EMI Test Report

Tested in accordance with
Federal Communications Commission (FCC)
Personal Communications Services
CFR 47, Part 15 Subpart C and E

REPORT NO.: RTS-6046-1307-46B

PRODUCT MODEL NO.: RFW121LW, RFV121LW
TYPE NAME: BlackBerry® smartphone
FCC ID: L6ARFW120LW, L6ARFV120LW

DATE: October 25, 2013

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

592

Statement of Performance:

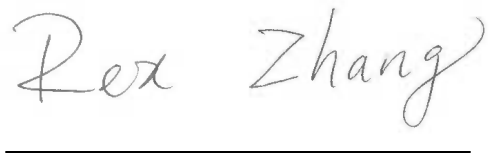
The BlackBerry® smartphone, model RFW121LW, part number CER 54733-001 Rev 2-x08-00, and its accessories perform within the requirements of the test standards when configured and operated under BlackBerry's operation instructions.

The BlackBerry® smartphone, model RFV121LW, part number CER 54734-001 Rev 2-x08-00 and accessories when configured and operated per BlackBerry's operation instructions performs within the requirements of the test standards.

Declaration:

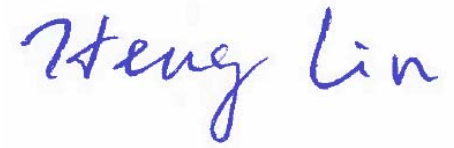
We hereby certify that:
The test data reported herein is an accurate record of the performance of the sample(s) tested.
The test results are valid for the tested unit (s) only.
The test equipment used was suitable for the tests performed and within manufacturer's published specifications and operating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

Documented by:



Rex Zhang
Regulatory Compliance Assicoate

Reviewed by:



Heng Lin
Regulatory Compliance Specialist

Reviewed and Approved by:

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

Table of Contents

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, October, 2012
- o FCC CFR 47 Part 15, Subpart E, October, 2012

B. Associated Documents

1) BlackBerrySystemSimilarity_RFW121LW_RFV121LW
2) Test report 1-6234_13-07-05-A
3) Test report 1-6234_13-07-06-A
4) Test report 1-6234_13-07-07-A

C. Product Identification

Manufactured by BlackBerry Limited whose headquarters is located at:

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

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

RTS EMI test facilities

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

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

The testing was performed from July 12 - 29, 2013.

The sample EUT included:

SAMPLE	MODEL	CER NUMBER	PIN	SOFTWARE
1	RFW121LW	CER 54733-001 Rev 2-x08-00	2FFFE438	OS Version: 10.2.0.519 Bundle: 519
2	RFW121LW	CER 54733-001 Rev 2-x08-00	2FFFE960	OS Version: 10.2.0.519 Bundle: 519
3	RFW121LW	CER 54733-001 Rev 2-x08-00	2FFFE470	OS Version: 10.2.0.519 Bundle: 519
4	RFW121LW	CER 54733-001 Rev 2-x08-00	2FFFE448	OS Version: 10.2.0.519 Bundle: 519
5	RFW121LW	CER 54733-001 Rev 1-006-00	2AE0FC27	OS Version: 10.2.0.519 Bundle: 519
6	RFW121LW	CER 54733-001 Rev 2-x08-00	2FFFE459	OS Version: 10.2.0.519 Bundle: 519
7	RFW121LW	CER 54733-001 Rev 2-x08-00	2FFFE45F	OS Version: 10.2.0.519 Bundle: 519

Radiated Emissions testing was performed on samples 1, 2, 3, 4 and 7
Conducted Emissions testing was performed on sample 5 and 6
Near Field Communications testing was performed on sample 6

Only the characteristics that may have been affected by the changes from RFW121LW to RFV121LW were re-tested.
For more information, see BlackBerrySystemSimilarity_RFW121LW_RFV121LW

BlackBerry® smartphone Accessories Tested

1) World Wide Travel Charger, part number HDW 34725-002, with an output voltage 5 volts dc, 2A
2) Wired Headset, part number HDW-55351-001, with a lead length of 1.1 metres

D. Support Equipment Used for the Testing of the EUT

N/A

E. Test Results Chart

SPECIFICATION	TEST TYPE	Meets Requirements	TEST DATA
FCC CFR 47			APPENDIX
Part 15.207	Conducted AC Line Emission	Pass	1
Part 15.209 Part 15.247	BT/BLE Radiated Spurious Emissions	Pass	2
Part 15.209 Part 15.247	BT/BLE Radiated Band Edge Compliance	Pass	2
Part 15.209 Part 15.247	802.11b/g/n Radiated Spurious Emissions	Pass	Test Reports 1-6234_13-07-05-A, 1-6234_13-07-06-A
Part 15.209 Part 15.247	802.11b/g/n Radiated Band Edge Compliance	Pass	See report 1-6234_13-07-05-A and 1-6234_13-07-06-A
Part 15.209 Part 15.407	802.11a/n Radiated Spurious Emissions	Pass	Test Report 1-6234_13-07-07-A
Part 15.209 Part 15.407	802.11a/n Radiated Band Edge Compliance	Pass	Test Report 1-6234_13-07-07-A
Part 15.247(a)	BT, 20 dB Bandwidth	Pass	3
Part 15.247(a)	BT, Carrier Frequency Separation	Pass	3
Part 15.247(a)	BT, Number of Hopping Frequencies	Pass	3
Part 15.247(a)	BT, Time of Occupancy (Dwell Time)	Pass	3
Part 15.247(b)	BT, Maximum Peak Conducted Output Power	Pass	3
Part 15.247(c)	BT, Band-Edge Compliance of RF Conducted Emissions	Pass	3
Part 15.247(c)	BT, Spurious RF Conducted Emissions	Pass	3
Part 15.247(a)	BLE, 6 dB Bandwidth	Pass	3
Part 15.247(b)	BLE, Maximum Conducted Output Power	Pass	3
Part 15.247(c)	BLE, Band-Edge	Pass	3
Part 15.247(d)	BLE, Peak Power Spectral Density	Pass	3
Part 15.247(c)	BLE, Spurious RF Conducted Emissions	Pass	3

Test Results Chart cont'd

SPECIFICATION FCC CFR 47	TEST TYPE	Meets Requirements	TEST DATA APPENDIX
Part 15.247(a)	802.11b/g/n, 6 dB Bandwidth	Pass	4
Part 15.247(b)	802.11b/g/n, Maximum Conducted Output Power	Pass	4
Part 15.247(c)	802.11b/g/n, Band-Edge	Pass	4
Part 15.247(d)	802.11b/g/n, Peak Power Spectral Density	Pass	4
Part 15.247(c)	802.11b/g/n, Spurious RF Conducted Emissions	Pass	4
Part 15.407	802.11a/n, 6 dB Bandwidth	Pass	5
Part 15.407	802.11a/n, Maximum Conducted Output Power	Pass	5
Part 15.407	802.11a/n, Band-Edge	Pass	5
Part 15.407	802.11a/n, Peak Power Spectral Density	Pass	5
Part 15.407	802.11a/n, Spurious RF Conducted Emissions	Pass	5
Part 15.209 Part 15.225(a)	Near Field Communications, Radiated Emissions	Pass	6
Part 15.225(e)	Near Field Communications, Occupied Bandwidth	Pass	6
Part 15.225(e)	Near Field Communications, Frequency Stability	Pass	6

F. Summary of Results

1) AC LINE CONDUCTED EMISSIONS

The following tests were performed on model RFW121LW.

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

The following test configurations were measured:

Test Configuration	Operating Mode(s)	Charger + Accessories
3	NFC Tx	WWTC 2.0A + Wired Headset

The sample EUT's conducted emissions were compared with respect to the FCC CFR 47 Part 15, Subpart C limits. The sample EUT had a worst case test margin of 15.72 dB below the QP limit at 0.168 MHz in Test Configuration 1

See APPENDIX 1 for the test data.

Measurement Uncertainty ±3.2 dB

2) BLUETOOTH AND BLUETOOTH LOW ENERGY RADIATED EMISSIONS

The following tests were performed on model RFW121LW.

a) Radiated Spurious and Harmonic Emissions

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

The measurements were done in a semi-anechoic chamber (SAC) below 1 GHz and a semi-anechoic chamber (SAC) with floor absorbers above 1 GHz. The SAC's FCC registration number is **778487**. The SAC with floor absorber's FCC registration number is **959115**.

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

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

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.

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.

The Bluetooth harmonics were investigated up to the 10th harmonic. The sample EUT emissions were in the noise floor (NF).
The Bluetooth Low Energy harmonics were investigated up to the 10th harmonic. The sample EUT emissions were in the noise floor (NF).
See APPENDIX 1 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.

Measurement Uncertainty ±4.5 dB
See APPENDIX 2 for the test data

3) i) BLUETOOTH RF CONDUCTED EMISSIONS

The following tests were performed on model RFW121LW.

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 0.918 MHz for channel 78 in normal data rate mode and 1.326MHz for all channels in EDR mode.
See APPENDIX 3 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). Channel 38 to 39 was measured. The result includes both normal data rate and EDR.
See APPENDIX 3 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). The number of hopping channels measured was 79.
See APPENDIX 3 for the test data.

d) Time of Occupancy (Dwell Time)
The EUT met the requirements of the dwell time as per 47 CFR 15.247(a) and RSS-210. Low channel (0), middle channel (39) and high channel (78) were measured in DH1, DH3 and DH5 modes. Bluetooth was operating in frequency hopping (Euro/US) mode during the measurements.
See APPENDIX 3 for the test data.

e) Maximum Peak Conducted Output Power

The BlackBerry® smartphone met the requirements of the maximum peak conducted output power as per 47 CFR 15.247(b). Low channel (0), middle channel (39) and high channel (78) were measured. The result includes both normal data rate and EDR. The worst case Conducted Output Power level was 6.3 dBm (0.00427 W) for Channel 78 in normal data rate mode and 5.3 dBm (0.00339 W) for channels 0, 39 and 78 in EDR mode.
See APPENDIX 3 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). Channels 0 and 78 were measured in frequency hopping (Euro/US) mode and single frequency mode. The result includes both normal data rate and EDR.
See APPENDIX 3 for the test data.

g) Spurious RF Conducted Emissions
The BlackBerry® smartphone met the requirements of the spurious RF conducted emissions as per 47 CFR 15.247(c). The frequency range measured was 10 MHz to 26 GHz. Low channel (0), middle channel (39) and high channel (78) were measured in single frequency mode and frequency hopping (Euro/US) mode. The result includes both normal data rate and EDR.
See APPENDIX 3 for the test data.

4) ii) BLUETOOTH LOW ENERGY RF CONDUCTED EMISSIONS

The following tests were performed on model RFW121LW.

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). Low channel (0), middle channel (20) and high channel (39) were measured. The worst case 6 dB Bandwidth was 709.1 MHz for channel 20.
See APPENDIX 3 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). Low channel (0), middle channel (20) and high channel (39) were measured. The worst case Conducted Output Power level was 5.82 dBm (0.00382 W) for channel 20.
See APPENDIX 3 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). Low channel (0) and high channel (39) were measured.
See APPENDIX 3 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). Low channel (0), middle channel (20) and high channel (39) were measured.
See APPENDIX 3 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). The frequency range measured was 30 MHz to 26 GHz. Low channel (0), middle channel (20) and high channel (39) were measured.
See APPENDIX 3 for the test data.

5) 802.11b/g/n RF CONDUCTED EMISSIONS

The following tests were performed on model RFW121LW.

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). Low channel (1), middle channel (6) and high channel (11) were measured. The worst case 6 dB Bandwidth was 8.40 MHz for channel 6 in 802.11b mode, 16.38 MHz for channel 6 in 802.11g mode, and 17.66 MHz for channels 11 in 802.11n mode.
See APPENDIX 4 for the test data.

b) Maximum Conducted Output Power
The EUT met the requirements of the maximum conducted output power as per 47 CFR 15.247(b). Low channel (1), middle channel (6) and high channel (11) were measured. The worst case Conducted Output Power level was 18.47 dBm (0.0703 W) for channel 6 in 802.11b mode, 18.03 dBm (0.0635W) for channel 6 in 802.11g mode, and 18.03 dBm (0.0635 W) for channel 6 in 802.11n mode.
See APPENDIX 4 for the test data

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

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

e) Spurious RF Conducted Emissions
The EUT met the requirements of the spurious RF conducted emissions as per 47 CFR 15.247(c). The frequency range measured was 30 MHz to 26 GHz. Low channel (1), middle channel (6) and high channel (11) were measured.
See APPENDIX 4 for the test data.

6) 802.11a/n RF CONDUCTED EMISSIONS

The following tests were performed on model RFW121LW.

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. Channels 36, 48, 64, 100, 140, and 165 were measured. The worst case 6 dB Bandwidth was 16.38 MHz for channels 36 in 802.11a mode. The worst case 6 dB Bandwidth was 15.14 MHz for channels 36, 64 and 165 in 802.11n mode.
See APPENDIX 5 for the test data.

b) Maximum Conducted Output Power
The EUT met the requirements of the maximum conducted output power as per 47 CFR 15.407. Channels 36, 48, 64, 100, 140, and 165 were measured. The worst case Conducted Output Power level was 17.11 dBm (0.0514 W) for channel 48 in 802.11a mode. The worst case Conducted Output Power level was 18.52 dBm (0.071W) for channel 64 in 802.11n mode.
See APPENDIX 5 for the test data

c) Band-Edge Compliance of RF Conducted Emissions
The EUT met the requirements of band-edge compliance of RF conducted emissions as per 47 CFR 15.407. Channels 36, 48, 52, 64, 100, 149, 161 and 165 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 15.407/15.247. Channels 36, 44, 48, 52, 60, 64, 149, 157, 161 and 165 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 15.407. The frequency range measured was 30 MHz to 40 GHz. Channels 44, 60 and 157 were measured.
See APPENDIX 5 for the test data.

7) Near Field Communications (NFC)

The following tests were performed on model RFW121LW.

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

a) Radiated Emissions
The BlackBerry® smartphone was measured in standalone configuration transmitting at 13.56 MHz. The system's radiated emission levels were compared with respect to the FCC CFR 47 Part 15 Subpart C, 15.209, 15.225(a).

The NFC emissions were investigated from 9 kHz to 1 GHz. The sample EUT has a field strength measurement of 49.39 dBuV/m.
See APPENDIX 6 for the test data.

b) Occupied Bandwidth
The EUT met the requirements of the Occupied bandwidth as per 47 CFR 15 C. The EUT was measured in test mode with modulation on and transmitting at 13.56 MHz.
See APPENDIX 6 for the test data.

c) Frequency Stability
The EUT met the requirements of the Frequency Stability as per 47 CFR 15.225(e). The EUT was measured in test mode with modulation on and transmitting at 13.56 MHz.
See APPENDIX 6 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	13-11-30	Conducted/Radiated Emissions
EMI Test Receiver	Rohde & Schwarz	ESU 40	100162	13-11-30	Conducted/Radiated Emissions
Hybrid Log Antenna	EMC Automation	HLP-3003C	017301	14-08-13	Radiated Emissions
Horn Antenna	CMT	3116	R52734-001	14-08-02	Radiated Emissions
Horn Antenna	ETS-Lindgren	3117	2538	15-08-07	Radiated Emissions
Preamplifier	Rohde & Schwarz	TS-ANA4-SP	001	14-02-13	Radiated Emissions
Preamplifier	Sonoma	310N/11909A	185831	13-10-10	Radiated Emissions
Preamplifier	Rohde & Schwarz	TS-ANA-SP	001	14-02-13	Radiated Emissions
L.I.S.N.	Rohde & Schwarz	ENV216	100060	13-10-25	Conducted Emissions
Environment Monitor	Omega	iTHX-SD	0380561	13-10-30	Radiated Emissions
EMC Analyzer	Agilent	E7405A	US40240226	14-01-15	Radiated Emissions
Environment Monitor	Omega	iTHX-SD	0380561	13-10-30	Radiated Emissions
EMC Analyzer	Agilent	E7405A	US40240226	14-01-15	Radiated Emissions
Environment Monitor	Omega	iTHX-SD	0340060	13-10-30	RF Conducted Emissions
Environmental Chamber	Test Equity	107	0900246	N/R	Frequency Stability
Bluetooth Tester	Rohde & Schwarz	CBT	119549	13-12-04	RF Conducted Emissions
Bluetooth Tester	Rohde & Schwarz	CBT35	100368	13-12-04	Radiated Emissions
Bluetooth Tester	Rohde & Schwarz	CBT35	100370	13-12-04	Radiated Emissions
Power Meter	Agilent	N1911A	MY45100951	14-08-16	RF Conducted / Frequency Stability
Power Sensor	Agilent	N1921A	MY45241383	14-09-11	RF Conducted / Frequency Stability
Digital Multimeter	Hewlett Packard	34401A	US36042324	13-11-13	Conducted/Radiated Emissions
Environment Monitor	Omega	iTHX-SD	0380567	13-10-30	Radiated Emissions

APPENDIX 1 – AC CONDUCTED EMISSIONS TEST DATA/PLOTS

AC Conducted Emission Test Results

The following tests were performed on model RFW121LW.

The following tests were performed by Kevin Guo

Test Configuration 1

The BlackBerry® smartphone was tested on August 12, 2013

The environmental test conditions were: Temperature: 26.3 ºC
Relative Humidity: 42.5 %

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	N	37.01	11.20	48.21	65.80	55.80	-17.59
0.159	L1	34.33	11.14	45.47	65.50	55.50	-20.03
0.168	N	38.27	11.11	49.38	65.10	55.10	**-15.72**
0.173	L1	33.55	11.05	44.60	64.80	54.80	-20.20
0.200	N	34.91	10.89	45.80	63.60	53.60	-17.80
0.227	L1	29.89	10.67	40.56	62.60	52.60	-22.04
0.240	N	35.53	10.60	46.13	62.10	52.10	-15.97
0.276	N	34.14	10.34	44.48	60.90	50.90	-16.42
0.362	N	30.04	10.08	40.13	58.70	48.70	-18.58
0.371	N	29.36	10.07	39.43	58.50	48.50	-19.07
0.389	L1	28.73	10.03	38.76	58.10	48.10	-19.34
0.470	N	30.38	9.93	40.31	56.50	46.50	-16.19
0.474	L1	30.18	9.92	40.10	56.40	46.40	-16.30
0.587	N	23.94	9.87	33.81	56.00	46.00	-22.19
1.073	L1	25.32	9.80	35.13	56.00	46.00	-20.87
1.091	N	26.67	9.81	36.47	56.00	46.00	-19.53
1.415	L1	26.03	9.80	35.83	56.00	46.00	-20.17

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 Conducted Emissions Test Graphs

Test Configuration 1

Figure 1-1: L1 lines

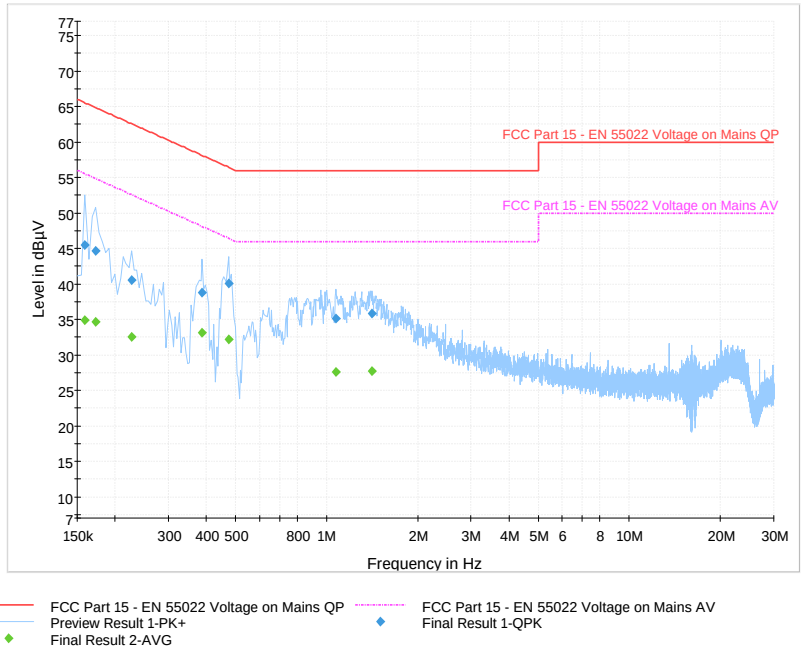
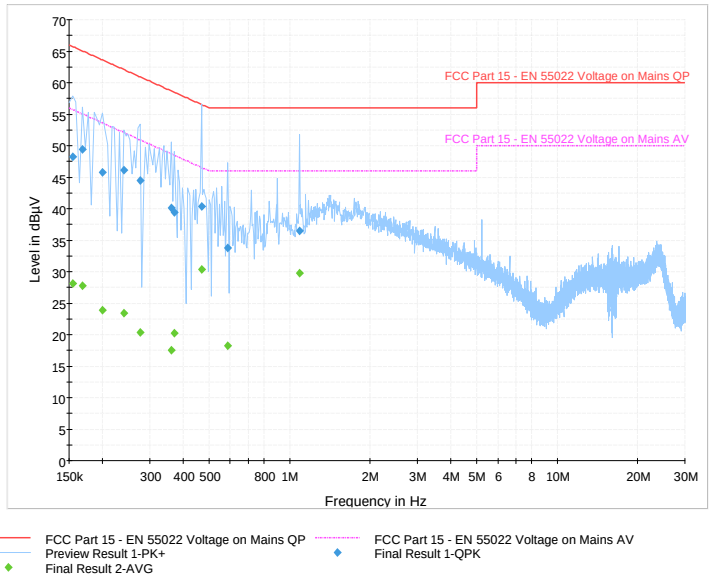


Figure 1-2: N Lines



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

Radiated Emissions Test Results
Bluetooth Band

The following tests were performed on model RFW121LW.

Date of Test: July 15, 2013
Measurements were performed by Feras Obeid.

The environmental test conditions were: Temperature: 25.2-25.7 ºC
Relative Humidity: 36.7-38.9 %

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

The BlackBerry® smartphone in Bluetooth Tx mode was in USB 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 other emission levels were at least 25 dB below the limit.

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

Date of Test: July 13, 2013 – July 21, 2013
Measurements were performed by Masud Attayi and Kevin Guo.

The environmental test conditions were: Temperature: 24.5-27.6ºC
Relative Humidity: 18.3-25.1 %

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

The BlackBerry® smartphone in Bluetooth Tx mode was in horizontal 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 other emission levels were at least 25 dB below the limit.

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

Date of test: July 22, 2013
Measurements were performed by Rex Zhang.

The environmental test conditions were: Temperature: 24.4 º C
Relative Humidity: 35.7 %

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

The test distance was 3.0 metres.

Channel	Freq. (MHz)	Rx Antenna Type	Rx Antenna POL.	Detector	VBW	Corrected Reading (dBuV/m)	Delta Marker (dB)	Corrected Band edge (dBuV/m)	Limit (dBuV/m)	Diff. To Limit (dB)
Low Channel, Packet Type DH5										
0	2402	Horn	V	PK	1 MHz	103.34	59.14	44.2	74	-29.8
0	2402	Horn	H	PK	1 MHz	102.77	57.37	45.4	74	-28.6
0	2402	Horn	V	AVE.	10 Hz	96.24	59.14	37.1	54	-16.9
0	2402	Horn	H	AVE.	10 Hz	95.7	57.37	38.33	54	-15.67
High Channel, Packet Type DH5										
78	2480	Horn	V	PK	1 MHz	102.9	56.55	46.35	74	-27.65
78	2480	Horn	H	PK	1 MHz	102.93	56.53	46.4	74	-27.6
78	2480	Horn	V	AVE.	10 Hz	95.84	56.55	39.29	54	-14.71
78	2480	Horn	H	AVE.	10 Hz	95.89	56.53	39.36	54	-14.64
Low Channel, Packet Type 2-DH5										
0	2402	Horn	V	PK	1 MHz	102.07	56.27	45.8	74	-28.2
0	2402	Horn	H	PK	1 MHz	101.47	55.13	46.34	74	-27.66
0	2402	Horn	V	AVE.	10 Hz	86.88	56.27	30.61	54	-23.39
0	2402	Horn	H	AVE.	10 Hz	86.2	55.13	31.07	54	-22.93
High Channel, Packet Type 2-DH5										
78	2480	Horn	V	PK	1 MHz	101.33	53.64	47.69	74	-26.31
78	2480	Horn	H	PK	1 MHz	101.48	53.59	47.89	74	-26.11
78	2480	Horn	V	AVE.	10 Hz	86.14	53.64	32.5	54	-21.5
78	2480	Horn	H	AVE.	10 Hz	85.93	53.59	32.34	54	-21.66

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

Bluetooth Band

Channel	Freq. (MHz)	Rx Antenna Type	Rx Antenna POL.	Detector	VBW	Corrected Reading (dBuV/m)	Delta Marker (dB)	Corrected Band edge (dBuV/m)	Limit (dBuV/m)	Diff. To Limit (dB)
Low Channel, Packet Type 3-DH5										
0	2402	Horn	V	PK	1 MHz	102.27	56.38	45.89	74	-28.11
0	2402	Horn	H	PK	1 MHz	101.74	55.2	46.54	74	-27.46
0	2402	Horn	V	AVE.	10 Hz	92.39	56.38	36.01	54	-17.99
0	2402	Horn	H	AVE.	10 Hz	91.84	55.2	36.64	54	-17.36
High Channel, Packet Type 3-DH5										
78	2480	Horn	V	PK	1 MHz	101.64	53.81	47.83	74	-26.17
78	2480	Horn	H	PK	1 MHz	101.74	54.13	47.61	74	-26.39
78	2480	Horn	V	AVE.	10 Hz	91.55	53.81	37.74	54	-16.26
78	2480	Horn	H	AVE.	10 Hz	91.76	54.13	37.63	54	-16.37

See figures 3-1 to 3-12 for the plots of the Bluetooth band-edge compliance.

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

Figure 3-1: Band-Edge Compliance of RF Rad. Emissions.
Bluetooth, Single freq., Static PBRS,
DH5, Channel 0, Pol: V, Detector: PK

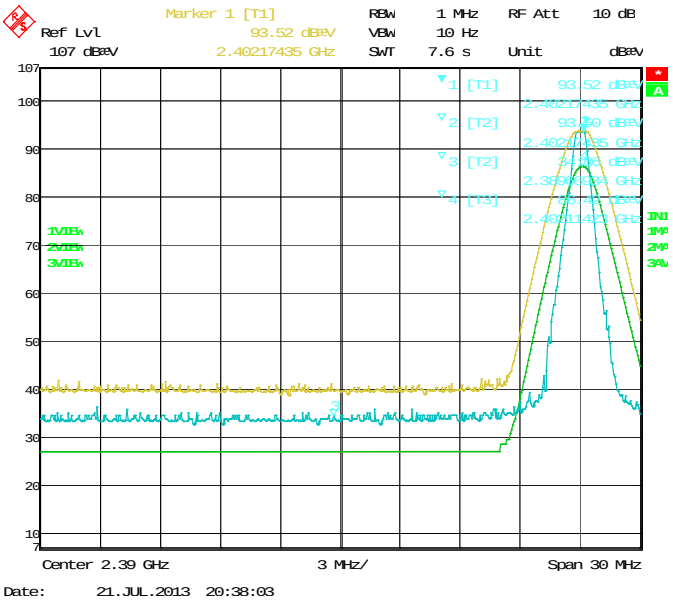


Figure 3-2: Band-Edge Compliance of RF Rad. Emi**ssions.**
Bluetooth, Single freq., Static PBRS,
DH5, Channel 0, Pol: H, Detector: PK

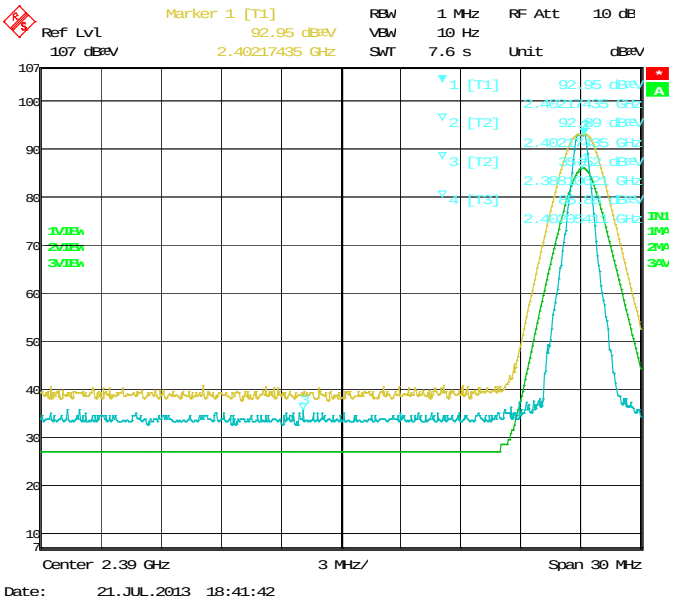


Figure 3-3: Band-Edge Compliance of RF Rad. Emissions.
Bluetooth, Single freq., Static PBRS,
DH5, Channel 78, Pol: V, Detector: PK

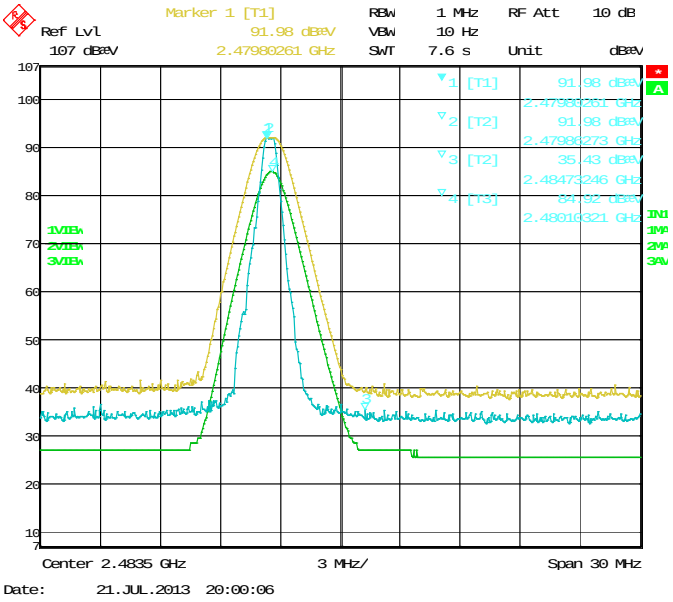
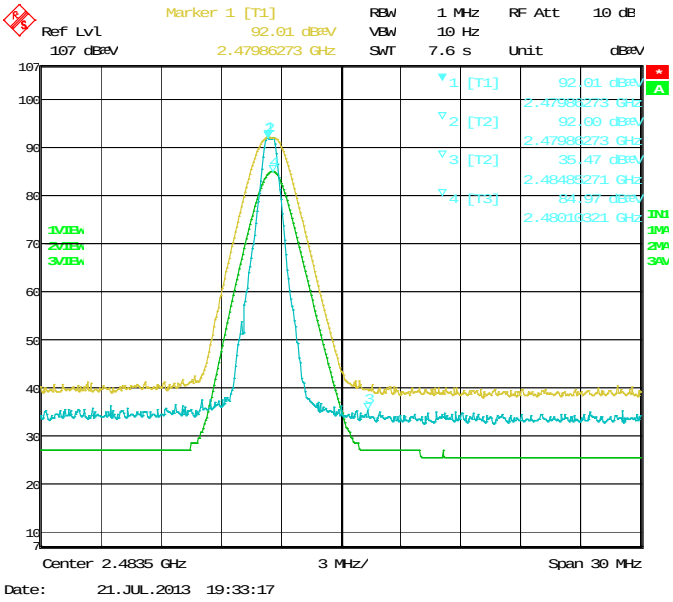


Figure 3-4: Band-Edge Compliance of RF Rad. Emissions
Bluetooth, Single freq., Static PBRS,
DH5, Channel 78, Pol: H, Detector: PK



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

Figure 3-5: Band-Edge Compliance of RF Rad. Emissions.
Bluetooth, Single freq., Static PBRS,
3-DH5, Channel 0, PoI: V, Detector: PK

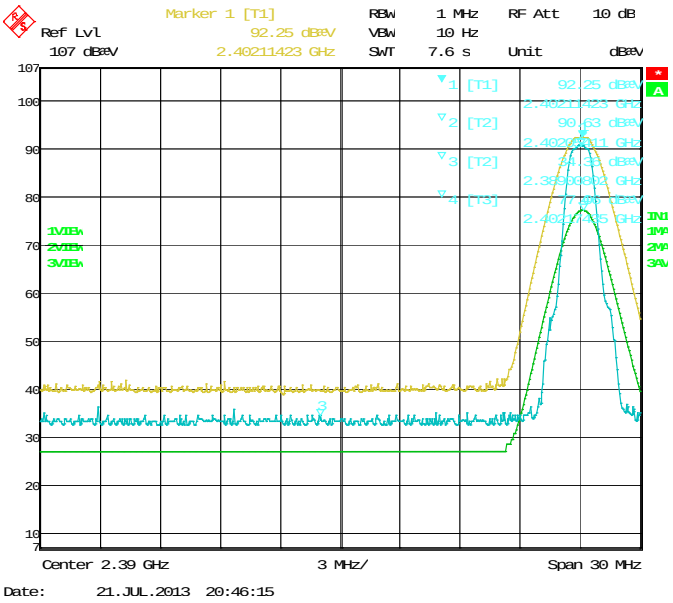


Figure 3-6: Band-Edge Compliance of RF Rad. Emissions.
Bluetooth, Single freq., Static PBRS,
3-DH5, Channel 0, PoI: H, Detector: PK

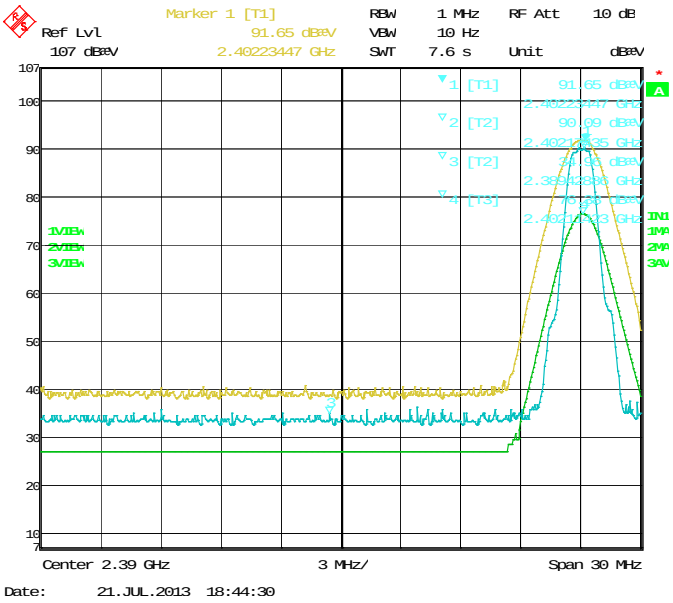


Figure 3-7: Band-Edge Compliance of RF Rad. Emissions.
Bluetooth, Single freq., Static PBRS,
2-DH5, Channel 78, PoI: V, Detector: PK

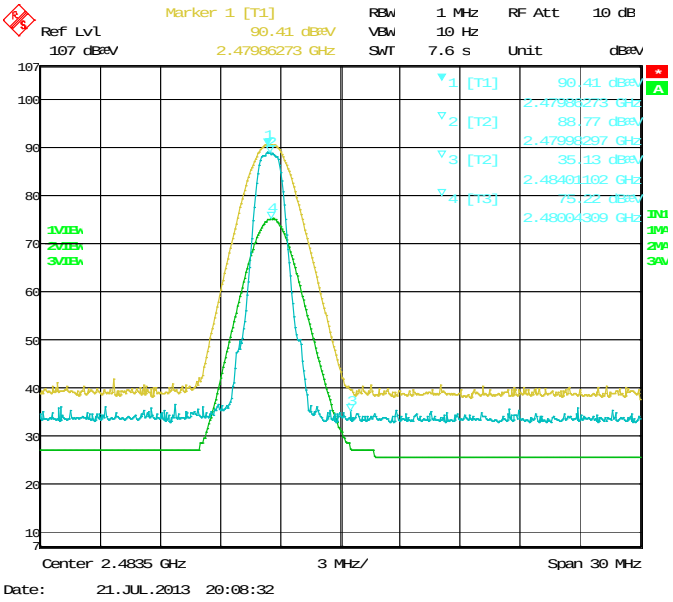
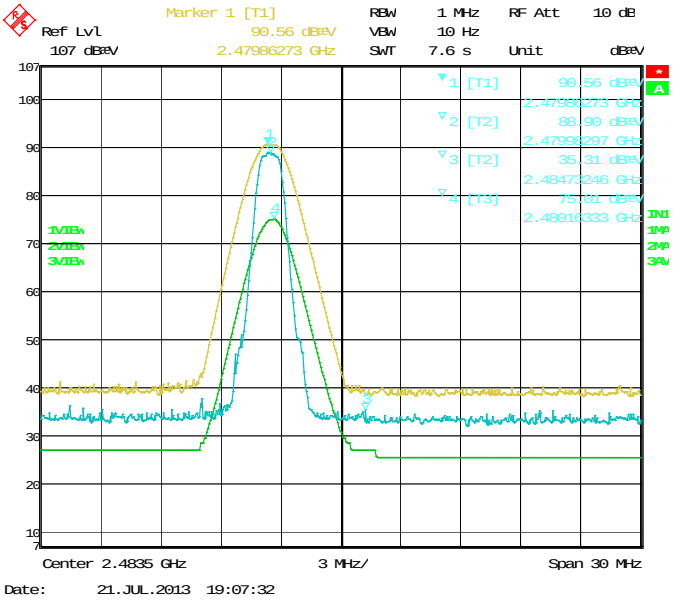


Figure 3-8: Band-Edge Compliance of RF Rad. Emissions.
Bluetooth, Single freq., Static PBRS,
2-DH5, Channel 78, PoI: H, Detector: PK



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

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

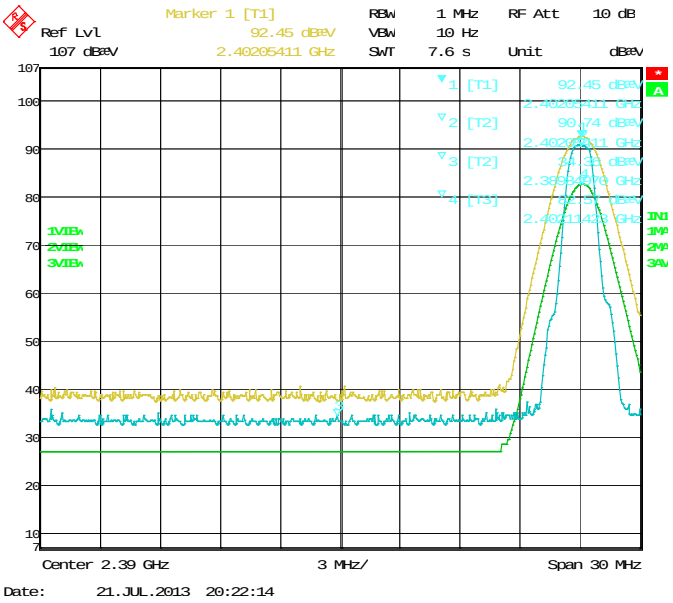


Figure 3-10: Band-Edge Compliance of RF Rad. Emissions.
Bluetooth, Single freq., Static PBRS,
3-DH5, Channel 0, PoI: H, Detector: PK

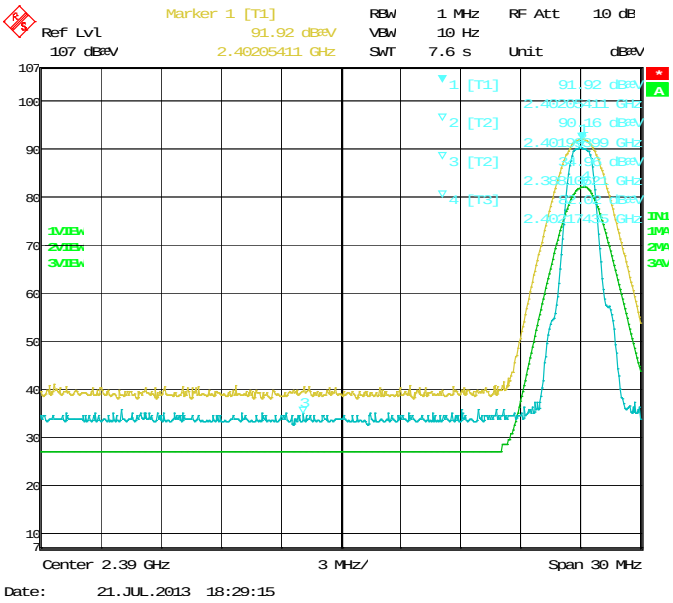


Figure 3-11: Band-Edge Compliance of RF Rad. Emissions.
Bluetooth, Single freq., Static PBRS,
3-DH5, Channel 78, PoI: V, Detector: PK

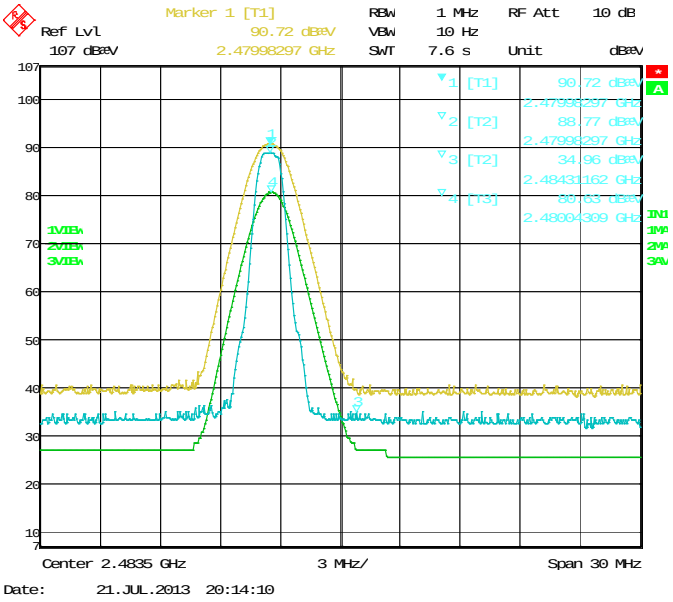
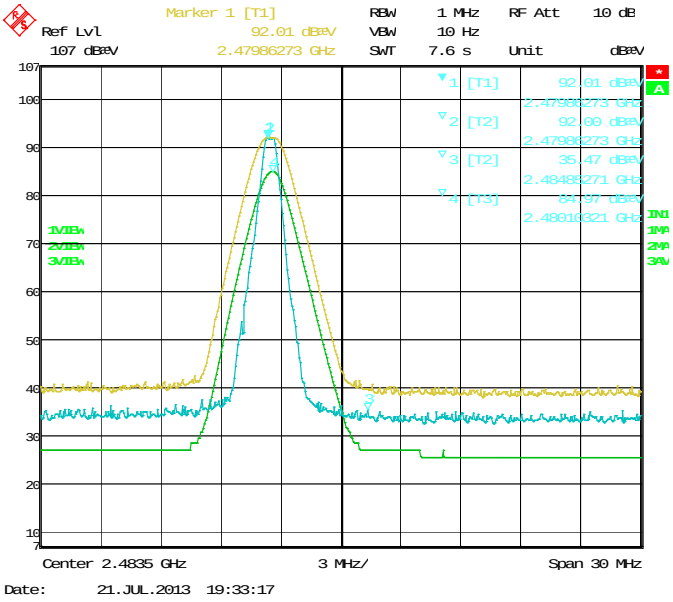


Figure 3-12: Band-Edge Compliance of RF Rad. Emissions.
Bluetooth, Single freq., Static PBRS,
3-DH5, Channel 78, PoI: H, Detector: PK



Radiated Emissions Test Results cont'd
Bluetooth Low Energy Band

Date of Test: July 15, 2013
Measurements were performed by Feras Obeid.

The environmental test conditions were: Temperature: 25.4 ºC
Relative Humidity: 37.2 %

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

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

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

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

Date of Test: July 14-21, 2013
Measurements were performed by Mahmood Ahmed and Kevin Guo.

The environmental test conditions were: Temperature: 26.9 - 27.9 ºC
Relative Humidity: 34.1 - 42.7 %

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

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

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

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

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

Date of test: January 22, 2013
Measurements were performed by Rex Zhang.

The environmental test conditions were: Temperature: 24.4º C
Relative Humidity: 35.7 %

The BlackBerry® smartphone was in horizontal position.

The test distance was 3.0 metres.

Channel	Freq. (MHz)	Rx Antenna Type	Rx Antenna POL.	Detector	VBW	Corrected Reading (dBuV/m)	Delta Marker (dB)	Corrected Band edge (dBuV/m)	Limit (dBuV/m)	Diff. To Limit (dB)
Low Channel, LE										
0	2402	Horn	V	PK	1 MHz	99.58	54.4	45.18	74	-28.82
0	2402	Horn	H	PK	1 MHz	97.16	51.5	45.66	74	-28.34
0	2402	Horn	V	AVE.	10 Hz	94.79	54.4	40.39	54	-13.61
0	2402	Horn	H	AVE.	10 Hz	91.86	51.5	40.36	54	-13.64
High Channel, LE										
39	2480	Horn	V	PK	1 MHz	98.87	53.53	45.34	74	-28.66
39	2480	Horn	H	PK	1 MHz	98.21	53.19	45.02	74	-28.98
39	2480	Horn	V	AVE.	10 Hz	94.12	53.53	40.59	54	-13.41
39	2480	Horn	H	AVE.	10 Hz	93.29	53.19	40.1	54	-13.9

See figures 3-13 to 3-16 for the plots of the Bluetooth Low Energy band-edge compliance.

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

Figure 3-13: Band-Edge Compliance of RF Rad. Emissions.
Bluetooth Low Energy, Single freq.,
LE, Channel 0, Pol: V, Detector: PK

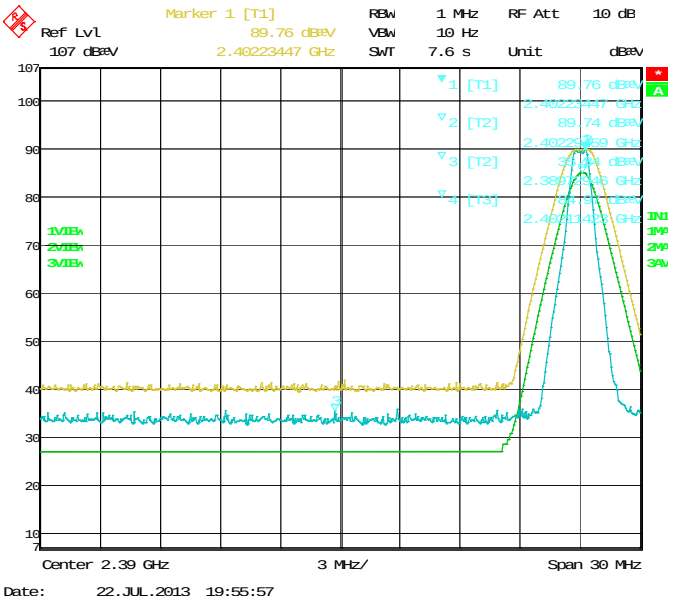


Figure 3-14: Band-Edge Compliance of RF Rad. Emissions.
Bluetooth Low Energy, Single freq.,
LE, Channel 0, Pol: H, Detector: PK

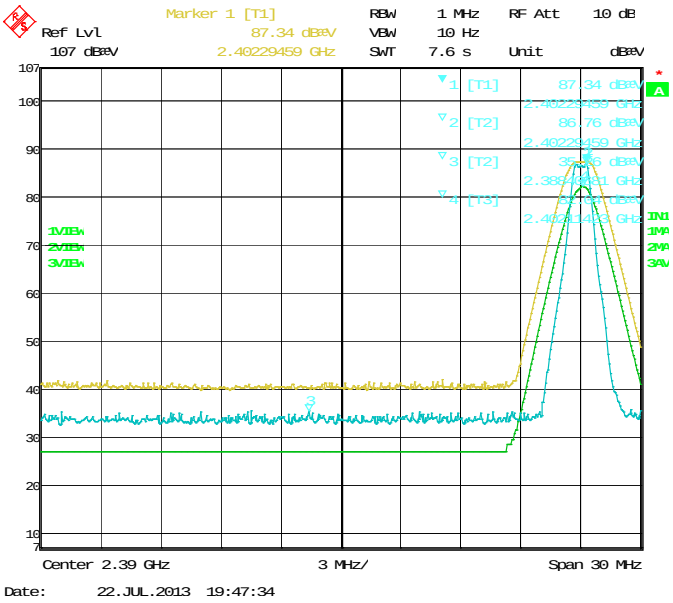


Figure 3-15: Band-Edge Compliance of RF Rad. Emissions.
Bluetooth Low Energy, Single freq.,
LE, Channel 39, Pol: V, Detector: PK

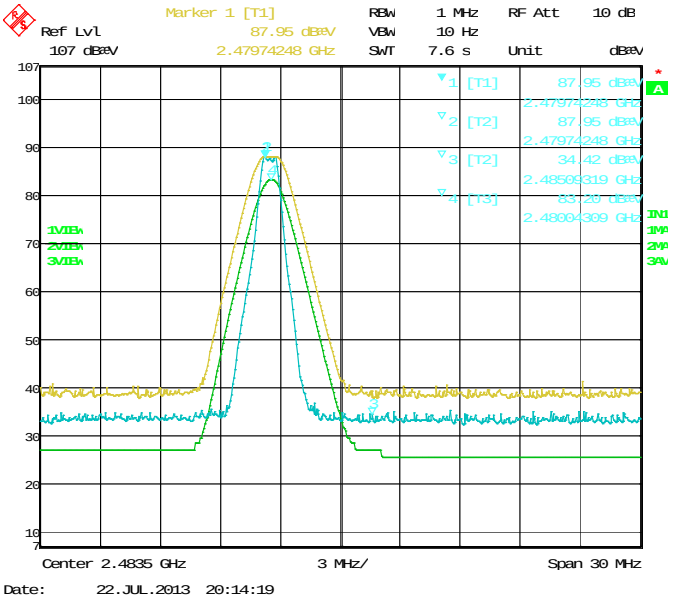
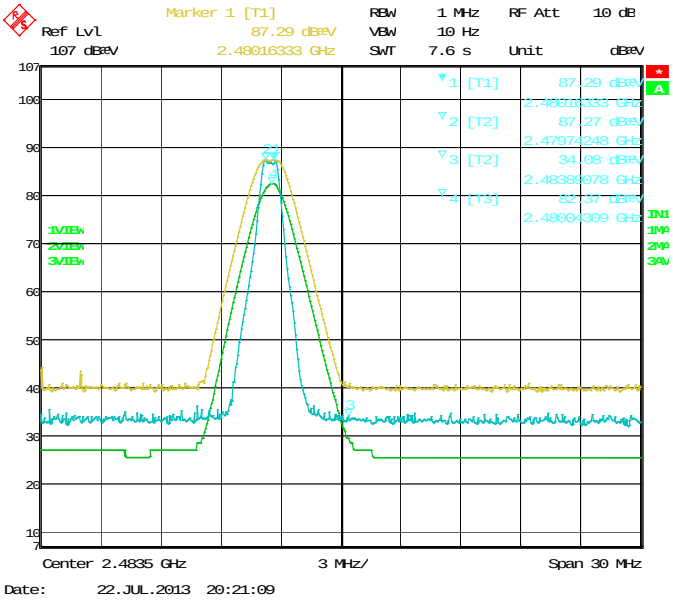


Figure 3-16: Band-Edge Compliance of RF Rad. Emissions
Bluetooth Low Energy, Single freq.,
LE, Channel 39, Pol: H, Detector: PK



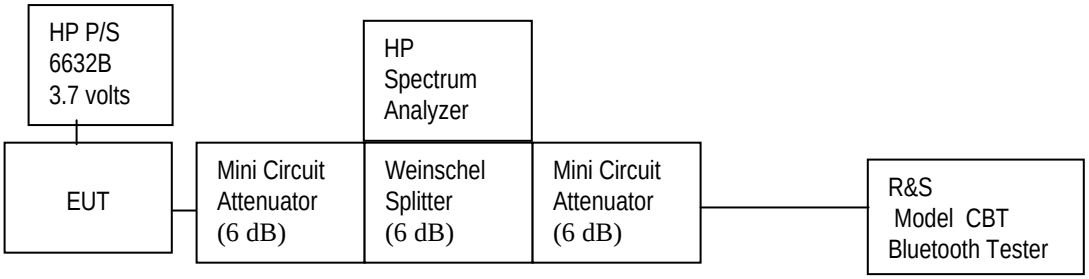
APPENDIX 3 – BLUETOOTH AND BLUETOOTH LOW ENERGY CONDUCTED EMISSIONS TEST DATA/PLOTS

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 Berkin Can

Date of test: June 12, 2013

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: 25 ºC
Relative Humidity: 42 %

Bluetooth RF Conducted Emission Test Results cont'd

The following tests were performed on model RFW121LW.

20 dB Bandwidth

The EUT met the requirements of the 20 dB bandwidth as per 47 CFR 15.247(a). 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	0.915
39	≤1.0	0.915
78	≤1.0	**0.918**

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

Figure 3-1: 20 dB Bandwidth
Single freq., Static PBRS, DH5

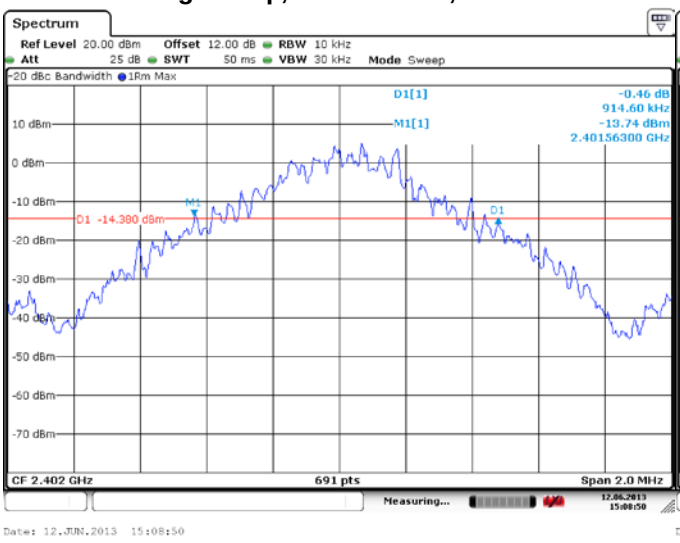
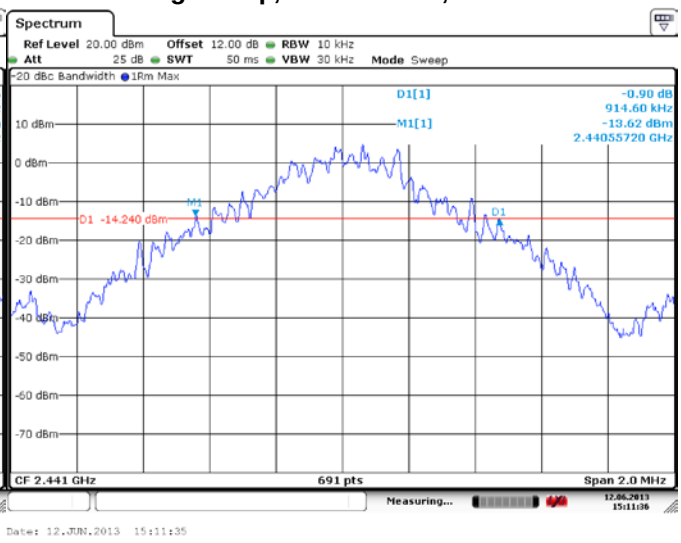
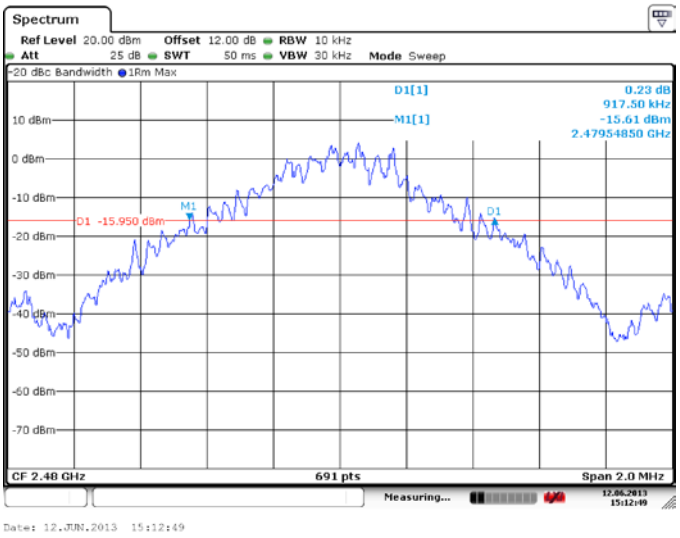


Figure 3-2: 20 dB Bandwidth
Single freq., Static PBRS, DH5



Bluetooth RF Conducted Emission Test Results cont'd

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



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

Bluetooth Channel	Limit (MHz)	Measured Level (MHz)
0	≤1.5	1.320
39	≤1.5	1.314
78	≤1.5	**1.326**

See figures 3-4 to 3-6 for the plots of the 20 dB bandwidth measurements.

Bluetooth RF Conducted Emission Test Results cont'd

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

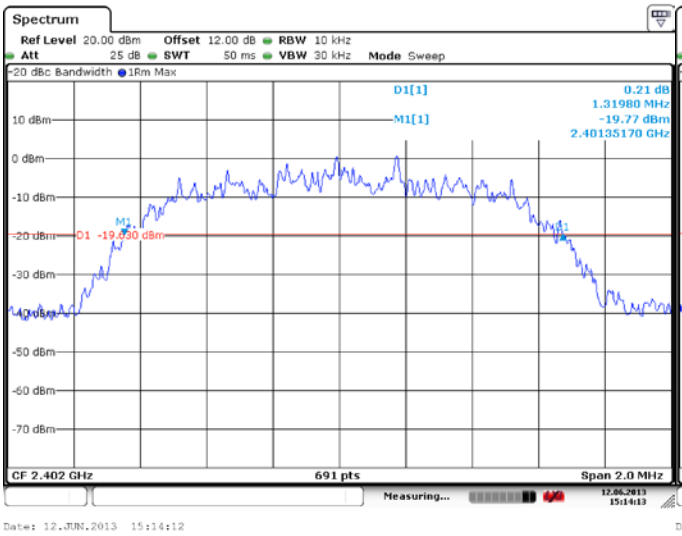


Figure 3-5: 20 dB Bandwidth
Single freq., Static PBRS, 3-DH5

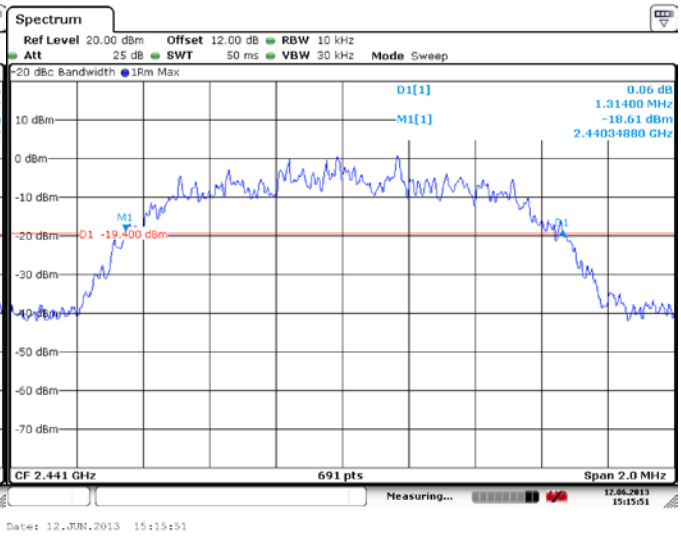
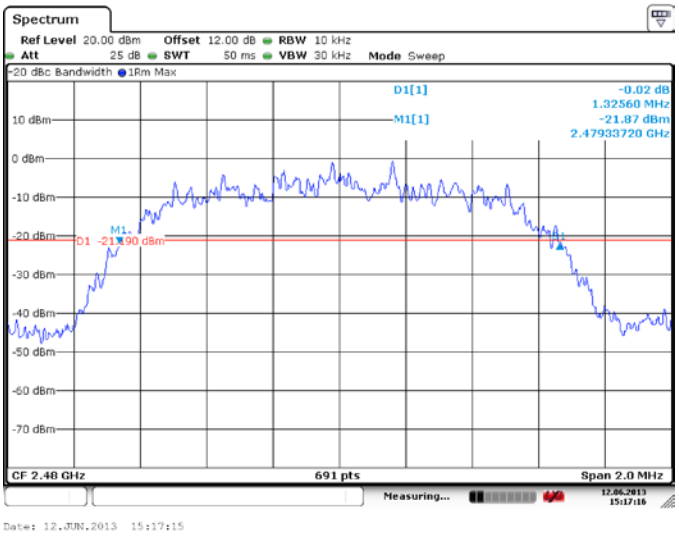


Figure 3-6: 20 dB Bandwidth
Single freq., Static PBRS, 2-DH5



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

Bluetooth Channel	Limit (MHz)	Measured Level (MHz)
0	≤1.5	**1.326**
39	≤1.5	**1.326**
78	≤1.5	1.320

See figures 3-7 to 3-9 for the plots of the 20 dB bandwidth measurements.

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

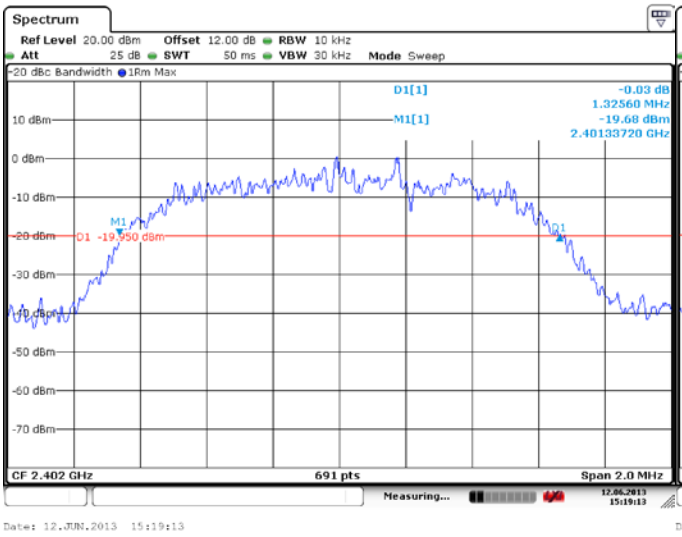


Figure 3-8: 20 dB Bandwidth
Single freq., Static PBRS, 3-DH5

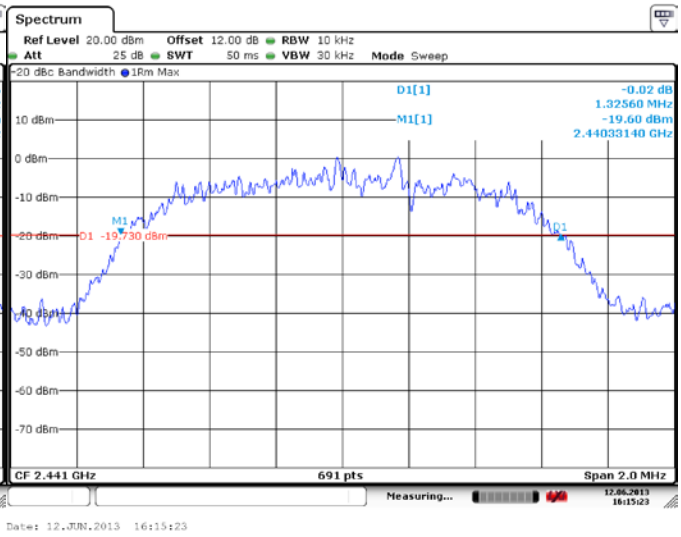
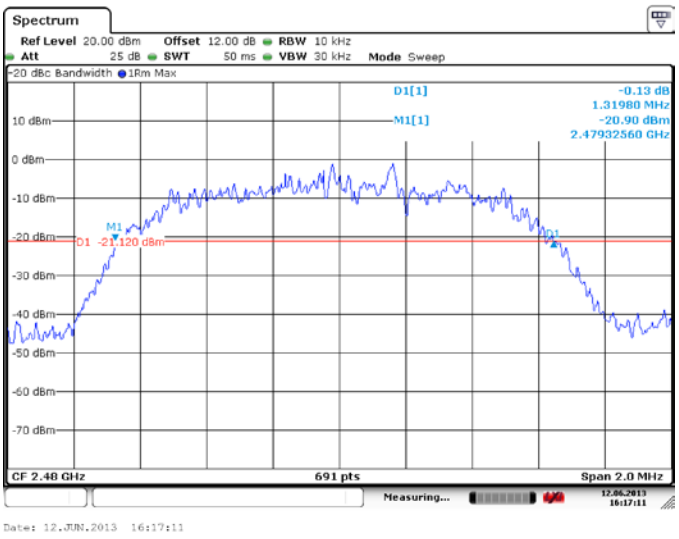


Figure 3-9: 20 dB Bandwidth
Single freq., Static PBRS, 3-DH5



Bluetooth RF Conducted Emission Test Results cont'd

Carrier Frequency Separation

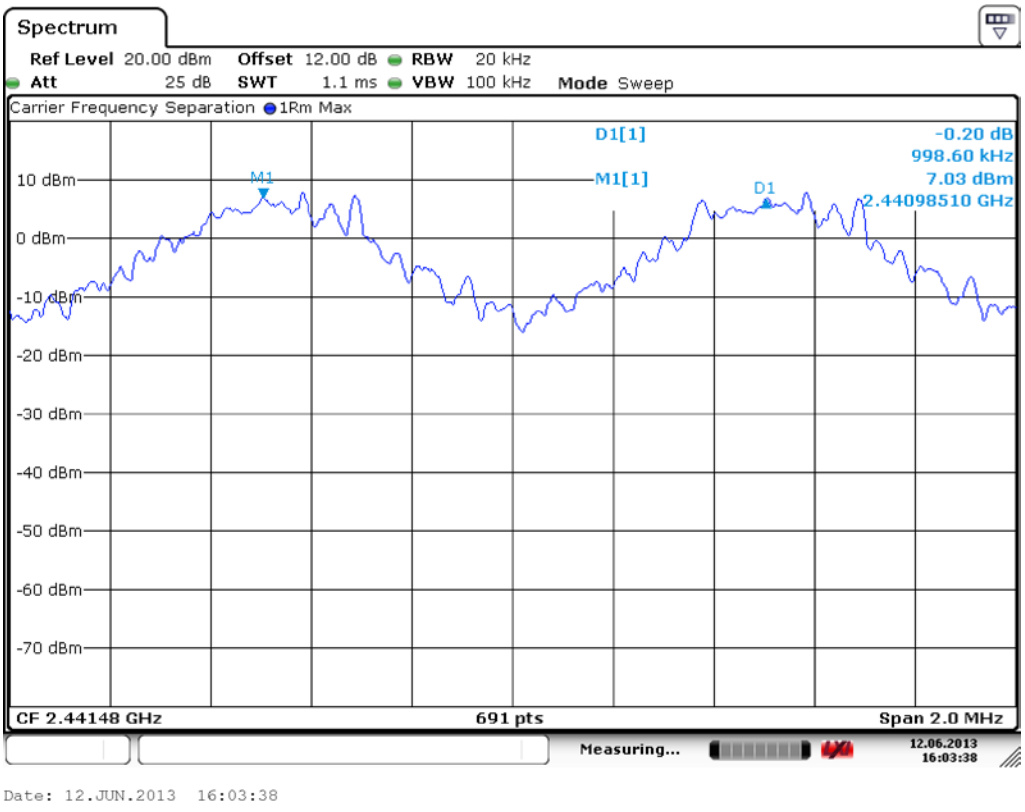
The EUT met the requirements of the Carrier Frequency Separation as per 47 CFR 15.247(a). Channel 38 to 39 was measured. Bluetooth was operating in frequency hopping (Euro/US) mode.

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	0.999

See figure 2 -10 for the plot of the Carrier Frequency Separation measurement.

Figure 3-10: Carrier Frequency Separation, Freq. Hopping, Static PBRS, DH5, Channels 38 to 39



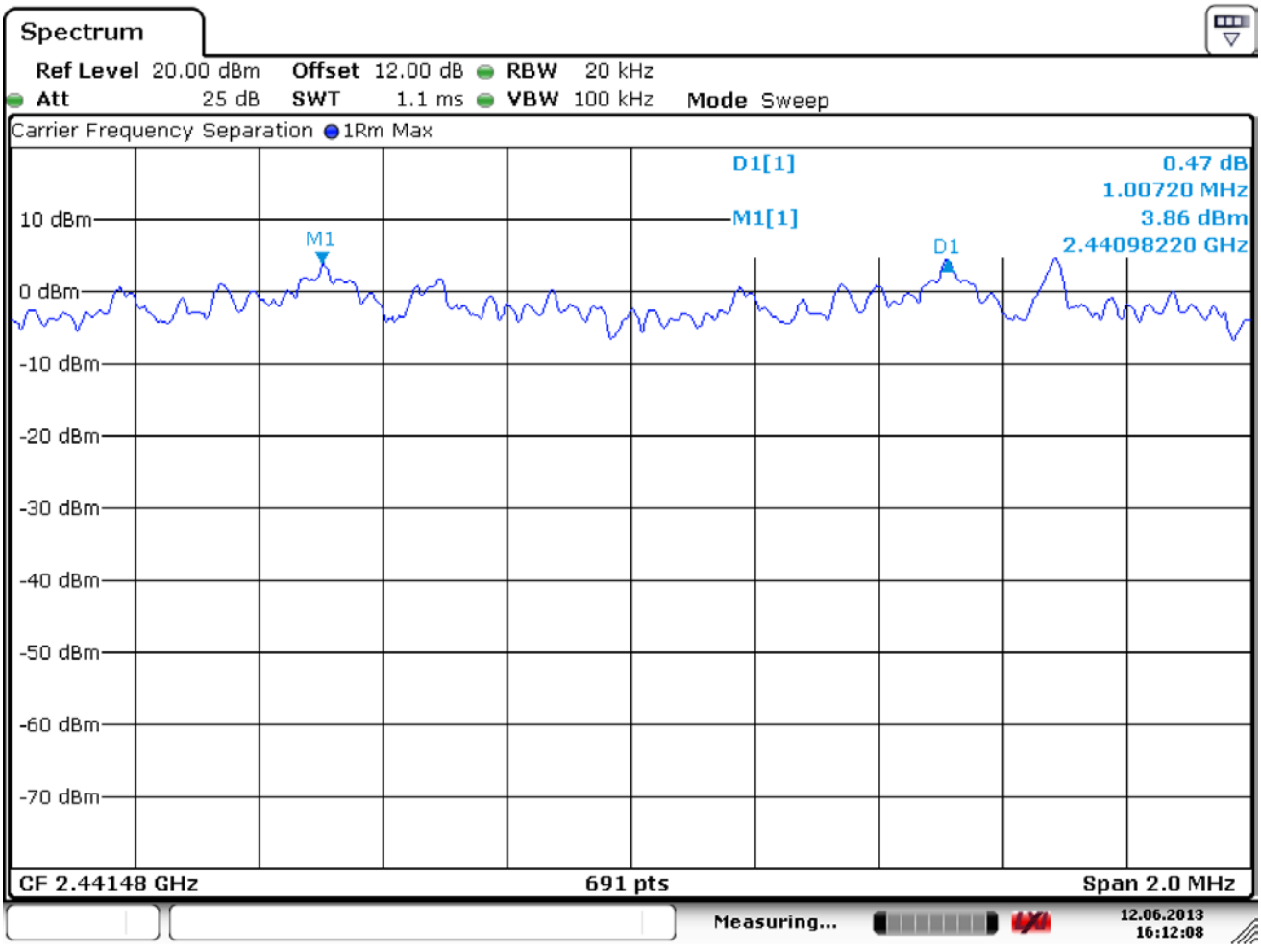
Bluetooth RF Conducted Emission Test Results cont'd

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	1.007

See figure 3-11 for the plot of the Carrier Frequency Separation measurement.

Figure 3-11: Carrier Frequency Separation, Freq. Hopping, Static PBRS, 2-DH5, Channels 38 to 39



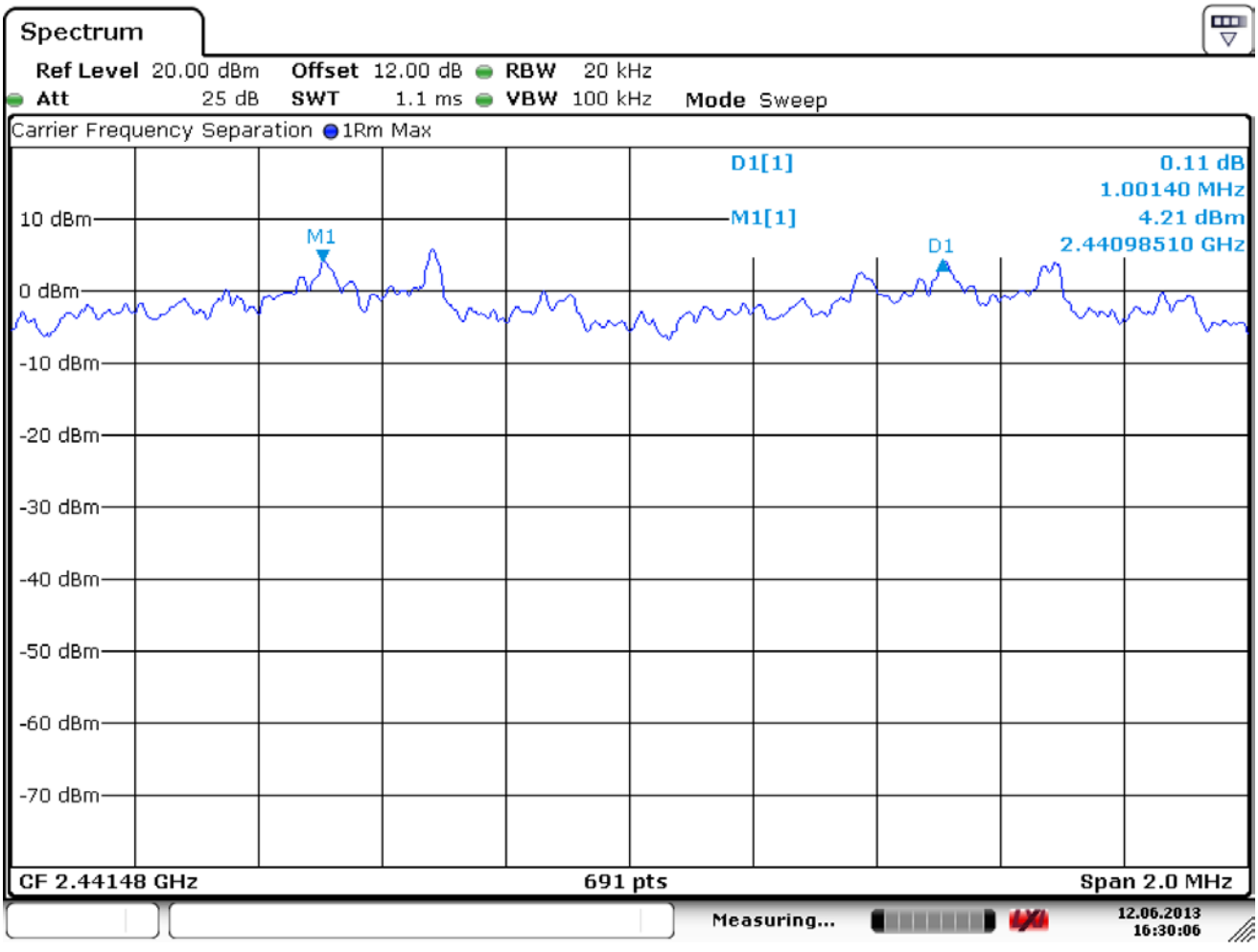
Bluetooth RF Conducted Emission Test Results cont'd

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	1.001

See figure 3-12 for the plot of the Carrier Frequency Separation measurement.

Figure 3-12: 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). 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 3-13 to 3-16 for the plots of the number of hopping frequencies.

Figure 3-13: Number of Hopping Frequencies Static PBRS, DH5

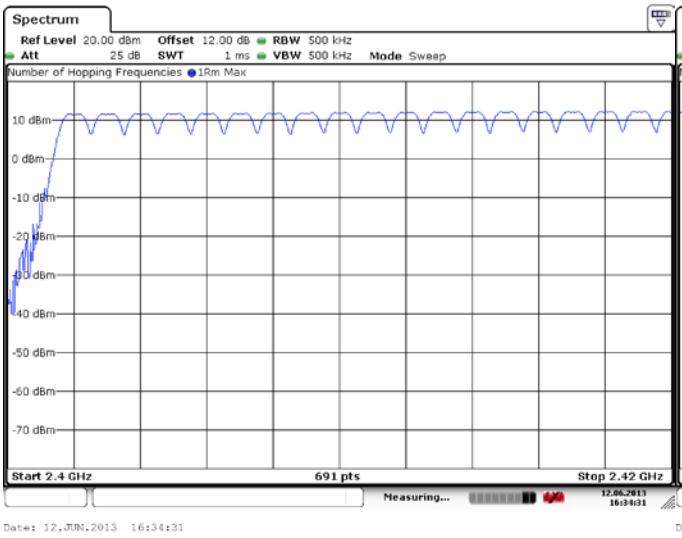
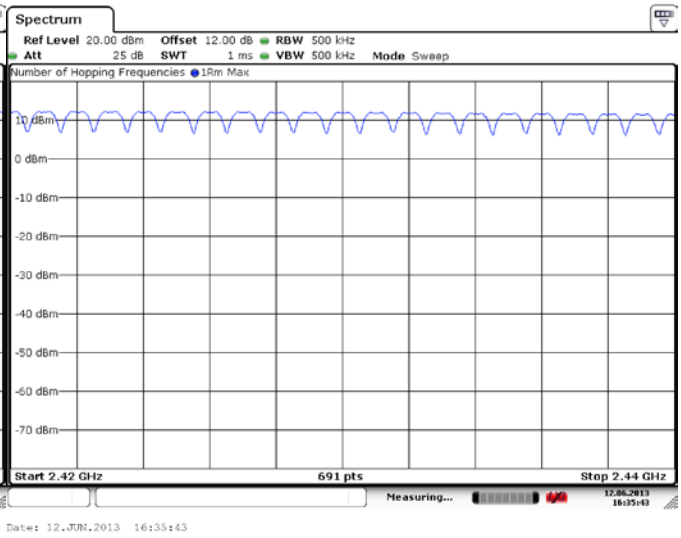


Figure 3-14: Number of Hopping Frequencies Static PBRS, DH5



Bluetooth RF Conducted Emission Test Results cont'd

Figure 3-15: Number of Hopping Frequencies Static PBRS, DH5

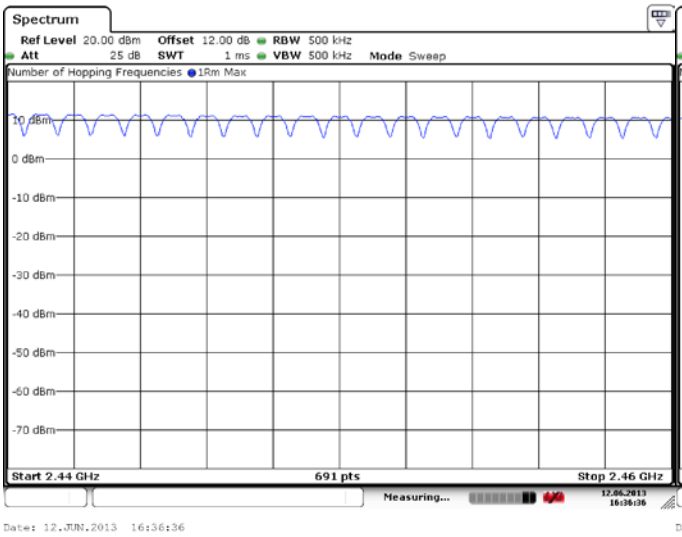
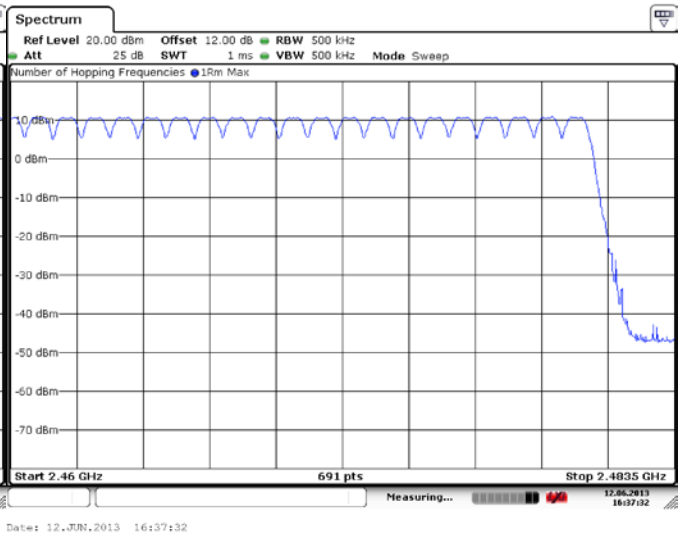


Figure 3-16: Number of Hopping Frequencies Static PBRS, DH5



Time of Occupancy (Dwell Time)

The EUT met the requirements of the time of occupancy (dwell time) as per 47 CFR 15.247(a). 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 RF Conducted Emission Test Results cont'd

Bluetooth Channel	Mode	Tx Time (ms)	Dwell Time/31.6 sec. (msec.)	Limit (msec.)	Margin (msec.)
0	DH1	0.4030	0.403 x 320.0 = 128.96	400	271.04
39	DH1	0.4030	0.403 x 320.0 = 128.96	400	271.04
78	DH1	0.3996	0.399 x 325.7 = 127.86	400	272.14
0	DH3	1.6669	1.667 x 159.9 = 266.54	400	133.46
39	DH3	1.6626	1.663 x 159.9 = 265.85	400	134.15
78	DH3	1.6626	1.663 x 159.9 = 265.85	400	134.15
0	DH5	2.9210	2.921 x 106.8 = 311.96	400	88.04
39	DH5	2.9300	2.93 x 106.8 = 312.92	400	87.08
78	DH5	2.9210	2.921 x 106.8 = 311.96	400	88.04

See figures 3-17 to 3-25 for the plots of the dwell time.

Bluetooth RF Conducted Emission Test Results cont'd

Figure 3-17: Time of Occupancy (Dwell Time) Freq. Hopping, Static PBRS, DH1

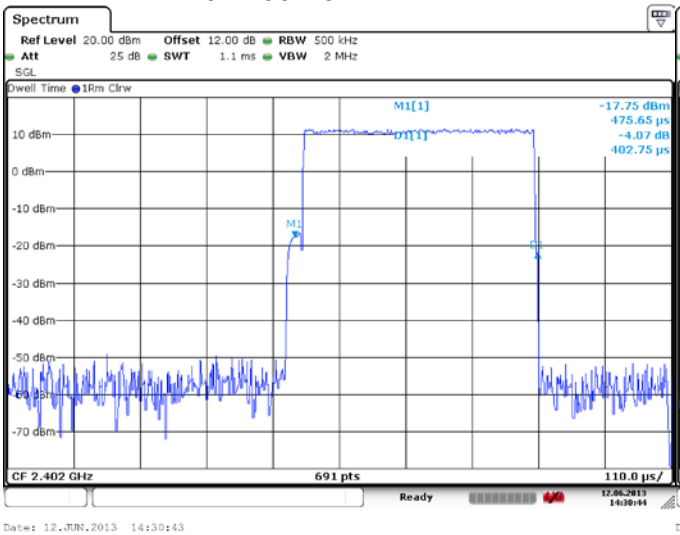
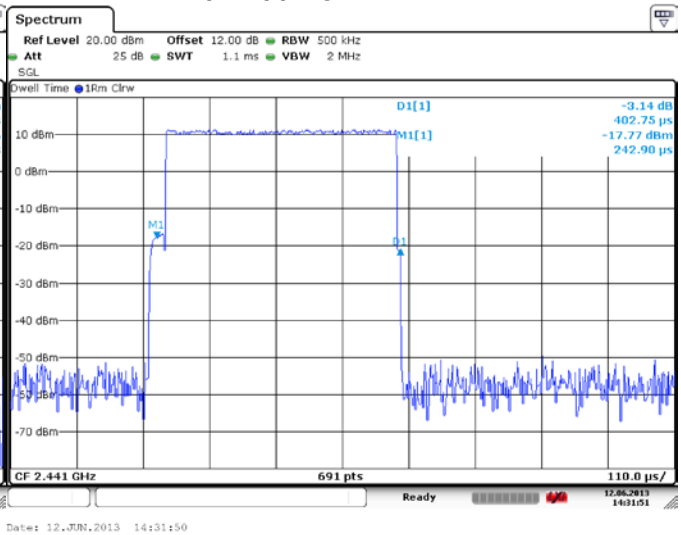


Figure 3-18: Time of Occupancy (Dwell Time) Freq. Hopping, Static PBRS, DH1



Bluetooth RF Conducted Emission Test Results cont'd

Figure 3-19: Time of Occupancy (Dwell Time) Freq. Hopping, Static PBRS, DH1

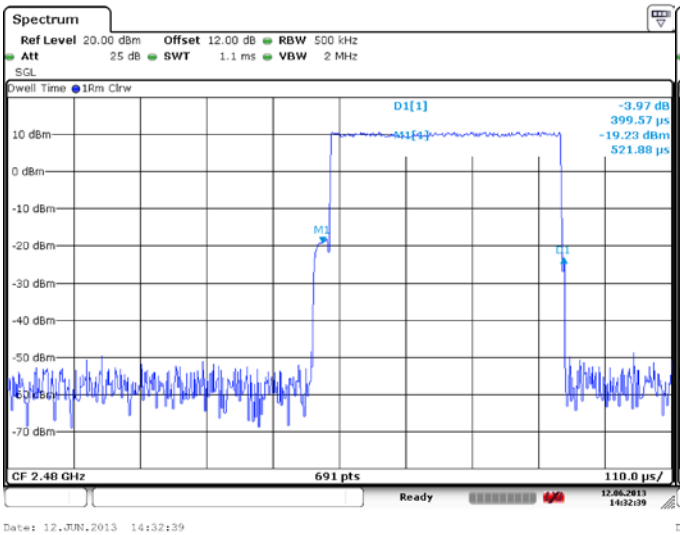


Figure 3-20: Time of Occupancy (Dwell Time) Freq. Hopping, Static PBRS, DH3

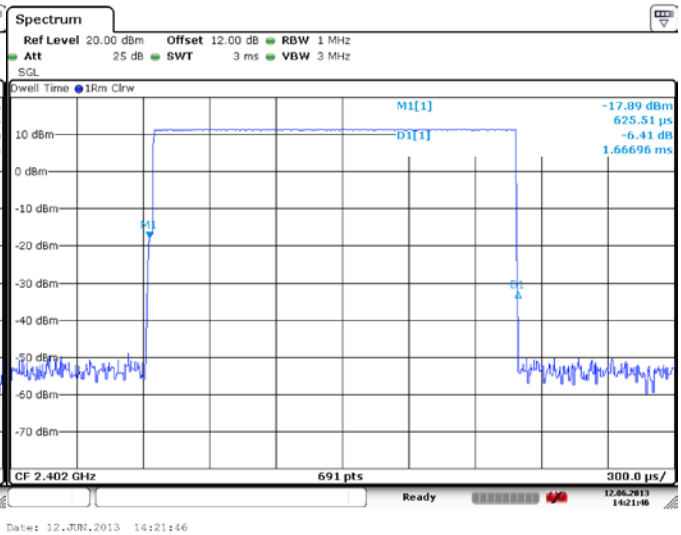


Figure 3-21: Time of Occupancy (Dwell Time) Freq. Hopping, Static PBRS, DH3

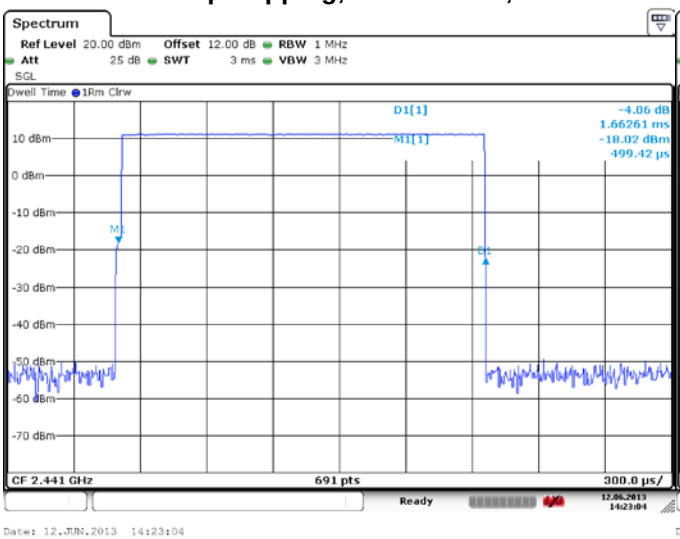
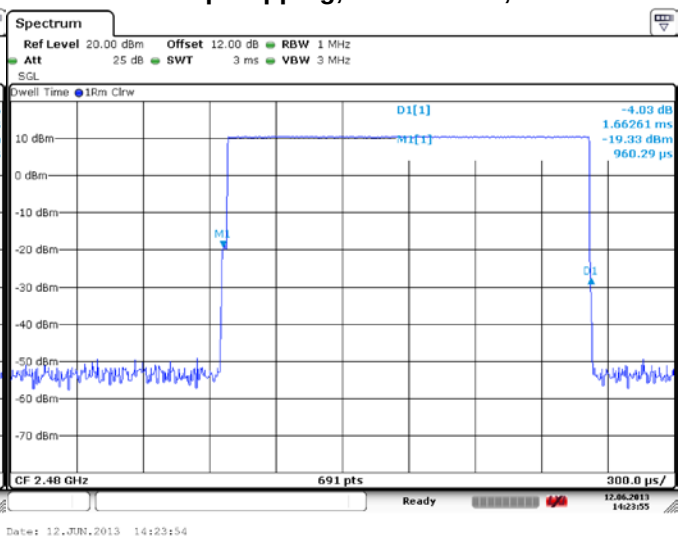


Figure 3-22: Time of Occupancy (Dwell Time) Freq. Hopping, Static PBRS, DH3



Bluetooth RF Conducted Emission Test Results cont'd

Figure 3-23: Time of Occupancy (Dwell Time)
Freq. Hopping, Static PBRS, DH5

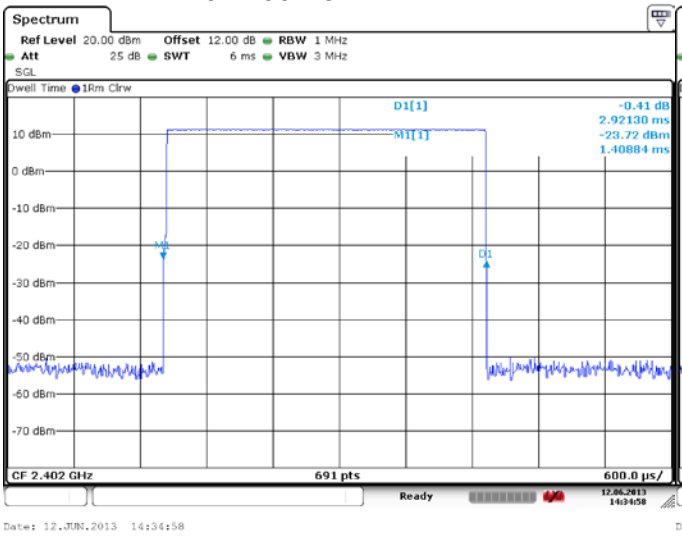


Figure 3-24: Time of Occupancy (Dwell Time)
Freq. Hopping, Static PBRS, DH5

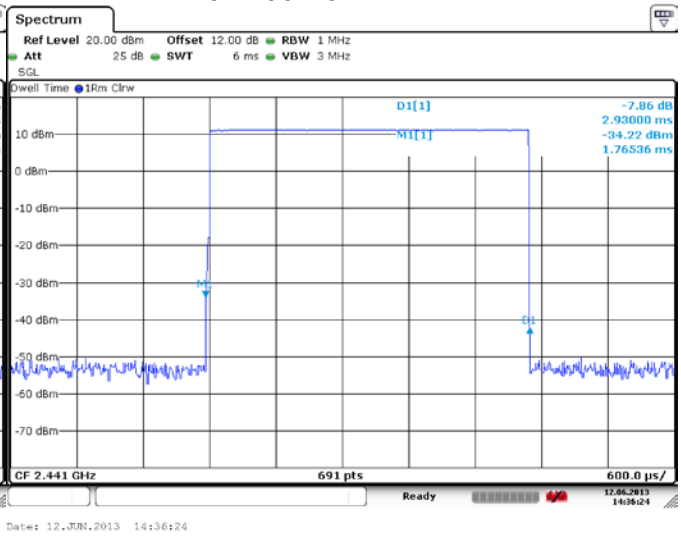
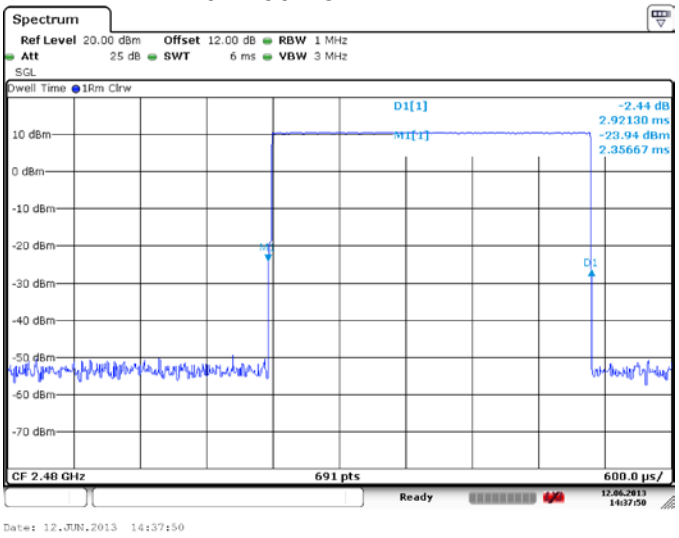


Figure 3-25: Time of Occupancy (Dwell Time)
Freq. Hopping, Static PBRS, DH5



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

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

Bluetooth Channel	Measured Level (dBm)	Measured Level (W)	Class 1 Limit (dBm)
0	6.2	0.00417	0.0 to 20.0
39	6.2	0.00417	0.0 to 20.0
78	**6.3**	**0.00427**	0.0 to 20.0

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

Bluetooth Channel	Measured Level (dBm)	Measured Level (W)	Class 1 Limit (dBm)
0	**5.30**	**0.00339**	0.0 to 20.0
39	**5.30**	**0.00339**	0.0 to 20.0
78	**5.30**	**0.00339**	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	4.80	0.00302	0.0 to 20.0
39	4.90	0.00309	0.0 to 20.0
78	4.80	0.00302	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). 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	-59.76	-20	-39.76
78	Single Frequency	-61.14	-20	-41.14
0	Hopping	-63.2	-20	-43.20
78	Hopping	-62.09	-20	-42.09

See figures 3-35 to 3-38 for the plots of the band edge compliance measurements.

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

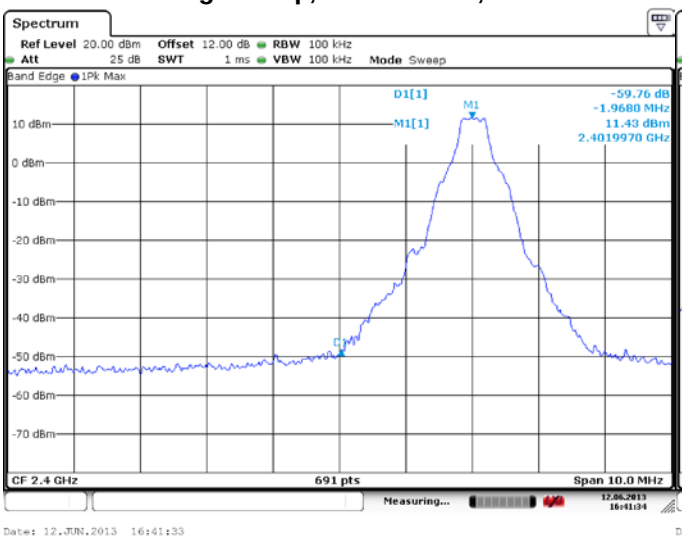
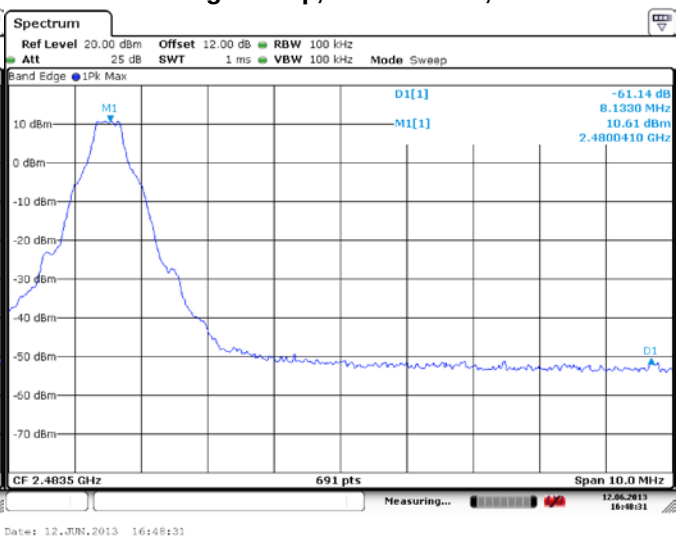


Figure 3-36: Band Edge Compliance
Single Freq., Static PBRS, DH5



Bluetooth RF Conducted Emission Test Results cont'd

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

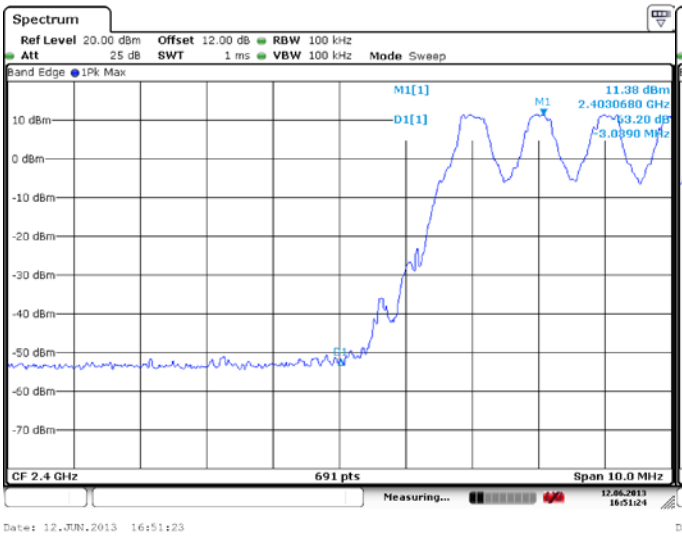
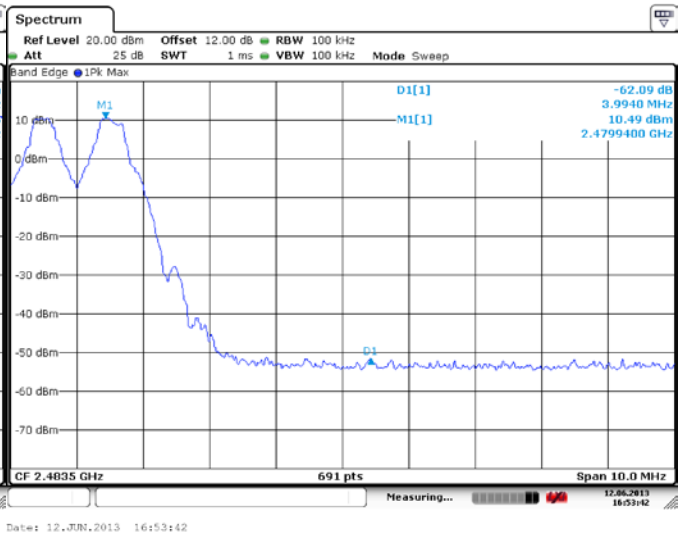


Figure 3-38: Band Edge Compliance
Freq. Hopping, Static PBRS, DH5



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

Bluetooth Channel	Operating Mode	Measured Level (dBc)	Limit (dBc)	Margin (dB)
0	Single Frequency	-55.42	-20	-35.42
78	Single Frequency	-58.37	-20	-38.37
0	Hopping	-57.15	-20	-37.15
78	Hopping	-58.15	-20	-38.15

See figures 3-39 to 3-42 for the plots of the band edge compliance measurements.

Bluetooth RF Conducted Emission Test Results cont'd

Figure 3-39: Band Edge Compliance
Single Freq., Static PBRS, 2-DH5

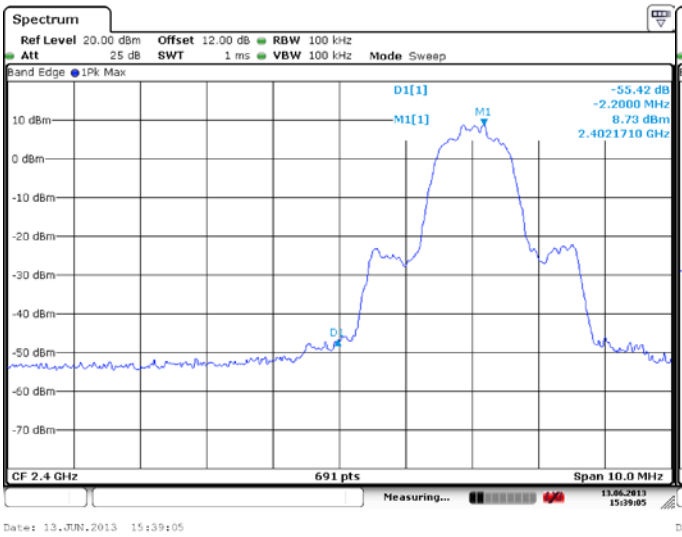


Figure 3-40: Band Edge Compliance
Single Freq., Static PBRS, 2-DH5

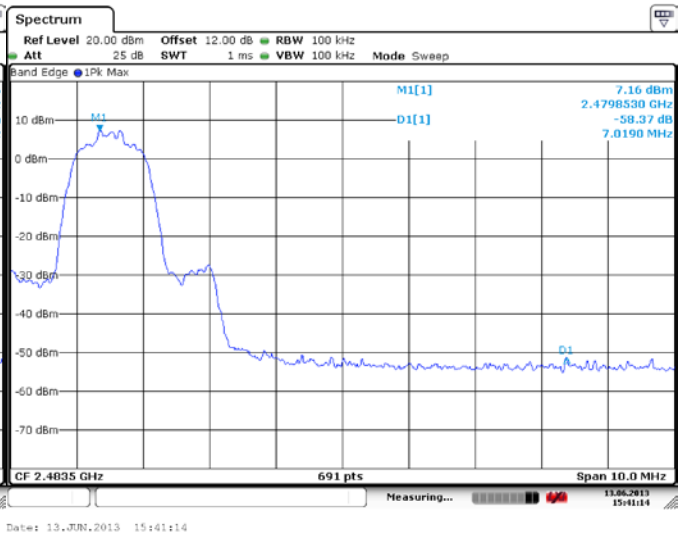


Figure 3-41: Band Edge Compliance
Freq. Hopping, Static PBRS, 2-DH5

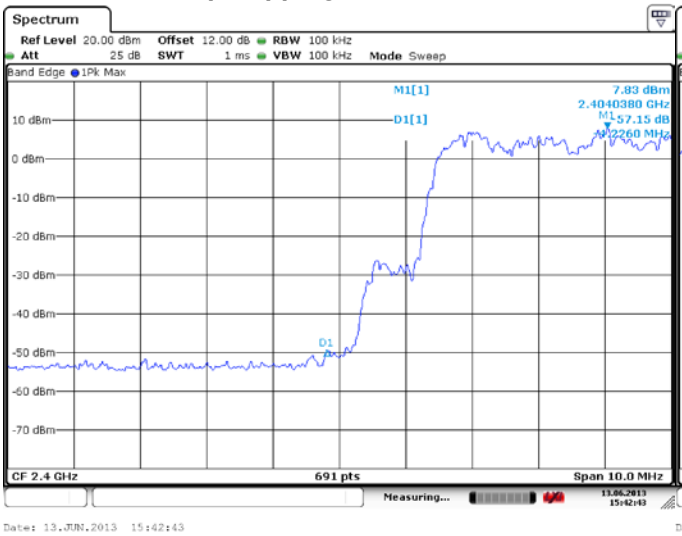
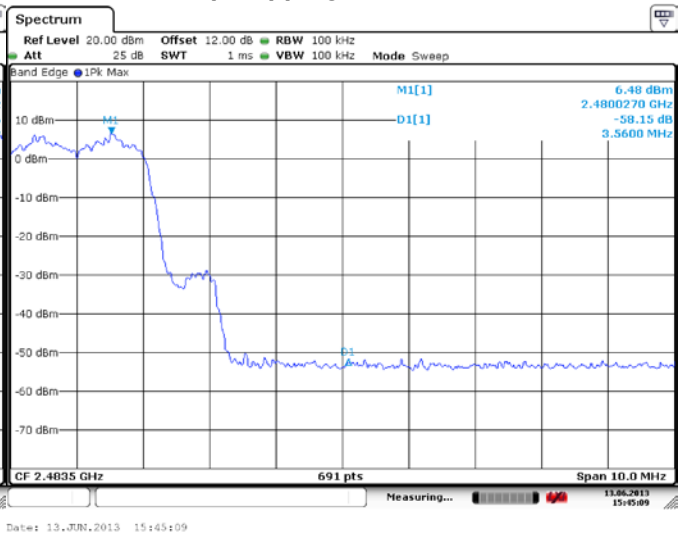


Figure 3-42: Band Edge Compliance
Freq. Hopping, Static PBRS, 2-DH5



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	-53.82	-20	-33.82
78	Single Frequency	-61.17	-20	-41.17
0	Hopping	-55.66	-20	-35.66
78	Hopping	-57.86	-20	-37.86

See figures 3-43 to 3-46 for the plots of the band edge compliance measurements.

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

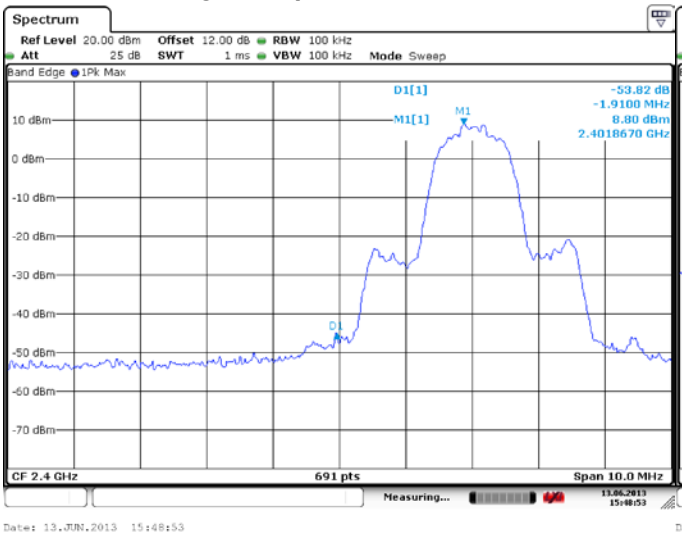
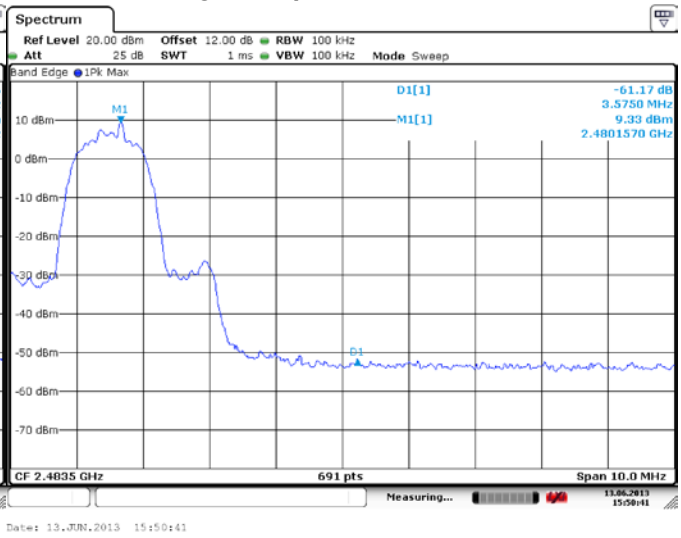


Figure 3-44: Band Edge Compliance Single Freq., Static PBRS, 3-DH5



Bluetooth RF Conducted Emission Test Results cont'd

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

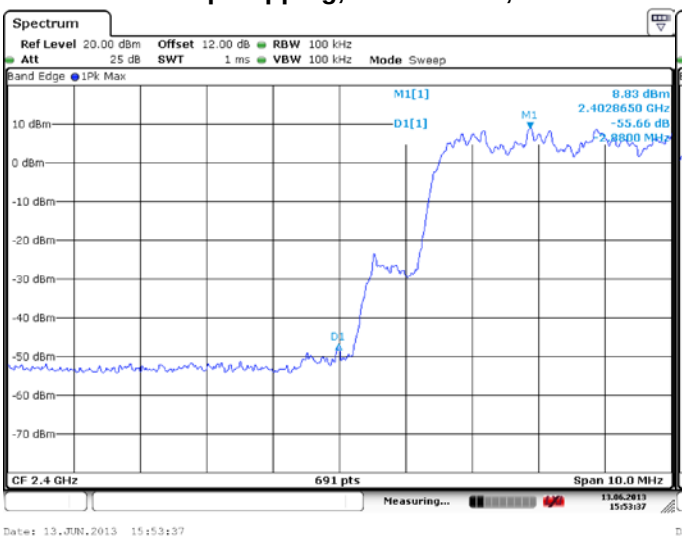
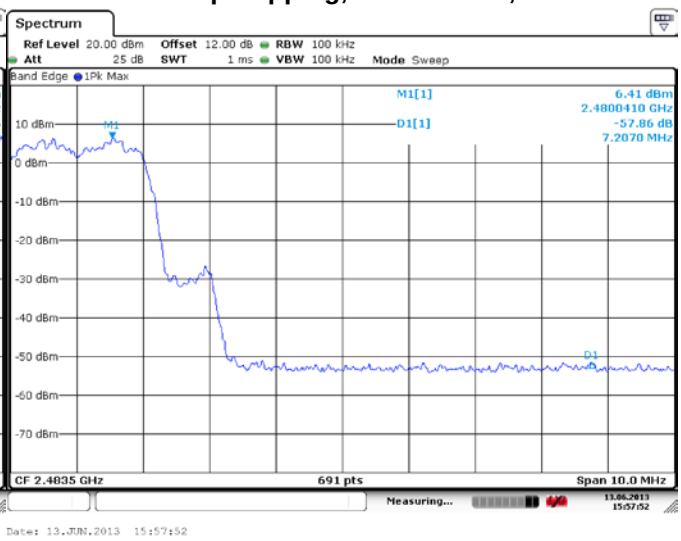


Figure 3-46: Band Edge Compliance
Freq. Hopping, Static PBRS, 3-DH5



Bluetooth RF Conducted Emission Test Results cont'd

Spurious RF Conducted Emissions

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

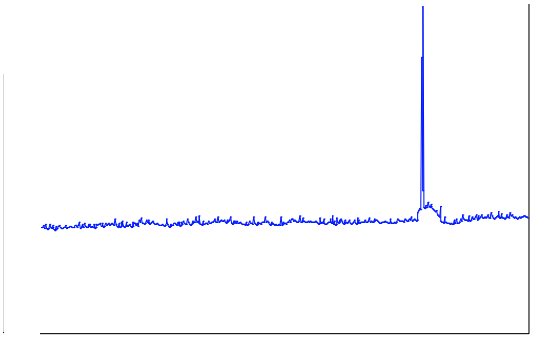
Using pattern type "Static PBRS" and packet type "DH5" during the measurements.

Bluetooth Channel	Channel Power (dBm)	Max. Measured Level (dBm)	Max. Measured Level from carrier (dBc)	Limit (dBc)
0.00	6.20	-41.53	-47.73	-20.00
39.00	6.20	-40.99	-47.19	-20.00
78.00	6.30	-41.44	-47.74	-20.00
Hopping mode	6.20	-41.43	-47.63	-20.00

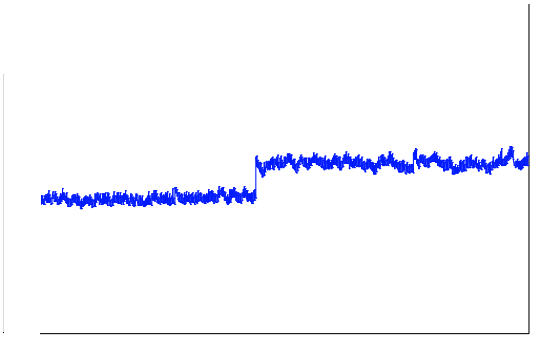
See figures 3-47 to 3-50 for the plots of the spurious RF conducted emissions.

Bluetooth RF Conducted Emission Test Results cont'd

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

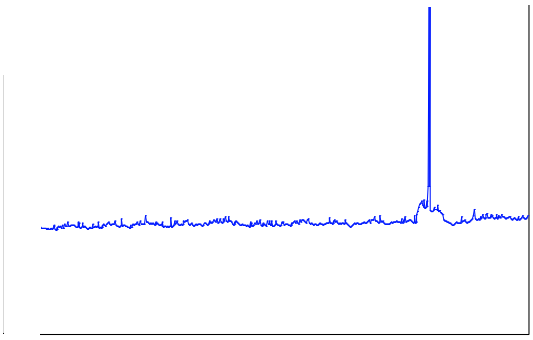


Date: 14.JUN.2013 10:06:03

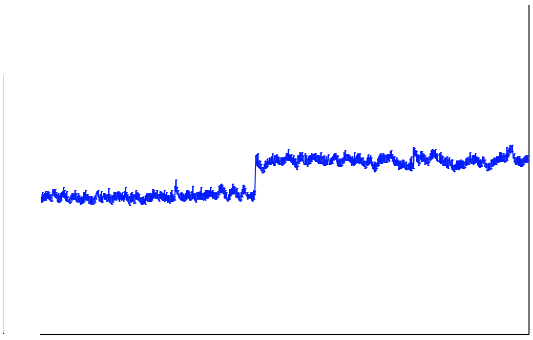


Date: 14.JUN.2013 12:21:41

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



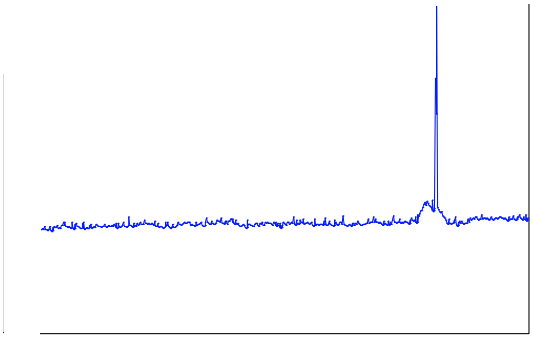
Date: 14.JUN.2013 10:27:52



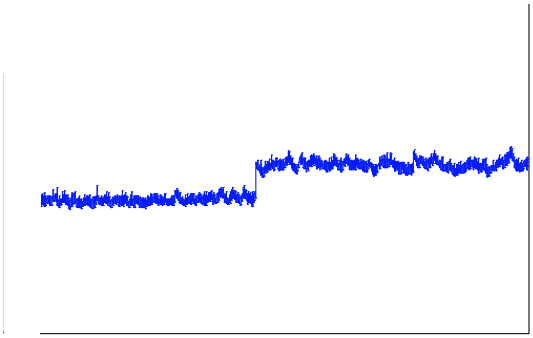
Date: 14.JUN.2013 14:14:00

Bluetooth RF Conducted Emission Test Results cont'd

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

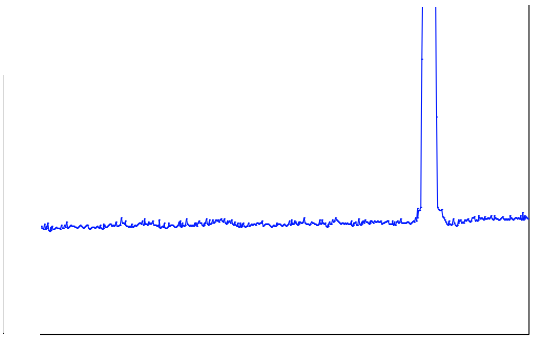


Date: 14.JUN.2013 10:36:39

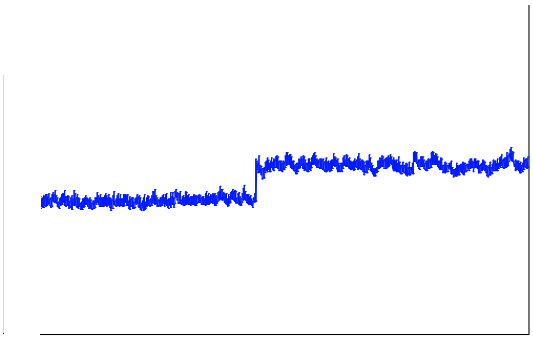


Date: 14.JUN.2013 14:14:42

Figure 3-50: Spurious RF Conducted Emissions
Freq. Hopping, Static PBRS, DH5



Date: 14.JUN.2013 10:40:10



Date: 14.JUN.2013 14:15:22

Bluetooth RF Conducted Emission Test Results cont'd

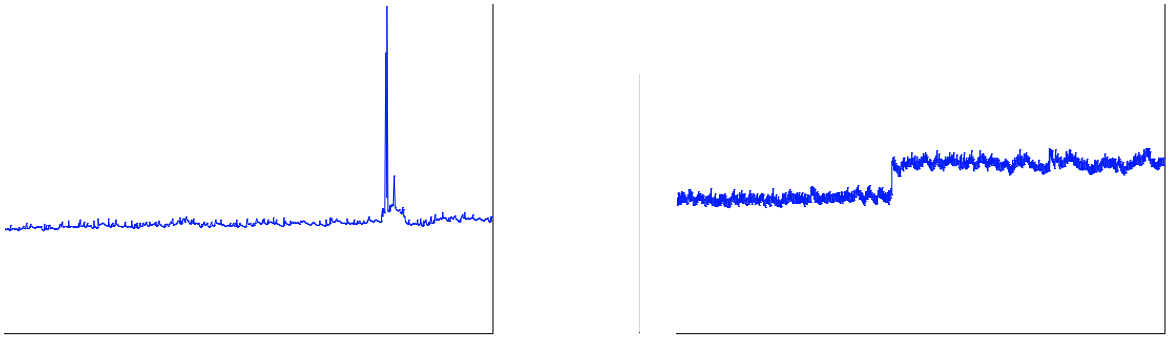
Using pattern type "Static PBRS" and packet type "2-DH5" during the measurements.

Bluetooth Channel	Channel Power (dBm)	Max. Measured Level (dBm)	Max. Measured Level from carrier (dBc)	Limit (dBc)
0.00	4.80	-38.78	-43.58	-20.00
39.00	4.90	-42.25	-47.15	-20.00
78.00	4.80	-41.56	-46.36	-20.00
Hopping mode	4.80	-41.48	-46.28	-20.00

See figures 3-51 to 3-54 for the plots of the spurious RF conducted emissions.

Bluetooth RF Conducted Emission Test Results cont'd

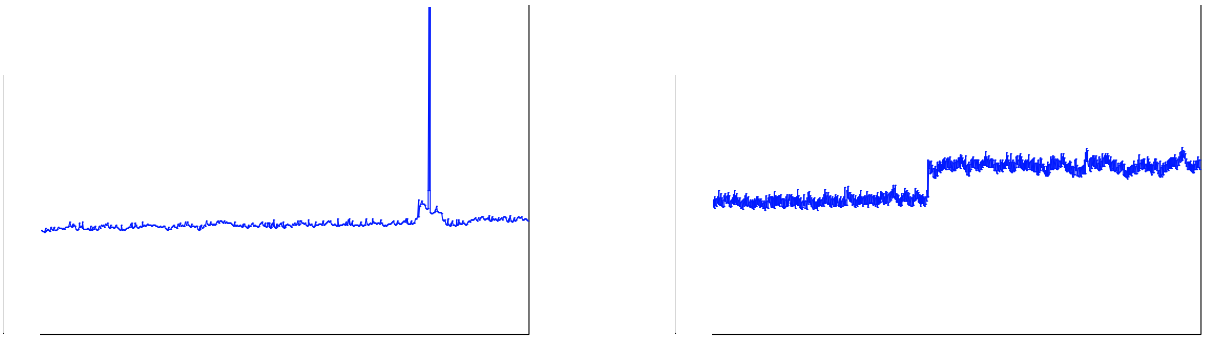
Figure 3-51: Spurious RF Conducted Emissions
Single Freq., Static PBRS, 2-DH5



Date: 14.JUN.2013 11:14:11

Date: 14.JUN.2013 14:16:23

Figure 3-52: Spurious RF Conducted Emissions
Single Freq., Static PBRS, 2-DH5

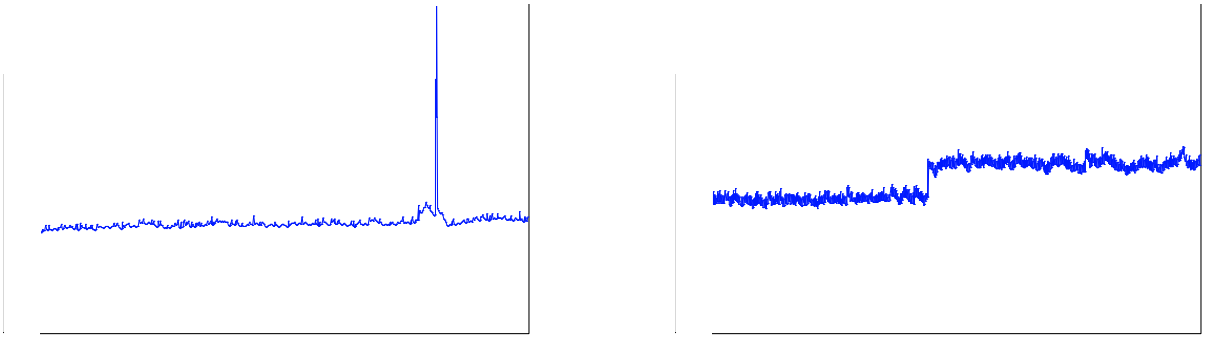


Date: 14.JUN.2013 11:16:02

Date: 14.JUN.2013 14:16:55

Bluetooth RF Conducted Emission Test Results cont'd

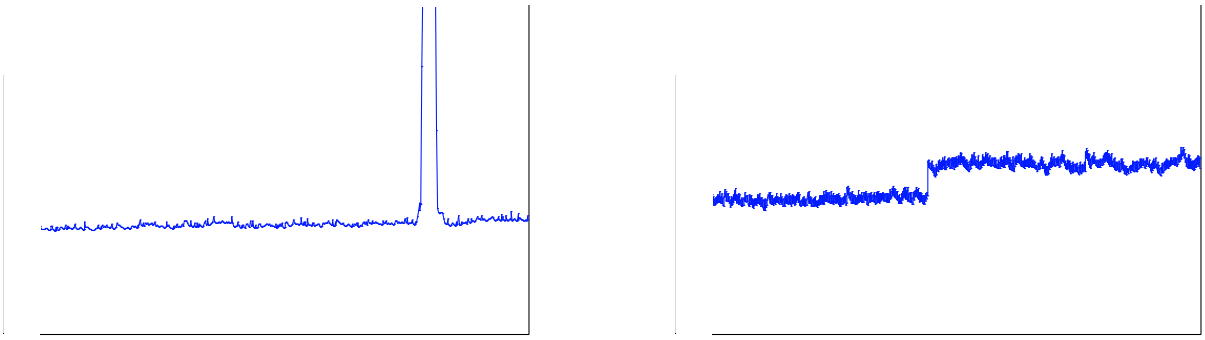
Figure 3-53: Spurious RF Conducted Emissions
Single Freq., Static PBRS, 2-DH5



Date: 14.JUN.2013 11:18:17

Date: 14.JUN.2013 14:17:59

Figure 3-54: Spurious RF Conducted Emissions
Freq. Hopping, Static PBRS, 2-DH5



Date: 14.JUN.2013 11:20:42

Date: 14.JUN.2013 14:19:32

Bluetooth RF Conducted Emission Test Results cont'd

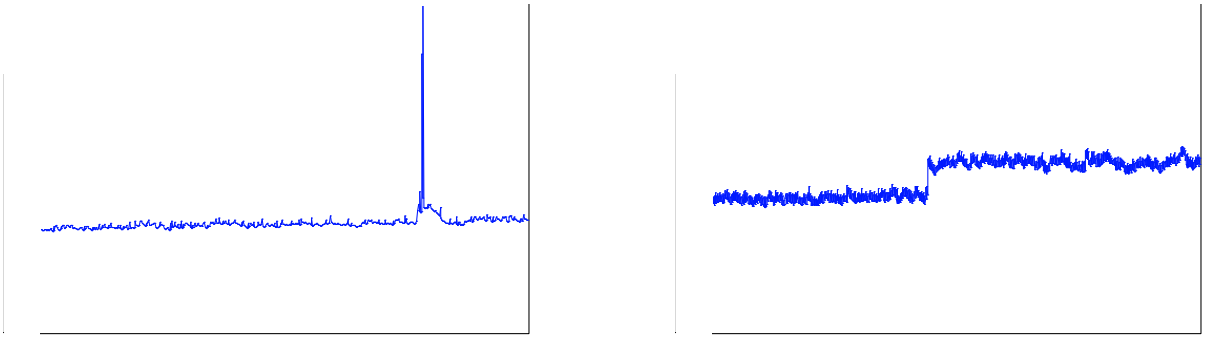
Using pattern type "Static PBRS" and packet type "3-DH5" during the measurements.

Bluetooth Channel	Channel Power (dBm)	Max. Measured Level (dBm)	Max. Measured Level from carrier (dBc)	Limit (dBc)
0.00	5.30	-41.34	-46.64	-20.00
39.00	5.30	-41.62	-46.92	-20.00
78.00	5.30	-41.54	-46.84	-20.00
Hopping mode	5.30	-41.64	-46.94	-20.00

See figures 3-55 to 3-58 for the plots of the spurious RF conducted emissions.

Bluetooth RF Conducted Emission Test Results cont'd

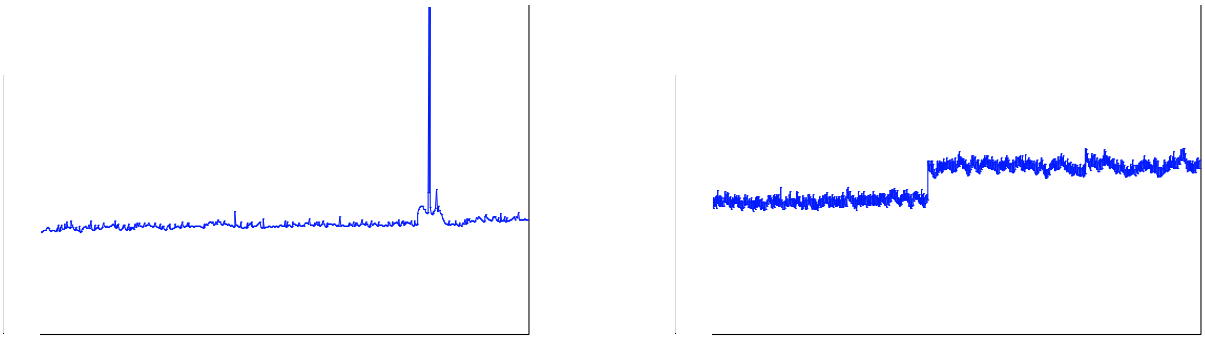
Figure 3-55: Spurious RF Conducted Emissions
Single Freq., Static PBRS, 3-DH5



Date: 14.JUN.2013 11:22:13

Date: 14.JUN.2013 14:21:57

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

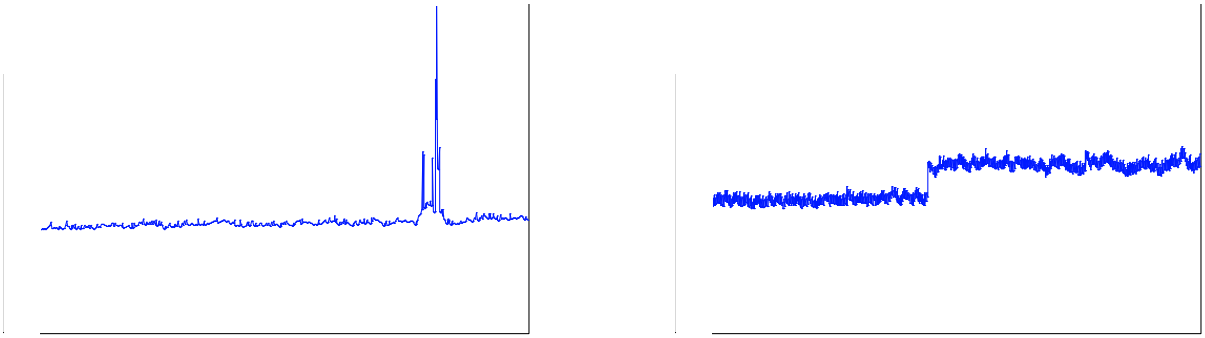


Date: 14.JUN.2013 11:23:59

Date: 14.JUN.2013 14:22:24

Bluetooth RF Conducted Emission Test Results cont'd

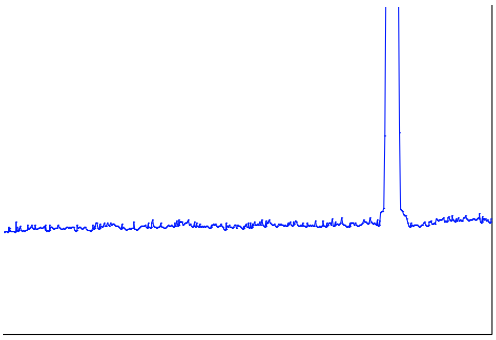
Figure 3-57: Spurious RF Conducted Emissions
Single Freq., Static PBRS, 3-DH5



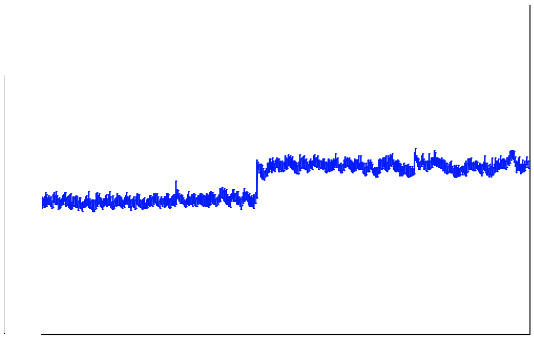
Date: 14.JUN.2013 11:26:16

Date: 14.JUN.2013 14:23:03

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



Date: 14.JUN.2013 12:02:07



Date: 14.JUN.2013 14:23:34

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). Channels 0, 20 and 39 were measured.

Channel	Limit (kHz)	Measured Level (MHz)
0	≥ 500	701.90
20	≥ 500	**709.10**
39	≥ 500	701.90

See figures 3-59 to 3-61 for the plots of the 6 dB bandwidth measurements for Channels 0, 20, and 39.

Figure 3-59: 6 dB Bandwidth LE, Channel 0

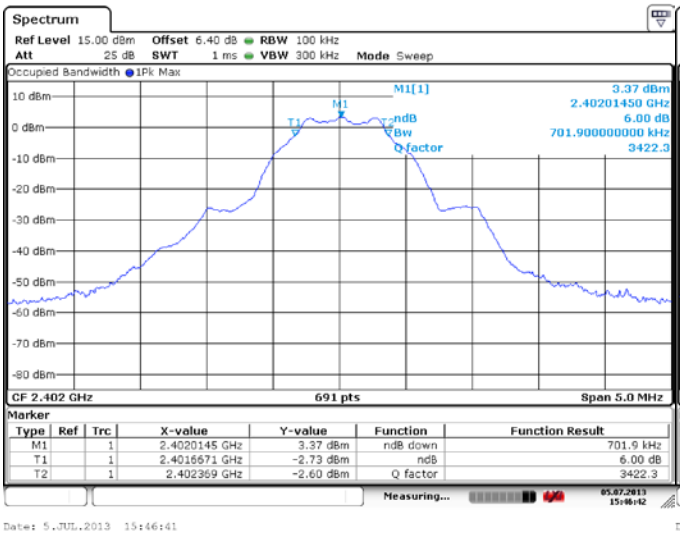
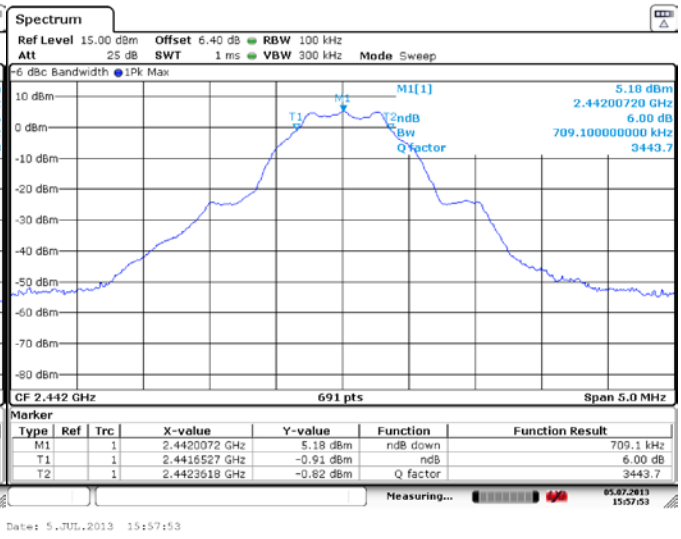
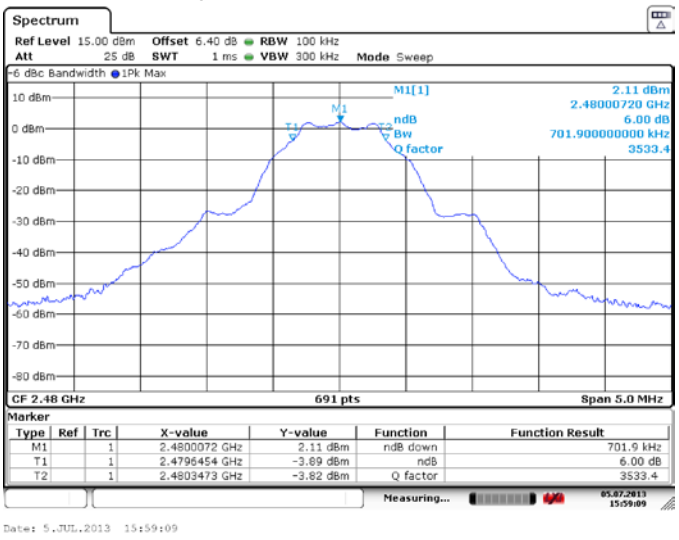


Figure 3-60: 6 dB Bandwidth LE, Channel 20



Bluetooth Low Energy RF Conducted Emission Test Results cont'd

Figure 3-61: 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). 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	5.51	0.00356
20	< 1.00	**5.82**	**0.00382**
39	< 1.00	5.6	0.003.63

Bluetooth Low Energy RF Conducted Emission Test Results cont'd

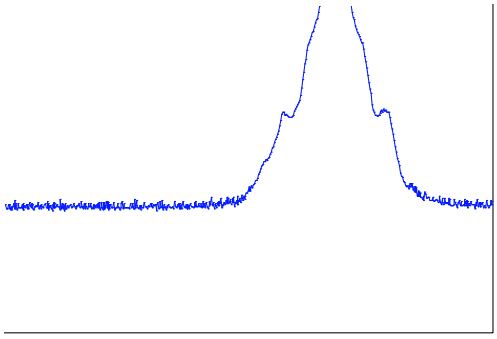
Band Edge Compliance

The EUT met the requirements of the band edge compliance as per 47 CFR 15.247(c). Channels 0 and 39 were measured.

Channel	Limit (dBc)	Measured Level (dBc)	Margin (dBc)
0	< -20	-50.47	-30.47
39	< -20	-49.47	-29.47

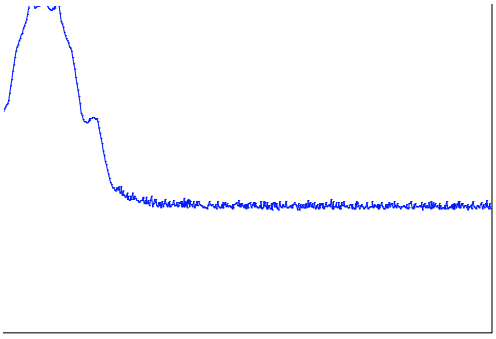
See figures 3-62 to 3-63 for the plots of the band edge compliance measurements for Channels 0 and 39.

Figure 3-62: Band Edge Compliance LE, Channel 0



Date: 9.JUL.2013 13:28:44

Figure 3-63: Band Edge Compliance LE, Channel 39



Date: 9.JUL.2013 13:26:41

Bluetooth Low Energy RF Conducted Emission Test Results cont'd

Peak Power Spectral Density

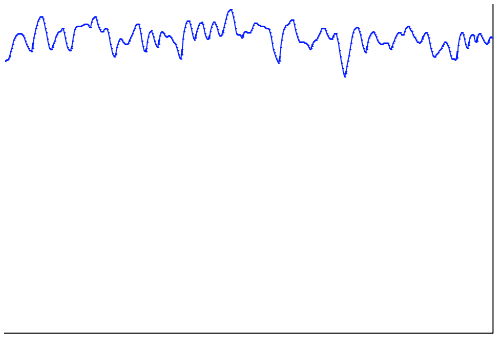
The EUT met the requirements of the peak power spectral density as per 47 CFR 15.247(d). Channels 0, 20 and 39 were measured.

Channel	Limit (dBm)	Measured Level (dBm)	Margin (dBm)
0	< 8.00	-9.38	-17.38
20	< 8.00	-7.98	-15.98
39	< 8.00	-10.64	-18.64

Bluetooth Low Energy RF Conducted Emission Test Results cont'd

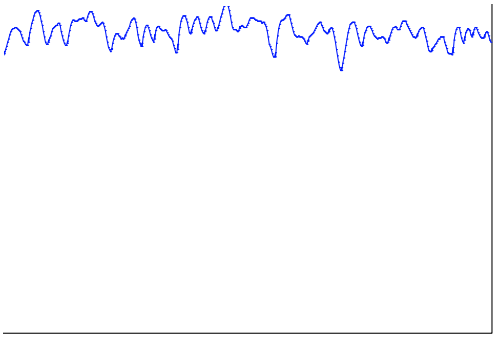
See figures 3-64 to 3-66 for the plots of the peak power spectral density for Channels 0, 20 and 39.

Figure 3-64: Peak Power Spectral Density LE, Channel 0



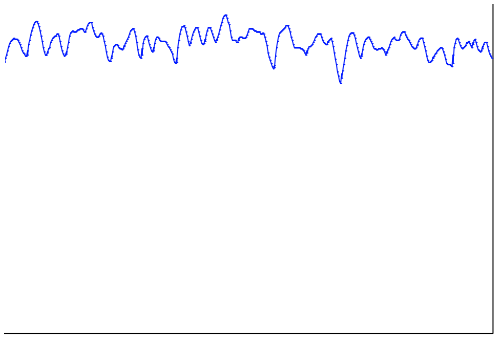
Date: 9.JUL.2013 13:54:05

Figure 3-65: Peak Power Spectral Density LE, Channel 20



Date: 9.JUL.2013 14:00:41

Figure 3-66: Peak Power Spectral Density LE, Channel 39

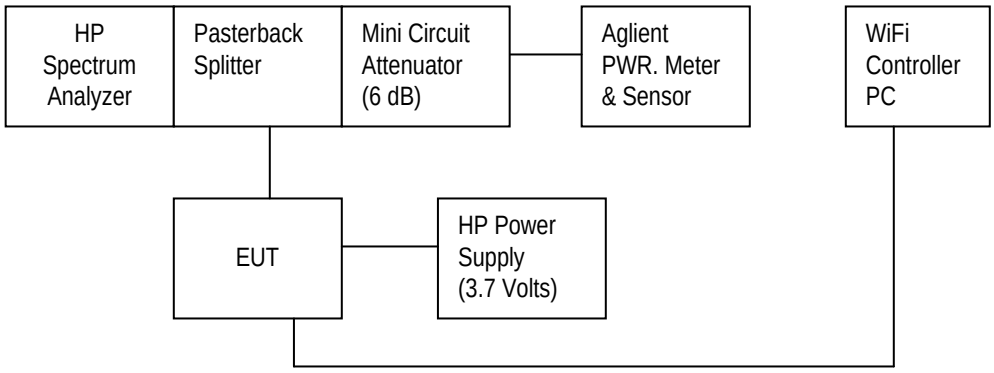


Date: 9.JUL.2013 14:05:32

APPENDIX 4 – 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: July 12 - 20, 2013
The measurements on the BlackBerry® smartphone were performed by Kevin Guo.

The environmental test conditions were: Temperature: 25.4 ºC
Relative Humidity: 36 %

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

The following tests were performed on model RFW121LW.

6 dB Bandwidth

The EUT met the requirements of the 6 dB bandwidth as per 47 CFR 15.247(a)(2). 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	7.08
	5.5 Mbps	≥ 500	7.36
	11 Mbps	≥ 500	8.06
	6 Mbps	≥ 500	15.52
	24 Mbps	≥ 500	16.35
	54 Mbps	≥ 500	16.36
	MCS 0	≥ 500	15.12
	MCS 4	≥ 500	17.56
	MCS 7	≥ 500	17.60
6	1 Mbps	≥ 500	8.02
	5.5 Mbps	≥ 500	7.96
	11 Mbps	≥ 500	**8.40**
	6 Mbps	≥ 500	15.32
	24 Mbps	≥ 500	**16.38**
	54 Mbps	≥ 500	**16.38**
	MCS 0	≥ 500	15.12
	MCS 4	≥ 500	17.50
	MCS 7	≥ 500	17.62
11	1 Mbps	≥ 500	8.02
	5.5 Mbps	≥ 500	7.68
	11 Mbps	≥ 500	7.88
	6 Mbps	≥ 500	15.14
	24 Mbps	≥ 500	16.34
	54 Mbps	≥ 500	16.32
	MCS 0	≥ 500	15.12
	MCS 4	≥ 500	17.34
	MCS 7	≥ 500	**17.66**

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

See figures 3-1 to 3-9 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 3-1: 6 dB Bandwidth
802.11b, Channel 1, 1 Mbps

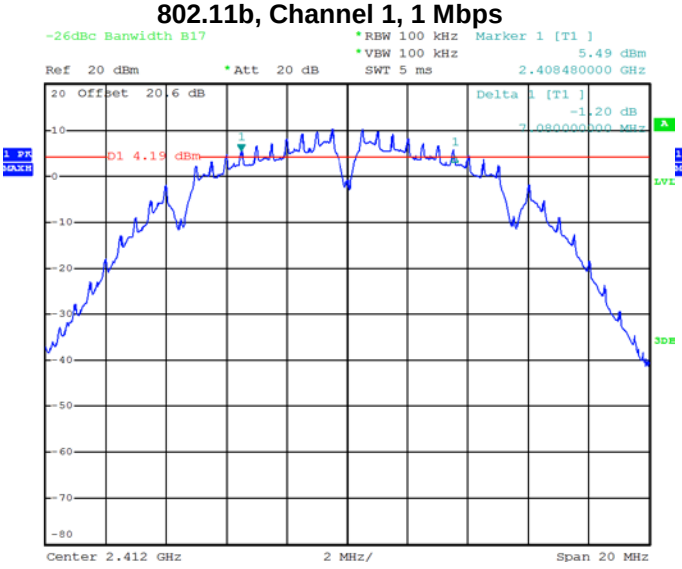


Figure 3-2: 6 dB Bandwidth
802.11b, Channel 6, 1 Mbps

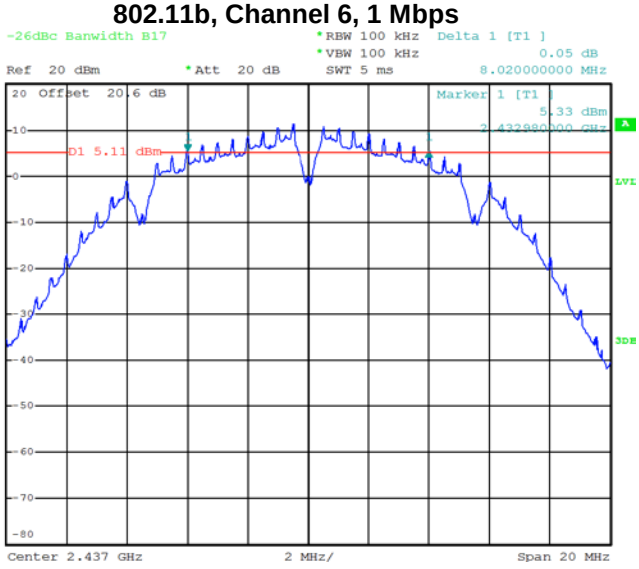


Figure 3-3: 6 dB Bandwidth
802.11b, Channel 11, 1 Mbps

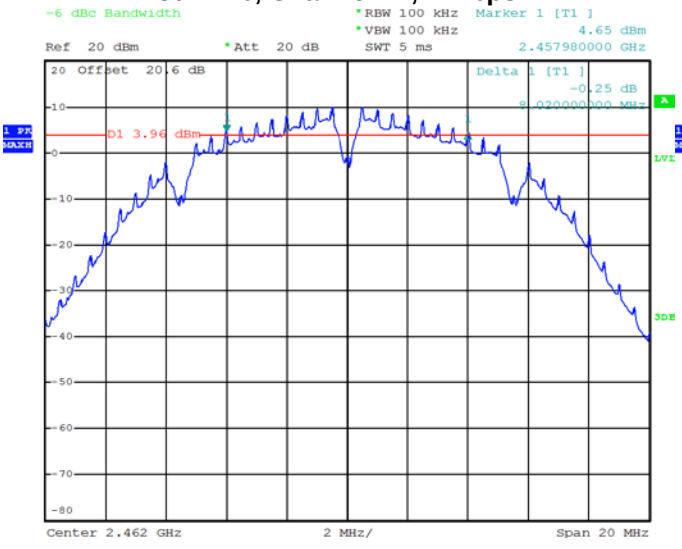
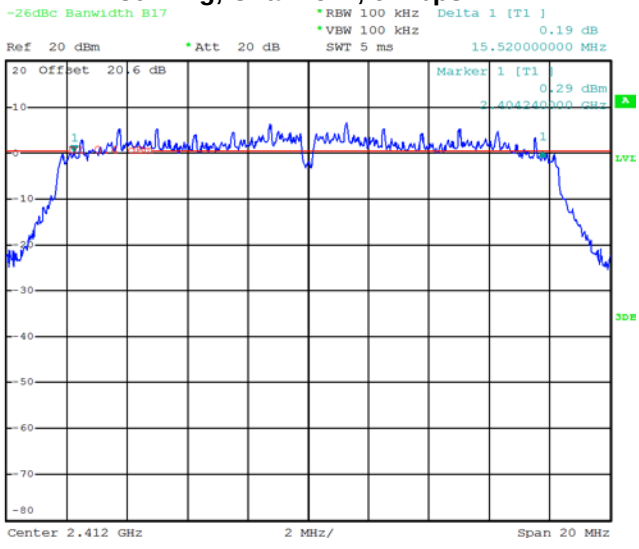


Figure 3-4: 6 dB Bandwidth
802.11g, Channel 1, 6 Mbps



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

Figure 3-5: 6 dB Bandwidth
802.11g, Channel 6, 6 Mbps

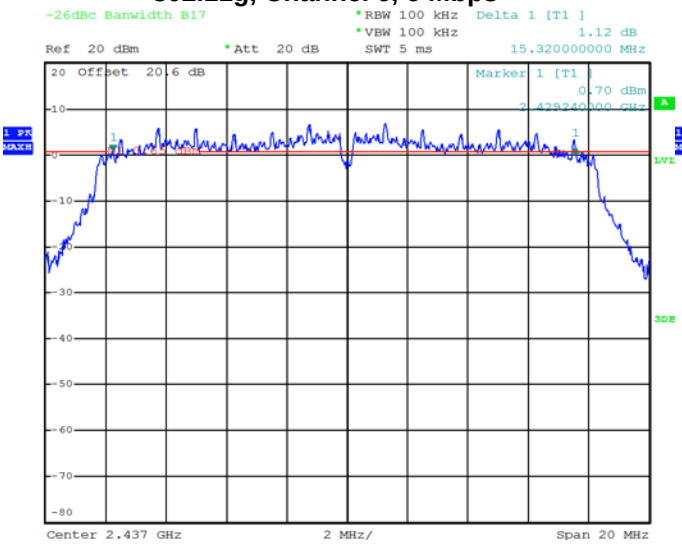


Figure 3-6: 6 dB Bandwidth
802.11g, Channel 11, 6 Mbps

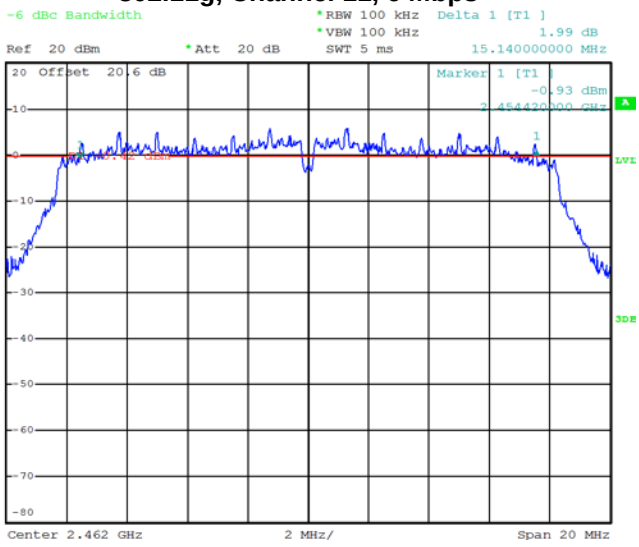


Figure 3-7: 6 dB Bandwidth
802.11n, Channel 1, MCS 0

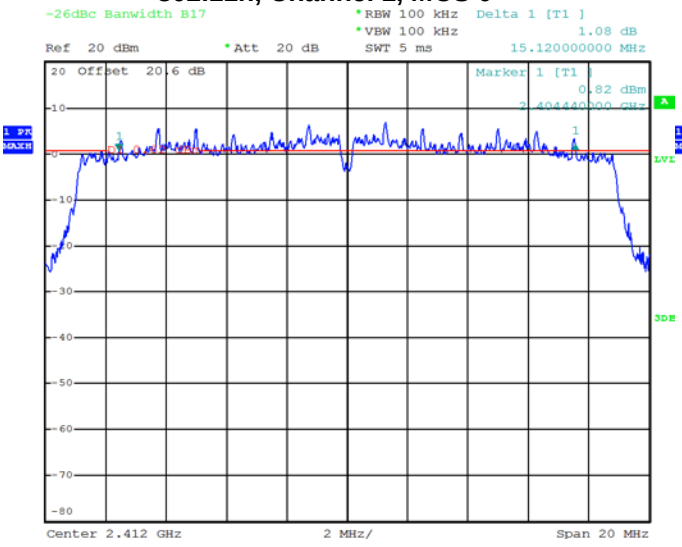


Figure 3-8: 6 dB Bandwidth
802.11n, Channel 6, MCS 0

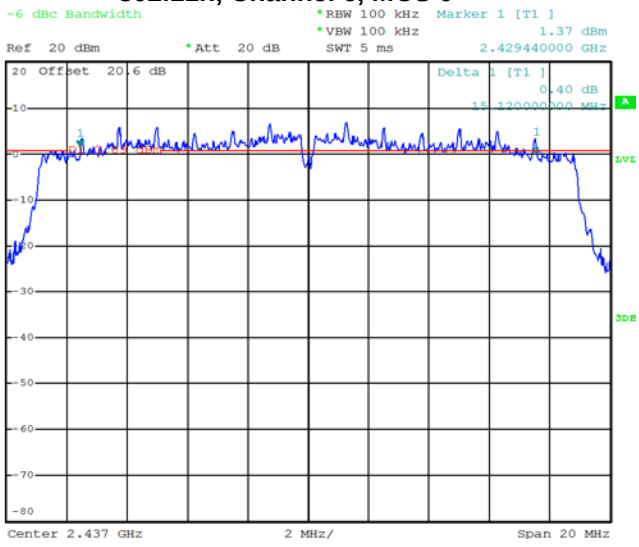
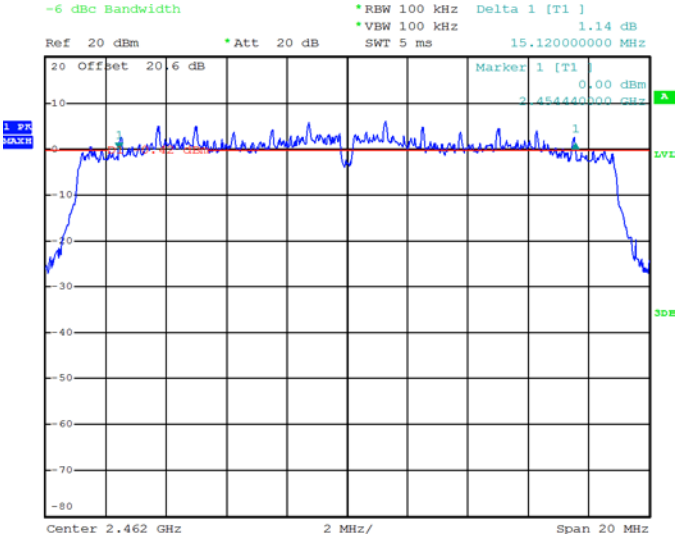


Figure 3-9: 6 dB Bandwidth

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

Channel	Data Rate	Class 2 Limit (W)	Measured Level (dBm)	Measured Level (W)
1	1 Mbps	< 1.00	18.08	0.0642
	5.5 Mbps	< 1.00	17.97	0.0627
	11 Mbps	< 1.00	17.85	0.0610
	6 Mbps	< 1.00	17.72	0.0591
	24 Mbps	< 1.00	17.18	0.0522
	54 Mbps	< 1.00	15.66	0.0368
	MCS 0	< 1.00	17.47	0.0558
	MCS 4	< 1.00	14.93	0.0311
	MCS 7	< 1.00	13.51	0.0224
6	1 Mbps	< 1.00	**18.47**	**0.0703**
	5.5 Mbps	< 1.00	18.45	0.0700
	11 Mbps	< 1.00	18.22	0.0663
	6 Mbps	< 1.00	**18.03**	**0.0635**
	24 Mbps	< 1.00	17.60	0.0576
	54 Mbps	< 1.00	16.01	0.0399
	MCS 0	< 1.00	**18.03**	**0.0635**
	MCS 4	< 1.00	15.30	0.0339
	MCS 7	< 1.00	13.98	0.0250

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	18.18	65.84
	5.5 Mbps	< 1.00	18.06	63.93
	11 Mbps	< 1.00	17.98	62.76
	6 Mbps	< 1.00	17.79	60.11
	24 Mbps	< 1.00	17.23	52.81
	54 Mbps	< 1.00	15.73	37.45
	MCS 0	< 1.00	17.61	57.61
	MCS 4	< 1.00	15.09	32.27
	MCS 7	< 1.00	13.49	22.33

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). 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	-47.67	-27.67
	5.5 Mbps	< -20	-48.77	-28.77
	11 Mbps	< -20	-48.92	-28.92
	6 Mbps	< -20	-31.08	-11.08
	24 Mbps	< -20	-31.83	-11.83
	54 Mbps	< -20	-32.94	-12.94
	MCS 0	< -20	-30.41	-10.41
	MCS 4	< -20	-36.13	-16.13
	MCS 7	< -20	-40.71	-20.71
11	1 Mbps	< -20	-46.98	-26.98
	5.5 Mbps	< -20	-47.84	-27.84
	11 Mbps	< -20	-48.20	-28.20
	6 Mbps	< -20	-36.10	-16.10
	24 Mbps	< -20	-37.10	-17.10
	54 Mbps	< -20	-37.48	-17.48
	MCS 0	< -20	-35.17	-15.17
	MCS 4	< -20	-39.99	-19.99
	MCS 7	< -20	-43.38	-23.38

See figures 3-10 to 3-15 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 3-10: Band Edge Compliance
802.11b, Channel 1, 1 Mbps

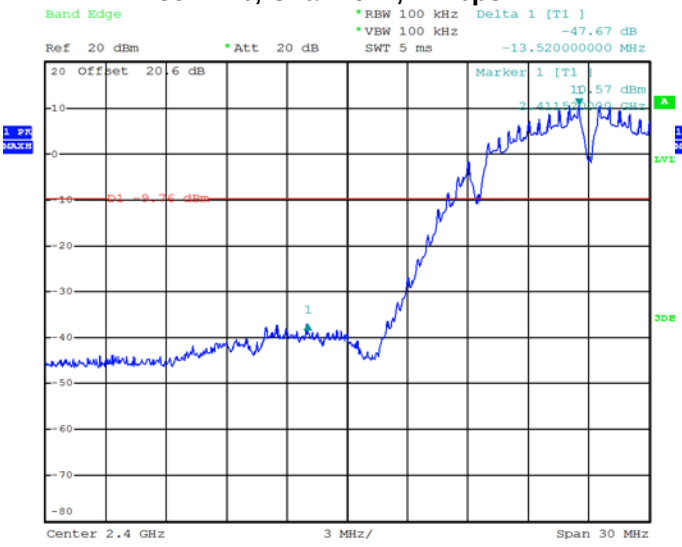


Figure 3-11: Band Edge Compliance
802.11b, Channel 11, 1 Mbps

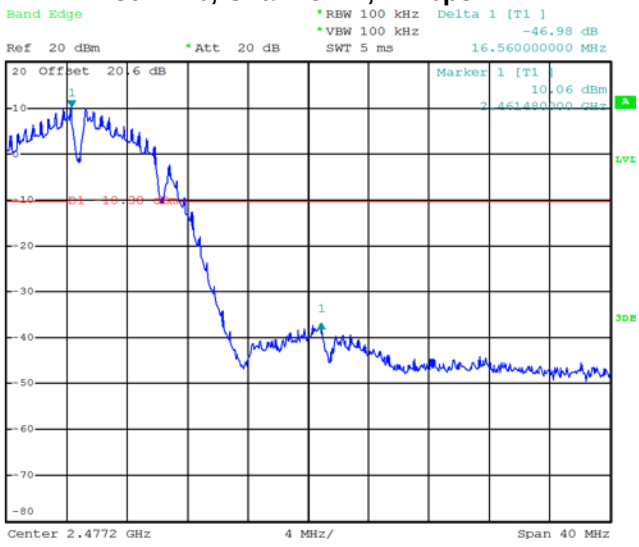


Figure 3-12: Band Edge Compliance
802.11g, Channel 1, 6 Mbps

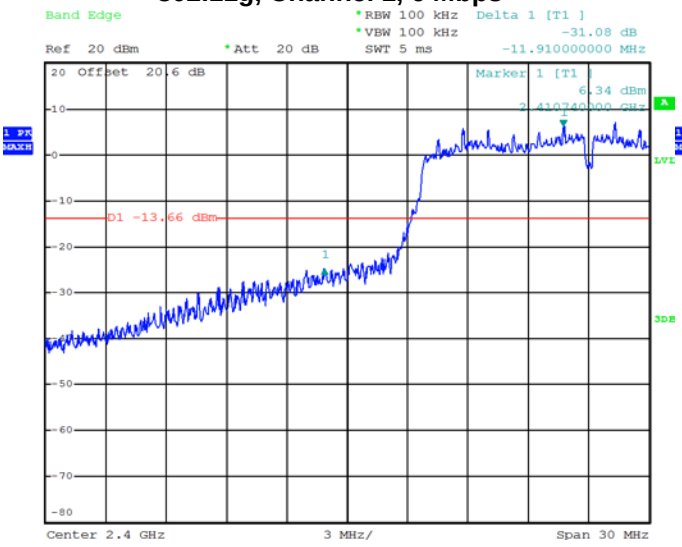
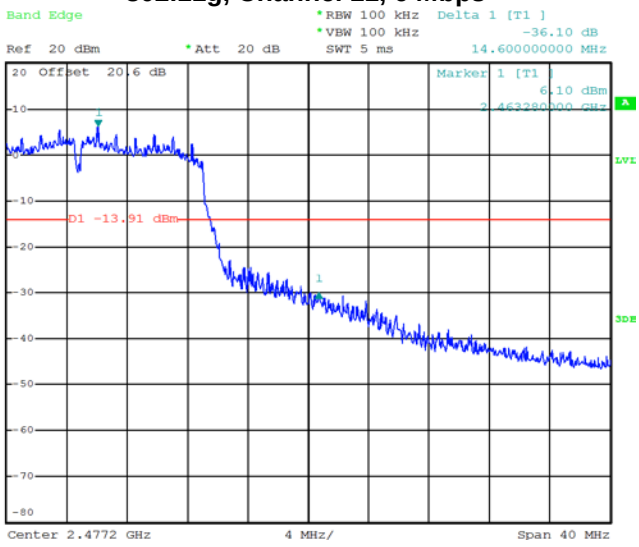


Figure 3-13: Band Edge Compliance
802.11g, Channel 11, 6 Mbps



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

Figure 3-14: Band Edge Compliance
802.11n, Channel 1, MCS 0

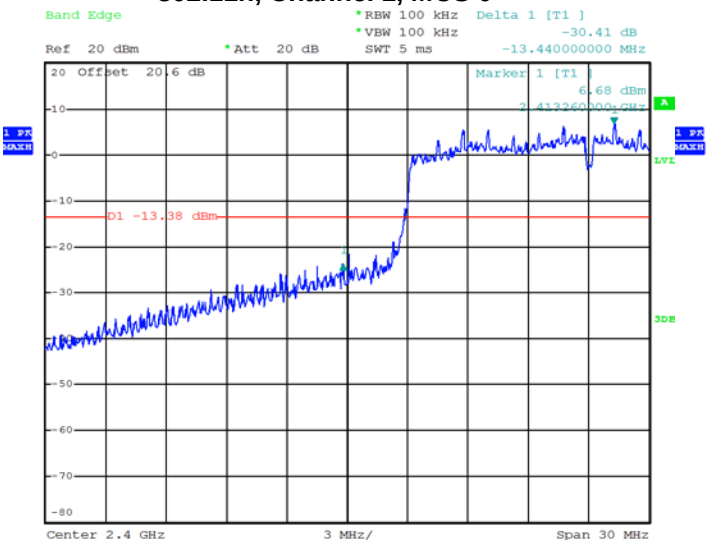
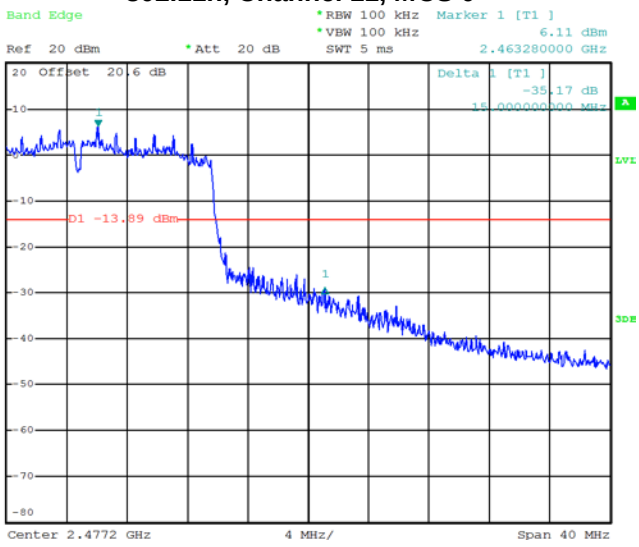


Figure 3-15: Band Edge Compliance
802.11n, Channel 11, MCS 0



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). 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	-3.94	-11.94
	5.5 Mbps	< 8.00	-2.79	-10.79
	11 Mbps	< 8.00	-5.77	-13.77
	6 Mbps	< 8.00	-7.72	-15.72
	24 Mbps	< 8.00	-6.27	-14.27
	54 Mbps	< 8.00	-7.92	-15.92
	MCS 0	< 8.00	-7.72	-15.72
	MCS 4	< 8.00	-7.76	-15.76
	MCS 7	< 8.00	-7.32	-15.32
6	1 Mbps	< 8.00	-2.49	-10.49
	5.5 Mbps	< 8.00	-2.53	-10.53
	11 Mbps	< 8.00	-3.96	-11.96
	6 Mbps	< 8.00	-6.89	-14.89
	24 Mbps	< 8.00	-6.24	-14.24
	54 Mbps	< 8.00	-7.96	-15.96
	MCS 0	< 8.00	-7.64	-15.64
	MCS 4	< 8.00	-7.25	-15.25
	MCS 7	< 8.00	-8.12	-16.12
11	1 Mbps	< 8.00	-3.25	-11.25
	5.5 Mbps	< 8.00	-3.06	-11.06
	11 Mbps	< 8.00	-5.34	-13.34
	6 Mbps	< 8.00	-7.92	-15.92
	24 Mbps	< 8.00	-7.10	-15.10
	54 Mbps	< 8.00	-10.18	-18.18
	MCS 0	< 8.00	-8.50	-16.50
	MCS 4	< 8.00	-9.28	-17.28
	MCS 7	< 8.00	-8.12	-16.12

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

See figures 3-16 to 3-24 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 3-16: Peak Power Spectral Density
802.11b, Channel 1, 1 Mbps

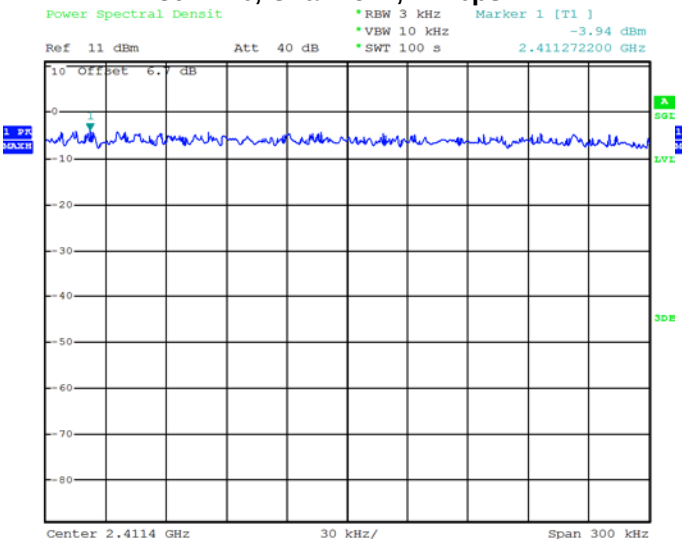


Figure 3-17: Peak Power Spectral Density
802.11b, Channel 6, 1 Mbps

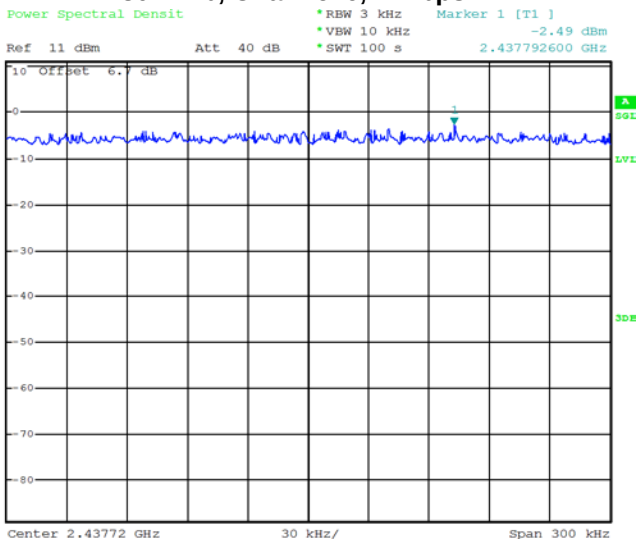
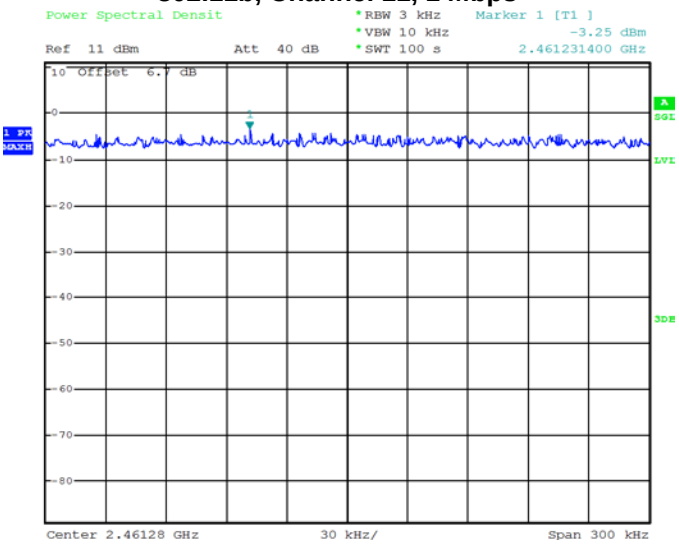


Figure 3-18: Peak Power Spectral Density
802.11b, Channel 11, 1 Mbps



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

Figure 3-19: Peak Power Spectral Density
802.11g, Channel 1, 6 Mbps

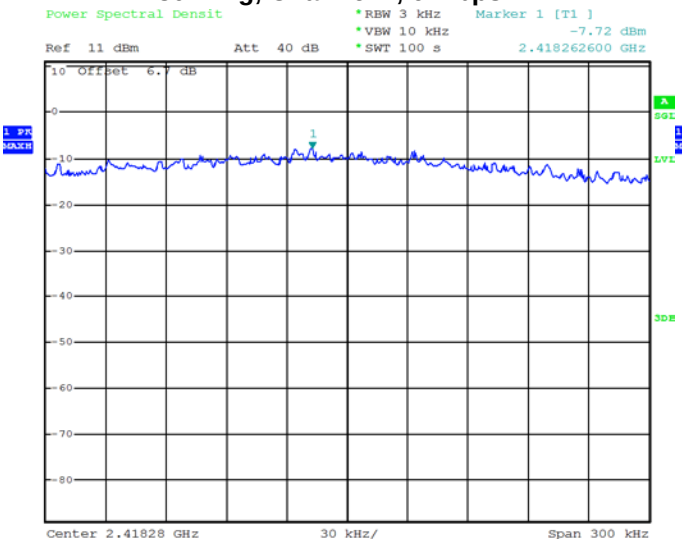


Figure 3-20: Peak Power Spectral Density
802.11g, Channel 6, 6 Mbps

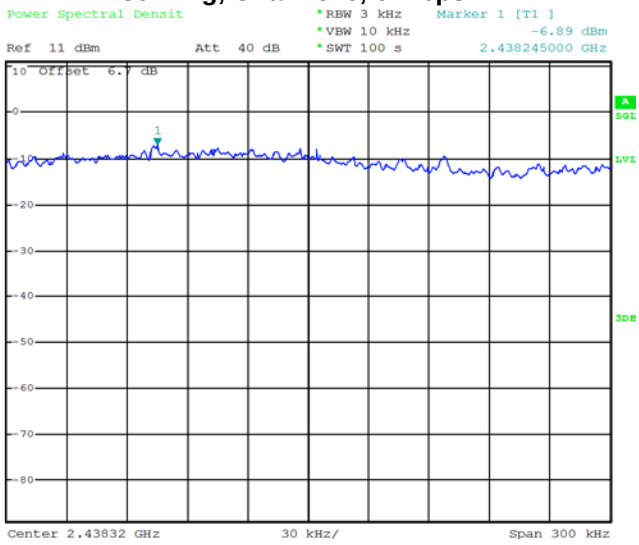
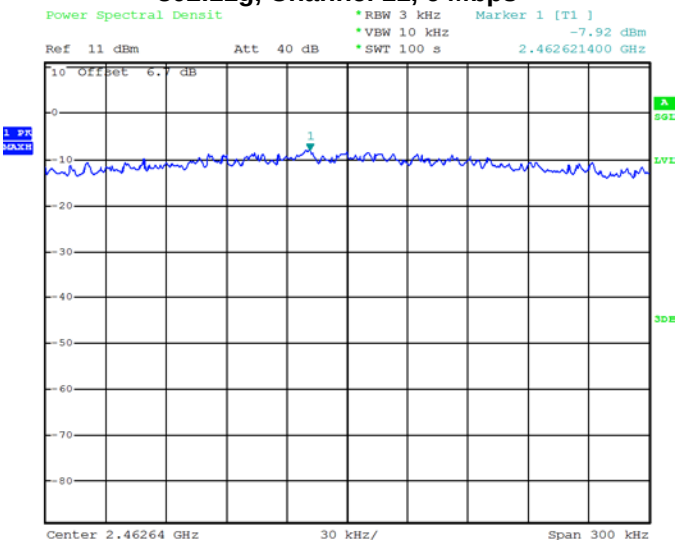


Figure 3-21: Peak Power Spectral Density
802.11g, Channel 11, 6 Mbps



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

Figure 3-22: Peak Power Spectral Density
802.11n, Channel 1, MCS 0

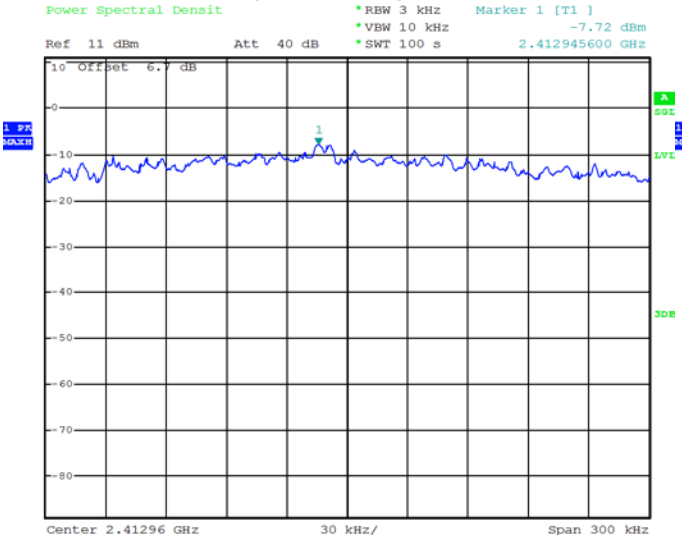


Figure 3-23: Peak Power Spectral Density
802.11n, Channel 6, MCS 0

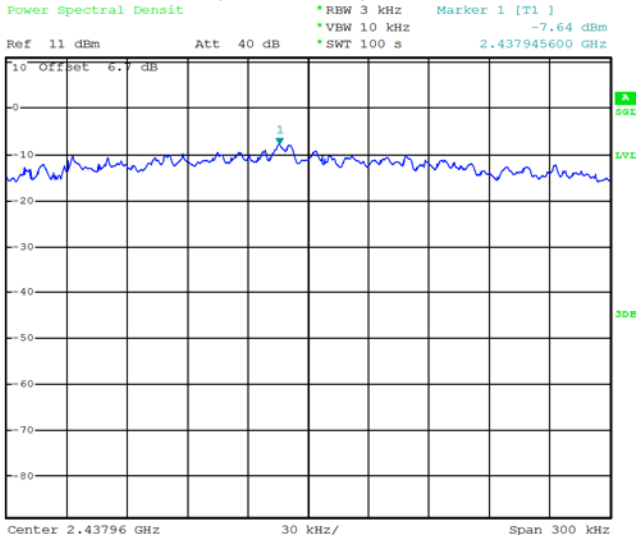
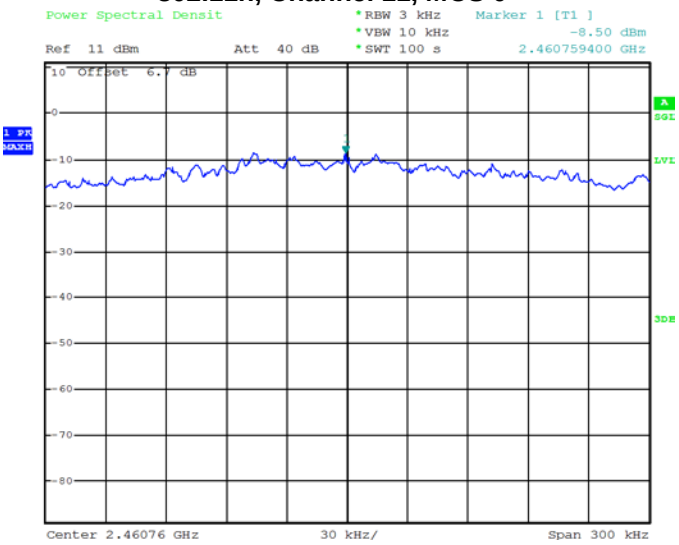


Figure 3-24: Peak Power Spectral Density
802.11n, Channel 11, MCS 0



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

Channel	Data Rate	Power (dBm)	Max. Measured Level (dBm)	Max. Measured Level from Carrier (dBc)	Limit (dBc)
1	1 Mbps	18.08	-35.44	-53.52	-20
	5.5 Mbps	17.97	-37.48	-55.45	-20
	11 Mbps	17.85	-35.43	-53.28	-20
	6 Mbps	17.72	-40.28	-58.00	-20
	24 Mbps	17.18	-40.27	-57.45	-20
	54 Mbps	15.66	-40.88	-56.54	-20
	MCS 0	17.47	-39.97	-57.44	-20
	MCS 4	14.93	-39.31	-54.24	-20
	MCS 7	13.51	-39.19	-52.70	-20
6	1 Mbps	18.47	-35.66	-54.13	-20
	5.5 Mbps	18.45	-37.09	-55.54	-20
	11 Mbps	18.22	-37.45	-55.67	-20
	6 Mbps	18.03	-40.70	-58.73	-20
	24 Mbps	17.60	-38.61	-56.21	-20
	54 Mbps	16.01	-39.00	-55.01	-20
	MCS 0	18.03	-39.65	-57.68	-20
	MCS 4	15.30	-40.89	-56.19	-20
	MCS 7	13.98	-39.00	-52.98	-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	18.18	-40.08	-58.26	-20
	5.5 Mbps	18.06	-38.29	-56.35	-20
	11 Mbps	17.98	-38.86	-56.84	-20
	6 Mbps	17.79	-39.73	-57.52	-20
	24 Mbps	17.23	-38.83	-56.06	-20
	54 Mbps	15.73	-40.65	-56.38	-20
	MCS 0	17.61	-39.87	-57.48	-20
	MCS 4	15.09	-37.38	-52.47	-20
	MCS 7	13.49	-38.98	-52.47	-20

The emissions were in the NF.

See figures 3-25 to 3-33 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 3-25: Spurious Conducted RF Emissions

802.11b, Channel 1, 1 Mbps

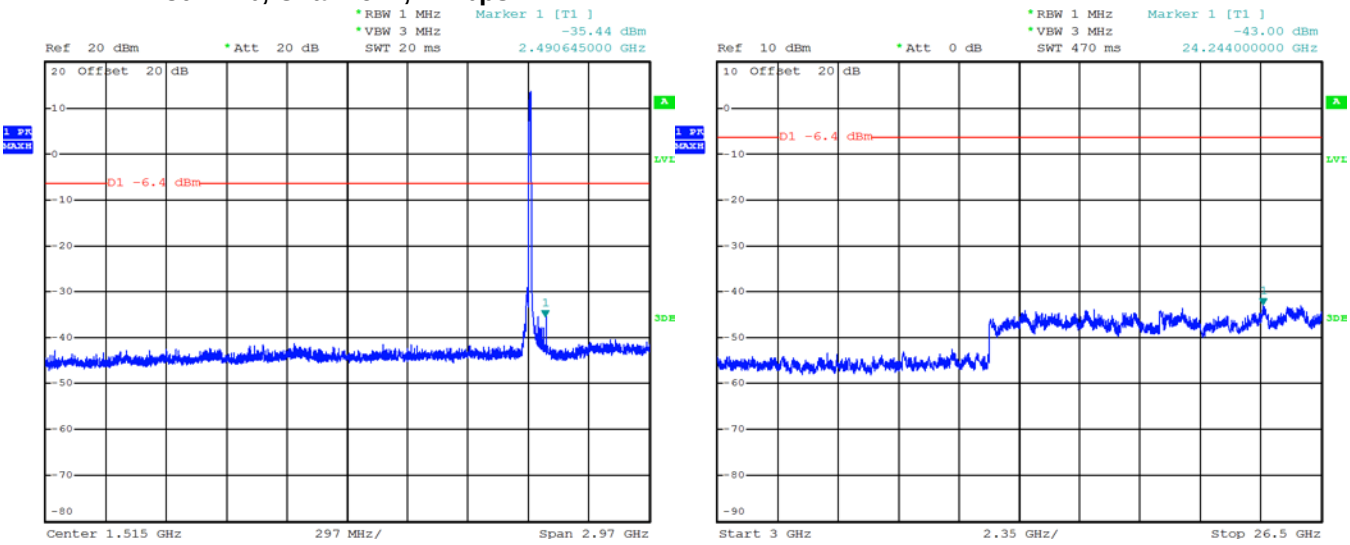
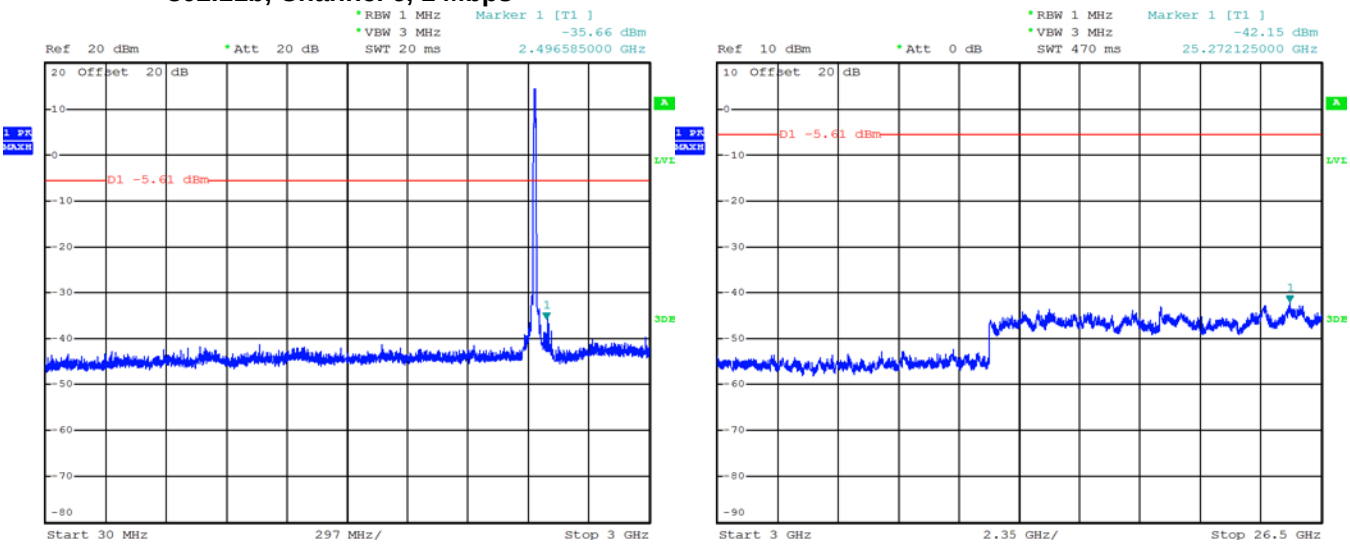


Figure 3-26 : Spurious Conducted RF Emissions

802.11b, Channel 6, 1 Mbps



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

Figure 3-27: Spurious Conducted RF Emissions
802.11b, Channel 11, 1 Mbps

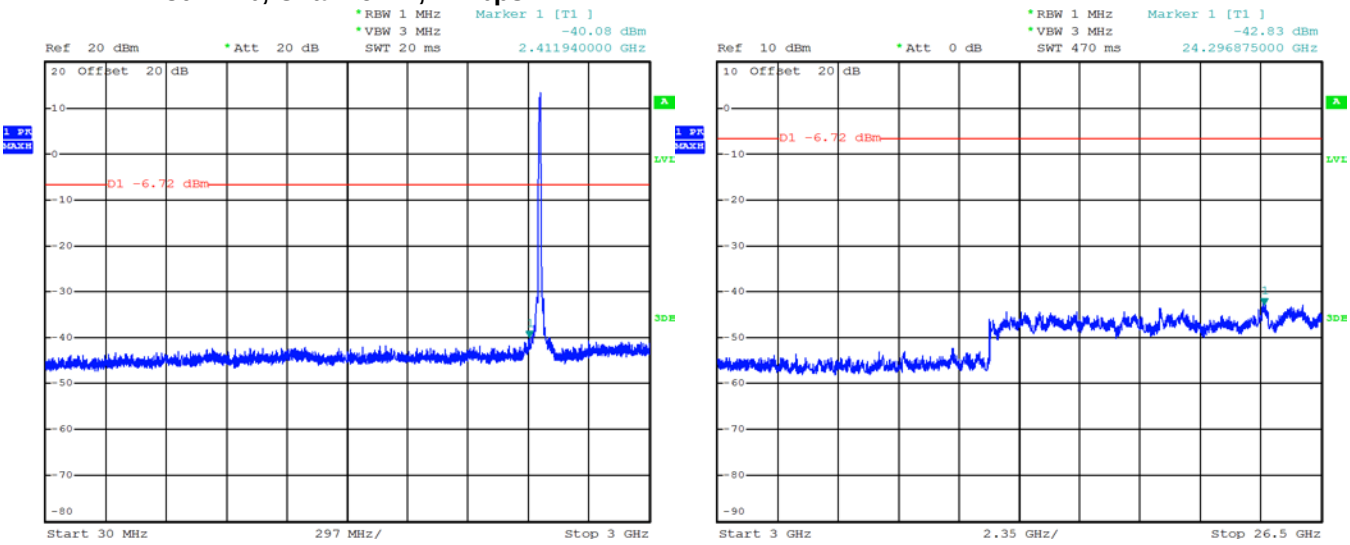
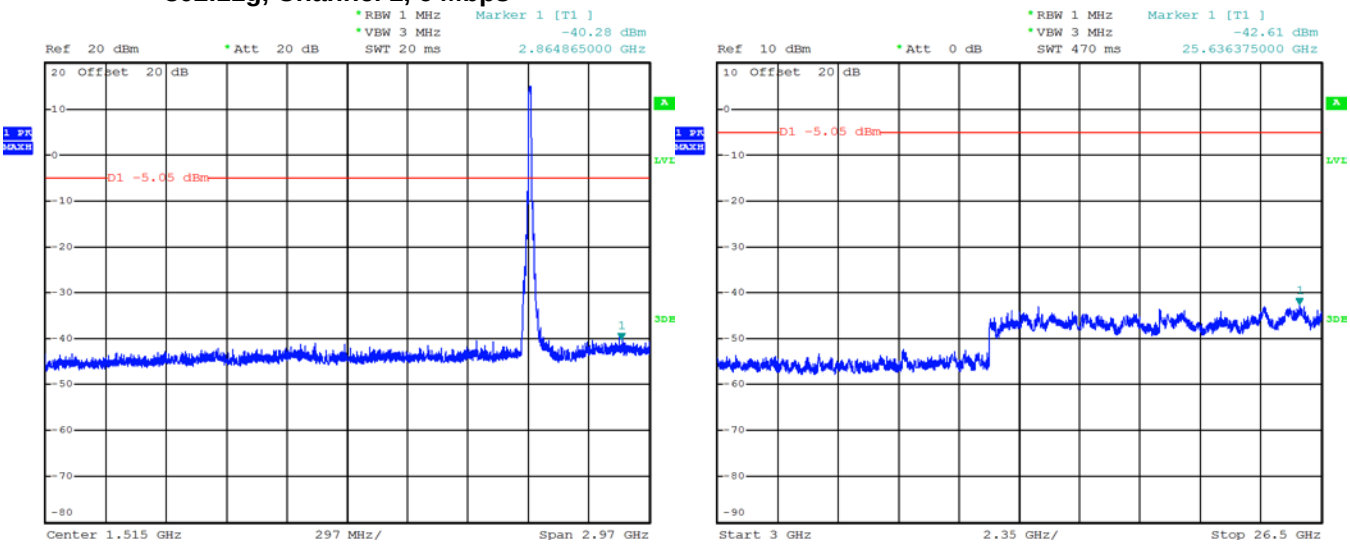


Figure 3-28: Spurious Conducted RF Emissions
802.11g, Channel 1, 6 Mbps



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

Figure 3-29: Spurious Conducted RF Emissions
802.11g, Channel 6, 6 Mbps

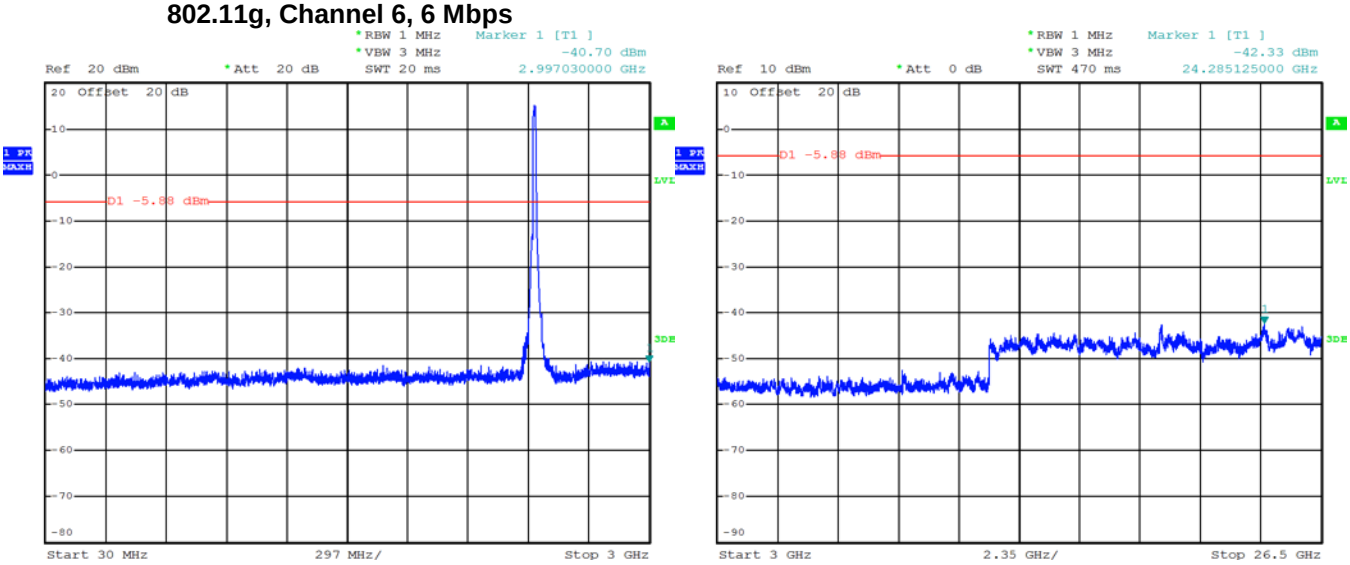
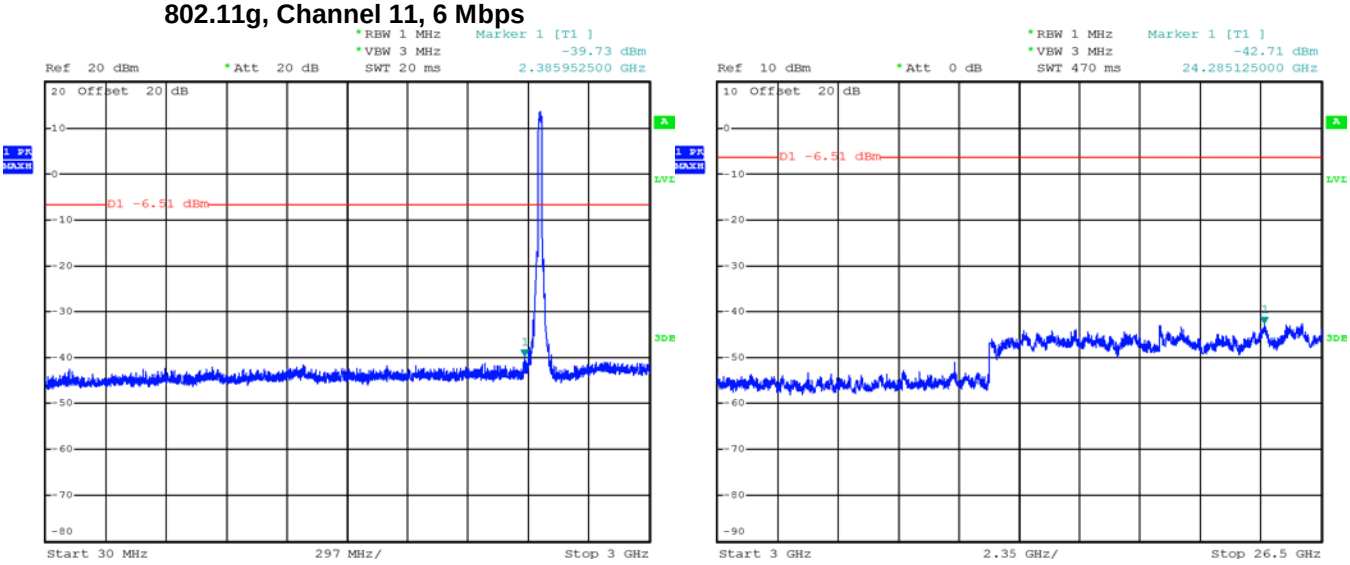


Figure 3-30: Spurious Conducted RF Emissions
802.11g, Channel 11, 6 Mbps



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

Figure 3-31: Spurious Conducted RF Emissions
802.11n, Channel 1, MCS 0

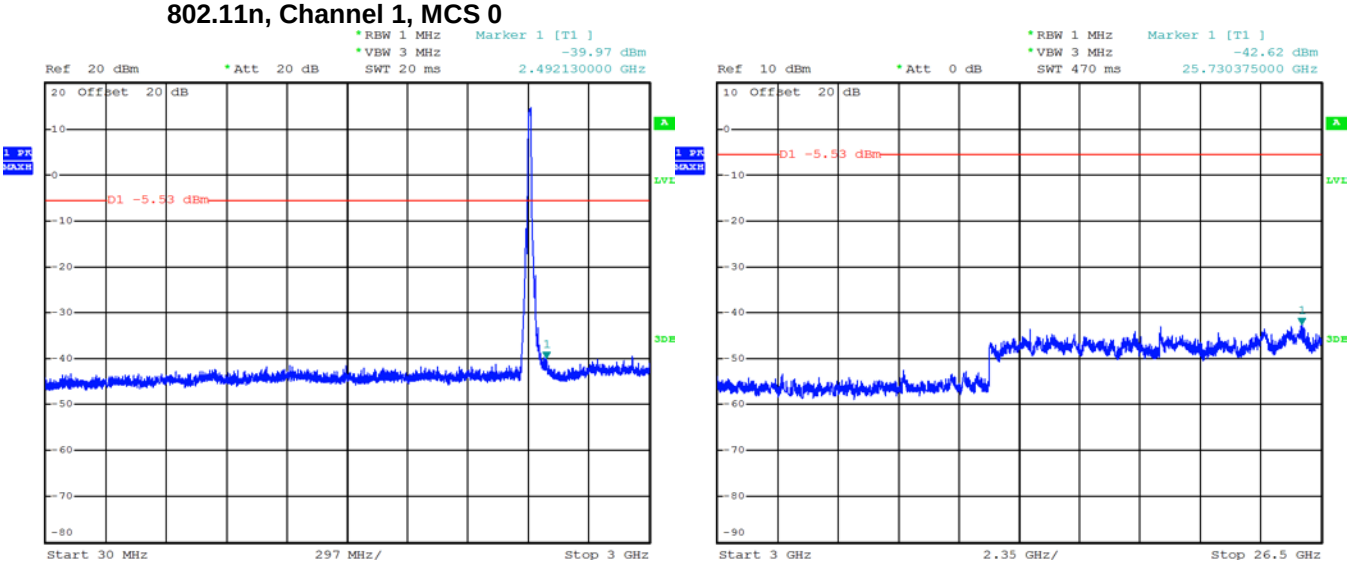
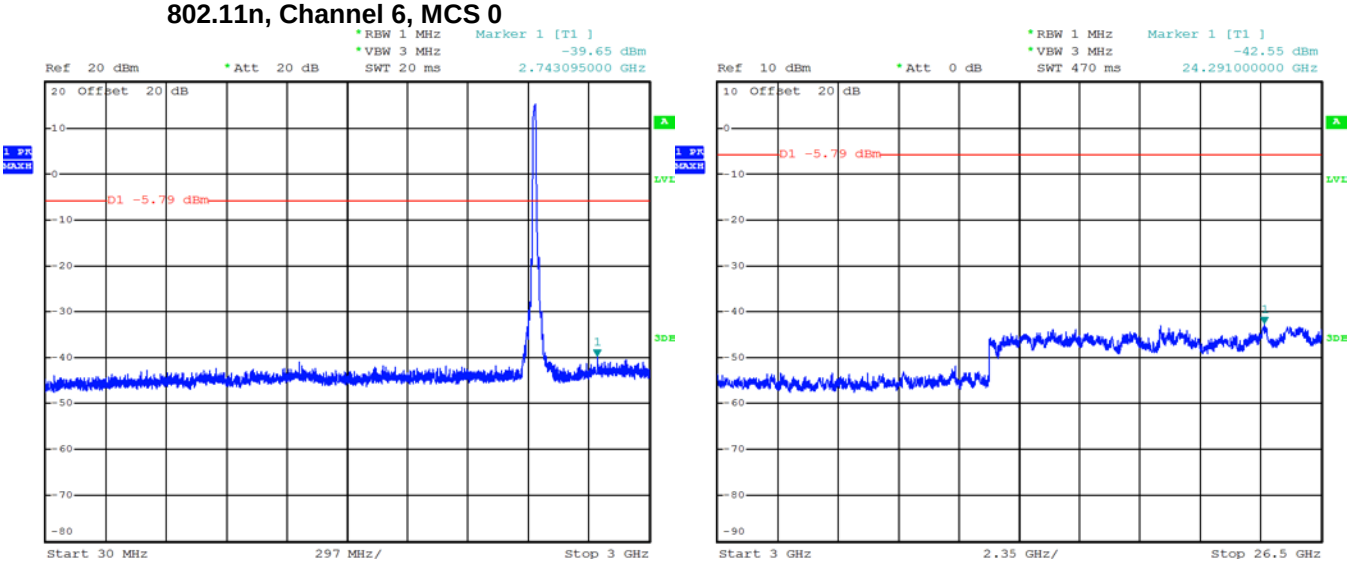
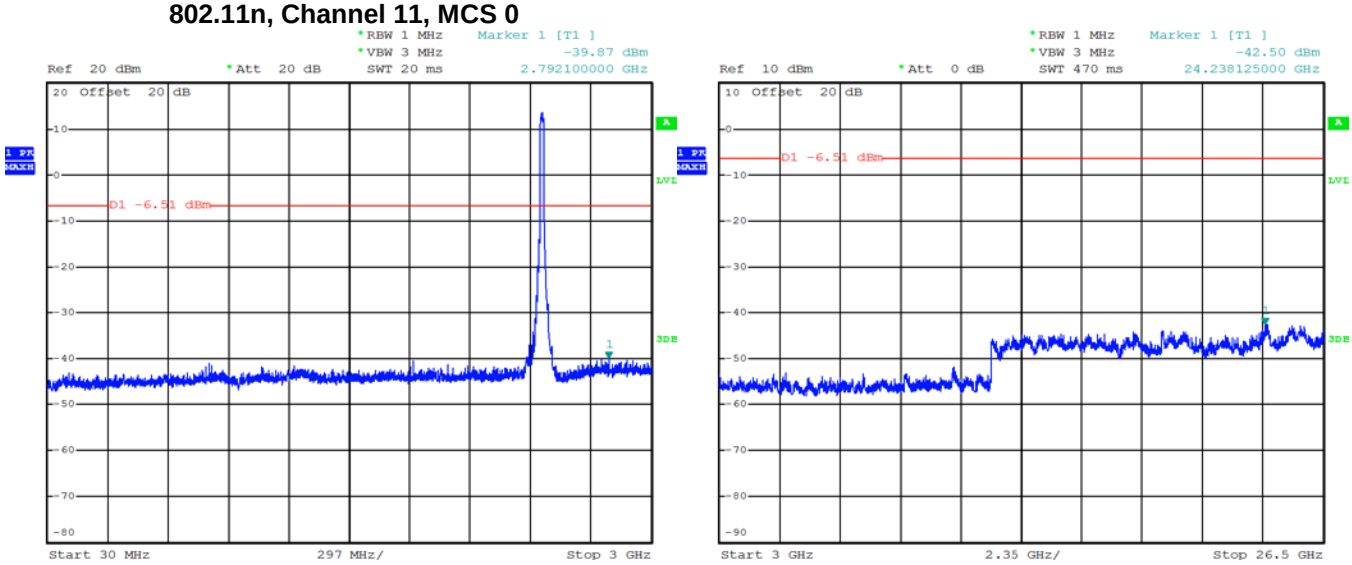


Figure 3-32: Spurious Conducted RF Emissions
802.11n, Channel 6, MCS 0



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

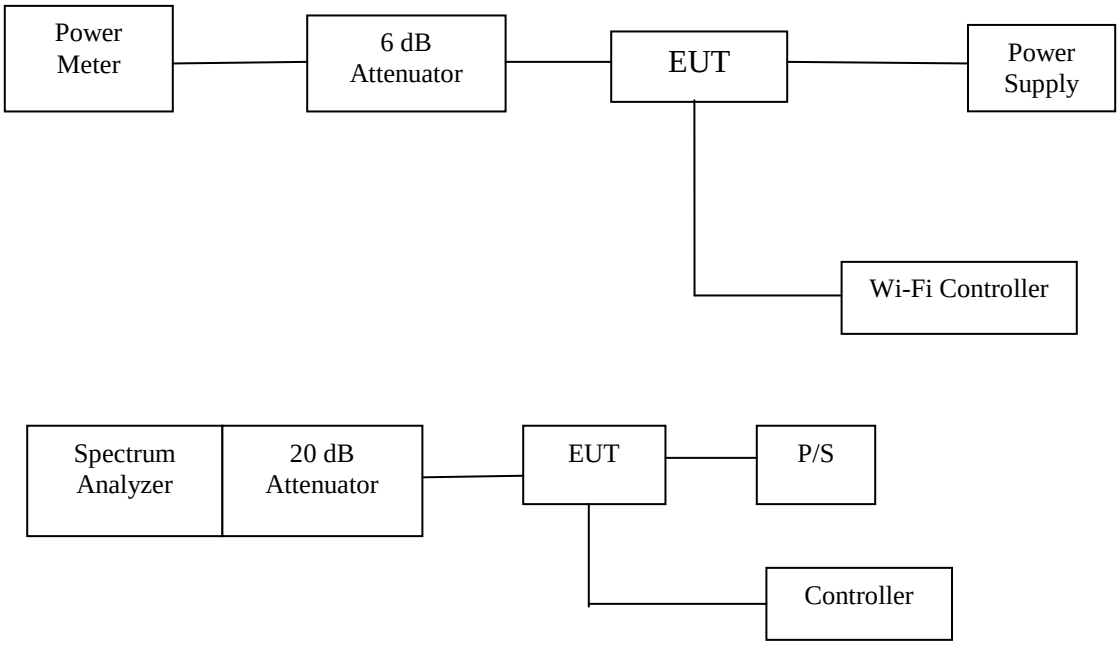
Figure 3-33: Spurious Conducted RF Emissions
802.11n, Channel 11, MCS 0



APPENDIX 5 – 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: July 26 - 29, 2013
The measurements were performed by Berkin Can and Chuan Pao Tran.

The environmental test conditions were:	Temperature:	22.6 - 25.4 ºC
	Relative Humidity:	23.9 - 36 %

802.11a RF Conducted Emission Test Results cont'd

The following tests were performed on model RFW121LW.

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	15.12
	24 Mbps	≥ 500	**16.38**
	54 Mbps	≥ 500	**16.38**
48	6 Mbps	≥ 500	15.44
	24 Mbps	≥ 500	16.04
	54 Mbps	≥ 500	16.36
64	6 Mbps	≥ 500	15.14
	24 Mbps	≥ 500	15.44
	54 Mbps	≥ 500	15.14
100	6 Mbps	≥ 500	15.12
	24 Mbps	≥ 500	15.14
	54 Mbps	≥ 500	15.16
140	6 Mbps	≥ 500	15.16
	24 Mbps	≥ 500	15.16
	54 Mbps	≥ 500	15.14
165	6 Mbps	≥ 500	15.36
	24 Mbps	≥ 500	16.00
	54 Mbps	≥ 500	16.36

See figures 6-1 to 6-6 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). Channels 36, 64 and 165 were measured at MCS 0, MCS 4 an MCS 7 each for 802.11n mode.

Channel	Data Rate	Limit (kHz)	Measured Level (MHz)
36	MCS0	≥ 500	**15.14**
	MCS4	≥ 500	15.12
	MCS7	≥ 500	**15.14**
64	MCS0	≥ 500	**15.14**
	MCS4	≥ 500	15.12
	MCS7	≥ 500	**15.14**
165	MCS0	≥ 500	15.12
	MCS4	≥ 500	15.12
	MCS7	≥ 500	**15.14**

See figures 6-7 to 6-9 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 5-1: 6 dB Bandwidth
802.11a, Channel 36, 6 Mbps

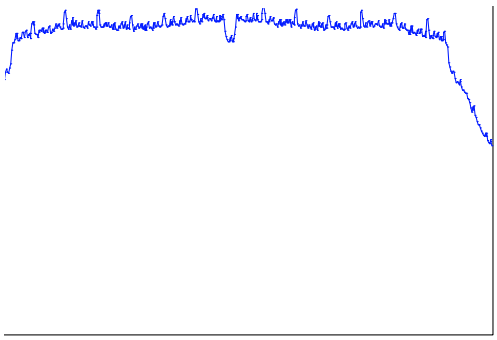


Figure 5-2: 6 dB Bandwidth
802.11a, Channel 48, 6 Mbps

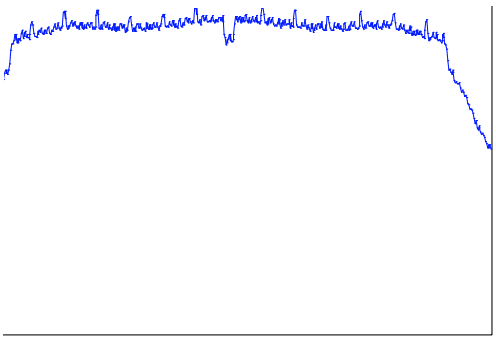


Figure 5-3: 6 dB Bandwidth
802.11a, Channel 64, 6 Mbps

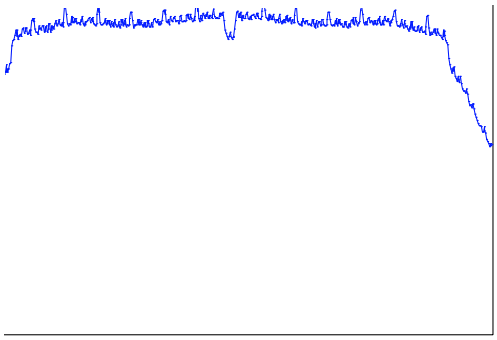
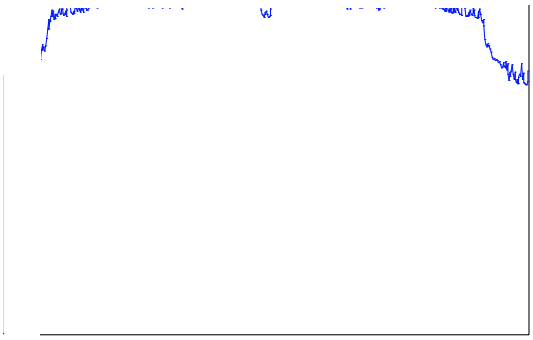


Figure 5-4: 6 dB Bandwidth
802.11a, Channel 100, 6 Mbps



802.11a RF Conducted Emission Test Results cont'd

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

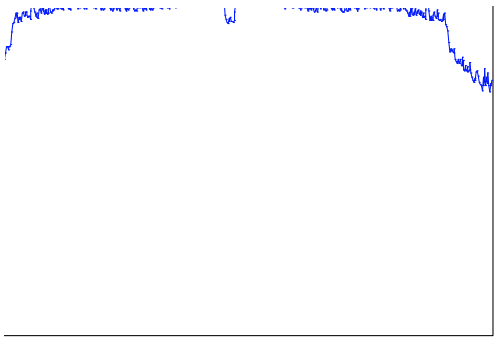
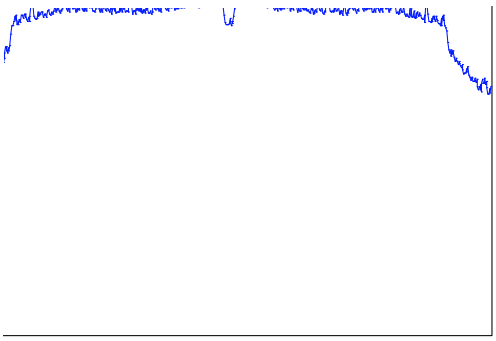
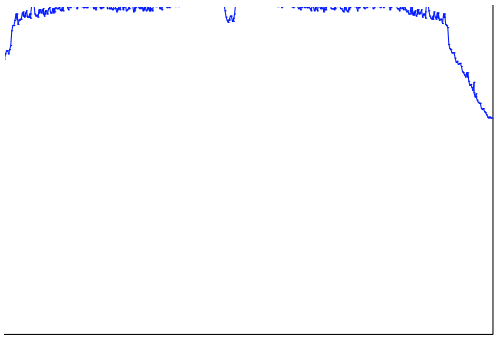


Figure 5-6: 6 dB Bandwidth
802.11a, Channel 165, 6 Mbps



802.11n RF Conducted Emission Test Results

Figure 5-7: 6 dB Bandwidth
802.11n, Channel 36, MCS 0

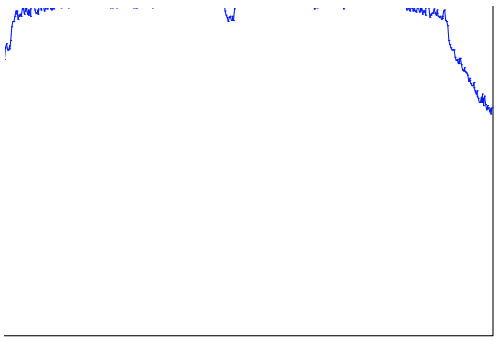


Date: 30.JUL.2013 09:48:20

Figure 5-8: 6 dB Bandwidth
802.11n, Channel 100, MCS 0

Date: 30.JUL.2013 09:55:11

Figure 5-9: 6 dB Bandwidth
802.11n, Channel 165, MCS 0



Date: 30.JUL.2013 09:56:50

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. Channels 36, 48, 52, 60, 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	**17.11**	**0.0514**
	24 Mbps	< 50.0	16.72	0.0470
	54 Mbps	< 50.0	16.15	0.0412
48	6 Mbps	< 50.0	16.98	0.0499
	24 Mbps	< 50.0	16.51	0.0448
	54 Mbps	< 50.0	16.00	0.0398
64	6 Mbps	< 250.0	16.71	0.0469
	24 Mbps	< 250.0	16.31	0.0428
	54 Mbps	< 250.0	15.74	0.0375
100	6 Mbps	< 250.0	16.66	0.0464
	24 Mbps	< 250.0	16.26	0.0423
	54 Mbps	< 250.0	15.73	0.0374
140	6 Mbps	< 250.0	16.35	0.0431
	24 Mbps	< 250.0	15.90	0.0389
	54 Mbps	< 250.0	15.34	0.0342
165	6 Mbps	< 1000	16.21	0.0418
	24 Mbps	< 1000	15.84	0.0383
	54 Mbps	< 1000	15.26	0.0336

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. Channels 36, 48, 52, 60, 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.

Channel	Data Rate	Class 2 Limit (mW)	Measured Level (dBm)	Measured Level (mW)
36	6 Mbps	< 50.0	17.16	0.0520
	24 Mbps	< 50.0	13.01	0.0200
	54 Mbps	< 50.0	11.60	0.0145
48	6 Mbps	< 50.0	17.11	0.0515
	24 Mbps	< 50.0	12.84	0.0192
	54 Mbps	< 50.0	11.52	0.0142
64	6 Mbps	< 250.0	**18.52**	0.0710
	24 Mbps	< 250.0	17.87	0.0612
	54 Mbps	< 250.0	17.60	0.0576
100	6 Mbps	< 250.0	17.73	0.0593
	24 Mbps	< 250.0	17.19	0.0524
	54 Mbps	< 250.0	16.84	0.0483
140	6 Mbps	< 250.0	15.12	0.0325
	24 Mbps	< 250.0	13.55	0.0226
	54 Mbps	< 250.0	12.02	0.0159
165	6 Mbps	< 1000	12.15	0.0164
	24 Mbps	< 1000	12.17	0.0165
	54 Mbps	< 1000	12.15	0.0164

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. Channels 36, 64, 100, 149, 161 and 165 were measured at 6 Mbps, 24 Mbps, and 54 Mbps each for 802.11a mode.

Channel	Data Rate	Limit (dBc)	Measured Level (dBc)	Margin (dBc)
36	6 Mbps	< -20	-35.27	-15.27
	24 Mbps	< -20	-34.93	-14.93
	54 Mbps	< -20	-36.04	-16.04
64	6 Mbps	< -20	-36.40	-16.40
	24 Mbps	< -20	-35.52	-15.52
	54 Mbps	< -20	-37.10	-17.10
100	6 Mbps	< -20	-37.42	-17.42
	24 Mbps	< -20	-38.25	-18.25
	54 Mbps	< -20	-38.07	-18.07
140	6 Mbps	< -20	-37.75	-17.75
	24 Mbps	< -20	-37.88	-17.88
	54 Mbps	< -20	-37.35	-17.35
149	6 Mbps	< -20	-37.57	-17.57
	24 Mbps	< -20	-37.61	-17.61
	54 Mbps	< -20	-37.80	-17.80
165	6 Mbps	< -20	-36.37	-16.37
	24 Mbps	< -20	-38.18	-18.18
	54 Mbps	< -20	-38.54	-18.54

See figures 6-10 to 6-15 for the plots of the band edge compliance measurements for Channel 36, 64, 100, 149, 161 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. Channels 36, 64 and 165 were measured at MCS 0, MCS 4 and MCS 7 each for 802.11n mode.

Channel	Data Rate	Limit (dBc)	Measured Level (dBc)	Margin (dBc)
36	MCS0	< -20	-35.27	-15.27
	MCS4	< -20	-34.93	-14.93
	MCS7	< -20	-36.04	-16.04
64	MCS0	< -20	-36.40	-16.40
	MCS4	< -20	-35.52	-15.52
	MCS7	< -20	-37.10	-17.10
100	MCS0	< -20	-37.42	-17.42
	MCS4	< -20	-38.25	-18.25
	MCS7	< -20	-38.07	-18.07
140	MCS0	< -20	-37.75	-17.75
	MCS4	< -20	-37.88	-17.88
	MCS7	< -20	-37.35	-17.35
149	MCS0	< -20	-37.57	-17.57
	MCS4	< -20	-37.61	-17.61
	MCS7	< -20	-37.80	-17.80
165	MCS0	< -20	-36.37	-16.37
	MCS4	< -20	-38.18	-18.18
	MCS7	< -20	-38.54	-18.54

See figures 5-16 to 5-21 for the plots of the band edge compliance measurements for Channel 36, 64, 100, 149, 161 and 165 at MCS 0 each for 802.11n mode.

802.11a RF Conducted Emission Test Results cont'd

Figure 5-10: Band Edge Compliance
802.11a, Channel 36, 6 Mbps

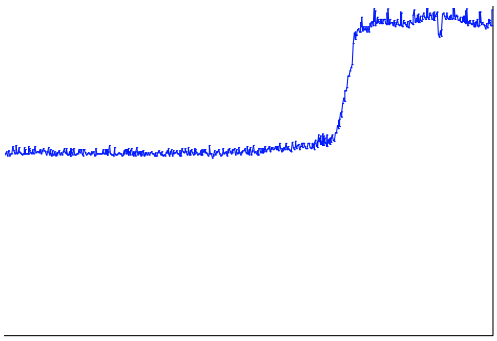


Figure 5-11: Band Edge Compliance
802.11a, Channel 64, 6 Mbps

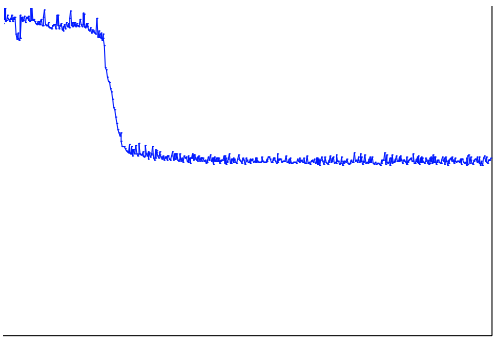


Figure 5-12: Band Edge Compliance
802.11a, Channel 100, 6 Mbps

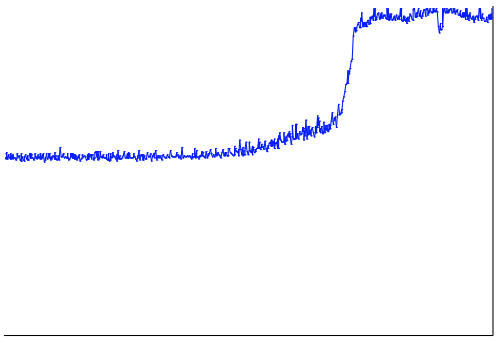
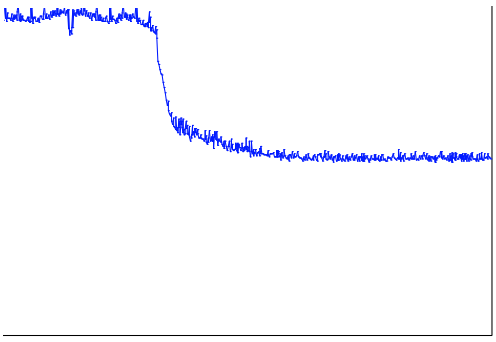


Figure 5-13: Band Edge Compliance
802.11a, Channel 140, 6 Mbps



802.11a RF Conducted Emission Test Results cont'd

Figure 5-14: Band Edge Compliance
802.11a, Channel 149, 6 Mbps

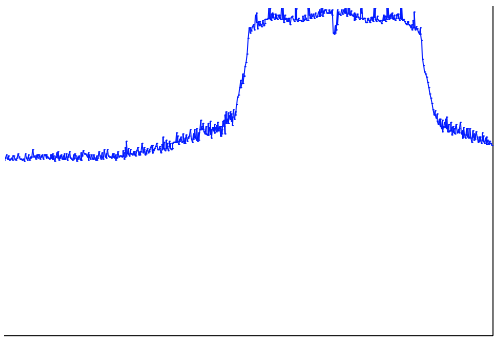
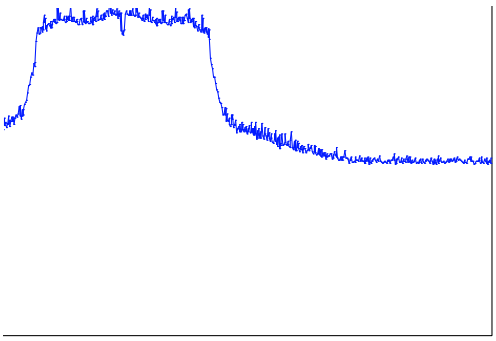


Figure 5-15: Band Edge Compliance
802.11a, Channel 165, 6 Mbps



802.11n RF Conducted Emission Test Results

Figure 5-16: Band Edge Compliance
802.11n, Channel 36, 6 Mbps

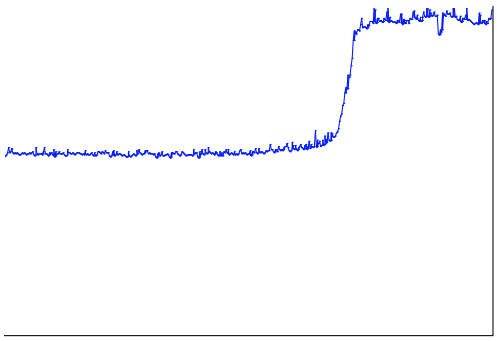


Figure 5-17: Band Edge Compliance
802.11n, Channel 64, 6 Mbps

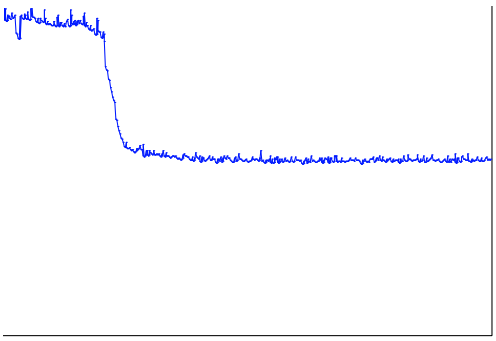


Figure 5-18: Band Edge Compliance
802.11n, Channel 100, 6 Mbps

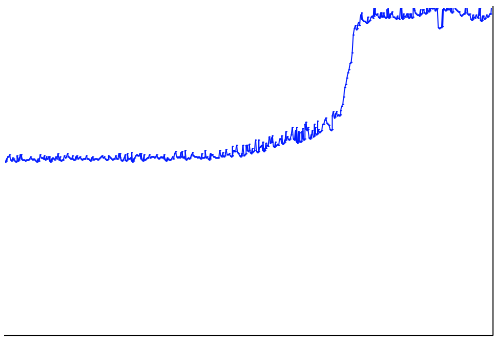
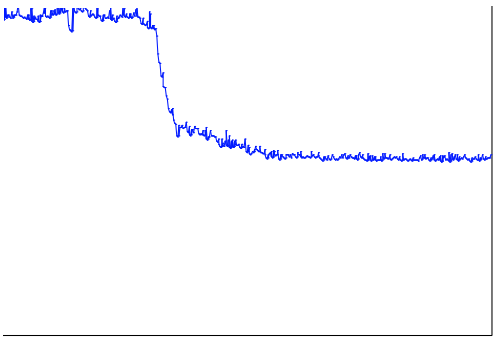


Figure 5-19: Band Edge Compliance
802.11n, Channel 140, 6 Mbps



802.11n RF Conducted Emission Test Results cont'd

Figure 5-20: Band Edge Compliance
802.11n, Channel 149, 6 Mbps

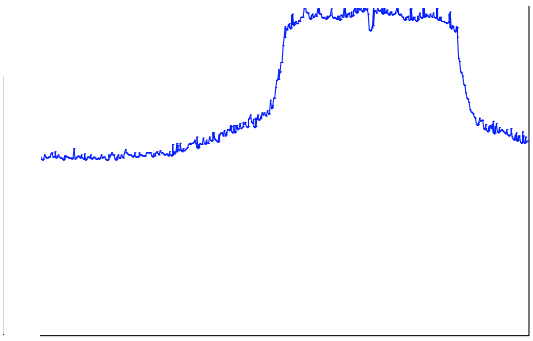
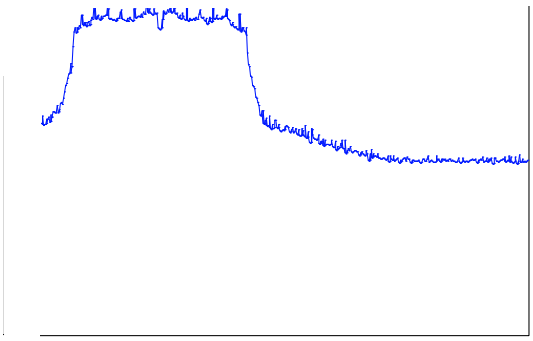


Figure 5-21: Band Edge Compliance
802.11n, Channel 165, 6 Mbps



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 15.407/15.247. 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	< 4.00	2.47	-1.53
	24 Mbps	< 4.00	2.08	-1.92
	54 Mbps	< 4.00	1.51	-2.49
48	6 Mbps	< 4.00	2.01	-1.99
	24 Mbps	< 4.00	1.63	-2.37
	54 Mbps	< 4.00	1.11	-2.89
64	6 Mbps	< 11.00	1.60	-9.40
	24 Mbps	< 11.00	1.58	-9.42
	54 Mbps	< 11.00	1.57	-9.43
100	6 Mbps	< 11.00	3.26	-7.74
	24 Mbps	< 11.00	3.31	-7.69
	54 Mbps	< 11.00	3.32	-7.68
140	6 Mbps	< 11.00	1.97	-9.03
	24 Mbps	< 11.00	2.08	-8.92
	54 Mbps	< 11.00	2.06	-8.94
165	6 Mbps	< 17.00	-9.40	-26.40
	24 Mbps	< 17.00	-12.75	-29.75
	54 Mbps	< 17.00	-15.05	-32.05

See figures 6-22 to 6-27 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 15.407/15.247. Channels 36, 64 and 165 were measured at MCS 0, MCS 4 and MCS 7 each for 802.11n mode.

Channel	Data Rate	Limit (dBm)	Measured Level (dBm)	Margin (dBm)
36	6 Mbps	< 4.00	1.52	-2.48
	24 Mbps	< 4.00	1.53	-2.47
	54 Mbps	< 4.00	1.54	-2.46
64	6 Mbps	< 11.00	1.64	-9.40
	24 Mbps	< 11.00	1.61	-9.42
	54 Mbps	< 11.00	1.61	-9.43
165	6 Mbps	< 17.00	-13.61	-30.61
	24 Mbps	< 17.00	-12.37	-29.37
	54 Mbps	< 17.00	-13.24	-30.24

See figures 5-28 to 5-30 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 5-22: Peak Power Spectral Density
802.11a, Channel 36, 6 Mbps

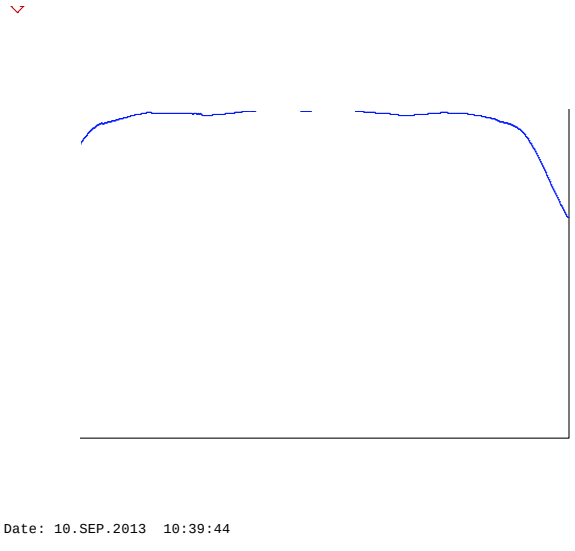


Figure 5-23: Peak Power Spectral Density
802.11a, Channel 48, 6 Mbps

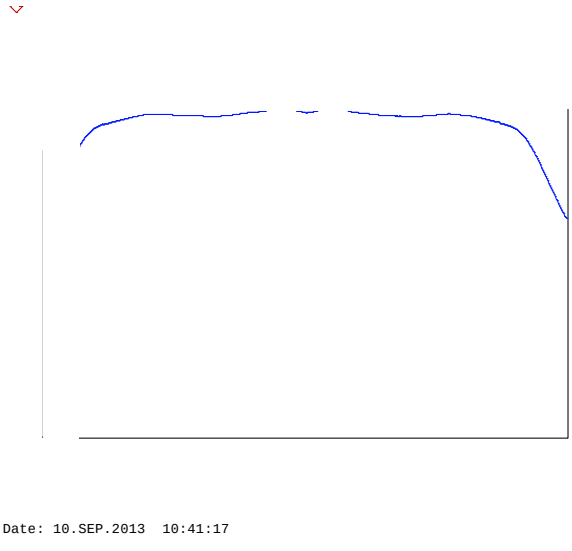


Figure 5-24: Peak Power Spectral Density
802.11a, Channel 64, 6 Mbps

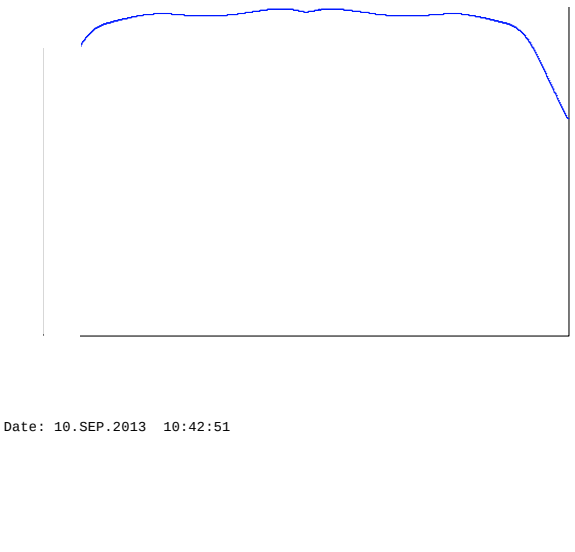
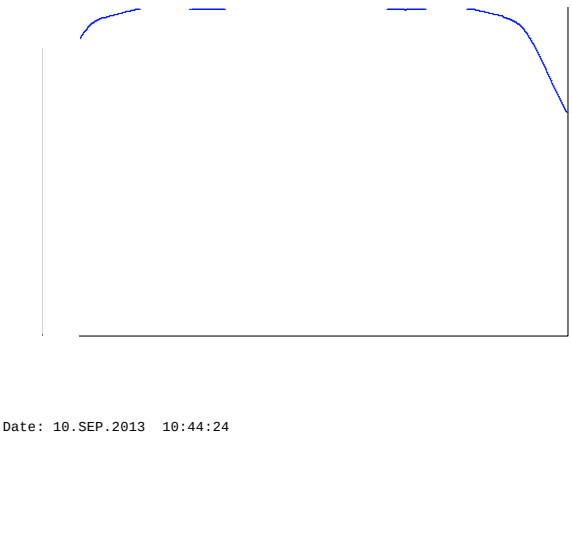
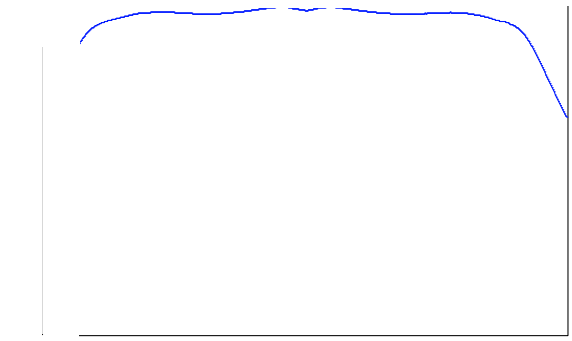


Figure 5-25: Peak Power Spectral Density
802.11a, Channel 100, 6 Mbps



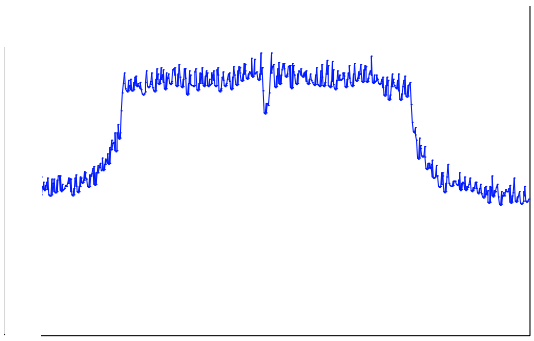
802.11a RF Conducted Emission Test Results cont'd

Figure 5-26: Peak Power Spectral Density 802.11a, Channel 140, 6 Mbps



Date: 10.SEP.2013 10:45:58

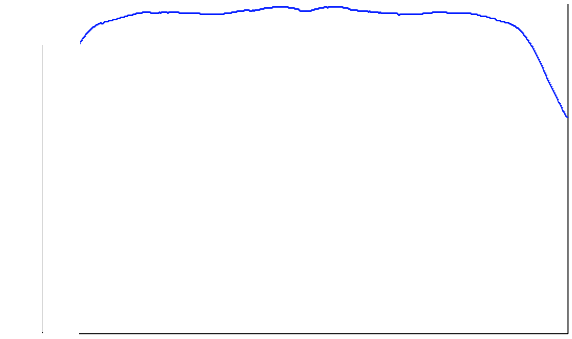
Figure 5-27: Peak Power Spectral Density 802.11a, Channel 165, 6 Mbps



Date: 10.SEP.2013 12:29:07

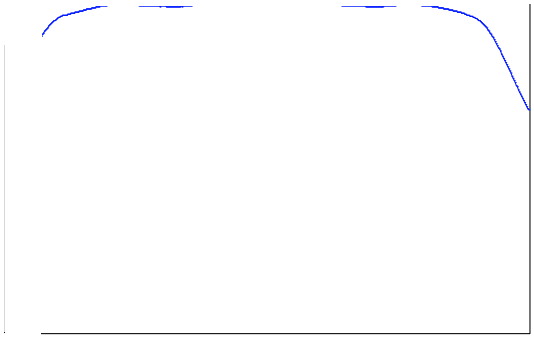
802.11n RF Conducted Emission Test Results

Figure 5-28: Peak Power Spectral Density
802.11n, Channel 36, MCS 0



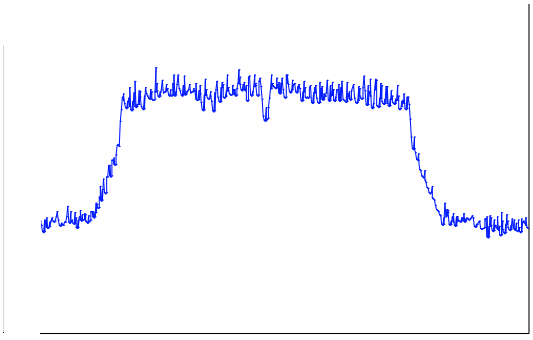
Date: 10.SEP.2013 10:40:31

Figure 5-29: Peak Power Spectral Density
802.11n, Channel 64, MCS 0



Date: 10.SEP.2013 10:45:11

Figure 5-30: Peak Power Spectral Density
802.11n, Channel 165, MCS 0



Date: 10.SEP.2013 12:29:28

802.11a RF Conducted Emission Test Results cont'd

Spurious RF Conducted Emissions

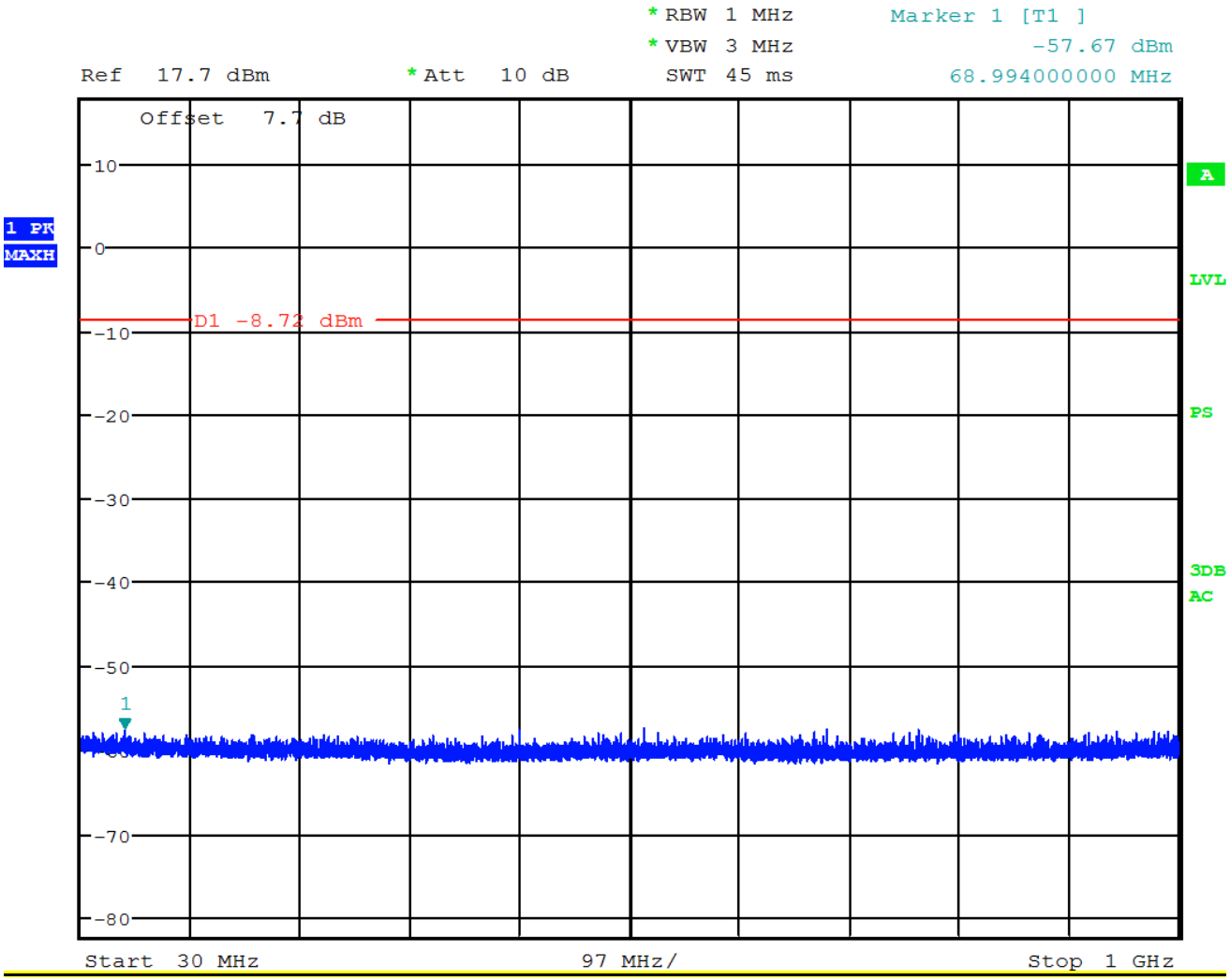
The EUT met the requirements of the spurious RF conducted emissions as per 47 CFR 15.407. Channels 44, 60, and 157 were measured at 6 Mbps each for 802.11a mode. Peak power was measured using an Agilent power meter, model N1911A with model N1921A power sensor. A reference offset of 29.0 dB was applied to the spectrum analyzer reference level for the attenuators and coaxial cable loss in the test circuit.

Channel	Data Rate	Power (dBm)	Max. Measured Level (dBm)	Max. Measured Level from Carrier (dBc)	Limit (dBc)
36	6 Mbps	17.11	-43.66	-60.77	-20
	24 Mbps	16.72	-43.71	-60.43	-20
	54 Mbps	16.15	-42.87	-59.02	-20
64	6 Mbps	16.71	-46.01	-62.72	-20
	24 Mbps	16.31	-46.28	-62.59	-20
	54 Mbps	15.74	-46.54	-62.28	-20
100	6 Mbps	16.66	-44.24	-60.90	-20
	24 Mbps	16.26	-43.63	-59.89	-20
	54 Mbps	15.73	-44.52	-60.25	-20
140	6 Mbps	16.35	-37.52	-53.87	-20
	24 Mbps	15.90	-37.04	-52.94	-20
	54 Mbps	15.34	-37.35	-52.69	-20

See figures 5-31 to 5-34 for the plots of the spurious RF conducted emissions for Channel 64, 60 and 157 at 6 Mbps each for 802.11a mode.

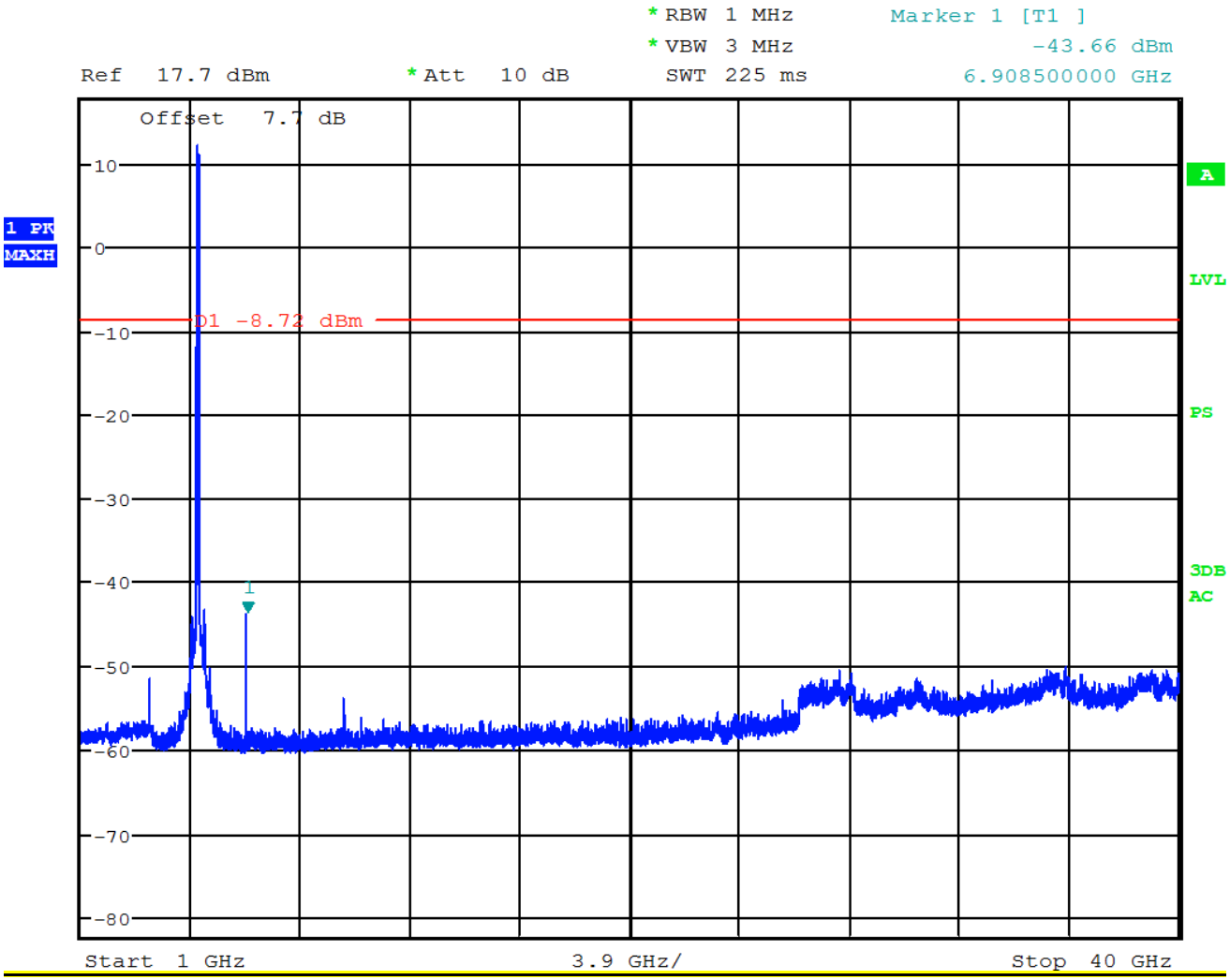
802.11a RF Conducted Emission Test Results cont'd

Figure 5-31a: Spurious RF Conducted Emissions, 802.11a Channel 36, 6 Mbps



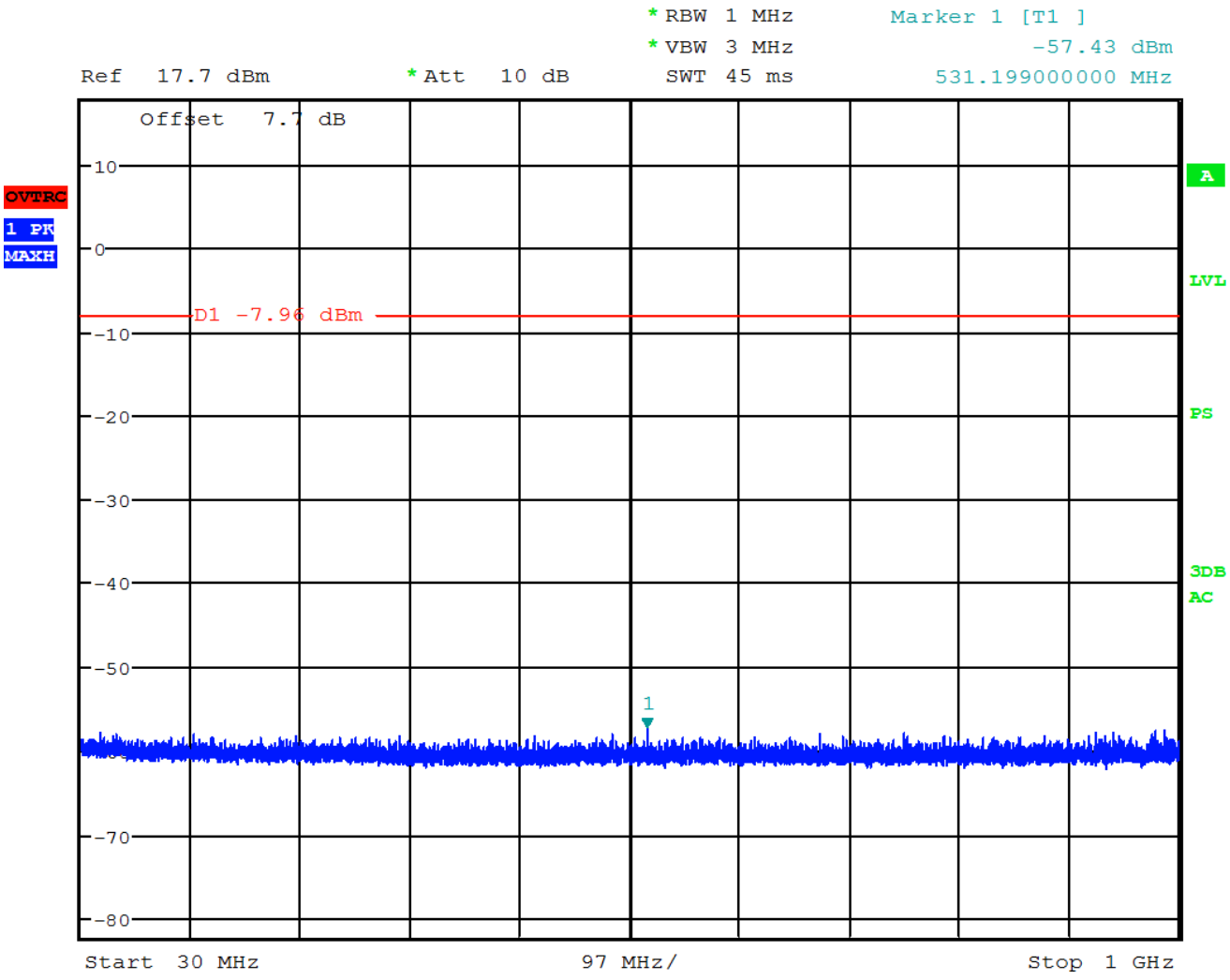
802.11a RF Conducted Emission Test Results cont'd

Figure 5-31b: Spurious RF Conducted Emissions, 802.11a Channel 36, 6 Mbps



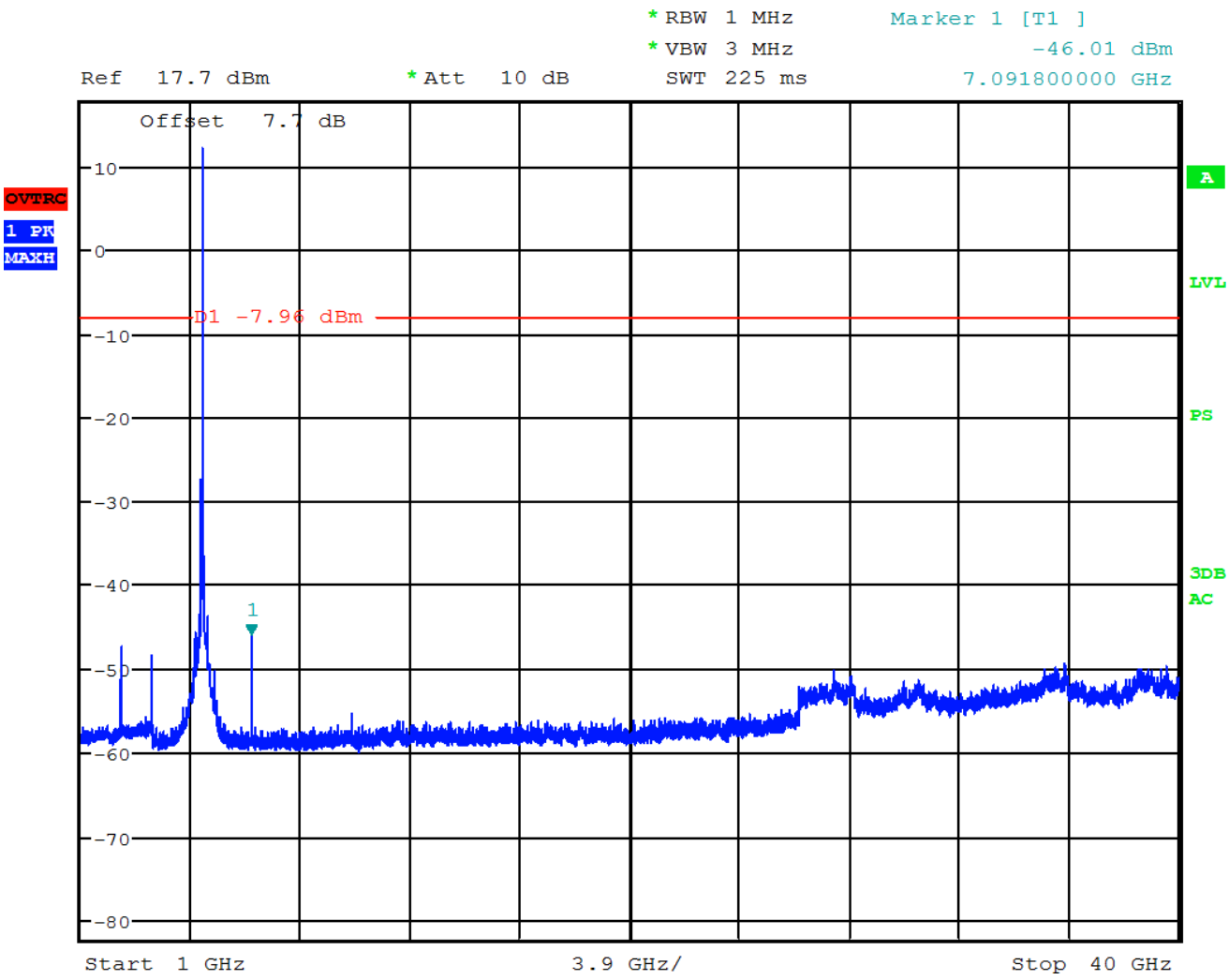
802.11a RF Conducted Emission Test Results cont'd

Figure 5-32a: Spurious RF Conducted Emissions, 802.11a Channel 64, 6 Mbps



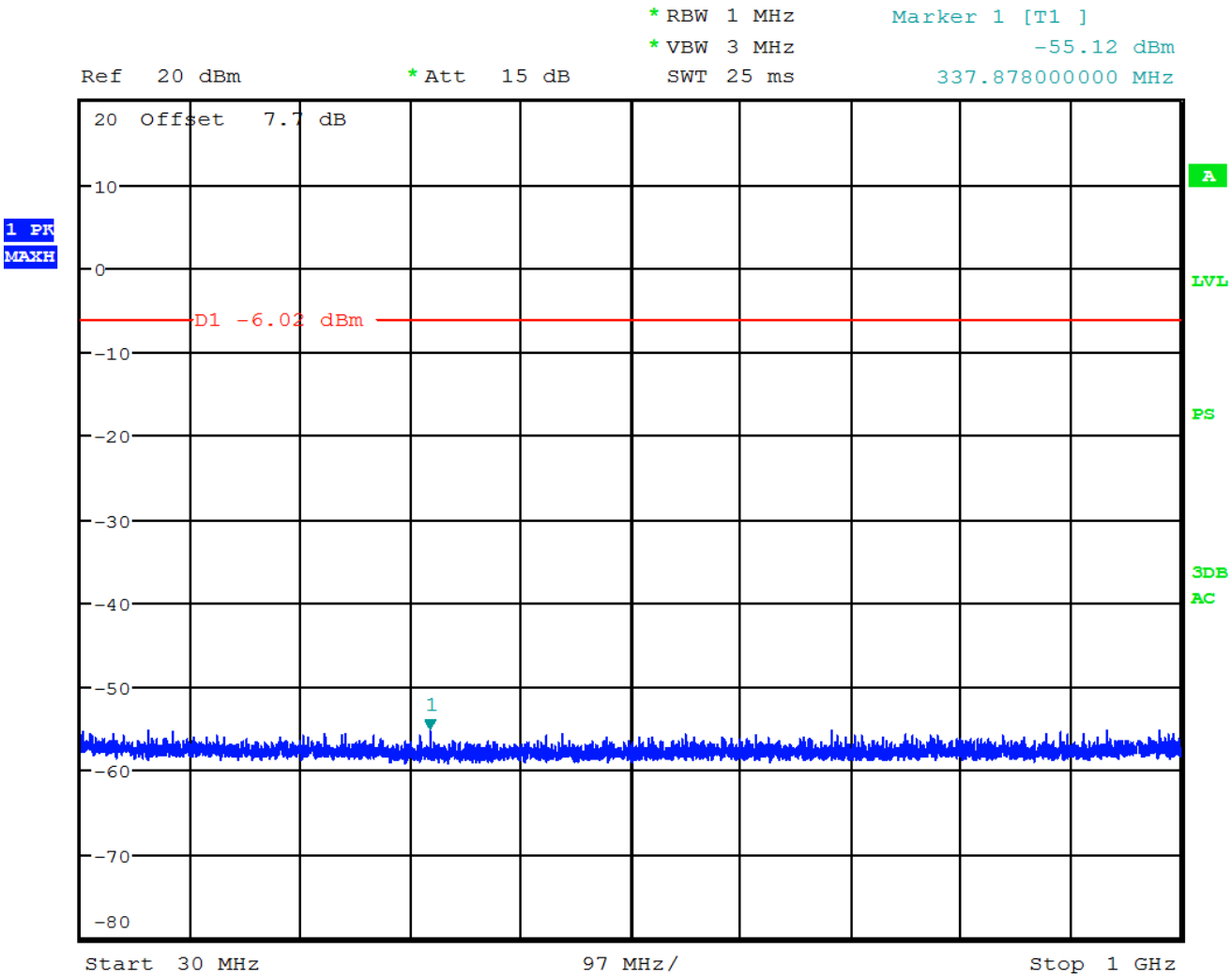
802.11a RF Conducted Emission Test Results cont'd

Figure 5-32b: Spurious RF Conducted Emissions, 802.11a Channel 64, 6 Mbps



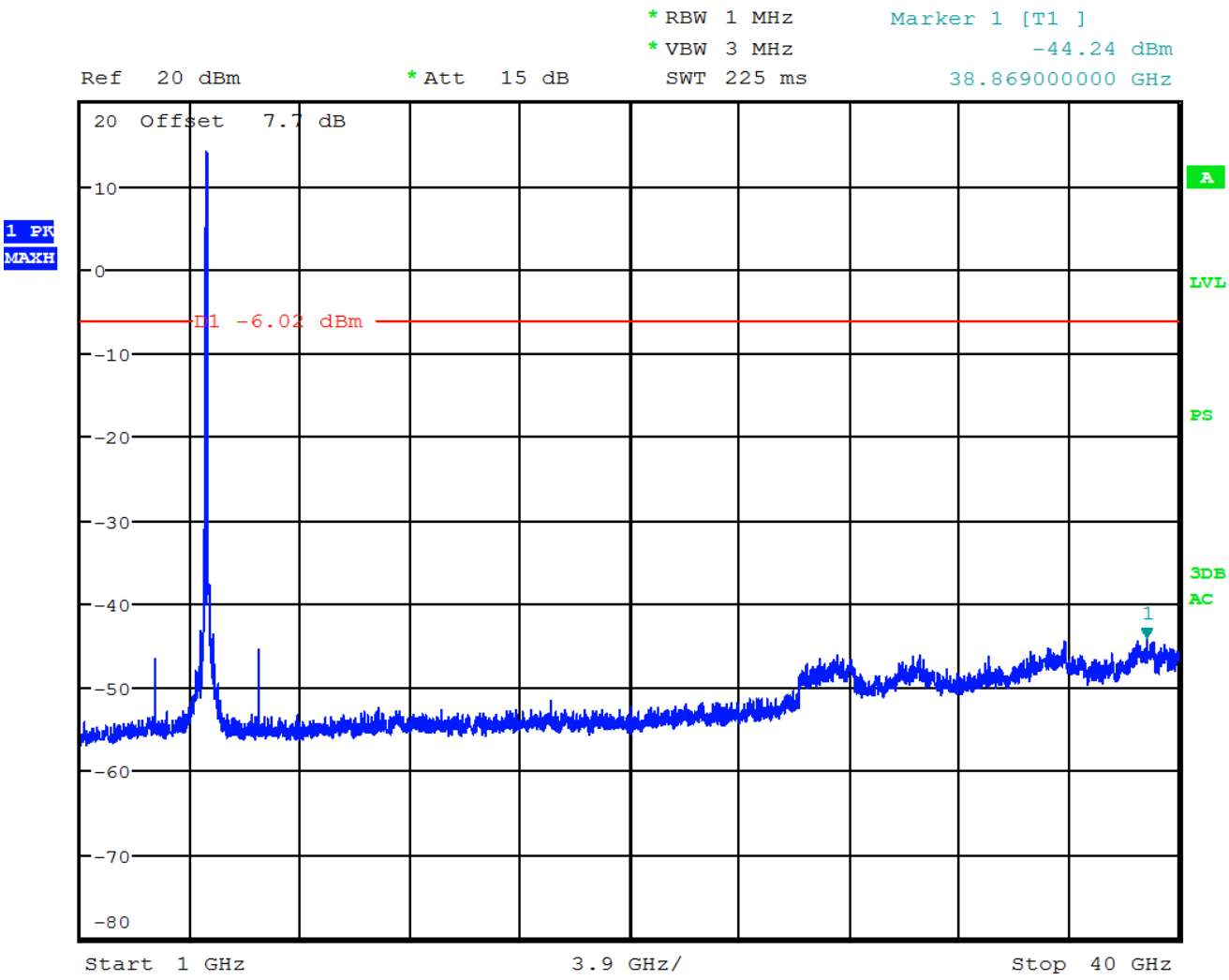
802.11a RF Conducted Emission Test Results cont'd

Figure 5-33a: Spurious RF Conducted Emissions, 802.11a Channel 100, 6 Mbps



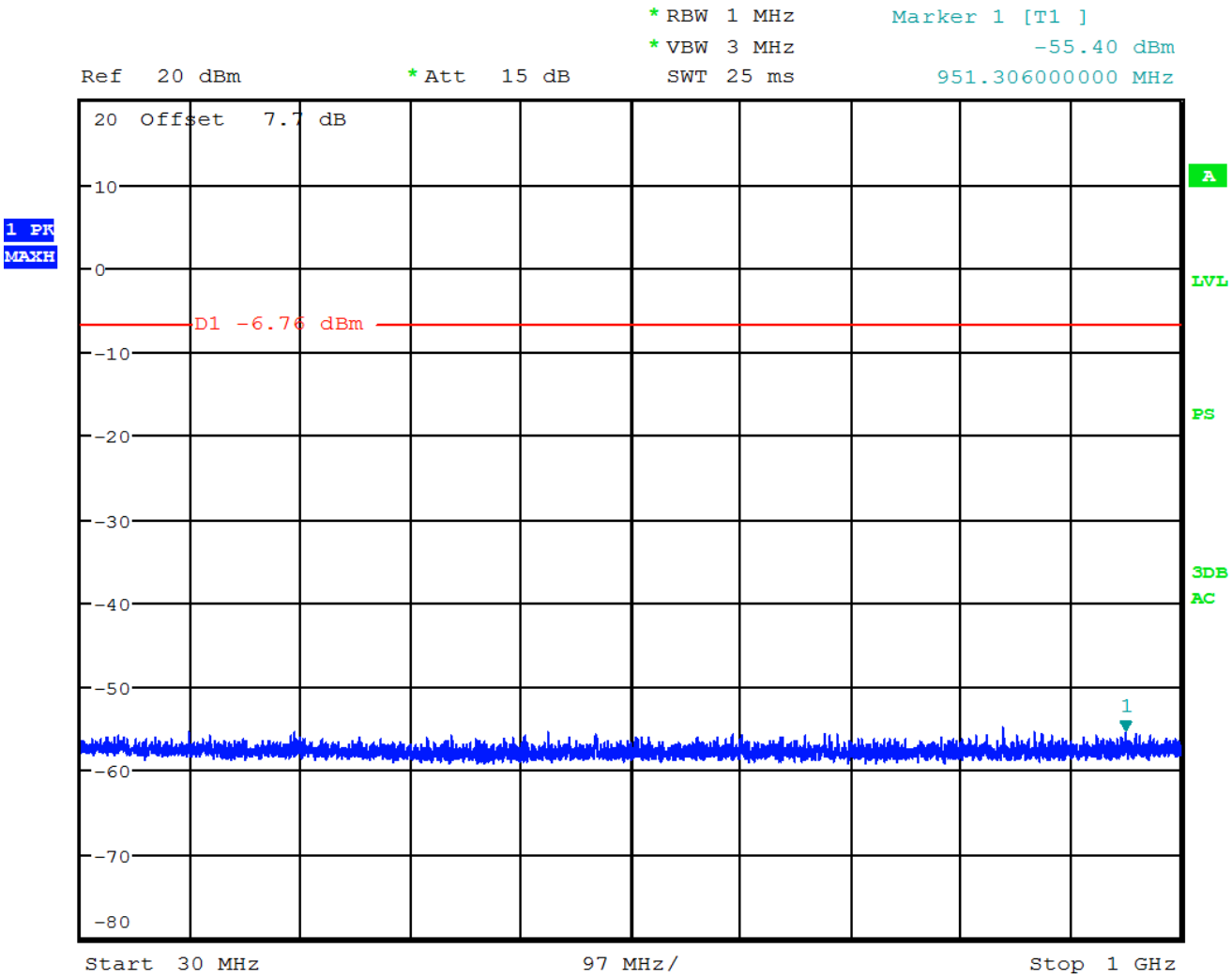
802.11a RF Conducted Emission Test Results cont'd

Figure 5-33b: Spurious RF Conducted Emissions, 802.11a Channel 100, 6 Mbps



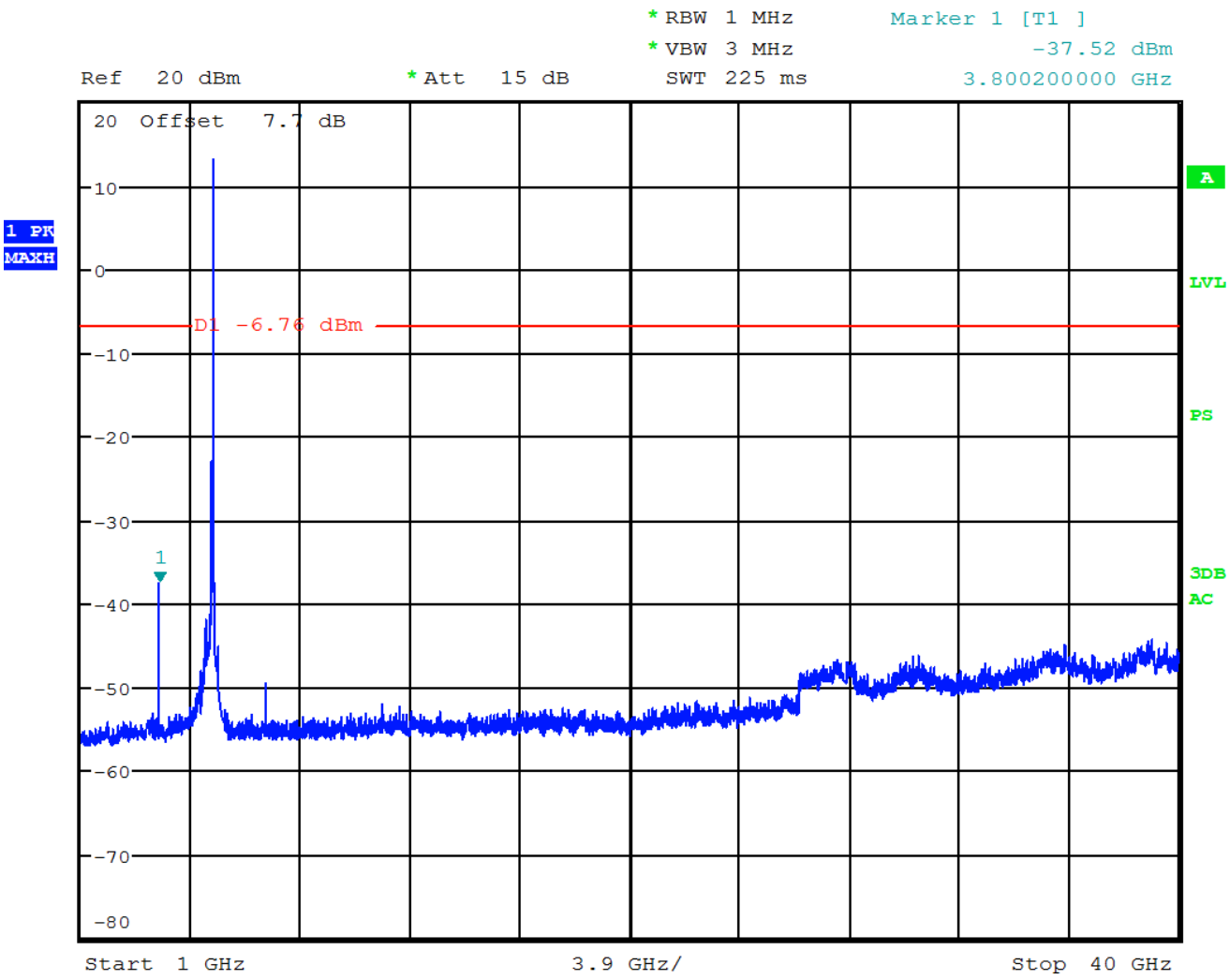
802.11a RF Conducted Emission Test Results cont'd

Figure 5-34a: Spurious RF Conducted Emissions, 802.11a Channel 140, 6 Mbps



802.11a RF Conducted Emission Test Results cont'd

Figure 5-34b: Spurious RF Conducted Emissions, 802.11a Channel 140, 6 Mbps



APPENDIX 6 – NEAR FIELD COMMUNICATIONS TEST DATA/PLOTS

Near Field Communications (NFC) Test Results

Radiated Emissions

The following tests were performed on model RFW121LW.

Date of Test: July 19, 2013
Measurements were performed by Feras Obeid.

The environmental test conditions were: Temperature: 26.8 ºC
Relative Humidity: 39.2 %

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

The BlackBerry® smartphone was in vertical position.

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

Frequency (MHz)	Reading (QP) (dBµV)	Correction Factor (dB)	Corrected Reading (QP) (dBµV/m)	Limit (dBµV/m)	Test Margin (dB)
13.559	31.26	18.13	49.39	124.00	-74.61

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

Near Field Communications (NFC) Test Results cont'd

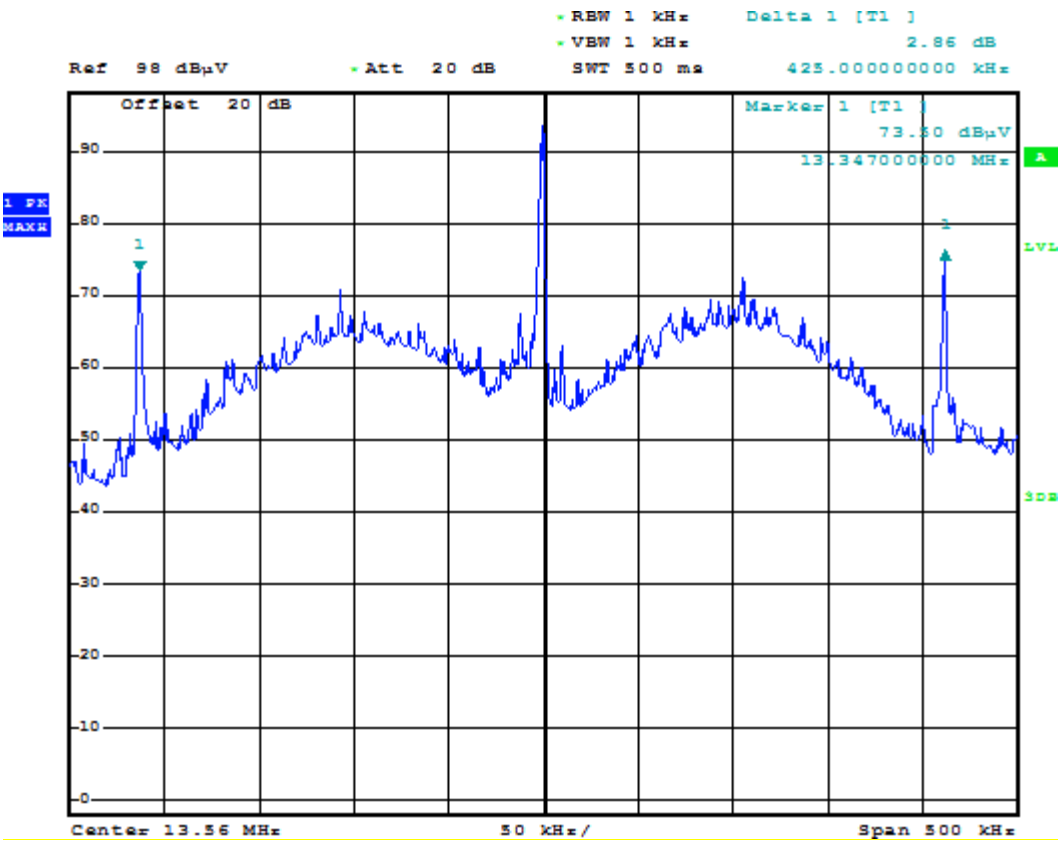
Occupied Bandwidth

Date of test: July 30, 2013
The measurements were performed by Berkin Can.

The environmental test conditions were: Temperature: 24.2 ºC
Relative Humidity: 23.6 %

Operation mode (TX ON)	Occupied Bandwidth (kHz)
NFC, modulated	425

Figure 6-1: Occupied Bandwidth, NFC TX Frequency = 13.56 MHz



Near Field Communications (NFC) Test Results cont'd

Frequency Stability

Date of test: February 14, 2013.
The measurements were performed by Berkin Can.

The environmental test conditions were: Temperature: 24.2 ºC
Relative Humidity: 23.6 %

Test Temperature (Celsius)	Nominal Freq. (MHz)	Measured Freq. (MHz)	Input Voltage (Volts)	Max Freq Error (Hz)	% Deviation (Limit .01%)	PPM
-20	13.56	13.559622	3.6	-378	-0.00279	-27.8761
-20	13.56	13.559686	3.8	-314	-0.00232	-23.1563
-20	13.56	13.559692	4.35	-308	-0.00227	-22.7139
-10	13.56	13.559570	3.6	-430	-0.00317	-31.7109
-10	13.56	13.559492	3.8	-508	-0.00375	-37.4631
-10	13.56	13.559519	4.35	-481	-0.00355	-35.4720
0	13.56	13.559516	3.6	-484	-0.00357	-35.6932
0	13.56	13.559478	3.8	-522	-0.00385	-38.4956
0	13.56	13.559712	4.35	-288	-0.00212	-21.2389
10	13.56	13.559557	3.6	-443	-0.00327	-32.6696
10	13.56	13.559578	3.8	-422	-0.00311	-31.1209
10	13.56	13.559581	4.35	-419	-0.00309	-30.8997
20	13.56	13.559584	3.6	-416	-0.00307	-30.6785
20	13.56	13.559652	3.8	-348	-0.00257	-25.6637
20	13.56	13.559316	4.35	-684	-0.00504	-50.4425

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	13.559355	3.6	-645	-0.00476	-47.5664
30	13.56	13.559747	3.8	-253	-0.00187	-18.6578
30	13.56	13.559482	4.35	-518	-0.00382	-38.2006
40	13.56	13.559512	3.6	-488	-0.00360	-35.9882
40	13.56	13.559643	3.8	-357	-0.00263	-26.3274
40	13.56	13.559451	4.35	-549	-0.00405	-40.4867
50	13.56	13.559496	3.6	-504	-0.00372	-37.1681
50	13.56	13.559630	3.8	-370	-0.00273	-27.2861
50	13.56	13.559594	4.35	-406	-0.00299	-29.9410
60	13.56	13.559485	3.6	-515	-0.00380	-37.9794
60	13.56	13.559654	3.8	-346	-0.00255	-25.5162
60	13.56	13.559607	4.35	-393	-0.00290	-28.9823