

**COMPLIANCE WORLDWIDE INC.
TEST REPORT 411-12**

In Accordance with the Requirements of
**FCC PART 24:2012 Subpart E
IC RSS 133, Issue 6 (January 2013)**

Issued to

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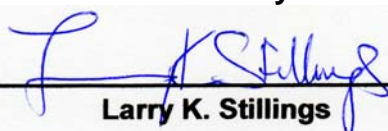
for

**Co-Pilot Beacon P4
Model: CSI-CPBH-MG-P4**

**FCC ID: NVRCSICPBHMG-P4
IC: 4307A-CPBHMGP4**


Report Issued on April 5, 2013

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 CSI-CPBH-MG-P4, as tested, meets the FCC Part 24 Subpart E 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:** Co-Pilot Beacon CSI-CPBH-MG-P4
- 2.3. Serial Number:** Pre production prototype
- 2.4. Description:** The Co-Pilot Beacon 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	SP130P954ER	06502248	
Notebook PC	Dell	Latitude D610	19472301901	Configuring Unit

3.2. Cables

Cable Type	Length	Shield	From	To
RF, 50 Ω, SMA male – SMA male	1M	Yes	DUT	Cellular Antennas
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	2M	Yes	DUT	Notebook PC
USB 1 & USB 2	2M	Yes	DUT	Notebook PC
Ethernet	2M	No	DUT	Notebook PC

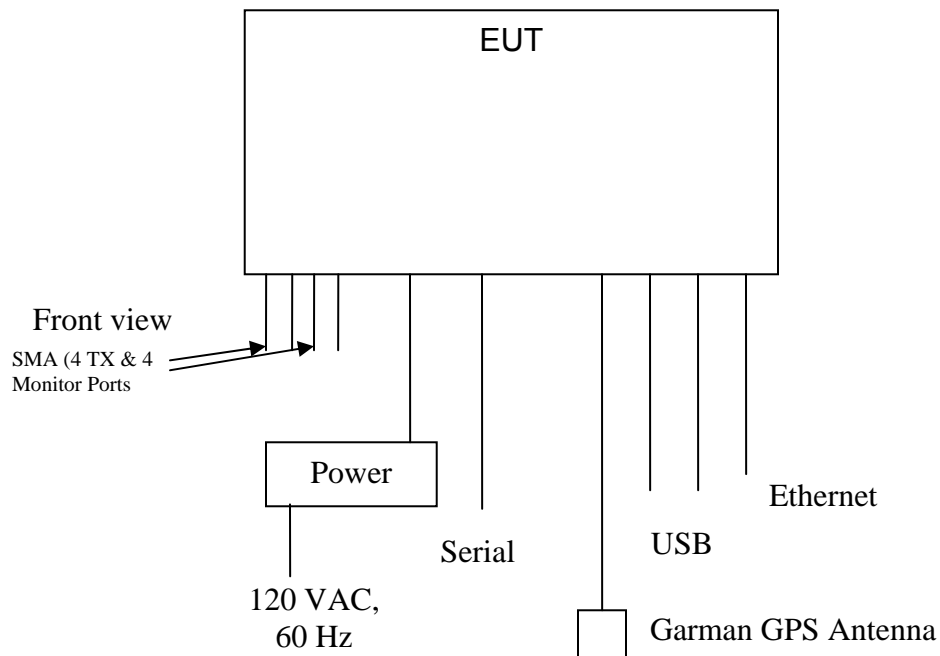
Notebook PC is connected only during setup

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	2/26/2015
Spectrum Analyzer	Rohde & Schwarz	FSV40	100899	5/31/2013
EMI Receiver	Hewlett Packard	8546A	3330A00115	06/08/2014
Microwave Preamp	Hewlett Packard	8449B	3008A01323	12/01/2013
Bilog Antenna	Com-Power	AC-220	25509	8/31/2013
Horn Antenna	Electro-Metrics	EM-6961	6337	10/19/2013
Horn Antenna	Com-Power	AH-826	080151	08/27/2014
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	5/1/2013
AC Power Source	Combinova	AC Source 330	3475	UWCE

4.2. Measurement & Equipment Setup

Test Dates: 12/26/2012, 12/28/2012,
1/4/2013, 4/1/2013

Test Engineer: Larry Stillings

Normal Site Temperature (15 – 35°C): 21.6

Relative Humidity (20 -75%RH): 25

4.3. Test Procedures

The test measurements contained in this report are based on the requirements detailed in FCC Parts 2 & Part 24, Subpart E.

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	IC Part Reference	Test Report Section	Result	Comment
Power and Antenna height limits, Output Power	24.232	RSS-133 6.4	6.1	Compliant	
Occupied Bandwidth	Part 2.1049	RSS-GEN	6.2	Compliant	
Spurious Emissions at Antenna Terminals	24.238	RSS-133 6.5	6.3	Compliant	
Field Strength of Spurious Emissions	24.238	RSS-133 6.5 & 6.6	6.4	Compliant	
Frequency Stability	24.235	RSS-133 6.3	6.5	Compliant	1.0 ppm Must stay in frequency block
Public Exposure to Radio Frequency Energy Levels	Section 1.1307 (b)(1)	RSS-102	6.6	Compliant	

6. Measurement Data

6.1. Power and Antenna Height Limits 24.232 (a), RSS-133 6.4

Requirement: Base stations are limited to 1640 watts peak equivalent isotropically radiated power (EIRP) with an antenna height up to 300 meters HAAT.

6.1.1. Peak Transmitter Output Power, Transmitter Only

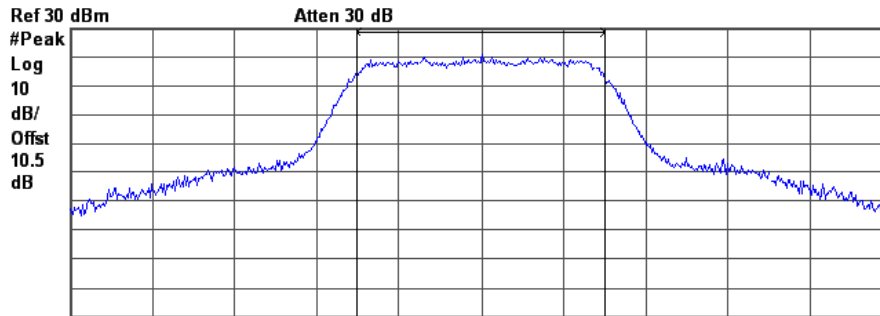
Channels	Frequency	Output Power		Result
	(MHz)	(W)	(dBm)	
Low Channel 16 – TX1	1930.8	0.225	23.52	Compliant
Mid Channel 601 – TX1	1960.05	0.316	25.00	Compliant
High Channel 1186 – TX1	1989.3	0.280	24.47	Compliant
All Channels – TX1	1930.8 - 1989.3	0.542	27.34	Compliant
Low Channel 16 – TX2	1930.8	0.154	21.88	Compliant
Mid Channel 601 – TX2	1960.05	0.127	21.05	Compliant
High Channel 1186 – TX2	1989.3	0.140	21.47	Compliant
All Channels – TX2	1930.8 - 1989.3	0.242	23.83	Compliant
Low Channel 16 – TX3	1930.8	0.194	22.88	Compliant
Mid Channel 601 – TX3	1960.05	0.234	23.70	Compliant
High Channel 1186 – TX3	1989.3	0.196	22.92	Compliant
All Channels – TX3	1930.8 - 1989.3	0.335	25.25	Compliant
Low Channel 16 – TX4	1930.8	0.110	20.42	Compliant
Mid Channel 601 – TX4	1960.05	0.130	21.15	Compliant
High Channel 1186 – TX4	1989.3	0.056	17.45	Compliant
All Channels – TX4	1930.8 - 1989.3	0.136	21.33	Compliant

6. Measurement Data

6.1. Power and Antenna Height Limits 24.232 (a) (cont)

Low Channel 16 – TX1

Agilent 17:13:38 Dec 26, 2012 R T

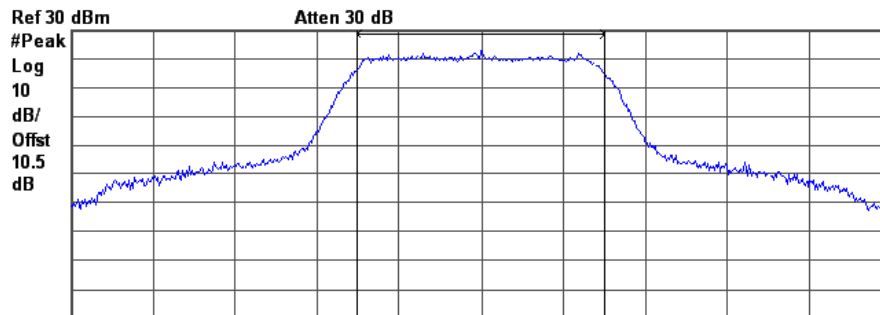


Center 1.931 GHz Span 4.167 MHz
#Res BW 100 kHz #VBW 300 kHz Sweep 6 ms (601 pts)

Channel Power Power Spectral Density
23.52 dBm / 1.2500 MHz -37.45 dBm/Hz

Mid Channel 601 – TX1

Agilent 17:15:41 Dec 26, 2012 R T



Center 1.96 GHz Span 4.167 MHz
#Res BW 100 kHz #VBW 300 kHz Sweep 6 ms (601 pts)

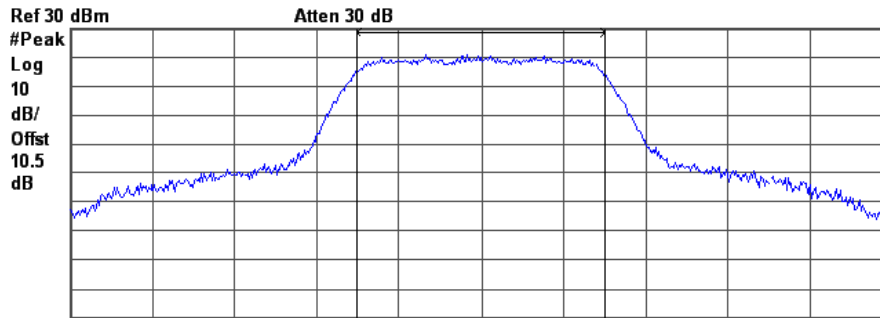
Channel Power Power Spectral Density
25.00 dBm / 1.2500 MHz -35.97 dBm/Hz

6. Measurement Data

6.1. Power and Antenna Height Limits 24.232 (a) (cont)

High Channel 1186 – TX1

Agilent 17:16:44 Dec 26, 2012 R T



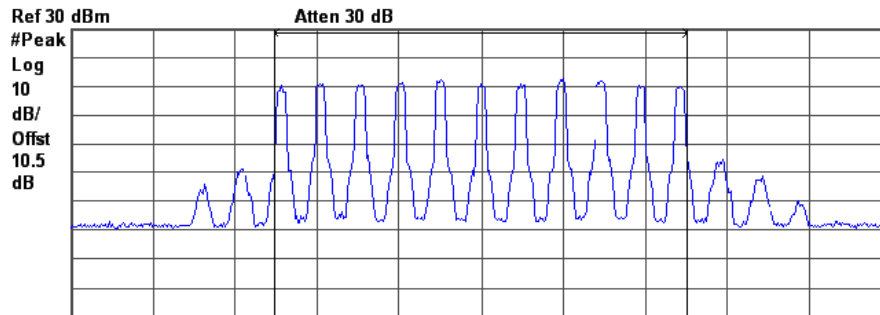
Center 1.989 GHz Span 4.167 MHz
#Res BW 100 kHz #VBW 300 kHz Sweep 6 ms (601 pts)

Channel Power Power Spectral Density
24.47 dBm / 1.2500 MHz -36.50 dBm/Hz



All Channels – TX1

Agilent 17:10:11 Dec 26, 2012 R T



Center 1.96 GHz Span 120 MHz
#Res BW 100 kHz #VBW 300 kHz Sweep 12.43 ms (601 pts)

Channel Power Power Spectral Density
27.34 dBm / 60.0000 MHz -50.45 dBm/Hz

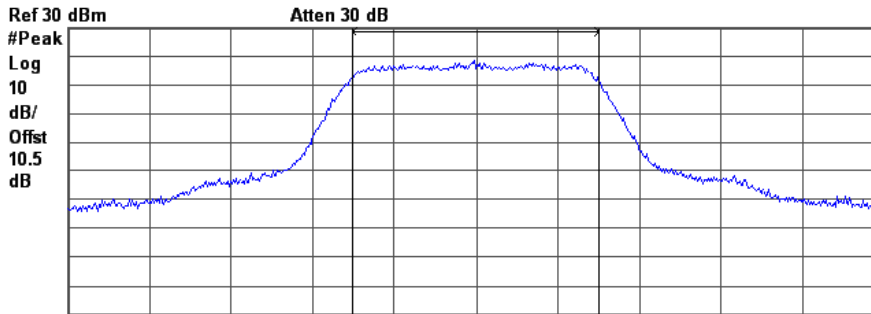


6. Measurement Data

6.1. Power and Antenna Height Limits 24.232 (a) (cont)

Low Channel 16 – TX2

Agilent 16:07:16 Dec 28, 2012 R T

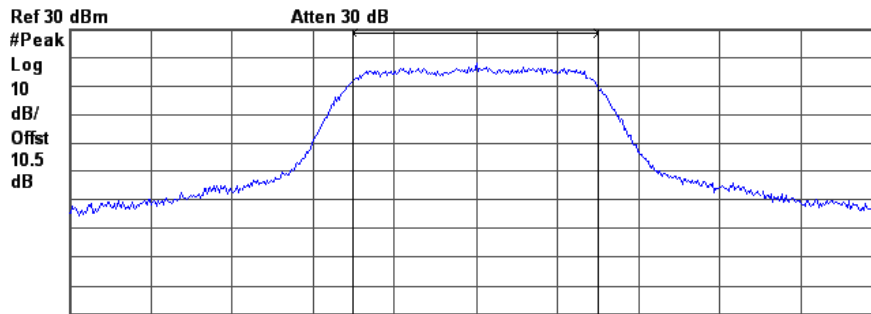


Center 1.931 GHz Span 4.167 MHz
#Res BW 100 kHz #VBW 300 kHz Sweep 6 ms (601 pts)

Channel Power Power Spectral Density
21.88 dBm / 1.2500 MHz -39.09 dBm/Hz

Mid Channel 601 – TX2

Agilent 16:09:41 Dec 28, 2012 R T



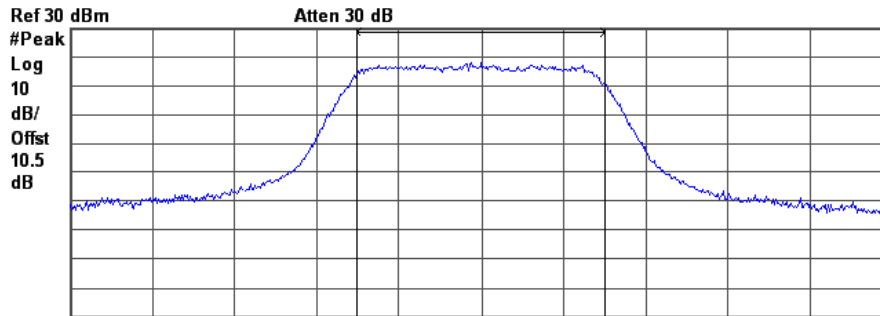
Center 1.96 GHz Span 4.167 MHz
#Res BW 100 kHz #VBW 300 kHz Sweep 6 ms (601 pts)

Channel Power Power Spectral Density
21.05 dBm / 1.2500 MHz -39.92 dBm/Hz

6. Measurement Data

6.1. Power and Antenna Height Limits 24.232 (a) (cont)
High Channel 1186 – TX2

Agilent 16:11:01 Dec 28, 2012 R T

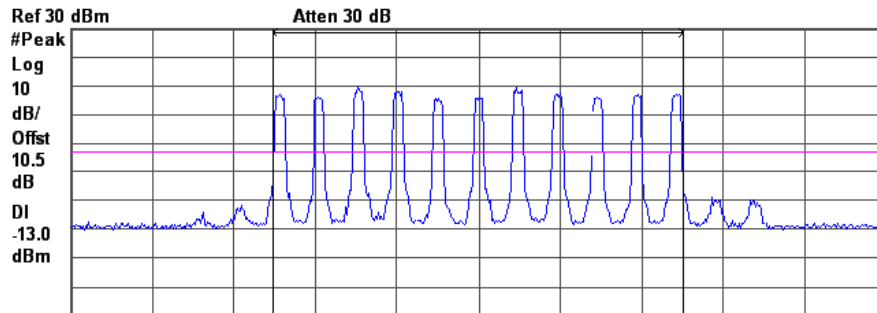


Center 1.989 GHz Span 4.167 MHz
#Res BW 100 kHz #VBW 300 kHz Sweep 6 ms (601 pts)

Channel Power Power Spectral Density
21.47 dBm / 1.2500 MHz -39.50 dBm/Hz

All Channels – TX2

Agilent 15:59:14 Dec 28, 2012 R T



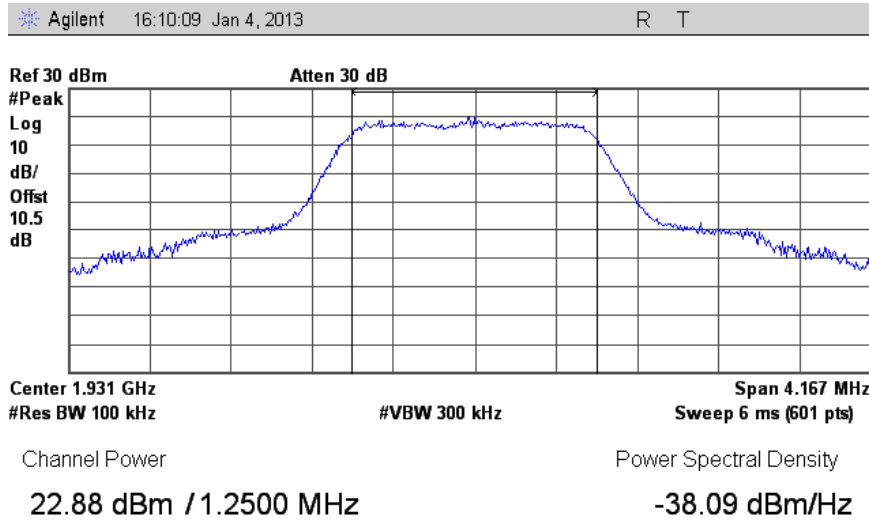
Center 1.96 GHz Span 120 MHz
#Res BW 100 kHz #VBW 300 kHz Sweep 12.43 ms (601 pts)

Channel Power Power Spectral Density
23.83 dBm / 60.0000 MHz -53.96 dBm/Hz

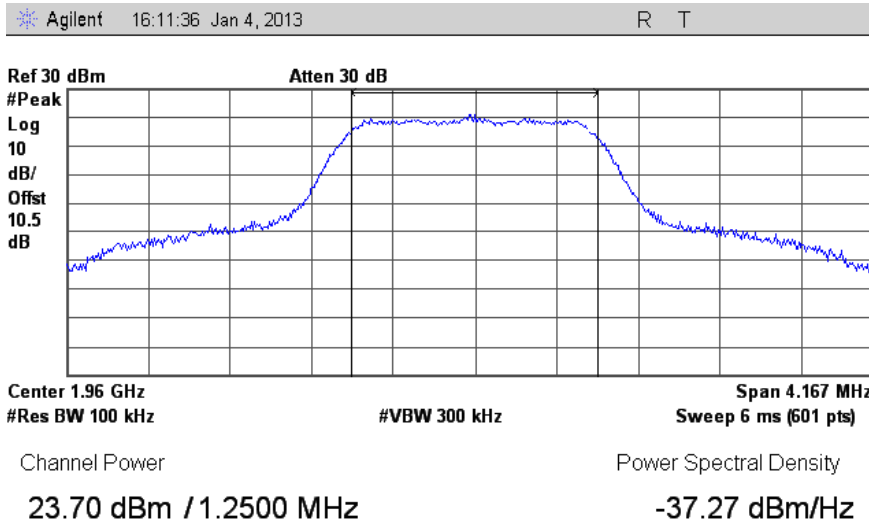
6. Measurement Data

6.1. Power and Antenna Height Limits 24.232 (a) (cont)

Low Channel 16 – TX3



Mid Channel 601 – TX3

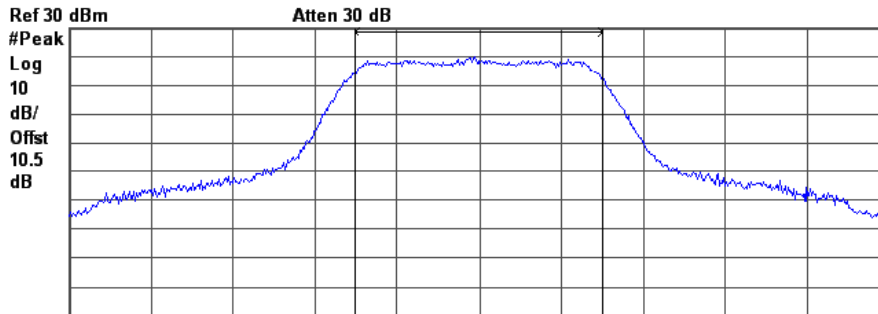


6. Measurement Data

6.1. Power and Antenna Height Limits 24.232 (a) (cont)

High Channel 1186 – TX3

Agilent 16:12:46 Jan 4, 2013 R T

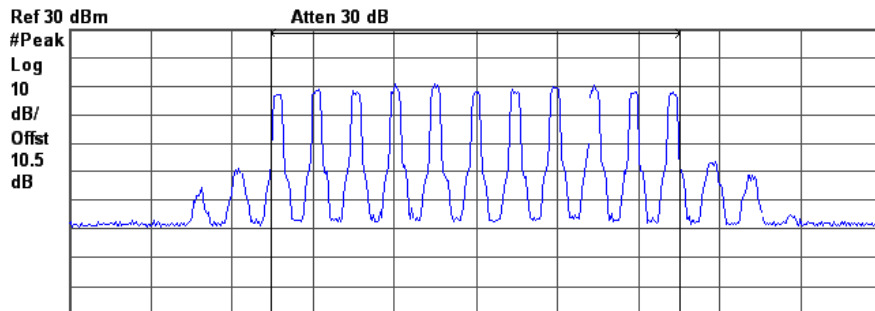


Center 1.989 GHz Span 4.167 MHz
#Res BW 100 kHz #VBW 300 kHz Sweep 6 ms (601 pts)

Channel Power Power Spectral Density
22.92 dBm / 1.2500 MHz -38.05 dBm/Hz

All Channels – TX3

Agilent 16:59:07 Dec 28, 2012 R T

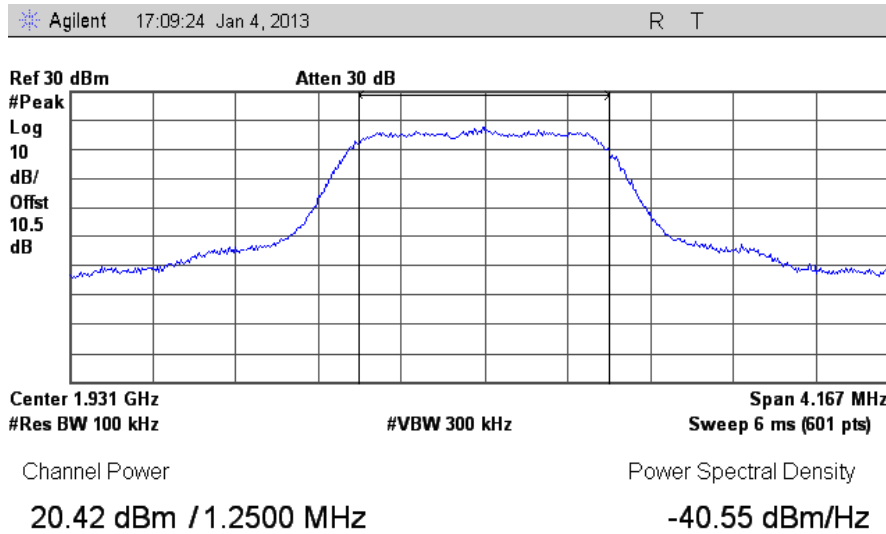


Center 1.96 GHz Span 120 MHz
#Res BW 100 kHz #VBW 300 kHz Sweep 12.43 ms (601 pts)

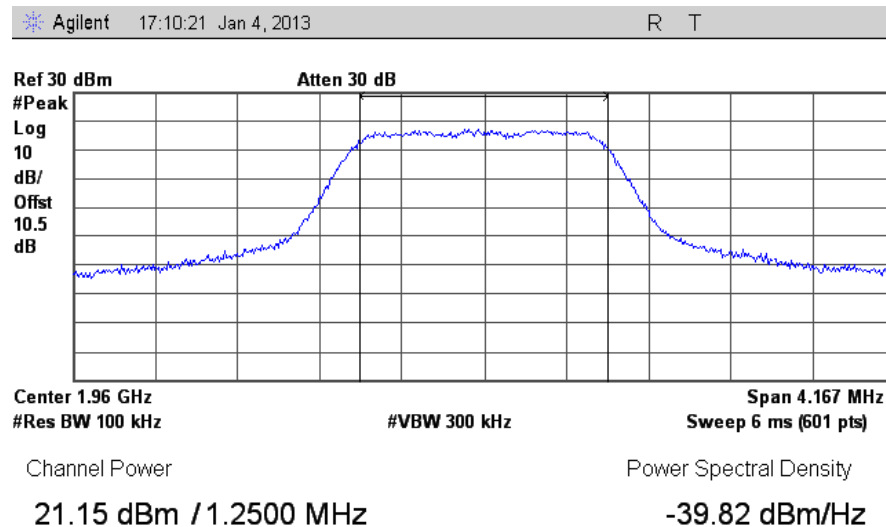
Channel Power Power Spectral Density
25.25 dBm / 60.0000 MHz -52.53 dBm/Hz

6. Measurement Data

6.1. Power and Antenna Height Limits 24.232 (a) (cont)
Low Channel 16 – TX4



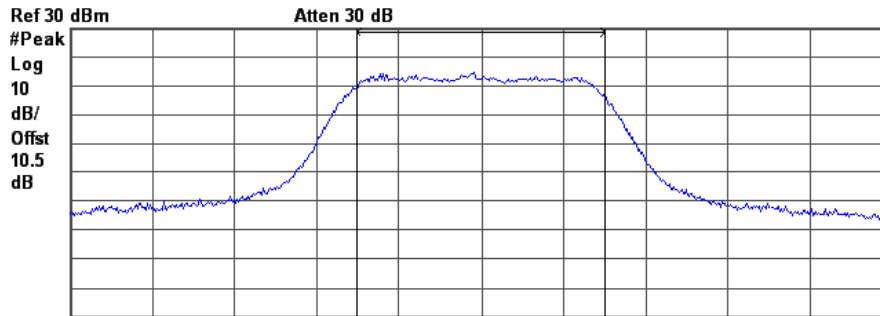
Mid Channel 601 – TX4



6. Measurement Data

6.1. Power and Antenna Height Limits 24.232 (a) (cont)
High Channel 1186 – TX4

Agilent 17:11:47 Jan 4, 2013 R T

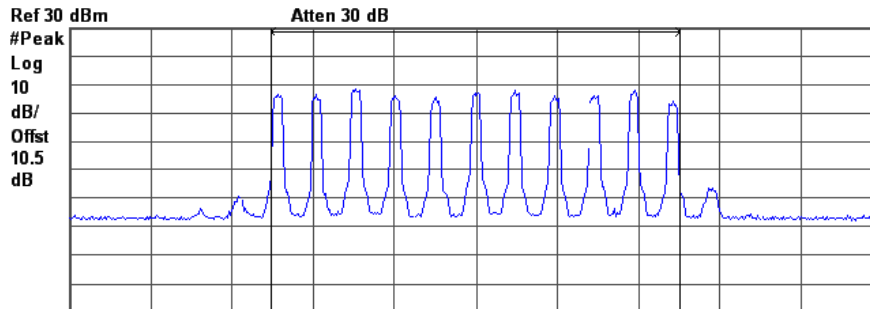


Center 1.989 GHz Span 4.167 MHz
#Res BW 100 kHz #VBW 300 kHz Sweep 6 ms (601 pts)

Channel Power Power Spectral Density
17.45 dBm / 1.2500 MHz -43.52 dBm/Hz

All Channels – TX4

Agilent 17:06:37 Jan 4, 2013 R T



Center 1.96 GHz Span 120 MHz
#Res BW 100 kHz #VBW 300 kHz Sweep 12.43 ms (601 pts)

Channel Power Power Spectral Density
21.33 dBm / 60.0000 MHz -56.45 dBm/Hz

6. Measurement Data

6.1. Power and Antenna Height 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."

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

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 TX1	Frequency	Transmitter Power ¹	Cable Insertion Loss	Antenna Gain ²	Total Output Power	
	(MHz)				(dBm)	(dBm)
Low	1930.8	23.52	0.00	+3	26.52	0.45
Mid	1960.05	25.00	0.00	+3	28.00	0.63
High	1989.3	24.47	0.00	+3	27.47	0.56
All	1930.8-1989.3	27.34	0.00	+3	30.34	1.08
Low	1930.8	23.52	0.00	+14	37.52	5.65
Mid	1960.05	25.00	0.00	+14	39.00	7.94
High	1989.3	24.47	0.00	+14	38.47	7.03
All	1930.8-1989.3	27.34	0.00	+14	41.34	13.61

Channel TX2	Frequency	Transmitter Power ¹	Cable Insertion Loss	Antenna Gain ²	Total Output Power	
	(MHz)				(dBm)	(dBm)
Low	1930.8	21.88	0.00	+3	24.88	0.31
Mid	1960.05	21.05	0.00	+3	24.05	0.25
High	1989.3	21.47	0.00	+3	24.47	0.28
All	1930.8-1989.3	23.83	0.00	+3	26.83	0.48
Low	1930.8	21.88	0.00	+14	35.88	3.87
Mid	1960.05	21.05	0.00	+14	35.05	3.20
High	1989.3	21.47	0.00	+14	35.47	3.52
All	1930.8-1989.3	23.83	0.00	+14	37.83	6.07

¹ Measured. See section 6.1.1.

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

6. Measurement Data

6.1. Power and Antenna Height 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."

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

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 TX3	Frequency	Transmitter Power ¹	Cable Insertion Loss	Antenna Gain ²	Total Output Power	
	(MHz)	(dBm)	(dB)	(dBi)	(dBm)	(Watts)
Low	1930.8	22.88	0.00	+3	25.88	0.39
Mid	1960.05	23.70	0.00	+3	26.70	0.47
High	1989.3	22.92	0.00	+3	25.92	0.39
All	1930.8-1989.3	25.25	0.00	+3	28.25	0.67
Low	1930.8	22.88	0.00	+14	36.88	4.88
Mid	1960.05	23.70	0.00	+14	37.70	5.89
High	1989.3	22.92	0.00	+14	36.92	4.92
All	1930.8-1989.3	25.25	0.00	+14	39.25	8.41

Channel TX4	Frequency	Transmitter Power ¹	Cable Insertion Loss	Antenna Gain ²	Total Output Power	
	(MHz)	(dBm)	(dB)	(dBi)	(dBm)	(Watts)
Low	1930.8	20.42	0.00	+3	23.42	0.22
Mid	1960.05	21.15	0.00	+3	24.15	0.26
High	1989.3	17.45	0.00	+3	20.45	0.11
All	1930.8-1989.3	21.33	0.00	+3	24.33	0.27
Low	1930.8	20.42	0.00	+14	34.42	2.77
Mid	1960.05	21.15	0.00	+14	35.15	3.27
High	1989.3	17.45	0.00	+14	31.45	1.40
All	1930.8-1989.3	21.33	0.00	+14	35.33	3.41

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, IC RSS-GEN

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 – TX1	1930.8	1.2680	Compliant
Mid Channel – TX1	1960.05	1.2664	Compliant
High Channel – TX1	1989.3	1.2670	Compliant
Low Channel – TX2	1930.8	1.2667	Compliant
Mid Channel – TX2	1960.05	1.2711	Compliant
High Channel – TX2	1989.3	1.2679	Compliant
Low Channel – TX3	1930.8	1.2692	Compliant
Mid Channel – TX3	1960.05	1.2663	Compliant
High Channel – TX3	1989.3	1.2500	Compliant
Low Channel – TX4	1930.8	1.2711	Compliant
Mid Channel – TX4	1960.05	1.2665	Compliant
High Channel – TX4	1989.3	1.2656	Compliant

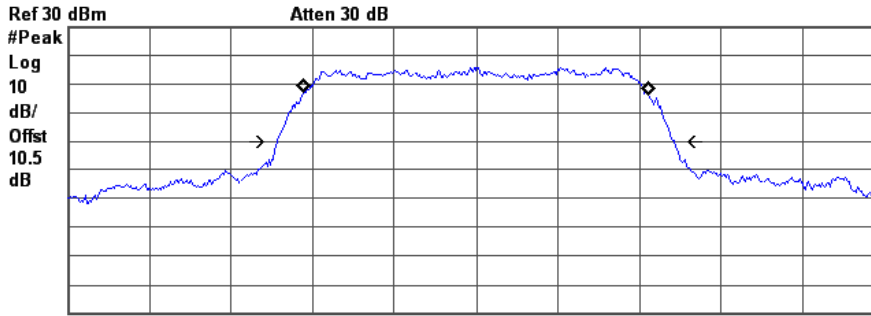
NOTE: EUT can only transmit a CDMA signal.

6. Measurement Data (continued)

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

6.2.1.1. Occupied (99% Power) Bandwidth Measurement, 1930.8 MHz – TX1

Agilent 17:20:40 Dec 26, 2012 R T



Center 1.931 GHz Span 3 MHz
#Res BW 30 kHz #VBW 100 kHz Sweep 6 ms (601 pts)

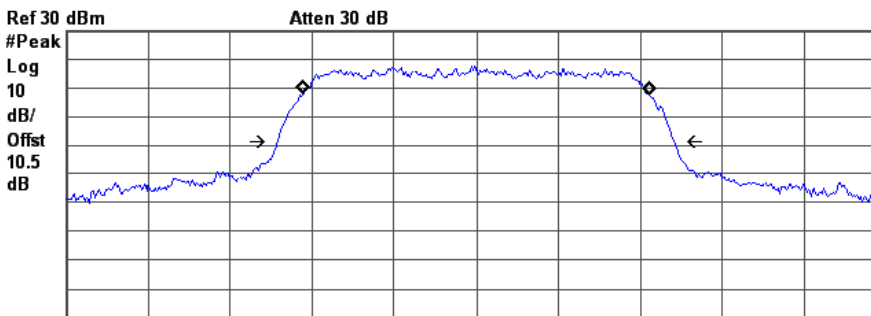
Occupied Bandwidth
1.2680 MHz

Occ BW % Pwr 99.00 %
x dB -26.00 dB

Transmit Freq Error 1.198 kHz
x dB Bandwidth 1.464 MHz

6.2.1.2. Occupied (99% Power) Bandwidth Input Signal, 1960.05 MHz – TX1

Agilent 17:19:43 Dec 26, 2012 R T



Center 1.96 GHz Span 3 MHz
#Res BW 30 kHz #VBW 100 kHz Sweep 6 ms (601 pts)

Occupied Bandwidth
1.2664 MHz

Occ BW % Pwr 99.00 %
x dB -26.00 dB

Transmit Freq Error 151.593 Hz
x dB Bandwidth 1.453 MHz

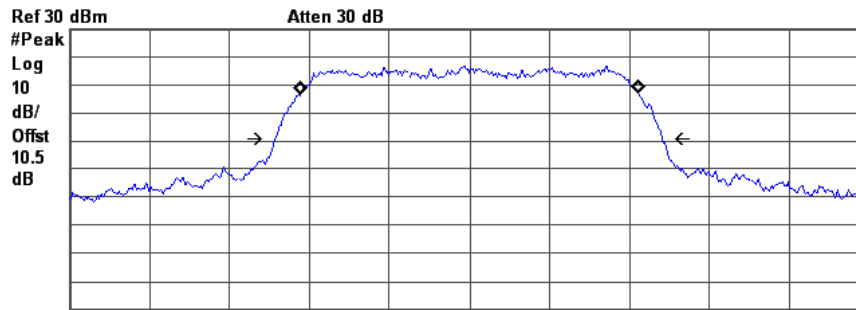
6. Measurement Data (continued)

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

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

6.2.1.3. Occupied (99% Power) Bandwidth Measurement, 1989.3 MHz – TX1

Agilent 17:18:45 Dec 26, 2012 R T



Center 1.989 GHz Span 3 MHz
#Res BW 30 kHz #VBW 100 kHz Sweep 6 ms (601 pts)

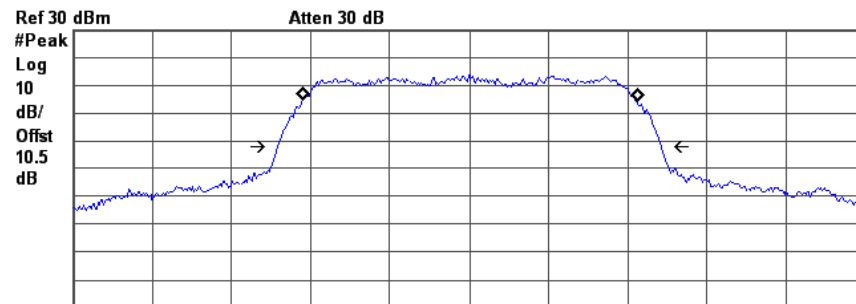
Occupied Bandwidth
1.2670 MHz

Occ BW % Pwr 99.00 %
x dB -26.00 dB

Transmit Freq Error -227.271 Hz
x dB Bandwidth 1.455 MHz

6.2.1.4. Occupied (99% Power) Bandwidth Measurement, 1930.8 MHz – TX2

Agilent 16:20:20 Dec 28, 2012 R T



Center 1.931 GHz Span 3 MHz
#Res BW 30 kHz #VBW 100 kHz Sweep 6 ms (601 pts)

Occupied Bandwidth
1.2667 MHz

Occ BW % Pwr 99.00 %
x dB -26.00 dB

Transmit Freq Error 5.155 kHz
x dB Bandwidth 1.456 MHz

6. Measurement Data (continued)

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

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

6.2.1.5. Occupied (99% Power) Bandwidth Input Signal, 1960.05 MHz – TX2

Agilent 16:19:12 Dec 28, 2012 R T



Center 1.96 GHz #Res BW 30 kHz #VBW 100 kHz Sweep 6 ms (601 pts) Span 3 MHz

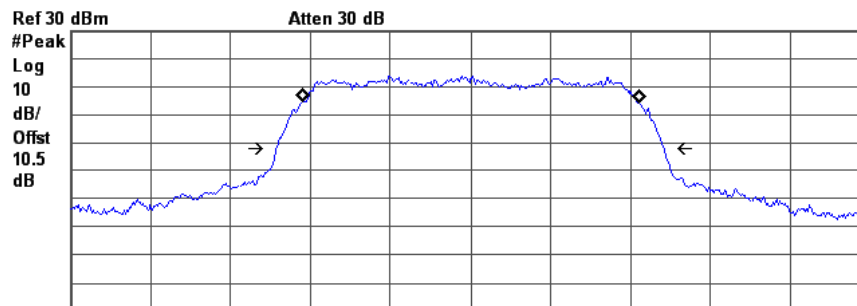
Occupied Bandwidth
1.2711 MHz

Occ BW % Pwr 99.00 %
x dB -26.00 dB

Transmit Freq Error 6.482 kHz
x dB Bandwidth 1.454 MHz

6.2.1.6. Occupied (99% Power) Bandwidth Measurement, 1989.3 MHz – TX2

Agilent 16:18:14 Dec 28, 2012 R T



Center 1.989 GHz #Res BW 30 kHz #VBW 100 kHz Sweep 6 ms (601 pts) Span 3 MHz

Occupied Bandwidth
1.2679 MHz

Occ BW % Pwr 99.00 %
x dB -26.00 dB

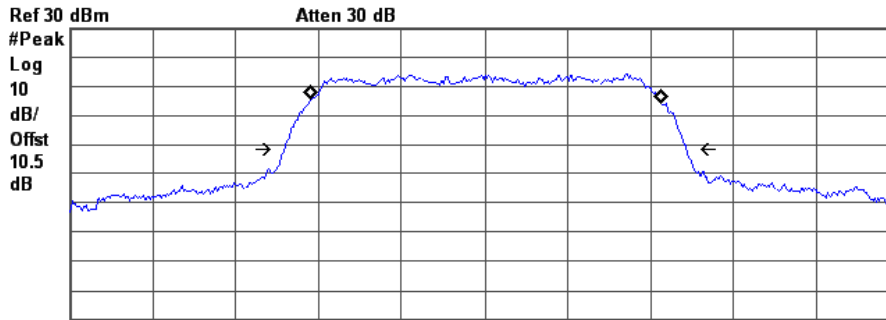
Transmit Freq Error 1.811 kHz
x dB Bandwidth 1.458 MHz

6. Measurement Data (continued)

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

6.2.1.7. Occupied (99% Power) Bandwidth Measurement, 1930.8 MHz – TX3

Agilent 16:18:04 Jan 4, 2013 R T



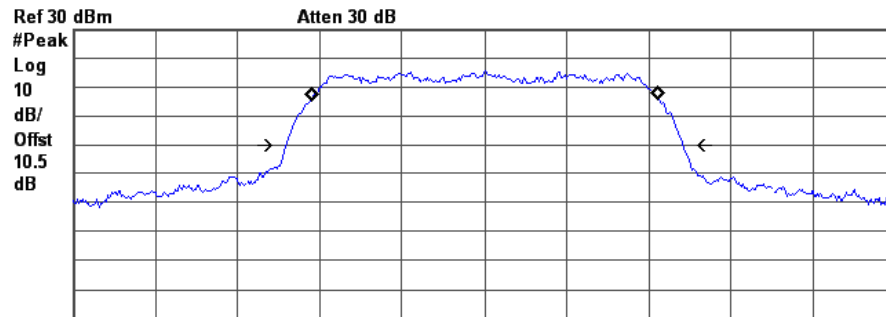
Center 1.931 GHz Span 3 MHz
#Res BW 30 kHz #VBW 100 kHz Sweep 6 ms (601 pts)

Occupied Bandwidth 1.2692 MHz Occ BW % Pwr 99.00 %
x dB -26.00 dB

Transmit Freq Error 5.585 kHz
x dB Bandwidth 1.457 MHz

6.2.1.8. Occupied (99% Power) Bandwidth Input Signal, 1960.05 MHz – TX3

Agilent 16:16:35 Jan 4, 2013 R T



Center 1.96 GHz Span 3 MHz
#Res BW 30 kHz #VBW 100 kHz Sweep 6 ms (601 pts)

Occupied Bandwidth 1.2663 MHz Occ BW % Pwr 99.00 %
x dB -26.00 dB

Transmit Freq Error 3.275 kHz
x dB Bandwidth 1.452 MHz

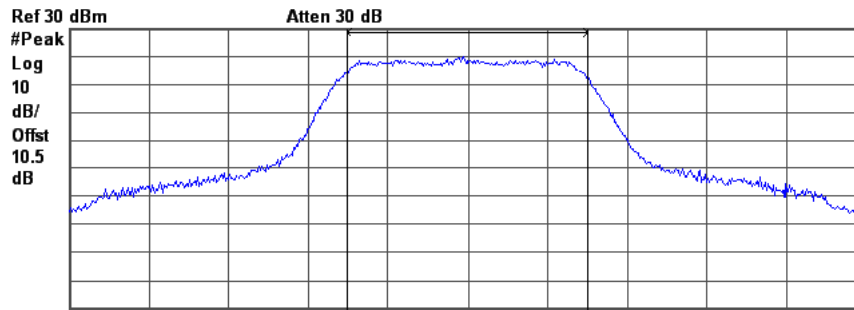
6. Measurement Data (continued)

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

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

6.2.1.9. Occupied (99% Power) Bandwidth Measurement, 1989.3 MHz – TX3

Agilent 16:12:46 Jan 4, 2013 R T



Center 1.989 GHz Span 4.167 MHz
#Res BW 100 kHz #VBW 300 kHz Sweep 6 ms (601 pts)

Channel Power

Power Spectral Density

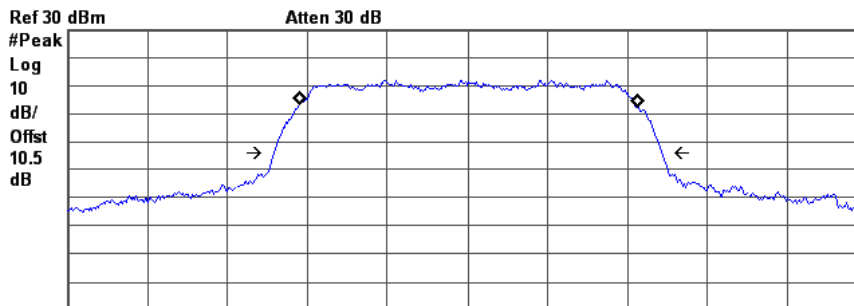
22.92 dBm / 1.2500 MHz

-38.05 dBm/Hz



6.2.1.10. Occupied (99% Power) Bandwidth Measurement, 1930.8 MHz – TX4

Agilent 17:16:12 Jan 4, 2013 R T



Center 1.931 GHz Span 3 MHz
#Res BW 30 kHz #VBW 100 kHz Sweep 6 ms (601 pts)

Occupied Bandwidth

1.2711 MHz

Occ BW % Pwr 99.00 %
x dB -26.00 dB

Transmit Freq Error 6.270 kHz
x dB Bandwidth 1.458 MHz



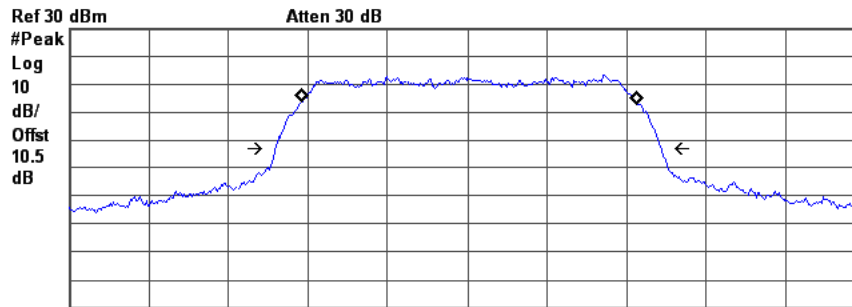
6. Measurement Data (continued)

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

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

6.2.1.11. Occupied (99% Power) Bandwidth Input Signal, 1960.05 MHz – TX4

Agilent 17:14:51 Jan 4, 2013 R T



Center 1.96 GHz Span 3 MHz
#Res BW 30 kHz #VBW 100 kHz Sweep 6 ms (601 pts)

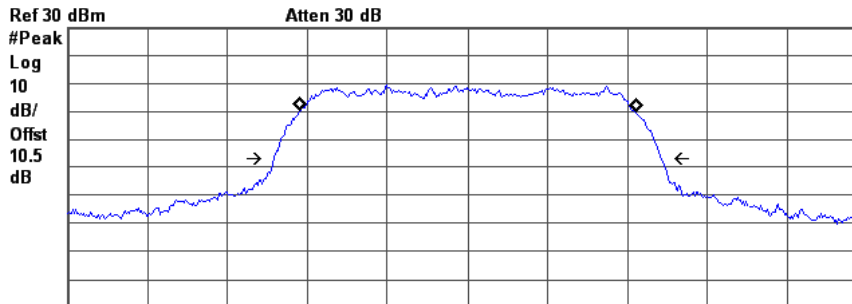
Occupied Bandwidth
1.2665 MHz

Occ BW % Pwr 99.00 %
x dB -26.00 dB

Transmit Freq Error 8.817 kHz
x dB Bandwidth 1.456 MHz

6.2.1.12. Occupied (99% Power) Bandwidth Measurement, 1989.3 MHz – TX4

Agilent 17:13:31 Jan 4, 2013 R T



Center 1.989 GHz Span 3 MHz
#Res BW 30 kHz #VBW 100 kHz Sweep 6 ms (601 pts)

Occupied Bandwidth
1.2656 MHz

Occ BW % Pwr 99.00 %
x dB -26.00 dB

Transmit Freq Error 2.595 kHz
x dB Bandwidth 1.454 MHz

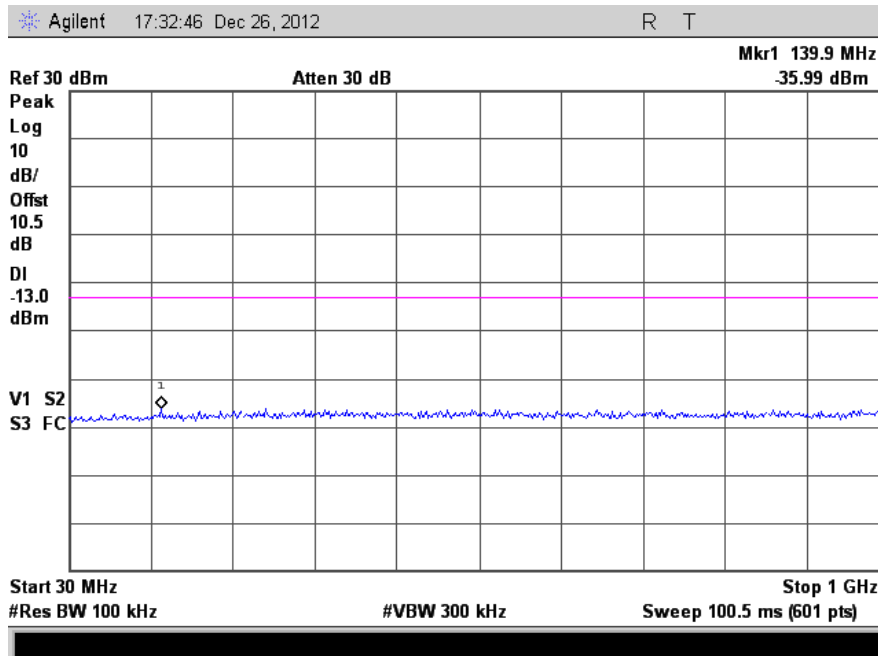
6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 24.238 (a)

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.

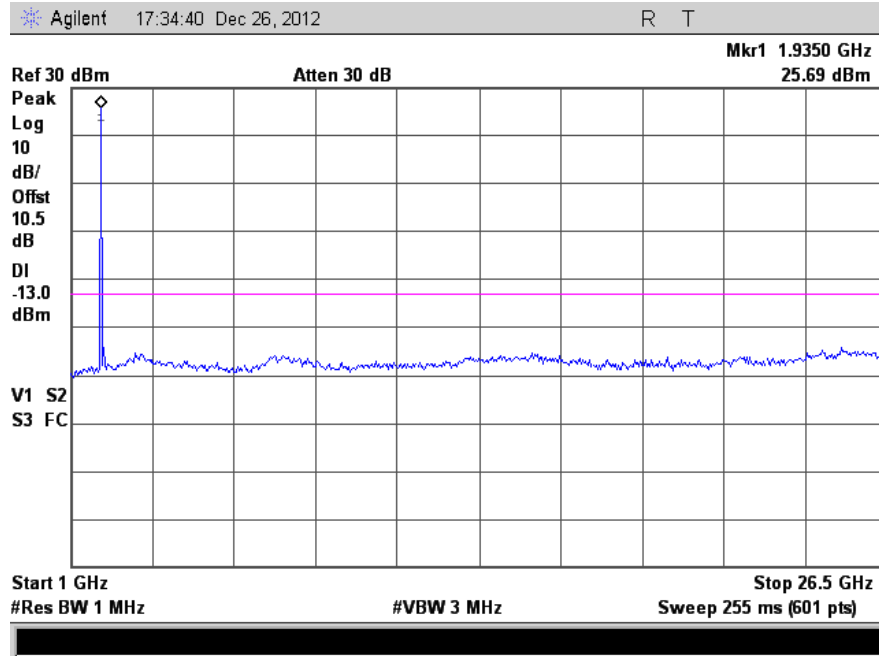
6.3.1. Low Channel, 30 MHz to 1 GHz – TX1



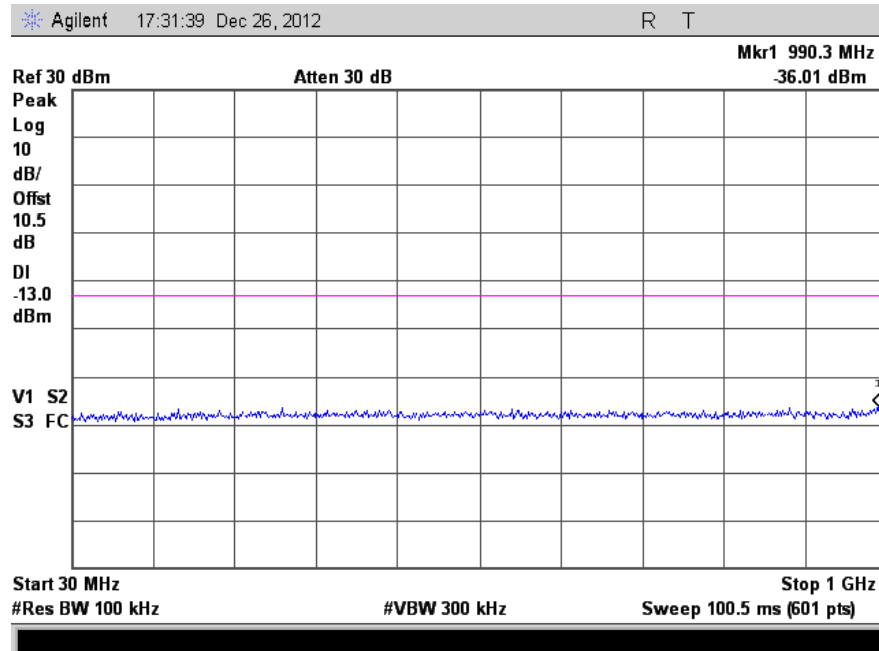
6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 24.238 (a) (continued)

6.3.2. Low Channel, 1 to 26.5 GHz – TX1



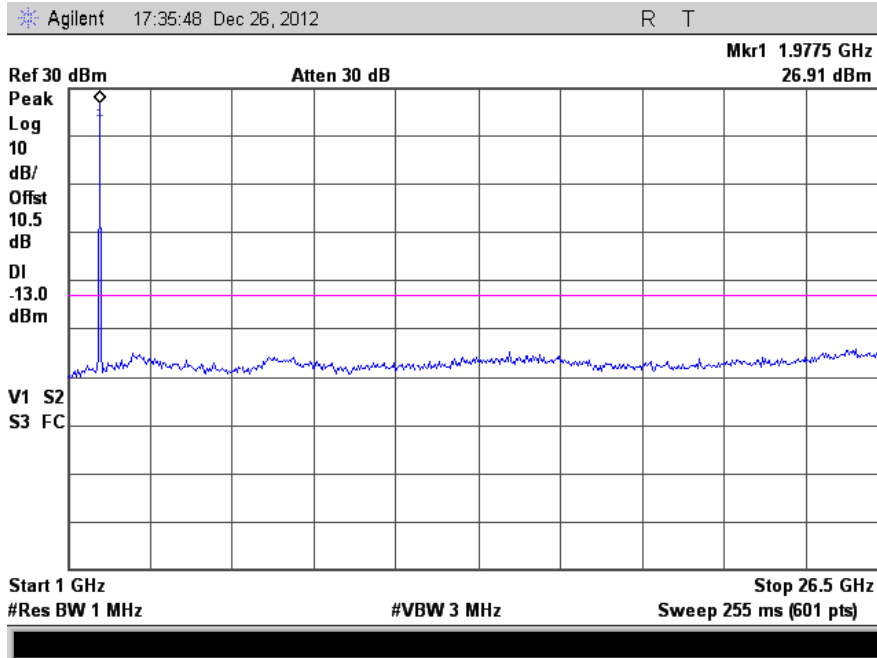
6.3.3. Mid Channel, 30 MHz to 1 GHz – TX1



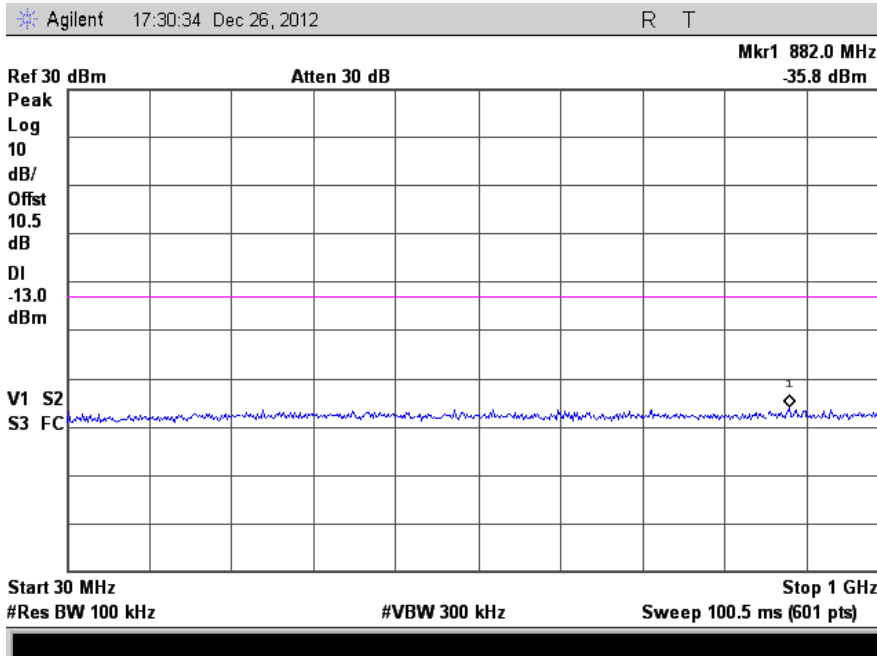
6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 24.238 (a) (continued)

6.3.4. Mid Channel, 1 to 26.5 GHz – TX1



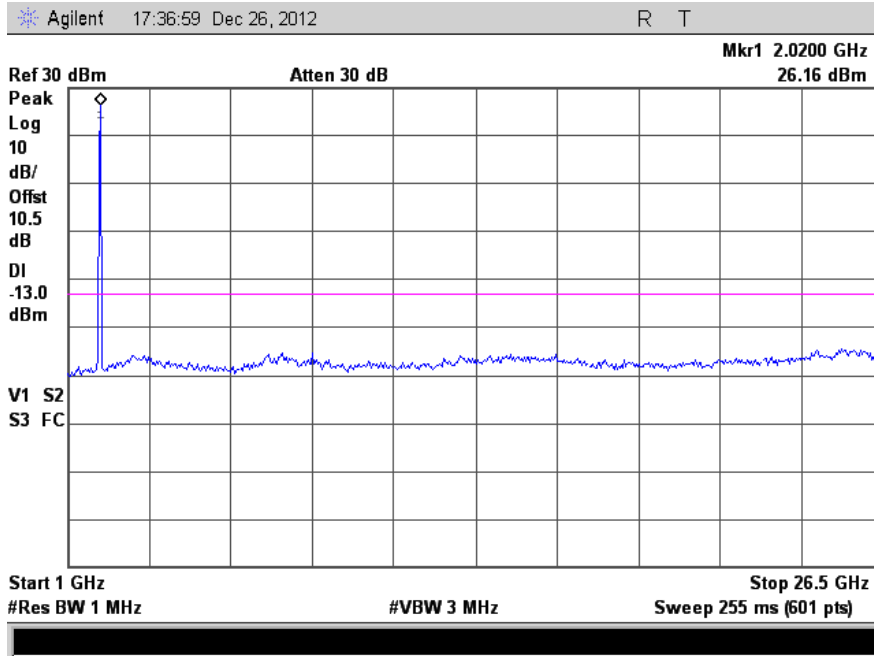
6.3.5. High Channel, 30 to 1000 MHz – TX1



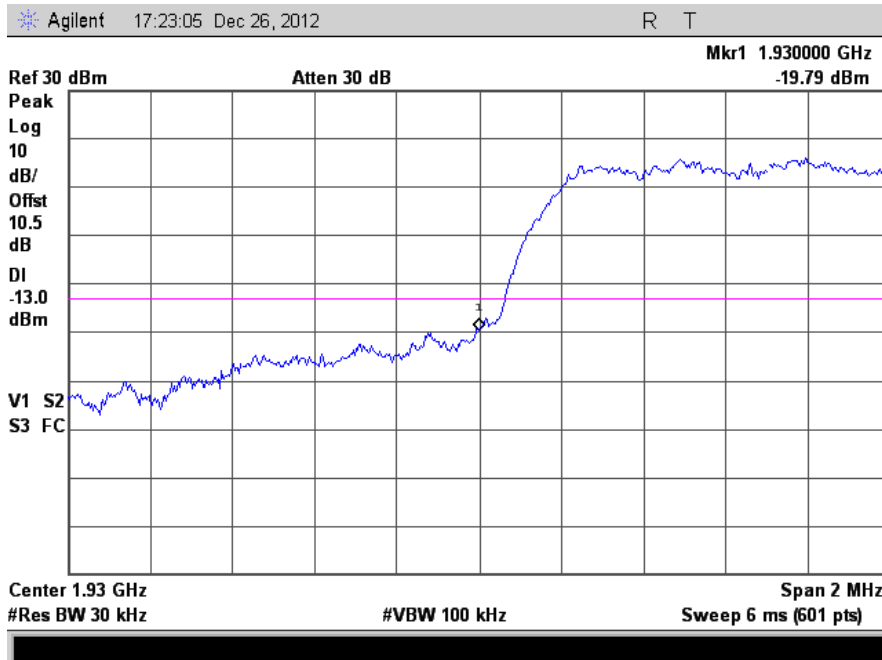
6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 24.238 (a) (continued)

6.3.6. High Channel, 1 to 26.5 GHz – TX1



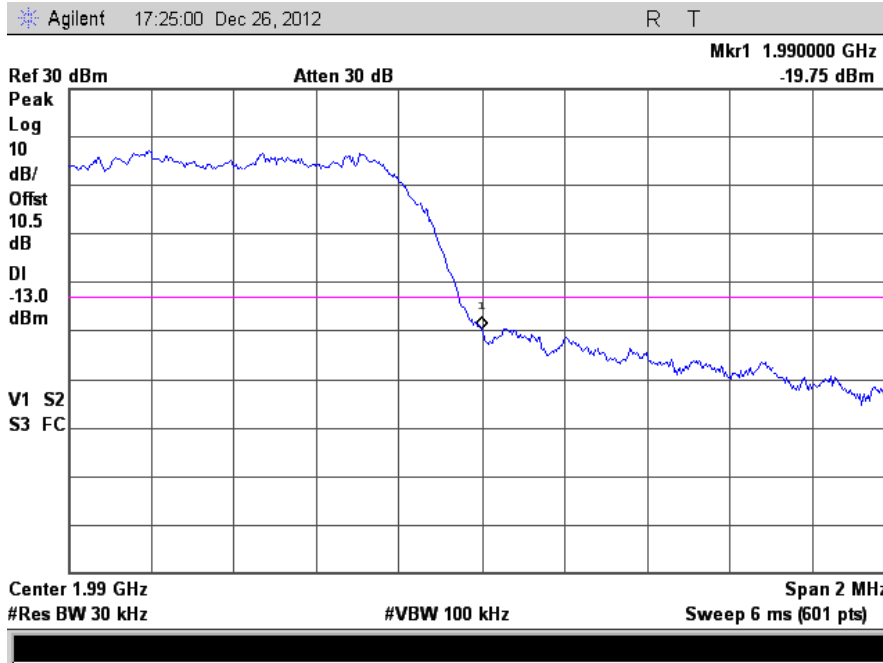
6.3.7. 1930 MHz Lower Bandedge Measurement – TX1



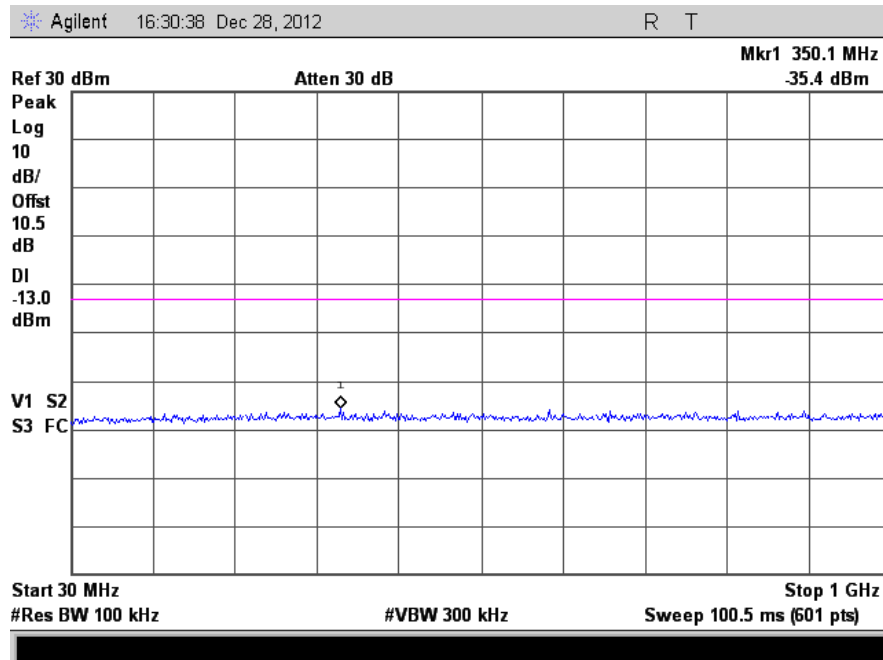
6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 24.238 (a) (continued)

6.3.8. 1990 MHz Upper Bandedge Measurement – TX1



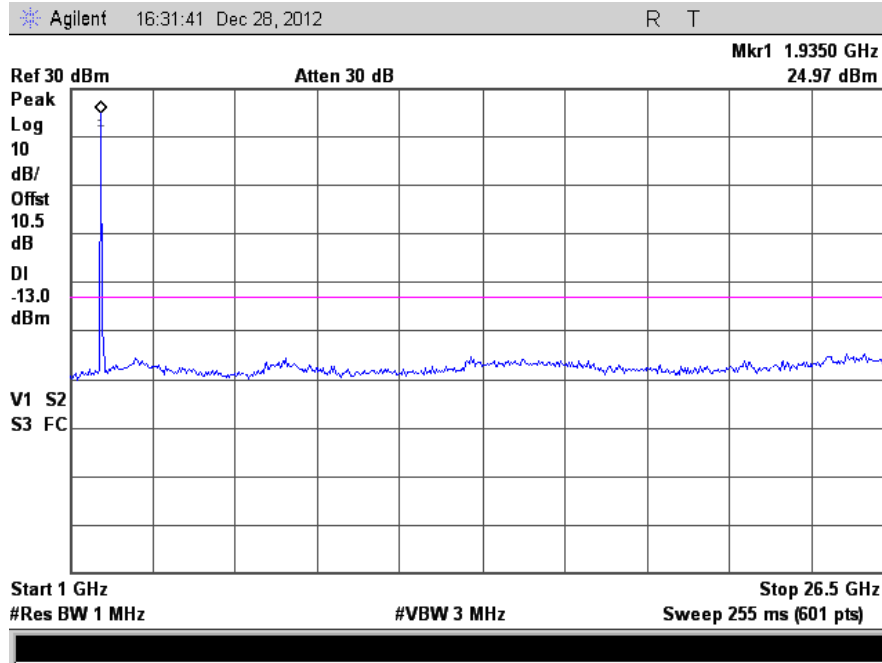
6.3.9. Low Channel, 30 MHz to 1 GHz – TX2



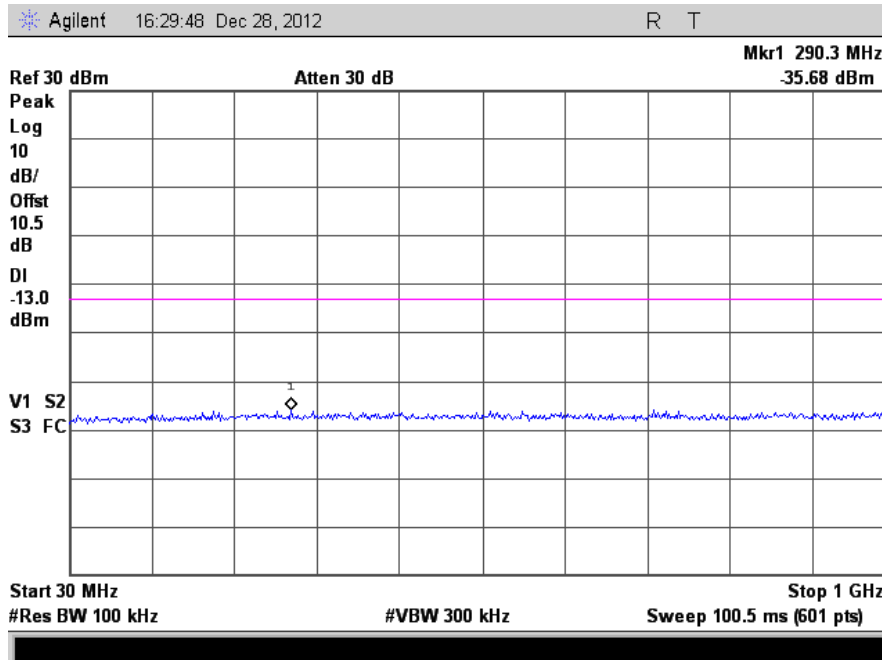
6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 24.238 (a) (continued)

6.3.10. Low Channel, 1 to 26.5 GHz – TX2



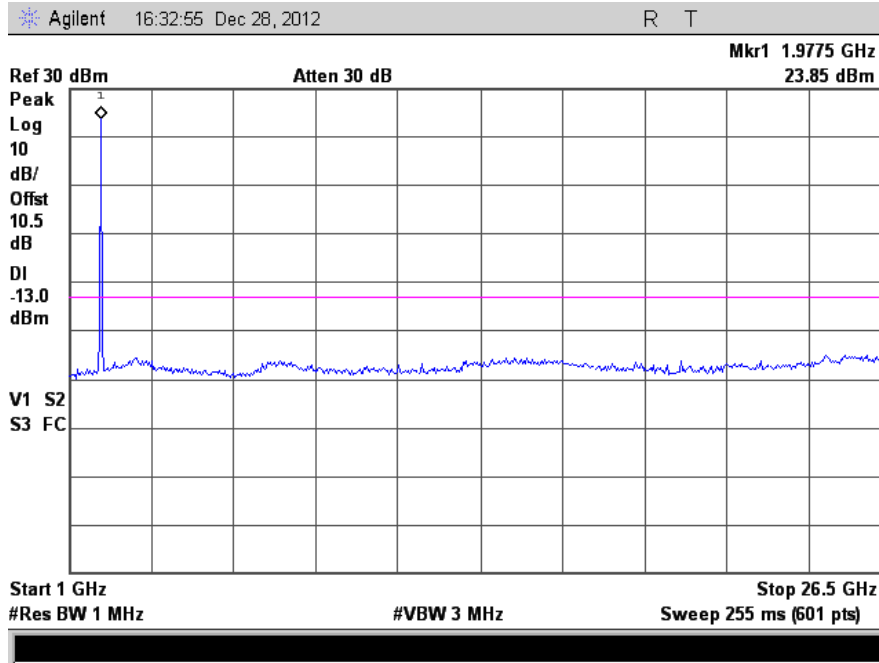
6.3.11. Mid Channel, 30 MHz to 1 GHz – TX2



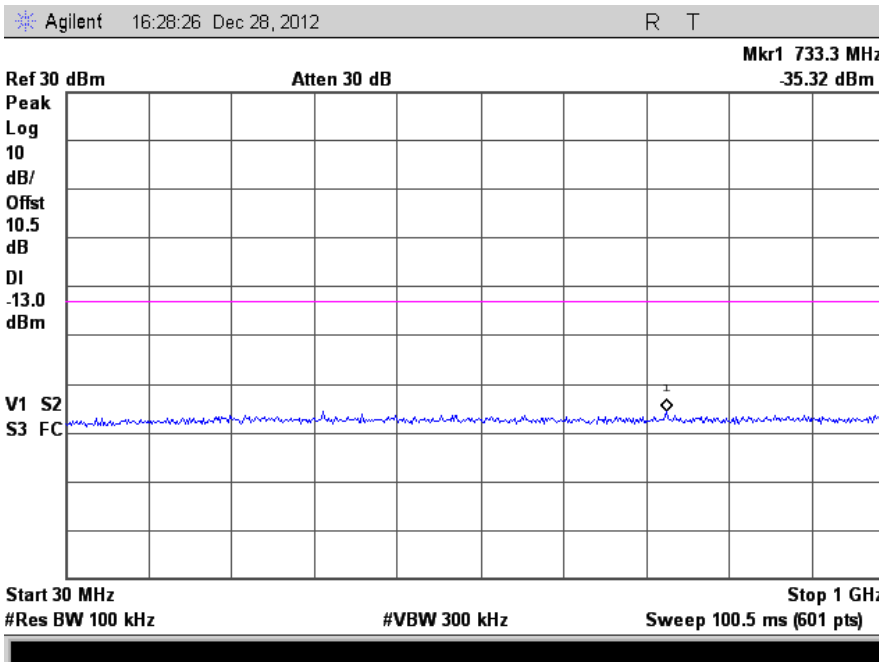
6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 24.238 (a) (continued)

6.3.12. Mid Channel, 1 to 26.5 GHz – TX2



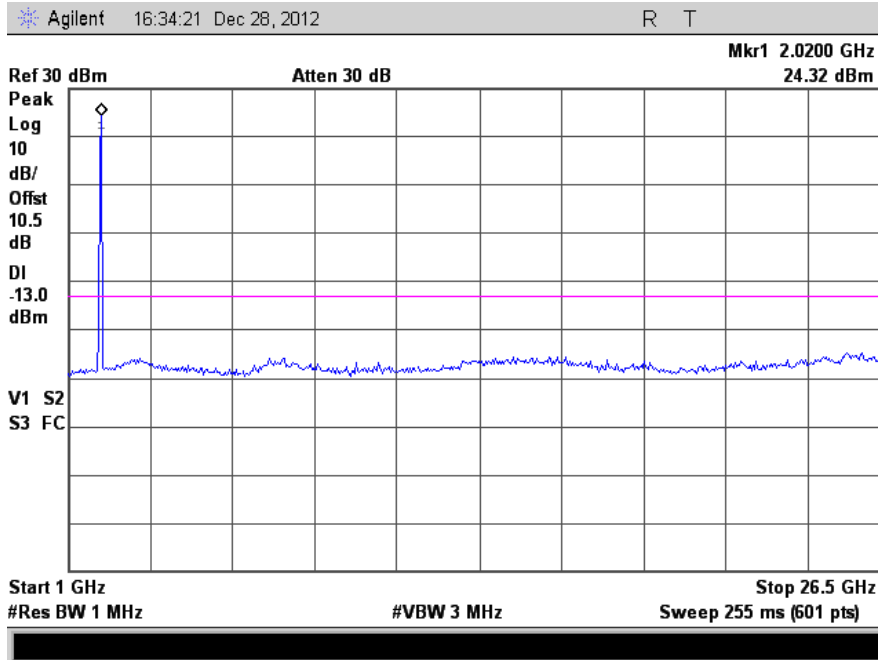
6.3.13. High Channel, 30 to 1000 MHz – TX2



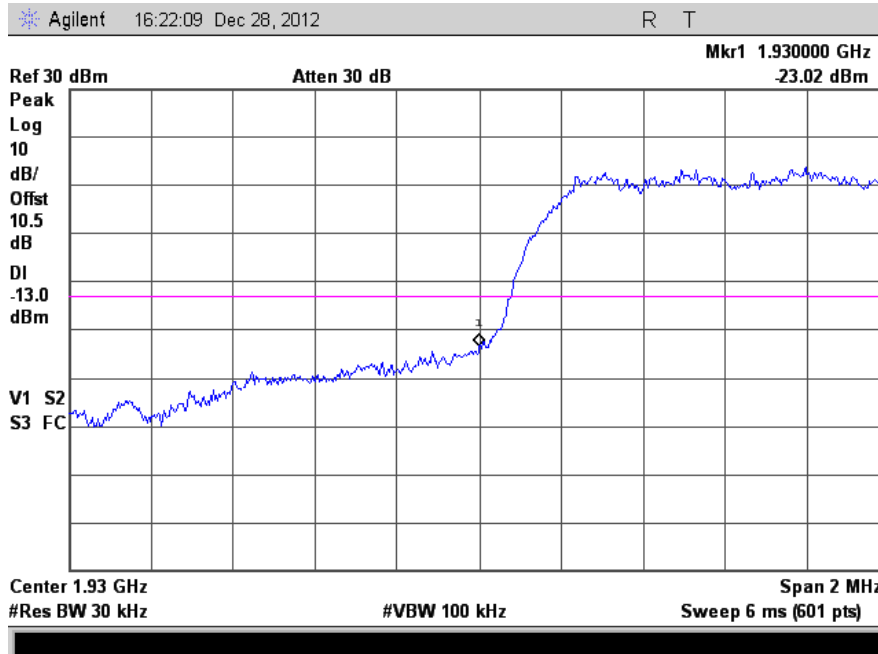
6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 24.238 (a) (continued)

6.3.14. High Channel, 1 to 26.5 GHz – TX2



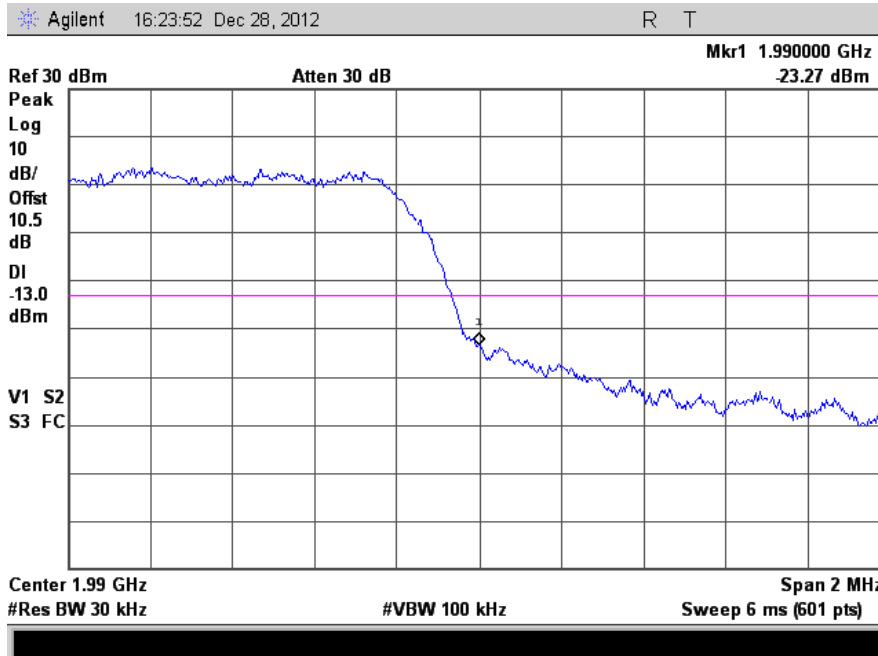
6.3.15. 1930 MHz Lower Bandedge Measurement – TX2



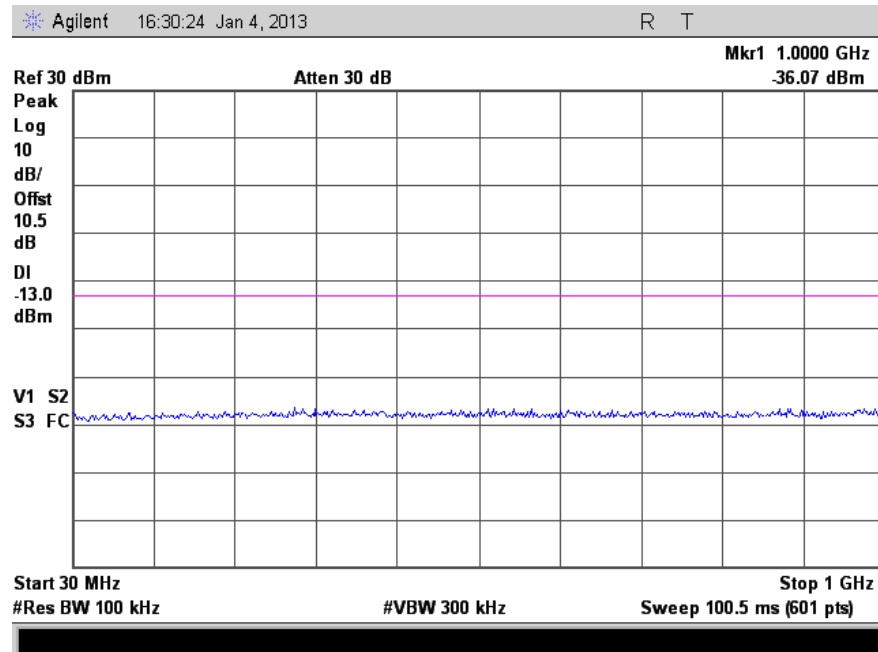
6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 24.238 (a) (continued)

6.3.16. 1990 MHz Upper Bandedge Measurement – TX2



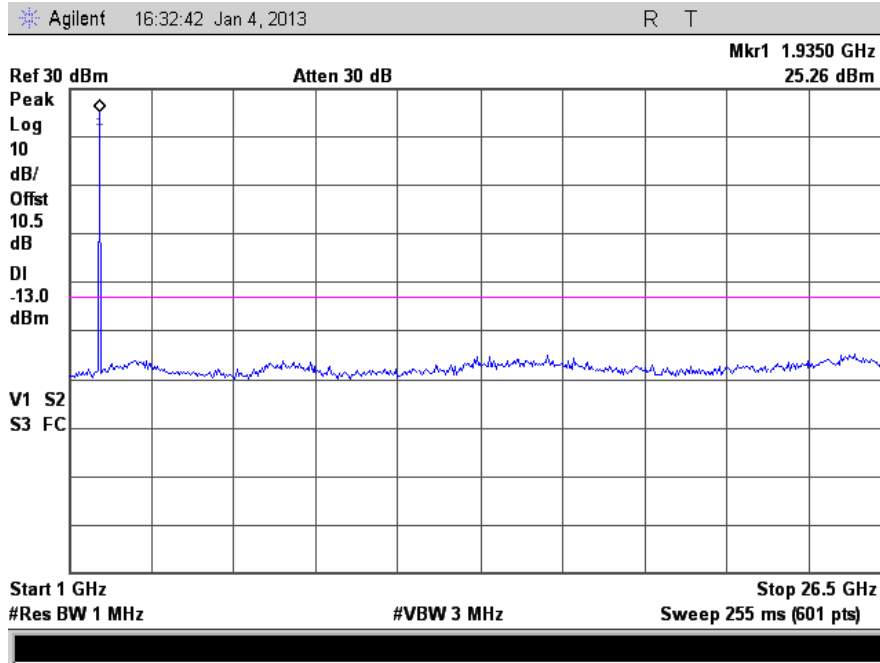
6.3.17. Low Channel, 30 MHz to 1 GHz – TX3



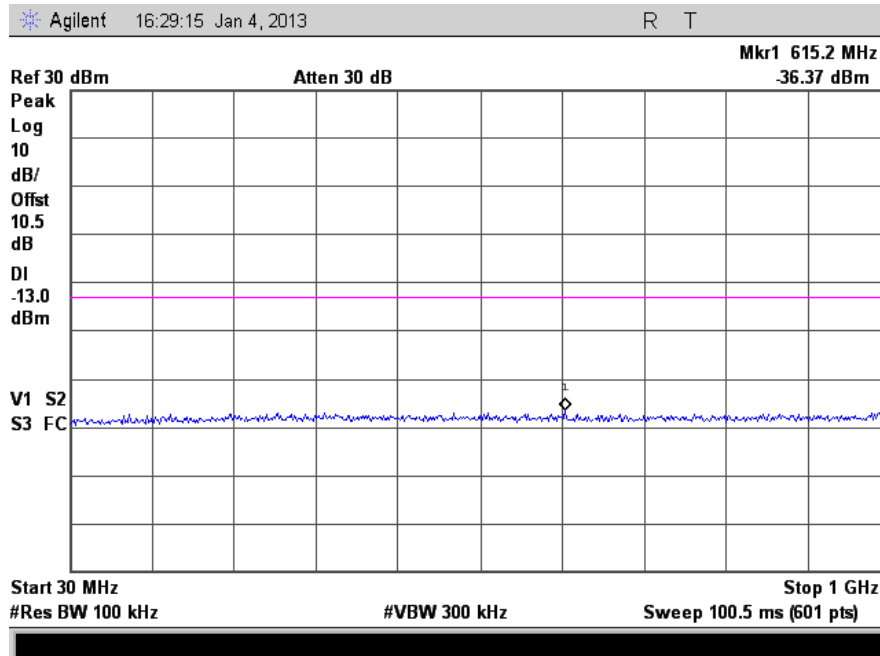
6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 24.238 (a) (continued)

6.3.18. Low Channel, 1 to 26.5 GHz – TX3



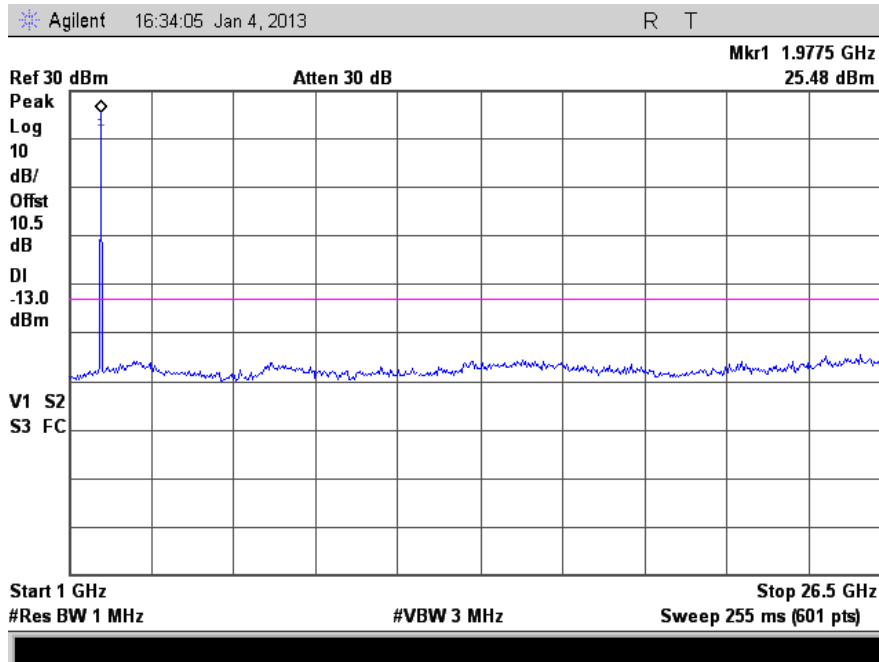
6.3.19. Mid Channel, 30 MHz to 1 GHz – TX3



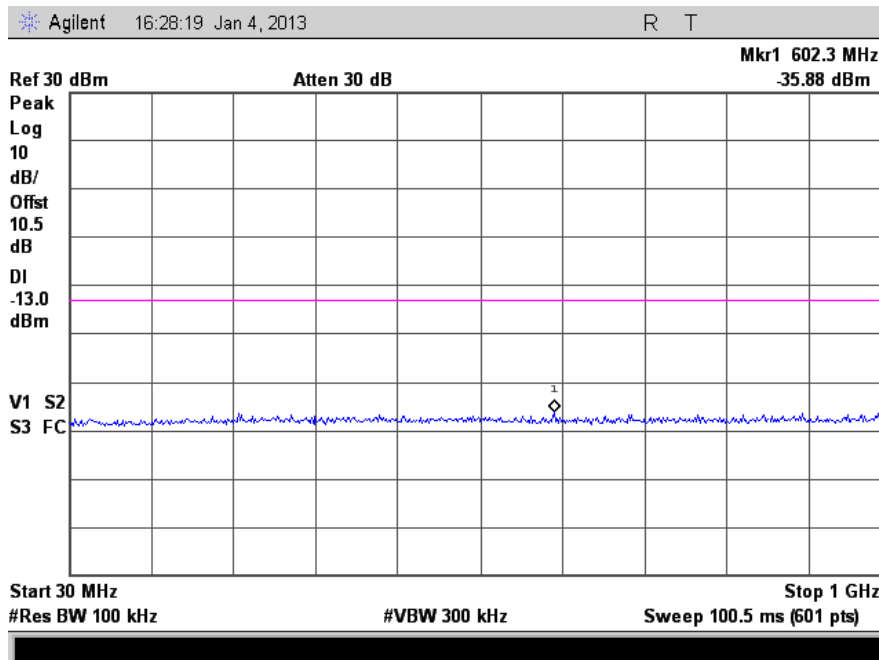
6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 24.238 (a) (continued)

6.3.20. Mid Channel, 1 to 26.5 GHz – TX3



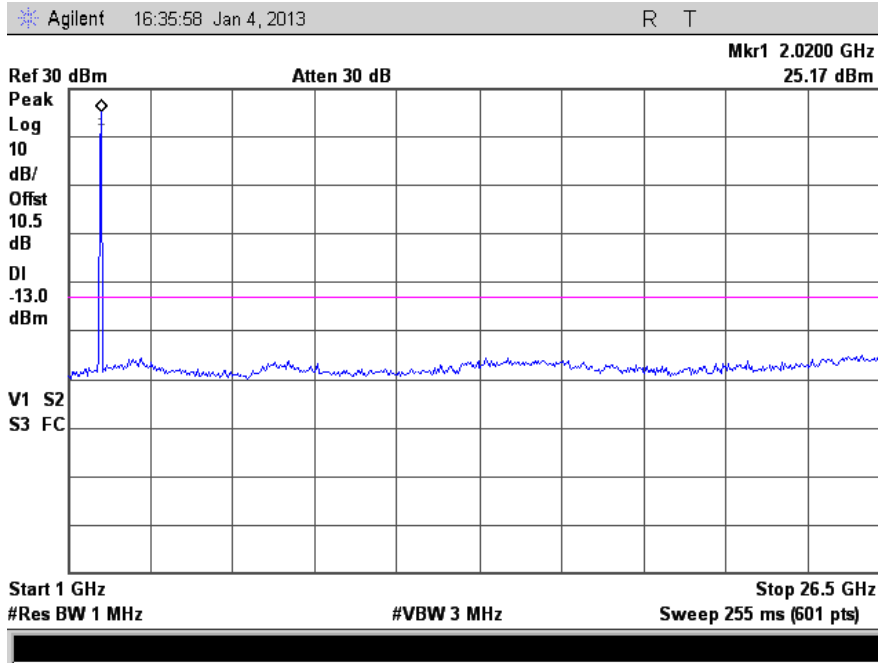
6.3.21. High Channel, 30 to 1000 MHz – TX3



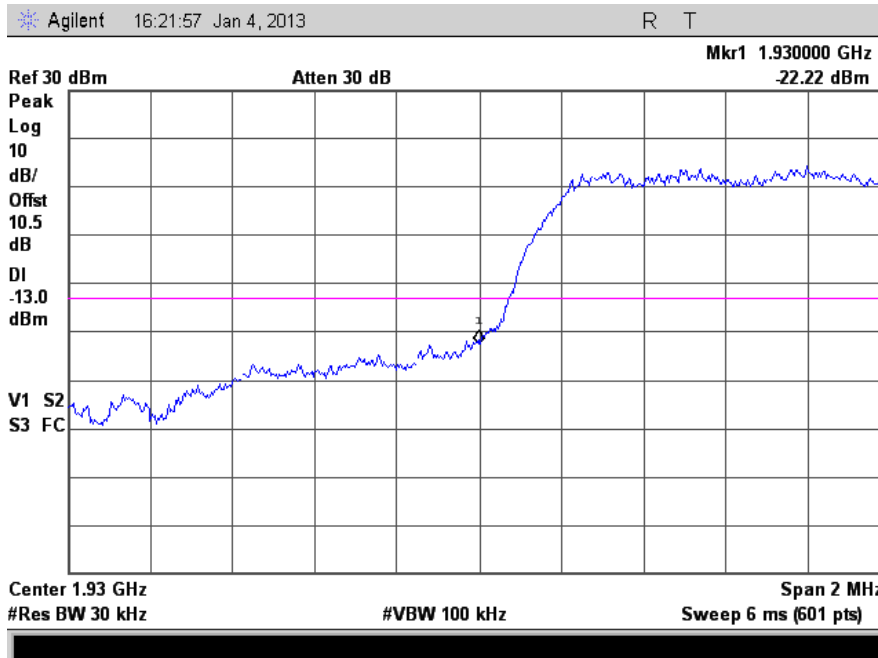
6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 24.238 (a) (continued)

6.3.22. High Channel, 1 to 26.5 GHz – TX3



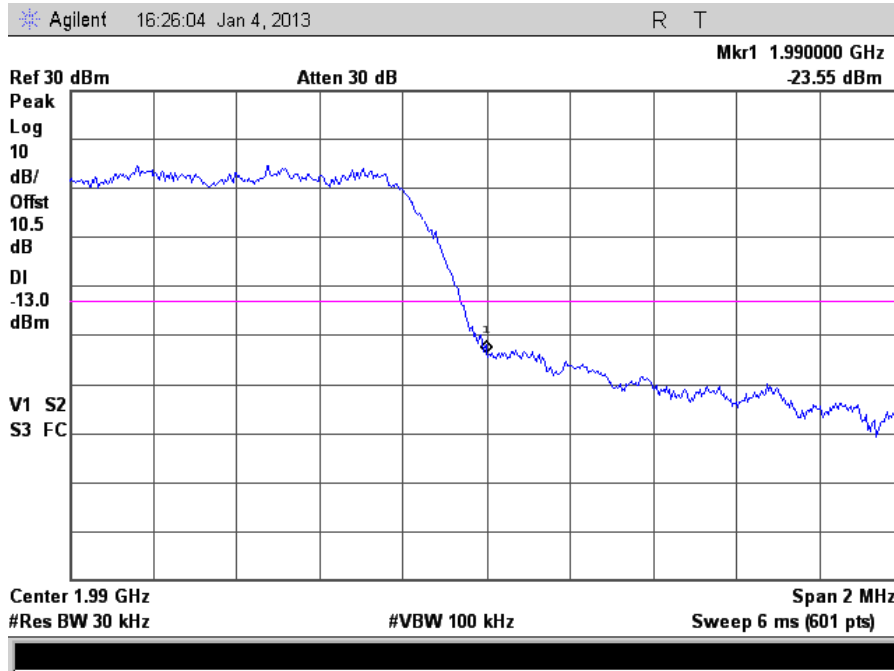
6.3.23. 1930 MHz Lower Bandedge Measurement – TX3



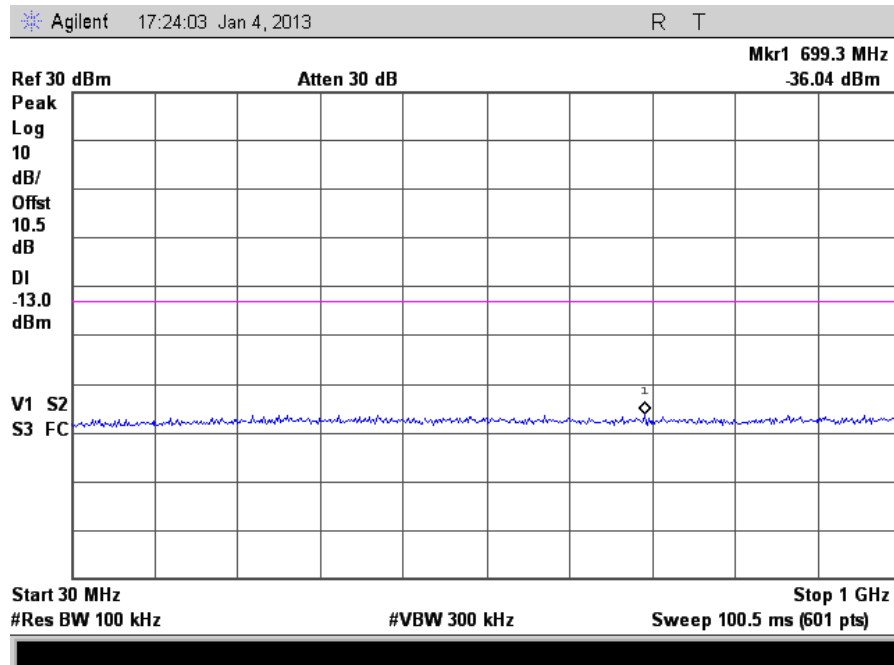
6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 24.238 (a) (continued)

6.3.24. 1990 MHz Upper Bandedge Measurement – TX3



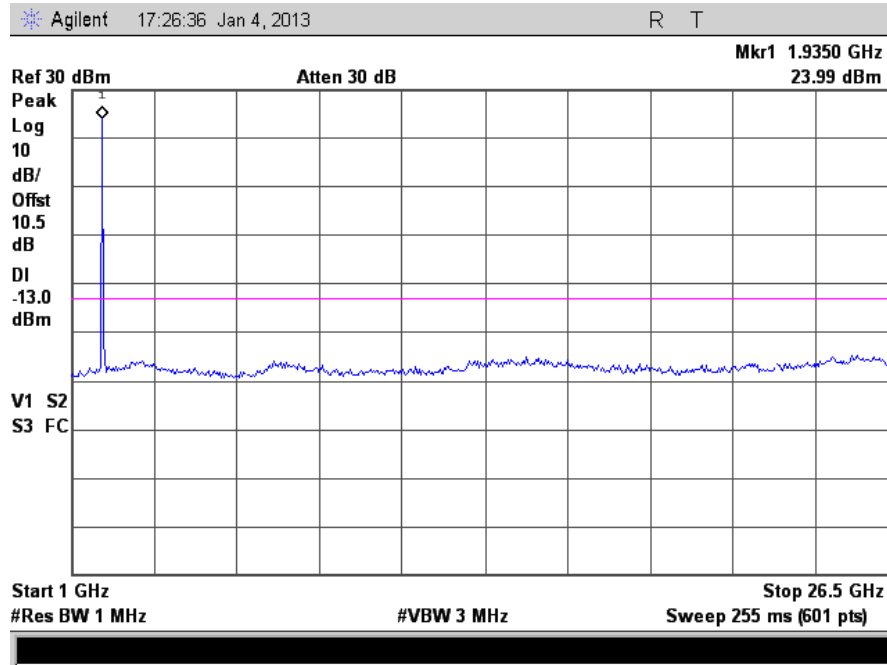
6.3.25. Low Channel, 30 MHz to 1 GHz – TX4



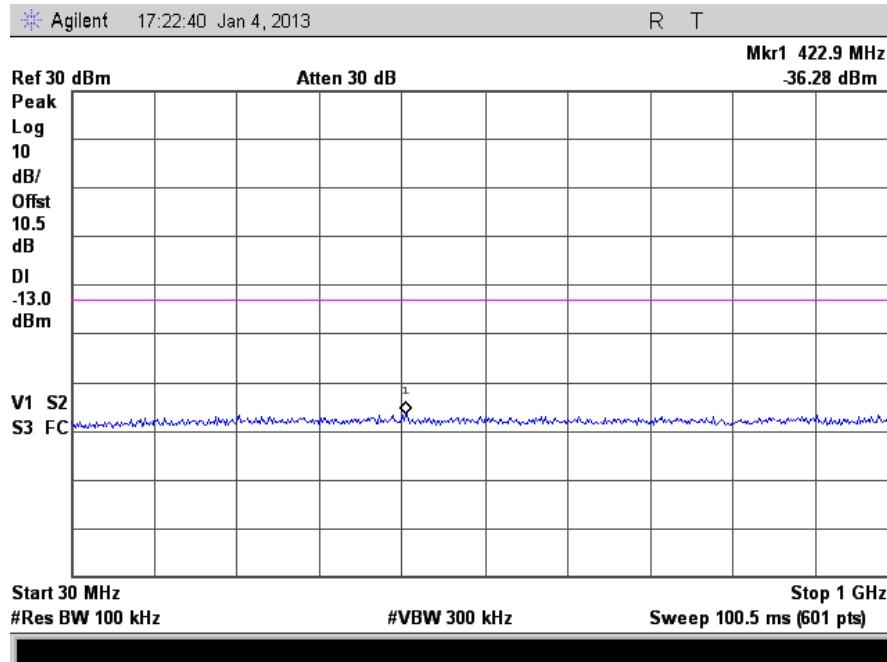
6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 24.238 (a) (continued)

6.3.26. Low Channel, 1 to 26.5 GHz – TX4



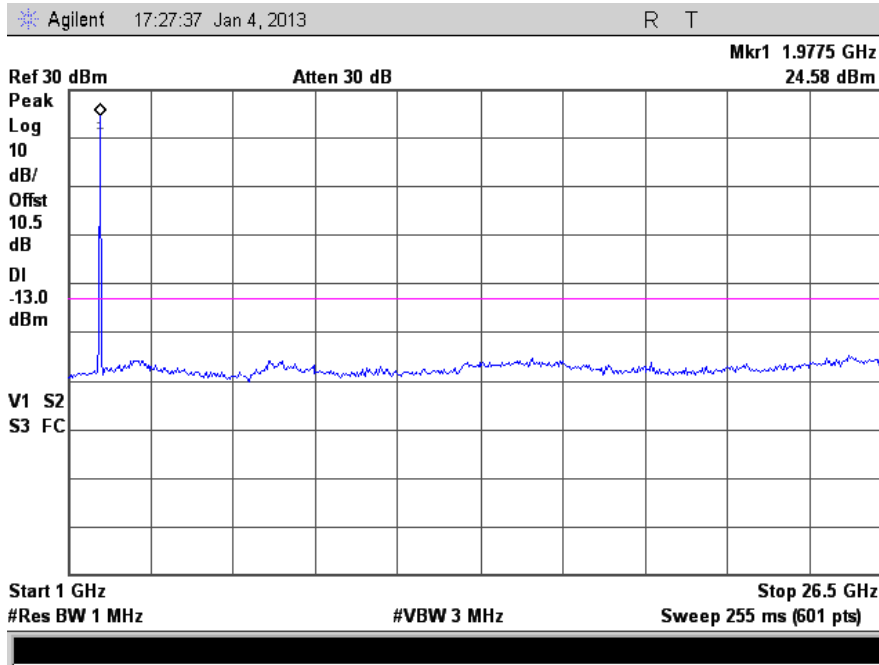
6.3.27. Mid Channel, 30 MHz to 1 GHz – TX4



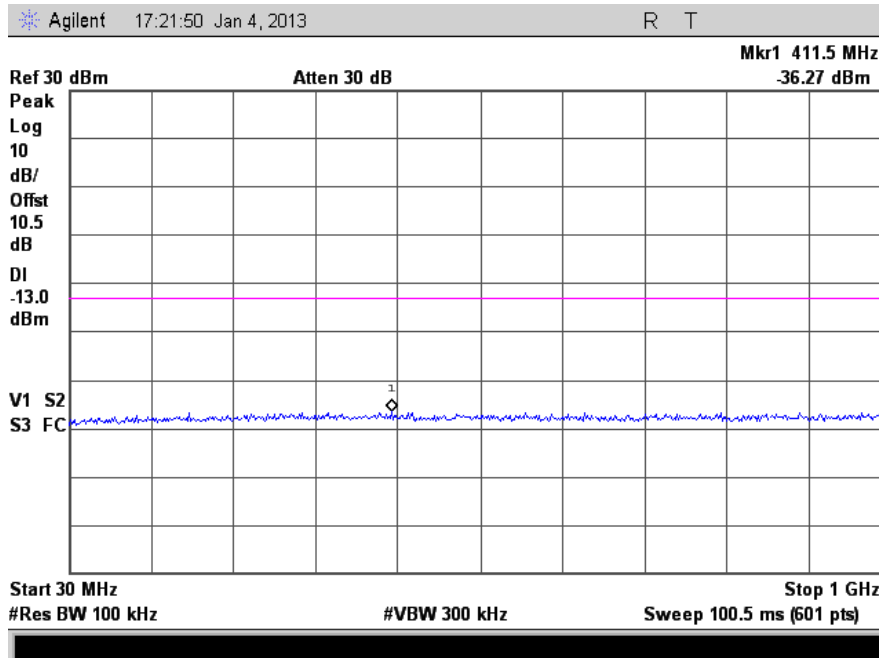
6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 24.238 (a) (continued)

6.3.28. Mid Channel, 1 to 26.5 GHz – TX4



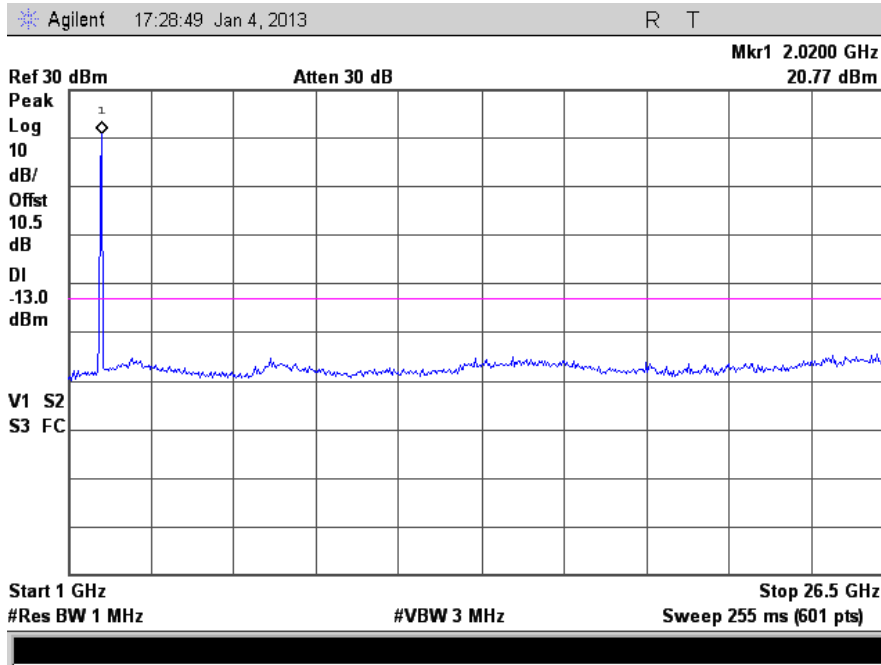
6.3.29. High Channel, 30 to 1000 MHz – TX4



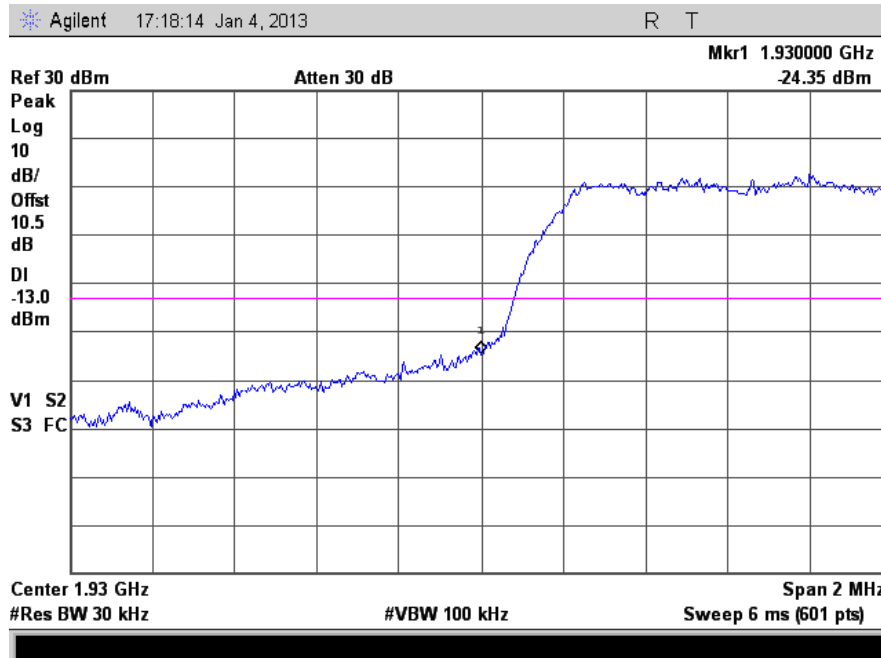
6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 24.238 (a) (continued)

6.3.30. High Channel, 1 to 26.5 GHz – TX4



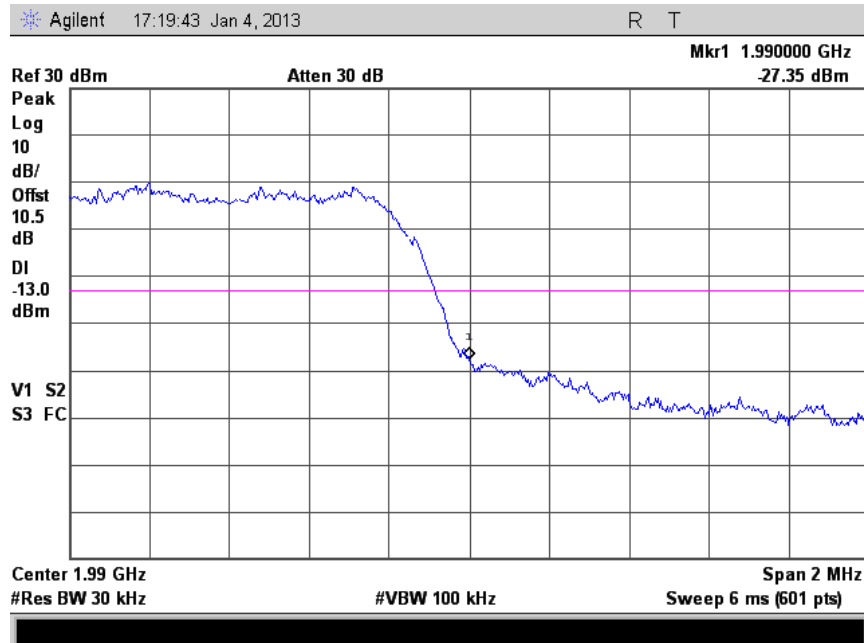
6.3.31. 1930 MHz Lower Bandedge Measurement – TX4



6. Measurement Data (continued)

6.3. Spurious Emissions at the Antenna Terminals 24.238 (a) (continued)

6.3.32. 1990 MHz Upper Bandedge Measurement – TX4



6. Measurement Data (continued)**6.4. Field Strength of Spurious Emissions 24.238 (a)**

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:	04/01/2013
Test Engineer:	Cody Merry
Site Temperature (°C):	21
Relative Humidity (%RH):	32
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 C63.4-2009, Standard Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronics Equipment in the Range of 9 kHz to 40 GHz.

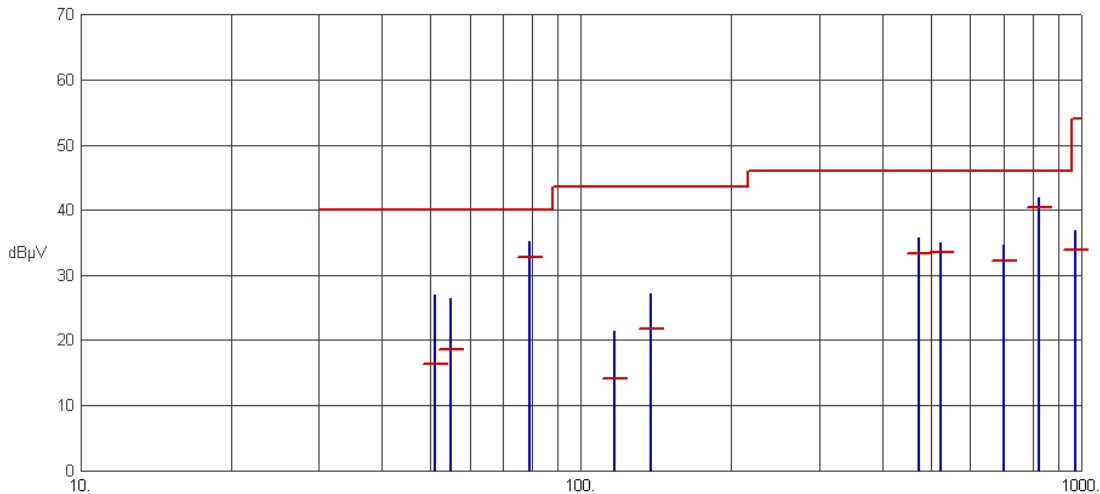
6. Measurement Data (continued)

6.4. Field Strength of Spurious Emissions 24.238 (a) (continued)

6.4.3. Horizontal Polarity

Test No.: 233-13, Radiated Emissions - Horizontal Polarity

FCC, Class B



Frequency (MHz)	Pk Amp (dBµV/m)	QP Amp (dBµV/m)	QP Limit (dBµV/m)	Margin (dB)	Ant Ht (cm)	Table (Deg)	Comments
51.0702	26.95	16.35	40.00	-23.65	N/A	N/A	
54.8424	26.42	18.59	40.00	-21.41	N/A	N/A	
79.1993	35.20	32.66	40.00	-7.34	N/A	N/A	
117.0329	21.28	14.08	43.50	-29.42	N/A	N/A	
137.7189	27.23	21.74	43.50	-21.76	N/A	N/A	
475.0346	35.73	33.32	46.00	-12.68	N/A	N/A	
525.0331	34.96	33.54	46.00	-12.46	N/A	N/A	
700.1500	34.70	32.11	46.00	-13.89	N/A	N/A	
825.0650	41.97	40.34	46.00	-5.66	N/A	N/A	
975.0665	36.90	33.81	54.00	-20.19	N/A	N/A	

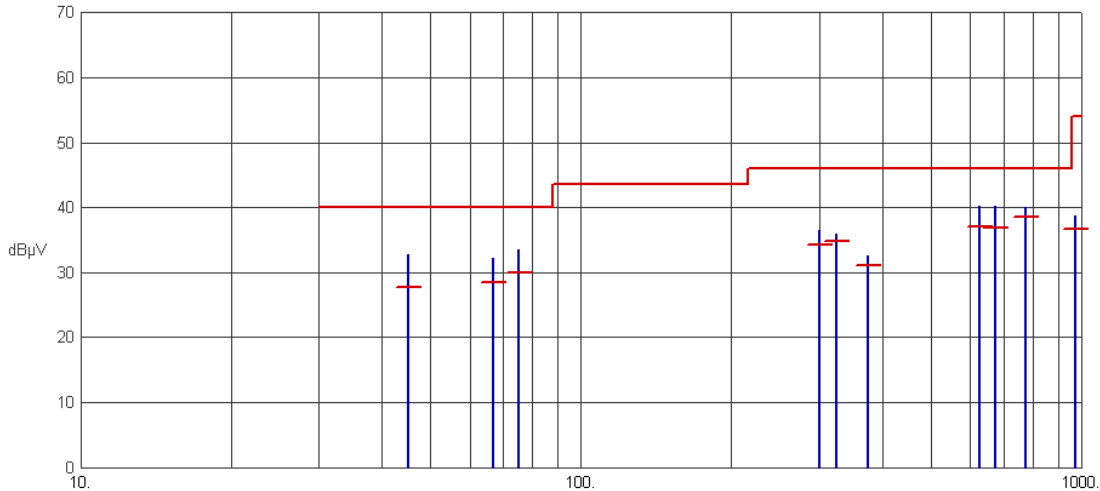
6. Measurement Data (continued)

6.4. Field Strength of Spurious Emissions 24.238 (a) (continued)

6.4.4. Vertical Polarity

Test No.: 233-13, Radiated Emissions - Vertical Polarity

FCC, Class B



Frequency (MHz)	Pk Amp (dBµV/m)	QP Amp (dBµV/m)	QP Limit (dBµV/m)	Margin (dB)	Ant Ht (cm)	Table (Deg)	Comments
45.2364	32.83	27.78	40.00	-12.22	N/A	N/A	
66.9962	32.14	28.41	40.00	-11.59	N/A	N/A	
75.2808	33.47	29.90	40.00	-10.10	N/A	N/A	
300.0564	36.40	34.20	46.00	-11.80	N/A	N/A	
325.0133	35.99	34.85	46.00	-11.15	N/A	N/A	
375.0330	32.65	31.14	46.00	-14.86	N/A	N/A	
625.0290	40.18	36.95	46.00	-9.05	N/A	N/A	
675.0435	40.21	36.77	46.00	-9.23	N/A	N/A	
775.0400	40.09	38.60	46.00	-7.40	N/A	N/A	
975.0664	38.80	36.66	54.00	-17.34	N/A	N/A	

6. Measurement Data (continued)**6.4. Field Strength of Spurious Emissions 24.238 (a) (continued)**

6.4.5. Measurement and Equipment Setup

Test Date:	04/01/2013
Test Engineer:	Cody Merry
Site Temperature (°C):	21
Relative Humidity (%RH):	32
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

6.4.6. Radiated Emissions above 1 GHz

Note: There were no measurable signals above 1 GHz

6. Measurement Data (continued)

6.5. Frequency Stability 24.235, IC RSS 133 6.3

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

The carrier frequency shall not depart from the reference frequency, in excess of ± 2.5 ppm for mobile stations and ± 1.0 ppm for base stations.

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	1960.049	1960.049	1960.049
-20	1960.049	1960.049	1960.049
-10	1960.049	1960.049	1960.049
0	1960.050	1960.050	1960.050
10	1960.050	1960.050	1960.050
20	1960.050	1960.050	1960.050
30	1960.050	1960.050	1960.050
40	1960.050	1960.050	1960.050
50	1960.049	1960.049	1960.049
Max Deviation (MHz)	0.0010	0.0010	0.0010
Max Deviation (ppm)	0.5102	0.5102	0.5102

6. Measurement Data (continued)

6.6. 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	20.0	23.52	3.0000	0.0892751	0.8927506	1	Compliant
Mid	20.0	25.00	3.0000	0.1255250	1.2552498	1	Compliant
High	20.0	24.47	3.0000	0.1111041	1.1110412	1	Compliant
All	20.0	27.34	3.0000	0.2151444	2.1514445	1	Compliant
Low	20.0	21.88	3.0000	0.0611970	0.6119700	1	Compliant
Mid	20.0	21.05	3.0000	0.0505510	0.5055105	1	Compliant
High	20.0	21.47	3.0000	0.0556840	0.5568396	1	Compliant
All	20.0	23.83	3.0000	0.0958805	0.9588047	1	Compliant
Low	20.0	22.88	3.0000	0.0770425	0.7704246	1	Compliant
Mid	20.0	23.70	3.0000	0.0930529	0.9305295	1	Compliant
High	20.0	22.92	3.0000	0.0777553	0.7775533	1	Compliant
All	20.0	25.25	3.0000	0.1329628	1.3296280	1	Compliant
Low	20.0	20.42	3.0000	0.0437250	0.4372503	1	Compliant
Mid	20.0	21.15	3.0000	0.0517285	0.5172853	1	Compliant
High	20.0	17.45	3.0000	0.0220663	0.2206633	1	Compliant
All	20.0	21.33	3.0000	0.0539175	0.5391755	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 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.

6. Measurement Data (continued)

6.6. Public Exposure to Radio Frequency Energy Levels 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	22.0	23.52	14.0000	0.9288483	9.2884827	1	Compliant
Mid	26.0	25.00	14.0000	0.9350685	9.3506853	1	Compliant
High	24.0	24.47	14.0000	0.9713319	9.7133190	1	Compliant
All	33.0	27.34	14.0000	0.9948607	9.9486066	1	Compliant
Low	20.0	21.88	14.0000	0.7704246	7.7042461	1	Compliant
Mid	20.0	21.05	14.0000	0.6364000	6.3639996	1	Compliant
High	20.0	21.47	14.0000	0.7010196	7.0101957	1	Compliant
All	22.0	23.83	14.0000	0.9975732	9.9757320	1	Compliant
Low	20.0	22.88	14.0000	0.9699071	9.6990711	1	Compliant
Mid	22.0	23.70	14.0000	0.9681547	9.6815474	1	Compliant
High	20.0	22.92	14.0000	0.9788816	9.7888155	1	Compliant
All	26.0	25.25	14.0000	0.9904748	9.9047482	1	Compliant
Low	20.0	20.42	14.0000	0.5504656	5.5046555	1	Compliant
Mid	20.0	21.15	14.0000	0.6512236	6.5122362	1	Compliant
High	20.0	17.45	14.0000	0.2777987	2.7779866	1	Compliant
All	20.0	21.33	14.0000	0.6787817	6.7878173	1	Compliant

Note: For outdoor installations, users must be instructed to be at least 33 cm away from the high gain antenna when the device is in operation.

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

- 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.
- Section 6.1.2 of this test report. Note that the value has been adjusted to include the cable insertion loss.
- Data supplied by the client. 3 dBi for Indoor, 14 dBi for Outdoor Applications
- Power density is calculated from field strength measurement and antenna gain.
- 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**).

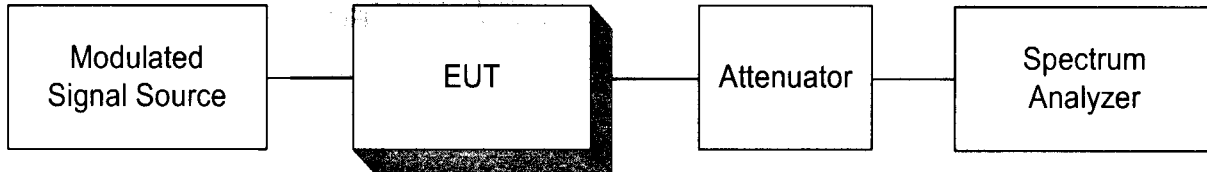
The radiated emissions test site is a 3 and 10 meter enclosed open area test site (OATS). Personnel, support equipment and test equipment are located in the basement beneath the OATS ground plane.

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.

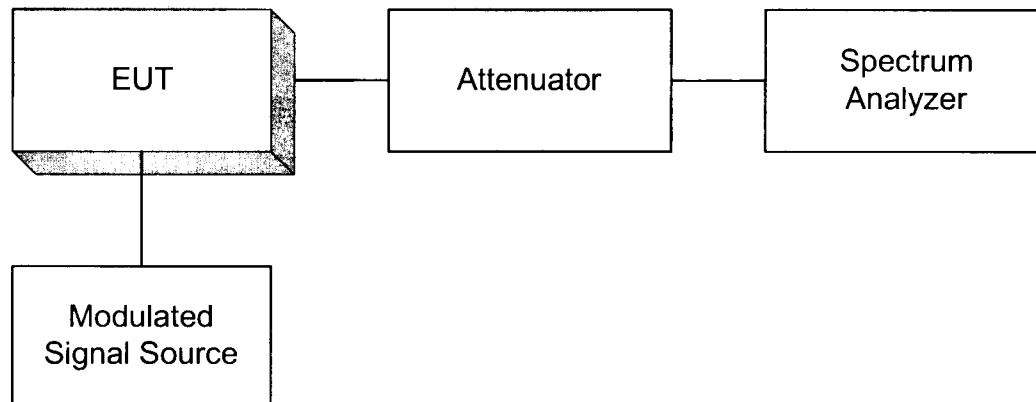
Both sites are designed to test products or systems 1.5 meter W x 1.5 meter L x 2.0 meter H, floor standing or table top.

Appendix A

RF Output Power

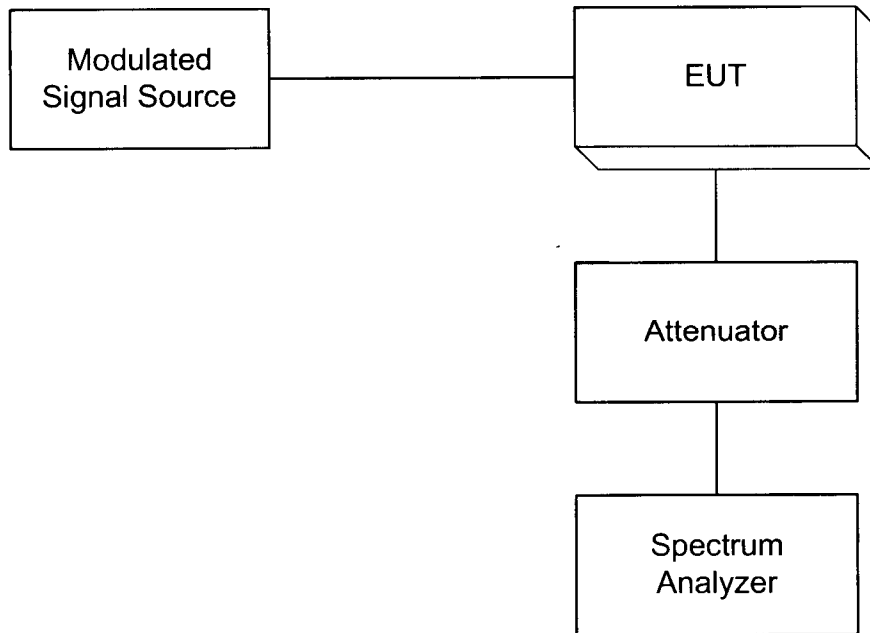


Occupied Bandwidth



Appendix A

Spurious Emissions at the Antenna Terminals



Field Strength of Spurious Radiation

