Engineering and Testing for EMC and Safety Compliance

LIMITED MODULAR APPROVAL CERTIFICATION APPLICATION REPORT
FCC PART 15.247 & INDUSTRY CANADA RSS-210

Test Lab:	Applicant:
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FCC ID/ IC ID:	I28MD-BTC2TY5/ 3798A-BTC2TY5	**Test Report Date:**	March 17, 2006
Platform:	Zebra portable printers & other Zebra products with similar physical characteristics	**RTL Work Order Number:**	2006028
Model Name/ Model Number:	Cameo Bluetooth Radio Module/Cameo-ZBR3	**RTL Quote Number:**	QRTL06-171

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 (mW)	Frequency Tolerance	Emission Designator
2402-2480	0.3	N/A	1M11FXD

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 17, 2006

Typed/Printed Name: Desmond A. Fraser

Position: President

Table of Contents

1 General Information 5
1.1 Scope 5
1.2 Description of EUT 5
1.3 Test Facility 5
1.4 Related Submittal(s)/Grant(s) 5
1.5 Modifications 5
2 Test Information 6
2.1 Description of Test Modes 6
2.2 Exercising the EUT 6
2.3 Test Result Summary 7
2.4 Test System Details 8
2.5 Configuration of Tested System 9
3 Peak Output Power - §15.247(b)(1); RSS-210 §A8.4 (2) 10
3.1 Power Output Test Procedure 10
3.2 Power Output Test Data 10
4 Compliance with the Band Edge – FCC §15.205; RSS-210 §2.6 11
4.1 Band Edge Test Procedure 11
4.2 Restricted Band Edge Test Results 12
4.2.1 Calculation of Lower Band Edge – Bluetooth 12
4.2.2 Calculation of Upper Band Edge – Bluetooth 13
5 Antenna Conducted Spurious Emissions - §15.247(d); RSS-GEN 14
5.1 Antenna Conducted Spurious Emissions Test Procedures 14
5.2 Antenna Conducted Spurious Emissions Test Results 14
6 20 dB Bandwidth – FCC §15.247 (a)(1)(ii); IC RSS-GEN 16
6.1 20 dB Bandwidth Test Procedure 16
6.2 20 dB Modulated Bandwidth Test Data 16
6.3 20 dB Bandwidth Plots 17
7 Carrier Frequency Separation - §15.247(a)(1) ; RSS-210 A8.1 20
7.1 Carrier Frequency Separation Test Procedure 20
7.2 Carrier Frequency Separation Test Data 20
8 Hopping Characteristics – FCC §15.247 (a)(1)(iii); RSS-210 A8.1 21
8.1 Hopping Characteristics Test Procedure 21
8.2 Number of Hopping Frequencies - Bluetooth 21
8.3 Average Time of Occupancy - Bluetooth 22
9 Conducted Limits – FCC §15.207; IC RSS-GEN 24
9.1 Limits of Conducted Emissions Measurement 24
9.2 Test Methodology for Conducted Emissions Measurements 24
9.3 Conducted Spurious Emissions Test Data 25
10 Radiated Emissions - §15.209; RSS-210 §6.2.1 27
10.1 Limits of Radiated Emissions Measurement 27
10.2 Radiated Emissions Measurement Test Procedure 27
10.3 Radiated Emissions Test Results 29
10.3.1 Radiated Emissions Digital/Receiver; IC RSS-GEN 29
10.3.2 Radiated Emissions Harmonics/Spurious 29
11 Conclusion 31

Figure Index

Figure 2-1: Configuration of System under Test....9

Table Index

Table 2-1: Channels Tested....6
Table 2-2: Test Result Summary – FCC Part 15, Subpart C (Section 15.247) 7
Table 2-3: Equipment under Test....8
Table 2-4: Other Equipment Used in Testing....8
Table 3-1: Power Output Test Equipment....10
Table 3-2: Power Output Test Data 10
Table 4-1: Band Edge Test Equipment....11
Table 5-1: Antenna Conducted Spurious Emissions Test Equipment....14
Table 5-2: Antenna Conducted Spurious Emissions Test Data (2402 MHz)....14
Table 5-3: Antenna Conducted Spurious Emissions Test Data (2441 MHz)....15
Table 5-4: Antenna Conducted Spurious Emissions Test Data (2480 MHz)....15
Table 6-1: 20 dB Bandwidth Test Equipment....16
Table 6-2: 20 dB Modulated Bandwidth Test Data....16
Table 7-1: Carrier Frequency Separation Test Equipment....20
Table 8-1: Hopping Characteristics Test Equipment....21
Table 8-2: Average Time of Occupancy Test Equipment....22
Table 9-1: Conducted Emission Test Equipment....24
Table 9-2: Conducted Emissions Neutral Side (Line 1); Transmit Mode; 2441 MHz 25
Table 9-3: Conducted Emissions Hot Side (Line 2); Transmit Mode; 2441 MHz 25
Table 9-4: Conducted Emissions Neutral Side (Line 1); Receive Mode....26
Table 9-5: Conducted Emissions Hot Side (Line 2); Receive Mode....26
Table 10-1: Radiated Emissions Test Equipment 28
Table 10-2: Digital/Receiver Radiated Emissions Test Results 29
Table 10-3: Radiated Emissions Harmonics/Spurious Channel 1 (TX Frequency: 2402 MHz)....29
Table 10-4: Radiated Emissions Harmonics/Spurious Channel 40 (TX Frequency: 2441 MHz)....29
Table 10-5: Radiated Emissions Harmonics/Spurious Channel 79 (TX Frequency: 2480 MHz)....30

Plot Index

Plot 4-1: Lower Band Edge: Average Measurement Channel 1 (TX Frequency: 2402 MHz) 12
Plot 4-2: Upper Band Edge: Average Measurement Channel 79 (TX Frequency: 2480 MHz) 13
Plot 6-1: 20 dB Bandwidth Channel 1....17
Plot 6-2: 20 dB Bandwidth Channel 40....18
Plot 6-3: 20 dB Bandwidth Channel 79....19
Plot 7-1: Carrier Frequency Separation - Bluetooth....20
Plot 8-1: Number of Hopping Frequencies....21
Plot 8-2: Time of Occupancy (Dwell Time) 22
Plot 8-3: Time of Occupancy (Dwell Time 5 Second Sweep) 23

Appendix Index

Appendix A: RF Exposure Compliance....32
Appendix B: FCC Limited Modular Approval Request....33
Appendix C: IC Limited Modular Approval....34
Appendix D: Agency Authorization Letter....35
Appendix E: Confidentiality Request Letter....36
Appendix F: IC Agent Authority and Listing Requirements Letters....37
Appendix G: Label and Label Location....38
Appendix H: Technical Operational Description....39
Appendix I: Schematics....40
Appendix J: Block Diagram....41
Appendix K: Manual....42
Appendix L: Test Photographs....43
Appendix M: Internal Photographs....47

Photograph Index

Photograph 1: Radiated Testing – Front View....43
Photograph 2: Radiated Testing – Back View....44
Photograph 3: Conducted AC Testing – Front View....45
Photograph 4: Conducted AC Testing – Back View....46
Photograph 5: PCB in Cameo 3 Printer....47
Photograph 6: PCB in Cameo 3 Printer with scanner....48
Photograph 7: PCB Top View....49
Photograph 8: PCB Bottom View....50
Photograph 9: CQ17718-G1 Antenna Front....51
Photograph 10: CQ17718-G1 Antenna Back....52
Photograph 11: CQ17718-G2 Antenna Front....53
Photograph 12: CQ17718-G2 Antenna Back....54

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	Cameo Bluetooth Radio Module
Model	Cameo-ZBR3
Power Supply	Battery operated
Modulation Type	FHSS - Bluetooth
Transfer Rate	2 Mbps
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 FCC certification application for LIMITED MODULAR transmitter approval, based on the guidelines in FCC Publication DA 00-1407, for Zebra Technologies Corp., Model Name: Cameo Bluetooth Radio Module, Model # Cameo-ZBR3, a modular Bluetooth radio, under FCC ID: I28MD-BTC2TY5. The applicant requests LIMITED MODULAR APPROVAL to allow the use of this radio in Zebra printers and other Zebra products similar in style to those presented in this report, including housing type and materials, but not limited to the printers in this report. Appendix B of this report is a letter from the applicant justifying the LIMITED MODULAR APPROVAL request.

With respect to Industry Canada, the applicant requests LIMITED MODULAR APPROVAL, based on RSS-GEN. Appendix C of this report includes a letter from the applicant justifying LIMITED MODULAR APPROVAL under the conditions set forth in the standard.

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 frequencies in the following table were tested.

Table 2-1: Channels Tested

Channel	Frequency
0	2402
40	2441
78	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	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)(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 16, 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 2-3: Equipment under Test

Part	Manufacturer	Model	Serial Number	FCC ID	Cable Description	RTL Bar Code
Cameo Bluetooth Radio Module	Zebra Technologies Corp.	Cameo-ZBR3	259306-01R	I28MD-BTC2TY5	N/A	17109
Portable Printer	Zebra Technologies Corp.	Cameo 3	XXLO06-07-5112	N/A	N/A	17108
Portable Printer with Scanner	Zebra Technologies Corp.	Cameo 3	XXLO06-07-5112	N/A	N/A	17107
NiMH 7.2V Battery	Zebra Technologies Corp.	CC15294-3	N/A	N/A	N/A	17110
NiMH 7.2V Battery	Zebra Technologies Corp.	CC15294-3	N/A	N/A	N/A	17111
Battery Charger	Zebra Technologies Corp.	UCN72	N/A	N/A	2m shielded power	17113
Battery Charger	Zebra Technologies Corp.	UCN72	N/A	N/A	2m shielded power	17112

Table 2-4: Other Equipment Used in Testing

Part	Manufacturer	Model	Serial Number	FCC ID	Cable Description	RTL Bar Code
Serial Cable	Zebra Technologies Corp.	BL11757-000	N/A	N/A	1.8m shielded I/O	N/A
Laptop	Toshiba	Satellite 1905-S301	92043315C	N/A	N/A	16621

2.5 Configuration of Tested System

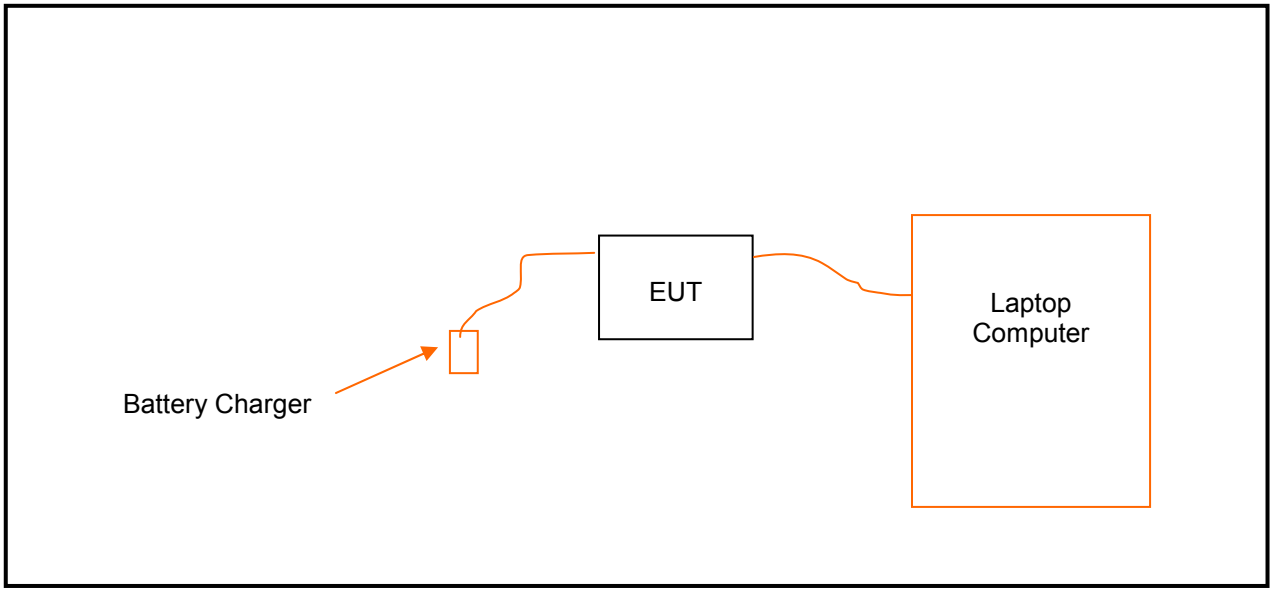


Figure 2-1: Configuration of System under Test

3 Peak Output Power - §15.247(b)(1); RSS-210 §A8.4 (2)

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

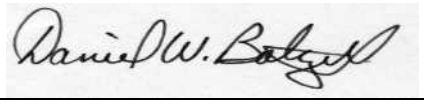
RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901413	Agilent	E4448A	Spectrum Analyzer (3 Hz – 50 GHz)	US440203416	11/02/06

3.2 Power Output Test Data

Table 3-2: Power Output Test Data

Channel	Frequency (MHz)	Peak Power Conducted Output (dBm)	Peak Power Conducted Output (mW)
0	2402	-4.81	0.33
39	2440	-5.07	0.31
78	2480	-5.08	0.31

Test Personnel:



Daniel W. Baltzell		March 16, 2006
EMC Test Engineer	Signature	Date of Test

4 Compliance with the Band Edge – FCC §15.205; RSS-210 §2.6

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
901425	Insulated Wire, Inc.	KPS-1503-2400-KPS	RF cable, 20'	NA	12/12/06
901424	Insulated Wire Inc.	KPS-1503-360-KPS	RF cable 36"	NA	12/12/06
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
901020	Hewlett Packard	8564E	Portable Spectrum Analyzer (9 kHz - 40 GHz)	3943A01719	9/14/06

4.2 Restricted Band Edge Test Results

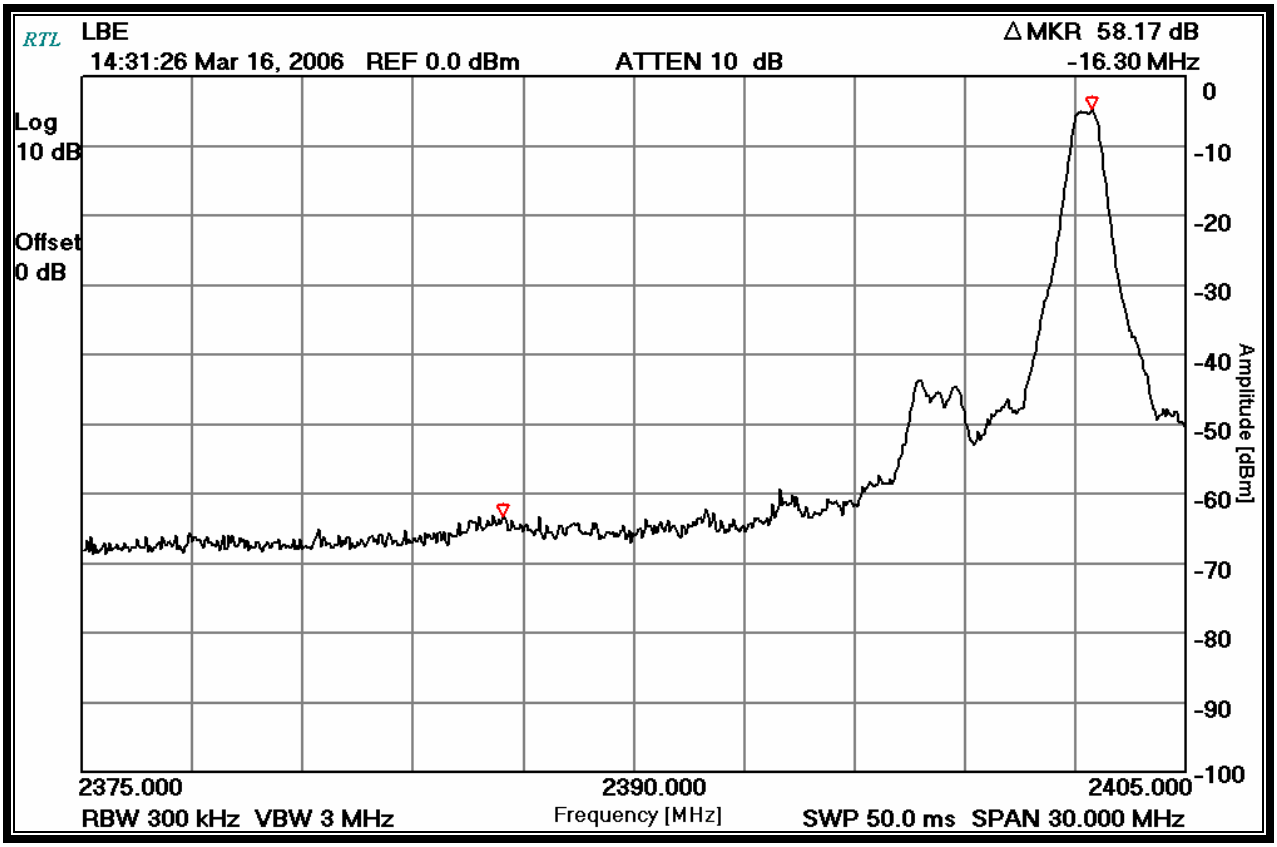
4.2.1 Calculation of Lower Band Edge – Bluetooth

75.8 dBuV/m is the field strength measurement, from which the delta measurement of 58.2 dB is subtracted (reference plots), resulting in a level of 17.6 dB. This level has a margin of 36.4 dB below the limit of 54 dBuV/m.

Calculation: 75.8 dBuV/m – 58.2 dB – 54 dBuV/m = -36.4 dB

Peak Field Strength of Lower Band Edge (1 MHz RBW/1 MHz VBW) = 75.8 dBuV/m
Average Field Strength of Lower Band Edge (1 MHz RBW/10 Hz VBW) = 53.8 dBuV/m
Delta measurement = 58.2 dB

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



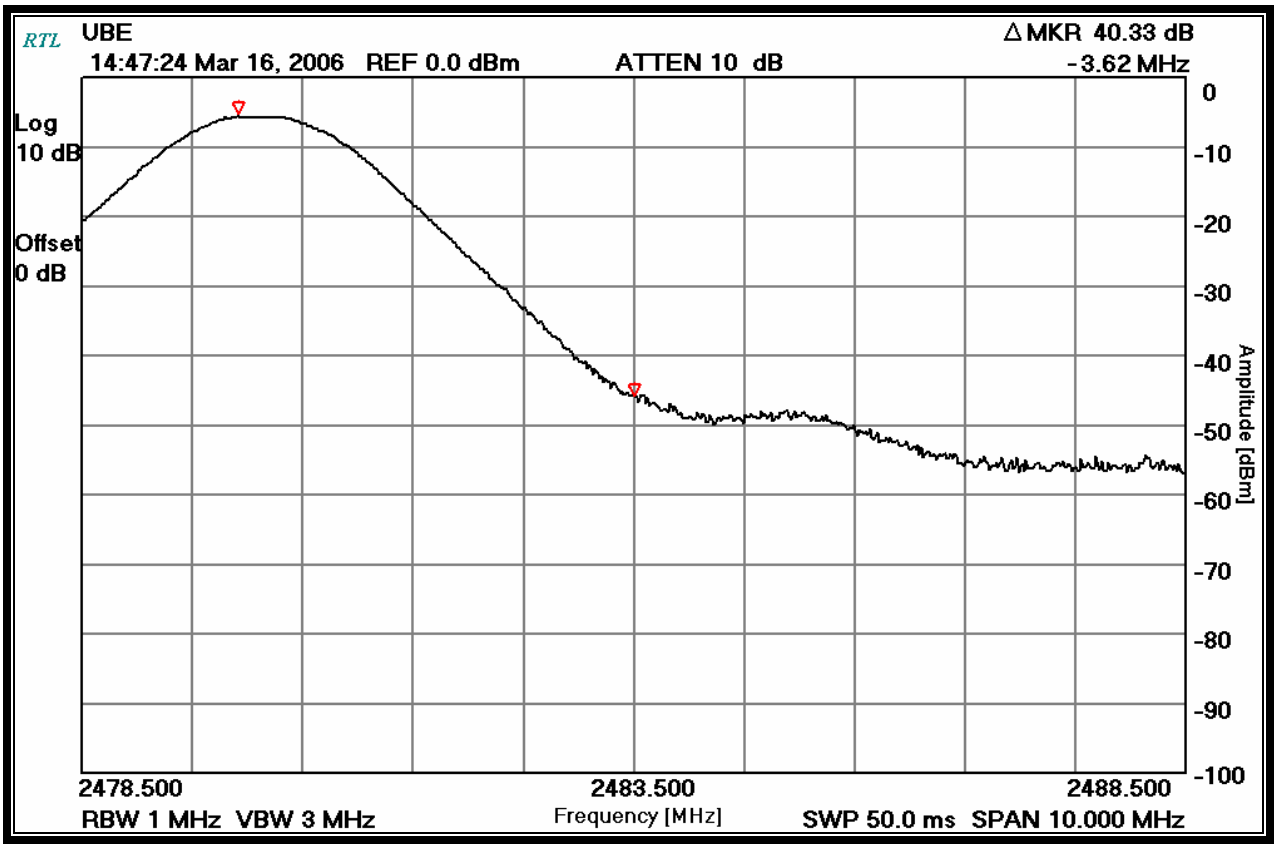
4.2.2 Calculation of Upper Band Edge – Bluetooth

78.1 dBuV/m is the field strength measurement, from which the delta measurement of 40.3 dB is subtracted (reference plots), resulting in a level of 37.8 dB. This level has a margin of 16.2 dB below the limit of 54 dBuV/m.

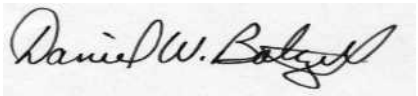
Calculation: 78.1 dBuV/m – 40.3 dB – 54 dBuV/m = -16.2 dB

Peak Field Strength of Lower Band Edge (1 MHz RBW/1 MHz VBW) = 78.1 dBuV/m
Average Field Strength of Lower Band Edge (1 MHz RBW/10 Hz VBW) = 54.1 dBuV/m
Delta measurement = 40.3 dB

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



Test Personnel:

Daniel W. Baltzell		March 16, 2006
Test Engineer	Signature	Dates of Test

5 Antenna Conducted Spurious Emissions - §15.247(d); RSS-GEN

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
901020	Hewlett Packard	8564E	Portable Spectrum Analyzer (9 kHz - 40 GHz)	3943A01719	9/14/06

5.2 Antenna Conducted Spurious Emissions Test Results

Table 5-2: Antenna Conducted Spurious Emissions Test Data (2402 MHz)

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
1202.0	-70.3	-27.5	-42.8	Pass
2210.0	-70.7	-27.5	-43.2	Pass
2370.0	-65.2	-27.5	-37.7	Pass
2402.0	-7.5	-27.5	Fundamental	
2433.0	-61.3	-27.5	-33.8	Pass
2593.0	-64.8	-27.5	-37.3	Pass
2627.0	-62.7	-27.5	-35.2	Pass
3603.0	-71.5	-27.5	-44.0	Pass
4804.0	-66.5	-27.5	-39.0	Pass
7206.0	-71.5	-27.5	-44.0	Pass
9608.0	-73.7	-27.5	-46.2	Pass

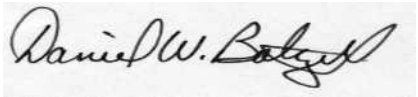
Table 5-3: Antenna Conducted Spurious Emissions Test Data (2441 MHz)

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
1222.0	-69.7	-27.3	-42.4	1222.0
2213.0	-70.3	-27.3	-43.0	2213.0
2410.0	-64.0	-27.3	-36.7	2410.0
2441.0	-7.3	-27.3	fundamental	2441.0
2473.0	-61.8	-27.3	-34.5	2473.0
2670.0	-62.3	-27.3	-35.0	2670.0
3663.0	-70.7	-27.3	-43.4	3663.0
4882.0	-66.5	-27.3	-39.2	4882.0
7323.0	-76.8	-27.3	-49.5	7323.0
9764.0	-78.3	-27.3	-51.0	9764.0
1222.0	-69.7	-27.3	-42.4	1222.0

Table 5-4: Antenna Conducted Spurious Emissions Test Data (2480 MHz)

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Result
1238.60	-70.5	-25.7	-44.8	1238.60
1239.63	-68.7	-25.7	-43.0	1239.63
1240.43	-68.7	-25.7	-43.0	1240.43
2448.20	-64.0	-25.7	-38.3	2448.20
2480.00	-5.7	-25.7	fundamental	2480.00
2512.50	-59.8	-25.7	-34.1	2512.50
3720.00	-72.5	-25.7	-46.8	3720.00
4960.00	-64.0	-25.7	-38.3	4960.00
7440.00	-78.2	-25.7	-52.5	7440.00
9920.00	-81.5	-25.7	-55.8	9920.00
1238.60	-70.5	-25.7	-44.8	1238.60

Test Personnel:



Daniel W. Baltzell		March 16, 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-GEN 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
901020	Hewlett Packard	8564E	Portable Spectrum Analyzer (9 kHz - 40 GHz)	3943A01719	9/14/06

6.2 20 dB Modulated Bandwidth Test Data

Table 6-2: 20 dB Modulated Bandwidth Test Data

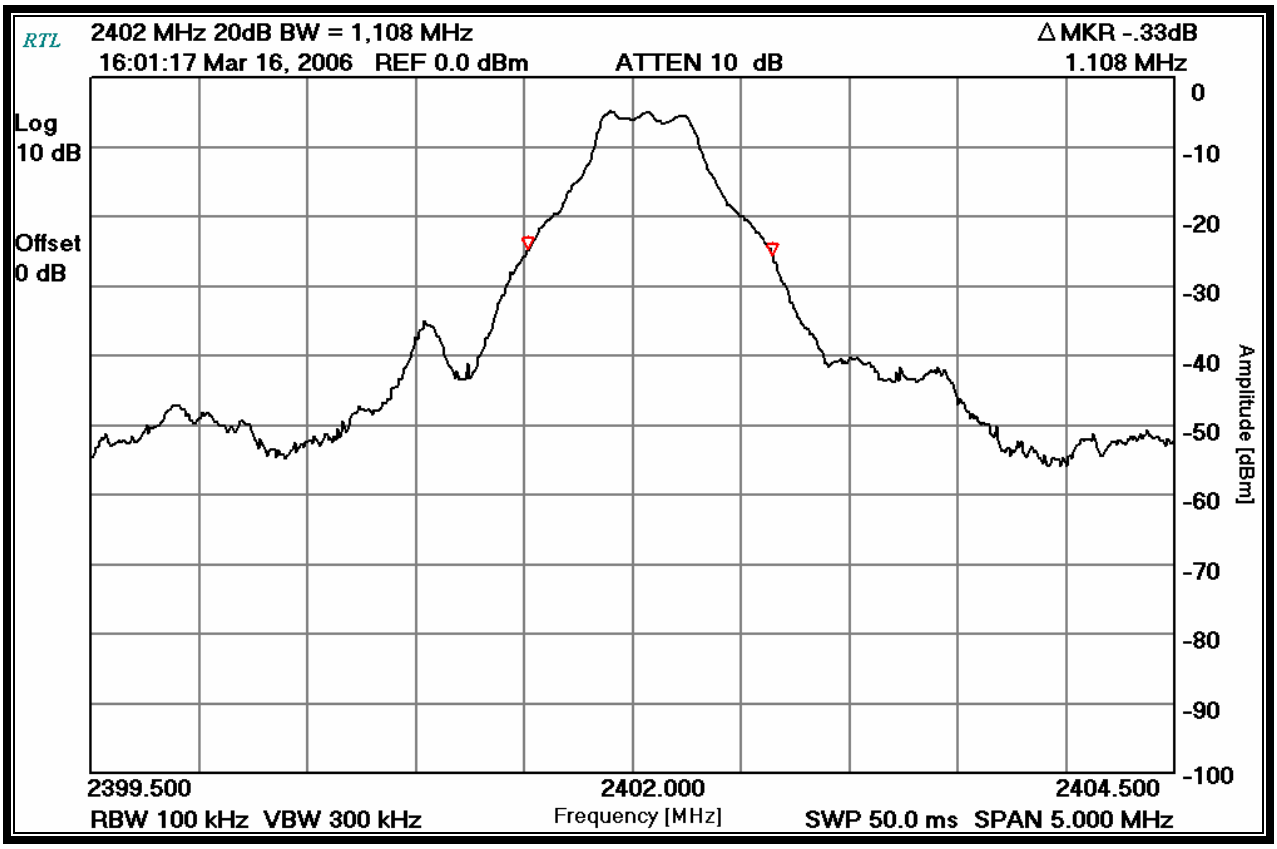
Minimum 20 dB bandwidths

Frequency (MHz)	20 dB Bandwidth (MHz)
2402	1.108
2441	1.108
2480	1.108

6.3 20 dB Bandwidth Plots

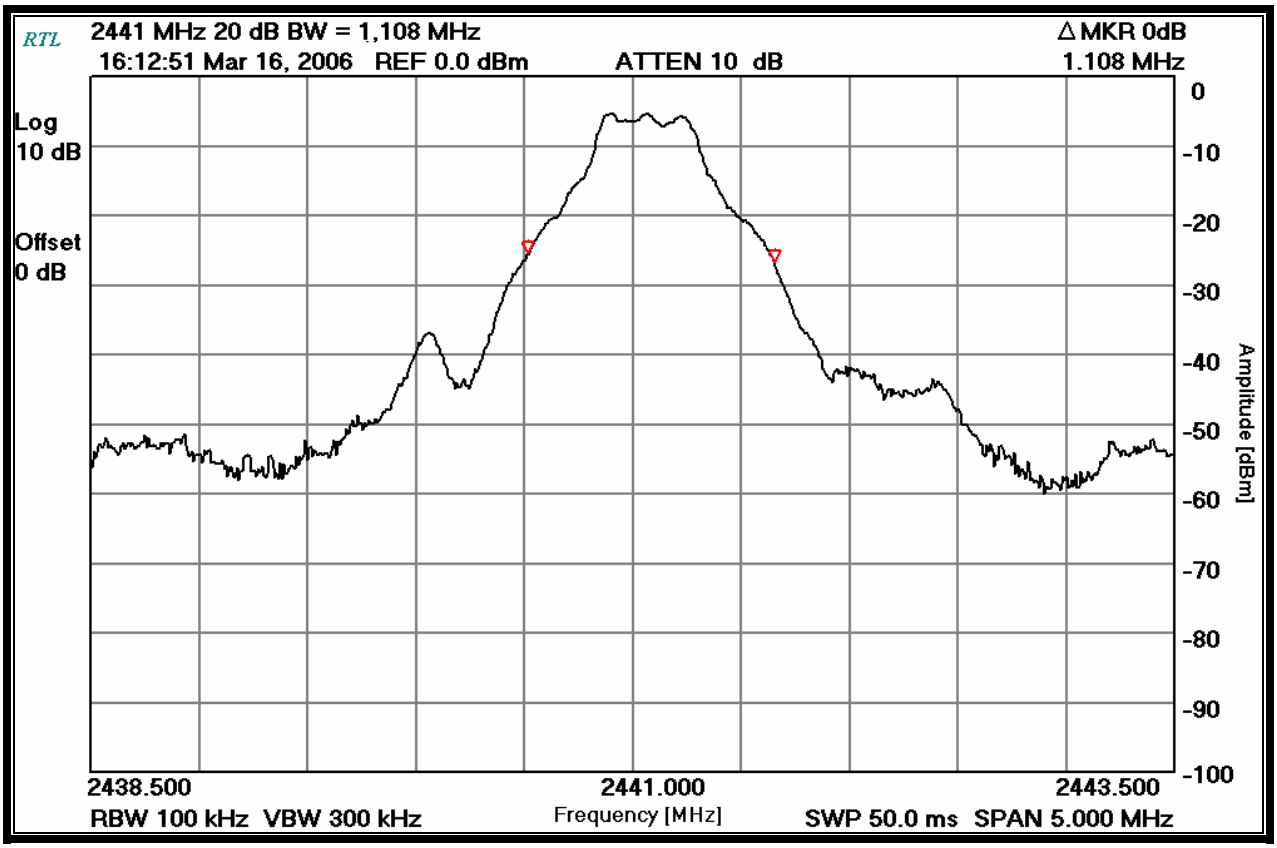
Channel:	1
Channel Frequency (MHz):	2402
Resolution Bandwidth (kHz):	100
Video Bandwidth (kHz):	300
Span (MHz):	5

Plot 6-1: 20 dB Bandwidth Channel 1



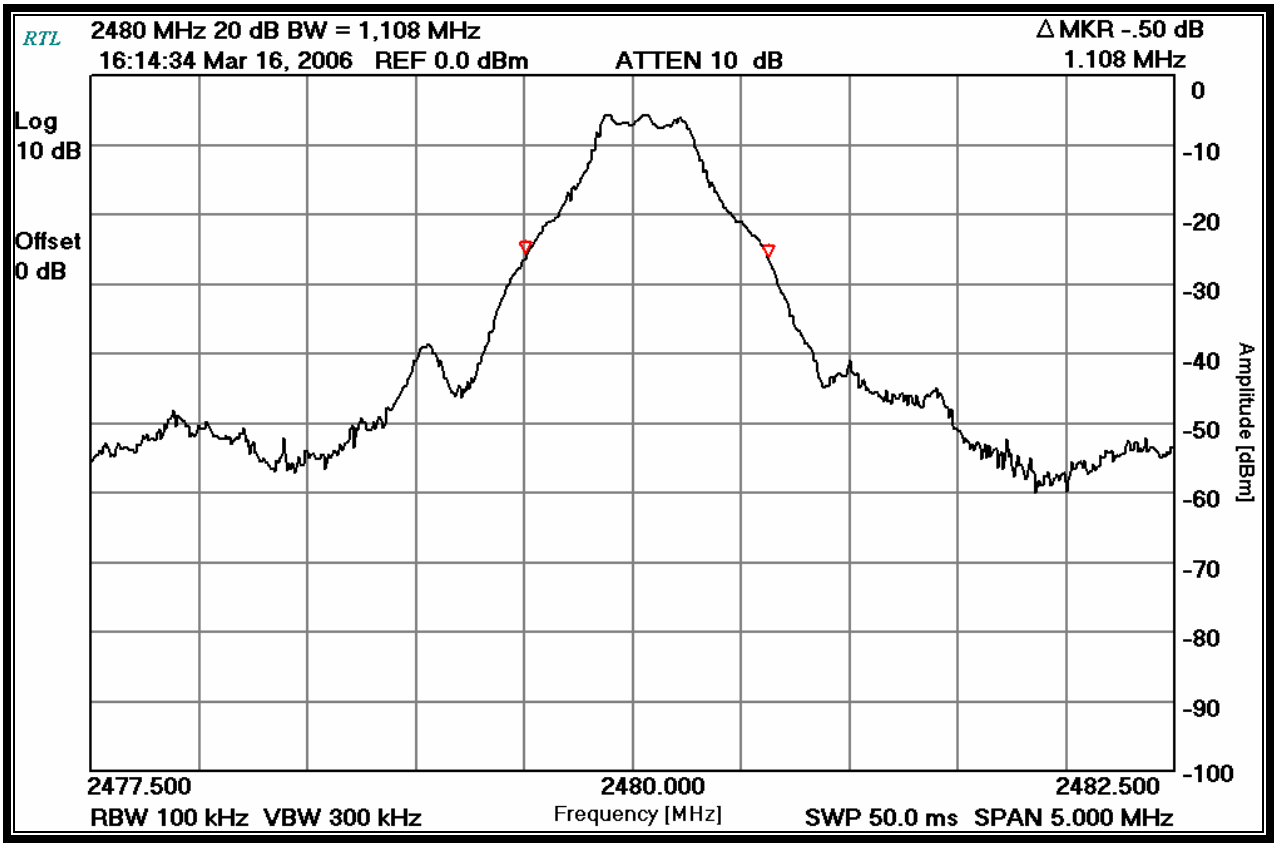
Channel:	40
Channel Frequency (MHz):	2441
Resolution Bandwidth (kHz):	100
Video Bandwidth (kHz):	300
Span (MHz):	5

Plot 6-2: 20 dB Bandwidth Channel 40



Channel:	79
Channel Frequency (MHz):	2480
Resolution Bandwidth (kHz):	100
Video Bandwidth (kHz):	300
Span (MHz):	5

Plot 6-3: 20 dB Bandwidth Channel 79



Test Personnel:

Daniel W. Baltzell	Daniel W. Baltzell	March 16, 2006
EMC Test Engineer	Signature	Date of Test

7 Carrier Frequency Separation - §15.247(a)(1) ; RSS-210 A8.1

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.

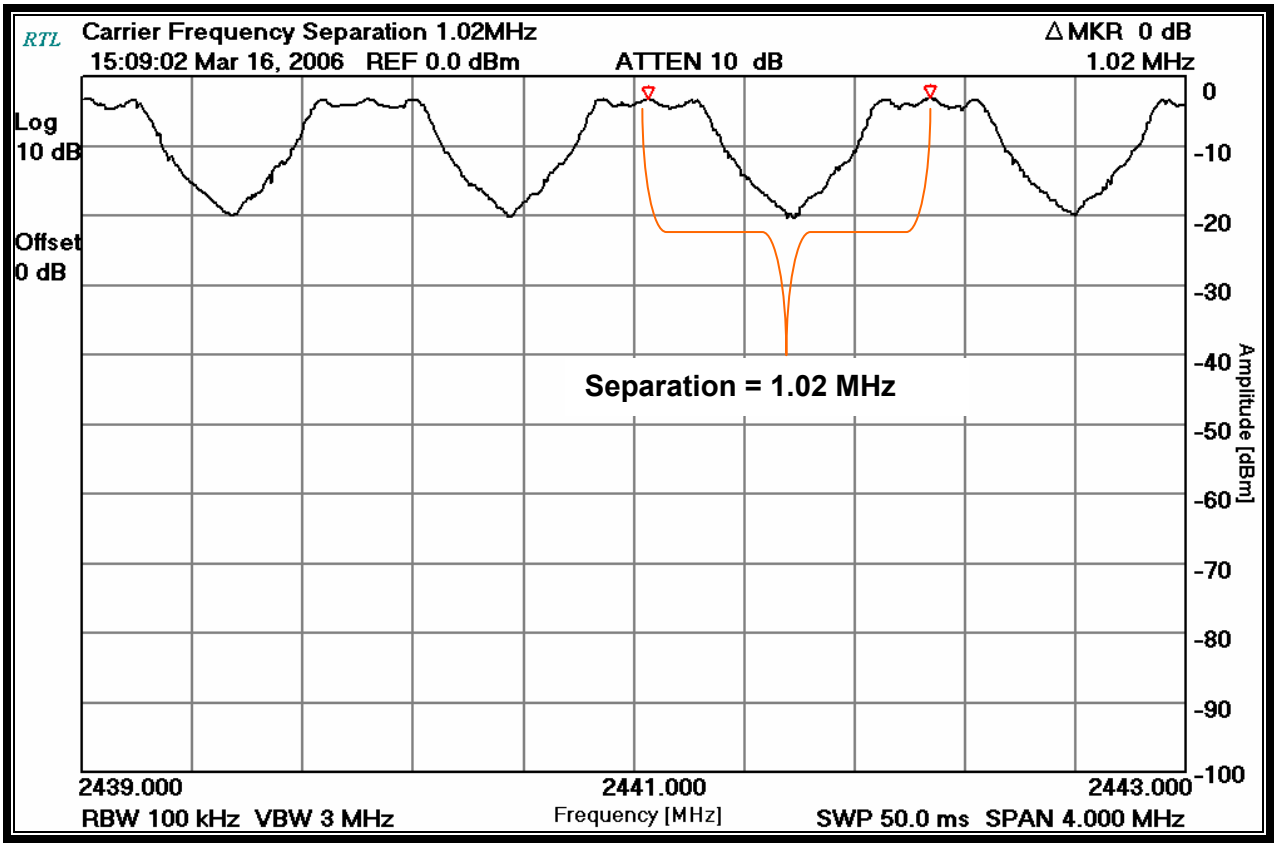
Measured frequency separation = 1.02 MHz

Table 7-1: Carrier Frequency Separation 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

7.2 Carrier Frequency Separation Test Data

Plot 7-1: Carrier Frequency Separation - Bluetooth



Test Personnel:

Daniel W. Baltzell	Daniel W. Baltzell	March 16, 2006
EMC Test Engineer	Signature	Date of Test

8 Hopping Characteristics – FCC §15.247 (a)(1)(iii); RSS-210 A8.1

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.

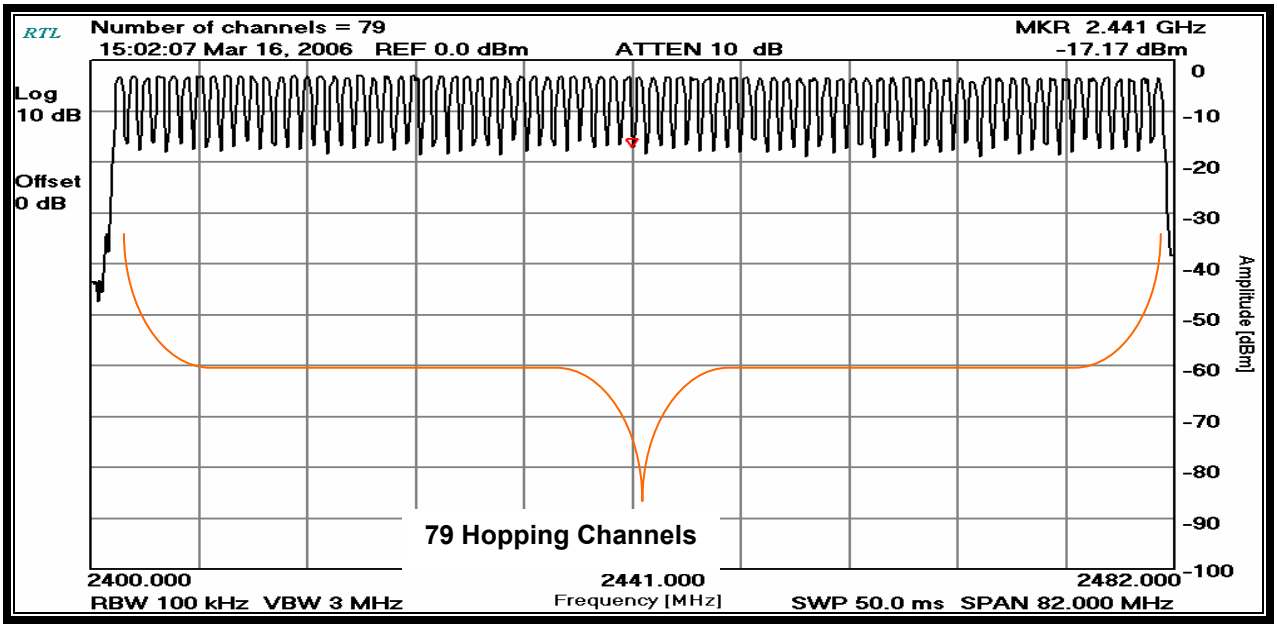
Table 8-1: Hopping Characteristics Test Equipment

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

8.2 Number of Hopping Frequencies - Bluetooth

Measured number of hopping frequencies = 79

Plot 8-1: Number of Hopping Frequencies



Test Personnel:

Daniel W. Baltzell	Daniel W. Baltzell	March 16, 2006
EMC Test Engineer	Signature	Date of Test

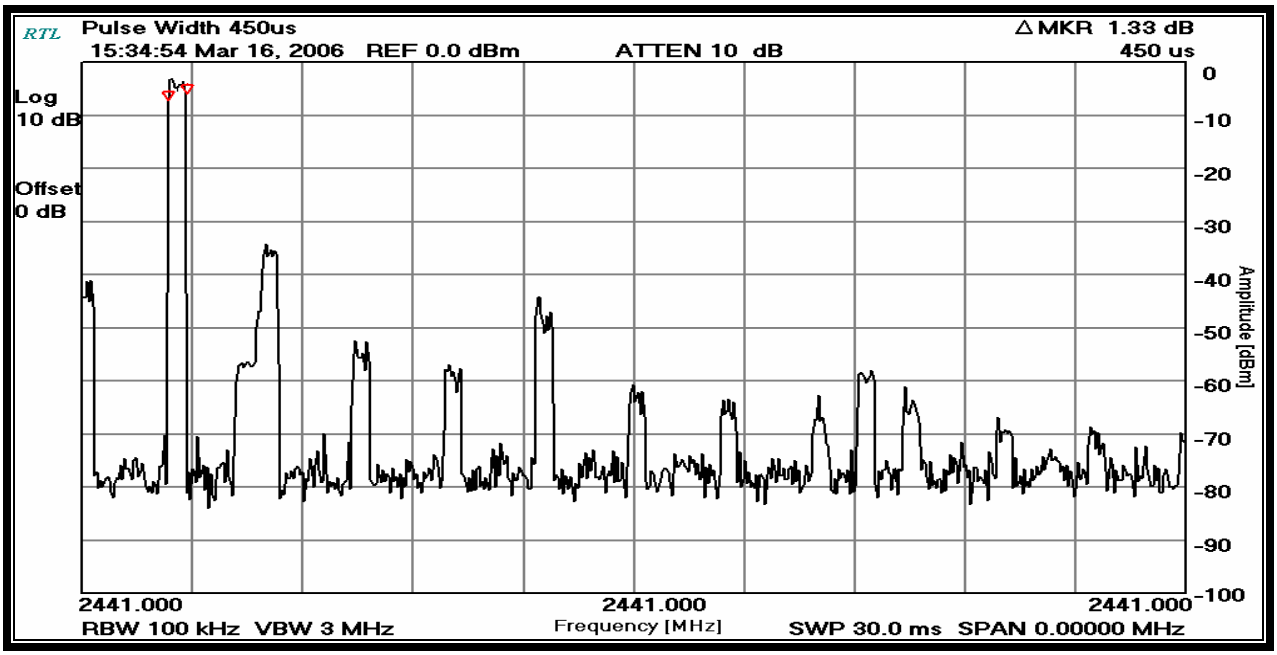
8.3 Average Time of Occupancy - Bluetooth

The spectrum analyzer sweep was set to 30 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 50. Therefore, the number of pulses in a period of 0.4 seconds X 79 hopping channels (31.6 s) would be 316 pulses. The average time of occupancy in the above period (31.6 s) is equal to 316 pulses X 0.450 ms = 142 ms, which meets the limit as defined by 15.247(a)(1)(iii) of 0.4 seconds.

Table 8-2: Average Time of Occupancy 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

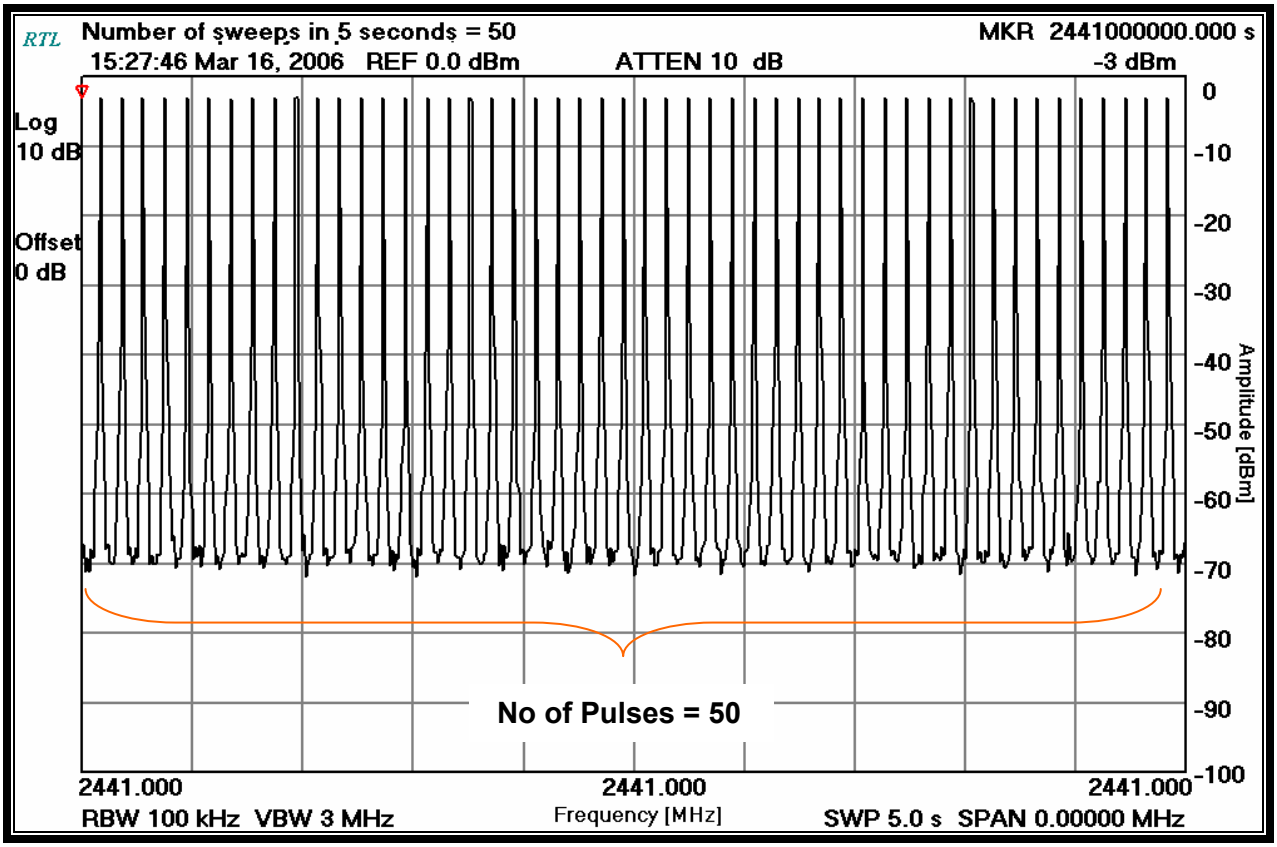
Plot 8-2: Time of Occupancy (Dwell Time)



Test Personnel:

Daniel W. Baltzell	Daniel W. Baltzell	March 16, 2006
EMC Test Engineer	Signature	Date of Test

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



Plot

Number of pulses in 5 seconds: 50

Therefore, the number of pulses in the period of 0.4 s X 79 channels would be 316.

Test Personnel:

Daniel W. Baltzell	Daniel W. Baltzell	March 16, 2006
EMC Test Engineer	Signature	Date of Test

9 Conducted Limits – FCC §15.207; IC 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

The EUT is battery operated, but the battery can be charged during operation, therefore conducted line emissions data is presented.

9.2 Test Methodology for Conducted Emissions Measurements

The power line conducted emission 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 (EUT 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 7 kHz high-pass filter. The filter is used to prevent overload of the spectrum analyzer from noise below 7 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. No video filter less than 10 times the resolution bandwidth was 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 limit were measured and have been recorded in this report.

Note: Rhein Tech Laboratories, Inc. has implemented procedures to minimize errors that occur from test instruments, calibration, procedures, and test setups. Test instrument and calibration errors are documented from the manufacturer or calibration lab. Other errors have been defined and calculated within the Rhein Tech Quality Manual, Section 6.1. Rhein Tech implements the following procedures to minimize errors that may occur: yearly as well as daily calibration methods, technician training, and emphasis to employees on avoiding errors.

Table 9-1: Conducted Emission Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900931	Hewlett Packard	8566B	Spectrum Analyzer (100 Hz - 22 GHz)	3138A07771	8/3/06
901084	AFJ International	LS16	16A LISN	16010020082	1/23/07
900969	Hewlett Packard	85650A	Quasi-Peak Adapter	2412A00414	8/3/06

9.3 Conducted Emissions Test Data

Table 9-2: Conducted Emissions Neutral Side (Line 1); Transmit Mode; 2441 MHz

Temperature: 80°F Humidity: 22%									
Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)	AV Limit (dBuV)	AV Margin (dBuV)	Pass/ Fail
0.202	Pk	47.1	0.2	47.3	63.5	-16.2	53.5	-6.2	Pass
0.298	Pk	44.6	0.3	44.9	60.3	-15.4	50.3	-5.4	Pass
0.398	Pk	42.2	0.3	42.5	57.9	-15.4	47.9	-5.4	Pass
0.497	Pk	40.8	0.2	41.0	56.0	-15.0	46.0	-5.0	Pass
1.986	Pk	42.7	0.7	43.4	56.0	-12.6	46.0	-2.6	Pass
2.870	Pk	43.4	1.0	44.4	56.0	-11.6	46.0	-1.6	Pass
14.320	Pk	43.0	2.0	45.0	60.0	-15.0	50.0	-5.0	Pass

Table 9-3: Conducted Emissions Hot Side (Line 2); Transmit Mode; 2441 MHz

Temperature: 80°F Humidity: 22%									
Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)	AV Limit (dBuV)	AV Margin (dBuV)	Pass/ Fail
0.201	Pk	47.4	0.2	47.6	63.6	-16.0	53.6	-6.0	Pass
0.297	Pk	46.3	0.3	46.6	60.3	-13.7	50.3	-3.7	Pass
0.399	Pk	44.6	0.3	44.9	57.9	-13.0	47.9	-3.0	Pass
0.496	Pk	41.7	0.2	41.9	56.1	-14.2	46.1	-4.2	Pass
0.599	Pk	44.4	0.3	44.7	56.0	-11.3	46.0	-1.3	Pass
4.275	Qp	43.3	1.1	44.4	56.0	-11.6	46.0	-1.6	Pass
4.277	Av	34.3	1.1	35.4	56.0	-20.6	46.0	-10.6	Pass
13.200	Pk	37.1	2.0	39.1	60.0	-20.9	50.0	-10.9	Pass

Table 9-4: Conducted Emissions Neutral Side (Line 1); Receive Mode

Temperature: 80°F Humidity: 22%									
Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)	AV Limit (dBuV)	AV Margin (dBuV)	Pass/ Fail
0.201	Pk	47.4	0.2	47.6	63.6	-16.0	53.6	-6.0	Pass
0.298	Pk	45.4	0.3	45.7	60.3	-14.6	50.3	-4.6	Pass
0.401	Pk	42.9	0.3	43.2	57.8	-14.6	47.8	-4.6	Pass
0.500	Pk	44.2	0.2	44.4	56.0	-11.6	46.0	-1.6	Pass
0.599	Pk	45.4	0.3	45.7	56.0	-10.3	46.0	-0.3	Pass
0.599	Qp	44.4	0.3	44.7	56.0	-11.3	46.0	-1.3	Pass
0.600	Av	32.4	0.3	32.7	56.0	-23.3	46.0	-13.3	Pass
2.700	Pk	43.7	0.9	44.6	56.0	-11.4	46.0	-1.4	Pass
13.900	Pk	40.6	2.0	42.6	60.0	-17.4	50.0	-7.4	Pass

Table 9-5: Conducted Emissions Hot Side (Line 2); Receive Mode

Temperature: 80°F Humidity: 22%									
Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)	AV Limit (dBuV)	AV Margin (dBuV)	Pass/ Fail
0.201	Pk	49.9	0.2	50.1	63.6	-13.5	53.6	-3.5	Pass
0.302	Pk	48.4	0.3	48.7	60.2	-11.5	50.2	-1.5	Pass
0.400	Pk	44.5	0.3	44.8	57.9	-13.1	47.9	-3.1	Pass
0.499	Pk	44.4	0.2	44.6	56.0	-11.4	46.0	-1.4	Pass
1.797	Qp	44.1	0.6	44.7	56.0	-11.3	46.0	-1.3	Pass
1.798	Av	36.1	0.6	36.7	56.0	-19.3	46.0	-9.3	Pass
3.193	Av	35.7	1.0	36.7	56.0	-19.3	46.0	-9.3	Pass
3.193	Qp	44.8	1.0	45.8	56.0	-10.2	46.0	-0.2	Pass
12.890	Pk	38.4	2.0	40.4	60.0	-19.6	50.0	-9.6	Pass

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
901425	Insulated Wire, Inc.	KPS-1503-2400-KPS	RF cable, 20'	NA	12/12/06
901424	Insulated Wire Inc.	KPS-1503-360-KPS	RF cable 36"	NA	12/12/06
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; IC RSS-GEN

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

Temperature: 43°F Humidity: 96%										
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
111.169	Qp	V	180	1.0	36.5	-15.8	20.7	43.5	-22.8	Pass
112.830	Qp	V	0	1.0	45.5	-15.7	29.8	43.5	-13.7	Pass
133.384	Qp	V	180	1.0	36.1	-16.1	20.0	43.5	-23.5	Pass
222.351	Qp	V	180	1.0	34.9	-17.1	17.8	46.0	-28.2	Pass
289.041	Qp	V	270	1.0	34.7	-14.0	20.7	46.0	-25.3	Pass
333.502	Qp	H	0	2.0	34.7	-12.3	22.4	46.0	-23.6	Pass
511.318	Qp	H	0	2.0	33.1	-7.6	25.5	46.0	-20.5	Pass

10.3.2 Radiated Emissions Harmonics/Spurious

Table 10-3: Radiated Emissions Harmonics/Spurious Channel 1 (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	7.0	31.2	10.1	41.3	54.0	-12.7
7206.0	41.5	30.8	10.4	41.2	55.8	-14.6
9608.0	42.5	31.3	13.3	44.6	55.8	-11.2
12010.0	43.0	31.3	15.8	47.1	54.0	-6.9
14412.0	42.5	31.5	19.0	50.5	55.8	-5.3
16814.0	40.0	29.8	19.2	49.0	55.8	-6.8

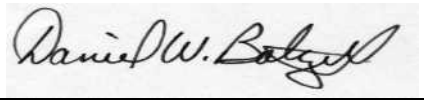
Table 10-4: Radiated Emissions Harmonics/Spurious Channel 40 (TX Frequency: 2441 MHz)

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	41.8	31.7	9.9	41.6	54.0	-12.4
7323.0	42.3	31.3	10.3	41.6	54.0	-12.4
9764.0	42.0	32.3	12.3	44.6	56.0	-11.4
12205.0	41.8	31.0	14.6	45.6	54.0	-8.4
14646.0	42.0	31.3	20.2	51.5	56.0	-4.5
17087.0	42.0	31.2	19.8	51.0	56.0	-5.0

Table 10-5: Radiated Emissions Harmonics/Spurious Channel 79 (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	42.8	31.8	10.6	42.4	54.0	-11.6
7440.0	43.2	31.7	10.8	42.5	54.0	-11.5
9920.0	44.5	32.5	13.3	45.8	58.1	-12.3
12400.0	43.7	31.7	17.8	49.5	54.0	-4.5
14880.0	41.3	29.3	20.6	49.9	58.1	-8.2
17360.0	43.3	30.2	17.8	48.0	58.1	-10.1

Test Personnel:



Daniel W. Baltzell		March 17, 2006
EMC Test Engineer	Signature	Date of Test

11 Conclusion

The data in this measurement report shows that the EUT as tested, Zebra Technologies, Inc. Model: Cameo Bluetooth Radio Module, Model # Cameo-ZBR3, FCC ID: I28MD-BTC2TY5, IC: 3798A-BTC2TY5, complies with all the applicable requirements of Parts 2 and 15 of the FCC Rules and Regulations, and Industry Canada RSS-210 & RSS-GEN.