

EMI Test Report

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

RIM Testing Services (RTS)

A division of Research In Motion Limited

REPORT NO.: RTS-0736-0709-04

PRODUCT MODEL NO.: RBS21CW
TYPE NAME: BlackBerry® smartphone
FCC ID: L6ARBS20CW
IC: 2503A-RBS20CW

DATE: 04 September 2007

RTS RIM Testing Services	EMI Test Report for the BlackBerry® smartphone Model RBS21CW	
Test Report No. RTS-0736-0709-04	Dates of Test August 24 - September 07, 2007	Author Data C. O'Neill

Statement of Performance:

The BlackBerry® smartphone, model RBS21CW, part number CER-16580-001 Rev. 1, 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: 04 Sept 2007

Tested and reviewed by:



Maurice Battler
Compliance Specialist
Date: 07 Sept 2007

Tested and Reviewed by:



Masud S. Attayi, P.Eng.
Team Lead, Regulatory Compliance
Date: 10 Sept 2007

Approved by:



Paul G. Cardinal, Ph.D.
Director
Date: 10 Sept 2007

RTS RIM Testing Services	EMI Test Report for the BlackBerry® smartphone Model RBS21CW	
Test Report No. RTS-0736-0709-04	Dates of Test August 24 - September 07, 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.	Modifications to EUT	5
F.	Summary of Results	6
G.	Compliance Test Equipment Used	10
	APPENDIX 1 – AC LINE CONDUCTED EMISSIONS TEST DATA.....	11
	APPENDIX 2 – RADIATED EMISSIONS TEST DATA	16
	APPENDIX 3 – BLUETOOTH CONDUCTED EMISSIONS TEST DATA/PLOTS.....	23

RTS RIM Testing Services	EMI Test Report for the BlackBerry® smartphone Model RBS21CW	
Test Report No. RTS-0736-0709-04	Dates of Test August 24 - September 07, 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, May 04, 2007
- Industry Canada, RSS-210, Issue 7, June 2007, Low Power Licence-Exempt Radiocommunication Devices
- Industry Canada, RSS-GEN, Issue 2, June 2007, General Requirements and Information for the Certification of Radiocommunication Equipment

B. Associated Documents

1. None.

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 testing was performed August 24 to September 07, 2007.

RTS RIM Testing Services	EMI Test Report for the BlackBerry® smartphone Model RBS21CW	
Test Report No. RTS-0736-0709-04	Dates of Test August 24 - September 07, 2007	Author Data C. O'Neill

The sample BlackBerry® smartphones tested were:

SAMPLE	MODEL	CER NUMBER	PIN
1	RBS21CW	CER-16580-001 Rev. 1	301A4237
2	RBS21CW	CER-16580-001 Rev. 1	301AOF89

AC Conducted and Radiated Emission testing were performed on sample 1.
Conducted Emissions testing was performed on sample 2.

BlackBerry® smartphone Accessories Tested

- 1) Alternative Captive Cable Charger, part number HDW-14917-001 with an output voltage of 5.0 volts dc, 0.50 amps and attached USB cable with a lead length of 1.80 metres.
- 2) BlackBerry® Power Station, part number HDW-12736-001 Rev. 2
- 3) Stereo Headset, 2.5mm, part number HDW-13019-001, 1.3 metres long
- 4) Mono Headset, part number HDW-12420-001, 1.25 metres long.
- 5) TTY adapter, part number HDW-12420-001.

D. Support Equipment Used for the Testing of the EUT

- 1) Communication Tester, Rohde & Schwarz, model CMU 200, serial number 837493/073
- 2) Communication Tester, Rohde & Schwarz, model CMU 200, serial number 102204
- 3) DC Power Supply, H/P, model 6632B, serial number US37472178
- 4) Bluetooth Tester, Rohde & Schwarz, model CBT, serial number 100368

E. Modifications to EUT

No modifications were required on the EUT.

RTS RIM Testing Services	EMI Test Report for the BlackBerry® smartphone Model RBS21CW	
Test Report No. RTS-0736-0709-04	Dates of Test August 24 - September 07, 2007	Author Data C. O'Neill

F. Summary of Results

SPECIFICATION		TEST TYPE	Meets Requirements	TEST DATA
FCC CFR 47	IC			APPENDIX
Part 15.207	RSS-GEN, 7.2.2	Conducted AC Line Emission	Yes	1
Part 15.209 Part 15.247	RSS-210, A8.5	Radiated Spurious Emissions and Radiated Band Edge Compliance	Yes	2
Part 15.247(a)	RSS-210, A8.1	Bluetooth 20 dB Bandwidth	Yes	3
Part 15.247(a)	RSS-210, A8.1	Bluetooth Carrier Frequency Separation	Yes	3
Part 15.247(a)	RSS-210, A8.1d	Bluetooth Number of Hopping Frequencies	Yes	3
Part 15.247(a)	RSS-210, A8.1c	Bluetooth Time of Occupancy (Dwell Time)	Yes	3
Part 15.247(b)	RSS-210, A8.4	Bluetooth Maximum Peak Conducted Output Power	Yes	3
Part 15.247(c)	RSS-210, A8.5	Bluetooth Band-Edge Compliance of RF Conducted Emissions	Yes	3
Part 15.247(c)	RSS-210, A8.5	Bluetooth Spurious RF Conducted Emissions	Yes	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.

The following test configurations were measured. The ac input voltage was 120 volts, 60 Hz.

1. The BlackBerry® smartphone PIN 301A4237 in Bluetooth transmit mode and battery charging mode was connected to the Alternative Captive Cable Charger and the Mono Headset through the TTY adapter.

RTS RIM Testing Services	EMI Test Report for the BlackBerry® smartphone Model RBS21CW	
Test Report No. RTS-0736-0709-04	Dates of Test August 24 - September 07, 2007	Author Data C. O'Neill

2. The BlackBerry® smartphone PIN 301A4237 in Bluetooth transmit mode and battery charging mode was connected to the BlackBerry® Power Station Rev. 2 and the 2.5mm Stereo Headset through the TTY adapter.

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 10.94 dB below the QP limit at 0.178 MHz using the Quasi-peak detector for the BlackBerry® Power Station Rev. 2, test configuration 2.

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 polarizations 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 BlackBerry® smartphone PIN 301A4237 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 10.27 dB at 4960.0 MHz using the peak detector and a worse case test margin of 2.09 dB at 4960.0 MHz using the average detector.

See APPENDIX 2 for the test data

RTS RIM Testing Services	EMI Test Report for the BlackBerry® smartphone Model RBS21CW	
Test Report No. RTS-0736-0709-04	Dates of Test August 24 - September 07, 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 BlackBerry® smartphone PIN 301A4237 met the requirements for the Band-Edge Compliance of RF Radiated Emissions for Bluetooth 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. 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® smartphone Model RBS21CW	
Test Report No. RTS-0736-0709-04	Dates of Test August 24 - September 07, 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 26 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® smartphone Model RBS21CW	
Test Report No. RTS-0736-0709-04	Dates of Test August 24 - September 07, 2007	Author Data C. O'Neill

G. 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
EMC Analyzer	Agilent	E7405A	US40240226	07-10-20	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
EMI Receiver	Rohde & Schwarz	ESIB-40	831438/004	08-02-01	Radiated Emissions
Universal Radio Communication Tester	Rohde & Schwarz	CMU 200	102204	08-04-22	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	Control Company	15-077-21	51129471	08-05-22	Frequency Stability
Environmental Chamber	ESPEC Corp.	SH-240S1	91005607	N/R	Frequency Stability
Bluetooth Tester	Rohde & Schwarz	CBT	100368	08-04-26	Conducted/Radiated Emissions
Signal Generator	Agilent	8648C	4037U03155	07-09-13	Frequency Stability
Digital Multimeter	Hewlett Packard	34401A	US36042324	07-09-19	Conducted/Radiated Emissions
L.I.S.N.	Emco	3816/2	1120	08-08-20	Conducted Emissions
Impulse Limiter	Rohde & Schwarz	ESHS-Z2	100475	08-08-20	Conducted Emissions

RTS RIM Testing Services	EMI Test Report for the BlackBerry® smartphone Model RBS21CW	
Test Report No. RTS-0736-0709-04	Dates of Test August 24 - September 07, 2007	Author Data C. O'Neill

APPENDIX 1 – AC LINE CONDUCTED EMISSIONS TEST DATA

RTS RIM Testing Services	EMI Test Report for the BlackBerry® smartphone Model RBS21CW	
Test Report No. RTS-0736-0709-04	Dates of Test August 24 - September 07, 2007	Author Data C. O'Neill

AC Conducted Emissions Test Results

The measurements were performed by Vimal Olaganathan.

Test Configuration 1

The environmental test conditions were:

Temperature	24°C
Pressure	1016 mb
Relative Humidity	34%

Date of test: August 27, 2007

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) (dBµV)	Limit (QP) (dBµV)	Limit (AV)	Margin (QP) Limits (dB)	Margin (AV) Limits (dB)
0.160	N	43.30	9.89	53.19	65.21	55.21	-12.02	-2.02
0.187	L1	39.69	9.89	49.58	63.61	53.61	-14.03	-4.03
0.203	N	35.43	9.89	45.32	62.82	52.82	-17.49	-7.49
0.201	L1	35.43	9.90	45.33	62.63	52.63	-17.31	-7.31
0.546	L1	21.11	9.92	31.03	56.00	46.00	-24.97	-14.97

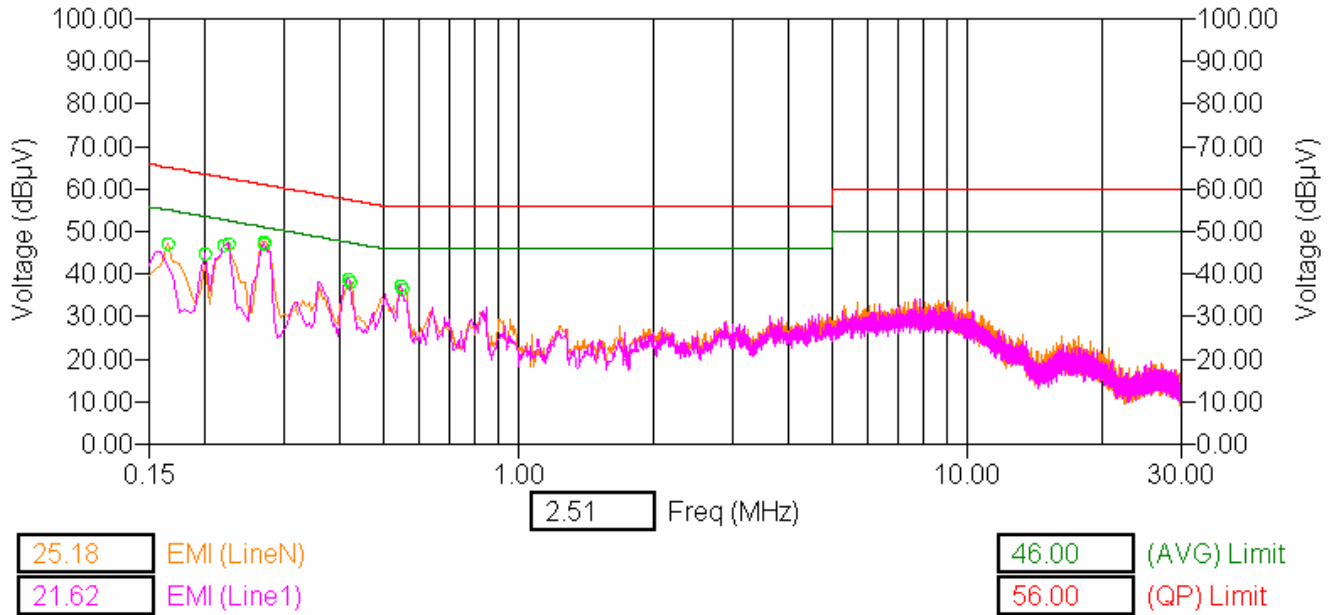
All other emission levels had a test margin of greater than 25 dB.

Measurements were done with the quasi-peak detector.

See graph 1 for the measurement plot.

RTS RIM Testing Services	EMI Test Report for the BlackBerry® smartphone Model RBS21CW	
Test Report No. RTS-0736-0709-04	Dates of Test August 24 - September 07, 2007	Author Data C. O'Neill

AC Conducted Emissions Test Graph 1



Test Configuration 1

RTS RIM Testing Services	EMI Test Report for the BlackBerry® smartphone Model RBS21CW	
Test Report No. RTS-0736-0709-04	Dates of Test August 24 - September 07, 2007	Author Data C. O'Neill

AC Conducted Emissions Test Results cont'd

The measurements were performed by Anas Hawari.

Test Configuration 2

The environmental test conditions were: Temperature 24°C
 Pressure 1010 mb
 Relative Humidity 32%

Date of test: September 07, 2007

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) (dBµV)	Limit (QP) (dBµV)	Limit (AV)	Margin (QP) Limits (dB)	Margin (AV) Limits (dB)
0.155	N	44.9	9.89	54.79	66	56	-11.21	-1.21
0.151	L1	45.16	9.89	55.05	66	56	-10.95	-0.95
0.178	N	43.43	9.89	53.32	64.26	54.26	-10.94	-0.94
0.187	N	41.74	9.89	51.63	63.61	53.61	-11.98	-1.98
0.2	L1	40.7	9.89	50.59	63.61	53.61	-13.02	-3.02
0.215	L1	39.55	9.89	49.44	63.01	53.01	-13.57	-3.57
0.235	N	38.03	9.90	47.93	61.76	51.76	-13.83	-3.83
0.254	N	36.66	9.90	46.56	61.43	51.43	-14.87	-4.87
0.249	L1	37.09	9.90	46.99	61.27	51.27	-14.28	-4.28
0.308	L1	32.83	9.91	42.74	59.71	49.71	-16.96	-6.96
0.423	L1	25.7	9.94	35.64	57.45	47.45	-21.81	-11.81
0.468	N	25.37	9.94	35.31	56.69	46.69	-21.38	-11.38

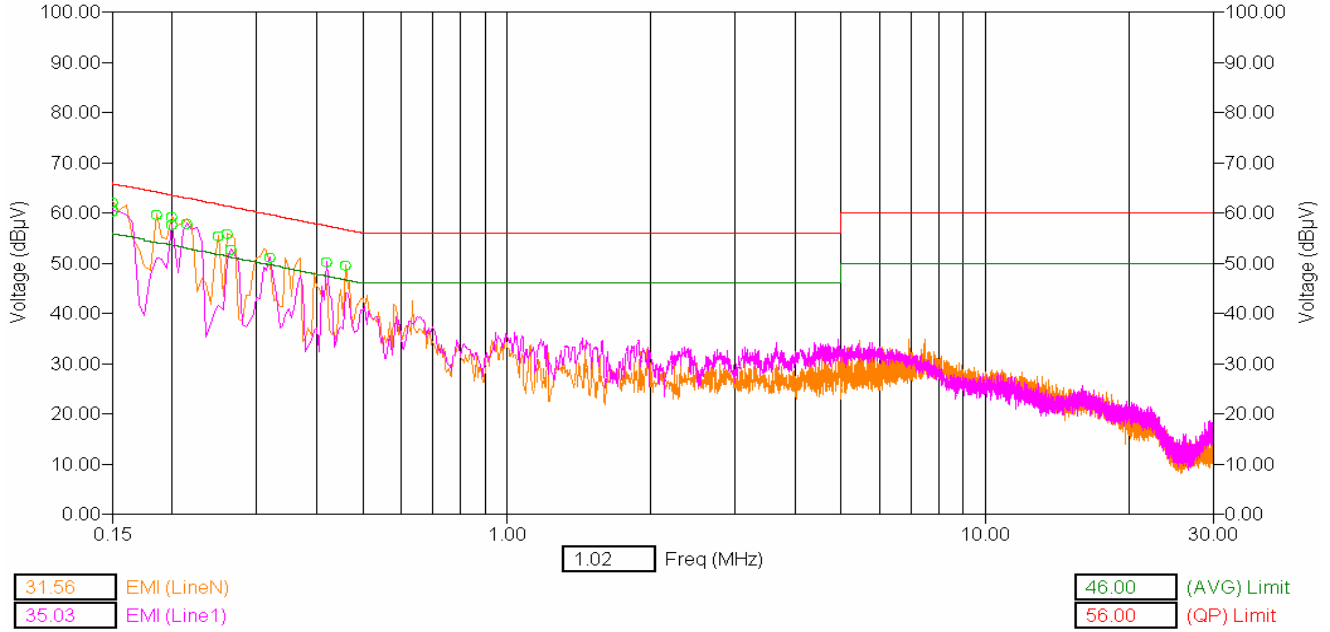
All other emission levels had a test margin of greater than 25 dB.

Measurements were done with the quasi-peak detector.

See graph 2 for the measurement plot.

RTS RIM Testing Services	EMI Test Report for the BlackBerry® smartphone Model RBS21CW	
Test Report No. RTS-0736-0709-04	Dates of Test August 24 - September 07, 2007	Author Data C. O'Neill

AC Conducted Emissions Test Graph 2



Test Configuration 2

RTS RIM Testing Services	EMI Test Report for the BlackBerry® smartphone Model RBS21CW	
Test Report No. RTS-0736-0709-04	Dates of Test August 24 - September 07, 2007	Author Data C. O'Neill

APPENDIX 2 – RADIATED EMISSIONS TEST DATA

RTS RIM Testing Services	EMI Test Report for the BlackBerry® smartphone Model RBS21CW	
Test Report No. RTS-0736-0709-04	Dates of Test August 24 - September 07, 2007	Author Data C. O'Neill

Radiated Emissions Test Data Results

The measurements were performed by Anas Hawari.

Bluetooth Band

The environmental test conditions were:

Temperature	24°C
Pressure	1031 mb
Relative Humidity	31%

Date of Test: August 30, 2007

Test Distance was 3.0 metres with a EUT height of 0.8 metres, 30 MHz to 1000 MHz. The BlackBerry® smartphone PIN 301A4237 was in standalone, vertical position.

The frequency sweep 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 (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)							
30.050	V	1.85	248	PK	34.20	-17.71	16.49	40.00	-23.51

All other emissions had a test margin greater than 25.0 dB.

RTS RIM Testing Services	EMI Test Report for the BlackBerry® smartphone Model RBS21CW	
Test Report No. RTS-0736-0709-04	Dates of Test August 24 - September 07, 2007	Author Data C. O'Neill

Radiated Emissions Test Data Results cont'd

Bluetooth Band

The environmental test conditions were:

Temperature	25°C
Pressure	1011 mb
Relative Humidity	31%

Date of Test: August 29, 2007

Test Distance was 3.0 metres with a EUT height of 0.8 metres, 1 GHz to 25 GHz.
The BlackBerry® smartphone PIN 301A4237 was in standalone, vertical position.

The frequency sweep 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® smartphone Model RBS21CW	
Test Report No. RTS-0736-0709-04	Dates of Test August 24 - September 07, 2007	Author Data C. O'Neill

Bluetooth Radiated Emissions Test Results cont'd

Bluetooth Band

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)				
BlackBerry® smartphone Standalone, Vertical Hopping mode.									
2 nd	0-78	4960.0	Horn	V	43.33	61.17	PK.	74	-12.83
2 nd	0-78	4960.0	Horn	H	43.38				
2 nd	0-78	4960.0	Horn	V	29.67	47.46	AVE.	54	-6.54
2 nd	0-78	4960.0	Horn	H	29.67				
The emissions were investigated up to the 10 th harmonic. Emissions were in the NF									

The environmental test conditions were:

Temperature	25°C
Pressure	1011 mb
Humidity	33%

RTS RIM Testing Services	EMI Test Report for the BlackBerry® smartphone Model RBS21CW	
Test Report No. RTS-0736-0709-04	Dates of Test August 24 - September 07, 2007	Author Data C. O'Neill

Band-Edge Compliance of RF Radiated Emissions Test Results

The measurements were performed by Masud Attayi.

Bluetooth Band

The test distance was 3.0 metres.

Date of test: August 31, 2007

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

Channel	Freq. (MHz)	Rx Antenna		Detector	VBW (MHz)	Corrected Reading (dBuV/m)	Delta Marker (dB)	Corrected Band edge (dBuV/m)	Limit (dBuV/m)	Diff. To Limit (dB)
		Type	POL.	(PK, AVE.)						
0	2402.0	Horn	V	PK	1.0 MHz	88.05	41.1	46.95	74	-27.05
0	2402.0	Horn	H	PK	1.0 MHz	89.35	36.5	52.85	74	-21.15
0	2402.0	Horn	V	AVE.	10 Hz	81.85	41.1	40.75	54	-13.25
0	2402.0	Horn	H	AVE.	10 Hz	82.35	36.5	45.85	54	-8.15

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

Channel	Freq. (MHz)	Rx Antenna		Detector	VBW (MHz)	Corrected Reading (dBuV/m)	Delta Marker (dB)	Corrected Band edge (dBuV/m)	Limit (dBuV/m)	Diff. To Limit (dB)
		Type	POL.	(PK, AVE.)						
78	2480.0	Horn	V	PK	1.0 MHz	84.70	35.9	48.8	74	-25.2
78	2480.0	Horn	H	PK	1.0 MHz	87.90	39.9	48.0	74	-26.0
78	2480.0	Horn	V	AVE.	10 Hz	77.70	35.9	41.8	54	-12.2
78	2480.0	Horn	H	AVE.	10 Hz	81.00	39.9	41.1	54	-12.9

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® smartphone Model RBS21CW	
	Test Report No. RTS-0736-0709-04	Dates of Test August 24 - September 07, 2007

Band-Edge Compliance of RF Radiated Emissions cont'd

Bluetooth Band

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

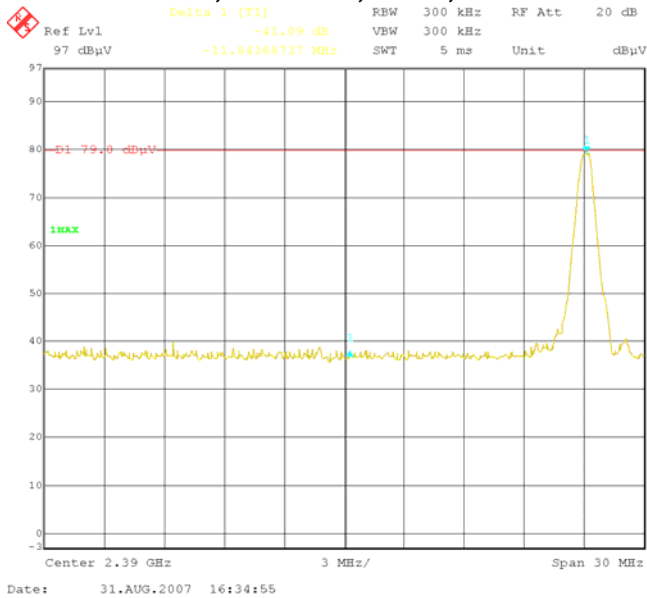


Figure 2-2: Band-Edge Compliance of RF Rad. Emi. Bluetooth, Single freq., Static PBRs, DH5, Channel 0, Pol: H, Detector: PK

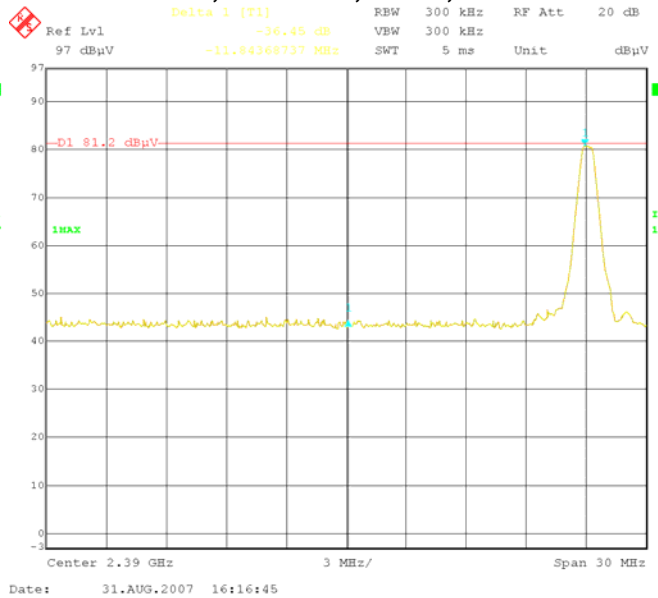


Figure 2-3: Band-Edge Compliance of RF Rad. Emi. Bluetooth, Single freq., Static PBRs, DH5, Channel 78, Pol: V, Detector: PK

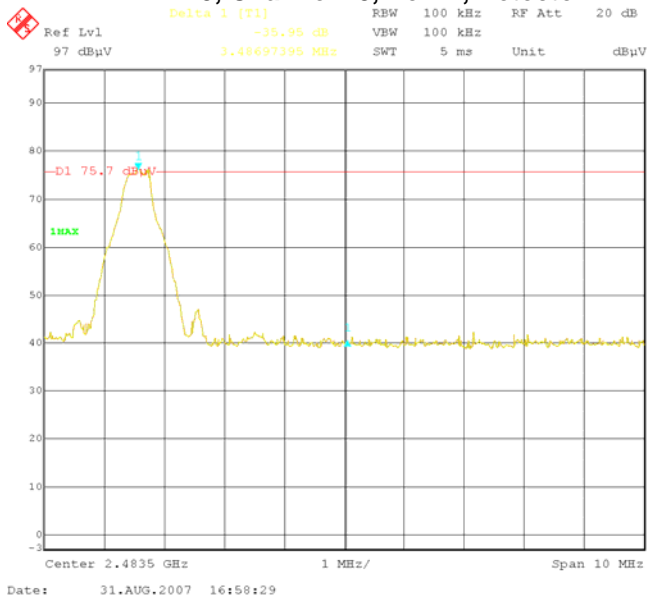
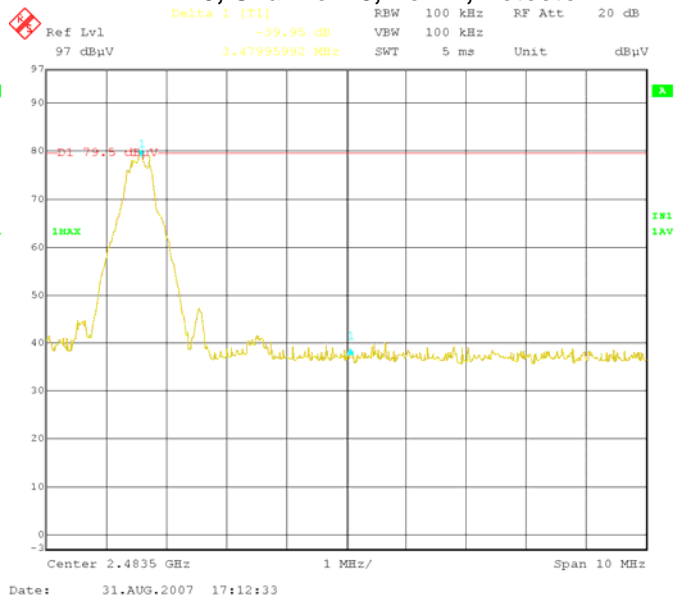


Figure 2-4: Band-Edge Compliance of RF Rad. Emi. Bluetooth, Single freq., Static PBRs, DH5, Channel 78, Pol: H, Detector: PK



RTS RIM Testing Services	EMI Test Report for the BlackBerry® smartphone Model RBS21CW	
Test Report No. RTS-0736-0709-04	Dates of Test August 24 - September 07, 2007	Author Data C. O'Neill

APPENDIX 3 – BLUETOOTH CONDUCTED EMISSIONS TEST DATA/PLOTS

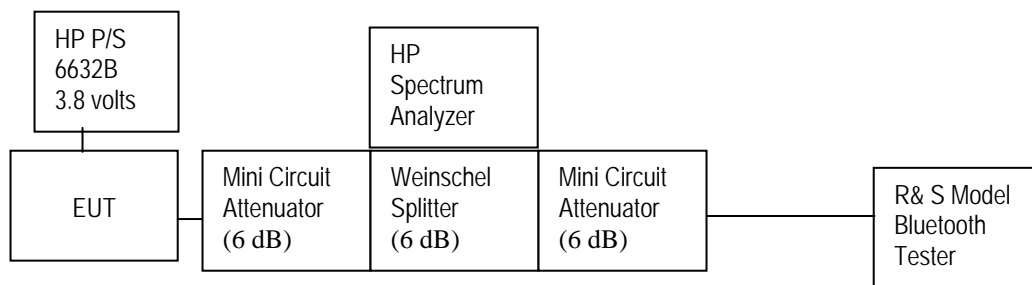
RTS RIM Testing Services	EMI Test Report for the BlackBerry® smartphone Model RBS21CW	
Test Report No. RTS-0736-0709-04	Dates of Test August 24 - September 07, 2007	Author Data C. O'Neill

Bluetooth RF Conducted Emission Test Results

The measurements were performed by Maurice Battler.

Bluetooth power output was at maximum for all the recorded measurements shown below on the BlackBerry® smartphone PIN 301AOF89.

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(s) of Test: August 24 - September 05, 2007

RTS RIM Testing Services	EMI Test Report for the BlackBerry® smartphone Model RBS21CW	
	Test Report No. RTS-0736-0709-04	Dates of Test August 24 - September 07, 2007

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.

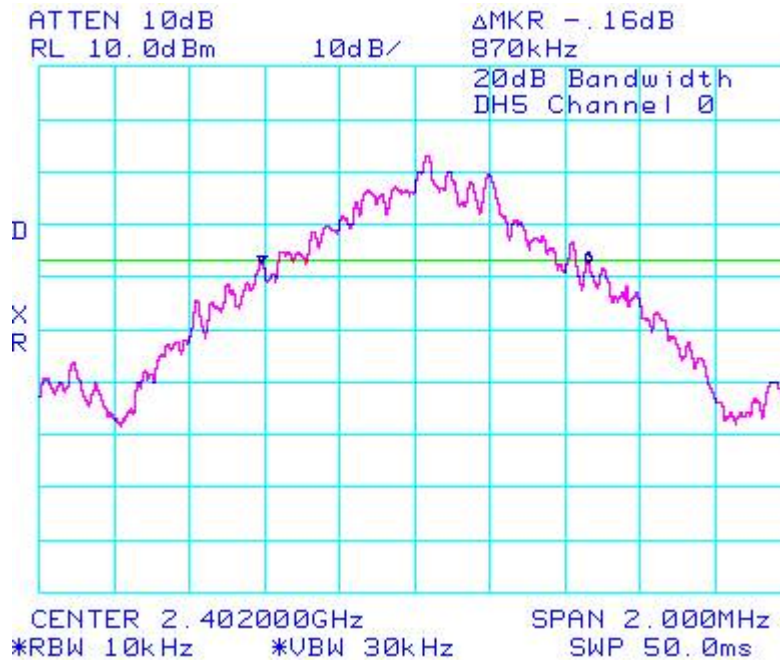
Bluetooth Channel	Limit (MHz)	Measured Level (MHz)
0	≤1.0	0.870
39	≤1.0	0.867
78	≤1.0	0.823

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

The environmental test conditions were:

Temperature	24°C
Pressure	1017 mb
Relative Humidity	31%

Figure 1: 20 dB Bandwidth, channel 0



RTS RIM Testing Services	EMI Test Report for the BlackBerry® smartphone Model RBS21CW	
Test Report No. RTS-0736-0709-04	Dates of Test August 24 - September 07, 2007	Author Data C. O'Neill

Bluetooth RF Conducted Emission Test Results cont'd

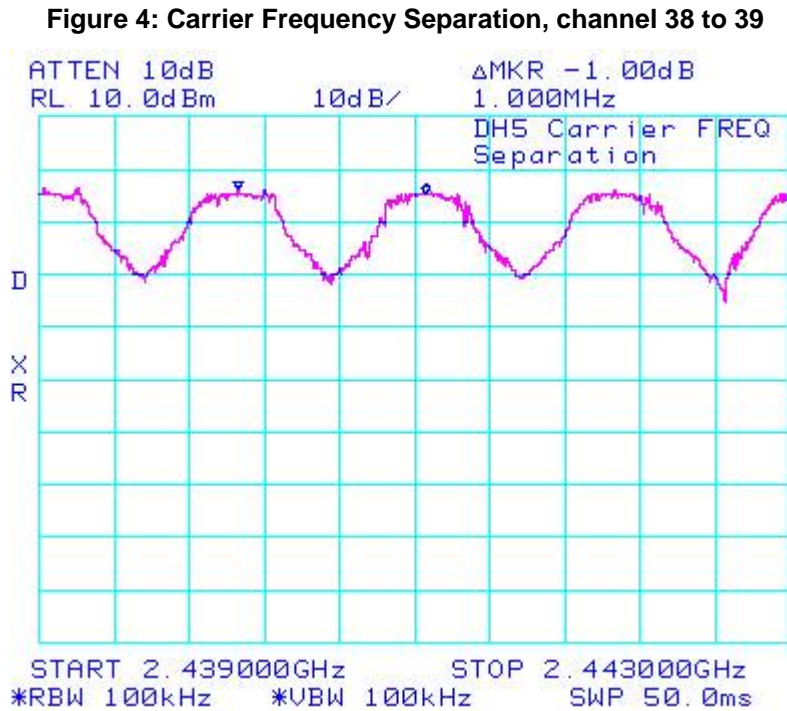
Carrier Frequency Separation

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 24°C
Pressure 1017 mb
Relative Humidity 31%

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



RTS RIM Testing Services	EMI Test Report for the BlackBerry® smartphone Model RBS21CW	
Test Report No. RTS-0736-0709-04	Dates of Test August 24 - September 07, 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.

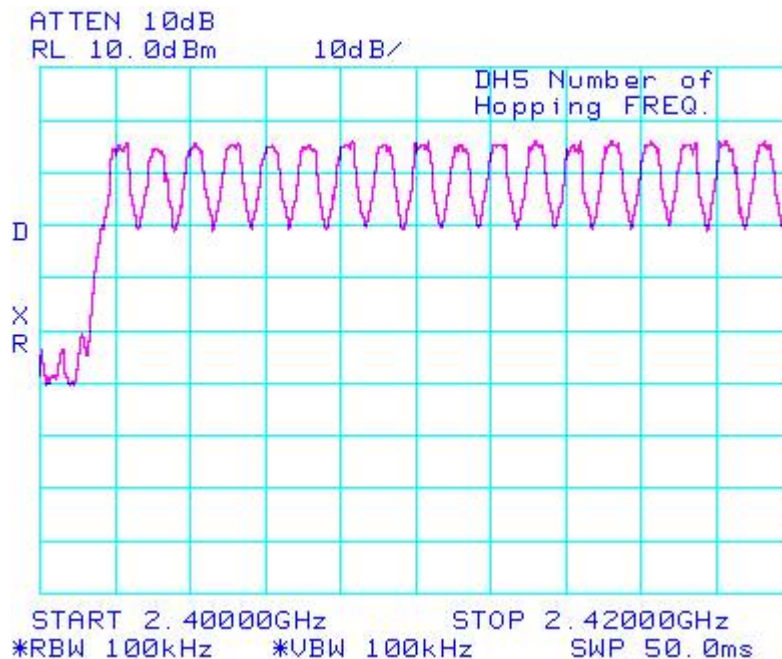
Limit (CH)	Number of Hopping Frequencies (CH)
≥ 75	79

The environmental test conditions were:

Temperature	24°C
Pressure	1017 mb
Relative Humidity	31%

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® smartphone Model RBS21CW	
Test Report No. RTS-0736-0709-04	Dates of Test August 24 - September 07, 2007	Author Data C. O'Neill

Bluetooth RF Conducted Emission Test Results cont'd

Figure 6: Number of Hopping Frequencies

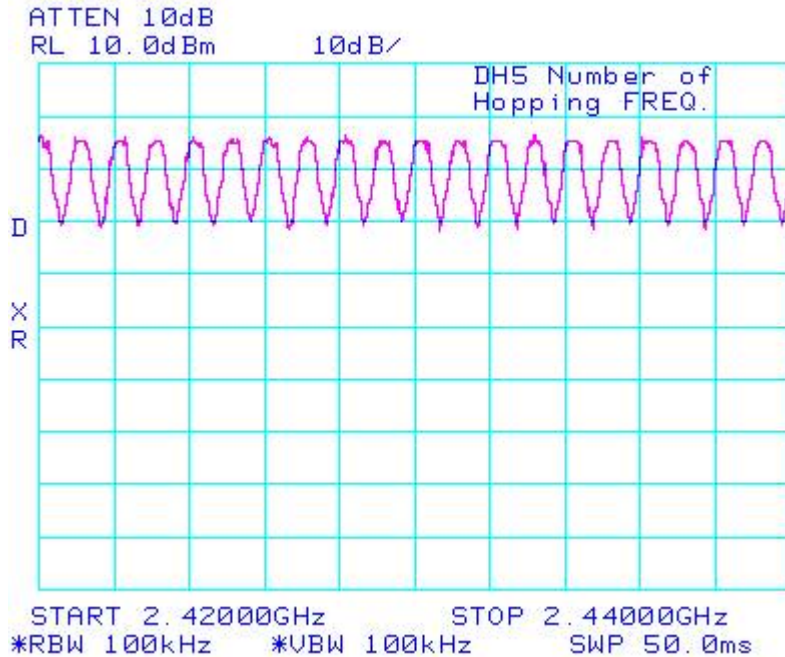
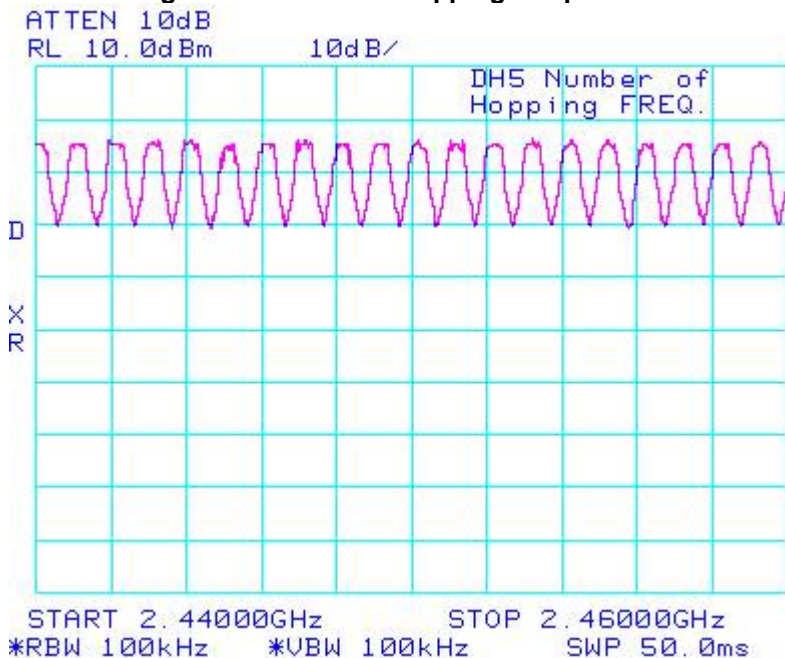


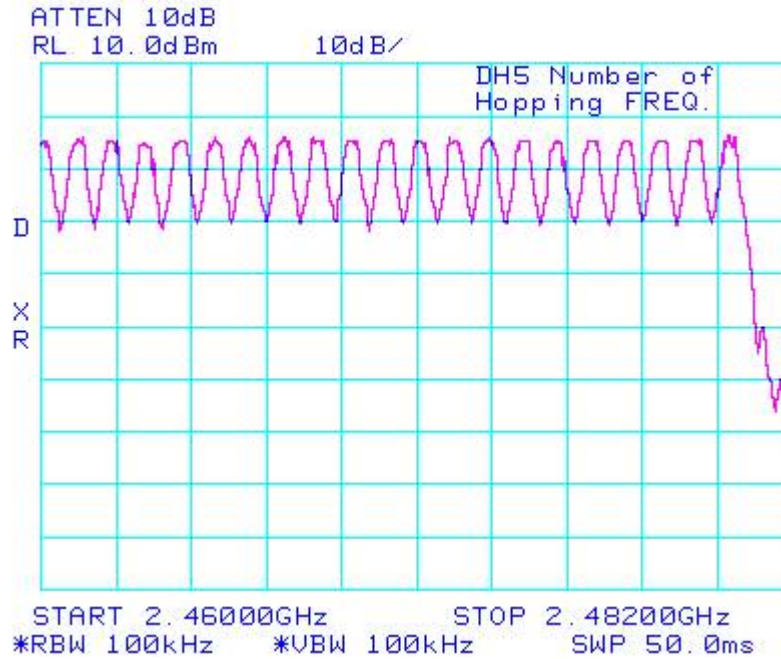
Figure 7: Number of Hopping Frequencies



RTS RIM Testing Services	EMI Test Report for the BlackBerry® smartphone Model RBS21CW	
Test Report No. RTS-0736-0709-04	Dates of Test August 24 - September 07, 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® smartphone Model RBS21CW	
Test Report No. RTS-0736-0709-04	Dates of Test August 24 - September 07, 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	0.5270	0.5270 x 320.0 = 168.6	400	231.4
39	DH1	0.5355	0.5355 x 320.0 = 171.4	400	228.6
78	DH1	0.5298	0.5298 x 320.0 = 169.5	400	230.5
0	DH3	1.7750	1.7750 x 159.9 = 283.8	400	116.2
39	DH3	1.7650	1.7650 x 159.9 = 282.2	400	117.8
78	DH3	1.7900	1.7900 x 159.9 = 286.2	400	113.8
0	DH5	3.0333	3.0333 x 106.8 = 324.0	400	76.0
39	DH5	3.0333	3.0333 x 106.8 = 324.0	400	76.0
78	DH5	3.0167	3.0167 x 106.8 = 322.2	400	77.8

The environmental test conditions were: Temperature 24°C
 Pressure 1009 mb
 Relative Humidity 35%

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

RTS RIM Testing Services	EMI Test Report for the BlackBerry® smartphone Model RBS21CW	
Test Report No. RTS-0736-0709-04	Dates of Test August 24 - September 07, 2007	Author Data C. O'Neill

Bluetooth RF Conducted Emission Test Results cont'd

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

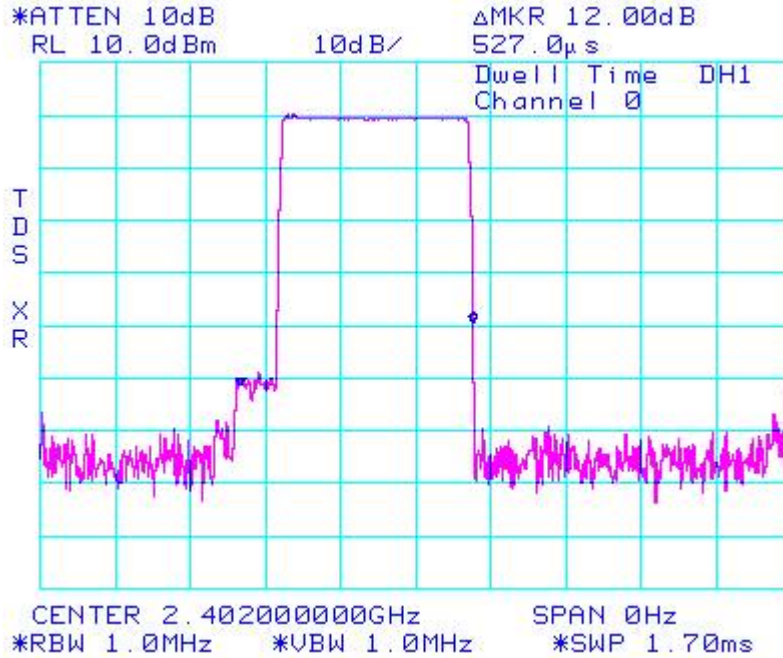
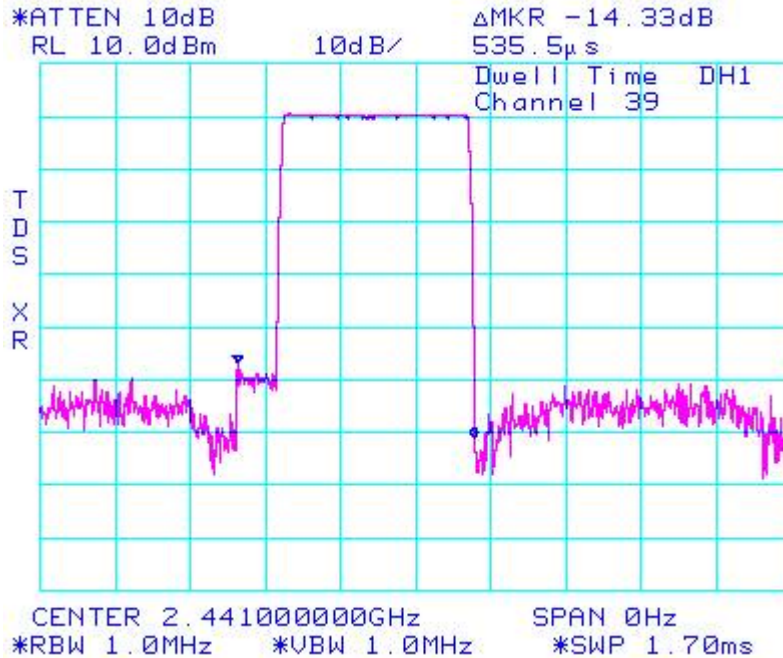


Figure 10: Dwell Time, Middle Channel, Packet Type DH1



RTS RIM Testing Services	EMI Test Report for the BlackBerry® smartphone Model RBS21CW	
	Test Report No. RTS-0736-0709-04	Dates of Test August 24 - September 07, 2007

Bluetooth RF Conducted Emission Test Results cont'd

Figure 11: Dwell Time, High Channel, Packet Type DH1

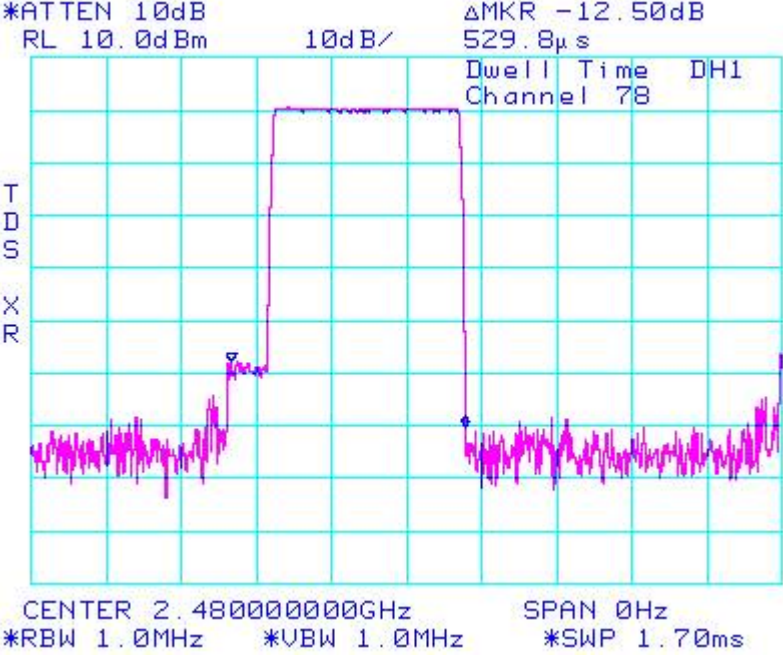
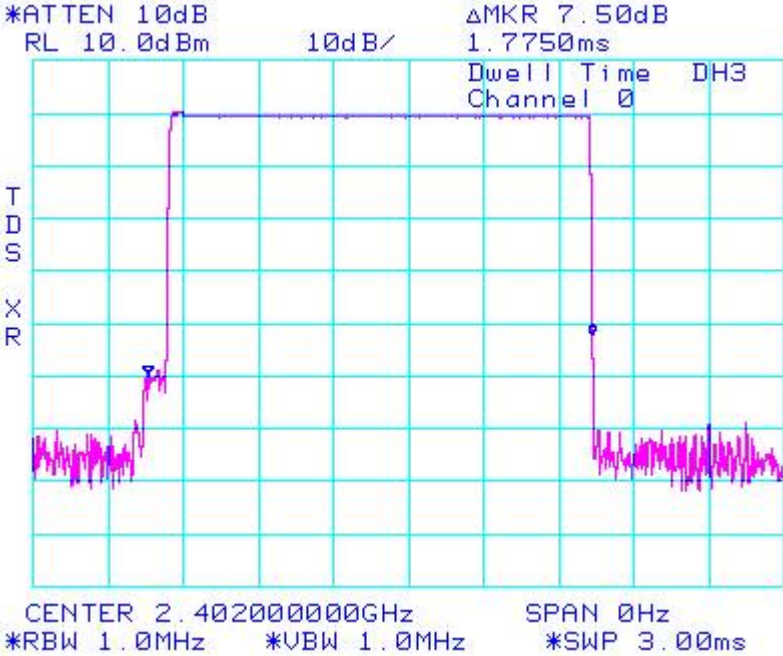


Figure 12: Dwell Time, Low Channel, Packet Type DH3



RTS RIM Testing Services	EMI Test Report for the BlackBerry® smartphone Model RBS21CW	
Test Report No. RTS-0736-0709-04	Dates of Test August 24 - September 07, 2007	Author Data C. O'Neill

Bluetooth RF Conducted Emission Test Results cont'd

Figure 13: Dwell Time, Middle Channel, Packet Type DH3

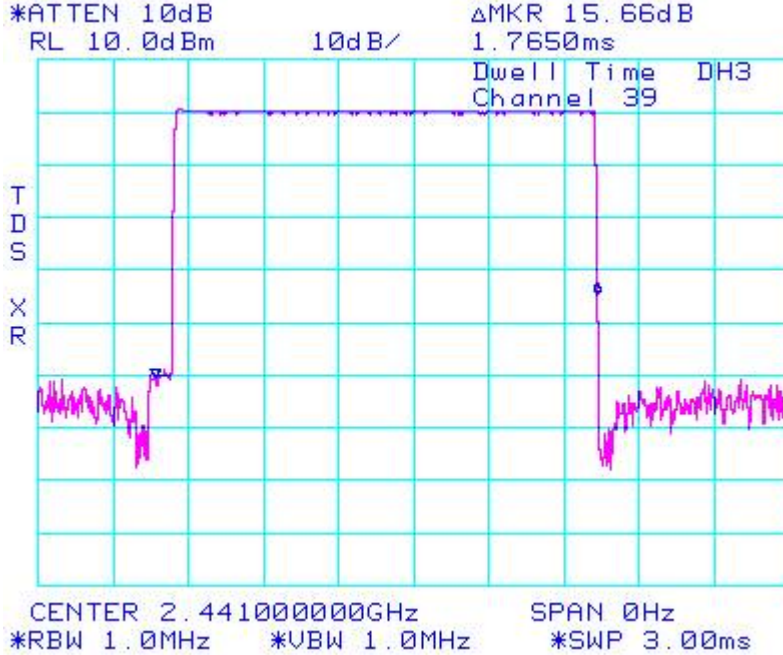
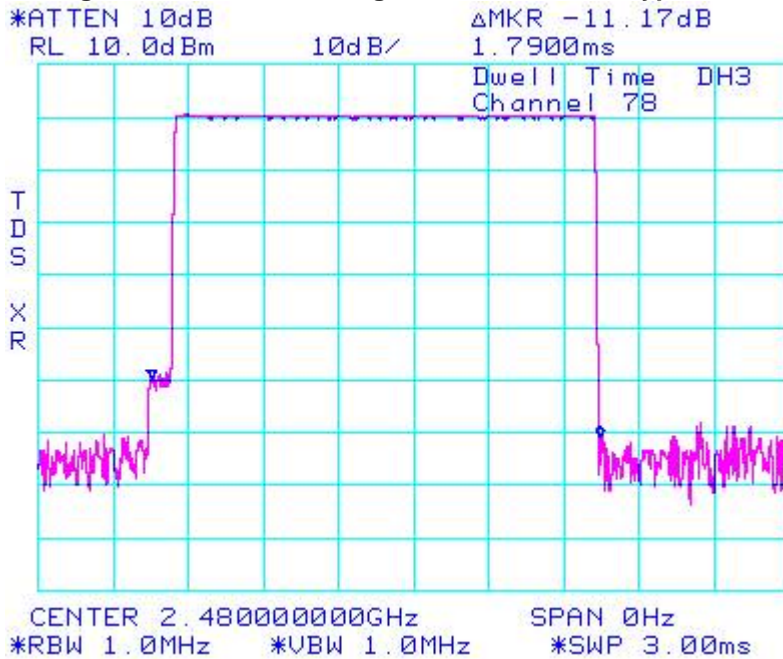


Figure 14: Dwell Time, High Channel, Packet Type DH3



RTS RIM Testing Services	EMI Test Report for the BlackBerry® smartphone Model RBS21CW	
Test Report No. RTS-0736-0709-04	Dates of Test August 24 - September 07, 2007	Author Data C. O'Neill

Bluetooth RF Conducted Emission Test Results cont'd

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

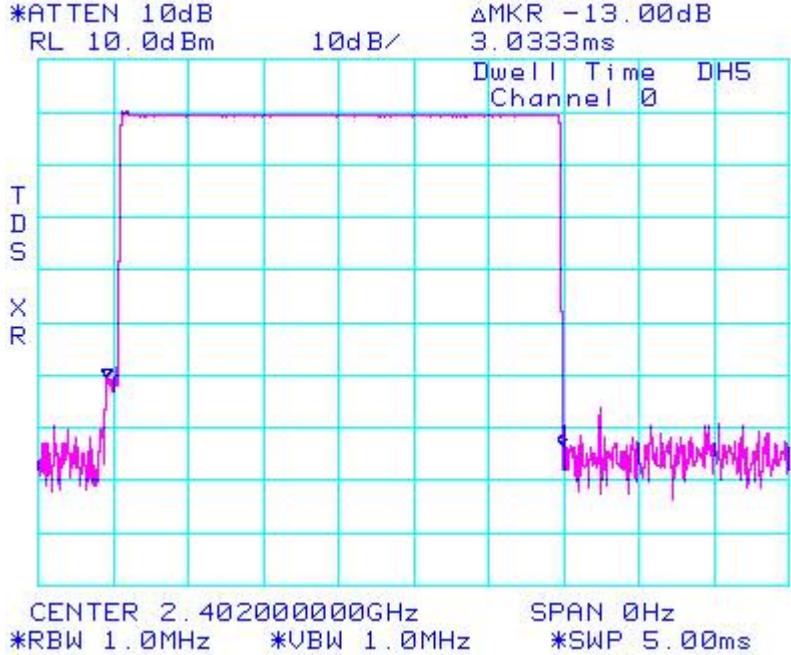
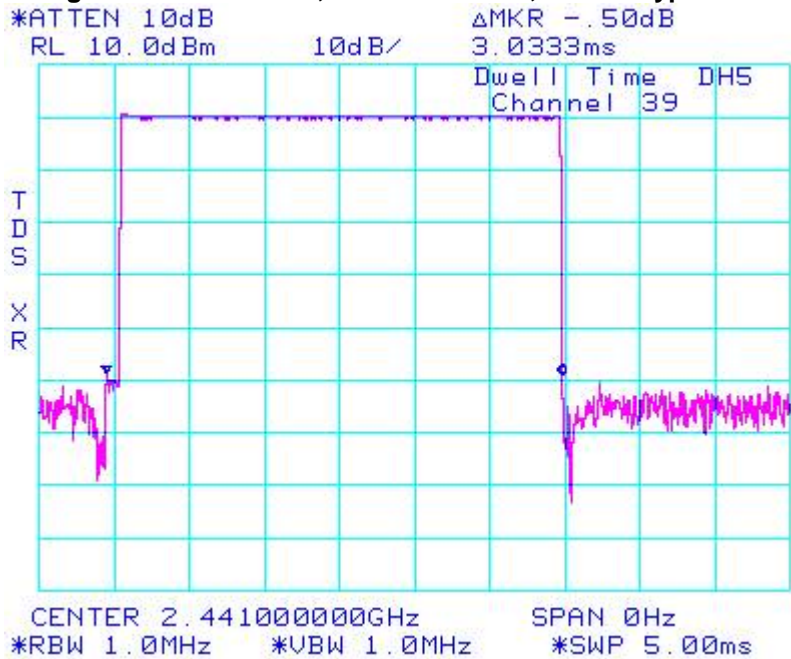


Figure 16: Dwell Time, Middle Channel, Packet Type DH5



RTS RIM Testing Services	EMI Test Report for the BlackBerry® smartphone Model RBS21CW	
Test Report No. RTS-0736-0709-04	Dates of Test August 24 - September 07, 2007	Author Data C. O'Neill

Bluetooth RF Conducted Emission Test Results cont'd

Maximum Peak Conducted Output Power

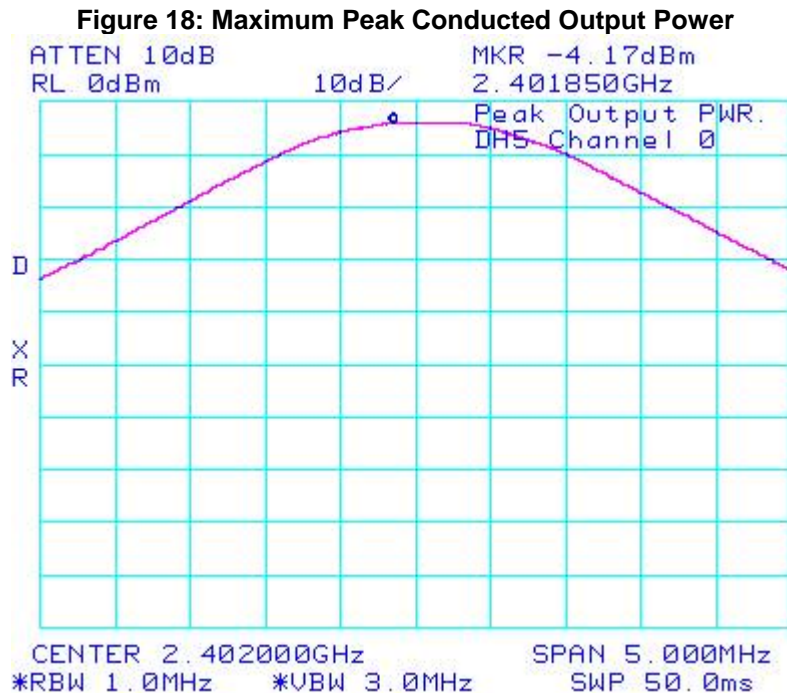
The EUT met the requirements of the maximum peak conducted output power of class 2 as per 47 CFR 15.247(b) and RSS-210. Low channel (0), middle channel (39) and high channel (78) were measured. Bluetooth was operating in single frequency mode during the measurements. A reference offset of 12.4 dB was 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	-4.17	0.000383	-6.0 to 4.0
39	-3.50	0.000447	-6.0 to 4.0
78	-3.67	0.000430	-6.0 to 4.0

The environmental test conditions were:

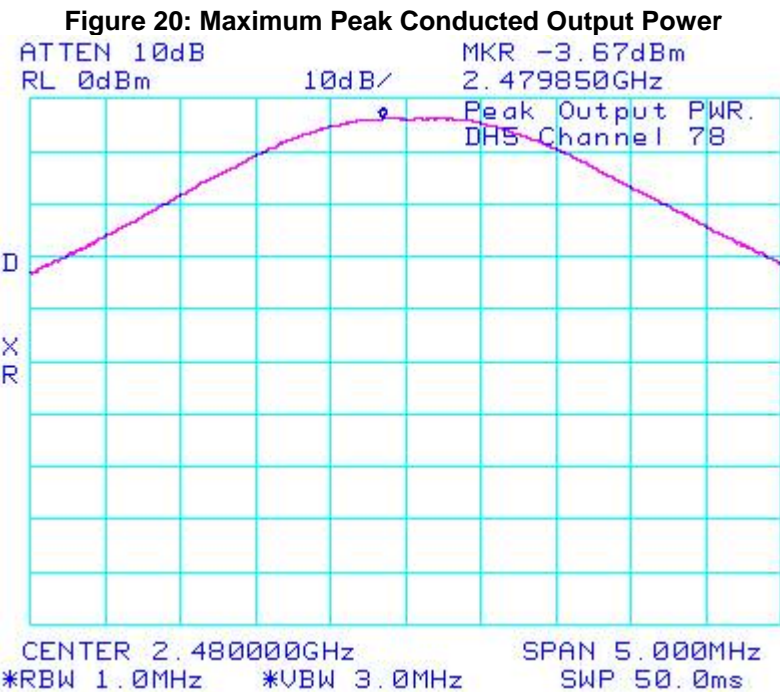
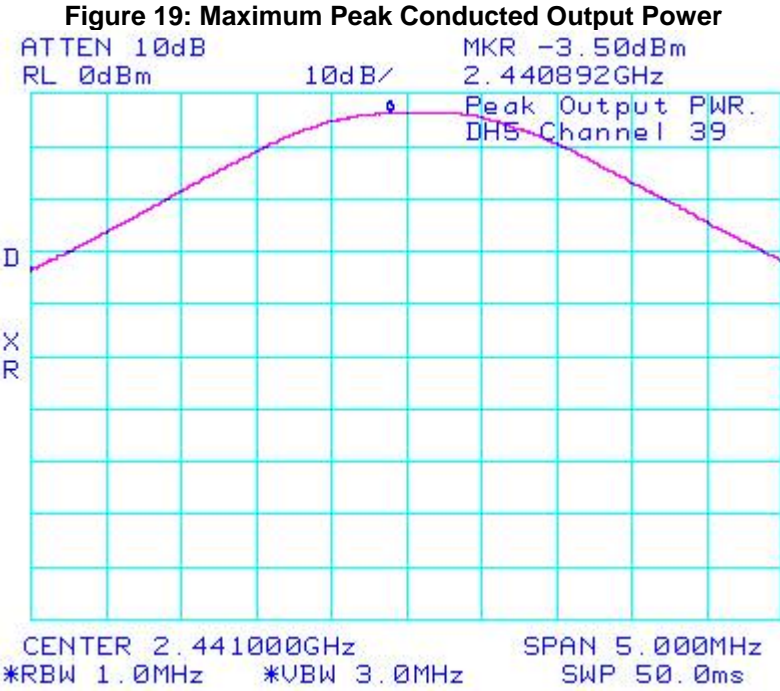
Temperature	24°C
Pressure	1017 mb
Relative Humidity	31%

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



RTS RIM Testing Services	EMI Test Report for the BlackBerry® smartphone Model RBS21CW	
	Test Report No. RTS-0736-0709-04	Dates of Test August 24 - September 07, 2007

Bluetooth RF Conducted Emission Test Results cont'd



RTS RIM Testing Services	EMI Test Report for the BlackBerry® smartphone Model RBS21CW	
Test Report No. RTS-0736-0709-04	Dates of Test August 24 - September 07, 2007	Author Data C. O'Neill

Bluetooth RF Conducted Emission Test Results cont'd

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

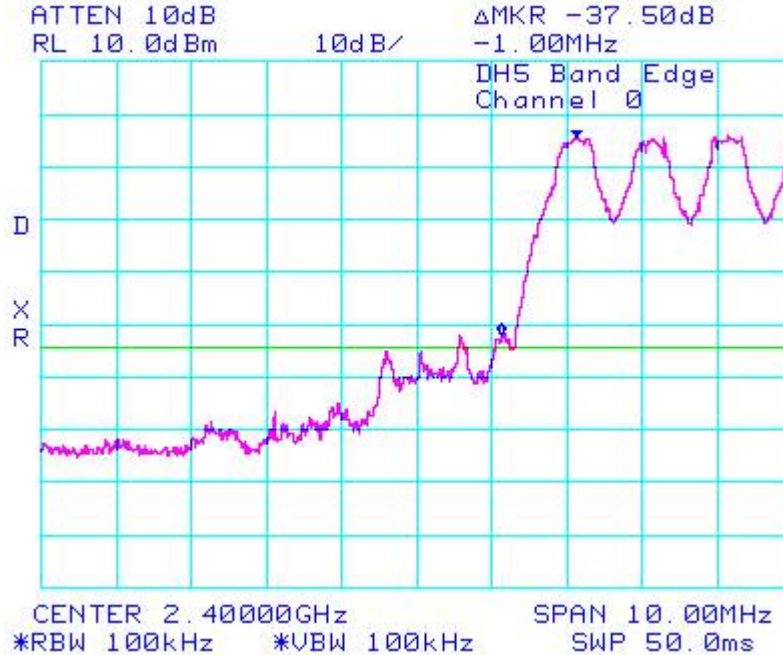
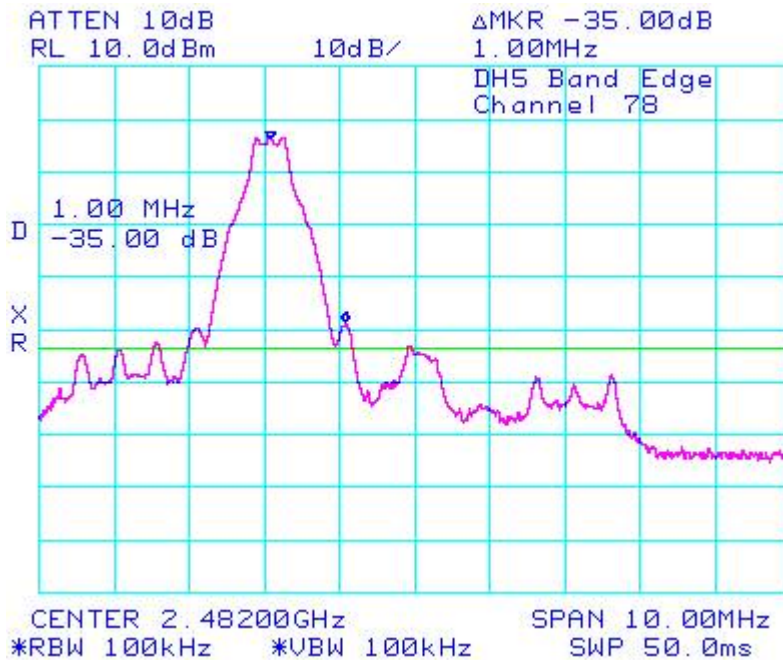


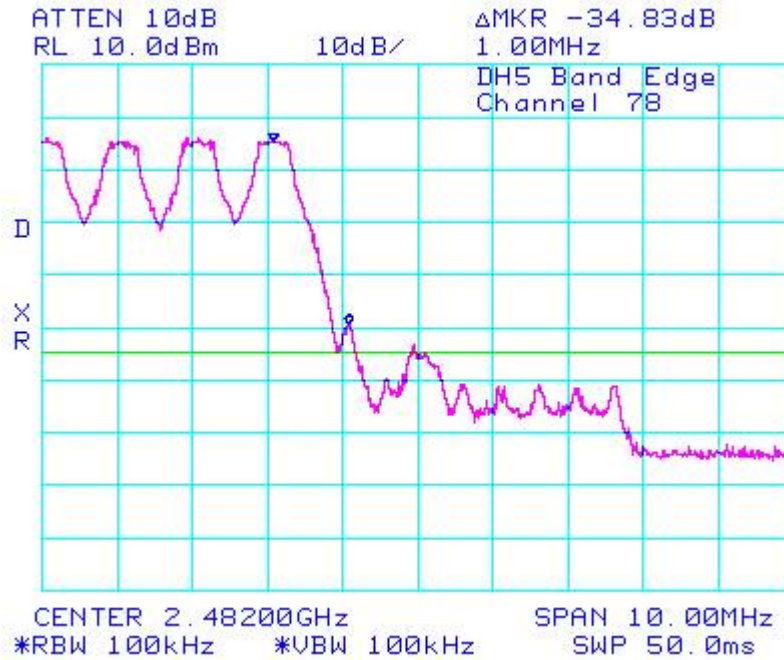
Figure 23: Band Edge Compliance, Single Frequency Mode, Channel 78



RTS RIM Testing Services	EMI Test Report for the BlackBerry® smartphone Model RBS21CW	
Test Report No. RTS-0736-0709-04	Dates of Test August 24 - September 07, 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® smartphone Model RBS21CW	
Test Report No. RTS-0736-0709-04	Dates of Test August 24 - September 07, 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	-4.16	-34.50	-30.34	-20
39	-3.50	-34.17	-30.67	-20
78	-3.67	-35.67	-32.00	-20
Hopping mode	-3.50	-34.00	-30.50	-20

The environmental test conditions were: Temperature 24°C
 Pressure 1017 mb
 Relative Humidity 31%

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

