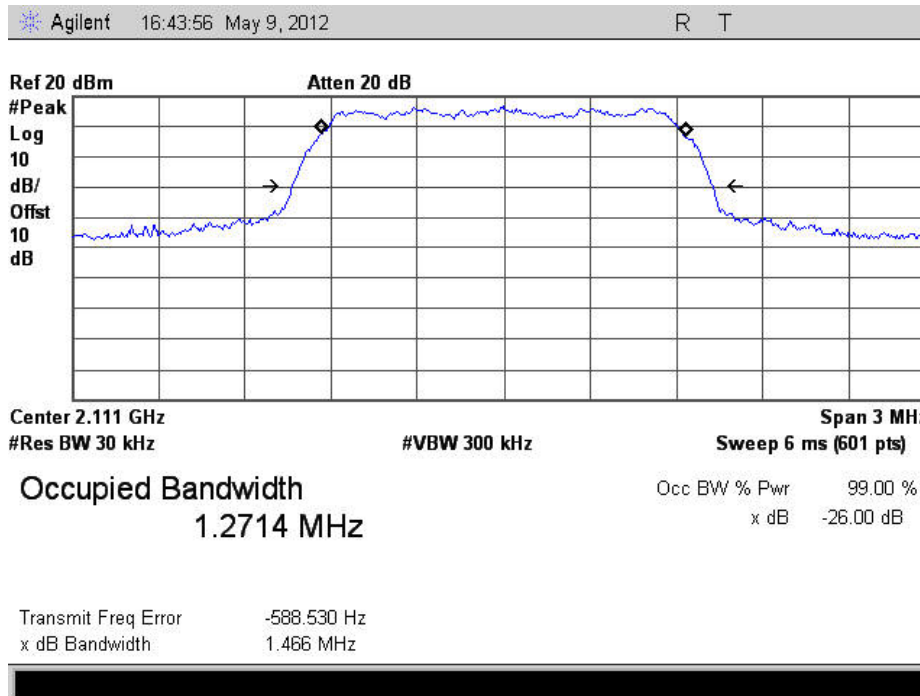
Requirement: Each authorization issued to a station licensed under this part will show an emission designator representing the class of emission authorized. The designator will be prefixed by a specified necessary bandwidth. This number does not necessarily indicate the bandwidth occupied by the emission at any instant.

6.2.1. Occupied (99% Power) Bandwidth

	Frequency	Occupied Bandwidth	Result
	(MHz)	(MHz)	
Low Channel	2111.25	1.2714	Compliant
Mid Channel	2132.50	1.2687	Compliant
High Channel	2153.25	1.2708	Compliant

NOTE: EUT can only transmit a CDMA signal.

6.2.1.1. Occupied (99% Power) Bandwidth Measurement, 2111.25 MHz

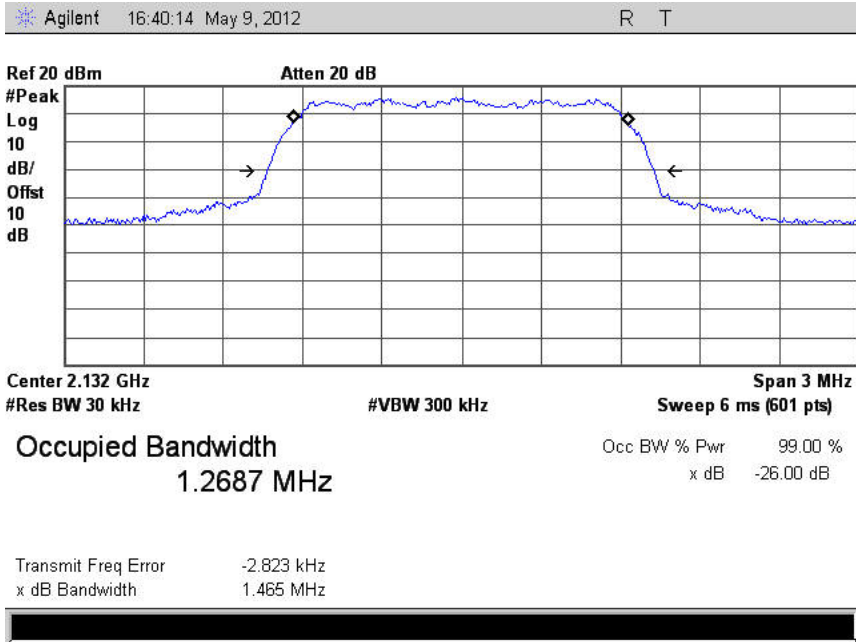


6. Measurement Data (continued)

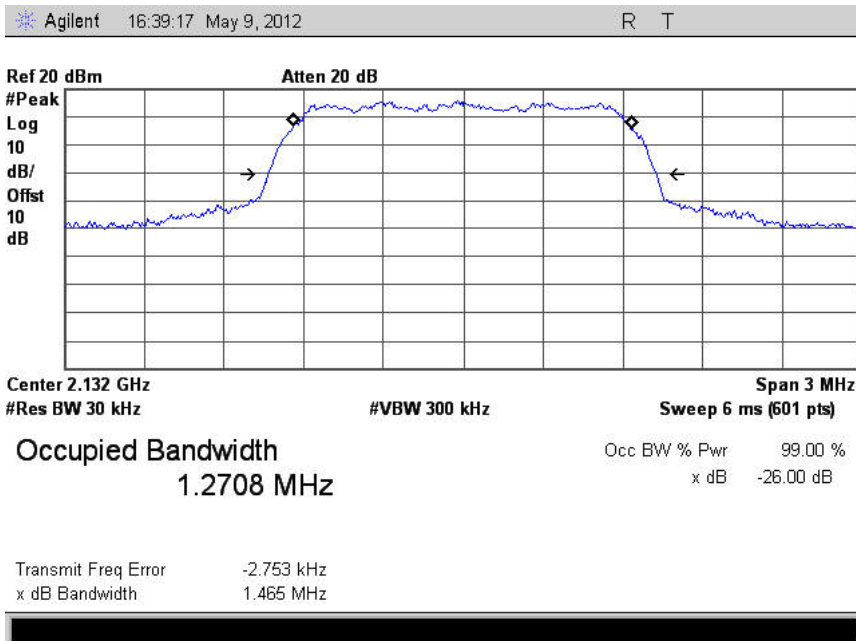
6.2. Bandwidth Limitations (FCC Part 2.1049) (continued)

6.2.1. Occupied (99% Power) Bandwidth (continued)

6.2.1.2. Occupied (99% Power) Bandwidth Input Signal, 2132.50 MHz



6.2.1.3. Occupied (99% Power) Bandwidth Measurement, 2153.25 MHz



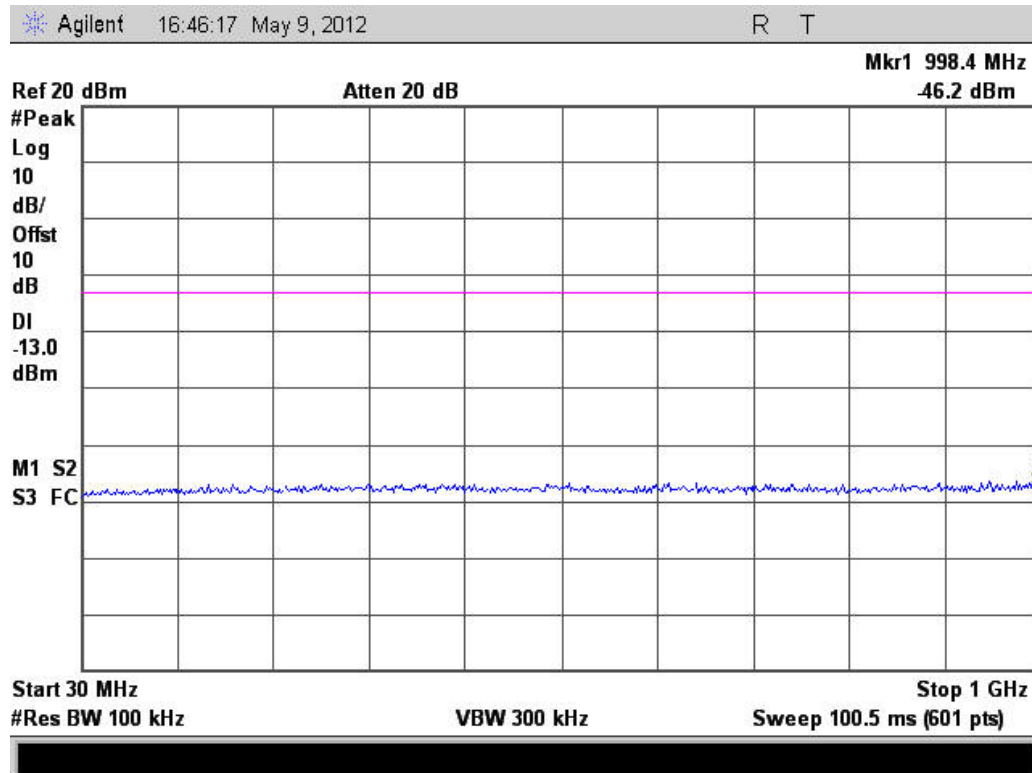
6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 27.53 (h)

Requirement: The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log (P)$ dB

Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

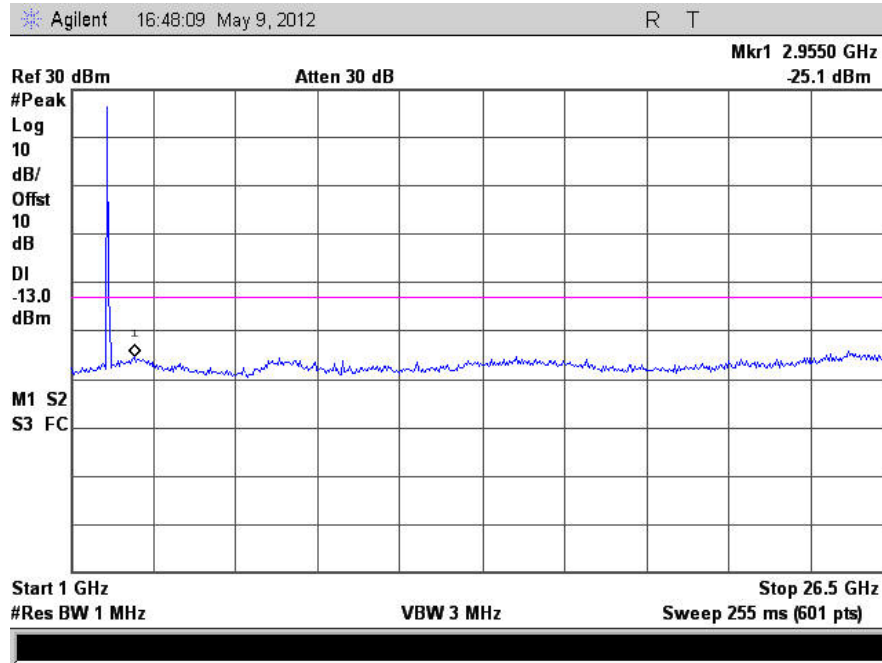
6.3.1. Low Channel, 30 MHz to 1 GHz



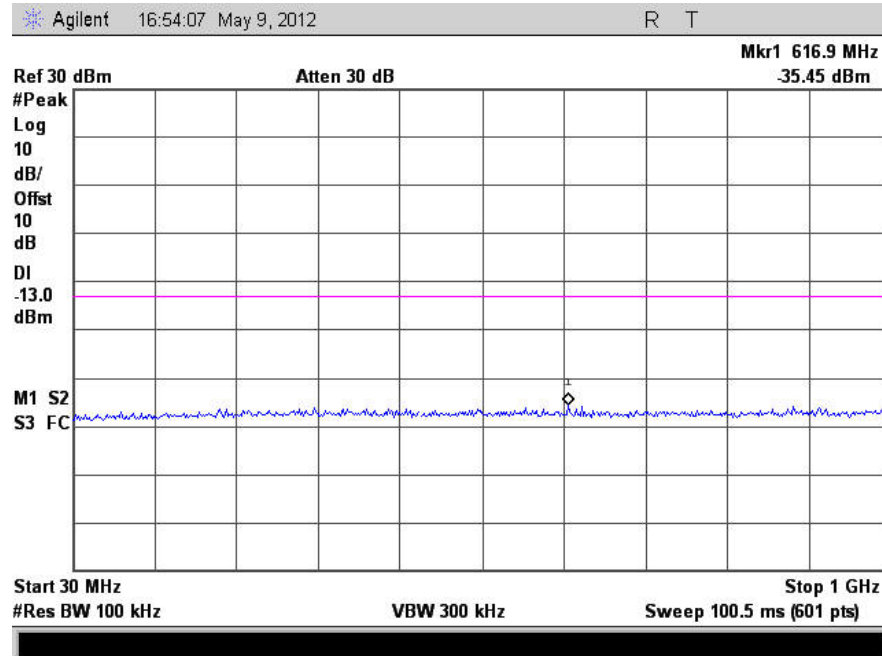
6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 27.53 (h) (continued)

6.3.2. Low Channel, 1 to 26.5 GHz



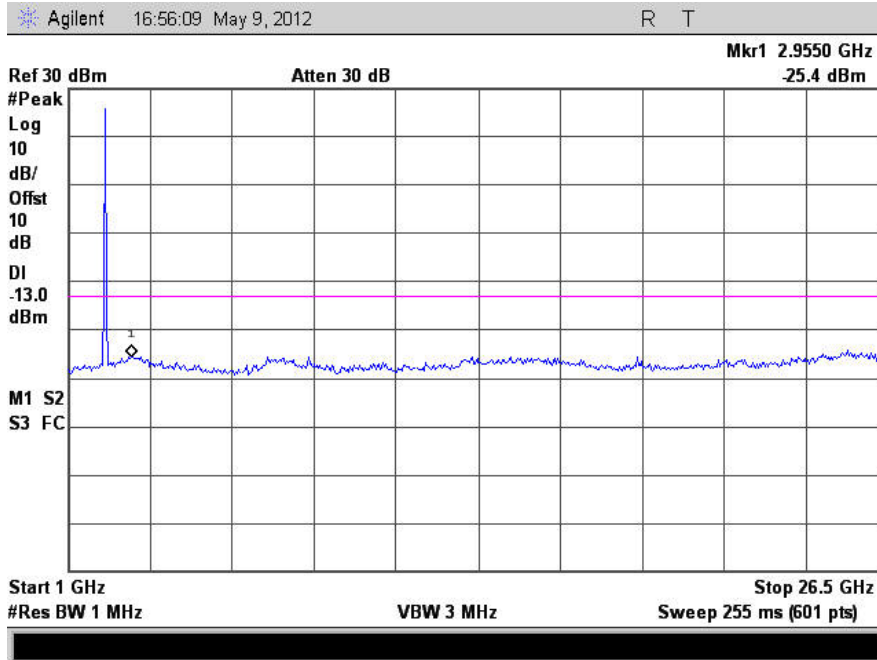
6.3.3. Mid Channel, 30 MHz to 1 GHz



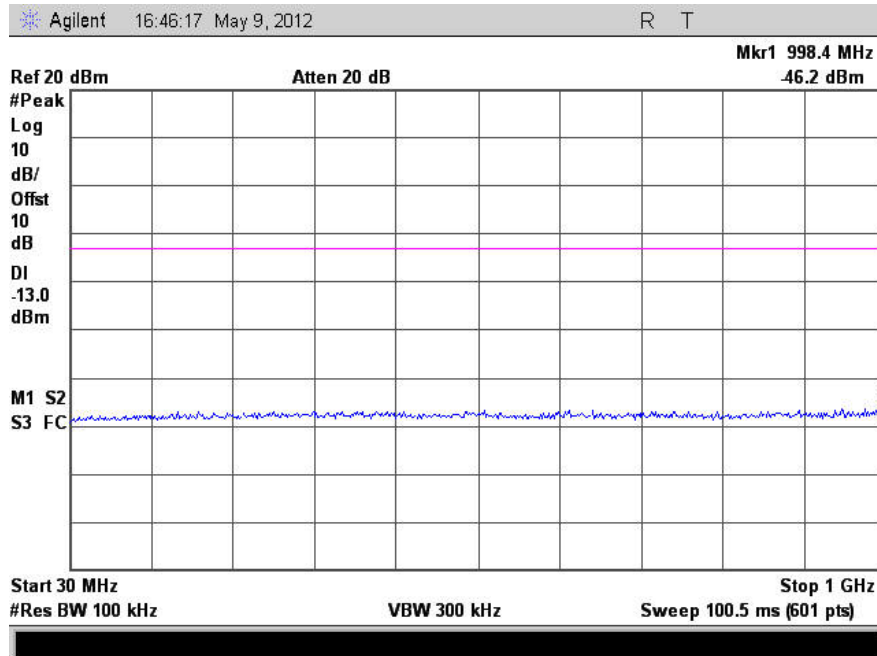
6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 27.53 (h) (continued)

6.3.4. Mid Channel, 1 to 26.5 GHz



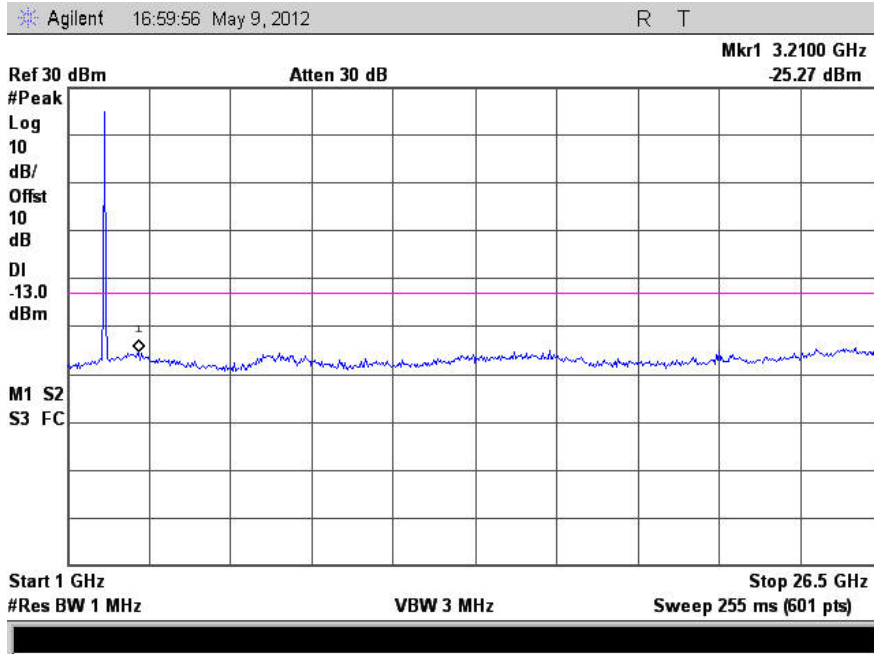
6.3.5. High Channel, 30 to 1000 MHz



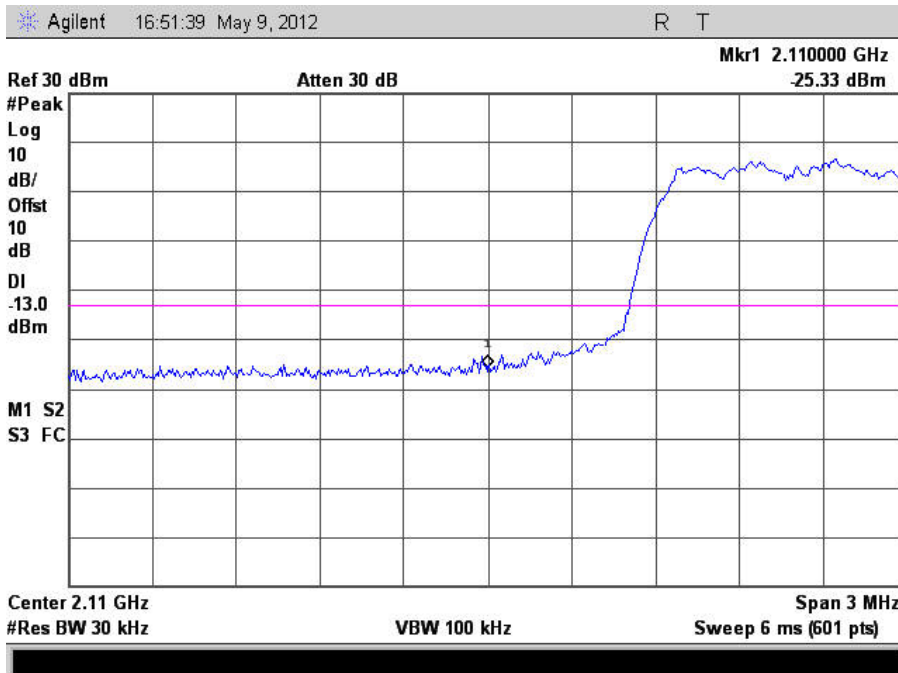
6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 27.53 (h) (continued)

6.3.6. High Channel, 1 to 26.5 GHz



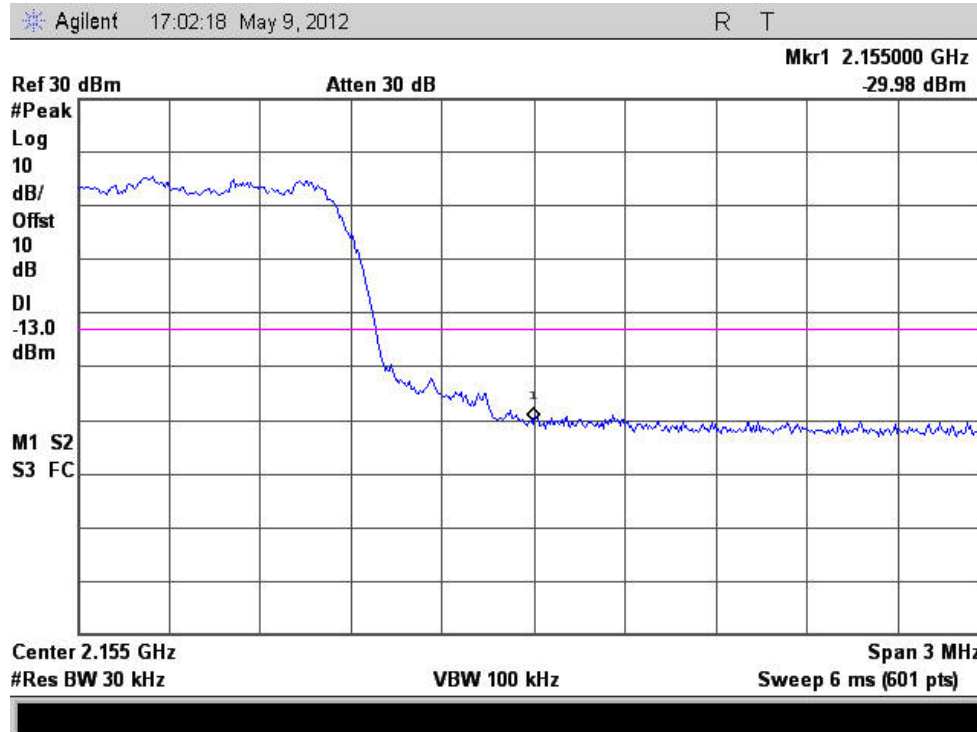
6.3.7. 2110 MHz Lower Bandedge Measurement



6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 27.53 (h) (continued)

6.3.8. 2155 MHz Upper Bandedge Measurement



6. Measurement Data (continued)**6.5. Field Strength of Spurious Emissions 27.53 (h)**

Requirement: The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log (P)$ dB

6.5.1. Measurement and Equipment Setup

Test Date:	04/18/2012
Test Engineer:	Cody Merry
Site Temperature (°C):	24
Relative Humidity (%RH):	30
Frequency Range:	30 MHz to 1 GHz
Measurement Distance:	3 Meters
EMI Receiver IF Bandwidth:	120 kHz
EMI Receiver Avg Bandwidth:	300 kHz
Detector Functions:	Peak and Quasi-Peak.
Antenna Height:	1 to 4 meters

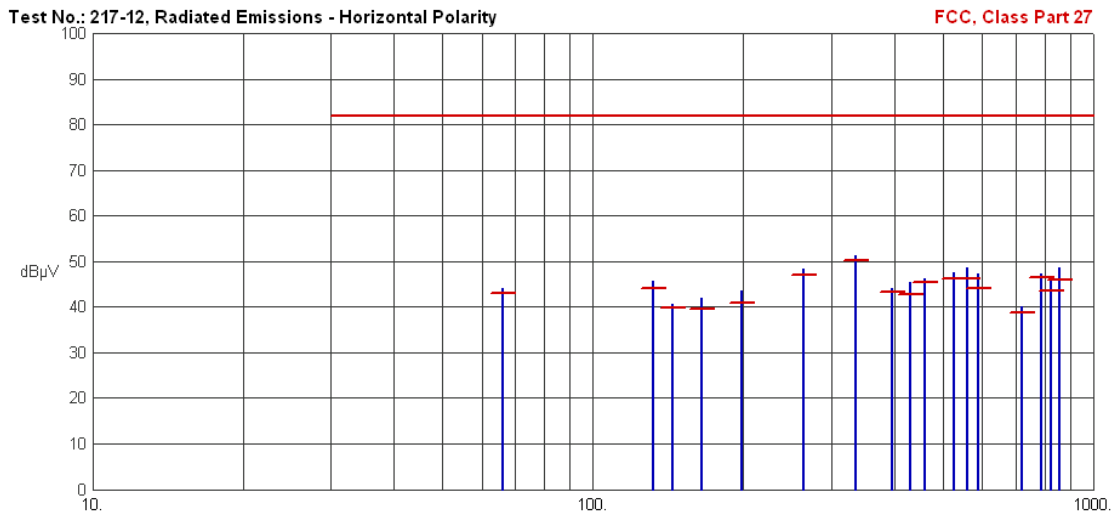
6.5.2 Test Procedure

Test measurements were made in accordance with ANSI C63.4-2009, Standard Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronics Equipment in the Range of 9 kHz to 40 GHz.

6. Measurement Data (continued)

6.5. Field Strength of Spurious Emissions 27.53 (h) (continued)

6.5.3. Horizontal Polarity

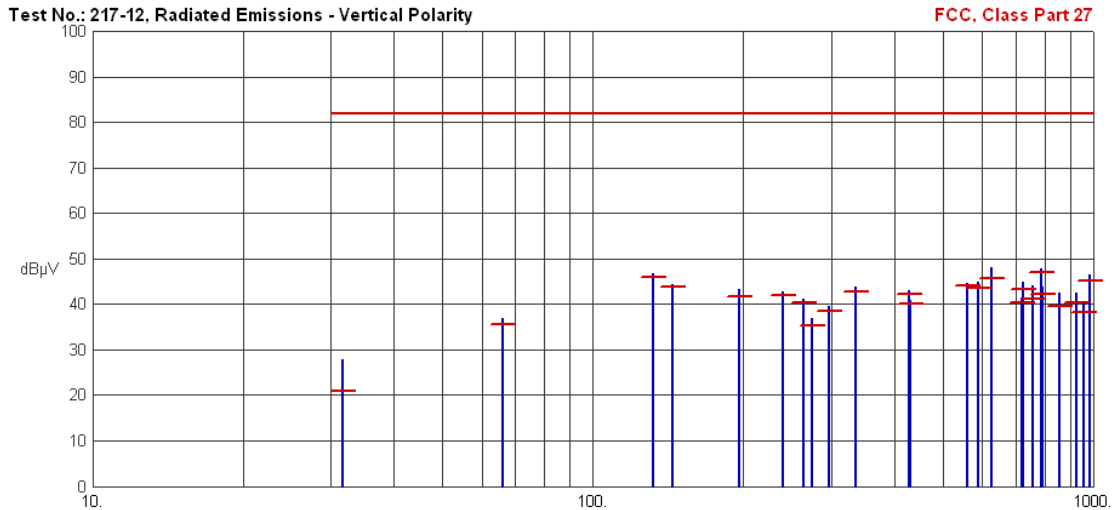


Frequency (MHz)	Pk Amp (dBµV/m)	QP Amp (dBµV/m)	QP Limit (dBµV/m)	Margin (dB)	Ant Ht (cm)	Table (Deg)	Comments
65.9815	44.24	42.93	82.00	-39.07	N/A	N/A	
132.0076	45.71	44.20	82.00	-37.80	N/A	N/A	
143.9978	40.74	39.86	82.00	-42.14	N/A	N/A	
164.9803	41.97	39.55	82.00	-42.45	N/A	N/A	
197.9819	43.68	41.02	82.00	-40.98	N/A	N/A	
263.9814	48.28	47.11	82.00	-34.89	N/A	N/A	
335.9843	51.23	50.31	82.00	-31.69	N/A	N/A	
395.9818	44.18	43.26	82.00	-38.74	N/A	N/A	
431.9940	45.49	42.91	82.00	-39.09	N/A	N/A	
461.9813	46.25	45.44	82.00	-36.56	N/A	N/A	
528.0025	47.58	46.14	82.00	-35.86	N/A	N/A	
560.9914	48.74	46.38	82.00	-35.62	N/A	N/A	
589.8056	47.35	44.17	82.00	-37.83	N/A	N/A	
719.9868	40.07	38.76	82.00	-43.24	N/A	N/A	
786.4116	47.44	46.61	82.00	-35.39	N/A	N/A	
824.9949	46.36	43.51	82.00	-38.49	N/A	N/A	
857.9793	48.57	46.06	82.00	-35.94	N/A	N/A	

6. Measurement Data (continued)

6.5. Field Strength of Spurious Emissions 27.53 (h) (continued)

6.5.4. Vertical Polarity



Frequency (MHz)	Pk Amp (dBµV/m)	QP Amp (dBµV/m)	QP Limit (dBµV/m)	Margin (dB)	Ant Ht (cm)	Table (Deg)	Comments
31.7337	27.96	20.86	82.00	-61.14	N/A	N/A	
65.9825	36.93	35.46	82.00	-46.54	N/A	N/A	
131.9988	46.67	45.86	82.00	-36.14	N/A	N/A	
143.9970	44.30	43.86	82.00	-38.14	N/A	N/A	
196.5904	43.33	41.82	82.00	-40.18	N/A	N/A	
239.9830	42.86	41.94	82.00	-40.06	N/A	N/A	
263.9776	41.18	40.45	82.00	-41.55	N/A	N/A	
275.0194	37.05	35.42	82.00	-46.58	N/A	N/A	
296.9841	39.51	38.49	82.00	-43.51	N/A	N/A	
335.9843	43.87	42.74	82.00	-39.26	N/A	N/A	
428.9804	43.07	42.23	82.00	-39.77	N/A	N/A	
431.9843	40.86	40.08	82.00	-41.92	N/A	N/A	
560.9980	44.67	44.18	82.00	-37.82	N/A	N/A	
589.8229	45.04	43.49	82.00	-38.51	N/A	N/A	
626.9825	48.00	45.69	82.00	-36.31	N/A	N/A	
719.9849	41.46	40.36	82.00	-41.64	N/A	N/A	
725.9821	45.03	43.37	82.00	-38.63	N/A	N/A	
758.9706	44.09	41.26	82.00	-40.74	N/A	N/A	
786.4109	47.80	47.06	82.00	-34.94	N/A	N/A	
791.9792	43.94	42.32	82.00	-39.68	N/A	N/A	
857.9822	42.44	39.46	82.00	-42.54	N/A	N/A	
923.9848	42.42	40.40	82.00	-41.60	N/A	N/A	
957.0060	40.24	38.20	82.00	-43.80	N/A	N/A	
983.0176	46.42	45.28	82.00	-36.72	N/A	N/A	

6. Measurement Data (continued)

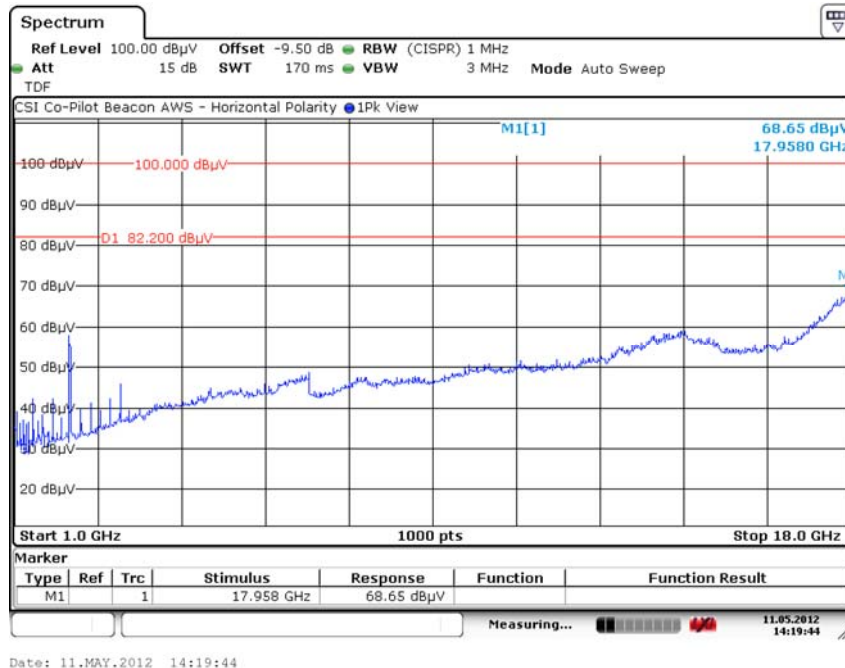
6.5. Field Strength of Spurious Emissions 27.53 (h) (continued)

6.5.5. Measurement and Equipment Setup

Test Date: 5/11/2012
 Test Engineers: Brian Breault
 Site Temperature (°C): 24
 Relative Humidity (%RH): 30
 Frequency Range: Above 1 GHz
 Measurement Distance: 3 Meters
 EMI Receiver IF Bandwidth: 1 MHz
 EMI Receiver Avg Bandwidth: 3 MHz
 Detector Functions: Peak and EMI Average
 Antenna Height: 1 to 4 meters

Note: Measured in Anechoic Chamber at 1 Meter

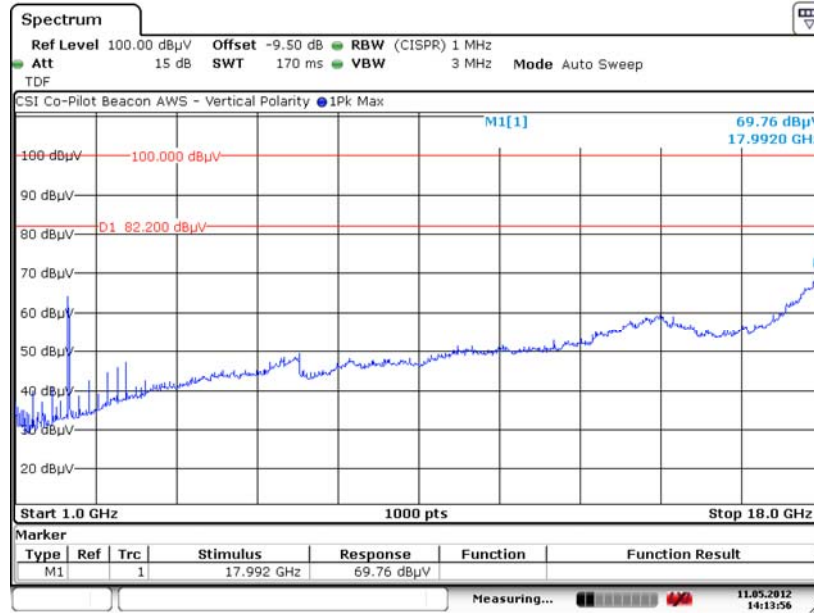
6.5.6. Radiated Emissions 1 to 18 GHz – Horizontal



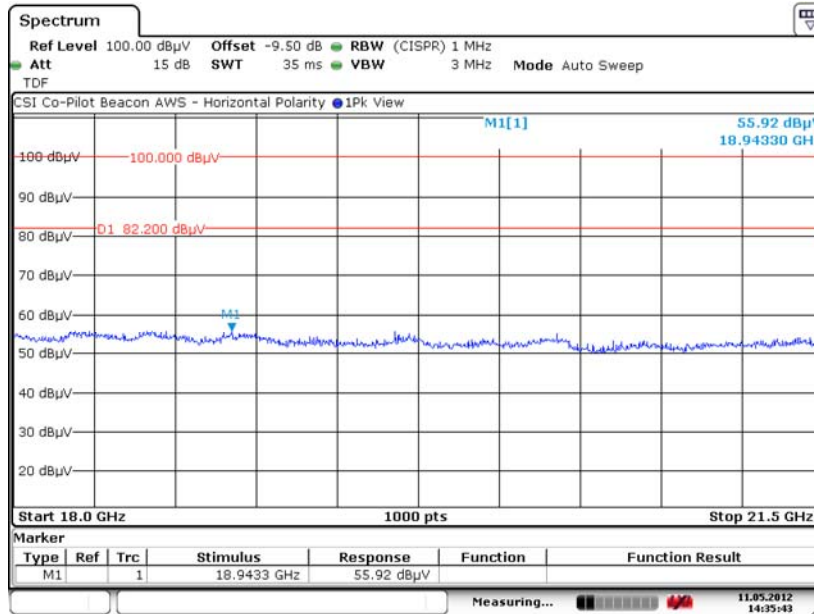
6. Measurement Data (continued)

6.5. Field Strength of Spurious Emissions 27.53 (h) (continued)

6.5.7. Radiated Emissions 1 to 18 GHz – Vertical



6.5.8. Radiated Emissions 18 – 21.5 GHz – Horizontal



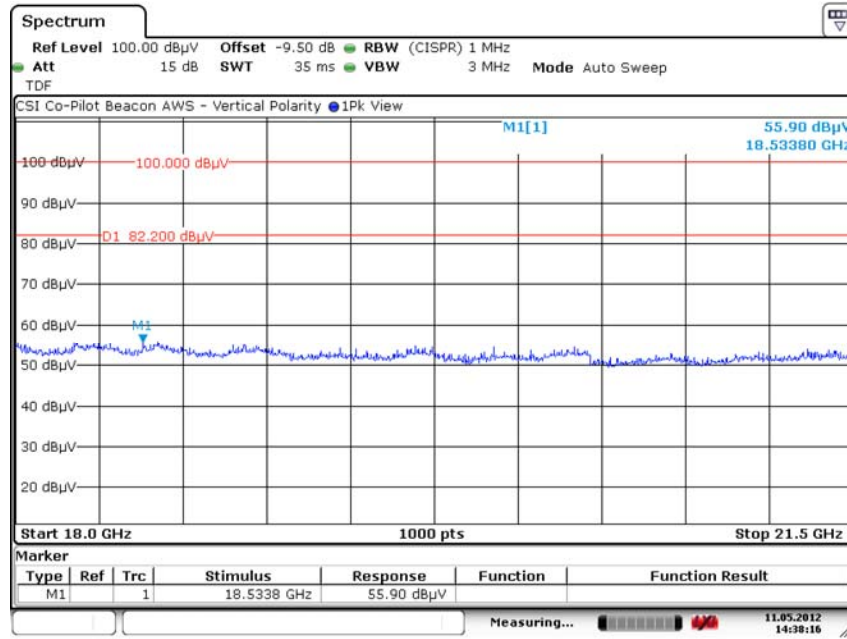
Test Number: 217-12R1

Issue Date: 05/24/2012

6. Measurement Data (continued)

6.5. Field Strength of Spurious Emissions 27.53 (h) (continued)

6.5.9. Radiated Emissions 18 to 21.5 GHz – Vertical



Date: 11.MAY.2012 14:38:16

6. Measurement Data (continued)

6.6. Frequency Stability 27.54 per Section 2.1055

Requirement: The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized band of operation.

The temperature shall be varied from -30 to +50 degrees C in increments of 10 degrees C allowing time for the product to stabilize at each of the temperature steps.

Also, the frequency stability shall be measured with a variation of supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

Temperature Degrees C	Frequency (MHz)	85% Nominal Voltage	115% Nominal Voltage
-30	2132.4625	2132.4625	2132.4625
-20	2132.4625	2132.4625	2132.4625
-10	2132.4750	2132.4750	2132.4750
0	2132.4875	2132.4875	2132.4875
10	2132.4875	2132.4875	2132.4875
20	2132.4875	2132.4875	2132.4875
30	2132.4875	2132.4875	2132.4875
40	2132.4875	2132.4875	2132.4875
50	2132.4625	2132.4625	2132.4625
Max Deviation	0.0250	0.0250	0.0250

6. Measurement Data (continued)

6.7. Public Exposure to Radio Frequency Energy Levels 27.52 per 1.1307 (b)(1)

Channel	MPE Distance (cm)	DUT Output Power (dBm)	DUT Antenna Gain (dBi)	Power Density		Limit (mW/cm ²)	Result
				(mW/cm ²)	(W/m ²)		
	(1)	(2)	(3)	(4)		(5)	
Low	20	23.85	3	0.0963230	0.9632303	1	Compliant
Mid	20	23.17	3	0.0823626	0.8236262	1	Compliant
High	20	22.31	3	0.0675663	0.6756630	1	Compliant
All	20	24.08	3	0.1015617	1.0156174	1	Compliant
Low	23	23.85	14	0.9169264	9.1692637	1	Compliant
Mid	21	23.17	14	0.9404843	9.4048429	1	Compliant
High	20	22.31	14	0.8506093	8.5060934	1	Compliant
All	23	24.08	14	0.9667952	9.6679515	1	Compliant

Note: For outdoor installations, users must be instructed to be at least 23 cm away from the high gain antenna when the device is in operation.

$$PD = \frac{OP + AG}{(4 \times \pi \times d^2)}$$

1. Reference CFR 2.1093(b): For purposes of this section, a portable device is defined as a transmitting device designed to be used so that the radiating structure(s) of the device is/are within 20 centimeters of the body of the user. Actual separation distance was calculated for outdoor applications.
2. Section 6.1.2 of this test report. Note that the value has been adjusted to include the cable insertion loss.
3. Data supplied by the client. 3 dBi for Indoor, 14 dBi for Outdoor Applications
4. Power density is calculated from field strength measurement and antenna gain.
5. Reference CFR 1.1310, Table 1: Limits for Maximum Permissible Exposure (MPE), Section (B): Limits for General Population/Uncontrolled Exposure.

7. Test Site Description

Compliance Worldwide is located at 357 Main Street in Sandown, New Hampshire. The test sites at Compliance Worldwide are used for conducted and radiated emissions testing in accordance with Federal Communications Commission (FCC) and Industry Canada standards. A description of the test sites is on file with the FCC (registration number **96392**) and Industry Canada (file number **IC 3023A-1**).

The radiated emissions test site is a 3 and 10 meter enclosed open area test site (OATS). Personnel, support equipment and test equipment are located in the basement beneath the OATS ground plane.

The conducted emissions site is part of a 16' x 20' x 12' ferrite tile chamber and uses one of the walls for the vertical ground plane required by EN 55022.

Both sites are designed to test products or systems 1.5 meter W x 1.5 meter L x 2.0 meter H, floor standing or table top.

8. Test Setup Photographs

Antenna Port Conducted Emissions



8. Test Setup Photographs (cont)

Radiated Emissions (Front)



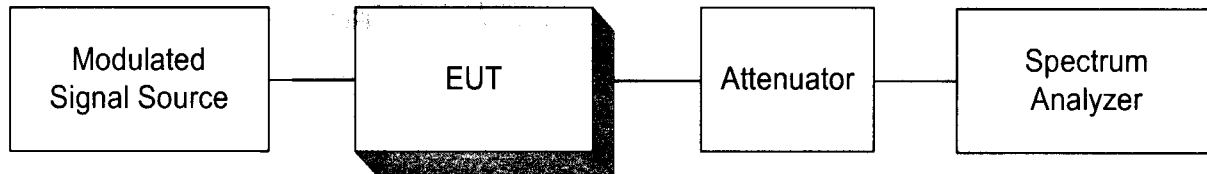
8. Test Setup Photographs (cont)

Radiated Emissions (Rear)

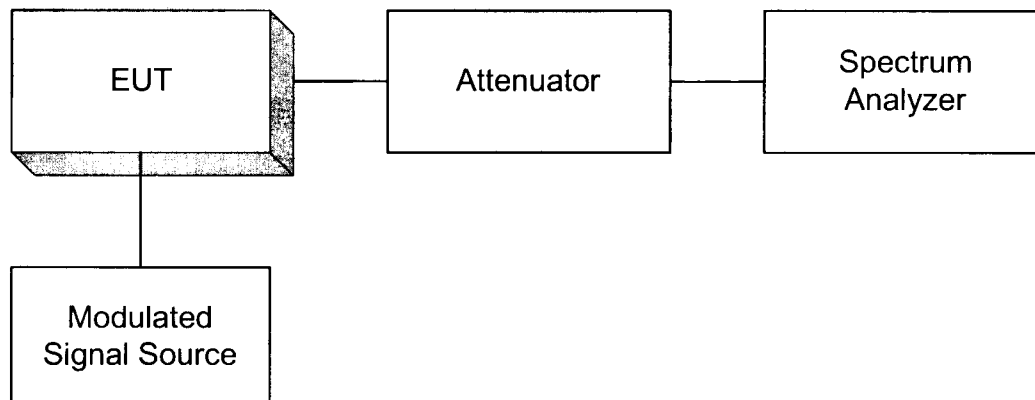


Appendix A

RF Output Power

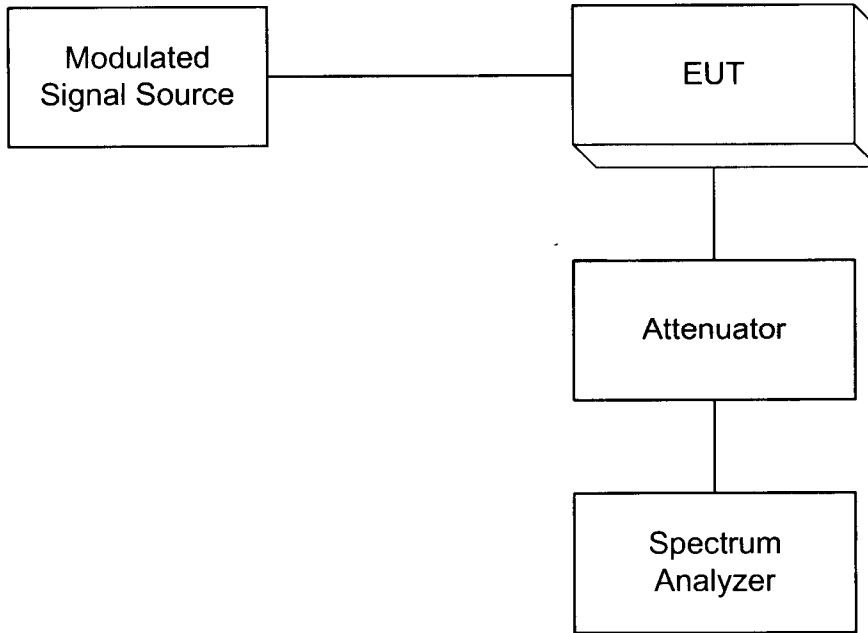


Occupied Bandwidth



Appendix A

Spurious Emissions at the Antenna Terminals



Field Strength of Spurious Radiation

