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-0441-0612-06-Rev1

PRODUCT MODEL NO.: RBM41GW
TYPE NAME: BlackBerry
FCC ID: L6ARBM40GW
IC: 2503A-RBM40GW

DATE: 5 January 2007

Statement of Performance:

The BlackBerry Wireless Handheld, model RBM41GW, part number CER-13626-001 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.
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.
This equipment supports Bluetooth Frequency Hopping.

Tested by:

Kevin Chow
Compliance Specialist
Date: 05 Jan 2007

Tested and Reviewed by:

Maurice Battler
Compliance Specialist
Date: 05 Jan 2007

Tested and Reviewed by:

Masud S. Attayi, P.Eng.
Team Lead, Regulatory Compliance
Date: 05 Jan 2007

Approved by:

Paul G. Cardinal, Ph.D.
Director
Date: 05 Jan 2007

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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, 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 Document

1. Document number RTS-0441-RBM41GW-01_rev1

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:

1a. BlackBerry Handheld, model RBG41GW, part number CER-13626-001 Rev. 1, PIN 20502F1C, LCD-11059-003.
1b. BlackBerry Handheld, model RBG41GW, part number CER-13626-001 Rev. 2, PIN 2053032F, LCD-11059-001
2. BlackBerry Handheld, model RBG41GW, part number CER-13626-001 Rev. 1, PIN 20506DB7, LCD-11059-001

Sample numbers 1a, and 1b were used for radiated emission and radiated band edge testing. Sample number 2 was used for conducted tests.

To view the differences between CER-13626-001 Rev 2 and CER-13626-001 Rev 3 see document number RTS-0441-RBM41GW-01_rev1.

Only the measurements that may have been impacted by the changes from Rev 2 to Rev 3 were re-measured.

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 1000134

E. Test Voltage

The ac input voltage was 120/230 volts, 60/50 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 and Kevin Chow
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

G. Modifications to EUT

No modifications were required on the EUT.

H. Summary of Results

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:

1. The Handheld 1b in battery charging mode, was connected to the Folding Blade Charger, part number ASY-07040-001. The ac input to the Folding Blade Charger was 120 volts, 60 Hz. The Handheld 1b was also connected to the Stereo Headset, part number HDW-13019-001.

The sample EUT's conducted emissions were compared with respect to the FCC CFR 47 Part 15, Subpart C and IC RSS-210 limit. The sample EUT had a worse case test margin of 7.90 dB below the limit at 1.690 MHz quasi peak detector, and 14.90 dB below the limit at 1.657 MHz using the average detector with the Folding Blade Charger, test configuration 1.
See APPENDIX 1 for the test data

Measurement Uncertainty ±2.0 dB

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 40.0 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 "3-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 10.8 dB at 4882.0 MHz using the peak detector and a worse case test margin of 2.8 dB at 4882.0 MHz using the average detector.
See APPENDIX 2 for the test data

b) 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. The results include both normal data rate and EDR for Bluetooth.

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.

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. The result includes both normal data rate and EDR.
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.
The result includes both normal data rate and EDR.
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. The result includes both normal data rate and EDR.
See APPENDIX 3 for the test data.

I. Compliance Test Equipment Used

UNIT	MANUFACTURER	MODEL	SERIAL NUMBER	CAL DUE DATE (YY MM DD)	USE
Preamplifier	Sonoma	310N/11909A	185831	06-11-27	Radiated Emissions
Preamplifier system	TDK RF Solutions	PA-02	080010	06-11-25	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	06-11-28	Radiated Emissions
Universal Radio Communication Tester	Rohde & Schwarz	CMU 200	837493/073	07-03-23	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	06-12-23	Radiated Emissions
Environment Monitor	Control Company	1870	230355189	06-12-23	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	Radiated Emissions
Signal Generator	Agilent	8648C	4037U03155	07-09-13	Frequency Stability
Power Meter	Giga-tronics	8541C	1837762	06-12-03	Frequency Stability
Power Sensor	Giga-tronics	80401A	1835838	06-12-03	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

APPENDIX 1 – AC CONDUCTED EMISSIONS TEST DATA/PLOTS

Bluetooth AC Conducted Emission Test Results

AC Power Line Conducted Emissions

The EUT met the requirements of the AC Power Line Conducted Emissions as per FCC CFR 47 Part 15, Subpart C and IC RSS-210.

The environmental test conditions were:

Temperature	22ºC
Pressure	976 mb
Relative Humidity	38%

Test Configuration 1

Date of test: November 29, 2006

Frequency (MHz)	Line	Reading (QP) (dBµV)	Correction Factor (dB)	Corrected Reading (QP) (dB)	Limit (QP) (dBµV)	Margin (QP) Limits (dB)
0.917	N	24.55	9.04	33.59	56.00	-22.41
1.011	N	38.60	9.07	47.67	56.00	-8.33
1.683	L1	28.13	9.34	37.47	56.00	-18.53
1.690	N	38.76	9.34	48.10	56.00	**-7.90**
1.794	N	36.81	9.37	46.18	56.00	-9.82
1.902	N	35.04	9.37	44.40	56.00	-11.60
2.371	L1	26.24	9.46	35.70	56.00	-20.30

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

Measurements were done with the quasi-peak detector.

See figure 1-1 for the measurement plot of AC power line conducted emissions.

Bluetooth AC Conducted Emission Test Results cont'd

Test Configuration 1

Date of test: November 29, 2006

Frequency (MHz)	Line	Reading (AV) (dBµV)	Correction Factor (dB)	Corrected Reading (AV) (dB)	Limit (AV) (dBµV)	Margin (AV) Limits (dB)
0.960	N	13.56	9.04	22.60	46.00	-23.40
1.050	N	13.18	9.07	22.25	46.00	-23.75
1.168	L1	21.39	9.13	30.52	46.00	-15.48
1.167	N	18.77	9.13	27.90	46.00	-18.10
1.657	L1	21.76	9.34	31.10	46.00	**-14.90**
1.661	N	16.23	9.34	25.57	46.00	-20.43
1.756	L1	19.91	9.36	29.27	46.00	-16.73
2.342	L1	18.34	9.46	27.80	46.00	-18.20

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

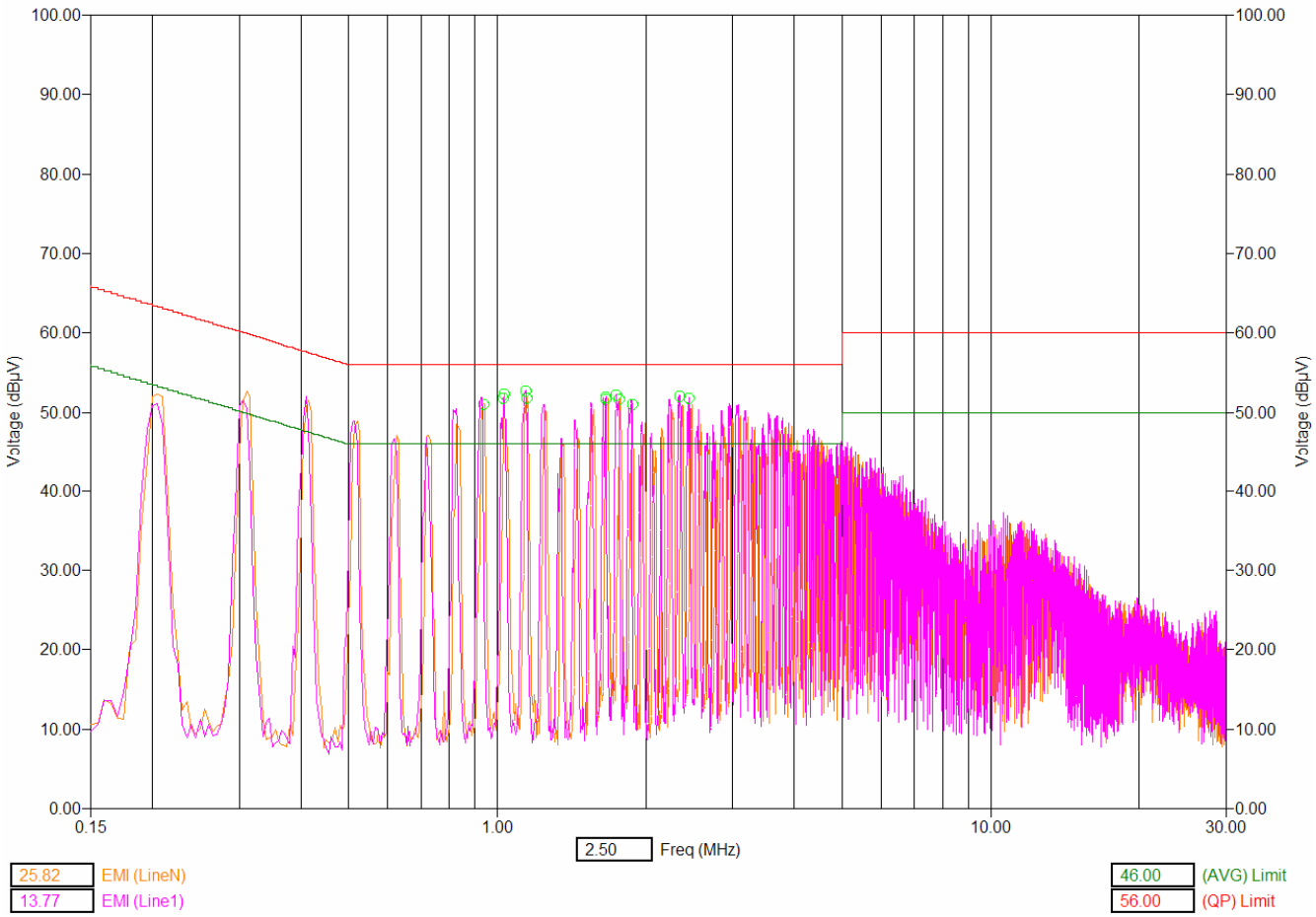
Measurements were done with the average detector.

See figure 1-1 for the measurement plot of AC power line conducted emissions.

Bluetooth AC Conducted Emission Test Results cont'd

Test Configuration 1

Figure 1-1



APPENDIX 2 – RADIATED EMISSIONS TEST DATA

Radiated Emissions Test Results
Bluetooth Band

Test Distance was 3.0 metre.
Date of test: November 3, 2006

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 Type	Antenna Pol	Reading (Peak) (dBuV)	Corrected Reading (dBuV)	Detector (AVE/PK)	Peak Limit (dBuV/m)	Diff. To Limit (dB)
Handheld Standalone, USB side down									
Single frequency mode Low Channel									
2nd	0	4804.0	Horn	V	NF	NF	PK.	74	-
2nd	0	4804.0	Horn	H	NF				
2nd	0	4804.0	Horn	V	NF	NF	AVE.	54	-
2nd	0	4804.0	Horn	H	NF				
The harmonics were investigated up to the 10th harmonic. Emissions were in the noise floor (NF)									
Single frequency mode Middle Channel									
2nd	39	4882.0	Horn	V	42.4	63.2	PK.	74	-10.8
2nd	39	4882.0	Horn	H	NF				
2nd	39	4882.0	Horn	V	30.4	51.2	AVE.	54	**-2.8**
2nd	39	4882.0	Horn	H	NF				
The harmonics were investigated up to the 10th harmonic. Emissions above the 2nd harmonic were in the NF									
Single frequency mode High Channel									
2nd	78	4960.0	Horn	V	NF	NF	PK.	74	-
2nd	78	4960.0	Horn	H	NF				
2nd	78	4960.0	Horn	V	NF	NF	AVE.	54	-
2nd	78	4960.0	Horn	H	NF				
The harmonics were investigated up to the 10th harmonic. Emissions were in the NF									

Bluetooth Radiated Emissions Test Results cont'd

Using Pattern type "Static PRBS" and packet type "3-DH5" during the measurements.

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

The environmental test conditions were:

Temperature	23ºC
Pressure	1050 mb
Humidity	33 %

Bluetooth Band-Edge Compliance of RF Radiated Emissions Test Results

The test distance was 3 metres.
Date of test: November 13, 2006
Handheld standalone, vertical, Pattern type "Static PRBS" and packet type "3-DH5" during the measurements.

Channel	Freq. (MHz)	Rx Antenna Type	Rx Antenna POL.	Detector (PK, AVE.)	VBW (MHz)	Corrected Reading (dBuV/m)	Delta Marker (dB)	Corrected Band edge (dBuV/m)	Limit (dBuV/m)	Diff. To Limit (dB)
0	2402.0	Horn	V	PK	1.0 MHz	90.9	46.1	44.8	74	-29.2
0	2402.0	Horn	H	PK	1.0 MHz	91.0	49.2	41.8	74	-32.2
0	2402.0	Horn	V	AVE.	10 Hz	80.1	46.1	34.0	54	-20.0
0	2402.0	Horn	H	AVE.	10 Hz	80.9	49.2	31.7	54	-22.3

Handheld in standalone, vertical, Pattern type "Static PRBS" and packet type "3-DH5" during the measurements.

Channel	Freq. (MHz)	Rx Antenna Type	Rx Antenna POL.	Detector (PK, AVE.)	VBW (MHz)	Corrected Reading (dBuV/m)	Delta Marker (dB)	Corrected Band edge (dBuV/m)	Limit (dBuV/m)	Diff. To Limit (dB)
78	2480.0	Horn	V	PK	1.0 MHz	87.1	42.7	44.4	74	-29.6
78	2480.0	Horn	H	PK	1.0 MHz	88.6	43.5	45.1	74	-28.9
78	2480.0	Horn	V	AVE.	10 Hz	77.7	42.7	35.0	54	-19.0
78	2480.0	Horn	H	AVE.	10 Hz	79.8	43.5	36.3	54	-17.7

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

Channel	Freq. (MHz)	Rx Antenna Type	Rx Antenna POL.	Detector (PK, AVE.)	VBW (MHz)	Corrected Reading (dBuV/m)	Delta Marker (dB)	Corrected Band edge (dBuV/m)	Limit (dBuV/m)	Diff. To Limit (dB)
78	2480.0	Horn	V	PK	1.0 MHz	87.1	40.1	47.0	74	-27.0
78	2480.0	Horn	H	PK	1.0 MHz	89.2	44.7	44.5	74	-29.5
78	2480.0	Horn	V	AVE.	10 Hz	80.2	40.1	40.1	54	-13.9
78	2480.0	Horn	H	AVE.	10 Hz	82.3	44.7	37.6	54	-16.4

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

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, 3-DH5, Channel 0, Pol: V, Detector: PK

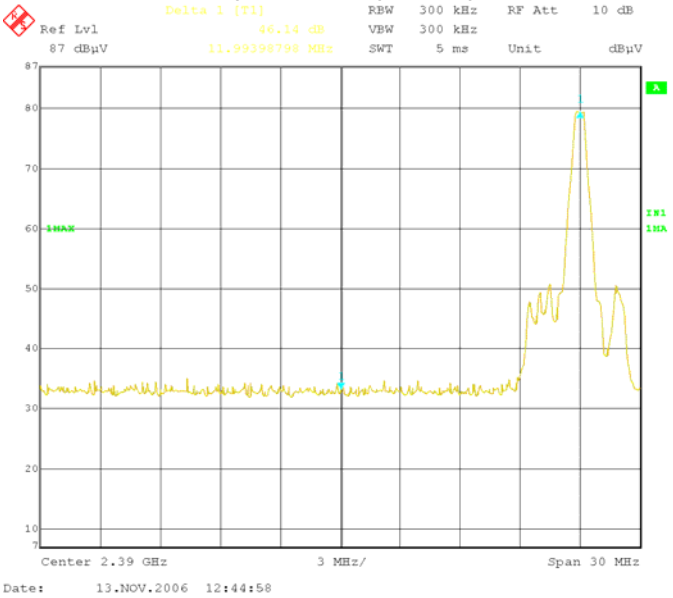


Figure 2-2: Band-Edge Compliance of RF Rad. Emi. Bluetooth, Single freq., Static PBRS, 3-DH5, Channel 0, Pol: H, Detector: PK

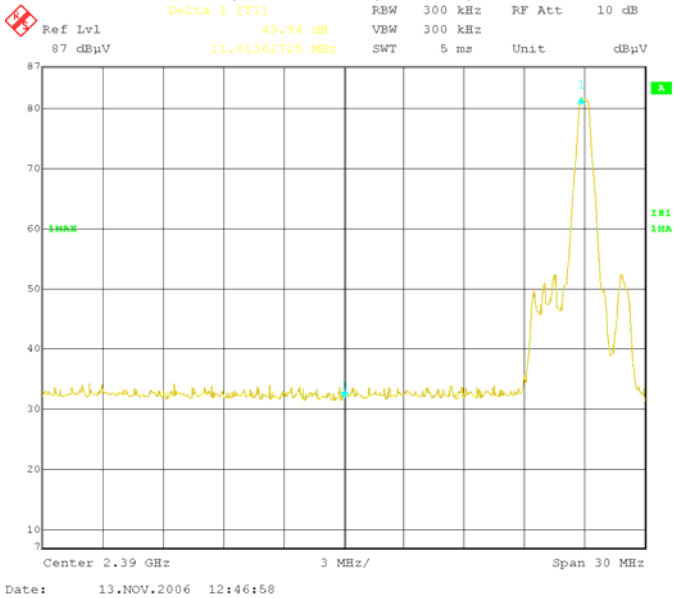


Figure 2-3: Band-Edge Compliance of RF Rad. Emi. Bluetooth, Single freq., Static PBRS, 3-DH5, Channel 78, Pol: V, Detector: PK

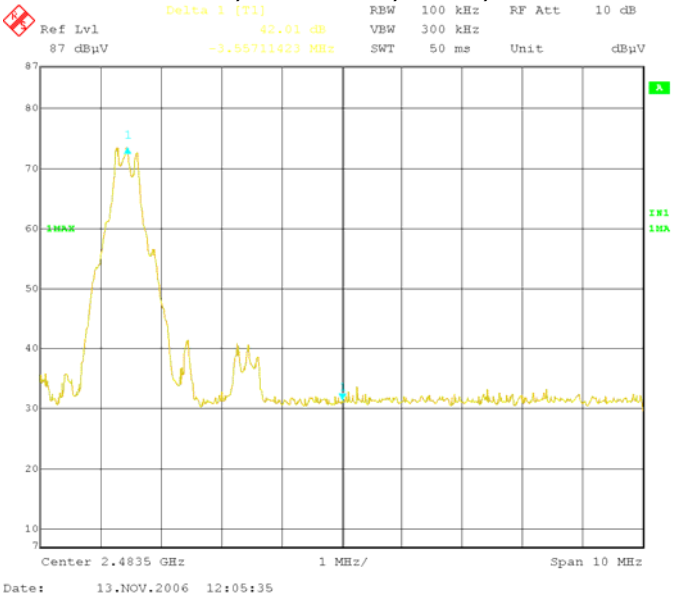
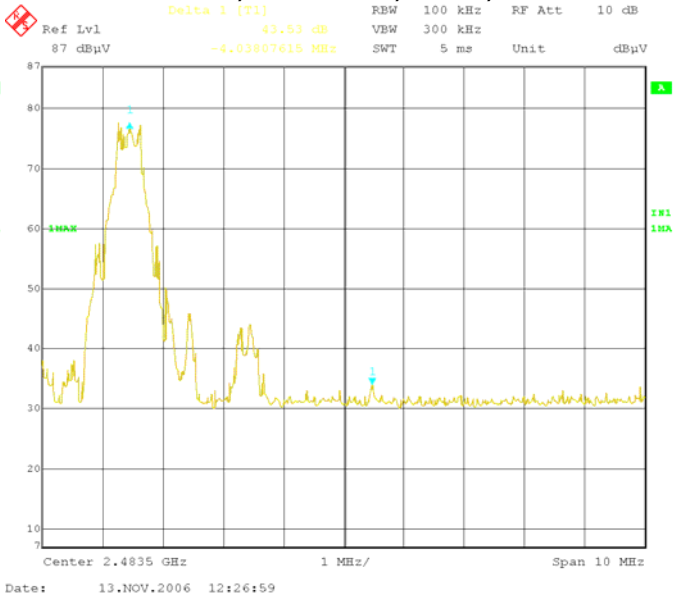


Figure 2-4: Band-Edge Compliance of RF Rad. Emi. Bluetooth, Single freq., Static PBRS, 3-DH5, Channel 78, Pol: H, Detector: PK

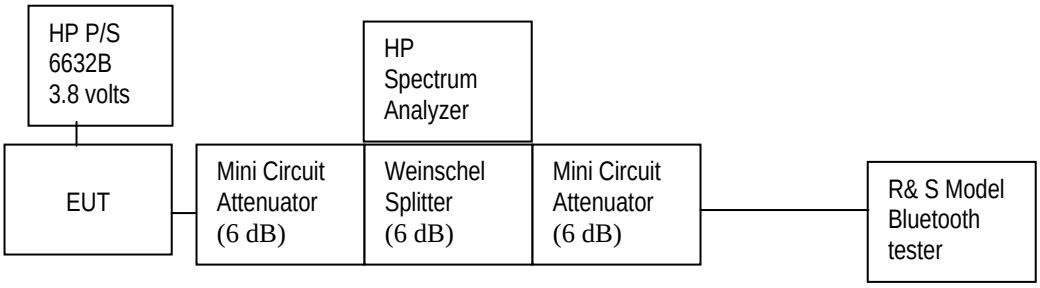


APPENDIX 3 – BLUETOOTH CONDUCTED EMISSIONS TEST DATA/PLOTS

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: October 20, 2006

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	0.947
39	<=1.0	0.933
78	<=1.0	0.933

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

The environmental test conditions were:

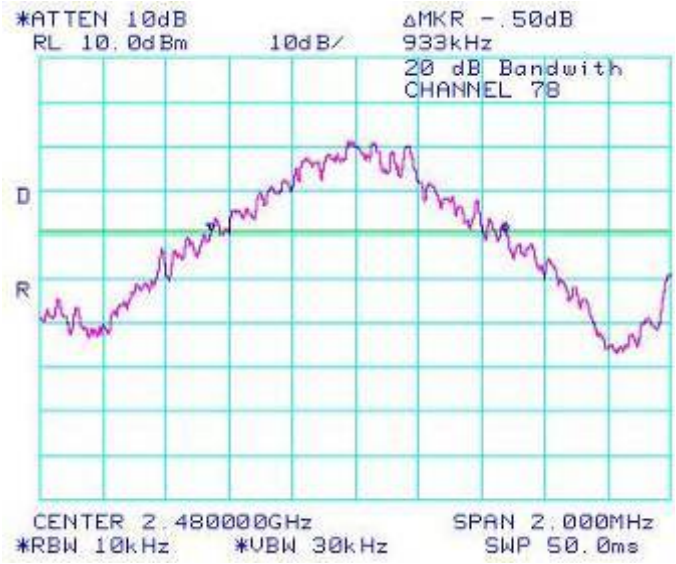
Temperature	24ºC
Pressure	1003 mb
Relative Humidity	27%

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



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.

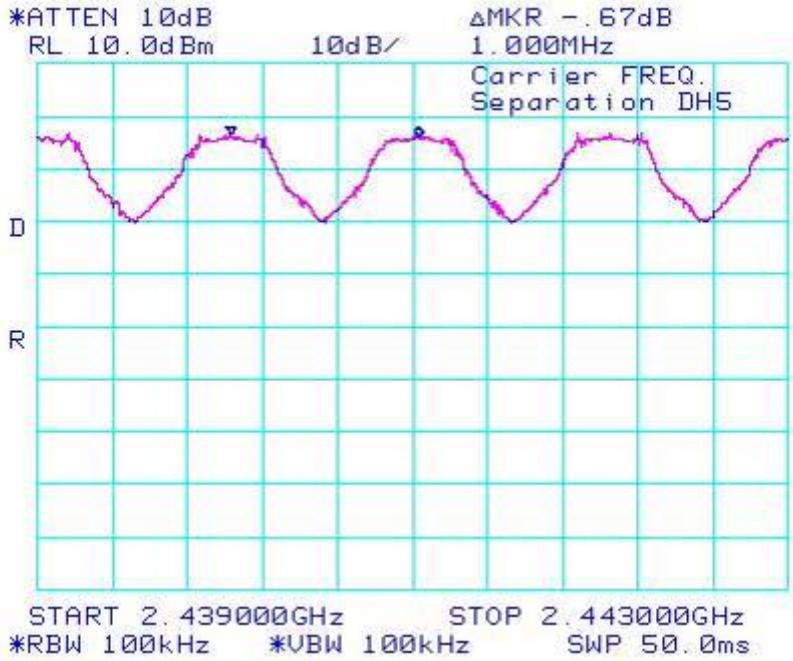
Bluetooth Channels	Limit (MHz)	Measured Level (MHz)
38 to 39	>= 0.025 or 20 dB bandwidth	1.000

The environmental test conditions were:

Temperature	24ºC
Pressure	1003 mb
Relative Humidity	27%

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



Bluetooth RF Conducted Emission Test Results cont'd

Using Pattern type "Static PRBS" and packet type "3-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	24ºC
Pressure	1003 mb
Relative Humidity	27%

See figure 3-5 for the plot of the Carrier Frequency Separation measurement.

Figure 3-5: Carrier Frequency Separation, Freq. Hopping, Static PBRS, 3-DH5, Channels 38 to 39

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	24ºC
Pressure	1003 mb
Relative Humidity	27%

See figures 3-6 to 3-9 for the plots of the number of hopping frequencies.

Bluetooth RF Conducted Emission Test Results cont'd

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

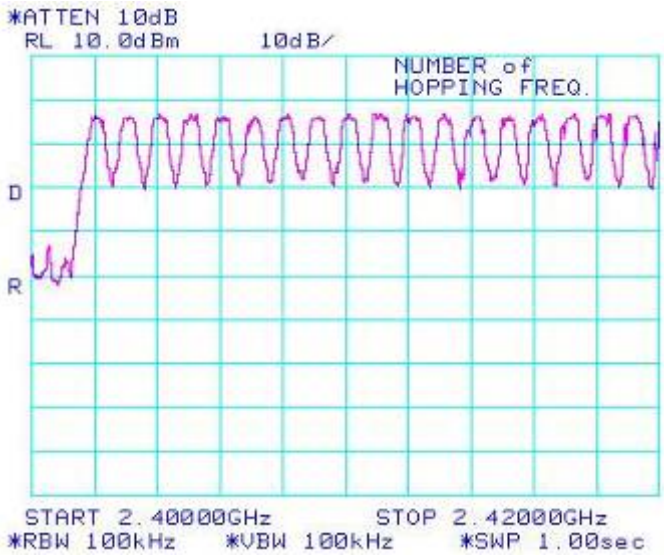


Figure 3-7: Number of Hopping Frequencies Static PBRS, DH5

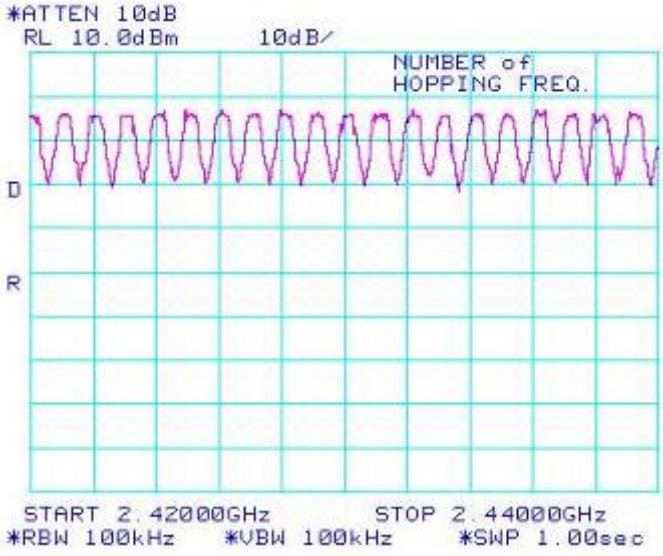


Figure 3-8: Number of Hopping Frequencies Static PBRS, DH5

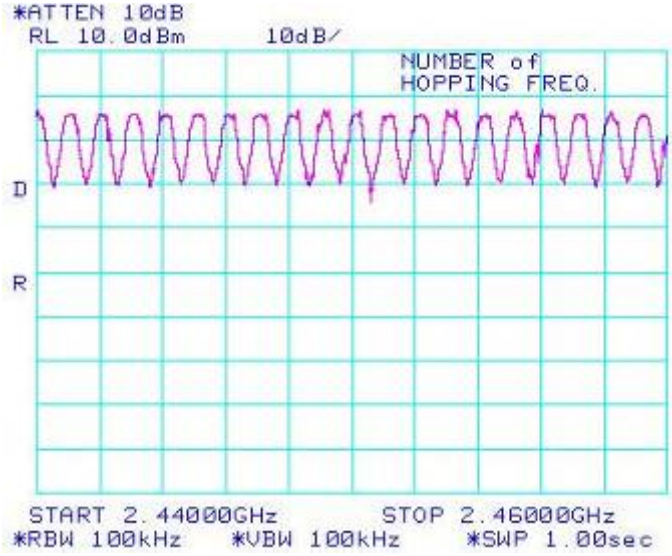
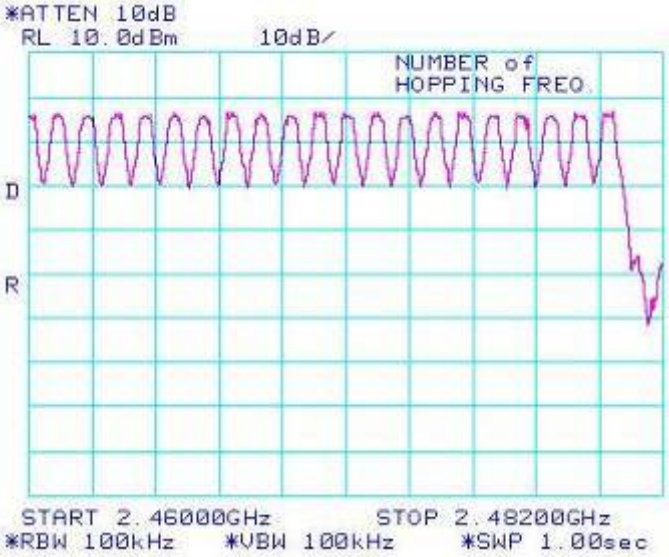


Figure 3-9: Number of Hopping Frequencies Static PBRS, DH5



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. (msec.)	Limit (msec.)	Margin (msec.)
0	DH1	0.500	0.500 x 320.0 = 160.00	400	240.00
39	DH1	0.500	0.500 x 320.0 = 160.00	400	240.00
78	DH1	0.500	0.500 x 320.0 = 160.00	400	240.00
0	DH3	1.742	1.742 x 159.9 = 278.55	400	121.45
39	DH3	1.758	1.758 x 159.9 = 281.10	400	118.90
78	DH3	1.767	1.767 x 159.9 = 282.54	400	117.46
0	DH5	3.000	3.00 x 106.8 = 320.40	400	79.60
39	DH5	3.000	3.00 x 106.8 = 320.40	400	79.60
78	DH5	3.000	3.00 x 106.8 = 320.40	400	79.60

The environmental test conditions were:

Temperature	24ºC
Pressure	1003 mb
Relative Humidity	27%

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

Bluetooth RF Conducted Emission Test Results cont'd

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

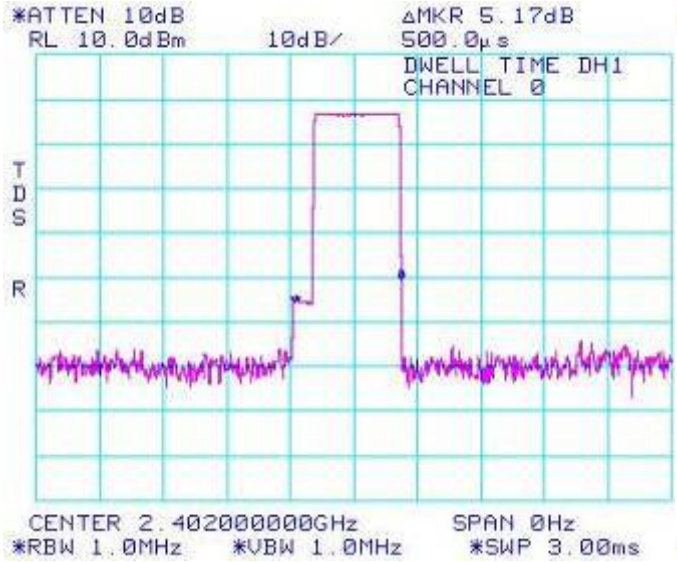


Figure 3-11: Time of Occupancy (Dwell Time) Freq. Hopping, Static PBRS, DH1

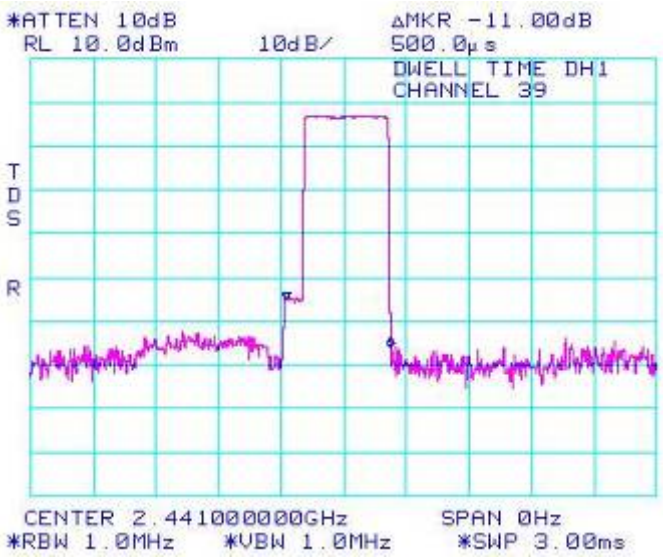


Figure 3-12: Time of Occupancy (Dwell Time) Freq. Hopping, Static PBRS, DH1

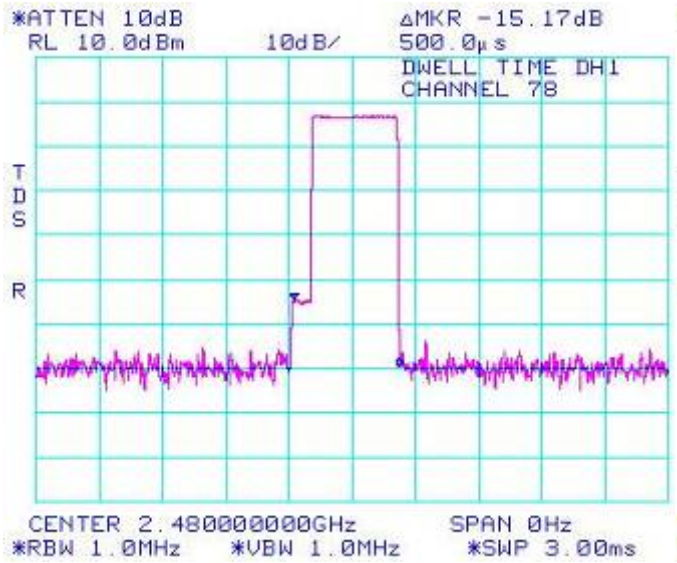
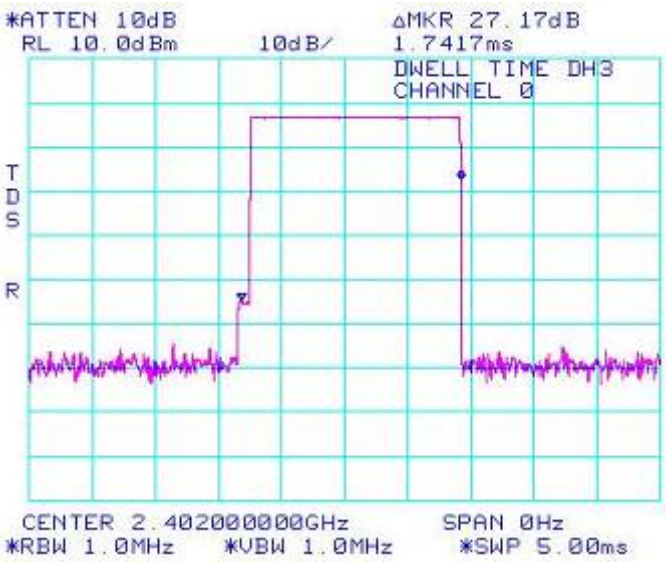


Figure 3-13: Time of Occupancy (Dwell Time) Freq. Hopping, Static PBRS, DH3



Bluetooth RF Conducted Emission Test Results cont'd

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

Figure 3-5 : Time of Occupancy (Dwell Time)
Freq. Hopping, Static PBRS, DH3

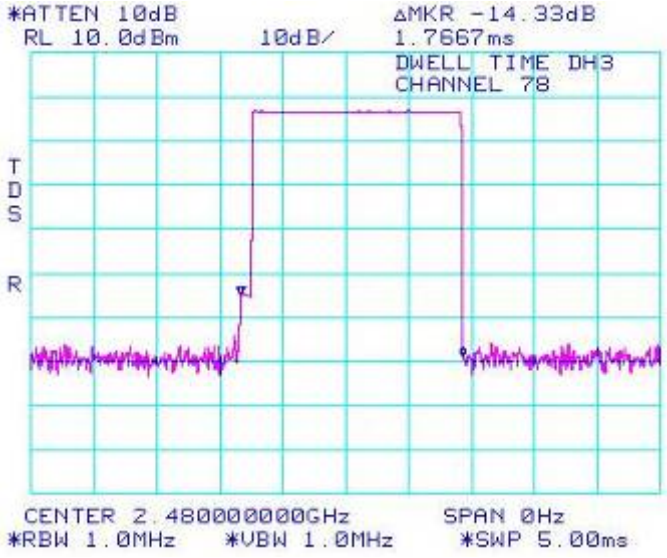


Figure 3-16: Time of Occupancy (Dwell Time)
Freq. Hopping, Static PBRS, DH5

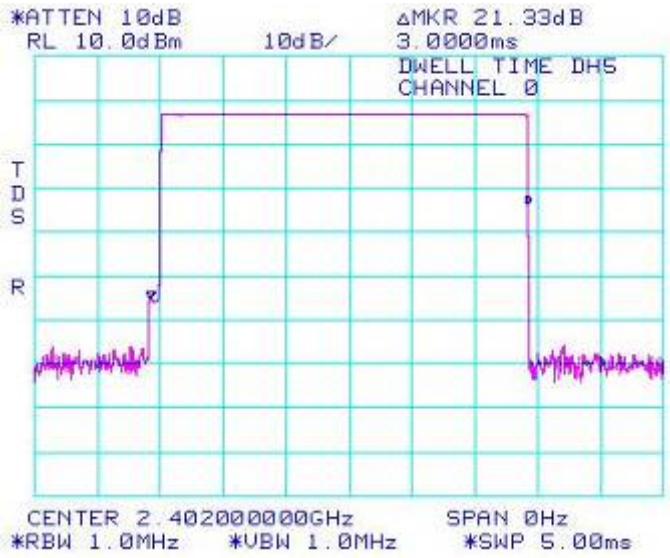
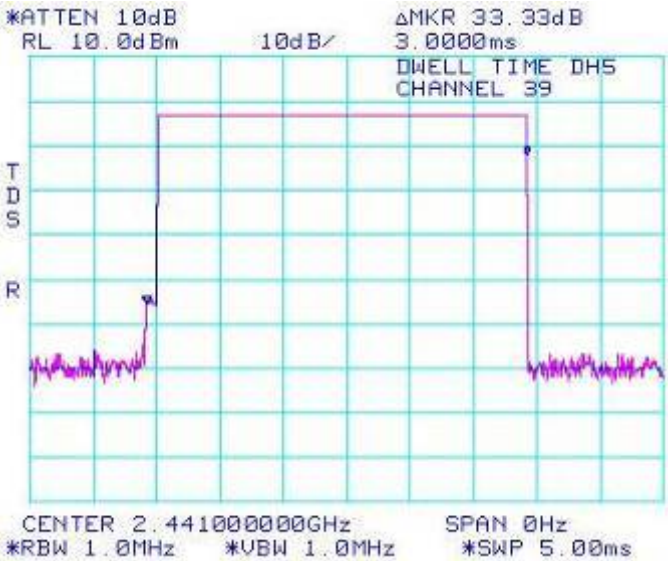
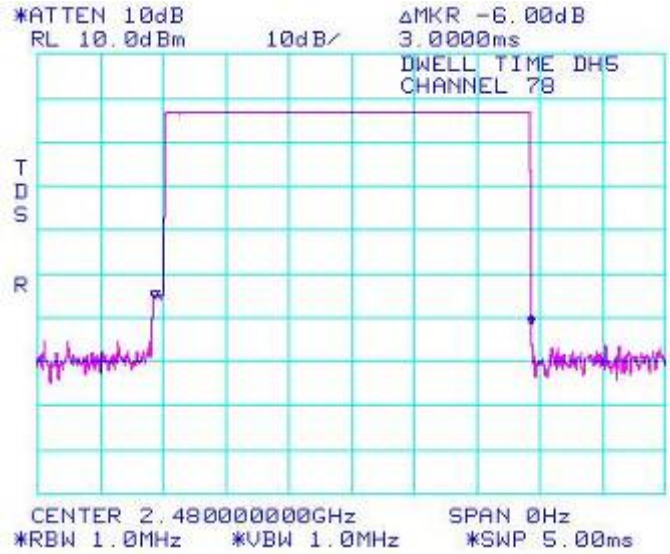


Figure 3-17: Time of Occupancy (Dwell Time)
Freq. Hopping, Static PBRS, DH5



Bluetooth RF Conducted Emission Test Results cont'd

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



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.

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

Bluetooth Channel	Measured Level (dBm)	Class 2 Limit (dBm)
0	-3.00	-6.0 to 4.0
39	-3.00	-6.0 to 4.0
78	-3.17	-6.0 to 4.0

The environmental test conditions were:

Temperature	24ºC
Pressure	1003 mb
Relative Humidity	27%

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

Bluetooth RF Conducted Emission Test Results cont'd

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

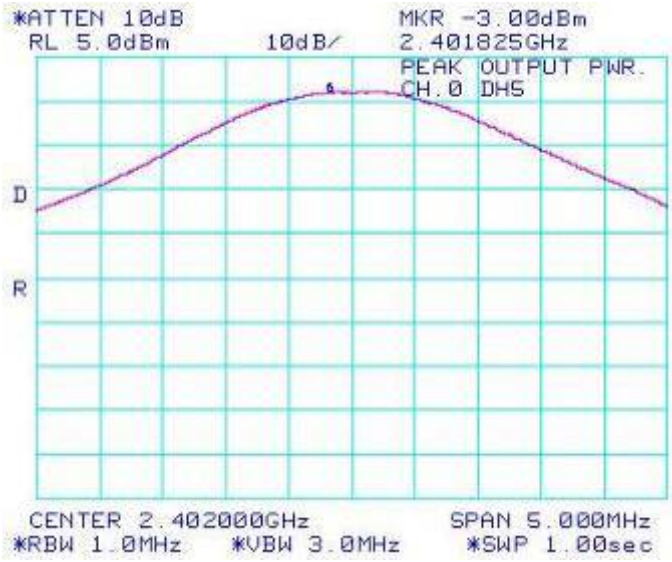


Figure 3-20: Max. Peak Conducted Output Power Single Freq., Static PBRS, DH5

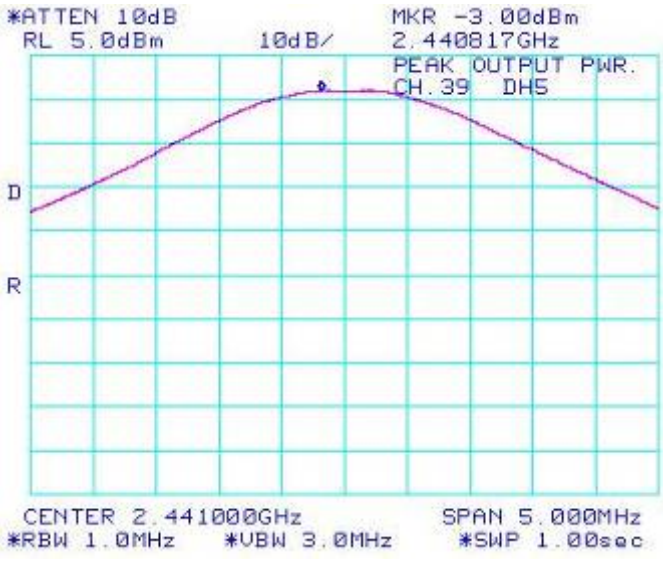
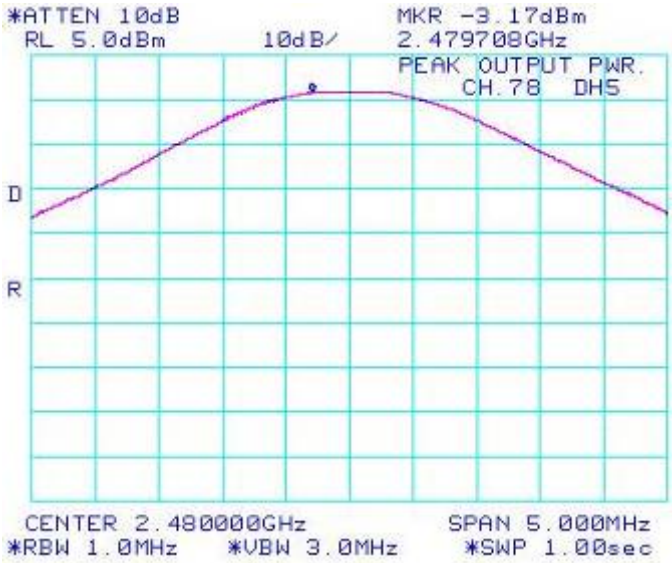


Figure 3-21: Max. Peak Conducted Output Power Single Freq., Static PBRS, DH5



Bluetooth RF Conducted Emission Test Results cont'd

Using Pattern type "Static PRBS" and packet type "3-DH5" during the measurements.

Bluetooth Channel	Measured Level (dBm)	Class 2 Limit (dBm)
0	-1.50	-6.0 to 4.0
39	-1.50	-6.0 to 4.0
78	-1.83	-6.0 to 4.0

The environmental test conditions were:

Temperature	24ºC
Pressure	1003 mb
Relative Humidity	27%

See figures 3-22 to 3-24 for the plots of the maximum peak conducted output power.

Bluetooth RF Conducted Emission Test Results cont'd

Figure 3-22: Max. Peak Conducted Output Power Single Freq., Static PBRS, 3-DH5

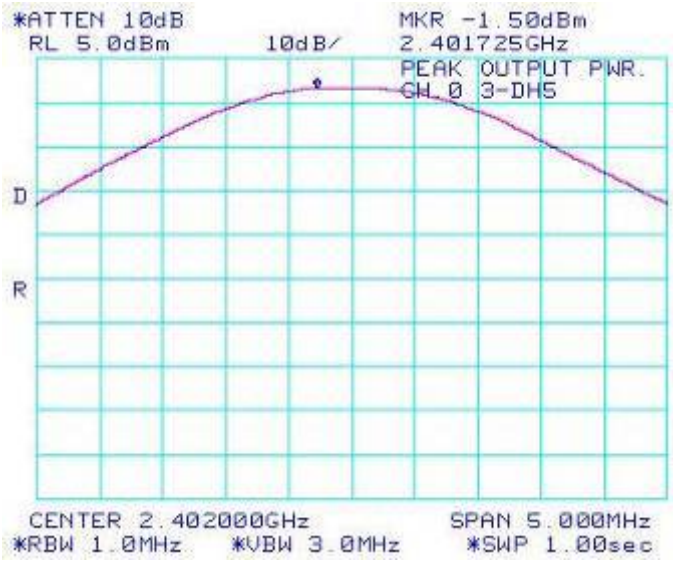


Figure 3-23: Max. Peak Conducted Output Power Single Freq., Static PBRS, 3-DH5

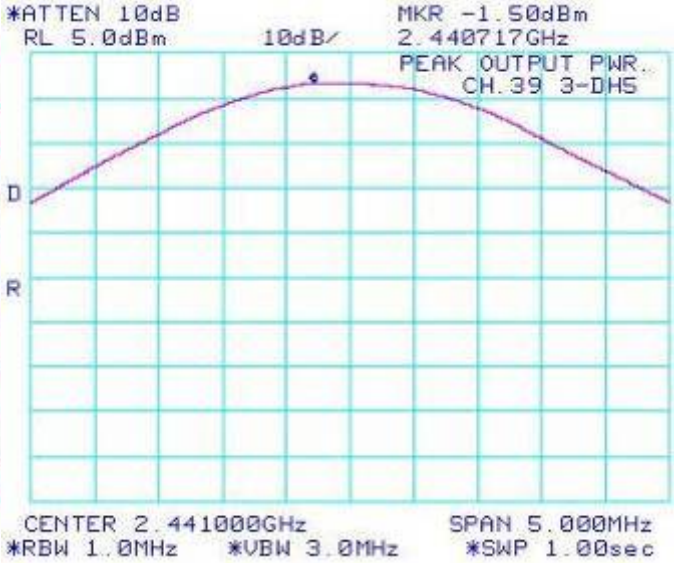
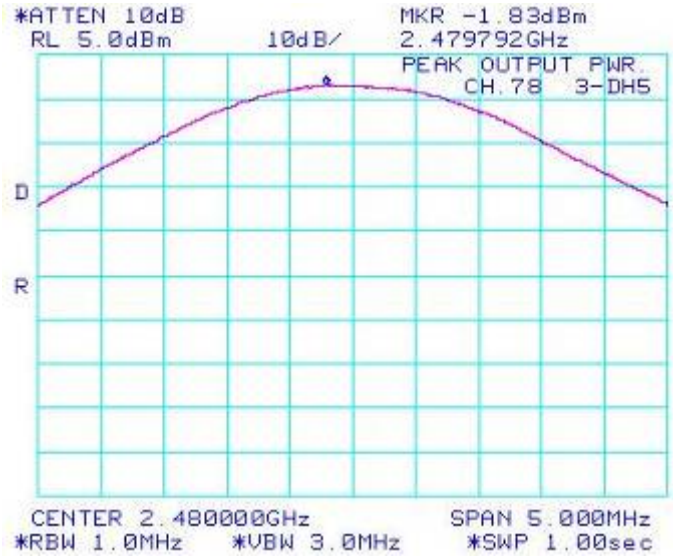


Figure 3-24: Max. Peak Conducted Output Power Single Freq., Static PBRS, 3-DH5



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	-29.17	-20	-9.17
78	Single Frequency	-32.34	-20	-12.34
0 - 78	Hopping	-29.66	-20	-9.66
0 - 78	Hopping	-31.66	-20	-11.66

The environmental test conditions were:

Temperature	24ºC
Pressure	1003 mb
Relative Humidity	27%

See figures 3-25 to 3-28 for the plots of the band edge compliance measurements.

Bluetooth RF Conducted Emission Test Results cont'd

Figure 3-25: Band Edge Compliance
Single Freq., Static PBRS, DH5

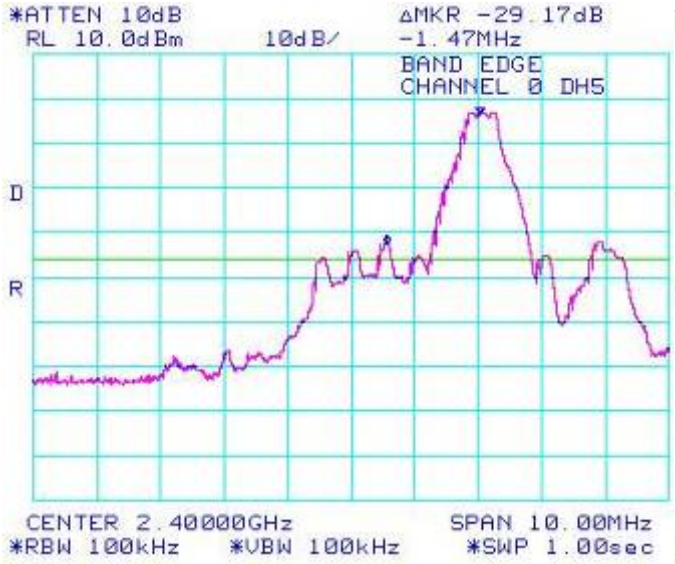


Figure 3-26: Band Edge Compliance
Single Freq., Static PBRS, DH5

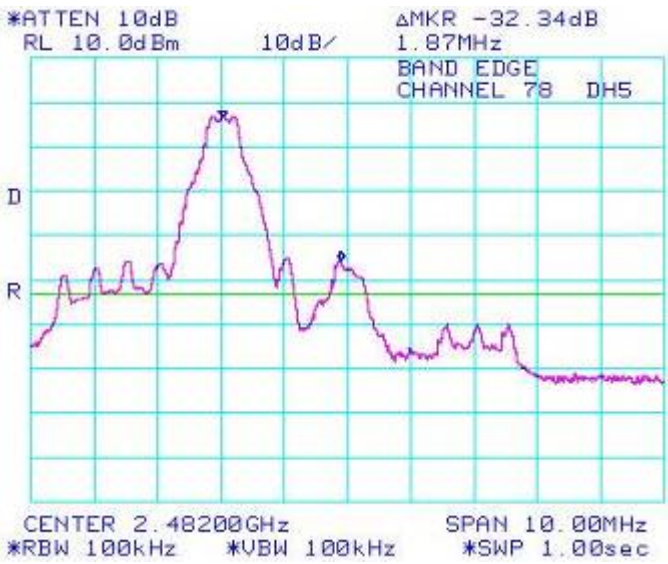


Figure 3-27: Band Edge Compliance
Freq. Hopping, Static PBRS, DH5

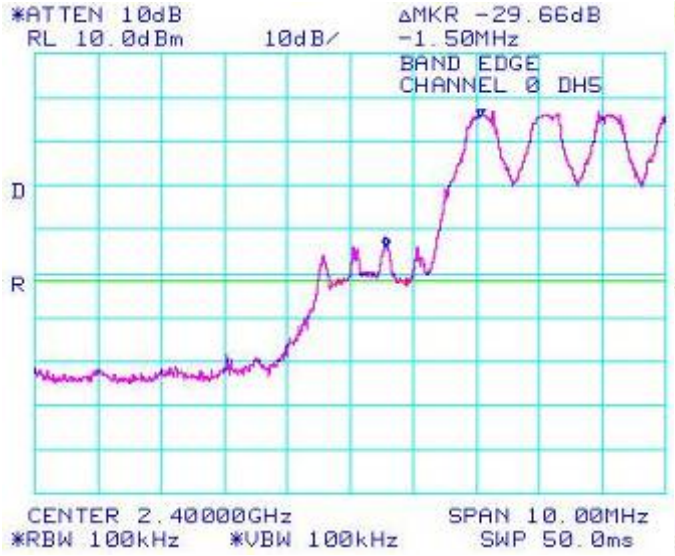
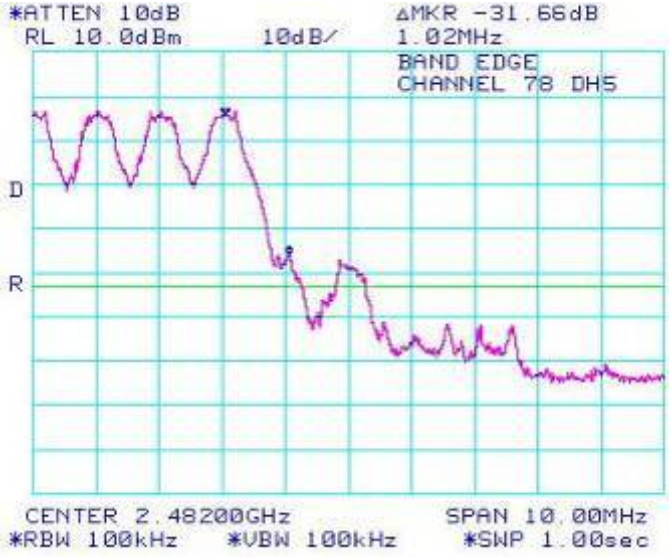


Figure 3-28: Band Edge Compliance
Freq. Hopping, Static PBRS, DH5



Bluetooth RF Conducted Emission Test Results cont'd

Using pattern type "Static PRBS" and packet type "3-DH5" during the measurements.

Bluetooth Channel	Operating Mode	Measured Level (dBc)	Limit (dBc)	Margin (dB)
0	Single Frequency	-32.84	-20	-12.84
78	Single Frequency	-33.33	-20	-13.33
0 - 78	Hopping	-33.33	-20	-13.33
0 - 78	Hopping	-35.16	-20	-15.16

The environmental test conditions were:

Temperature	24ºC
Pressure	1003 mb
Relative Humidity	27%

See figures 3-29 to 3-32 for the plots of the band edge compliance measurements.

Bluetooth RF Conducted Emission Test Results cont'd

Figure 3-29: Band Edge Compliance
Single Freq., Static PBRS, 3-DH5

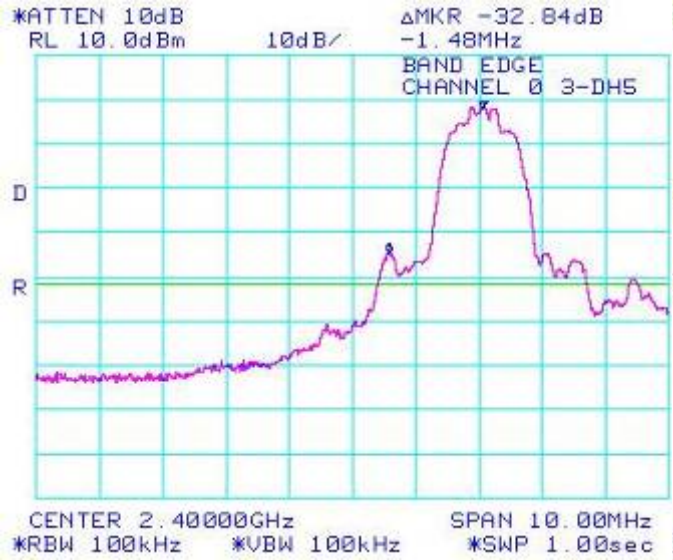


Figure 3-30: Band Edge Compliance
Single Freq., Static PBRS, 3-DH5

Figure 3-31: Band Edge Compliance
Freq. Hopping, Static PBRS, 3-DH5

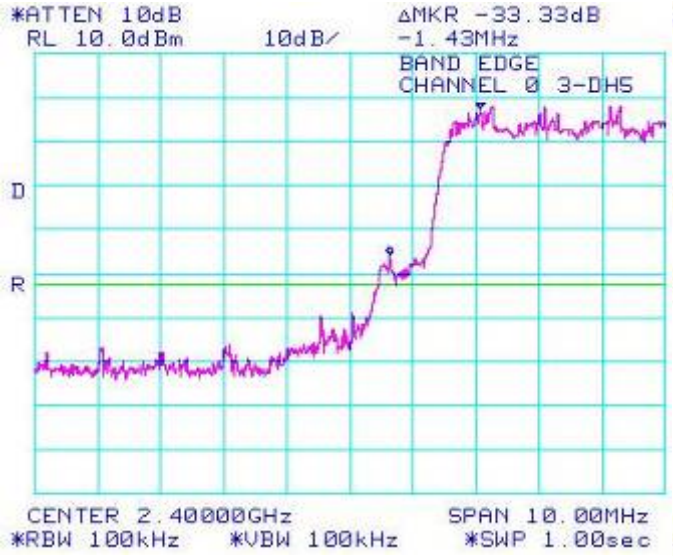


Figure 3-32: Band Edge Compliance
Freq. Hopping, Static PBRS, 3-DH5

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 PRBS" 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	-3.00	-51.33	-48.33	-20
39	-3.00	-51.33	-48.33	-20
78	-3.17	-53.67	-50.50	-20
Hopping mode	-3.00	-52.17	-49.17	-20

The environmental test conditions were:

Temperature	23ºC
Pressure	1005 mb
Relative Humidity	25%

See figures 2-33 to 2-36 for the plots of the spurious RF conducted emissions.

Bluetooth RF Conducted Emission Test Results cont'd

Figure 2-33: Spurious RF Conducted Emissions
Single Freq., Static PBRS, DH5,

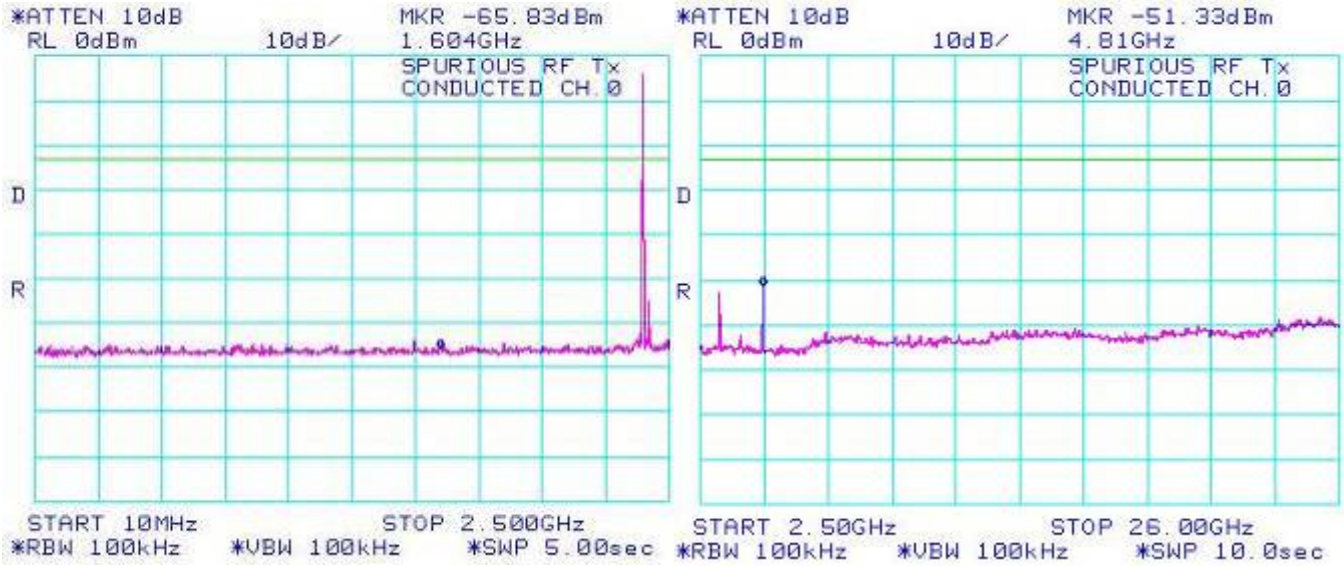
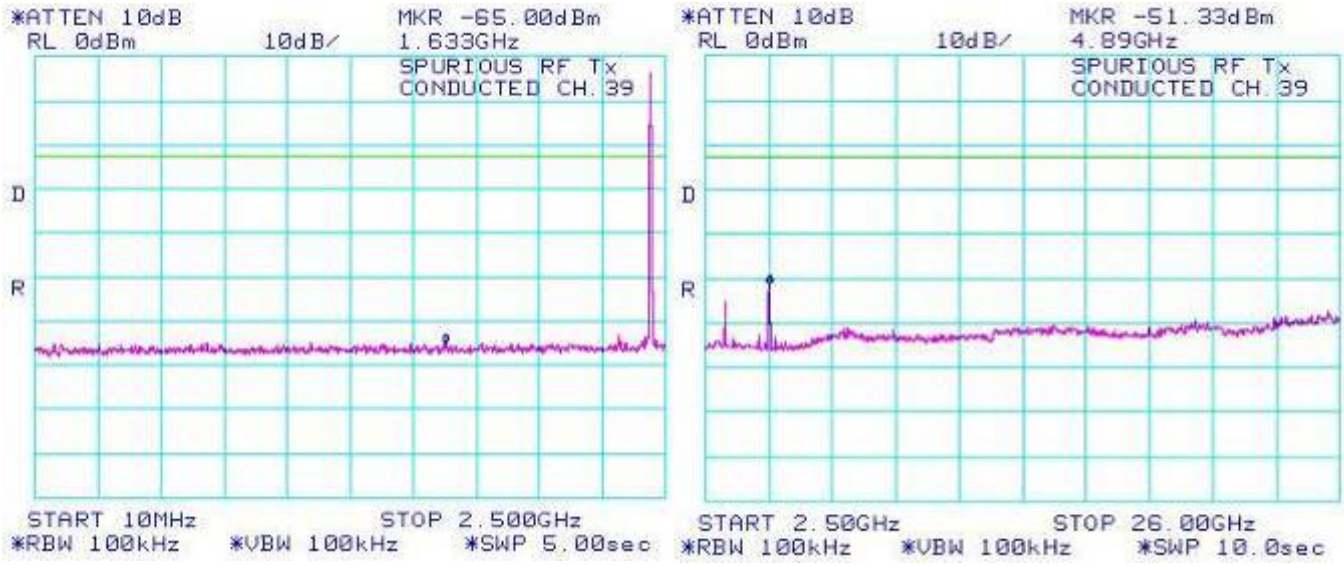


Figure 2-34: Spurious RF Conducted Emissions
Single Freq., Static PBRS, DH5



Bluetooth RF Conducted Emission Test Results cont'd

Figure 2-35: Spurious RF Conducted Emissions
Single Freq., Static PBRS, DH5

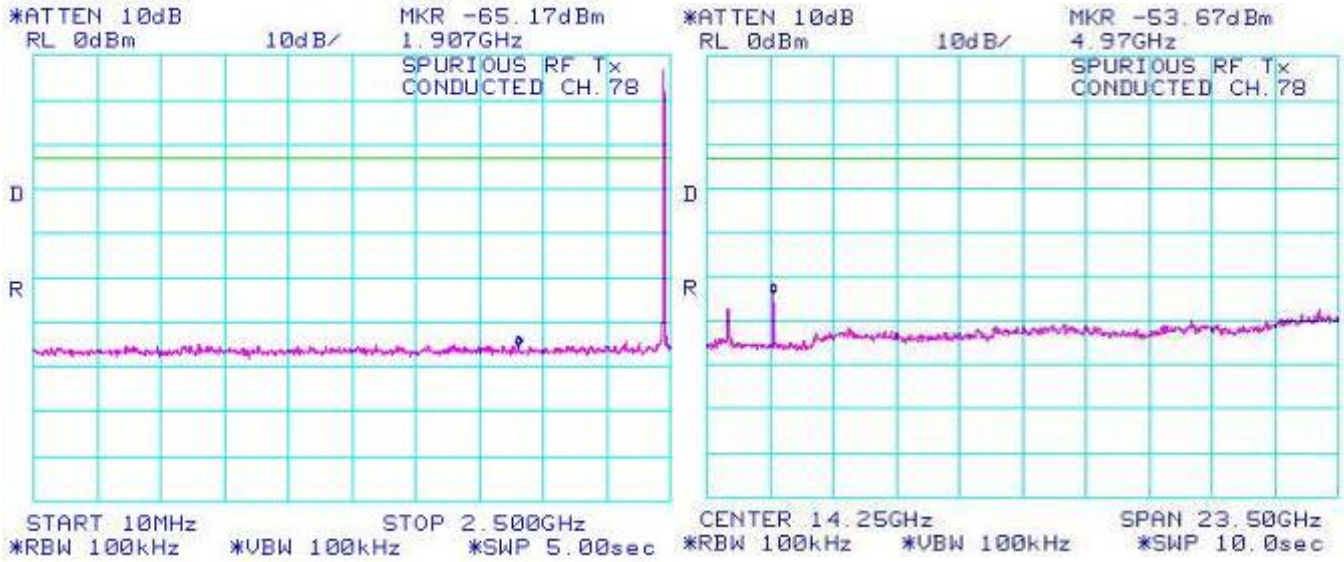
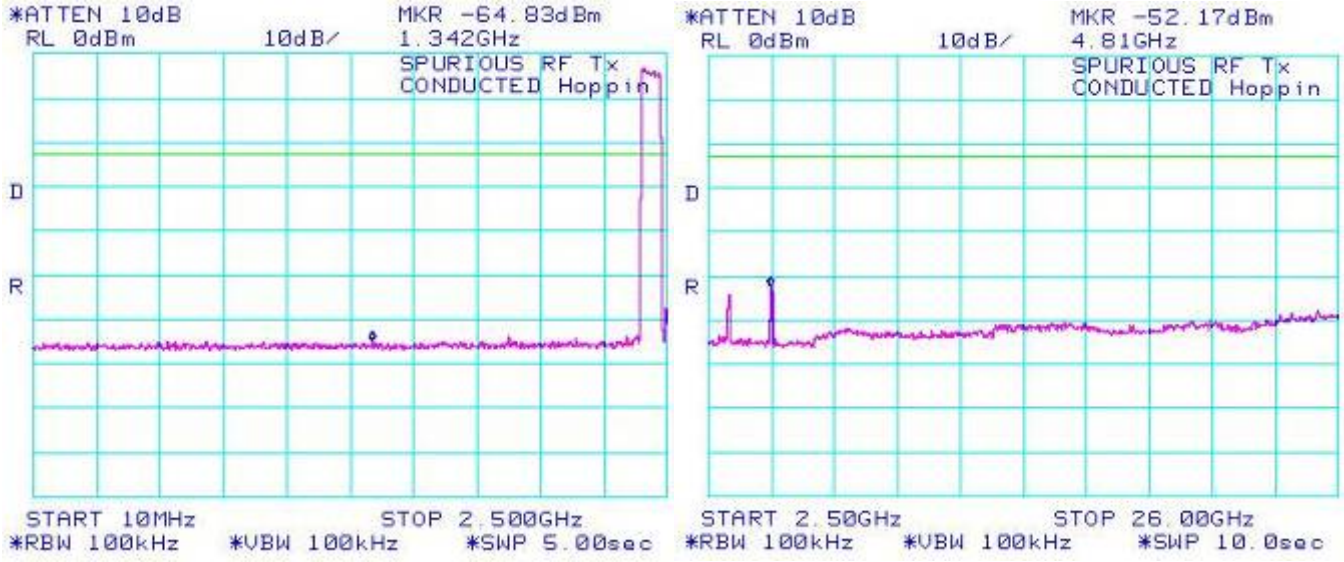


Figure 2-36: Spurious RF Conducted Emissions
Freq. Hopping, Static PBRS, DH5



Bluetooth RF Conducted Emission Test Results cont'd

Using pattern type "Static PRBS" and packet type "3-DH5" during the measurements.

Bluetooth Channel	Channel Power (dBm)	Max. Measured Level (dBm)	Max. Measured Level from carrier (dBc)	Limit (dBc)
0	-1.50	-57.83	-56.33	-20
39	-1.50	-57.00	-55.50	-20
78	-1.83	-56.33	-54.50	-20
Hopping mode	-1.50	-55.83	-54.33	-20

The environmental test conditions were:

Temperature	24ºC
Pressure	1004 mb
Relative Humidity	26%

See figures 3-37 to 3-40 for the plots of the spurious RF conducted emissions.

Bluetooth RF Conducted Emission Test Results cont'd

Figure 3-37 : Spurious RF Conducted Emissions
Single Freq., Static PBRS, 3-DH5

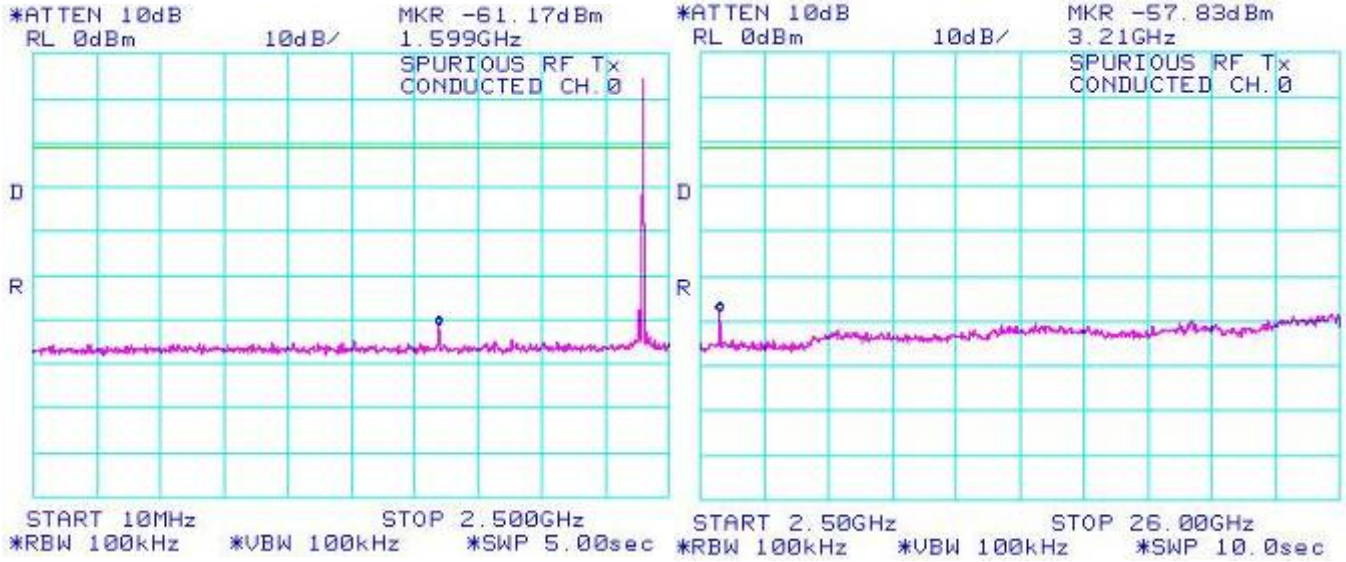
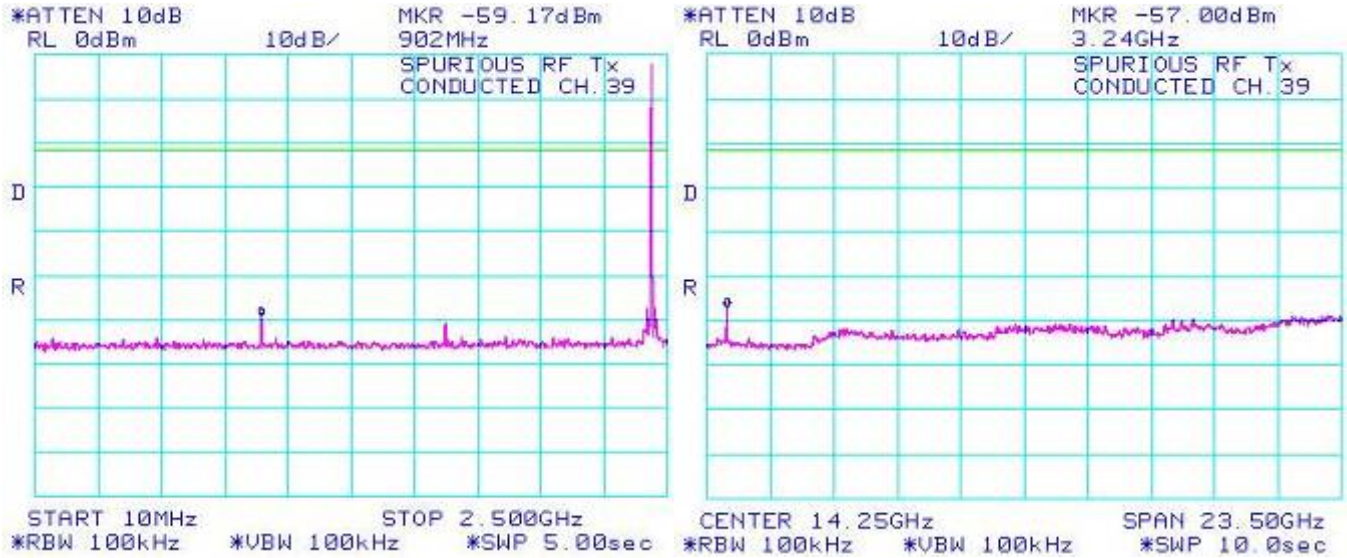


Figure 3-38: Spurious RF Conducted Emissions
Single Freq., Static PBRS, 3-DH5



Bluetooth RF Conducted Emission Test Results cont'd

Figure 3-39: Spurious RF Conducted Emissions
Single Freq., Static PBRS, 3-DH5

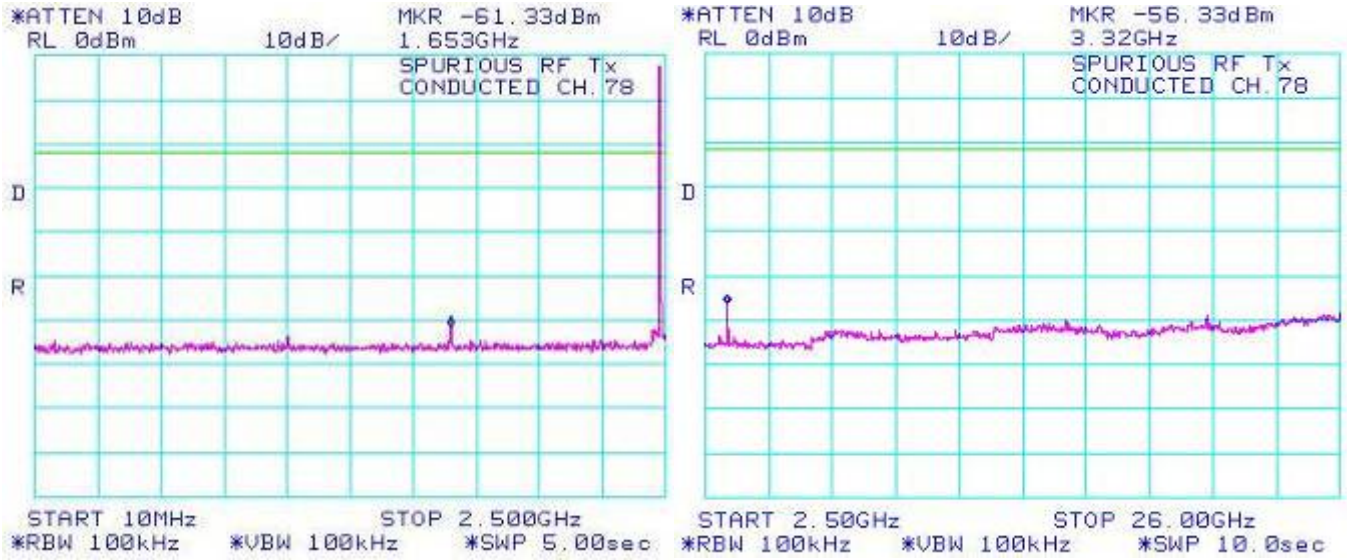


Figure 3-40 : Spurious RF Conducted Emissions
Freq. Hopping, Static PBRS, 3-DH5