Engineering and Testing for EMC and Safety Compliance

CERTIFICATION APPLICATION REPORT
FCC Part 15.247 & INDUSTRY CANADA RSS-210

Test Lab:	Applicant:
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FCC ID / IC ID:	MQOSRX-10000 / 2570A-SRX10000	**Test Report Date:**	March 8, 2006
Platform:	N/A	**RTL Work Order Number:**	2006025
Model Name / Model Number:	SRX Wireless Headset / HD-800-X	**RTL Quote Number:**	QRTL06-105

American National Standard Institute:	ANSI C63.4: 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 (Bluetooth portion)
FCC Rule Part(s):	FCC Rules Part 15.247: Operation within the bands 920-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz Direct Sequence System
Industry Canada:	RSS-210: 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
2402-2480	0.001	N/A	N/A

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: March 8, 2006

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

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1 General Information

1.1 Scope

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	Bluetooth Headset
Model Name	SRX Wireless Headset
Power Supply	Battery operated
Modulation Type	FHSS - Bluetooth
Transfer Rate	723 kB/s
Frequency Range	2402 – 2480 MHz
Antenna Connector Type	Internal
Antenna Types	Internal

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 certification for Vocollect, Inc. Model SRX Wireless Headset, FCC ID: MQOSRX-10000.

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

Channel	Frequency
1	2402
39	2441
79	2480

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 C (Section 15.247)

Standard	Test	Pass/Fail or N/A
FCC 15.207	AC Power Conducted Emissions	N/A
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)(ii)	20 dB Bandwidth	Pass
FCC 15.247 (a)(1)(iii)	Hopping Characteristics	Pass
FCC 15.247 (a)(1)(iii)	Average Time of Occupancy	Pass

2.4 Test System Details

The test sample was received on March 3, 2006. The FCC identifiers for all applicable equipment, plus descriptions of all cables used in the tested system, are identified in the following tables.

Table 2-2-3: Equipment Under Test

Part	Manufacturer	Model	Serial Number	FCC ID	Cable Description	RTL Bar Code
Bluetooth Headset	Vocollect, Inc.	SRX Wireless Headset	N/A	MQOSRX-10000	N/A	17071

2.5 Configuration of Tested System

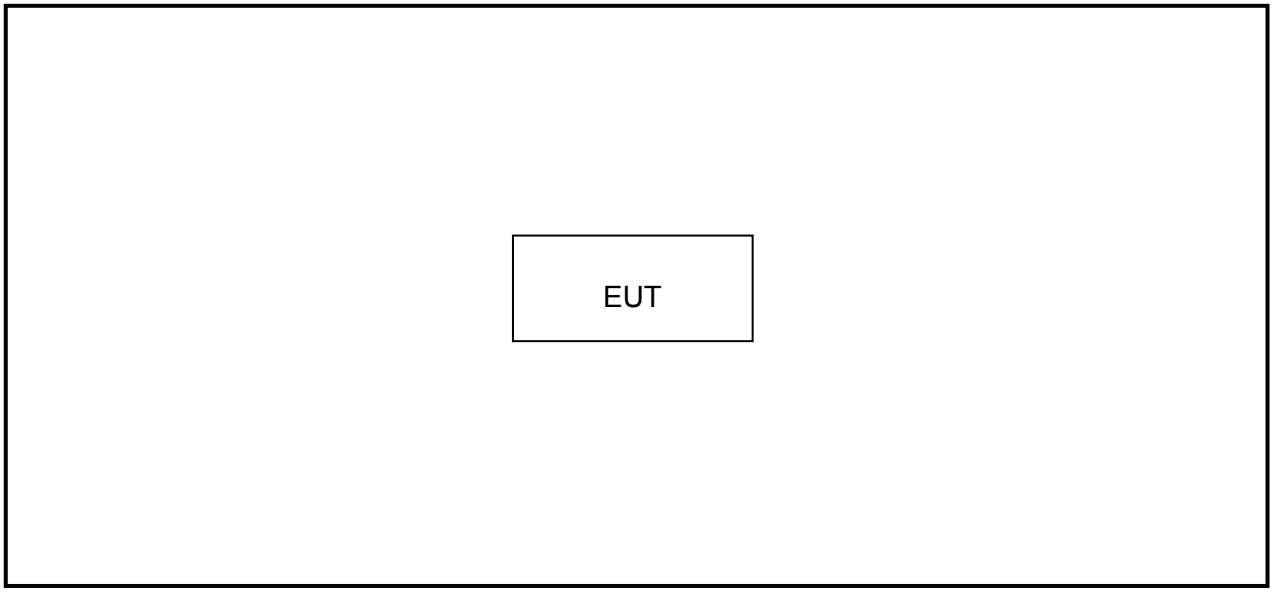


Figure 2-1: Configuration of System Under Test

3 Peak Output Power - §15.247(b)(1); RSS-210 §6.6.2(o)

3.1 Power Output Test Procedure

A conducted power measurement of the EUT was taken using an Agilent 4416A EPM-P Series Power Meter with an E9323A Peak and Average Power Sensor.

Table 3-1: Power Output Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901413	Agilent	E4448A	Spectrum Analyzer (3 Hz – 50 GHz)	US440203416	11/02/06

3.2 Power Output Test Data

Table 3-2: Power Output Test Data

Channel	Frequency (MHz)	Peak Power Conducted Output (dBm)
1	2402	0.57
39	2441	0.56
79	2480	0.55

Test Personnel:

Richard B. McMurray	Richard B. McMurray	March 6, 2006
EMC Test Engineer	Signature	Date of Test

4 Compliance with the Band Edge – FCC §15.247(d); RSS-210 §6.6.2(o)

4.1 Band Edge Test Procedure

The transmitter output was connected to its appropriate antenna. Peak (1 MHz RBW/VBW) and average (1 MHz RBW/10 Hz VBW) radiated measurements were taken with a suitable span to encompass the peak of the fundamental. A delta measurement was performed from the highest peak in the restricted band to the peak of the fundamental, and subtracted from the field strength; the result was compared to the limit in the restricted band (54 dBuV/m).

Table 4-1: Band Edge Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901020	Hewlett Packard	8564E	Portable Spectrum Analyzer (9 kHz - 40 GHz)	3943A01719	9/14/06
900878	Rhein Tech Labs	AM3-1197-0005	3 meter antenna mast, polarizing	Outdoor Range 1	Not Required
901231	IW Microwave Products	KPS-1503-2400-KPS	High frequency RF cables	240"	9/1/06
901232	IW Microwave Products	KPS-1503-2400-KPS	High frequency RF cables	240"	9/1/06
901235	IW Microwave Products	KPS-1503-360-KPS	High frequency RF cables	36"	9/1/06
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	5/20/07

4.2 Restricted Band Edge Test Results

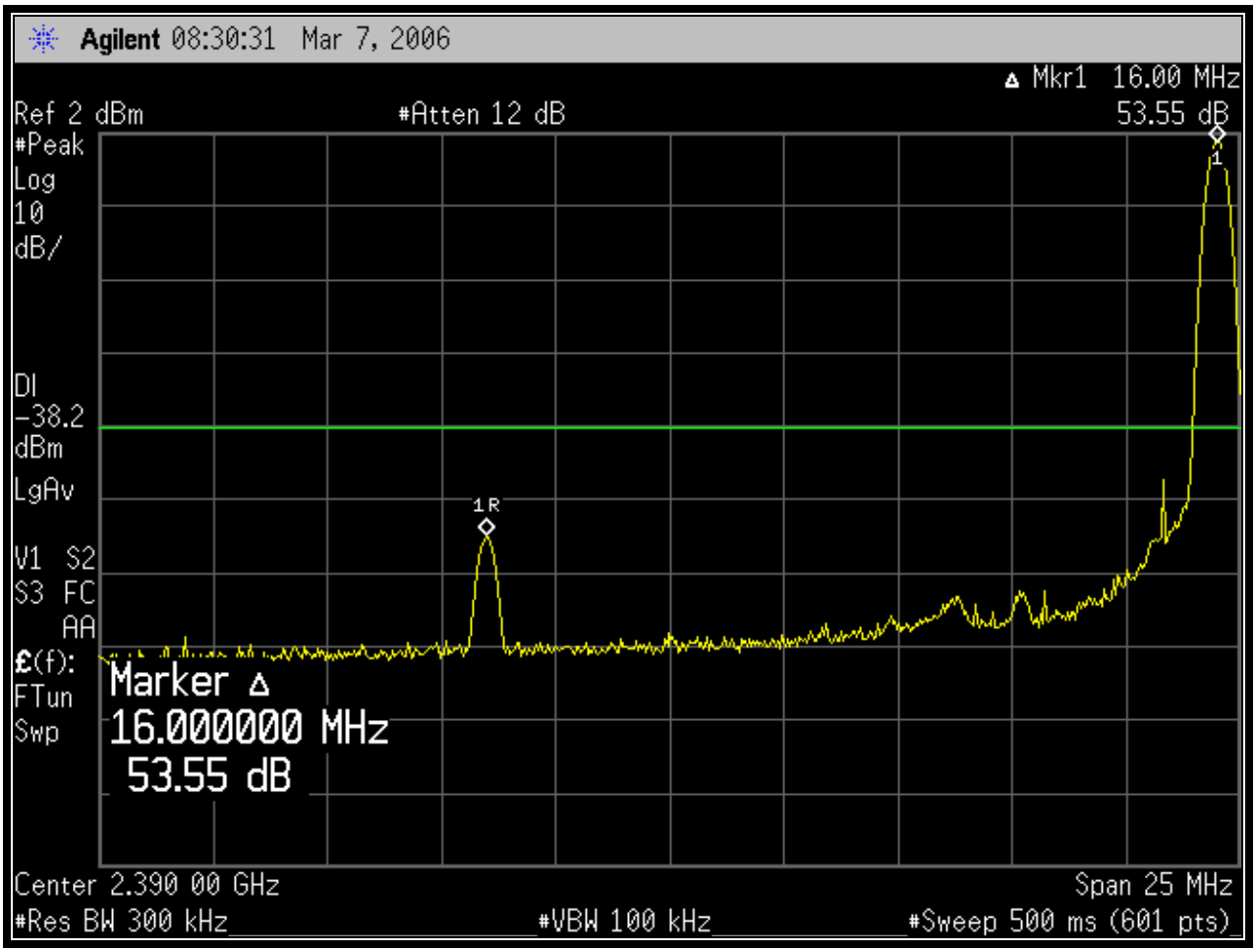
4.2.1 Calculation of Lower Band Edge – Bluetooth

97.6 dBuV/m is the field strength measurement, from which the delta measurement of 53.6 dB is subtracted (reference plots), resulting in a level of 44.0 dB. This level has a margin of 10.0 dB below the limit of 54 dBuV/m.

Calculation: 97.6 dBuV/m – 53.6 dB – 54 dBuV/m = -10.0 dB

Peak Field Strength of Lower Band Edge (1 MHz RBW/1 MHz VBW) = 97.9 dBuV/m
Average Field Strength of Lower Band Edge (1 MHz RBW/10 Hz VBW) = 97.6 dBuV/m
Delta measurement = 53.6 dB

Plot 4-1: Lower Band Edge: Average Measurement Channel 1 (TX Frequency: 2402 MHz)



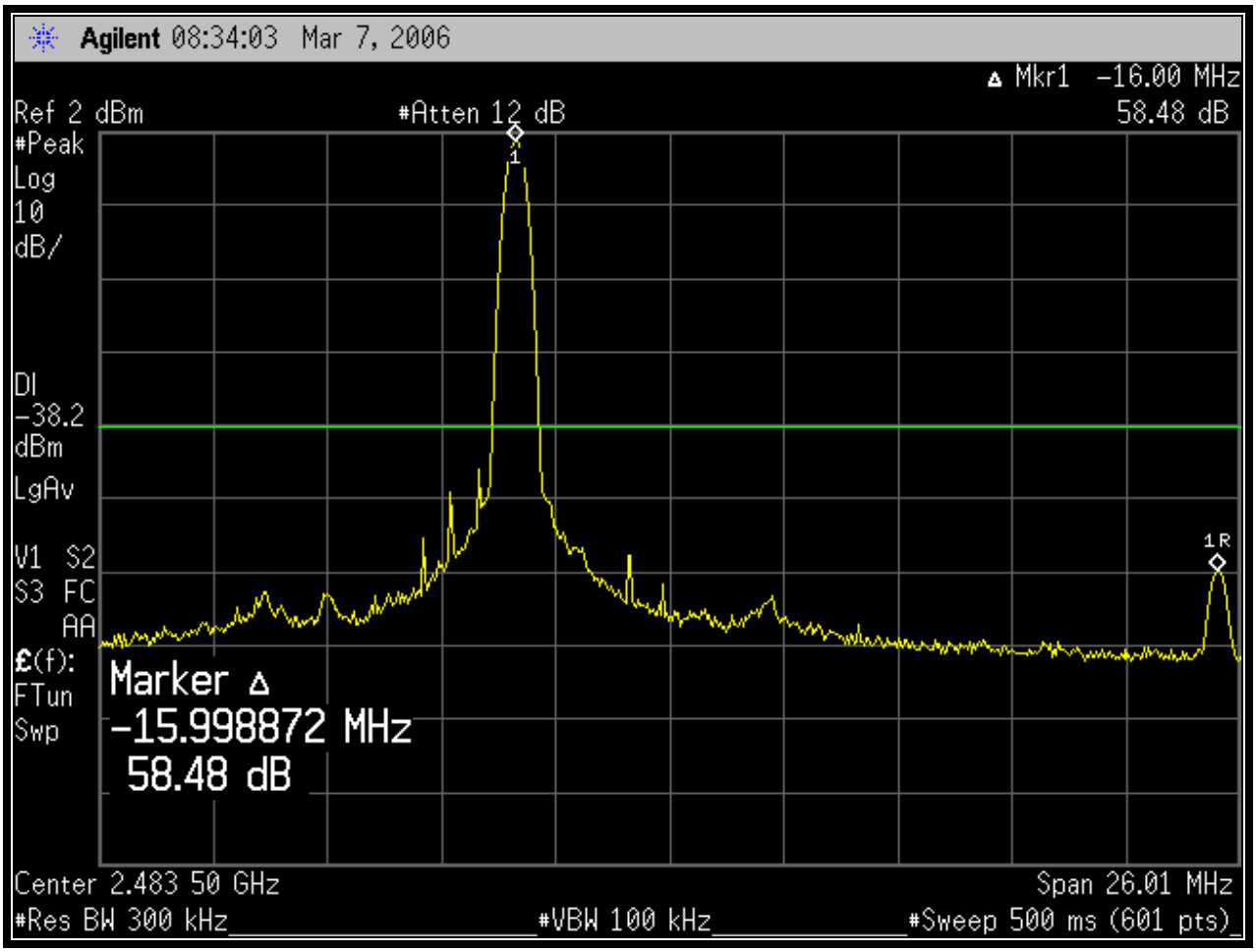
4.2.2 Calculation of Upper Band Edge – Bluetooth

97.2 dBuV/m is the field strength measurement, from which the delta measurement of 58.5 dB is subtracted (reference plots), resulting in a level of 38.7 dB. This level has a margin of 15.3 dB below the limit of 54 dBuV/m.

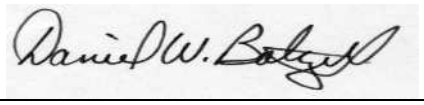
Calculation: 97.2 dBuV/m – 58.5 dB – 54 dBuV/m = -15.3 dB

Peak Field Strength of Lower Band Edge (1 MHz RBW/1 MHz VBW) = 97.4 dBuV/m
Average Field Strength of Lower Band Edge (1 MHz RBW/10 Hz VBW) = 97.2 dBuV/m
Delta measurement = 58.5 dB

Plot 4-2: Upper Band Edge: Average Measurement Channel 79 (TX Frequency: 2480 MHz)



Test Personnel:



Daniel W. Baltzell		March 7, 2006
Test Engineer	Signature	Dates of Test

5 Antenna Conducted Spurious Emissions - §15.247(d); RSS-210 §6.6.2(o)

5.1 Antenna Conducted Spurious Emissions Test Procedures

Antenna spurious emissions per FCC 15.247(c) were measured from the EUT antenna port using a 50 ohm spectrum analyzer with the resolution and video bandwidth set at 100 kHz. The modulated carrier was identified at the following frequencies: 2402 MHz, 2441 MHz and 2480 MHz.

Table 5-1: Antenna Conducted Spurious Emissions Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901413	Agilent	E4448A	Spectrum Analyzer (3 Hz – 50 GHz)	US440203416	11/02/06

5.2 Antenna Conducted Spurious Emissions Test Results

Table 5-2: Antenna Conducted Spurious Emissions Test Data

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
4883	-31.4	-19.4	-12.0	Pass
5696	-68.4	-19.4	-49.0	Pass
6509	-57.2	-19.4	-37.8	Pass
7323	-60.4	-19.4	-41.0	Pass
9764	-57.1	-19.4	-37.7	Pass

Test Personnel:

Richard B. McMurray	Richard B. McMurray	March 6, 2006
EMC Test Engineer	Signature	Date of Test

6 20 dB Bandwidth – FCC §15.247 (a)(1)(ii); IC RSS-GEN

6.1 20 dB Bandwidth Test Procedure

The minimum 20 dB bandwidths per RSS-210 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 10 seconds 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 delta marker set 20 dB down from the peak of the carrier and modulated with a 2 Mbps data rate. The table below contains the bandwidth measurement results.

Table 6-1: 20 dB Bandwidth Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901413	Agilent	E4448A	Spectrum Analyzer (3 Hz – 50 GHz)	US440203416	11/02/06

6.2 20 dB Modulated Bandwidth Test Data

Table 6-2: 20 dB Modulated Bandwidth Test Data

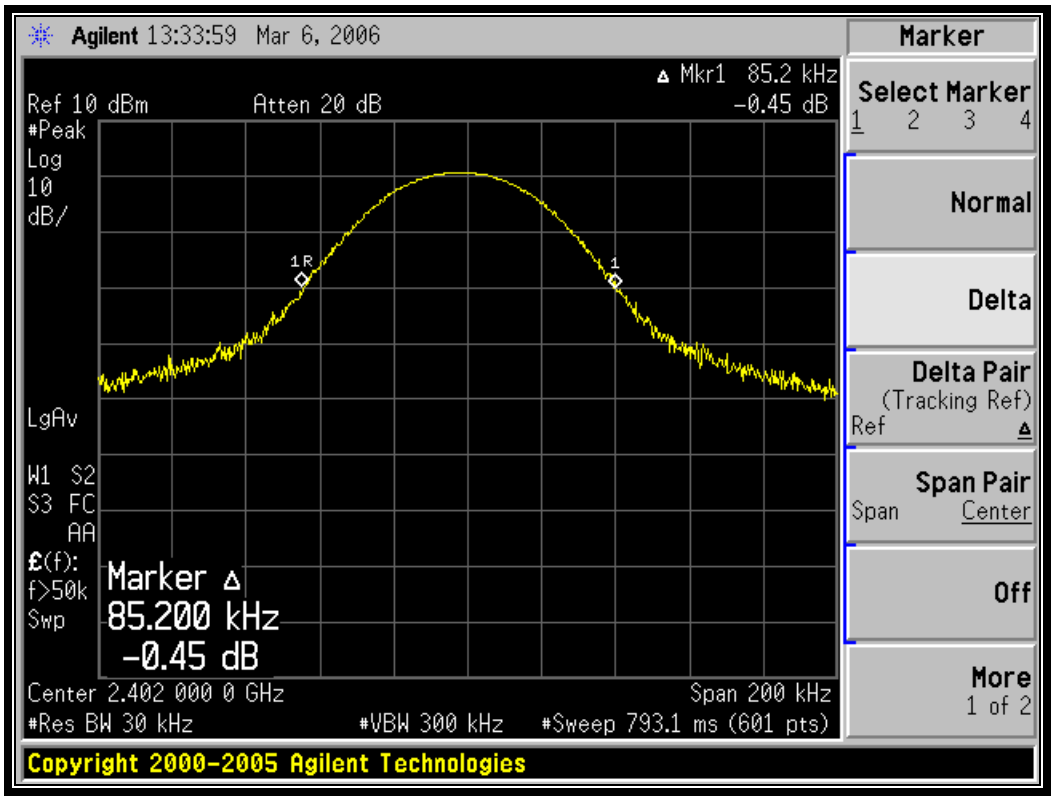
Minimum 20 dB bandwidths

Channel	20 dB Bandwidth (kHz)
1	85.2
39	83.2
79	82.2

6.3 20 dB Bandwidth Plots

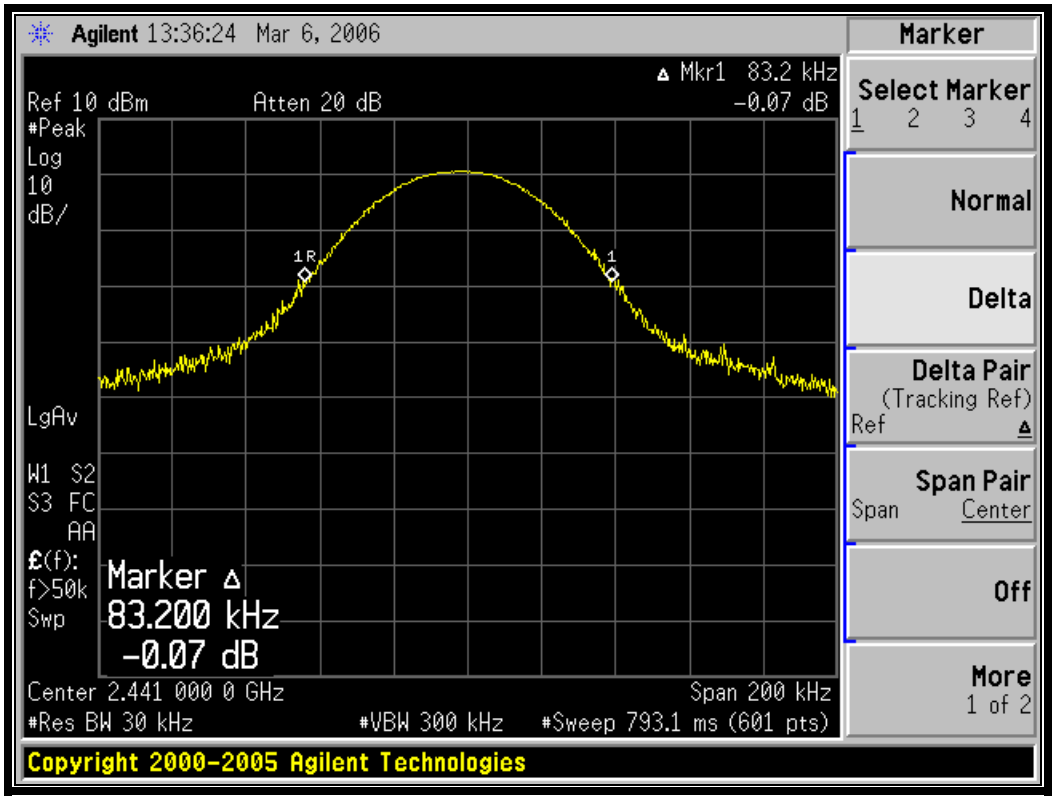
Channel:	1
Channel Frequency (MHz):	2402
Resolution Bandwidth (kHz):	30
Video Bandwidth (kHz):	300
Span (MHz):	0.2

Plot 6-1: 20 dB Bandwidth Channel 1



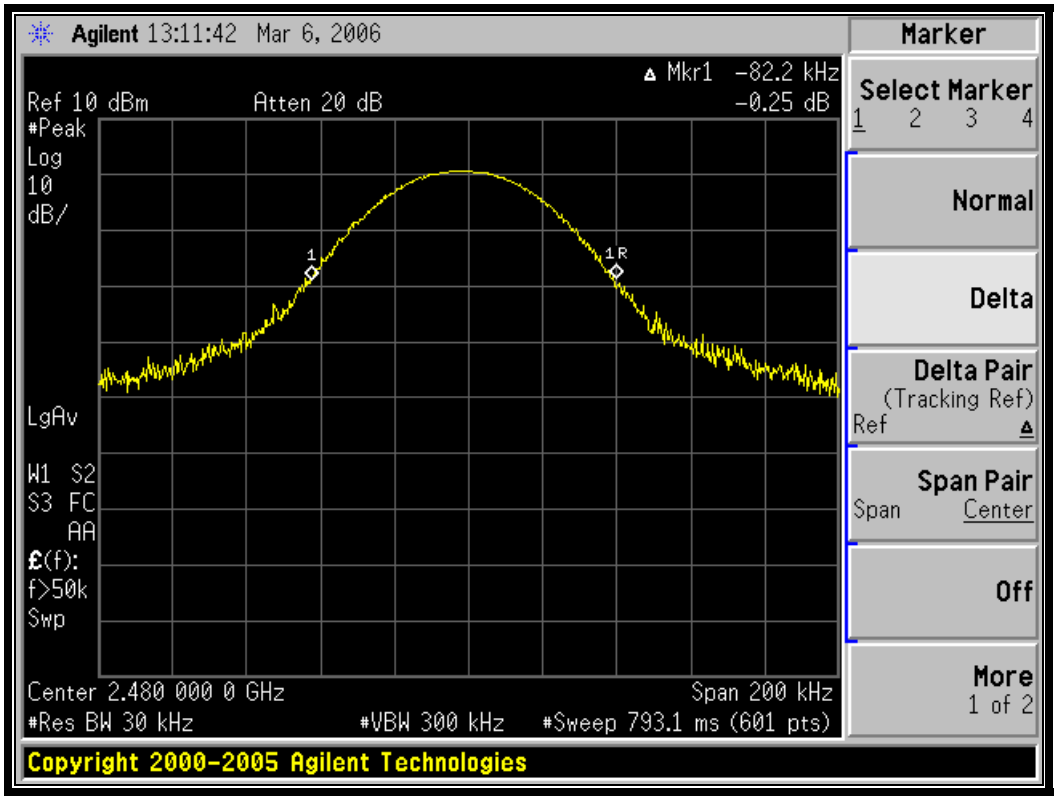
Channel:	39
Channel Frequency (MHz):	2441
Resolution Bandwidth (kHz):	30
Video Bandwidth (kHz):	300
Span (MHz):	0.2

Plot 6-2: 20 dB Bandwidth Channel 39



Channel:	79
Channel Frequency (MHz):	2480
Resolution Bandwidth (kHz):	30
Video Bandwidth (kHz):	300
Span (MHz):	0.2

Plot 6-3: 20 dB Bandwidth Channel 79



Test Personnel:

Richard B. McMurray	Richard B. McMurray	March 6, 2006
EMC Test Engineer	Signature	Date of Test

7 Carrier Frequency Separation - §15.247(a)(1)

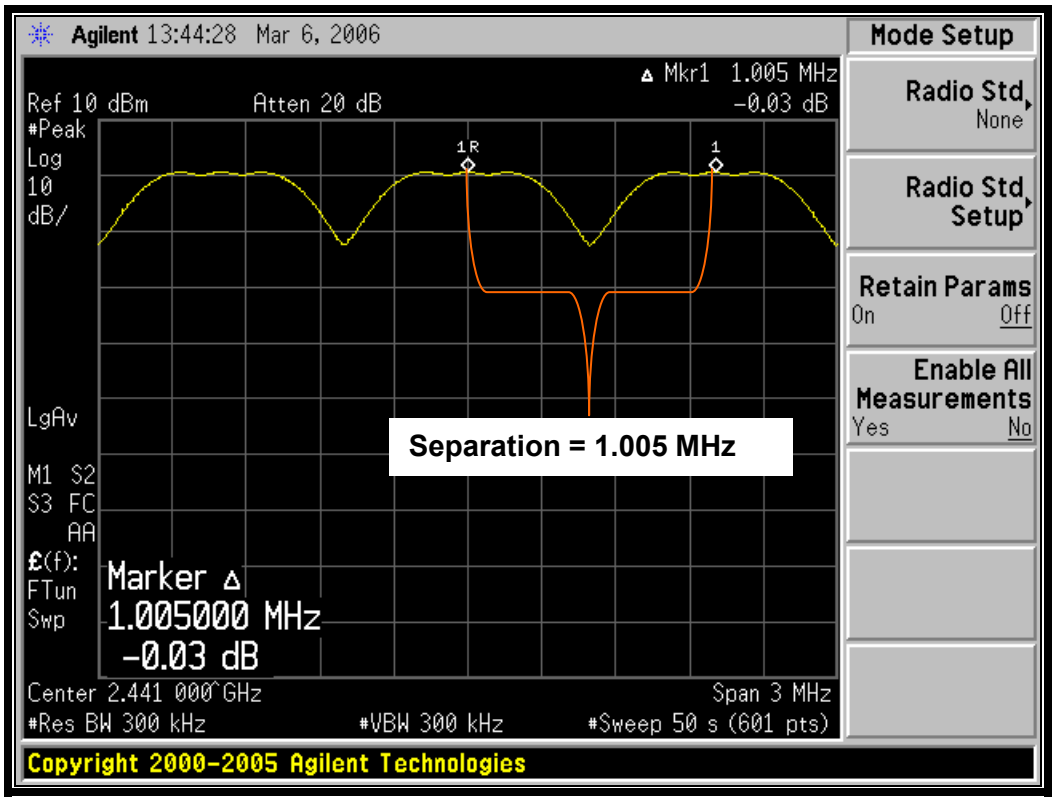
7.1 Carrier Frequency Separation Test Procedure

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 = 1.005 MHz

7.2 Carrier Frequency Separation Test Data

Plot 7-1: Carrier Frequency Separation - Bluetooth



Test Personnel:

Richard B. McMurray	Richard B. McMurray	March 6, 2006
EMC Test Engineer	Signature	Date of Test

8 Hopping Characteristics – FCC §15.247 (a)(1)(iii); IC RSS-210 §6.2.2(o)

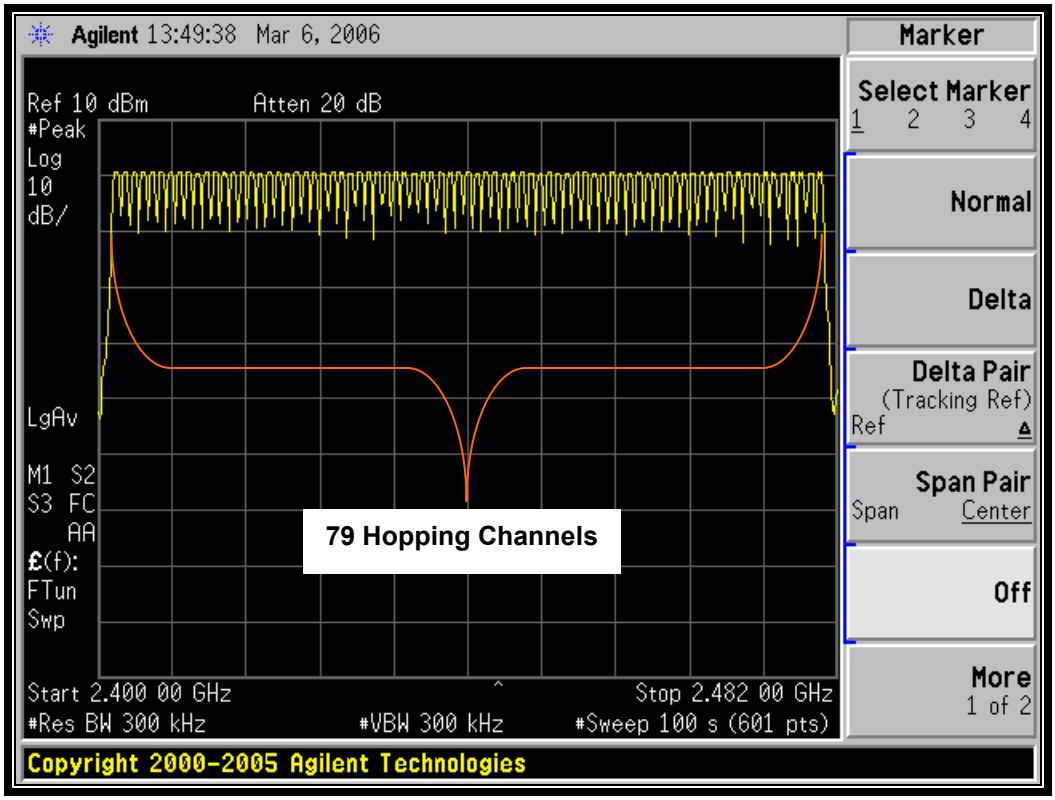
8.1 Hopping Characteristics Test Procedure

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

8.2 Number of Hopping Frequencies - Bluetooth

Measured number of hopping frequencies = 79

Plot 8-1: Number of Hopping Frequencies



Test Personnel:

Richard B. McMurray	Richard B. McMurray	March 6, 2006
EMC Test Engineer	Signature	Date of Test

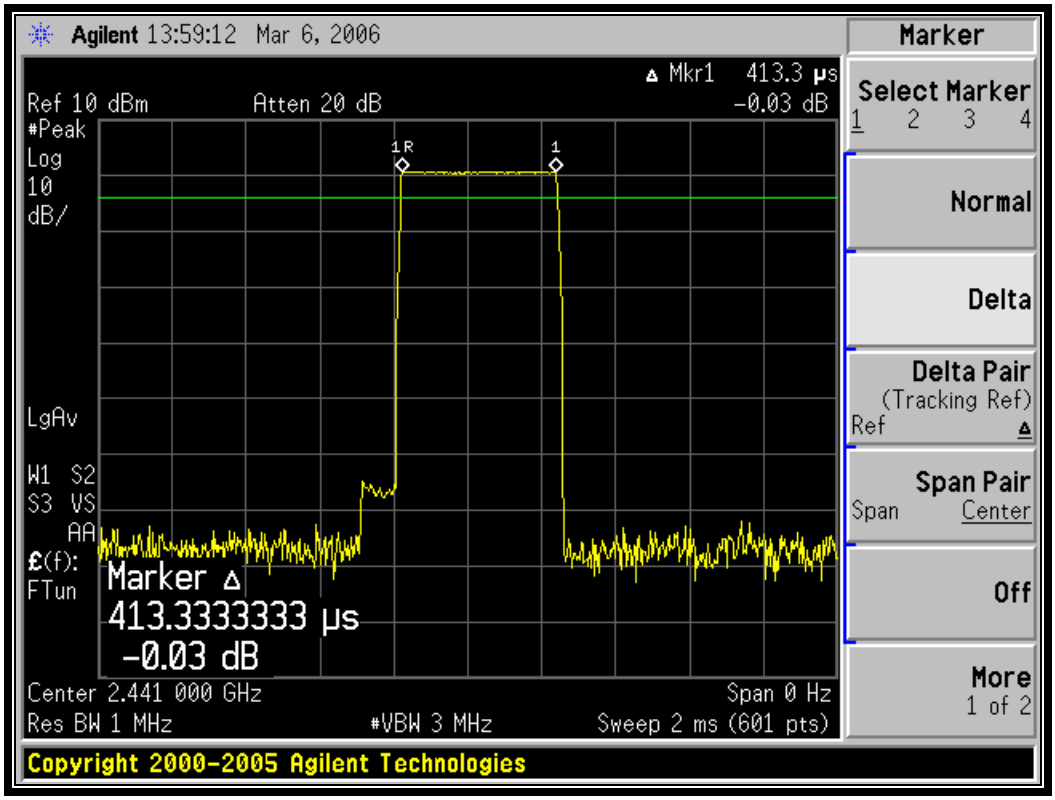
8.3 Average Time of Occupancy - Bluetooth

The spectrum analyzer sweep was set to 2 ms, with a zero span and max hold until a pulse from the device under test was captured. A marker delta was used to measure the dwell time for this pulse. The sweep was then set to single sweep for 5 s (it was not possible to get a suitable display with a sweep time of 31.6 s).

The number of pulses in 5 s was 51. Therefore, the number of pulses in a period of 0.4 seconds X 79 hopping channels (31.6 s) would be 322 pulses.

The average time of occupancy in the above period (31.6 s) is equal to 322 pulses X 0.413 ms = 133 ms, which meets the limit as defined by 15.247(a)(1)(iii) of 0.4 seconds.

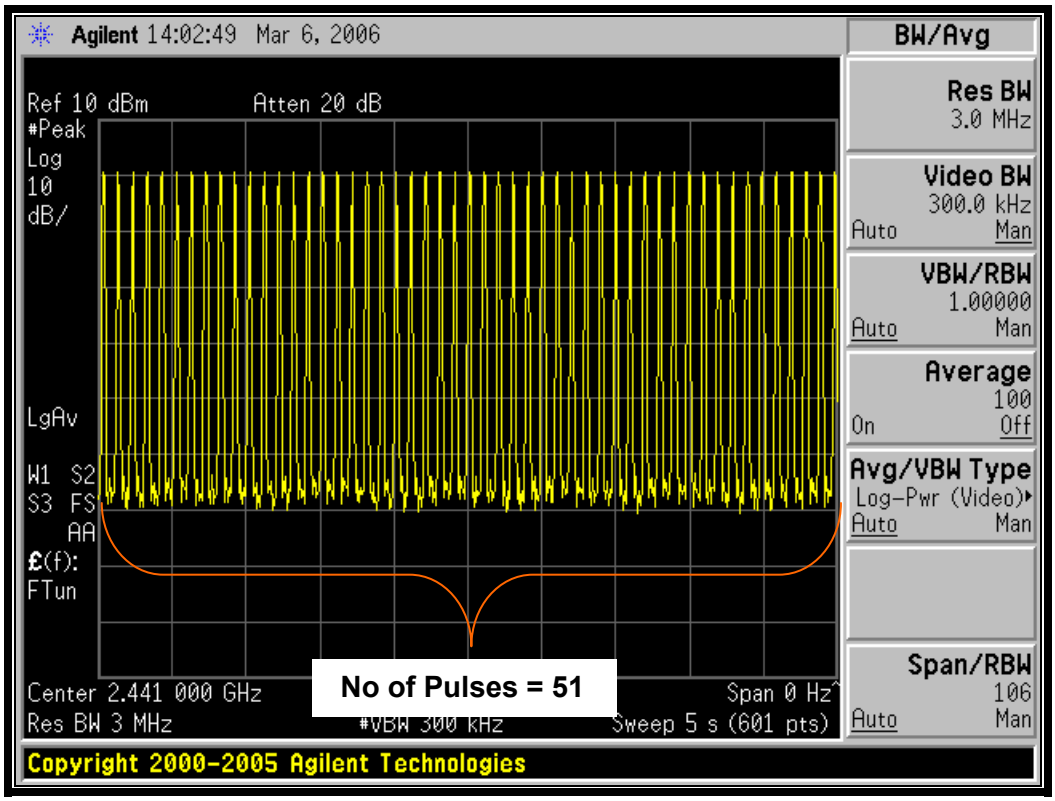
Plot 8-2: Time of Occupancy (Dwell Time)



Test Personnel:

Richard B. McMurray	Richard B. McMurray	March 6, 2006
EMC Test Engineer	Signature	Date of Test

Plot 8-3: Time of Occupancy (Dwell Time 5 Second Sweep)



Number of pulses in 5 seconds: 51

Therefore, the number of pulses in the period of 0.4 s X 79 channels would be 322.

Test Personnel:

Richard B. McMurray	Richard B. McMurray	March 6, 2006
EMC 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 Conducted Emissions Measurement Test Procedure

Note: This test was not applicable as the EUT is battery operated.

10 Radiated Emissions - §15.209; RSS-210 §6.2.1

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	Loop Antenna (9 kHz - 30 MHz)	827525/019	8/25/06
900932	Hewlett Packard	8449B OPT H02	Preamplifier (1 - 26.5 GHz)	3008A00505	5/20/06
901020	Hewlett Packard	8564E	Portable Spectrum Analyzer (9 kHz - 40 GHz)	3943A01719	9/14/06
901281	Rhein Tech Labs	PR-1040	Amplifier	1003	12/8/06
900878	Rhein Tech Labs	AM3-1197-0005	3 meter antenna mast, polarizing	Outdoor Range 1	Not Required
901231	IW Microwave Products	KPS-1503-2400-KPS	High frequency RF cables	240"	9/1/06
901232	IW Microwave Products	KPS-1503-2400-KPS	High frequency RF cables	240"	9/1/06
901235	IW Microwave Products	KPS-1503-360-KPS	High frequency RF cables	36"	9/1/06
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	5/20/07
900321	EMCO	3161-03	Horn Antennas (4 - 8,2GHz)	9508-1020	5/20/07
900323	EMCO	3160-7	Horn Antennas (8,2 - 12,4 GHz)	9605-1054	5/20/07
900356	EMCO	3160-08	Horn Antenna (12.4 - 18 GHz)	9607-1044	5/20/07
900325	EMCO	3160-9	Horn Antennas (18 - 26.5 GHz)	9605-1051	5/20/07
901218	EMCO	3301B	Horn Antenna (18 - 26.5 GHz)	960281-003	5/20/07
900392	Hewlett Packard	1197OK	Harmonic Mixer (18 – 26.5 GH)z	3525A00159	11/27/07
900931	Hewlett Packard	8566B	Spectrum Analyzer (100 Hz - 22 GHz)	3138A07771	8/3/06
900930	Hewlett Packard	85662A	Spectrum Analyzer Display Section	3144A20839	8/3/06
900889	Hewlett Packard	85685A	RF Preselector (20 Hz - 2 GHz)	3146A01309	4/5/06

10.3 Radiated Emissions Test Results

10.3.1 Radiated Emissions Digital/Receiver

Table 10-2: Digital/Receiver Radiated Emissions Test Results

Temperature: 37°F Humidity: 35%										
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
276.203	Qp	V	180	1.0	40.9	-14.5	26.4	46.0	-19.6	276.203
280.823	Qp	H	90	1.0	52.2	-13.8	38.4	46.0	-7.6	280.823
466.824	Qp	H	180	2.0	39.1	-8.2	30.9	46.0	-15.1	466.824
488.200	Qp	V	225	1.0	37.4	-8.4	29.0	46.0	-17.0	488.200
498.900	Qp	V	0	1.0	41.3	-8.3	33.0	46.0	-13.0	498.900
510.100	Qp	V	180	1.0	38.5	-7.7	30.8	46.0	-15.2	510.100
515.024	Qp	H	0	2.0	43.1	-7.7	35.4	46.0	-10.6	515.024
655.997	Qp	V	0	1.0	33.2	-5.2	28.0	46.0	-18.0	655.997
708.522	Qp	V	0	1.0	33.2	-5.1	28.1	46.0	-17.9	708.522

10.3.2 Radiated Emissions Harmonics/Spurious

Table 10-3: Radiated Emissions Harmonics/Spurious Channel 0 (TX Frequency: 2402 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)
4804.0	48.2	21.7	10.1	31.8	54.0	-22.2
7206.0	39.3	24.0	10.4	34.4	77.6	-43.2
9608.0	40.3	23.8	13.3	37.1	77.6	-40.5
12010.0	37.8	24.0	15.8	39.8	54.0	-14.2
14412.0	29.0	25.2	19.0	44.2	77.6	-33.4
16814.0	30.3	23.7	19.2	42.9	77.6	-34.7

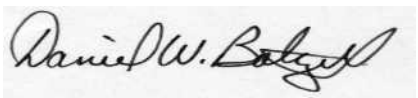
Table 10-4: Radiated Emissions Harmonics/Spurious Channel 39 (TX Frequency: 2441 MHz)

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)
4882.0	48.7	22.2	9.9	32.1	54.0	-21.9
7323.0	40.8	24.7	10.1	34.8	54.0	-19.2
9764.0	41.0	24.0	12.4	36.4	77.3	-40.9
12205.0	35.8	25.8	14.5	40.3	54.0	-13.7
14646.0	29.2	25.2	18.9	44.1	77.3	-33.2
17087.0	28.7	25.2	19.8	45.0	77.3	-32.3

Table 10-5: Radiated Emissions Harmonics/Spurious Channel 78 (TX Frequency: 2480 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)
4960.0	45.3	22.3	10.6	32.9	54.0	-21.1
7440.0	36.5	24.3	10.8	35.1	54.0	-18.9
9920.0	37.2	25.0	13.3	38.3	77.2	-38.9
12400.0	38.3	24.7	17.8	42.5	54.0	-11.5
14880.0	27.3	25.3	20.6	45.9	77.2	-31.3
17360.0	28.7	25.2	17.8	43.0	77.2	-34.2

Test Personnel:



Daniel W. Baltzell		March 7, 2006
EMC Test Engineer	Signature	Date of Test

11 Conclusion

The data in this measurement report shows that the EUT as tested, Vocollect, Inc. Model SRX Wireless Headset, FCC ID: MQOSRX-10000, IC: 2570A-SRX10000, complies with all the applicable requirements of Parts 2 and 15 of the FCC Rules and Regulations, and Industry Canada RSS-210 & RSS-GEN.