Engineering and Testing for EMC and Safety Compliance

Unlicensed National Information Infrastructure (UNII) Transmitter Report
FCC Part 15E & Industry Canada RSS-210

Test Lab:	Applicant:
Rhein Tech Laboratories, Inc. Phone: 703-689-0368 360 Herndon Parkway Fax: 703-689-2056 Suite 1400 Web: www.rheintech.com Herndon, VA 20170 E-Mail: atcbinfo@rheintech.com	Vocollect, Inc. Phone: 412-349-2580 Contact: Joe Lesik Fax: 412-829-1063 703 Rodi Road Pittsburgh, PA 15235

FCC ID/ IC:	MQO-TT-800-1-1/ 2570A-TT80011	**Test Report Date:**	October 27, 2010
Platform:	N/A	**RTL Work Order Number:**	2010175-3
Model Name/ Model Number:	A500 / TT-800-1-1	**RTL Quote Number:**	QRTL10-396
American National Standard Institute:	ANSI C63.4-2003 Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz		
FCC Classification:	NII - Unlicensed National Information Infrastructure		
FCC Rule Part(s):	FCC Rules Part 15.407 (Subpart E): Unlicensed National Information Infrastructure Devices (10-01-09)		
Industry Canada:	RSS-210 Issue 7: Low Power License-Exempt Communications Devices		
Digital Interface Information	Digital Interface was found to be compliant		

Frequency Range (MHz)	Output Power (W)	Frequency Tolerance	Emission Designator
5180-5240	0.031	N/A	16M5G7D
5260-5320	0.044	N/A	16M5G7D
5500-5700	0.087	N/A	16M5G7D

I, the undersigned, hereby declare that the equipment tested and referenced in this report conforms to the identified standard(s) as described in this test report. No modifications were made to the equipment during testing in order to achieve compliance with these standards. Furthermore, there was no deviation from, additions to, or exclusions from, the applicable parts of FCC Part 2, FCC Part 15, FCC 97-114, ANSI C63.4, and Industry Canada RSS-210.

Signature: _____ Date: October 27, 2010

Typed/Printed Name: Desmond A. Fraser Position: President

These tests are accredited and meet the requirements of ISO/IEC 17025 as verified by ANSI-ASQ National Accreditation Board/ACLASS. Refer to certificate and scope of accreditation AT-1445.

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1 General Information

1.1 Scope

Applicable Standards:

- FCC Rules Part 15E: Unlicensed National Information Infrastructure Devices
- Industry Canada RSS-210: Low Power License-Exempt Communications Devices

1.2 Description of EUT

Equipment Under Test	Body Worn Terminal
Model	A500
Power Supply	Battery operated
Modulation Type	DSSS, OFDM
Transfer Rate	1, 2, 5.5, 11, 6, 12, 18, 24, 36, 48, 54
Frequency Range	5180 – 5320; 5500-5700 MHz
Antenna Connector Type	Internal
Antenna Types	Internal

Note that the EUT is a slave/client device with no ad-hoc capabilities.

1.3 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located at 360 Herndon Parkway, Suite 1400, Herndon, Virginia 20170. This site has been fully described in a report and approved by the Federal Communications Commission to perform AC line conducted and radiated emissions testing (ANSI C63.4 2003).

1.4 Related Submittal(s)/Grant(s)

This is an original certification application for Vocollect, Inc., Model Name: A500, Model # TT-800-1-1, FCC ID: MQO-TT-800-1-1, IC: 2570A-TT80011.

1.5 Modifications

No modifications were required for compliance.

2 Test Information

2.1 Description of Test Modes

In accordance with FCC 15.31(m), and because the EUT utilizes an operating band greater than 10 MHz, the following frequencies were tested:

Table 2-1: Channels Tested - 802.11a (54 Mbps)

Channel	Frequency (MHz)
36	5180
40	5200
48	5240
52	5260
60	5300
64	5320
100	5500
116	5580
140	5700

2.2 Exercising the EUT

The EUT was tested in all three orthogonal planes in order to determine worst-case emissions. The EUT was provided with software to continuously transmit during testing. The carrier was also checked to verify that information was being transmitted. There were no deviations from the test standard(s) and/or methods. The test results reported relate only to the item tested.

2.3 Test Result Summary

Table 2-2: Test Result Summary – FCC Part 15, Subpart E (Section 15.407)

Standard	Test	Pass/Fail or N/A
FCC §15.407(a/1/2/3)	Peak Transmit Power Measurement	Pass
FCC §15.407(a)(6)	Peak Power Excursion Measurement	Pass
FCC §15.407(a/1/2/3)	Peak Power Spectral Density Measurement	Pass
FCC §15.407(g)	Frequency Stability Measurement	Pass
FCC §15.407(7), §15.205	Compliance With the Band Edge	Pass
FCC §15.407(6)(b)	Antenna Conducted Spurious Emissions	Pass
FCC §15.407(a)	26 dB Bandwidth	Pass
FCC §15.209	Radiated Emissions	Pass
FCC §15.207	Conducted AC Emissions	Pass

2.4 Test System Details

The test sample was received on September 20, 2010. The FCC identifiers for all applicable equipment, plus descriptions of all cables used in the tested system, are identified in the following tables.

Table 2-3: Equipment Under Test

Part	Manufacturer	Model	Serial Number	FCC ID	Cable Description	RTL Bar Code
A500 Talkman WLAN/Bluetooth Terminal	Vocollect, Inc.	TT-800-1-1	30100051	MQO-TT-800-1-1	N/A	19876
A500 Talkman WLAN/Bluetooth Terminal	Vocollect, Inc.	TT-800-1-1	30100030	MQO-TT-800-1-1	N/A	19877
Battery	Vocollect, Inc.	BT-700 (730037)	3501904392	N/A	N/A	19883
Battery	Vocollect, Inc.	BT-700 (730037)	3500201661	N/A	N/A	19884

Table 2-4: Support Equipment

Part	Manufacturer	Model	Serial Number	FCC ID	Cable Description	RTL Bar Code
Battery Charger	Vocollect, Inc.	CM-700-2	166300020A	N/A	9' unshielded	19879
Headset	Vocollect, Inc.	N/A	N/A	N/A	N/A	19869

2.5 Configuration of Tested System

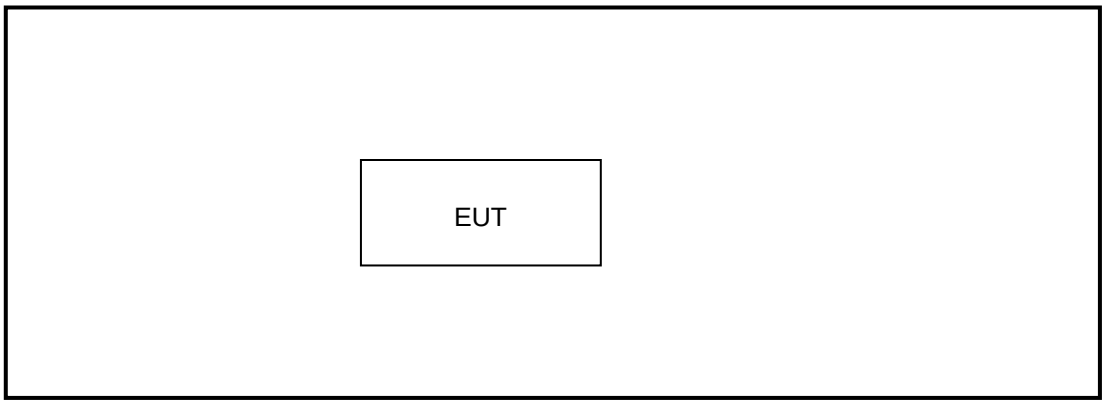


Figure 2-1: Configuration of System Under Test

3 Peak Transmit Power Measurement – FCC §15.407(a/1/2/3); RSS-210 A9.2

3.1 Power Output Test Procedure

ANSI C63.10, Section 6.10.3.3, Method 3—power integration with max hold

Method 3 is used if sweep time > *T*, and EBW > largest available RBW.
a) Set span to encompass the entire EBW of the signal.
b) Set sweep trigger to "free run"
c) Set RBW = 1 MHz.
d) Set VBW _ 1/*T.*
e) Use linear display mode.
f) Use sample detector mode if bin width (i.e., span/number of points in spectrum) < 0.5 RBW. Otherwise, use peak detector mode.
g) Set max hold.
h) Allow max hold to run for 60 s.
i) Compute power by integrating the spectrum across the 26 dB EBW, or apply a bandwidth correction factor of 10 log (EBW/1 MHz) to the spectral peak of the emission. The integration can be performed using the spectrum analyzer's band power measurement function with band limits set equal to the EBW band edges or by summing power levels in each 1 MHz band in linear power terms. The 1 MHz band-power levels to be summed can be obtained by averaging, in linear power terms, the power levels in each frequency bin across the 1 MHz.

Since the bin width is less than half the RBW sample detector was used in max hold, the power was integrated across the 26 dB EBW using the analyzer's band power measurement function. The fundamental was gated and the analyzer set to run for 60 s.

Table 3-1: Power Output Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901413	Agilent Technologies	E4448A	Spectrum Analyzer	US44020346	11/11/10

3.2 Power Output Test Data

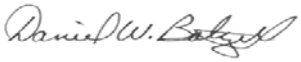
Table 3-2: Power Output Test Data

Channel	Frequency (MHz)	Maximum Conducted Output Power (dBm)
36	5180	13.5
40	5200	14.0
48	5240	14.9
52	5260	15.3
60	5300	16.1
64	5320	16.4
100	5500	19.4
116	5580	18.5
140	5700	15.3

3.3 Limits of Maximum Transmit Power Measurement

Frequency Band	Limit
5.15-5.25GHz	The lesser of 50 mW (17 dBm) or 4 dBm+10logB
5.25-5.35GHz	The lesser of 250 mW (24 dBm) or 11 dBm+10logB
5.725-5.825GHz	The lesser of 1 W (30 dBm) or 17 dBm+10logB

Test Personnel:

Daniel W. Baltzell		September 20, 2010
Test Engineer	Signature	Date Of Test

4 Peak Power Excursion Measurement – FCC §15.407(a)(6)

4.1 Limits of Peak Power Excursion

Frequency Band	Limit
5.15-5.25 GHz	13 dB
5.25-5.35 GHz	13 dB
5.725-5.825 GHz	13 dB

4.2 Peak Power Excursion Measurement Test Procedure

1. The transmit output was connected to a spectrum analyzer.
2. Span was set to the entire emission bandwidth of signal.
3. Using peak detector and max hold function for trace A, set RBW to 1 MHz and VBW to 3,MHz. Set for trace B, RBW to 1 MHz and VBW to 300 kHz.
4. Record the largest difference between trace A and trace B in any 1 MHz band on any frequency.

Table 4-1: Peak Power Excursion Measurement Test Equipment

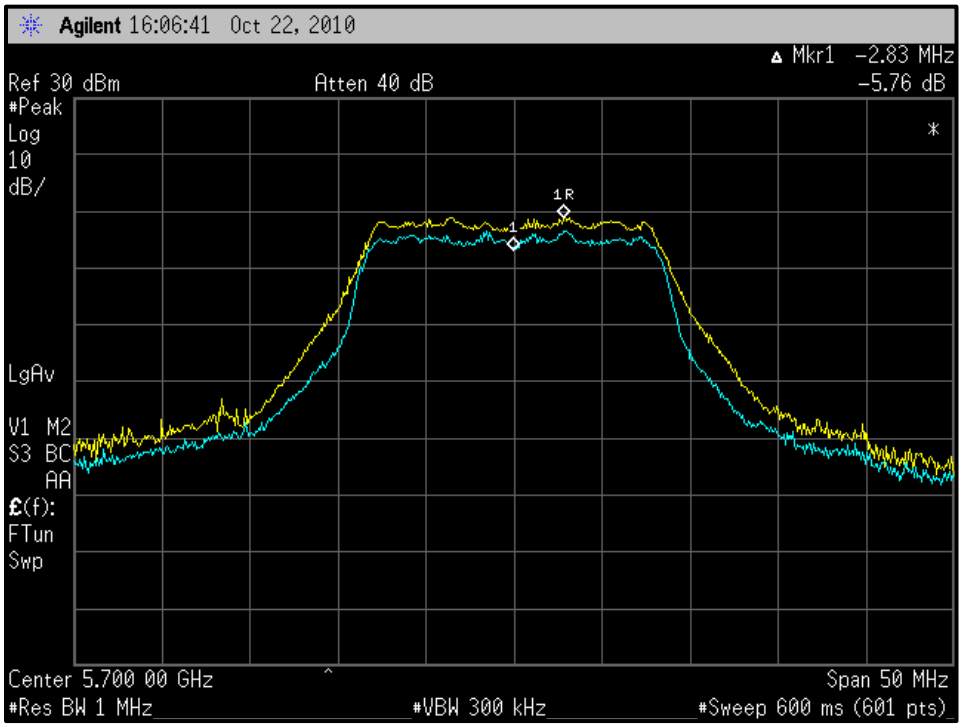
RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901413	Agilent Technologies	E4448A	Spectrum Analyzer	US44020346	11/11/10

4.3 Peak Power Excursion Test Data

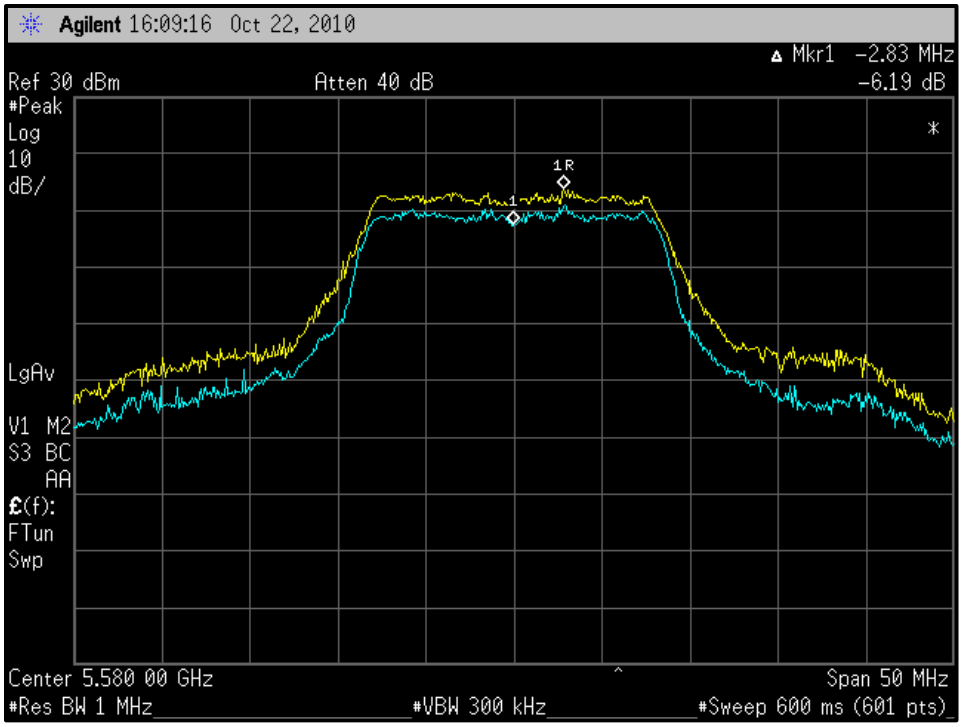
Table 4-2: Peak Power Excursion Test Data

Channel	Frequency (MHz)	Peak Power Excursion (dB)	Peak to Avg Excursion Limit (dB)	Pass/Fail
36	5180	7.3	13.0	Pass
40	5200	6.5	13.0	Pass
48	5240	6.9	13.0	Pass
52	5260	6.9	13.0	Pass
60	5300	6.5	13.0	Pass
64	5320	6.1	13.0	Pass
100	5500	6.9	13.0	Pass
116	5580	6.2	13.0	Pass
140	5700	5.8	13.0	Pass

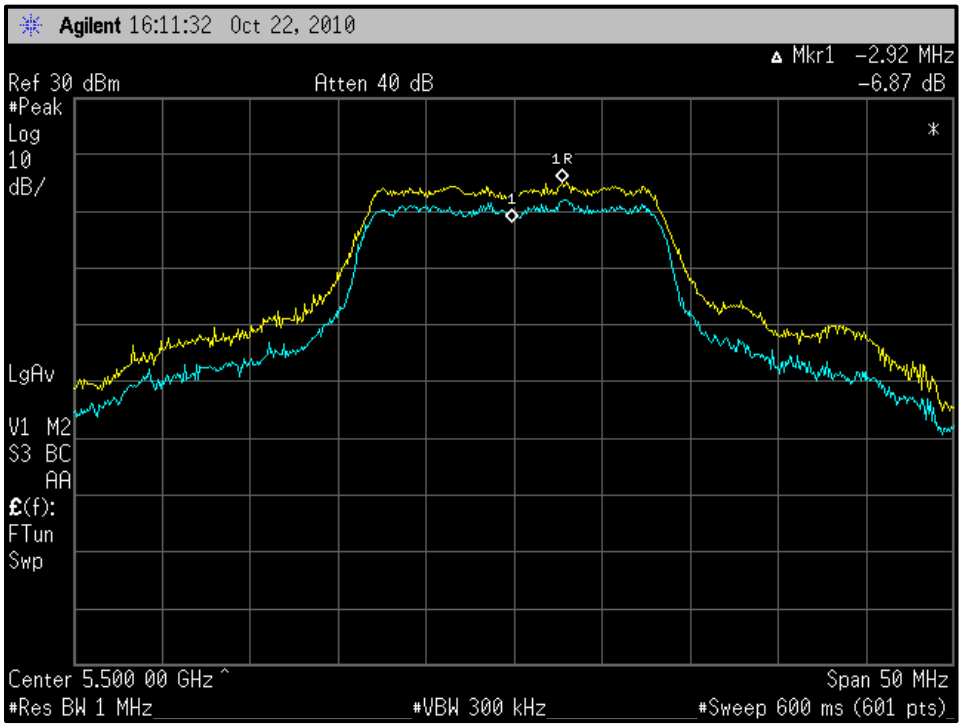
Plot 4-1: Peak Power Excursion: Channel 140 (5700 MHz – 54 Mb/s)



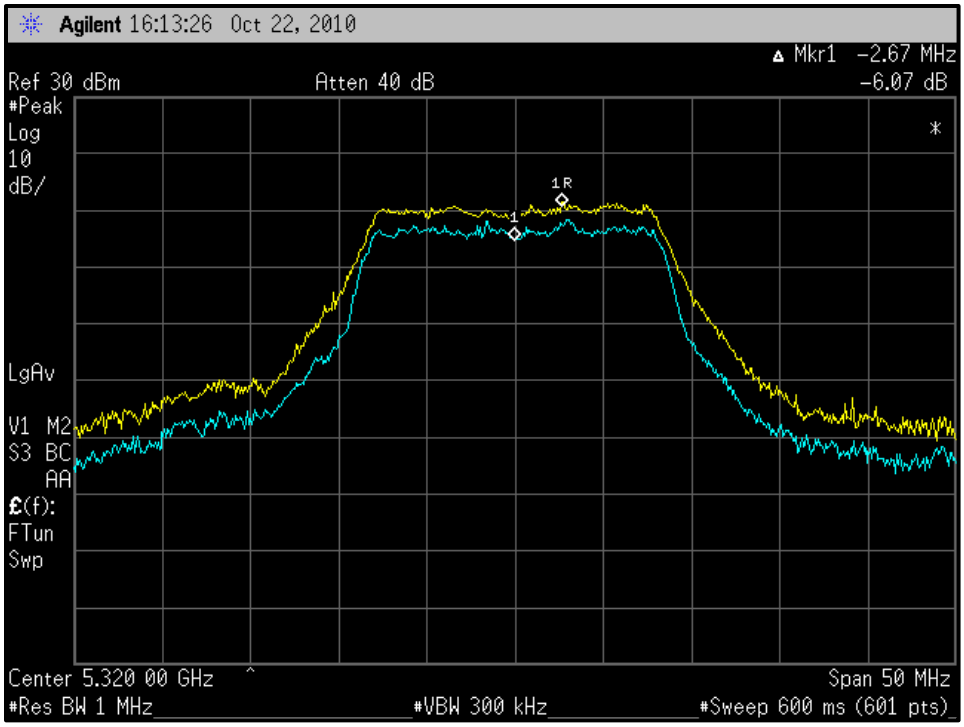
Plot 4-2: Peak Power Excursion: Channel 116 (5580 MHz – 54 Mb/s)



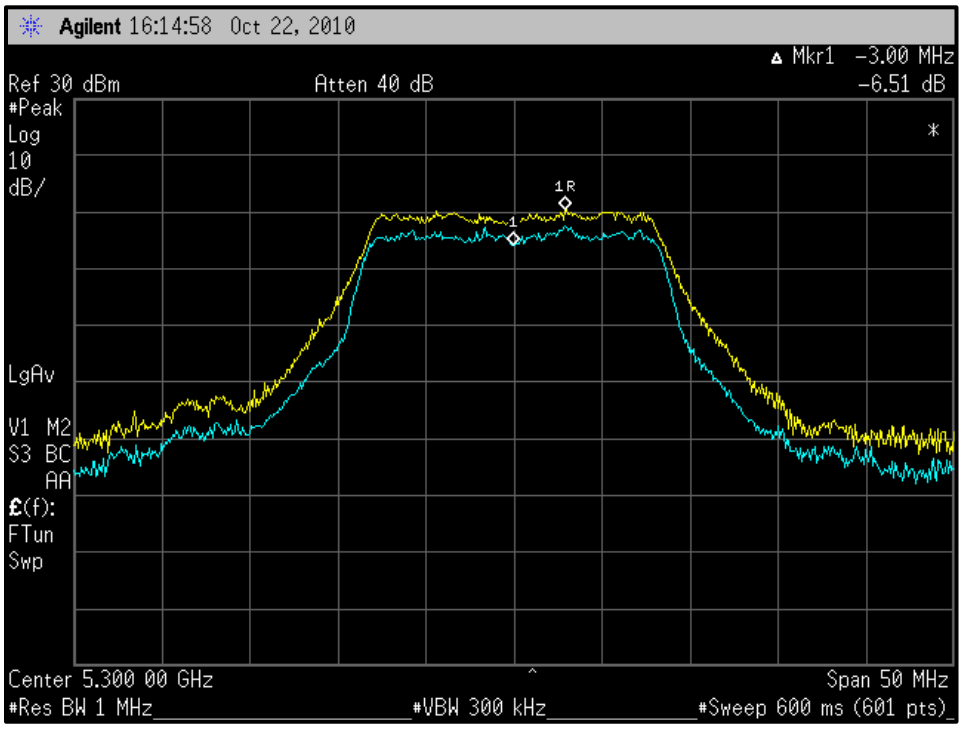
Plot 4-3: Peak Power Excursion: Channel 100 (5500 MHz – 54 Mb/s)



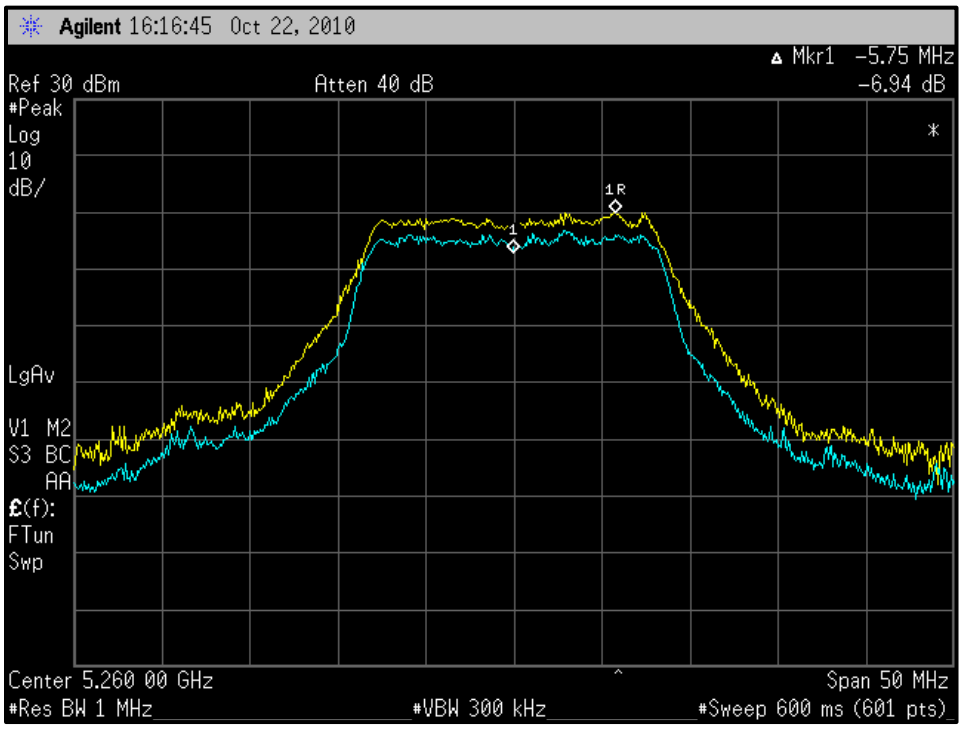
Plot 4-4: Peak Power Excursion: Channel 64 (5320 MHz – 54 Mb/s)



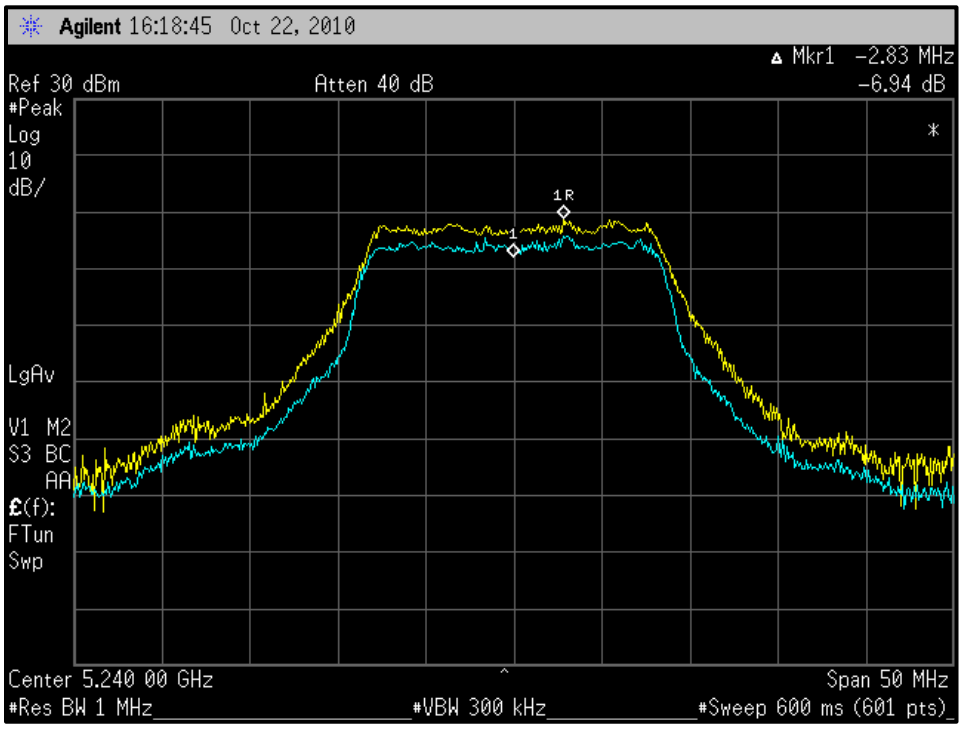
Plot 4-5: Peak Power Excursion: Channel 60 (5300 MHz – 54 Mb/s)



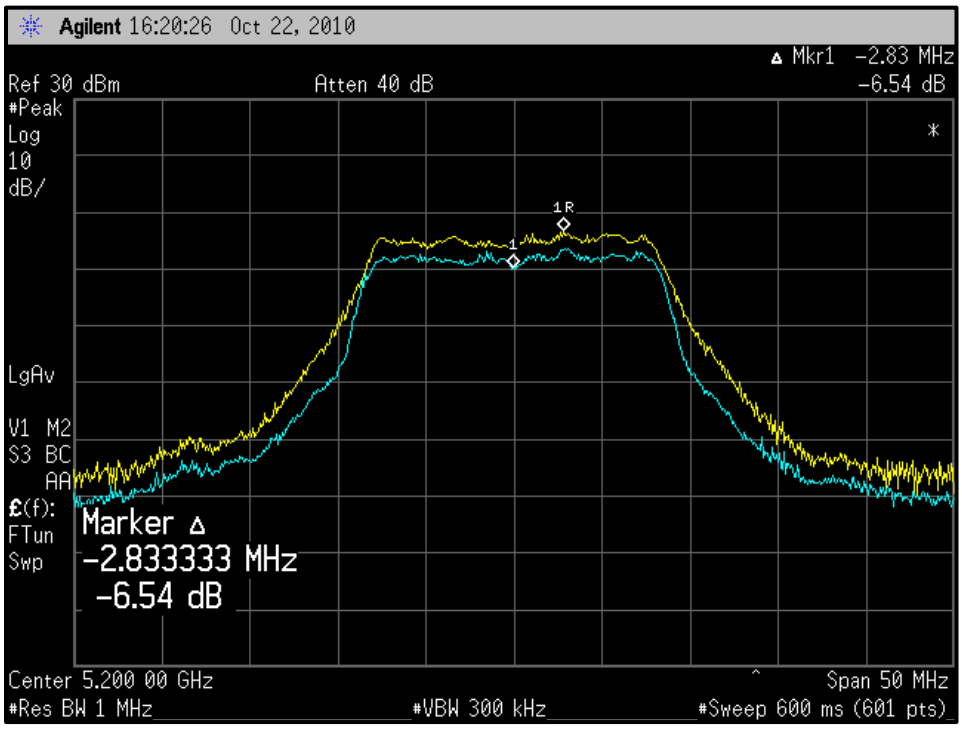
Plot 4-6: Peak Power Excursion: Channel 52 (5260 MHz – 54 Mb/s)



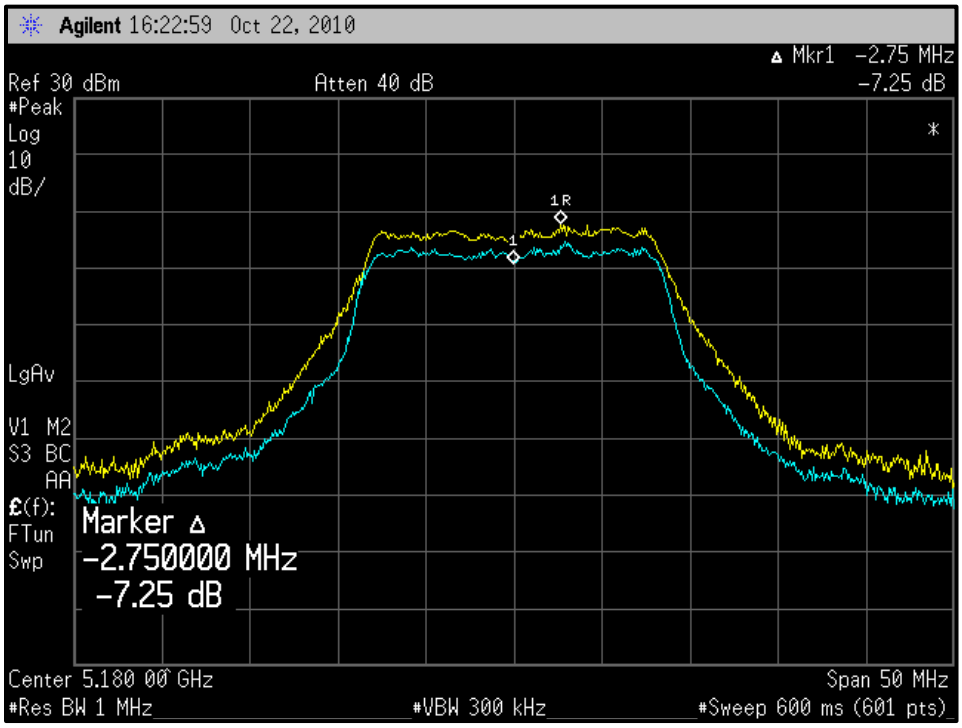
Plot 4-7: Peak Power Excursion: Channel 48 (5240 MHz – 54 Mb/s)



Plot 4-8: Peak Power Excursion: Channel 40 (5200 MHz – 54 Mb/s)



Plot 4-9: Peak Power Excursion: Channel 36 (5180 MHz – 54 Mb/s)



Test Personnel:

Daniel W. Baltzell	Daniel W. Baltzell	October 22, 2010
EMC Test Engineer	Signature	Date Of Test

5 Peak Power Spectral Density Measurement – FCC §15.407(a/1/2/3); RSS-210 A9.2

5.1 Limits of Peak Power Spectral Density

Frequency Band	Limit
5.15-5.25 GHz	4 dBm
5.25-5.35 GHz	11 dBm
5.725-5.825 GHz	17 dBm

5.2 Peak Power Spectral Density Measurement Test Procedure

1. The transmitter output was connected to a spectrum analyzer
2. RBW was set to 1 MHz and VBW to 3 MHz. The highest level PPSD was measured across the emission in any 1 MHz band.

Table 5-1: Peak Power Spectral Density Measurement Test Equipment

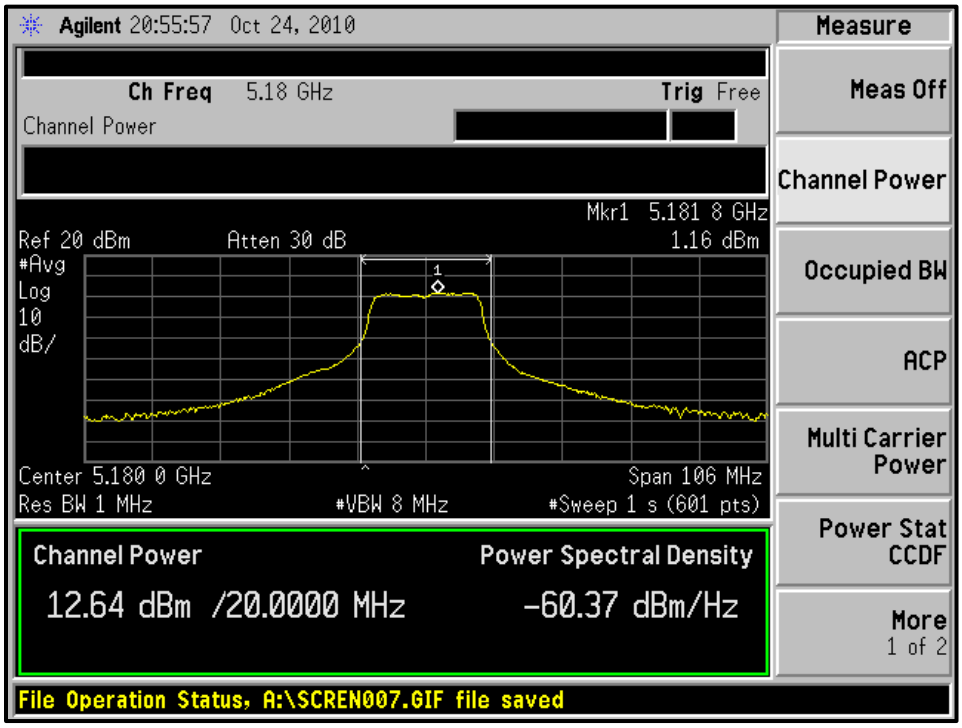
RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901413	Agilent Technologies	E4448A	Spectrum Analyzer	US44020346	11/11/10

5.3 Peak Power Spectral Density Test Data

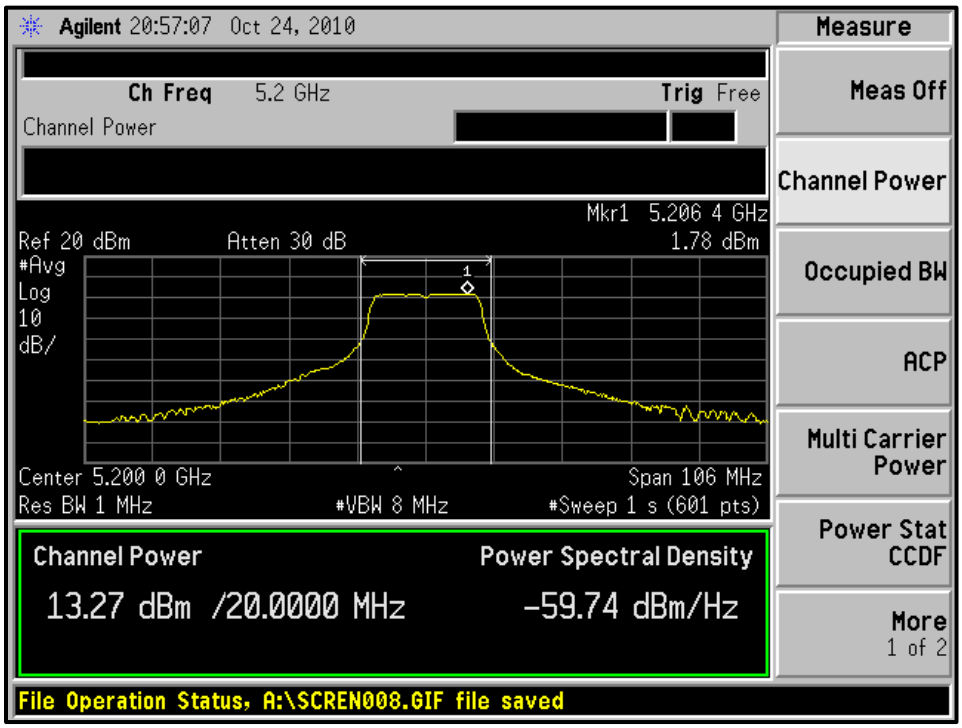
Table 5-2: Peak Power Spectral Density Test Data

Channel	Frequency (MHz)	RF Power Level in 1MHz BW (dBm)	Maximum Limit (dBm)	Pass/Fail
36	5180	1.2	4	Pass
40	5200	1.8	4	Pass
48	5240	2.9	4	Pass
52	5260	2.9	11	Pass
60	5300	4.2	11	Pass
64	5320	4.1	11	Pass
100	5500	7.0	17	Pass
116	5580	6.2	17	Pass
140	5700	3.3	17	Pass

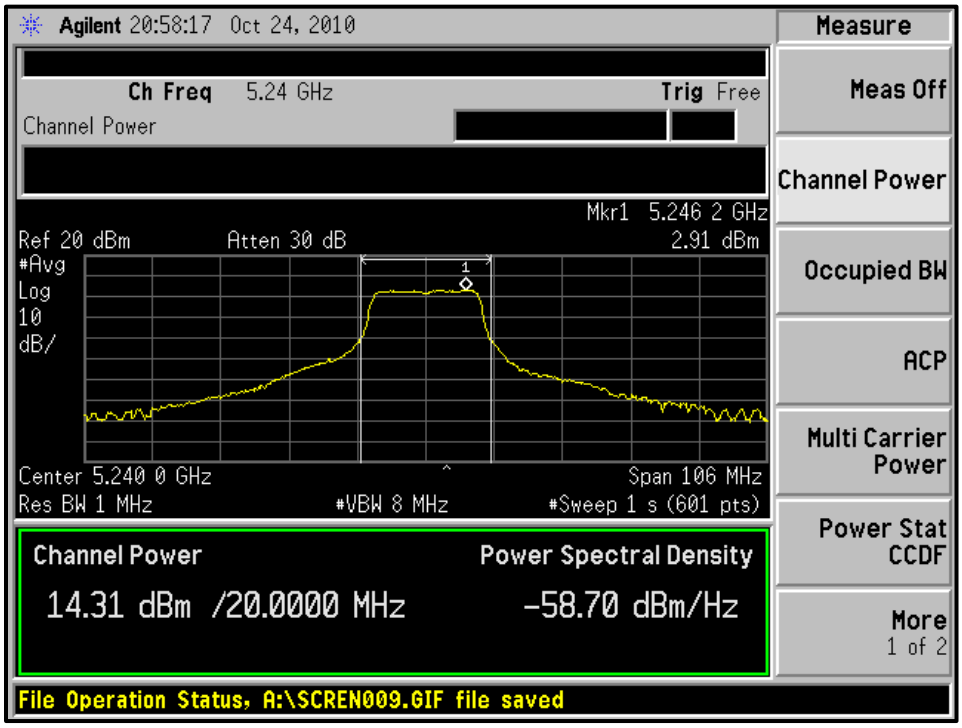
Plot 5-1: Peak Power Spectral Density: Channel 36 (5180 MHz – 54 Mb/s)



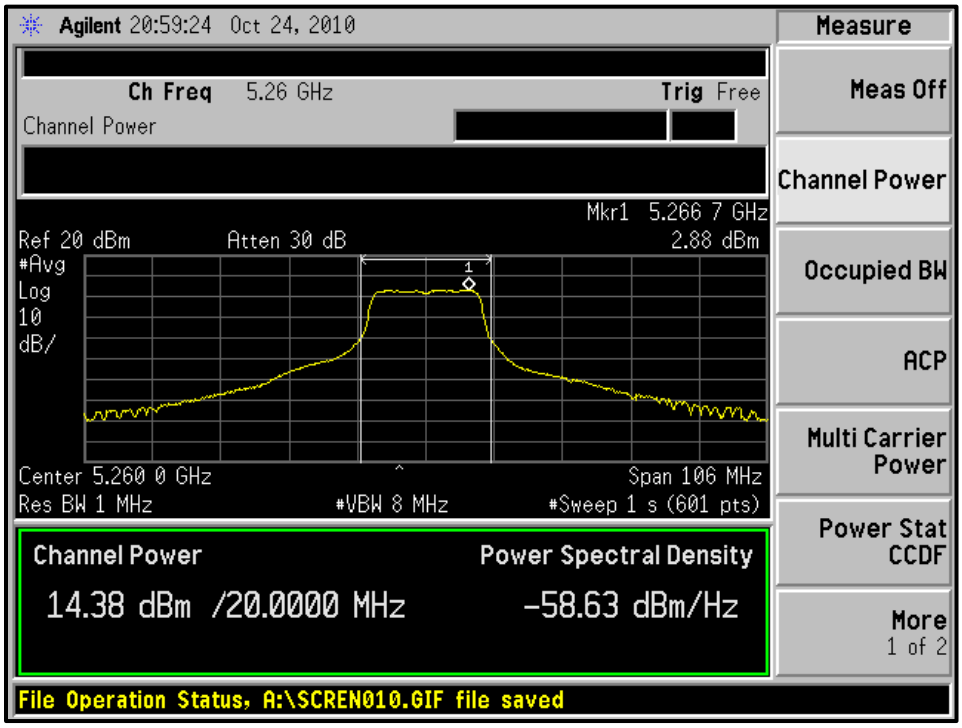
Plot 5-2: Peak Power Spectral Density: Channel 40 (5200 MHz – 54 Mb/s)



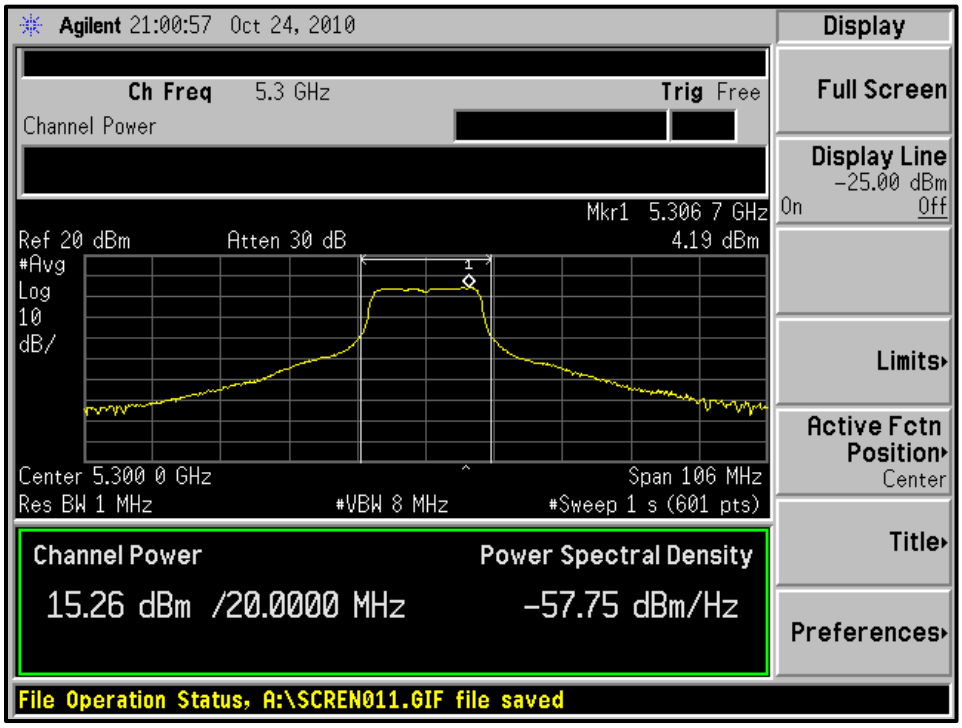
Plot 5-3: Peak Power Spectral Density: Channel 48 (5240 MHz – 54 Mb/s)



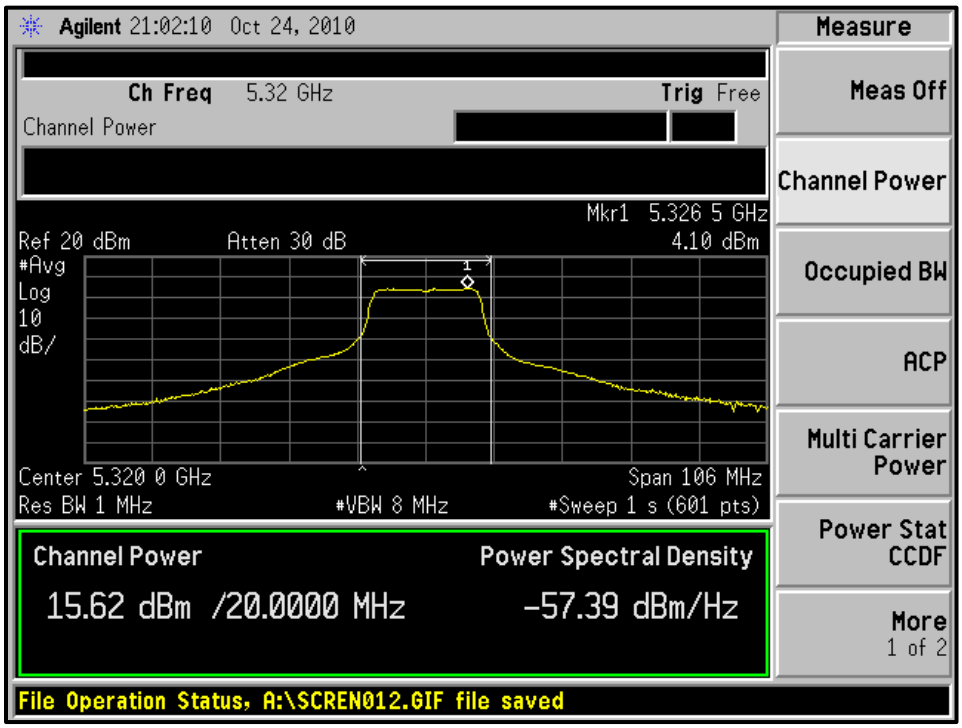
Plot 5-4: Peak Power Spectral Density: Channel 52 (5260 MHz – 54 Mb/s)



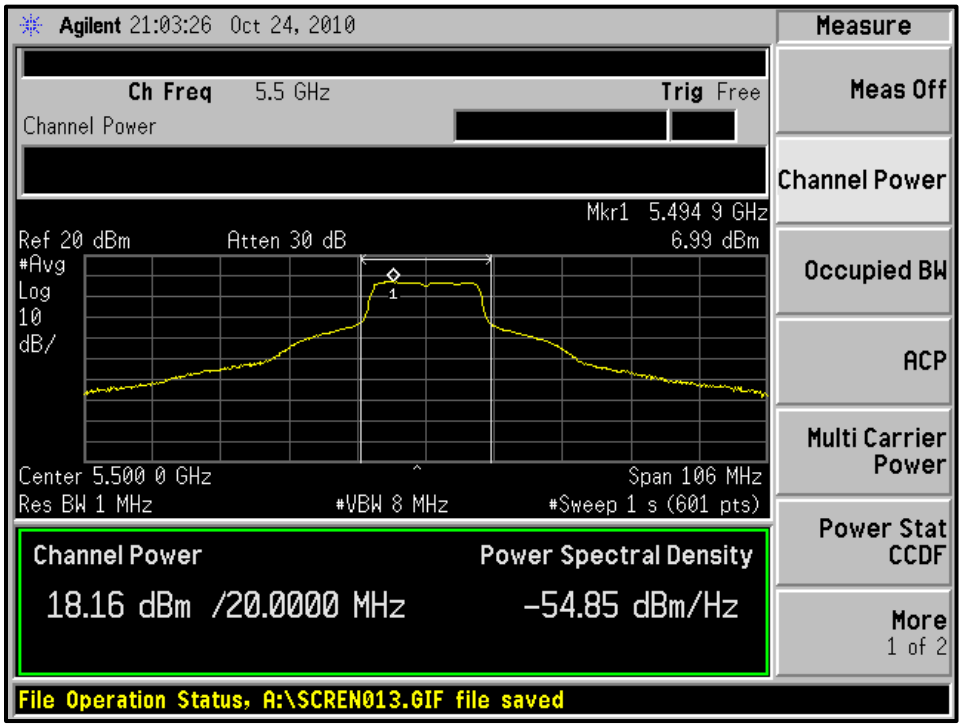
Plot 5-5: Peak Power Spectral Density: Channel 60 (5300 MHz – 54 Mb/s)



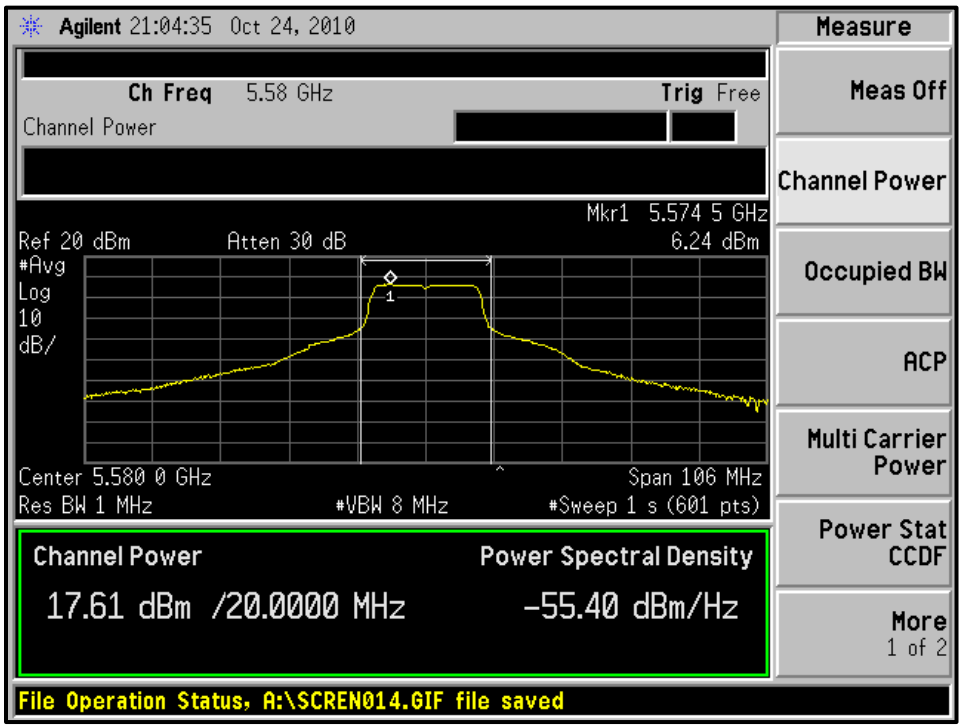
Plot 5-6: Peak Power Spectral Density: Channel 64 (5320 MHz – 54 Mb/s)



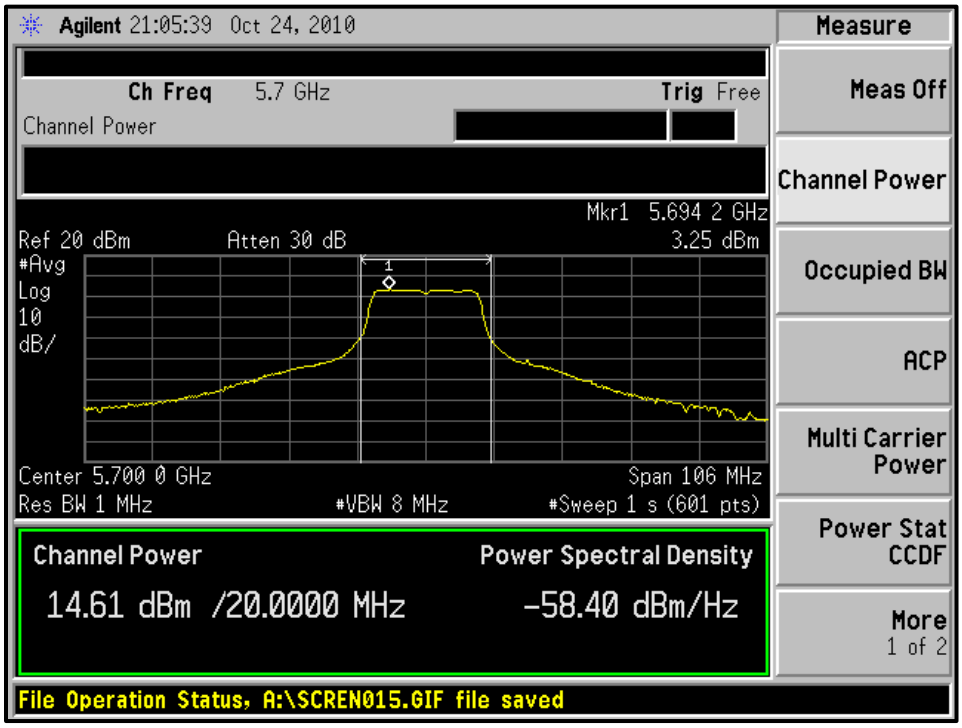
Plot 5-7: Peak Power Spectral Density: Channel 100 (5500 MHz – 54 Mb/s)



Plot 5-8: Peak Power Spectral Density: Channel 116 (5580 MHz – 54 Mb/s)



Plot 5-9: Peak Power Spectral Density: Channel 140 (5700 MHz – 54 Mb/s)



Test Personnel:

Daniel W. Baltzell		October 24, 2010
Test Engineer	Signature	Date Of Test

6 Frequency Stability Measurement – FCC §15.407(g)

6.1 Limits of Frequency Stability

The frequency tolerance of the CW shall be maintained within +/-0.02% of the operating frequency over a temperature variation of -30° C to 50° C at normal supply voltage, and for a variation in the primary supply voltage from 85%-115% of the rated supply voltage at a temperature of 20° C.

6.2 Frequency Stability Measurement Test Procedure

The EUT was placed inside temperature chamber and supplied by nominal 3.7 VDC. The EUT was connected to a .4 which was located outside of test chamber. The temperature was set to the lowest level and the EUT was allowed to stabilize with power off for a period of 30 minutes. The EUT was then powered up and the frequency of the CW was measured. The higher temperature level of 50 degrees C in steps of 10 degrees was measured. The chamber was then allowed to stabilize between measurements for approximately 30 minutes. The EUT supply voltage was then adjusted to 85% and 115% of nominal voltage and the frequency was again recorded and finally normalized to 20C

Table 6-1: Frequency Stability Measurement Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901300	Agilent Technologies	53131A (225 MHz)	Universal Frequency Counter	MY40001345	7/29/11

6.3 Frequency Stability Test Data

Table 6-2: Frequency Stability/Temperature Variation; Channel 36 – 5180 MHz

Temperature (°C)	Measured Frequency (MHz)	ppm
-30	5180.009178	1.8
-20	5180.011831	2.3
-10	5180.014143	2.7
0	5180.012126	2.3
10	5180.007266	1.4
20	5180.000000	0.0
30	5179.995055	-1.0
40	5179.992767	-1.4
50	5179.990930	-1.8

Table 6-3: Frequency Stability/Voltage Variation; Channel 36 – 5180 MHz

Voltage (VDC)	Measured Frequency (MHz)	ppm
3.145	5179.997569	-0.5
3.7	5180.000000	0.0
4.255	5179.996671	-0.6

Table 6-4: Frequency Stability/Temperature Variation; Channel 40 – 5200 MHz

Temperature (°C)	Measured Frequency (MHz)	ppm
-30	5200.016247	3.1
-20	5200.018080	3.5
-10	5200.018974	3.6
0	5200.016367	3.1
10	5200.010844	2.1
20	5200.000000	0.0
30	5200.000023	0.0
40	5199.995890	-0.8
50	5199.995751	-0.8

Table 6-5: Frequency Stability/Voltage Variation; Channel 40 – 5200 MHz

Voltage (VDC)	Measured Frequency (MHz)	ppm
3.145	5199.999670	-0.1
3.7	5200.000000	0.0
4.255	5200.001353	0.3

Table 6-6: Frequency Stability/Temperature Variation; Channel 48 – 5240 MHz

Temperature (°C)	Measured Frequency (MHz)	ppm
-30	5240.016260	3.1
-20	5240.020335	3.9
-10	5240.019814	3.8
0	5240.016038	3.1
10	5240.010552	2.0
20	5240.000000	0.0
30	5240.000088	0.0
40	5239.995272	-0.9
50	5239.997620	-0.5

Table 6-7: Frequency Stability/Voltage Variation; Channel 48 – 5240 MHz

Voltage (VDC)	Measured Frequency (MHz)	ppm
3.145	5240.000396	0.1
3.7	5240.000000	0.0
4.255	5240.001495	0.3

Table 6-8: Frequency Stability/Temperature Variation; Channel 52 – 5260 MHz

Temperature (°C)	Measured Frequency (MHz)	ppm
-30	5260.017701	3.4
-20	5260.020347	3.9
-10	5260.019232	3.7
0	5260.014937	2.8
10	5260.008998	1.7
20	5260.000000	0.0
30	5259.999646	-0.1
40	5259.993384	-1.3
50	5259.998709	-0.2

Table 6-9: Frequency Stability/Voltage Variation; Channel 52 – 5260 MHz

Voltage (VDC)	Measured Frequency (MHz)	ppm
3.145	5260.000056	0.0
3.7	5260.000000	0.0
4.255	5260.001062	0.2

Table 6-10: Frequency Stability/Temperature Variation; Channel 60 – 5300 MHz

Temperature (°C)	Measured Frequency (MHz)	ppm
-30	5300.019187	3.6
-20	5300.020245	3.8
-10	5300.018925	3.6
0	5300.014526	2.7
10	5300.008497	1.6
20	5300.000000	0.0
30	5299.998988	-0.2
40	5299.992615	-1.4
50	5299.998409	-0.3

Table 6-11: Frequency Stability/Voltage Variation; Channel 60 – 5300 MHz

Voltage (VDC)	Measured Frequency (MHz)	ppm
3.145	5299.999952	0.0
3.7	5300.000000	0.0
4.255	5300.000861	0.2

Table 6-12: Frequency Stability/Temperature Variation; Channel 64 – 5320 MHz

Temperature (°C)	Measured Frequency (MHz)	ppm
-30	5320.019254	3.6
-20	5320.020328	3.8
-10	5320.018308	3.4
0	5320.013903	2.6
10	5320.007611	1.4
20	5320.000000	0.0
30	5319.998250	-0.3
40	5319.991857	-1.5
50	5319.999163	-0.2

Table 6-13: Frequency Stability/Voltage Variation; Channel 64 – 5320 MHz

Voltage (VDC)	Measured Frequency (MHz)	ppm
3.145	5319.999898	0.0
3.7	5320.000000	0.0
4.255	5320.000745	0.1

Table 6-14: Frequency Stability/Temperature Variation; Channel 100 – 5500 MHz

Temperature (°C)	Measured Frequency (MHz)	ppm
-30	5500.020261	3.7
-20	5500.020960	3.8
-10	5500.018085	3.3
0	5500.013495	2.5
10	5500.006981	1.3
20	5500.000000	0.0
30	5499.997526	-0.4
40	5499.990559	-1.7
50	5499.999300	-0.1

Table 6-15: Frequency Stability/Voltage Variation; Channel 100 – 5500 MHz

Voltage (VDC)	Measured Frequency (MHz)	ppm
3.145	5499.999542	-0.1
3.7	5500.000000	0.0
4.255	5500.000414	0.1

Table 6-16: Frequency Stability/Temperature Variation; Channel 116 – 5580 MHz

Temperature (°C)	Measured Frequency (MHz)	ppm
-30	5580.020889	3.7
-20	5580.021162	3.8
-10	5580.017958	3.2
0	5580.013009	2.3
10	5580.006190	1.1
20	5580.000000	0.0
30	5579.996786	-0.6
40	5579.989857	-1.8
50	5580.000247	0.0

Table 6-17: Frequency Stability/Voltage Variation; Channel 116 – 5580 MHz

Voltage (VDC)	Measured Frequency (MHz)	ppm
3.145	5579.999266	-0.1
3.7	5580.000000	0.0
4.255	5580.000251	0.0

Table 6-18: Frequency Stability/Temperature Variation; Channel 140 – 5700 MHz

Temperature (°C)	Measured Frequency (MHz)	ppm
-30	5700.021160	3.7
-20	5700.021405	3.8
-10	5700.018289	3.2
0	5700.012585	2.2
10	5700.006092	1.1
20	5700.000000	0.0
30	5699.996702	-0.6
40	5699.989409	-1.9
50	5699.999395	-0.1

Table 6-19: Frequency Stability/Voltage Variation; Channel 140 – 5700 MHz

Voltage (VDC)	Measured Frequency (MHz)	ppm
3.145	5699.999162	-0.1
3.7	5700.000000	0.0
4.255	5700.000082	0.0

Test Personnel:

Daniel W. Baltzell		October 25, 2010
Test Engineer	Signature	Date Of Tests

7 Compliance With the Band Edge – FCC §15.407(b)(7), §15.205; RSS-210 A9.3

7.1 Limits of Band Edge Measurement

Below -20 dB of the highest emission level of operating band (in 100 kHz resolution bandwidth).

7.2 Band Edge Test Procedure

The transmitter output was connected to a spectrum analyzer through a low loss cable. The RBW was set to 1 MHz and the VBW was set to 1 MHz with a suitable span including 100 MHz bandwidth from band edge.

For signals in the restricted band above and below 5150 and 5350 MHz, a measurement of the amplitude of the spurious emissions was made with respect to the intentional signal. The relative amplitude, in dBc, was applied to the average measurement using the peak field strength which was measured on the OATS site to calculate the field strength of the unintentional signals.

Table 7-1: Band Edge Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901413	Agilent Technologies	E4448A	Spectrum Analyzer	US44020346	11/11/10

7.3 Restricted Band Edge Test Results

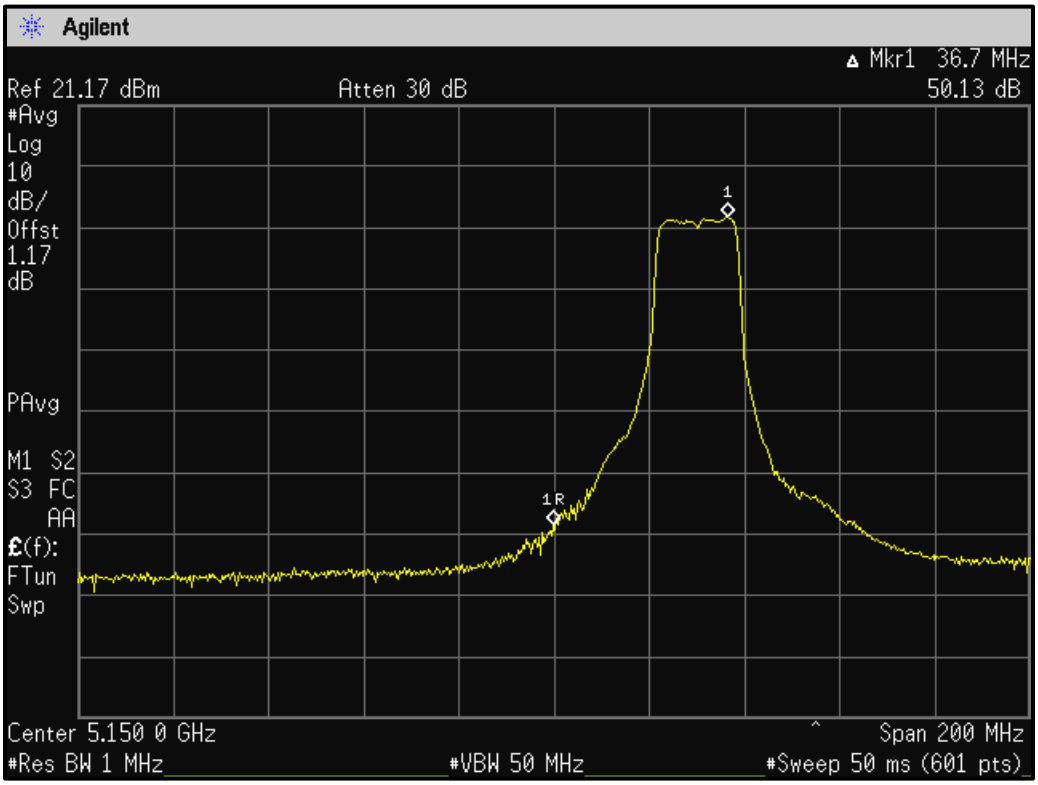
7.3.1 Calculation of Lower Band Edge

85.6 dBuV/m is the field strength measurement, from which the delta measurement of 50.1 dB is subtracted (reference plots), resulting in a level of 35.5 dB. This level has a margin of 18.5 dB below the limit of 54 dBuV/m.

Calculation: 85.6 dBuV/m – 50.1 dB – 54 dBuV/m = -18.5 dB

Field strength of Lower Band Edge (Average) = 85.6 dBuV/m
Field strength of Lower Band Edge (Peak) = 91.0 dBuV/m
Delta measurement = 50.1 dB

Plot 7-1: Lower Band Edge: Measurement Channel 36 (TX Frequency: 5180 MHz)



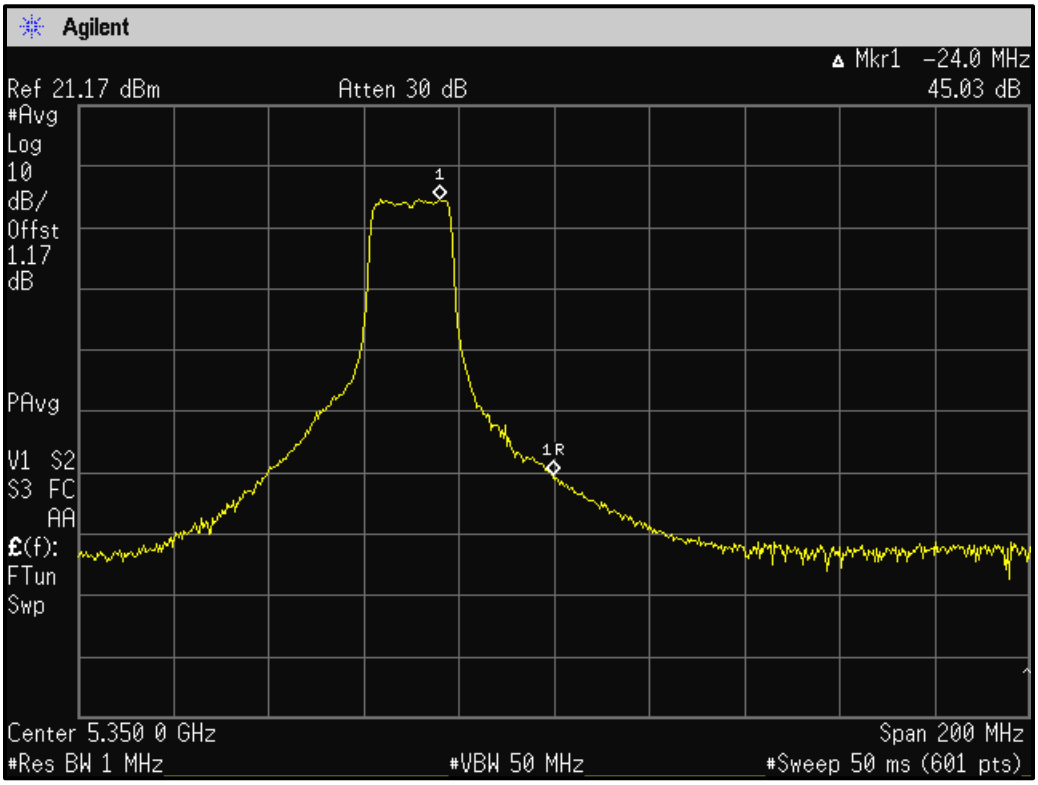
7.3.2 Calculation of Upper Band Edge

85.9 dBuV/m is the field strength measurement, from which the delta measurement of 45 dB is subtracted (reference plots), resulting in a level of 40.9 dB. This level has a margin of 13.1 dB below the limit of 54 dBuV/m.

Calculation: 85.9 dBuV/m – 45 dB – 54 dBuV/m = -13.1 dB

Field strength of Lower Band (Average) = 85.9 dBuV/m
Field strength of Lower Band (Peak) = 95.0 dBuV/m
Delta measurement = 45 dB

Plot 7-2: Upper Band Edge: Measurement Channel 64 (TX Frequency: 5320 MHz)



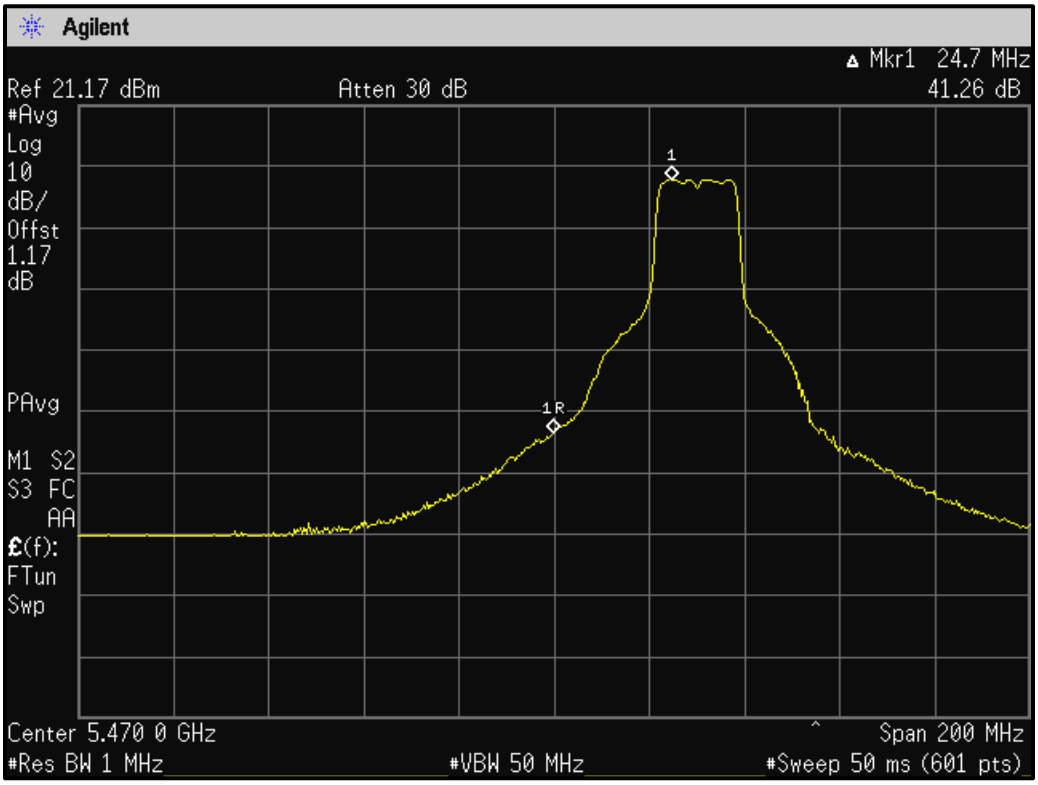
7.3.3 Calculation of Lower Band Edge

85.6 dBuV/m is the field strength measurement, from which the delta measurement of 41.3 dB is subtracted (reference plots), resulting in a level of 44.3 dB. This level has a margin of 9.7 dB below the limit of 54 dBuV/m.

Calculation: 85.6 dBuV/m – 41.3 dB – 54 dBuV/m = -9.7 dB

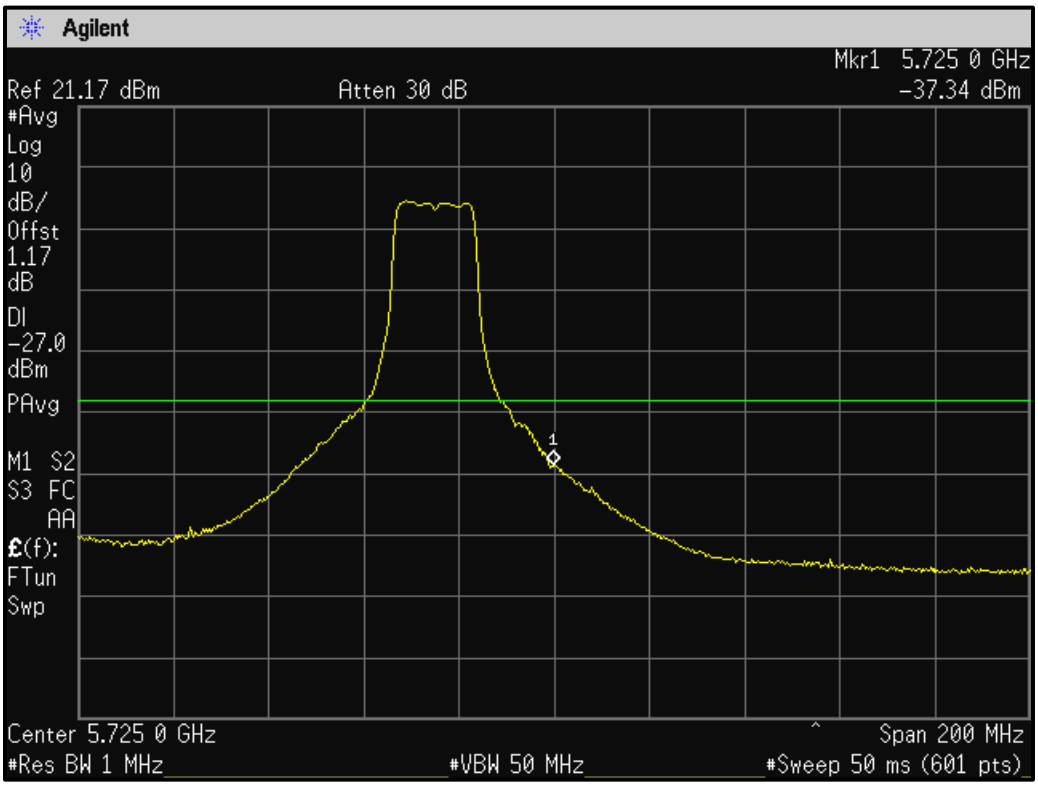
Field strength of Lower Band (Average) = 85.6 dBuV/m
Field strength of Lower Band (Peak) = 95.7 dBuV/m
Delta measurement = 41.3 dB

Plot 7-3: Lower Band Edge: Peak Measurement Channel 100 (TX Frequency: 5500 MHz)



7.3.4 Upper Band Edge

Plot 7-4: Upper Band Edge Measurement Channel 140 (TX Frequency: 5700 MHz)



Note: Offset uses manufacturer's antenna gain added for EIRP comparison to limit.

Test Personnel:

Daniel W. Baltzell		October 24, 2010
Test Engineer	Signature	Date Of Tests

8 Antenna Conducted Spurious Emissions - §15.407(b); RSS-210 A9.3

8.1 Antenna Conducted Spurious Emissions Test Procedures

Antenna spurious emissions were measured from the EUT antenna port using a 50-ohm spectrum analyzer.

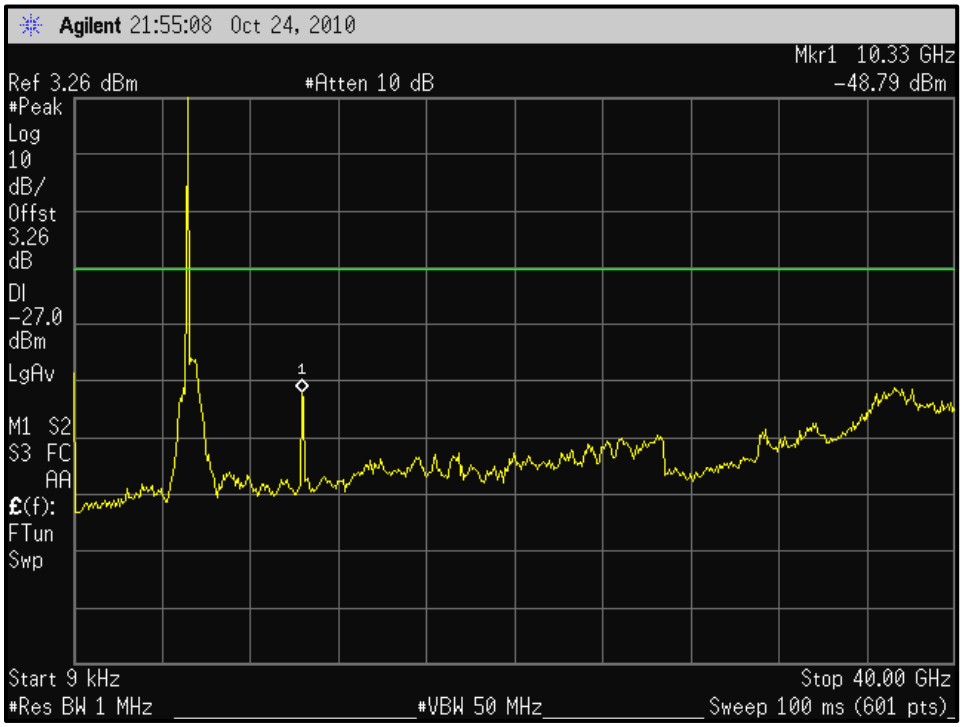
NOTE: Offset is manufacturer's antenna gain added for EIRP comparison to limit.

Table 8-1: Antenna Conducted Spurious Test Equipment

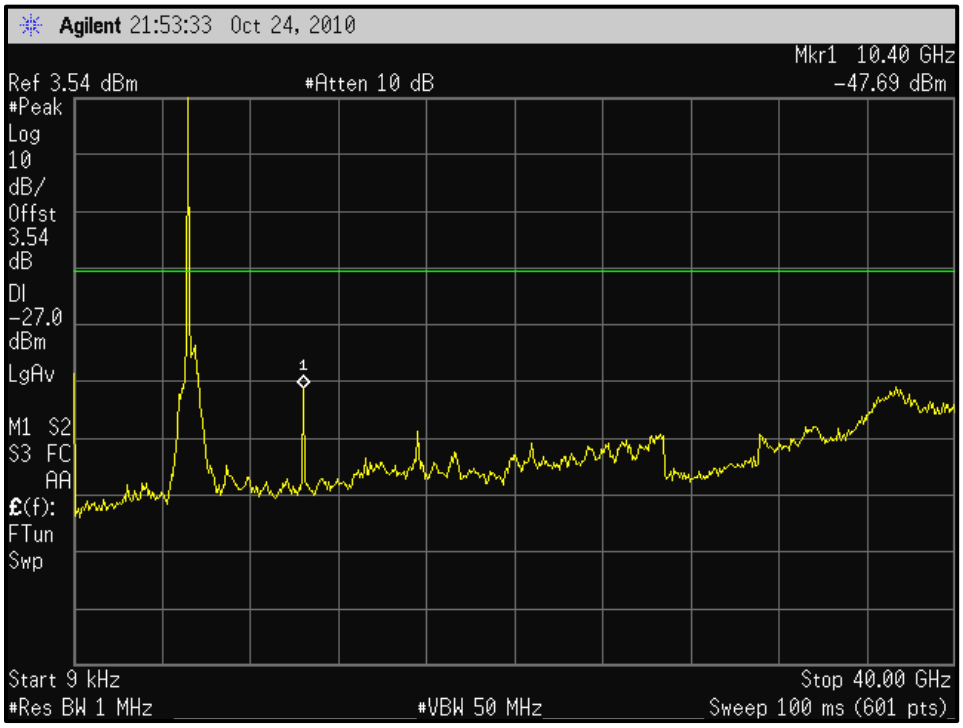
RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901413	Agilent Technologies	E4448A	Spectrum Analyzer	US44020346	11/11/10

8.2 Antenna Conducted Spurious Emissions Test Results

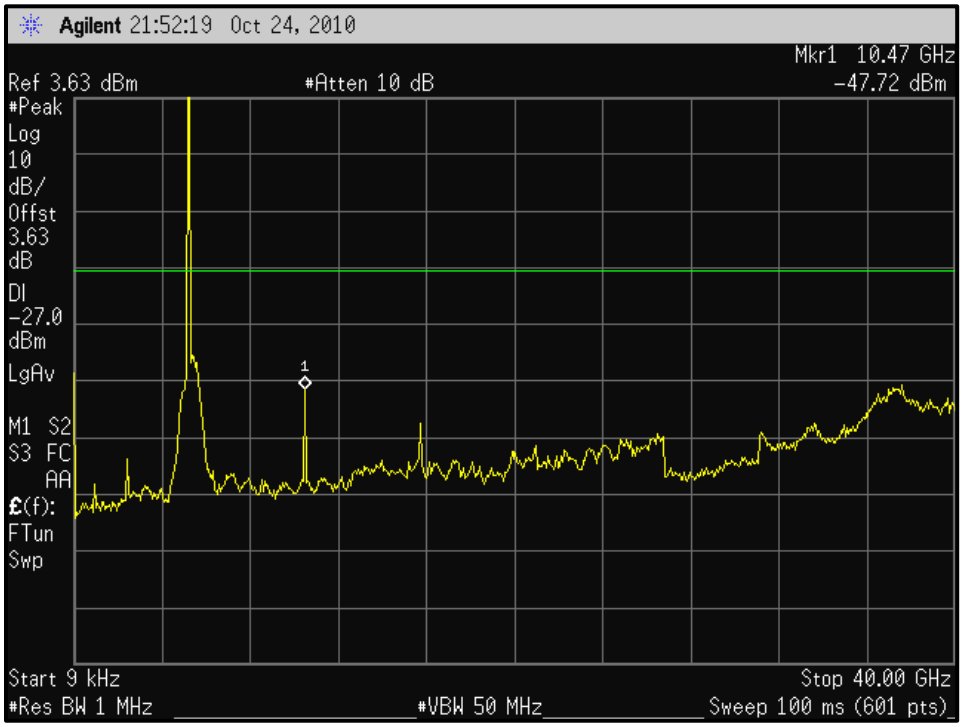
Plot 8-1: Conducted Spurious Emissions Channel 36 (TX Frequency: 5180 MHz)



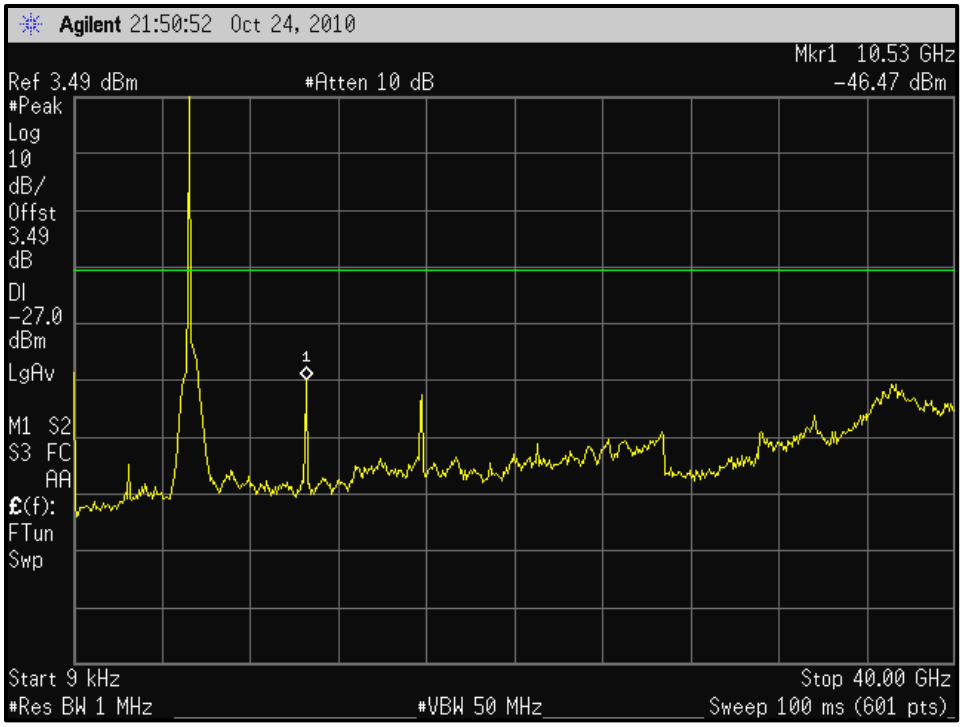
Plot 8-2: Conducted Spurious Emissions Channel 40 (TX Frequency: 5200 MHz)



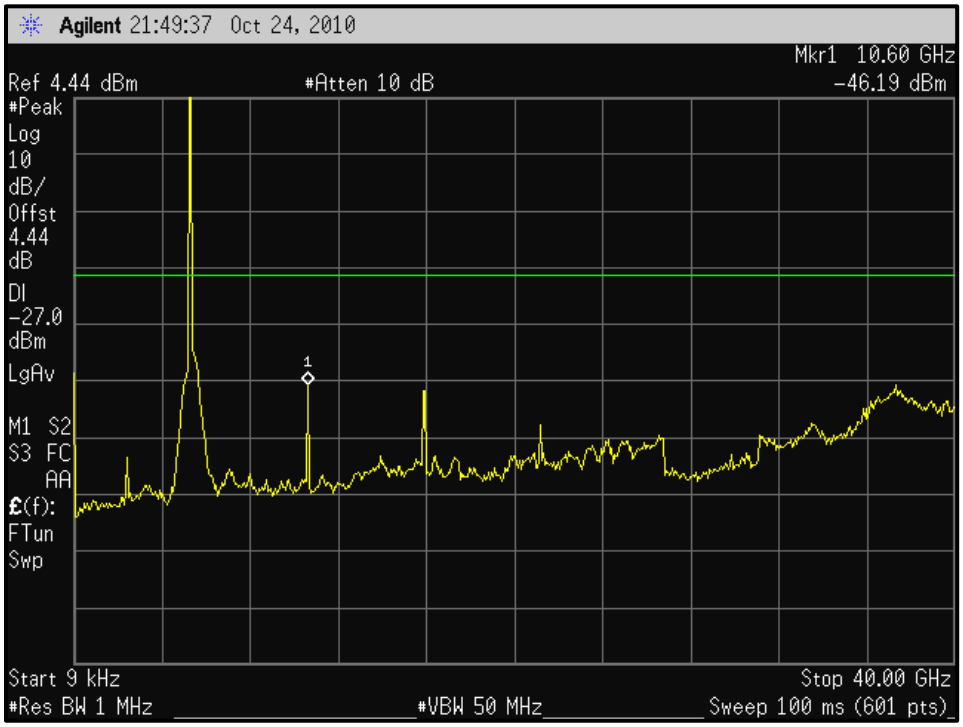
Plot 8-3: Conducted Spurious Emissions Channel 48 (TX Frequency: 5240 MHz)



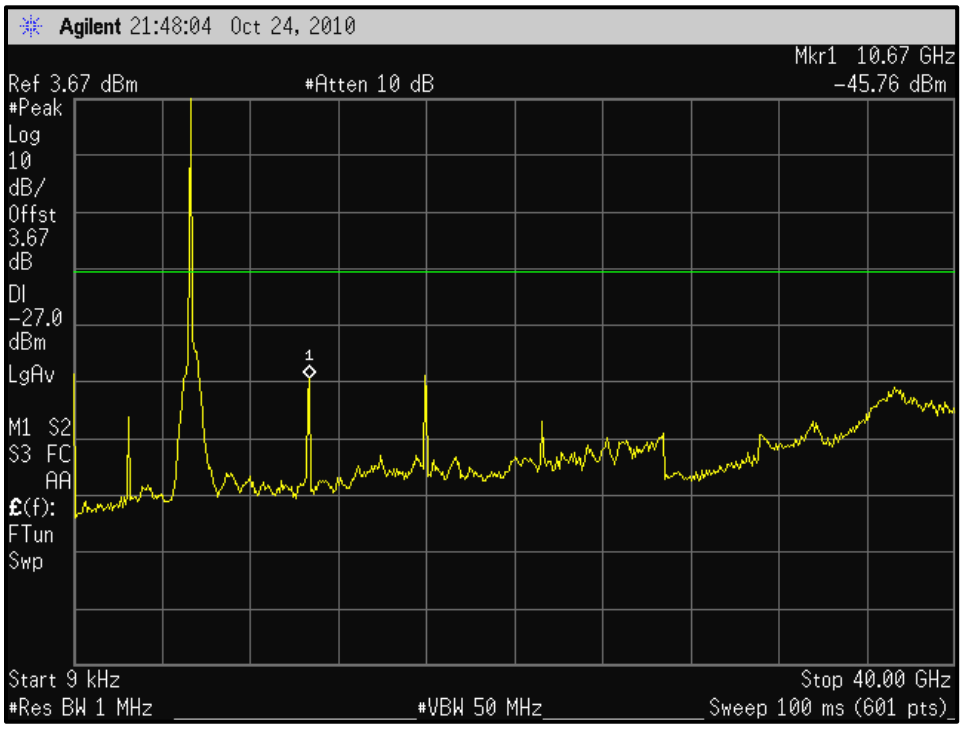
Plot 8-4: Conducted Spurious Emissions Channel 52 (TX Frequency: 5260 MHz)



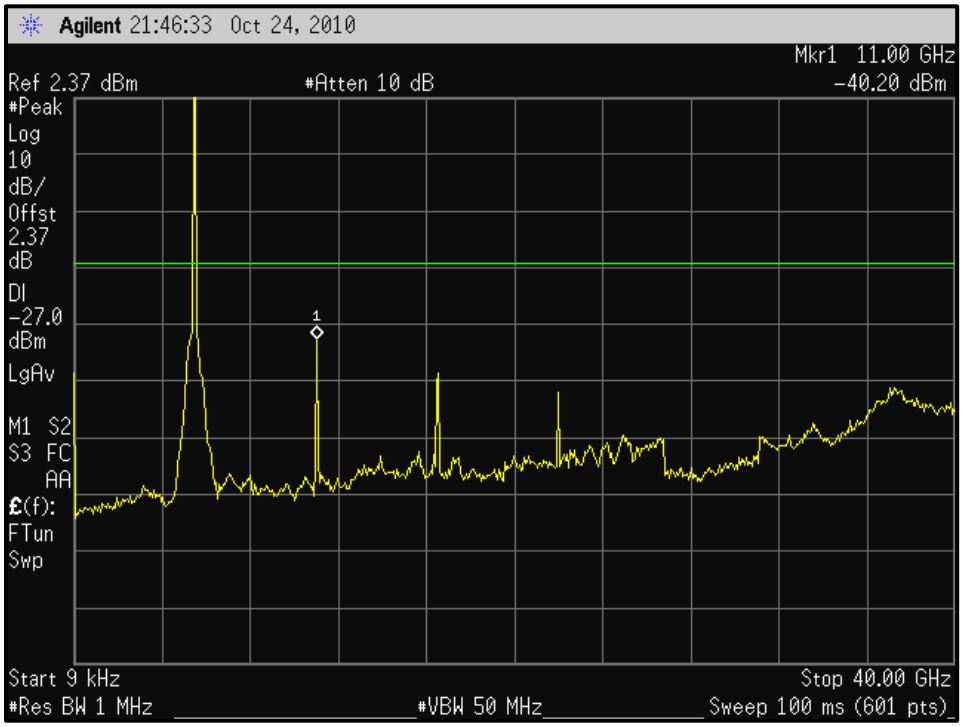
Plot 8-5: Conducted Spurious Emissions Channel 60 (TX Frequency: 5300 MHz)



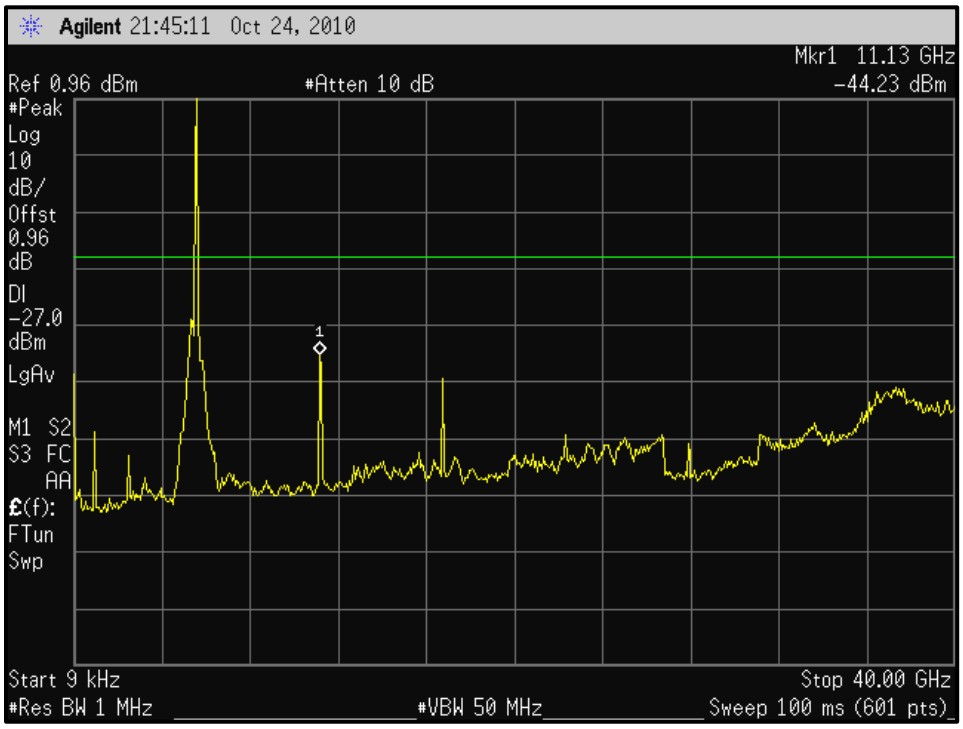
Plot 8-6: Conducted Spurious Emissions Channel 64 (TX Frequency: 5320 MHz)



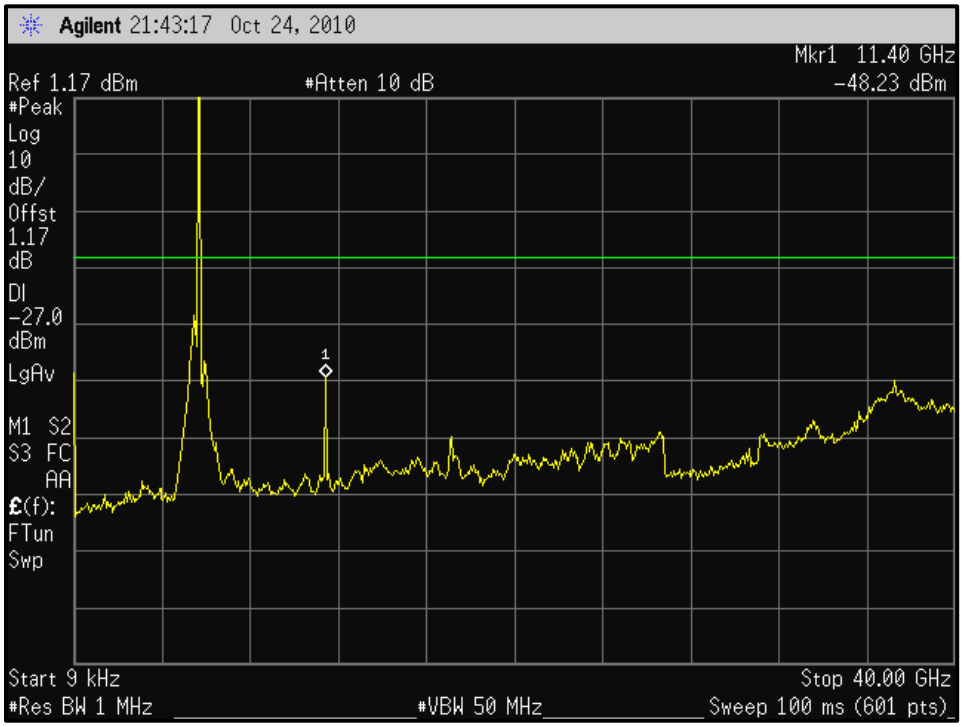
Plot 8-7: Conducted Spurious Emissions Channel 100 (TX Frequency: 5500 MHz)



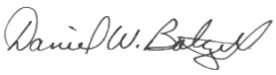
Plot 8-8: Conducted Spurious Emissions Channel 116 (TX Frequency: 5580 MHz)



Plot 8-9: Conducted Spurious Emissions Channel 140 (TX Frequency: 5700 MHz)



Test Personnel:

Daniel W. Baltzell		October 24, 2010
Test Engineer	Signature	Date Of Test

9 26 dB Bandwidth – FCC §15.407(a); RSS-210 A9.2

9.1 26 db Bandwidth Test Procedure

The 26 dB bandwidths were measured using a 50-ohm spectrum analyzer with the resolution bandwidth set at 1% of the span. The device was modulated and the spectrum analyzer placed in max hold to capture the trace. The minimum 26 dB bandwidths are presented below.

Table 9-1: 6 dB Bandwidth Test Equipment

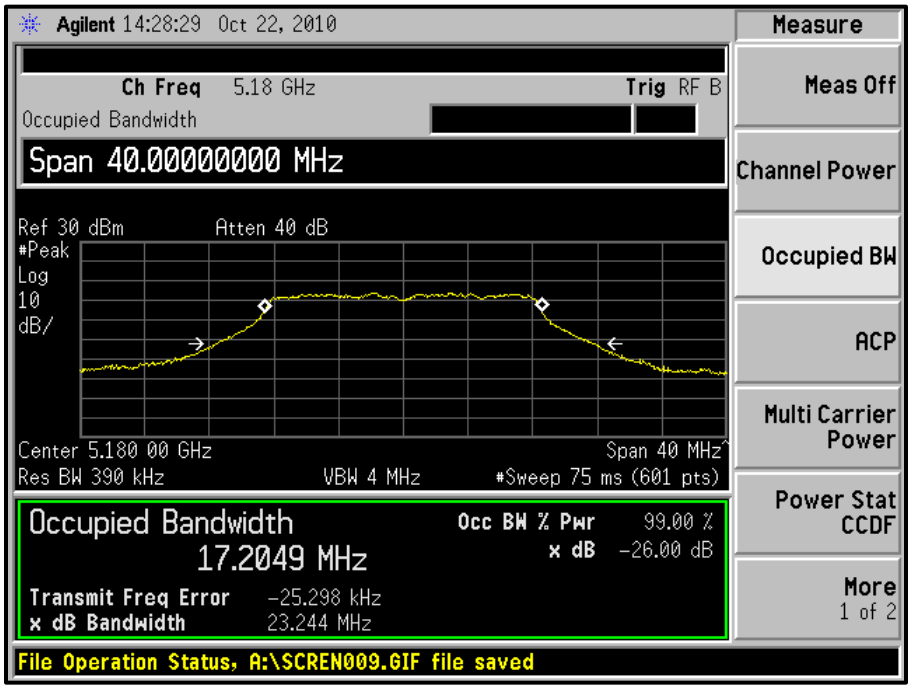
RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901413	Agilent Technologies	E4448A	Spectrum Analyzer	US44020346	11/11/10

9.2 26 db Bandwidth Test Results

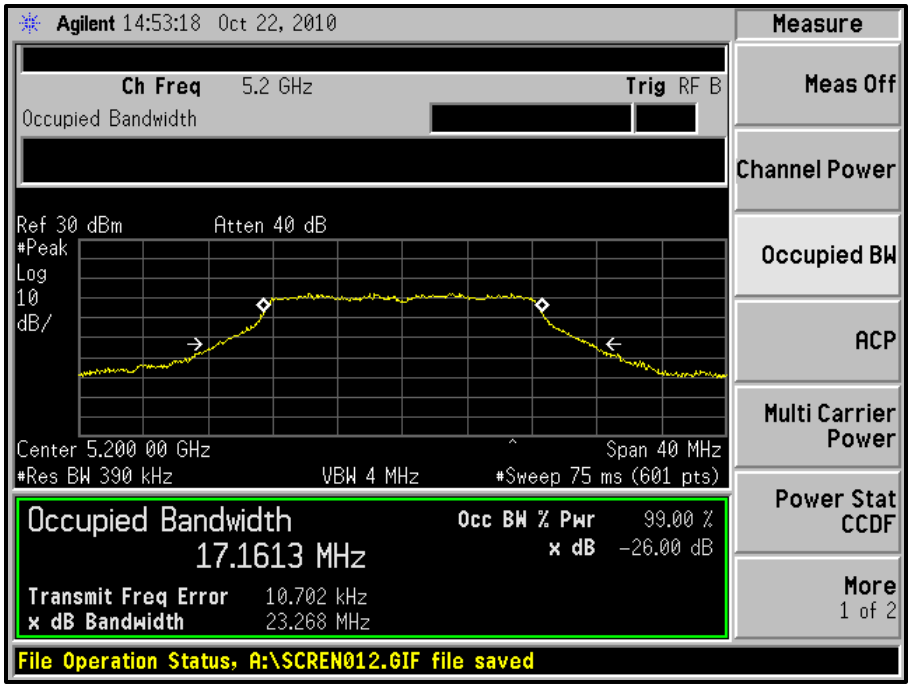
Table 9-2: 26 db Bandwidth Test Data

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
36	5180	23.2
40	5200	23.3
48	5240	23.1
52	5260	22.9
60	5300	23.1
64	5320	23.2
100	5500	26.1
116	5580	23.4
140	5700	23.3

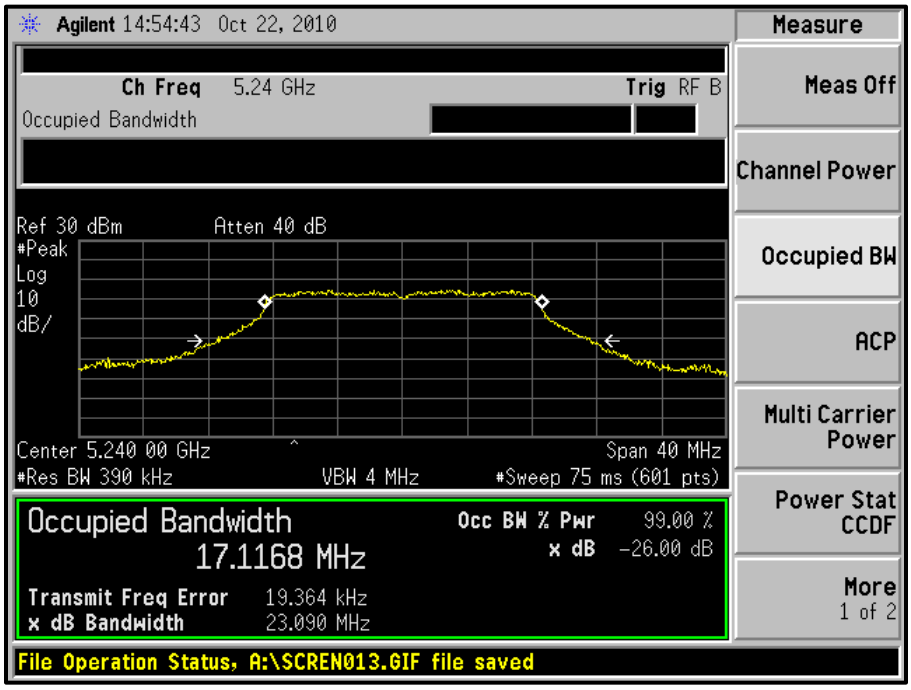
Plot 9-1: 26 dB Bandwidth Channel 36 (TX Frequency 5180 MHz) - 802.11a



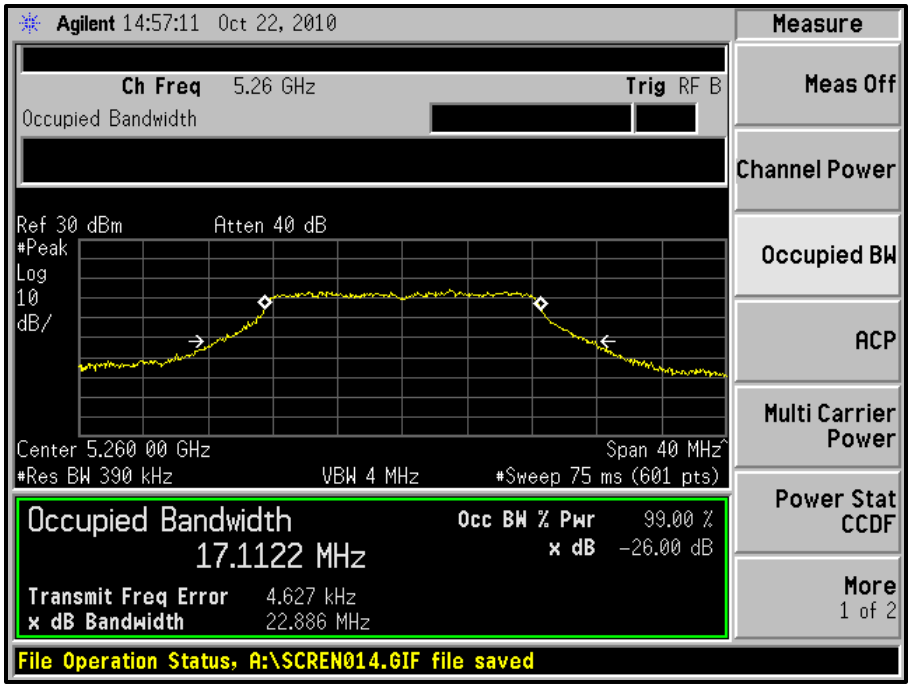
Plot 9-2: 26 dB Bandwidth Channel 40 (TX Frequency 5200 MHz) - 802.11a



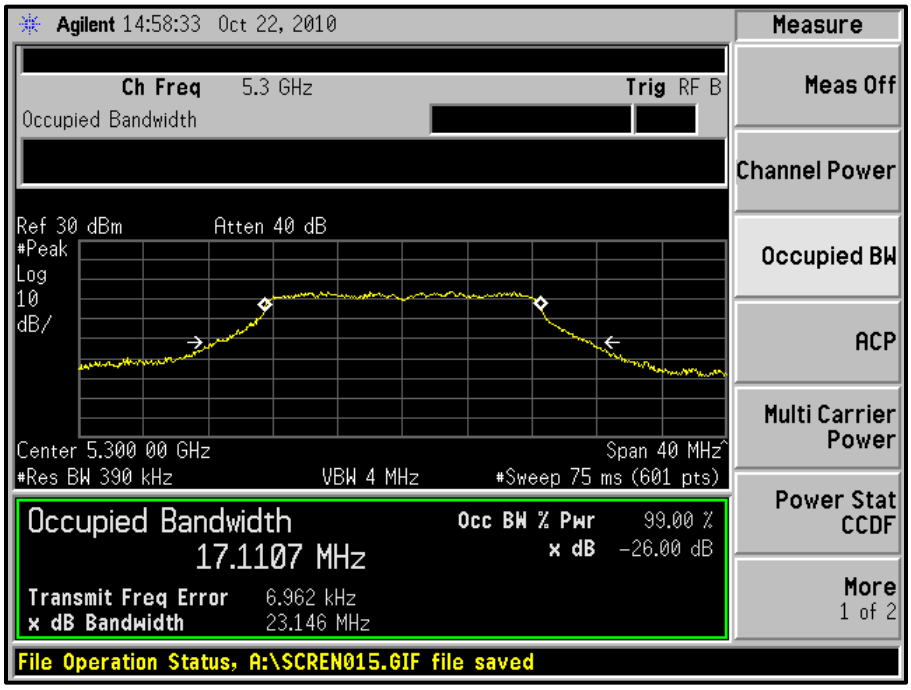
Plot 9-3: 26 dB Bandwidth Channel 48 (TX Frequency 5240 MHz) - 802.11a



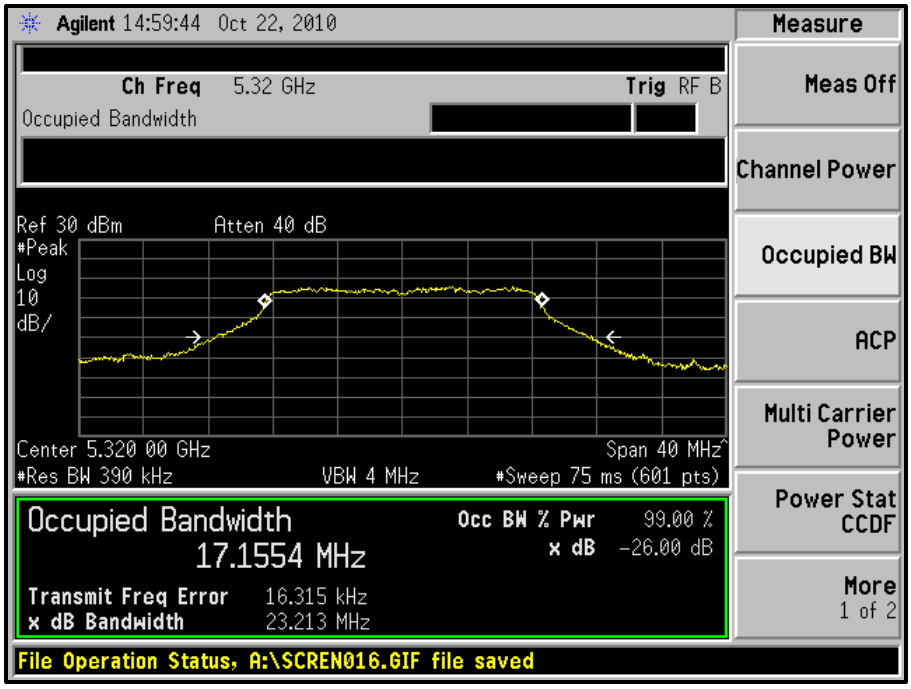
Plot 9-4: 26 dB Bandwidth Channel 52 (TX Frequency 5260 MHz) - 802.11a



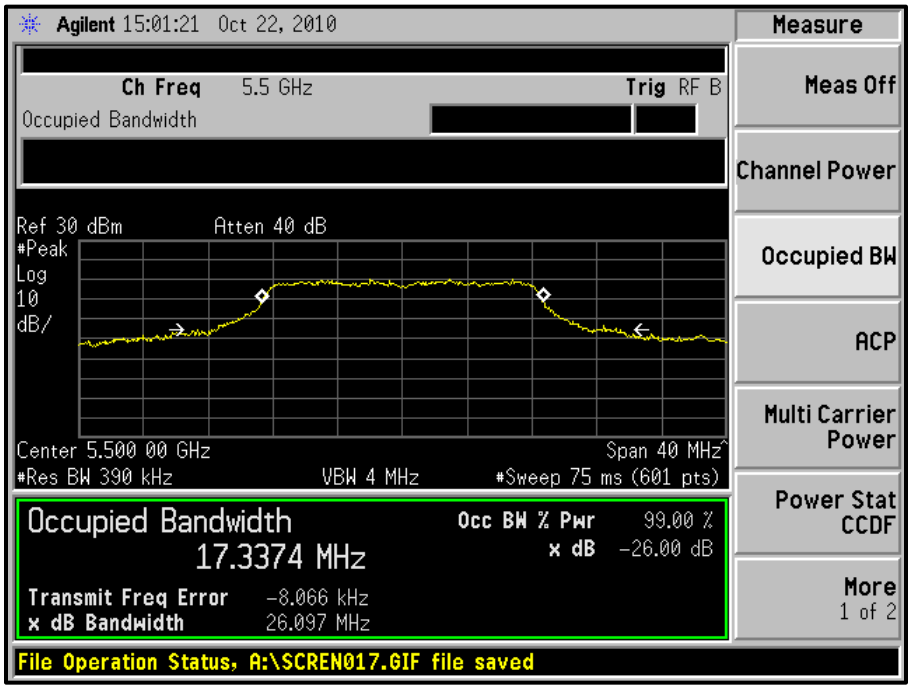
Plot 9-5: 26 dB Bandwidth Channel 60 (TX Frequency 5300 MHz) - 802.11a



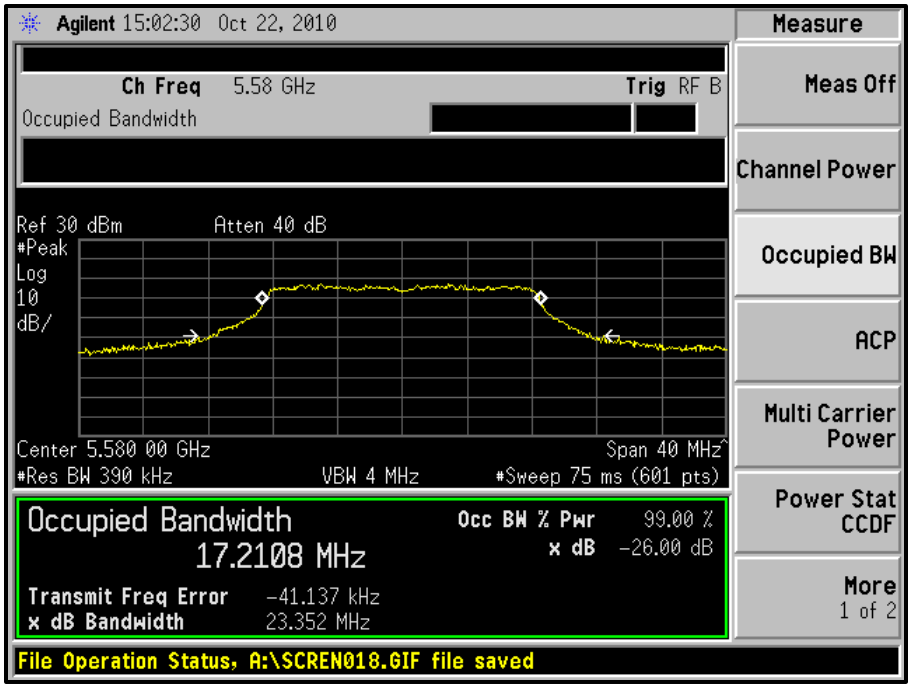
Plot 9-6: 26 dB Bandwidth Channel 64 (TX Frequency 5320 MHz) - 802.11a



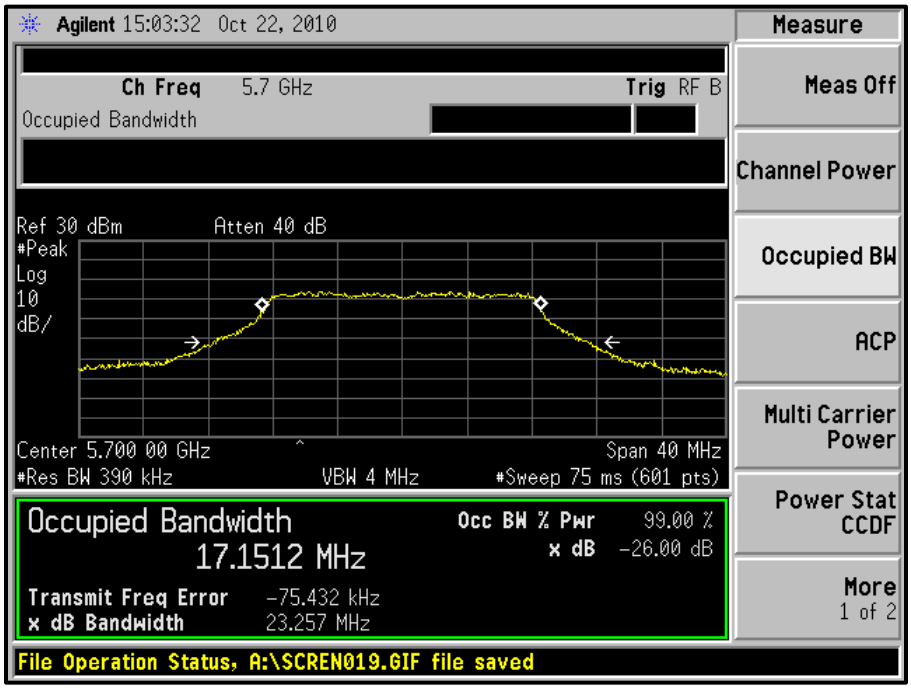
Plot 9-7: 26 dB Bandwidth Channel 100 (TX Frequency 5500 MHz) - 802.11a



Plot 9-8: 26 dB Bandwidth Channel 116 (TX Frequency 5580 MHz) - 802.11a



Plot 9-9: 26 dB Bandwidth Channel 140 (TX Frequency 5700 MHz) - 802.11a



Test Personnel:

Daniel W. Baltzell		October 22, 2010
Test Engineer	Signature	Date Of Tests

10 Radiated Emissions – FCC §15.209; RSS-Gen

10.1 Limits of Radiated Emissions Measurement

Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
0.009-0.490	2400/f (kHz)	300
0.490-1.705	2400/f (kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

As shown in 15.35(b), for frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any circumstances of modulation.

10.2 Radiated Emissions Measurement Test Procedure

Before final measurements of radiated emissions were made on the open-field three/ten meter range, the EUT was scanned indoors at one and three meter distances. This was done in order to determine its emissions spectrum signature. The physical arrangement of the test system and associated cabling was varied in order to determine the effect on the EUT's emissions in amplitude, direction and frequency. This process was repeated during final radiated emissions measurements on the open-field range, at each frequency, in order to ensure that maximum emission amplitudes were attained.

Final radiated emissions measurements were made on the three/ten-meter, open-field test site. The EUT was placed on a nonconductive turntable 0.8 meters above the ground plane. The spectrum was examined from 9 kHz to the 10^{th} harmonic of the highest fundamental transmitter frequency (24.8 GHz).

At each frequency, the EUT was rotated 360°, and the antenna was raised and lowered from 1 to 4 meters in order to determine the emission's maximum level. Measurements were taken using both horizontal and vertical antenna polarizations. For frequencies between 30 and 1000 MHz, the spectrum analyzer's 6 dB bandwidth was set to 120 kHz, and the analyzer was operated in the CISPR quasi-peak detection mode. For emissions above 1000 MHz, emissions are measured using the average detector function with a minimum resolution bandwidth of 1 MHz. No video filter less than 10 times the resolution bandwidth was used. The highest emission amplitudes relative to the appropriate limit were measured and recorded in this report.

Table 10-1: Radiated Emissions Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900151	Rohde and Schwarz	HFH2-Z2	Antenna (Loop, 9 kHz - 30 MHz)	827525/019	10/1/12
900932	Hewlett Packard	8449B OPT H02	Preamplifier (1 - 26.5 GHz)	3008A00505	2/22/11
901413	Agilent	E4448A	Spectrum Analyzer	US44020346	11/11/10
900905	Rhein Tech Laboratories	PR-1040	OATS 1 Preamplifier 40 dB (30 MHz – 2 GHz)	1006	4/10/11
900878	Rhein Tech Laboratories	AM3-1197-0005	3 meter antenna mast, polarizing	Outdoor Range 1	Not Required
901516	Insulated Wire, Inc.	KPS-1503-2400-KPS-09302008	RF cable, 20'	NA	10/19/11
901517	Insulated Wire Inc.	KPS-1503-360-KPS-09302008	RF cable 36"	NA	10/19/11
901242	Rhein Tech Laboratories	WRT-000-0003	Wood rotating table	N/A	Not Required
900772	EMCO	3161-02	Horn Antenna (2 - 4 GHz)	9804-1044	6/14/11
900321	EMCO	3161-03	Horn Antennas (4 - 8,2 GHz)	9508-1020	6/14/11
900323	EMCO	3160-7	Horn Antennas (8,2 - 12,4 GHz)	9605-1054	6/14/11
900356	EMCO	3160-08	Horn Antenna (12.4 - 18 GHz)	9607-1044	6/14/11
900325	EMCO	3160-9	Horn Antennas (18 - 26.5 GHz)	9605-1051	6/14/11
900392	Hewlett Packard	1197OK	Harmonic Mixer (18 – 26.5 GHz)	3525A00159	6/14/11
900791	Chase	CBL6111B	Bilog Antenna (30 MHz – 2000 MHz)	N/A	12/12/10

10.3 Radiated Emissions Test Results

10.3.1 Radiated Emissions Digital Test Data

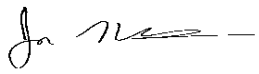
Table 10-2: Digital Radiated Emissions

Temperature: 71°F Humidity: 71%										
Emission Frequency (MHz)	**Test Detector**	**Antenna Polarity (H/V)**	**Turntable Azimuth (deg)**	**Antenna Height (m)**	**Analyzer Reading (dBuV)**	**Site Correction Factor (dB/m)**	**Emission Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Pass/ Fail**
57.650	Qp	H	160	3.0	44.2	-23.9	20.3	40.0	-19.7	Pass
72.670	Qp	H	80	1.5	41.2	-24.4	16.8	40.0	-23.2	Pass
92.060	Qp	V	355	2.0	44.7	-20.8	23.9	43.5	-19.6	Pass
102.805	Qp	V	35	1.0	37.5	-18.5	19.0	43.5	-24.5	Pass
151.110	Qp	H	70	1.0	40.2	-18.4	21.8	43.5	-21.7	Pass

Table 10-3: Digital Radiated Emissions with Headset

Temperature: 71°F Humidity: 71%										
Emission Frequency (MHz)	**Test Detector**	**Antenna Polarity (H/V)**	**Turntable Azimuth (deg)**	**Antenna Height (m)**	**Analyzer Reading (dBuV)**	**Site Correction Factor (dB/m)**	**Emission Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Pass/ Fail**
98.130	Qp	H	90	2.5	34.6	-19.3	15.3	43.5	-28.2	Pass
143.600	Qp	H	5	1.0	38.1	-18.2	19.9	43.5	-23.6	Pass
156.390	Qp	H	180	2.8	39.4	-18.2	21.2	43.5	-22.3	Pass
159.000	Qp	H	355	2.2	37.2	-18.3	18.9	43.5	-24.6	Pass
213.980	Qp	V	290	1.0	36.5	-18.9	17.6	43.5	-25.9	Pass
311.955	Qp	V	230	2.0	37.3	-14.5	22.8	46.0	-23.2	Pass
433.935	Qp	H	75	1.8	36.6	-11.0	25.6	46.0	-20.4	Pass

Test Personnel:

Jonathan Wilson		September 23, 2010
Test Engineer	Signature	Date Of Test

10.3.2 Radiated Emissions Harmonics/Spurious Test Data

Table 10-4: Radiated Emissions Harmonics/Spurious Channel 36 (TX Frequency: 5180 MHz)

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (dBuV) (1 MHz RBW/ 10 Hz VBW)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
10360.0	45.7	28.5	18.3	46.8	54.0	-7.2
15540.0	42.5	30.2	17.9	48.1	54.0	-5.9
20720.0	12.6	1.0	41.6	42.6	54.0	-11.4

Table 10-5: Radiated Emissions Harmonics/Spurious Channel 40 (TX Frequency: 5200 MHz)

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (dBuV) (1 MHz RBW/ 10 Hz VBW)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
15600.0	37.2	25.3	18.7	44.0	54.0	-10.0
20800.0	32.9	20.9	26.3	47.2	54.0	-6.8

Table 10-6: Radiated Emissions Harmonics/Spurious Channel 48 (TX Frequency: 5240 MHz)

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (dBuV) (1 MHz RBW/ 10 Hz VBW)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
15720.0	36.6	24.9	18.9	43.8	54.0	-10.2
20960.0	32.6	20.2	26.6	46.8	54.0	-7.2

Table 10-7: Radiated Emissions Harmonics/Spurious Channel 52 (TX Frequency: 5260 MHz)

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (dBuV) (1 MHz RBW/ 10 Hz VBW)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
15780.0	42.7	30.4	15.3	45.7	54.0	-8.3
21040.0	12.2	1.0	44.1	45.1	54.0	-8.9
31560.0	11.4	1.0	37.8	38.8	54.0	-15.2

Table 10-8: Radiated Emissions Harmonics/Spurious Channel 60 (TX Frequency: 5300 MHz)

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (dBuV) (1 MHz RBW/ 10 Hz VBW)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
10600.0	41.6	25.5	12.5	38.0	54.0	-16.0
15900.0	44.3	24.4	19.1	43.5	54.0	-10.5
21200.0	32.3	20.9	26.3	47.2	54.0	-6.8

Table 10-9: Radiated Emissions Harmonics/Spurious Channel 64 (TX Frequency: 5320 MHz)

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (dBuV) (1 MHz RBW/ 10 Hz VBW)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
10640.0	53.6	30.6	15.9	46.5	54.0	-7.5
15960.0	43.4	29.2	20.7	49.9	54.0	-4.1
21280.0	12.3	1.0	43.7	44.7	54.0	-9.3

Table 10-10: Radiated Emissions Harmonics/Spurious Channel 100 (TX Frequency: 5500 MHz)

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (dBuV) (1 MHz RBW/ 10 Hz VBW)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
11000.0	63.4	31.8	14.7	46.5	54.0	-7.5

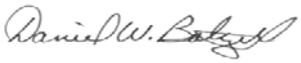
Table 10-11: Radiated Emissions Harmonics/Spurious Channel 116 (TX Frequency: 5580 MHz)

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (dBuV) (1 MHz RBW/ 10 Hz VBW)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
11160.0	52.2	26.4	12.8	39.2	54.0	-14.8
22320.0	32.6	21.4	25.5	46.9	54.0	-7.1

Table 10-12: Radiated Emissions Harmonics/Spurious Channel 140(TX Frequency: 5700 MHz)

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (dBuV) (1 MHz RBW/ 10 Hz VBW)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
11400.0	58.2	30.8	15.4	46.2	54.0	-7.8
22800.0	11.8	0.5	45.7	46.2	54.0	-7.8

Test Personnel:

Daniel W. Baltzell		October 26, 2010
Test Engineer	Signature	Date Of Test

11 Conducted Emissions - FCC Rules and Regulations Part 15.207; RSS-Gen 7.2.2

11.1 Site and Test Description

The power line conducted emissions measurements were performed in a Series 81 type shielded enclosure manufactured by Rayproof. The EUT was assembled on a wooden table 80 centimeters high. Power was fed to the EUT through a 50-ohm/50 microhenry Line Impedance Stabilization Network (LISN). The EUT LISN was fed power through an A.C. filter box on the outside of the shielded enclosure. The filter box and EUT LISN housing are bonded to the ground plane of the shielded enclosure. A second LISN, the peripheral LISN, provides isolation for the EUT test peripherals. This peripheral LISN was also fed A.C. power. A metal power outlet box, which is bonded to the ground plane and electrically connected to the peripheral LISN, powers the EUT host peripherals.

The spectrum analyzer was connected to the AC line through an isolation transformer. The 50-ohm output of the EUT LISN was connected to the spectrum analyzer input through a Solar 100 kHz high-pass filter. The filter is used to prevent overload of the spectrum analyzer from noise below 100 kHz. Conducted emission levels were measured on each current-carrying line with the spectrum analyzer operating in the CISPR quasi-peak mode (or peak mode if applicable).

The analyzer's 6 dB bandwidth was set to 9 kHz. Video filter less than 10 times the resolution bandwidth is not used. Average measurements are performed in linear mode using a 10 kHz resolution bandwidth, a 1 Hz video bandwidth, and by increasing the sweep time in order to obtain a calibrated measurement. The emission spectrum was scanned from 150 kHz to 30 MHz. The highest emission amplitudes relative to the appropriate limits were measured and have been recorded.

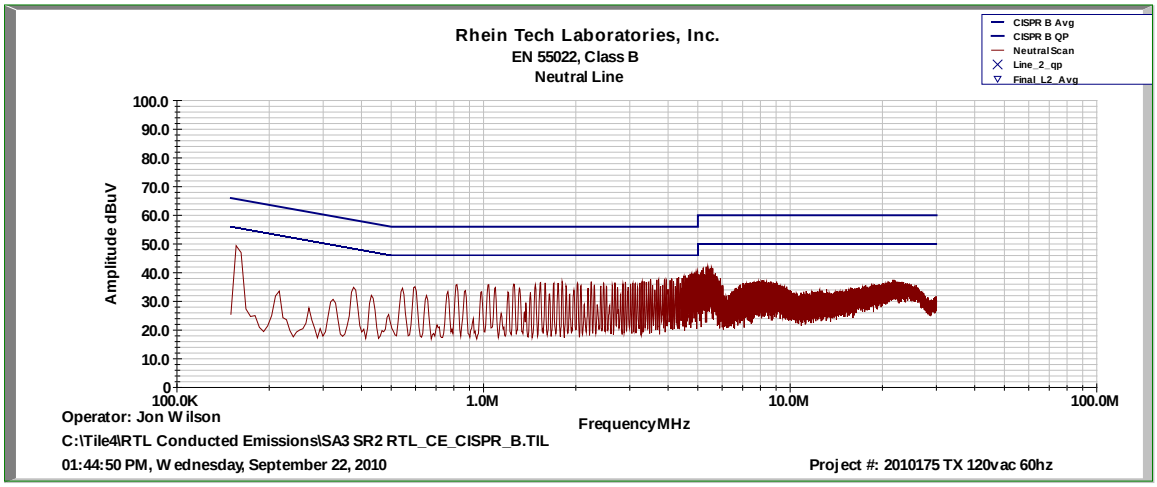
11.2 Test Limits

Line-Conducted Emissions		
Limit (dBµV)		
Frequency (MHz)	**Quasi-Peak**	**Average**
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5.00	56	46
5.00 to 30.00	60	50

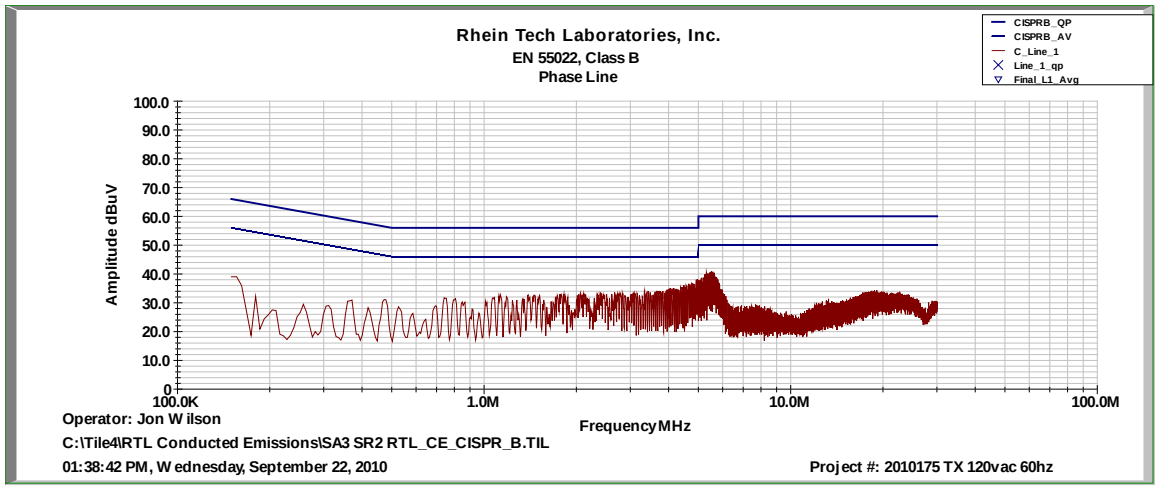
11.3 Conducted Emissions Test Data

11.3.1 Conducted Emissions Transmit Center Channel Simultaneous TX

Plot 11-1: Conducted Emissions Transmit Center Channel - Neutral Side

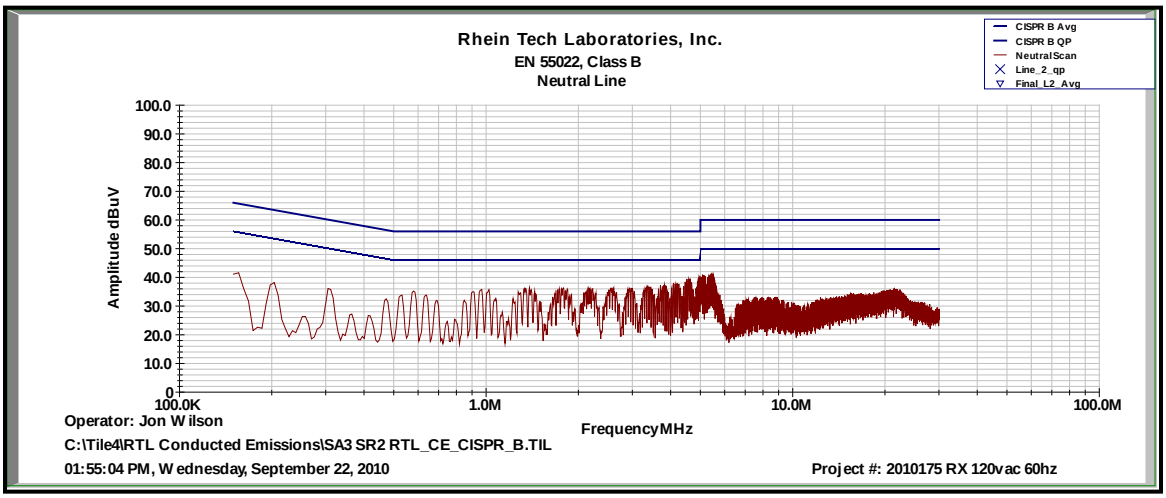


Plot 11-2: Conducted Emissions Transmit Center Channel - Hot Side

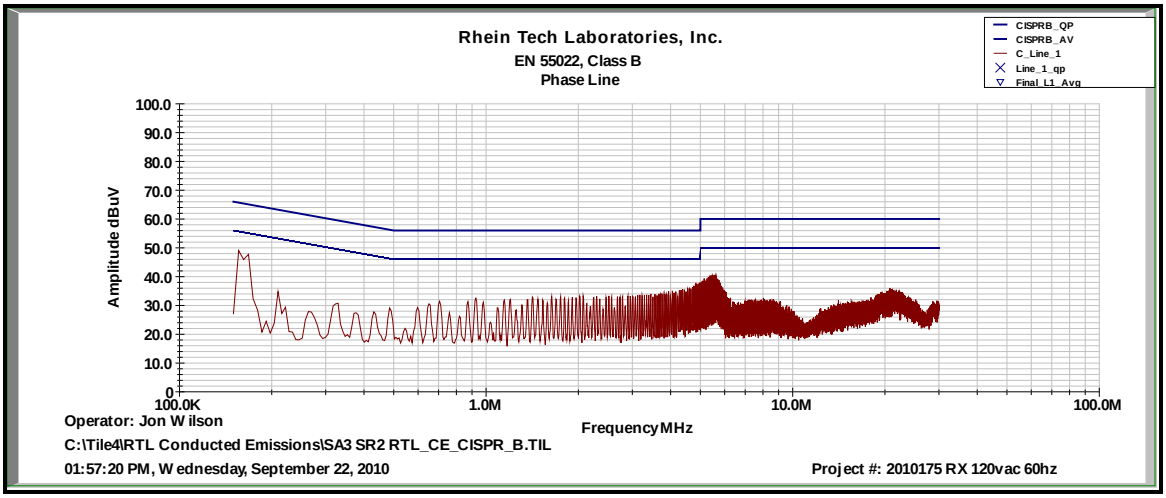


11.3.2 Conducted Emissions Receive Channel 6 DSSS

Plot 11-3: Conducted Emissions Receive Channel 6 DSSS Neutral Side



Plot 11-4: Conducted Emissions Receive Channel 6 FHSS/DSSS Hot Side



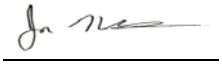
Results: Pass

Table 11-1: Conducted Emissions Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900968	Hewlett Packard	8567A	Spectrum Analyzer (100 Hz - .15 GHz)	2602A00160	10/26/10
900970	Hewlett Packard	85662A	Spectrum Analyzer Display Section	2542A11239	10/26/10
900339	Hewlett Packard	85650A	Quasi-Peak Adapter	2521A00743	10/26/10
900729	Solar	8130	Filter	947306	2/22/11
901083	AFJ International	LS16/110VAC	16A LISN	16010020081	11/4/10
N/A	Quantum Change	Tile	Emissions Testing Software	4.0.A.8	N/A

Test Personnel:

Jon Wilson — EMC Test Engineer


Signature

September 23, 2010 — Date Of Test

12 Conclusion

The data in this measurement report shows that the EUT as tested, Vocollect, Inc. Model Name A500, Model # TT-800-1-1, FCC ID: MQO-TT-800-1-1, IC: 2570A-TT80011, complies with all the applicable requirements of Parts 2 and 15 of the FCC Rules and Regulations, and Industry Canada RSS-210.