Engineering and Testing for EMC and Safety Compliance

Accredited under A2LA Testing Certificate # 2653.01

Certification Application Report for Limited Modular Approval
FCC Part 15.247 & Industry Canada RSS-210

Test Lab:		Applicant:	
Rhein Tech Laboratories, Inc. 360 Herndon Parkway Suite 1400 Herndon, VA 20170 E-Mail: atcbinfo@rheintech.com	Tel: 703-689-0368 Fax: 703-689-2056 www.rheintech.com	Banner Engineering Corp. 9714 10th Ave North Minneapolis, MN 55441 Contact: Dan Hagens	Tel: 763-544-3164 Fax: 763-519-7028
FCC ID/ IC:	UE3RM912HP/ 7044A-RM912HP	**Test Report Date:**	February 3, 2010
Platform:	N/A	**RTL Work Order #:**	2009324
Model:	RM912HP	**RTL Quote #:**	QRTL09-491
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:	DSS – Part 15 Digital Transmission System		
FCC Rule Part(s)/Guidance:	FCC Rules Part 15.247: Operation within the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz Direct Sequence System October 1, 2009, DA 00-705		
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
903-927	0.447	N/A	946KG7D

** power is peak conducted*

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, Industry Canada RSS-210 and ANSI C63.4.

Signature: _____ Date: February 3, 2010

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

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1 General Information

1.1 Scope

This is an original certification application request.

Applicable Standards:

- FCC Rules Part 15.247: Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz.
- Industry Canada RSS-210: Low Power License-Exempt Communications Devices

1.2 Description of EUT

Equipment Under Test	Transceiver
Model	RM912HP
Power Supply	24 VDC
Modulation Type	DSSS, 1000K SIN; 1000K RC; BPSK40; OQPSK250
Frequency Range	903 – 927 MHz
Antenna Types	6 dBi Yagi, 8 dBi dipole, 5 dBi monopole

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 application for **limited modular approval** for Banner Engineering Corporation, Model RM912HP, FCC ID: UE3RM912HP, IC: 7044A-RM912HP.

1.5 Modifications

No modifications were made to the equipment during testing in order to achieve compliance with these standards.

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

Channel	Frequency (MHz)
Low	903
Middle	915
High	927

2.2 Exercising the EUT

The EUT was supplied with test firmware programmed with a high, mid, and low channel for testing. 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 C (Section 15.247) - FHSS

FCC Reference	Test	Pass/Fail or N/A
FCC 15.207	AC Power Conducted Emissions	Pass
FCC 15.209	Radiated Emissions	Pass
FCC 15.247(b)	Maximum Peak Power Output	Pass
FCC 15.247(d)	Antenna Conducted Spurious Emissions	Pass
FCC 15.247(d)	Band Edge	Pass
FCC 15.247(a)(2)	6 dB Bandwidth	Pass
FCC 15.247(e)	Power Spectral Density	Pass

2.4 Test System Details

The test samples were received on January 8, 2010. The FCC identifiers for all applicable equipment, plus descriptions of all cables used in the tested system, are identified in the following table.

Table 2-3: Equipment under Test

Part	Manufacturer	Model	Serial Number	FCC ID	Cable Description	RTL Bar Code
Housing with RM912HP	Banner Engineering Corporation	RM912HP	100022	UE3RM912HP	N/A	19369
RM912HP Module	Banner Engineering Corporation	RM912HP	147324A SXI-0090518	UE3RM912HP	N/A	19367
AC Adapter	CUI, Inc.	N/A	DPS240050UPS-P5P-SZ	N/A	1.8m unshielded	19183

2.5 Configuration of Tested System

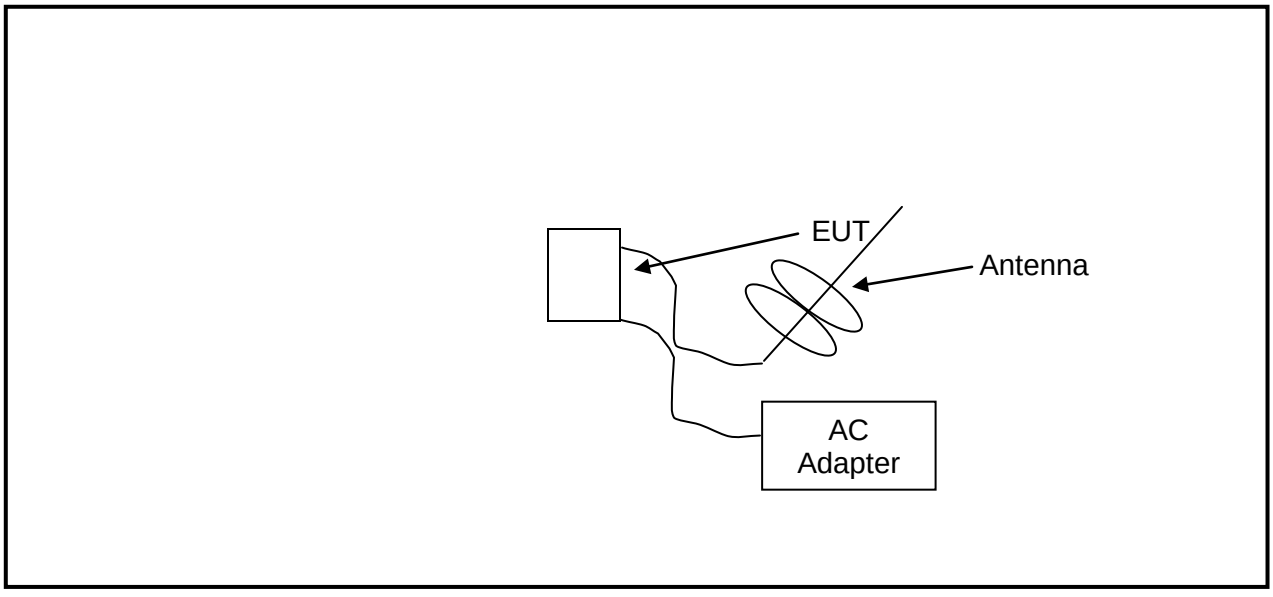


Figure 2-1: Configuration of System under Test

3 Peak Output Power - 15.247(b)(3); RSS-Gen

3.1 Power Output Test Procedure

A conducted power measurement of the EUT was taken.

Table 3-1: Power Output Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901413	Agilent Technologies	E4448A	Spectrum Analyzer (3 Hz – 50 GHz)	US440203416	7/31/10
901522	M/A Com	2082-6174-20	20 dB Attenuator	N/A	7/29/10

3.2 Power Output Test Data

Table 3-2: Power Output Test Data 1000K SIN Modulation

Channel	Frequency (MHz)	Peak Power Conducted Output (dBm)
Low	903	26.3
Middle	915	26.3
High	927	26.4

Table 3-3: Power Output Test Data 1000K RC Modulation

Channel	Frequency (MHz)	Peak Power Conducted Output (dBm)
Low	903	26.3
Middle	915	26.3
High	927	26.4

Table 3-4: Power Output Test Data BPSK40 Modulation

Channel	Frequency (MHz)	Peak Power Conducted Output (dBm)
Low	906	26.3
Middle	916	26.4
High	924	26.5

Table 3-5: Power Output Test Data OQPSK250 Modulation

Channel	Frequency (MHz)	Peak Power Conducted Output (dBm)
Low	906	26.3
Middle	916	26.4
High	924	26.4

Test Personnel:

Dan Baltzell		January 8, 2010
Test Engineer	Signature	Date Of Test

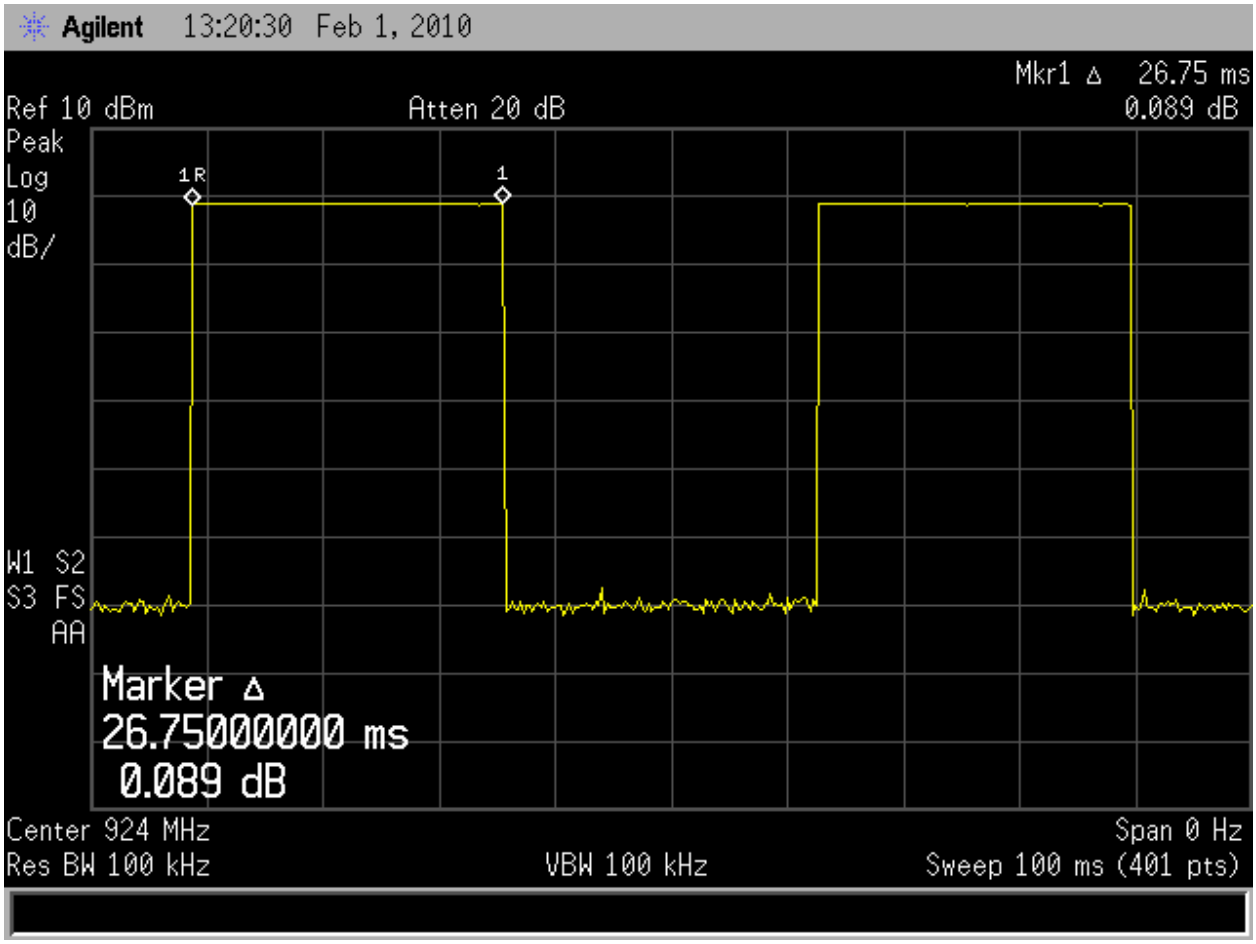
4 Duty Cycle Measurement

The pulse width was taken using a video trigger at zero span and a delta marker was used to show pulse width and pulse train length. The worst case modulation type, BPSK40, was selected as representative for radiated testing.

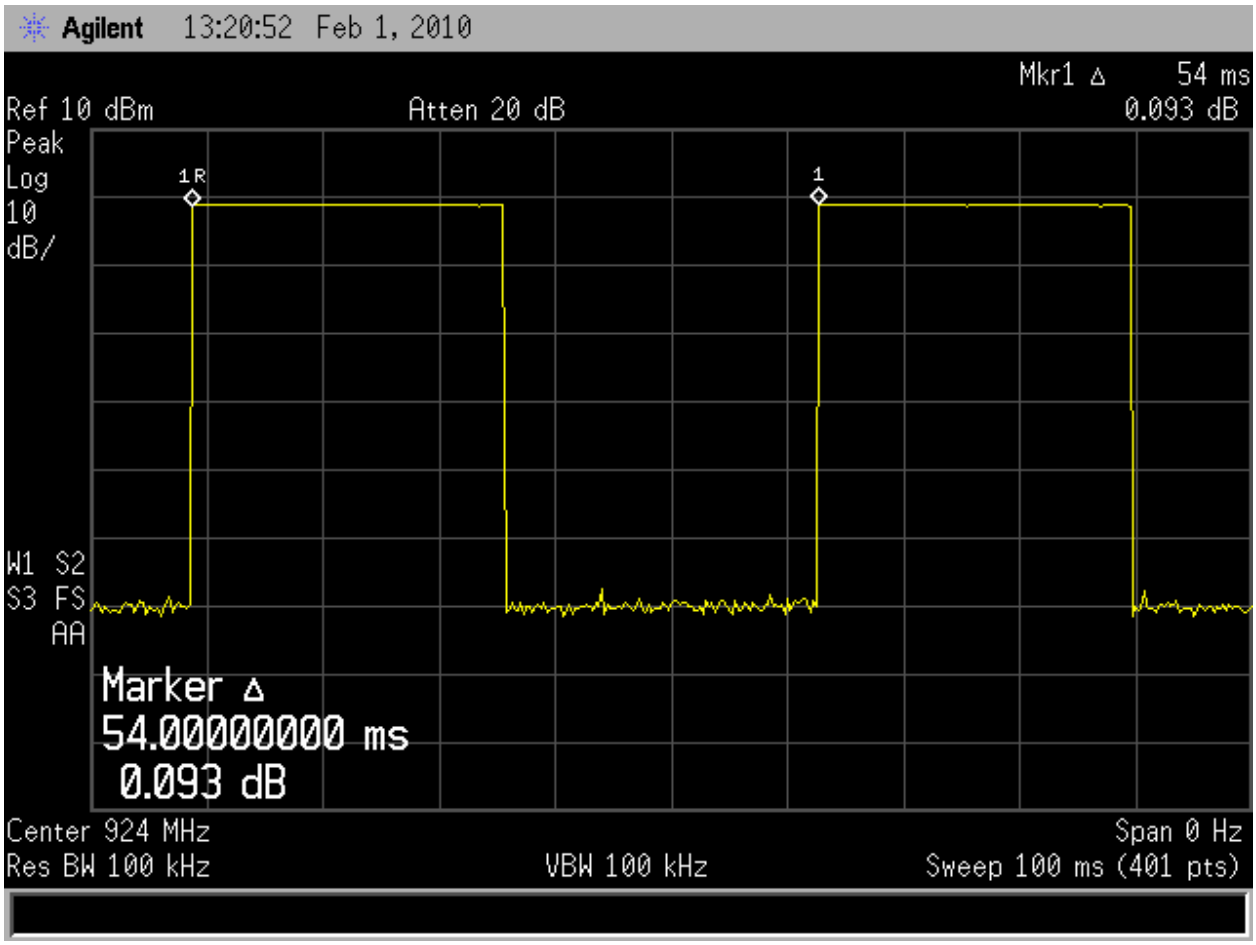
Table 4-1: Duty Cycle Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901413	Agilent Technologies	E4448A	Spectrum Analyzer (3 Hz – 50 GHz)	US440203416	7/31/10
901522	M/A Com	2082-6174-20	20 dB Attenuator	N/A	7/29/10

4.1 Duty Cycle Data



Plot 4-1: Pulse Width



Plot 4-2: Duty Cycle Length

Duty cycle calculation from above plot:

20 Log (26.75/54) = -6.1 dB correction

Test Personnel:

Richard B. McMurray, P.E.	Richard B. McMurray	February 1, 2010
Test Engineer	Signature	Date Of Test

5 Compliance with the Band Edge – FCC §15.247(d); §22.917; §24.238; IC RSS-132 §4.5.1; RSS-133 §6.5.1; RSS-210 §A8.5

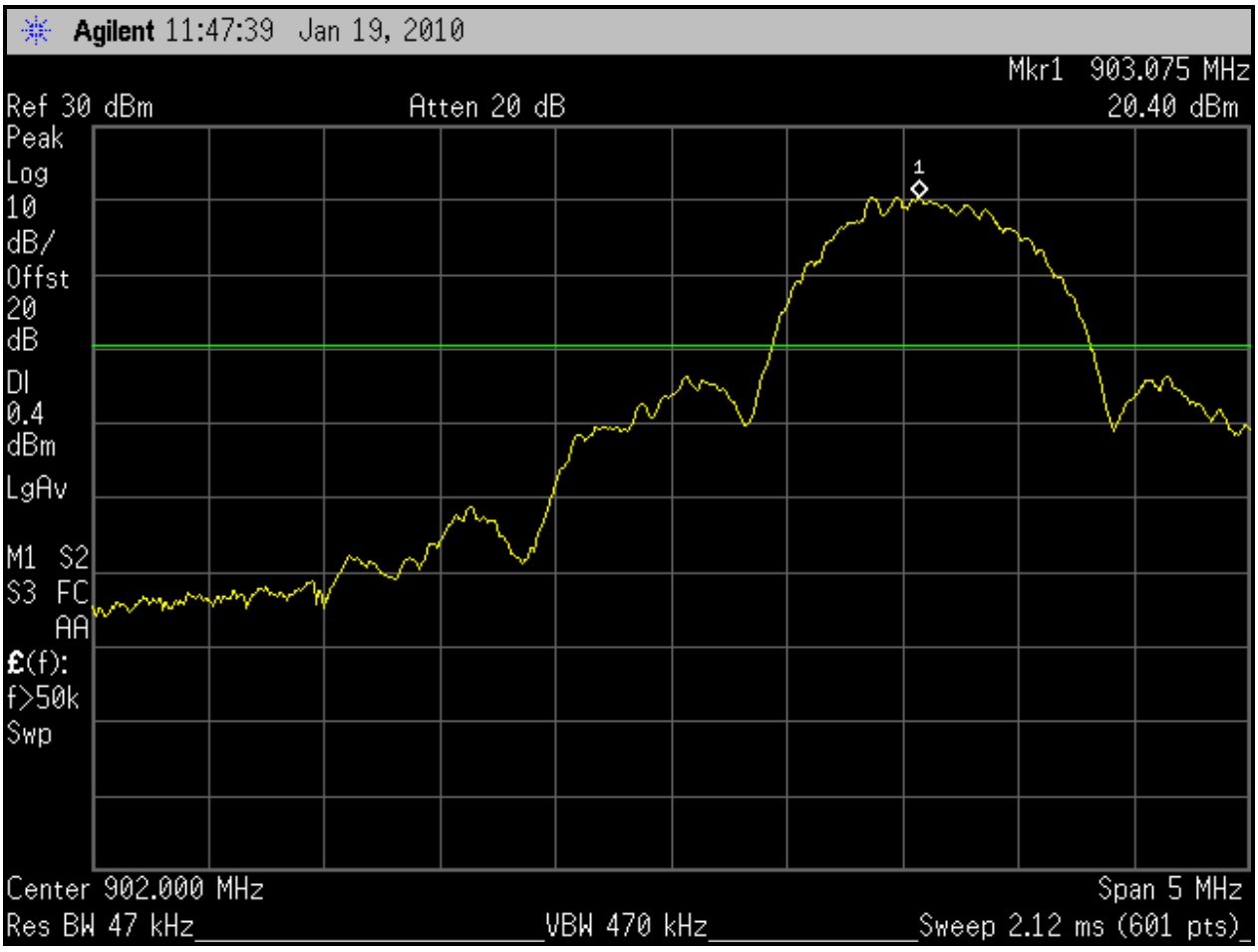
5.1 Band Edge Test Procedure

The transmitter output was connected to its appropriate antenna. Peak radiated measurements were taken with a suitable span to encompass the peak of the fundamental. A trace was used to capture the trace and compared to the limit.

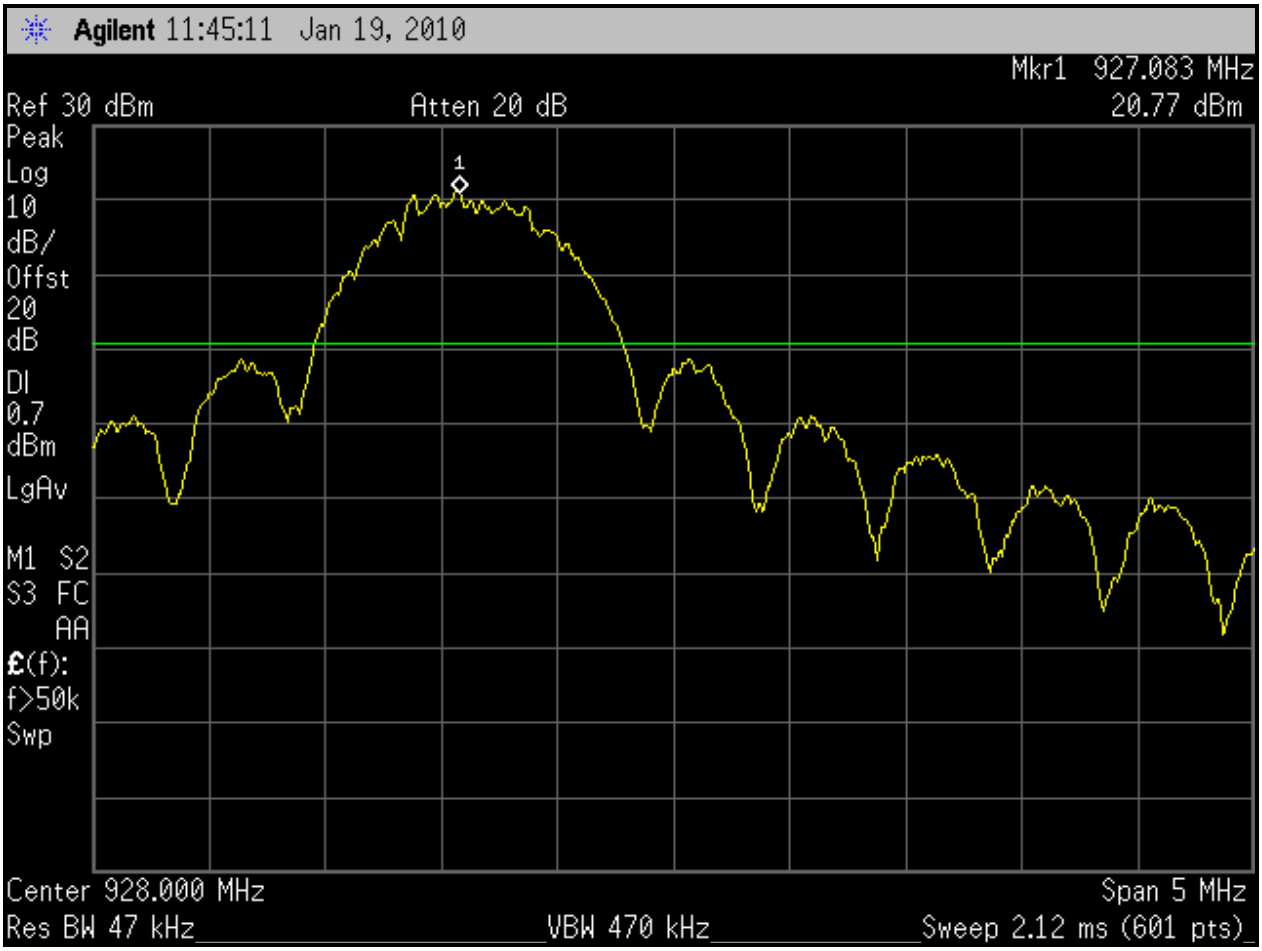
Table 5-1: Band Edge Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901413	Agilent Technologies	E4448A	Spectrum Analyzer	US44020346	11/10/10
901522	M/A Com	2082-6174-20	20 dB Attenuator	N/A	7/29/10

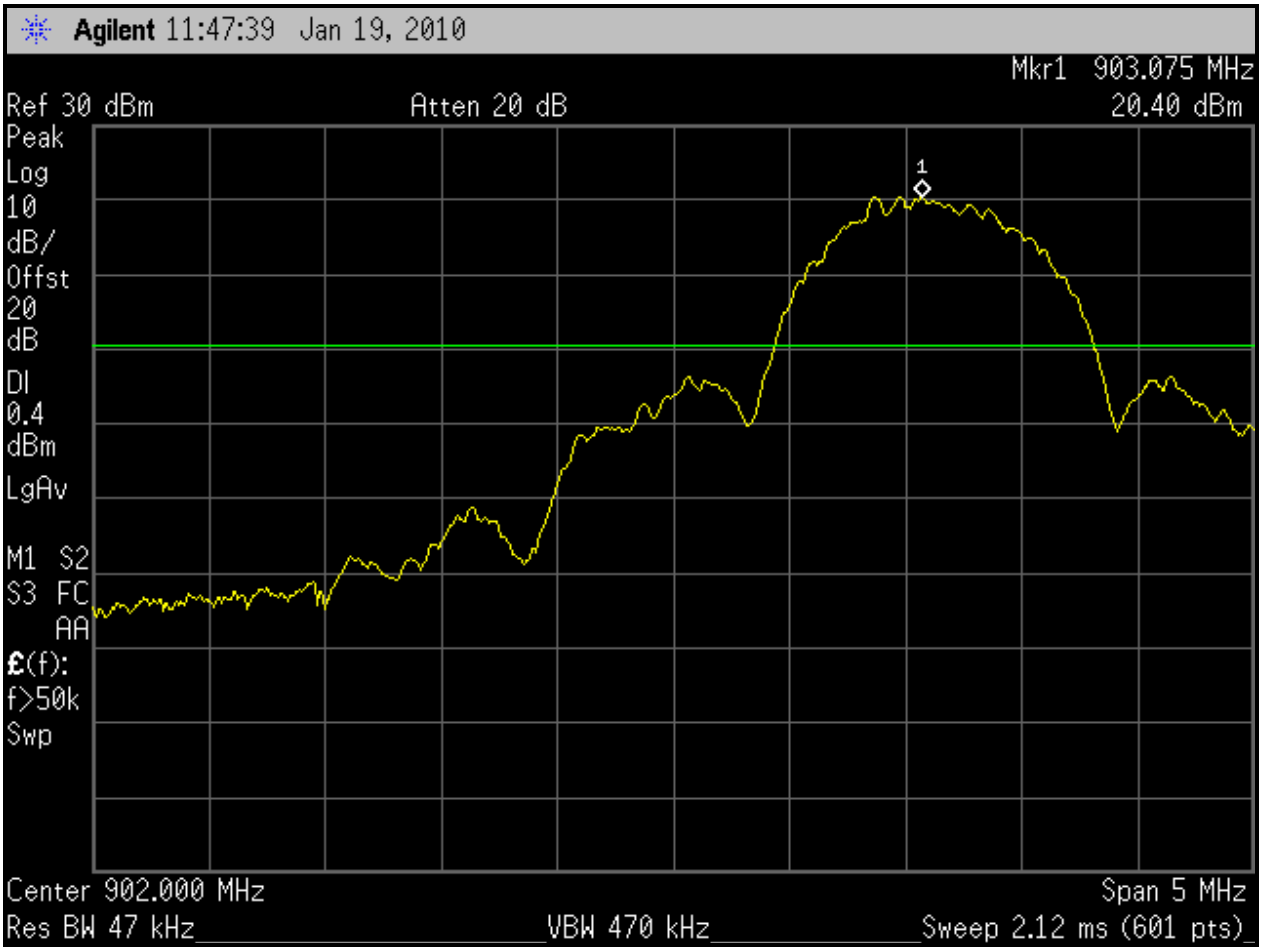
5.2 Band Edge Test Results



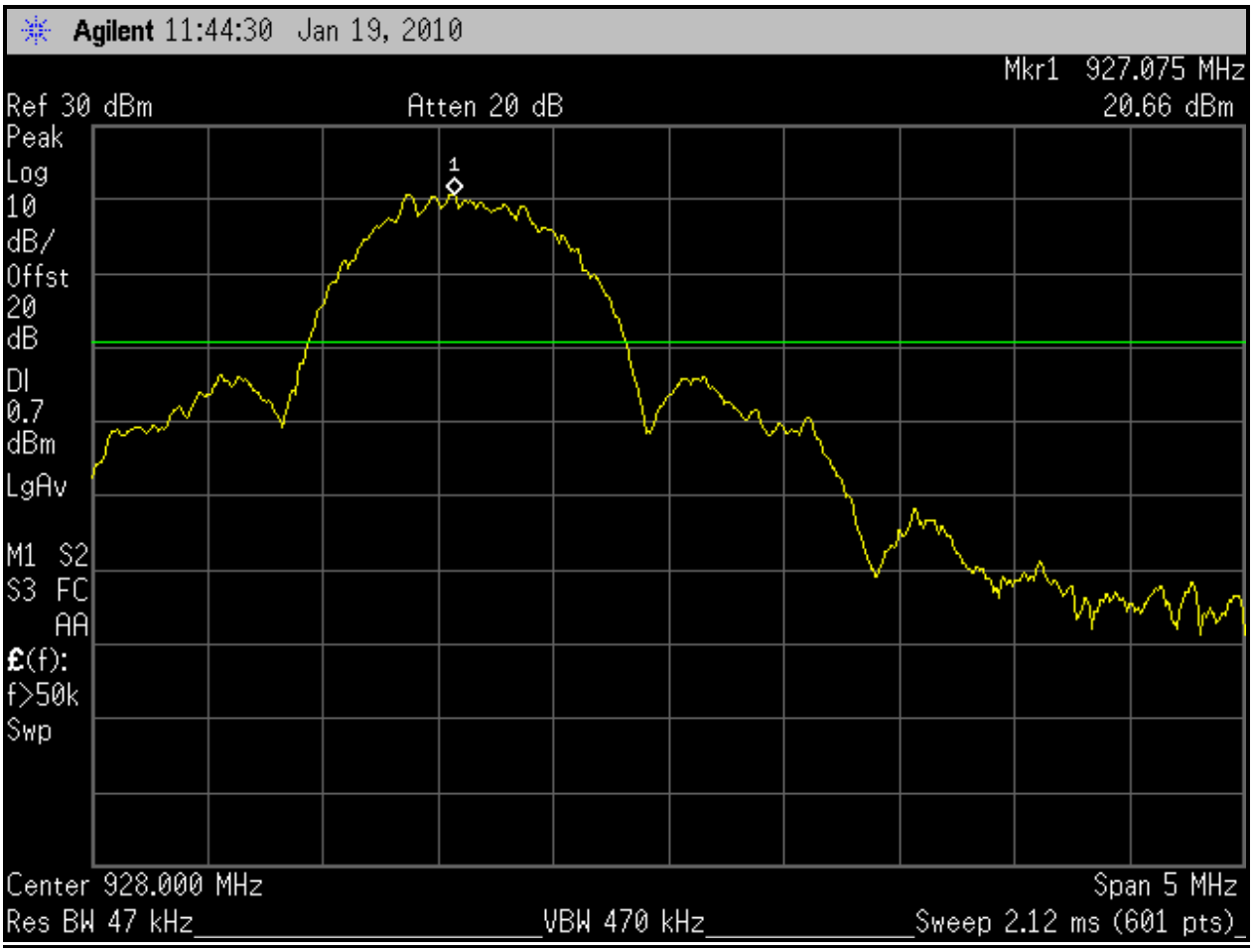
Plot 5-1: Lower Band Edge: Peak Measurement 903 MHz; 1000K SIN Modulation



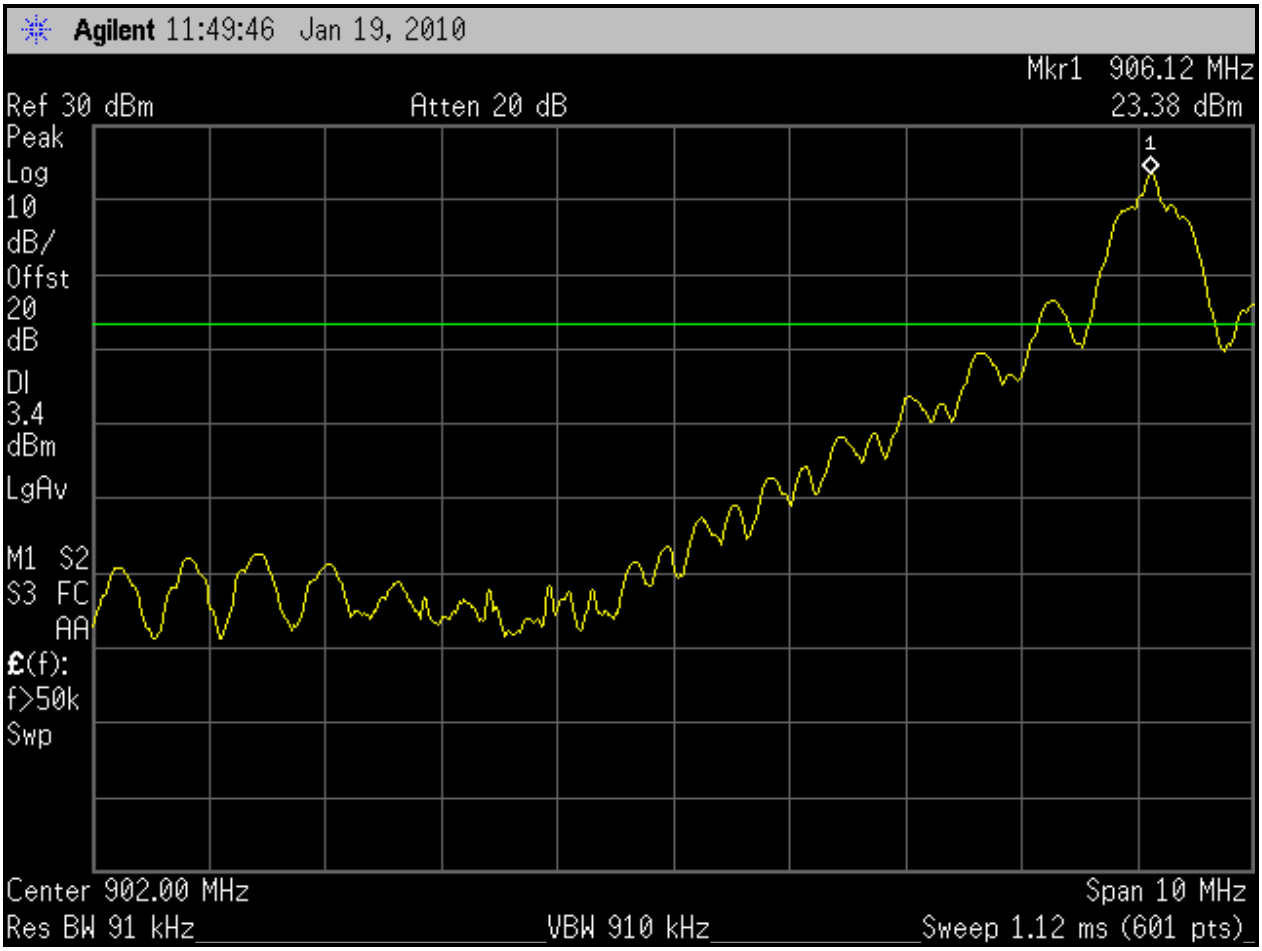
Plot 5-2: Upper Band Edge: Peak Measurement 927 MHz; 1000K SIN Modulation



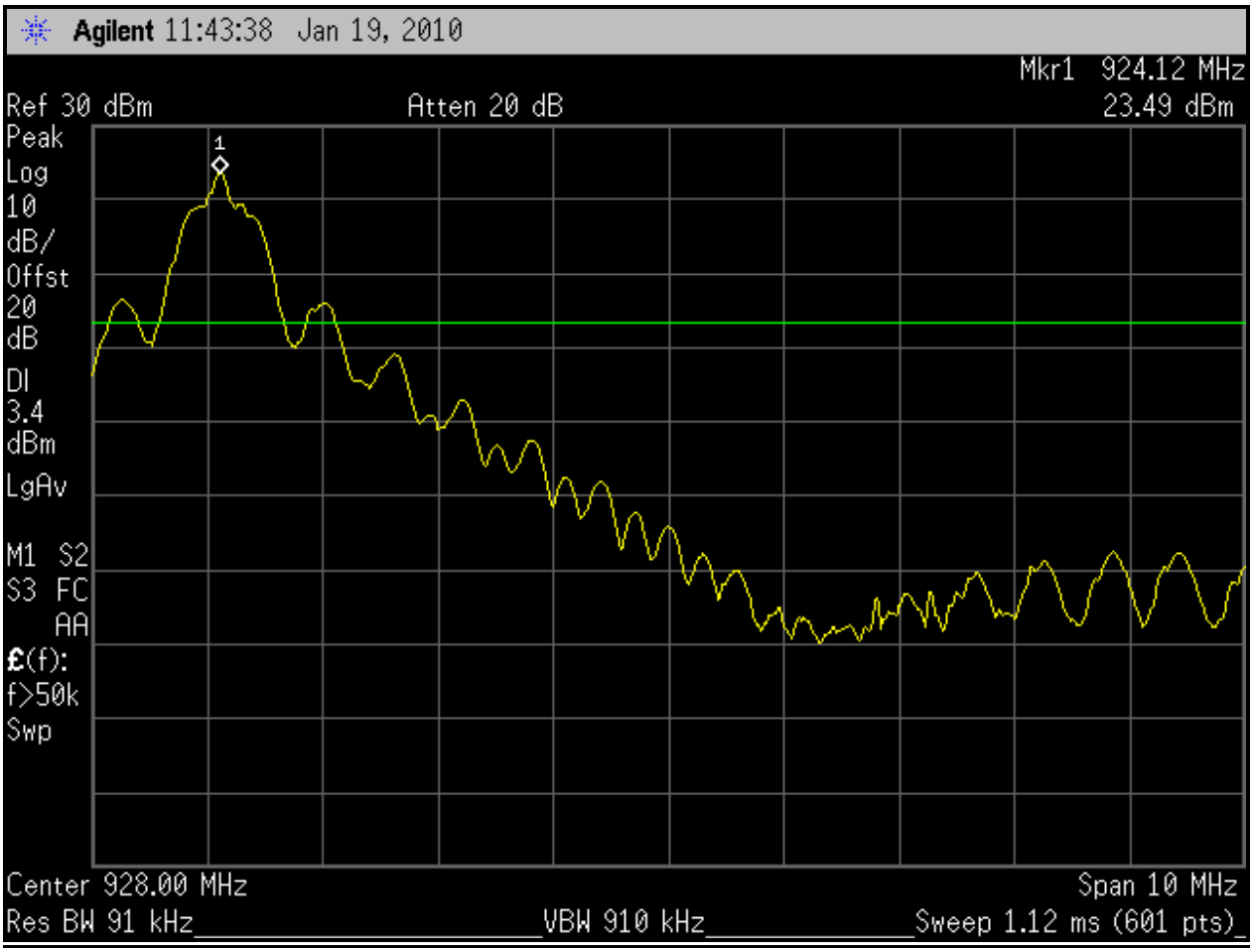
Plot 5-3: Lower Band Edge: Peak Measurement 903 MHz; 1000K RC Modulation



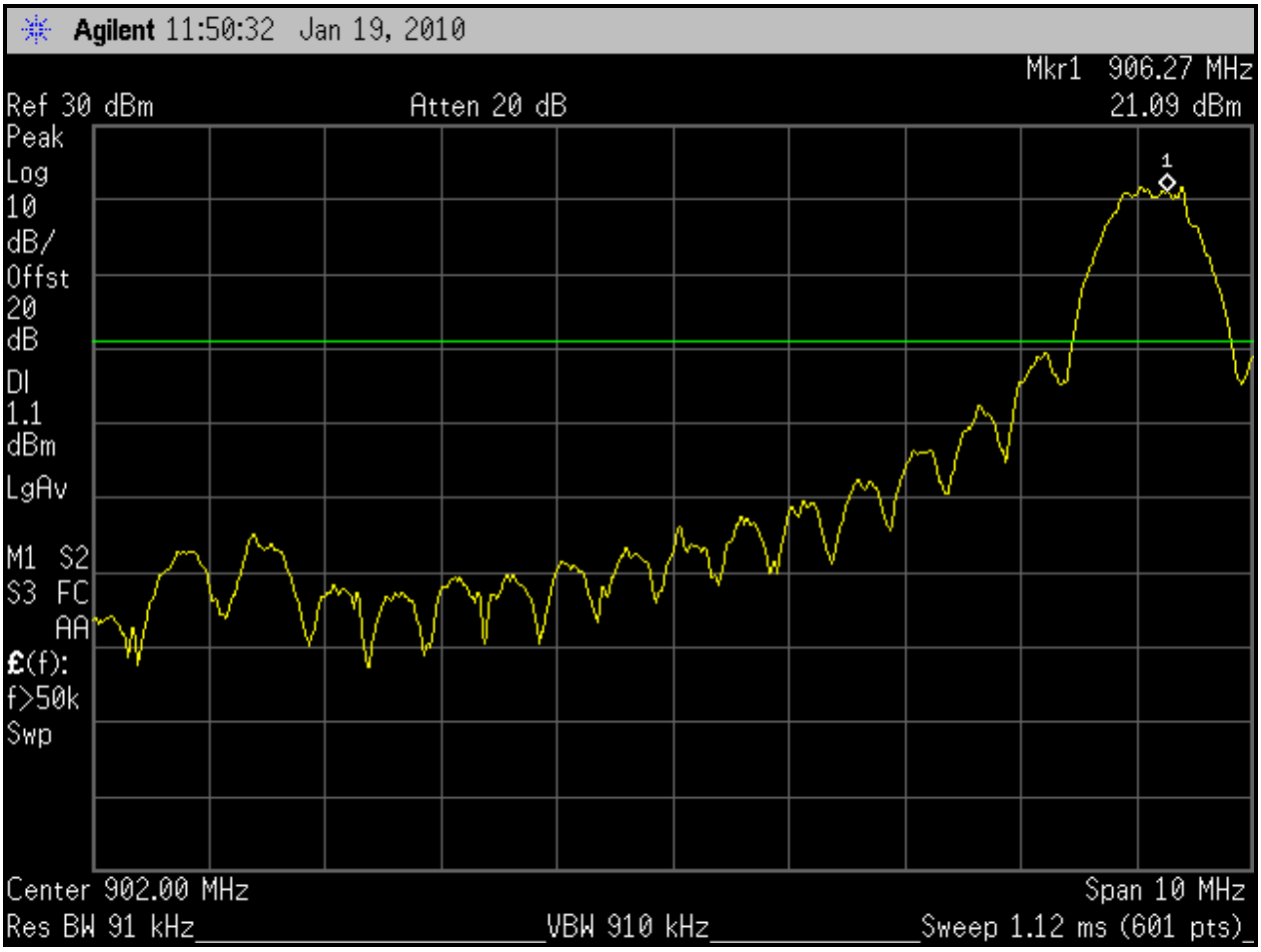
Plot 5-4: Upper Band Edge: Peak Measurement 927 MHz; 1000K RC Modulation



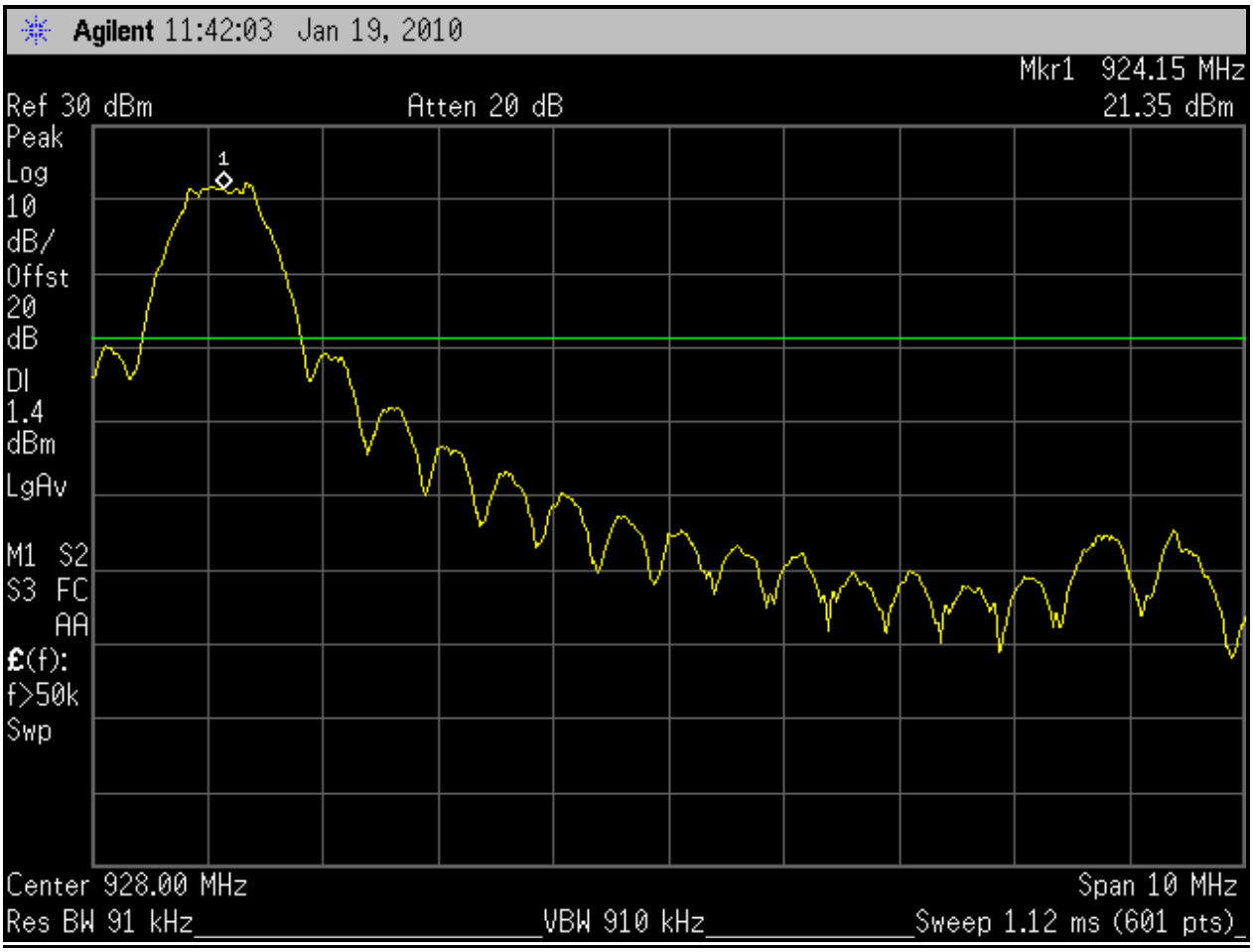
Plot 5-5: Lower Band Edge: Peak Measurement 906 MHz; BPSK40 Modulation



Plot 5-6: Upper Band Edge: Peak Measurement 924 MHz; BPSK40 Modulation



Plot 5-7: Lower Band Edge: Peak Measurement 906 MHz; OQPSK250 Modulation



Plot 5-8: Upper Band Edge: Peak Measurement 924 MHz; OQPSK250 Modulation

Test Personnel:

Dan Baltzell		January 19, 2010
Test Engineer	Signature	Date Of Test

6 Antenna Conducted Spurious Emissions - 15.247(d); RSS-Gen

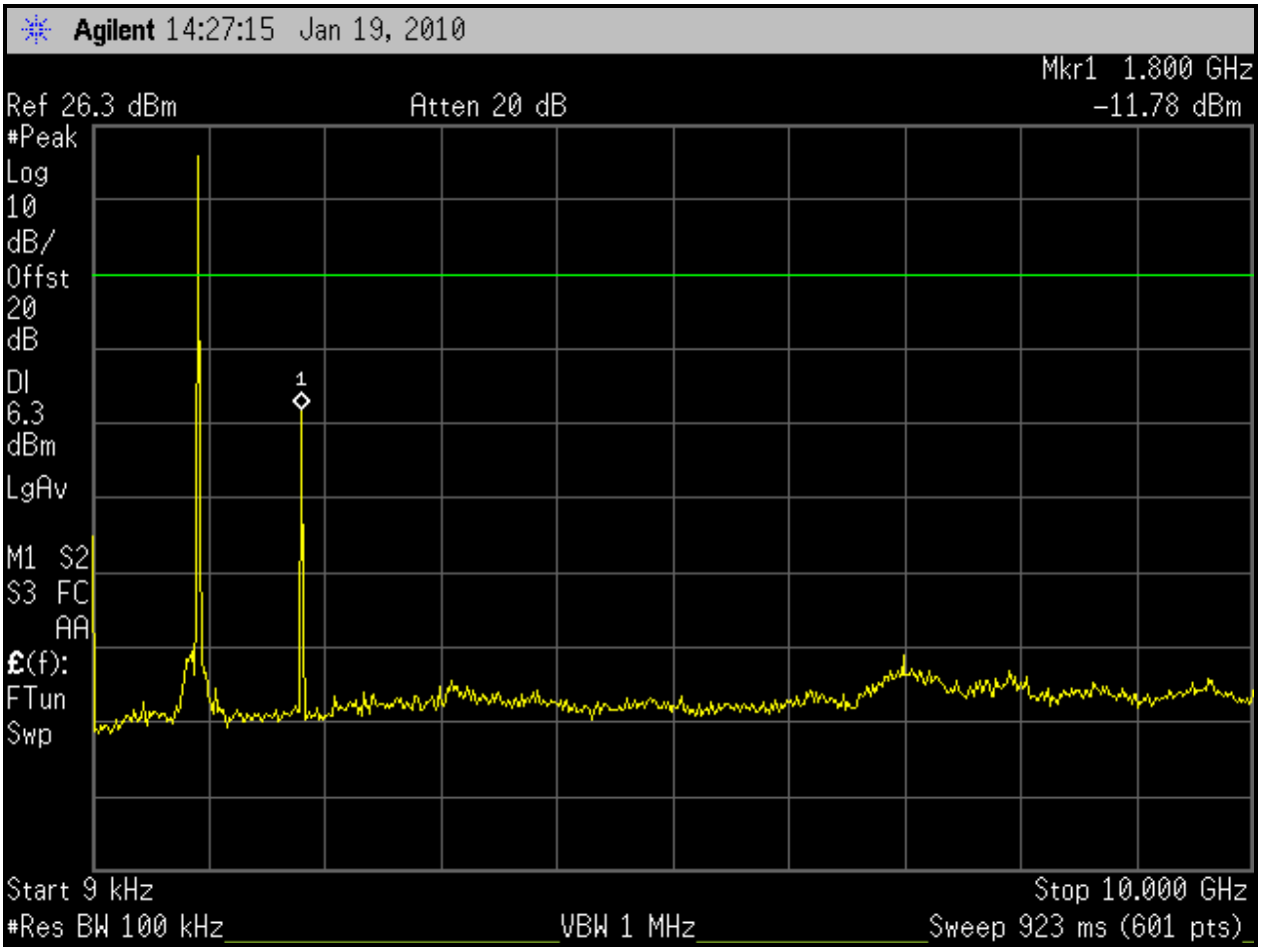
6.1 Antenna Conducted Spurious Emissions Test Procedures

Antenna spurious emissions per FCC 15.247(d) was measured from the EUT antenna port using a 50 ohm spectrum analyzer with the resolution bandwidth set at 100 kHz, and the video bandwidth set at 1 MHz. The modulated carrier was identified at the low, mid, and high frequencies for each modulation type.

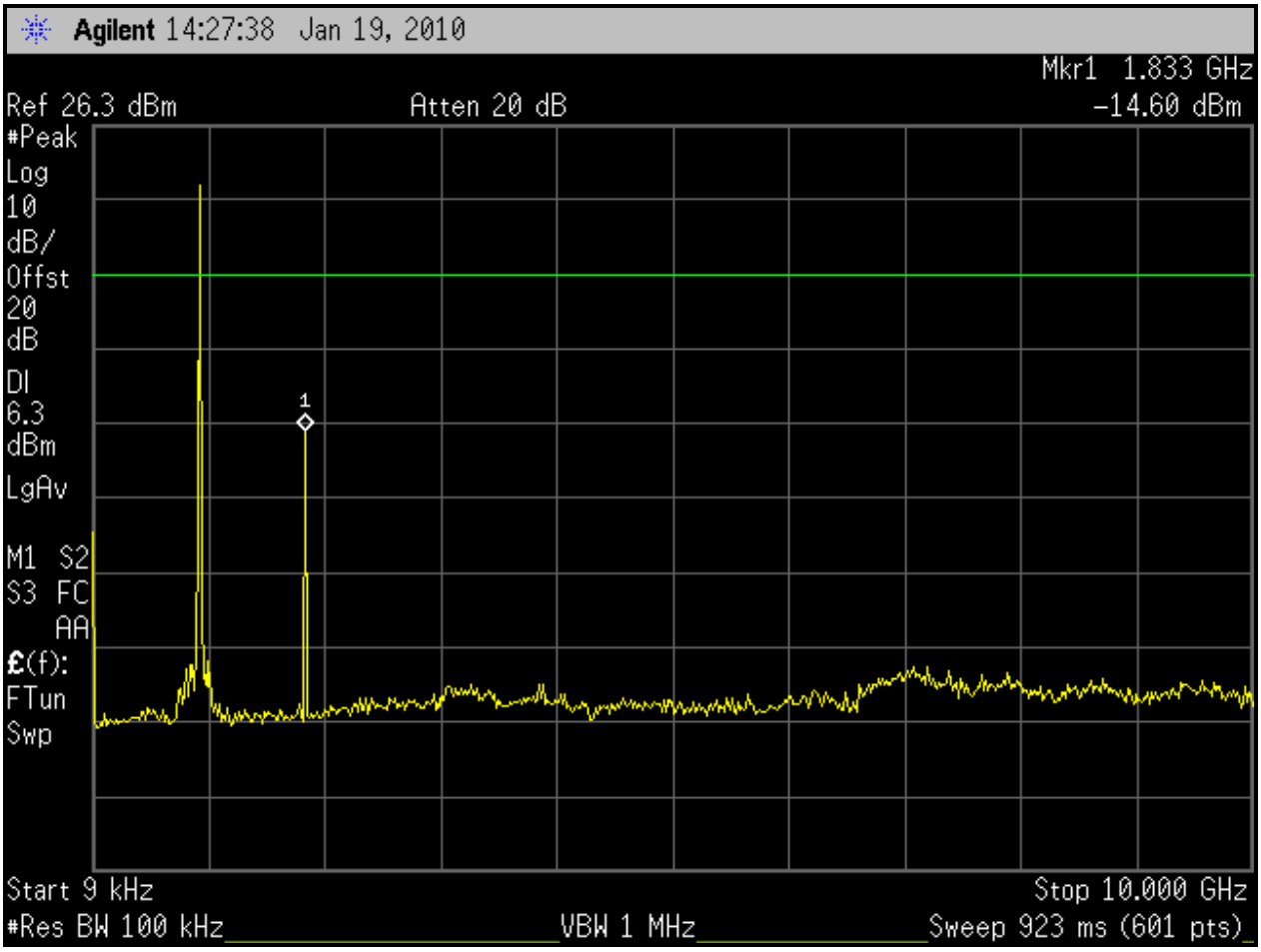
The following plots show no harmonics or spurs were found within 20 dB (note that we are reporting power as peak) of the limit from the carrier to the 10th harmonic of the carrier frequency.

Table 6-1: Antenna Conducted Spurious Emissions Test Equipment

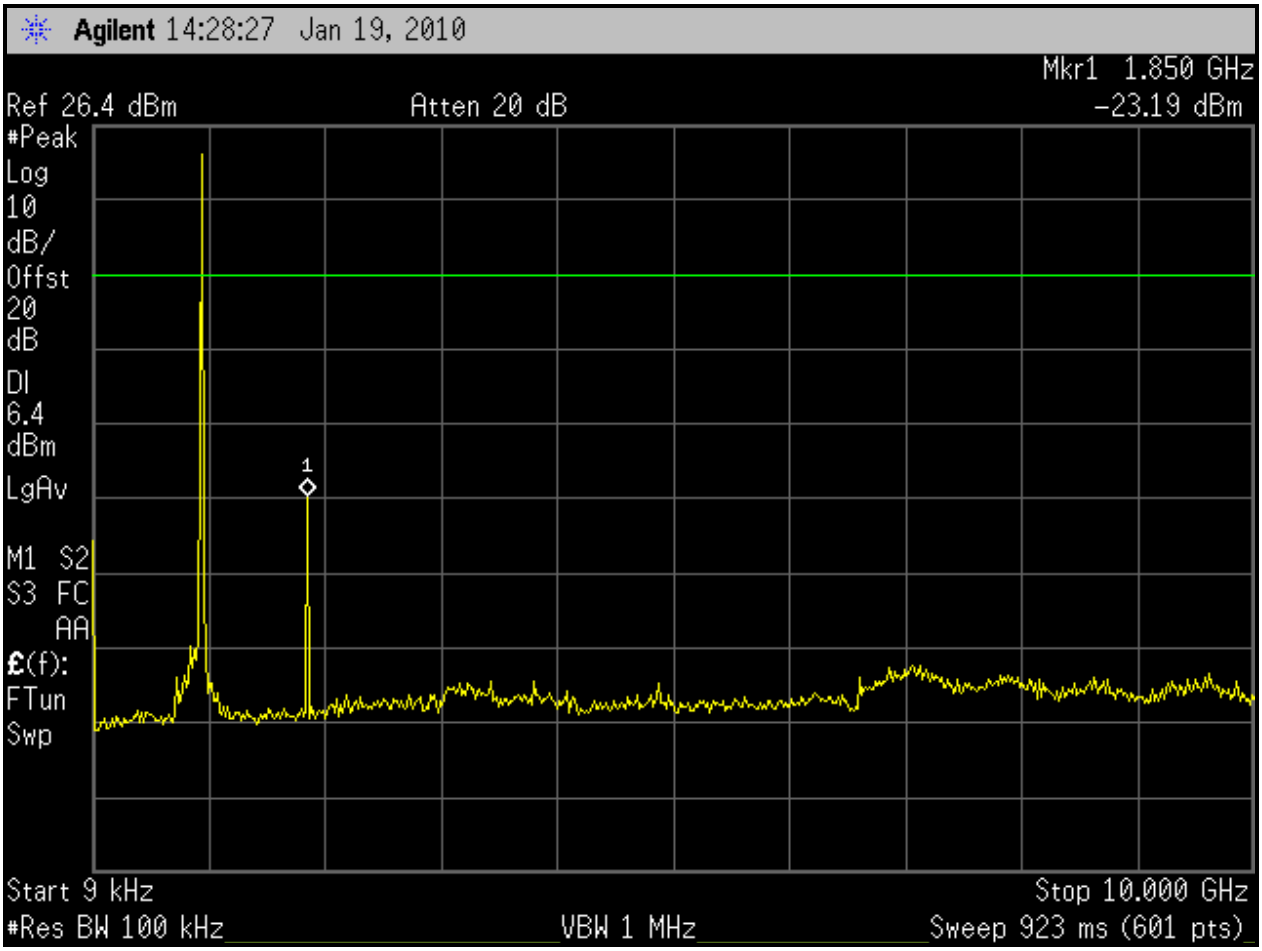
RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901413	Agilent Technologies	E4448A	Spectrum Analyzer	US44020346	7/31/10
901522	M/A Com	2082-6174-20	20 dB Attenuator	N/A	7/29/10



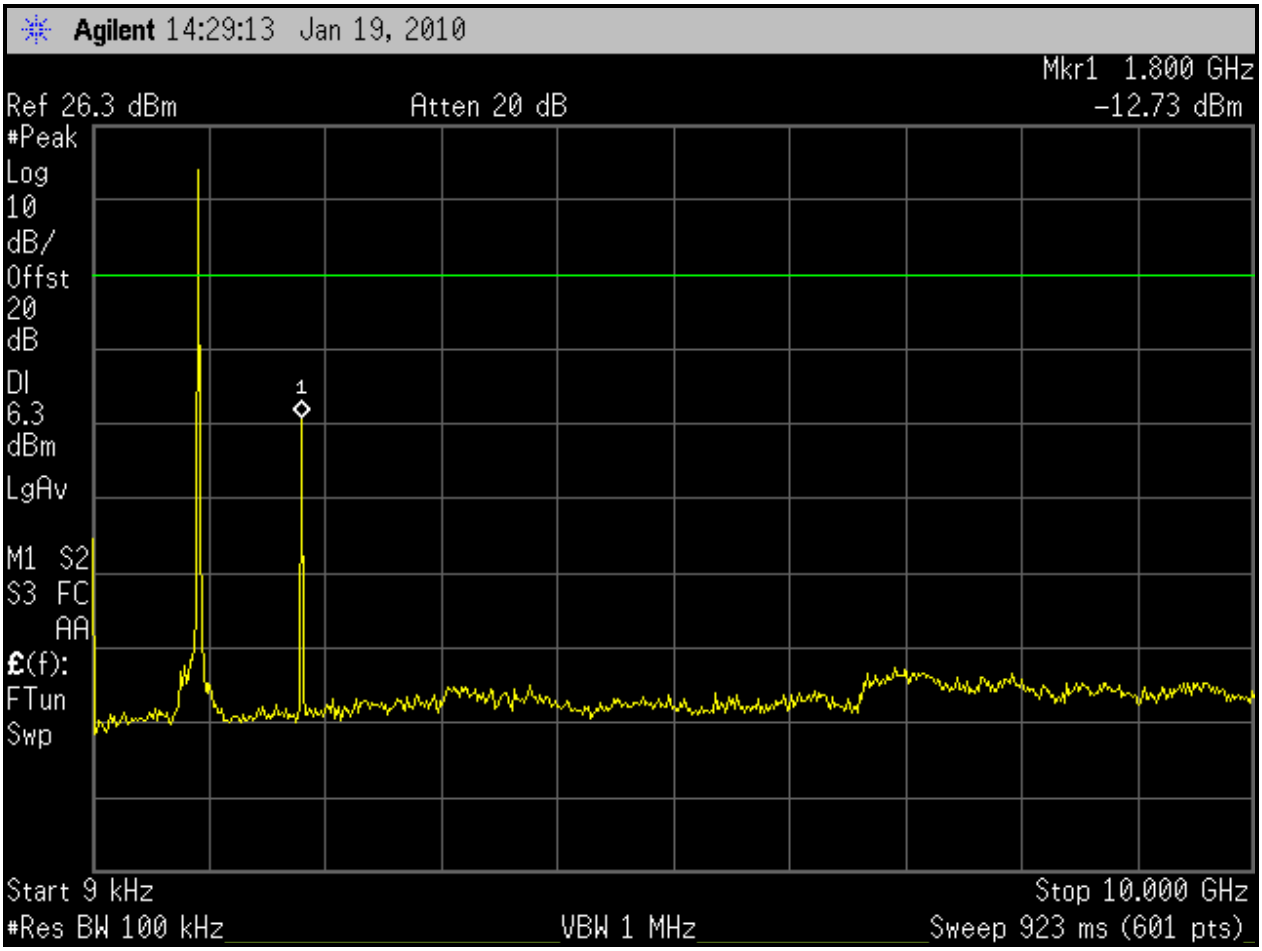
Plot 6-1: Conducted Spurious: Peak Measurement 903 MHz; 1000K SIN Modulation



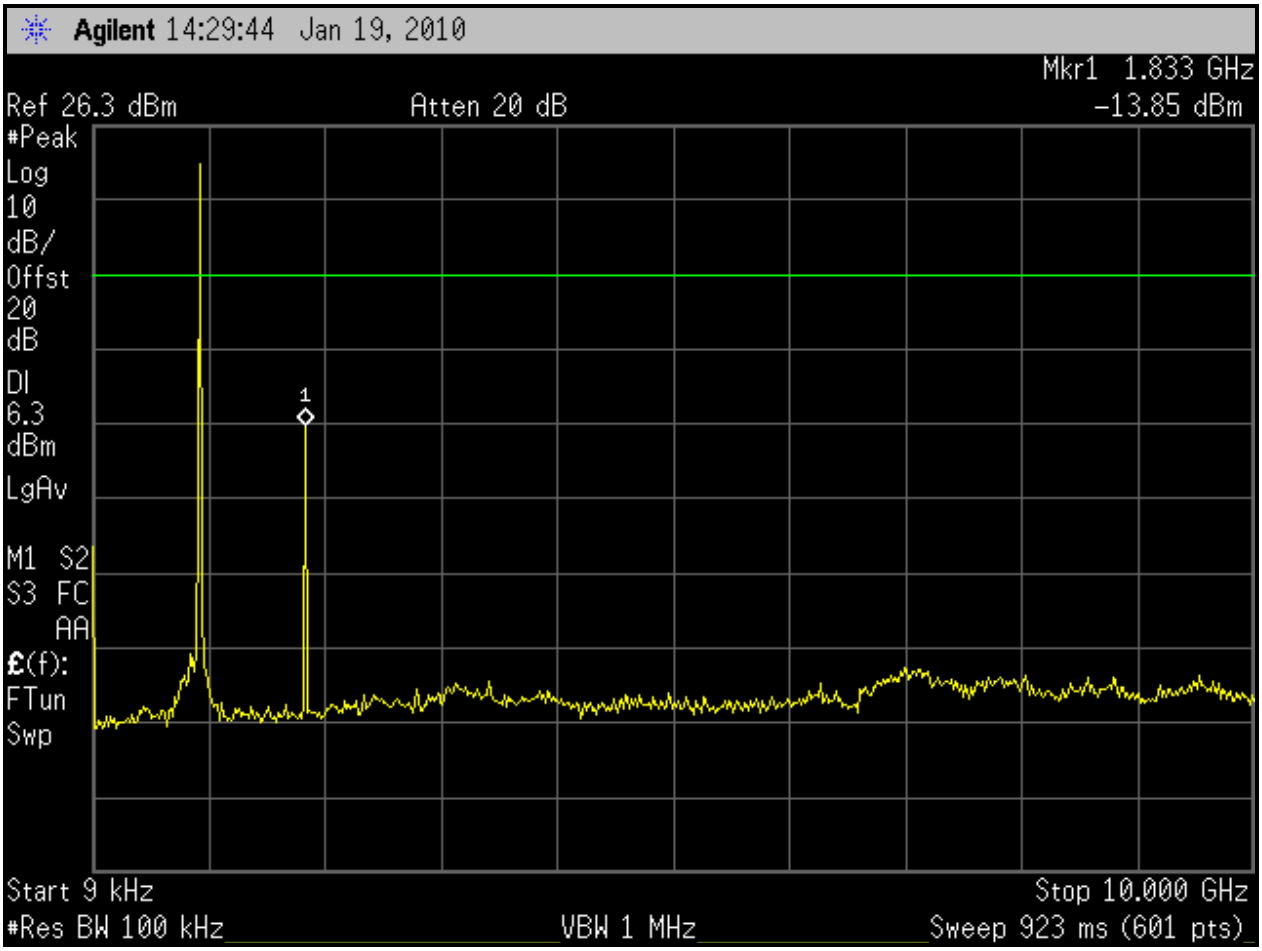
Plot 6-2: Conducted Spurious: Peak Measurement 915 MHz; 1000K SIN Modulation



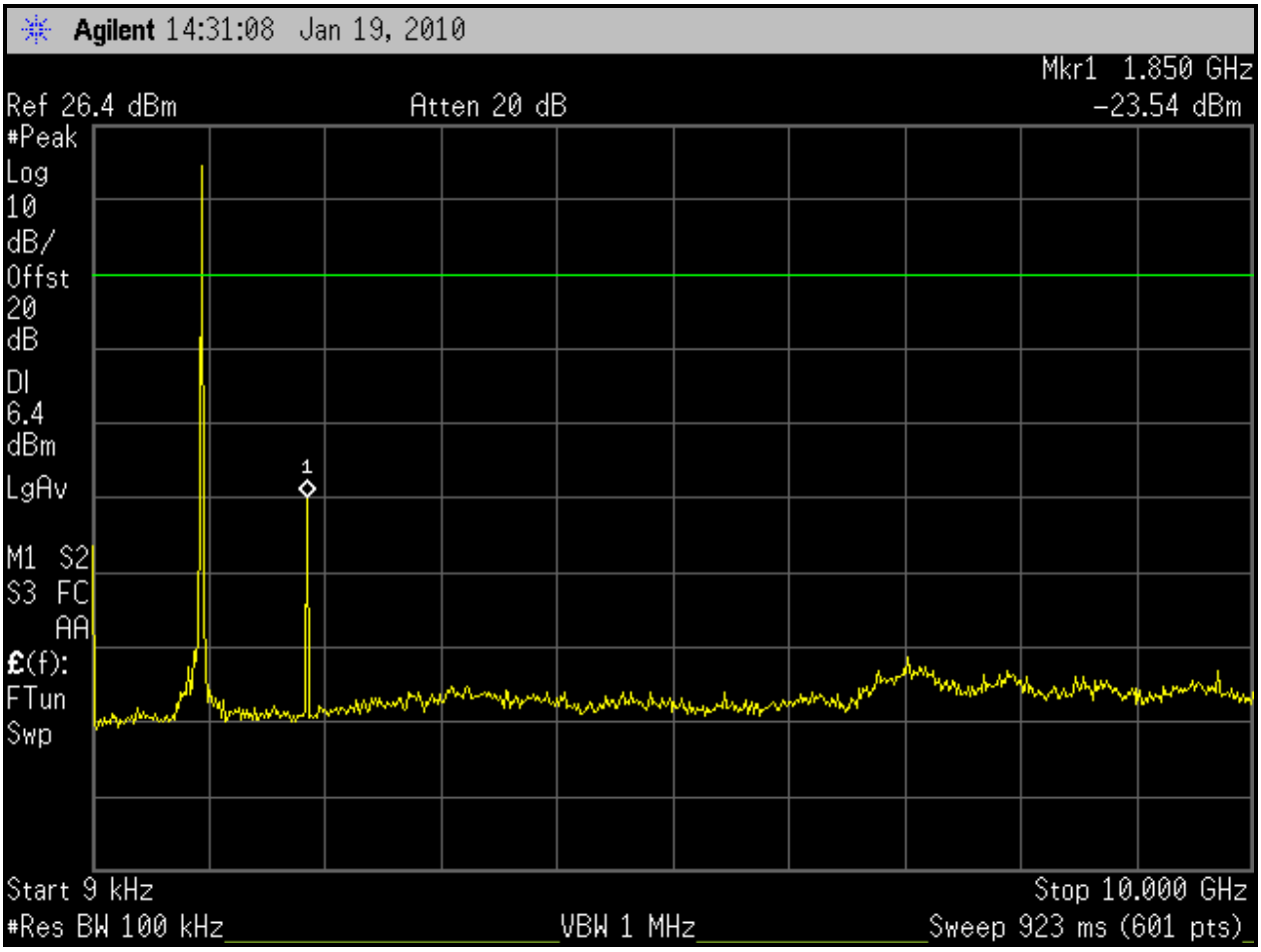
Plot 6-3: Conducted Spurious: Peak Measurement 927 MHz; 1000K SIN Modulation



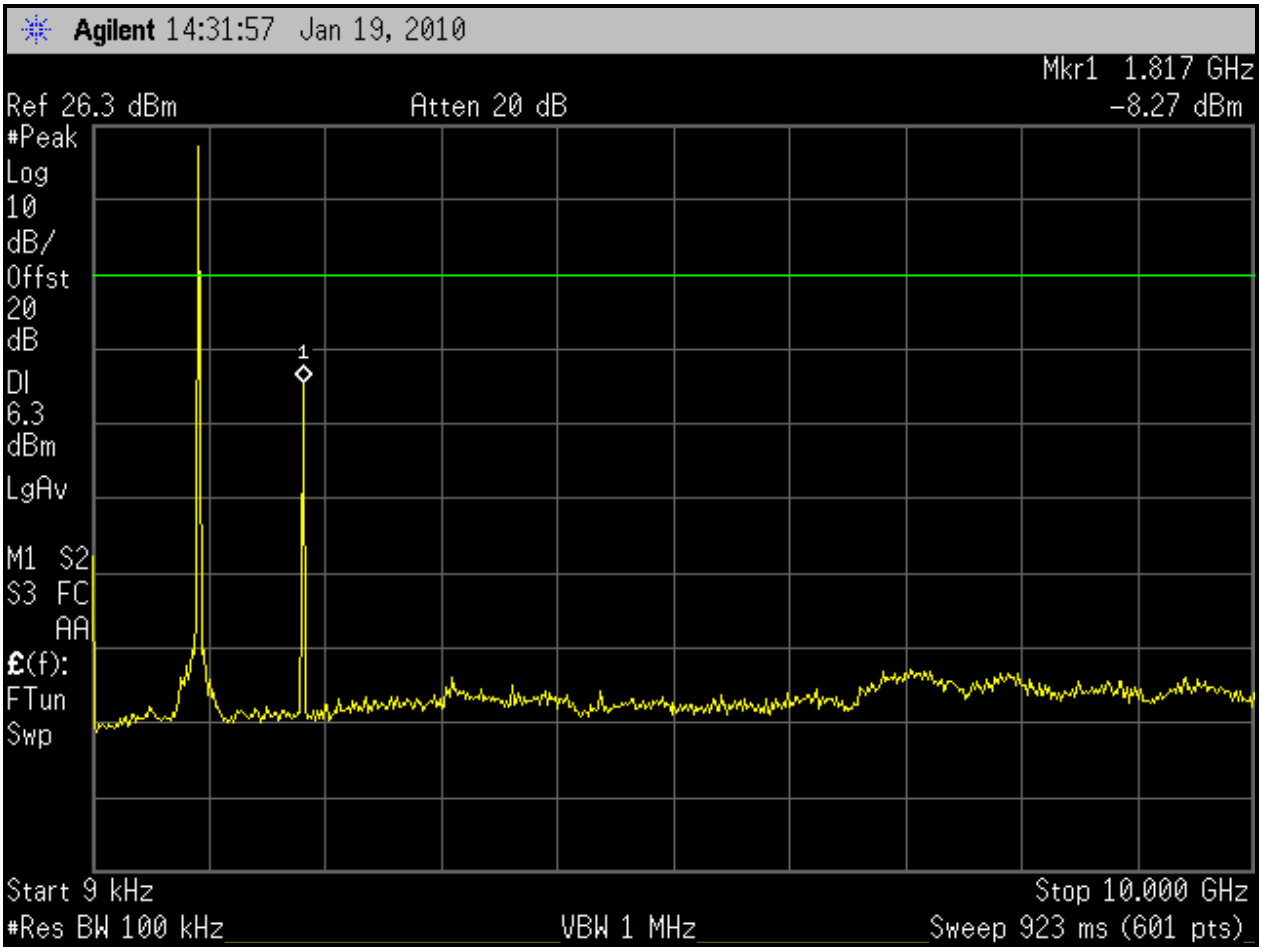
Plot 6-4: Conducted Spurious: Peak Measurement 903 MHz; 1000K RC Modulation



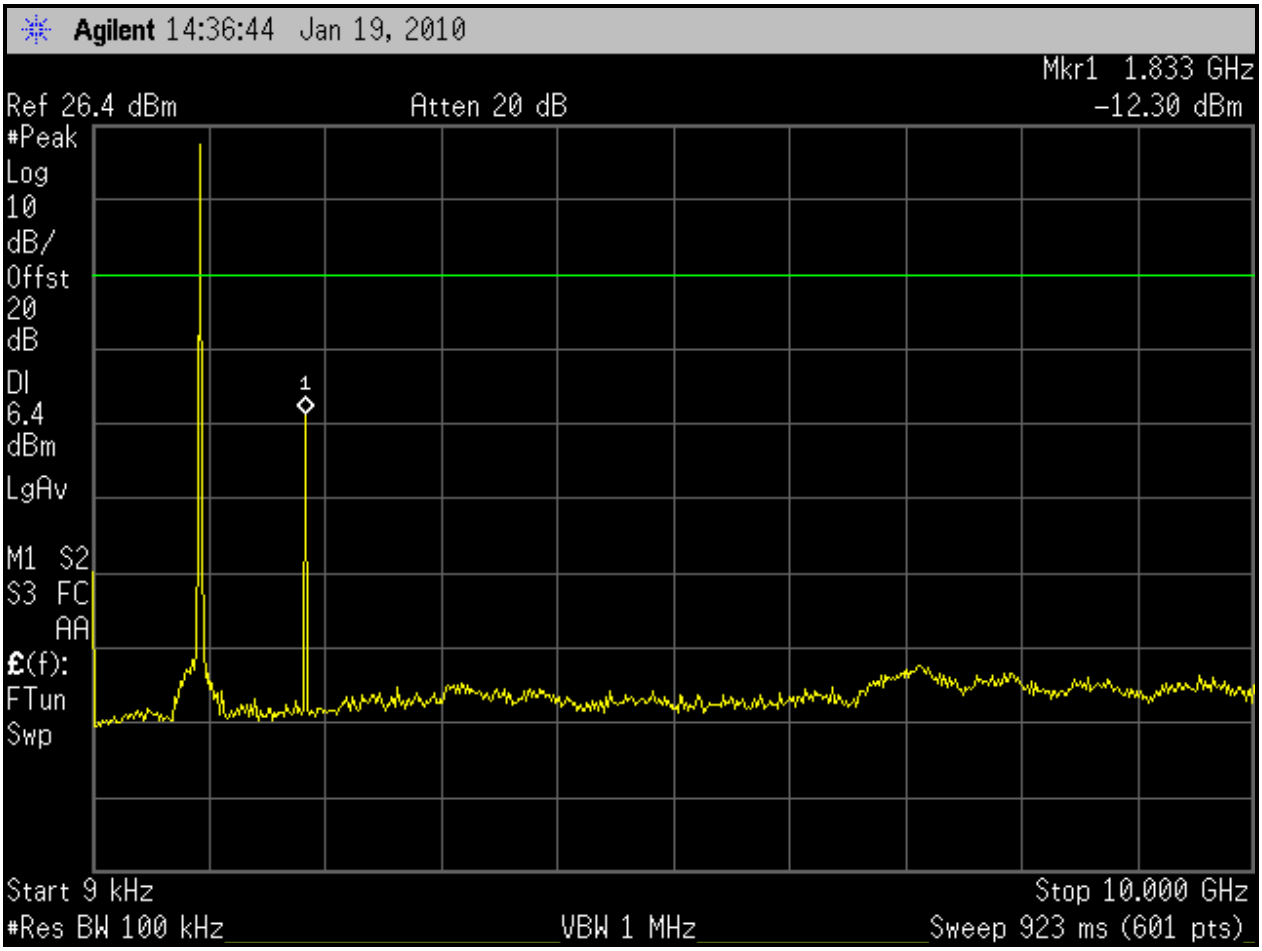
Plot 6-5: Conducted Spurious: Peak Measurement 915 MHz; 1000K RC Modulation



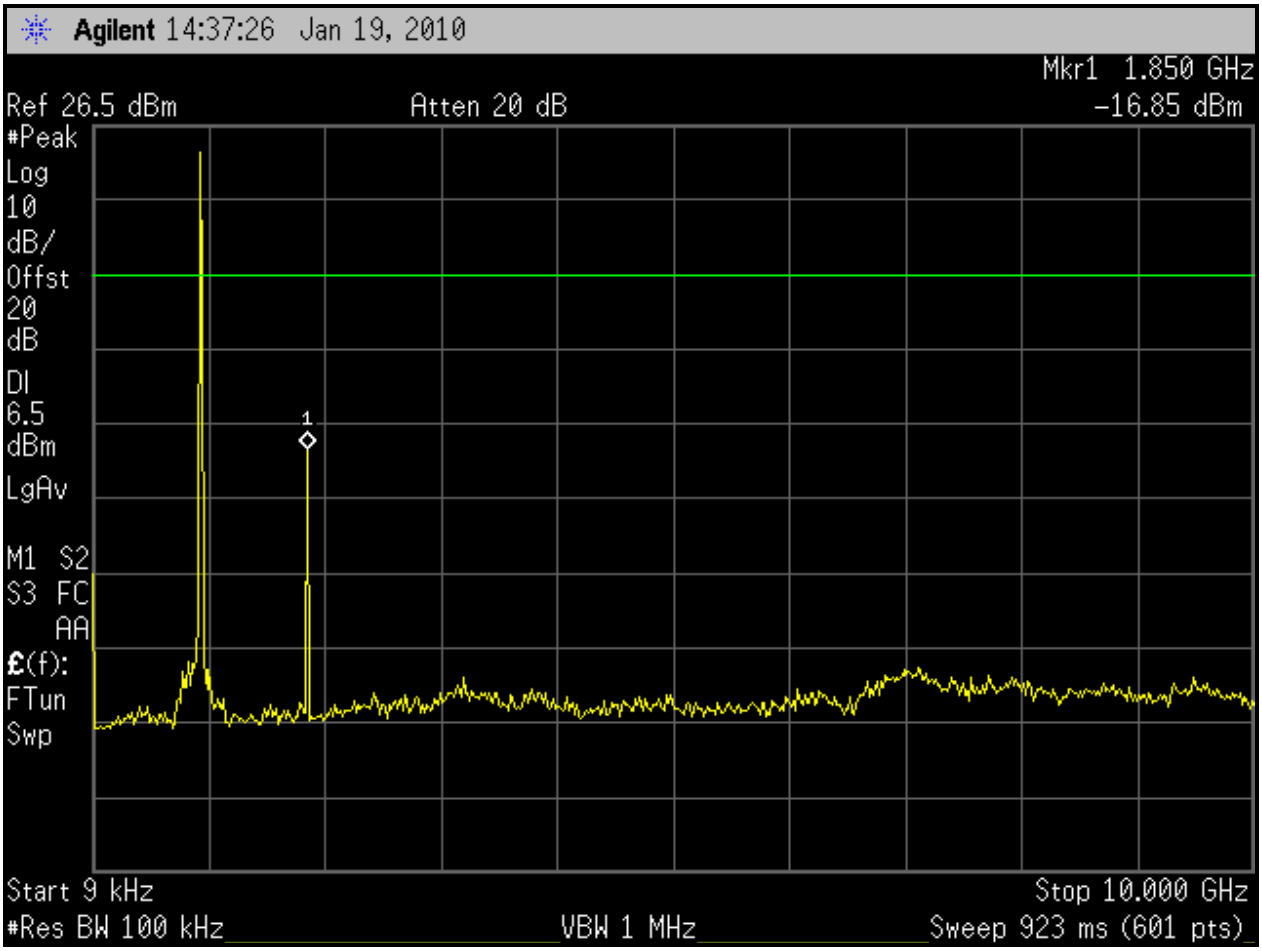
Plot 6-6: Conducted Spurious: Peak Measurement 927 MHz; 1000K RC Modulation



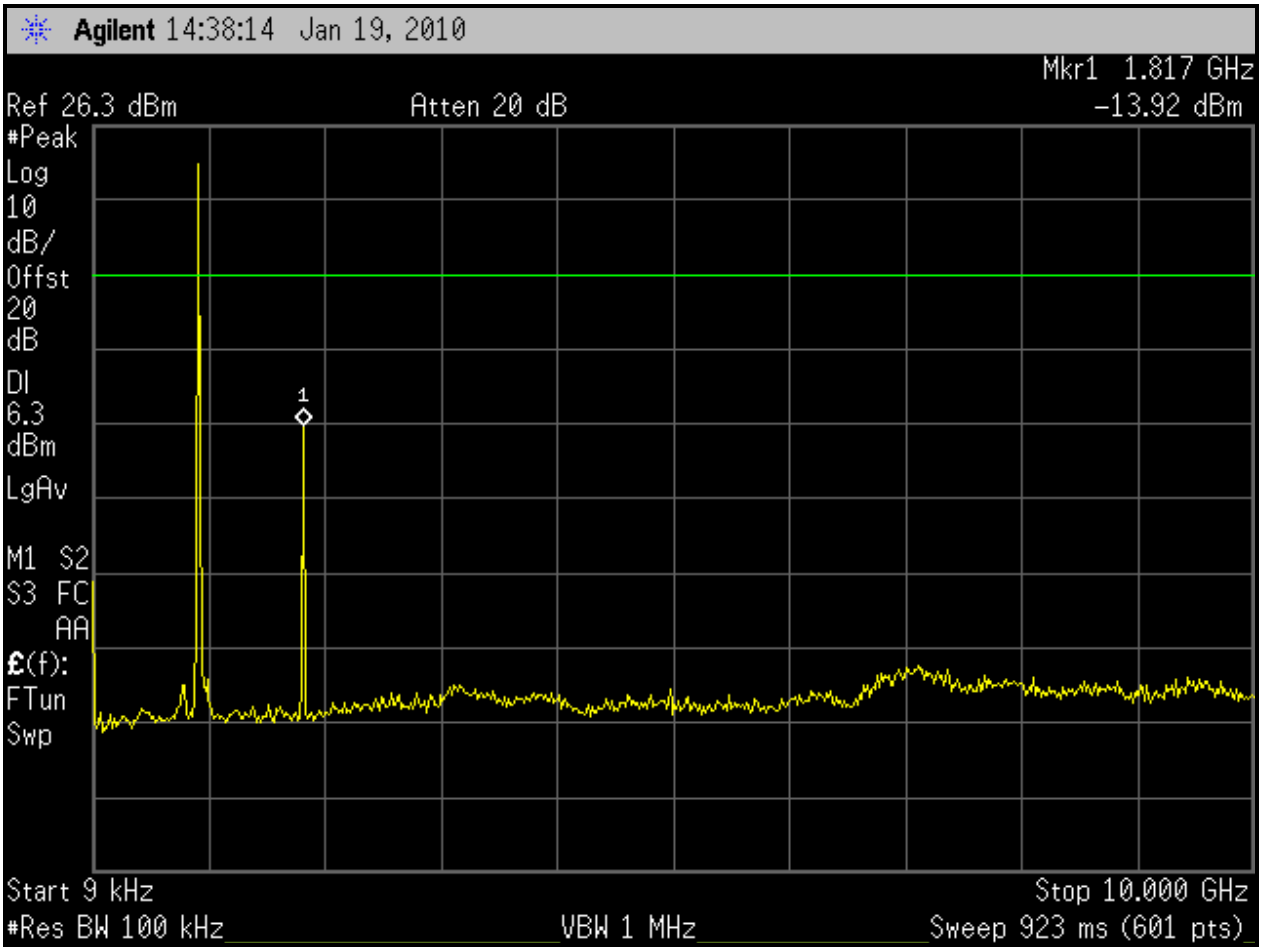
Plot 6-7: Conducted Spurious: Peak Measurement 906 MHz; BPSK40 Modulation



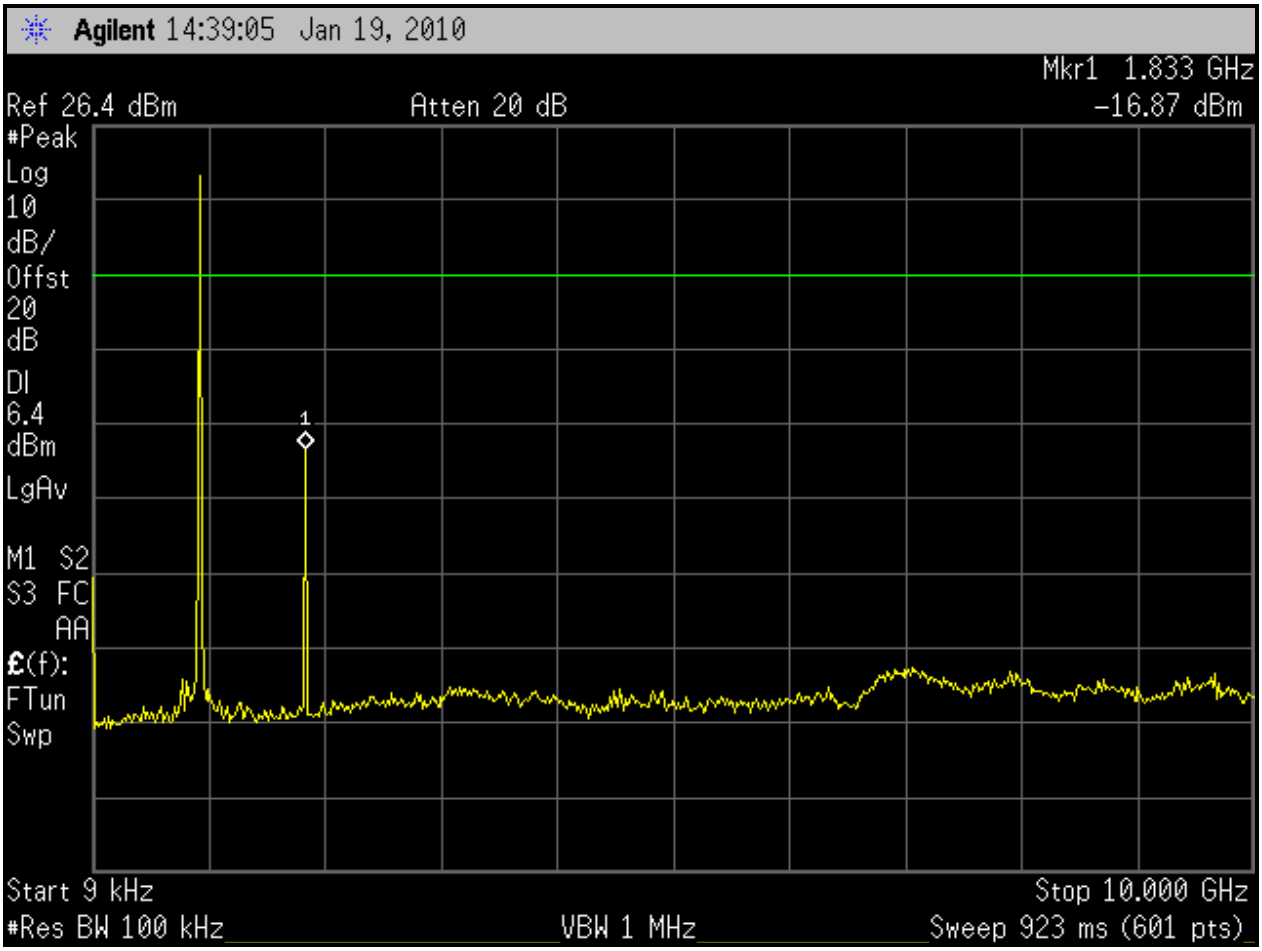
Plot 6-8: Conducted Spurious: Peak Measurement 916 MHz; BPSK40 Modulation



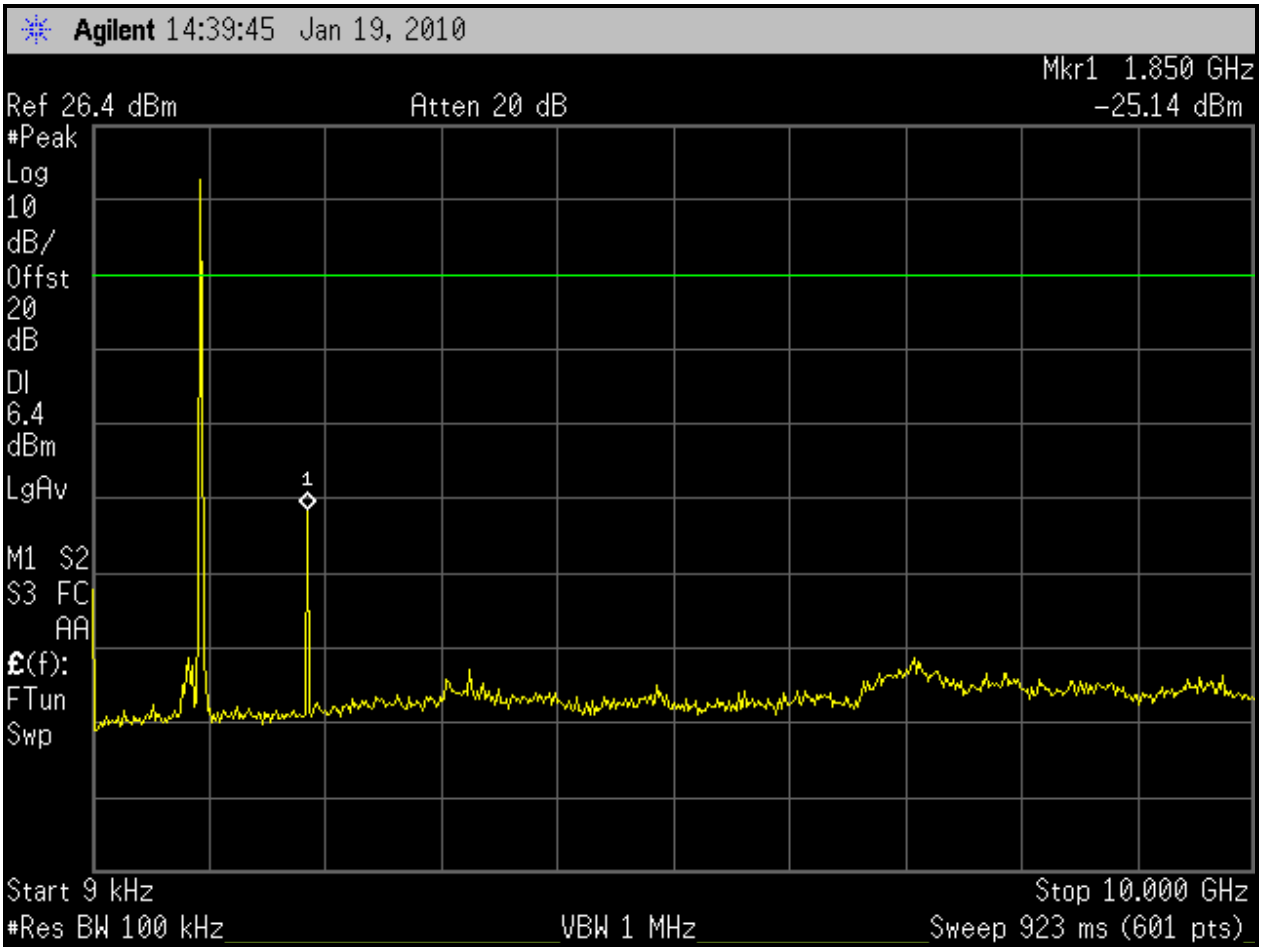
Plot 6-9: Conducted Spurious: Peak Measurement 924 MHz; BPSK40 Modulation



Plot 6-10: Conducted Spurious: Peak Measurement 906 MHz; OQPSK250 Modulation



Plot 6-11: Conducted Spurious: Peak Measurement 916 MHz; OQPSK250 Modulation



Plot 6-12: Conducted Spurious: Peak Measurement 924 MHz; OQPSK250 Modulation

Test Personnel:

Dan Baltzell		January 19, 2010
Test Engineer	Signature	Date Of Test

7 6 dB Bandwidth – FCC 15.247(a)(2)

7.1 6 dB Bandwidth Test Procedure – Minimum 6 dB Bandwidth

Procedure: C63.10-2009 6.9

The minimum 6 dB bandwidths per FCC 15.247(a)(2) were measured using a 50 ohm spectrum analyzer with the resolution bandwidth set at 120 kHz, and the video bandwidth set at 300 kHz. The device was modulated. The minimum 6 dB bandwidths are presented below.

Table 7-1: 6 dB Bandwidth Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
95448	Agilent Technologies	E4448A	Spectrum Analyzer (3 Hz – 50 GHz)	MY46180621	5/29/11
901522	M/A Com	2082-6174-20	20 dB Attenuator	N/A	7/29/10

7.2 6 dB Bandwidth Test Results

Table 7-2: 6 dB Bandwidth Test Data; 1000K SIN and 1000K RC Modulations

Frequency (MHz)	1000K SIN Modulation 6 dB Bandwidth (MHz)	1000K RC Modulation 6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass/Fail
903.0	0.805	0.873	0.5	Pass
915.0	0.808	0.946	0.5	Pass
927.0	0.797	0.878	0.5	Pass

Table 7-3: 6 dB Bandwidth Test Data; BPSK40 and OPQSK250 Modulations

Frequency (MHz)	BPSK40 Modulation 6 dB Bandwidth (MHz)	OPQSK250 Modulation 6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass/Fail
906.0	0.608	0.810	0.5	Pass
916.0	0.605	0.811	0.5	Pass
924.0	0.608	0.787	0.5	Pass

Test Personnel:

Dan Baltzell		January 19, 2010
Test Engineer	Signature	Date Of Test

8 Power Spectral Density – FCC 15.247(e)

8.1 Power Spectral Density Test Procedure

Procedure: C63.10-2009 6.11.2

The power spectral density per FCC 15.247(d) was measured using a 50 ohm spectrum analyzer with the resolution bandwidth set at 3 kHz, the video bandwidth set at 100 kHz, and the sweep time set at (span/3 kHz) seconds, and values converted from a 1 Hz noise measurement by adding 10log(3000)=34.8 dB. The spectral lines were resolved for the modulated carriers at low, mid, and high channels. These levels are below the +8 dBm limit. See the power spectral density table.

Table 8-1: Power Spectral Density Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
95448	Agilent Technologies	E4448A	Spectrum Analyzer (3 Hz – 50 GHz)	MY46180621	5/29/11
901522	M/A Com	2082-6174-20	20 dB Attenuator	N/A	7/29/10

8.2 Power Spectral Density Test Data

Table 8-2: Power Spectral Density Test Data; 1000K SIN and 1000K RC Modulations

Frequency (MHz)	1000K SIN Modulation RF Power Level (dBm)	1000K RC Modulation RF Power Level (dBm)	Maximum Limit +8 dBm	Pass/Fail
903.0	3.7	3.2	8	Pass
915.0	3.8	3.3	8	Pass
927.0	3.9	3.3	8	Pass

Table 8-3: Power Spectral Density Test Data; BPSK40 and OPQSK250 Modulations

Frequency (MHz)	BPSK40 Modulation RF Power Level (dBm)	OPQSK250 Modulation RF Power Level (dBm)	Maximum Limit +8 dBm	Pass/Fail
906.0	3.2	4.0	8	Pass
916.0	3.2	4.0	8	Pass
924.0	3.2	4.1	8	Pass

Test Personnel:

Dan Baltzell		January 10, 2010
Test Engineer	Signature	Date Of Test

9 Conducted Emissions Measurement Limits – FCC 15.207; RSS-Gen

9.1 Limits of Conducted Emissions Measurement

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66-56	56-46
0.5-5.0	56	46
5.0-30.0	60	50

9.2 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 A.C. 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.

Table 9-1: Conducted Emissions Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901215	Hewlett Packard	8596EM	Spectrum Analyzer (9 kHz - 12.8 GHz)	3826A00144	11/23/10
901082	AFJ International	LS16	16A LISN	16010020081	2/23/10

9.3 Conducted Emissions Test Data

Table 9-2: Conducted Emissions Test Data – Neutral - TX Mode

Temperature: 74°F Humidity: 33%									
Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC 15.207 QP Limit (dBuV)	FCC 15.207 QP Margin (dBuV)	FCC 15.207 AV Limit (dBuV)	FCC 15.207 AV Margin (dBuV)	Pass/ Fail
0.165	Qp	32.1	0.3	32.4	65.2	-32.8			Pass
0.363	Qp	41.0	0.5	41.5	58.7	-17.2			Pass
0.724	Qp	37.6	0.5	38.1	56.0	-17.9			Pass
1.066	Qp	33.1	0.7	33.8	56.0	-22.2			Pass
3.841	Qp	24.1	1.5	25.6	56.0	-30.4			Pass
8.440	Pk	35.8	2.3	38.1			50.0	-11.9	Pass

Table 9-3: Conducted Emissions Test Data – Hot – TX Mode

Temperature: 74°F Humidity: 33%									
Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC 15.207 QP Limit (dBuV)	FCC 15.207 QP Margin (dBuV)	FCC 15.207 AV Limit (dBuV)	FCC 15.207 AV Margin (dBuV)	Pass/ Fail
0.172	Qp	27.9	0.2	28.1	64.9	-36.8			Pass
0.361	Qp	40.2	0.4	40.6	58.7	-18.1			Pass
0.710	Qp	38.4	0.4	38.8	56.0	-17.2			Pass
1.448	Qp	31.2	1.0	32.2	56.0	-23.8			Pass
3.750	Pk	36.9	1.5	38.4			46.0	-7.6	Pass
8.410	Pk	36.7	2.3	39.0			50.0	-11.0	Pass

Table 9-4: Conducted Emissions Test Data – Neutral - RX Mode

Temperature: 74°F Humidity: 33%									
Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC 15.207 QP Limit (dBuV)	FCC 15.207 QP Margin (dBuV)	FCC 15.207 AV Limit (dBuV)	FCC 15.207 AV Margin (dBuV)	Pass/ Fail
0.200	Qp	43.4	0.4	43.8	63.6	-19.8			Pass
0.265	Qp	40.0	0.5	40.5	61.3	-20.8			Pass
0.301	Qp	39.4	0.5	39.9	60.2	-20.3			Pass
1.306	Qp	36.3	0.9	37.2	56.0	-18.8			Pass
4.310	Qp	37.3	1.5	38.8	56.0	-17.2			Pass
19.430	Pk	27.5	3.8	31.3			50.0	-18.7	Pass

Table 9-5: Conducted Emissions Test Data – Hot – RX Mode

Temperature: 74°F Humidity: 33%									
Emission Frequency (MHz)	**Test Detector**	**Analyzer Reading (dBuV)**	**Site Correction Factor (dB)**	**Emission Level (dBuV)**	**FCC 15.207 QP Limit (dBuV)**	**FCC 15.207 QP Margin (dBuV)**	**FCC 15.207 AV Limit (dBuV)**	**FCC 15.207 AV Margin (dBuV)**	**Pass/ Fail**
0.199	Qp	44.3	0.4	44.7	63.7	-19.0			Pass
0.265	Qp	41.4	0.4	41.8	61.3	-19.5			Pass
0.301	Qp	40.9	0.4	41.3	60.2	-18.9			Pass
0.631	Qp	40.0	0.6	40.6	56.0	-15.4			Pass
1.651	Qp	33.4	0.9	34.3	56.0	-21.7			Pass
4.240	Pk	39.4	1.5	40.9			46.0	-5.1	Pass
19.430	Pk	29.1	3.5	32.6			50.0	-17.4	Pass

Test Personnel:

Daniel W. Baltzell		January 12, 2010
Test Engineer	Signature	Date Of Test

10 Radiated Emissions – FCC 15.209

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

Procedure: C63.10-2009 6.5, 6.6

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.

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 1,000 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 for BPSK40 modulation type since this was found to be worst case modulation and spurious from conducted and power measurements.

Table 10-1: Radiated Emissions Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901365	MITEQ	JS4-00102600-41-5P	Amplifier, 0.1-26 GHz, 30dB gain	N/A	3/4/10
900151	Rohde and Schwarz	HFH2-Z2	Loop Antenna (9 kHz - 30 MHz)	827525/019	9/15/10
900878	Rhein Tech Labs	AM3-1197-0005	3 meter antenna mast, polarizing	Outdoor Range 1	Not Required
901516	Insulated Wire, Inc.	KPS-1503-2400-KPS	RF cable, 20'	NA	10/19/10
901517	Insulated Wire Inc.	KPS-1503-360-KPS	RF cable 36"	NA	10/19/10
901242	Rhein Tech Labs	WRT-000-0003	Wood rotating table	N/A	Not Required
900772	EMCO	3161-02	Horn Antenna (2 - 4 GHz)	9804-1044	6/14/10
900321	EMCO	3161-03	Horn Antennas (4 - 8,2GHz)	9508-1020	6/14/10
900323	EMCO	3160-7	Horn Antennas (8,2 - 12,4 GHz)	9605-1054	6/14/10
901215	Hewlett Packard	8596EM	Spectrum Analyzer (9 KHz - 12.8 GHz)	3826A00144	11/23/10
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 Harmonics/Spurious

Table 10-2: Radiated Emissions Harmonics/Spurious TX Frequency – 906.0 MHz; 6 dBi Yagi

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (dBuV) (6.1 dB Duty Cycle Correction)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
2718.0	61.7	55.6	-6.5	49.1	54	-4.9
3624.0	47.8	41.7	-5.1	36.6	54	-17.4
4530.0	50.5	44.4	1.4	45.8	54	-8.2
5436.0	51.4	45.3	3.6	48.9	54	-5.1
8154.0	47.5	41.4	6.4	47.8	54	-6.2
9060.0	44.5	38.4	12.1	50.5	54	-3.5

Table 10-3: Radiated Emissions Harmonics/Spurious TX Frequency – 916.0 MHz; 6 dBi Yagi

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (dBuV) (6.1 dB Duty Cycle Correction)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
2748.0	59.3	53.2	-6.2	47.0	54	-7.0
3664.0	45.9	39.8	-5.1	34.7	54	-19.3
4580.0	49.5	43.4	1.6	45.0	54	-9.0
7328.0	52.8	46.7	5.4	52.1	54	-1.9
8244.0	43.5	37.4	11.6	49.0	54	-5.0
9160.0	43.4	37.3	12.3	49.6	54	-4.4

Table 10-4: Radiated Emissions Harmonics/Spurious TX Frequency – 924.0 MHz; 6 dBi Yagi

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (dBuV) (6.1 dB Duty Cycle Correction)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
2772.0	59.7	53.6	-6.3	47.3	54	-6.7
3696.0	48.1	42.0	-5.0	37.0	54	-17.0
4620.0	51.7	45.6	1.5	47.1	54	-6.9
7392.0	50.5	44.4	5.8	50.2	54	-3.8
8316.0	45.0	38.9	11.6	50.5	54	-3.5
9240.0	44.0	37.9	12.5	50.4	54	-3.6

Table 10-5: Radiated Emissions Harmonics/Spurious TX Frequency – 906.0 MHz; 8 dBi Dipole

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (dBuV) (6.1 dB Duty Cycle Correction)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
2718.0	63.0	56.9	-6.5	50.4	54	-3.6
3624.0	49.5	43.4	-5.1	38.3	54	-15.7
4530.0	53.0	46.9	1.4	48.3	54	-5.7
5436.0	51.5	45.4	3.6	49.0	54	-5.0
8154.0	45.1	39.0	6.4	45.4	54	-8.6
9060.0	43.0	36.9	12.1	49.0	54	-5.0

Table 10-6: Radiated Emissions Harmonics/Spurious TX Frequency – 916.0 MHz; 8 dBi Dipole

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (dBuV) (6.1 dB Duty Cycle Correction)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
2748.0	57.1	51.0	-6.2	44.8	54	-9.2
3664.0	48.0	41.9	-5.1	36.8	54	-17.2
4580.0	49.4	43.3	1.6	44.9	54	-9.1
7328.0	51.5	45.4	5.4	50.8	54	-3.2
8244.0	44.5	38.4	11.6	50.0	54	-4.0
9160.0	43.0	36.9	12.3	49.2	54	-4.8

Table 10-7: Radiated Emissions Harmonics/Spurious TX Frequency – 924.0 MHz; 8 dBi Dipole

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (dBuV) (6.1 dB Duty Cycle Correction)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
2772.0	61.5	55.4	-6.3	49.1	54	-4.9
3696.0	47.9	41.8	-5.0	36.8	54	-17.2
4620.0	49.0	42.9	1.5	44.4	54	-9.6
7392.0	47.6	41.5	5.8	47.3	54	-6.7
8316.0	45.9	39.8	11.6	51.4	54	-2.6
9240.0	44.4	38.3	12.5	50.8	54	-3.2

Table 10-8: Radiated Emissions Harmonics/Spurious TX Frequency – 906.0 MHz; 5 dBi Monopole

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (dBuV) (6.1 dB Duty Cycle Correction)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
2718.0	62.0	55.9	-6.5	49.4	54	-4.6
3624.0	43.8	37.7	-5.1	32.6	54	-21.4
4530.0	48.8	42.7	1.4	44.1	54	-9.9
5436.0	51.3	45.2	3.6	48.8	54	-5.2
8154.0	49.0	42.9	6.4	49.3	54	-4.7
9060.0	42.3	36.2	12.1	48.3	54	-5.7

Table 10-9: Radiated Emissions Harmonics/Spurious TX Frequency – 916.0 MHz; 5 dBi Monopole

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (dBuV) (6.1 dB Duty Cycle Correction)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
2748.0	60.3	54.2	-6.2	48.0	54	-6.0
3664.0	48.6	42.5	-5.1	37.4	54	-16.6
4580.0	48.9	42.8	1.6	44.4	54	-9.6
7328.0	54.0	47.9	5.4	53.3	54	-0.7
8244.0	44.7	38.6	11.6	50.2	54	-3.8
9160.0	43.3	37.2	12.3	49.5	54	-4.5

Table 10-10: Radiated Emissions Harmonics/Spurious TX Frequency – 924.0 MHz; 5 dBi Monopole

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (dBuV) (6.1 dB Duty Cycle Correction)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
2772.0	60.7	54.6	-6.3	48.3	54	-5.7
3696.0	49.0	42.9	-5.0	37.9	54	-16.1
4620.0	50.1	44.0	1.5	45.5	54	-8.5
7392.0	53.3	47.2	5.8	53.0	54	-1.0
8316.0	46.4	40.3	11.6	51.9	54	-2.1
9240.0	45.0	38.9	12.5	51.4	54	-2.6

Test Personnel:

Daniel W. Baltzell		January 17, 2010
EMC Test Engineer	Signature	Date Of Test

11 Conclusion

The data in this measurement report shows that the Banner Engineering Corporation, Model # RM912HP, FCC ID: UE3RM912HP, IC: 7044A-RM912HP, complies with all the applicable requirements of Parts 2 and 15 of the FCC Rules and Regulations and Industry Canada RSS-210.