EMI 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

A division of Research In Motion Limited

REPORT NO.: RTS-6012-1212-07

PRODUCT MODEL NO.: RFA91LW
TYPE NAME: BlackBerry® smartphone
FCC ID: L6ARFA90LW
IC: 2503A-RFA90LW
Emission Designator (Bluetooth): 1M31F1D
Emission Designator (802.11b/g/n): 17M7G1D
Emission Designator (802.11a/n): 17M0G1D

DATE: December 07, 2012

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

592

Statement of Performance:

The BlackBerry® smartphone, model RFA91LW, part number CER-48926-001 Rev2, and its accessories perform within the requirements of the test standards when configured and operated under RIM'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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A. Scope

This report details the results of compliance tests which were performed in accordance with the requirements of:

- o FCC CFR 47 Part 15, Subpart C, October, 2011, Intentional Radiators
- o FCC CFR 47 Part 15, Subpart E, October, 2011, Unlicensed National Information Infrastructure Devices
- o Industry Canada, RSS-210, Issue 8, December 2010, Licence-exempt Radio Apparatus
- o Industry Canada, RSS-GEN, Issue 3, December 2010, General Requirements and Information for the Certification of Radio Apparatus

B. Associated Documents

1) MultiSourceDeclaration_RFA91LW_b602
2) MultiSourceDeclaration_RFA911LW _b1107
3) RFA91LW _HW_Declaration_CER-48926-001_Rev2

C. Product Identification

Manufactured by Research In Motion Limited whose headquarters is located at:
295 Phillip Street
Waterloo, Ontario
Canada, N2L 3W8
Phone: 519 888 7465
Fax: 519 888 6906

The equipment under test (EUT) was tested at the following locations:

RIM Testing Services EMI test facilities

305 Phillip Street	440 Phillip Street
Waterloo, Ontario	Waterloo, Ontario
Canada, N2L 3W8	Canada, N2L 5R9
Phone: 519 888 7465	Phone: 519 888 7465
Fax: 519 888 6906	Fax: 519 888 6906

The testing was performed from August 23-September 07, October 31-December 01, 2012

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The sample EUT included:

SAMPLE	MODEL	CER NUMBER	PIN	SOFTWARE
1	RFA91LW	CER-48926-001 Rev1	332BED61	OS Version: 127.0.1.1651 Bundle: 1651
2	RFA91LW	CER-48926-001 Rev1	332BED6A	OS Version: 127.0.1.1651 Bundle: 1651
3	RFA91LW	CER-48926-001 Rev1	332BED63	OS Version: 127.0.1.1651 Bundle: 1651
4	RFA91LW	CER-48926-001 Rev2	332F96D8	OS Version: 10.0.9.602 Bundle 602
5a	RFA91LW	CER-48926-001 Rev2	332F96E0	OS Version: 10.0.9.927 Bundle 927
5b	RFA91LW	CER-48926-001 Rev2	332F96E0	OS Version: 10.0.9.1107 Bundle 1107
6	RFA91LW	CER-48926-001 Rev2	332F96E0	OS Version: 10.0.9.1107 Bundle 1107

AC Line Conducted Emissions testing was performed on sample 5b
Radiated Emissions testing was performed on samples.1,2,4,5a, 5b,
Conducted Emissions testing was performed on sample 3.6
Near Field Communications testing was performed on sample 1,6

Only the characteristics that may have been affected by the changes from RFA91LW Rev1 to RFA91LW Rev2 were re-tested.
For more details, refer to RFA91LW _HW_Declaration_CER-48926-001_Rev2

To view the differences between software bundles 127.0.1.1651 to 10.0.9.602 for RFA91LW, see document MultiSourceDeclaration_RFA91LW_B602 and MultiSourceDeclaration_RFA91LW _b1107

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BlackBerry® smartphone Accessories Tested

1) Fixed Blade Charger, part number HDW-47725-001, with an output voltage of 5.0 volts dc, 850 mA
2) Folding Blade Charger, part number HDW-34724-001, with an output voltage of 5.0 volts dc, 1.8 A.
3) Alt. Fixed Blade Charger, part number HDW-44303-001 with an output voltage of 5.0 volts dc, 550mA
4) Captive Cable Charger, part number HDW-17957-003 with an output voltage of 5.0 volts dc, 750 mA
5) Wired Headset, part number HDW-44306-001, with a lead length of 1.1 metres.
6) Alt. Wired Headset, part number HDW-44306-001, with a lead length of 1.1 metres.
7) USB Data Cable, part number HDW-28109-003, 1.20 metres long.
8) USB Data Cable, part number HDW-48415-001, 1.0 metre long.
9) USB Y-Cable, part number HDW-19137-002, lead lengths of 26 cm and 11 cm
10) External Battery Charger, part number HDW-50225-001.

D. Support Equipment Used for the Testing of the EUT

1) Philips Monitor, type MWE12244T, product ID 2444E1SB/27

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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	Conducted AC Line 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 15.247(a)	RSS-210	BT, 20 dB Bandwidth	Pass	4
Part 15.247(a)	RSS-210	BT, Carrier Frequency Separation	Pass	4
Part 15.247(a)	RSS-210	BT, Number of Hopping Frequencies	Pass	4
Part 15.247(a)	RSS-210	BT, Time of Occupancy (Dwell Time)	Pass	4
Part 15.247(b)	RSS-210	BT, Maximum Peak Conducted Output Power	Pass	4
Part 15.247(c)	RSS-210	BT, Band-Edge Compliance of RF Conducted Emissions	Pass	4
Part 15.247(c)	RSS-210	BT, Spurious RF Conducted Emissions	Pass	4
Part 15.247(a)	RSS-210	BLE, 6 dB Bandwidth	Pass	4
Part 15.247(b)	RSS-210	BLE, Maximum Conducted Output Power	Pass	4
Part 15.247(c)	RSS-210	BLE, Band-Edge	Pass	4
Part 15.247(d)	RSS-210	BLE, Peak Power Spectral Density	Pass	4
Part 15.247(c)	RSS-210	BLE, Spurious RF Conducted Emissions	Pass	4

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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	5
Part 15.247(b)	RSS-210	802.11b/g/n, Maximum Conducted Output Power	Pass	5
Part 15.247(c)	RSS-210	802.11b/g/n, Band-Edge	Pass	5
Part 15.247(d)	RSS-210	802.11b/g/n, Peak Power Spectral Density	Pass	5
Part 15.247(c)	RSS-210	802.11b/g/n, Spurious RF Conducted Emissions	Pass	5
Part 15.407	RSS-210	802.11a/n, 6 dB Bandwidth	Pass	6
Part 15.407	RSS-210	802.11a/n, Maximum Conducted Output Power	Pass	6
Part 15.407	RSS-210	802.11a/n, Band-Edge	Pass	6
Part 15.407	RSS-210	802.11a/n, Peak Power Spectral Density	Pass	6
Part 15.407	RSS-210	802.11a/n, Spurious RF Conducted Emissions	Pass	6
Part 15.209 Part 15.225(a)	RSS-210 RSS-GEN	Near Field Communications, Radiated Emissions	Pass	7
Part 15.225(e)	RSS-210	Near Field Communications, Occupied Bandwidth	Pass	7
Part 15.225(e)	RSS-210	Near Field Communications, Frequency Stability	Pass	7

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F. Summary of Results

1) AC LINE CONDUCTED EMISSIONS

The conducted emissions were measured using the test procedure outlined in CISPR Recommendation 22 through a 50 Ohm Line Impedance Stabilization Network (LISN), which was inserted in the power line to the equipment to provide the specified impedance for measurements. The EUT was placed on a nonconductive wooden table, 80 cm high that was positioned 40 cm from a vertical ground plane. The RF output of the network was connected to an EMI receiver system with characteristics that duplicate those of the receiver specified in CISPR Publication 16.
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	Bluetooth Tx, Charging with Audio Playback	Fixed Blade Charger + Wired Headset + USB Cable 1.20m
2	802.11b Tx, Charging with Video Playback	Folding Blade Charger + Alt.Wired Headset
3	802.11a Tx, Charging with Audio Playback	Alt. Fixed Blade Charger + Wired Headset + USB Cable 1.0m
4	NFC Tx, Charging	Captive Cable Charger + Alt. Wired Headset + Y Cable + External Battery Charger

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 7.19 dB below the QP limit at 0.267 MHz and 7.82 dB below the AV limit at 0.267 MHz with the Alt. Fixed Blade Charger in Test Configuration 3
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 semi-anechoic chamber (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 SAC with floor absorber'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 RIM'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 worst case test margin was 9.07dB below the accepted limit at 517.694 MHz.

The Bluetooth Low Energy Harmonics were investigated up to the 10th Harmonic. The worst case test margin was 10.07dB below the accepted limit at 517.677 MHz.

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The 802.11b/g/n harmonics were investigated up to the 10th harmonic. The worst case test margin was 9.85dB below the accepted limit at 517.661 MHz 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 ±4.5 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 semi-anechoic chamber (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 SAC with floor absorber'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 RIM'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. The sample EUT emissions were in the noise floor.

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 ±4.5 dB

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4) 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 0.923MHz for channel 0, 39 and 78 in normal data rate mode and 1.311MHz for channel 78 in EDR mode.
See APPENDIX 4 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 4 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 4 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 4 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 6.84 dBm (0.00483 W) for Channel 78 in normal data rate mode and 5.96 dBm (0.00394 W) for channel 39 in EDR mode.
See APPENDIX 4 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 4 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 4 for the test data.

4) 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 0.680 MHz for channel 0.
See APPENDIX 4 for the test data.

b) Maximum Conducted Output Power
The EUT met the requirements of the maximum conducted output power as per 47 CFR 15.247(b) and RSS-210. Low channel (0), middle channel (20) and high channel (39) were measured. The worst case Conducted Output Power level was 7.4 dBm (0.0055 W) for channel 39.
See APPENDIX 4 for the test data

c) Band-Edge Compliance of RF Conducted Emissions
The EUT met the requirements of band-edge compliance of RF conducted emissions as per 47 CFR 15.247(b) and RSS-210. Low channel (0) and high channel (39) were measured.
See APPENDIX 4 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 4 for the test data.

e) Spurious RF Conducted Emissions
The EUT met the requirements of the spurious RF conducted emissions as per 47 CFR 15.247(c) and RSS-210. The frequency range measured was 30 MHz to 26 GHz. Low channel (0), middle channel (20) and high channel (39) were measured.
See APPENDIX 4 for the test data.

5) 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 10.38 MHz for channel 1 in 802.11b mode, 16.45 MHz for channels 6 and 11 in 802.11g mode, and 17.73 MHz for channel 11 in 802.11n mode.
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 (1), middle channel (6) and high channel (11) were measured. The worst case Conducted Output Power level was 17.16 dBm (0.065W) for channel 1 in 802.11b mode, 16.57 dBm (0.019W) for channel 1 in 802.11g mode, and 16.46 dBm (0.019W) for channel 1 in 802.11n mode.
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 (1) and high channel (11) 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 (1), middle channel (6) and high channel (11) 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 (1), middle channel (6) and high channel (11) were measured.
See APPENDIX 5 for the test data.

6) 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, 44, 48, 52, 60, 64, 100, 140, 149, 157, 161 and 165 were measured. The worst case 6 dB Bandwidth was 16.55 MHz for channel 60 in 802.11a mode. The worst case 6 dB Bandwidth was 17.04 MHz for channel 44 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 15.407 and RSS-210. Channels 36, 44, 48, 52, 60, 64, 100, 140, 149, 157, 161 and 165 were measured. The worst case Conducted Output Power level was 14.22 dBm (0.022W) for channel 52 in 802.11a mode. The worst case Conducted Output Power level was 13.46 dBm (0.026W) for channel 52 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 15.407 and RSS-210. Channels 36, 48, 52, 64, 100, 149, 161 and 165 were measured.
See APPENDIX 6 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 15.407 and RSS-210. Channels 36, 44, 48, 52, 60, 64, 149, 157, 161 and 165 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 15.407 and RSS-210. The frequency range measured was 30 MHz to 40 GHz. Channels 44, 60 and 157 were measured.
See APPENDIX 6 for the test data.

7) 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 13.56 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.

The NFC emissions were investigated from 9 kHz to 1 GHz. The sample EUT has a field strength measurement of 48.8 dBuV/m.
See APPENDIX 7 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 7 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 7 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	12-12-08	Conducted/Radiated Emissions
EMI Test Receiver	Rohde & Schwarz	ESU 40	100162	12-12-07	Conducted/Radiated Emissions
Hybrid Log Antenna	EMC Automation	HLP-3003C	017301	13-08-23	Radiated Emissions
Horn Antenna	CMT	3116	R52734-001	14-08-02	Radiated Emissions
Horn Antenna	ETS-Lindgren	3117	2538	13-08-04	Radiated Emissions
Preamplifier	Rohde & Schwarz	TS-ANA4-SP	001	13-09-01	Radiated Emissions
Preamplifier	Sonoma	310N/11909A	185831	13-10-10	Radiated Emissions
Preamplifier	Rohde & Schwarz	TS-ANA-SP	001	13-09-01	Radiated Emissions
L.I.S.N.	Rohde & Schwarz	ENV216	100060	13-10-25	Conducted Emissions
Environment Monitor	Omega	iTHX-SD	0380561	13-10-30	Radiated Emissions
EMC Analyzer	Agilent	E7405A	US40240226	13-01-03	Radiated Emissions
Spectrum Analyzer	HP	8563E	3745A08113	13-10-05	RF Conducted Emissions
DC Power Supply	HP	6632B	US37472178	13-09-25	RF Conducted Emissions
Environment Monitor	Omega	iTHX-SD	0340060	13-10-30	RF Conducted Emissions
Environmental Chamber	Test Equity	107	0900246	N/R	Frequency Stability
Bluetooth Tester	Rohde & Schwarz	CBT	119549	13-12-05	RF Conducted Emissions
Bluetooth Tester	Rohde & Schwarz	CBT35	100368	13-12-05	Radiated Emissions
Bluetooth Tester	Rohde & Schwarz	CBT35	100370	13-12-05	Radiated Emissions
Power Meter	Agilent	N1911A	MY45100951	13-08-16	RF Conducted / Frequency Stability
Power Sensor	Agilent	N1921A	MY45241383	13-09-11	RF Conducted / Frequency Stability
Digital Multimeter	Hewlett Packard	34401A	US36042324	13-11-13	Conducted/Radiated Emissions
Environment Monitor	Omega	iTHX-SD	0380567	13-10-30	Radiated Emissions

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APPENDIX 1 – AC CONDUCTED EMISSIONS TEST DATA/PLOTS

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AC Conducted Emission Test Results

The following tests were performed by Forhad Hasnat

Test Configuration 1

The BlackBerry® smartphone was tested on November 24, 2012

The environmental test conditions were: Temperature: 24.5 ºC
Relative Humidity: 22%

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	L1	32.21	11.20	43.41	66.00	56.00	-22.59
0.209	L1	29.34	10.80	40.14	63.30	53.30	-23.16
0.227	L1	28.21	10.67	38.88	62.60	52.60	-23.72
0.420	L1	28.97	9.98	38.95	57.40	47.40	-18.45
1.176	L1	25.58	9.80	35.38	56.00	46.00	-20.62
1.212	L1	22.55	9.80	32.35	56.00	46.00	-23.65
1.253	L1	25.16	9.80	34.96	56.00	46.00	-21.04
1.289	L1	22.69	9.80	32.50	56.00	46.00	-23.51

All other emission levels had a test margin of greater than 25 dB.
Measurements were done with the quasi-peak detector.
See figure 1-1 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 Conducted Emissions Test Graphs

Test Configuration 1

Figure 1-1: L1 lines

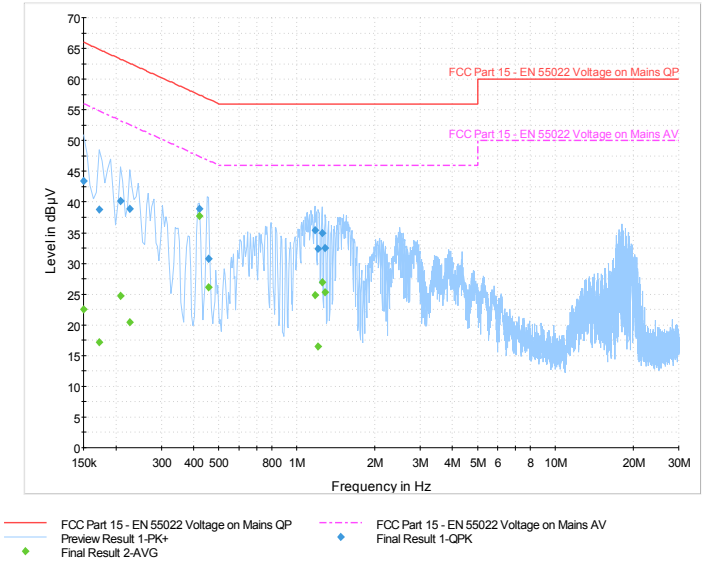
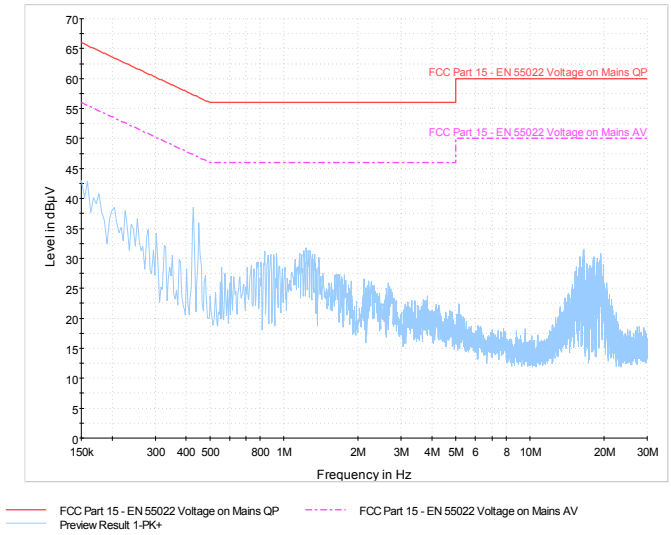


Figure 1-2: N Lines



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AC Conducted Emission Test Results cont'd

Test Configuration 2

The BlackBerry® smartphone was tested on November 24, 2012.

The environmental test conditions were: Temperature: 25 ºC
Relative Humidity: 22 %

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	L1	41.06	11.20	52.27	66.00	56.00	-13.73
0.155	N	36.25	11.20	47.45	63.40	53.40	-15.95
0.204	L1	37.17	10.83	48.00	61.60	51.60	-13.60
0.204	N	33.88	10.85	44.73	60.20	50.20	-15.47
0.254	L1	33.37	10.48	43.85	58.90	48.90	-15.05
0.254	N	31.89	10.50	42.39	56.00	46.00	-13.61
0.303	L1	30.21	10.16	40.36	63.40	53.40	-23.04
0.353	L1	30.19	10.08	40.27	61.60	51.60	-21.33
0.402	N	30.38	10.02	40.40	58.90	48.90	-18.50
0.474	N	37.11	9.93	47.04	57.80	47.80	-10.76
0.515	L1	33.96	9.90	43.86	56.40	46.40	-12.54
0.587	N	28.89	9.87	38.76	56.00	46.00	-17.24
0.636	N	26.42	9.86	36.28	56.00	46.00	-19.72

All other emission levels had a test margin of greater than 25 dB.
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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AC Conducted Emissions Test Graphs

Test Configuration 2

Figure 1-3: L1 lines

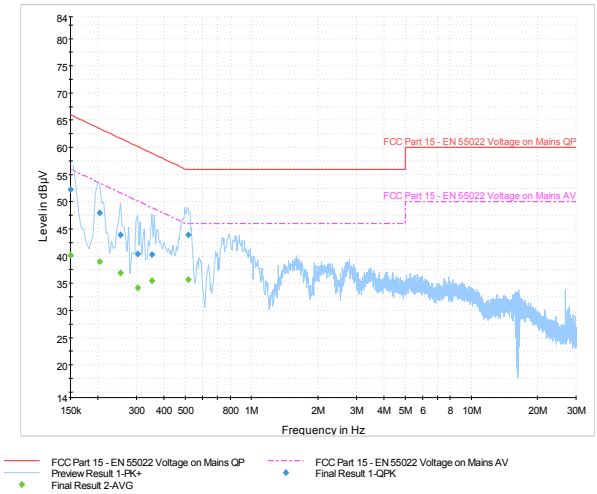
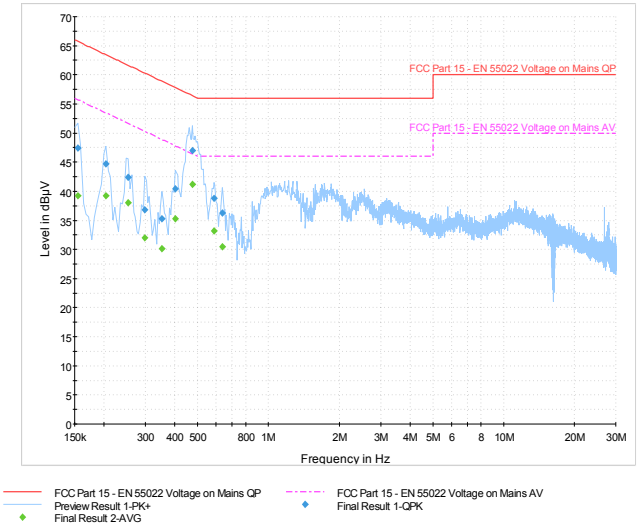


Figure 1-4: N Lines



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AC Conducted Emissions Test Results cont'd

Test Configuration 3

The BlackBerry® smartphone was tested on November 24, 2012.

The environmental test conditions were: Temperature: 25 ºC
Relative Humidity: 22 %

Frequency (MHz)	Line	Reading (QP) (dBµV)	Correction Factor (dB)	Corrected Reading (QP) (dB)	Limit (QP) (dBµV)	Margin (QP) Limits (dB)
0.159	N	32.23	11.17	43.40	64.40	-21.00
0.182	L1	32.24	10.99	43.23	61.20	-17.97
0.249	N	34.63	10.54	45.16	56.00	-10.84
0.267	L1	38.43	10.39	48.82	56.00	**-7.19**
0.272	N	33.01	10.38	43.39	56.00	-12.61
0.533	L1	31.29	9.89	41.19	56.00	-14.81
0.663	N	25.89	9.85	35.74	56.00	-20.26
0.776	L1	33.75	9.82	43.57	56.00	-12.43
0.956	N	25.83	9.81	35.64	56.00	-20.36
1.149	N	24.89	9.80	34.70	56.00	-21.31
1.608	N	27.49	9.82	37.30	56.00	-18.70
1.874	L1	32.89	9.82	42.71	56.00	-13.29
2.054	L1	31.72	9.83	41.55	56.00	-14.46
2.108	L1	32.27	9.83	42.10	65.50	-23.40
2.306	L1	31.83	9.84	41.67	61.10	-19.43
2.450	L1	31.00	9.85	40.85	56.00	-15.15
2.454	N	25.45	9.85	35.30	56.00	-20.70
2.508	L1	31.08	9.85	40.93	56.00	-15.07
2.576	L1	31.57	9.85	41.42	56.00	-14.58
2.616	L1	31.20	9.86	41.05	56.00	-14.95
2.697	L1	30.71	9.86	40.58	56.00	-15.42
2.711	N	24.72	9.87	34.59	56.00	-21.41
3.156	N	22.56	9.88	32.45	56.00	-23.56
Frequency	Line	Reading (QP)	Correction Factor	Corrected Reading (QP)	Limit (AV)	Margin (AV) Limits

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(MHz)		(dBµV)	(dB)	(dB)	(dBµV)	(dB)
0.182	L1	20.00	10.99	30.98	44.40	-23.42
0.267	L1	32.99	10.39	43.38	41.20	**-7.82**
0.533	L1	21.95	9.89	31.84	36.00	-14.16
0.776	L1	24.49	9.82	34.31	36.00	-11.69
1.874	L1	21.73	9.82	31.55	36.00	-14.45
2.054	L1	22.24	9.83	32.07	36.00	-13.93
2.108	L1	22.59	9.83	32.41	36.00	-13.59
2.306	L1	21.29	9.84	31.13	36.00	-14.87
2.450	L1	21.36	9.85	31.21	36.00	-14.79
2.508	L1	20.65	9.85	30.50	36.00	-15.50
2.576	L1	21.25	9.85	31.11	36.00	-14.89
2.616	L1	21.36	9.86	31.22	36.00	-14.78
2.697	L1	20.63	9.86	30.49	36.00	-15.51
0.249	N	31.13	10.54	41.67	41.80	-10.13
0.272	N	29.30	10.38	39.68	41.10	-11.42
0.663	N	20.68	9.85	30.53	36.00	-15.48
0.956	N	19.46	9.81	29.27	36.00	-16.73
1.149	N	17.74	9.80	27.54	36.00	-18.46
1.608	N	20.02	9.82	29.83	36.00	-16.17
2.229	N	17.67	9.84	27.50	36.00	-18.50
2.454	N	17.73	9.85	27.58	36.00	-18.42
2.711	N	16.37	9.87	26.23	36.00	-19.77
3.156	N	14.35	9.88	24.23	36.00	-21.77

All other emission levels had a test margin of greater than 25 dB.
Measurements were done with the quasi-peak and average 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 Conducted Emissions Test Graphs

Test Configuration 3

Figure 1-5: L1, lines

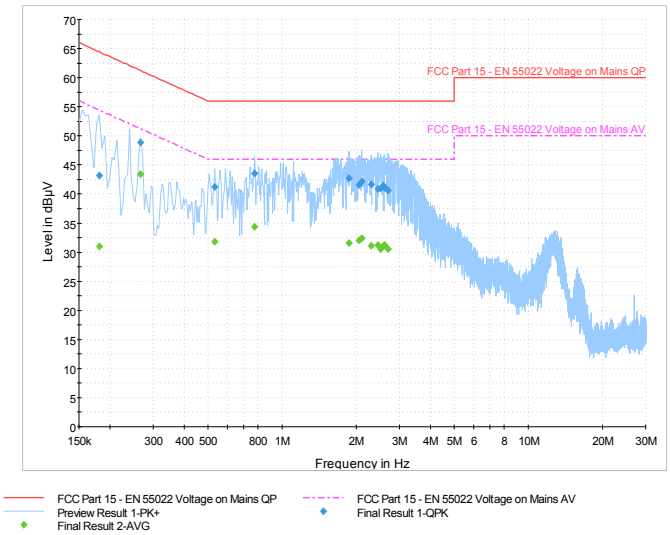
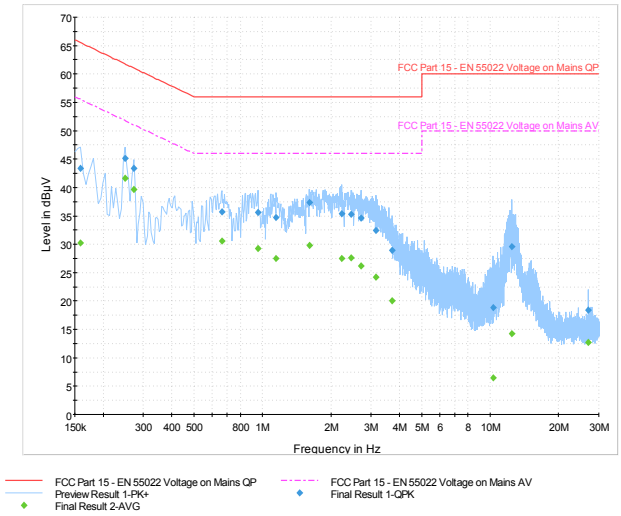


Figure 1-6: N, lines



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AC Conducted Emission Test Results cont'd

Test Configuration 4

The BlackBerry® smartphone was tested on November 28, 2012.

The environmental test conditions were: Temperature: 25.4 ºC
Relative Humidity: 21.3 %

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	L1	41.06	11.20	52.27	66.00	56.00	-13.73
0.155	N	36.25	11.20	47.45	63.40	53.40	-15.95
0.204	L1	37.17	10.83	48.00	61.60	51.60	-13.60
0.204	N	33.88	10.85	44.73	60.20	50.20	-15.47
0.254	L1	33.37	10.48	43.85	58.90	48.90	-15.05
0.254	N	31.89	10.50	42.39	56.00	46.00	-13.61
0.303	L1	30.21	10.16	40.36	63.40	53.40	-23.04
0.353	L1	30.19	10.08	40.27	61.60	51.60	-21.33
0.402	N	30.38	10.02	40.40	58.90	48.90	-18.50
0.474	N	37.11	9.93	47.04	57.80	47.80	-10.76
0.515	L1	33.96	9.90	43.86	56.40	46.40	-12.54
0.587	N	28.89	9.87	38.76	56.00	46.00	-17.24
0.636	N	26.42	9.86	36.28	56.00	46.00	-19.72

All other emission levels had a test margin of greater than 25 dB.
Measurements were done with the quasi-peak detector.
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 Conducted Emissions Test Graphs

Test Configuration 4

Figure 1-7: L1 lines

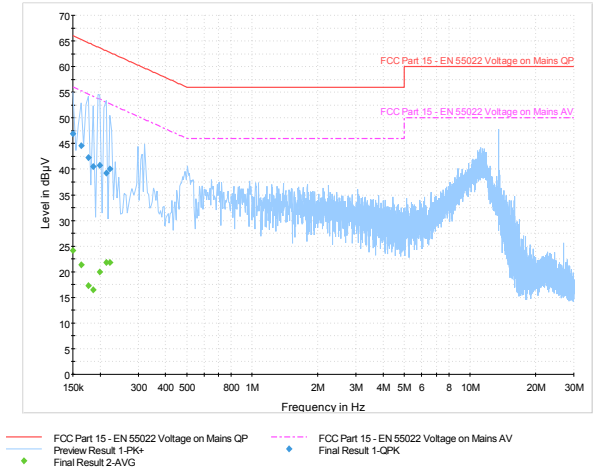
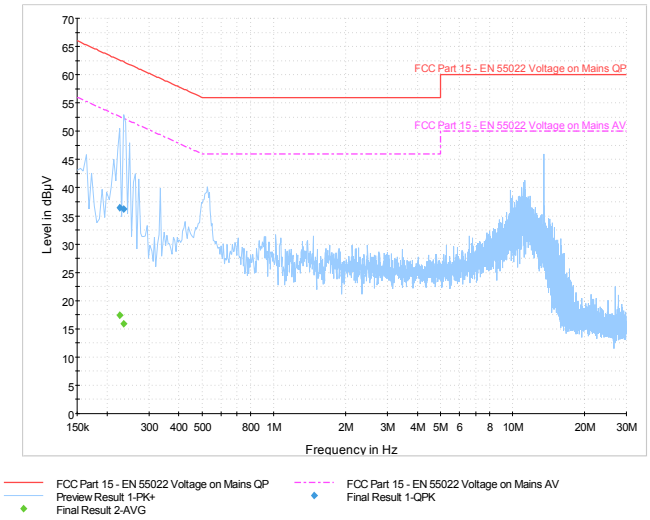


Figure 1-8: N Lines



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

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Radiated Emissions Test Results
Bluetooth Band

Date of Test: August 23, 2012
Measurements were performed by Savtej Sandhu and Feras Obeid

The environmental test conditions were: Temperature: 27.9 ºC
Relative Humidity: 24.3%

The test distance was 3.0 metres with a EUT height of 0.8 metres, 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".

Frequency (MHz)	Channel	Packet Type	Antenna Pol. (V/H)	Antenna Height (metres)	Test Angle (Deg.)	Measured Level (dBµV)	Correction Factor for preamp/antenna/ cables/ filter (dB/m)	Field Strength Level (reading+corr) (dBµV/m)	Limit @ 3.0 m (dBµV/m)	Test Margin (dB)
517.686	0	DH5	H	2.10	327	35.22	1.61	36.83	46.00	-9.17
517.694	0	2DH5	V	3.35	346	35.32	1.61	**36.93**	46.00	**-9.07**
517.692	0	3DH5	H	3.68	219	34.99	1.61	36.60	46.00	-9.40
517.705	39	DH5	H	2.99	200	34.68	1.61	36.29	46.00	-9.71
517.676	39	2DH5	V	1.99	16	34.92	1.61	36.53	46.00	-9.47
517.684	39	3DH5	H	1.11	129	34.87	1.61	36.48	46.00	-9.52
517.690	78	DH5	H	1.58	323	5.15	31.73	36.88	46.00	-9.12
517.692	78	2DH5	H	1.15	129	34.65	1.61	36.26	46.00	-9.74
517.678	78	3DH5	H	3.99	158	34.63	1.61	36.24	46.00	-9.76

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

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

Date of Test: November 19-21, 30, 2012
Measurements were performed by Heng Lin and Forhad Hasnat.

The environmental test conditions were: Temperature: 25.1-25.4ºC
Relative Humidity: 22-35.4 %

The test distance was 3.0 metres with a EUT height of 0.8 metres, 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 emissions had a test margin of greater than 25.0 dB.

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

Date of test: November 16, 2012
Measurements were performed by Feras Obeid

The environmental test conditions were: Temperature: 25.0 º C
Relative Humidity: 28.5 %

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

The test distance was 3.0 metres.

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	104.32	44.34	59.98	74	-14.02
0	2402	Horn	H	PK	1 MHz	97.38	42.98	54.4	74	-19.6
0	2402	Horn	V	AVE.	10 Hz	70.92	44.34	26.58	54	-27.42
0	2402	Horn	H	AVE.	10 Hz	67.46	42.98	24.48	54	-29.52
High Channel, Packet Type DH5										
78	2480	Horn	V	PK	1 MHz	103.25	48.35	54.9	74	-19.1
78	2480	Horn	H	PK	1 MHz	100.96	47.82	53.14	74	-20.86
78	2480	Horn	V	AVE.	10 Hz	70.78	48.35	22.43	54	-31.57
78	2480	Horn	H	AVE.	10 Hz	69.6	47.82	21.78	54	-32.22
Low Channel, Packet Type 2-DH5										
0	2402	Horn	V	PK	1 MHz	103.16	43.24	59.92	74	-14.08
0	2402	Horn	H	PK	1 MHz	97.72	42.39	55.33	74	-18.67
0	2402	Horn	V	AVE.	10 Hz	68.66	43.24	25.42	54	-28.58
0	2402	Horn	H	AVE.	10 Hz	65.91	42.39	23.52	54	-30.48
High Channel, Packet Type 2-DH5										
78	2480	Horn	V	PK	1 MHz	101.83	46.06	55.77	74	-18.23
78	2480	Horn	H	PK	1 MHz	99.7	45.49	54.21	74	-19.79
78	2480	Horn	V	AVE.	10 Hz	68.52	46.06	22.46	54	-31.54
78	2480	Horn	H	AVE.	10 Hz	67.34	45.49	21.85	54	-32.15

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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	103.5	43.45	60.05	74	-13.95
0	2402	Horn	H	PK	1 MHz	98.15	42.19	55.96	74	-18.04
0	2402	Horn	V	AVE.	10 Hz	68.57	43.45	25.12	54	-28.88
0	2402	Horn	H	AVE.	10 Hz	65.79	42.19	23.6	54	-30.4
High Channel, Packet Type 3-DH5										
78	2480	Horn	V	PK	1 MHz	102.15	45.76	56.39	74	-17.61
78	2480	Horn	H	PK	1 MHz	99.96	43.9	56.06	74	-17.94
78	2480	Horn	V	AVE.	10 Hz	68.44	45.76	22.68	54	-31.32
78	2480	Horn	H	AVE.	10 Hz	67.25	43.9	23.35	54	-30.65

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

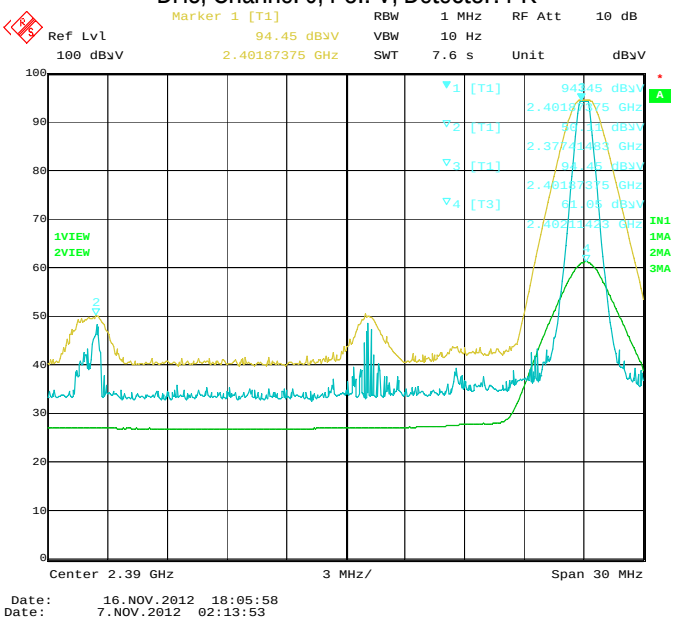


Figure 2-2: Band-Edge Compliance of RF Rad. Emissions.
Bluetooth, Single freq., Static PBRS,
DH5, Channel 0, Pol: H, Detector: PK

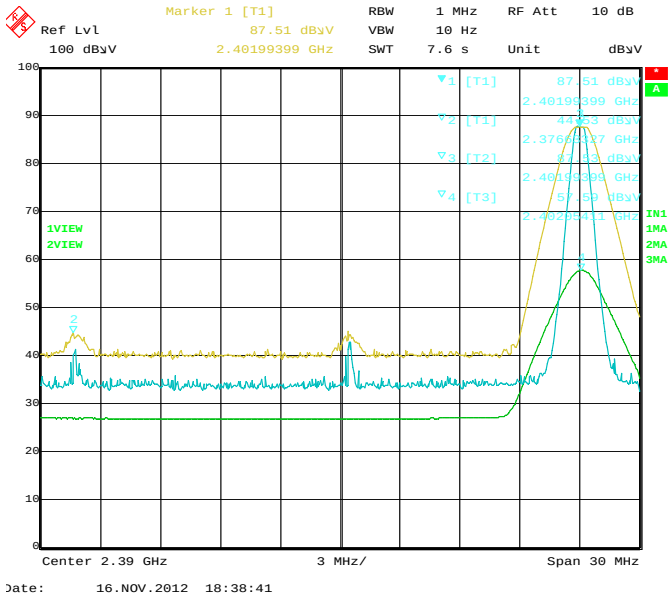


Figure 2-3: Band-Edge Compliance of RF Rad. Emissions.
Bluetooth, Single freq., Static PBRS,
DH5, Channel 78, Pol: V, Detector: PK

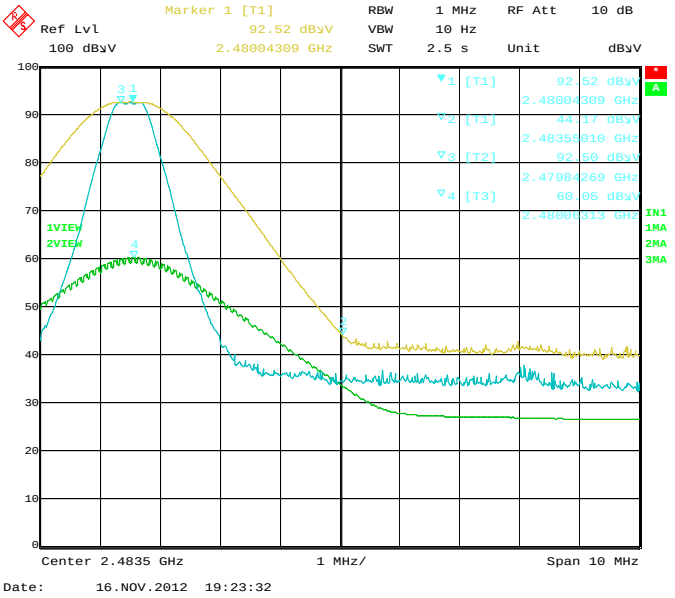
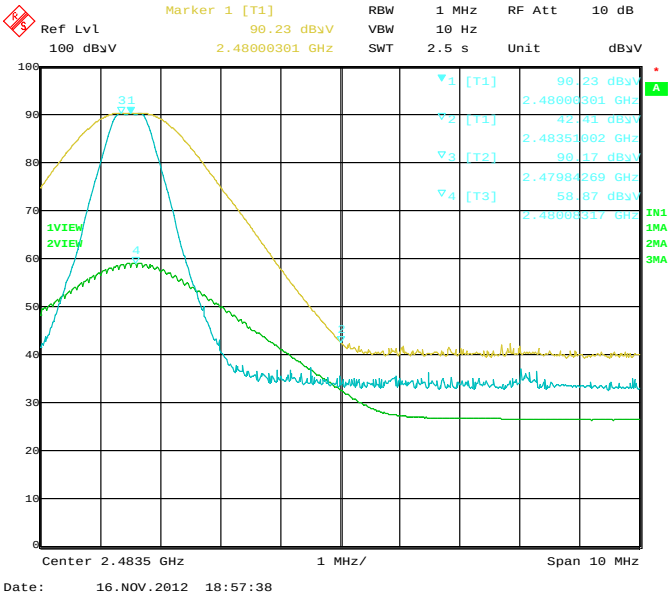


Figure 2-4: Band-Edge Compliance of RF Rad. Emissions
Bluetooth, Single freq., Static PBRS,
DH5, Channel 78, Pol: H, Detector: PK



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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

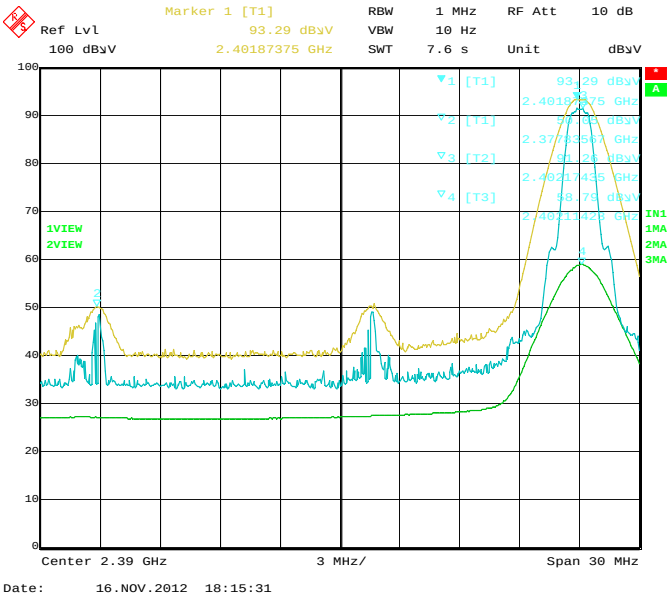


Figure 2-6: Band-Edge Compliance of RF Rad. Emissions. Bluetooth, Single freq., Static PBRS, 2-DH5, Channel 0, Pol: H, Detector: PK

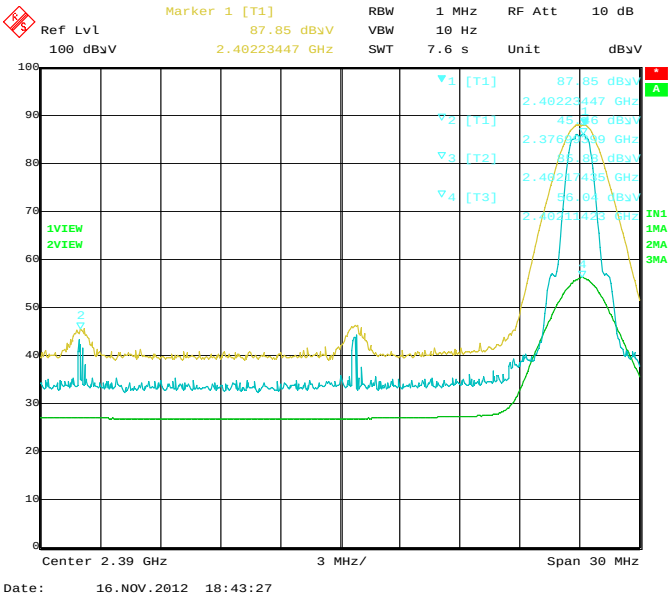


Figure 2-7: Band-Edge Compliance of RF Rad. Emissions. Bluetooth, Single freq., Static PBRS, 2-DH5, Channel 78, Pol: V, Detector: PK

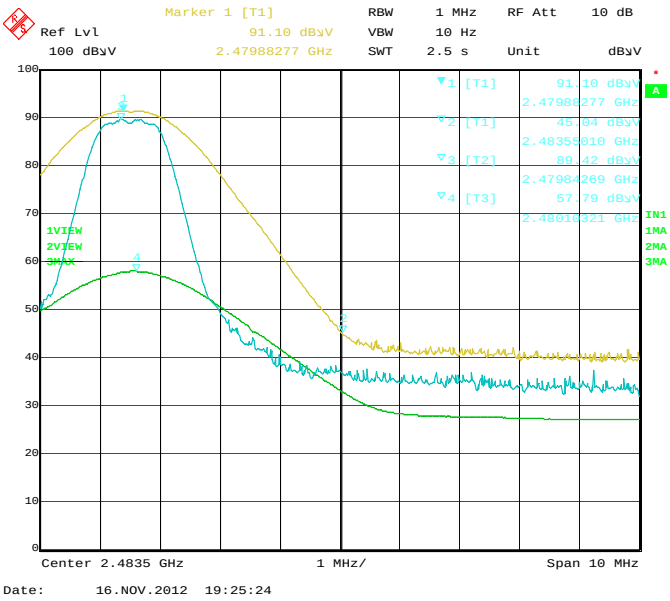
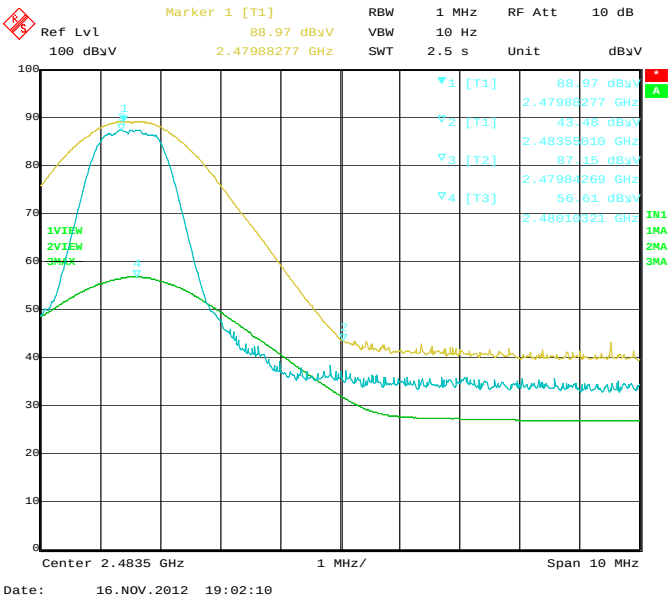


Figure 2-8: Band-Edge Compliance of RF Rad. Emissions. Bluetooth, Single freq., Static PBRS, 2-DH5, Channel 78, Pol: H, Detector: PK



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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

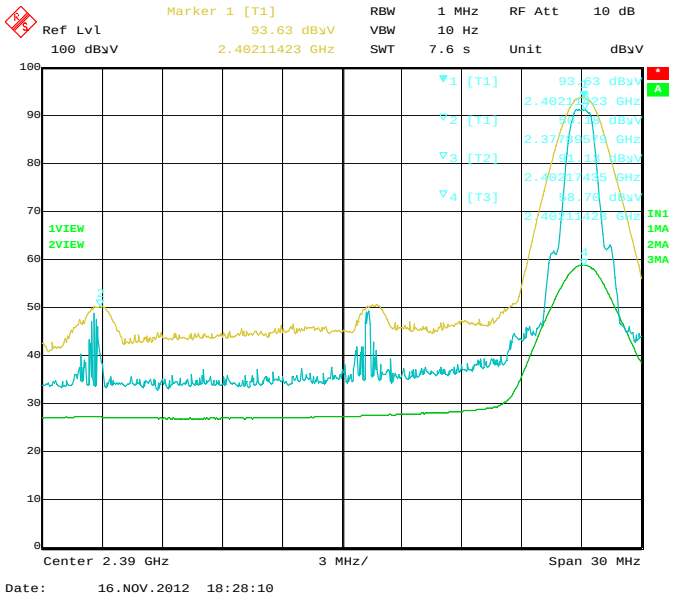


Figure 2-10: Band-Edge Compliance of RF Rad. Emissions. Bluetooth, Single freq., Static PBRS, 3-DH5, Channel 0, Pol: H, Detector: PK

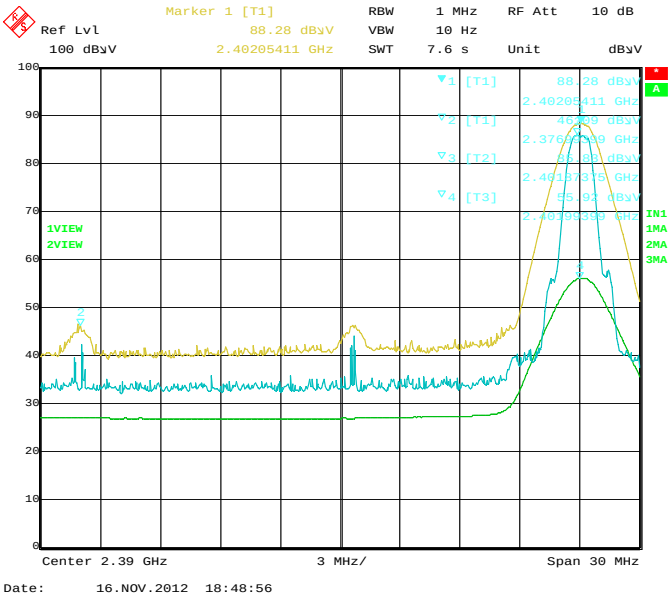


Figure 2-11: Band-Edge Compliance of RF Rad. Emissions. Bluetooth, Single freq., Static PBRS, 3-DH5, Channel 78, Pol: V, Detector: PK

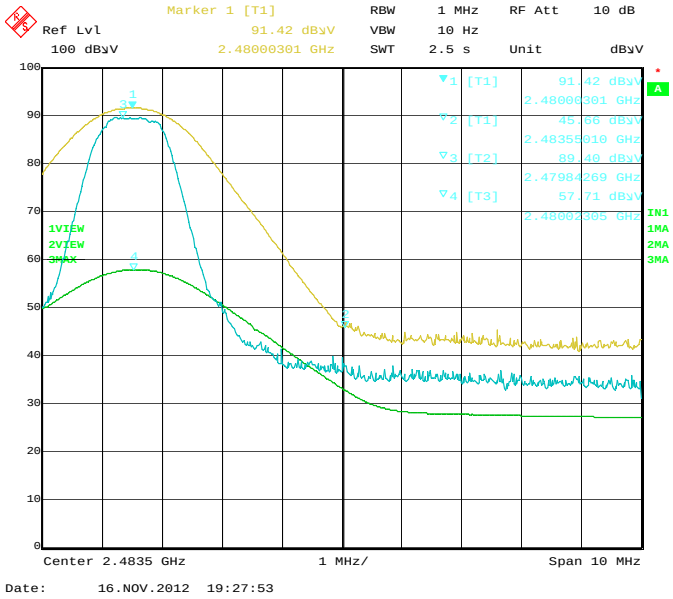
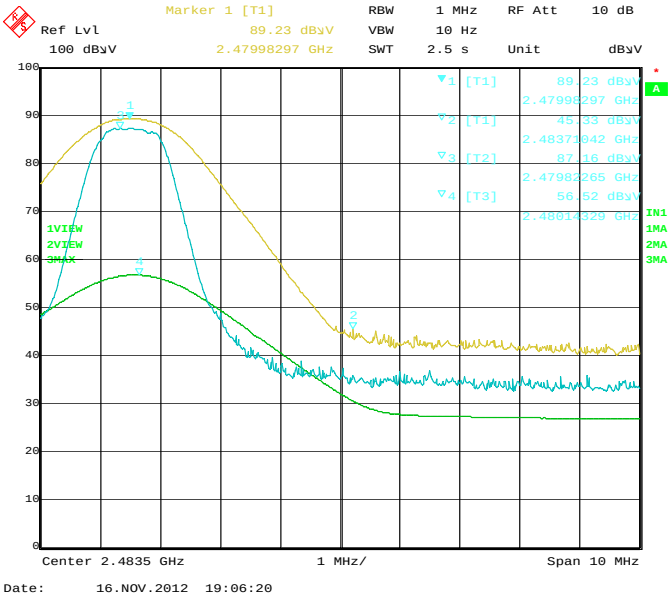


Figure 2-12: Band-Edge Compliance of RF Rad. Emissions. Bluetooth, Single freq., Static PBRS, 3-DH5, Channel 78, Pol: H, Detector: PK



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Radiated Emissions Test Results cont'd
Bluetooth Low Energy Band

Date of Test: August 29, 2012
Measurements were performed by Feras Obeid.

The environmental test conditions were: Temperature: 26.1 ºC
Relative Humidity: 28.4 %

The test distance was 3.0 metres with a EUT height of 0.8 metres, 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.

Frequency (MHz)	Channel	Packet Type	Antenna Pol. (V/H)	Antenna Height (metres)	Test Angle (Deg.)	Measured Level (dBµV)	Correction Factor for preamp/antenna/ cables/ filter (dB/m)	Field Strength Level (reading+corr) (dBµV/m)	Limit @ 3.0 m (dBµV/m)	Test Margin (dB)
517.658	0	BLE	V	2.15	204	33.54	1.61	35.15	46.00	-10.85
517.677	20	BLE	V	3.08	313	34.32	1.61	**35.93**	46.00	**-10.07**
517.730	39	BLE	H	1.09	172	33.23	1.61	34.84	46.00	-11.16

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

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Radiated Emissions Test Results cont'd
Bluetooth Low Energy Band

Date of Test: November 19, 2012
Measurements were performed by Forhad Hasnat

The environmental test conditions were: Temperature: 24.6 ºC
Relative Humidity: 37.3 %

The test distance was 3.0 metres with a EUT height of 0.8 metres, 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 emissions had a test margin of greater than 25.0 dB.

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

Date of test: November 16, 2012
Measurements were performed by Feras Obeid

The environmental test conditions were: Temperature: 25.0º C
Relative Humidity: 28.5 %

The BlackBerry® smartphone was in horizontal position.

The test distance was 3.0 metres.

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	103.82	35.38	68.44	74	-5.56
0	2402	Horn	H	PK	1 MHz	98.58	35.58	63	74	-11
0	2402	Horn	V	AVE.	10 Hz	80.29	35.38	44.91	54	-9.09
0	2402	Horn	H	AVE.	10 Hz	76.42	35.58	40.84	54	-13.16
High Channel, LE										
39	2441	Horn	V	PK	1 MHz	105.02	35.59	69.43	74	-4.57
39	2441	Horn	H	PK	1 MHz	106.04	35.83	70.21	74	-3.79
39	2441	Horn	V	AVE.	10 Hz	81.19	35.59	45.6	54	-8.4
39	2441	Horn	H	AVE.	10 Hz	81.86	35.83	46.03	54	-7.97

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

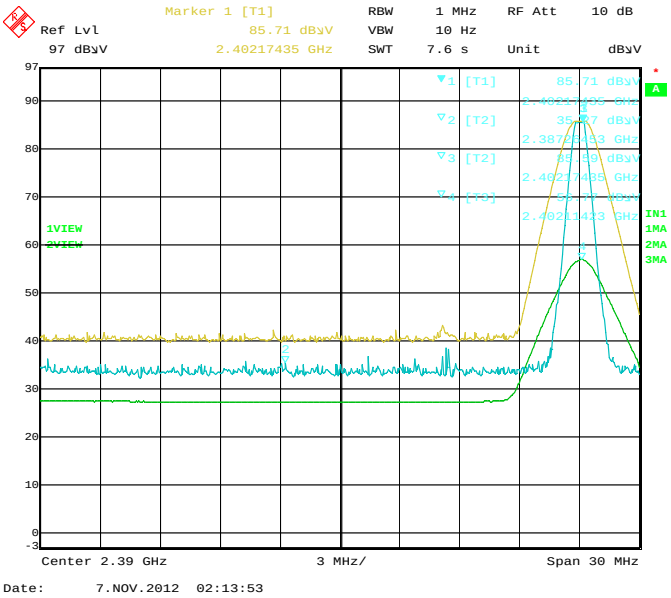


Figure 2-14: Band-Edge Compliance of RF Rad. Emissions.
Bluetooth Low Energy, Single freq.,
LE, Channel 0, Pol: H, Detector: PK

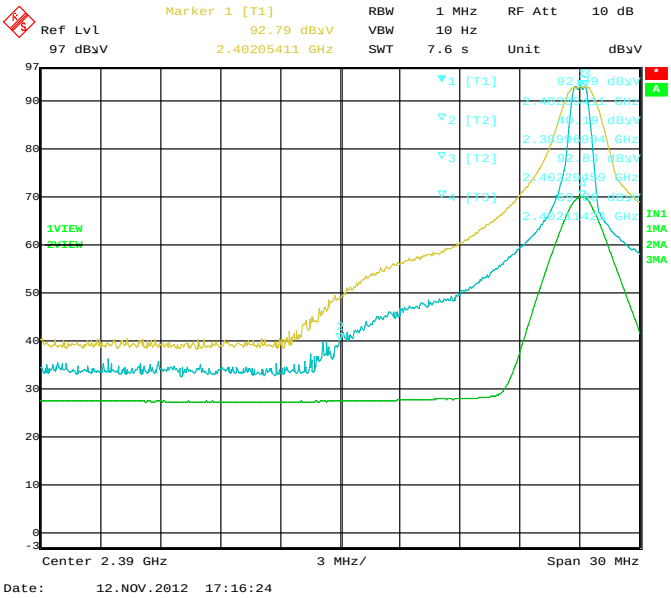


Figure 2-15: Band-Edge Compliance of RF Rad. Emissions.
Bluetooth Low Energy, Single freq.,
LE, Channel 39, Pol: V, Detector: PK

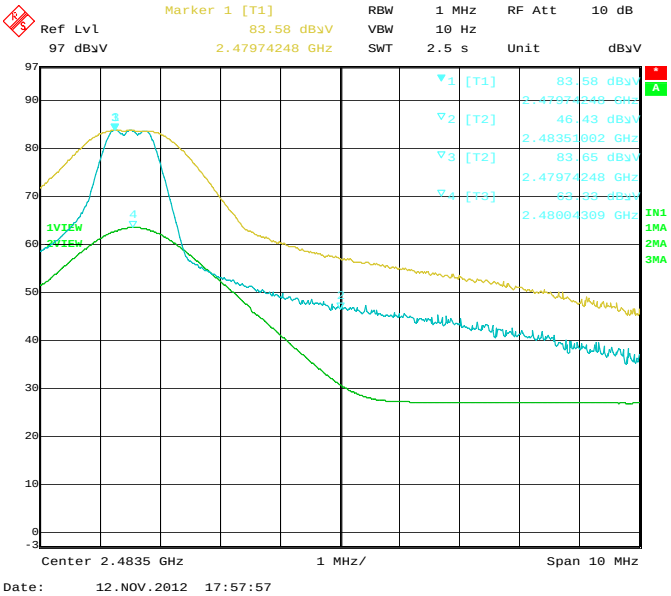
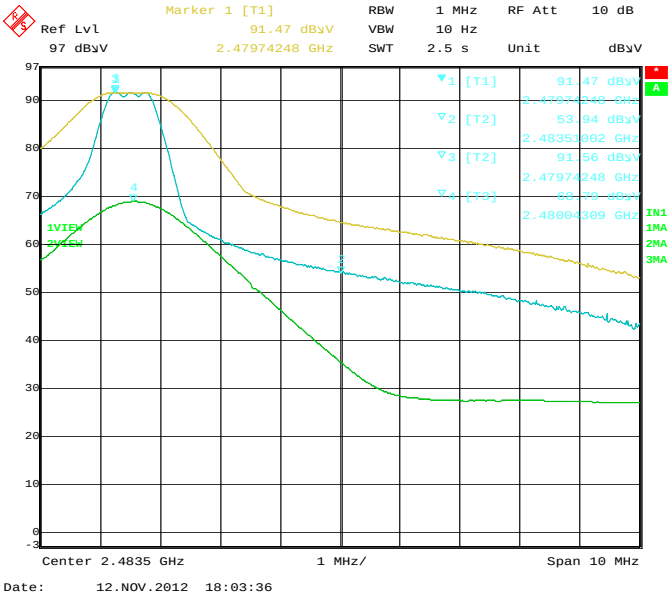


Figure 2-16: Band-Edge Compliance of RF Rad. Emissions
Bluetooth Low Energy, Single freq.,
LE, Channel 39, Pol: H, Detector: PK



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

Date of Test: August 24, 2012
Measurements performed by Feras Obeid

The environmental test conditions were: Temperature: 23.8ºC
Relative Humidity: 28.1 %

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

The BlackBerry® smartphone was in USB 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.

Frequency (MHz)	Channel	Packet Type	Antenna Pol. (V/H)	Antenna Height (metres)	Test Angle (Deg.)	Measured Level (dBµV)	Correction Factor for preamp/antenna/ cables/ filter (dB/m)	Field Strength Level (reading+corr) (dBµV/m)	Limit @ 3.0 m (dBµV/m)	Test Margin (dB)
517.663	1	B	V	3.32	139	33.25	1.62	34.87	46.00	-11.13
517.693	1	G	H	3.99	247	33.93	1.61	35.54	46.00	-10.46
518.109	1	N	V	2.46	163	32.74	1.64	34.38	46.00	-11.62
517.718	6	B	H	3.79	110	33.38	1.61	34.99	46.00	-11.01
517.701	6	G	H	3.18	351	33.42	1.61	35.03	46.00	-10.97
517.675	6	N	V	2.62	290	33.66	1.61	35.27	46.00	-10.73
517.689	11	B	H	1.17	110	33.48	1.61	35.09	46.00	-10.91
517.692	11	G	H	2.83	214	33.51	1.61	35.12	46.00	-10.88
517.661	11	N	V	3.32	139	34.54	1.61	**36.15**	46.00	**-9.85**

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

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

Date of Test: August 24, September 4, and December 1, 2012
Measurements performed by Shuo Wang and Forhad Hasnat

The environmental test conditions were: Temperature: 25.1-25.4 ºC
Relative Humidity: 37-41.7 %

The test distance was 3.0 metres with a EUT height of 0.8 metres, 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: November 15, 2012
Measurements performed by Feras Obeid.

The environmental test conditions were: Temperature: 25.0 ºC
Relative Humidity: 14.5 %

802.11b Band

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

The test distance was 3 metres.

Channel	Freq. (MHz)	Rx Antenna Type	Rx Antenna POL.	Detector	VBW For Peak	Peak Corrected Reading (dBuV/m)	Delta Marker (dB)	Corrected Band edge (dBuV/m)	Limit (dBuV/m)	Diff. To Limit (dB)
Low Channel, 802.11b										
1.0	2412.00	Horn	V	PK	1 MHz	109.77	49.41	60.36	74.00	-13.64
1.0	2412.00	Horn	H	PK	1 MHz	104.79	49.33	55.46	74.00	-18.54
1.0	2412.00	Horn	V	AV	10 Hz	105.78	54.04	51.74	54.00	-2.26
1.0	2412.00	Horn	H	AV	10 Hz	100.74	54.52	46.22	54.00	-7.78
High Channel, 802.11b										
11.0	2462.00	Horn	V	PK	1 MHz	109.80	52.64	57.16	74.00	-16.84
11.0	2462.00	Horn	H	PK	1 MHz	106.41	51.65	54.76	74.00	-19.24
11.0	2462.00	Horn	V	AV	10 Hz	105.82	58.61	47.21	54.00	-6.79
11.0	2462.00	Horn	H	AV	10 Hz	102.45	59.72	42.73	54.00	-11.27

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802.11g Band

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

The test distance was 3 metres.

Channel	Freq. (MHz)	Rx Antenna Type	Rx Antenna POL.	Detector	VBW For Peak	Peak Corrected Reading (dBuV/m)	Delta Marker (dB)	Corrected Band edge (dBuV/m)	Limit (dBuV/m)	Diff. To Limit (dB)
Low Channel , 802.11g										
1.0	2412.00	Horn	V	PK	1 MHz	107.59	41.68	65.91	74.00	-8.09
1.0	2412.00	Horn	H	PK	1 MHz	102.93	41.85	61.08	74.00	-12.92
1.0	2412.00	Horn	V	AV	10 Hz	94.26	48.76	45.50	54.00	-8.50
1.0	2412.00	Horn	H	AV	10 Hz	89.77	47.92	41.85	54.00	-12.15
High Channel, 802.11g										
11.0	2462.00	Horn	V	PK	1 MHz	107.63	45.84	61.79	74.00	-12.21
11.0	2462.00	Horn	H	PK	1 MHz	103.63	42.92	60.71	74.00	-13.29
11.0	2462.00	Horn	V	AV	10 Hz	94.38	49.24	45.14	54.00	-8.86
11.0	2462.00	Horn	H	AV	10 Hz	91.05	48.68	42.37	54.00	-11.63

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802.11n Band

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

The test distance was 3 metres.

Channel	Freq. (MHz)	Rx Antenna Type	Rx Antenna POL.	Detector	VBW For Peak	Peak Corrected Reading (dBuV/m)	Delta Marker (dB)	Corrected Band edge (dBuV/m)	Limit (dBuV/m)	Diff. To Limit (dB)
Low Channel,802.11n										
1.0	2412.00	Horn	V	PK	1 MHz	107.51	41.00	66.51	74.00	-7.49
1.0	2412.00	Horn	H	PK	1 MHz	101.86	40.69	61.17	74.00	-12.83
1.0	2412.00	Horn	V	AV	10 Hz	94.06	48.17	45.89	54.00	-8.11
1.0	2412.00	Horn	H	AV	10 Hz	89.11	47.12	41.99	54.00	-12.01
High Channel, 802.11n										
11.0	2462.00	Horn	V	PK	1 MHz	107.05	41.13	65.92	74.00	-8.08
11.0	2462.00	Horn	H	PK	1 MHz	103.28	42.33	60.95	74.00	-13.05
11.0	2462.00	Horn	V	AV	10 Hz	93.95	47.47	46.48	54.00	-7.52
11.0	2462.00	Horn	H	AV	10 Hz	90.79	47.16	43.63	54.00	-10.37

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

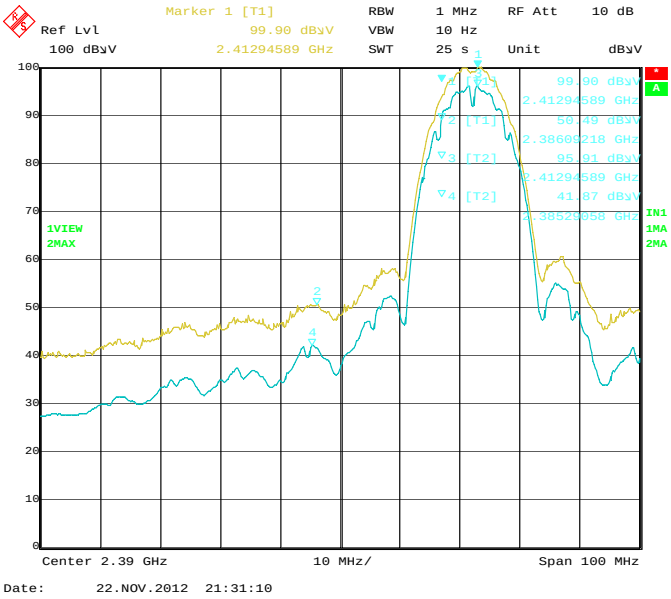

Figure 2-18: Band-Edge Compliance of RF Radiated Emission 802.11b, Channel 1, 2412 MHz, Max Pol: H, Detector: PK

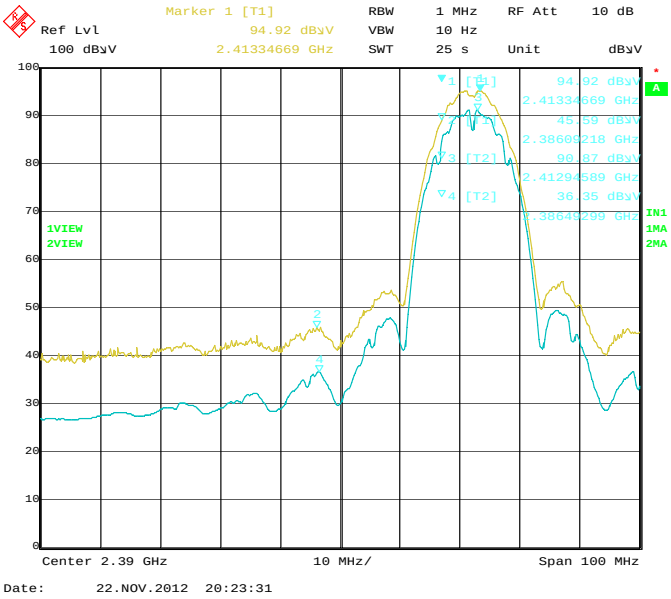

Figure 2-19: Band-Edge Compliance of RF Radiated Emission 802.11b, Channel 11, 2462 MHz, Max Pol: V, Detector: PK

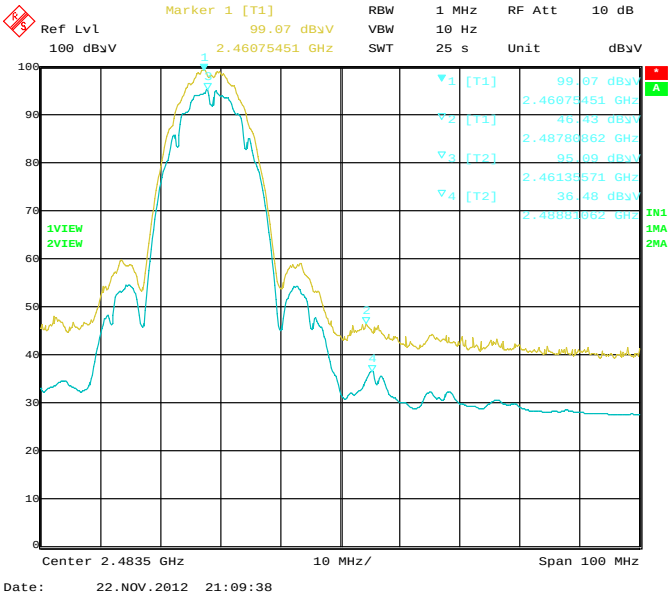

Figure 2-20: Band-Edge Compliance of RF Radiated Emission 802.11b, Channel 11, 2462 MHz, Max Pol: H, Detector: PK

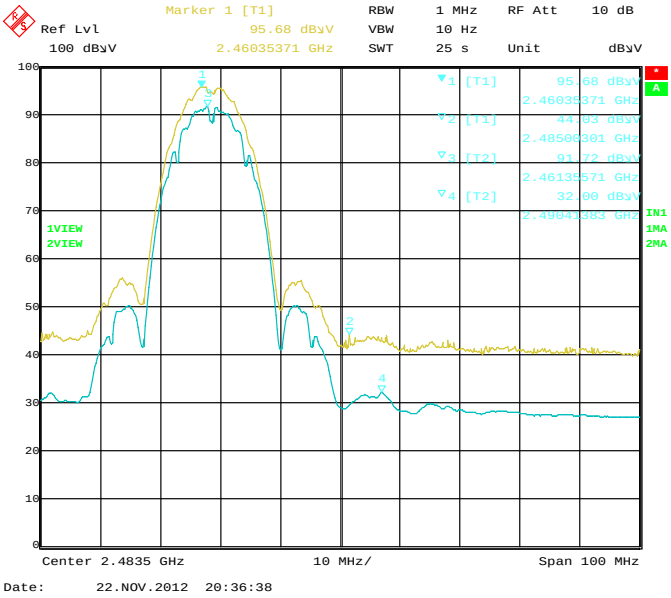

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Figure 2-21: Band-Edge Compliance of RF Radiated Emission 802.11g, Channel 1, 2412 MHz, Max Pol: V, Detector: PK

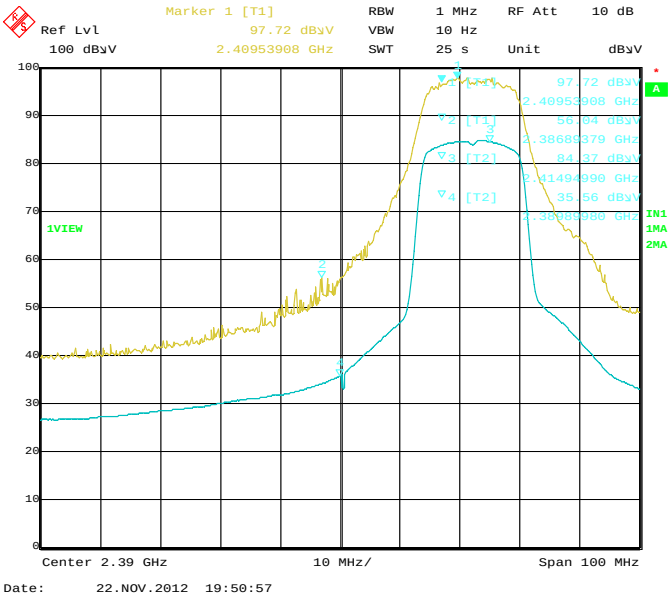

Figure 2-22: Band-Edge Compliance of RF Radiated Emission 802.11g, Channel 1, 2412 MHz, Max Pol: H, Detector: PK

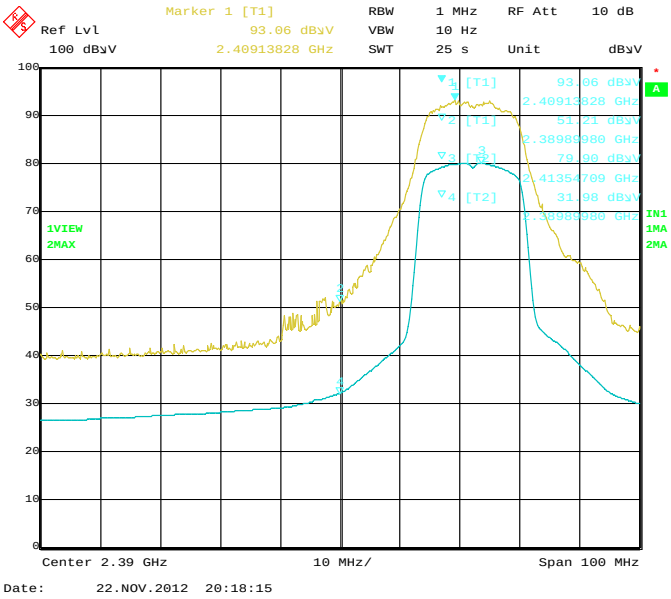

Figure 2-23: Band-Edge Compliance of RF Radiated Emission 802.11g, Channel 11, 2462 MHz, Max Pol: V, Detector: PK

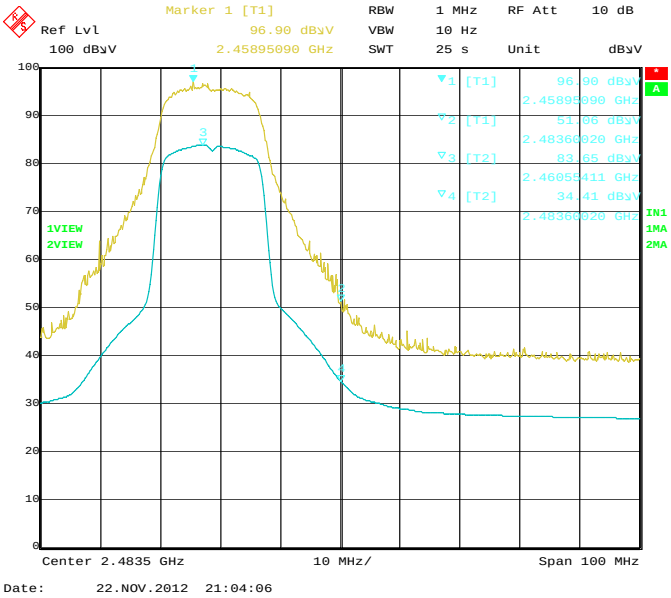

Figure 2-24: Band-Edge Compliance of RF Radiated Emission 802.11g, Channel 11, 2462 MHz, Max Pol: H, Detector: PK

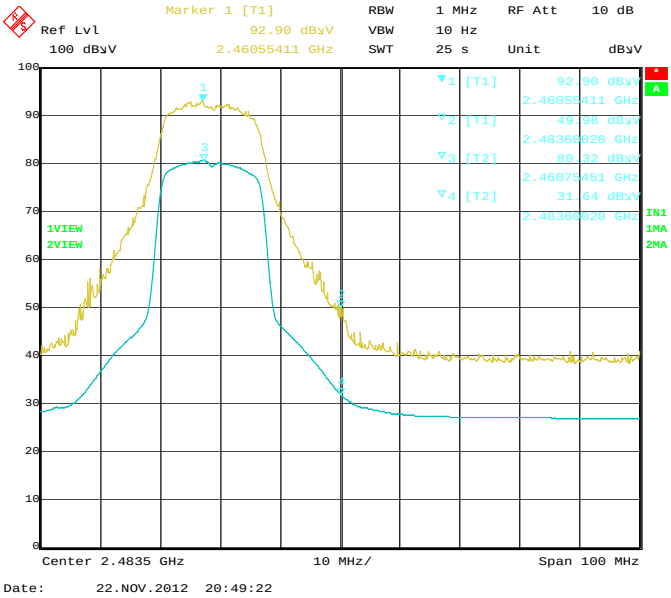

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Figure 2-25: Band-Edge Compliance of RF Radiated Emission 802.11n, Channel 1, 2412 MHz, Max Pol: V, Detector: PK

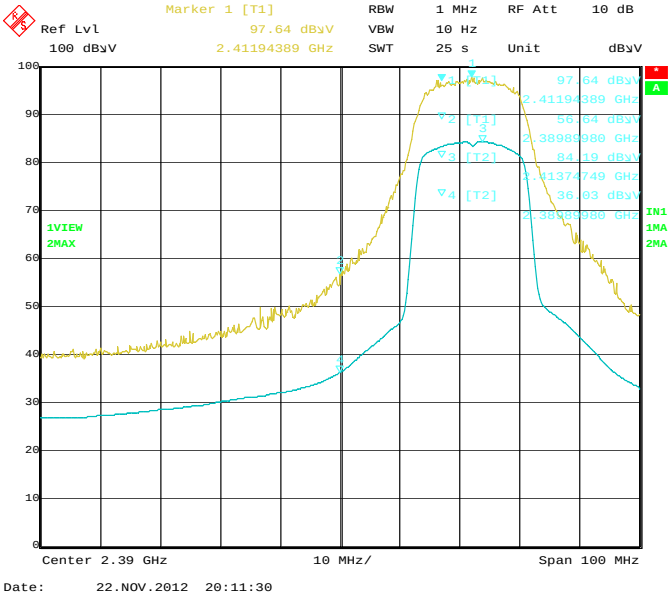


Figure 2-26: Band-Edge Compliance of RF Radiated Emission 802.11n, Channel 1, 2412 MHz, Max Pol: H, Detector: PK

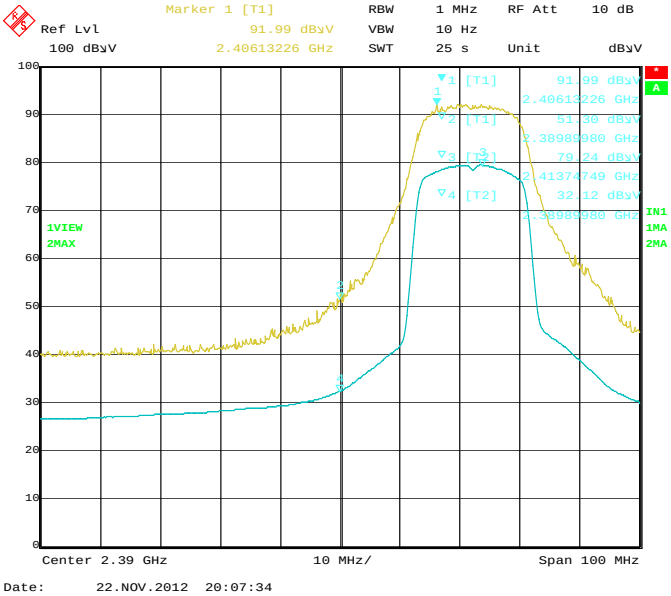


Figure 2-27: Band-Edge Compliance of RF Radiated Emission 802.11n, Channel 11, 2462 MHz, Max Pol: V, Detector: PK

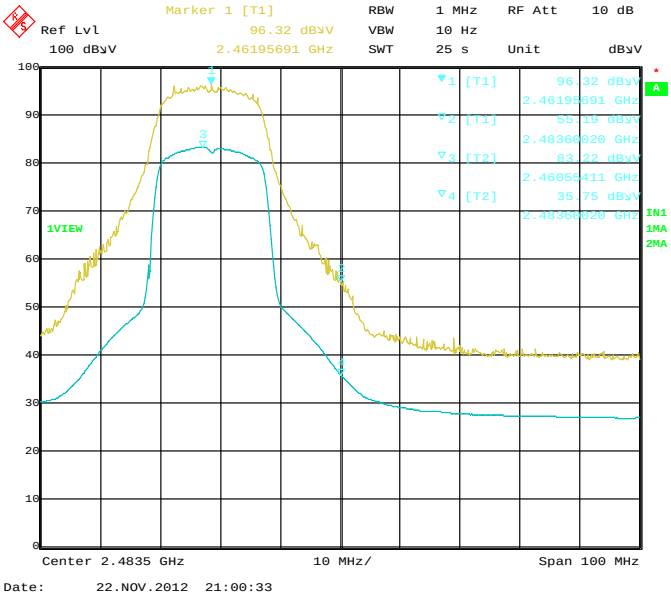
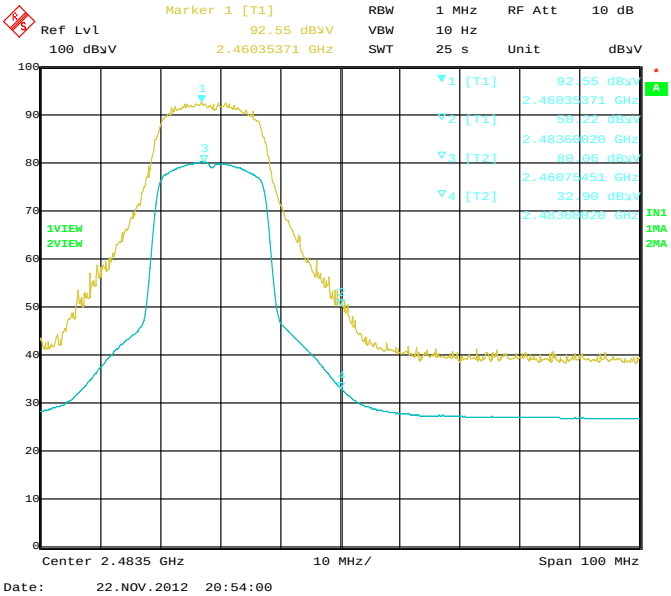


Figure 2-28: Band-Edge Compliance of RF Radiated Emission 802.11n, Channel 11, 2462 MHz, Max Pol: H, Detector: PK



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APPENDIX 3 – 802.11a/n RADIATED EMISSIONS TEST DATA

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Radiated Emissions Test Results
802.11a Band

Date of Test: September 07, 2012
Measurements were performed by Feras Obeid.

The environmental test conditions were: Temperature: 25.1-25.3 ºC
Relative Humidity: 30.9-32.4 %

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

The BlackBerry® smartphone was in USB 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 emissions had a test margin of greater than 25.0 dB.

Date of Test: August 28, September 04, November 12, 2012, Measurements were performed by Shuo Wang and Forhad Hasnat

The environmental test conditions were: Temperature: 25.1-25.4ºC
Relative Humidity: 30.5-41.7 %

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

The BlackBerry® smartphone was in horizontal 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 emissions had a test margin of greater than 25.0 dB.

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Radiated Emissions Test Results cont'd
802.11n Band

Date of Test: November 14d, 2012
Measurements were performed by Feras Obeid.

The environmental test conditions were: Temperature: 23.8 ºC
Relative Humidity: 28.1%

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

The BlackBerry® smartphone was in USB up position.

The frequency sweep measurements were performed in 802.11n Tx mode at MCS 0 on channels 36, 48, 64, 100, 140 and 165.

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

Date of Test: October 31, November 01 and 06-09, 2012
Measurements were performed by Heng Lin.

The environmental test conditions were: Temperature: 24.2-25.9ºC
Relative Humidity: 31.6-41 %

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

The BlackBerry® smartphone was in horizontal position.

The frequency sweep measurements were performed in 802.11n Tx mode at MCS 0 on channels 36, 48, 64, 100, 140 and 165.

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

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802.11a Band-Edge Compliance of RF Radiated Emissions

Date of Tests: November 14, 2012
Measurements performed by Savtej Sandhu.

The environmental test conditions were: Temperature: 25.7 ºC
Relative Humidity: 21.1 %

The measurements were performed on BlackBerry® smartphone in standalone, USB up configuration on channels 36, 64, 100, 140, 149 and 165 for 802.11a mode at 6 Mbps.

The test distance was 3 metres.

Centre at Band-Edge: 5150 MHz

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)
36.0	5180	Horn	V	PK	1 MHz	105.74	41.67	64.07	74.00	-9.93
36.0	5180	Horn	H	PK	1 MHz	108.22	43.68	64.54	74.00	-9.46
36.0	5180	Horn	V	AV	10 Hz	93.43	43.09	50.34	54.00	-3.66
36.0	5180	Horn	H	AV	10 Hz	95.40	44.73	50.67	54.00	-3.33

Centre at Band-Edge: 5350 MHz

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)
64.0	5320	Horn	V	PK	1 MHz	104.97	40.02	64.95	74.00	-9.05
64.0	5320	Horn	H	PK	1 MHz	108.21	43.21	65.00	74.00	-9.00
64.0	5320	Horn	V	AV	10 Hz	92.69	41.40	51.29	54.00	-2.71
64.0	5320	Horn	H	AV	10 Hz	95.54	43.94	51.60	54.00	-2.40

Centre at Band-Edge: 5460 MHz

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)
100.0	5500	Horn	V	PK	1 MHz	102.19	35.69	66.50	74.00	-7.50
100.0	5500	Horn	H	PK	1 MHz	106.43	40.19	66.24	74.00	-7.76
100.0	5500	Horn	V	AV	10 Hz	89.91	37.36	52.55	54.00	-1.45
100.0	5500	Horn	H	AV	10 Hz	94.31	41.55	52.76	54.00	-1.24

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

Centre at Band-Edge: 5725 MHz

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)
140.0	5700	Horn	V	PK	1 MHz	102.08	35.05	67.03	68.20	-1.17
140.0	5700	Horn	H	PK	1 MHz	108.74	42.43	66.31	68.20	-1.89

Centre at Band-Edge: 5725 MHz

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)
149.0	5745	Horn	V	PK	10 Hz	100.03	33.61	66.42	78.20	-11.78
149.0	5745	Horn	H	PK	10 Hz	109.97	35.41	74.56	78.20	-3.64

Centre at Band-Edge: 5715 MHz

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)
149.0	5745	Horn	V	PK	1 MHz	100.03	33.01	67.02	68.20	-1.18
149.0	5745	Horn	H	PK	1 MHz	109.97	43.45	66.52	68.20	-1.68

Centre at Band-Edge: 5805 MHz

Channel	Freq. (MHz)	Rx Antenna Type	Rx Antenna POL.	Detector	VBW	Corrected Reading (dBuV/m)	Delta Marker (dBc)	Remarks
165.0	5825	Horn	V	PK	1 MHz	105.27	33.01	No restricted band on border; 20dBc requirement valid instead
165.0	5825	Horn	H	PK	1 MHz	110.30	43.45	

Centre at Band-Edge: 5850 MHz

Channel	Freq. (MHz)	Rx Antenna Type	Rx Antenna POL.	Detector	VBW	Corrected Reading (dBuV/m)	Delta Marker (dBc)	Remarks
165.0	5825	Horn	V	PK	1 MHz	105.27	33.01	No restricted band on border; 20dBc requirement valid instead
165.0	5825	Horn	H	PK	1 MHz	110.30	43.45	

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802.11n Band-Edge Compliance of RF Radiated Emissions

Date of Tests: November 09, 2012
Measurements performed by Savtej Sandhu.

The environmental test conditions were: Temperature: 25.7 ºC
Relative Humidity: 21.1 %

The measurements were performed on BlackBerry® smartphone in standalone, USB up configuration on channels 36, 64 and 165 for 802.11n mode at MCS 0.

The test distance was 3 metres.

Centre at Band-Edge: 5150 MHz

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)
36.0	5180	Horn	V	PK	1 MHz	105.46	40.94	64.52	74.00	-9.48
36.0	5180	Horn	H	PK	1 MHz	107.27	43.46	63.81	74.00	-10.19
36.0	5180	Horn	V	AV	10 Hz	92.89	42.56	50.33	54.00	-3.67
36.0	5180	Horn	H	AV	10 Hz	94.87	44.60	50.27	54.00	-3.73

Centre at Band-Edge: 5350 MHz

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)
64.0	5320	Horn	V	PK	1 MHz	104.99	40.42	64.57	74.00	-9.43
64.0	5320	Horn	H	PK	1 MHz	107.44	42.10	65.34	74.00	-8.66
64.0	5320	Horn	V	AV	10 Hz	92.43	41.12	51.31	54.00	-2.69
64.0	5320	Horn	H	AV	10 Hz	95.16	43.48	51.68	54.00	-2.32

Centre at Band-Edge: 5470 MHz

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)
100.0	5500	Horn	V	PK	1 MHz	101.31	35.12	66.19	74.00	-7.81
100.0	5500	Horn	H	PK	1 MHz	106.13	39.32	66.81	74.00	-7.19
100.0	5500	Horn	V	AV	10 Hz	89.34	36.78	52.56	54.00	-1.44
100.0	5500	Horn	H	AV	10 Hz	93.81	41.05	52.76	54.00	-1.24

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

Centre at Band-Edge: 5725 MHz

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)
140.0	5700	Horn	V	PK	1 MHz	101.20	34.41	66.79	68.20	-1.41
140.0	5700	Horn	H	PK	1 MHz	110.50	40.16	70.34	68.20	2.14

Centre at Band-Edge: 5725 MHz

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)
149.0	5745	Horn	V	PK	10 Hz	99.74	33.41	66.33	78.20	-11.87
149.0	5745	Horn	H	PK	10 Hz	109.61	35.42	74.19	78.20	-4.01

Centre at Band-Edge: 5715 MHz

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)
149.0	5745	Horn	V	PK	1 MHz	99.74	32.03	67.71	68.20	-0.49
149.0	5745	Horn	H	PK	1 MHz	109.61	42.59	67.02	68.20	-1.18

Centre at Band-Edge: 5805 MHz

Channel	Freq. (MHz)	Rx Antenna Type	Rx Antenna POL.	Detector	VBW	Corrected Reading (dBuV/m)	Delta Marker (dBc)	Remarks
165.0	5825	Horn	V	PK	1 MHz	105.64	32.03	No restricted band on border; 20dBc requirement valid instead
165.0	5825	Horn	H	PK	1 MHz	110.02	42.59	

Centre at Band-Edge: 5850 MHz

Channel	Freq. (MHz)	Rx Antenna Type	Rx Antenna POL.	Detector	VBW	Corrected Reading (dBuV/m)	Delta Marker (dBc)	Remarks
165.0	5825	Horn	V	PK	1 MHz	105.64	32.03	No restricted band on border; 20dBc requirement valid instead
165.0	5825	Horn	H	PK	1 MHz	110.02	42.59	

See figures 3-1 to 3-16 for the plots of the 802.11a band-edge compliance and figures 3-17 to 3-24 for the plots of the 802.11n band-edge.

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

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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

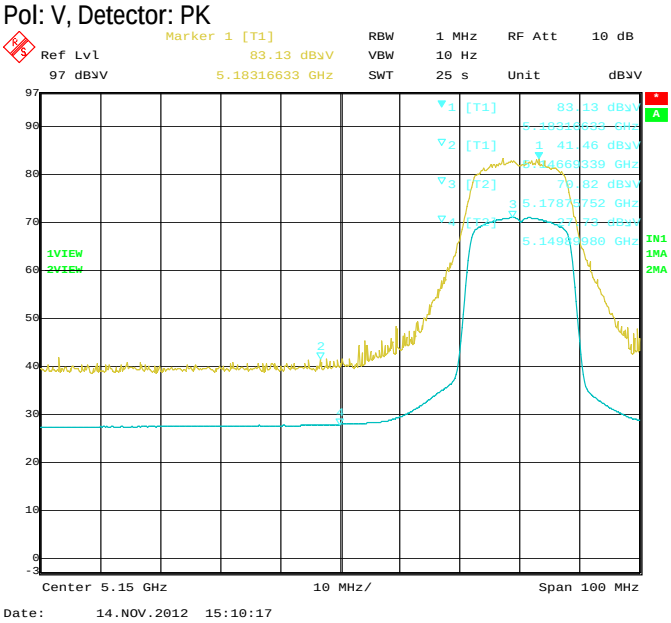


Figure 3-2: Band-Edge Compliance of RF Radiated Emission 802.11a, Ch 36, 5180 MHz, Centre of Band-Edge: 5150 MHz Pol: H, Detector: PK

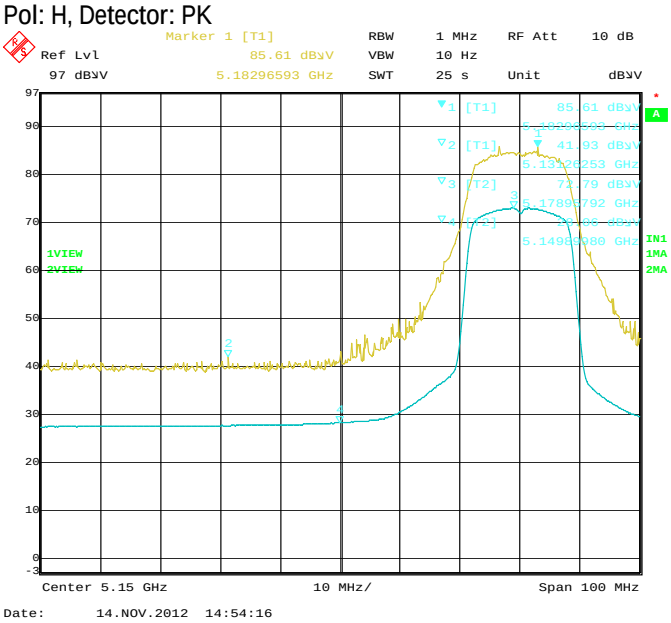


Figure 3-3: Band-Edge Compliance of RF Radiated Emission 802.11a, Ch 64, 5320 MHz, Centre of Band-Edge: 5350 MHz Pol: V, Detector: PK

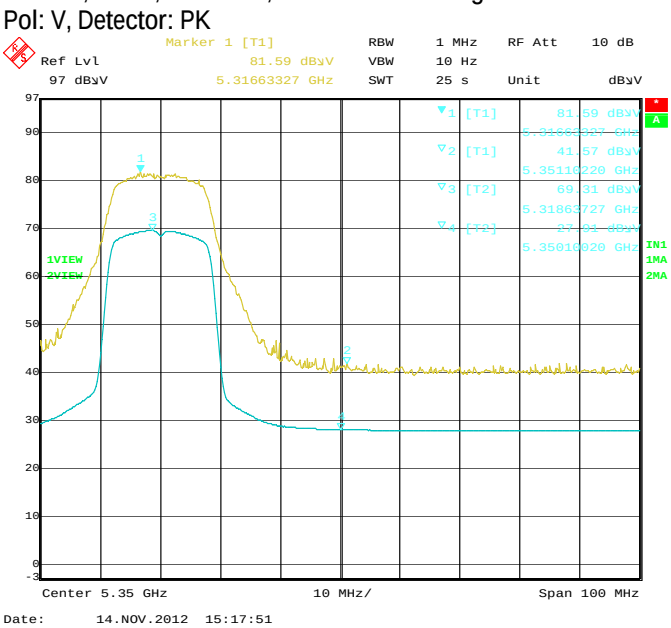
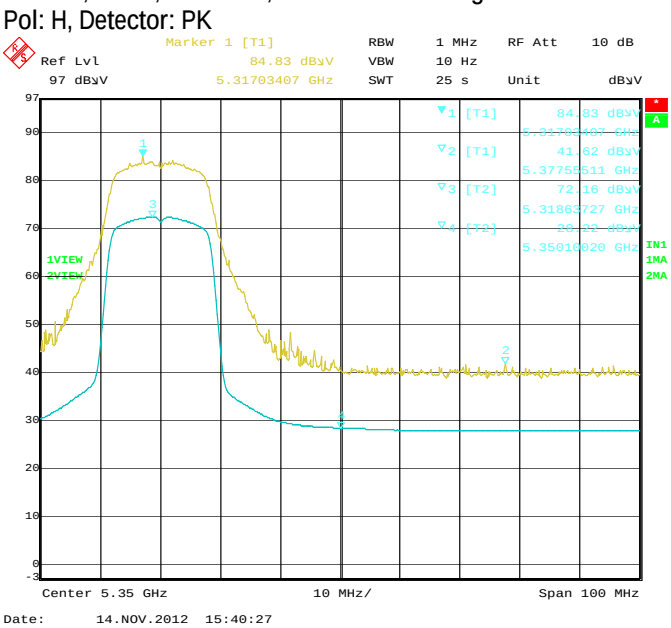


Figure 3-4: Band-Edge Compliance of RF Radiated Emission 802.11a, Ch 64, 5320 MHz, Centre of Band-Edge: 5350 MHz Pol: H, Detector: PK



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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

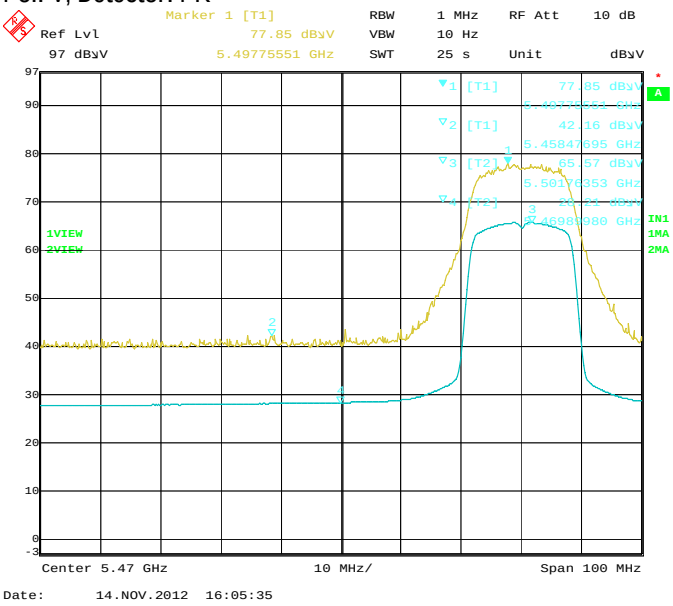


Figure 3-6: Band-Edge Compliance of RF Radiated Emission. 802.11a, Ch 100, 5500 MHz, Centre of Band-Edge: 5460 MHz Pol: H, Detector: PK

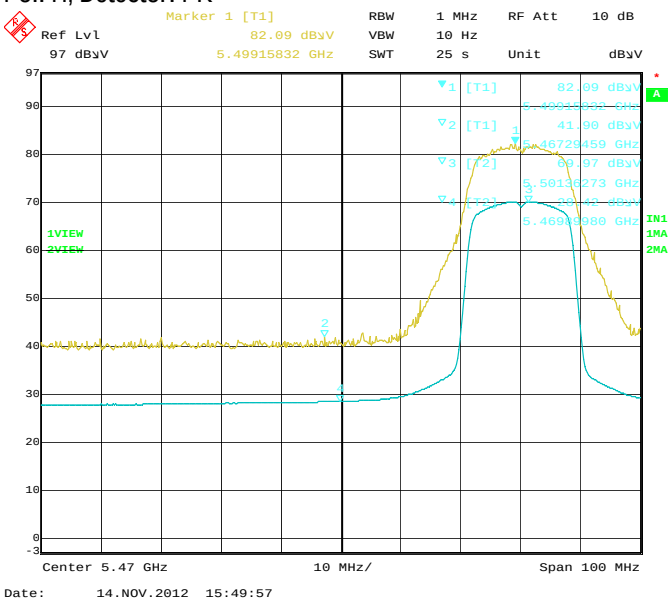


Figure 3-7: Band-Edge Compliance of RF Radiated Emission. 802.11a, Ch 140, 5700 MHz, Centre of Band-Edge: 5725 MHz Pol: V, Detector: PK

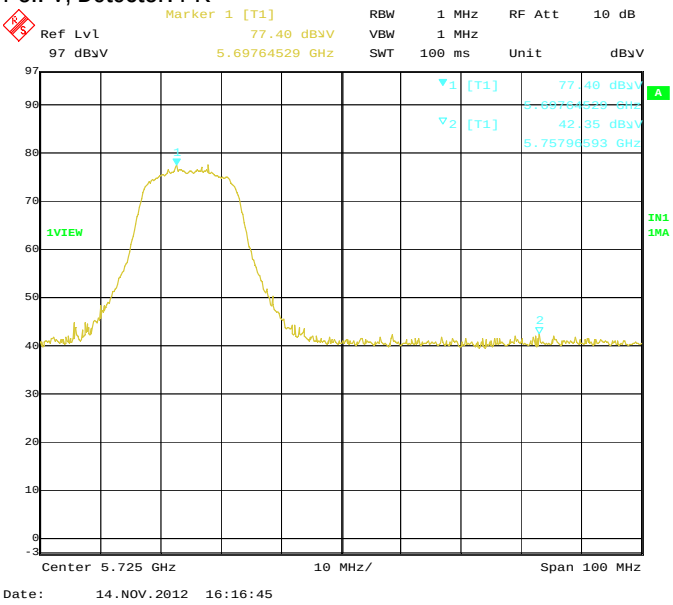
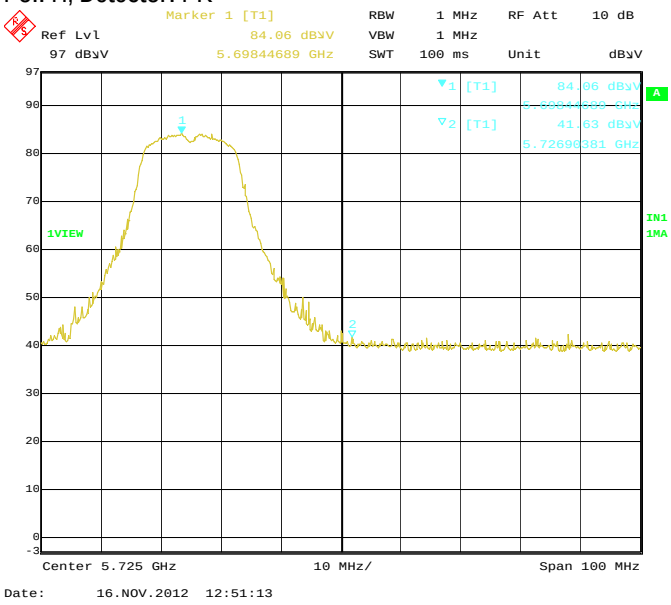


Figure 3-8: Band-Edge Compliance of RF Radiated Emission. 802.11a, Ch 140, 5700 MHz, Centre of Band-Edge: 5725 MHz Pol: H, Detector: PK



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

Figure 3-9: Band-Edge Compliance of RF Radiated Emission
802.11a, Ch 149, 5745 MHz, Centre of Band-Edge: 5725 MHz
Pol: V, Detector: PK

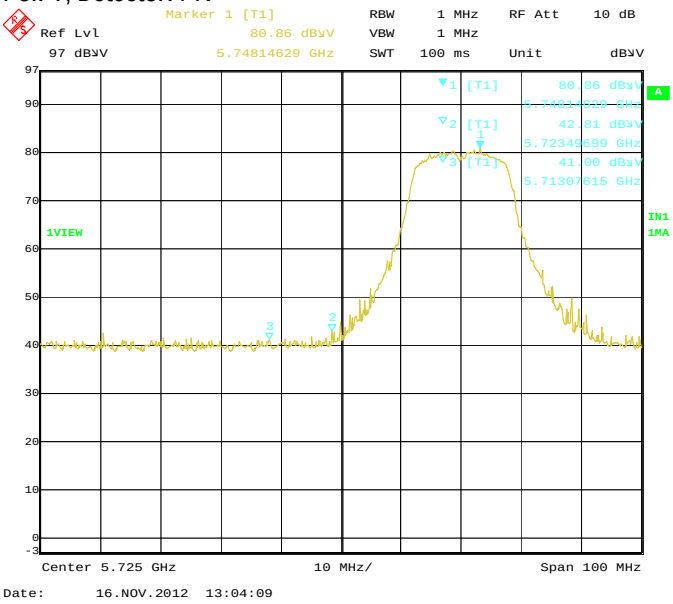


Figure 3-10: Band-Edge Compliance of RF Radiated Emission.
802.11a, Ch 149, 5745 MHz, Centre of Band-Edge: 5725 MHz
Pol: H, Detector: PK

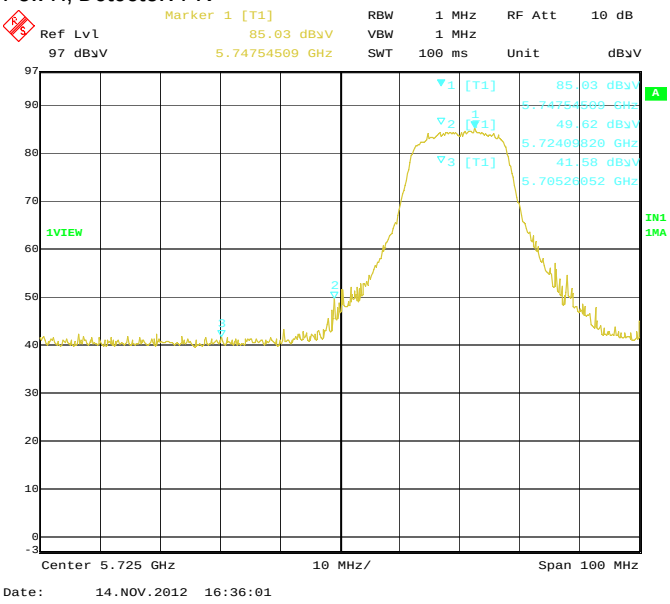


Figure 3-11: Band-Edge Compliance of RF Radiated Emission.
802.11a, Ch 149, 5745 MHz, Centre of Band-Edge: 5715 MHz
Pol: V, Detector: PK

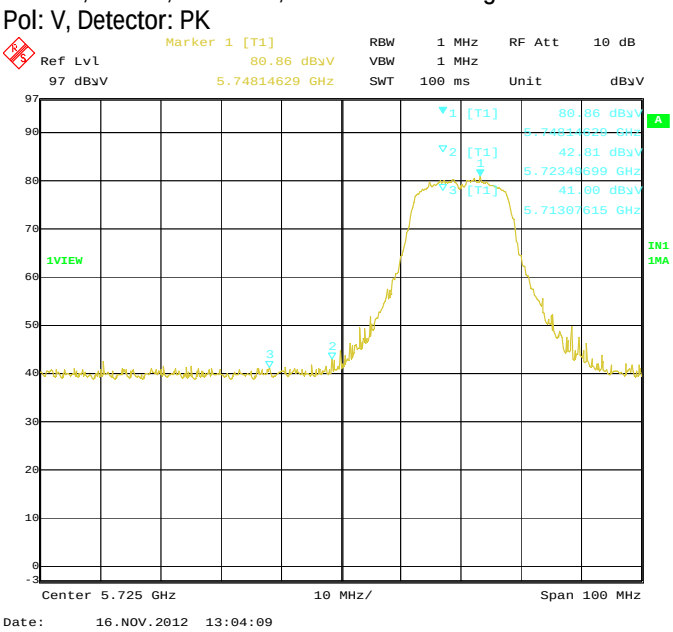
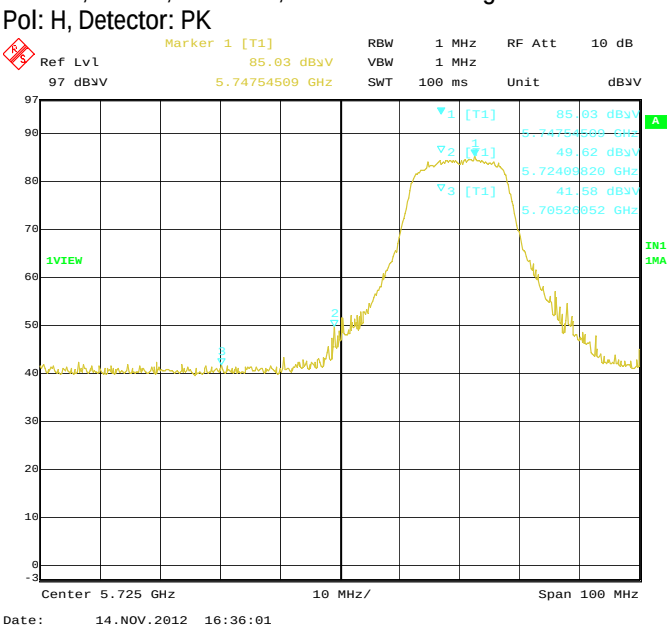


Figure 3-12: Band-Edge Compliance of RF Radiated Emission.
802.11a, Ch 149, 5745 MHz, Centre of Band-Edge: 5715 MHz
Pol: H, Detector: PK



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

Figure 3-13: Band-Edge Compliance of RF Radiated Emission
802.11a, Ch 165, 5825 MHz, Centre of Band-Edge: 5805 MHz
Pol: V, Detector: PK

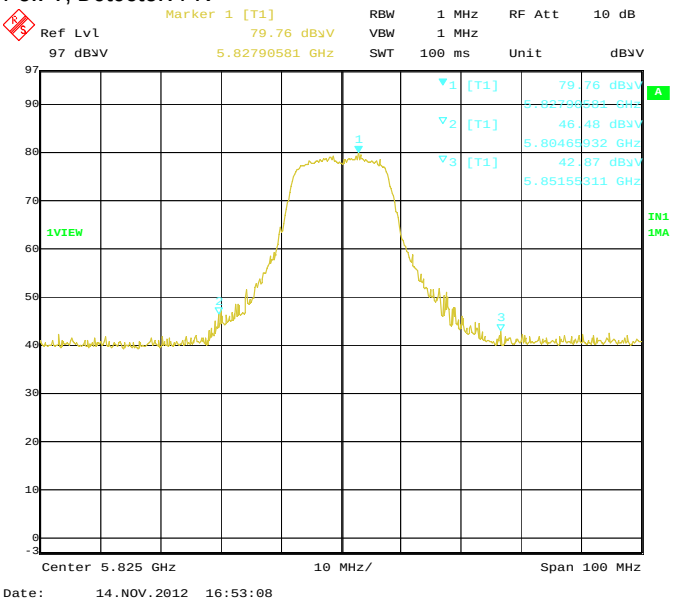


Figure 3-14: Band-Edge Compliance of RF Radiated Emission.
802.11a, Ch 165, 5825 MHz, Centre of Band-Edge: 5805 MHz
Pol: H, Detector: PK

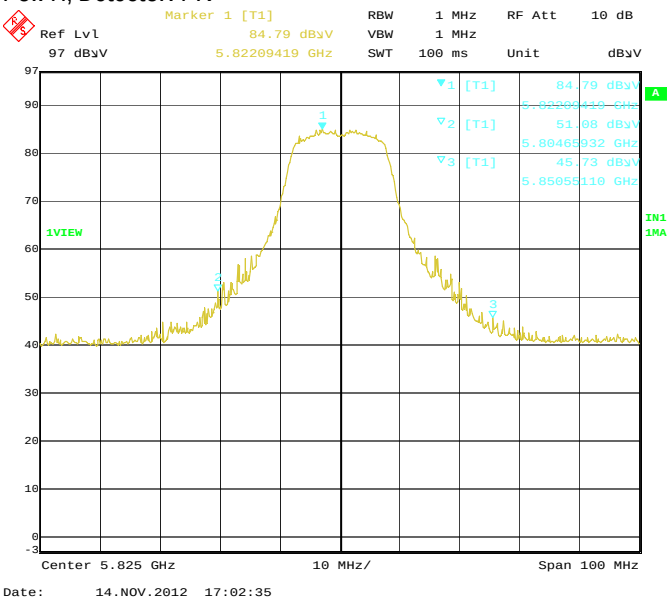


Figure 3-15: Band-Edge Compliance of RF Radiated Emission.
802.11a, Ch 165, 5825 MHz, Centre of Band-Edge: 5850 MHz
Pol: V, Detector: PK

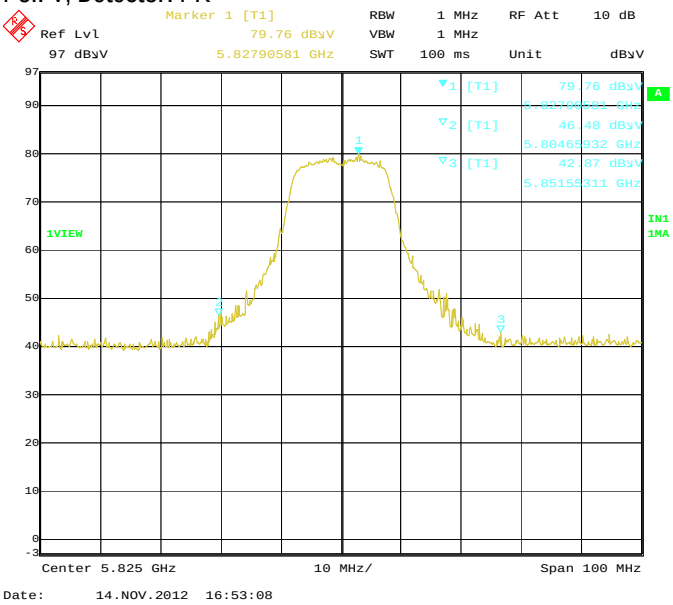
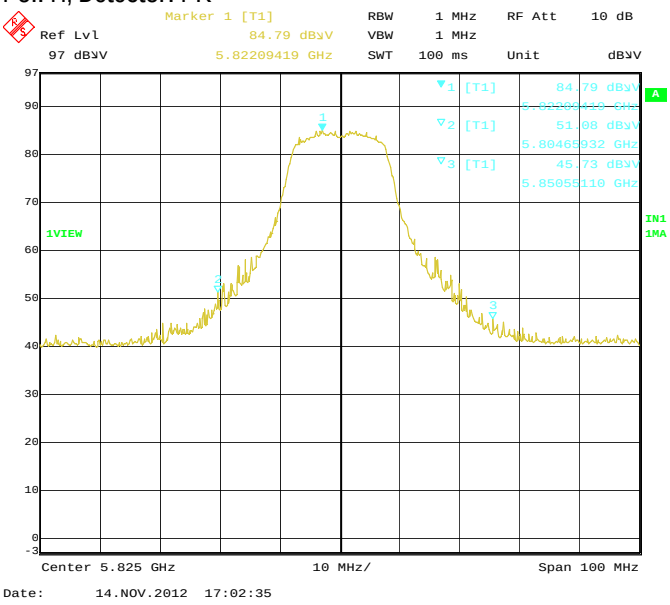


Figure 3-16: Band-Edge Compliance of RF Radiated Emission.
802.11a, Ch 165, 5825 MHz, Centre of Band-Edge: 5850 MHz
Pol: H, Detector: PK



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802.11n Band-Edge Compliance of RF Radiated Emissions

Figure 3-17: Band-Edge Compliance of RF Radiated Emission 802.11n, Ch 36, 5180 MHz, Centre of Band-Edge: 5150 MHz Pol: V, Detector: PK

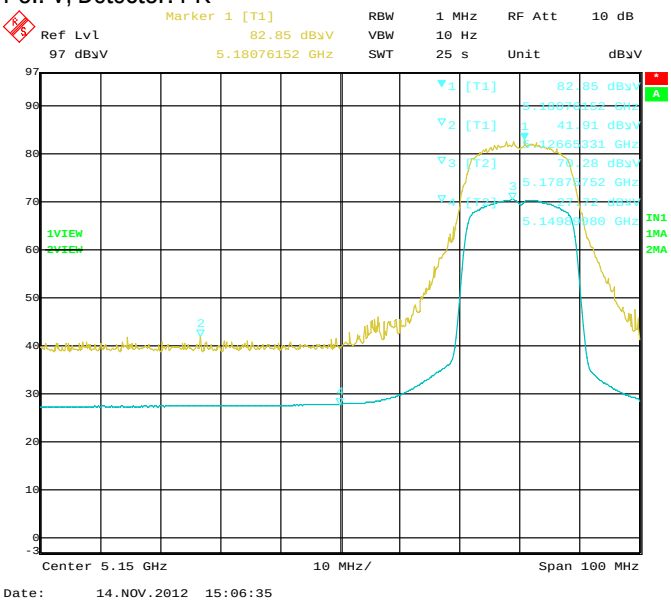


Figure 3-18: Band-Edge Compliance of RF Radiated Emission 802.11n, Ch 36, 5180 MHz, Centre of Band-Edge: 5150 MHz Pol: H, Detector: PK

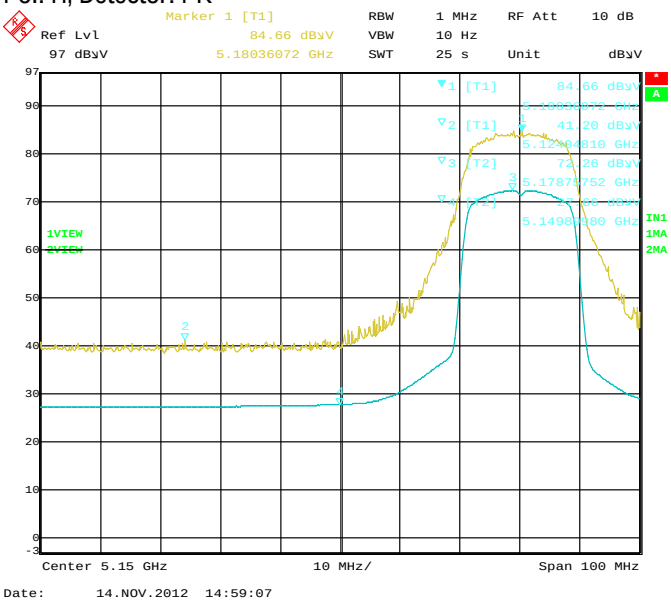


Figure 3-19: Band-Edge Compliance of RF Radiated Emission 802.11n, Ch 64, 5320 MHz, Centre of Band-Edge: 5350 MHz Pol: V, Detector: PK

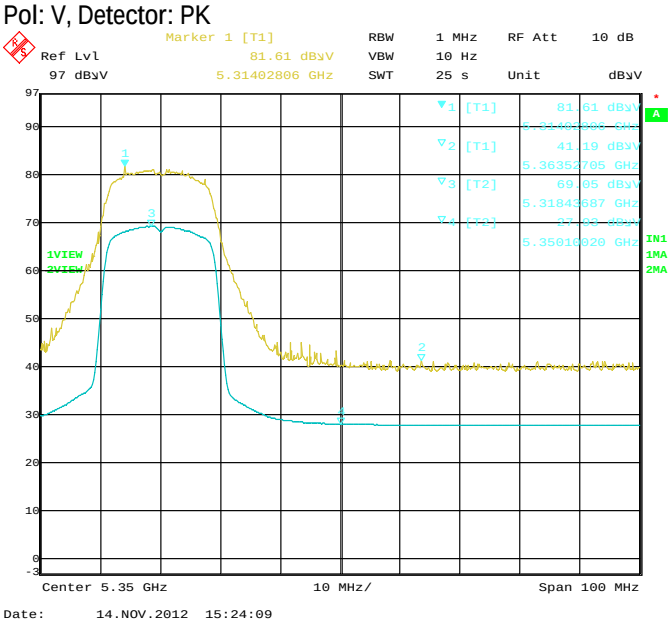
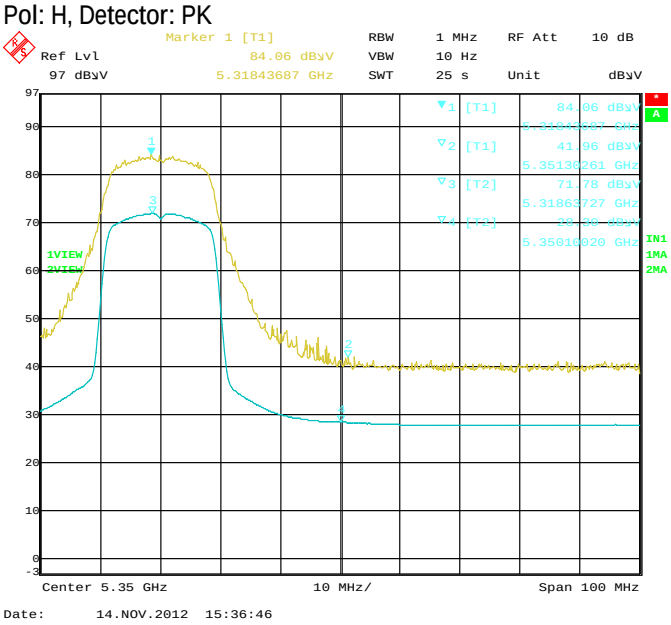


Figure 3-20: Band-Edge Compliance of RF Radiated Emission 802.11n, Ch 64, 5320 MHz, Centre of Band-Edge: 5350 MHz Pol: H, Detector: PK



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

Figure 3-21: Band-Edge Compliance of RF Radiated Emission
802.11n, Ch 100, 5500 MHz, Centre of Band-Edge: 5460 MHz
Pol: V, Detector: PK

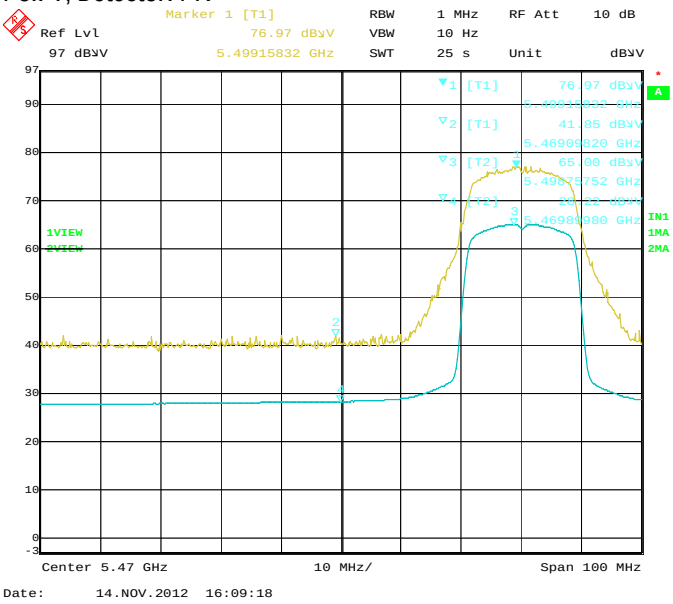


Figure 3-22: Band-Edge Compliance of RF Radiated Emission.
802.11n, Ch 100, 5500 MHz, Centre of Band-Edge: 5460 MHz
Pol: H, Detector: PK

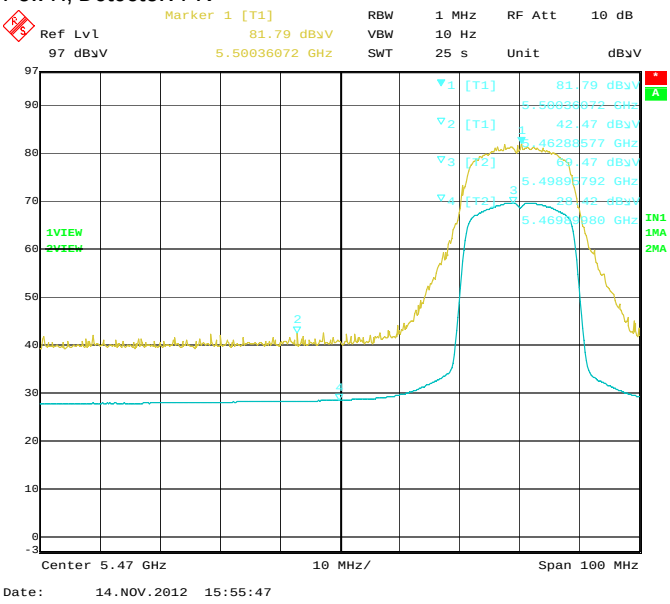


Figure 3-23: Band-Edge Compliance of RF Radiated Emission.
802.11n, Ch 140, 5700 MHz, Centre of Band-Edge: 5725 MHz
Pol: V, Detector: PK

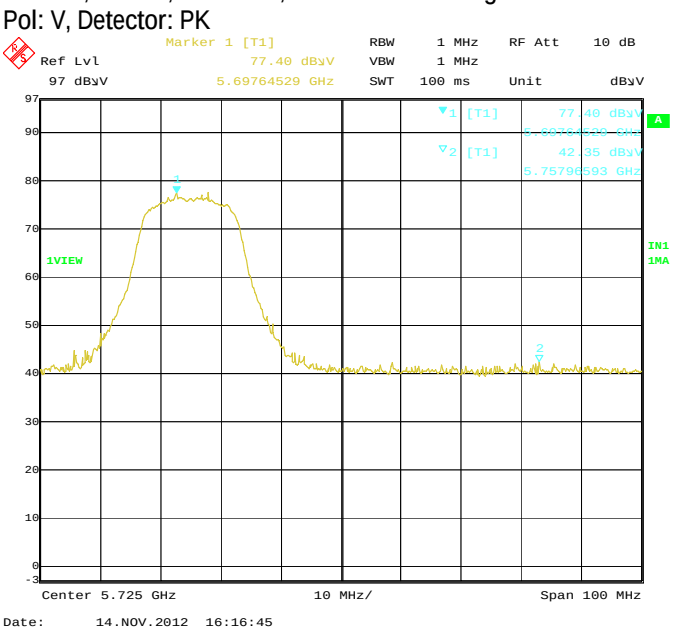
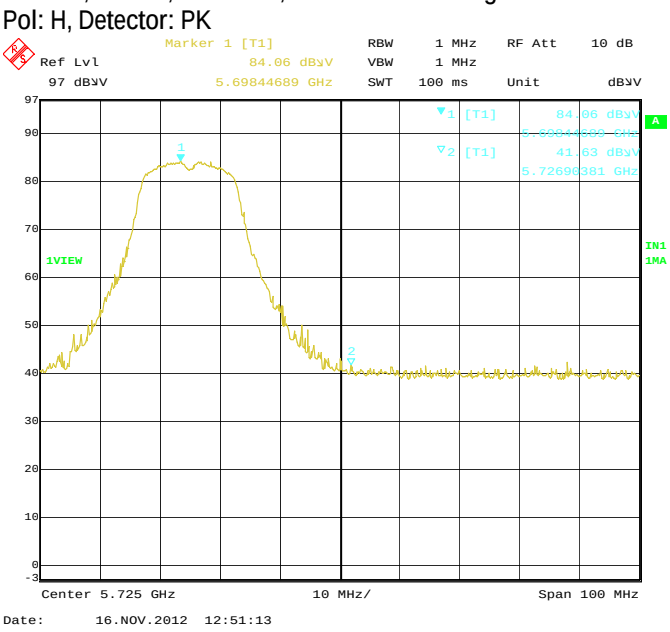


Figure 3-24: Band-Edge Compliance of RF Radiated Emission.
802.11n, Ch 140, 5700 MHz, Centre of Band-Edge: 5725 MHz
Pol: H, Detector: PK



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

Figure 3-25: Band-Edge Compliance of RF Radiated Emission 802.11n, Ch 149, 5745 MHz, Centre of Band-Edge: 5725 MHz Pol: V, Detector: PK

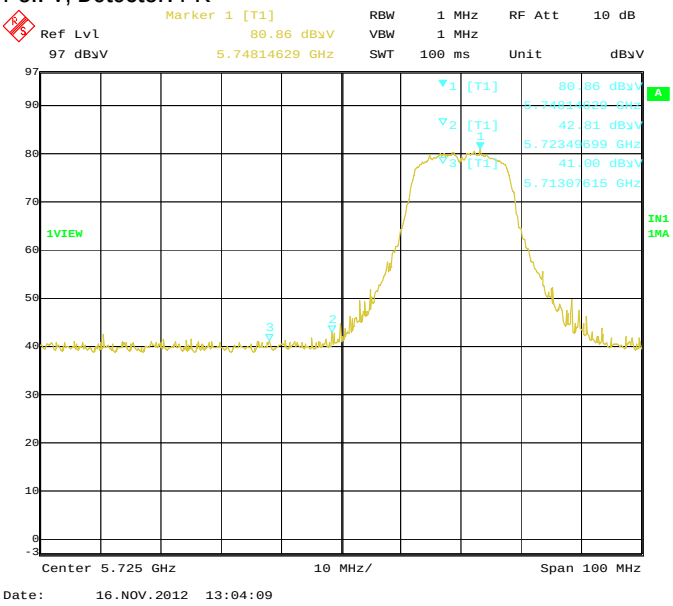


Figure 3-26: Band-Edge Compliance of RF Radiated Emission. 802.11n, Ch 149, 5745 MHz, Centre of Band-Edge: 5725 MHz Pol: H, Detector: PK

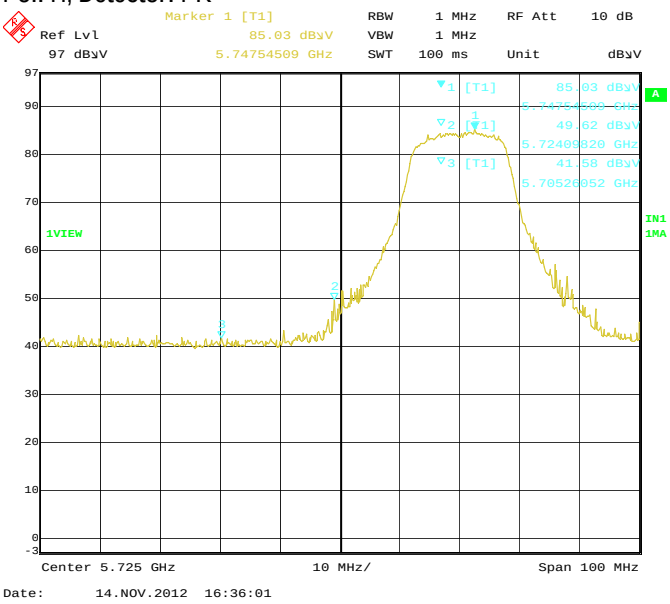


Figure 3-27: Band-Edge Compliance of RF Radiated Emission. 802.11n, Ch 149, 5745 MHz, Centre of Band-Edge: 5715 MHz Pol: V, Detector: PK

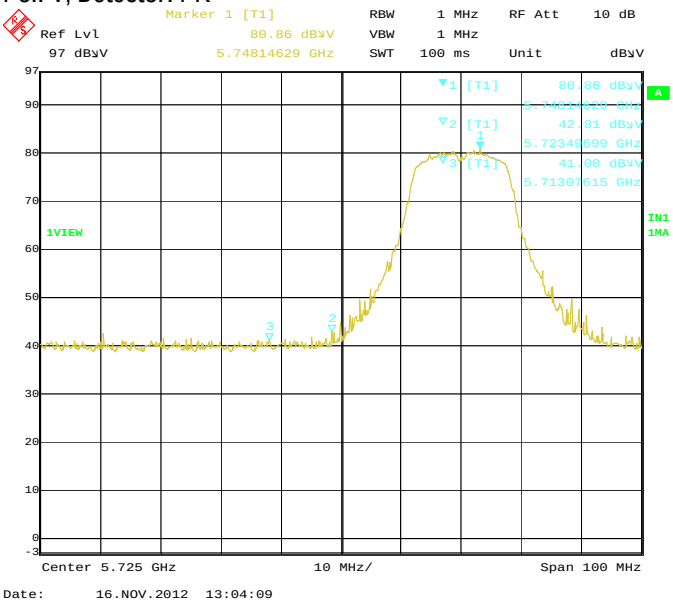
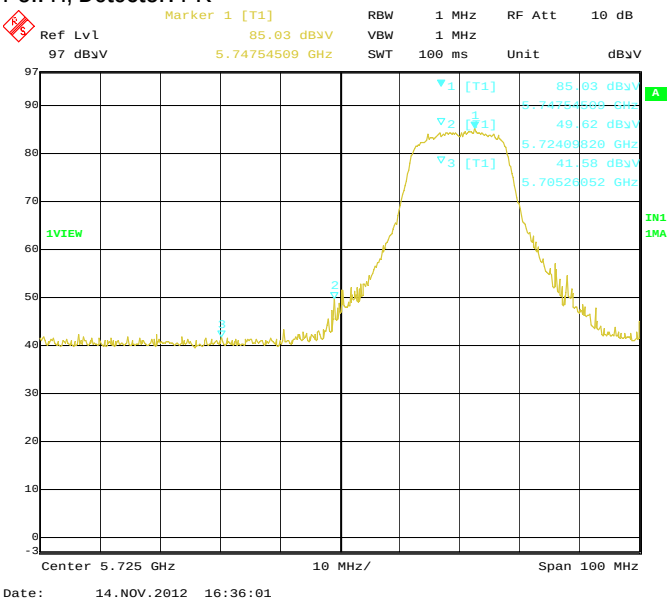


Figure 3-28: Band-Edge Compliance of RF Radiated Emission. 802.11n, Ch 149, 5745 MHz, Centre of Band-Edge: 5715 MHz Pol: H, Detector: PK



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

Figure 3-29: Band-Edge Compliance of RF Radiated Emission 802.11n, Ch 165, 5825 MHz, Centre of Band-Edge: 5805 MHz Pol: V, Detector: PK

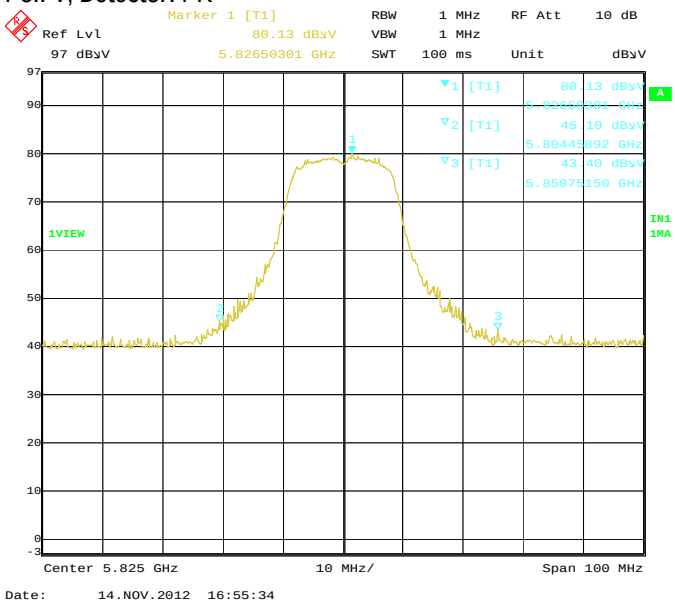


Figure 3-30: Band-Edge Compliance of RF Radiated Emission. 802.11n, Ch 165, 5825 MHz, Centre of Band-Edge: 5805 MHz Pol: H, Detector: PK

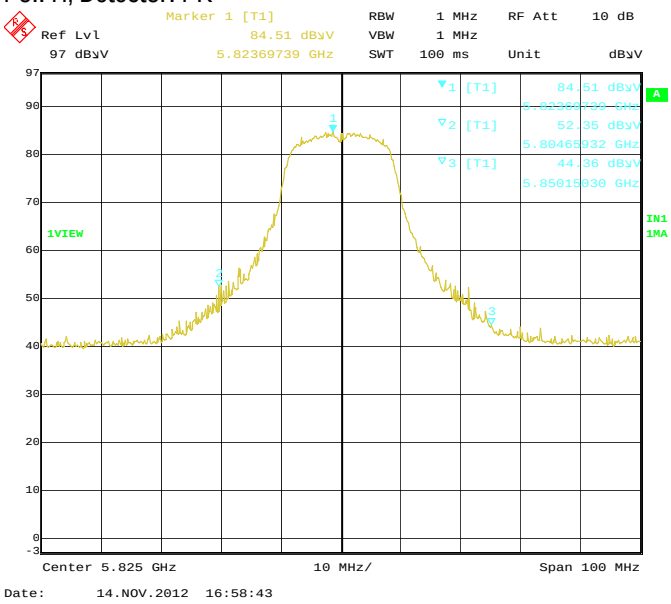


Figure 3-31: Band-Edge Compliance of RF Radiated Emission. 802.11n, Ch 165, 5825 MHz, Centre of Band-Edge: 5850 MHz Pol: V, Detector: PK

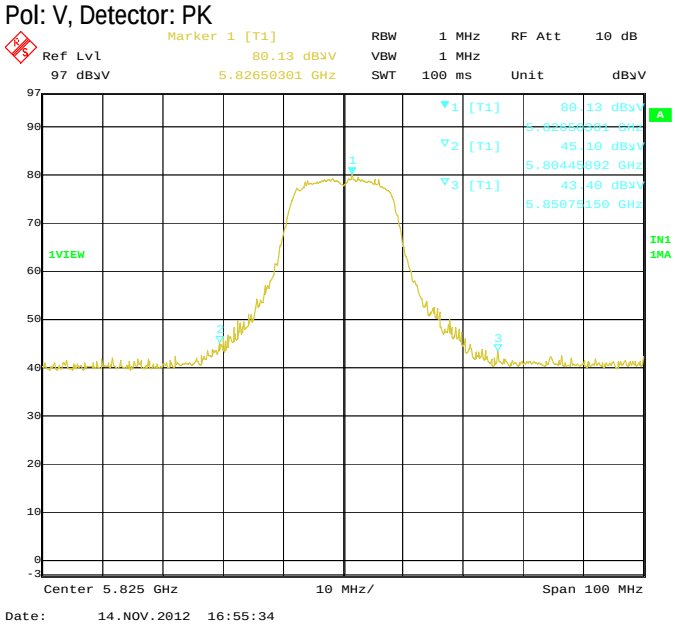
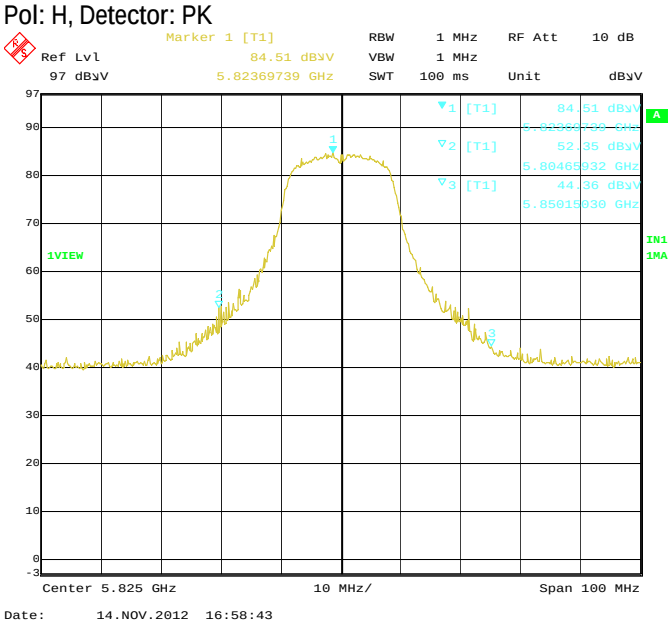


Figure 3-31: Band-Edge Compliance of RF Radiated Emission. 802.11n, Ch 165, 5825 MHz, Centre of Band-Edge: 5850 MHz Pol: H, Detector: PK



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APPENDIX 4 – BLUETOOTH AND BLUETOOTH LOW ENERGY CONDUCTED EMISSIONS TEST DATA/PLOTS

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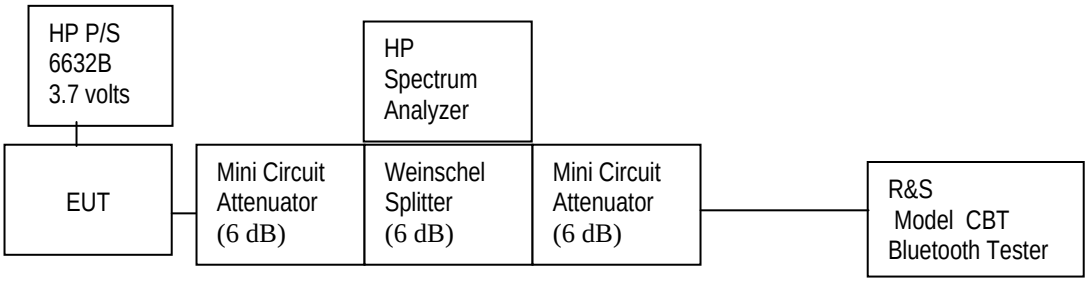
Bluetooth RF Conducted Emission Test Results

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

Date of test: November 28, 2012

Test Setup Diagram



A reference offset of 12.4 dB was applied to the spectrum analyzer reference level for the attenuators and coaxial cable loss in the test circuit.

The environmental test conditions were: Temperature: 23.4 ºC
Relative Humidity: 39.8 %

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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	0.923
39	≤1.0	0.923
78	≤1.0	0.923

See figures 4-1 to 4-3 for the plots of the 20 dB bandwidth measurements.

Figure 4-1: 20 dB Bandwidth
Single freq., Static PBRS, DH5

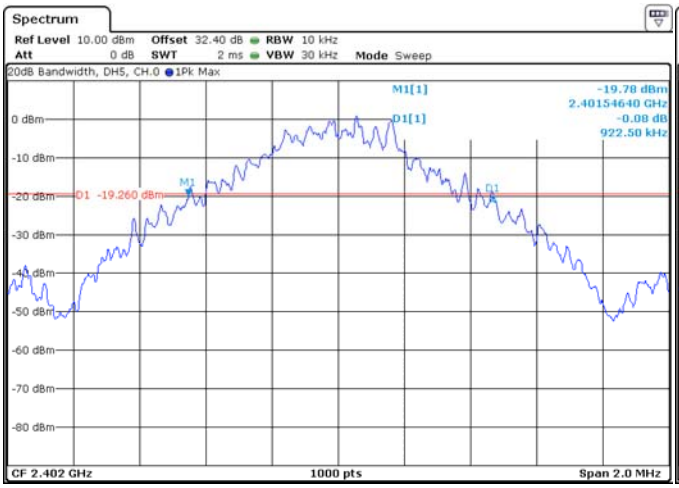
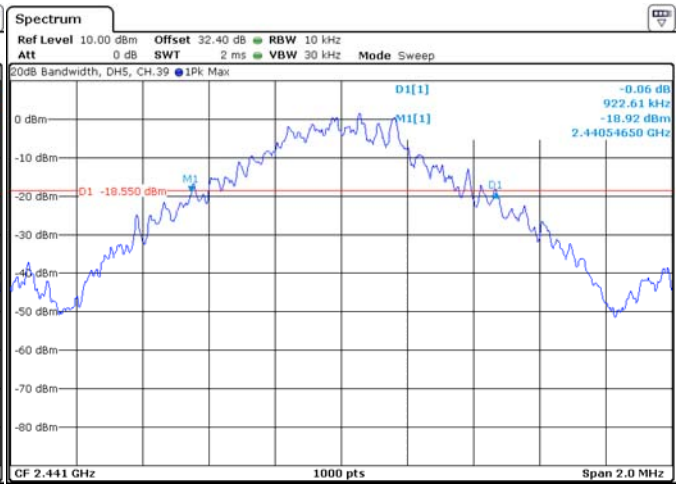


Figure 4-2: 20 dB Bandwidth
Single freq., Static PBRS, DH5



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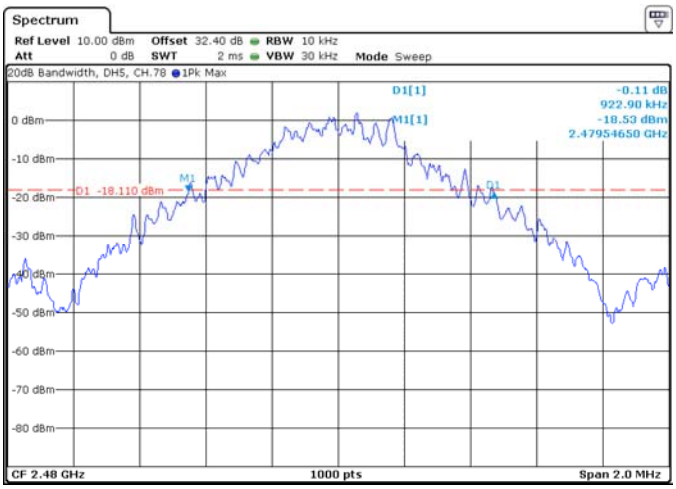
Bluetooth RF Conducted Emission Test Results cont'd

Figure 4-3: 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	1.263
39	≤1.5	1.292
78	≤1.5	1.311

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

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Bluetooth RF Conducted Emission Test Results cont'd

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

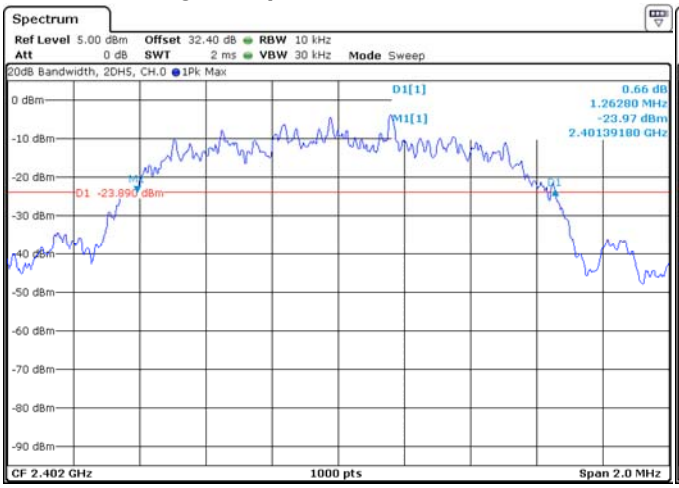


Figure 4-5: 20 dB Bandwidth
Single freq., Static PBRS, 2-DH5

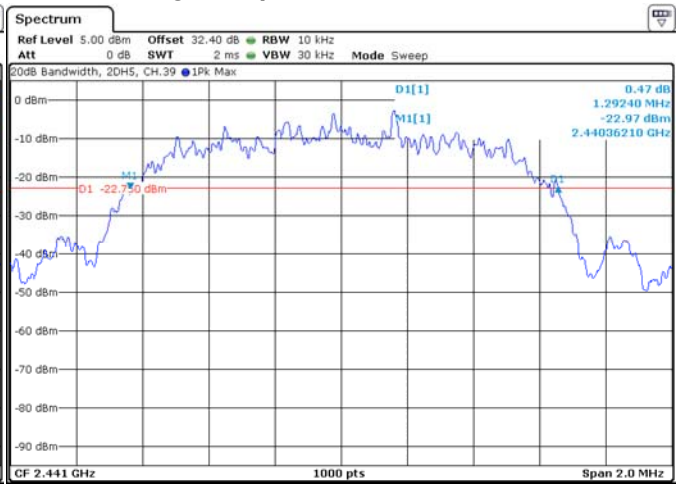
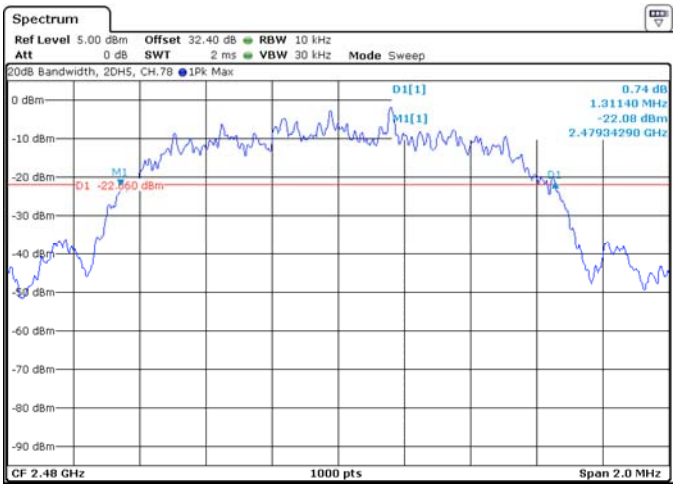


Figure 4-6: 20 dB Bandwidth
Single freq., Static PBRS, 2-DH5



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

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Bluetooth Channel	Limit (MHz)	Measured Level (MHz)
0	≤1.5	1.289
39	≤1.5	1.288
78	≤1.5	1.289

See figures 4-7 to 4-9 for the plots of the 20 dB bandwidth measurements.

Figure 4-7: 20 dB Bandwidth
Single freq., Static PBRS, 3-DH5

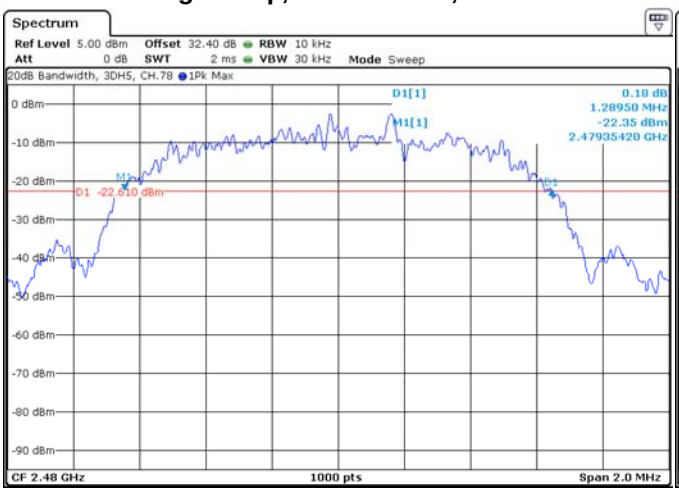


Figure 4-8: 20 dB Bandwidth
Single freq., Static PBRS, 3-DH5

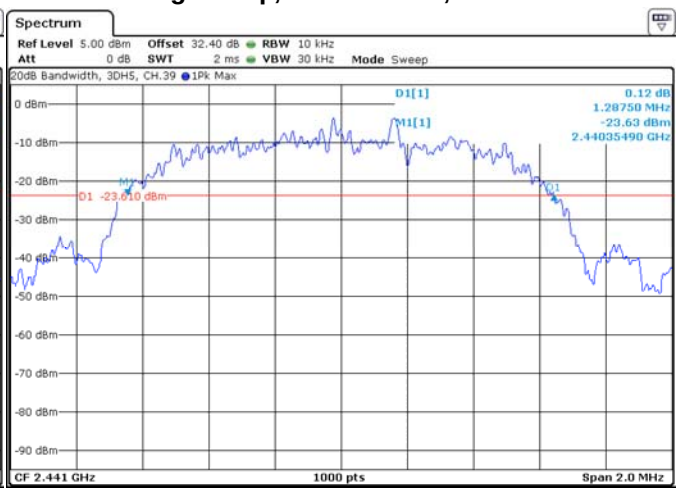
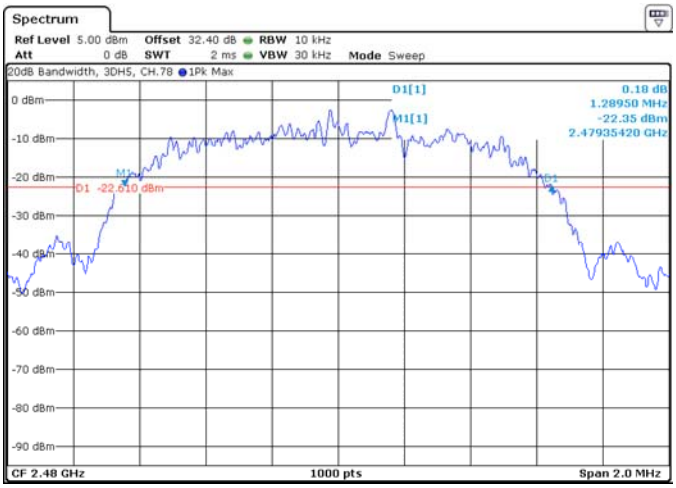


Figure 4-9: 20 dB Bandwidth
Single freq., Static PBRS, 3-DH5



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Bluetooth RF Conducted Emission Test Results cont'd

Carrier Frequency Separation

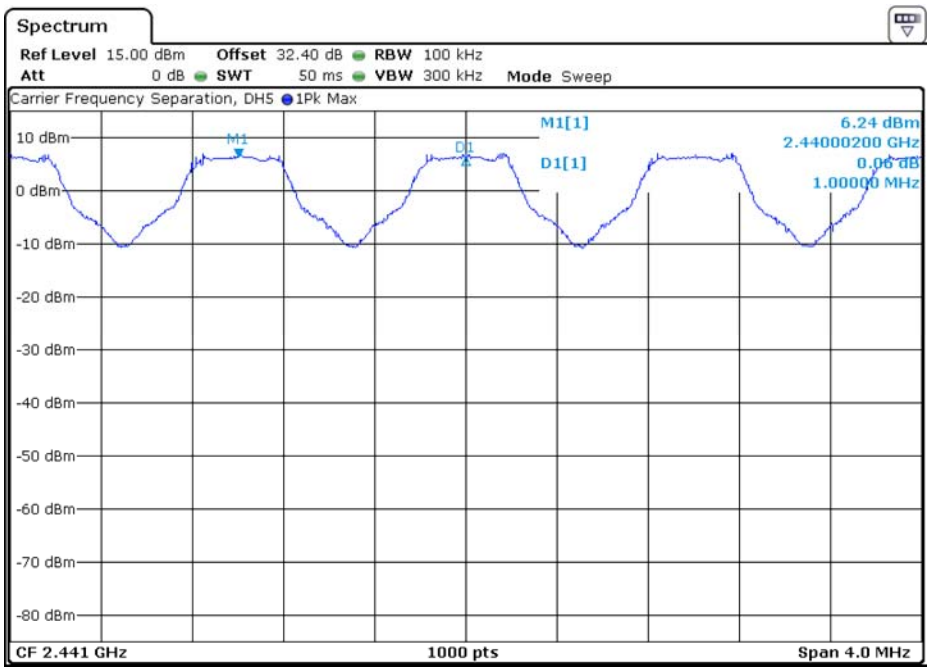
The EUT met the requirements of the Carrier Frequency Separation as per 47 CFR 15.247(a) and RSS-210. Channel 38 to 39 was measured. Bluetooth was operating in frequency hopping (Euro/US) mode.

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 4-10 for the plot of the Carrier Frequency Separation measurement.

Figure 4-10: Carrier Frequency Separation, Freq. Hopping, Static PBRS, DH5, Channels 38 to 39



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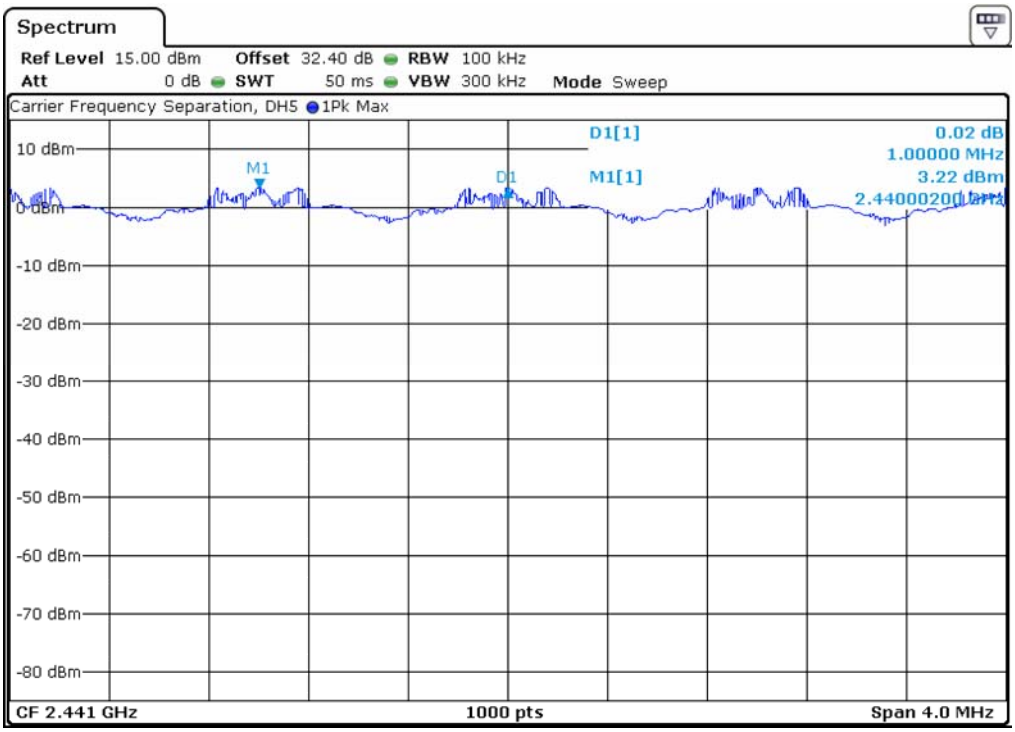
Bluetooth RF Conducted Emission Test Results cont'd

Using Pattern type "Static 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 4-11 for the plot of the Carrier Frequency Separation measurement.

Figure 4-11: Carrier Frequency Separation, Freq. Hopping, Static PBRS, 2-DH5, Channels 38 to 39



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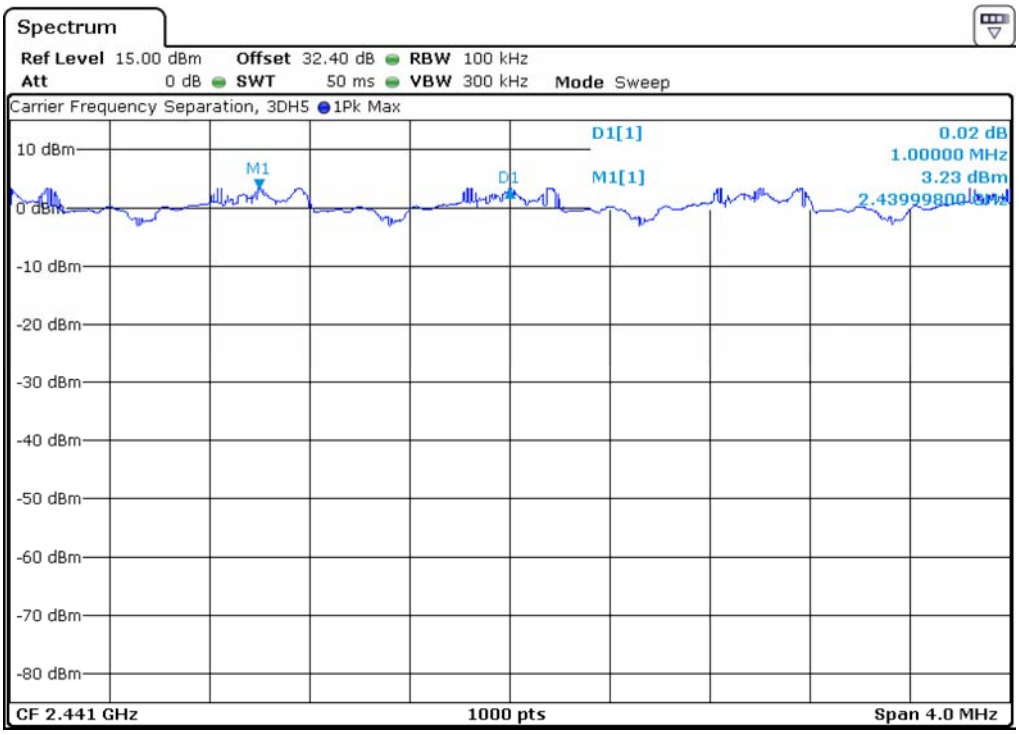
Bluetooth RF Conducted Emission Test Results cont'd

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 4-12 for the plot of the Carrier Frequency Separation measurement.

Figure 4-12: 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 4-13 to 4-16 for the plots of the number of hopping frequencies.

Figure 4-13: Number of Hopping Frequencies Static PBRS, DH5

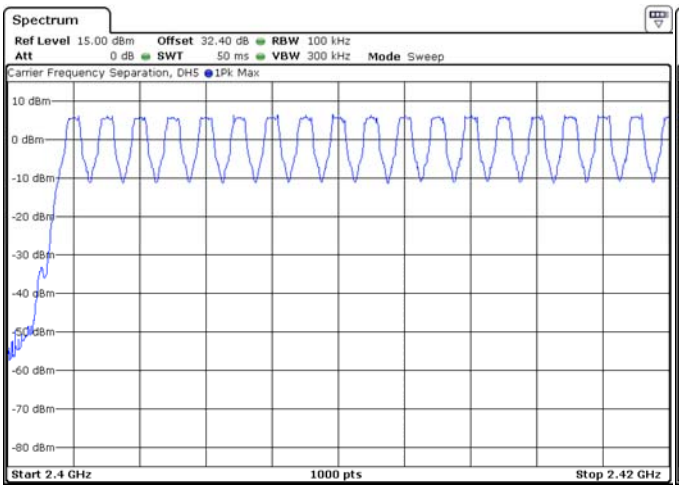
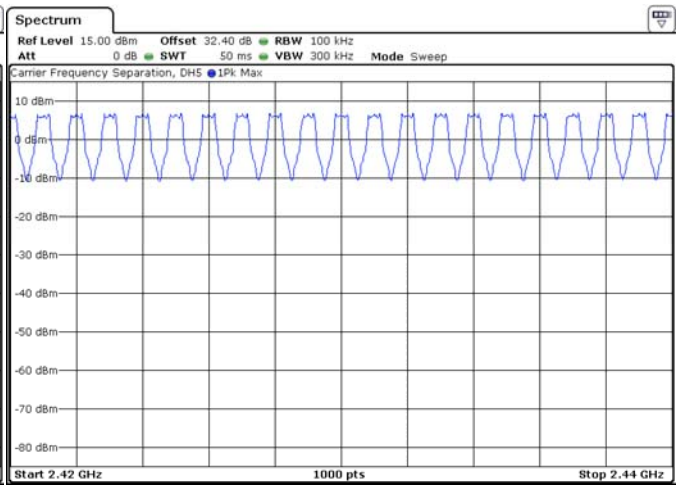


Figure 4-14: Number of Hopping Frequencies Static PBRS, DH5



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Bluetooth RF Conducted Emission Test Results cont'd

Figure 4-15: Number of Hopping Frequencies Static PBRS, DH5

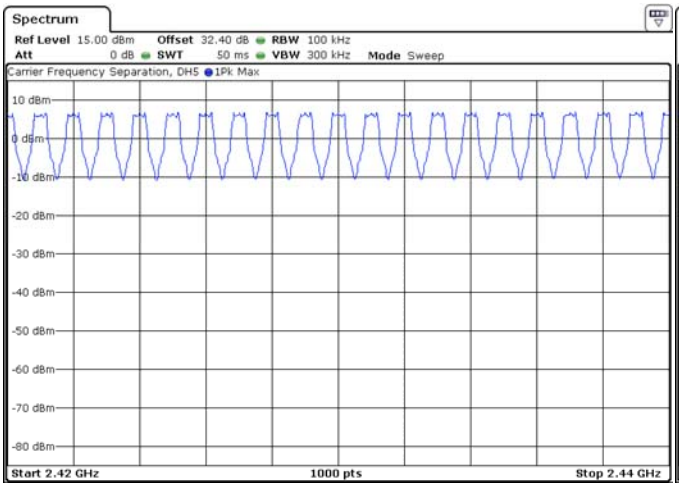
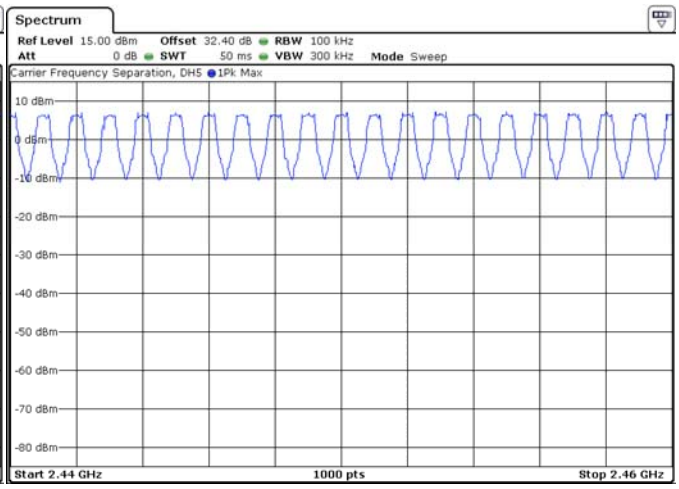


Figure 4-16: Number of Hopping Frequencies Static PBRS, DH5



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.

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Bluetooth RF Conducted Emission Test Results cont'd

Bluetooth Channel	Mode	Tx Time (ms)	Dwell Time/31.6 sec. (msec.)	Limit (msec.)	Margin (msec.)
0	DH1	0.4020	0.402 x 320.0 = 128.64	400	271.36
39	DH1	0.3990	0.399 x 320.0 = 127.68	400	272.32
78	DH1	0.4020	0.402 x 320.0 = 128.64	400	271.36
0	DH3	1.6650	1.665 x 159.9 = 266.23	400	133.77
39	DH3	1.7000	1.7 x 159.9 = 271.83	400	128.17
78	DH3	1.6610	1.661 x 159.9 = 265.59	400	134.41
0	DH5	2.9220	2.922 x 106.8 = 312.07	400	87.93
39	DH5	2.9130	2.913 x 106.8 = 311.11	400	88.89
78	DH5	2.9130	2.913 x 106.8 = 311.11	400	88.89

See figures 4-17 to 4-25 for the plots of the dwell time.

Bluetooth RF Conducted Emission Test Results cont'd

Figure 4-17: Time of Occupancy (Dwell Time) Freq. Hopping, Static PBRS, DH1

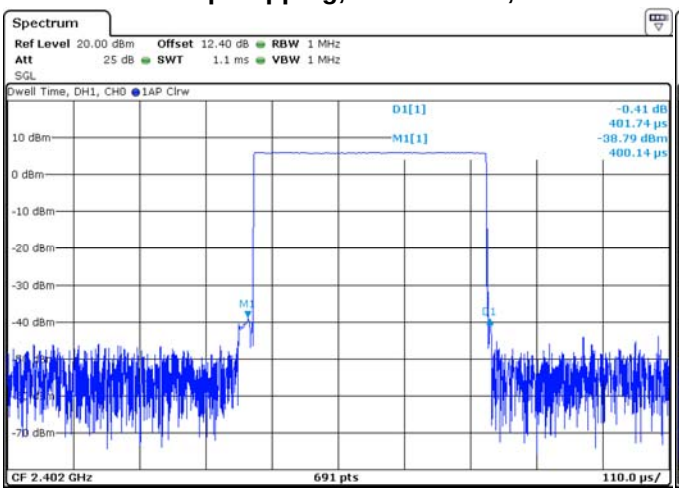
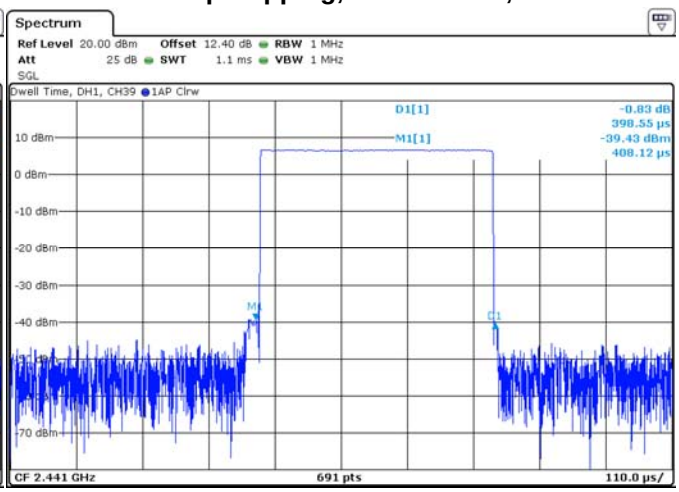


Figure 4-18: Time of Occupancy (Dwell Time) Freq. Hopping, Static PBRS, DH1



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Bluetooth RF Conducted Emission Test Results cont'd

Figure 4-19: Time of Occupancy (Dwell Time) Freq. Hopping, Static PBRS, DH1

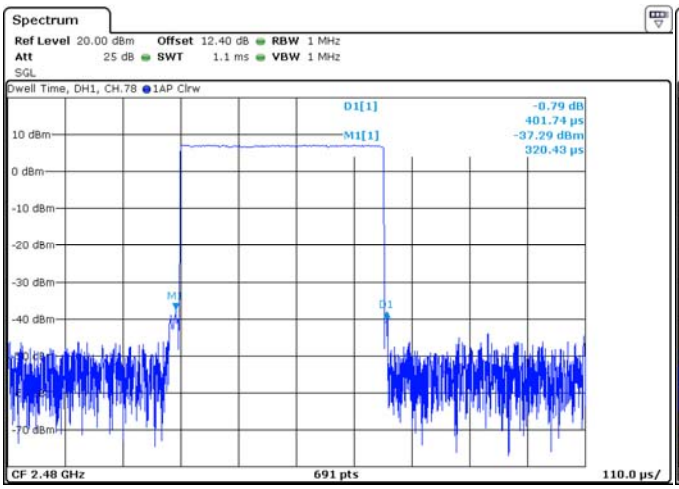


Figure 4-20: Time of Occupancy (Dwell Time) Freq. Hopping, Static PBRS, DH3

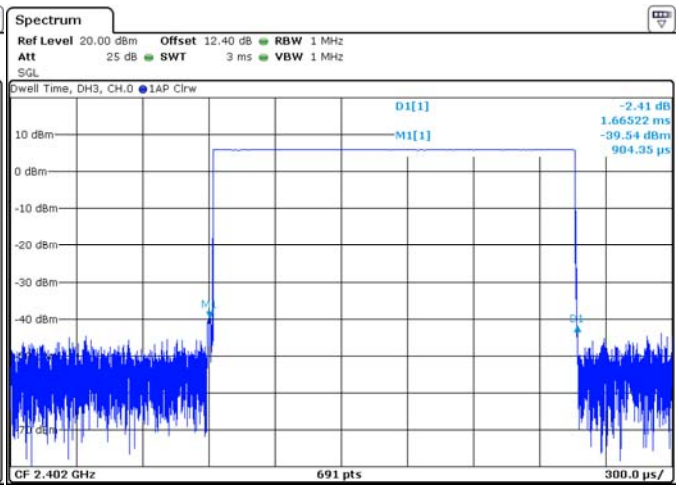


Figure 4-21: Time of Occupancy (Dwell Time) Freq. Hopping, Static PBRS, DH3

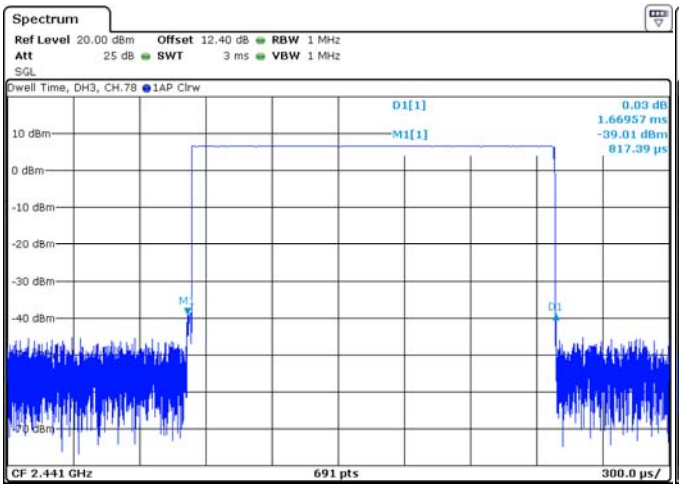
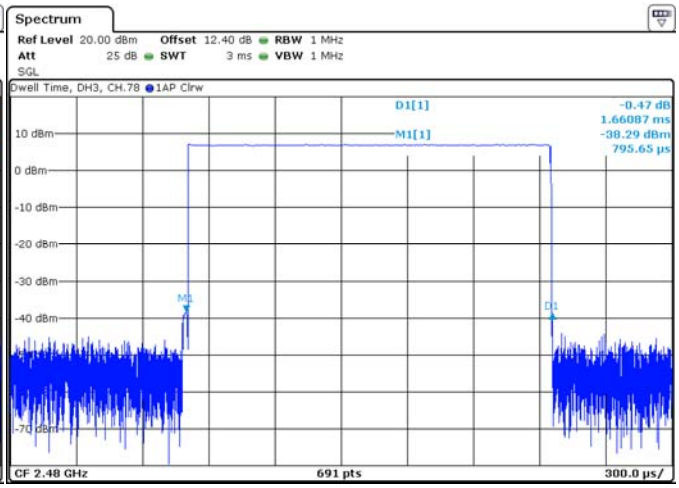


Figure 4-22: Time of Occupancy (Dwell Time) Freq. Hopping, Static PBRS, DH3



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Bluetooth RF Conducted Emission Test Results cont'd

Figure 4-23: Time of Occupancy (Dwell Time) Freq. Hopping, Static PBRS, DH5

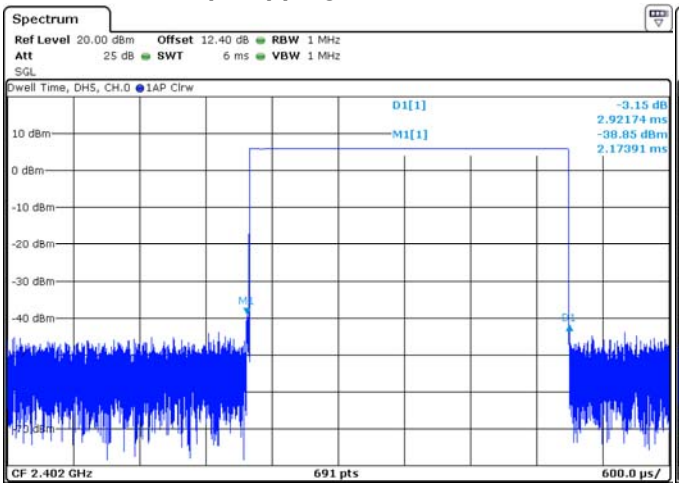


Figure 4-24: Time of Occupancy (Dwell Time) Freq. Hopping, Static PBRS, DH5

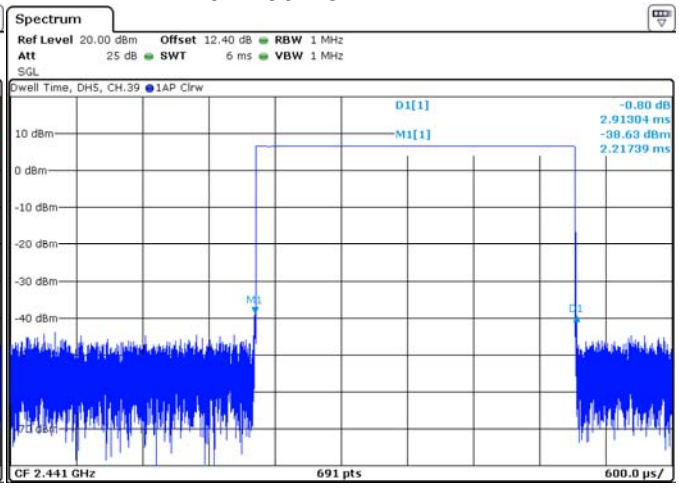
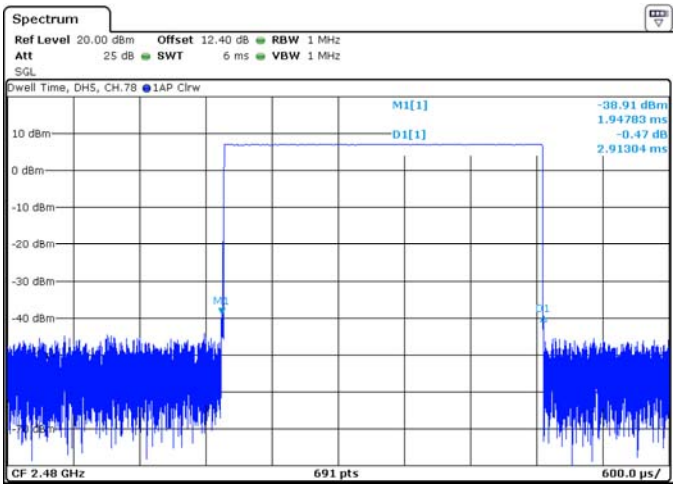


Figure 4-25: Time of Occupancy (Dwell Time) Freq. Hopping, Static PBRS, DH5



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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	6.26	0.00423	0.0 to 20.0
39	6.75	0.00473	0.0 to 20.0
78	6.84	0.00483	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	4.71	0.00296	0.0 to 20.0
39	5.35	0.00343	0.0 to 20.0
78	5.96	0.00394	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	5.22	0.00333	0.0 to 20.0
39	5.80	0.00380	0.0 to 20.0
78	5.55	0.00359	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	-38.12	-20	-18.12
78	Single Frequency	-37.91	-20	-17.91
0	Hopping	-38.76	-20	-18.76
78	Hopping	-38.12	-20	-18.12

See figures 4-35 to 4-38 for the plots of the band edge compliance measurements.

Figure 4-35: Band Edge Compliance
Single Freq., Static PBRS, DH5

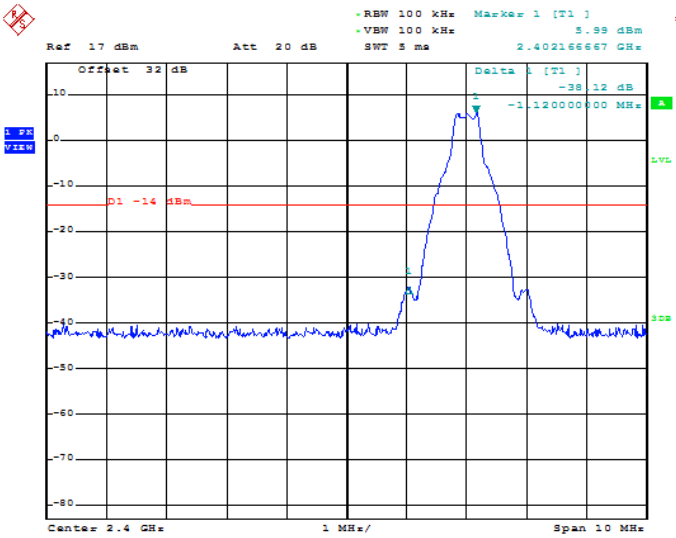
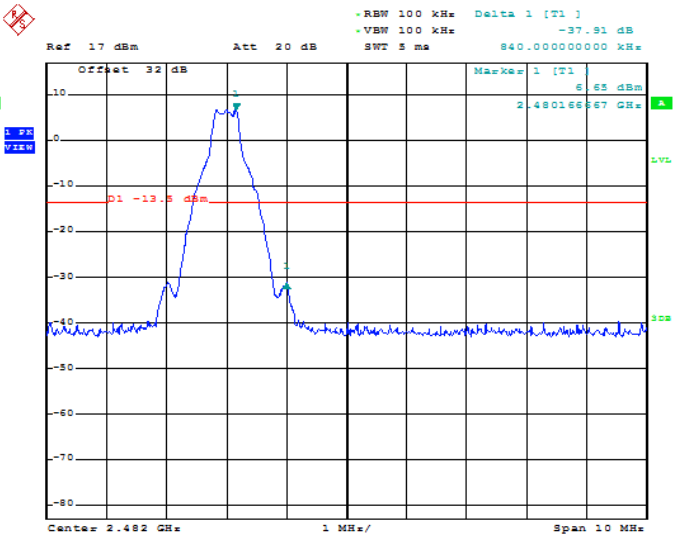


Figure 4-36: Band Edge Compliance
Single Freq., Static PBRS, DH5



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Bluetooth RF Conducted Emission Test Results cont'd

Figure 4-37: Band Edge Compliance
Freq. Hopping, Static PBRS, DH5

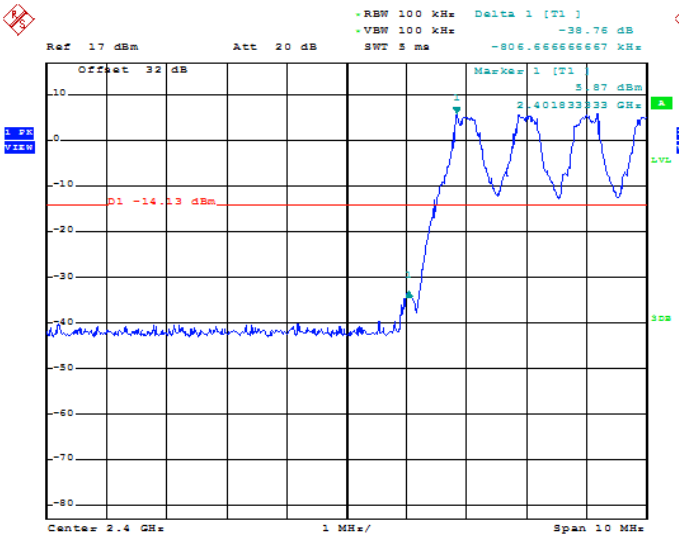
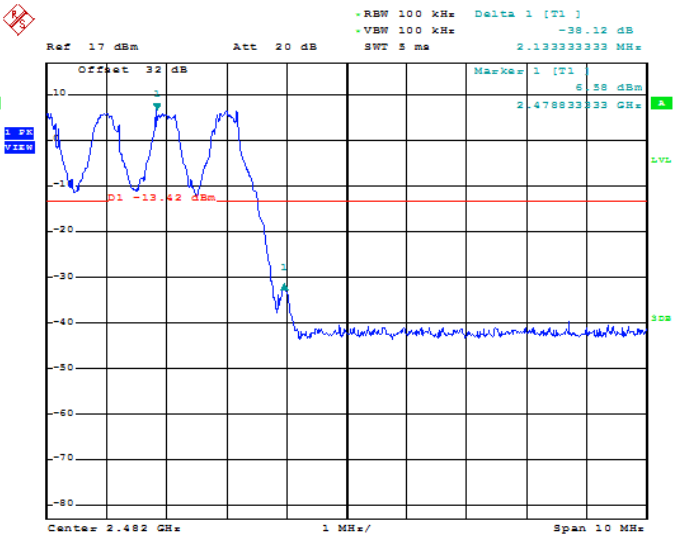


Figure 4-38: Band Edge Compliance
Freq. Hopping, Static PBRS, DH5



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	-31.6	-20	-11.60
78	Single Frequency	-34.63	-20	-14.63
0	Hopping	-31.64	-20	-11.64
78	Hopping	-35.4	-20	-15.40

See figures 4-39 to 4-42 for the plots of the band edge compliance measurements.

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Bluetooth RF Conducted Emission Test Results cont'd

Figure 4-39: Band Edge Compliance
Single Freq., Static PBRS, 2-DH5

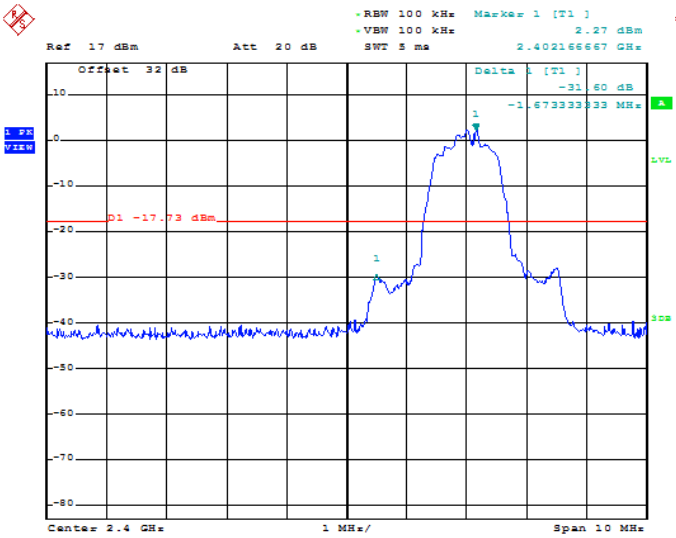


Figure 4-40: Band Edge Compliance
Single Freq., Static PBRS, 2-DH5

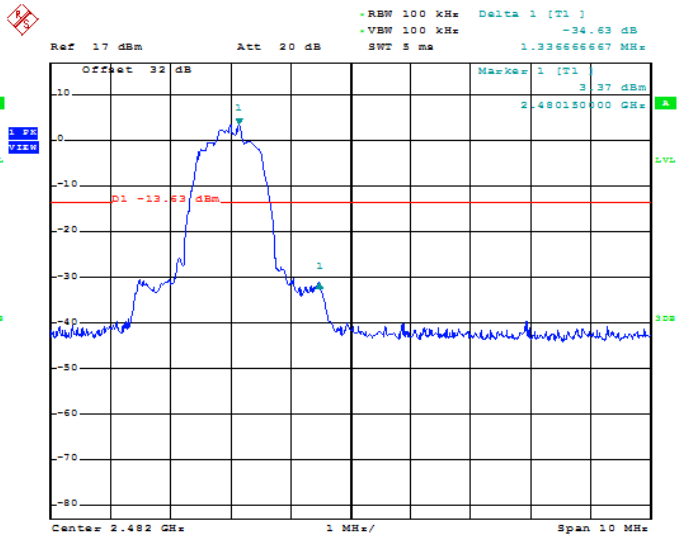


Figure 4-41: Band Edge Compliance
Freq. Hopping, Static PBRS, 2-DH5

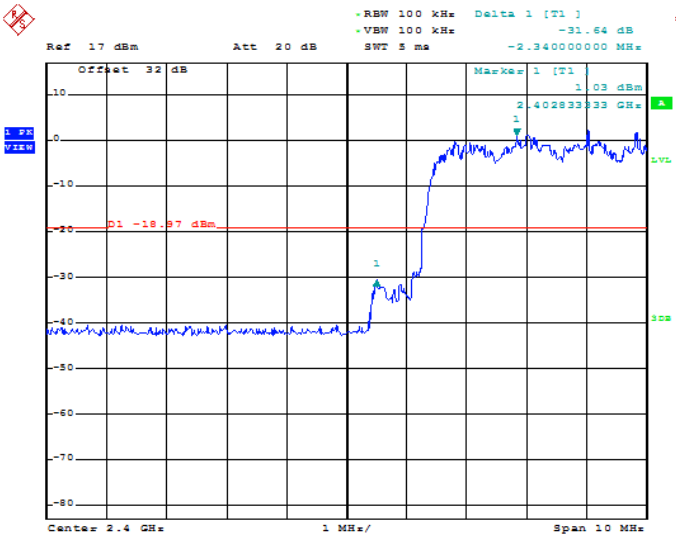
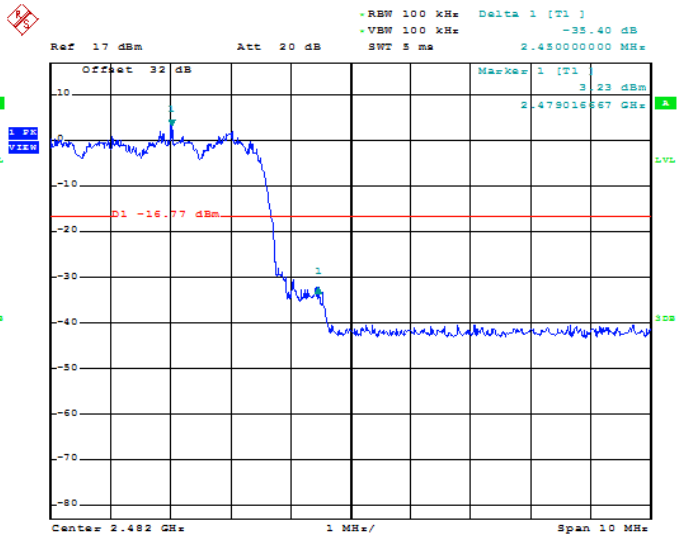


Figure 4-42: Band Edge Compliance
Freq. Hopping, Static PBRS, 2-DH5



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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	-31.42	-20	-11.42
78	Single Frequency	-32.89	-20	-12.89
0	Hopping	-33.04	-20	-13.04
78	Hopping	-33.05	-20	-13.05

See figures 4-43 to 4-46 for the plots of the band edge compliance measurements.

Figure 4-43: Band Edge Compliance
Single Freq., Static PBRS, 3-DH5

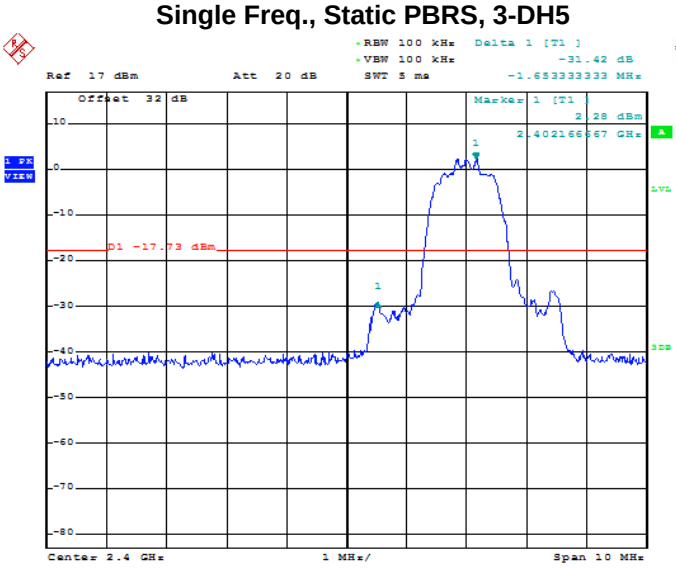
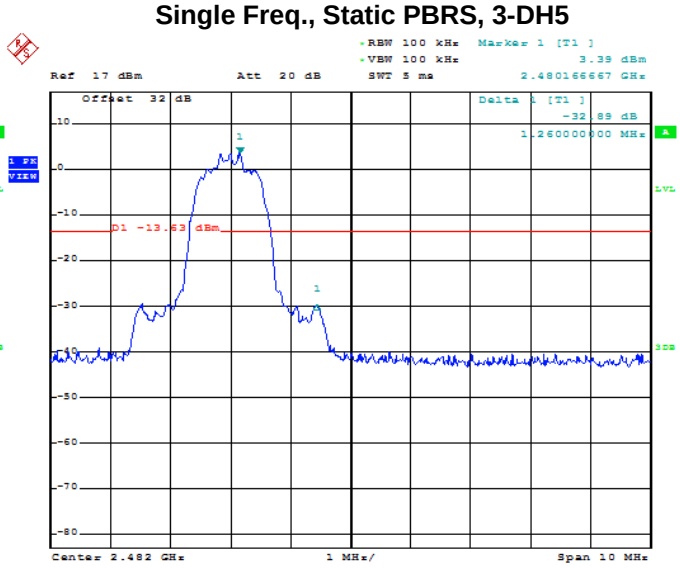


Figure 4-44: Band Edge Compliance
Single Freq., Static PBRS, 3-DH5



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Bluetooth RF Conducted Emission Test Results cont'd

Figure 4-45: Band Edge Compliance
Freq. Hopping, Static PBRS, 3-DH5

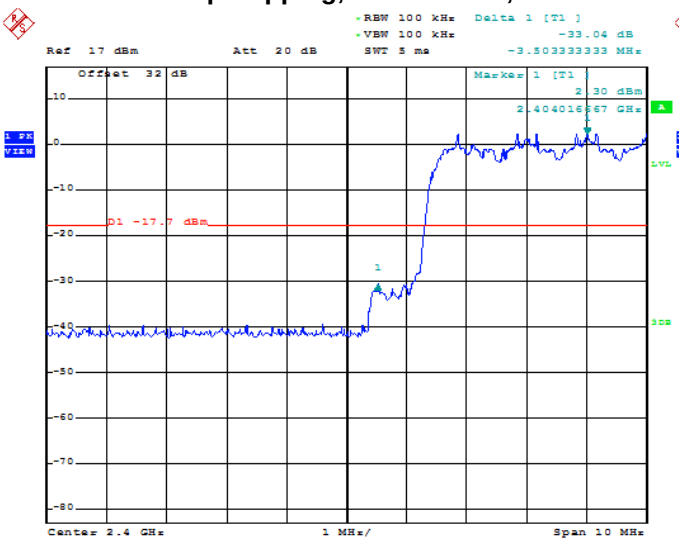
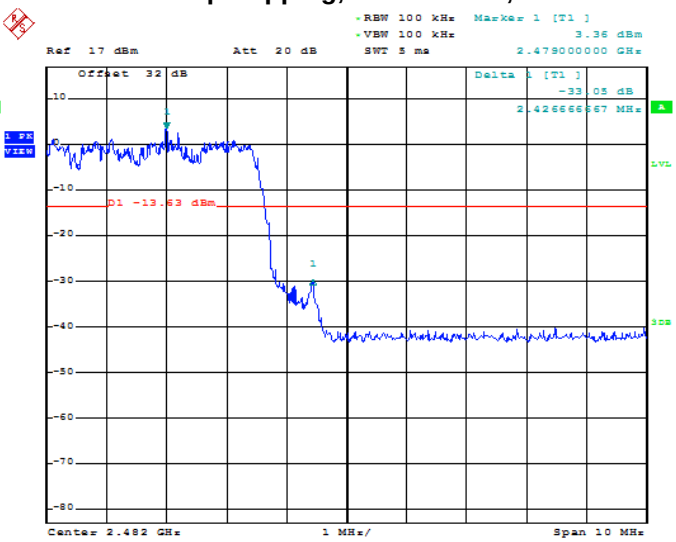


Figure 4-46: Band Edge Compliance
Freq. Hopping, Static PBRS, 3-DH5



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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	6.26	-31.09	-37.35	-20.00
39.00	6.75	-31.56	-38.31	-20.00
78.00	6.84	-31.66	-38.50	-20.00
Hopping mode	6.26	-30.91	-37.17	-20.00

See figures 4-47 to 4-50 for the plots of the spurious RF conducted emissions.

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Bluetooth RF Conducted Emission Test Results cont'd

Figure 4-47: Spurious RF Conducted Emissions
Single Freq., Static PBRS, DH5,

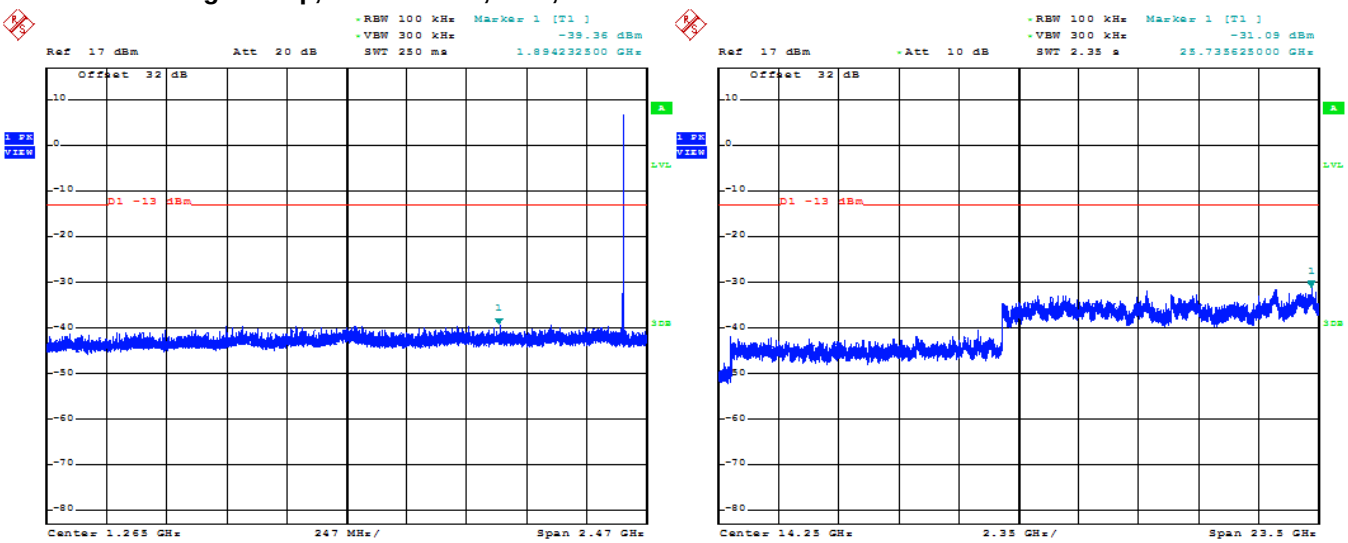
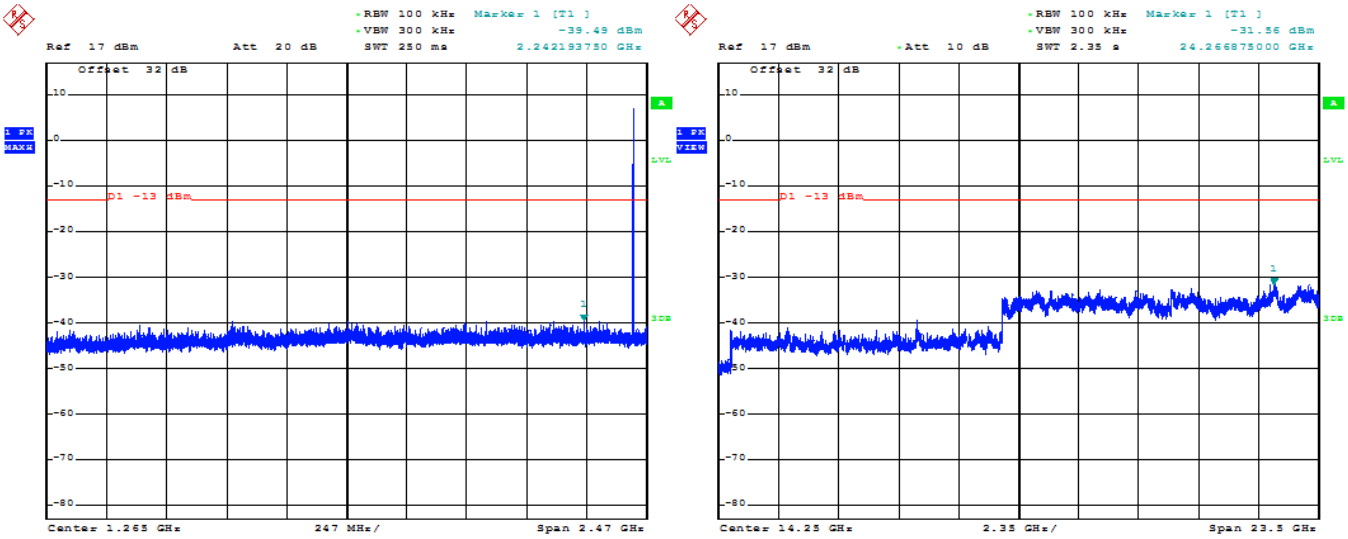


Figure 4-48: Spurious RF Conducted Emissions
Single Freq., Static PBRS, DH5



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Bluetooth RF Conducted Emission Test Results cont'd

Figure 4-49: Spurious RF Conducted Emissions
Single Freq., Static PBRS, DH5

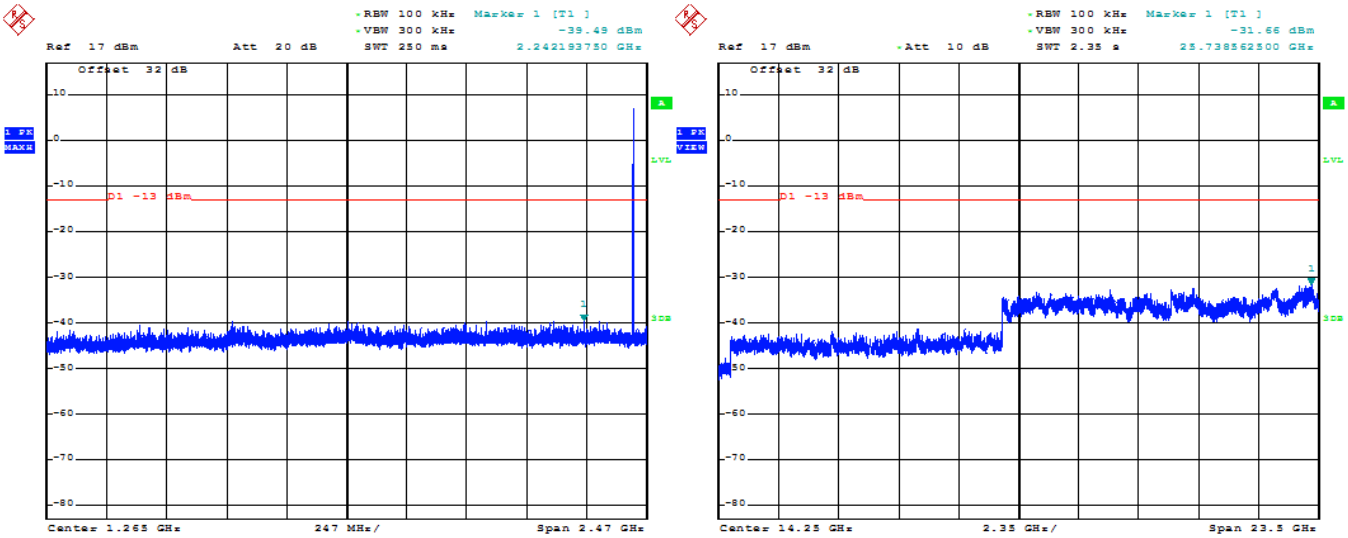
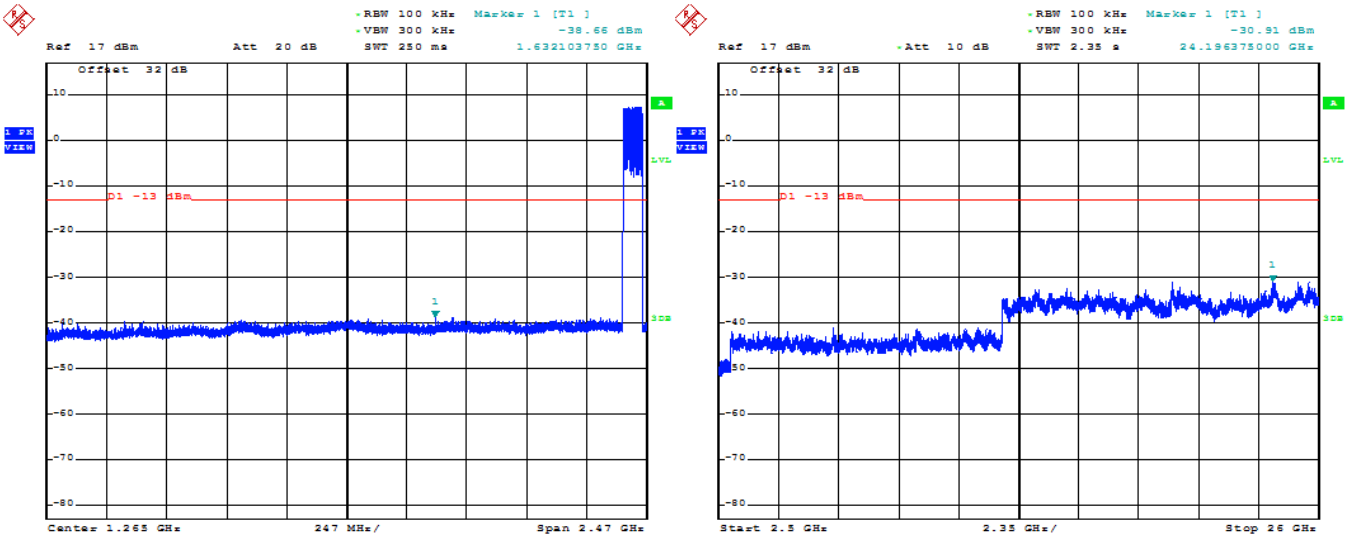


Figure 4-50: Spurious RF Conducted Emissions
Freq. Hopping, Static PBRS, DH5



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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	5.22	-30.31	-35.53	-20.00
39.00	5.80	-30.98	-36.78	-20.00
78.00	5.55	-31.52	-37.07	-20.00
Hopping mode	5.22	-31.07	-36.29	-20.00

See figures 4-51 to 4-54 for the plots of the spurious RF conducted emissions.

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Bluetooth RF Conducted Emission Test Results cont'd

Figure 4-51: Spurious RF Conducted Emissions
Single Freq., Static PBRS, 2-DH5

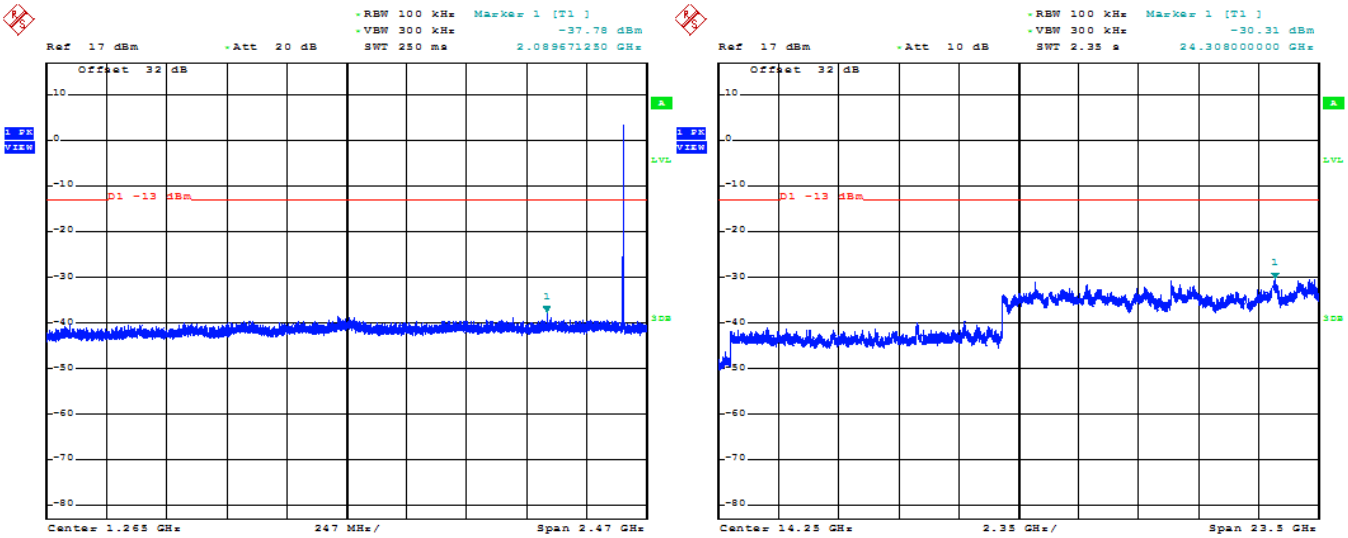
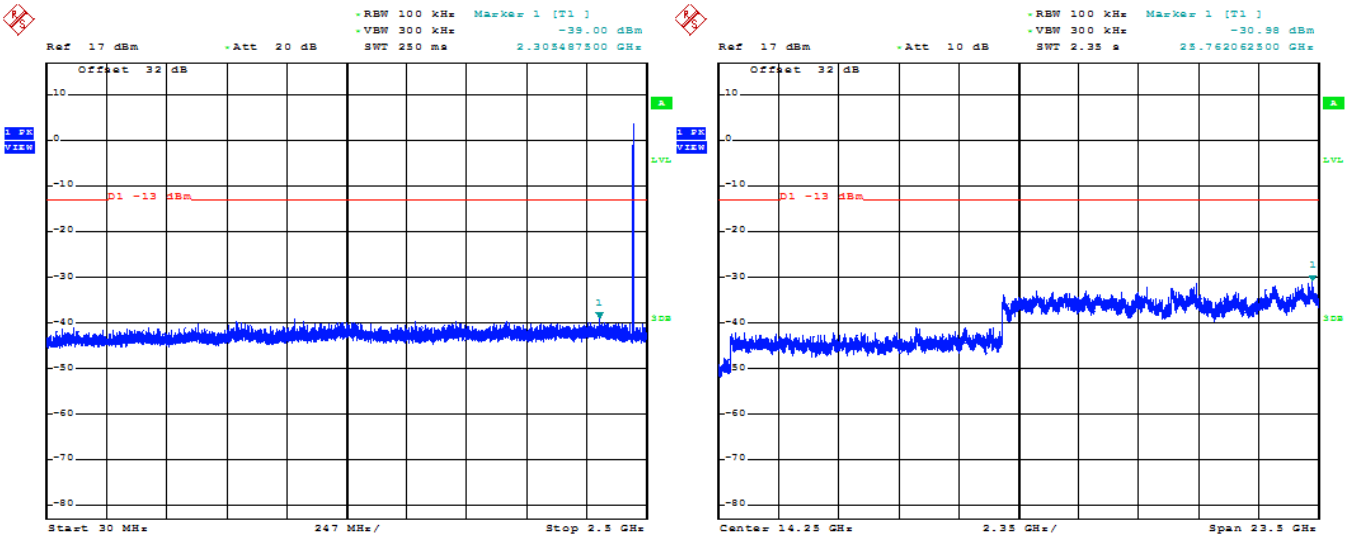


Figure 4-52: Spurious RF Conducted Emissions
Single Freq., Static PBRS, 2-DH5



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Bluetooth RF Conducted Emission Test Results cont'd

Figure 4-53: Spurious RF Conducted Emissions
Single Freq., Static PBRS, 2-DH5

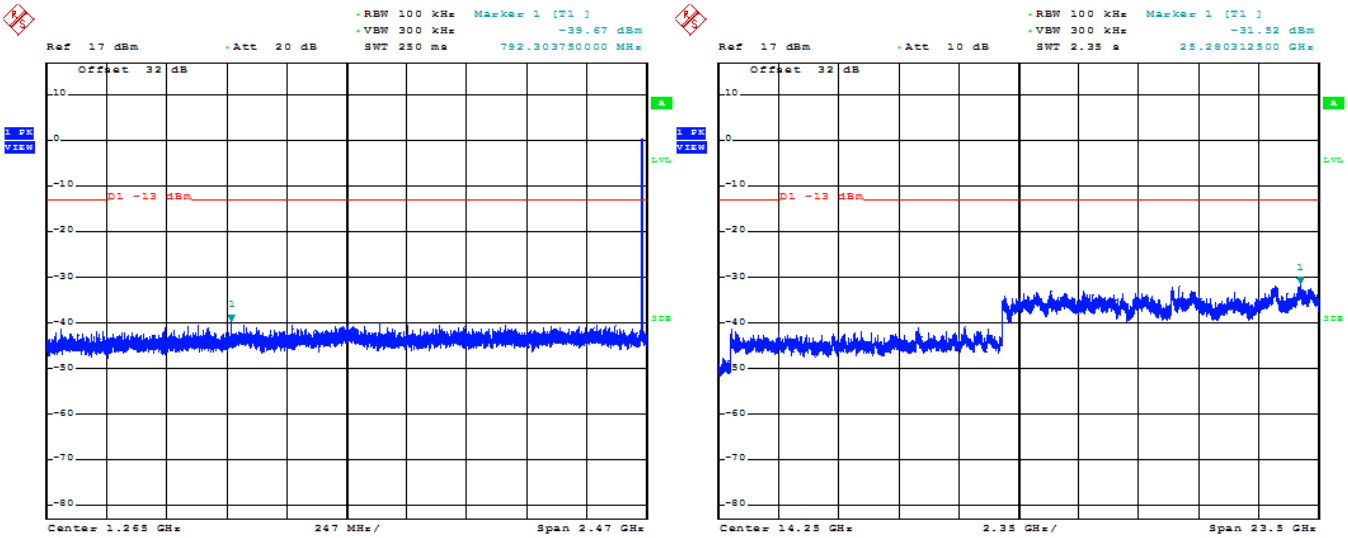
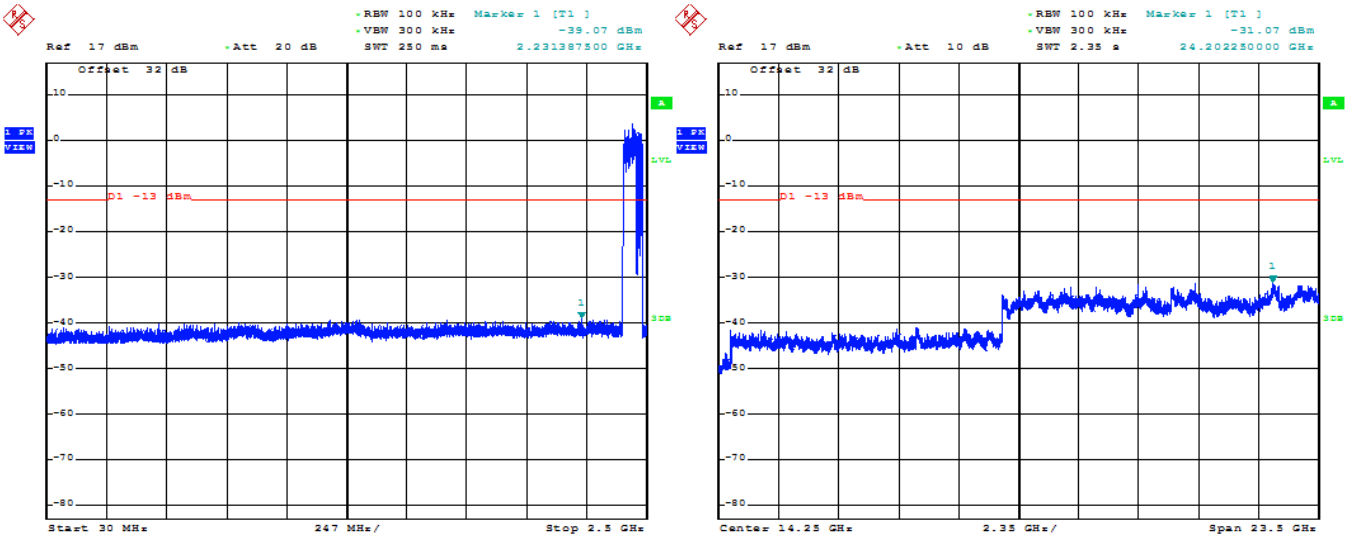


Figure 4-54: Spurious RF Conducted Emissions
Freq. Hopping, Static PBRS, 2-DH5



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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	4.71	-30.58	-35.29	-20.00
39.00	5.35	-31.36	-36.71	-20.00
78.00	5.96	-30.05	-36.01	-20.00
Hopping mode	4.71	-31.28	-35.99	-20.00

See figures 4-55 to 4-58 for the plots of the spurious RF conducted emissions.

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Bluetooth RF Conducted Emission Test Results cont'd

Figure 4-55: Spurious RF Conducted Emissions
Single Freq., Static PBRS, 3-DH5

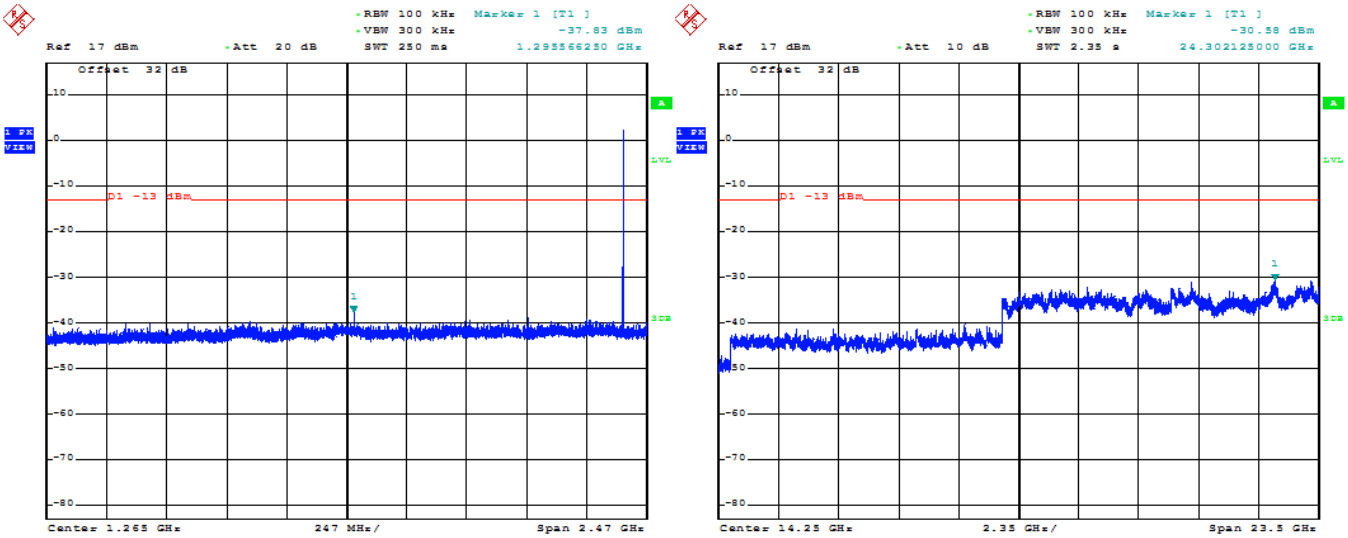
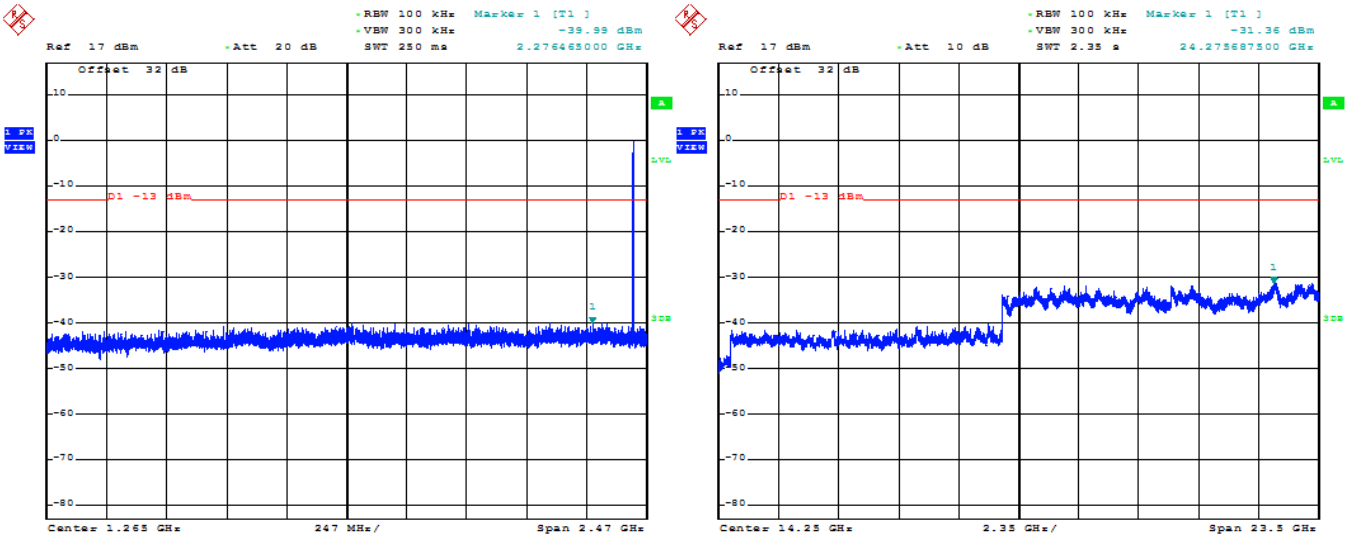


Figure 4-56: Spurious RF Conducted Emissions
Single Freq., Static PBRS, 3-DH5



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Bluetooth RF Conducted Emission Test Results cont'd

Figure 4-57: Spurious RF Conducted Emissions
Single Freq., Static PBRS, 3-DH5

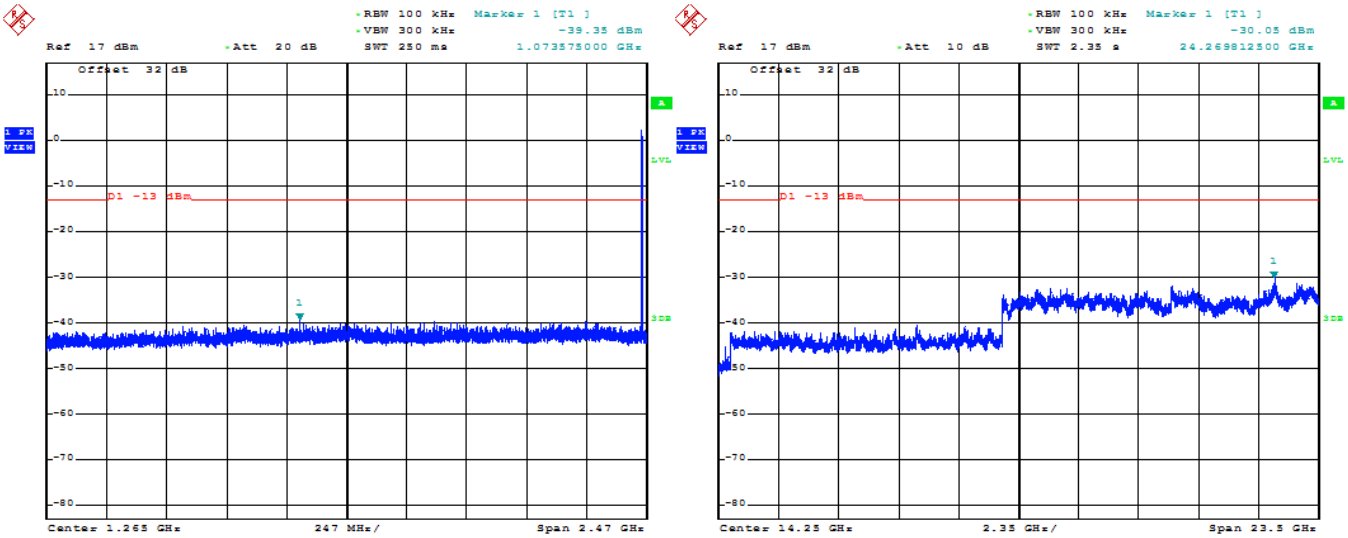
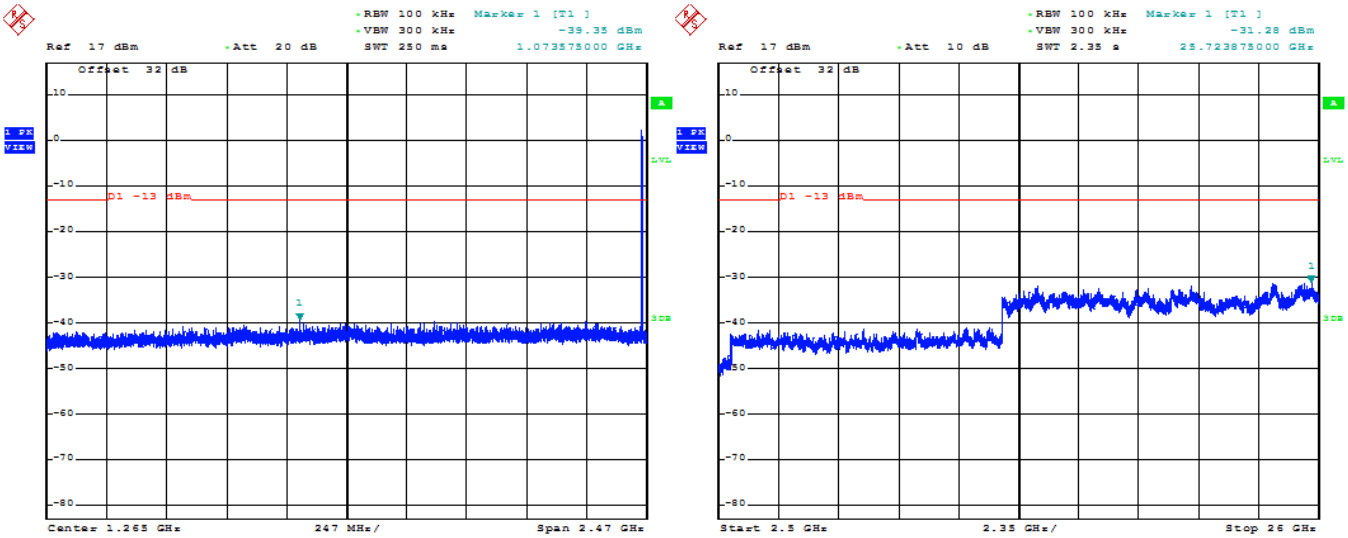


Figure 4-58: Spurious RF Conducted Emissions
Freq. Hopping, Static PBRS, 3-DH5



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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	680.00
20	≥ 500	673.00
39	≥ 500	673.00

See figures 4-59 to 4-61 for the plots of the 6 dB bandwidth measurements for Channels 0, 20, and 39.

Figure 4-59: 6 dB Bandwidth LE, Channel 0

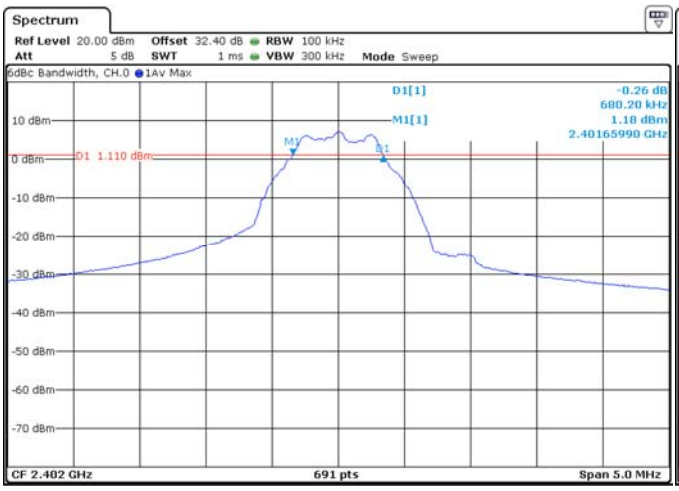
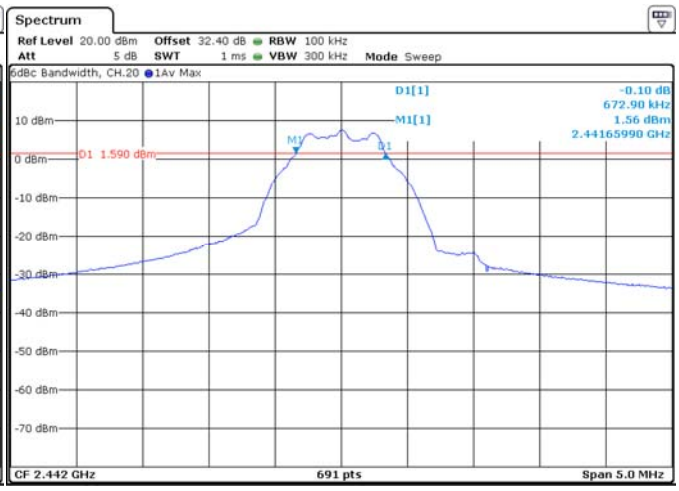


Figure 4-60: 6 dB Bandwidth LE, Channel 20



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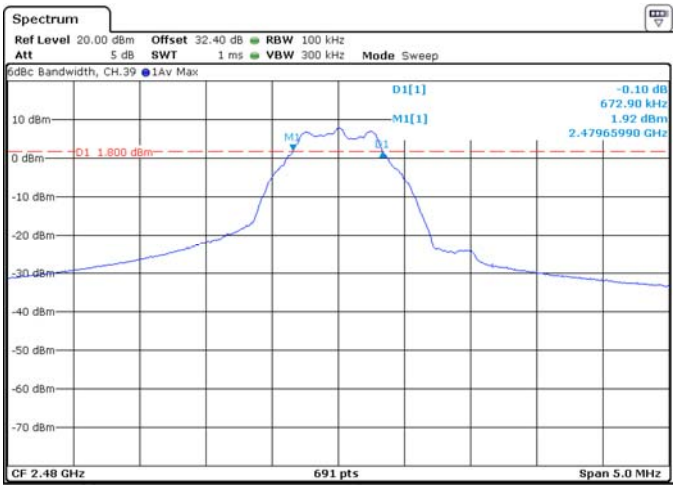
Bluetooth Low Energy RF Conducted Emission Test Results cont'd

Figure 4-61: 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 (W)
0	< 1.00	6.6	0.0046
20	< 1.00	7.1	0.0051
39	< 1.00	7.4	0.0055

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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	-46.54	-26.54
39	< -20	-44.08	-24.08

See figures 4-62 to 4-63 for the plots of the band edge compliance measurements for Channels 0 and 39.

Figure 4-62: Band Edge Compliance LE, Channel 0

Figure 4-63: 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	-7.42	-15.42
20	< 8.00	-7.21	-15.21
39	< 8.00	-6.84	-14.84

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Bluetooth Low Energy RF Conducted Emission Test Results cont'd

See figures 4-64 to 4-66 for the plots of the peak power spectral density for Channels 0, 20 and 39.

Figure 4-64: Peak Power Spectral Density LE, Channel 0

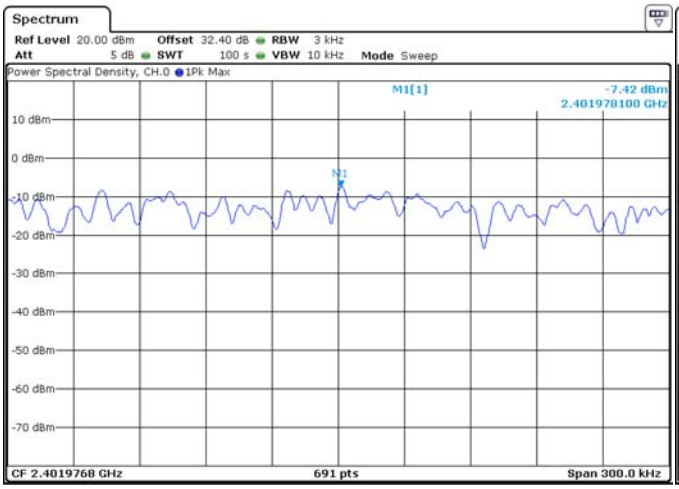


Figure 4-65: Peak Power Spectral Density LE, Channel 20

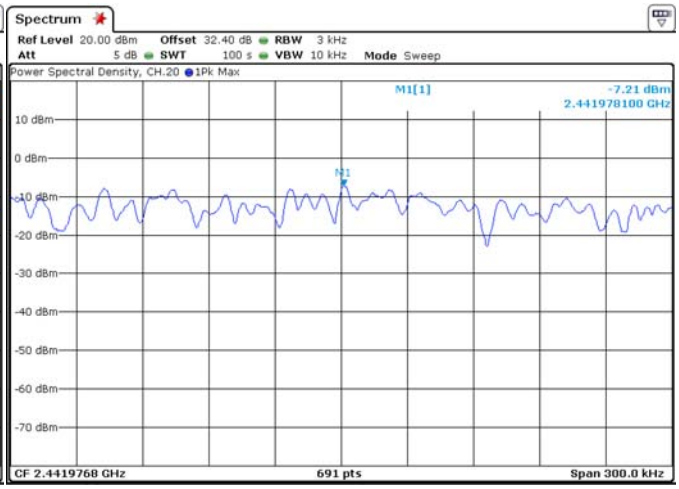
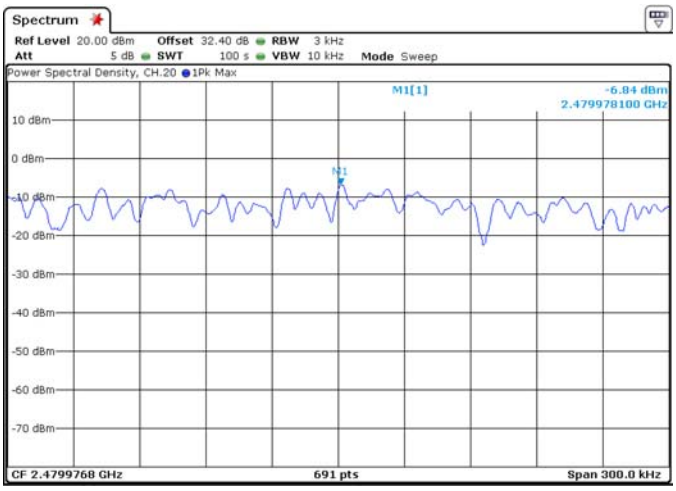


Figure 4-66: Peak Power Spectral Density LE, Channel 39



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Bluetooth Low Energy RF Conducted Emission Test Results cont'd

Spurious RF Conducted Emissions

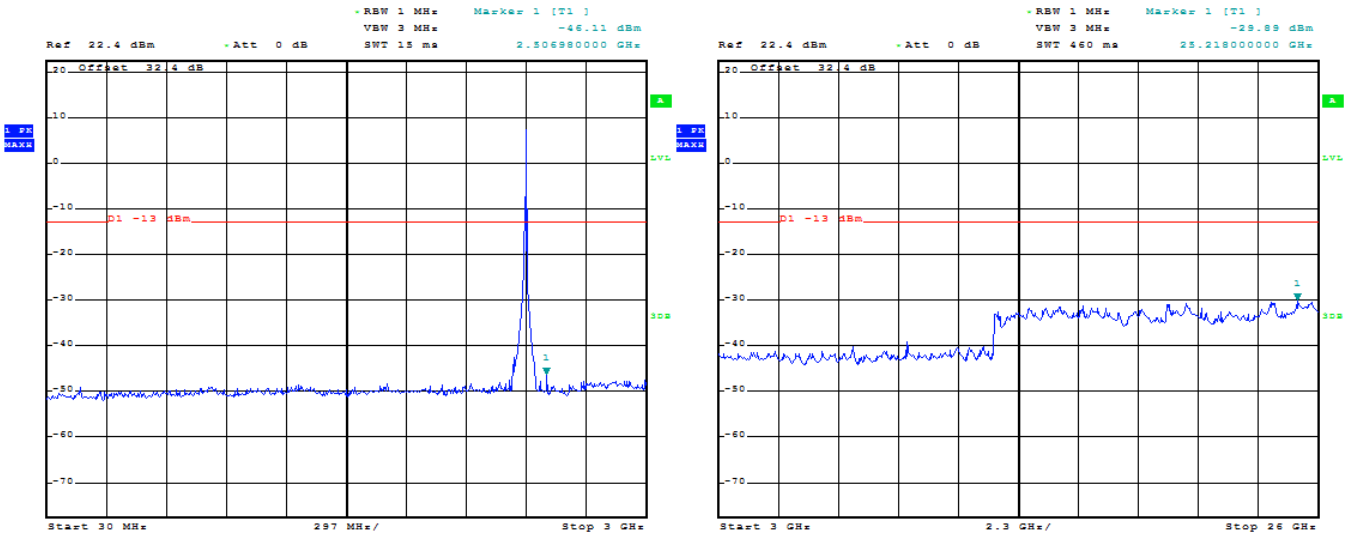
The EUT met the requirements of the spurious RF conducted emissions as per 47 CFR 15.247(c) and RSS-210. Channels 0, 20 and 39 were measured. Peak power was measured using an Agilent power meter, model N1911A with model N1921A power sensor. A reference offset of 6.4 dB was applied to the power meter 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	6.6	-29.89	-36.49	-20
20	7.1	-30.4	-37.5	-20
39	7.2	-35.43	-42.63	-20

The emissions were in the NF.

See figures 4-67 to 4-69 for the plots of the spurious RF conducted emissions for Channels 0, 20 and 39.

Figure 4-67: Spurious Conducted RF Emissions
LE, Channel 0



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Bluetooth Low Energy RF Conducted Emission Test Results cont'd

Figure 4-68 : Spurious Conducted RF Emissions
LE, Channel 20

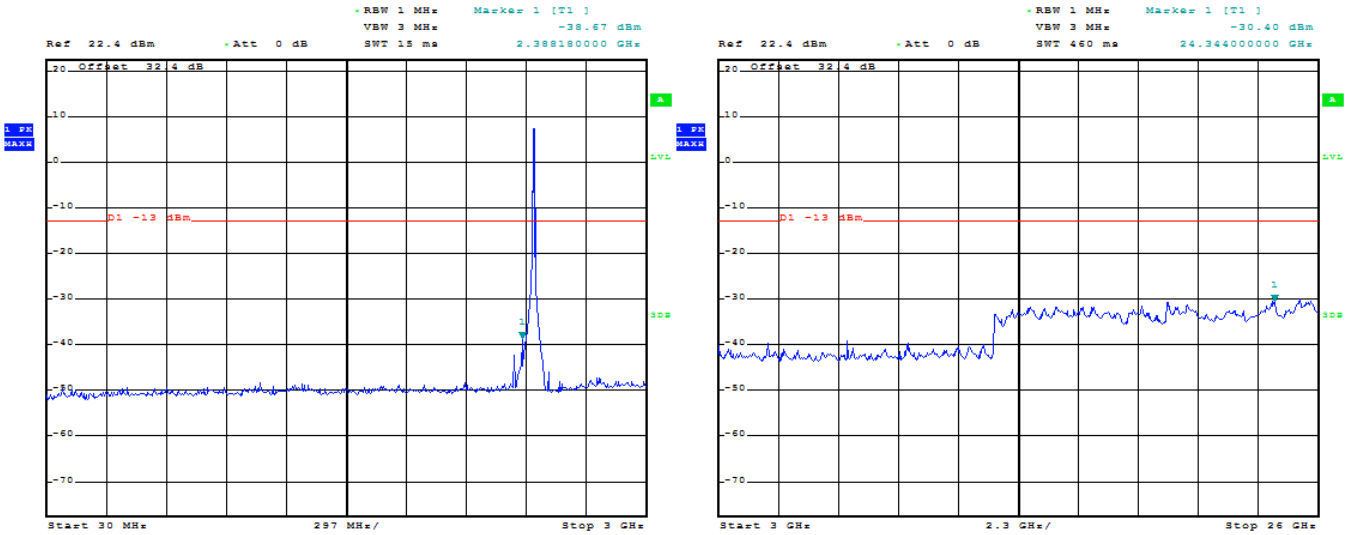
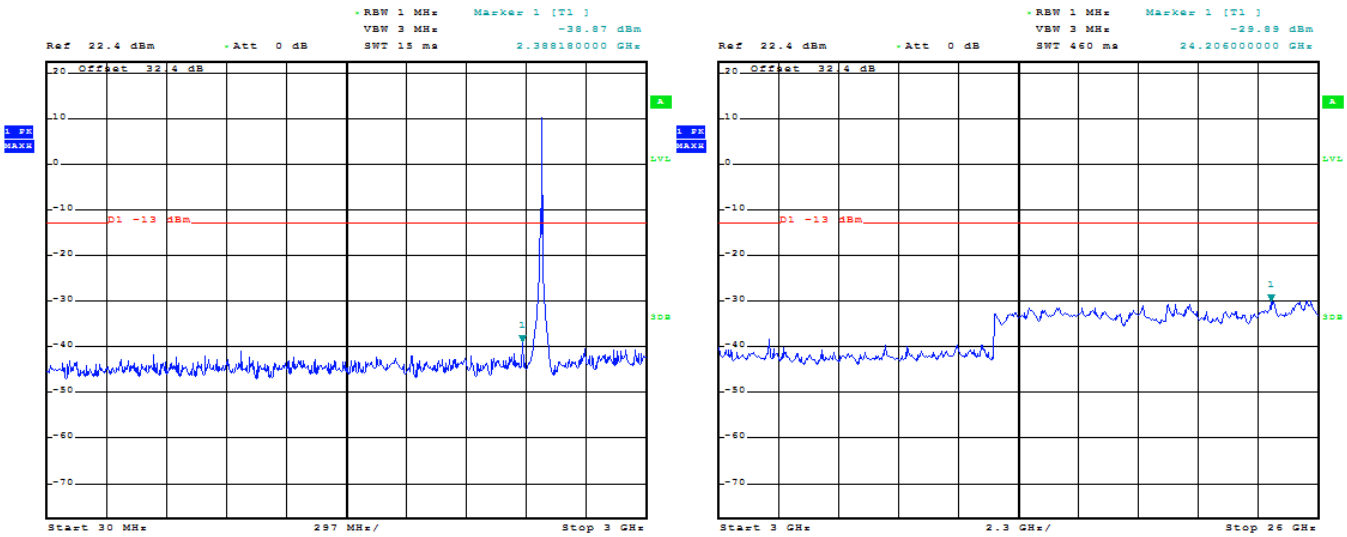


Figure 4-69: Spurious Conducted RF Emissions
LE, Channel 39



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APPENDIX 5 – 802.11b/g/n CONDUCTED EMISSIONS TEST DATA/PLOTS

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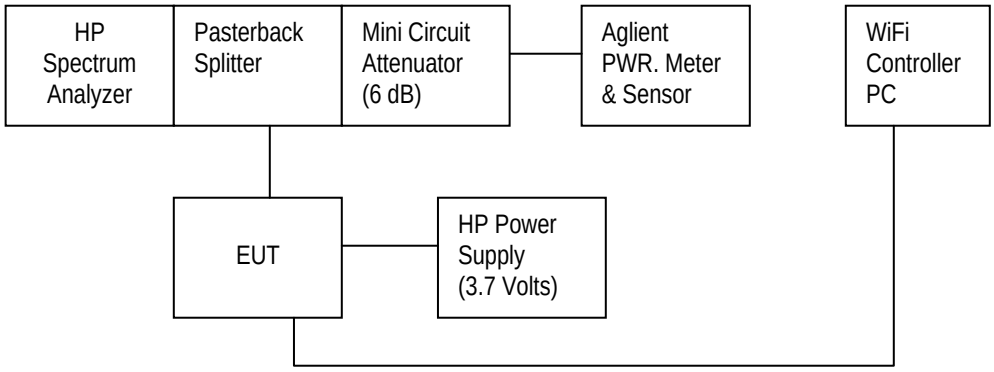
802.11b/g/n RF Conducted Emission Test Results

Test Setup Diagram



A reference offset of 20.4 dB was applied to the spectrum analyzer and 6.6 dB was applied to the Power Meter reference level for the attenuators and coaxial cable loss in the test circuit.

Date of test: November 05, 2012
The measurements on the BlackBerry® smartphone were performed by Berkin Can.

The environmental test conditions were: Temperature: 24.7 ºC
Relative Humidity: 16.7 %

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

6 dB Bandwidth

The EUT met the requirements of the 6 dB bandwidth as per 47 CFR 15.247(a)(2) and RSS-210. Channels 1, 6 and 11 were measured at 1 Mbps, 5.5 Mbps, and 11Mbps each for 802.11b mode, 6 Mbps, 24 Mbps, and 54 Mbps each for 802.11g mode, and MCS 0, 4, and 7 for 802.11n mode.

Channel	Data Rate	Limit (kHz)	Measured Level (MHz)
1	1 Mbps	≥ 500	10.02
	5.5 Mbps	≥ 500	9.82
	11 Mbps	≥ 500	10.38
	6 Mbps	≥ 500	16.01
	24 Mbps	≥ 500	16.34
	54 Mbps	≥ 500	16.40
	MCS 0	≥ 500	16.35
	MCS 4	≥ 500	17.56
	MCS 7	≥ 500	16.97
6	1 Mbps	≥ 500	10.06
	5.5 Mbps	≥ 500	9.81
	11 Mbps	≥ 500	10.10
	6 Mbps	≥ 500	16.02
	24 Mbps	≥ 500	16.00
	54 Mbps	≥ 500	16.45
	MCS 0	≥ 500	16.27
	MCS 4	≥ 500	17.31
	MCS 7	≥ 500	17.59
11	1 Mbps	≥ 500	9.57
	5.5 Mbps	≥ 500	10.29
	11 Mbps	≥ 500	9.95
	6 Mbps	≥ 500	15.79
	24 Mbps	≥ 500	16.35
	54 Mbps	≥ 500	16.45
	MCS 0	≥ 500	16.51
	MCS 4	≥ 500	17.31
	MCS 7	≥ 500	**17.73**

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

See figures 5-1 to 5-9 for the plots of the 6 dB bandwidth measurements for Channels 1, 6, and 11, at 1 Mbps each for 802.11b mode, 6 Mbps each for 802.11g mode, and MCS 0 each for 802.11n mode.

Figure 5-1: 6 dB Bandwidth
802.11b, Channel 1, 1 Mbps

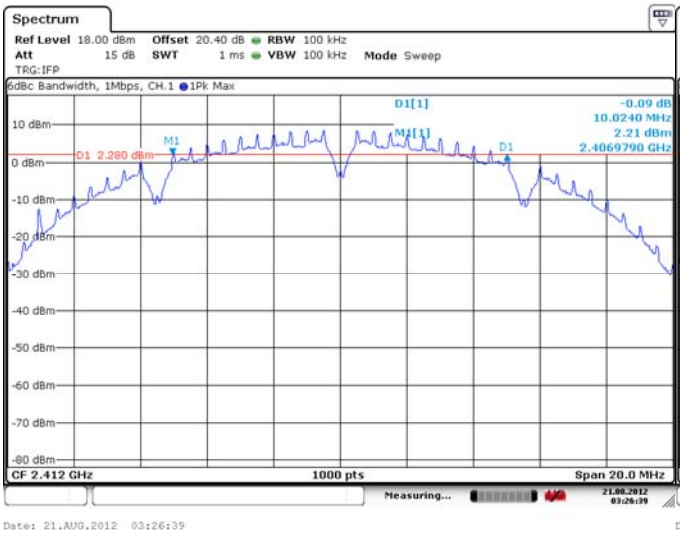


Figure 5-2: 6 dB Bandwidth
802.11b, Channel 6, 1 Mbps

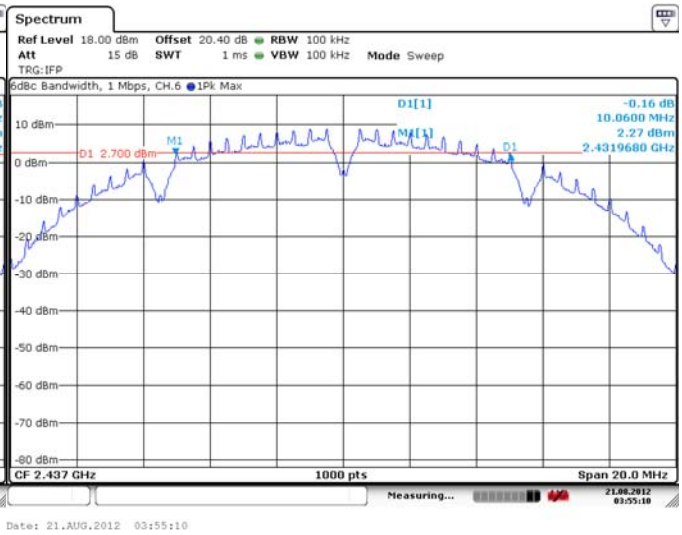


Figure 5-3: 6 dB Bandwidth
802.11b, Channel 11, 1 Mbps

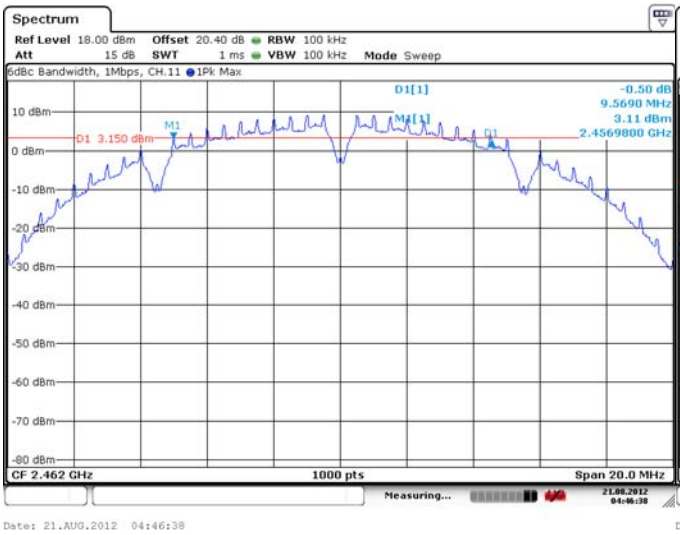
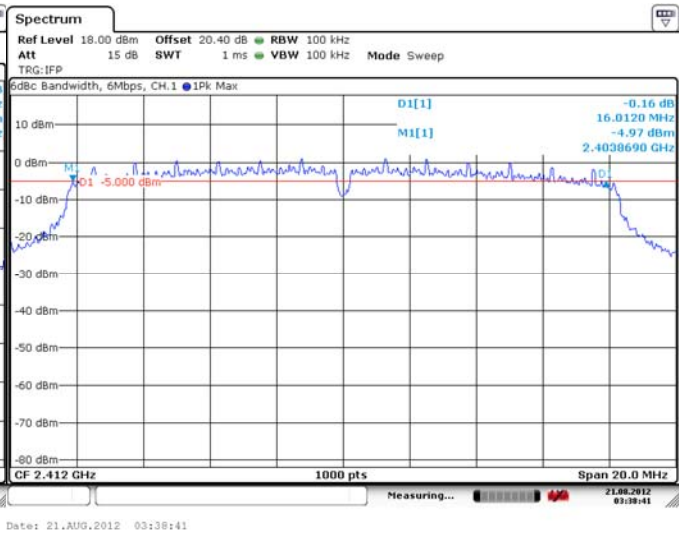


Figure 5-4: 6 dB Bandwidth
802.11g, Channel 1, 6 Mbps



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

Figure 5-5: 6 dB Bandwidth
802.11g, Channel 6, 6 Mbps

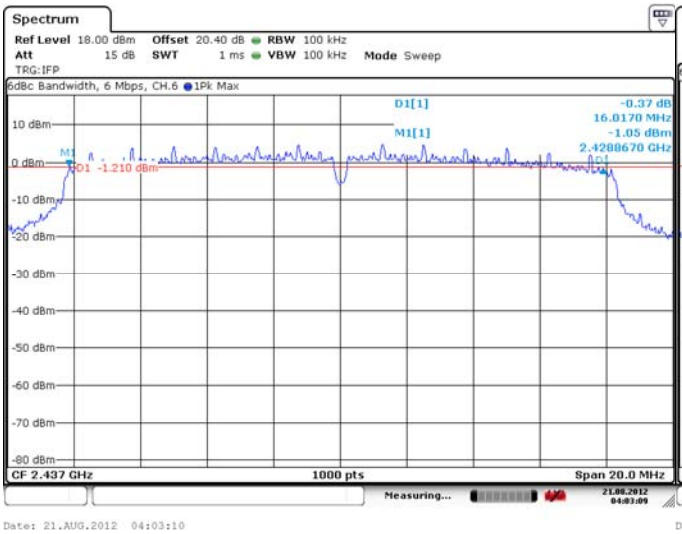

Figure 5-6: 6 dB Bandwidth
802.11g, Channel 11, 6 Mbps

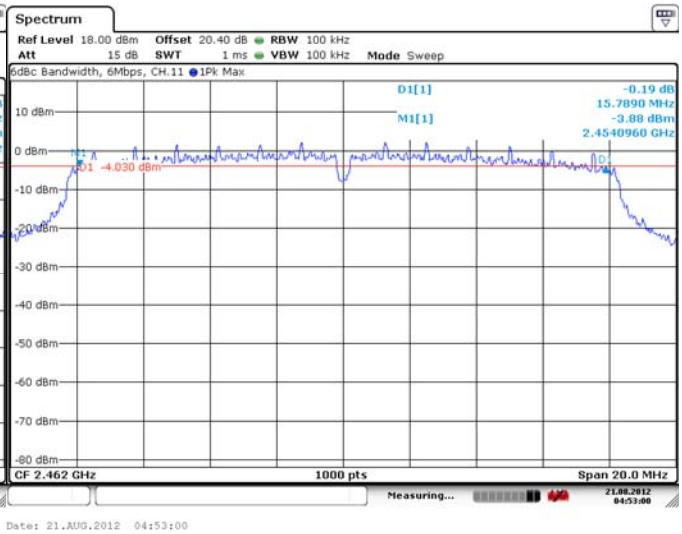

Figure 5-7: 6 dB Bandwidth
802.11n, Channel 1, MCS 0

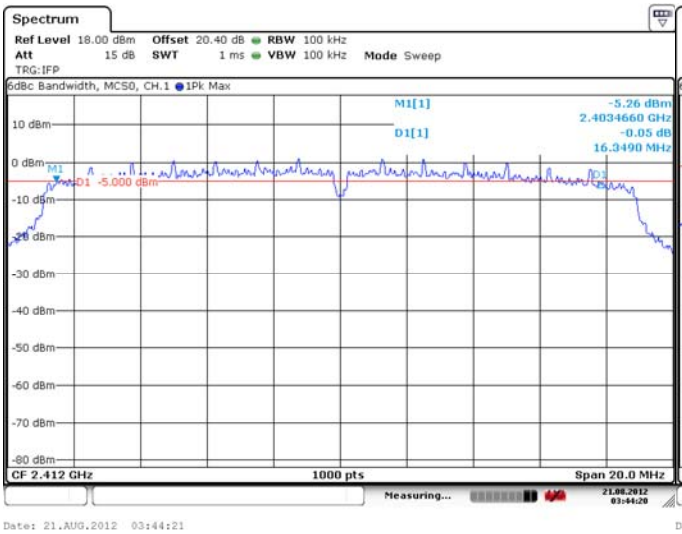

Figure 5-8: 6 dB Bandwidth
802.11n, Channel 6, MCS 0

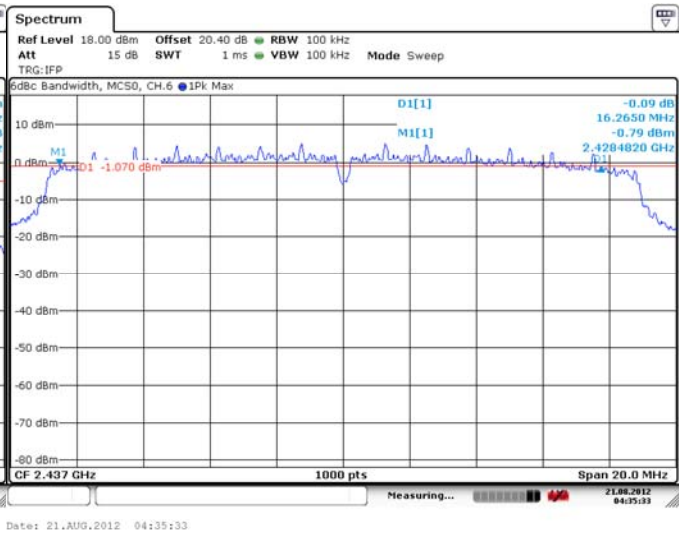

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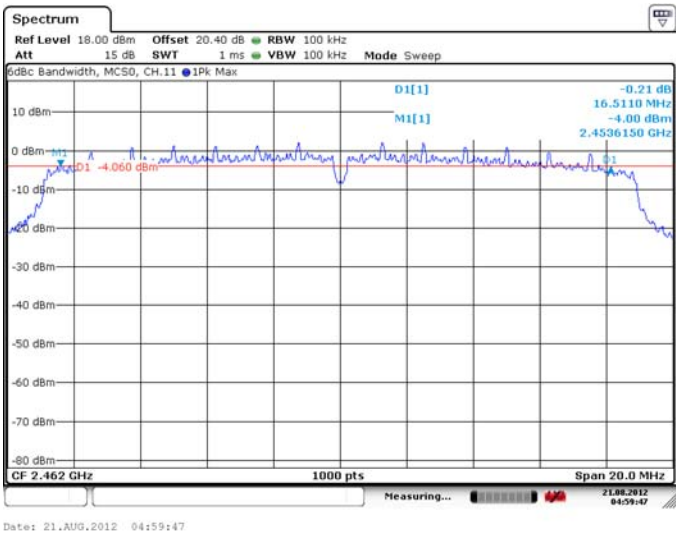
Figure 5-9: 6 dB Bandwidth
802.11n, Channel 11, MCS 0



802.11b/g/n 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 1, 6 and 11 were measured at 1 Mbps, 5.5 Mbps, and 11 Mbps each for 802.11b mode, 6 Mbps, 24 Mbps, and 54 Mbps each for 802.11g mode, and MCS 0, 4 and 7 for 802.11n mode using an Aglient power meter, model N1911A with model N1921A power sensor. A reference offset of 18.4 dB was applied to the power meter reference level for the coaxial cable loss and attenuators in the test circuit.

Channel	Data Rate	Class 2 Limit (W)	Measured Level (dBm)	Measured Level (W)
1	1 Mbps	< 1.00	**17.16**	0.068
	5.5 Mbps	< 1.00	17.01	0.065
	11 Mbps	< 1.00	16.92	0.062
	6 Mbps	< 1.00	**16.57**	0.019
	24 Mbps	< 1.00	15.96	0.017
	54 Mbps	< 1.00	14.23	0.015
	MCS 0	< 1.00	**16.46**	0.019
	MCS 4	< 1.00	15.66	0.016
	MCS 7	< 1.00	12.27	0.012
6	1 Mbps	< 1.00	16.05	0.070
	5.5 Mbps	< 1.00	15.97	0.069
	11 Mbps	< 1.00	15.67	0.065
	6 Mbps	< 1.00	15.52	0.044
	24 Mbps	< 1.00	15.02	0.035
	54 Mbps	< 1.00	13.59	0.020
	MCS 0	< 1.00	15.32	0.043
	MCS 4	< 1.00	14.78	0.032
	MCS 7	< 1.00	11.51	0.012

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

Channel	Data Rate	Class 2 Limit (W)	Measured Level (dBm)	Measured Level (W)
11	1 Mbps	< 1.00	16.50	0.073
	5.5 Mbps	< 1.00	16.42	0.071
	11 Mbps	< 1.00	16.23	0.068
	6 Mbps	< 1.00	16.10	0.022
	24 Mbps	< 1.00	15.55	0.020
	54 Mbps	< 1.00	13.94	0.017
	MCS 0	< 1.00	15.98	0.022
	MCS 4	< 1.00	15.31	0.018
	MCS 7	< 1.00	11.80	0.013

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802.11b/g/n 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 1 and 11 were measured at 1 Mbps, 5.5 Mbps, and 11 Mbps each for 802.11b mode, 6 Mbps, 24 Mbps, and 54 Mbps each for 802.11g mode, and MCS 0, 4 and 7 for 802.11n mode.

Channel	Data Rate	Limit (dBc)	Measured Level (dBc)	Margin (dBc)
1	1 Mbps	< -20	-38.37	-18.37
	5.5 Mbps	< -20	-39.88	-19.88
	11 Mbps	< -20	-38.74	-18.74
	6 Mbps	< -20	-25.76	-5.76
	24 Mbps	< -20	-27.55	-7.55
	54 Mbps	< -20	-28.41	-8.41
	MCS 0	< -20	-23.27	-3.27
	MCS 4	< -20	-25.82	-5.82
	MCS 7	< -20	-27.69	-7.69
11	1 Mbps	< -20	-40.36	-20.36
	5.5 Mbps	< -20	-40.15	-20.15
	11 Mbps	< -20	-42.43	-22.43
	6 Mbps	< -20	-35.13	-15.13
	24 Mbps	< -20	-34.05	-14.05
	54 Mbps	< -20	-35.59	-15.59
	MCS 0	< -20	-33.28	-13.28
	MCS 4	< -20	-35.93	-15.93
	MCS 7	< -20	-35.31	-15.31

See figures 5-10 to 5-15 for the plots of the band edge compliance measurements for Channels 1 and 11, at 1 Mbps each for 802.11b mode, 6 Mbps each for 802.11g mode, and MCS 0 each for 802.11n mode.

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

Figure 5-10: Band Edge Compliance 802.11b, Channel 1, 1 Mbps

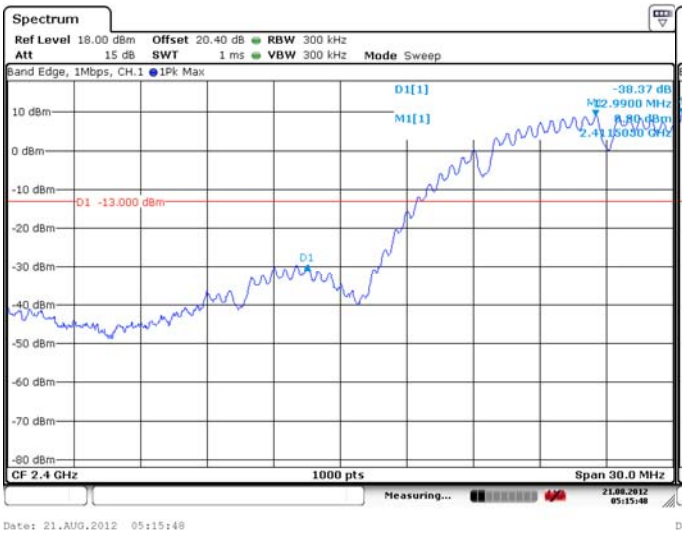


Figure 5-11: Band Edge Compliance 802.11b, Channel 11, 1 Mbps

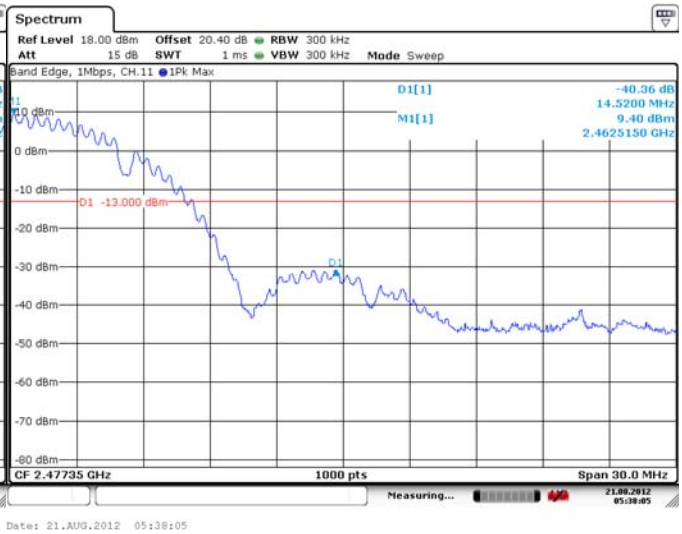


Figure 5-12: Band Edge Compliance 802.11g, Channel 1, 6 Mbps

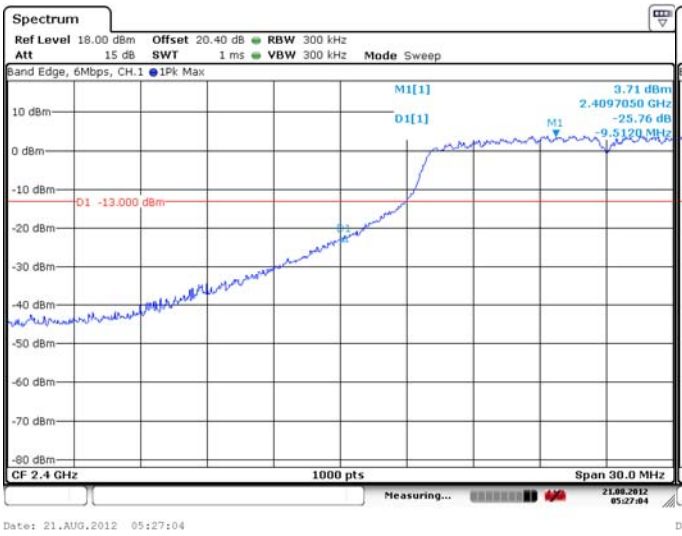
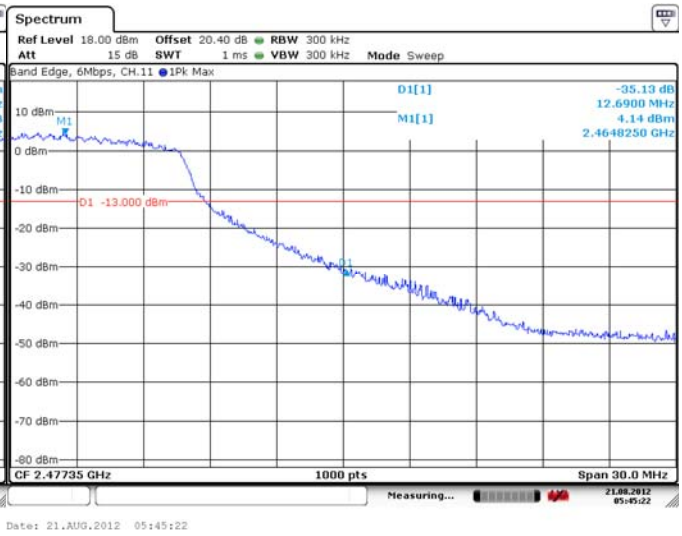


Figure 5-13: Band Edge Compliance 802.11g, Channel 11, 6 Mbps



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

Figure 5-14: Band Edge Compliance 802.11n, Channel 1, MCS 0

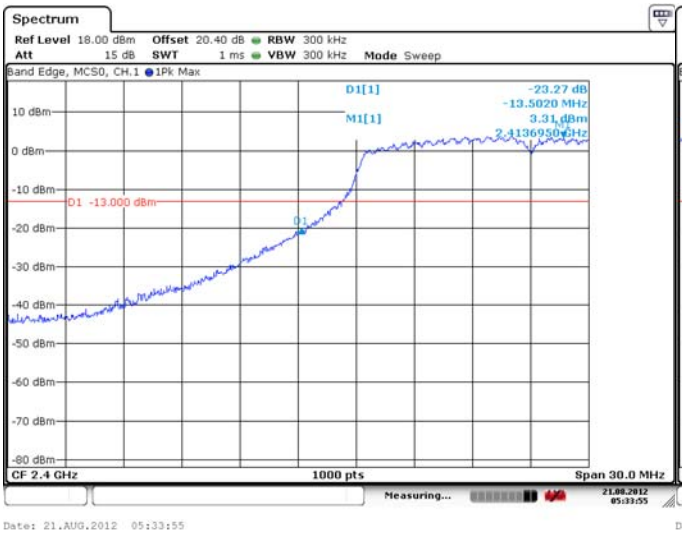
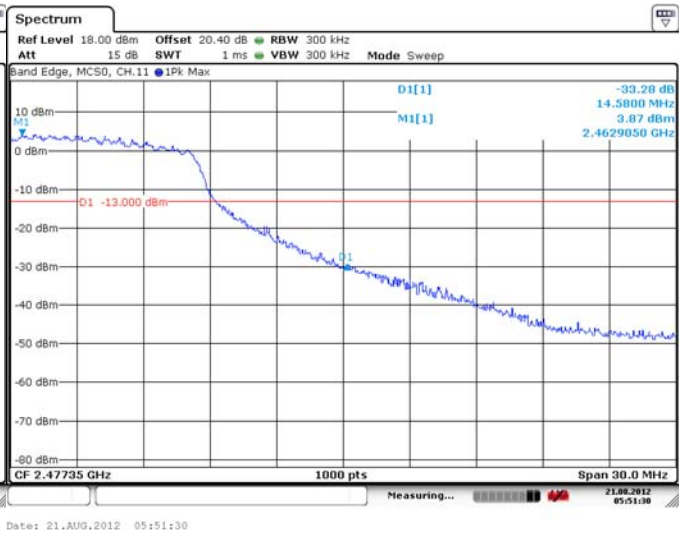


Figure 5-15: Band Edge Compliance 802.11n, Channel 11, MCS 0



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802.11b/g/n 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 1, 6 and 11 were measured at 1 Mbps, 5.5 Mbps, and 11 Mbps each for 802.11b mode, 6 Mbps, 24 Mbps, and 54 Mbps each for 802.11g mode, and MCS 0, 4, and 7 for 802.11n mode.

Channel	Data Rate	Limit (dBm)	Measured Level (dBm)	Margin (dBm)
1	1 Mbps	< 8.00	-4.98	-12.98
	5.5 Mbps	< 8.00	-6.58	-14.58
	11 Mbps	< 8.00	-8.75	-16.75
	6 Mbps	< 8.00	-12.65	-20.65
	24 Mbps	< 8.00	-13.03	-21.03
	54 Mbps	< 8.00	-13.38	-21.38
	MCS 0	< 8.00	-12.09	-20.09
	MCS 4	< 8.00	-13.31	-21.31
	MCS 7	< 8.00	-13.53	-21.53
6	1 Mbps	< 8.00	-4.68	-12.68
	5.5 Mbps	< 8.00	-6.19	-14.19
	11 Mbps	< 8.00	-7.45	-15.45
	6 Mbps	< 8.00	-8.73	-16.73
	24 Mbps	< 8.00	-9.05	-17.05
	54 Mbps	< 8.00	-9.27	-17.27
	MCS 0	< 8.00	-8.44	-16.44
	MCS 4	< 8.00	-9.78	-17.78
	MCS 7	< 8.00	-10.32	-18.32
11	1 Mbps	< 8.00	-4.29	-12.29
	5.5 Mbps	< 8.00	-6.12	-14.12
	11 Mbps	< 8.00	-7.64	-15.64
	6 Mbps	< 8.00	-11.42	-19.42
	24 Mbps	< 8.00	-12.58	-20.58
	54 Mbps	< 8.00	-13.02	-21.02
	MCS 0	< 8.00	-12.09	-20.09
	MCS 4	< 8.00	-12.68	-20.68
	MCS 7	< 8.00	-12.79	-20.79

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

See figures 5-16 to 5-24 for the plots of the peak power spectral density for Channels 1, 6 and 11, at 1 Mbps each for 802.11b mode, 6 Mbps each for 802.11g mode, and MCS 0 for 802.11n mode.

Figure 5-16: Peak Power Spectral Density 802.11b, Channel 1, 1 Mbps

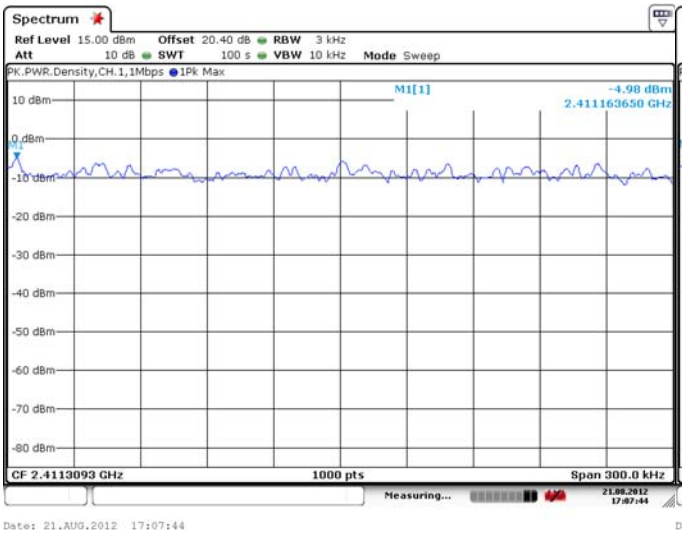


Figure 5-17: Peak Power Spectral Density 802.11b, Channel 6, 1 Mbps

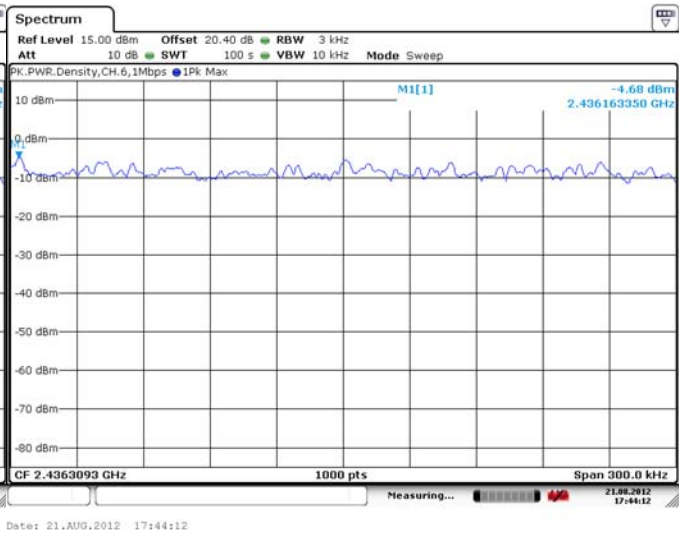
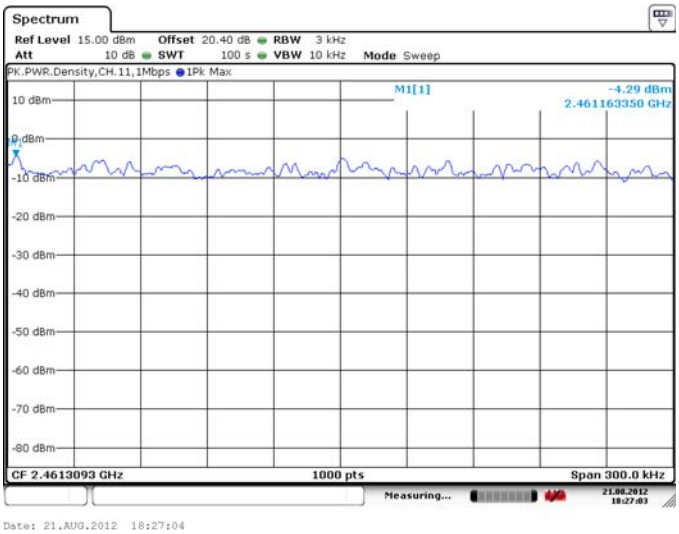


Figure 5-18: Peak Power Spectral Density 802.11b, Channel 11, 1 Mbps



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

Figure 5-19: Peak Power Spectral Density 802.11g, Channel 1, 6 Mbps

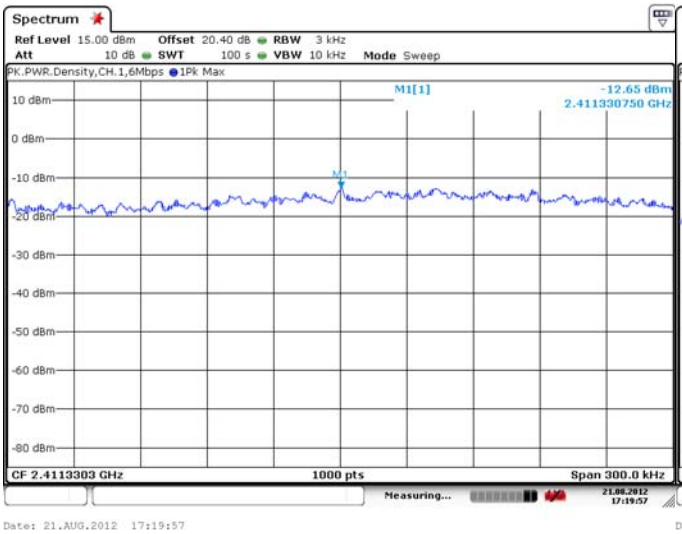


Figure 5-20: Peak Power Spectral Density 802.11g, Channel 6, 6 Mbps

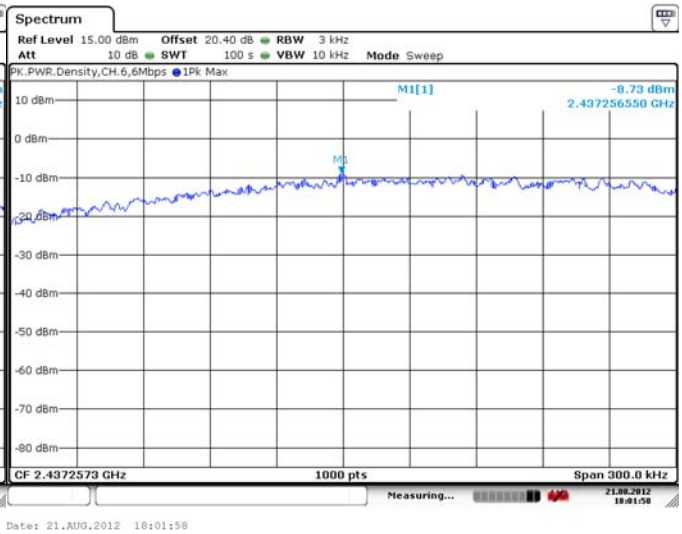
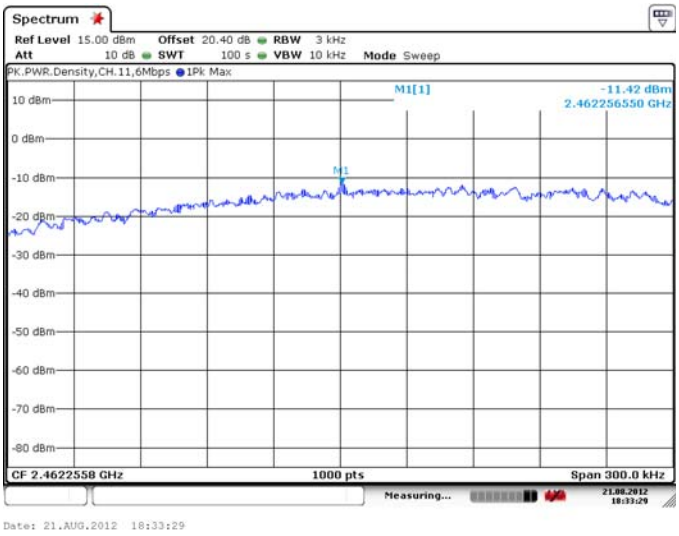


Figure 5-21: Peak Power Spectral Density 802.11g, Channel 11, 6 Mbps



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

Figure 5-22: Peak Power Spectral Density 802.11n, Channel 1, MCS 0

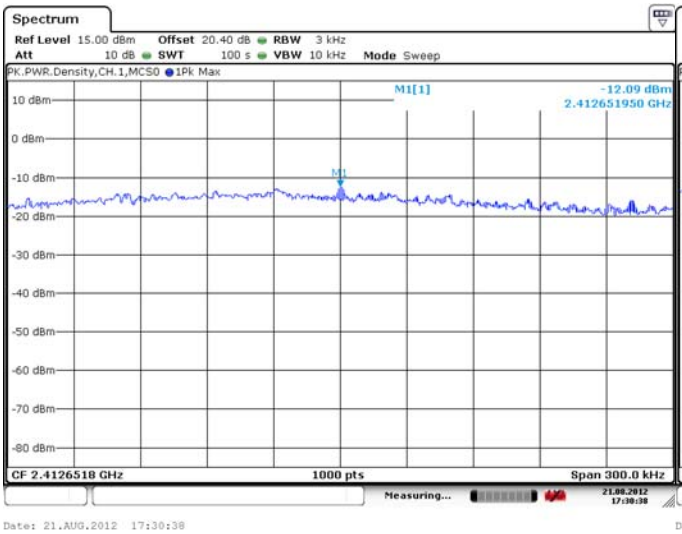


Figure 5-23: Peak Power Spectral Density 802.11n, Channel 6, MCS 0

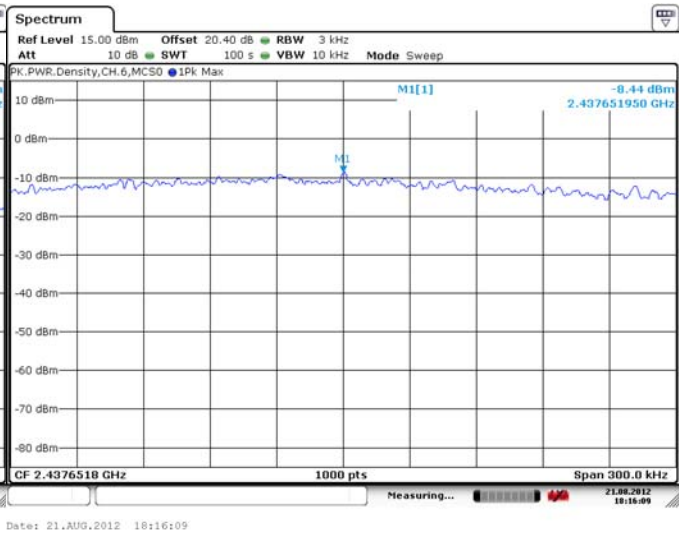
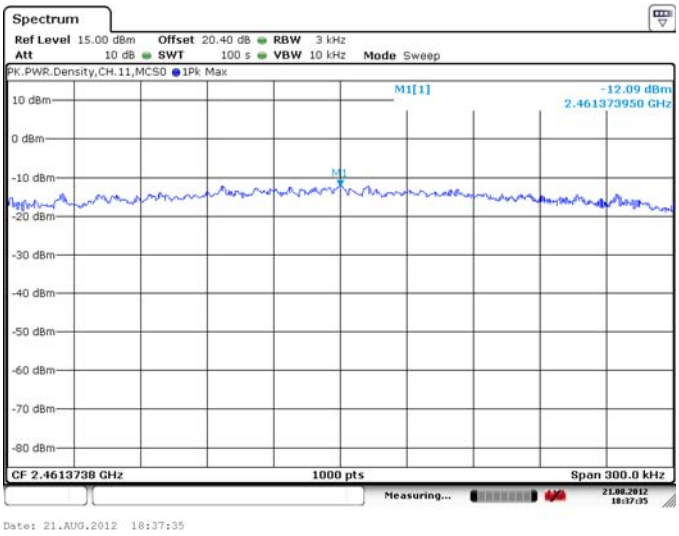


Figure 5-24: Peak Power Spectral Density 802.11n, Channel 11, MCS 0



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802.11b/g/n 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 1, 6 and 11 were measured at 1 Mbps, 5.5 Mbps, and 11 Mbps each for 802.11b mode, 6 Mbps, 24 Mbps, and 54 Mbps each for 802.11g mode, and MCS 0, 4, and 7 for 802.11n mode. Peak power was measured using an Agilent power meter, model N1911A with model N1921A power sensor. A reference offset of 18.4 dB was applied to the power meter reference level for the coaxial cable loss and attenuators in the test circuit.

Channel	Data Rate	Power (dBm)	Max. Measured Level (dBm)	Max. Measured Level from Carrier (dBc)	Limit (dBc)
1	1 Mbps	18.34	-42.22	-60.56	-20
	6 Mbps	12.84	-43.38	-56.22	-20
	MCS 0	12.69	-44.38	-57.07	-20
6	1 Mbps	18.45	-44.32	-62.77	-20
	6 Mbps	16.43	-41.45	-57.88	-20
	MCS 0	16.35	-43.11	-59.46	-20
11	1 Mbps	18.63	-43.86	-62.49	-20
	6 Mbps	13.38	-40.12	-53.5	-20
	MCS 0	13.33	-41.47	-54.8	-20

The emissions were in the NF.

See figures 5-25 to 5-33 for the plots of the spurious RF conducted emissions for Channels 1, 6 and 11, at 1 Mbps each for 802.11b mode, 6 Mbps each for 802.11g mode, and MCS 0 each for 802.11n mode.

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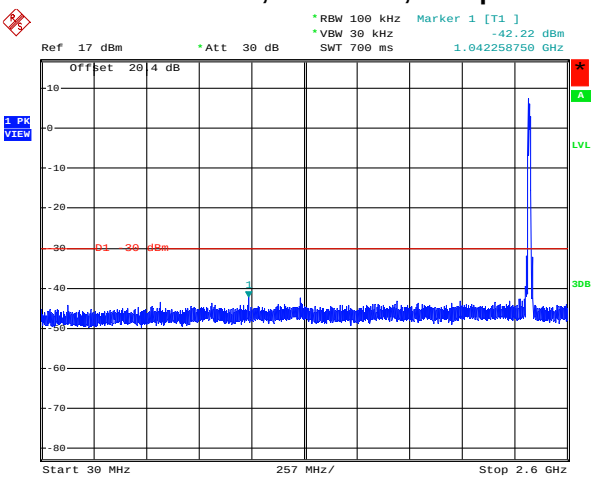
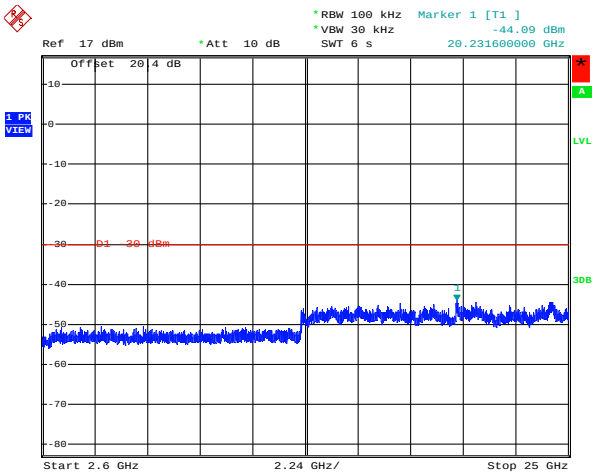
802.11b/g/n RF Conducted Emission Test Results cont'd

Figure 5-25: Spurious Conducted RF Emissions
802.11b, Channel 1, 1 Mbps

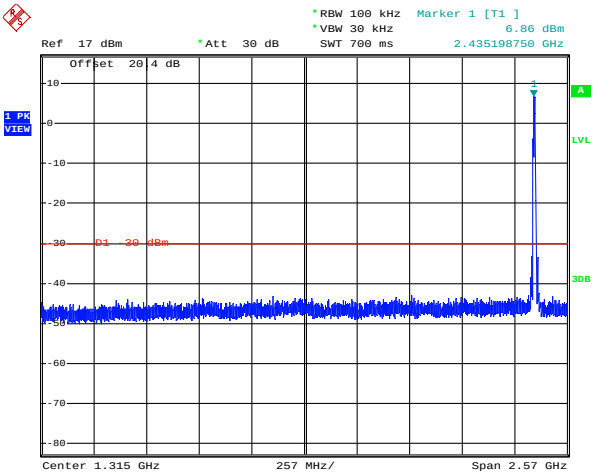


Date: 22.NOV.2012 15:44:18

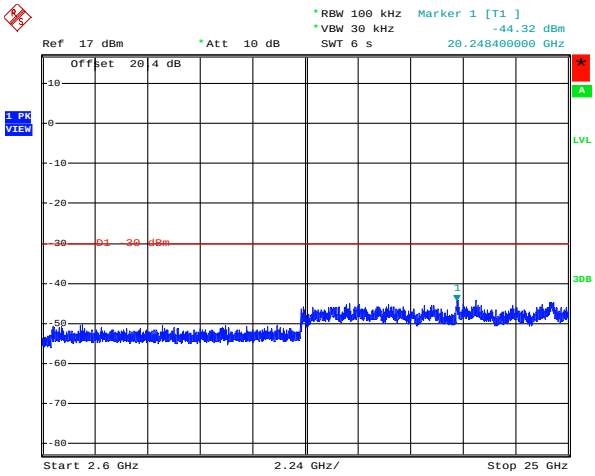


Date: 22.NOV.2012 15:03:27

Figure 5-26 : Spurious Conducted RF Emissions
802.11b, Channel 6, 1 Mbps



Date: 22.NOV.2012 15:42:14



Date: 22.NOV.2012 15:05:18

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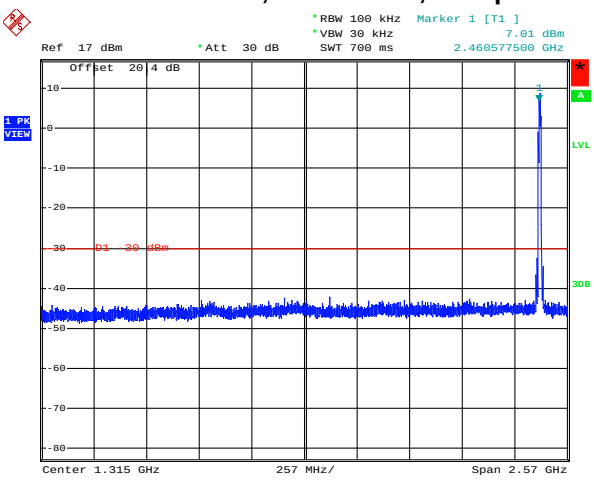
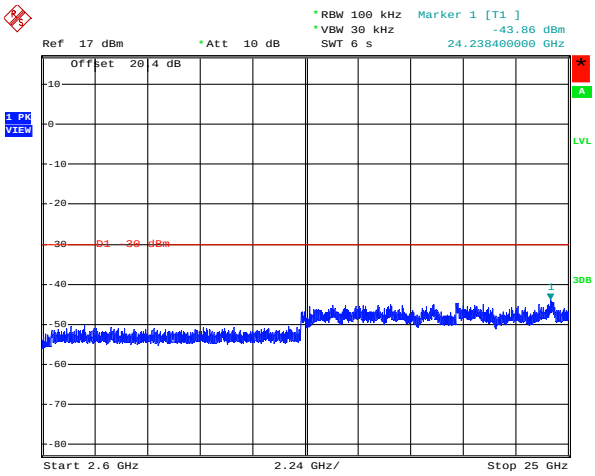
802.11b/g/n RF Conducted Emission Test Results cont'd

Figure 5-27: Spurious Conducted RF Emissions
802.11b, Channel 11, 1 Mbps

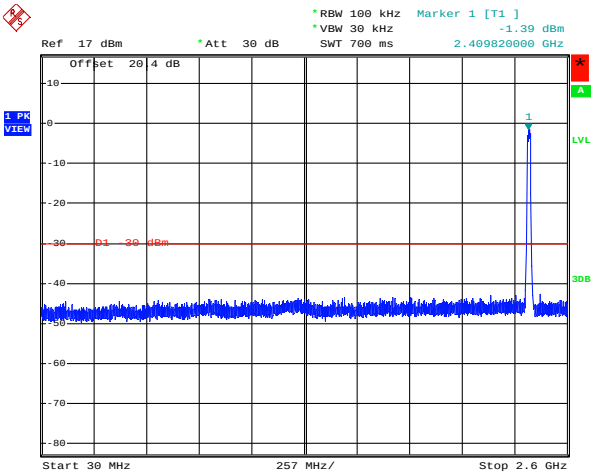


Date: 22.NOV.2012 15:40:08

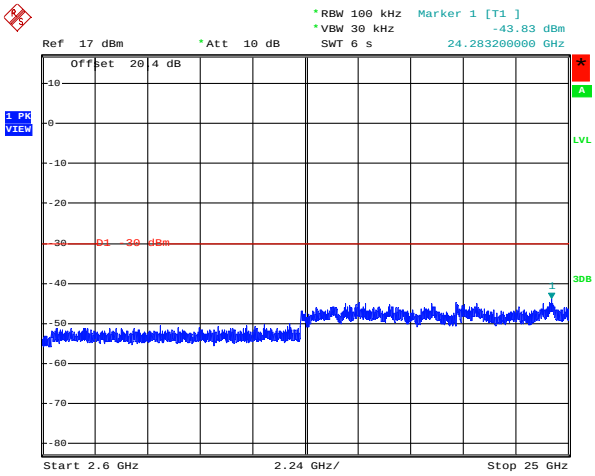


Date: 22.NOV.2012 15:07:09

Figure 5-28: Spurious Conducted RF Emissions
802.11g, Channel 1, 6 Mbps



Date: 22.NOV.2012 15:45:08



Date: 22.NOV.2012 15:08:59

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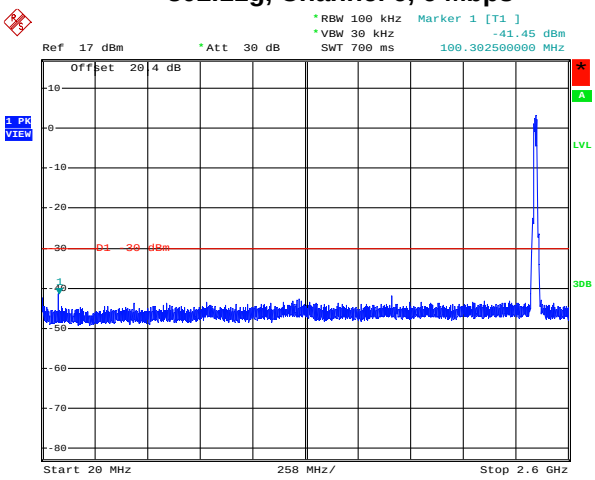
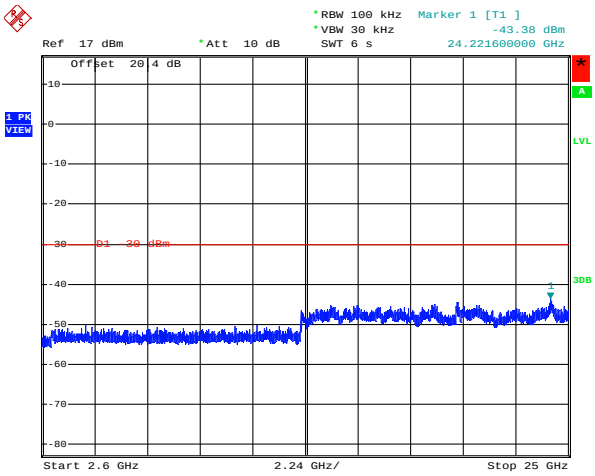
802.11b/g/n RF Conducted Emission Test Results cont'd

Figure 5-29: Spurious Conducted RF Emissions 802.11g, Channel 6, 6 Mbps

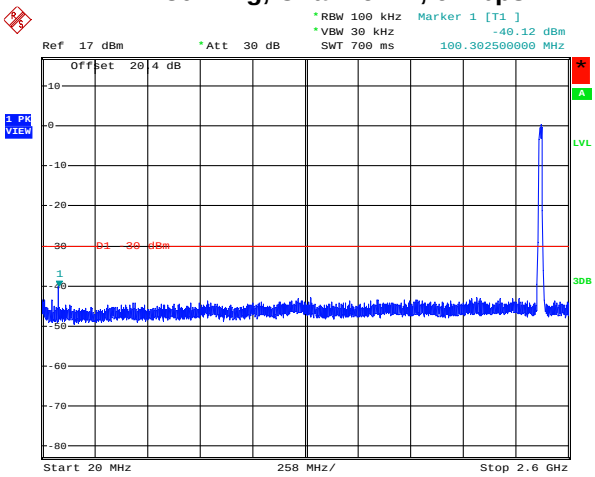


Date: 22.NOV.2012 15:09:33

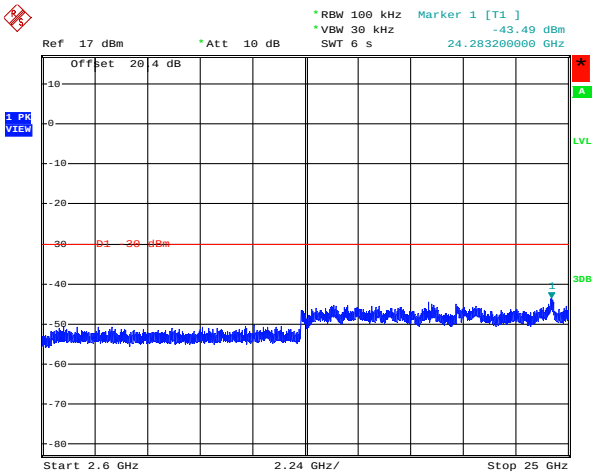


Date: 22.NOV.2012 15:10:50

Figure 5-30: Spurious Conducted RF Emissions 802.11g, Channel 11, 6 Mbps



Date: 22.NOV.2012 15:11:23



Date: 22.NOV.2012 15:12:40

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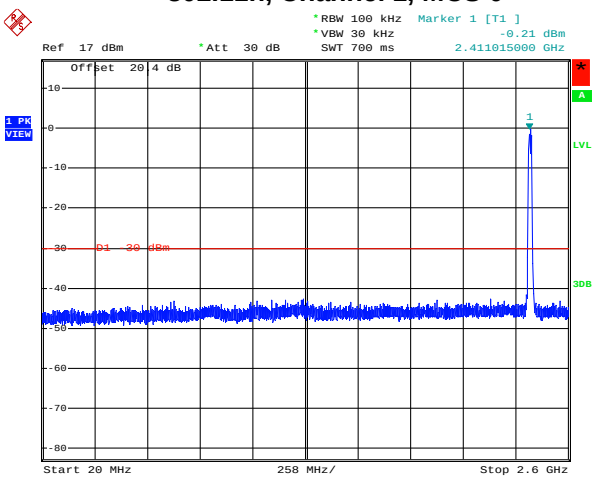
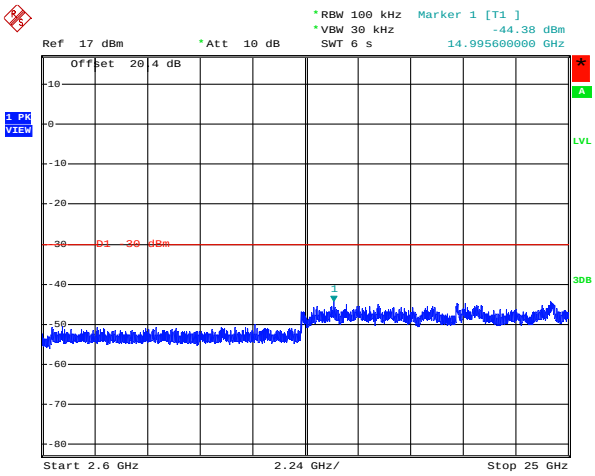
802.11b/g/n RF Conducted Emission Test Results cont'd

Figure 5-31: Spurious Conducted RF Emissions 802.11n, Channel 1, MCS 0

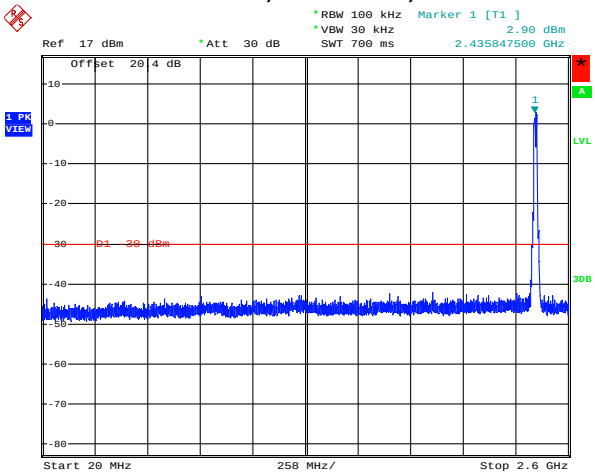


Date: 22.NOV.2012 15:13:14

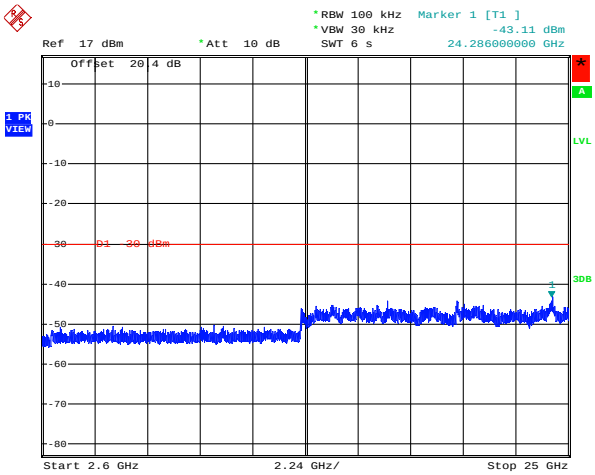


Date: 22.NOV.2012 15:14:31

Figure 5-32: Spurious Conducted RF Emissions 802.11n, Channel 6, MCS 0



Date: 22.NOV.2012 15:15:05



Date: 22.NOV.2012 15:16:22

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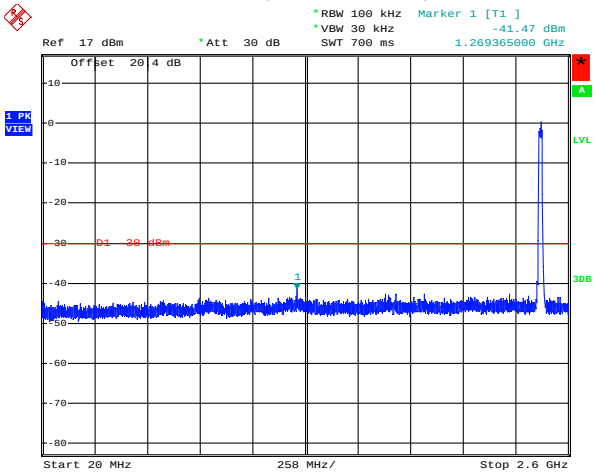
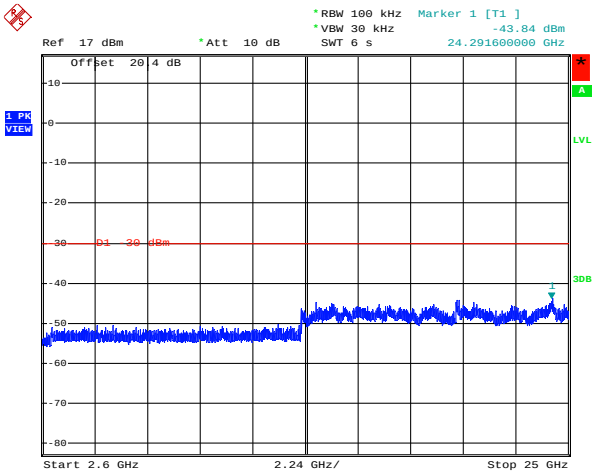
802.11b/g/n RF Conducted Emission Test Results cont'd

Figure 5-33: Spurious Conducted RF Emissions
802.11n, Channel 11, MCS 0



Date: 22.NOV.2012 15:16:55



Date: 22.NOV.2012 15:18:12

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APPENDIX 6 – 802.11a/n CONDUCTED EMISSIONS TEST DATA/PLOTS

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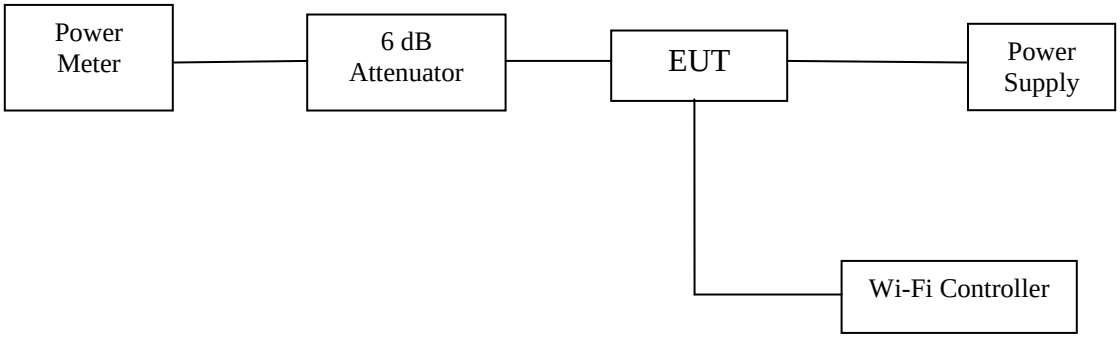
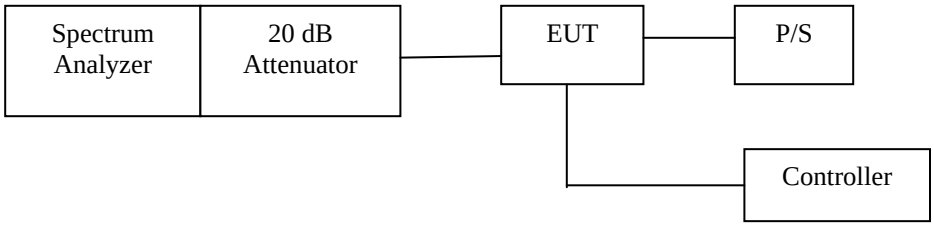
802.11a/n RF Conducted Emission Test Results

Test Setup Diagram





A reference offset of 8.9 dB was applied to the spectrum analyzer and 7.4 dB to the Power Meter reference level for the attenuators and coaxial cable loss in the test circuit.

Date of test: November 12, 2012.
The measurements were performed by Berkin Can.

The environmental test conditions were: Temperature: 24 ºC
Relative Humidity: 14.8-34.4 %

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802.11a RF Conducted Emission Test Results cont'd

6 dB Bandwidth

The EUT met the requirements of the 6 dB bandwidth as per 47 CFR 15.247(a) (2) and RSS-210. Channels 36, 44, 48, 52, 60, 64, 100, 140, 149, 157, 161 and 165 were measured at 6 Mbps, 24 Mbps, and 54 Mbps each for 802.11a mode.

Channel	Data Rate	Limit (kHz)	Measured Level (MHz)
36	6 Mbps	>= 500	16.32
	24 Mbps	>= 500	16.48
	54 Mbps	>= 500	16.51
44	6 Mbps	>= 500	15.76
	24 Mbps	>= 500	16.35
	54 Mbps	>= 500	16.45
48	6 Mbps	>= 500	16.08
	24 Mbps	>= 500	16.42
	54 Mbps	>= 500	16.53
52	6 Mbps	>= 500	16.28
	24 Mbps	>= 500	16.48
	54 Mbps	>= 500	16.51
60	6 Mbps	>= 500	16.32
	24 Mbps	>= 500	16.40
	54 Mbps	>= 500	**16.55**
64	6 Mbps	>= 500	15.80
	24 Mbps	>= 500	16.41
	54 Mbps	>= 500	16.48
100	6 Mbps	>= 500	16.28
	24 Mbps	>= 500	16.37
	54 Mbps	>= 500	16.40

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802.11a RF Conducted Emission Test Results cont'd

Channel	Data Rate	Limit (kHz)	Measured Level (MHz)
140	6 Mbps	>= 500	15.84
	24 Mbps	>= 500	16.26
	54 Mbps	>= 500	16.30
149	6 Mbps	>= 500	16.04
	24 Mbps	>= 500	16.38
	54 Mbps	>= 500	16.45
157	6 Mbps	>= 500	15.84
	24 Mbps	>= 500	16.44
	54 Mbps	>= 500	16.52
161	6 Mbps	>= 500	15.96
	24 Mbps	>= 500	16.47
	54 Mbps	>= 500	16.49
165	6 Mbps	>= 500	15.84
	24 Mbps	>= 500	16.36
	54 Mbps	>= 500	16.45

See figures 6-1 to 6-12 for the plots of the 6 dB bandwidth measurements for Channel 36, 44, 48, 52, 60, 64, 100, 140, 149, 157, 161 and 165 at 6 Mbps each for 802.11a mode.

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802.11n 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 36, 64 and 165 were measured at MCS 0, MCS 4 an MCS 7 each for 802.11n mode.

Channel	Data Rate	Limit (kHz)	Measured Level (MHz)
36	6 Mbps	>= 500	16.76
	24 Mbps	>= 500	
	54 Mbps	>= 500	
44	6 Mbps	>= 500	17.04
	24 Mbps	>= 500	
	54 Mbps	>= 500	
48	6 Mbps	>= 500	17.00
	24 Mbps	>= 500	
	54 Mbps	>= 500	
52	6 Mbps	>= 500	16.52
	24 Mbps	>= 500	
	54 Mbps	>= 500	
60	6 Mbps	>= 500	16.80
	24 Mbps	>= 500	
	54 Mbps	>= 500	
64	6 Mbps	>= 500	16.96
	24 Mbps	>= 500	
	54 Mbps	>= 500	
100	6 Mbps	>= 500	16.80
	24 Mbps	>= 500	
	54 Mbps	>= 500	

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802.11n RF Conducted Emission Test Results cont'd

Channel	Data Rate	Limit (kHz)	Measured Level (MHz)
140	6 Mbps	>= 500	16.80
	24 Mbps	>= 500	
	54 Mbps	>= 500	
149	6 Mbps	>= 500	16.92
	24 Mbps	>= 500	
	54 Mbps	>= 500	
157	6 Mbps	>= 500	16.28
	24 Mbps	>= 500	
	54 Mbps	>= 500	
161	6 Mbps	>= 500	16.92
	24 Mbps	>= 500	
	54 Mbps	>= 500	
165	6 Mbps	>= 500	16.96
	24 Mbps	>= 500	
	54 Mbps	>= 500	

See figures 6-13 to 6-15 for the plots of the 6 dB bandwidth measurements for Channel 36, 64 and 165 at MCS 0 each for 802.11n mode.

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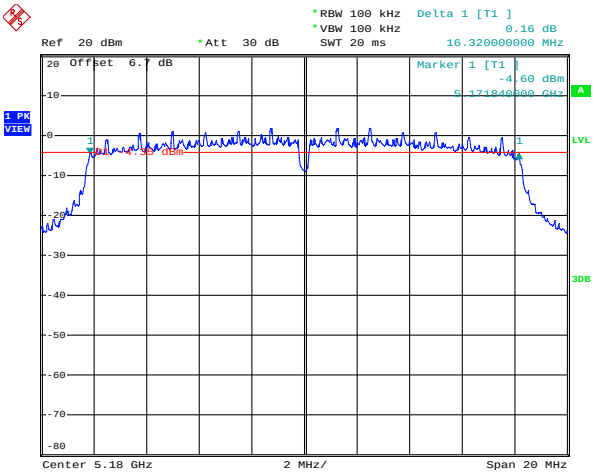
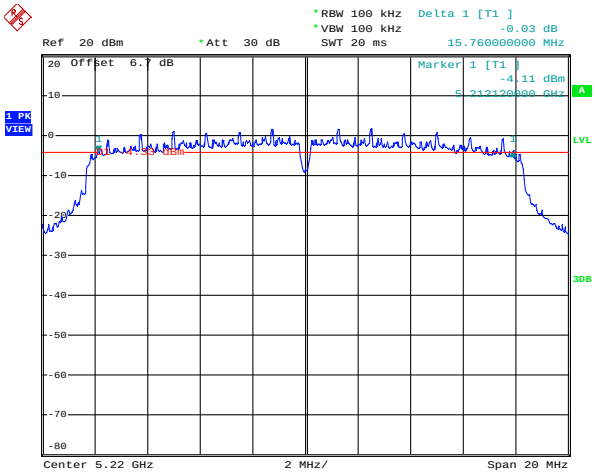
802.11a RF Conducted Emission Test Results cont'd

Figure 6-1: 6 dB Bandwidth
802.11a, Channel 36, 6 Mbps



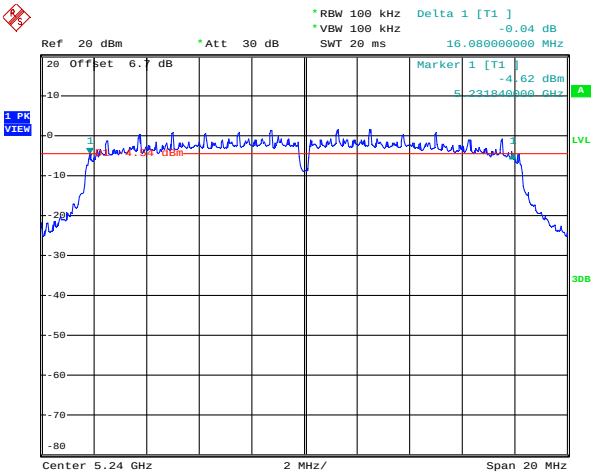
Date: 27.NOV.2012 15:45:19

Figure 6-2: 6 dB Bandwidth
802.11a, Channel 44, 6 Mbps



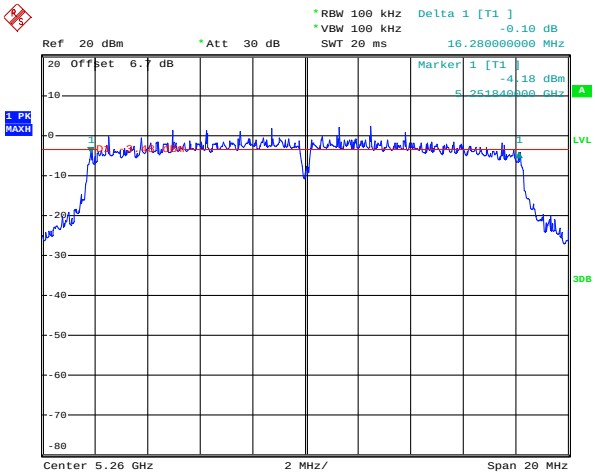
Date: 27.NOV.2012 15:49:23

Figure 6-3: 6 dB Bandwidth
802.11a, Channel 48, 6 Mbps



Date: 27.NOV.2012 15:51:31

Figure 6-4: 6 dB Bandwidth
802.11a, Channel 52, 6 Mbps



Date: 27.NOV.2012 16:18:54

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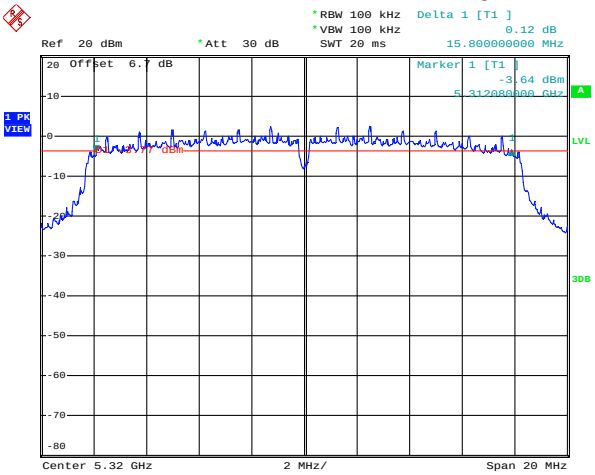
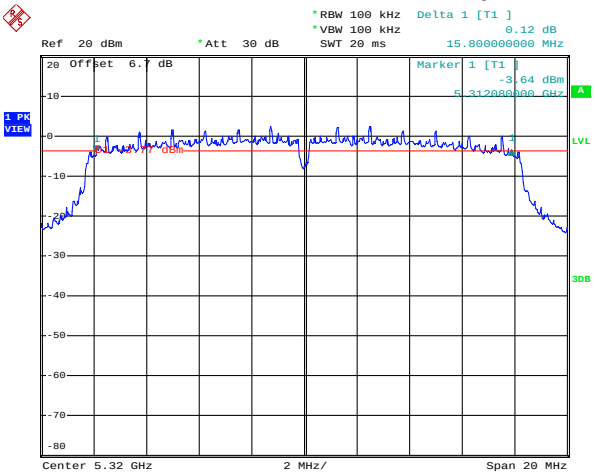
802.11a RF Conducted Emission Test Results cont'd

Figure 6-5: 6 dB Bandwidth
802.11a, Channel 60, 6 Mbps



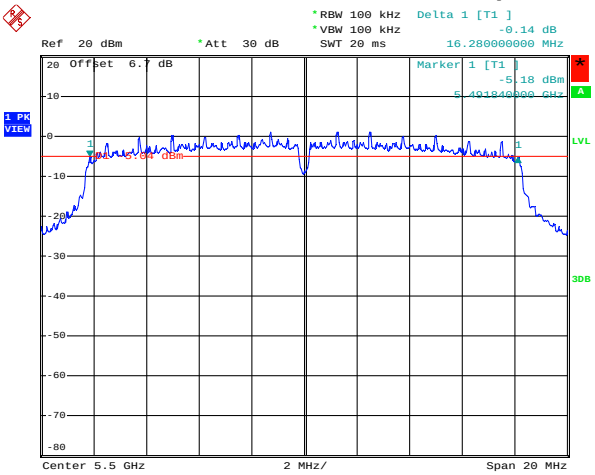
Date: 27.NOV.2012 16:24:09

Figure 6-6: 6 dB Bandwidth
802.11a, Channel 64, 6 Mbps



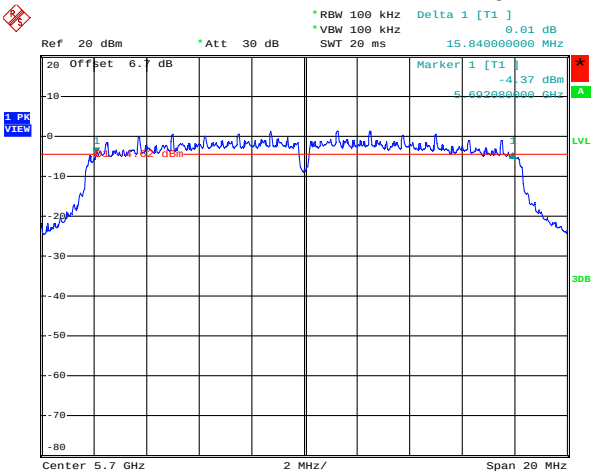
Date: 27.NOV.2012 16:24:09

Figure 6-7: 6 dB Bandwidth
802.11a, Channel 100, 6 Mbps



Date: 27.NOV.2012 16:27:04

Figure 6-8: 6 dB Bandwidth
802.11a, Channel 140, 6 Mbps



Date: 27.NOV.2012 16:30:28

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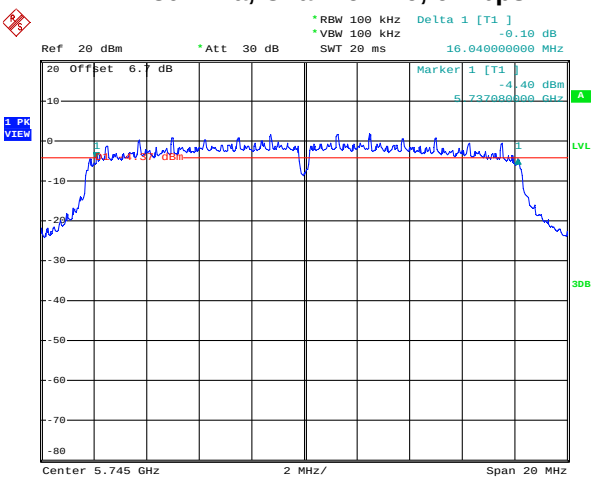
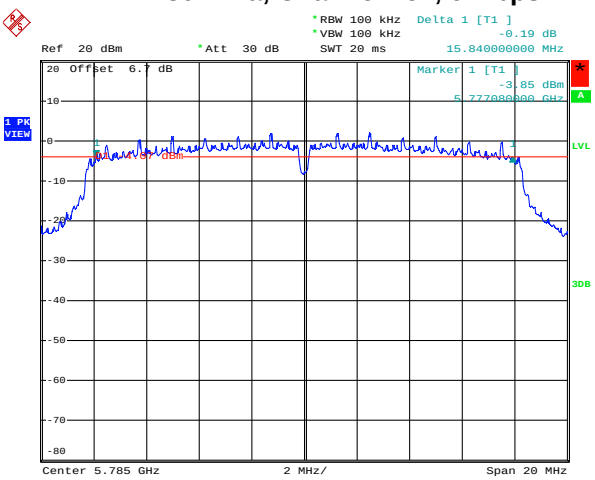
802.11a RF Conducted Emission Test Results cont'd

Figure 6-9: 6 dB Bandwidth
802.11a, Channel 149, 6 Mbps



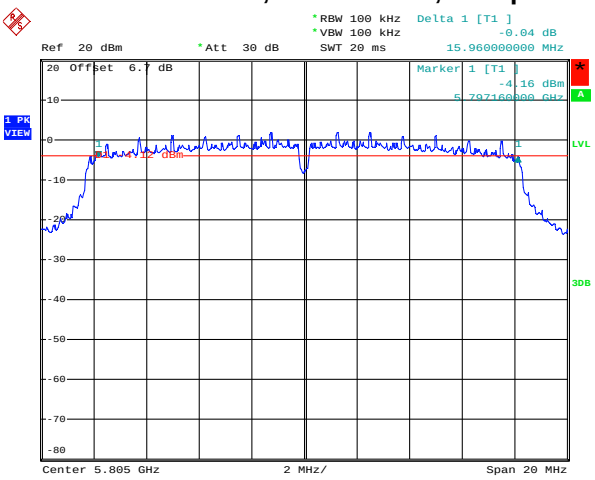
Date: 27.NOV.2012 16:34:18

Figure 6-10: 6 dB Bandwidth
802.11a, Channel 157, 6 Mbps



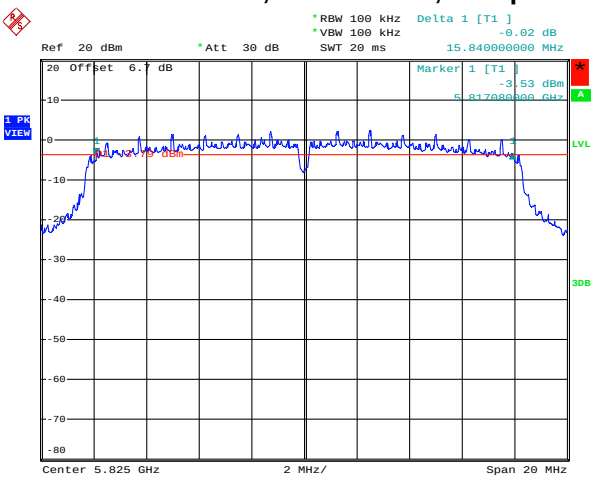
Date: 27.NOV.2012 16:37:43

Figure 6-11: 6 dB Bandwidth
802.11a, Channel 161, 6 Mbps



Date: 27.NOV.2012 16:40:09

Figure 6-12: 6 dB Bandwidth
802.11a, Channel 165, 6 Mbps



Date: 27.NOV.2012 16:42:19

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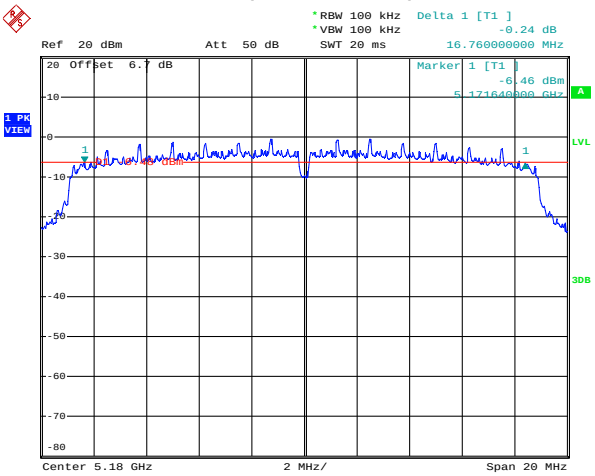
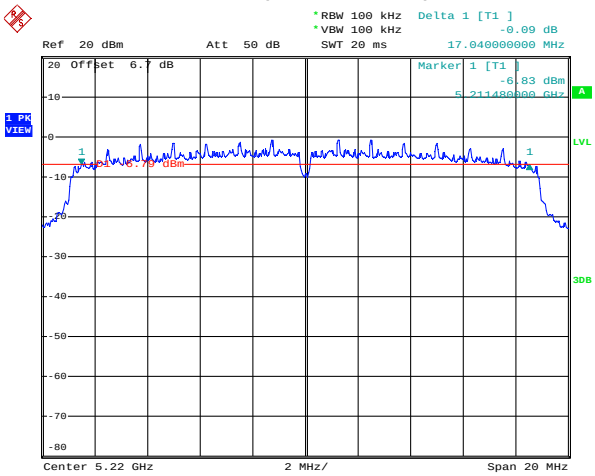
802.11n RF Conducted Emission Test Results

Figure 6-13: 6 dB Bandwidth
802.11n, Channel 36, MCS 0



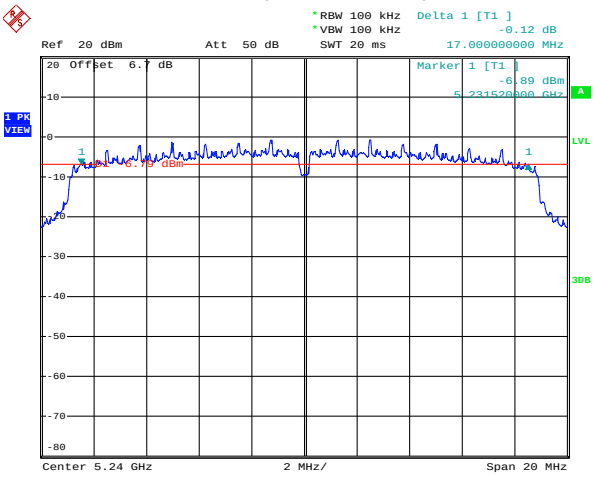
Date: 4.DEC.2012 10:39:14

Figure 6-14: 6 dB Bandwidth
802.11n, Channel 44, MCS 0



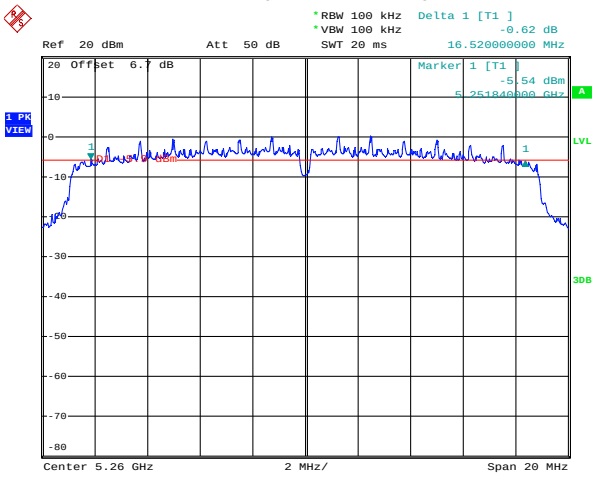
Date: 4.DEC.2012 10:48:23

Figure 6-15: 6 dB Bandwidth
802.11n, Channel 48, MCS 0



Date: 4.DEC.2012 10:59:07

Figure 6-16: 6 dB Bandwidth
802.11n, Channel 52, MCS 0



Date: 4.DEC.2012 11:02:06

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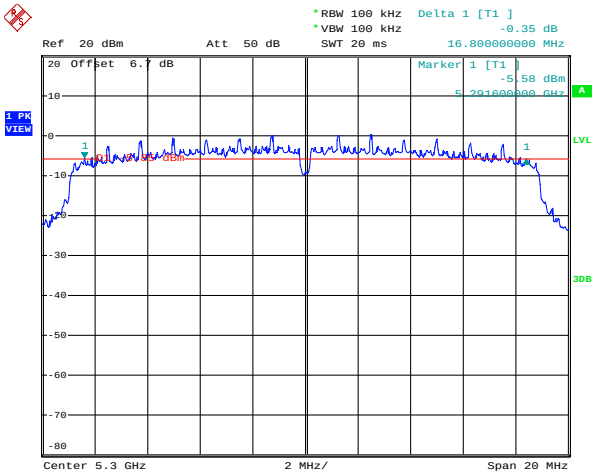
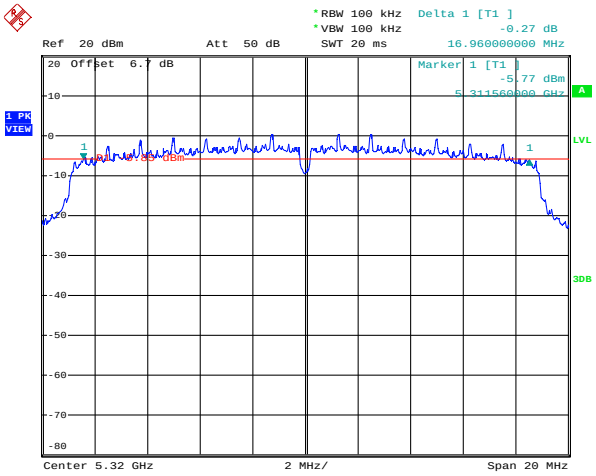
802.11n RF Conducted Emission Test Results cont'd

Figure 6-17: 6 dB Bandwidth
802.11n, Channel 60, MCS 0



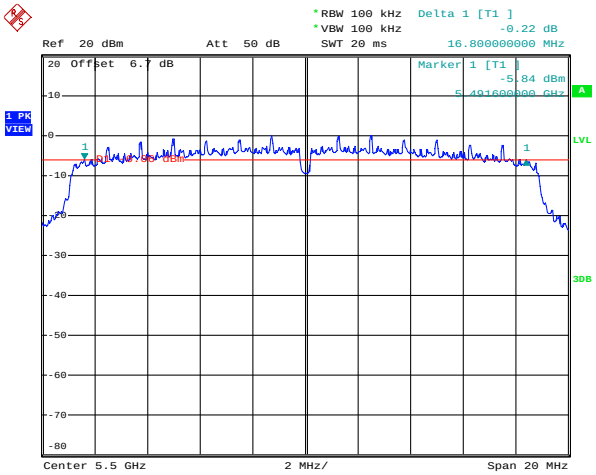
Date: 4.DEC.2012 11:03:44

Figure 6-18: 6 dB Bandwidth
802.11n, Channel 64, MCS 0



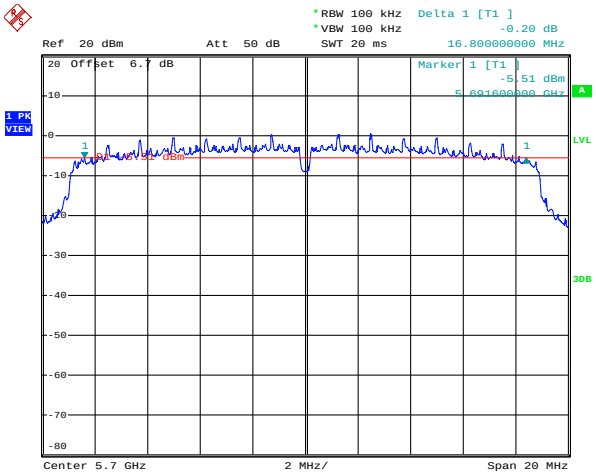
Date: 4.DEC.2012 11:06:18

Figure 6-19: 6 dB Bandwidth
802.11n, Channel 100, MCS 0



Date: 4.DEC.2012 11:08:23

Figure 6-20: 6 dB Bandwidth
802.11n, Channel 140, MCS 0



Date: 4.DEC.2012 11:12:44

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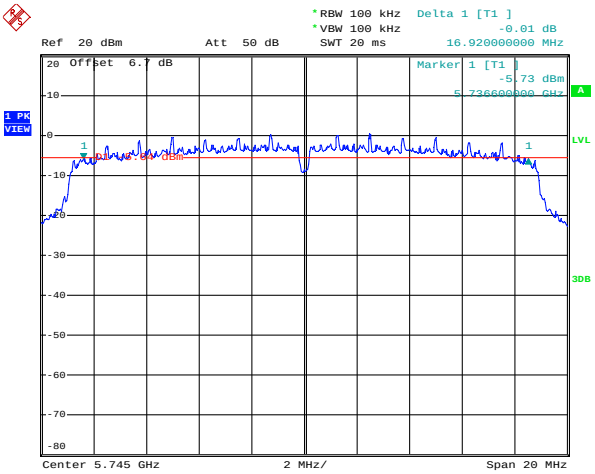
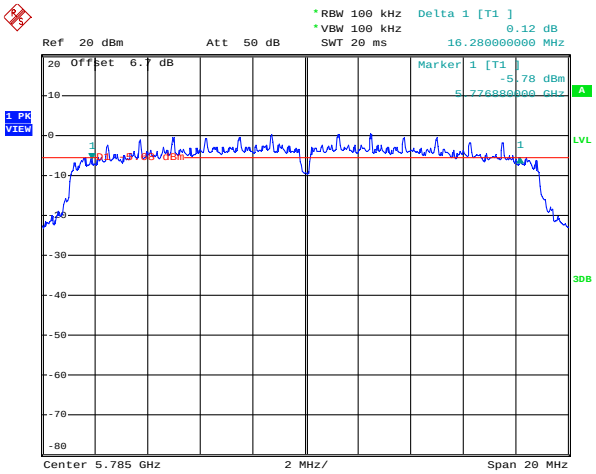
802.11n RF Conducted Emission Test Results cont'd

Figure 6-21: 6 dB Bandwidth
802.11n, Channel 149, MCS 0



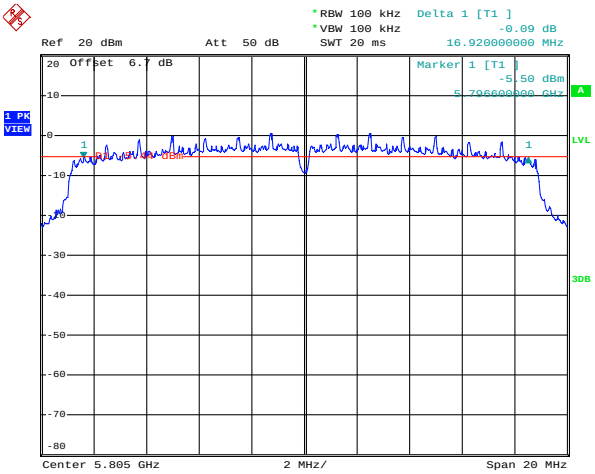
Date: 4.DEC.2012 11:17:21

Figure 6-22: 6 dB Bandwidth
802.11n, Channel 157, MCS 0



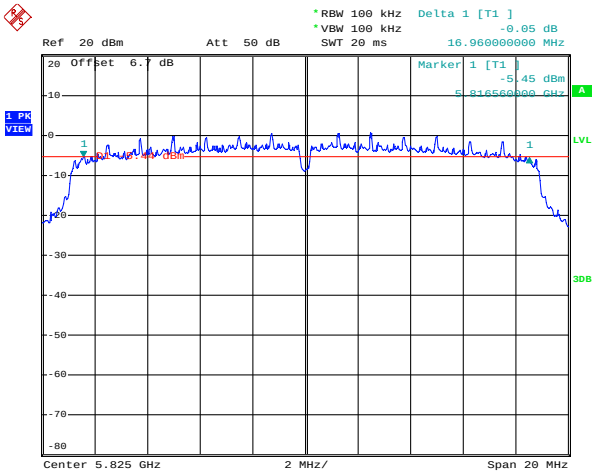
Date: 4.DEC.2012 11:19:35

Figure 6-23: 6 dB Bandwidth
802.11n, Channel 161, MCS 0



Date: 4.DEC.2012 11:21:39

Figure 6-24: 6 dB Bandwidth
802.11n, Channel 165, MCS 0



Date: 4.DEC.2012 11:28:12

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802.11a 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 15.407 and RSS-210. Channels 36, 44, 48, 52, 60, 64, 100, 140, 149, 157, 161 and 165 were measured for 802.11a mode using an Agilent power meter, model N1911A with model N1921A power sensor. A reference offset of 8.9 dB was applied to the power meter reference level for the coaxial cable loss and attenuators in the test circuit.

Channel	Data Rate	Class 2 Limit (W)	Measured Level (dBm)	Measured Level (mW)
36	6 Mbps	< 1.00	13.61	22.96
	24 Mbps	< 1.00	13.27	21.23
	54 Mbps	< 1.00	12.18	16.52
44	6 Mbps	< 1.00	13.58	22.80
	24 Mbps	< 1.00	13.09	20.37
	54 Mbps	< 1.00	12.01	15.89
48	6 Mbps	< 1.00	13.51	22.44
	24 Mbps	< 1.00	13.07	20.28
	54 Mbps	< 1.00	12.04	16.00
52	6 Mbps	< 1.00	**14.22**	26.42
	24 Mbps	< 1.00	13.92	24.66
	54 Mbps	< 1.00	12.12	16.29
60	6 Mbps	< 1.00	14.12	25.82
	24 Mbps	< 1.00	13.71	23.50
	54 Mbps	< 1.00	11.76	15.00
64	6 Mbps	< 1.00	14.12	25.82
	24 Mbps	< 1.00	13.59	22.86
	54 Mbps	< 1.00	11.95	15.67
100	6 Mbps	< 1.00	13.24	21.09
	24 Mbps	< 1.00	12.85	19.28
	54 Mbps	< 1.00	10.61	11.51

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802.11a RF Conducted Emission Test Results cont'd

Channel	Data Rate	Class 2 Limit (W)	Measured Level (dBm)	Measured Level (mW)
140	6 Mbps	< 1.00	13.28	21.28
	24 Mbps	< 1.00	13.00	19.95
	54 Mbps	< 1.00	10.74	11.86
149	6 Mbps	< 1.00	13.14	20.61
	24 Mbps	< 1.00	12.73	18.75
	54 Mbps	< 1.00	10.34	10.81
157	6 Mbps	< 1.00	13.17	20.75
	24 Mbps	< 1.00	12.83	19.19
	54 Mbps	< 1.00	10.50	11.22
161	6 Mbps	< 1.00	13.14	20.61
	24 Mbps	< 1.00	12.97	19.82
	54 Mbps	< 1.00	11.03	12.68
165	6 Mbps	< 1.00	13.20	20.89
	24 Mbps	< 1.00	12.95	19.72
	54 Mbps	< 1.00	11.01	12.62

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802.11n RF Conducted Emission Test Results

Maximum Conducted Output Power

The EUT met the requirements of the maximum conducted output power of class 2 as per 47 CFR 15.407 and RSS-210. Channels 36, 64 and 165 were measured for 802.11n mode using an Agilent power meter, model N1911A with model N1921A power sensor. A reference offset of 8.9 dB was applied to the power meter reference level for the coaxial cable loss and attenuators in the test circuit.

Channel	Data Rate	Class 2 Limit (W)	Measured Level (dBm)	Measured Level (mW)
36	6 Mbps	< 1.00	12.70	18.62
44	6 Mbps	< 1.00	12.62	18.28
48	6 Mbps	< 1.00	12.50	17.78
52	6 Mbps	< 1.00	13.46	22.18
60	6 Mbps	< 1.00	13.32	21.48
64	6 Mbps	< 1.00	13.23	21.01
100	6 Mbps	< 1.00	12.84	19.23
140	6 Mbps	< 1.00	12.80	19.05
149	6 Mbps	< 1.00	12.55	17.99

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802.11a RF Conducted Emission Test Results cont'd

Band Edge Compliance

The EUT met the requirements of the band edge compliance as per 47 CFR 15.407 and RSS-210. Channels 36, 48, 52, 64, 100, 149, 161 and 165 were measured at 6 Mbps, 24 Mbps, and 54 Mbps each for 802.11a mode.

Channel	Data Rate	Limit (dBc)	Measured Level (dBc)	Margin (dBc)
36	6 Mbps	< -20	-40.32	-20.32
	24 Mbps	< -20	-40.23	-20.23
	54 Mbps	< -20	-41.12	-21.12
64	6 Mbps	< -20	-50.36	-30.36
	24 Mbps	< -20	-50.20	-30.20
	54 Mbps	< -20	-50.28	-30.28
100	6 Mbps	< -20	-49.81	-29.81
	24 Mbps	< -20	-50.03	-30.03
	54 Mbps	< -20	-50.03	-30.03
149	6 Mbps	< -20	-47.06	-27.06
	24 Mbps	< -20	-47.32	-27.32
	54 Mbps	< -20	-47.13	-27.13
165	6 Mbps	< -20	-25.14	-5.14
	24 Mbps	< -20	-25.21	-5.21
	54 Mbps	< -20	-26.68	-6.68

See figures 6-16 to 6-21 for the plots of the band edge compliance measurements for Channel 36, 64, 100, 140, 149 and 165 at 6 Mbps each for 802.11a mode.

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802.11n RF Conducted Emission Test Results

Band Edge Compliance

The EUT met the requirements of the band edge compliance as per 47 CFR 15.407 and RSS-210. Channels 36, 64 and 165 were measured at MCS 0, MCS 4 and MCS 7 each for 802.11n mode.

Channel	Data Rate	Limit (dBc)	Measured Level (dBc)	Margin (dBc)
36	6 Mbps	< -20	-45.67	-25.67
64	6 Mbps	< -20	-46.94	-26.94
100	6 Mbps	< -20	-45.97	-25.97
140	6 Mbps	< -20	-45.70	-25.70
149	6 Mbps	< -20	-42.35	-22.35
165	6 Mbps	< -20	-23.65	-3.65

See figures 6-22 to 6-27 for the plots of the band edge compliance measurements for Channel 36, 64, 100, 140, 149 and 165 at MCS 0 each for 802.11n mode.

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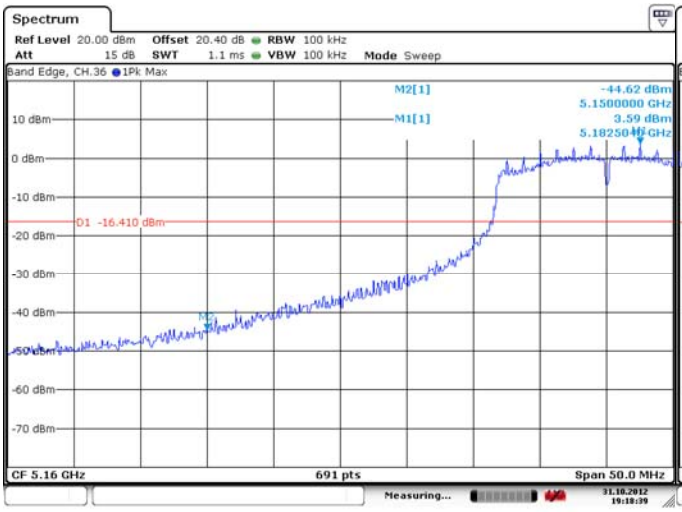
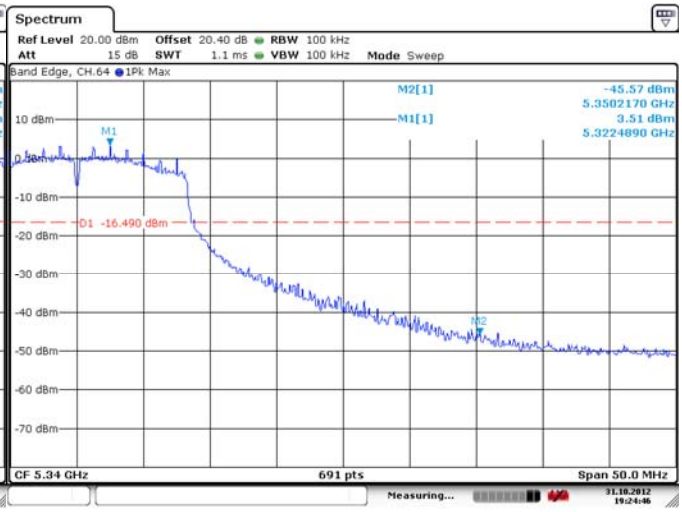
802.11a RF Conducted Emission Test Results cont'd

Figure 6-16: Band Edge Compliance 802.11a, Channel 36, 6 Mbps



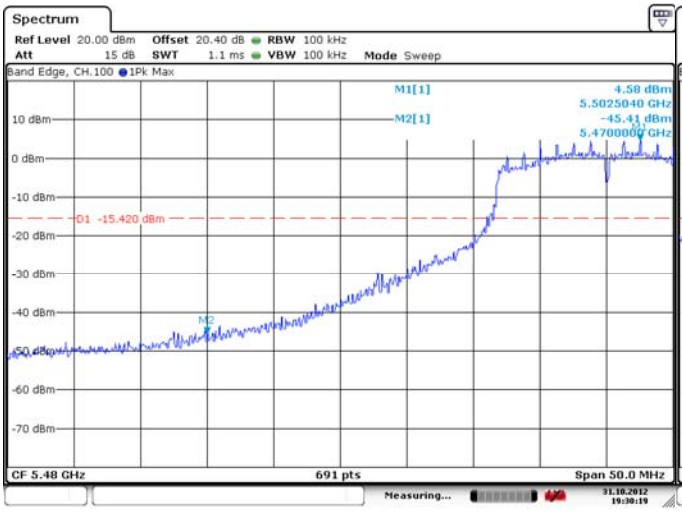
Date: 31.OCT.2012 19:18:39

Figure 6-17: Band Edge Compliance 802.11a, Channel 64, 6 Mbps



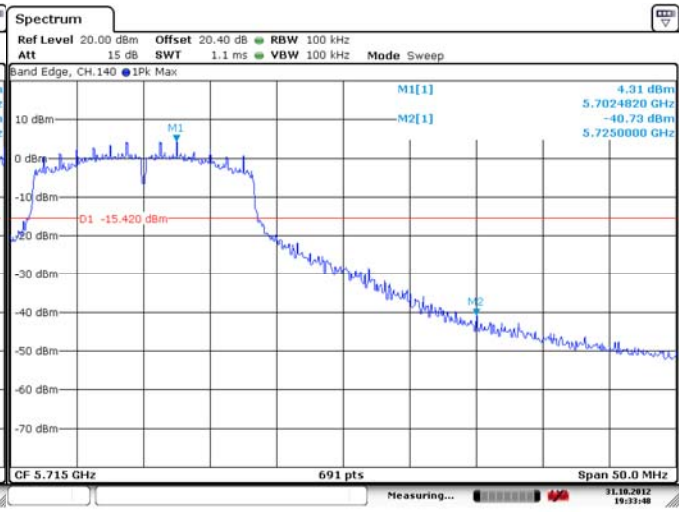
Date: 31.OCT.2012 19:24:46

Figure 6-18: Band Edge Compliance 802.11a, Channel 100, 6 Mbps



Date: 31.OCT.2012 19:30:19

Figure 6-19: Band Edge Compliance 802.11a, Channel 140, 6 Mbps



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802.11a RF Conducted Emission Test Results cont'd

Figure 6-20: Band Edge Compliance 802.11a, Channel 149, 6 Mbps

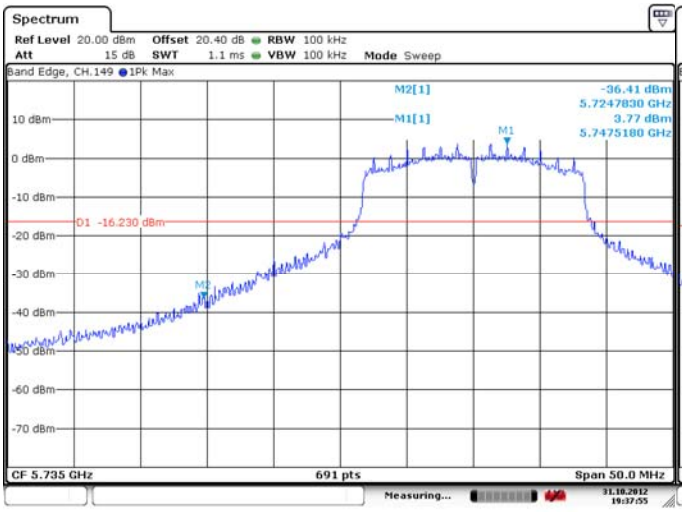
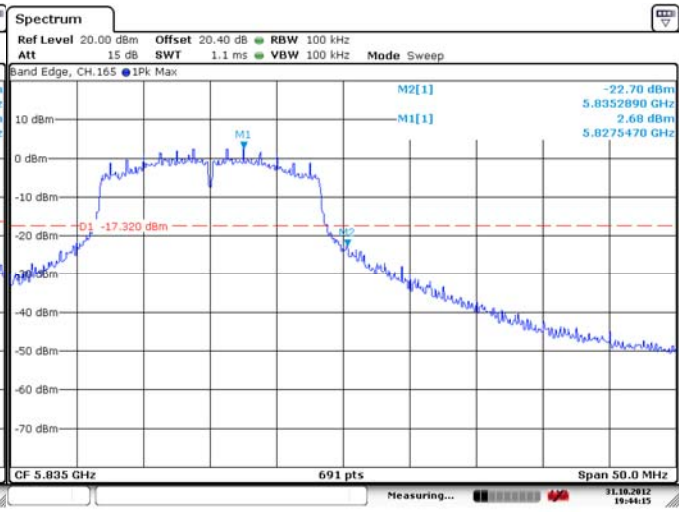


Figure 6-21: Band Edge Compliance 802.11a, Channel 165, 6 Mbps



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802.11n RF Conducted Emission Test Results

Figure 6-22: Band Edge Compliance 802.11n, Channel 36, MCS 0

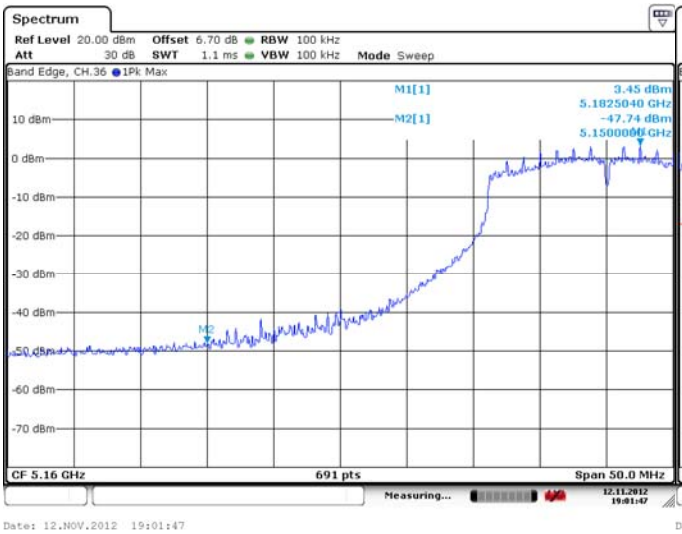

Figure 6-23: Band Edge Compliance 802.11n, Channel 64, MCS 0

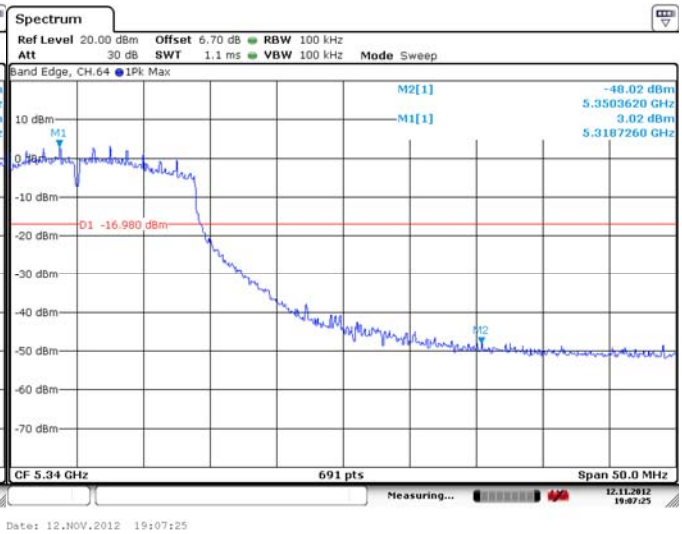

Figure 6-24: Band Edge Compliance 802.11n, Channel 100, MCS 0

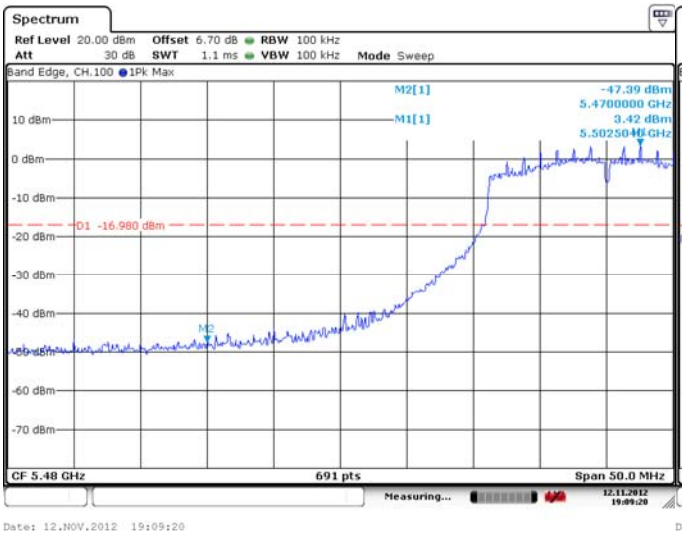

Figure 6-25: Band Edge Compliance 802.11n, Channel 140, MCS 0

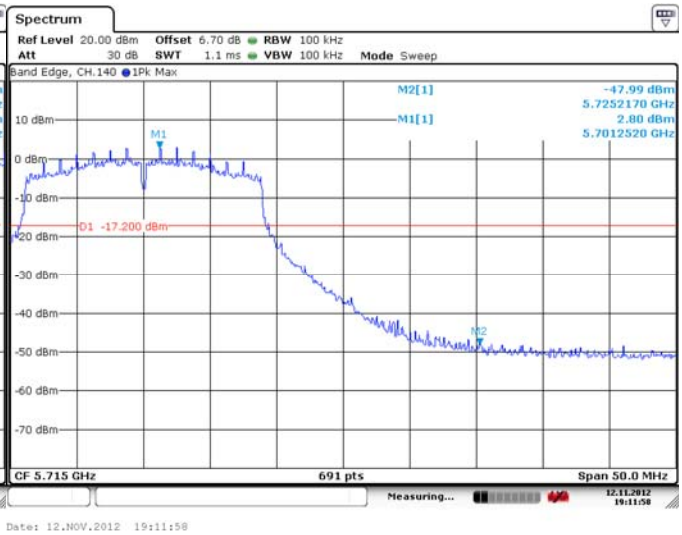

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Figure 6-26: Band Edge Compliance 802.11n, Channel 149, MCS 0

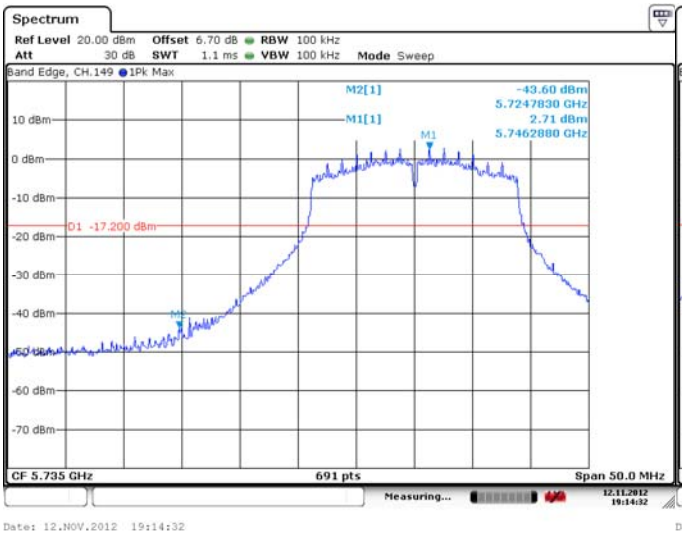
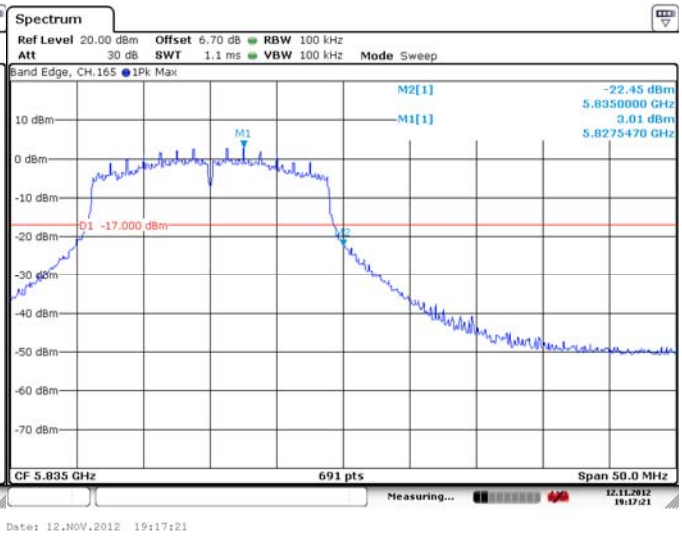


Figure 6-27: Band Edge Compliance 802.11n, Channel 165, MCS 0



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802.11a 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 15.407 and RSS-210. Channels 36, 44, 48, 52, 60, 64, 149, 157, 161 and 165 were measured at 6 Mbps, 24 Mbps, and 54 Mbps each for 802.11a mode.

Channel	Data Rate	Limit (dBm)	Measured Level (dBm)	Margin (dBm)
36	6 Mbps	< 4.00	-12.14	-16.14
	24 Mbps	< 4.00	-12.77	-16.77
	54 Mbps	< 4.00	-13.17	-17.17
44	6 Mbps	< 4.00	-11.68	-15.68
	24 Mbps	< 4.00	-12.23	-16.23
	54 Mbps	< 4.00	-13.39	-17.39
48	6 Mbps	< 4.00	-12.94	-16.94
	24 Mbps	< 4.00	-12.56	-16.56
	54 Mbps	< 4.00	-14.11	-18.11
52	6 Mbps	< 11.00	-10.47	-21.47
	24 Mbps	< 11.00	-12.50	-23.50
	54 Mbps	< 11.00	-14.11	-25.11
60	6 Mbps	< 11.00	-12.02	-23.02
	24 Mbps	< 11.00	-11.91	-22.91
	54 Mbps	< 11.00	-14.28	-25.28
64	6 Mbps	< 11.00	-12.05	-23.05
	24 Mbps	< 11.00	-11.91	-22.91
	54 Mbps	< 11.00	-15.02	-26.02
100	6 Mbps	< 11.00	-13.41	-24.41
	24 Mbps	< 11.00	-12.59	-23.59
	54 Mbps	< 11.00	-14.68	-25.68
140	6 Mbps	< 11.00	-11.53	-22.53
	24 Mbps	< 11.00	-12.89	-23.89
	54 Mbps	< 11.00	-15.42	-26.42
149	6 Mbps	< 11.00	-12.61	-29.61
	24 Mbps	< 11.00	-12.28	-29.28
	54 Mbps	< 11.00	-14.36	-31.36
157	6 Mbps	< 11.00	-11.64	-28.64
	24 Mbps	< 11.00	-12.39	-29.39
	54 Mbps	< 11.00	-14.21	-31.21
161	6 Mbps	< 17.00	-10.77	-27.77
	24 Mbps	< 17.00	-11.98	-28.98

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	54 Mbps	< 17.00	-14.05	-31.05
165	6 Mbps	< 17.00	-12.33	-29.33
	24 Mbps	< 17.00	-11.69	-28.69
	54 Mbps	< 17.00	-14.45	-31.45

See figures 6-27 to 6-38 for the plots of the peak power spectral density for Channel 36, 44, 48, 52, 60, 64, 149, 157, 161 and 165 at 6 Mbps each for 802.11a mode.

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802.11n RF Conducted Emission Test Results

Peak Power Spectral Density

The EUT met the requirements of the peak power spectral density as per 47 CFR 15.407 and RSS-210. Channels 36, 44, 48, 52, 60, 64, 149, 157, 161 and 165 were measured at 6 Mbps, 24 Mbps, and 54 Mbps each for 802.11a mode.

Channel	Data Rate	Limit (dBm)	Measured Level (dBm)	Margin (dBm)
36	6 Mbps	< 4.00	-12.93	-16.93
44	6 Mbps	< 4.00	-14.05	-18.05
48	6 Mbps	< 4.00	-13.26	-17.26
52	6 Mbps	< 11.00	-12.08	-23.08
60	6 Mbps	< 11.00	-12.48	-23.48
64	6 Mbps	< 11.00	-11.66	-22.66

See figures 6-39 to 6-46 for the plots of the peak power spectral density for Channel 36, 64 and 165 at MCS 0 each for 802.11n mode.

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802.11n RF Conducted Emission Test Results, cont'd

Channel	Data Rate	Limit (dBm)	Measured Level (dBm)	Margin (dBm)
100	6 Mbps	< 11.00	-13.18	-24.18
140	6 Mbps	< 11.00	-12.83	-23.83
149	6 Mbps	< 11.00	-12.20	-29.20
157	6 Mbps	< 11.00	-12.90	-29.90
161	6 Mbps	< 17.00	-12.33	-29.33
165	6 Mbps	< 17.00	-12.11	-29.11

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802.11a RF Conducted Emission Test Results cont'd

Figure 6-27: Peak Power Spectral Density 802.11a, Channel 36, 6 Mbps

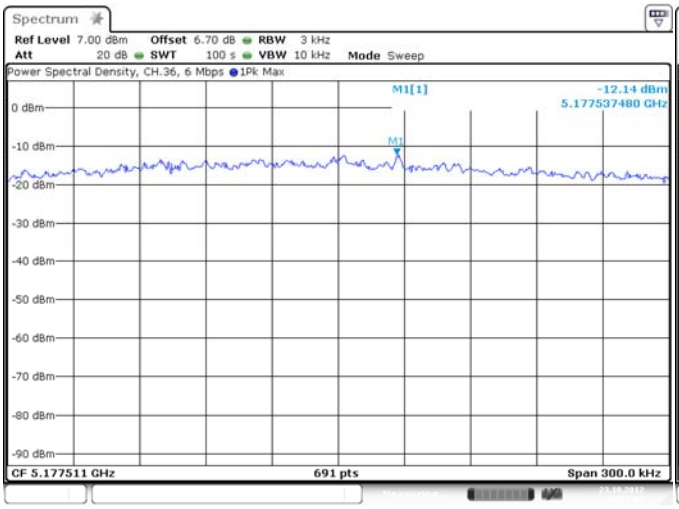


Figure 6-28: Peak Power Spectral Density 802.11a, Channel 44, 6 Mbps

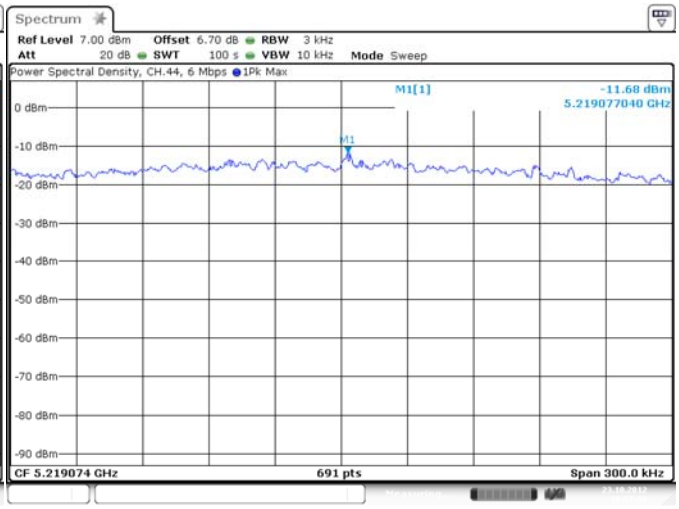


Figure 6-29: Peak Power Spectral Density 802.11a, Channel 48, 6 Mbps

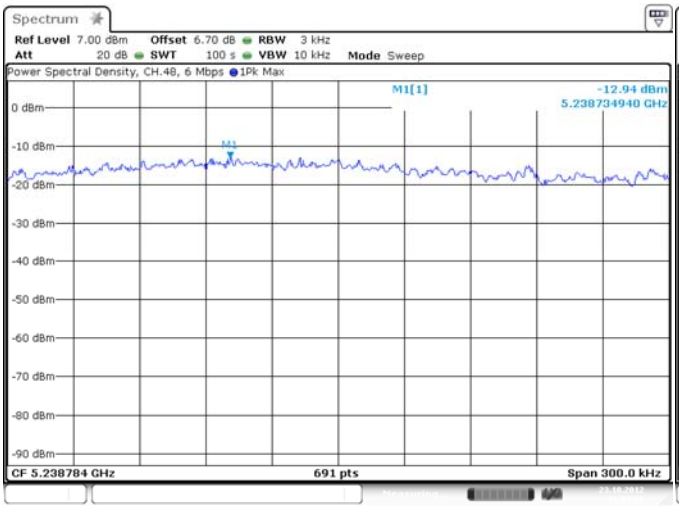
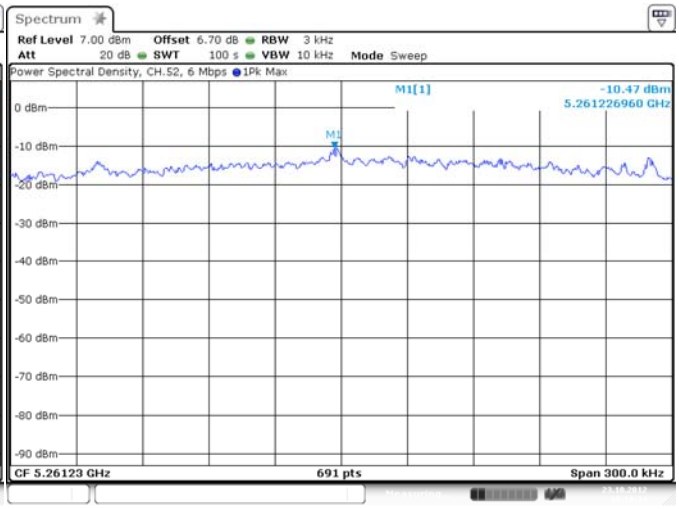


Figure 6-30: Peak Power Spectral Density 802.11a, Channel 52, 6 Mbps



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802.11a RF Conducted Emission Test Results cont'd

Figure 6-31: Peak Power Spectral Density 802.11a, Channel 60, 6 Mbps

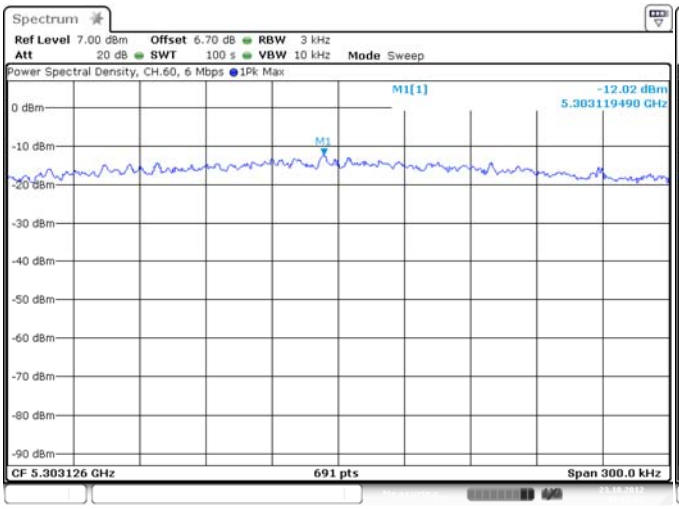


Figure 6-32: Peak Power Spectral Density 802.11a, Channel 64, 6 Mbps

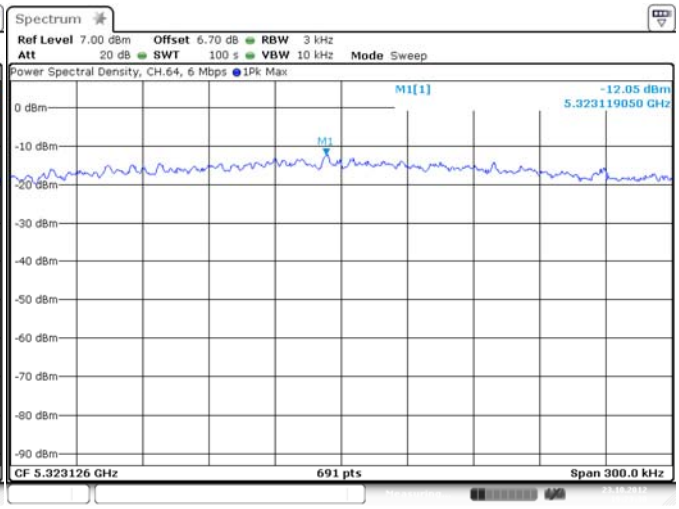


Figure 6-33: Peak Power Spectral Density 802.11a, Channel 100, 6 Mbps

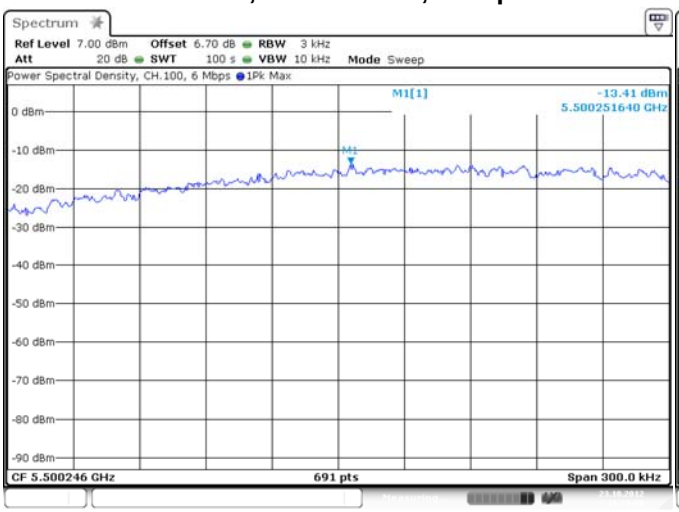
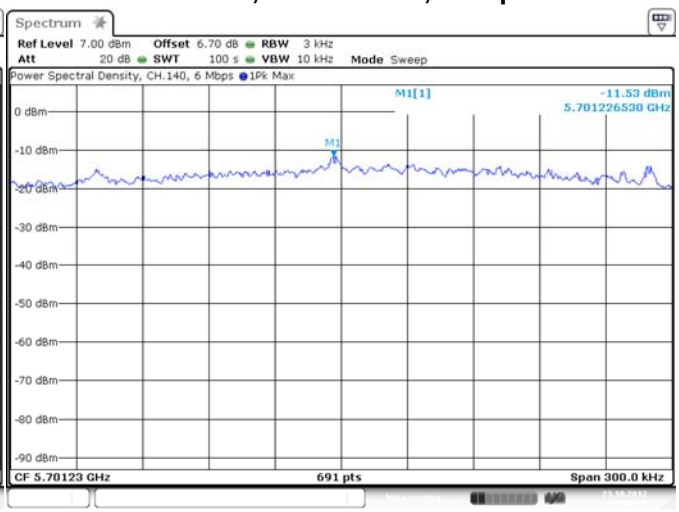


Figure 6-34: Peak Power Spectral Density 802.11a, Channel 140, 6 Mbps



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802.11a RF Conducted Emission Test Results cont'd

Figure 6-35: Peak Power Spectral Density 802.11a, Channel 149, 6 Mbps

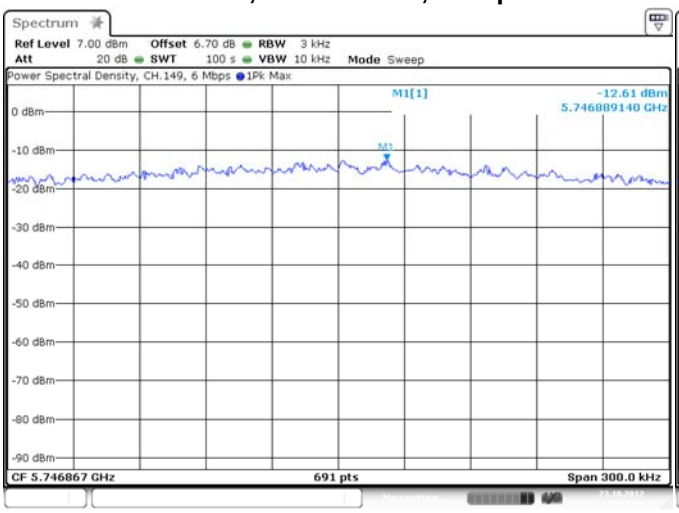


Figure 6-36: Peak Power Spectral Density 802.11a, Channel 157, 6 Mbps

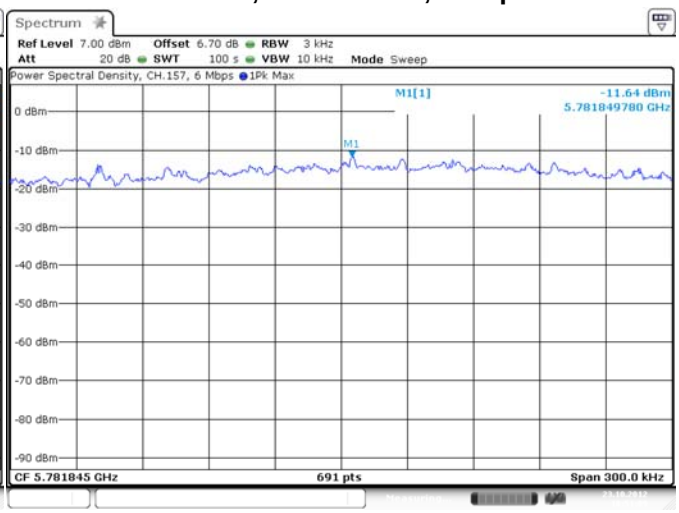


Figure 6-37: Peak Power Spectral Density 802.11a, Channel 161, 6 Mbps

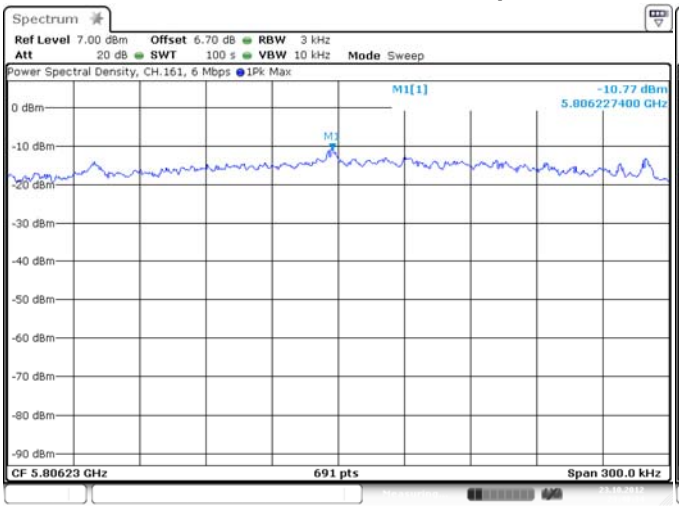
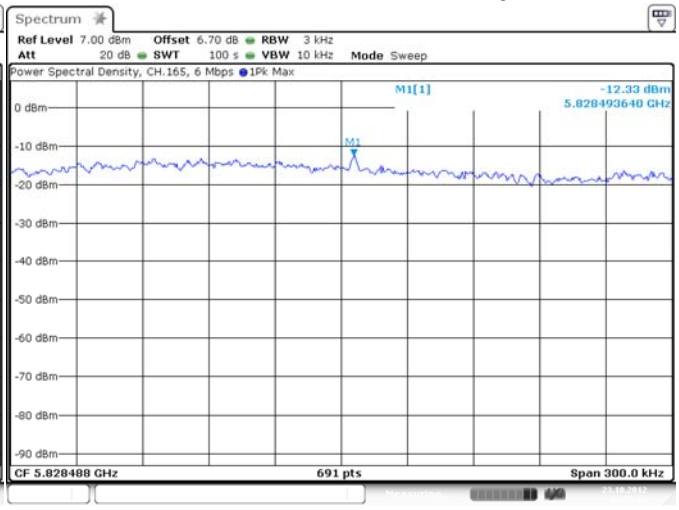


Figure 6-38: Peak Power Spectral Density 802.11a, Channel 165, 6 Mbps



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802.11n RF Conducted Emission Test Results

Figure 6-39: Peak Power Spectral Density
802.11n, Channel 36, MCS 0

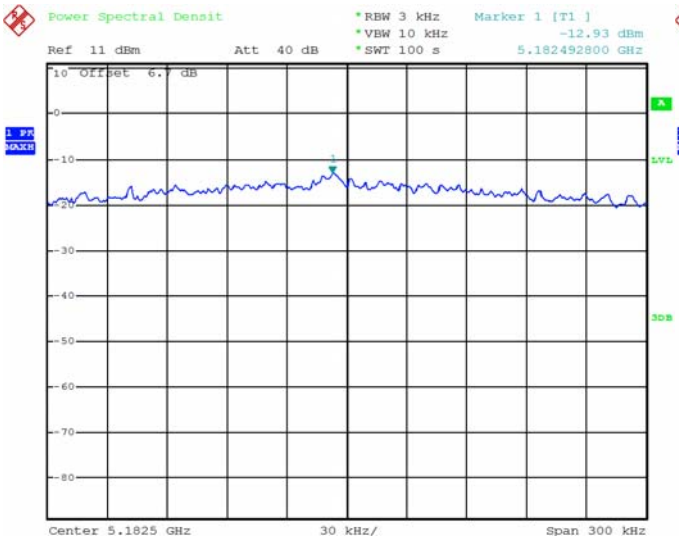


Figure 6-40: Peak Power Spectral Density
802.11n, Channel 44, MCS 0

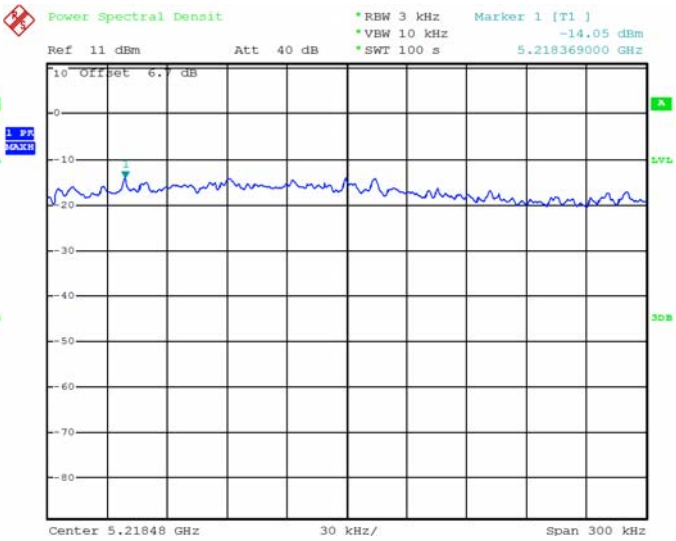


Figure 6-41: Peak Power Spectral Density
802.11n, Channel 48, MCS 0

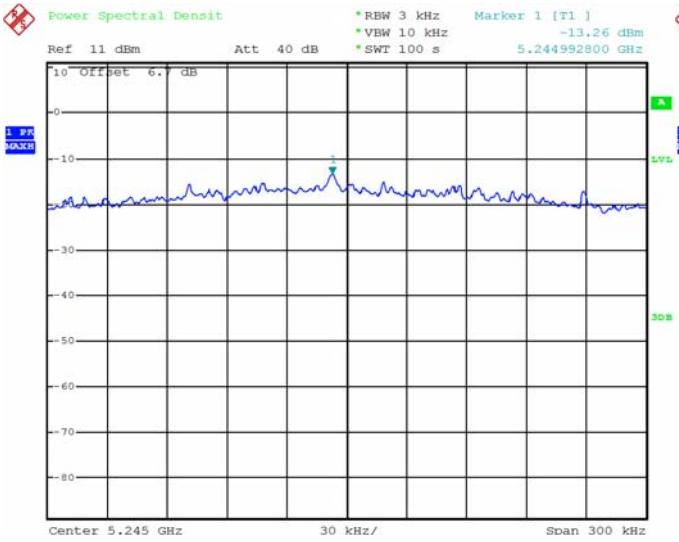
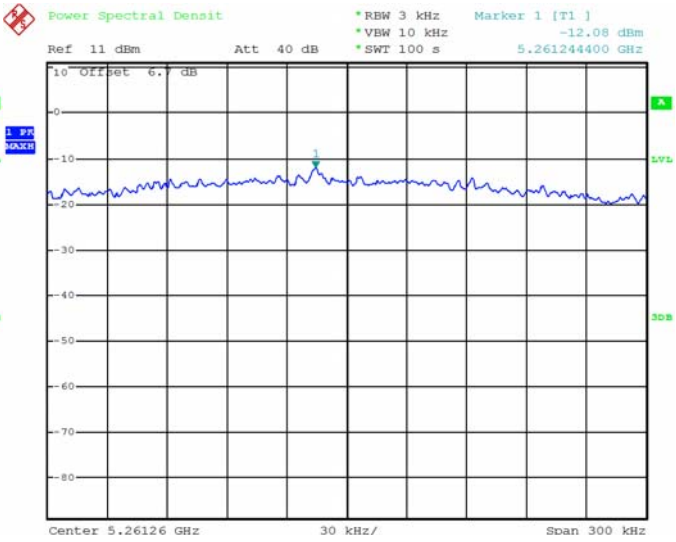


Figure 6-42: Peak Power Spectral Density
802.11n, Channel 52, MCS 0



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802.11n RF Conducted Emission Test Results cont'd

Figure 6-43: Peak Power Spectral Density
802.11n, Channel 60, MCS 0

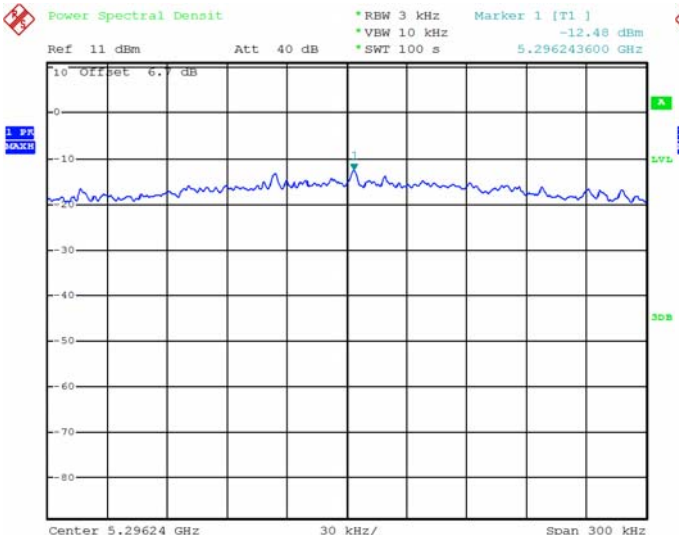

Figure 6-44: Peak Power Spectral Density
802.11n, Channel 64, MCS 0

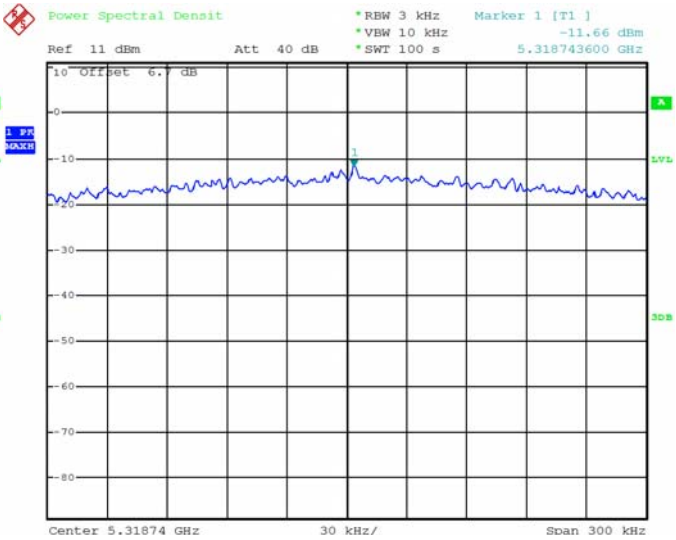

Figure 6-45: Peak Power Spectral Density
802.11n, Channel 100, MCS 0

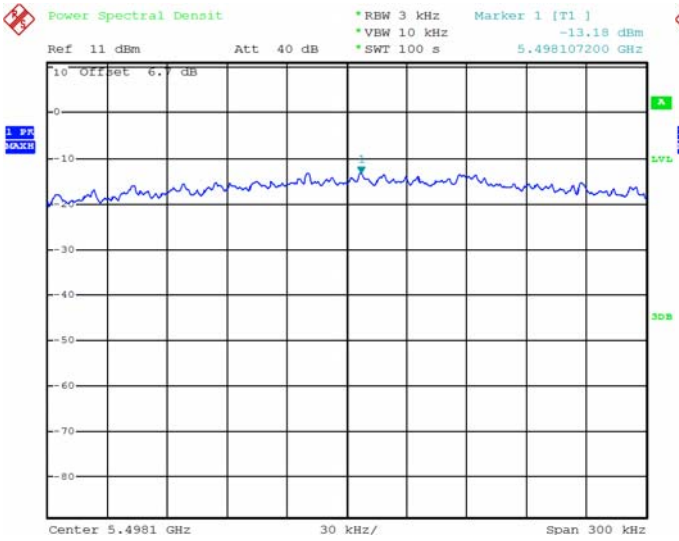

Figure 6-46: Peak Power Spectral Density
802.11n, Channel 140, MCS 0

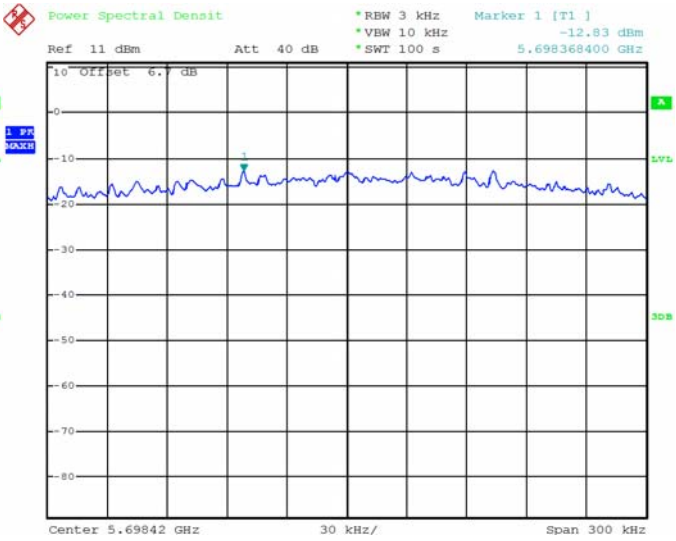

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Figure 6-47: Peak Power Spectral Density 802.11n, Channel 149, MCS 0

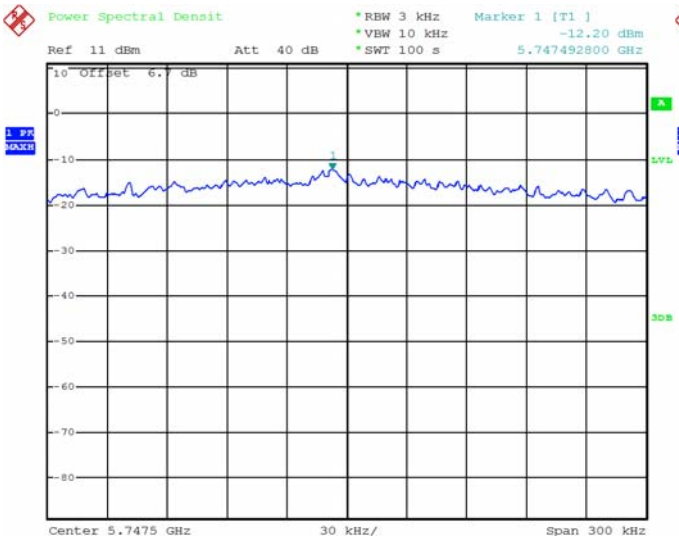


Figure 6-48: Peak Power Spectral Density 802.11n, Channel 157, MCS 0

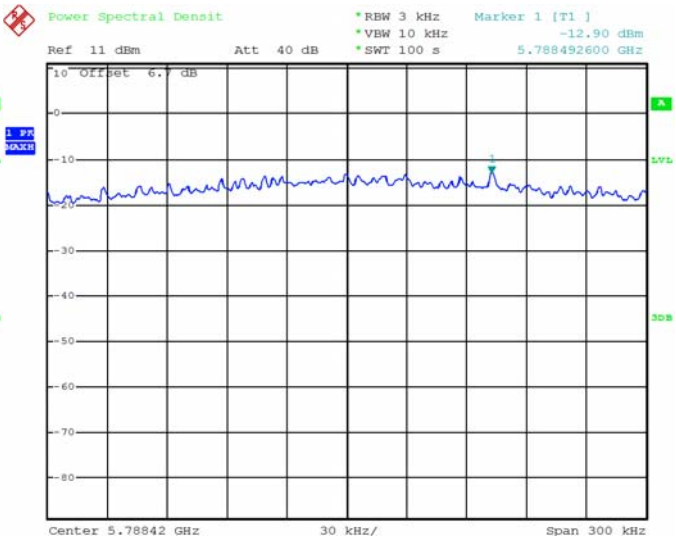


Figure 6-45: Peak Power Spectral Density 802.11n, Channel 161, MCS 0

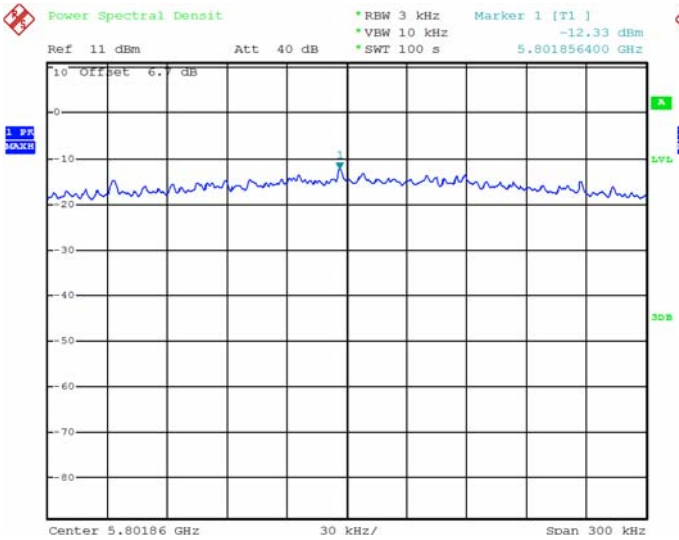
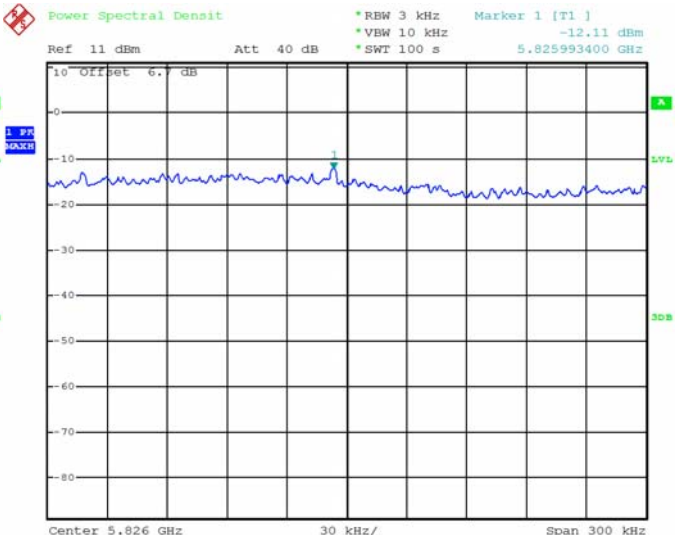


Figure 6-46: Peak Power Spectral Density 802.11n, Channel 165, MCS 0



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802.11a 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 15.407 and RSS-210. Channels 44, 60, and 157 were measured at 6 Mbps each for 802.11a mode. Peak power was measured using an Agilent power meter, model N1911A with model N1921A power sensor. A reference offset of 29.0 dB was applied to the spectrum analyzer reference level for the attenuators and coaxial cable loss in the test circuit.

Channel	Data Rate	Power (dBm)	Max. Measured Level (dBm)	Limit (dBc)	Margin (dB)
44	6 Mbps	13.68	-39.98	-20	-19.98
60	6 Mbps	12.92	-39.97	-20	-19.97
157	6 Mbps	11.64	-40.71	-20	-20.71

See figures 6-47 to 6-49 for the plots of the spurious RF conducted emissions for Channel 44, 60 and 157 at 6 Mbps each for 802.11a mode.

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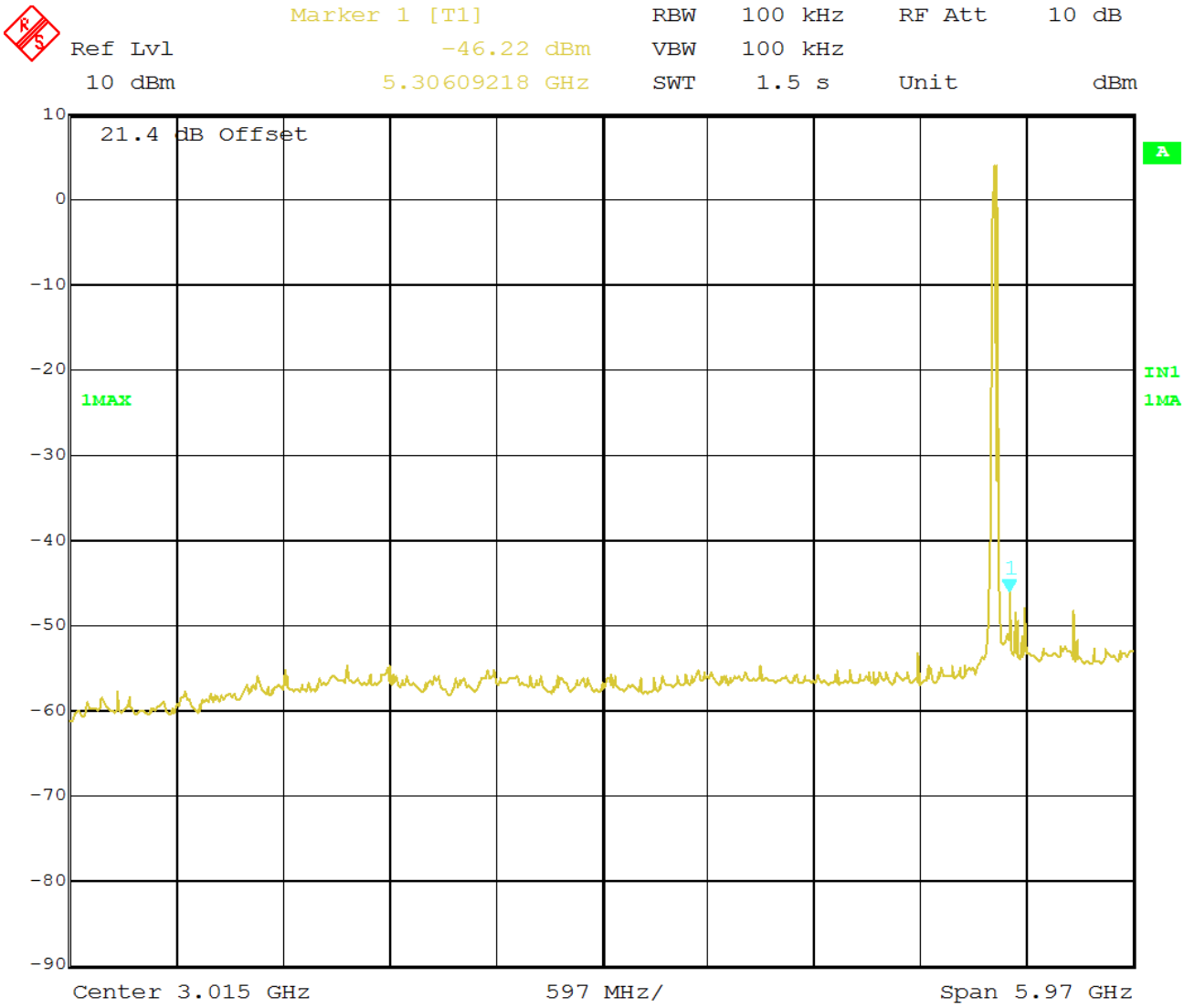
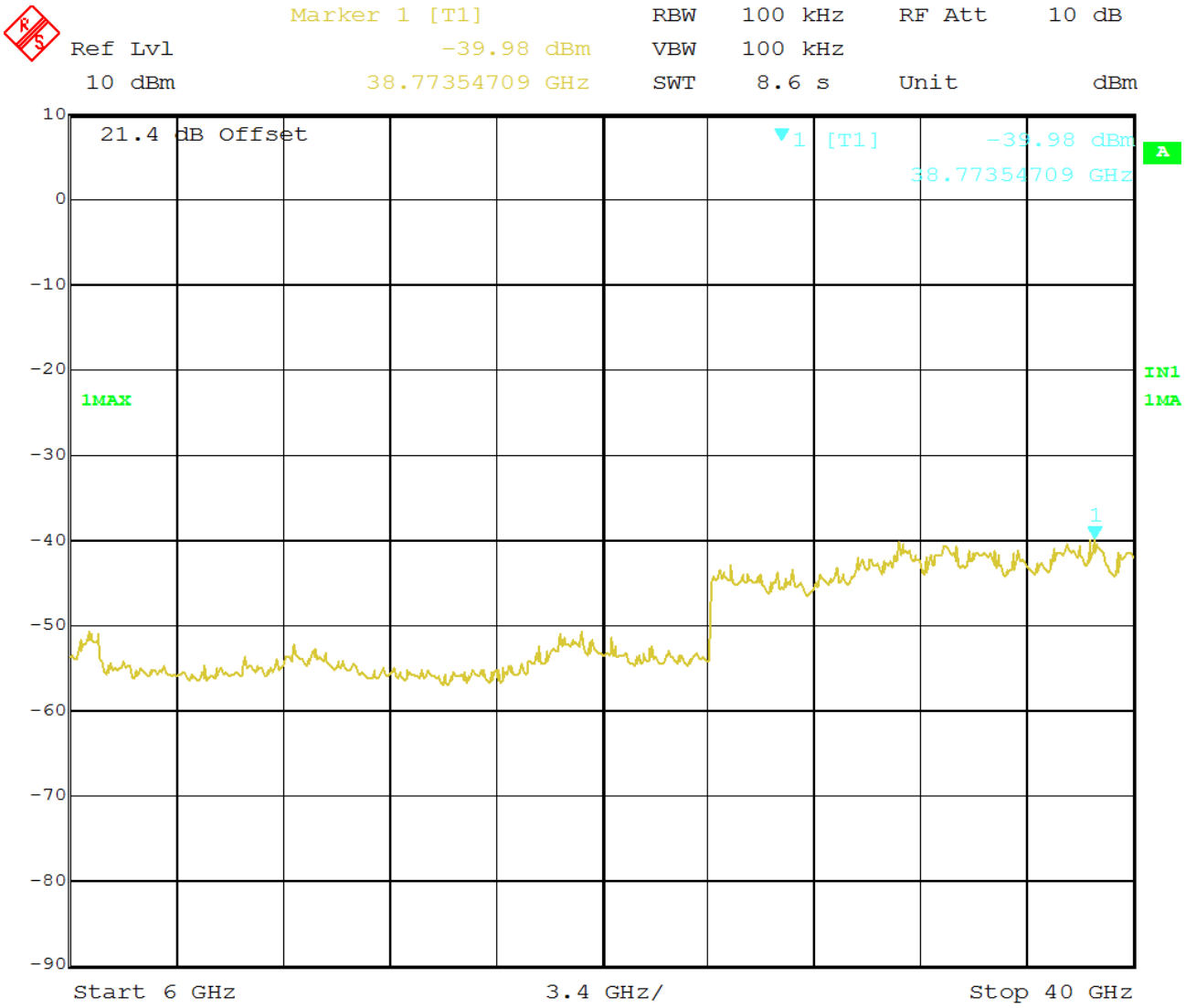
802.11a RF Conducted Emission Test Results cont'd

Figure 6-47a: Spurious RF Conducted Emissions, 802.11a Channel 44, 6 Mbps



802.11a RF Conducted Emission Test Results cont'd

Figure 6-47b: Spurious RF Conducted Emissions, 802.11a Channel 44, 6 Mbps



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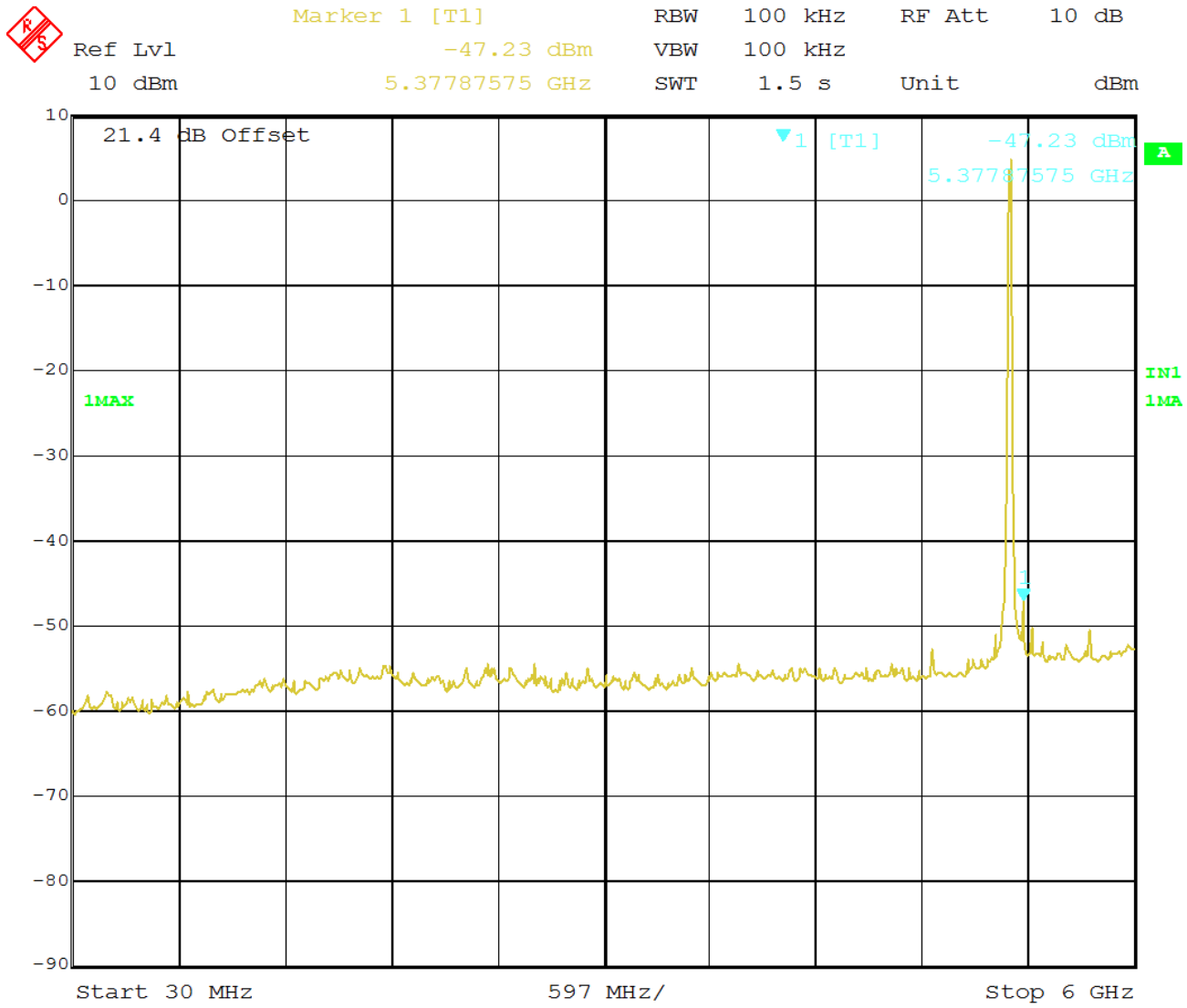
802.11a RF Conducted Emission Test Results cont'd

Figure 6-48a: Spurious RF Conducted Emissions, 802.11a Channel 60, 6 Mbps



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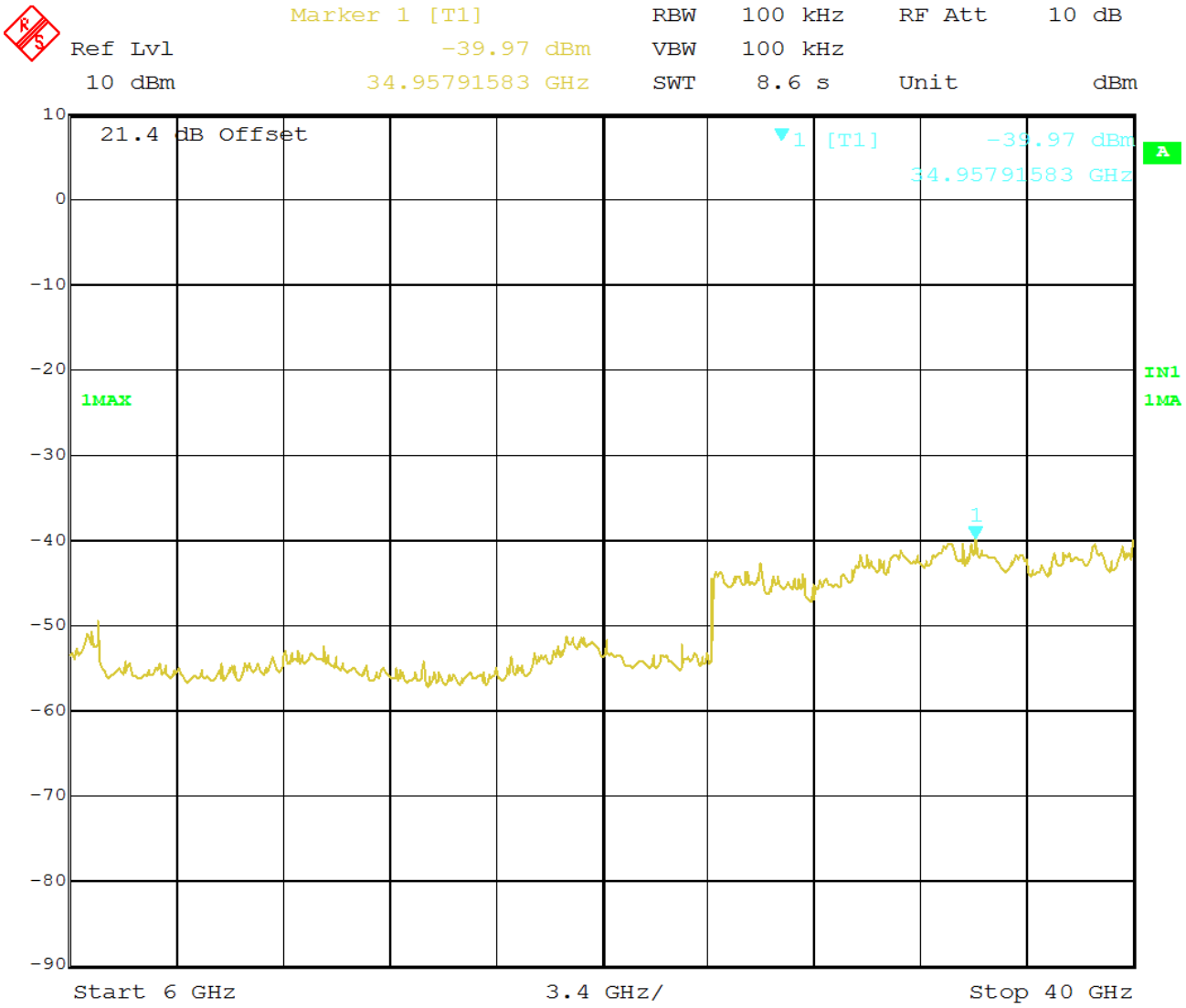
802.11a RF Conducted Emission Test Results cont'd

Figure 6-48b: Spurious RF Conducted Emissions, 802.11a Channel 60, 6 Mbps



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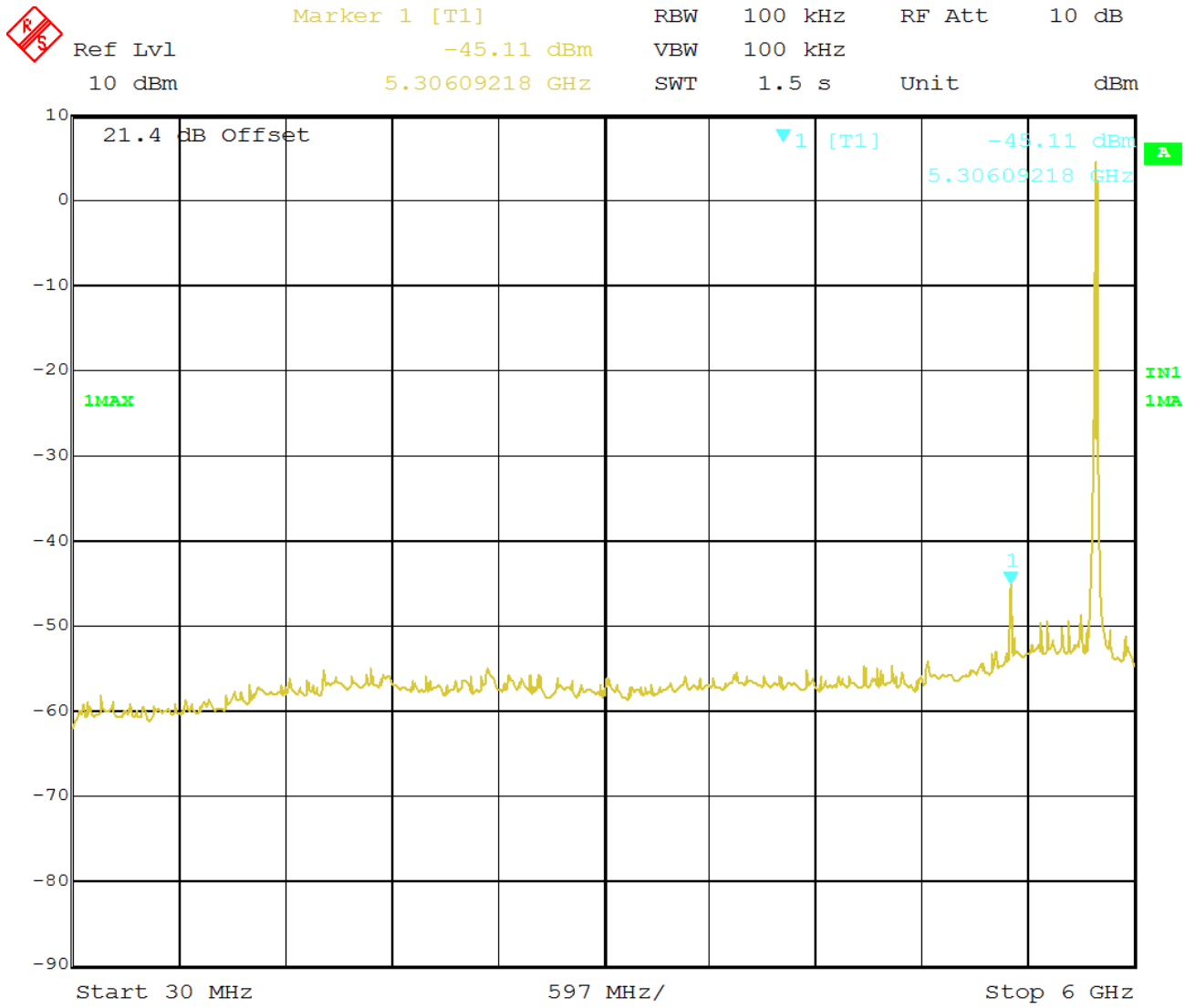
802.11a RF Conducted Emission Test Results cont'd

Figure 6-49a: Spurious RF Conducted Emissions, 802.11a Channel 157, 6 Mbps



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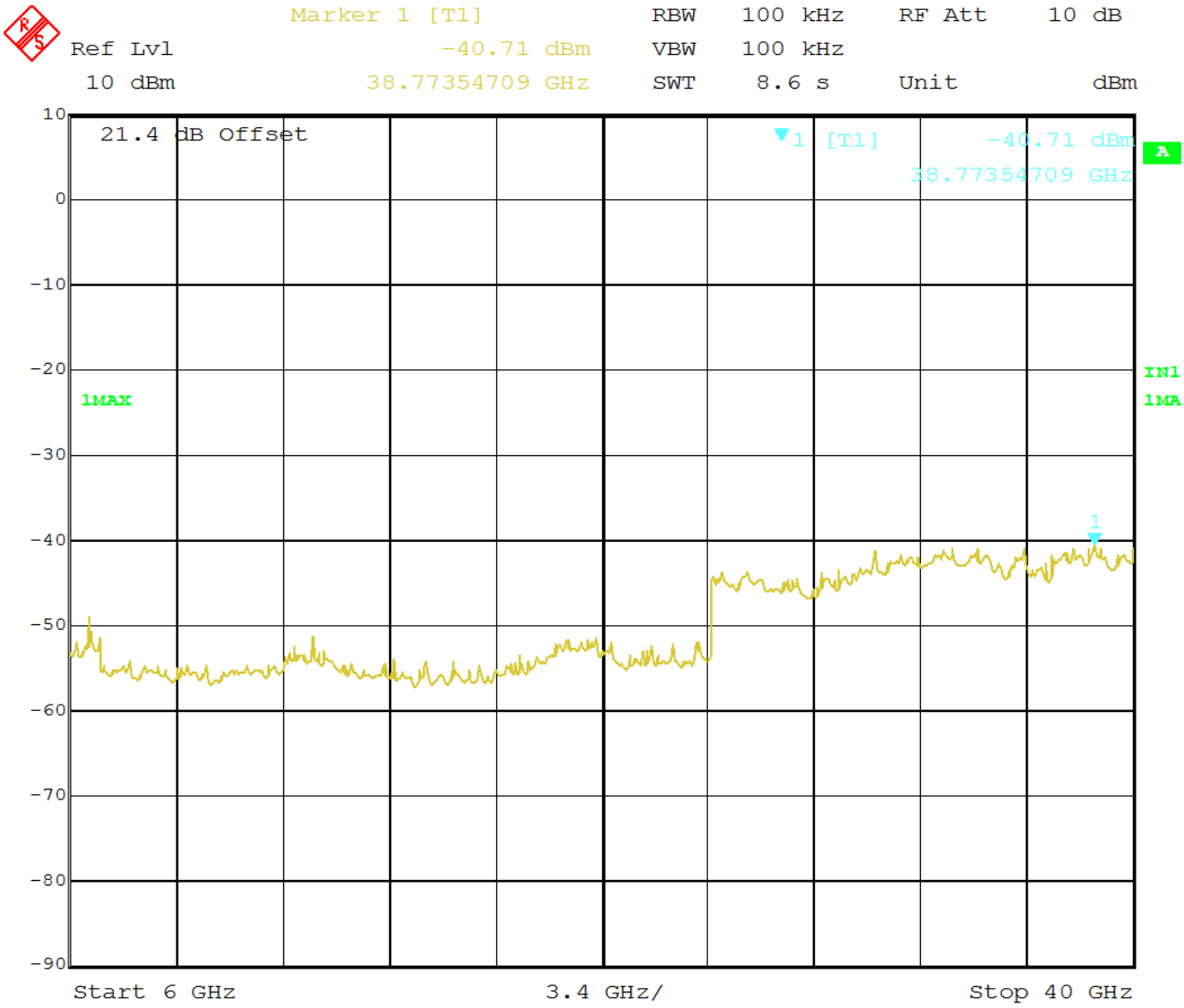
802.11a RF Conducted Emission Test Results cont'd

Figure 6-49b: Spurious RF Conducted Emissions, 802.11a Channel 157, 6 Mbps



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802.11n 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 15.407 and RSS-210. Channels 44, 60, and 157 were measured at 6 Mbps each for 802.11a mode. Peak power was measured using an Agilent power meter, model N1911A with model N1921A power sensor. A reference offset of 29.0 dB was applied to the spectrum analyzer reference level for the attenuators and coaxial cable loss in the test circuit.

Channel	Data Rate	Power (dBm)	Max. Measured Level (dBm)	Limit (dBc)	Margin (dB)
44	6 Mbps	12.62	-41.71	-54.33	-20.26
60	6 Mbps	13.32	-43.38	-56.7	-21.52
157	6 Mbps	12.60	-42.46	-55.06	-41.93

See figures 6-50 to 6-52 for the plots of the spurious RF conducted emissions for Channel 44, 60 and 157 at 6 Mbps each for 802.11n mode.

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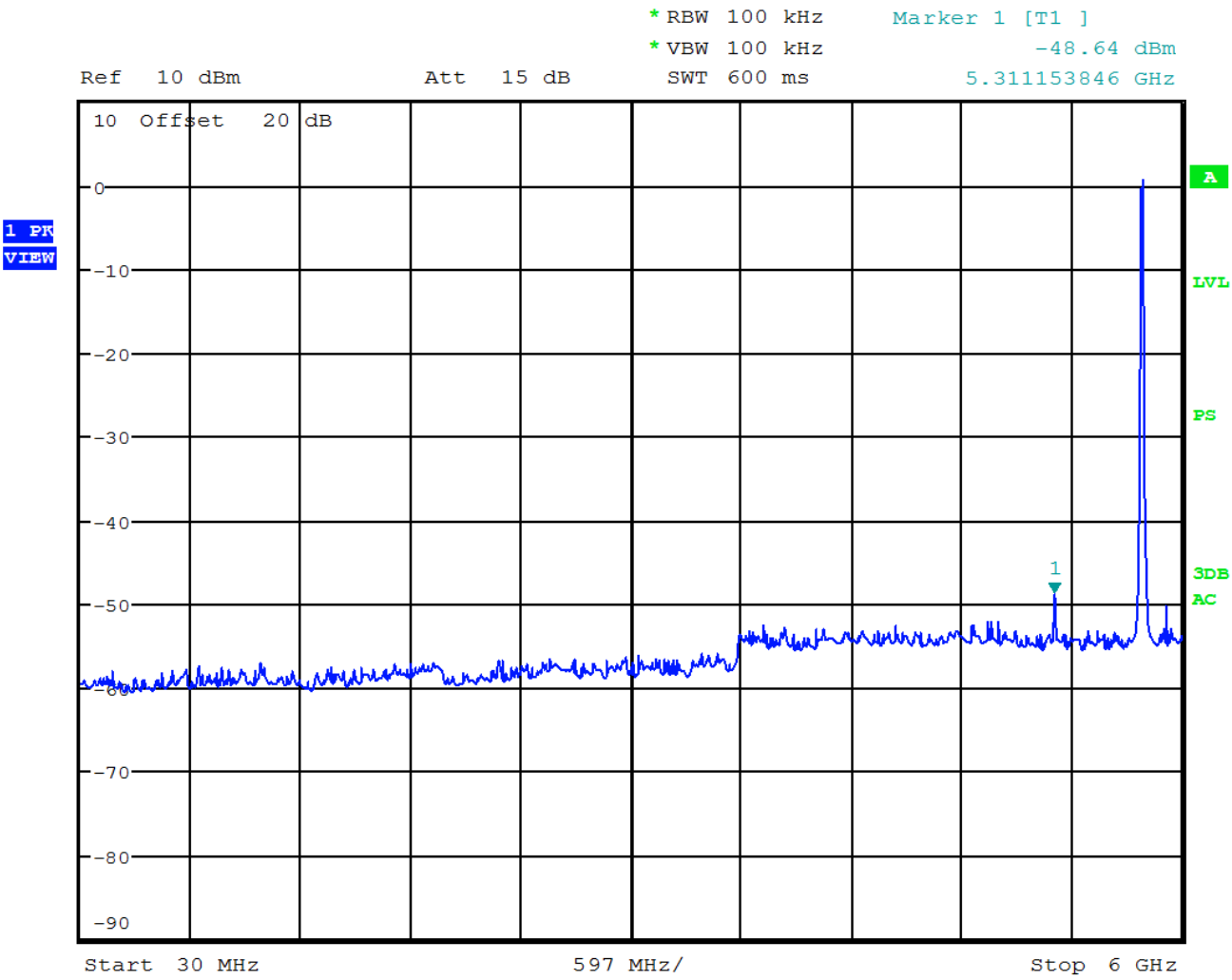
802.11n RF Conducted Emission Test Results cont'd

Figure 6-47a: Spurious RF Conducted Emissions, 802.11n Channel 44, 6 Mbps



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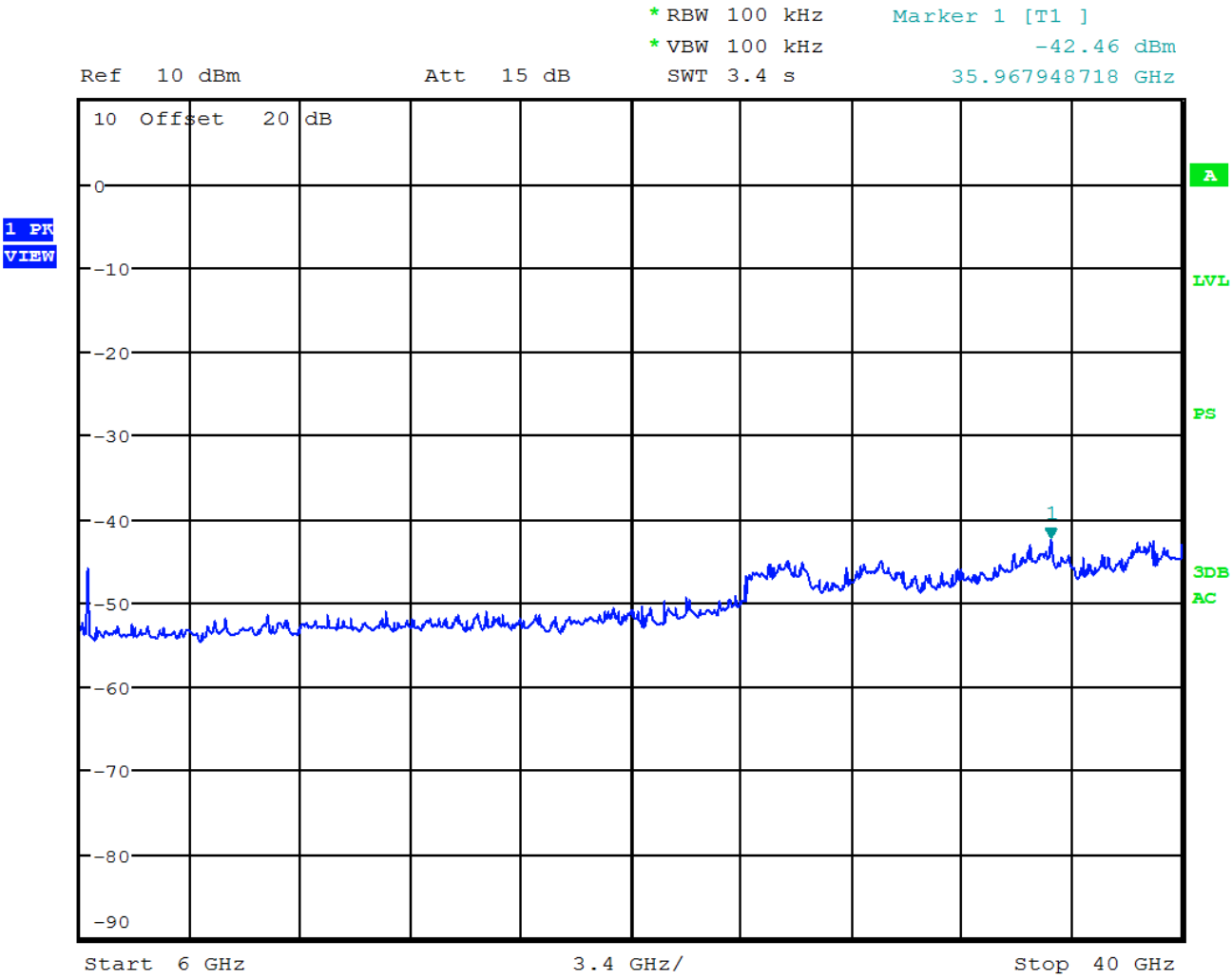
802.11n RF Conducted Emission Test Results cont'd

Figure 6-47a: Spurious RF Conducted Emissions, 802.11n Channel 44, 6 Mbps



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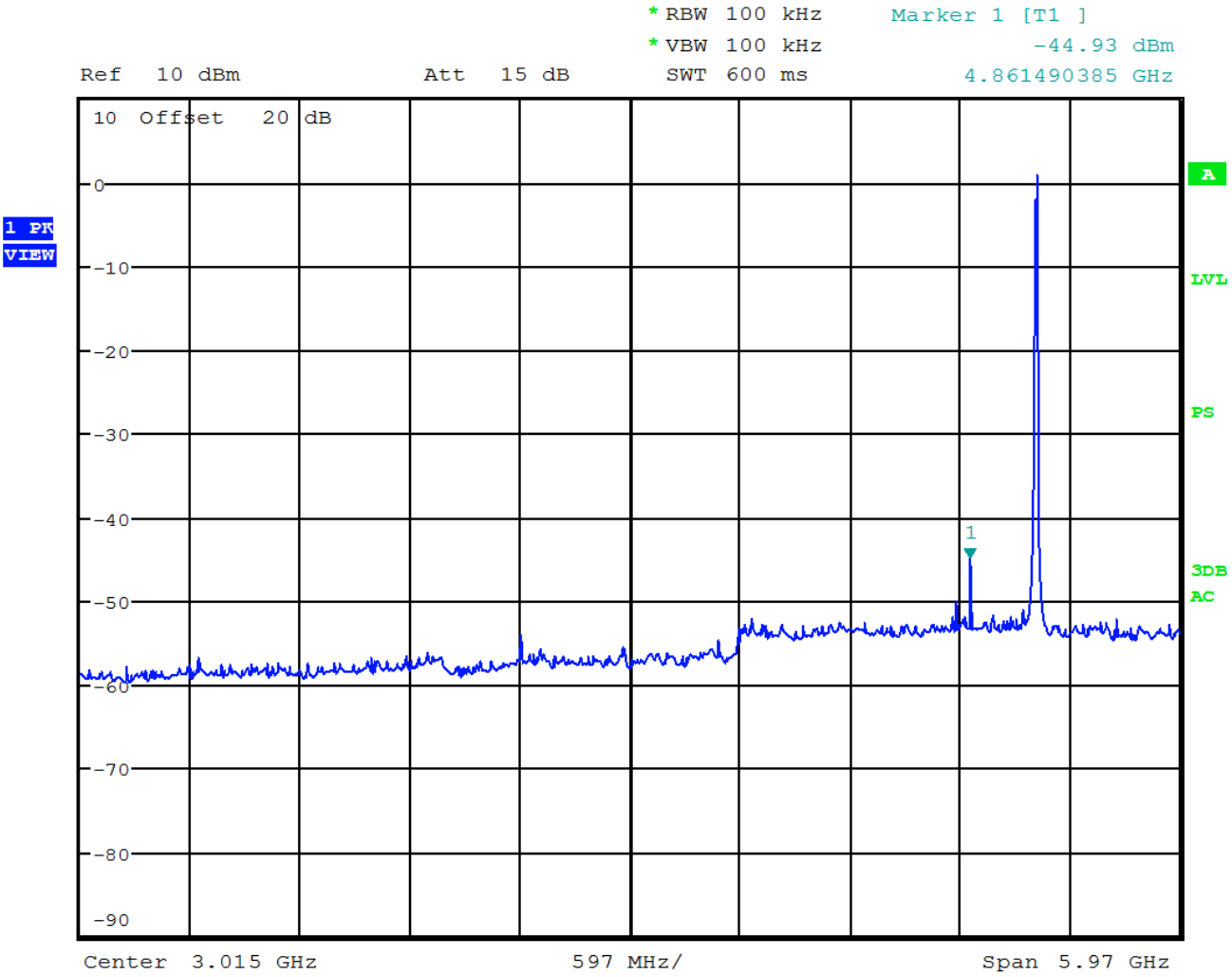
802.11n RF Conducted Emission Test Results cont'd

Figure 6-47a: Spurious RF Conducted Emissions, 802.11n Channel 60, 6 Mbps



802.11n RF Conducted Emission Test Results cont'd

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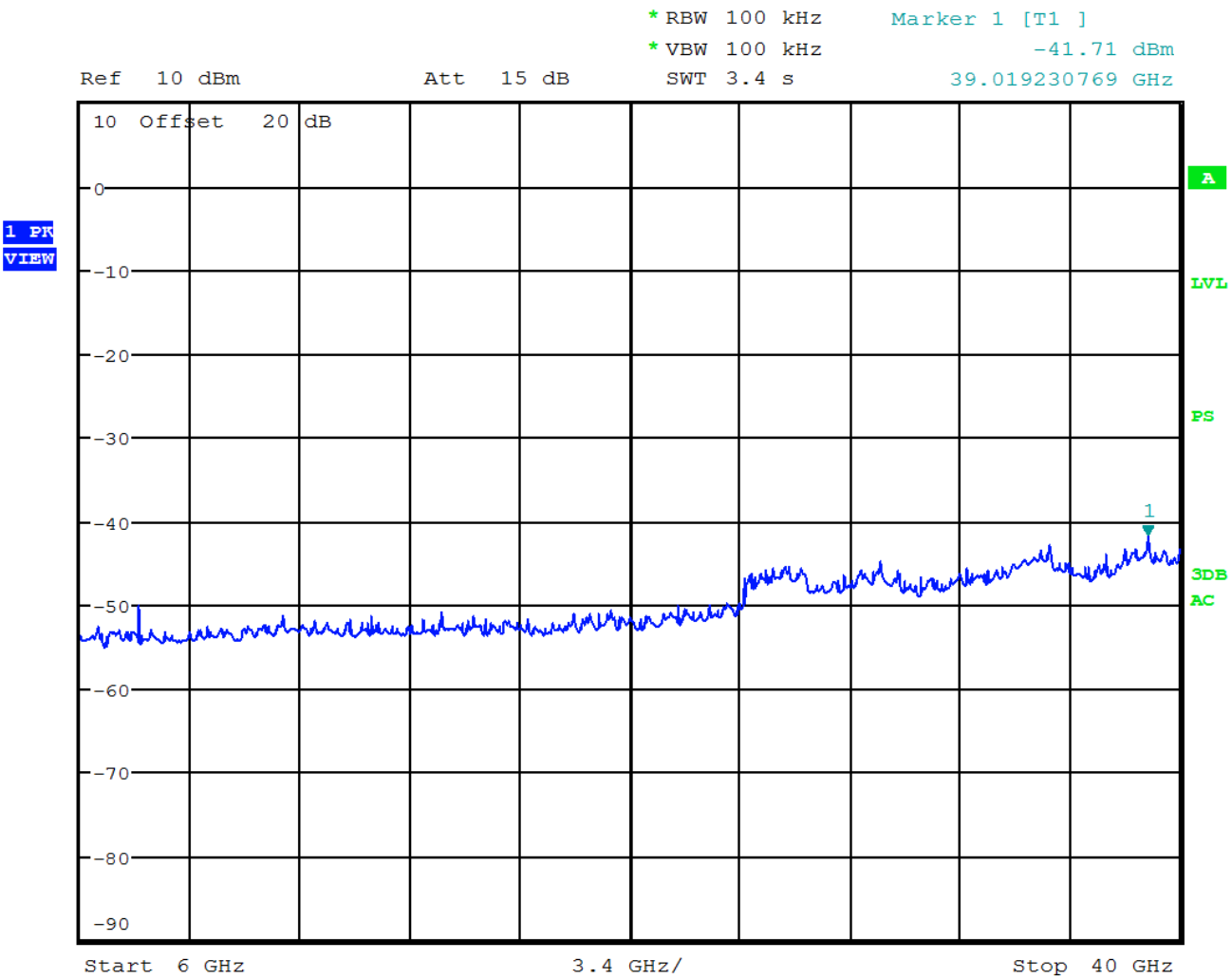
Figure 6-47a: Spurious RF Conducted Emissions, 802.11n Channel 60, 6 Mbps



802.11n RF Conducted Emission Test Results cont'd

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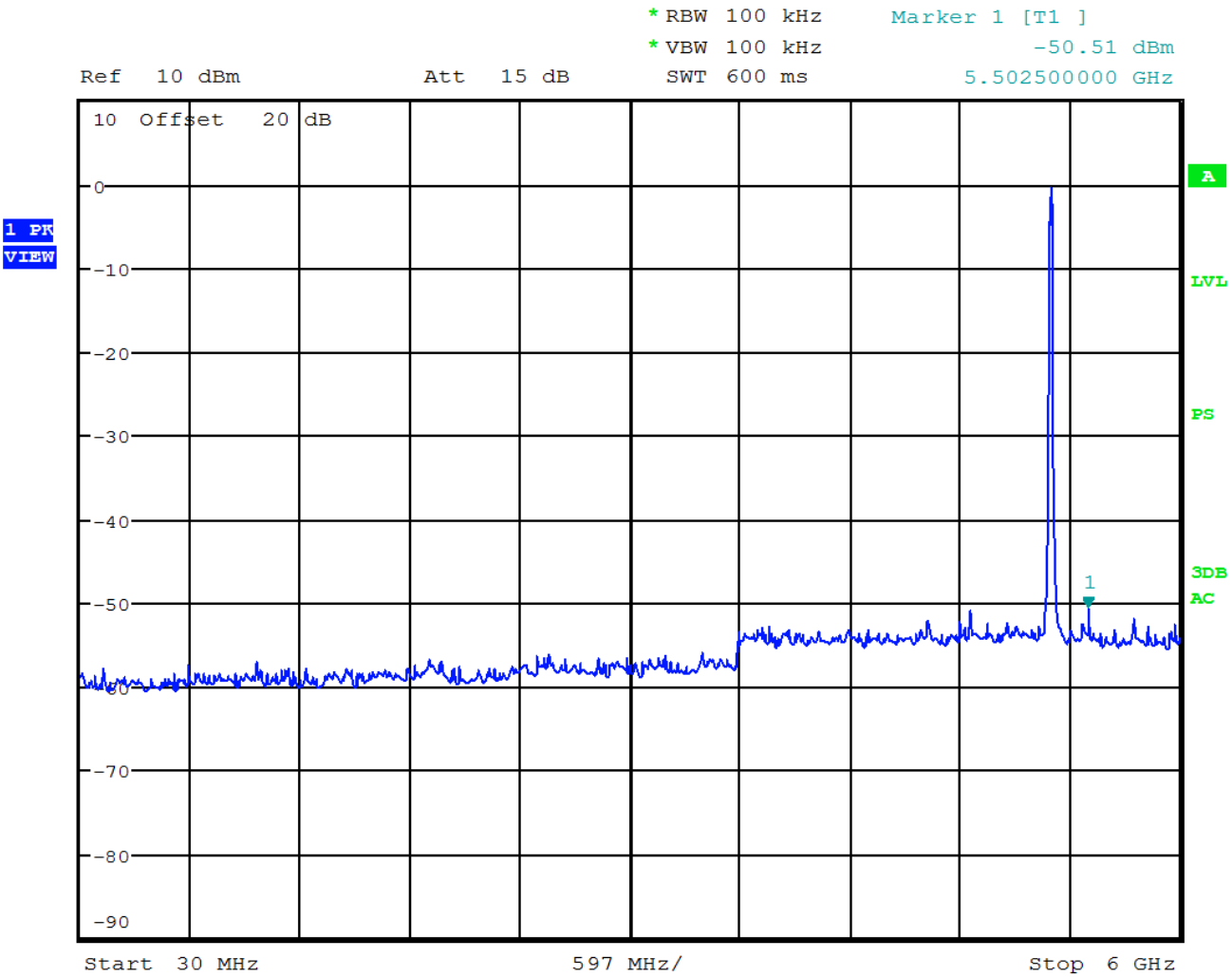
Figure 6-47a: Spurious RF Conducted Emissions, 802.11n Channel 157, 6 Mbps



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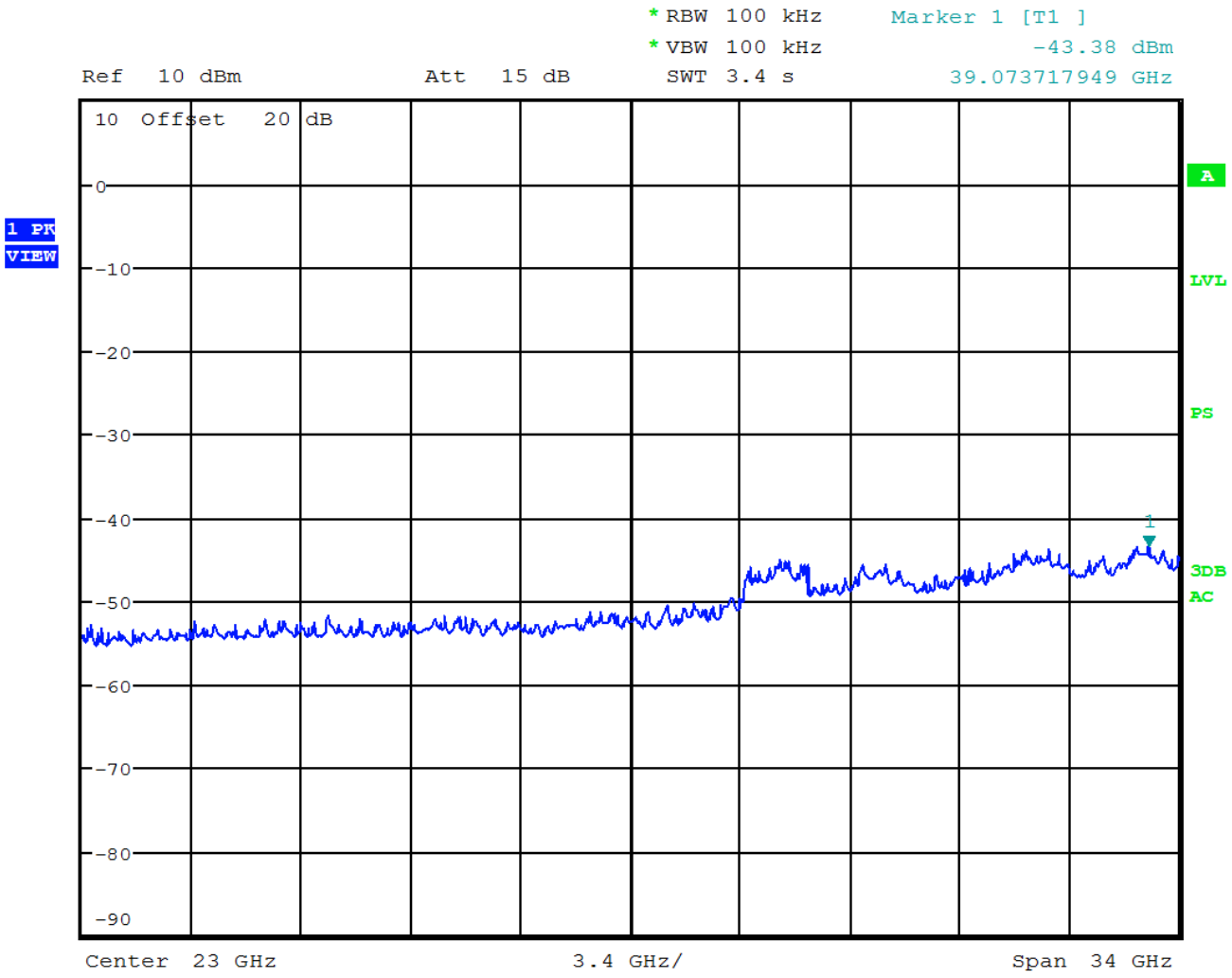
802.11n RF Conducted Emission Test Results cont'd

Figure 6-47a: Spurious RF Conducted Emissions, 802.11n Channel 157, 6 Mbps



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APPENDIX 7 – NEAR FIELD COMMUNICATIONS TEST DATA/PLOTS

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Near Field Communications (NFC) Test Results

Radiated Emissions

Date of Test: August 28, 2012
Measurements were performed by Savtej Sandhu.

The environmental test conditions were: Temperature: 26.1 ºC
Relative Humidity: 30.3 %

The test distance was 3.0 metres with a EUT height of 0.8 metres, and sweep frequency of 9 kHz to 1 GHz.

The BlackBerry® smartphone was in vertical position.

The frequency sweep measurements were performed in Near Field Communications Tx mode at 13.56 MHz.

Frequency (MHz)	Reading (QP) (dBµV)	Correction Factor (dB)	Corrected Reading (QP) (dBµV/m)	Limit (dBµV/m)	Test Margin (dB)
13.56	30.64	18.16	48.8	124	-75.2

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

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Near Field Communications (NFC) Test Results cont'd

Occupied Bandwidth

Date of test: November 28, 2012.
The measurements were performed by Berkin Can

The environmental test conditions were: Temperature: 24 ºC
Relative Humidity: 46 %

Operation mode (TX ON)	Occupied Bandwidth (kHz)
NFC, modulated	424.4370

Figure 7-1: Occupied Bandwidth, NFC TX Frequency = 13.56 MHz

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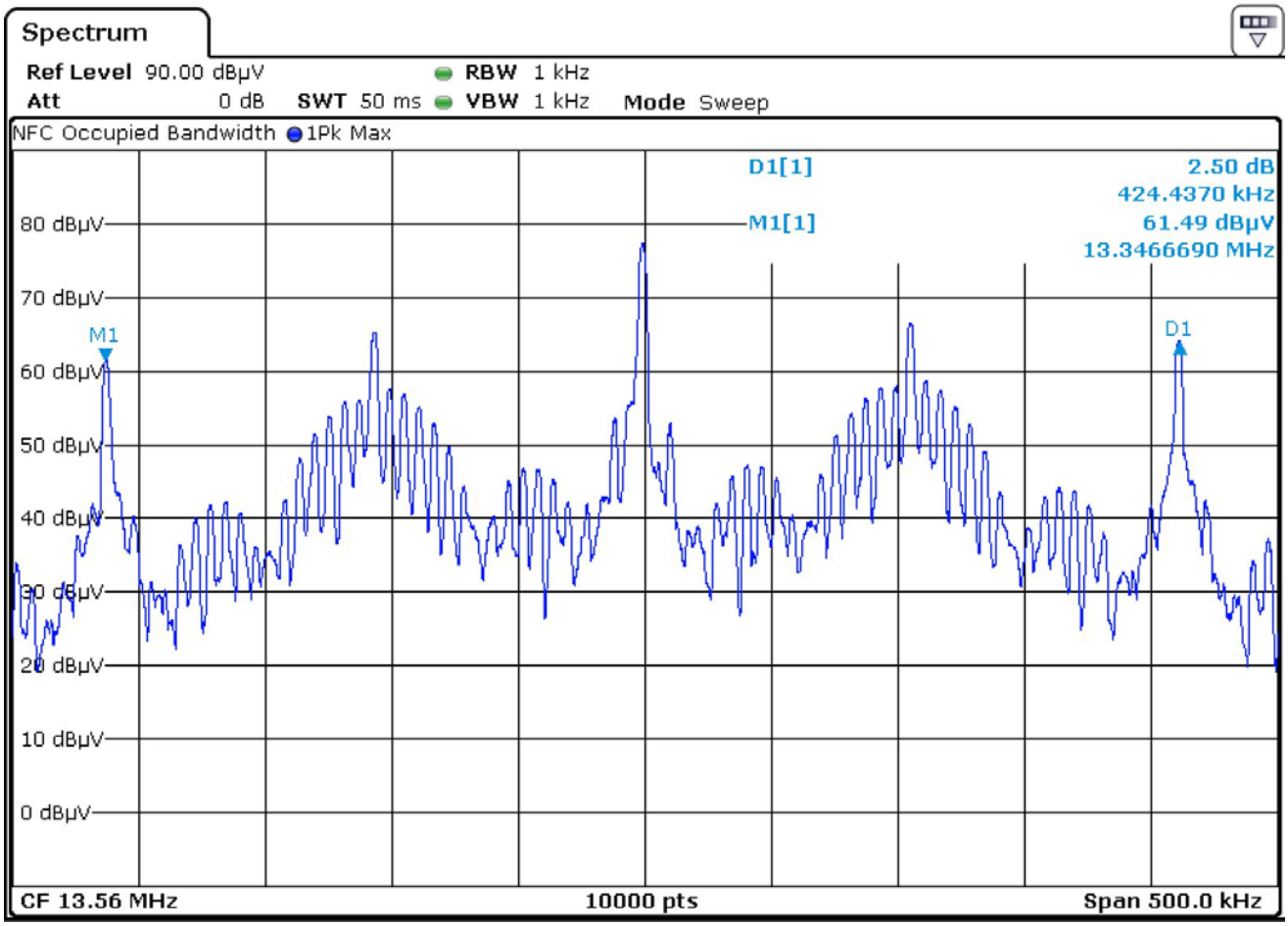

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Near Field Communications (NFC) Test Results cont'd

Frequency Stability

Date of test: November 10, 2012.
The measurements were performed by Berkin Can

The environmental test conditions were: Temperature: 24 ºC
Relative Humidity: 46 %

Test Temperature (Celsius)	Nominal Freq. (MHz)	Measured Freq. (MHz)	Input Voltage (Volts)	Max Freq Error (Hz)	% Deviation (Limit .01%)	PPM
-20	13.56	13.559200	3.6	-800	-0.00469	-46.9395
-20	13.56	13.559050	3.8	-950	-0.00579	-57.8820
-20	13.56	13.559070	4.35	-930	-0.00567	-56.7109
-10	13.56	13.559080	3.6	-920	-0.00557	-55.7153
-10	13.56	13.559010	3.8	-990	-0.00613	-61.3311
-10	13.56	13.559080	4.35	-920	-0.00564	-56.3732
0	13.56	13.559040	3.6	-960	-0.00586	-58.6283
0	13.56	13.559140	3.8	-860	-0.00516	-51.6224
0	13.56	13.559150	4.35	-850	-0.00513	-51.3274
10	13.56	13.559120	3.6	-880	-0.00531	-53.0973
10	13.56	13.559120	3.8	-880	-0.00529	-52.8761
10	13.56	13.558900	4.35	-1100	-0.00689	-68.8791
20	13.56	13.559120	3.6	-880	-0.00536	-53.6136
20	13.56	13.559030	3.8	-970	-0.00600	-59.9558
20	13.56	13.558910	4.35	-1090	-0.00687	-68.6578
30	13.56	13.558980	3.6	-1020	-0.00639	-63.8643
30	13.56	13.559130	3.8	-870	-0.00529	-52.8761
30	13.56	13.558850	4.35	-1150	-0.00724	-72.4189
40	13.56	13.558930	3.6	-1070	-0.00670	-67.0354
40	13.56	13.558910	3.8	-1090	-0.00684	-68.3628
40	13.56	13.559010	4.35	-990	-0.00611	-61.0619

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Near Field Communications (NFC) Test Results cont'd

Frequency Stability cont'd

Test Temperature (Celsius)	Nominal Freq. (MHz)	Measured Freq. (MHz)	Input Voltage (Volts)	Max Freq Error (Hz)	% Deviation (Limit .01%)	PPM
50	13.56	13.558950	3.6	-1050	-0.00774	-77.4336
50	13.56	13.558820	3.8	-1180	-0.00870	-87.0206
50	13.56	13.559000	4.35	-1000	-0.00737	-73.7463
60	13.56	13.558890	3.6	-1110	-0.00819	-81.8584
60	13.56	13.558970	3.8	-1030	-0.00760	-75.9587
60	13.56	13.558960	4.35	-1040	-0.00767	-76.6962

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