EMC Test Report

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

REPORT NO.: RTS-6067-1505-16_rev1

PRODUCT MODEL NO.:	RHR191LW (SQW100-4)
TYPE NAME:	BlackBerry® smartphone
FCC ID:	L6ARHR190LW
IC:	2503A-RHR190LW

This report supersedes the report RTS-6067-1505-16 dated May 15, 2015

DATE: June 18, 2015

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

592

Report Revision History:

Rev1:

1. Updated result tables on pages 143, 196, and 197.

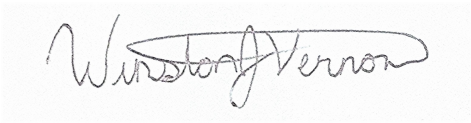
Statement of Performance:

The BlackBerry® smartphone, model RHR191LW (SQW100-4), part number CER-59662-001 Rev3-x10-00 and its accessories perform within the requirements of the test standards when configured and operated under BlackBerry's operation instructions.

Declaration:

We hereby certify that:
The test data reported herein is an accurate record of the performance of the sample(s) tested.
The test results are valid for the tested unit (s) only.
The test equipment used was suitable for the tests performed and within manufacturer's published specifications and operating parameters.
The test methods were consistent with the methods described in the relevant standards.

Documented by:



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A. Scope

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

- o FCC CFR 47 Part 15, Subpart C and E, October, 2014
- o Industry Canada, RSS-210, Issue 8, December 2010, and Amendment1, February 2015, License-Exempt, Low Power Radio Apparatus operating in the Television Bands
- o Industry Canada, RSS-GEN, Issue 04, November 2014, General Requirements for Compliance of Radio Apparatus
- o 789033 D02 General UNII Test Procedures v01
- o 905462 D06 802.11 Channel Plans v01
- o American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices, ANSI C63.10 – 2013
- o American National Standards for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electric Equipment in the Range of 9 kHz to 40 GHz, ANSI C63.4-2014

B. Associated Documents

1. RHR191LW-R158–HWD_CER-59662-001-Rev2-x08-01
2. RHR191LW-R158–HWD_CER-59662-001-Rev2-x08-02
3. RHR191LW-R164–HWD_CER-59662-001-Rev3-x10-00
4. MultiSourceDeclaration_R164_AAA728_10.3.2.2025

C. Product Identification

Manufactured by BlackBerry Limited whose headquarters is located at:

2200 University Ave. East
Waterloo, Ontario
Canada, N2K 0A7
Phone: 519 888 7465
Fax: 519 888 6906
The equipment under test (EUT) was tested at the following locations:

BlackBerry RTS EMC test facilities

305 Phillip Street 440 Phillip Street

Waterloo, Ontario
Canada, N2L 3W8
Phone:519-888-7465
Fax: 519-888-6906

Waterloo, Ontario
Canada, N2L 5R9
Phone:519-888-7465
Fax: 519-888-6906

The testing was performed from April 02 – May 14, 2015.

SAMPLE	MODEL	CER NUMBER	SN/PIN	SOFTWARE
1	RHR191LW (SQW100-4)	CER-59662-001 Rev1-x08-00	1160694539	Software Build: AAA728
2	RHR191LW (SQW100-4)	CER-59662-001 Rev1-x08-00	1160693373	Software Build: AAA728
3	RHR191LW (SQW100-4)	CER-59662-001 Rev1-x08-00	1160692430	Software Build: AAA728
4	RHR191LW (SQW100-4)	CER-59662-001 Rev1-x08-00	1160685324	Software Build: AAA728
5	RHR191LW (SQW100-4)	CER-59662-001 Rev1-x08-00	1160686597	Software Build: AAA728
6	RHR191LW (SQW100-4)	CER-59662-001 Rev1-x08-00	1160685327	Software Build: AAA728
7	RHR191LW (SQW100-4)	CER-59662-001 Rev3-x10-00	2FFE9034	OS Version: 10.3.2.2024 Radio Version: 10.3.2.2025 SW Release Version: 10.3.2.2012
8	RHR191LW (SQW100-4)	CER-59662-001 Rev3-x10-00	2FFE9016	OS Version: 10.3.2.2024 Radio Version: 10.3.2.2025 SW Release Version: 10.3.2.2012
9	RHR191LW (SQW100-4)	CER-59662-001 Rev3-x10-00	2FFE9017	OS Version: 10.3.2.2024 Radio Version: 10.3.2.2025 SW Release Version: 10.3.2.2012

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

The characteristics that may have been affected by the changes from Rev1-x08-00 to Rev3-x10-00 for RHR191LW were verified/re-tested. If necessary
For more details, refer to RHR191LW-R158–HWD_CER-59662-001-Rev2-x08-01,

RHR191LW-R158–HWD_CER-59662-001-Rev2-x08-02, and
RHR191LW-R164–HWD_CER-59662-001-Rev3-x10-00.

To view the differences between software builds AAA728 to 10.3.2.2024 for RHR191LW, see document MultiSourceDeclaration_R164_AAA728_10.3.2.2025.

BlackBerry® smartphone Accessories Tested

1) NA Fixed Blade Charger, part number HDW-58920-001, with an output voltage 5 volts dc, 1300mA
2) Headset, part number HDW-49299-001, with a lead length of 1.1 meters
3) Alt Headset, part number HDW-44306-001, with a lead length of 1.1 meters
4) USB Cable, part number HDW-50071-001, with a lead length of 1.2 meters
5) Alt USB Cable, part number HDW-51800-001, with a lead length of 1.2 meters

D. Support Equipment Used for the Testing of the EUT

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

E. Test Results Chart

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

Test Results Chart cont'd

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

F. Summary of Results

1) AC POWER LINE CONDUCTED EMISSIONS

The AC Powerline conducted emissions were measured using the test procedure outlined in CISPR Recommendation 22 through a 50 Ohm Line Impedance Stabilization Network (LISN), which was inserted in the power line to the equipment to provide the specified impedance for measurements. The EUT was placed on a nonconductive wooden table, 80 cm high that was positioned 40 cm from a vertical ground plane. The RF output of the network was connected to an EMI receiver system with characteristics that duplicate those of the receiver specified in CISPR Publication 16.
BlackBerry® smartphone was in battery charging mode. The input voltage was 120 V, 60 Hz.

The following test configurations were measured:

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

The sample EUT's conducted emissions were compared with respect to the FCC CFR 47 Part 15, Subpart C and E as well as IC RSS-210 limits. The sample EUT had a worst case test margin of 11.57 dB below the QP limit at 0.164 MHz with the NA Fixed Blade Charger in Test Configuration 1.

See APPENDIX 1 for the test data.

Measurement Uncertainty ±3.2 dB

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

a) Radiated Spurious Emissions and Harmonics

The EUT was placed on a nonconductive styrofoam table, 1.5 metres high that was positioned on a remotely controlled turntable. The test distance used between the EUT and the receiving antenna was three metres. The turntable was rotated to determine the azimuth of the peak emissions. Then the emissions were maximized by elevating the antenna in the range of 1 to 4 metres. The maximum emission level was recorded. The frequency range measured was from 30 MHz to 25.0 GHz. Both the horizontal and vertical polarizations of the emissions were measured.

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

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

The BlackBerry® smartphone was measured in standalone configuration with Bluetooth transmitting in single frequency mode at low channel (0), middle channel (39) and high channel (78) for packet type "DH5", "2-DH5" and "3-DH5". The system's radiated emission levels were compared with respect to the FCC CFR 47 Part 15, Subpart C, 15.247 and RSS-210.

The BlackBerry® smartphone was measured in standalone configuration with Bluetooth Low Energy transmitting in single frequency mode at low channel (0), middle channel (20) and high channel (39). The system's radiated emission levels were compared with respect to the FCC CFR 47 Part 15, Subpart C, 15.247 and RSS-210.

The BlackBerry® smartphone was measured in standalone configuration transmitting on channels 1, 6 & 11 at 1 Mbps for 802.11b mode, at 6 Mbps for 802.11g mode, and at MCS 0 for 802.11n mode. The system's radiated emission levels were compared with respect to the FCC CFR 47 Part 15 Subpart C, 15.247 and RSS-210.

The Bluetooth harmonics were investigated up to the 10th harmonic. All emissions had a test margin of greater than 25 dB.

The Bluetooth Low Energy harmonics were investigated up to the 10th harmonic. The sample EUT emissions were in the noise floor (NF).

The 802.11b/g/n harmonics were investigated up to the 10th harmonic. All emissions had a test margin of greater than 25 dB.

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.

See APPENDIX 2 for the test data

Measurement Uncertainty ±4.2 dB

3) 802.11a/n RADIATED EMISSIONS

a) Radiated Spurious and Harmonic Emissions
The EUT was placed on a nonconductive styrofoam table, 1.5 metres high that was positioned on a remotely controlled turntable. The test distance used between the EUT and the receiving antenna was three metres. The turntable was rotated to determine the azimuth of the peak emissions. Then the emissions were maximized by elevating the antenna in the range of 1 to 4 metres. The maximum emission level was recorded. The frequency range measured was from 30 MHz to 40.0 GHz. Both the horizontal and vertical polarizations of the emissions were measured.

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

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

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

The 802.11a/n harmonics were investigated up to the 10th harmonic. All emissions had a test margin of greater than 25 dB.

See APPENDIX 3 for the test data.

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

See APPENDIX 3 for the test data

Measurement Uncertainty ±4.2 dB

4) 802.11ac RADIATED EMISSIONS

a) Radiated Spurious and Harmonic Emissions

The EUT was placed on a nonconductive styrofoam table, 1.5 metres high that was positioned on a remotely controlled turntable. The test distance used between the EUT and the receiving antenna was three metres. The turntable was rotated to determine the azimuth of the peak emissions. Then the emissions were maximized by elevating the antenna in the range of 1 to 4 metres. The maximum emission level was recorded. The frequency range measured was from 30 MHz to 40.0 GHz. Both the horizontal and vertical polarizations of the emissions were measured.

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

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

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

The 802.11ac harmonics were investigated up to the 10th harmonic. All emissions had a test margin of greater than 25 dB.

See APPENDIX 4 for the test data.

b) Band-Edge Compliance of RF Radiated Emissions

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

See APPENDIX 4 for the test data

Measurement Uncertainty ±4.2 dB

5) i) BLUETOOTH RF CONDUCTED EMISSIONS

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

a) 20 dB Bandwidth
The BlackBerry® smartphone met the requirements of the 20 dB bandwidth as per 47 CFR 15.247(a) and RSS-210. Low channel (0), middle channel (39) and high channel (78) were measured. The result includes both normal data rate and EDR. The worst case 20 dB Bandwidth was 0.930 MHz for channel 39 in normal data rate mode and 1.338 MHz for channels 0, 39 and 78 in EDR mode.
See APPENDIX 5 for the test data.

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

c) Number of Hopping Frequencies
The BlackBerry® smartphone met the requirements of the number of hopping frequencies as per 47 CFR 15.247(a) and RSS-210. The number of hopping channels measured was 79.
See APPENDIX 5 for the test data.

d) Time of Occupancy (Dwell Time)
The EUT met the requirements of the dwell time as per 47 CFR 15.247(a) and RSS-210. Low channel (0), middle channel (39) and high channel (78) were measured in DH1, DH3 and DH5 modes. Bluetooth was operating in frequency hopping (Euro/US) mode during the measurements.
See APPENDIX 5 for the test data.

e) Maximum Peak Conducted Output Power
The BlackBerry® smartphone met the requirements of the maximum peak conducted output power as per 47 CFR 15.247(b) and RSS-210. Low channel (0), middle channel (39) and high channel (78) were measured. The result includes both normal data rate and EDR. The worst case Conducted Output Power level was 9.60 dBm (0.00912 W) for Channel 39 in normal data rate mode and 8.90 dBm (0.00776 W) for channel 39 in EDR mode.
See APPENDIX 5 for the test data.

f) Band-Edge Compliance of RF Conducted Emissions
The BlackBerry® smartphone met the requirements of the band-edge compliance of RF conducted emissions as per 47 CFR 15.247(c) and RSS-210. Channels 0 and 78 were measured in frequency hopping (Euro/US) mode and single frequency mode. The result includes both normal data rate and EDR.
See APPENDIX 5 for the test data.

g) Spurious RF Conducted Emissions
The BlackBerry® smartphone met the requirements of the spurious RF conducted emissions as per 47 CFR 15.247(c) and RSS-210. The frequency range measured was 10 MHz to 26 GHz. Low channel (0), middle channel (39) and high channel (78) were measured in single frequency mode and frequency hopping (Euro/US) mode. The result includes both normal data rate and EDR.
See APPENDIX 5 for the test data.

ii) BLUETOOTH LOW ENERGY RF CONDUCTED EMISSIONS

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

a) 6dB Bandwidth
The EUT met the requirements of the 6 dB bandwidth as per 47 CFR 15.247(b) and RSS-210. Low channel (0), middle channel (20) and high channel (39) were measured. The worst case 6 dB Bandwidth was 0.682 MHz for channel 0.
See APPENDIX 5 for the test data.

b) Maximum Conducted Output Power
The EUT met the requirements of the maximum conducted output power as per 47 CFR 15.247(b) and RSS-210. Low channel (0), middle channel (20) and high channel (39) were measured. The worst case Conducted Output Power level was 6.53 dBm (0.0045 W) for channel 20.
See APPENDIX 5 for the test data

c) Band-Edge Compliance of RF Conducted Emissions
The EUT met the requirements of band-edge compliance of RF conducted emissions as per 47 CFR 15.247(b) and RSS-210. Low channel (0) and high channel (39) were measured.
See APPENDIX 5 for the test data.

d) Peak Power Spectral Density
The EUT met the requirements of peak power spectral density as per 47 CFR 15.247(b) and RSS-210. Low channel (0), middle channel (20) and high channel (39) were measured.
See APPENDIX 5 for the test data.

e) Spurious RF Conducted Emissions
The EUT met the requirements of the spurious RF conducted emissions as per 47 CFR 15.247(c) and RSS-210. The frequency range measured was 30 MHz to 26 GHz. Low channel (0), middle channel (20) and high channel (39) were measured.
See APPENDIX 5 for the test data.

6) 802.11b/g/n RF CONDUCTED EMISSIONS

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

a) 6dB Bandwidth
The EUT met the requirements of the 6 dB bandwidth as per 47 CFR 15.247(b) and RSS-210. Low channel (1), middle channel (6) and high channel (11) were measured. The worst case 6 dB Bandwidth was 8.48 MHz for channel 6 in 802.11b mode, 16.50 MHz for channel 6 in 802.11g mode, and 17.72 MHz for channel 6 in 802.11n mode.
See APPENDIX 6 for the test data.

b) Maximum Conducted Output Power
The EUT met the requirements of the maximum conducted output power as per 47 CFR 15.247(b) and RSS-210. Low channel (1), middle channel (6) and high channel (11) were measured. The worst case Conducted Output Power level was 14.97 dBm (0.0313 W) for channel 6 in 802.11b mode, 16.78 dBm (0.0477 W) for channel 6 in 802.11g mode, and 16.92 dBm (0.0492 W) for channel 6 in 802.11n mode.
See APPENDIX 6 for the test data

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

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

e) Spurious RF Conducted Emissions
The EUT met the requirements of the spurious RF conducted emissions as per 47 CFR 15.247(c) and RSS-210. The frequency range measured was 30 MHz to 26 GHz. Low channel (1), middle channel (6) and high channel (11) were measured.
See APPENDIX 6 for the test data.

7) 802.11a/n RF CONDUCTED EMISSIONS

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

a) 6 dB Bandwidth
The EUT met the requirements of the 6 dB bandwidth as per 47 CFR 15.407 and RSS-210. Channels 36, 64, 100, 140 and 165 were measured. The worst case 6 dB Bandwidth was 16.48 MHz for channels 36, 64 in 802.11a mode. The worst case 6 dB Bandwidth was 17.76 MHz for channels 100 and 165 for 20 MHz bandwidth; 36.52 MHz for channel 36 in 40 MHz bandwidth for 802.11n mode.
See APPENDIX 7 for the test data.

b) Maximum Conducted Output Power
The EUT met the requirements of the maximum conducted output power as per 47 CFR 15.407 and RSS-210. Channels 36, 64, 100, 140 and 165 were measured. The worst case Conducted Output Power level was 17.29 dBm (0.0535 W) for channel 165 in 802.11a mode. The worst case Conducted Output Power level was 16.53 dBm (0.0450 W) for channel 100 in 20 MHz bandwidth and 18.88 dBm (0.0773 W) in 40 MHz bandwidth for channel 140 in 802.11n mode.
See APPENDIX 7 for the test data

c) Band-Edge Compliance of RF Conducted Emissions
The EUT met the requirements of band-edge compliance of RF conducted emissions as per 47 CFR 15.407 and RSS-210. Channels 36, 64, 100, 140, 149 and 165 were measured.
See APPENDIX 7 for the test data.

d) Peak Power Spectral Density
The EUT met the requirements of peak power spectral density as per 47 CFR 15.407 and RSS-210. Channels 36, 48, 64, 100, 140 and 165 were measured for 802.11a and channels 36, 100 and 165 were measured for 802.11n with 20 MHz and 40 MHz bandwidth.
See APPENDIX 7 for the test data.

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

8) 802.11ac RF CONDUCTED EMISSIONS

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

a) 6 dB Bandwidth
The EUT met the requirements of the 6 dB bandwidth as per 47 CFR 15.407 and RSS-210. Channels 36, 64, 140 and 149 were measured for 20MHz bandwidth, channels 38, 62, 142 and 151 were measured for 40MHz bandwidth, channels 42, 58, 138 and 155 were measured for 80MHz bandwidth. The worst case 6 dB Bandwidth was 17.74 MHz for channel 36 for 802.11ac mode, 20MHz bandwidth; the worst case 6 dB Bandwidth was 36.48 MHz for channels 38 and 142 for 802.11ac mode, 40MHz bandwidth; the worst case 6 dB Bandwidth was 76.48 MHz for channel 58 for 802.11ac mode, 80MHz bandwidth.
See APPENDIX 7 for the test data.

b) Maximum Conducted Output Power
The EUT met the requirements of the maximum conducted output power as per 47 CFR 15.407 and RSS-210. Channels 36, 64, 100, 140 and 149 were measured for 20MHz bandwidth, channels 38, 62, 102, 142 and 151 were measured for 40MHz bandwidth, and channels 42, 58, 105, 138 and 151 were measured for 80MHz bandwidth. The worst case Conducted Output Power level was 16.61 dBm (0.0457 W) for channel 100 for 802.11ac mode, 20MHz bandwidth; the worst case Conducted Output Power level was 16.23 dBm (0.0420 W) for channel 142 for 802.11ac mode, 40MHz bandwidth; the worst case Conducted Output Power level was 14.36 dBm (0.0272 W) for channel 138 for 802.11ac mode, 80MHz bandwidth
See APPENDIX 7 for the test data.

b) Band-Edge Compliance of RF Conducted Emissions
The EUT met the requirements of band-edge compliance of RF conducted emissions as per 47 CFR 15.407 and RSS-210. Channels 36, 64, 100, 140, 149 and 165 were measured for 20MHz bandwidth, channels 38, 62,102,142, 151 and 159 were measured for 40MHz bandwidth, and channels 42, 58, 105, 138 and 155 were measured for 80MHz bandwidth.
See APPENDIX 7 for the test data.

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

e) Spurious RF Conducted Emissions

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

9) Near Field Communications (NFC)

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

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

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

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

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	15-12-04	Conducted/Radiated Emissions
EMI Test Receiver	Rohde & Schwarz	ESU 40	100162	15-12-02	Conducted/Radiated Emissions
Hybrid Log Antenna	EMC Automation	HLP-3003C	017401	16-02-03	Radiated Emissions
Horn Antenna	CMT	3116	R52734-001	17-03-02	Radiated Emissions
Horn Antenna	ETS-Lindgren	3117	2538	15-08-07	Radiated Emissions
Active Loop Antenna	EMCO	6507	00032	15-08-21	Radiated Emissions
Preamplifier	Rohde & Schwarz	TS-ANA4-SP	001	15-09-10	Radiated Emissions
Preamplifier	Sonoma	310N/11909A	185831	15-10-22	Radiated Emissions
Preamplifier	Rohde & Schwarz	TS-ANA-SP	001	15-09-10	Radiated Emissions
L.I.S.N.	Rohde & Schwarz	ENV216	100060	15-10-08	Conducted Emissions
Environment Monitor	Omega	iTHX-SD	0380561	16-11-15	Radiated Emissions
EMC Analyzer	Agilent	E7405A	US40240226	16-01-23	Radiated Emissions
DC Power Supply	HP	6632B	US37472178	15-10-20	RF Conducted Emissions
Environment Monitor	Omega	iTHX-SD	0340060	16-09-11	RF Conducted Emissions
Environmental Chamber	Test Equity	107	0900246	N/R	Frequency Stability
Bluetooth Tester	Rohde & Schwarz	CBT	119549	15-12-04	RF Conducted Emissions
Bluetooth Tester	Rohde & Schwarz	CBT35	100368	15-11-25	Radiated Emissions
Bluetooth Tester	Rohde & Schwarz	CBT35	100370	15-12-04	Radiated Emissions
Power Meter	Agilent	N1911A	MY45100951	15-09-10	RF Conducted / Frequency Stability
Power Sensor	Agilent	N1921A	MY45241383	15-09-05	RF Conducted / Frequency Stability
Environment Monitor	Omega	iTHX-SD	0380567	16-11-15	Radiated Emissions

H. Test Software Used

SOFTWARE	COMPANY	VERSION	USE
EMC32	Rohde & Schwarz	8.53.0	Radiated Emissions
TDK Standard Emission Test	TDK RF Solutions	8.53.1.62	Radiated Emissions

APPENDIX 1 – AC POWER CONDUCTED EMISSIONS TEST DATA/PLOTS

AC Powerline Conducted Emission Test Results

The following tests were performed by Winston Vernon

Test Configuration 1

The BlackBerry® smartphone was tested on April 17, 2015

The environmental test conditions were: Temperature: 25.1 ºC
Relative Humidity: 39.4 %

Frequency (MHz)	Line	Reading (QP) (dBµV)	Correction Factor (dB)	Corrected Reading (QP) (dB)	Limit (QP) (dBµV)	Limit (AV) (dBµV)	Margin (QP) Limits (dB)
0.164	L1	42.62	11.11	53.73	65.30	55.30	**-11.57**
0.204	N	40.95	10.85	51.80	63.40	53.40	-11.60
0.227	L1	37.23	10.67	47.90	62.60	52.60	-14.70
0.299	N	34.55	10.18	44.74	60.30	50.30	-15.57
0.533	L1	30.75	9.89	40.64	56.00	46.00	-15.36
0.537	N	31.00	9.90	40.90	56.00	46.00	-15.10
1.100	L1	30.45	9.80	40.25	56.00	46.00	-15.75
1.401	N	27.59	9.81	37.40	56.00	46.00	-18.60
16.094	L1	25.93	10.12	36.05	60.00	50.00	-23.95

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

AC Powerline Conducted Emissions Test Graphs

Test Configuration 1

Figure 1-1: L1 lines

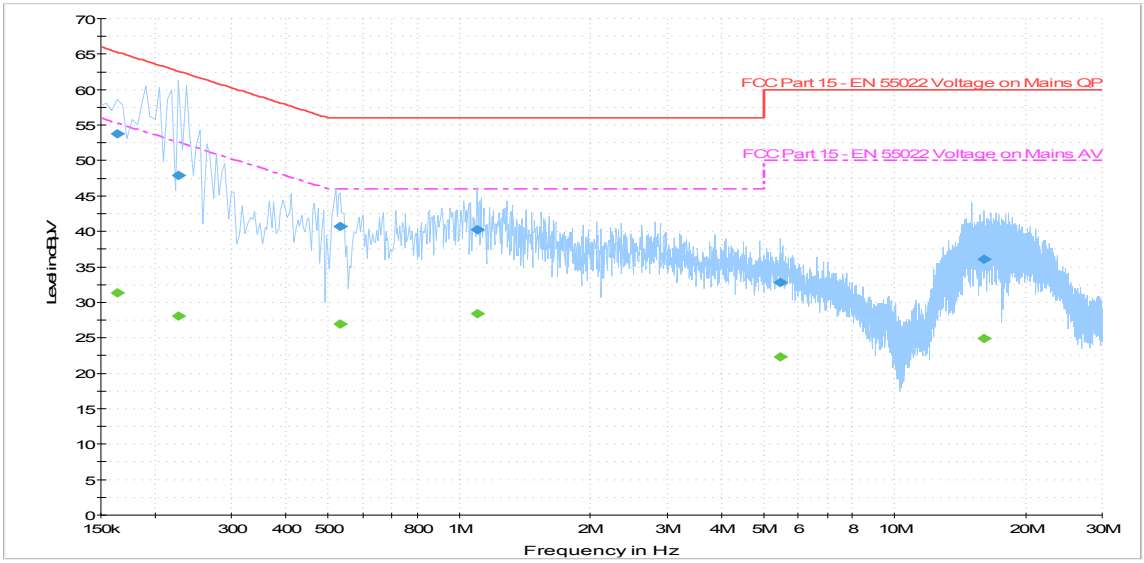
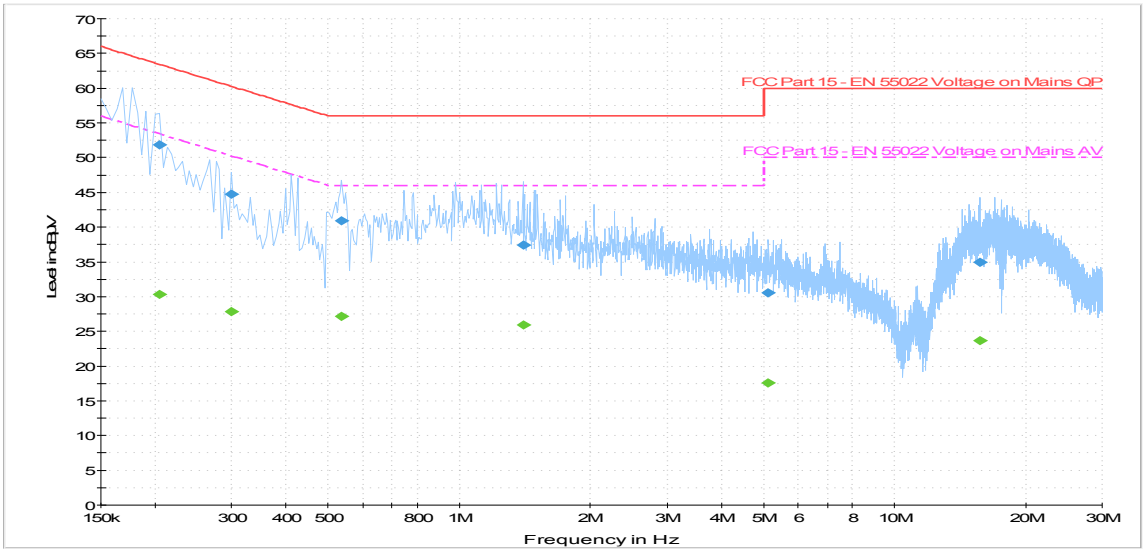


Figure 1-2: N Lines



AC Powerline Conducted Emission Test Results cont'd

Test Configuration 2

The BlackBerry® smartphone was tested on April 17, 2015

The environmental test conditions were: Temperature: 25.1 ºC
Relative Humidity: 39.4 %

Frequency (MHz)	Line	Reading (QP) (dBµV)	Correction Factor (dB)	Corrected Reading (QP) (dB)	Limit (QP) (dBµV)	Limit (AV) (dBµV)	Margin (QP) Limits (dB)
0.173	N	37.33	11.08	48.41	64.80	54.80	-16.40
0.191	L1	35.20	10.92	46.13	64.00	54.00	-17.87
0.290	L1	24.88	10.23	35.11	60.50	50.50	-25.39
0.443	N	28.13	9.96	38.09	57.00	47.00	-18.91
0.470	L1	34.71	9.93	44.64	56.50	46.50	-11.87
1.163	N	30.02	9.80	39.83	56.00	46.00	-16.17
1.356	L1	29.83	9.80	39.63	56.00	46.00	-16.37
1.743	N	27.07	9.82	36.89	56.00	46.00	-19.11
2.423	N	26.18	9.85	36.03	56.00	46.00	-19.97
2.823	L1	25.54	9.87	35.40	56.00	46.00	-20.60
14.474	L1	27.95	10.07	38.02	60.00	50.00	-21.98
15.680	N	27.63	10.09	37.72	60.00	50.00	-22.28

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

Figure 1-3: L1 lines

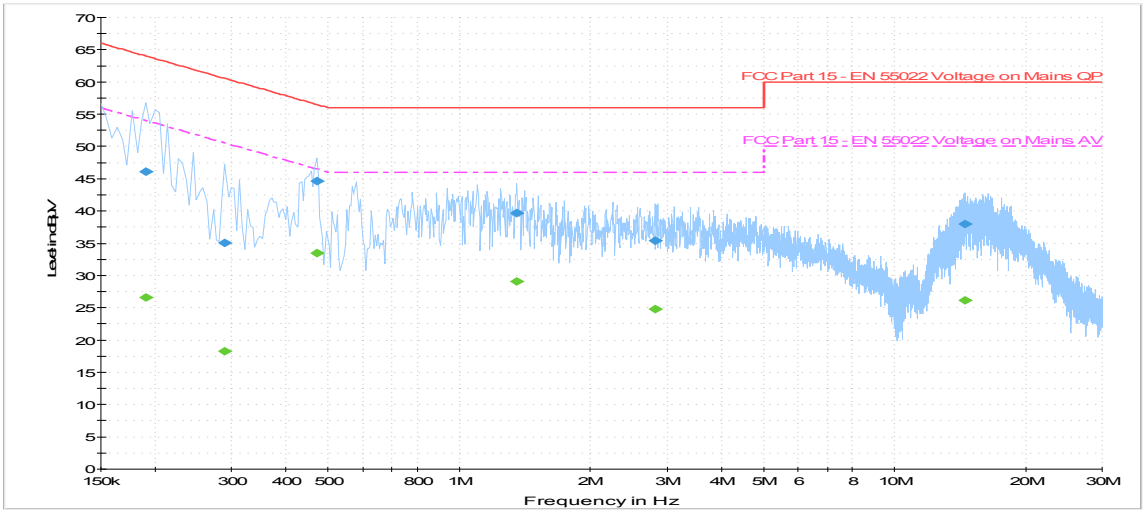
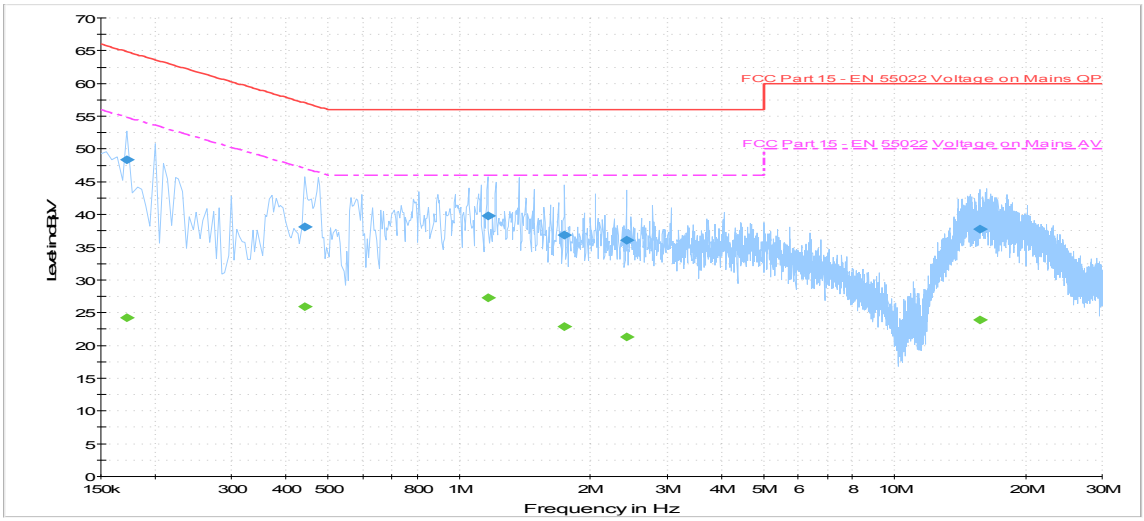


Figure 1-4: N Lines



AC Powerline Conducted Emissions Test Results cont'd

Test Configuration 3

The BlackBerry® smartphone was tested on April 17, 2015

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

Frequency (MHz)	Line	Reading (QP) (dBµV)	Correction Factor (dB)	Corrected Reading (QP) (dB)	Limit (QP) (dBµV)	Limit (AV) (dBµV)	Margin (QP) Limits (dB)
0.155	L1	41.42	11.17	52.59	65.80	55.80	-13.21
0.164	N	38.69	11.14	49.83	65.30	55.30	-15.47
0.195	L1	36.60	10.89	47.50	63.80	53.80	-16.31
0.474	N	33.55	9.93	43.48	56.40	46.40	-12.92
0.474	L1	34.51	9.92	44.43	56.40	46.40	-11.97
1.104	N	30.12	9.81	39.92	56.00	46.00	-16.08
1.104	L1	31.24	9.80	41.04	56.00	46.00	-14.96
1.748	N	27.15	9.82	36.97	56.00	46.00	-19.03
3.156	L1	24.37	9.88	34.25	56.00	46.00	-21.75
4.776	N	21.22	9.91	31.13	56.00	46.00	-24.87
14.442	N	26.72	10.08	36.80	60.00	50.00	-23.20
16.278	L1	26.87	10.13	37.00	60.00	50.00	-23.00

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

AC Powerline Conducted Emissions Test Graphs

Test Configuration 3

Figure 1-5: L1 Lines

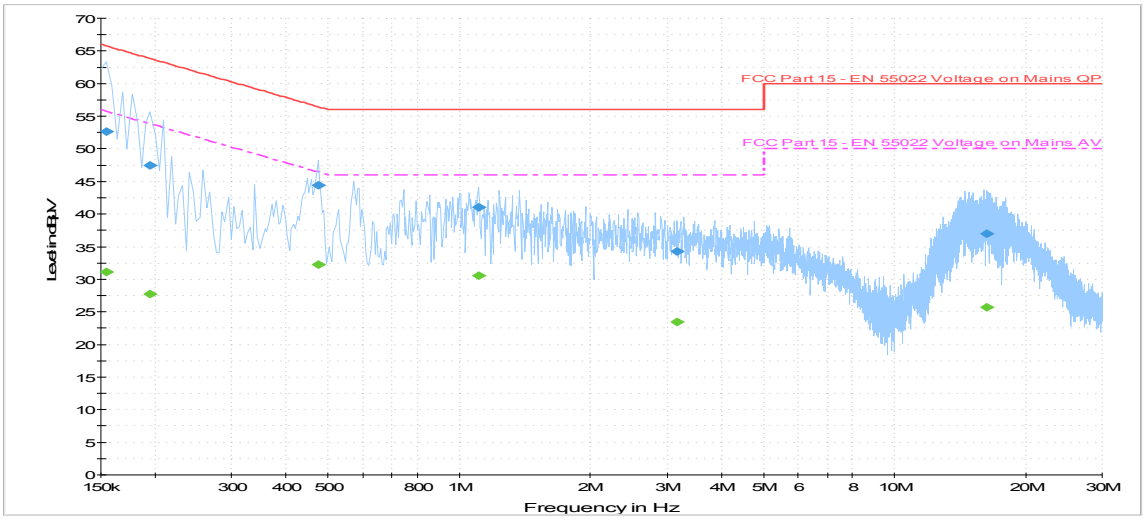
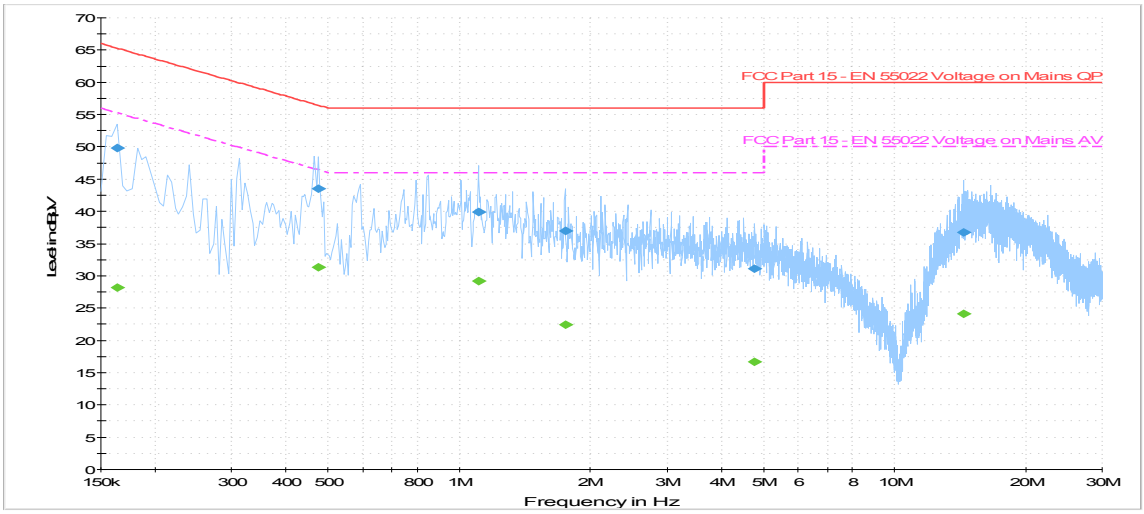


Figure 1-6: N Lines



AC Powerline Conducted Emission Test Results cont'd

Test Configuration 4

The BlackBerry® smartphone was tested on April 17, 2015

The environmental test conditions were: Temperature: 25.1 ºC
Relative Humidity: 39.4 %

Frequency (MHz)	Line	Reading (QP) (dBµV)	Correction Factor (dB)	Corrected Reading (QP) (dB)	Limit (QP) (dBµV)	Limit (AV) (dBµV)	Margin (QP) Limits (dB)
0.164	L1	42.50	11.11	53.61	65.30	55.30	-11.69
0.164	N	41.85	11.14	52.99	65.30	55.30	-12.31
0.191	L1	39.66	10.92	50.59	64.00	54.00	-13.41
0.200	N	37.23	10.89	48.11	63.60	53.60	-15.49
0.434	L1	34.04	9.96	44.00	57.20	47.20	-13.20
0.447	N	31.99	9.95	41.94	56.90	46.90	-14.96
0.938	L1	31.97	9.81	41.78	56.00	46.00	-14.22
1.334	N	26.53	9.81	36.34	56.00	46.00	-19.66
1.959	N	23.16	9.83	32.99	56.00	46.00	-23.02
2.909	L1	25.47	9.87	35.33	56.00	46.00	-20.67
15.621	N	27.47	10.09	37.56	60.00	50.00	-22.44
16.526	L1	27.64	10.14	37.79	60.00	50.00	-22.21

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

AC Powerline Conducted Emissions Test Graphs

Test Configuration 4

Figure 1-7: L1 lines

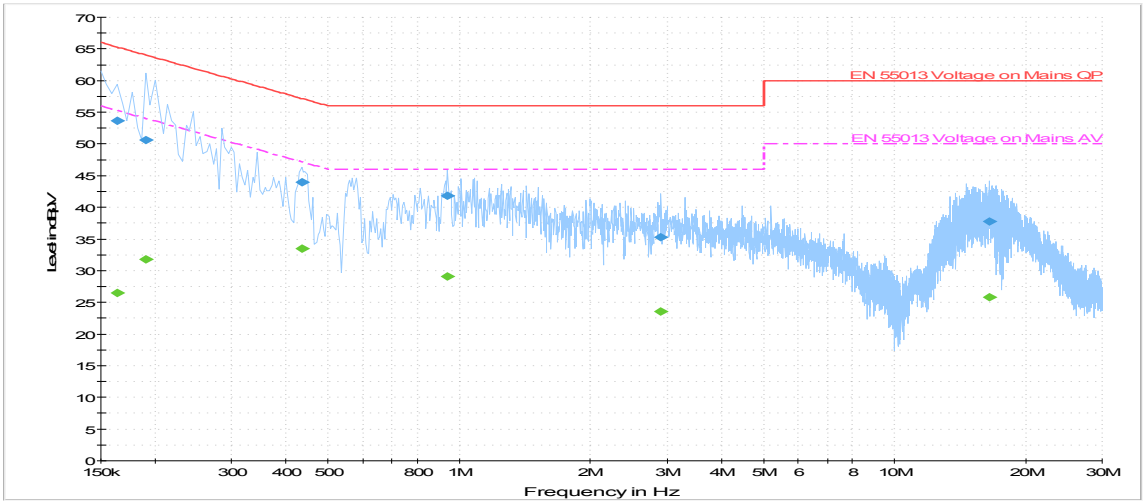
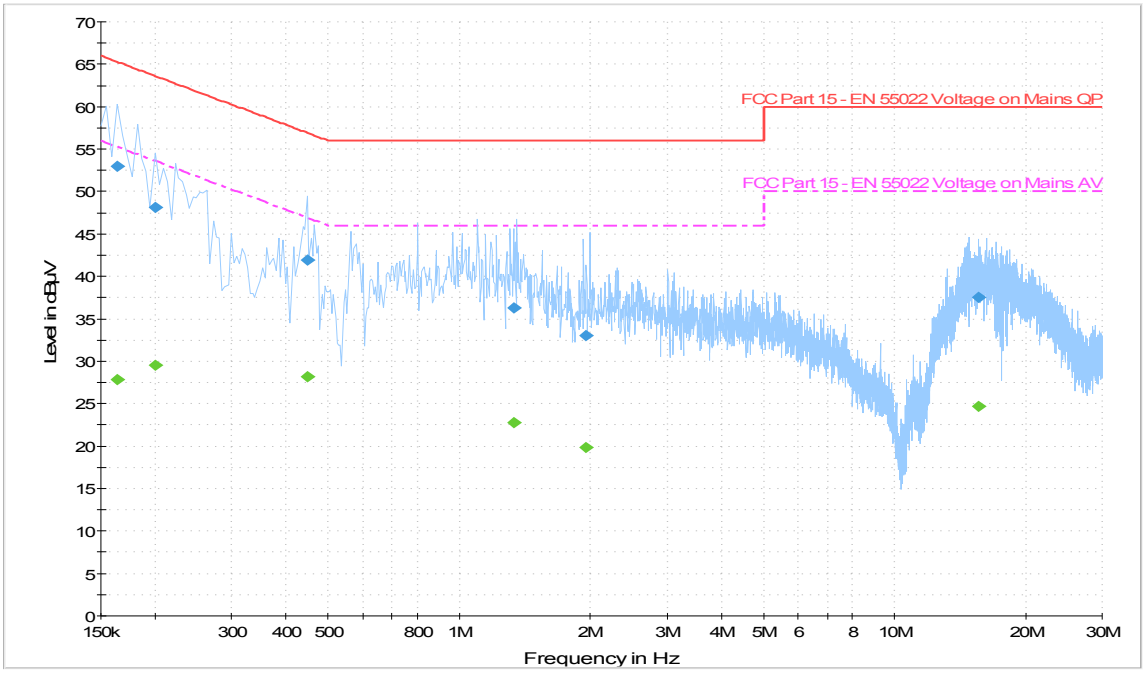


Figure 1-8: N Lines



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

Radiated Emissions Test Results
Bluetooth Band

Date of Test: April 13, 2015
Measurements were performed by Shiva Kumbham.

The environmental test conditions were: Temperature: 27.7ºC
Relative Humidity: 24.8 %

The test distance was 3.0 meters with a EUT height of 1.5 meters, and sweep frequency of 30 MHz to 1 GHz.

The BlackBerry® smartphone in Bluetooth TX mode was in volume key 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 the emission had a test margin of 25 dB.

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

Date of Test: April 09, 10, 14, 15, and 24, 2015
Measurements were performed by Winston Vernon

The environmental test conditions were: Temperature: 26.0ºC
Relative Humidity: 31.2%

The test distance was 3.0 meters with a EUT height of 1.5 meters, and sweep frequency of 1GHz to 25GHz.

The BlackBerry® smartphone in Bluetooth TX mode was in volume key up 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 the emission had a test margin of greater than 25 dB.

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

Date of test: April 23, 2015
Measurements were performed by Shiva Kumbham.

The environmental test conditions were: Temperature: 25.3 º C
Relative Humidity: 12.7 %

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

The test distance was 3.0 meters.

Channel	Freq.	Rx Antenna		Detector	VBW	Reading	Corrected Reading	Delta Marker	Corrected Band edge	Limit	Diff. To Limit
	(MHz)	Type	POL.			(dBuV)	(dBuV/m)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
Low Channel, Packet Type DH5											
0	2402	Horn	V	PK	1 MHz	90.13	100.35	59.00	41.35	74.00	-32.65
0	2402	Horn	H	PK	1 MHz	94.07	104.29	64.00	40.29	74.00	-33.71
0	2402	Horn	V	AV	10 Hz	83.33	93.55	59.00	34.55	54.00	-19.45
0	2402	Horn	H	AV	10 Hz	87.21	97.43	64.00	33.43	54.00	-20.57
High Channel, Packet Type DH5											
78	2480	Horn	V	PK	1 MHz	87.42	98.57	55.75	42.82	74.00	-31.18
78	2480	Horn	H	PK	1 MHz	90.04	101.19	59.14	42.05	74.00	-31.95
78	2480	Horn	V	AV	10 Hz	81.17	92.32	55.75	36.57	54.00	-17.43
78	2480	Horn	H	AV	10 Hz	83.20	94.35	59.14	35.21	54.00	-18.79
Low Channel, Packet Type 2-DH5											
0	2402	Horn	V	PK	1 MHz	88.11	98.33	55.96	42.37	74.00	-31.63
0	2402	Horn	H	PK	1 MHz	92.11	102.33	59.38	42.95	74.00	-31.05
0	2402	Horn	V	AV	10 Hz	79.24	89.46	55.96	33.50	54.00	-20.50
0	2402	Horn	H	AV	10 Hz	82.90	93.12	59.38	33.74	54.00	-20.26
High Channel, Packet Type 2-DH5											
78	2480	Horn	V	PK	1 MHz	84.94	96.09	53.21	42.88	74.00	-31.12
78	2480	Horn	H	PK	1 MHz	87.51	98.66	55.83	42.83	74.00	-31.17
78	2480	Horn	V	AV	10 Hz	76.50	87.65	53.21	34.44	54.00	-19.56
78	2480	Horn	H	AV	10 Hz	78.23	89.38	55.83	33.55	54.00	-20.45

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

Channel	Freq.	Rx Antenna		Detector	VBW	Reading	Corrected Reading	Delta Marker	Corrected Band edge	Limit	Diff. To Limit
	(MHz)	Type	POL.			(dBuV)	(dBuV/m)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
Low Channel, Packet Type 3-DH5											
0	2402	Horn	V	PK	1 MHz	88.41	98.63	55.27	43.36	74.00	-30.64
0	2402	Horn	H	PK	1 MHz	92.28	102.50	59.37	43.13	74.00	-30.87
0	2402	Horn	V	AV	10 Hz	79.32	89.54	55.27	34.27	54.00	-19.73
0	2402	Horn	H	AV	10 Hz	83.02	93.24	59.37	33.87	54.00	-20.13
High Channel, Packet Type 3-DH5											
78	2480	Horn	V	PK	1 MHz	85.30	96.45	52.50	43.95	74.00	-30.05
78	2480	Horn	H	PK	1 MHz	87.72	98.87	55.46	43.41	74.00	-30.59
78	2480	Horn	V	AV	10 Hz	76.42	87.57	52.50	35.07	54.00	-18.93
78	2480	Horn	H	AV	10 Hz	78.25	89.40	55.46	33.94	54.00	-20.06

See figures 2-1 to 2-12 for the plots of the Bluetooth band-edge compliance.

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

Figure 2-1: Band-Edge Compliance of RF Rad. Emissions.
Bluetooth, Single freq., Static PBRS,
DH5, Channel 0, Pol: V, Detector: PK

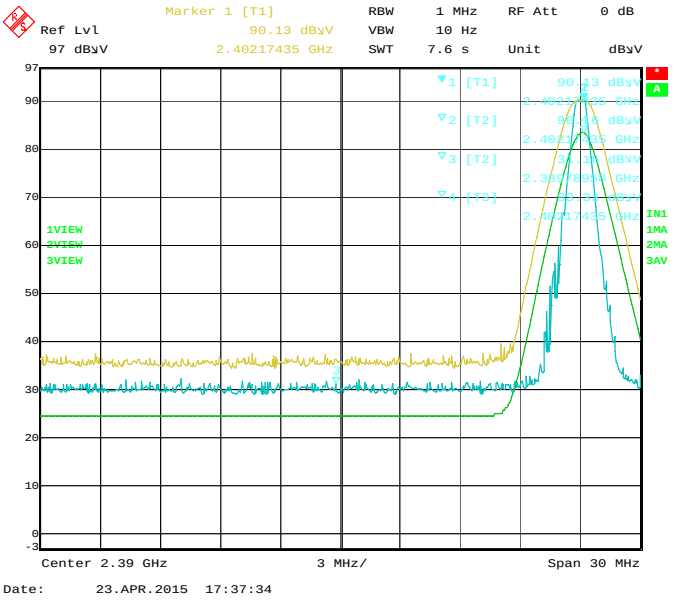


Figure 2-2: Band-Edge Compliance of RF Rad. Emissions.
Bluetooth, Single freq., Static PBRS,
DH5, Channel 0, Pol: H, Detector: PK

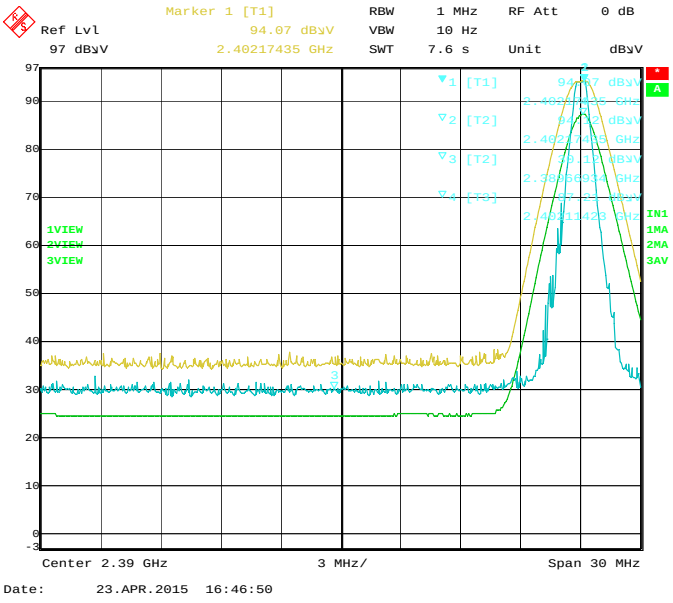


Figure 2-3: Band-Edge Compliance of RF Rad. Emissions.
Bluetooth, Single freq., Static PBRS,
DH5, Channel 78, Pol: V, Detector: PK

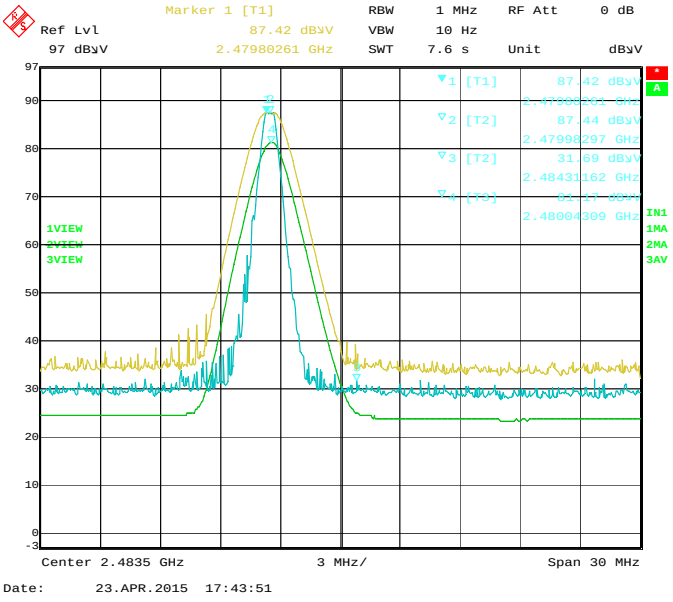
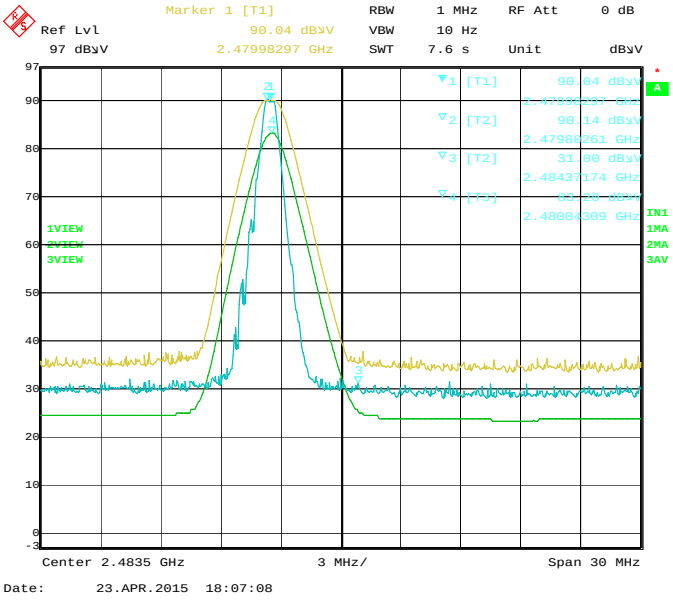


Figure 2-4: Band-Edge Compliance of RF Rad. Emissions
Bluetooth, Single freq., Static PBRS,
DH5, Channel 78, Pol: H, Detector: PK



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

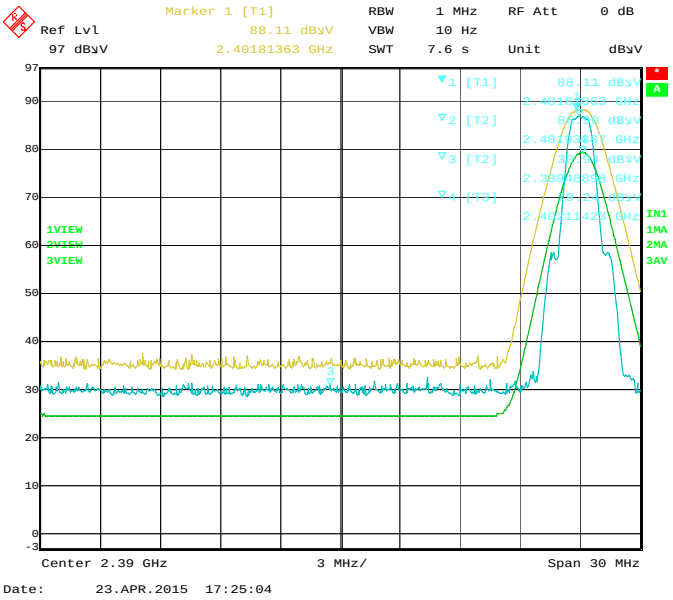


Figure 2-6: Band-Edge Compliance of RF Rad. Emissions.
Bluetooth, Single freq., Static PBRS,
2-DH5, Channel 0, Pol: H, Detector: PK

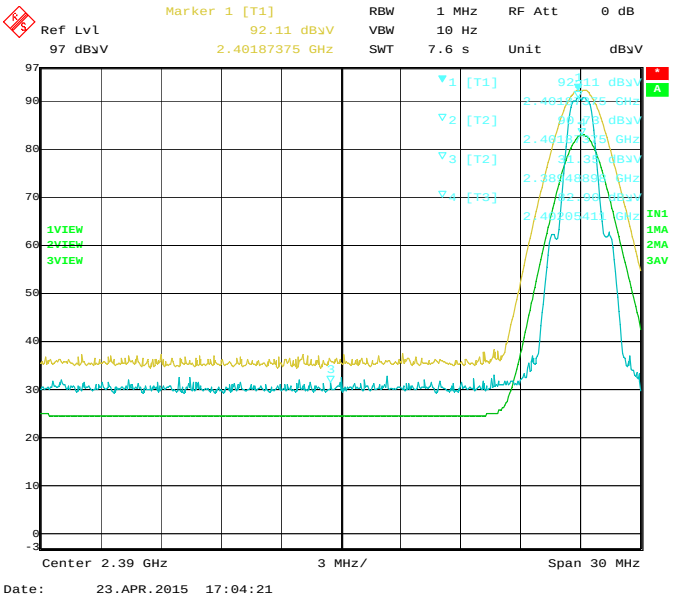


Figure 2-7: Band-Edge Compliance of RF Rad. Emissions.
Bluetooth, Single freq., Static PBRS,
2-DH5, Channel 78, Pol: V, Detector: PK

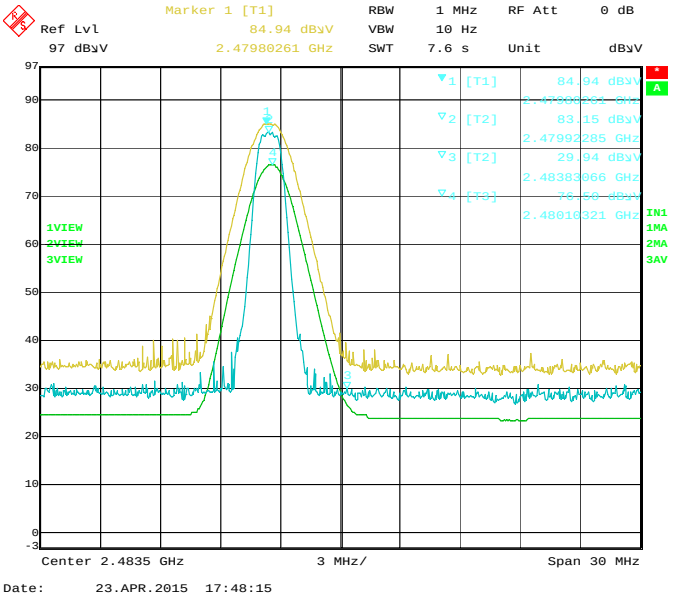
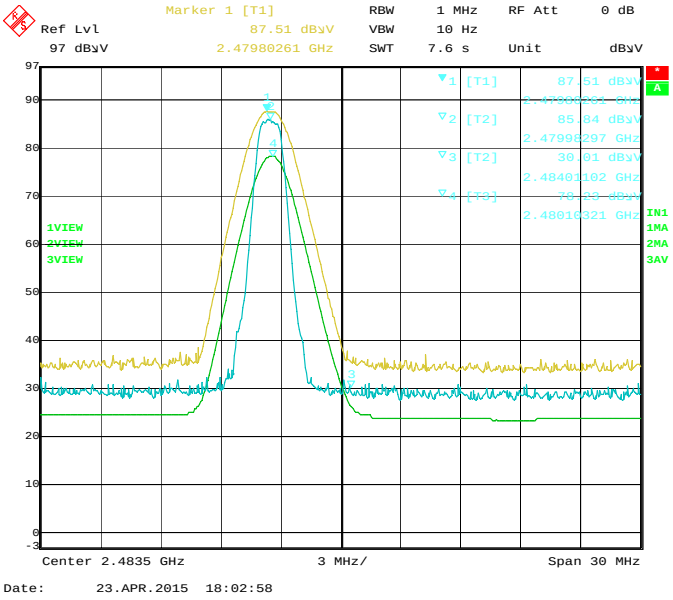


Figure 2-8: Band-Edge Compliance of RF Rad. Emissions.
Bluetooth, Single freq., Static PBRS,
2-DH5, Channel 78, Pol: H, Detector: PK



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

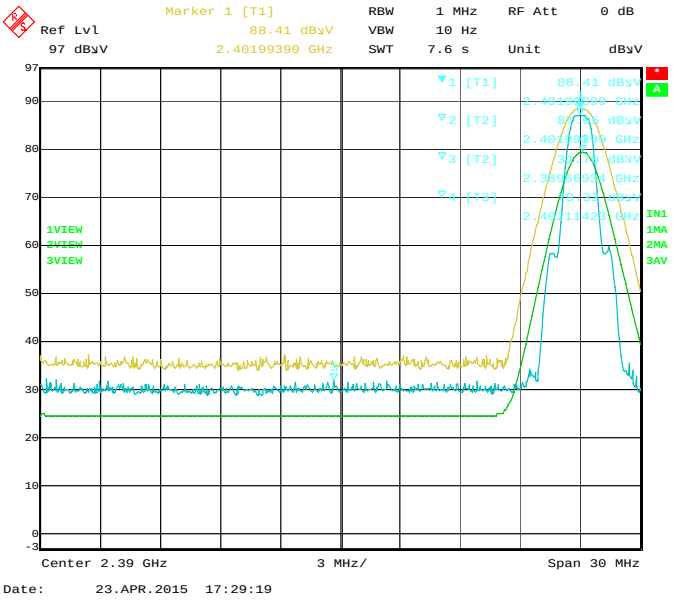


Figure 2-10: Band-Edge Compliance of RF Rad. Emissions.
Bluetooth, Single freq., Static PBRS,
3-DH5, Channel 0, Pol: H, Detector: PK

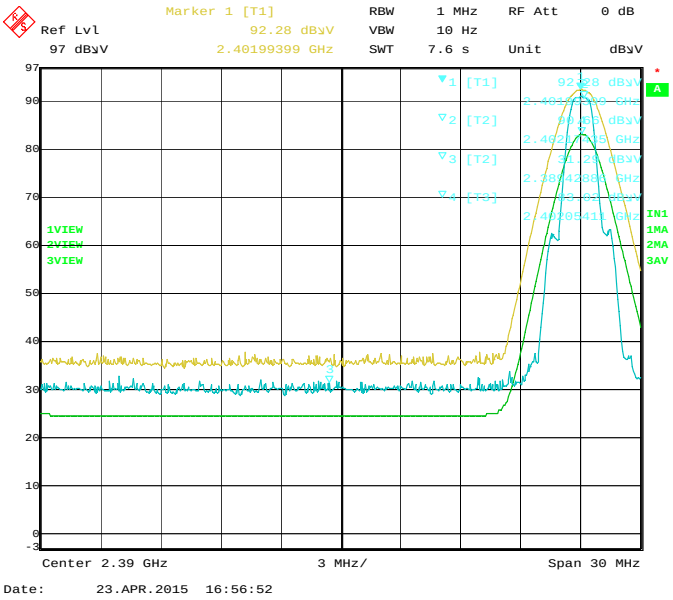


Figure 2-11: Band-Edge Compliance of RF Rad. Emissions.
Bluetooth, Single freq., Static PBRS,
3-DH5, Channel 78, Pol: V, Detector: PK

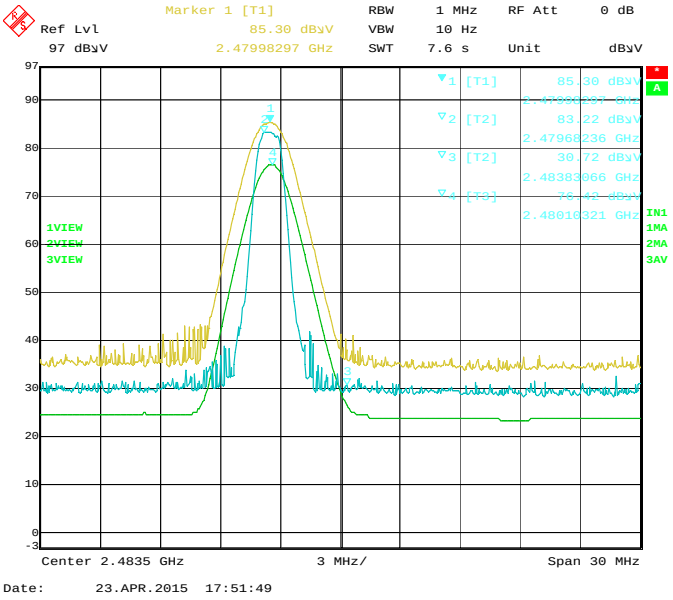
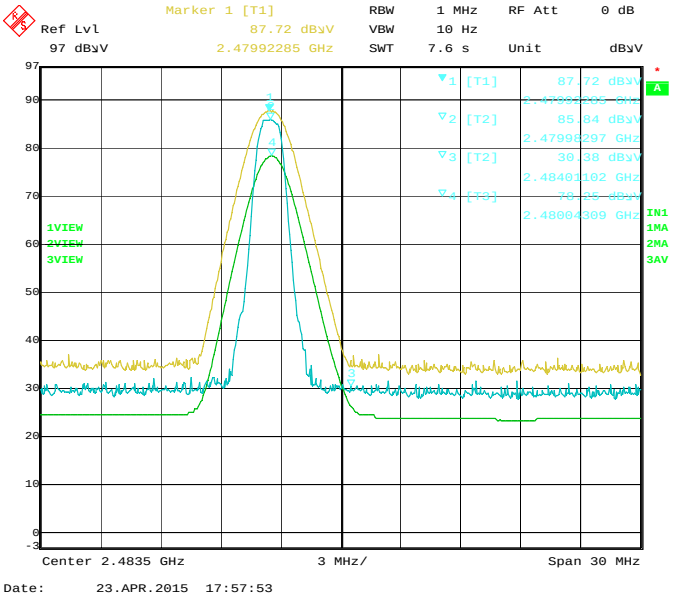


Figure 2-12: Band-Edge Compliance of RF Rad. Emissions.
Bluetooth, Single freq., Static PBRS,
3-DH5, Channel 78, Pol: H, Detector: PK



Radiated Emissions Test Results cont'd
Bluetooth Low Energy Band

Date of Test: April 17, 2015
Measurements were performed by Shiva Kumbham.

The environmental test conditions were: Temperature: 26.7 ºC
Relative Humidity: 20.8 %

The test distance was 3.0 meters with a EUT height of 1.5 meters, and sweep frequency of 30 MHz to 1 GHz.

The BlackBerry® smartphone in Bluetooth Low Energy TX mode was in volume key 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.

Date of Test: April 14 and 24, 2015
Measurements were performed by Kevin Guo.

The environmental test conditions were: Temperature: 25.2ºC
Relative Humidity: 35.8%

The test distance was 3.0 meters with a EUT height of 1.5 meters, and sweep frequency of 1GHz to 25GHz.

The BlackBerry® smartphone in Bluetooth Low Energy TX mode was in volume key up position.

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

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

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

Date of test: April 23, 2015
Measurements were performed by Shiva Kumbham.

The environmental test conditions were: Temperature: 25.3º C
Relative Humidity: 12.7 %

The BlackBerry® smartphone was in volume key down position.

The test distance was 3.0 meters.

Channel	Freq. (MHz)	Rx Antenna Type	POL.	Detector	VBW	Reading (dBuV)	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	86.27	96.49	55.61	40.88	74.00	-33.12
0	2402	Horn	H	PK	1 MHz	88.53	98.75	57.07	41.68	74.00	-32.32
0	2402	Horn	V	AV	10 Hz	81.44	91.66	55.61	36.05	54.00	-17.95
0	2402	Horn	H	AV	10 Hz	83.71	93.93	57.07	36.86	54.00	-17.14
High Channel, LE											
39	2480	Horn	V	PK	1 MHz	86.73	97.88	56.50	41.38	74.00	-32.62
39	2480	Horn	H	PK	1 MHz	87.29	98.44	56.20	42.24	74.00	-31.76
39	2480	Horn	V	AV	10 Hz	81.94	93.09	56.50	36.59	54.00	-17.41
39	2480	Horn	H	AV	10 Hz	82.46	93.61	56.20	37.41	54.00	-16.59

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

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

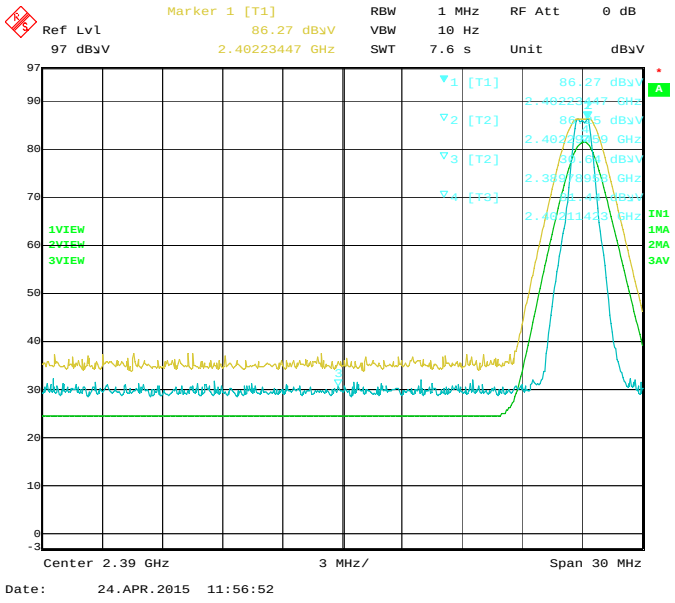


Figure 2-14: Band-Edge Compliance of RF Rad. Emissions.
Bluetooth Low Energy, Single freq.,
LE, Channel 0, Pol: H, Detector: PK

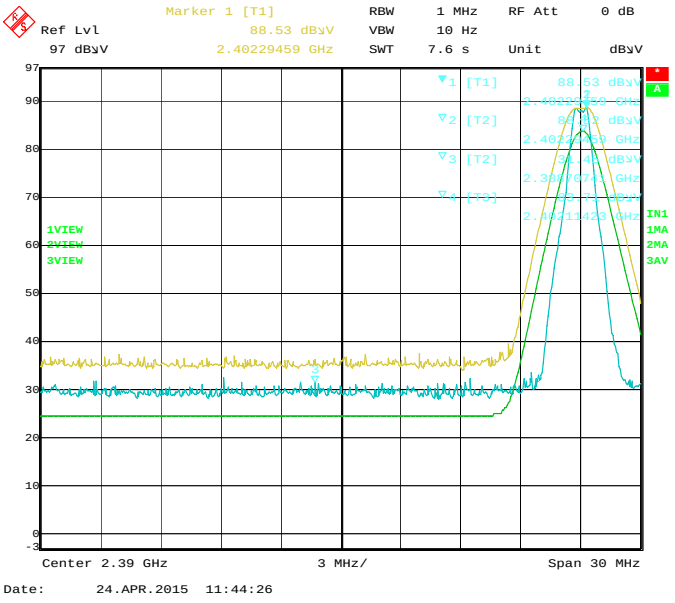


Figure 2-15: Band-Edge Compliance of RF Rad. Emissions.
Bluetooth Low Energy, Single freq.,
LE, Channel 39, Pol: V, Detector: PK

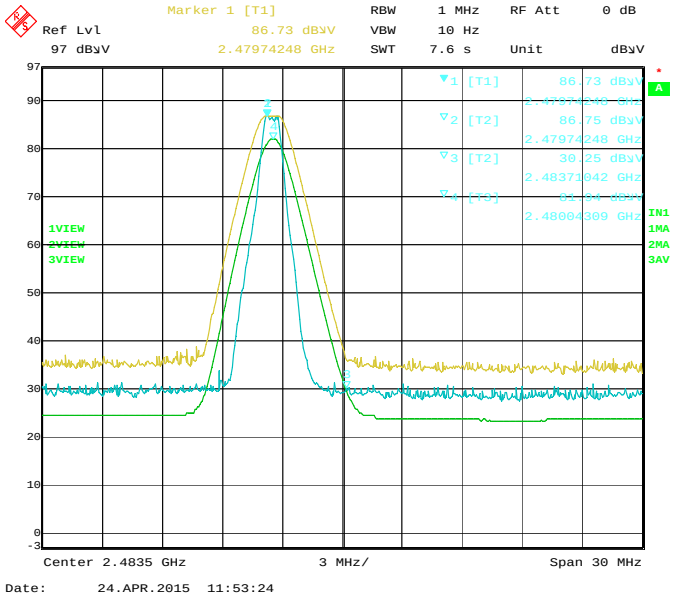
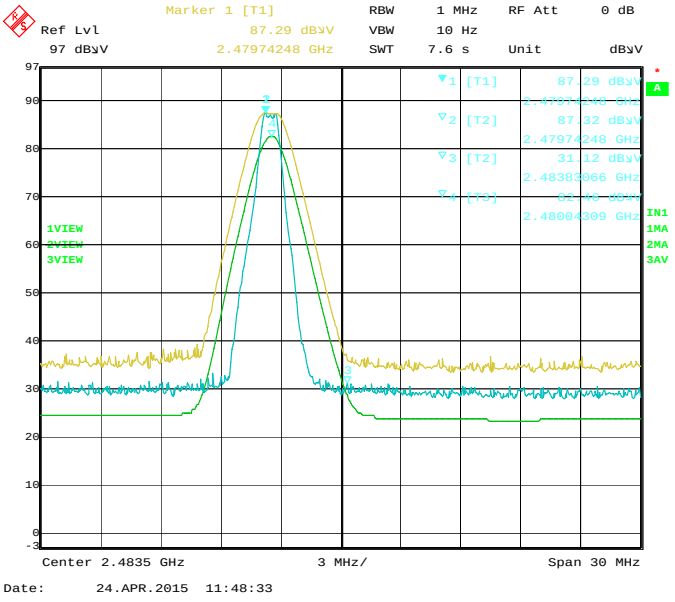


Figure 2-16: Band-Edge Compliance of RF Rad. Emissions
Bluetooth Low Energy, Single freq.,
LE, Channel 39, Pol: H, Detector: PK



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

Date of Test: April 1, 2015
Measurements performed by Shiva Kumbham.

The environmental test conditions were: Temperature: 27.1 ºC
Relative Humidity: 8.1%

The test distance was 3.0 meters with a EUT height of 1.5 meters, and sweep frequency of 30 MHz to 1 GHz.

The BlackBerry® smartphone was in volume key down 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.

Date of Test: April 07, 10, 20 and 24, 2015
Measurements performed by Winston Vernon.

The environmental test conditions were: Temperature: 25.1 ºC
Relative Humidity: 36.5 %

The test distance was 3.0 meters with a EUT height of 1.5 meters, and sweep frequency of 1GHz to 25GHz.

The BlackBerry® smartphone was in horizontal position.

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

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

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

Date of Tests: May 14, 2015
Measurements performed by Savtej Sandhu.

The environmental test conditions were: Temperature: 23.9 ºC
Relative Humidity: 22.6 %

802.11b Band

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

The test distance was 3 meters.

Channel	Freq.	Rx Antenna		Detector	VBW	Reading	Corrected Band edge	Limit	Diff. To Limit
	(MHz)	Type	POL.	(MHz)		(dBuV)	(dBuV/m)	(dBuV/m)	(dB)
Low channel 802.11b,1Mbps									
1.0	2412.00	Horn	V	PK	1 MHz	36.14	46.36	74.00	-27.64
1.0	2412.00	Horn	H	PK	1 MHz	36.07	46.29	74.00	-27.71
1.0	2412.00	Horn	V	AV	10 Hz	24.36	34.58	54.00	-19.42
1.0	2412.00	Horn	H	AV	10 Hz	24.36	34.58	54.00	-19.42
High channel 802.11b,1Mbps									
11.0	2462.00	Horn	V	PK	1 MHz	37.69	48.84	74.00	-25.16
11.0	2462.00	Horn	H	PK	1 MHz	42.05	53.20	74.00	-20.80
11.0	2462.00	Horn	V	AV	10 Hz	25.52	36.67	54.00	-17.33
11.0	2462.00	Horn	H	AV	10 Hz	29.04	40.19	54.00	-13.81

802.11g Band

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

The test distance was 3 meters.

Channel	Freq.	Rx Antenna		Detector	VBW	Reading	Corrected Band edge	Limit	Diff. To Limit
	(MHz)	Type	POL.	(MHz)		(dBuV)	(dBuV/m)	(dBuV/m)	(dB)
Low channel 802.11g,6Mbps									
1.0	2412.00	Horn	V	PK	1 MHz	40.04	50.26	74.00	-23.74
1.0	2412.00	Horn	H	PK	1 MHz	42.04	52.26	74.00	-21.74
1.0	2412.00	Horn	V	AV	10 Hz	27.01	37.23	54.00	-16.77
1.0	2412.00	Horn	H	AV	10 Hz	29.39	39.61	54.00	-14.39
High channel 802.11g,6Mbps									
11.0	2462.00	Horn	V	PK	1 MHz	45.54	56.69	74.00	-17.31
11.0	2462.00	Horn	H	PK	1 MHz	51.51	62.66	74.00	-11.34
11.0	2462.00	Horn	V	AV	10 Hz	33.48	44.63	54.00	-9.37
11.0	2462.00	Horn	H	AV	10 Hz	39.16	50.31	54.00	-3.69

802.11n Band

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

The test distance was 3 meters.

Channel	Freq.	Rx Antenna		Detector	VBW	Reading	Corrected Band edge	Limit	Diff. To Limit
	(MHz)	Type	POL.	(MHz)		(dBuV)	(dBuV/m)	(dBuV/m)	(dB)
Low channel 802.11n, MCS0									
1.0	2412.00	Horn	V	PK	1 MHz	37.33	47.55	74.00	-26.45
1.0	2412.00	Horn	H	PK	1 MHz	40.12	50.34	74.00	-23.66
1.0	2412.00	Horn	V	AV	10 Hz	24.96	35.18	54.00	-18.82
1.0	2412.00	Horn	H	AV	10 Hz	26.04	36.26	54.00	-17.74
High channel 802.11n, MCS0									
11.0	2462.00	Horn	V	PK	1 MHz	45.29	56.44	74.00	-17.56
11.0	2462.00	Horn	H	PK	1 MHz	52.11	63.26	74.00	-10.74
11.0	2462.00	Horn	V	AV	10 Hz	27.88	39.03	54.00	-14.97
11.0	2462.00	Horn	H	AV	10 Hz	33.03	44.18	54.00	-9.82

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.

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

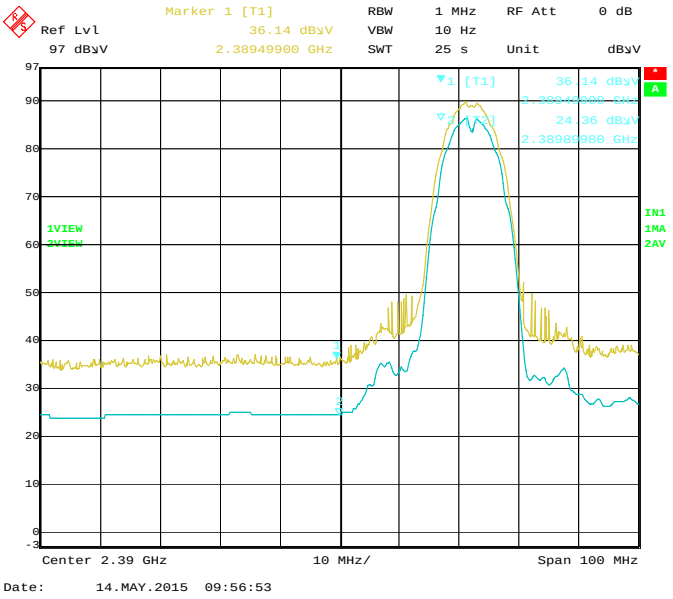


Figure 2-18: Band-Edge Compliance of RF Radiated Emission 802.11b, Channel 1, 2412 MHz, Max Pol: H, Detector: PK

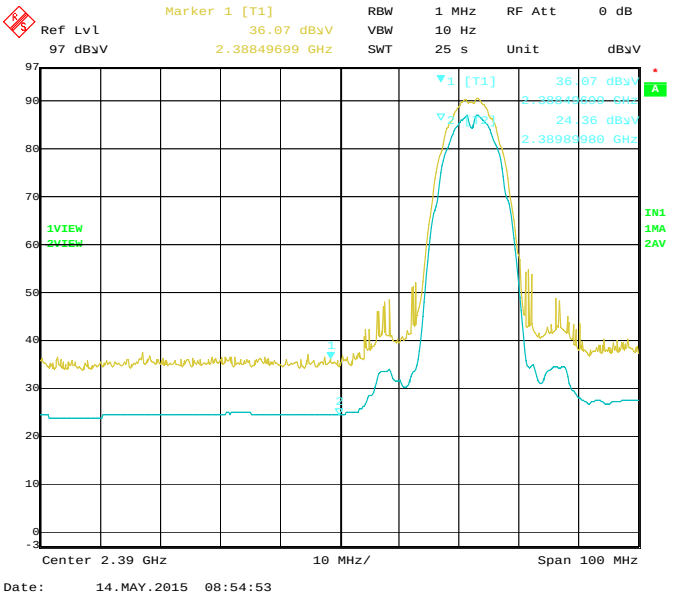


Figure 2-19: Band-Edge Compliance of RF Radiated Emission 802.11b, Channel 11, 2462 MHz, Max Pol: V, Detector: PK

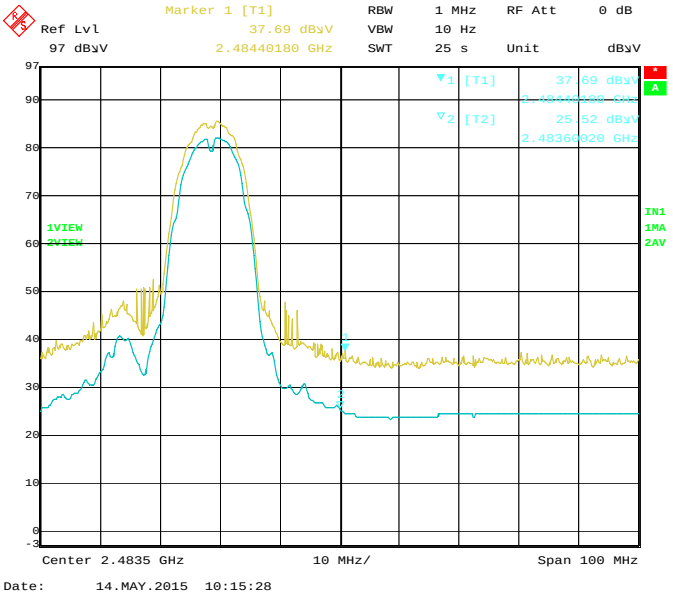


Figure 2-20: Band-Edge Compliance of RF Radiated Emission 802.11b, Channel 11, 2462 MHz, Max Pol: H, Detector: PK

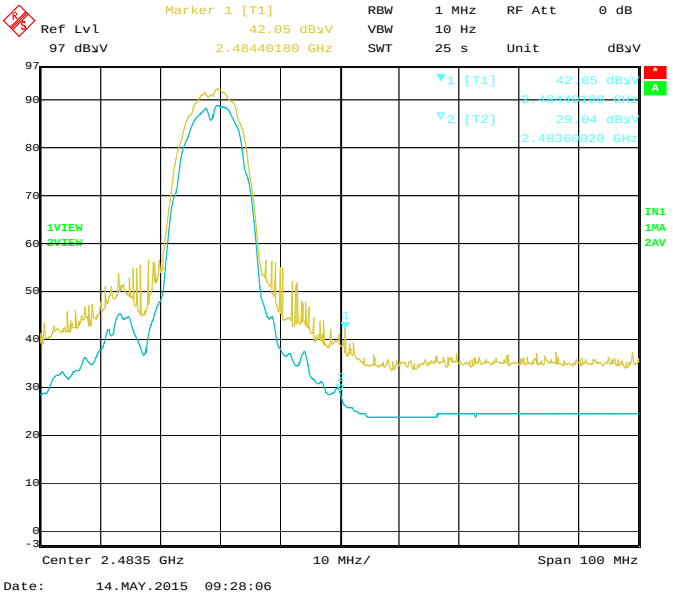


Figure 2-21: Band-Edge Compliance of RF Radiated Emission
802.11g, Channel 1, 2412 MHz, Max Pol: V,
Detector: PK

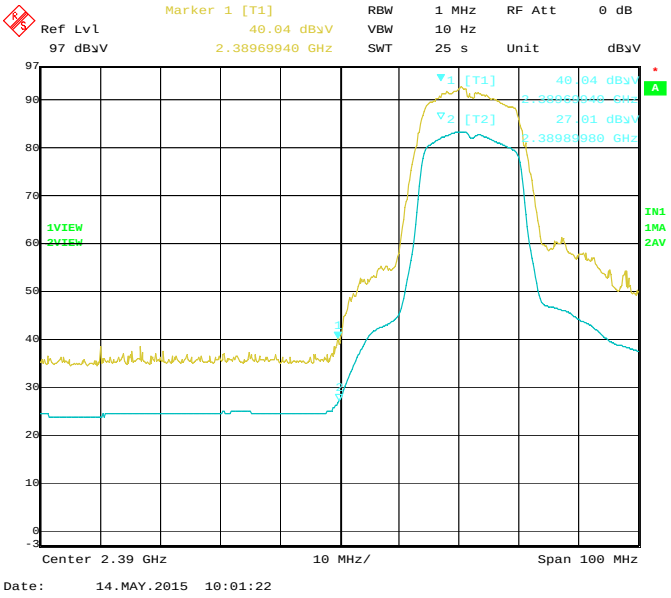


Figure 2-22: Band-Edge Compliance of RF Radiated Emission
802.11g, Channel 1, 2412 MHz, Max Pol: H,
Detector: PK

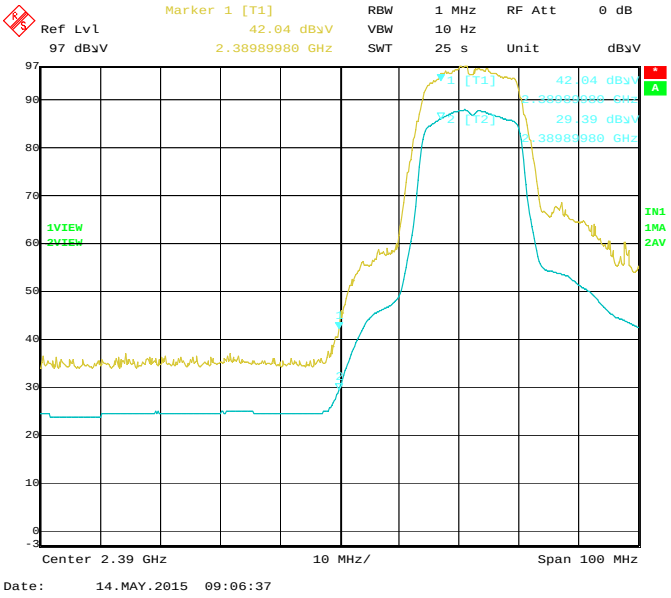


Figure 2-23: Band-Edge Compliance of RF Radiated Emission
802.11g, Channel 11, 2462 MHz, Max Pol: V,
Detector: PK

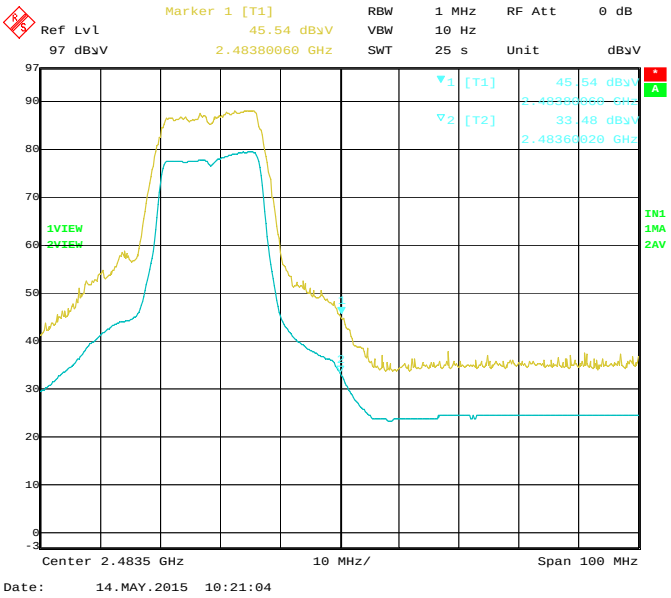


Figure 2-24: Band-Edge Compliance of RF Radiated Emission
802.11g, Channel 11, 2462 MHz, Max Pol: H,
Detector: PK

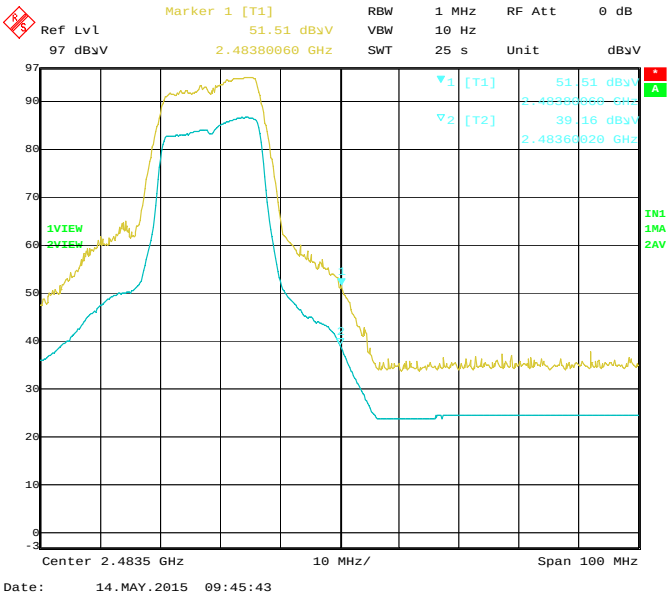


Figure 2-25: Band-Edge Compliance of RF Radiated Emission 802.11n, Channel 1, 2412 MHz, Max Pol: V, Detector: PK

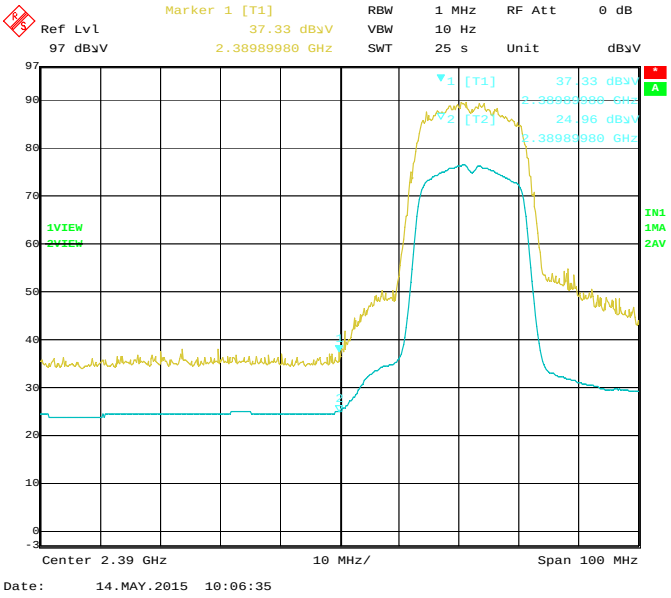


Figure 2-26: Band-Edge Compliance of RF Radiated Emission 802.11n, Channel 1, 2412 MHz, Max Pol: H, Detector: PK

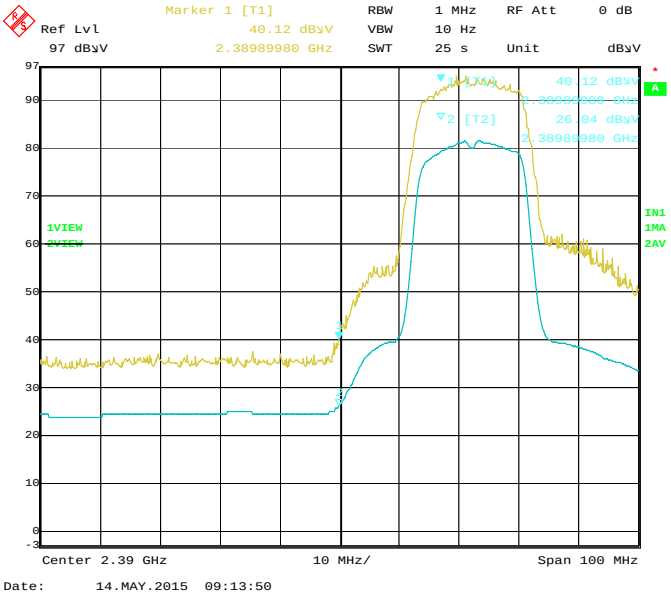


Figure 2-27: Band-Edge Compliance of RF Radiated Emission 802.11n, Channel 11, 2462 MHz, Max Pol: V, Detector: PK

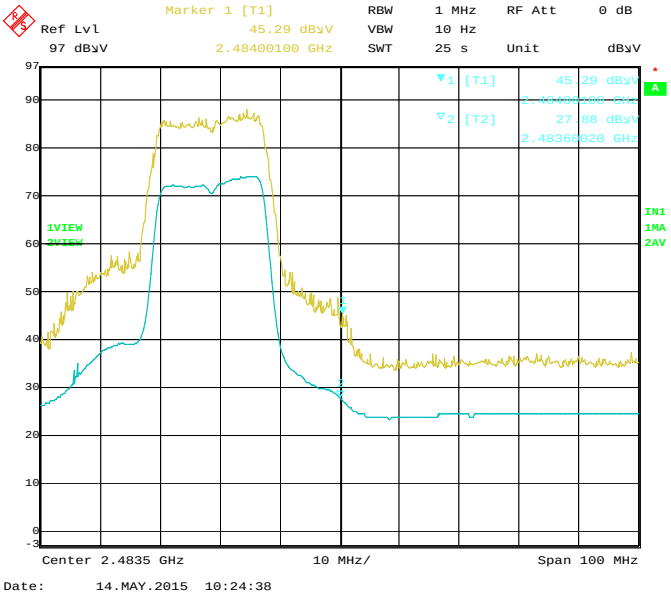
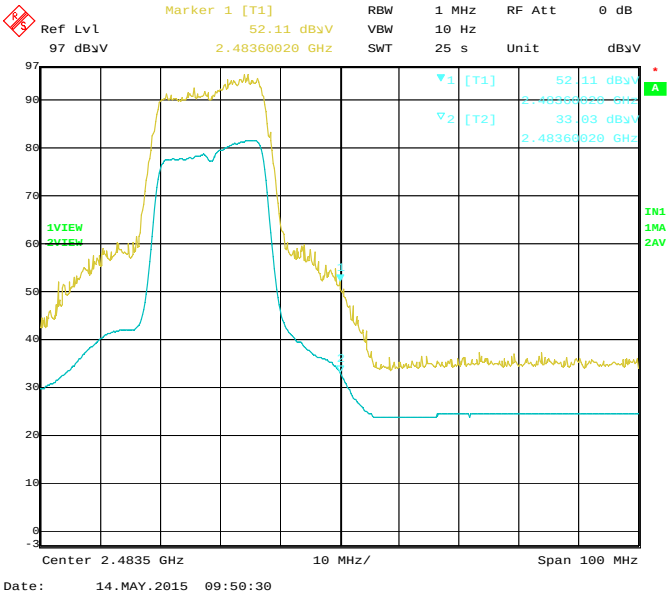


Figure 2-28: Band-Edge Compliance of RF Radiated Emission 802.11n, Channel 11, 2462 MHz, Max Pol: H, Detector: PK



APPENDIX 3 – 802.11a/n RADIATED EMISSIONS TEST DATA

Radiated Emissions Test Results
802.11a Band

Date of Test: April 02, 2015
Measurements were performed by Savtej Sandhu

The environmental test conditions were: Temperature: 26.7 ºC
Relative Humidity: 13.3 %

The test distance was 3.0 meters with a EUT height of 1.5 meters, and sweep frequency of 30 MHz to 1 GHz.

The BlackBerry® smartphone was in volume key up position.

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

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

Radiated Emissions Test Results
802.11a Band

Date of Test: April 13, 15, and 20, 2015
Measurements were performed by Winston Vernon.

The environmental test conditions were: Temperature: 24.8ºC
Relative Humidity: 38.6 %

The test distance was 3.0 meters with a EUT height of 1.5 meters, and sweep frequency of 1GHz to 40GHz.

The BlackBerry® smartphone was in Volume Key Up position.

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

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

Radiated Emissions Test Results cont'd
802.11n Band

Date of Test: April 02, 2015
Measurements were performed by Savtej Sandhu

The environmental test conditions were: Temperature: 26.7 ºC
Relative Humidity: 13.3 %

The test distance was 3.0 meters with a EUT height of 1.5 meters, and sweep frequency of 30 MHz to 1 GHz.

The BlackBerry® smartphone was in volume key up position.

The frequency sweep measurements were performed in 802.11n TX mode at MCS 0 on channels 38, 62, 102 and 159.

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

Radiated Emissions Test Results cont'd
802.11n Band

Date of Test: April 15, and 20 2015
Measurements were performed by Winston Vernon.

The environmental test conditions were: Temperature: 24.8ºC
Relative Humidity: 38.6 %

The test distance was 3.0 meters with a EUT height of 1.5 meters, and sweep frequency of 1GHz to 40GHz.

The BlackBerry® smartphone was in Volume Key Up.

The frequency sweep measurements were performed in 802.11n TX mode at MCS 0 on channels 38, 62, 102, and 159.
All emission had a test margin of greater than 25 dB.

802.11a Band-Edge Compliance of RF Radiated Emissions

Date of Tests: May 13, 2015
Measurements performed by Shiva Kumbham.

The environmental test conditions were: Temperature: 23.9 ºC
Relative Humidity: 22.6 %
The measurements were performed on BlackBerry® smartphone in standalone, volume key up configuration on channels 36, 64, 100, 140 for 802.11a mode at 6 Mbps.

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

Bandwidth 20MHz

Channel	Freq.	Rx Antenna		Detector	VBW	Reading	Corrected Band edge	Limit	Diff. To Limit
	(MHz)	Type	POL.	(MHz)		(dBuV)	(dBuV/m)	(dBuV/m)	(dB)
Centre at Band-Edge: 5150 MHz, 802.11a									
36.0	5180.00	Horn	V	PK	1 MHz	41.57	64.79	74.00	-9.21
36.0	5180.00	Horn	H	PK	1 MHz	35.97	59.19	74.00	-14.81
36.0	5180.00	Horn	V	AV	10 Hz	24.96	48.18	54.00	-5.82
36.0	5180.00	Horn	H	AV	10 Hz	23.71	46.93	54.00	-7.07
Centre at Band-Edge: 5350 MHz, 802.11a									
64.0	5320.00	Horn	V	PK	1 MHz	41.35	65.31	74.00	-8.69
64.0	5320.00	Horn	H	PK	1 MHz	35.97	59.93	74.00	-14.07
64.0	5320.00	Horn	V	AV	10 Hz	25.52	49.48	54.00	-4.52
64.0	5320.00	Horn	H	AV	10 Hz	24.36	48.32	54.00	-5.68

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

Channel	Freq. (MHz)	Rx Antenna Type	Rx Antenna POL.	Detector (MHz)	VBW	Reading (dBuV)	Corrected Band edge (dBuV/m)	Limit (dBuV/m)	Diff. To Limit (dB)
Centre at Band-Edge: 5470 MHz, 802.11a									
100.0	5500.00	Horn	V	PK	1 MHz	40.74	65.57	74.00	-8.43
100.0	5500.00	Horn	H	PK	1 MHz	36.06	60.89	74.00	-13.11
100.0	5500.00	Horn	V	AV	10 Hz	24.96	49.79	54.00	-4.21
100.0	5500.00	Horn	H	AV	10 Hz	23.71	48.54	54.00	-5.46
Centre at Band-Edge: 5725 MHz, 802.11a									
140.0	5700.00	Horn	V	PK	1 MHz	36.31	61.53	68.20	-6.67
140.0	5700.00	Horn	H	PK	1 MHz	35.80	61.02	68.20	-7.18

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

802.11n Band-Edge Compliance of RF Radiated Emissions

Date of Tests: May 13, 2015
Measurements performed by Shiva Kumbham.

The environmental test conditions were: Temperature: 23.9 ºC
Relative Humidity: 22.6 %

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

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

Bandwidth 20MHz

Channel	Freq.	Rx Antenna		Detector	VBW	Reading	Corrected Band edge	Limit	Diff. To Limit
	(MHz)	Type	POL.	(MHz)		(dBuV)	(dBuV/m)	(dBuV/m)	(dB)
Centre at Band-Edge: 5150 MHz, 802.11n									
36.0	5180.00	Horn	V	PK	1 MHz	42.15	65.37	74.00	-8.63
36.0	5180.00	Horn	H	PK	1 MHz	37.08	60.30	74.00	-13.70
36.0	5180.00	Horn	V	AV	10 Hz	25.52	48.74	54.00	-5.26
36.0	5180.00	Horn	H	AV	10 Hz	23.71	46.93	54.00	-7.07
Centre at Band-Edge: 5350 MHz, 802.11n									
64.0	5320.00	Horn	V	PK	1 MHz	39.60	63.56	74.00	-10.44
64.0	5320.00	Horn	H	PK	1 MHz	36.41	60.37	74.00	-13.63
64.0	5320.00	Horn	V	AV	10 Hz	25.52	49.48	54.00	-4.52
64.0	5320.00	Horn	H	AV	10 Hz	24.36	48.32	54.00	-5.68

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

Channel	Freq. (MHz)	Rx Antenna Type	Rx Antenna POL.	Detector (MHz)	VBW	Reading (dBuV)	Corrected Band edge (dBuV/m)	Limit (dBuV/m)	Diff. To Limit (dB)
Centre at Band-Edge: 5470 MHz, 802.11n									
100.0	5500.00	Horn	V	PK	1 MHz	43.40	68.23	74.00	-5.77
100.0	5500.00	Horn	H	PK	1 MHz	36.33	61.16	74.00	-12.84
100.0	5500.00	Horn	V	AV	10 Hz	26.04	50.87	54.00	-3.13
100.0	5500.00	Horn	H	AV	10 Hz	23.71	48.54	54.00	-5.46
Centre at Band-Edge: 5725 MHz, 802.11n									
140.0	5700.00	Horn	V	PK	1 MHz	39.19	64.41	68.20	-3.79
140.0	5700.00	Horn	H	PK	1 MHz	35.03	60.25	68.20	-7.95

Bandwidth 40MHz

Channel	Freq. (MHz)	Rx Antenna Type	Rx Antenna POL.	Detector (MHz)	VBW	Reading (dBuV)	Corrected Band edge (dBuV/m)	Limit (dBuV/m)	Diff. To Limit (dB)
Centre at Band-Edge: 5150 MHz, 802.11n									
38.00	5190.0	Horn	V	PK	1 MHz	47.33	70.55	74.00	-3.45
38.00	5190.0	Horn	H	PK	1 MHz	37.08	60.30	74.00	-13.70
38.00	5190.0	Horn	V	AV	10 Hz	29.39	52.61	54.00	-1.39
38.00	5190.0	Horn	H	AV	10 Hz	24.36	47.58	54.00	-6.42

Channel	Freq. (MHz)	Rx Antenna Type	Rx Antenna POL.	Detector	VBW	Reading (dBuV)	Corrected Band edge (dBuV/m)	Limit (dBuV/m)	Diff. To Limit (dB)
Centre at Band-Edge: 5350 MHz, 802.11n									
62.00	5310.0	Horn	V	PK	1 MHz	43.71	67.67	74.00	-6.33
62.00	5310.0	Horn	H	PK	1 MHz	37.29	61.25	74.00	-12.75
62.00	5310.0	Horn	V	AV	10 Hz	26.04	50.00	54.00	-4.00
62.00	5310.0	Horn	H	AV	10 Hz	24.36	48.32	54.00	-5.68
Centre at Band-Edge: 5470 MHz, 802.11n									
102.00	5510.0	Horn	V	PK	1 MHz	45.38	70.21	74.00	-3.79
102.00	5510.0	Horn	H	PK	1 MHz	38.66	63.49	74.00	-10.51
102.00	5510.0	Horn	V	AV	10 Hz	27.46	52.29	54.00	-1.71
102.00	5510.0	Horn	H	AV	10 Hz	24.36	49.19	54.00	-4.81

See figures 3-9 to 3-22 for the plots of the 802.11n band-edge compliance.

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

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

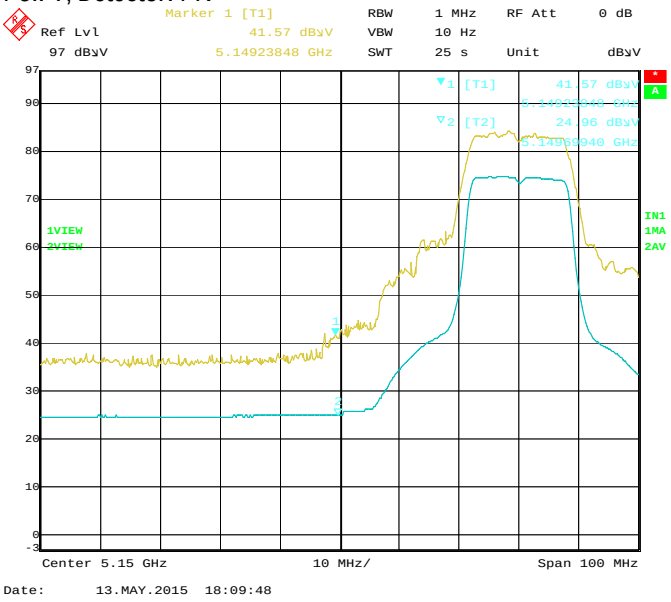


Figure 3-2: Band-Edge Compliance of RF Radiated Emission
802.11a, Ch. 36, 5180 MHz, Centre of Band-Edge: 5150 MHz
Pol: H, Detector: PK

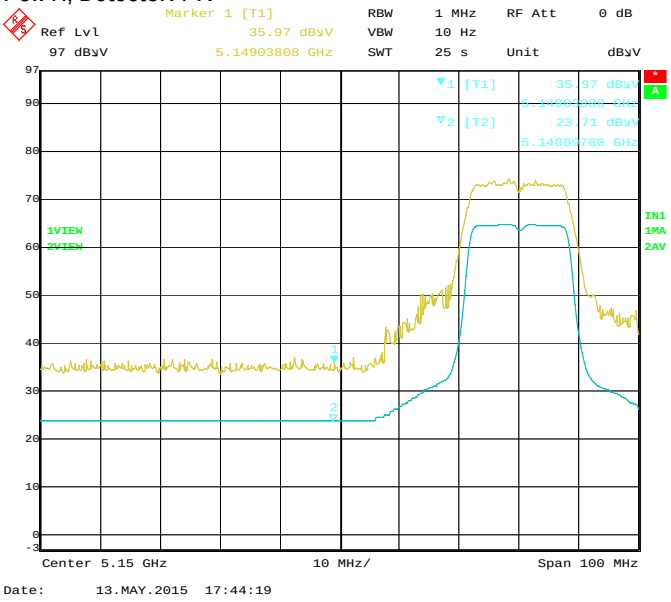


Figure 3-3: Band-Edge Compliance of RF Radiated Emission
802.11a, Ch. 64, 5320 MHz, Centre of Band-Edge: 5350 MHz
Pol: V, Detector: PK

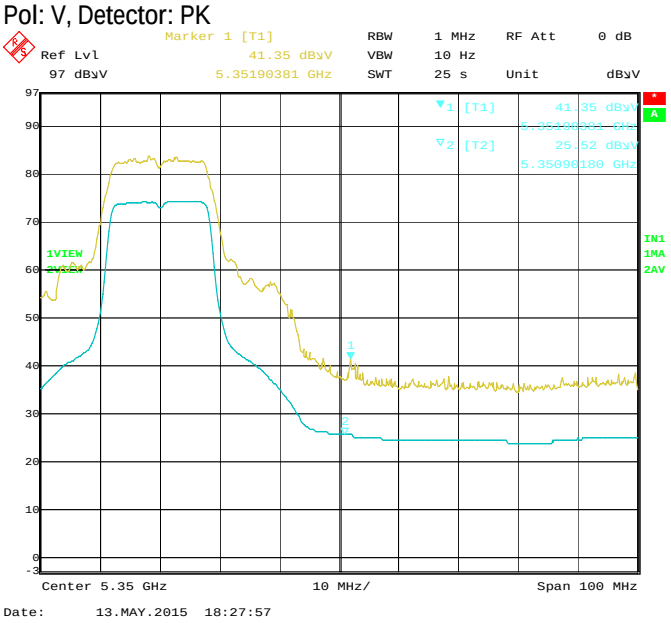
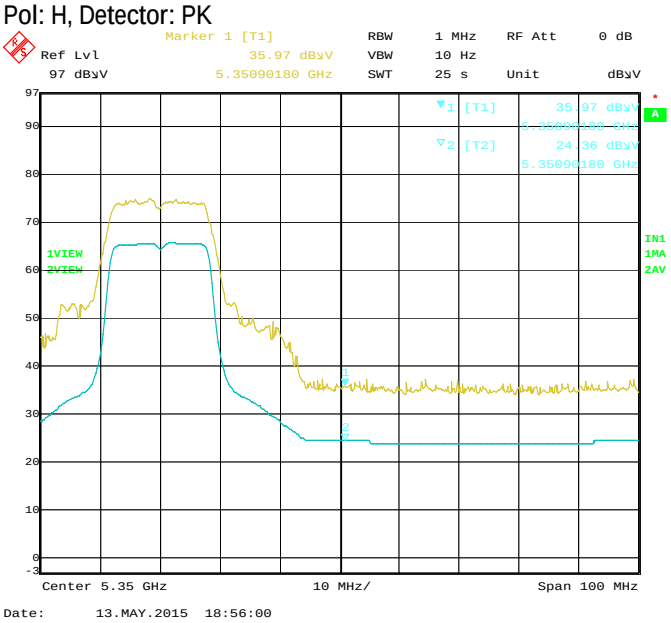


Figure 3-4: Band-Edge Compliance of RF Radiated Emission
802.11a, Ch. 64, 5320 MHz, Centre of Band-Edge: 5350 MHz
Pol: H, Detector: PK



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

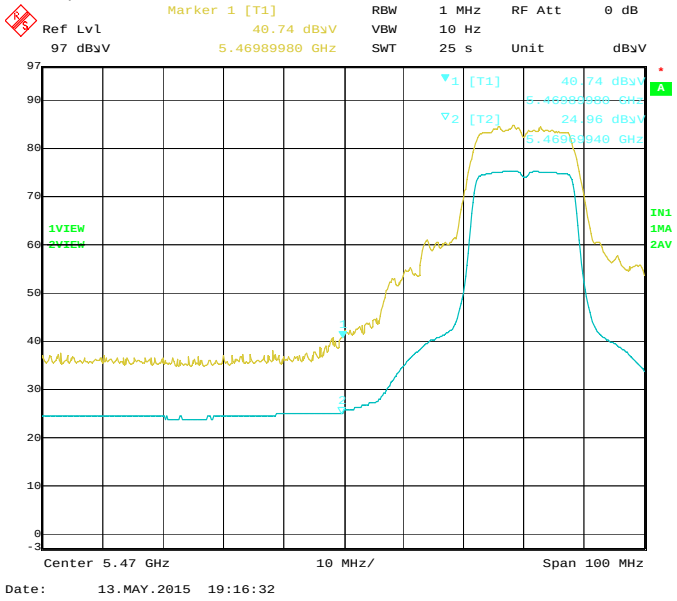


Figure 3-6: Band-Edge Compliance of RF Radiated Emission.
802.11a, Ch. 100, 5500 MHz, Centre of Band-Edge: 5460 MHz
Pol: H, Detector: PK

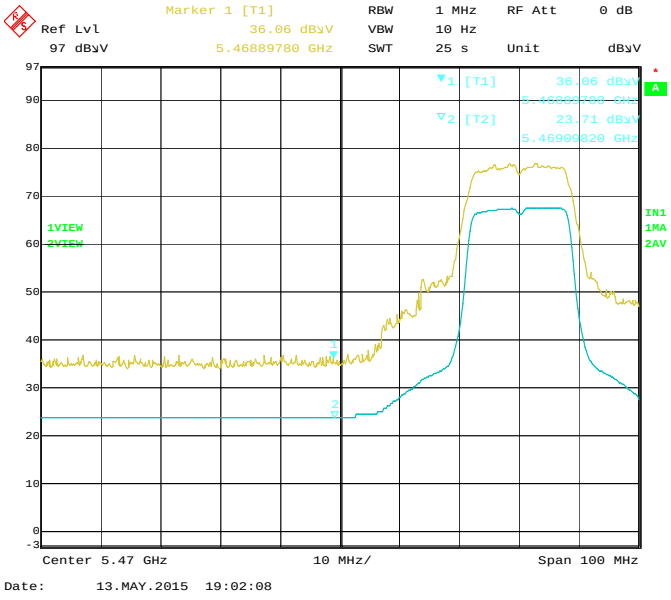


Figure 3-7: Band-Edge Compliance of RF Radiated Emission.
802.11a, Ch. 140, 5700 MHz, Centre of Band-Edge: 5725 MHz
Pol: V, Detector: PK

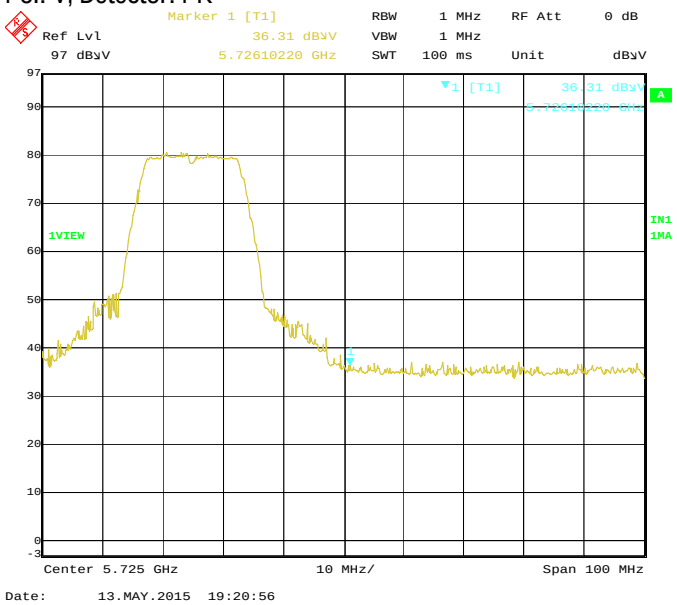
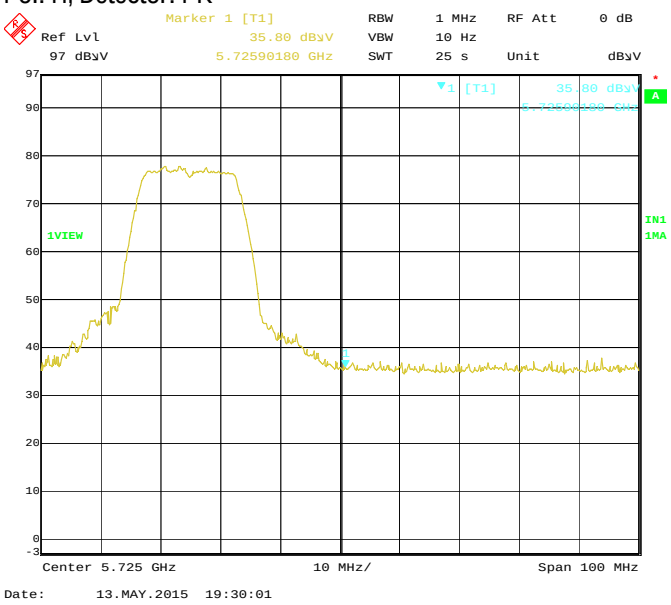


Figure 3-8: Band-Edge Compliance of RF Radiated Emission.
802.11a, Ch. 140, 5700 MHz, Centre of Band-Edge: 5725 MHz
Pol: H, Detector: PK



802.11n Band-Edge Compliance of RF Radiated Emissions
20 MHz Bandwidth

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

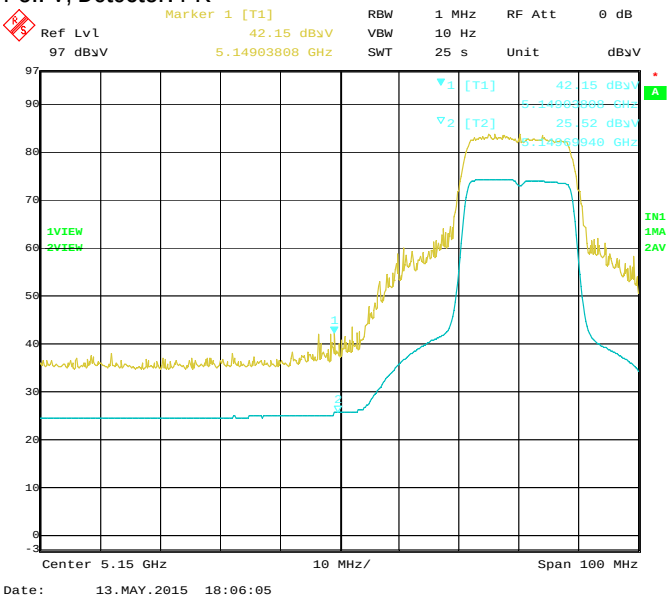


Figure 3-10: Band-Edge Compliance of RF Radiated Emission
802.11n, Ch. 36, 5180 MHz, Centre of Band-Edge: 5150 MHz
Pol: H, Detector: PK

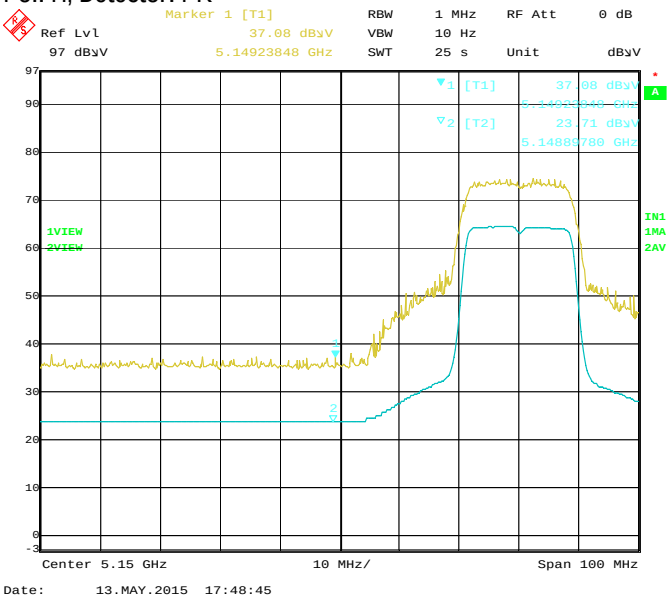


Figure 3-11: Band-Edge Compliance of RF Radiated Emission
802.11n, Ch. 64, 5320 MHz, Centre of Band-Edge: 5350 MHz
Pol: V, Detector: PK

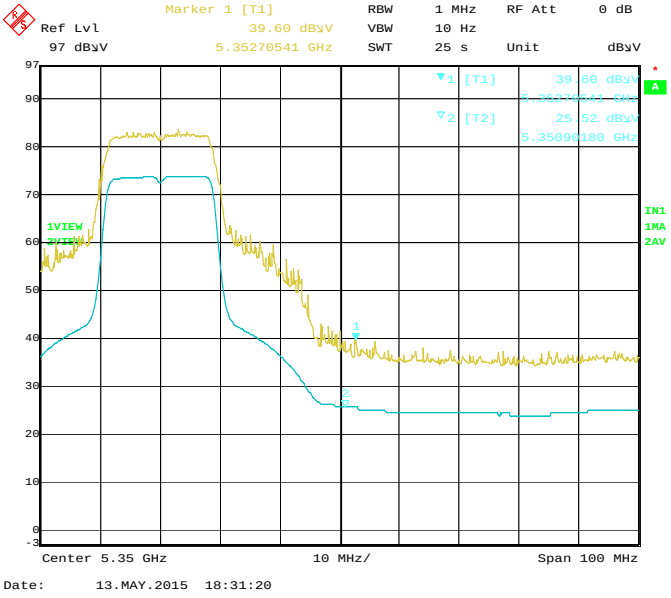
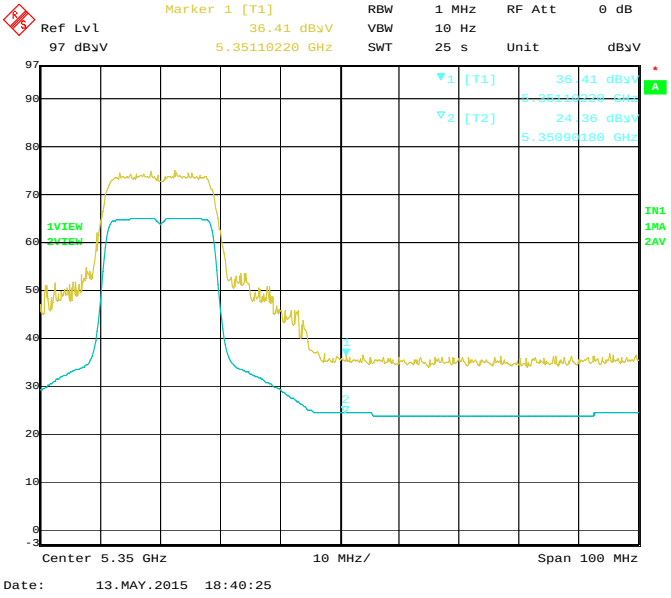


Figure 3-12: Band-Edge Compliance of RF Radiated Emission
802.11n Ch. 64, 5320 MHz, Centre of Band-Edge: 5350 MHz
Pol: H, Detector: PK



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

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

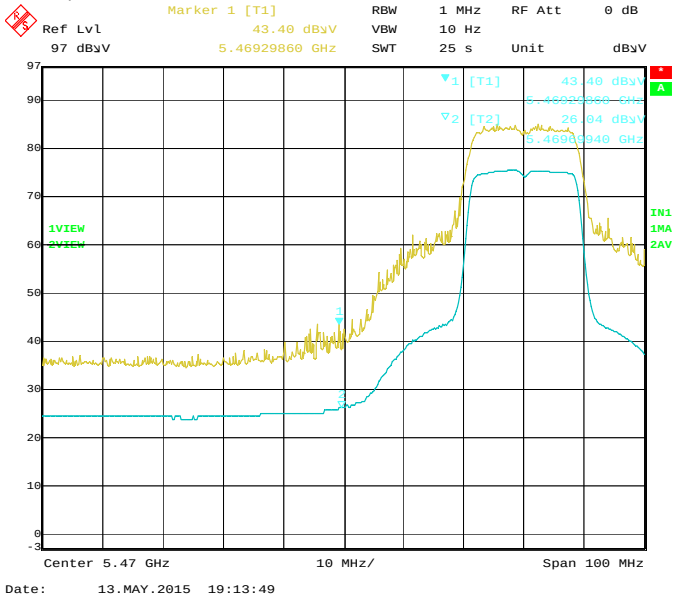


Figure 3-14: Band-Edge Compliance of RF Radiated Emission.
802.11n, Ch. 100, 5500 MHz, Centre of Band-Edge: 5460 MHz
Pol: H, Detector: PK

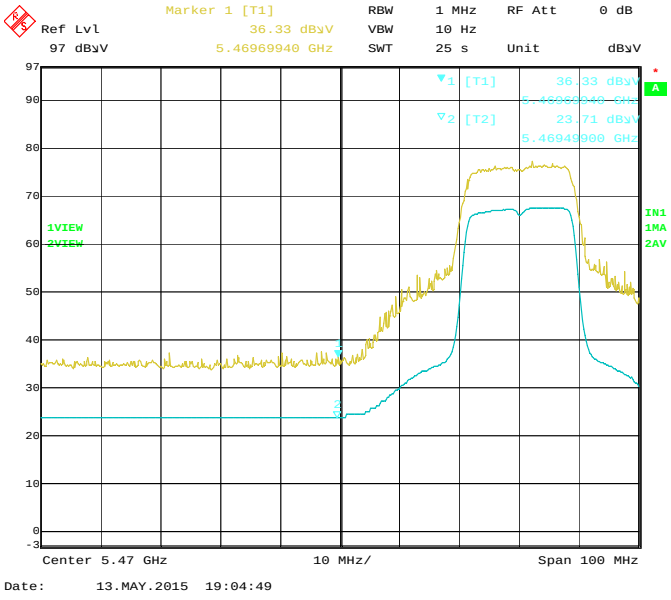


Figure 3-15: Band-Edge Compliance of RF Radiated Emission.
802.11n, Ch. 140, 5700 MHz, Centre of Band-Edge: 5725 MHz
Pol: V, Detector: PK

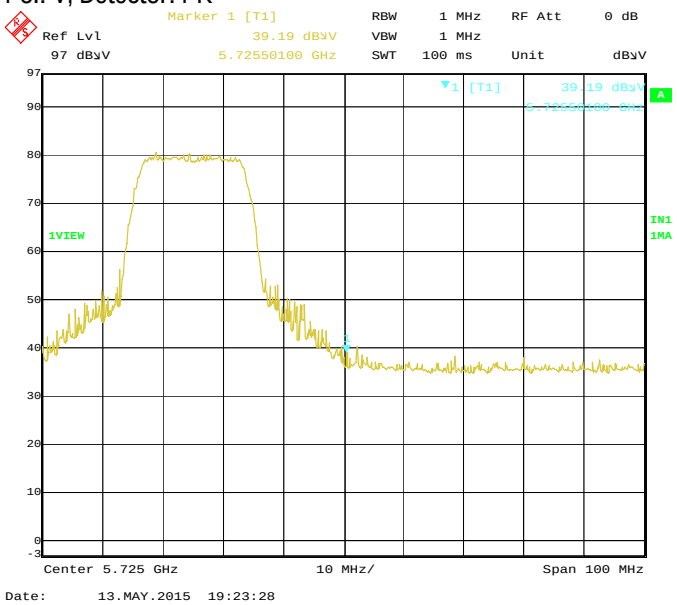
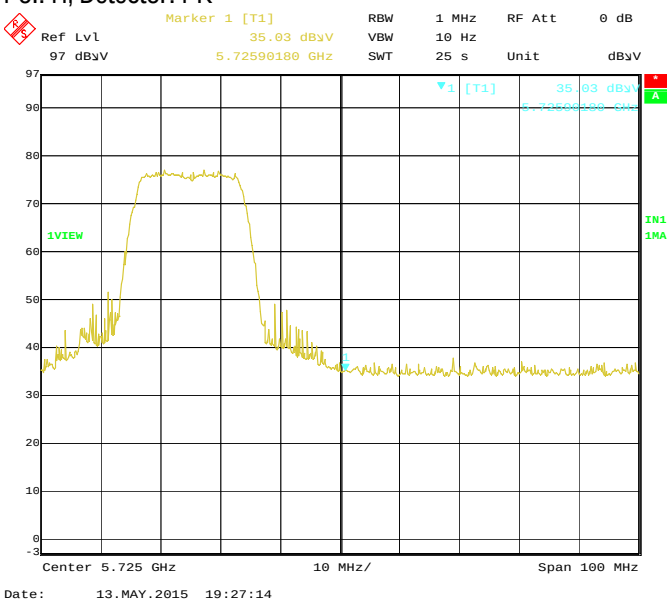


Figure 3-16: Band-Edge Compliance of RF Radiated Emission.
802.11n, Ch. 140, 5700 MHz, Centre of Band-Edge: 5725 MHz
Pol: H, Detector: PK



802.11n Band-Edge Compliance of RF Radiated Emissions
40 MHz Bandwidth

Figure 3-17: Band-Edge Compliance of RF Radiated Emission
802.11n, Ch. 38, 5190 MHz, Centre of Band-Edge: 5150 MHz
Pol: V, Detector: PK

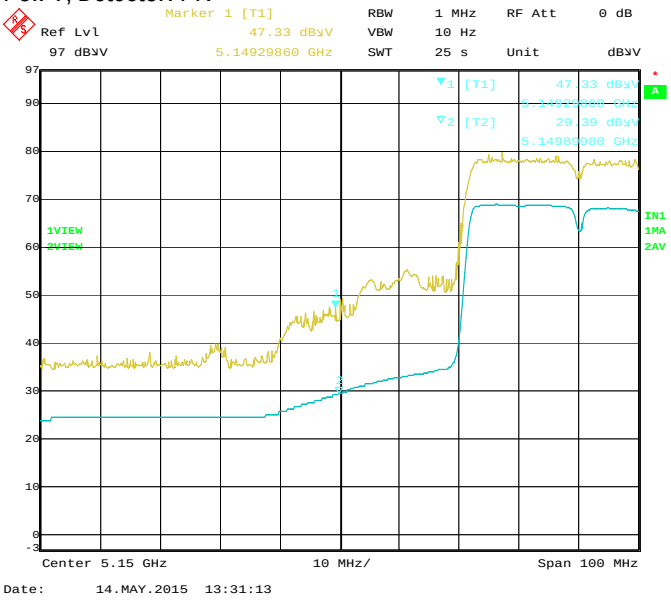


Figure 3-18: Band-Edge Compliance of RF Radiated Emission
802.11n, Ch. 38, 5190 MHz, Centre of Band-Edge: 5150 MHz
Pol: H, Detector: PK

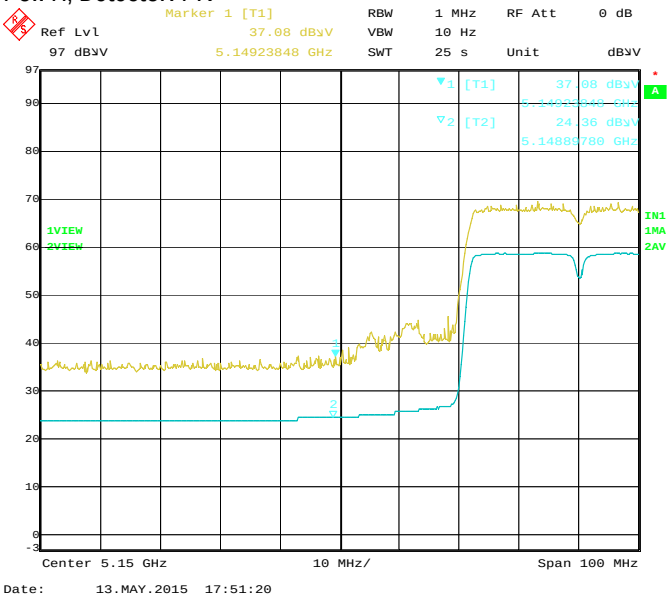


Figure 3-19 Band-Edge Compliance of RF Radiated Emission
802.11n, Ch. 62, 5310 MHz, Centre of Band-Edge: 5350 MHz
Pol: V, Detector: PK

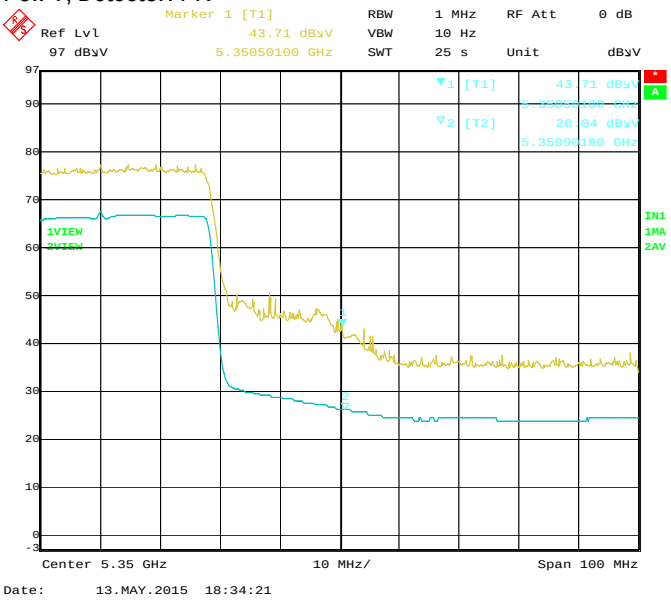
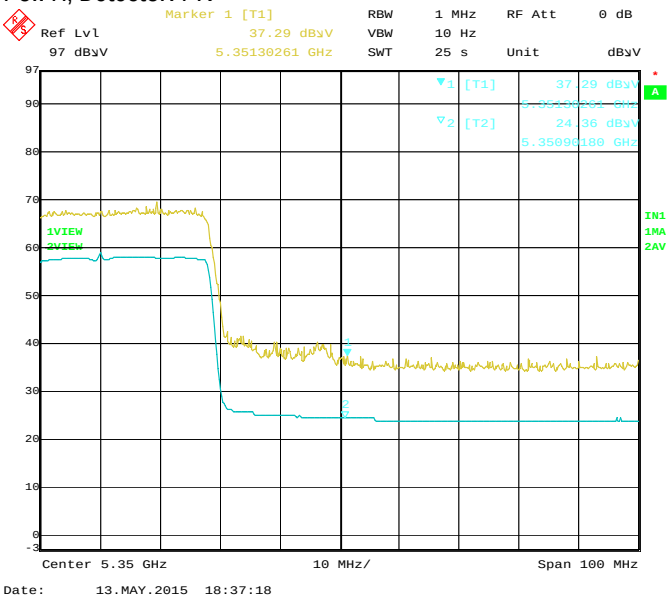


Figure 3-20: Band-Edge Compliance of RF Radiated Emission
802.11n Ch. 62, 5310 MHz, Centre of Band-Edge: 5350 MHz
Pol: H, Detector: PK



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

Figure 3-21: Band-Edge Compliance of RF Radiated Emission
802.11n, Ch. 102, 55100 MHz, Centre of Band-Edge: 5470 MHz
Pol: V, Detector: PK

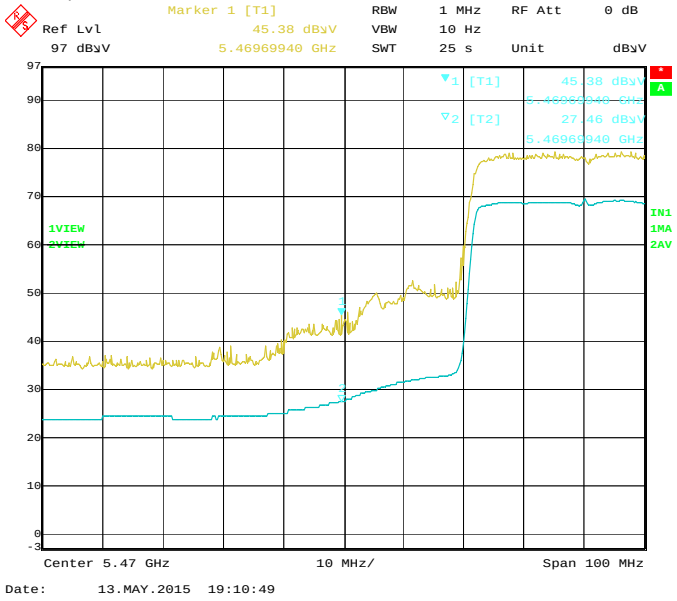
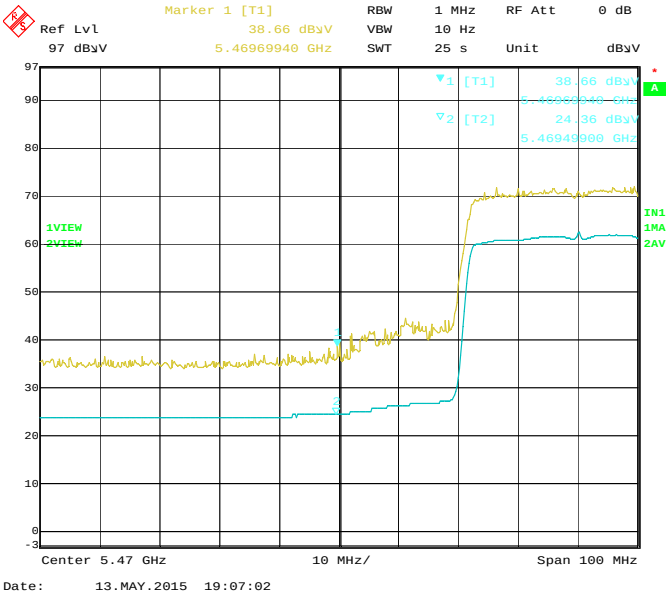


Figure 3-22: Band-Edge Compliance of RF Radiated Emission.
802.11n, Ch. 102, 5510 MHz, Centre of Band-Edge: 5470 MHz
Pol: H, Detector: PK



APPENDIX 4 – 802.11ac RADIATED EMISSIONS TEST DATA

Radiated Emissions Test Results
802.11ac Band

Date of Test: April 6, 2015
Measurements were performed by Savtej Sandhu

The environmental test conditions were: Temperature: 27.5 ºC
Relative Humidity: 13.7 %

The test distance was 3.0 meters with a EUT height of 1.5 meters, and sweep frequency of 30 MHz to 1 GHz.

The BlackBerry® smartphone was in volume key up position.

The frequency sweep measurements were performed in 802.11ac TX mode at 6 Mbps on channels 42, 58,106, and 155 bandwidth 80MHz.

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

Radiated Emissions Test Results
802.11ac Band

Date of Test: April 20 and 24, 2015
Measurements were performed by Winston Vernon.

The environmental test conditions were: Temperature: 25.1ºC
Relative Humidity: 36.5 %

The test distance was 3.0 meters with a EUT height of 1.5 meters, and sweep frequency of 1GHz to 40GHz.

The BlackBerry® smartphone was in horizontal position.

The frequency sweep measurements were performed in 802.11ac TX mode at 6 Mbps on channel 42, 58, 106, and 155 bandwidth 40 MHz and 80MHz.

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

802.11ac Band-Edge Compliance of RF Radiated Emissions

Date of Tests: May 13, 2015
Measurements performed by Shiva Kumbham.

The environmental test conditions were: Temperature: 24.2 ºC
Relative Humidity: 20.8 %

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

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

Bandwidth 20MHz

Channel	Freq. (MHz)	Rx Antenna Type	Rx Antenna POL.	Detector (MHz)	VBW for peak (dBuV/m)	Carrier Freq (dBuV/m)	Corrected Band edge (dBuV/m)	Limit (dBuV/m)	Diff. To Limit (dB)
Centre at Band-Edge: 5150 MHz, 802.11ac									
36.0	5180.00	Horn	V	PK	1 MHz	42.24	65.46	74.00	-8.54
36.0	5180.00	Horn	H	PK	1 MHz	35.85	59.07	74.00	-14.93
36.0	5180.00	Horn	V	AV	10 Hz	24.96	48.18	54.00	-5.82
36.0	5180.00	Horn	H	AV	10 Hz	23.71	46.93	54.00	-7.07
Centre at Band-Edge: 5350 MHz, 802.11ac									
64.0	5320.00	Horn	V	PK	1 MHz	41.10	65.06	74.00	-8.94
64.0	5320.00	Horn	H	PK	1 MHz	36.55	60.51	74.00	-13.49
64.0	5320.00	Horn	V	AV	10 Hz	25.52	49.48	54.00	-4.52
64.0	5320.00	Horn	H	AV	10 Hz	24.36	48.32	54.00	-5.68

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

Bandwidth 20MHz

Channel	Freq. (MHz)	Rx Antenna Type	Rx Antenna POL.	Detector (MHz)	VBW	Reading (dBuV)	Corrected Band edge (dBuV/m)	Limit (dBuV/m)	Diff. To Limit (dB)
Centre at Band-Edge: 5470 MHz, 802.11ac									
100	5500	Horn	V	PK	1 MHz	42.52	67.35	74.00	-6.65
100	5500	Horn	H	PK	1 MHz	37.75	62.58	74.00	-11.42
100	5500	Horn	V	AV	10 Hz	26.54	51.37	54.00	-2.63
100	5500	Horn	H	AV	10 Hz	24.96	49.79	54.00	-4.21
Centre at Band-Edge: 5725 MHz, 802.11ac									
140	5700	Horn	V	PK	1 MHz	38.39	63.61	68.20	-4.59
140	5700	Horn	H	PK	1 MHz	37.27	62.49	68.20	-5.71

Bandwidth 40MHz

Channel	Freq. (MHz)	Rx Antenna Type	Rx Antenna POL.	Detector (MHz)	VBW	Reading (dBuV)	Corrected Band edge (dBuV/m)	Limit (dBuV/m)	Diff. To Limit (dB)
Centre at Band-Edge: 5150 MHz, 802.11ac									
38.0	5190.00	Horn	V	PK	1 MHz	45.32	68.54	74.00	-5.46
38.0	5190.00	Horn	H	PK	1 MHz	37.27	60.49	74.00	-13.51
38.0	5190.00	Horn	V	AV	10 Hz	27.46	50.68	54.00	-3.32
38.0	5190.00	Horn	H	AV	10 Hz	24.36	47.58	54.00	-6.42
Centre at Band-Edge: 5350 MHz, 802.11ac									
62.0	5310.00	Horn	V	PK	1 MHz	39.07	63.03	74.00	-10.97
62.0	5310.00	Horn	H	PK	1 MHz	36.22	60.18	74.00	-13.82
62.0	5310.00	Horn	V	AV	10 Hz	26.04	50.00	54.00	-4.00
62.0	5310.00	Horn	H	AV	10 Hz	24.36	48.32	54.00	-5.68

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

Bandwidth 40MHz

Channel	Freq. (MHz)	Rx Antenna Type	Rx Antenna POL.	Detector (MHz)	VBW	Reading (dBuV)	Corrected Band edge (dBuV/m)	Limit (dBuV/m)	Diff. To Limit (dB)
Centre at Band-Edge: 5470 MHz, 802.11ac									
102.0	5510.0	Horn	V	PK	1 MHz	44.23	69.06	74.00	-4.94
102.0	5510.0	Horn	H	PK	1 MHz	40.52	65.35	74.00	-8.65
102.0	5510.0	Horn	V	AV	10 Hz	27.01	51.84	54.00	-2.16
102.0	5510.0	Horn	H	AV	10 Hz	26.04	50.87	54.00	-3.13

Bandwidth 80MHz

Channel	Freq. (MHz)	Rx Antenna Type	Rx Antenna POL.	Detector (MHz)	VBW	Reading (dBuV)	Corrected Band edge (dBuV/m)	Limit (dBuV/m)	Diff. To Limit (dB)
Centre at Band-Edge: 5150 MHz, 802.11ac									
42.0	5210.00	Horn	V	PK	1 MHz	38.76	61.98	74.00	-12.02
42.0	5210.00	Horn	H	PK	1 MHz	34.94	58.16	74.00	-15.84
42.0	5210.00	Horn	V	AV	10 Hz	24.96	48.18	54.00	-5.82
42.0	5210.00	Horn	H	AV	10 Hz	23.71	46.93	54.00	-7.07
Centre at Band-Edge: 5350 MHz, 802.11ac									
58.0	5290.00	Horn	V	PK	1 MHz	37.26	61.22	74.00	-12.78
58.0	5290.00	Horn	H	PK	1 MHz	36.38	60.34	74.00	-13.66
58.0	5290.00	Horn	V	AV	10 Hz	24.96	48.92	54.00	-5.08
58.0	5290.00	Horn	H	AV	10 Hz	24.36	48.32	54.00	-5.68
Centre at Band-Edge: 5470 MHz, 802.11ac									
106.0	5530.0	Horn	V	PK	1 MHz	38.34	63.17	74.00	-10.83
106.0	5530.0	Horn	H	PK	1 MHz	36.86	61.69	74.00	-12.31
106.0	5530.0	Horn	V	AV	10 Hz	24.96	49.79	54.00	-4.21
106.0	5530.0	Horn	H	AV	10 Hz	24.36	49.19	54.00	-4.81

See figures 4-1 to 4-20 for the plots of the 802.11ac band-edge compliance.

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

Bandwidth 20MHz

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

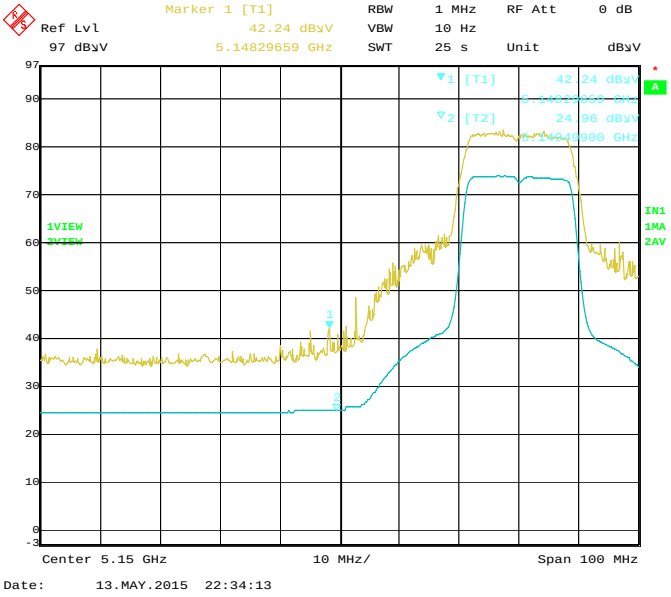


Figure 4-2: Band-Edge Compliance of RF Radiated Emission
802.11ac, Ch. 36, 5180 MHz, Centre of Band-Edge: 5150 MHz
Pol: H, Detector: PK

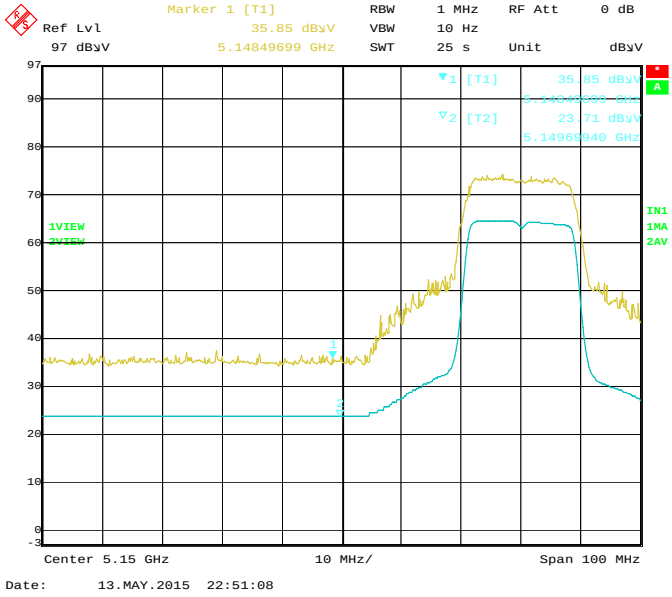


Figure 4-3: Band-Edge Compliance of RF Radiated Emission
802.11ac, Ch. 64, 5320 MHz, Centre of Band-Edge: 5350 MHz
Pol: V, Detector: PK

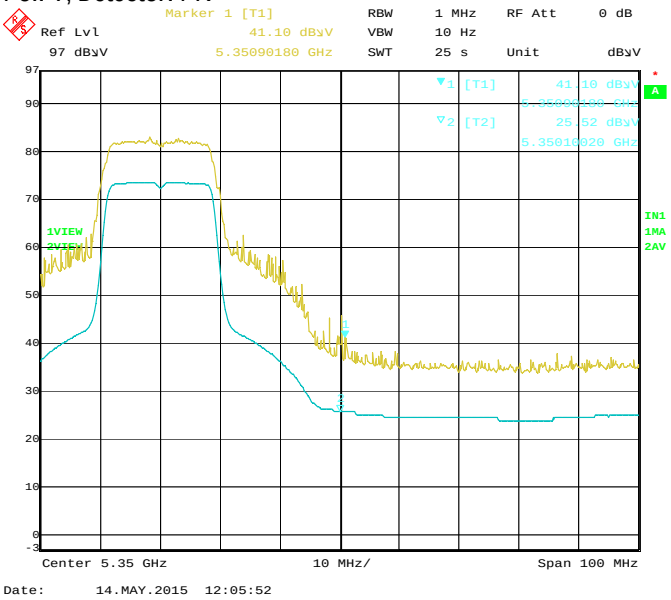
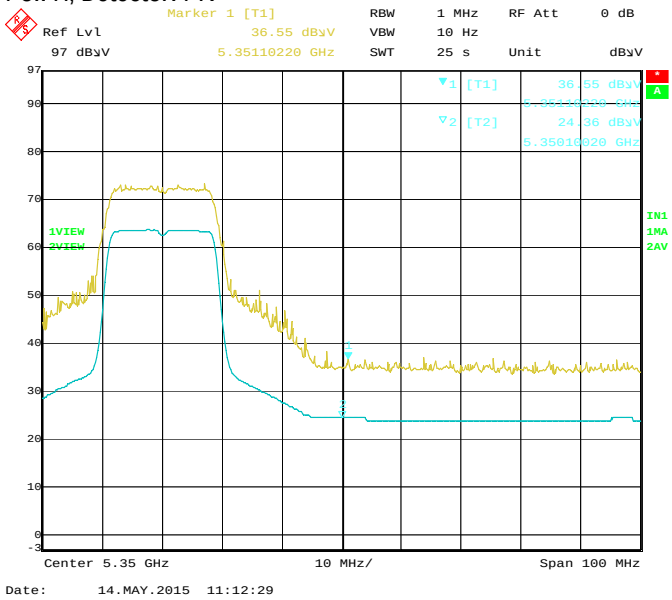


Figure 4-4: Band-Edge Compliance of RF Radiated Emission
802.11ac, Ch. 64, 5320 MHz, Centre of Band-Edge: 5350 MHz
Pol: H, Detector: PK



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

Bandwidth 20MHz

Figure 4-5: Band-Edge Compliance of RF Radiated Emission 802.11ac, Ch. 100, 5500 MHz, Centre of Band-Edge: 5470 MHz Pol: V, Detector: PK

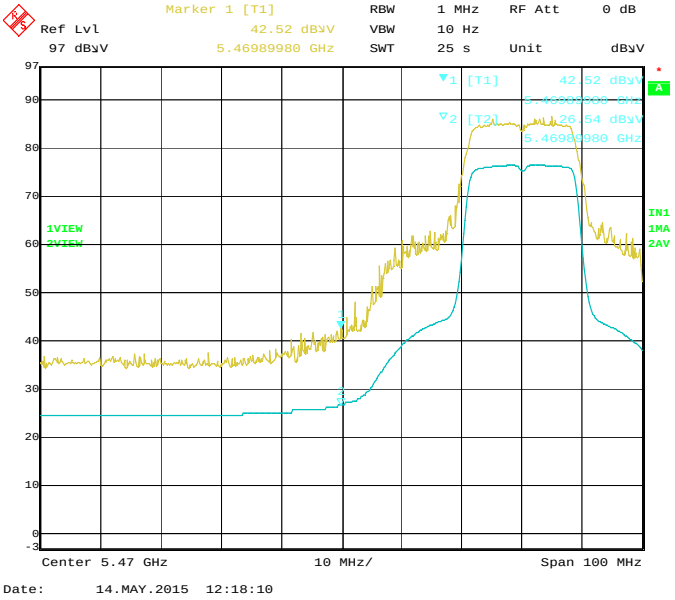


Figure 4-6: Band-Edge Compliance of RF Radiated Emission. 802.11ac, Ch. 100, 5500 MHz, Centre of Band-Edge: 5470 MHz Pol: H, Detector: PK

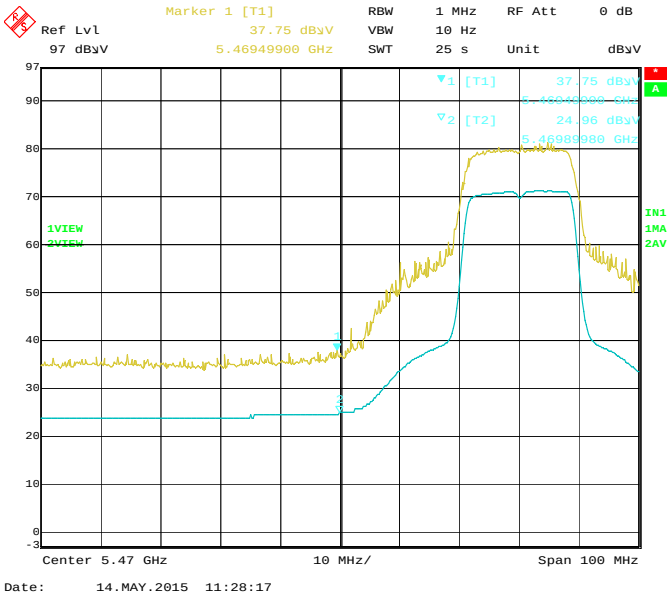


Figure 4-7: Band-Edge Compliance of RF Radiated Emission. 802.11ac, Ch. 140, 5700 MHz, Centre of Band-Edge: 5725 MHz Pol: V, Detector: PK

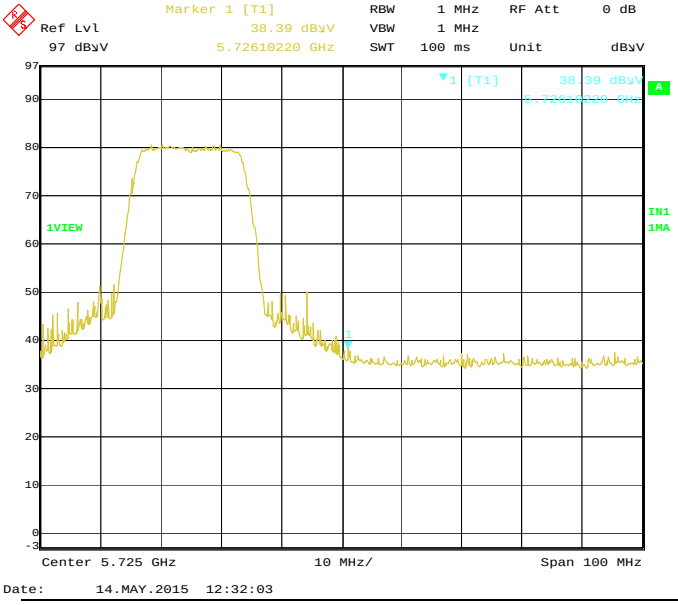
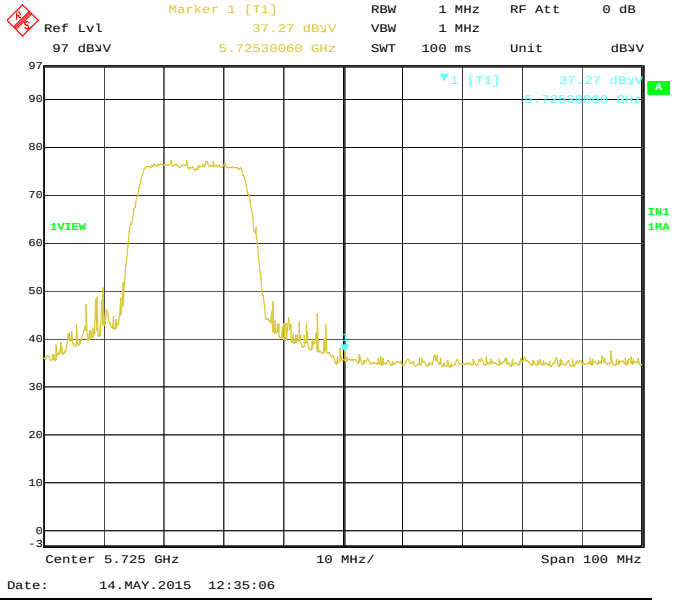


Figure 4-8: Band-Edge Compliance of RF Radiated Emission. 802.11ac, Ch. 140, 5700 MHz, Centre of Band-Edge: 5725 MHz Pol: H, Detector: PK



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

Bandwidth 40MHz

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

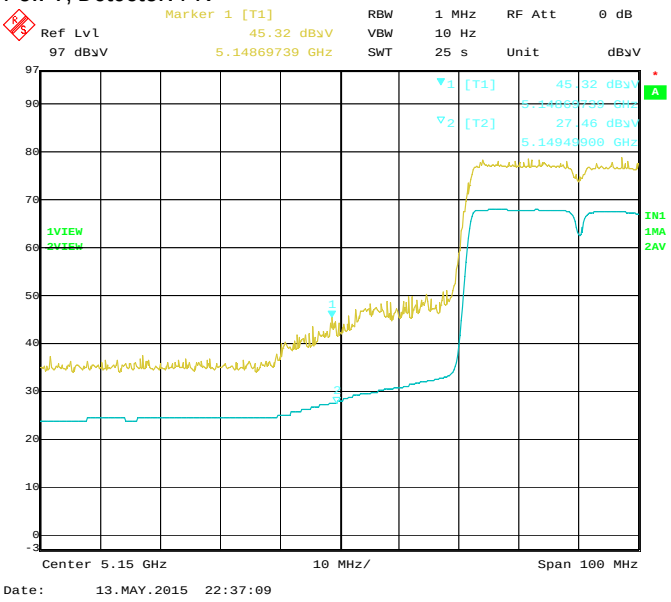


Figure 4-10: Band-Edge Compliance of RF Radiated Emission 802.11ac, Ch. 38, 5190 MHz, Centre of Band-Edge: 5150 MHz Pol: H, Detector: PK

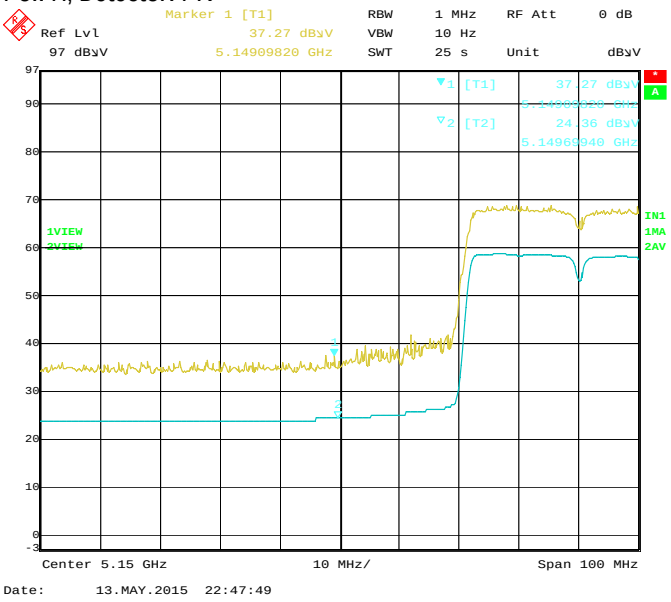


Figure 4-11: Band-Edge Compliance of RF Radiated Emission 802.11ac, Ch. 62, 5310 MHz, Centre of Band-Edge: 5350 MHz Pol: V, Detector: PK

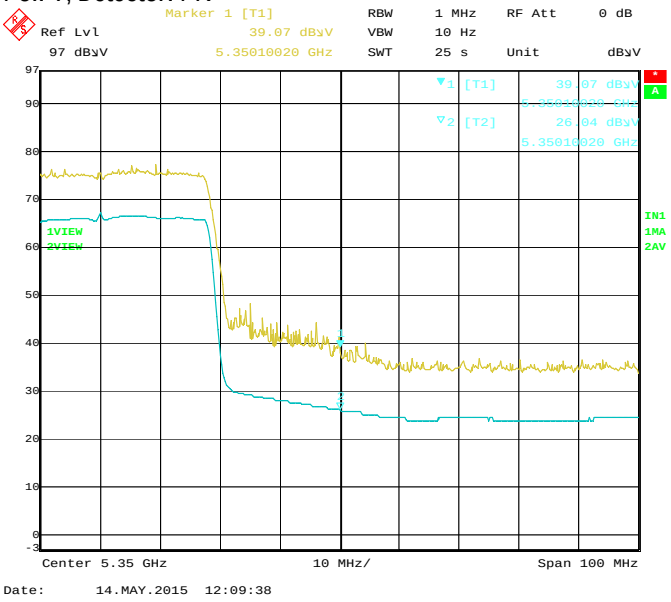
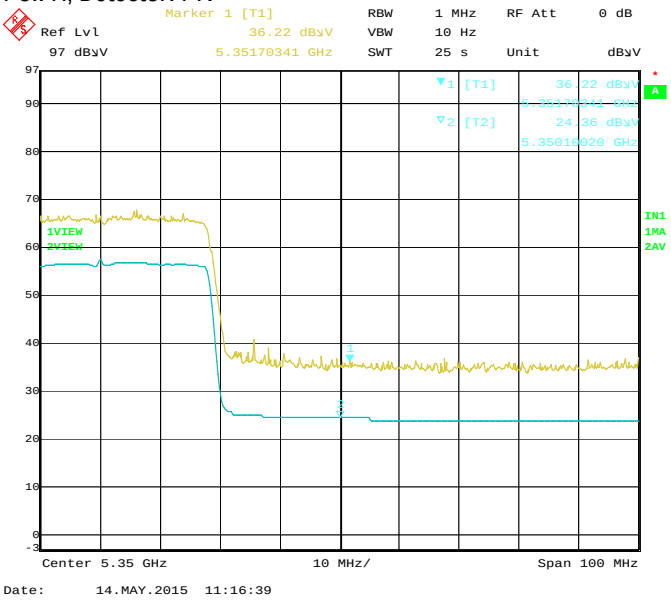


Figure 4-12: Band-Edge Compliance of RF Radiated Emission 802.11ac, Ch. 62, 5310 MHz, Centre of Band-Edge: 5350 MHz Pol: H, Detector: PK



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

Bandwidth 40MHz

Figure 4-13: Band-Edge Compliance of RF Radiated Emission
802.11ac, Ch. 102, 5510 MHz, Centre of Band-Edge: 5470 MHz
Pol: V, Detector: PK

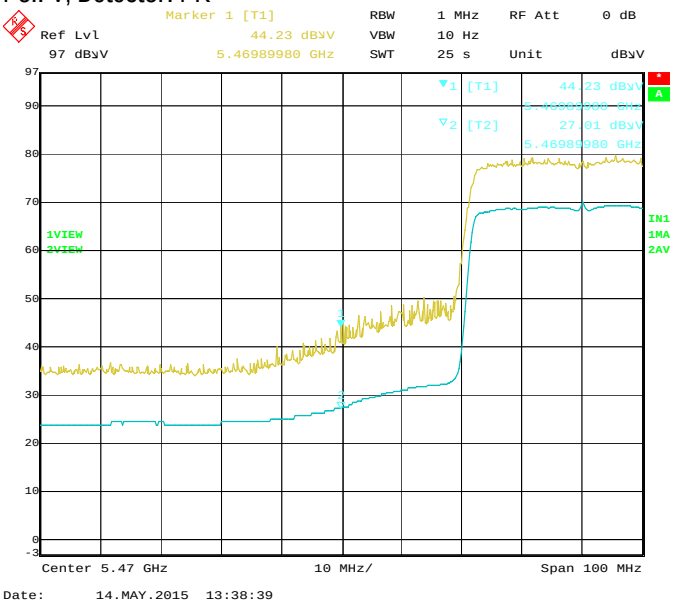
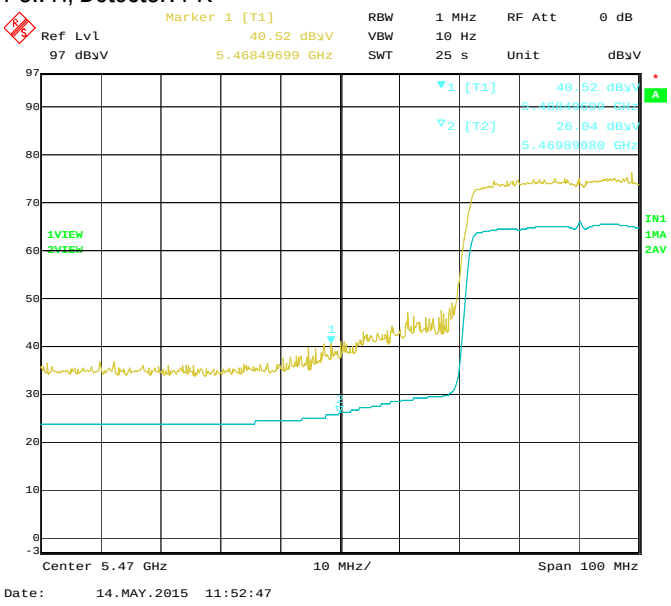


Figure 4-14: Band-Edge Compliance of RF Radiated Emission.
802.11ac, Ch. 102, 5510 MHz, Centre of Band-Edge: 5470 MHz
Pol: H, Detector: PK



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

Bandwidth 80MHz

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

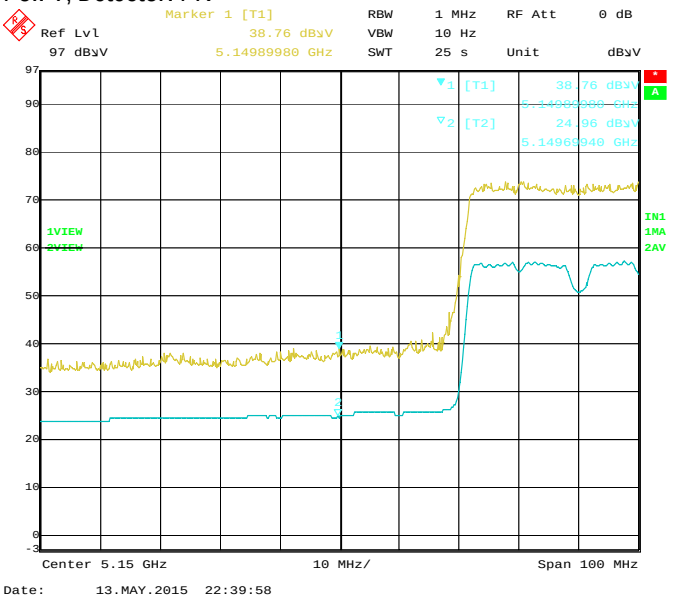


Figure 4-16: Band-Edge Compliance of RF Radiated Emission 802.11ac, Ch. 42, 5210 MHz, Centre of Band-Edge: 5150 MHz Pol: H, Detector: PK

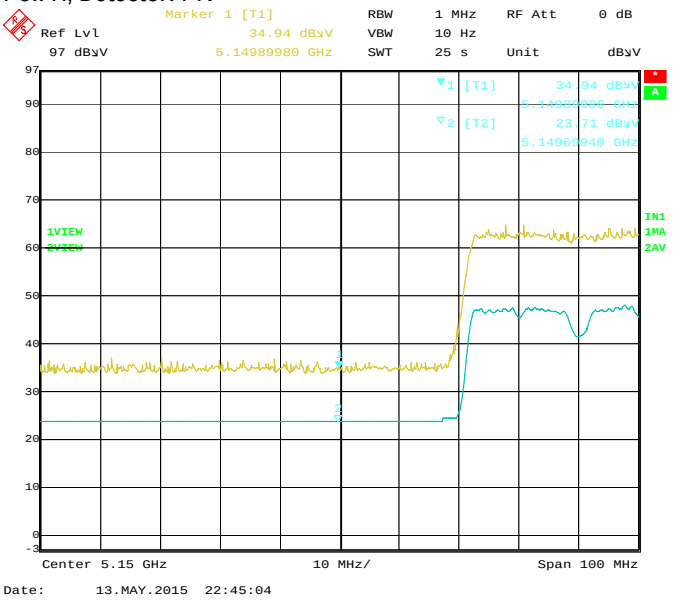


Figure 4-17: Band-Edge Compliance of RF Radiated Emission 802.11ac, Ch. 58, 5290 MHz, Centre of Band-Edge: 5350 MHz Pol: V, Detector: PK

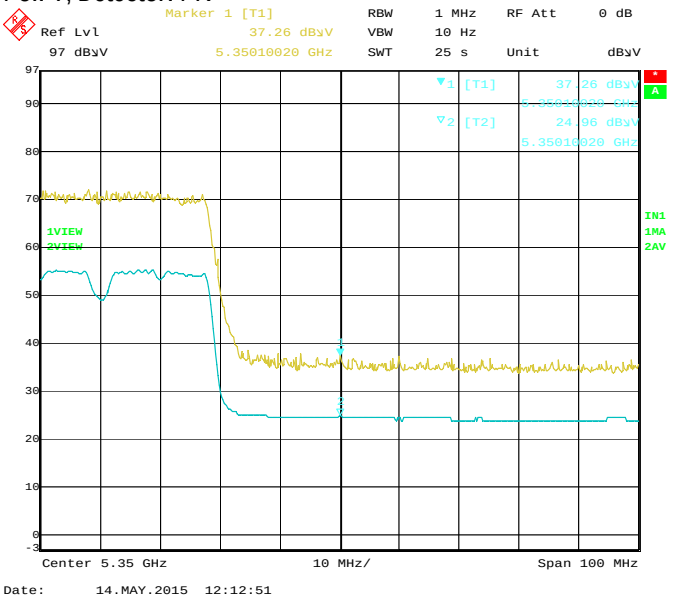
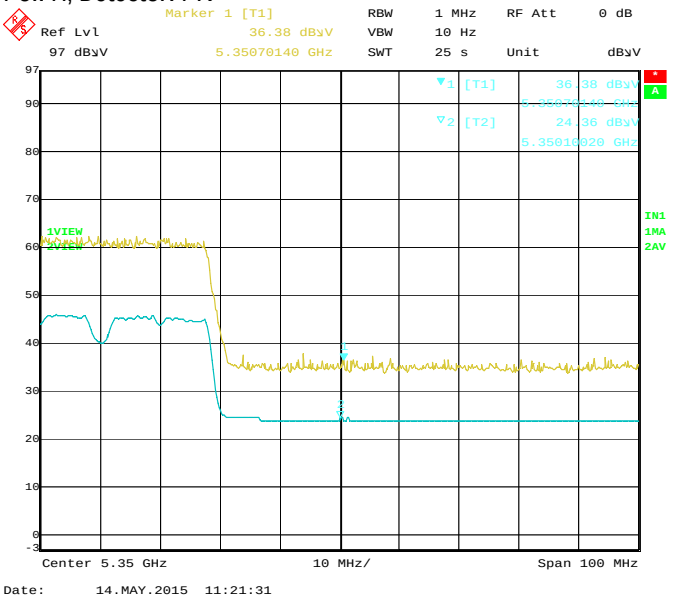


Figure 4-18: Band-Edge Compliance of RF Radiated Emission 802.11ac, Ch. 58, 5290 MHz, Centre of Band-Edge: 5350 MHz Pol: H, Detector: PK



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

Bandwidth 40MHz

Figure 4-19: Band-Edge Compliance of RF Radiated Emission
802.11ac, Ch. 106, 5530 MHz, Centre of Band-Edge: 5470 MHz
Pol: V, Detector: PK

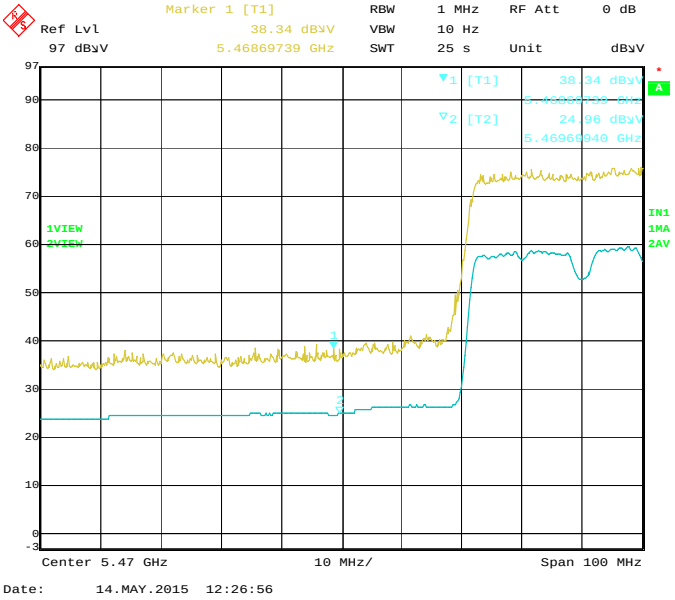
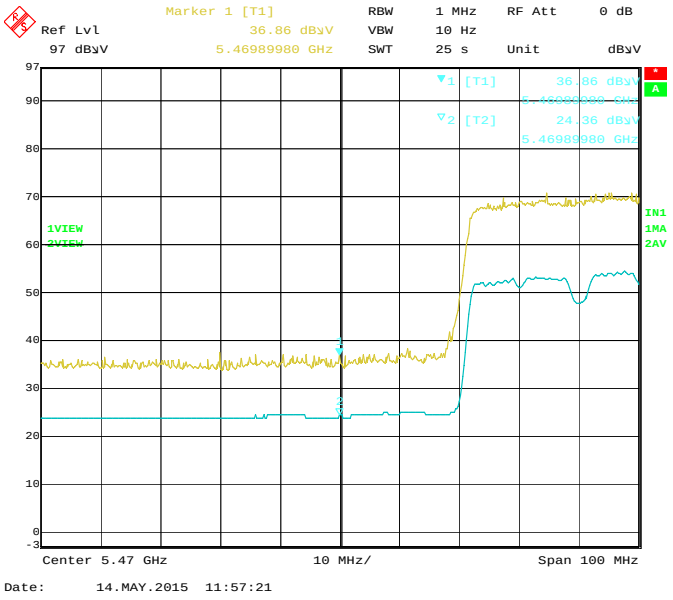


Figure 4-20: Band-Edge Compliance of RF Radiated Emission.
802.11ac, Ch. 106, 5530 MHz, Centre of Band-Edge: 5470 MHz
Pol: H, Detector: PK



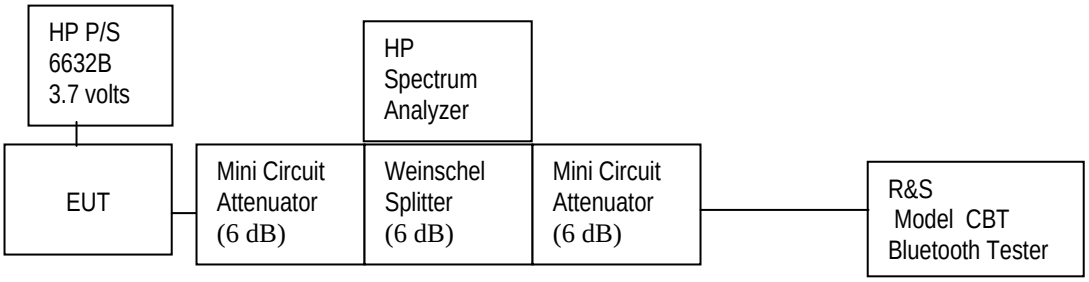
APPENDIX 5 – BLUETOOTH AND BLUETOOTH LOW ENERGY CONDUCTED EMISSIONS TEST DATA/PLOTS

Bluetooth RF Conducted Emission Test Results

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

Date of test: April 27, 2015

Test Setup Diagram



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

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

The environmental test conditions were: Temperature: 24.7 ºC
Relative Humidity: 41.0 %

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	0.926
39	≤1.0	**0.930**
78	≤1.0	0.928

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

Figure 5-1: 20 dB Bandwidth
Single freq. CH 0 Static PBRS, DH5

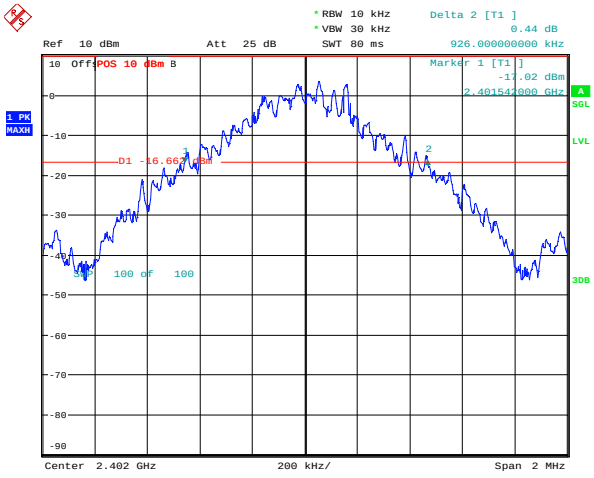
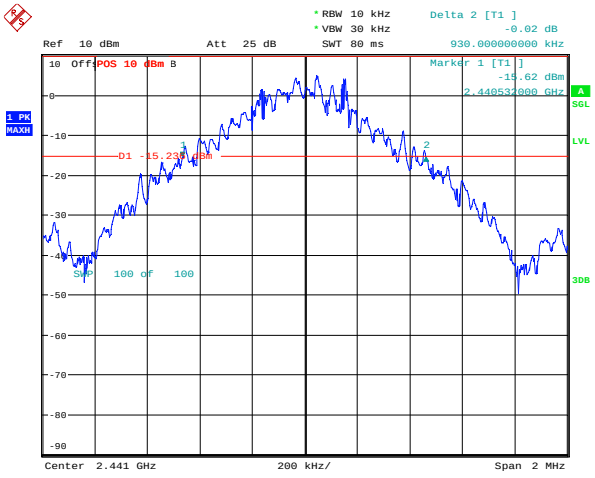


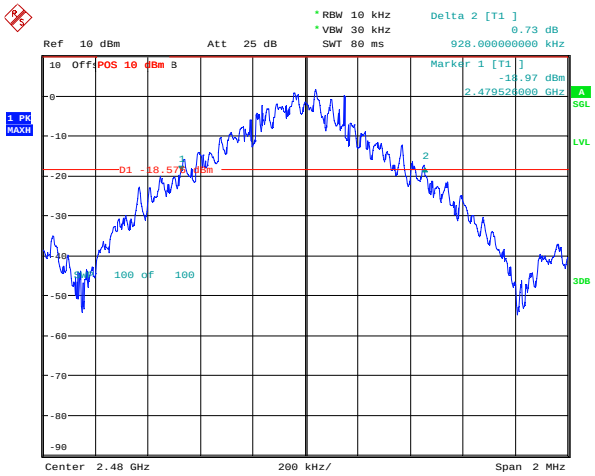
Figure 5-2: 20 dB Bandwidth
Single freq. CH 39 Static PBRS, DH5



Bluetooth RF Conducted Emission Test Results cont'd

Figure 5-3: 20 dB Bandwidth

Single freq. CH 78 Static PBRS, DH5



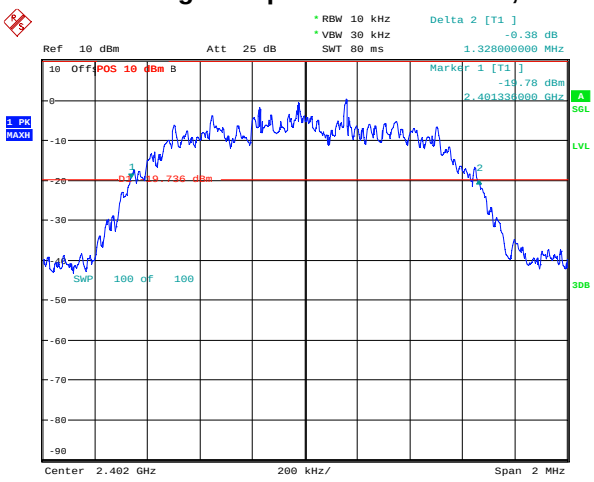
Using Pattern type "Static PBRS" and packet type "2-DH5" during the measurements.

Bluetooth Channel	Limit (MHz)	Measured Level (MHz)
0	≤1.5	1.328
39	≤1.5	1.322
78	≤1.5	1.322

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

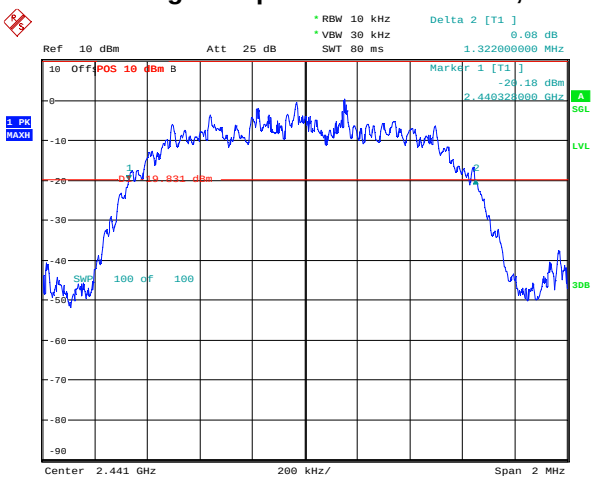
Bluetooth RF Conducted Emission Test Results cont'd

Figure 5-4: 20 dB Bandwidth
Single freq. CH 0 Static PBRS, 2-DH5



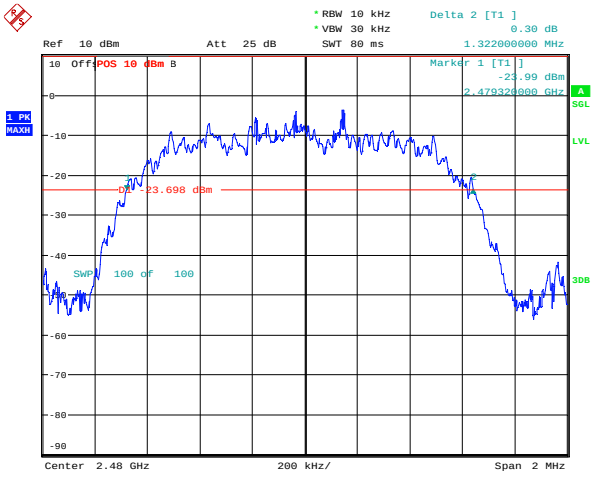
Date: 28.APR.2015 11:31:53

Figure 5-5: 20 dB Bandwidth
Single freq. CH 39 Static PBRS, 2-DH5



Date: 28.APR.2015 11:32:07

Figure 5-6: 20 dB Bandwidth
Single freq. CH 78 Static PBRS, 2-DH5



Date: 28.APR.2015 11:32:21

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

Bluetooth Channel	Limit (MHz)	Measured Level (MHz)
0	≤1.5	**1.338**
39	≤1.5	**1.338**
78	≤1.5	**1.338**

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

Figure 5-7: 20 dB Bandwidth
Single freq. CH 0 Static PBRS, 3-DH5

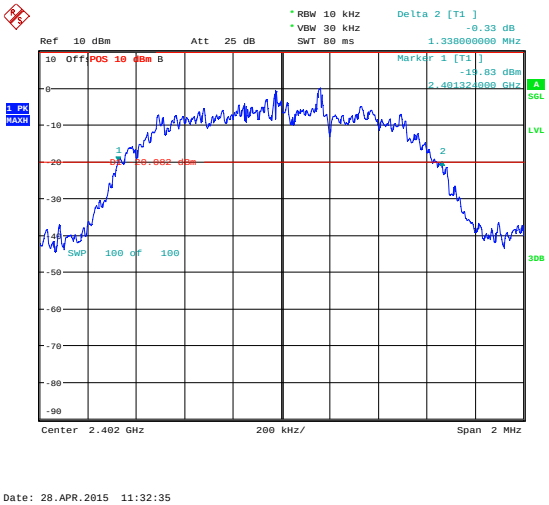


Figure 5-8: 20 dB Bandwidth
Single freq. CH 39 Static PBRS, 3-DH5

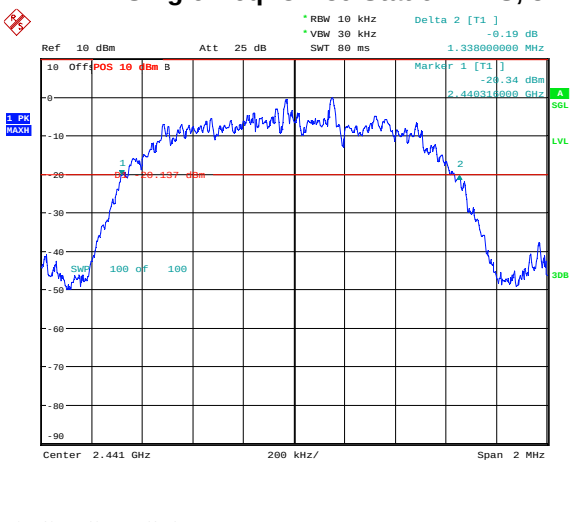
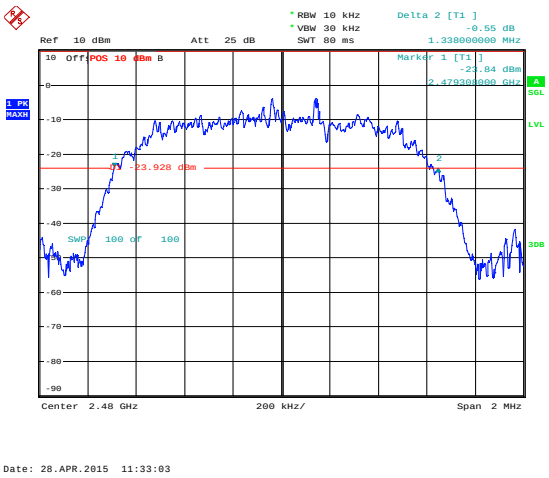


Figure 5-9: 20 dB Bandwidth
Single freq. CH 78 Static PBRS, 3-DH5



Bluetooth RF Conducted Emission Test Results cont'd

Carrier Frequency Separation

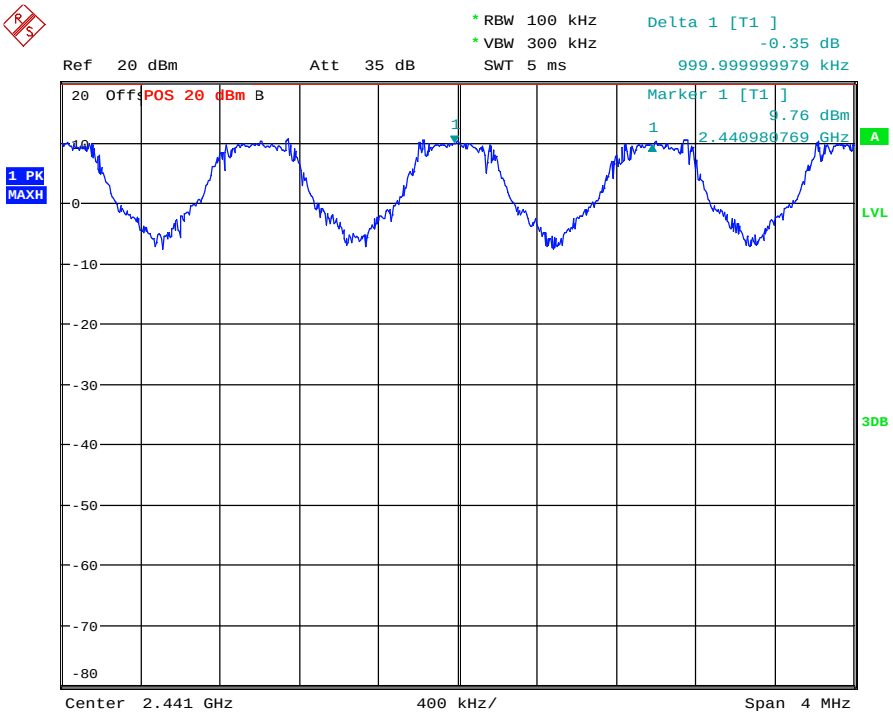
The EUT met the requirements of the Carrier Frequency Separation as per 47 CFR 15.247(a) and RSS-210. Channel 38 to 39 was measured. Bluetooth was operating in frequency hopping (Euro/US) mode.

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

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

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

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



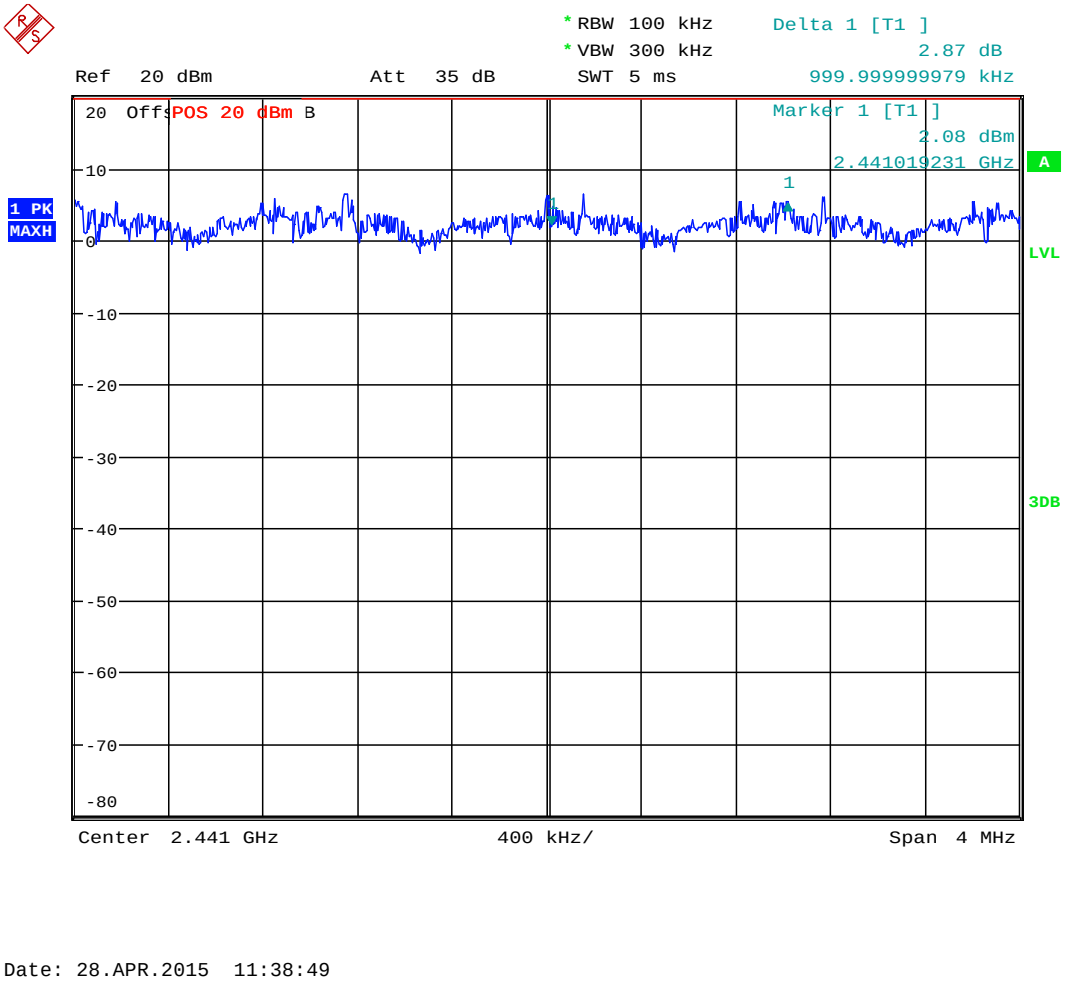
Bluetooth RF Conducted Emission Test Results cont'd

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

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

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

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



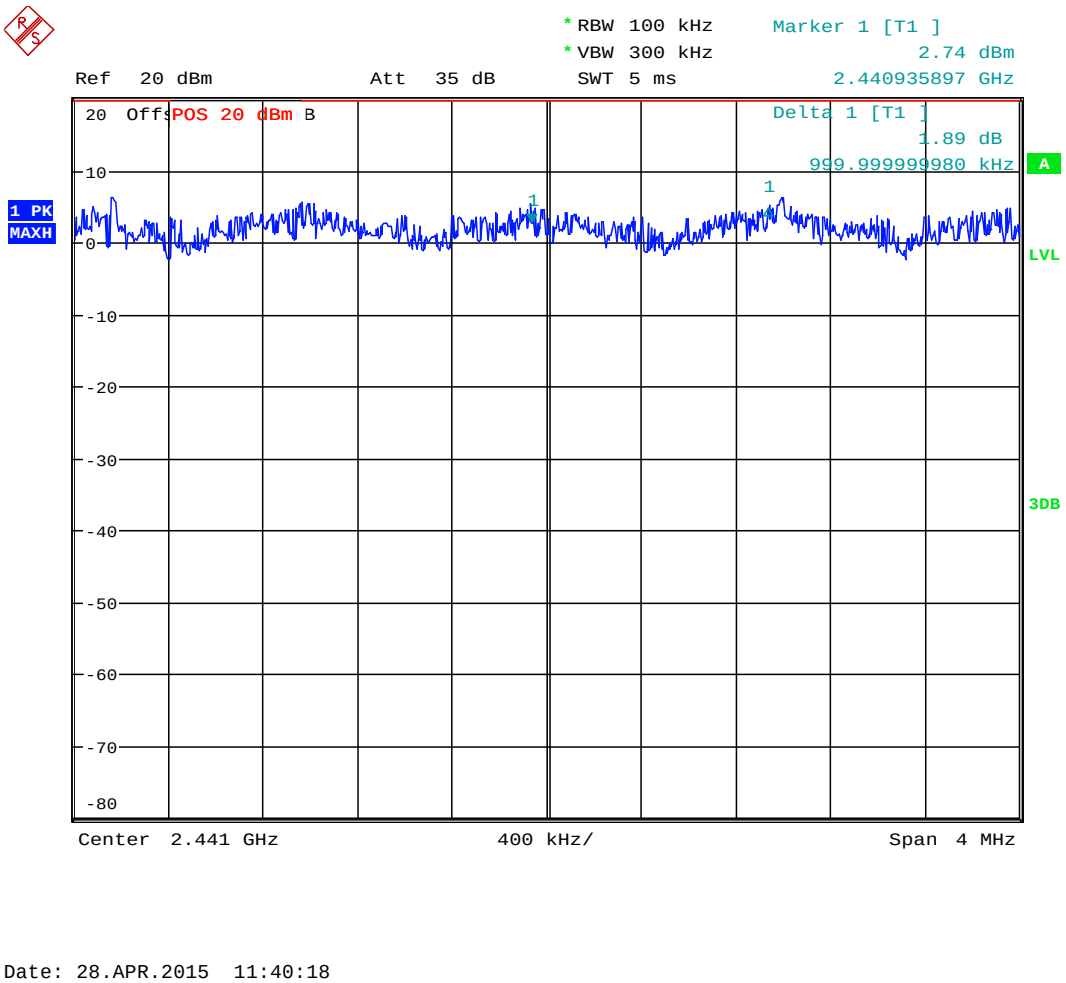
Bluetooth RF Conducted Emission Test Results cont'd

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

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

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

Figure 5-12: Carrier Frequency Separation, Freq. Hopping, Static PBRS, 3-DH5, Channels 38 to 39



Bluetooth RF Conducted Emission Test Results cont'd

Number of Hopping Frequencies

The EUT met the requirements of the number of hopping frequencies as per 47 CFR 15.247(a) and RSS-210. Bluetooth was operating in frequency hopping (Euro/US) mode.

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

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

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

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

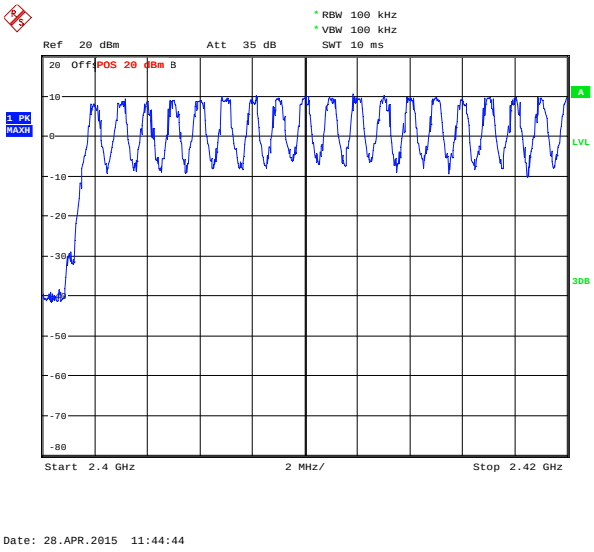
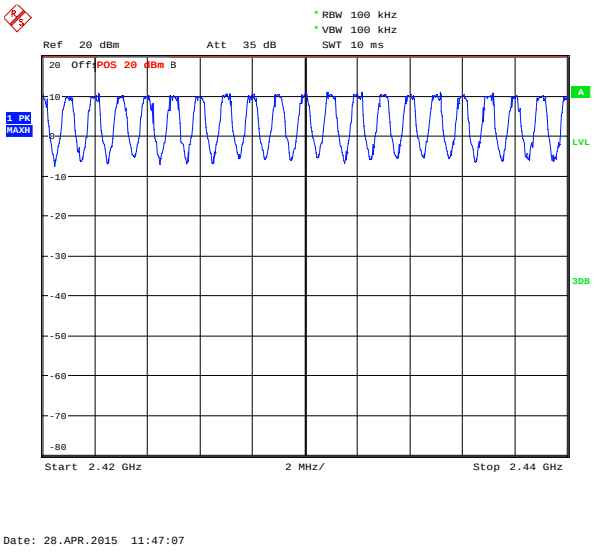


Figure 5-14: Number of Hopping Frequencies
Static PBRS, DH5



Bluetooth RF Conducted Emission Test Results cont'd

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

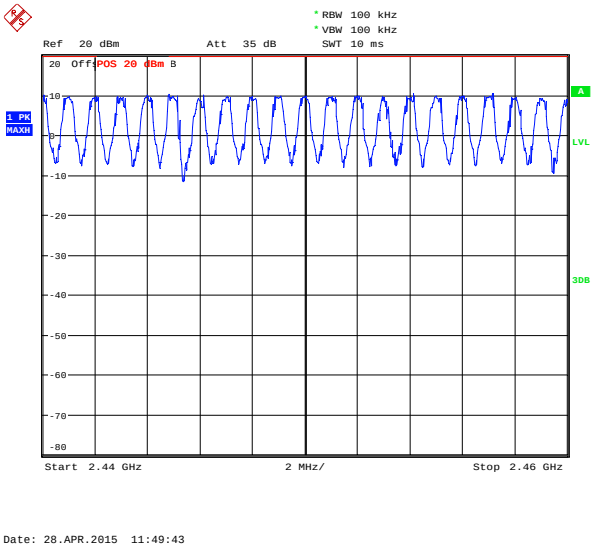
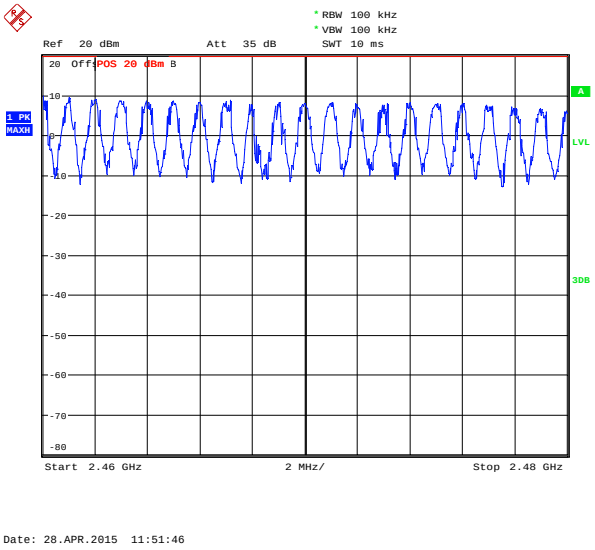


Figure 5-16: Number of Hopping Frequencies Static PBRS, DH5



Time of Occupancy (Dwell Time)

The EUT met the requirements of the time of occupancy (dwell time) as per 47 CFR 15.247(a) and RSS-210. Low channel (0), middle channel (39) and high channel (78) were measured in packet types DH1, DH3 and DH5. Bluetooth was operating in frequency hopping (Euro/US) mode during the measurements. The frequency hopping is 1600 hops per second for a dwell time of 625 µsec for 79 channels.

A DH1 packet needs one time slot for transmitting and one time slot for receiving. The frequency hopping is 800 hops per second with 79 channels which is 10.127 times per second. As per 15.247(a) (iii) "The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed". Therefore for 31.6 seconds (79x0.4) there are 320.0 times of appearance.

A DH3 packet needs one time slot for transmitting and one time slot for receiving. The frequency hopping is 400 hops per second with 79 channels which is 5.06 times per second. Therefore for 31.6 seconds there are 159.9 times of appearance.

A DH5 packet needs one time slot for transmitting and one time slot for receiving. The frequency hopping is 266.7 hops per second with 79 channels which is 3.38 times per second. Therefore for 31.6 seconds there are 106.8 times of appearance.

Bluetooth Channel	Mode	TX Time (ms)	Dwell Time/31.6 sec. (msec.)	Limit (msec.)	Margin (msec.)
0	DH1	0.3940	0.394 x 320.0 = 126.08	400	273.92
39	DH1	0.3920	0.392 x 320.0 = 125.44	400	274.56
78	DH1	0.3970	0.397 x 320.0 = 127.04	400	272.96
0	DH3	1.5785	1.579 x 159.9 = 252.4	400	147.60
39	DH3	1.6870	1.687 x 159.9 = 269.75	400	130.25
78	DH3	1.6870	1.687 x 159.9 = 269.75	400	130.25
0	DH5	2.9370	2.937 x 106.8 = 313.67	400	86.33
39	DH5	2.9370	2.937 x 106.8 = 313.67	400	86.33
78	DH5	2.9370	2.937 x 106.8 = 313.67	400	86.33

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

Bluetooth RF Conducted Emission Test Results cont'd

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

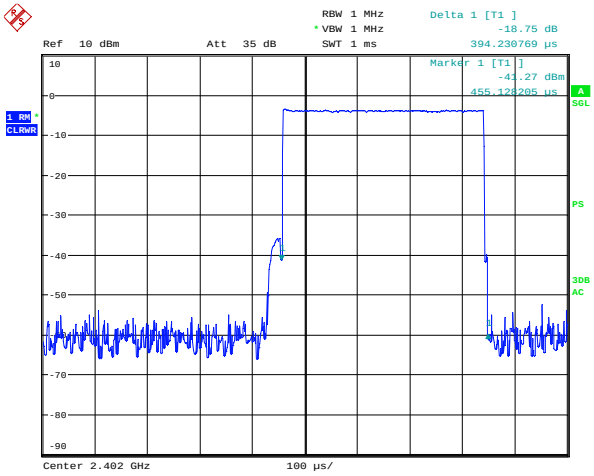


Figure 5-18: Time of Occupancy (Dwell Time) Freq. Hopping, Static PBRS, DH1

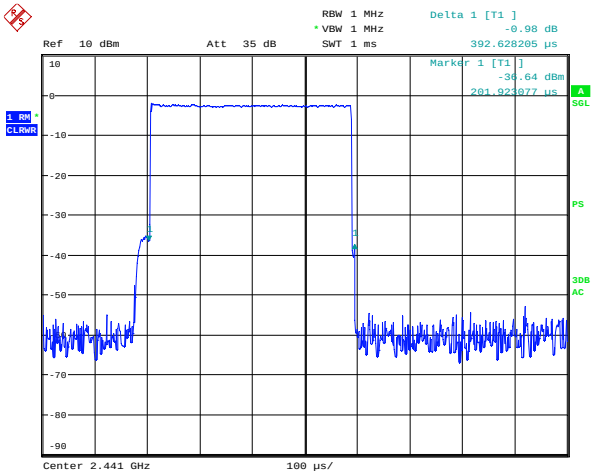


Figure 5-19: Time of Occupancy (Dwell Time) Freq. Hopping, Static PBRS, DH1

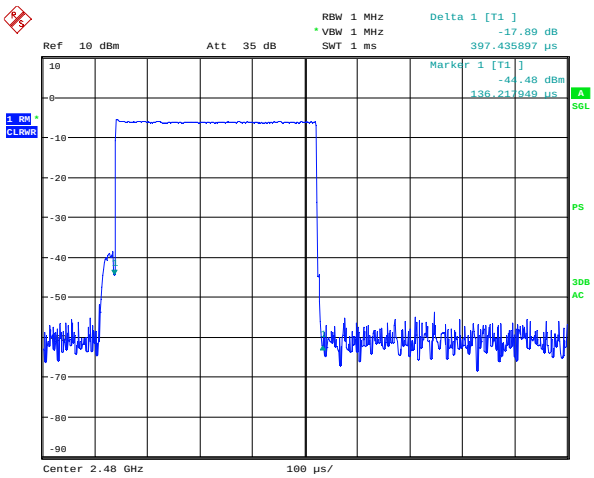
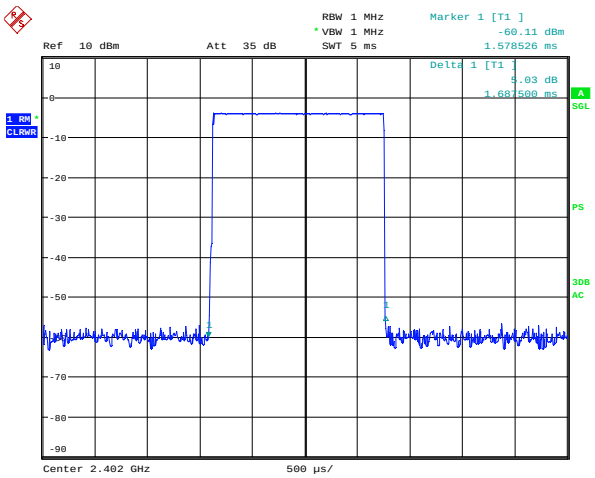


Figure 5-20: Time of Occupancy (Dwell Time) Freq. Hopping, Static PBRS, DH3



Bluetooth RF Conducted Emission Test Results cont'd

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

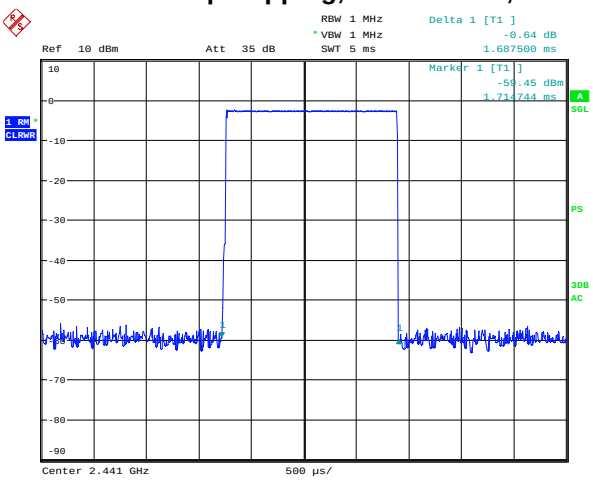


Figure 5-22: Time of Occupancy (Dwell Time) Freq. Hopping, Static PBRS, DH3

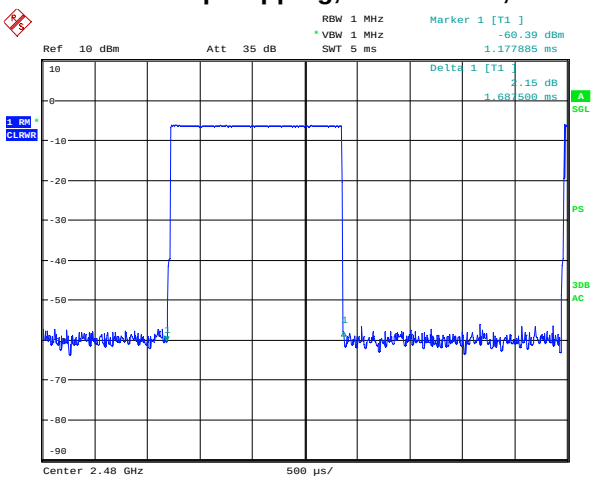


Figure 5-23: Time of Occupancy (Dwell Time) Freq. Hopping, Static PBRS, DH5

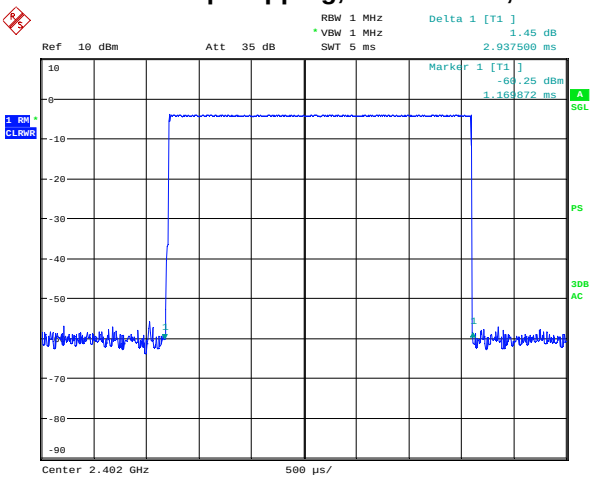
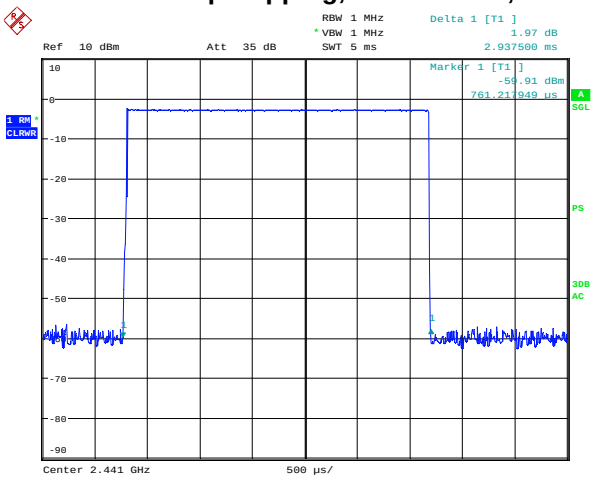
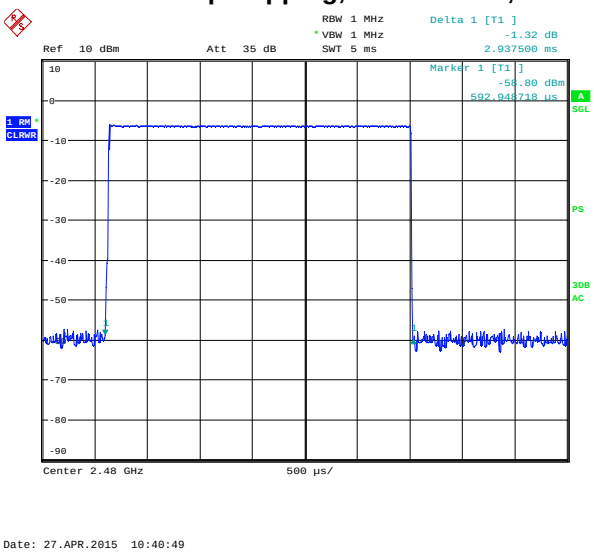


Figure 5-24: Time of Occupancy (Dwell Time) Freq. Hopping, Static PBRS, DH5



Bluetooth RF Conducted Emission Test Results cont'd

Figure 5-25: Time of Occupancy (Dwell Time)
Freq. Hopping, Static PBRS, DH5



Bluetooth RF Conducted Emission Test Results cont'd

Maximum Peak Conducted Output Power

The EUT met the requirements of the maximum peak conducted output power of class 1 as per 47 CFR 15.247(b) and RSS-210. Low channel (0), middle channel (39) and high channel (78) were measured. Bluetooth was operating in single frequency mode during the measurements. A reference offset of 12.4 dB was applied to the spectrum analyzer reference level for the coaxial cable loss and attenuators in the test circuit.

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

Bluetooth Channel	Measured Level (dBm)	Measured Level (W)	Class 1 Limit (dBm)
0	7.70	0.00589	0.0 to 20.0
39	**9.60**	**0.00912**	0.0 to 20.0
78	8.80	0.00759	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	6.90	0.00490	0.0 to 20.0
39	**8.90**	**0.00776**	0.0 to 20.0
78	4.90	0.00309	0.0 to 20.0

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

Bluetooth Channel	Measured Level (dBm)	Measured Level (W)	Class 1 Limit (dBm)
0	5.10	0.00324	0.0 to 20.0
39	7.50	0.00562	0.0 to 20.0
78	5.80	0.00380	0.0 to 20.0

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	-51.02	-20	-31.02
78	Single Frequency	-51.36	-20	-31.36
0	Hopping	-53.01	-20	-33.01
78	Hopping	-50.49	-20	-30.49

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

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

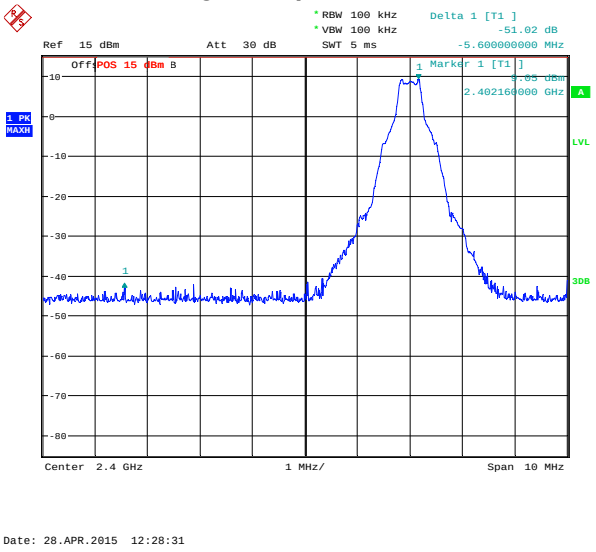
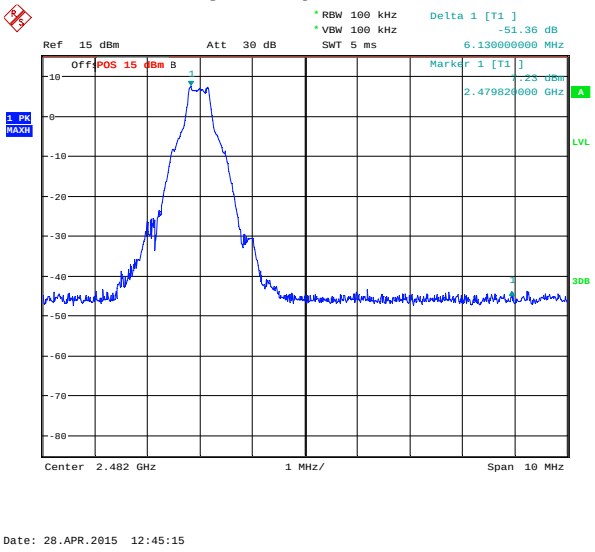


Figure 5-27: Band Edge Compliance
Single Freq., Static PBRS, DH5



Bluetooth RF Conducted Emission Test Results cont'd

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

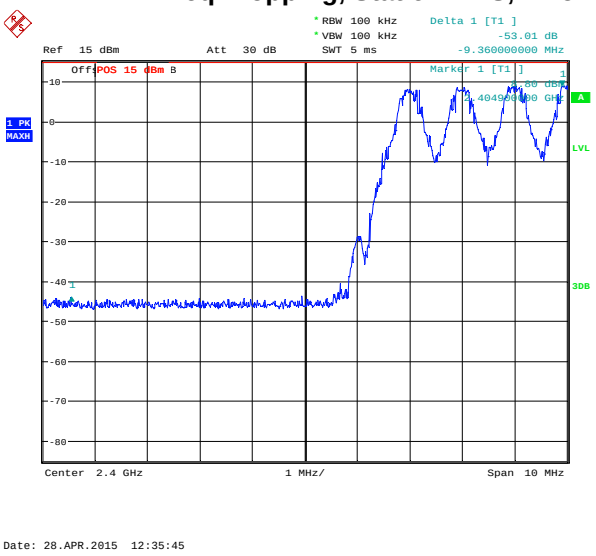


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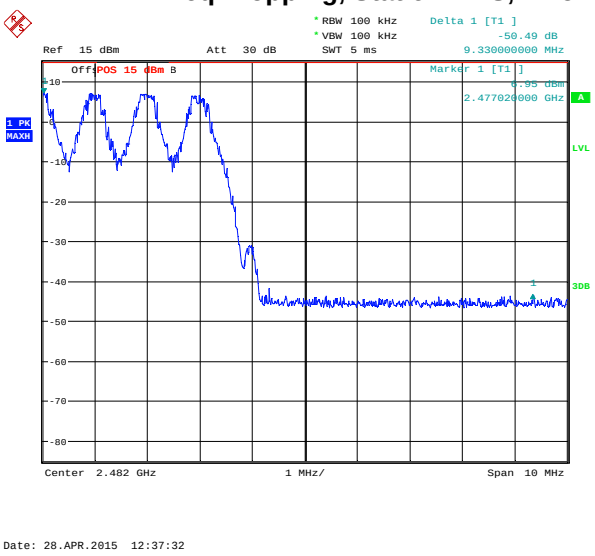
Figure 5-29: Band Edge Compliance
Freq. Hopping, Static PBRS, DH5



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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	-49.35	-20	-29.35
78	Single Frequency	-47.45	-20	-27.45
0	Hopping	-52.61	-20	-32.61
78	Hopping	-46.32	-20	-26.32

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

Bluetooth RF Conducted Emission Test Results cont'd

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

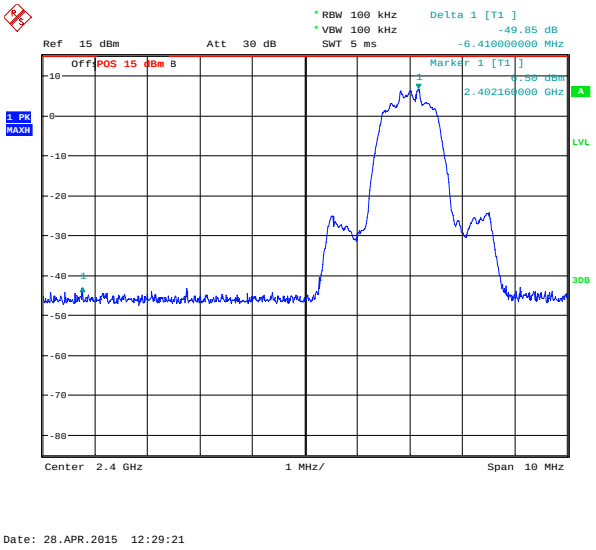

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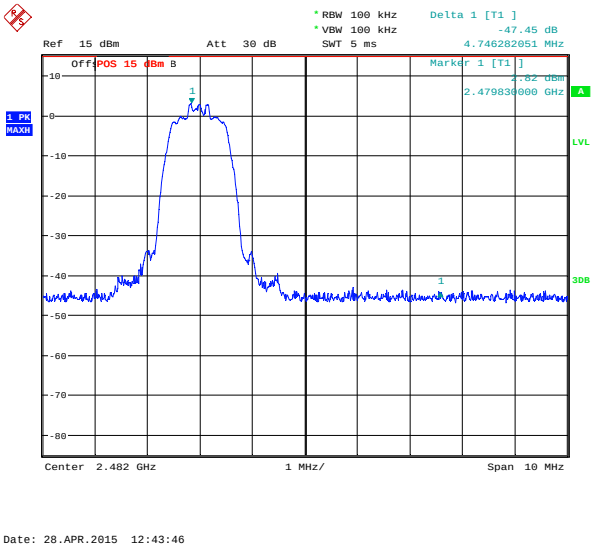
Figure 5-31: Band Edge Compliance
Single Freq., Static PBRS, 2-DH5



Date: 28.APR.2015 12:43:46

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

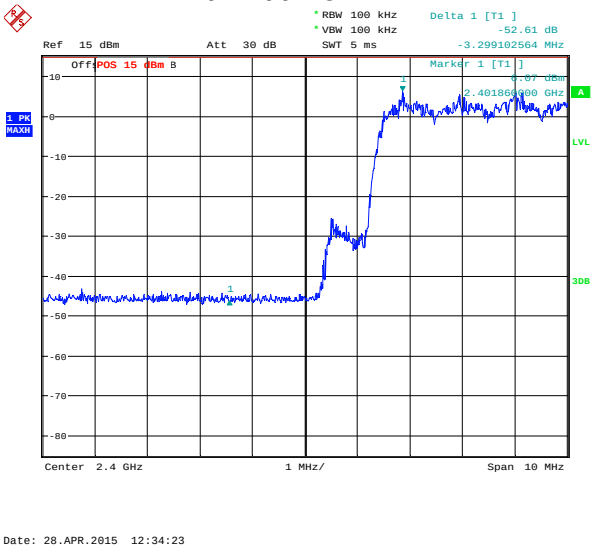


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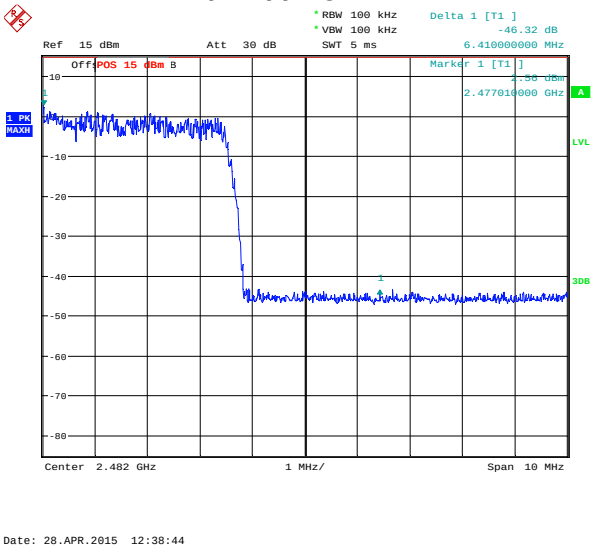
Figure 5-33: Band Edge Compliance
Freq. Hopping, Static PBRS, 2-DH5



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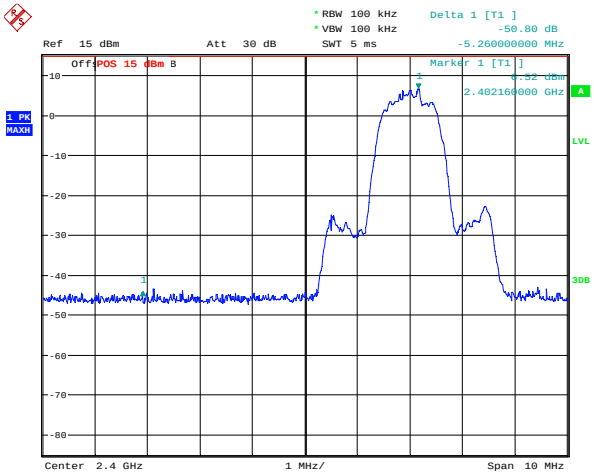
Bluetooth RF Conducted Emission Test Results cont'd

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

Bluetooth Channel	Operating Mode	Measured Level (dBc)	Limit (dBc)	Margin (dB)
0	Single Frequency	-50.77	-20	-30.77
78	Single Frequency	-46.46	-20	-26.46
0	Hopping	-48.71	-20	-28.71
78	Hopping	-46.21	-20	-26.21

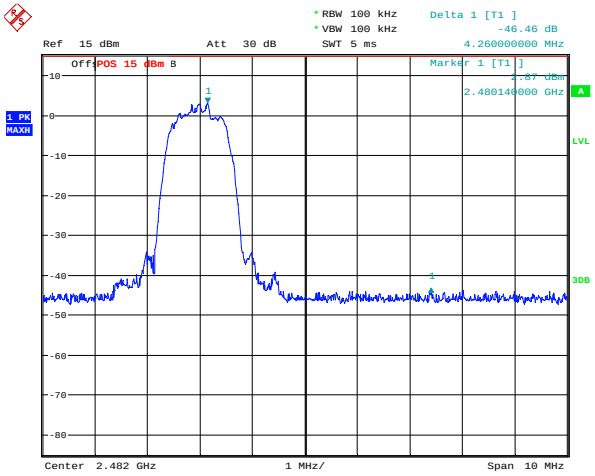
See figures 5-34 to 5-37 for the plots of the band edge compliance measurements.

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



Date: 28.APR.2015 12:30:45

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



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Bluetooth RF Conducted Emission Test Results cont'd

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

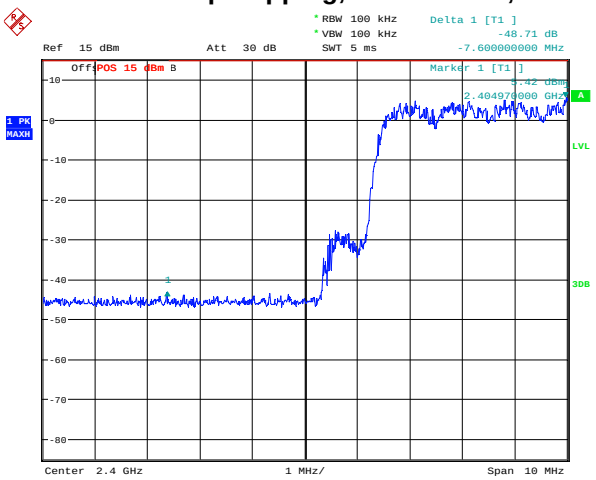

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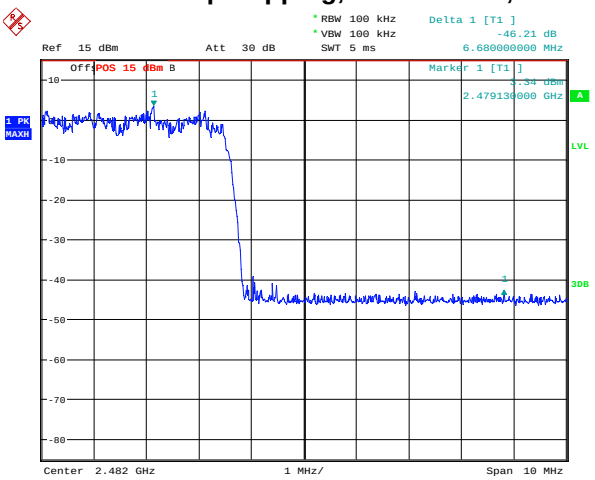
Figure 5-37: Band Edge Compliance
Freq. Hopping, Static PBRS, 3-DH5



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Bluetooth RF Conducted Emission Test Results cont'd

Spurious RF Conducted Emissions

The EUT met the requirements of the spurious RF conducted emissions as per 47 CFR 15.247(c) and RSS-210. Low channel (0), mid channel (39) and high channel (78) were measured. Bluetooth was operating in single frequency and hopping mode. A reference offset of 12.4 dB was applied to the spectrum analyzer reference level for the attenuators and coaxial cable loss in the test circuit.

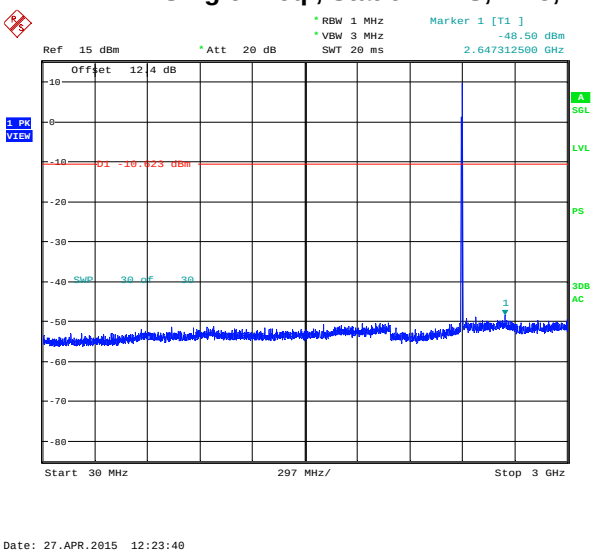
Using pattern type "Static PBRS" and packet type "DH5" during the measurements.

Bluetooth Channel	Channel Power (dBm)	Max. Measured Level (dBm)	Max. Measured Level from carrier (dBc)	Limit (dBc)
0.00	7.70	-48.50	-56.20	-20.00
39.00	9.60	-48.78	-58.38	-20.00
78.00	8.80	-48.69	-57.49	-20.00
Hopping mode	7.70	-48.23	-55.93	-20.00

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

Bluetooth RF Conducted Emission Test Results cont'd

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



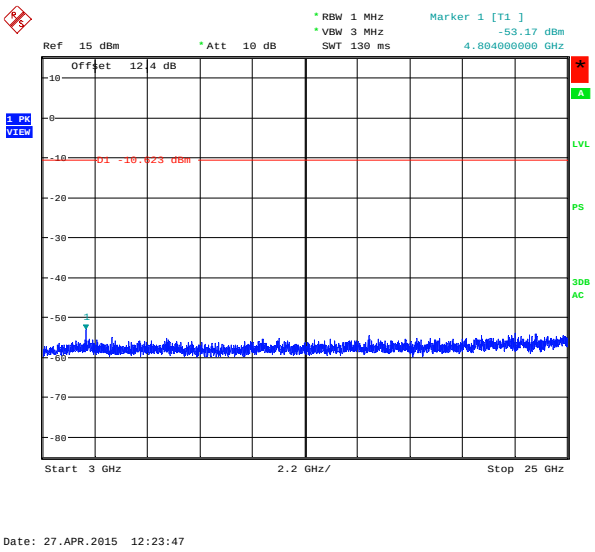
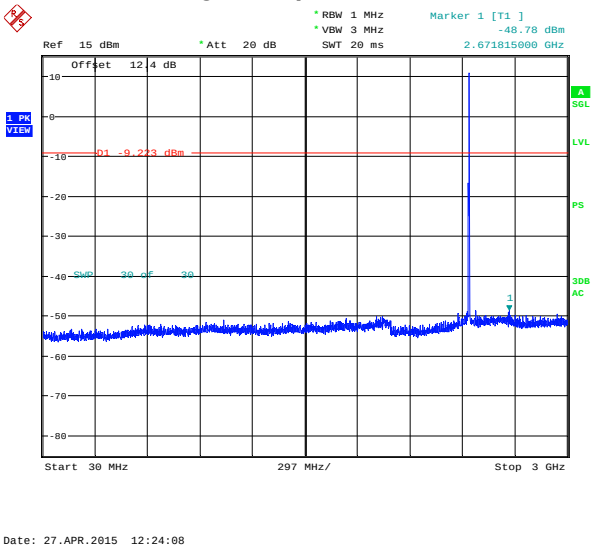
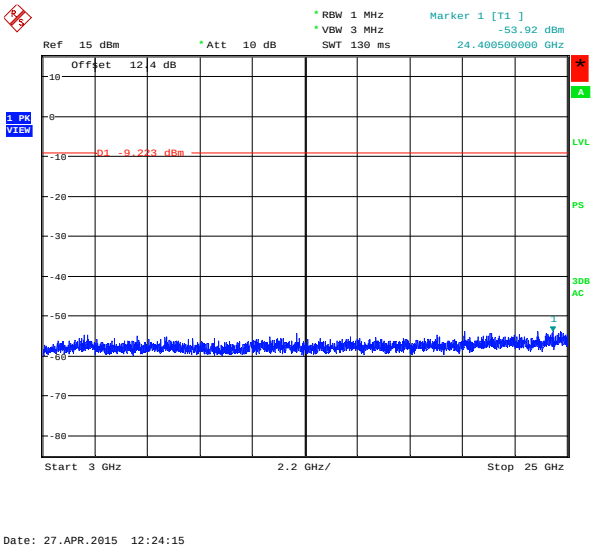


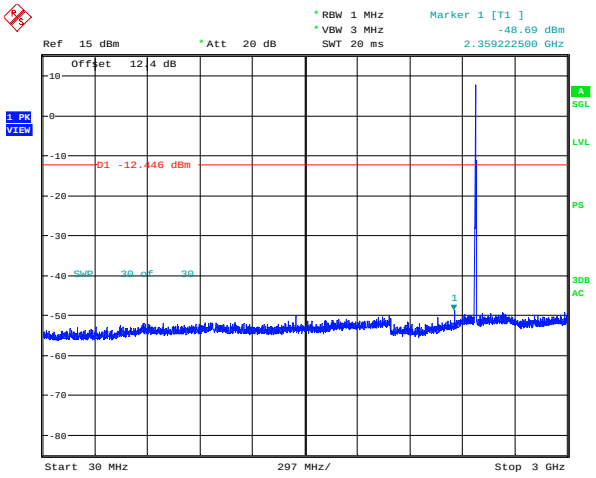
Figure 5-39: Spurious RF Conducted Emissions
Single Freq., Static PBRS, DH5



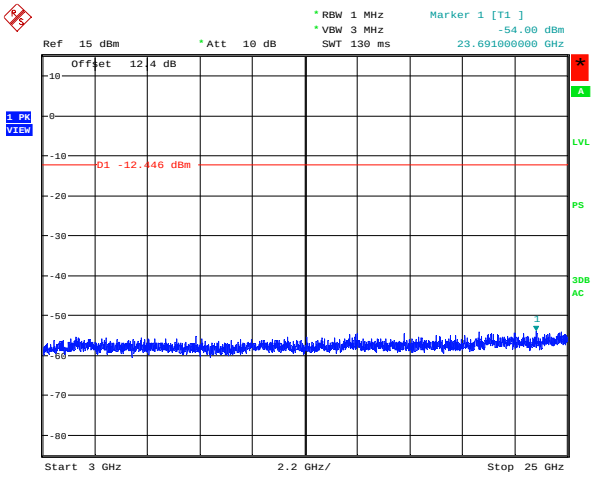


Bluetooth RF Conducted Emission Test Results cont'd

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

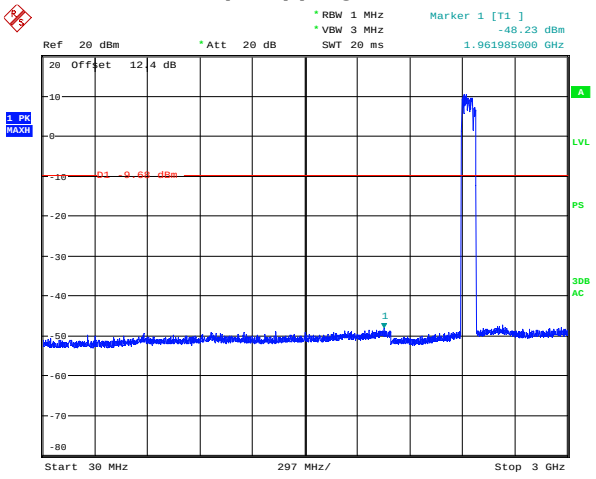


Date: 27.APR.2015 12:24:36

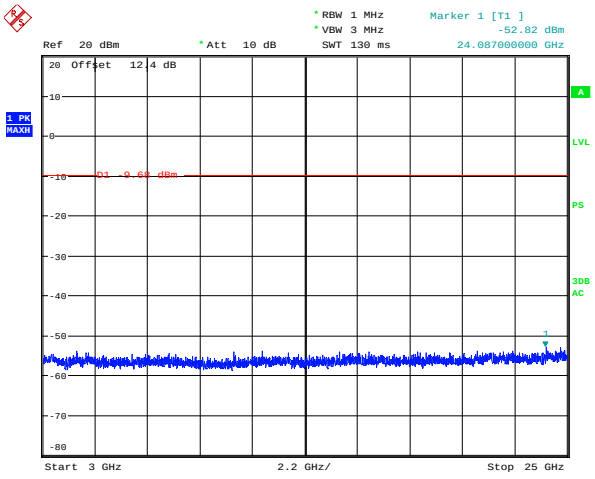


Date: 27.APR.2015 12:24:43

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



Date: 27.APR.2015 12:43:47



Date: 27.APR.2015 12:44:28

Bluetooth RF Conducted Emission Test Results cont'd

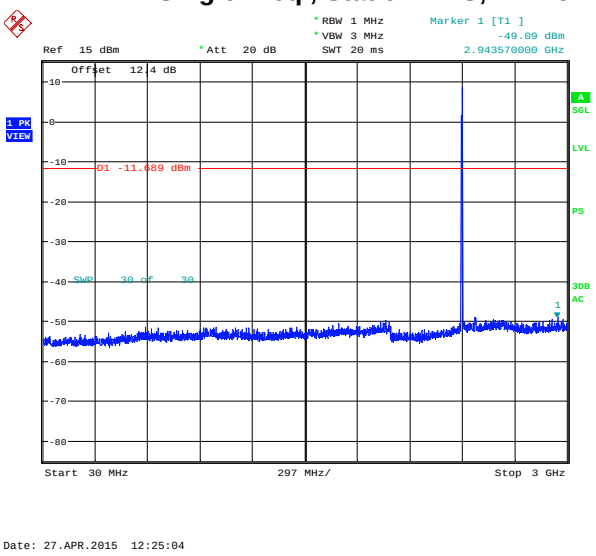
Using pattern type "Static PBRS" and packet type "2-DH5" during the measurements.

Bluetooth Channel	Channel Power (dBm)	Max. Measured Level (dBm)	Max. Measured Level from carrier (dBc)	Limit (dBc)
0.00	5.10	-49.09	-54.19	-20.00
39.00	7.50	-49.08	-56.58	-20.00
78.00	5.80	-49.02	-54.82	-20.00
Hopping mode	5.10	-49.43	-54.53	-20.00

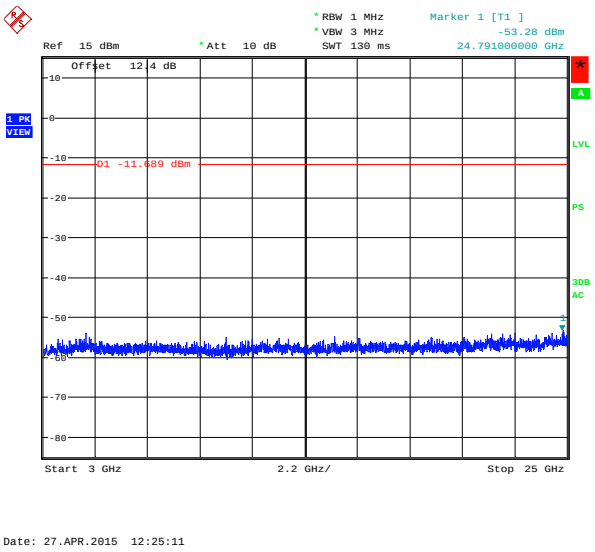
See figures 5-42 to 5-45 for the plots of the spurious RF conducted emissions.

Bluetooth RF Conducted Emission Test Results cont'd

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

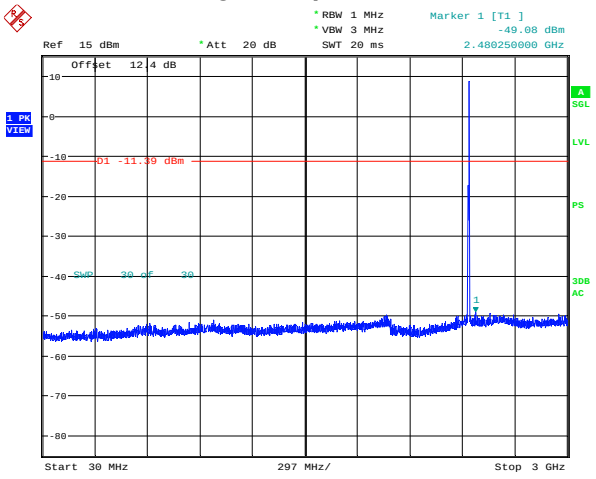


Date: 27.APR.2015 12:25:04

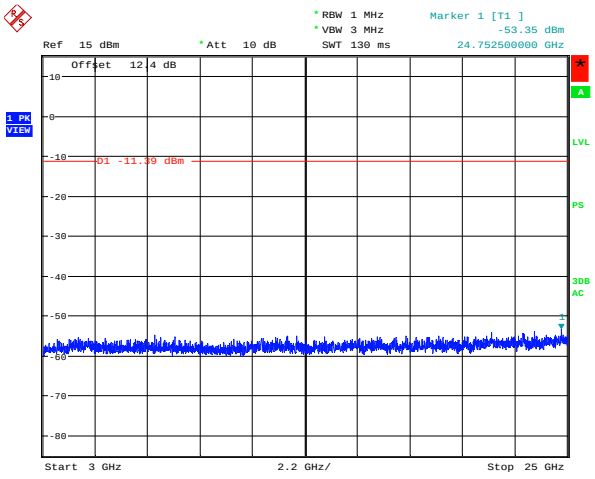


Date: 27.APR.2015 12:25:11

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



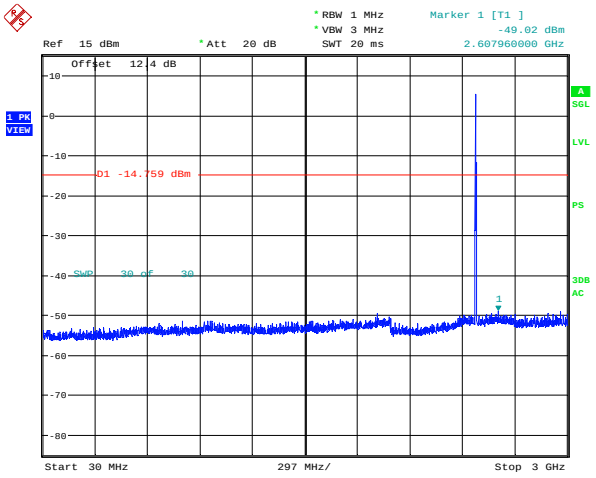
Date: 27.APR.2015 12:25:32



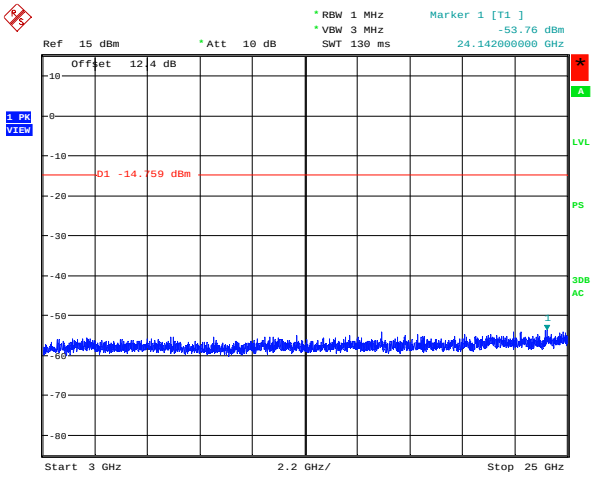
Date: 27.APR.2015 12:25:39

Bluetooth RF Conducted Emission Test Results cont'd

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

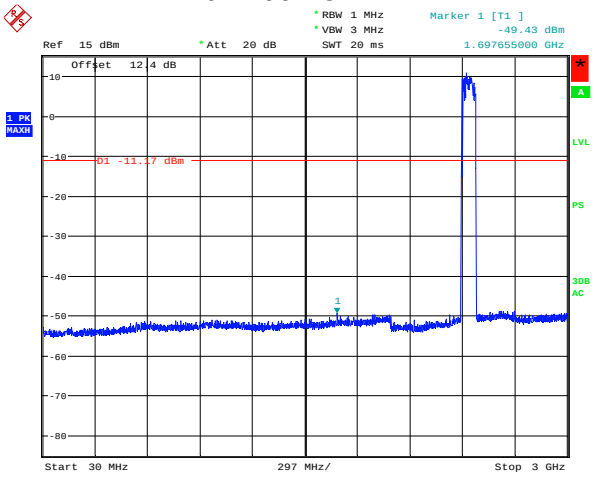


Date: 27.APR.2015 12:26:00

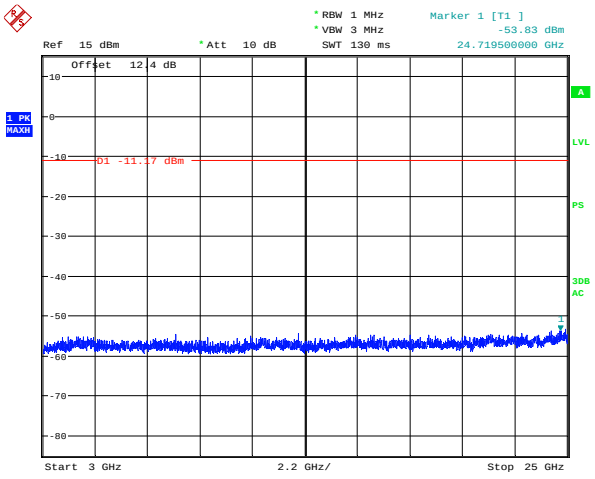


Date: 27.APR.2015 12:26:07

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



Date: 27.APR.2015 12:35:33



Date: 27.APR.2015 12:36:20

Bluetooth RF Conducted Emission Test Results cont'd

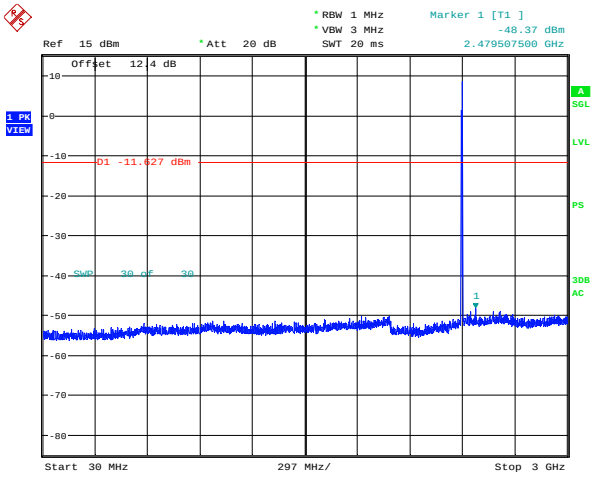
Using pattern type "Static PBRS" and packet type "3-DH5" during the measurements.

Bluetooth Channel	Channel Power (dBm)	Max. Measured Level (dBm)	Max. Measured Level from carrier (dBc)	Limit (dBc)
0.00	6.90	-48.37	-55.27	-20.00
39.00	8.90	-49.20	-58.10	-20.00
78.00	4.90	-48.95	-53.85	-20.00
Hopping mode	4.90	-44.11	-49.01	-20.00

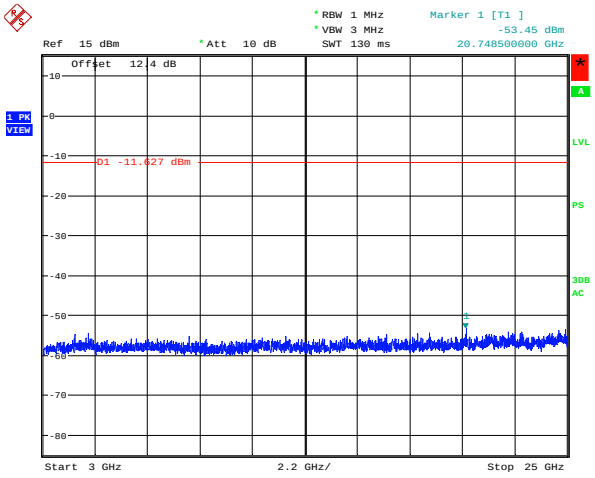
See figures 5-46 to 5-49 for the plots of the spurious RF conducted emissions.

Bluetooth RF Conducted Emission Test Results cont'd

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

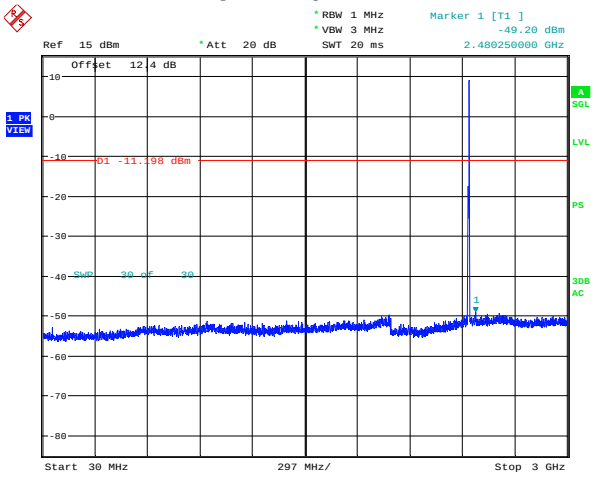


Date: 27.APR.2015 12:26:28

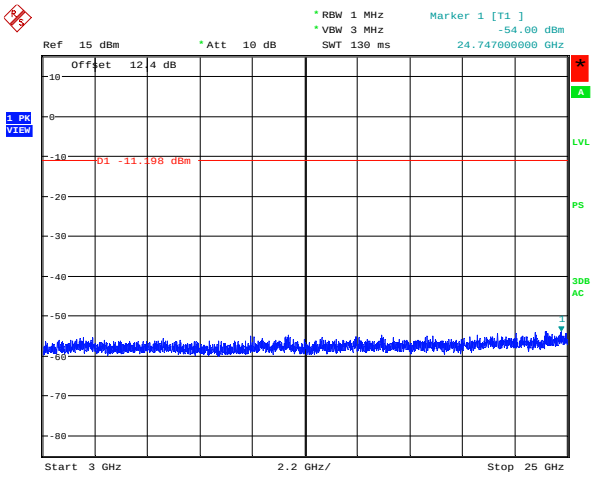


Date: 27.APR.2015 12:26:36

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



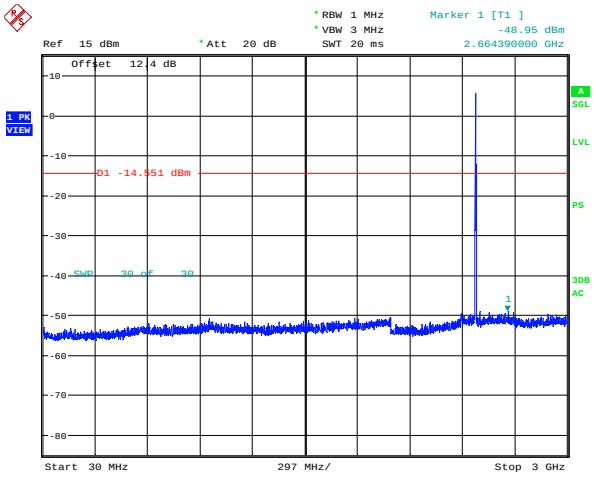
Date: 27.APR.2015 12:26:56



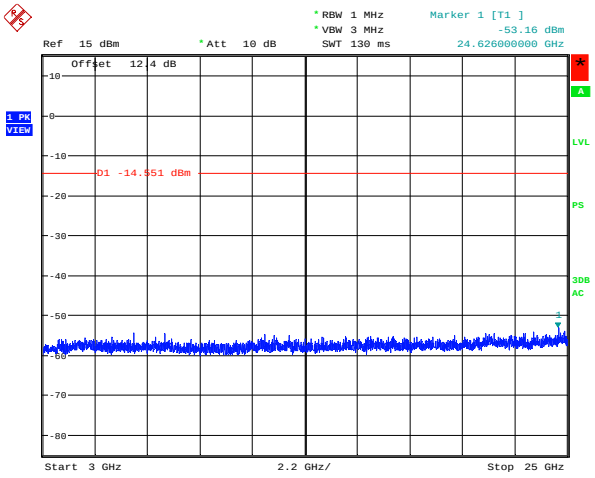
Date: 27.APR.2015 12:27:03

Bluetooth RF Conducted Emission Test Results cont'd

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

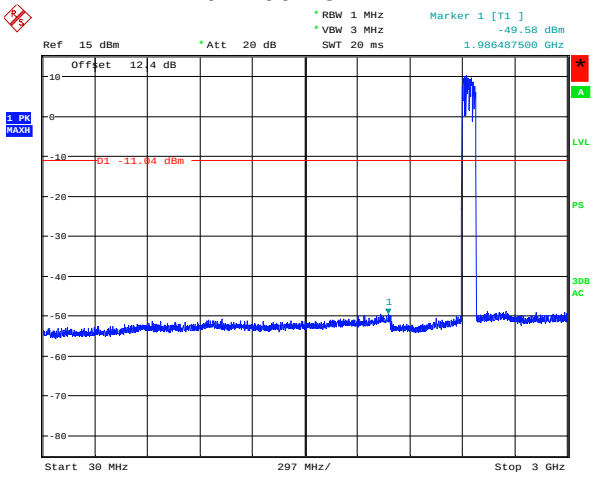


Date: 27.APR.2015 12:27:24

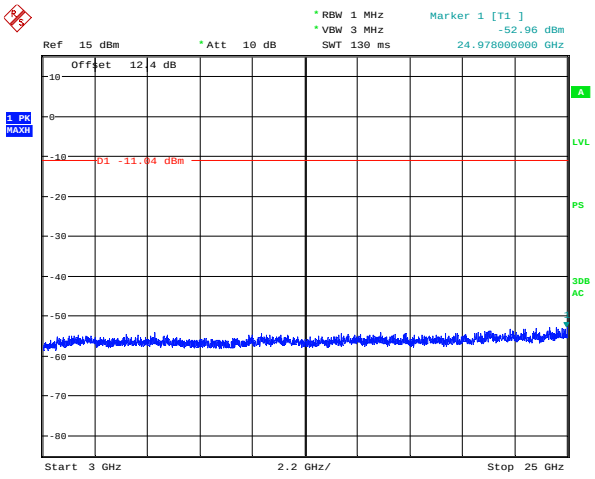


Date: 27.APR.2015 12:27:31

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



Date: 27.APR.2015 12:20:11



Date: 27.APR.2015 12:22:55

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	**682.00**
20	≥ 500	670.64
39	≥ 500	642.00

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

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

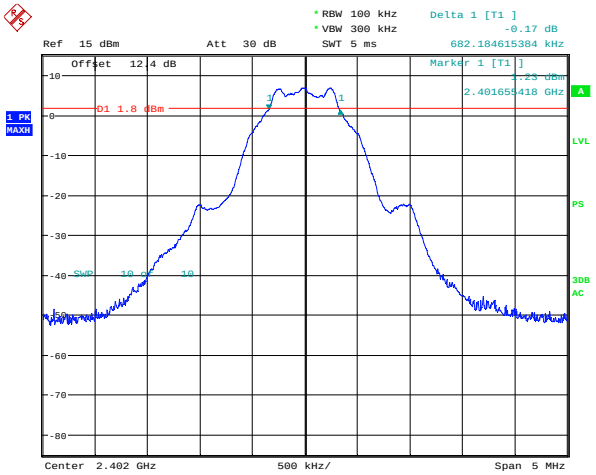
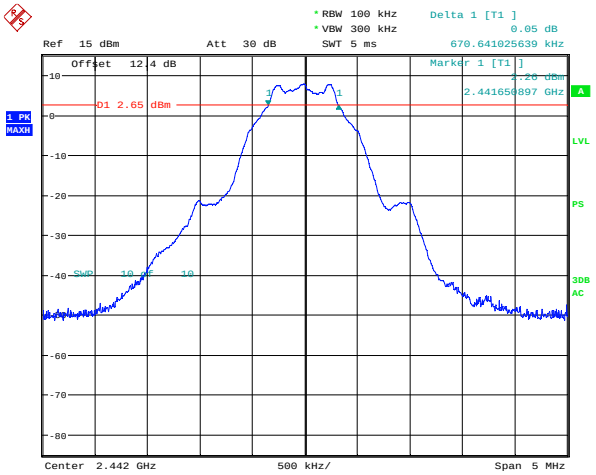


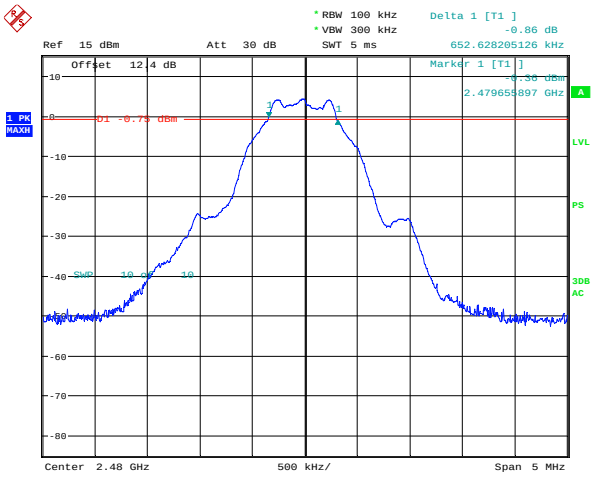
Figure 5-51: 6 dB Bandwidth
LE, Channel 20



Bluetooth Low Energy RF Conducted Emission Test Results cont'd

Figure 5-52: 6 dB Bandwidth

LE, Channel 39



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	6.42	.00439
20	< 1.00	**6.53**	**.00450**
39	< 1.00	5.83	.00383

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	-57.66	-37.66
39	< -20	-54.71	-34.71

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

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

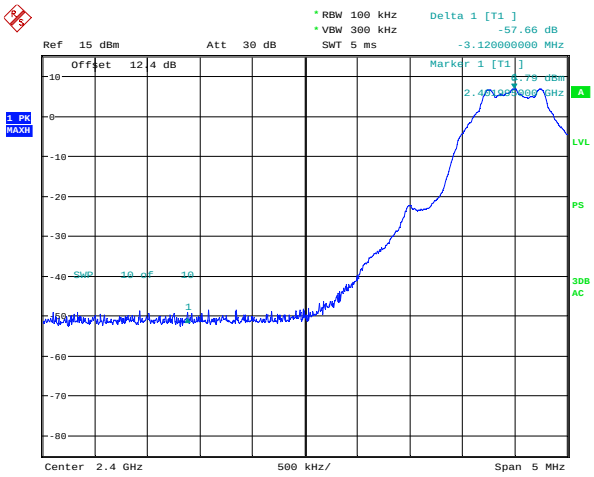
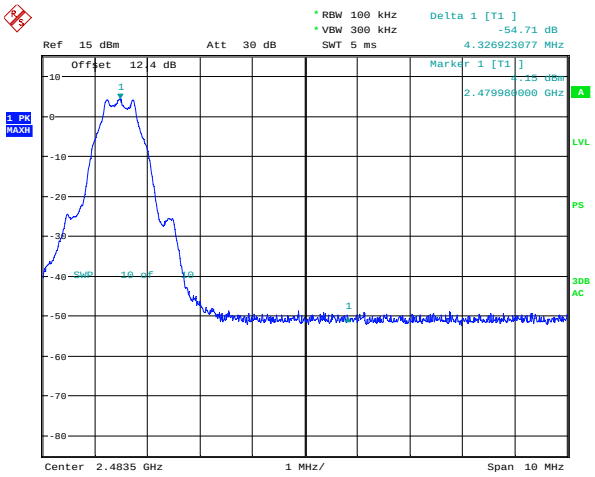


Figure 5-54: Band Edge Compliance LE, Channel 39



Peak Power Spectral Density

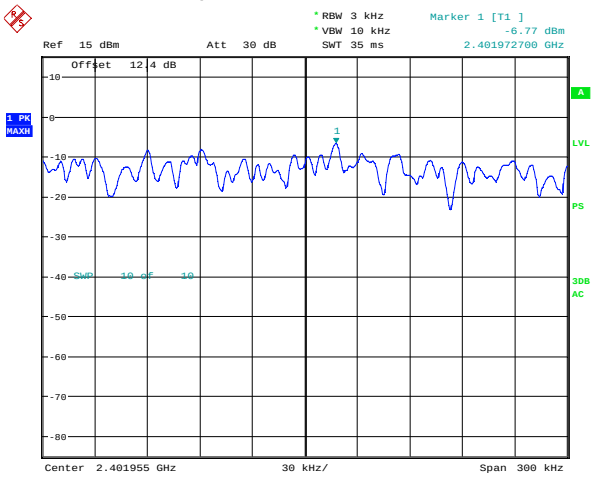
The EUT met the requirements of the peak power spectral density as per 47 CFR 15.247(d) and RSS-210. Channels 0, 20 and 39 were measured.

Channel	Limit (dBm)	Measured Level (dBm)	Margin (dBm)
0	< 8.00	-6.77	-14.77
20	< 8.00	-9.74	-17.74
39	< 8.00	-11.07	-19.07

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

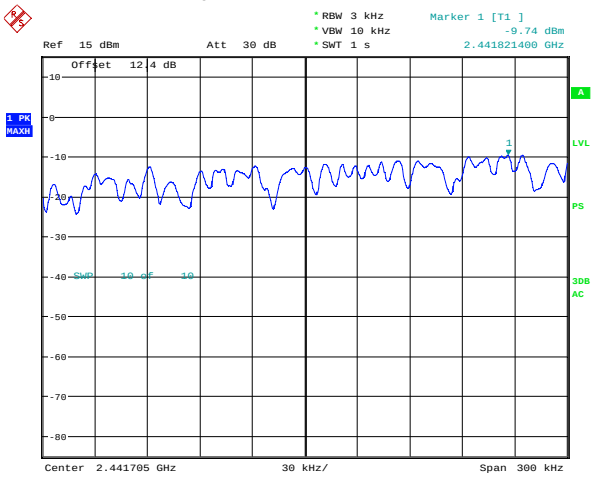
Bluetooth Low Energy RF Conducted Emission Test Results cont'd

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



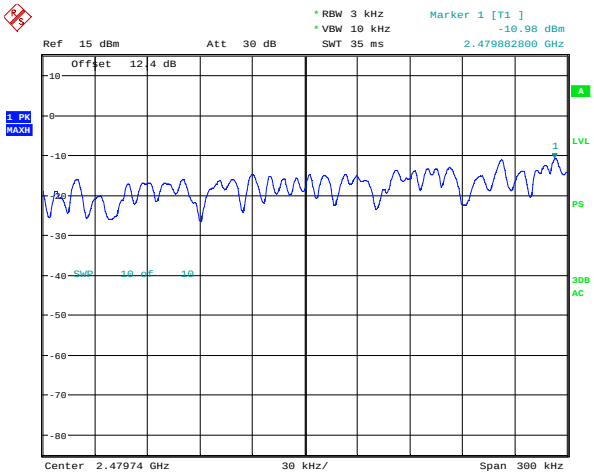
Date: 27.APR.2015 16:42:16

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



Date: 27.APR.2015 16:56:08

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



Date: 27.APR.2015 17:13:44

Bluetooth Low Energy RF Conducted Emission Test Results cont'd

Spurious RF Conducted Emissions

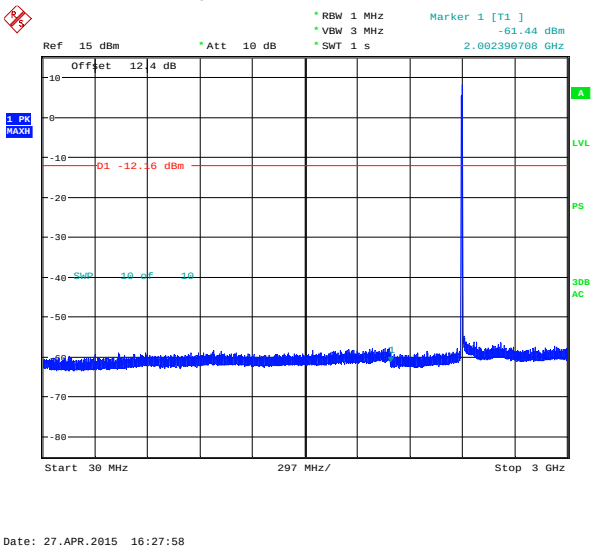
The EUT met the requirements of the spurious RF conducted emissions as per 47 CFR 15.247(c) and RSS-210. Channels 0, 20 and 39 were measured. Peak power was measured using an Agilent power meter, model N1911A with model N1921A power sensor. A reference offset of 6.4 dB was applied to the power meter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

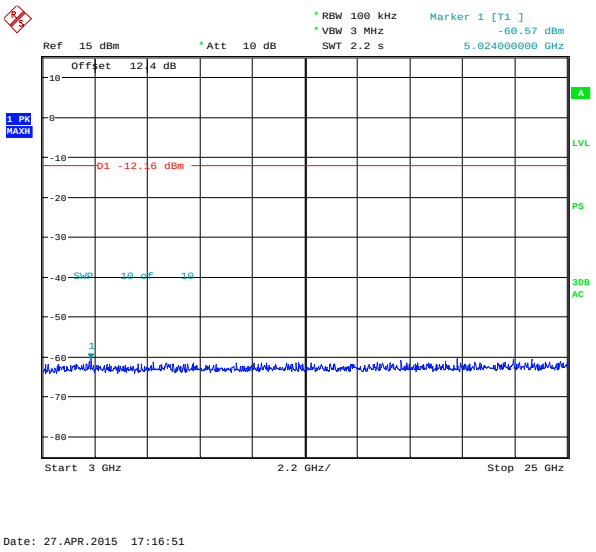
Channel	Power (dBm)	Max. Measured Level (dBm)	Max. Measured Level from Carrier (dBc)	Limit (dBc)
0	6.4	-43.0	-49.4	-20.0
20	6.5	-44.5	-51.1	-20.0
39	5.8	-43.9	-49.7	-20.0

The emissions were in the NF.

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

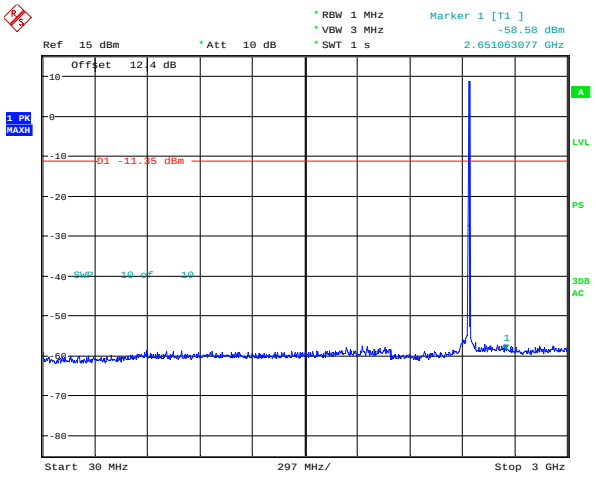
Figure 5-58: Spurious Conducted RF Emissions LE, Channel 0





Bluetooth Low Energy RF Conducted Emission Test Results cont'd

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



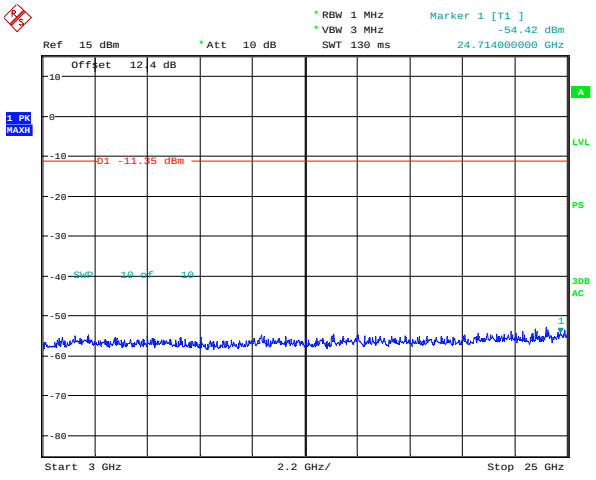
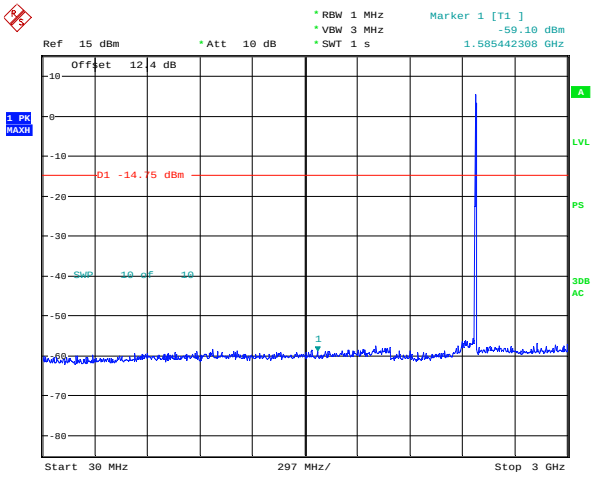
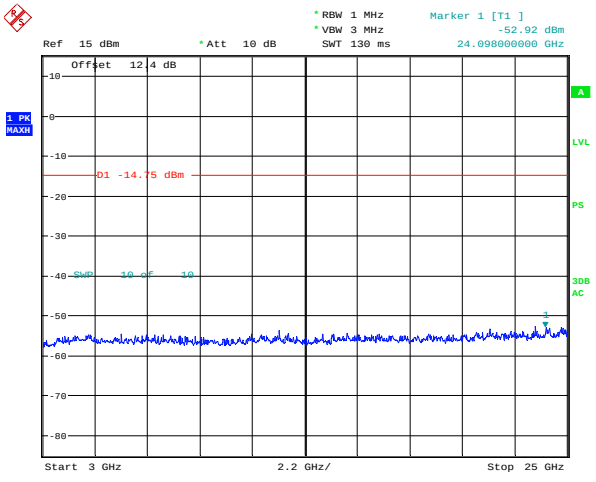


Figure 5-60: Spurious Conducted RF Emissions LE, Channel 39

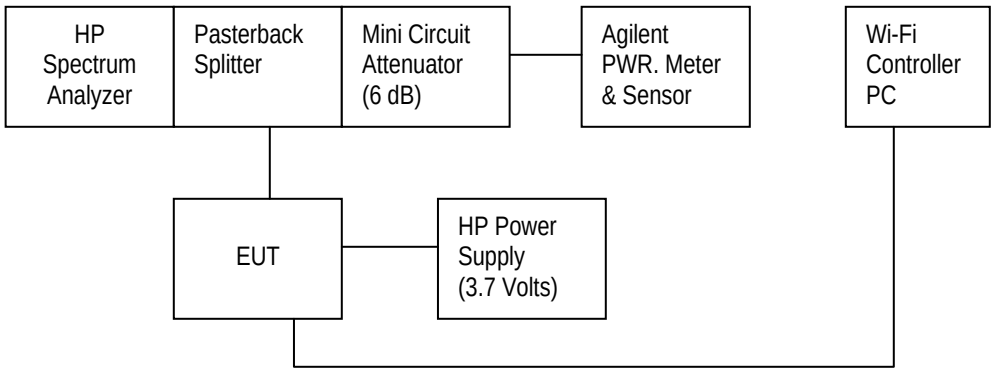




APPENDIX 6 – 802.11b/g/n CONDUCTED EMISSIONS TEST DATA/PLOTS

802.11b/g/n RF Conducted Emission Test Results

Test Setup Diagram



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

A reference offset of 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: May 12, 2015
The measurements on the BlackBerry® smartphone were performed by Sijia Li.

The environmental test conditions were: Temperature: 23.7 ºC
Relative Humidity: 39.8 %

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	8.08
	5.5 Mbps	≥ 500	7.92
	11 Mbps	≥ 500	7.34
	6 Mbps	≥ 500	14.20
	24 Mbps	≥ 500	16.44
	54 Mbps	≥ 500	15.64
	MCS 0	≥ 500	16.36
	MCS 4	≥ 500	17.04
	MCS 7	≥ 500	17.28
6	1 Mbps	≥ 500	**8.48**
	5.5 Mbps	≥ 500	8.34
	11 Mbps	≥ 500	7.94
	6 Mbps	≥ 500	16.38
	24 Mbps	≥ 500	**16.50**
	54 Mbps	≥ 500	16.44
	MCS 0	≥ 500	17.50
	MCS 4	≥ 500	17.66
	MCS 7	≥ 500	**17.72**
11	1 Mbps	≥ 500	8.02
	5.5 Mbps	≥ 500	8.44
	11 Mbps	≥ 500	8.42
	6 Mbps	≥ 500	16.40
	24 Mbps	≥ 500	16.32
	54 Mbps	≥ 500	16.46
	MCS 0	≥ 500	17.66
	MCS 4	≥ 500	17.32
	MCS 7	≥ 500	16.94

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

See figures 6-1 to 6-9 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 6-1: 6 dB Bandwidth
802.11b, Channel 1, 1 Mbps

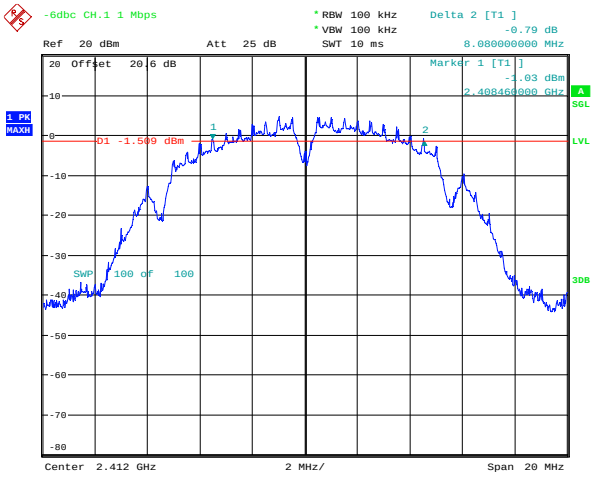


Figure 6-2: 6 dB Bandwidth
802.11b, Channel 6, 1 Mbps

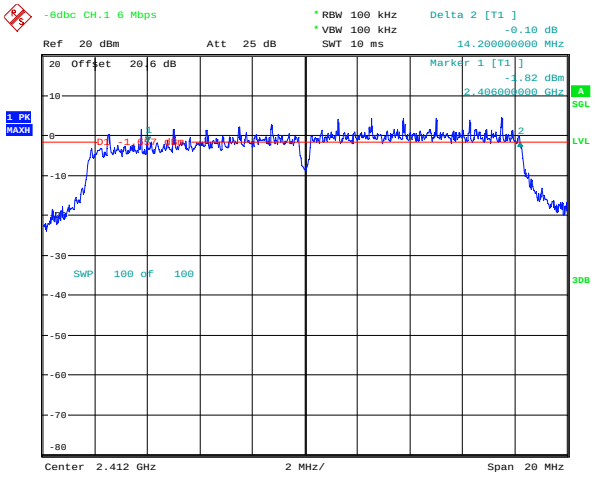


Figure 6-3: 6 dB Bandwidth
802.11b, Channel 11, 1 Mbps

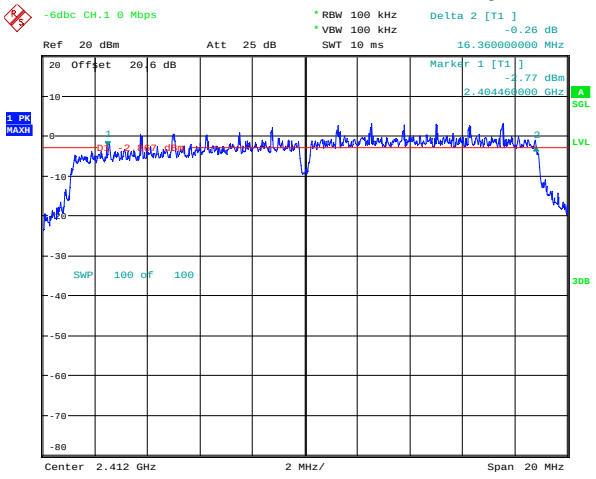
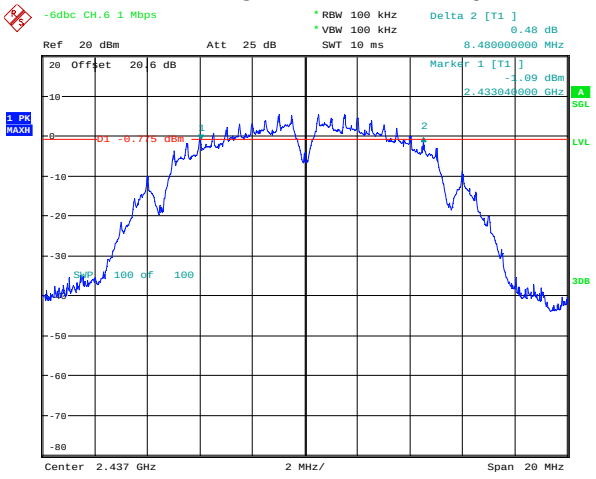
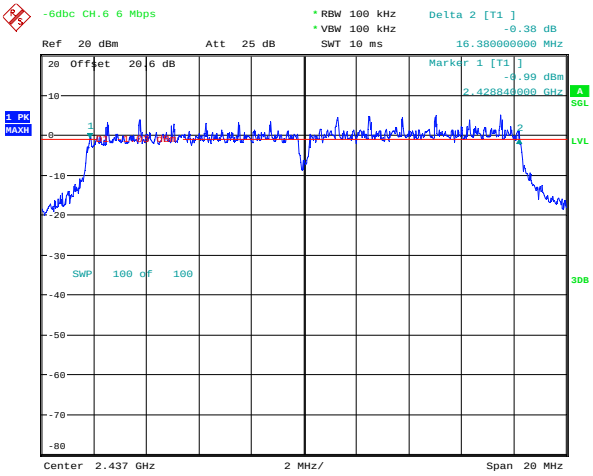


Figure 6-4: 6 dB Bandwidth
802.11g, Channel 1, 6 Mbps



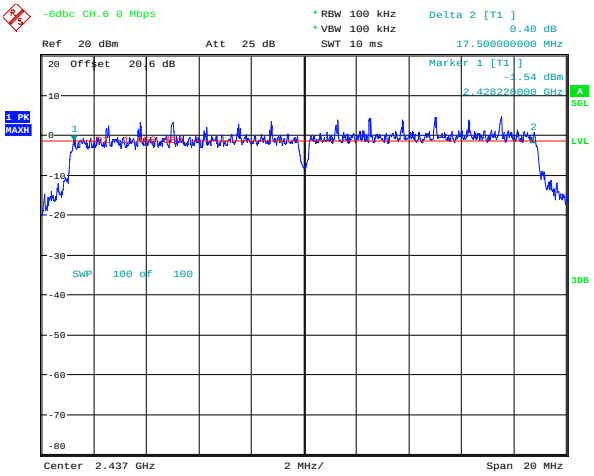
802.11b/g/n RF Conducted Emission Test Results cont'd

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



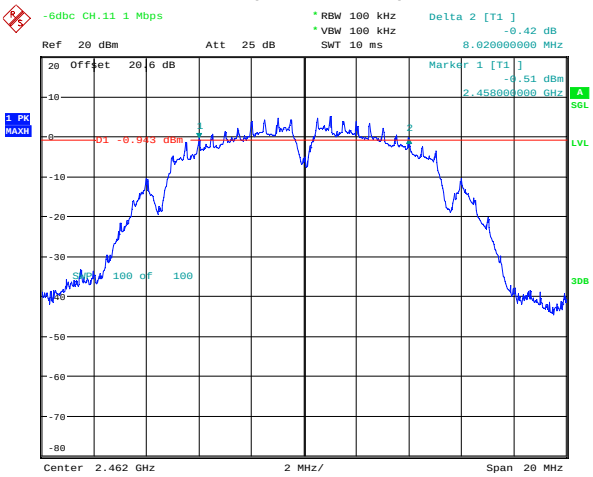
Date: 12.MAY.2015 11:39:58

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



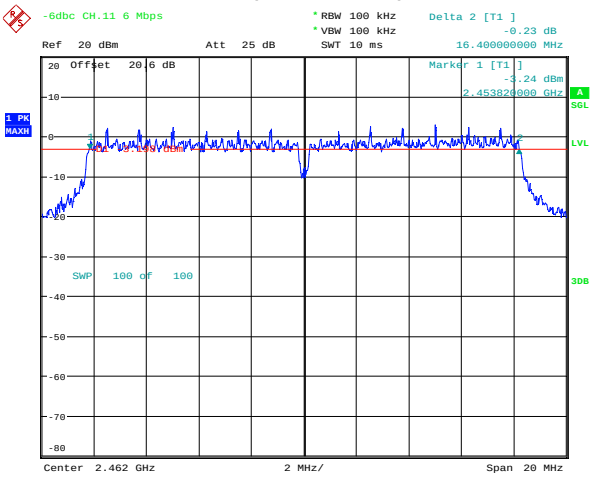
Date: 12.MAY.2015 11:40:47

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



Date: 12.MAY.2015 11:41:39

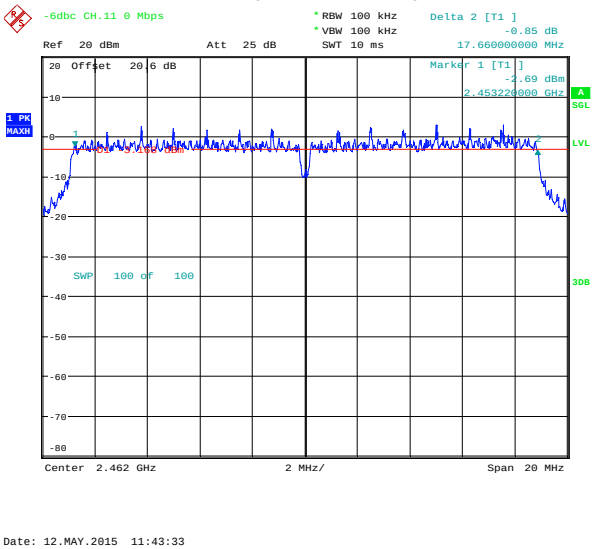
Figure 6-8: 6 dB Bandwidth
802.11n, Channel 6, MCS 0



Date: 12.MAY.2015 11:42:35

Figure 6-9: 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 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	Class 2 Limit (W)	Measured Level (dBm)	Measured Level (W)
1	1 Mbps	< 1.00	13.96	.0249
	5.5 Mbps	< 1.00	14.59	.0287
	11 Mbps	< 1.00	14.61	.0288
	6 Mbps	< 1.00	16.07	.0405
	24 Mbps	< 1.00	15.23	.0333
	54 Mbps	< 1.00	14.33	.0271
	MCS 0	< 1.00	15.14	.0326
	MCS 4	< 1.00	14.32	.027
	MCS 7	< 1.00	12.84	.020
6	1 Mbps	< 1.00	14.77	.030
	5.5 Mbps	< 1.00	**14.97**	**.0313**
	11 Mbps	< 1.00	14.89	.0385
	6 Mbps	< 1.00	**16.78**	**.0476**
	24 Mbps	< 1.00	13.32	.0214
	54 Mbps	< 1.00	14.05	.0253
	MCS 0	< 1.00	**16.92**	**.0491**
	MCS 4	< 1.00	14.64	.0291
	MCS 7	< 1.00	14.08	.0256

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

Channel	Data Rate	Class 2 Limit (W)	Measured Level (dBm)	Measured Level (mW)
11	1 Mbps	< 1.00	14.42	27.70
	5.5 Mbps	< 1.00	14.43	27.73
	11 Mbps	< 1.00	14.67	29.28
	6 Mbps	< 1.00	15.57	36.05
	24 Mbps	< 1.00	15.51	35.53
	54 Mbps	< 1.00	15.54	35.82
	MCS 0	< 1.00	15.40	34.65
	MCS 4	< 1.00	12.59	18.16
	MCS 7	< 1.00	13.25	21.13

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	-44.23	-24.23
	5.5 Mbps	< -20	-43.96	-23.96
	11 Mbps	< -20	-44.67	-24.67
	6 Mbps	< -20	-39.35	-19.35
	24 Mbps	< -20	-38.65	-18.65
	54 Mbps	< -20	-38.93	-18.93
	MCS 0	< -20	-38.62	-18.62
	MCS 4	< -20	-36.53	-16.53
	MCS 7	< -20	-38.70	-18.70
11	1 Mbps	< -20	-42.73	-22.73
	5.5 Mbps	< -20	-43.37	-23.37
	11 Mbps	< -20	-44.28	-24.28
	6 Mbps	< -20	-36.84	-16.84
	24 Mbps	< -20	-36.00	-16.00
	54 Mbps	< -20	-36.36	-16.36
	MCS 0	< -20	-38.68	-18.68
	MCS 4	< -20	-36.23	-16.23
	MCS 7	< -20	-37.31	-17.31

See figures 6-10 to 6-15 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.

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

Figure 6-10: Band Edge Compliance
802.11b, Channel 1, 1 Mbps

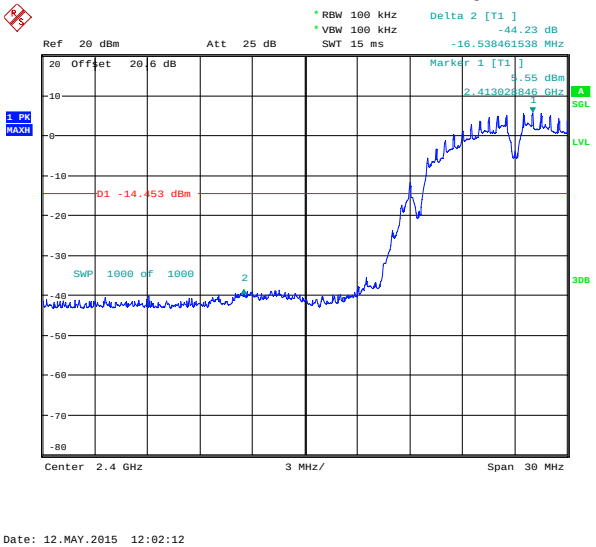


Figure 6-11: Band Edge Compliance
802.11b, Channel 11, 1 Mbps

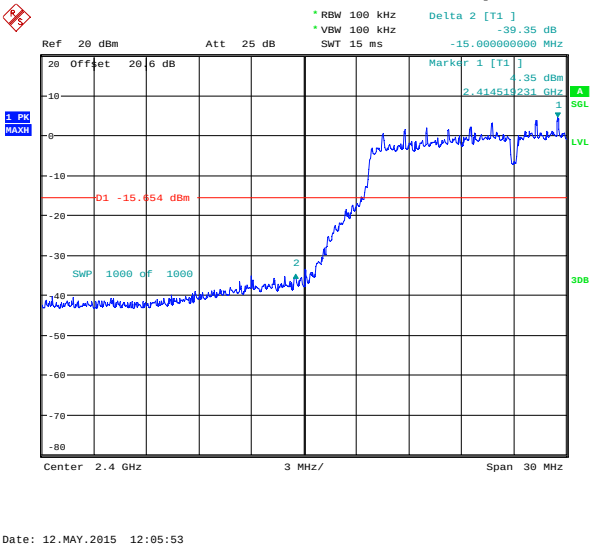


Figure 6-12: Band Edge Compliance
802.11g, Channel 1, 6 Mbps

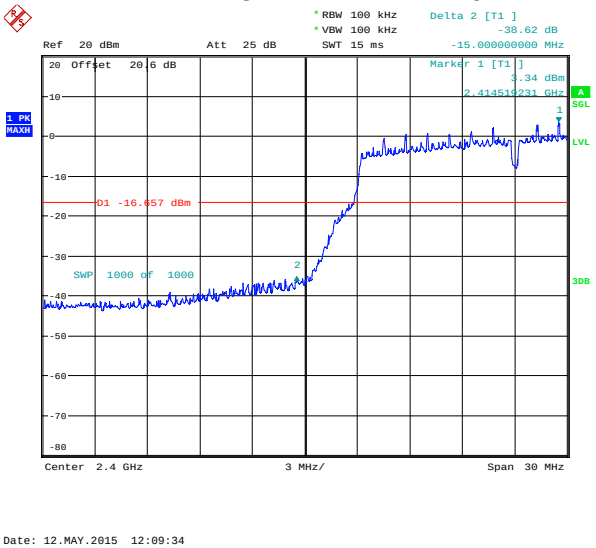
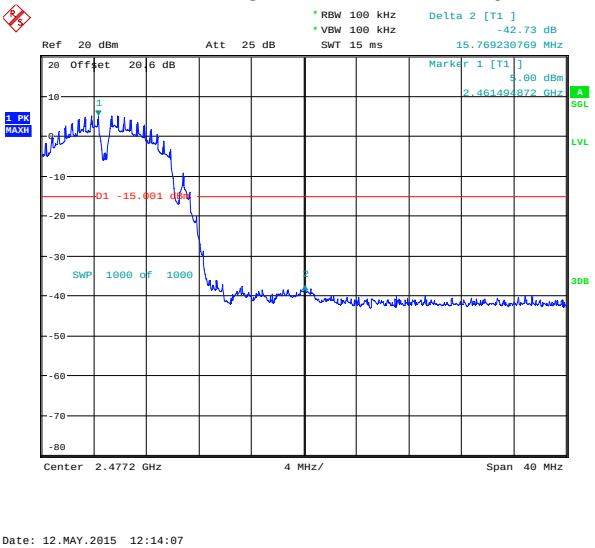
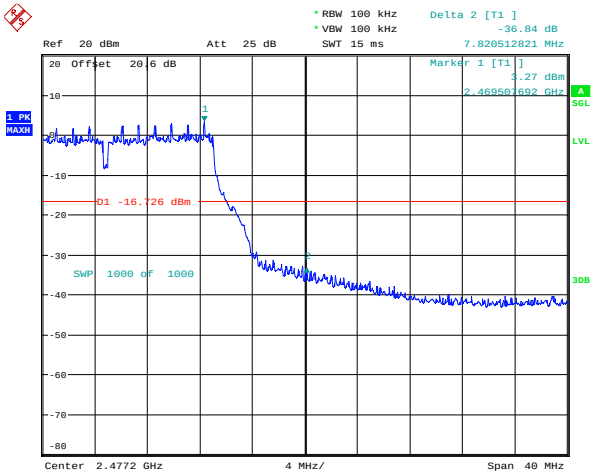


Figure 6-13: Band Edge Compliance
802.11g, Channel 11, 6 Mbps



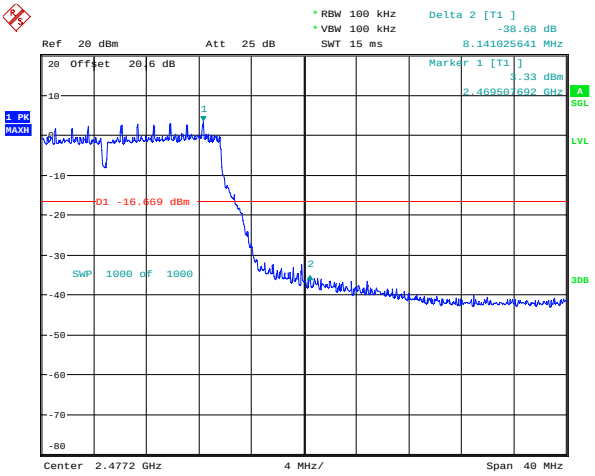
802.11b/g/n RF Conducted Emission Test Results cont'd

Figure 6-14: Band Edge Compliance
802.11n, Channel 1, MCS 0



Date: 12.MAY.2015 12:17:56

Figure 6-15: Band Edge Compliance
802.11n, Channel 11, MCS 0



Date: 12.MAY.2015 12:21:45

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	-7.66	-15.66
	5.5 Mbps	< 8.00	-9.19	-17.19
	11 Mbps	< 8.00	-8.61	-16.61
	6 Mbps	< 8.00	-9.65	-17.65
	24 Mbps	< 8.00	-9.69	-17.69
	54 Mbps	< 8.00	-12.26	-20.26
	MCS 0	< 8.00	-8.01	-16.01
	MCS 4	< 8.00	-10.85	-18.85
	MCS 7	< 8.00	-11.44	-19.44
6	1 Mbps	< 8.00	-7.34	-15.34
	5.5 Mbps	< 8.00	-8.37	-16.37
	11 Mbps	< 8.00	-7.47	-15.47
	6 Mbps	< 8.00	-9.15	-17.15
	24 Mbps	< 8.00	-9.88	-17.88
	54 Mbps	< 8.00	-12.05	-20.05
	MCS 0	< 8.00	-7.10	-15.10
	MCS 4	< 8.00	-10.52	-18.52
	MCS 7	< 8.00	-11.61	-19.61
11	1 Mbps	< 8.00	-7.92	-15.92
	5.5 Mbps	< 8.00	-8.84	-16.84
	11 Mbps	< 8.00	-9.46	-17.46
	6 Mbps	< 8.00	-10.51	-18.51
	24 Mbps	< 8.00	-10.38	-18.38
	54 Mbps	< 8.00	-12.30	-20.30
	MCS 0	< 8.00	-8.52	-16.52
	MCS 4	< 8.00	-10.18	-18.18
	MCS 7	< 8.00	-12.12	-20.12

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

See figures 6-16 to 6-24 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 6-16: Peak Power Spectral Density 802.11b, Channel 1, 1 Mbps

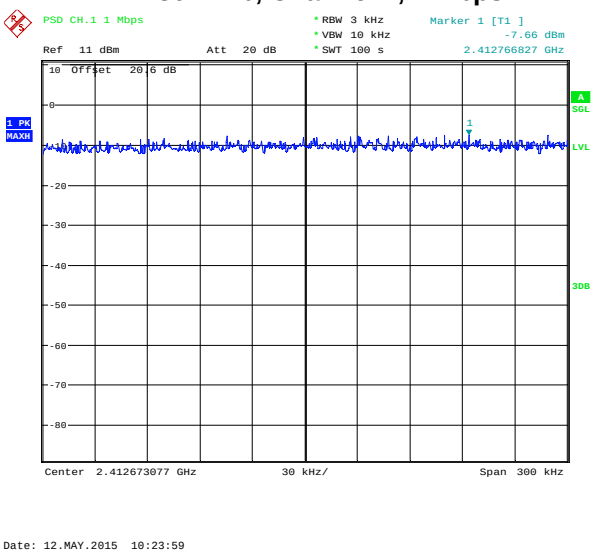


Figure 6-17: Peak Power Spectral Density 802.11b, Channel 6, 1 Mbps

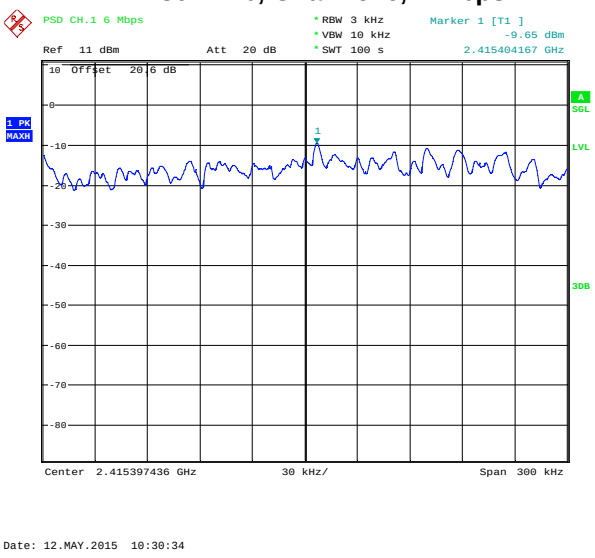
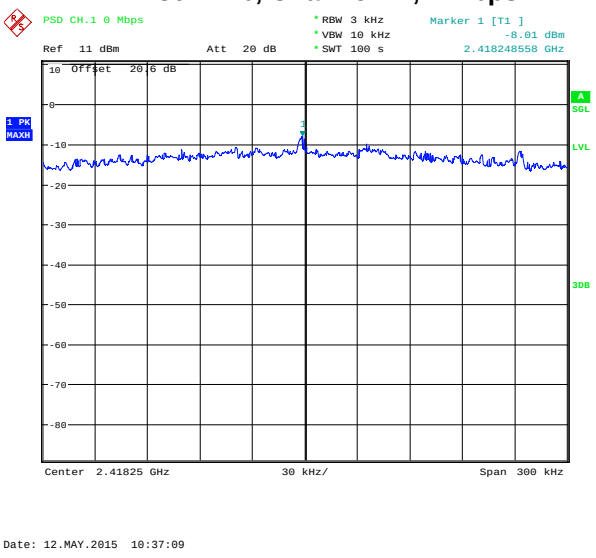


Figure 6-18: Peak Power Spectral Density 802.11b, Channel 11, 1 Mbps



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

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

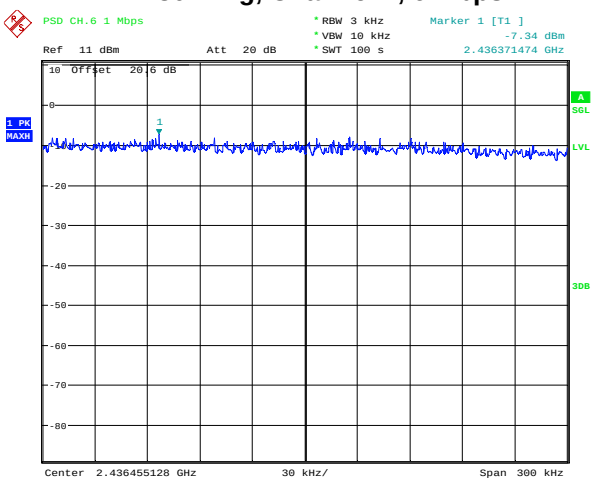


Figure 6-20: Peak Power Spectral Density 802.11g, Channel 6, 6 Mbps

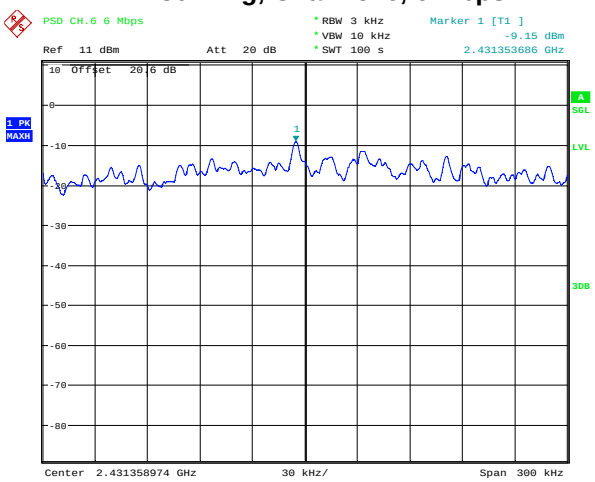
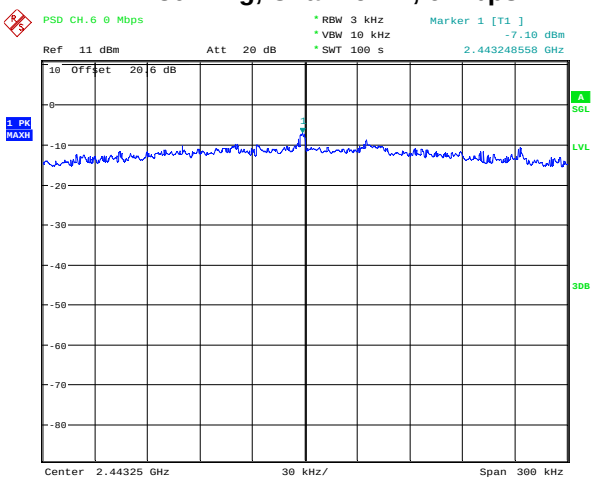


Figure 6-21: Peak Power Spectral Density 802.11g, Channel 11, 6 Mbps



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

Figure 6-22: Peak Power Spectral Density
802.11n, Channel 1, MCS 0

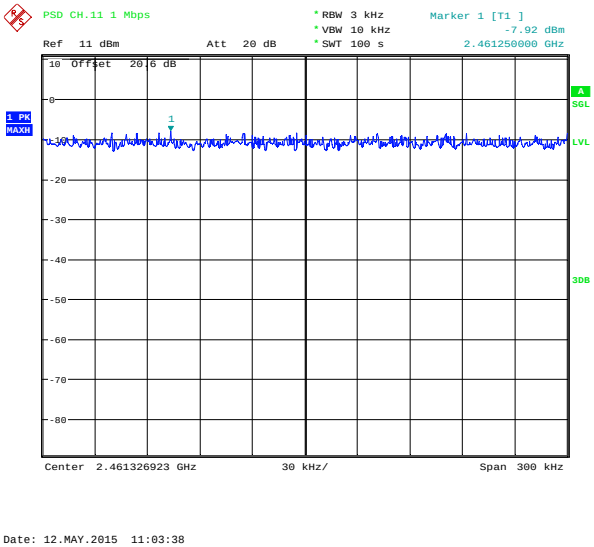


Figure 6-23: Peak Power Spectral Density
802.11n, Channel 6, MCS 0

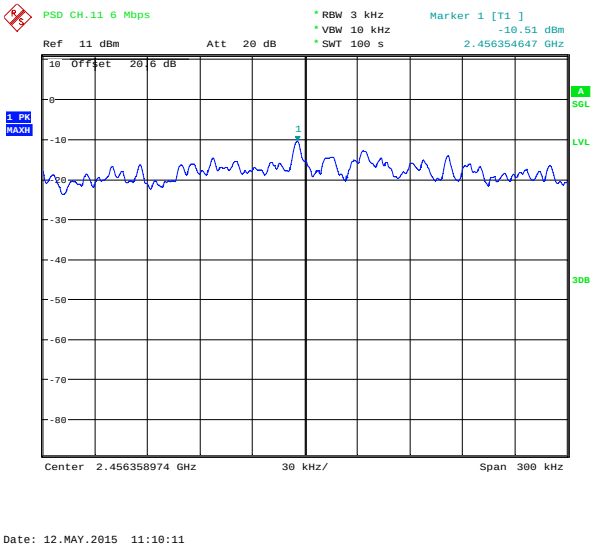
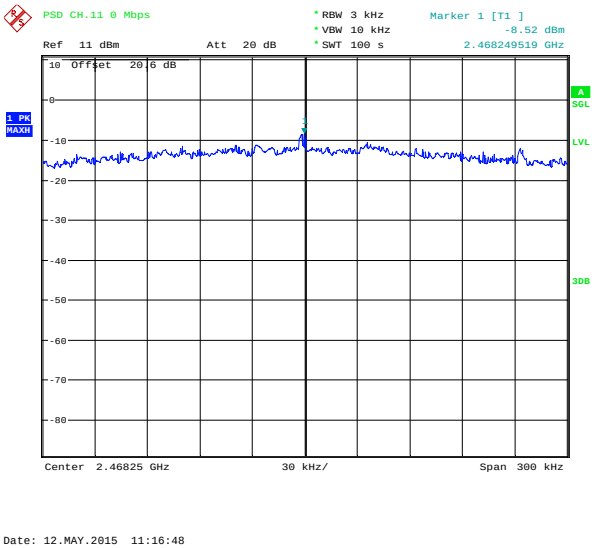


Figure 6-24: Peak Power Spectral Density
802.11n, Channel 11, MCS 0



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	13.96	-26.10	-40.87	-20
	5.5 Mbps	14.59	-34.03	-48.62	-20
	11 Mbps	14.61	-26.17	-40.78	-20
	6 Mbps	16.07	-24.55	-40.62	-20
	24 Mbps	15.23	-35.96	-51.20	-20
	54 Mbps	14.33	-36.91	-51.24	-20
	MCS 0	15.14	-36.68	-51.83	-20
	MCS 4	14.32	-35.52	-49.84	-20
	MCS 7	12.84	-32.24	-45.08	-20
6	1 Mbps	14.77	-26.01	-40.78	-20
	5.5 Mbps	14.97	-30.81	-45.78	-20
	11 Mbps	14.89	-30.24	-45.13	-20
	6 Mbps	16.78	-36.62	-53.40	-20
	24 Mbps	13.32	-35.90	-49.22	-20
	54 Mbps	14.05	-36.86	-50.91	-20
	MCS 0	16.92	-36.51	-53.43	-20
	MCS 4	14.64	-35.86	-50.50	-20
	MCS 7	14.08	-19.98	-34.07	-20

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

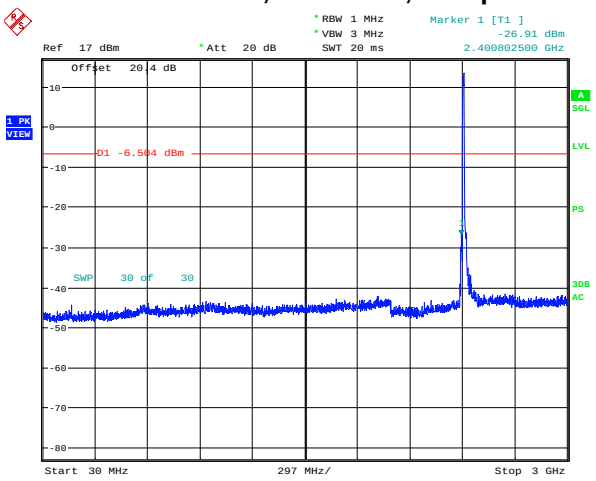
Channel	Data Rate	Power (dBm)	Max. Measured Level (dBm)	Max. Measured Level from Carrier (dBc)	Limit (dBc)
11	1 Mbps	14.42	-24.46	-38.89	-20
	5.5 Mbps	14.43	-24.40	-38.83	-20
	11 Mbps	14.67	-34.20	-48.86	-20
	6 Mbps	15.57	-18.41	-33.98	-20
	24 Mbps	15.51	-36.61	-52.12	-20
	54 Mbps	15.54	-36.57	-52.11	-20
	MCS 0	15.40	-36.31	-51.70	-20
	MCS 4	12.59	-36.19	-48.78	-20
	MCS 7	13.25	-36.12	-49.37	-20

The emissions were in the NF.

See figures 6-25 to 6-33 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.

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

Figure 6-25: Spurious Conducted RF Emissions
802.11b, Channel 1, 1 Mbps



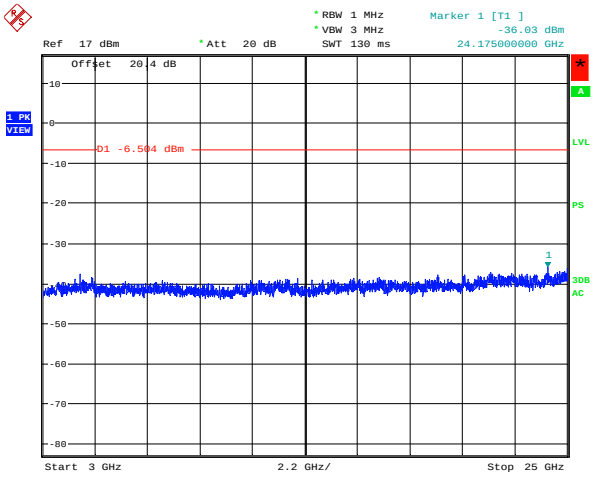
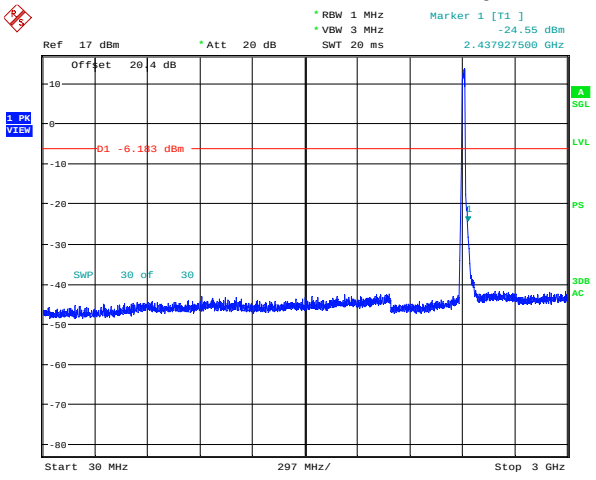
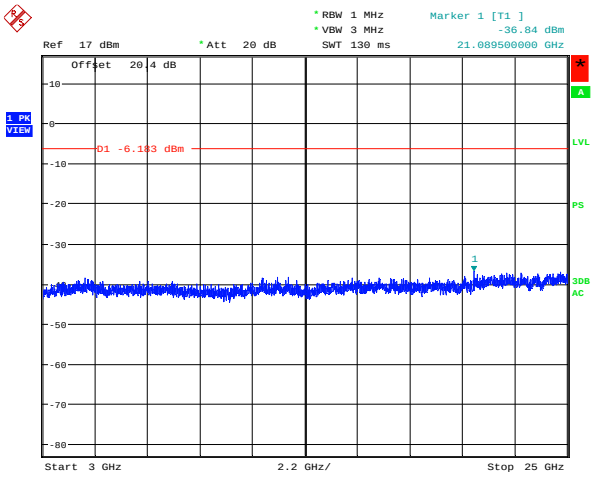


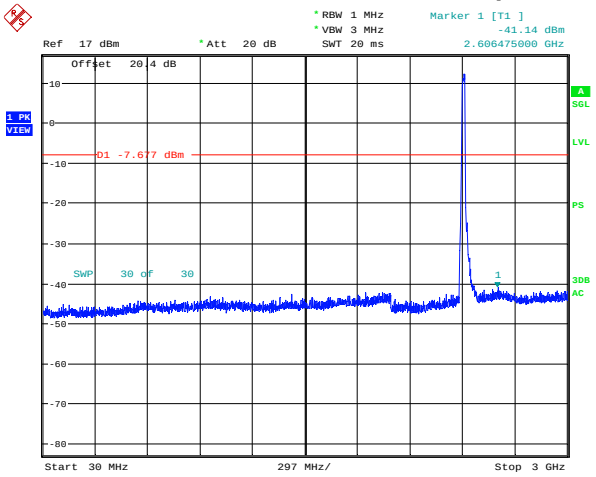
Figure 6-26 : Spurious Conducted RF Emissions
802.11b, Channel 6, 1 Mbps





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

Figure 6-27: Spurious Conducted RF Emissions
802.11b, Channel 11, 1 Mbps



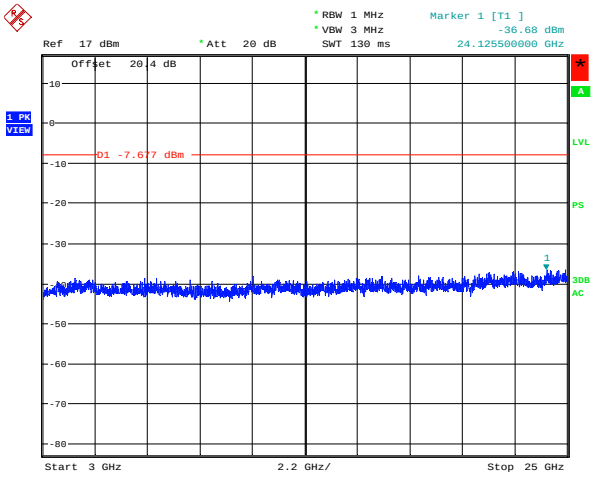
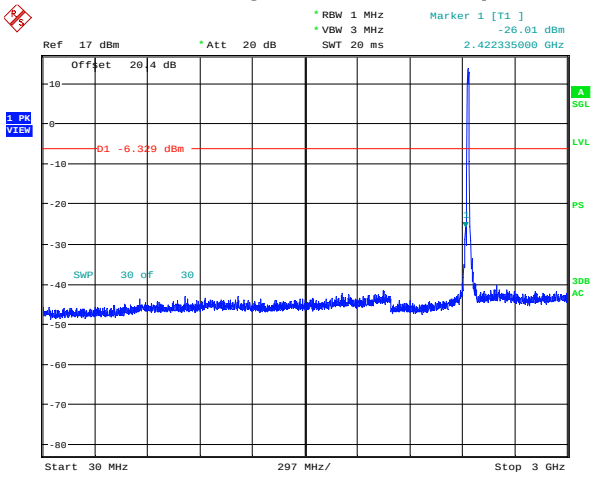
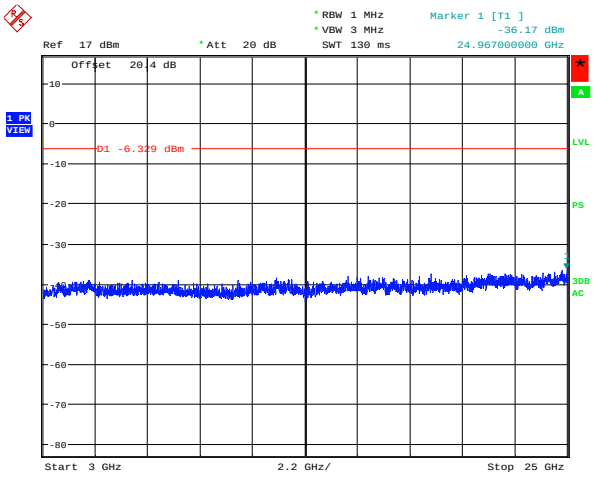


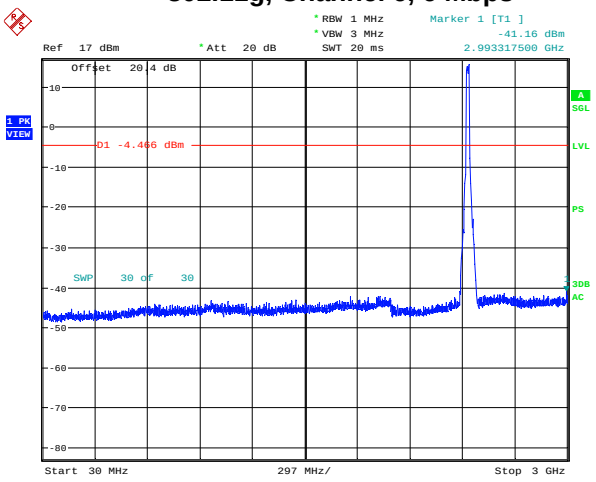
Figure 6-28: Spurious Conducted RF Emissions
802.11g, Channel 1, 6 Mbps





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

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



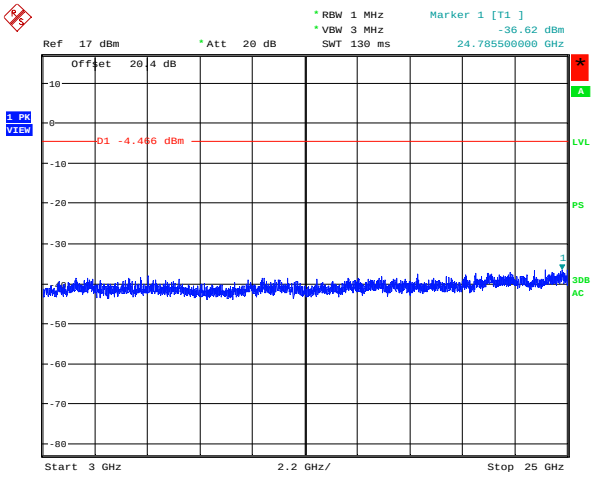
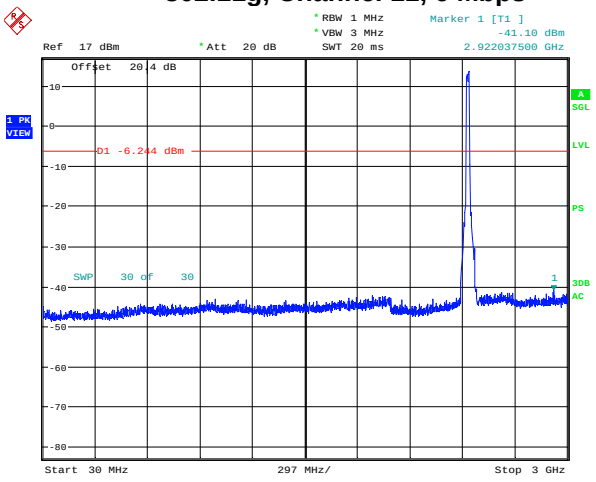
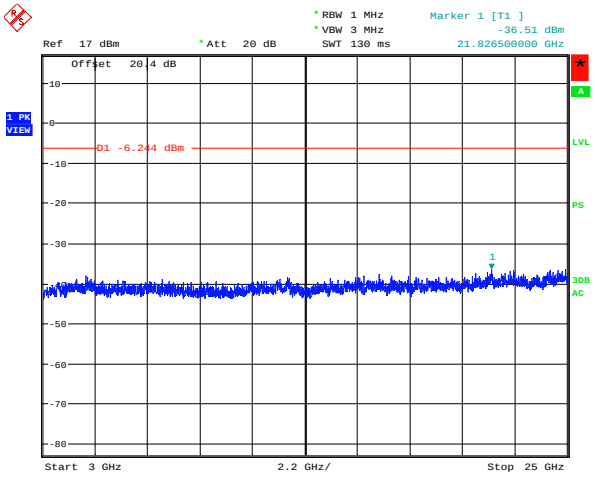


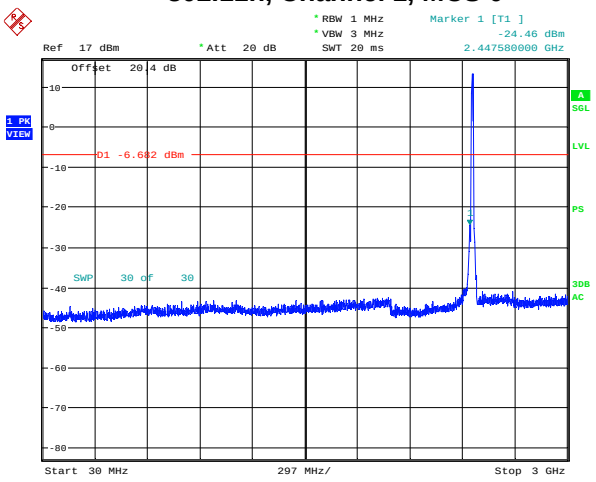
Figure 6-30: Spurious Conducted RF Emissions
802.11g, Channel 11, 6 Mbps



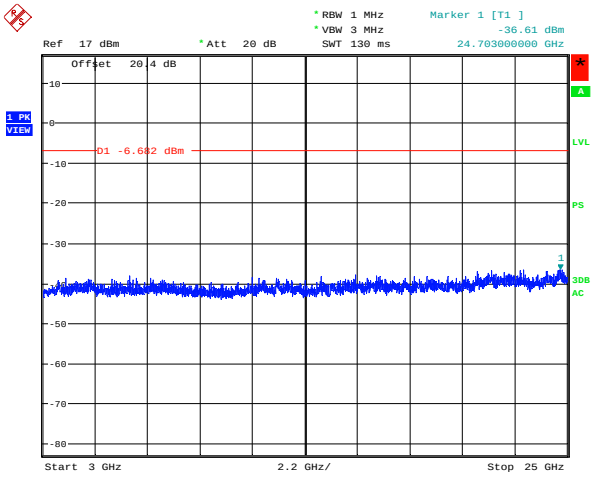


802.11b/g/n RF Conducted Emission Test Results cont'd

Figure 6-31: Spurious Conducted RF Emissions
802.11n, Channel 1, MCS 0

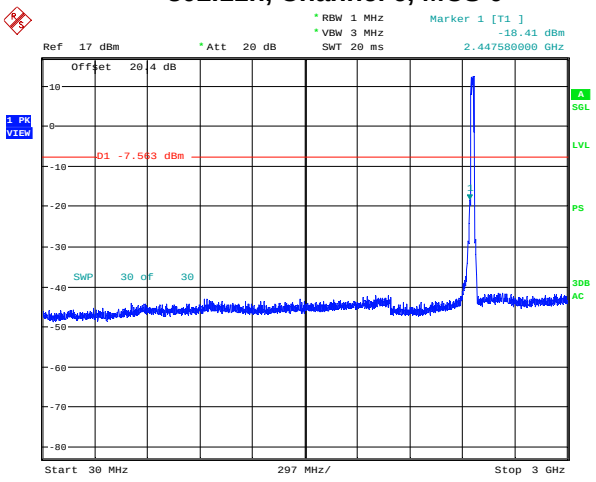


Date: 25.APR.2015 20:03:58

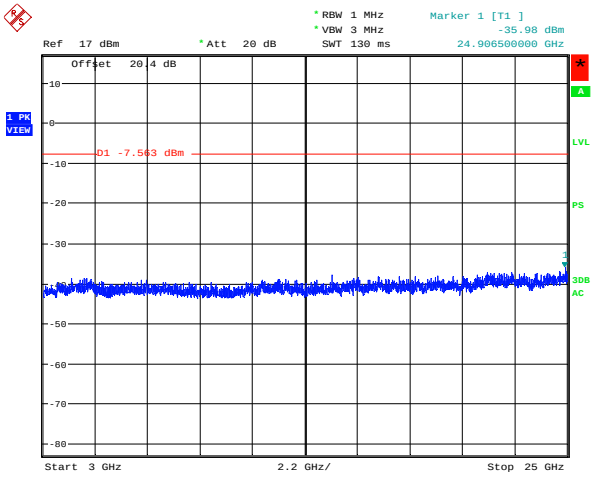


Date: 25.APR.2015 20:04:05

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



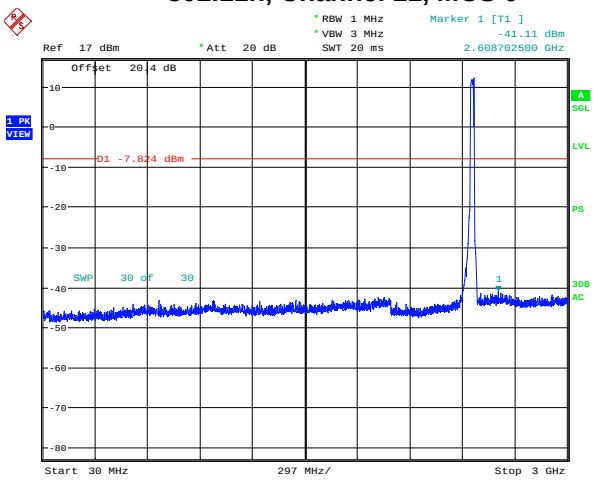
Date: 25.APR.2015 20:05:25

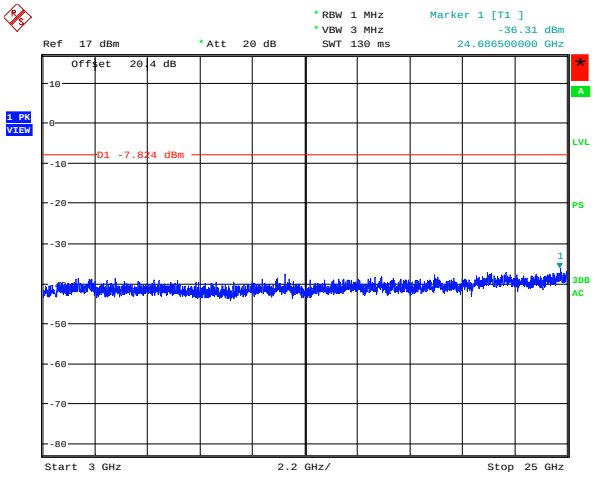


Date: 25.APR.2015 20:05:32

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

Figure 6-33: Spurious Conducted RF Emissions
802.11n, Channel 11, MCS 0

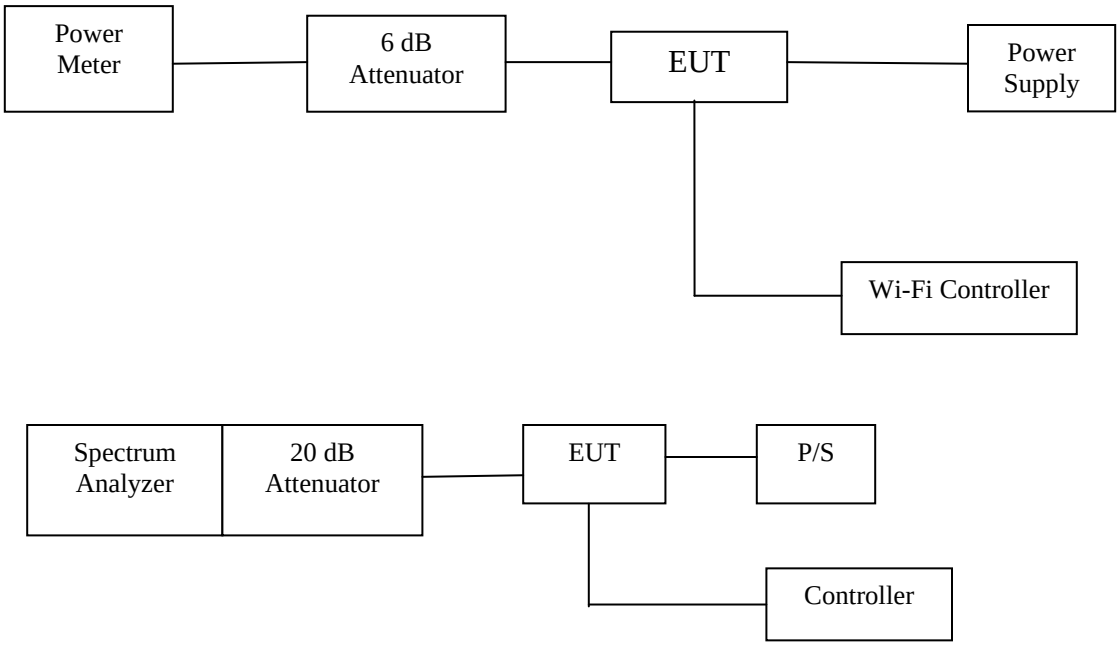




APPENDIX 7 – 802.11a/n CONDUCTED EMISSIONS TEST DATA/PLOTS

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: April 6, 2015
The measurements were performed by Sijia LI.

The environmental test conditions were: Temperature: 25.7ºC
Relative Humidity: 31.2 %

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, 48, 64, 100, 140, 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	16.38
	24 Mbps	≥ 500	**16.48**
	54 Mbps	≥ 500	16.40
48	6 Mbps	≥ 500	16.36
	24 Mbps	≥ 500	16.30
	54 Mbps	≥ 500	16.42
64	6 Mbps	≥ 500	16.36
	24 Mbps	≥ 500	**16.48**
	54 Mbps	≥ 500	16.42
100	6 Mbps	≥ 500	16.36
	24 Mbps	≥ 500	16.30
	54 Mbps	≥ 500	16.46
140	6 Mbps	≥ 500	16.38
	24 Mbps	≥ 500	16.28
	54 Mbps	≥ 500	16.42
165	6 Mbps	≥ 500	16.16
	24 Mbps	≥ 500	16.28
	54 Mbps	≥ 500	16.42

See figures 7-1 to 7-6 for the plots of the 6 dB bandwidth measurements for Channel 36, 48, 64, 100, 140, and 165 at 6 Mbps each for 802.11a mode

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

20 MHz Bandwidth

Channel	Data Rate	Limit (kHz)	Measured Level (MHz)
36	MCS0	≥ 500	17.52
	MCS4	≥ 500	17.48
	MCS7	≥ 500	17.50
100	MCS0	≥ 500	17.60
	MCS4	≥ 500	17.72
	MCS7	≥ 500	**17.76**
165	MCS0	≥ 500	17.52
	MCS4	≥ 500	**17.76**
	MCS7	≥ 500	**17.76**

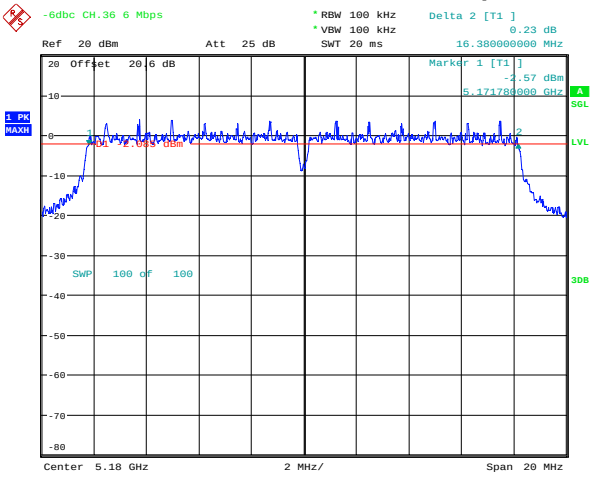
40 MHz Bandwidth

Channel	Data Rate	Limit (kHz)	Measured Level (MHz)
36	MCS0	≥ 500	36.00
	MCS4	≥ 500	36.48
	MCS7	≥ 500	**36.52**
100	MCS0	≥ 500	36.20
	MCS4	≥ 500	36.24
	MCS7	≥ 500	35.88
165	MCS0	≥ 500	36.16
	MCS4	≥ 500	36.24
	MCS7	≥ 500	36.24

See figures 7-7 to 7-12 for the plots of the 6 dB bandwidth measurements for Channel 36, 100 and 165 at MCS 0 each for 802.11n mode.

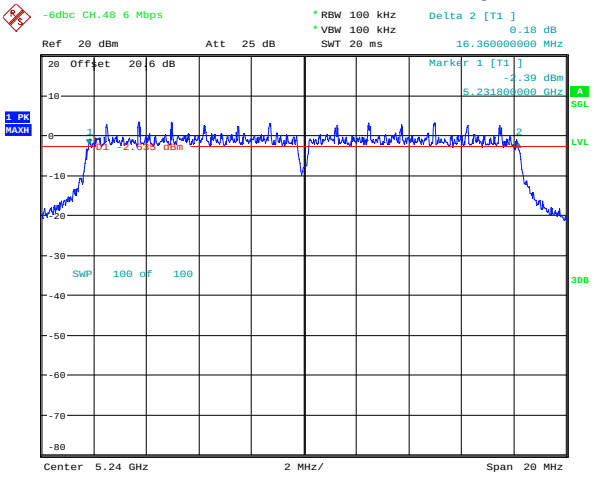
802.11a RF Conducted Emission Test Results cont'd

Figure 7-1: 6 dB Bandwidth
802.11a, Channel 36, 6 Mbps



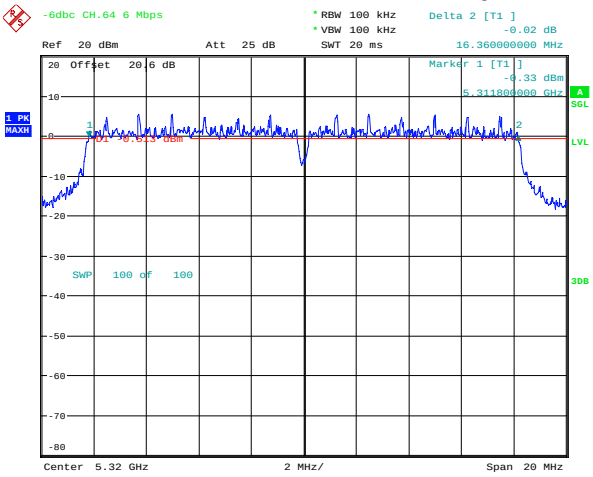
Date: 6.APR.2015 15:52:52

Figure 7-2: 6 dB Bandwidth
802.11a, Channel 48, 6 Mbps



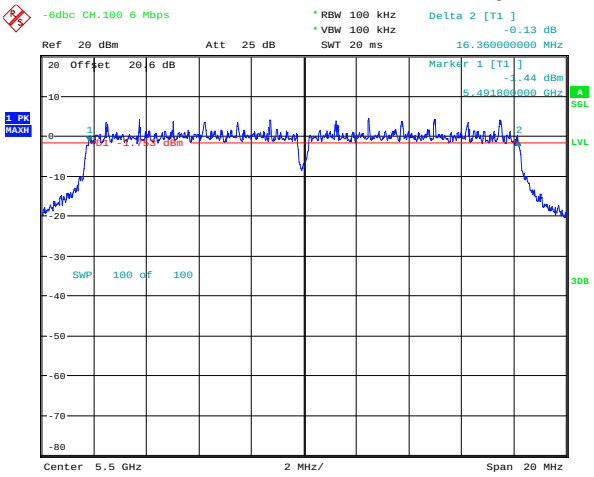
Date: 6.APR.2015 15:53:25

Figure 7-3: 6 dB Bandwidth
802.11a, Channel 64, 6 Mbps



Date: 6.APR.2015 15:53:59

Figure 7-4: 6 dB Bandwidth
802.11a, Channel 100, 6 Mbps



Date: 6.APR.2015 15:54:32

802.11a RF Conducted Emission Test Results cont'd

Figure 7-5: 6 dB Bandwidth
802.11a, Channel 140, 6 Mbps

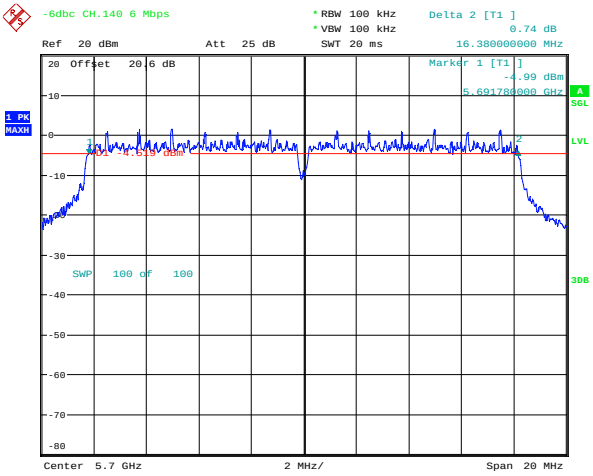
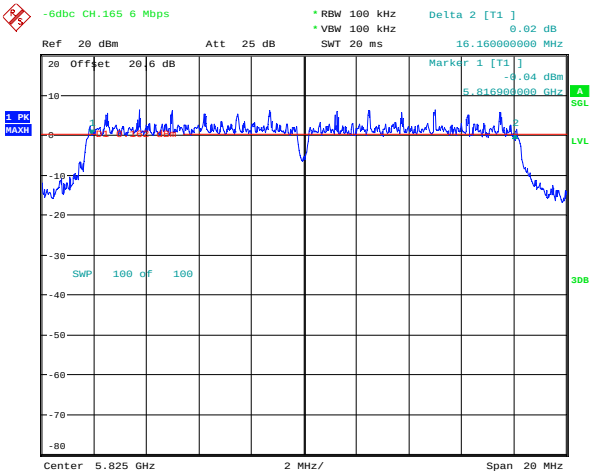


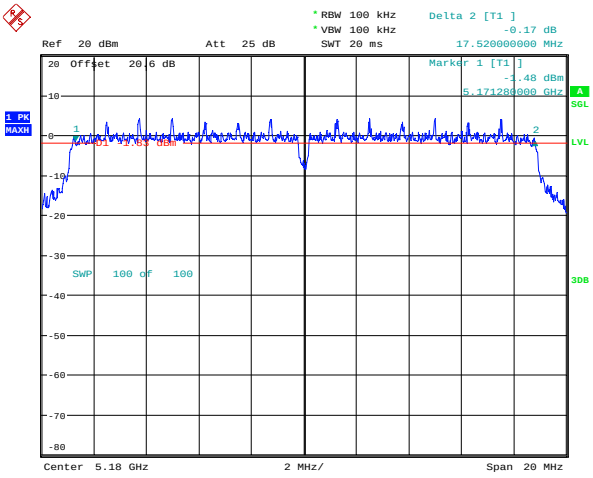
Figure 7-6: 6 dB Bandwidth
802.11a, Channel 165, 6 Mbps



802.11n RF Conducted Emission Test Results cont'd

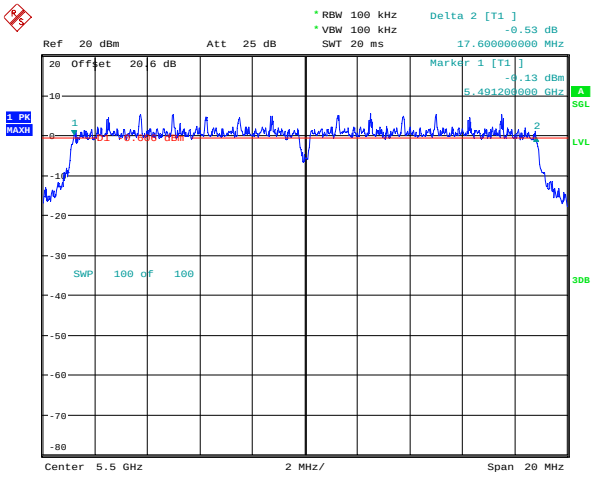
20 MHz Bandwidth

Figure 7-7: 6 dB Bandwidth
802.11n, Channel 36, MCS 0



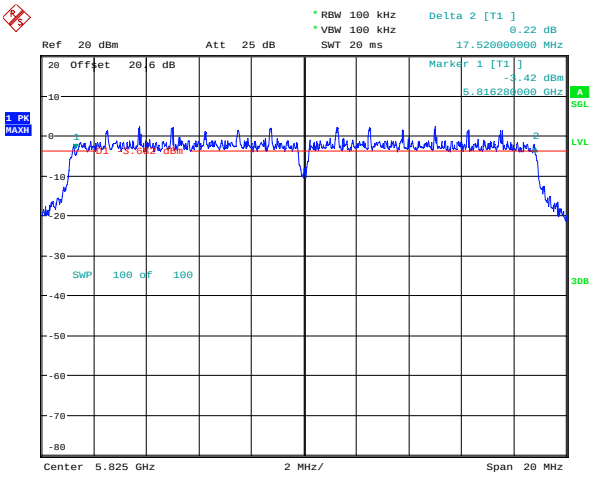
Date: 8.APR.2015 12:37:57

Figure 7-8: 6 dB Bandwidth
802.11n, Channel 100, MCS 0



Date: 8.APR.2015 12:38:34

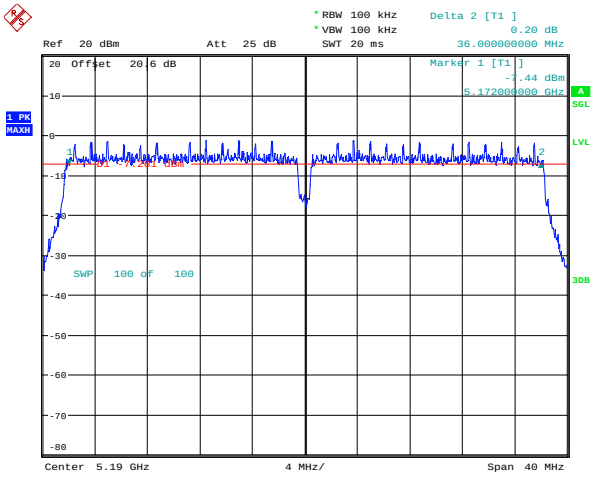
Figure 7-9: 6 dB Bandwidth
802.11n, Channel 165, MCS 0



Date: 8.APR.2015 12:39:11

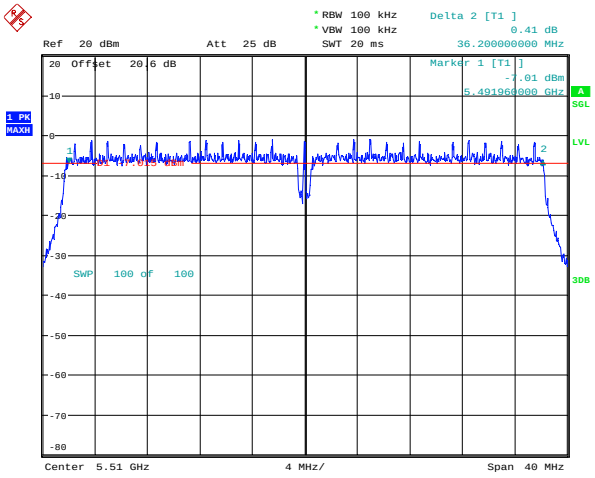
40 MHz Bandwidth

Figure 7-10: 6 dB Bandwidth
802.11n, Channel 36, MCS 0



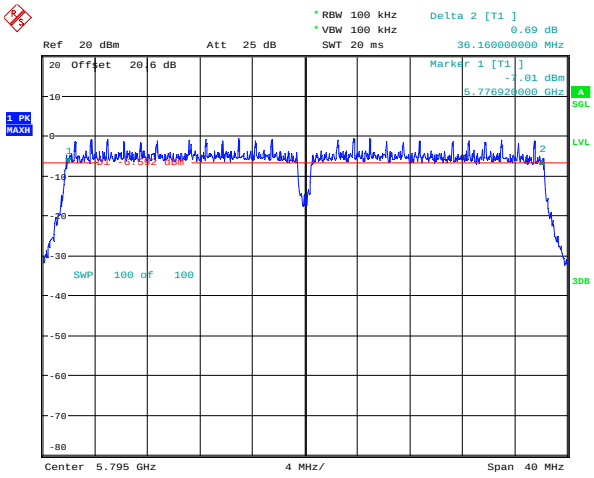
Date: 25.APR.2015 18:27:49

Figure 7-11: 6 dB Bandwidth
802.11n, Channel 100, MCS 0



Date: 25.APR.2015 18:28:21

Figure 7-12: 6 dB Bandwidth
802.11n, Channel 165, MCS 0



Date: 25.APR.2015 18:34:30

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, 48, 64, 100, 140 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	Power Limit (mW)	Measured Level (dBm)	Measured Level (W)
36	6 Mbps	< 50.0	15.49	0.0354
	24 Mbps	< 50.0	14.68	0.0294
	54 Mbps	< 50.0	13.91	0.0246
48	6 Mbps	< 50.0	17.04	0.0506
	24 Mbps	< 50.0	15.92	0.0391
	54 Mbps	< 50.0	13.58	0.0228
64	6 Mbps	< 250.0	16.02	0.0400
	24 Mbps	< 250.0	15.28	0.0337
	54 Mbps	< 250.0	14.28	0.0268
100	6 Mbps	< 250.0	13.12	0.0205
	24 Mbps	< 250.0	12.15	0.0164
	54 Mbps	< 250.0	11.29	0.0135
140	6 Mbps	< 250.0	15.25	0.0335
	24 Mbps	< 250.0	14.45	0.0279
	54 Mbps	< 250.0	13.71	0.0235
165	6 Mbps	< 1000	**17.29**	**0.0536**
	24 Mbps	< 1000	16.02	0.0400
	54 Mbps	< 1000	13.79	0.0239

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, 100, 140 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.

20 MHz Bandwidth

Channel	Data Rate	Class 2 Limit (W)	Measured Level (dBm)	Measured Level (W)
36	5180	< 50.0	15.49	0.0354
	24 Mbps	< 50.0	14.37	0.0274
	54 Mbps	< 50.0	12.98	0.0199
64	5320	< 250.0	16.49	0.0446
	24 Mbps	< 250.0	15.10	0.0324
	54 Mbps	< 250.0	12.41	0.0174
100	5500	< 250.0	**16.53**	**0.0450**
	24 Mbps	< 250.0	15.48	0.0353
	54 Mbps	< 250.0	13.27	0.0212
140	5700	< 250.0	12.79	0.0190
	24 Mbps	< 250.0	11.61	0.0145
	54 Mbps	< 250.0	11.05	0.0127
165	5825	< 1000	13.69	0.0234
	24 Mbps	< 1000	12.57	0.0181
	54 Mbps	< 1000	12.11	0.0163

40 MHz Bandwidth

Channel	Data Rate	Class 2 Limit (W)	Measured Level (dBm)	Measured Level (W)
36	5180	< 50.0	16.17	0.0414
	24 Mbps	< 50.0	14.55	0.0285
	54 Mbps	< 50.0	13.71	0.0235
64	5320	< 250.0	15.88	0.0387
	24 Mbps	< 250.0	14.39	0.0275
	54 Mbps	< 250.0	13.46	0.0222
100	5500	< 250.0	16.43	0.0440
	24 Mbps	< 250.0	14.92	0.0310
	54 Mbps	< 250.0	14.18	0.0262
140	5700	< 250.0	**18.88**	**0.0773**
	24 Mbps	< 250.0	16.21	0.0418
	54 Mbps	< 250.0	14.75	0.0299
165	5825	< 1000	18.17	0.0656
	24 Mbps	< 1000	17.13	0.0516
	54 Mbps	< 1000	15.73	0.0374

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, 64, 100, 140, 149, 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	-45.76	-25.76
	24 Mbps	< -20	-45.57	-25.57
	54 Mbps	< -20	-45.45	-25.45
64	6 Mbps	< -20	-46.70	-26.70
	24 Mbps	< -20	-46.05	-26.05
	54 Mbps	< -20	-44.70	-24.70
100	6 Mbps	< -20	-45.05	-25.05
	24 Mbps	< -20	-46.30	-26.30
	54 Mbps	< -20	-45.75	-25.75
140	6 Mbps	< -20	-43.72	-23.72
	24 Mbps	< -20	-43.70	-23.70
	54 Mbps	< -20	-43.71	-23.71
149	6 Mbps	< -20	-38.48	-18.48
	24 Mbps	< -20	-41.33	-21.33
	54 Mbps	< -20	-42.35	-22.35
165	6 Mbps	< -20	-32.06	-12.06
	24 Mbps	< -20	-35.10	-15.10
	54 Mbps	< -20	-37.44	-17.44

See figures 7-13 to 7-18 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.

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, 100, 140, 149 and 165 were measured at MCS 0, MCS 4 and MCS 7 each for 802.11n mode.

20 MHz bandwidth

Channel	Data Rate	Limit (dBc)	Measured Level (dBc)	Margin (dBc)
36	6 Mbps	< -20	-44.75	-24.75
	24 Mbps	< -20	-45.21	-25.21
	54 Mbps	< -20	-45.40	-25.40
64	6 Mbps	< -20	-43.75	-23.75
	24 Mbps	< -20	-44.61	-24.61
	54 Mbps	< -20	-45.37	-25.37
100	6 Mbps	< -20	-46.44	-26.44
	24 Mbps	< -20	-45.60	-25.60
	54 Mbps	< -20	-46.47	-26.47
140	6 Mbps	< -20	-43.09	-23.09
	24 Mbps	< -20	-43.06	-23.06
	54 Mbps	< -20	-43.87	-23.87
149	6 Mbps	< -20	-38.50	-18.50
	24 Mbps	< -20	-38.58	-18.58
	54 Mbps	< -20	-40.23	-20.23
165	6 Mbps	< -20	-31.49	-11.49
	24 Mbps	< -20	-31.97	-11.97
	54 Mbps	< -20	-38.82	-18.82

802.11n RF Conducted Emission Test Results

40 MHz bandwidth

Channel	Data Rate	Limit (dBc)	Measured Level (dBc)	Margin (dBc)
36	6 Mbps	< -20	-38.35	-18.35
	24 Mbps	< -20	-38.70	-18.70
	54 Mbps	< -20	-38.56	-18.56
64	6 Mbps	< -20	-39.61	-19.61
	24 Mbps	< -20	-39.40	-19.40
	54 Mbps	< -20	-40.21	-20.21
100	6 Mbps	< -20	-39.21	-19.21
	24 Mbps	< -20	-38.96	-18.96
	54 Mbps	< -20	-40.23	-20.23
140	6 Mbps	< -20	-24.56	-4.56
	24 Mbps	< -20	-29.84	-9.84
	54 Mbps	< -20	-32.34	-12.34
149	6 Mbps	< -20	-27.51	-7.51
	24 Mbps	< -20	-30.01	-10.01
	54 Mbps	< -20	-31.53	-11.53
165	6 Mbps	< -20	-37.89	-17.89
	24 Mbps	< -20	-37.85	-17.85
	54 Mbps	< -20	-39.85	-19.85

See figures 7-19 to 7-30 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.

802.11a RF Conducted Emission Test Results cont'd

Figure 7-13: Band Edge Compliance
802.11a, Channel 36, 6 Mbps

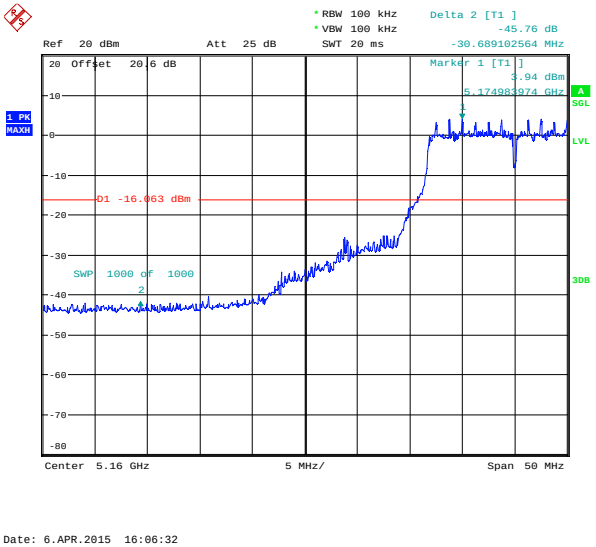


Figure 7-14: Band Edge Compliance
802.11a, Channel 64, 6 Mbps

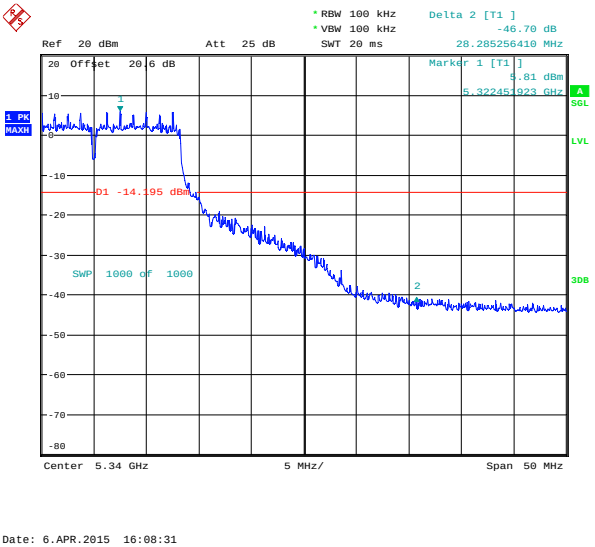


Figure 7-15: Band Edge Compliance
802.11a, Channel 100, 6 Mbps

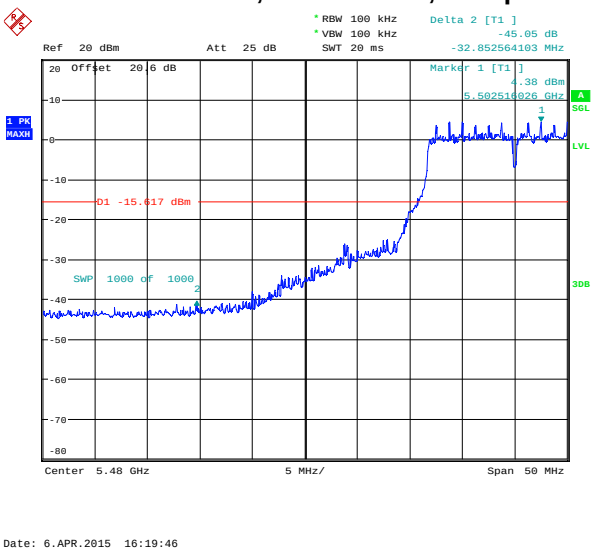
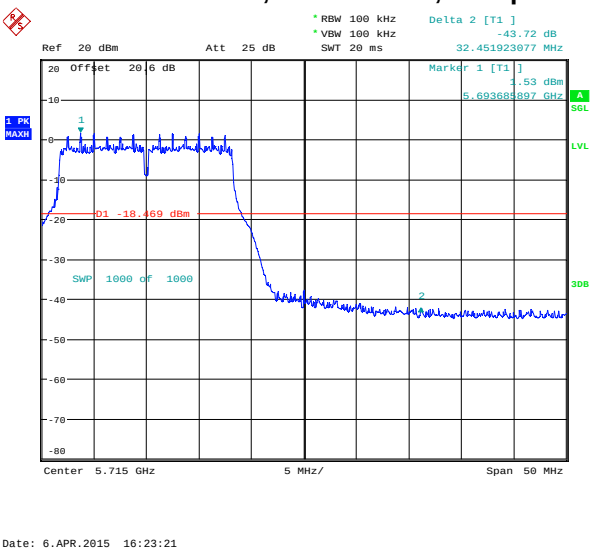
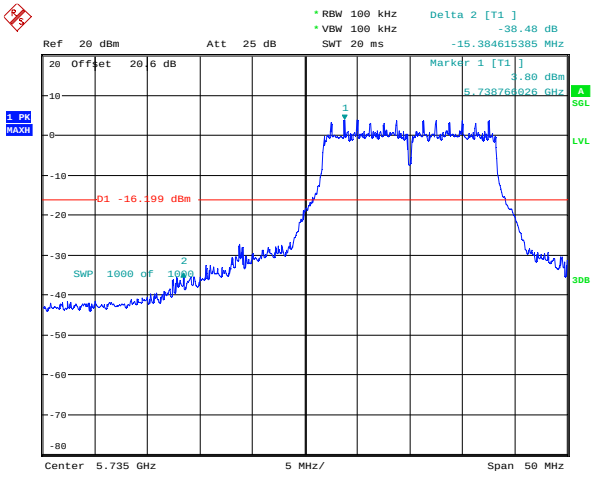


Figure 7-16: Band Edge Compliance
802.11a, Channel 140, 6 Mbps



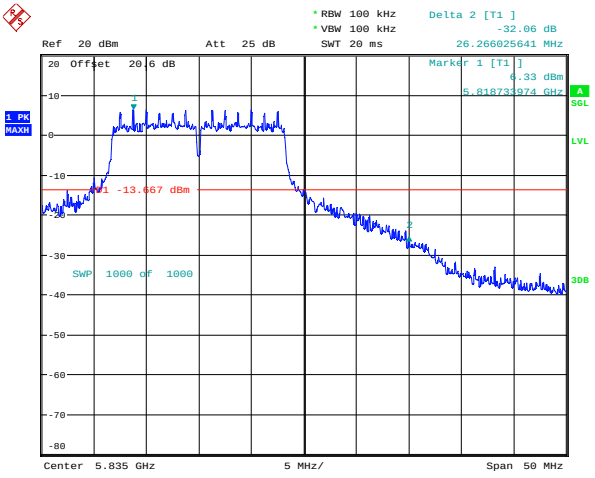
802.11a RF Conducted Emission Test Results cont'd

Figure 7-17: Band Edge Compliance
802.11a, Channel 149, 6 Mbps



Date: 6.APR.2015 16:10:35

Figure 7-18: Band Edge Compliance
802.11a, Channel 165, 6 Mbps

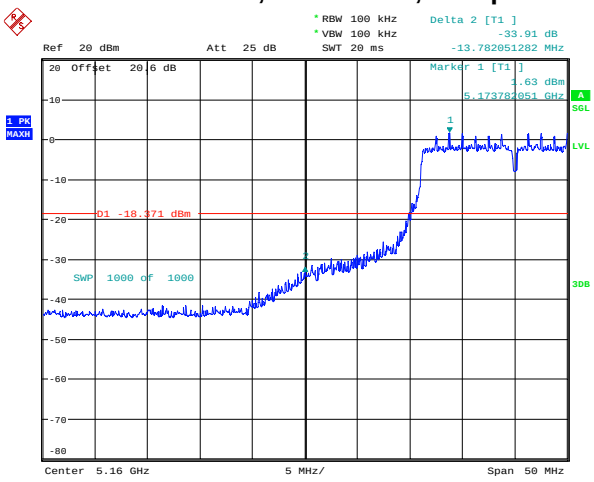


Date: 6.APR.2015 16:17:57

802.11n RF Conducted Emission Test Results

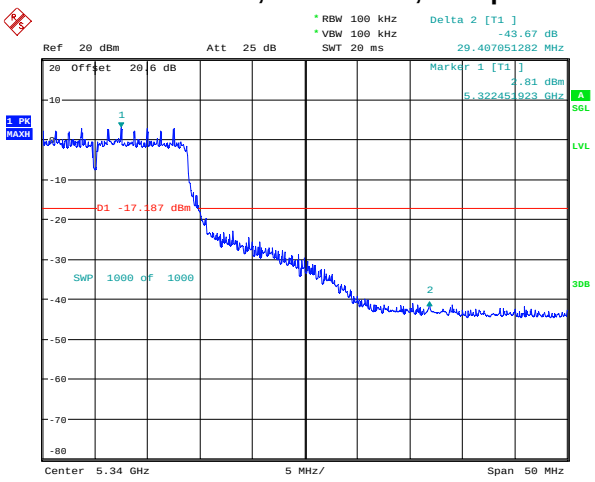
20 MHz Bandwidth

Figure 7-19: Band Edge Compliance
802.11n, Channel 36, 6 Mbps



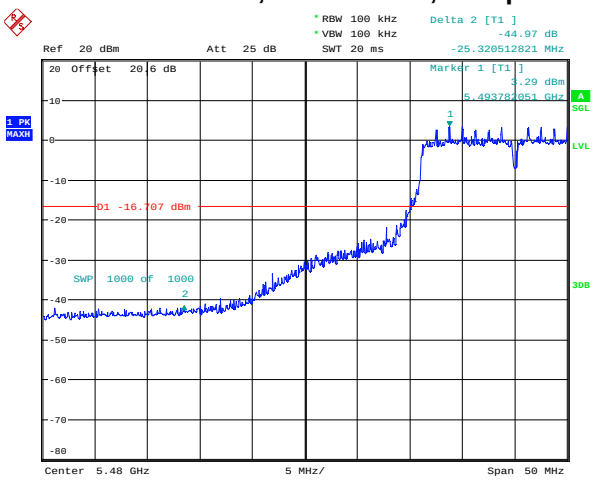
Date: 21.APR.2015 11:22:21

Figure 7-20: Band Edge Compliance
802.11n, Channel 64, 6 Mbps



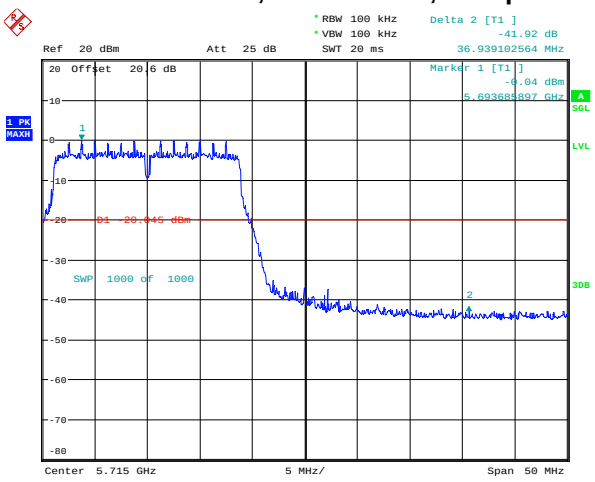
Date: 21.APR.2015 11:30:46

Figure 7-21: Band Edge Compliance
802.11n, Channel 100, 6 Mbps



Date: 21.APR.2015 11:40:06

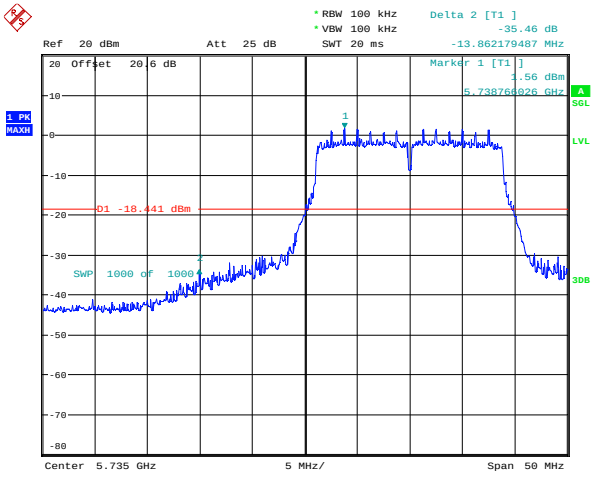
Figure 7-22: Band Edge Compliance
802.11n, Channel 140, 6 Mbps



Date: 21.APR.2015 12:00:20

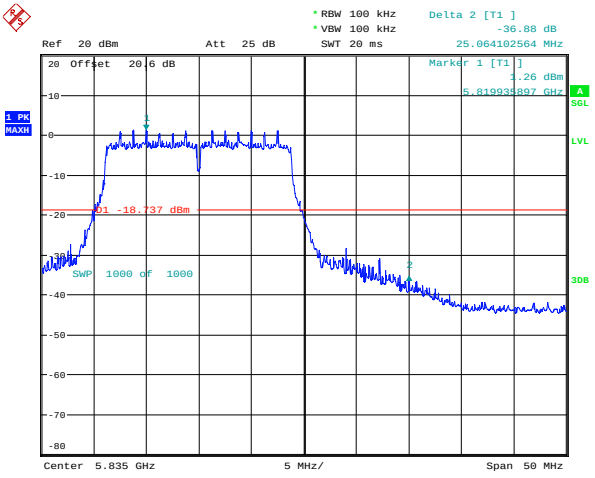
802.11n RF Conducted Emission Test Results cont'd

Figure 7-23: Band Edge Compliance
802.11n, Channel 149, 6 Mbps



Date: 21.APR.2015 11:57:52

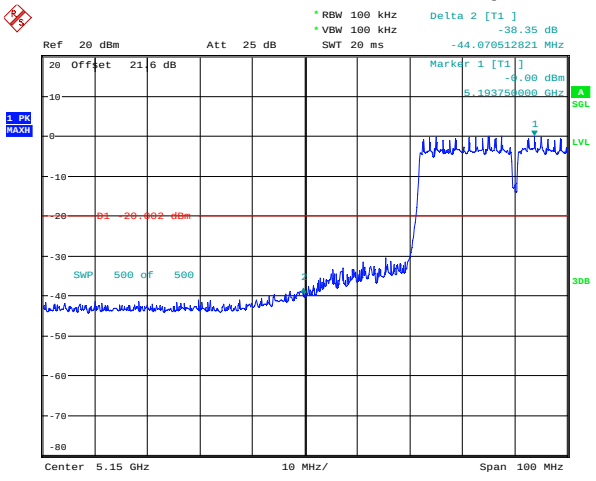
Figure 7-24: Band Edge Compliance
802.11n, Channel 165, 6 Mbps



Date: 21.APR.2015 11:57:01

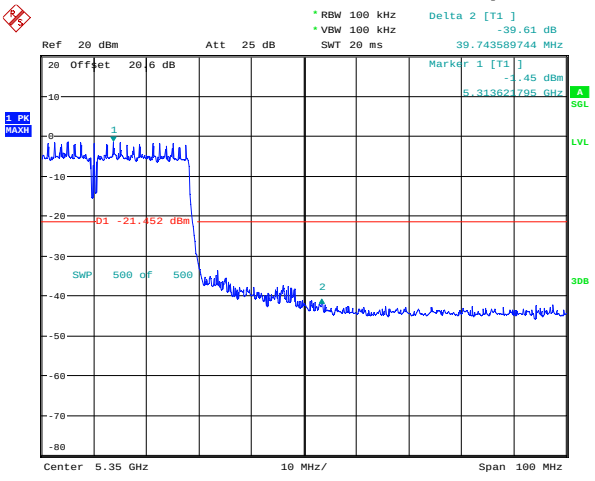
40 MHz Bandwidth

Figure 7-25: Band Edge Compliance
802.11n, Channel 36, 6 Mbps



Date: 25.APR.2015 17:58:06

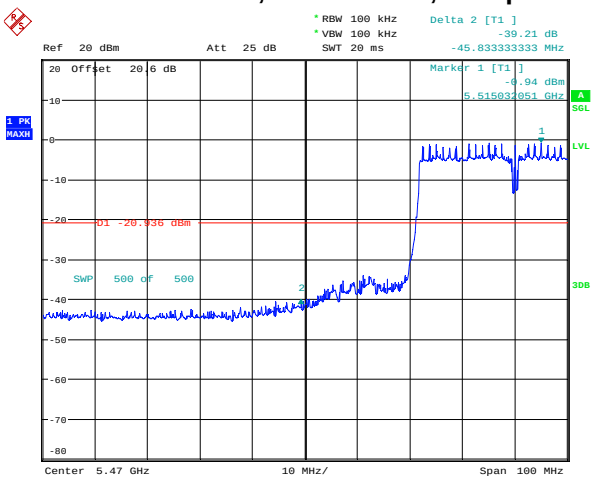
Figure 7-26: Band Edge Compliance
802.11n, Channel 64, 6 Mbps



Date: 25.APR.2015 17:59:57

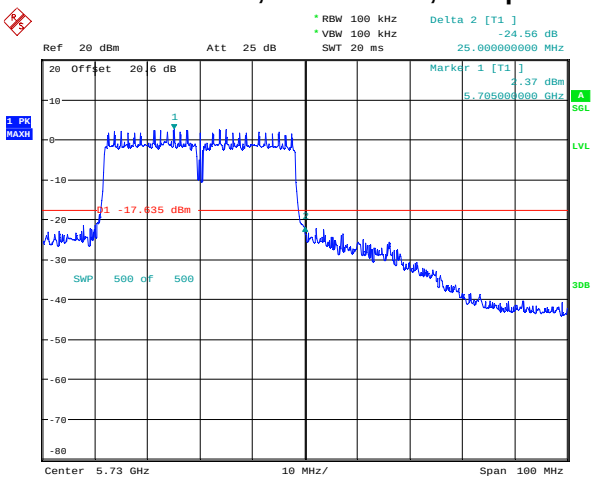
802.11n RF Conducted Emission Test Results cont'd

Figure 7-27: Band Edge Compliance
802.11n, Channel 100, 6 Mbps



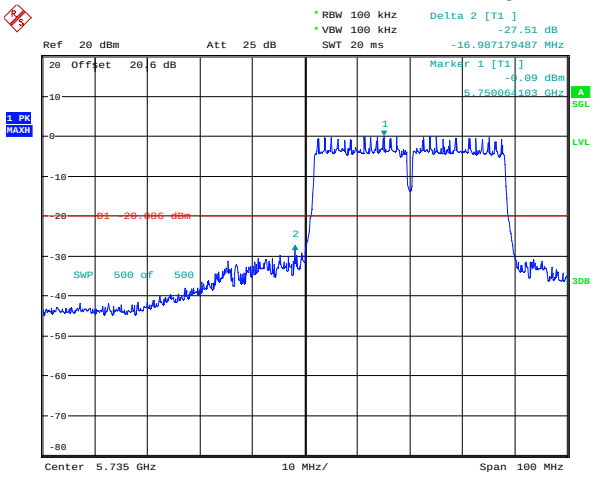
Date: 25.APR.2015 18:01:48

Figure 7-28: Band Edge Compliance
802.11n, Channel 140, 6 Mbps



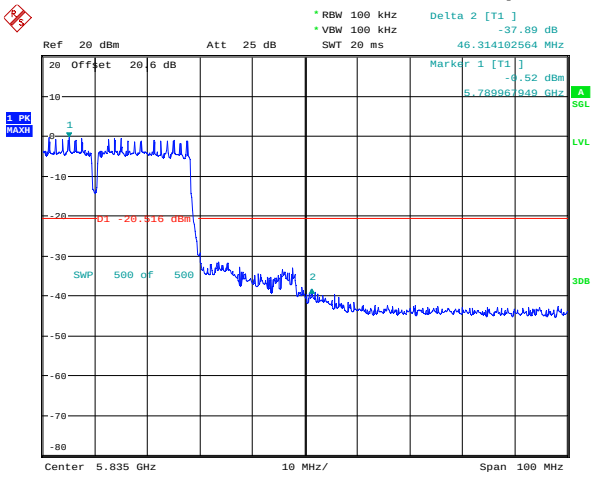
Date: 25.APR.2015 18:03:40

Figure 7-29: Band Edge Compliance
802.11n, Channel 149, 6 Mbps



Date: 25.APR.2015 18:05:33

Figure 7-30: Band Edge Compliance
802.11n, Channel 165, 6 Mbps



Date: 25.APR.2015 18:07:26

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, 48, 64, 100, 140 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	< 11.00	3.84	-7.16
	24 Mbps	< 11.00	3.04	-7.96
	54 Mbps	< 11.00	2.31	-8.69
48	6 Mbps	< 11.00	3.50	-7.50
	24 Mbps	< 11.00	3.37	-7.63
	54 Mbps	< 11.00	1.91	-9.09
64	6 Mbps	< 11.00	5.75	-5.25
	24 Mbps	< 11.00	4.16	-6.84
	54 Mbps	< 11.00	1.91	-9.09
100	6 Mbps	< 11.00	4.51	-6.49
	24 Mbps	< 11.00	3.70	-7.30
	54 Mbps	< 11.00	3.11	-7.89
140	6 Mbps	< 11.00	1.83	-9.17
	24 Mbps	< 11.00	0.99	-10.01
	54 Mbps	< 11.00	0.15	-10.85
165	6 Mbps	< 33.00	-16.49	-33.49
	24 Mbps	< 33.00	-17.08	-34.08
	54 Mbps	< 33.00	-18.71	-35.71

See figures 7-31 to 7-36 for the plots of the peak power spectral density for Channel 36, 48, 64, 100, 140, and 165 at 6 Mbps each for 802.11a mode.

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

20 MHz Bandwidth

Channel	Data Rate	Limit (dBm)	Measured Level (dBm)	Margin (dBm)
36	6 Mbps	< 4.00	3.83	-0.17
	24 Mbps	< 4.00	2.91	-1.09
	54 Mbps	< 4.00	1.43	-2.57
100	6 Mbps	< 11.00	4.95	-6.05
	24 Mbps	< 11.00	4.13	-6.87
	54 Mbps	< 11.00	1.94	-9.06
165	6 Mbps	< 17.00	-20.03	-37.03
	24 Mbps	< 17.00	-21.03	-38.03
	54 Mbps	< 17.00	-19.66	-36.66

40 MHz Bandwidth

Channel	Data Rate	Limit (dBm)	Measured Level (dBm)	Margin (dBm)
36	6 Mbps	< 4.00	-1.72	-5.72
	24 Mbps	< 4.00	-3.13	-7.13
	54 Mbps	< 4.00	-5.79	-9.79
100	6 Mbps	< 11.00	-1.19	-12.19
	24 Mbps	< 11.00	-2.80	-13.80
	54 Mbps	< 11.00	-5.67	-16.67
161	6 Mbps	< 17.00	-23.32	-40.32
	24 Mbps	< 17.00	-24.36	-41.36
	54 Mbps	< 17.00	-26.74	-43.74

See figures 7-37 to 7-42 for the plots of the peak power spectral density for Channel 36, 64 and 165 at MCS 0 each for 802.11n mode.

802.11a RF Conducted Emission Test Results cont'd

Figure 7-31: Peak Power Spectral Density
802.11a, Channel 36, 6 Mbps

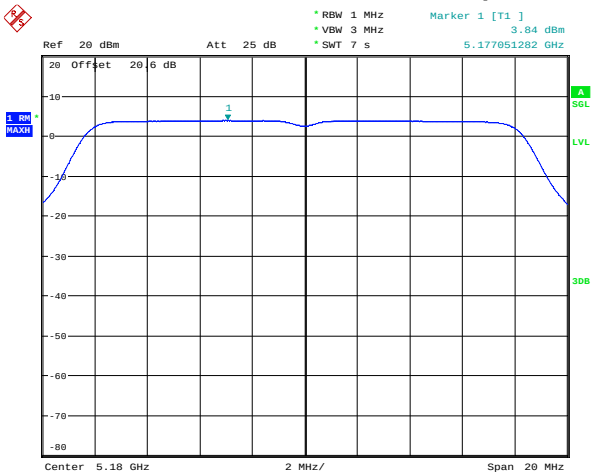


Figure 7-32: Peak Power Spectral Density
802.11a, Channel 48, 6 Mbps

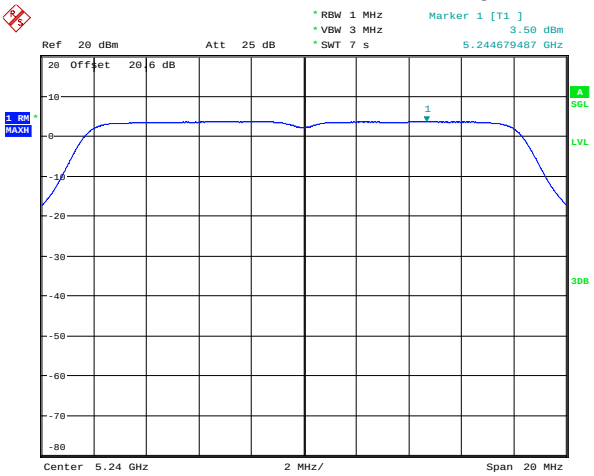


Figure 7-33: Peak Power Spectral Density
802.11a, Channel 64, 6 Mbps

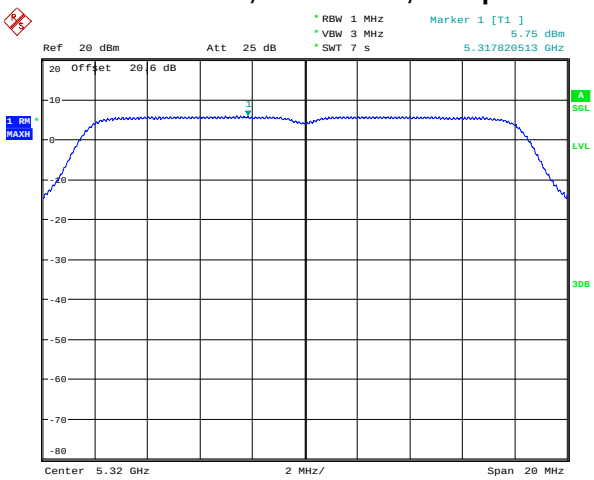
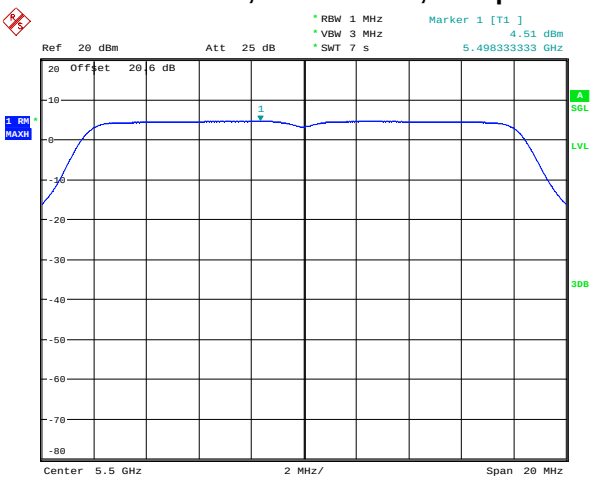


Figure 7-34: Peak Power Spectral Density
802.11a, Channel 100, 6 Mbps



802.11a RF Conducted Emission Test Results cont'd

Figure 7-35: Peak Power Spectral Density
802.11a, Channel 140, 6 Mbps

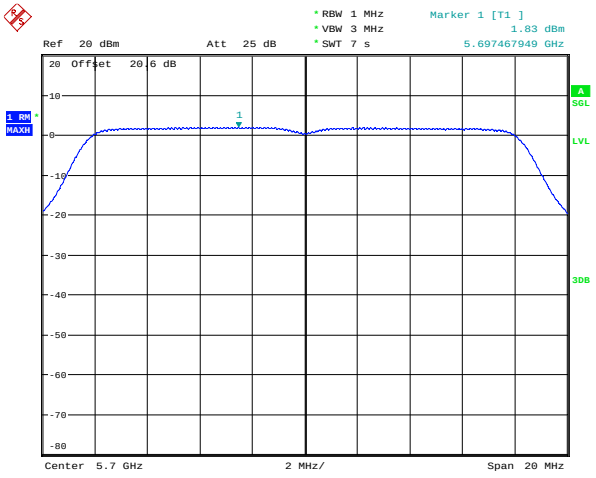
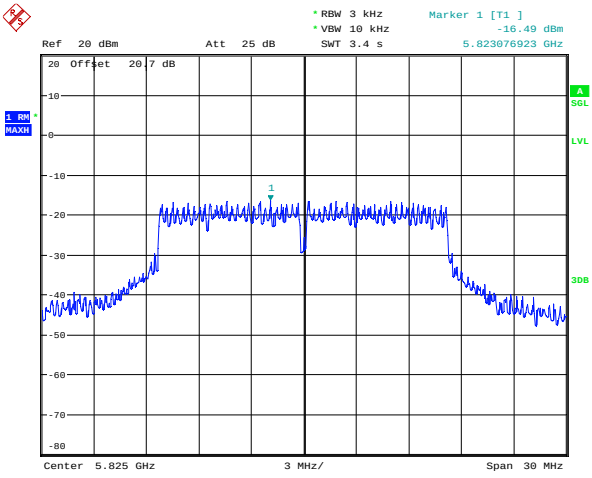


Figure 7-36: Peak Power Spectral Density
802.11a, Channel 165, 6 Mbps



802.11n RF Conducted Emission Test Results

20 MHz bandwidth

Figure 7-37: Peak Power Spectral Density
802.11n, Channel 36, MCS 0

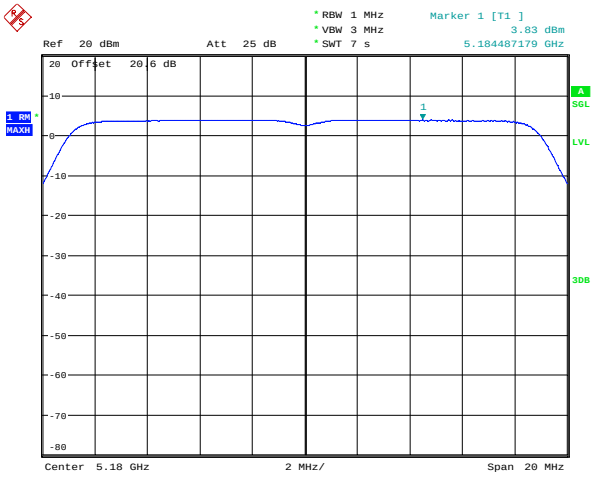


Figure 7-38: Peak Power Spectral Density
802.11n, Channel 64, MCS 0

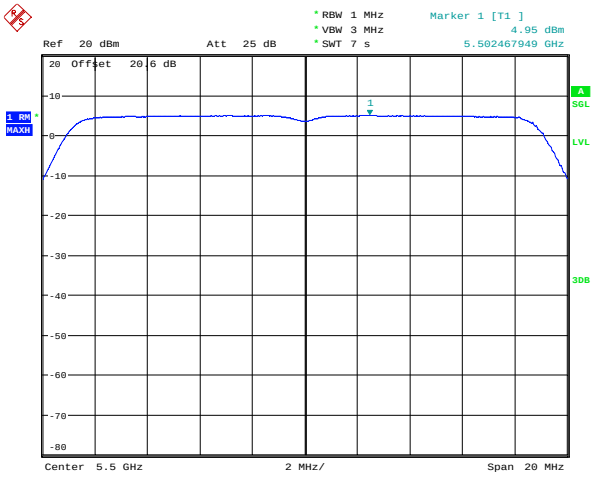
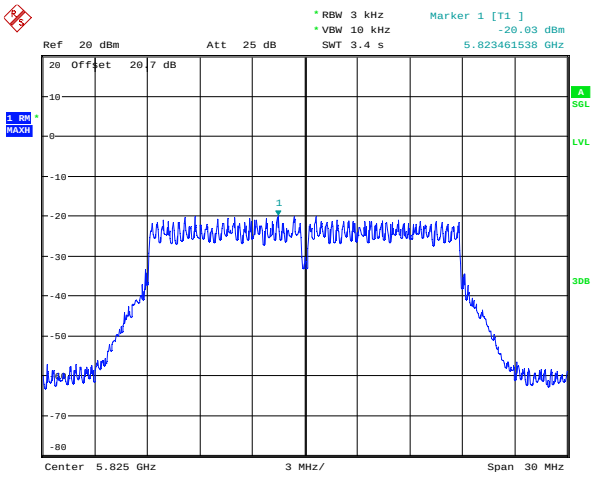


Figure 7-39: Peak Power Spectral Density
802.11n, Channel 165, MCS 0



40 MHz bandwidth

Figure 7-40: Peak Power Spectral Density 802.11n, Channel 36, MCS 0

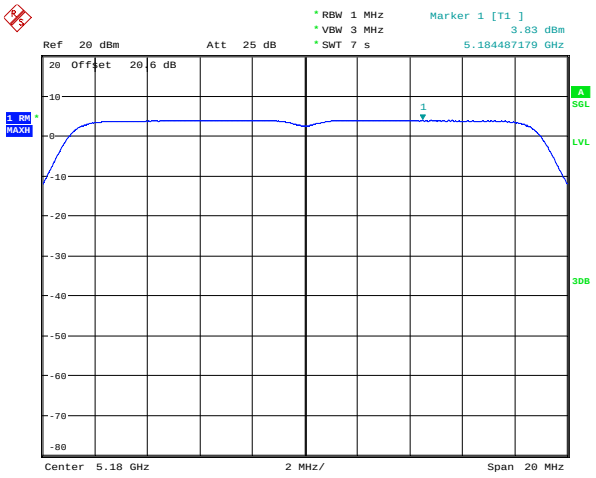


Figure 7-41: Peak Power Spectral Density 802.11n, Channel 64, MCS 0

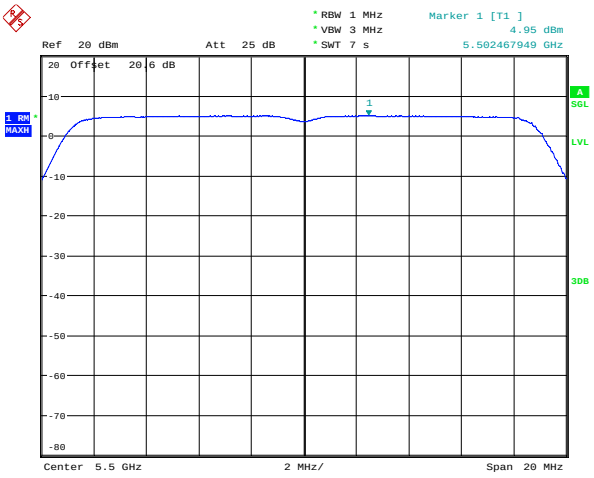
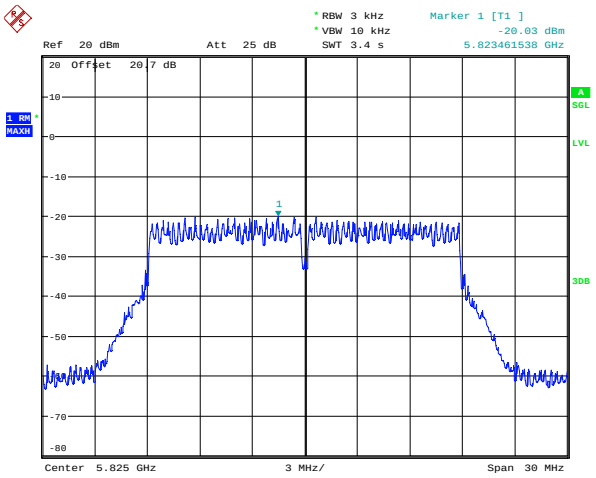


Figure 7-42: Peak Power Spectral Density 802.11n, Channel 165, MCS 0



802.11a RF Conducted Emission Test Results cont'd

Spurious RF Conducted Emissions

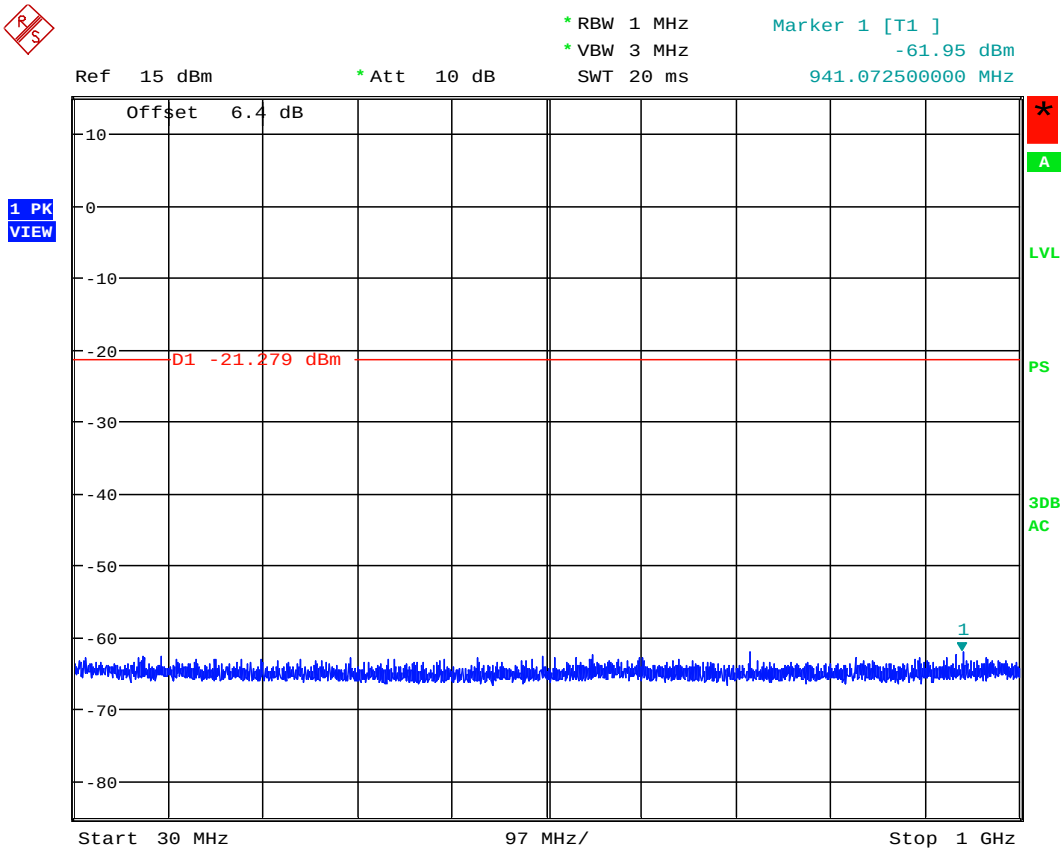
The EUT met the requirements of the spurious RF conducted emissions as per 47 CFR 15.407 and RSS-210. Channels 36, 64, 100 and 140 were measured at 6 Mbps, 24Mbps and 54 Mbps each for 802.11a mode. Peak power was measured using an Agilent power meter, model N1911A with model N1921A power sensor. A reference 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)	Max. Measured Level from Carrier (dBc)	Limit (dBc)
36	6 Mbps	15.49	-55.297	-70.79	-20
	24 Mbps	14.68	-55.350	-70.03	-20
	54 Mbps	13.91	-55.990	-69.90	-20
64	6 Mbps	16.02	-54.029	-70.05	-20
	24 Mbps	15.28	-56.616	-71.90	-20
	54 Mbps	14.28	-57.091	-71.37	-20
100	6 Mbps	13.12	-57.491	-70.61	-20
	24 Mbps	12.15	-56.515	-68.66	-20
	54 Mbps	11.29	-55.419	-66.71	-20
140	6 Mbps	15.25	-56.833	-72.08	-20
	24 Mbps	14.45	-56.560	-71.01	-20
	54 Mbps	13.71	-56.620	-70.33	-20

See figures 7-43 to 7-50 for the plots of the spurious RF conducted emissions for Channel 36, 64, 100 and 140 at 6 Mbps each for 802.11a mode.

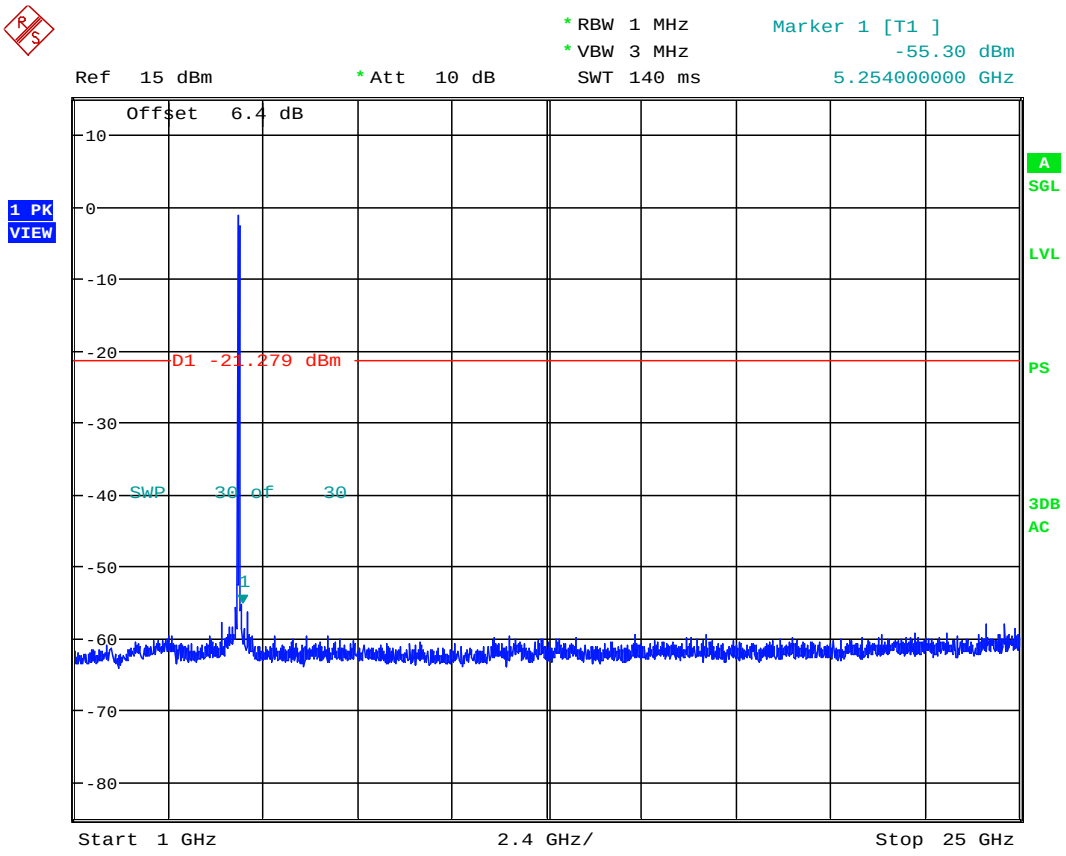
802.11a RF Conducted Emission Test Results cont'd

Figure 7-43: Spurious RF Conducted Emissions, 802.11a Channel 36, 6 Mbps



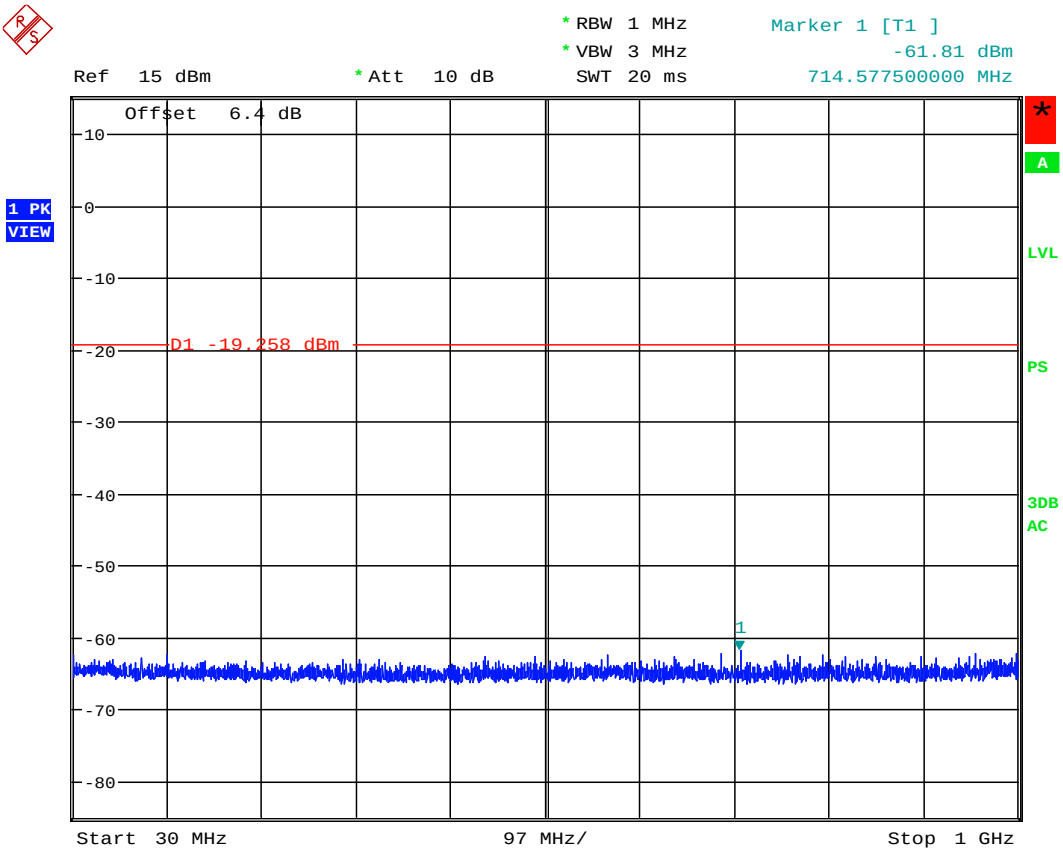
802.11a RF Conducted Emission Test Results cont'd

Figure 7-44: Spurious RF Conducted Emissions, 802.11a Channel 36, 6 Mbps



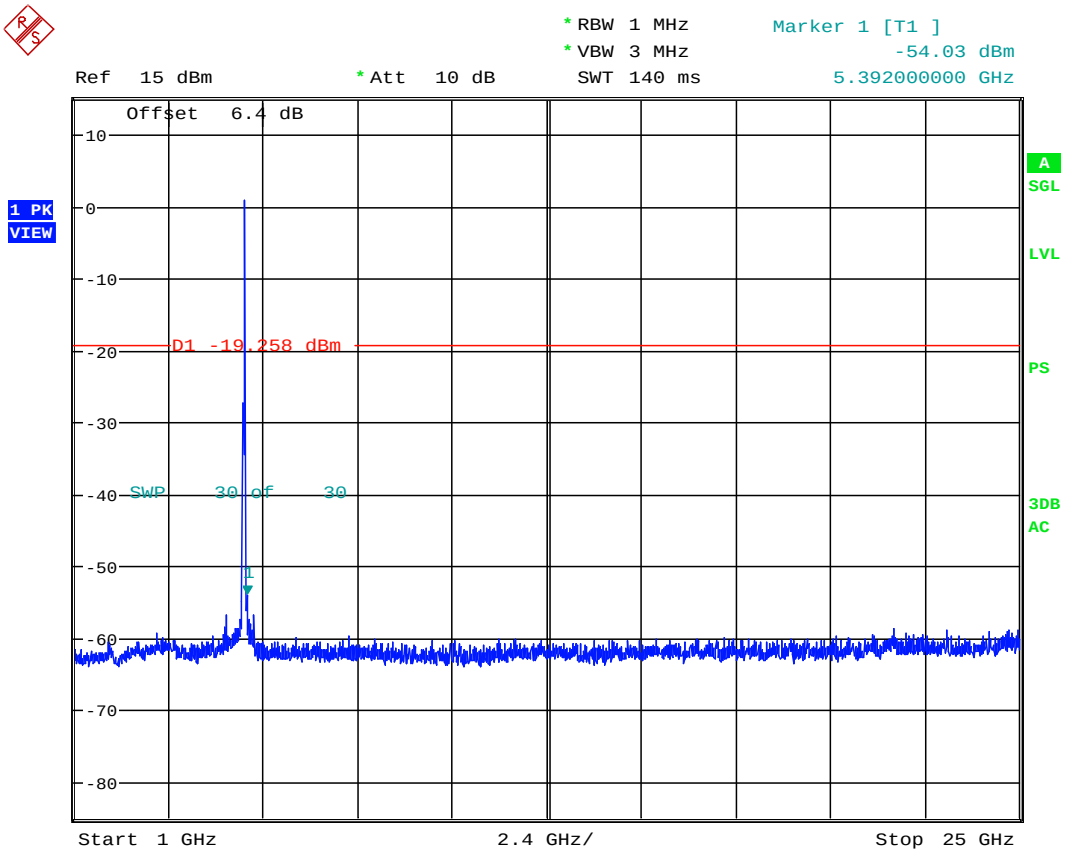
802.11a RF Conducted Emission Test Results cont'd

Figure 7-45: Spurious RF Conducted Emissions, 802.11a Channel 64, 6 Mbps



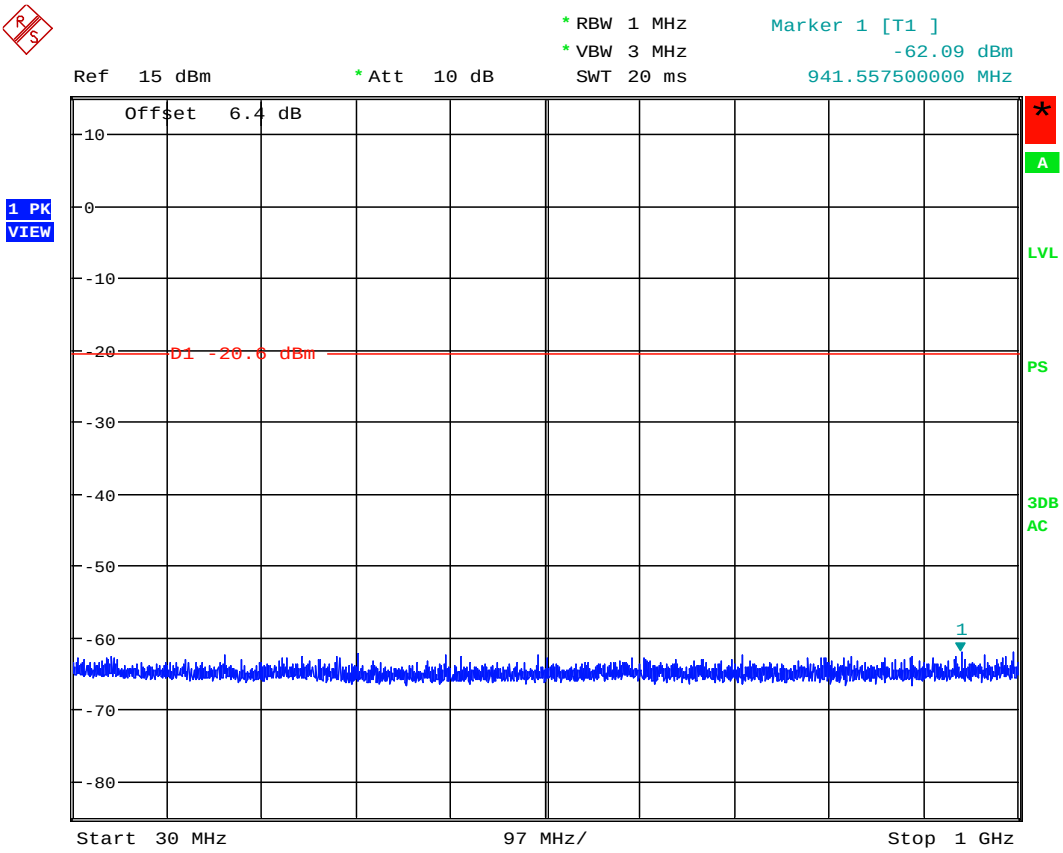
802.11a RF Conducted Emission Test Results cont'd

Figure 7-46: Spurious RF Conducted Emissions, 802.11a Channel 64, 6 Mbps



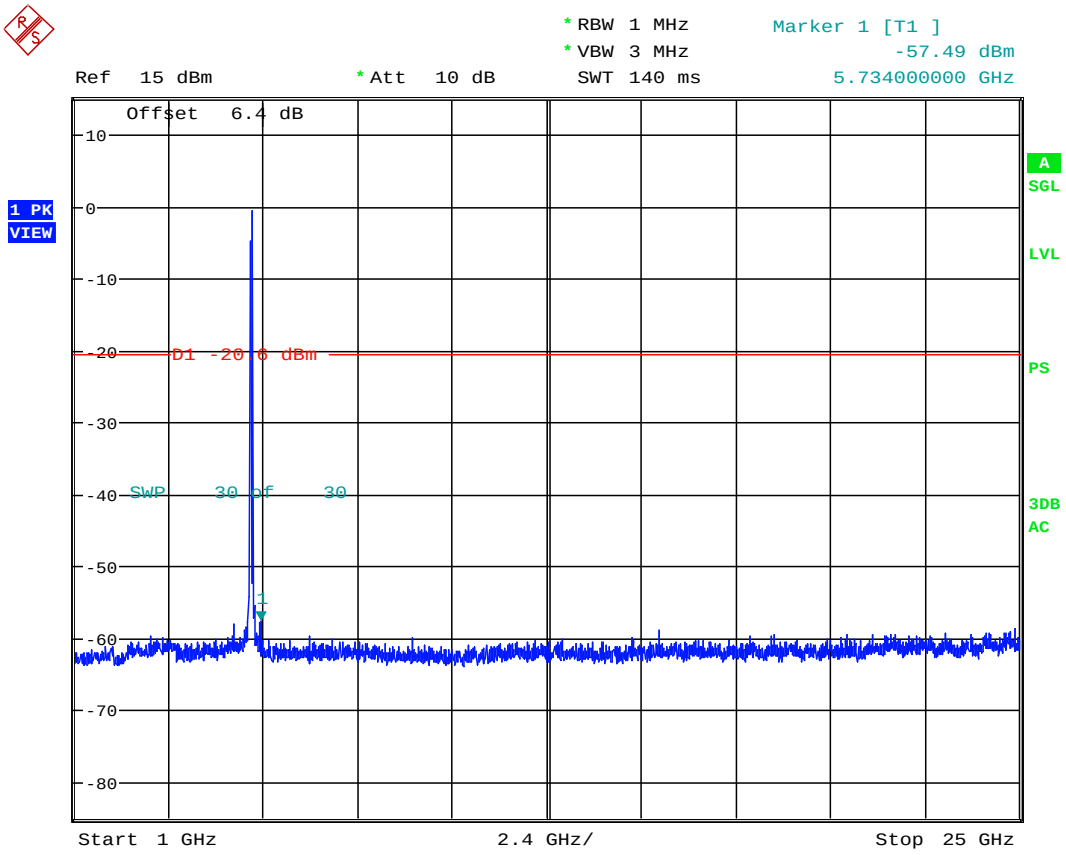
802.11a RF Conducted Emission Test Results cont'd

Figure 7-47: Spurious RF Conducted Emissions, 802.11a Channel 100, 6 Mbps



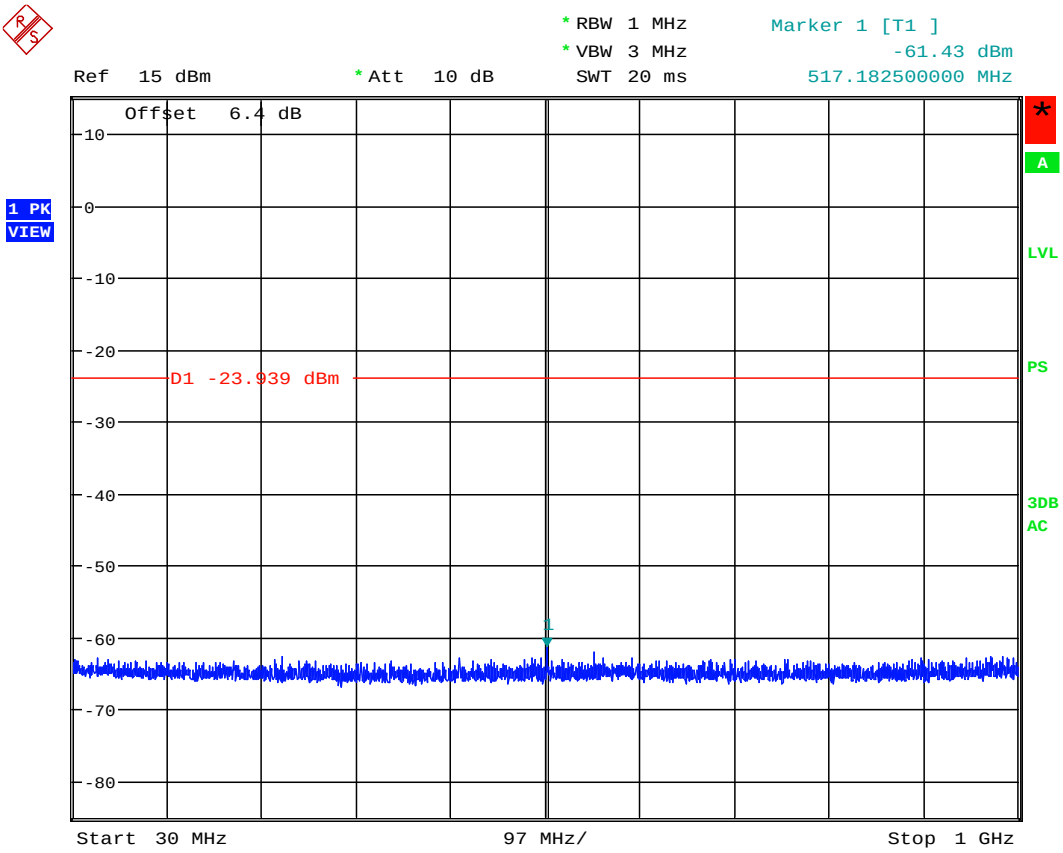
802.11a RF Conducted Emission Test Results cont'd

Figure 7-48: Spurious RF Conducted Emissions, 802.11a Channel 100, 6 Mbps



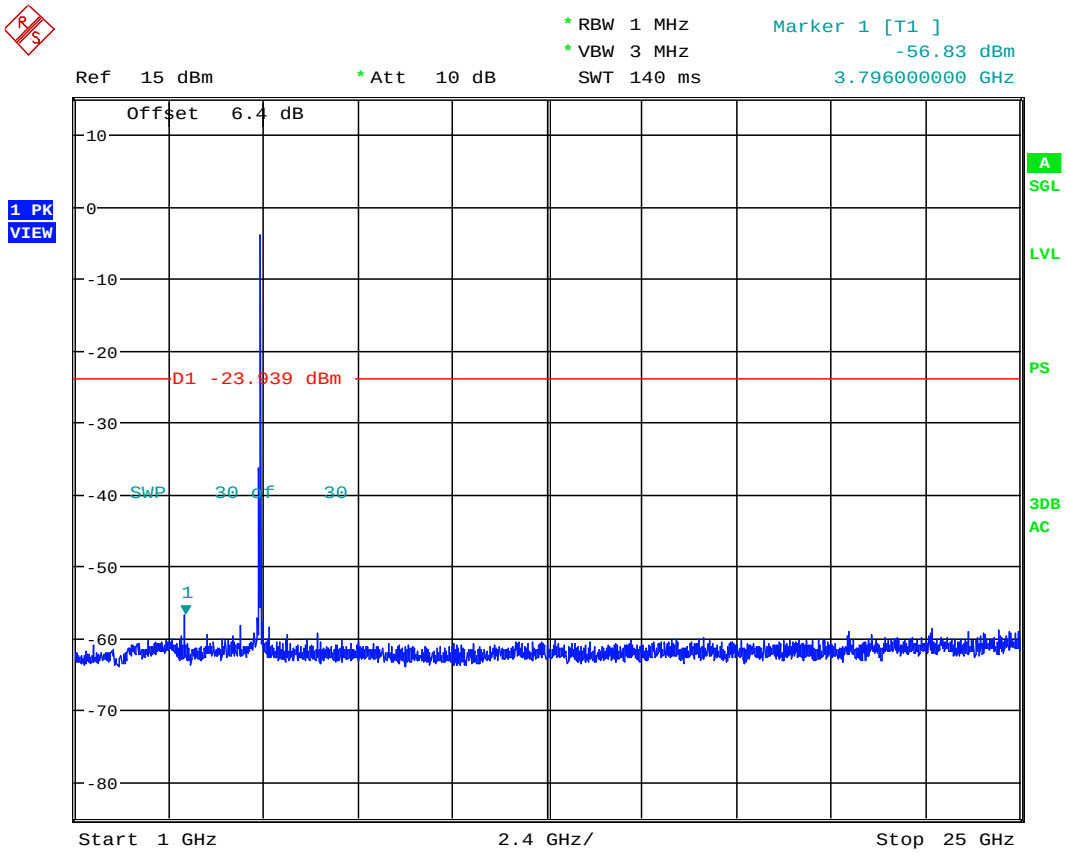
802.11a RF Conducted Emission Test Results cont'd

Figure 7-49: Spurious RF Conducted Emissions, 802.11a Channel 140, 6 Mbps



802.11a RF Conducted Emission Test Results cont'd

Figure 7-50: Spurious RF Conducted Emissions, 802.11a Channel 140, 6 Mbps



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 36, 64, 100 and 140 were measured at MCS0 Mbps, MCS4 Mbps and MCS7 Mbps each for 802.11n 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.

20 MHZ Bandwidth

Channel	Data Rate	Power (dBm)	Max. Measured Level (dBm)	Max. Measured Level from Carrier (dBc)	Limit (dBc)
36	MCS0	15.49	-49.616	-65.11	-20
	MCS4	14.37	-49.082	-63.46	-20
	MCS7	12.98	-48.494	-61.47	-20
64	MCS0	16.49	-49.177	-65.66	-20
	MCS4	15.10	-50.012	-65.11	-20
	MCS7	12.41	-49.183	-61.59	-20
100	MCS0	16.53	-50.539	-67.07	-20
	MCS4	15.48	-52.184	-67.67	-20
	MCS7	13.27	-49.745	-63.02	-20
140	MCS0	12.79	-46.698	-59.49	-20
	MCS4	11.61	-46.623	-58.23	-20
	MCS7	11.05	-46.730	-57.78	-20

40 MHZ Bandwidth

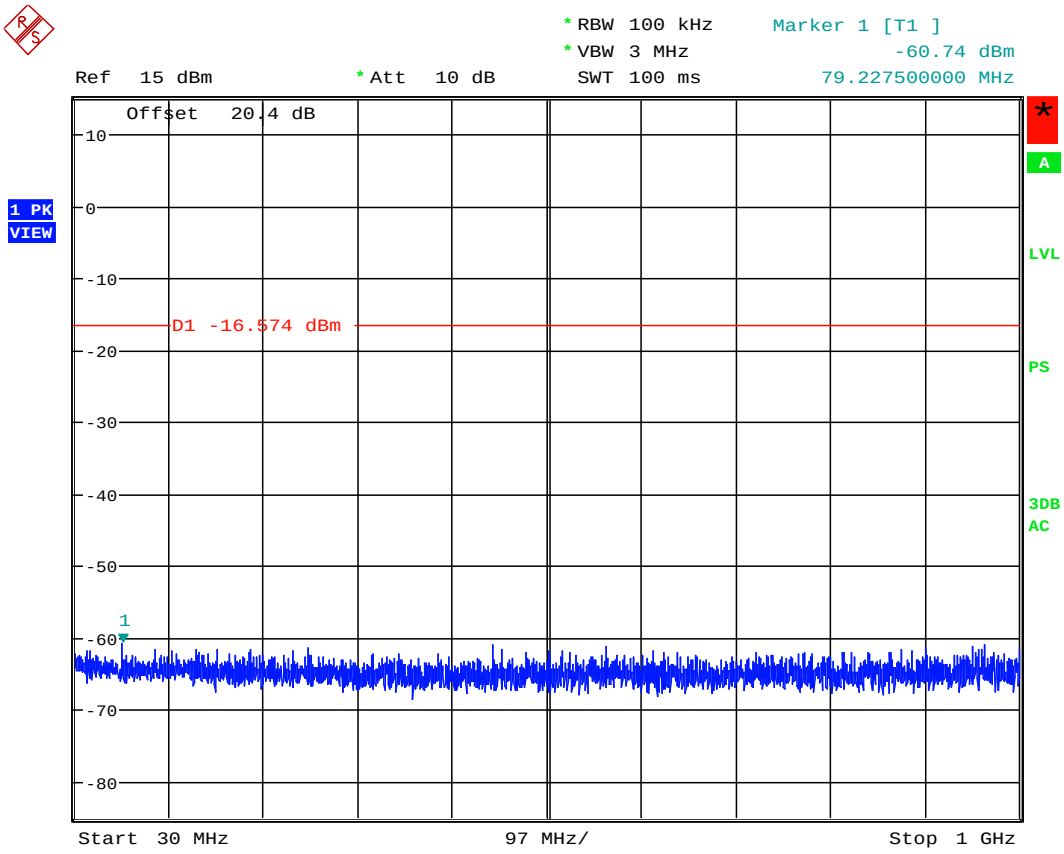
Channel	Data Rate	Power (dBm)	Max. Measured Level (dBm)	Max. Measured Level from Carrier (dBc)	Limit (dBc)
36	MCS0	16.17	-45.80	-61.98	-20
	MCS4	14.55	-46.75	-61.30	-20
	MCS7	13.71	-46.02	-59.73	-20
64	MCS0	15.88	-22.35	-38.24	-20
	MCS4	14.39	-45.94	-60.33	-20
	MCS7	13.46	-46.09	-59.55	-20
100	MCS0	16.43	-46.53	-62.95	-20
	MCS4	14.92	-46.11	-61.03	-20
	MCS7	14.18	-46.52	-60.70	-20
140	MCS0	18.88	-44.40	-63.28	-20
	MCS4	16.21	-43.87	-60.08	-20
	MCS7	14.75	-44.56	-59.31	-20

See figures 7-51 to 7-66 for the plots of the spurious RF conducted emissions for Channel 36, 64, 100 and 140 at MCS0 Mbps each for 802.11n mode.

802.11n RF Conducted Emission Test Results cont'd

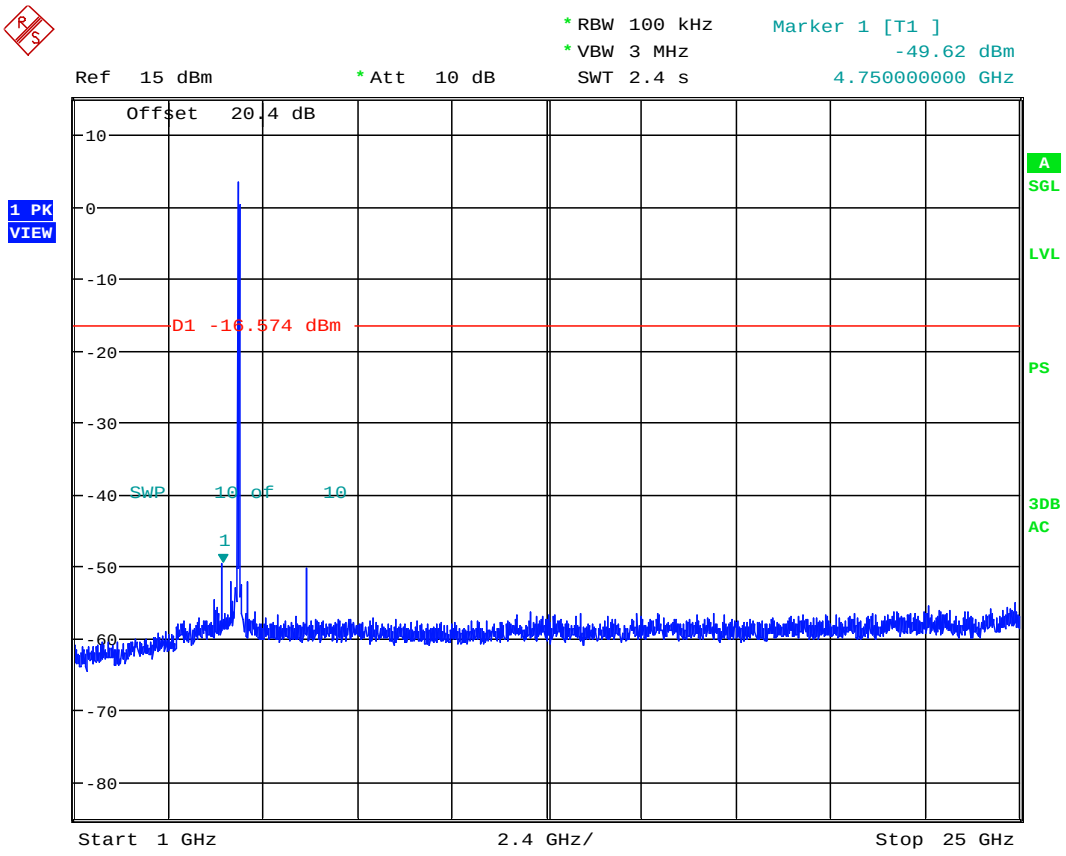
20 MHz Bandwidth

Figure 7-51: Spurious RF Conducted Emissions, 802.11n Channel 36, MCS0 Mbps



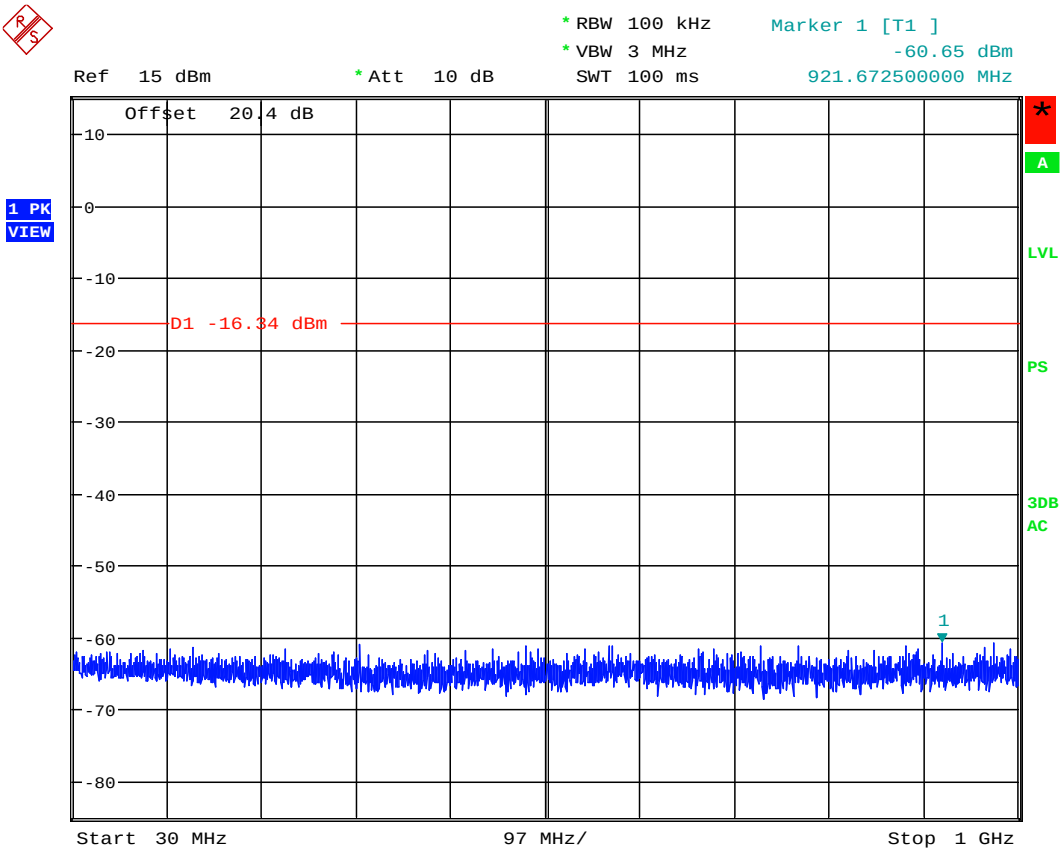
802.11n RF Conducted Emission Test Results cont'd

Figure 7-52: Spurious RF Conducted Emissions, 802.11n Channel 36, MCS0 Mbps



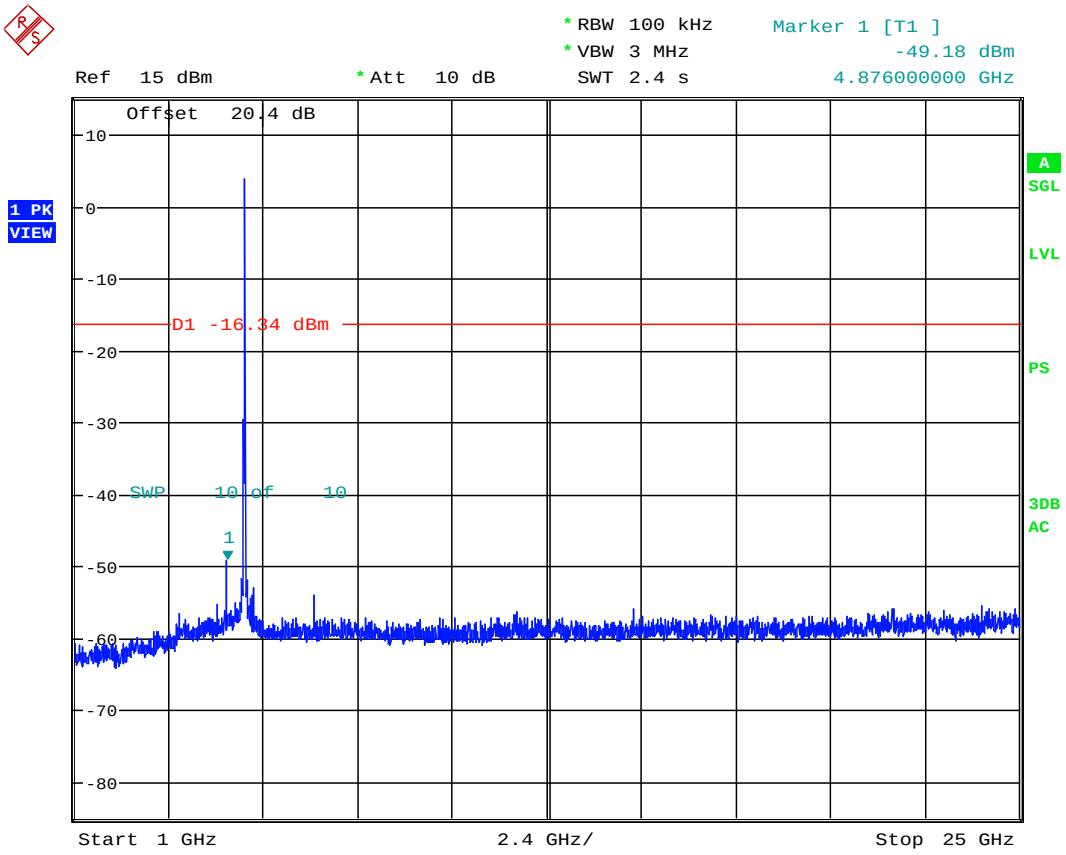
802.11n RF Conducted Emission Test Results cont'd

Figure 7-53: Spurious RF Conducted Emissions, 802.11n Channel 64, MCS0 Mbps



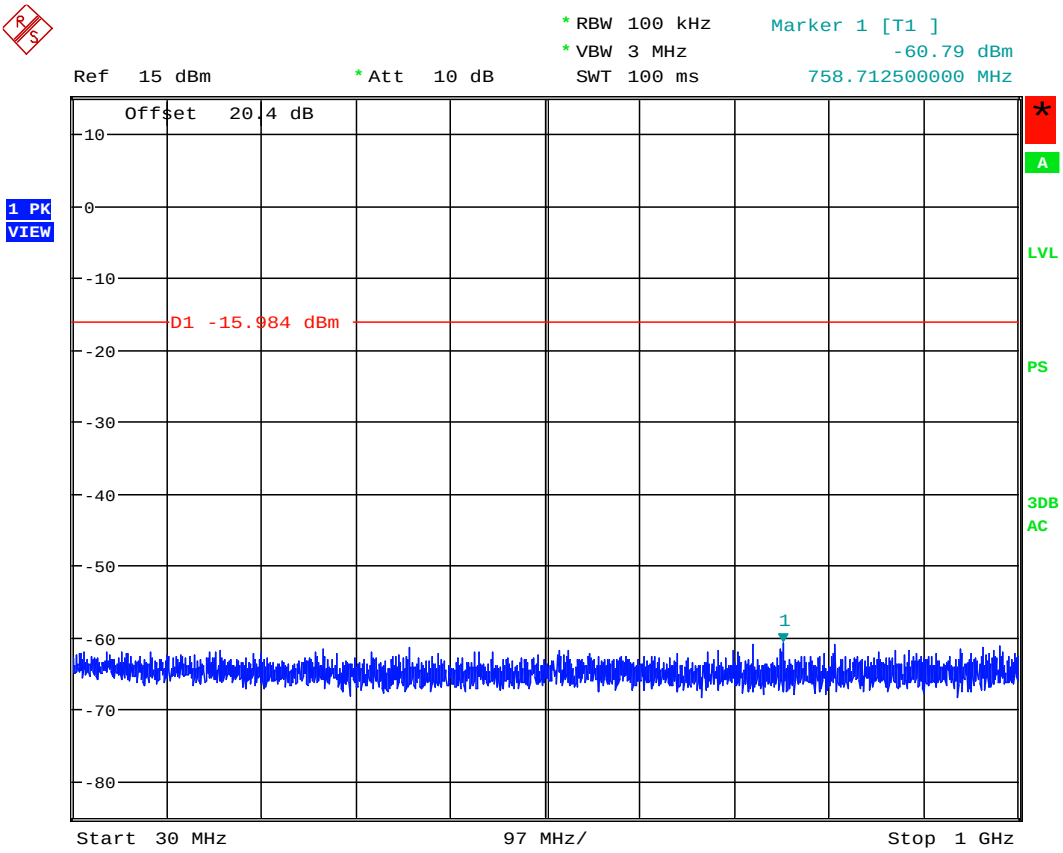
802.11n RF Conducted Emission Test Results cont'd

Figure 7-54: Spurious RF Conducted Emissions, 802.11n Channel 64, MCS0 Mbps



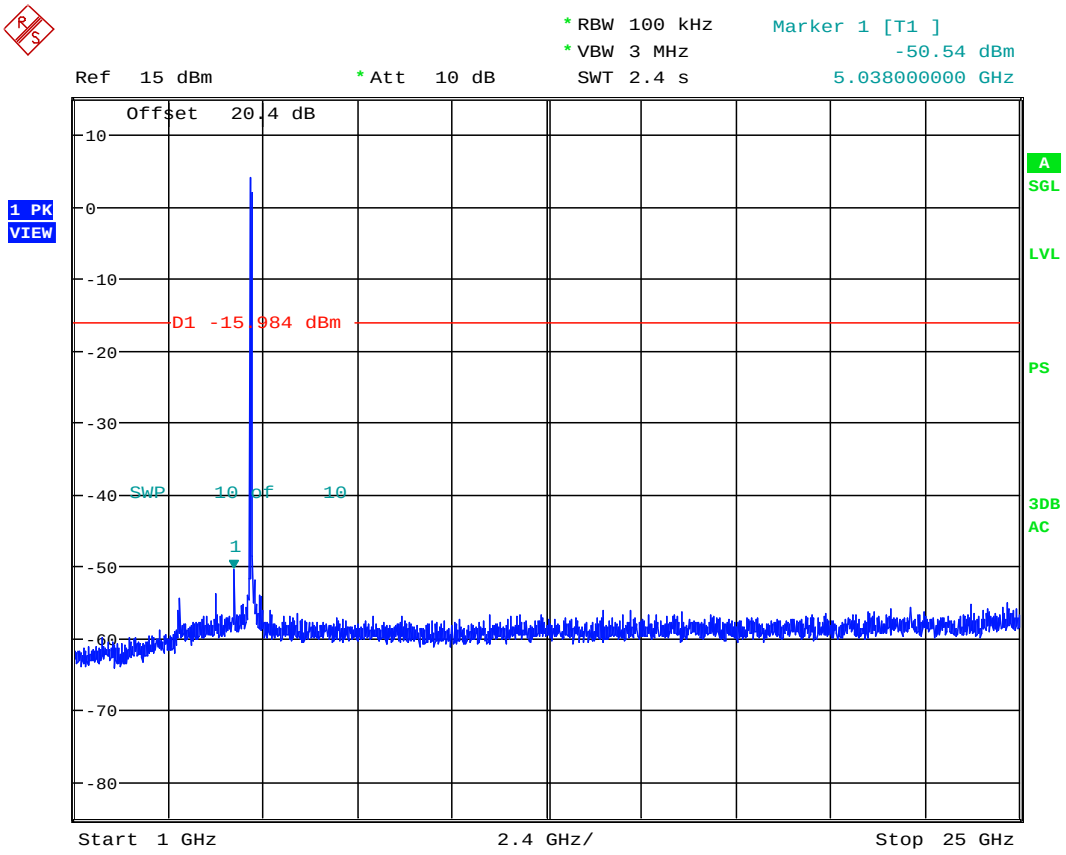
802.11n RF Conducted Emission Test Results cont'd

Figure 7-55: Spurious RF Conducted Emissions, 802.11n Channel 100, MCS0 Mbps



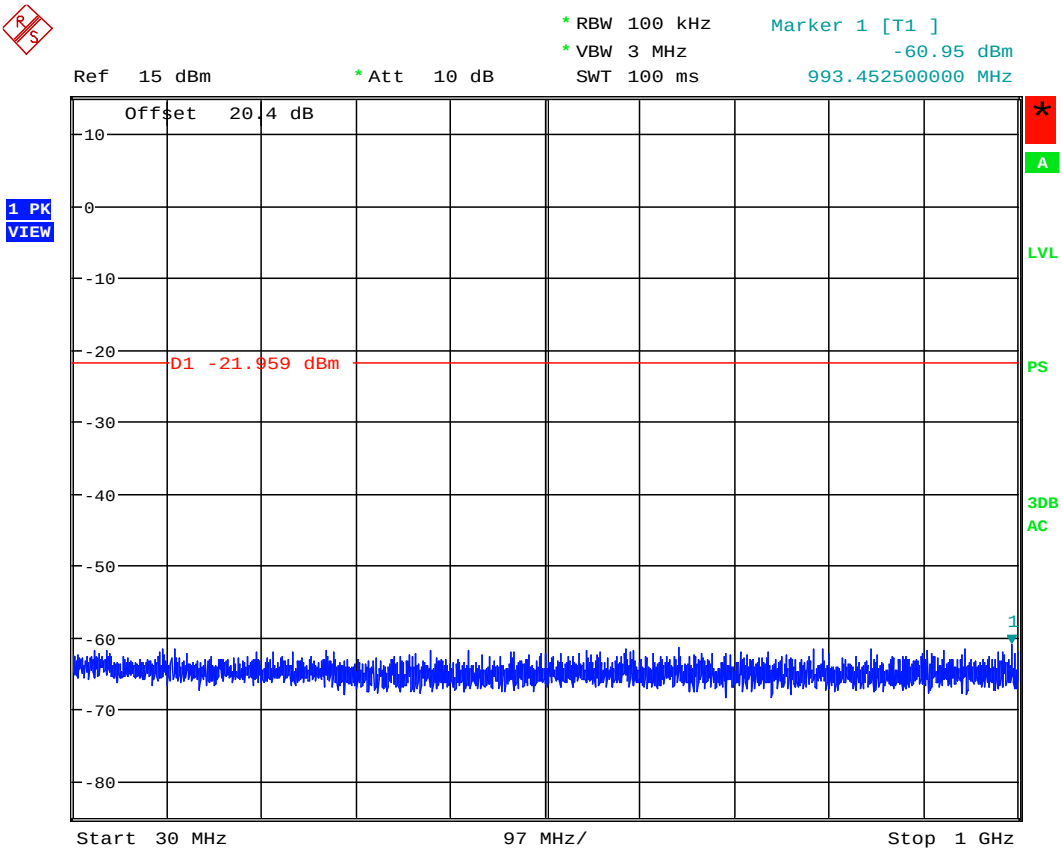
802.11n RF Conducted Emission Test Results cont'd

Figure 7-56: Spurious RF Conducted Emissions, 802.11n Channel 100, MCS0 Mbps



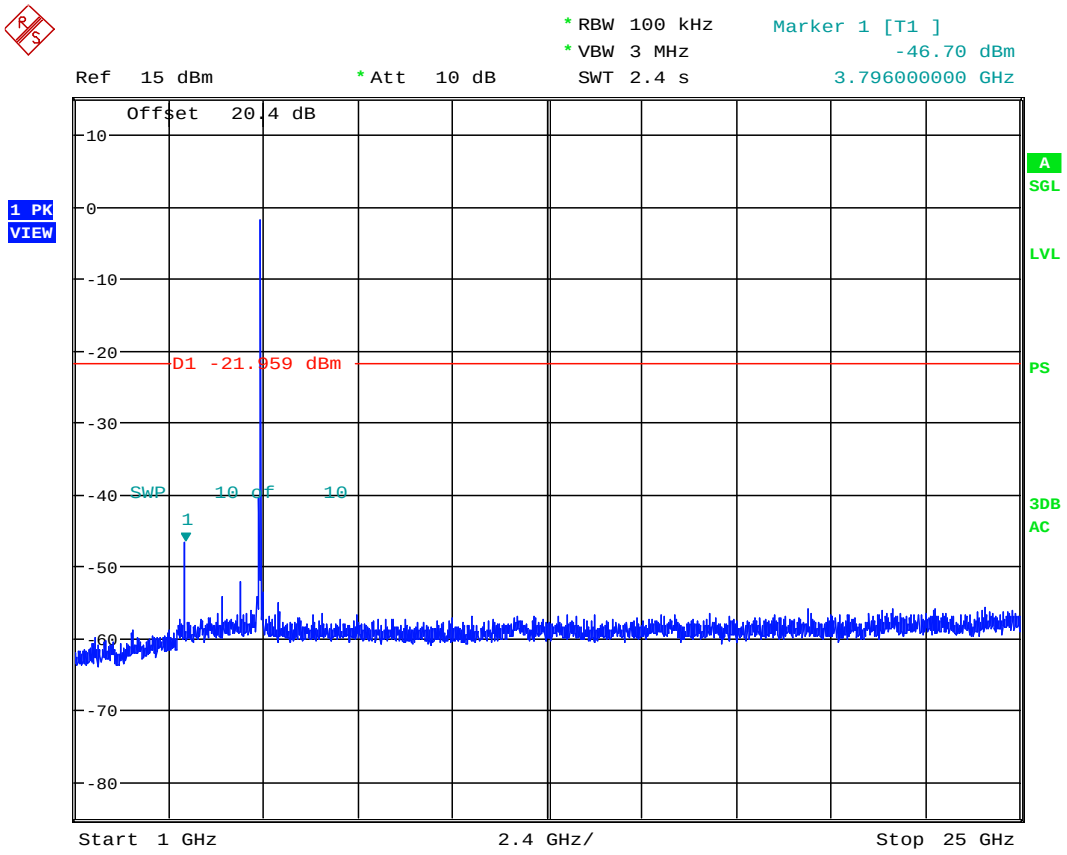
802.11n RF Conducted Emission Test Results cont'd

Figure 7-57: Spurious RF Conducted Emissions, 802.11n Channel 140, MCS0 Mbps



802.11n RF Conducted Emission Test Results cont'd

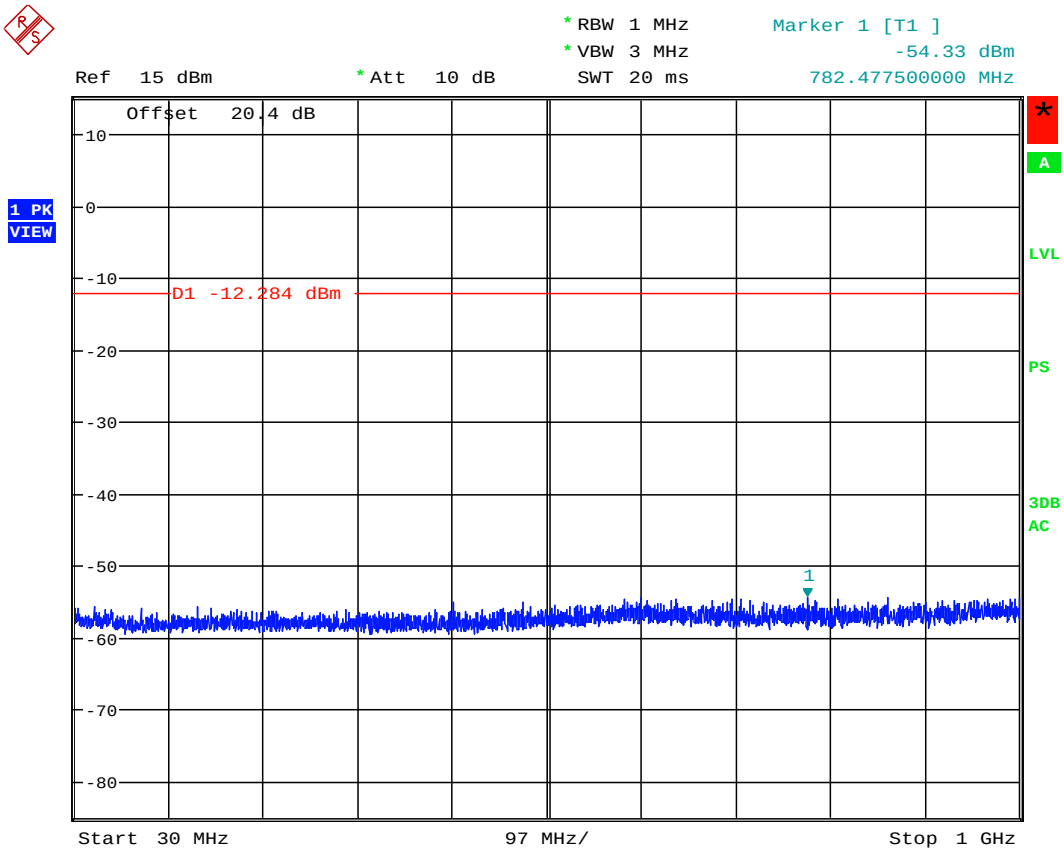
Figure 7-58: Spurious RF Conducted Emissions, 802.11a Channel 140, MCS0 Mbps



802.11n RF Conducted Emission Test Results cont'd

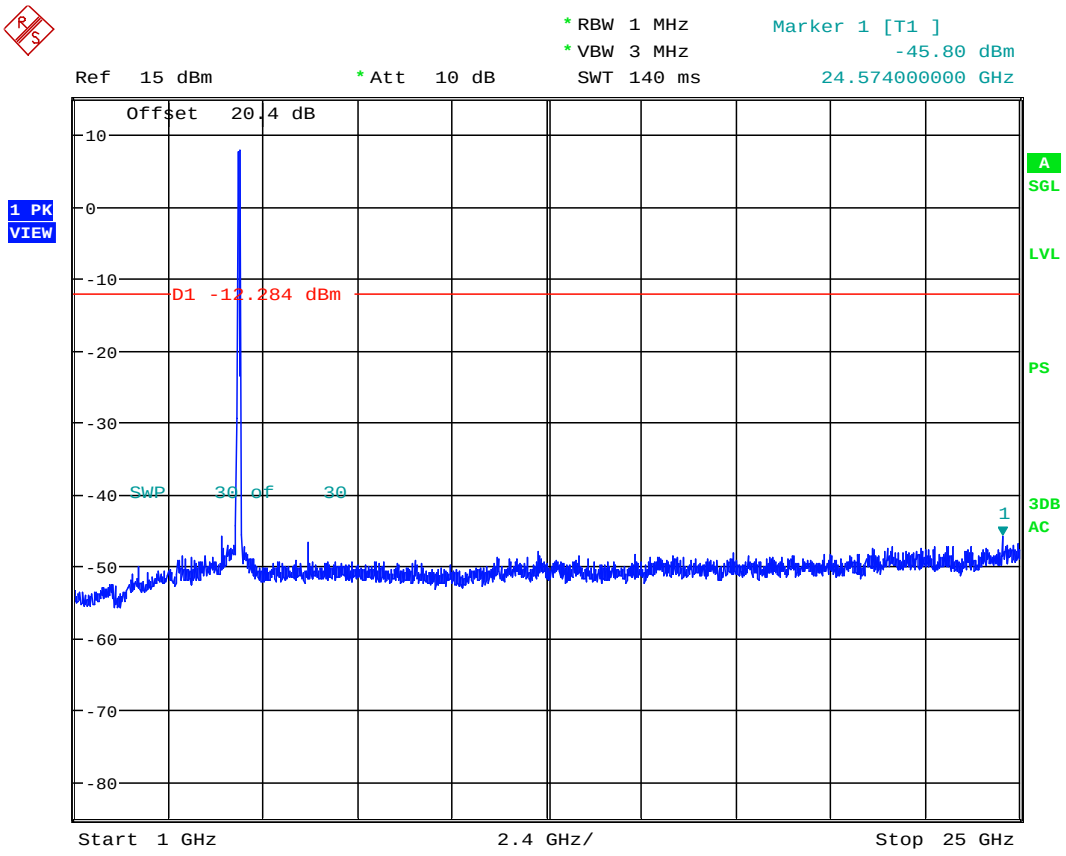
40 MHz Bandwidth

Figure 7-59: Spurious RF Conducted Emissions, 802.11n Channel 36, MCS0 Mbps



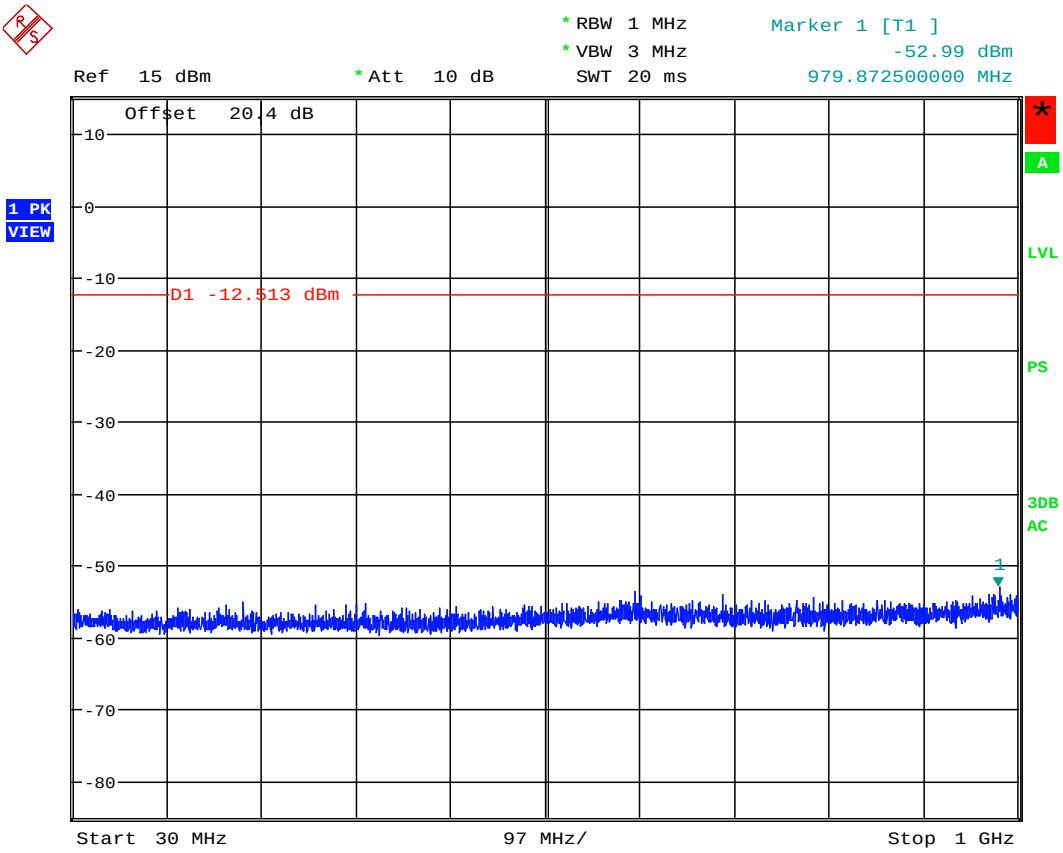
802.11n RF Conducted Emission Test Results cont'd

Figure 7-60: Spurious RF Conducted Emissions, 802.11n Channel 36, MCS0 Mbps



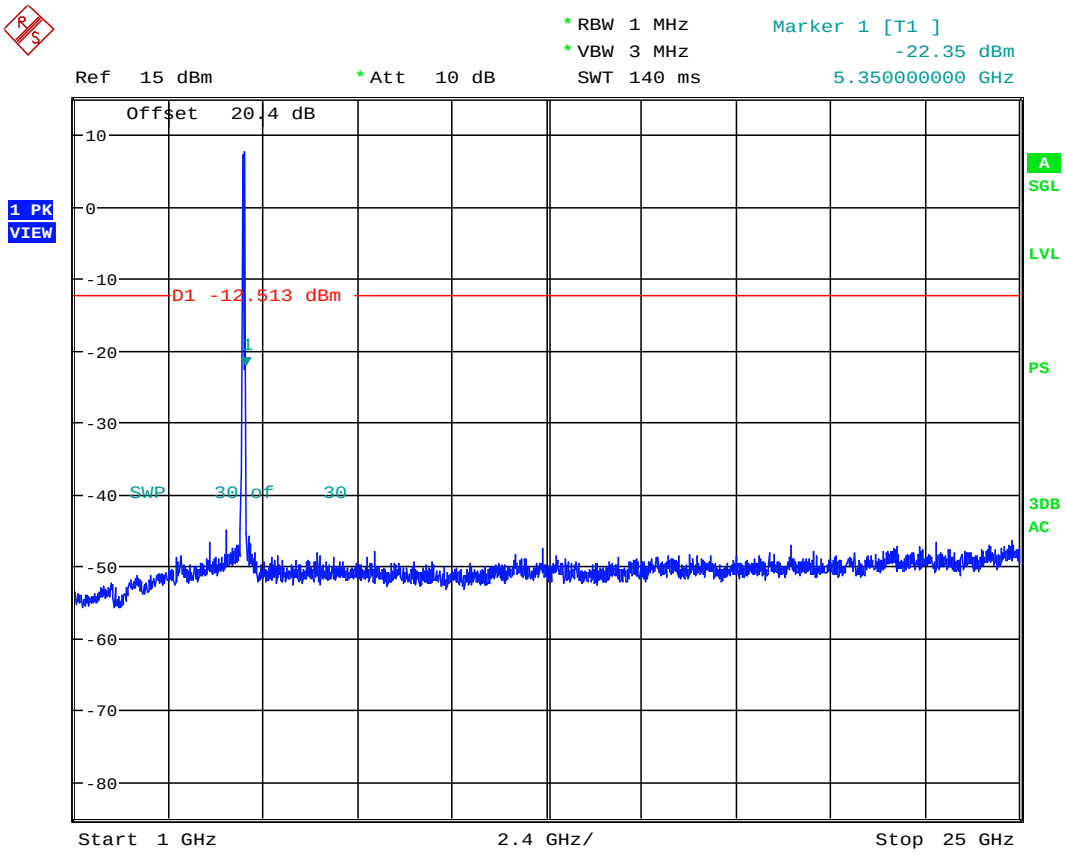
802.11n RF Conducted Emission Test Results cont'd

Figure 7-61: Spurious RF Conducted Emissions, 802.11n Channel 64, MCS0 Mbps



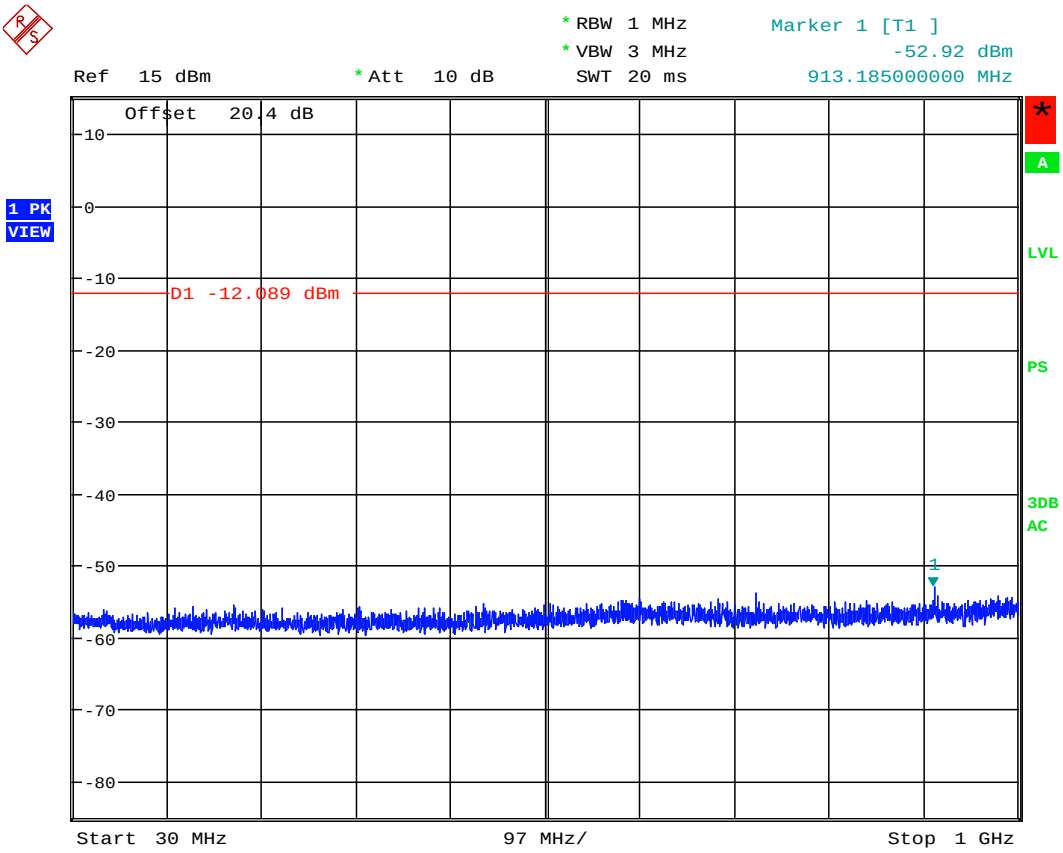
802.11n RF Conducted Emission Test Results cont'd

Figure 7-62: Spurious RF Conducted Emissions, 802.11n Channel 64, MCS0 Mbps



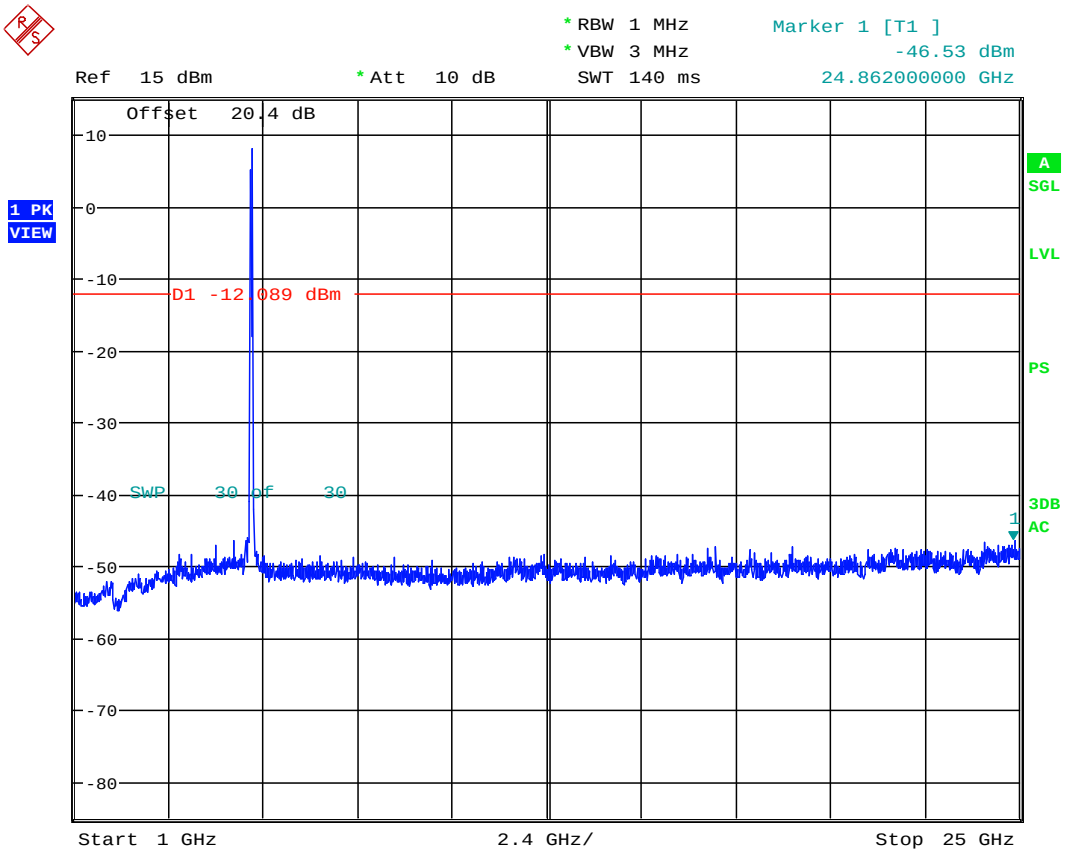
802.11n RF Conducted Emission Test Results cont'd

Figure 7-63: Spurious RF Conducted Emissions, 802.11n Channel 100, MCS0 Mbps



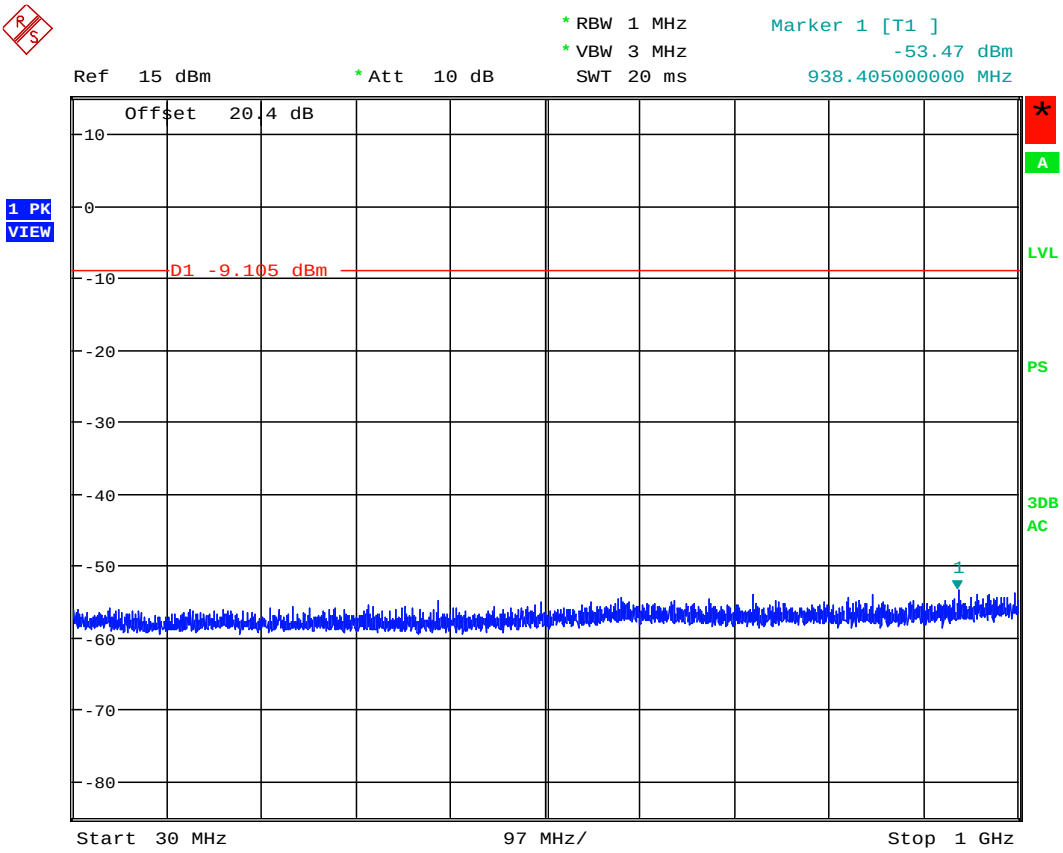
802.11n RF Conducted Emission Test Results cont'd

Figure 7-64: Spurious RF Conducted Emissions, 802.11n Channel 100, MCS0 Mbps



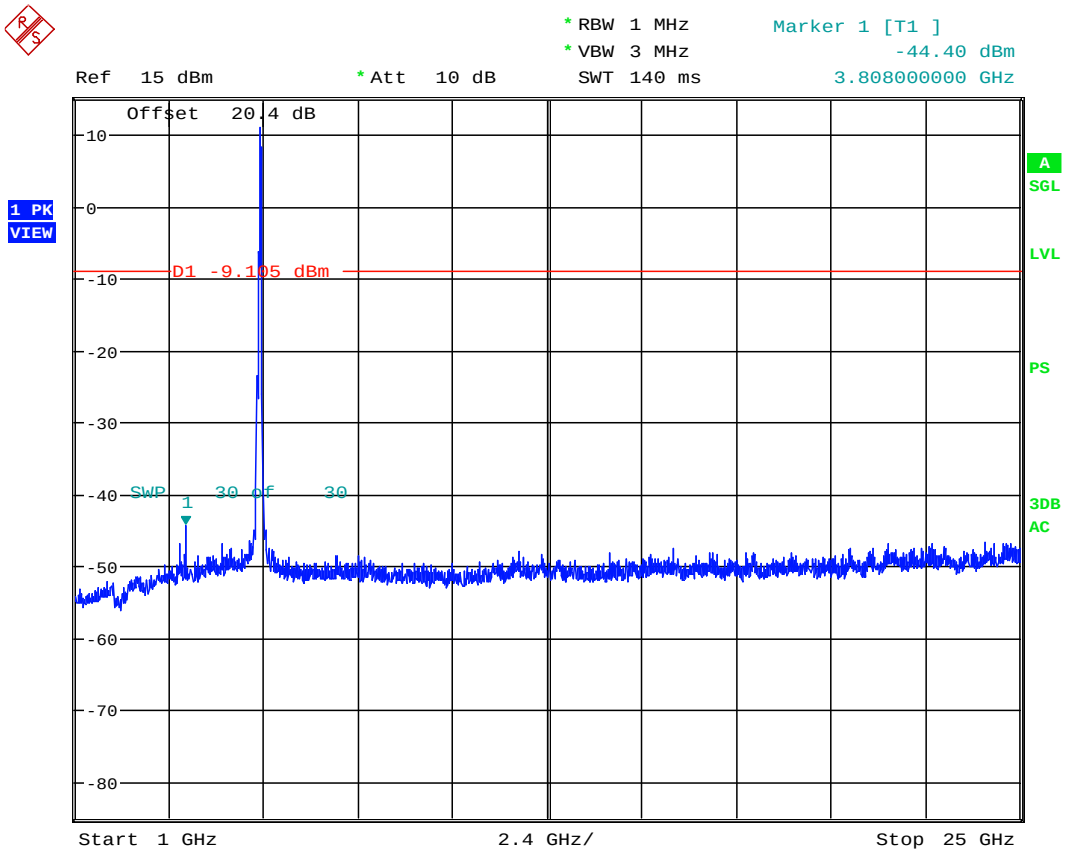
802.11n RF Conducted Emission Test Results cont'd

Figure 7-65: Spurious RF Conducted Emissions, 802.11n Channel 140, MCS0 Mbps



802.11n RF Conducted Emission Test Results cont'd

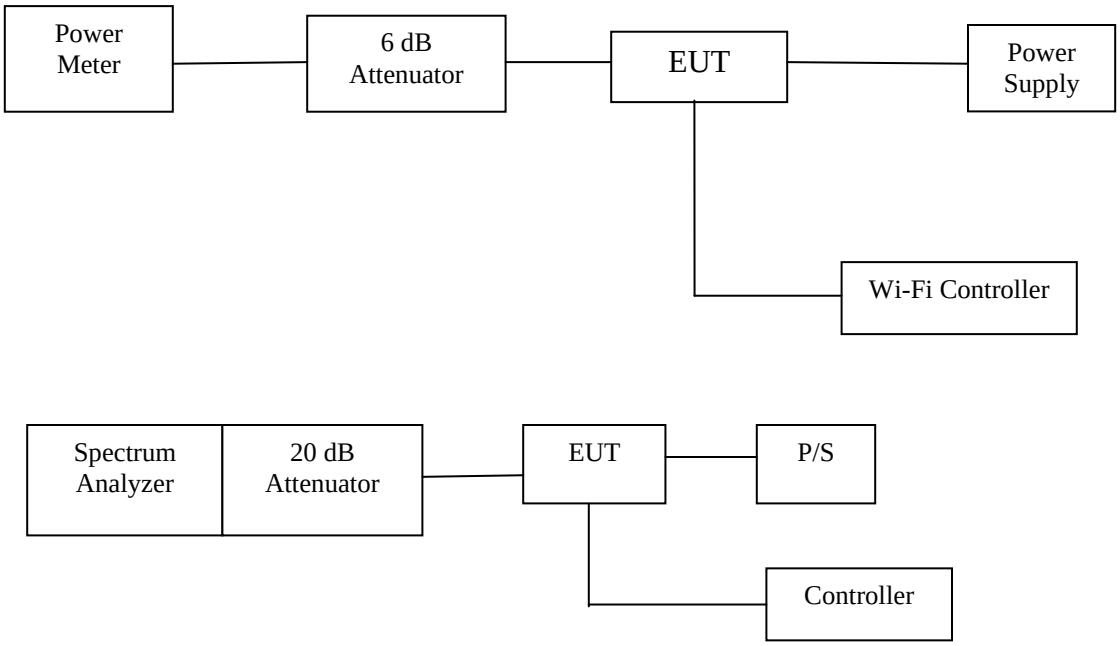
Figure 7-66: Spurious RF Conducted Emissions, 802.11a Channel 140, MCS0 Mbps



APPENDIX 8 – 802.11ac CONDUCTED EMISSIONS TEST DATA/PLOTS

802.11ac 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: April 25, 2015
The measurements were performed by Sijia Li.

The environmental test conditions were:	Temperature:	23.7 ºC
	Relative Humidity:	40.5 %

802.11ac 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. For bandwidth 20 MHz, channels 36, 64, 140 and 149 were measured at 0 Mbps, 4 Mbps, and 9 Mbps each; for bandwidth 40 MHz, channels 38, 62, 142 and 151 were measured at 0 Mbps, 4 Mbps, and 9 Mbps each; for bandwidth 80 MHz, channels 42, 58, 138 and 155 were measured at 0 Mbps, 4 Mbps, and 9 Mbps each

20MHz Bandwidth

Channel	Data Rate	Limit (kHz)	Measured Level (MHz)
36	MCS0	≥ 500	17.62
	MCS4	≥ 500	**17.74**
	MCS9	≥ 500	12.74
64	MCS0	≥ 500	6.78
	MCS4	≥ 500	11.10
	MCS9	≥ 500	15.24
140	MCS0	≥ 500	9.04
	MCS4	≥ 500	15.48
	MCS9	≥ 500	15.24
149	MCS0	≥ 500	13.92
	MCS4	≥ 500	13.58
	MCS9	≥ 500	15.24

See figures 8-1 to 8-4 for the plots of the 6 dB bandwidth measurements for Channel 36, 64, 140 and 149 at MCS0 Mbps each for 802.11ac mode

802.11ac RF Conducted Emission Test Results cont'd

40MHz Bandwidth

Channel	Data Rate	Limit (kHz)	Measured Level (MHz)
38	MCS0	≥ 500	36.40
	MCS4	≥ 500	**36.48**
	MCS9	≥ 500	35.92
62	MCS0	≥ 500	36.00
	MCS4	≥ 500	35.96
	MCS9	≥ 500	36.28
142	MCS0	≥ 500	36.20
	MCS4	≥ 500	36.28
	MCS9	≥ 500	**36.48**
151	MCS0	≥ 500	36.40
	MCS4	≥ 500	35.76
	MCS9	≥ 500	35.92

See figures 8-5 to 8-8 for the plots of the 6 dB bandwidth measurements for Channel 38, 62, 142 and 151 at MCS 0 each for 802.11ac mode.

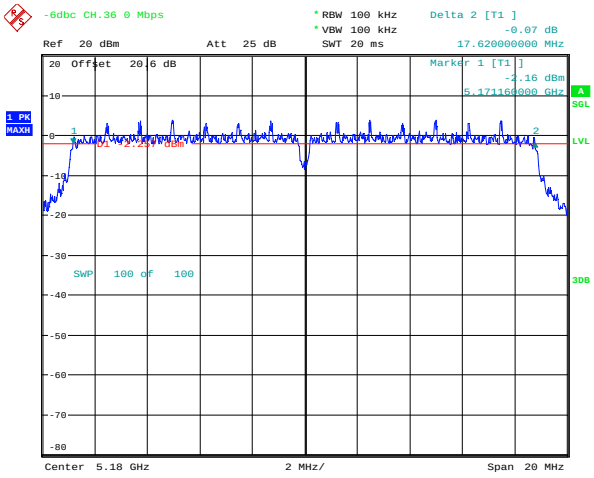
80MHz Bandwidth

Channel	Data Rate	Limit (kHz)	Measured Level (MHz)
42	MCS0	≥ 500	76.40
	MCS4	≥ 500	76.40
	MCS9	≥ 500	76.24
58	MCS0	≥ 500	76.40
	MCS4	≥ 500	**76.48**
	MCS9	≥ 500	75.84
138	MCS0	≥ 500	76.40
	MCS4	≥ 500	76.40
	MCS9	≥ 500	76.32
155	MCS0	≥ 500	76.40
	MCS4	≥ 500	76.40
	MCS9	≥ 500	76.40

See figures 8-9 to 8-12 for the plots of the 6 dB bandwidth measurements for Channel 42, 58, 138 and 155 at MCS 0 each for 802.11n mode.

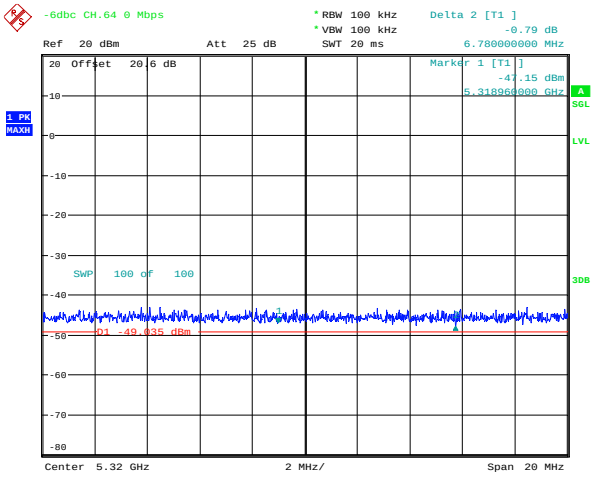
802.11a RF Conducted Emission Test Results cont'd
20 MHz Bandwidth

Figure 8-1: 6 dB Bandwidth
802.11ac, Channel 36, MCS0 Mbps



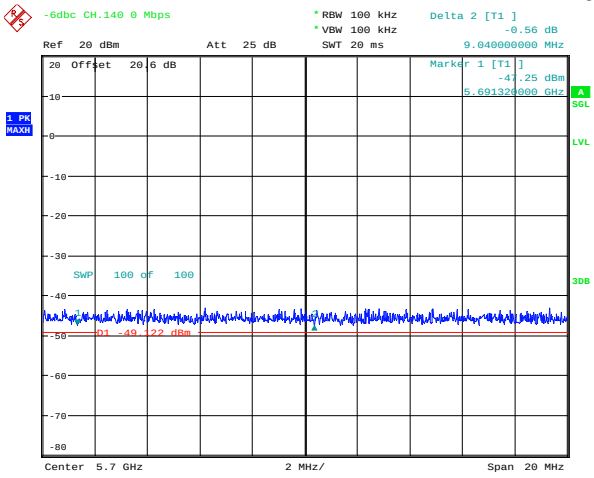
Date: 6.APR.2015 16:35:46

Figure 8-2: 6 dB Bandwidth
802.11ac, Channel 48, MCS0 Mbps



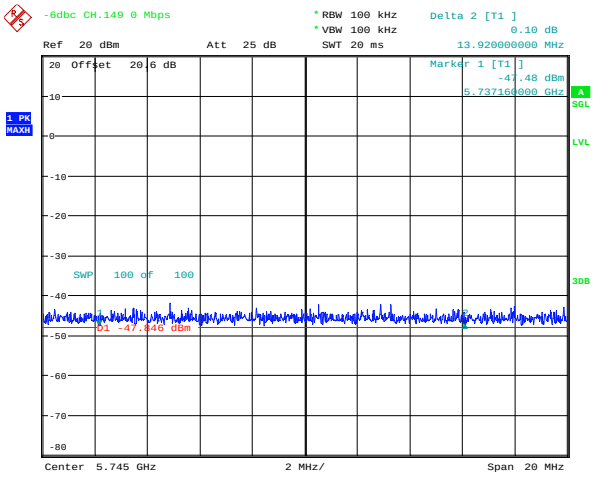
Date: 6.APR.2015 16:36:19

Figure 8-3: 6 dB Bandwidth
802.11ac, BW20, Channel 64, 6 Mbps



Date: 6.APR.2015 16:36:52

Figure 8-4: 6 dB Bandwidth
802.11ac, BW20, Channel 100, 6 Mbps



Date: 6.APR.2015 16:37:25

802.11ac RF Conducted Emission Test Results cont'd
Bandwidth 40 MHz

Figure 8-5: 6 dB Bandwidth
802.11ac, Channel 38, MCS0 Mbps

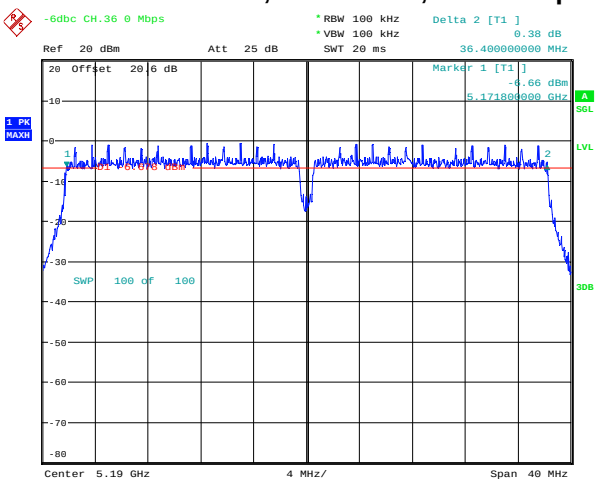


Figure 8-6: 6 dB Bandwidth
802.11ac, Channel 62, MCS0 Mbps

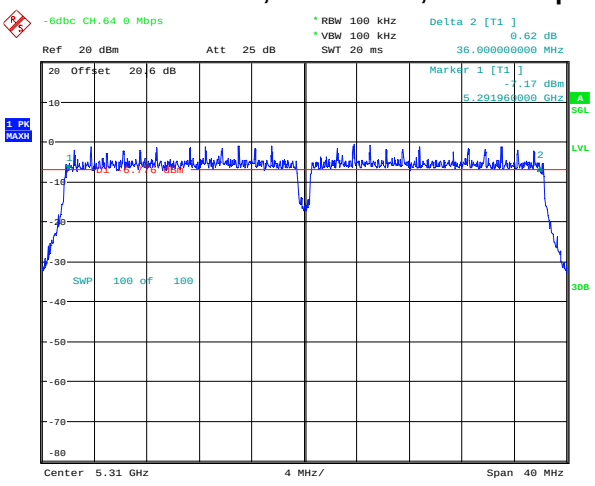


Figure 8-7: 6 dB Bandwidth
802.11ac, Channel 142, MCS0 Mbps

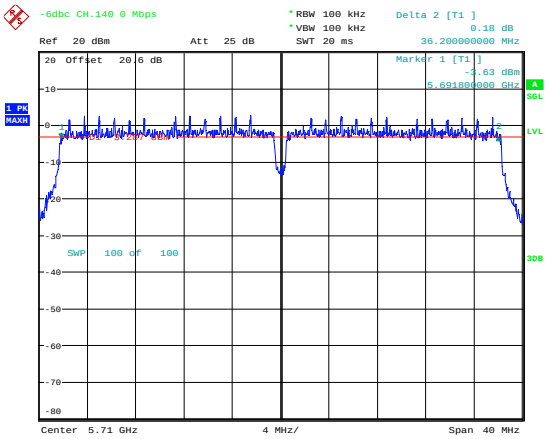
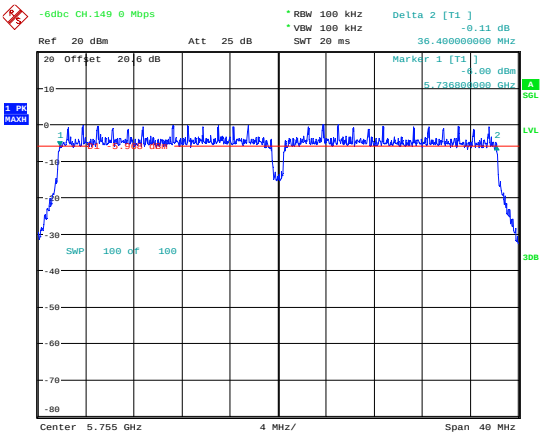


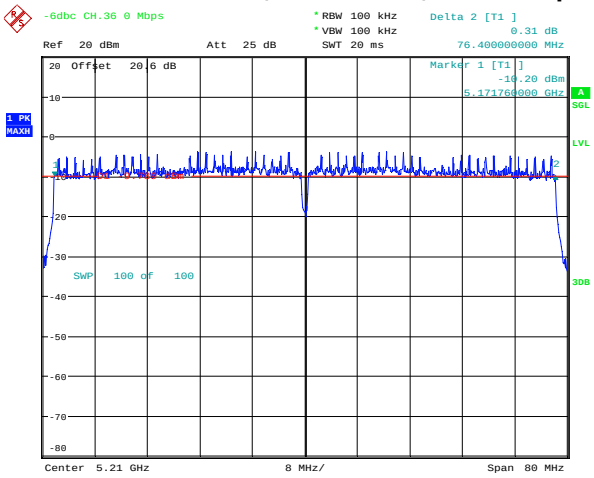
Figure 8-8: 6 dB Bandwidth
802.11ac, Channel 151, MCS0 Mbps



802.11ac RF Conducted Emission Test Results cont'd

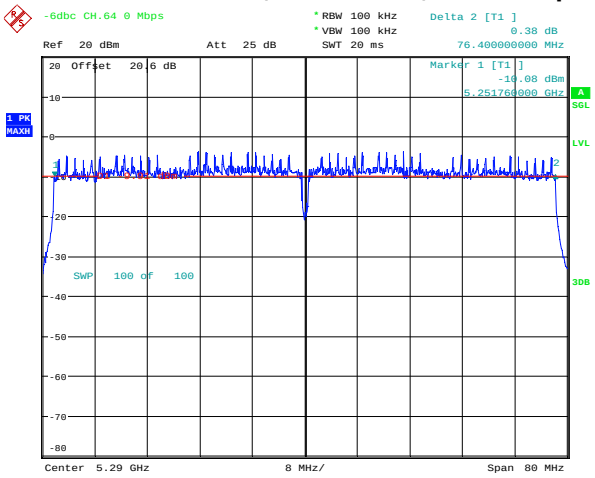
Bandwidth 80 MHz

Figure 8-9: 6 dB Bandwidth
802.11ac, Channel 42, MCS0 Mbps



Date: 8.APR.2015 12:31:01

Figure 8-10: 6 dB Bandwidth
802.11ac, Channel 58, MCS0 Mbps



Date: 8.APR.2015 12:31:37

Figure 8-11: 6 dB Bandwidth
802.11ac, Channel 138, MCS0 Mbps

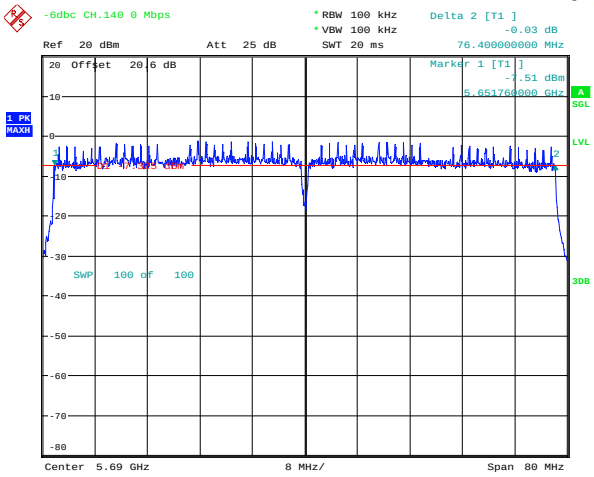


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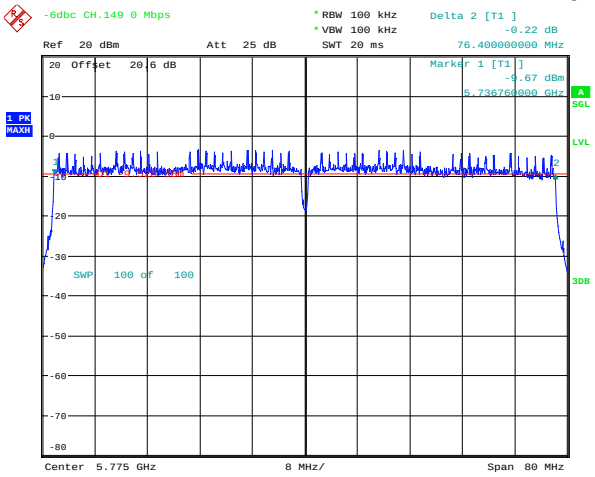
Figure 8-12: 6 dB Bandwidth
802.11ac, Channel 155, MCS0 Mbps



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802.11ac 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, 48, 64, 100, 140 and 165 were measured for 802.11ac mode, bandwidth 20MHz, 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.

20 MHz Bandwidth

Channel	BW(MHz)	Data Rate	Power Limit (mW)	Measured Level (dBm)	Measured Level (W)
36	20	MCS0	< 50.0	15.46	0.0352
		MCS4	< 50.0	14.32	0.0270
		MCS9	< 50.0	10.88	0.0122
64	20	MCS0	< 250.0	16.45	0.0442
		MCS4	< 250.0	15.10	0.0324
		MCS9	< 250.0	10.61	0.0115
100	20	MCS0	< 250.0	**16.61**	**0.0458**
		MCS4	< 250.0	15.50	0.0355
		MCS9	< 250.0	11.32	0.0136
140	20	MCS0	< 250.0	12.73	0.0187
		MCS4	< 250.0	11.59	0.0144
		MCS9	< 250.0	10.74	0.0119
149	20	MCS0	< 1000	14.21	0.0264
		MCS4	< 1000	13.00	0.0200
		MCS9	< 1000	11.24	0.0133

802.11ac RF Conducted Emission Test Results

Channels 38, 62, 102, 142 and 151 were measured for 802.11ac mode, bandwidth 40MHz, 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.

40 MHz Bandwidth

Channel	BW(MHz)	Data Rate	Power Limit (mW)	Measured Level (dBm)	Measured Level (W)
38	40	MCS0	< 50.0	13.39	0.0218
		MCS4	< 50.0	11.82	0.0152
		MCS9	< 50.0	8.94	0.0078
62	40	MCS0	< 250.0	13.00	0.0200
		MCS4	< 250.0	11.33	0.0136
		MCS9	< 250.0	8.53	0.0071
102	40	MCS0	< 250.0	13.79	0.0239
		MCS4	< 250.0	12.10	0.0162
		MCS9	< 250.0	9.13	0.0082
142	40	MCS0	< 250.0	**16.23**	**0.0420**
		MCS4	< 250.0	13.49	0.0223
		MCS9	< 250.0	8.70	0.0074
151	40	MCS0	< 1000	13.73	0.0236
		MCS4	< 1000	12.07	0.0161
		MCS9	< 1000	9.17	0.0083

802.11ac RF Conducted Emission Test Results

Channels 42, 58, 105, 138 and 151 were measured for 802.11ac mode, bandwidth 80MHz, 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.

80 MHz Bandwidth

Channel	BW(MHz)	Data Rate	Power Limit (mW)	Measured Level (dBm)	Measured Level (W)
42	80	MCS0	< 50.0	12.27	0.0169
		MCS4	< 50.0	10.14	0.0103
		MCS9	< 50.0	7.20	0.0052
58	80	MCS0	< 50.0	12.07	0.0161
		MCS4	< 50.0	9.98	0.0100
		MCS9	< 50.0	7.13	0.0052
105	80	MCS0	< 250.0	12.66	0.0185
		MCS4	< 250.0	10.55	0.0114
		MCS9	< 250.0	7.59	0.0057
138	80	MCS0	< 250.0	**14.36**	**0.0273**
		MCS4	< 250.0	11.61	0.0145
		MCS9	< 250.0	7.10	0.0051
151	80	MCS0	< 1000	12.38	0.0173
		MCS4	< 1000	10.21	0.0105
		MCS9	< 1000	7.31	0.0054

802.11ac 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, 64, 100, 140, 149, and 165 were measured at MCS0 Mbps, MCS4 Mbps, and MCS9 Mbps each for bandwidth 20MHz, 802.11ac mode.

20MHz Bandwidth

Channel	Bandwidt(MHz)	Data Rate	Limit (dBc)	Measured Level (dBc)	Margin (dBc)
36	20	MCS0	< -20	-42.96	-22.96
		MCS4	< -20	-43.16	-23.16
		MCS9	< -20	-40.71	-20.71
64	20	MCS0	< -20	-44.45	-24.45
		MCS4	< -20	-44.02	-24.02
		MCS9	< -20	-40.72	-20.72
100	20	MCS0	< -20	-44.58	-24.58
		MCS4	< -20	-43.88	-23.88
		MCS9	< -20	-41.80	-21.80
140	20	MCS0	< -20	-42.11	-22.11
		MCS4	< -20	-41.16	-21.16
		MCS9	< -20	-41.64	-21.64
149	20	MCS0	< -20	-37.35	-17.35
		MCS4	< -20	-39.77	-19.77
		MCS9	< -20	-41.19	-21.19
165	20	MCS0	< -20	-36.58	-16.58
		MCS4	< -20	-39.98	-19.98
		MCS9	< -20	-39.80	-19.80

See figures 8-13 to 8-18 for the plots of the band edge compliance measurements for Channel 36, 64, 100, 149 and 165 at MCS0 Mbps each for 802.11ac mode.

802.11ac RF Conducted Emission Test Results cont'd

Figure 8-13: Band Edge Compliance
802.11ac, Channel 36, MCS0 Mbps

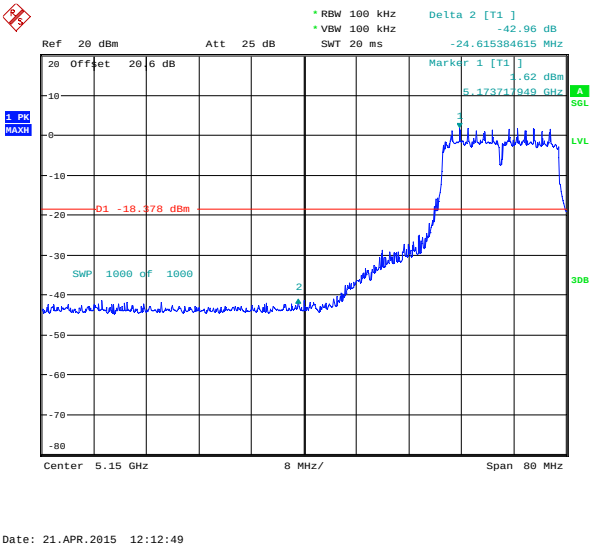

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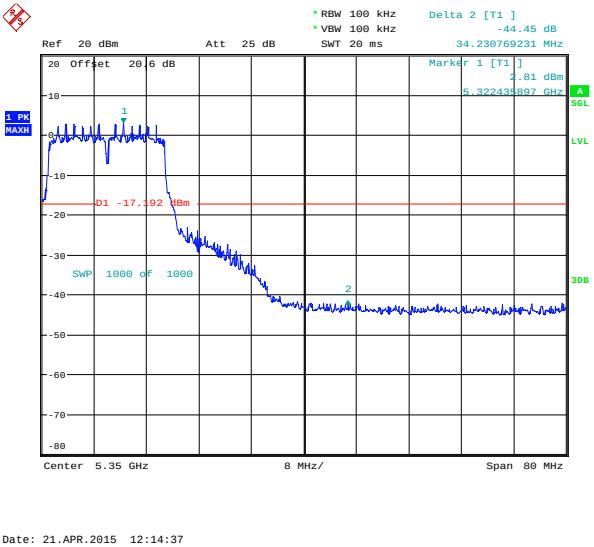
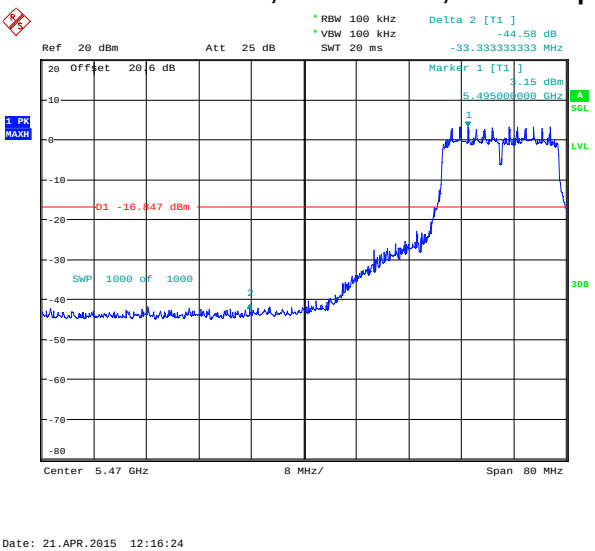
Figure 8-14: Band Edge Compliance
802.11ac, Channel 64, MCS0 Mbps



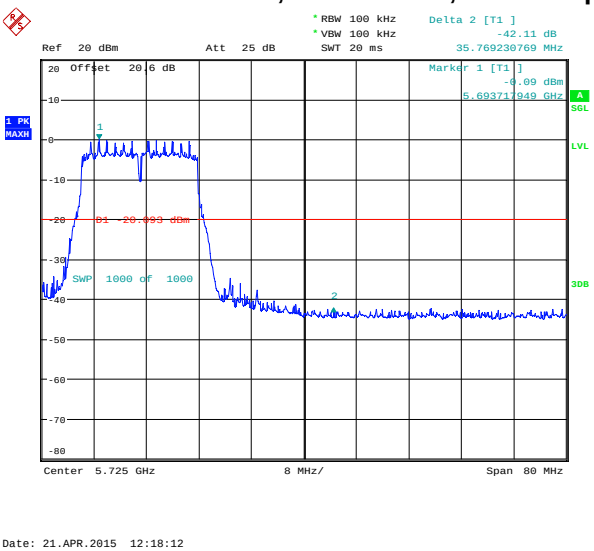
Date: 21.APR.2015 12:14:37

Figure 8-15: Band Edge Compliance
802.11ac, Channel 100, MCS0 Mbps



Date: 21.APR.2015 12:16:24

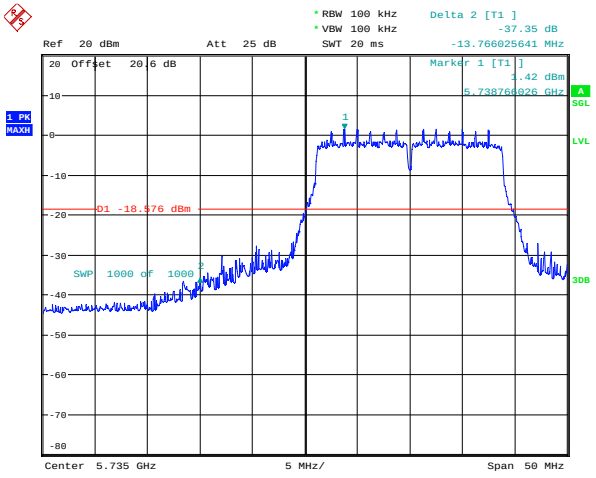
Figure 8-16: Band Edge Compliance
802.11ac, Channel 140, MCS0 Mbps



Date: 21.APR.2015 12:18:12

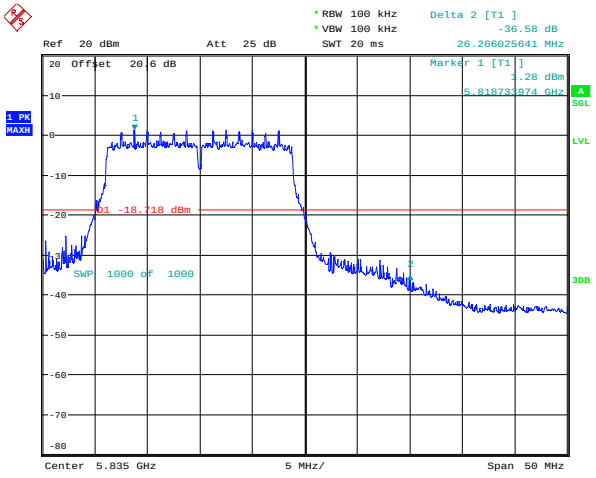
802.11a RF Conducted Emission Test Results cont'd

Figure 8-17: Band Edge Compliance
802.11ac, Channel 149, MCS0 Mbps



Date: 21.APR.2015 12:19:59

Figure 8-18: Band Edge Compliance
802.11ac, Channel 165, MCS0 Mbps



Date: 21.APR.2015 12:21:45

802.11ac RF Conducted Emission Test Results cont'd

Channels 38, 62, 102, 142, 151, and 159 were measured at MCS0 Mbps, MCS4 Mbps, and MCS9 Mbps each for bandwidth 40MHz, 802.11ac mode.

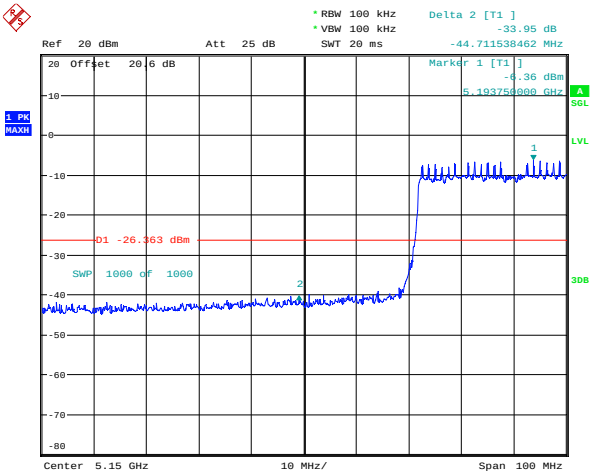
40MHz Bandwidth

Channel	Bandwidt(MHz)	Data Rate	Limit (dBc)	Measured Level (dBc)	Margin (dBc)
38	40	MCS0	< -20	-33.95	-13.95
		MCS4	< -20	-34.16	-14.16
		MCS9	< -20	-32.72	-12.72
62	40	MCS0	< -20	-34.55	-14.55
		MCS4	< -20	-34.84	-14.84
		MCS9	< -20	-32.62	-12.62
102	40	MCS0	< -20	-34.85	-14.85
		MCS4	< -20	-34.80	-14.80
		MCS9	< -20	-33.93	-13.93
142	40	MCS0	< -20	-26.94	-6.94
		MCS4	< -20	-30.21	-10.21
		MCS9	< -20	-29.97	-9.97
151	40	MCS0	< -20	-34.78	-45.78
		MCS4	< -20	-35.63	-46.63
		MCS9	< -20	-34.27	-45.27
159	40	MCS0	< -20	-35.35	-46.35
		MCS4	< -20	-36.20	-47.20
		MCS9	< -20	-34.54	-45.54

See figures 8-19 to 8-24 for the plots of the band edge compliance measurements for Channel 38, 62, 102, 142, 151, and 159 at MCS0 Mbps each for 802.11ac mode.

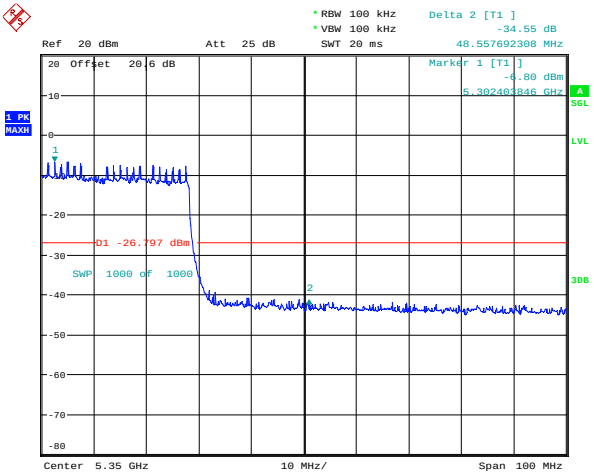
802.11ac RF Conducted Emission Test Results cont'd

Figure 8-19: Band Edge Compliance
802.11ac, Channel 38, MCS0 Mbps



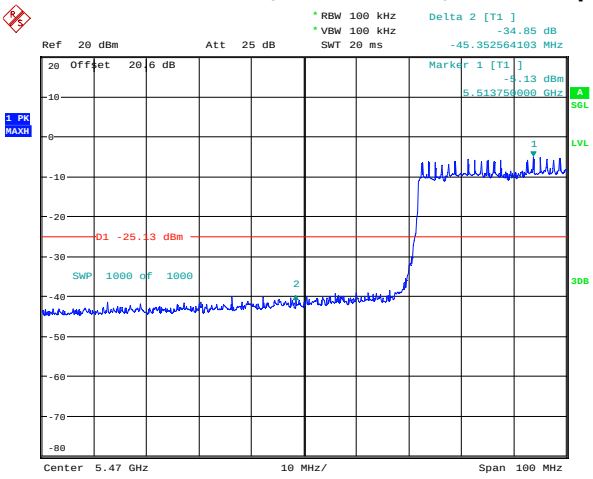
Date: 21.APR.2015 12:56:30

Figure 8-20: Band Edge Compliance
802.11ac, Channel 62, MCS0 Mbps



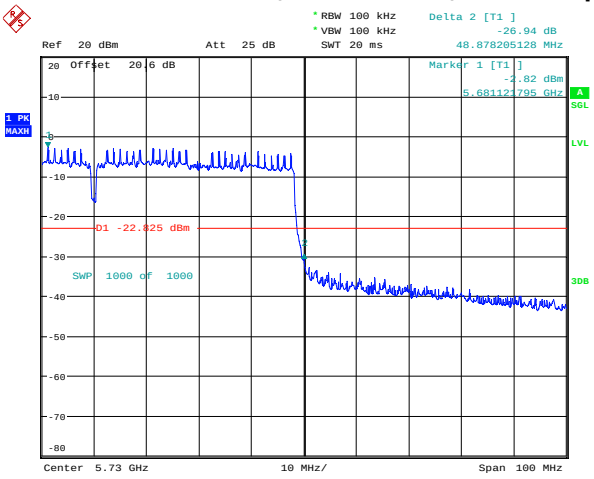
Date: 21.APR.2015 13:00:03

Figure 8-21: Band Edge Compliance
802.11ac, Channel 102, MCS0 Mbps



Date: 21.APR.2015 13:03:38

Figure 8-22: Band Edge Compliance
802.11ac, Channel 142, MCS0 Mbps



Date: 21.APR.2015 13:07:13

802.11a RF Conducted Emission Test Results cont'd

Figure 8-23: Band Edge Compliance
802.11ac, Channel 151, MCS0 Mbps

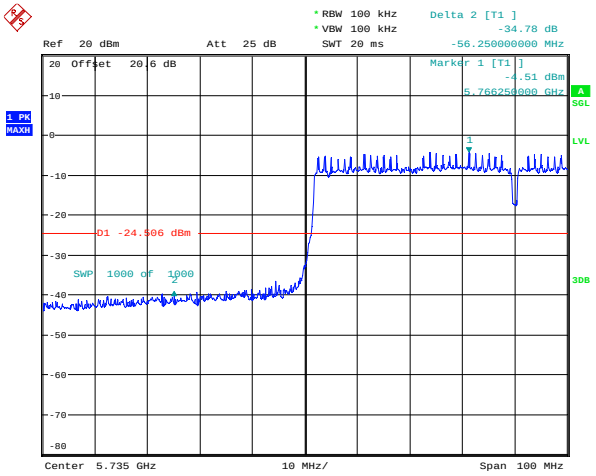
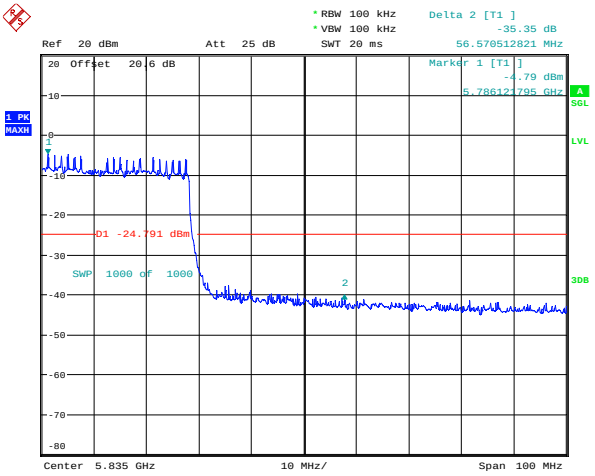


Figure 8-24: Band Edge Compliance
802.11ac, Channel 159, MCS0 Mbps



802.11ac RF Conducted Emission Test Results cont'd

Channels 42, 58, 105, 138, 155, and 155 were measured at MCS0 Mbps, MCS4 Mbps, and MCS9 Mbps each for bandwidth 80MHz, 802.11ac mode.

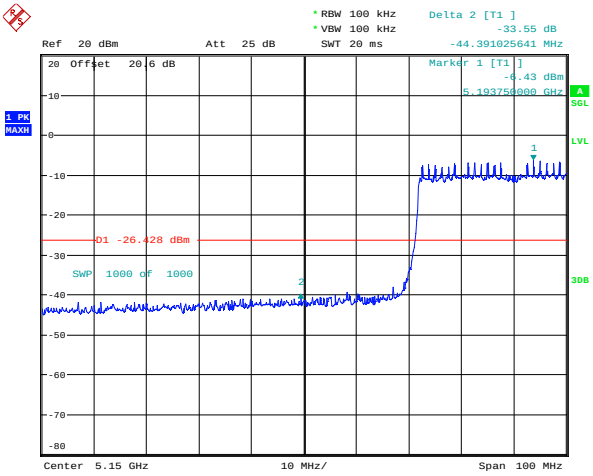
80MHz Bandwidth

Channel	Bandwidt(MHz)	Data Rate	Limit (dBc)	Measured Level (dBc)	Margin (dBc)
42	80	MCS0	< -20	-33.55	-13.55
		MCS4	< -20	-34.72	-14.72
		MCS9	< -20	-32.76	-12.76
58	80	MCS0	< -20	-34.37	-14.37
		MCS4	< -20	-35.04	-15.04
		MCS9	< -20	-32.79	-12.79
105	80	MCS0	< -20	-34.95	-14.95
		MCS4	< -20	-34.94	-14.94
		MCS9	< -20	-34.54	-14.54
138	80	MCS0	< -20	-29.06	-9.06
		MCS4	< -20	-29.61	-9.61
		MCS9	< -20	-29.15	-9.15
155 (Low Edge)	80	MCS0	< -20	-33.90	-13.90
		MCS4	< -20	-34.22	-14.22
		MCS9	< -20	-33.92	-13.92
155 (High Edge)	80	MCS0	< -20	-35.77	-15.77
		MCS4	< -20	-35.72	-15.72
		MCS9	< -20	-34.19	-14.19

See figures 8-25 to 8-30 for the plots of the band edge compliance measurements for Channel 42, 58, 105, 138 and 155 at MCS0 Mbps each for 802.11ac mode.

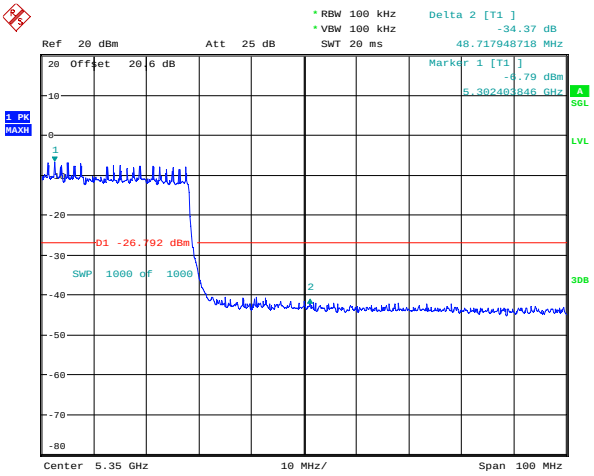
802.11ac RF Conducted Emission Test Results cont'd

Figure 8-25: Band Edge Compliance
802.11ac, Channel 38, MCS0 Mbps



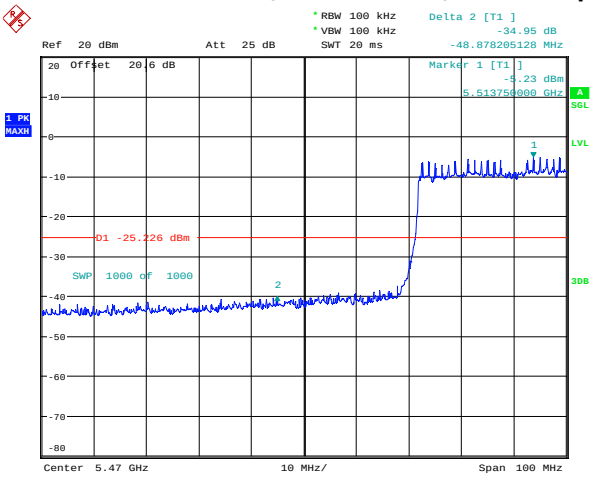
Date: 21.APR.2015 13:22:25

Figure 8-26: Band Edge Compliance
802.11ac, Channel 62, MCS0 Mbps



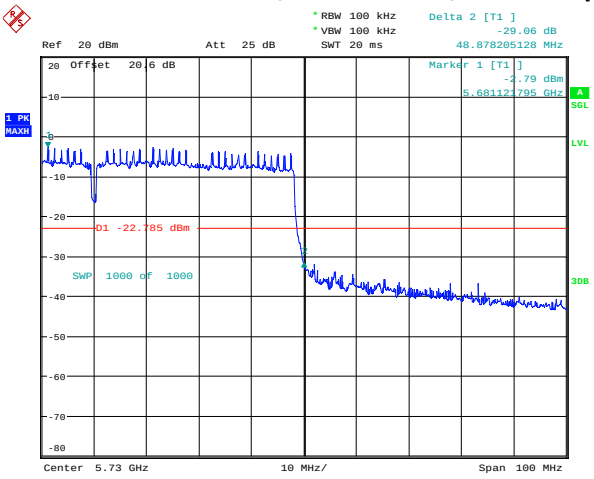
Date: 21.APR.2015 13:25:58

Figure 8-27: Band Edge Compliance
802.11ac, Channel 102, MCS0 Mbps



Date: 21.APR.2015 13:29:32

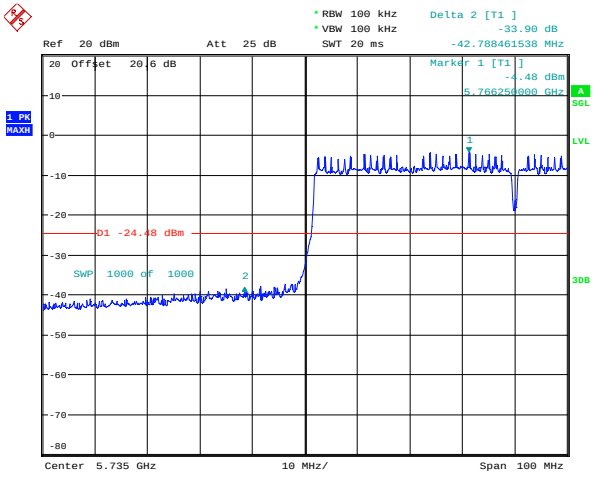
Figure 8-28: Band Edge Compliance
802.11ac, Channel 142, MCS0 Mbps



Date: 21.APR.2015 13:33:08

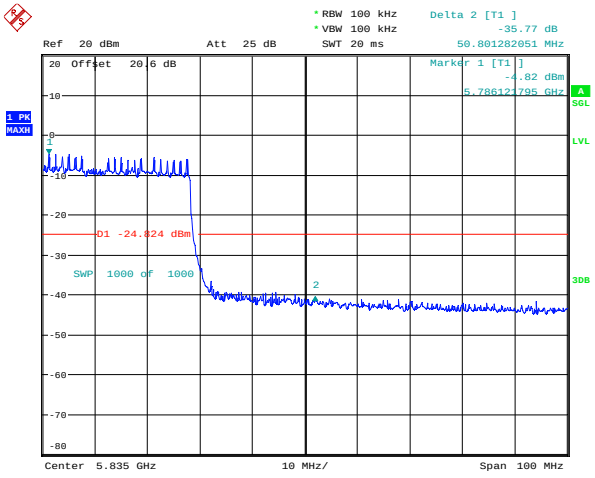
802.11ac RF Conducted Emission Test Results cont'd

Figure 8-29: Band Edge Compliance
802.11ac, Channel 151, MCS0 Mbps



Date: 21.APR.2015 13:36:46

Figure 8-30: Band Edge Compliance
802.11ac, Channel 159, MCS0 Mbps



Date: 21.APR.2015 13:40:23

802.11ac 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, 64, 140 and 149 were measured at MCS0 Mbps, MCS4 Mbps, and MCS9 Mbps each for 802.11ac mode, bandwidth 20MHz.

Bandwidth 20MHz

Channel	Data Rate	Limit (dBm)	Measured Level (dBm)	Margin (dBm)
36	MCS0	< 11.00	3.92	-7.08
	MCS4	< 11.00	2.95	-8.05
	MCS9	< 11.00	-0.37	-11.37
64	MCS0	< 11.00	4.90	-6.10
	MCS4	< 11.00	3.57	-7.43
	MCS9	< 11.00	-0.71	-11.71
140	MCS0	< 11.00	1.39	-9.61
	MCS4	< 11.00	0.35	-10.65
	MCS9	< 11.00	-0.43	-11.43
149	MCS0	< 11.00	-18.68	-29.68
	MCS4	< 11.00	-19.25	-30.25
	MCS9	< 11.00	-20.17	-31.17

See figures 8-31 to 8-34 for the plots of the peak power spectral density for Channel 36, 64, 140 and 149 at MCS0 Mbps each for 802.11ac mode, 20MHz bandwidth.

802.11ac RF Conducted Emission Test Results cont'd

Figure 8-31: Peak Power Spectral Density
802.11ac, Channel 36, MCS0 Mbps

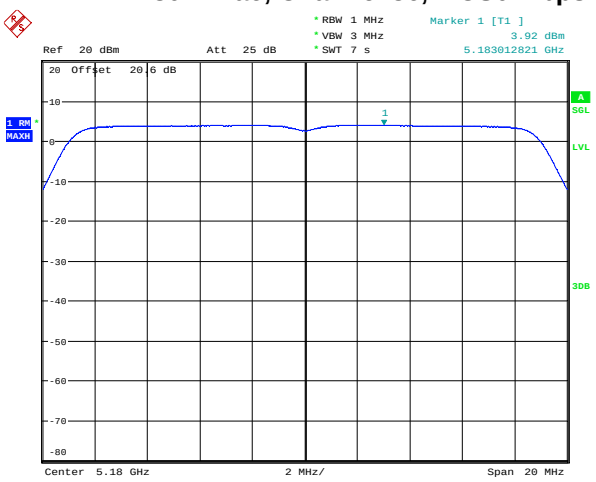


Figure 8-32: Peak Power Spectral Density
802.11ac, Channel 64, MCS0 Mbps

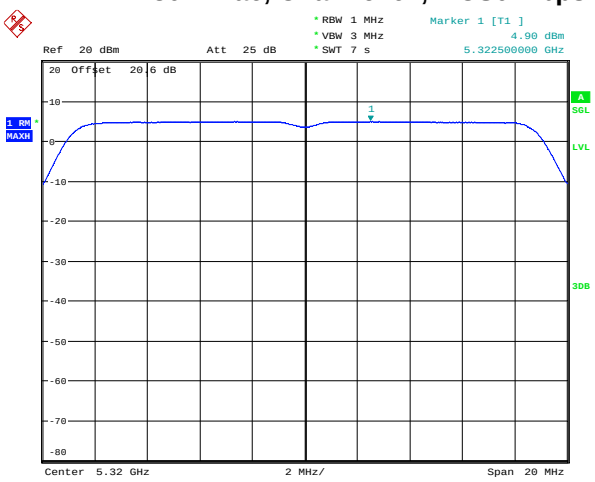


Figure 8-33: Peak Power Spectral Density
802.11ac, Channel 140, MCS0 Mbps

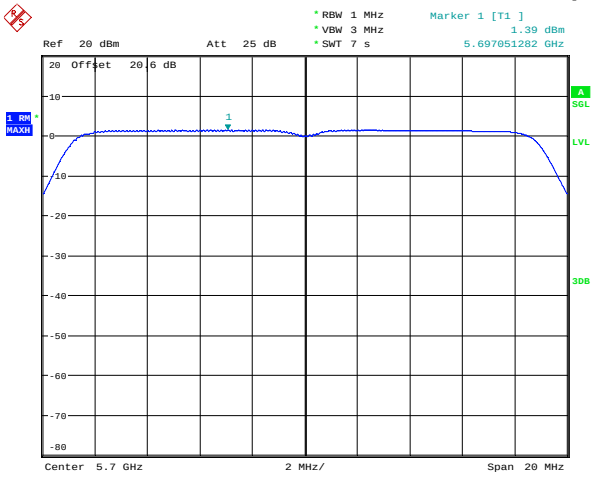
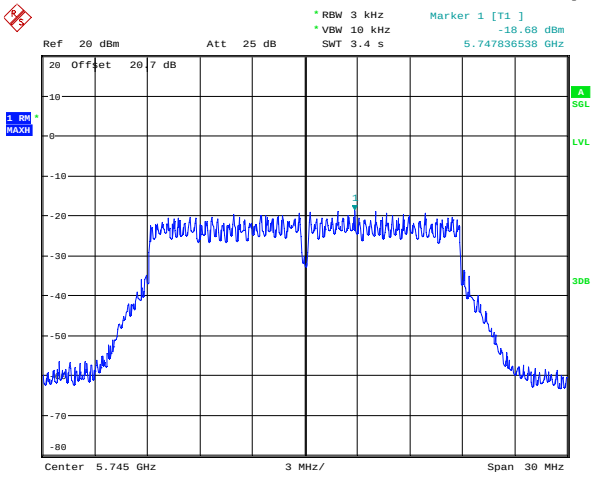


Figure 8-34: Peak Power Spectral Density
802.11ac, Channel 149, MCS0 Mbps



802.11ac RF Conducted Emission Test Results cont'd

Channels 38, 62, 142 and 151 were measured at MCS0 Mbps, MCS4 Mbps, and MCS9 Mbps each for 802.11ac mode, bandwidth 40MHz.

Bandwidth 40MHz

Channel	Data Rate	Limit (dBm)	Measured Level (dBm)	Margin (dBm)
38	MCS0	< 11.00	-1.12	-12.12
	MCS4	< 11.00	-2.75	-13.75
	MCS9	< 11.00	-5.07	-16.07
62	MCS0	**< 11.00**	-1.59	-12.59
	MCS4	< 11.00	-3.05	-14.05
	MCS9	< 11.00	-5.76	-16.76
142	MCS0	< 11.00	1.88	-9.12
	MCS4	< 11.00	-0.76	-11.76
	MCS9	< 11.00	-5.48	-16.48
151	MCS0	< 11.00	-23.11	-34.11
	MCS4	< 11.00	-23.58	-34.58
	MCS9	< 11.00	-25.26	-36.26

See figures 8-35 to 8-38 for the plots of the peak power spectral density for channel 38, 62, 142 and 151 at MCS0 Mbps each for 802.11ac mode, 40MHz bandwidth.

802.11ac RF Conducted Emission Test Results cont'd

Figure 8-35: Peak Power Spectral Density
802.11ac, Channel 38, MCS0 Mbps

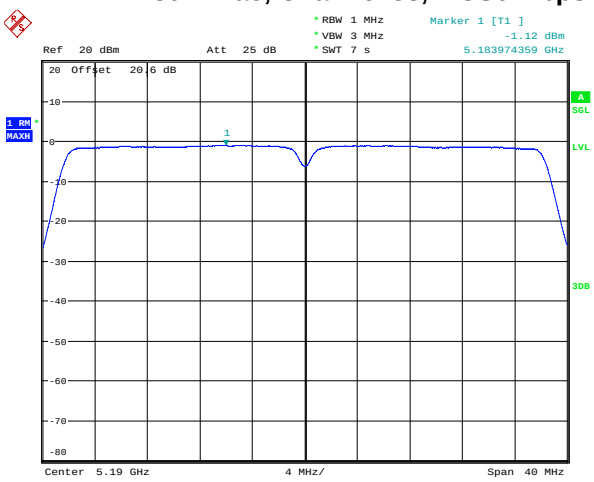


Figure 8-36: Peak Power Spectral Density
802.11ac, Channel 62, MCS0 Mbps

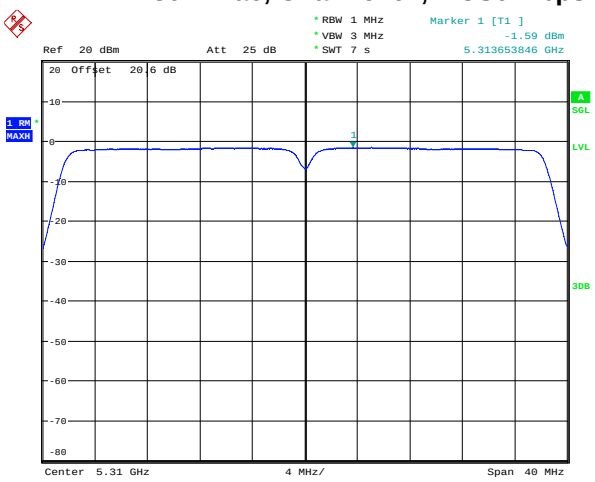


Figure 8-37: Peak Power Spectral Density
802.11ac, Channel 142, MCS0 Mbps

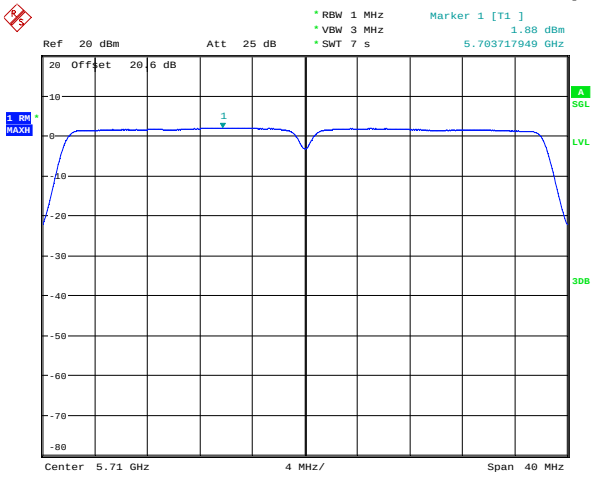
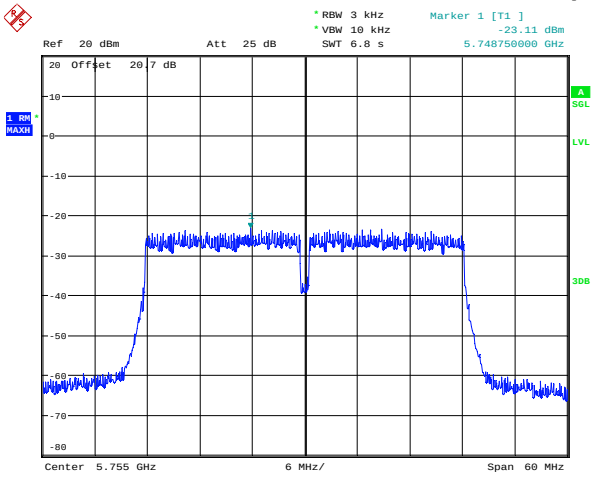


Figure 8-38: Peak Power Spectral Density
802.11ac, Channel 151, MCS0 Mbps



802.11ac RF Conducted Emission Test Results cont'd

Channels 42, 58, 138 and 155 were measured at MCS0 Mbps, MCS4 Mbps, and MCS9 Mbps each for 802.11ac mode, bandwidth 80MHz.

Bandwidth 80MHz

Channel	Data Rate	Limit (dBm)	Measured Level (dBm)	Margin (dBm)
42	MCS0	< 11.00	-5.02	-16.02
	MCS4	< 11.00	-6.65	-17.65
	MCS9	< 11.00	-9.57	-20.57
58	MCS0	< 11.00	-5.20	-16.20
	MCS4	< 11.00	-6.91	-17.91
	MCS9	< 11.00	-9.69	-20.69
138	MCS0	< 11.00	-2.59	-13.59
	MCS4	< 11.00	-5.03	-16.03
	MCS9	< 11.00	-9.27	-20.27
155	MCS0	< 11.00	-28.17	-39.17
	MCS4	< 11.00	-28.42	-39.42
	MCS9	< 11.00	-30.86	-41.86

See figures 8-39 to 8-42 for the plots of the peak power spectral density for channel 42, 58, 138 and 155 at MCS0 Mbps each for 802.11ac mode, 80MHz bandwidth.

802.11ac RF Conducted Emission Test Results cont'd

Figure 8-39: Peak Power Spectral Density
802.11ac, Channel 42, MCS0 Mbps

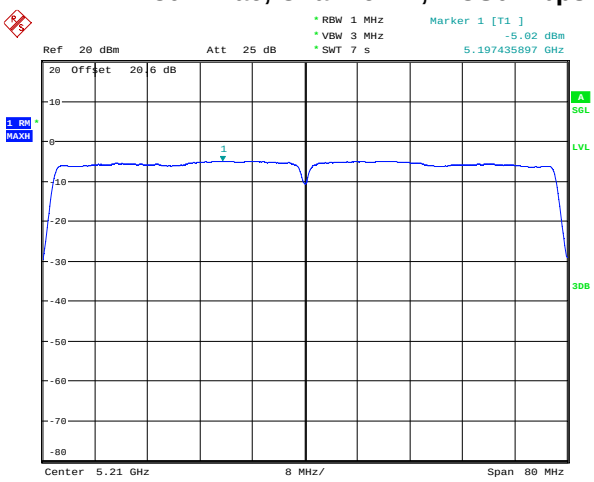


Figure 8-40: Peak Power Spectral Density
802.11ac, Channel 58, MCS0 Mbps

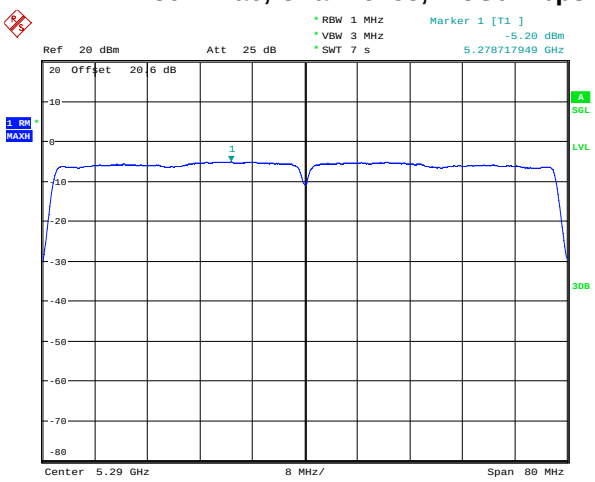


Figure 8-41: Peak Power Spectral Density
802.11ac, Channel 138, MCS0 Mbps

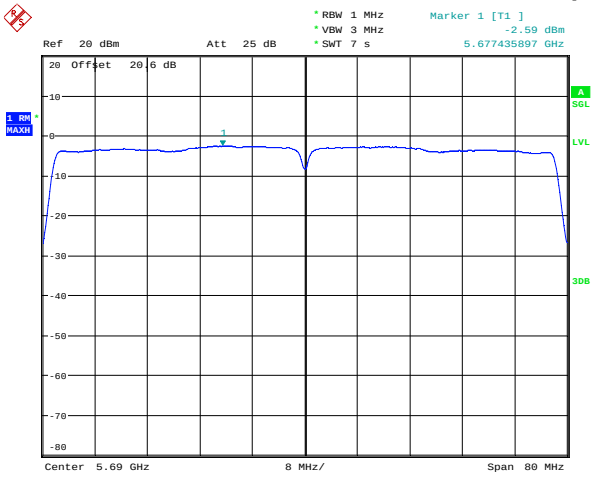
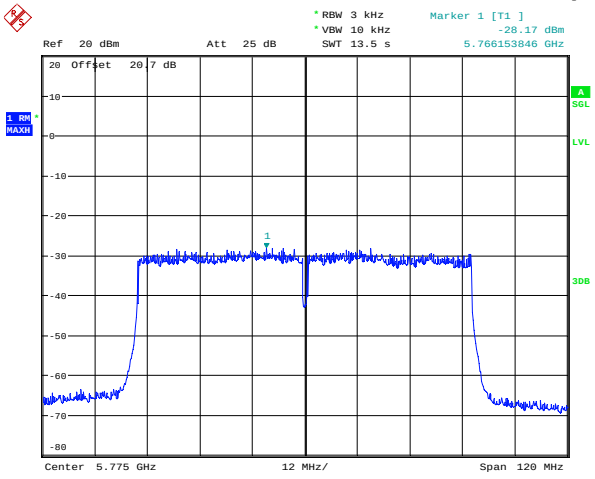


Figure 8-42: Peak Power Spectral Density
802.11ac, Channel 155, MCS0 Mbps



802.11ac 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 36, 64, 140 and 149 were measured at MCS0 Mbps, MCS4 Mbps and MCS9 Mbps each for 802.11ac mode, 20MHz bandwidth. 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.

20MHZ Bandwidth

Channel	Data Rate	Power (dBm)	Max. Measured Level (dBm)	Max. Measured Level from Carrier (dBc)	Limit (dBc)
36	MCS0	15.46	-45.92	-61.38	-20
	MCS4	14.32	-42.72	-57.04	-20
	MCS9	10.88	-46.67	-57.55	-20
64	MCS0	16.45	-43.73	-60.18	-20
	MCS4	15.10	-46.51	-61.61	-20
	MCS9	10.61	-46.42	-57.02	-20
140	MCS0	12.73	-44.20	-56.93	-20
	MCS4	11.59	-43.73	-55.31	-20
	MCS9	10.74	-44.44	-55.19	-20
149	MCS0	14.21	-43.54	-57.75	-20
	MCS4	13.00	-42.53	-55.53	-20
	MCS9	11.24	-43.43	-54.66	-20

See figures 8-43 to 8-46 for the plots of the spurious RF conducted emissions for Channel 36, 64, 140 and 149 at MCS0 Mbps each for 802.11ac mode.

802.11ac RF Conducted Emission Test Results cont'd

Figure 8-43a: Spurious RF Conducted Emissions, 802.11ac Channel 36, MCS0 Mbps

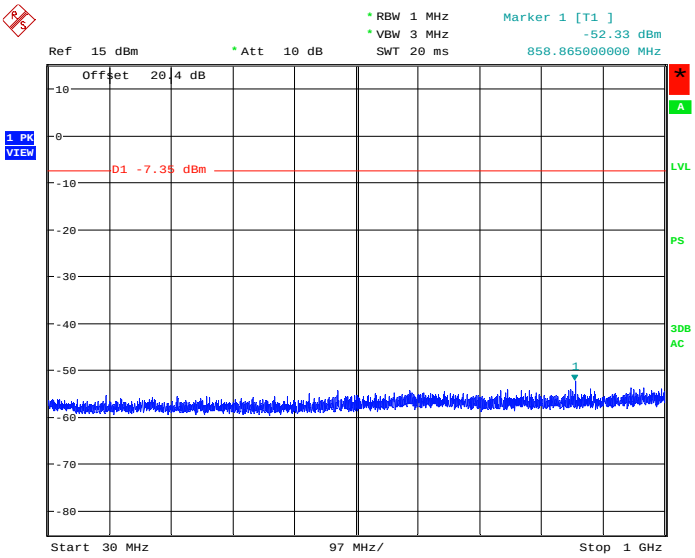
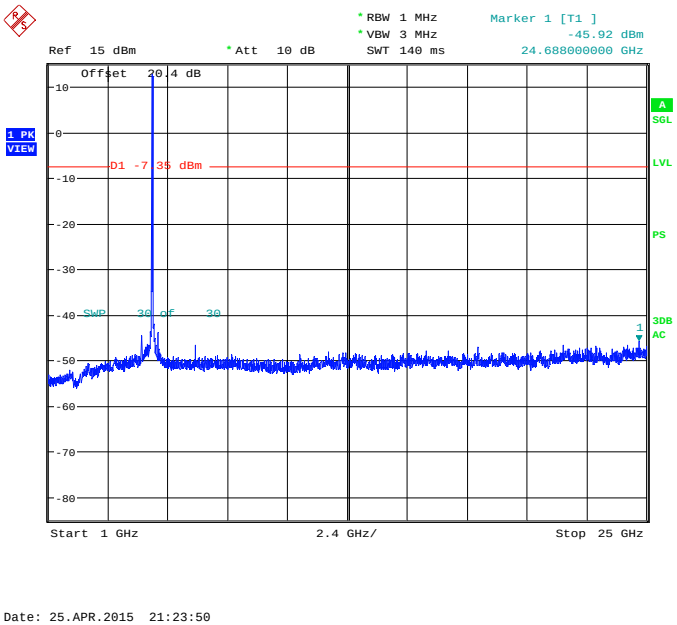


Figure 8-43b: Spurious RF Conducted Emissions, 802.11ac Channel 36, MCS0



802.11ac RF Conducted Emission Test Results cont'd

Figure 8-44a: Spurious RF Conducted Emissions, 802.11ac Channel 64, MCS0

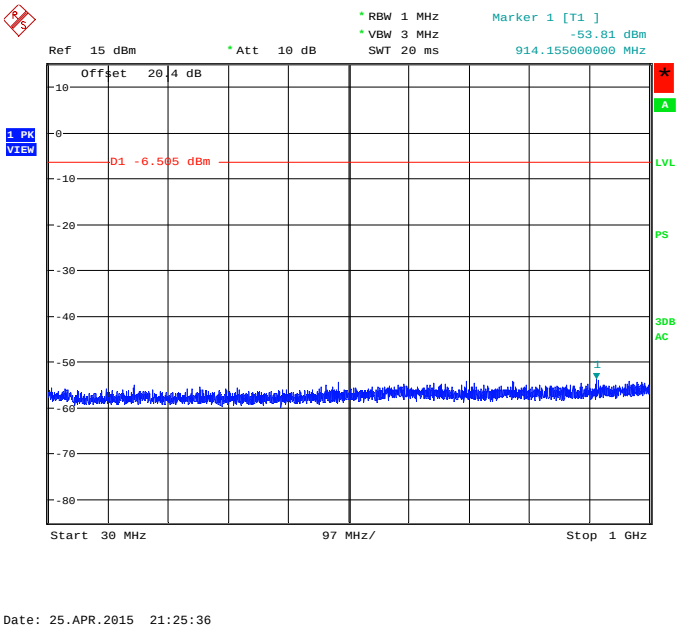
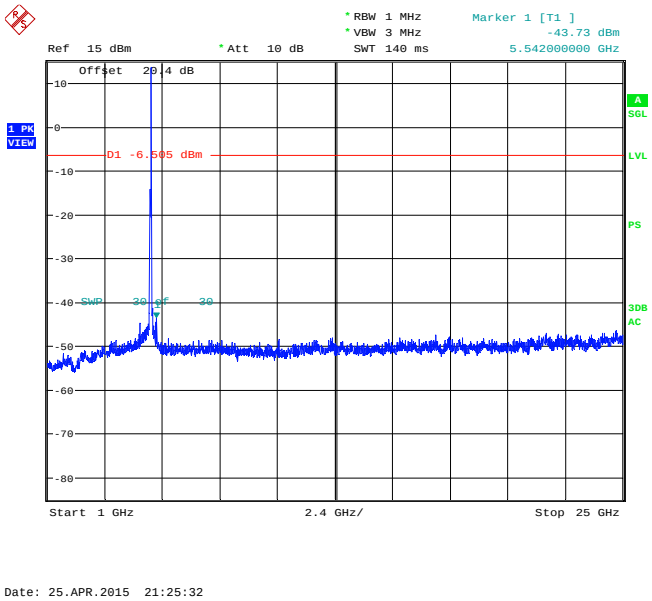


Figure 8-44b: Spurious RF Conducted Emissions, 802.11ac Channel 64, MCS0



802.11ac RF Conducted Emission Test Results cont'd

Figure 8-45a: Spurious RF Conducted Emissions, 802.11ac Channel 140, MCS0

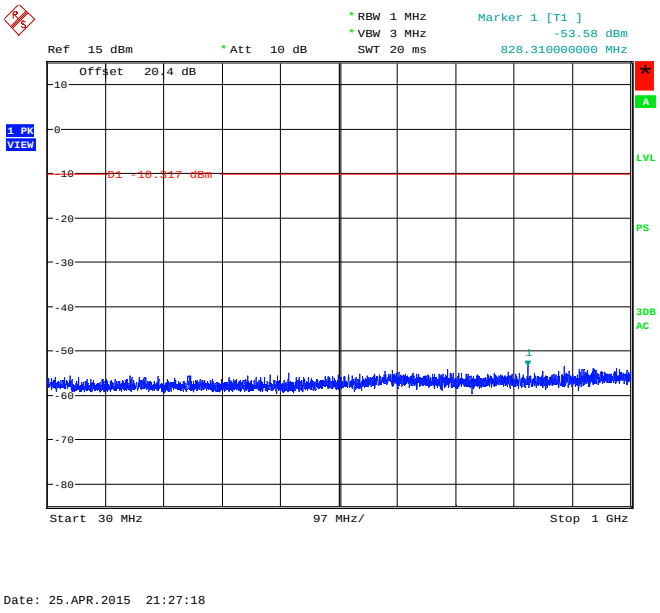
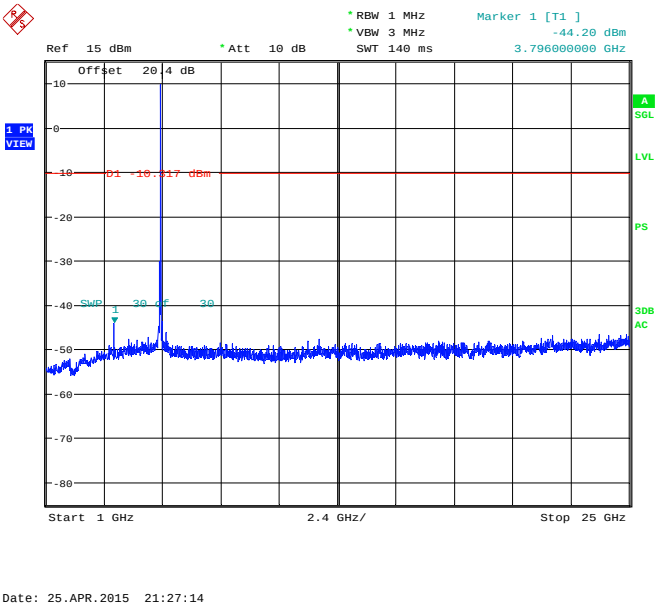


Figure 8-45b: Spurious RF Conducted Emissions, 802.11ac Channel 140, MCS0



802.11ac RF Conducted Emission Test Results cont'd

Figure 8-46a: Spurious RF Conducted Emissions, 802.11ac Channel 149, MCS0

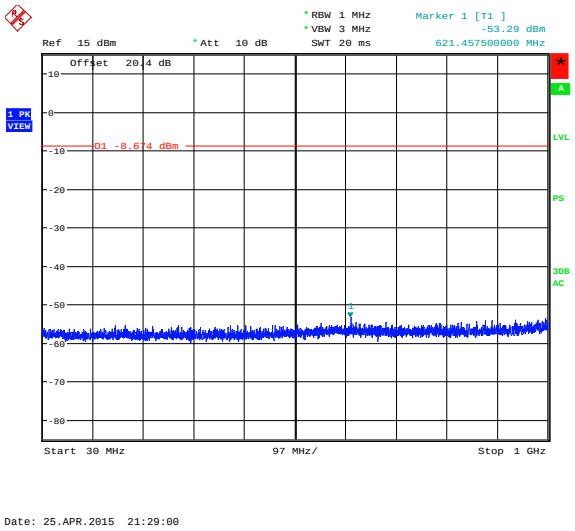
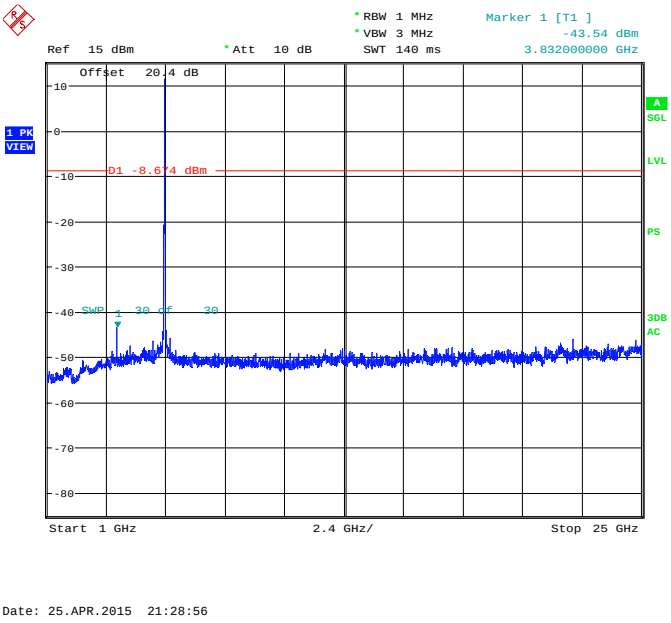


Figure 8-46b: Spurious RF Conducted Emissions, 802.11ac Channel 149, MCS0



802.11ac RF Conducted Emission Test Results cont'd

Channels 38, 62, 142 and 151 were measured at MCS0 Mbps, MCS4 Mbps and MCS9 Mbps each for 802.11ac mode, 40MHz bandwidth. 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.

40MHZ Bandwidth

Channel	Data Rate	Power (dBm)	Max. Measured Level (dBm)	Max. Measured Level from Carrier (dBc)	Limit (dBc)
38	MCS0	13.39	-55.30	-68.69	-20
	MCS4	11.82	-55.35	-67.17	-20
	MCS9	8.94	-55.99	-64.93	-20
62	MCS0	13.00	-54.03	-67.03	-20
	MCS4	11.33	-56.62	-67.94	-20
	MCS9	8.53	-57.09	-65.62	-20
142	MCS0	16.23	-57.49	-73.72	-20
	MCS4	13.49	-56.52	-70.01	-20
	MCS9	8.70	-55.42	-64.11	-20
151	MCS0	13.73	-56.83	-70.56	-20
	MCS4	12.07	-56.56	-68.63	-20
	MCS9	9.17	-56.62	-65.79	-20

See figures 8-47 to 8-50 for the plots of the spurious RF conducted emissions for Channel 38, 62, 142 and 151 at MCS0 Mbps each for 802.11ac mode, bandwidth 40MHz.

802.11ac RF Conducted Emission Test Results cont'd

Figure 8-47a: Spurious RF Conducted Emissions, 802.11ac Channel 38, MCS0

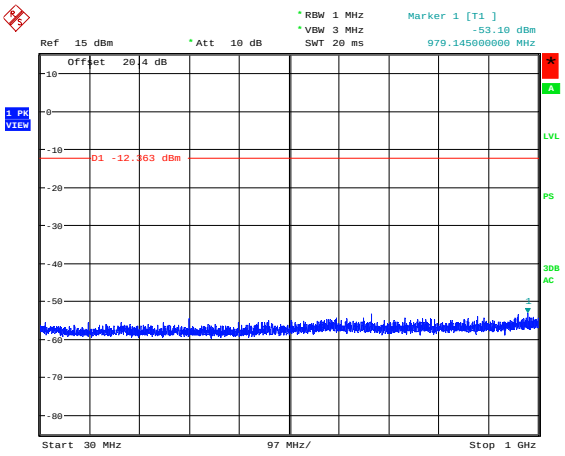


Figure 8-47b: Spurious RF Conducted Emissions, 802.11ac Channel 38, MCS0

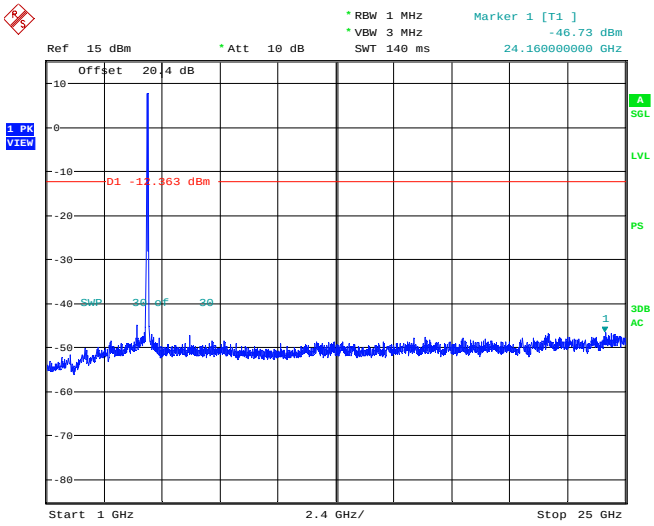


Figure 8-48a: Spurious RF Conducted Emissions, 802.11ac Channel 62, MCS0

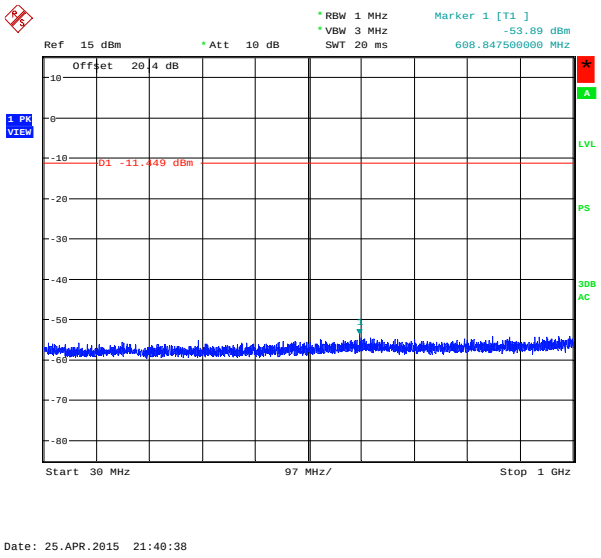
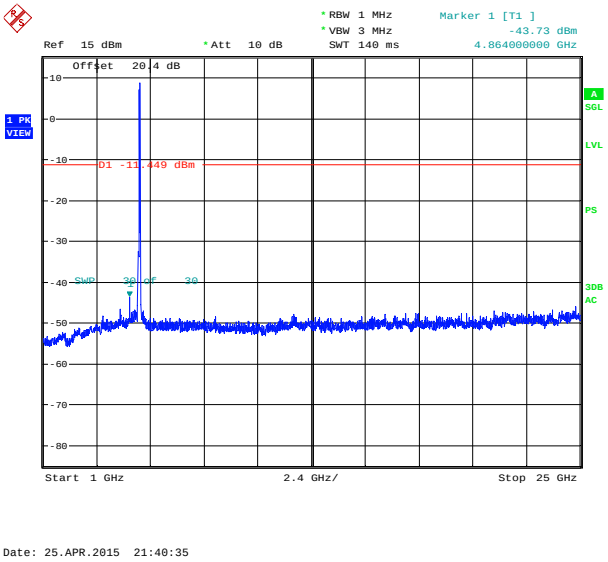


Figure 8-48b: Spurious RF Conducted Emissions, 802.11ac Channel 62, MCS0



802.11ac RF Conducted Emission Test Results cont'd

Figure 8-49a: Spurious RF Conducted Emissions, 802.11ac Channel 142, MCS0

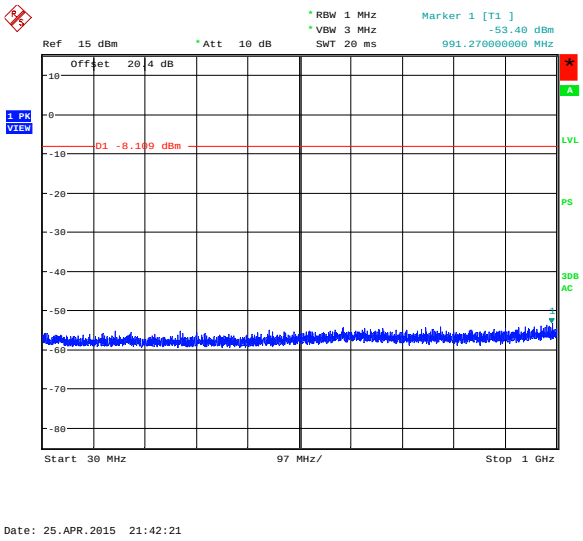
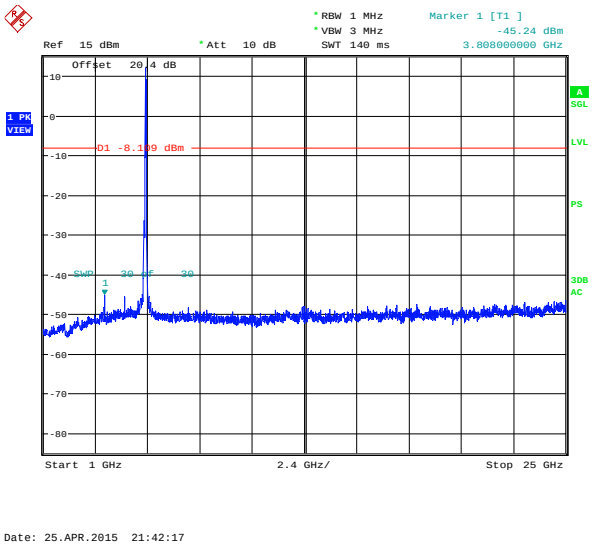


Figure 8-49b: Spurious RF Conducted Emissions, 802.11ac Channel 142, MCS0



802.11ac RF Conducted Emission Test Results cont'd

Figure 8-50a: Spurious RF Conducted Emissions, 802.11ac Channel 151, MCS0

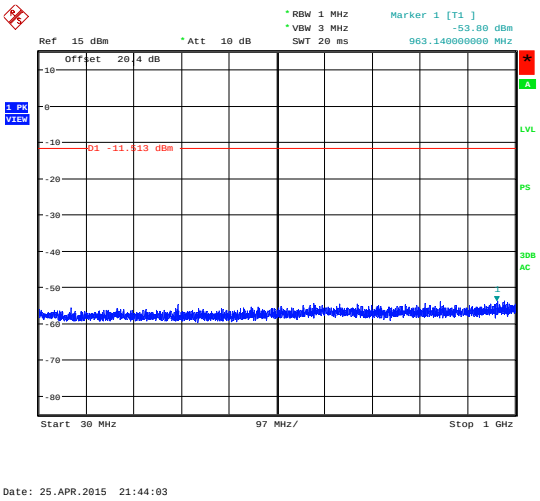
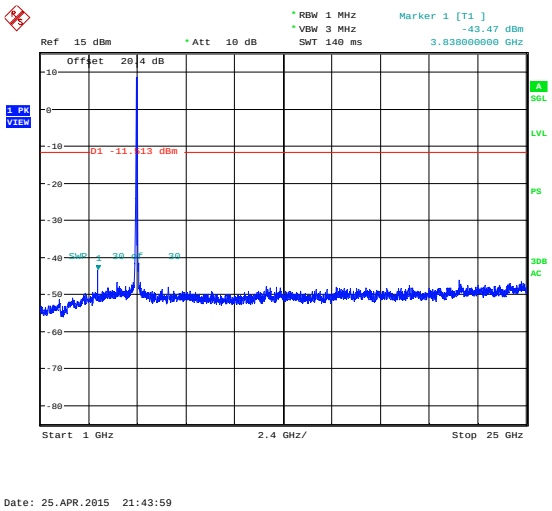


Figure 8-50b: Spurious RF Conducted Emissions, 802.11ac Channel 151, MCS0



802.11ac RF Conducted Emission Test Results cont'd

Channels 42, 58, 138 and 155 were measured at MCS0 Mbps, MCS4 Mbps and MCS9 Mbps each for 802.11ac mode, 80MHz bandwidth. 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.

80MHZ Bandwidth

Channel	Data Rate	Power (dBm)	Max. Measured Level (dBm)	Max. Measured Level from Carrier (dBc)	Limit (dBc)
42	MCS0	12.27	-43.715	-55.98	-20
	MCS4	10.14	-43.645	-53.79	-20
	MCS9	7.20	-44.225	-51.43	-20
58	MCS0	12.66	-44.415	-57.08	-20
	MCS4	10.55	-44.603	-55.15	-20
	MCS9	7.13	-43.802	-50.93	-20
138	MCS0	14.36	-43.751	-58.11	-20
	MCS4	11.61	-43.964	-55.57	-20
	MCS9	7.10	-44.675	-51.77	-20
155	MCS0	12.38	-45.298	-57.67	-20
	MCS4	10.21	-44.305	-54.51	-20
	MCS9	7.31	-42.920	-50.23	-20

See figures 8-51 to 8-54 for the plots of the spurious RF conducted emissions for Channel 42, 58, 138 and 155 at MCS0 Mbps each for 802.11ac mode, bandwidth 80MHz.

802.11ac RF Conducted Emission Test Results cont'd

Figure 8-51a: Spurious RF Conducted Emissions, 802.11ac Channel 42, MCS0

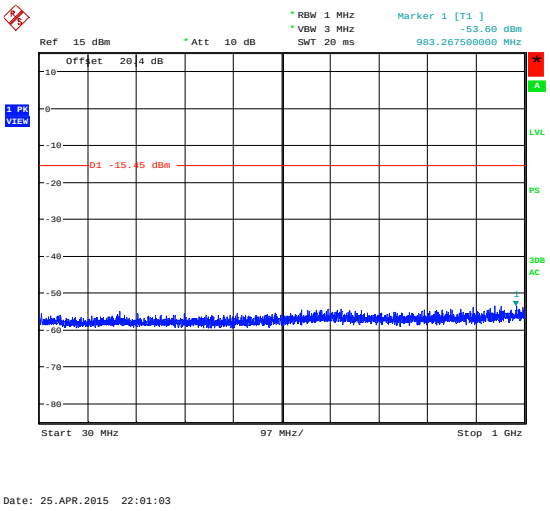
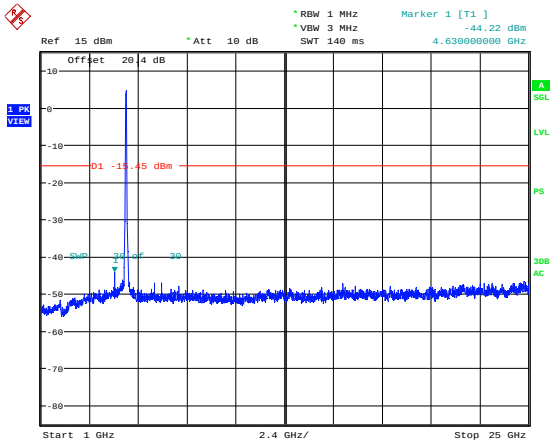


Figure 8-51b: Spurious RF Conducted Emissions, 802.11ac Channel 42, MCS0



802.11ac RF Conducted Emission Test Results cont'd

Figure 8-52a: Spurious RF Conducted Emissions, 802.11ac Channel 58, MCS0

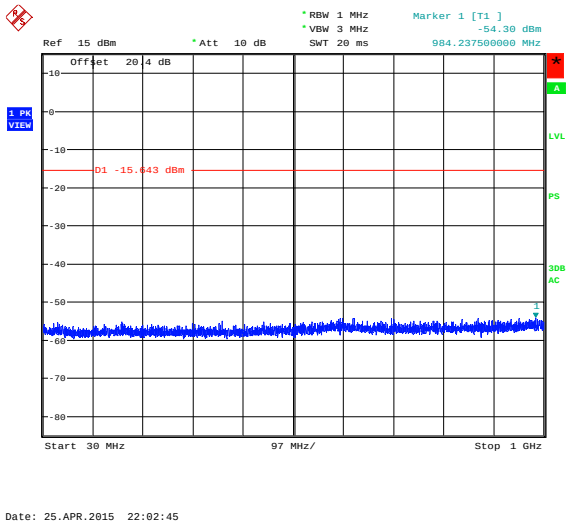
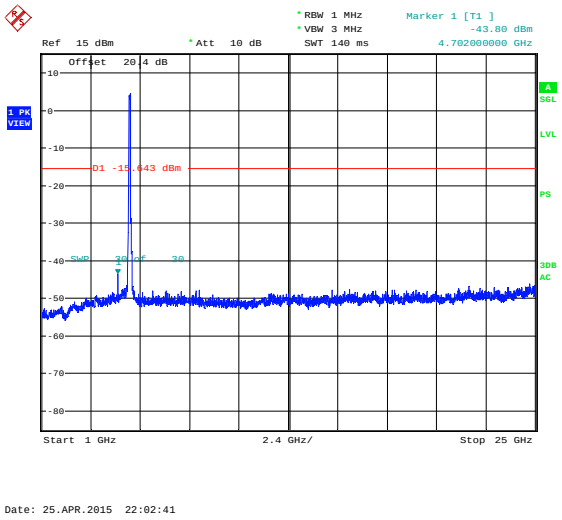


Figure 8-52b: Spurious RF Conducted Emissions, 802.11ac Channel 58, MCS0



802.11ac RF Conducted Emission Test Results cont'd

Figure 8-53a: Spurious RF Conducted Emissions, 802.11ac Channel 138, MCS0

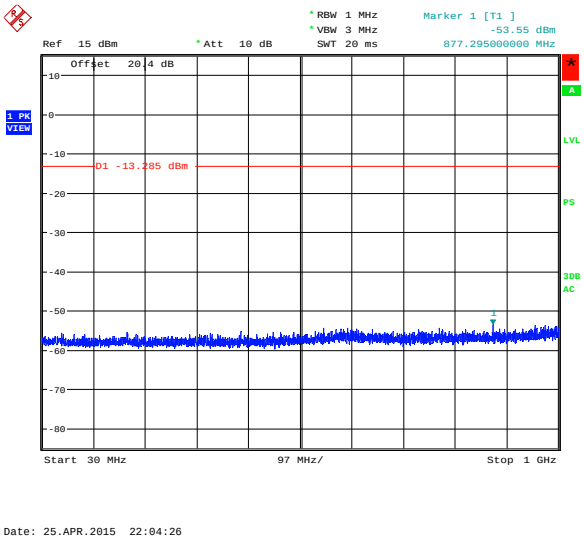
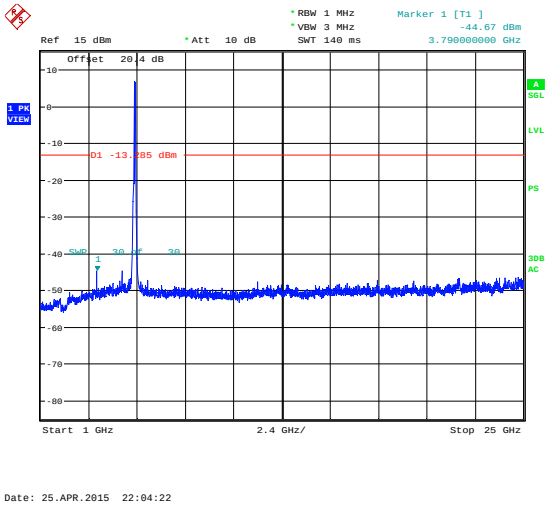


Figure 8-53b: Spurious RF Conducted Emissions, 802.11ac Channel 138, MCS0



802.11ac RF Conducted Emission Test Results cont'd

Figure 8-54a: Spurious RF Conducted Emissions, 802.11ac Channel 155, MCS0

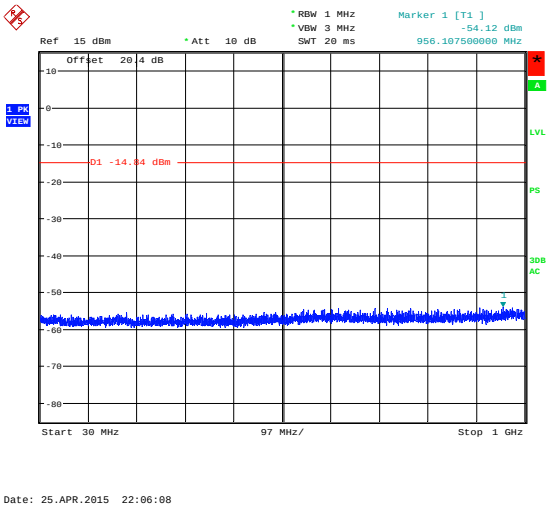
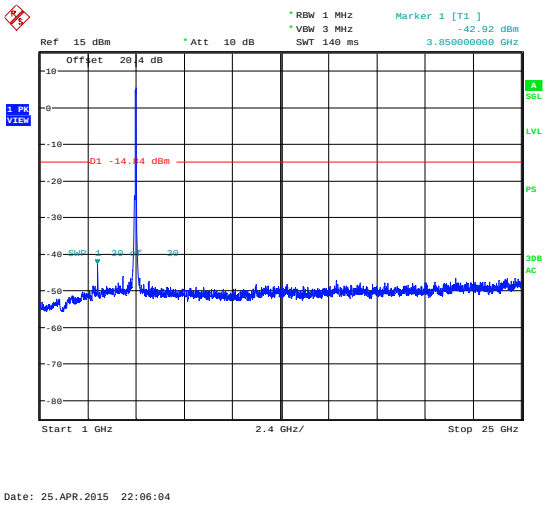


Figure 8-54b: Spurious RF Conducted Emissions, 802.11ac Channel 155, MCS0



APPENDIX 9 – NEAR FIELD COMMUNICATIONS TEST DATA/PLOTS

Near Field Communications (NFC) Test Results

Radiated Emissions

Date of Test: May 12, 2015

Measurements were performed by Savtej Sandhu.

The environmental test conditions were: Temperature: 25.3 ºC
Relative Humidity: 28.7 %

The test distance was 3.0 meters with a EUT height of 1.5 meters, 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)
13.57	50.91	16.67	50.91	124.00	-73.09

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

Near Field Communications (NFC) Test Results

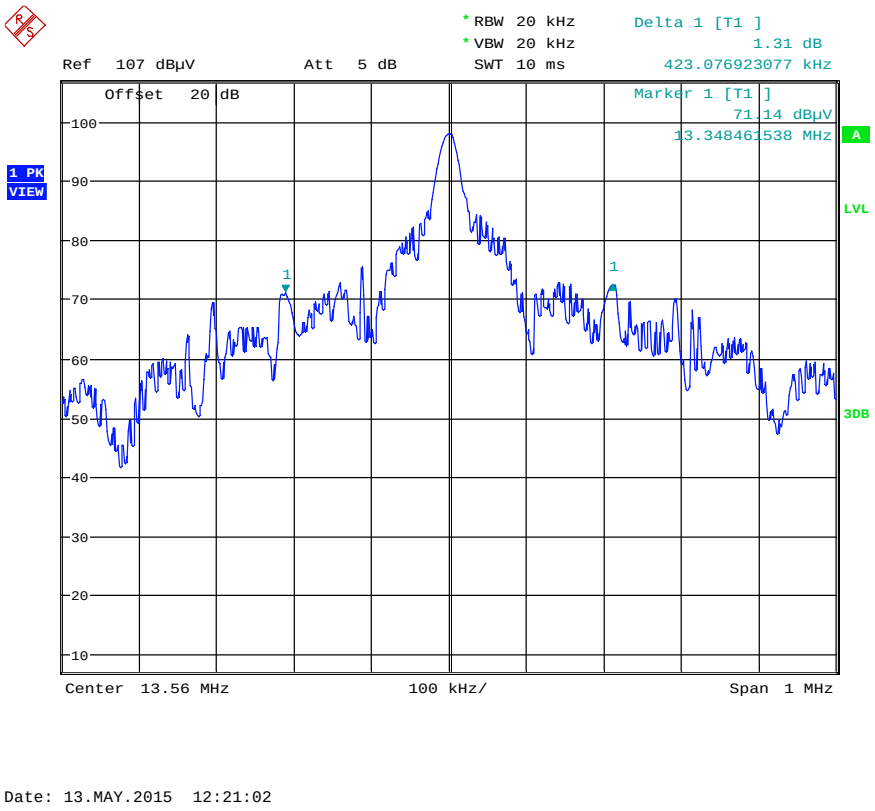
Occupied Bandwidth

Date of test: May 13, 2015
The measurements were performed by Siji Li.

The environmental test conditions were: Temperature: 25.2 ºC
Relative Humidity: 41.5 %

Operation mode (TX ON)	Occupied Bandwidth (kHz)
NFC, modulated	491.99

Figure 9-1: Occupied Bandwidth, NFC TX Frequency = 13.56 MHz



Near Field Communications (NFC) Test Results cont'd

Frequency Stability

The measurements were performed by Sijia Li.

The environmental test conditions were: Temperature: 25.2 ºC
Relative Humidity: 41.5 %

Test Temperature (Celsius)	Nominal Freq. (MHz)	Measured Freq. (MHz)	Input Voltage (Volts)	Max Freq Error (Hz)	% Deviation (Limit .01%)	PPM
-20	13.56	13.560018	3.6	18	0.00013	1.3000
-20	13.56	13.560021	3.8	21	0.00015	1.5364
-20	13.56	13.560018	4.35	18	0.00013	1.3000
-10	13.56	13.560061	3.6	61	0.00045	4.4910
-10	13.56	13.560058	3.8	58	0.00043	4.2546
-10	13.56	13.560063	4.35	63	0.00046	4.6091
0	13.56	13.560066	3.6	66	0.00048	4.8455
0	13.56	13.560066	3.8	66	0.00048	4.8455
0	13.56	13.560066	4.35	66	0.00048	4.8455
10	13.56	13.560046	3.6	46	0.00034	3.4273
10	13.56	13.560053	3.8	53	0.00039	3.9000
10	13.56	13.560054	4.35	54	0.00040	4.0182
20	13.56	13.560019	3.6	19	0.00014	1.4182
20	13.56	13.560027	3.8	27	0.00020	2.0091
20	13.56	13.560022	4.35	22	0.00017	1.6546

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
30	13.56	13.559989	3.6	-11	-0.00008	-0.8273
30	13.56	13.559992	3.8	-8	-0.00006	-0.5909
30	13.56	13.559989	4.35	-11	-0.00008	-0.8273
40	13.56	13.559955	3.6	-45	-0.00033	-3.3091
40	13.56	13.559955	3.8	-45	-0.00033	-3.3091
40	13.56	13.559960	4.35	-40	-0.00030	-2.9546
50	13.56	13.559926	3.6	-74	-0.00054	-5.4364
50	13.56	13.559925	3.8	-75	-0.00056	-5.5546
50	13.56	13.559925	4.35	-75	-0.00056	-5.5546
60	13.56	13.559912	3.6	-88	-0.00065	-6.5001
60	13.56	13.559912	3.8	-88	-0.00065	-6.5001
60	13.56	13.559910	4.35	-90	-0.00066	-6.6183