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:
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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 Spread Spectrum Transmitter		
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	1	N/A	460KFXD

** 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	FHSS, OQPSK400
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
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

Standard	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 Measurement	Pass
FCC 15.247(a)(1)	Carrier Frequency Separation	Pass
FCC 15.247(a)(1)(i)	20 dB Bandwidth	Pass
FCC 15.247(a)(1)(i)	Hopping Characteristics	Pass
FCC 15.247(a)(1)(i)	Average Time of Occupancy	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 PCB	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

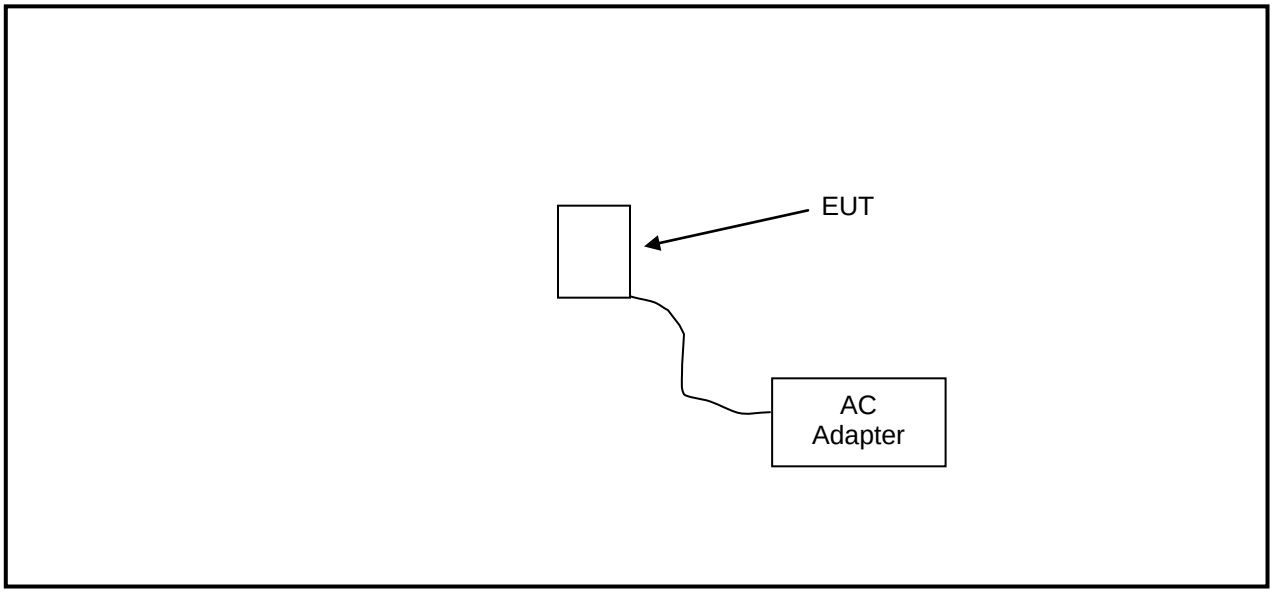


Figure 2-1: Configuration of System under Test

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

Channel	Frequency (MHz)	Peak Power Conducted Output (dBm)
Low	903	29.9
Middle	915	29.9
High	927	30.0

Test Personnel:

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

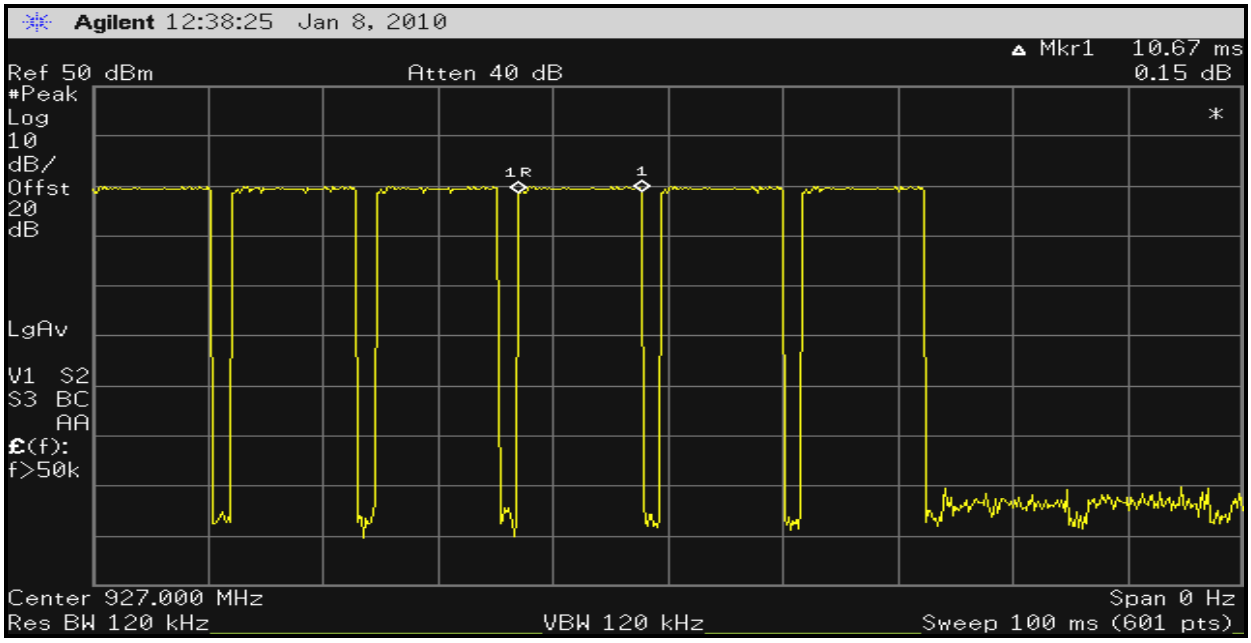
4 FHSS Duty Cycle Measurement

The pulse width was taken using a video trigger at zero span and a marker used to show pulse width. The sweep time was set to 100ms to show the number of pulses. A worst case timing mode was provided with a long dwell period OQPSK100.

4.1 Duty Cycle Test Equipment

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



Plot 4-1: Pulse Width

Duty cycle calculation from above plot:

20 Log ((10.67*6)/100ms) = -3.9 dB correction

Test Personnel:

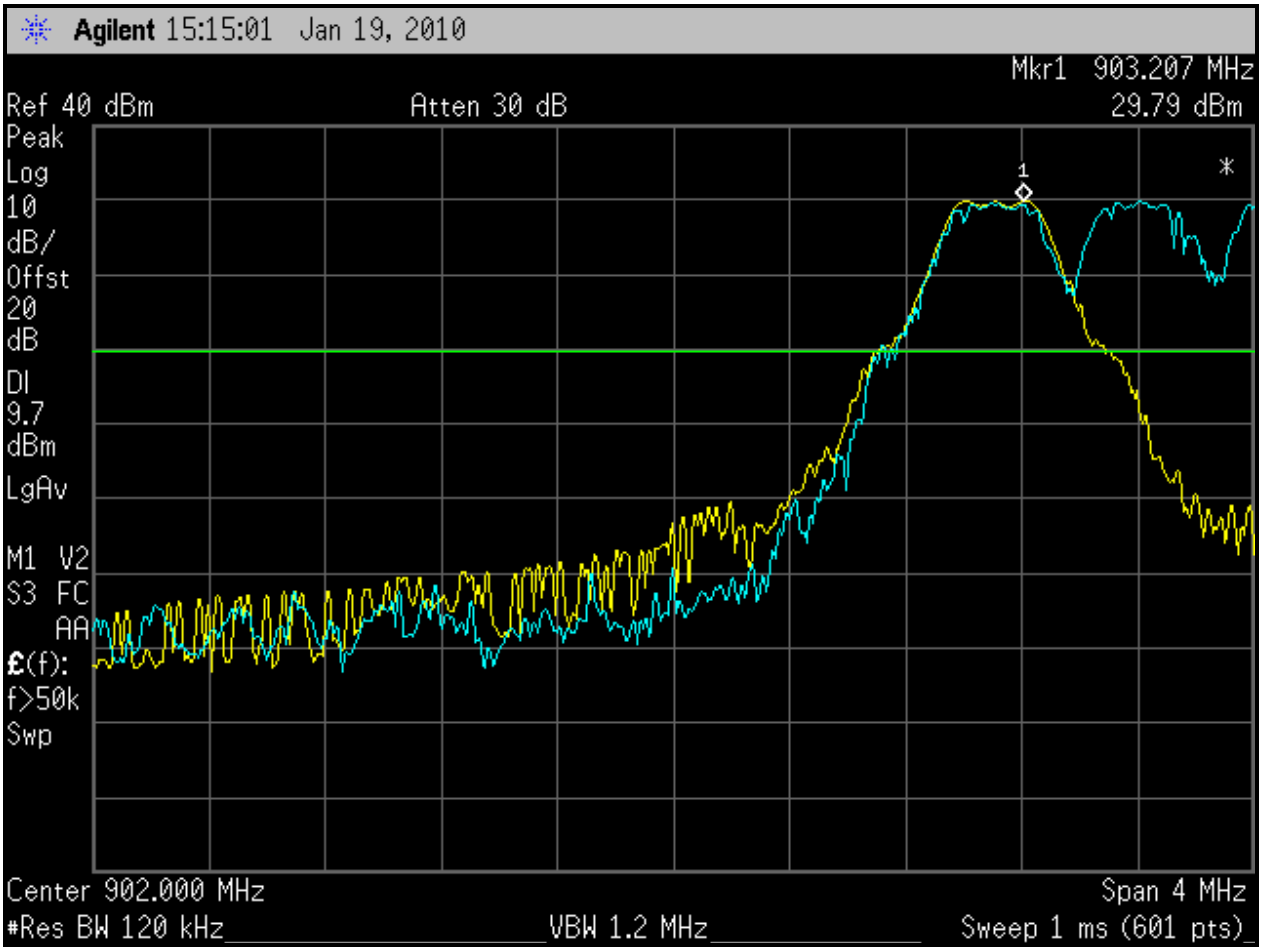
Daniel W. Baltzell		January 8, 2010
Test Engineer	Signature	Date Of Test

5 Compliance with the Band Edge – FCC §15.247(d); RSS-210 §A8.5

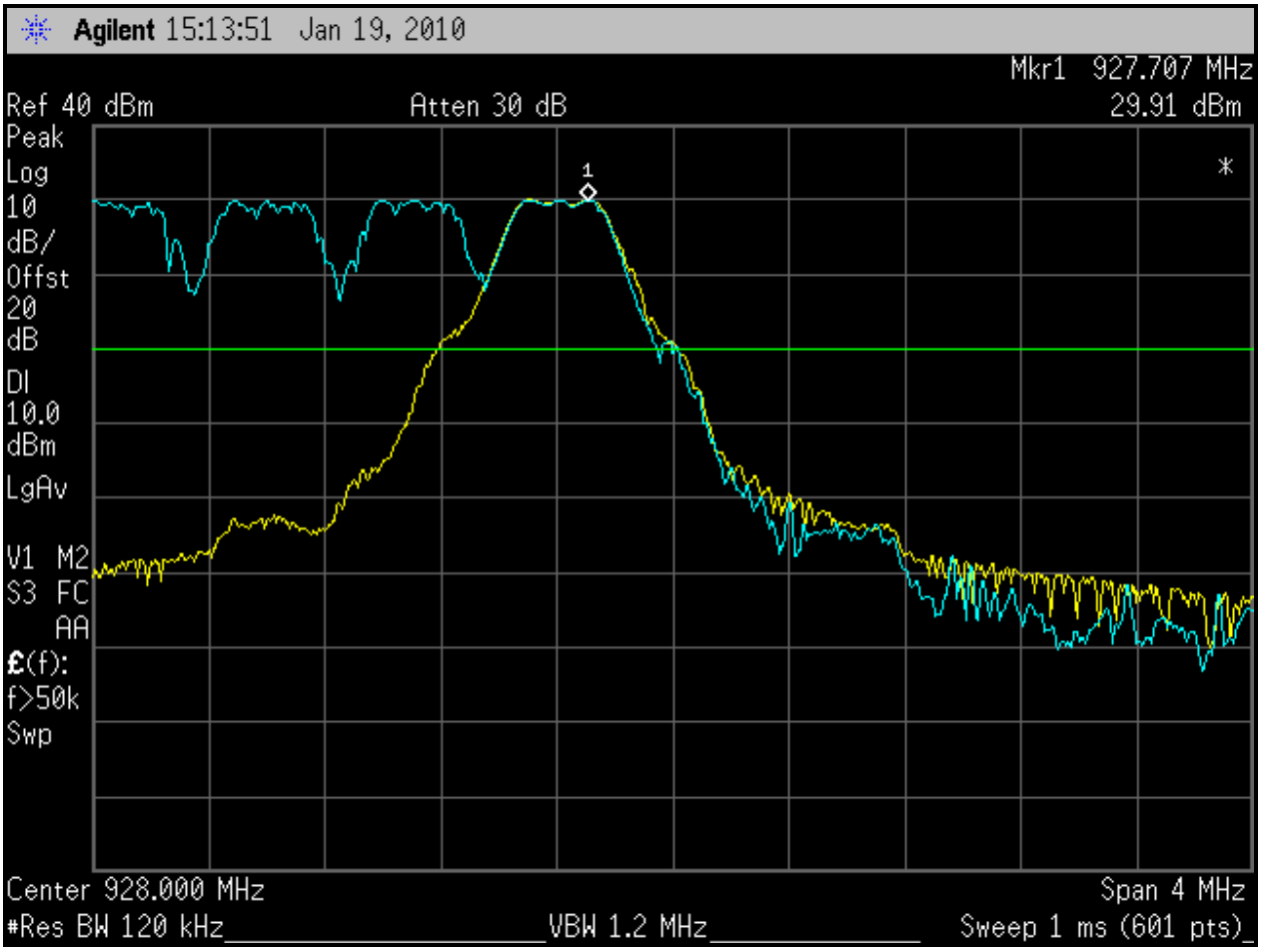
5.1 Band Edge Test Procedure

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 both hopping and with the hopping stopped then compared to the limit.

5.2 Band Edge Test Results



Plot 5-1: Lower Band Edge: Peak Measurement - 903 MHz



Plot 5-2: Upper Band Edge: Peak Measurement - 927.5 MHz

5.3 Band Edge Test Equipment

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

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) were 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 following frequencies: 903 MHz, 915 MHz and 927 MHz.

Other than the data presented below, 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. Per FCC 15.31(o), no other data is being reported.

6.2 Antenna Conducted Spurious Emissions Test Data

Table 6-1: Antenna Conducted Spurious Emissions; 903 MHz

Frequency (MHz)	Measured Amplitude(dBm)	Limit (dBm)	Margin
1806.608	-2.4	9.9	-12.3
2709.5	-0.9	9.9	-10.8

Table 6-2: Antenna Conducted Spurious Emissions; 915 MHz

Frequency (MHz)	Measured Amplitude(dBm)	Limit (dBm)	Margin
1830.661	-3.3	9.9	-13.2

Table 6-3: Antenna Conducted Spurious Emissions; 927 MHz

Frequency (MHz)	Measured Amplitude(dBm)	Limit (dBm)	Margin
1853.992	-4.7	10.0	-14.7

6.3 Antenna Conducted Spurious Emissions Test Equipment

Table 6-4: 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

Test Personnel:

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

7 20 dB Bandwidth – FCC §15.247(a)(1)(i); IC RSS-210 §A8.1(a)

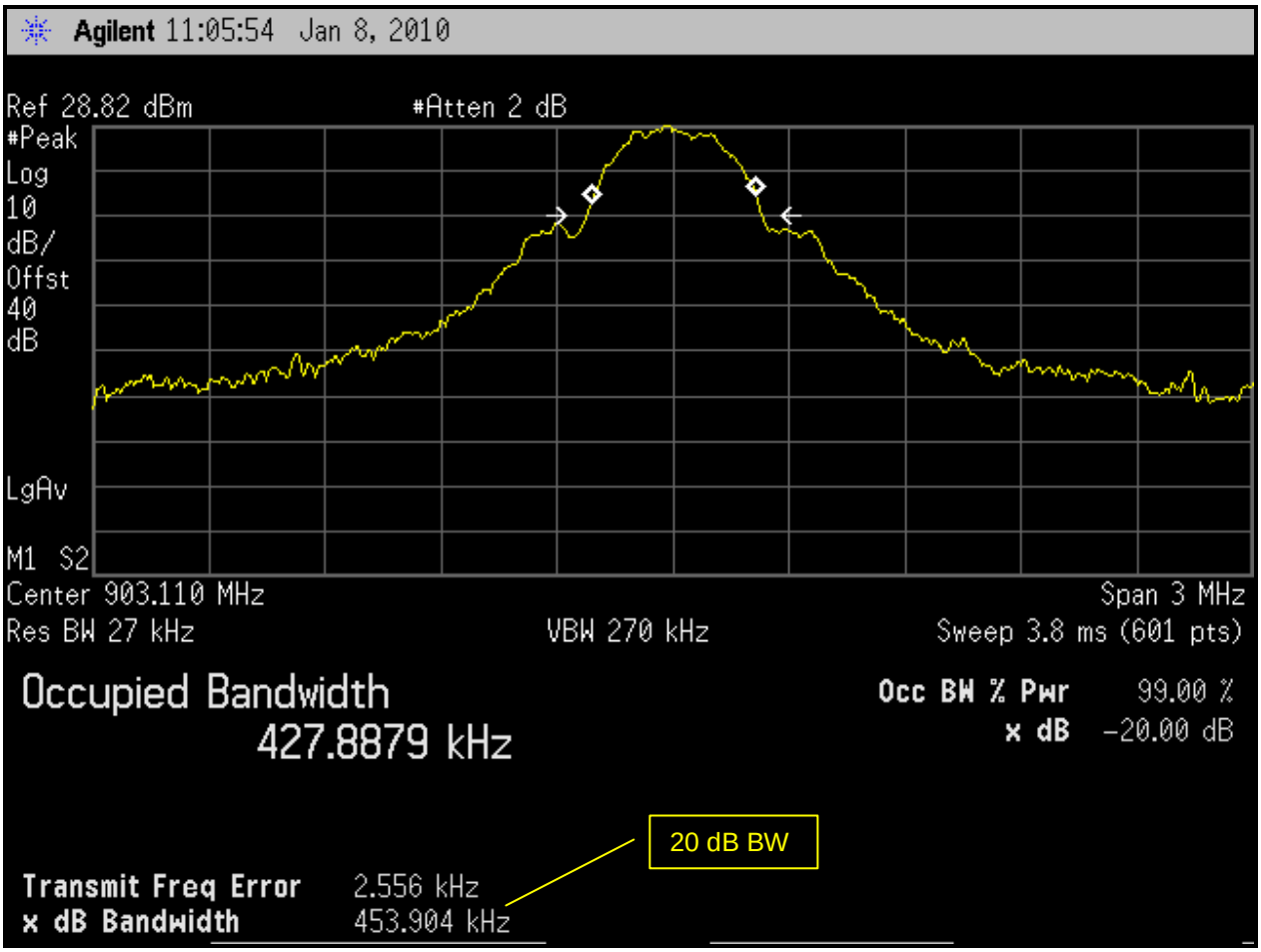
7.1 20 dB Bandwidth Test Procedure

The minimum 20 dB bandwidths were measured using a 50 ohm spectrum analyzer. The carrier was adjusted on the analyzer so that it was displayed entirely on the spectrum analyzer. The sweep time was set to auto and allowed through several sweeps with the max hold function used in peak detector mode. The resolution bandwidth was set to 100 kHz, and the video bandwidth set at 300 kHz. The minimum 20 dB bandwidths were measured using the spectrum analyzer set to -20 dBc. The table below contains the bandwidth measurement results.

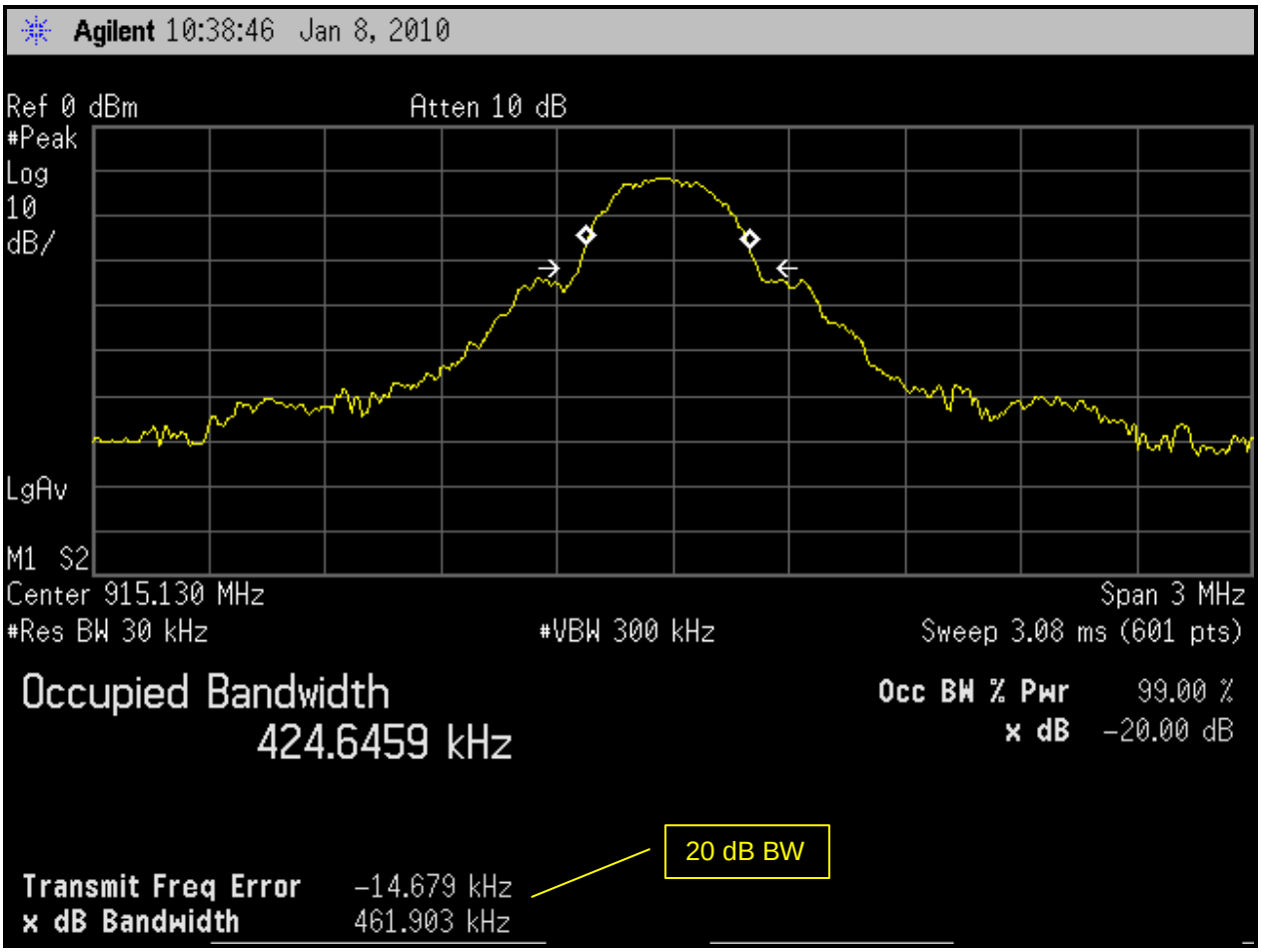
7.2 20 dB Modulated Bandwidth Test Data

Table 7-1: 20 dB Bandwidth Test Data

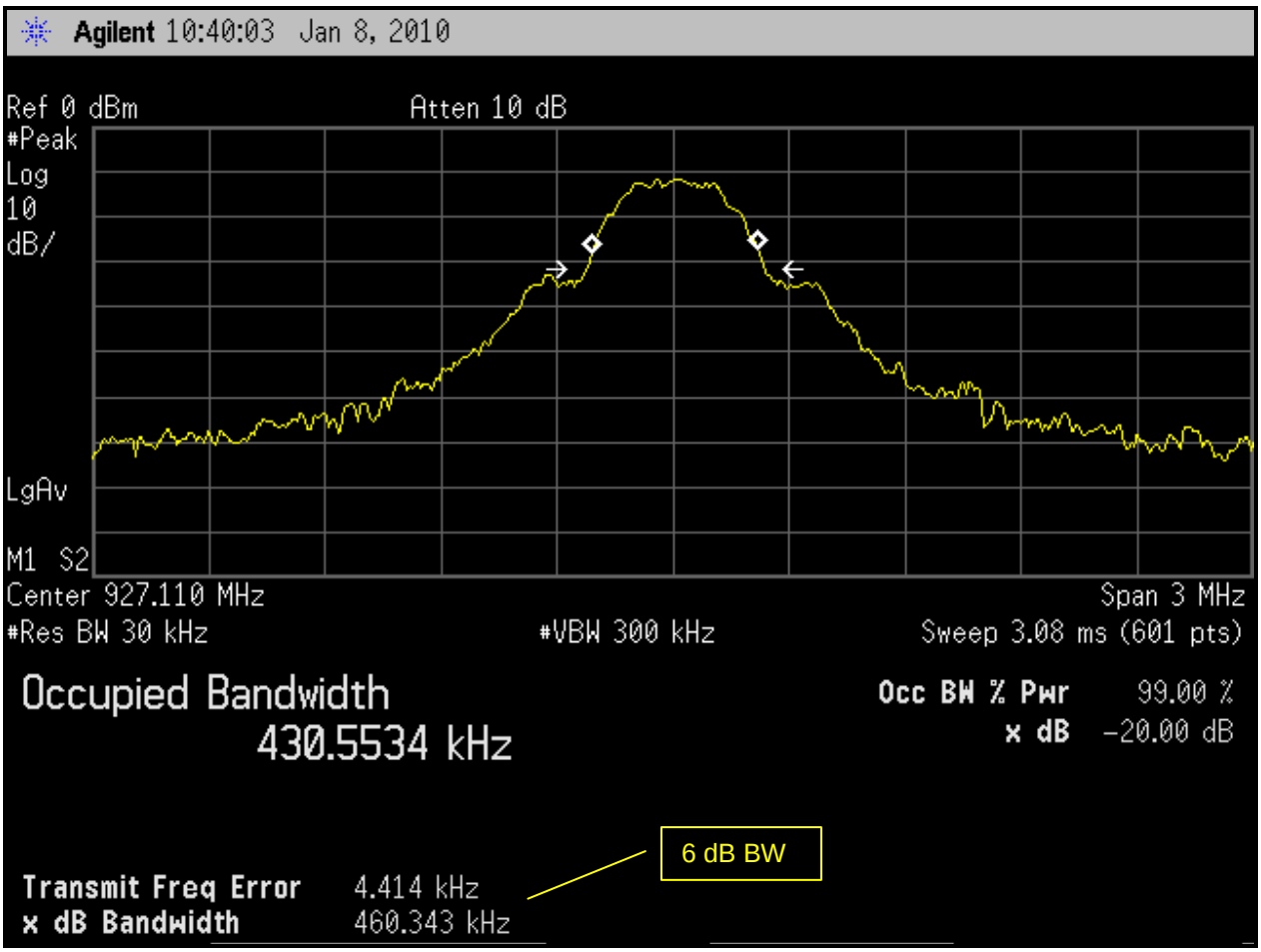
Frequency (MHz)	20 dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass/Fail
903	453.9	0.5	Pass
915	461.9	0.5	Pass
927	460.3	0.5	Pass



Plot 7-1: 20 dB Bandwidth – 903 MHz



Plot 7-2: 20 dB Bandwidth – 915 MHz



Plot 7-3: 20 dB Bandwidth – 927 MHz

7.3 20 db Bandwidth Test Equipment

Table 7-2: 20 dB Bandwidth 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

Test Personnel:

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

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

8.1 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

8.2 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.

8.3 Conducted Emissions Test Data

Table 8-1: Conducted Emissions Test Data – Neutral - Hopping 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
0.163	Qp	32.8	0.3	33.1	65.3	-32.2			Pass
0.348	Qp	40.9	0.5	41.4	59.0	-17.6			Pass
0.349	Av	18.2	0.5	18.7			49.0	-30.3	Pass
0.460	Qp	31.3	0.6	31.9	56.7	-24.8			Pass
0.673	Qp	35.0	0.5	35.5	56.0	-20.5			Pass
1.474	Qp	28.6	0.9	29.5	56.0	-26.5			Pass
8.500	Pk	35.6	2.3	37.9			50.0	-12.1	Pass

Table 8-2: Conducted Emissions Test Data – Hot – Hopping 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
0.150	Qp	31.4	0.2	31.6	66.0	-34.4			Pass
0.198	Qp	30.0	0.3	30.3	63.7	-33.4			Pass
0.239	Qp	33.6	0.3	33.9	62.1	-28.2			Pass
0.351	Av	17.7	0.4	18.1			48.9	-30.8	Pass
0.351	Qp	40.6	0.4	41.0	58.9	-17.9			Pass
3.290	Pk	42.1	1.5	43.6			46.0	-2.4	Pass
7.880	Pk	36.2	2.2	38.4			50.0	-11.6	Pass

Table 8-3: 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 8-4: 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

8.4 Conducted Emissions Test Equipment

Table 8-5: 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

Test Personnel:

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

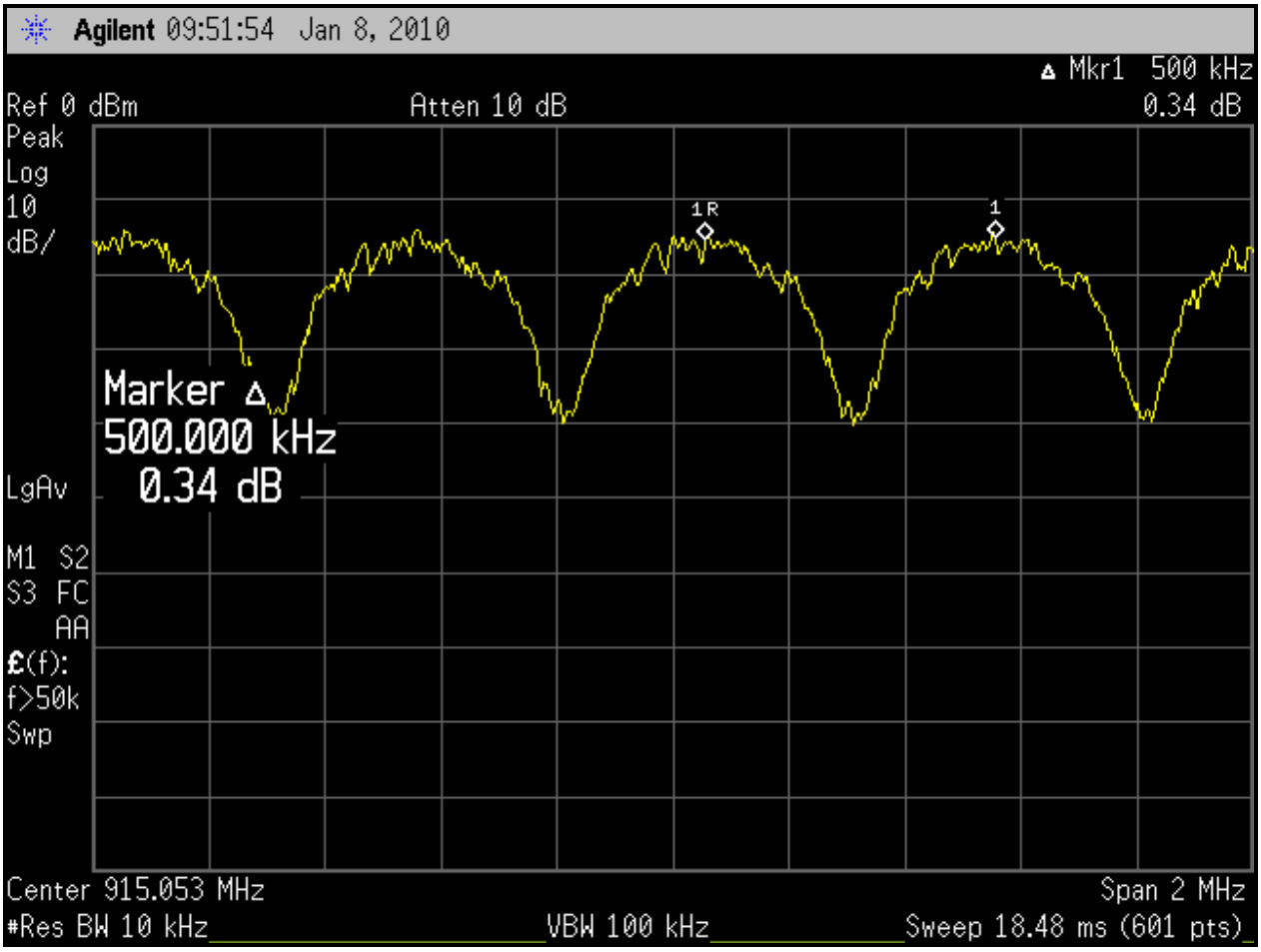
9 Carrier Frequency Separation - §15.247(a)(1); IC RSS-210 §A8.1(b)

9.1 Carrier Frequency Separation Test Procedure

Frequency Hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

Measured frequency separation = 500 kHz

9.2 Carrier Frequency Separation Test Data



Plot 9-1: Carrier Frequency Separation

9.3 Carrier Frequency Separation Test Equipment

Table 9-1: Carrier Frequency Separation 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

Test Personnel:

Daniel W. Baltzell		January 8, 2010
Test Engineer	Signature	Date Of Test

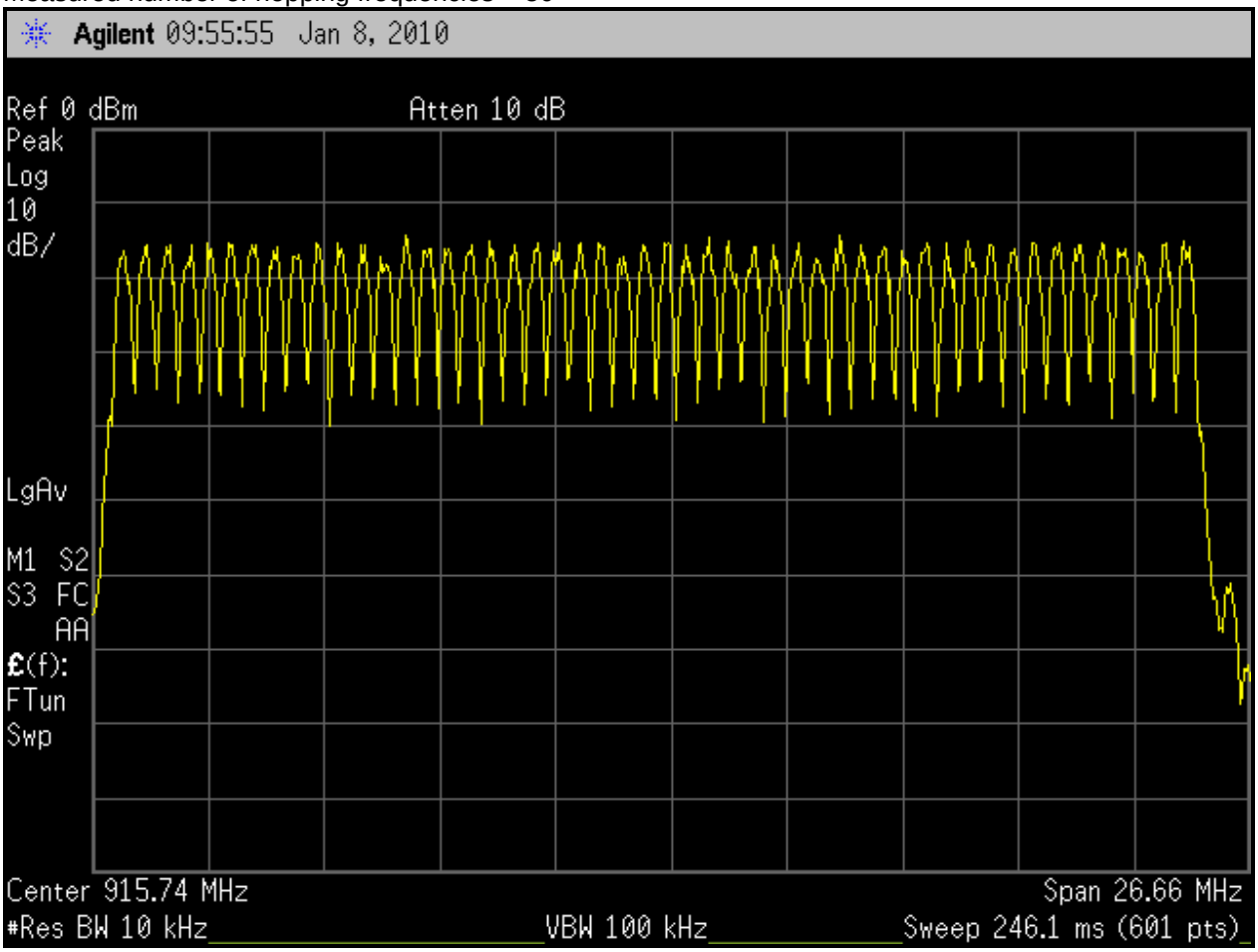
10 Hopping Characteristics – FCC §15.247(a)(1)(i); IC RSS-210 §A8.1(c)

10.1 Hopping Characteristics Test Procedure

For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

10.2 Number of Hopping Frequencies

Measured number of hopping frequencies = 50



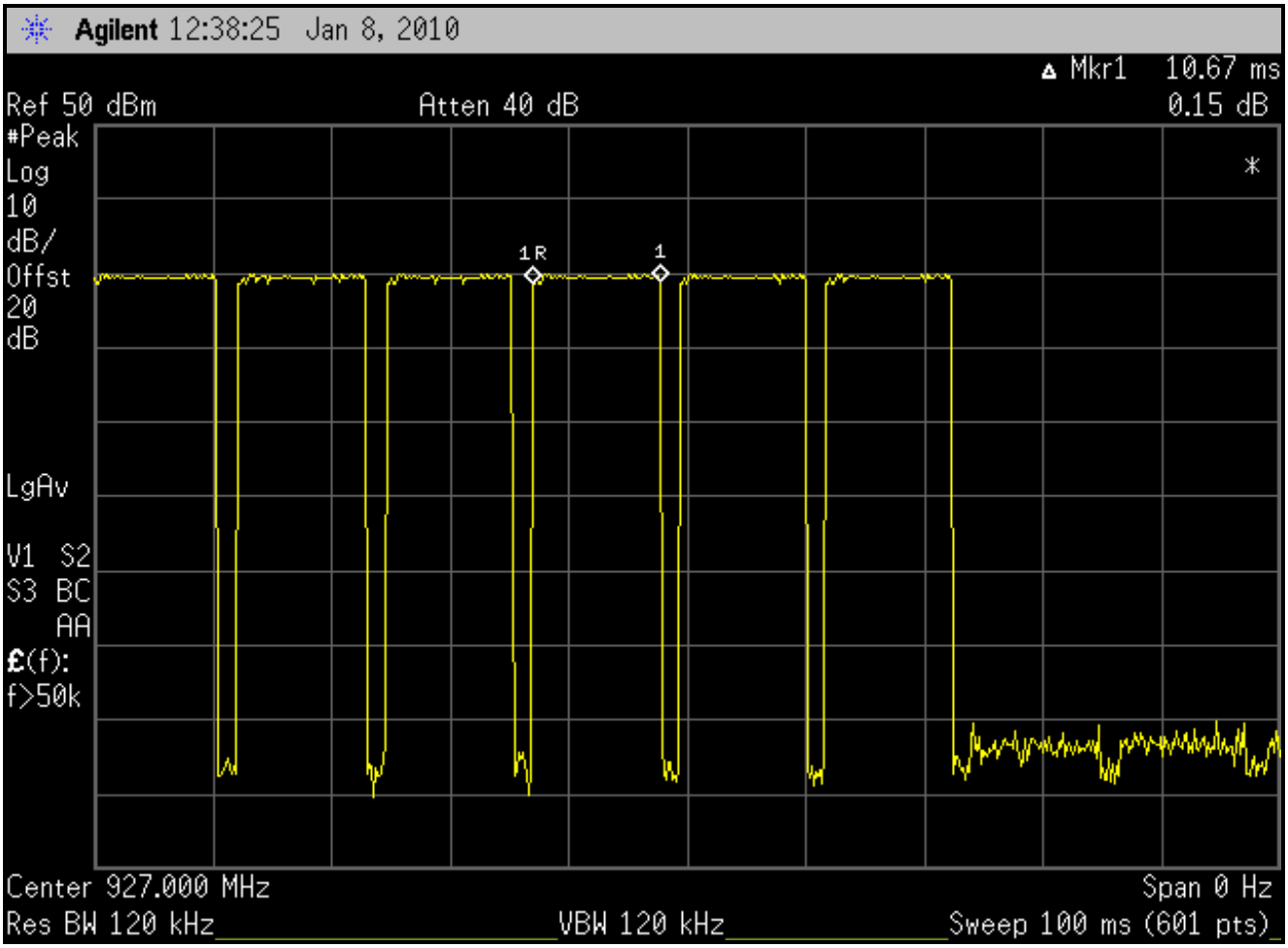
Plot 10-1: Number of Hopping Frequencies – 903–927 MHz = 50 frequencies

10.3 Average Time of Occupancy

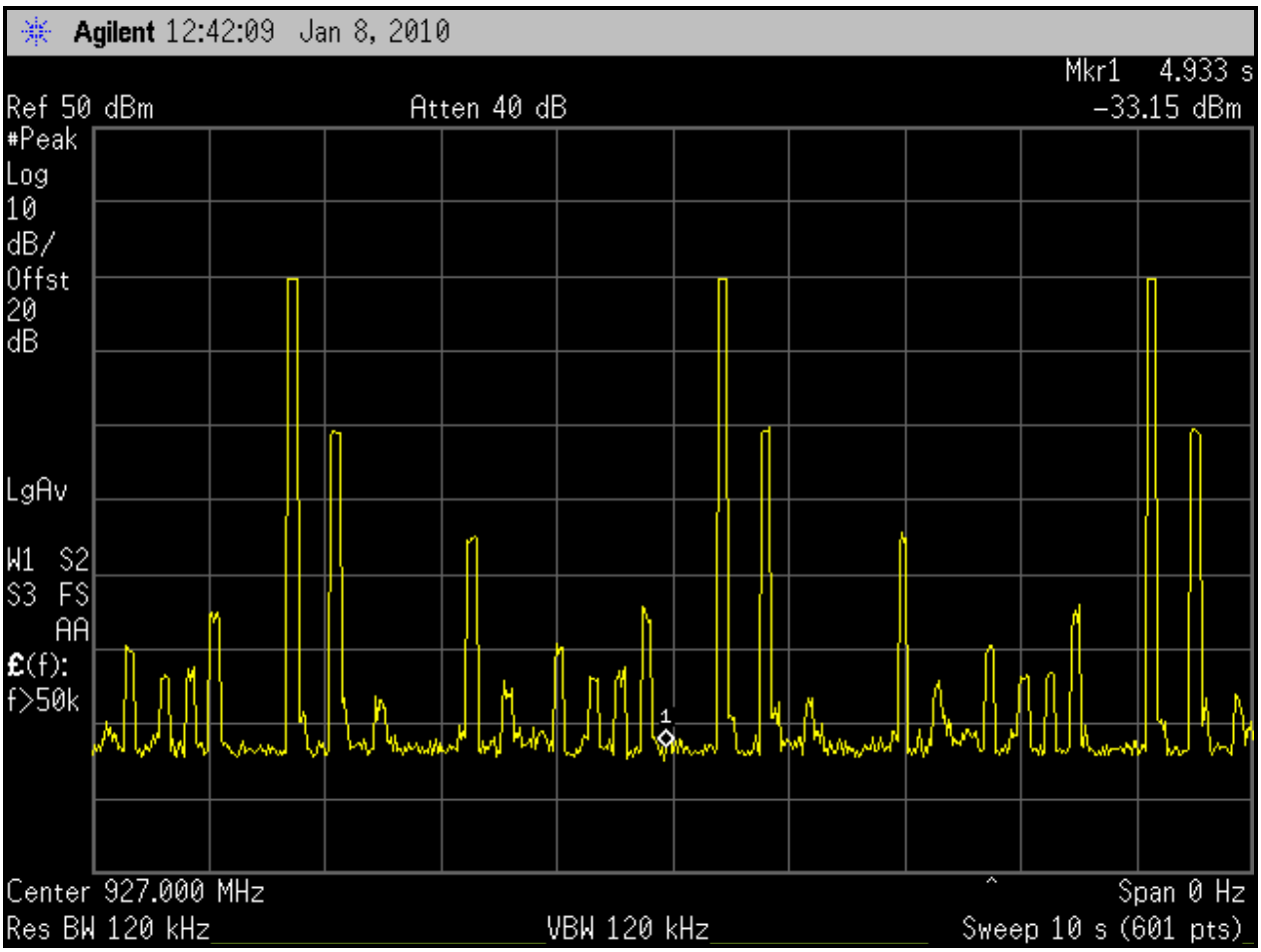
The spectrum analyzer sweep was set to 5 ms, with a zero span and video triggered until a pulse from the device under test was captured. The marker was used to measure the dwell time for this pulse. The sweep was then set to single sweep for 10 s.

The number of pulses in 10 s was 3.

The average time of occupancy in 10 seconds is equal to 3 pulses x (10.67*10) ms = 320 ms, which meets the limit as defined by 15.247(a)(1)(i) of 0.4 seconds.



Plot 10-2: Time of Occupancy (Dwell Time)



Plot 10-3: Time of Occupancy (Dwell Time 10 Second Sweep)

Number of pulses in 10 seconds: 3

10.4 Hopping Characteristics Test Equipment

Table 10-1: Hopping Characteristics 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

Test Personnel:

Daniel W. Baltzell		January 8, 2010
Test Engineer	Signature	Date Of Test

11 Radiated Emissions - FCC §15.209; §15.247(d); RSS-210 §A8.5

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.

11.1 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 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 positioned in three dimensions, 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 were measured using 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 the substitution measurements for the cellular and PCS bands a substitution antenna replaced the EUT and an amplitude achieved to match the initial analyzer level and further corrected for comparison to the limit.

11.2 Radiated Emissions Test Results

11.2.1 Radiated Emissions Digital Test Data

Table 11-1: Digital Radiated Emissions Test Data

Temperature: 34°F Humidity: 5092%										
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
45.300	Qp	V	90	1.0	40.4	-20.8	19.6	40.0	-20.4	Pass
75.300	Qp	H	180	1.5	37.3	-24.9	12.4	40.0	-27.6	Pass
97.500	Qp	V	0	1.0	39.4	-20.1	19.3	43.5	-24.2	Pass
155.375	Qp	V	40	1.2	32.9	-18.4	14.5	43.5	-29.0	Pass
219.279	Qp	H	90	1.0	32.1	-19.1	13.0	46.0	-33.0	Pass
243.671	Qp	V	45	1.2	31.5	-18.0	13.5	46.0	-32.5	Pass

11.2.2 Radiated Emissions Harmonics/Spurious Test Data

Table 11-2: Radiated Emissions Harmonics/Spurious; 903 MHz; 6 dBi Yagi in Host

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (1MHz/10Hz VBW and Duty Cycle)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
2709.0	74.5	59.6	-6.6	53.0	54.0	-1.0
3612.0	58.2	43.3	-5.0	38.3	54.0	-15.7
4515.0	56.6	41.7	1.3	43.0	54.0	-11.0
5418.0	58.5	43.6	3.6	47.2	54.0	-6.8
8127.0	46.1	31.2	6.4	37.6	54.0	-16.4
9030.0	42.4	27.5	12.2	39.7	54.0	-14.3

Table 11-3: Radiated Emissions Harmonics/Spurious; 915 MHz; 6 dBi Yagi in Host

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (1MHz/10Hz VBW and Duty Cycle)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
2745.0	65.9	51.0	-6.1	44.9	54.0	-9.1
3660.0	58.6	43.7	-5.1	38.6	54.0	-15.4
4575.0	56.6	41.7	1.7	43.4	54.0	-10.6
7320.0	44.8	29.9	5.3	35.2	54.0	-18.8
8235.0	43.7	28.8	11.6	40.4	54.0	-13.6
9150.0	42.1	27.2	12.3	39.5	54.0	-14.5

Table 11-4: Radiated Emissions Harmonics/Spurious; 927.5 MHz; 6 dBi Yagi in Host

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (1MHz/10Hz VBW and Duty Cycle)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
2782.5	64.5	49.6	-6.3	43.3	54.0	-10.7
3710.0	65.1	50.2	-5.0	45.2	54.0	-8.8
4637.5	54.7	39.8	1.7	41.5	54.0	-12.5
7420.0	45.7	30.8	5.7	36.5	54.0	-17.5
8347.5	44.9	30.0	11.6	41.6	54.0	-12.4
9275.0	44.7	29.8	12.4	42.2	54.0	-11.8

Table 11-5: Radiated Emissions Harmonics/Spurious; Hopping Mode; 6 dBi Yagi in Host

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (1MHz/10Hz VBW and Duty Cycle)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
2733.0	67.4	52.5	-6.3	46.2	54.0	-7.8
3697.0	65.7	50.8	-5.0	45.8	54.0	-8.2
4594.2	58.8	43.9	1.5	45.4	54.0	-8.6
4610.0	57.5	42.6	1.5	44.1	54.0	-9.9
7374.0	51.9	37.0	5.9	42.9	54.0	-11.1
8138.0	45.4	30.5	6.4	36.9	54.0	-17.1
8284.0	46.3	31.4	11.6	43.0	54.0	-11.0
8472.0	43.4	28.5	12.4	40.9	54.0	-13.1

Table 11-6: Radiated Emissions Harmonics/Spurious; 903 MHz; 8 dBi Dipole in Host

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (1MHz/10Hz VBW and Duty Cycle)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
2709.0	68.7	53.8	-6.6	47.2	54.0	-6.8
3612.0	57.3	42.4	-5.0	37.4	54.0	-16.6
4515.0	55.7	40.8	1.3	42.1	54.0	-11.9
5418.0	59.5	44.6	3.6	48.2	54.0	-5.8
8127.0	47.1	32.2	6.4	38.6	54.0	-15.4
9030.0	41.2	26.3	12.2	38.5	54.0	-15.5

Table 11-7: Radiated Emissions Harmonics/Spurious; 915 MHz; 8 dBi Dipole in Host

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (1MHz/10Hz VBW and Duty Cycle)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
2745.0	61.6	46.7	-6.1	40.6	54.0	-13.4
3660.0	62.8	47.9	-5.1	42.8	54.0	-11.2
4575.0	56.0	41.1	1.7	42.8	54.0	-11.2
7320.0	48.3	33.4	5.3	38.7	54.0	-15.3
8235.0	45.0	30.1	11.6	41.7	54.0	-12.3
9150.0	42.0	27.1	12.3	39.4	54.0	-14.6

Table 11-8: Radiated Emissions Harmonics/Spurious; 927.5 MHz; 8 dBi Dipole in Host

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (1MHz/10Hz VBW and Duty Cycle)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
2782.5	68.1	53.2	-6.3	46.9	54.0	-7.1
3710.0	68.3	53.4	-5.0	48.4	54.0	-5.6
4637.5	55.2	40.3	1.7	42.0	54.0	-12.0
7420.0	45.3	30.4	5.7	36.1	54.0	-17.9
8347.5	45.7	30.8	11.6	42.4	54.0	-11.6
9275.0	42.9	28.0	12.4	40.4	54.0	-13.6

Table 11-9: Radiated Emissions Harmonics/Spurious; Hopping Mode; 8 dBi Dipole in Host

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (1MHz/10Hz VBW and Duty Cycle)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
2719.2	66.4	51.5	-6.5	45.0	54.0	-9.0
2726.4	67.8	52.9	-6.4	46.5	54.0	-7.5
3636.0	56.0	41.1	-5.3	35.8	54.0	-18.2
3670.4	60.7	45.8	-5	40.8	54.0	-13.2
4545.0	57.3	42.4	1.4	43.8	54.0	-10.2
7250.0	49.5	34.6	5.7	40.3	54.0	-13.7
8130.0	46.0	31.1	6.4	37.5	54.0	-16.5
8216.0	44.3	29.4	11.4	40.8	54.0	-13.2
9121.0	42.2	27.3	12.3	39.6	54.0	-14.4

Table 11-10: Radiated Emissions Harmonics/Spurious; 903 MHz; 5 dBi Monopole in Host

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (1MHz/10Hz VBW and Duty Cycle)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
2709.0	66.1	51.2	-6.6	44.6	54.0	-9.4
3612.0	58.7	43.8	-5.0	38.8	54.0	-15.2
4515.0	56.6	41.7	1.3	43.0	54.0	-11.0
5418.0	60.2	45.3	3.6	48.9	54.0	-5.1
8127.0	48.5	33.6	6.4	40.0	54.0	-14.0
9030.0	41.2	26.3	12.2	38.5	54.0	-15.5

Table 11-11: Radiated Emissions Harmonics/Spurious; 915 MHz; 5 dBi Monopole in Host

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (1MHz/10Hz VBW and Duty Cycle)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
2745.0	61.2	46.3	-6.1	40.2	54.0	-13.8
3660.0	62.8	47.9	-5.1	42.8	54.0	-11.2
4575.0	58.4	43.5	1.7	45.2	54.0	-8.8
7320.0	47.1	32.2	5.3	37.5	54.0	-16.5
8235.0	43.8	28.9	11.6	40.5	54.0	-13.5
9150.0	41.7	26.8	12.3	39.1	54.0	-14.9

Table 11-12: Radiated Emissions Harmonics/Spurious; 927.5 MHz; 5 dBi Monopole in Host

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (1MHz/10Hz VBW and Duty Cycle)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
2782.5	71.0	56.1	-6.3	49.8	54.0	-4.2
3710.0	70.3	55.4	-5.0	50.4	54.0	-3.6
4637.5	55.1	40.2	1.7	41.9	54.0	-12.1
7420.0	54.9	40.0	5.7	45.7	54.0	-8.3
8347.5	47.0	32.1	11.6	43.7	54.0	-10.3
9275.0	42.2	27.3	12.4	39.7	54.0	-14.3

Table 11-13: Radiated Emissions Harmonics/Spurious; Hopping Mode; 5 dBi Monopole in Host

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (1MHz/10Hz VBW and Duty Cycle)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
2768.0	68.6	24.4	9.5	33.9	54.0	-20.1
3710.0	69.1	24.9	10.0	34.9	54.0	-19.1
4599.0	57.6	13.4	-1.5	11.9	54.0	-42.1
5379.0	65.7	21.5	6.6	28.1	54.0	-25.9
7253.0	53.2	9.0	-5.9	3.1	54.0	-50.9
8346.0	44.7	0.5	-14.4	-13.9	54.0	-67.9

Table 11-14: Radiated Emissions Harmonics/Spurious; 903 MHz; 6 dBi Yagi with Module

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (1MHz/10Hz VBW and Duty Cycle)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
2709.0	65.7	50.8	-6.6	44.2	54.0	-9.8
3612.0	61.4	46.5	-5.0	41.5	54.0	-12.5
4515.0	60.8	45.9	1.3	47.2	54.0	-6.8
5418.0	57.9	43.0	3.6	46.6	54.0	-7.4
8127.0	54.1	39.2	6.4	45.6	54.0	-8.4
9030.0	44.0	29.1	12.2	41.3	54.0	-12.7

Table 11-15: Radiated Emissions Harmonics/Spurious; 915 MHz; 6 dBi Yagi with Module

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (1MHz/10Hz VBW and Duty Cycle)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
2745.0	60.2	45.3	-6.1	39.2	54.0	-14.8
3660.0	52.2	37.3	-5.1	32.2	54.0	-21.8
4575.0	56.1	41.2	1.7	42.9	54.0	-11.1
7320.0	58.4	43.5	5.3	48.8	54.0	-5.2
8235.0	51.5	36.6	11.6	48.2	54.0	-5.8
9150.0	46.5	31.6	12.3	43.9	54.0	-10.1

Table 11-16: Radiated Emissions Harmonics/Spurious; 927.5 MHz; 6 dBi Yagi with Module

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (1MHz/10Hz VBW and Duty Cycle)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
2782.5	60.8	45.9	-6.3	39.6	54.0	-14.4
3710.0	54.0	39.1	-5.0	34.1	54.0	-19.9
4637.5	54.6	39.7	1.7	41.4	54.0	-12.6
7420.0	58.0	43.1	5.7	48.8	54.0	-5.2
8347.5	52.6	37.7	11.6	49.3	54.0	-4.7
9275.0	45.2	30.3	12.4	42.7	54.0	-11.3

Table 11-17: Radiated Emissions Harmonics/Spurious; Hopping Mode; 6 dBi Yagi with Module

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (1MHz/10Hz VBW and Duty Cycle)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
2733.0	61.1	46.2	-6.3	39.9	54.0	-14.1
3624.0	54.0	39.1	-5.1	34.0	54.0	-20.0
4601.0	57.1	42.2	1.5	43.7	54.0	-10.3
7297.0	58.5	43.6	5.2	48.8	54.0	-5.2
8130.0	52.8	37.9	6.4	44.3	54.0	-9.7
8348.0	52.3	37.4	11.7	49.1	54.0	-4.9
9149.0	46.5	31.6	12.3	43.9	54.0	-10.1
2733.0	61.1	46.2	-6.3	39.9	54.0	-14.1

Table 11-18: Radiated Emissions Harmonics/Spurious; 903 MHz; 8 dBi Dipole with Module

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (1MHz/10Hz VBW and Duty Cycle)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
2709.0	63.3	48.4	-6.6	41.8	54.0	-12.2
3612.0	59.6	44.7	-5.0	39.7	54.0	-14.3
4515.0	53.3	38.4	1.3	39.7	54.0	-14.3
5418.0	53.9	39.0	3.6	42.6	54.0	-11.4
8127.0	51.9	37.0	6.4	43.4	54.0	-10.6
9030.0	43.8	28.9	12.2	41.1	54.0	-12.9

Table 11-19: Radiated Emissions Harmonics/Spurious; 915 MHz; 8 dBi Dipole with Module

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (1MHz/10Hz VBW and Duty Cycle)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
2745.0	57.6	42.7	-6.1	36.6	54.0	-17.4
3660.0	52.7	37.8	-5.1	32.7	54.0	-21.3
4575.0	52.6	37.7	1.7	39.4	54.0	-14.6
7320.0	57.6	42.7	5.3	48.0	54.0	-6.0
8235.0	48.8	33.9	11.6	45.5	54.0	-8.5
9150.0	43.4	28.5	12.3	40.8	54.0	-13.2

Table 11-20: Radiated Emissions Harmonics/Spurious; 927.5 MHz; 8 dBi Dipole with Module

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (1MHz/10Hz VBW and Duty Cycle)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
2782.5	63.1	48.2	-6.3	41.9	54.0	-12.1
3710.0	54.5	39.6	-5.0	34.6	54.0	-19.4
4637.5	51.6	36.7	1.7	38.4	54.0	-15.6
7420.0	57.1	42.2	5.7	47.9	54.0	-6.1
8347.5	49.9	35.0	11.6	46.6	54.0	-7.4
9275.0	45.0	30.1	12.4	42.5	54.0	-11.5

Table 11-21: Radiated Emissions Harmonics/Spurious; Hopping Mode; 8 dBi Dipole with Module

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (1MHz/10Hz VBW and Duty Cycle)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
2715.0	63.3	48.4	-6.6	41.8	54.0	-12.2
2781.0	62.5	47.6	-6.3	41.3	54.0	-12.7
3616.0	56.0	41.1	-5.1	36.0	54.0	-18.0
3710.0	54.0	39.1	-5.0	34.1	54.0	-19.9
4620.0	54.2	39.3	1.5	40.8	54.0	-13.2
5434.0	57.4	42.5	3.6	46.1	54.0	-7.9
8172.0	52.9	38.0	6.4	44.4	54.0	-9.6
8349.0	48.2	33.3	11.7	45.0	54.0	-9.0
9123.0	42.3	27.4	12.3	39.7	54.0	-14.3

Table 11-22: Radiated Emissions Harmonics/Spurious; 903 MHz; 5 dBi Monopole with Module

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (1MHz/10Hz VBW and Duty Cycle)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
2709.0	60.3	45.4	-6.6	38.8	54.0	-15.2
3612.0	54.5	39.6	-5.0	34.6	54.0	-19.4
4515.0	54.5	39.6	1.3	40.9	54.0	-13.1
5418.0	54.3	39.4	3.6	43.0	54.0	-11.0
8127.0	49.2	34.3	6.4	40.7	54.0	-13.3
9030.0	45.1	30.2	12.2	42.4	54.0	-11.6

Table 11-23: Radiated Emissions Harmonics/Spurious; 915 MHz; 5 dBi Monopole with Module

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (1MHz/10Hz VBW and Duty Cycle)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
2745.0	67.3	52.4	-6.1	46.3	54.0	-7.7
3660.0	52.7	37.8	-5.1	32.7	54.0	-21.3
4575.0	55.1	40.2	1.7	41.9	54.0	-12.1
7320.0	56.5	41.6	5.3	46.9	54.0	-7.1
8235.0	52.6	37.7	11.6	49.3	54.0	-4.7
9150.0	43.7	28.8	12.3	41.1	54.0	-12.9

Table 11-24: Radiated Emissions Harmonics/Spurious; 927.5 MHz; 5 dBi Monopole with Module

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (1MHz/10Hz VBW and Duty Cycle)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
2782.5	63.4	48.5	-6.3	42.2	54.0	-11.8
3710.0	53.5	38.6	-5.0	33.6	54.0	-20.4
4637.5	52.7	37.8	1.7	39.5	54.0	-14.5
7420.0	55.7	40.8	5.7	46.5	54.0	-7.5
8347.5	52.5	37.6	11.6	49.2	54.0	-4.8
9275.0	46.2	31.3	12.4	43.7	54.0	-10.3

Table 11-25: Radiated Emissions Harmonics/Spurious; Hopping; 5 dBi Monopole with Module

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (1MHz/10Hz VBW and Duty Cycle)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
2753.0	64.5	49.6	-6.2	43.4	54.0	-10.6
3685.0	58.4	43.5	-5.0	38.5	54.0	-15.5
4515.0	61.0	46.1	1.3	47.4	54.0	-6.6
4630.0	58.9	44.0	1.6	45.6	54.0	-8.4
7329.0	57.8	42.9	5.4	48.3	54.0	-5.7
8137.0	52.5	37.6	6.4	44.0	54.0	-10.0
8351.0	50.5	35.6	11.7	47.3	54.0	-6.7

11.3 Radiated Emissions Test Equipment

Table 11-26: Radiated Emissions Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900151	Rohde and Schwarz	HFH2-Z2	Loop Antenna (9 kHz - 30 MHz)	827525/019	9/15/10
901365	MITEQ	JS4-00102600-41-5P	Amplifier, 0.1-26 GHz, 30dB gain	N/A	3/4/10
900905	Rhein Tech Laboratories	PR-1040	OATS 1 Preamplifier 40dB (30 MHz – 2 GHz)	1006	4/10/10
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	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 Laboratories	WRT-000-0003	Wood rotating table	N/A	Not Required
900913	Hewlett Packard	85462A	EMI Receiver RF Section (9 kHz – 6.5 GHz)	3325A00159	6/8/10
900772	EMCO	3161-02	Horn Antenna (2 - 4 GHz)	9804-1044	6/14/10
900321	EMCO	3161-03	Horn Antenna (4.0 - 8.2 GHz)	9508-1020	6/14/10
900323	EMCO	3160-07	Horn Antenna (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

Test Personnel:

Daniel W. Baltzell		January 13-16, 2010
Test Engineer	Signature	Dates Of Tests

12 Conclusion

The data in this measurement report shows that the EUT as tested, 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 for limited modular approval.