EMC Test Report

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

REPORT NO.: RTS-6057-1406-11_rev1

PRODUCT MODEL NO.: RGY181LW
TYPE NAME: BlackBerry® smartphone
FCC ID: L6ARGY180LW
IC: 2503A- RGY180LW

This report supersedes the report RTS-6057-1406-11 dated June 6, 2014

DATE: July 10, 2014

RTS is accredited
according to
EN ISO/IEC 17025 by:

592

Report Revision History:

Rev1:

1. Editorial changes in the header.
2. Addition of KDB references in section A Scope.

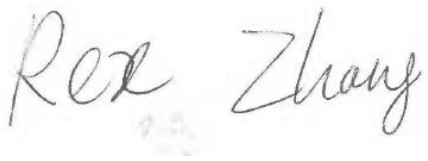
Statement of Performance:

The BlackBerry® smartphone, model RGY181LW, part number CER -59665-001 Rev 2-x05-04, and its accessories perform within the requirements of the test standards when configured and operated under BlackBerry's operation instructions.

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.

Documented by:



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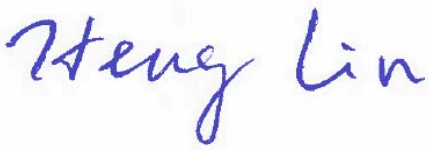

Heng Lin
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Reviewed and Approved by:

Masud S. Attayi, P.Eng.
Manager, Regulatory Compliance

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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, October, 2013
- FCC CFR 47 Part 15, Subpart E, October, 2013
- Industry Canada, RSS-210, Issue 8, December 2010, License-exempt Radio Apparatus
- Industry Canada, RSS-GEN, Issue 3, December 2010, General Requirements and Information for the Certification of Radio Apparatus
- KDB 789033 D02 General UNII Test Procedures
- KDB 905462 D06 802.11 Channel Plans

B. Associated Documents

1) MultiSourceDeclaration_R135_10.3.0.302_10.3.0.203
2) MultiSourceDeclaration_R135_10.3.0.302_10.3.0.416
3) MultiSourceDeclaration_R135_10.3.0.302_10.3.0.530
4) MultiSourceDeclaration_R135_10.3.0.302_10.3.0.590
5) MultiSourceDeclaration_R135_10.3.0.302_10.3.0.596_reg_only
6) MultiSourceDeclaration_R135_10.3.0.302_10.3.0.626
7) MultiSourceDeclaration_R135_Trunk 2315_Trunk 2495_reg_only
8) RGY181LW_CER-59665-001 – Rev1 - x04-00
9) RGY181LW _CER-59665-001 – Rev2 - x05-02
10) RGY181LW _CER-59665-001 – Rev2 - x05-04

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C. Product Identification

Manufactured by BlackBerry Limited whose headquarters is located at:
2200 University Ave. E
Waterloo, Ontario
Canada, N2K 0A7
Phone: 519 888 7465
Fax: 519 888 7884

The equipment under test (EUT) was tested at the following locations:
BlackBerry RTS EMC test facilities

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

440 Phillip Street
Waterloo, Ontario
Canada, N2L 5R9
Phone: 519 888 7465
Fax: 519 888 6906

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The testing was performed from April 24 – June 17, 2014.

SAMPLE	MODEL	CER NUMBER	PIN	SOFTWARE
1	RGY181LW	CER-59665-001Rev1-x04-00	2FFF3D3F	OS Version: 10.3.0.203 Bundle: 203
1a	RGY181LW	CER-59665-001Rev1-x04-00	2FFF3D3F	OS Version: 10.3.0.416 Bundle: 416
1b	RGY181LW	CER-59665-001Rev1-x04-00	2FFF3D3F	OS Version: 10.3.0.530 Bundle: 530
2	RGY181LW	CER-59665-001Rev1-x04-00	2FFF3D3E	OS Version: 10.3.0.203 Bundle: 203
2a	RGY181LW	CER-59665-001Rev1-x04-00	2FFF3D3E	OS Version: 10.3.0.416 Bundle: 416
2b	RGY181LW	CER-59665-001Rev1-x04-00	2FFF3D3E	OS Version: 10.3.0.530 Bundle: 530
3	RGY181LW	CER-59665-001Rev2-x05-02	2FFF470B	OS Version: 10.3.0.590 Bundle: 590
3a	RGY181LW	CER-59665-001Rev2-x05-02	2FFF470B	OS Version: 10.3.0.596 Bundle: 596
3b	RGY181LW	CER-59665-001Rev2-x05-02	2FFF470B	OS Version: 127.0.2.2495 Bundle: 2495
4	RGY181LW	CER-59665-001Rev2-x05-02	2FFF46EB	OS Version: 10.3.0.590 Bundle: 590
4a	RGY181LW	CER-59665-001Rev2-x05-02	2FFF46EB	OS Version: 10.3.0.596 Bundle: 596
5	RGY181LW	CER-59665-001Rev1-x04-00	2FFF3D4E	OS Version: 10.3.0.416 Bundle 416
6	RGY181LW	CER-59665-001Rev1-x04-00	2FFF3D39	OS Version: 10.3.0.416 Bundle 416
7	RGY181LW	CER-59665-001Rev2-x05-02	2FFF470E	OS Version: 10.3.0.530 Bundle: 530
7a	RGY181LW	CER-59665-001Rev2-x05-02	2FFF470E	OS Version: 10.3.0.590 Bundle: 590
7b	RGY181LW	CER-59665-001Rev2-x05-02	2FFF470E	OS Version: 10.3.0.626 Bundle: 626
8	RGY181LW	CER-59665-001Rev2-x05-02	2FFF4752	OS Version: 10.3.0.530 Bundle: 530
8a	RGY181LW	CER-59665-001Rev2-x05-02	2FFF4752	OS Version: 10.3.0.590 Bundle: 590
8b	RGY181LW	CER-59665-001Rev2-x05-02	2FFF4752	OS Version: 10.3.0.626 Bundle: 626
9	RGY181LW	CER-59665-001Rev1-x04-00	2FFF3D34	OS Version: 10.3.0.416 Bundle 416

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9a	RGY181LW	CER-59665-001Rev1-x04-00	2FFF3D34	OS Version: 10.3.0.530 Bundle: 530
10	RGY181LW	CER-59665-001Rev1-x04-00	2FFF3D35	OS Version: 10.3.0.416 Bundle 416
10a	RGY181LW	CER-59665-001Rev1-x04-00	2FFF3D35	OS Version: 10.3.0.530 Bundle: 530
11	RGY181LW	CER-59665-001Rev1-x05-04	2FFF4752	OS Version: 10.3.0.626 Bundle: 626

AC Line Conducted Emissions testing was performed on sample 7b and 8b
Conducted Emissions testing was performed on sample 9, 9a, 10 and 10a
Radiated Emissions testing was performed on sample 1,1a, 1b, 2, 2a, 2b, 3, 3a, 4, 4a 5, 6, 7, 7a, 7b, 8, 8a, 8b and 11
Near Field Communications testing was performed on sample 3b and 10a

Only the characteristics that may have been affected by the changes from RGY181LW Rev1 to Rev2 were re-tested. For more details, please view documents RGY181LW_CER-59665-001 – Rev1 - x04-00, RGY181LW_CER-59665-001 – Rev2 - x05-02 and RGY181LW-R135-HWD_CER-59665-001 – Rev2 - x05-04

To view the differences between software bundles 10.3.0.203, 10.3.0.416, 10.3.0.530, 10.3.0.590, 10.3.0.596 and 10.3.0.626 for RGY181LW, see documents:
MultiSourceDeclaration_R135_10.3.0.302_10.3.0.203
MultiSourceDeclaration_R135_10.3.0.302_10.3.0.416
MultiSourceDeclaration_R135_10.3.0.302_10.3.0.530
MultiSourceDeclaration_R135_10.3.0.302_10.3.0.590
MultiSourceDeclaration_R135_10.3.0.302_10.3.0.596_reg_only
MultiSourceDeclaration_R135_10.3.0.302_10.3.0.626
MultiSourceDeclaration_R135_Trunk 2315_Trunk 2495_reg_only

BlackBerry® smartphone Accessories Tested

1) Scarlet North America Fixed Blade Charger, part number HDW-58920-001, with an output voltage 5 volts dc, 1300mA
2) Stereo Wired Headset, part number HDW-49299-002, with a lead length of 1.1 meters
3) Mono Wired Headset, part number HDW-55351-002, with a lead length of 1.1 meters
4) USB Cable, part number HDW-50071-001, with a lead length of 1.2 meters
5) USB Cable, part number HDW-51800-001, with a lead length of 1.2 meters

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D. Support Equipment Used for the Testing of the EUT

1) Lenovo Thinkpad laptop, type 4236-D84, S/N PB-HX502 12/02, product ID 4236D84

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E. Test Results Chart

SPECIFICATION		TEST TYPE	Meets Requirements	TEST DATA
FCC CFR 47	IC			APPENDIX
Part 15.207	RSS-210 RSS-GEN	AC Powerline Conducted Emission	Pass	1
Part 15.209 Part 15.247	RSS-210 RSS-GEN	BT/BLE Radiated Spurious Emissions	Pass	2
Part 15.209 Part 15.247	RSS-210 RSS-GEN	BT/BLE Radiated Band Edge Compliance	Pass	2
Part 15.209 Part 15.247	RSS-210 RSS-GEN	802.11b/g/n Radiated Spurious Emissions	Pass	2
Part 15.209 Part 15.247	RSS-210 RSS-GEN	802.11b/g/n Radiated Band Edge Compliance	Pass	2
Part 15.209 Part 15.407	RSS-210 RSS-GEN	802.11a/n Radiated Spurious Emissions	Pass	3
Part 15.209 Part 15.407	RSS-210 RSS-GEN	802.11a/n Radiated Band Edge Compliance	Pass	3
Part 15.209 Part 15.407	RSS-210 RSS-GEN	802.11ac Radiated Spurious Emissions	Pass	4
Part 15.209 Part 15.407	RSS-210 RSS-GEN	802.11ac Radiated Band Edge Compliance	Pass	4
Part 15.247(a)	RSS-210	BT, 20 dB Bandwidth	Pass	5
Part 15.247(a)	RSS-210	BT, Carrier Frequency Separation	Pass	5
Part 15.247(a)	RSS-210	BT, Number of Hopping Frequencies	Pass	5
Part 15.247(a)	RSS-210	BT, Time of Occupancy (Dwell Time)	Pass	5
Part 15.247(b)	RSS-210	BT, Maximum Peak Conducted Output Power	Pass	5
Part 15.247(c)	RSS-210	BT, Band-Edge Compliance of RF Conducted Emissions	Pass	5
Part 15.247(c)	RSS-210	BT, Spurious RF Conducted Emissions	Pass	5
Part 15.247(a)	RSS-210	BLE, 6 dB Bandwidth	Pass	5
Part 15.247(b)	RSS-210	BLE, Maximum Conducted Output Power	Pass	5
Part 15.247(c)	RSS-210	BLE, Band-Edge	Pass	5
Part 15.247(d)	RSS-210	BLE, Peak Power Spectral Density	Pass	5
Part 15.247(c)	RSS-210	BLE, Spurious RF Conducted Emissions	Pass	5

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Test Results Chart cont'd

SPECIFICATION		TEST TYPE	Meets Requirements	TEST DATA
FCC CFR 47	IC			APPENDIX
Part 15.247(a)	RSS-210	802.11b/g/n, 6 dB Bandwidth	Pass	6
Part 15.247(b)	RSS-210	802.11b/g/n, Maximum Conducted Output Power	Pass	6
Part 15.247(c)	RSS-210	802.11b/g/n, Band-Edge	Pass	6
Part 15.247(d)	RSS-210	802.11b/g/n, Peak Power Spectral Density	Pass	6
Part 15.247(c)	RSS-210	802.11b/g/n, Spurious RF Conducted Emissions	Pass	6
Part 15.407	RSS-210	802.11a/n, 6 dB Bandwidth	Pass	7
Part 15.407	RSS-210	802.11a/n, Maximum Conducted Output Power	Pass	7
Part 15.407	RSS-210	802.11a/n, Band-Edge	Pass	7
Part 15.407	RSS-210	802.11a/n, Peak Power Spectral Density	Pass	7
Part 15.407	RSS-210	802.11a/n, Spurious RF Conducted Emissions	Pass	7
Part 15.407	RSS-210	802.11ac, 6 dB Bandwidth	Pass	8
Part 15.407	RSS-210	802.11ac, Maximum Conducted Output Power	Pass	8
Part 15.407	RSS-210	802.11ac, Band-Edge	Pass	8
Part 15.407	RSS-210	802.11ac, Peak Power Spectral Density	Pass	8
Part 15.407	RSS-210	802.11ac, Spurious RF Conducted Emissions	Pass	8
Part 15.209 Part 15.225(a)	RSS-210 RSS-GEN	Near Field Communications, Radiated Emissions	Pass	9
Part 15.225(e)	RSS-210	Near Field Communications, Occupied Bandwidth	Pass	9
Part 15.225(e)	RSS-210	Near Field Communications, Frequency Stability	Pass	9

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F. Summary of Results

1) AC POWER LINE CONDUCTED EMISSIONS

The AC Powerline 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.
BlackBerry® smartphone was in battery charging mode. The input voltage was 120 V, 60 Hz.

The following test configurations were measured:

Test Configuration	Operating Mode(s)	Charger + Accessories
1	NFC TX	Fixed Blade Charger + Stereo Wired Headset + USB Cable 1.20m
2	Bluetooth TX	Fixed Blade Charger + Stereo Wired Headset + USB Cable 1.20m
3	802.11b TX	Fixed Blade Charger + Mono Wired Headset + USB Cable 1.20m
4	802.11ac TX	Fixed Blade Charger + Stereo Wired Headset + USB Cable 1.20m

The sample EUT's conducted emissions were compared with respect to the FCC CFR 47 Part 15, Subpart C and IC RSS-210 limits. The sample EUT had a worst case test margin of 11.85 dB below the QP limit at 0.483 MHz with the Fixed Blade Charger in Test Configuration 2.

See APPENDIX 1 for the test data.

Measurement Uncertainty ±3.2 dB

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2) BLUETOOTH, BLUETOOTH LOW ENERGY AND 802.11b/g/n RADIATED EMISSIONS

a) Radiated Spurious and Harmonic Emissions

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

The measurements were done in a semi-anechoic chamber (SAC) below 1 GHz and a modified semi-anechoic chamber (modified SAC) with floor absorbers above 1 GHz. The SAC's FCC registration number is **778487** and the Industry Canada (IC) file number is **2503B-1**. The modified SAC's FCC registration number is **959115** and the IC file number is **2503C-1**.

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

The BlackBerry® smartphone 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", "2-DH5" and "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 BlackBerry® smartphone was measured in standalone configuration with Bluetooth Low Energy transmitting in single frequency mode at low channel (0), middle channel (20) and high channel (39). 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 BlackBerry® smartphone was measured in standalone configuration transmitting on channels 1, 6 & 11 at 1 Mbps for 802.11b mode, at 6 Mbps for 802.11g mode, and at MCS 0 for 802.11n 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 Bluetooth harmonics were investigated up to the 10th harmonic. The sample EUT emissions were in the noise floor (NF).

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The Bluetooth Low Energy harmonics were investigated up to the 10th harmonic. The sample EUT emissions were in the noise floor (NF).
The 802.11b/g/n harmonics were investigated up to the 10th harmonic. The sample EUT emissions were in the noise floor (NF).
See APPENDIX 2 for the test data.

b) Band-Edge Compliance of RF Radiated Emissions
The BlackBerry® smartphone met the requirements for band-edge compliance of RF radiated emissions for Bluetooth, Bluetooth Low Energy and 802.11b/g/n as per the requirements of 15.247, 15.209, and RSS-210/RSS-GEN.

Measurement Uncertainty ±4.2 dB
See APPENDIX 2 for the test data

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3) 802.11a/n 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 polarizations of the emissions were measured.

The measurements were done in a semi-anechoic chamber (SAC) below 1 GHz and a modified semi-anechoic chamber (modified SAC) with floor absorbers above 1 GHz. The SAC's FCC registration number is **778487** and the Industry Canada (IC) file number is **2503B-1**. The modified SAC's FCC registration number is **959115** and the IC file number is **2503C-1**.

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

The BlackBerry® smartphone was measured in standalone configuration transmitting on channels 36, 48, 64, 100, 140 and 165 at 6 Mbps for 802.11a mode and at MCS 0 for 802.11n. The system's radiated emission levels were compared with respect to the FCC CFR 47 Part 15 Subpart E, 15.407 and RSS-210/RSS-GEN.

The 802.11a/n harmonics were investigated up to the 10th harmonic. EUT emissions were in the noise floor (NF).
See APPENDIX 3 for the test data.

b) Band-Edge Compliance of RF Radiated Emissions

The BlackBerry® smartphone met the requirements for band-edge compliance of RF radiated emissions for 802.11a/n as per the requirements of 15.407, 15.209 and RSS-210/ RSS-GEN.

See APPENDIX 3 for the test data

Measurement Uncertainty ±4.2 dB

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4) 802.11ac 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 polarizations of the emissions were measured.

The measurements were done in a semi-anechoic chamber (SAC) below 1 GHz and a modified semi-anechoic chamber (modified SAC) with floor absorbers above 1 GHz. The SAC's FCC registration number is **778487** and the Industry Canada (IC) file number is **2503B-1**. The modified SAC's FCC registration number is **959115** and the IC file number is **2503C-1**.

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

The BlackBerry® smartphone was measured in standalone configuration transmitting on channels 36 and 38 for 802.11ac mode 20MHz bandwidth; on channels 38 and 151 for 802.11ac mode 40MHz bandwidth and on channel 138 for 802.11ac mode 80MHz bandwidth. The system's radiated emission levels were compared with respect to the FCC CFR 47 Part 15 Subpart E, 15.407 and RSS-210/RSS-GEN.

The 802.11ac harmonics were investigated up to the 10th harmonic. EUT emissions were in the noise floor (NF).
See APPENDIX 4 for the test data.

b) Band-Edge Compliance of RF Radiated Emissions

The BlackBerry® smartphone met the requirements for band-edge compliance of RF radiated emissions for 802.11a/n as per the requirements of 15.407, 15.209 and RSS-210/ RSS-GEN.

See APPENDIX 4 for the test data

Measurement Uncertainty ±4.2 dB

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5) i) BLUETOOTH RF CONDUCTED EMISSIONS

The Bluetooth conducted RF emissions from the BlackBerry® smartphone were measured using the methods outlined in FCC CFR 47 Part 15, Subpart C.

a) 20 dB Bandwidth
The BlackBerry® smartphone 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. The result includes both normal data rate and EDR. The worst case 20 dB Bandwidth was 0.949 MHz for channel 78 in normal data rate mode and 1.340 MHz for channels 0 in EDR mode.
See APPENDIX 5 for the test data.

b) Carrier Frequency Separation
The BlackBerry® smartphone met the requirements of the carrier frequency separation as per 47 CFR 15.247(a) and RSS-210. Channel 38 to 39 was measured. The result includes both normal data rate and EDR.
See APPENDIX 5 for the test data.

c) Number of Hopping Frequencies
The BlackBerry® smartphone 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 5 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 5 for the test data.

e) Maximum Peak Conducted Output Power
The BlackBerry® smartphone 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. The worst case Conducted Output Power level was 9.50 dBm (0.00891 W) for Channel 39 in normal data rate mode and 5.80 dBm (0.00380 W) for channel 39 in EDR mode.
See APPENDIX 5 for the test data.

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f) Band-Edge Compliance of RF Conducted Emissions
The BlackBerry® smartphone 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 5 for the test data.

g) Spurious RF Conducted Emissions
The BlackBerry® smartphone 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 5 for the test data.

ii) BLUETOOTH LOW ENERGY RF CONDUCTED EMISSIONS

The Bluetooth Low Energy conducted RF emissions from the BlackBerry® smartphone were measured using the methods outlined in FCC CFR 47 Part 15, Subpart C.

a) 6dB Bandwidth
The EUT met the requirements of the 6 dB bandwidth as per 47 CFR 15.247(b) and RSS-210. Low channel (0), middle channel (20) and high channel (39) were measured. The worst case 6 dB Bandwidth was 0.729 MHz for channel 20.
See APPENDIX 5 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. Low channel (0), middle channel (20) and high channel (39) were measured. The worst case Conducted Output Power level was 8 dBm (0.00631 W) for channel 20.
See APPENDIX 5 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. Low channel (0) and high channel (39) were measured.
See APPENDIX 5 for the test data.

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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. Low channel (0), middle channel (20) and high channel (39) were measured.
See APPENDIX 5 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. The frequency range measured was 30 MHz to 26 GHz. Low channel (0), middle channel (20) and high channel (39) were measured.
See APPENDIX 5 for the test data.

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6) 802.11b/g/n RF CONDUCTED EMISSIONS

The 802.11b/g/n conducted RF emissions from the BlackBerry® smartphone were measured using the methods outlined in FCC CFR 47 Part 15, Subpart C.

a) 6dB Bandwidth
The EUT met the requirements of the 6 dB bandwidth as per 47 CFR 15.247(b) and RSS-210. Low channel (1), middle channel (6) and high channel (11) were measured. The worst case 6 dB Bandwidth was 9.92 MHz for channel 6 in 802.11b mode, 16.48 MHz for channels 1,6 and 11 in 802.11g mode, and 16.48 MHz for channels 1, 6 and 11 in 802.11n mode.
See APPENDIX 6 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. Low channel (1), middle channel (6) and high channel (11) were measured. The worst case Conducted Output Power level was 16.05 dBm (40.3 mW) for channel 11 in 802.11b mode, 15.81 dBm (38.10 mW) for channel 6 in 802.11g mode, and 15.46 dBm (35.1 mW) for channel 6 in 802.11n mode.
See APPENDIX 6 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. Low channel (1) and high channel (11) were measured.
See APPENDIX 6 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. Low channel (1), middle channel (6) and high channel (11) were measured.
See APPENDIX 6 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. The frequency range measured was 30 MHz to 26 GHz. Low channel (1), middle channel (6) and high channel (11) were measured.
See APPENDIX 6 for the test data.

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7) 802.11a/n RF CONDUCTED EMISSIONS

The 802.11a/n conducted RF emissions from the BlackBerry® smartphone were measured using the methods outlined in FCC CFR 47 Part 15, Subpart E.

a) 6 dB Bandwidth
The EUT met the requirements of the 6 dB bandwidth as per 47 CFR 15.407 and RSS-210. Channels 36, 64, 100, 140 and 165 were measured. The worst case 6 dB Bandwidth was 16.51 MHz for channels 36, 64 and 140 in 802.11a mode. The worst case 6 dB Bandwidth was 16.51 MHz for channel 36 in 802.11n mode. See APPENDIX 7 for the test data.

b) Maximum Conducted Output Power
The EUT met the requirements of the maximum conducted output power as per 47 CFR 15.407 and RSS-210. Channels 36, 64, 100, 140 and 165 were measured. The worst case Conducted Output Power level was 18.18 dBm (65.77 mW) for channel 165 in 802.11a mode. The worst case Conducted Output Power level was was 17.23 dBm (52.84 mW) for channel 64 in 802.11n mode.
See APPENDIX 7 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 15.407 and RSS-210. Channels 36, 64, 100, 140 and 165 were measured.
See APPENDIX 7 for the test data.

d) Peak Power Spectral Density
The EUT met the requirements of peak power spectral density as per 47 CFR 15.407 and RSS-210. Channels 36, 64, 100, 140 and 165 were measured.
See APPENDIX 7 for the test data.

e) Spurious RF Conducted Emissions
The EUT met the requirements of the spurious RF conducted emissions as per 47 CFR 15.407 and RSS-210. The frequency range measured was 30 MHz to 40 GHz. Channels 36, 64, 100 and 140 were measured.
See APPENDIX 7 for the test data.

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8) 802.11ac RF CONDUCTED EMISSIONS

The 802.11ac conducted RF emissions from the BlackBerry® smartphone were measured using the methods outlined in FCC CFR 47 Part 15, Subpart E.

b) 6 dB Bandwidth
The EUT met the requirements of the 6 dB bandwidth as per 47 CFR 15.407 and RSS-210. Channels 36, 64, 140 and 149 were measured for 20MHz bandwidth, channels 38, 62, 142 and 151 were measured for 40MHz bandwidth, channels 42, 58, 138 and 155 were measured for 80MHz bandwidth. The worst case 6 dB Bandwidth was 17.79 MHz for channels 36, 64 and 149 for 802.11ac mode, 20MHz bandwidth; the worst case 6 dB Bandwidth was 36.60 MHz for channels 142 for 802.11ac mode, 40MHz bandwidth; the worst case 6 dB Bandwidth was 76.54 MHz for channels 42, 58, 138 and 155 for 802.11ac mode, 80MHz bandwidth
See APPENDIX 7 for the test data.

c) Maximum Conducted Output Power
The EUT met the requirements of the maximum conducted output power as per 47 CFR 15.407 and RSS-210. Channels 36, 64, 140 and 149 were measured for 20MHz bandwidth, channels 38, 62, 142 and 151 were measured for 40MHz bandwidth, channels 42, 58, 138 and 155 were measured for 80MHz bandwidth. The worst case Conducted Output Power level was 17.34 dBm (54.20 mW) for channels 64 for 802.11ac mode, 20MHz bandwidth; the worst case Conducted Output Power level was 17.66 dBm (58.34 mW) for channel 102 for 802.11ac mode, 40MHz bandwidth; the worst case Conducted Output Power level was 16.05 dBm (40.27 mW) for channel 138 for 802.11ac mode, 80MHz bandwidth
See APPENDIX 7 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 15.407 and RSS-210. Channels 36, 64, 140 and 149 were measured for 20MHz bandwidth, channels 38, 62, 142 and 151 were measured for 40MHz bandwidth, channels 42, 58, 138 and 155 were measured for 80MHz bandwidth.
See APPENDIX 7 for the test data.

d) Peak Power Spectral Density
The EUT met the requirements of peak power spectral density as per 47 CFR 15.407 and RSS-210. Channels 36, 64, 140 and 149 were measured for 20MHz bandwidth, channels 38, 62, 142 and 151 were measured for 40MHz bandwidth, channels 42, 58, 138 and 155 were measured for 80MHz bandwidth.
See APPENDIX 7 for the test data.

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e) Spurious RF Conducted Emissions

The EUT met the requirements of the spurious RF conducted emissions as per 47 CFR 15.407 and RSS-210. The frequency range measured was 30 MHz to 40 GHz. Channels 36, 64, 140 and 149 were measured for 20MHz bandwidth, channels 38, 62, 142 and 151 were measured for 40MHz bandwidth, and channels 42, 58, 138 and 155 were measured for 80MHz bandwidth.
See APPENDIX 7 for the test data.

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9) Near Field Communications (NFC)

The Near Field Communications emissions from the BlackBerry® smartphone were measured using the methods outlined in FCC CFR 47 Part 15, Subpart C.

a) Radiated Emissions
The BlackBerry® smartphone was measured in standalone configuration transmitting at 13.57 MHz. The system's radiated emission levels were compared with respect to the FCC CFR 47 Part 15 Subpart C, 15.209, 15.225(a) and RSS-210/RSS-GEN.
See APPENDIX 9 for the test data.

b) Occupied Bandwidth
The EUT met the requirements of the Occupied bandwidth as per 47 CFR 15 C and RSS-210. The EUT was measured in test mode with modulation on and transmitting at 13.56 MHz.
See APPENDIX 9 for the test data.

c) Frequency Stability
The EUT met the requirements of the Frequency Stability as per 47 CFR 15.225(e) and RSS-210. The EUT was measured in test mode with modulation on and transmitting at 13.56 MHz.
See APPENDIX 9 for the test data.

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G. Compliance Test Equipment Used

UNIT	MANUFACTURER	MODEL	SERIAL NUMBER	CAL DUE DATE (YY MM DD)	USE
EMI Test Receiver	Rohde & Schwarz	ESIB 40	100255	14-12-11	Conducted/Radiated Emissions
EMI Test Receiver	Rohde & Schwarz	ESU 40	100162	14-12-08	Conducted/Radiated Emissions
Hybrid Log Antenna	EMC Automation	HLP-3003C	017301	14-08-13	Radiated Emissions
Horn Antenna	CMT	3116	R52734-001	14-08-02	Radiated Emissions
Horn Antenna	ETS-Lindgren	3117	2538	15-08-07	Radiated Emissions
Active Loop Antenna	EMCO	6507	00032	15-08-21	Radiated Emissions
Preamplifier	Rohde & Schwarz	TS-ANA4-SP	001	14-10-13	Radiated Emissions
Preamplifier	Sonoma	310N/11909A	185831	14-10-10	Radiated Emissions
Preamplifier	Rohde & Schwarz	TS-ANA-SP	001	14-10-13	Radiated Emissions
L.I.S.N.	Rohde & Schwarz	ENV216	100060	15-10-08	Conducted Emissions
Environment Monitor	Omega	iTHX-SD	0380561	14-10-30	Radiated Emissions
EMC Analyzer	Agilent	E7405A	US40240226	15-01-23	Radiated Emissions
DC Power Supply	HP	6632B	US37472178	14-09-03	RF Conducted Emissions
Environment Monitor	Omega	iTHX-SD	0340060	16-09-11	RF Conducted Emissions
Environmental Chamber	Test Equity	107	0900246	N/R	Frequency Stability
Bluetooth Tester	Rohde & Schwarz	CBT	119549	14-11-28	RF Conducted Emissions
Bluetooth Tester	Rohde & Schwarz	CBT35	100368	14-11-28	Radiated Emissions
Bluetooth Tester	Rohde & Schwarz	CBT35	100370	14-11-28	Radiated Emissions
Power Meter	Agilent	N1911A	MY45100951	15-09-10	RF Conducted / Frequency Stability
Power Sensor	Agilent	N1921A	MY45241383	15-09-11	RF Conducted / Frequency Stability
Environment Monitor	Omega	iTHX-SD	0380567	14-10-30	Radiated Emissions

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APPENDIX 1 – AC POWER CONDUCTED EMISSIONS TEST DATA/PLOTS

AC Powerline Conducted Emission Test Results

The following tests were performed by Kevin Guo
Following tests were performed on the model RGY181LW.

Test Configuration 1

The BlackBerry® smartphone was tested on June 10, 2014

The environmental test conditions were: Temperature: 22.4 ºC
Relative Humidity: 38.0 %

Frequency (MHz)	Line	Reading (QP) (dBµV)	Correction Factor (dB)	Corrected Reading (QP) (dB)	Limit (QP) (dBµV)	Limit (AV) (dBµV)	Margin (QP) Limits (dB)
0.191	L1	35.30	10.92	46.22	64.00	54.00	-17.78
0.213	L1	32.37	10.77	43.14	63.10	53.10	-19.97
0.357	L1	26.84	10.08	36.92	58.80	48.80	-21.88
0.389	N	29.39	10.04	39.43	58.10	48.10	-18.67
0.528	N	31.43	9.90	41.34	56.00	46.00	-14.67
1.064	N	29.43	9.81	39.24	56.00	46.00	-16.77
1.271	L1	27.87	9.80	37.67	56.00	46.00	-18.33
1.599	L1	26.07	9.81	35.88	56.00	46.00	-20.12
1.856	N	25.61	9.82	35.43	56.00	46.00	-20.57
16.220	N	25.03	10.14	35.17	60.00	50.00	-24.83

All other emission levels were at least 25 dB below the limit.
Measurements were done with the quasi-peak detector.
See figure 1-1 and figure 1-2 for the measurement plot of the L1 and N lines of AC power line conducted emissions.

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AC Powerline Conducted Emissions Test Graphs

Test Configuration 1

Figure 1-1: L1 lines

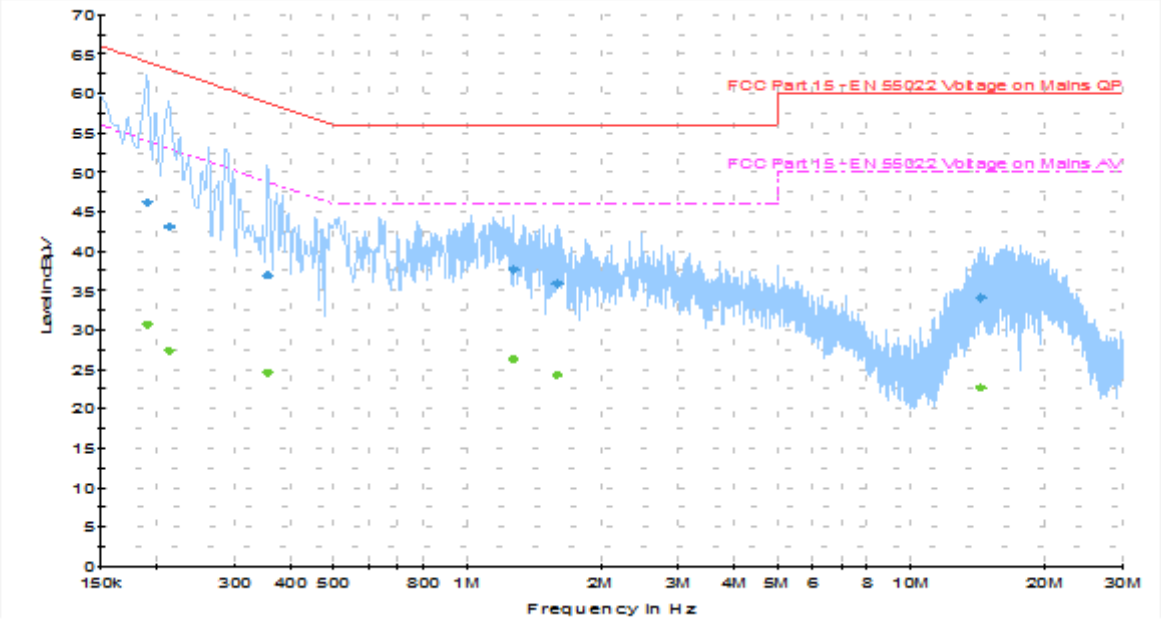
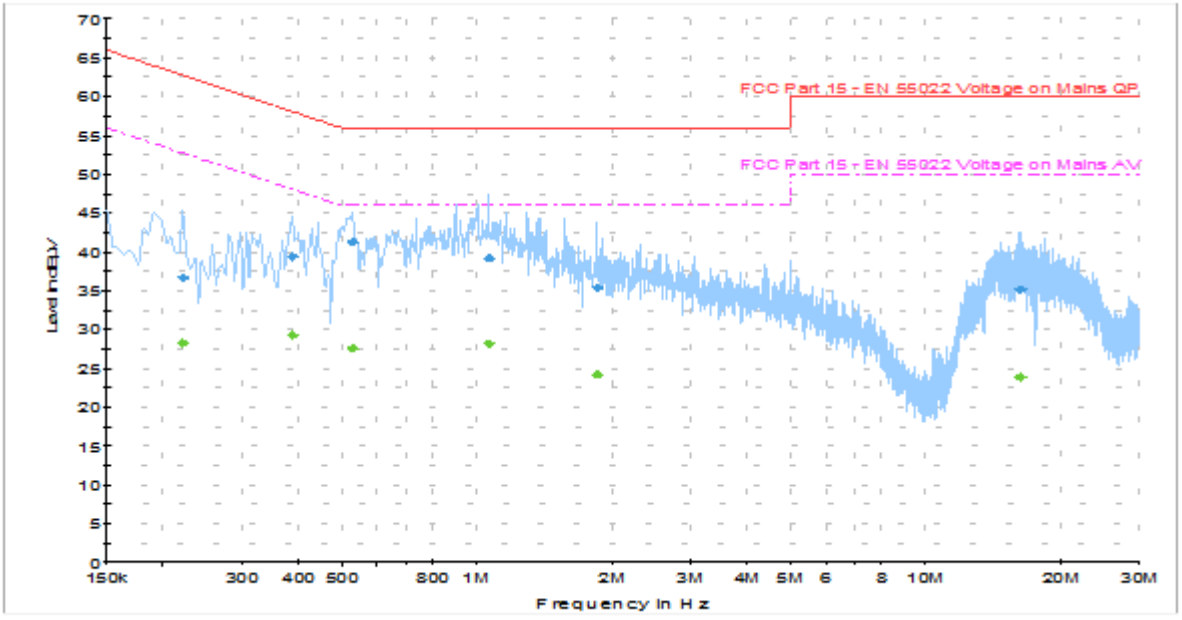


Figure 1-2: N Lines



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AC Powerline Conducted Emission Test Results cont'd

Test Configuration 2

The BlackBerry® smartphone was tested on June 10, 2014

The environmental test conditions were: Temperature: 22.4 ºC
Relative Humidity: 38.0 %

Frequency (MHz)	Line	Reading (QP) (dBµV)	Correction Factor (dB)	Corrected Reading (QP) (dB)	Limit (QP) (dBµV)	Limit (AV) (dBµV)	Margin (QP) Limits (dB)
0.159	N	39.21	11.17	50.38	65.50	55.50	-15.12
0.191	L1	37.45	10.92	48.38	64.00	54.00	-15.63
0.267	N	29.90	10.41	40.31	61.20	51.20	-20.89
0.483	L1	34.54	9.92	44.45	56.30	46.30	**-11.85**
0.564	N	25.40	9.88	35.28	56.00	46.00	-20.72
0.578	L1	27.93	9.87	37.79	56.00	46.00	-18.21
0.996	L1	30.33	9.80	40.14	56.00	46.00	-15.87
1.392	N	21.87	9.81	31.67	56.00	46.00	-24.33
2.139	L1	25.77	9.83	35.60	56.00	46.00	-20.40
14.834	L1	26.69	10.07	36.75	60.00	50.00	-23.25

All other emission levels were at least 25 dB below the limit.
Measurements were done with the quasi-peak detector
See figure 1-3 and figure 1-4 for the measurement plot of the L1 and N lines of AC power line conducted emissions.

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Figure 1-3: L1 lines

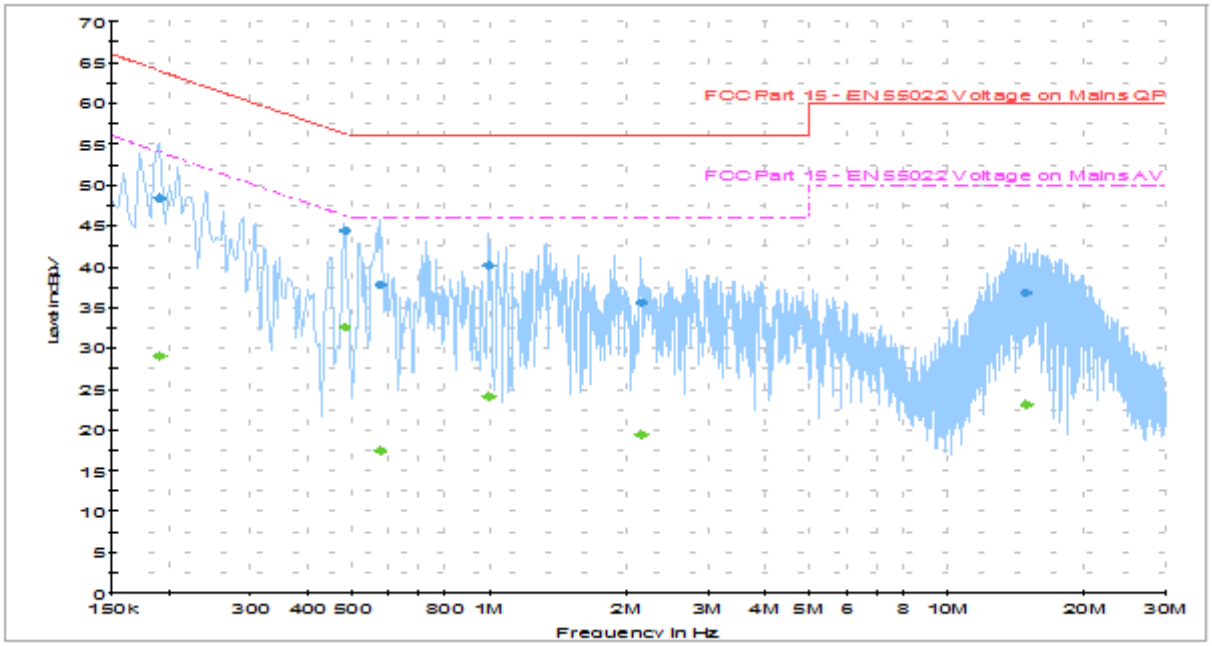
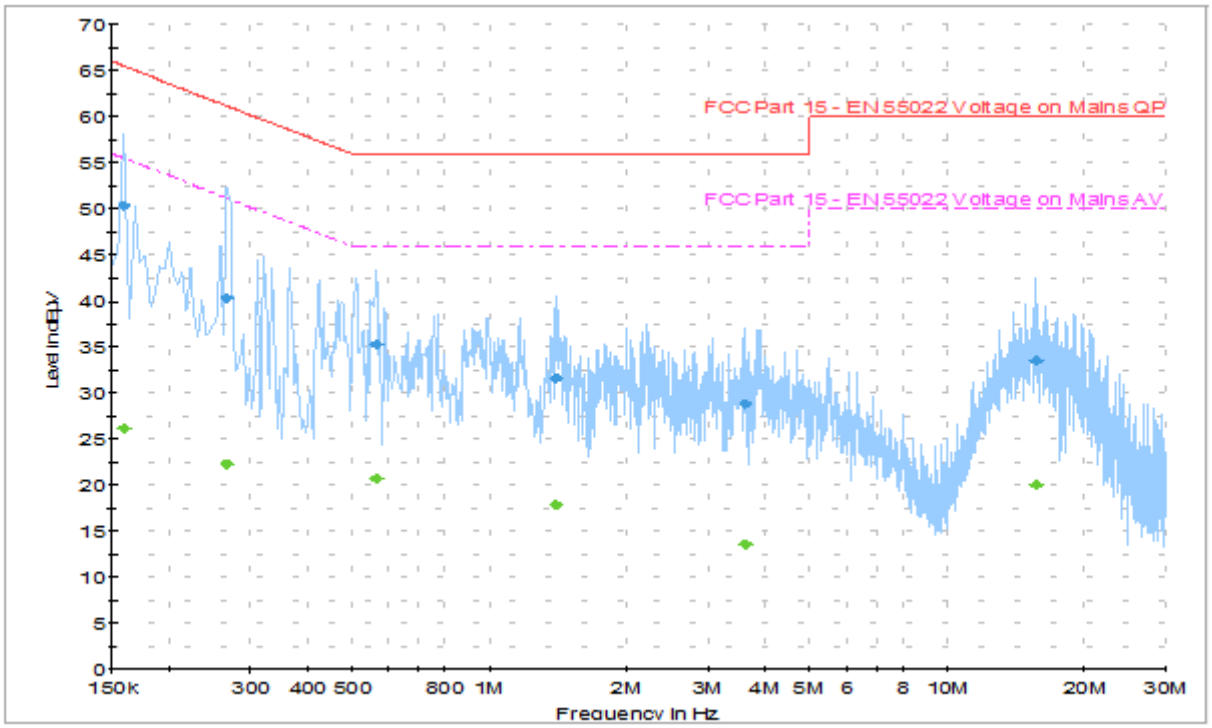


Figure 1-4: N Lines



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AC Powerline Conducted Emissions Test Results cont'd

Test Configuration 3

The BlackBerry® smartphone was tested on June 10, 2014

The environmental test conditions were: Temperature: 22.4 ºC
Relative Humidity: 38.0 %

Frequency (MHz)	Line	Reading (QP) (dBµV)	Correction Factor (dB)	Corrected Reading (QP) (dB)	Limit (QP) (dBµV)	Limit (AV) (dBµV)	Margin (QP) Limits (dB)
0.150	N	40.59	11.23	51.83	66.00	56.00	-14.17
0.159	L1	39.07	11.14	50.21	65.50	55.50	-15.29
0.182	N	38.42	11.01	49.43	64.40	54.40	-14.97
0.204	L1	35.84	10.83	46.67	63.40	53.40	-16.73
0.236	L1	33.08	10.61	43.69	62.30	52.30	-18.62
0.236	N	33.11	10.63	43.74	62.30	52.30	-18.56
0.290	N	30.98	10.25	41.22	60.50	50.50	-19.28
0.560	N	26.04	9.89	35.93	56.00	46.00	-20.07
1.136	L1	24.29	9.80	34.10	56.00	46.00	-21.91
14.105	N	26.13	10.08	36.21	60.00	50.00	-23.79

All other emission levels were at least 25 dB below the limit.
Measurements were done with the quasi-peak detectors
See figure 1-5 and 1-6 for the measurement plot of the L1 and N lines of AC power line conducted emissions.

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AC Powerline Conducted Emissions Test Graphs

Test Configuration 3

Figure 1-5: L1 Lines

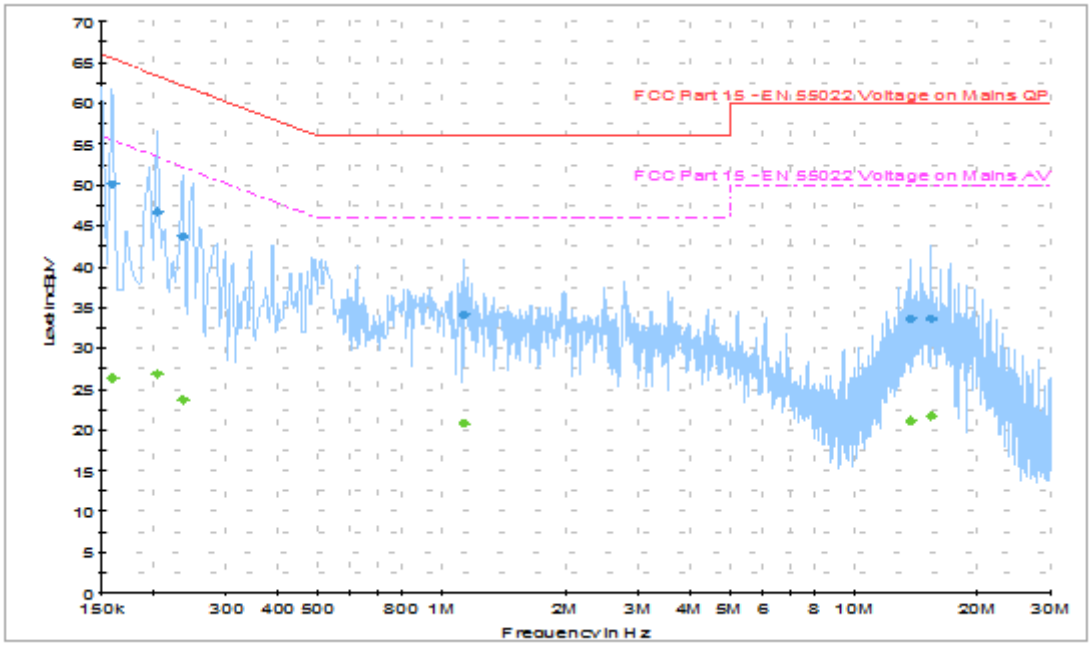
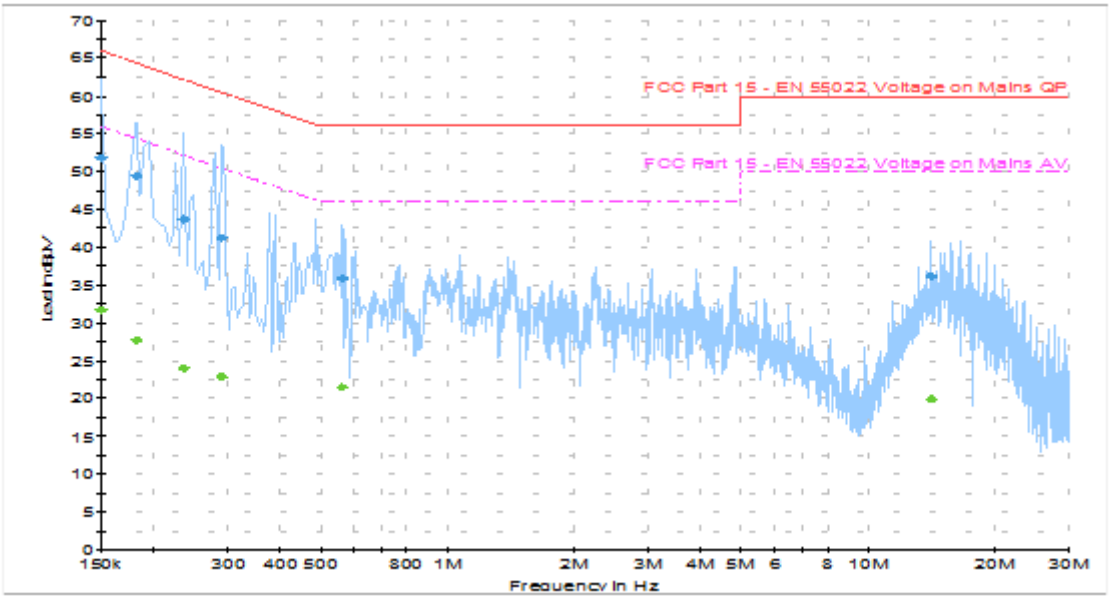


Figure 1-6: N Lines



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AC Powerline Conducted Emission Test Results cont'd

Test Configuration 4

The BlackBerry® smartphone was tested on June 10, 2014

The environmental test conditions were: Temperature: 22.4 ºC
Relative Humidity: 38.0 %

Frequency (MHz)	Line	Reading (QP) (dBµV)	Correction Factor (dB)	Corrected Reading (QP) (dB)	Limit (QP) (dBµV)	Limit (AV) (dBµV)	Margin (QP) Limits (dB)
0.155	L1	41.11	11.17	52.29	65.80	55.80	-13.51
0.159	N	40.31	11.17	51.48	65.50	55.50	-14.02
0.191	L1	38.08	10.92	49.00	64.00	54.00	-15.00
0.200	N	37.19	10.89	48.08	63.60	53.60	-15.52
0.240	L1	34.53	10.58	45.11	62.10	52.10	-17.00
0.299	N	29.97	10.18	40.16	60.30	50.30	-20.14
0.483	L1	30.87	9.92	40.79	56.30	46.30	-15.52
0.839	N	23.00	9.82	32.82	56.00	46.00	-23.18
1.721	N	21.25	9.82	31.06	56.00	46.00	-24.94

All other emission levels were at least 25 dB below the limit.
Measurements were done with the quasi-peak detectors.
See figure 1-7 and figure 1-8 for the measurement plot of the L1 and N lines of AC power line conducted emissions.

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AC Powerline Conducted Emissions Test Graphs

Test Configuration 4

Figure 1-7: L1 lines

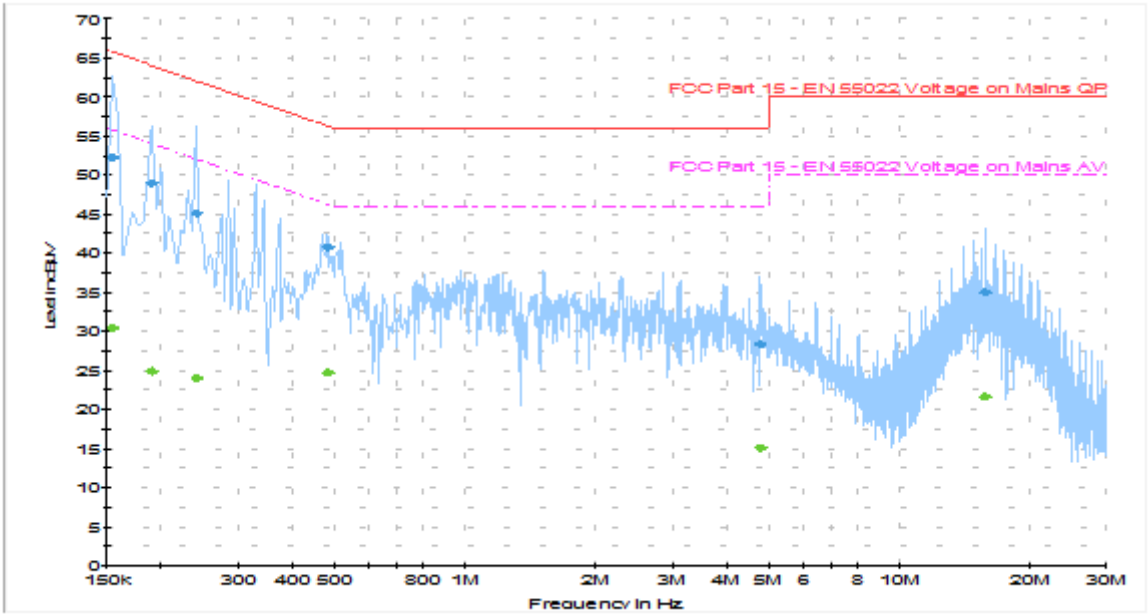
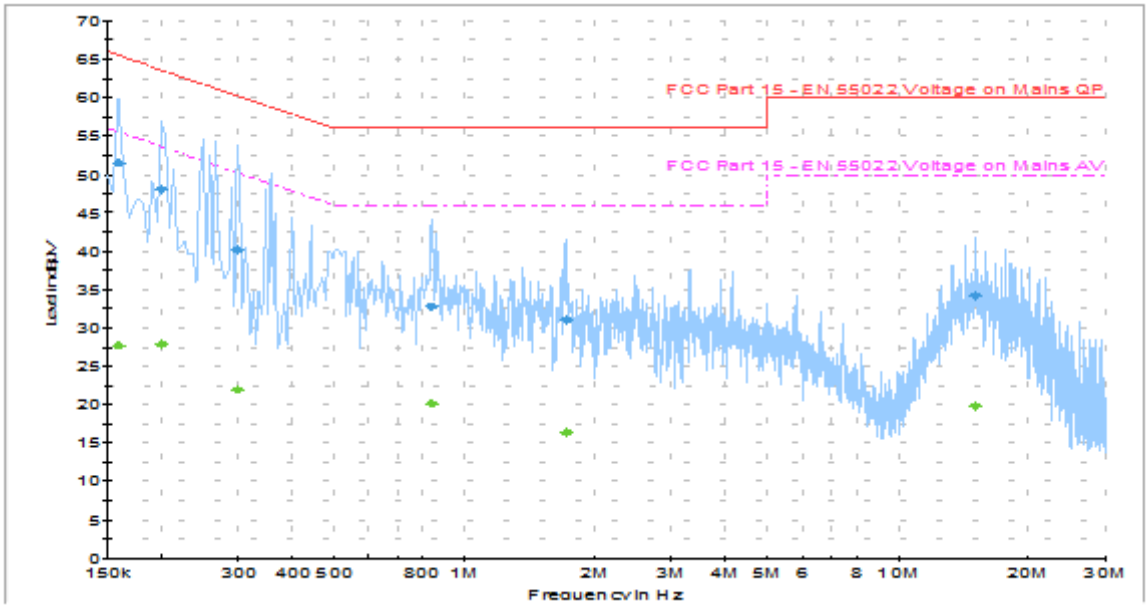


Figure 1-8: N Lines



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APPENDIX 2 – BLUETOOTH, BLUETOOTH LOW ENERGY AND 802.11b/g/n RADIATED EMISSIONS TEST DATA

Radiated Emissions Test Results
Bluetooth Band

Date of Test: April 24, 2014
Measurements were performed by Savtej Sandhu.

The environmental test conditions were: Temperature: 24.5ºC
Relative Humidity: 17.3 %

The test distance was 3.0 meters with a EUT height of 0.8 meters, and sweep frequency of 30 MHz to 1 GHz.

The BlackBerry® smartphone in Bluetooth TX mode was in horizontal position.

The frequency sweep measurements were performed in single frequency mode on channels 0, 39 and 78 using packet types "DH5", "2-DH5" and "3-DH5".

All emission levels were at least 25 dB below the limit.

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Radiated Emissions Test Results cont'd
Bluetooth Band cont'd

Date of Test: April 30, May 1 and 23, 2014
Measurements were performed by Kevin Guo

The environmental test conditions were: Temperature: 23ºC
Relative Humidity: 45 %

The test distance was 3.0 meters with a EUT height of 0.8 meters, and sweep frequency of 1GHz to 25GHz.

The BlackBerry® smartphone in Bluetooth TX mode was in horizontal down position.

The frequency sweep measurements were performed in single frequency mode on channels 0, 39 and 78 using packet types "DH5", "2-DH5" and "3-DH5".

All emission levels were at least 25 dB below the limit.

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Band-Edge Compliance of RF Radiated Emissions Test Results
Bluetooth Band

Date of test: April 30, 2014
Measurements were performed by Rex Zhang.

The environmental test conditions were: Temperature: 24.5 º C
Relative Humidity: 31.8 %

The BlackBerry® smartphone was in standalone, Vertical Up position and pattern type "Static PBRS" in "DH5", "2-DH5" and "3-DH5" modulation during the measurements.

The test distance was 3.0 meters.

Channel	Freq. (MHz)	Rx Antenna Type	Rx Antenna POL.	Detector	VBW	Corrected Reading (dBuV/m)	Delta Marker (dB)	Corrected Band edge (dBuV/m)	Limit (dBuV/m)	Diff. To Limit (dB)
Low Channel, Packet Type DH5										
0	2402	Horn	V	PK	1 MHz	98.89	55.98	42.91	74	-31.09
0	2402	Horn	H	PK	1 MHz	102.38	60.08	42.30	74	-31.70
0	2402	Horn	V	AVE.	10 Hz	96.10	55.98	40.12	54	-13.88
0	2402	Horn	H	AVE.	10 Hz	99.54	60.08	39.46	54	-14.54
High Channel, Packet Type DH5										
78	2480	Horn	V	PK	1 MHz	96.33	54.8	41.53	74	-32.47
78	2480	Horn	H	PK	1 MHz	101.3	58.93	42.37	74	-31.63
78	2480	Horn	V	AVE.	10 Hz	93.34	54.80	38.54	54	-15.46
78	2480	Horn	H	AVE.	10 Hz	98.31	58.93	39.38	54	-14.62
Low Channel, Packet Type 2-DH5										
0	2402	Horn	V	PK	1 MHz	97.35	53.01	44.34	74	-29.66
0	2402	Horn	H	PK	1 MHz	101.1	57.03	44.07	74	-29.93
0	2402	Horn	V	AVE.	10 Hz	92.11	53.01	39.10	54	-14.90
0	2402	Horn	H	AVE.	10 Hz	96.01	57.03	38.98	54	-15.02
High Channel, Packet Type 2-DH5										
78	2480	Horn	V	PK	1 MHz	94.17	49.67	44.50	74	-29.50
78	2480	Horn	H	PK	1 MHz	98.64	54.69	43.95	74	-30.05
78	2480	Horn	V	AVE.	10 Hz	88.49	49.67	38.82	54	-15.18
78	2480	Horn	H	AVE.	10 Hz	93.43	54.69	38.74	54	-15.26

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

Channel	Freq. (MHz)	Rx Antenna Type	Rx Antenna POL.	Detector	VBW	Corrected Reading (dBuV/m)	Delta Marker (dB)	Corrected Band edge (dBuV/m)	Limit (dBuV/m)	Diff. To Limit (dB)
Low Channel, Packet Type 3-DH5										
0	2402	Horn	V	PK	1 MHz	97.51	53.32	44.19	74	-29.81
0	2402	Horn	H	PK	1 MHz	101.38	57.75	43.63	74	-30.37
0	2402	Horn	V	AVE.	10 Hz	92.23	53.32	38.91	54	-15.09
0	2402	Horn	H	AVE.	10 Hz	95.91	57.75	38.16	54	-15.84
High Channel, Packet Type 3-DH5										
78	2480	Horn	V	PK	1 MHz	94.41	49.63	44.78	74	-29.22
78	2480	Horn	H	PK	1 MHz	99.52	53.96	45.56	74	-28.44
78	2480	Horn	V	AVE.	10 Hz	88.50	49.63	38.87	54	-15.13
78	2480	Horn	H	AVE.	10 Hz	93.29	53.96	39.33	54	-14.67

See figures 2-1 to 2-12 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. Emissions. Bluetooth, Single freq., Static PBRS, DH5, Channel 0, Pol: V, Detector: PK

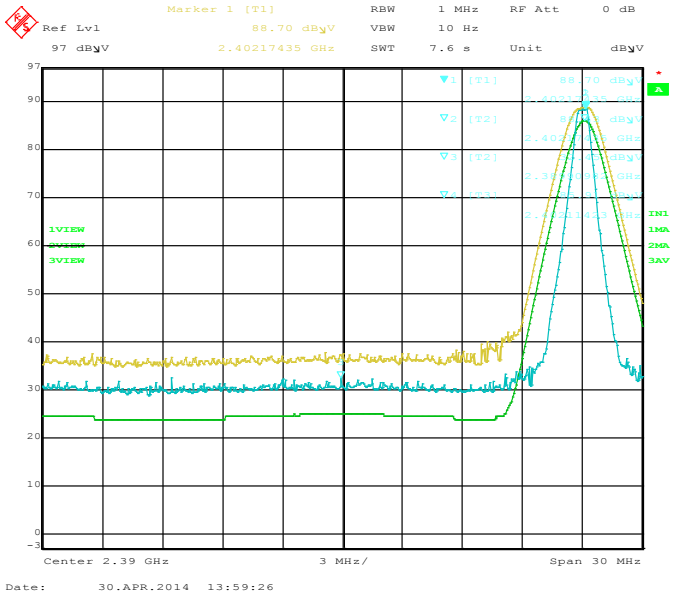


Figure 2-2: Band-Edge Compliance of RF Rad. Emissions. Bluetooth, Single freq., Static PBRS, DH5, Channel 0, Pol: H, Detector: PK

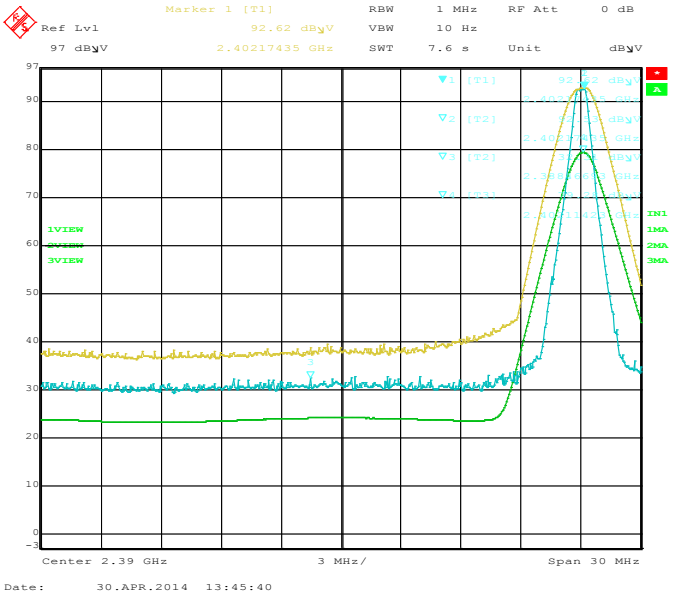


Figure 2-3: Band-Edge Compliance of RF Rad. Emissions. Bluetooth, Single freq., Static PBRS, DH5, Channel 78, Pol: V, Detector: PK

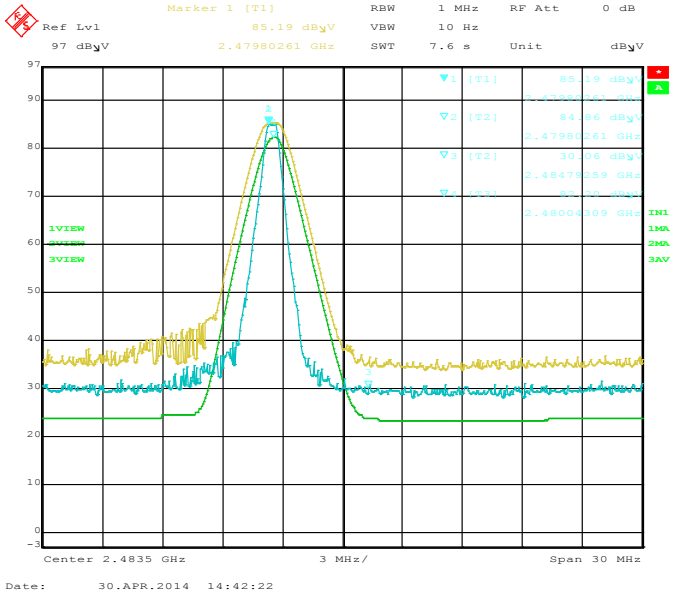
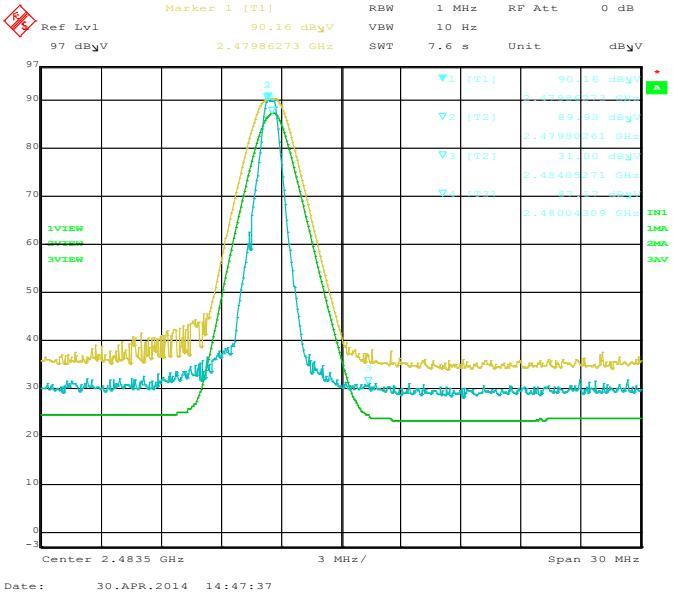


Figure 2-4: Band-Edge Compliance of RF Rad. Emissions Bluetooth, Single freq., Static PBRS, DH5, Channel 78, Pol: H, Detector: PK



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

Figure 2-5: Band-Edge Compliance of RF Rad. Emissions. Bluetooth, Single freq., Static PBRS, 2-DH5, Channel 0, Pol: V, Detector: PK

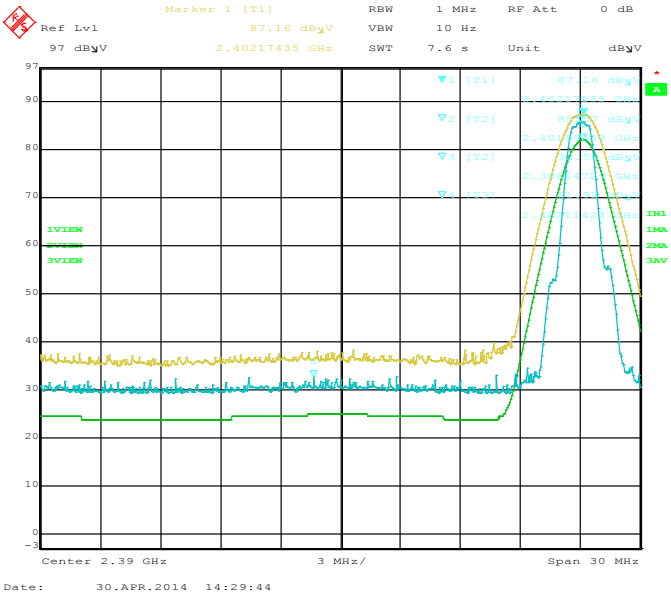


Figure 2-6: Band-Edge Compliance of RF Rad. Emissions. Bluetooth, Single freq., Static PBRS, 2-DH5, Channel 0, Pol: H, Detector: PK

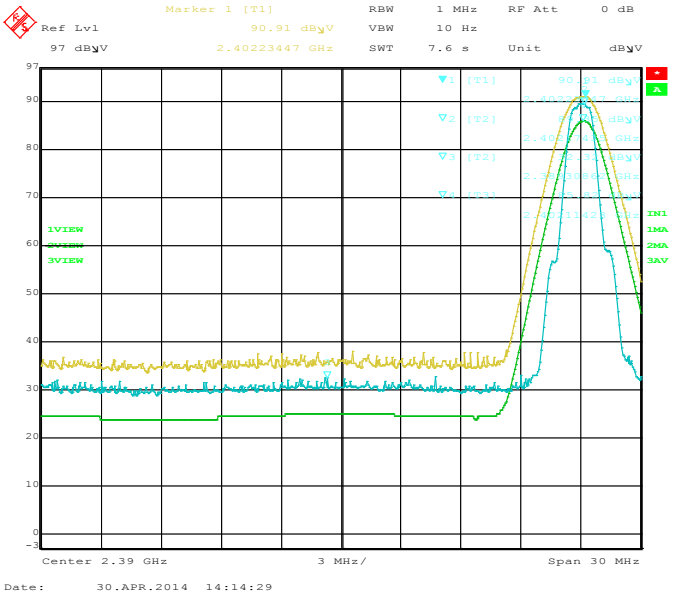


Figure 2-7: Band-Edge Compliance of RF Rad. Emissions. Bluetooth, Single freq., Static PBRS, 2-DH5, Channel 78, Pol: V, Detector: PK

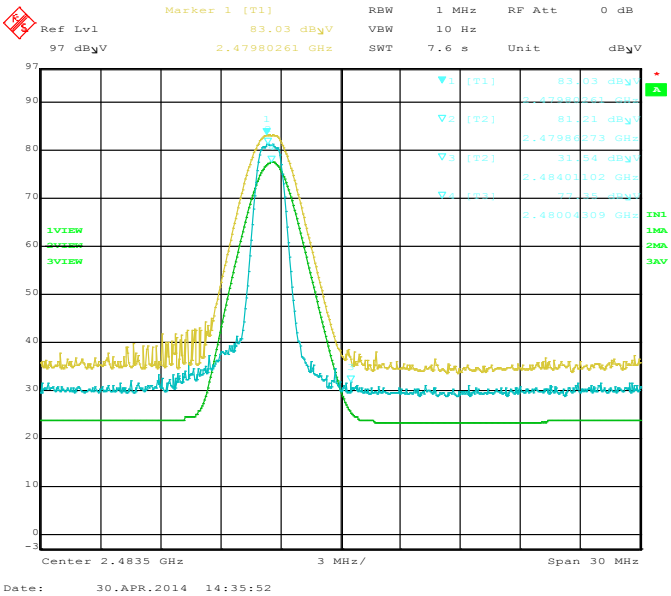
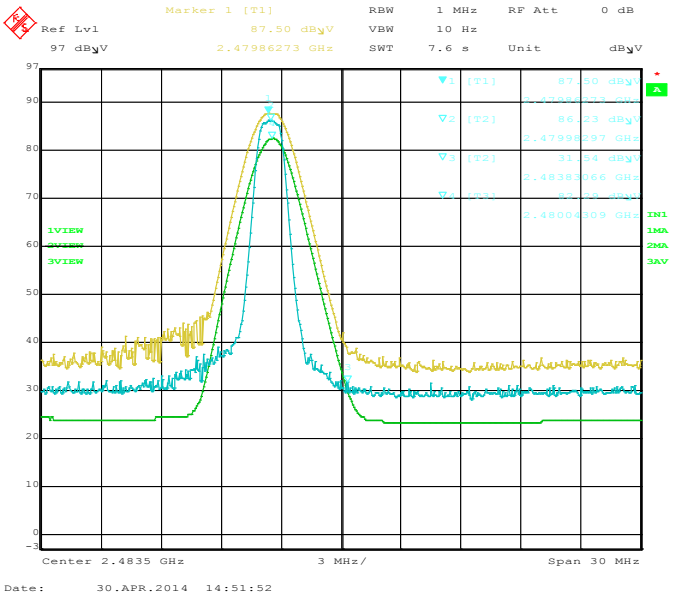


Figure 2-8: Band-Edge Compliance of RF Rad. Emissions. Bluetooth, Single freq., Static PBRS, 2-DH5, Channel 78, Pol: H, Detector: PK



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

Figure 2-9: Band-Edge Compliance of RF Rad. Emissions. Bluetooth, Single freq., Static PBRS, 3-DH5, Channel 0, Pol: V, Detector: PK

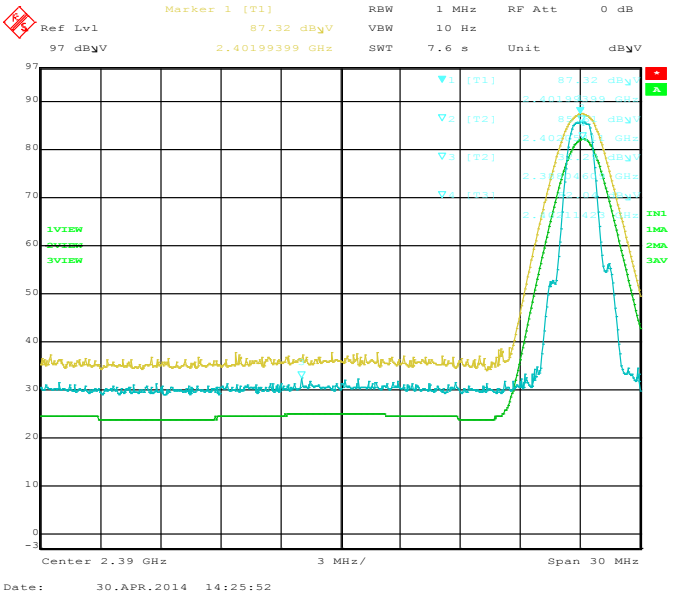


Figure 2-10: Band-Edge Compliance of RF Rad. Emissions. Bluetooth, Single freq., Static PBRS, 3-DH5, Channel 0, Pol: H, Detector: PK

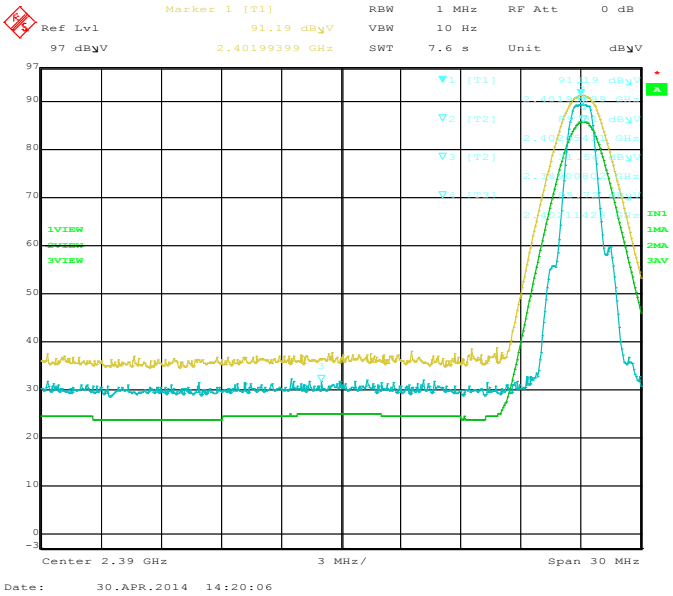


Figure 2-11: Band-Edge Compliance of RF Rad. Emissions. Bluetooth, Single freq., Static PBRS, 3-DH5, Channel 78, Pol: V, Detector: PK

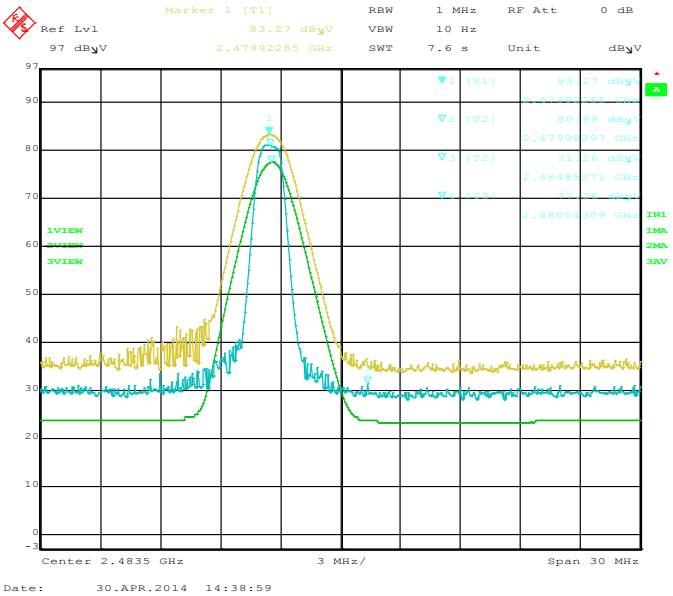
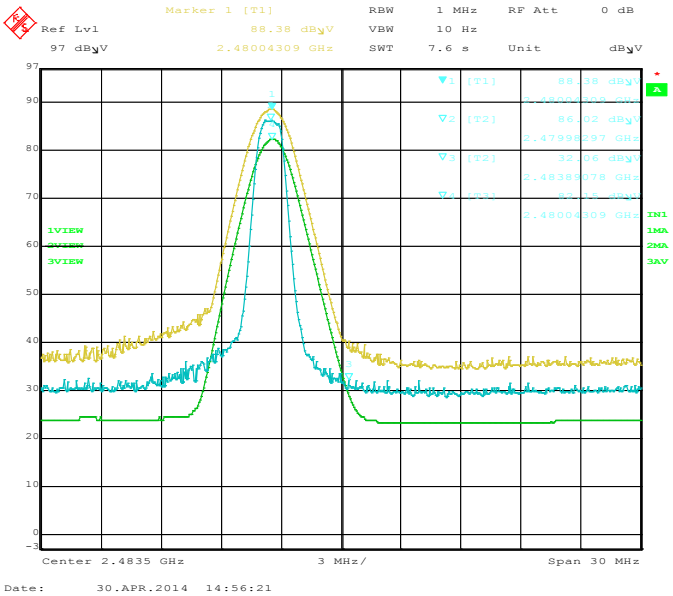


Figure 2-12: Band-Edge Compliance of RF Rad. Emissions. Bluetooth, Single freq., Static PBRS, 3-DH5, Channel 78, Pol: H, Detector: PK



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Radiated Emissions Test Results cont'd
Bluetooth Low Energy Band

Date of Test: May 27, 2014
Measurements were performed by Rex Zhang.

The environmental test conditions were: Temperature: 24.1 ºC
Relative Humidity: 38.8 %

The test distance was 3.0 meters with a EUT height of 0.8 meters, and sweep frequency of 30 MHz to 1 GHz.

The BlackBerry® smartphone in Bluetooth Low Energy TX mode was in horizontal position.

The frequency sweep measurements were performed in single frequency mode on channels 0, 20 and 39.

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

Date of Test: May 21 and 23, 2014
Measurements were performed by Kevin Guo.

The environmental test conditions were: Temperature: 23ºC
Relative Humidity: 45%

The test distance was 3.0 meters with a EUT height of 0.8 meters, and sweep frequency of 1GHz to 25GHz.

The BlackBerry® smartphone in Bluetooth Low Energy TX mode was in horizontal down position.

The frequency sweep measurements were performed in single frequency mode on channels 0, 20 and 39.

All other emission levels were at least 25 dB below the limit.

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Band-Edge Compliance of RF Radiated Emissions Test Results
Bluetooth Low Energy Band

Date of test: April 30, 2014
Measurements were performed by Rex Zhang.

The environmental test conditions were: Temperature: 24.5º C
Relative Humidity: 31.8 %

The BlackBerry® smartphone was in Vertical Up position.

The test distance was 3.0 meters.

Channel	Freq. (MHz)	Rx Antenna Type	Rx Antenna POL.	Detector	VBW	Corrected Reading (dBuV/m)	Delta Marker (dB)	Corrected Band edge (dBuV/m)	Limit (dBuV/m)	Diff. To Limit (dB)
Low Channel, LE										
0	2402	Horn	V	PK	1 MHz	98.27	56.46	41.81	74	-32.19
0	2402	Horn	H	PK	1 MHz	103.06	61.15	41.91	74	-32.09
0	2402	Horn	V	AVE.	10 Hz	93.40	56.46	36.94	54	-17.06
0	2402	Horn	H	AVE.	10 Hz	98.32	61.15	37.17	54	-16.83
High Channel, LE										
39	2480	Horn	V	PK	1 MHz	95.14	52.88	42.26	74	-31.74
39	2480	Horn	H	PK	1 MHz	99.62	56.42	43.20	74	-30.80
39	2480	Horn	V	AVE.	10 Hz	90.28	52.88	37.40	54	-16.60
39	2480	Horn	H	AVE.	10 Hz	94.80	56.42	38.38	54	-15.62

See figures 2-13 to 2-16 for the plots of the Bluetooth Low Energy band-edge compliance.

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

Figure 2-13: Band-Edge Compliance of RF Rad. Emissions. Bluetooth Low Energy, Single freq., LE, Channel 0, Pol: V, Detector: PK

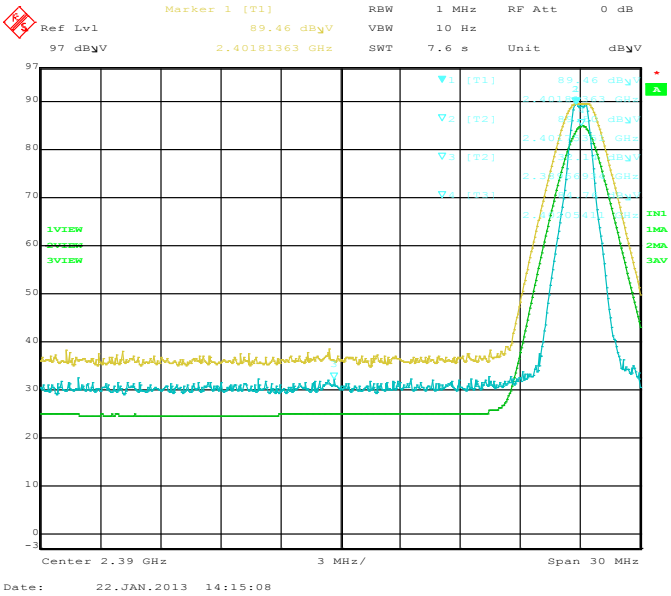


Figure 2-14: Band-Edge Compliance of RF Rad. Emissions. Bluetooth Low Energy, Single freq., LE, Channel 0, Pol: H, Detector: PK

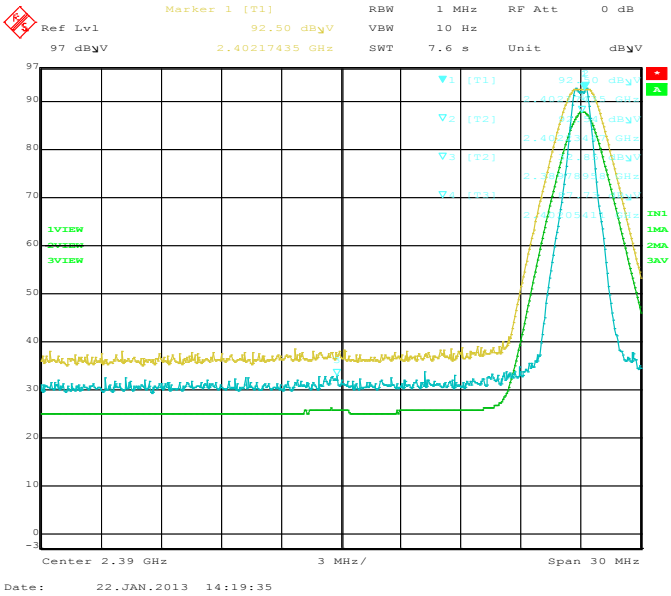


Figure 2-15: Band-Edge Compliance of RF Rad. Emissions. Bluetooth Low Energy, Single freq., LE, Channel 39, Pol: V, Detector: PK

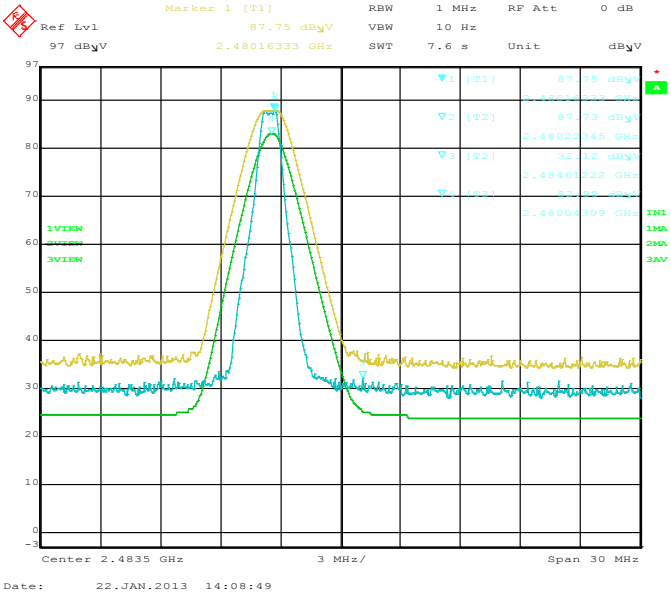
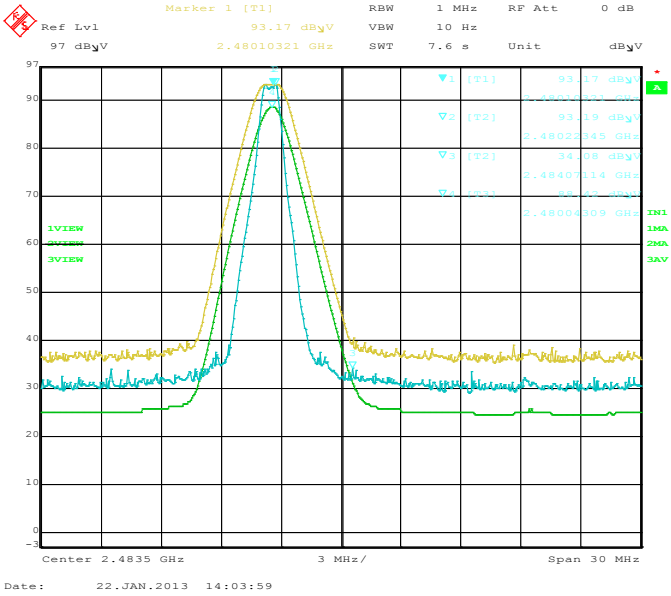


Figure 2-16: Band-Edge Compliance of RF Rad. Emissions Bluetooth Low Energy, Single freq., LE, Channel 39, Pol: H, Detector: PK



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Radiated Emissions Test Results cont'd
802.11b/g/n Band

Date of Test: May 5, 2014
Measurements performed by Savtej Sandhu.

The environmental test conditions were: Temperature: 23.8 ºC
Relative Humidity: 26%

The test distance was 3.0 meters with a EUT height of 0.8 meters, and sweep frequency of 30 MHz to 1 GHz.

The BlackBerry® smartphone was in USB Vertical Up position.

The frequency sweep measurements were performed in 802.11b TX mode at 1 Mbps on channels 1, 6 and 11, in 802.11g TX mode at 6 Mbps on channels 1, 6 and 11, and in 802.11n TX mode at MCS 0 on channels 1, 6 and 11.

All other emission levels were at least 25 dB below the limit.

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Date of Test: May 12, 14 and 23, 2014
Measurements performed by Kevin Guo.

The environmental test conditions were: Temperature: 24 ºC
Relative Humidity: 43 %

The test distance was 3.0 meters with a EUT height of 0.8 meters, and sweep frequency of 1GHz to 25GHz.

The BlackBerry® smartphone was in horizontal position.

The frequency sweep measurements were performed in 802.11b TX mode at 1 Mbps on channels 1, 6 and 11, in 802.11g TX mode at 6 Mbps on channels 1, 6 and 11, and in 802.11n TX mode at MCS 0 on channels 1, 6 and 11.

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

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

Date of Tests: May 5, 2014
Measurements performed by Savtej Sandhu.

The environmental test conditions were: Temperature: 23.8 ºC
Relative Humidity: 26.9 %

802.11b Band

The measurements were performed on BlackBerry® smartphone in standalone, Vertical Up configuration on channels 1 and 11 for 802.11b mode at 1 Mbps.

The test distance was 3 meters.

Channel	Freq.	Rx Antenna		Detector	VBW For Peak	Peak Corrected Reading	Delta Marker	Corrected Band edge	Limit	Diff. To Limit
	(MHz)	Type	POL.	(MHz)	(dBuV/m)	(dBuV/m)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
1.0	2412.00	Horn	V	PK	1 MHz	104.39	57.01	47.38	74.00	-26.62
1.0	2412.00	Horn	H	PK	1 MHz	109.08	57.26	51.82	74.00	-22.18
1.0	2412.00	Horn	V	AV	10 Hz	101.14	64.91	36.23	54.00	-17.77
1.0	2412.00	Horn	H	AV	10 Hz	105.86	67.33	38.53	54.00	-15.47

Channel	Freq.	Rx Antenna		Detector	VBW For Peak	Peak Corrected Reading	Delta Marker	Corrected Band edge	Limit	Diff. To Limit
	(MHz)	Type	POL.	(MHz)	(dBuV/m)	(dBuV/m)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
11.0	2462.00	Horn	V	PK	1 MHz	102.56	50.91	51.65	74.00	-22.35
11.0	2462.00	Horn	H	PK	1 MHz	108.31	49.94	58.37	74.00	-15.63
11.0	2462.00	Horn	V	AV	10 Hz	99.16	57.04	42.12	54.00	-11.88
11.0	2462.00	Horn	H	AV	10 Hz	104.90	57.22	47.68	54.00	-6.32

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802.11g Band

The measurements were performed on the BlackBerry® smartphone in standalone, Vertical up configuration on channels 1 and 11 for 802.11g mode at 6 Mbps.

The test distance was 3 meters.

Channel	Freq.	Rx Antenna		Detector	VBW For Peak	Peak Corrected Reading	Delta Marker	Corrected Band edge	Limit	Diff. To Limit
	(MHz)	Type	POL.	(MHz)	(dBuV/m)	(dBuV/m)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
1.0	2412.00	Horn	V	PK	1 MHz	104.85	55.06	49.79	74.00	-24.21
1.0	2412.00	Horn	H	PK	1 MHz	109.57	56.38	53.19	74.00	-20.81
1.0	2412.00	Horn	V	AV	10 Hz	95.94	58.74	37.20	54.00	-16.80
1.0	2412.00	Horn	H	AV	10 Hz	100.59	60.90	39.69	54.00	-14.31

Channel	Freq.	Rx Antenna		Detector	VBW For Peak	Peak Corrected Reading	Delta Marker	Corrected Band edge	Limit	Diff. To Limit
	(MHz)	Type	POL.	(MHz)	(dBuV/m)	(dBuV/m)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
11.0	2462.00	Horn	V	PK	1 MHz	104.06	40.30	63.76	74.00	-10.24
11.0	2462.00	Horn	H	PK	1 MHz	109.20	42.50	66.70	74.00	-7.30
11.0	2462.00	Horn	V	AV	10 Hz	95.49	44.85	50.64	54.00	-3.36
11.0	2462.00	Horn	H	AV	10 Hz	100.45	48.63	51.82	54.00	-2.18

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802.11n Band

The measurements were performed on the BlackBerry® smartphone in standalone, Vertical up configuration on channels 1 and 11 for 802.11n mode at MCS 0.

The test distance was 3 meters.

Channel	Freq.	Rx Antenna		Detector	VBW For Peak	Peak Corrected Reading	Delta Marker	Corrected Band edge	Limit	Diff. To Limit
	(MHz)	Type	POL.	(MHz)	(dBuV/m)	(dBuV/m)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
1.0	2412.00	Horn	V	PK	1 MHz	103.16	56.09	47.07	74.00	-26.93
1.0	2412.00	Horn	H	PK	1 MHz	108.02	57.06	50.96	74.00	-23.04
1.0	2412.00	Horn	V	AV	10 Hz	94.43	58.72	35.71	54.00	-18.29
1.0	2412.00	Horn	H	AV	10 Hz	99.01	60.48	38.53	54.00	-15.47

Channel	Freq.	Rx Antenna		Detector	VBW For Peak	Peak Corrected Reading	Delta Marker	Corrected Band edge	Limit	Diff. To Limit
	(MHz)	Type	POL.	(MHz)	(dBuV/m)	(dBuV/m)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
11.0	2462.00	Horn	V	PK	1 MHz	103.24	42.08	61.16	74.00	-12.84
11.0	2462.00	Horn	H	PK	1 MHz	109.12	41.89	67.23	74.00	-6.77
11.0	2462.00	Horn	V	AV	10 Hz	94.30	47.24	47.06	54.00	-6.94
11.0	2462.00	Horn	H	AV	10 Hz	99.78	46.84	52.94	54.00	-1.06

See figures 2-17 to 2-20 for the plots of the 802.11b band-edge compliance.
See figures 2-21 to 2-24 for the plots of the 802.11g band-edge compliance.
See figures 2-25 to 2-28 for the plots of the 802.11n band-edge compliance.

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

Figure 2-17: Band-Edge Compliance of RF Radiated Emission 802.11b, Channel 1, 2412 MHz, Max Pol: V, Detector: PK

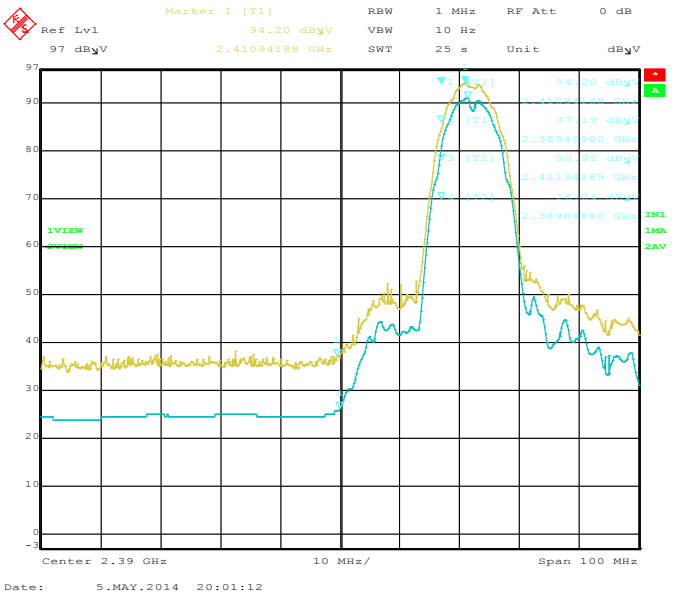

Figure 2-18: Band-Edge Compliance of RF Radiated Emission 802.11b, Channel 1, 2412 MHz, Max Pol: H, Detector: PK

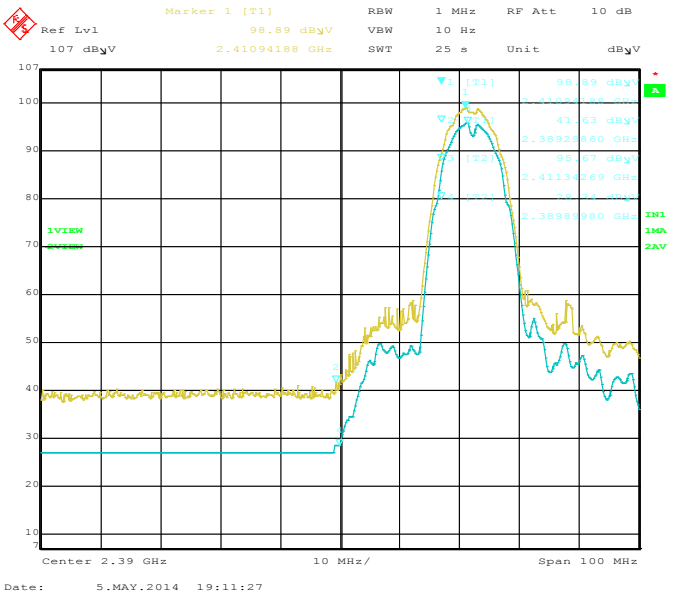

Figure 2-19: Band-Edge Compliance of RF Radiated Emission 802.11b, Channel 11, 2462 MHz, Max Pol: V, Detector: PK

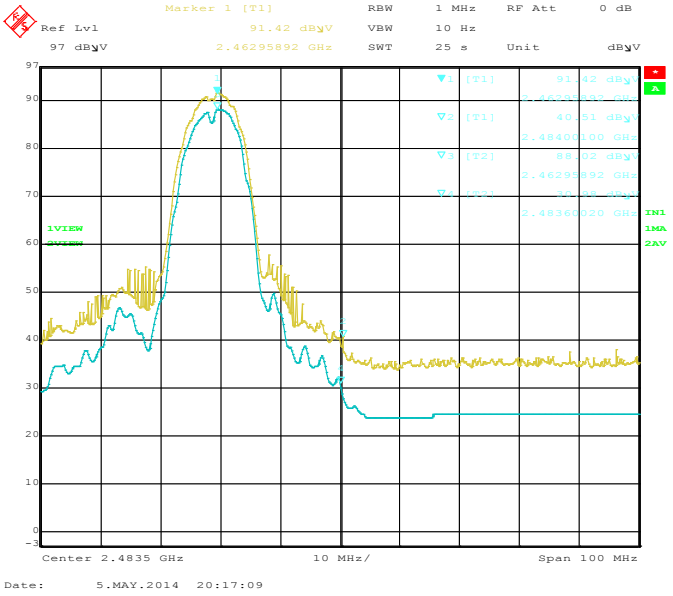

Figure 2-20: Band-Edge Compliance of RF Radiated Emission 802.11b, Channel 11, 2462 MHz, Max Pol: H, Detector: PK

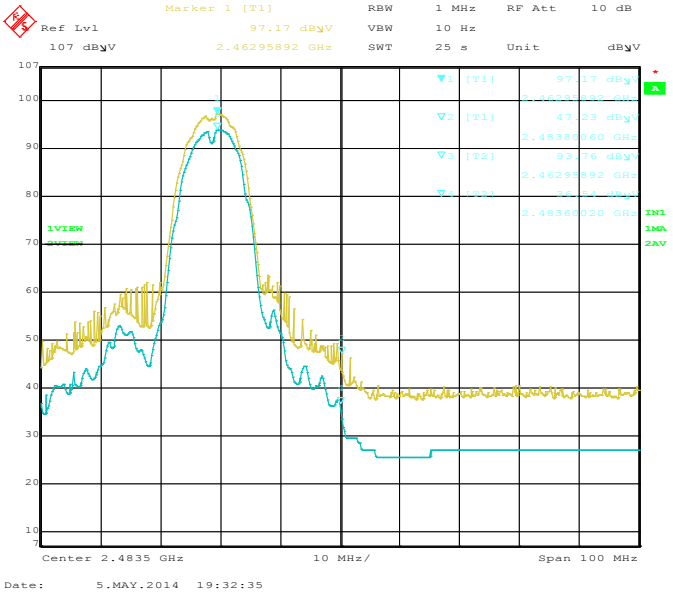

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Figure 2-21: Band-Edge Compliance of RF Radiated Emission 802.11g, Channel 1, 2412 MHz, Max Pol: V, Detector: PK

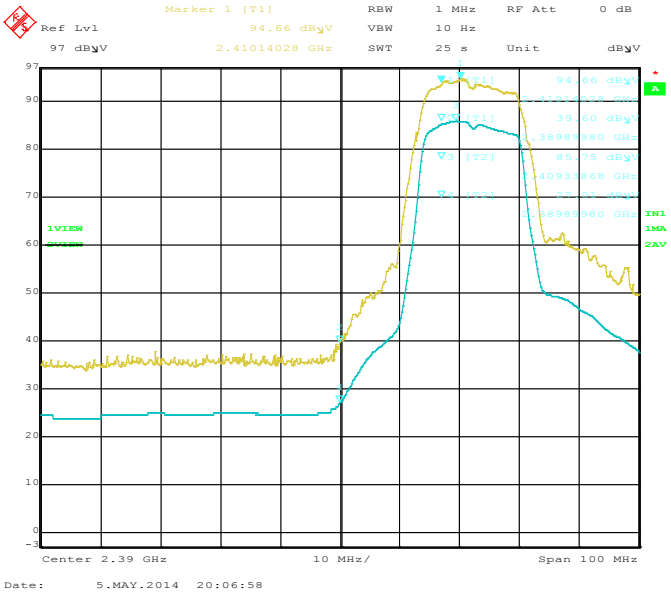

Figure 2-22: Band-Edge Compliance of RF Radiated Emission 802.11g, Channel 1, 2412 MHz, Max Pol: H, Detector: PK

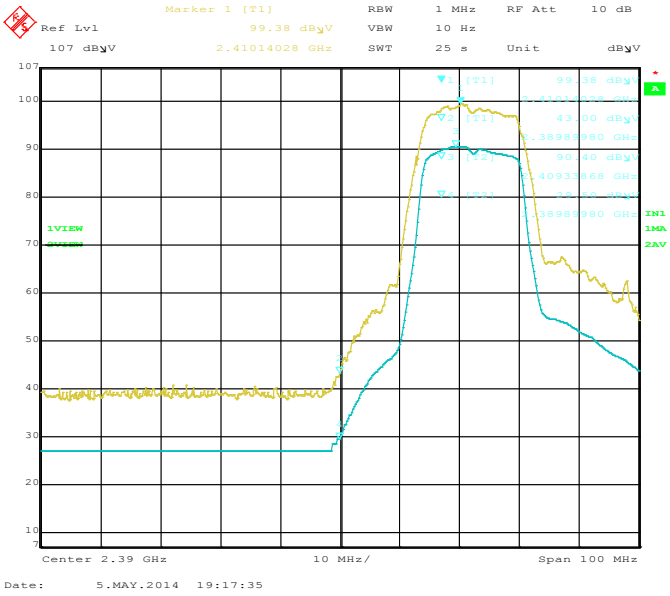

Figure 2-23: Band-Edge Compliance of RF Radiated Emission 802.11g, Channel 11, 2462 MHz, Max Pol: V, Detector: PK

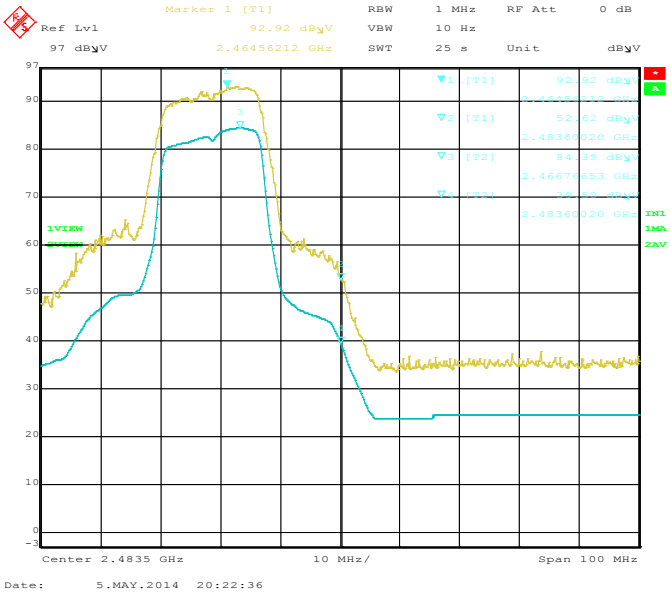

Figure 2-24: Band-Edge Compliance of RF Radiated Emission 802.11g, Channel 11, 2462 MHz, Max Pol: H, Detector: PK

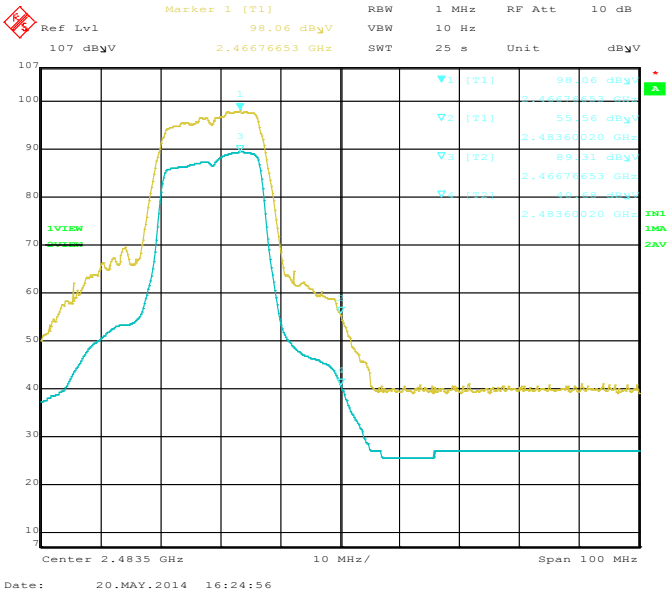

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Figure 2-25: Band-Edge Compliance of RF Radiated Emission 802.11n, Channel 1, 2412 MHz, Max Pol: V, Detector: PK

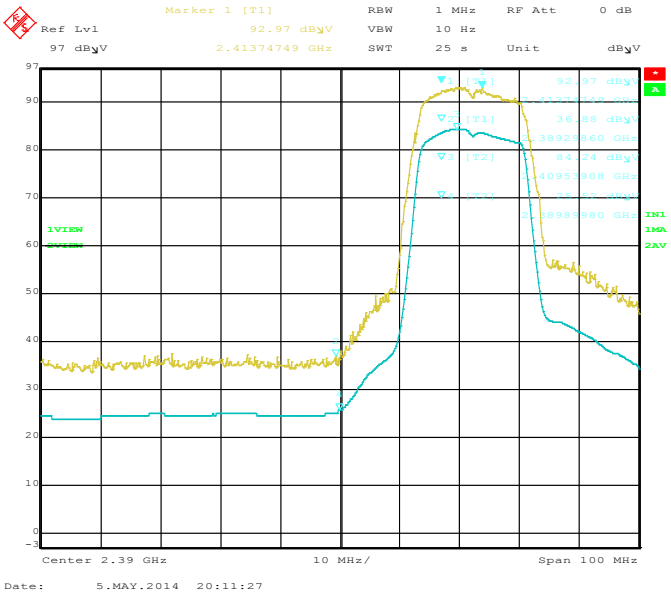


Figure 2-26: Band-Edge Compliance of RF Radiated Emission 802.11n, Channel 1, 2412 MHz, Max Pol: H, Detector: PK

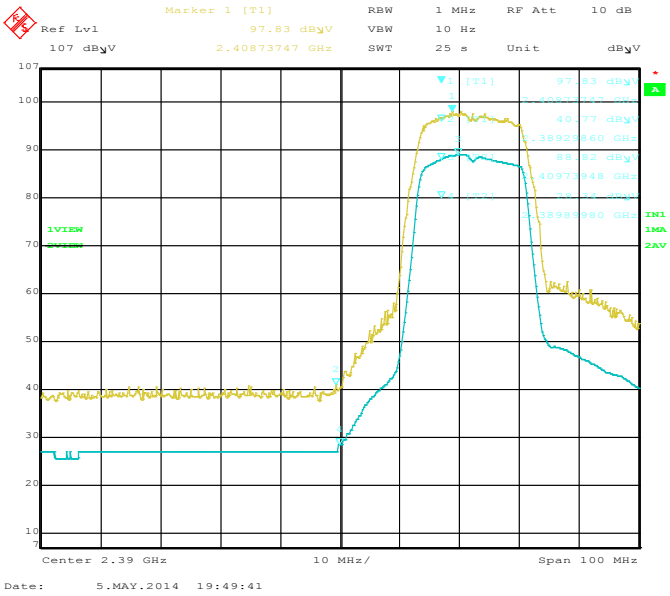


Figure 2-27: Band-Edge Compliance of RF Radiated Emission 802.11n, Channel 11, 2462 MHz, Max Pol: V, Detector: PK

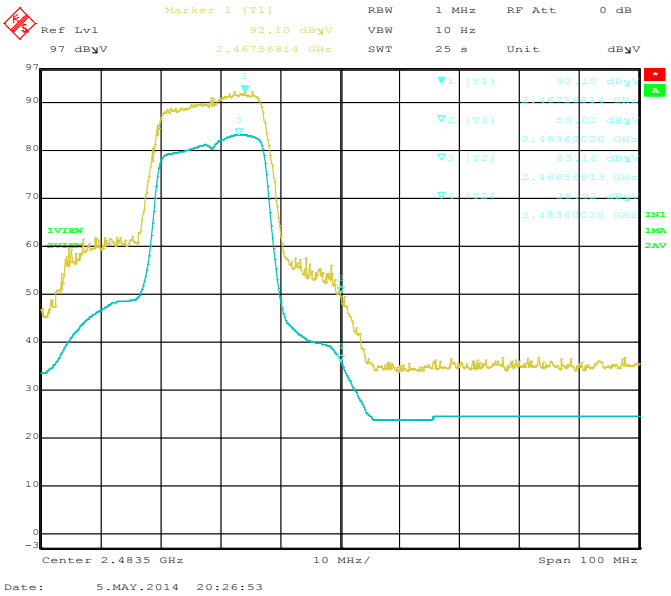
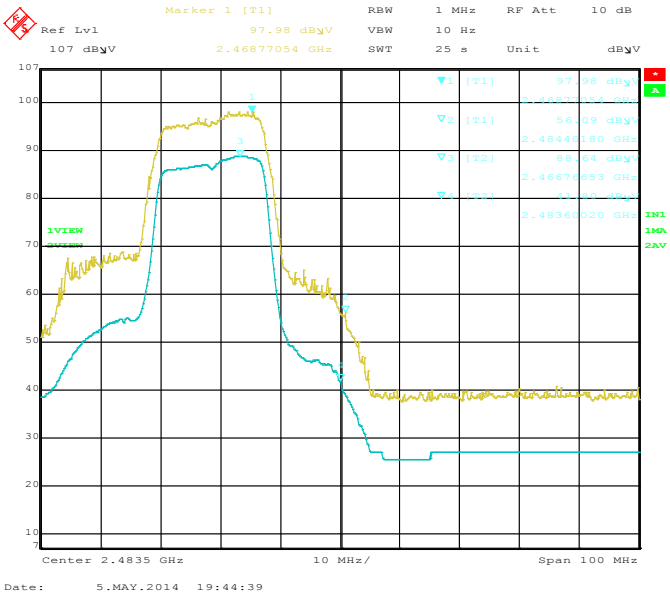


Figure 2-28: Band-Edge Compliance of RF Radiated Emission 802.11n, Channel 11, 2462 MHz, Max Pol: H, Detector: PK



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APPENDIX 3 – 802.11a/n RADIATED EMISSIONS TEST DATA

Radiated Emissions Test Results
802.11a Band

Date of Test: May 26, 2014
Measurements were performed by Savtej Sandhu

The environmental test conditions were: Temperature: 27.9 ºC
Relative Humidity: 29.8 %

The test distance was 3.0 meters with a EUT height of 0.8 meters, and sweep frequency of 30 MHz to 1 GHz.

The BlackBerry® smartphone was in Vertical Down position.

The frequency sweep measurements were performed in 802.11a TX mode at 6 Mbps on channels 36, 48, 64, 100, 140 and 165.

All emission levels were at least 25 dB below the limit.

Radiated Emissions Test Results
802.11a Band

Date of Test: May 12, 2014 to June 4, 2014
Measurements were performed by Masud Attayi and Kevin Guo.

The environmental test conditions were: Temperature: 24ºC
Relative Humidity: 43 %

The test distance was 3.0 meters with a EUT height of 0.8 meters, and sweep frequency of 1GHz to 40GHz.

The BlackBerry® smartphone was in Volume Key Up position.

The frequency sweep measurements were performed in 802.11a TX mode at 6 Mbps on channels 36, 48, 64, 100, 140 and 165.

All other emission levels were at least 25 dB below the limit.

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Radiated Emissions Test Results cont'd
802.11n Band

Date of Test: May 26, 2014
Measurements were performed by Savtej Sandhu

The environmental test conditions were: Temperature: 27.9 ºC
Relative Humidity: 29.8 %

The test distance was 3.0 meters with a EUT height of 0.8 meters, and sweep frequency of 30 MHz to 1 GHz.

The BlackBerry® smartphone was in Vertical Down position.

The frequency sweep measurements were performed in 802.11n TX mode at MCS 0 on channels 36, 64 and 165.

All emission levels were at least 25 dB below the limit.

Radiated Emissions Test Results cont'd
802.11n Band

Date of Test: May 12, 2014 to June 4, 2014
Measurements were performed by Masud Attayi and Kevin Guo.

The environmental test conditions were: Temperature: 24ºC
Relative Humidity: 43 %

The test distance was 3.0 meters with a EUT height of 0.8 meters, and sweep frequency of 1GHz to 40GHz.

The BlackBerry® smartphone was in Volume Key Up.

The frequency sweep measurements were performed in 802.11n TX mode at MCS 0 on channels 36, 48, 64, 100, 140 and 165.
All emission levels were at least 25 dB below the limit.

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802.11a Band-Edge Compliance of RF Radiated Emissions

Date of Tests: May 6, 2014 to May 26, 2014
Measurements performed by Savtej Sandhu.

The environmental test conditions were: Temperature: 24.5 ºC
Relative Humidity: 26.9 %
The measurements were performed on BlackBerry® smartphone in standalone, Vertical Down configuration on channels 36, 64, 100, 140 for 802.11a mode at 6 Mbps.

The test distance was performed at a distance of 3 meters.

Centre at Band-Edge: 5150 MHz

Channel	Freq.	Rx Antenna		Detector	VBW For Peak	Peak Corrected Reading	Delta Marker	Corrected Band edge	Limit	Diff. To Limit
	(MHz)	Type	POL.	(MHz)	(dBuV/m)	(dBuV/m)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
36.0	5180.00	Horn	V	PK	1 MHz	107.49	44.32	63.17	74.00	-10.83
36.0	5180.00	Horn	H	PK	1 MHz	109.65	43.34	66.31	74.00	-7.69
36.0	5180.00	Horn	V	AV	10 Hz	98.30	50.00	48.30	54.00	-5.70
36.0	5180.00	Horn	H	AV	10 Hz	100.59	51.73	48.86	54.00	-5.14

Centre at Band-Edge: 5350 MHz

Channel	Freq.	Rx Antenna		Detector	VBW For Peak	Peak Corrected Reading	Delta Marker	Corrected Band edge	Limit	Diff. To Limit
	(MHz)	Type	POL.	(MHz)	(dBuV/m)	(dBuV/m)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
64.0	5320.00	Horn	V	PK	1 MHz	105.71	41.58	64.13	74.00	-9.87
64.0	5320.00	Horn	H	PK	1 MHz	112.69	42.05	70.64	74.00	-3.36
64.0	5320.00	Horn	V	AV	10 Hz	96.53	47.08	49.45	54.00	-4.55
64.0	5320.00	Horn	H	AV	10 Hz	103.55	50.95	52.60	54.00	-1.40

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802.11a Band-Edge Compliance of RF Radiated Emissions cont'd

Centre at Band-Edge: 5470 MHz

Channel	Freq.	Rx Antenna		Detector	VBW For Peak	Peak Corrected Reading	Delta Marker	Corrected Band edge	Limit	Diff. To Limit
	(MHz)	Type	POL.	(MHz)	(dBuV/m)	(dBuV/m)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
100.0	5500.00	Horn	V	PK	1 MHz	108.93	40.83	68.10	74.00	-5.90
100.0	5500.00	Horn	H	PK	1 MHz	109.69	42.98	66.71	74.00	-7.29
100.0	5500.00	Horn	V	AV	10 Hz	99.84	48.28	51.56	54.00	-2.44
100.0	5500.00	Horn	H	AV	10 Hz	97.86	47.88	49.98	54.00	-4.02

Centre at Band-Edge: 5725 MHz

Channel	Freq.	Rx Antenna		Detector	VBW For Peak	Peak Corrected Reading	Delta Marker	Corrected Band edge	Limit	Diff. To Limit
	(MHz)	Type	POL.	(MHz)	(dBuV/m)	(dBuV/m)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
140.0	5700.00	Horn	V	PK	1 MHz	104.88	42.84	62.04	68.20	-6.16
140.0	5700.00	Horn	H	PK	1 MHz	109.80	44.11	65.69	68.20	-2.51

See figures 3-1 to 3-8 for the plots of the 802.11a band-edge compliance.

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802.11n Band-Edge Compliance of RF Radiated Emissions

Date of Tests: May 6, 2014 and May 26, 2014
Measurements performed by Savtej Sandhu.

The environmental test conditions were: Temperature: 24.5 ºC
Relative Humidity: 26.9 %

The measurements were performed on BlackBerry® smartphone in standalone, Vertical Down configuration on channels 36, 64, 100 and 140 for 802.11n mode at MCS 0.

The test distance was performed at a distance of 3 meters.

Centre at Band-Edge: 5150 MHz

Channel	Freq.	Rx Antenna		Detector	VBW For Peak	Peak Corrected Reading	Delta Marker	Corrected Band edge	Limit	Diff. To Limit
	(MHz)	Type	POL.	(MHz)	(dBuV/m)	(dBuV/m)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
36.0	5180.00	Horn	V	PK	1 MHz	107.42	44.19	63.23	74.00	-10.77
36.0	5180.00	Horn	H	PK	1 MHz	109.42	44.87	64.55	74.00	-9.45
36.0	5180.00	Horn	V	AV	10 Hz	97.50	49.20	48.30	54.00	-5.70
36.0	5180.00	Horn	H	AV	10 Hz	100.23	50.85	49.38	54.00	-4.62

Centre at Band-Edge: 5350 MHz

Channel	Freq.	Rx Antenna		Detector	VBW For Peak	Peak Corrected Reading	Delta Marker	Corrected Band edge	Limit	Diff. To Limit
	(MHz)	Type	POL.	(MHz)	(dBuV/m)	(dBuV/m)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
64.0	5320.00	Horn	V	PK	1 MHz	105.65	40.30	65.35	74.00	-8.65
64.0	5320.00	Horn	H	PK	1 MHz	112.27	41.61	70.66	74.00	-3.34
64.0	5320.00	Horn	V	AV	10 Hz	96.41	46.44	49.97	54.00	-4.03
64.0	5320.00	Horn	H	AV	10 Hz	100.30	49.36	50.94	54.00	-3.06

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802.11a Band-Edge Compliance of RF Radiated Emissions cont'd

Centre at Band-Edge: 5470 MHz

Channel	Freq.	Rx Antenna		Detector	VBW For Peak	Peak Corrected Reading	Delta Marker	Corrected Band edge	Limit	Diff. To Limit
	(MHz)	Type	POL.	(MHz)	(dBuV/m)	(dBuV/m)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
100.0	5500.00	Horn	V	PK	1 MHz	107.91	39.86	68.05	74.00	-5.95
100.0	5500.00	Horn	H	PK	1 MHz	110.21	40.65	69.56	74.00	-4.44
100.0	5500.00	Horn	V	AV	10 Hz	98.67	47.61	51.06	54.00	-2.94
100.0	5500.00	Horn	H	AV	10 Hz	97.57	47.03	50.54	54.00	-3.46

Centre at Band-Edge: 5725 MHz

Channel	Freq.	Rx Antenna		Detector	VBW For Peak	Peak Corrected Reading	Delta Marker	Corrected Band edge	Limit	Diff. To Limit
	(MHz)	Type	POL.	(MHz)	(dBuV/m)	(dBuV/m)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
140.0	5700.00	Horn	V	PK	1 MHz	104.82	41.95	62.87	68.20	-5.33
140.0	5700.00	Horn	H	PK	1 MHz	110.76	43.63	67.13	68.20	-1.07

See figures 3-9 to 3-16 for the plots of the 802.11n band-edge compliance.

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802.11a Band-Edge Compliance of RF Radiated Emissions cont'd

Figure 3-1: Band-Edge Compliance of RF Radiated Emission 802.11a, Ch. 36, 5180 MHz, Centre of Band-Edge: 5150 MHz Pol: V, Detector: PK

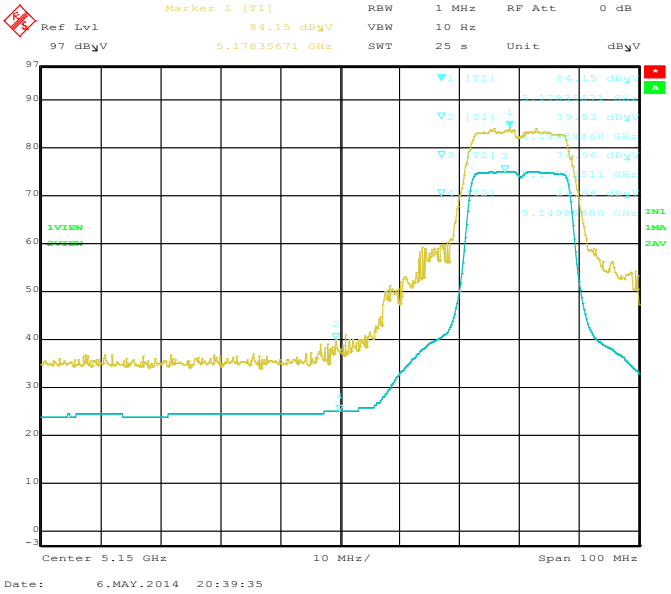


Figure 3-2: Band-Edge Compliance of RF Radiated Emission 802.11a, Ch. 36, 5180 MHz, Centre of Band-Edge: 5150 MHz Pol: H, Detector: PK

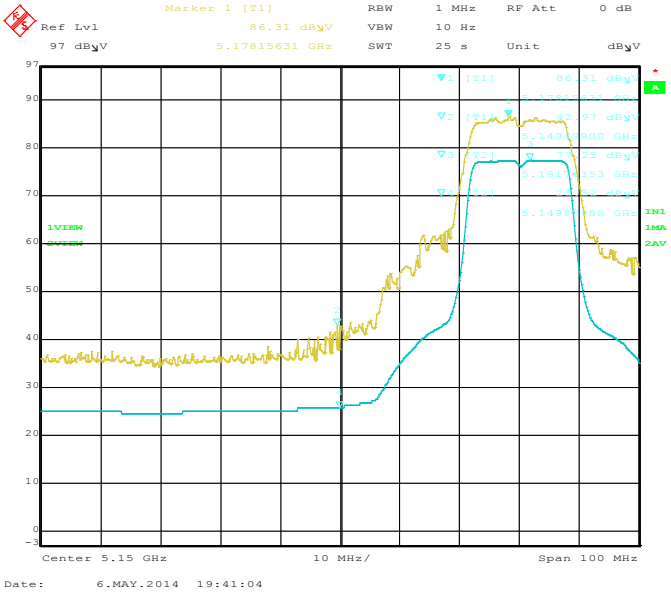


Figure 3-3: Band-Edge Compliance of RF Radiated Emission 802.11a, Ch. 64, 5320 MHz, Centre of Band-Edge: 5350 MHz Pol: V, Detector: PK

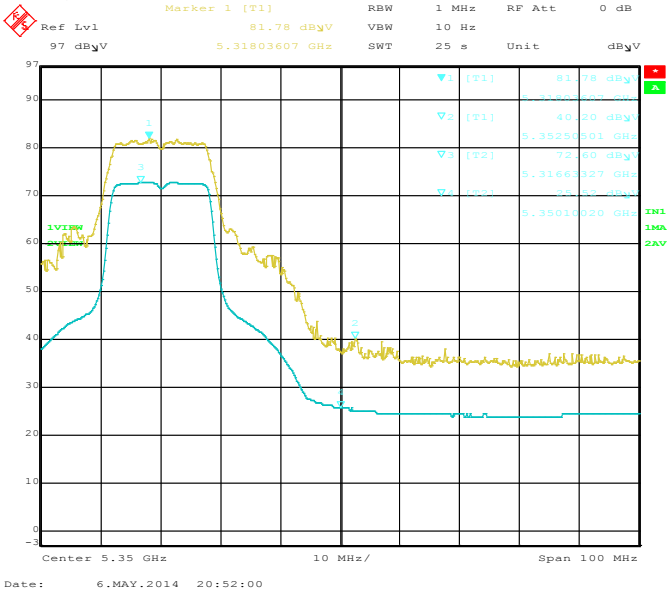
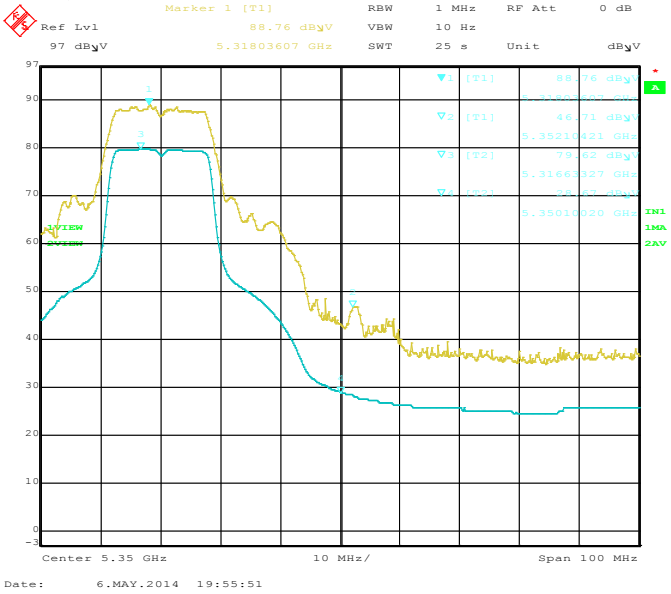


Figure 3-4: Band-Edge Compliance of RF Radiated Emission 802.11a, Ch. 64, 5320 MHz, Centre of Band-Edge: 5350 MHz Pol: H, Detector: PK



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802.11a Band-Edge Compliance of RF Radiated Emissions cont'd

Figure 3-5: Band-Edge Compliance of RF Radiated Emission 802.11a, Ch. 100, 5500 MHz, Centre of Band-Edge: 5460 MHz Pol: V, Detector: PK

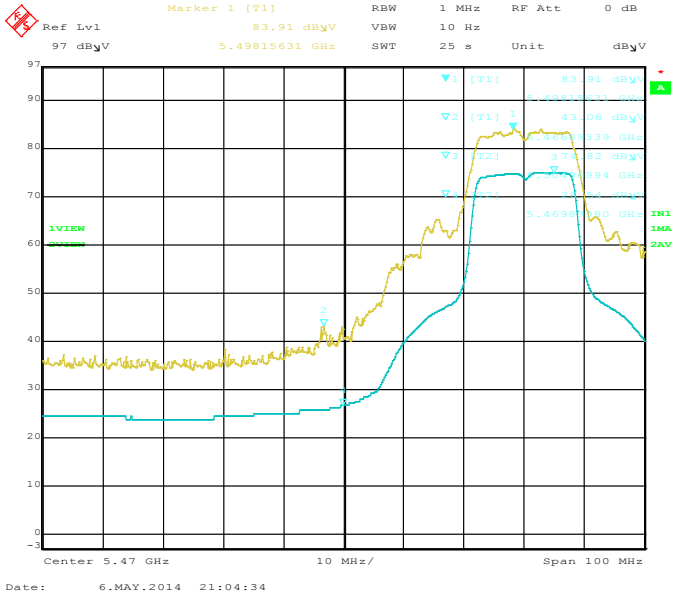


Figure 3-6: Band-Edge Compliance of RF Radiated Emission. 802.11a, Ch. 100, 5500 MHz, Centre of Band-Edge: 5460 MHz Pol: H, Detector: PK

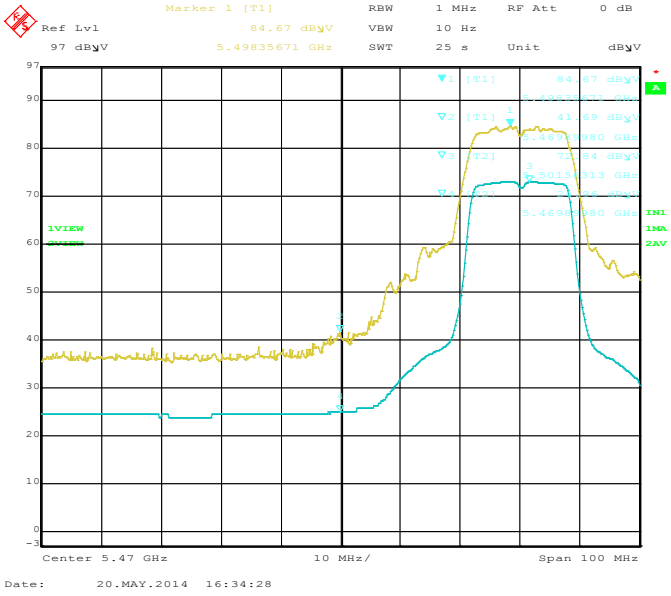


Figure 3-7: Band-Edge Compliance of RF Radiated Emission. 802.11a, Ch. 140, 5700 MHz, Centre of Band-Edge: 5725 MHz Pol: V, Detector: PK

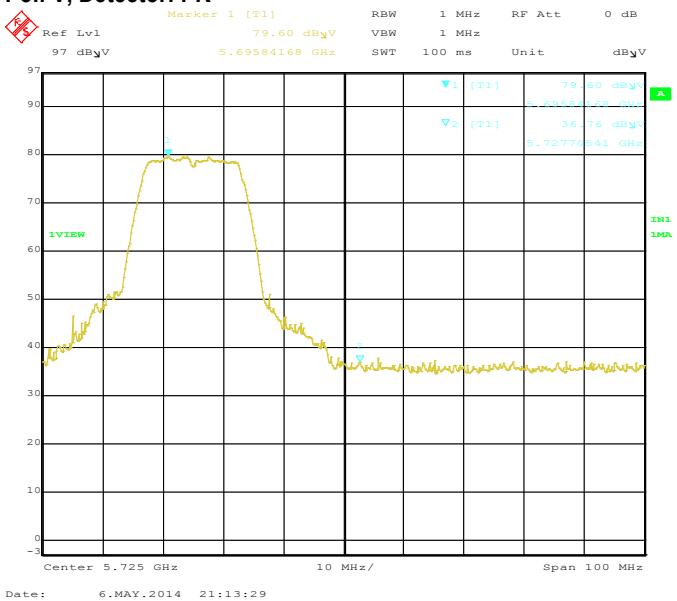
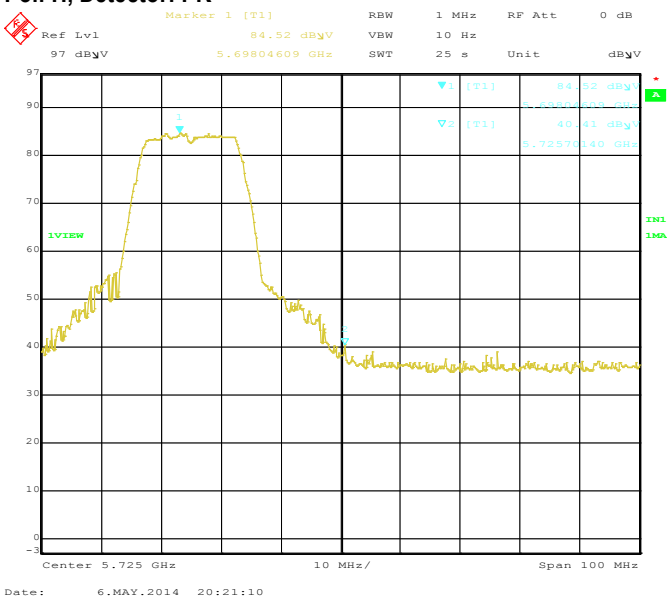


Figure 3-8: Band-Edge Compliance of RF Radiated Emission. 802.11a, Ch. 140, 5700 MHz, Centre of Band-Edge: 5725 MHz Pol: H, Detector: PK



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802.11n Band-Edge Compliance of RF Radiated Emissions

Figure 3-9: Band-Edge Compliance of RF Radiated Emission 802.11n, Ch. 36, 5180 MHz, Centre of Band-Edge: 5150 MHz Pol: V, Detector: PK

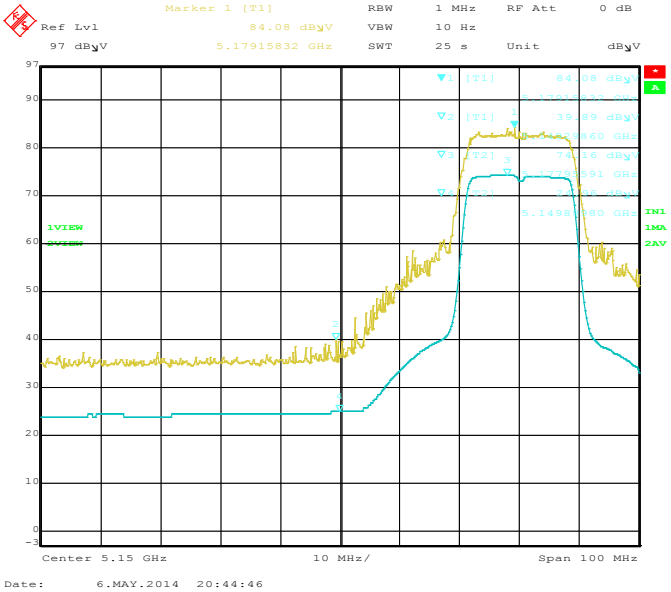


Figure 3-10: Band-Edge Compliance of RF Radiated Emission 802.11n, Ch. 36, 5180 MHz, Centre of Band-Edge: 5150 MHz Pol: H, Detector: PK

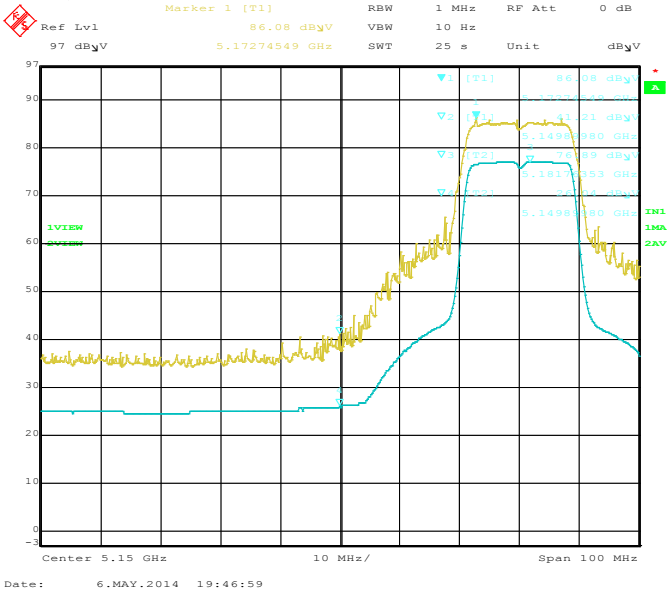


Figure 3-11: Band-Edge Compliance of RF Radiated Emission 802.11n, Ch. 64, 5320 MHz, Centre of Band-Edge: 5350 MHz Pol: V, Detector: PK

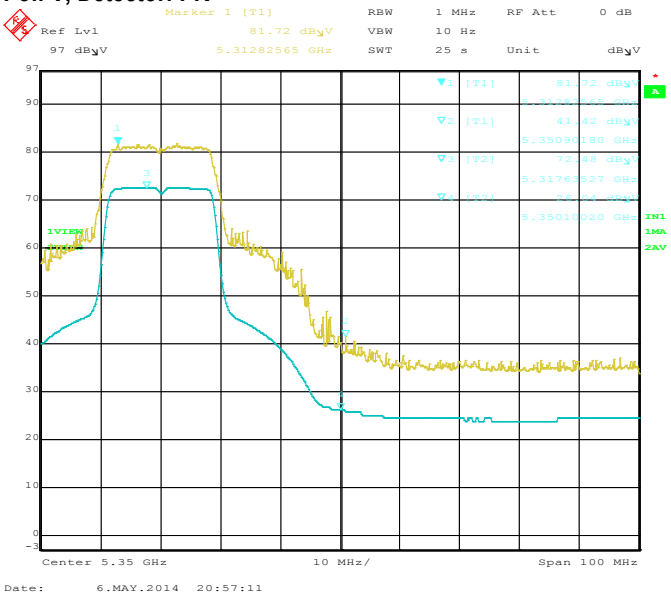
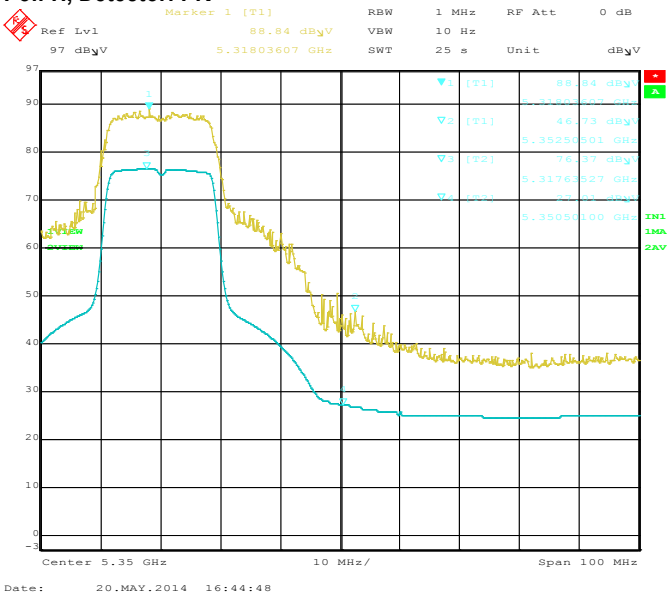


Figure 3-12: Band-Edge Compliance of RF Radiated Emission 802.11n Ch. 64, 5320 MHz, Centre of Band-Edge: 5350 MHz Pol: H, Detector: PK



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802.11n Band-Edge Compliance of RF Radiated Emissions cont'd

Figure 3-13: Band-Edge Compliance of RF Radiated Emission 802.11n, Ch. 100, 5500 MHz, Centre of Band-Edge: 5460 MHz Pol: V, Detector: PK

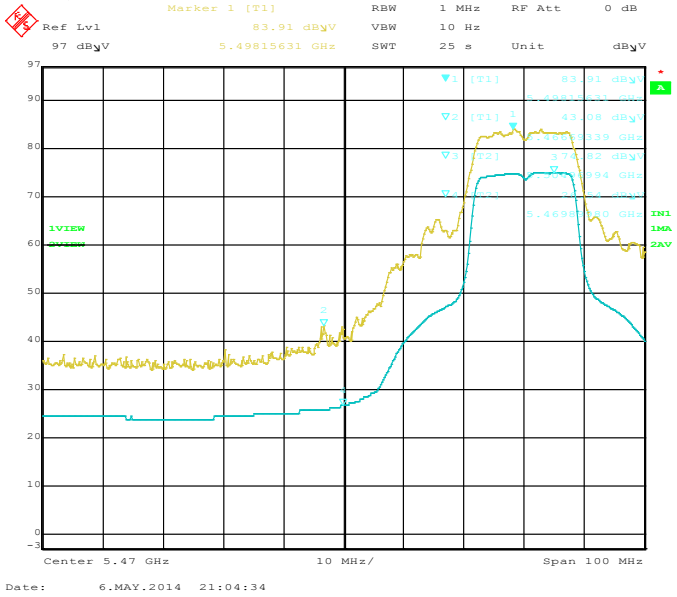


Figure 3-14: Band-Edge Compliance of RF Radiated Emission. 802.11n, Ch. 100, 5500 MHz, Centre of Band-Edge: 5460 MHz Pol: H, Detector: PK

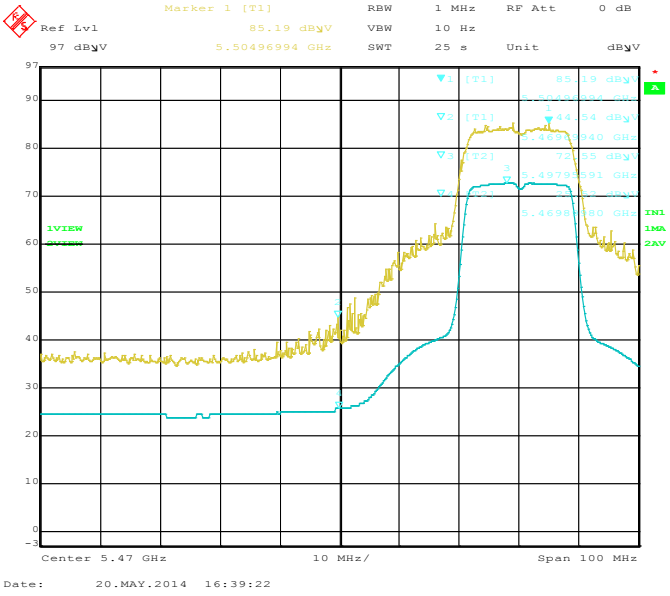


Figure 3-15: Band-Edge Compliance of RF Radiated Emission. 802.11n, Ch. 140, 5700 MHz, Centre of Band-Edge: 5725 MHz Pol: V, Detector: PK

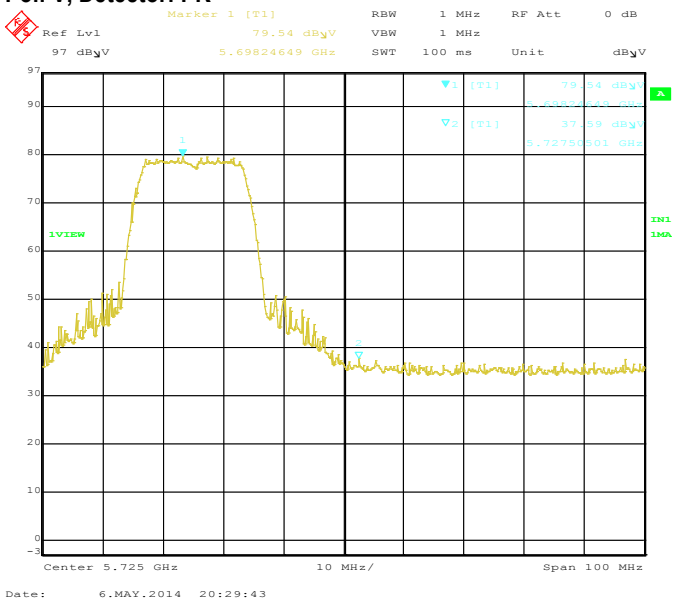
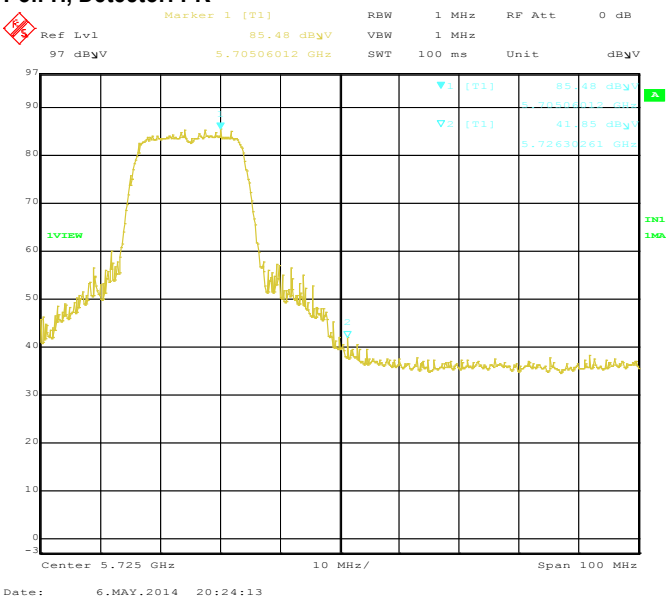


Figure 3-16: Band-Edge Compliance of RF Radiated Emission. 802.11n, Ch. 140, 5700 MHz, Centre of Band-Edge: 5725 MHz Pol: H, Detector: PK



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APPENDIX 4 – 802.11ac RADIATED EMISSIONS TEST DATA

Radiated Emissions Test Results
802.11ac Band

Date of Test: May 27, 2014
Measurements were performed by Rex Zhang

The environmental test conditions were: Temperature: 27.7 ºC
Relative Humidity: 41 %

The test distance was 3.0 meters with a EUT height of 0.8 meters, and sweep frequency of 30 MHz to 1 GHz.

The BlackBerry® smartphone was in Vertical Down position.

The frequency sweep measurements were performed in 802.11ac TX mode at 6 Mbps on channel 36, bandwidth 20MHz; channel 38 and 151, bandwidth 40MHz; and channel 138, bandwidth 80MHz.

All emission levels were at least 25 dB below the limit.

Radiated Emissions Test Results
802.11ac Band

Date of Test: May 12, 2014 to June 4, 2014
Measurements were performed by Masud Attayi and Kevin Guo.

The environmental test conditions were: Temperature: 24ºC
Relative Humidity: 43 %

The test distance was 3.0 meters with a EUT height of 0.8 meters, and sweep frequency of 1GHz to 40GHz.

The BlackBerry® smartphone was in horizontal position.

The frequency sweep measurements were performed in 802.11ac TX mode at 6 Mbps on channel 36, bandwidth 20MHz; channel 38 and 151, bandwidth 40MHz; and channel 138, bandwidth 80MHz.

All other emission levels were at least 25 dB below the limit.

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802.11ac Band-Edge Compliance of RF Radiated Emissions

Date of Tests: May 29, 2014
Measurements performed by Rex Zhang.

The environmental test conditions were: Temperature: 24.5 ºC
Relative Humidity: 36.2 %

The measurements were performed on BlackBerry® smartphone in standalone, Vertical Down configuration on Bandwidth 20MHz, channel 36, 64,100, 140; Bandwidth 40MHz, channels 38, 62 and 102; Bandwidth 80 MHz, channels 42, 58 and 106 for 802.11ac mode at MCS0 data rate.

The test distance was performed at a distance of 3 meters.

Bandwidth 20MHz

Centre at Band-Edge: 5150 MHz

Channel	Freq.	Rx Antenna		Detector	VBW For Peak	Carrier Freq (dBuV)	Corrected Band edge	Limit	Diff. To Limit
	(MHz)	Type	POL.	(MHz)	(dBuV/m)	(dBuV)	(dBuV/m)	(dBuV/m)	(dB)
36.0	5180.00	Horn	V	PK	1 MHz	45.49	68.83	74.00	-5.17
36.0	5180.00	Horn	H	PK	1 MHz	44.85	68.19	74.00	-5.81
36.0	5180.00	Horn	V	AV	10 Hz	24.96	48.30	54.00	-5.70
36.0	5180.00	Horn	H	AV	10 Hz	25.52	48.86	54.00	-5.14

Centre at Band-Edge: 5350 MHz

Channel	Freq.	Rx Antenna		Detector	VBW For Peak	Carrier Freq (dBuV)	Corrected Band edge	Limit	Diff. To Limit
	(MHz)	Type	POL.	(MHz)	(dBuV/m)	(dBuV)	(dBuV/m)	(dBuV/m)	(dB)
64.0	5320.00	Horn	V	PK	1 MHz	45.07	69.00	74.00	-5.00
64.0	5320.00	Horn	H	PK	1 MHz	48.89	72.82	74.00	-1.18
64.0	5320.00	Horn	V	AV	10 Hz	26.54	50.47	54.00	-3.53
64.0	5320.00	Horn	H	AV	10 Hz	27.88	51.81	54.00	-2.19

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802.11ac Band-Edge Compliance of RF Radiated Emissions cont'd

Bandwidth 20MHz

Centre at Band-Edge: 5470 MHz

Channel	Freq.	Rx Antenna		Detector	VBW For Peak	Carrier Freq (dBuV)	Corrected Band edge	Limit	Diff. To Limit
	(MHz)	Type	POL.	(MHz)	(dBuV/m)	(dBuV)	(dBuV/m)	(dBuV/m)	(dB)
100.0	5500.0	Horn	V	PK	1 MHz	43.73	68.75	74.00	-5.25
100.0	5500.0	Horn	H	PK	1 MHz	47.72	72.74	74.00	-1.26
100.0	5500.0	Horn	V	AV	10 Hz	24.96	49.98	54.00	-4.02
100.0	5500.0	Horn	H	AV	10 Hz	27.01	52.03	54.00	-1.97

Centre at Band-Edge: 5725 MHz

Channel	Freq.	Rx Antenna		Detector	VBW For Peak	Carrier Freq (dBuV)	Corrected Band edge	Limit	Diff. To Limit
	(MHz)	Type	POL.	(MHz)	(dBuV/m)	(dBuV)	(dBuV/m)	(dBuV/m)	(dB)
140.0	5700.00	Horn	V	PK	1 MHz	38.41	63.69	68.20	-4.51
140.0	5700.00	Horn	H	PK	1 MHz	41.64	66.92	68.20	-1.28

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802.11ac Band-Edge Compliance of RF Radiated Emissions cont'd

Bandwidth 40MHz

Centre at Band-Edge: 5150 MHz

Channel	Freq. (MHz)	Rx Antenna Type	Rx Antenna POL.	Detector (MHz)	VBW For Peak (dBuV/m)	Carrier Freq (dBuV)	Corrected Band edge (dBuV)	Limit (dBuV/m)	Diff. To Limit (dB)
38.0	5190.00	Horn	V	PK	1 MHz	45.16	68.50	74.00	-5.50
38.0	5190.00	Horn	H	PK	1 MHz	45.60	68.94	74.00	-5.06
38.0	5190.00	Horn	V	AV	10 Hz	28.28	51.62	54.00	-2.38
38.0	5190.00	Horn	H	AV	10 Hz	28.28	51.62	54.00	-2.38

Centre at Band-Edge: 5350 MHz

Channel	Freq. (MHz)	Rx Antenna Type	Rx Antenna POL.	Detector (MHz)	VBW For Peak (dBuV/m)	Carrier Freq (dBuV)	Corrected Band edge (dBuV)	Limit (dBuV/m)	Diff. To Limit (dB)
62.0	5310.00	Horn	V	PK	1 MHz	41.75	65.68	74.00	-8.32
62.0	5310.00	Horn	H	PK	1 MHz	45.63	69.56	74.00	-4.44
62.0	5310.00	Horn	V	AV	10 Hz	25.52	49.45	54.00	-4.55
62.0	5310.00	Horn	H	AV	10 Hz	28.67	52.60	54.00	-1.40

Centre at Band-Edge: 5470 MHz

Channel	Freq. (MHz)	Rx Antenna Type	Rx Antenna POL.	Detector (MHz)	VBW For Peak (dBuV/m)	Carrier Freq (dBuV)	Corrected Band edge (dBuV)	Limit (dBuV/m)	Diff. To Limit (dB)
102.0	5510.0	Horn	V	PK	1 MHz	42.41	67.43	74.00	-6.57
102.0	5510.0	Horn	H	PK	1 MHz	45.70	70.72	74.00	-3.28
102.0	5510.0	Horn	V	AV	10 Hz	26.54	51.56	54.00	-2.44
102.0	5510.0	Horn	H	AV	10 Hz	27.88	52.90	54.00	-1.10

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802.11ac Band-Edge Compliance of RF Radiated Emissions cont'd

Bandwidth 80MHz

Centre at Band-Edge: 5150 MHz

Channel	Freq. (MHz)	Rx Antenna Type	Rx Antenna POL.	Detector (MHz)	VBW For Peak (dBuV/m)	Carrier Freq (dBuV)	Corrected Band edge (dBuV)	Limit (dBuV/m)	Diff. To Limit (dB)
42.0	5210.00	Horn	V	PK	1 MHz	44.19	67.53	74.00	-6.47
42.0	5210.00	Horn	H	PK	1 MHz	45.08	68.42	74.00	-5.58
42.0	5210.00	Horn	V	AV	10 Hz	27.46	50.80	54.00	-3.20
42.0	5210.00	Horn	H	AV	10 Hz	27.46	50.80	54.00	-3.20

Centre at Band-Edge: 5350 MHz

Channel	Freq. (MHz)	Rx Antenna Type	Rx Antenna POL.	Detector (MHz)	VBW For Peak (dBuV/m)	Carrier Freq (dBuV)	Corrected Band edge (dBuV)	Limit (dBuV/m)	Diff. To Limit (dB)
58.0	5290.00	Horn	V	PK	1 MHz	38.44	62.37	74.00	-11.63
58.0	5290.00	Horn	H	PK	1 MHz	45.54	69.47	74.00	-4.53
58.0	5290.00	Horn	V	AV	10 Hz	24.96	48.89	54.00	-5.11
58.0	5290.00	Horn	H	AV	10 Hz	27.88	51.81	54.00	-2.19

Centre at Band-Edge: 5470 MHz

Channel	Freq. (MHz)	Rx Antenna Type	Rx Antenna POL.	Detector (MHz)	VBW For Peak (dBuV/m)	Carrier Freq (dBuV)	Corrected Band edge (dBuV)	Limit (dBuV/m)	Diff. To Limit (dB)
106.0	5530.0	Horn	V	PK	1 MHz	41.61	66.63	74.00	-7.37
106.0	5530.0	Horn	H	PK	1 MHz	44.97	69.99	74.00	-4.01
106.0	5530.0	Horn	V	AV	10 Hz	25.52	50.54	54.00	-3.46
106.0	5530.0	Horn	H	AV	10 Hz	27.01	52.03	54.00	-1.97

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802.11ac Band-Edge Compliance of RF Radiated Emissions cont'd

Bandwidth 20MHz

Figure 4-1: Band-Edge Compliance of RF Radiated Emission 802.11ac, Ch. 36, 5180 MHz, Centre of Band-Edge: 5150 MHz Pol: V, Detector: PK

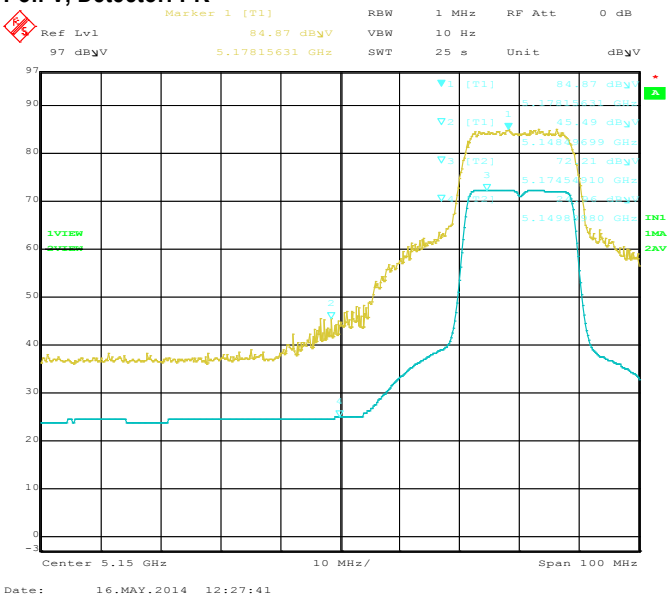


Figure 4-2: Band-Edge Compliance of RF Radiated Emission 802.11ac, Ch. 36, 5180 MHz, Centre of Band-Edge: 5150 MHz Pol: H, Detector: PK

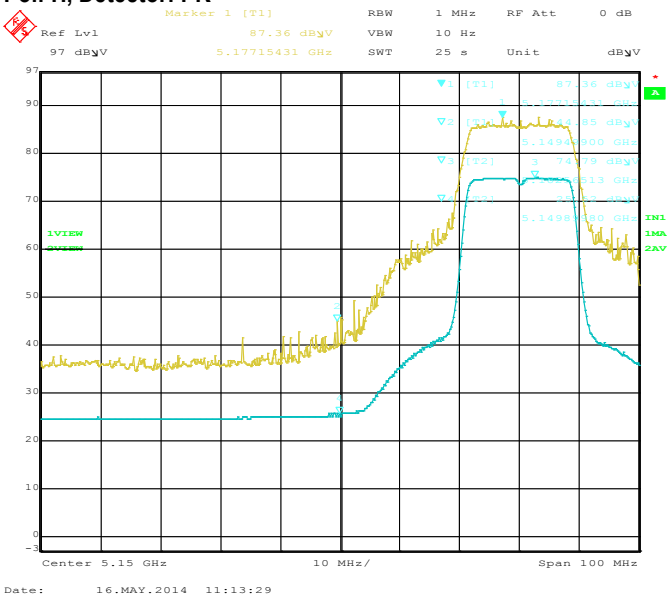


Figure 4-3: Band-Edge Compliance of RF Radiated Emission 802.11ac, Ch. 64, 5320 MHz, Centre of Band-Edge: 5350 MHz Pol: V, Detector: PK

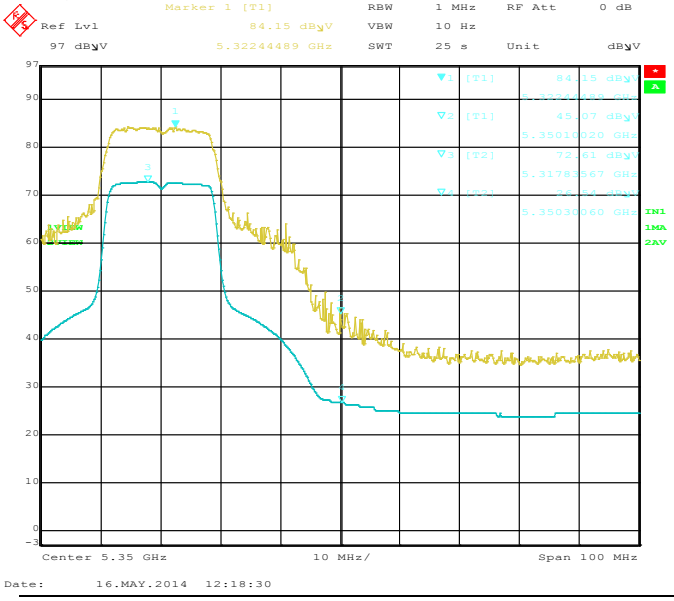
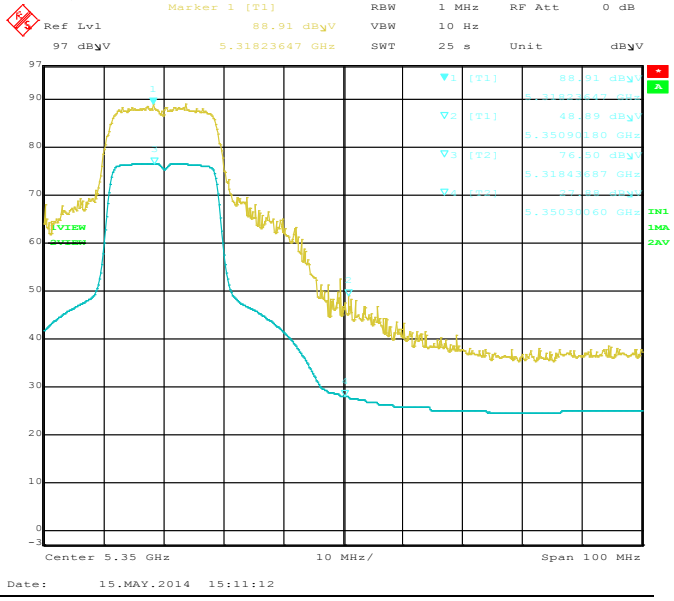


Figure 4-4: Band-Edge Compliance of RF Radiated Emission 802.11ac, Ch. 64, 5320 MHz, Centre of Band-Edge: 5350 MHz Pol: H, Detector: PK



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802.11ac Band-Edge Compliance of RF Radiated Emissions cont'd

Bandwidth 20MHz

Figure 4-5: Band-Edge Compliance of RF Radiated Emission 802.11ac, Ch. 100, 5500 MHz, Centre of Band-Edge: 5460 MHz Pol: V, Detector: PK

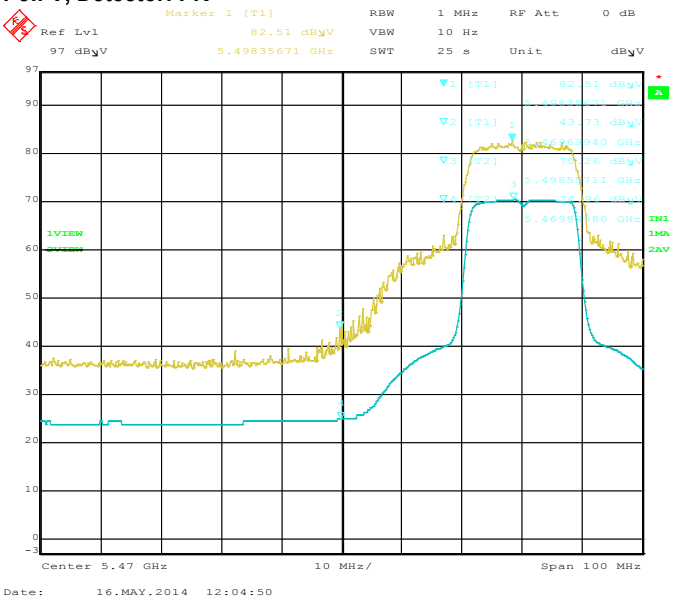


Figure 4-6: Band-Edge Compliance of RF Radiated Emission. 802.11ac, Ch. 100, 5500 MHz, Centre of Band-Edge: 5460 MHz Pol: H, Detector: PK

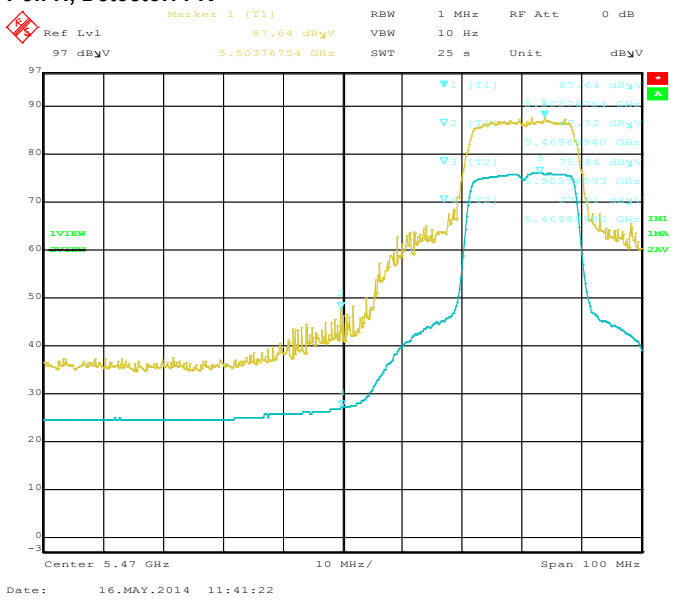


Figure 4-7: Band-Edge Compliance of RF Radiated Emission. 802.11ac, Ch. 140, 5700 MHz, Centre of Band-Edge: 5725 MHz Pol: V, Detector: PK

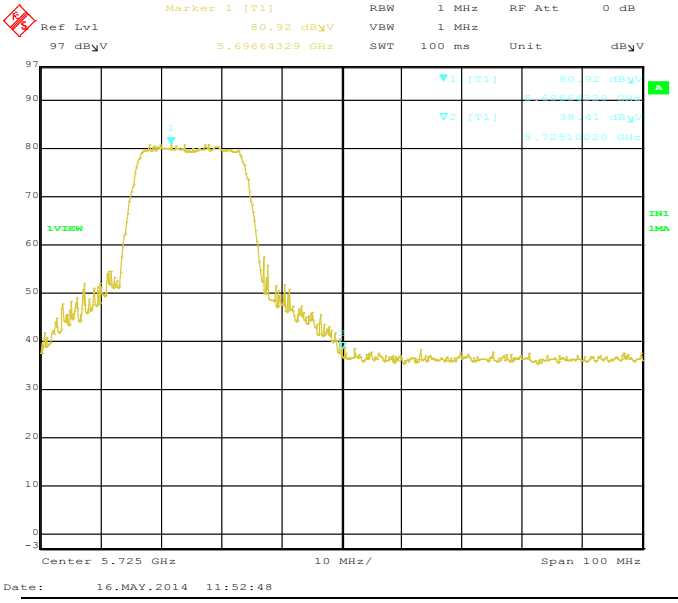
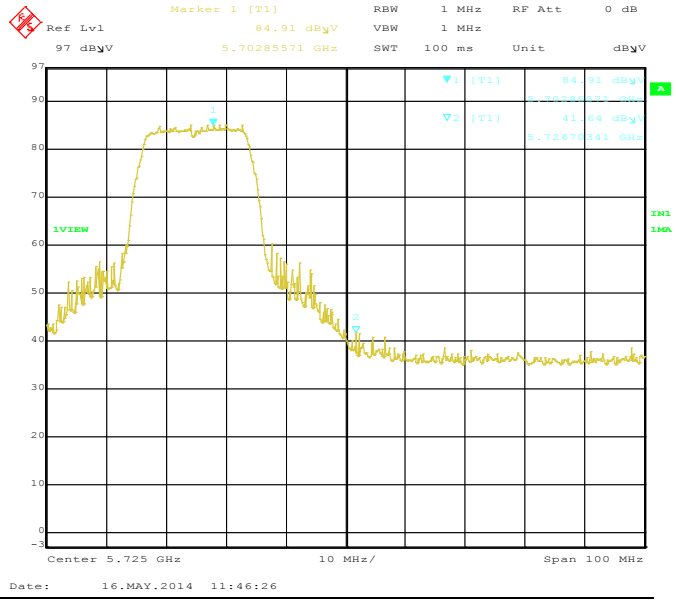


Figure 4-8: Band-Edge Compliance of RF Radiated Emission. 802.11ac, Ch. 140, 5700 MHz, Centre of Band-Edge: 5725 MHz Pol: H, Detector: PK



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802.11ac Band-Edge Compliance of RF Radiated Emissions cont'd

Bandwidth 40MHz

Figure 4-9: Band-Edge Compliance of RF Radiated Emission 802.11ac, Ch. 38, 5190 MHz, Centre of Band-Edge: 5150 MHz Pol: V, Detector: PK

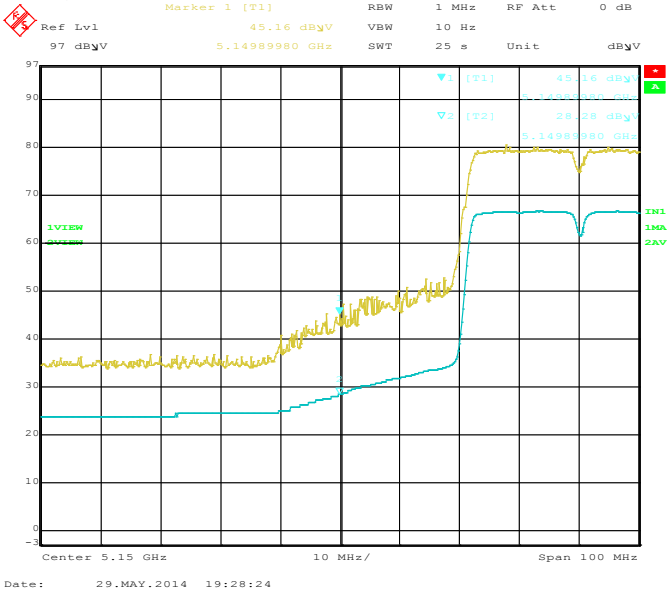


Figure 4-10: Band-Edge Compliance of RF Radiated Emission 802.11ac, Ch. 38, 5190 MHz, Centre of Band-Edge: 5150 MHz Pol: H, Detector: PK

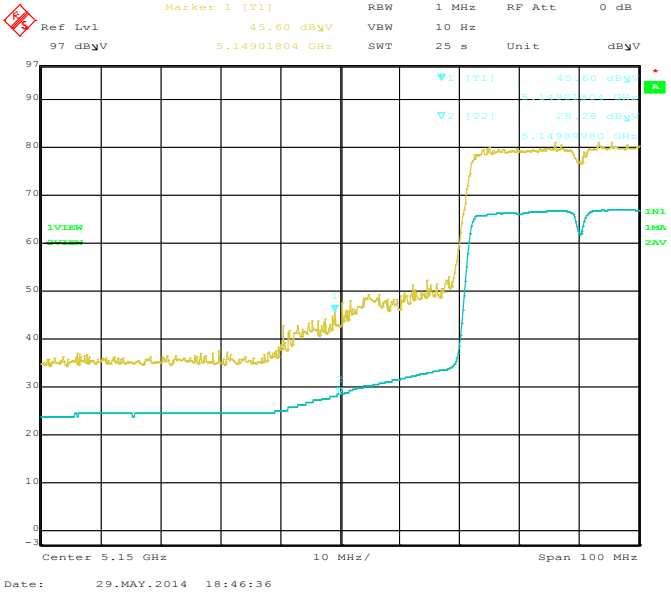


Figure 4-11: Band-Edge Compliance of RF Radiated Emission 802.11ac, Ch. 62, 5310 MHz, Centre of Band-Edge: 5350 MHz Pol: V, Detector: PK

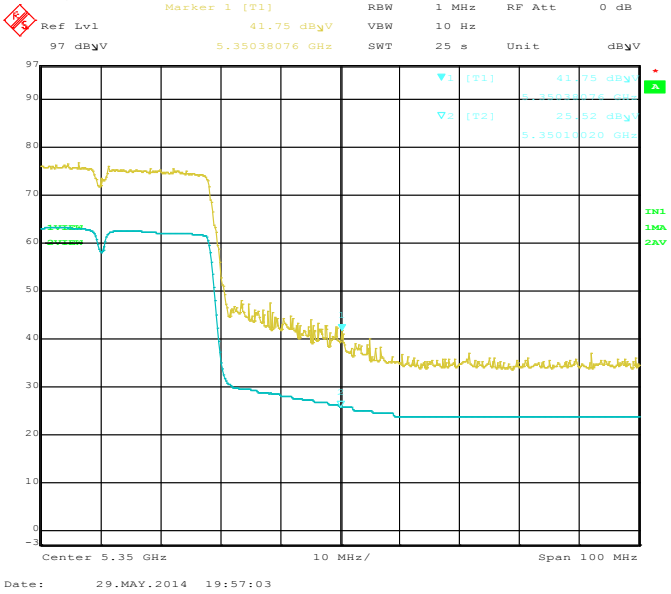
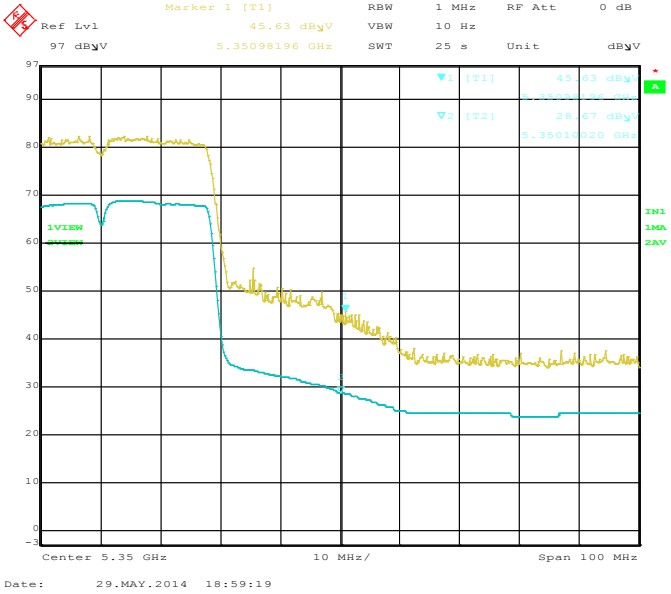


Figure 4-12: Band-Edge Compliance of RF Radiated Emission 802.11ac, Ch. 62, 5310 MHz, Centre of Band-Edge: 5350 MHz Pol: H, Detector: PK



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802.11ac Band-Edge Compliance of RF Radiated Emissions cont'd

Bandwidth 40MHz

Figure 4-13: Band-Edge Compliance of RF Radiated Emission 802.11ac, Ch. 102, 5510 MHz, Centre of Band-Edge: 5460 MHz Pol: V, Detector: PK

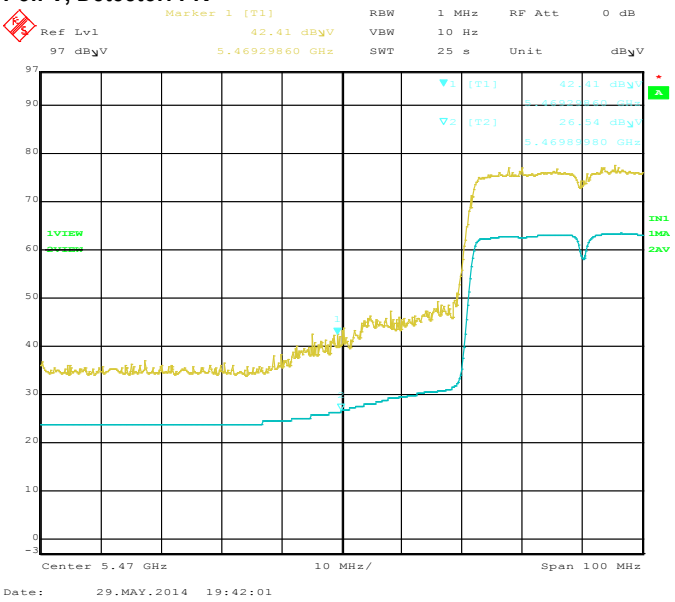
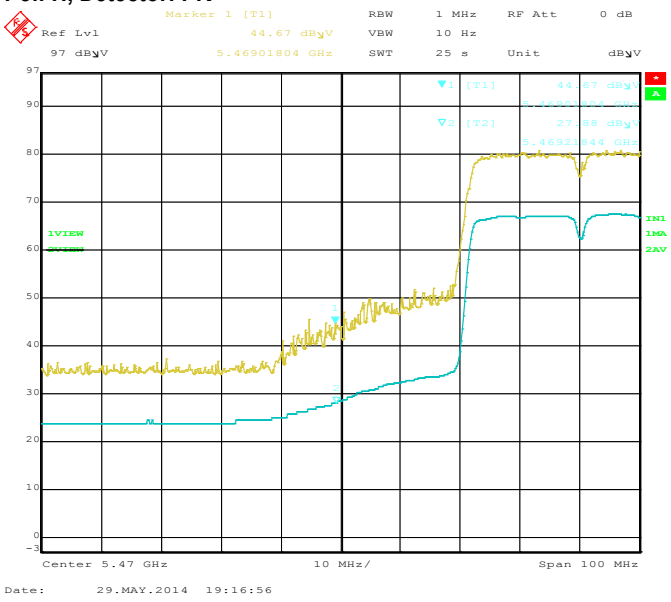


Figure 4-14: Band-Edge Compliance of RF Radiated Emission. 802.11ac, Ch. 102, 5510 MHz, Centre of Band-Edge: 5460 MHz Pol: H, Detector: PK



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802.11ac Band-Edge Compliance of RF Radiated Emissions cont'd

Bandwidth 80MHz

Figure 4-15: Band-Edge Compliance of RF Radiated Emission 802.11ac, Ch. 42, 5210 MHz, Centre of Band-Edge: 5150 MHz Pol: V, Detector: PK

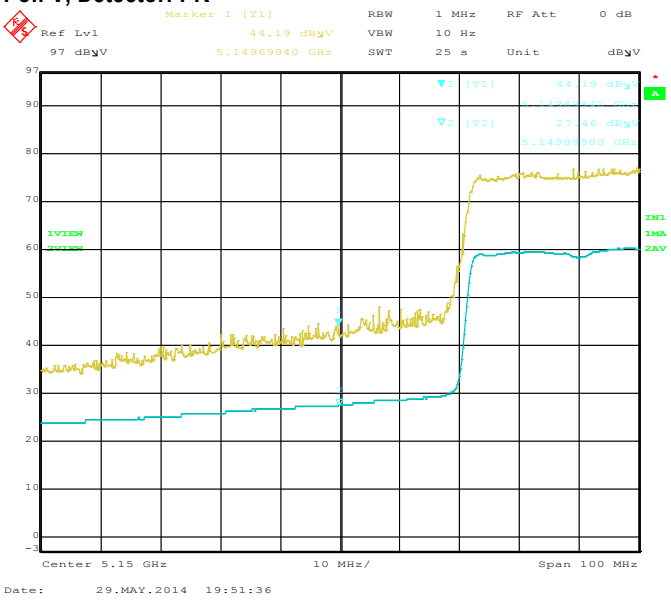

Figure 4-16: Band-Edge Compliance of RF Radiated Emission 802.11ac, Ch. 42, 5210 MHz, Centre of Band-Edge: 5150 MHz Pol: H, Detector: PK

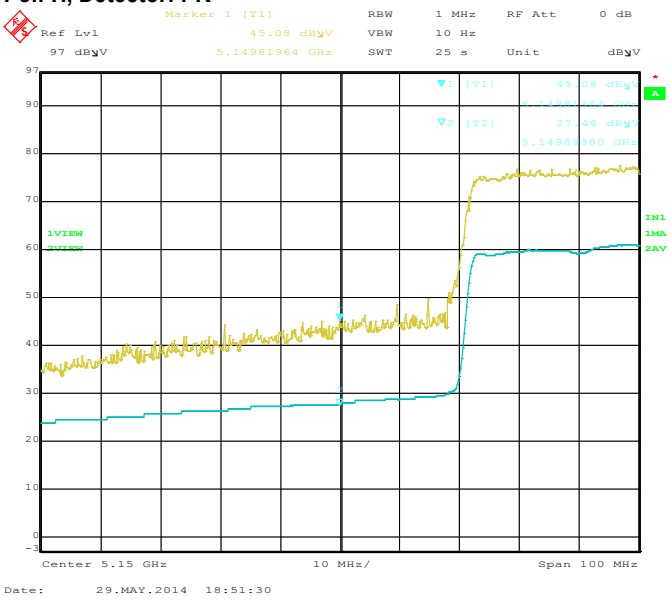

Figure 4-17: Band-Edge Compliance of RF Radiated Emission 802.11ac, Ch. 58, 5290 MHz, Centre of Band-Edge: 5350 MHz Pol: V, Detector: PK

Figure 4-18: Band-Edge Compliance of RF Radiated Emission 802.11ac, Ch. 58, 5290 MHz, Centre of Band-Edge: 5350 MHz Pol: H, Detector: PK

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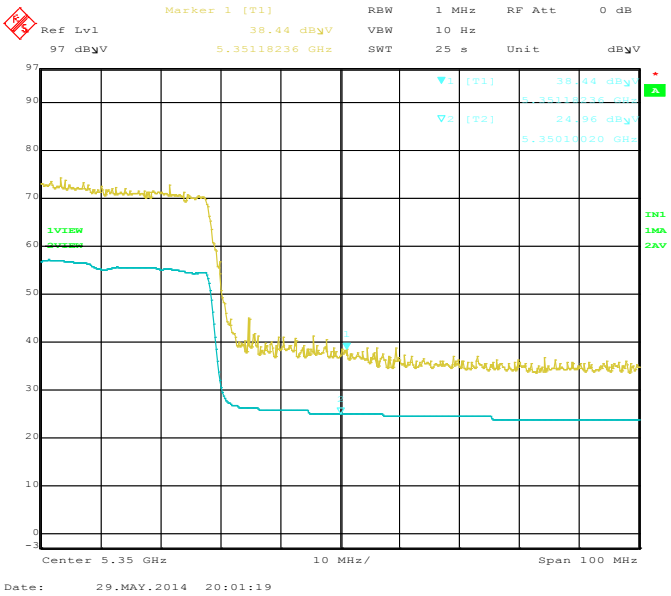

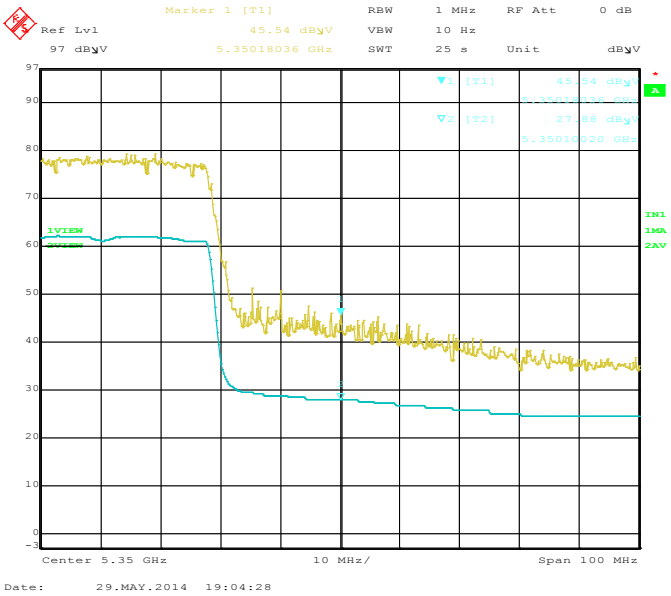

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802.11ac Band-Edge Compliance of RF Radiated Emissions cont'd

Bandwidth 40MHz

Figure 4-19: Band-Edge Compliance of RF Radiated Emission 802.11ac, Ch. 106, 5530 MHz, Centre of Band-Edge: 5460 MHz Pol: V, Detector: PK

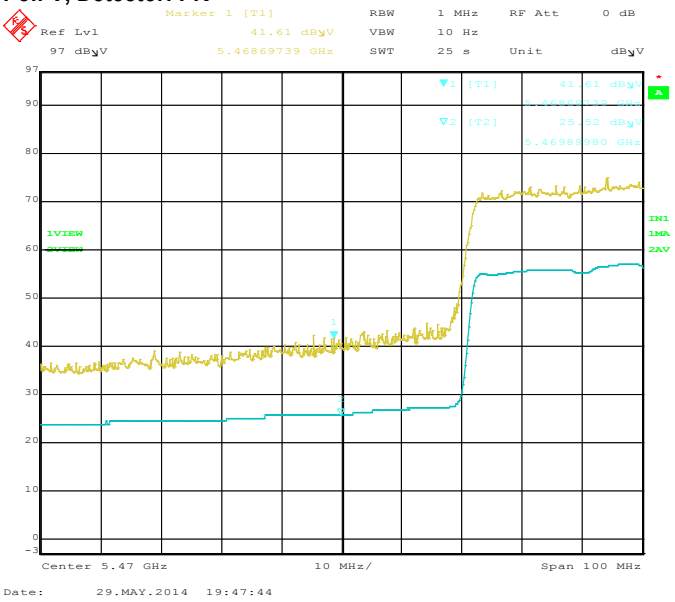
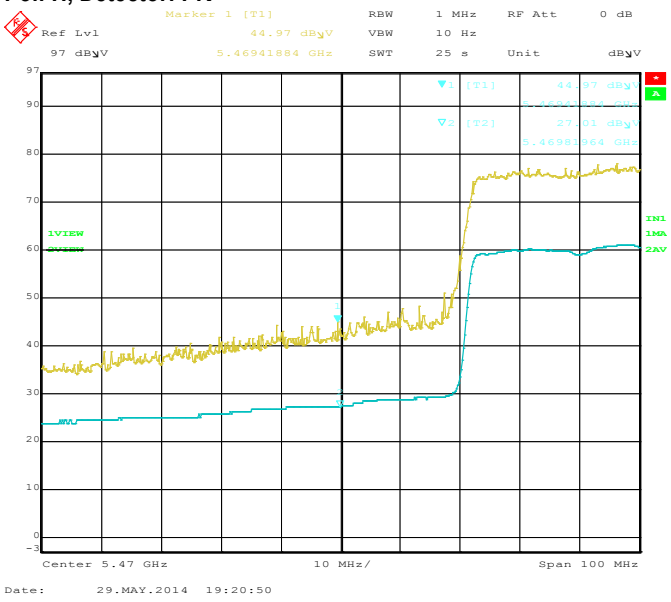


Figure 4-20: Band-Edge Compliance of RF Radiated Emission. 802.11ac, Ch. 106, 5530 MHz, Centre of Band-Edge: 5460 MHz Pol: H, Detector: PK



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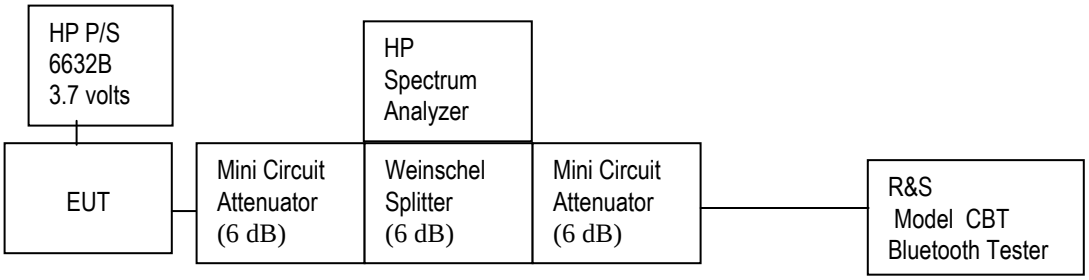
APPENDIX 5 – BLUETOOTH AND BLUETOOTH LOW ENERGY CONDUCTED EMISSIONS TEST DATA/PLOTS

Bluetooth RF Conducted Emission Test Results

Bluetooth power output from BlackBerry® smartphone was at maximum for all the recorded measurements shown below.
The measurements were performed by Chuan Tran

Date of test: May 28, 2014

Test Setup Diagram



UNIT	MANUFACTURER	MODEL	SERIAL NUMBER
Attenuator 1	Mini-Circuits	BW-S6W2+	0647
Attenuator 2	Mini-Circuits	BW-S6W2+	0648
Attenuator 3	Mini-Circuits	BW-S20-2W263+	1234
Splitter 1	Weinschel	1515	MES 92

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.

The environmental test conditions were: Temperature: 24.8 ºC
Relative Humidity: 33.5 %

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Bluetooth RF Conducted Emission Test Results cont'd

20 dB Bandwidth

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

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

Bluetooth Channel	Limit (MHz)	Measured Level (MHz)
0	≤1.0	0.933
39	≤1.0	0.926
78	≤1.0	**0.949**

See figures 5-1 to 5-3 for the plots of the 20 dB bandwidth measurements.

Figure 5-1: 20 dB Bandwidth
Single freq., Static PBRS, DH5

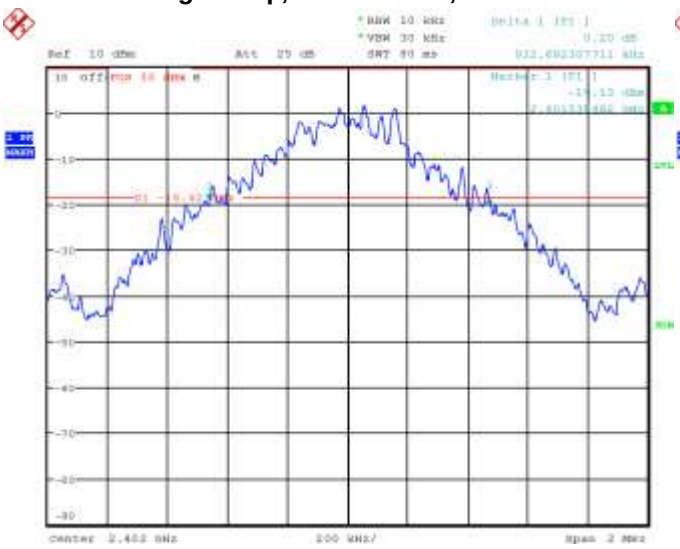
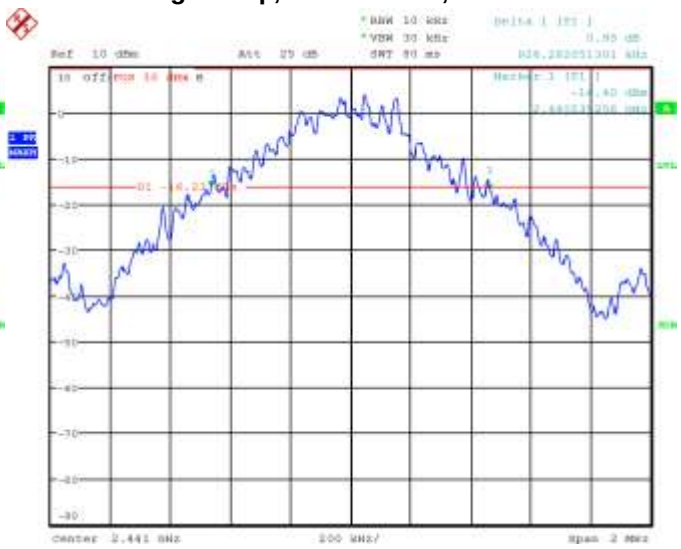


Figure 5-2: 20 dB Bandwidth
Single freq., Static PBRS, DH5



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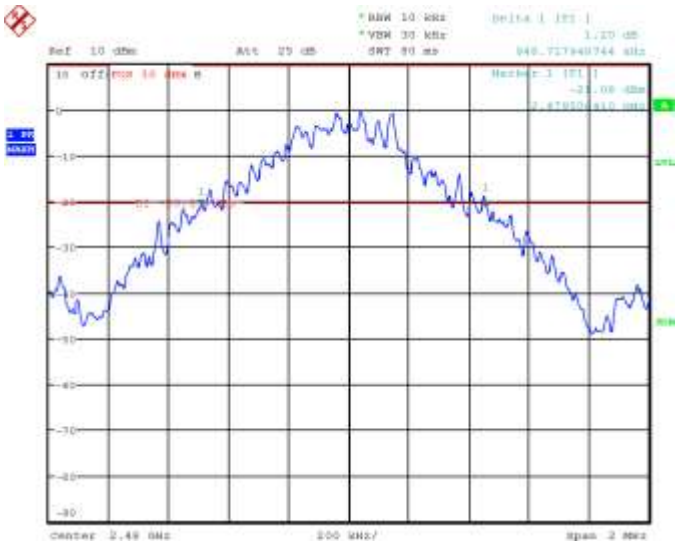
Bluetooth RF Conducted Emission Test Results cont'd

Figure 5-3: 20 dB Bandwidth
Single freq., Static PBRS, DH5



Using Pattern type "Static PBRS" and packet type "2-DH5" during the measurements.

Bluetooth Channel	Limit (MHz)	Measured Level (MHz)
0	≤1.5	1.324
39	≤1.5	1.324
78	≤1.5	1.324

See figures 5-4 to 5-6 for the plots of the 20 dB bandwidth measurements.

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Bluetooth RF Conducted Emission Test Results cont'd

Figure 5-4: 20 dB Bandwidth
Single freq., Static PBRS, 2-DH5

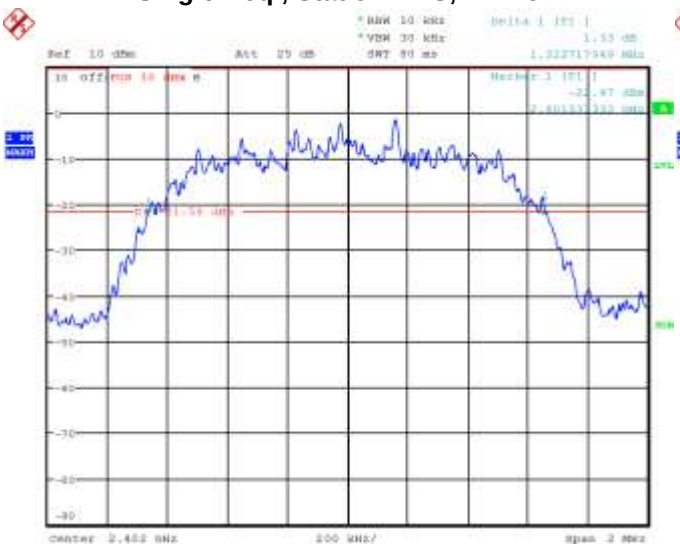


Figure 5-5: 20 dB Bandwidth
Single freq., Static PBRS, 2-DH5

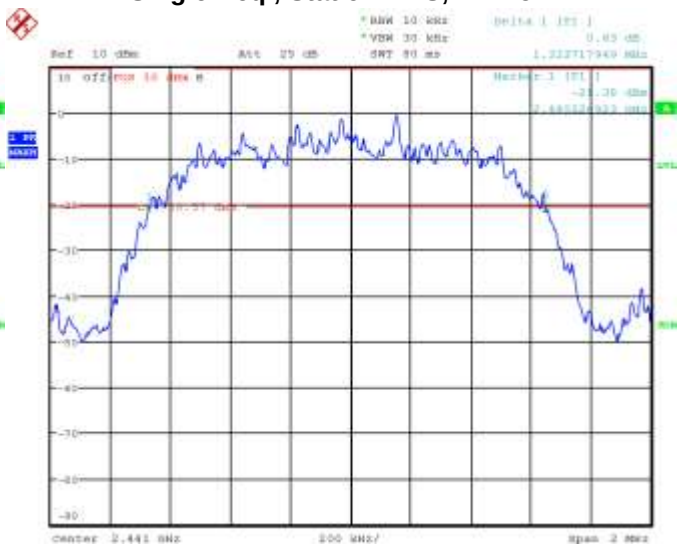
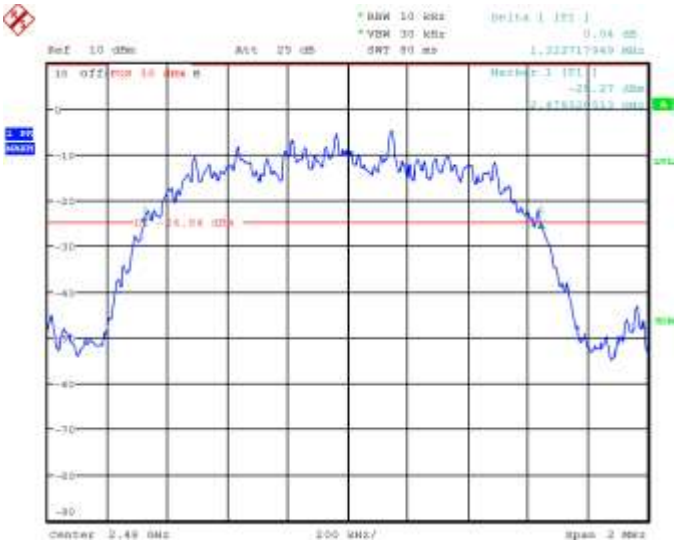


Figure 5-6: 20 dB Bandwidth
Single freq., Static PBRS, 2-DH5



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Using Pattern type “Static PBRS” and packet type “3-DH5” during the measurements.

Bluetooth Channel	Limit (MHz)	Measured Level (MHz)
0	≤1.5	**1.340**
39	≤1.5	1.324
78	≤1.5	1.321

See figures 5-7 to 5-9 for the plots of the 20 dB bandwidth measurements.

Figure 5-7: 20 dB Bandwidth
Single freq., Static PBRS, 3-DH5

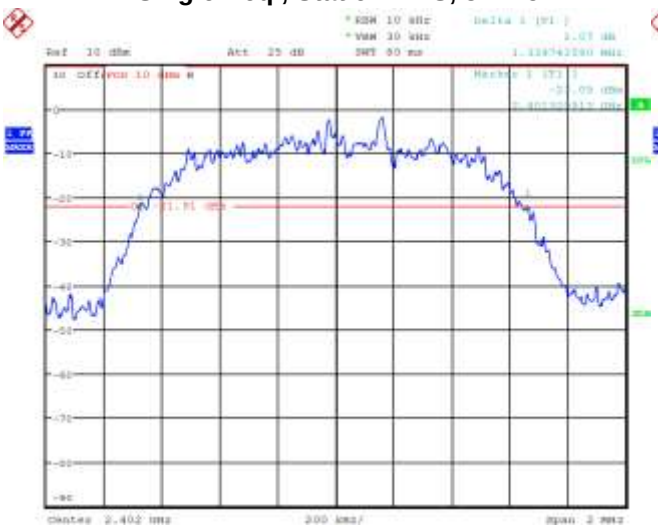


Figure 5-8: 20 dB Bandwidth
Single freq., Static PBRS, 3-DH5

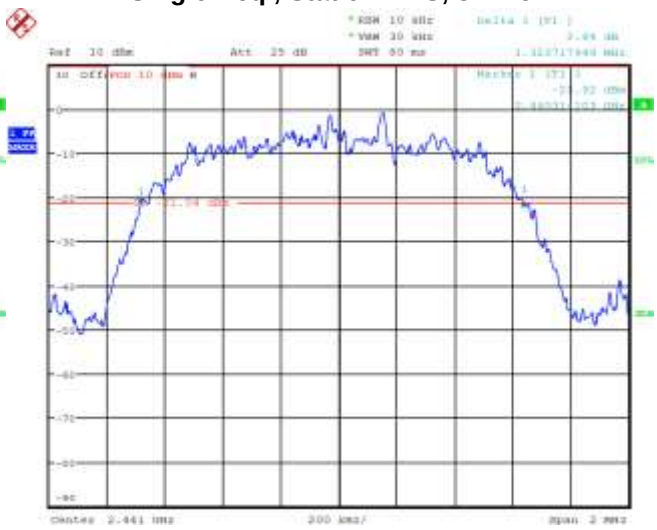
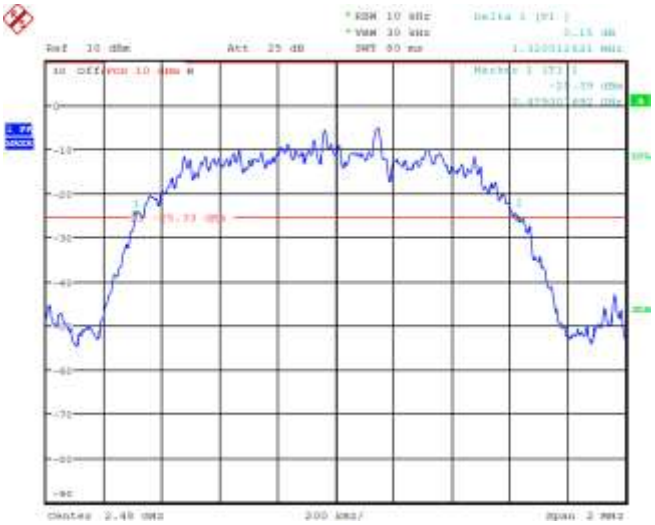


Figure 5-9: 20 dB Bandwidth
Single freq., Static PBRS, 3-DH5



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Bluetooth RF Conducted Emission Test Results cont'd

Carrier Frequency Separation

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

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

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

See figure 5-10 for the plot of the Carrier Frequency Separation measurement.

Figure 5-10: Carrier Frequency Separation, Freq. Hopping, Static PBRS, DH5, Channels 38 to 39

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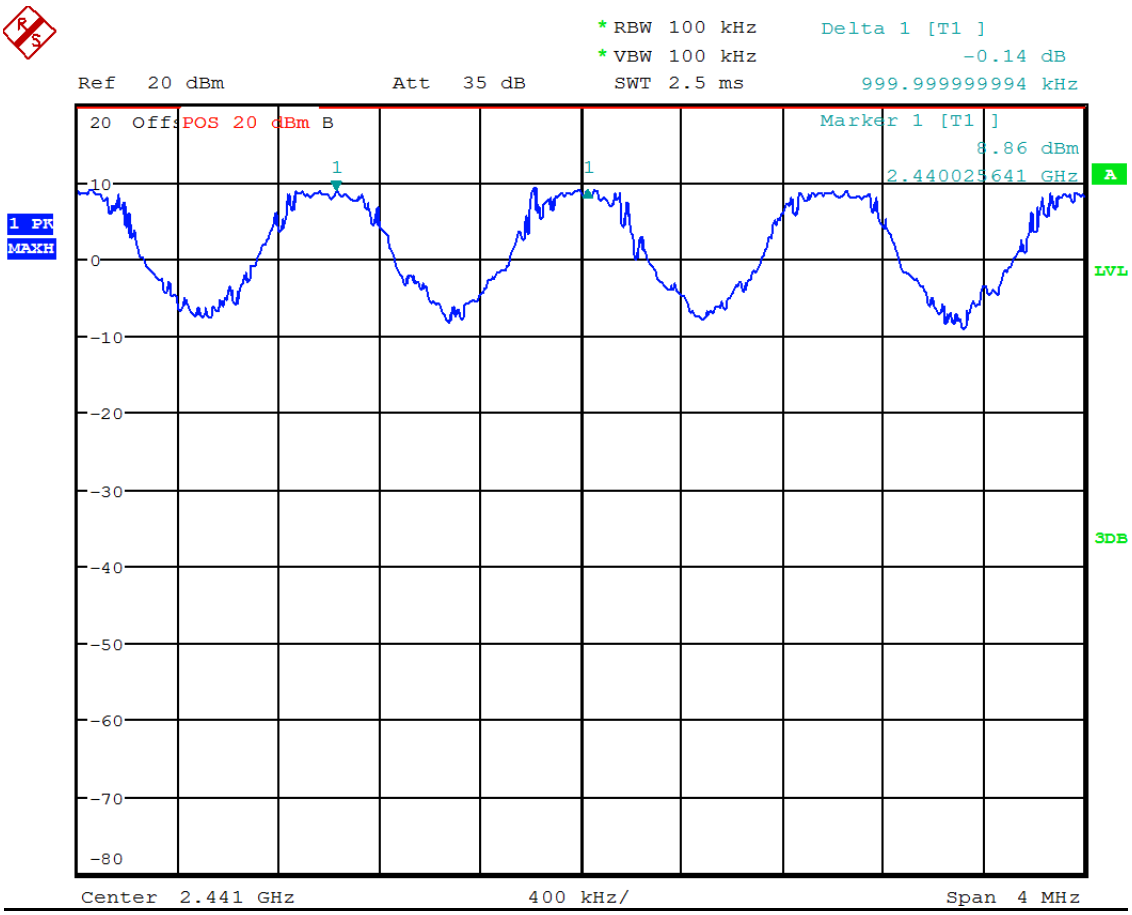

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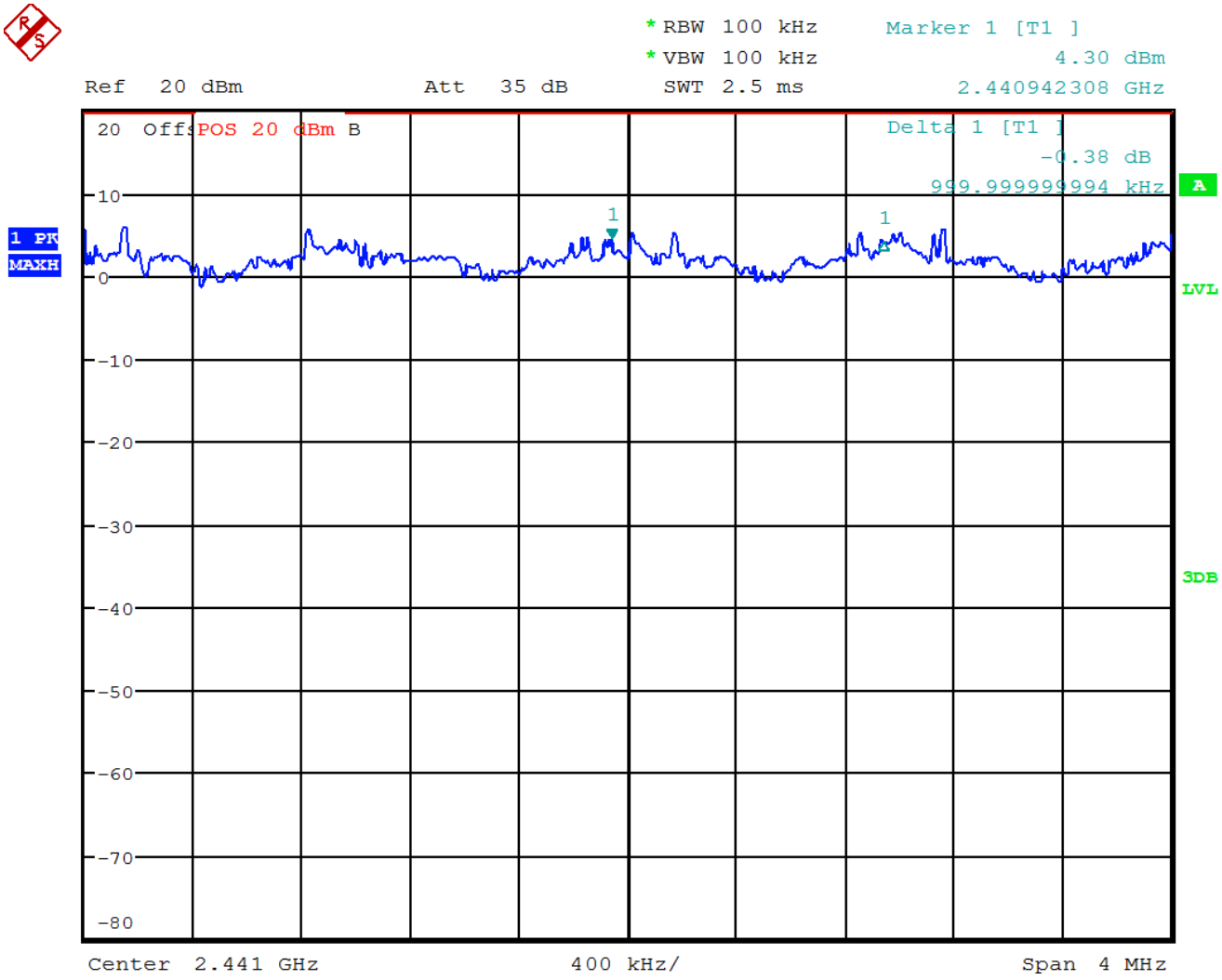
Bluetooth RF Conducted Emission Test Results cont'd

Using Pattern type "Static PBRS" and packet type "2-DH5" during the measurements.

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

See figure 5-11 for the plot of the Carrier Frequency Separation measurement.

Figure 5-11: Carrier Frequency Separation, Freq. Hopping, Static PBRS, 2-DH5, Channels 38 to 39



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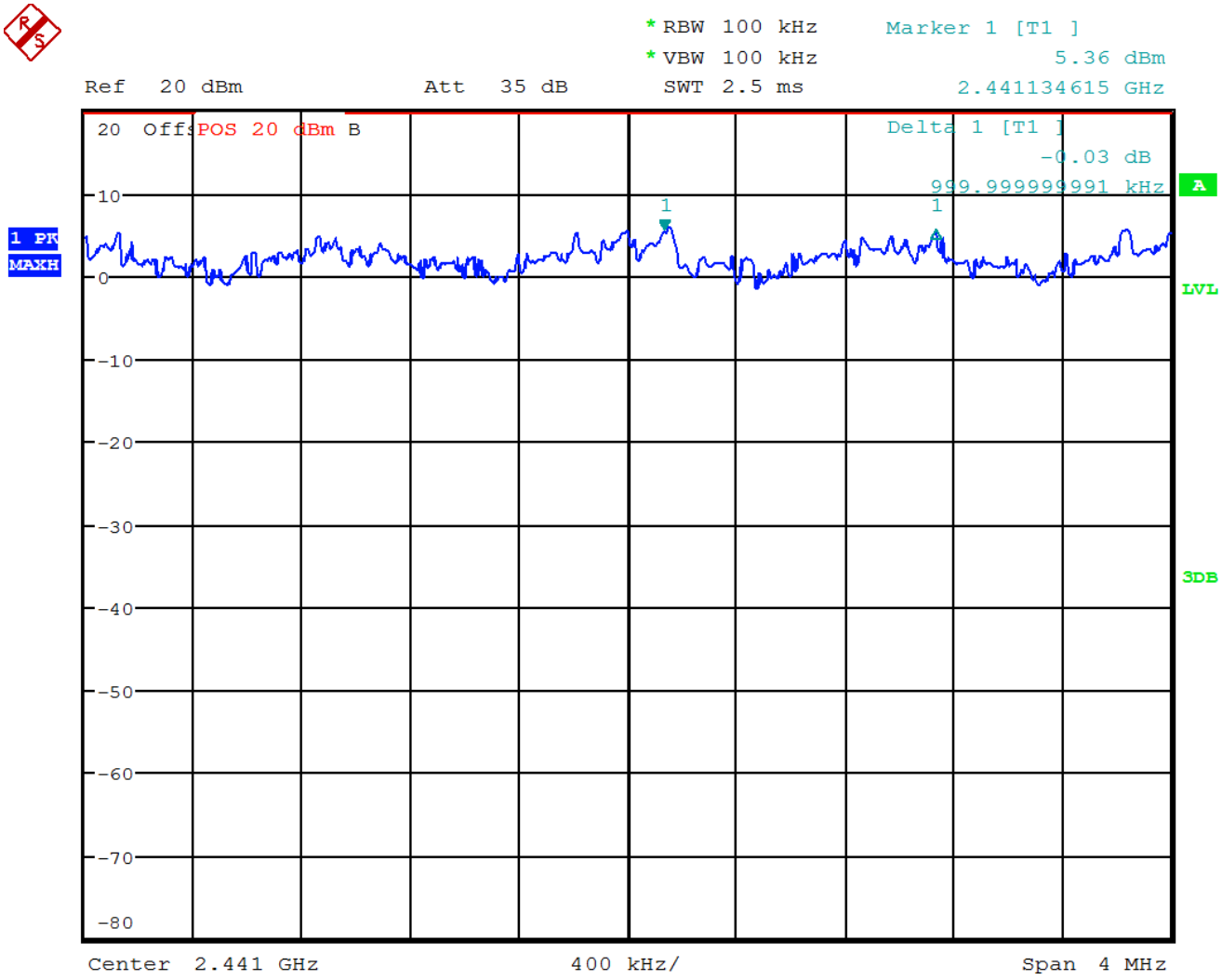
Bluetooth RF Conducted Emission Test Results cont'd

Using Pattern type "Static PBRS" 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

See figure 5-12 for the plot of the Carrier Frequency Separation measurement.

Figure 5-12: 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. Bluetooth was operating in frequency hopping (Euro/US) mode.

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

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

See figures 5-13 to 5-16 for the plots of the number of hopping frequencies.

Figure 5-13: Number of Hopping Frequencies
Static PBRS, DH5

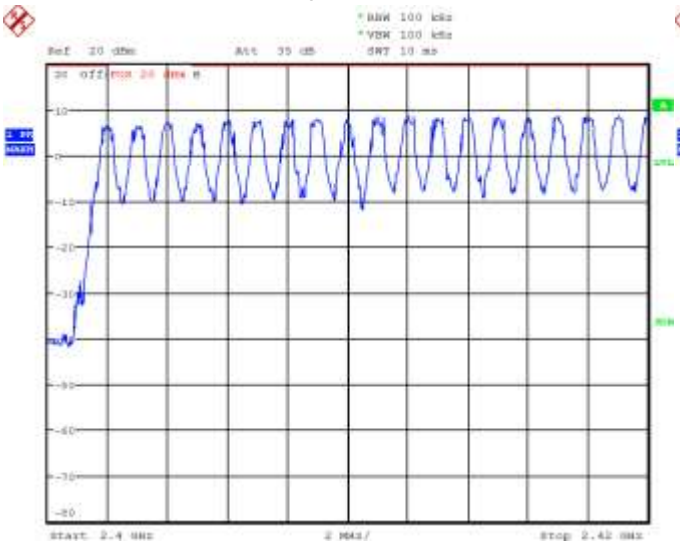
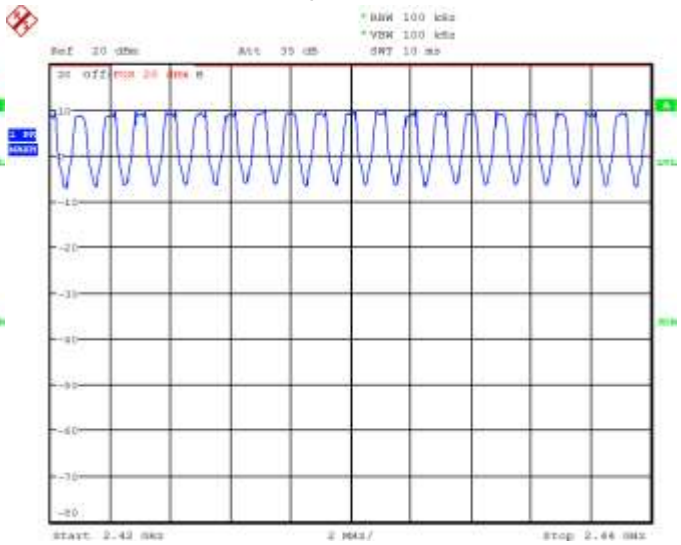


Figure 5-14: Number of Hopping Frequencies
Static PBRS, DH5



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Bluetooth RF Conducted Emission Test Results cont'd

Figure 5-15: Number of Hopping Frequencies
Static PBRS, DH5

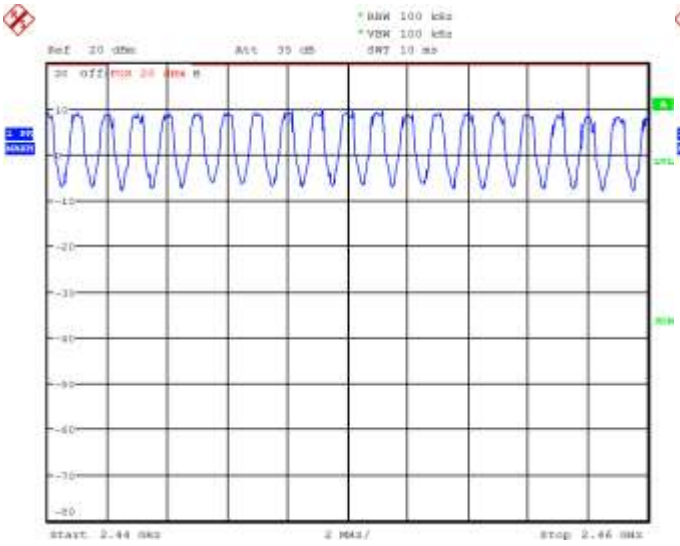
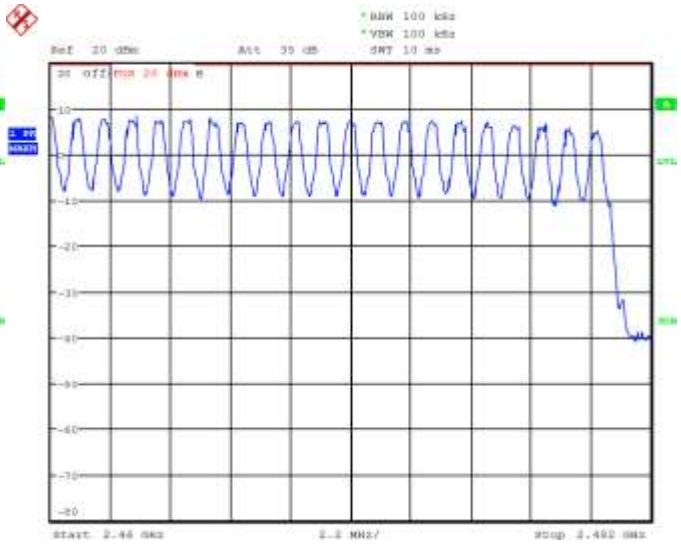


Figure 5-16: Number of Hopping Frequencies
Static PBRS, DH5



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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	0.3890	0.5200 x 320.0 = 166.40	400	275.52
39	DH1	0.3880	0.5200 x 320.0 = 166.40	400	275.84
78	DH1	0.3910	0.5220 x 320.0 = 167.04	400	274.88
0	DH3	1.6540	1.7500 x 159.9 = 279.83	400	135.53
39	DH3	1.6540	1.7500 x 159.9 = 279.83	400	135.53
78	DH3	1.6630	1.7750 x 159.9 = 283.82	400	134.09
0	DH5	2.9130	2.9400 x 106.8 = 313.99	400	88.89
39	DH5	2.9130	2.9900 x 106.8 = 319.33	400	88.89
78	DH5	2.9080	3.0200 x 106.8 = 322.54	400	89.43

See figures 5-17 to 5-25 for the plots of the dwell time.

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Bluetooth RF Conducted Emission Test Results cont'd

Figure 5-17: Time of Occupancy (Dwell Time)
Freq. Hopping, Static PBRS, DH1

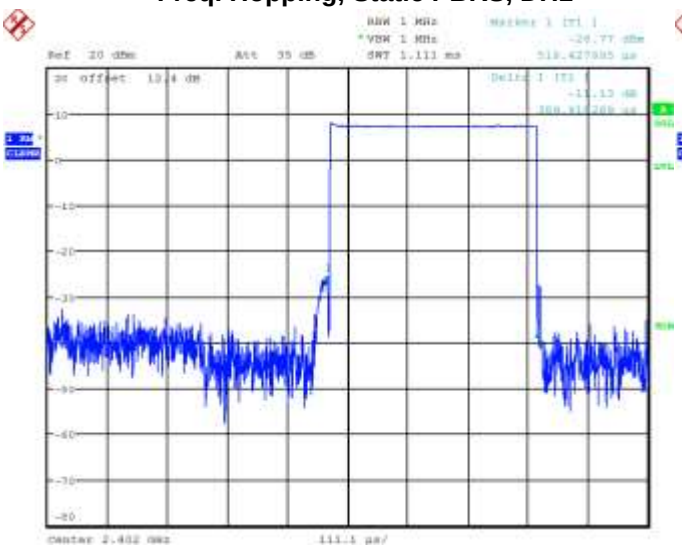

Figure 5-18: Time of Occupancy (Dwell Time)
Freq. Hopping, Static PBRS, DH1

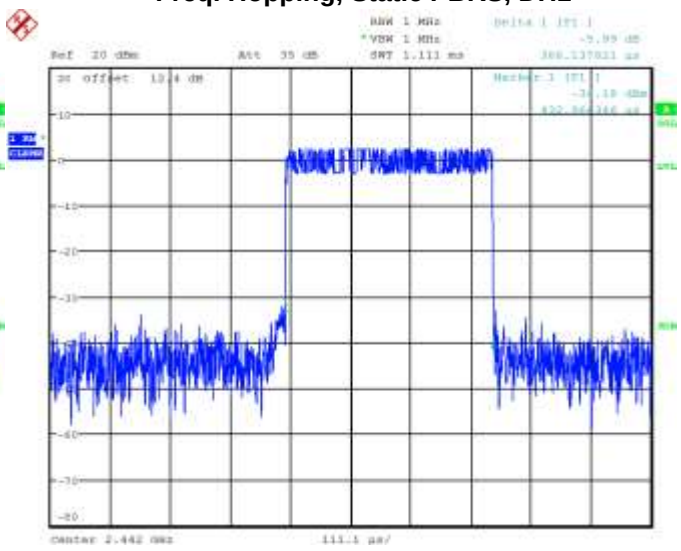

Figure 5-19: Time of Occupancy (Dwell Time)
Freq. Hopping, Static PBRS, DH1

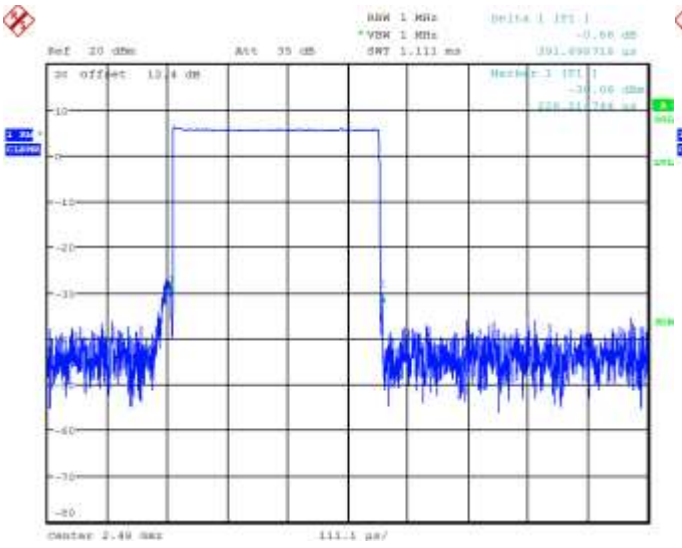

Figure 5-20: Time of Occupancy (Dwell Time)
Freq. Hopping, Static PBRS, DH3

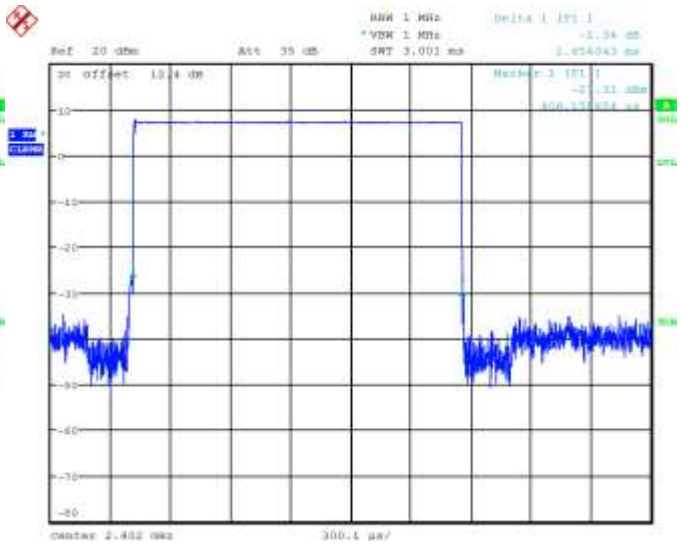

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Figure 5-21: Time of Occupancy (Dwell Time)
Freq. Hopping, Static PBRS, DH3

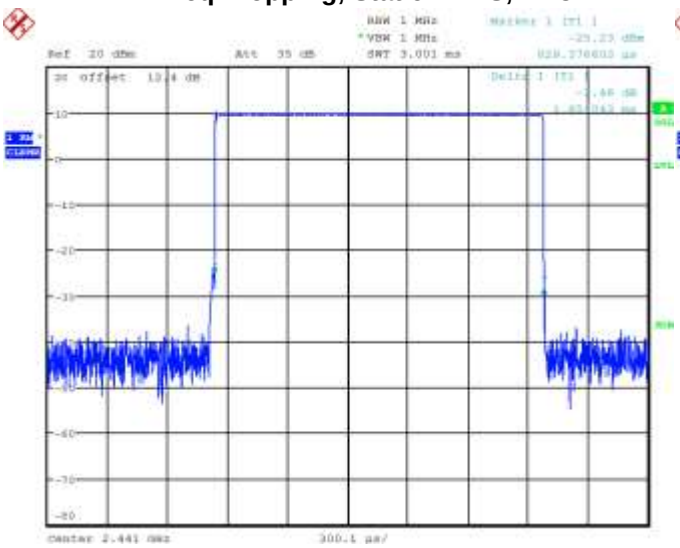


Figure 5-22: Time of Occupancy (Dwell Time)
Freq. Hopping, Static PBRS, DH3

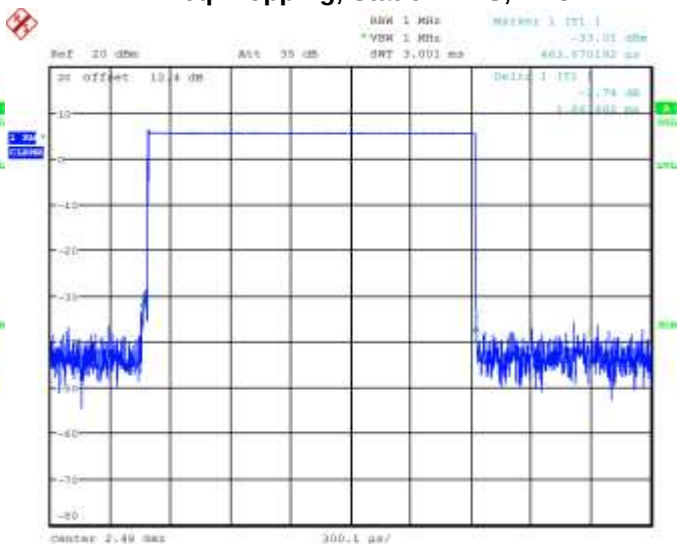


Figure 5-23: Time of Occupancy (Dwell Time)
Freq. Hopping, Static PBRS, DH5

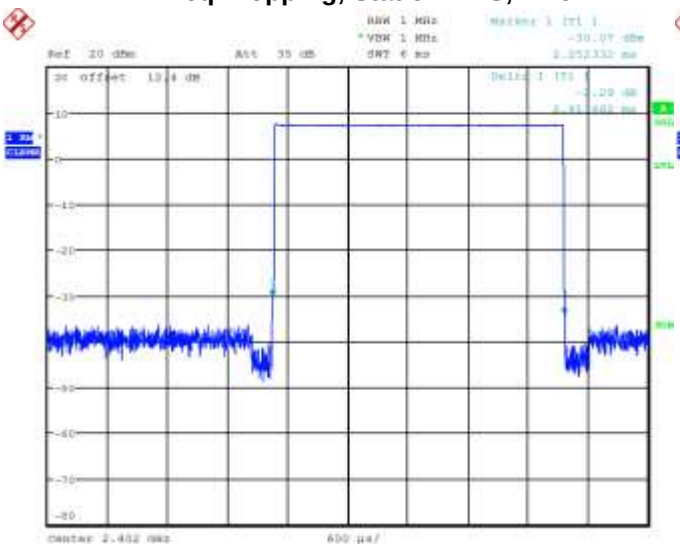
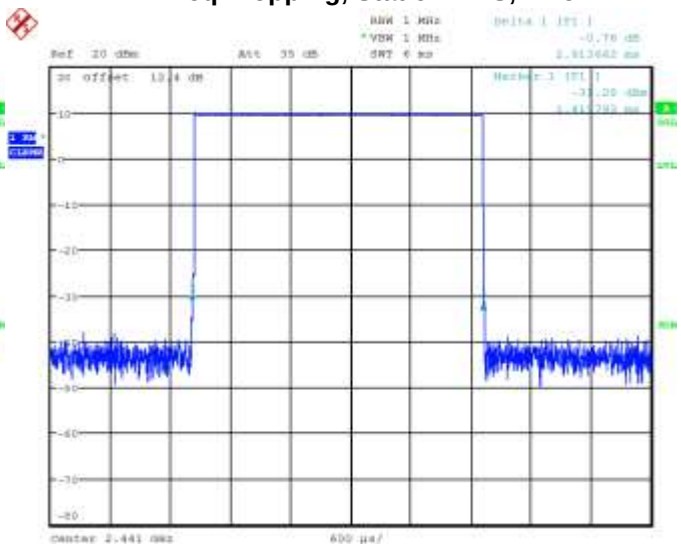


Figure 5-24: Time of Occupancy (Dwell Time)
Freq. Hopping, Static PBRS, DH5



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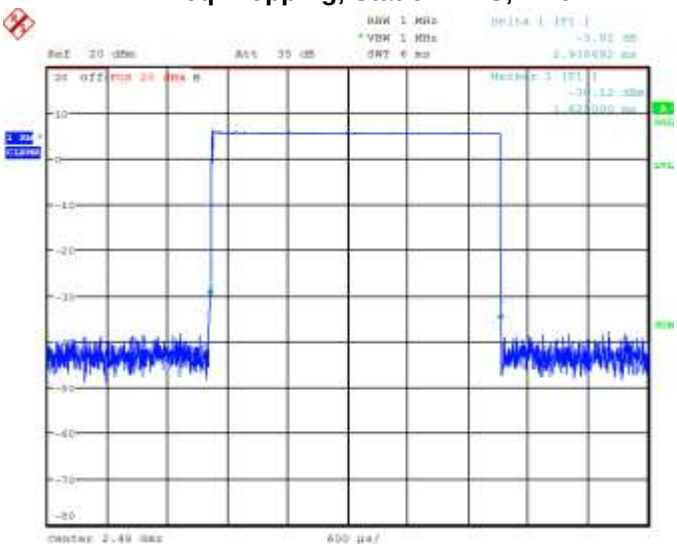
Bluetooth RF Conducted Emission Test Results cont'd

Figure 5-25: 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 1 as per 47 CFR 15.247(b) and RSS-210. Low channel (0), middle channel (39) and high channel (78) were measured. Bluetooth was operating in single frequency mode during the measurements. A reference offset of 12.4 dB was applied to the spectrum analyzer reference level for the coaxial cable loss and attenuators in the test circuit.

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

Bluetooth Channel	Measured Level (dBm)	Measured Level (W)	Class 1 Limit (dBm)
0	7.70	0.00589	0.0 to 20.0
39	**9.50**	**0.00891**	0.0 to 20.0
78	5.80	0.00380	0.0 to 20.0

Using Pattern type "Static PBRS" and packet type "2-DH5" during the measurements.

Bluetooth Channel	Measured Level (dBm)	Measured Level (W)	Class 1 Limit (dBm)
0	5.10	0.00324	0.0 to 20.0
39	**5.80**	**0.00380**	0.0 to 20.0
78	1.80	0.00151	0.0 to 20.0

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

Bluetooth Channel	Measured Level (dBm)	Measured Level (W)	Class 1 Limit (dBm)
0	5.10	0.00324	0.0 to 20.0
39	**5.80**	**0.00380**	0.0 to 20.0
78	1.80	0.00151	0.0 to 20.0

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Bluetooth RF Conducted Emission Test Results cont'd

Band Edge Compliance

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

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

Bluetooth Channel	Operating Mode	Measured Level (dBc)	Limit (dBc)	Margin (dB)
0	Single Frequency	-48.27	-20	-28.27
78	Single Frequency	-44.56	-20	-24.56
0	Hopping	-48.24	-20	-28.24
78	Hopping	-46.67	-20	-26.67

See figures 5-26 to 5-29 for the plots of the band edge compliance measurements.

Figure 5-26: Band Edge Compliance
Single Freq., Static PBRS, DH5

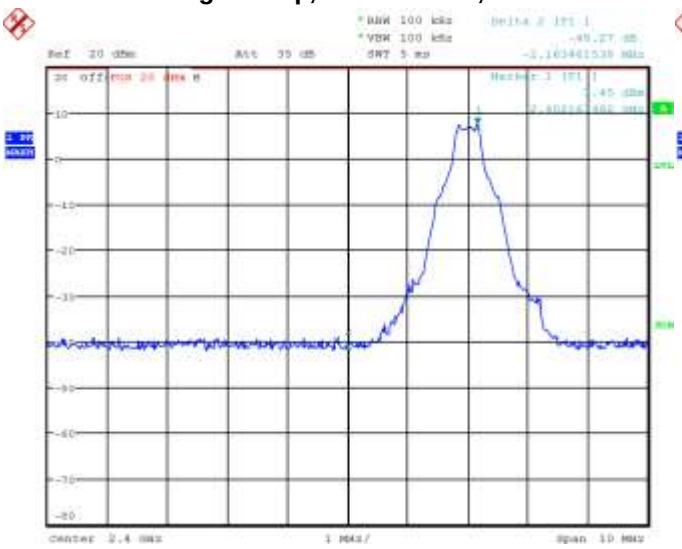
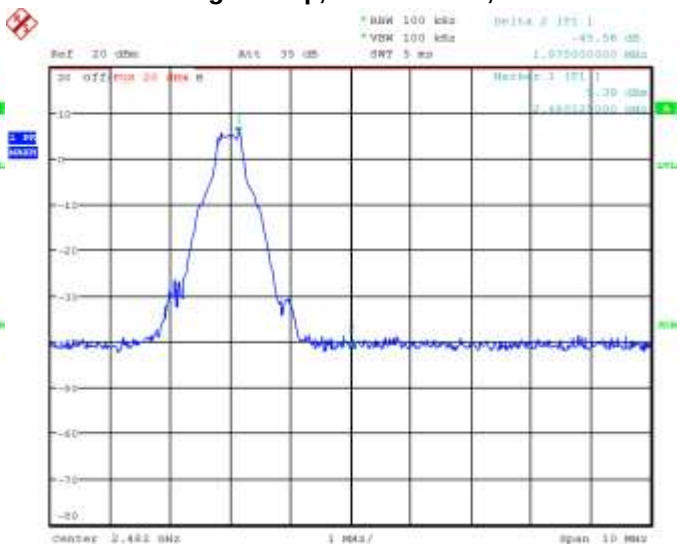


Figure 5-27: Band Edge Compliance
Single Freq., Static PBRS, DH5



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Bluetooth RF Conducted Emission Test Results cont'd

Figure 5-28: Band Edge Compliance
Freq. Hopping, Static PBRS, DH5

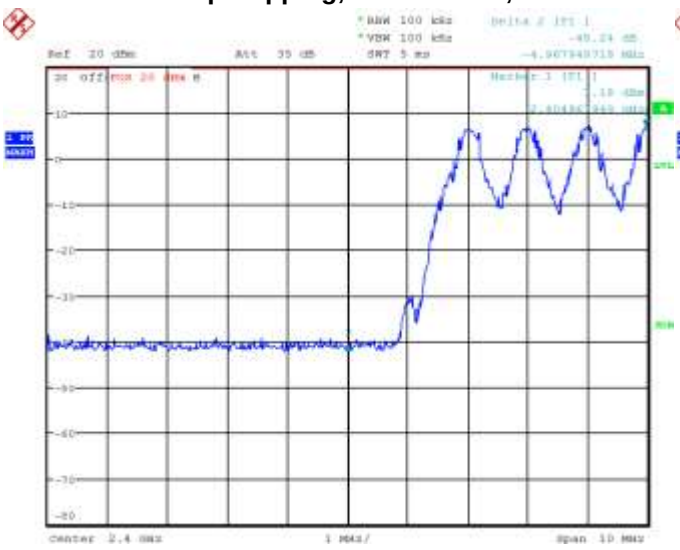
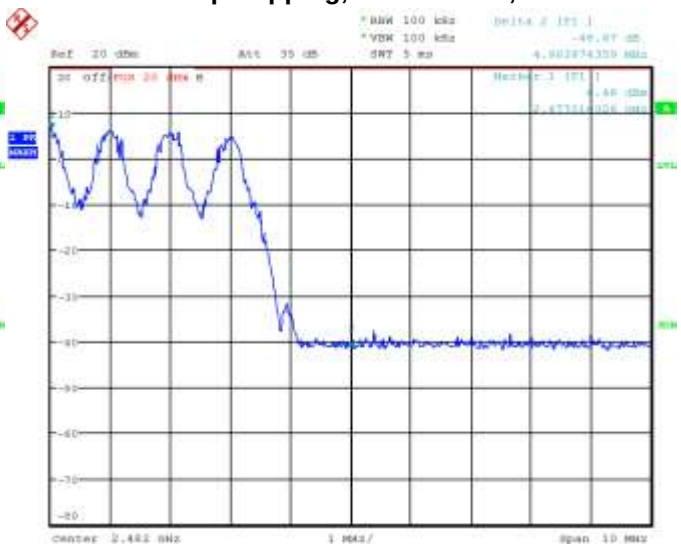


Figure 5-29: Band Edge Compliance
Freq. Hopping, Static PBRS, DH5



Using pattern type "Static PBRS" and packet type "2-DH5" during the measurements.

Bluetooth Channel	Operating Mode	Measured Level (dBc)	Limit (dBc)	Margin (dB)
0	Single Frequency	-44.92	-20	-24.92
78	Single Frequency	-41.00	-20	-21.00
0	Hopping	-45.10	-20	-25.10
78	Hopping	-41.32	-20	-21.32

See figures 5-30 to 5-33 for the plots of the band edge compliance measurements.

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Bluetooth RF Conducted Emission Test Results cont'd

Figure 5-30: Band Edge Compliance
Single Freq., Static PBRS, 2-DH5

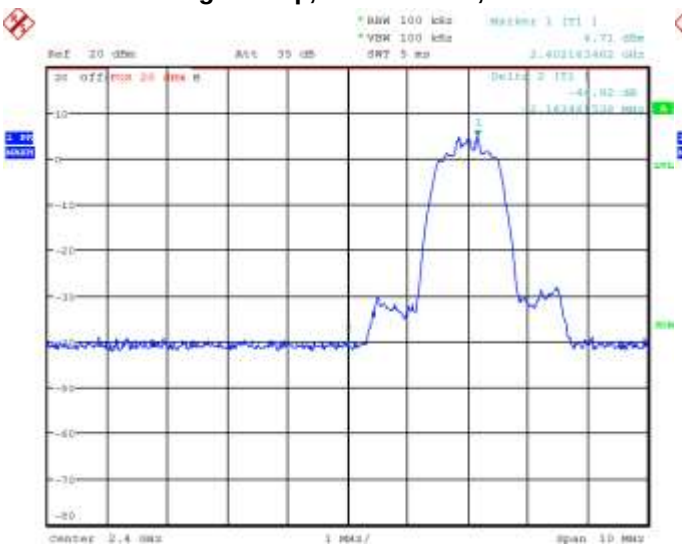


Figure 5-31: Band Edge Compliance
Single Freq., Static PBRS, 2-DH5

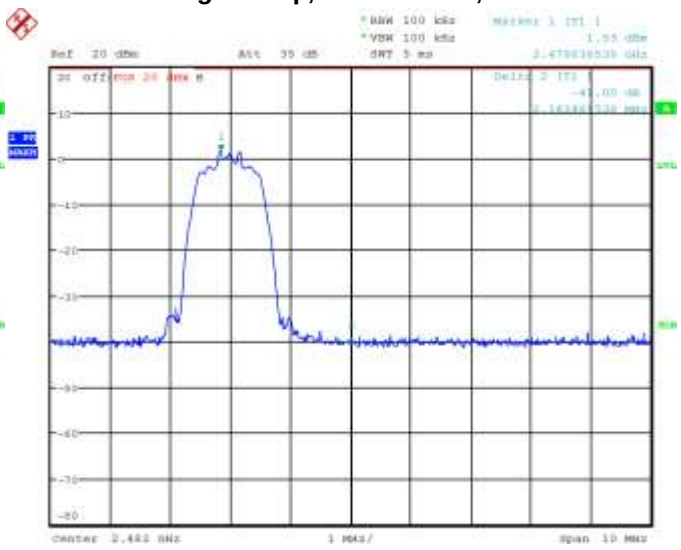


Figure 5-32: Band Edge Compliance
Freq. Hopping, Static PBRS, 2-DH5

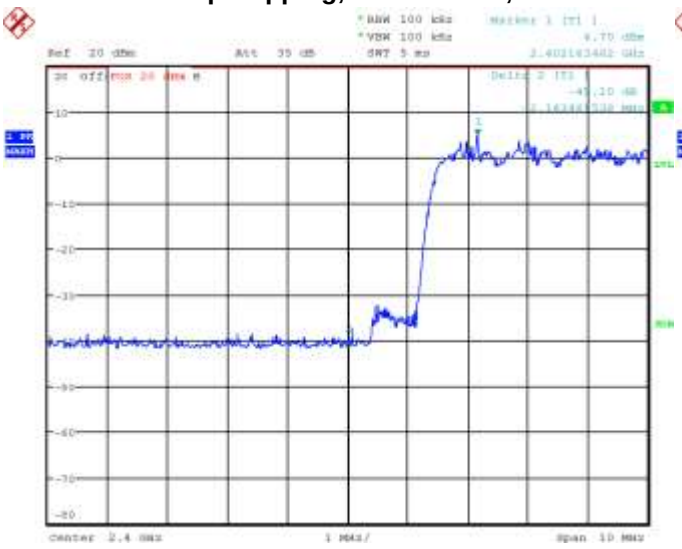
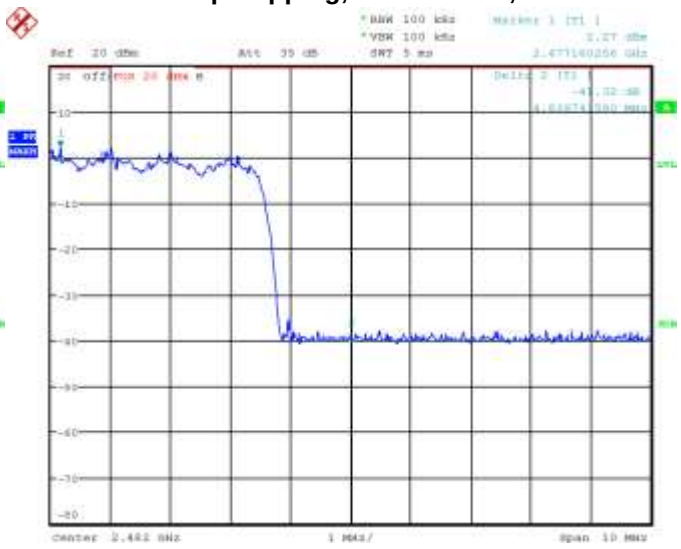


Figure 5-33: Band Edge Compliance
Freq. Hopping, Static PBRS, 2-DH5



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Bluetooth RF Conducted Emission Test Results cont'd

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

Bluetooth Channel	Operating Mode	Measured Level (dBc)	Limit (dBc)	Margin (dB)
0	Single Frequency	-43.69	-20	-23.69
78	Single Frequency	-42.43	-20	-22.43
0	Hopping	-45.01	-20	-25.01
78	Hopping	-39.44	-20	-19.44

See figures 5-34 to 5-37 for the plots of the band edge compliance measurements.

Figure 5-34: Band Edge Compliance
Single Freq., Static PBRS, 3-DH5

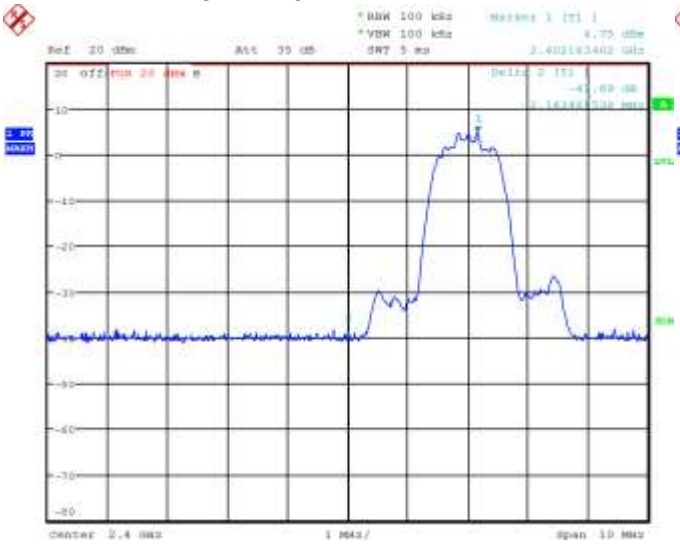
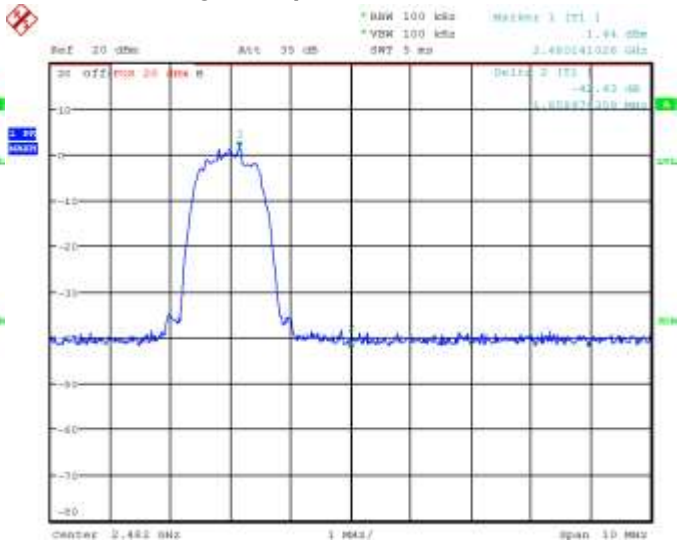


Figure 5-35: Band Edge Compliance
Single Freq., Static PBRS, 3-DH5



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Bluetooth RF Conducted Emission Test Results cont'd

Figure 5-36: Band Edge Compliance
Freq. Hopping, Static PBRS, 3-DH5

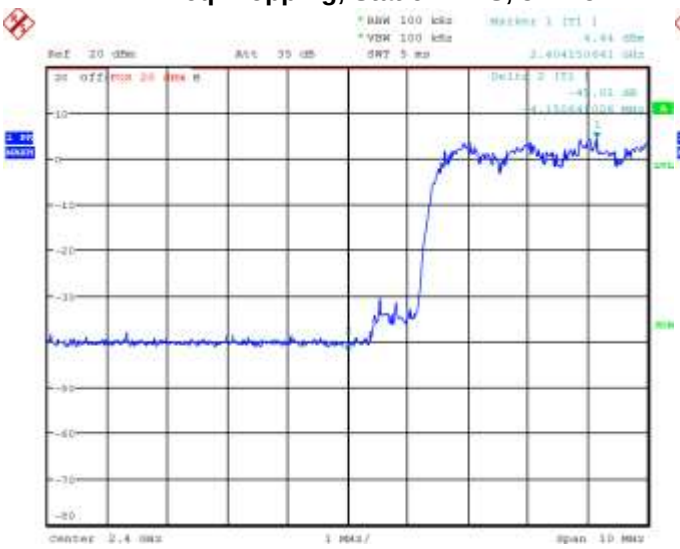
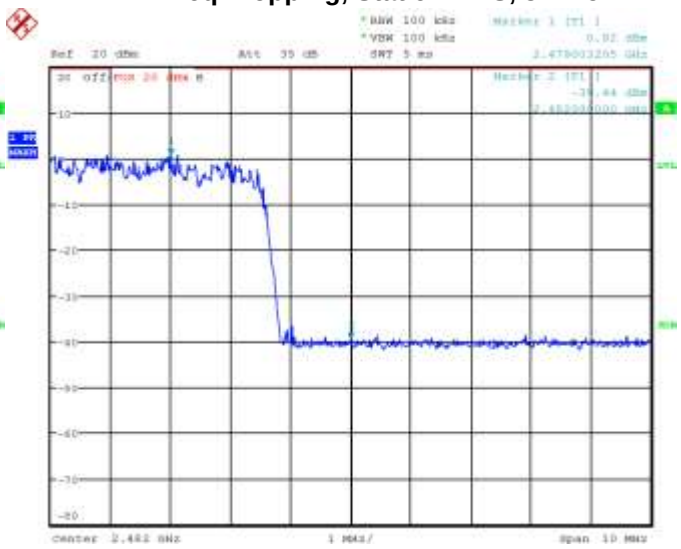


Figure 5-37: Band Edge Compliance
Freq. Hopping, Static PBRS, 3-DH5



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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. Low channel (0), mid channel (39) and high channel (78) were measured. Bluetooth was operating in single frequency and hopping mode. A reference offset of 12.4 dB was applied to the spectrum analyzer reference level for the attenuators and coaxial cable loss in the test circuit.

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

Bluetooth Channel	Channel Power (dBm)	Max. Measured Level (dBm)	Max. Measured Level from carrier (dBc)	Limit (dBc)
0.00	7.70	-44.26	-51.96	-20.00
39.00	9.50	-44.76	-54.26	-20.00
78.00	5.80	-44.50	-50.30	-20.00
Hopping mode	5.80	-44.80	-50.60	-20.00

See figures 5-38 to 5-41 for the plots of the spurious RF conducted emissions.

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Bluetooth RF Conducted Emission Test Results cont'd

Figure 5-38: Spurious RF Conducted Emissions
Single Freq., Static PBRS, DH5,

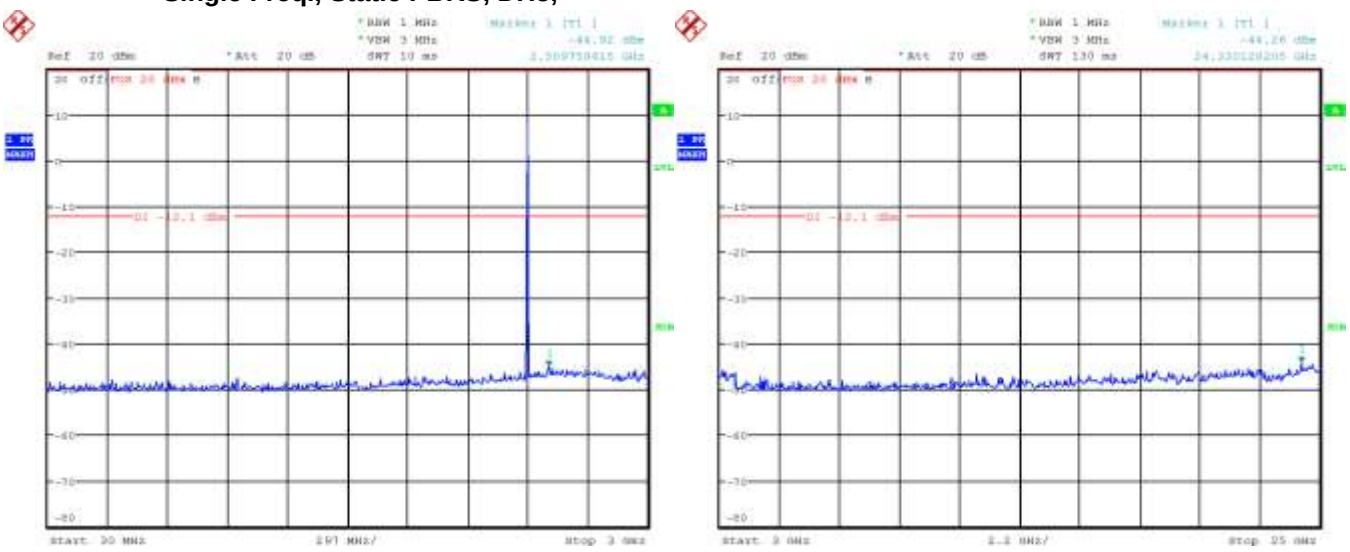
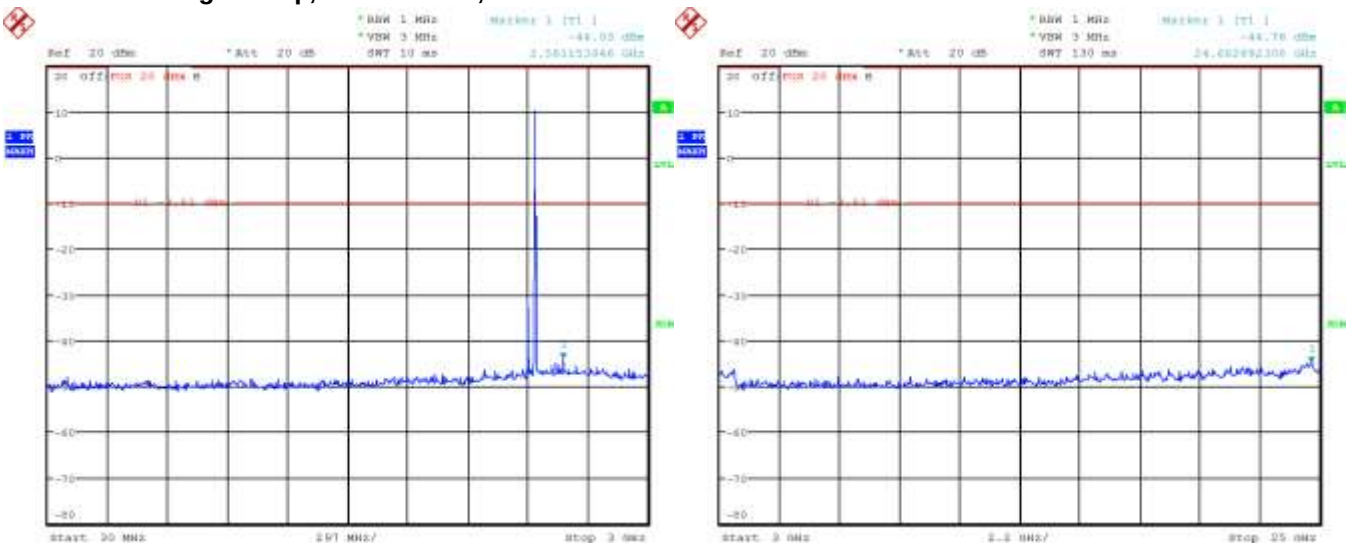


Figure 5-39: Spurious RF Conducted Emissions
Single Freq., Static PBRS, DH5



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Bluetooth RF Conducted Emission Test Results cont'd

Figure 5-40: Spurious RF Conducted Emissions
Single Freq., Static PBRS, DH5

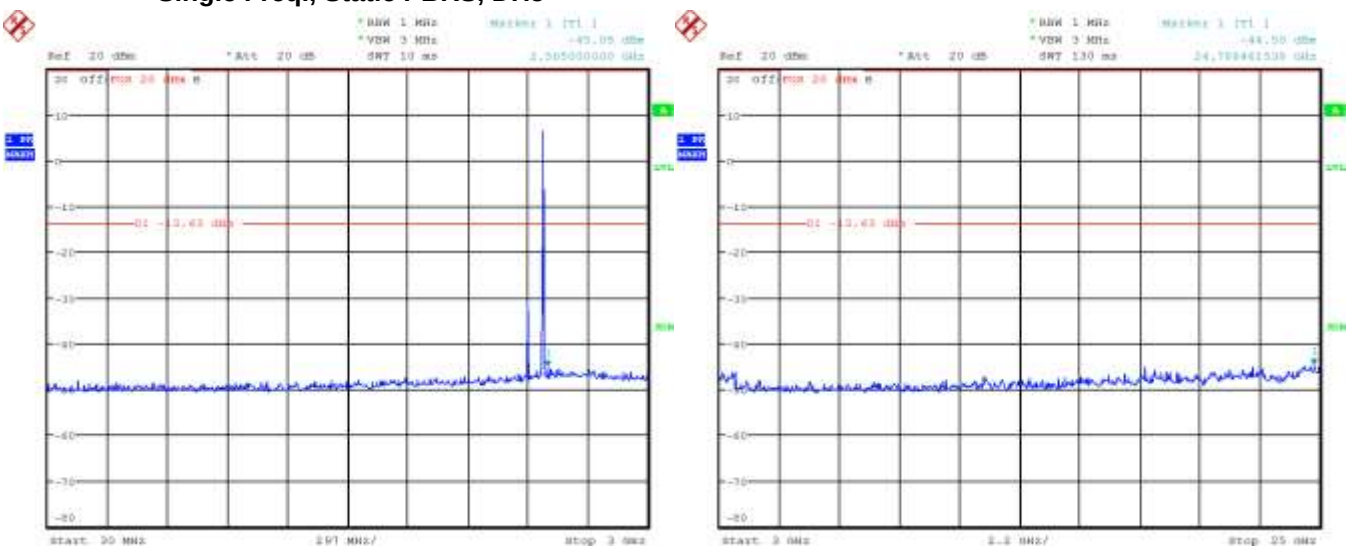
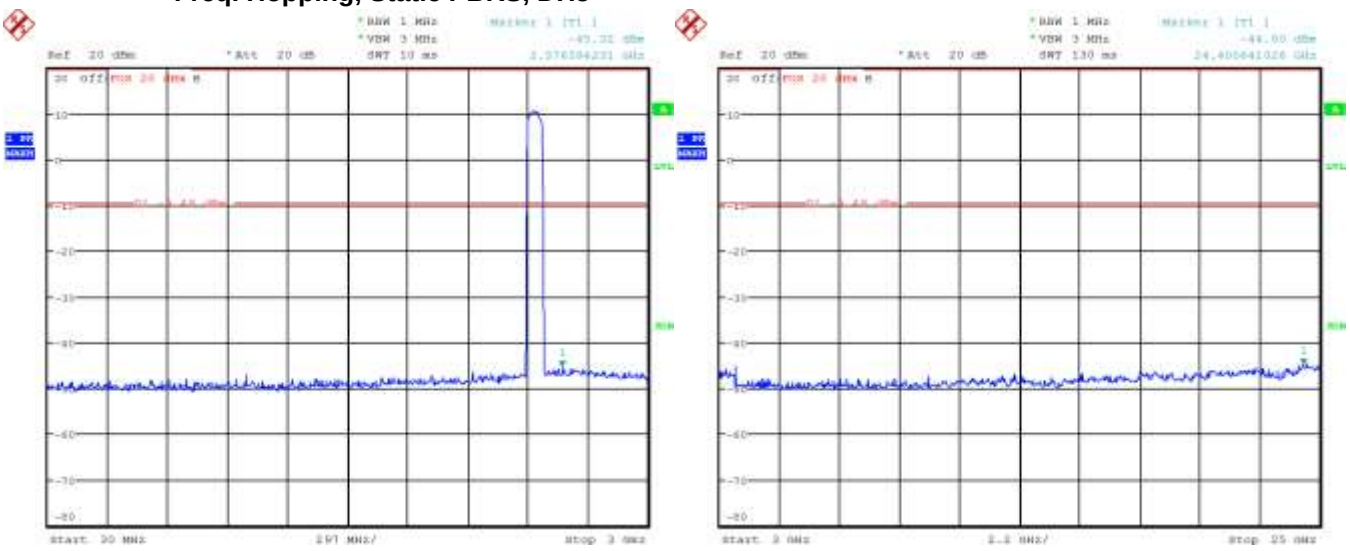


Figure 5-41: Spurious RF Conducted Emissions
Freq. Hopping, Static PBRS, DH5



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Bluetooth RF Conducted Emission Test Results cont'd

Using pattern type "Static PBRS" and packet type "2-DH5" during the measurements.

Bluetooth Channel	Channel Power (dBm)	Max. Measured Level (dBm)	Max. Measured Level from carrier (dBc)	Limit (dBc)
0.00	5.10	-44.34	-49.44	-20.00
39.00	5.80	-45.02	-50.82	-20.00
78.00	1.80	-44.29	-46.09	-20.00
Hopping mode	1.80	-44.24	-46.04	-20.00

See figures 5-42 to 5-45 for the plots of the spurious RF conducted emissions.

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Bluetooth RF Conducted Emission Test Results cont'd

Figure 5-42: Spurious RF Conducted Emissions
Single Freq., Static PBRS, 2-DH5

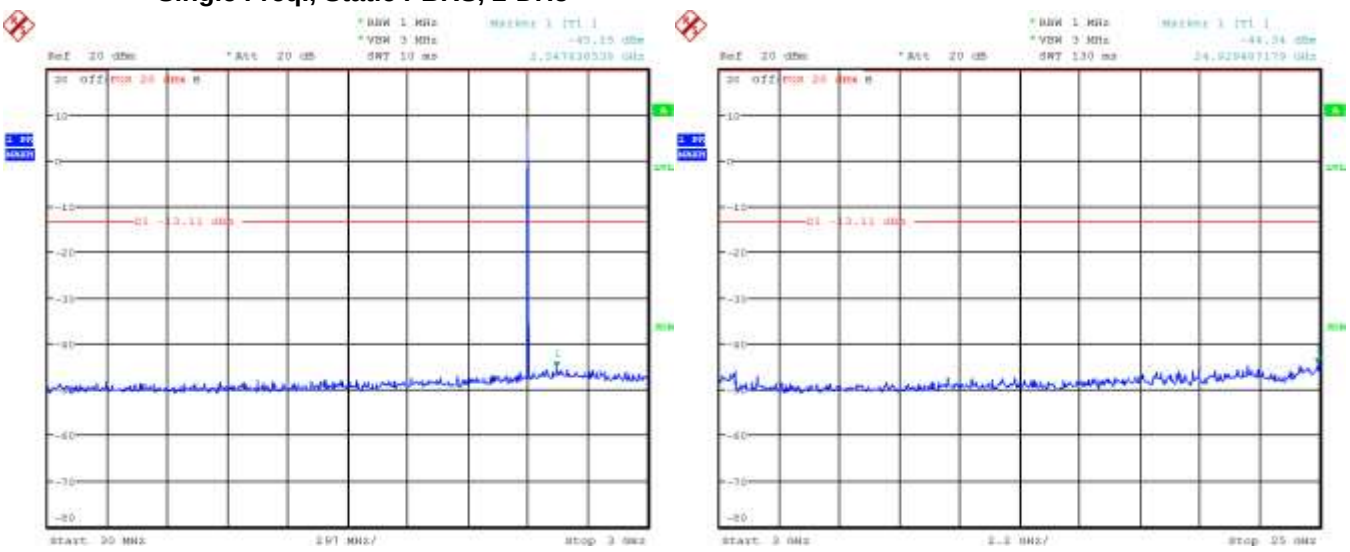
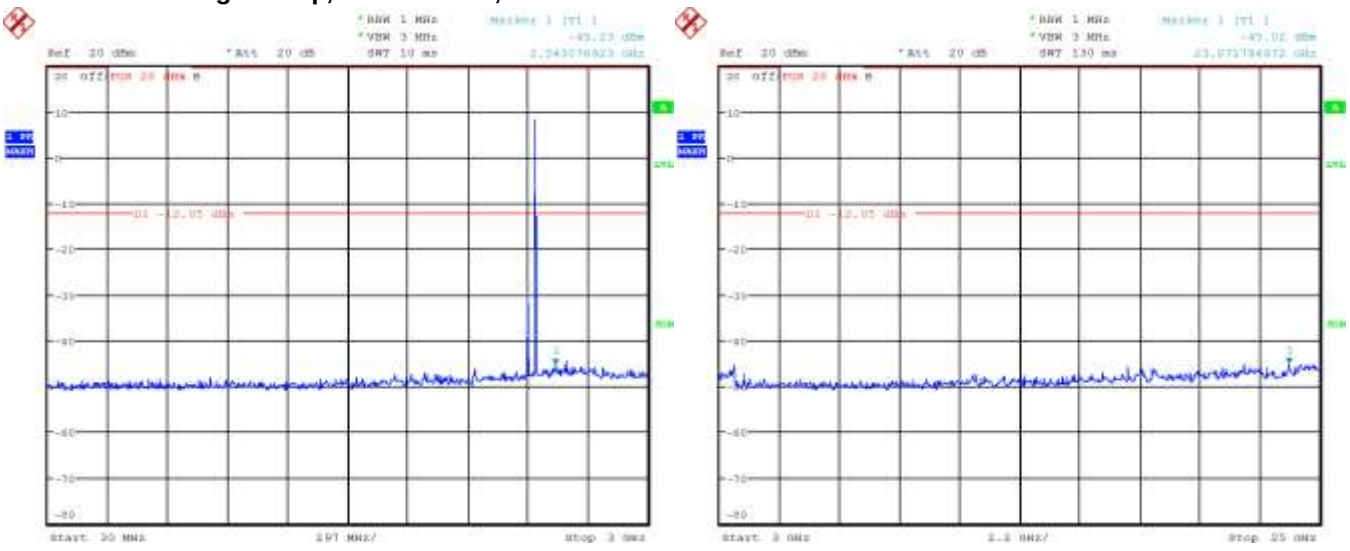


Figure 5-43: Spurious RF Conducted Emissions
Single Freq., Static PBRS, 2-DH5



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Bluetooth RF Conducted Emission Test Results cont'd

Figure 5-44: Spurious RF Conducted Emissions
Single Freq., Static PBRS, 2-DH5

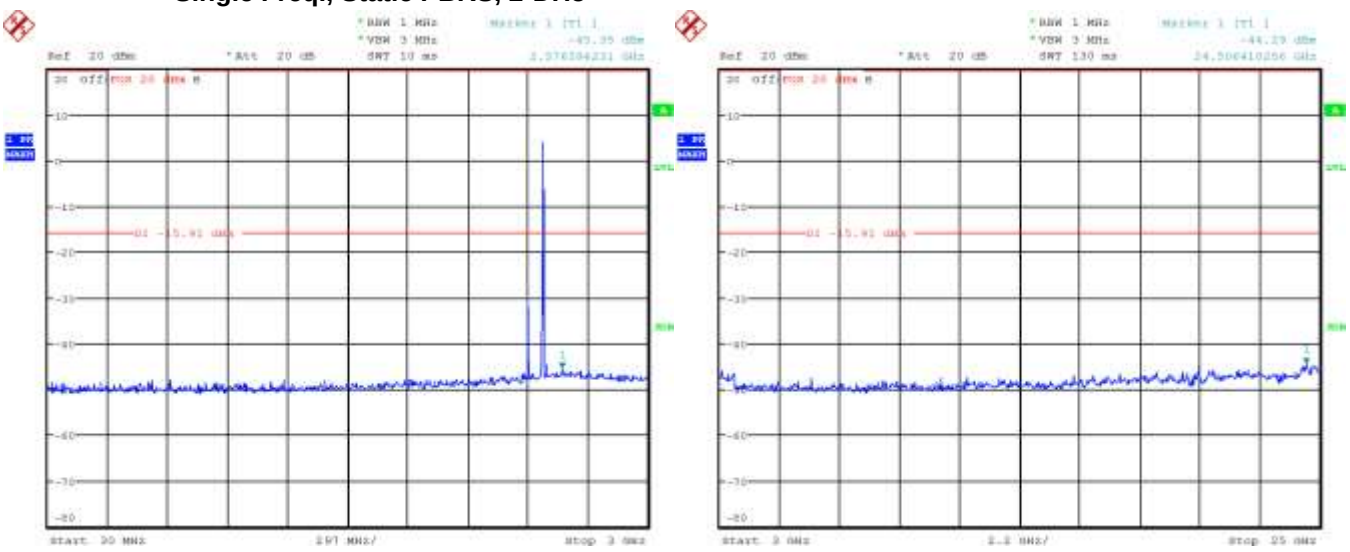
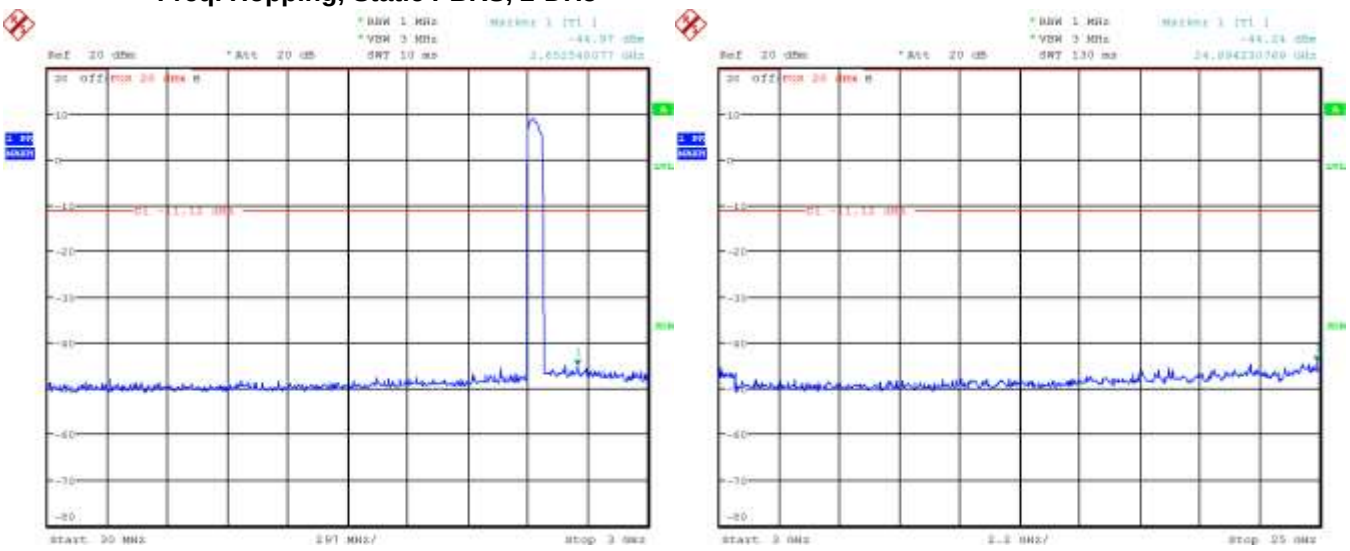


Figure 5-45: Spurious RF Conducted Emissions
Freq. Hopping, Static PBRS, 2-DH5



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Bluetooth RF Conducted Emission Test Results cont'd

Using pattern type "Static PBRS" 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)
0.00	5.10	-44.98	-50.08	-20.00
39.00	5.80	-44.46	-50.26	-20.00
78.00	1.80	-44.64	-46.44	-20.00
Hopping mode	1.80	-44.77	-46.57	-20.00

See figures 5-46 to 5-49 for the plots of the spurious RF conducted emissions.

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Bluetooth RF Conducted Emission Test Results cont'd

Figure 5-46: Spurious RF Conducted Emissions
Single Freq., Static PBRS, 3-DH5

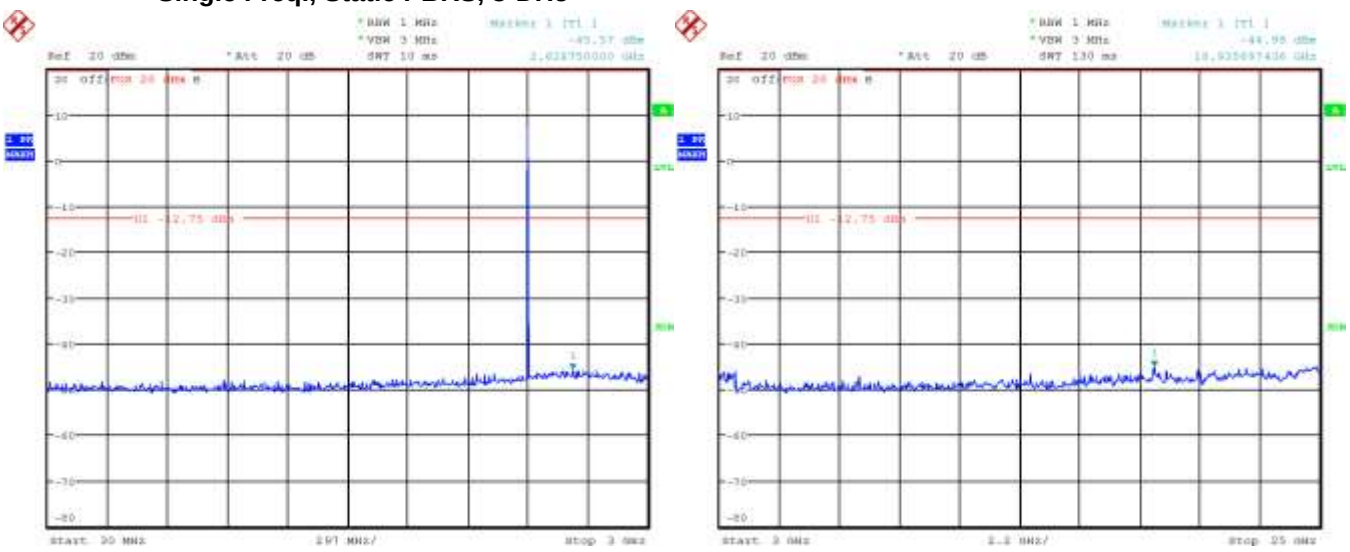
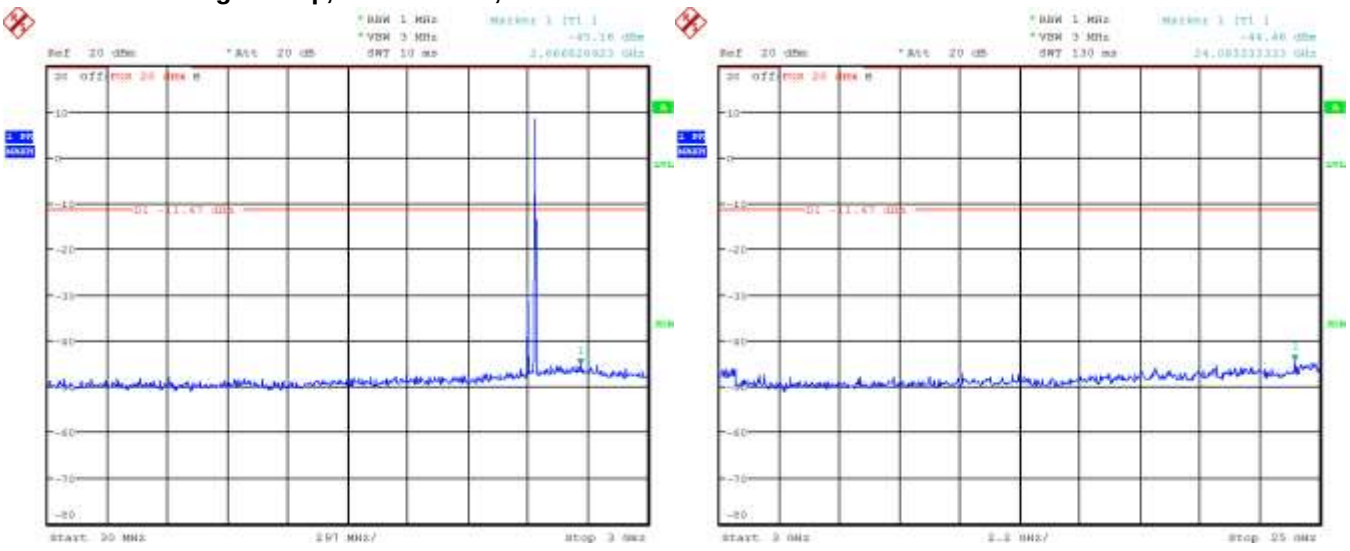


Figure 5-47: Spurious RF Conducted Emissions
Single Freq., Static PBRS, 3-DH5



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Bluetooth RF Conducted Emission Test Results cont'd

Figure 5-48: Spurious RF Conducted Emissions
Single Freq., Static PBRS, 3-DH5

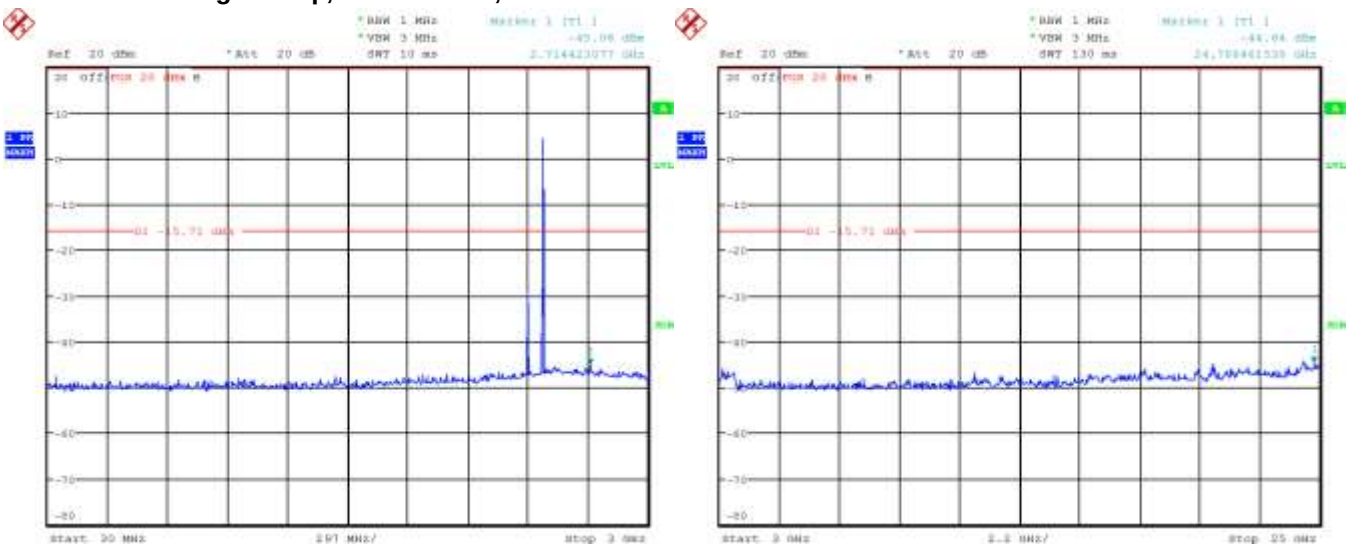
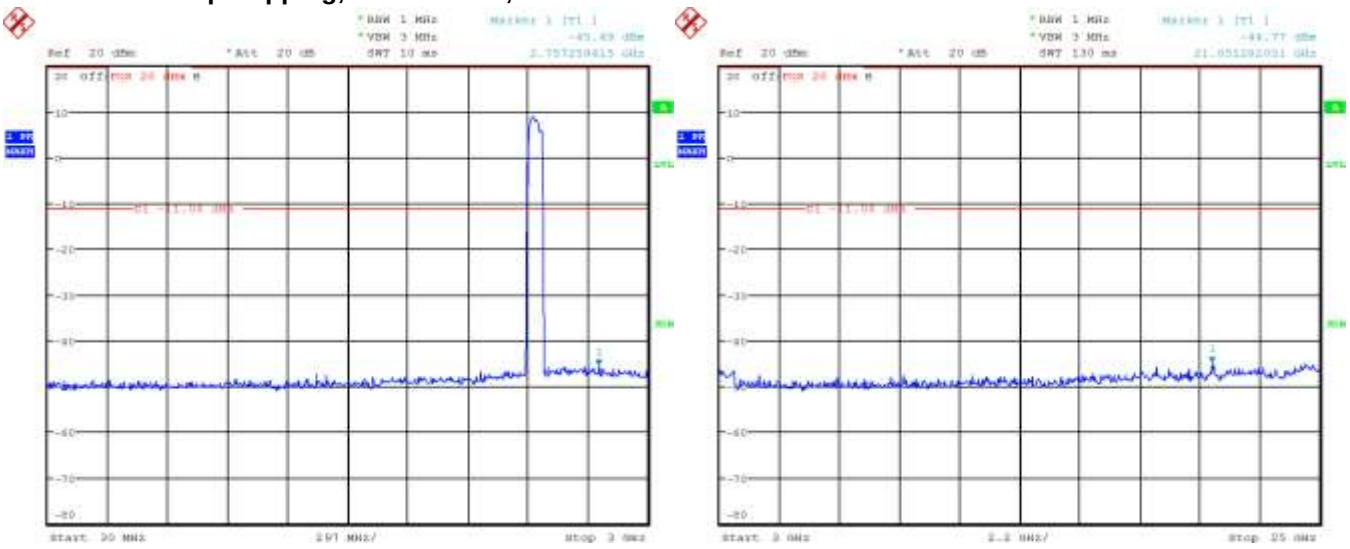


Figure 5-49: Spurious RF Conducted Emissions
Freq. Hopping, Static PBRS, 3-DH5



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Bluetooth Low Energy RF Conducted Emission Test Results

6 dB Bandwidth

The EUT met the requirements of the 6 dB bandwidth as per 47 CFR 15.247(a)(2) and RSS-210.

Channels 0, 20 and 39 were measured.

Channel	Limit (kHz)	Measured Level (KHz)
0	≥ 500	721.15
20	≥ 500	**729.17**
39	≥ 500	713.14

See figures 5-50 to 5-52 for the plots of the 6 dB bandwidth measurements for Channels 0, 20, and 39.

Figure 5-50: 6 dB Bandwidth
LE, Channel 0

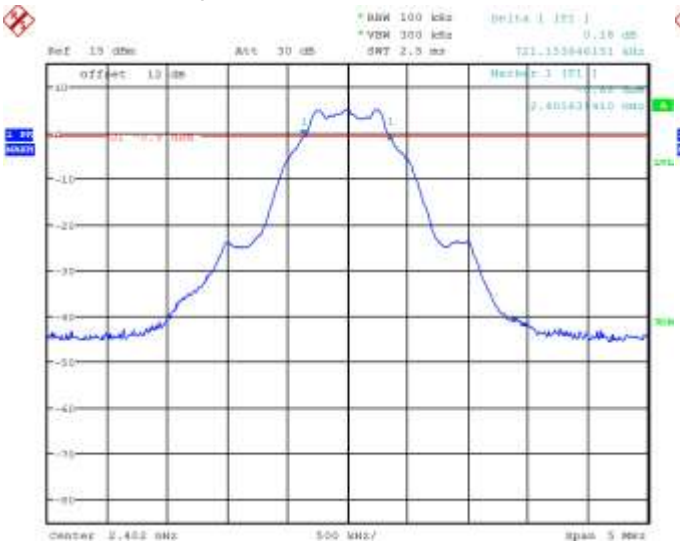
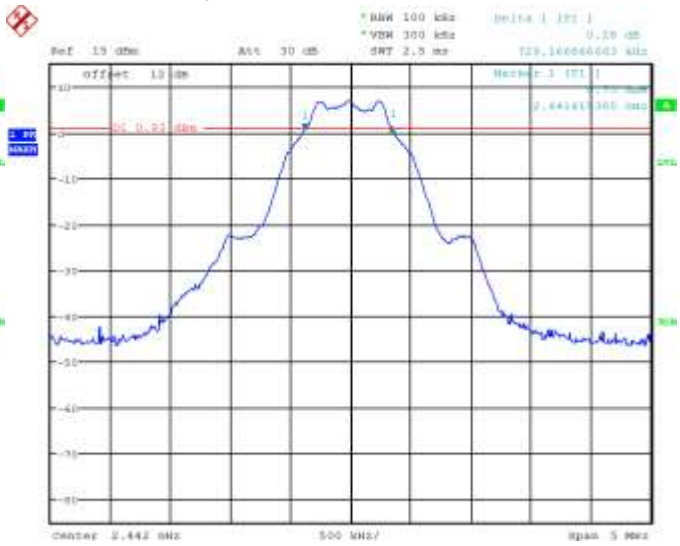


Figure 5-51: 6 dB Bandwidth
LE, Channel 20



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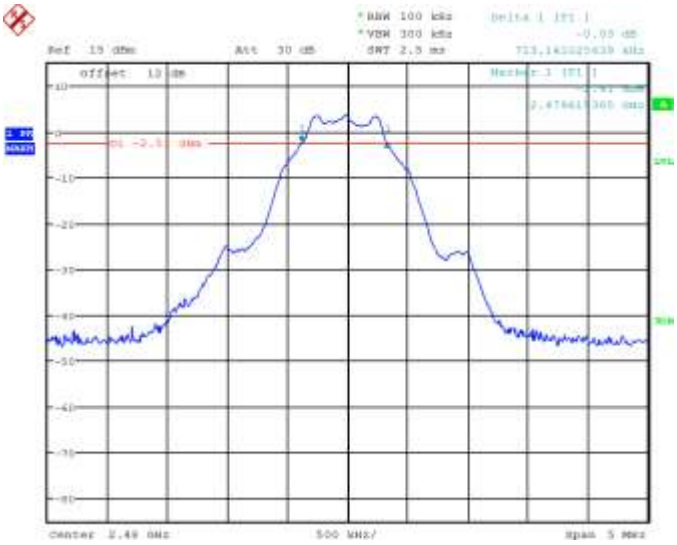
Bluetooth Low Energy RF Conducted Emission Test Results cont'd

Figure 5-52: 6 dB Bandwidth
LE, Channel 39



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Bluetooth Low Energy 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. Channels 0, 20 and 39 were measured using an Agilent power meter, model N1911A with model N1921A power sensor. A reference offset of 6.4 dB was applied to the power meter reference level for the coaxial cable loss and attenuators in the test circuit.

Channel	Class 2 Limit (W)	Measured Level (dBm)	Measured Level (mW)
0	< 1.00	4.9	3.09029
20	< 1.00	**8.0**	**6.30957**
39	< 1.00	2.7	1.86208

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Bluetooth Low Energy 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. Channels 0 and 39 were measured.

Channel	Limit (dBc)	Measured Level (dBc)	Margin (dBc)
0	< -20	-49.78	-29.78
39	< -20	**-48.30**	**-28.30**

See figures 5-53 to 5-54 for the plots of the band edge compliance measurements for Channels 0 and 39.

Figure 5-53: Band Edge Compliance LE, Channel 0

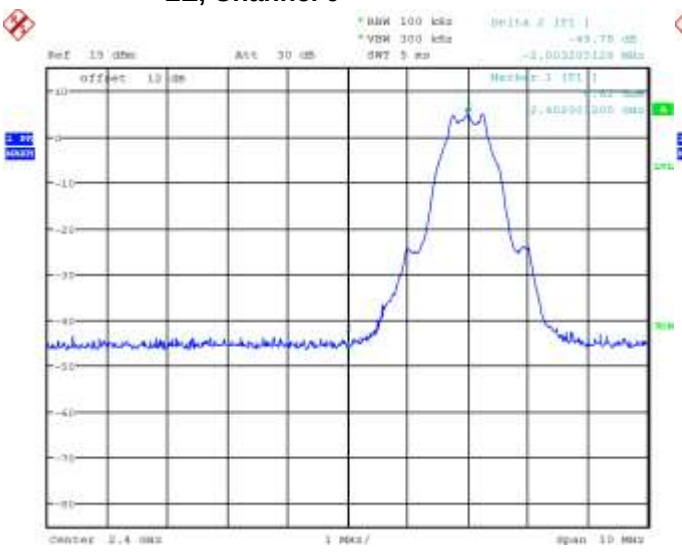
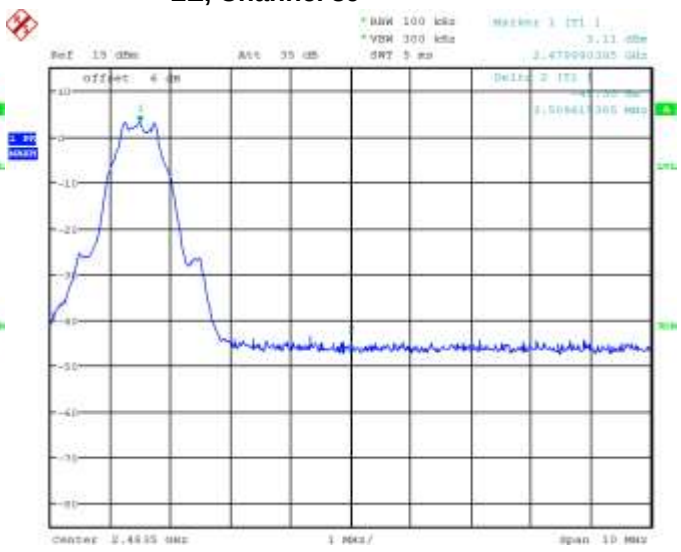


Figure 5-54: Band Edge Compliance LE, Channel 39



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Bluetooth Low Energy 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. Channels 0, 20 and 39 were measured.

Channel	Limit (dBm)	Measured Level (dBm)	Margin (dBm)
0	< 8.00	-8.78	-16.78
20	< 8.00	**-6.81**	**-14.81**
39	< 8.00	-10.29	-18.29

See figures 5-55 to 5-57 for the plots of the peak power spectral density for Channels 0, 20 and 39.

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Bluetooth Low Energy RF Conducted Emission Test Results cont'd

Figure 5-55: Peak Power Spectral Density LE, Channel 0

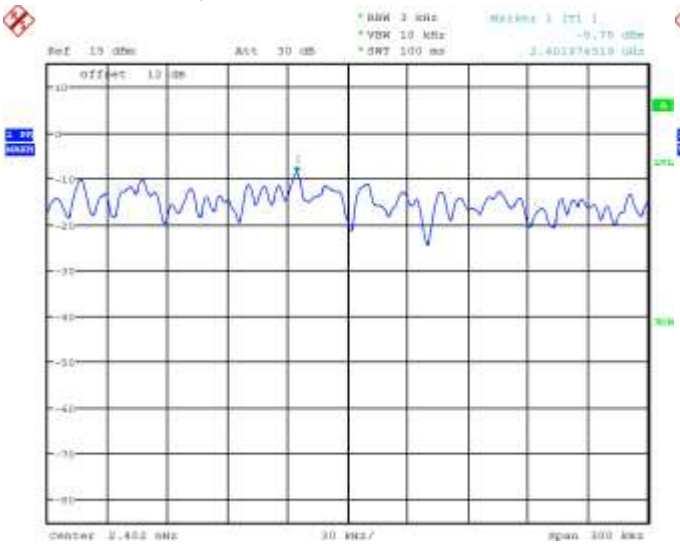


Figure 5-56: Peak Power Spectral Density LE, Channel 20

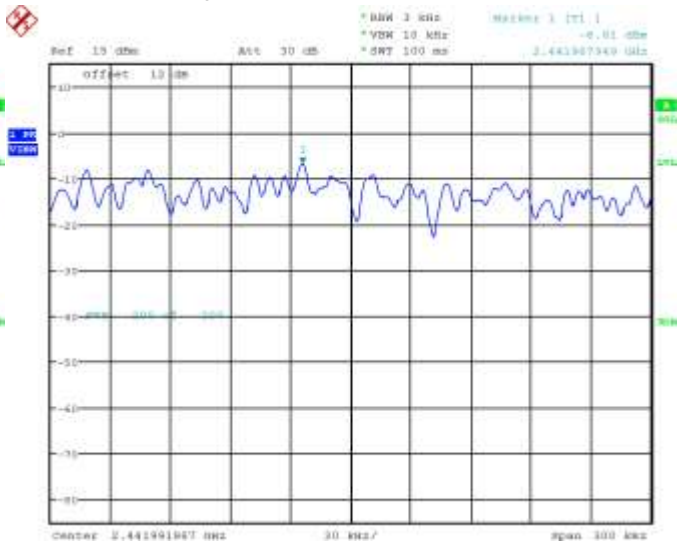
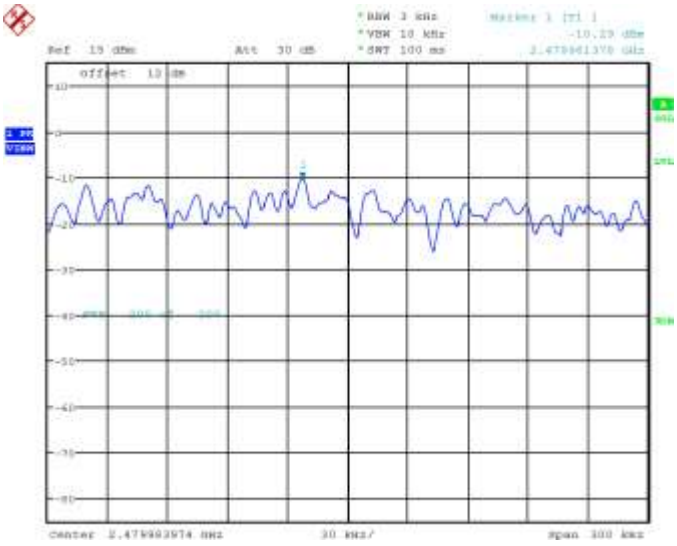


Figure 5-57: Peak Power Spectral Density LE, Channel 39



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Bluetooth Low Energy RF Conducted Emission Test Results cont'd

Spurious RF Conducted Emissions

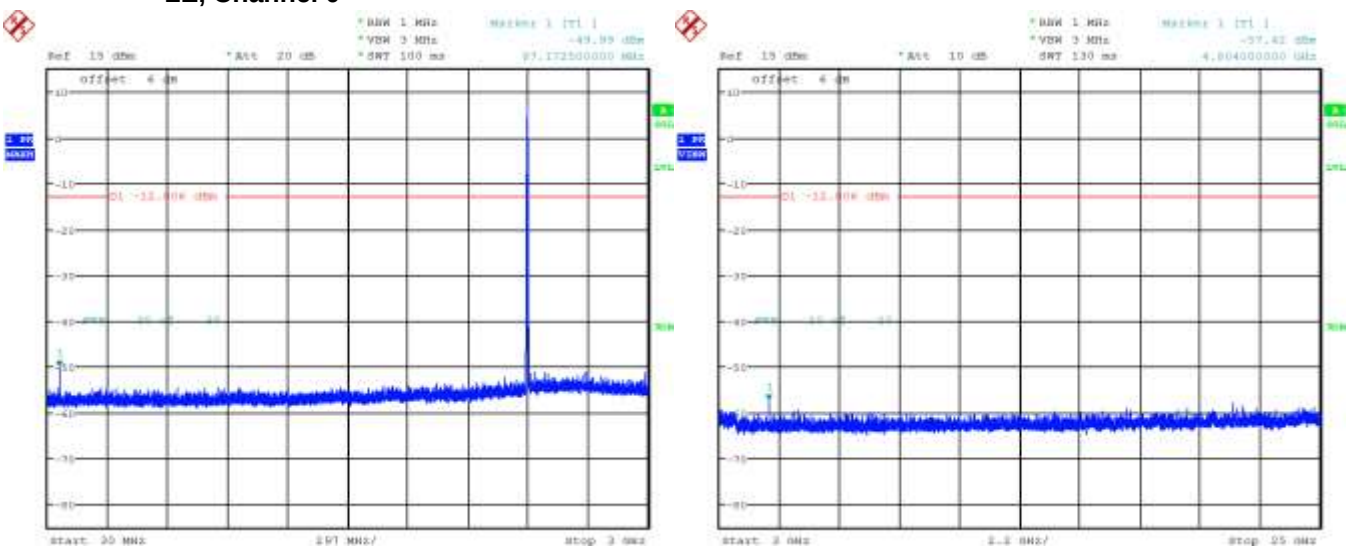
The EUT met the requirements of the spurious RF conducted emissions as per 47 CFR 15.247(c) and RSS-210. Channels 0, 20 and 39 were measured. Peak power was measured using an Agilent power meter, model N1911A with model N1921A power sensor. A reference offset of 6.4 dB was applied to the power meter reference level for the coaxial cable loss and attenuators in the test circuit.

Channel	Power (dBm)	Max. Measured Level (dBm)	Max. Measured Level from Carrier (dBc)	Limit (dBc)
0	4.9	-50.0	-54.9	-20.0
20	8.0	-49.7	-57.7	-20.0
39	2.7	-51.9	-54.6	-20.0

The emissions were in the NF.

See figures 5-58 to 5-60 for the plots of the spurious RF conducted emissions for Channels 0, 20 and 39.

Figure 5-58: Spurious Conducted RF Emissions
LE, Channel 0



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Bluetooth Low Energy RF Conducted Emission Test Results cont'd

Figure 5-59 : Spurious Conducted RF Emissions
LE, Channel 20

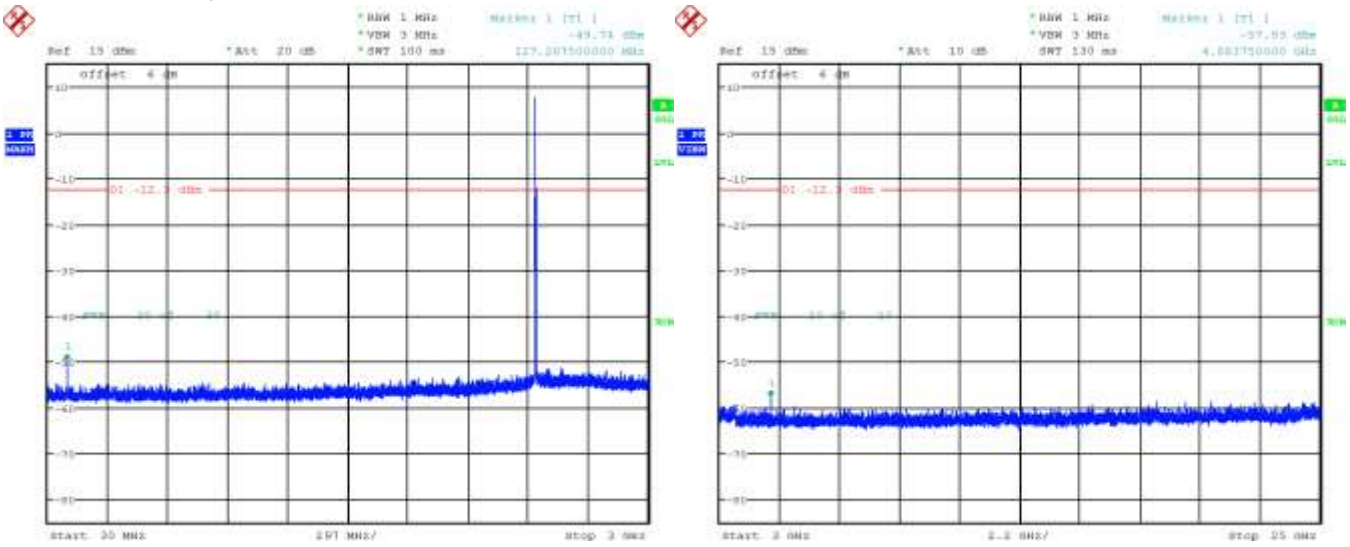
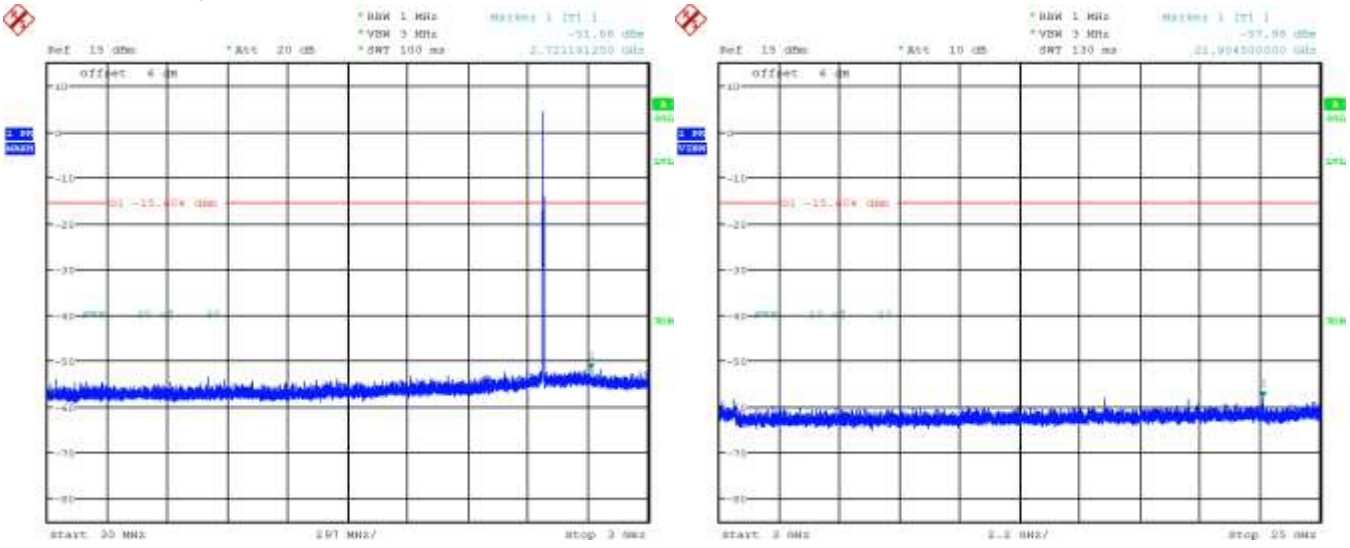


Figure 5-60: Spurious Conducted RF Emissions
LE, Channel 39



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