

EMI Test Report

Tested in accordance with
Federal Communications Commission (FCC)
Personal Communications Services
CFR 47, Part 15 Subpart C
&
RSS-210, RSS-GEN

RIM Testing Services (RTS)

A division of Research In Motion Limited

REPORT NO.: RTS-0491-0702-05

PRODUCT MODEL NO.: RBK41CG
TYPE NAME: BlackBerry
FCC ID: L6ARBK40CG
IC: 2503A-RBK40CG

DATE: 30 March 2007

RTS RIM Testing Services	EMI Test Report for the BlackBerry Handheld Model RBK41CG	
Test Report No. RTS-0491-0702-05	Dates of Test January 19 to March 12 2007	Author Data C. O'Neill

Statement of Performance:

The BlackBerry Wireless Handheld, model RBK41CG, part number CER-14121-001 Rev. 3, and accessories when configured and operated per RIM's operation instructions, performs within the requirements of the test standards.

Declaration:

We hereby certify that:

The test data reported herein is an accurate record of the performance of the sample(s) tested.

The test results are valid for the tested unit (s) only.

This equipment supports Bluetooth Frequency Hopping.

The test equipment used was suitable for the tests performed and within manufacturer's published specifications and operating parameters.


The test methods were consistent with the methods described in the relevant standards.

Documented by:



Caitlin O'Neill
Compliance Specialist
Date: 28 Mar 2007

Tested and reviewed by:



Maurice Battler
Compliance Specialist
Date: 28 Mar 2007

Tested and reviewed by:



Masud S. Attayi, P.Eng.
Team Lead, Regulatory Compliance
Date: 28 Mar 2007

Approved by:



Paul G. Cardinal, Ph.D.
Director
Date: 28 Mar 2007

RTS RIM Testing Services	EMI Test Report for the BlackBerry Handheld Model RBK41CG	
Test Report No. RTS-0491-0702-05	Dates of Test January 19 to March 12 2007	Author Data C. O'Neill

Table of Contents

A.	Scope	4
B.	Associated Documents.....	4
C.	Product Identification.....	4
D.	Support Equipment Used for the Testing of the EUT	5
E.	Test Voltage	5
F.	Test Results Chart.....	5
G.	Modifications to EUT	6
H.	Summary of Results	6
I.	Compliance Test Equipment Used	10
APPENDIX 1 – AC LINE CONDUCTED EMISSIONS TEST DATA.....		11
APPENDIX 2 – RADIATED EMISSIONS TEST DATA		14
APPENDIX 3 – BLUETOOTH CONDUCTED EMISSIONS TEST DATA/PLOTS.....		21

RTS RIM Testing Services	EMI Test Report for the BlackBerry Handheld Model RBK41CG	
Test Report No. RTS-0491-0702-05	Dates of Test January 19 to March 12 2007	Author Data C. O'Neill

A. Scope

This report details the results of compliance tests which were performed in accordance to the requirements of:

- FCC CFR 47 Part 15, Subpart C, Aug. 14, 2006
- Industry Canada, RSS-210, Issue 6, September 2005, Low Power Licence-Exempt Radiocommunication Devices
- Industry Canada, RSS-GEN, Issue 1, September 2005, General Requirements and Information for the Certification of Radiocommunication Equipment

B. Associated Documents

1. Document number RTS-0491-RBK41CG-01

C. Product Identification

Manufactured by Research In Motion Limited located at:

295 Phillip Street
Waterloo, Ontario
Canada, N2L 3W8
Phone: 519 888 7465
Fax: 519 888 6906

The equipment under test (EUT) was tested at the RIM Testing Services (RTS) EMI test facility, located at:

305 Phillip Street
Waterloo, Ontario
Canada, N2L 3W8
Phone: 519 888 7465
Fax: 519 888 6906

The sample EUT included:

1. BlackBerry Handheld, model RBK41CG, CER-14121-001 Rev. 1, PIN: 3016B213
2. BlackBerry Handheld, model RBK41CG, CER-14121-001 Rev. 1, PIN: 3016B678
3. BlackBerry Handheld, model RBK41CG, CER-14121-001 Rev. 3, PIN: 301726FD

Conducted Emission testing was performed on handheld PIN 3016B213 and 301726FD. Radiated Emission testing was performed on handheld PIN 3016B678.

RTS RIM Testing Services	EMI Test Report for the BlackBerry Handheld Model RBK41CG	
Test Report No. RTS-0491-0702-05	Dates of Test January 19 to March 12 2007	Author Data C. O'Neill

To view the differences between CER-14121-001 Rev. 1 and CER-14121-001 Rev. 3, see document number RTS-0491-RBK41CG-01.

Only the differences that maybe impacted by the changes were re-measured.

The transmit frequency bands operating in North America for the Handheld are: Cellular 824 to 849 MHz, PCS 1867.5 to 1872.5 MHz and Bluetooth 2402 to 2480 MHz.

D. Support Equipment Used for the Testing of the EUT

- 1) Communication Tester, Rohde & Schwarz, model CMU 200, serial number 837493/073
- 2) DC Power Supply, HP, model 6632B, serial number US37472178
- 3) Bluetooth Tester, Rohde & Schwarz, model CMU CBT, serial number 1000134

E. Test Voltage

The ac input voltage was 120 volts, 60 Hz where applicable. This configuration was per RIM's specifications.

F. Test Results Chart

SPECIFICATION	TEST TYPE	MEETS REQUIREMENTS	PERFORMED BY
FCC CFR 47 Part 15.207 IC RSS-210/RSS-GEN	AC Line Conducted Emissions	Yes	Masud Attayi
FCC CFR 47 Part 15.209, 15.247 IC RSS-210/RSS-GEN	Radiated Emissions Radiated Band Edge Compliance	Yes	Masud Attayi
FCC CFR 47 Part 15.247(a), (b), (c) IC RSS-210/RSS-GEN	20 dB Bandwidth Carrier Freq. Separation Number of Hopping freq. Dwell Time Max. Peak Output Power Band Edge Compliance Spurious RF Conducted Emissions	Yes	Maurice Battler

RTS RIM Testing Services	EMI Test Report for the BlackBerry Handheld Model RBK41CG	
Test Report No. RTS-0491-0702-05	Dates of Test January 19 to March 12 2007	Author Data C. O'Neill

G. Modifications to EUT

No modifications were required on the EUT.

H. Summary of Results

SPECIFICATION		TEST TYPE	RESULT	TEST DATA APPENDIX
FCC CFR 47	IC			
Part 15.207	RSS-210 RSS-GEN	Conducted AC Line Emission	Pass	1
Part 15.209 Part 15.247	RSS-210 RSS-GEN	Radiated Spurious Emissions and Radiated Band Edge Compliance	Pass	2
Part 15.247(a)	RSS-210	20 dB Bandwidth	Pass	3
Part 15.247(a)	RSS-210	Carrier Frequency Separation	Pass	3
Part 15.247(a)	RSS-210	Number of Hopping Frequencies	Pass	3
Part 15.247(a)	RSS-210	Time of Occupancy (Dwell Time)	Pass	3
Part 15.247(b)	RSS-210	Maximum Peak Conducted Output Power	Pass	3
Part 15.247(c)	RSS-210	Band-Edge Compliance of RF Conducted Emissions	Pass	3
Part 15.247(c)	RSS-210	Spurious RF Conducted Emissions	Pass	3

1) AC LINE CONDUCTED EMISSIONS

The conducted emissions were measured using the test procedure outlined in CISPR Recommendation 22 through a 50 Ohm Line Impedance Stabilization Network (LISN), which was inserted in the power line to the equipment to provide the specified impedance for measurements. The EUT was placed on a nonconductive wooden table, 80 cm high that was positioned 40 cm from a vertical ground plane. The RF output of the network was connected to an EMI receiver system with characteristics that duplicate those of the receiver specified in CISPR Publication 16.

RTS RIM Testing Services	EMI Test Report for the BlackBerry Handheld Model RBK41CG	
Test Report No. RTS-0491-0702-05	Dates of Test January 19 to March 12 2007	Author Data C. O'Neill

The Handheld was in Bluetooth Tx and battery charging mode. The following test configuration was measured:

The ac input voltage was 120 volts, 60 Hz for the below:

1. The Handheld was connected to the Folding Blade Charger and to the Stereo Headset.

The sample EUT's conducted emissions were compared with respect to the FCC CFR 47 Part 15, Subpart B, and IC ICES-003 Class B limit. The sample EUT had a worse case test margin of 10.26 dB below the limit at 0.722 MHz using the QP detector for the Folding Blade Charger, Stereo headset, test configuration 1.

Measurement Uncertainty ± 2.0 dB

To view the test data/plots, see APPENDIX 1.

2) RADIATED EMISSIONS

a) Radiated Spurious and Harmonic Emissions

The EUT was placed on a nonconductive styrofoam table, 80 cm high that was positioned on a remotely controlled turntable. The test distance used between the EUT and the receiving antenna was three metres. The turntable was rotated to determine the azimuth of the peak emissions. Then the emissions were maximized by elevating the antenna in the range of 1 to 4 metres. The maximum emission level was recorded. The frequency range measured was from 30 MHz to 25.0 GHz. Both the horizontal and vertical polarisations of the emissions were measured.

The measurements were performed in a semi-anechoic chamber. The semi-anechoic chamber's FCC registration number is **778487** and the Industry Canada file number is **IC4240**.

The EUT was configured and operated to produce the maximum radiated emissions while still keeping within RIM's specifications.

The Handheld was measured in standalone configuration with Bluetooth transmitting in single frequency mode at low channel (0), middle channel (39) and high channel (78) for packet type "DH5" and frequency hopping for packet type "DH5". The system's radiated emission levels were compared with respect to the FCC CFR 47 Part 15, Subpart C, 15.247 and RSS-210.

The Bluetooth harmonics were investigated up to the 10th harmonic. The sample EUT had a worse case test margin of 10.0 dB at 4804.0 MHz using the peak detector and a worse case test margin of 5.2 dB at 4804.0 MHz using the average detector.

See APPENDIX 2 for the test data

RTS RIM Testing Services	EMI Test Report for the BlackBerry Handheld Model RBK41CG	
Test Report No. RTS-0491-0702-05	Dates of Test January 19 to March 12 2007	Author Data C. O'Neill

b) Co-location measurements.

The radiated emissions were measured up to 18 GHz for middle channels for simultaneous transmission in CDMA Cellular/Bluetooth and PCS/Bluetooth. Both horizontal and vertical polarizations were measured.

The emission due to different simultaneous transmission did not increase the amplitude of any emissions nor did it produce any new intermodulation products as a result of mixing.

c) Band-Edge Compliance of RF Radiated Emissions

The Band-Edge Compliance of RF Radiated Emissions for Bluetooth met the requirements as per 15.247, 15.209, and RSS-210.

See APPENDIX 2 for the test data.

Measurement Uncertainty ± 4.0 dB

3) BLUETOOTH RF CONDUCTED EMISSIONS

a) 20 dB Bandwidth

The EUT met the requirements of the 20 dB bandwidth as per 47 CFR 15.247(a) and RSS-210. Low channel (0), middle channel (39) and high channel (78) were measured.

See APPENDIX 3 for the test data.

b) Carrier Frequency Separation

The EUT met the requirements of the carrier frequency separation as per 47 CFR 15.247(a) and RSS-210. Channel 38 to 39 was measured.

See APPENDIX 3 for the test data.

c) Number of Hopping Frequencies

The EUT met the requirements of the number of hopping frequencies as per 47 CFR 15.247(a) and RSS-210. The number of hopping channels measured was 79.

See APPENDIX 3 for the test data.

d) Time of Occupancy (Dwell Time)

The EUT met the requirements of the dwell time as per 47 CFR 15.247(a) and RSS-210. Low channel (0), middle channel (39) and high channel (78) were measured in DH1, DH3 and DH5 modes. Bluetooth was operating in frequency hopping (Euro/US) mode during the measurements.

See APPENDIX 3 for the test data.

RTS RIM Testing Services	EMI Test Report for the BlackBerry Handheld Model RBK41CG	
Test Report No. RTS-0491-0702-05	Dates of Test January 19 to March 12 2007	Author Data C. O'Neill

- e) **Maximum Peak Conducted Output Power**
The EUT met the requirements of the maximum peak conducted output power as per 47 CFR 15.247(b) and RSS-210. Low channel (0), middle channel (39) and high channel (78) were measured.
See APPENDIX 3 for the test data.

- f) **Band-Edge Compliance of RF Conducted Emissions**
The EUT met the requirements of the band-edge compliance of RF conducted emissions as per 47 CFR 15.247(c) and RSS-210. Channels 0 and 78 were measured in frequency hopping (Euro/US) mode and single frequency mode.
See APPENDIX 3 for the test data.

- g) **Spurious RF Conducted Emissions**
The EUT met the requirements of the spurious RF conducted emissions as per 47 CFR 15.247(c) and RSS-210. The frequency range measured was 10 MHz to 25 GHz. Low channel (0), middle channel (39) and high channel (78) were measured in single frequency mode and frequency hopping (Euro/US) mode.
See APPENDIX 3 for the test data.

RTS RIM Testing Services	EMI Test Report for the BlackBerry Handheld Model RBK41CG	
Test Report No. RTS-0491-0702-05	Dates of Test January 19 to March 12 2007	Author Data C. O'Neill

I. Compliance Test Equipment Used

<u>UNIT</u>	<u>MANUFACTURER</u>	<u>MODEL</u>	<u>SERIAL NUMBER</u>	<u>CAL DUE DATE</u> (YY MM DD)	<u>USE</u>
Preamplifier	Sonoma	310N/11909A	185831	07-11-23	Radiated Emissions
Preamplifier system	TDK RF Solutions	PA-02	080010	07-11-22	Radiated Emissions
Hybrid Log Antenna	TDK	HLP-3003C	017401	08-08-04	Radiated Emissions
Horn Antenna	TDK	HRN-0118	030101	08-07-26	Radiated Emissions
Horn Antenna	Emco	3116	2538	08-09-25	Radiated Emissions
Preamplifier	TDK	18-26	030002	07-11-23	Radiated Emissions
Universal Radio Communication Tester	Rohde & Schwarz	CMU 200	837493/073	07-12-01	Radiated Emissions
EMI Receiver	Rohde & Schwarz	ESIB-40	100255	07-05-11	Radiated Emissions
EMI Receiver	Agilent	8546A	3942A00517	07-09-21	Conducted/Radiated Emissions
RF Filter Section	Agilent	85460A	3704A00481	07-09-21	Conducted/Radiated Emissions
Universal Radio Communication Tester	Rohde & Schwarz	CMU 200	100251	07-04-23	Conducted Emissions
Spectrum Analyzer	HP	8563E	3745A08112	07-09-20	RF Conducted Emissions
DC Power Supply	HP	6632B	US37472178	07-09-14	RF Conducted Emissions
Environment Monitor	Control Company	1870	230355190	07-12-28	Radiated Emissions
Environment Monitor	Control Company	1870	230355189	07-12-28	RF Conducted Emissions
Temperature Probe	Hart Scientific	61161-302	21352860	07-08-31	Frequency Stability
Environmental Chamber	ESPEC Corp.	SH-240S1	91005607	N/R	Frequency Stability
Bluetooth Tester	Rohde & Schwarz	CBT	100034	07-06-15	Conducted/Radiated Emissions
Signal Generator	Agilent	8648C	4037U03155	07-09-13	Frequency Stability
Power Meter	Giga-tronics	8541C	1837762	07-12-15	Frequency Stability
Power Sensor	Giga-tronics	80401A	1835838	07-12-15	Frequency Stability
Power Meter	Aglient	N1911A	GE45100234	08-09-25	Radiated Emissions
Power Sensor	Agilent	N1921A	US44510427	07-05-30	Radiated Emissions
Digital Multimeter	Hewlett Packard	34401A	US36042324	07-09-19	Conducted/Radiated Emissions
L.I.S.N.	Emco	3816/2	1120	08-08-28	Conducted Emissions
Impulse Limiter	Rohde & Schwarz	ESHS-Z2	836248/052	07-11-20	Conducted Emissions

RTS RIM Testing Services	EMI Test Report for the BlackBerry Handheld Model RBK41CG	
Test Report No. RTS-0491-0702-05	Dates of Test January 19 to March 12 2007	Author Data C. O'Neill

APPENDIX 1 – AC LINE CONDUCTED EMISSIONS TEST DATA

RTS RIM Testing Services	EMI Test Report for the BlackBerry Handheld Model RBK41CG	
Test Report No. RTS-0491-0702-05	Dates of Test January 19 to March 12 2007	Author Data C. O'Neill

AC Conducted Emissions Test Results

The environmental test conditions were:

Temperature	23°C
Pressure	1018mb
Relative Humidity	23%

Date of test: March 12, 2007

Test Configuration 1

FCC CFR 47 Part 15, Subpart B, IC ICES-003

Frequency (MHz)	Line	Reading (QP) (dBμV)	Correction Factor for Impulse Limiter, LISN, Cable (dB)	Corrected Reading (QP) (dB)	Limit (QP) (dBμV)	Limit (AV)	Margin (QP) Limits (dB)	Margin (AV) Limits (dB)
0.486	N	33.69	9.85	43.54	56.25	46.25	-12.72	-2.72
0.482	L1	35.93	9.85	45.78	56.25	46.25	-10.48	-0.48
0.602	L1	35.07	9.85	44.92	56.00	46.00	-11.08	-1.08
0.611	N	34.82	9.85	44.67	56.00	46.00	-11.33	-1.33
0.636	N	32.91	9.87	42.78	56.00	46.00	-13.22	-3.22
0.722	L1	35.88	9.86	45.74	56.00	46.00	-10.26	-0.26
0.929	N	30.81	9.87	40.68	56.00	46.00	-15.32	-5.32
1.062	L1	31.53	9.87	41.40	56.00	46.00	-14.60	-4.60
1.151	L1	31.93	9.88	41.81	56.00	46.00	-14.19	-4.19
1.471	N	26.87	9.89	36.76	56.00	46.00	-19.24	-9.24
1.717	L1	25.75	9.89	35.64	56.00	46.00	-20.36	-10.36
1.732	N	29.68	9.89	39.57	56.00	46.00	-16.43	-6.43

Measurements were done with the quasi-peak detector.

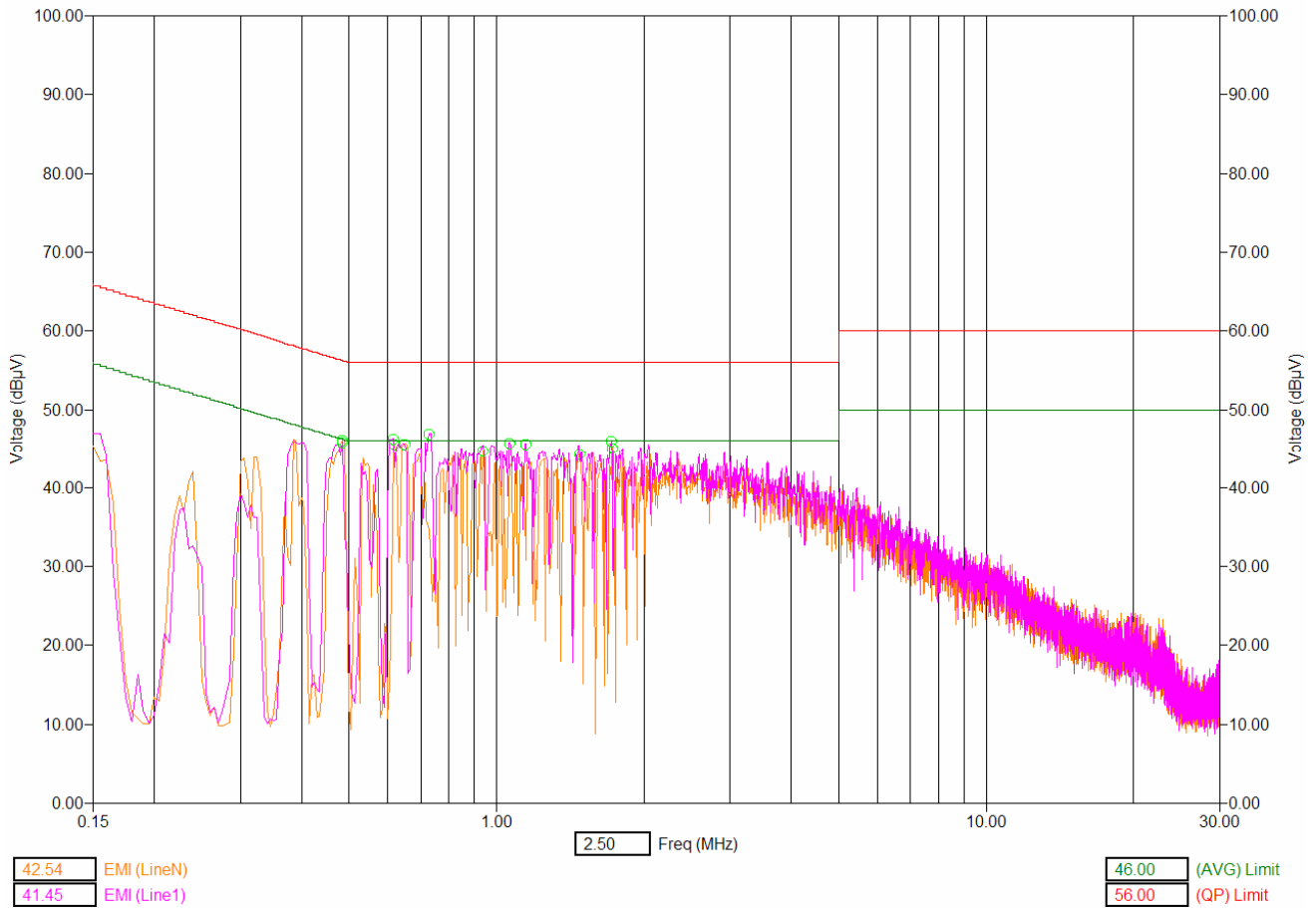
See figure 1-1 for the measurement plot.

RTS RIM Testing Services	EMI Test Report for the BlackBerry Handheld Model RBK41CG	
	Test Report No. RTS-0491-0702-05	Dates of Test January 19 to March 12 2007

AC Conducted Emission

Test Configuration 1

Figure 1-1



RTS RIM Testing Services	EMI Test Report for the BlackBerry Handheld Model RBK41CG	
Test Report No. RTS-0491-0702-05	Dates of Test January 19 to March 12 2007	Author Data C. O'Neill

APPENDIX 2 – RADIATED EMISSIONS TEST DATA

RTS RIM Testing Services	EMI Test Report for the BlackBerry Handheld Model RBK41CG	
Test Report No. RTS-0491-0702-05	Dates of Test January 19 to March 12 2007	Author Data C. O'Neill

Radiated Emissions Test Data Results cont'd

Bluetooth Band

The environmental test conditions were: Temperature 24°C
 Pressure 1009mb
 Relative Humidity 21%

Date of Test: January 31 2007

Test Distance was 3.0 metres with a EUT height of 0.8 metres, 30 MHz to 1000 MHz.
 The Handheld PIN 3016B678 was in standalone, vertical position.

The measurements were performed in single frequency mode using packet type "DH5",
 channel 39.

Frequency (MHz)	Antenna		Test Angle (Deg.)	Detector (PK or AV)	Measured Level (dB μ V)	Correction Factor for preamp/antenna/ cables/ filter (dB/m)	Field Strength Level (reading+corr) (dB μ V/m)	Limit @ 3.0 m (dB)	Test Margin (dB)
	Pol. (V/H)	Height (metres)							
35.80	H	1.64	254	PK	40.34	-19.47	20.87	40	-19.13
35.79	H	3.90	278	AV	17.11	-19.47	-2.36	40	-42.36
35.81	V	2.21	107	PK	47.27	-19.48	27.79	40	-12.21
35.90	V	1.83	150	AV	18.21	-19.48	-1.27	40	-41.27
72.16	V	3.81	23	PK	46.34	-21.27	25.07	40	-14.93
72.36	V	1.48	41	AV	17.54	-21.27	-3.73	40	-43.73
73.61	H	3.54	250	PK	35.88	-21.24	14.64	40	-25.36
73.67	H	3.39	217	AV	16.57	-21.24	-4.67	40	-44.67

RTS RIM Testing Services	EMI Test Report for the BlackBerry Handheld Model RBK41CG	
Test Report No. RTS-0491-0702-05	Dates of Test January 19 to March 12 2007	Author Data C. O'Neill

Radiated Emissions Test Data Results cont'd

Bluetooth Band

The environmental test conditions were: Temperature 24°C
 Pressure 1009 mb
 Relative Humidity 21%

Date of Test: January 31 2007

Test Distance was 3.0 metres with a EUT height of 0.8 metres, 1 GHz to 25 GHz.
 The Handheld PIN 3016B678 was in standalone, vertical position.

The measurements were performed in single frequency mode using packet type "DH5",
 channel 39.

Frequency (MHz)	Antenna		Test Angle (Deg.)	Detector (PK or AVE)	Measured Level (dBµV)	Correction Factor for preamp/antenna/ cables/ filter (dB/m)	Field Strength Level (reading+corr) (dBµV/m)	Limit @ 3.0 m (dB)	Test Margin (dB)
	Pol. (V/H)	Height (metres)							
-	-	-	-	-	-	-	-	-	-

All emissions were in the noise floor (NF).

RTS RIM Testing Services	EMI Test Report for the BlackBerry Handheld Model RBK41CG	
Test Report No. RTS-0491-0702-05	Dates of Test January 19 to March 12 2007	Author Data C. O'Neill

Radiated Emissions Test Results
Bluetooth Band

Test Distance was 3.0 metres.

Date of test: January 24 to 31, 2007

The measurements were performed in single frequency and hopping mode (channels 0 to 78) at maximum output power.

Using Pattern type "Static PRBS" and packet type "DH5" during the measurements.

Type	Channel	Frequency (MHz)	Antenna		Reading (Peak)	Corrected Reading (dBuV)	Detector (AVE/PK)	Peak Limit (dBuV/m)	Diff. To Limit (dB)
			Type	Pol	(dBuV)				
Handheld Standalone, USB down									
Single frequency mode Low Channel									
2 nd	0	4804.0	Horn	V	43.4	64.0	PK.	74	-10.0
2 nd	0	4804.0	Horn	H	39.3				
2 nd	0	4804.0	Horn	V	28.2	48.8	AVE.	54	-5.2
2 nd	0	4804.0	Horn	H	25.6				
The harmonics were investigated up to the 10 th harmonic. Emissions above the 2 nd harmonic were in the noise floor (NF)									
Single frequency mode Middle Channel									
2 nd	39	4882.0	Horn	V	40.1	61.1	PK.	74	-12.9
2 nd	39	4882.0	Horn	H	37.1				
2 nd	39	4882.0	Horn	V	25.9	46.9	AVE.	54	-7.1
2 nd	39	4882.0	Horn	H	24.1				
The harmonics were investigated up to the 10 th harmonic. Emissions above the 2 nd harmonic were in the NF									
Single frequency mode High Channel									
2 nd	78	4960.0	Horn	V	37.2	58.4	PK.	74	-15.6
2 nd	78	4960.0	Horn	H	37.1				
2 nd	78	4960.0	Horn	V	24.2	45.4	AVE.	54	-8.6
2 nd	78	4960.0	Horn	H	23.8				
The harmonics were investigated up to the 10 th harmonic. Emissions above the 2 nd harmonic were in the NF									

RTS RIM Testing Services	EMI Test Report for the BlackBerry Handheld Model RBK41CG	
Test Report No. RTS-0491-0702-05	Dates of Test January 19 to March 12 2007	Author Data C. O'Neill

Bluetooth Radiated Emissions Test Results cont'd

Using Pattern type "Static PRBS" and packet type "DH5" during the measurements.

Type	Channel	Frequency (MHz)	Antenna		Reading (Peak) (dBuV)	Corrected Reading (dBuV)	Detector (AVE/PK)	Peak Limit (dBuV/m)	Diff. To Limit (dB)
			Type	Pol					
Handheld Standalone, USB down Hopping mode.									
2 nd	0-78	4960.0	Horn	V	NF	NF	PK.	74	-
2 nd	0-78	4960.0	Horn	H	NF				
2 nd	0-78	4960.0	Horn	V	NF	NF	AVE.	54	-
2 nd	0-78	4960.0	Horn	H	NF				
The harmonics were investigated up to the 10 th harmonic. Emissions were in the NF									

The environmental test conditions were:

Temperature	22°C
Pressure	1011 mb
Humidity	22 %

RTS RIM Testing Services	EMI Test Report for the BlackBerry Handheld Model RBK41CG	
Test Report No. RTS-0491-0702-05	Dates of Test January 19 to March 12 2007	Author Data C. O'Neill

Bluetooth Band-Edge Compliance of RF Radiated Emissions Test Results

The test distance was 3.0 metres.

Date of test: February 1, 2007

Handheld standalone, vertical, Pattern type “Static PRBS” and packet type “DH5” during the measurements.

Channel	Freq. (MHz)	Rx Antenna		Detector (PK, AVE.)	VBW (MHz)	Corrected Reading (dBuV/m)	Delta Marker (dB)	Corrected Band edge (dBuV/m)	Limit (dBuV/m)	Diff. To Limit (dB)
		Type	POL.							
0	2402.0	Horn	V	PK	1.0 MHz	95.55	43.6	51.95	74	-22.05
0	2402.0	Horn	H	PK	1.0 MHz	97.65	46.5	51.15	74	-22.85
0	2402.0	Horn	V	AVE.	10 Hz	87.45	43.6	43.85	54	-10.15
0	2402.0	Horn	H	AVE.	10 Hz	89.35	46.5	42.85	54	-11.15

Handheld in standalone, vertical, Pattern type “Static PRBS” and packet type “DH5” during the measurements.

Channel	Freq. (MHz)	Rx Antenna		Detector (PK, AVE.)	VBW (MHz)	Corrected Reading (dBuV/m)	Delta Marker (dB)	Corrected Band edge (dBuV/m)	Limit (dBuV/m)	Diff. To Limit (dB)
		Type	POL.							
78	2480.0	Horn	V	PK	1.0 MHz	88.90	40.5	48.4	74	-25.60
78	2480.0	Horn	H	PK	1.0 MHz	92.20	41.7	50.3	74	-23.70
78	2480.0	Horn	V	AVE.	10 Hz	81.80	40.5	41.3	54	-12.70
78	2480.0	Horn	H	AVE.	10 Hz	85.10	41.7	43.4	54	-10.60

See figures 2-1 to 2-4 for the plots of the Bluetooth band-edge compliance.

RTS RIM Testing Services	EMI Test Report for the BlackBerry Handheld Model RBK41CG	
Test Report No. RTS-0491-0702-05	Dates of Test January 19 to March 12 2007	Author Data C. O'Neill

Bluetooth Band-Edge Compliance of RF Radiated Emissions cont'd

Figure 2-1: Band-Edge Compliance of RF Rad. Emi. Bluetooth, Single freq., Static PBRs, DH5, Channel 0, Pol: V, Detector: PK

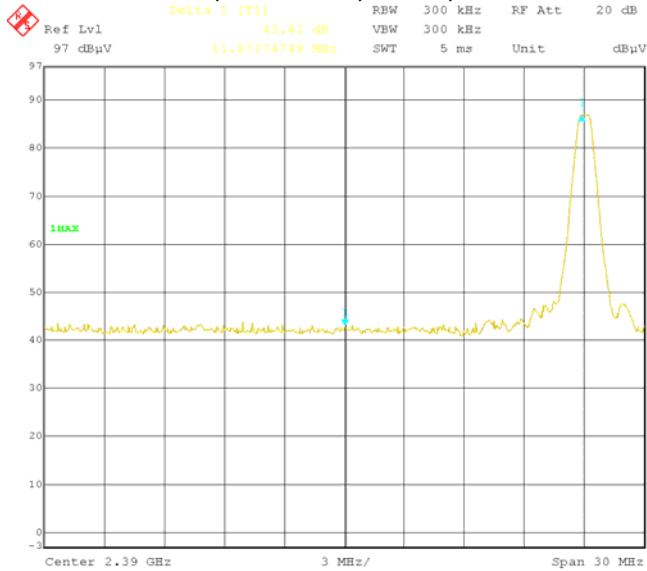


Figure 2-2: Band-Edge Compliance of RF Rad. Emi. Bluetooth, Single freq., Static PBRs, DH5, Channel 0, Pol: H, Detector: PK

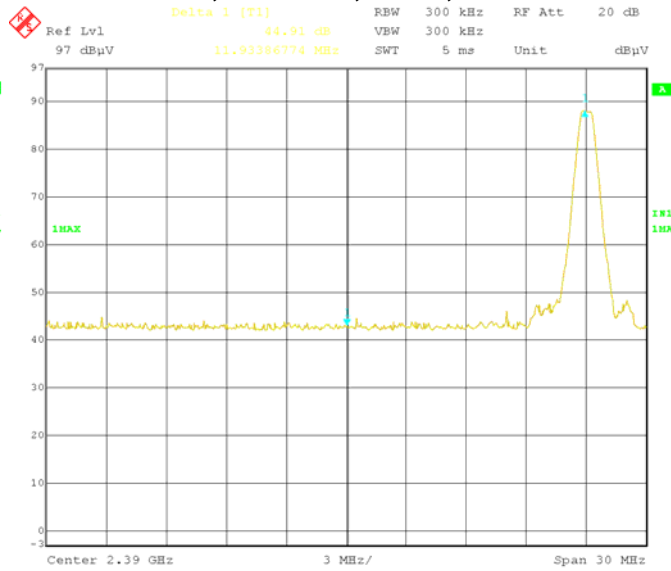


Figure 2-3: Band-Edge Compliance of RF Rad. Emi. Bluetooth, Single freq., Static PBRs, DH5, Channel 78, Pol: V, Detector: PK

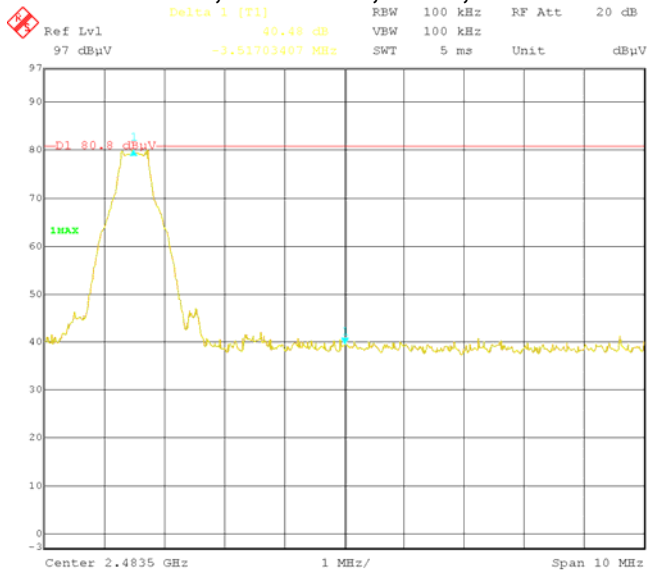
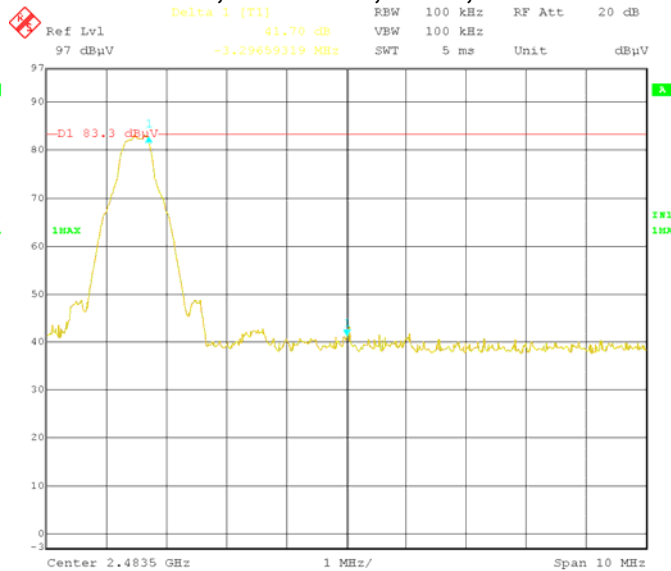


Figure 2-4: Band-Edge Compliance of RF Rad. Emi. Bluetooth, Single freq., Static PBRs, DH5, Channel 78, Pol: H, Detector: PK



RTS RIM Testing Services	EMI Test Report for the BlackBerry Handheld Model RBK41CG	
Test Report No. RTS-0491-0702-05	Dates of Test January 19 to March 12 2007	Author Data C. O'Neill

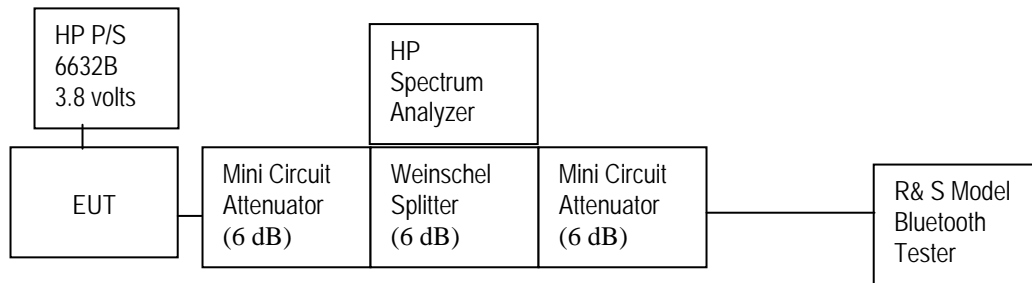
APPENDIX 3 – BLUETOOTH CONDUCTED EMISSIONS TEST DATA/PLOTS

RTS RIM Testing Services	EMI Test Report for the BlackBerry Handheld Model RBK41CG	
Test Report No. RTS-0491-0702-05	Dates of Test January 19 to March 12 2007	Author Data C. O'Neill

Bluetooth RF Conducted Emission Test Results

Bluetooth power output was at maximum for all the recorded measurements shown below.

Test Setup Diagram



A reference offset of 12.4 dB was applied to the spectrum analyzer reference level for the attenuators and coaxial cable loss in the test circuit.

Date of Test: January 19, 2007

RTS RIM Testing Services	EMI Test Report for the BlackBerry Handheld Model RBK41CG	
Test Report No. RTS-0491-0702-05	Dates of Test January 19 to March 12 2007	Author Data C. O'Neill

Bluetooth RF Conducted Emission Test Results cont'd

20 dB Bandwidth

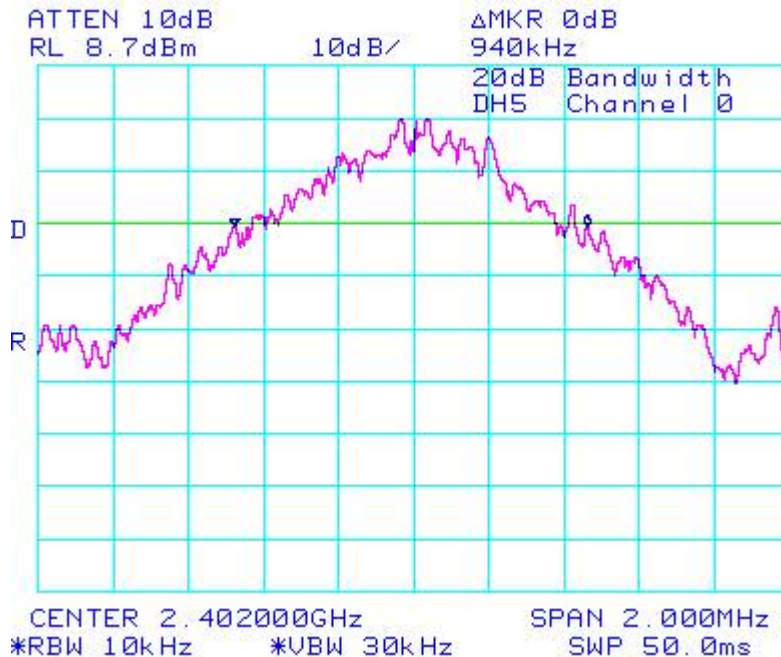
The EUT met the requirements of the 20 dB bandwidth as per 47 CFR 15.247(a) and RSS-210. Low channel (0), middle channel (39) and high channel (78) were measured. Bluetooth was operating in single frequency mode using pattern type Static PRBS and packet type DH5 during the measurements.

Bluetooth Channel	Limit (MHz)	Measured Level (MHz)
0	<=1.0	0.940
39	<=1.0	0.903
78	<=1.0	0.907

See figures 1 to 3 for the plots of the 20 dB bandwidth measurements.

The environmental test conditions were: Temperature 23°C
 Pressure 1007 mb
 Relative Humidity 23%

Figure 1: 20 dB Bandwidth, channel 0



RTS RIM Testing Services	EMI Test Report for the BlackBerry Handheld Model RBK41CG	
Test Report No. RTS-0491-0702-05	Dates of Test January 19 to March 12 2007	Author Data C. O'Neill

Bluetooth RF Conducted Emission Test Results cont'd

Figure 2: 20 dB Bandwidth, channel 39

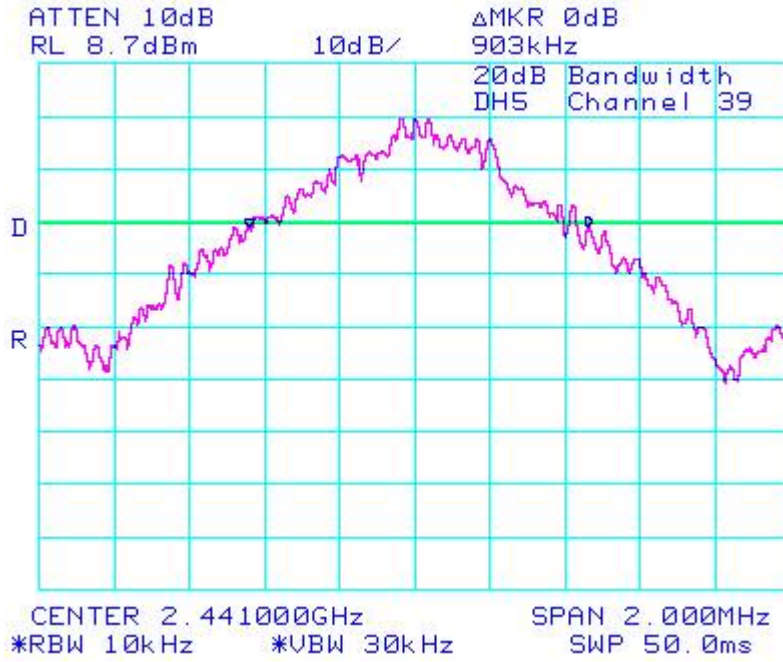
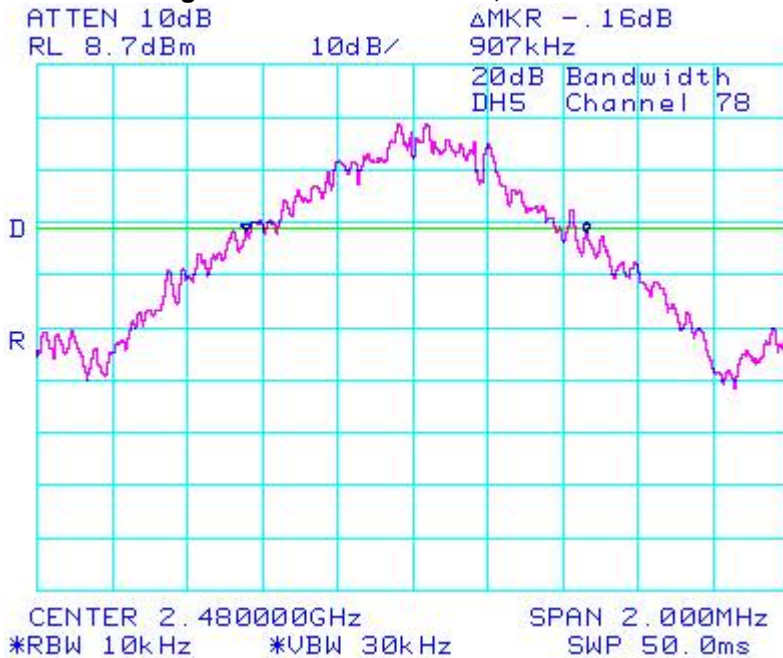


Figure 3: 20 dB Bandwidth, channel 78



RTS RIM Testing Services	EMI Test Report for the BlackBerry Handheld Model RBK41CG	
Test Report No. RTS-0491-0702-05	Dates of Test January 19 to March 12 2007	Author Data C. O'Neill

Bluetooth RF Conducted Emission Test Results cont'd

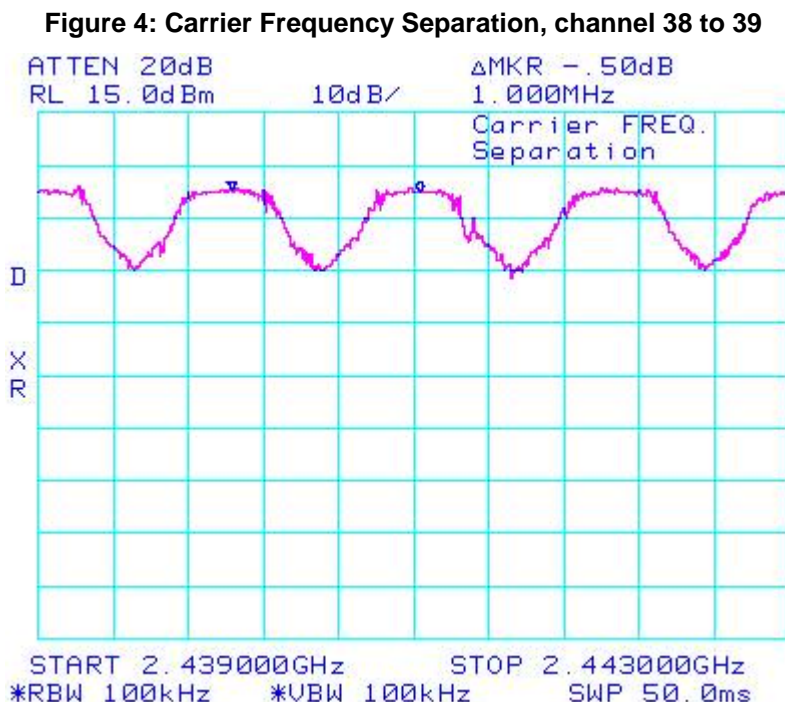
Carrier Frequency Separation

The EUT met the requirements of the Carrier Frequency Separation as per 47 CFR 15.247(a) and RSS-210. Channel 38 to 39 was measured. Bluetooth was operating in frequency hopping (Euro/US) mode using pattern type Static PRBS and packet type DH5 during the measurements.

Bluetooth Channels	Limit (MHz)	Measured Level (MHz)
38 to 39	>= 0.025 or 20 dB bandwidth	1.000

The environmental test conditions were: Temperature 23°C
 Pressure 1007 mb
 Relative Humidity 23%

See figure 4 for the plot of the Carrier Frequency Separation measurement.



RTS RIM Testing Services	EMI Test Report for the BlackBerry Handheld Model RBK41CG	
Test Report No. RTS-0491-0702-05	Dates of Test January 19 to March 12 2007	Author Data C. O'Neill

Bluetooth RF Conducted Emission Test Results cont'd

Number of Hopping Frequencies

The EUT met the requirements of the number of hopping frequencies as per 47 CFR 15.247(a) and RSS-210.

Bluetooth was operating in frequency hopping (Euro/US) mode using pattern type Static PRBS and packet type DH5 during the measurements.

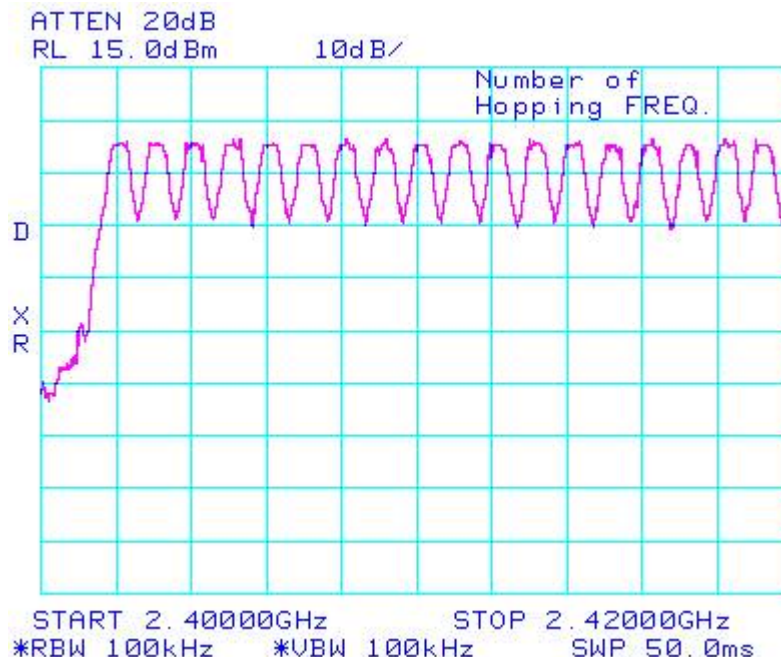
Limit (CH)	Number of Hopping Frequencies (CH)
>= 75	79

The environmental test conditions were:

Temperature	23°C
Pressure	1007 mb
Relative Humidity	23%

See figures 5 to 8 for the plots of the number of hopping frequencies.

Figure 5: Number of Hopping Frequencies



RTS RIM Testing Services	EMI Test Report for the BlackBerry Handheld Model RBK41CG	
Test Report No. RTS-0491-0702-05	Dates of Test January 19 to March 12 2007	Author Data C. O'Neill

Bluetooth RF Conducted Emission Test Results cont'd

Figure 6: Number of Hopping Frequencies

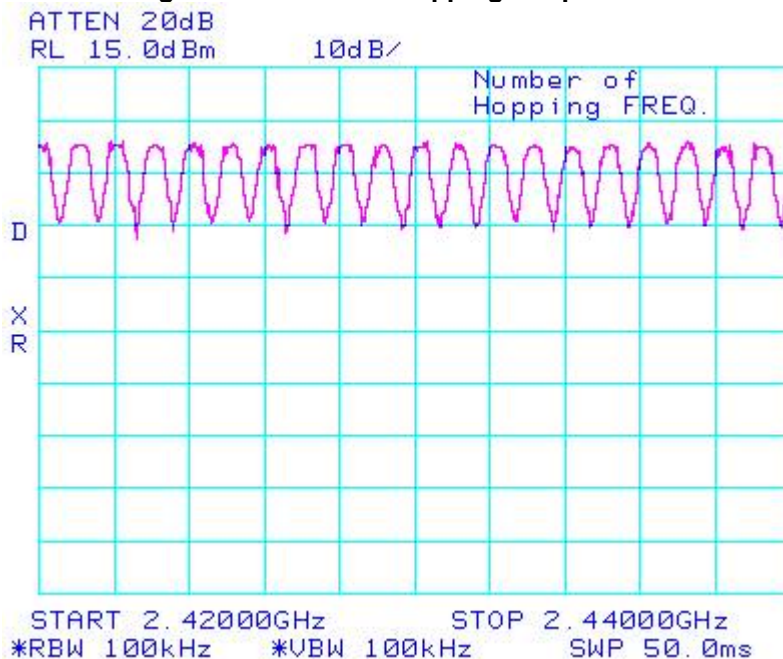
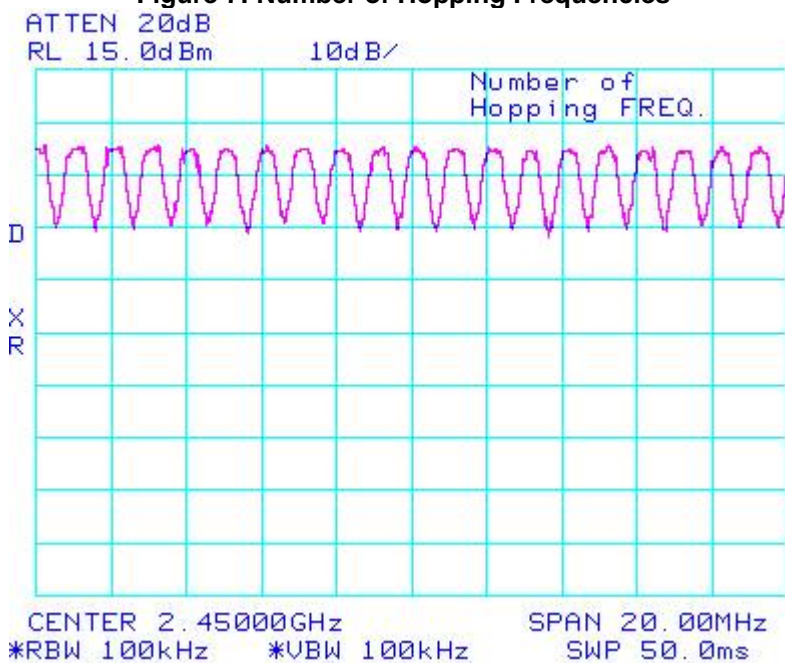


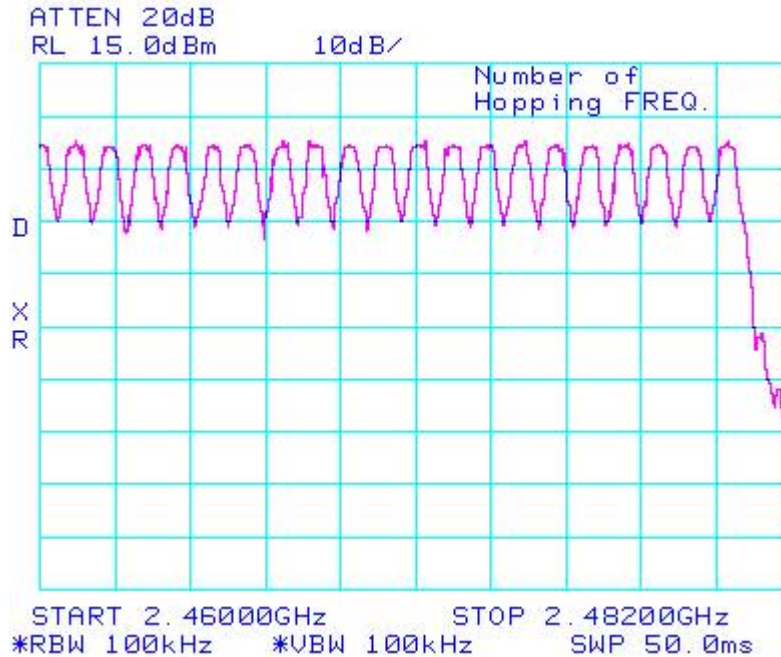
Figure 7: Number of Hopping Frequencies



RTS RIM Testing Services	EMI Test Report for the BlackBerry Handheld Model RBK41CG	
Test Report No. RTS-0491-0702-05	Dates of Test January 19 to March 12 2007	Author Data C. O'Neill

Bluetooth RF Conducted Emission Test Results cont'd

Figure 8: Number of Hopping Frequencies



RTS RIM Testing Services	EMI Test Report for the BlackBerry Handheld Model RBK41CG	
Test Report No. RTS-0491-0702-05	Dates of Test January 19 to March 12 2007	Author Data C. O'Neill

Bluetooth RF Conducted Emission Test Results cont'd

Time of Occupancy (Dwell Time)

The EUT met the requirements of the time of occupancy (dwell time) as per 47 CFR 15.247(a) and RSS-210. Low channel (0), middle channel (39) and high channel (78) were measured in packet types DH1, DH3 and DH5. Bluetooth was operating in frequency hopping (Euro/US) mode during the measurements.

The frequency hopping is 1600 hops per second for a dwell time of 625 μsec. for 79 channels.

A DH1 packet needs one time slot for transmitting and one time slot for receiving. The frequency hopping is 800 hops per second with 79 channels which is 10.127 times per second. As per 15.247(a) (iii) "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". Therefore for 31.6 seconds (79x0.4) there are 320.0 times of appearance.

A DH3 packet needs one time slot for transmitting and one time slot for receiving. The frequency hopping is 400 hops per second with 79 channels which is 5.06 times per second. Therefore for 31.6 seconds there are 159.9 times of appearance.

A DH5 packet needs one time slot for transmitting and one time slot for receiving. The frequency hopping is 266.7 hops per second with 79 channels which is 3.38 times per second. Therefore for 31.6 seconds there are 106.8 times of appearance.

Bluetooth Channel	Mode	Tx Time (ms)	Dwell Time/31.6 sec. (ms)	Limit (ms)	Margin (ms)
0	DH1	0.5242	.5242 x 320.0 = 167.7	400	232.3
39	DH1	0.5270	.5270 x 320.0 = 168.6	400	231.4
78	DH1	0.5213	.5213 x 320.0 = 166.8	400	233.2
0	DH3	1.7773	1.7773 x 159.9 = 284.2	400	115.8
39	DH3	1.7618	1.7618 x 159.9 = 281.7	400	118.3
78	DH3	1.7685	1.7685 x 159.9 = 282.8	400	117.2
0	DH5	3.0213	3.0213 x 106.8 = 322.7	400	77.3
39	DH5	3.0128	3.0128 x 106.8 = 321.8	400	78.2
78	DH5	3.0299	3.0299 x 106.8 = 323.6	400	76.4

The environmental test conditions were: Temperature 23°C
 Pressure 1007 mb
 Relative Humidity 23%

See figures 9 to 17 for the plots of the dwell time.

RTS RIM Testing Services	EMI Test Report for the BlackBerry Handheld Model RBK41CG	
Test Report No. RTS-0491-0702-05	Dates of Test January 19 to March 12 2007	Author Data C. O'Neill

Bluetooth RF Conducted Emission Test Results cont'd

Figure 9: Dwell Time, Low Channel, Packet Type DH1

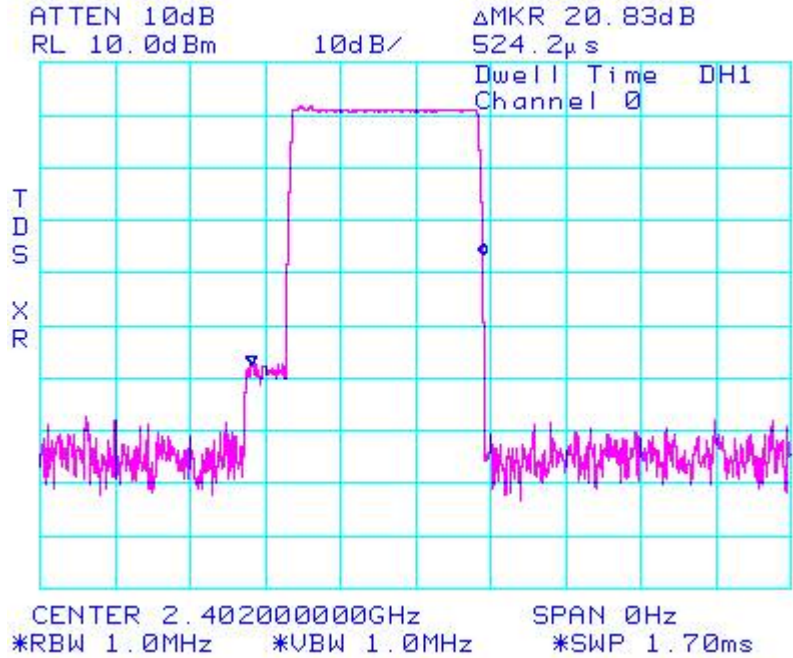
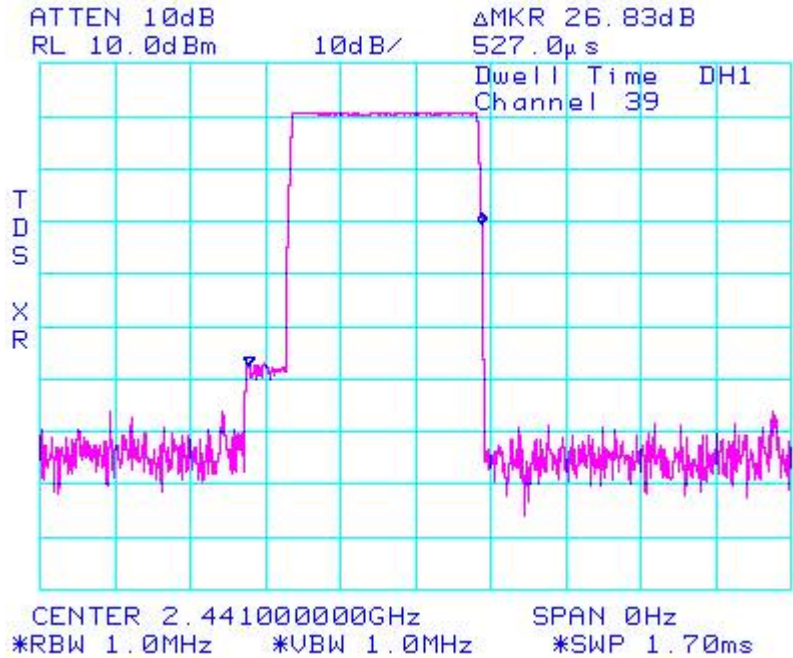
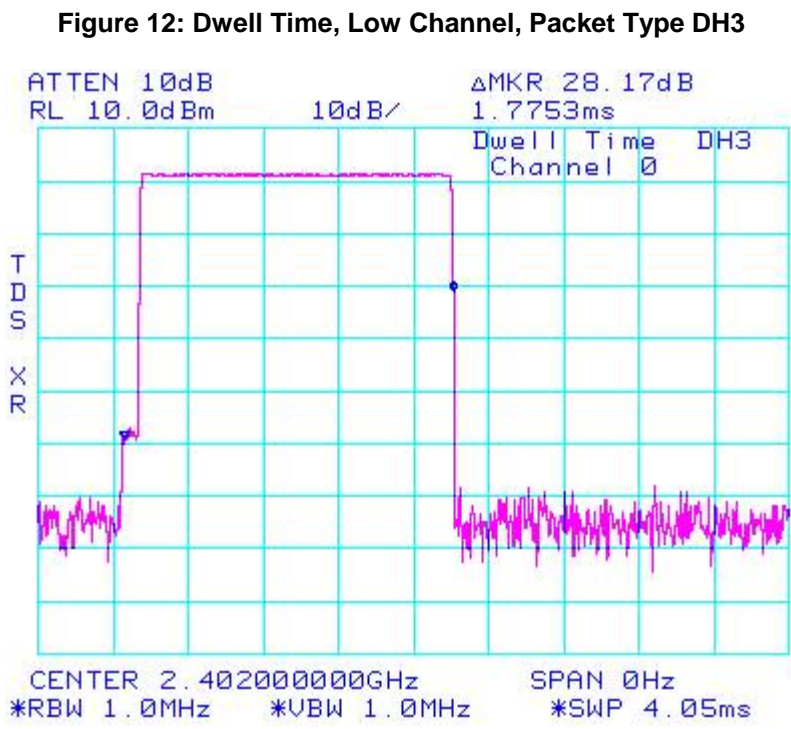
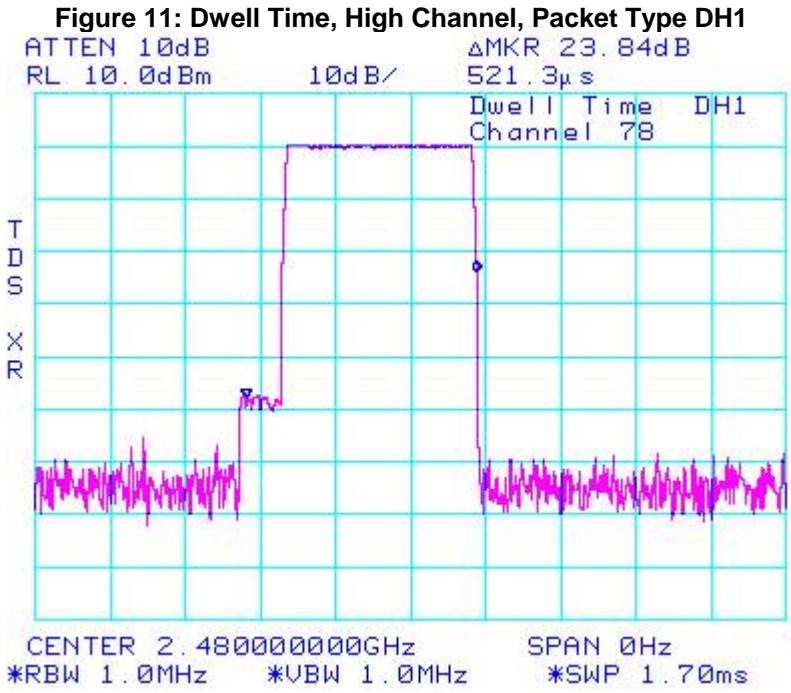


Figure 10: Dwell Time, Middle Channel, Packet Type DH1



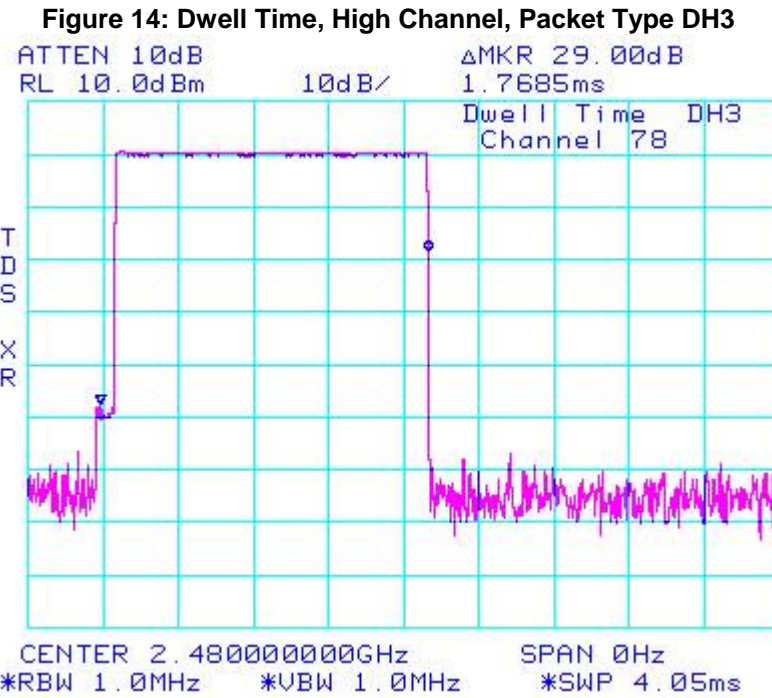
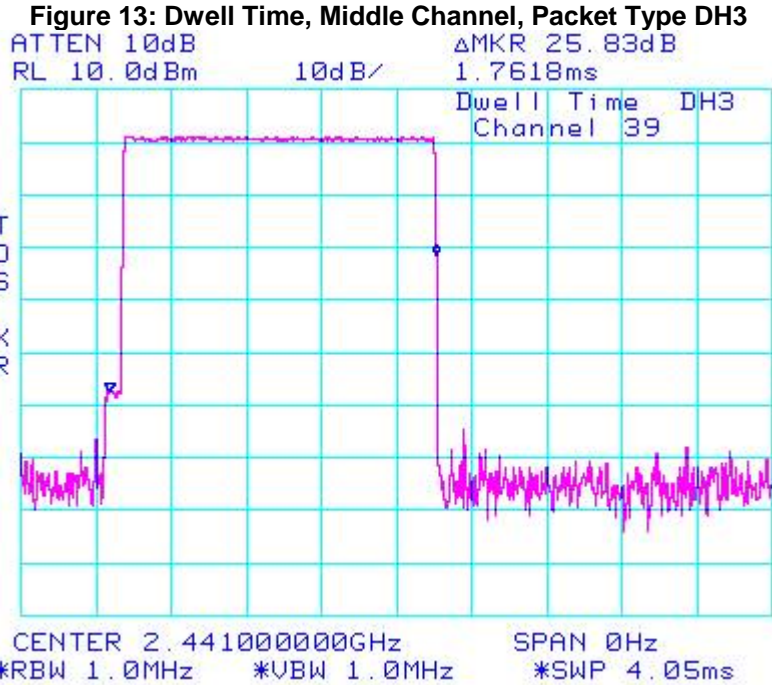
RTS RIM Testing Services	EMI Test Report for the BlackBerry Handheld Model RBK41CG	
Test Report No. RTS-0491-0702-05	Dates of Test January 19 to March 12 2007	Author Data C. O'Neill

Bluetooth RF Conducted Emission Test Results cont'd



RTS RIM Testing Services	EMI Test Report for the BlackBerry Handheld Model RBK41CG	
Test Report No. RTS-0491-0702-05	Dates of Test January 19 to March 12 2007	Author Data C. O'Neill

Bluetooth RF Conducted Emission Test Results cont'd



RTS RIM Testing Services	EMI Test Report for the BlackBerry Handheld Model RBK41CG	
Test Report No. RTS-0491-0702-05	Dates of Test January 19 to March 12 2007	Author Data C. O'Neill

Bluetooth RF Conducted Emission Test Results cont'd

Figure 15: Dwell Time, Low Channel, Packet Type DH5

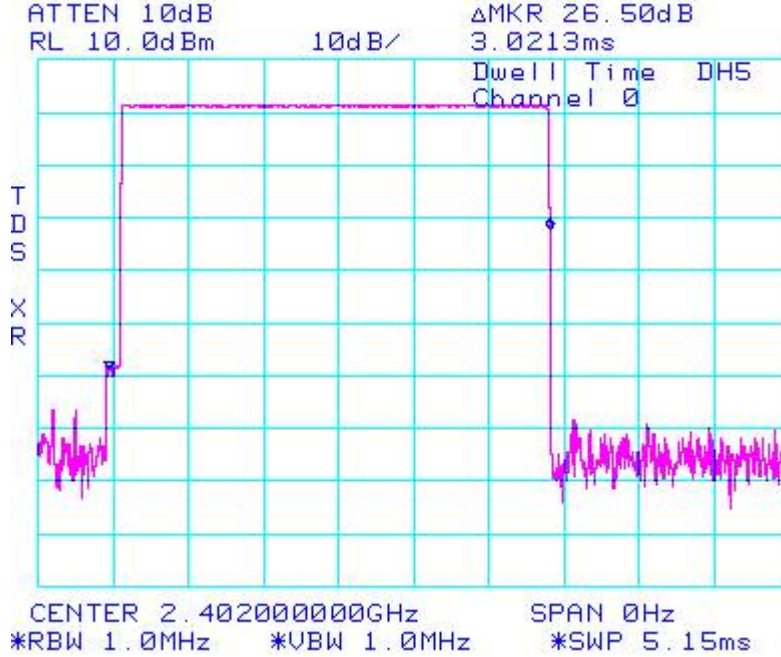
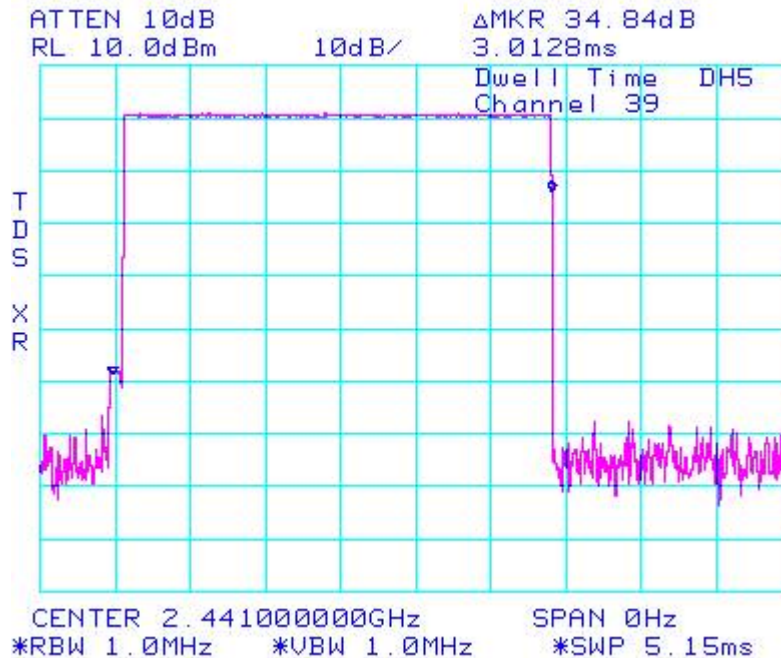


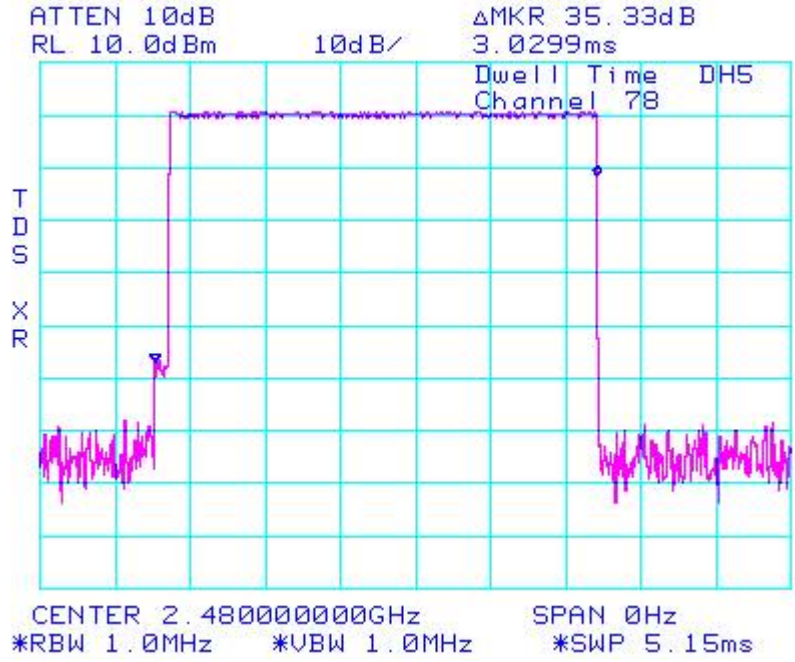
Figure 16: Dwell Time, Middle Channel, Packet Type DH5



RTS RIM Testing Services	EMI Test Report for the BlackBerry Handheld Model RBK41CG	
	Test Report No. RTS-0491-0702-05	Dates of Test January 19 to March 12 2007
	Author Data C. O'Neill	

Bluetooth RF Conducted Emission Test Results cont'd

Figure 17: Dwell Time, High Channel, Packet Type DH5



RTS RIM Testing Services	EMI Test Report for the BlackBerry Handheld Model RBK41CG	
Test Report No. RTS-0491-0702-05	Dates of Test January 19 to March 12 2007	Author Data C. O'Neill

Bluetooth RF Conducted Emission Test Results cont'd

Maximum Peak Conducted Output Power

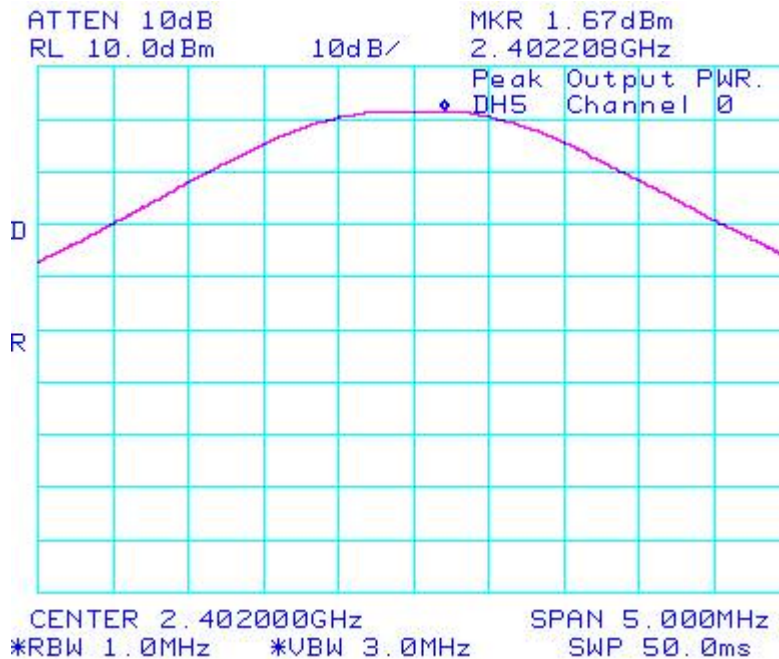
The EUT met the requirements of the maximum peak conducted output power of class 2 as per 47 CFR 15.247(b) and RSS-210. Low channel (0), middle channel (39) and high channel (78) were measured. Bluetooth was operating in single frequency mode during the measurements. A reference offset of 12.4 dB was applied to the spectrum analyzer reference level for the coaxial cable loss and attenuators in the test circuit.

Bluetooth Channel	Measured Level (dBm)	Measured Level (Watt)	Class 2 Limit (dBm)
0	1.67	0.00147	-6.0 to 4.0
39	1.00	0.00126	-6.0 to 4.0
78	0.50	0.00112	-6.0 to 4.0

The environmental test conditions were: Temperature 23°C
Pressure 1007 mb
Relative Humidity 23%

See figures 18 to 20 for the plots of the maximum peak conducted output power.

Figure 18: Maximum Peak Conducted Output Power



RTS RIM Testing Services	EMI Test Report for the BlackBerry Handheld Model RBK41CG	
	Test Report No. RTS-0491-0702-05	Dates of Test January 19 to March 12 2007

Bluetooth RF Conducted Emission Test Results cont'd

Figure 19: Maximum Peak Conducted Output Power

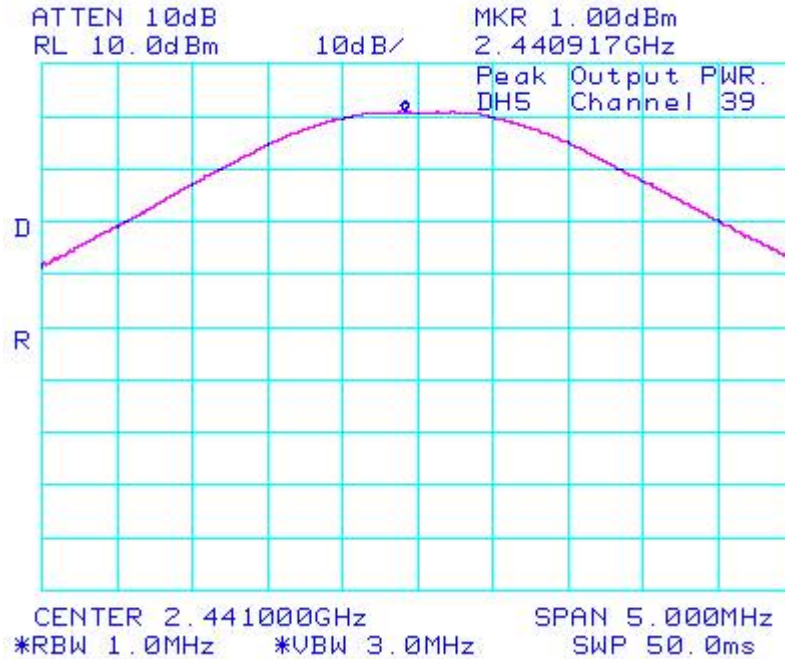
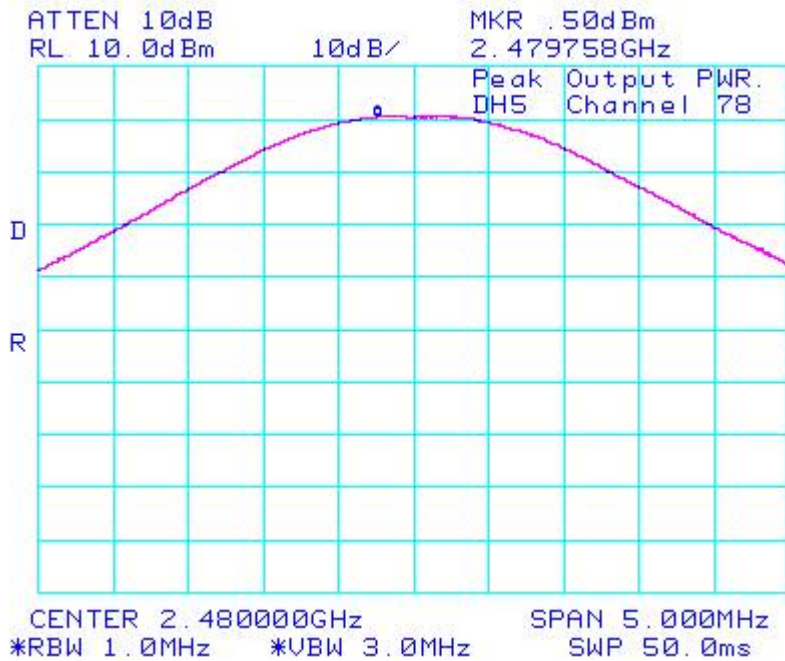


Figure 20: Maximum Peak Conducted Output Power



RTS RIM Testing Services	EMI Test Report for the BlackBerry Handheld Model RBK41CG	
Test Report No. RTS-0491-0702-05	Dates of Test January 19 to March 12 2007	Author Data C. O'Neill

Bluetooth RF Conducted Emission Test Results cont'd

Band Edge Compliance

The EUT met the requirements of the band edge compliance as per 47 CFR 15.247(c) and RSS-210. Low channel (0) and high channel (78) were measured. Bluetooth was operating in single frequency and hopping mode using pattern type Static PRBS and packet type DH5 during the measurements.

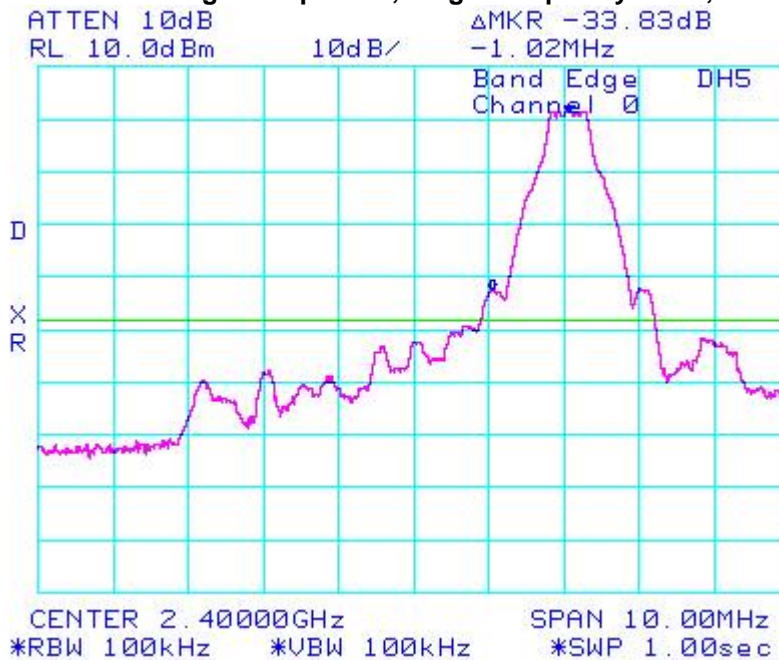
Bluetooth Channel	Operating Mode	Measured Level (dBc)	Limit (dBc)	Margin (dB)
0	Single Frequency	-33.83	-20	-13.83
0 - 78	Hopping	-33.84	-20	-13.84
78	Single Frequency	-35.66	-20	-15.66
0 - 78	Hopping	-35.50	-20	-15.50

The environmental test conditions were:

Temperature	23°C
Pressure	1007 mb
Relative Humidity	23%

See figures 21 to 24 for the plots of the band edge compliance measurements.

Figure 21: Band Edge Compliance, Single Frequency Mode, Channel 0



RTS RIM Testing Services	EMI Test Report for the BlackBerry Handheld Model RBK41CG	
	Test Report No. RTS-0491-0702-05	Dates of Test January 19 to March 12 2007

Bluetooth RF Conducted Emission Test Results cont'd

Figure 22: Band Edge Compliance, Hopping Frequency Mode, Channel 0

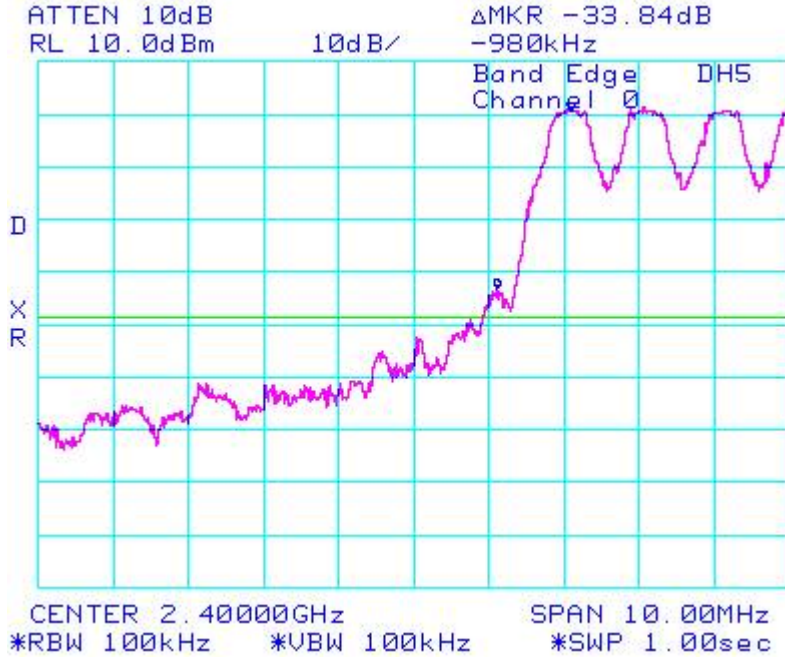
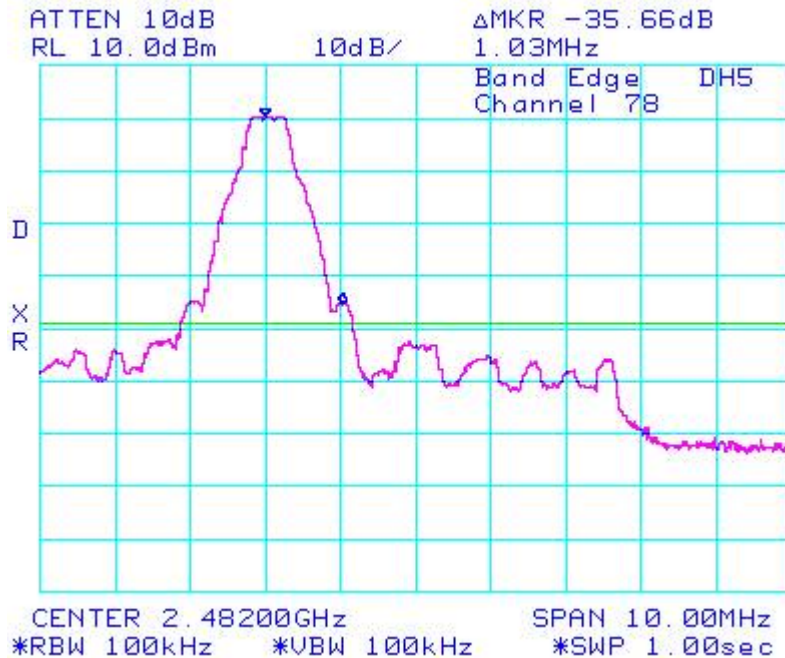


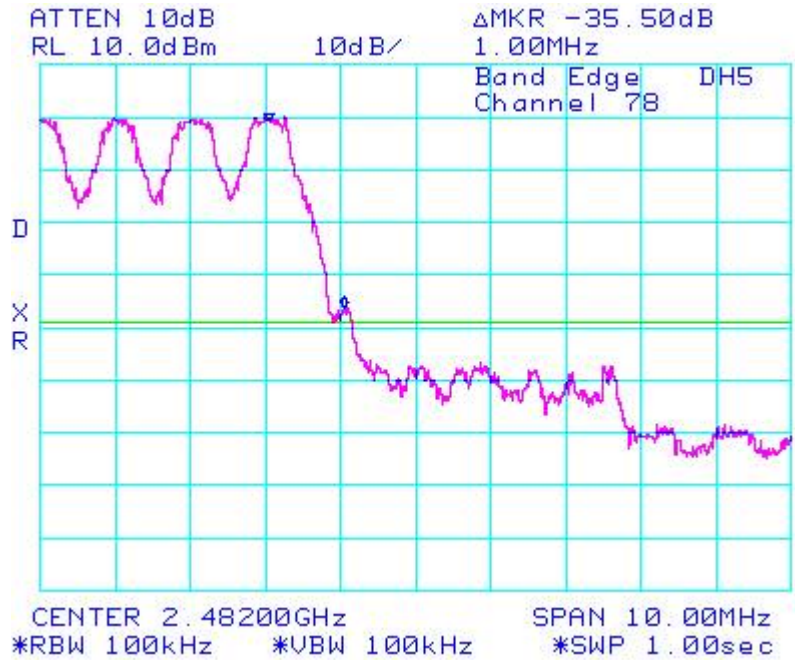
Figure 23: Band Edge Compliance, Single Frequency Mode, Channel 78



RTS RIM Testing Services	EMI Test Report for the BlackBerry Handheld Model RBK41CG	
Test Report No. RTS-0491-0702-05	Dates of Test January 19 to March 12 2007	Author Data C. O'Neill

Bluetooth RF Conducted Emission Test Results cont'd

Figure 24: Band Edge Compliance, Hopping Frequency Mode, Channel 78



RTS RIM Testing Services	EMI Test Report for the BlackBerry Handheld Model RBK41CG	
Test Report No. RTS-0491-0702-05	Dates of Test January 19 to March 12 2007	Author Data C. O'Neill

Bluetooth RF Conducted Emission Test Results cont'd

Spurious RF Conducted Emissions

The EUT met the requirements of the spurious RF conducted emissions as per 47 CFR 15.247(c) and RSS-210. Low channel (0) and high channel (78) were measured. Bluetooth was operating in single frequency mode using pattern type Static PRBS and packet type DH5 during the measurements. A reference offset of 12.4 dB was applied to the spectrum analyzer reference level for the attenuators and coaxial cable loss in the test circuit.

Bluetooth Channel	Channel Power (dBm)	Max. Measured Level (dBm)	Max. Measured Level from carrier (dBc)	Limit (dBc)
0	1.67	-47.67	-49.34	-20
39	1.00	-50.00	-51.00	-20
78	0.50	-54.17	-54.67	-20
Hopping mode	1.67	-47.00	-48.67	-20

The environmental test conditions were: Temperature 25°C
 Pressure 1008 mb
 Relative Humidity 22%

See figures 25 to 32 for the plots of the Spurious RF Conducted Emissions.

RTS RIM Testing Services	EMI Test Report for the BlackBerry Handheld Model RBK41CG	
Test Report No. RTS-0491-0702-05	Dates of Test January 19 to March 12 2007	Author Data C. O'Neill

Bluetooth RF Conducted Emission Test Results cont'd

Figure 25: Spurious RF Conducted Emissions, Channel 0

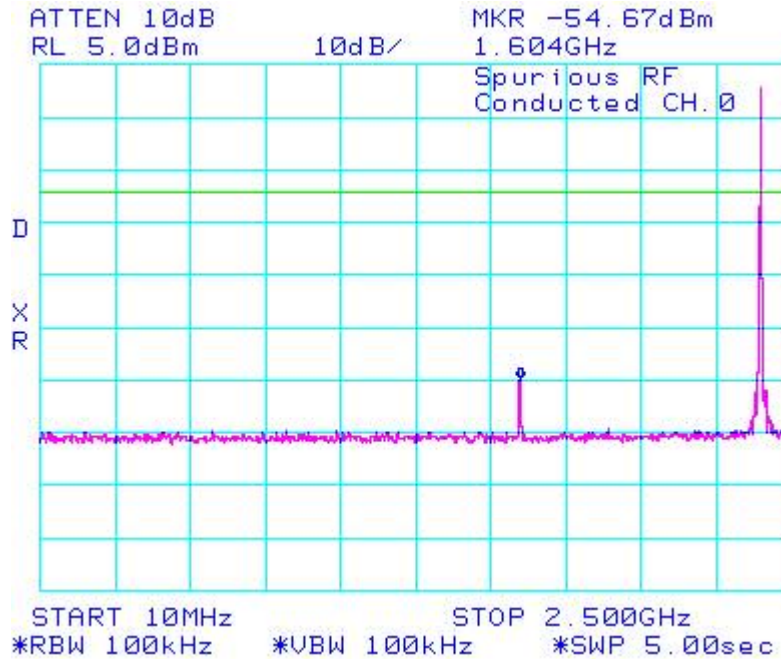
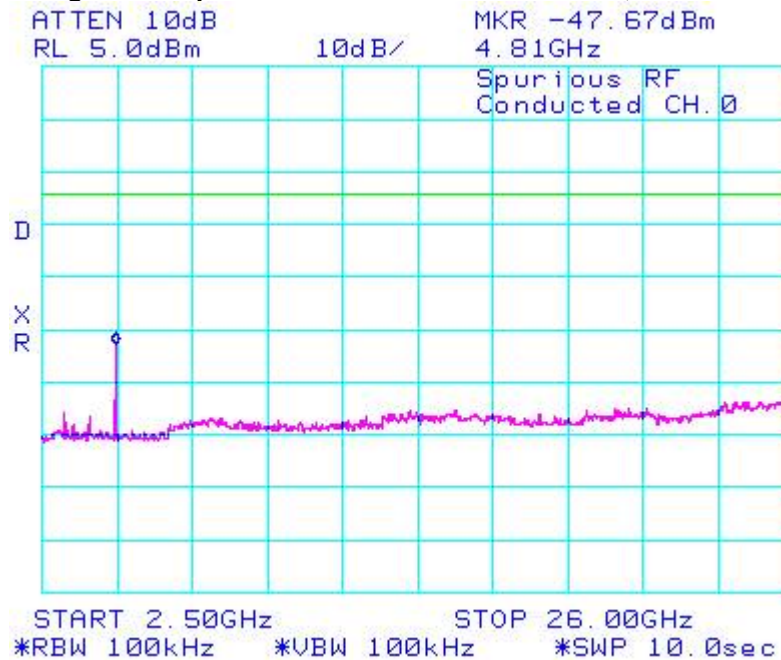


Figure 26: Spurious RF Conducted Emissions, Channel 0



RTS RIM Testing Services	EMI Test Report for the BlackBerry Handheld Model RBK41CG	
Test Report No. RTS-0491-0702-05	Dates of Test January 19 to March 12 2007	Author Data C. O'Neill

Bluetooth RF Conducted Emission Test Results cont'd

Figure 27: Spurious RF Conducted Emissions, Channel 39

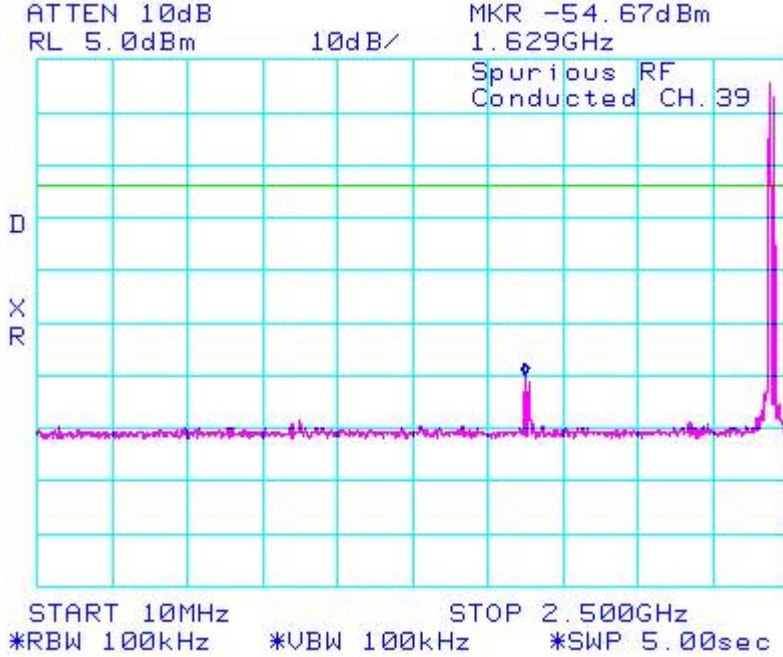
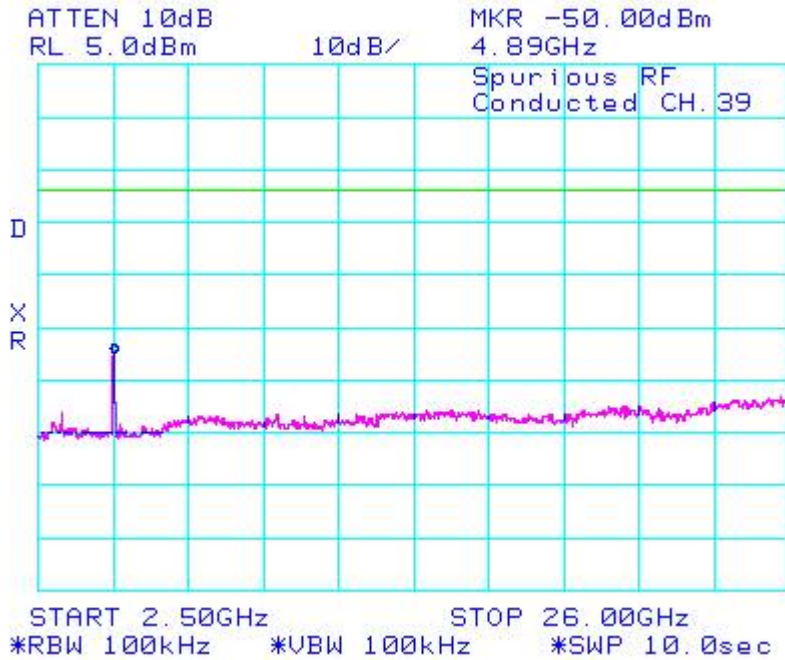


Figure 28: - Spurious RF Conducted Emissions, Channel 39



RTS RIM Testing Services	EMI Test Report for the BlackBerry Handheld Model RBK41CG	
Test Report No. RTS-0491-0702-05	Dates of Test January 19 to March 12 2007	Author Data C. O'Neill

Bluetooth RF Conducted Emission Test Results cont'd

Figure 29: Spurious RF Conducted Emissions, Channel 78

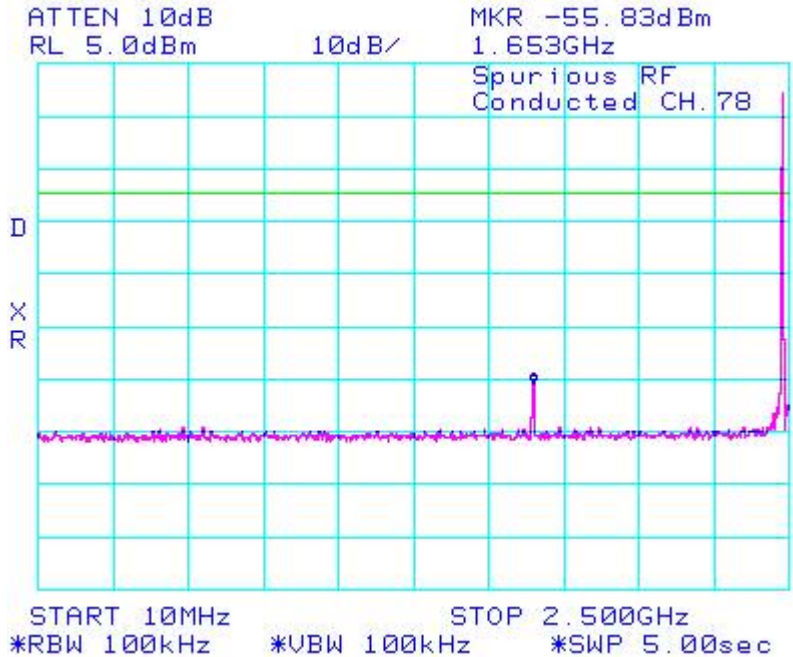
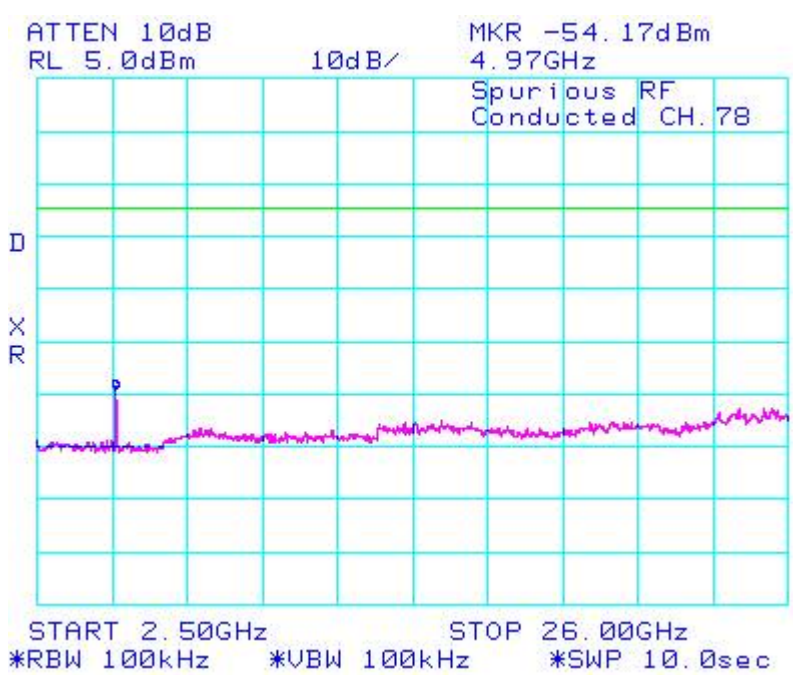


Figure 30: Spurious RF Conducted Emissions, Channel 78



RTS RIM Testing Services	EMI Test Report for the BlackBerry Handheld Model RBK41CG	
Test Report No. RTS-0491-0702-05	Dates of Test January 19 to March 12 2007	Author Data C. O'Neill

Bluetooth RF Conducted Emission Test Results cont'd

Figure 31: Spurious RF Conducted Emissions, Frequency Hopping Mode

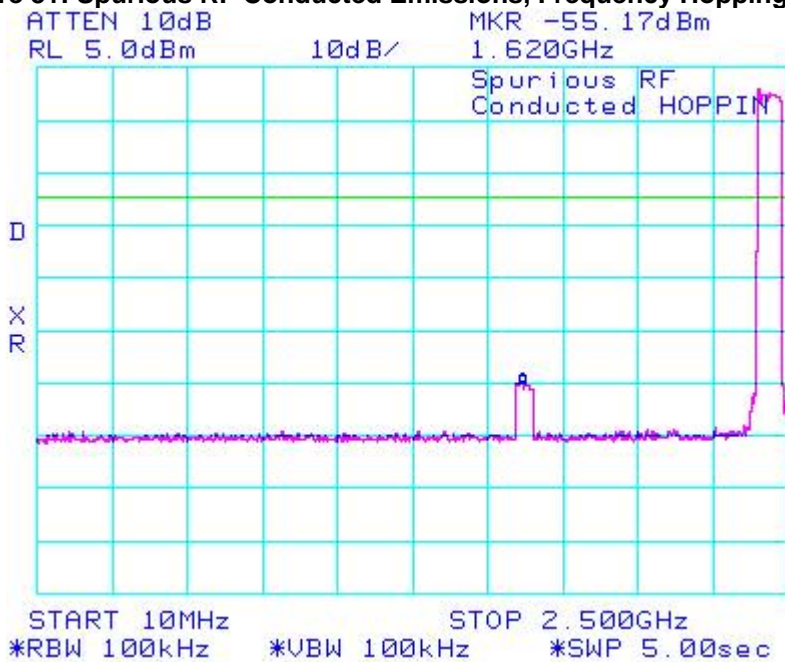


Figure 32: Spurious RF Conducted Emissions, Frequency Hopping Mode

