EMI Test Report

Tested in accordance with
Federal Communications Commission (FCC)
Personal Communications Services
CFR 47, Part 15 Subpart C and E
&
Industry Canada (IC) RSS-210, RSS-GEN (Only applies to RGF111LW)

BlackBerry RTS

A division of BlackBerry Limited

REPORT NO.: RTS-6050-1309-24A_rev1

PRODUCT MODEL NO.: RGE111LW, RGF111LW
TYPE NAME: BlackBerry® smartphone
FCC ID: Not Applicable, L6ARGF110LW
IC: Not Applicable, 2503A-RGF110LW

This report supersedes the report RTS-6050-1309-24A dated September 24, 2013

DATE: October 10, 2013

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

592

Report Revision History:

Rev1:

1. Editorial changes in the header.
2. Associated Documents Product Identification sections updated.
3. Summary of Results and Appendix 4 updated with 802.11a/n results.
4. Equipment List update in section G.

Statement of Performance:

The BlackBerry® smartphone, model RGE111LW, part number CER-57712-001 - Rev1-x01-00, and its accessories perform within the requirements of the test standards when configured and operated under BlackBerry's operation instructions.

The BlackBerry® smartphone, model RGF111LW, part number CER-57711-001 Rev1-x01-00, and its accessories perform within the requirements of the test standards when configured and operated under BlackBerry's operation instructions.

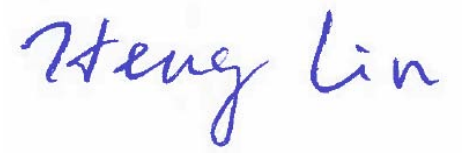
Declaration:

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

Documented by:

Savtej S. Sandhu
Regulatory Compliance Specialist

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
- o Industry Canada, RSS-210, Issue 8, December 2010, Licence-exempt Radio Apparatus
- o Industry Canada, RSS-GEN, Issue 3, December 2010, General Requirements and Information for the Certification of Radio Apparatus

B. Associated Documents

1) MultiSourceDeclaration_RGE111LW_10.2.0.1155
2) MultiSourceDeclaration_RGE111LW_b981
3) BlackBerrySystemSimilarity_RGE111LW_RGF111LW
4) Test Report 1-6234_13-08-06
5) Test Report 1-6234_13-08-07
6) Test Report 1-6234_13-08-08
7) Test Report 1-6234_13-08-09
8) Test Report 1-6234_13-08-10
9) Test Report 1-6234_13-08-11
10) Test Report 1-6234_13-08-13-B

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:

BlackBerry RTS EMI test facilities

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

The testing was performed from August 6 – September 24 and October 09, 2013.

SAMPLE	MODEL	CER NUMBER	PIN	SOFTWARE
1a	RGE111LW	CER-57712-001 - Rev1-x01-00	2FFF53EB	OS Version: 10.2.0.981 Bundle: 981
1b	RGE111LW	CER-57712-001 - Rev1-x01-00	2FFF53EB	OS Version: 10.2.0.1155 Bundle: 1155
2	RGF111LW	CER-57711-001 - Rev1-x01-00	2FFF5DBA	OS Version: 10.2.0.981 Bundle: 981

Conducted Emissions testing was performed on sample 1a, 1b and 2

Near Field Communications testing was performed on sample 2

As per manufacture's declaration, the two devices are similar for the bands contained in this report.
Changes between RGE111LW and RGF111LW did not impact the measurements.
For more information, refer to BlackBerrySystemSimilarity_RGE111LW_RGF111LW.

To view the differences between software bundles 981 to 1155 for RGE111LW, see document MultiSourceDeclaration_RGE111LW_10.2.0.1155.

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-49299-005, with a lead length of 1.1 metres

D. Support Equipment Used for the Testing of the EUT

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

E. Test Results Chart

SPECIFICATION		TEST TYPE	Meets Requirements	TEST DATA
FCC CFR 47	IC			APPENDIX
Part 15.207	RSS-210 RSS-GEN	Conducted AC Line Emission	Pass	1, Report 1-6234_13-08-13-B
Part 15.209 Part 15.247	RSS-210 RSS-GEN	BT/BLE Radiated Spurious Emissions	Pass	Reports 1-6234_13-08-09, 1-6234_13-08-10
Part 15.209 Part 15.247	RSS-210 RSS-GEN	BT/BLE Radiated Band Edge Compliance	Pass	Reports 1-6234_13-08-09, 1-6234_13-08-10
Part 15.209 Part 15.247	RSS-210 RSS-GEN	802.11b/g/n Radiated Spurious Emissions	Pass	Report 1-6234_13-08-06-A
Part 15.209 Part 15.247	RSS-210 RSS-GEN	802.11b/g/n Radiated Band Edge Compliance	Pass	Report 1-6234_13-08-06-A
Part 15.209 Part 15.407	RSS-210 RSS-GEN	802.11a/n Radiated Spurious Emissions	Pass	Report 1-6234_13-08-07, 1-6234_13-08-08
Part 15.209 Part 15.407	RSS-210 RSS-GEN	802.11a/n Radiated Band Edge Compliance	Pass	Report 1-6234_13-08-07, 1-6234_13-08-08
Part 15.247(a)	RSS-210	BT, 20 dB Bandwidth	Pass	2
Part 15.247(a)	RSS-210	BT, Carrier Frequency Separation	Pass	2
Part 15.247(a)	RSS-210	BT, Number of Hopping Frequencies	Pass	2
Part 15.247(a)	RSS-210	BT, Time of Occupancy (Dwell Time)	Pass	2
Part 15.247(b)	RSS-210	BT, Maximum Peak Conducted Output Power	Pass	2
Part 15.247(c)	RSS-210	BT, Band-Edge Compliance of RF Conducted Emissions	Pass	2
Part 15.247(c)	RSS-210	BT, Spurious RF Conducted Emissions	Pass	2
Part 15.247(a)	RSS-210	BLE, 6 dB Bandwidth	Pass	2
Part 15.247(b)	RSS-210	BLE, Maximum Conducted Output Power	Pass	2
Part 15.247(c)	RSS-210	BLE, Band-Edge	Pass	2
Part 15.247(d)	RSS-210	BLE, Peak Power Spectral Density	Pass	2
Part 15.247(c)	RSS-210	BLE, Spurious RF Conducted Emissions	Pass	2

Test Results Chart cont'd

SPECIFICATION		TEST TYPE	Meets Requirements	TEST DATA
FCC CFR 47	IC			APPENDIX
Part 15.247(a)	RSS-210	802.11b/g/n, 6 dB Bandwidth	Pass	3
Part 15.247(b)	RSS-210	802.11b/g/n, Maximum Conducted Output Power	Pass	3
Part 15.247(c)	RSS-210	802.11b/g/n, Band-Edge	Pass	3
Part 15.247(d)	RSS-210	802.11b/g/n, Peak Power Spectral Density	Pass	3
Part 15.247(c)	RSS-210	802.11b/g/n, Spurious RF Conducted Emissions	Pass	3
Part 15.407	RSS-210	802.11a/n, 6 dB Bandwidth	Pass	4
Part 15.407	RSS-210	802.11a/n, Maximum Conducted Output Power	Pass	4
Part 15.407	RSS-210	802.11a/n, Band-Edge	Pass	4
Part 15.407	RSS-210	802.11a/n, Peak Power Spectral Density	Pass	4
Part 15.407	RSS-210	802.11a/n, Spurious RF Conducted Emissions	Pass	4
Part 15.209 Part 15.225(a)	RSS-210 RSS-GEN	Near Field Communications, Radiated Emissions	Pass	Report 1-6234_13-08-11
Part 15.225(e)	RSS-210	Near Field Communications, Occupied Bandwidth	Pass	5
Part 15.225(e)	RSS-210	Near Field Communications, Frequency Stability	Pass	5

F. Summary of Results

The following tests were performed on device RGF111LW.

1) AC LINE CONDUCTED EMISSIONS

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

The following test configurations were measured:

Test Configuration	Operating Mode(s)	Charger + Accessories
1	NFC Tx	Fixed Blade Charger + Wired Headset + USB Cable 1.20m

The sample EUT's conducted emissions were compared with respect to the FCC CFR 47 Part 15, Subpart C and IC RSS-210 limits. The sample EUT had a worst case test margin of 9.9 dB below the QP limit at 1.532 MHz in Test Configuration 1.

See APPENDIX 1 for the test data.

Measurement Uncertainty ±3.2 dB

Following tests were performed on device RGE111LW.

2) i) BLUETOOTH RF CONDUCTED EMISSIONS

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

a) 20 dB Bandwidth
The BlackBerry® smartphone met the requirements of the 20 dB bandwidth as per 47 CFR 15.247(a) and RSS-210. Low channel (0), middle channel (39) and high channel (78) were measured. The result includes both normal data rate and EDR. The worst case 20 dB Bandwidth was 0.924 MHz for channels 0, 39 and 78 in normal data rate mode and 1.328 MHz for channel 0 in EDR mode.
See APPENDIX 2 for the test data.

b) Carrier Frequency Separation
The BlackBerry® smartphone met the requirements of the carrier frequency separation as per 47 CFR 15.247(a) and RSS-210. Channel 38 to 39 was measured. The result includes both normal data rate and EDR.
See APPENDIX 2 for the test data.

c) Number of Hopping Frequencies
The BlackBerry® smartphone met the requirements of the number of hopping frequencies as per 47 CFR 15.247(a) and RSS-210. The number of hopping channels measured was 79.
See APPENDIX 2 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 2 for the test data.

e) Maximum Peak Conducted Output Power
The BlackBerry® smartphone met the requirements of the maximum peak conducted output power as per 47 CFR 15.247(b) and RSS-210. Low channel (0), middle channel (39) and high channel (78) were measured. The result includes both normal data rate and EDR. The worst case Conducted Output Power level was 8.10 dBm (0.00646 W) for Channel 39 in normal data rate mode and 8.80 dBm (0.00759 W) for channel 39 in EDR mode.
See APPENDIX 2 for the test data.

f) Band-Edge Compliance of RF Conducted Emissions
The BlackBerry® smartphone met the requirements of the band-edge compliance of RF conducted emissions as per 47 CFR 15.247(c) and RSS-210. Channels 0 and 78 were measured in frequency hopping (Euro/US) mode and single frequency mode. The result includes both normal data rate and EDR.
See APPENDIX 2 for the test data.

g) Spurious RF Conducted Emissions
The BlackBerry® smartphone met the requirements of the spurious RF conducted emissions as per 47 CFR 15.247(c) and RSS-210. The frequency range measured was 10 MHz to 26 GHz. Low channel (0), middle channel (39) and high channel (78) were measured in single frequency mode and frequency hopping (Euro/US) mode. The result includes both normal data rate and EDR.
See APPENDIX 2 for the test data.

3) ii) BLUETOOTH LOW ENERGY RF CONDUCTED EMISSIONS

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

a) 6dB Bandwidth
The EUT met the requirements of the 6 dB bandwidth as per 47 CFR 15.247(b) and RSS-210. Low channel (0), middle channel (20) and high channel (39) were measured. The worst case 6 dB Bandwidth was 0.690 MHz for channel 0.
See APPENDIX 2 for the test data.

b) Maximum Conducted Output Power
The EUT met the requirements of the maximum conducted output power as per 47 CFR 15.247(b) and RSS-210. Low channel (0), middle channel (20) and high channel (39) were measured. The worst case Conducted Output Power level was 5.05 dBm (0.00320 W) for channel 20.
See APPENDIX 2 for the test data

c) Band-Edge Compliance of RF Conducted Emissions
The EUT met the requirements of band-edge compliance of RF conducted emissions as per 47 CFR 15.247(b) and RSS-210. Low channel (0) and high channel (39) were measured.
See APPENDIX 2 for the test data.

d) Peak Power Spectral Density
The EUT met the requirements of peak power spectral density as per 47 CFR 15.247(b) and RSS-210. Low channel (0), middle channel (20) and high channel (39) were measured.
See APPENDIX 2 for the test data.

e) Spurious RF Conducted Emissions
The EUT met the requirements of the spurious RF conducted emissions as per 47 CFR 15.247(c) and RSS-210. The frequency range measured was 30 MHz to 26 GHz. Low channel (0), middle channel (20) and high channel (39) were measured.
See APPENDIX 2 for the test data.

4) 802.11b/g/n RF CONDUCTED EMISSIONS

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

a) 6dB Bandwidth
The EUT met the requirements of the 6 dB bandwidth as per 47 CFR 15.247(b) and RSS-210. Low channel (1), middle channel (6) and high channel (11) were measured. The worst case 6 dB Bandwidth was 9.92 MHz for channel 6 in 802.11b mode, 16.48 MHz for channels 1,6 and 11 in 802.11g mode, and 16.48 MHz for channels 1, 6 and 11 in 802.11n mode.
See APPENDIX 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) and RSS-210. Low channel (1)**,** middle channel (6) and high channel (11) were measured. The worst case Conducted Output Power level was 16.05 dBm (40.3 mW) for channel 11 in 802.11b mode, 15.81 dBm (38.10 mW) for channel 6 in 802.11g mode, and 15.46 dBm (35.1 mW) for channel 6 in 802.11n mode.
See APPENDIX 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) and RSS-210. Low channel (1) and high channel (11) 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) and RSS-210. Low channel (1), middle channel (6) and high channel (11) 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) and RSS-210. The frequency range measured was 30 MHz to 26 GHz. Low channel (1), middle channel (6) and high channel (11) were measured.
See APPENDIX 3 for the test data.

5) 802.11a/n RF CONDUCTED EMISSIONS

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

a) 6 dB Bandwidth
The EUT met the requirements of the 6 dB bandwidth as per 47 CFR 15.407 and RSS-210. Channels 36, 44, 48, 52, 60, 64, 100, 140, 149, 157, 161 and 165 were measured. The worst case 6 dB Bandwidth was 16.56 MHz for channels 48, 64, 100, 140 and 165 in 802.11a mode. The worst case 6 dB Bandwidth was 9.12 MHz for channel 165 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 15.407 and RSS-210. Channels 36, 44, 48, 52, 60, 64, 100, 140, 149, 157, 161 and 165 were measured. The worst case Conducted Output Power level was 13.96 dBm (24.9 mW) for channel 100 in 802.11a mode. The worst case Conducted Output Power level was 13.73 mW for channel 100 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 15.407 and RSS-210. Channels 36, 48, 52, 64, 100, 149, 161 and 165 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 15.407 and RSS-210. Channels 36, 48, 52, 60, 64, 149, 157, 161 and 165 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 15.407 and RSS-210. The frequency range measured was 30 MHz to 40 GHz. Channels 44, 60 and 157 were measured.
See APPENDIX 4 for the test data.

6) Near Field Communications (NFC)

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

a) Occupied Bandwidth

The EUT met the requirements of the Occupied bandwidth as per 47 CFR 15 C and RSS-210. The EUT was measured in test mode with modulation on and transmitting at 13.56 MHz.
See APPENDIX 5 for the test data.

b) Frequency Stability

The EUT met the requirements of the Frequency Stability as per 47 CFR 15.225(e) and RSS-210. The EUT was measured in test mode with modulation on and transmitting at 13.56 MHz.
See APPENDIX 5 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	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 by Kevin Guo
Following test were performed on the model RGF111LW.

Test Configuration 1

The BlackBerry® smartphone was tested on September 23, 2013

The environmental test conditions were: Temperature: 26 ºC
Relative Humidity: 23.9 %

Frequency (MHz)	Line	Reading (QP) (dBµV)	Correction Factor (dB)	Corrected Reading (QP) (dB)	Limit (QP) (dBµV)	Limit (AV) (dBµV)	Margin (QP) Limits (dB)
0.164	N	30.11	11.14	41.25	65.30	55.30	-24.05
0.195	L1	36.06	10.89	46.95	63.80	53.80	-16.85
0.393	L1	27.39	10.02	37.41	58.00	48.00	-20.59
0.425	N	33.71	9.98	43.70	57.40	47.40	-13.70
1.122	L1	32.45	9.80	42.25	56.00	46.00	-13.75
1.338	N	30.54	9.81	40.35	56.00	46.00	-15.65
1.532	L1	36.30	9.80	46.10	56.00	46.00	**-9.90**
1.689	N	24.23	9.82	34.05	56.00	46.00	-21.95
1.712	L1	32.32	9.81	42.13	56.00	46.00	-13.87
2.607	N	25.45	9.86	35.31	56.00	46.00	-20.69
13.560	L1	28.76	10.07	38.83	60.00	50.00	-21.18
13.560	N	38.68	10.08	48.77	60.00	50.00	-11.23
18.398	L1	23.14	10.22	33.35	60.00	50.00	-26.65

All other emission levels were at least 25 dB below the limit.
Measurements were done with the quasi-peak and the average detectors.
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

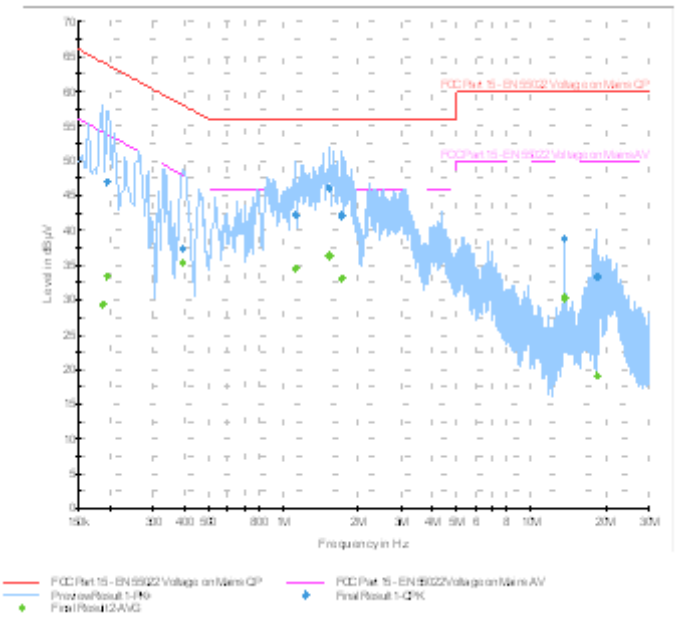
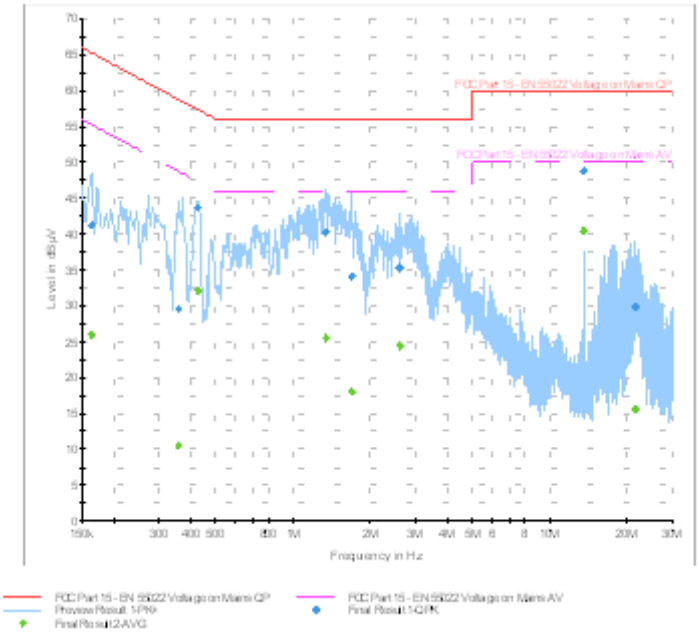


Figure 1-2: N Lines



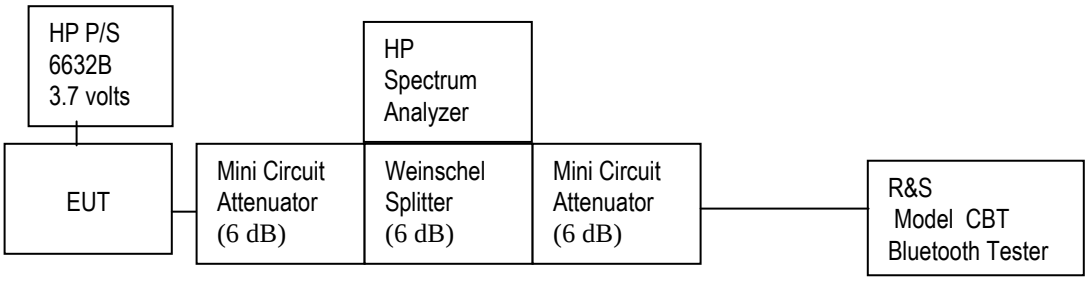
APPENDIX 2 – BLUETOOTH AND BLUETOOTH LOW ENERGY CONDUCTED EMISSIONS TEST DATA/PLOTS

Bluetooth RF Conducted Emission Test Results

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

Date of test: September 4, 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: 25.8 ºC
Relative Humidity: 31.2 %

Bluetooth RF Conducted Emission Test Results cont'd

Following tests were performed on the model RGE111LW.

20 dB Bandwidth

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

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

Bluetooth Channel	Limit (MHz)	Measured Level (MHz)
0	≤1.0	**0.924**
39	≤1.0	**0.924**
78	≤1.0	**0.924**

See figures 2-1 to 2-3 for the plots of the 20 dB bandwidth measurements.

Figure 2-1: 20 dB Bandwidth
Single freq., Static PBRS, DH5

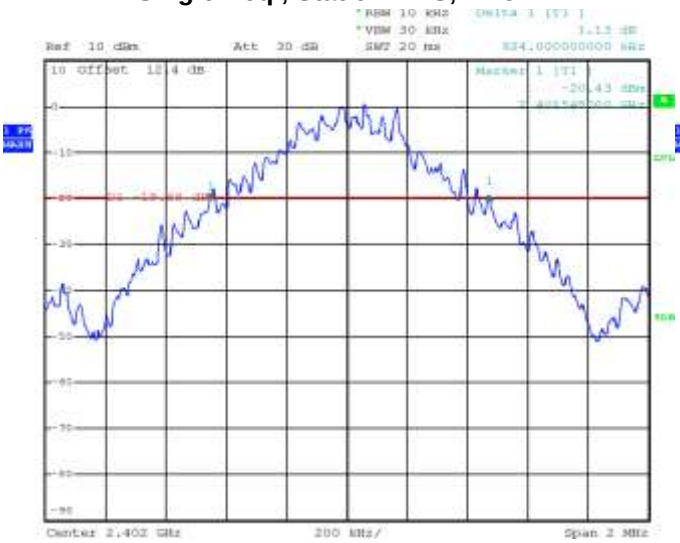
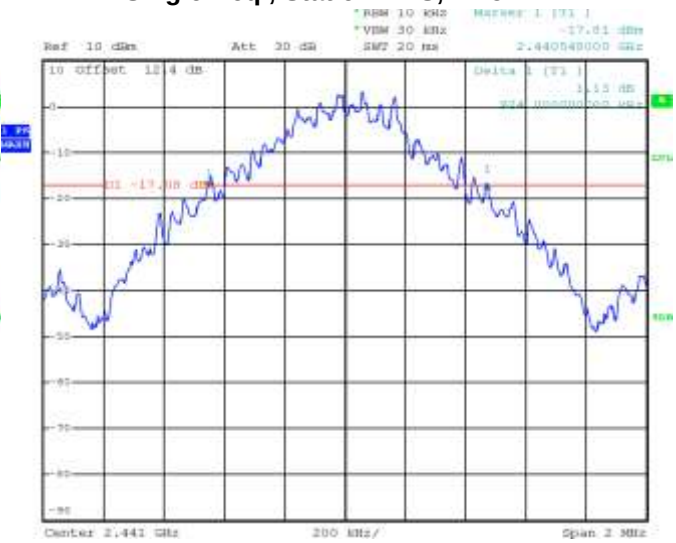
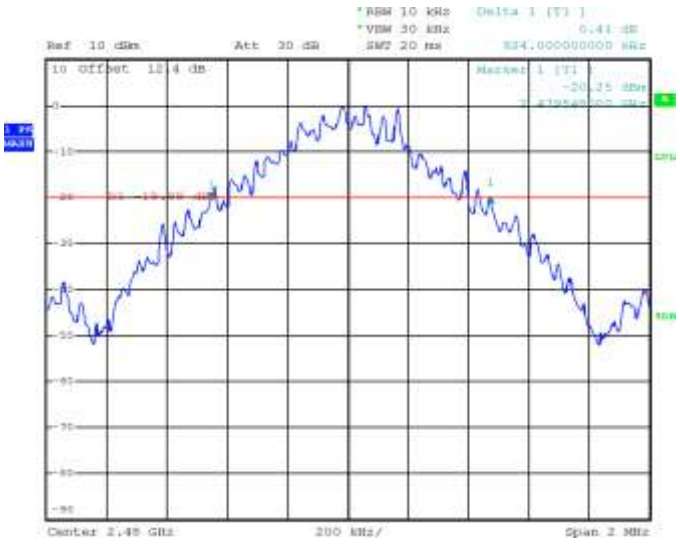


Figure 2-2: 20 dB Bandwidth
Single freq., Static PBRS, DH5



Bluetooth RF Conducted Emission Test Results cont'd

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



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

Bluetooth Channel	Limit (MHz)	Measured Level (MHz)
0	≤1.5	**1.324**
39	≤1.5	1.316
78	≤1.5	**1.324**

See figures 2-4 to 2-6 for the plots of the 20 dB bandwidth measurements.

Bluetooth RF Conducted Emission Test Results cont'd

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

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

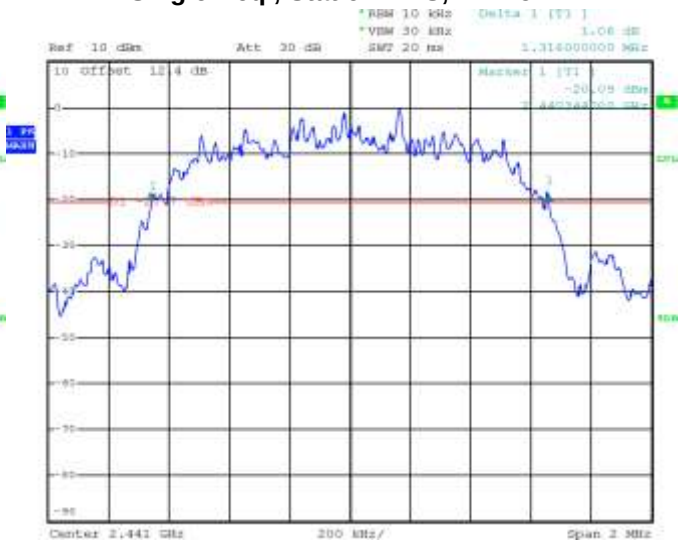
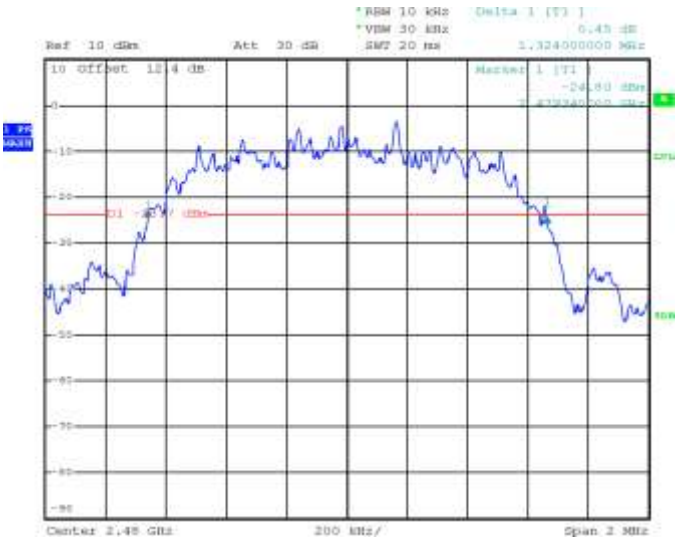


Figure 2-6: 20 dB Bandwidth
Single freq., Static PBRS, 2-DH5



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

Bluetooth Channel	Limit (MHz)	Measured Level (MHz)
0	≤1.5	**1.328**
39	≤1.5	1.324
78	≤1.5	1.324

See figures 2-7 to 2-9 for the plots of the 20 dB bandwidth measurements.

Figure 2-7: 20 dB Bandwidth
Single freq., Static PBRS, 3-DH5

Figure 2-8: 20 dB Bandwidth
Single freq., Static PBRS, 3-DH5

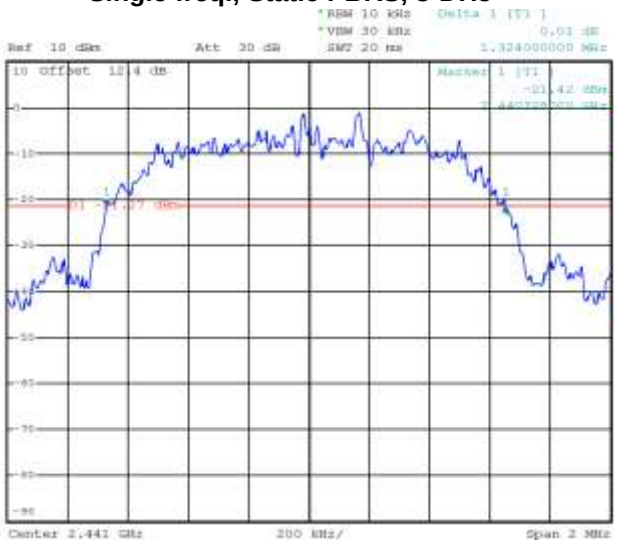


Figure 2-9: 20 dB Bandwidth
Single freq., Static PBRS, 3-DH5

Bluetooth RF Conducted Emission Test Results cont'd

Carrier Frequency Separation

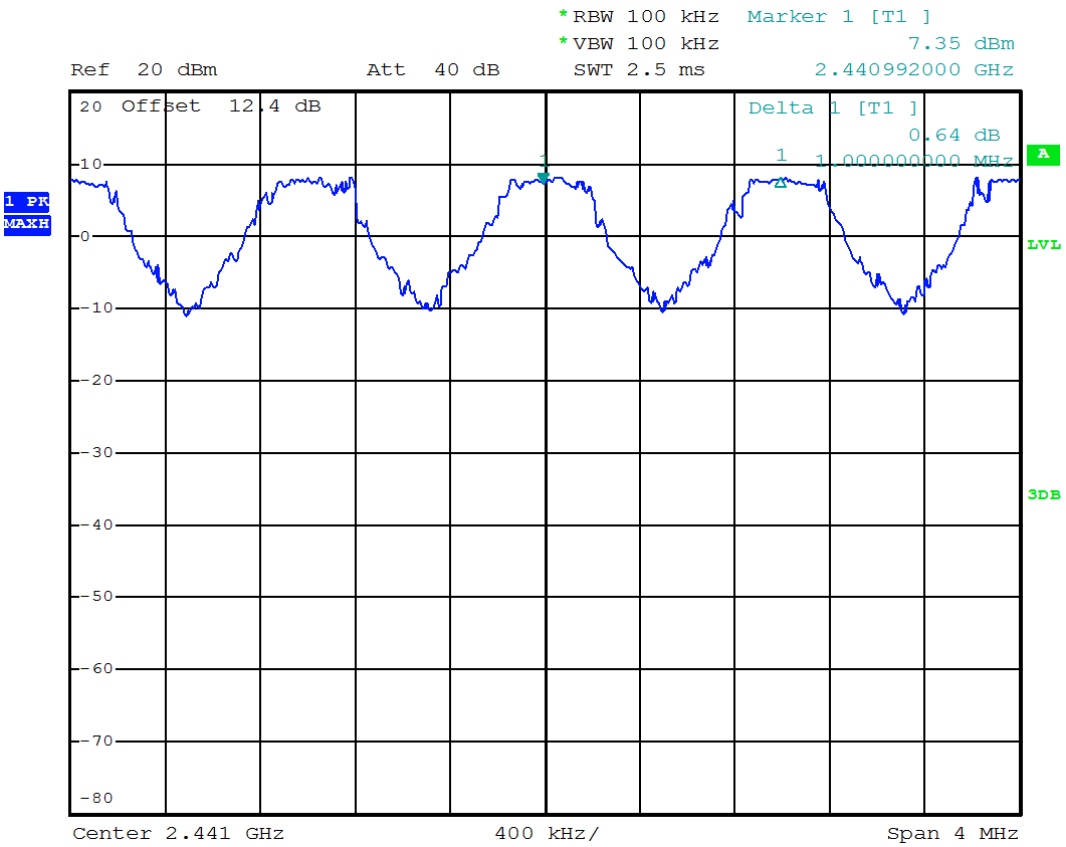
The EUT met the requirements of the Carrier Frequency Separation as per 47 CFR 15.247(a) and RSS-210. Channel 38 to 39 was measured. Bluetooth was operating in frequency hopping (Euro/US) mode.

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

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

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

Figure 2-10: Carrier Frequency Separation, Freq. Hopping, Static PBRS, DH5, Channels 38 to 39



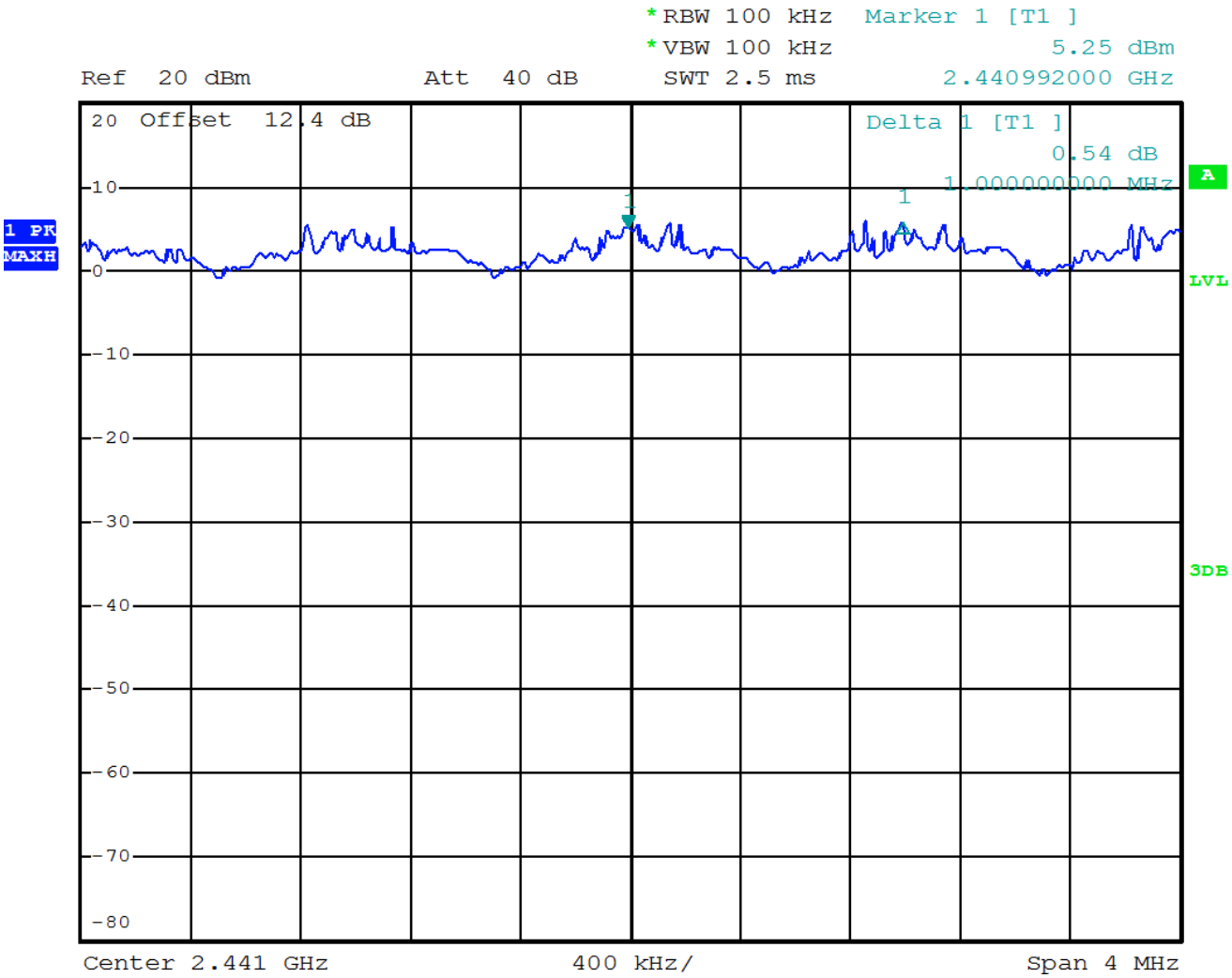
Bluetooth RF Conducted Emission Test Results cont'd

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

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

See figure 2-11 for the plot of the Carrier Frequency Separation measurement.

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



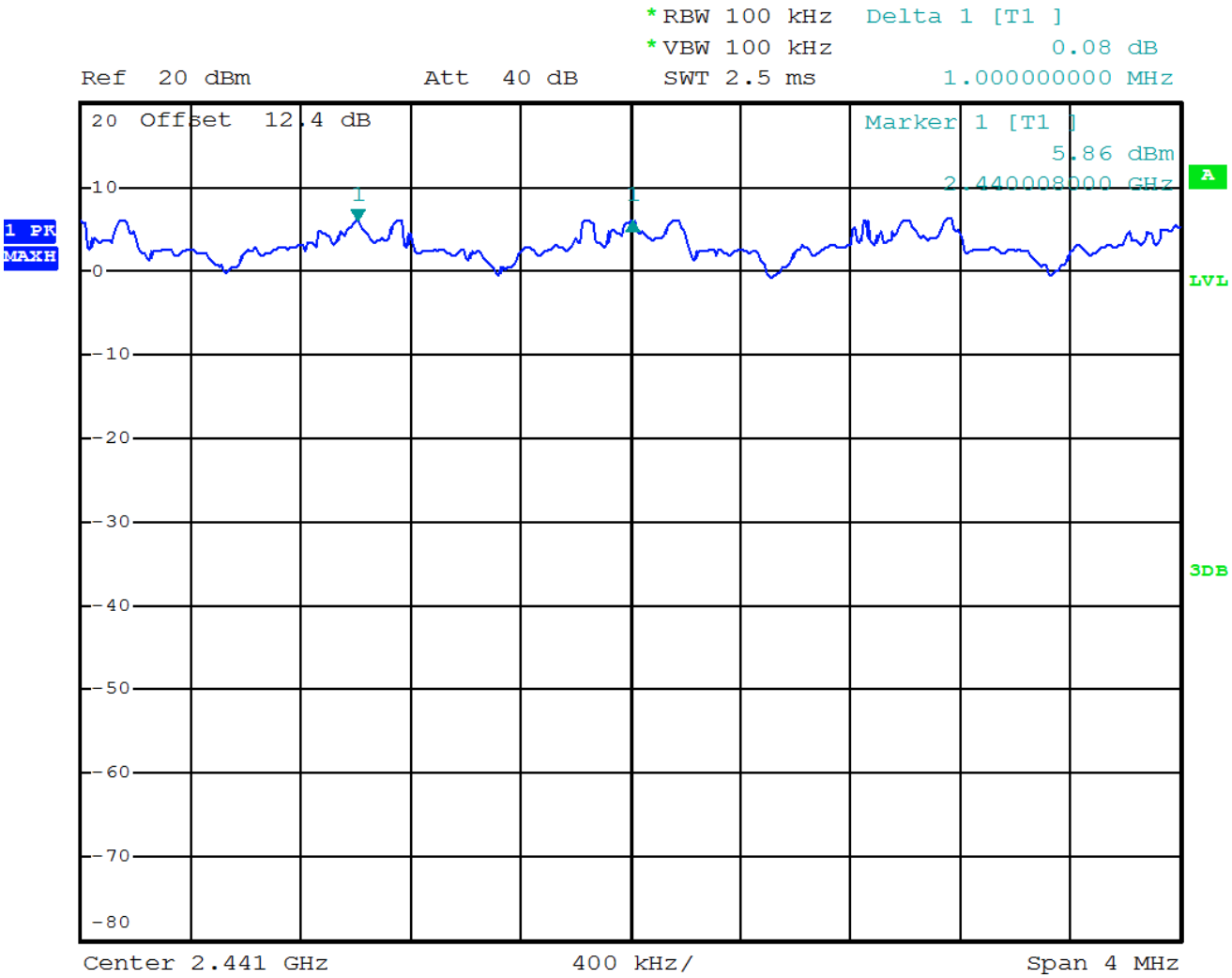
Bluetooth RF Conducted Emission Test Results cont'd

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

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

See figure 2-12 for the plot of the Carrier Frequency Separation measurement.

Figure 2-12: Carrier Frequency Separation, Freq. Hopping, Static PBRS, 3-DH5, Channels 38 to 39



Bluetooth RF Conducted Emission Test Results cont'd

Number of Hopping Frequencies

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

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

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

See figures 2-13 to 2-16 for the plots of the number of hopping frequencies.

Figure 2-13: Number of Hopping Frequencies
Static PBRS, DH5

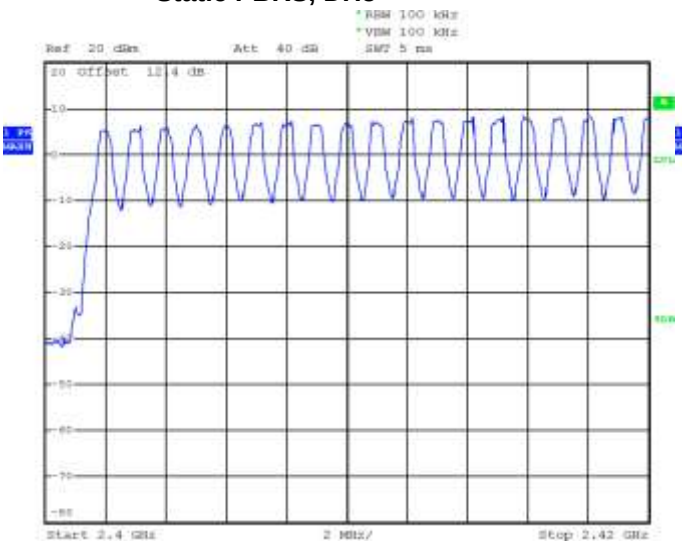
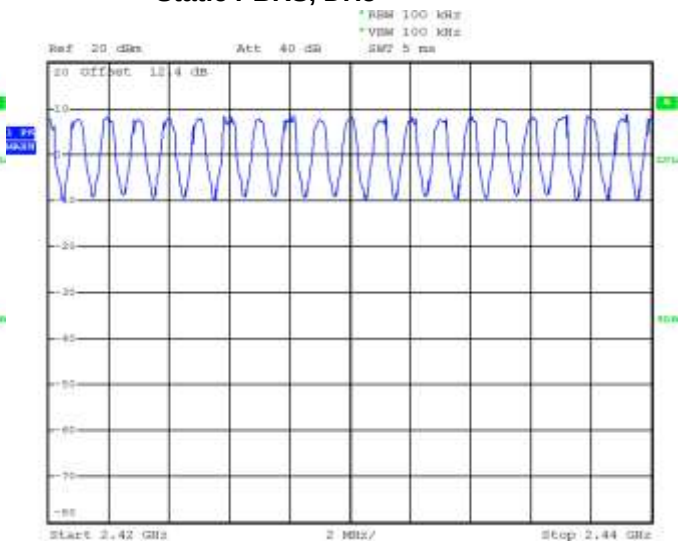


Figure 2-14: Number of Hopping Frequencies
Static PBRS, DH5



Bluetooth RF Conducted Emission Test Results cont'd

Figure 2-15: Number of Hopping Frequencies
Static PBRS, DH5

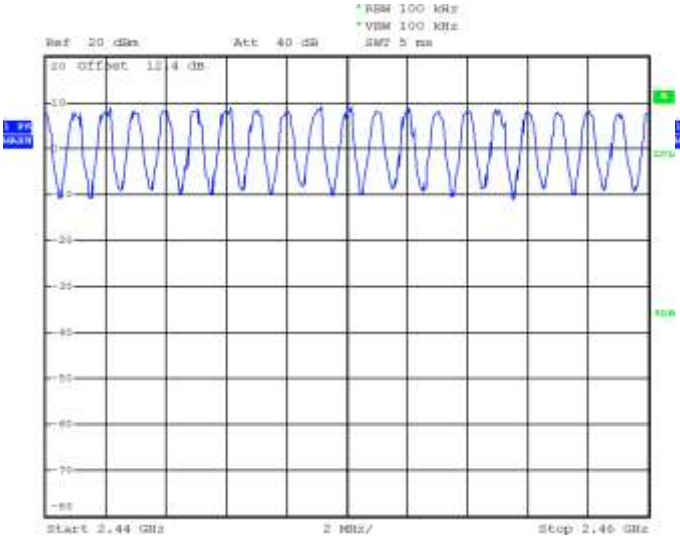
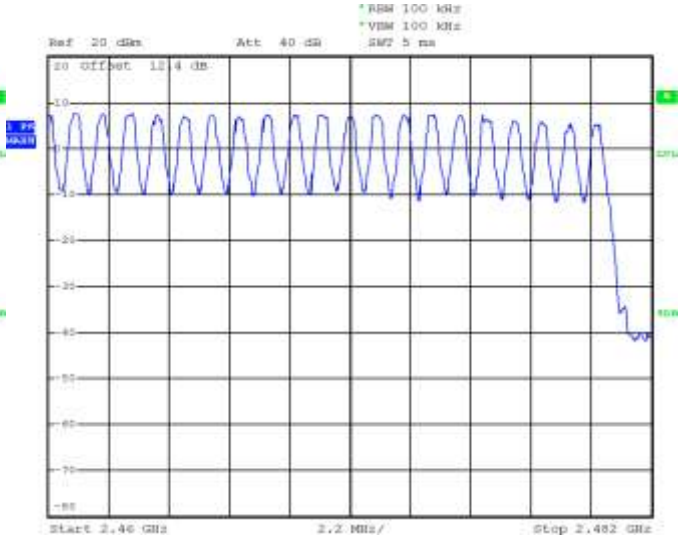


Figure 2-16: Number of Hopping Frequencies
Static PBRS, DH5



Time of Occupancy (Dwell Time)

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

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

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

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

Bluetooth 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	0.4048	0.5200 x 320.0 = 166.4	400	270.46
39	DH1	0.4048	0.5200 x 320.0 = 166.4	400	270.46
78	DH1	0.4026	0.5220 x 320.0 = 167.04	400	271.17
0	DH3	1.6626	1.7500 x 159.9 = 279.83	400	134.15
39	DH3	1.6806	1.7500 x 159.9 = 279.83	400	131.27
78	DH3	1.6686	1.7750 x 159.9 = 283.82	400	133.19
0	DH5	2.9166	2.9400 x 106.8 = 313.99	400	88.51
39	DH5	2.9240	2.9900 x 106.8 = 319.33	400	87.72
78	DH5	2.9240	3.0200 x 106.8 = 322.54	400	87.72

See figures 2-17 to 2-25 for the plots of the dwell time.

Bluetooth RF Conducted Emission Test Results cont'd

Figure 2-17: Time of Occupancy (Dwell Time)
Freq. Hopping, Static PBRS, DH1

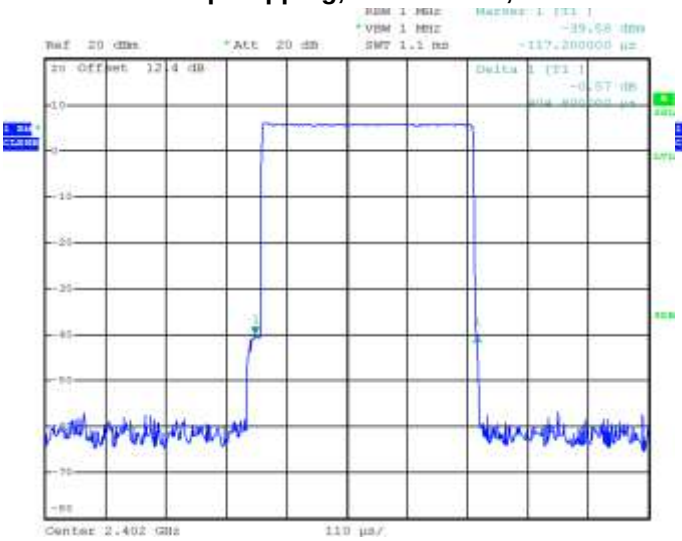
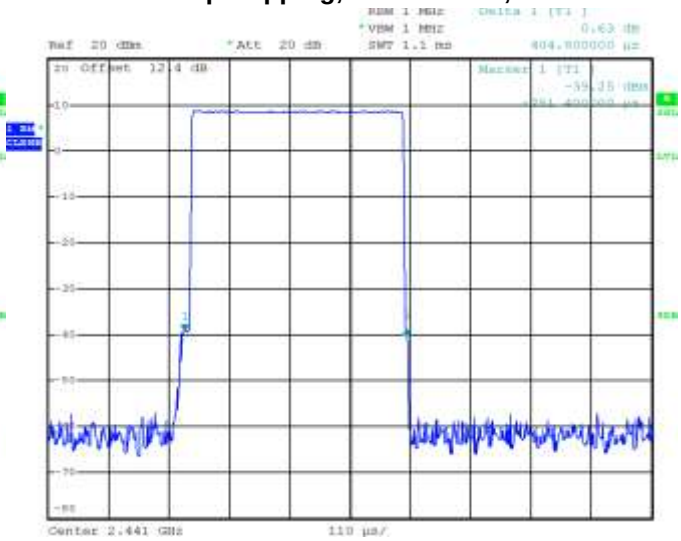


Figure 2-18: Time of Occupancy (Dwell Time)
Freq. Hopping, Static PBRS, DH1



Bluetooth RF Conducted Emission Test Results cont'd

Figure 2-19: Time of Occupancy (Dwell Time)
Freq. Hopping, Static PBRS, DH1

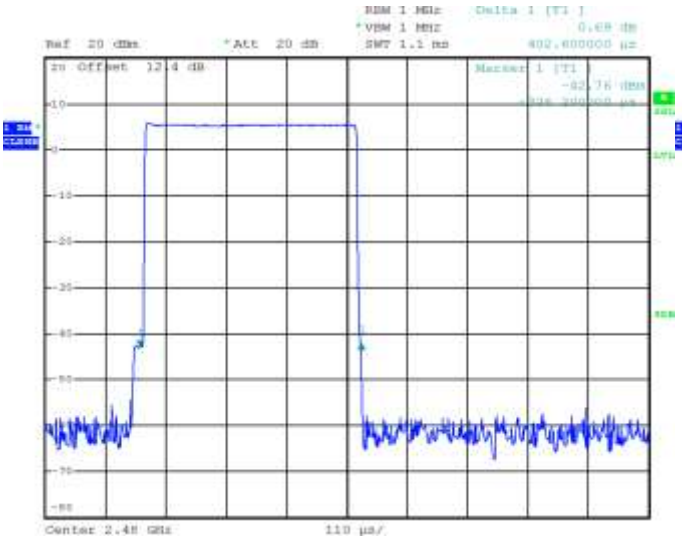


Figure 2-20: Time of Occupancy (Dwell Time)
Freq. Hopping, Static PBRS, DH3

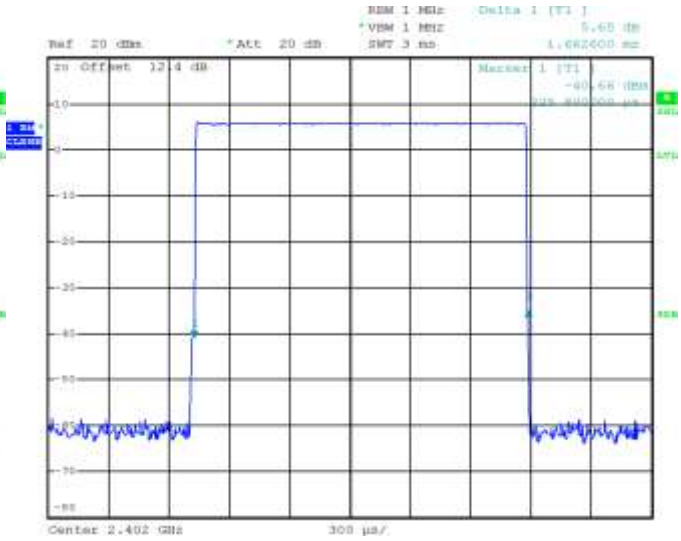


Figure 2-21: Time of Occupancy (Dwell Time)
Freq. Hopping, Static PBRS, DH3

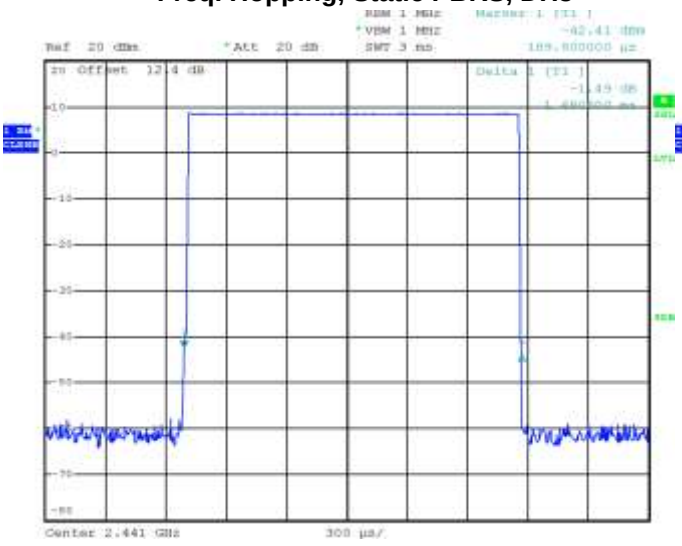
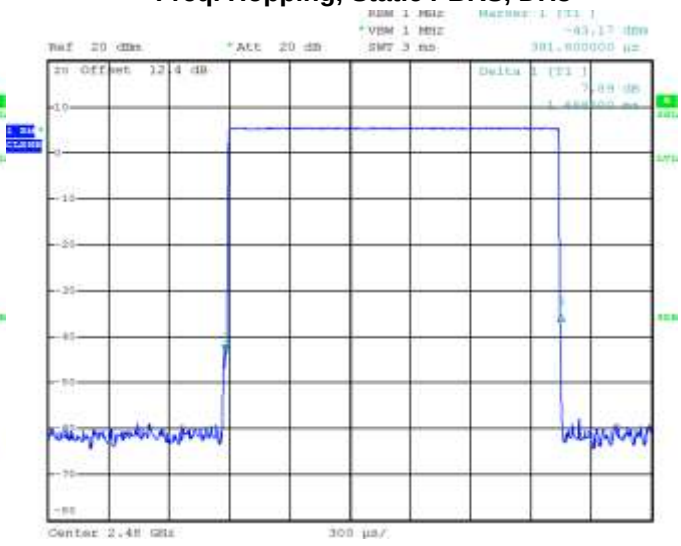


Figure 2-22: Time of Occupancy (Dwell Time)
Freq. Hopping, Static PBRS, DH3



Bluetooth RF Conducted Emission Test Results cont'd

Figure 2-23: Time of Occupancy (Dwell Time)
Freq. Hopping, Static PBRS, DH5

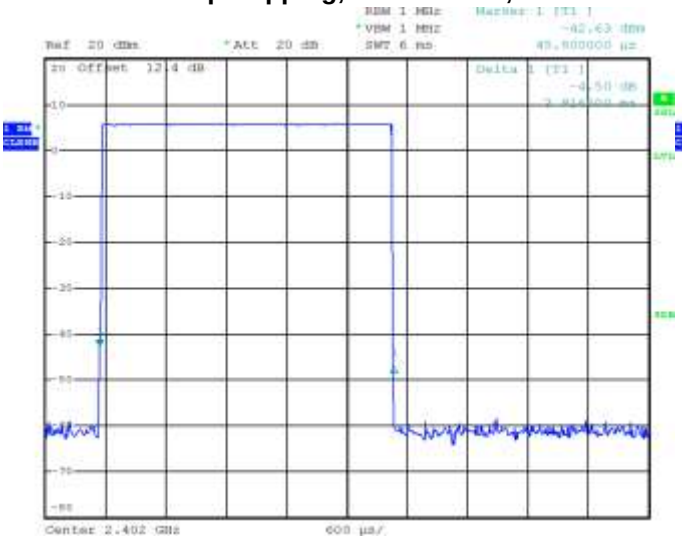


Figure 2-24: Time of Occupancy (Dwell Time)
Freq. Hopping, Static PBRS, DH5

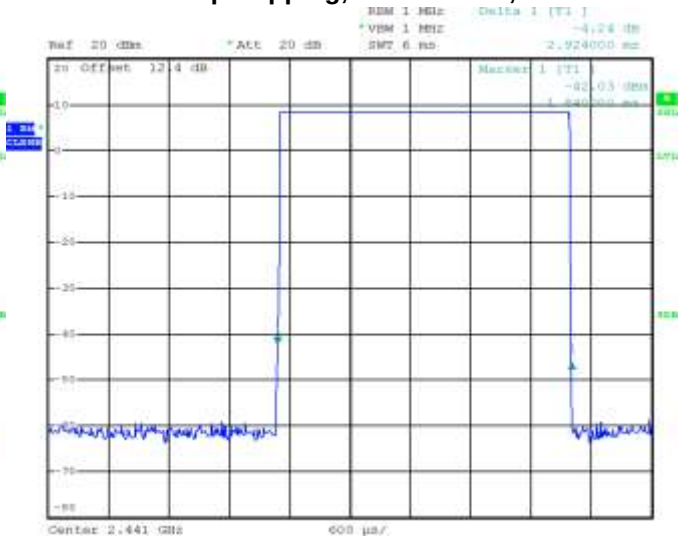
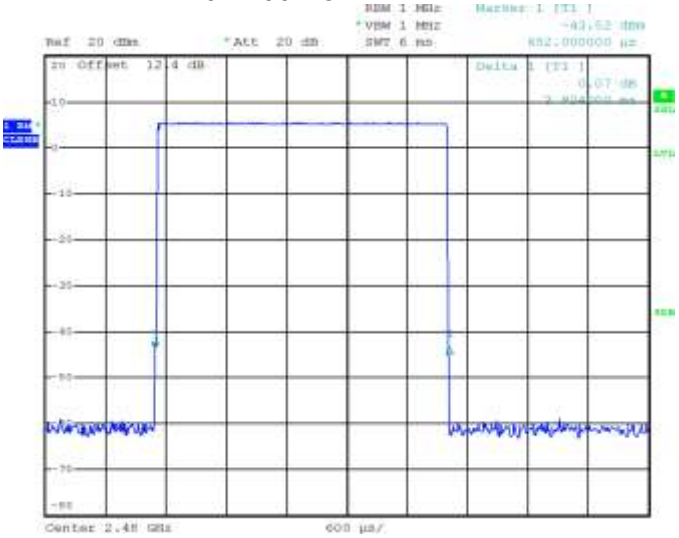


Figure 2-25: Time of Occupancy (Dwell Time)
Freq. Hopping, Static PBRS, DH5



Bluetooth RF Conducted Emission Test Results cont'd

Maximum Peak Conducted Output Power

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

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

Bluetooth Channel	Measured Level (dBm)	Measured Level (W)	Class 1 Limit (dBm)
0	5.70	0.00372	0.0 to 20.0
39	**8.10**	**0.00646**	0.0 to 20.0
78	5.30	0.00339	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	5.70	0.00372	0.0 to 20.0
39	**8.10**	**0.00646**	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	6.30	0.00427	0.0 to 20.0
39	**8.80**	**0.00759**	0.0 to 20.0
78	6.10	0.00407	0.0 to 20.0

See figures 2-26 to 2-28 for the plots of the maximum peak conducted output power.

Bluetooth RF Conducted Emission Test Results cont'd

Band Edge Compliance

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

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

Bluetooth Channel	Operating Mode	Measured Level (dBc)	Limit (dBc)	Margin (dB)
0	Single Frequency	-47.86	-20	-27.86
78	Single Frequency	-47.23	-20	-27.23
0	Hopping	-47.04	-20	-27.04
78	Hopping	-48.41	-20	-28.41

See figures 2-35 to 2-38 for the plots of the band edge compliance measurements.

Figure 2-35: Band Edge Compliance
Single Freq., Static PBRS, DH5

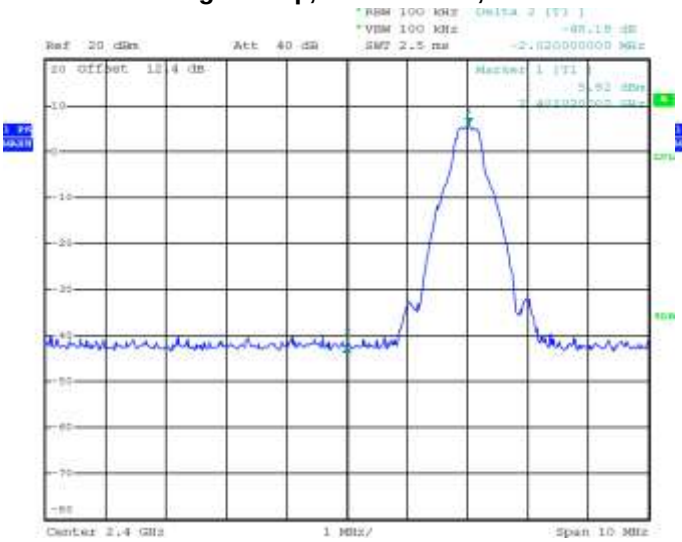
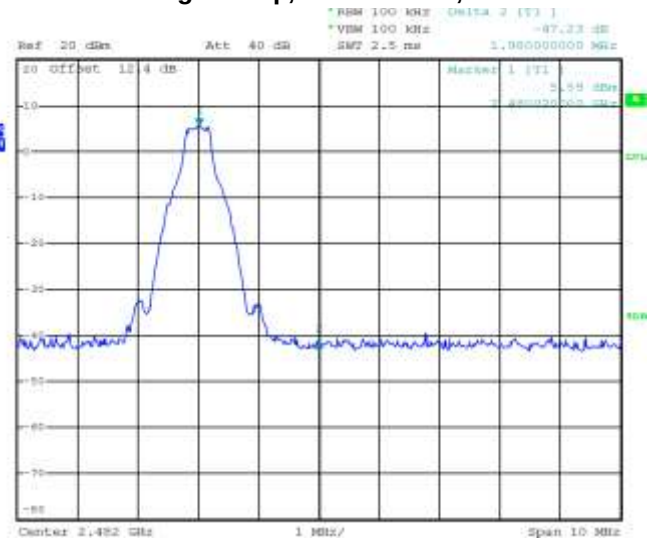


Figure 2-36: Band Edge Compliance
Single Freq., Static PBRS, DH5



Bluetooth RF Conducted Emission Test Results cont'd

Figure 2-37: Band Edge Compliance
Freq. Hopping, Static PBRS, DH5

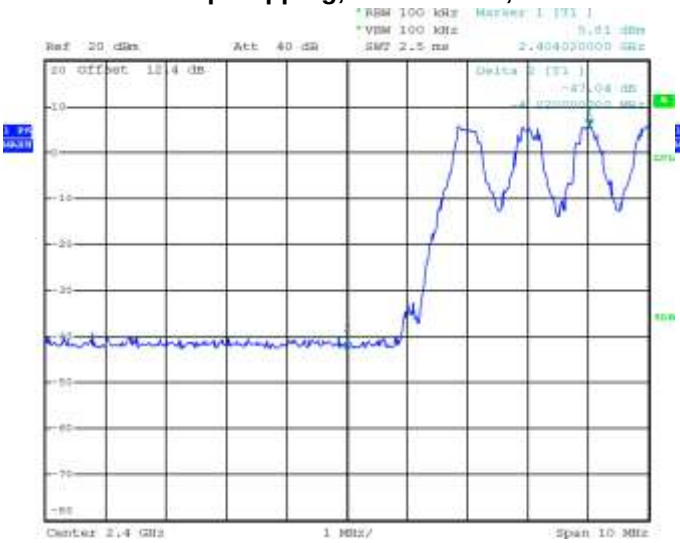
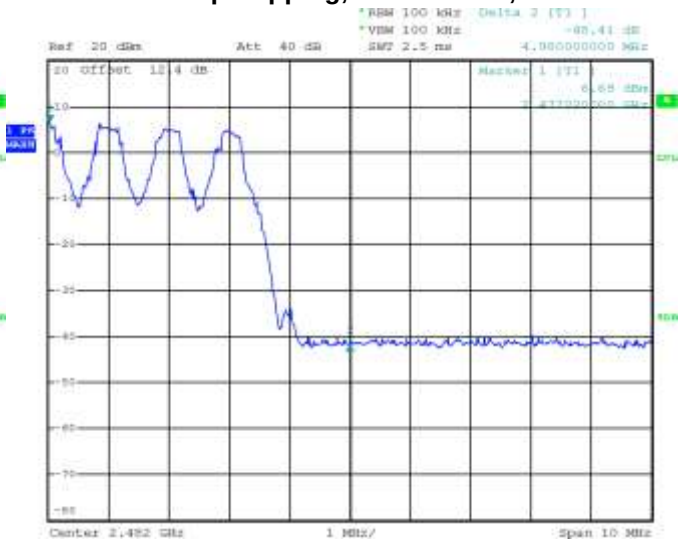


Figure 2-38: Band Edge Compliance
Freq. Hopping, Static PBRS, DH5



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	-45	-20	-25.00
78	Single Frequency	-44.05	-20	-24.05
0	Hopping	-44.17	-20	-24.17
78	Hopping	-43.97	-20	-23.97

See figures 2-39 to 2-42 for the plots of the band edge compliance measurements.

Bluetooth RF Conducted Emission Test Results cont'd

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

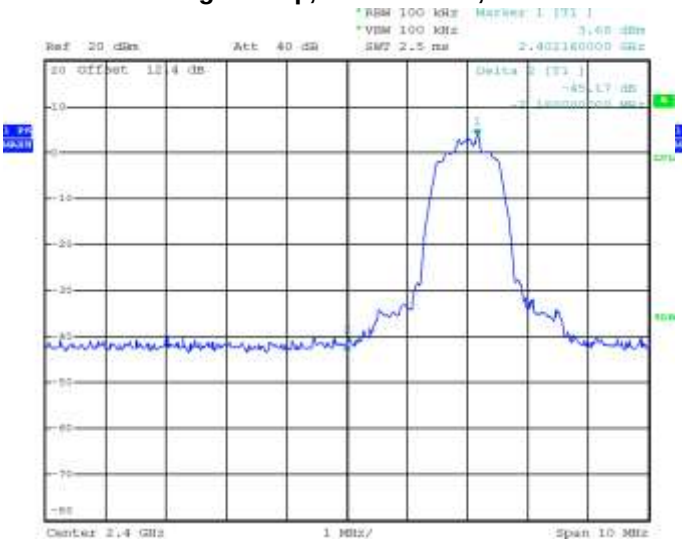


Figure 2-40: Band Edge Compliance
Single Freq., Static PBRS, 2-DH5

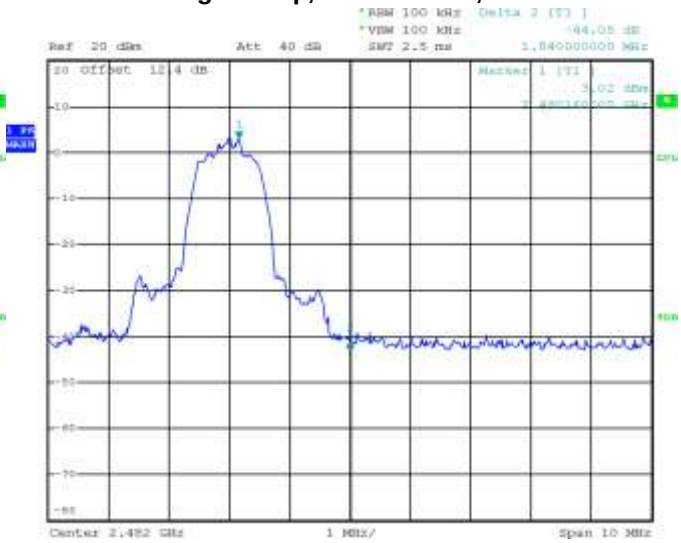


Figure 2-41: Band Edge Compliance
Freq. Hopping, Static PBRS, 2-DH5

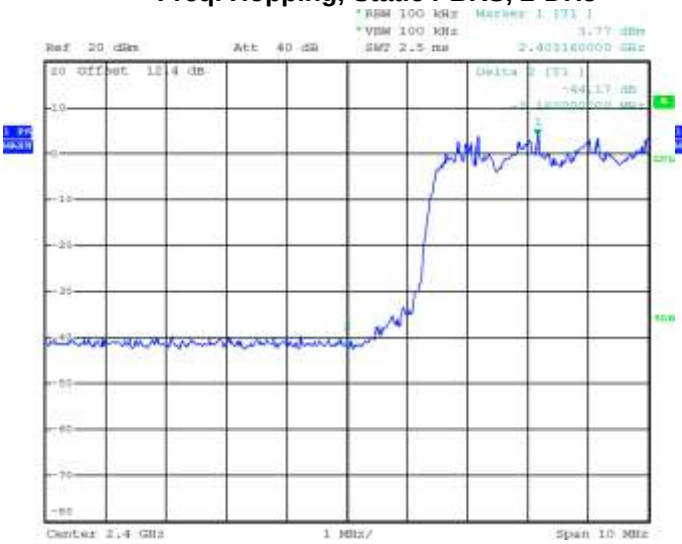
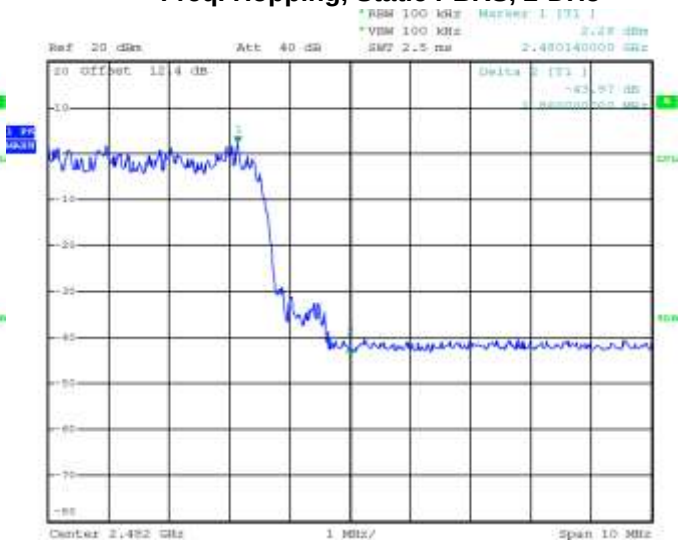


Figure 2-42: Band Edge Compliance
Freq. Hopping, Static PBRS, 2-DH5



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	-45.49	-20	-25.49
78	Single Frequency	-43.39	-20	-23.39
0	Hopping	-43.14	-20	-23.14
78	Hopping	-45.94	-20	-25.94

See figures 2-43 to 2-46 for the plots of the band edge compliance measurements.

Figure 2-43: Band Edge Compliance
Single Freq., Static PBRS, 3-DH5

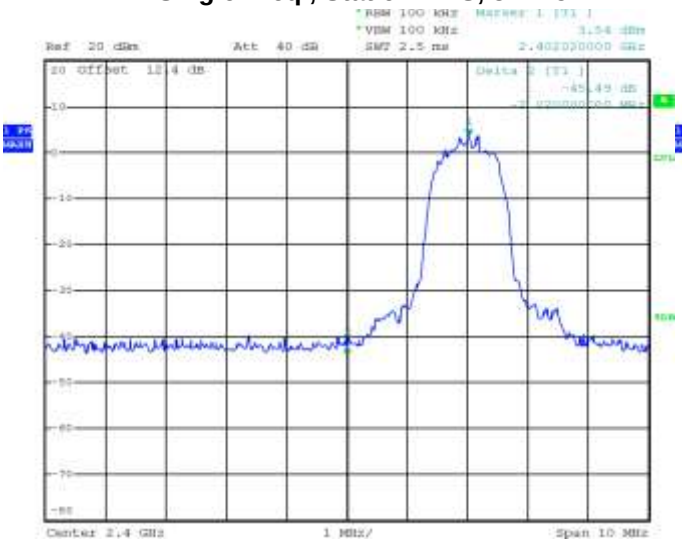
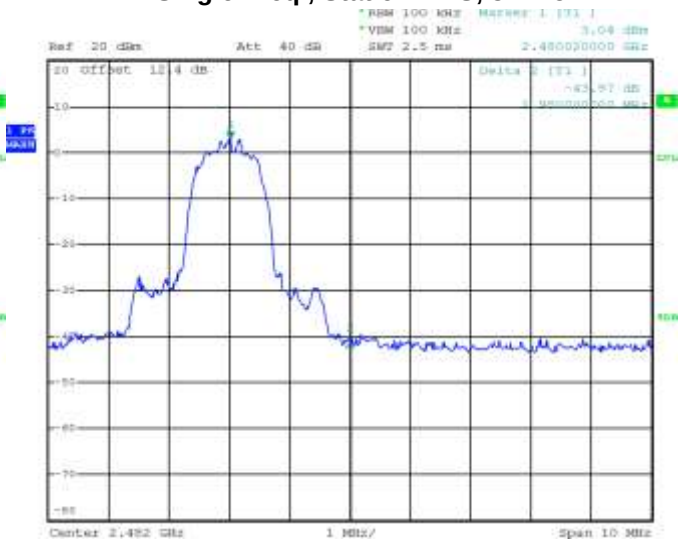


Figure 2-44: Band Edge Compliance
Single Freq., Static PBRS, 3-DH5



Bluetooth RF Conducted Emission Test Results cont'd

Figure 2-45: Band Edge Compliance
Freq. Hopping, Static PBRS, 3-DH5

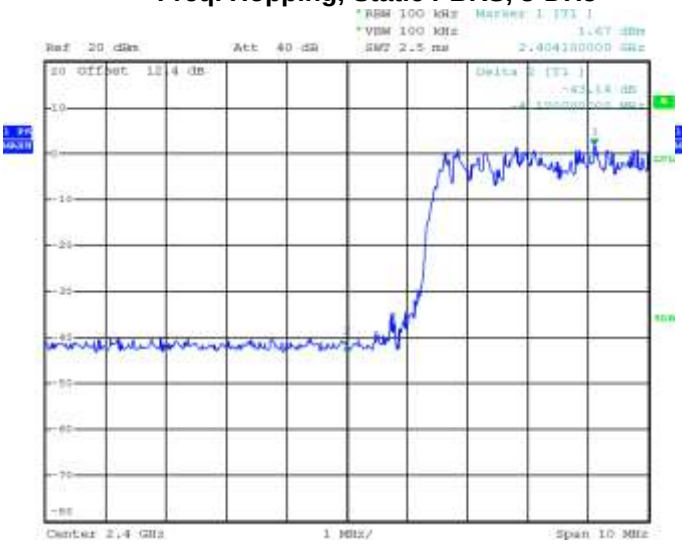
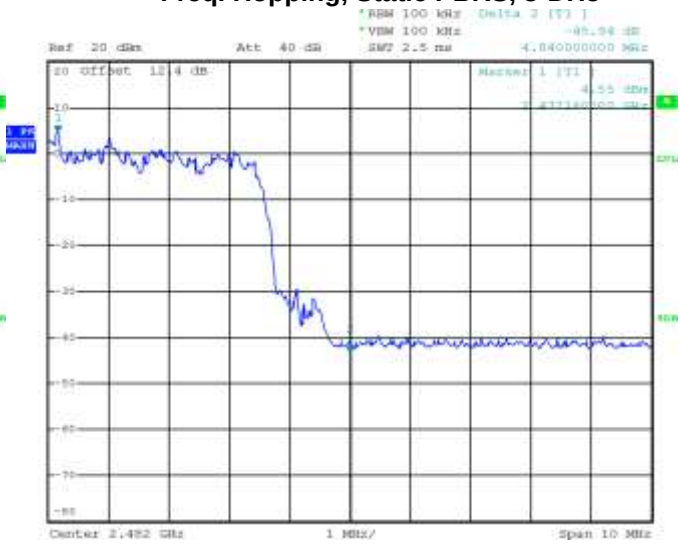


Figure 2-46: Band Edge Compliance
Freq. Hopping, Static PBRS, 3-DH5



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) and RSS-210. Low channel (0), mid channel (39) and high channel (78) were measured. Bluetooth was operating in single frequency and hopping mode. A reference offset of 12.4 dB was applied to the spectrum analyzer reference level for the attenuators and coaxial cable loss in the test circuit.

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

Bluetooth Channel	Channel Power (dBm)	Max. Measured Level (dBm)	Max. Measured Level from carrier (dBc)	Limit (dBc)
0.00	5.70	-31.14	-36.84	-20.00
39.00	8.10	-29.76	-37.86	-20.00
78.00	5.30	-30.68	-35.98	-20.00
Hopping mode	5.30	-29.64	-34.94	-20.00

See figures 2-47 to 2-50 for the plots of the spurious RF conducted emissions.

Bluetooth RF Conducted Emission Test Results cont'd

Figure 2-47: Spurious RF Conducted Emissions
Single Freq., Static PBRS, DH5,

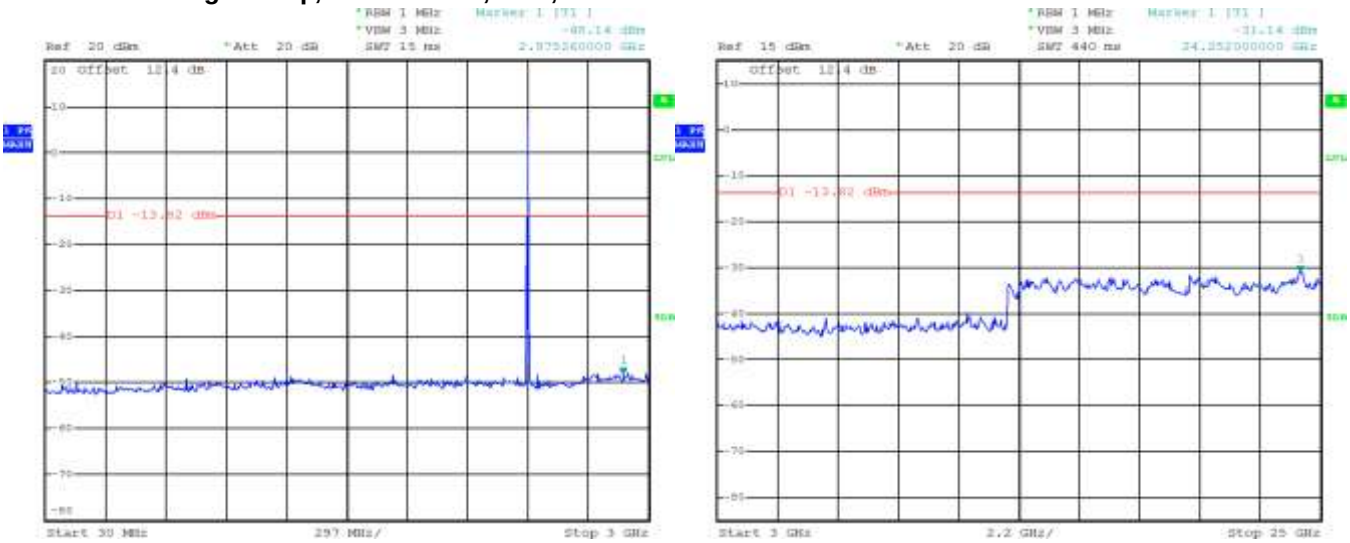
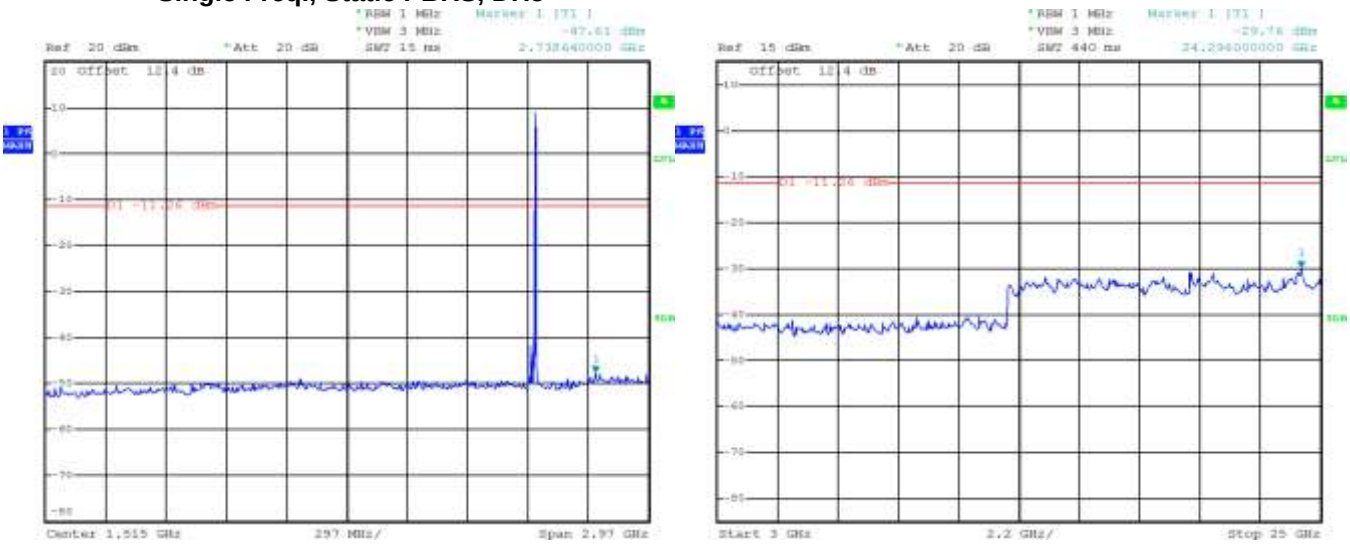


Figure 2-48: Spurious RF Conducted Emissions
Single Freq., Static PBRS, DH5



Bluetooth RF Conducted Emission Test Results cont'd

Figure 2-49: Spurious RF Conducted Emissions
Single Freq., Static PBRS, DH5

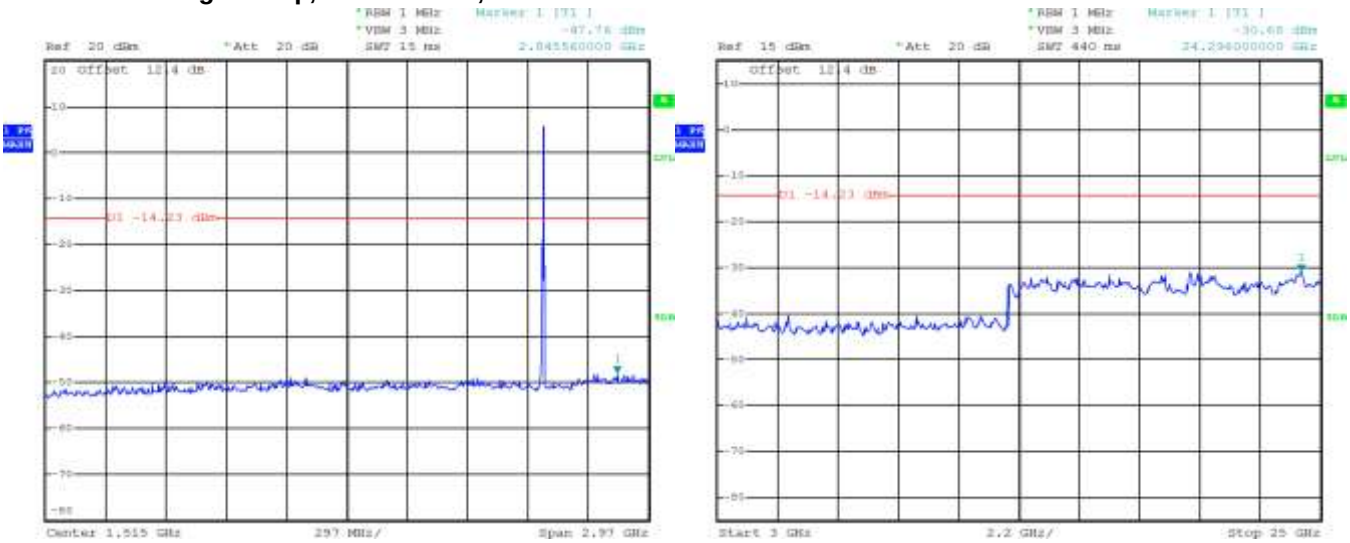
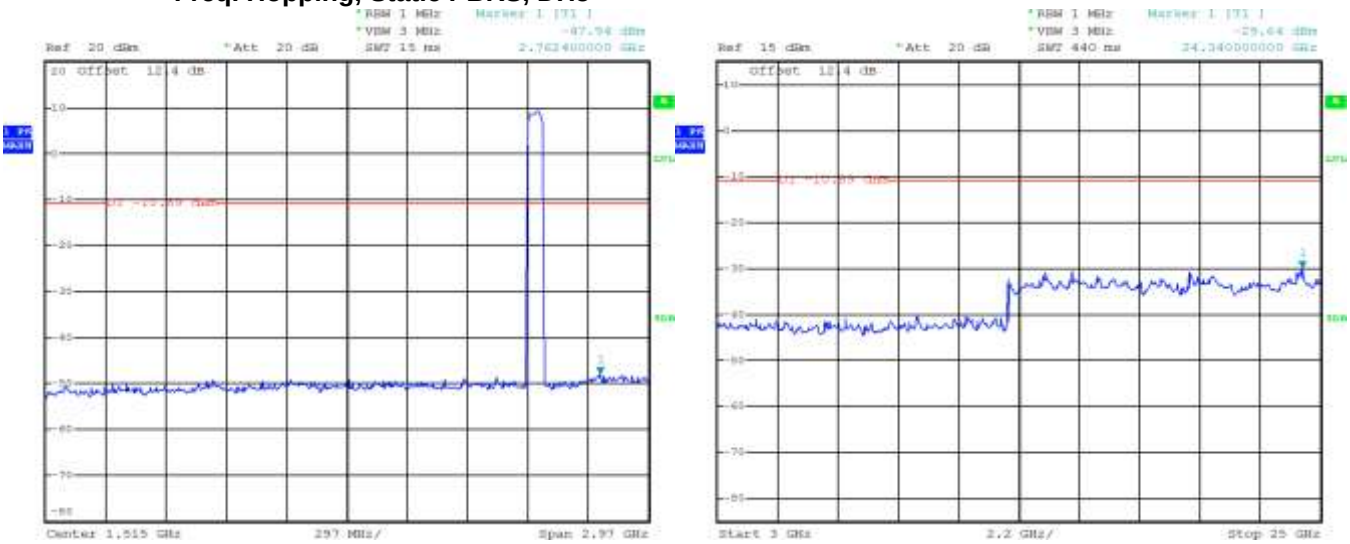


Figure 2-50: Spurious RF Conducted Emissions
Freq. Hopping, Static PBRS, DH5



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	6.30	-30.11	-36.41	-20.00
39.00	8.80	-30.75	-39.55	-20.00
78.00	6.10	-30.58	-36.68	-20.00
Hopping mode	6.10	-30.24	-36.34	-20.00

See figures 2-51 to 2-54 for the plots of the spurious RF conducted emissions.

Bluetooth RF Conducted Emission Test Results cont'd

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

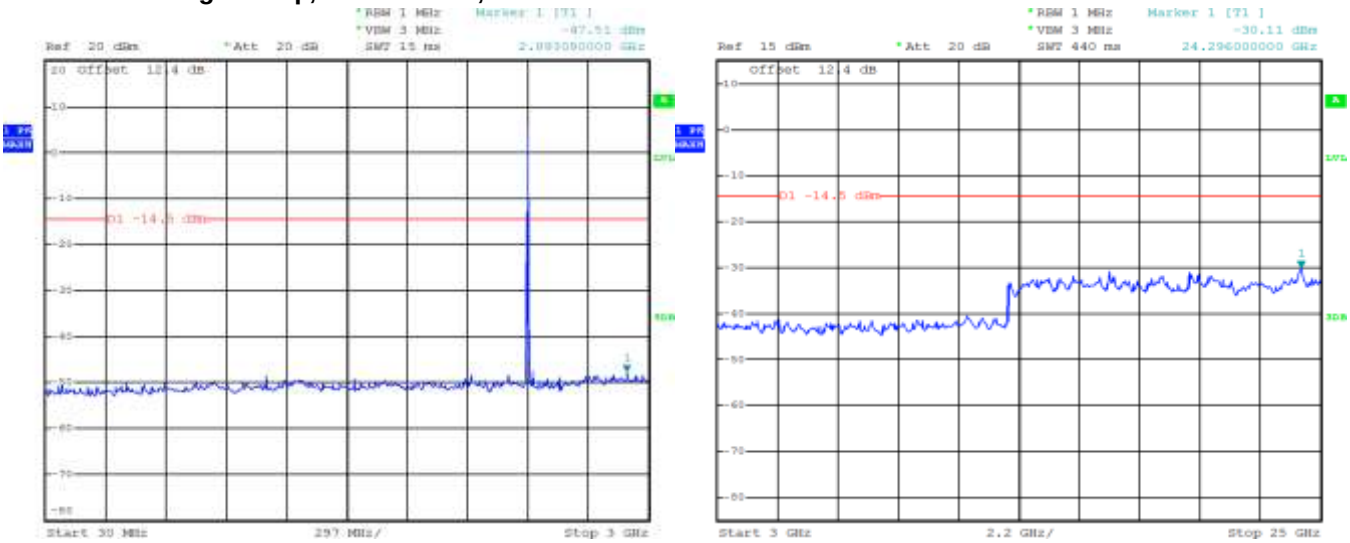
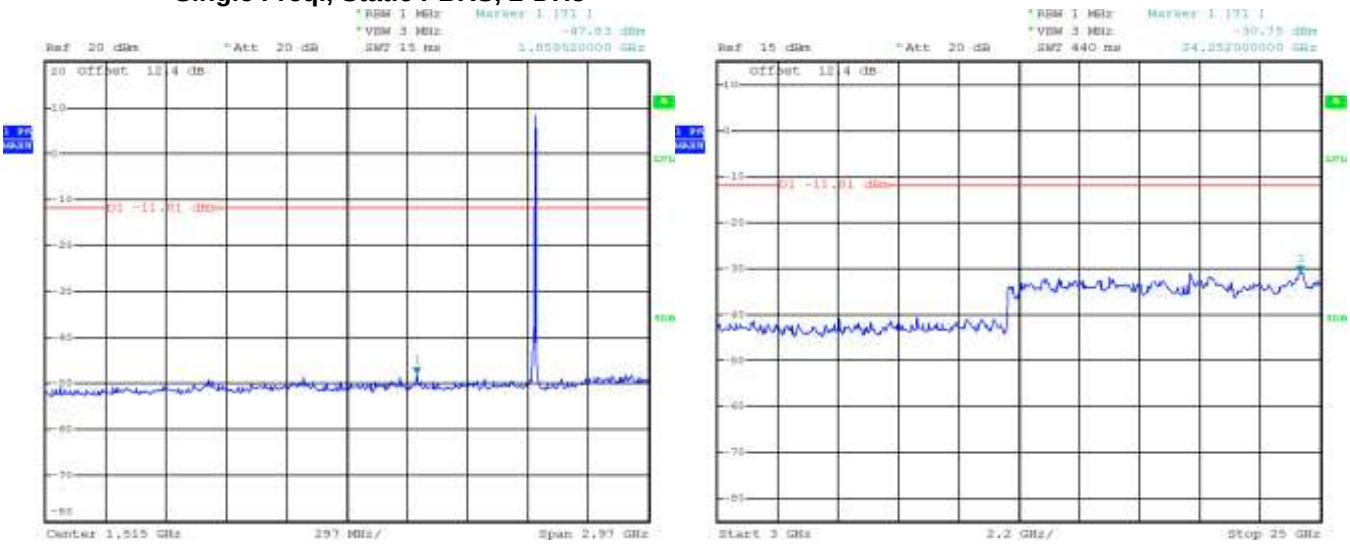


Figure 2-52: Spurious RF Conducted Emissions
Single Freq., Static PBRS, 2-DH5



Bluetooth RF Conducted Emission Test Results cont'd

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

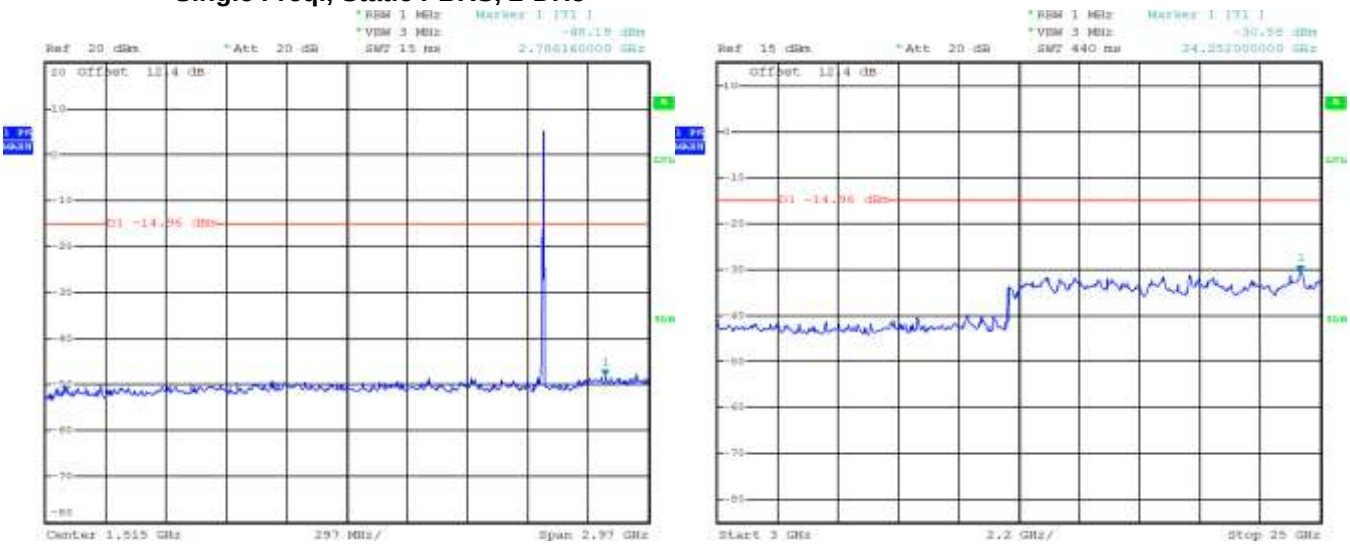
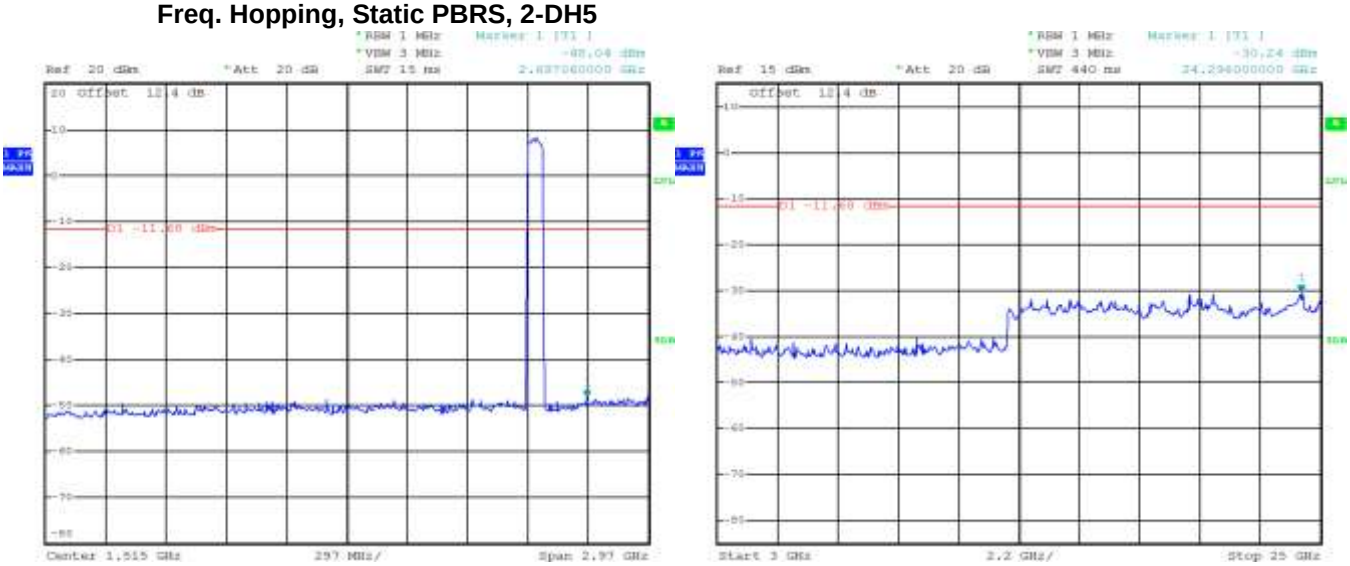


Figure 2-54: Spurious RF Conducted Emissions
Freq. Hopping, Static PBRS, 2-DH5



Bluetooth RF Conducted Emission Test Results cont'd

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

Bluetooth Channel	Channel Power (dBm)	Max. Measured Level (dBm)	Max. Measured Level from carrier (dBc)	Limit (dBc)
0.00	5.70	-30.97	-36.67	-20.00
39.00	8.10	-31.01	-39.11	-20.00
78.00	5.30	-30.10	-35.40	-20.00
Hopping mode	5.30	-30.72	-36.02	-20.00

See figures 2-55 to 2-58 for the plots of the spurious RF conducted emissions.

Bluetooth RF Conducted Emission Test Results cont'd

Figure 2-55: Spurious RF Conducted Emissions
Single Freq., Static PBRS, 3-DH5

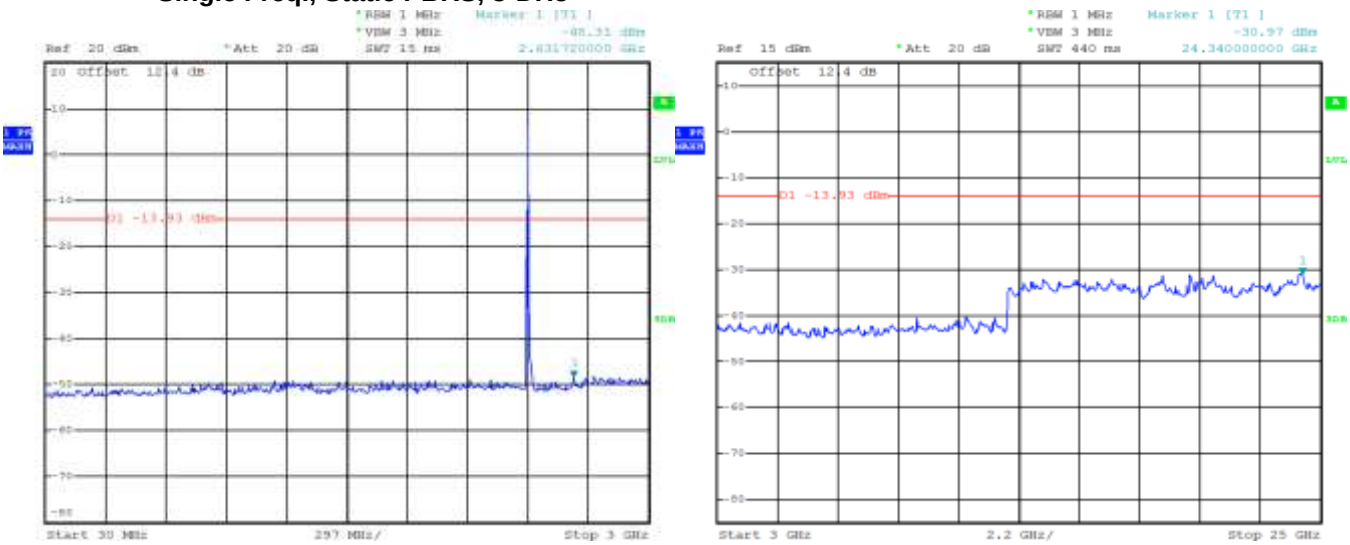
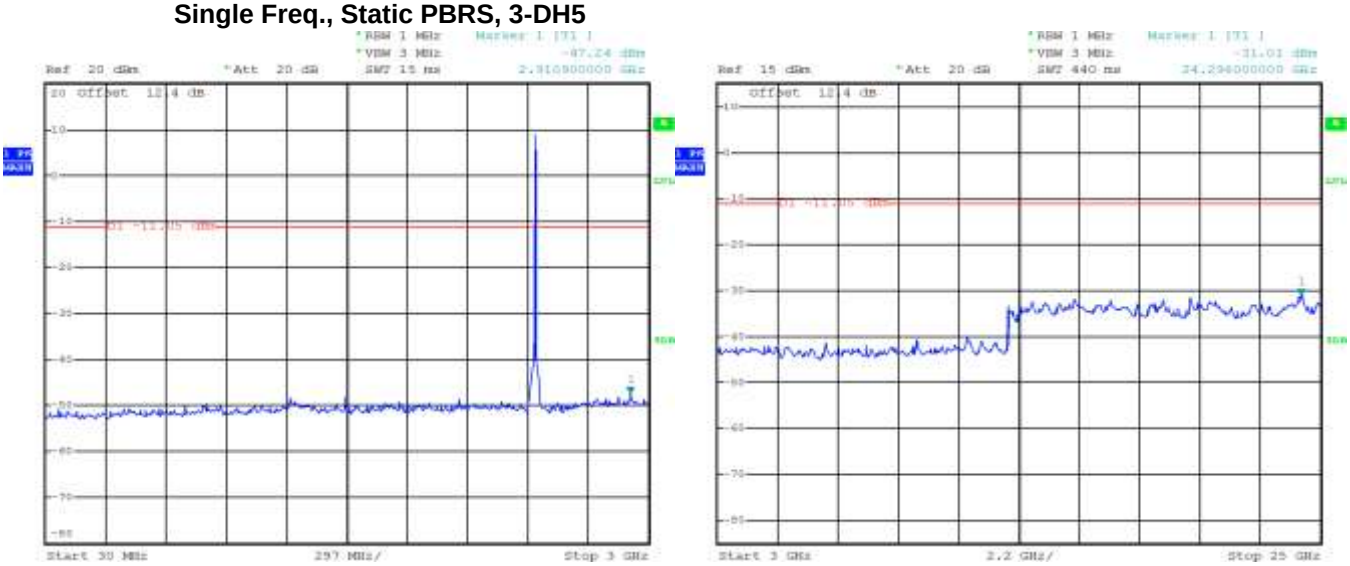


Figure 2-56: Spurious RF Conducted Emissions
Single Freq., Static PBRS, 3-DH5



Bluetooth RF Conducted Emission Test Results cont'd

Figure 2-57: Spurious RF Conducted Emissions
Single Freq., Static PBRS, 3-DH5

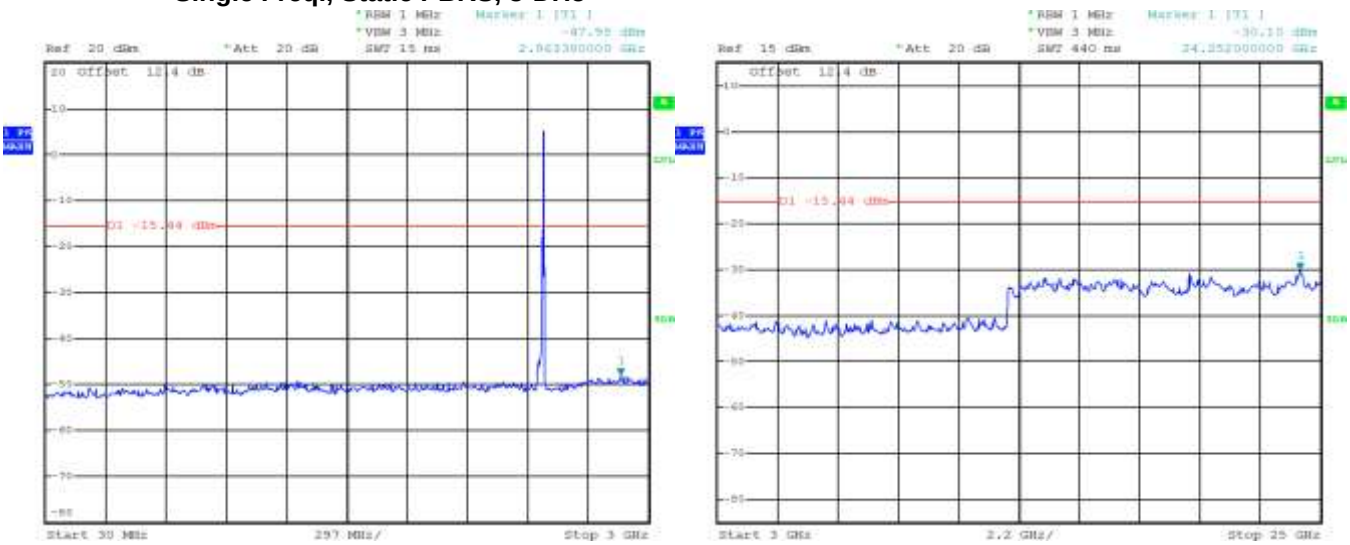
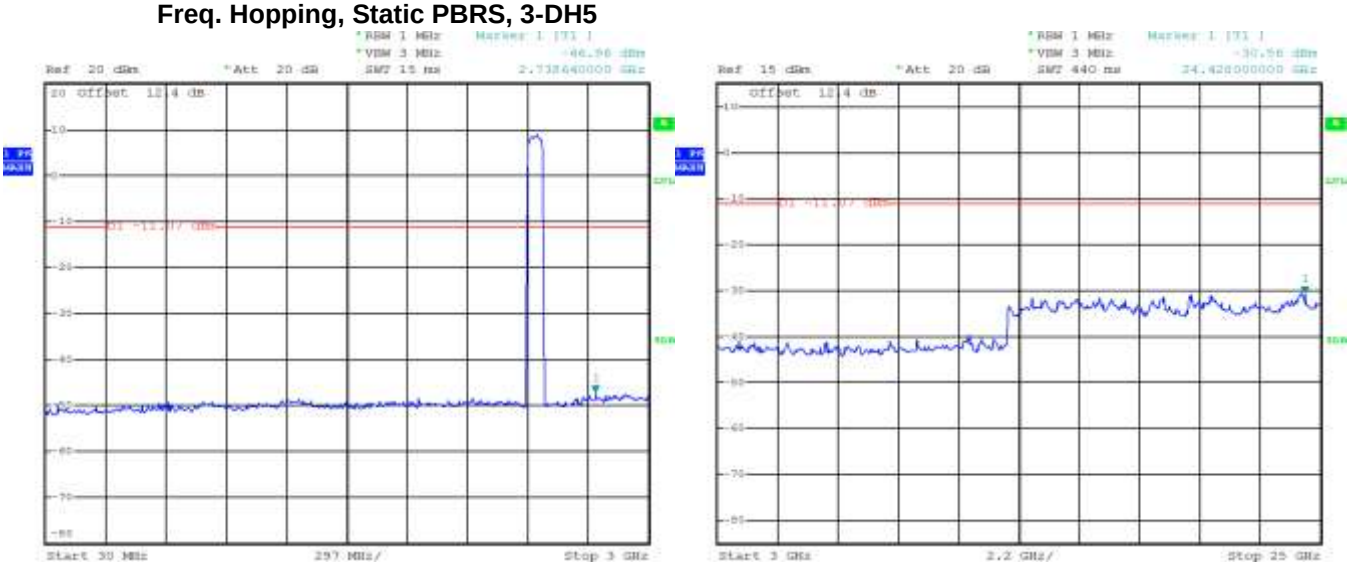


Figure 2-58: Spurious RF Conducted Emissions
Freq. Hopping, Static PBRS, 3-DH5



Bluetooth Low Energy RF Conducted Emission Test Results

6 dB Bandwidth

The EUT met the requirements of the 6 dB bandwidth as per 47 CFR 15.247(a)(2) and RSS-210. Channels 0, 20 and 39 were measured.

Channel	Limit (kHz)	Measured Level (KHz)
0	≥ 500	**690.00**
20	≥ 500	680.00
39	≥ 500	670.00

See figures 2-59 to 2-61 for the plots of the 6 dB bandwidth measurements for Channels 0, 20, and 39.

Figure 2-59: 6 dB Bandwidth LE, Channel 0

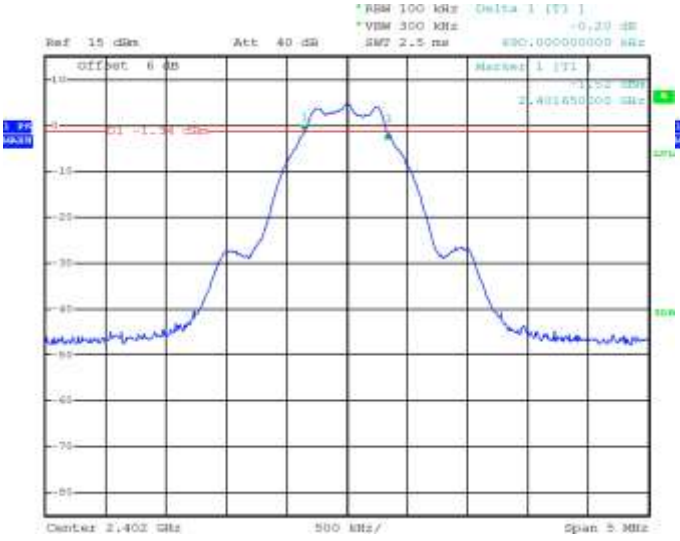
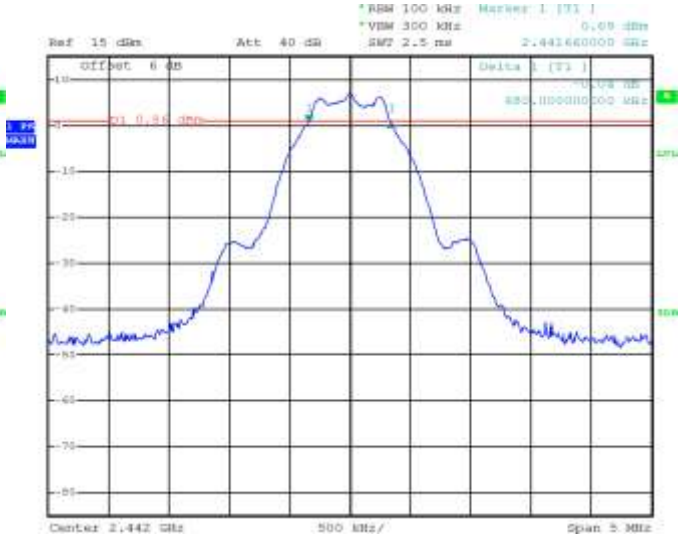


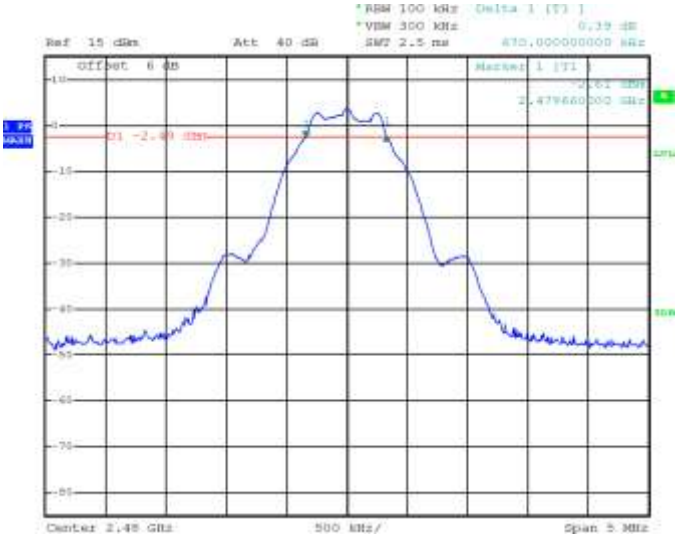
Figure 2-60: 6 dB Bandwidth LE, Channel 20



Bluetooth Low Energy RF Conducted Emission Test Results cont'd

Figure 2-61: 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) and RSS-210. Channels 0, 20 and 39 were measured using an Agilent power meter, model N1911A with model N1921A power sensor. A reference offset of 6.4 dB was applied to the power meter reference level for the coaxial cable loss and attenuators in the test circuit.

Channel	Class 2 Limit (W)	Measured Level (dBm)	Measured Level (W)
0	< 1.00	2.81	0.00191
20	< 1.00	**5.05**	**0.00320**
39	< 1.00	1.88	0.00154

Bluetooth Low Energy RF Conducted Emission Test Results cont'd

Band Edge Compliance

The EUT met the requirements of the band edge compliance as per 47 CFR 15.247(c) and RSS-210. Channels 0 and 39 were measured.

Channel	Limit (dBc)	Measured Level (dBc)	Margin (dBc)
0	< -20	-51.8	-31.80
39	< -20	-50.99	-30.99

See figures 2-62 to 2-63 for the plots of the band edge compliance measurements for Channels 0 and 39.

Figure 2-62: Band Edge Compliance LE, Channel 0

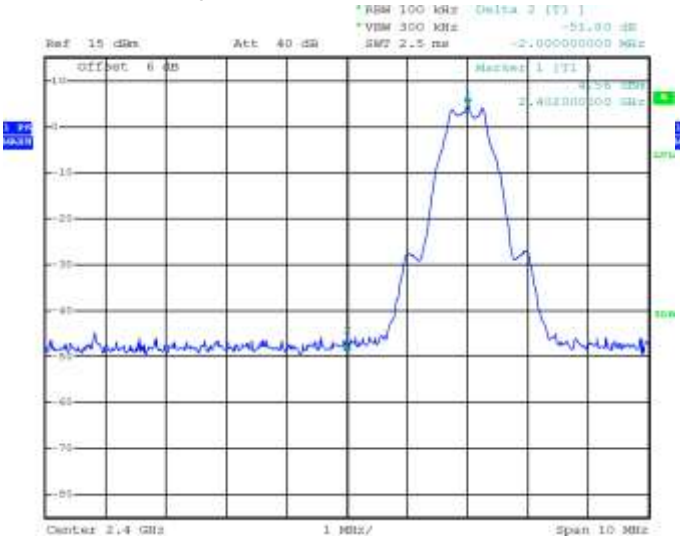
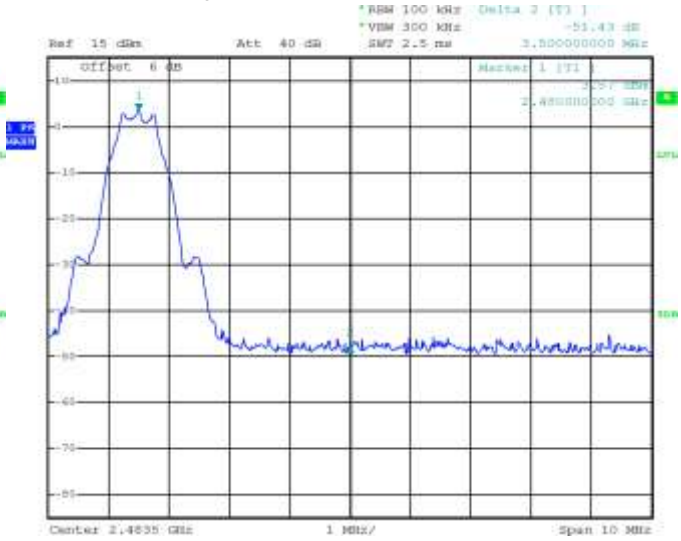


Figure 2-63: Band Edge Compliance LE, Channel 39



Bluetooth Low Energy RF Conducted Emission Test Results cont'd

Peak Power Spectral Density

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

Channel	Limit (dBm)	Measured Level (dBm)	Margin (dBm)
0	< 8.00	-11.53	-19.53
20	< 8.00	-8.24	-16.24
39	< 8.00	-11.53	-19.53

Bluetooth Low Energy RF Conducted Emission Test Results cont'd

See figures 2-64 to 2-66 for the plots of the peak power spectral density for Channels 0, 20 and 39.

Figure 2-64: Peak Power Spectral Density LE, Channel 0

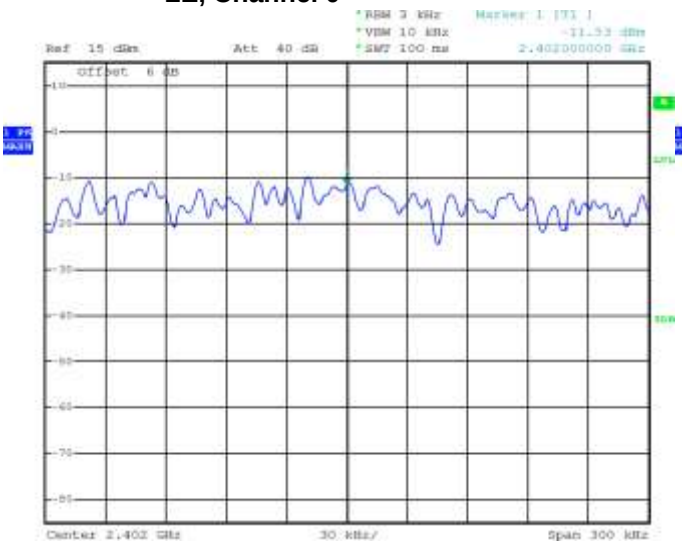


Figure 2-65: Peak Power Spectral Density LE, Channel 20

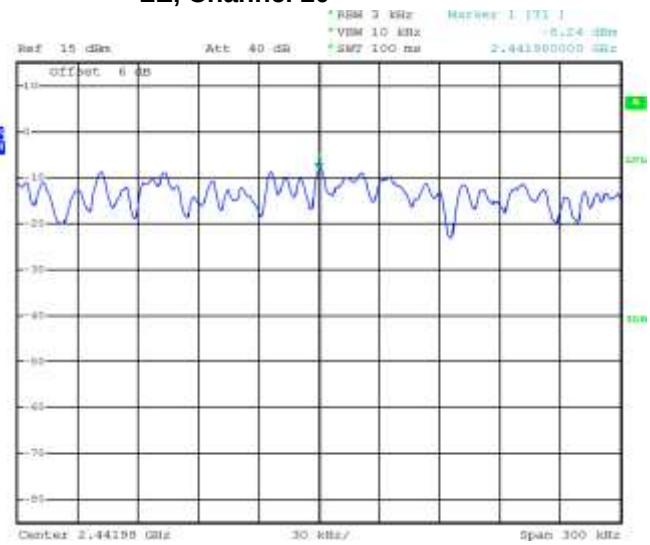
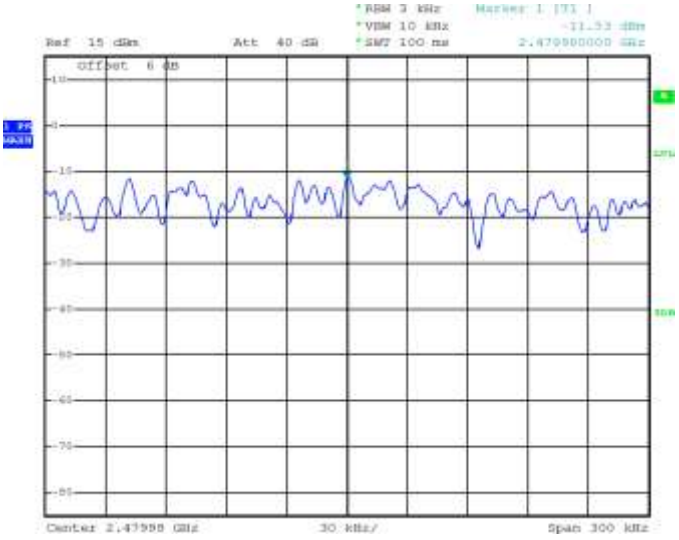


Figure 2-66: Peak Power Spectral Density LE, Channel 39



Bluetooth Low Energy RF Conducted Emission Test Results cont'd

Spurious RF Conducted Emissions

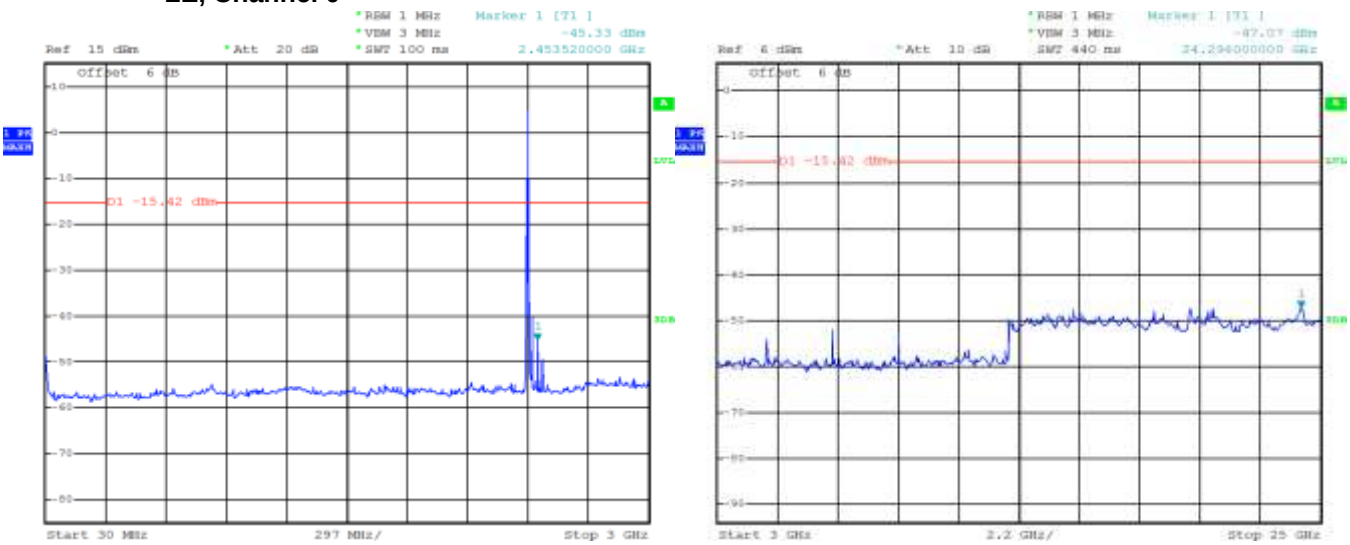
The EUT met the requirements of the spurious RF conducted emissions as per 47 CFR 15.247(c) and RSS-210. Channels 0, 20 and 39 were measured. Peak power was measured using an Agilent power meter, model N1911A with model N1921A power sensor. A reference offset of 6.4 dB was applied to the power meter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

Channel	Power (dBm)	Max. Measured Level (dBm)	Max. Measured Level from Carrier (dBc)	Limit (dBc)
0	2.8	-45.3	-48.1	-20.0
20	5.1	-39.3	-44.4	-20.0
39	1.9	-38.5	-40.4	-20.0

The emissions were in the NF.

See figures 2-67 to 2-69 for the plots of the spurious RF conducted emissions for Channels 0, 20 and 39.

Figure 2-67: Spurious Conducted RF Emissions
LE, Channel 0



Bluetooth Low Energy RF Conducted Emission Test Results cont'd

Figure 2-68 : Spurious Conducted RF Emissions
LE, Channel 20

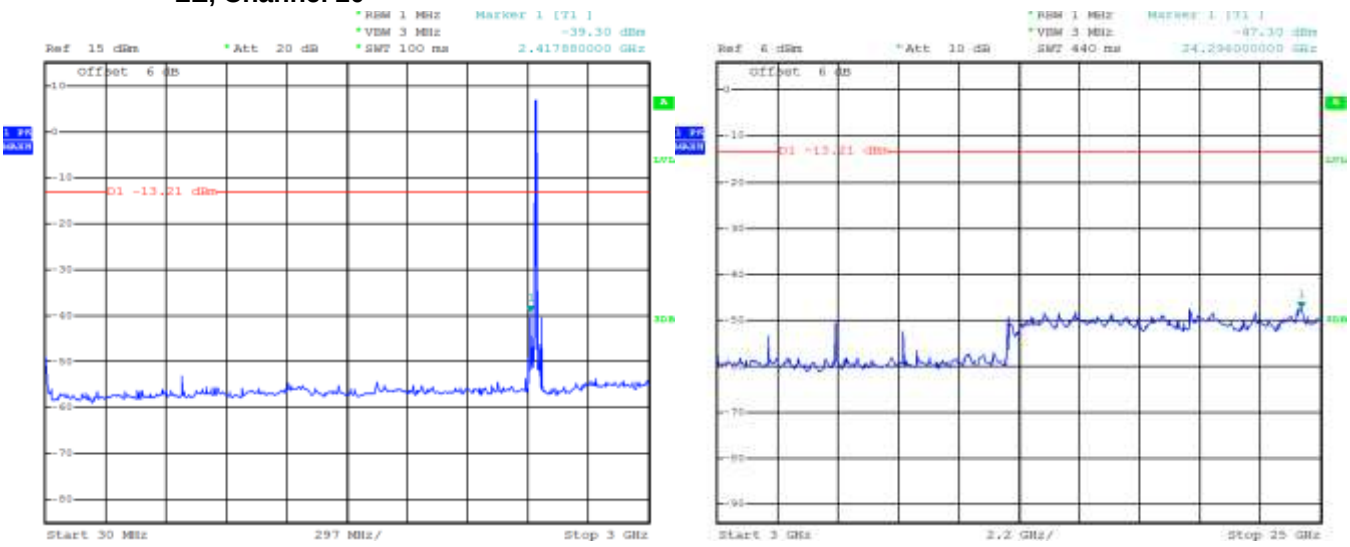
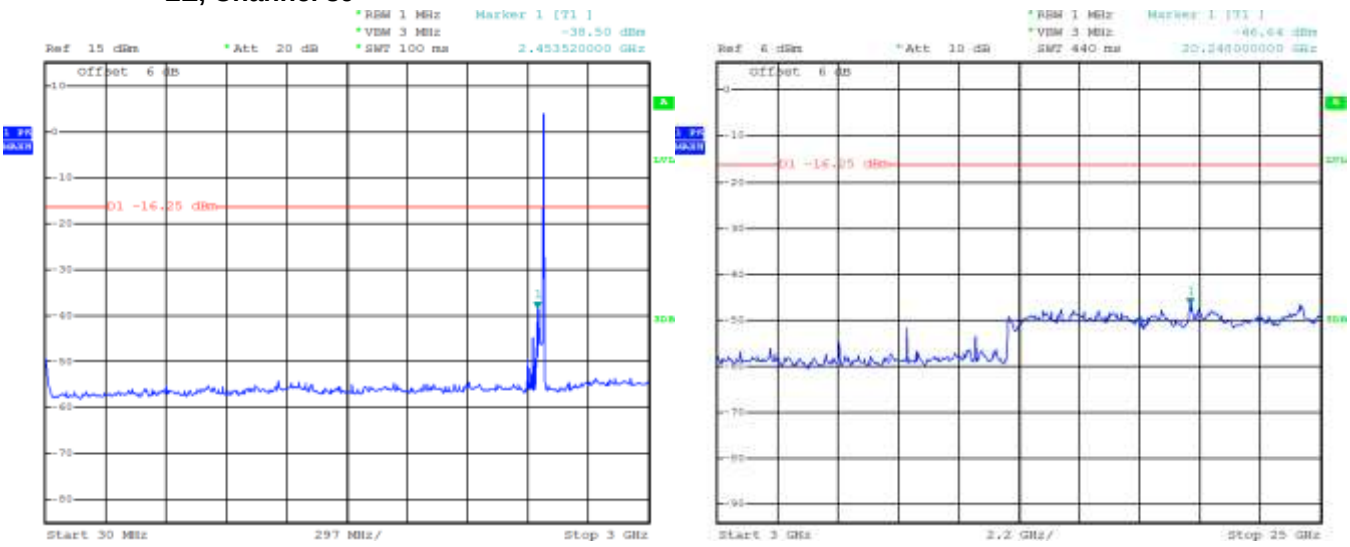


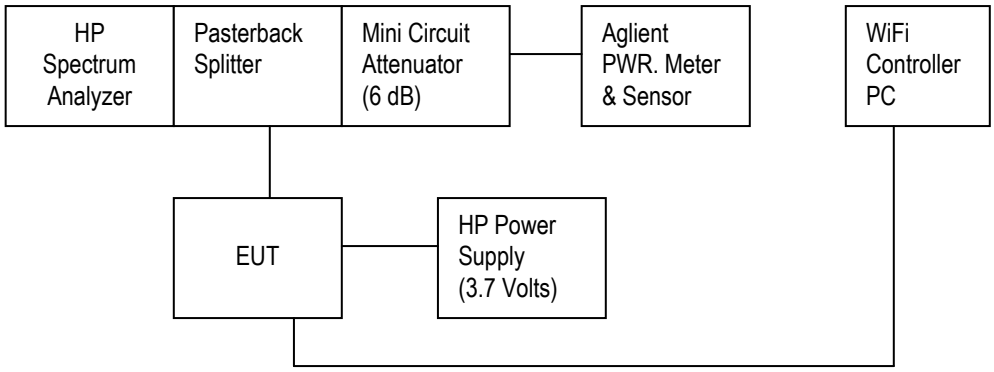
Figure 2-69: Spurious Conducted RF Emissions
LE, Channel 39



APPENDIX 3 – 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: August 27, 2013
The measurements on the BlackBerry® smartphone were performed by Chuan Tran.

The environmental test conditions were: Temperature: 27.5 ºC
Relative Humidity: 31.2 %

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

Following tests were performed on the model RGE111LW.

6 dB Bandwidth

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

Channel	Data Rate	Limit (kHz)	Measured Level (MHz)
1	1 Mbps	≥ 500	8.60
	5.5 Mbps	≥ 500	9.08
	11 Mbps	≥ 500	9.56
	6 Mbps	≥ 500	15.16
	24 Mbps	≥ 500	16.48
	54 Mbps	≥ 500	16.48
	MCS 0	≥ 500	16.48
	MCS 4	≥ 500	16.48
	MCS 7	≥ 500	16.48
6	1 Mbps	≥ 500	8.12
	5.5 Mbps	≥ 500	8.60
	11 Mbps	≥ 500	9.92
	6 Mbps	≥ 500	15.16
	24 Mbps	≥ 500	16.44
	54 Mbps	≥ 500	16.48
	MCS 0	≥ 500	16.48
	MCS 4	≥ 500	16.48
	MCS 7	≥ 500	16.48
11	1 Mbps	≥ 500	8.16
	5.5 Mbps	≥ 500	8.16
	11 Mbps	≥ 500	9.20
	6 Mbps	≥ 500	15.12
	24 Mbps	≥ 500	16.48
	54 Mbps	≥ 500	16.48
	MCS 0	≥ 500	16.48
	MCS 4	≥ 500	16.44
	MCS 7	≥ 500	16.48

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

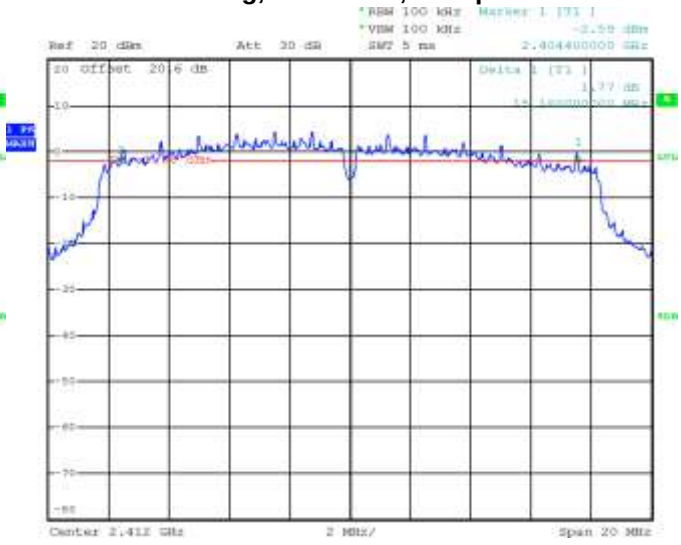
See figures 5-1 to 5-9 for the plots of the 6 dB bandwidth measurements for Channels 1, 6, and 11, at 1 Mbps each for 802.11b mode, 6 Mbps each for 802.11g mode, and MCS 0 each for 802.11n mode.

Figure 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

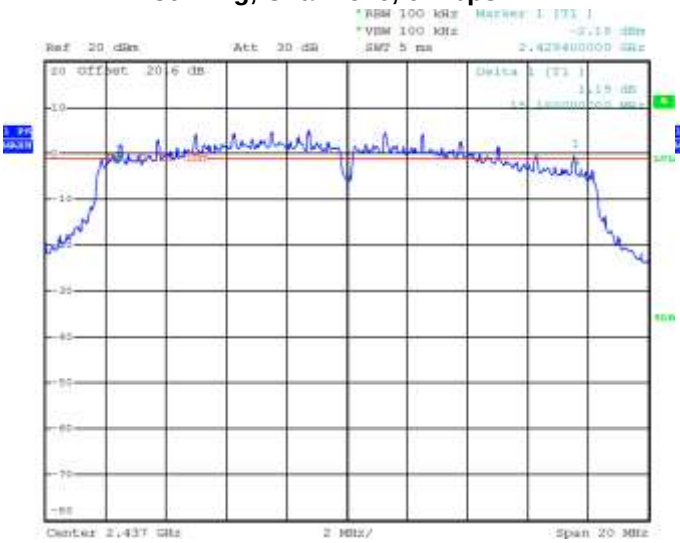


Figure 3-6: 6 dB Bandwidth
802.11g, Channel 11, 6 Mbps

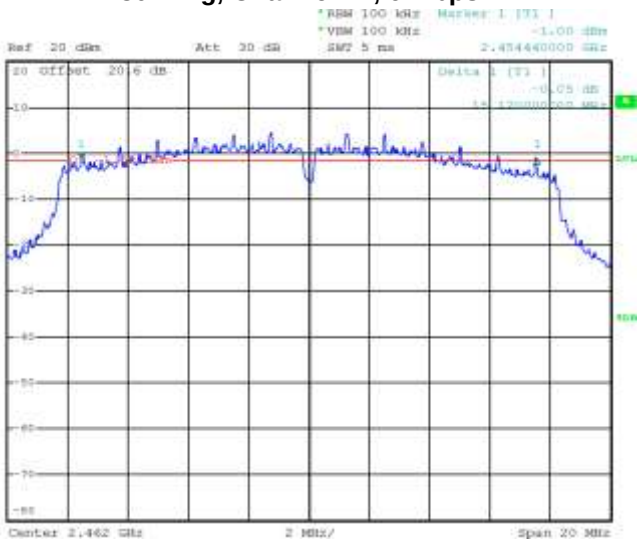


Figure 3-7: 6 dB Bandwidth
802.11n, Channel 1, MCS 0

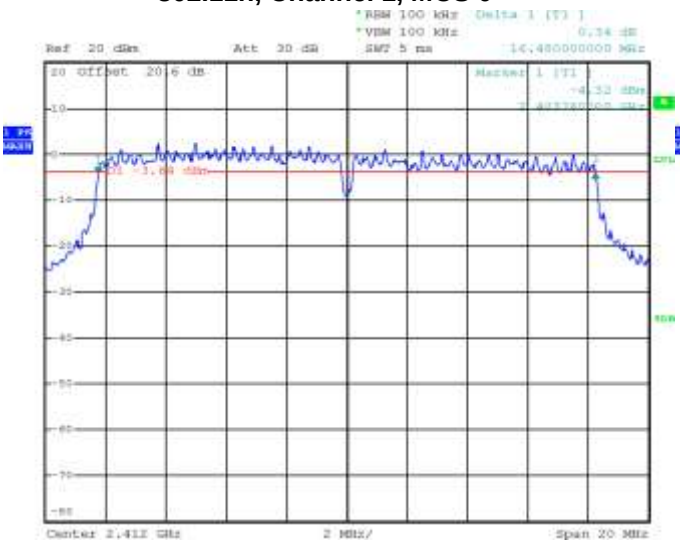


Figure 3-8: 6 dB Bandwidth
802.11n, Channel 6, MCS 0

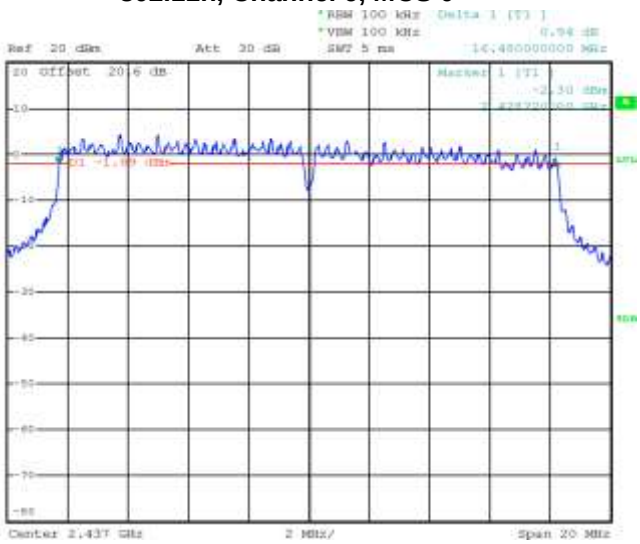
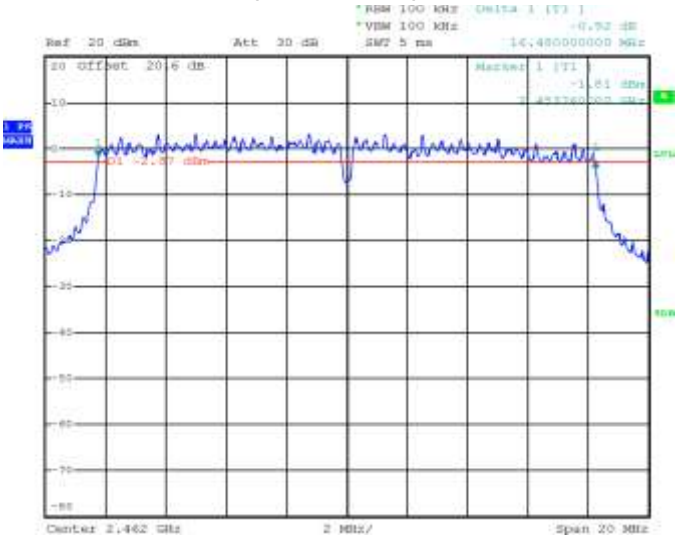


Figure 3-9: 6 dB Bandwidth
802.11n, Channel 11, MCS 0



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) and RSS-210. Channels 1, 6 and 11 were measured at 1 Mbps, 5.5 Mbps, and 11 Mbps each for 802.11b mode, 6 Mbps, 24 Mbps, and 54 Mbps each for 802.11g mode, and MCS 0, 4 and 7 for 802.11n mode using an Aglient power meter, model N1911A with model N1921A power sensor. A reference offset of 18.4 dB was applied to the power meter reference level for the coaxial cable loss and attenuators in the test circuit.

Channel	Data Rate	Class 2 Limit (W)	Measured Level (dBm)	Measured Level (W)
1	1 Mbps	< 1.00	15.71	0.0373
	5.5 Mbps	< 1.00	15.61	0.0364
	11 Mbps	< 1.00	15.49	0.0354
	6 Mbps	< 1.00	15.33	0.0342
	24 Mbps	< 1.00	14.76	0.0299
	54 Mbps	< 1.00	12.68	0.0185
	MCS 0	< 1.00	15.12	0.0325
	MCS 4	< 1.00	14.46	0.0279
	MCS 7	< 1.00	11.12	0.0129
6	1 Mbps	< 1.00	16.00	0.0398
	5.5 Mbps	< 1.00	15.83	0.0383
	11 Mbps	< 1.00	15.81	0.0381
	6 Mbps	< 1.00	15.81	0.0381
	24 Mbps	< 1.00	15.45	0.0351
	54 Mbps	< 1.00	13.35	0.0216
	MCS 0	< 1.00	15.46	0.0351
	MCS 4	< 1.00	14.96	0.0313
	MCS 7	< 1.00	11.60	0.0145

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

Channel	Data Rate	Class 2 Limit (W)	Measured Level (dBm)	Measured Level (W)
11	1 Mbps	< 1.00	16.05	0.0403
	5.5 Mbps	< 1.00	15.91	0.0390
	11 Mbps	< 1.00	15.78	0.0379
	6 Mbps	< 1.00	15.70	0.0372
	24 Mbps	< 1.00	15.21	0.0332
	54 Mbps	< 1.00	13.03	0.0201
	MCS 0	< 1.00	15.44	0.0350
	MCS 4	< 1.00	14.82	0.0303
	MCS 7	< 1.00	11.53	0.0142

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

Band Edge Compliance

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

Channel	Data Rate	Limit (dBc)	Measured Level (dBc)	Margin (dBc)
1	1 Mbps	< -20	-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	-45.27	-25.27
	5.5 Mbps	< -20	-44.63	-24.63
	11 Mbps	< -20	-42.82	-22.82
	6 Mbps	< -20	-38.92	-18.92
	24 Mbps	< -20	-37.30	-17.30
	54 Mbps	< -20	37.42	57.42
	MCS 0	< -20	-37.08	-17.08
	MCS 4	< -20	-36.94	-16.94
	MCS 7	< -20	-37.05	-17.05

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

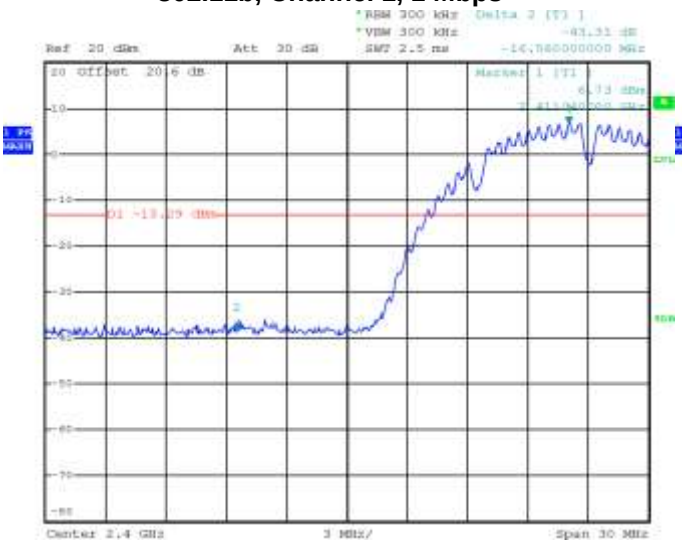


Figure 3-11: Band Edge Compliance
802.11b, Channel 11, 1 Mbps

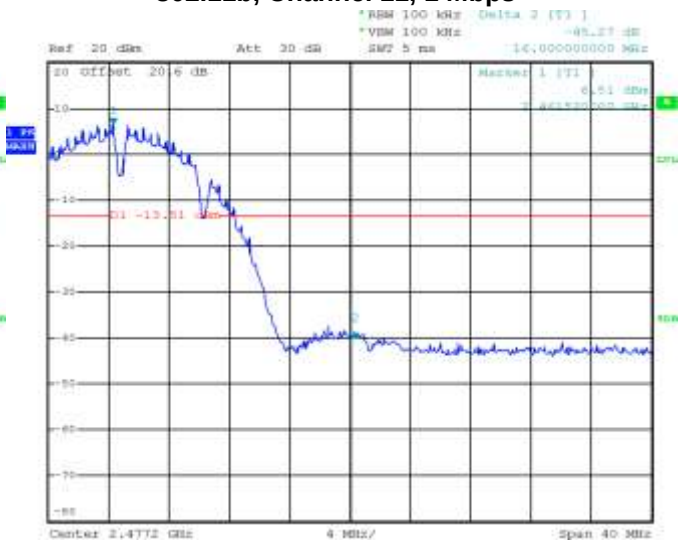


Figure 3-12: Band Edge Compliance
802.11g, Channel 1, 6 Mbps

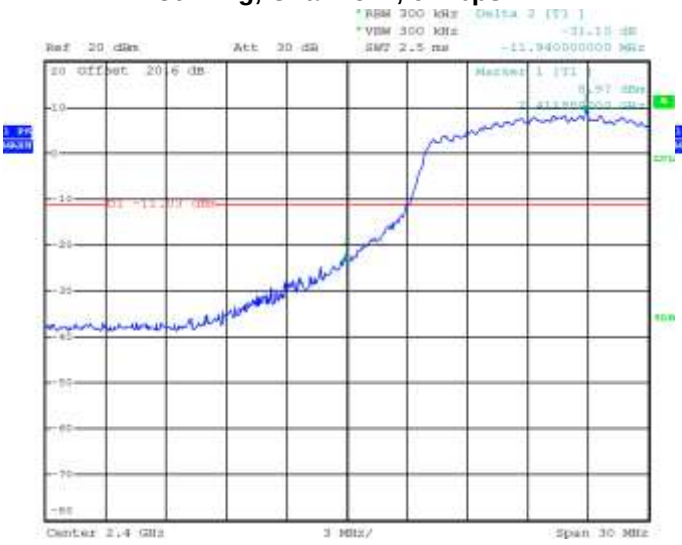
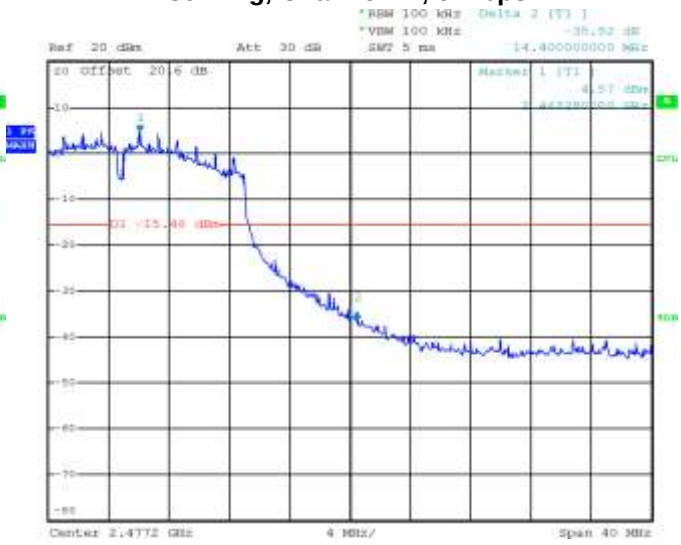


Figure 3-13: Band Edge Compliance
802.11g, Channel 11, 6 Mbps



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

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

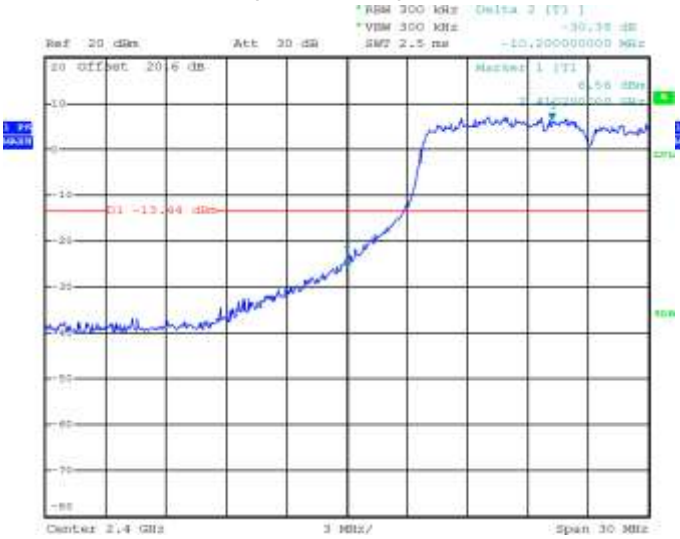
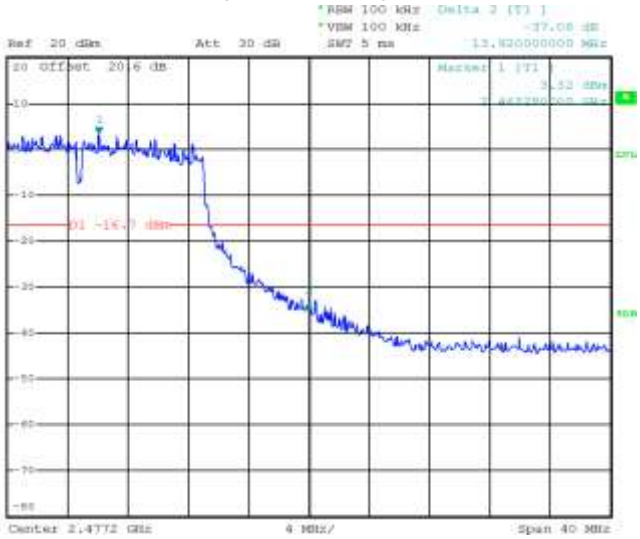


Figure 3-15: Band Edge Compliance
802.11n, Channel 11, MCS 0



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) and RSS-210. Channels 1, 6 and 11 were measured at 1 Mbps, 5.5 Mbps, and 11 Mbps each for 802.11b mode, 6 Mbps, 24 Mbps, and 54 Mbps each for 802.11g mode, and MCS 0, 4, and 7 for 802.11n mode.

Channel	Data Rate	Limit (dBm)	Measured Level (dBm)	Margin (dBm)
1	1 Mbps	< 8.00	-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	-5.74	-13.74
	5.5 Mbps	< 8.00	-6.44	-14.44
	11 Mbps	< 8.00	-7.86	-15.86
	6 Mbps	< 8.00	-6.54	-14.54
	24 Mbps	< 8.00	-9.29	-17.29
	54 Mbps	< 8.00	-10.40	-18.40
	MCS 0	< 8.00	-6.97	-14.97
	MCS 4	< 8.00	-9.29	-17.29
	MCS 7	< 8.00	-10.97	-18.97

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

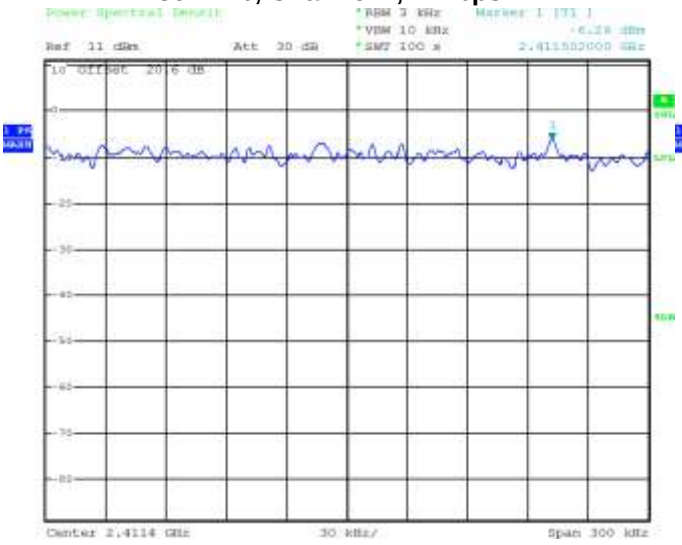


Figure 3-17: Peak Power Spectral Density
802.11b, Channel 6, 1 Mbps

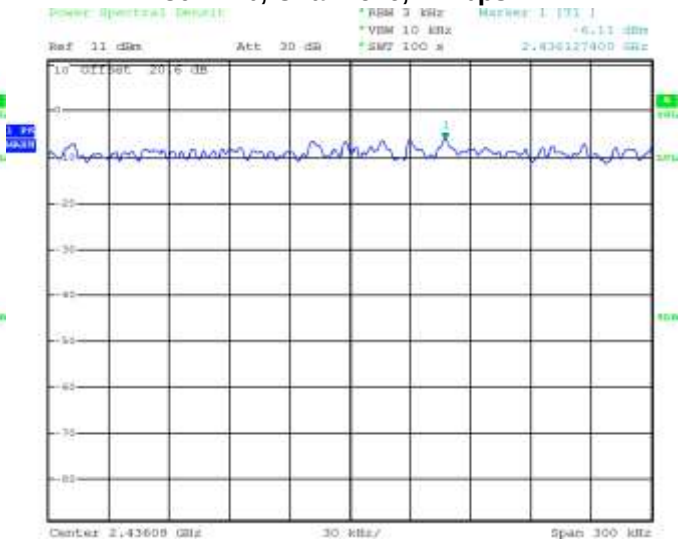
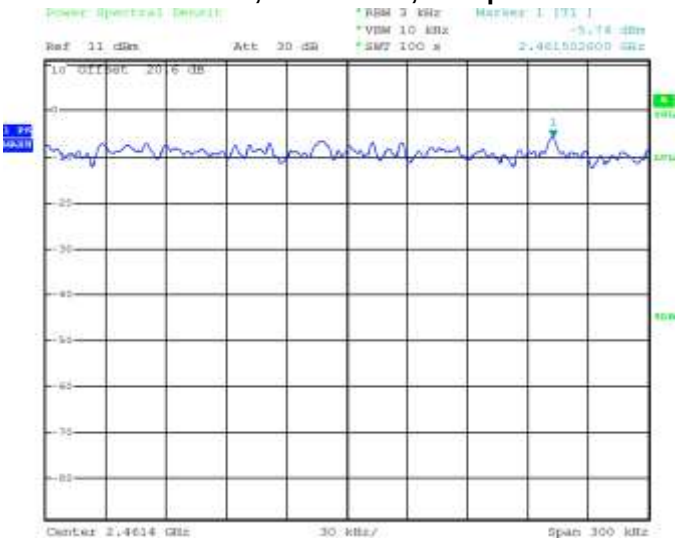


Figure 3-18: Peak Power Spectral Density
802.11b, Channel 11, 1 Mbps



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

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

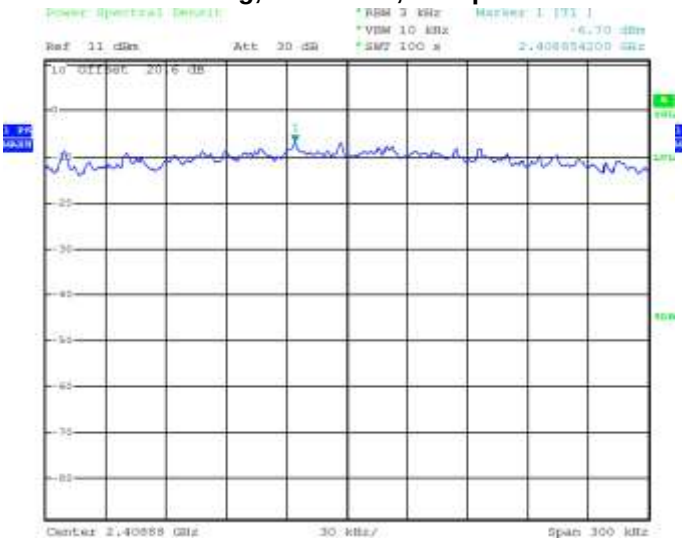


Figure 3-20: Peak Power Spectral Density
802.11g, Channel 6, 6 Mbps

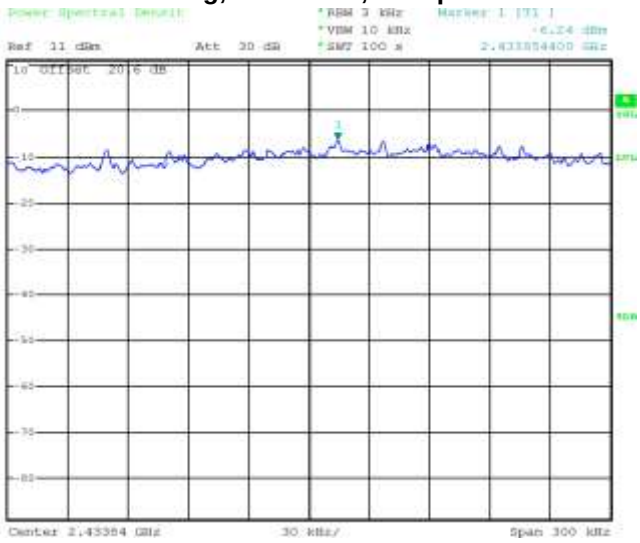
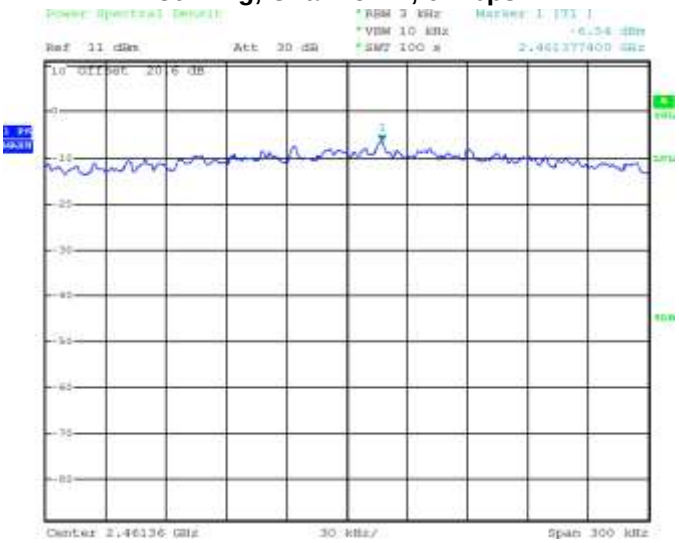


Figure 3-21: Peak Power Spectral Density
802.11g, Channel 11, 6 Mbps



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

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

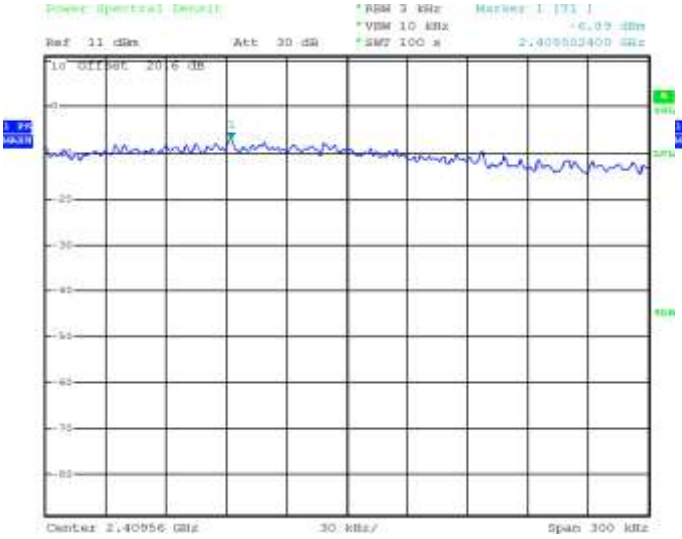


Figure 3-23: Peak Power Spectral Density
802.11n, Channel 6, MCS 0

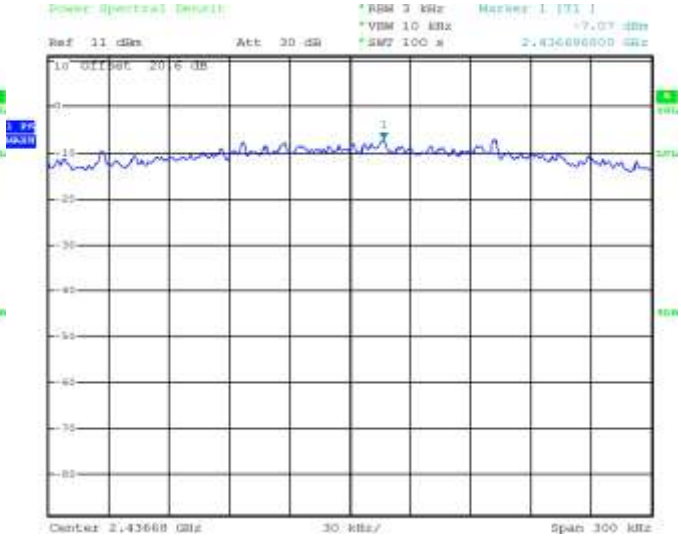
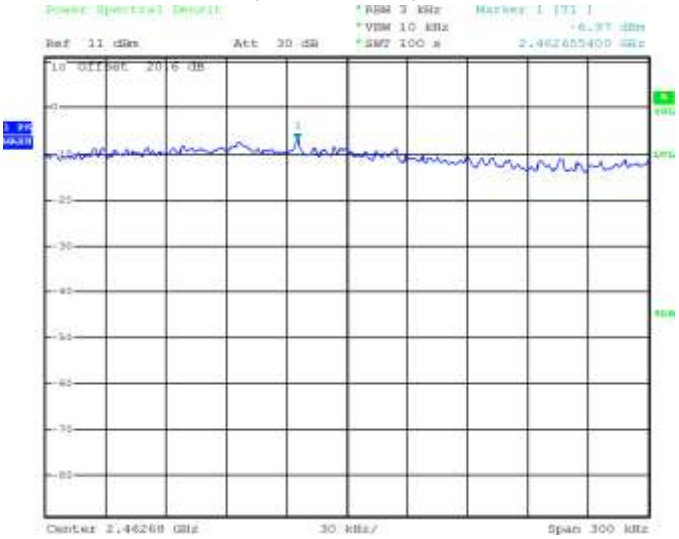


Figure 3-24: Peak Power Spectral Density
802.11n, Channel 11, MCS 0



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) and RSS-210. Channels 1, 6 and 11 were measured at 1 Mbps, 5.5 Mbps, and 11 Mbps each for 802.11b mode, 6 Mbps, 24 Mbps, and 54 Mbps each for 802.11g mode, and MCS 0, 4, and 7 for 802.11n mode. Peak power was measured using an Agilent power meter, model N1911A with model N1921A power sensor. A reference offset of 18.4 dB was applied to the power meter reference level for the coaxial cable loss and attenuators in the test circuit.

Channel	Data Rate	Power (dBm)	Max. Measured Level (dBm)	Max. Measured Level from Carrier (dBc)	Limit (dBc)
1	1 Mbps	18.08	-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	16.05	-40.54	-56.59	-20
	5.5 Mbps	15.91	-40.47	-56.38	-20
	11 Mbps	15.78	-39.94	-55.72	-20
	6 Mbps	15.70	-15.57	-31.28	-20
	24 Mbps	15.21	-40.79	-56.00	-20
	54 Mbps	13.03	-40.38	-53.42	-20
	MCS 0	15.44	-20.63	-36.07	-20
	MCS 4	14.82	-17.96	-32.78	-20
	MCS 7	11.53	-40.41	-51.94	-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

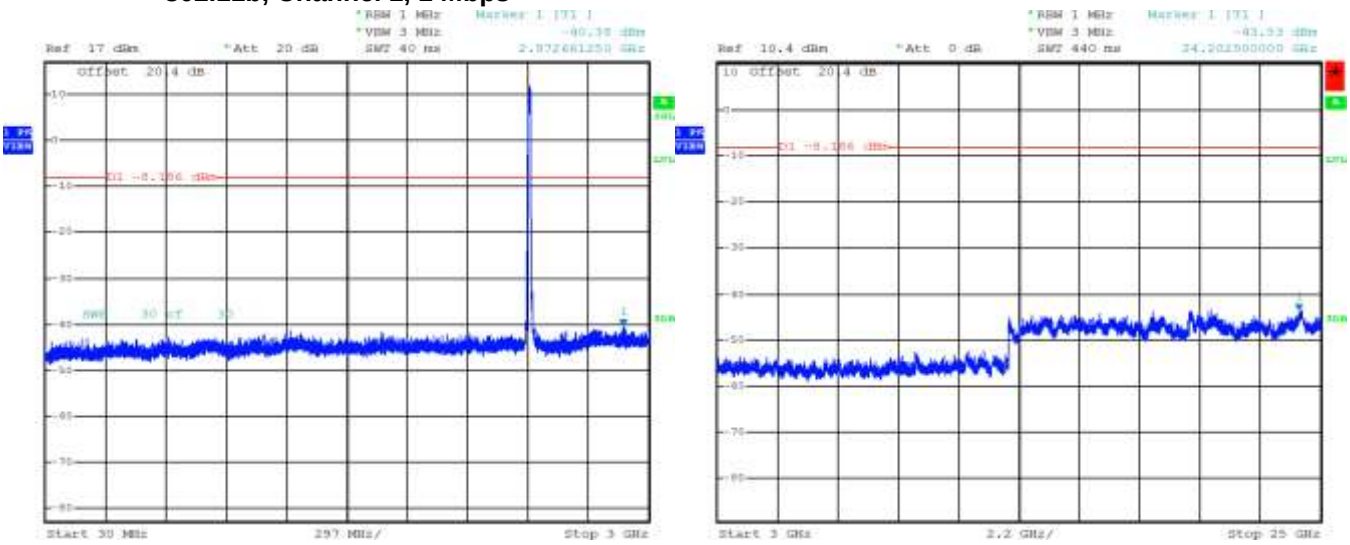
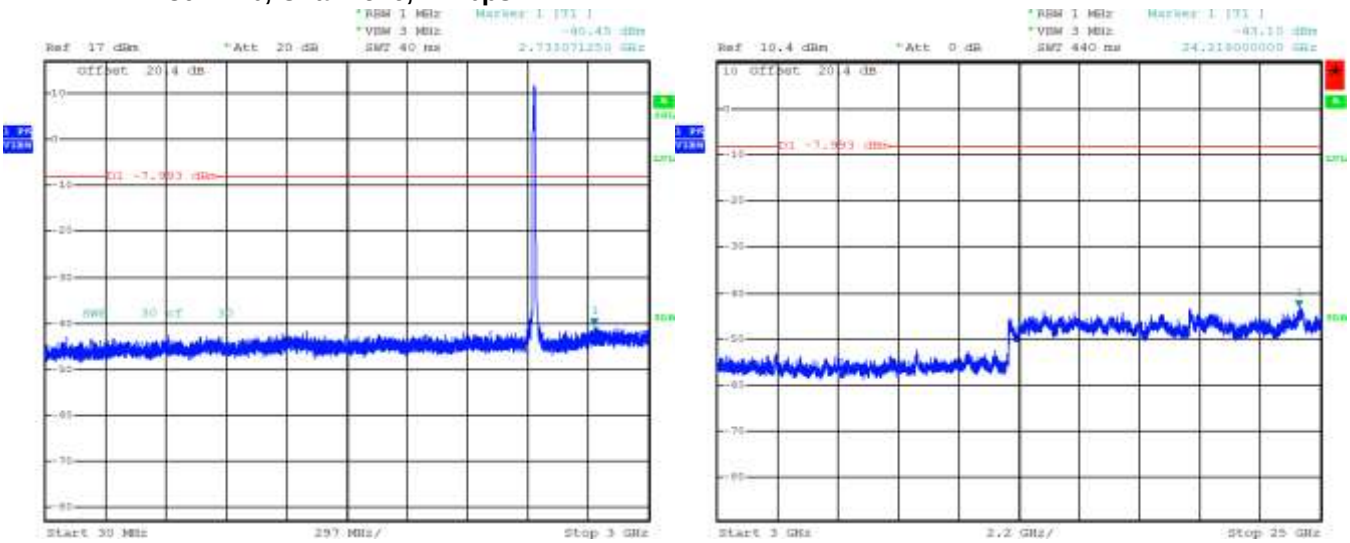


Figure 3-26 : Spurious Conducted RF Emissions
802.11b, Channel 6, 1 Mbps



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

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

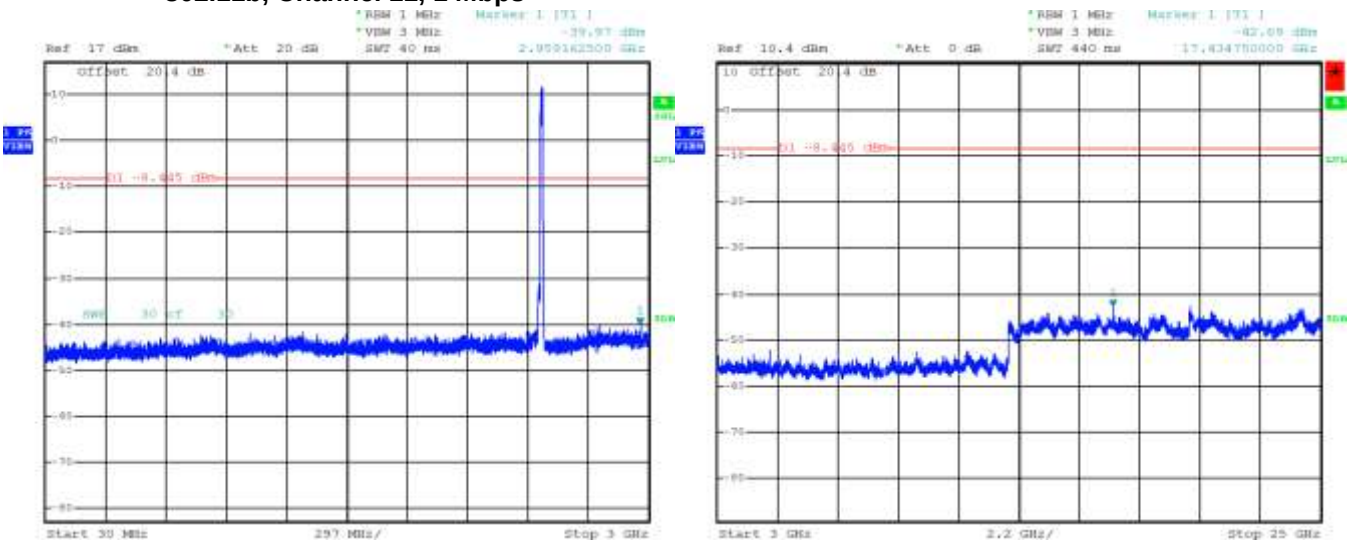
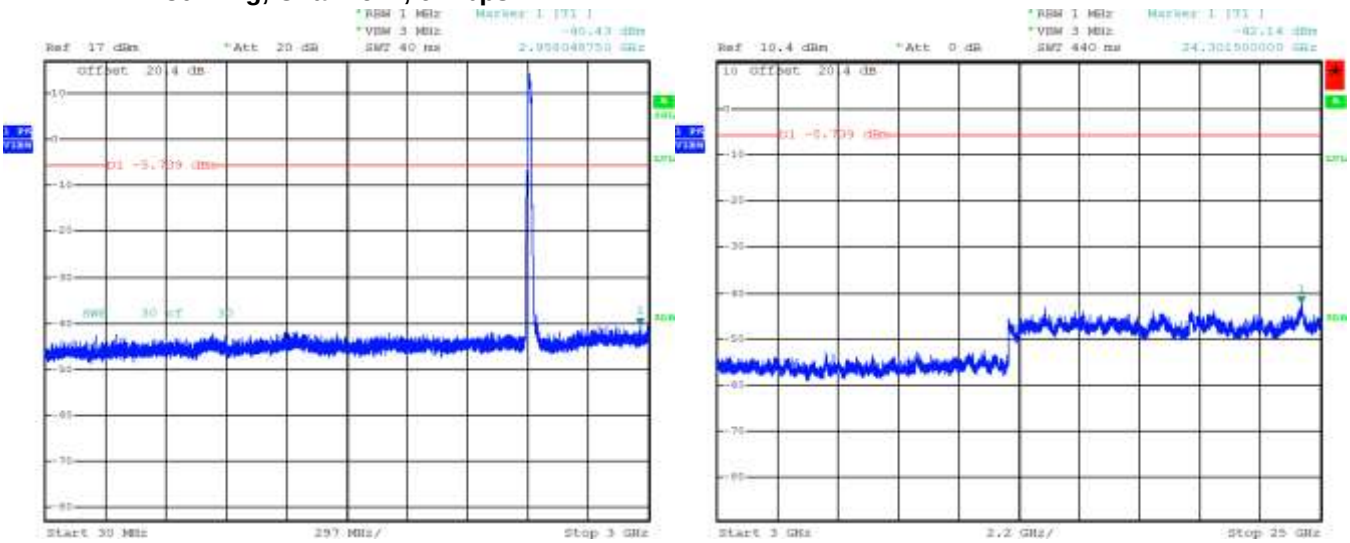


Figure 3-28: Spurious Conducted RF Emissions
802.11g, Channel 1, 6 Mbps



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

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

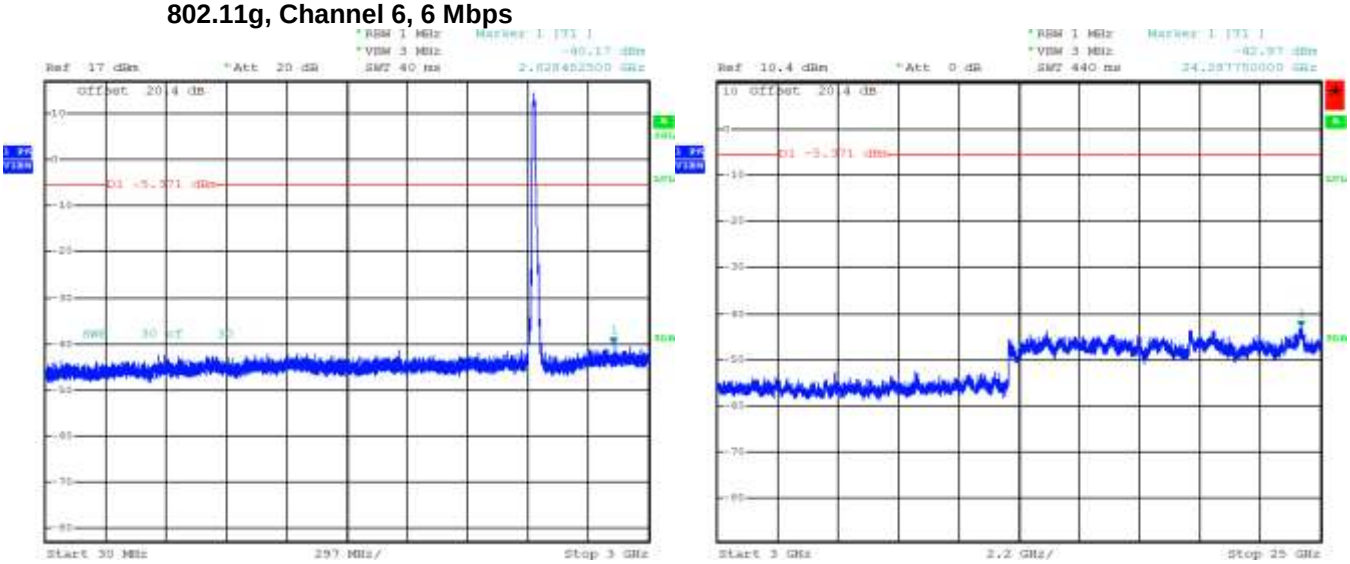
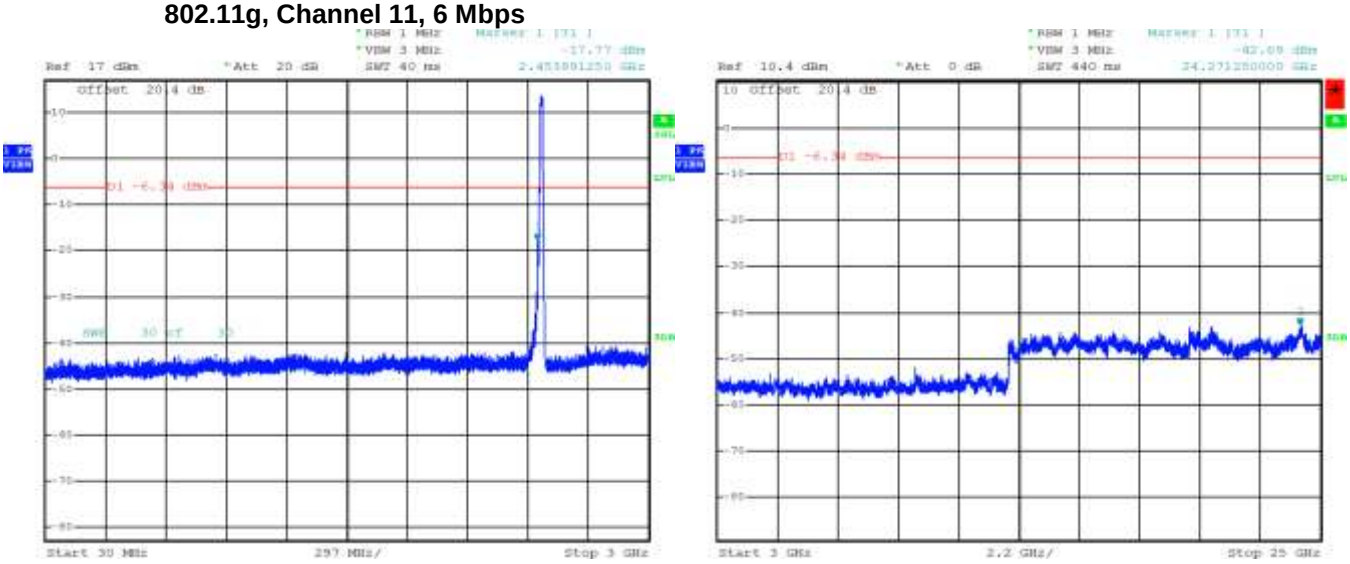


Figure 3-30: Spurious Conducted RF Emissions
802.11g, Channel 11, 6 Mbps



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

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

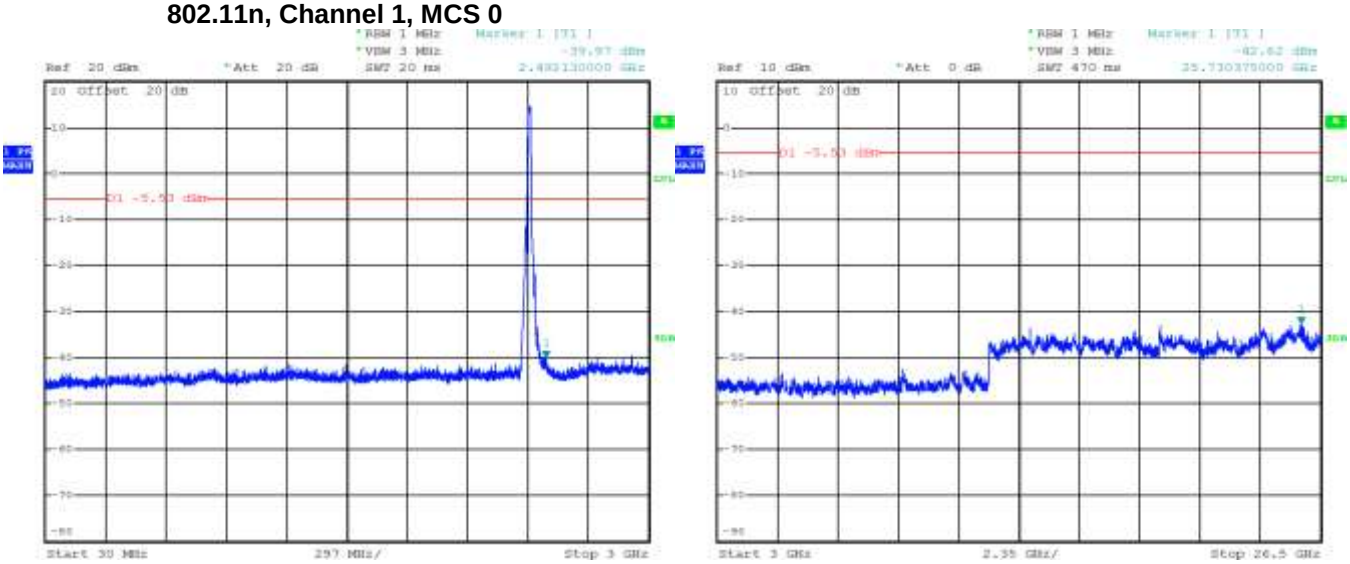
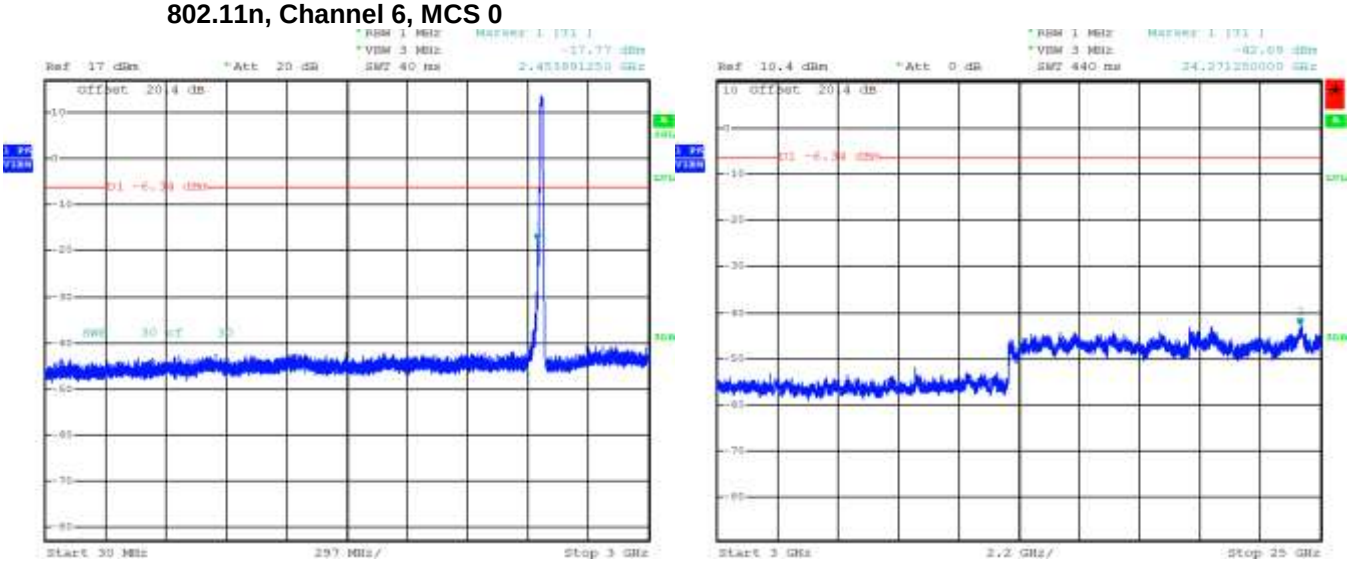
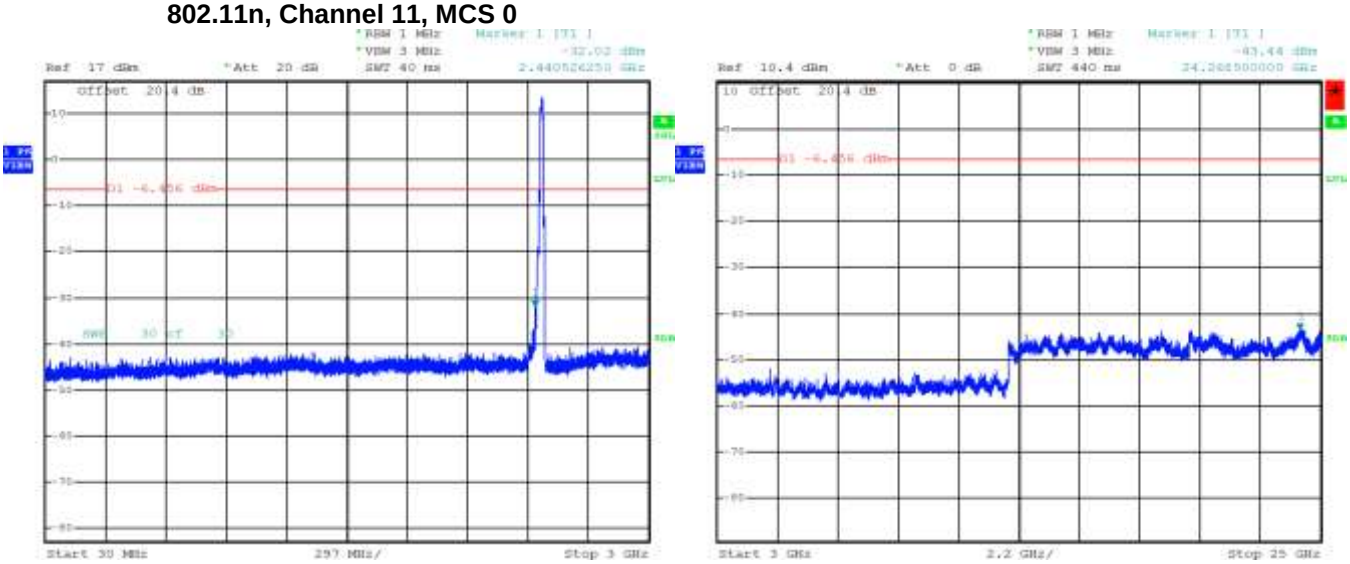


Figure 3-32: Spurious Conducted RF Emissions
802.11n, Channel 6, MCS 0



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

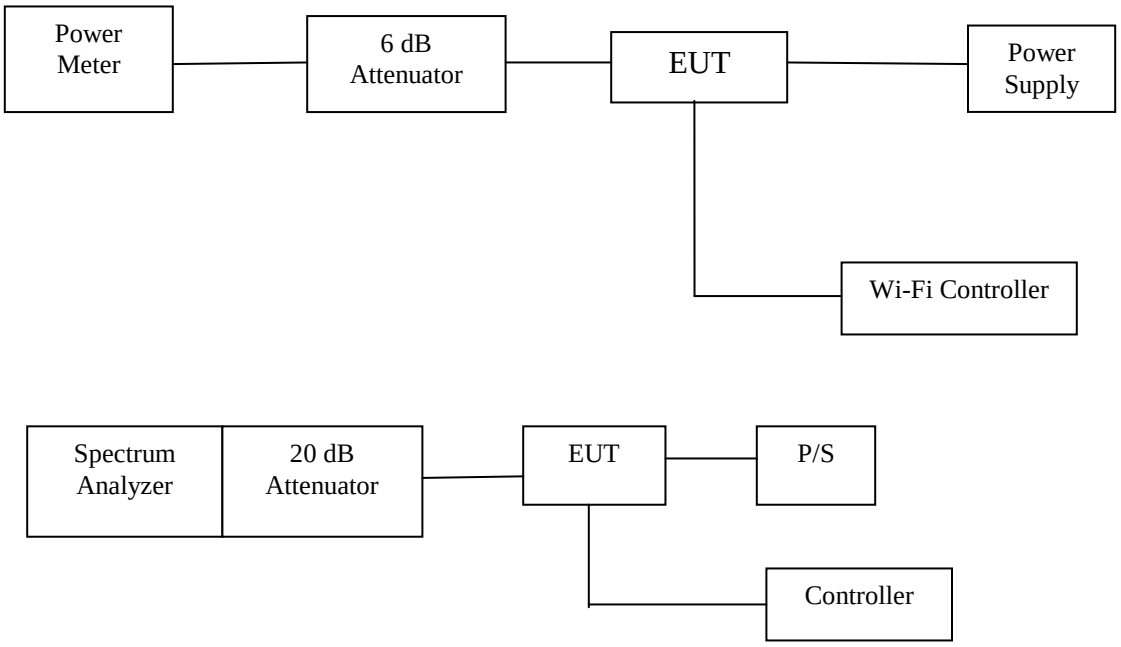
Figure 3-33: Spurious Conducted RF Emissions
802.11n, Channel 11, MCS 0



APPENDIX 4 – 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: August 30 – September 4 and October 09, 2013
The measurements were performed by Chuan Pao Tran.

The environmental test conditions were: Temperature: 25.8 – 26.3 ºC
Relative Humidity: 28.2 – 31.2 %

802.11a RF Conducted Emission Test Results cont'd

Following tests were performed on the model RGE111LW.

6 dB Bandwidth

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

Channel	Data Rate	Limit (kHz)	Measured Level (MHz)
36	6 Mbps	≥ 500	15.20
	24 Mbps	≥ 500	16.52
	54 Mbps	≥ 500	16.52
48	6 Mbps	≥ 500	15.16
	24 Mbps	≥ 500	**16.56**
	54 Mbps	≥ 500	**16.56**
64	6 Mbps	≥ 500	15.20
	24 Mbps	≥ 500	**16.56**
	54 Mbps	≥ 500	**16.56**
100	6 Mbps	≥ 500	15.16
	24 Mbps	≥ 500	**16.56**
	54 Mbps	≥ 500	**16.56**
140	6 Mbps	≥ 500	15.80
	24 Mbps	≥ 500	16.52
	54 Mbps	≥ 500	**16.56**
165	6 Mbps	≥ 500	15.16
	24 Mbps	≥ 500	**16.56**
	54 Mbps	≥ 500	**16.56**

See figures 4-1 to 4-6 for the plots of the 6 dB bandwidth measurements for Channel 36, 48, 64, 100, 140, and 165 at 6 Mbps each for 802.11a mode

802.11n RF Conducted Emission Test Results

6 dB Bandwidth

The EUT met the requirements of the 6 dB bandwidth as per 47 CFR 15.247(a) (2) and RSS-210. Channels 36, 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	9.08
	MCS4	≥ 500	9.08
	MCS7	≥ 500	9.08
64	MCS0	≥ 500	8.12
	MCS4	≥ 500	9.08
	MCS7	≥ 500	9.08
165	MCS0	≥ 500	**9.12**
	MCS4	≥ 500	9.08
	MCS7	≥ 500	**9.12**

See figures 4-7 to 4-9 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 4-1: 6 dB Bandwidth
802.11a, Channel 36, 6 Mbps

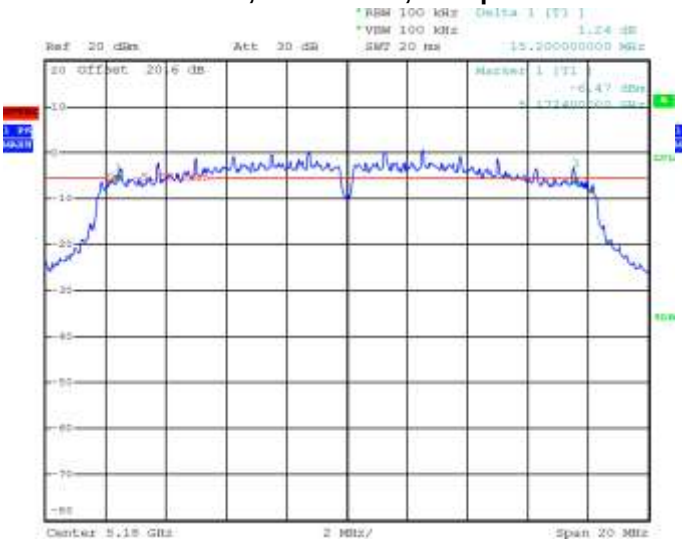


Figure 4-2: 6 dB Bandwidth
802.11a, Channel 48, 6 Mbps

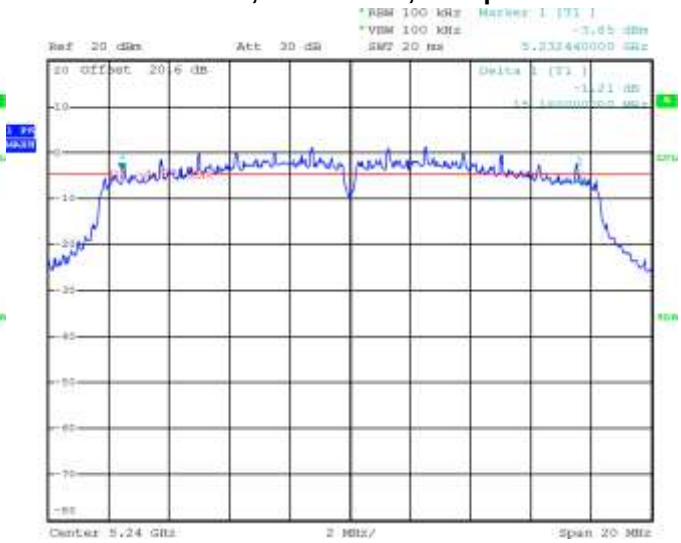


Figure 4-3: 6 dB Bandwidth
802.11a, Channel 64, 6 Mbps

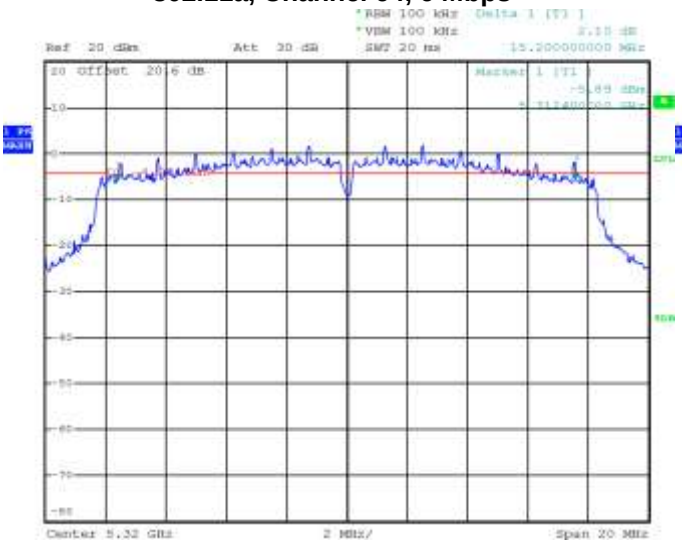
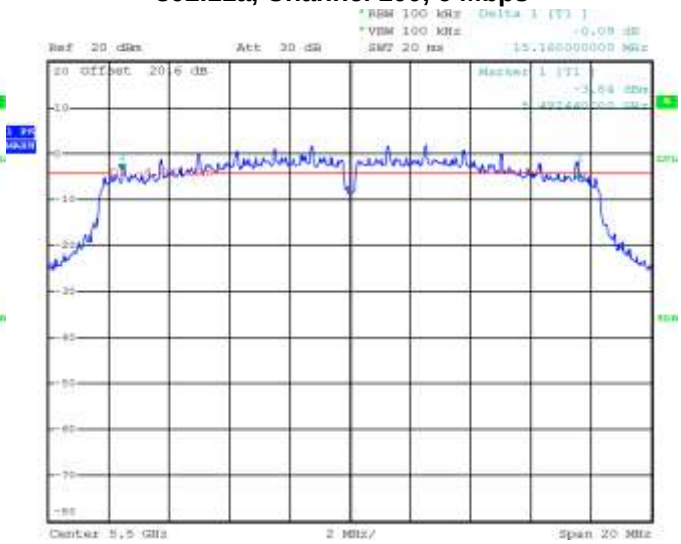


Figure 4-4: 6 dB Bandwidth
802.11a, Channel 100, 6 Mbps



802.11a RF Conducted Emission Test Results cont'd

Figure 4-5: 6 dB Bandwidth
802.11a, Channel 140, 6 Mbps

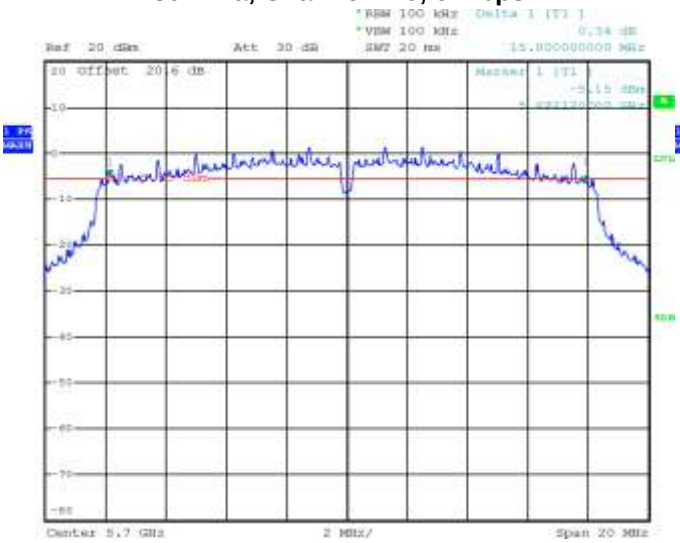
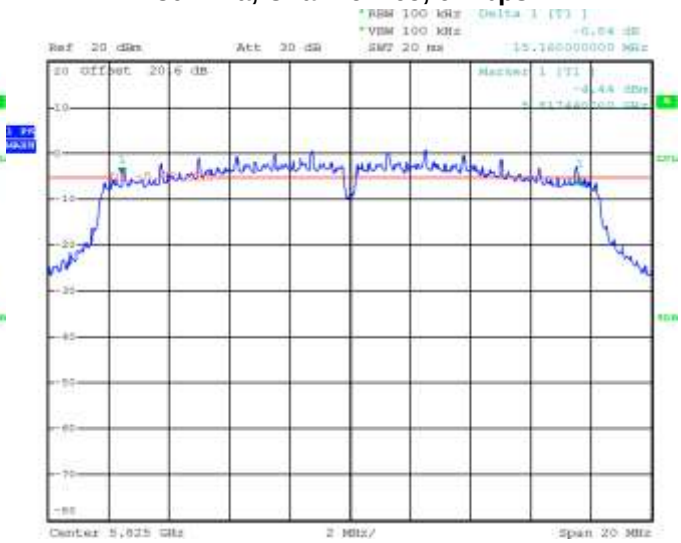


Figure 4-6: 6 dB Bandwidth
802.11a, Channel 165, 6 Mbps



802.11a RF Conducted Emission Test Results cont'd

Figure 4-7: 6 dB Bandwidth
802.11n, Channel 36, MCS 0

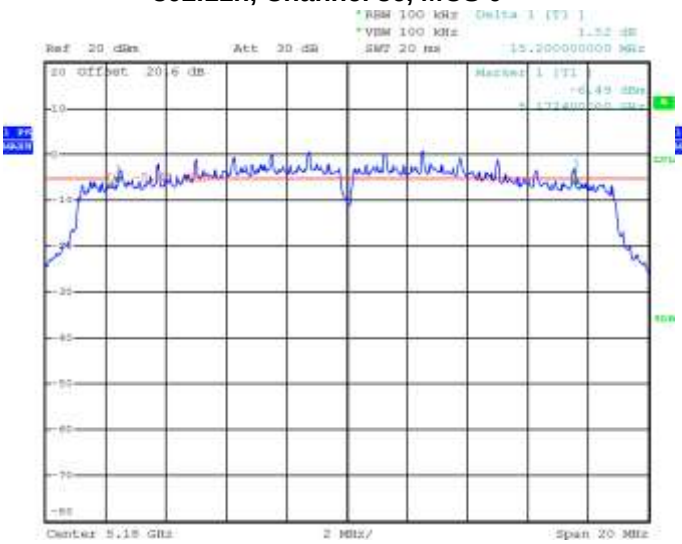


Figure 4-8: 6 dB Bandwidth
802.11n, Channel 100, MCS 0

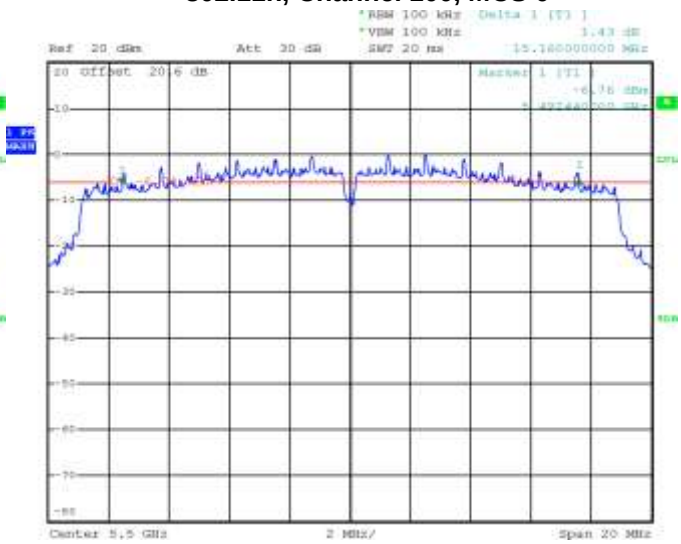
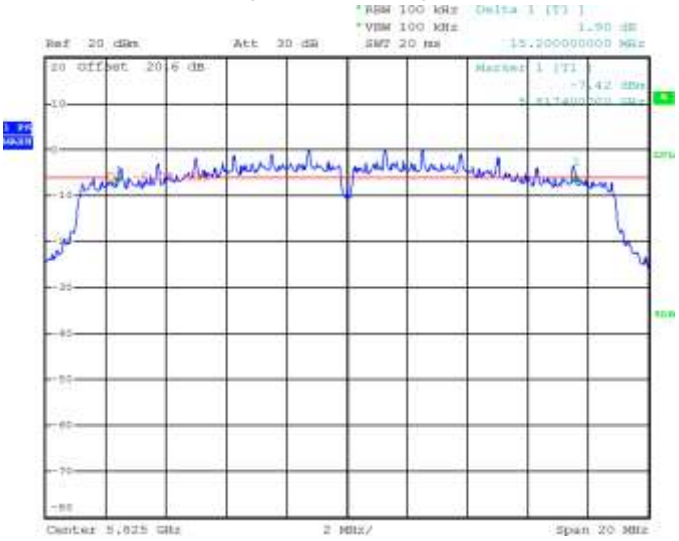


Figure 4-9: 6 dB Bandwidth
802.11n, Channel 165, MCS 0



802.11a RF Conducted Emission Test Results cont'd

Maximum Conducted Output Power

The EUT met the requirements of the maximum conducted output power of class 2 as per 47 CFR 15.407 and RSS-210. Channels 36, 48, 64, 100, 140 and 165 were measured for 802.11a mode using an Agilent power meter, model N1911A with model N1921A power sensor. A reference offset of 8.9 dB was applied to the power meter reference level for the coaxial cable loss and attenuators in the test circuit.

Channel	Data Rate	Power Limit (mW)	Measured Level (dBm)	Measured Level (W)
36	6 Mbps	< 50.0	12.72	0.0187
	24 Mbps	< 50.0	9.88	0.0097
	54 Mbps	< 50.0	8.64	0.0073
48	6 Mbps	< 50.0	12.75	0.0188
	24 Mbps	< 50.0	10.00	0.0100
	54 Mbps	< 50.0	8.72	0.0074
64	6 Mbps	< 250.0	13.51	0.0224
	24 Mbps	< 250.0	10.53	0.0113
	54 Mbps	< 250.0	9.19	0.0083
100	6 Mbps	< 250.0	**13.96**	**0.0249**
	24 Mbps	< 250.0	10.06	0.0101
	54 Mbps	< 250.0	8.64	0.0073
140	6 Mbps	< 250.0	13.49	0.0223
	24 Mbps	< 250.0	9.61	0.0091
	54 Mbps	< 250.0	8.30	0.0068
165	6 Mbps	< 1000	12.78	0.0190
	24 Mbps	< 1000	9.88	0.0097
	54 Mbps	< 1000	8.64	0.0073

802.11n RF Conducted Emission Test Results

Maximum Conducted Output Power

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

Channel	Data Rate	Class 2 Limit (W)	Measured Level (dBm)	Measured Level (mW)
36	5180	MCS0	< 50.0	17.91
	24 Mbps	MCS4	< 50.0	9.88
	54 Mbps	MCS7	< 50.0	8.64
64	5320	MCS0	< 250.0	13.38
	24 Mbps	MCS4	< 250.0	10.00
	54 Mbps	MCS7	< 250.0	8.72
100	5500	MCS0	< 250.0	**13.73**
	24 Mbps	MCS4	< 250.0	10.53
	54 Mbps	MCS7	< 250.0	9.19
140	5700	MCS0	< 250.0	13.24
	24 Mbps	MCS4	< 250.0	10.06
	54 Mbps	MCS7	< 250.0	8.64
165	5825	MCS0	< 1000	12.69
	24 Mbps	MCS4	< 1000	9.61
	54 Mbps	MCS7	< 1000	8.30

802.11a RF Conducted Emission Test Results cont'd

Band Edge Compliance

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

Channel	Data Rate	Limit (dBc)	Measured Level (dBc)	Margin (dBc)
36	6 Mbps	< -20	-31.47	-11.47
	24 Mbps	< -20	-33.54	-13.54
	54 Mbps	< -20	-32.82	-12.82
64	6 Mbps	< -20	-33.69	-13.69
	24 Mbps	< -20	-35.58	-15.58
	54 Mbps	< -20	-35.00	-15.00
100	6 Mbps	< -20	-35.75	-15.75
	24 Mbps	< -20	-34.91	-14.91
	54 Mbps	< -20	-35.24	-15.24
140	6 Mbps	< -20	-33.60	-13.60
	24 Mbps	< -20	-33.68	-13.68
	54 Mbps	< -20	-33.92	-13.92
149	6 Mbps	< -20	-27.22	-7.22
	24 Mbps	< -20	-24.31	-4.31
	54 Mbps	< -20	-25.58	-5.58
165	6 Mbps	< -20	-25.36	-5.36
	24 Mbps	< -20	-24.42	-4.42
	54 Mbps	< -20	-24.26	-4.26

See figures 4-10 to 4-15 for the plots of the band edge compliance measurements for Channel 36, 64, 100, 149 and 165 at 6 Mbps each for 802.11a mode.

See figures 4-16 to 4-23 for the plots of the band edge compliance measurements for Channel 36, 48, 52, 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 and RSS-210. Channels 36, 64, 100, 140, 149 and 165 were measured at MCS 0, MCS 4 and MCS 7 each for 802.11n mode.

Channel	Data Rate	Limit (dBc)	Measured Level (dBc)	Margin (dBc)
36	MCS0	< -20	-31.82	-11.82
	MCS4	< -20	-33.86	-13.86
	MCS7	< -20	-34.13	-14.13
64	MCS0	< -20	-32.80	-12.80
	MCS4	< -20	-36.06	-16.06
	MCS7	< -20	-36.73	-16.73
100	MCS0	< -20	-37.29	-17.29
	MCS4	< -20	-36.01	-16.01
	MCS7	< -20	-36.44	-16.44
140	MCS0	< -20	-34.24	-14.24
	MCS4	< -20	-36.09	-16.09
	MCS7	< -20	-35.98	-15.98
149	MCS0	< -20	-34.58	-14.58
	MCS4	< -20	-33.87	-13.87
	MCS7	< -20	-35.83	-15.83
165	MCS0	< -20	-24.10	-4.10
	MCS4	< -20	-35.26	-15.26
	MCS7	< -20	-35.27	-15.27

See figures 4-16 to 4-21 for the plots of the band edge compliance measurements for Channel 36, 64 and 165 at MCS 0 each for 802.11n mode.

802.11a RF Conducted Emission Test Results cont'd

Figure 4-10: Band Edge Compliance
802.11a, Channel 36, 6 Mbps

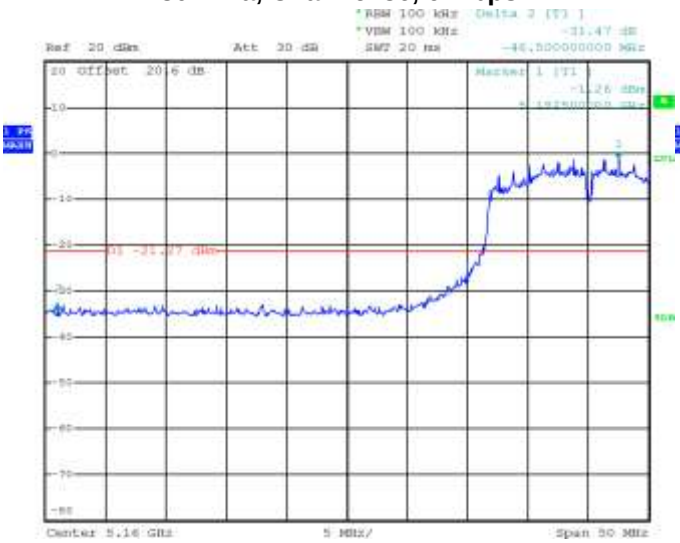


Figure 4-11: Band Edge Compliance
802.11a, Channel 64, 6 Mbps

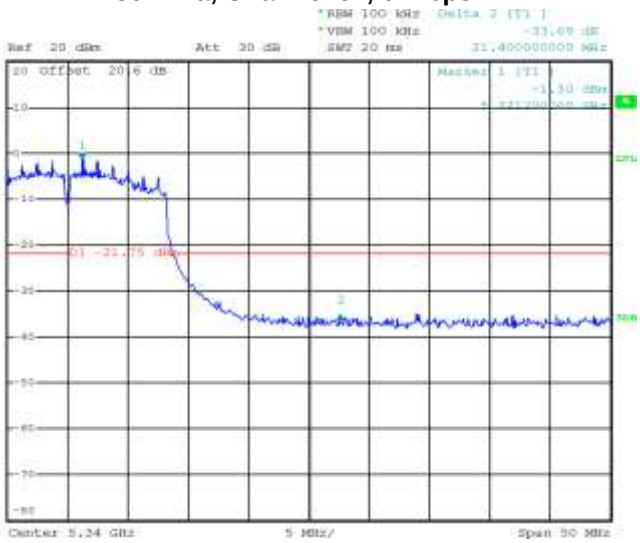


Figure 4-12: Band Edge Compliance
802.11a, Channel 100, 6 Mbps

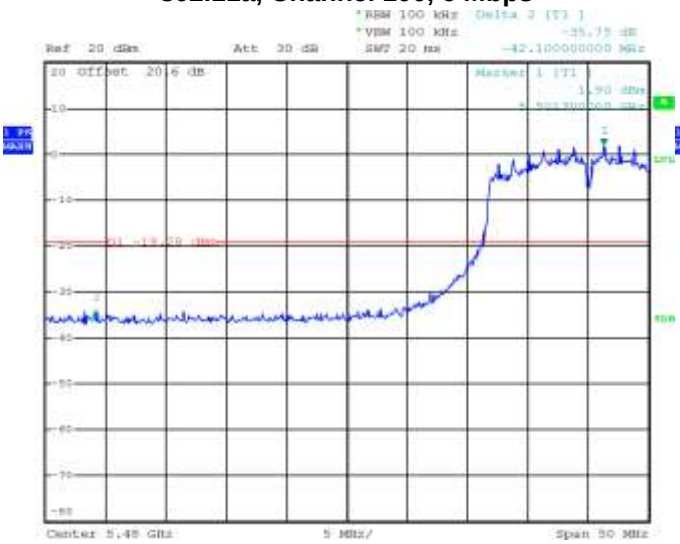
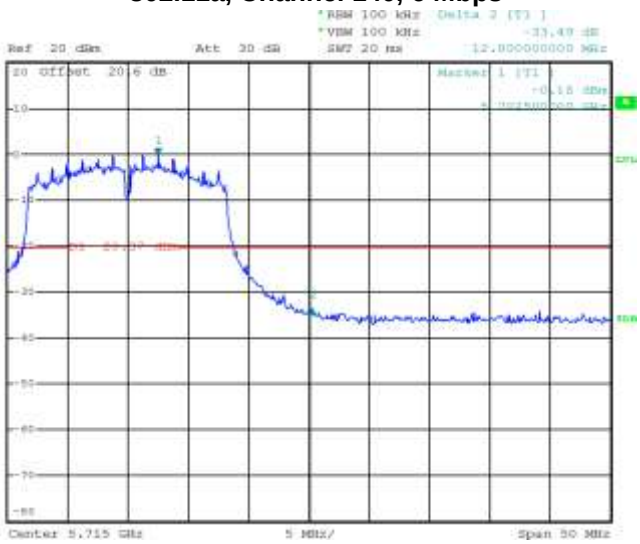


Figure 4-13: Band Edge Compliance
802.11a, Channel 140, 6 Mbps



802.11a RF Conducted Emission Test Results cont'd

Figure 4-14: Band Edge Compliance
802.11a, Channel 149, 6 Mbps

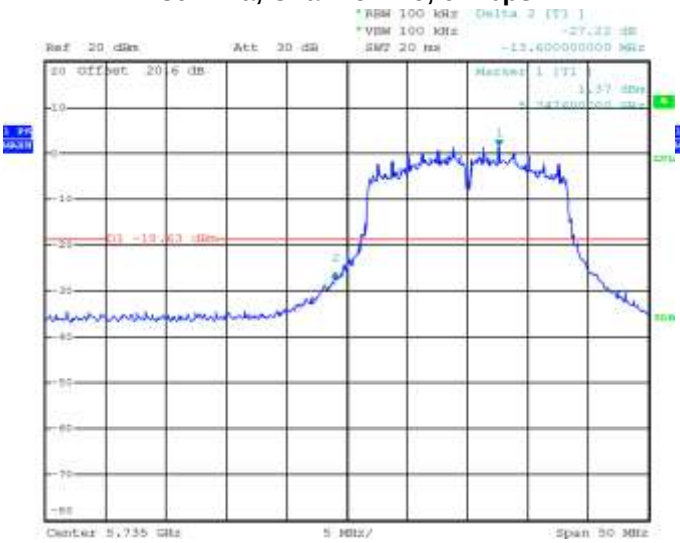
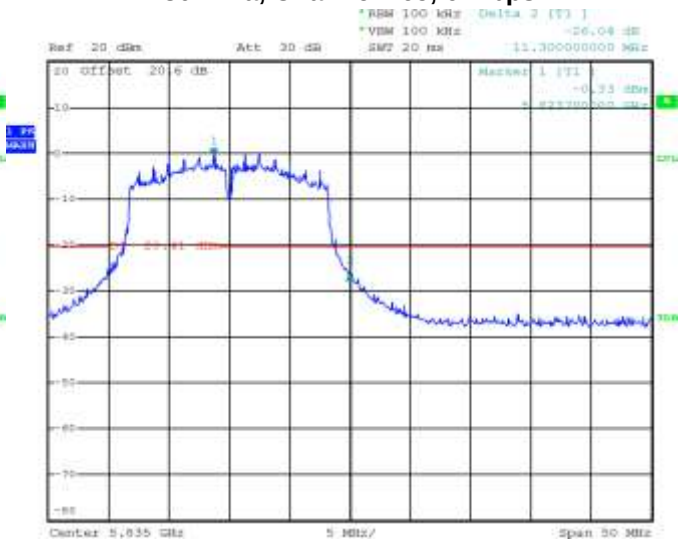


Figure 4-15: Band Edge Compliance
802.11a, Channel 165, 6 Mbps



802.11n RF Conducted Emission Test Results

Figure 4-16: Band Edge Compliance
802.11n, Channel 36, 6 Mbps

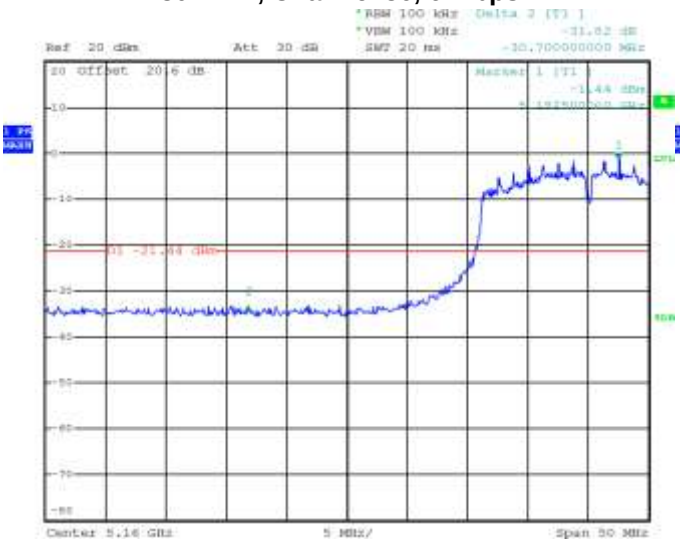


Figure 4-17: Band Edge Compliance
802.11n, Channel 64, 6 Mbps

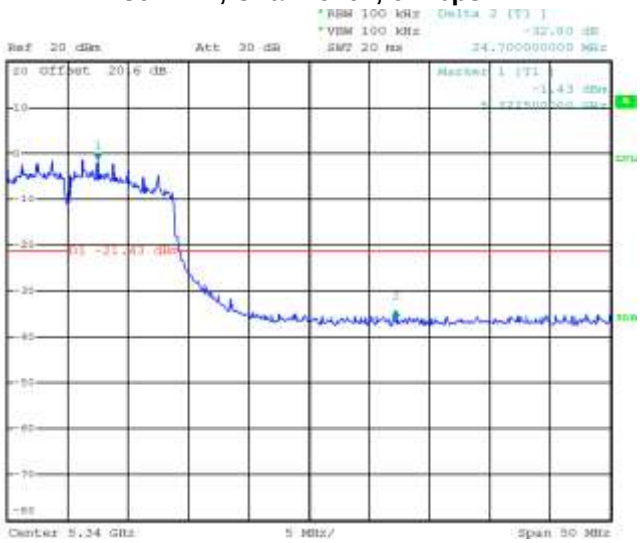


Figure 4-18: Band Edge Compliance
802.11n, Channel 100, 6 Mbps

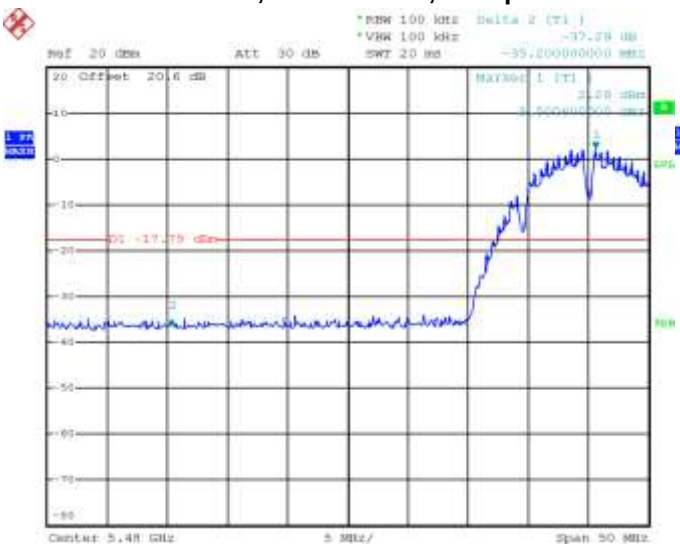
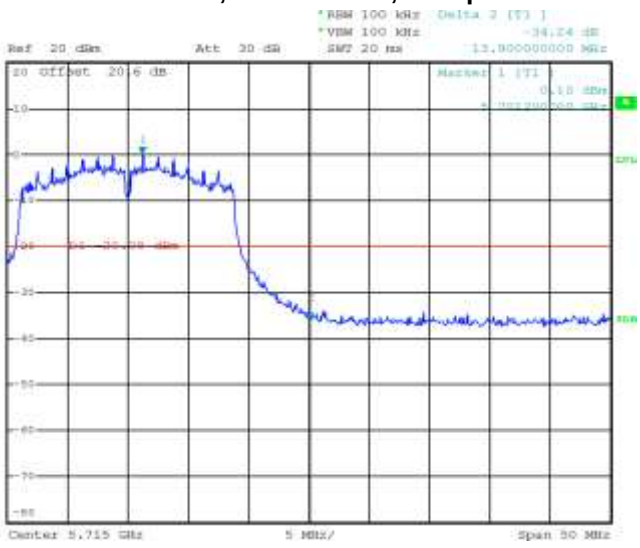


Figure 4-19: Band Edge Compliance
802.11n, Channel 140, 6 Mbps



802.11n RF Conducted Emission Test Results cont'd

Figure 4-20: Band Edge Compliance
802.11n, Channel 149, 6 Mbps

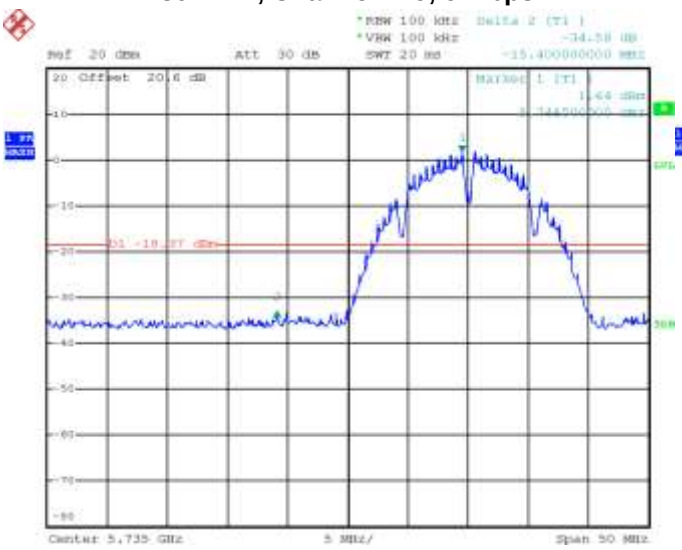
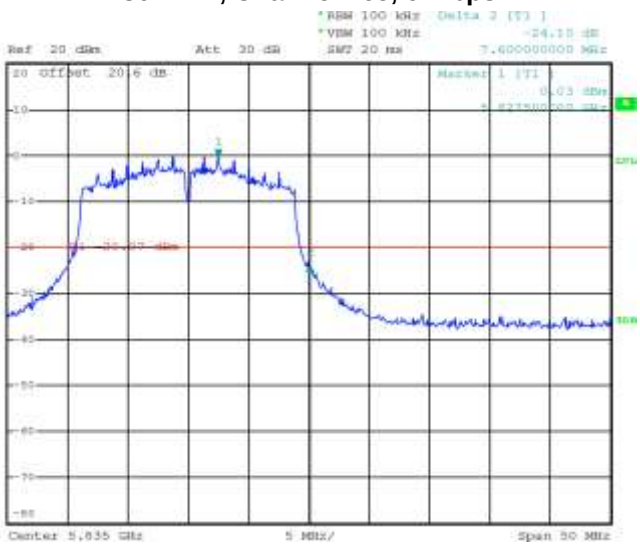


Figure 4-21: Band Edge Compliance
802.11n, Channel 165, 6 Mbps



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 and RSS-210. Channels 36, 48, 64, 100, 140 and 165 were measured at 6 Mbps, 24 Mbps, and 54 Mbps each for 802.11a mode.

Channel	Data Rate	Limit (dBm)	Measured Level (dBm)	Margin (dBm)
36	6 Mbps	< 4.00	-1.08	-5.08
	24 Mbps	< 4.00	-0.48	-4.48
	54 Mbps	< 4.00	-1.06	-5.06
48	6 Mbps	< 4.00	0.80	-3.20
	24 Mbps	< 4.00	-0.84	-4.84
	54 Mbps	< 4.00	-1.42	-5.42
64	6 Mbps	< 11.00	-1.27	-12.27
	24 Mbps	< 11.00	-0.83	-11.83
	54 Mbps	< 11.00	-1.36	-12.36
100	6 Mbps	< 11.00	0.49	-10.51
	24 Mbps	< 11.00	-1.18	-12.18
	54 Mbps	< 11.00	-1.72	-12.72
140	6 Mbps	< 11.00	0.52	-10.48
	24 Mbps	< 11.00	-1.51	-12.51
	54 Mbps	< 11.00	-2.12	-13.12
165	6 Mbps	< 17.00	-15.12	-32.12
	24 Mbps	< 17.00	-1.54	-18.54
	54 Mbps	< 17.00	-2.21	-19.21

See figures 4-22 to 4-27 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 and RSS-210. Channels 36, 64 and 165 were measured at MCS 0, MCS 4 and MCS 7 each for 802.11n mode.

Channel	Data Rate	Limit (dBm)	Measured Level (dBm)	Margin (dBm)
36	6 Mbps	< 4.00	-1.25	-5.25
	24 Mbps	< 4.00	-0.92	-4.92
	54 Mbps	< 4.00	-2.18	-6.18
64	6 Mbps	< 11.00	-1.50	-12.50
	24 Mbps	< 11.00	-1.68	-12.68
	54 Mbps	< 11.00	-2.89	-13.89
165	6 Mbps	< 17.00	-15.19	-32.19
	24 Mbps	< 17.00	-2.14	-19.14
	54 Mbps	< 17.00	-3.40	-20.40

See figures 4-28 to 4-30 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 4-22: Peak Power Spectral Density
802.11a, Channel 36, 6 Mbps

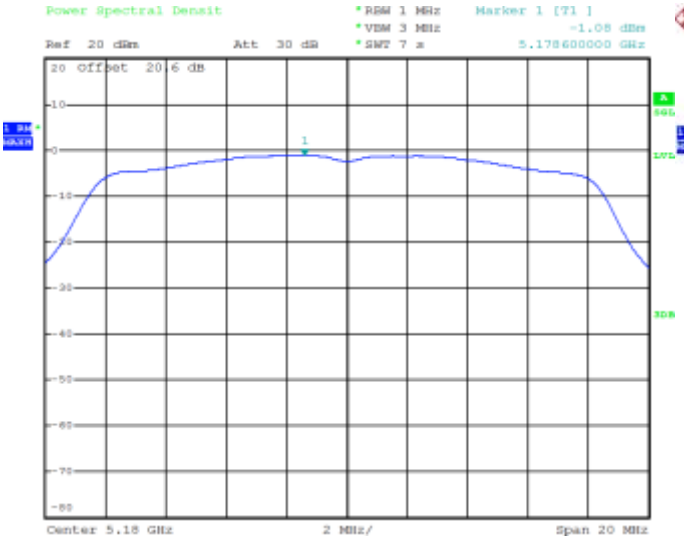


Figure 4-23: Peak Power Spectral Density
802.11a, Channel 48, 6 Mbps

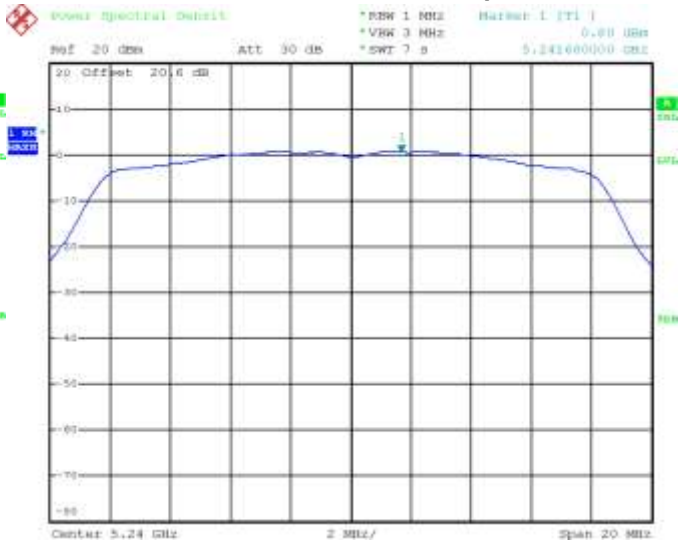


Figure 4-24: Peak Power Spectral Density
802.11a, Channel 64, 6 Mbps

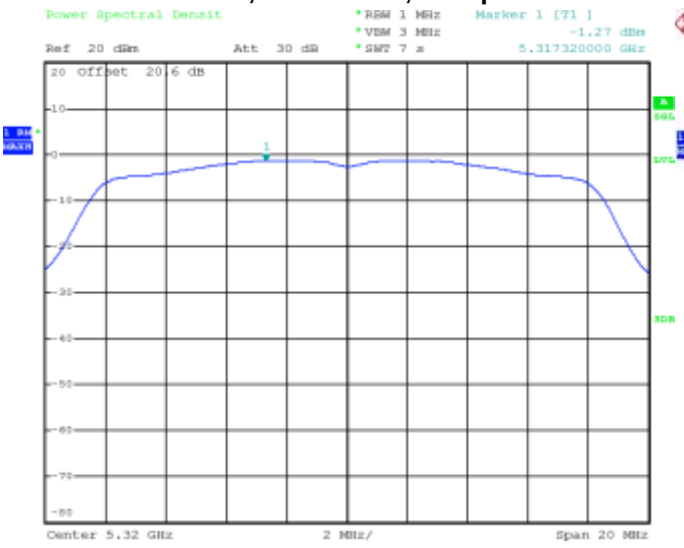
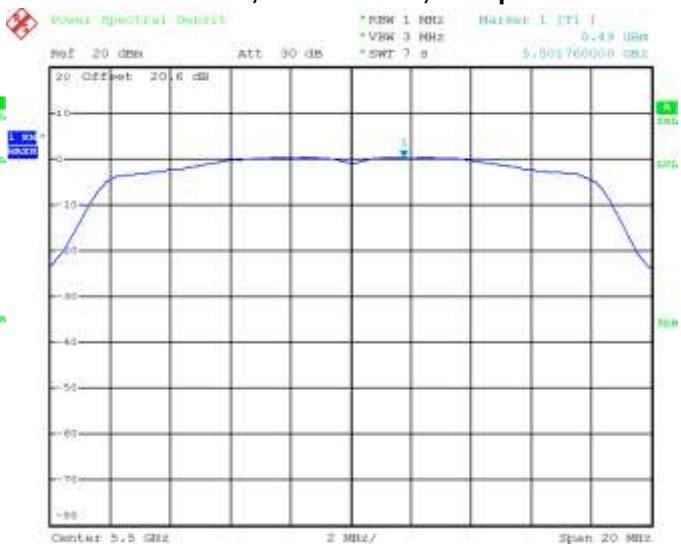


Figure 4-25: Peak Power Spectral Density
802.11a, Channel 100, 6 Mbps



802.11a RF Conducted Emission Test Results cont'd

Figure 4-26: Peak Power Spectral Density
802.11a, Channel 140, 6 Mbps

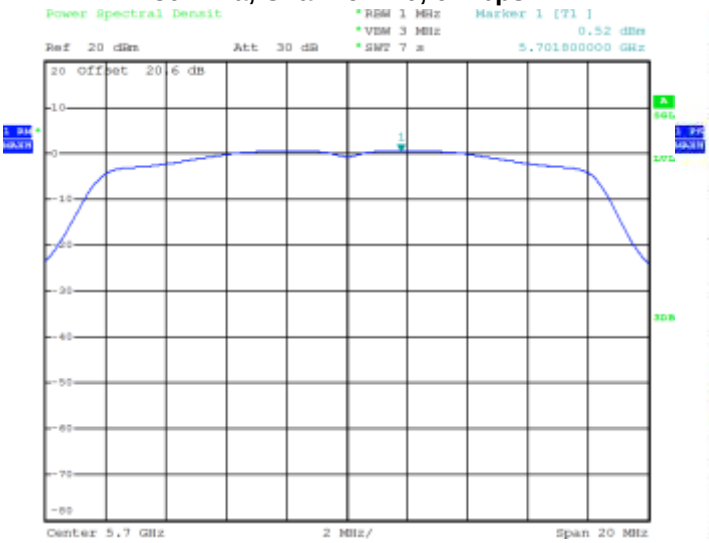
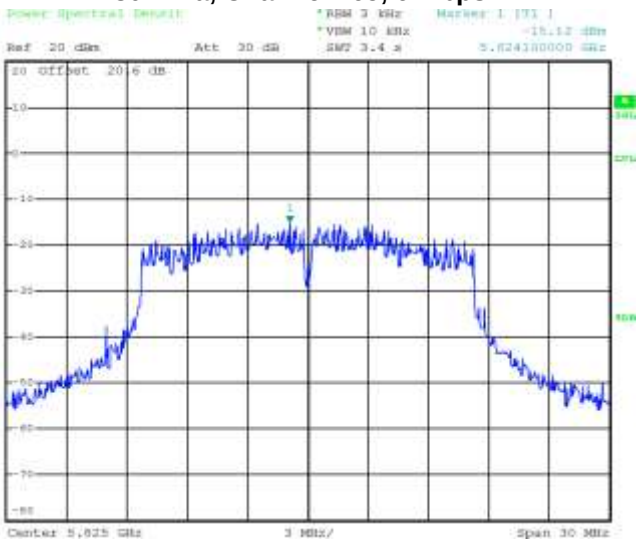


Figure 4-27: Peak Power Spectral Density
802.11a, Channel 165, 6 Mbps



802.11n RF Conducted Emission Test Results

Figure 4-28: Peak Power Spectral Density
802.11n, Channel 36, MCS 0

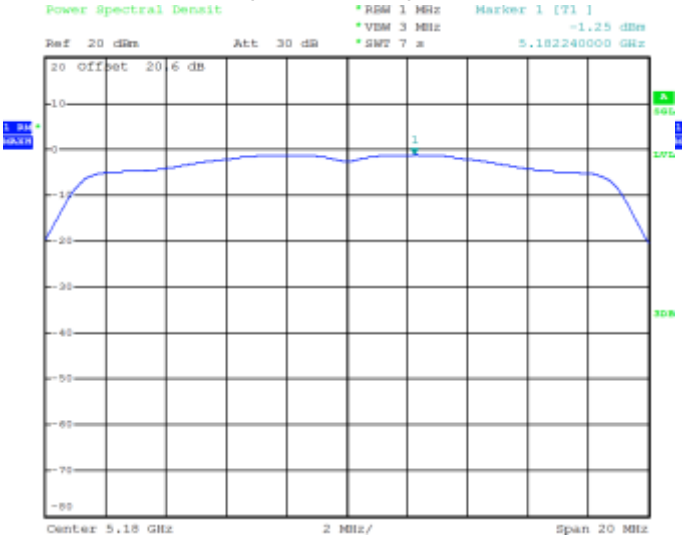


Figure 4-29: Peak Power Spectral Density
802.11n, Channel 64, MCS 0

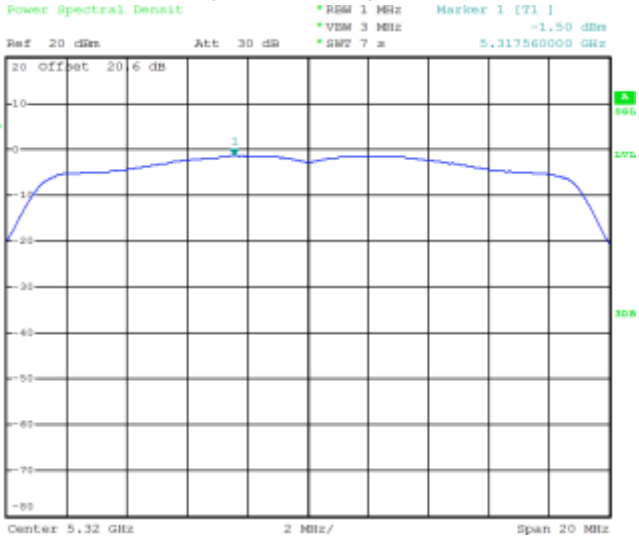
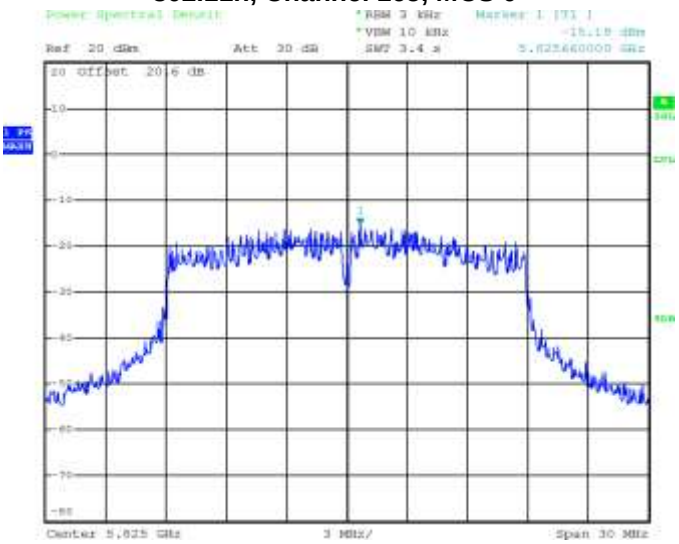


Figure 4-30: Peak Power Spectral Density
802.11n, Channel 165, MCS 0



802.11a RF Conducted Emission Test Results cont'd

Spurious RF Conducted Emissions

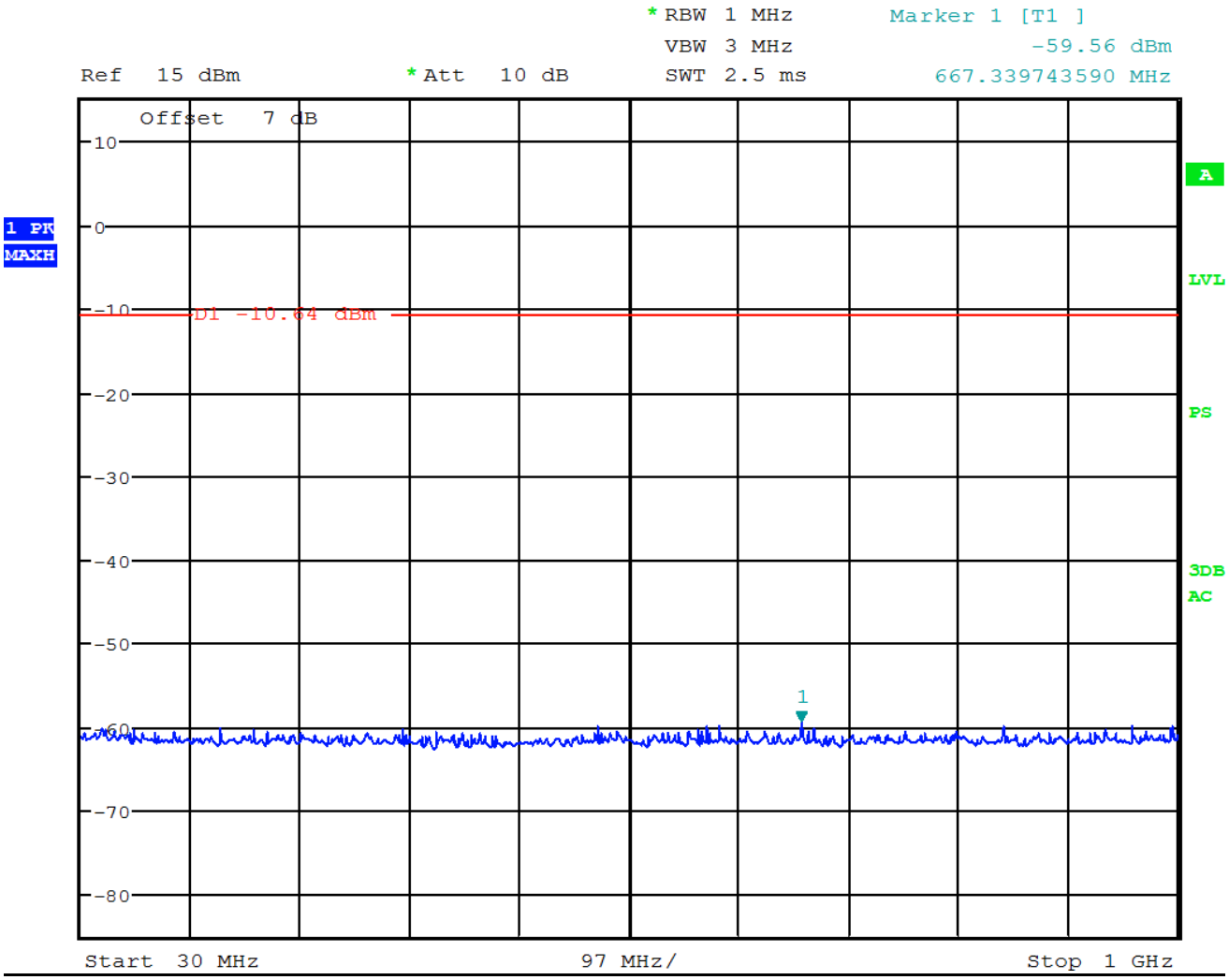
The EUT met the requirements of the spurious RF conducted emissions as per 47 CFR 15.407 and RSS-210. Channels 36, 64, 100 and 140 were measured at 6 Mbps, 24Mbps and 54 Mbps each for 802.11a mode. Peak power was measured using an Agilent power meter, model N1911A with model N1921A power sensor. A reference offset of 29.0 dB was applied to the spectrum analyzer reference level for the attenuators and coaxial cable loss in the test circuit.

Channel	Data Rate	Power (dBm)	Max. Measured Level (dBm)	Max. Measured Level from Carrier (dBc)	Limit (dBc)
36	6 Mbps	17.16	-50.98	-60.23	-20
	24 Mbps	13.01	-50.56	-55.85	-20
	54 Mbps	11.6	-50.49	-54.57	-20
64	6 Mbps	18.52	-50.02	-61.80	-20
	24 Mbps	17.87	-50.24	-61.03	-20
	54 Mbps	17.6	-50.18	-60.84	-20
100	6 Mbps	17.73	-51.16	-61.88	-20
	24 Mbps	17.19	-50.97	-61.53	-20
	54 Mbps	16.84	-51.22	-60.92	-20
140	6 Mbps	15.12	-51.32	-52.58	-20
	24 Mbps	13.55	-51.21	-51.08	-20
	54 Mbps	12.02	-51.04	-49.26	-20

See figures 4-31 to 4-34 for the plots of the spurious RF conducted emissions for Channel 36, 64, 100 and 140 at 6 Mbps each for 802.11a mode.

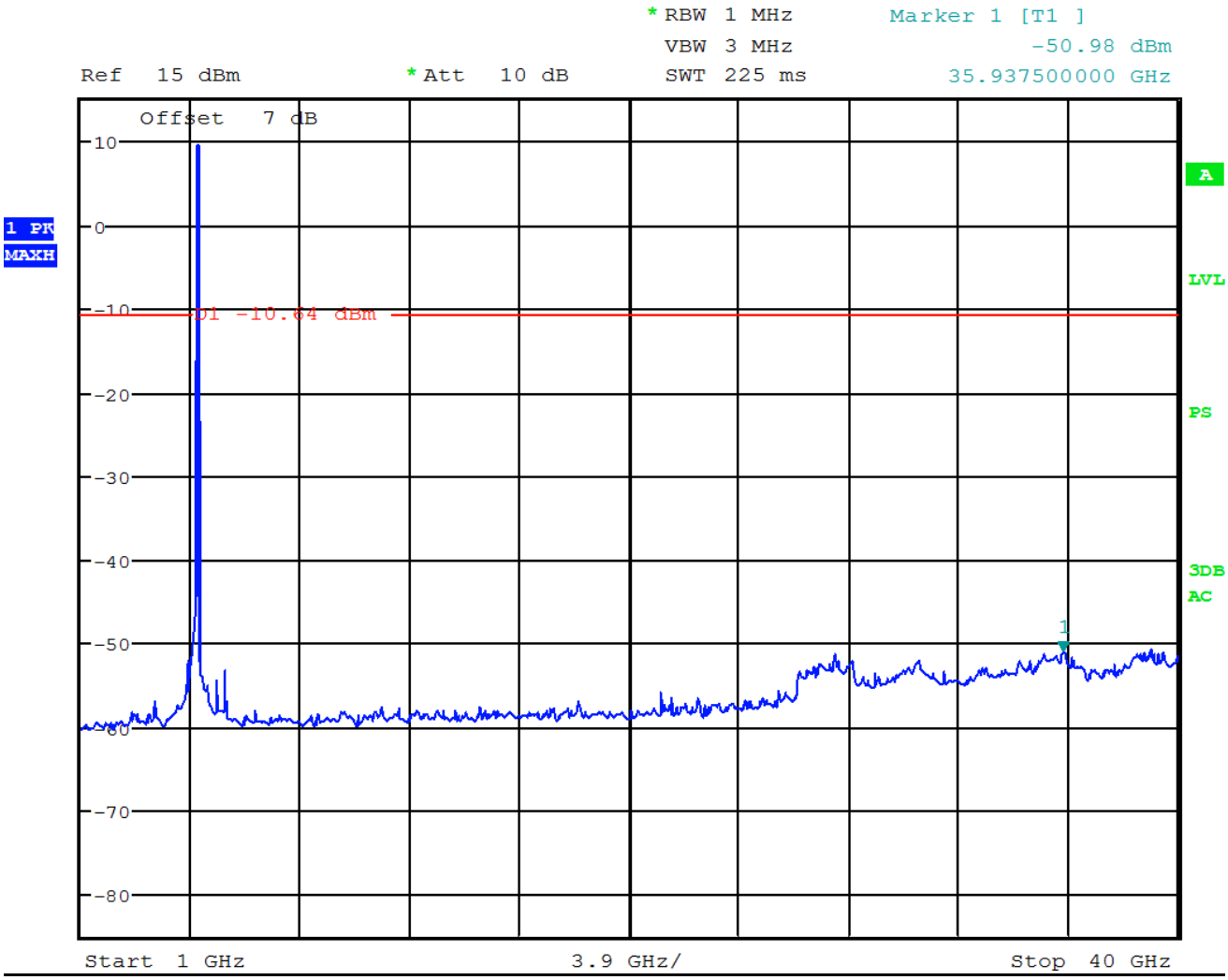
802.11a RF Conducted Emission Test Results cont'd

Figure 4-31a: Spurious RF Conducted Emissions, 802.11a Channel 36, 6 Mbps



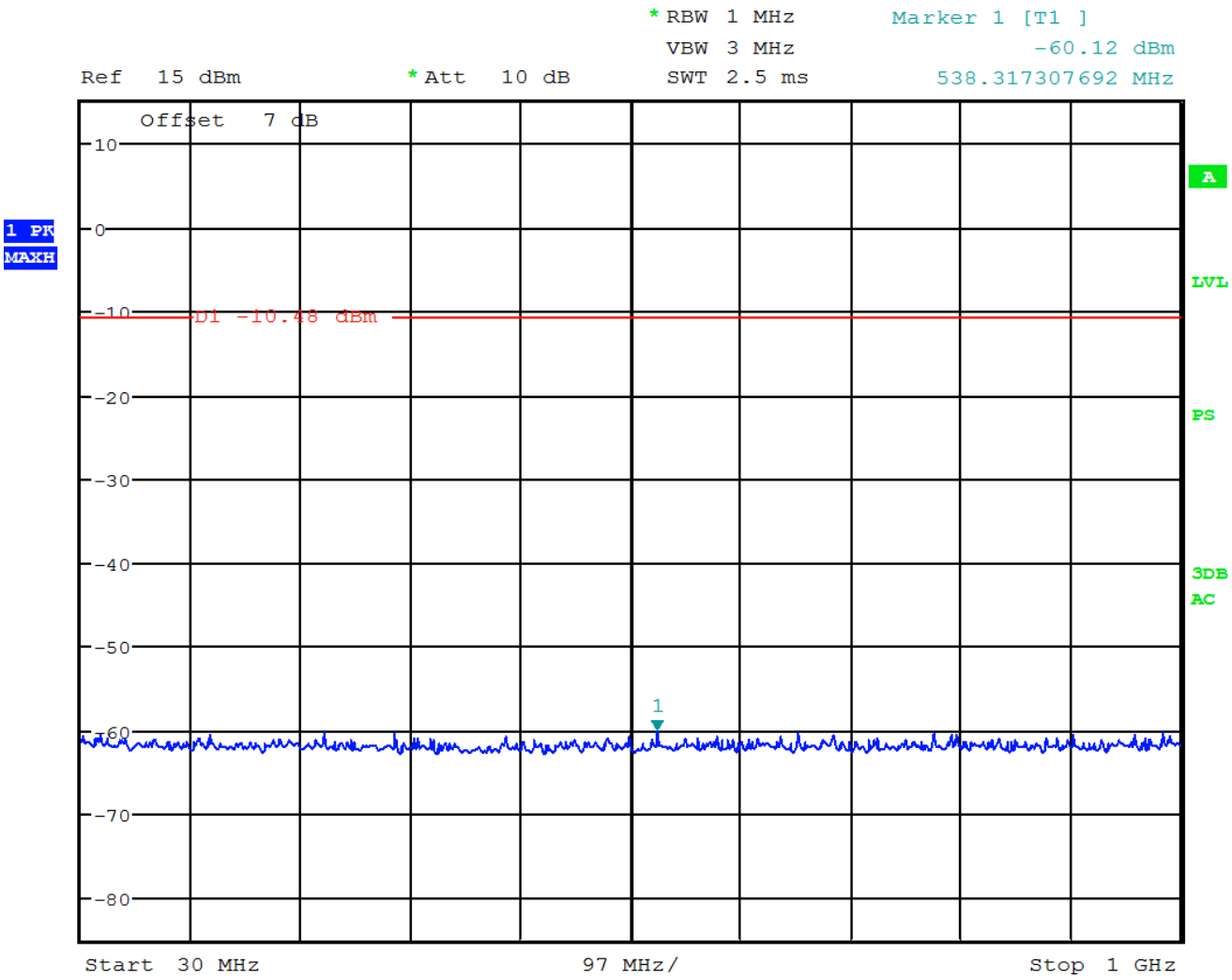
802.11a RF Conducted Emission Test Results cont'd

Figure 4-31b: Spurious RF Conducted Emissions, 802.11a Channel 36, 6 Mbps



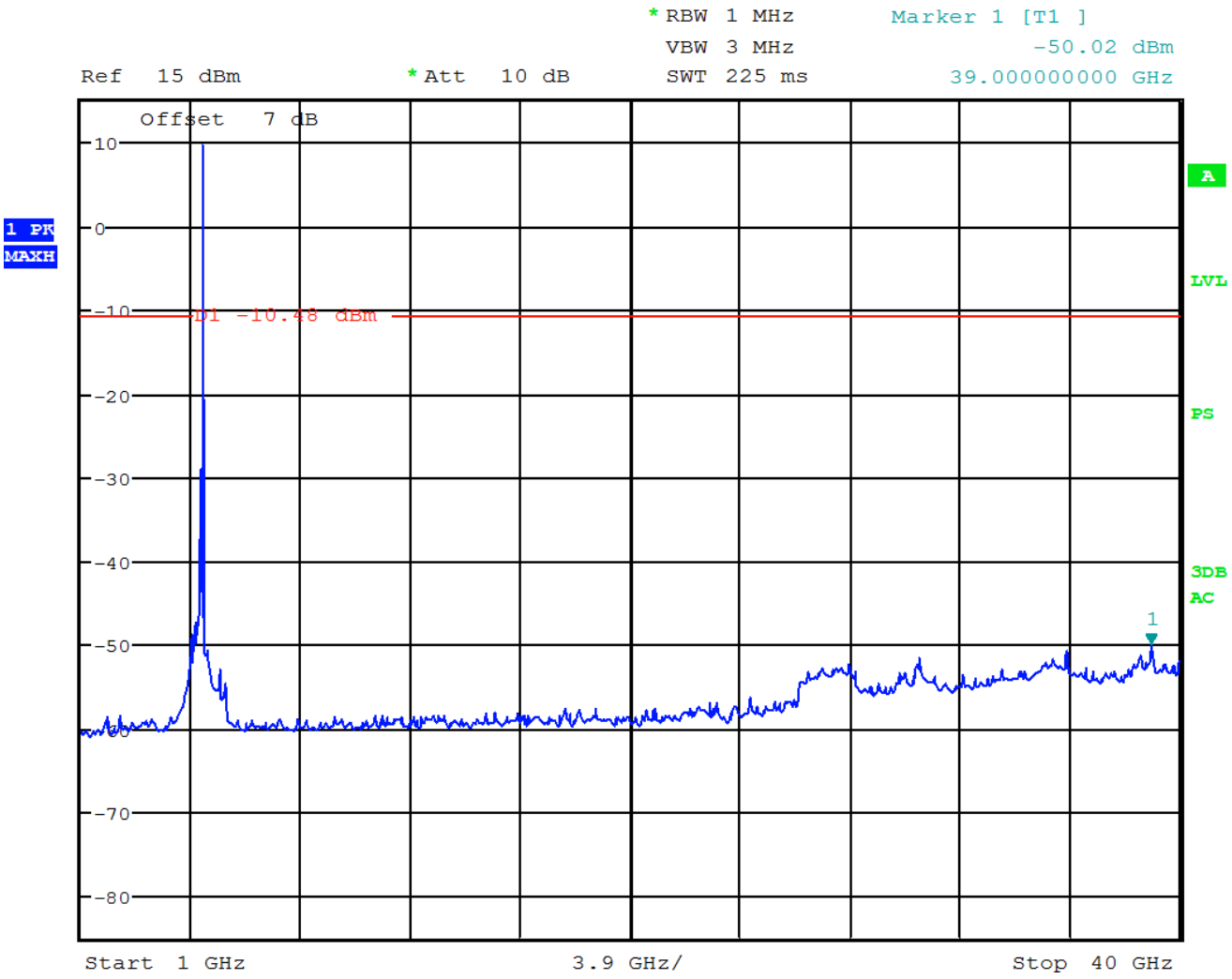
802.11a RF Conducted Emission Test Results cont'd

Figure 4-32a: Spurious RF Conducted Emissions, 802.11a Channel 64, 6 Mbps



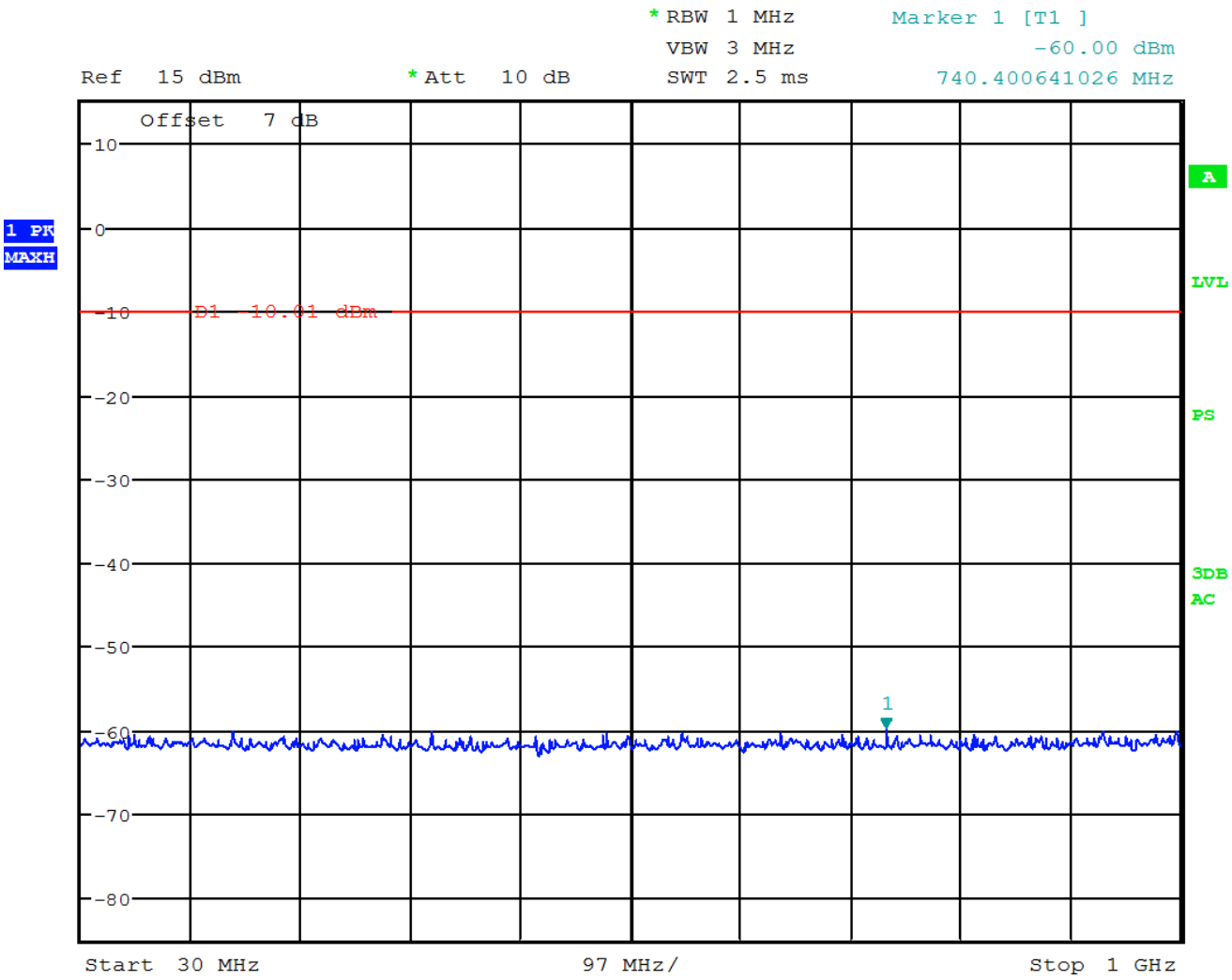
802.11a RF Conducted Emission Test Results cont'd

Figure 4-32b: Spurious RF Conducted Emissions, 802.11a Channel 64, 6 Mbps



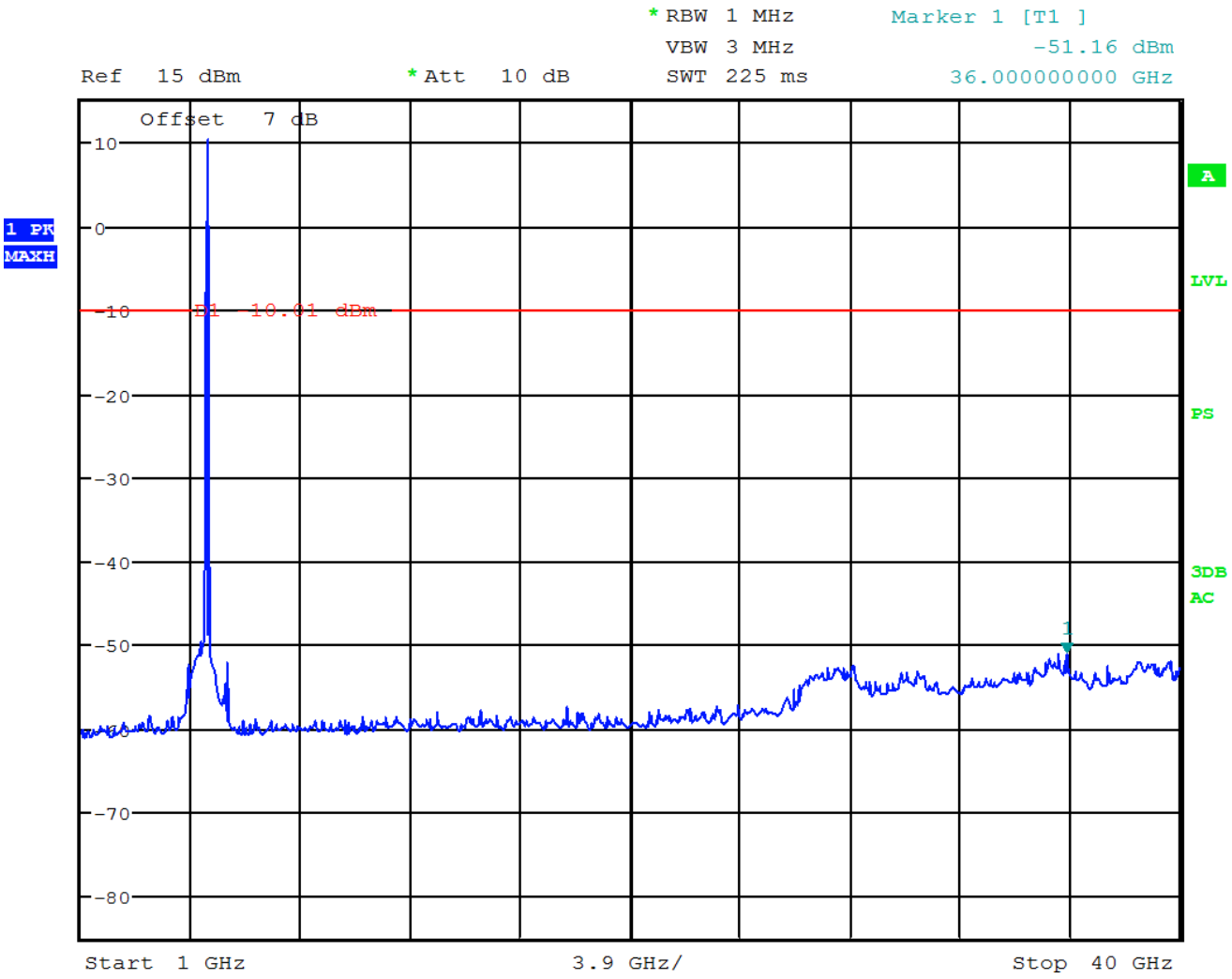
802.11a RF Conducted Emission Test Results cont'd

Figure 4-33a: Spurious RF Conducted Emissions, 802.11a Channel 100, 6 Mbps



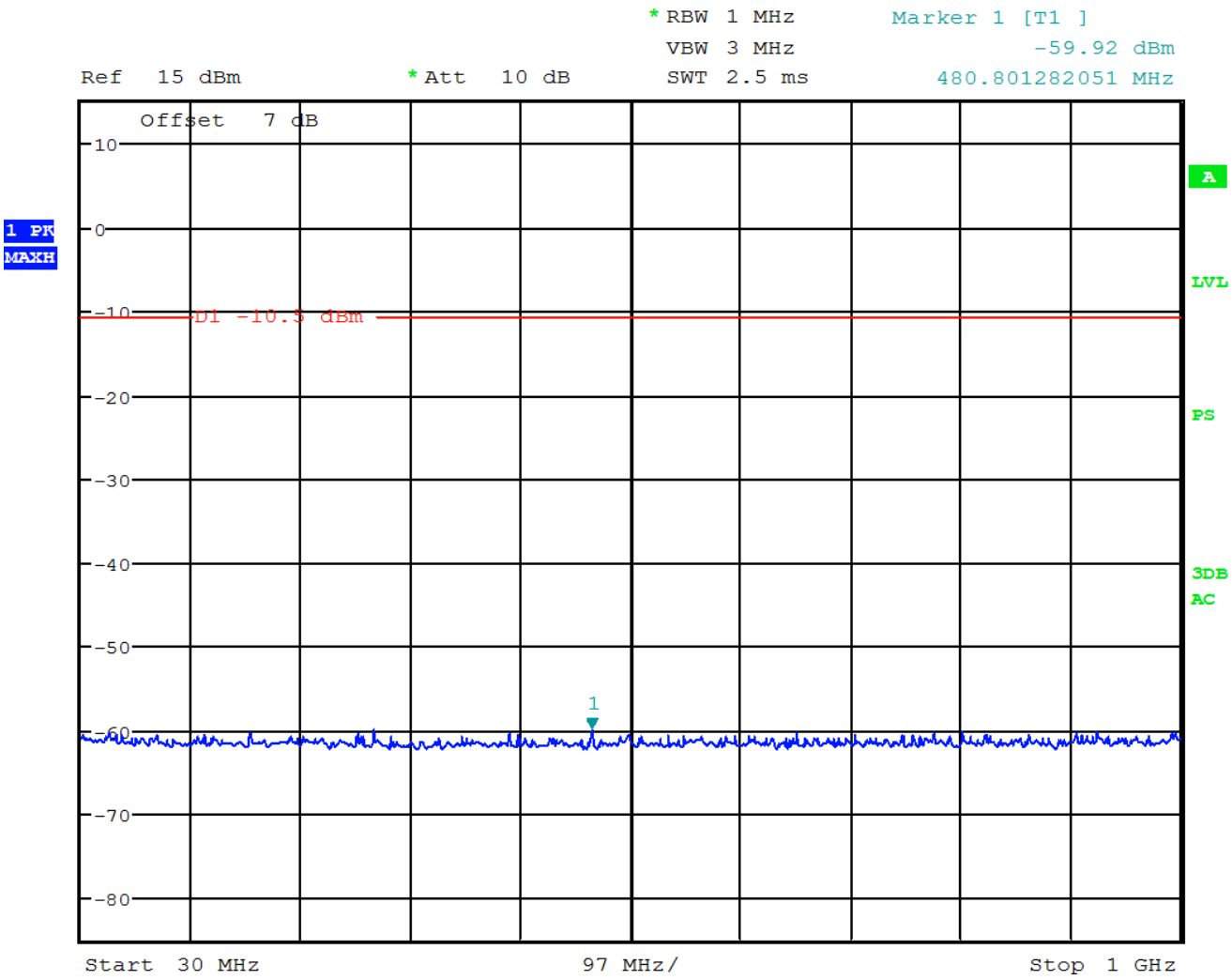
802.11a RF Conducted Emission Test Results cont'd

Figure 4-33b: Spurious RF Conducted Emissions, 802.11a Channel 100, 6 Mbps



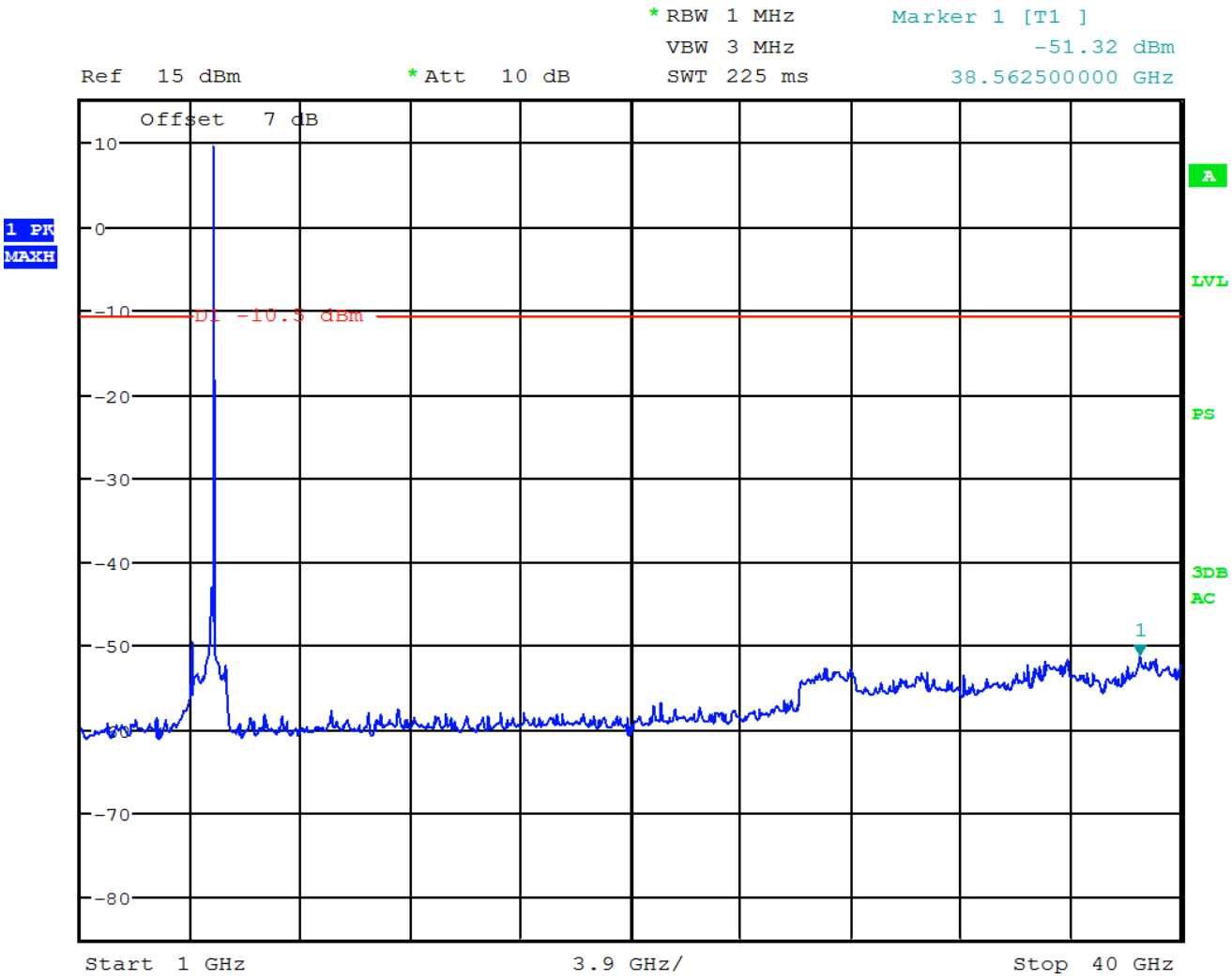
802.11a RF Conducted Emission Test Results cont'd

Figure 4-34a: Spurious RF Conducted Emissions, 802.11a Channel 140, 6 Mbps



802.11a RF Conducted Emission Test Results cont'd

Figure 4-34b: Spurious RF Conducted Emissions, 802.11a Channel 140, 6 Mbps



802.11n RF Conducted Emission Test Results cont'd

Spurious RF Conducted Emissions

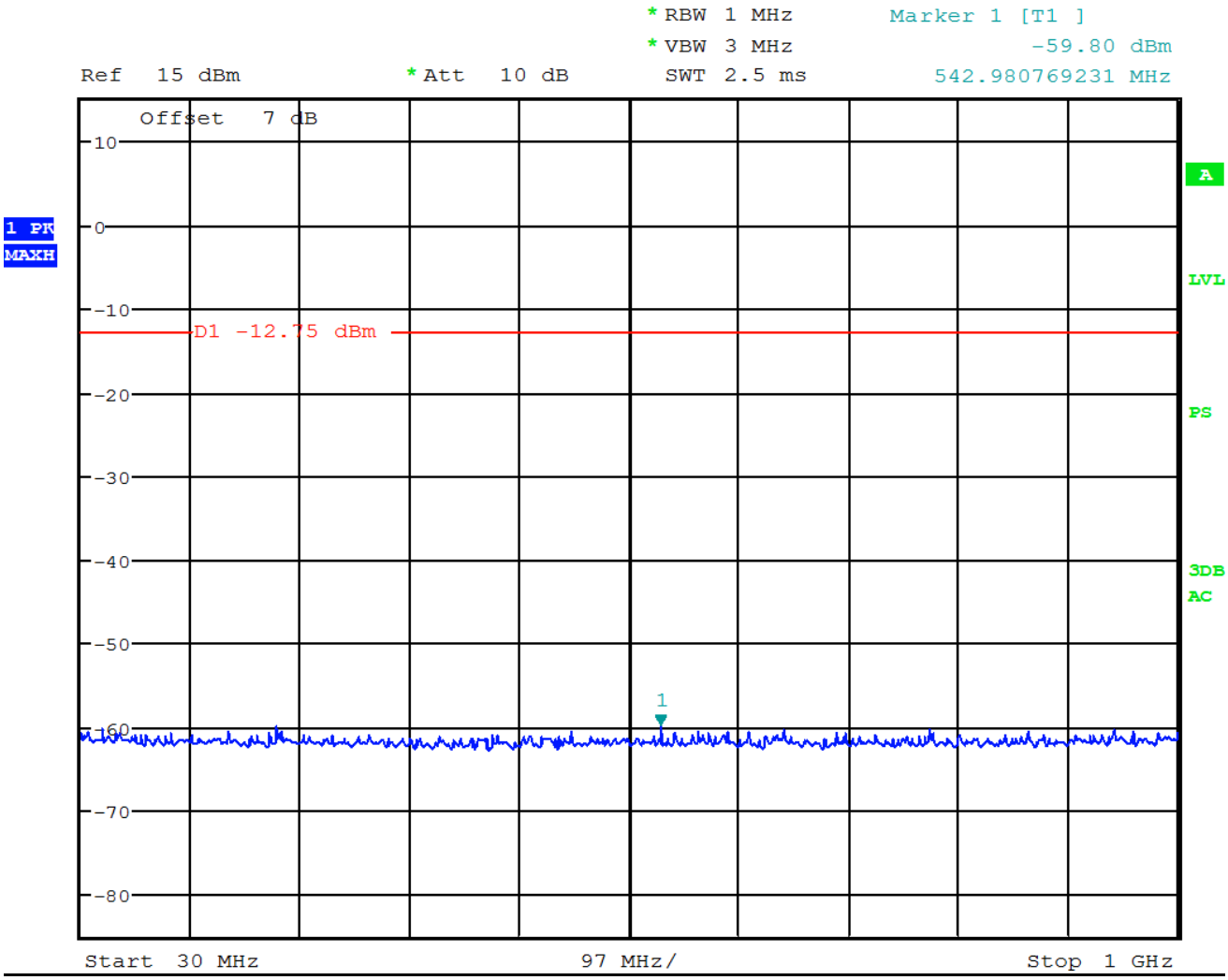
The EUT met the requirements of the spurious RF conducted emissions as per 47 CFR 15.407 and RSS-210. Channels 36, 64, 100 and 140 were measured at MCS0 Mbps, MCS4 Mbps and MCS7 Mbps each for 802.11n mode. Peak power was measured using an Agilent power meter, model N1911A with model N1921A power sensor. A reference offset of 29.0 dB was applied to the spectrum analyzer reference level for the attenuators and coaxial cable loss in the test circuit.

Channel	Data Rate	Power (dBm)	Max. Measured Level (dBm)	Max. Measured Level from Carrier (dBc)	Limit (dBc)
36	MCS0	10.60	-50.95	-61.55	-20
	MCS4	9.88	-50.32	-60.20	-20
	MCS7	8.64	-50.45	-59.09	-20
64	MCS0	10.79	-49.86	-60.65	-20
	MCS4	10.00	-50.02	-60.02	-20
	MCS7	8.72	-49.78	-58.50	-20
100	MCS0	11.21	-49.71	-60.92	-20
	MCS4	10.53	-49.23	-59.76	-20
	MCS7	9.19	-49.86	-59.05	-20
140	MCS0	10.75	-50.90	-61.65	-20
	MCS4	10.06	-50.64	-60.70	-20
	MCS7	8.64	-50.87	-59.51	-20

See figures 4-35 to 4-38 for the plots of the spurious RF conducted emissions for Channel 36, 64, 100 and 140 at MCS0 Mbps each for 802.11n mode.

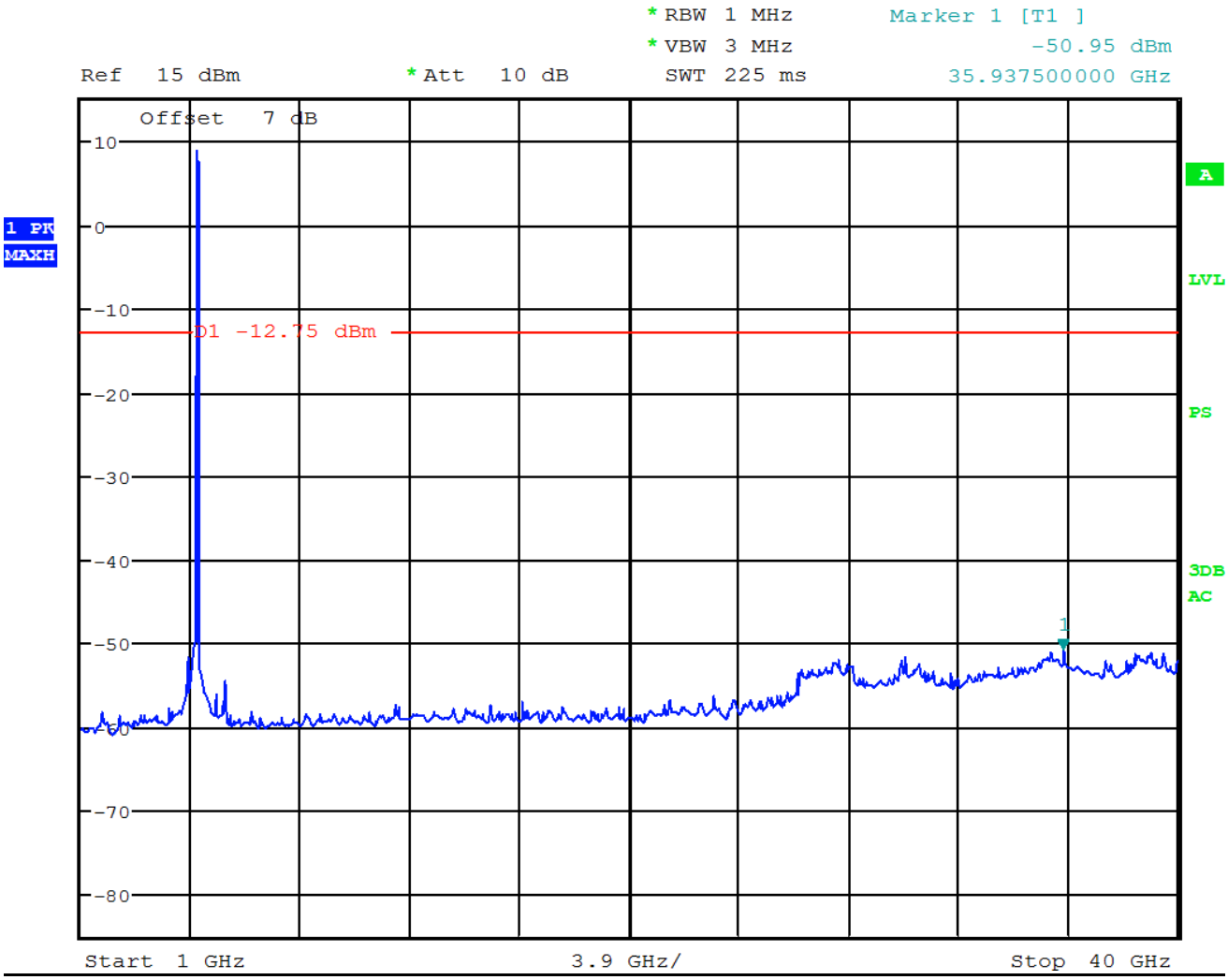
802.11a RF Conducted Emission Test Results cont'd

Figure 4-35a: Spurious RF Conducted Emissions, 802.11n Channel 36, MCS0 Mbps



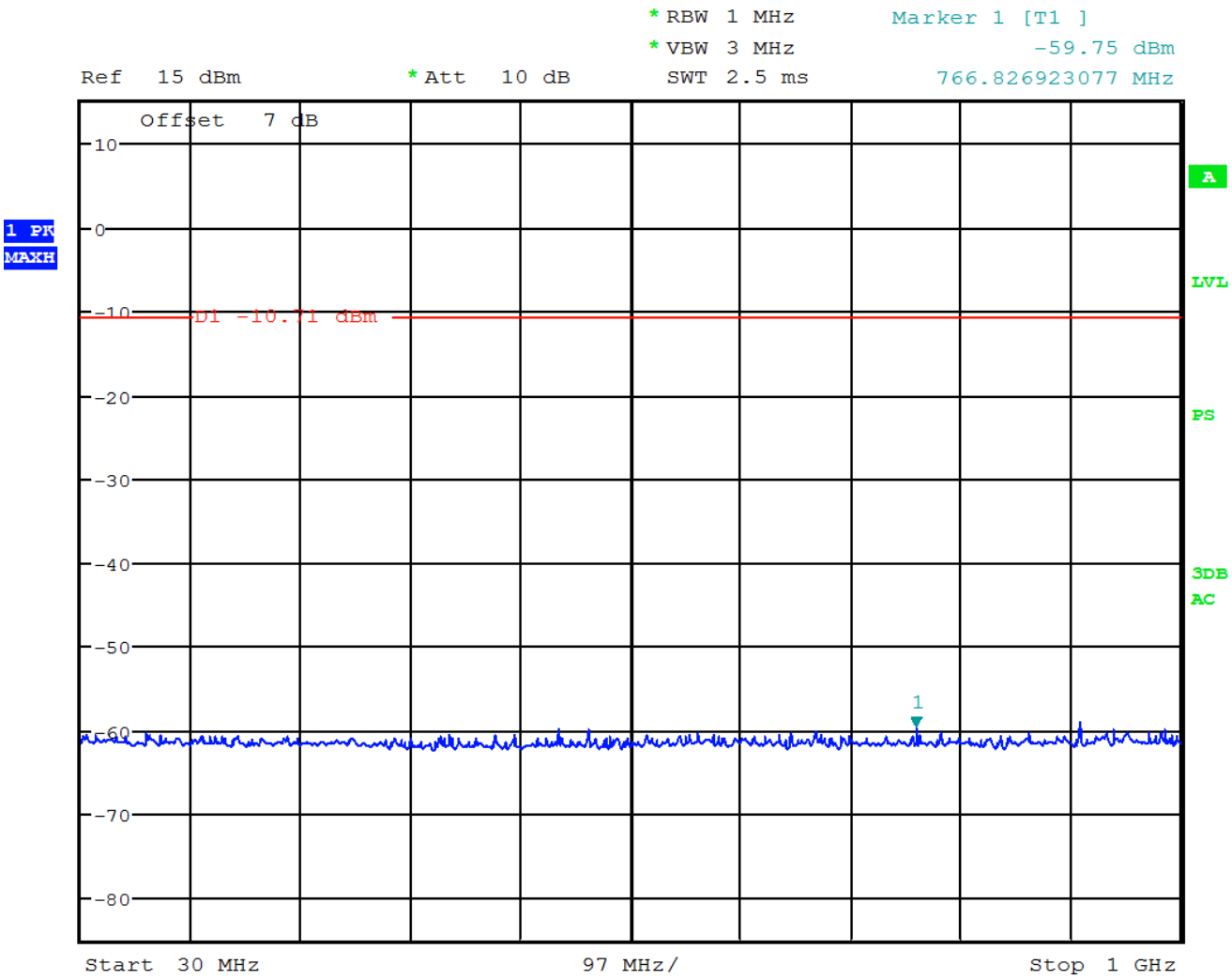
802.11n RF Conducted Emission Test Results cont'd

Figure 4-35b: Spurious RF Conducted Emissions, 802.11n Channel 36, MCS0 Mbps



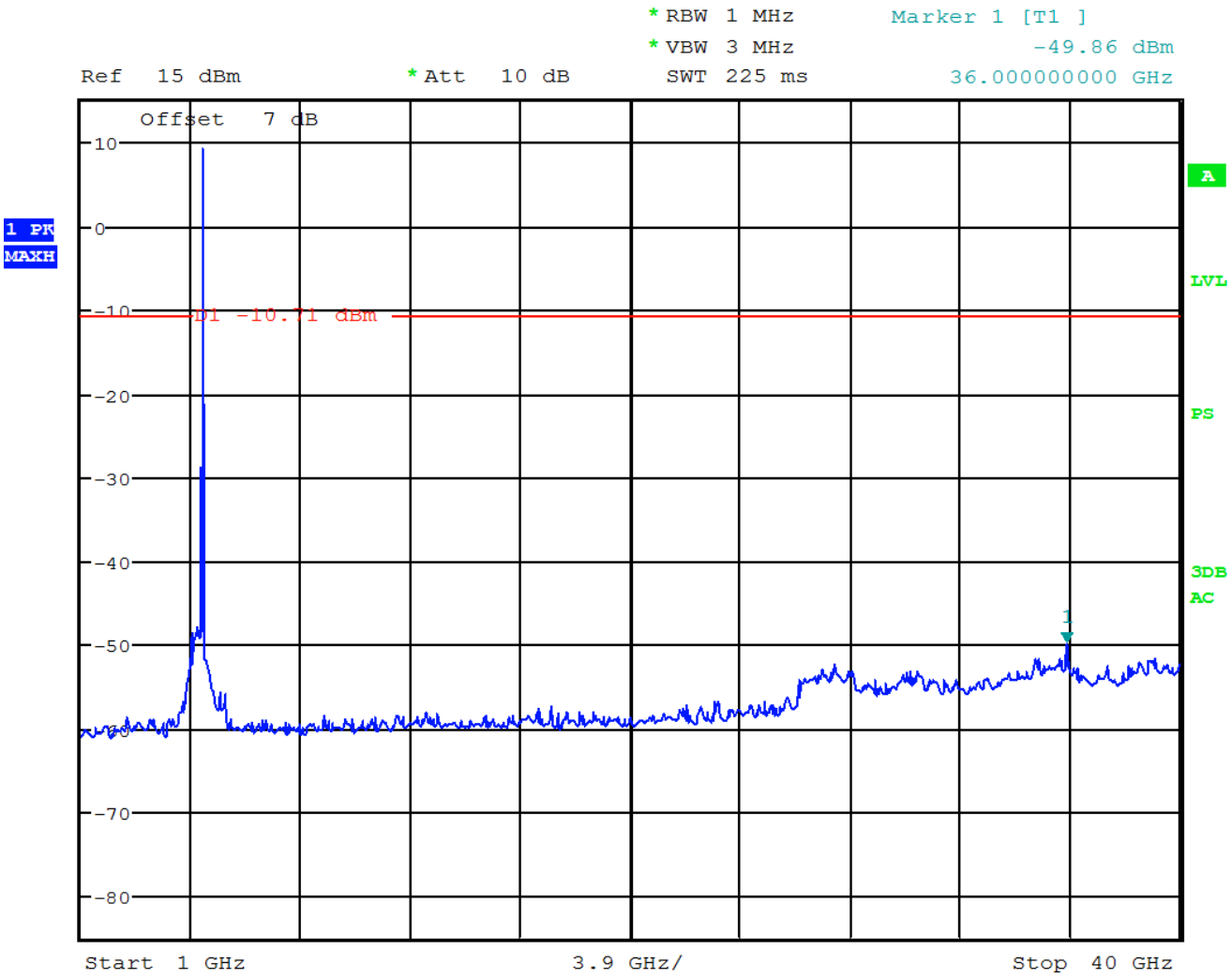
802.11n RF Conducted Emission Test Results cont'd

Figure 4-32a: Spurious RF Conducted Emissions, 802.11n Channel 64, MCS0 Mbps



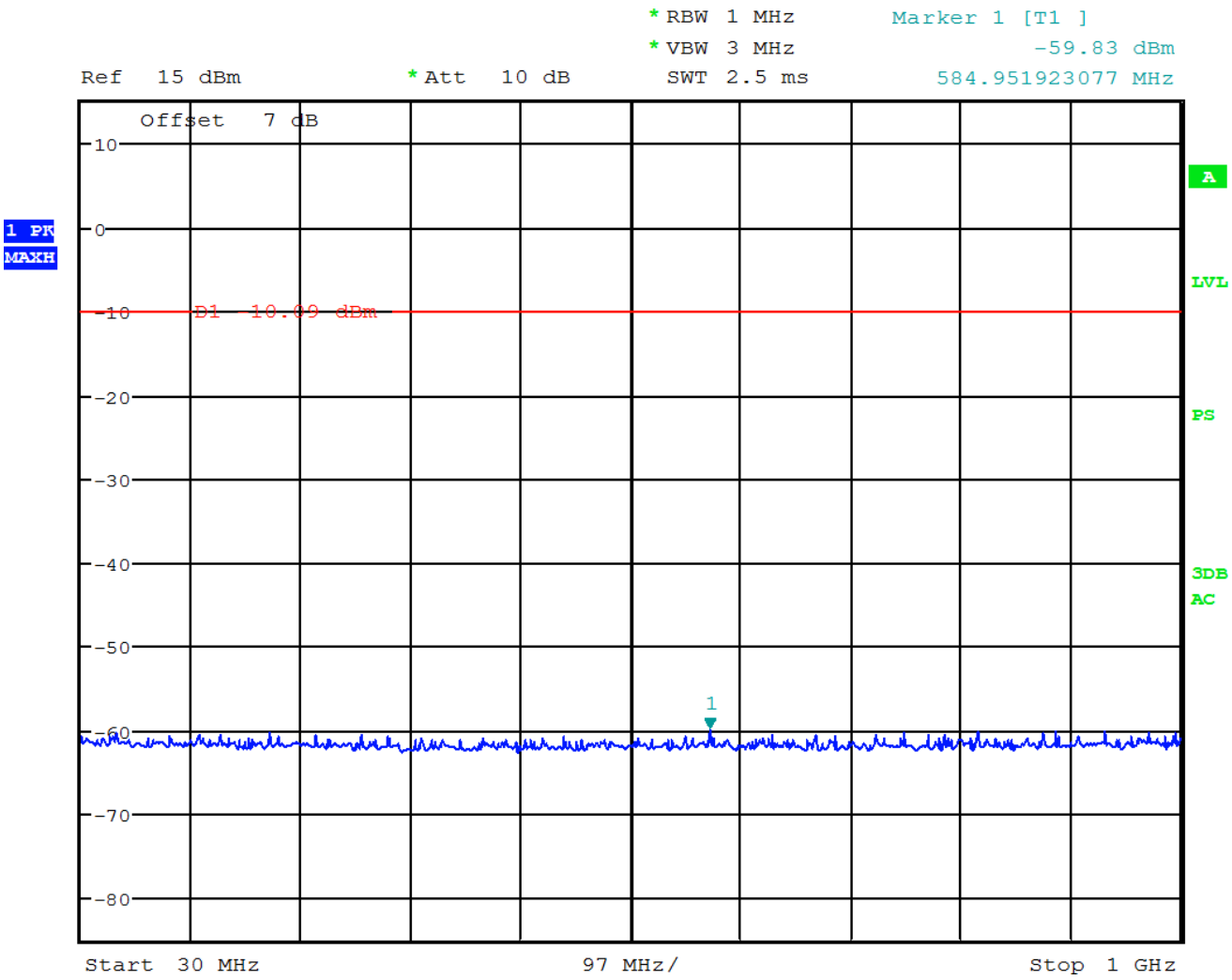
802.11n RF Conducted Emission Test Results cont'd

Figure 4-32b: Spurious RF Conducted Emissions, 802.11n Channel 64, MCS0 Mbps



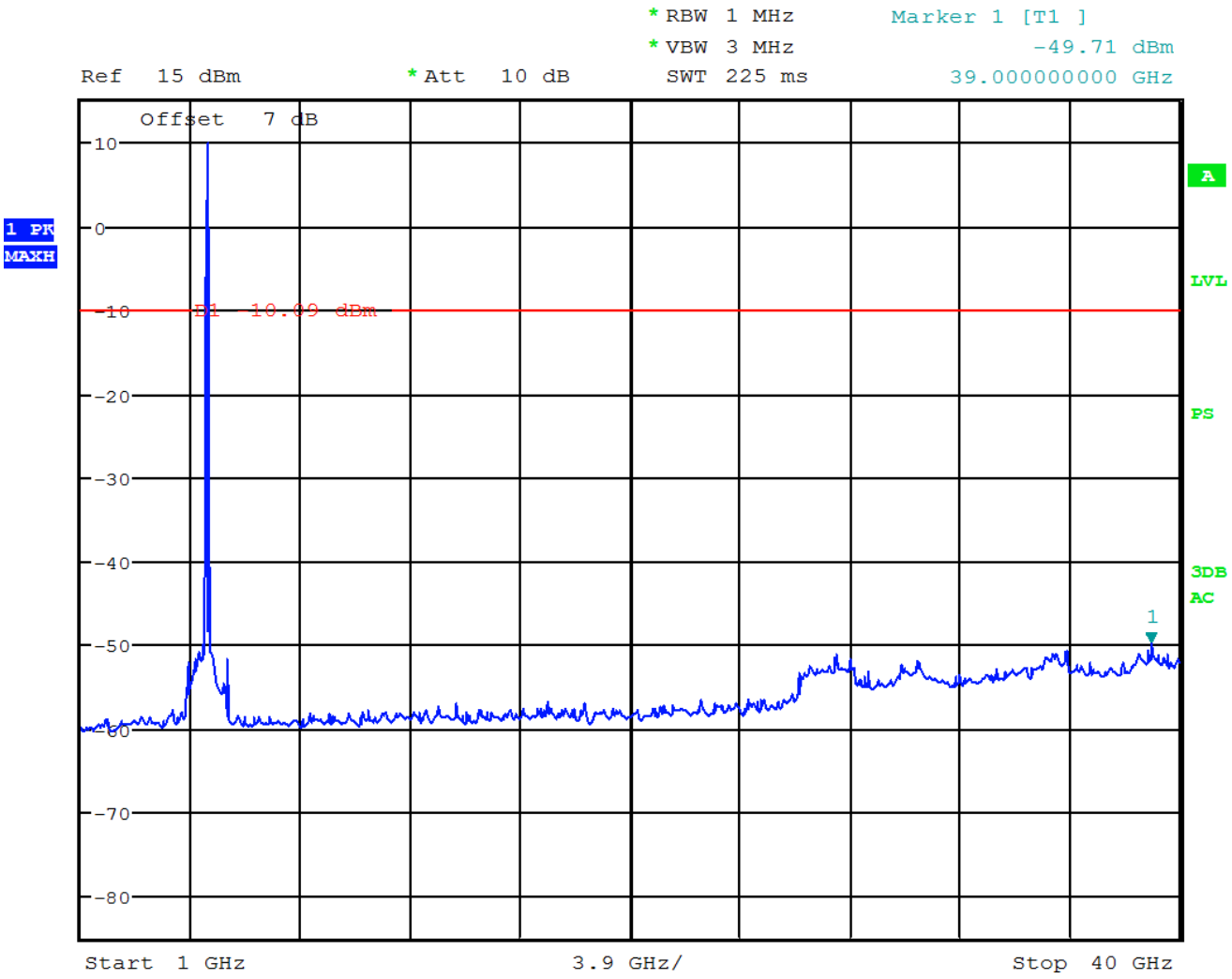
802.11n RF Conducted Emission Test Results cont'd

Figure 4-33a: Spurious RF Conducted Emissions, 802.11n Channel 100, MCS0 Mbps



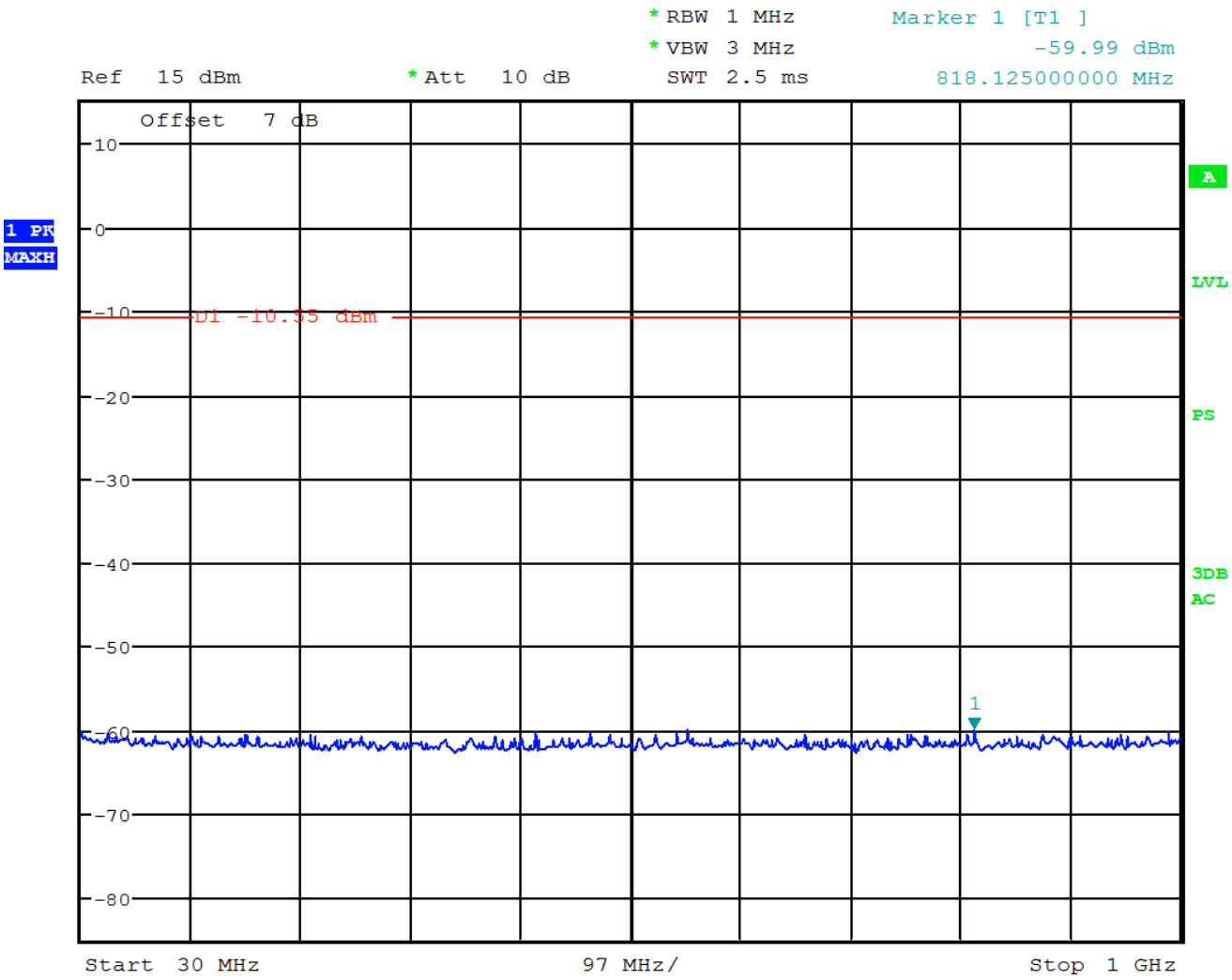
802.11n RF Conducted Emission Test Results cont'd

Figure 4-33b: Spurious RF Conducted Emissions, 802.11n Channel 100, MCS0 Mbps



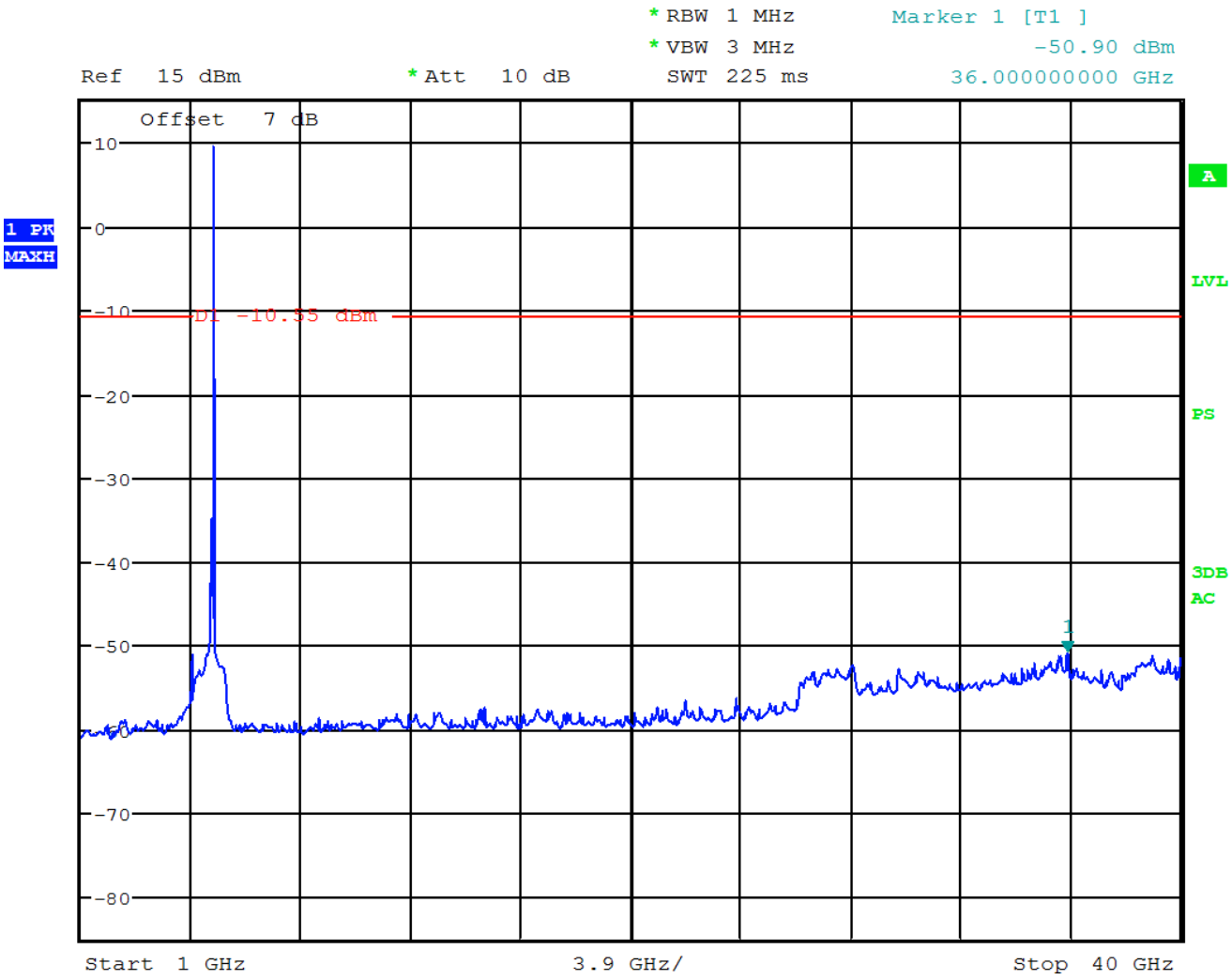
802.11n RF Conducted Emission Test Results cont'd

Figure 4-34a: Spurious RF Conducted Emissions, 802.11n Channel 140, MCS0 Mbps



802.11n RF Conducted Emission Test Results cont'd

Figure 4-34b: Spurious RF Conducted Emissions, 802.11a Channel 140, MCS0 Mbps



APPENDIX 5 – NEAR FIELD COMMUNICATIONS TEST DATA/PLOTS

Near Field Communications (NFC) Test Results

Following tests were performed on the model RGE111LW.

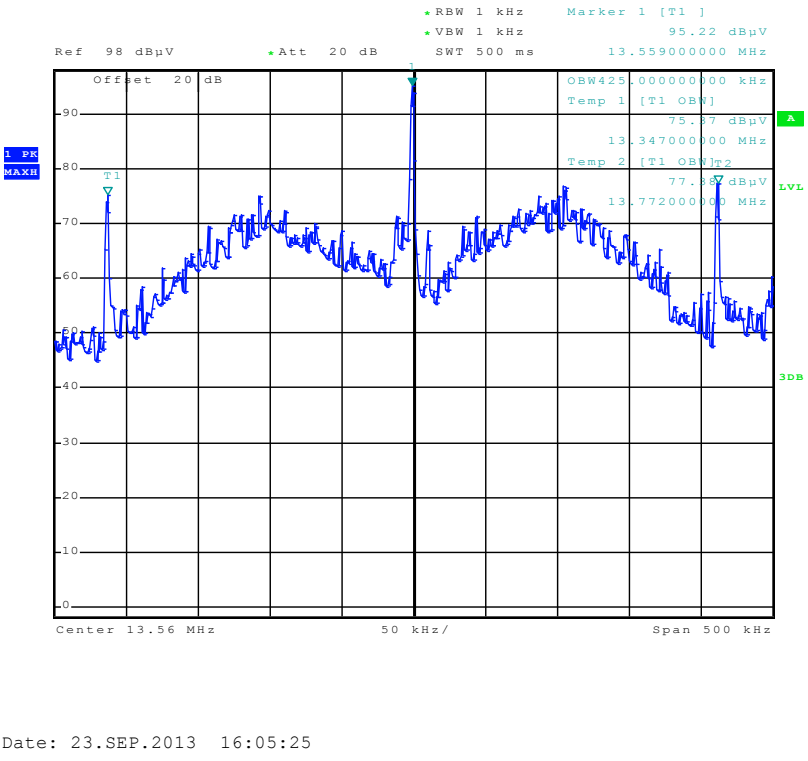
Occupied Bandwidth

Date of test: September 23, 2013
The measurements were performed by Chuan Tran.

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

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

Figure 5-1: Occupied Bandwidth, NFC TX Frequency = 13.56 MHz



Near Field Communications (NFC) Test Results cont'd

Frequency Stability

Date of test: September 23, 2013.
The measurements were performed by Chuan Tran.

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	13.559313	3.6	-687	-0.00507	-50.7006
-20	13.56	13.559150	3.8	-850	-0.00627	-62.6844
-20	13.56	13.559025	4.35	-975	-0.00719	-71.9027
-10	13.56	13.559188	3.6	-813	-0.00599	-59.9189
-10	13.56	13.558125	3.8	-1875	-0.01383	-138.2522
-10	13.56	13.559050	4.35	-950	-0.00701	-70.0590
0	13.56	13.559325	3.6	-675	-0.00498	-49.7788
0	13.56	13.559150	3.8	-850	-0.00627	-62.6844
0	13.56	13.559213	4.35	-788	-0.00581	-58.0752
10	13.56	13.559275	3.6	-725	-0.00535	-53.4661
10	13.56	13.559338	3.8	-663	-0.00489	-48.8569
10	13.56	13.558975	4.35	-1025	-0.00756	-75.5900
20	13.56	13.559125	3.6	-875	-0.00645	-64.5280
20	13.56	13.559272	3.8	-728	-0.00537	-53.6873
20	13.56	13.559025	4.35	-975	-0.00719	-71.9027

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	13.559272	3.6	-750	-0.00553	-55.3097
30	13.56	13.559025	3.8	-863	-0.00636	-63.6062
30	13.56	13.559250	4.35	-825	-0.00608	-60.8407
40	13.56	13.559138	3.6	-363	-0.00267	-26.7330
40	13.56	13.559175	3.8	-875	-0.00645	-64.5280
40	13.56	13.559638	4.35	-538	-0.00396	-39.6386
50	13.56	13.559125	3.6	-1025	-0.00756	-75.5900
50	13.56	13.559463	3.8	-975	-0.00719	-71.9027
50	13.56	13.558975	4.35	-950	-0.00701	-70.0590
60	13.56	13.559025	3.6	-1025	-0.00756	-75.5900
60	13.56	13.559050	3.8	-925	-0.00682	-68.2153
60	13.56	13.558975	4.35	-962	-0.00710	-70.9808