COMPLIANCE WORLDWIDE INC.
TEST REPORT 247-11

In Accordance with the Requirements of

FCC PART 90:2010

Issued to

Cellular Specialties, Inc.
670 North Commercial Street
Manchester, NH 03010
(603) 626-6677

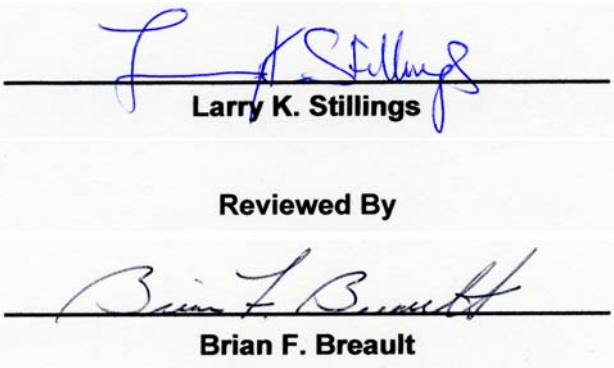
for

Bidirectional Amplifier
CSI-DSP95-255-PS8

FCC ID: NVRCSIDSP95255PS8

Report Issued on July 21, 2011

Tested by



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Compliance Worldwide, Inc. - 357 Main Street - Sandown, NH 03873
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1. Scope

This test report certifies that the Cellular Specialties DSP95-255-PS8, as tested, meets the FCC Part 2 and Part 90 Subpart I technical 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.

2. Product Details

2.1. Manufacturer: Cellular Specialties

2.2. Model Number: CSI-DSP95-255-PS8

2.3. Serial Number: COC10001

2.4. Description: CSI Modular multi-band high power repeaters deliver cost effective in-building signal enhancement over a passive DAS. Large facilities can be covered without additional hardware and installation costs or the complexity of a separate fiber DAS system.

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	Cellular Specialties	015-2096-001-C	091100003	
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	Antenna
RF, 50 Ω, N male – N male	1M	Yes	DUT	Antenna
Power Supply	2M + 2M	Yes	DUT	120 VAC, 60 Hz
Serial 1	2M	Yes	DUT	Notebook PC
USB 1	2M	Yes	DUT	Notebook PC
Ethernet	2M	No	DUT	Notebook PC

Notebook PC is connected only during setup

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3. Product Configuration (continued)

3.3. Operational Characteristics & Software

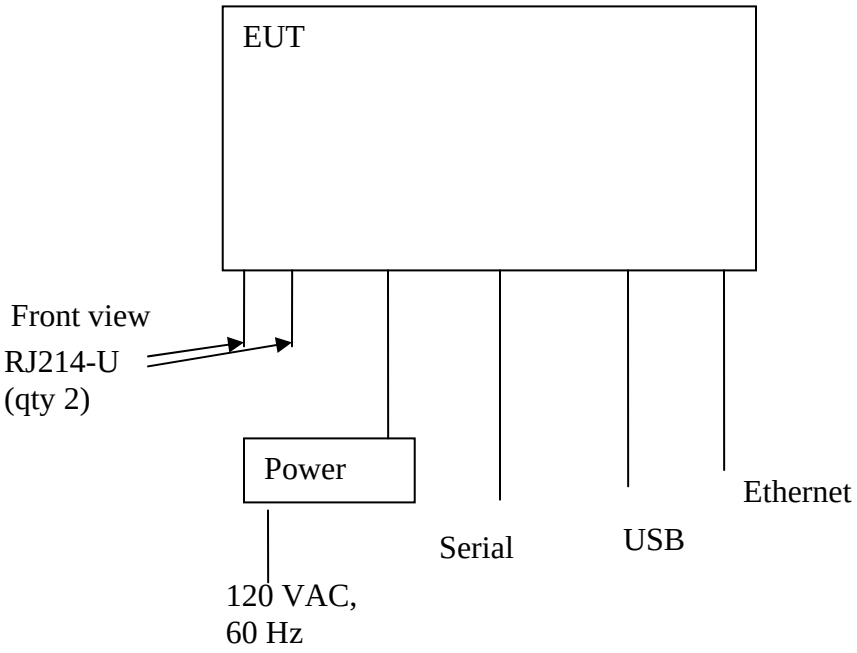
(1) The unit was allowed to power up normally and go through its configuration cycle.

(2) Using an RF Signal Generator on the Input and a Spectrum Analyzer on the output Downlink or Uplink frequencies a signal was generated over the intended bandwidth of operation.

(3) The signal generator was configured to provide several digital modulations to the input of the amplifier including TDMA modulation.

(4) The units internal AGC circuitry was toggled on and off to determine the maximum output power for each of the Uplink and Downlink frequencies and still maintain compliance with the standard.

3.4. Block Diagram



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4. Measurements Parameters

4.1. Measurement Equipment Used to Perform Test

Device	Manufacturer	Model No.	Serial No.	Cal Due
Spectrum Analyzer	Agilent	E4407B	MY45104493	12/22/2012
EMI Receiver	Hewlett Packard	8546A	3330A00115	10/28/2011
Microwave Preamp	Hewlett Packard	8449B	3008A01323	12/1/2012
Bilog Antenna	Com-Power	AC-220	25509	8/6/2011
Horn Antenna	Electro-Metrics	EM-6961	6337	10/19/2012
Horn Antenna	Com-Power	AH-118	10078	7/23/2011

4.2. Measurement & Equipment Setup

Test Date:	6/30/2011 – 7/21/2011
Test Engineer:	Larry Stillings
Normal Site Temperature (15 – 35°C):	21.1
Relative Humidity (20 -75%RH):	34

4.3. Test Procedure

The test measurements contained in this report are based on the requirements detailed in FCC Part 2 & Part 90, Subpart I.

The test methods used to generate the data is 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.

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5. Measurement Summary

Section Description or Test Requirement	FCC Reference	Test Report Section	Result	Comment
Effective Radiated Power Limits	90.219 (b)	6.1	Compliant	
Occupied Bandwidth	2.1049 90.219 (a)	6.2	Compliant	
Spurious Emissions at Antenna Terminals	90.210 (a)(b)	6.3	Compliant	
Spurious Emissions at the Antenna Terminals Additional Requirements	90.210 (a)(b)	6.3	Compliant	
Field Strength of Spurious Emissions	90.219 (c)	6.4	Compliant	
Frequency Tolerance	90.213	6.5	Compliant	
Inter-modulation	N/A	6.6	Compliant	
Public Exposure to Radio Frequency Energy Levels	Section 1.1307 (b)(1)	6.7	Compliant	

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6. Measurement Data

6.1. Effective Radiated Power Limits 90.219 (b)

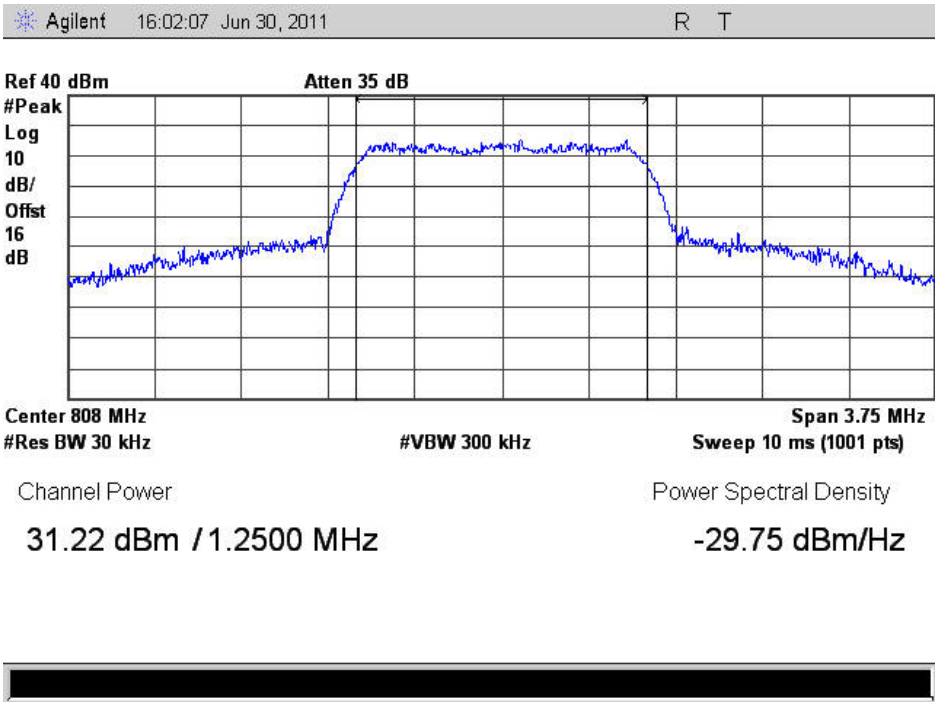
Requirement: Maximum ERP. In general, the effective radiated power (ERP) of signal boosters must not exceed 5 Watts (36.99 dBm) with AGC turned on.

Note: Measurement of Conducted Output Power at the antenna terminal

6.1.1. Peak Transmitter Output Power, Transmitter Only

Channels	Frequency	Output Power		
	(MHz)	(W)	(dBm)	Result
Low Channel	808	1.32	31.22	Compliant
Mid Channel	815	1.20	30.78	Compliant
High Channel	822	1.67	32.22	Compliant
Low Channel	853	3.90	35.91	Compliant
Mid Channel	860	4.10	36.13	Compliant
High Channel	867	3.60	35.56	Compliant

Low Channel 808 MHz



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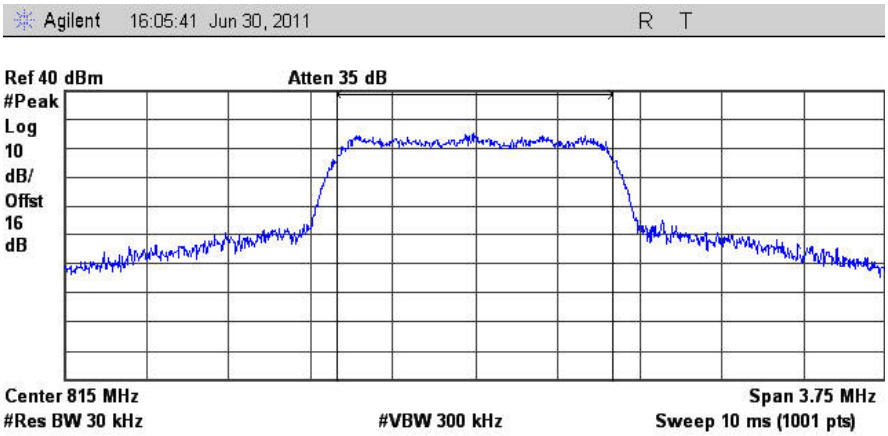
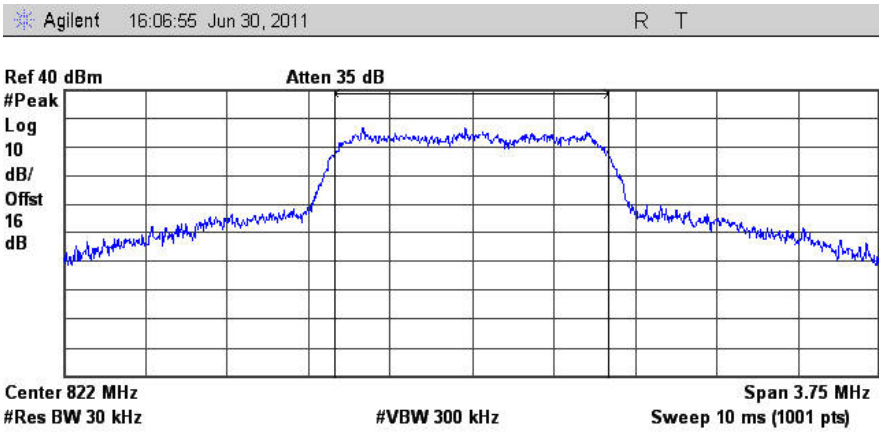
6. Measurement Data

6.1. Effective Radiated Power Limits 90.219 (b) (cont)

Mid Channel 815 MHz



High Channel 822 MHz



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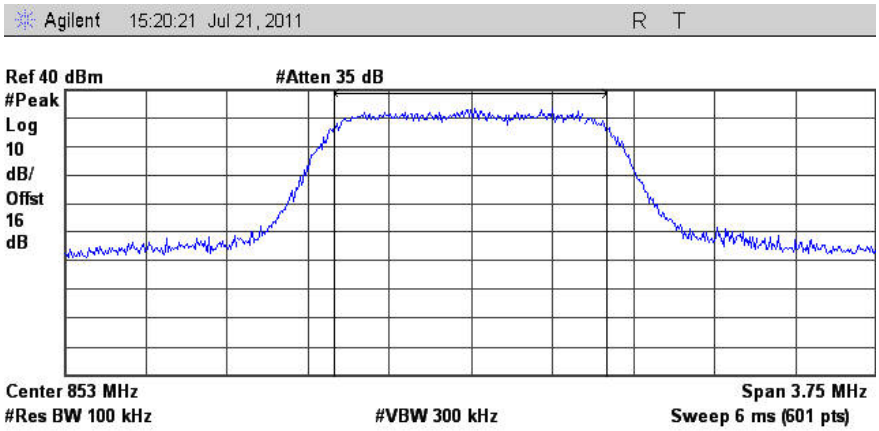
6. Measurement Data

6.1. Effective Radiated Power Limits 90.219 (b) (cont)

Low Channel 853 MHz



Channel Power

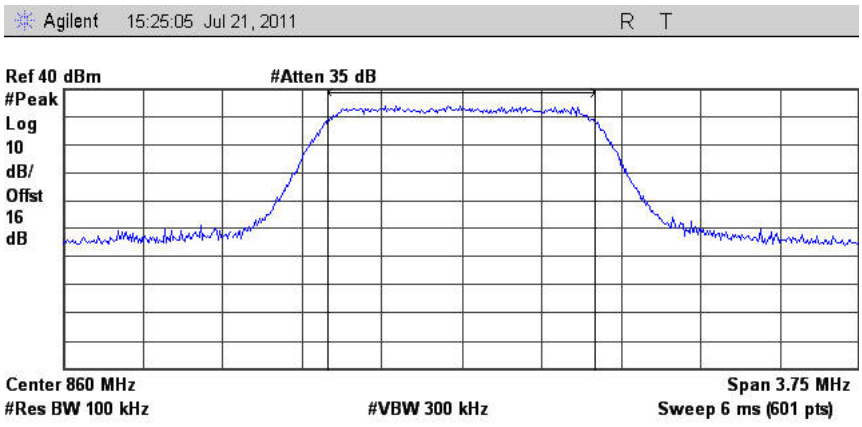
35.91 dBm / 1.2500 MHz

Power Spectral Density

-25.06 dBm/Hz

[redacted]

Mid Channel 860 MHz



Channel Power

36.13 dBm / 1.2500 MHz

Power Spectral Density

-24.84 dBm/Hz

[redacted]

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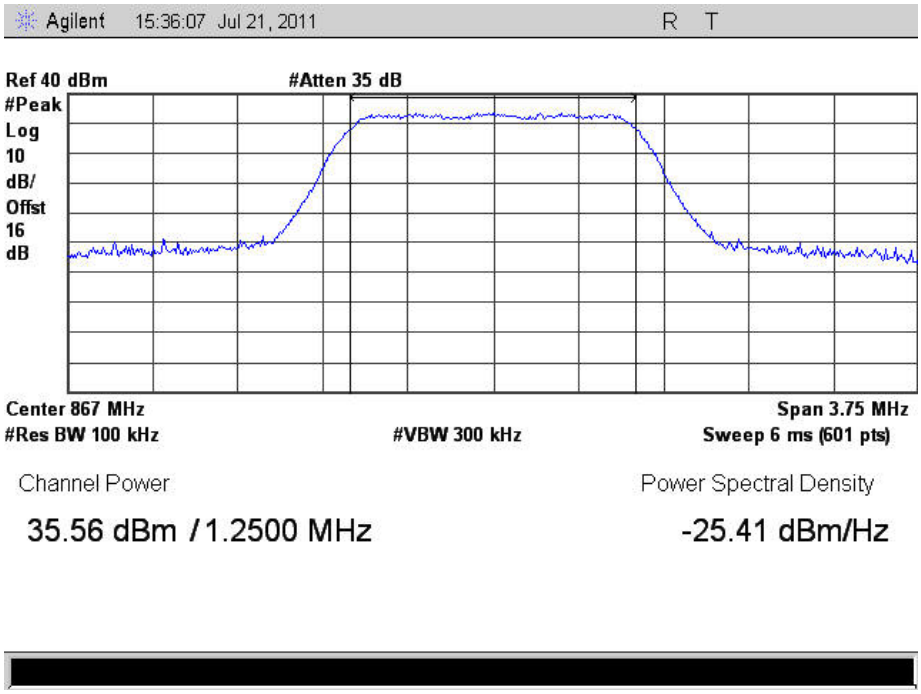
6. Measurement Data

6.1. Effective Radiated Power Limits 90.219 (b) (cont)

High Channel 867 MHz



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6. Measurement Data

6.1. Effective Radiated Power Limits 90.219 (b)

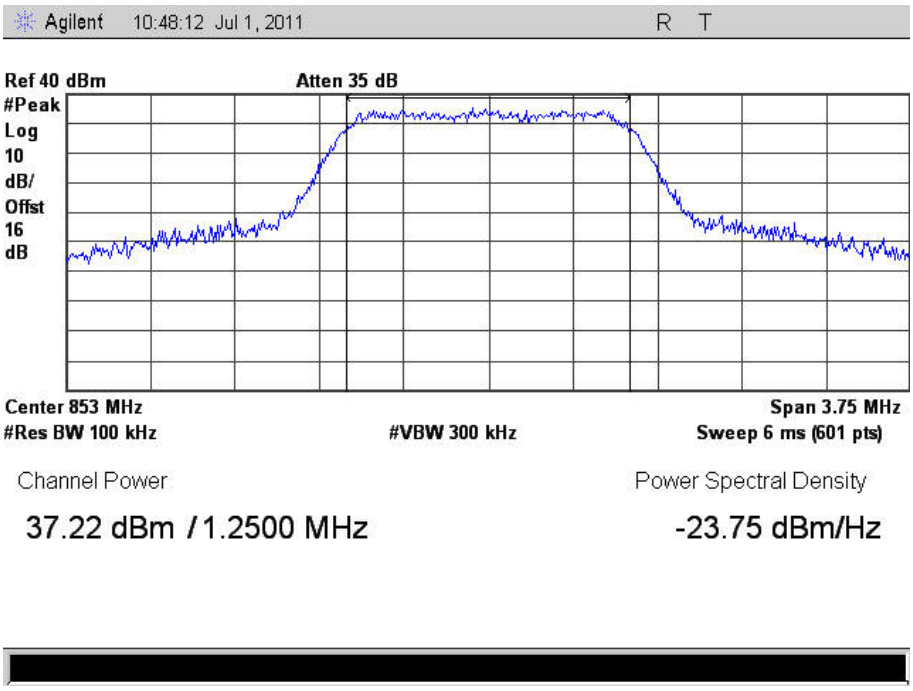
Requirement: Maximum ERP. In general, the effective radiated power (ERP) of signal boosters must not exceed 5 Watts (36.99 dBm) with AGC turned on. Under conditional provisions with the carrier and the FCC boosters may exceed 5 Watts.

Note: Measurement of Conducted Output Power at the antenna terminal

6.1.1. Peak Transmitter Output Power, Transmitter Only

Channels	Frequency	Output Power		
	(MHz)	(W)	(dBm)	Result
Low Channel	853	5.27	37.22	Compliant
Mid Channel	860	5.37	37.30	Compliant
High Channel	867	7.07	38.50	Compliant

Low Channel 808 MHz



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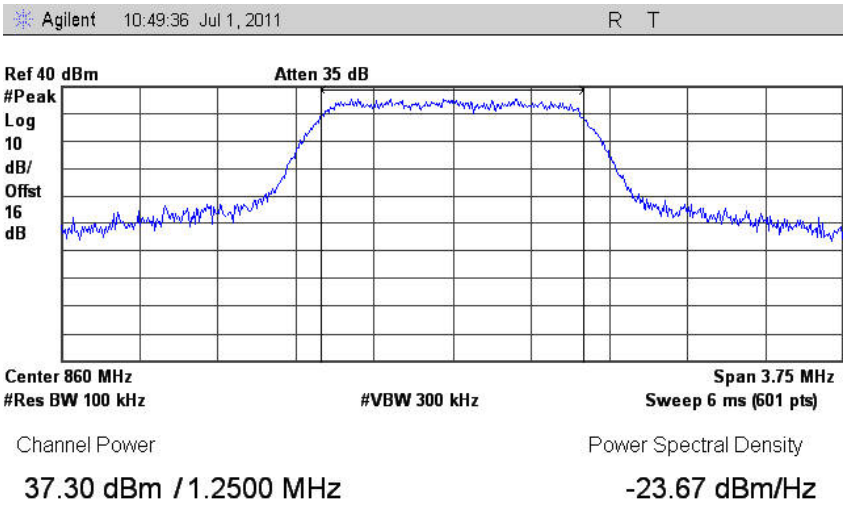
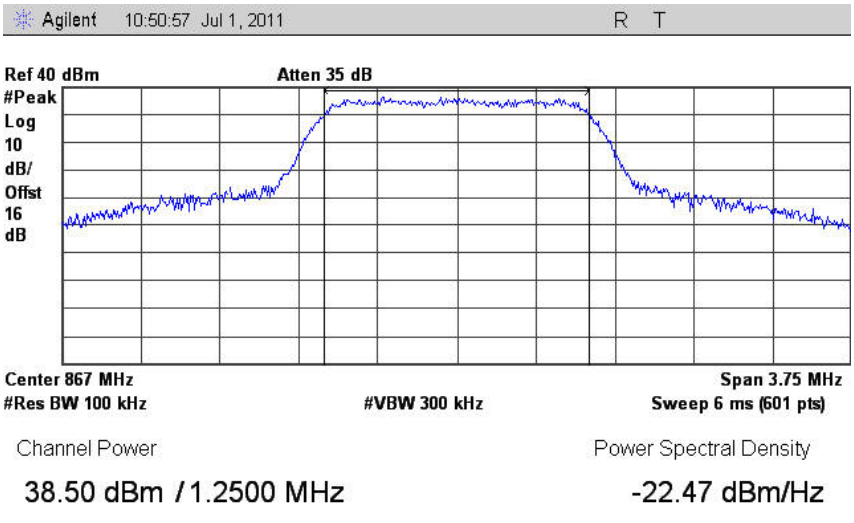
6. Measurement Data

6.1. Effective Radiated Power Limits 90.219 (b) (cont)

Mid Channel 860 MHz



High Channel 867 MHz



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6. Measurement Data

6.1. Effective Radiated Power Limits (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."

ERP = Transmitter Power (dBm) - Cable Loss (dB) + 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:

	Frequency	Transmitter Power[1]	Cable Insertion Loss	Antenna Gain[2]	Total Output Power	
	(MHz)	(dBm)	(dB)	(dBi)	(dBm)	(Watts)
Low Channel	808	31.22	0.00	+3	34.22	2.64
Mid Channel	815	30.78	0.00	+3	33.78	2.39
High Channel	822	32.22	0.00	+3	35.22	3.33
Low Channel	853	35.91	0.00	+0	35.91	3.90
Mid Channel	860	36.13	0.00	+0	36.13	4.10
High Channel	867	35.56	0.00	+0	35.56	3.60

[1] Measured. See section 6.1.1.
[2] Customer supplied. 3 dBi

Outdoor use under conditional provisions with carrier and FCC.

	Frequency	Transmitter Power[1]	Cable Insertion Loss	Antenna Gain[2]	Total Output Power	
	(MHz)	(dBm)	(dB)	(dBi)	(dBm)	(Watts)
Low Channel	808	31.22	0.00	+14	45.22	33.26
Mid Channel	815	30.78	0.00	+14	44.78	30.06
High Channel	822	32.22	0.00	+14	46.22	41.88
Low Channel	853	37.22	0.00	+14	51.22	132.43
Mid Channel	860	37.30	0.00	+14	51.30	134.89
High Channel	867	38.50	0.00	+14	52.50	177.82

[1] Measured. See section 6.1.1.
[2] Customer supplied. 14 dBi

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6. Measurement Data (continued)

6.2. Bandwidth Limitations (FCC Part 2.1049, 90.219(a))

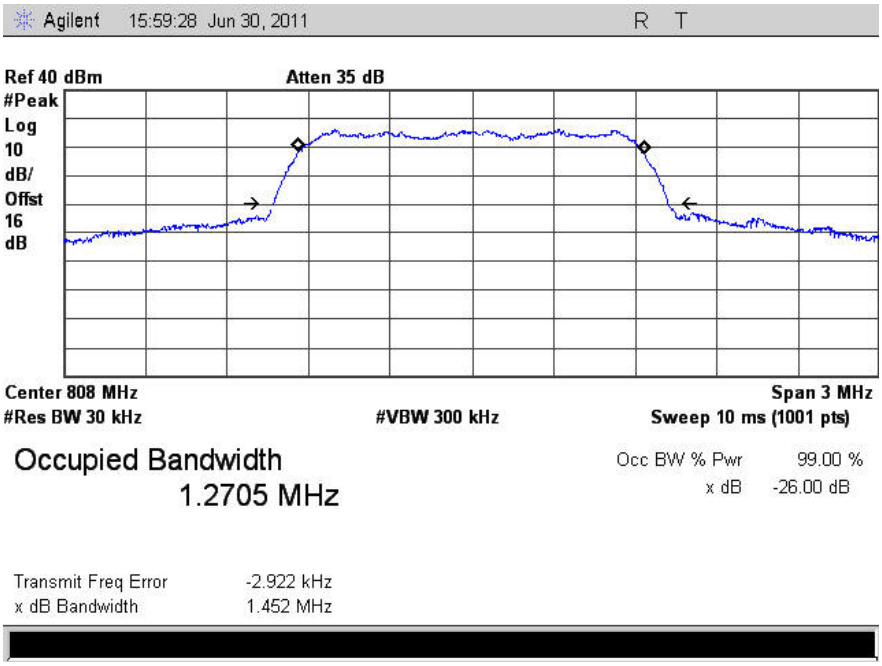
Requirement: Each authorization issued to a station licensed under this part will show an emission designator representing the class of emission authorized. The designator will be prefixed by a specified necessary bandwidth. This number does not necessarily indicate the bandwidth occupied by the emission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

6.2.1. Occupied (99% Power) Bandwidth

	Frequency	Occupied Bandwidth	Result
	(MHz)	(MHz)	
Low Channel	808	1.2705	Compliant
Mid Channel	815	1.2726	Compliant
High Channel	822	1.2800	Compliant
Low Channel	853	1.2692	Compliant
Mid Channel	860	1.2685	Compliant
High Channel	867	1.2626	Compliant

NOTE: EUT is typically used to repeat TDMA signals in the Band.

6.2.1.1. Occupied (99% Power) Bandwidth Measurement, 808 MHz



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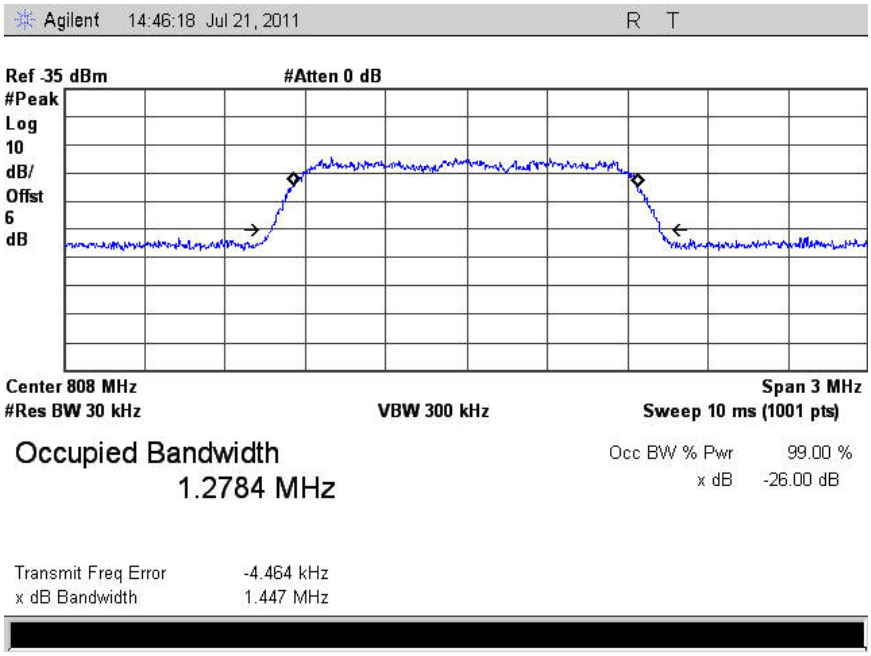
6. Measurement Data (continued)

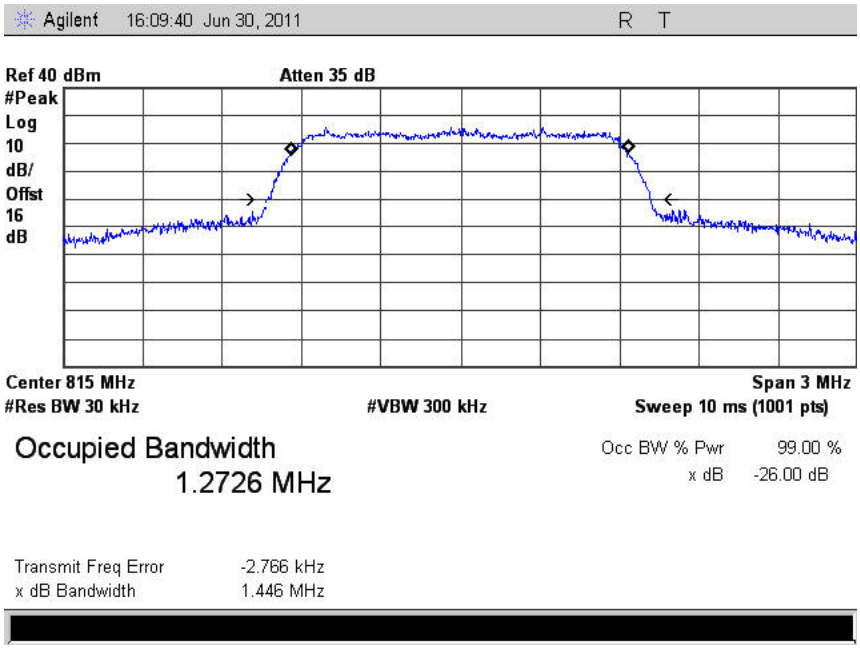
6.2. Bandwidth Limitations (FCC Part 2.1049, 90.219(a)) (continued)

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

6.2.1.2. Occupied (99% Power) Bandwidth Input Signal, 808 MHz



6.2.1.3. Occupied (99% Power) Bandwidth Measurement, 815 MHz



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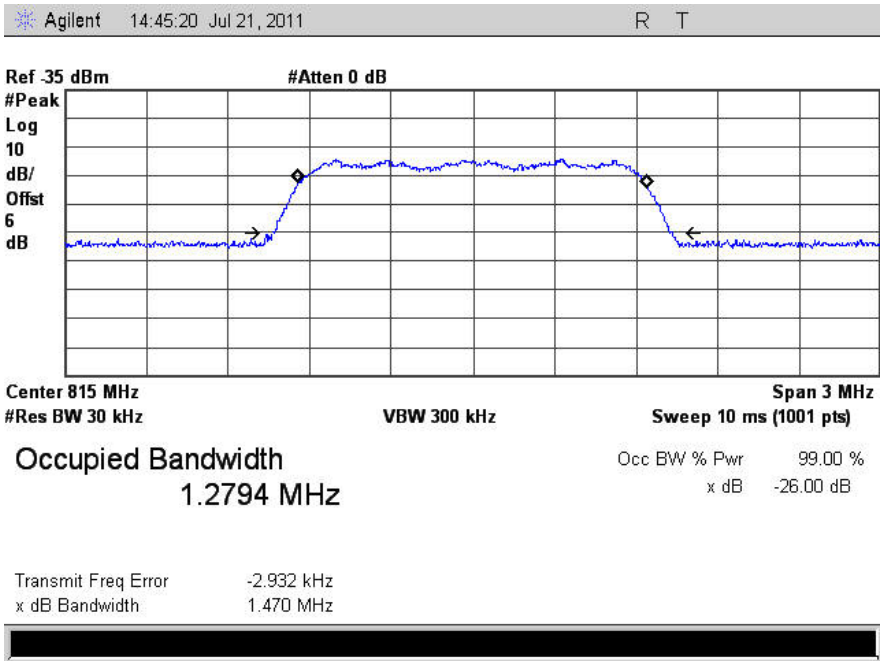
6. Measurement Data (continued)

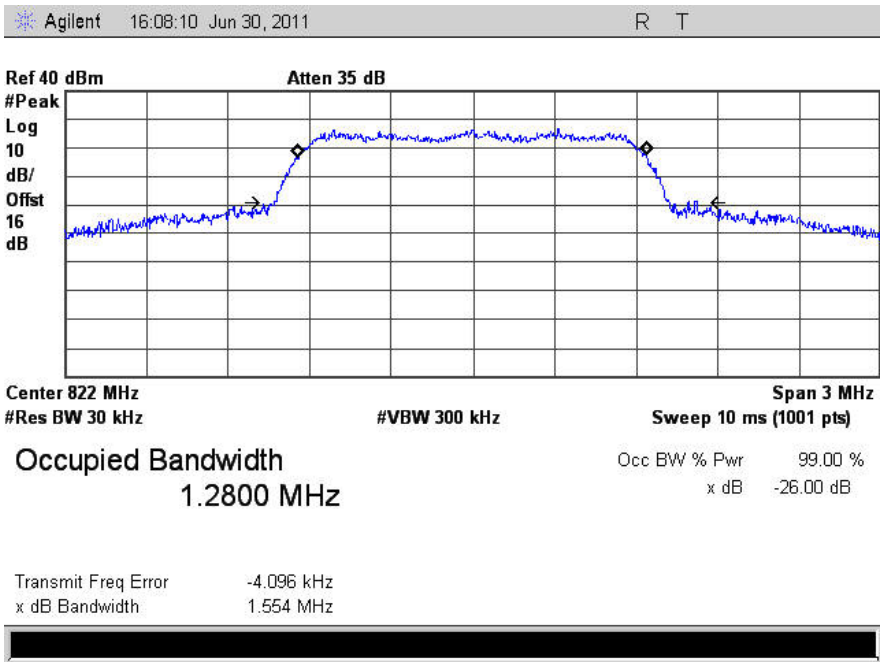
6.2. Bandwidth Limitations (FCC Part 2.1049, 90.219(a)) (continued)

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

6.2.1.4. Occupied (99% Power) Bandwidth Input Signal, 815 MHz



6.2.1.5. Occupied (99% Power) Bandwidth Measurement, 822 MHz



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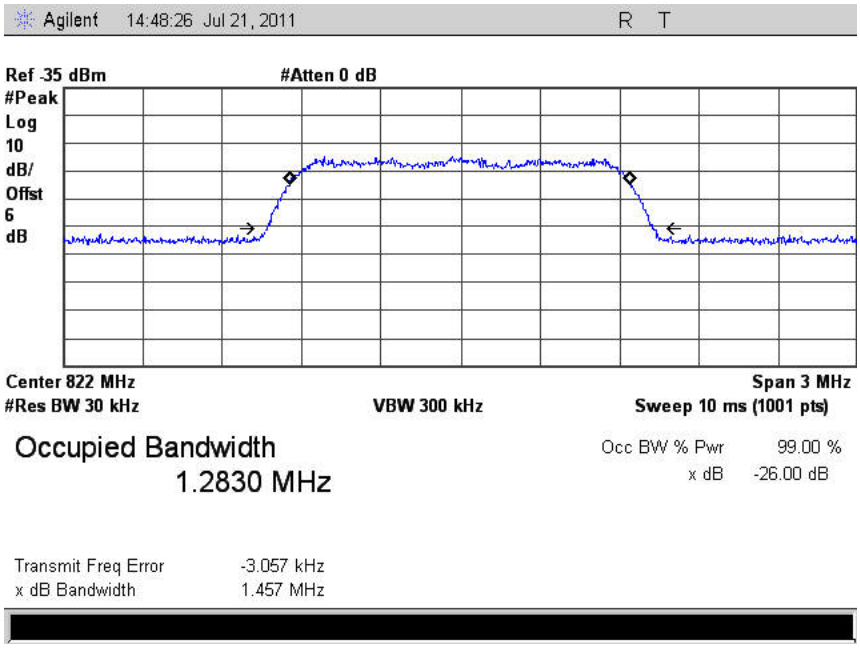
6. Measurement Data (continued)

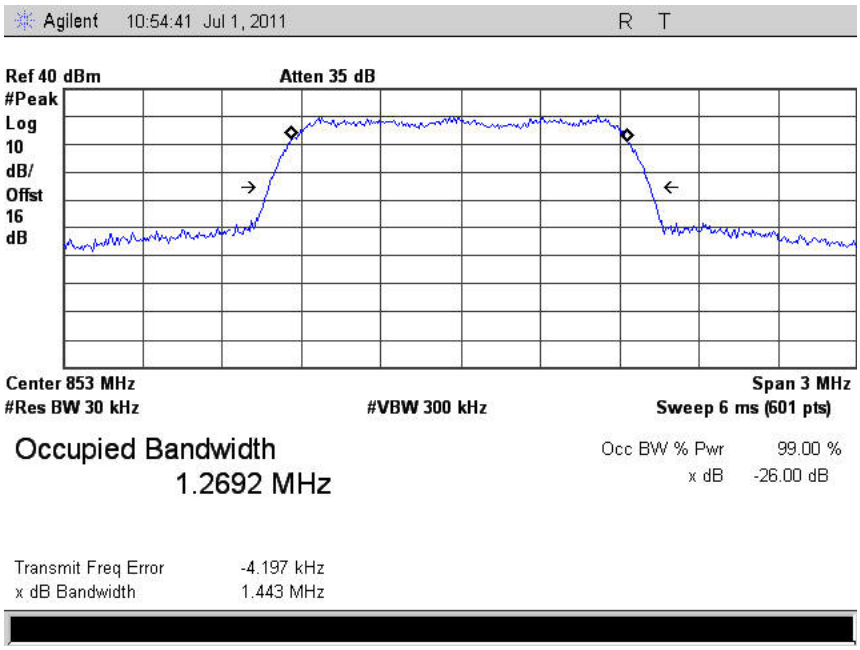
6.2. Bandwidth Limitations (FCC Part 2.1049, 90.219(a)) (continued)

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

6.2.1.6. Occupied (99% Power) Bandwidth Input Signal, 822 MHz



6.2.1.7. Occupied (99% Power) Bandwidth Measurement, 853 MHz



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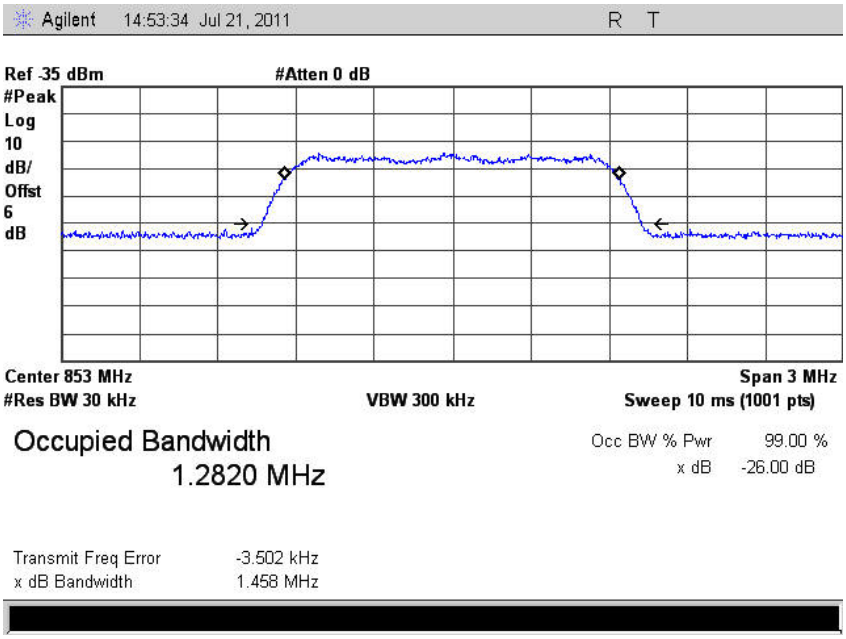
6. Measurement Data (continued)

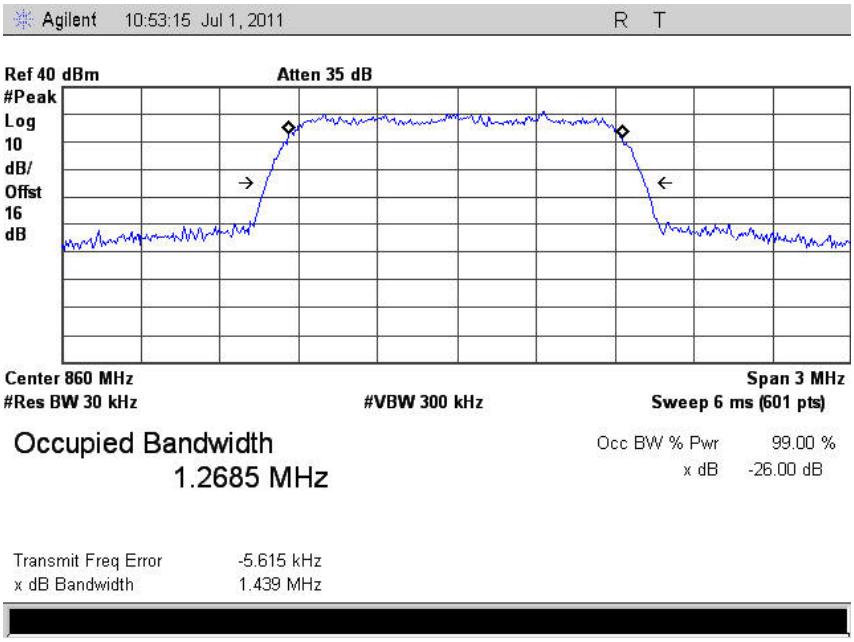
6.2. Bandwidth Limitations (FCC Part 2.1049, 90.219(a)) (continued)

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

6.2.1.8. Occupied (99% Power) Bandwidth Input Signal, 853 MHz



6.2.1.9. Occupied (99% Power) Bandwidth Measurement, 860 MHz



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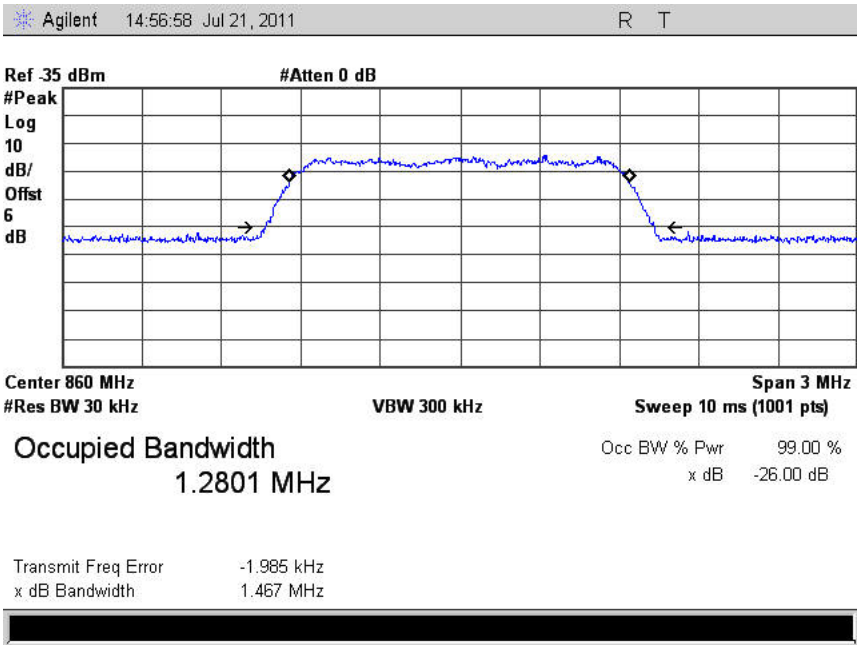
6. Measurement Data (continued)

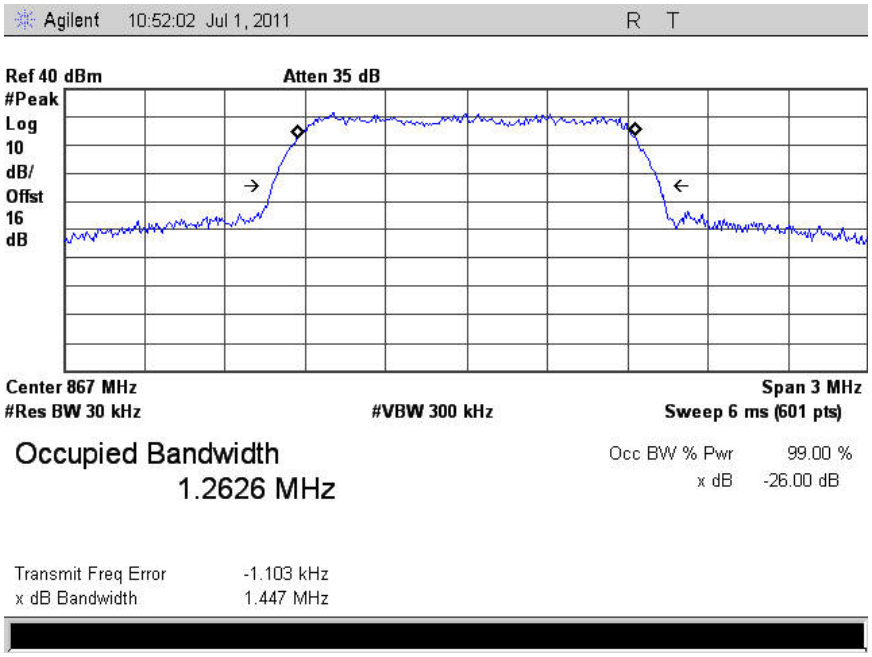
6.2. Bandwidth Limitations (FCC Part 2.1049, 90.219(a)) (continued)

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

6.2.1.10. Occupied (99% Power) Bandwidth Input Signal, 860 MHz



6.2.1.11. Occupied (99% Power) Bandwidth Measurement, 867 MHz



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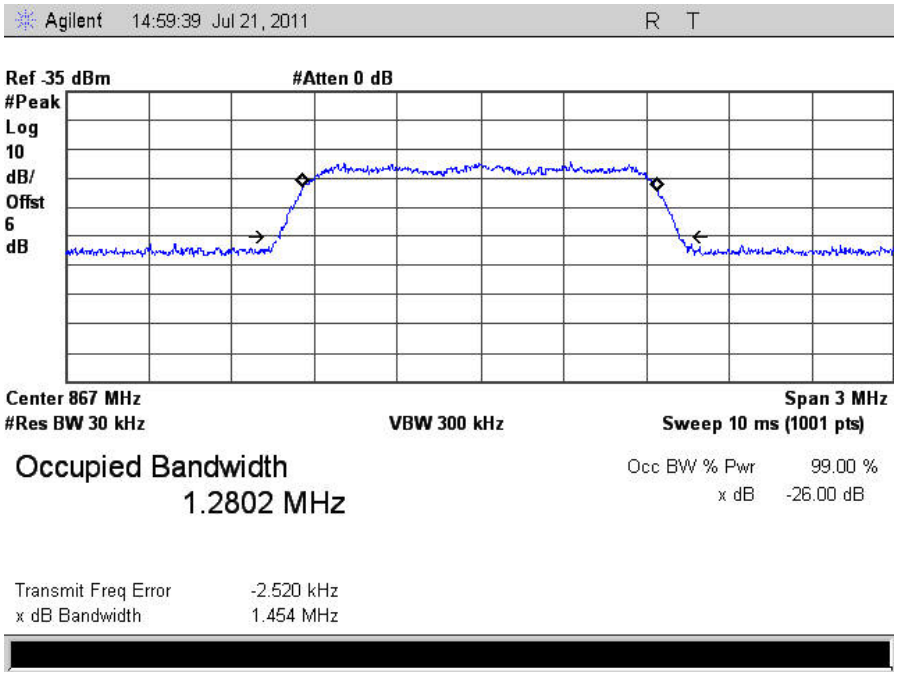
6. Measurement Data (continued)

6.2. Bandwidth Limitations (FCC Part 2.1049, 90.219(a)) (continued)

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

6.2.1.12. Occupied (99% Power) Bandwidth Input Signal, 867 MHz



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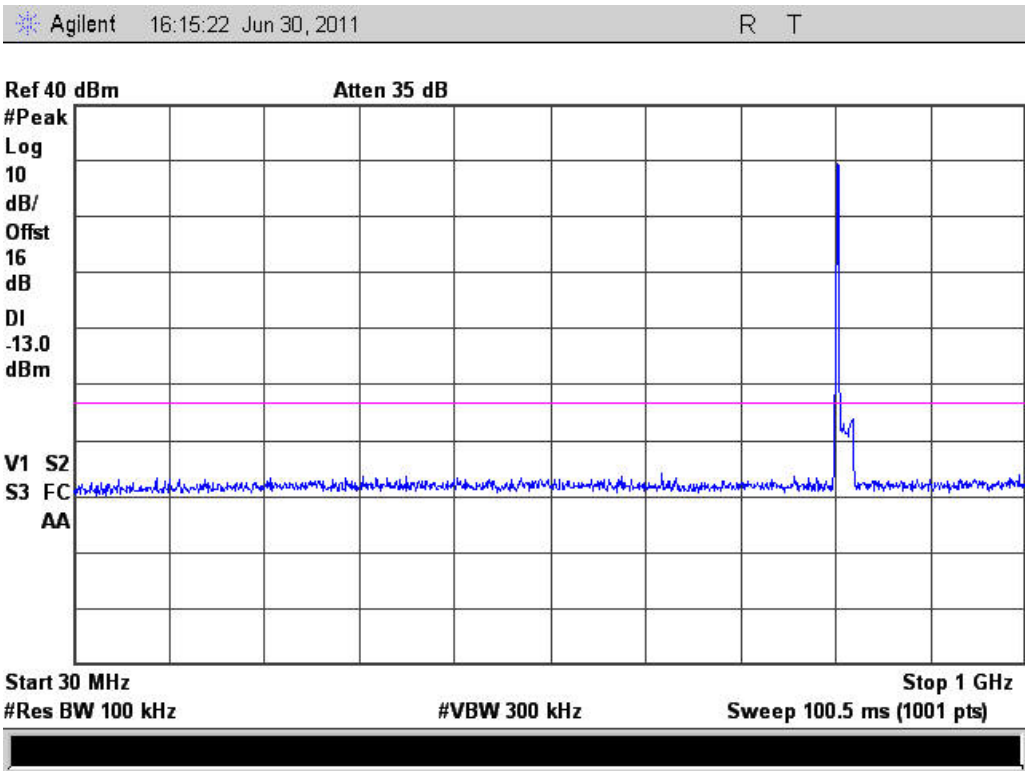
6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 90.210 (a) (b)

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 100 kHz 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 808 MHz, 30 MHz to 1 GHz



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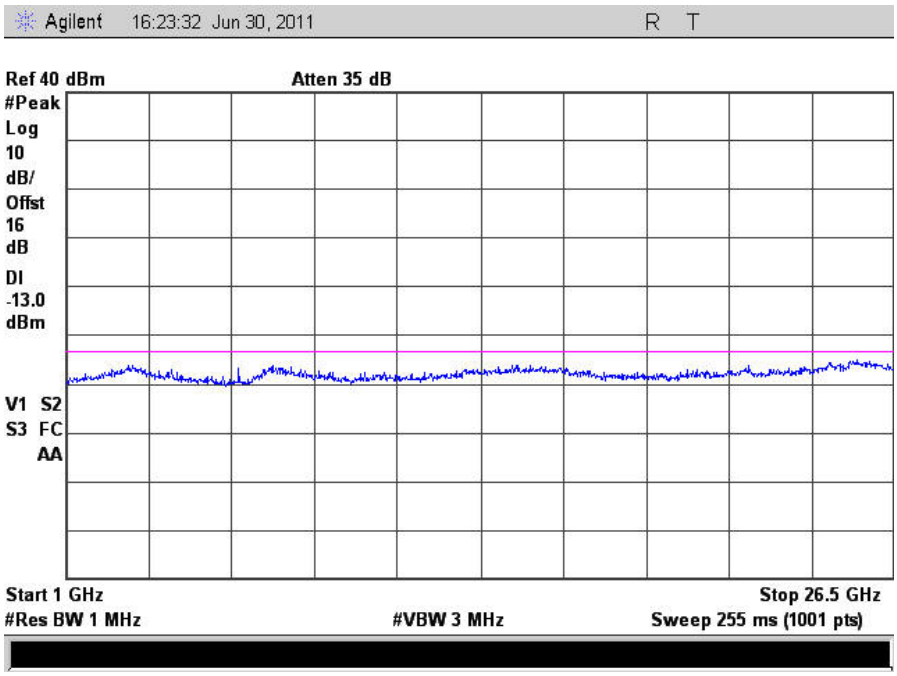
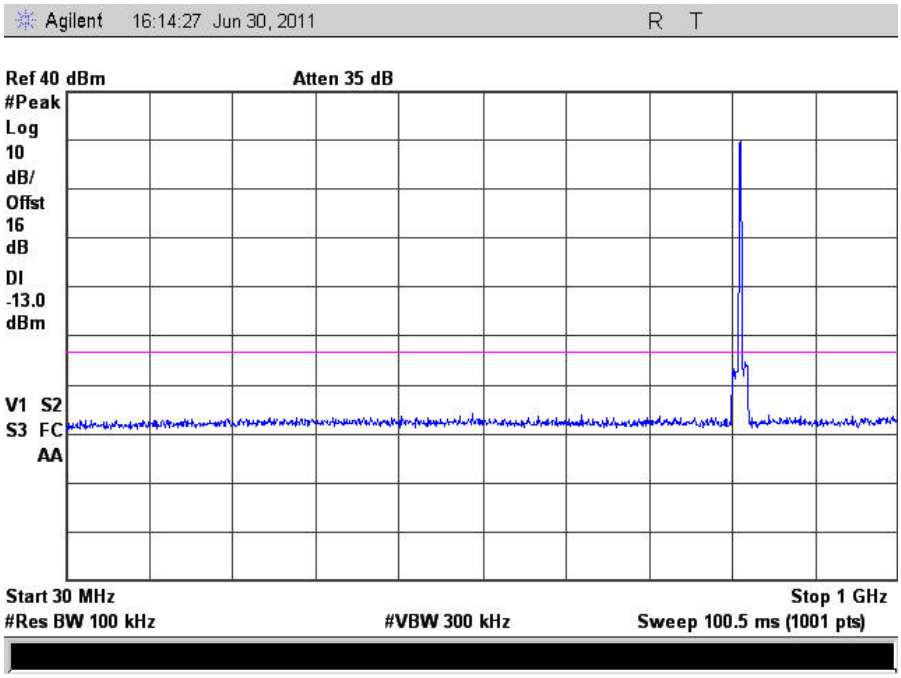
6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 90.210 (a) (b) (continued)

6.3.2. Low Channel 808 MHz, 1 to 26.5 GHz



6.3.3. Mid Channel 815 MHz, 30 MHz to 1 GHz



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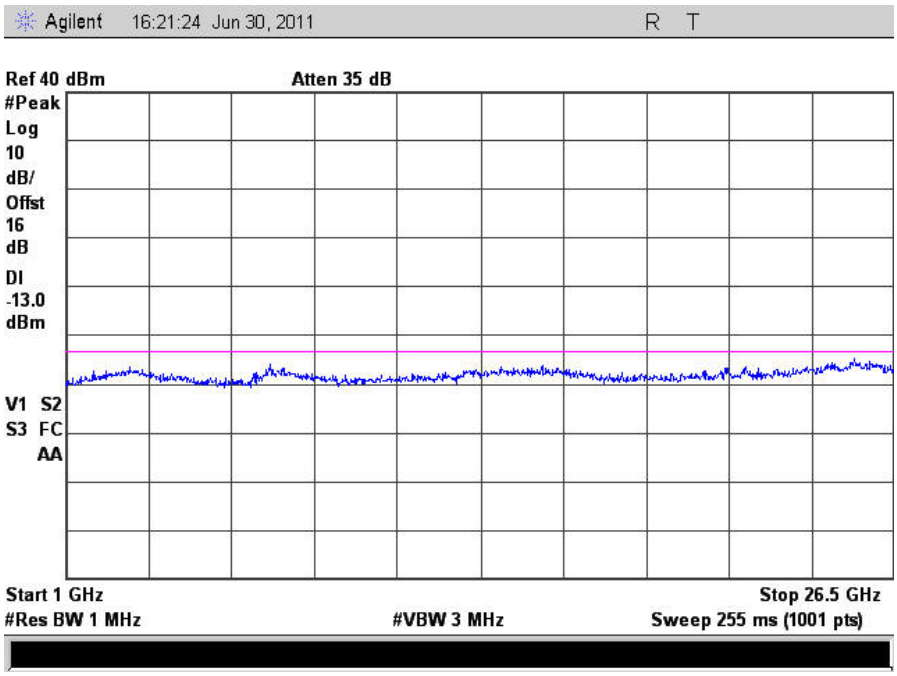
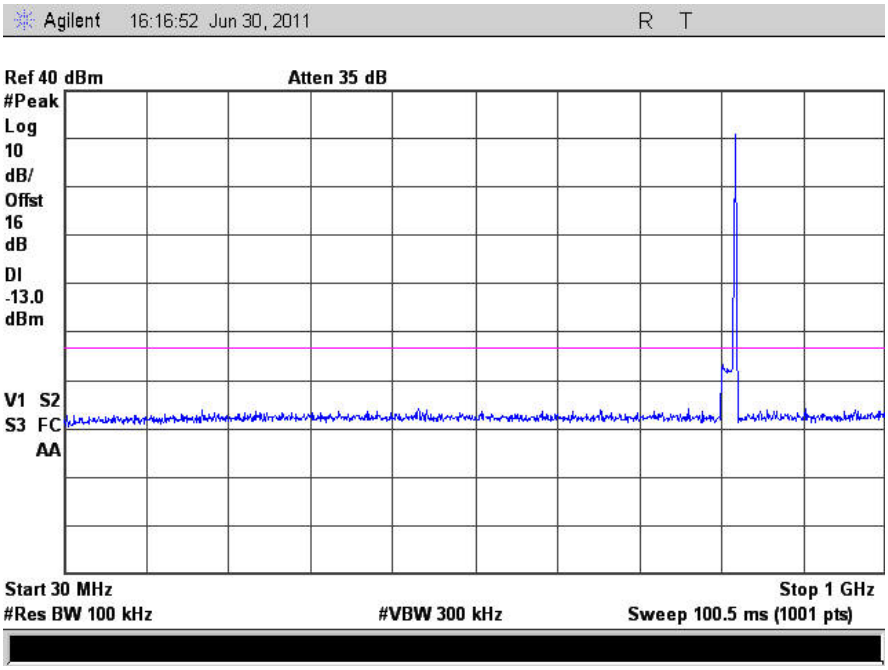
6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 90.210 (a) (b) (continued)

6.3.4. Mid channel 815 MHz, 1 to 26.5 GHz



6.3.5. High Channel 822 MHz, 30 to 1000 MHz



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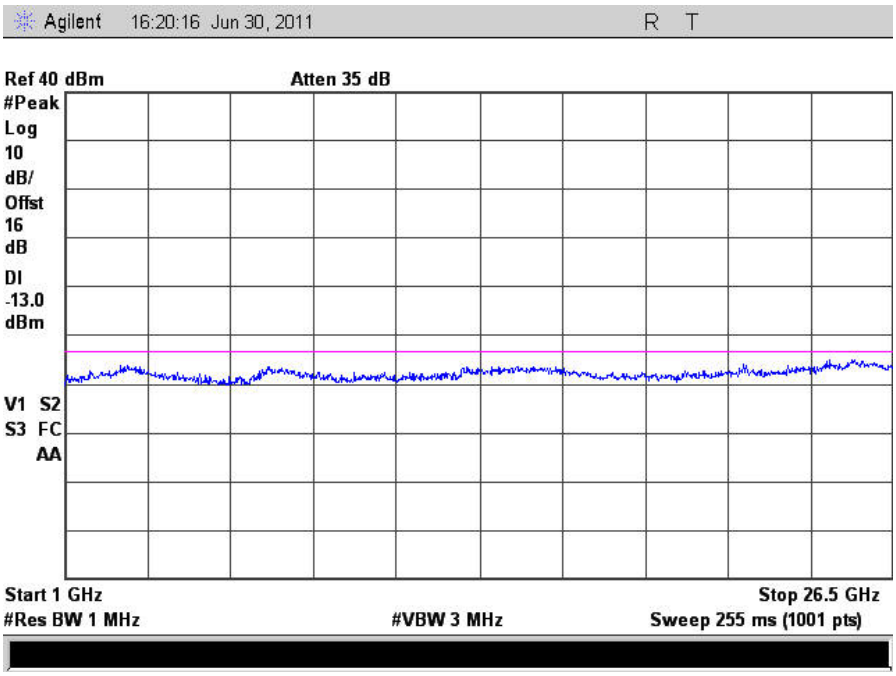
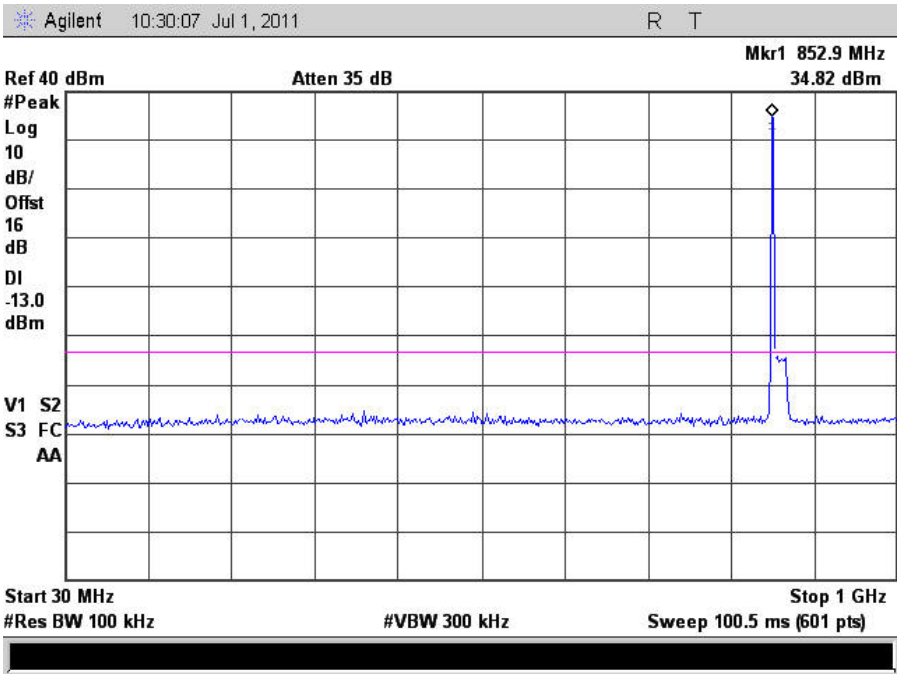
6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 90.210 (a) (b) (continued)

6.3.6. High Channel 822 MHz, 1 to 26.5 GHz



6.3.7. Low Channel 853 MHz, 30 to 1000 MHz



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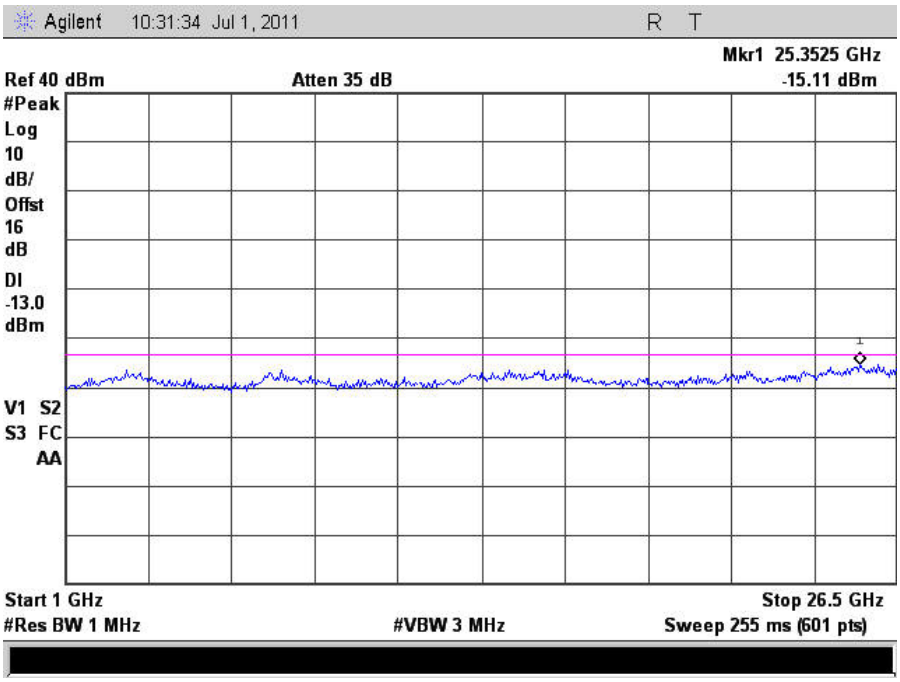
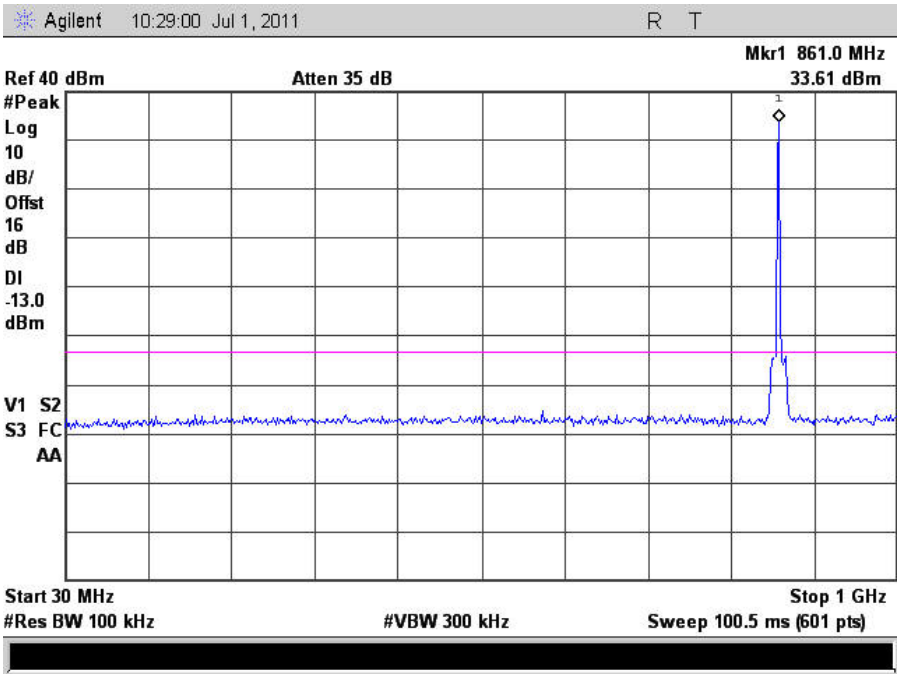
6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 90.210 (a) (b) (continued)

6.3.8. Low Channel 853 MHz, 1 to 26.5 GHz



6.3.9. Mid Channel 860 MHz, 30 to 1000 MHz



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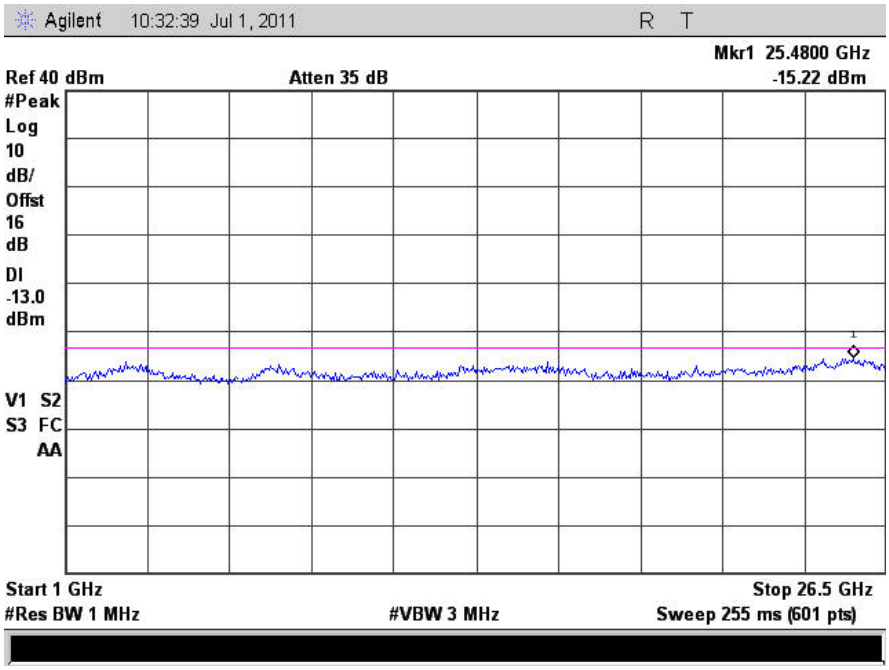
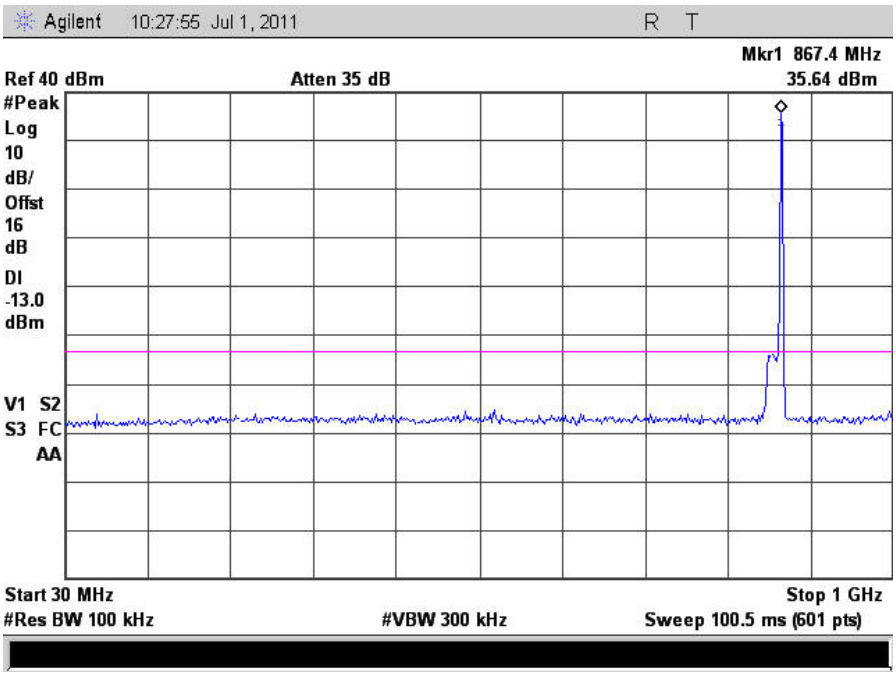
6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 90.210 (a) (b) (continued)

6.3.10. Mid Channel 860 MHz, 1 to 26.5 GHz



6.3.11. High Channel 867 MHz, 30 to 1000 MHz



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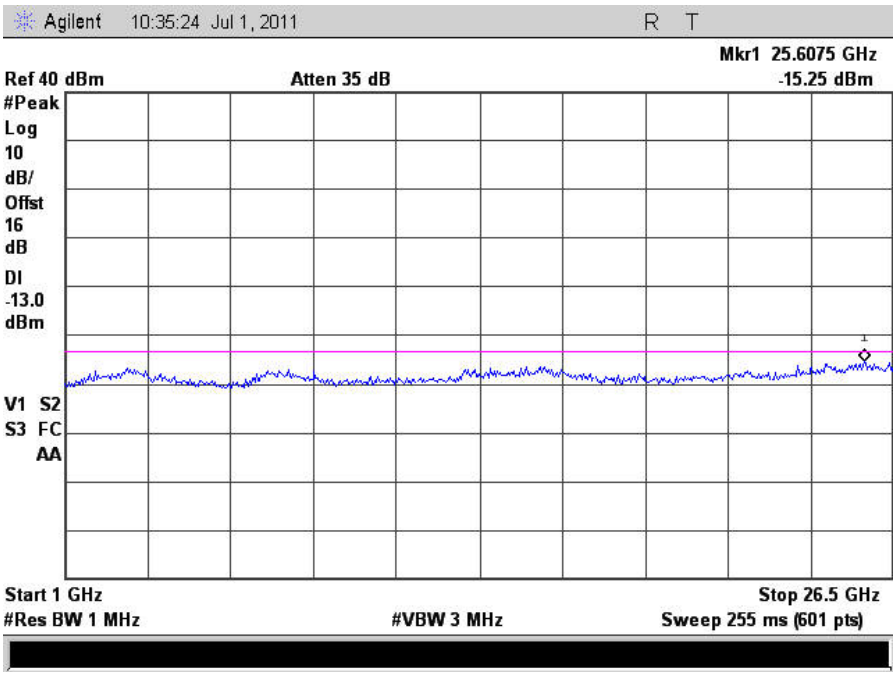
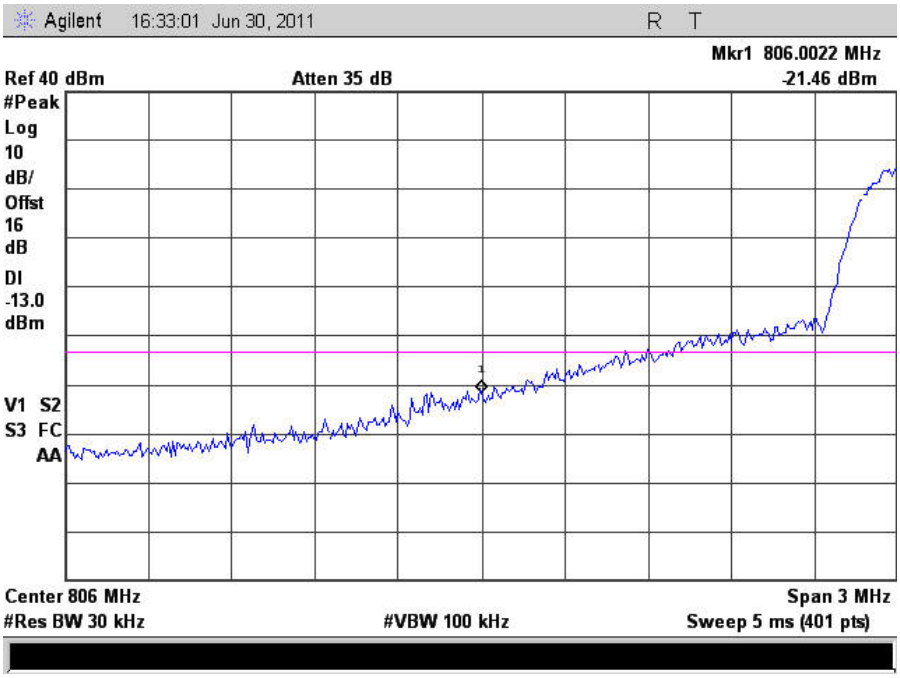
6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 90.210 (a) (b) (continued)

6.3.12. High Channel 867 MHz, 1 to 26.5 GHz



6.3.13. Low Channel 808 MHz Lower Bandedge Measurement



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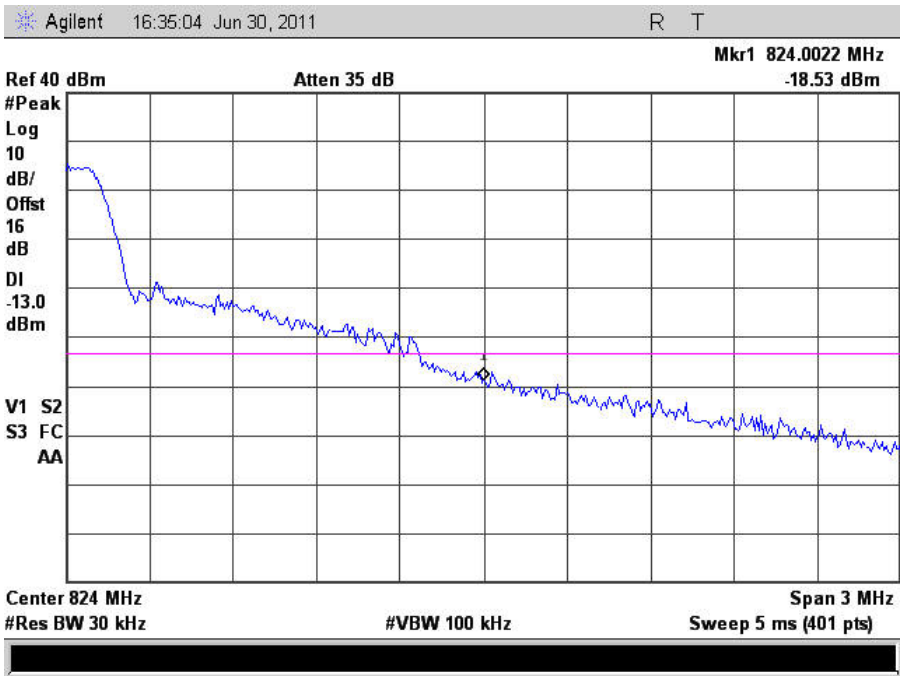
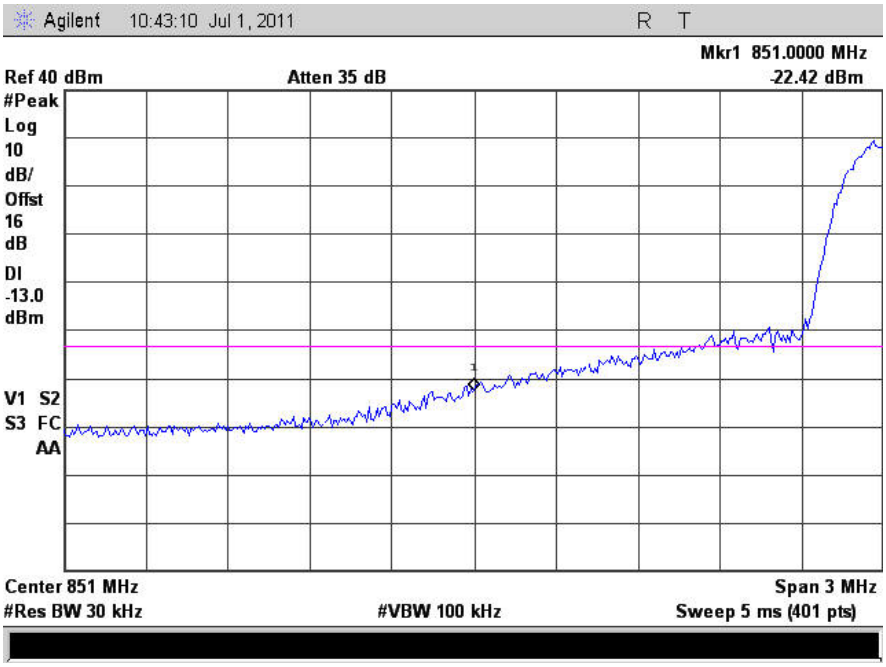
6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 90.210 (a) (b) (continued)

6.3.14. High Channel 822 MHz Upper Bandedge Measurement



6.3.15. Low Channel 853 MHz Lower Bandedge Measurement



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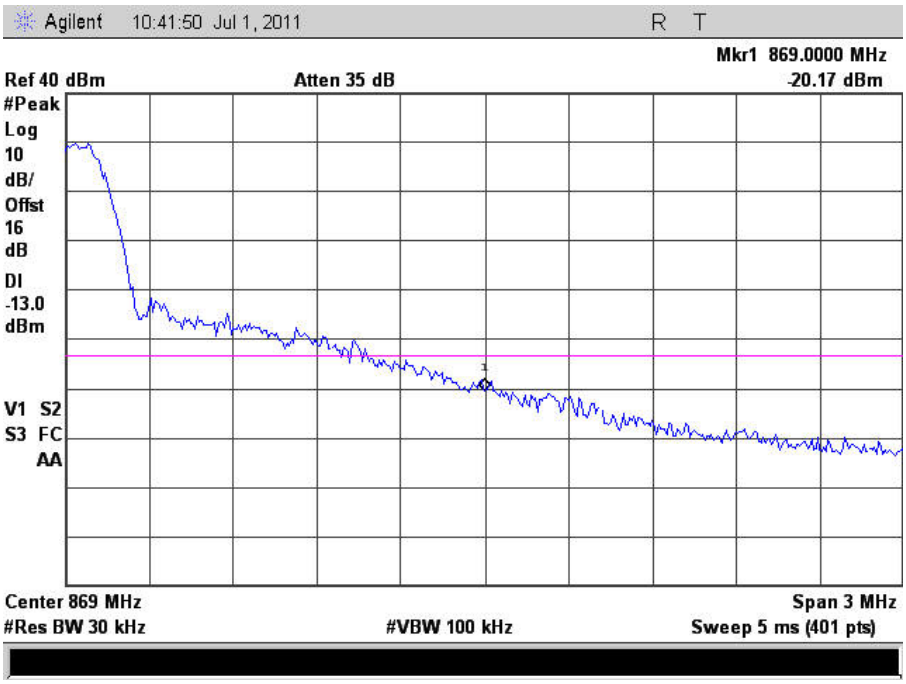
6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 90.210 (a) (b) (continued)

6.3.16. High Channel 867 MHz Upper Bandedge Measurement



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6. Measurement Data (continued)

6.4. Field Strength of Spurious Emissions 90.219 (c)

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

6.4.1. Measurement and Equipment Setup

Test Date:	05/24/2011
Test Engineer:	Tony Marchisio
Site Temperature (°C):	22.5
Relative Humidity (%RH):	47
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

6.4.2 Test Procedure

Test measurements were made in accordance with ANSI C63.4-2003, Standard Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronics Equipment in the Range of 9 kHz to 40 GHz.

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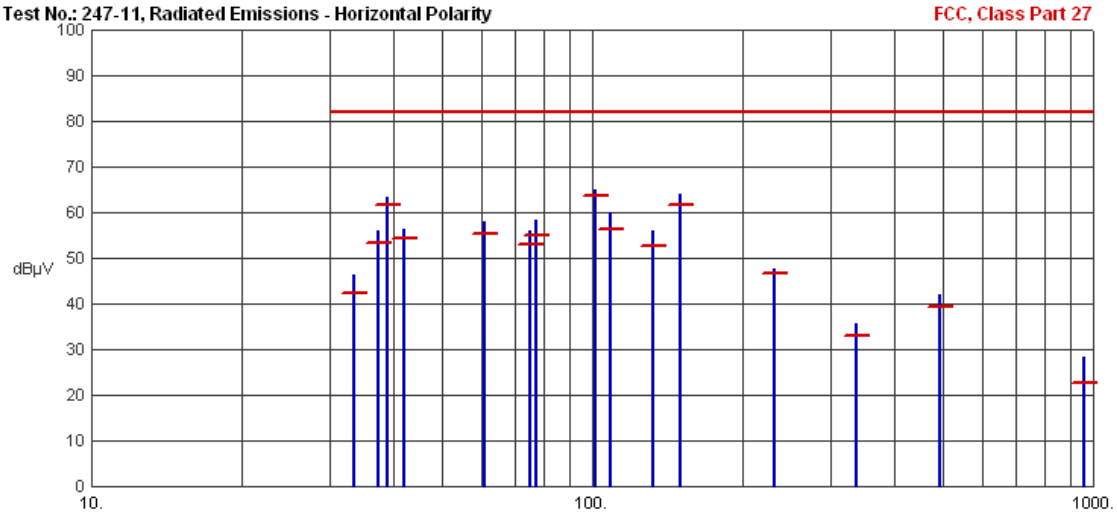
6. Measurement Data (continued)

6.4. Field Strength of Spurious Emissions 90.219 (c) (continued)

6.4.3. Horizontal Polarity



Frequency (MHz)	Pk Amp (dBµV/m)	QP Amp (dBµV/m)	QP Limit (dBµV/m)	Margin (dB)	Ant Ht (cm)	Table (Deg)	Comments
33.5254	46.32	42.37	82.00	-39.63	N/A	N/A	
37.3613	55.94	53.19	82.00	-28.81	N/A	N/A	
39.0530	63.33	61.62	82.00	-20.38	N/A	N/A	
42.2099	56.44	54.26	82.00	-27.74	N/A	N/A	
61.0660	58.11	55.21	82.00	-26.79	N/A	N/A	
75.3288	55.92	52.88	82.00	-29.12	N/A	N/A	
77.2500	58.36	55.04	82.00	-26.96	N/A	N/A	
101.0880	65.07	63.73	82.00	-18.27	N/A	N/A	
108.8130	59.92	56.20	82.00	-25.80	N/A	N/A	
132.1922	55.91	52.61	82.00	-29.39	N/A	N/A	
150.3064	64.07	61.66	82.00	-20.34	N/A	N/A	
231.0085	47.81	46.53	82.00	-35.47	N/A	N/A	
336.0188	35.70	32.85	82.00	-49.15	N/A	N/A	
494.9951	42.03	39.31	82.00	-42.69	N/A	N/A	
961.8794	28.39	22.75	82.00	-59.25	N/A	N/A	

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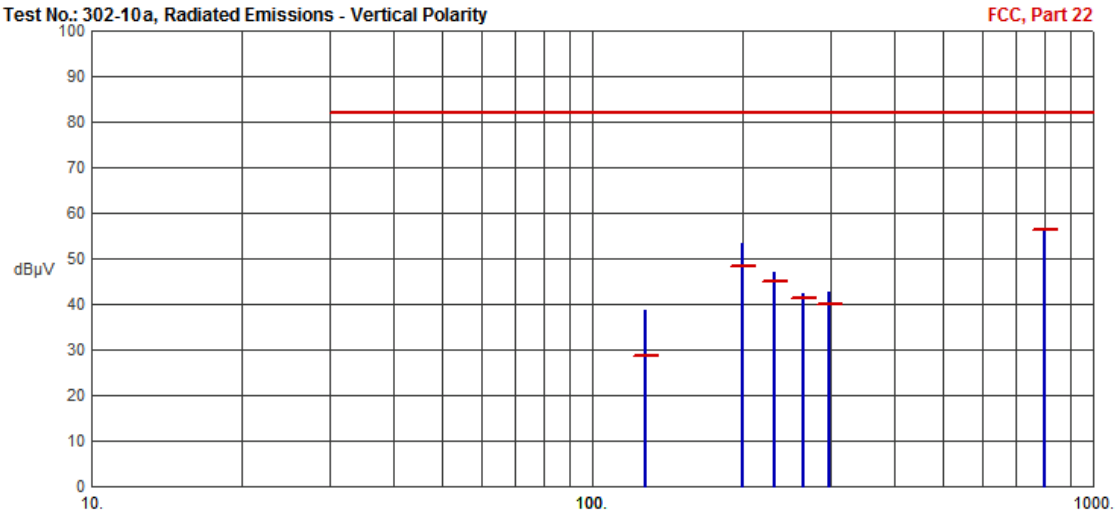
6. Measurement Data (continued)

6.4. Field Strength of Spurious Emissions 90.219 (c) (continued)

6.4.4. Vertical Polarity



Frequency (MHz)	Pk Amp (dBµV/m)	QP Amp (dBµV/m)	QP Limit (dBµV/m)	Margin (dB)	Ant Ht (cm)	Table (Deg)	Comments
127.2941	38.64	28.80	82.00	-53.20	N/A	N/A	
200.0007	53.29	48.34	82.00	-33.66	N/A	N/A	
231.0014	46.88	45.14	82.00	-36.86	N/A	N/A	
263.9990	42.19	41.30	82.00	-40.70	N/A	N/A	
296.9938	42.66	39.87	82.00	-42.13	N/A	N/A	
800.0041	56.71	56.19	82.00	-25.81	N/A	N/A	

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6. Measurement Data (continued)

6.4. Field Strength of Spurious Emissions 90.219 (c) (b) (continued)

6.4.5. Measurement and Equipment Setup

Test Date:	05/24/2011
Test Engineer:	Tony Marchisio
Site Temperature (°C):	22.5
Relative Humidity (%RH):	47
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 Average
Antenna Height:	1 to 4 meters

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6.4.6. Radiated Emissions above 1 GHz

There were no measurable emissions above 1 GHz

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6. Measurement Data (continued)

6.5. Frequency Tolerance 90.213

Requirement: The carrier frequency of each transmitter in the Public Mobile Services must be maintained within 1.0 or 1.5 ppm for a base station in the frequency band 806 to 869 MHz.

Note: The EUT does not translate the input frequency

Result: Compliant

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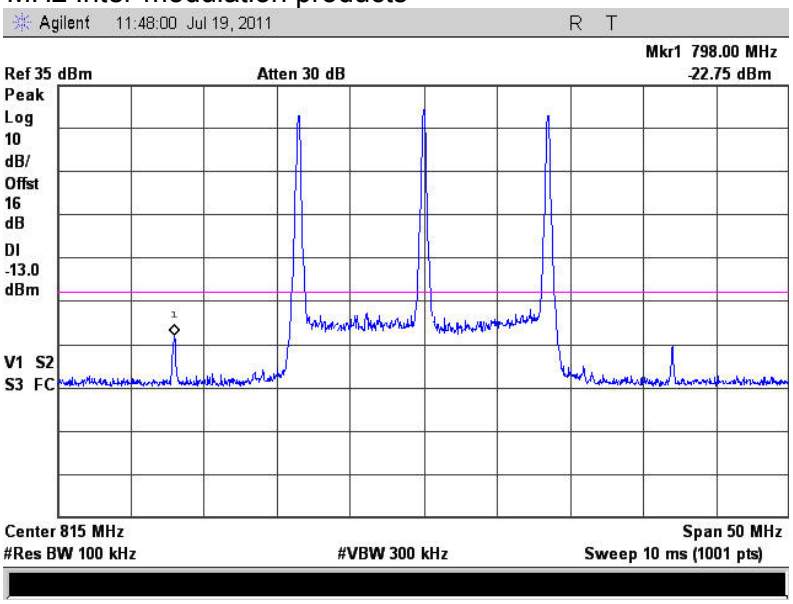
6. Measurement Data (continued)

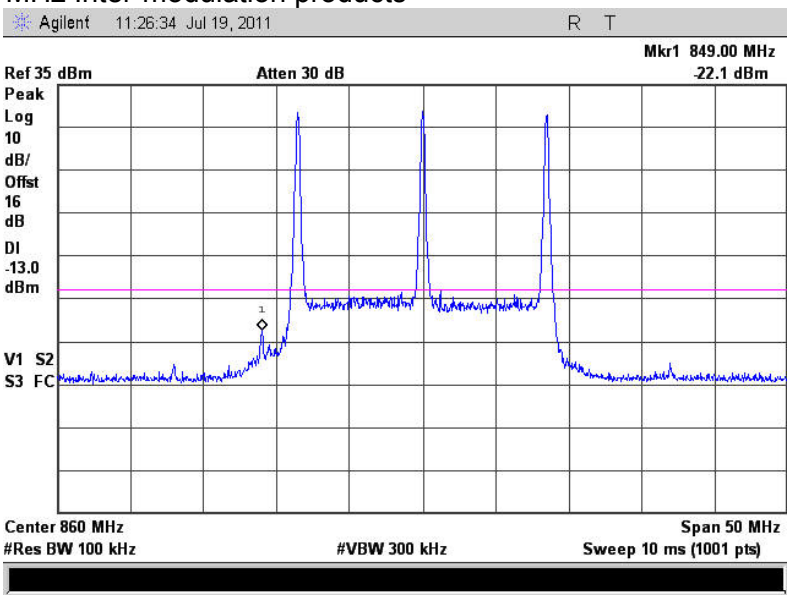
6.6. Inter-modulation

Requirement: Using the maximum drive level determined in the output power section apply three modulated tones at low, mid and high frequencies in the band and verify the inter-modulation products do not exceed -13 dBm conducted.

6.6.1. 815 MHz Inter-modulation products



6.6.2. 860 MHz Inter-modulation products



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6. Measurement Data (continued)

6.7. Public Exposure to Radio Frequency Energy Levels 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	31.22	3	0.525	5.25	1	Compliant
Mid	20	30.78	3	0.475	4.75	1	Compliant
High	20	32.22	3	0.661	6.61	1	Compliant
Low	20	35.91	0	0.775	7.75	1	Compliant
Mid	20	36.13	0	0.816	8.16	1	Compliant
High	20	35.56	0	0.715	7.15	1	Compliant

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

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
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.

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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.

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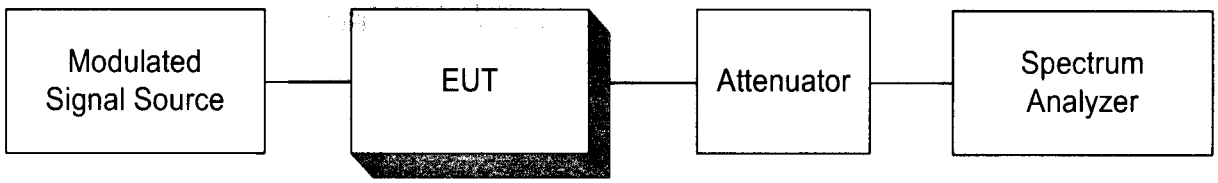
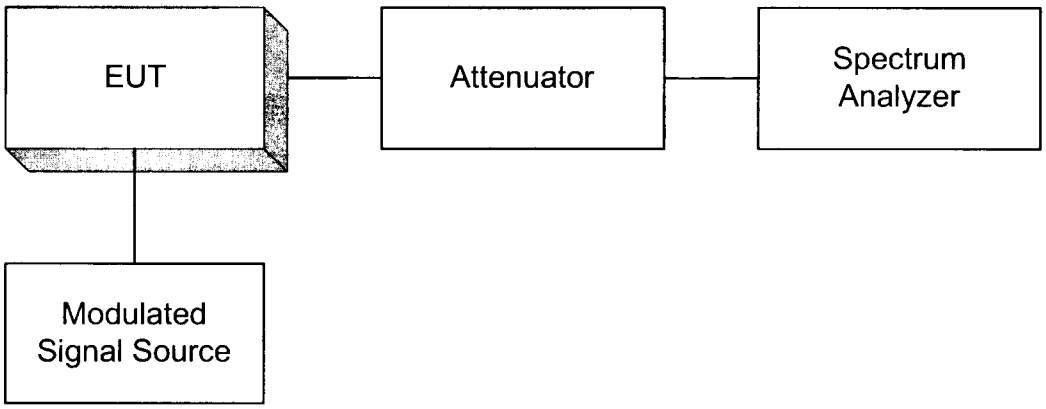
Appendix A

RF Output Power



Occupied Bandwidth



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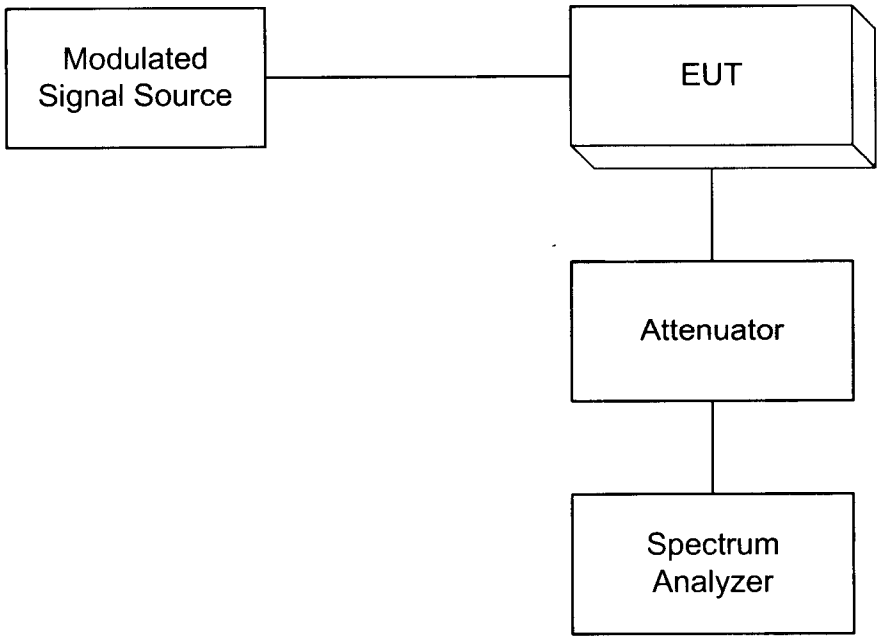
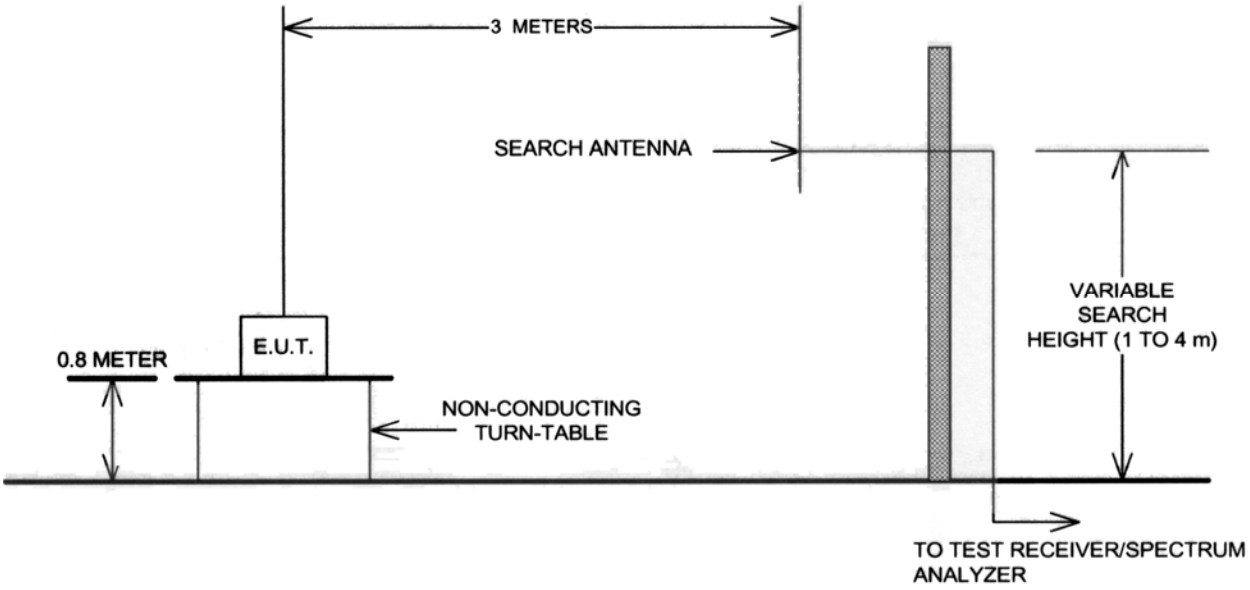
Appendix A

Spurious Emissions at the Antenna Terminals



Field Strength of Spurious Radiation



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