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-0655-0707-32

PRODUCT MODEL NO.: RBR41GW
TYPE NAME: BlackBerry® smartphone
FCC ID: L6ARBR40GW
IC: 2503A-RBR40GW

DATE: 02 August 2007

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Statement of Performance:

The BlackBerry® smartphone, model RBR41GW, part number CER-16231-001 Rev 3 and accessories when configured and operated per RIM's operation instructions, performs within the requirements of the test standards.

Declaration:

We hereby certify that:
The test data reported herein is an accurate record of the performance of the sample(s) tested.
The test results are valid for the tested unit (s) only.
This 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.

Documented by:

Caitlin O'Neill
Compliance Specialist
Date: 02 Aug 2007

Tested and reviewed by:

Maurice Battler
Compliance Specialist
Date: 07 Aug 2007

Tested and reviewed by:

Masud S. Attayi, P.Eng.
Team Lead, Regulatory Compliance
Date: 07 Aug 2007

Approved by:

Paul G. Cardinal, Ph.D.
Director
Date: 08 Aug 2007

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Table of Contents

A. Scope 4

B. Associated Document 4

C. Product Identification 4

D. Support Equipment Used for the Testing of the EUT 5

E. Test Results Chart 6

F. Modifications to EUT 6

G. Summary of Results 7

I Compliance Test Equipment Used 12

APPENDIX 1 – AC CONDUCTED EMISSIONS TEST DATA/PLOTS 13

APPENDIX 2 – RADIATED EMISSIONS TEST DATA 19

APPENDIX 3 – BLUETOOTH CONDUCTED EMISSIONS TEST DATA/PLOTS 32

APPENDIX 4 – 802.11b/g CONDUCTED EMISSIONS TEST DATA/PLOTS 58

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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 Document

1. Document number CER-16231-REV3-Hardware-Change Notification.doc

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 July 15 to August 2, 2007.

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The sample EUT included:

SAMPLE	MODEL	CER NUMBER	PIN
1	RBR41GW	CER-16231-001 Rev. 2	20610AF1
2	RBR41GW	CER-16231-001 Rev. 3	2061F66C
3	RBR41GW	CER-16231-001 Rev. 3	2061F989

AC Conducted and Radiated Emission testing were performed on samples 1 and 2. Conducted Emissions testing was performed on sample 3.

To view the differences between CER-16231-001 Rev 2 to CER-16231-001 Rev 3, see document number CER-16231-REV3-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, 0.75 amps 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, 0.50 amps and attached USB cable with a lead length of 1.80 metres.
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.
6) USB data cable, part number HDW-06610-001, 1.45 metres long
7) Mini External Battery Charger, part number HDW-12738-001

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

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E. 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	Vimal Olaganathan
FCC CFR 47 Part 15.209, 15.247 IC RSS-210/RSS-GEN	Radiated Emissions Radiated Band Edge Compliance	Yes	Anas Hawari Masud Attayi
FCC CFR 47 Part 15.247(a), (b), (c) IC RSS-210/RSS-GEN	20 dB Bandwidth Carrier Freq. Separation Number of Hopping freq. Dwell Time Max. Peak Output Power Band Edge Compliance Spurious RF Conducted Emissions	Yes	Maurice Battler

F. Modifications to EUT

No modifications were required on the EUT.

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G. Summary of Results

SPECIFICATION		TEST TYPE	RESULT	TEST DATA APPENDIX
FCC CFR 47	IC			
Part 15.207	RSS-GEN, 7.2.2	Conducted AC Line Emission	Pass	1
Part 15.209 Part 15.247	RSS-210, A8.5	Radiated Spurious Emissions and Radiated Band Edge Compliance	Pass	2
Part 15.247(a)	RSS-210, A8.1	Bluetooth 20 dB Bandwidth	Pass	3
Part 15.247(a)	RSS-210, A8.1	Bluetooth Carrier Frequency Separation	Pass	3
Part 15.247(a)	RSS-210, A8.1d	Bluetooth Number of Hopping Frequencies	Pass	3
Part 15.247(a)	RSS-210, A8.1c	Bluetooth Time of Occupancy (Dwell Time)	Pass	3
Part 15.247(b)	RSS-210, A8.4	Bluetooth Maximum Peak Conducted Output Power	Pass	3
Part 15.247(c)	RSS-210, A8.5	Bluetooth Band-Edge Compliance of RF Conducted Emissions	Pass	3
Part 15.247(c)	RSS-210, A8.5	Bluetooth Spurious RF Conducted Emissions	Pass	3
Part 15.247(b)	RSS-210, A8.2	WiFi 6 dB Bandwidth	Pass	4
Part 15.247(b)	RSS-210, A8.4	WiFi Maximum Peak Conducted Output Power	Pass	4
Part 15.209 Part 15.247	RSS-210, A8.5	WiFi Conducted Band Edge Compliance	Pass	4
Part 15.247 (d)	RSS 210, A8.2	Wifi Peak Power Spectral Density	Pass	4
Part 15.247(c)	RSS-210, A8.5	WiFi Spurious RF Conducted Emissions	Pass	4

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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 following test configurations were measured. The ac input voltage was 230 volts, 50 Hz.

1. The BlackBerry® smartphone PIN 20610AF1 in Bluetooth transmit mode and battery charging mode was connected to the Alternative Captive Cable Charger and the 2.5mm Mono Headset through the TTY adapter.
2. The BlackBerry® smartphone PIN 20610AF1 in wi-fi 802.11b/g transmit mode and battery charging mode was connected to the Folding Blade Charger 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 C and IC RSS-210 limit. The sample EUT had a worse case test margin of 9.51 dB below the QP limit at 0.908 MHz using the Quasi-peak detector and 16.44 dB below the AV limit at 0.925 MHz using the Average detector for the Folding Blade Charger, test configuration 2.

See APPENDIX 1 for the test data

Measurement Uncertainty ±2.0 dB

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2) RADIATED EMISSIONS

a) Radiated Spurious and Harmonic Emissions

The BlackBerry® smartphone PIN 20610AF1 was placed on a nonconductive styrofoam table, 80 cm high that was positioned on a remotely controlled turntable. The test distance used between the EUT and the receiving antenna was three metres. The turntable was rotated to determine the azimuth of the peak emissions. Then the emissions were maximized by elevating the antenna in the range of 1 to 4 metres. The maximum emission level was recorded. The frequency range measured was from 30 MHz to 25.0 GHz. Both the horizontal and vertical polarisations of the emissions were measured.
The measurements were performed in a semi-anechoic chamber. The semi-anechoic chamber's FCC registration number is **778487** and the Industry Canada file number is **IC4240**. The EUT was configured and operated to produce the maximum radiated emissions while still keeping within RIM's specifications.

The BlackBerry® smartphone PIN 20610AF1 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" and EDR mode at middle channel (39) 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 11.51 dB at 4960.00 MHz using the average detector.

The radiated emissions from the EUT were also measured in standalone configuration transmitting at channels 1 & 11 at 6 Mbps, and channel 6 at 1 Mbps for 802.11b/g mode. 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 802.11b/g harmonics were investigated up to the 10th harmonic. The sample EUT had a worse case test margin of 18.60 dB at 4924.00 MHz using the average detector.

See APPENDIX 2 for the test data

b) Band-Edge Compliance of RF Radiated Emissions

The BlackBerry® smartphone PIN 2061F66C met the requirements for the Band-Edge Compliance of RF Radiated Emissions for Bluetooth and 802.11b/g 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

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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, A8.1. 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. A8.1. 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, A8.1d. 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, A8.1c. 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, A8.4. Low channel (0), middle channel (39) and high channel (78) were measured. The results include 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, A8.5. Channels 0 and 78 were measured in frequency hopping (Euro/US) mode and single frequency mode.
The results include both normal data rate and EDR.
See APPENDIX 3 for the test data.

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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, A8.5. 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 results include both normal data rate and EDR.
See APPENDIX 3 for the test data.

4) 802.11b/g RF CONDUCTED EMISSIONS

a) 6dB Bandwidth
The EUT met the requirements of the 6 dB bandwidth as per 47 CFR 15.247(b) and RSS-210, A8.2. Low channel (1), middle channel (6) and high channel (11) were measured.
See APPENDIX 4 for the test data.

b) Maximum Conducted Output Power
The EUT met the requirements of the maximum conducted output power as per 47 CFR 15.247(b) and RSS-210, A8.4. Low channel (1), middle channel (6) and high channel (11) were measured.
See APPENDIX 4 for the test data

c) Band-Edge Compliance of RF Conducted Emissions
The EUT met the requirements of band-edge compliance of RF conducted emissions as per 47 CFR 15.247(b) and RSS-210, A8.5. Low channel (1), middle channel (6) and high channel (11) were measured.
See APPENDIX 4 for the test data.

d) Peak Power Spectral Density
The EUT met the requirements of peak power spectral density as per 47 CFR 15.247(b) and RSS-210, A8.2. Low channel (1), middle channel (6) and high channel (11) were measured.
See APPENDIX 4 for the test data.

e) 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, A8.5. The frequency range measured was 30 MHz to 26 GHz. Low channel (1), middle channel (6) and high channel (11) were measured.
See APPENDIX 4 for the test data.

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I Compliance Test Equipment Used

UNIT	MANUFACTURER	MODEL	SERIAL NUMBER	CAL DUE DATE (YY MM DD)	USE
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	100255	08-06-05	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	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	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	08-08-28	Conducted Emissions
Impulse Limiter	Rohde & Schwarz	ESHS-Z2	836248/052	07-11-20	Conducted Emissions

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APPENDIX 1 – AC CONDUCTED EMISSIONS TEST DATA/PLOTS

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AC Conducted Emissions Test Results

Test Configuration 1

The environmental test conditions were:

Temperature	24ºC
Pressure	1018mb
Relative Humidity	30%

Date of test: July 23, 2007

Frequency (MHz)	Line	Reading (QP) (dBµV)	Correction Factor (dB)	Corrected Reading (QP) (dB)	Limit (QP) (dBµV)	Limit (AV) (dBµV)	Margin (QP) Limits (dB)	Margin (AV) Limits (dB)
0.167	N	38.66	9.83	48.49	65.46	55.46	-16.98	-6.98
0.169	L1	37.43	9.83	47.26	65.21	55.21	-17.95	-7.95
0.202	L1	34.16	9.85	44.01	63.61	53.61	-19.60	-9.60
0.202	N	33.19	9.85	43.04	63.41	53.41	-20.36	-10.36
0.232	N	29.25	9.86	39.11	62.27	52.27	-23.16	-13.16
0.235	L1	29.19	9.86	39.05	62.27	52.27	-23.22	-13.22
0.267	N	35.02	9.86	44.88	61.43	51.43	-16.55	-6.55
0.269	L1	34.66	9.86	44.52	61.27	51.27	-16.76	-6.76
0.314	N	26.48	9.85	36.33	59.97	49.97	-23.64	-13.64
0.316	L1	25.06	9.85	34.91	59.97	49.97	-25.06	-15.06
0.333	N	29.37	9.85	39.22	59.33	49.33	-20.11	-10.11
0.336	L1	27.39	9.85	37.24	59.33	49.33	-22.09	-12.09

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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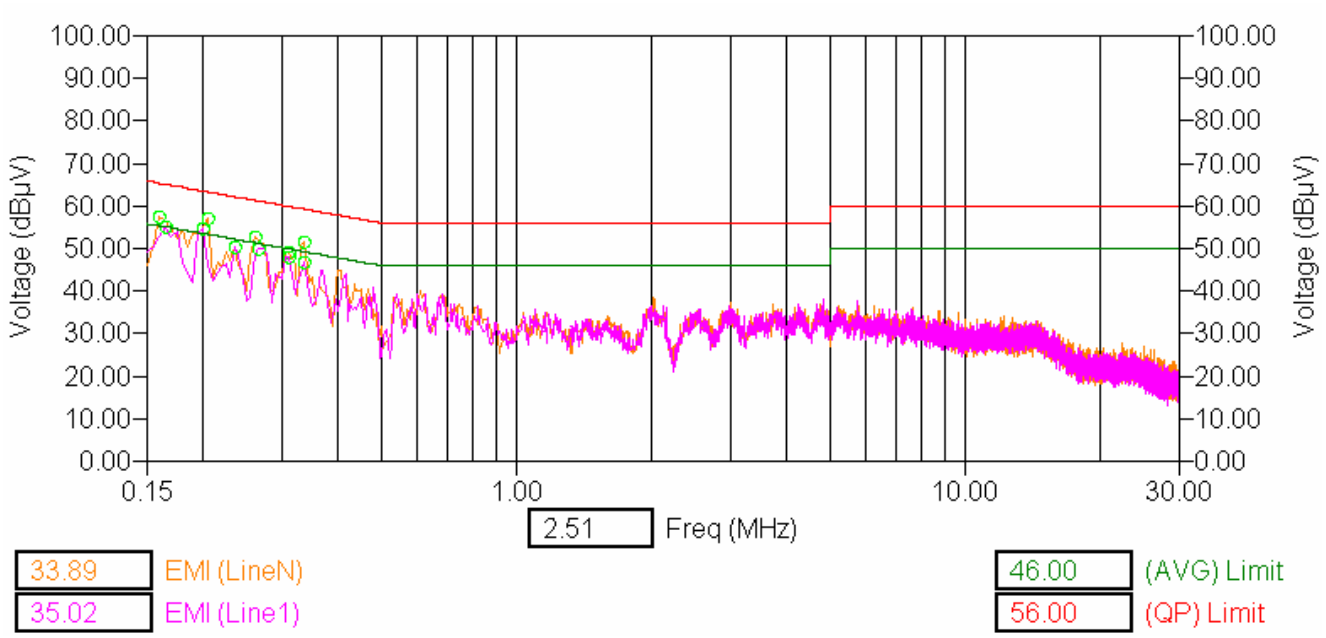
Bluetooth AC Conducted Emission Test Results cont'd

Test Configuration 1

Graph 1



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Bluetooth AC Conducted Emission Test Results

Test Configuration 2

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	23ºC
Pressure	1016 mb
Relative Humidity	30%

Date of test: July 23, 2007

Frequency (MHz)	Line	Reading (QP) (dBµV)	Correction Factor (dB)	Corrected Reading (QP) (dB)	Limit (QP) (dBµV)	Margin (QP) Limits (dB)
0.908	N	36.62	9.87	46.49	56.00	**-9.51**
0.926	L1	34.95	9.87	44.82	56.00	-11.18
1.025	N	21.22	9.87	31.09	56.00	-24.91
1.036	L1	22.56	9.87	32.43	56.00	-23.57
1.092	N	28.91	9.87	38.78	56.00	-17.22
1.119	N	22.28	9.88	32.16	56.00	-23.84
1.125	L1	23.15	9.88	33.03	56.00	-22.97
1.618	L1	26.39	9.89	36.28	56.00	-19.72
1.647	N	24.23	9.89	34.12	56.00	-21.88
1.724	L1	32.60	9.89	42.49	56.00	-13.51
1.730	N	29.92	9.89	39.81	56.00	-16.19
1.916	L1	26.83	9.85	36.68	56.00	-19.32

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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Bluetooth AC Conducted Emission Test Results cont'd

Test Configuration 2 cont'd

Date of test: July 23, 2007

Frequency (MHz)	Line	Reading (AV) (dBµV)	Correction Factor (dB)	Corrected Reading (AV) (dB)	Limit (AV) (dBµV)	Margin (AV) Limits (dB)
0.924	L1	19.45	9.87	29.32	46.00	-16.68
0.925	N	19.69	9.87	29.56	46.00	**-16.44**
1.092	N	17.09	9.87	26.96	46.00	-19.04
1.722	N	18.34	9.89	28.23	46.00	-17.77
1.724	L1	18.21	9.89	28.10	46.00	-17.90
1.888	L1	14.94	9.85	24.79	46.00	-21.21

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

Measurements were done with the average detector.

See graph 2 for the measurement plot.

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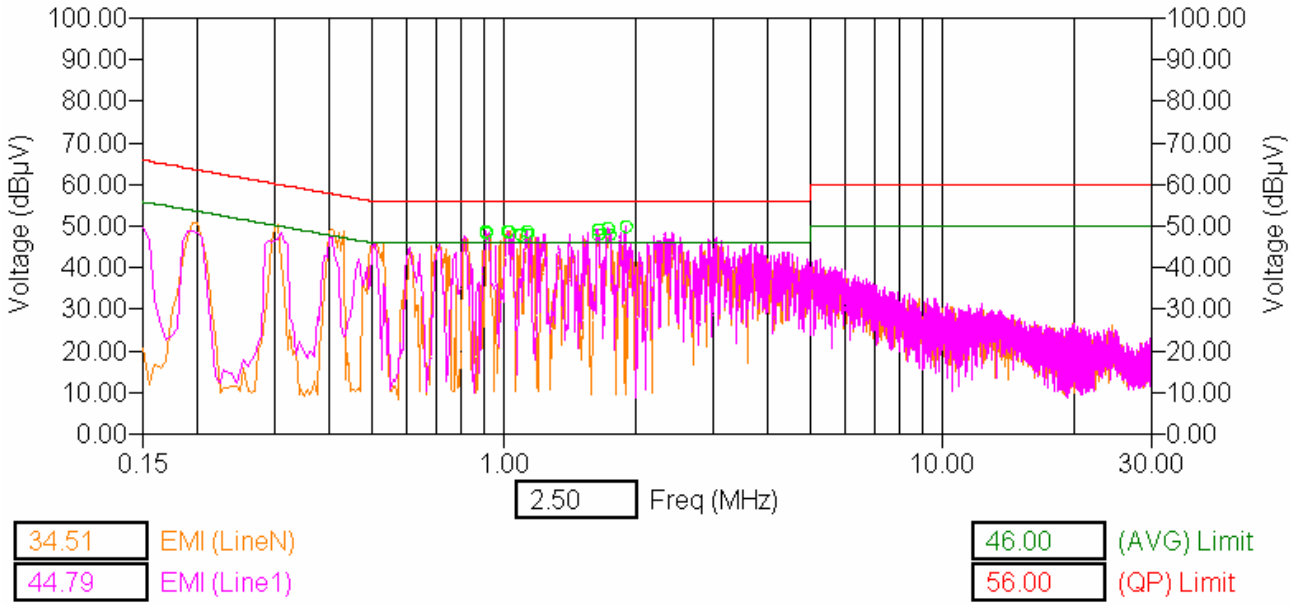
Bluetooth AC Conducted Emission Test Results cont'd

Test Configuration 2

Graph 2



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APPENDIX 2 – RADIATED EMISSIONS TEST DATA

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Radiated Emissions Test Data Results

Bluetooth Band

The environmental test conditions were:

Temperature	25ºC
Pressure	1011 mb
Relative Humidity	31%

Date of Test: July 17 2007

Test Distance was 3.0 metres with a EUT height of 0.8 metres, 30 MHz to 1000 MHz.

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

Frequency (MHz)	Antenna Pol. (V/H)	Antenna Height (metres)	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)
-	-	-	-	-	-	-	-	-	-

All emissions had a test margin greater than 25.0 dB.

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Radiated Emissions Test Results cont'd

The environmental test conditions were: Temperature 23ºC
Pressure 1005 mb
Humidity 37%

Date of test: July 15, 2007

The measurements were performed in single frequency, hopping mode (channels 0 to 78), and EDR mode at maximum output power. Test distance was 1.0 metre.
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)
BlackBerry® smartphone Standalone, Horizontal									
Single frequency mode Low Channel									
2nd	0	4804.0	Horn	V	40.86	53.31	PK.	74	-20.69
2nd	0	4804.0	Horn	H	50.39				
2nd	0	4804.0	Horn	V	29.26	41.00	AVE.	54	-13.00
2nd	0	4804.0	Horn	H	38.08				
The harmonics were investigated up to the 10th harmonic. All other emissions were in the noise floor (NF)									
Single frequency mode Middle Channel									
2nd	39	4882.0	Horn	V	41.13	55.66	PK.	74	-18.34
2nd	39	4882.0	Horn	H	52.35				
2nd	39	4882.0	Horn	V	28.93	42.18	AVE.	54	-11.82
2nd	39	4882.0	Horn	H	38.87				
The harmonics were investigated up to the 10th harmonic. All other emissions were in the NF									
Single frequency mode High Channel									
2nd	78	4960.0	Horn	V	40.91	54.42	PK.	74	-19.58
2nd	78	4960.0	Horn	H	50.80				
2nd	78	4960.0	Horn	V	29.27	42.49	AVE.	54	**-11.51**
2nd	78	4960.0	Horn	H	38.87				
The harmonics were investigated up to the 10th harmonic. All other emissions were in the NF									

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Bluetooth Radiated Emissions Test Results cont'd

Using Pattern type "Static PRBS" and packet type "DH5" hopping mode 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)
BlackBerry® smartphone Standalone, Horizontal Hopping mode.									
2nd	0-78	4960.0	Horn	V	40.49	53.35	PK.	74	-20.65
2nd	0-78	4960.0	Horn	H	49.73				
2nd	0-78	4960.0	Horn	V	27.48	36.36	AVE.	54	-17.64
2nd	0-78	4960.0	Horn	H	32.74				
The harmonics were investigated up to the 10th harmonic. All other emissions were in the noise floor (NF)									

Using Pattern type "Static PRBS" and packet type "3-DH5", EDR mode 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)
BlackBerry® smartphone Standalone, Horizontal EDR mode.									
2nd	39	4960.0	Horn	V	39.06	52.38	PK.	74	-21.62
2nd	39	4960.0	Horn	H	48.76				
2nd	39	4960.0	Horn	V	25.80	37.49	AVE.	54	-16.51
2nd	39	4960.0	Horn	H	33.87				
The harmonics were investigated up to the 10th harmonic. All other emissions were in the noise floor (NF)									

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Bluetooth Band-Edge Compliance of RF Radiated Emissions Test Results

The environmental test conditions were: Temperature 24ºC
Pressure 1014 mb
Humidity 31%

The test distance was 3.0 metres.
Date of test: July 25, 2007

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)
Centre at Bandedge 2390 MHz Pattern type "Static PBRS" and packet type "3-DH5" EDR mode, BlackBerry® smartphone standalone Vertical										
0	2402.0	Horn	V	PK	1.0 MHz	94.7	41.4	53.3	74	-20.7
0	2402.0	Horn	H	PK	1.0 MHz	96.4	45.1	51.3	74	-22.7
0	2402.0	Horn	V	AVE.	10 Hz	84.2	41.4	42.8	54	-11.2
0	2402.0	Horn	H	AVE.	10 Hz	86.8	45.1	41.7	54	-12.3
Centre at Bandedge 2483.5 MHz Pattern type "Static PBRS" and packet type "3-DH5" EDR mode, BlackBerry® smartphone standalone Vertical										
78	2480.0	Horn	V	PK	1.0 MHz	91.9	46.3	45.6	74	-28.4
78	2480.0	Horn	H	PK	1.0 MHz	95.6	41.1	54.5	74	-19.5
78	2480.0	Horn	V	AVE.	10 Hz	81.5	46.3	35.2	54	-18.8
78	2480.0	Horn	H	AVE.	10 Hz	85.9	41.1	44.8	54	-9.2
Cantre at Bandedge 2483.5 MHz Pattern type "Static PBRS" and packet type "DH5", BlackBerry® smartphone standalone Vertical										
78	2480.0	Horn	V	PK	1.0 MHz	92.8	40.1	52.7	74	-21.3
78	2480.0	Horn	H	PK	1.0 MHz	96.3	45.5	50.8	74	-23.2
78	2480.0	Horn	V	AVE.	10 Hz	85.8	40.1	45.7	54	-8.3
78	2480.0	Horn	H	AVE.	10 Hz	88.1	45.5	42.6	54	-11.4

See figures 2-1 to 2-6 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, 3-DH5, Channel 0, Pol: V, Detector: PK

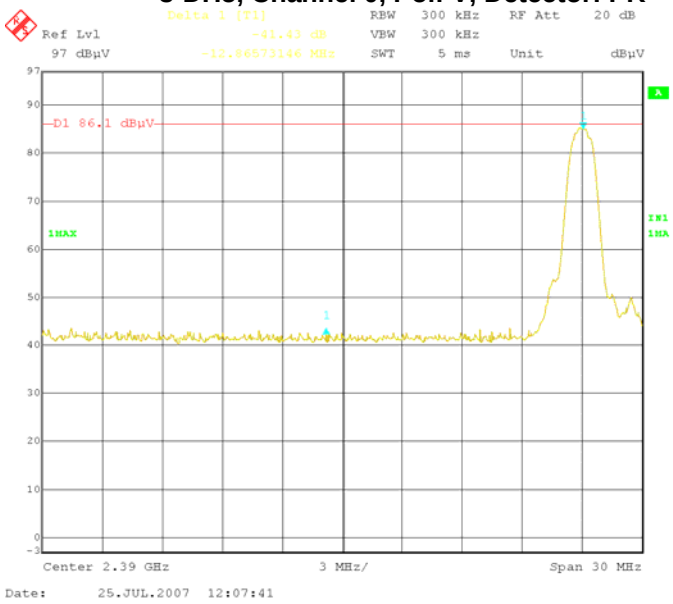


Figure 2-2: Band-Edge Compliance of RF Rad. Emi. Bluetooth, Single freq., Static PBRS, 3-DH5, Channel 0, Pol: H, Detector: PK

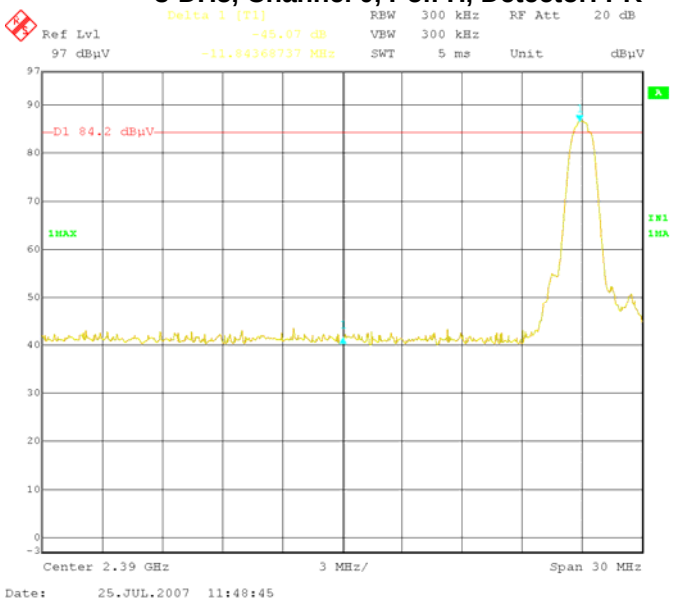


Figure 2-3: Band-Edge Compliance of RF Rad. Emi. Bluetooth, Single freq., Static PBRS, 3-DH5, Channel 78, Pol: V, Detector: PK

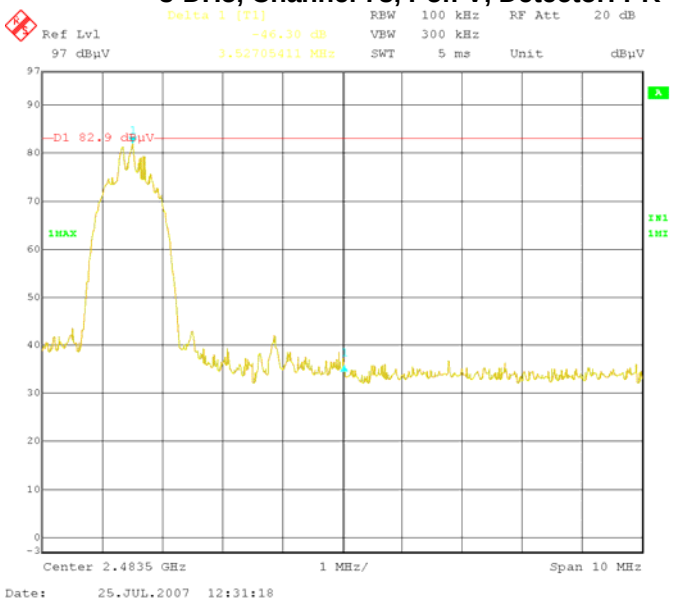
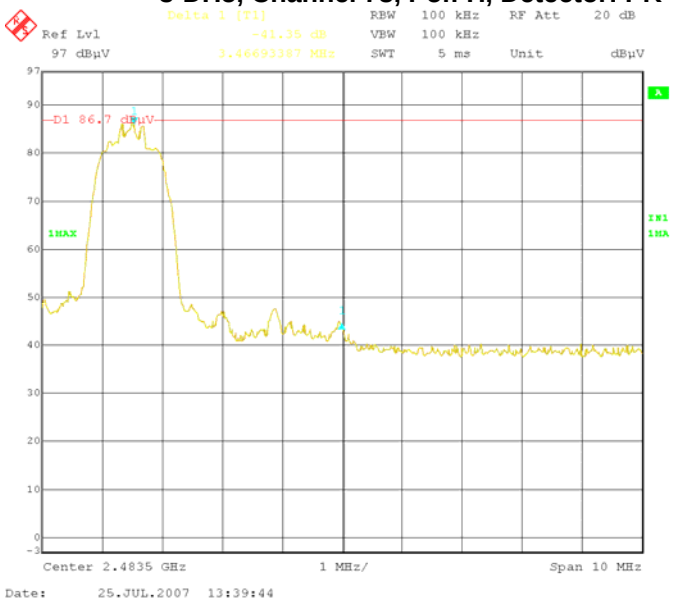


Figure 2-4: Band-Edge Compliance of RF Rad. Emi. Bluetooth, Single freq., Static PBRS, 3-DH5, Channel 78, Pol: H, Detector: PK



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

Figure 2-5: Band-Edge Compliance of RF Rad. Emi. Bluetooth, Single freq., Static PBRS, DH5, Channel 78, Pol: V, Detector: PK

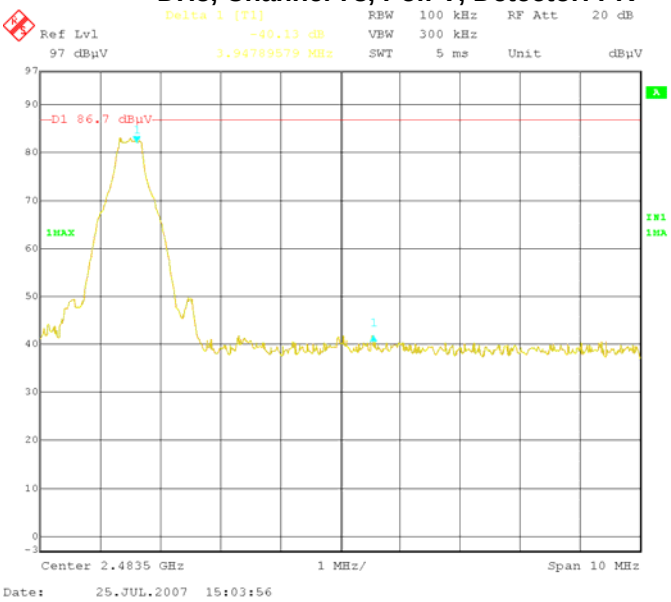
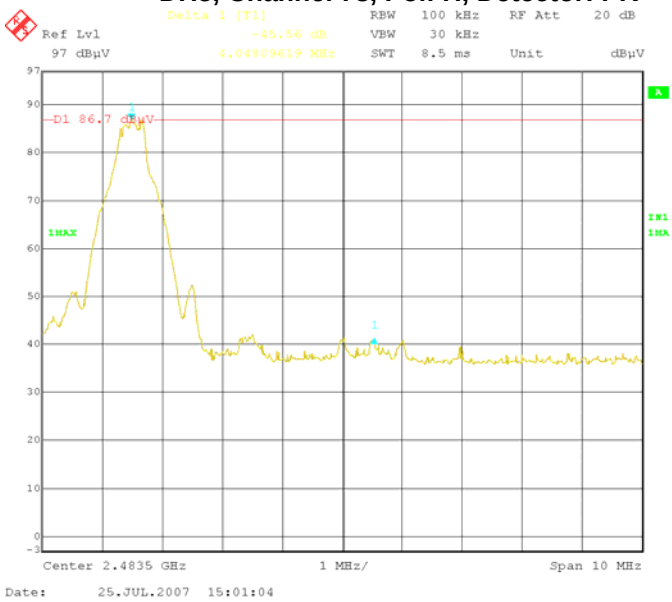


Figure 2-6: Band-Edge Compliance of RF Rad. Emi. Bluetooth, Single freq., Static PBRS, DH5, Channel 78, Pol: H, Detector: PK



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Radiated Emissions Test Data Results

802.11b/g Band

The environmental test conditions were:

Temperature	23ºC
Pressure	1017 mb
Relative Humidity	31%

Date of Test: July 16, 2007

Test Distance was 3.0 metres with a EUT height of 0.8 metres, 30 MHz to 1000 MHz.
The BlackBerry® smartphone PIN 20610AF1 was in standalone, vertical position.

The measurements were performed in 802.11b/g Tx mode, channel 1, 2412 MHz.

Frequency (MHz)	Antenna Pol. (V/H)	Antenna Height (metres)	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)
-	-	-	-	-	-	-	-	-	-

All emissions had a test margin greater than 25.0 dB.

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Radiated Emissions Test Data Results cont'd

802.11b/g Band

The environmental test conditions were: Temperature 24ºC
Pressure 1005 mb
Relative Humidity 33%

Date of Test: July 19, 2007

Test Distance was 3.0 metres with a EUT height of 0.8 metres, 30 MHz to 1000 MHz.
The BlackBerry® smartphone PIN 20610AF1 was in standalone, vertical position.

The measurements were performed in 802.11b/g Tx mode, channel 6, 2437 MHz.

Frequency (MHz)	Antenna Pol. (V/H)	Antenna Height (metres)	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)
-	-	-	-	-	-	-	-	-	-

All emissions had a test margin greater than 25.0 dB.

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Radiated Emissions Test Data Results cont'd

802.11b/g Band

The environmental test conditions were:

Temperature	24ºC
Pressure	1005 mb
Relative Humidity	33%

Date of Test: July 19, 2007

Test Distance was 3.0 metres with a EUT height of 0.8 metres, 30 MHz to 1000 MHz.
The BlackBerry® smartphone PIN 20610AF1 was in standalone, vertical position.

The measurements were performed in 802.11b/g Tx mode, channel 11, 2462 MHz.

Frequency (MHz)	Antenna Pol. (V/H)	Antenna Height (metres)	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)
-	-	-	-	-	-	-	-	-	-

All emissions had a test margin greater than 25.0 dB.

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Radiated Emissions Test Results cont'd

802.11b/g Band

Date of Test: July 15, 2007
Test Distance was 1.0 metre.

The measurements were performed on channels 1, 6 and 11 for 802.11 b/g mode.

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)
BlackBerry® smartphone Standalone, USB side down									
Single frequency mode Low Channel									
2nd	1	4824.00	Horn	V	38.25	41.68	PK.	74	-32.32
2nd	1	4824.00	Horn	H	38.69				
2nd	1	4824.00	Horn	V	30.86	33.85	AVE.	54	-20.15
2nd	1	4824.00	Horn	H	29.78				
The harmonics were investigated up to the 10th harmonic. Emissions above the 2nd harmonic were in the NF									
Single frequency mode Middle Channel									
2nd	6	4874.00	Horn	V	38.77	42.05	PK.	74	-31.95
2nd	6	4874.00	Horn	H	37.85				
2nd	6	4874.00	Horn	V	31.63	34.91	AVE.	54	-19.09
2nd	6	4874.00	Horn	H	30.66				
The harmonics were investigated up to the 10th harmonic. Emissions above the 2nd harmonic were in the NF									
Single frequency mode High Channel									
2nd	11	4924.00	Horn	V	37.80	41.22	PK.	74	-32.78
2nd	11	4924.00	Horn	H	37.59				
2nd	11	4924.00	Horn	V	31.98	35.40	AVE.	54	**-18.60**
2nd	11	4924.00	Horn	H	29.56				
The harmonics were investigated up to the 10th harmonic. Emissions above the 2nd harmonic were in the NF									

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802.11b/g Band-Edge Compliance of RF Radiated Emissions

The environmental test conditions were: Temperature 24ºC
Pressure 1014 mb
Humidity 31 %

Date of Test: July 25, 2007

Test distance was 3.0 metres.

BlackBerry® smartphone standalone, vertical, the measurements were performed on channel 1

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)
1	2412.0	Horn	V	PK	1.0 MHz	97.2	39.6	57.6	74	-16.4
1	2412.0	Horn	H	PK	1.0 MHz	100.3	41.7	48.6	74	-15.4
1	2412.0	Horn	V	AVE.	10 Hz	79.8	39.6	40.2	54	-13.8
1	2412.0	Horn	H	AVE.	10 Hz	89.3	41.7	47.6	54	-6.4

BlackBerry® smartphone standalone, vertical, the measurements were performed on channel 11

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)
11	2462.0	Horn	V	PK	1.0 MHz	98.1	39.4	58.7	74	-15.3
11	2462.0	Horn	H	PK	1.0 MHz	102.7	44.4	58.3	74	-15.7
11	2462.0	Horn	V	AVE.	10 Hz	85.6	39.4	46.2	54	-7.8
11	2462.0	Horn	H	AVE.	10 Hz	88.3	44.4	43.9	54	-10.1

See figures 2-5 to 2-8 for the plots of the 802.11b/g band-edge compliance.

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802.11b/g Band-Edge Compliance of RF Radiated Emissions cont'd

Figure 2-5: Band-Edge Compliance of RF Rad. Emi. 802.11b/g, Channel 1, 2412 MHz, Max Pol: V, Detector: PK

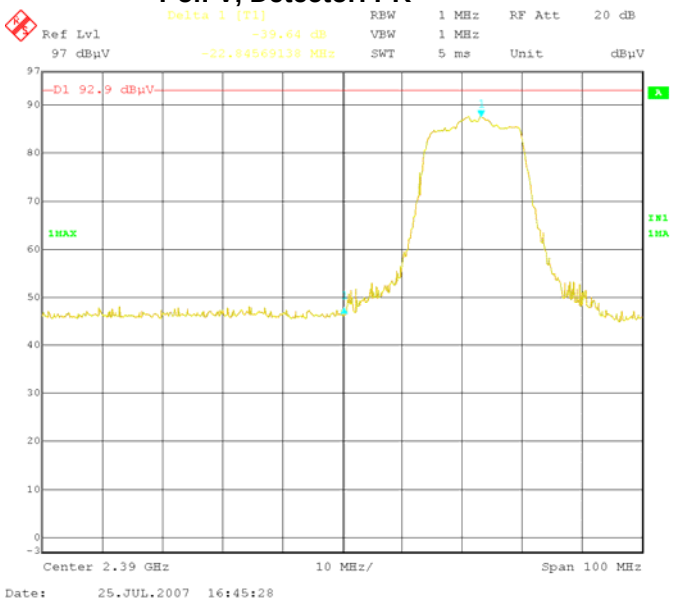


Figure 2-6: Band-Edge Compliance of RF Rad. Emi. 802.11b/g, Channel 1, 2412 MHz, Max Pol: H, Detector: PK

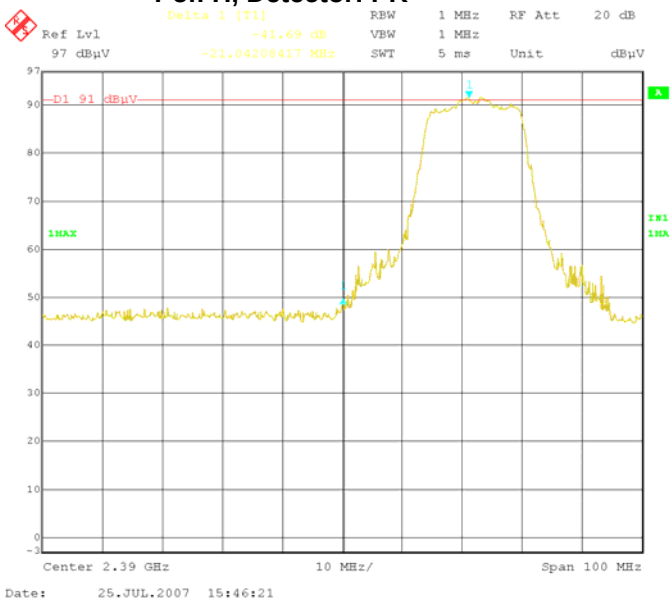


Figure 2-7: Band-Edge Compliance of RF Rad. Emi. 802.11b/g, Channel 11, 2462 MHz, Max Pol: V, Detector: PK

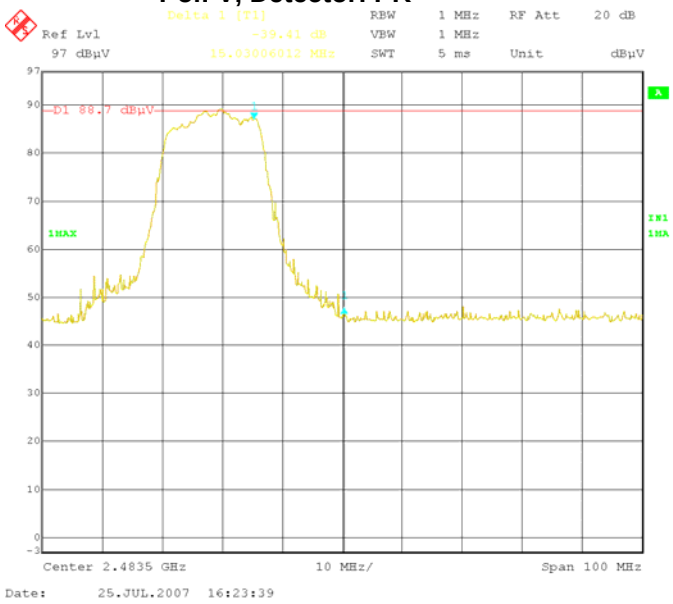
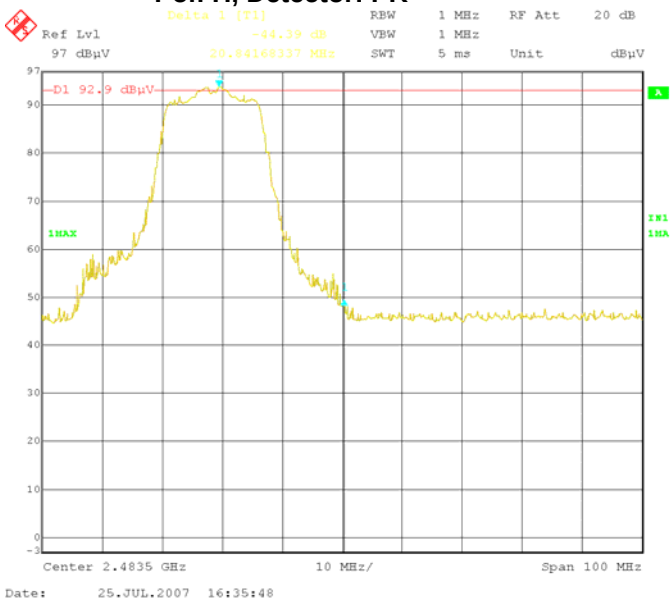


Figure 2-8: Band-Edge Compliance of RF Rad. Emi. 802.11b/g, Channel 11, 2462 MHz, Max Pol: H, Detector: PK



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APPENDIX 3 – BLUETOOTH CONDUCTED EMISSIONS TEST DATA/PLOTS

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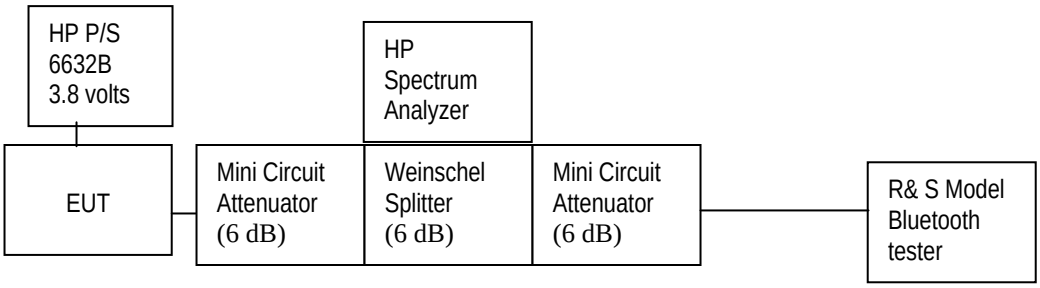
Bluetooth RF Conducted Emission Test Results

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 BlackBerry® smartphone PIN 2061F989 which was used for measurements.

Date of Tests: July 30, 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, A8.1. 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	0.737
39	≤1.0	0.740
78	≤1.0	0.703

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

The environmental test conditions were:

Temperature	22ºC
Pressure	1016 mb
Relative Humidity	34%

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Bluetooth RF Conducted Emission Test Results cont'd

Figure 3-1: 20 dB Bandwidth

Single freq., Static PBRS, DH5

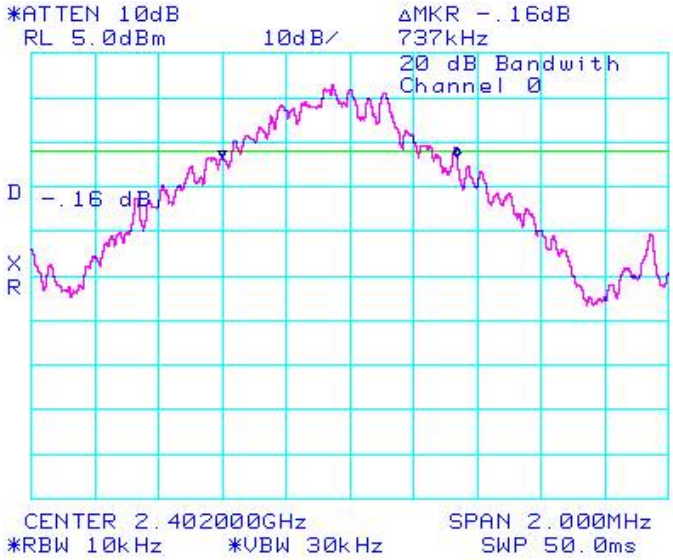


Figure 3-2: 20 dB Bandwidth

Single freq., Static PBRS, DH5

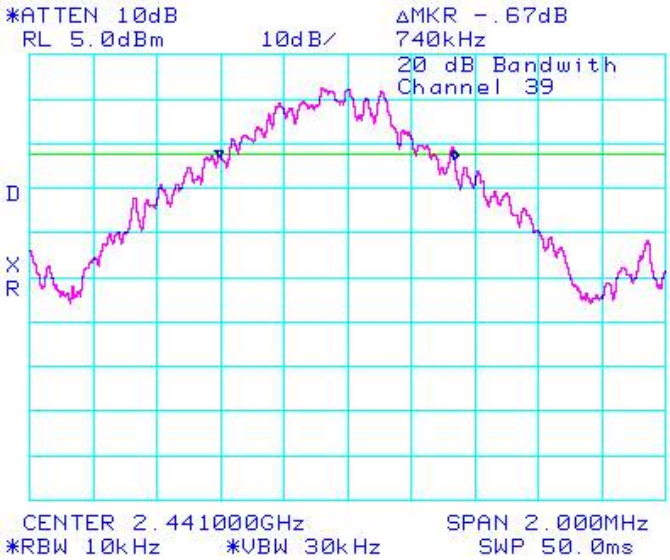
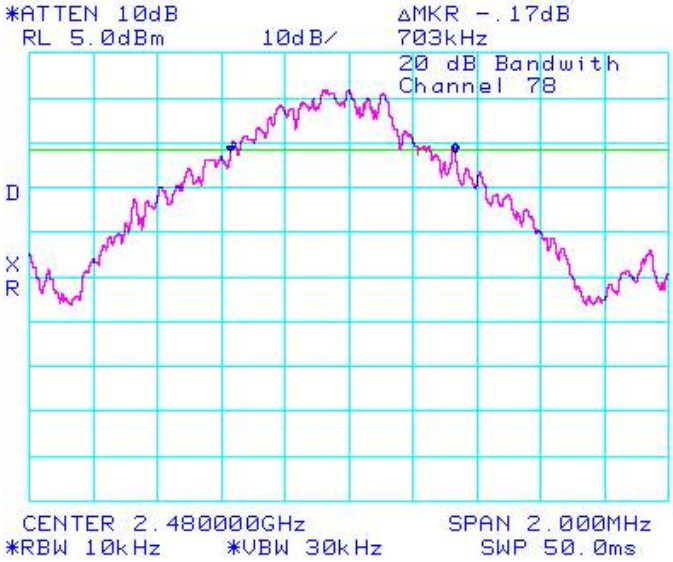


Figure 3-3: 20 dB Bandwidth

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, A8.1. 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.

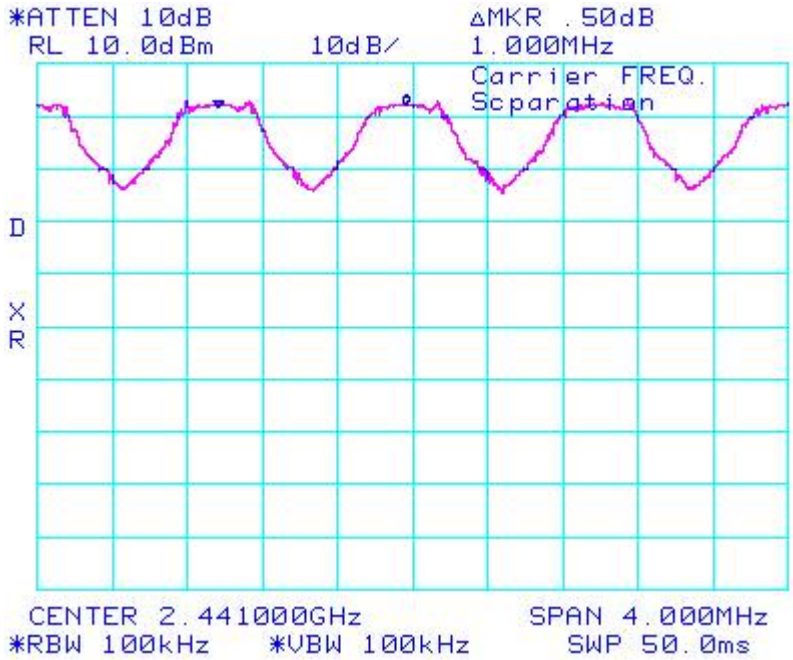
Bluetooth Channels	Limit (MHz)	Measured Level (MHz)
38 to 39	≥ 0.025 or 20 dB bandwidth	1.000

The environmental test conditions were:

Temperature	22ºC
Pressure	1016 mb
Relative Humidity	34%

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

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 22ºC
Pressure 1016 mb
Relative Humidity 34%

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

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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, A8.1d. 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	22ºC
Pressure	1016 mb
Relative Humidity	34%

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

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Bluetooth RF Conducted Emission Test Results cont'd

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

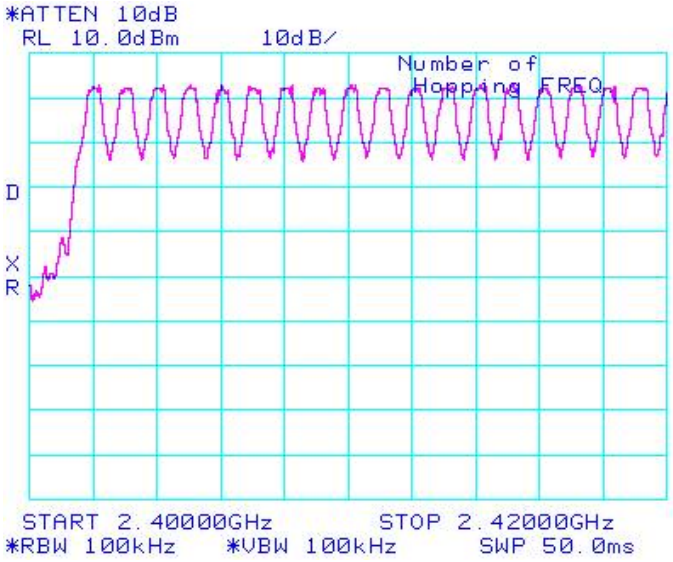


Figure 3-7: Number of Hopping Frequencies
Static PBRS, DH5

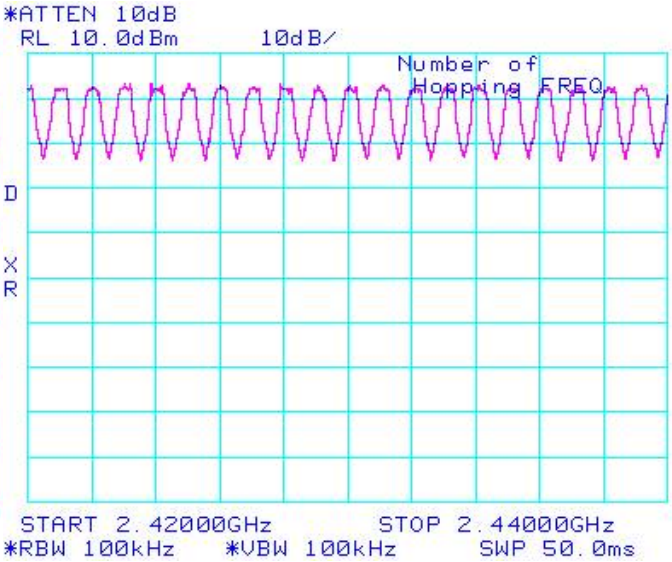


Figure 3-8: Number of Hopping Frequencies
Static PBRS, DH5

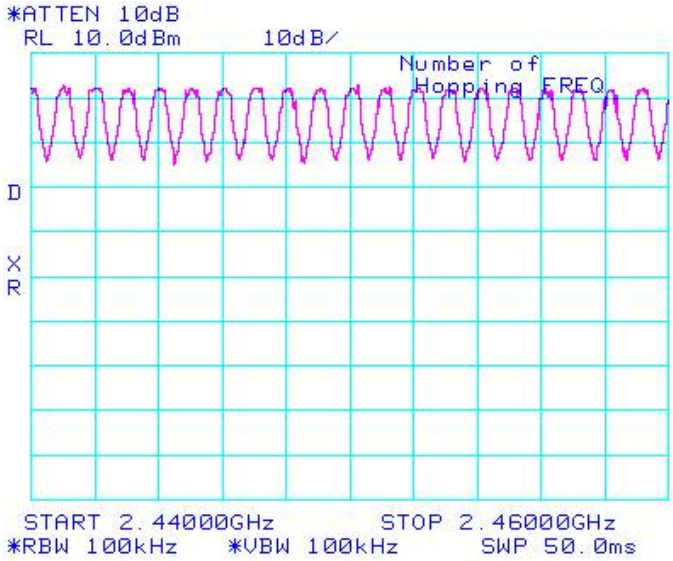
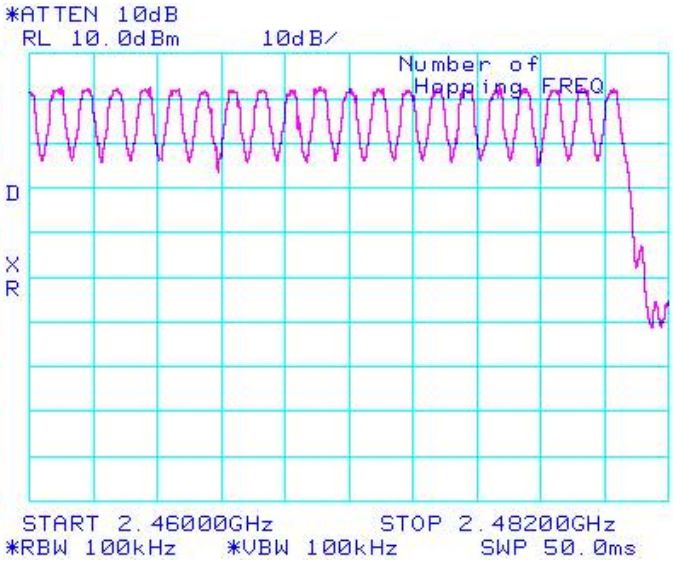


Figure 3-9: Number of Hopping Frequencies
Static PBRS, DH5



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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, A8.1c. 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	0.5080	0.5080 x 320.0 = 162.56	400	237.44
39	DH1	0.5080	0.5080 x 320.0 = 162.56	400	237.44
78	DH1	0.5080	0.5080 x 320.0 = 162.56	400	237.44
0	DH3	1.7680	1.7680 x 159.9 = 282.70	400	117.30
39	DH3	1.7680	1.7680 x 159.9 = 282.70	400	117.30
78	DH3	1.7667	1.7667 x 159.9 = 282.50	400	117.50
0	DH5	3.0073	3.0073 x 106.8 = 321.18	400	78.82
39	DH5	3.0073	3.0073 x 106.8 = 321.18	400	78.82
78	DH5	3.0160	3.0160 x 106.8 = 322.11	400	77.89

The environmental test conditions were:

Temperature	22ºC
Pressure	1016 mb
Relative Humidity	34%

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

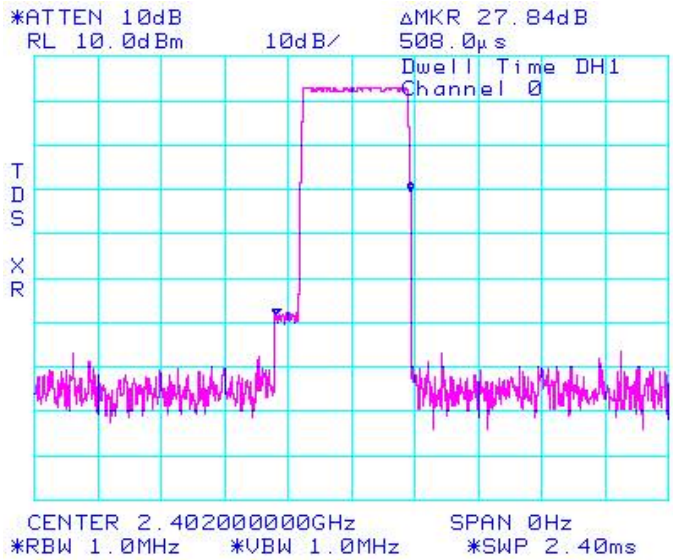


Figure 3-11: Time of Occupancy (Dwell Time) Freq. Hopping, Static PBRS, DH1

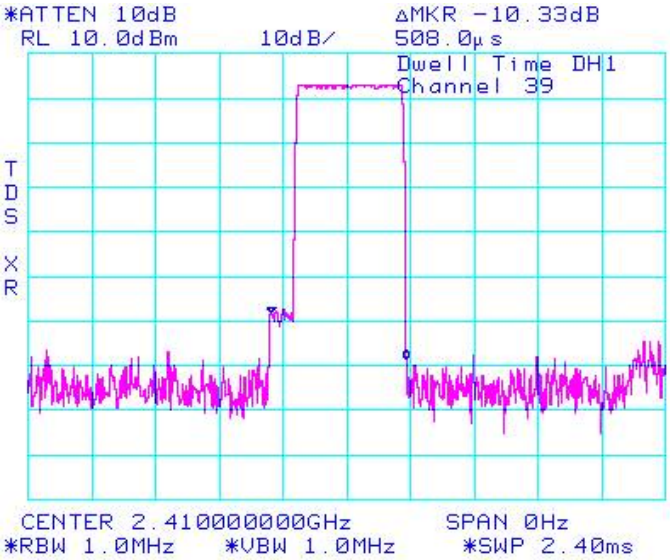


Figure 3-12: Time of Occupancy (Dwell Time) Freq. Hopping, Static PBRS, DH1

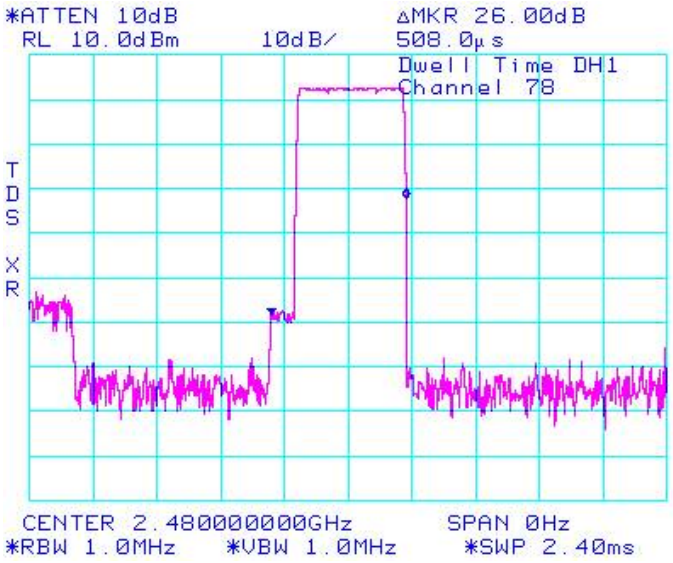
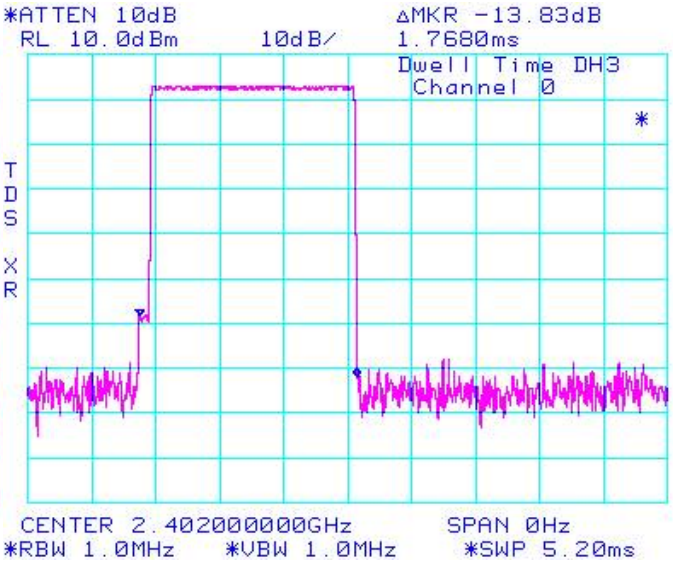


Figure 3-13: Time of Occupancy (Dwell Time) Freq. Hopping, Static PBRS, DH3



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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

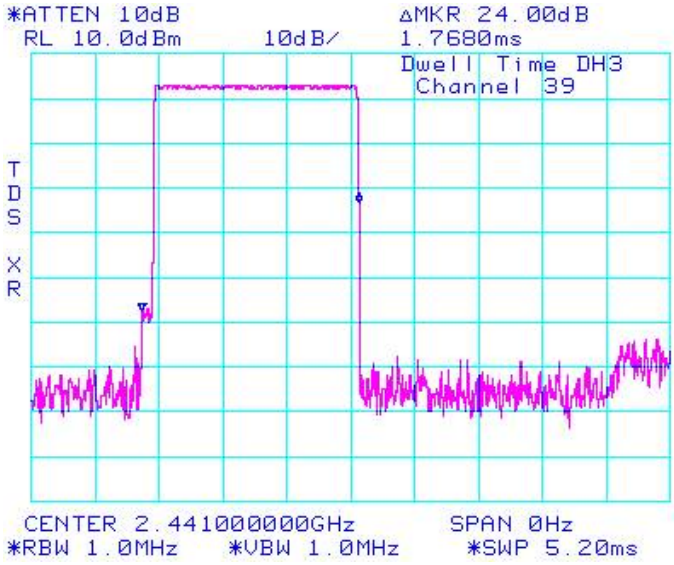


Figure 3-5 : Time of Occupancy (Dwell Time)
Freq. Hopping, Static PBRS, DH3

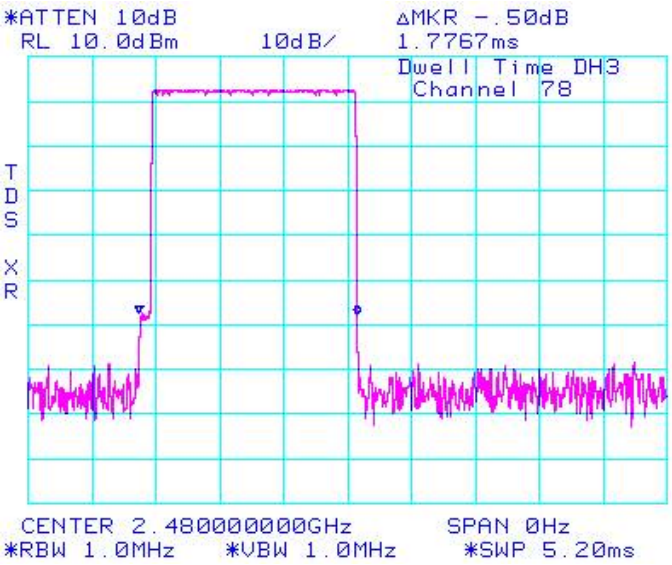


Figure 3-16: Time of Occupancy (Dwell Time)
Freq. Hopping, Static PBRS, DH5

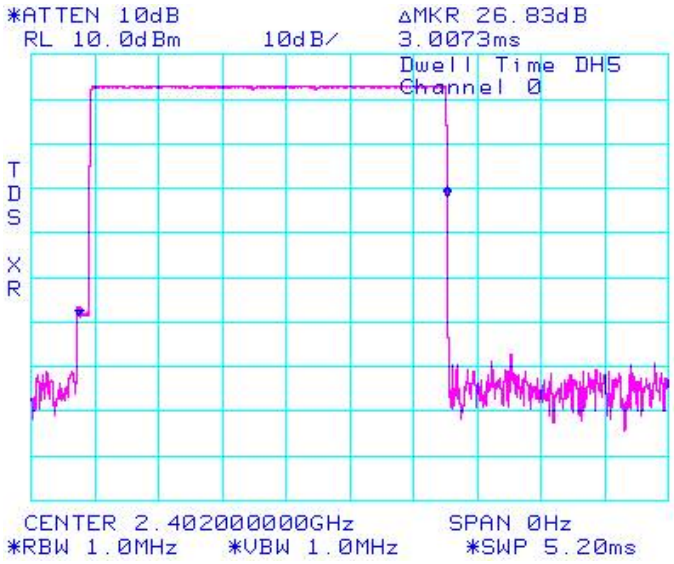
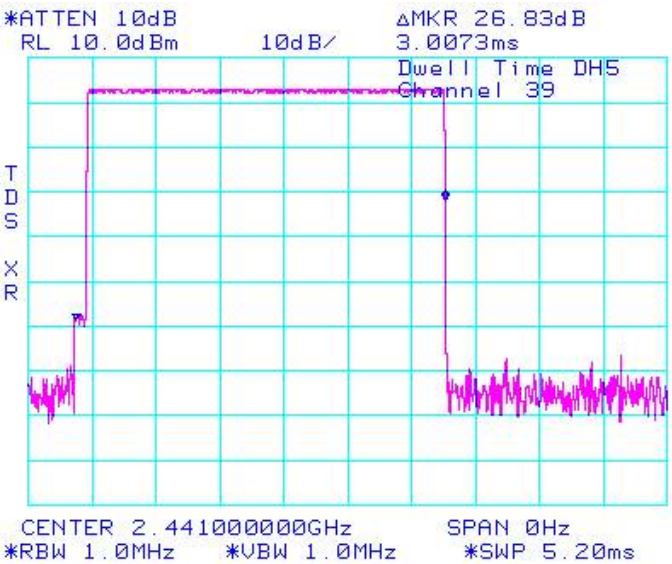


Figure 3-17: Time of Occupancy (Dwell Time)
Freq. Hopping, Static PBRS, DH5



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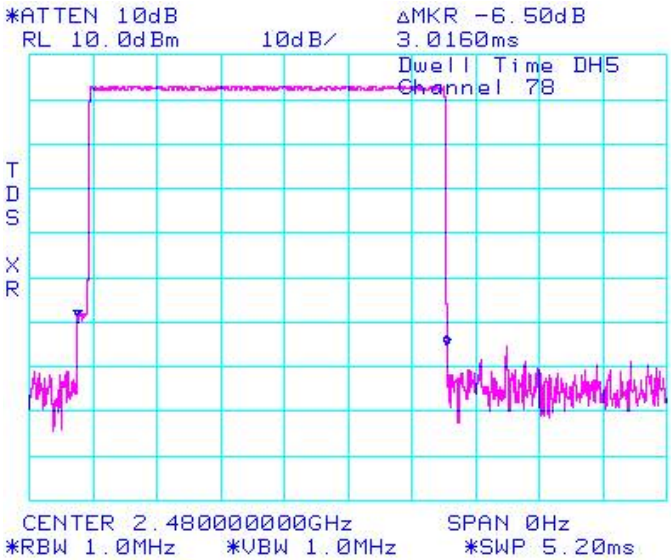
Bluetooth RF Conducted Emission Test Results cont'd

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



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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, A8.4. 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)	Measured Level (mW)	Class 2 Limit (dBm)	Class 2 Limit (mW)
0	3.00	2.00	-6.0 to 4.0	-0.25 to 2.51
39	3.17	2.07	-6.0 to 4.0	-0.25 to 2.51
78	2.67	1.85	-6.0 to 4.0	-0.25 to 2.51

The environmental test conditions were:

Temperature	23ºC
Pressure	1016 mb
Relative Humidity	32%

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

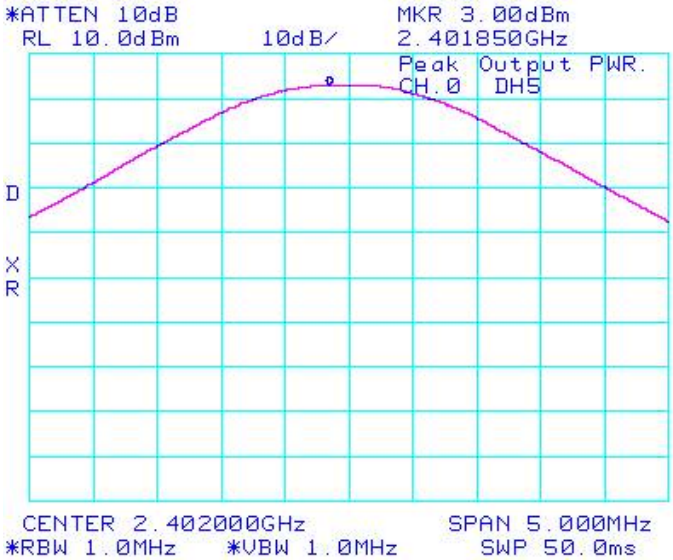


Figure 3-20: Max. Peak Conducted Output Power Single Freq., Static PBRS, DH5

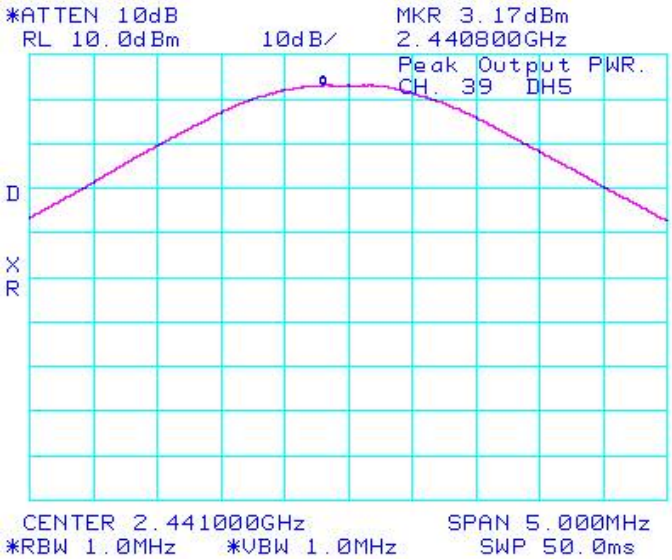
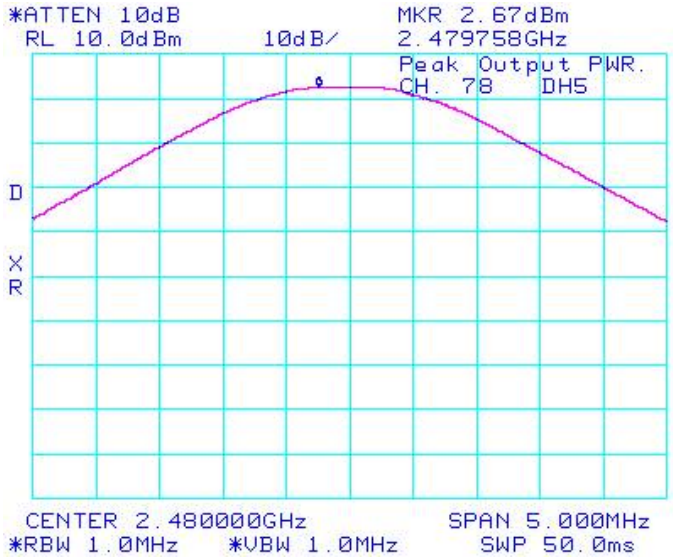


Figure 3-21: Max. Peak Conducted Output Power Single Freq., Static PBRS, DH5



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Bluetooth RF Conducted Emission Test Results cont'd

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

Bluetooth Channel	Measured Level (dBm)	Measured Level (mW)	Class 2 Limit (dBm)	Class 2 Limit (mW)
0	2.50	1.78	-6.0 to 4.0	-0.25 to 2.51
39	2.17	1.65	-6.0 to 4.0	-0.25 to 2.51
78	1.67	1.47	-6.0 to 4.0	-0.25 to 2.51

The environmental test conditions were: Temperature 23ºC
Pressure 1016 mb
Relative Humidity 32%

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

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Bluetooth RF Conducted Emission Test Results cont'd

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

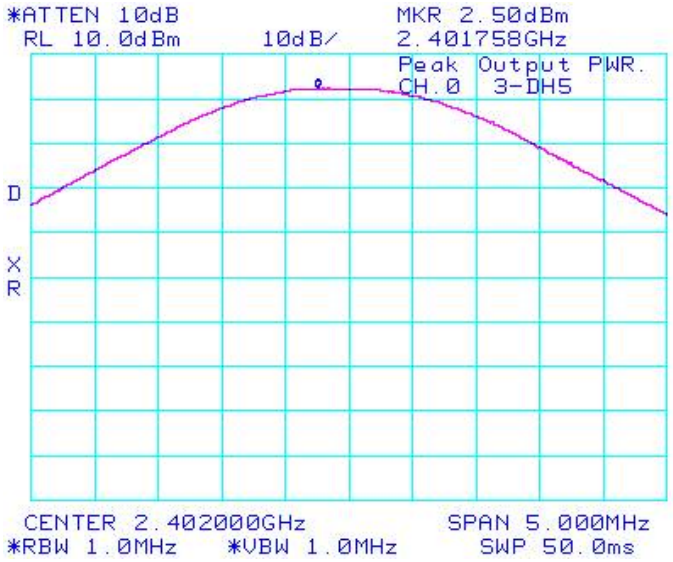


Figure 3-23: Max. Peak Conducted Output Power Single Freq., Static PBRS, 3-DH5

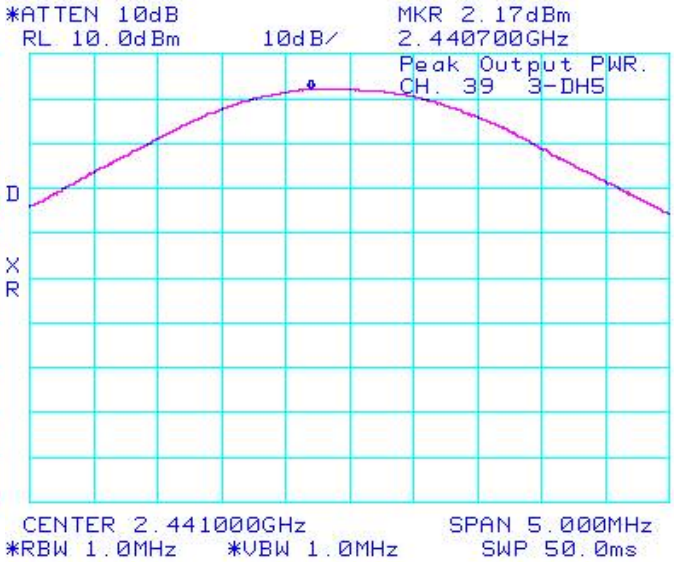
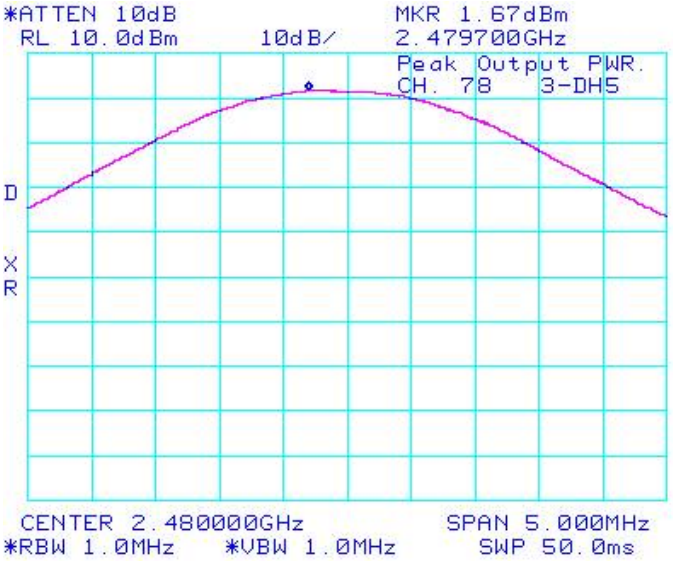


Figure 3-24: Max. Peak Conducted Output Power Single Freq., Static PBRS, 3-DH5



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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, A8.5. 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	-34.16	-20	-14.16
78	Single Frequency	-34.50	-20	-14.50
0	Hopping	-35.00	-20	-15.00
78	Hopping	-35.67	-20	-15.67

The environmental test conditions were:

Temperature	23ºC
Pressure	1016 mb
Relative Humidity	32%

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

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Bluetooth RF Conducted Emission Test Results cont'd

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

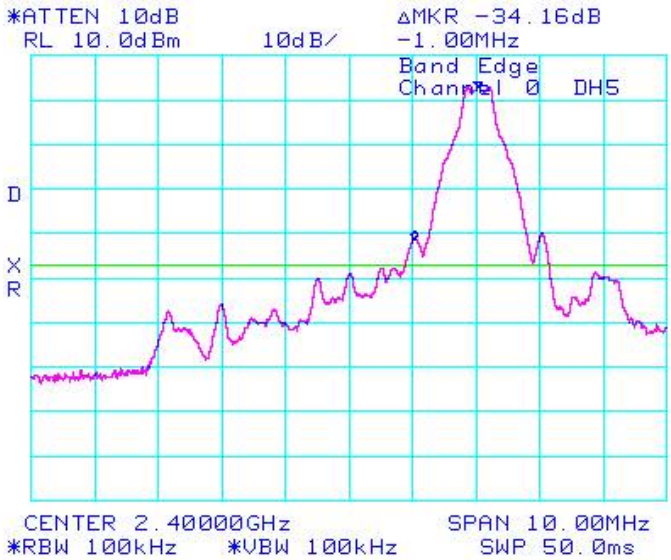


Figure 3-26: Band Edge Compliance
Single Freq., Static PBRS, DH5

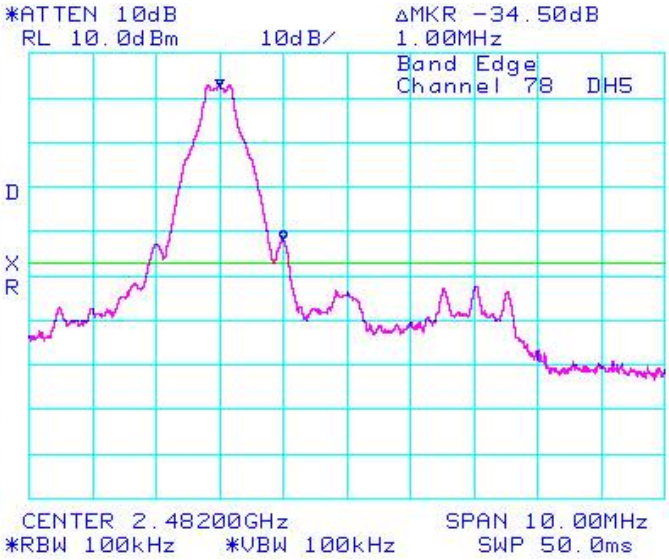


Figure 3-27: Band Edge Compliance
Freq. Hopping, Static PBRS, DH5

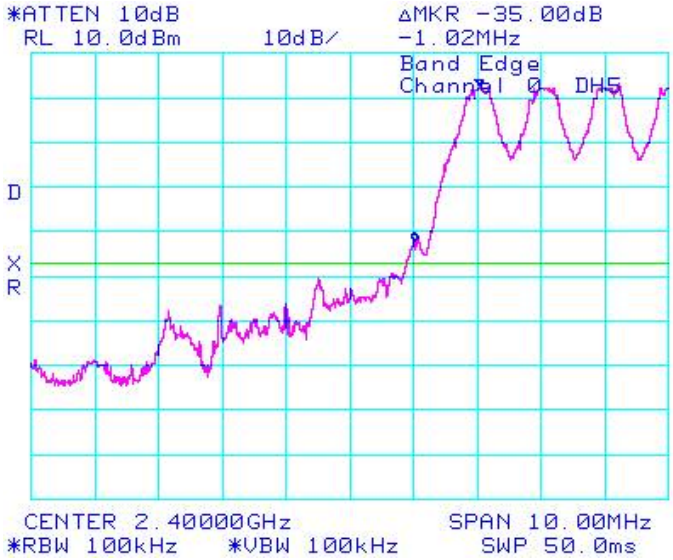
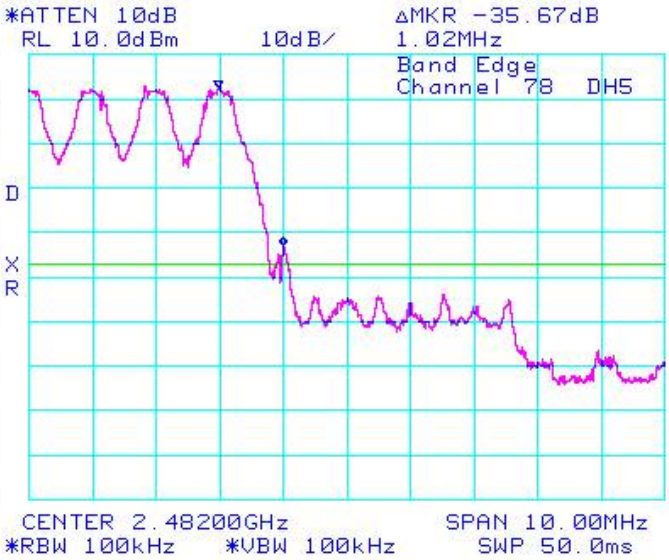


Figure 3-28: Band Edge Compliance
Freq. Hopping, Static PBRS, DH5



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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	-35.50	-20	-15.50
78	Single Frequency	-37.66	-20	-17.66
0	Hopping	-36.50	-20	-16.50
78	Hopping	-37.50	-20	-17.50

The environmental test conditions were: Temperature 23ºC
Pressure 1016 mb
Relative Humidity 32%

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

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Bluetooth RF Conducted Emission Test Results cont'd

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

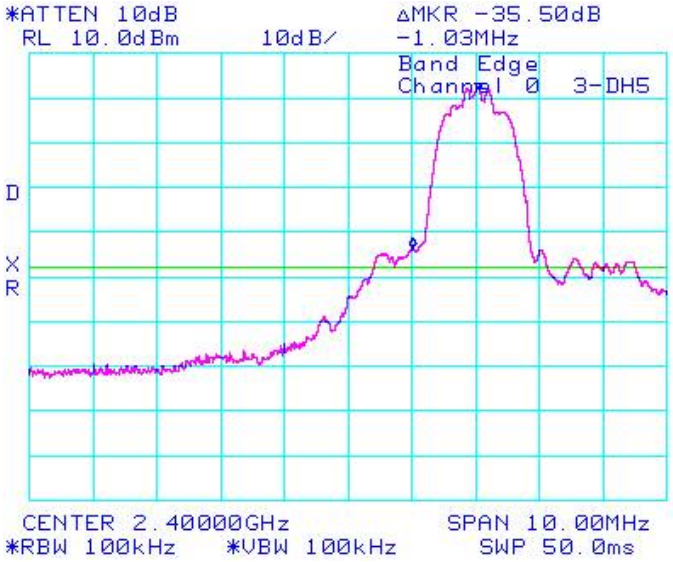

Figure 3-30: Band Edge Compliance
Single Freq., Static PBRS, 3-DH5

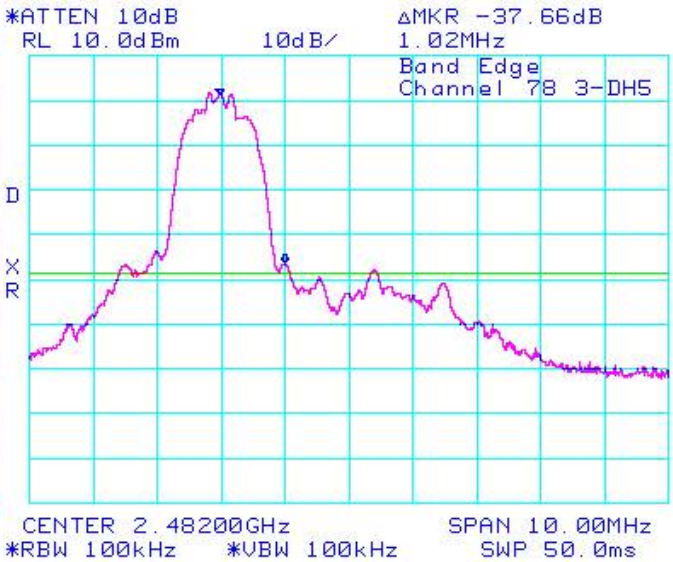

Figure 3-31: Band Edge Compliance
Freq. Hopping, Static PBRS, 3-DH5

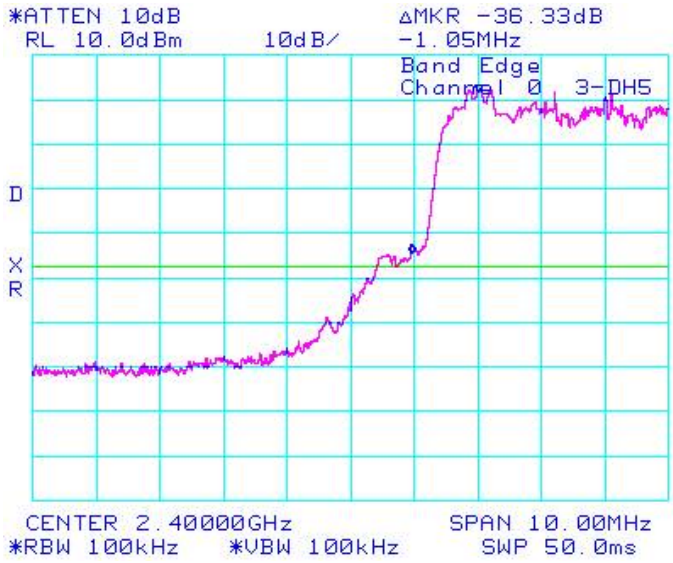

Figure 3-32: Band Edge Compliance
Freq. Hopping, Static PBRS, 3-DH5

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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, A8.5. 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	-53.83	-56.83	-20
39	3.17	-58.33	-61.50	-20
78	2.67	-58.17	-61.37	-20
Hopping mode	3.17	-58.50	-61.67	-20

The environmental test conditions were: Temperature 23ºC
Pressure 1015 mb
Relative Humidity 32%

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

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Bluetooth RF Conducted Emission Test Results cont'd

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

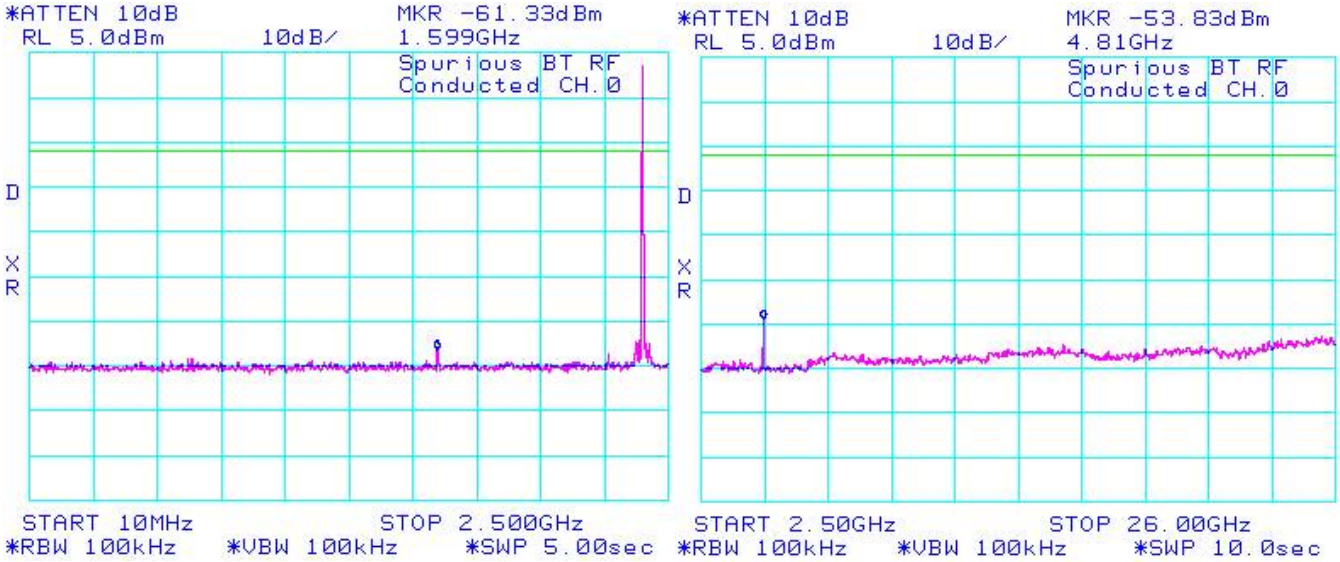
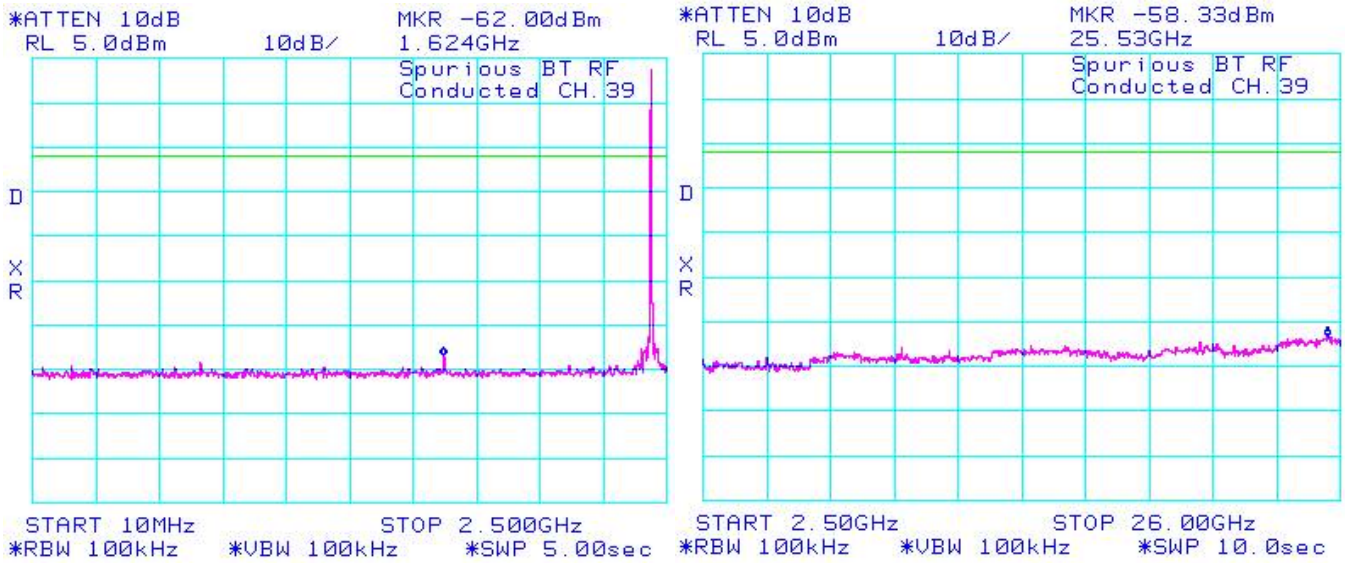


Figure 2-34: Spurious RF Conducted Emissions
Single Freq., Static PBRS, DH5



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Bluetooth RF Conducted Emission Test Results cont'd

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

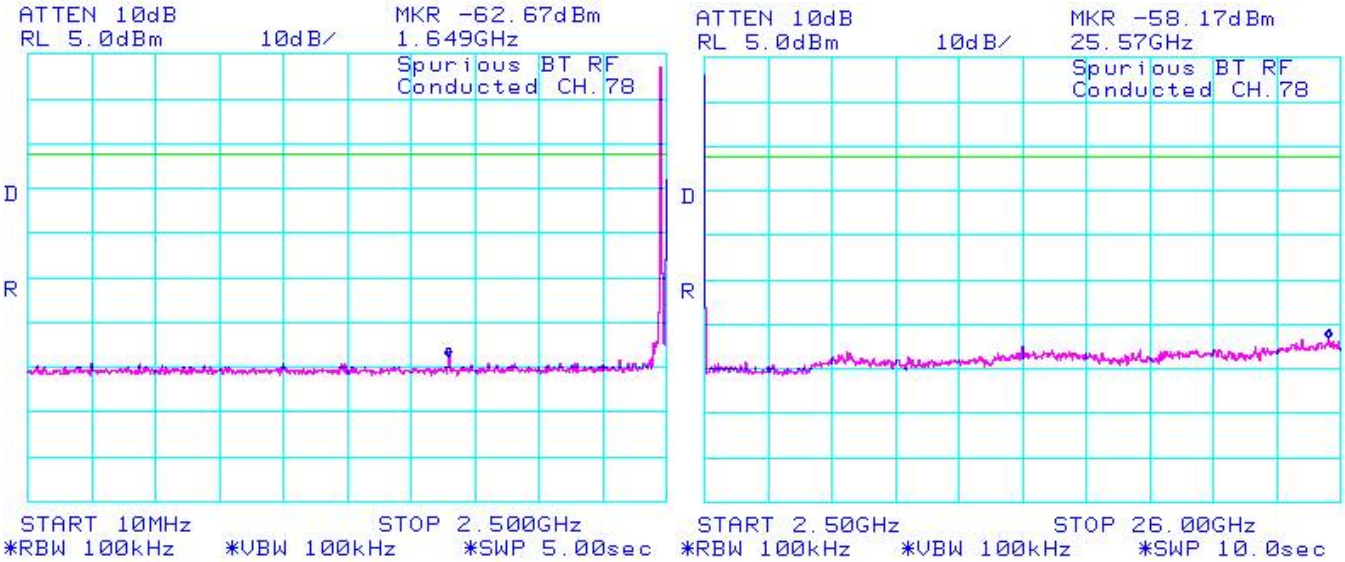
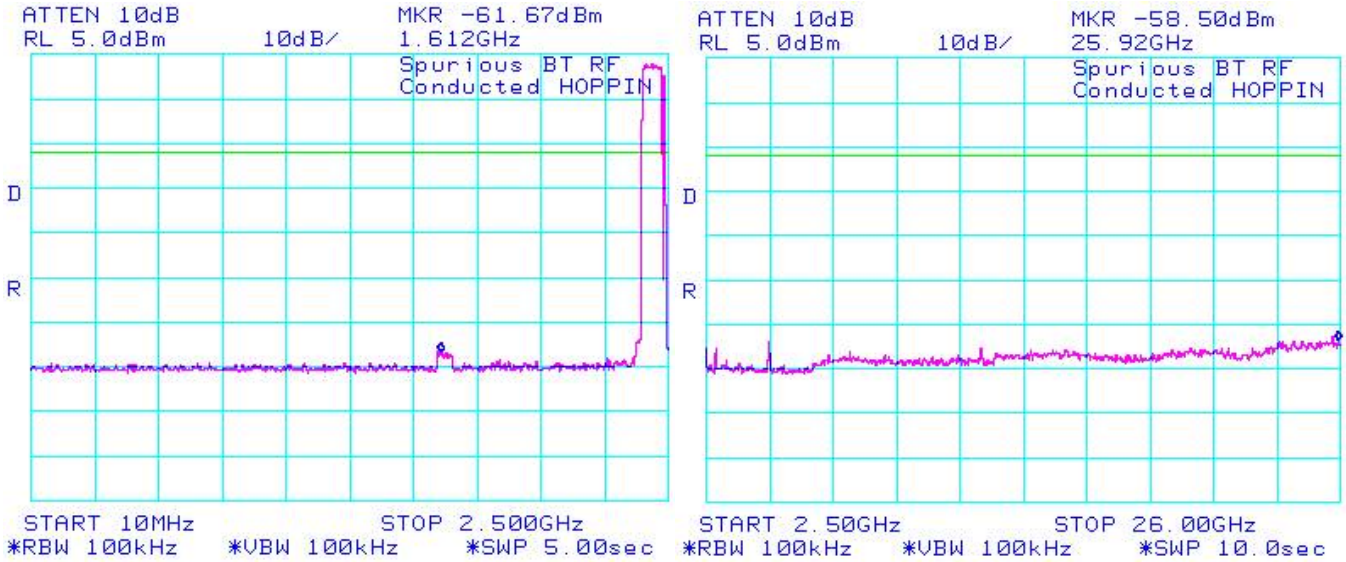


Figure 2-36: Spurious RF Conducted Emissions
Freq. Hopping, Static PBRS, DH5



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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	2.50	-57.67	-60.17	-20
39	2.17	-57.33	-59.50	-20
78	1.67	-58.17	-59.84	-20
Hopping mode	2.50	-58.67	-61.17	-20

The environmental test conditions were: Temperature 23ºC
Pressure 1015 mb
Relative Humidity 32%

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

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Bluetooth RF Conducted Emission Test Results cont'd

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

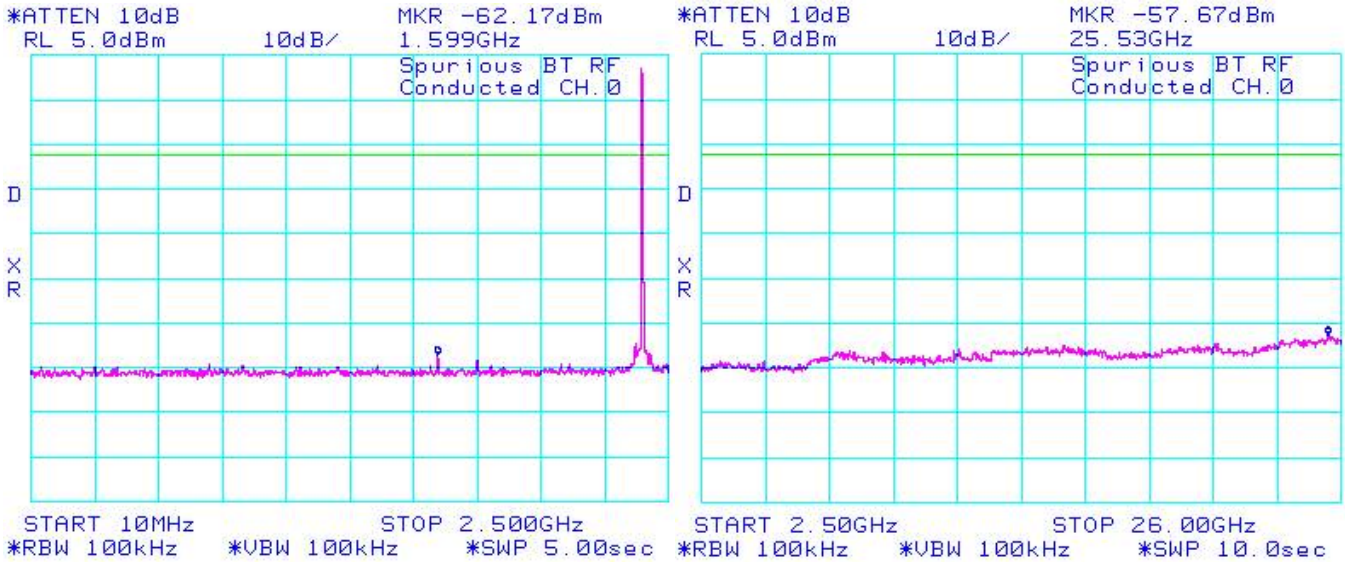
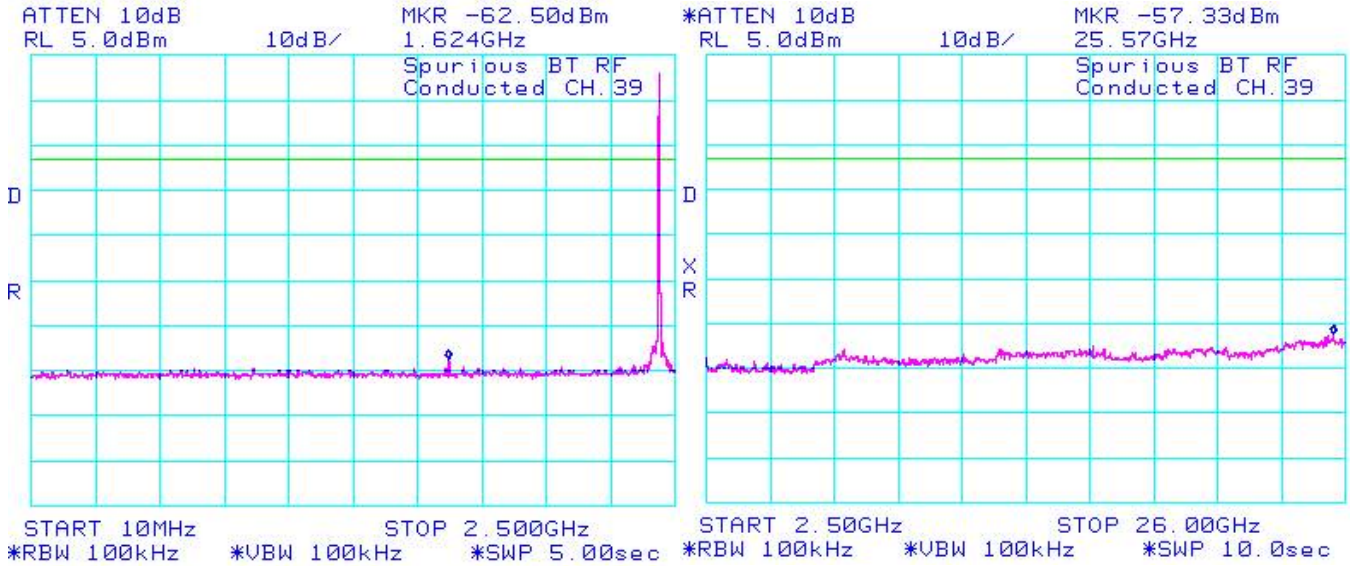


Figure 3-38: Spurious RF Conducted Emissions
Single Freq., Static PBRS, 3-DH5



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Bluetooth RF Conducted Emission Test Results cont'd

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

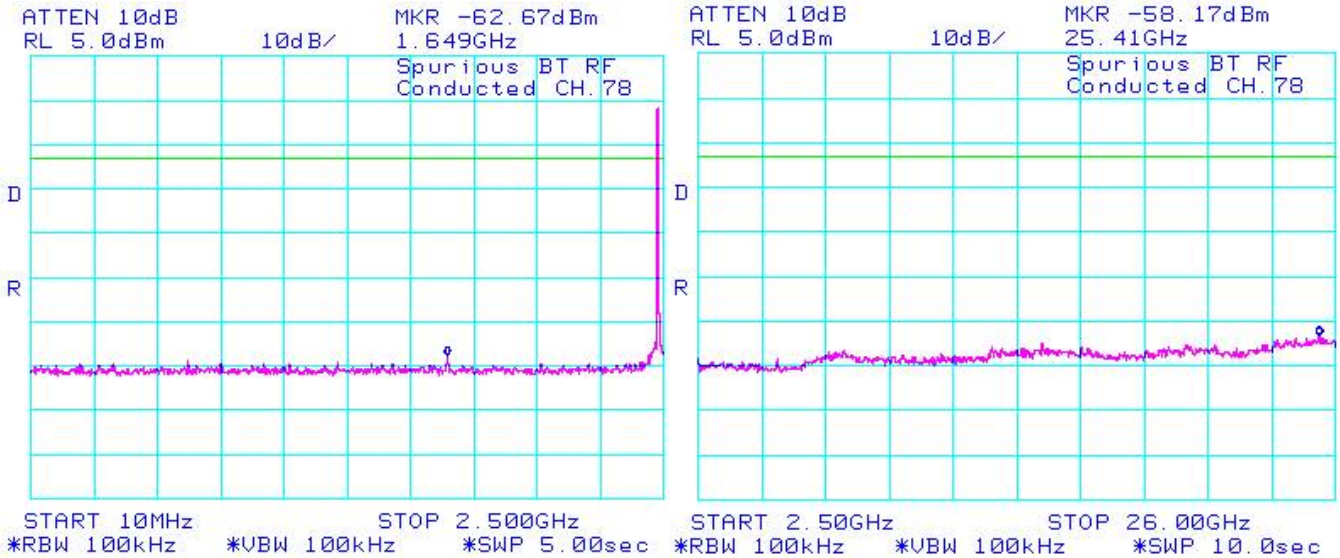
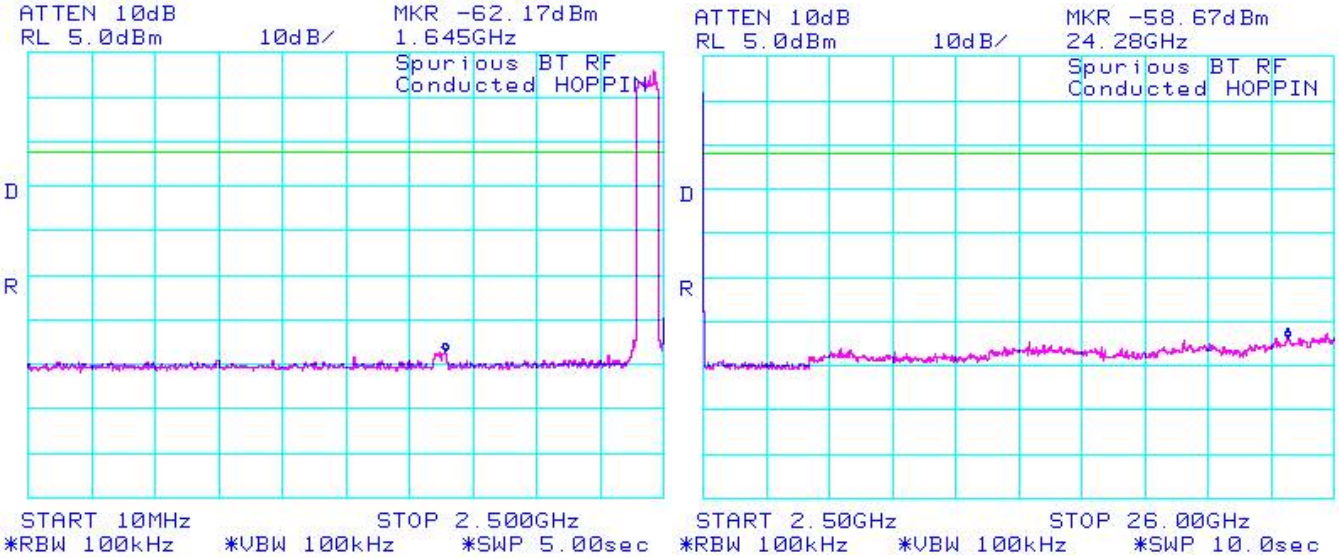


Figure 3-40 : Spurious RF Conducted Emissions
Freq. Hopping, Static PBRS, 3-DH5



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APPENDIX 4 – 802.11b/g CONDUCTED EMISSIONS TEST DATA/PLOTS

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802.11b/g RF Conducted Emission Test Results

802.11b/g Target Power Output for all the recorded measurements shown below:

Channel	Frequency	802.11b		802.11g	
		Data Rate	Power output (dBm)	Data Rate	Power output (dBm)
1	2412 MHz	1 Mbps	18.0	6 Mbps	14.0
		5.5 Mbps	18.0	24 Mbps	14.0
		11 Mbps	18.0	54 Mbps	13.0
6	2437 MHz	1 Mbps	18.0	6 Mbps	17.0
		5.5 Mbps	18.0	24 Mbps	14.5
		11 Mbps	18.0	54 Mbps	13.0
11	2462 MHz	1 Mbps	18.0	6 Mbps	14.0
		5.5 Mbps	18.0	24 Mbps	14.0
		11 Mbps	18.0	54 Mbps	13.0

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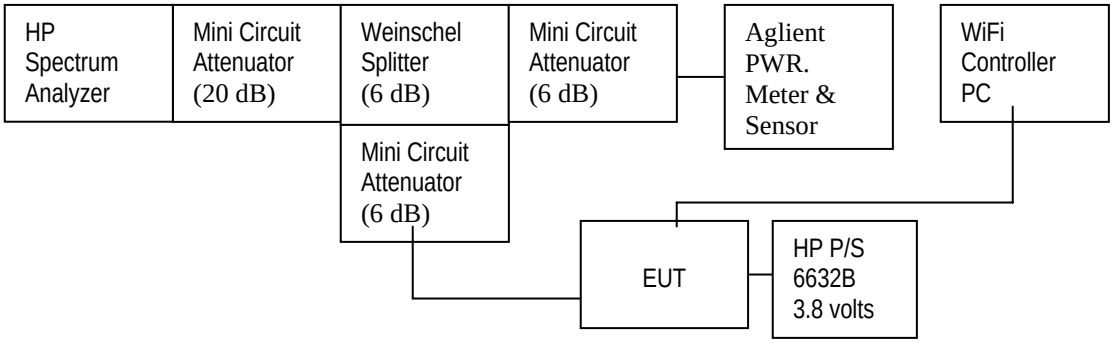
Test Setup Diagram



A reference offset of 32.4 dB was applied to the spectrum analyzer and 18.4 dB was applied to the Power Meter reference level for the attenuators and coaxial cable loss in the test circuit.
The BlackBerry® smartphone PIN 2061F989 was used for all of the measurements.

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802.11b/g RF Conducted Emission Test Results cont'd

6 dB Bandwidth

The EUT met the requirements of the 6 dB bandwidth as per 47 CFR 15.247(a)(2) and RSS-210, A8.2. Channels 1, 6 and 11 were measured at 1 Mbps, 5.5 Mbps, and 11Mbps each for 802.11b mode and 6 Mbps, 24 Mbps, and 54 Mbps each for 802.11g mode.

Channel	Data Rate	Limit (kHz)	Measured Level (MHz)
1	1 Mbps	≥ 500	11.10
	5.5 Mbps	≥ 500	10.43
	11 Mbps	≥ 500	12.47
	6 Mbps	≥ 500	16.60
	24 Mbps	≥ 500	16.67
	54 Mbps	≥ 500	16.67
6	1 Mbps	≥ 500	11.20
	5.5 Mbps	≥ 500	11.20
	11 Mbps	≥ 500	11.07
	6 Mbps	≥ 500	16.57
	24 Mbps	≥ 500	16.67
	54 Mbps	≥ 500	16.67
11	1 Mbps	≥ 500	11.17
	5.5 Mbps	≥ 500	10.50
	11 Mbps	≥ 500	10.40
	6 Mbps	≥ 500	16.53
	24 Mbps	≥ 500	16.67
	54 Mbps	≥ 500	16.67

See figures 4-1 to 4-6 for the plots of the 6 dB bandwidth measurements for Channels 1, 6, and 11, at 1 Mbps each for 802.11b mode and at 6 Mbps each for 802.11g mode.

The environmental test conditions were:

Temperature	22ºC
Pressure	1016 mb
Relative Humidity	36%

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802.11b/g RF Conducted Emission Test Results cont'd

Figure 4-1: 6 dB Bandwidth

802.11b, Channel 1, 1 Mbps

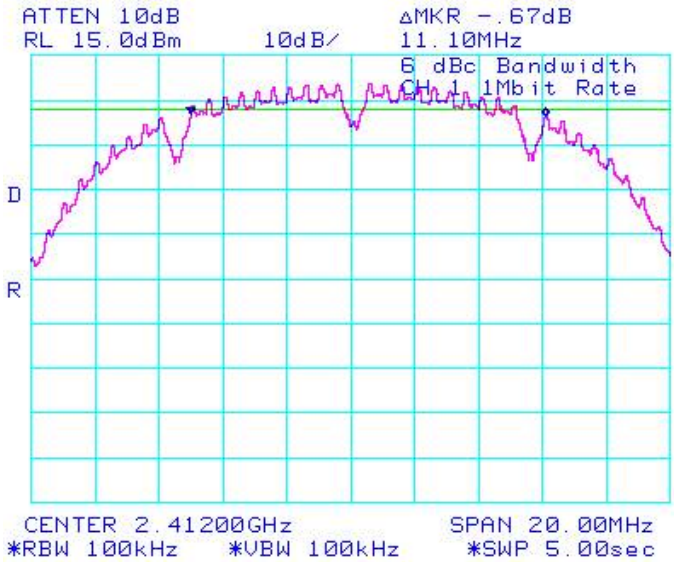


Figure 4-2: 6 dB Bandwidth

802.11b, Channel 6, 1 Mbps

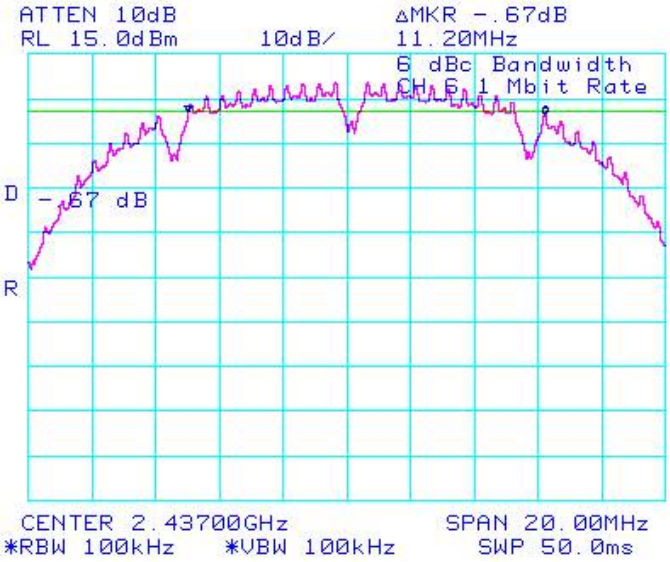
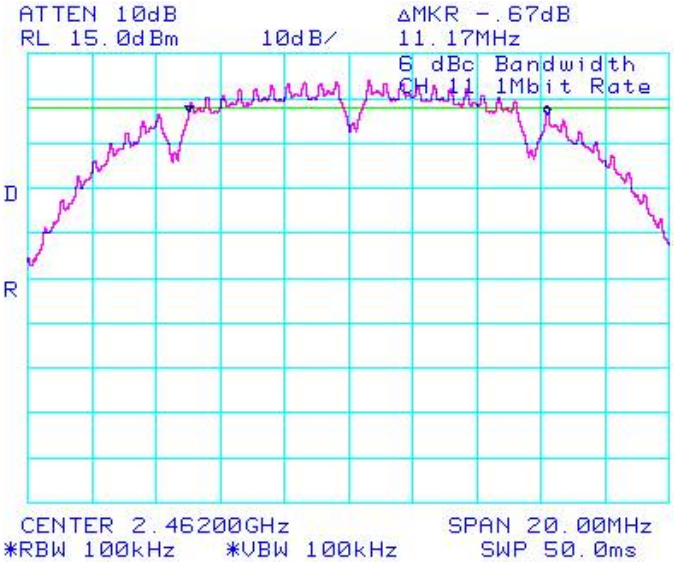


Figure 4-3: 6 dB Bandwidth

802.11b, Channel 11, 1 Mbps



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802.11b/g RF Conducted Emission Test Results cont'd

Figure 4-4: 6 dB Bandwidth

802.11g, Channel 1, 6 Mbps

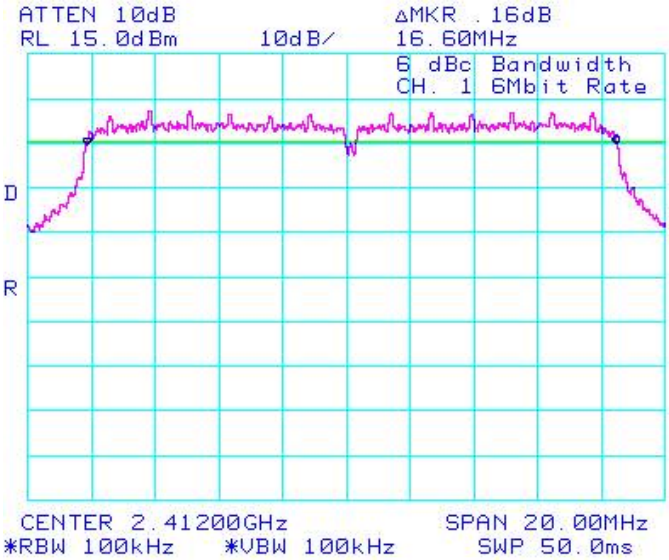
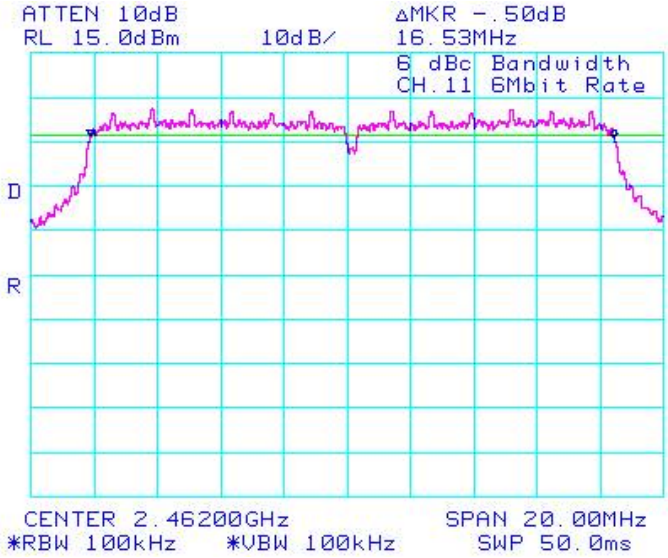


Figure 4-5: 6 dB Bandwidth

802.11g, Channel 6, 6 Mbps

Figure 4-6: 6 dB Bandwidth

802.11g, Channel 11, 6 Mbps



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802.11b/g RF Conducted Emission Test Results cont'd

Maximum Conducted Output Power

The EUT met the requirements of the maximum conducted output power of class 2 as per 47 CFR 15.247(b)(3) and RSS-210, A8.4. Channels 1, 6 and 11 were measured at 1 Mbps, 5.5 Mbps, and 11Mbps each for 802.11b mode and 6 Mbps, 24 Mbps, and 54 Mbps each for 802.11g mode using an Aglient power meter, model N1911A with model N1921A power sensor. A reference offset of 18.4 dB was applied to the power meter reference level for the coaxial cable loss and attenuators in the test circuit.

Channel	Data Rate	Class 2 Limit (W)	Measured Level (dBm)	Measured Level (mW)
1	1 Mbps	< 1.00	17.60	57.54
	5.5 Mbps	< 1.00	17.61	57.68
	11 Mbps	< 1.00	17.70	58.88
	6 Mbps	< 1.00	13.52	22.49
	24 Mbps	< 1.00	13.54	22.59
	54 Mbps	< 1.00	12.40	17.38
6	1 Mbps	< 1.00	17.87	61.24
	5.5 Mbps	< 1.00	18.00	63.10
	11 Mbps	< 1.00	17.83	60.67
	6 Mbps	< 1.00	16.90	48.98
	24 Mbps	< 1.00	14.12	25.82
	54 Mbps	< 1.00	12.59	18.16
11	1 Mbps	< 1.00	18.01	63.24
	5.5 Mbps	< 1.00	18.10	64.57
	11 Mbps	< 1.00	18.05	63.83
	6 Mbps	< 1.00	14.02	25.23
	24 Mbps	< 1.00	14.12	25.82
	54 Mbps	< 1.00	13.05	20.18

The environmental test conditions were:

Temperature	22ºC
Pressure	1016 mb
Relative Humidity	36%

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802.11b/g 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, A8.5. Channels 1 and 11 were measured at 1 Mbps, 5.5 Mbps, and 11Mbps each for 802.11b mode and 6 Mbps, 24 Mbps, and 54 Mbps each for 802.11g mode.

Channel	Data Rate	Limit (dBc)	Measured Level (dBc)	Margin (dB)
1	1 Mbps	< -20	-38.84	-18.84
	5.5 Mbps	< -20	-43.50	-23.50
	11 Mbps	< -20	-42.50	-22.50
	6 Mbps	< -20	-28.67	-8.67
	24 Mbps	< -20	-30.66	-10.66
	54 Mbps	< -20	-30.17	-10.17
11	1 Mbps	< -20	-47.17	-27.17
	5.5 Mbps	< -20	-51.00	-31.00
	11 Mbps	< -20	-50.33	-30.33
	6 Mbps	< -20	-44.50	-24.50
	24 Mbps	< -20	-44.50	-24.50
	54 Mbps	< -20	-44.00	-24.00

See figures 4-7 to 4-10 for the plots of the band edge compliance measurements for Channels 1, and 11, at 1 Mbps each for 802.11b mode and at 6 Mbps each for 802.11g mode.

The environmental test conditions were:

Temperature	22ºC
Pressure	1015 mb
Relative Humidity	34%

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802.11b/g RF Conducted Emission Test Results cont'd

Figure 4-7: Band Edge Compliance
802.11b, Channel 1, 1 Mbps

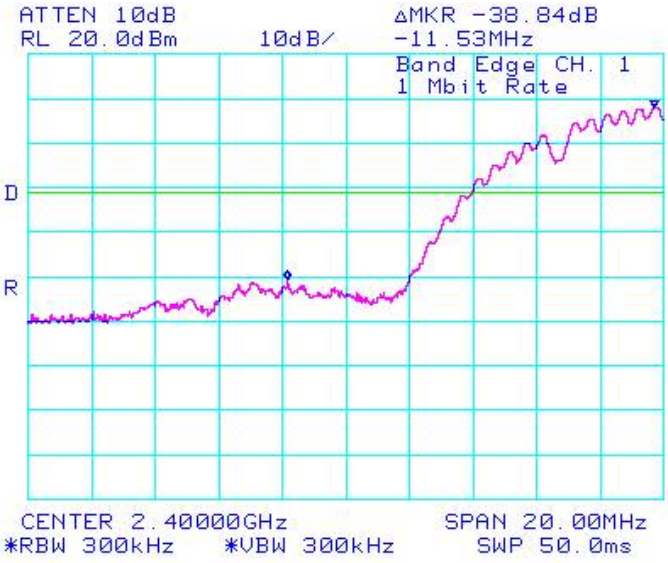


Figure 4-8: Band Edge Compliance
802.11b, Channel 11, 1 Mbps

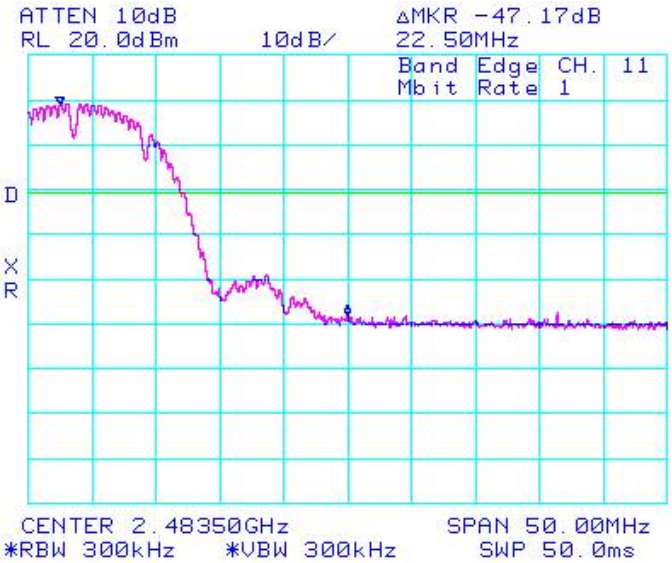


Figure 4-9: Band Edge Compliance
802.11g, Channel 1, 6 Mbps

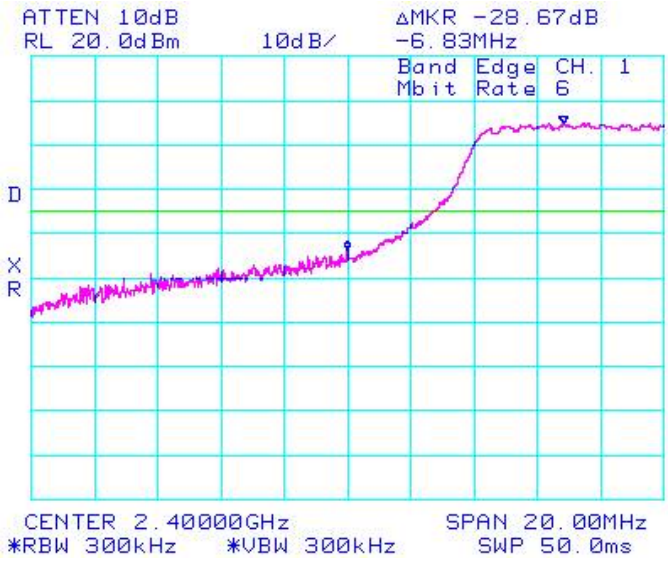
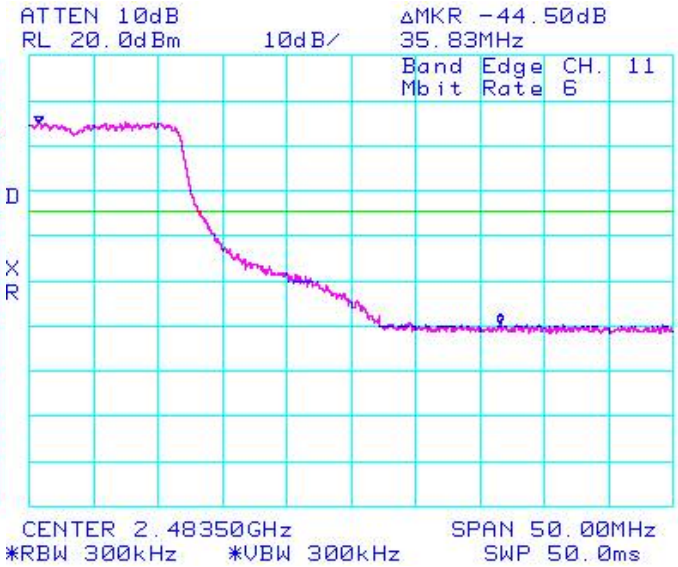


Figure 4-10: Band Edge Compliance
802.11g, Channel 11, 6 Mbps



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802.11b/g RF Conducted Emission Test Results cont'd

Peak Power Spectral Density

The EUT met the requirements of the peak power spectral density as per 47 CFR 15.247(d) and RSS-210, A8.2. Channels 1, 6 and 11 were measured at 1 Mbps, 5.5 Mbps, and 11Mbps each for 802.11b mode and 6 Mbps, 24 Mbps, and 54 Mbps each for 802.11g mode.

Channel	Data Rate	Limit (dBm)	Measured Level (dBm)	Margin (dB)
1	1 Mbps	< 8.00	-4.00	12.00
	5.5 Mbps	< 8.00	-5.67	13.67
	11 Mbps	< 8.00	-6.33	14.33
	6 Mbps	< 8.00	-10.50	18.50
	24 Mbps	< 8.00	-10.50	18.50
	54 Mbps	< 8.00	-12.00	20.00
6	1 Mbps	< 8.00	-4.00	12.00
	5.5 Mbps	< 8.00	-5.50	13.50
	11 Mbps	< 8.00	-6.33	14.33
	6 Mbps	< 8.00	-8.00	16.00
	24 Mbps	< 8.00	-9.83	17.83
	54 Mbps	< 8.00	-11.67	19.67
11	1 Mbps	< 8.00	-3.83	11.83
	5.5 Mbps	< 8.00	-5.00	13.00
	11 Mbps	< 8.00	-5.83	13.83
	6 Mbps	< 8.00	-10.00	18.00
	24 Mbps	< 8.00	-10.00	18.00
	54 Mbps	< 8.00	-11.50	19.50

See figures 4-11 to 4-16 for the plots of the peak power spectral density for Channels 1, 6 and 11, at 1 Mbps each for 802.11b mode and at 6 Mbps each for 802.11g mode.

The environmental test conditions were:

Temperature	22ºC
Pressure	1015 mb
Relative Humidity	34%

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802.11b/g RF Conducted Emission Test Results cont'd

Figure 4-11: Peak Power Spectral Density
802.11b, Channel 1, 1 Mbps

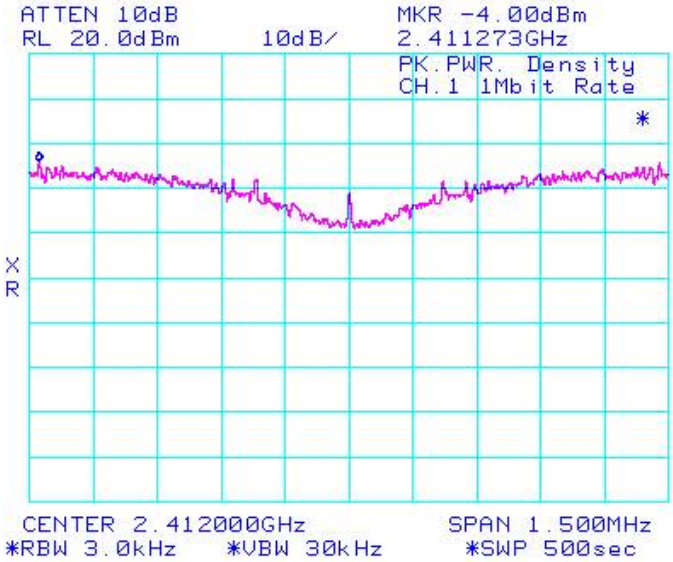


Figure 4-12: Peak Power Spectral Density
802.11b, Channel 6, 1 Mbps

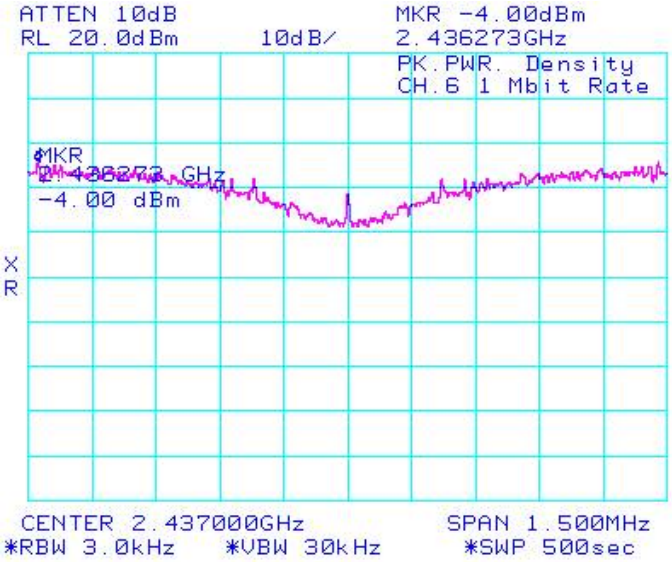
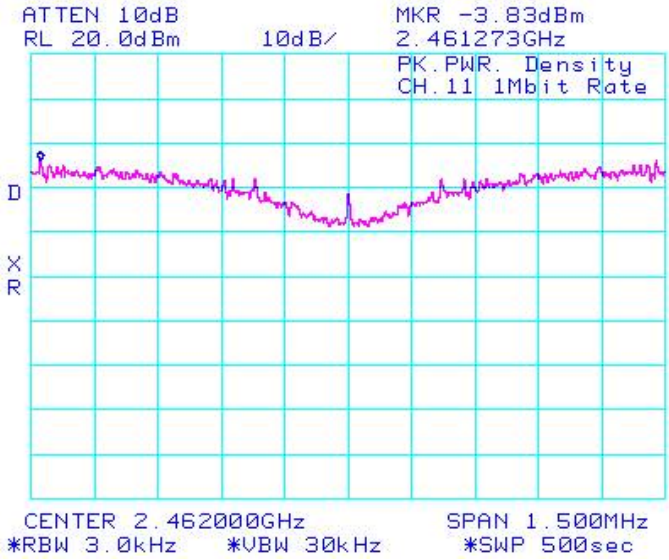


Figure 4-13: Peak Power Spectral Density
802.11b, Channel 11, 1 Mbps



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802.11b/g RF Conducted Emission Test Results cont'd

Figure 4-14: Peak Power Spectral Density
802.11g, Channel 1, 6 Mbps

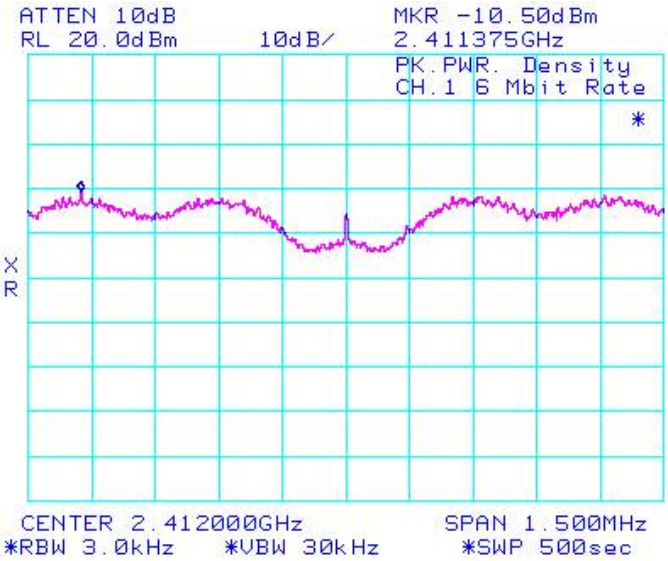


Figure 4-15: Peak Power Spectral Density
802.11g, Channel 6, 6 Mbps

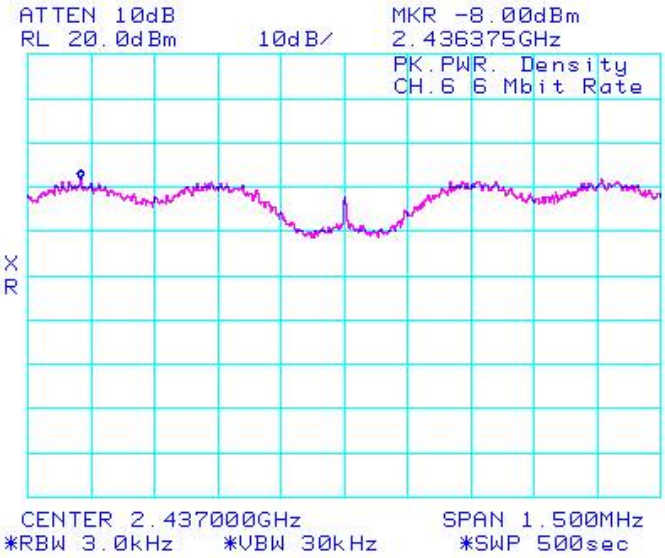
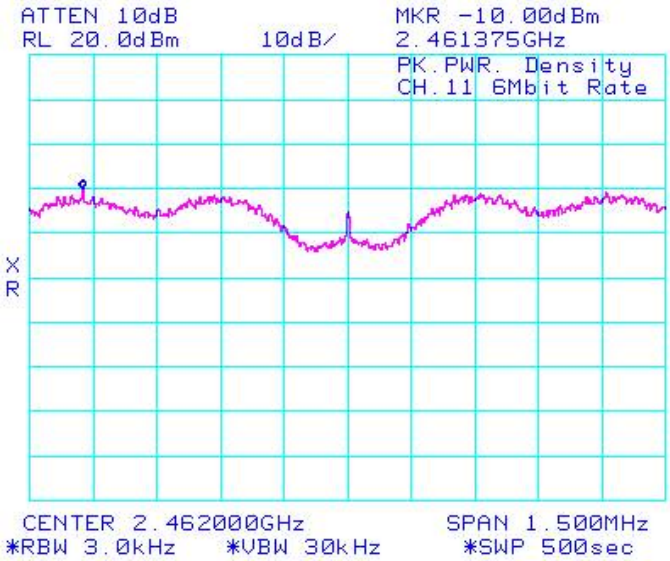


Figure 4-16: Peak Power Spectral Density
802.11g, Channel 11, 6 Mbps



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802.11b/g 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, A8.5. Channels 1, 6 and 11 were measured at 1 Mbps, 5.5 Mbps, and 11 Mbps each for 802.11b mode and 6 Mbps, 24 Mbps, and 54 Mbps each for 802.11g mode. Peak power was measured from the spectrum analyzer. A reference offset of 18.4 dB was applied to the spectrum analyzer reference level for the attenuators and coaxial cable loss in the test circuit.

Channel	Data Rate	Peak Power (dBm)	Max. Measured Level (dBm)	Max. Measured Level from Carrier (dBc)	Limit (dBc)
1	1 Mbps	17.60	-38.50	56.10	-20
	5.5 Mbps	17.61	-38.83	56.44	-20
	11 Mbps	17.70	-38.67	56.37	-20
	6 Mbps	13.52	-38.17	51.69	-20
	24 Mbps	13.54	-39.50	55.04	-20
	54 Mbps	12.40	-39.17	51.57	-20
6	1 Mbps	17.87	-39.17	57.04	-20
	5.5 Mbps	18.00	-39.00	57.00	-20
	11 Mbps	17.83	-38.50	56.33	-20
	6 Mbps	16.90	-38.00	54.90	-20
	24 Mbps	14.12	-38.83	52.95	-20
	54 Mbps	12.59	-38.67	51.26	-20
11	1 Mbps	18.01	-38.67	56.58	-20
	5.5 Mbps	18.10	-38.50	56.60	-20
	11 Mbps	18.05	-38.67	56.72	-20
	6 Mbps	14.02	-38.00	52.02	-20
	24 Mbps	14.12	-39.17	53.29	-20
	54 Mbps	13.05	-38.83	51.88	-20

See figures 4-17 to 4-22 for the plots of the spurious RF conducted emissions for Channels 1, 6 and 11, at 1 Mbps each for 802.11b mode and at 6 Mbps each for 802.11g mode.

The environmental test conditions were:

Temperature	24ºC
Pressure	1013 mb
Relative Humidity	31%

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802.11b/g RF Conducted Emission Test Results cont'd

Figure 4-17: Spurious Conducted RF Emissions
802.11b, Channel 1, 1 Mbps

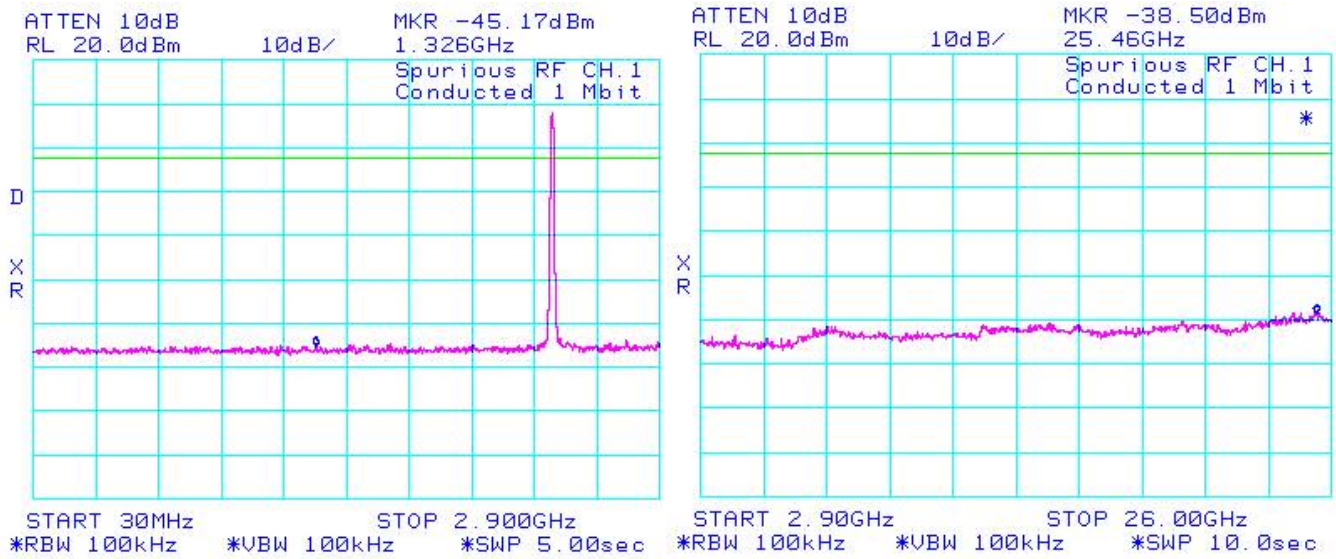
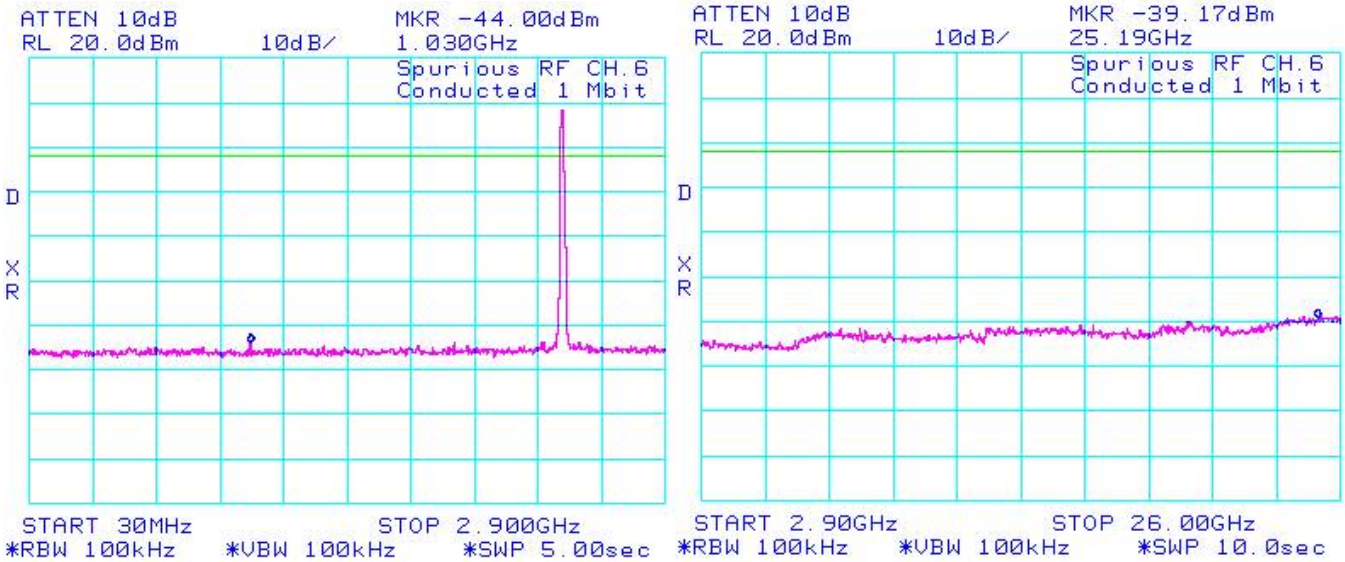


Figure 4-18 : Spurious Conducted RF Emissions
802.11b, Channel 6, 1 Mbps



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802.11b/g RF Conducted Emission Test Results cont'd

Figure 4-19: Spurious Conducted RF Emissions
802.11b, Channel 11, 1 Mbps

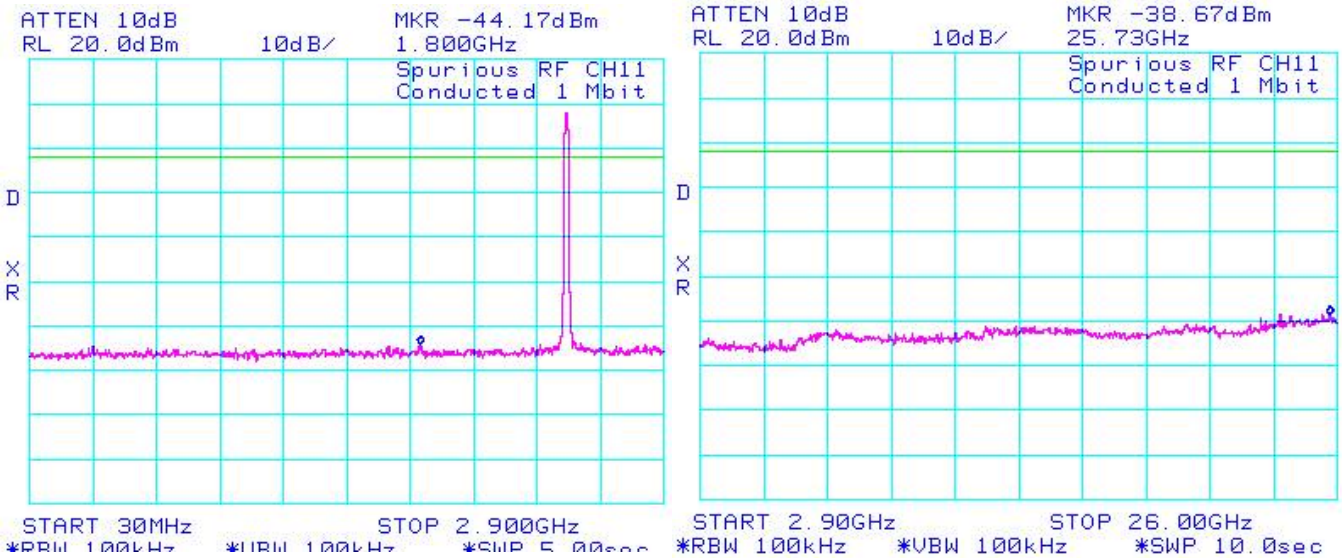
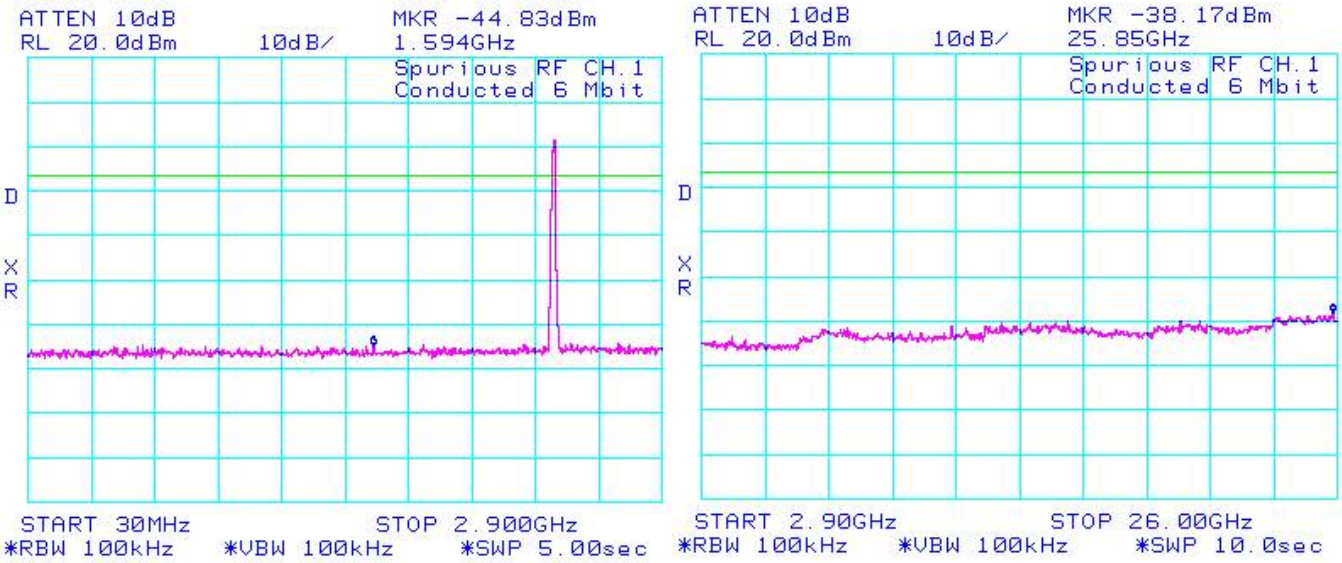


Figure 4-20: Spurious Conducted RF Emissions
802.11g, Channel 1, 6 Mbps



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802.11b/g RF Conducted Emission Test Results cont'd

Figure 4-21: Spurious Conducted RF Emissions
802.11g, Channel 6, 6 Mbps

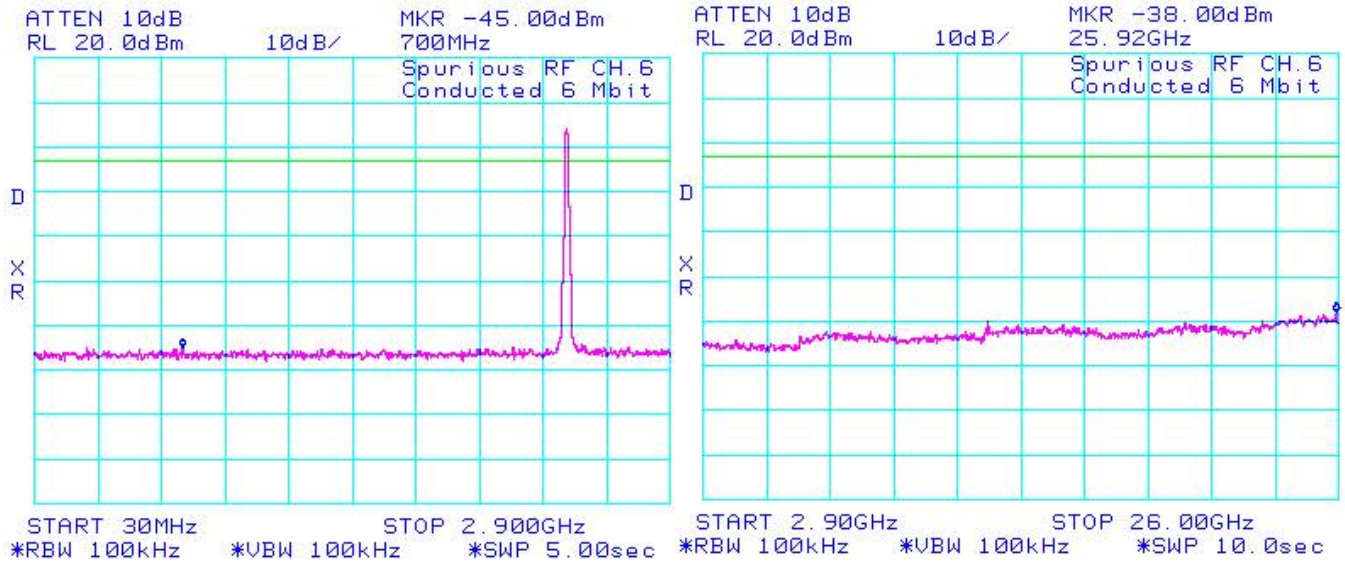
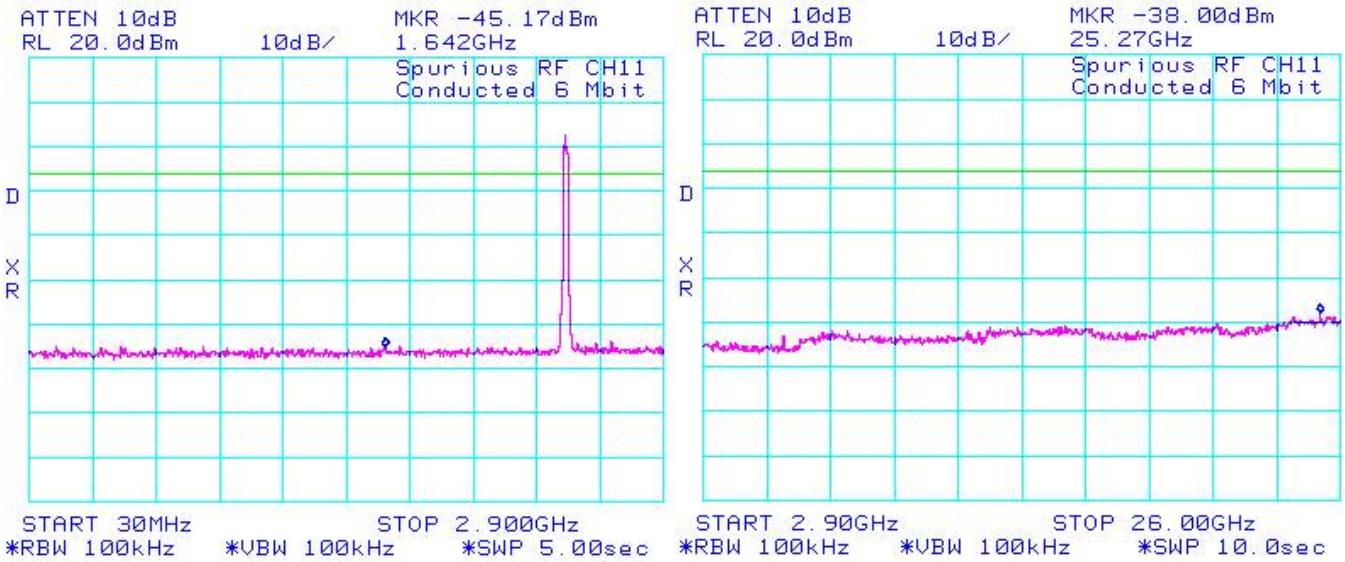


Figure 4-22: Spurious Conducted RF Emissions
802.11g, Channel 11, 6 Mbps



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