

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-0943-0801-18

PRODUCT MODEL NO.: RBU21CW
TYPE NAME: BlackBerry® smartphone
FCC ID: L6ARBU20CW
IC: 2503A-RBU20CW

DATE: 01 February 2008

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Statement of Performance:

The BlackBerry® smartphone, model RBU21CW, part number CER-16579-001 Rev 2, and accessories when configured and operated per RIM's operation instructions, perform 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.

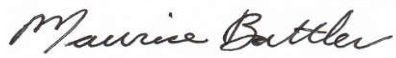
The test results are valid for the tested unit (s) only.

This device 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.

Tested & Documented by:



Maurice Battler
Compliance Specialist
Date: 01 February 2008

Tested by:



Vimal Olaganathan
Compliance Specialist
Date: 01 February, 2008

Reviewed by:



Masud S. Attayi, P.Eng.
Team Lead, Regulatory Compliance
Date: 03 February 2008

Approved by:



Paul G. Cardinal, Ph.D.
Director
Date: 05 February 2008

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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. Document number CER-16579-001-Rev 2-Hardware-Change Notification.doc

C. Product Identification

Manufactured by Research In Motion Limited whose headquarters is 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 December 24, 2007 to January 31, 2008.

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The sample BlackBerry® smartphones tested were:

SAMPLE NO.	MODEL	CER NUMBER
3	RBU21CW	CER-16579-001 Rev 1
6	RBU21CW	CER-16597-001 Rev 1
7	RBU21CW	CER-16597-001 Rev 2

AC Conducted and Radiated Emission testing were performed on samples 6.
 RF Conducted Emissions testing was performed on sample 3.
 Radiated Band Edge RF Emissions testing was performed on sample 7.

To view the differences between CER-16579-001 Rev 1 to CER-16579-001 Rev 2, see document number CER-16579-001-Rev 2-Hardware-Change Notification.doc

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

BlackBerry® smartphone Accessories Tested

- 1) Folding Blade Charger, part number ASY-07040-001 with an output voltage of 5.0 volts dc, 750 mA and attached USB cable with a lead length of 1.80 metres.
- 2) Alternative Captive Cable Charger part number HDW-14917-001 with an output voltage of 5.0 volts dc, 750 mA and attached USB cable with a lead length of 1.80 metres.
- 3) TTY adapter, part number HDW-12420-001.
- 4) Stereo Headset, 2.5 mm, part number HDW-13019-001, 1.3 metres long
- 5) Mono Headset, part number HDW-12420-001, 1.25 metres long.

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, H/P, model 6632B, serial number US37472178
- 3) Bluetooth Tester, Rohde & Schwarz, model CBT, serial number 100368

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E. Modification to EUT

No modifications were required on EUT.

F. Summary of Results

SPECIFICATION		TEST TYPE	Meets Requirements	TEST DATA APPENDIX
FCC CFR 47	IC			
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

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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 ac input voltage was 120 volts, 60 Hz. The following test configurations were measured using Sample 6 in Bluetooth Tx mode:

1. The BlackBerry® smartphone with the TTY adapter and Mono Headset was connected to the Folding Blade Charger.
2. The BlackBerry® smartphone with the TTY adapter and 2.5 mm Stereo Headset was connected to the Alternative Captive Cable Charger.

The sample EUT's conducted emissions were compared with respect to the FCC CFR 47 Part 15.207, Subpart C and IC RSS-Gen 7.2.2 limit. The sample EUT had a worse case test margin of 10.27 dB below the QP limit at 0.174 MHz using the Quasi-peak detector in test configuration 2.

Measurement Uncertainty ±2.0 dB

See APPENDIX 1 for the test data

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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 site number is **2503B-1**.

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

The BlackBerry® smartphone Sample 6 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 radiated spurious and harmonics were investigated up to the 10th harmonic. The sample EUT had a worse case test margin of 5.65 dB below the average limit at 4882 MHz using the average detector.

See APPENDIX 2 for the test data

b) Co-location measurements.

The radiated emissions were measured up to 18 GHz for middle channels for simultaneous transmission in GSM 850/Bluetooth and PCS 1900/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 Sample 7 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

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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.
- 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.

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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	08-11-21	Radiated Emissions
Preamplifier system	TDK RF Solutions	PA-02	080010	08-11-16	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	08-11-20	Radiated Emissions
Universal Radio Communication Tester	Rohde & Schwarz	CMU 200	837493/073	08-12-06	Radiated Emissions
EMC Analyzer	Agilent	E7405A	US40240226	08-10-01	Radiated Emissions
EMI Receiver	Agilent	8546A	3942A00517	08-11-19	Conducted AC Line/Radiated Emissions
RF Filter Section	Agilent	85460A	3704A00481	08-11-19	Conducted AC Line/Radiated Emissions
Spectrum Analyzer	HP	8563E	3745A08112	08-09-22	RF Conducted Emissions
DC Power Supply	HP	6632B	US37472178	08-09-24	RF Conducted Emissions
Environment Monitor	Control Company	1870	230355190	08-12-11	Radiated Emissions
Environment Monitor	Control Company	1870	230355189	08-12-11	RF Conducted Emissions
Temperature Probe	Hart Scientific	61161-302	21352860	08-08-14	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	09-09-20	Frequency Stability
Digital Multimeter	Hewlett Packard	34401A	US36042324	08-09-28	Conducted/Radiated Emissions
L.I.S.N.	Emco	3816/2	1120	08-08-28	Conducted Emissions
Impulse Limiter	Rohde & Schwarz	ESHS-Z2	100786	08-09-11	Conducted Emissions

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APPENDIX 1 – AC CONDUCTED EMISSIONS TEST DATA/PLOTS

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AC Conducted Emissions Test Results

The measurements were performed by Vimal Olaganathan.

Test Configuration 1

The environmental test conditions were:

Temperature	23°C
Pressure	1025 mb
Relative Humidity	22%

Date of test: January 31, 2008

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

Frequency (MHz)	Line	Reading (QP) (dBμV)	Correction Factor (dB)	Corrected Reading (QP) (dBμV)	Limit (QP) (dBμV)	Limit (AV) (dBμV)	Margin (QP) Limits (dB)
0.390	N	34.80	9.89	44.69	57.75	47.75	-13.06
0.467	N	34.14	9.91	44.05	56.25	46.25	-12.21
0.468	L1	34.72	9.91	44.63	56.25	46.25	-11.63
0.607	L1	33.67	9.92	43.59	56.00	46.00	-12.41
0.674	N	28.56	9.94	38.50	56.00	46.00	-17.50
0.705	L1	33.40	9.94	43.34	56.00	46.00	-12.66
0.707	N	31.45	9.94	41.39	56.00	46.00	-14.61
1.153	N	27.57	9.94	37.51	56.00	46.00	-18.49
1.140	L1	29.60	9.94	39.54	56.00	46.00	-16.46
1.467	L1	27.85	9.96	37.81	56.00	46.00	-18.19
1.474	L1	28.35	9.96	38.31	56.00	46.00	-17.69

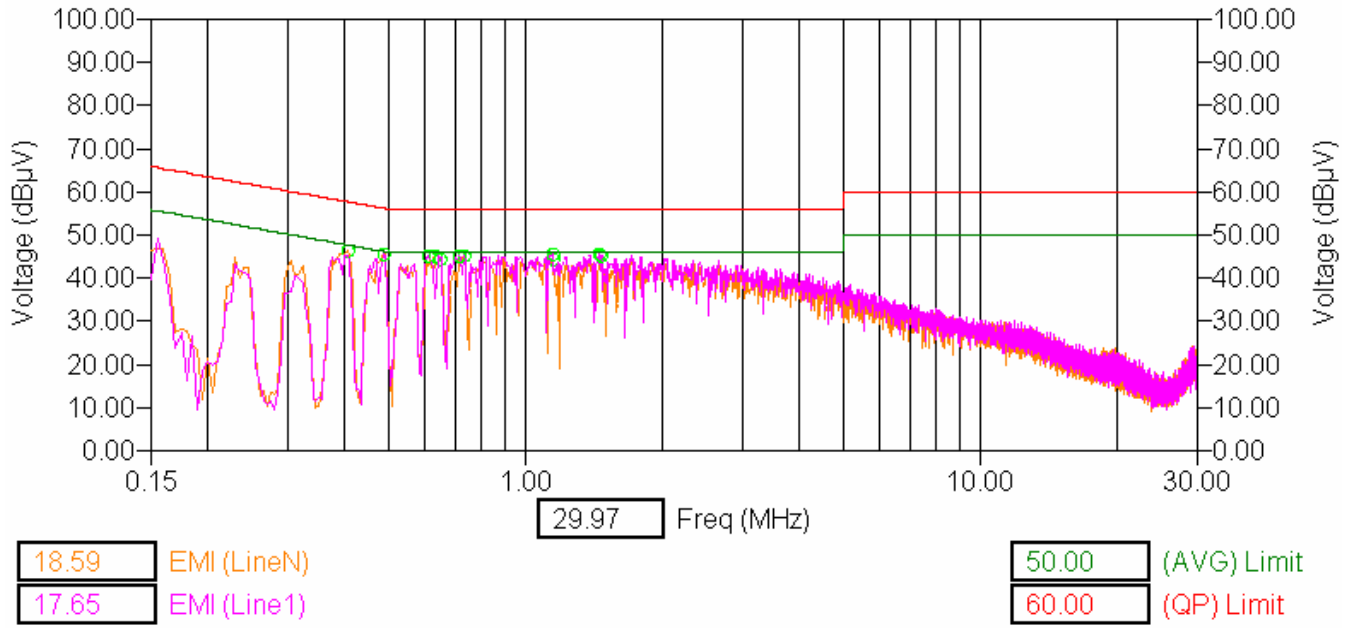
All other emission levels had a test margin of greater than 25 dB.

Measurements were done with the quasi-peak detector.

See graph 1 for the measurement plot.

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AC Conducted Emissions Test Graph 1



Test Configuration 1

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AC Conducted Emissions Test Results cont'd

Test Configuration 2

The environmental test conditions were:

Temperature	24°C
Pressure	1012 mb
Relative Humidity	22%

Date of test: January 17, 2008

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

Frequency (MHz)	Line	Reading (QP) (dBµV)	Correction Factor (dB)	Corrected Reading (QP) (dBµV)	Limit (QP) (dBµV)	Limit (AV) (dBµV)	Margin (QP) Limits (dB)
0.174	N	44.82	9.87	54.69	64.96	54.96	-10.27
0.175	L1	44.16	9.87	54.03	64.96	54.96	-10.93
0.198	N	40.93	9.87	50.80	63.61	53.61	-12.81
0.228	L1	34.72	9.87	44.59	62.27	52.27	-17.68
0.327	N	30.38	9.89	40.27	59.45	49.45	-19.18
0.330	L1	29.74	9.89	39.63	59.45	49.45	-19.82
0.349	L1	31.23	9.89	41.12	58.84	48.84	-17.72
0.367	N	29.91	9.89	39.80	58.61	48.61	-18.81
0.487	N	28.30	9.91	38.21	56.25	46.25	-18.05
0.486	L1	30.12	9.90	40.02	56.17	46.17	-16.14
0.533	L1	25.52	9.90	35.42	56.00	46.00	-20.58
4.480	N	22.01	10.09	32.00	56.00	46.00	-24.00

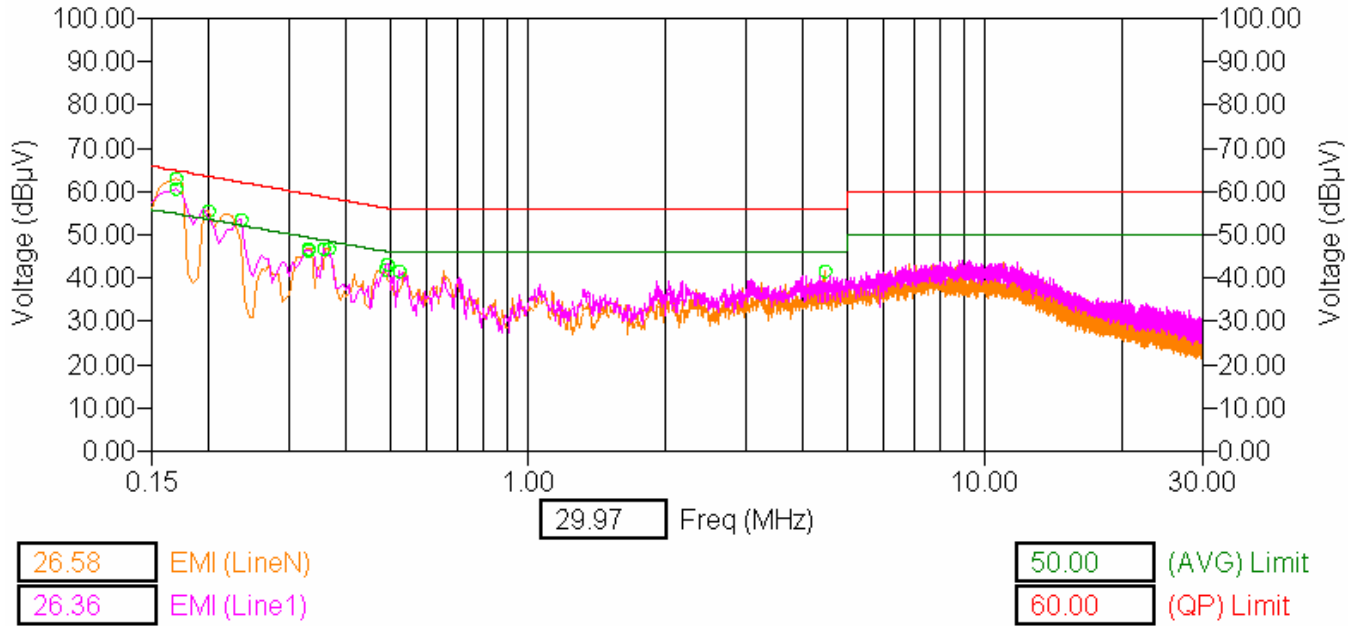
All other emission levels had a test margin of greater than 25 dB.

Measurements were done with the quasi-peak detector.

See graph 2 for the measurement plot.

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AC Conducted Emissions Test Graph 2



Test Configuration 2

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APPENDIX 2 – RADIATED EMISSIONS TEST DATA

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Radiated Emissions Test Data Results

The measurements were performed by Vimal Olaganathan

Bluetooth Band

The environmental test conditions were:

Temperature	23°C
Pressure	998 mb
Relative Humidity	24%

Date of Test: January 11, 2008

Test Distance was 3.0 metres with a EUT height of 0.8 metres, 30 MHz to 1000 MHz.
The BlackBerry® smartphone Sample 6 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)							
31.552	H	2.11	354	PK	35.91	-22.19	-18.04	40.00	-22.13
31.916	V	3.93	215	PK	37.02	-23.33	-18.07	40.00	-21.05
36.155	V	3.53	141	PK	39.48	-27.08	-19.34	40.00	-19.86
37.077	V	2.30	226	PK	40.27	-28.22	-19.68	40.00	-19.41
81.590	V	3.74	238	PK	38.18	-27.97	-21.27	40.00	-23.09

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

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Bluetooth Radiated Emissions Test Results cont'd

Using Pattern type "Static PBRs" and packet type "DH5" hopping mode 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					
BlackBerry® smartphone Standalone, USB side down Hopping mode.									
2 nd	0-78	4960.0	Horn	V	40.63	57.43	PK.	74	-16.57
2 nd	0-78	4960.0	Horn	H	39.97				
2 nd	0-78	4960.0	Horn	V	30.19	46.99	AVE.	54	-7.01
2 nd	0-78	4960.0	Horn	H	29.64				
The harmonics were investigated up to the 10th harmonic.									

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Band-Edge Compliance of RF Radiated Emissions Test Results

The measurements were performed by Vimal Olaganathan.

The environmental test conditions were:

Temperature	24°C
Pressure	1005 mb
Humidity	22 %

The test distance was 3.0 metres.

Date of test: January 31, 2008

BlackBerry® smartphone Sample 7 standalone, vertical, Pattern type “Static PBRs” and packet type “DH5” during the measurements.

Channel	Freq. (MHz)	Rx Antenna		Detector	VBW	Corrected Reading	Delta Marker	Corrected Band edge	Limit	Diff. To Limit
		Type	POL.	(PK, AVE.)	(MHz)	(dBuV/m)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
Low Channel										
0	2402.0	Horn	V	PK	1 MHz	88.75	43.96	44.79	74	-29.21
0	2402.0	Horn	H	PK	1 MHz	94.35	48.56	45.70	74	-28.30
0	2402.0	Horn	V	AVE.	10 Hz	82.33	43.96	38.37	54	-15.63
0	2402.0	Horn	H	AVE.	10 Hz	87.54	48.56	38.98	54	-15.02
High Channel										
78	2480.0	Horn	V	PK	1 MHz	86.19	43.80	42.39	74	-31.61
78	2480.0	Horn	H	PK	1 MHz	93.97	42.72	51.25	74	-22.75
78	2480.0	Horn	V	AVE.	10 Hz	78.77	43.80	34.97	54	-19.03
78	2480.0	Horn	H	AVE.	10 Hz	86.91	42.72	44.19	54	-9.81

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

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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

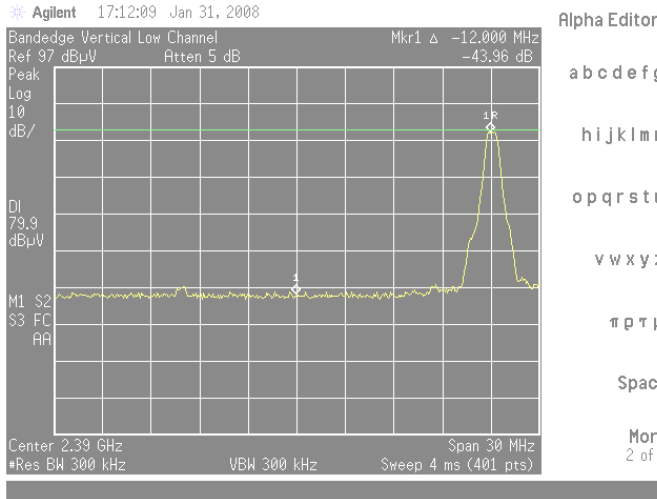


Figure 2-2: Band-Edge Compliance of RF Rad. Emi. Bluetooth, Single freq., Static PBRs, DH5, Channel 0, Pol: H, Detector: PK

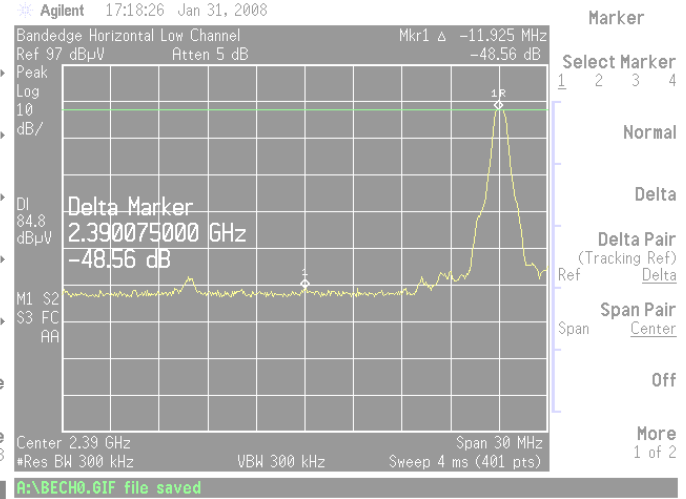


Figure 2-3: Band-Edge Compliance of RF Rad. Emi. Bluetooth, Single freq., Static PBRs, DH5, Channel 78, Pol: V, Detector: PK

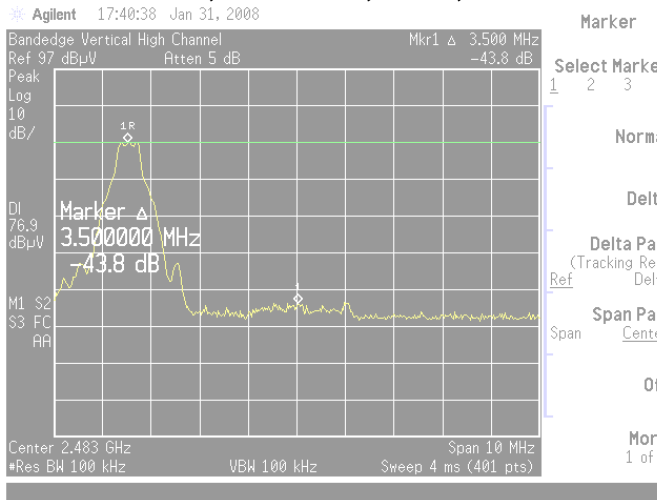
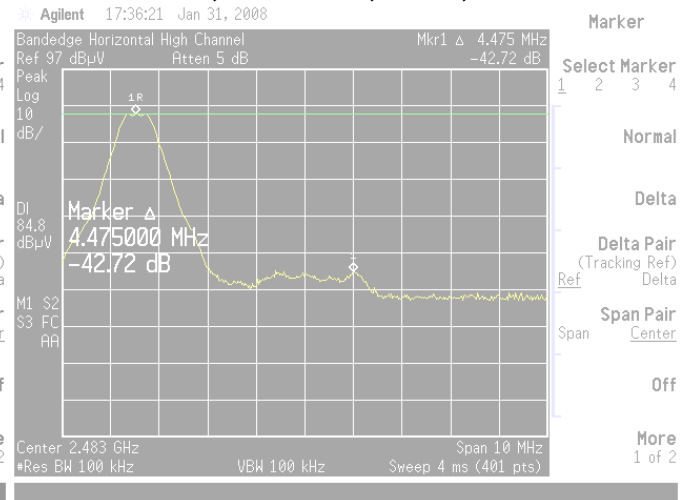


Figure 2-4: Band-Edge Compliance of RF Rad. Emi. Bluetooth, Single freq., Static PBRs, DH5, Channel 78, Pol: H, Detector: PK



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APPENDIX 3 – BLUETOOTH CONDUCTED EMISSIONS TEST DATA/PLOTS

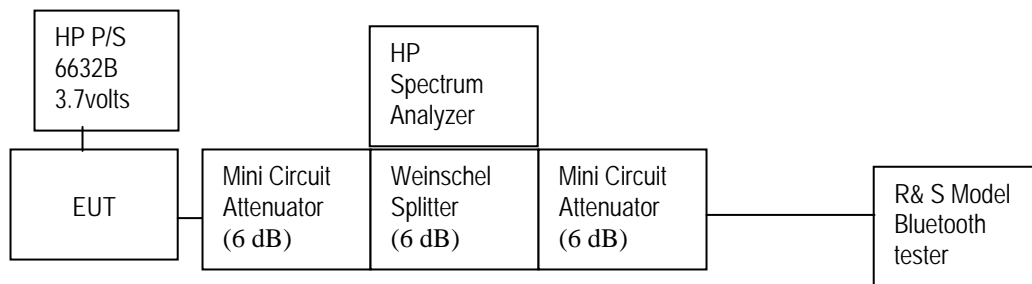
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Bluetooth RF Conducted Emission Test Results

The measurements were performed by Maurice Battler

Bluetooth power output was at maximum for all the recorded measurements shown below on the BlackBerry® smartphone sample number 3.

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 Tests: December 24, 2007

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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 PBRS and packet type DH5 during the measurements.

Bluetooth Channel	Limit (MHz)	Measured Level (MHz)
0	≤1.0	0.867
39	≤1.0	0.873
78	≤1.0	0.870

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

The environmental test conditions were:

Temperature	23°C
Pressure	999 mb
Relative Humidity	22%

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Bluetooth RF Conducted Emission Test Results cont'd

Figure 3-1: 20 dB Bandwidth

Single freq., Static PBRs, DH5

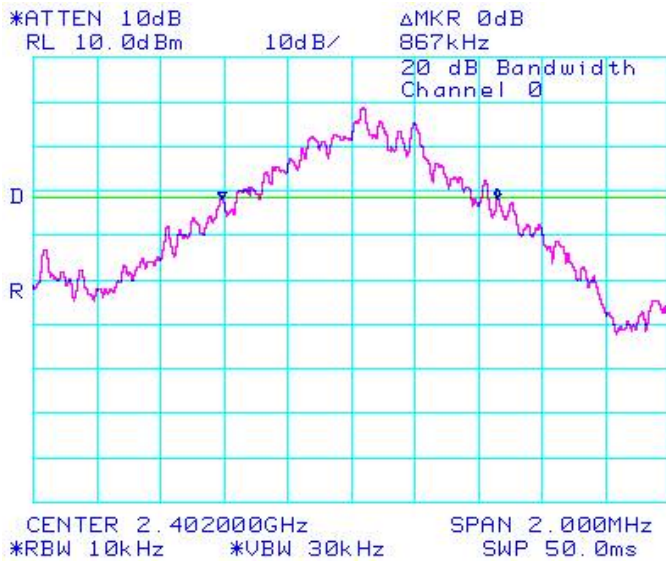


Figure 3-2: 20 dB Bandwidth

Single freq., Static PBRs, DH5

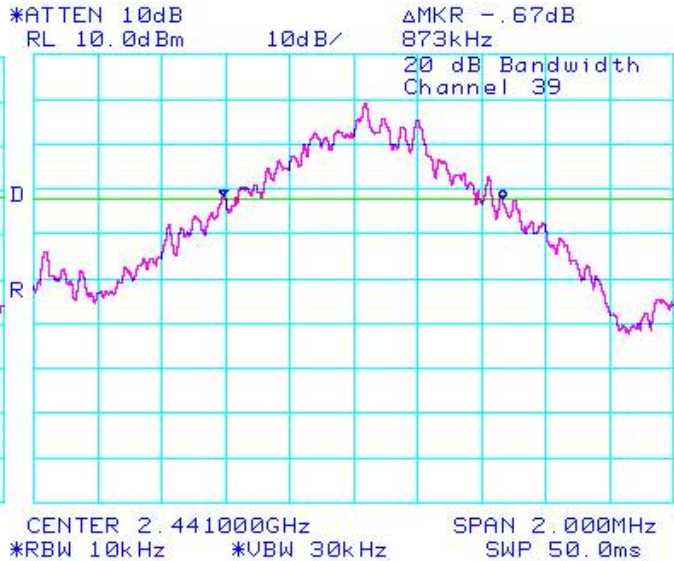
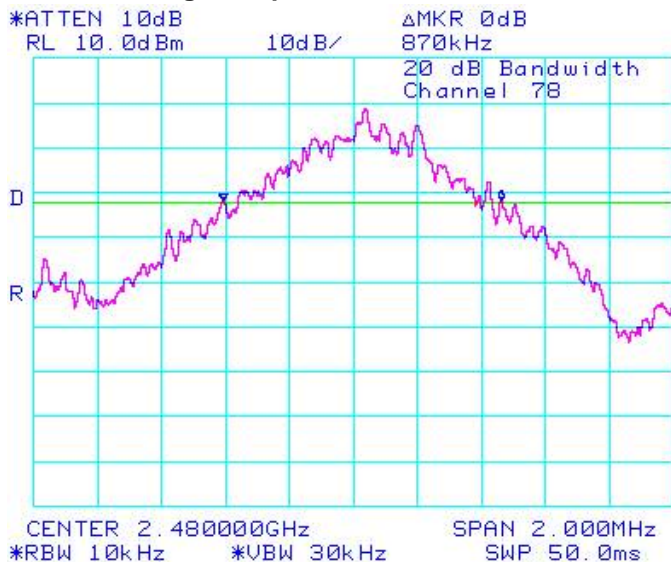


Figure 3-3: 20 dB Bandwidth

Single freq., Static PBRs, DH5



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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 PBRS" and packet type "DH5" during the measurements.

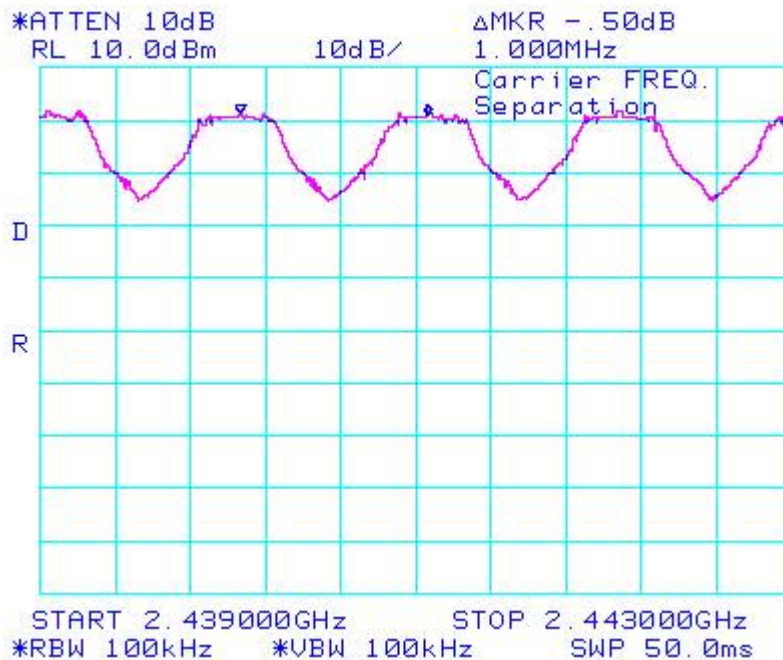
Bluetooth Channels	Limit (MHz)	Measured Level (MHz)
38 to 39	≥ 0.025 or 20 dB bandwidth	1.000

The environmental test conditions were:

Temperature	23 C
Pressure	999 mb
Relative Humidity	22 %

See figure 3-4 for the plot of the Carrier Frequency Separation measurement.

Figure 3-4: Carrier Frequency Separation, Freq. Hopping, Static PBRS, DH5, Channels 38 to 39



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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 PBRs” and packet type “DH5” during the measurements.

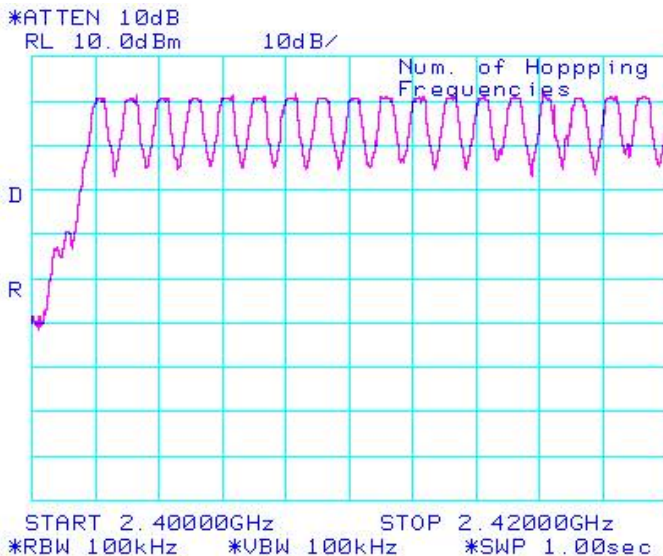
Limit (CH)	Number of Hopping Frequencies (CH)
≥ 75	79

The environmental test conditions were:

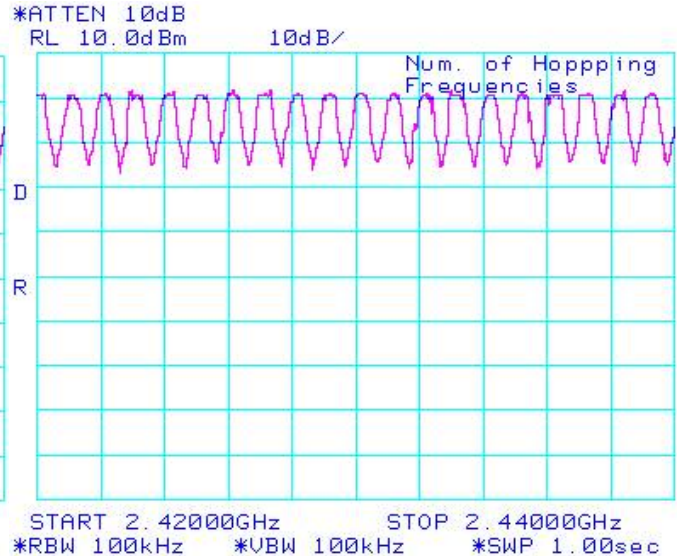
Temperature	22°C
Pressure	1007 mb
Relative Humidity	33%

See figures 3-5 to 3-9 for the plots of the number of hopping frequencies.

**Figure 3-5: Number of Hopping Frequencies
Static PBRs, DH5**



**Figure 3-6: Number of Hopping Frequencies
Static PBRs, DH5**



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Bluetooth RF Conducted Emission Test Results cont'd

Figure 3-7: Number of Hopping Frequencies
Static PBRs, DH5

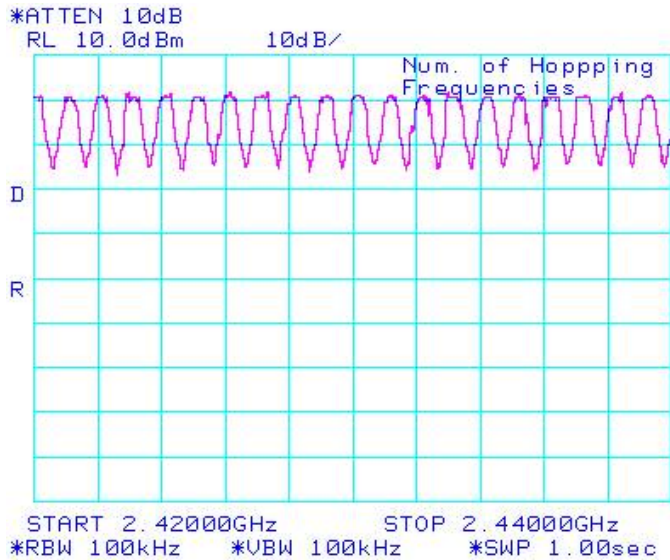


Figure 3-8: Number of Hopping Frequencies
Static PBRs, DH5

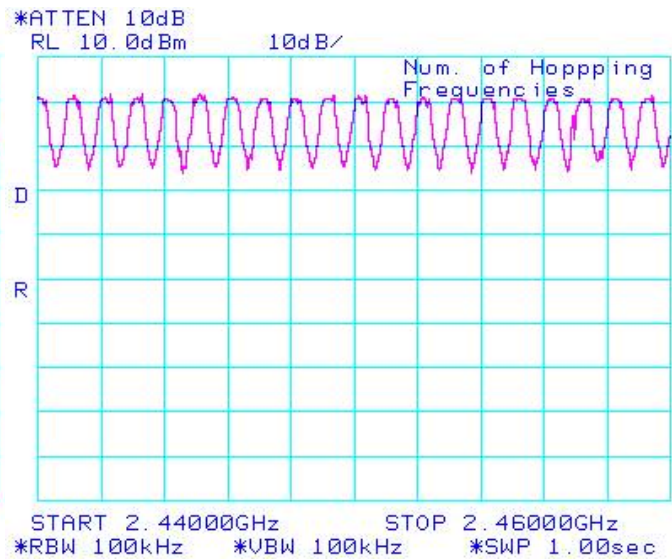
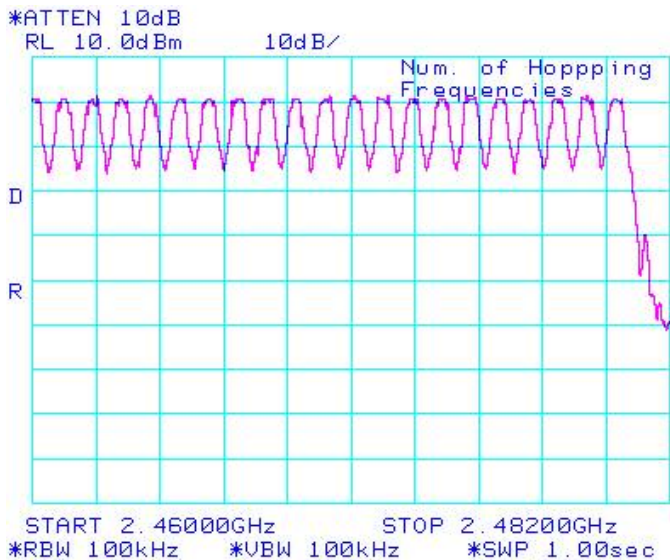


Figure 3-9: Number of Hopping Frequencies
Static PBRs, DH5



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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	0.5279	0.5279 x 320.0 = 168.93	400	231.07
39	DH1	0.5279	0.5279 x 320.0 = 168.93	400	231.07
78	DH1	0.5367	0.5367 x 320.0 = 171.74	400	228.26
0	DH3	1.7655	1.7655 x 159.9 = 282.30	400	110.56
39	DH3	1.7875	1.7875 x 159.9 = 285.82	400	114.08
78	DH3	1.7875	1.7875 x 159.9 = 285.82	400	114.08
0	DH5	3.0160	3.0160 x 106.8 = 322.11	400	77.89
39	DH5	3.0333	3.0333 x 106.8 = 323.96	400	76.04
78	DH5	3.0073	3.0073 x 106.8 = 321.18	400	78.82

The environmental test conditions were:

Temperature	23°C
Pressure	999 mb
Relative Humidity	22%

See figures 3-10 to 3-18 for the plots of the dwell time.

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Bluetooth RF Conducted Emission Test Results cont'd

Figure 3-10: Time of Occupancy (Dwell Time)
Freq. Hopping, Static PBRs, DH1

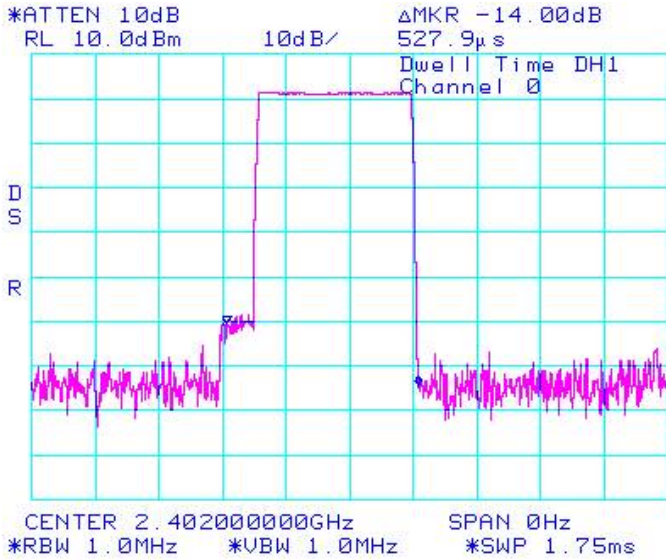


Figure 3-11: Time of Occupancy (Dwell Time)
Freq. Hopping, Static PBRs, DH1

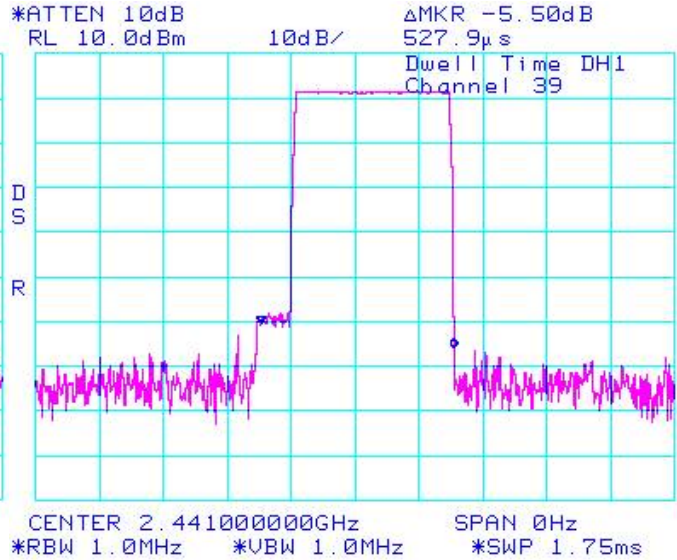


Figure 3-12: Time of Occupancy (Dwell Time)
Freq. Hopping, Static PBRs, DH1

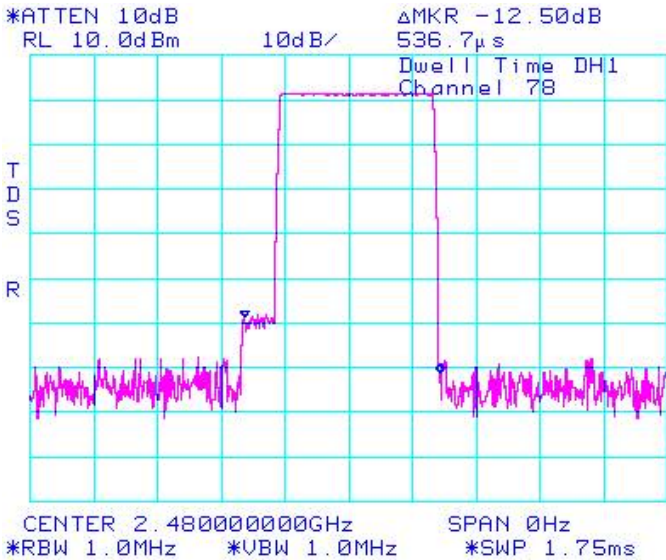
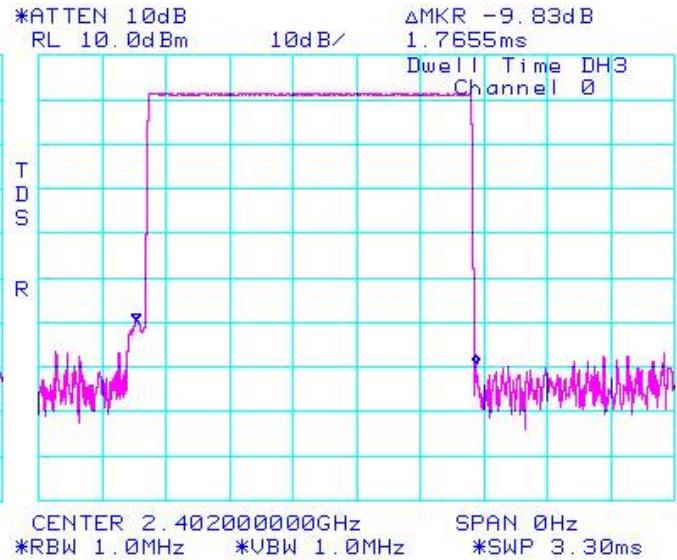


Figure 3-13: Time of Occupancy (Dwell Time)
Freq. Hopping, Static PBRs, DH3



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Bluetooth RF Conducted Emission Test Results cont'd

Figure 3-14: Time of Occupancy (Dwell Time)
Freq. Hopping, Static PBRs, DH3

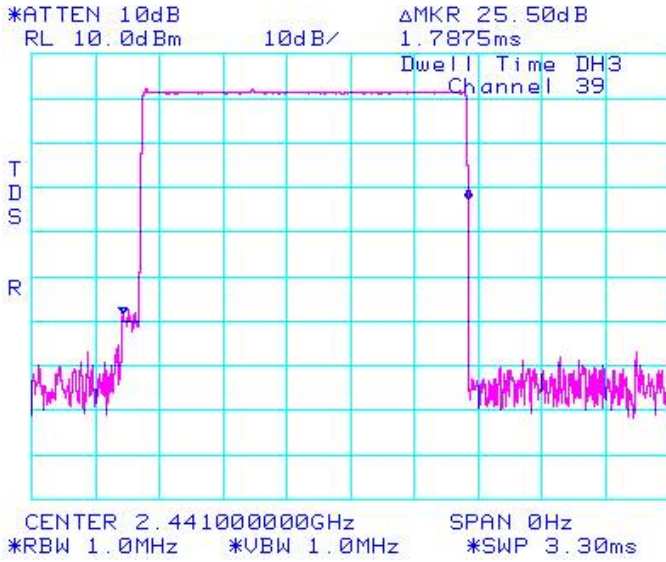


Figure 3-15 : Time of Occupancy (Dwell Time)
Freq. Hopping, Static PBRs, DH3

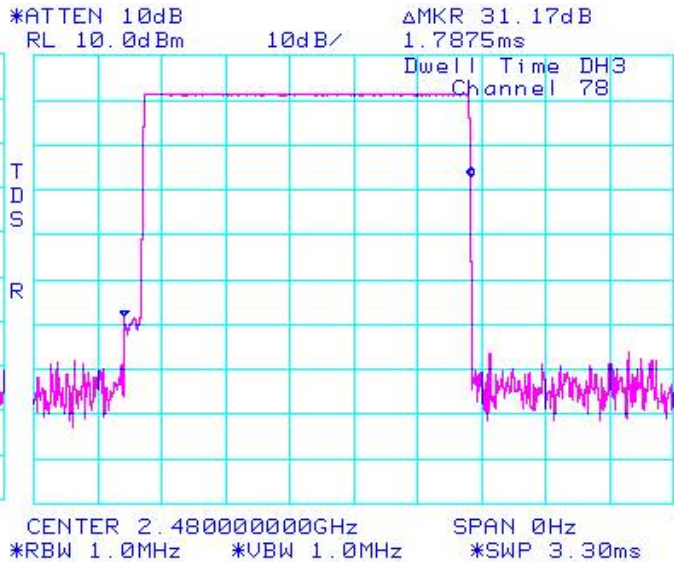


Figure 3-16: Time of Occupancy (Dwell Time)
Freq. Hopping, Static PBRs, DH5

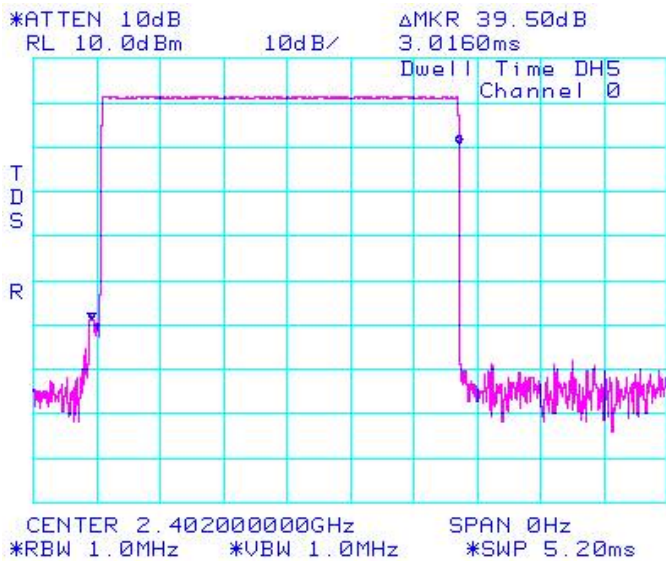
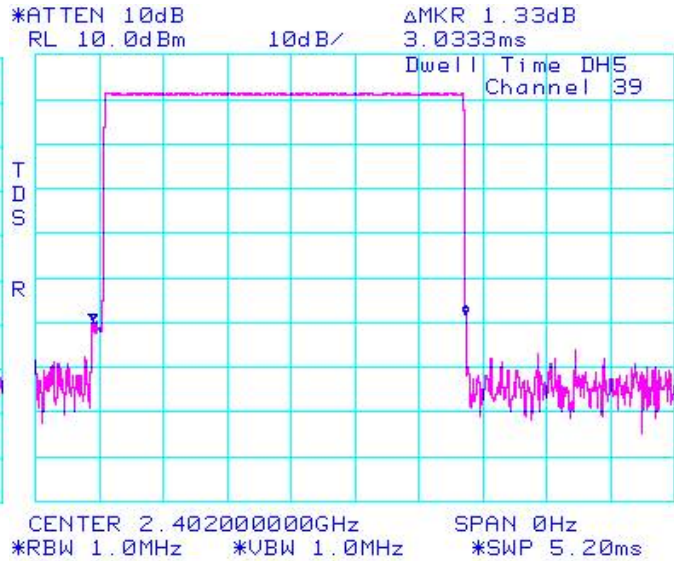


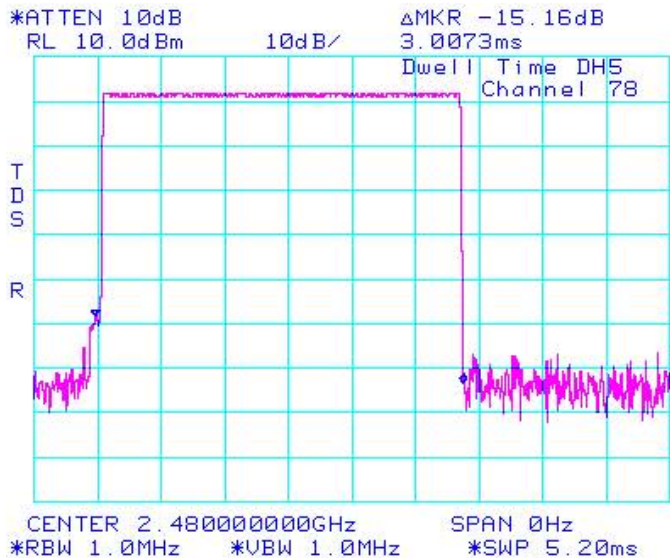
Figure 3-17: Time of Occupancy (Dwell Time)
Freq. Hopping, Static PBRs, DH5



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Bluetooth RF Conducted Emission Test Results cont'd

Figure 3-18: Time of Occupancy (Dwell Time)
Freq. Hopping, Static PBRs, DH5



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.

Using pattern type “Static PBRs” and packet type “DH5” during the measurements.

Bluetooth Channel	Measured Level (dBm)	Measured Level (mW)	Limit (W)
0	2.83	1.92	1.0
39	2.83	1.92	1.0
78	2.33	1.71	1.0

The environmental test conditions were:

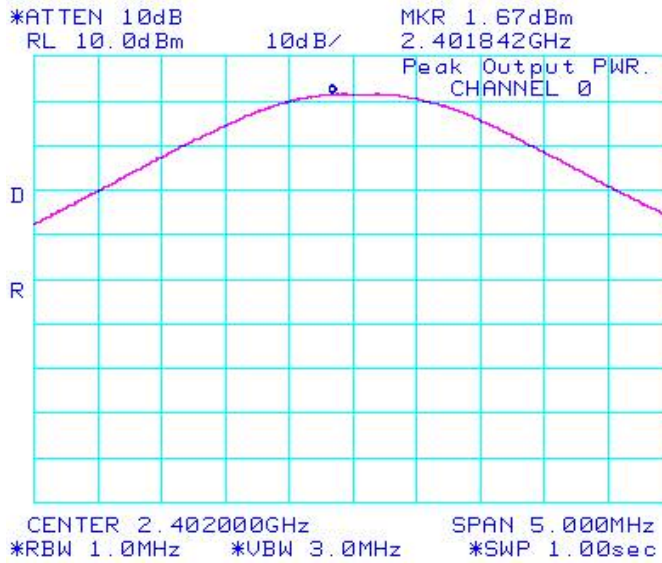
Temperature	22°C
Pressure	999 mb
Relative Humidity	22%

See figures 3-19 to 3-21 for the plots of the maximum peak conducted output power.

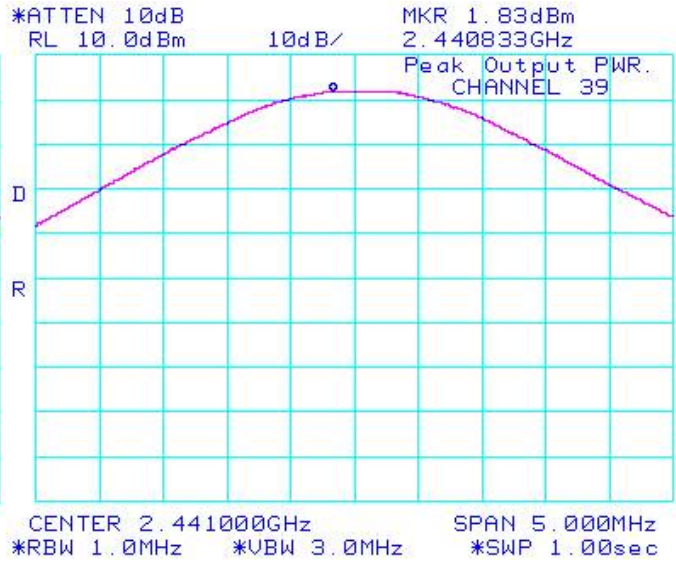
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Bluetooth RF Conducted Emission Test Results cont'd

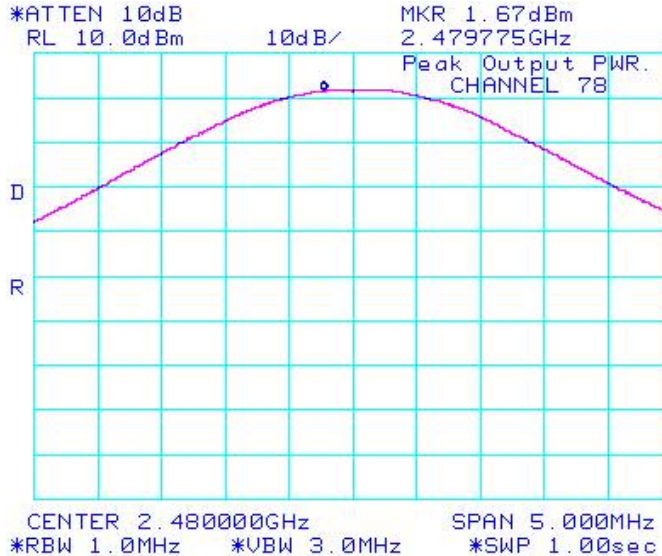
**Figure 3-19: Max. Peak Conducted Output Power
Single Freq., Static PBRS, DH5**



**Figure 3-20: Max. Peak Conducted Output Power
Single Freq., Static PBRS, DH5**



**Figure 3-21: Max. Peak Conducted Output Power
Single Freq., Static PBRS, DH5**



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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 PBRS" and packet type "DH5" during the measurements.

Bluetooth Channel	Operating Mode	Measured Level (dBc)	Limit (dBc)	Margin (dB)
0	Single Frequency	-30.00	-20	-10.00
78	Single Frequency	-30.67	-20	-10.67
0	Hopping	-29.33	-20	-9.33
78	Hopping	-31.84	-20	-11.84

The environmental test conditions were:

Temperature	23°C
Pressure	999 mb
Relative Humidity	22%

See figures 3-22 to 3-25 for the plots of the band edge compliance measurements.

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Bluetooth RF Conducted Emission Test Results cont'd

Figure 3-22: Band Edge Compliance

Single Freq., Static PBRS, DH5

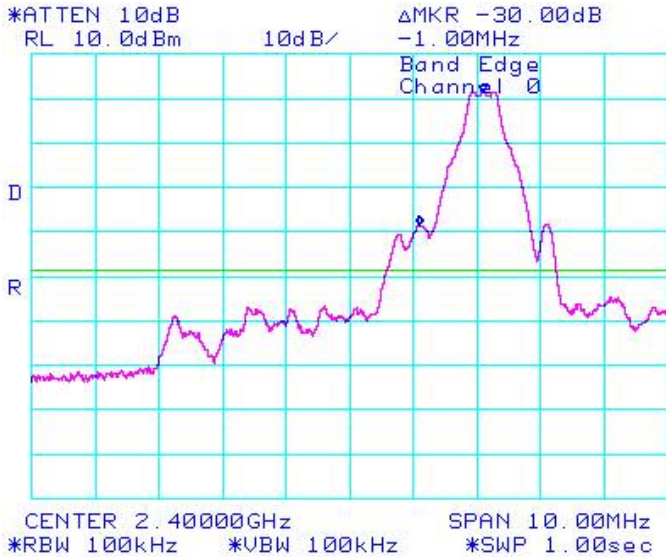


Figure 3-23: Band Edge Compliance

Single Freq., Static PBRS, DH5

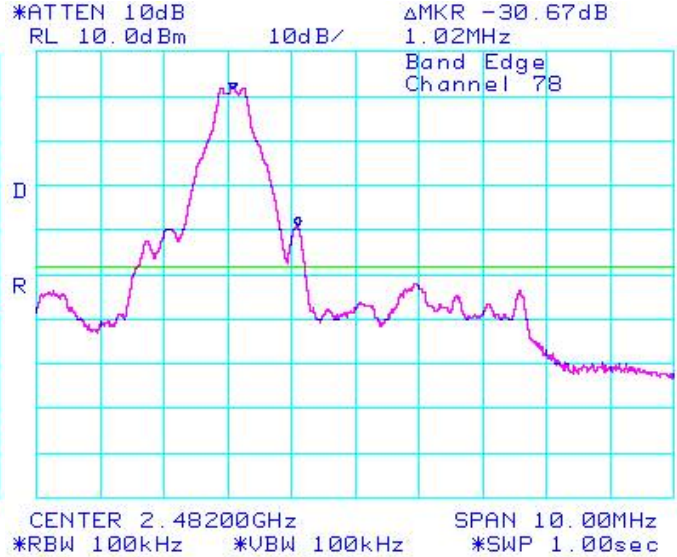


Figure 3-24: Band Edge Compliance

Freq. Hopping, Static PBRS, DH5

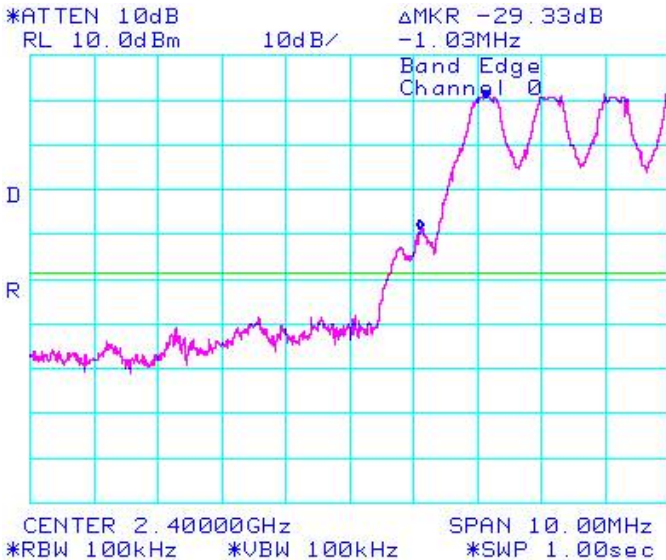
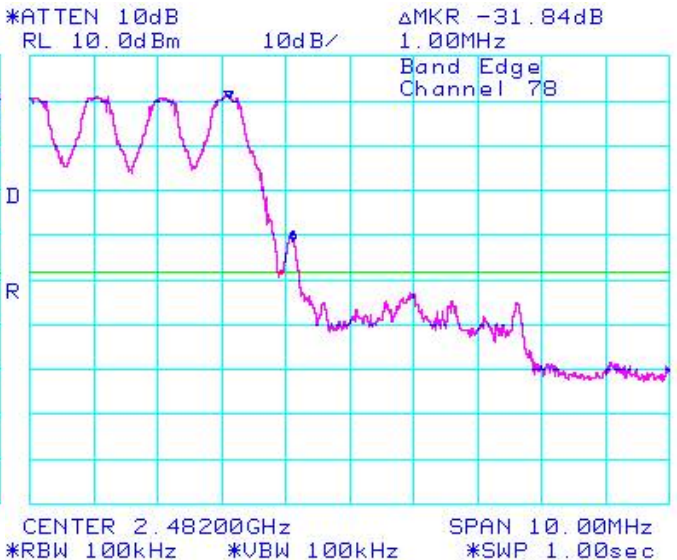


Figure 3-25: Band Edge Compliance

Freq. Hopping, Static PBRS, DH5



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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), mid channel (39) and high channel (78) were measured. Bluetooth was operating in single frequency and hopping mode. 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.

Using pattern type “Static PBRs” and packet type “DH5” during the measurements.

Bluetooth Channel	Channel Power (dBm)	Max. Measured Level (dBm)	Max. Measured Level from carrier (dBc)	Limit (dBc)
0	2.83	-58.00	-59.67	-20
39	2.83	-58.67	-60.50	-20
78	2.33	-58.17	-59.84	-20
Hopping mode	2.33	-57.83	-59.50	-20

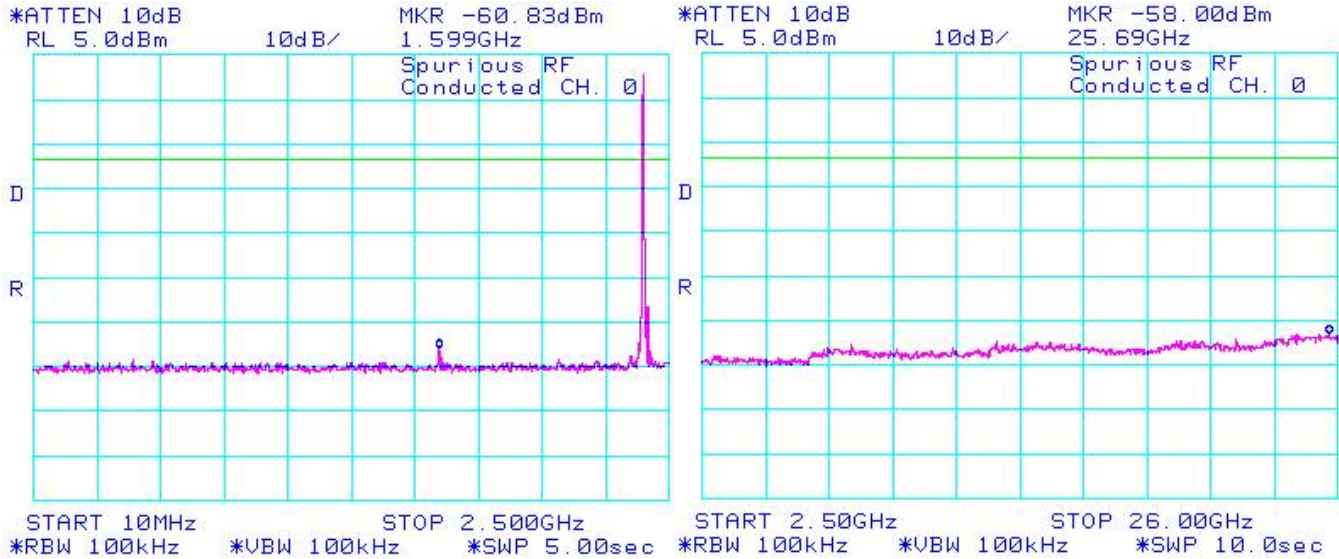
The environmental test conditions were: Temperature 23°C
 Pressure 999 mb
 Relative Humidity 22%

See figures 3-26 to 3-29 for the plots of the spurious RF conducted emissions.

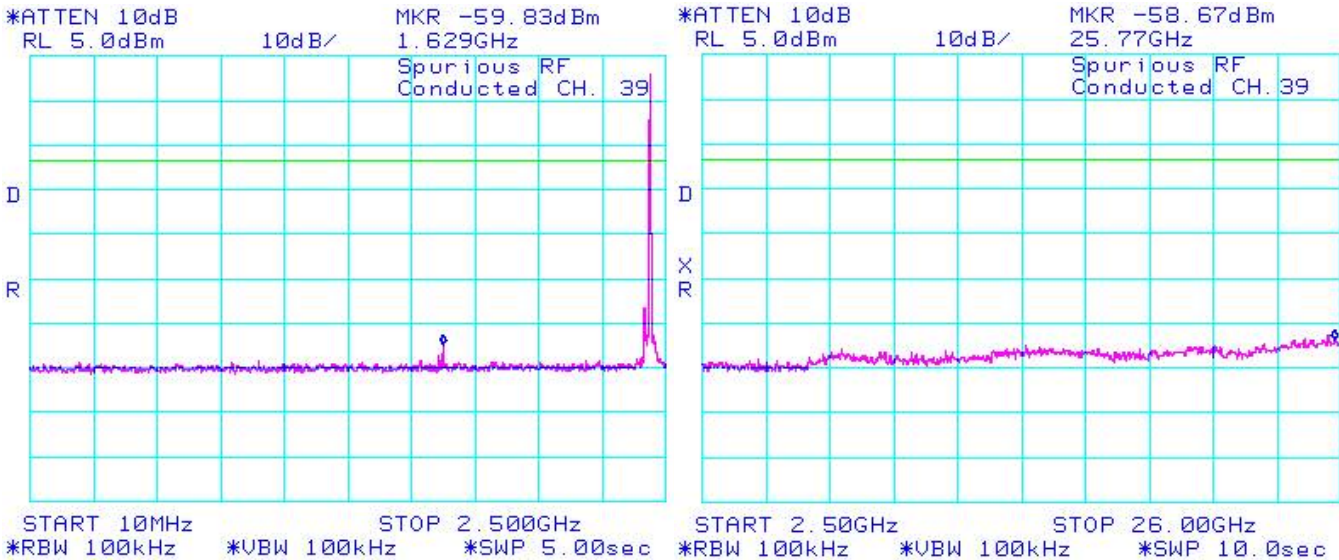
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Bluetooth RF Conducted Emission Test Results cont'd

**Figure 3-26: Spurious RF Conducted Emissions
Single Freq., Static PBRS, DH5,**



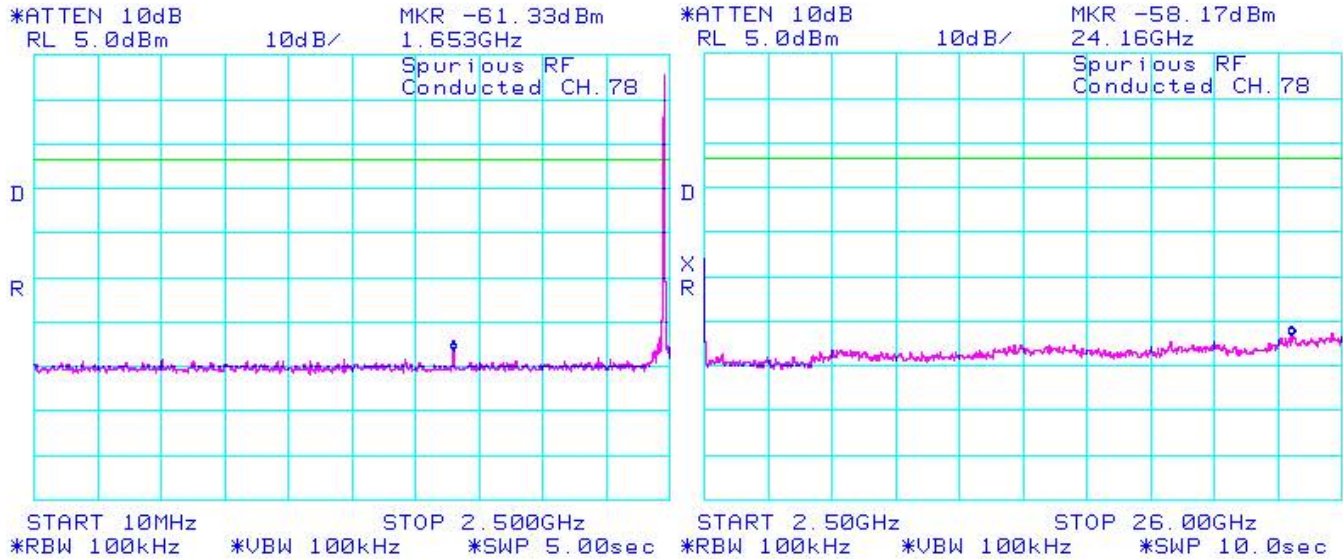
**Figure 3-27: Spurious RF Conducted Emissions
Single Freq., Static PBRS, DH5**



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Bluetooth RF Conducted Emission Test Results cont'd

**Figure 3-28: Spurious RF Conducted Emissions
Single Freq., Static PBRS, DH5**



**Figure 3-29: Spurious RF Conducted Emissions
Freq. Hopping, Static PBRS, DH5**

