Extron Electronics
INTERFACING, SWITCHING AND CONTROL

FCC AND IC RF TEST REPORT

Product Tested
ShareLink 250 W

Report Number
2051-1

Prepared for:
Extron Electronics
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Anaheim, CA 92805
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Prepared by:
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A2LA ACCREDITED
Testing Cert # 3429.01

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REVISION PAGE

Issue Date	Revision	Changes	By
3/15/2016	A	Initial Release	Boni Baniqued
3/29/2016	B	Updated product name and corrected typo error	Boni Baniqued
4/12/2016	C	Updated KDB 558074 D01 reference to the latest version	Boni Baniqued

CERTIFICATION

PRODUCT NAME:	Wireless Collaboration Gateway
BRAND NAME:	Extron
MODEL NUMBER:	ShareLink 250 W
FCC ID:	2AE3WEXTSL250W
IC:	10862A-EXTSL250W
APPLICANT NAME:	Extron Electronics, 1025 E, Ball Road, Anaheim, CA 92805
DATE OF TESTING:	February 19, 2016 to March 7, 2016
STANDARDS:	FCC Part 15 Subpart C (Section 15.247)
	IC RSS-247 Issue 1 (Digital Transmission Systems)
	IC RSS-GEN Issue 4
OPERATING BAND:	2400 MHz – 2483.5 MHz

The above equipment was found to be in compliance with the limits and levels of the standards listed in this report based on the testing results. Unless otherwise stated, the results of this report relate only to the items tested as described in the General Information section of this test report. If any significant changes are made to the EUT, the changes shall be evaluated and a retest may be required.

Test reports shall not be reproduced except in full, without the written approval of the Extron Director of Compliance Engineering, or his designee.

Approved & Released for
Extron Electronics Compliance Engineering By:

Homi Ahmadi
Director of Compliance Engineering
Extron Electronics

Tested By:

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DN: cn=Boni Baniqued, o=Extron Electronics, ou=Compliance Engineering, email=bbaniqued@extron.com, c=US
Date: 2016.04.12 16:18:31 -07'00'

Boni Baniqued
Regulatory Compliance Engineer
Extron Electronics

1 GENERAL INFORMATION

1.1 Applicant Information

Extron Electronics, 1025 E. Ball Road, Anaheim, CA 92805, USA

1.2 Application Type

FCC Part 15 Subpart C Section 15.247 and IC RSS-247 Issue 1 (Digital Transmission Systems) Certification

1.3 Related Submittal(s)/Grant(s)

N/A

1.4 Test Methodology

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, ANSI C63.10-2013, KDB 558074 D01 DTS Measurement Guidance v03r05, IC RSS-GEN Issue 4, and IC RSS-247 Issue 1.

1.5 Test Facilities and Accreditations

- All testing was performed at Extron Electronics – Compliance Laboratory, 1001 E. Ball Road, Anaheim, CA 92805, USA
- American Association for Laboratory Accreditation: 3429.01, Valid Through June 30, 2017
- FCC Designation Number: US1143, Valid Through 06/30/2016
- VCCI Registration Number: A-0186, Valid Through 06/30/2017
- Industry Canada Site Number: 10862A-1, Valid Through 07/15/2016

NOTE

This report cannot be used to claim product endorsement by any of the agencies listed above.

NOTE

The Extron Electronics – Compliance Laboratory operates as an independent test lab within Extron Electronics with no organizational or financial relationship.

1.6 Measurement Uncertainty

Measurement uncertainty is used to reflect the accuracy of the measured result as compared with its "true" or theoretically correct value. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4-2. In the case of transient tests our test equipment has been demonstrated by calibration to provide at least a 95% confidence that it complies with the test specification requirements. The measurement uncertainty for any test is available upon request.

Radiated Emissions

Test Method	Lab	Uncertainty	Units
Radiated Emissions 30-1000MHz (Vertical Polarity)	B	±4.88	dB
Radiated Emissions 30-1000MHz (Horizontal Polarity)	B	±4.88	dB
Radiated Emissions 1-18GHz	B	±5.01	dB
Radiated Emissions 18-40GHz	B	±5.02	dB

Conducted Emissions

Test Method	Lab	Uncertainty	Units
Conducted Emissions with LISN	E	±3.79	dB
Conducted Emissions with T-ISN	E	±3.75	dB

2 PRODUCT INFORMATION

2.1 Description of the EUT

The Equipment Under Test (EUT) is a Wireless Collaboration Gateway (P/N: 60-1558-01) with support for 2.4/5 GHz IEEE 802.11 a/b/g/n.

** The test data gathered are from Production samples, serial number EXTN2500151700016, received from the manufacturer on February 19, 2016.*

2.2 Description of the Antenna

WLAN External Antenna with SMA Male Reverse connector

Product Number	Manufacturer	Type	Peak Gain (dBi)	
			2400 ~ 2500 MHz	5150 ~ 5850 MHz
AN2450-4828RS	Cortec	Dipole	≤ 2.0	≤ 2.0

2.3 Description of Power Supply

Item	Type	Manufacturer	Model	Input	Output	Power Line
1	Adapter	ENG	6A-161WP05	100~240Vac, 50~60Hz, 0.6A	5.0Vdc, 2.6A	1.5m unshielded cable with one ferrite
2*	PoE	EXTRON	XTP PI 100	100~240Vac, 50~60Hz, 0.4A	+48Vdc, 0.35A	-

** PoE is an alternate power supply and provided as support only.*

2.4 Description of Test Setup

Support Equipment List

Description	Manufacturer	Model/Part Number	Serial Number	Quantity
Laptop PC	Dell	D630	N/A	1
Laptop PC	Dell	E6400	N/A	1
24” LED-LCD HDTV	Vizio	VX240M	VX24120109027	1
24” LED-LCD HDTV	Vizio	VX240M	LSMFAAK3604939	1
Gigabit Switch HUB	Allied Telesis	AT-GS950/16	A04374R121500007 A1	1
USB Mouse	Dell	M-BAC-DEL5	N/A	1
USB Keyboard	Dell	L100	N/A	1
USB Flash Drive	Sony	USM4GL	N/A	1

I/O Cable List

Description	Manufacturer	Model/Part Number	Serial Number	Quantity
CAT-5e UTP 10’ cable	Extron Electronics	26-640-10	N/A	2
CAT-5e UTP 35’ cable	Extron Electronics	26-640-35	N/A	1
HDMI PRO 25’ cable	Extron Electronics	26-650-25	N/A	1
HDMI ULTRA 15’ cable	Extron Electronics	26-663-15	N/A	1
VGA M-M 35’ cable	Extron Electronics	26-238-17	N/A	1
Audio Mini 25’ cable	Extron Electronics	26-571-01	N/A	1

2.5 Worst Test Modes and Channel Details

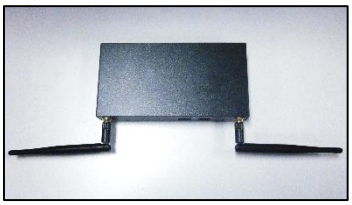
Test Condition	Test Item	Modulation Mode	Worst Data Rate (Mbps / MCS)	Test Frequency (MHz)	Application	
					Mode 1	Mode 2
RF Conducted	6dB EBW and 99% OBW Maximum Conducted Output Power Power Spectral Density Emissions in non-restricted frequency bands	802.11b	1 Mbps	2412 / 2437 / 2462	√	-
		802.11g	6 Mbps	2412 / 2437 / 2462	√	-
		802.11n (HT20)	MCS0 (6.5 Mbps)	2412 / 2437 / 2462	√	-
		802.11n (HT40)	MCS0 (13.5 Mbps)	2422 / 2437 / 2452	√	-
	Authorized Band-edge	802.11b	1 Mbps	2412 / 2462	√	-
		802.11g	6 Mbps	2412 / 2462	√	-
		802.11n (HT20)	MCS0 (6.5 Mbps)	2412 / 2462	√	-
		802.11n (HT40)	MCS0 (13.5 Mbps)	2422 / 2452	√	-
Radiated	Radiated Emissions < 1GHz	802.11b	1 Mbps	2412	√	√
	Radiated Spurious Emissions > 1GHz	802.11b	1 Mbps	2412 / 2437 / 2462	√	-
	Restricted-band band-edge	802.11b	1 Mbps	2412 / 2462	√	-
		802.11g	6 Mbps	2412 / 2462	√	-
		802.11n (HT20)	MCS0 (6.5 Mbps)	2412 / 2462	√	-
		802.11n (HT40)	MCS0 (13.5 Mbps)	2422 / 2452	√	-
Line Conducted	AC Power-line Conducted Emissions	802.11b	1 Mbps	2437	√	√

NOTE:

(1) The fundamental frequency of the EUT was investigated in three orthogonal orientations of the antenna, vertical (V), horizontal 1 (H1), and horizontal 2 (H2) as shown below. It was determined that the horizontal 1 (H1) antenna orientation was the worst-case orientation; therefore, a final radiated emission testing was performed with the antenna in the horizontal1 (H1) orientation.

1. Vertical (V)

2. Horizontal 1 (H1)



3. Horizontal 2 (H2)

(2) Per manufacturer, only Antenna 1 is active and Antenna 2 is disabled due to Hardware limitation.
(3) Mode 1- Power from AC adapter
(4) Mode 2- Power from PoE

2.6 Worst Case Power setting parameter

DTS: 2400 ~ 2483.5 MHz Band

Modulation Mode	Test Channel	Test Frequency (MHz)	Power Setting (RF Test v.0.1)
802.11b	1	2412	17
	6	2437	17
	11	2462	17
802.11g	1	2412	6
	6	2437	6
	11	2462	6
802.11n (HT20)	1	2412	2
	6	2437	2
	11	2462	2
802.11n (HT40)	3	2422	0
	6	2437	0
	9	2452	0

2.7 Equipment Modifications

None

2.8 Testing Condition

Test Item	Test Site	Environmental Condition			Tested By
		Temperature	Relative Humidity	Atmospheric Pressure	
RF Conducted Emissions	Lab M	22-25°C	40-60%	1002-1018mbar	Boni Baniqued
Radiated Spurious Emissions	Lab B	22-25°C	40-60%	1002-1018mbar	Boni Baniqued
AC Power-Line Conducted Emissions	Lab E	22-25°C	40-60%	1002-1018mbar	Boni Baniqued

2.9 Software

- RF Test (Ver0.1) – for Wi-Fi Module control
- R&S Power Viewer Plus – for maximum conducted output power measurement
- R&S EMC32 V8.54.0 - AC power line conducted emissions and radiated spurious emissions measurements
- R&S RSCommander V1.5.9 – for Spectrum Analyzer /Receiver plot capture

3 TEST AND MEASUREMENT EQUIPMENT

Equipment Type	Manufacturer	Model Number	Asset/Serial Number	Calibration Due Date
Signal and Spectrum Analyzer	Rohde & Schwarz	FSV40	101447	08/03/2016
EMI Receiver, 40 GHz	Rohde & Schwarz	ESU40	100161	08/27/2016
EMI Receiver, 26 GHz	Rohde & Schwarz	ESU26	100189	12/01/2016
AVG Power Sensor	Rohde & Schwarz	NRP-Z31	101721	07/20/2016
Antenna – Bilog, 30MHz-1GHz	ETS-Lingren	3142D	13988	04/13/2016
Antenna, Horn, 1-18 GHz	ETS-Lingren	3117	00108478	03/31/2016
Antenna, Horn, 18- 40 GHz	ATM	180-442-KF/CAL	L488008-01	05/18/2016
Pre-Amplifier, 1-18 GHz	Rohde & Schwarz	TS-PR18	100066	04/01/2016
Pre-Amplifier, 18-40 GHz	Rohde & Schwarz	TS-PR18-40	10001	05/18/2016
RF Cable, 0.30-18 GHz	SEMFLEX	N130SFBN10360	N/A	08/25/2016
RF Cable, 1-18 GHz	Huber-Suhner	Sucoflex 104E	232648 003	04/01/2016
RF Cable, 1-40 GHz	SEMFLEX	60637-59957	N/A	05/05/2016
RF Cable, 30 MHz -40 GHz	Pasternack	PE3CA1058-12	N/A	04/21/2016
Notch Filter, 2400-2500 MHz	Micro-Tronics	BRM50702-02	019	04/20/2016
Notch Filter, 5150-5880 MHz	Micro-Tronics	BRM50716-02	005	05/11/2016
Attenuator, 10dB	Bracke	BM10060.10	N/A	CNR
LISN	Rohde & Schwarz	ENV216	13724	4/1/2016
LISN	Com-Power	LI115	13725	CNR
Cable BNC	Pasternak	BNC-2	N/A	3/25/2016
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	115740	9/21/2017
Hygro-Thermometer/Barometer	VWR	89094-760	29221	4/14/2016

Note: CNR – Calibration Not Required

4 TEST RESULTS SUMMARY

FCC Rule Section	IC RSS Rule Section	Test Item Description		Test Limit	Test Conditions	Test Result
§ 15.247 (a)(2)	247 § 5.2 (1) Gen § 6.6	6dB Bandwidth and 99% OBW		≥ 500 kHz	Conducted	PASS
§ 15.247 (b)(3)	247 § 5.4 (4)	Maximum Conducted Output Power		< 1Watt (30 dBm) / 36 dBm (e.i.r.p.)		PASS
§ 15.247 (e)	247 § 5.2 (2)	Power Spectral Density		< 8dBm / 3kHz		PASS
§ 15.247 (d)	247 § 5.5	Unwanted Emissions /Band-edge		> 30dBc		PASS
§ 15.205 § 15.209 § 15.247 (d)	247 § 5.5 GEN § 8.10	Unwanted Emissions	Restricted Band-edge	FCC 15.209(a) Gen § 8.9 Table 4	Radiated	PASS
			Restricted Band	FCC 15.209(a) Gen § 8.9 Table 4		PASS
§ 15.207 (a)	Gen § 8.8	AC Power-Line Conducted Emissions		FCC 15.207(a) Gen § 8.8 Table 3	Line Conducted	PASS
§ 1.1307 § 1.1310 § 15.247 (i)	102 (4)	RF Exposure Requirements		FCC 1.1310 (e) 102 (4) Table 4	MPE Calculation	PASS

5 DUTY CYCLE

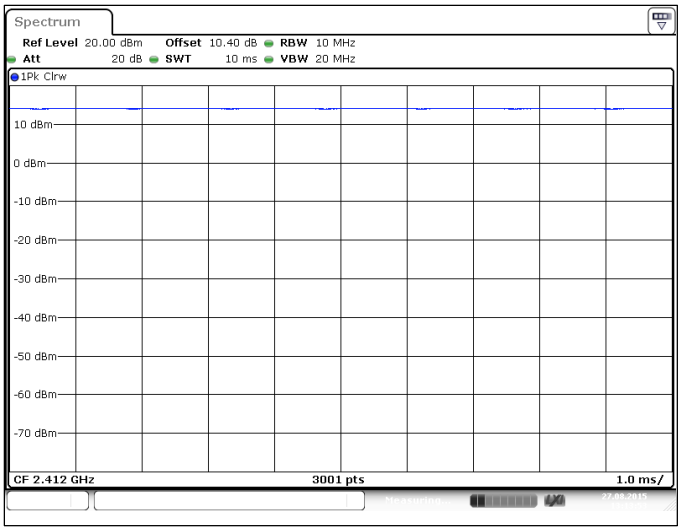
The duty cycles for all modes were determined based on measurements per KDB 558074 D01 v03r05 section 6.0 b) using spectrum analyzer in zero-span mode with RBW = 10 MHz, VBW = 10 MHz, and detector = Peak. The RBW and VBW are > than 50/T and the number of sweep points across duration T exceeds 100.

802.11 Mode	Data Rates	T_{OFF} (usec)	T_{ON} (usec)	Duty Cycle [DC]	Duty Cycle (%)	DC Factor (dB)
b	1 Mbps	0	10000	1	100	**0**
g	6 Mbps	0	10000	1	100	**0**
802.11n (HT20)	MCS0	0	10000	1	100	**0**
802.11n (HT20)	MCS0	0	10000	1	100	**0**

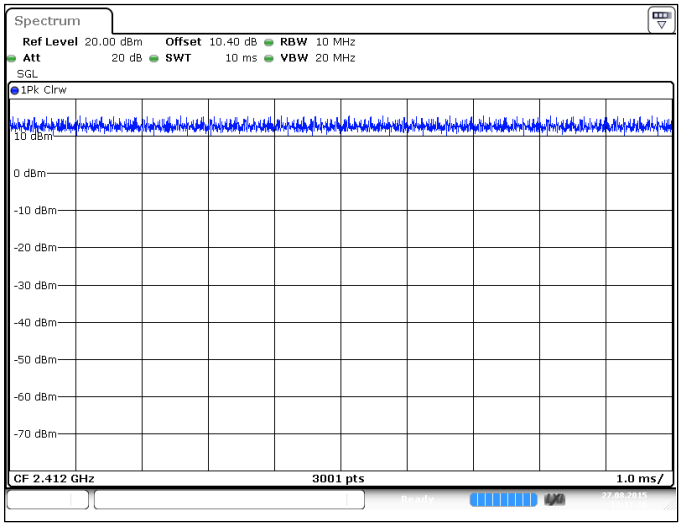
Note:

- No DC factor if the duty cycle is > 98%
- T_{OFF} – Transmission OFF time
- T_{ON} – Transmission ON time (Sweep Time)

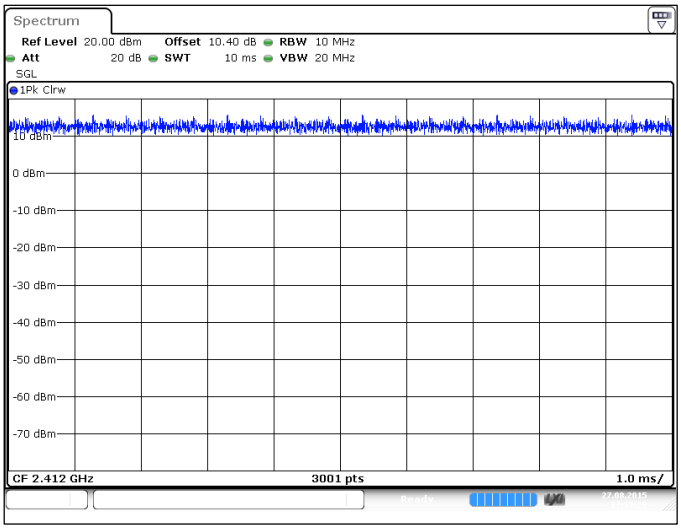
DUTY CYCLE PLOTS



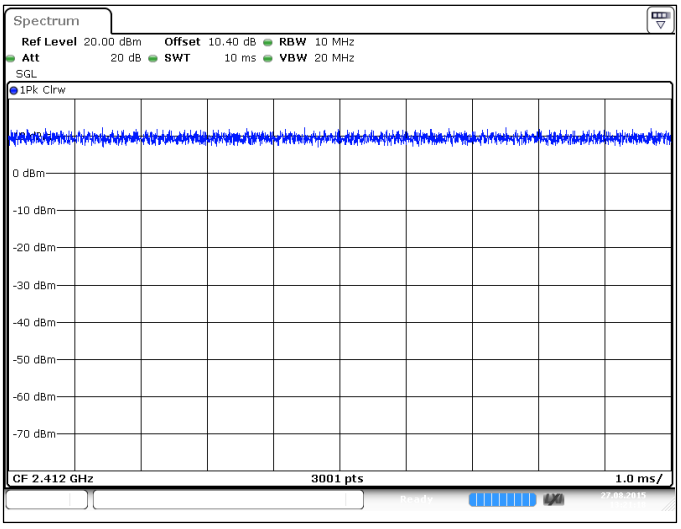
802.11b: 1 Mbps



802.11g: 6 Mbps



802.11n (HT20): MCS0/ 6.5 Mbps



802.11n (HT40): MCS0/ 15.5 Mbps

6 TEST RESULTS

6.1 6dB DTS Bandwidth and 99% Occupied Bandwidth

Limits

FCC Part 15 Subpart C §15.247 (a) (2) and Industry Canada RSS-247 § 5.2 (1) and RSS-GEN § 6.6

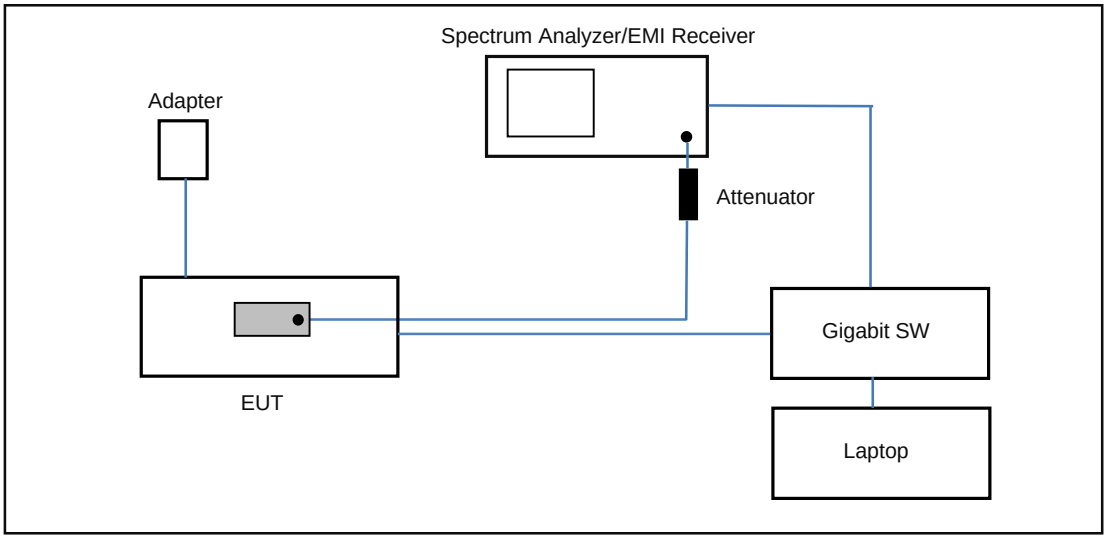
The minimum 6 dB bandwidth shall be at least 500 kHz

Test Procedures

ANSI C63.10-2013 § 11.8.1 Option 1
KDB 558074 D01 v03r05 § 8.1 Option 1

Note: EMI Receiver (Spectrum Analyzer) Reference Level Offset = 10.4 dB (10 dB Attenuator Pad + 0.4 cable loss)

Test Setup

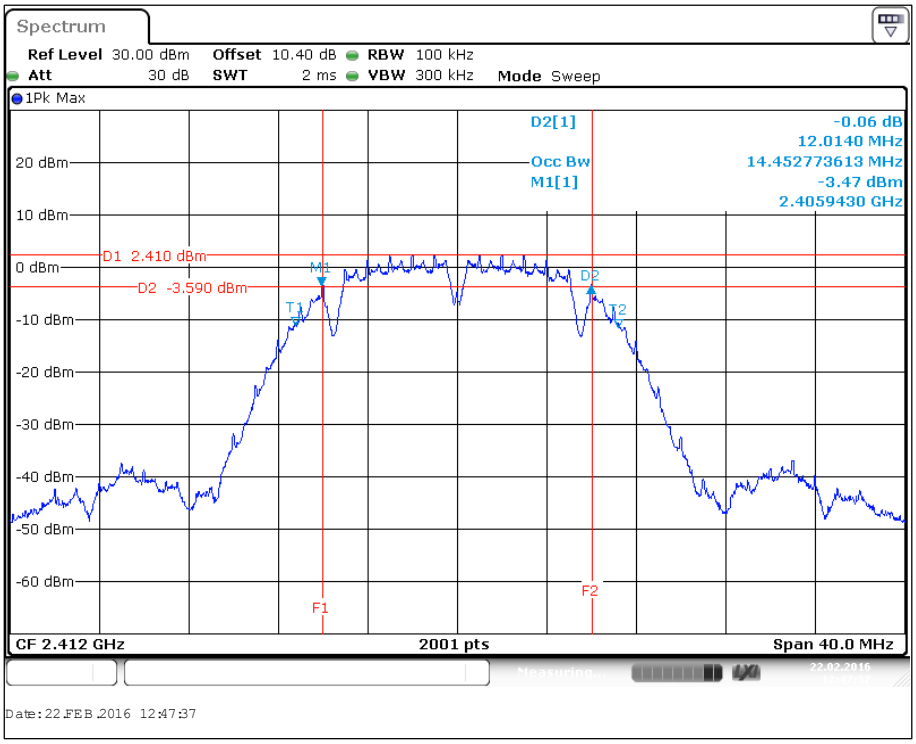


Test Results

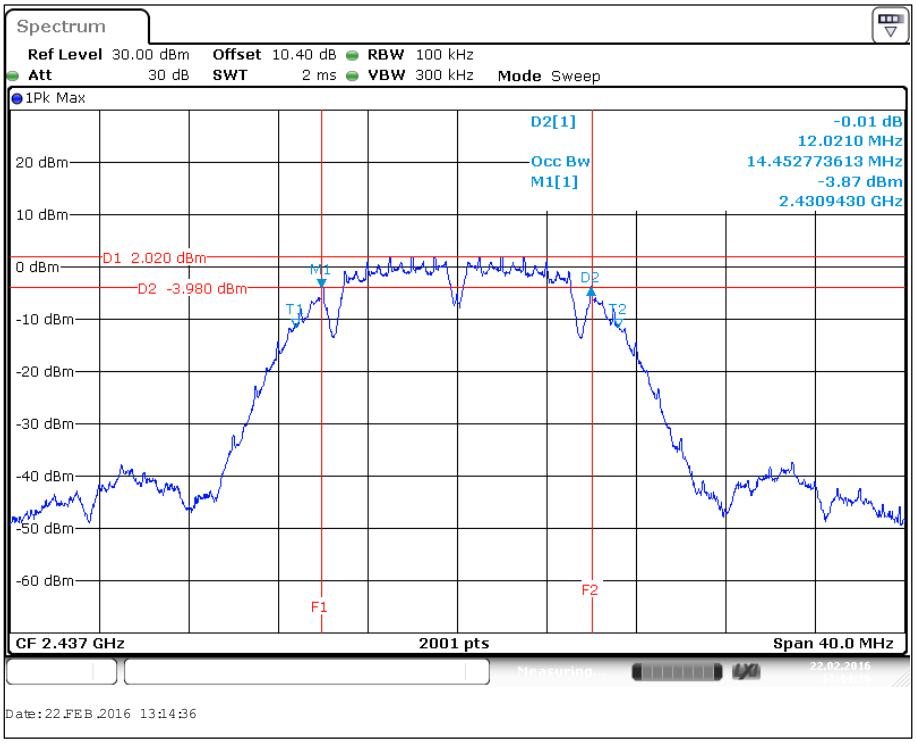
6.1.1 6dB DTS Bandwidth and 99% Occupied Bandwidth

802.11 Mode	Data Rate	Channel	Frequency (MHz)	6dB EBW (MHz)	99% OBW (MHz)	6dB EBW Limit (kHz)
b	1 Mbps	1	2412	12.0	14.5	> 500
		6	2437	12.0	14.5	> 500
		11	2462	12.0	14.5	> 500
g	6 Mbps	1	2412	16.4	16.4	> 500
		6	2437	16.4	16.4	> 500
		11	2462	16.4	16.4	> 500
n (HT20)	MCS0/ 6.5 Mbps	1	2412	17.5	17.5	> 500
		6	2437	17.5	17.5	> 500
		11	2462	17.5	17.5	> 500
n (HT40)	MCS0/ 13.5 Mbps	3	2422	36.2	35.9	> 500
		6	2437	36.2	35.9	> 500
		9	2452	36.2	35.9	> 500

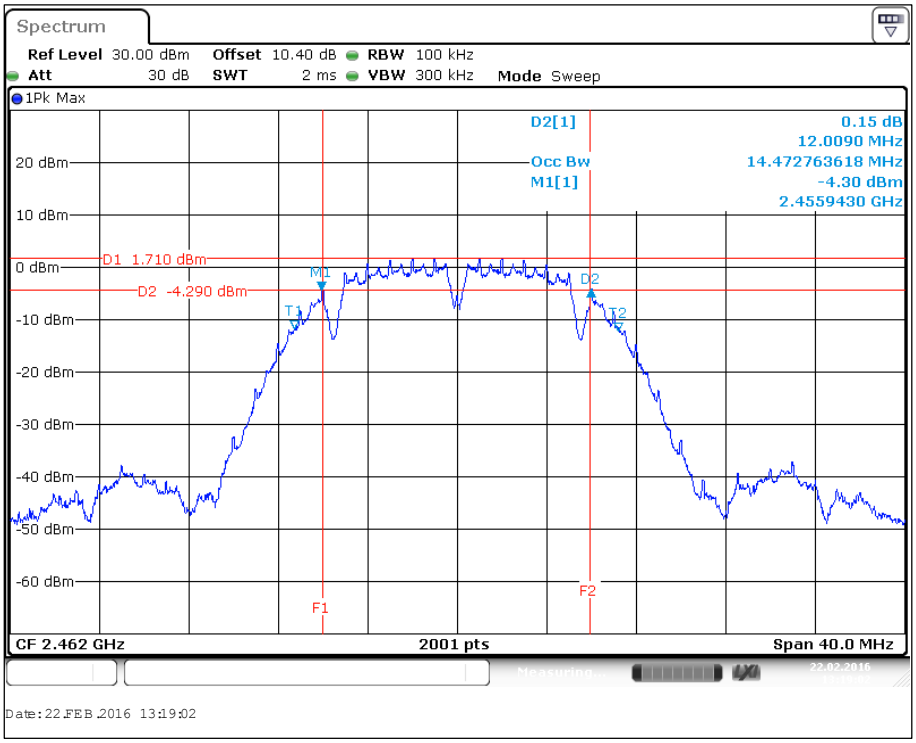
Refer to the following plots



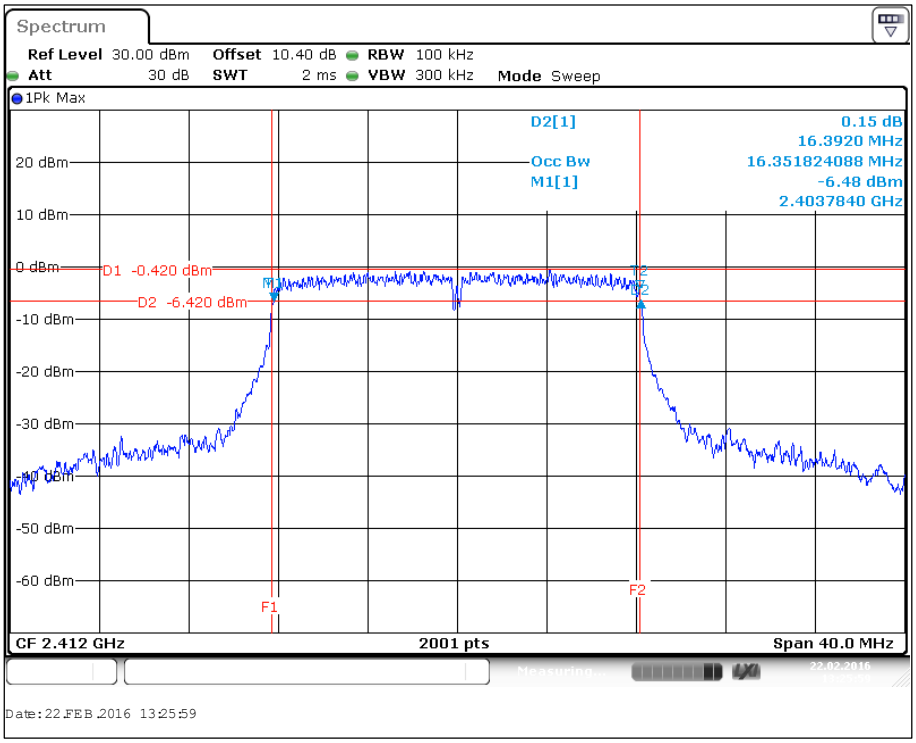
802.11b: 1Mbps – Channel 1 (2412 MHz) 6dB DTS BW and 99% OBW



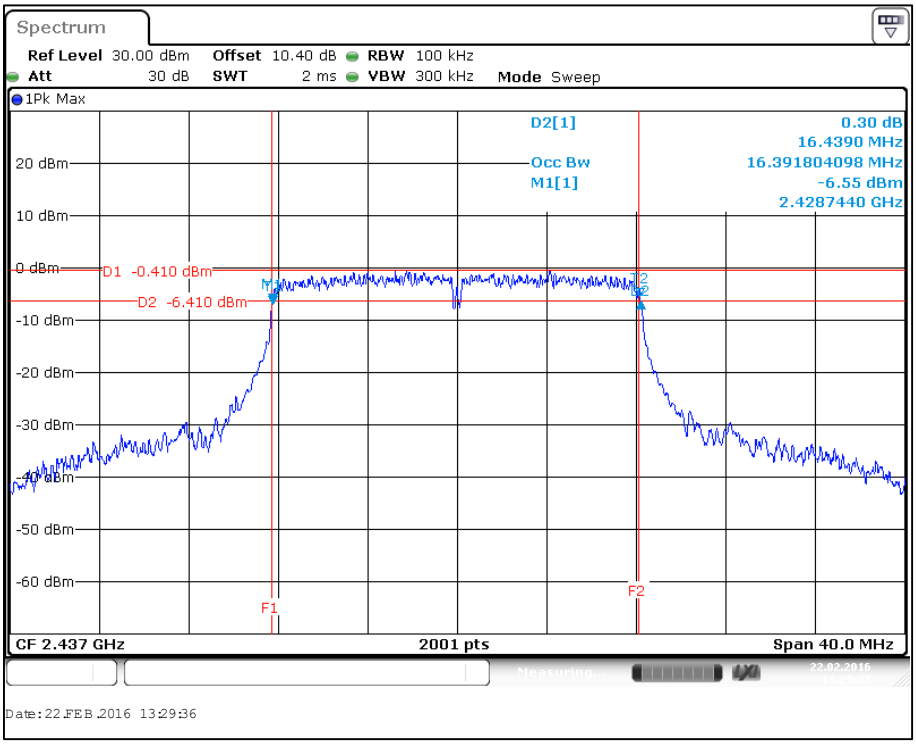
802.11b: 1Mbps – Channel 6 (2437 MHz) 6dB DTS BW and 99% OBW



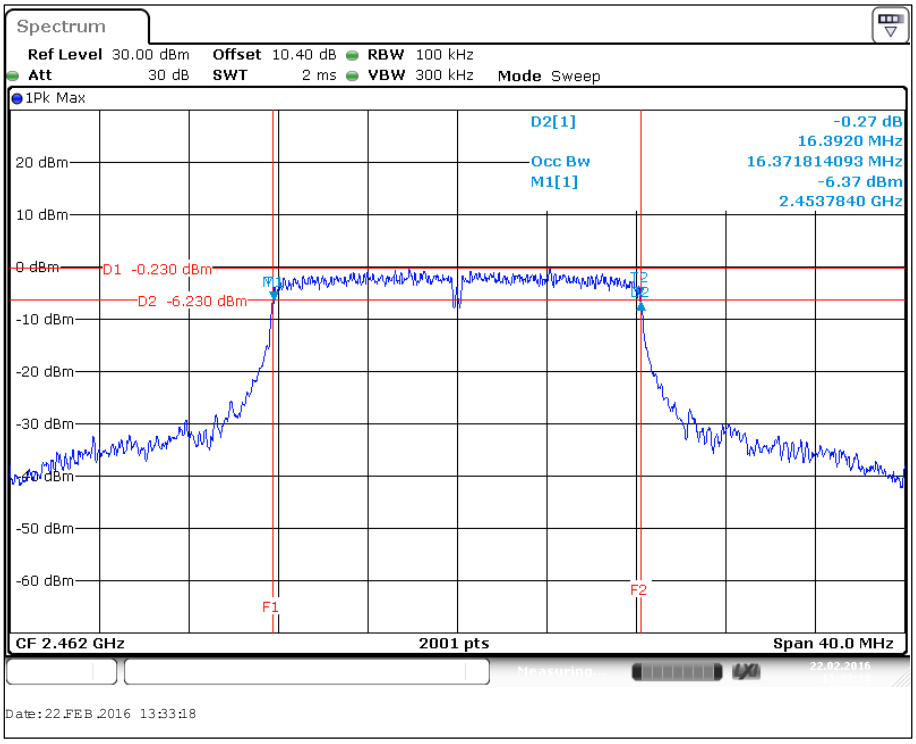
802.11b: 1Mbps – Channel 11 (2462 MHz) 6dB DTS BW and 99% OBW



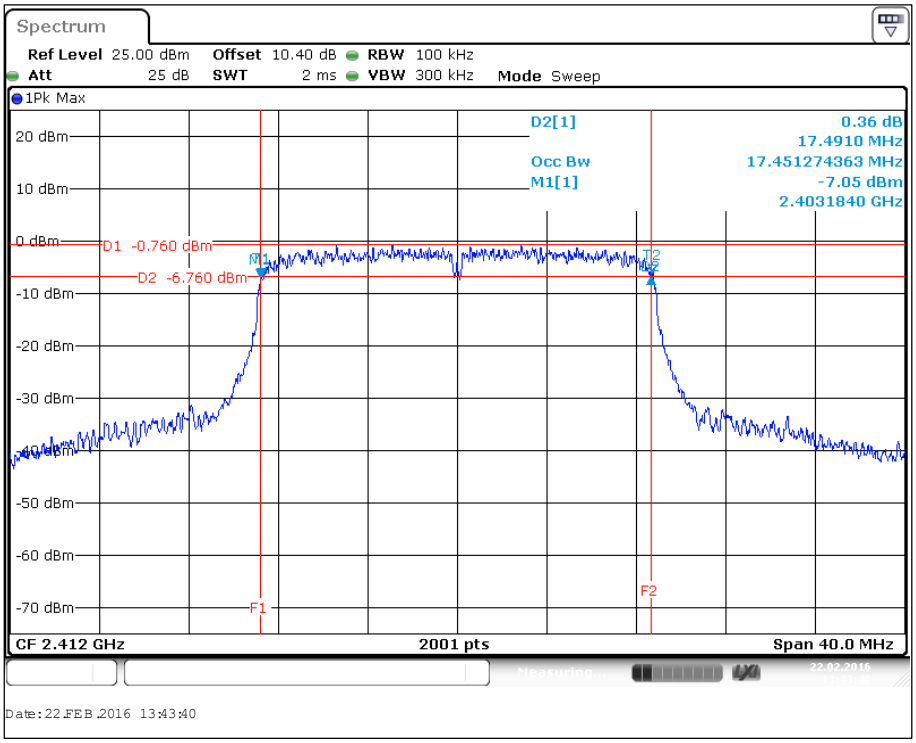
802.11g: 6Mbps – Channel 1 (2412 MHz) 6dB DTS BW and 99% OBW



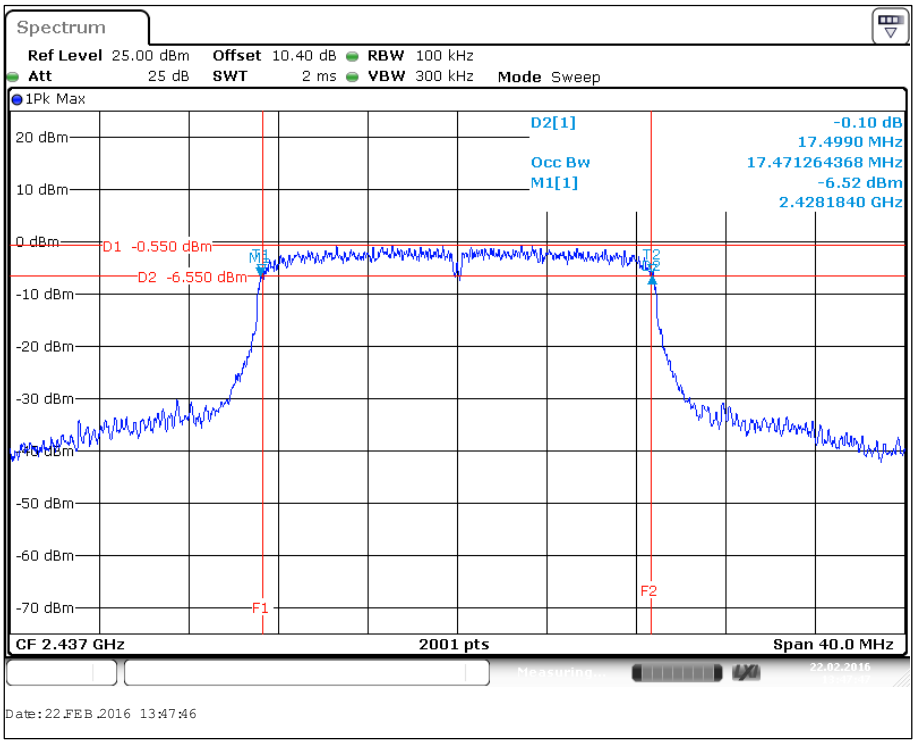
802.11g: 6Mbps – Channel 6 (2437 MHz) 6dB DTS BW and 99% OBW



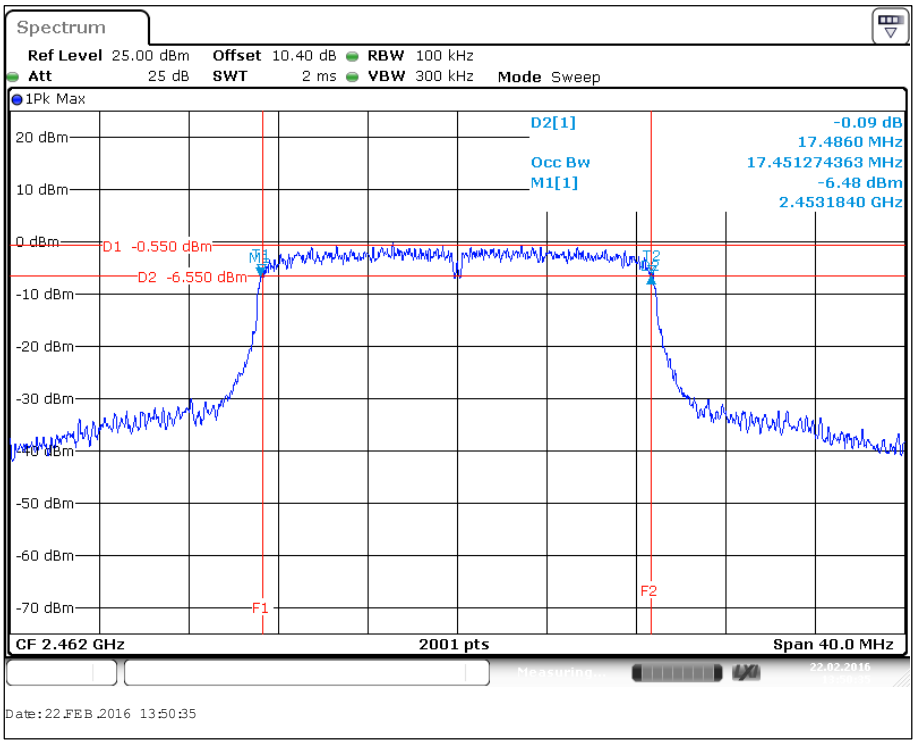
802.11g: 6Mbps – Channel 11 (2462 MHz) 6dB DTS BW and 99% OBW



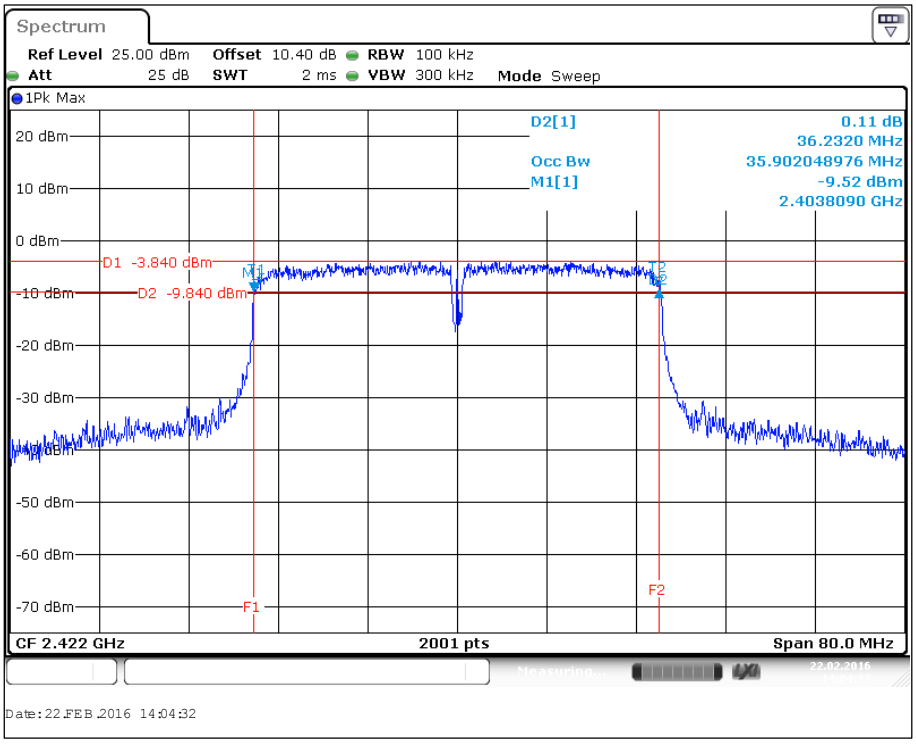
802.11n (HT20): MCS0 – Channel 1 (2412 MHz) 6dB DTS BW and 99% OBW



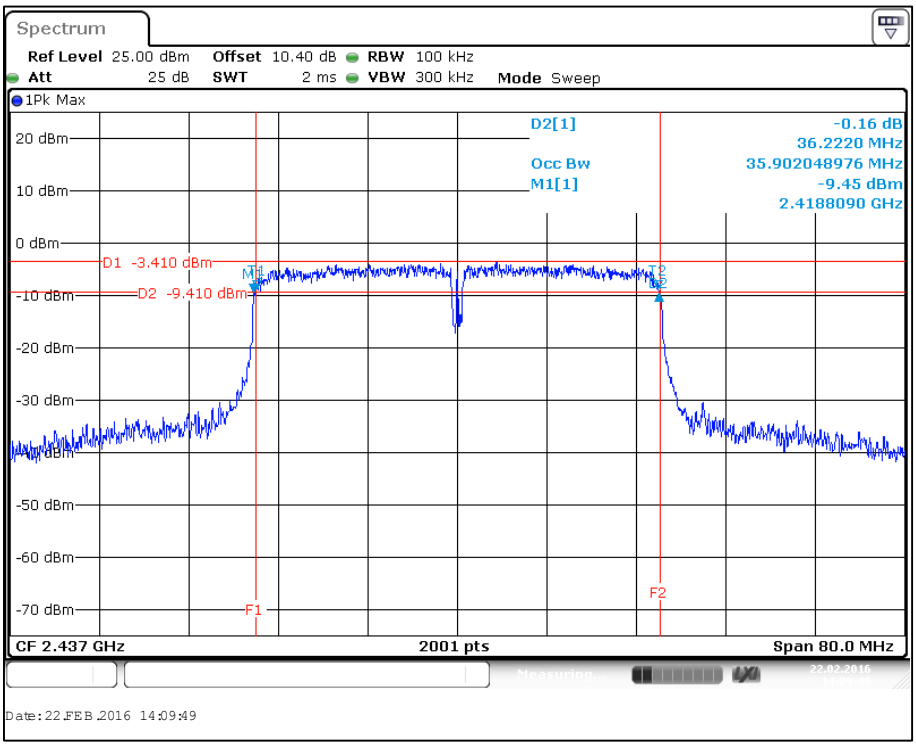
802.11n (HT20): MCS0 – Channel 6 (2437 MHz) 6dB DTS BW and 99% OBW



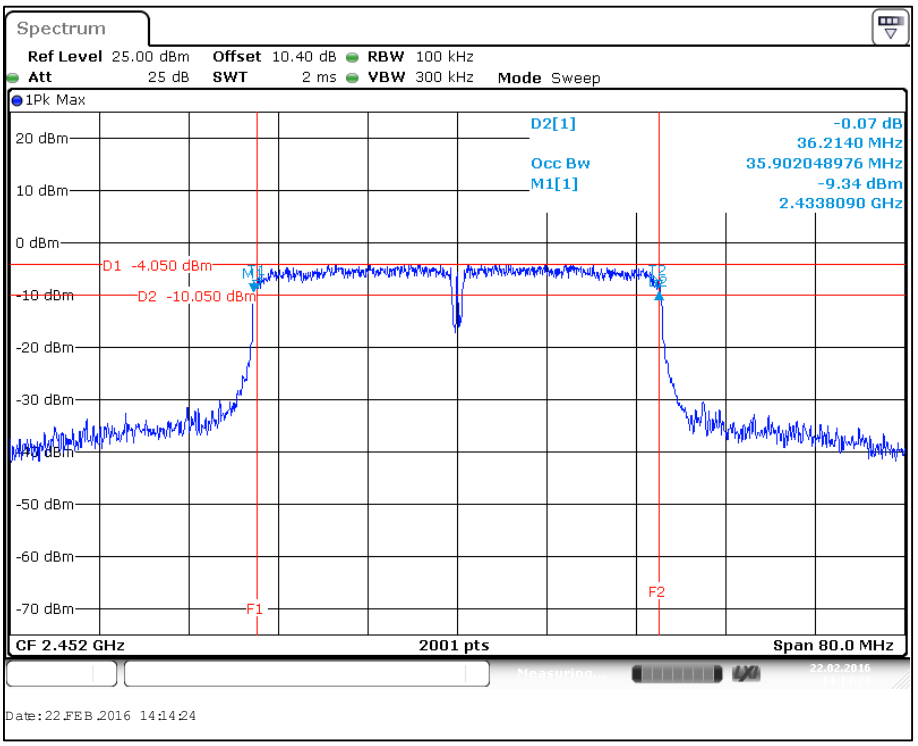
802.11n (HT20): MCS0 – Channel 11 (2462 MHz) 6dB DTS BW and 99% OBW



802.11n (HT40): MCS0 – Channel 3 (2422 MHz) 6dB DTS BW and 99% OBW



802.11n (HT40): MCS0 – Channel 6 (2437 MHz) 6dB DTS BW and 99% OBW



802.11n (HT40): MCS0 – Channel 9 (2452 MHz) 6dB DTS BW and 99% OBW

6.2 Maximum Conducted Output Power and e.i.r.p.

Limits

FCC Part 15 Subpart C §15.247 (b) (3)

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level..

Industry Canada RSS-247 Issue 1 §5.4 (4)

For DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1W. Except as provided in Section 5.4(5), the e.i.r.p. shall not exceed 4 W.

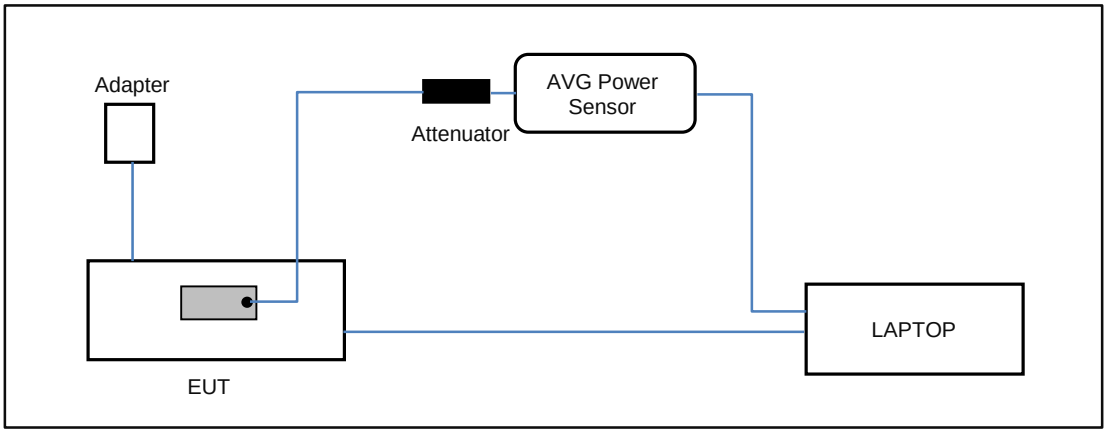
Test Procedures

For transmit duty cycle ≥ 98%
-ANSI C63.10-2013 § 11.9.2.3.1 Method AVGPM
-KDB 558074 D01 v03r05 § 9.2.3.1 Method AVGPM

Note:

Power Viewer Plus Level Offset Calculation:
Level Offset $_{(dB)}$ = 10.4 dB (10 dB Attenuator Pad + 0.4 dB cable loss)

Test Setup



Test Results

6.2.1 Maximum Conducted Output Power and e.i.r.p

802.11 Mode	Data Rate	Channel	Frequency (MHz)	Maximum Conducted Output Power			e.i.r.p.			
				Result (dBm)	Limit (dBm)	Margin (dB)	Directional Gain (dBi)	Result (dBm)	Limit (dBm)	Margin (dB)
b	1 Mbps	1	2412	15.9	30.0	-14.1	2.0	17.9	36.0	-18.1
		6	2437	15.5	30.0	-14.5	2.0	17.5	36.0	-18.5
		11	2462	15.1	30.0	-14.9	2.0	17.1	36.0	-18.9
g	6 Mbps	1	2412	10.1	30.0	-19.9	2.0	12.1	36.0	-23.9
		6	2437	10.3	30.0	-19.7	2.0	12.3	36.0	-23.7
		11	2462	10.2	30.0	-19.8	2.0	12.2	36.0	-23.8
n (HT20)	MCS0/ 6.5 Mbps	1	2412	7.9	30.0	-22.1	2.0	9.9	36.0	-26.1
		6	2437	8.1	30.0	-21.9	2.0	10.1	36.0	-25.9
		11	2462	8.0	30.0	-22.0	2.0	10.0	36.0	-26.0
n (HT40)	MCS0/ 13.5 Mbps	3	2422	7.1	30.0	-22.9	2.0	9.1	36.0	-26.9
		6	2437	7.2	30.0	-22.8	2.0	9.2	36.0	-26.8
		9	2452	7.2	30.0	-22.8	2.0	9.2	36.0	-26.8

6.3 Maximum Power Spectral Density

Limits

FCC Part 15 Subpart C §15.247 (e)

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

Industry Canada RSS-247 Issue §5.2 (2)

The transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of Section 5.4 (4), (i.e. the power spectral density shall be determined using the same method as is used to determine the conducted output power).

Test Procedures

ANSI C63.10-2013 § 11.10.3 Method AVGPSD-1
KDB558074 D01 v03R05 § 10.3 Method AVGPSD-1

Note:

Spectrum Analyzer Offset level Calculation:

$OFFSET_{(dB)}$ = 10.4 dB (10 dB Attenuator Pad + 0.4 dB cable loss)

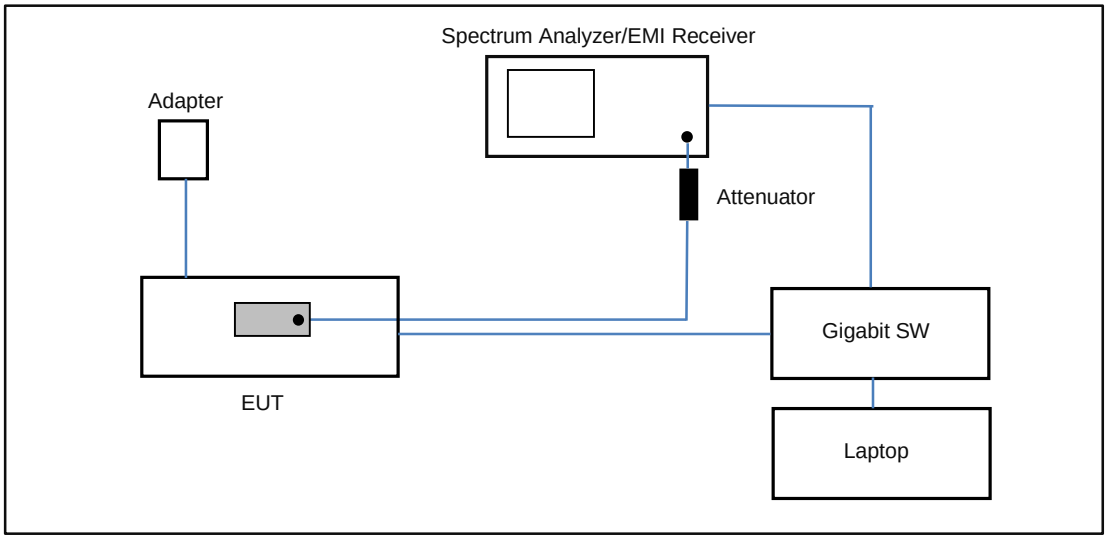
Bandwidth Correction Factor (BWCF) calculation:

$BWCF_{(dB)}$ = 10log (3 kHz/100kHz)
= -15.23

Maximum Power Spectral Density in dBm/3kHz Calculation:

$Maximum\ PSD_{(dBm/3kHz)} = Maximum\ PSD_{(dBm/100kHz)} + BWCF_{(dB)}$

Test Setup



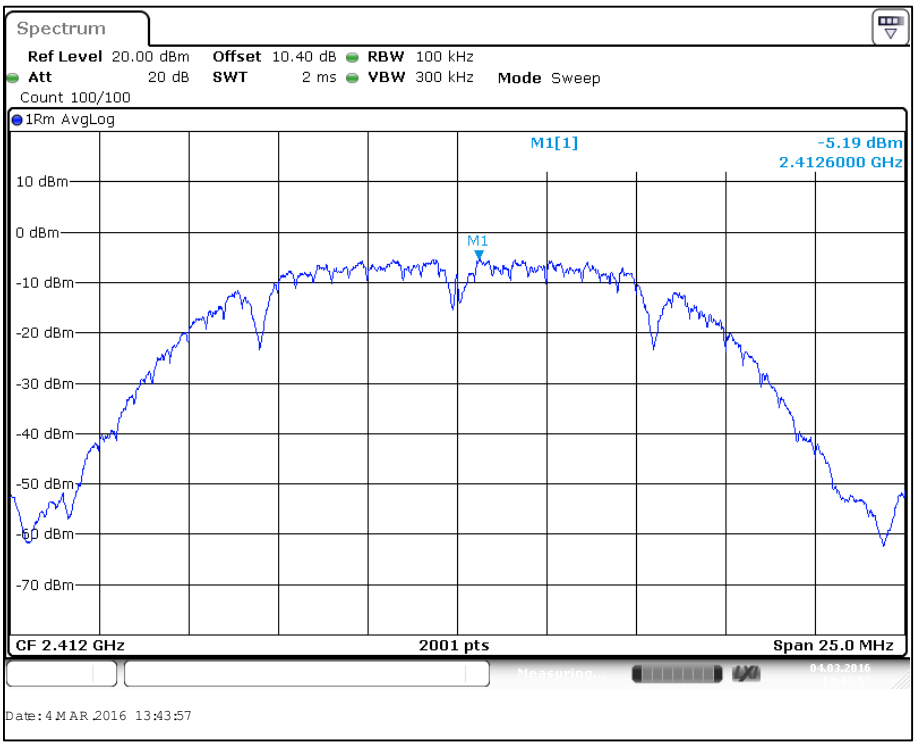
Test Results

6.3.1 Maximum Power Spectral Density

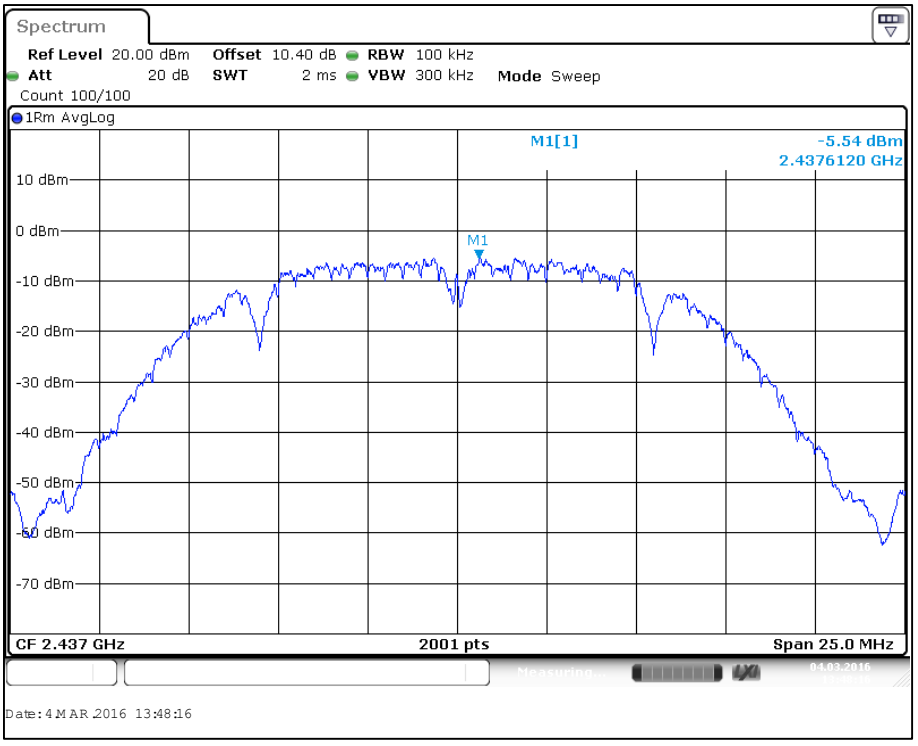
802.11 Mode	Data Rate	Channel	Frequency (MHz)	Maximum PSD (dBm/100kHz)	BWCF (dB)	Maximum PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
b	1 Mbps	1	2412	-5.19	-15.23	-20.42	8.0	-28.42
		6	2437	-5.54	-15.23	-20.77	8.0	-28.77
		11	2462	-5.94	-15.23	-21.17	8.0	-29.17
g	6 Mbps	1	2412	-11.57	-15.23	-26.80	8.0	-34.80
		6	2437	-11.34	-15.23	-26.57	8.0	-34.57
		11	2462	-11.55	-15.23	-26.78	8.0	-34.78
n (HT20)	MCS0/ 6.5 Mbps	1	2412	-14.00	-15.23	-29.23	8.0	-37.23
		6	2437	-13.79	-15.23	-29.02	8.0	-37.02
		11	2462	-14.04	-15.23	-29.27	8.0	-37.27
n (HT40)	MCS0/ 13.5 Mbps	3	2422	-15.12	-15.23	-30.35	8.0	-38.35
		6	2437	-14.99	-15.23	-30.22	8.0	-38.22
		9	2452	-14.99	-15.23	-30.22	8.0	-38.22

Refer to the following plots

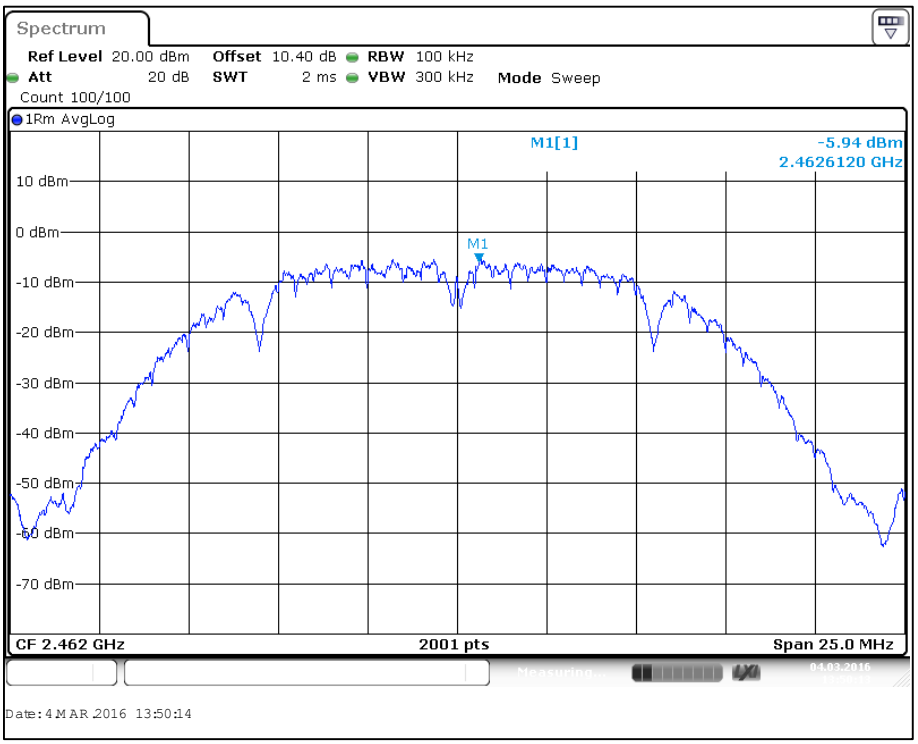
802.11b, 1 Mbps



802.11b: 1 Mbps - Channel 1 (2412 MHz) Maximum PSD

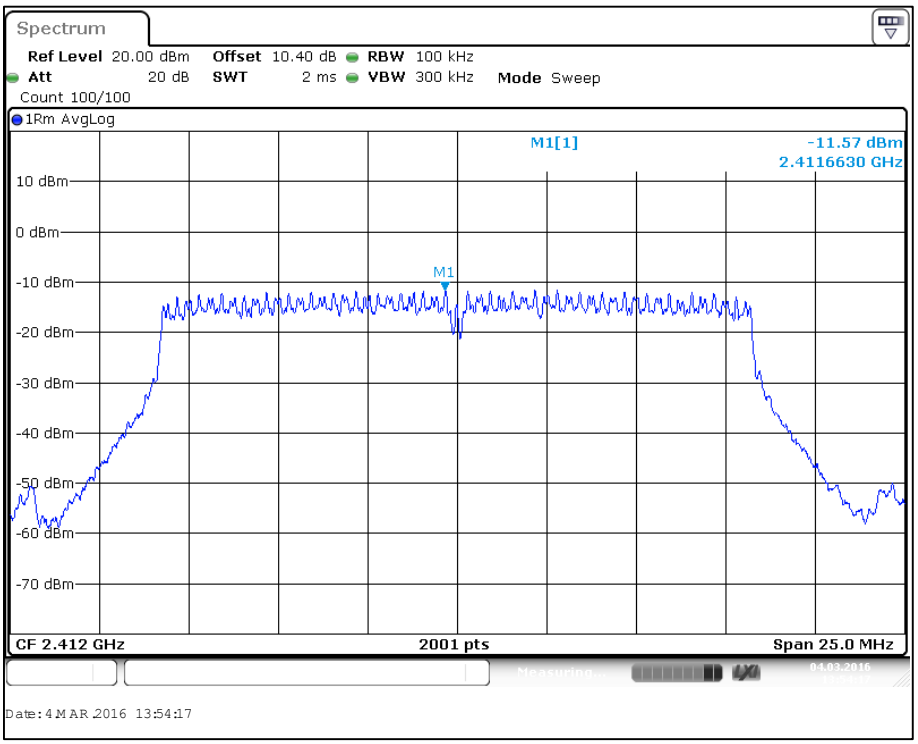


802.11b: 1 Mbps - Channel 6 (2437 MHz) Maximum PSD

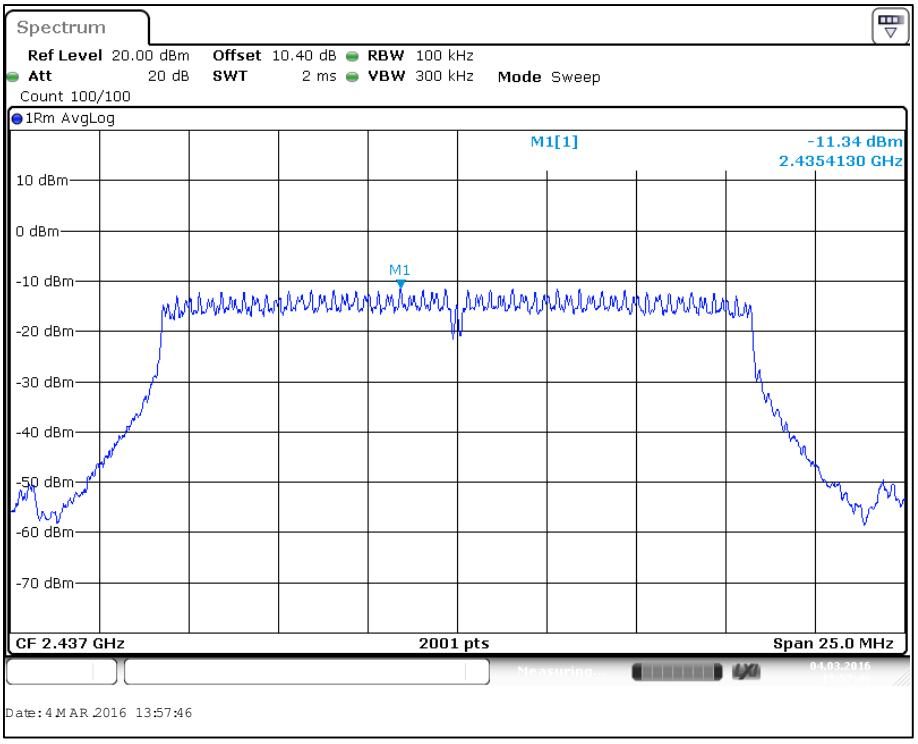


802.11b: 1 Mbps - Channel 11 (2462 MHz) Maximum PSD

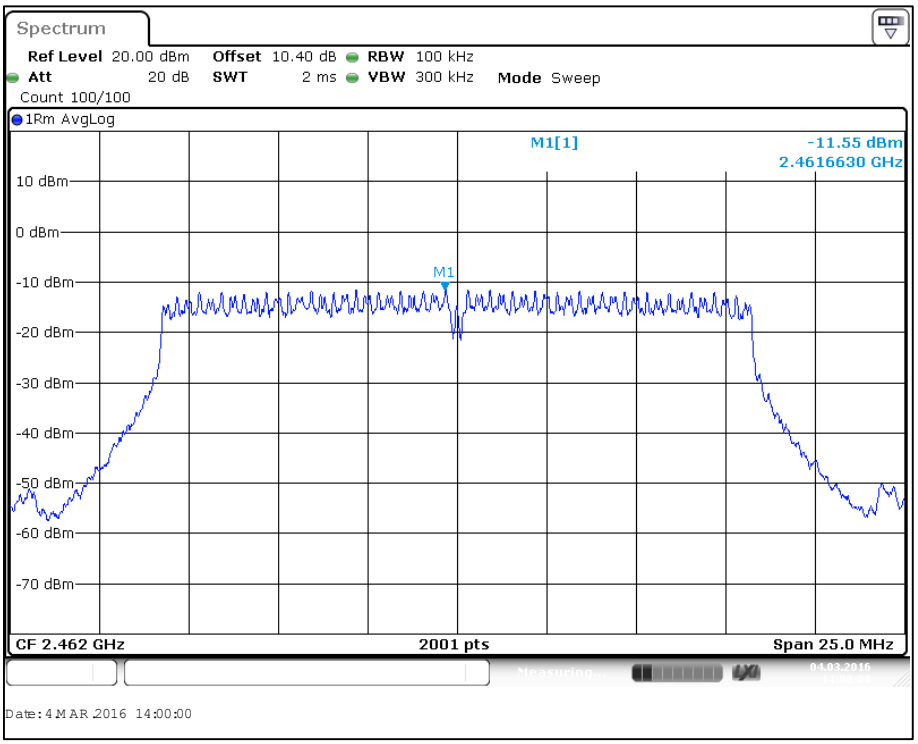
802.11g, 6 Mbps



802.11g: 6 Mbps - Channel 1 (2412 MHz) Maximum PSD

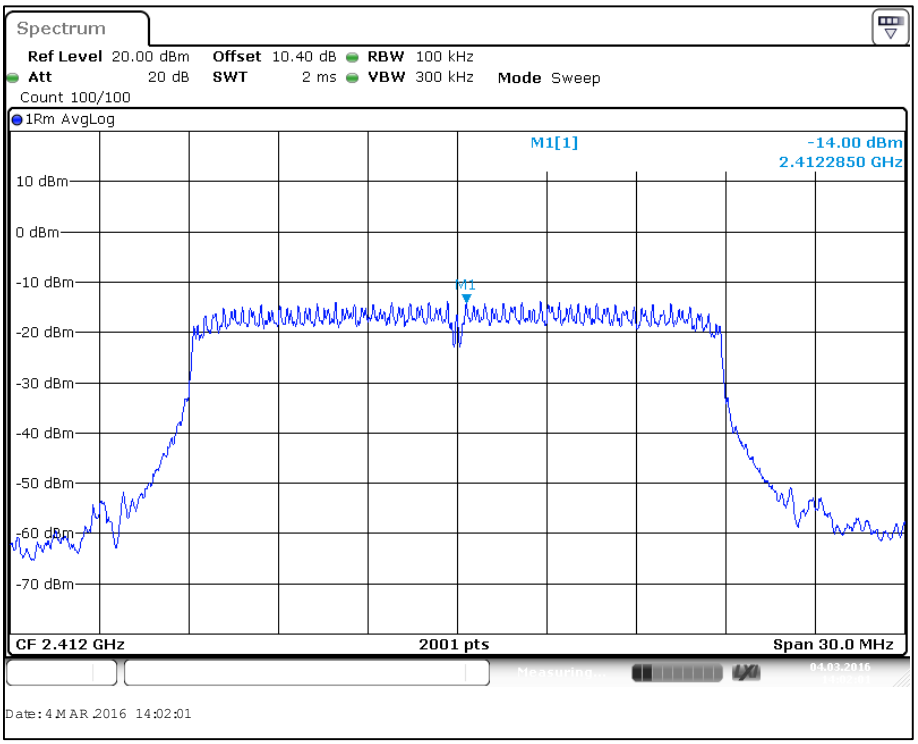


802.11g: 6 Mbps - Channel 6 (2437 MHz) Maximum PSD

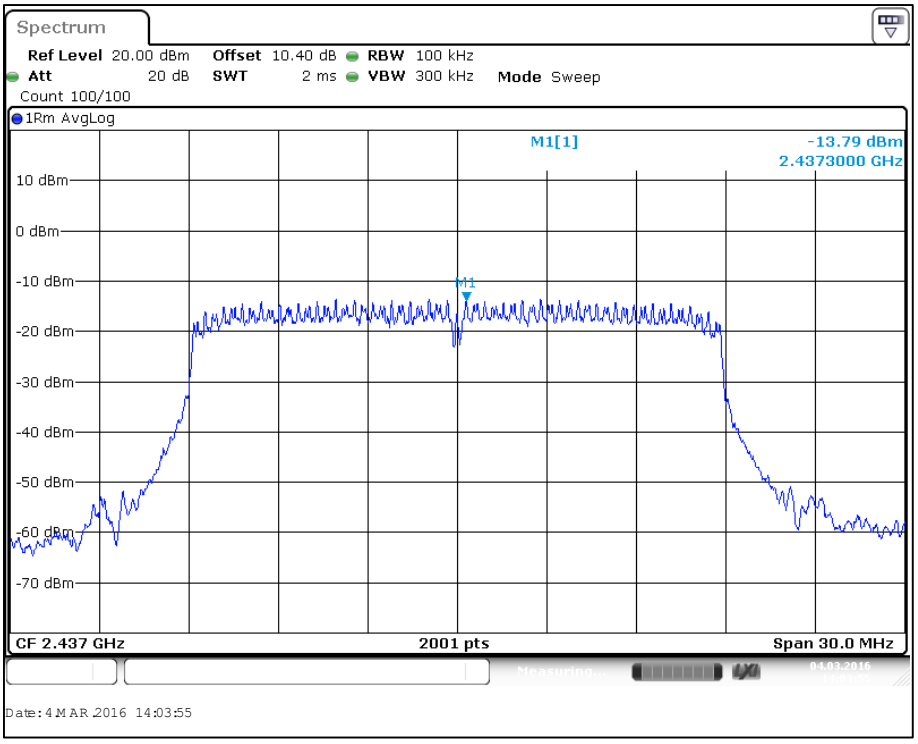


802.11g: 6 Mbps - Channel 11 (2462 MHz) Maximum PSD

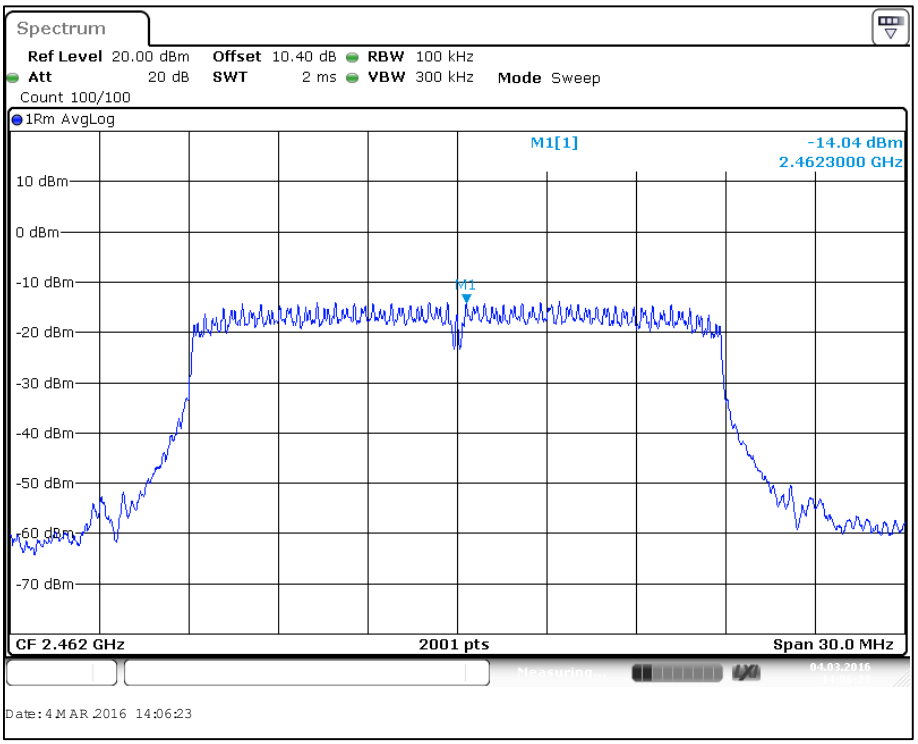
802.11n (HT20), MCS0/6.5 Mbps



802.11n (HT20): 6 Mbps - Channel 1 (2412 MHz) Maximum PSD

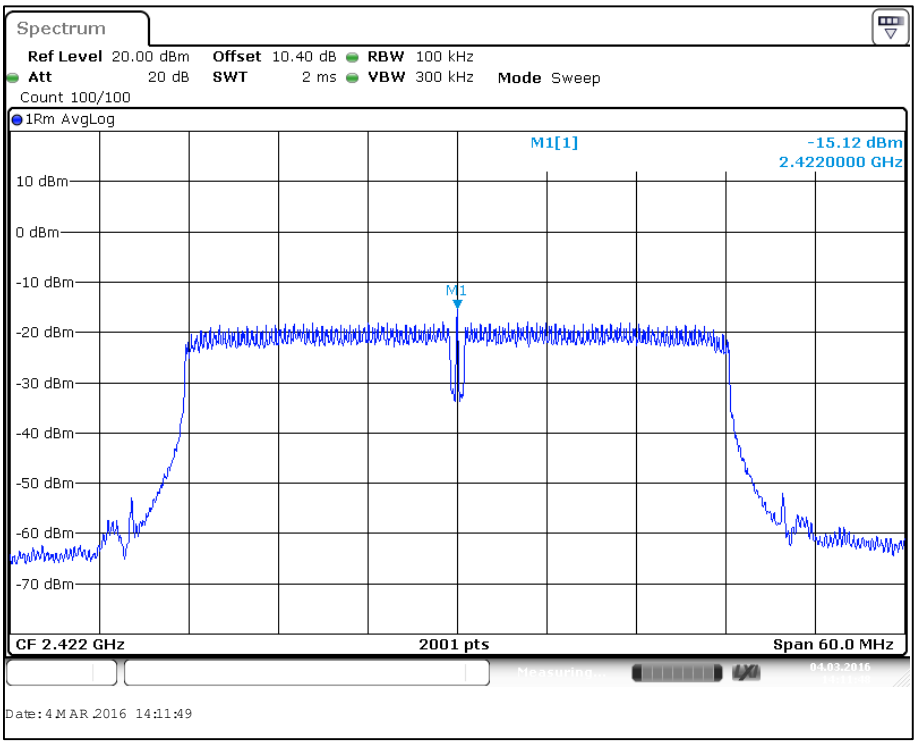


802.11n (HT20): 6 Mbps - Channel 6 (2437 MHz) Maximum PSD

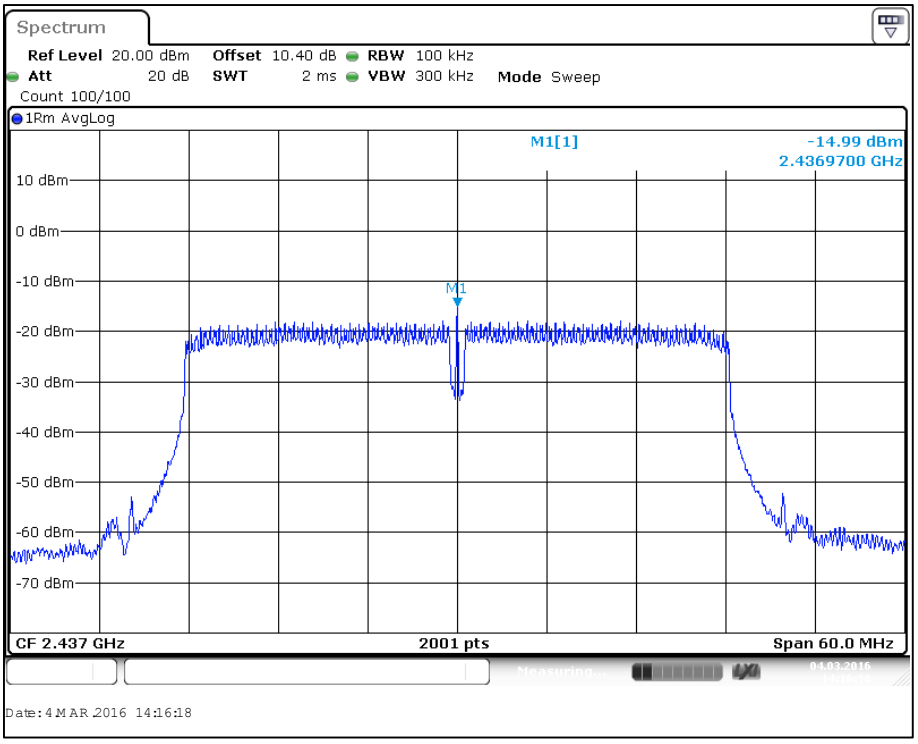


802.11n (HT20): 6 Mbps - Channel 11 (2462 MHz) Maximum PSD

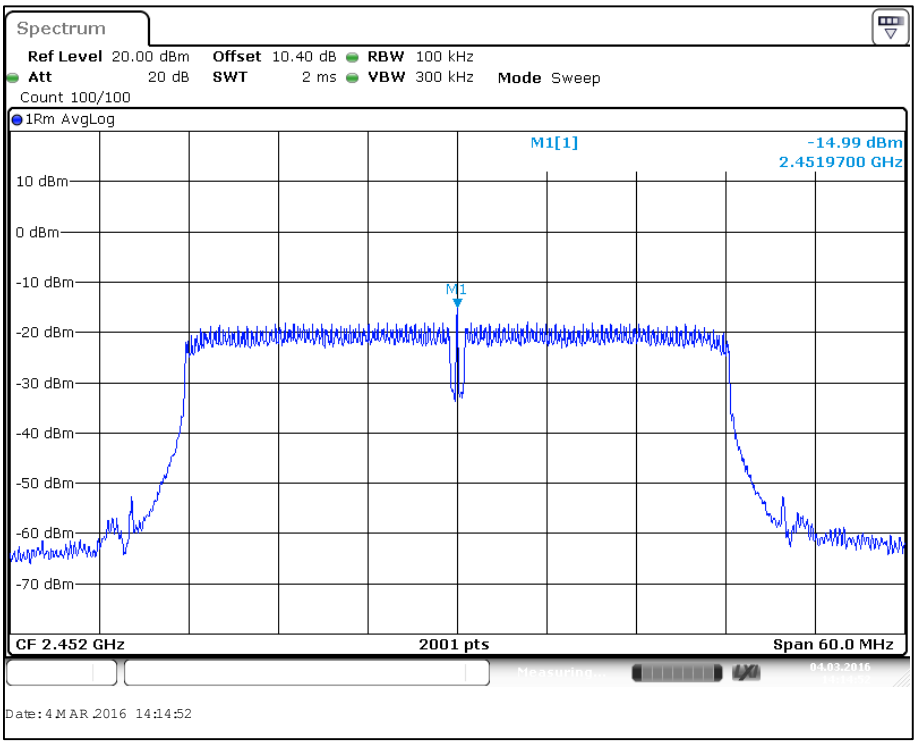
802.11n (HT40), MCS0/13.5 Mbps



802.11n (HT40): MCS0 - Channel 3 (2422 MHz) Maximum PSD



802.11n (HT40): MCS0 - Channel 6 (2437 MHz) Maximum PSD



802.11n (HT40): MCS0 - Channel 9 (2452 MHz) Maximum PSD

6.4 Unwanted Emissions: Conducted Spurious Emissions at Antenna Port

Limits

FCC Part 15 Subpart C §15.247 (d)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

Industry Canada RSS-247 Issue 1 §5.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4 (4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

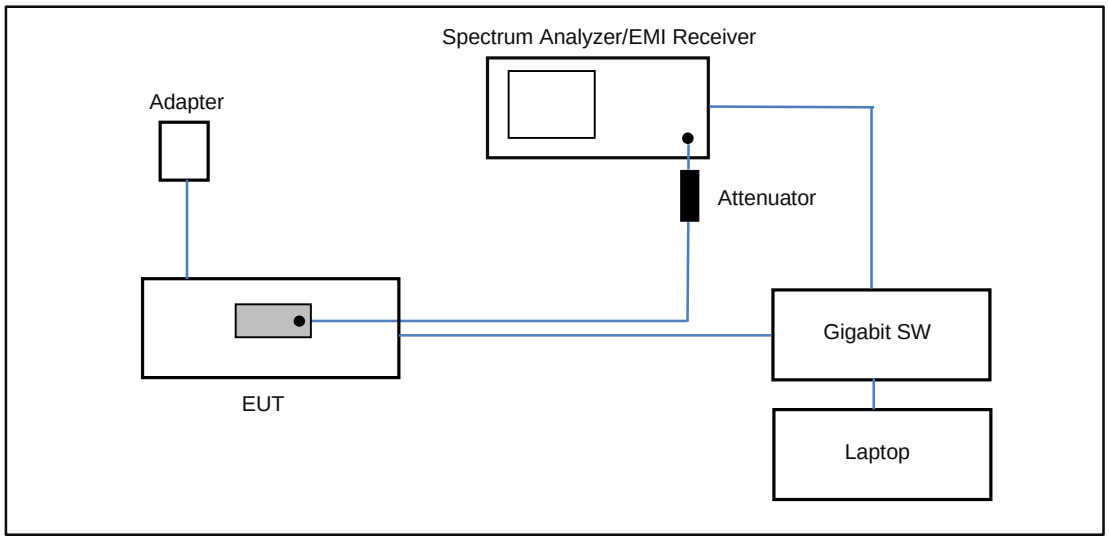
Test Procedures

ANSI C63.10-2013 § 6.10.4 – Authorized band-edge measurements
KDB 558074 v03r05 §11.0– Emissions in the non-restricted frequency bands

Note:
Authorized band-edge measurements and In-band reference level:
• *EMI Receiver (Spectrum Analyzer) Reference Level Offset = 10.4 dB (10 dB Attenuator Pad + 0.4 cable loss)*

Conducted spurious emissions measurements up to 25 GHz:
• *EMI Receiver (Spectrum Analyzer) Reference Level Offset = 10 dB (10 dB Attenuator Pad); with transducer factor (cable loss) in the 30 MHz to 25 GHz.*

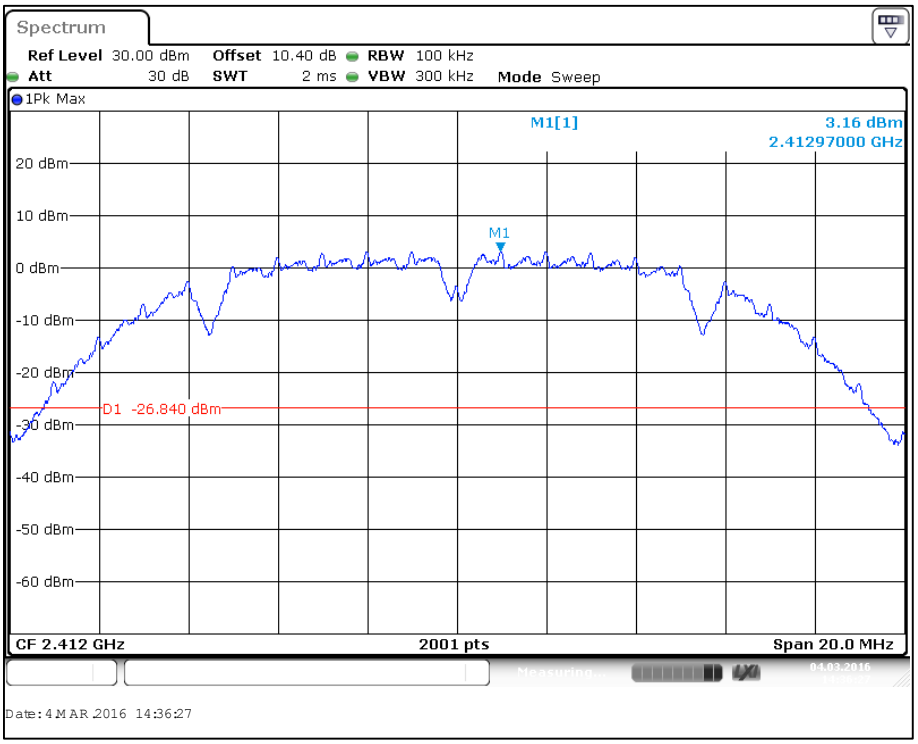
Test Setup


Spectrum Analyzer/EMI Receiver
Adapter
Attenuator
Gigabit SW
EUT
Laptop

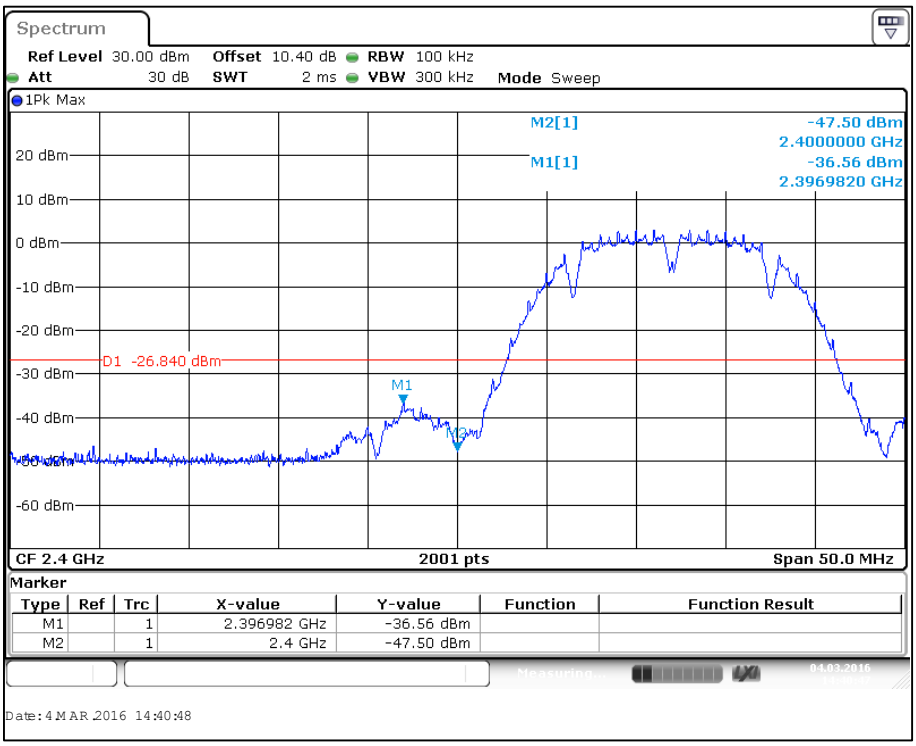
Test Results

6.4.1 Conducted Spurious Emissions at the authorized-band band-edge

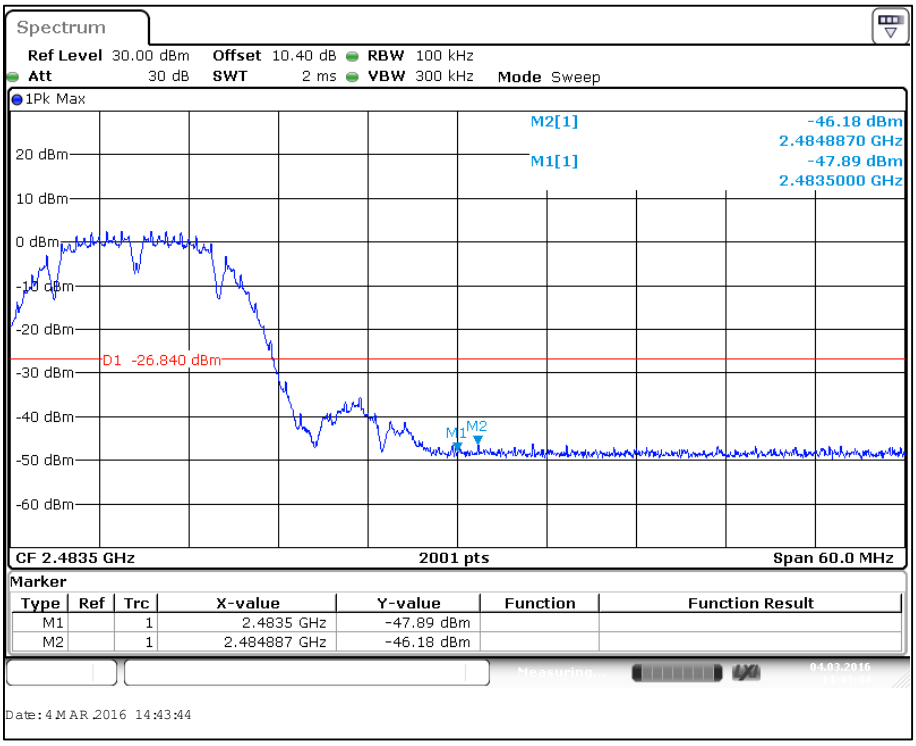
802.11b, 1 Mbps



In-band reference level (802.11b at 1Mbps- CH 1)

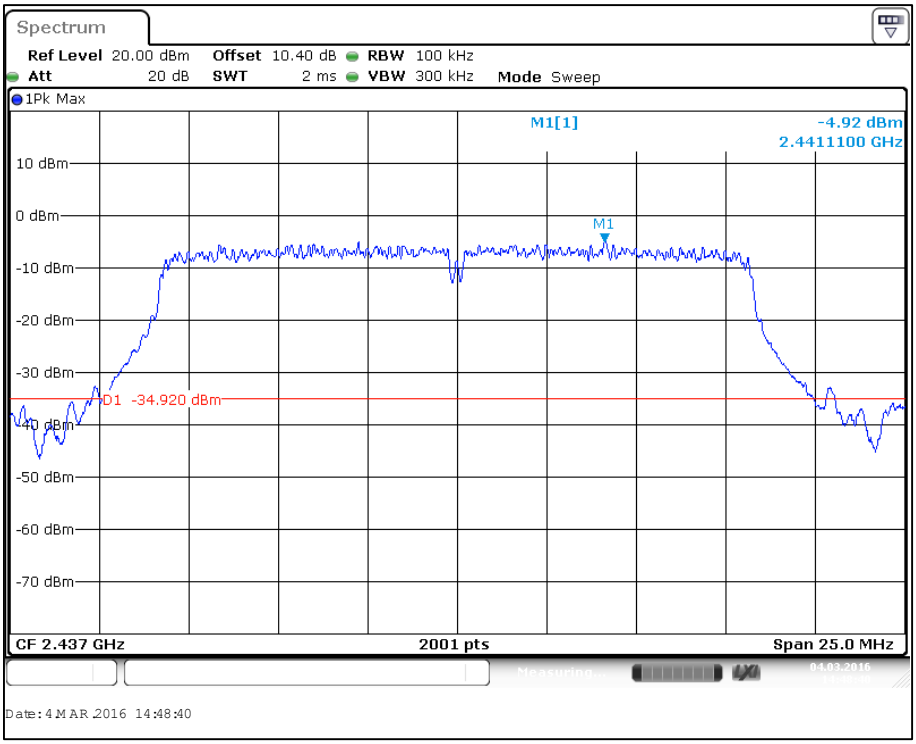


802.11b at 1Mbps – Conducted Spurious Emissions at the 2400 MHz Band Edge

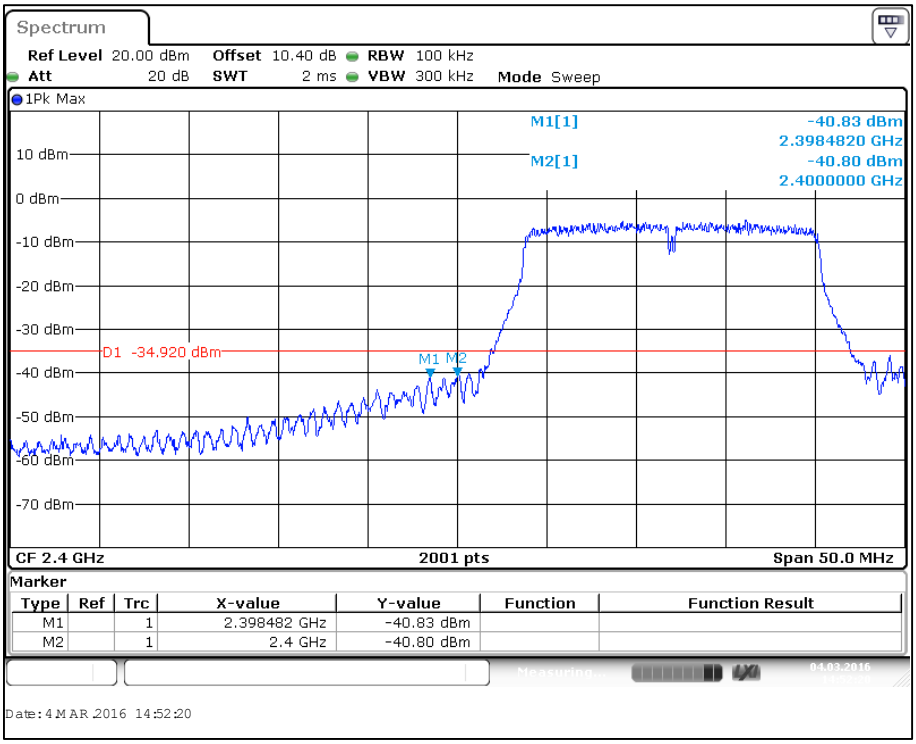


802.11b at 1Mbps - Conducted Spurious Emissions at the 2483.5 MHz Band Edge

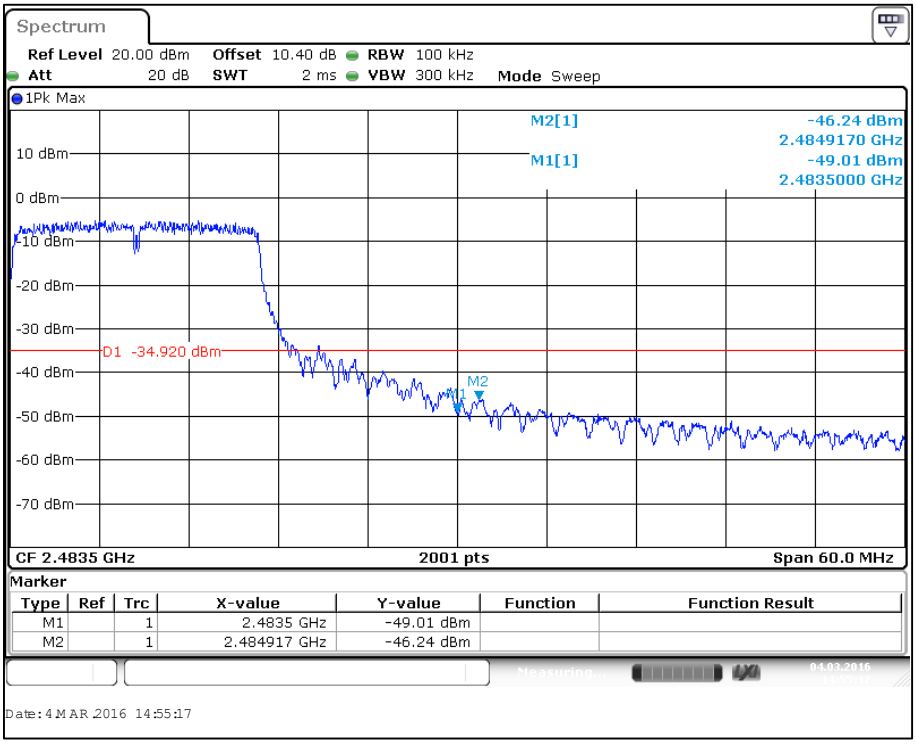
802.11g, 6 Mbps



In-band reference level (802.11g at 6Mbps - CH 6)

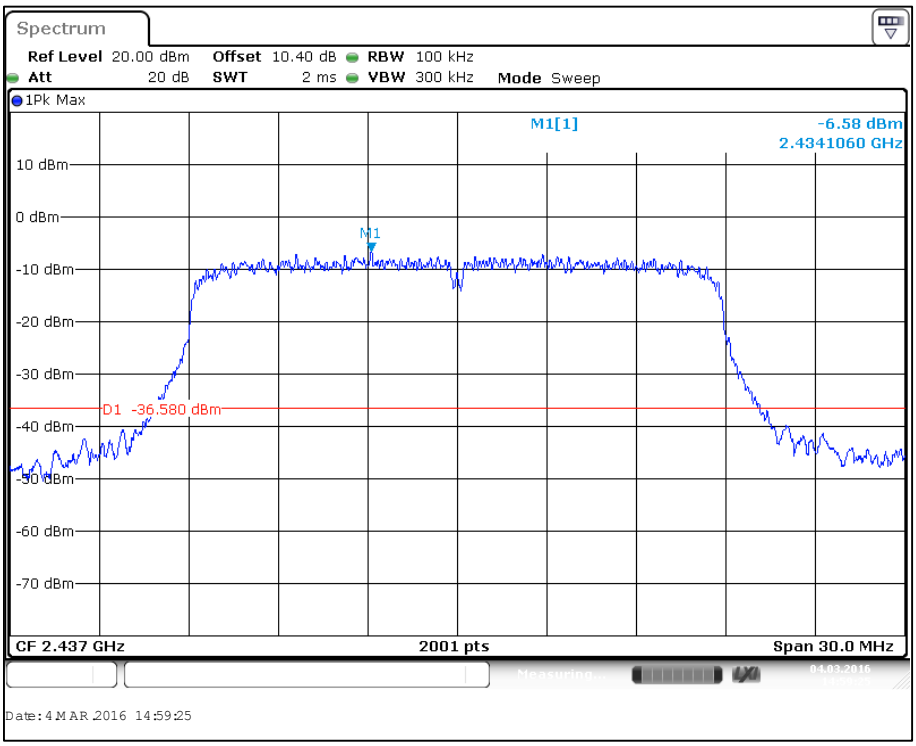


802.11g at 6Mbps – Conducted Spurious Emissions at the 2400 MHz Band Edge

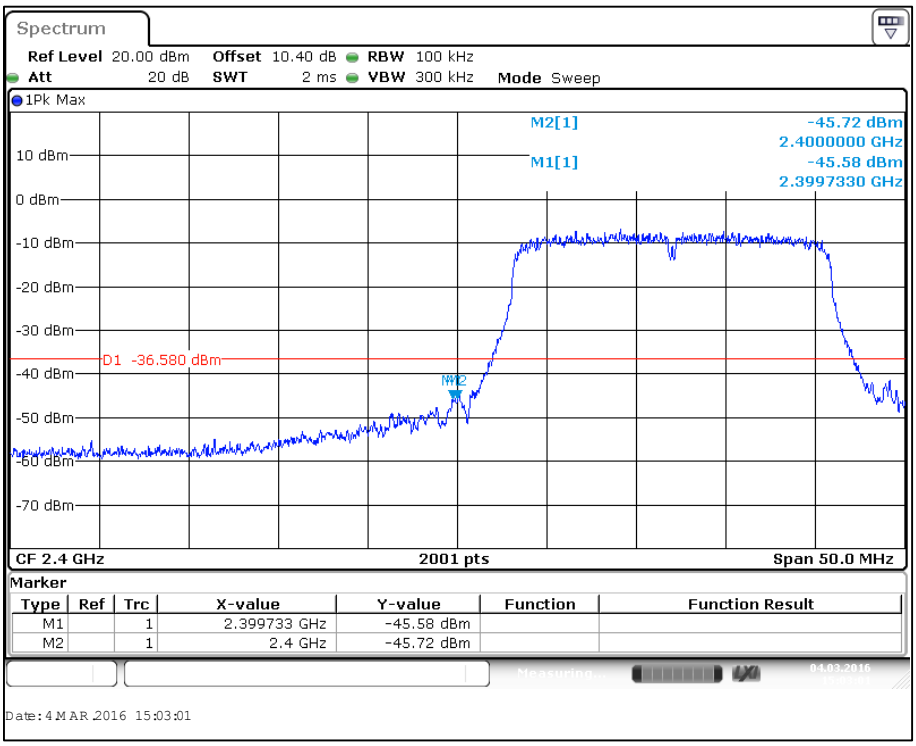


802.11g at 6Mbps - Conducted Spurious Emissions at the 2483.5 MHz Band Edge

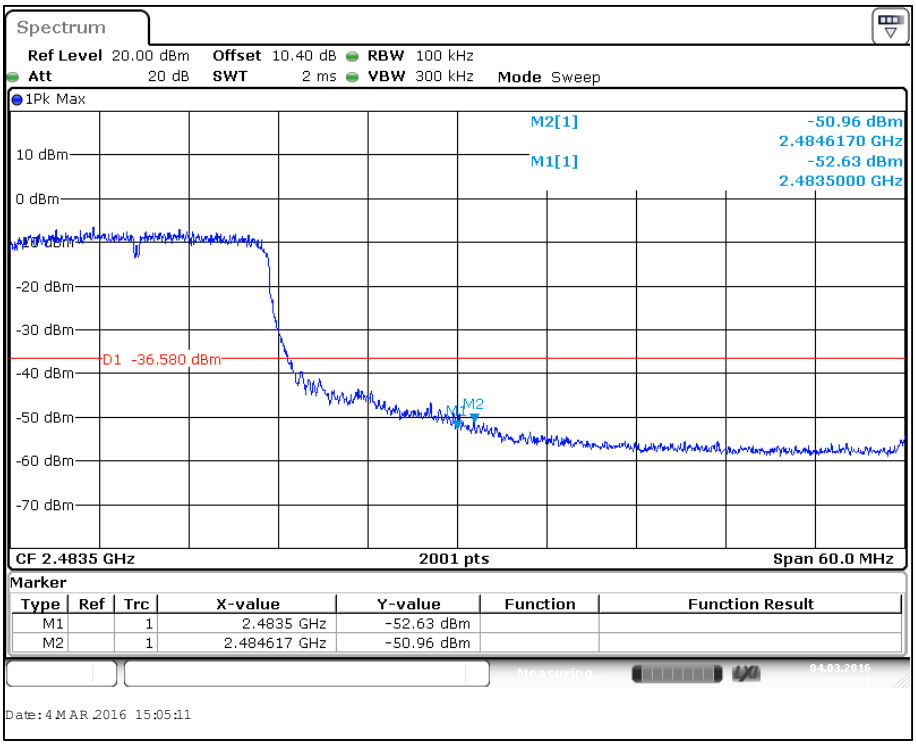
802.11n (HT20), MCS0/6.5 Mbps



In-band reference level [802.11n (HT20) at MCS0/6Mbps - CH 6]

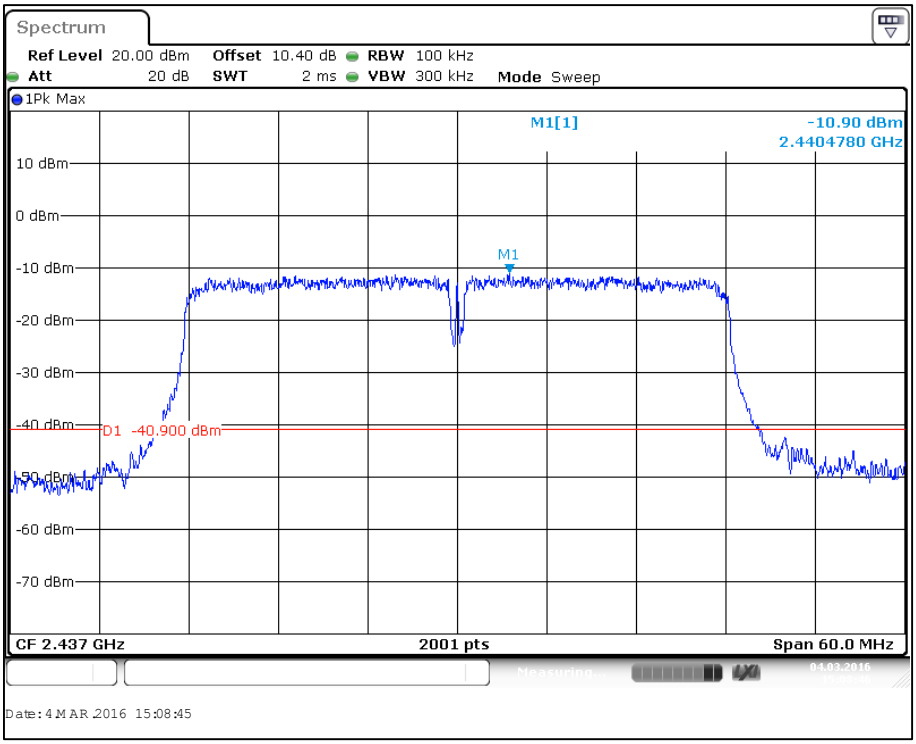


802.11n (HT20) at MCS0 – Conducted Spurious Emissions at the 2400 MHz Band Edge

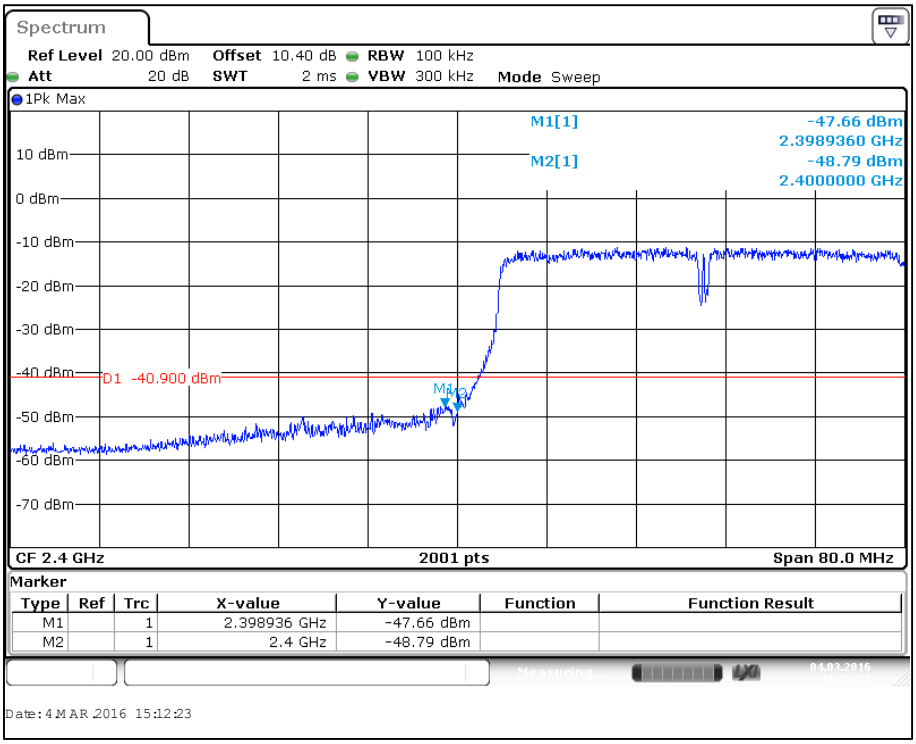


802.11n (HT20) at MCS0 - Conducted Spurious Emissions at the 2483.5 MHz Band Edge

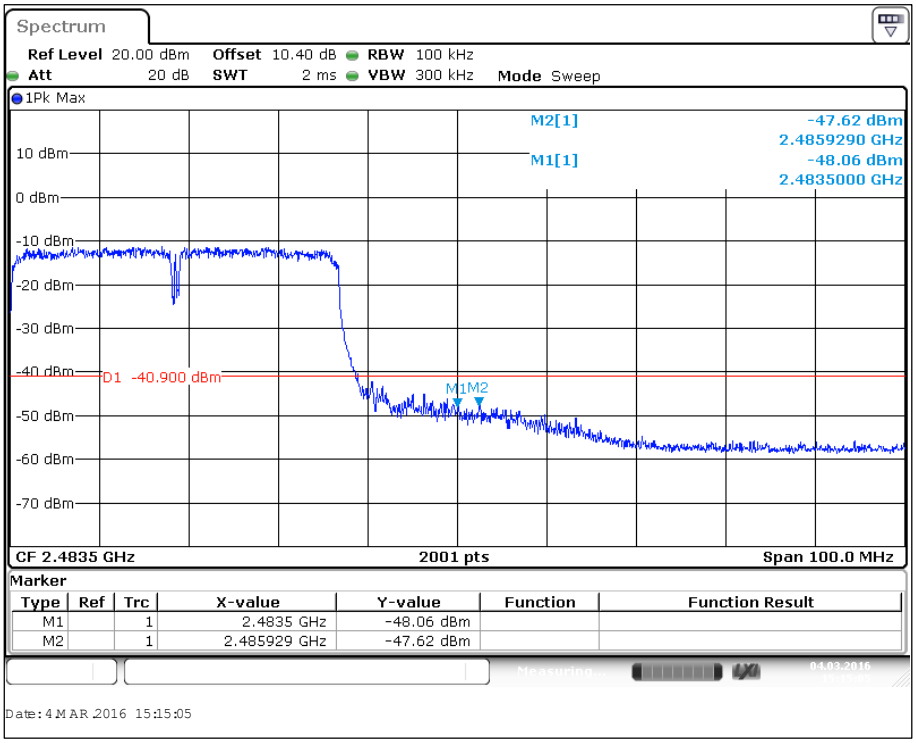
802.11n (HT40), MCS0/13.5 MHz



In-band reference level [802.11n (HT40) at MCS0/13.5 MHz – CH 6]



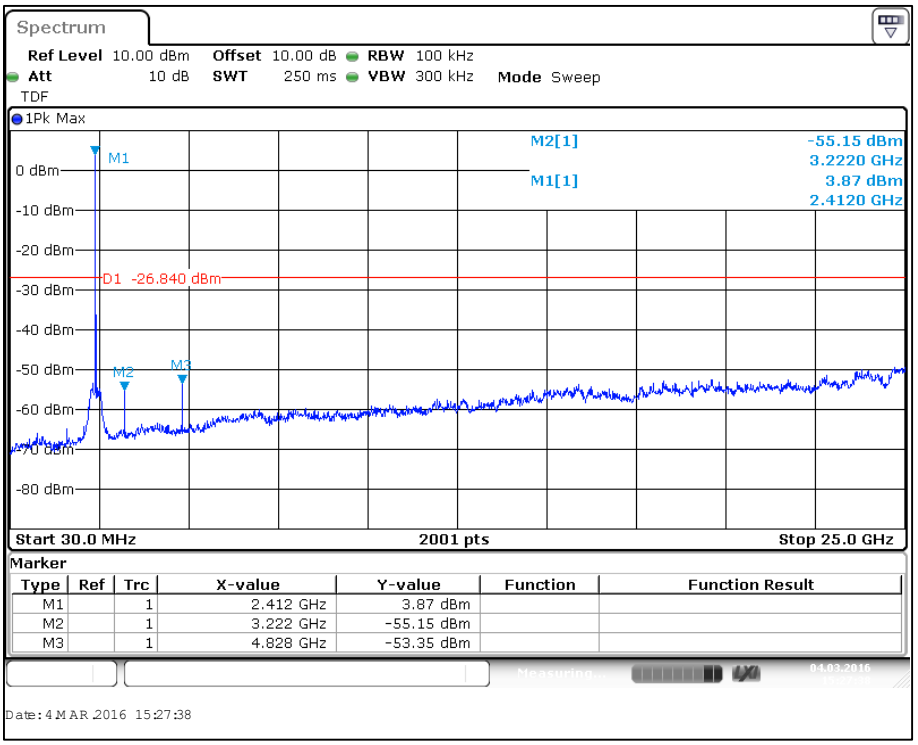
802.11n (HT40) at MCS0 – Conducted Spurious Emissions at the 2400 MHz Band Edge



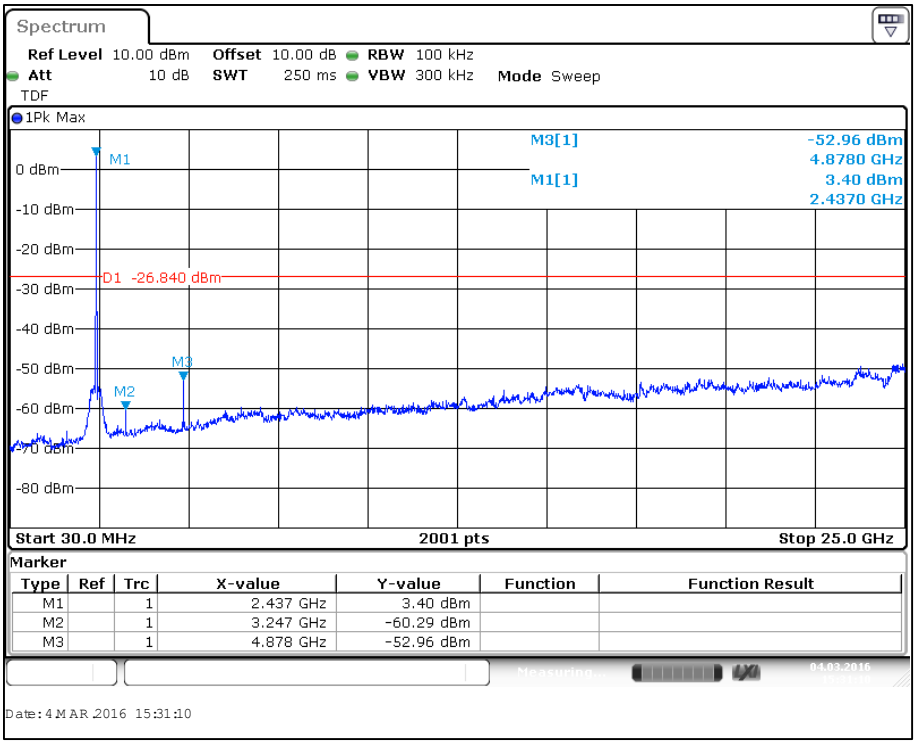
802.11n (HT40) at MCS0 - Conducted Spurious Emissions at the 2483.5 MHz Band Edge

6.4.2 Conducted Spurious Emissions in non-restricted frequency bands

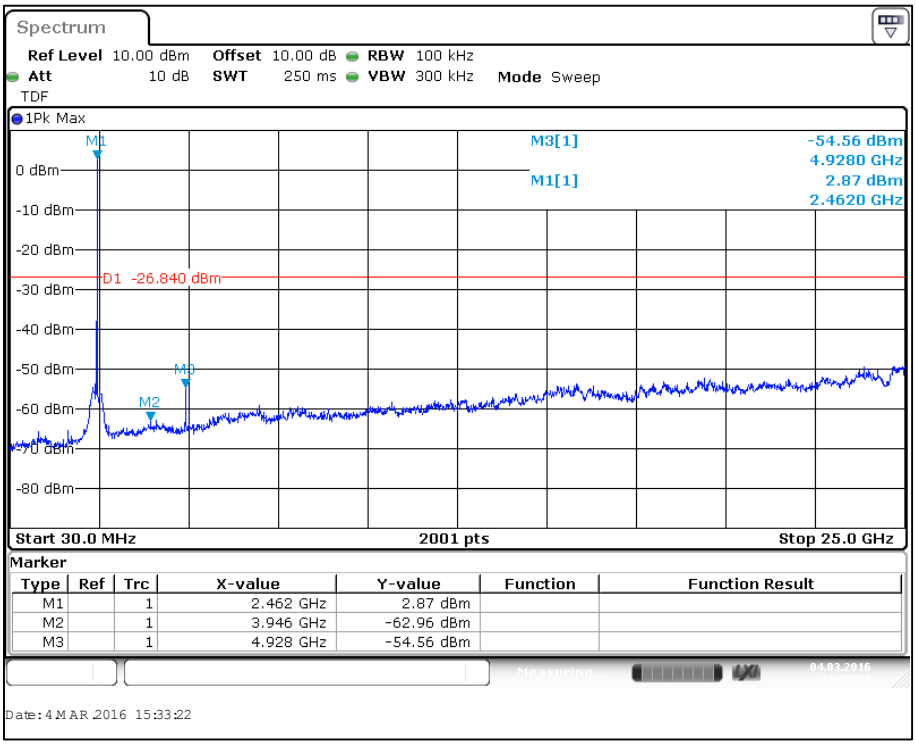
802.11b, 1 Mbps



Conducted Spurious Emissions Plot (802.11b at 1Mbps - CH1)

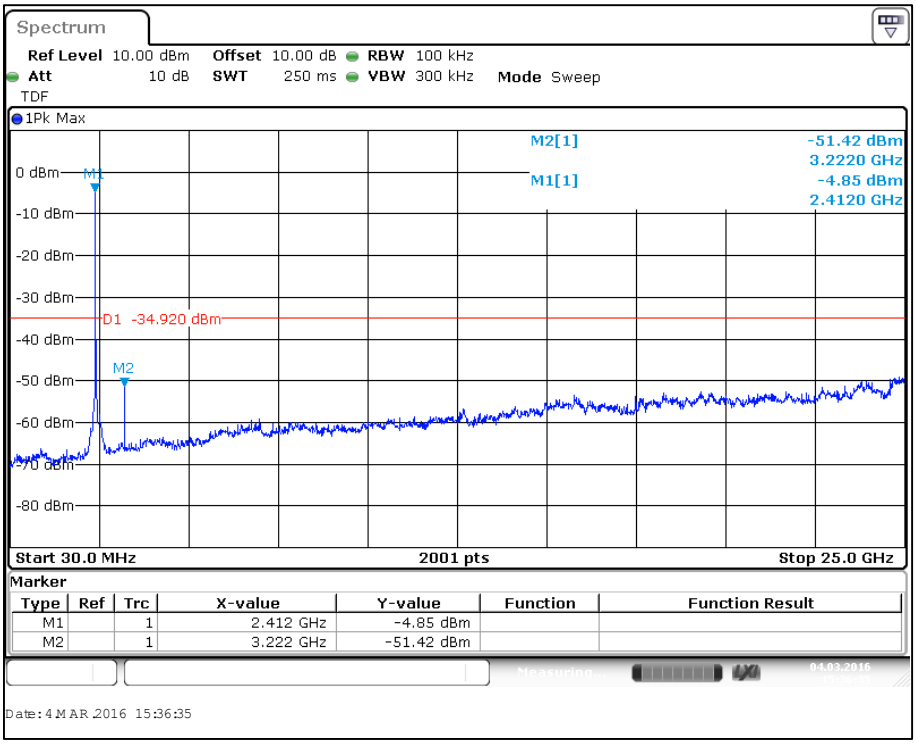


Conducted Spurious Emissions Plot (802.11b at 1Mbps - CH 6)

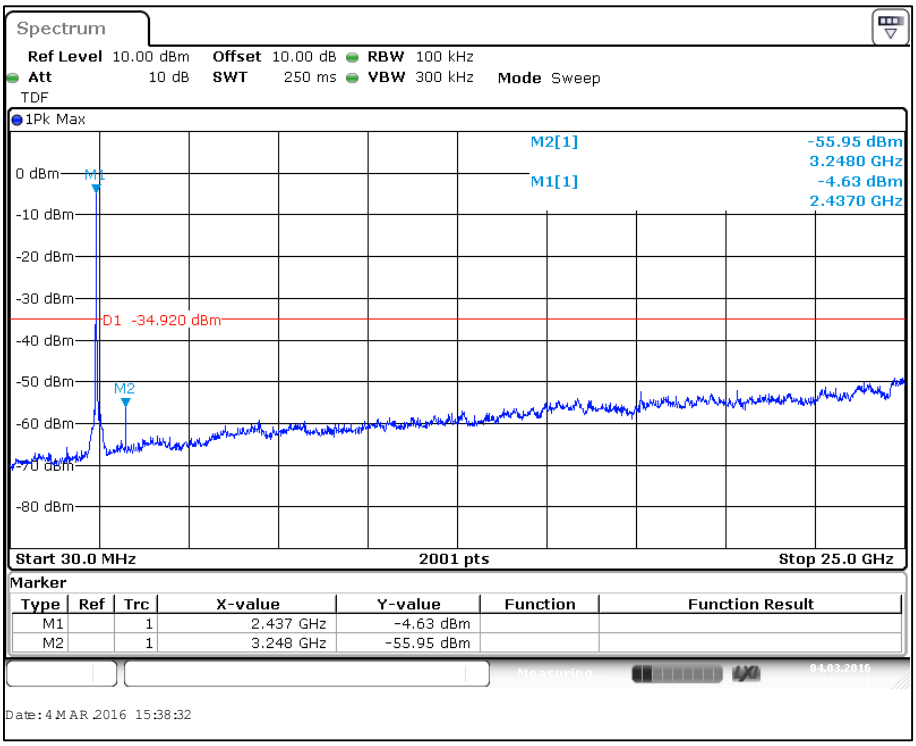


Conducted Spurious Emissions Plot (802.11b at 1Mbps - CH 11)

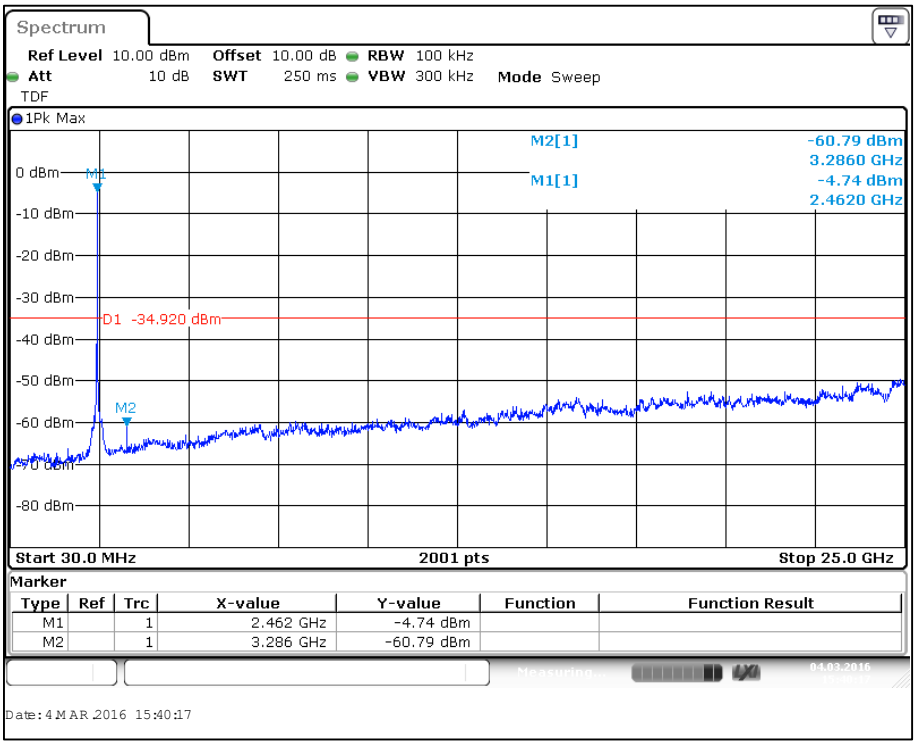
802.11g, 6 Mbps



Conducted Spurious Emissions Plot (802.11g at 6 Mbps - CH1)

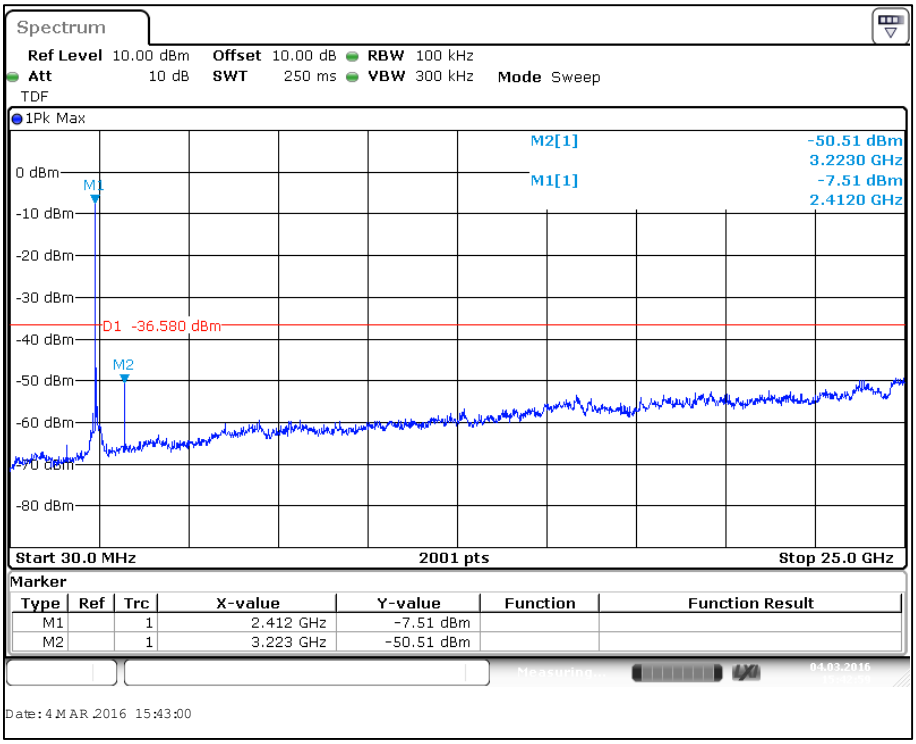


Conducted Spurious Emissions Plot (802.11g at 6 Mbps - CH 6)

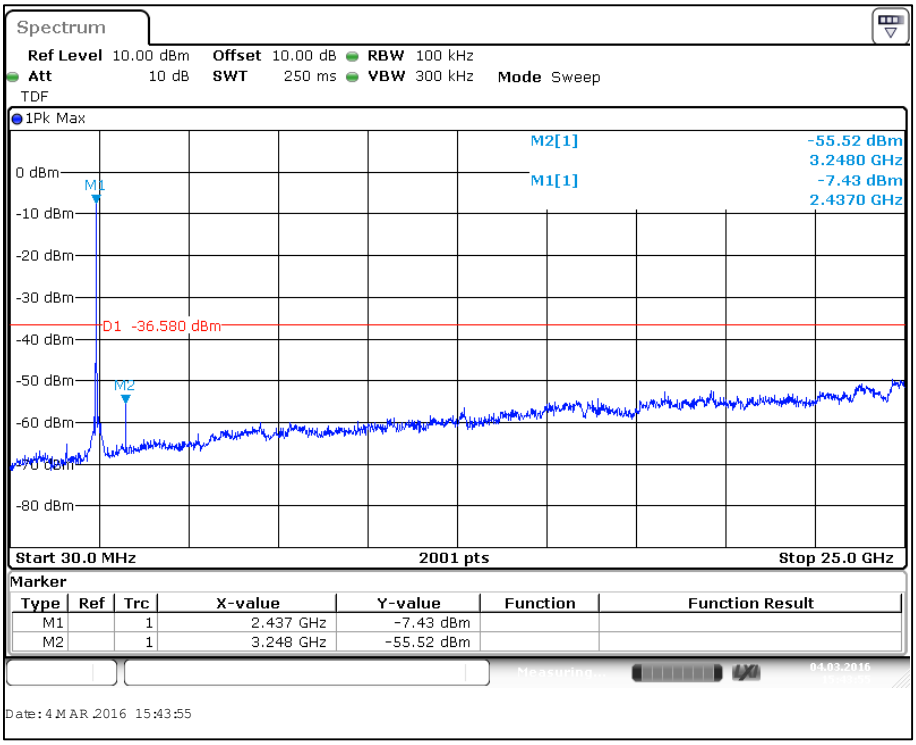


Conducted Spurious Emissions Plot (802.11g at 6 Mbps - CH 11)

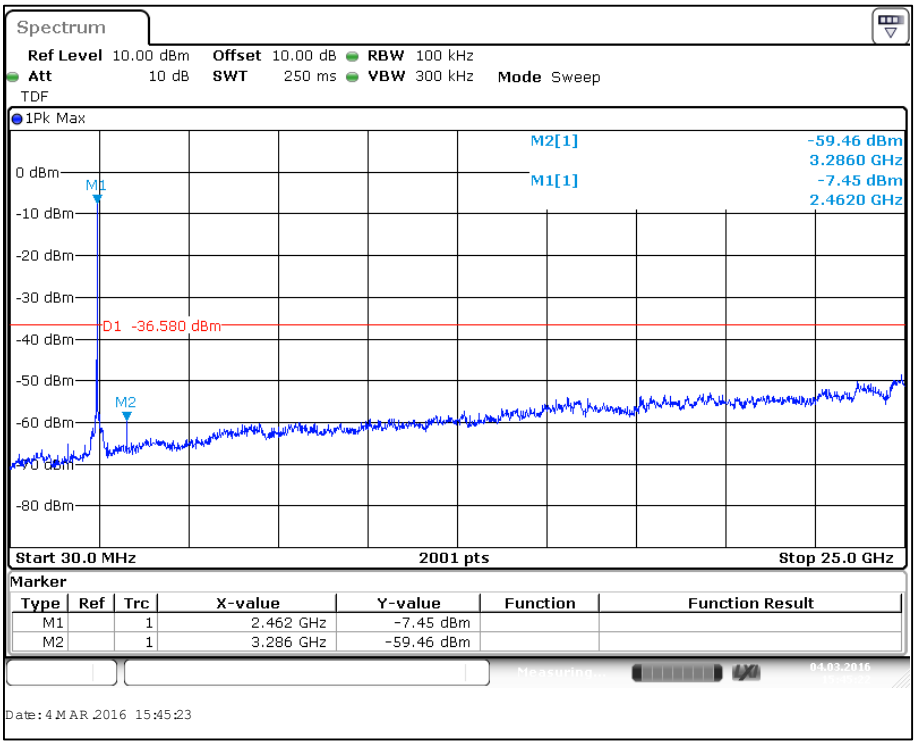
802.11n (HT20), MCS0/6.5 Mbps



Conducted Spurious Emissions Plot [802.11n (HT20) at MCS0/6.5Mbps - CH1]

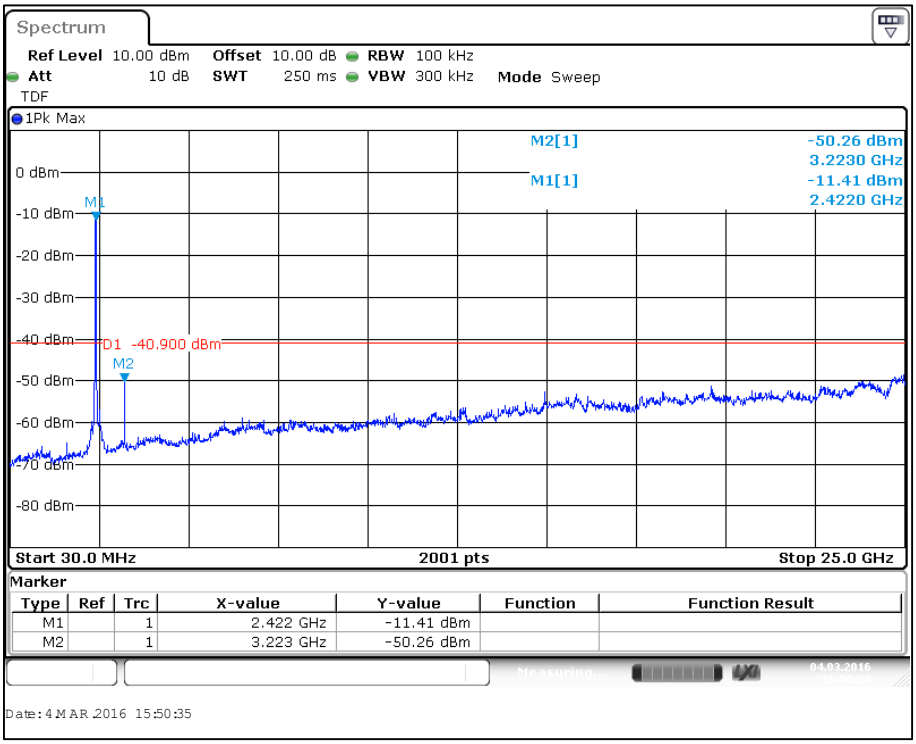


Conducted Spurious Emissions Plot [802.11n (HT20) at MCS0/6.5Mbps – CH6]

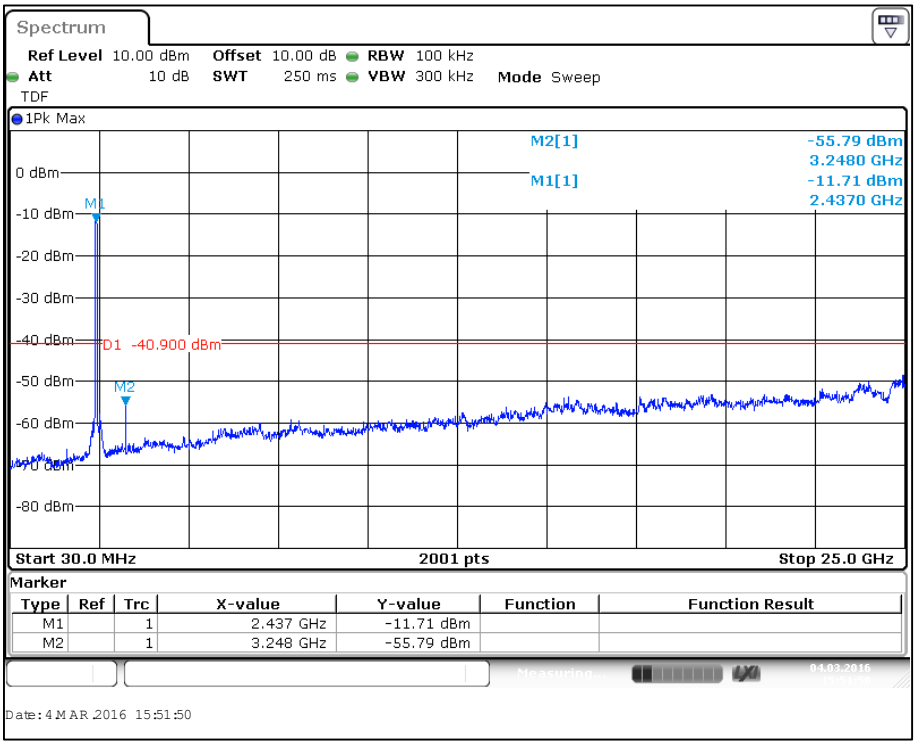


Conducted Spurious Emissions Plot [802.11n (HT20) at MCS0/6.5Mbps – CH11]

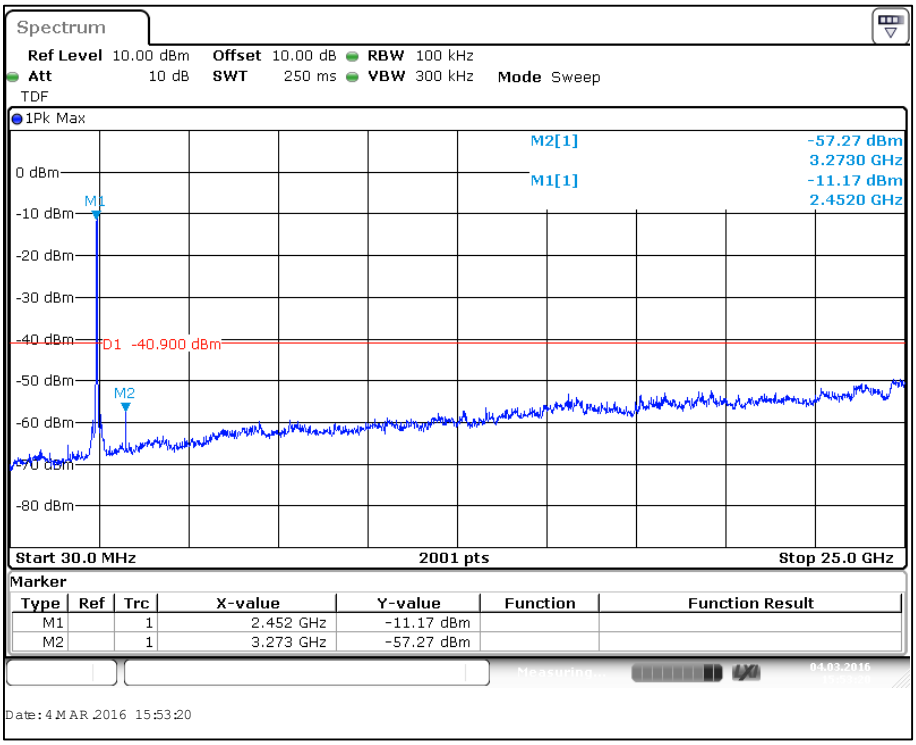
802.11n (HT40), MCS0/13.5 Mbps



Conducted Spurious Emissions Plot [802.11n (HT40) at MCS0/13.5Mbps – CH3]



Conducted Spurious Emissions Plot [802.11n (HT40) at MCS0/13.5Mbps - CH 6]



Conducted Spurious Emissions Plot [802.11n (HT40) at MCS0/13.5Mbps - CH 9]

6.5 Unwanted Emissions: Transmitter Radiated Spurious Emissions

Limits

FCC Part 15 Subpart C §15.247 (d)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

FCC Part 15 Subpart C §15.209 (a)

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

IC RSS-247 Issue 1 §5.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4 (4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

IC RSS-GEN Issue 4 §8.10 Restricted Frequency Bands

Restricted bands, identified in Table 6, are designated primarily for safety-of-life services (distress calling and certain aeronautical bands), certain satellite downlinks, radio astronomy and some government uses. Except where otherwise indicated, the following restrictions apply:

(a) Fundamental components of modulation of licence-exempt radio apparatus shall not fall within the restricted bands of Table 6 except for apparatus complying under RSS-287;
(b) Unwanted emissions that fall into restricted bands of Table 6 shall comply with the limits specified in RSS-Gen; and
(c) Unwanted emissions that do not fall within the restricted frequency bands of Table 6 shall comply either with the limits specified in the applicable RSS or with those specified in this RSS-Gen.

IC RSS-GEN §8.9 Table 4 – General Field Strength Limits for Licence-Exempt Transmitters at frequencies above 30 MHz

Frequency (MHz)	Field Strength (µv/m at 3 meters)
30-88	100
88-216	150
216-960	200
Above 960	500

Test Procedure used

ANSI C63.10-2013 §11.11 and KDB 558074 D01 v03r05 §11.0: for emissions in non-restricted frequency bands
ANSI C63.10-2013 §11.12.1 and KDB 558074 D01 v03r05 §12.1, §12.2.7: for emissions in restricted frequency bands

Sample Calculations

For Radiated Restricted Band Band-edge Measurement

• Corrected Level $_{(dB\mu V/m)}$ = Spectrum Analyzer (SA) Reading $_{(dB\mu V/m)}$ + Duty Cycle Factor $_{(dB)}$

• Spectrum Analyzer (SA) Reading $_{(dB\mu V/m)}$ = Amplitude (Raw) $_{(dB\mu V/m)}$ + Transducer Factor $_{(dB/m)}$ + Offset $_{(dB)}$

• Transducer Factor $_{(dB/m)}$ = Antenna Factor $_{(dB/m)}$ + Cable Loss $_{(dB)}$ – Pre-amplifier Gain $_{(dB)}$

• Offset $_{(dB)}$ = 10 dB Attenuator

• Margin $_{(dB)}$ = Corrected Level $_{(dB\mu V/m)}$ – Limit $_{(dB\mu V/m)}$

For Spurious Emissions Levels above 1GHz

• Corrected Level $_{(dB\mu V/m)}$ = Amplitude $_{(dB\mu V/m)}$ + Correction Factor $_{(dB)}$ + Duty Cycle Factor $_{(dB)}$

• Correction Factor $_{(dB)}$ = Antenna Factor $_{(dB/m)}$ + Cable Loss $_{(dB)}$ + Filter Insertion Loss $_{(dB)}$

• Margin $_{(dB)}$ = Corrected Level $_{(dB\mu V/m)}$ – Limit $_{(dB\mu V/m)}$

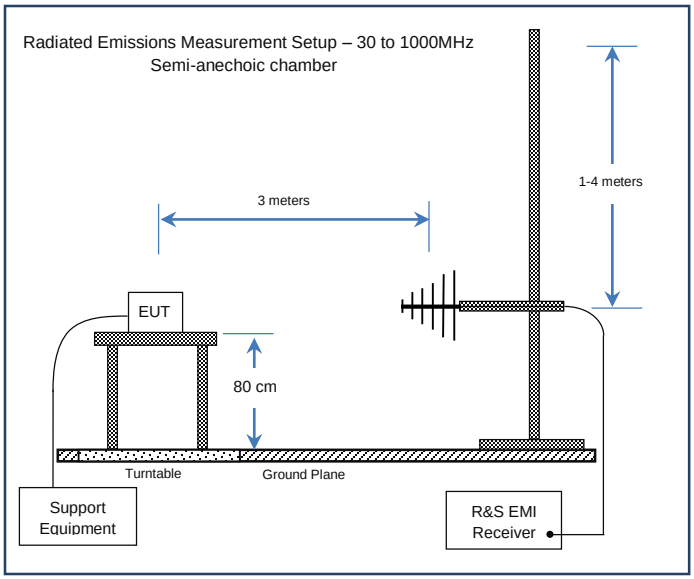
For Spurious Emissions Levels below 1GHz

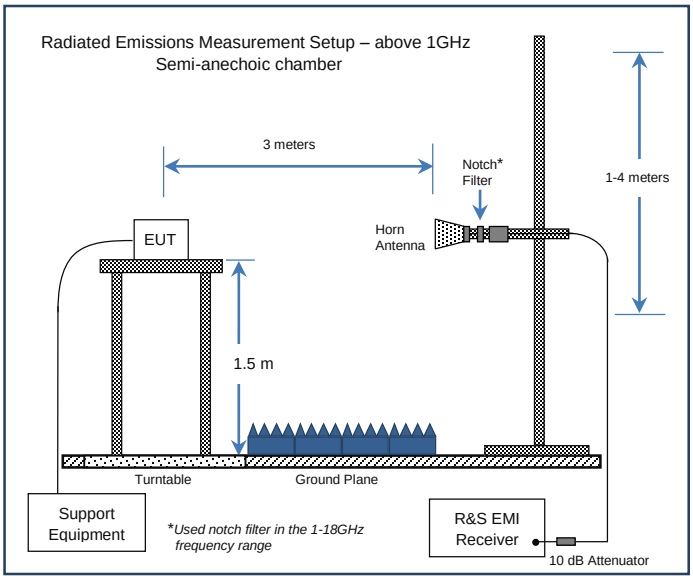
• Amplitude $_{(dB\mu V/m)}$ = Receiver Reading $_{(dB\mu V/m)}$ + Correction Factor $_{(dB)}$ + Duty Cycle Factor $_{(dB)}$

• Correction Factor $_{(dB)}$ = Antenna Factor $_{(dB/m)}$ + Cable Loss $_{(dB)}$

• Margin $_{(dB)}$ = Amplitude $_{(dB\mu V/m)}$ – Limit $_{(dB\mu V/m)}$

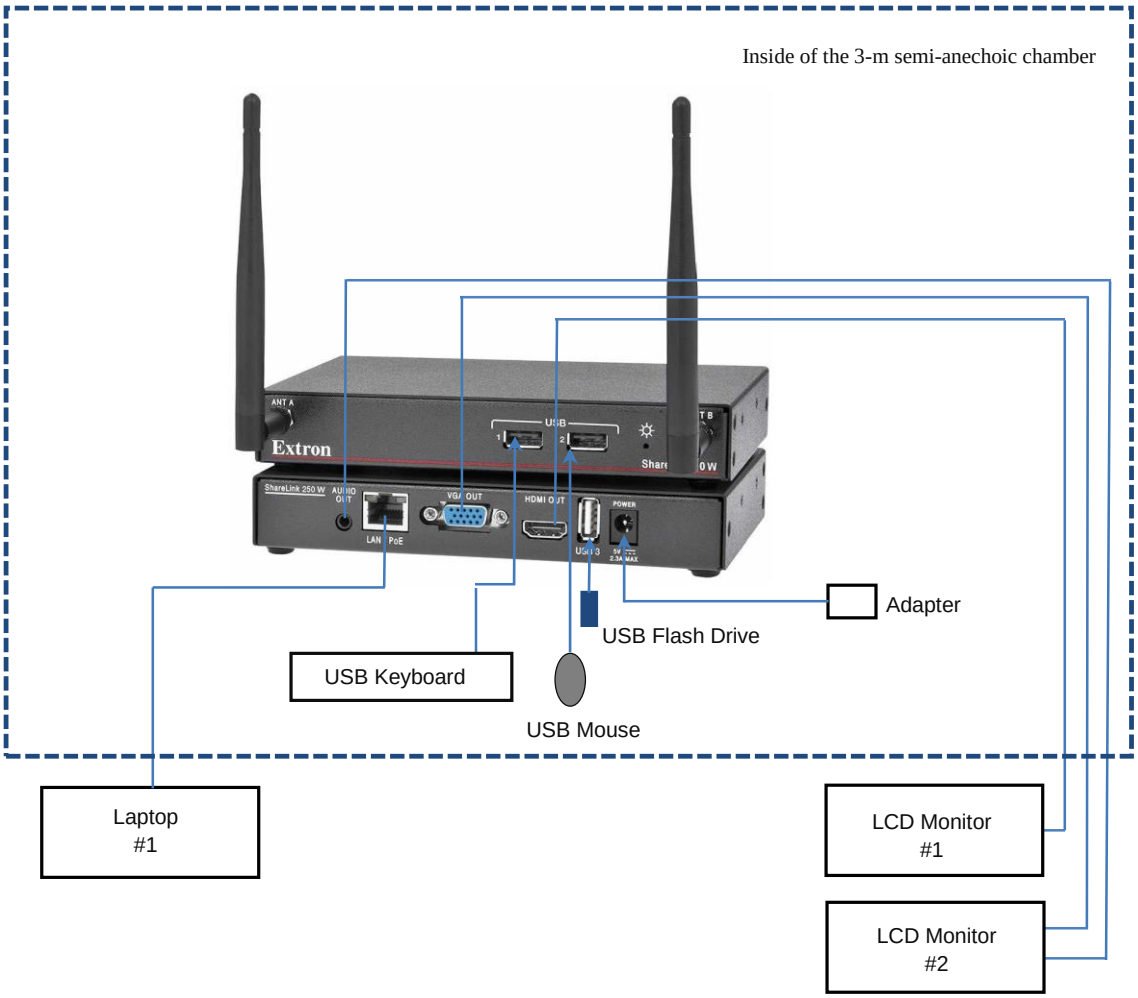
Test Setup


Radiated Emissions Measurement Setup – 30 to 1000MHz
Semi-anechoic chamber
3 meters
1-4 meters
EUT
80 cm
Turntable
Ground Plane
Support Equipment
R&S EMI Receiver


Radiated Emissions Measurement Setup – above 1GHz
Semi-anechoic chamber
3 meters
Notch* Filter
1-4 meters
Horn Antenna
EUT
1.5 m
Turntable
Ground Plane
Support Equipment
*Used notch filter in the 1-18GHz frequency range
R&S EMI Receiver
10 dB Attenuator

EUT Connection Diagram:

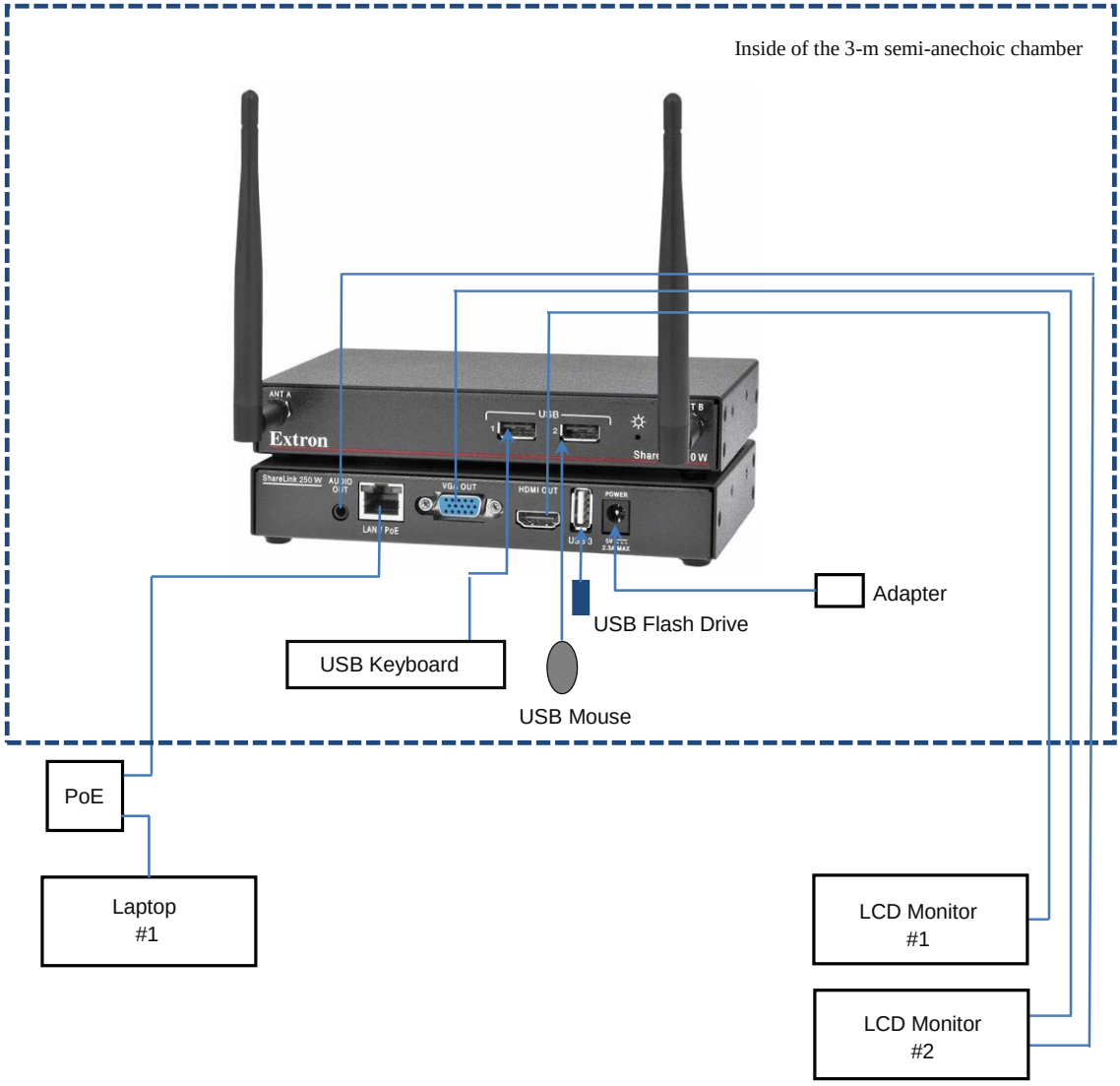
a. Using Adapter 6A-161WP05, 5Vdc



- HDMI OUT connected to LCD monitor #1 with 25' HDMI PRO cable.
- VGA OUT connected to LCD monitor #2 with 35' VGA cable.
- Audio OUT connected to LCD monitor #2 (PC Audio IN) with 25' Audio mini cable
- USB 1 with USB keyboard
- USB 2 with USB mouse
- USB 3 with USB Flash Drive
- LAN/POE connected to Laptop #1 with 35' CAT-53 UTP cable
- Power connected to AC Adapter

Note: EUT at Full Screen Display with 1080p, 60Hz resolution; W-Fi Transmitter ON; LAN at 1GB Connection

b. Using PoE XTP PI 100, +48Vdc



- HDMI OUT connected to LCD monitor #1 with 25' HDMI PRO cable.
- VGA OUT connected to LCD monitor #2 with 35' VGA cable.
- Audio OUT connected to LCD monitor #2 (PC Audio IN) with 25' Audio mini cable
- USB 1 with USB keyboard
- USB 2 with USB mouse
- USB 3 with USB Flash Drive
- LAN/POE connected to PoE Power Supply with 35' CAT-5e UTP cable
- PoE Power Supply connected to Laptop #1 with 10' CAT-5e UTP cable

Note: EUT at Full Screen Display with 1080p, 60Hz resolution; W-Fi Transmitter ON; LAN at 1GB Connection

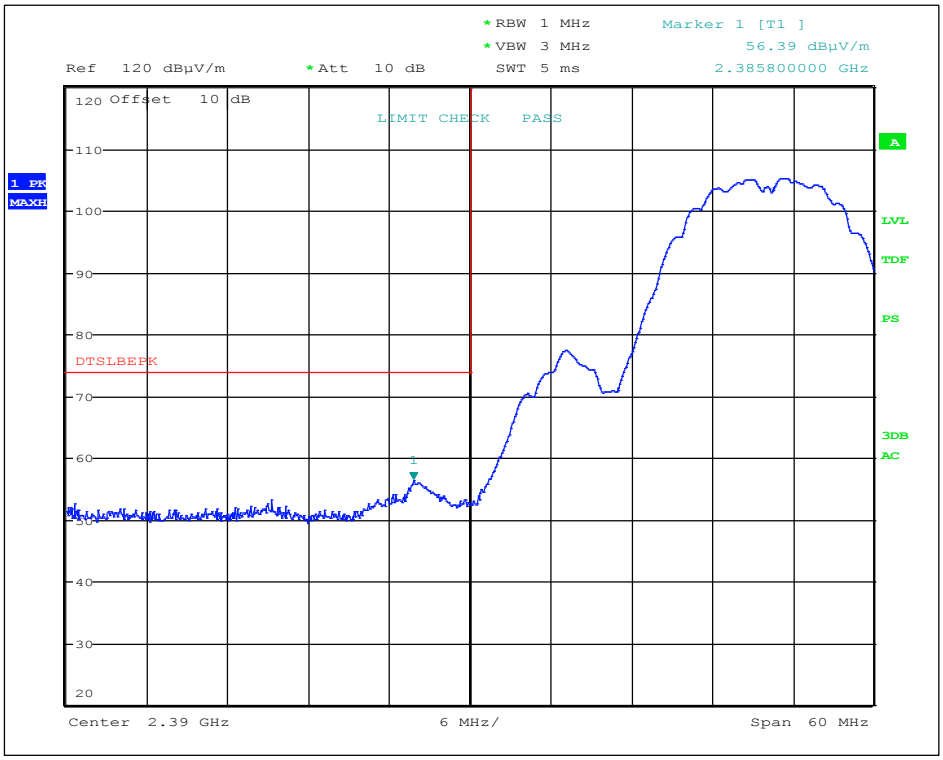
Test Results

6.5.1 Radiated Restricted-band band-edge measurements at 2390 MHz (802.11b, 1Mbps)

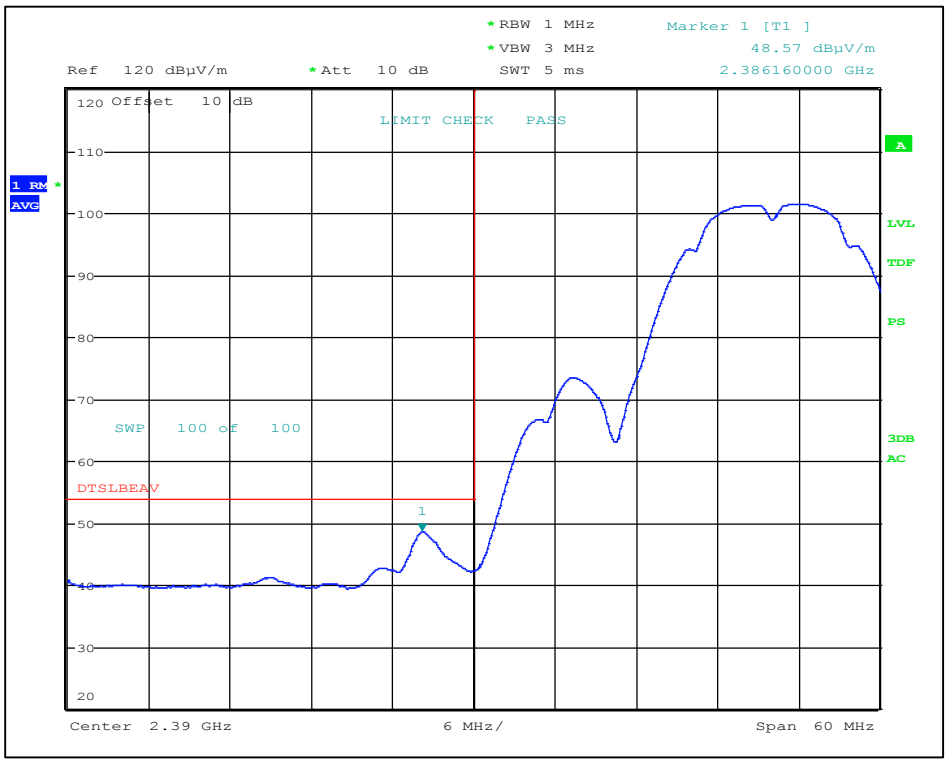
802.11b: 1 Mbps, Channel 1 (2412 MHz)

Frequency (MHz)	SA Reading (dBuV/m)	Detector PK/AV	Antenna		Turntable	EUT Antenna Polarity (V/H1/H2)	DC Factor (dB)	Transducer Factor (dB)	Corrected Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
			Height (cm)	Polarity (V/H)	Azimuth (Deg)						
2385.8	56.4	PK	160	V	335	V	0.00	-2.0	56.4	74.0	-17.6
2386.2	48.6	AV	160	V	335	V	0.00	-2.0	48.6	54.0	-5.4
2386.2	58.5	PK	110	H	65	H1	0.00	-2.2	58.5	74.0	-15.5
2386.2	51.9	AV	110	H	65	H1	0.00	-2.2	51.9	54.0	-2.1

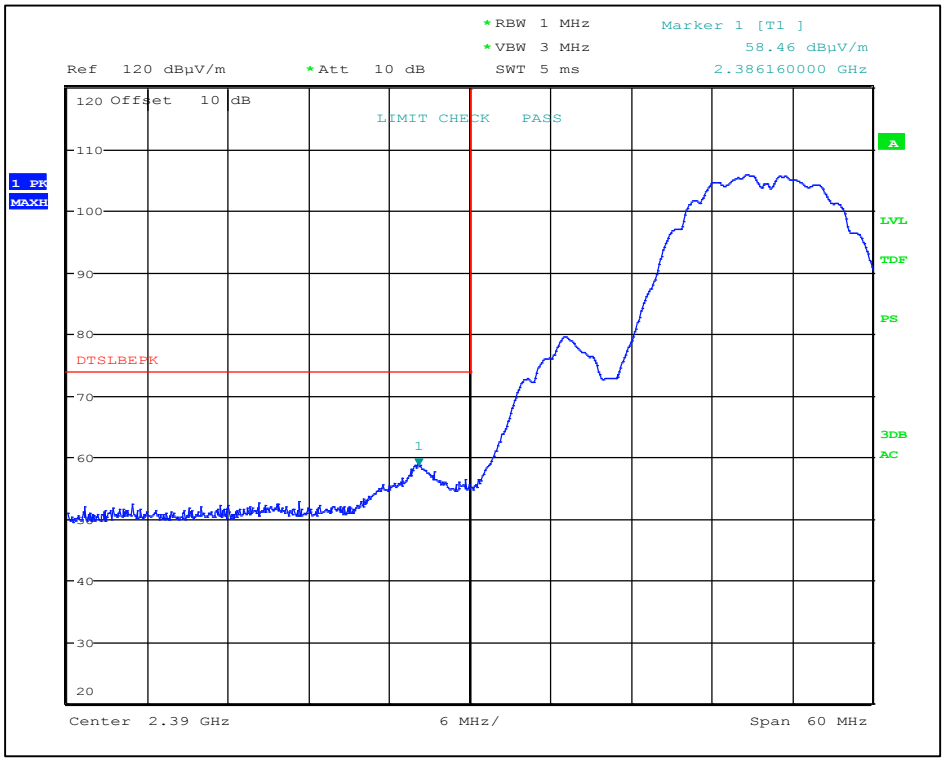
Refer to the following Plots



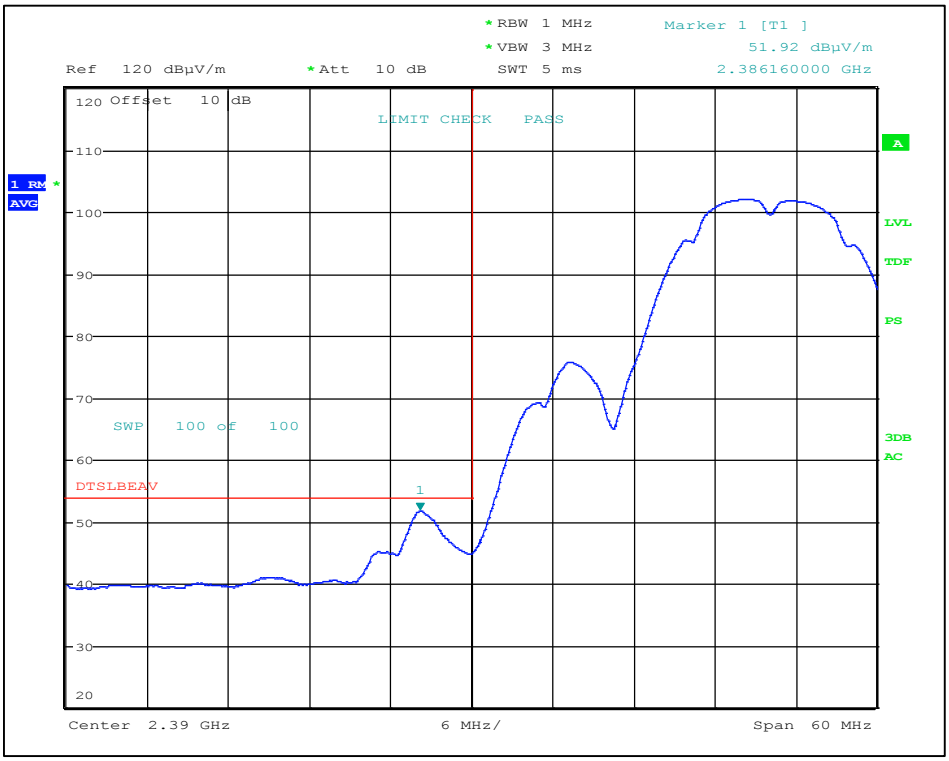
802.11b at 1Mbps – Restricted-band band-edge at low channel (Vertical Peak)



802.11b at 1Mbps - Restricted-band band-edge at low channel (Vertical Average)



802.11b at 1Mbps - Restricted-band band-edge at low channel (Horizontal Peak)



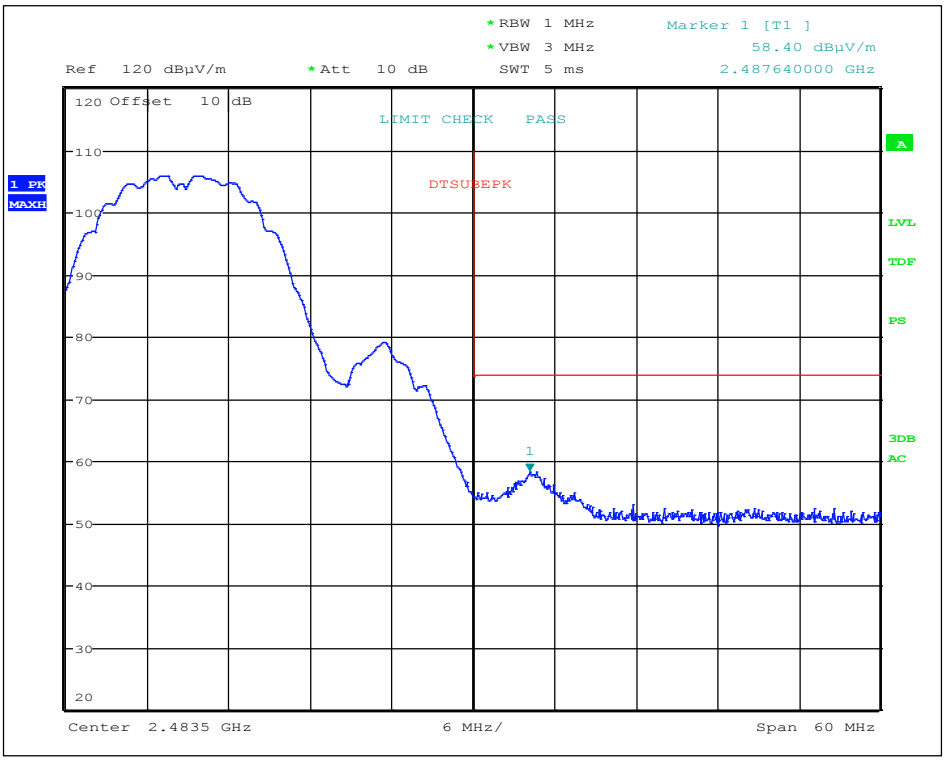
802.11b at 1Mbps - Restricted-band band-edge at low channel (Horizontal Average)

6.5.2 Radiated Restricted-band band-edge at 2483.5 MHz (802.11b, 1Mbps)

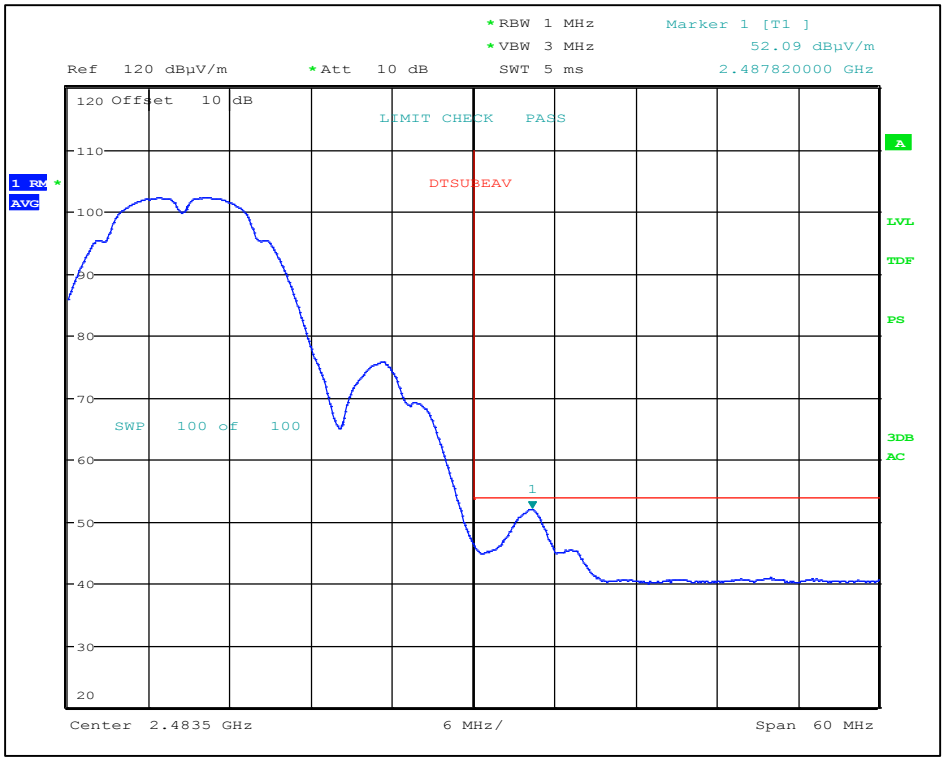
802.11b: 1Mbps, Channel 11 (2462 MHz)

Frequency (MHz)	SA Reading (dBuV/m)	Detector PK/AV	Antenna		Turntable	EUT Antenna Polarity (V/H1/H2)	DC Factor (dB)	Transducer Factor (dB)	Corrected Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
			Height (cm)	Polarity (V/H)	Azimuth (Deg)						
2487.6	58.4	PK	140	V	335	V	0.00	-1.5	58.4	74.0	-15.6
2487.8	52.1	AV	140	V	335	V	0.00	-1.5	52.1	54.0	-1.9
2487.9	58.0	PK	110	H	65	H1	0.00	-1.8	58.0	74.0	-16.0
2487.9	50.5	AV	110	H	65	H1	0.00	-1.8	50.5	54.0	-3.5

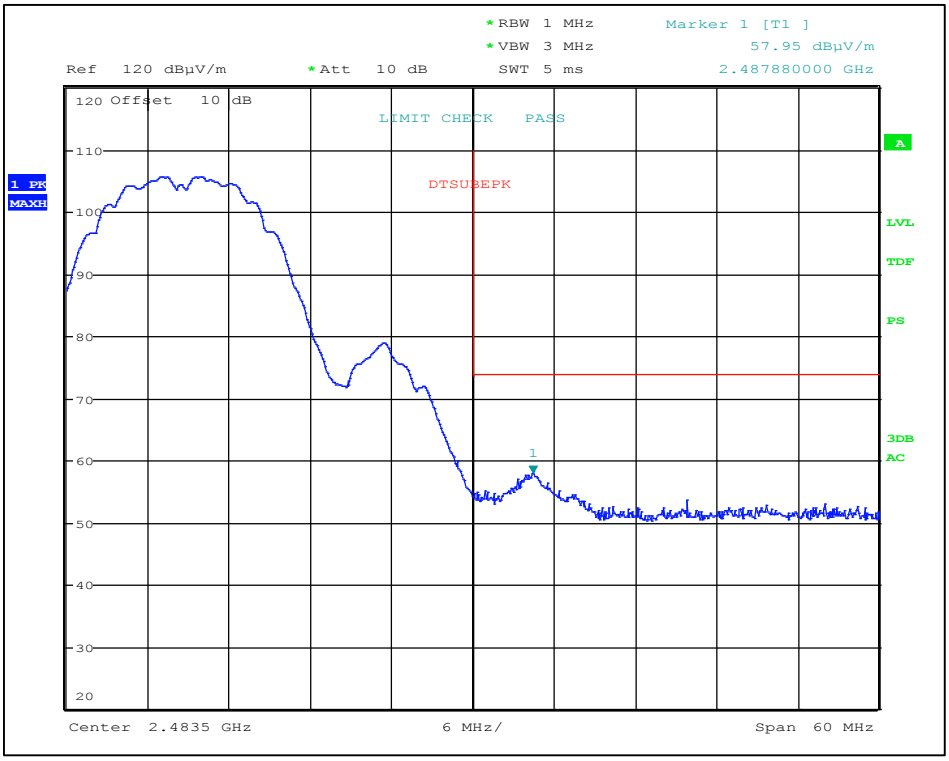
Refer to the following Plots



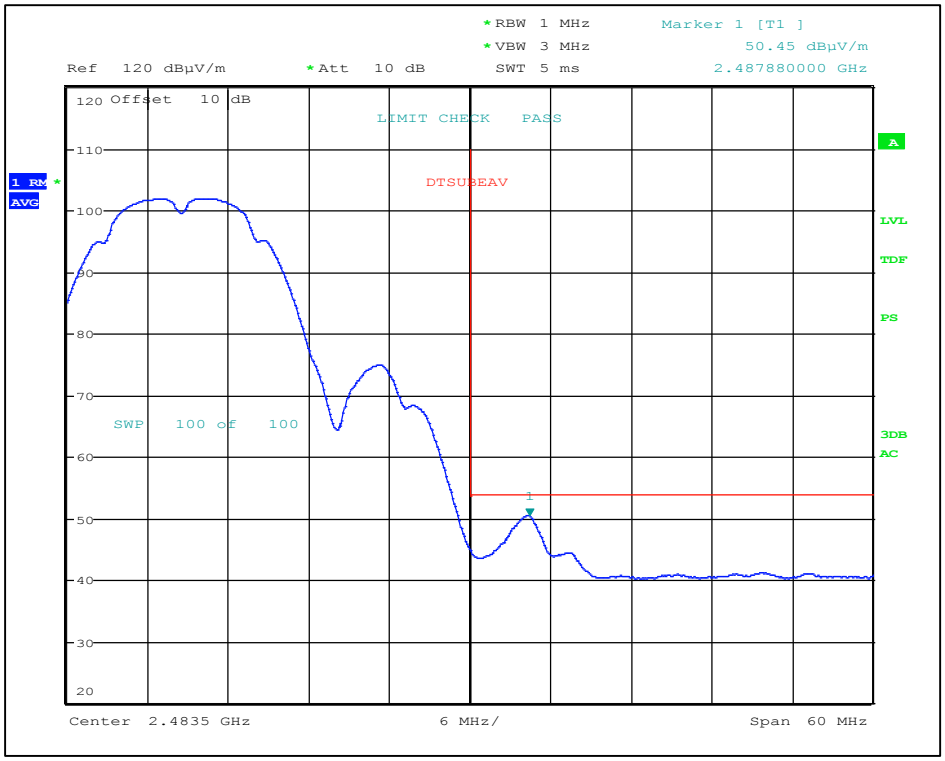
802.11b at 1Mbps - Restricted-band band-edge at high channel (Vertical Peak)



802.11b at 1Mbps - Restricted-band band-edge at high channel (Vertical Average)



802.11b at 1Mbps - Restricted-band band-edge at high channel (Horizontal Peak)



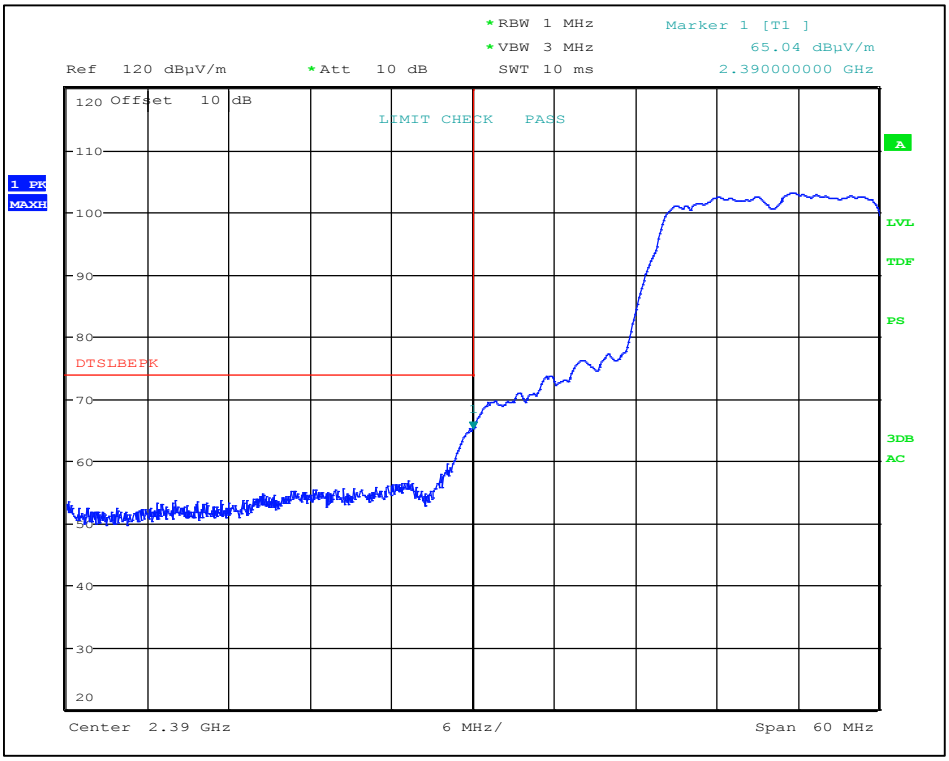
802.11b at 1Mbps - Restricted-band band-edge at high channel (Horizontal Average)

6.5.3 Radiated Restricted-band band-edge measurements at 2390 MHz (802.11g, 6Mbps)

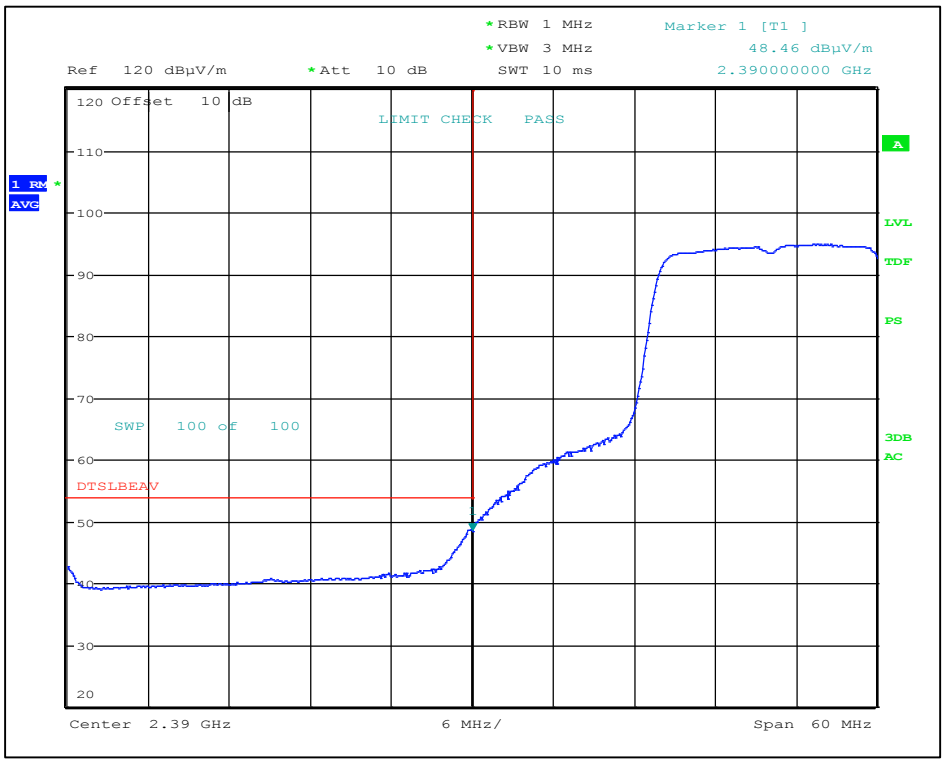
802.11g: 6 Mbps Channel 1 (2412 MHz)

Frequency (MHz)	SA Reading (dBuV/m)	Detector PK/AV	Antenna		Turntable	EUT Antenna Polarity (V/H1/H2)	DC Factor (dB)	Transducer Factor (dB)	Corrected Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
			Height (cm)	Polarity (V/H)	Azimuth (Deg)						
2390.0	65.0	PK	160	V	335	V	0.00	-2.0	65.0	74.0	-9.0
2390.0	48.5	AV	160	V	335	V	0.00	-2.0	48.5	54.0	-5.5
2390.0	66.3	PK	110	H	65	H1	0.00	-2.2	66.3	74.0	-7.7
2390.0	50.7	AV	110	H	65	H1	0.00	-2.2	50.7	54.0	-3.3

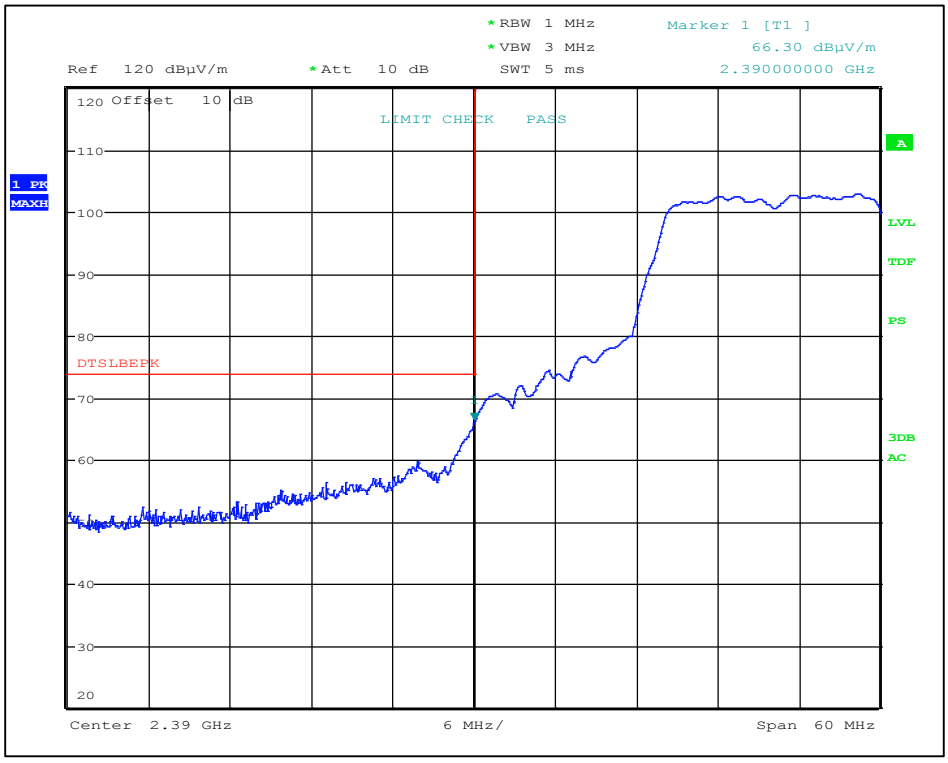
Refer to the following Plots



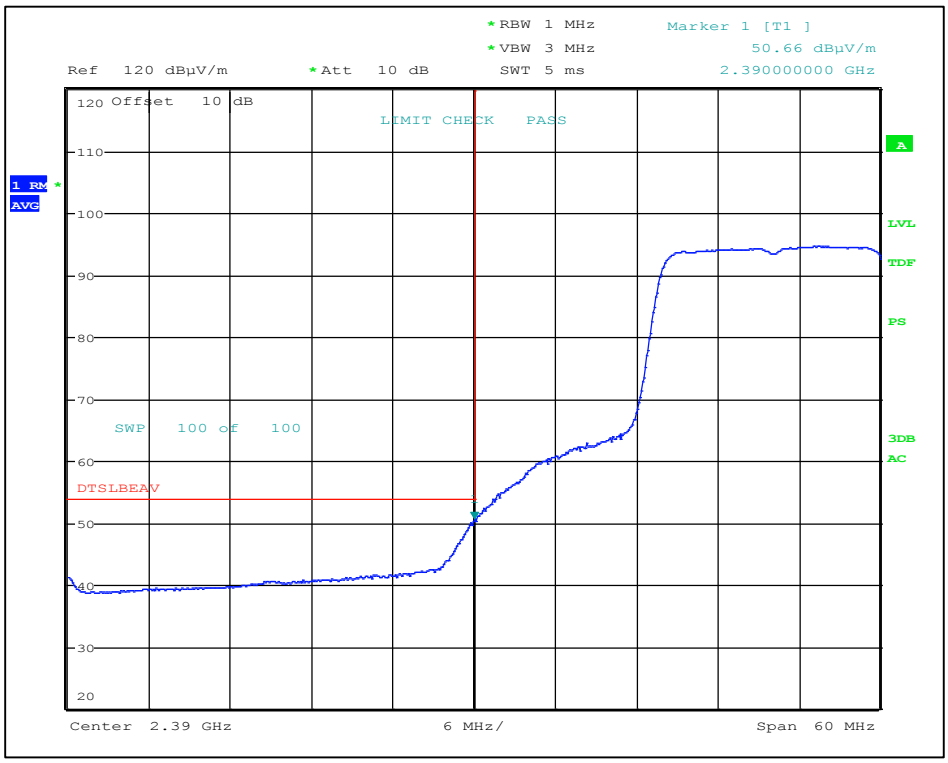
802.11g at 6 Mbps - Restricted-band band-edge at low channel (Vertical Peak)



802.11g at 6Mbps - Restricted-band band-edge at low channel (Vertical Average)



802.11g at 6Mbps - Restricted-band band-edge at low channel (Horizontal Peak)



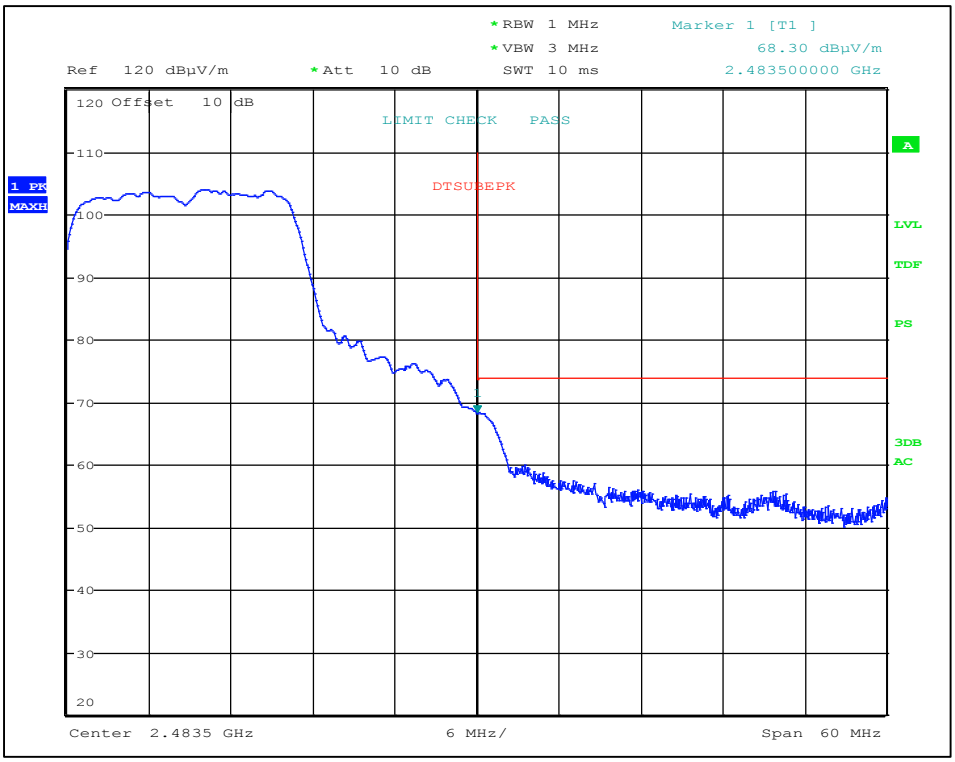
802.11g at 6Mbps - Restricted-band band-edge at low channel (Horizontal Average)

6.5.4 Radiated Restricted-band band-edge at 2483.5 MHz (802.11g, 6Mbps)

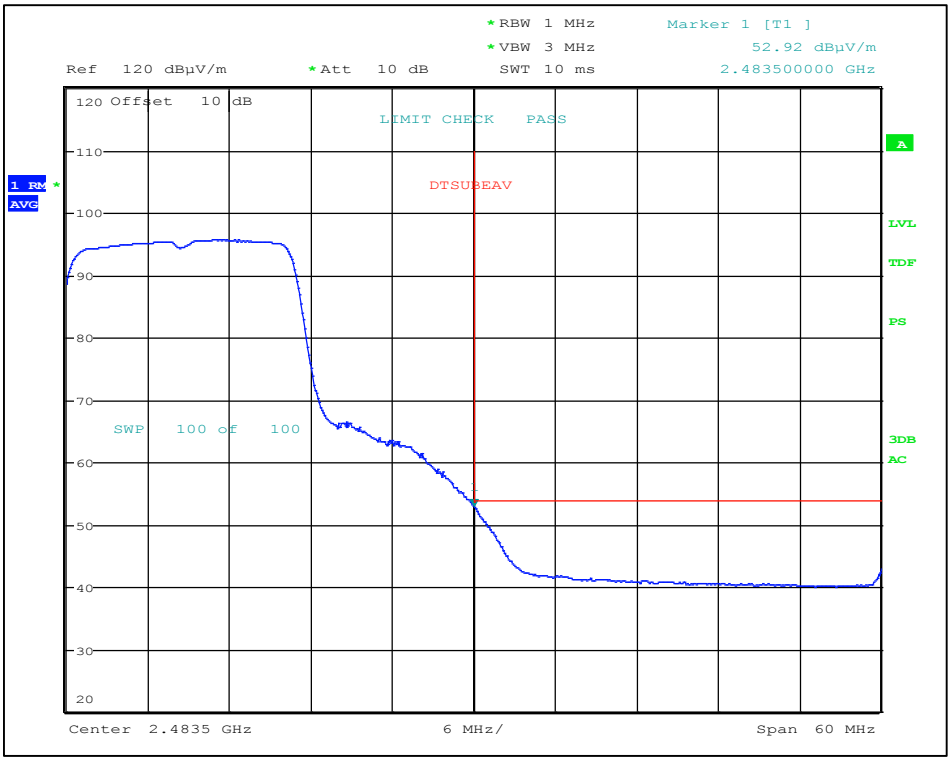
802.11g: 6Mbps, Channel 11 (2462 MHz)

Frequency (MHz)	SA Reading (dBuV/m)	Detector PK/AV	Antenna		Turntable	EUT Antenna Polarity (V/H1/H2)	DC Factor (dB)	Transducer Factor (dB)	Corrected Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
			Height (cm)	Polarity (V/H)	Azimuth (Deg)						
2483.5	68.3	PK	140	V	335	V	0.00	-1.5	68.3	74.0	-5.7
2483.5	52.9	AV	140	V	335	V	0.00	-1.5	52.9	54.0	-1.1
2483.5	70.2	PK	110	H	65	H1	0.00	-1.8	70.2	74.0	-3.8
2483.5	53.0	AV	110	H	65	H1	0.00	-1.8	53.0	54.0	-1.0

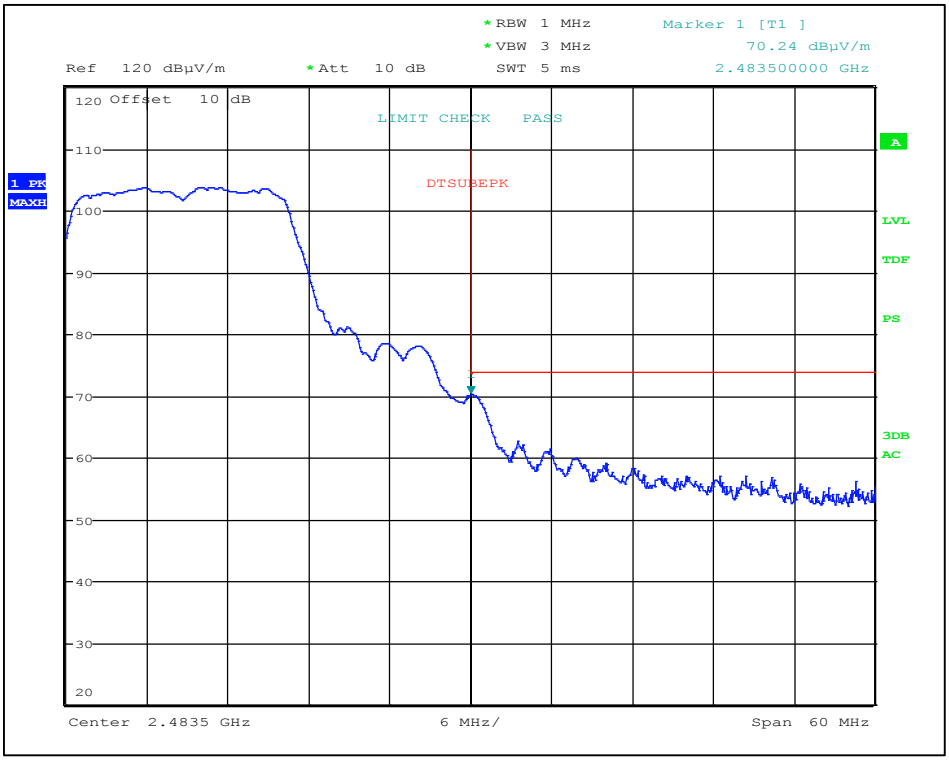
Refer to the following Plots



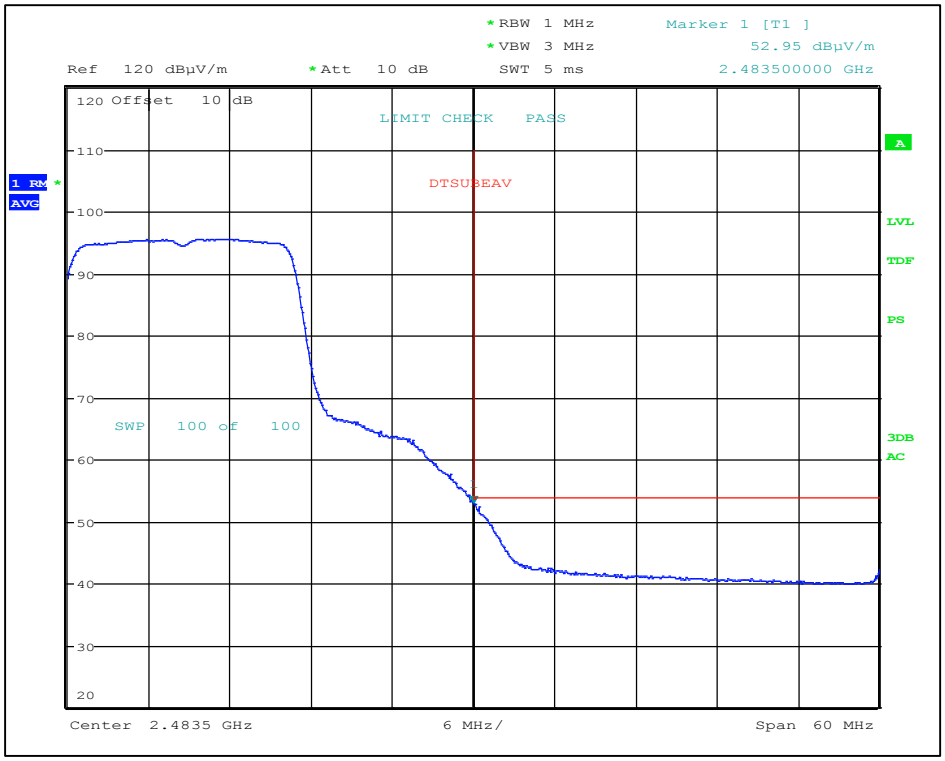
802.11g: 6Mbps - Restricted-band band-edge at high channel (Vertical Peak)



802.11g: 6Mbps - Restricted-band band-edge at high channel (Vertical Average)



802.11g: 6Mbps - Restricted-band band-edge at high channel (Horizontal Peak)



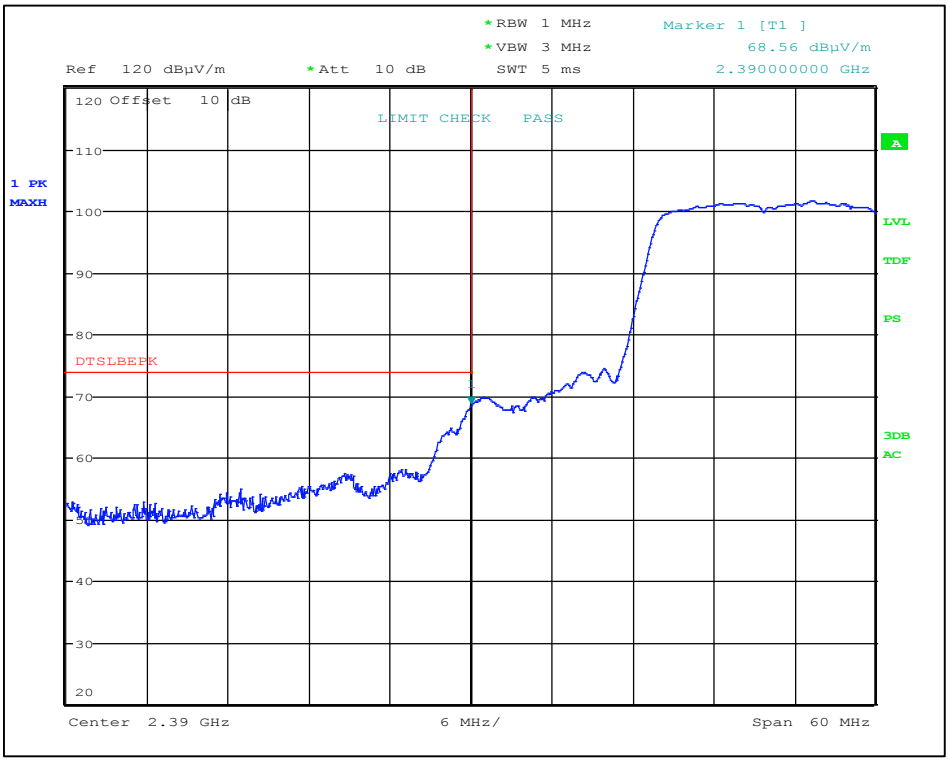
802.11g: 6Mbps - Restricted-band band-edge at high channel (Horizontal Average)

6.5.5 Radiated Restricted-band band-edge measurements at 2390 MHz [802.11n (HT20), MCS0]

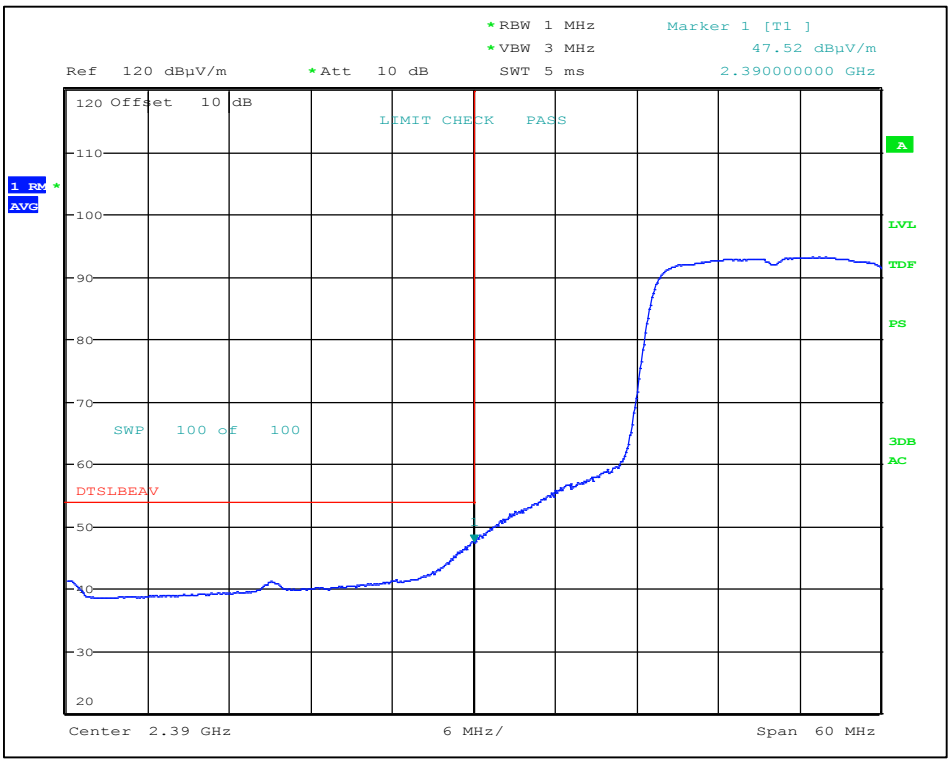
802.11n (HT20): MCS0/6.5 Mbps, Channel 1 (2412 MHz)

Frequency (MHz)	SA Reading (dBuV/m)	Detector PK/AV	Antenna		Turntable	EUT Antenna Polarity (V/H1/H2)	DC Factor (dB)	Transducer Factor (dB)	Corrected Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
			Height (cm)	Polarity (V/H)	Azimuth (Deg)						
2390.0	68.6	PK	160	V	335	V	0.00	-2.0	68.6	74.0	-5.4
2390.0	47.5	AV	160	V	335	V	0.00	-2.0	47.5	54.0	-6.5
2390.0	70.7	PK	100	H	65	H1	0.00	-2.2	70.7	74.0	-3.3
2390.0	49.5	AV	100	H	65	H1	0.00	-2.2	49.5	54.0	-4.5

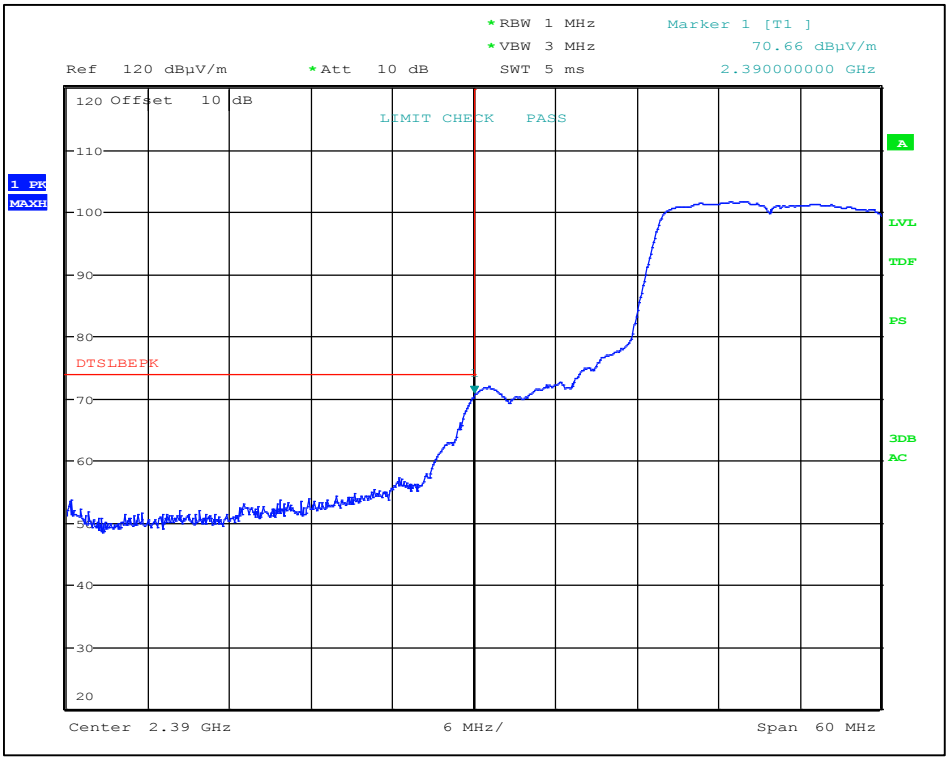
Refer to the following Plots



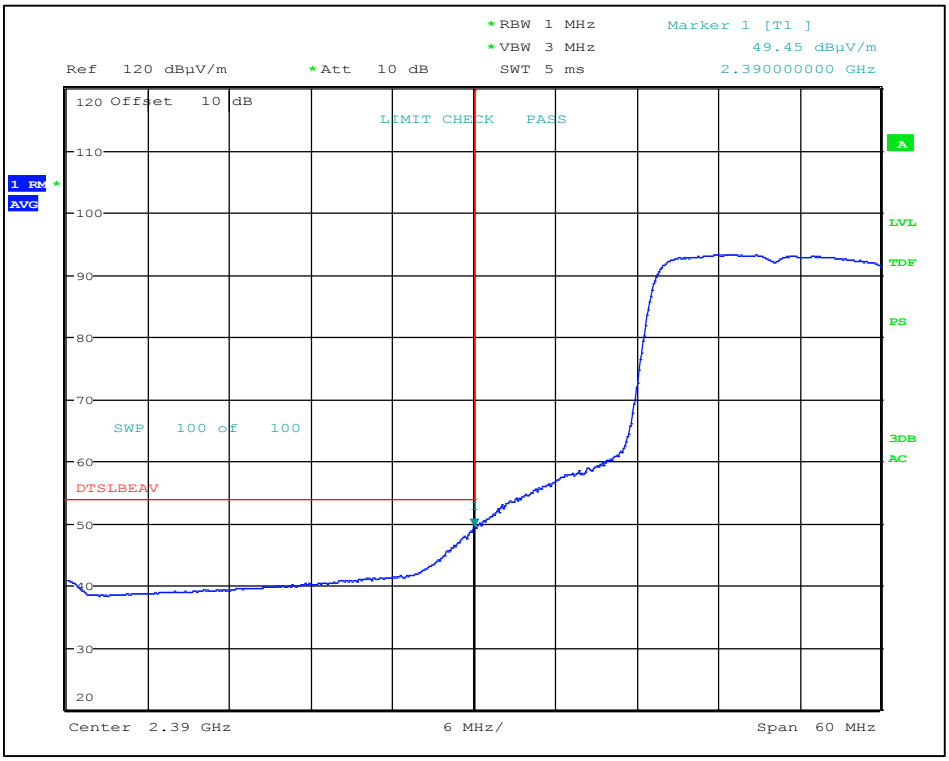
802.11n (HT20) at MCS0/6.5 Mbps - Restricted-band band-edge at low channel (Vertical Peak)



802.11n (HT20) at MCS0/6.5 Mbps - Restricted-band band-edge at low channel (Vertical Average)



802.11n (HT20) at MCS0/6.5 Mbps - Restricted-band band-edge at low channel (Horizontal Peak)



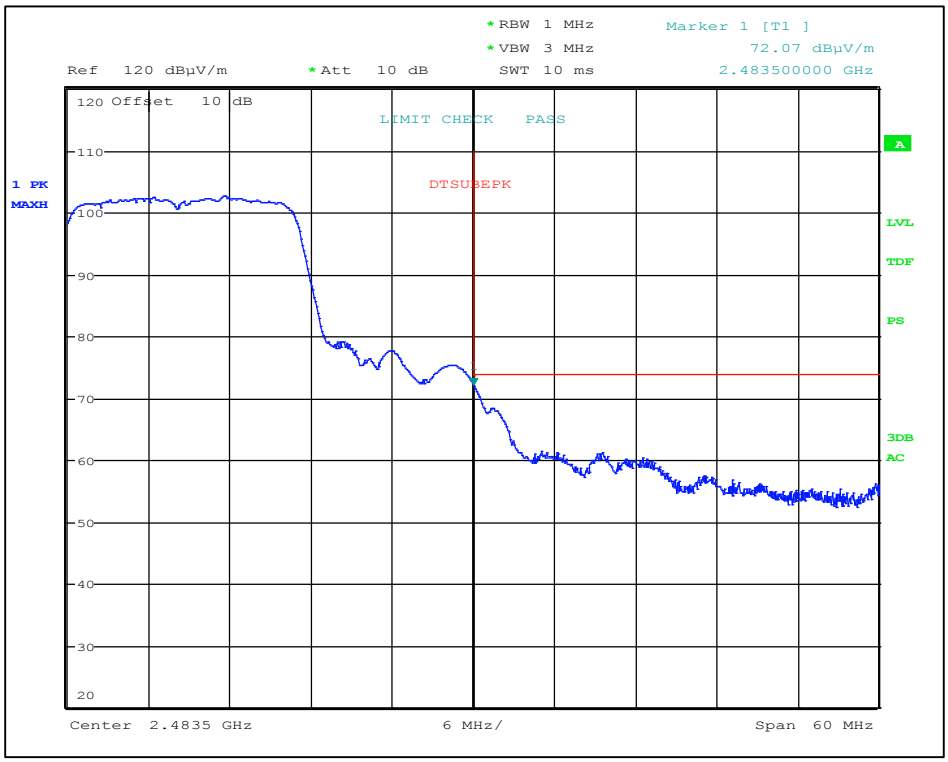
802.11n (HT20) at MCS0/6.5 Mbps - Restricted-band band-edge at low channel (Horizontal Average)

6.5.6 Radiated Restricted-band band-edge at 2483.5 MHz [802.11n (HT20), MCS0]

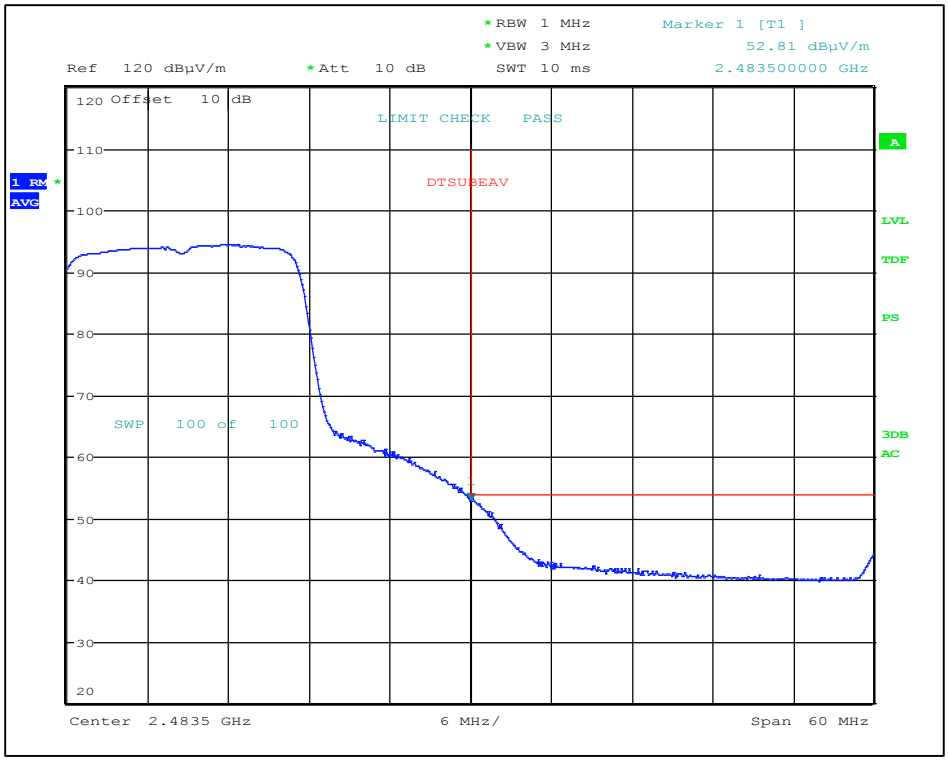
802.11n (HT20): MCS0/6.5 Mbps, Channel 11 (2462 MHz)

Frequency (MHz)	SA Reading (dBuV/m)	Detector PK/AV	Antenna		Turntable	EUT Antenna Polarity (V/H1/H2)	DC Factor (dB)	Transducer Factor (dB)	Corrected Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
			Height (cm)	Polarity (V/H)	Azimuth (Deg)						
2483.5	72.1	PK	140	V	335	V	0.00	-1.5	72.1	74.0	-1.9
2483.5	52.8	AV	140	V	335	V	0.00	-1.5	52.8	54.0	-1.2
2483.5	71.4	PK	100	H	65	H1	0.00	-1.8	71.4	74.0	-2.6
2483.5	51.8	AV	100	H	65	H1	0.00	-1.8	51.8	54.0	-2.2

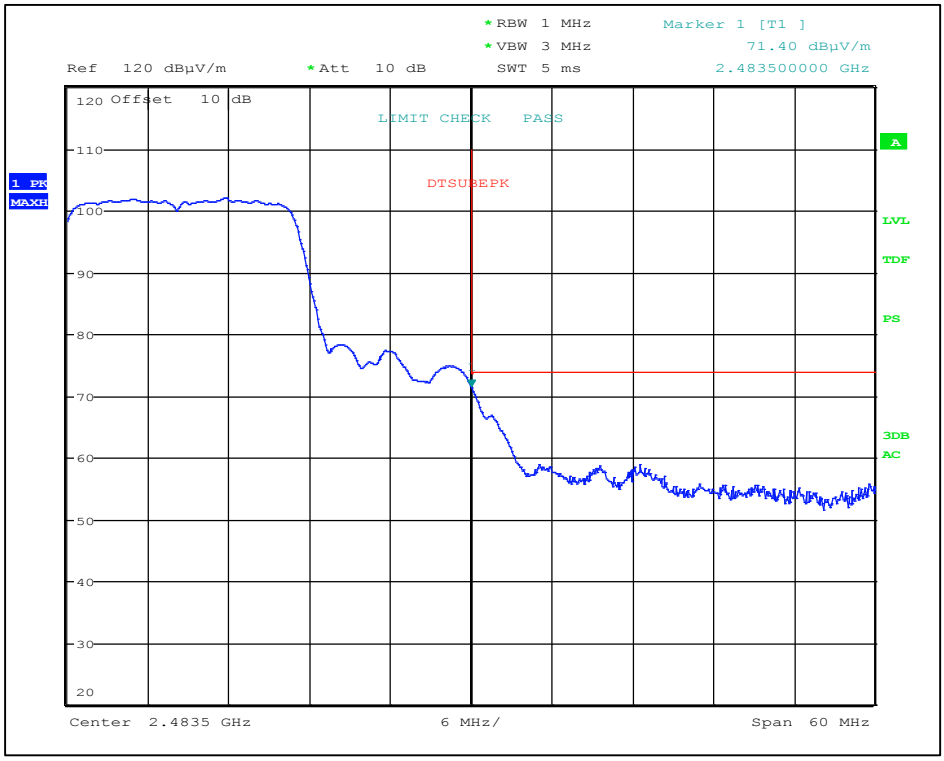
Refer to the following Plots



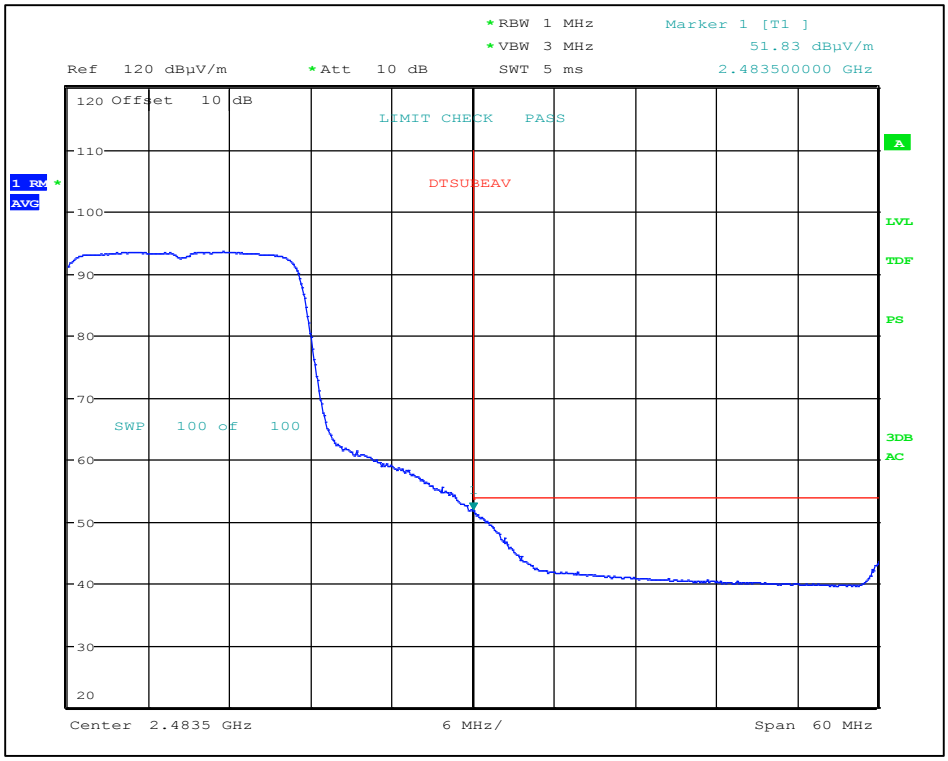
802.11n (HT20) at MCS0/6.5 Mbps - Restricted-band band-edge at high channel (Vertical Peak)



802.11n (HT20) at MCS0/6.5 Mbps - Restricted-band band-edge at high channel (Vertical Average)



802.11n (HT20) at MCS0/6.5 Mbps - Restricted-band band-edge at high channel (Horizontal Peak)



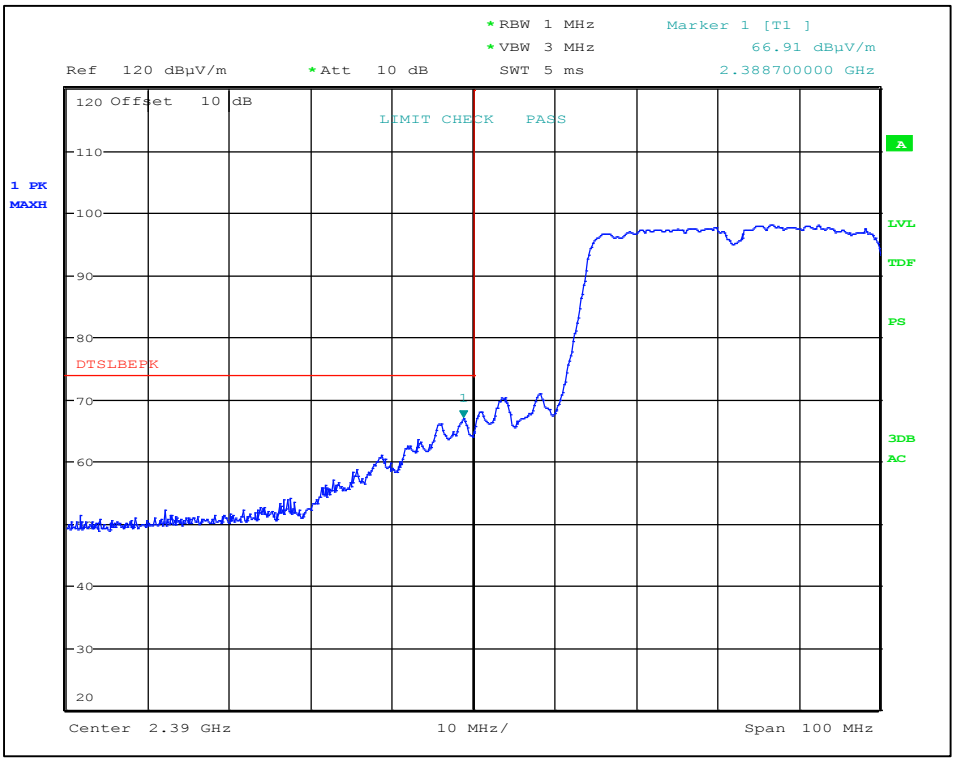
802.11n (HT20) at MCS0/6.5 Mbps - Restricted-band band-edge at high channel (Horizontal Average)

6.5.7 Radiated Restricted-band band-edge measurements at 2390 MHz [802.11n (HT40), MCS0]

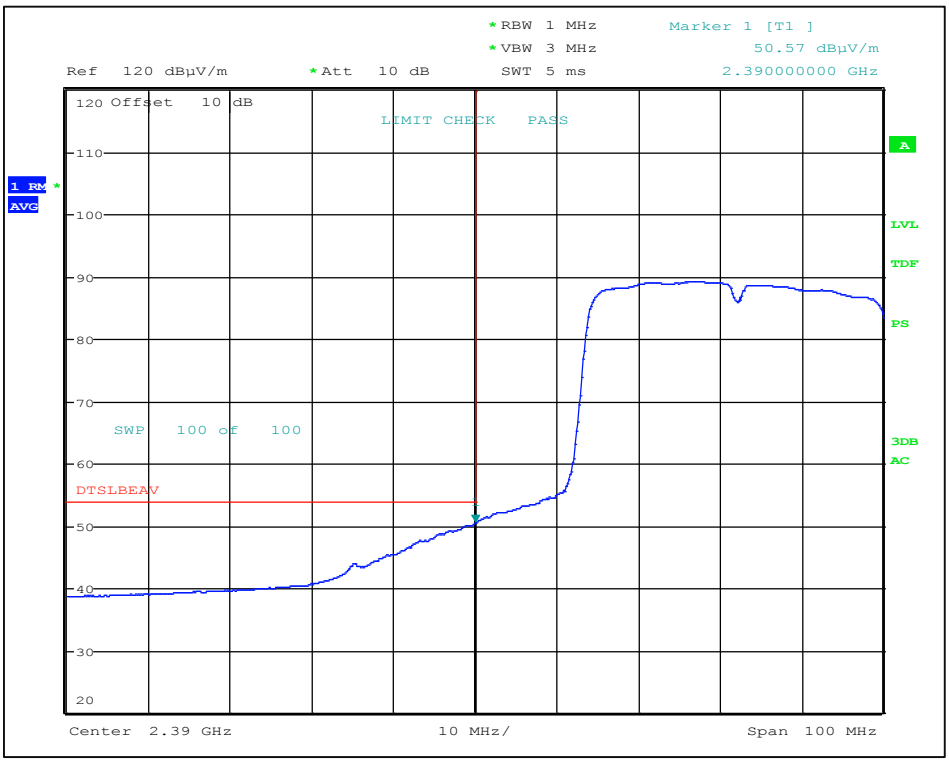
802.11n (HT40): MCS0/13.5 Mbps, Channel 3 (2422 MHz)

Frequency (MHz)	SA Reading (dBuV/m)	Detector PK/AV	Antenna		Turntable	EUT Antenna Polarity (V/H1/H2)	DC Factor (dB)	Transducer Factor (dB)	Corrected Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
			Height (cm)	Polarity (V/H)	Azimuth (Deg)						
2388.7	66.9	PK	130	V	335	V	0.00	-2.0	66.9	74.0	-7.1
2390.0	50.6	AV	130	V	335	V	0.00	-2.0	50.6	54.0	-3.4
2388.9	67.7	PK	100	H	65	H1	0.00	-2.2	67.7	74.0	-6.3
2390.0	53.0	AV	100	H	65	H1	0.00	-2.2	53.0	54.0	-1.0

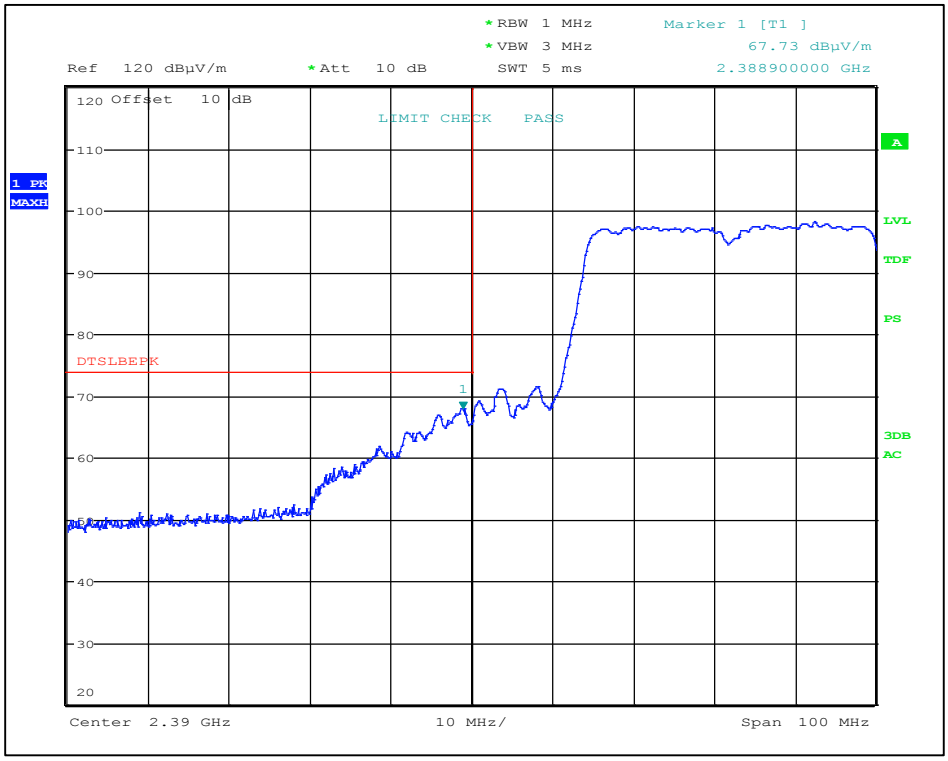
Refer to the following Plots



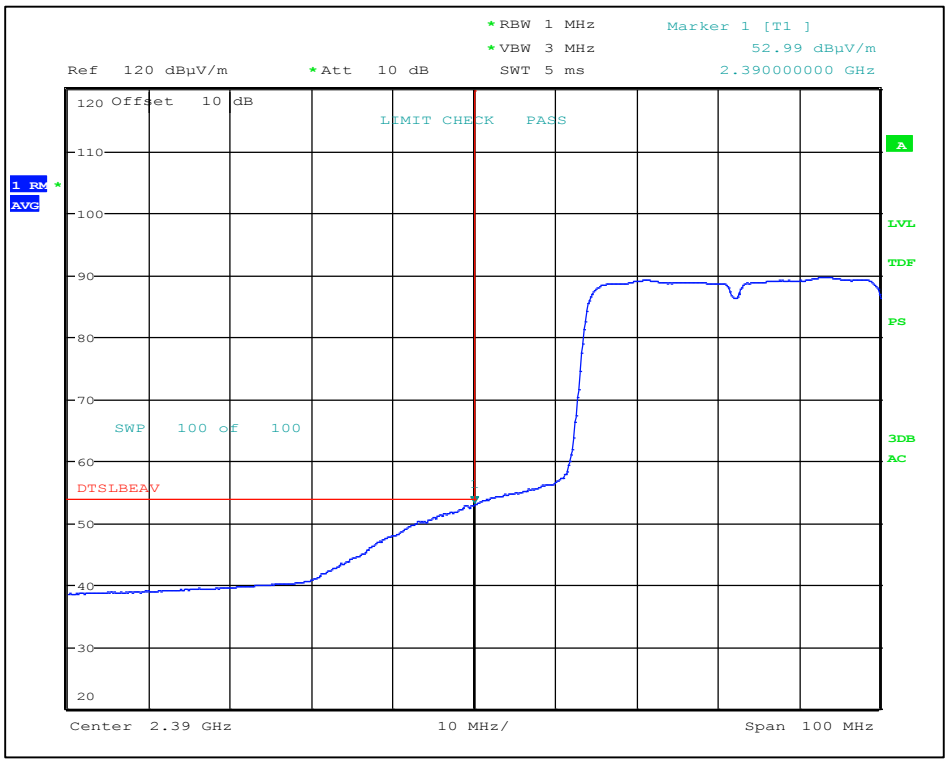
802.11n (HT40) at MCS0/13.5 Mbps - Restricted-band band-edge at low channel (Vertical Peak)



802.11n (HT40) at MCS0/13.5Mbps - Restricted-band band-edge at low channel (Vertical Average)



802.11n (HT40) at MCS0/13.5Mbps - Restricted-band band-edge at low channel (Horizontal Peak)



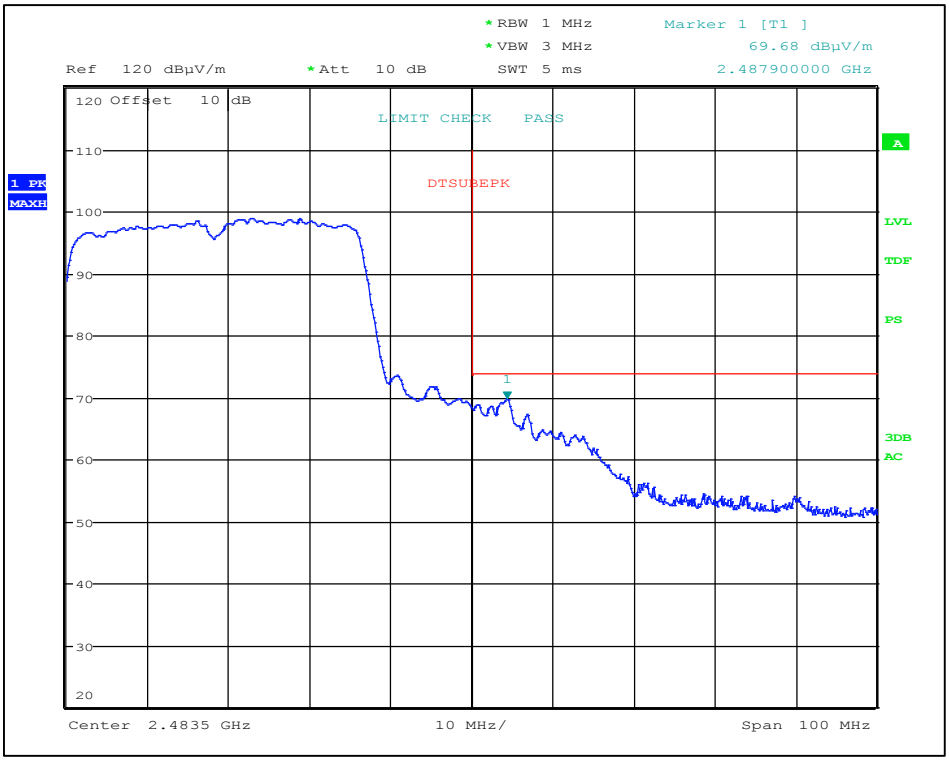
802.11n (HT40) at MCS0/13.5Mbps - Restricted-band band-edge at low channel (Horizontal Average)

6.5.8 Radiated Restricted-band band-edge at 2483.5 MHz [802.11n (HT40), MCS0]

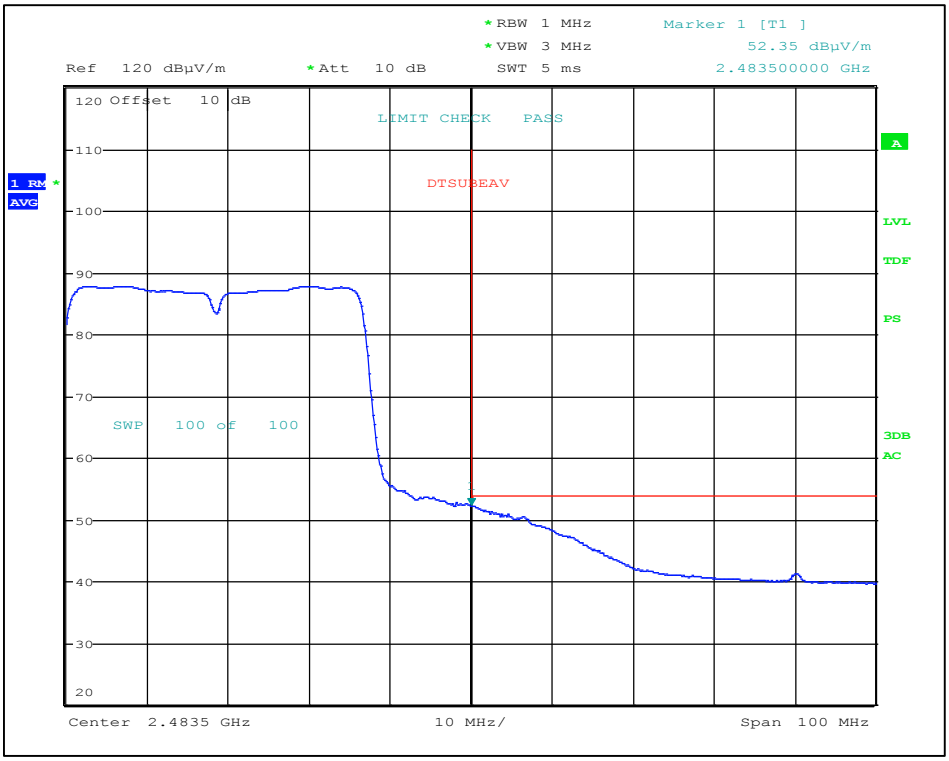
802.11n (HT40): MCS0/13.5 Mbps, Channel 9 (2452 MHz)

Frequency (MHz)	SA Reading (dBuV/m)	Detector PK/AV	Antenna		Turntable	EUT Antenna Polarity (V/H1/H2)	DC Factor (dB)	Transducer Factor (dB)	Corrected Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
			Height (cm)	Polarity (V/H)	Azimuth (Deg)						
2487.9	69.7	PK	130	V	335	V	0.00	-1.5	69.7	74.0	-4.3
2483.5	52.4	AV	130	V	335	V	0.00	-1.5	52.4	54.0	-1.6
2487.9	69.0	PK	100	H	65	H1	0.00	-1.8	69.0	74.0	-5.0
2483.5	52.8	AV	100	H	65	H1	0.00	-1.8	52.8	54.0	-1.2

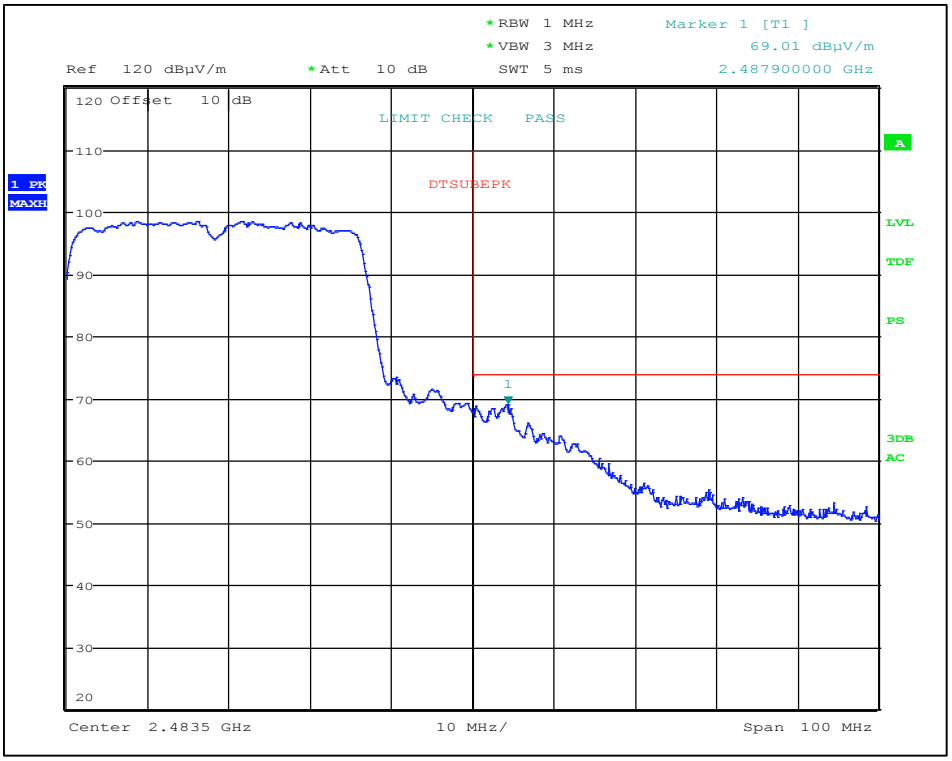
Refer to the following Plots



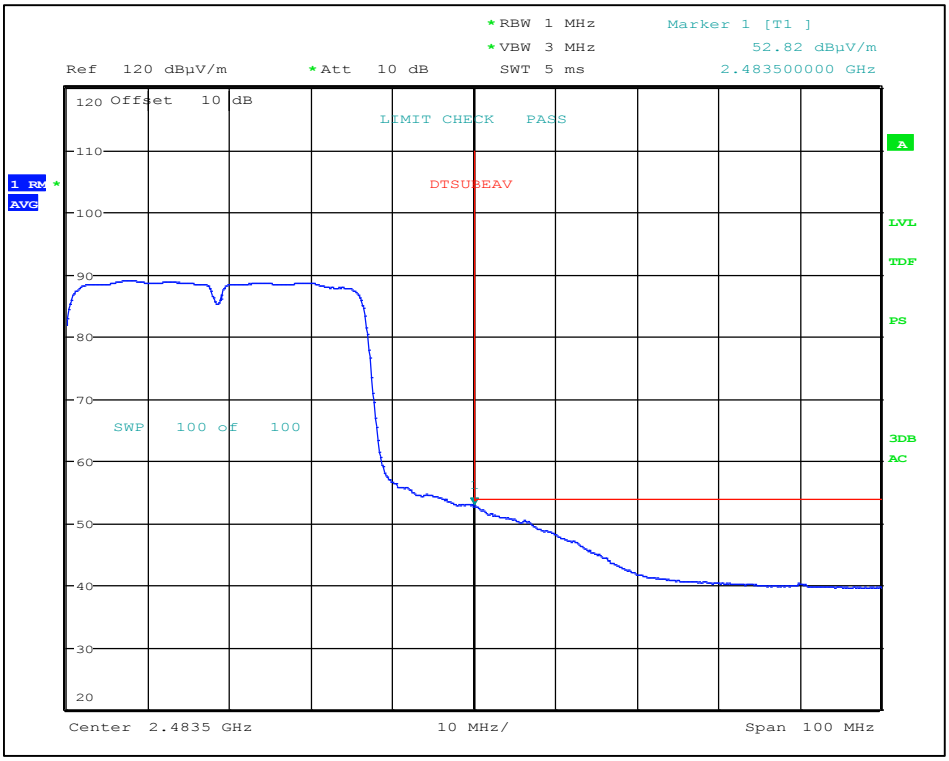
802.11n (HT40): MCS0/13.5 Mbps - Restricted-band band-edge at high channel (Vertical Peak)



802.11n (HT40): MCS0/13.5 Mbps - Restricted-band band-edge at high channel (Vertical Average)



802.11n (HT40): MCS0/13.5 Mbps - Restricted-band band-edge at high channel (Horizontal Peak)



802.11n (HT40): MCS0/13.5 Mbps - Restricted-band band-edge at high channel (Horizontal Average)

6.5.9 Transmitter Radiated Emissions above 1 GHz

Worst Case Mode:	802.11b
Data Rate:	1 Mbps
Measurement Distance:	3 meters
Operating Mode:	Continuous Transmit
Frequency Range:	1000 MHz – 25000 MHz
Note: The pre-scan plots do not show the maximized amplitude, only included for the purpose of identifying spurious emissions requiring final measurements.	

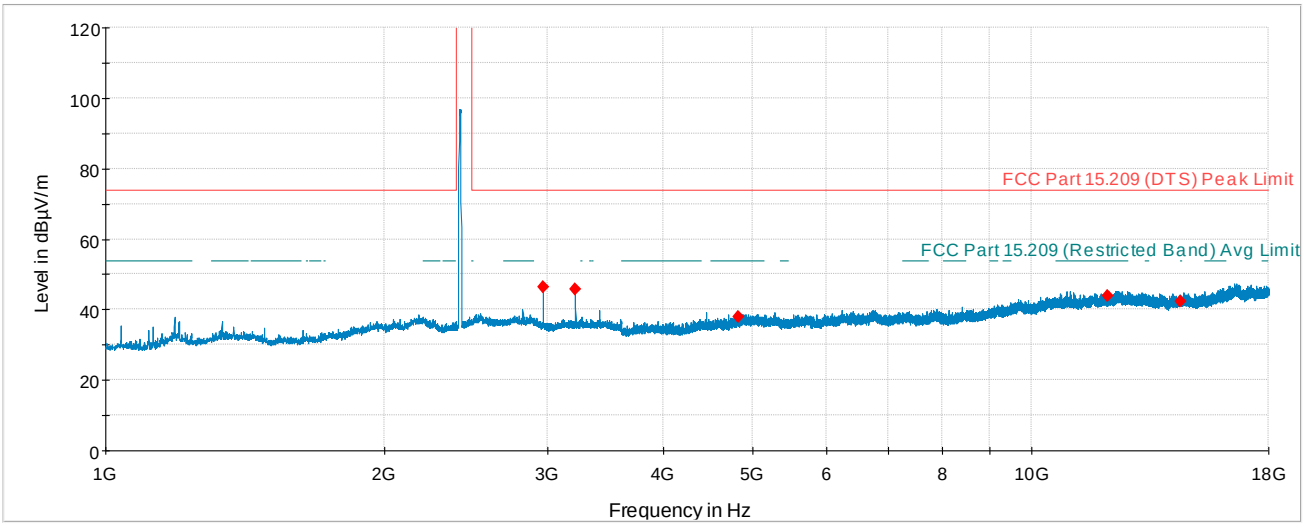
Channel 1 (2412 MHz)

Frequency (MHz)	SA Reading (dBuV/m)	Detector PK/AV	Antenna		Turntable	EUT Antenna Polarity (V/H1/H2)	DC Factor (dB)	Correction Factor (dB)	Corrected Level (dBuV/m)	Limit [RB] (dBuV/m)	Margin (dB)
			Height (cm)	Polarity (V/H)	Azimuth (Deg)						
*1200.0	48.8	PK	180.0	H	150.0	H1	0.0	-5.3	43.5	74.0	-30.5
*1200.0	36.9	AV	180.0	H	150.0	H1	0.0	-5.3	31.6	54.0	-22.4
*4824.0	37.3	PK	130.0	H	295.0	H1	0.0	3.4	40.7	74.0	-33.3
*4824.0	26.5	AV	130.0	H	295.0	H1	0.0	3.4	29.9	54.0	-24.1
*19296.0	#	PK	-	H	-	H1	0.0	4.7	#	74.0	-

*Note: * - indicates frequency in FCC §15.205 Restricted bands of operation; RB - Restricted Band*
 # - the maximized peak measured value was greater than 20 dB below the limit and/or complies with the average limit, thus both peak and average were not reported

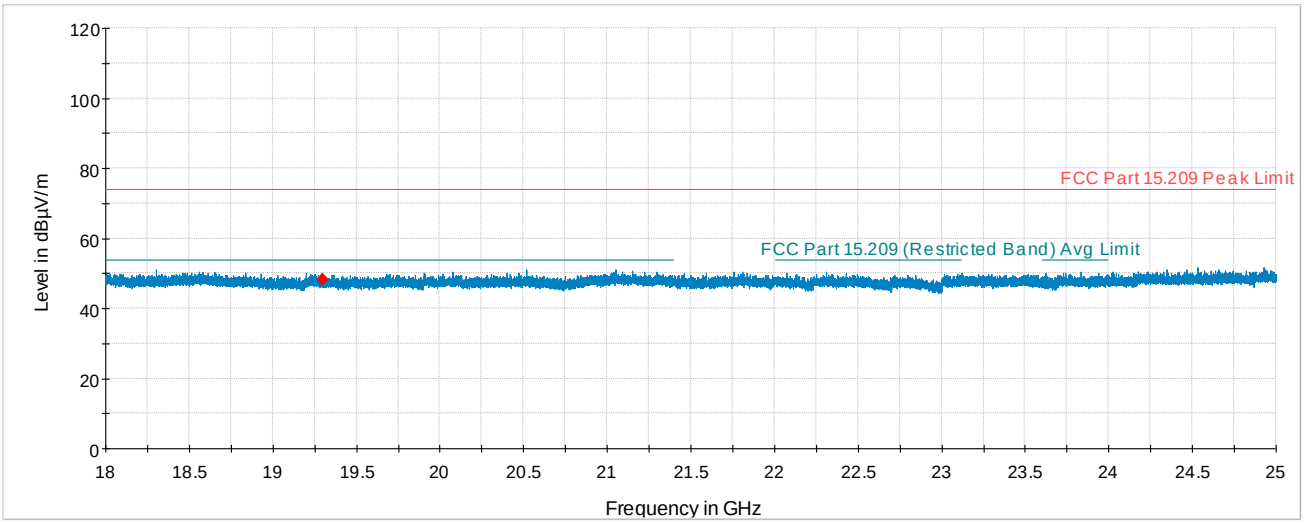
Radiated Spurious Emissions Pre-scan Vertical and Horizontal Plots

Channel 1 (2412 MHz) 1000-18000 MHz Vertical Plot



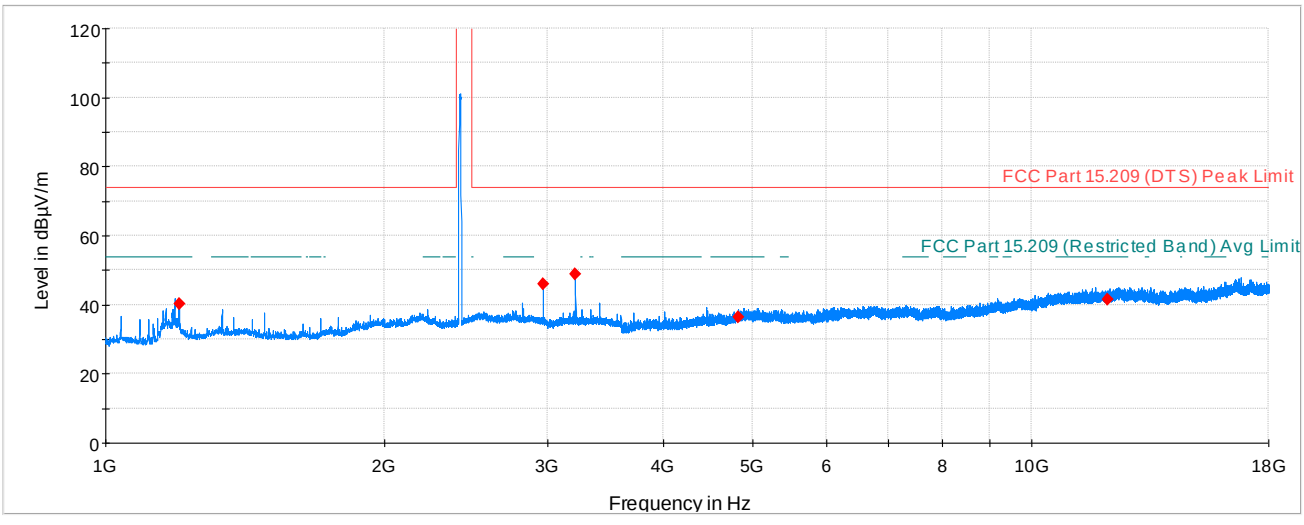
802.11b: 1Mbps - Radiated Emissions 1-18 GHz at Channel 1 (Vertical)

Channel 1 (2412 MHz) 18000-25000 MHz Vertical Plot



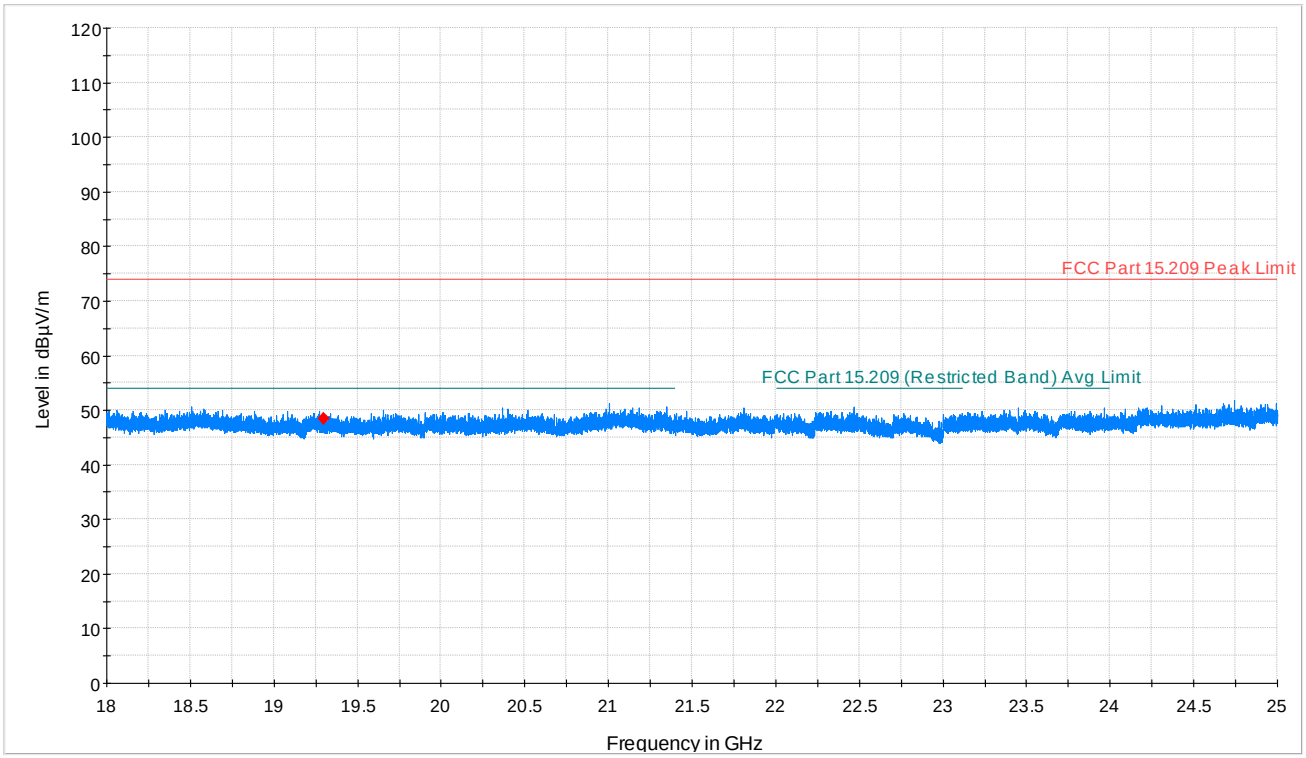
802.11b: 1Mbps - Radiated Emissions 1-18 GHz at Channel 1 (Vertical)

Channel 1 (2412 MHz) 1000-18000 MHz Horizontal Plot



802.11b: 1Mbps - Radiated Emissions 1-18 GHz at Channel 1 (Horizontal)

Channel 1 (2412 MHz) 18000-25000 MHz Horizontal Plot



802.11b: 1Mbps - Radiated Emissions 1-18 GHz at Channel 1 (Horizontal)

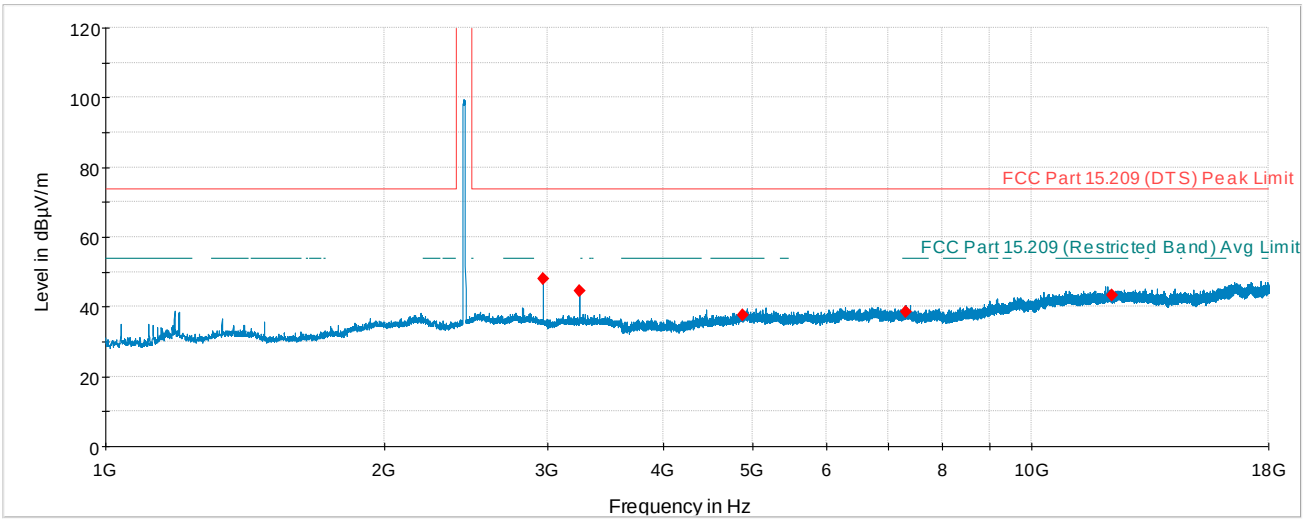
Channel 6 (2437 MHz)

Frequency (MHz)	SA Reading (dBuV/m)	Detector PK/AV	Antenna		Turntable	EUT Antenna Polarity (V/H1/H2)	DC Factor (dB)	Correction Factor (dB)	Corrected Level (dBuV/m))	Limit [RB] (dBuV/m)	Margin (dB)
			Height (cm)	Polarity (V/H)	Azimuth (Deg)						
*4874.0	37.0	PK	130.0	H	295.0	H1	0.0	3.8	40.8	74.0	-33.2
*4874.0	26.6	AV	130.0	H	295.0	H1	0.0	3.8	30.4	54.0	-23.6
*19496.0	#	PK	-	H	-	H1	0.0	4.8	#	74.0	-

*Note: * - indicates frequency in FCC §15.205 Restricted bands of operation; RB - Restricted Band*
 # - the maximized peak measured value was greater than 20 dB below the limit and/or complies with the average limit, thus both peak and average were not reported

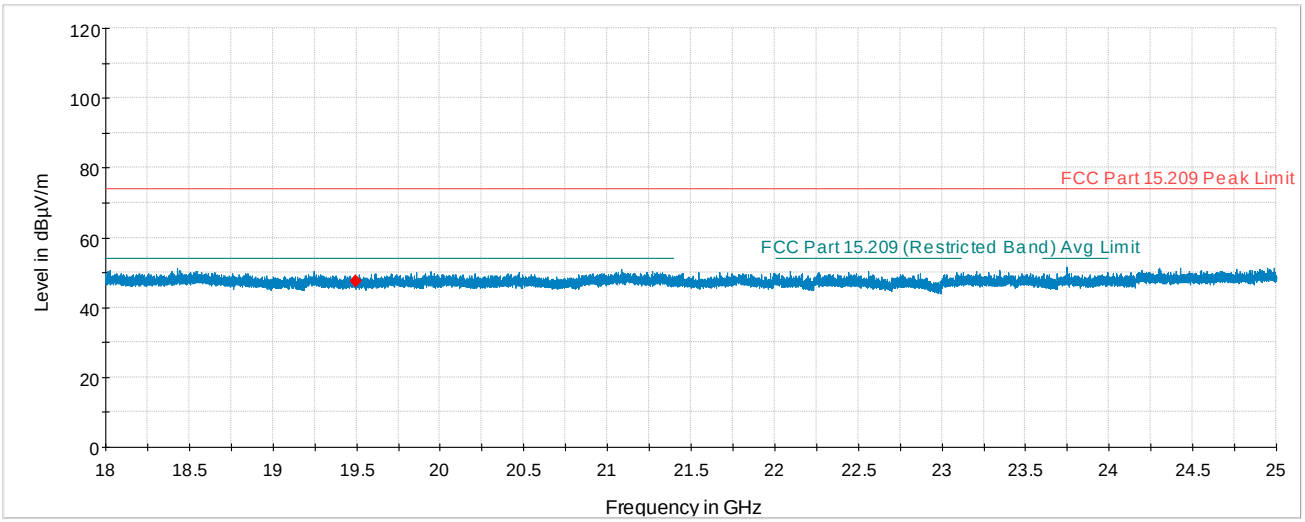
Radiated Spurious Emissions Pre-scan Vertical and Horizontal Plots

Channel 6 (2437 MHz): 1000-18000 MHz Vertical Plot



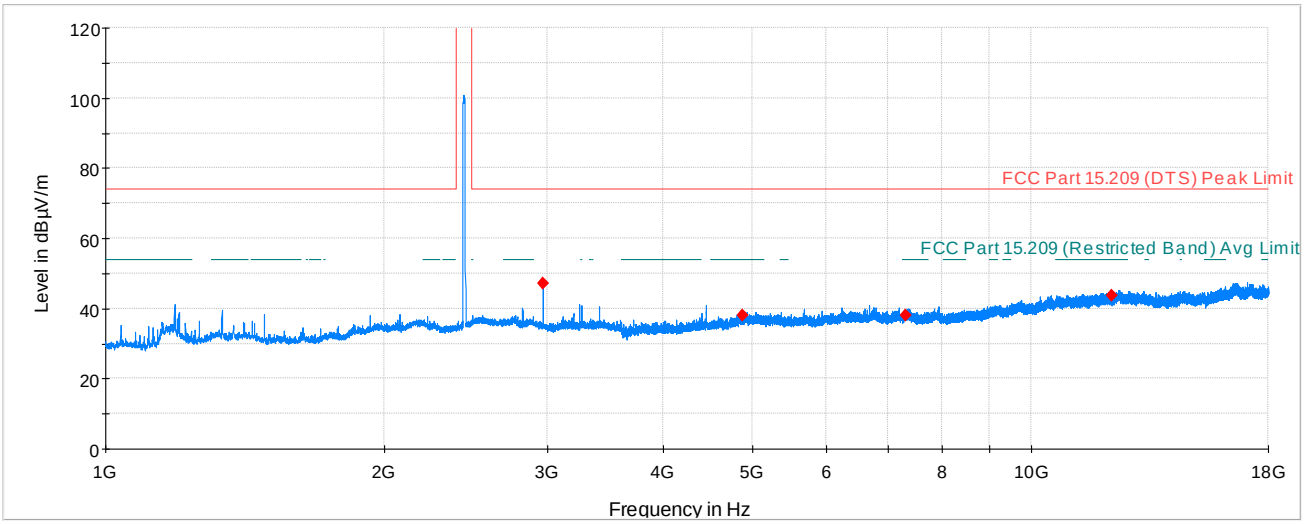
802.11b: 1Mbps - Radiated Emissions 1-18 GHz at Channel 6 (Vertical)

Channel 6 (2437 MHz): 18000-25000 MHz Vertical Plot



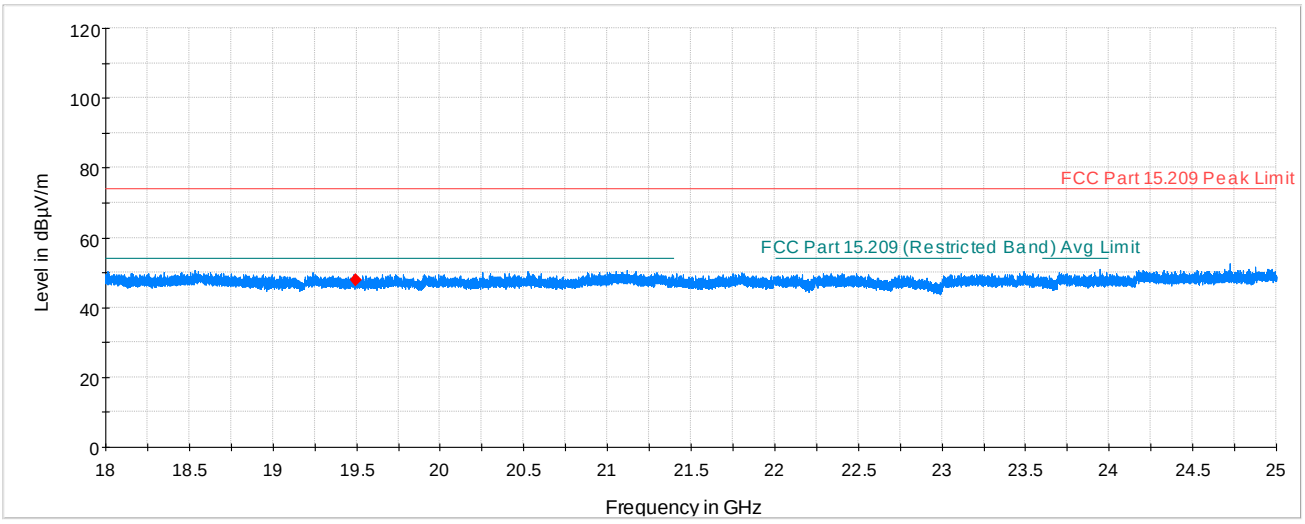
802.11b: 1Mbps - Radiated Emissions 1-18 GHz at Channel 6 (Vertical)

Channel 6 (2437 MHz): 1000-18000 MHz Horizontal Plot



802.11b: 1Mbps - Radiated Emissions 1-18 GHz at Channel 6 (Horizontal)

Channel 6 (2437 MHz): 18000-25000 MHz Horizontal Plot



802.11b: 1Mbps - Radiated Emissions 1-18 GHz at Channel 6 (Horizontal)

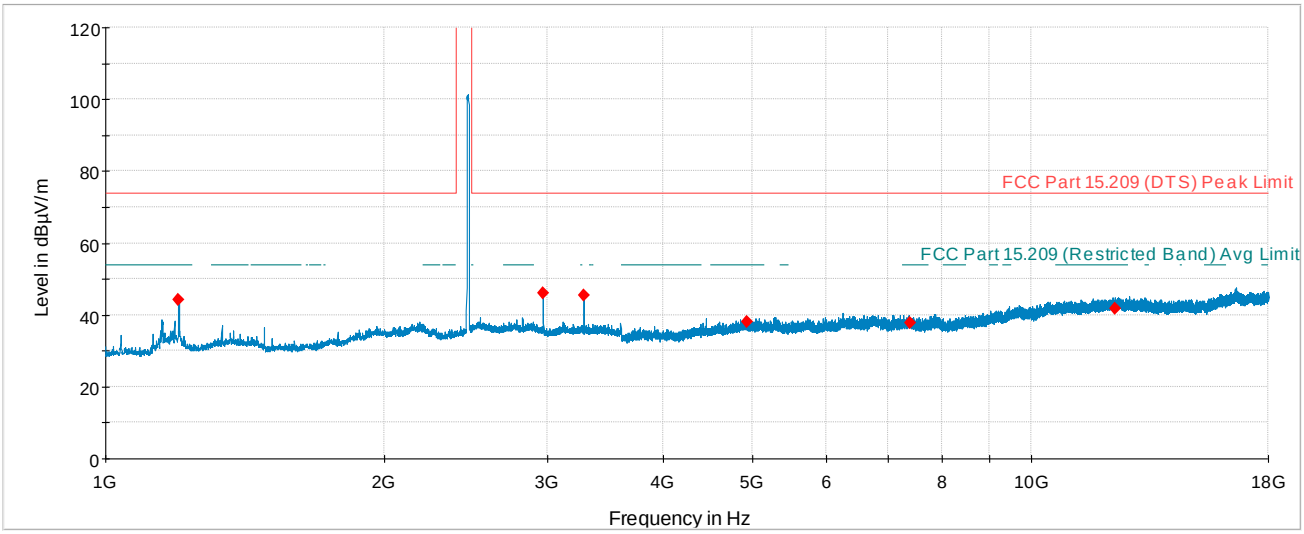
Channel 11 (2462 MHz)

Frequency (MHz)	SA Reading (dBuV/m)	Detector PK/AV	Antenna		Turntable	EUT Antenna Polarity (V/H1/H2)	DC Factor (dB)	Correction Factor (dB)	Corrected Level (dBuV/m)	Limit [RB] (dBuV/m)	Margin (dB)
			Height (cm)	Polarity (V/H)	Azimuth (Deg)						
*4924.0	37.5	PK	150.0	H	300.0	H1	0.0	4.0	41.5	74.0	-32.5
*4924.0	26.9	AV	150.0	H	300.0	H1	0.0	4.0	30.9	54.0	-23.1
*19696.0	#	PK	-	H	-	H1	0.0	5.0	#	74.0	-
*22158.0	#	PK	-	H	-	H1	0.0	5.7	#	74.0	-

*Note: * - indicates frequency in FCC §15.205 Restricted bands of operation; RB - Restricted Band*
 # - the maximized peak measured value was greater than 20 dB below the limit and/or complies with the average limit, thus both peak and average were not reported

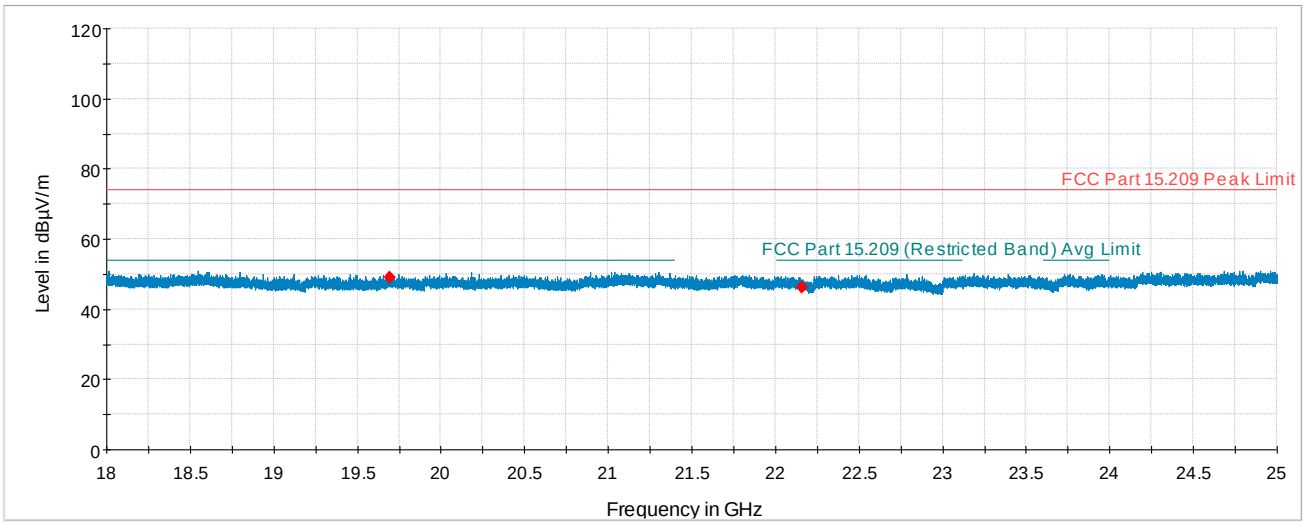
Radiated Spurious Emissions Pre-scan Vertical and Horizontal Plots

Channel 11 (2462 MHz): 1000-18000 MHz Vertical Plot



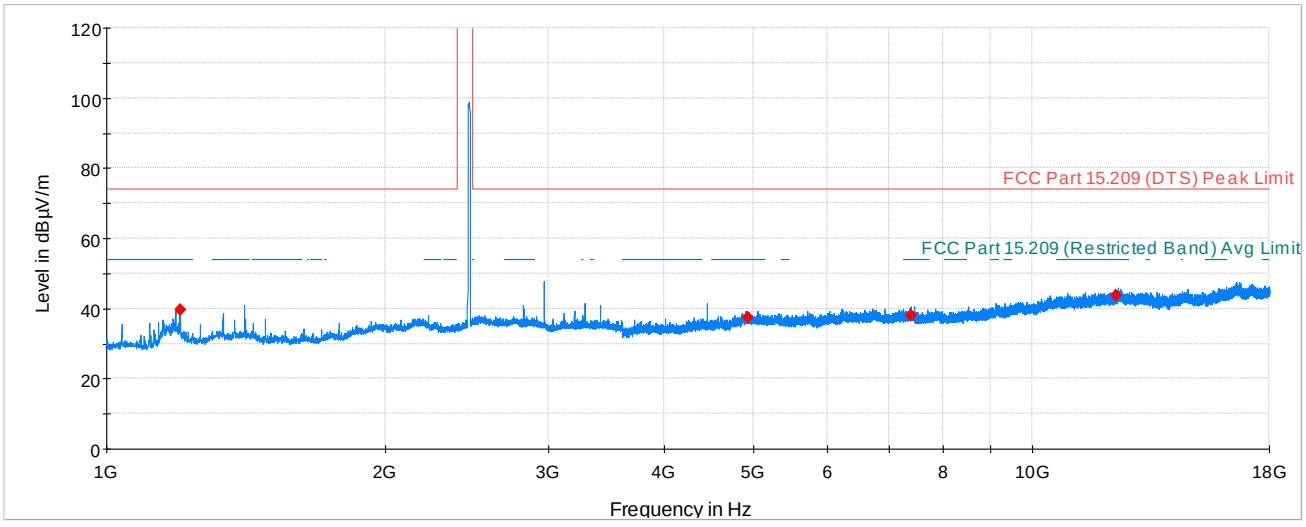
802.11b: 1Mbps - Radiated Emissions 1-18 GHz at Channel 11 (Vertical)

Channel 11 (2462 MHz): 18000-25000 MHz Vertical Plot



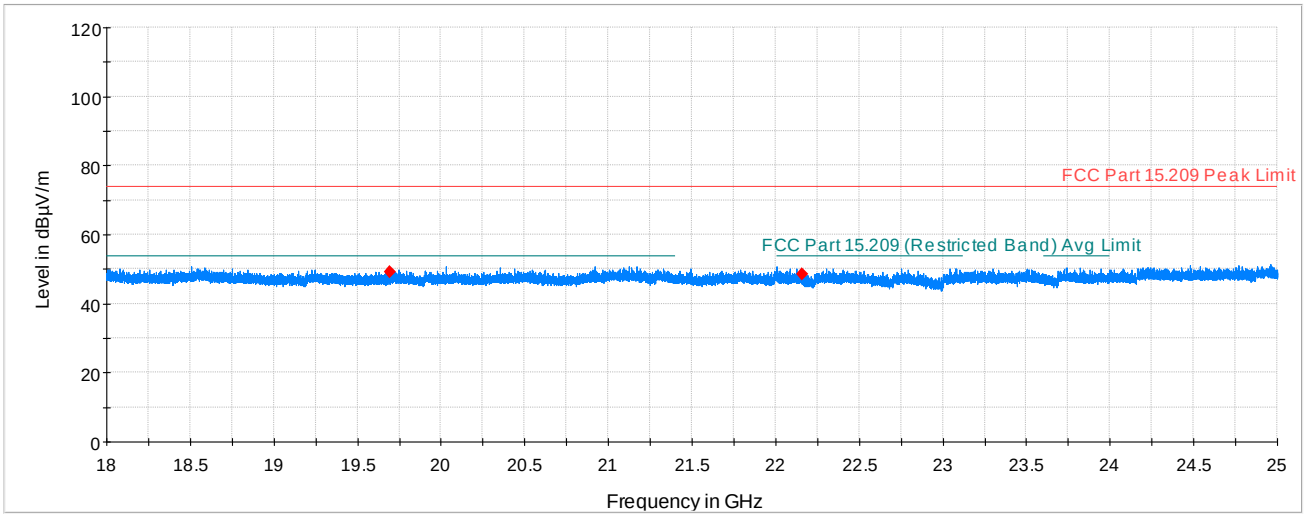
802.11b: 1Mbps - Radiated Emissions 1-18 GHz at Channel 11 (Vertical)

Channel 11 (2462 MHz): 1000-18000 MHz Horizontal Plot



802.11b: 1Mbps - Radiated Emissions 1-18 GHz at Channel 11 (Horizontal)

Channel 11 (2462 MHz): 18000-25000 MHz Horizontal Plot



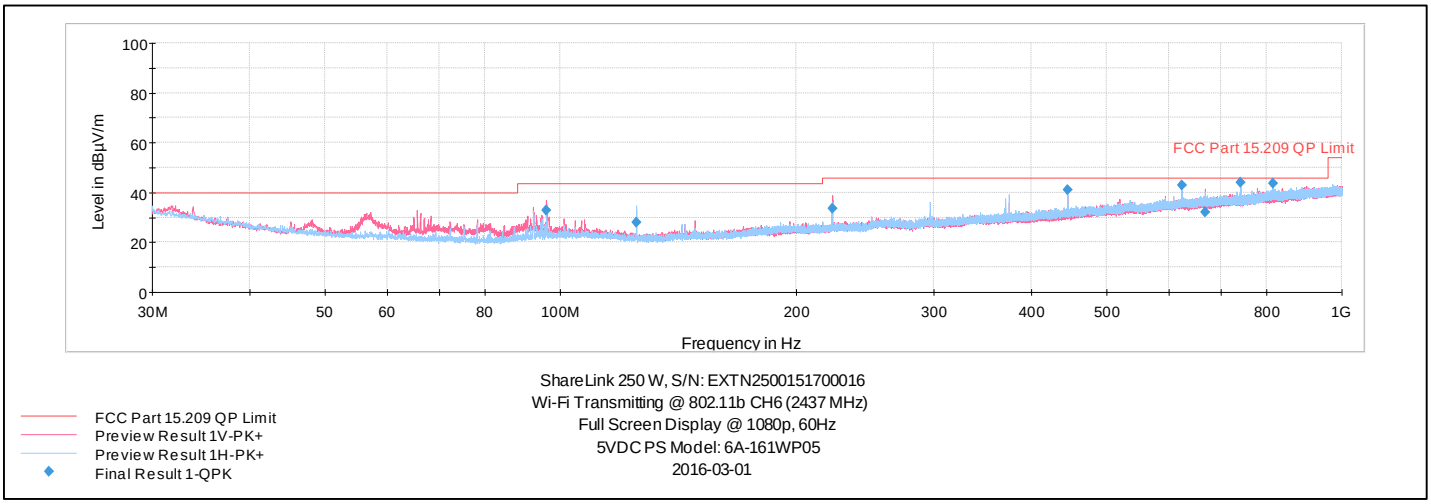
802.11b: 1Mbps - Radiated Emissions 1-18 GHz at Channel 11 (Horizontal)

6.5.10 Transmitter Radiated Emissions in the 30MHz to 1000MHz

A. Using adapter power supply (Model: 6A-161WP05)

Worst Case Mode:	802.11b	Test Date(s):	03/01/2016
Data Rate:	1Mbps	Test Location (Lab):	Lab B
Measurement Distance:	3 meters	Temperature (°C):	23
Operating Frequency:	2437 MHz	Humidity (%):	53
Test Channel:	6	Atmospheric pressure (mbar):	1017
Note: EUT at Full Screen Display with 1080p, 60Hz resolution; W-Fi Transmitter ON; LAN at 1GB Connection			

30-1000 MHz Plot



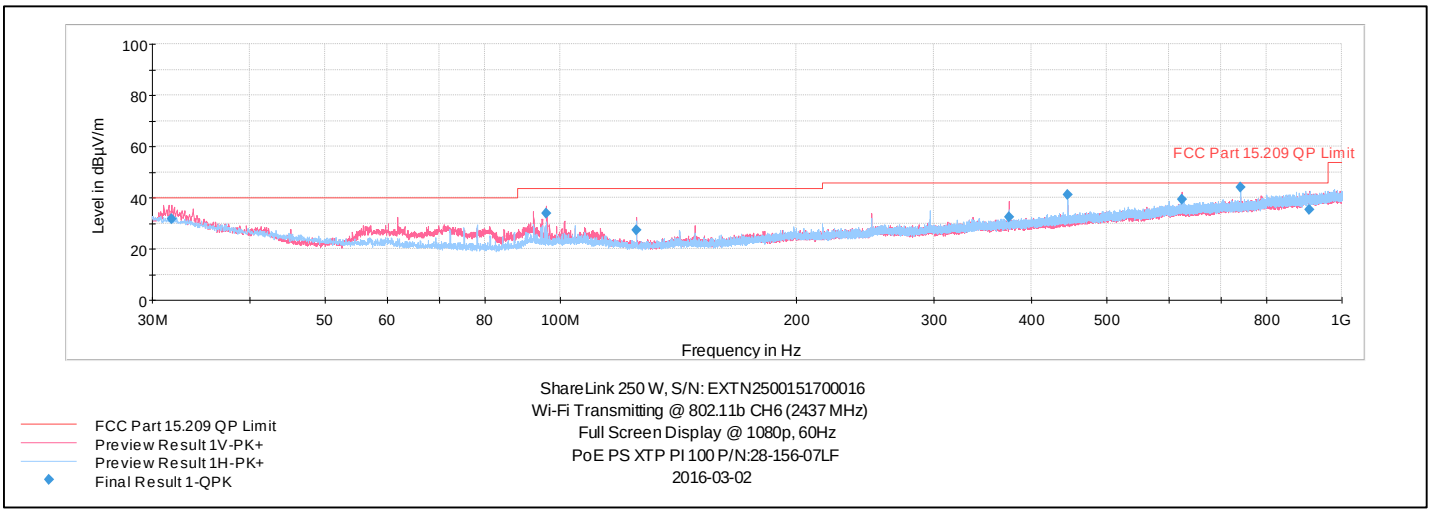
Results

Frequency (MHz)	Amplitude (dBµV)	Height (cm)	Antenna Polarization (H/V)	Azimuth (deg)	Correction Factor (dB)	Margin (dB)	Limit (dBµV/m)	Detector (QP/PK/AV)
742.188	44.0	123.0	H	279.0	23.5	-2.0	46.0	QP
816.443	43.7	116.0	H	306.0	25.3	-2.3	46.0	QP
625.002	42.8	170.0	H	254.0	22.6	-3.2	46.0	QP
445.306	40.9	100.0	H	162.0	19.0	-5.1	46.0	QP
95.942	32.8	113.0	V	235.0	10.2	-10.7	43.5	QP
222.689	33.6	100.0	V	0.0	12.5	-12.4	46.0	QP

B. Using PoE power supply (Model: XTP PI 100)

Worst Case Mode:	802.11b	Test Date(s):	03/02/2016
Data Rate:	1Mbps	Test Location (Lab):	Lab B
Measurement Distance:	3 meters	Temperature (°C):	23
Operating Frequency:	2437	Humidity (%):	45
Test Channel:	6	Atmospheric pressure (mbar):	1018
Note: EUT at Full Screen Display with 1080p, 60Hz resolution; W-Fi Transmitter ON; LAN at 1GB Connection			

30-1000 MHz Plot



Results

Frequency (MHz)	Amplitude (dBµV)	Height (cm)	Antenna Polarization (H/V)	Azimuth (deg)	Correction Factor (dB)	Margin (dB)	Limit (dBµV/m)	Detector (QP/PK/AV)
742.214	43.9	128.0	H	288.0	23.5	-2.1	46.0	QP
445.319	41.2	100.0	H	153.0	19.0	-4.8	46.0	QP
625.011	39.2	100.0	V	80.0	22.0	-6.8	46.0	QP
31.807	31.7	100.0	V	70.0	15.5	-8.3	40.0	QP
95.921	33.7	153.0	V	269.0	10.2	-9.8	43.5	QP
908.170	35.2	130.0	V	82.0	26.5	-10.8	46.0	QP

6.6 AC Power-line Conducted Emissions

Limits

FCC § 15.207 (a)

Frequency of emissions (MHz)	Conducted Limit (dBµV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

** Decreases with the logarithm of the frequency*

RSS-Gen Issue 4 Section 8.8

A radio apparatus that is designed to be connected to the public utility (AC) power line shall ensure that the radio frequency voltage, which is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz-30 MHz, shall not exceed the limits in Table 3.

Table 3 – AC Power Line Conducted Emissions Limits

Frequency of emissions (MHz)	Conducted Limit (dBµV)	
	Quasi-peak	Average**
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

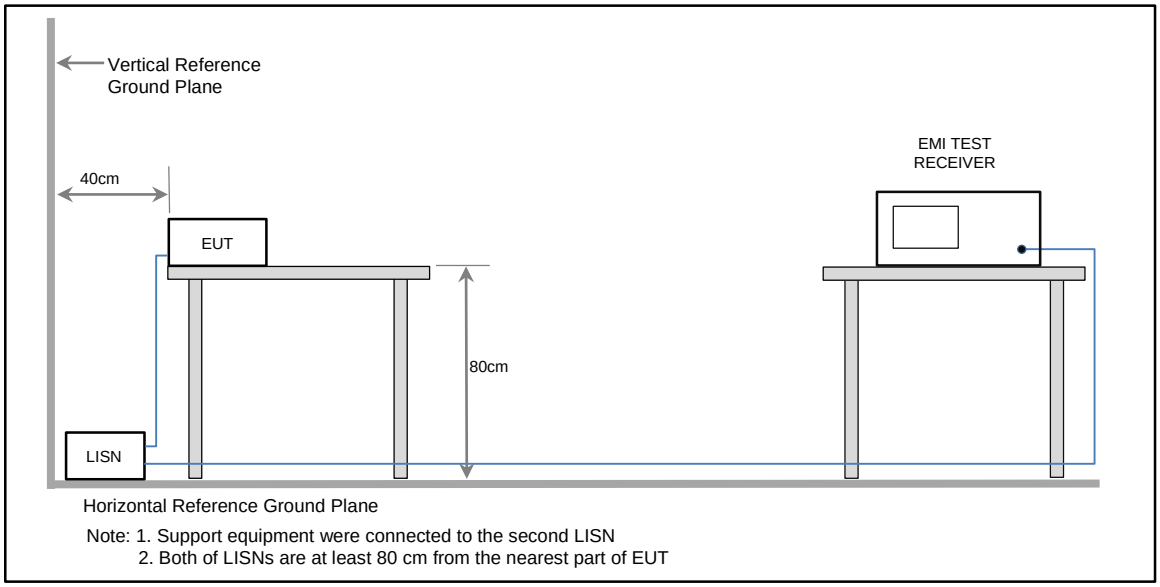
** Decreases with the logarithm of the frequency, ** A linear average detector is required*

Conducted Emissions Test Setup and Procedure

The EUT power cord was connected to a LISN and folded back and forth forming a bundle 30 to 40 cm long. All support equipment power cords were connected to an auxiliary LISN via a multiple outlet strip. The EUT LISN was kept at a distance 80 cm from the closest part of the EUT.
Using the test software, an initial PEAK pre-scan was taken. After the pre-scan was complete, a minimum of 6 highest frequencies were chosen. Quasi-Peak and Average measurements were taken at these frequencies selected. If the test software measured any signal within 3 dB of the limit, then the same signal was re-measured manually using the front keys of the EMI receiver to make sure of the software accuracy. This was performed for both “Line 1” and “Neutral” leads of the EUT power cord.

Example of Calculations:

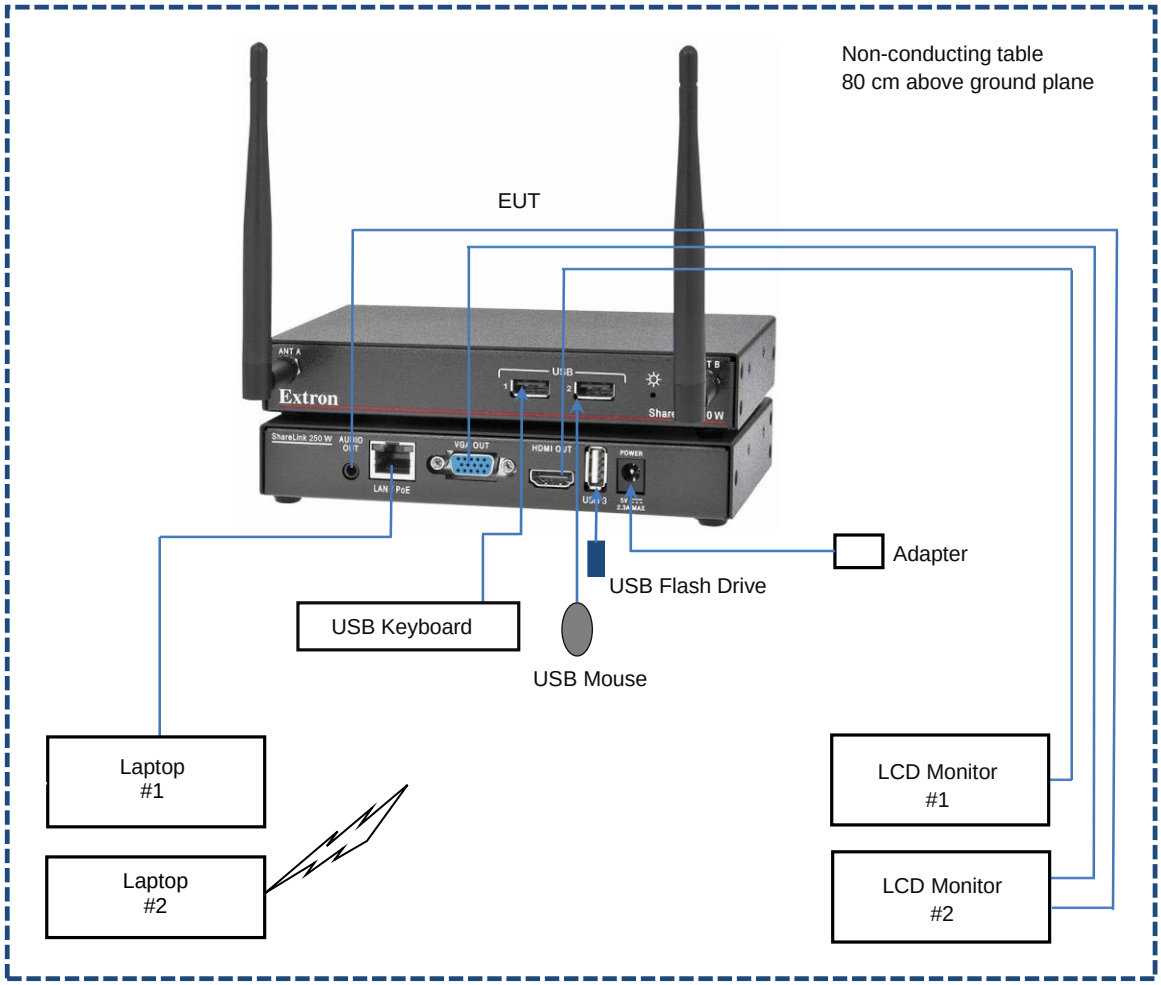
Amplitude [QP/AV] $_{(dBuV)}$ = Receiver Level $_{(dBµV)}$ + Correction Factor $_{(dB)}$
Correction Factor $_{(dB)}$ = Cable Loss $_{(dB)}$ + LISN Insertion Loss $_{(dB)}$ + 10 dB Attenuator
Margin $_{(dB)}$ = Amplitude [QP/AV] $_{(dBuV)}$ – Limit [QP/AV] $_{(dBuV)}$



Note: 1. Support equipment were connected to the second LISN
2. Both of LISNs are at least 80 cm from the nearest part of EUT

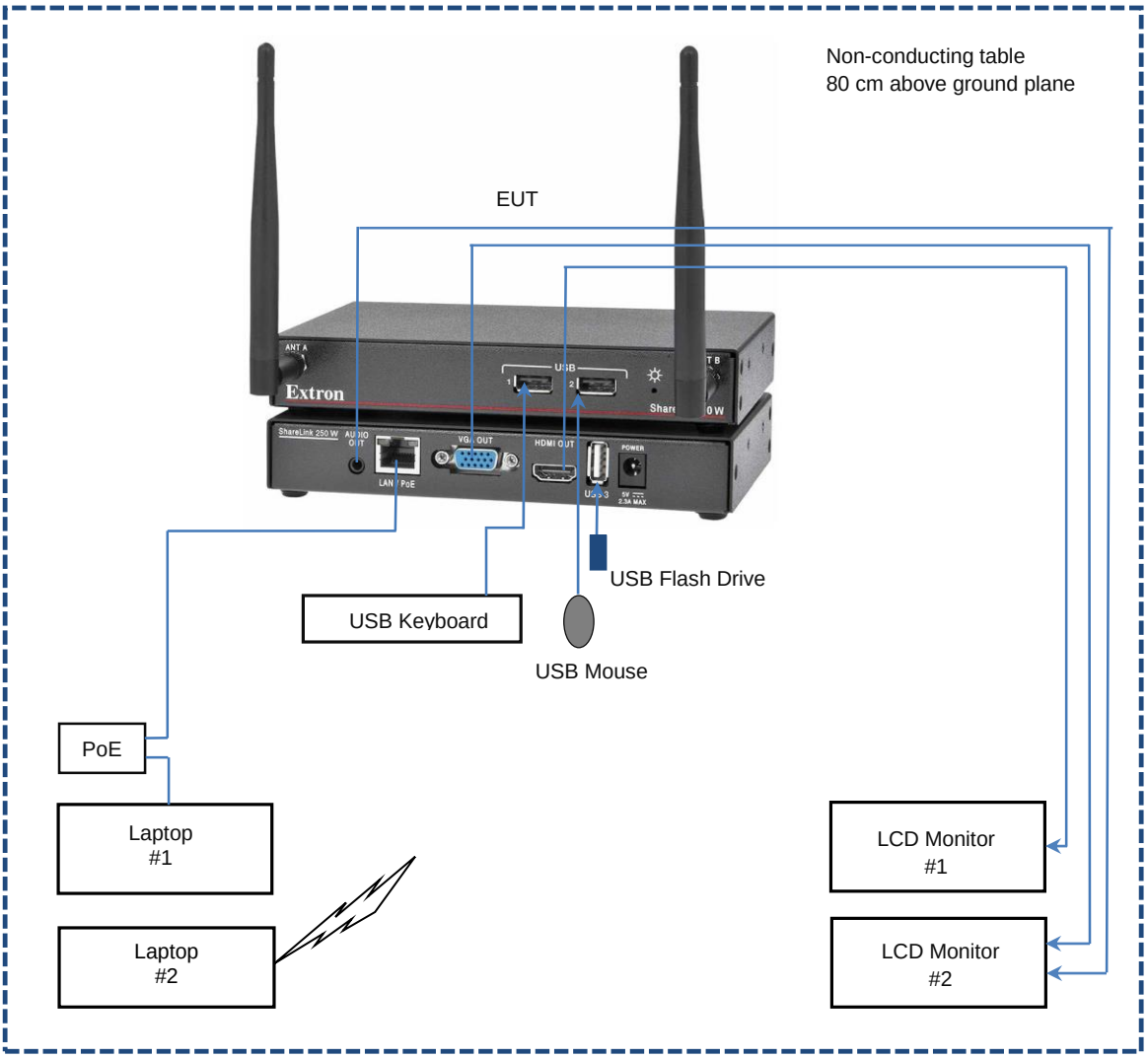
EUT Connection Diagram

a. Using Adapter 6A-161WP05, 5Vdc



- HDMI OUT connected to LCD monitor #1 with 15' HDMI Ultra cable.
- VGA OUT connected to LCD monitor #2 with 35' VGA cable.
- Audio OUT connected to LCD monitor #2 (PC Audio IN) with 25' Audio mini cable
- USB 1 with USB keyboard
- USB 2 with USB mouse
- USB 3 with USB Flash Drive
- Laptop #2 (receive mode) connected to EUT via Wi-Fi
- LAN/POE connected to Laptop #1 with 10' CAT-5e UTP cable
- Power connected to AC Adapter

b. Using PoE XTP PI 100, +48Vdc



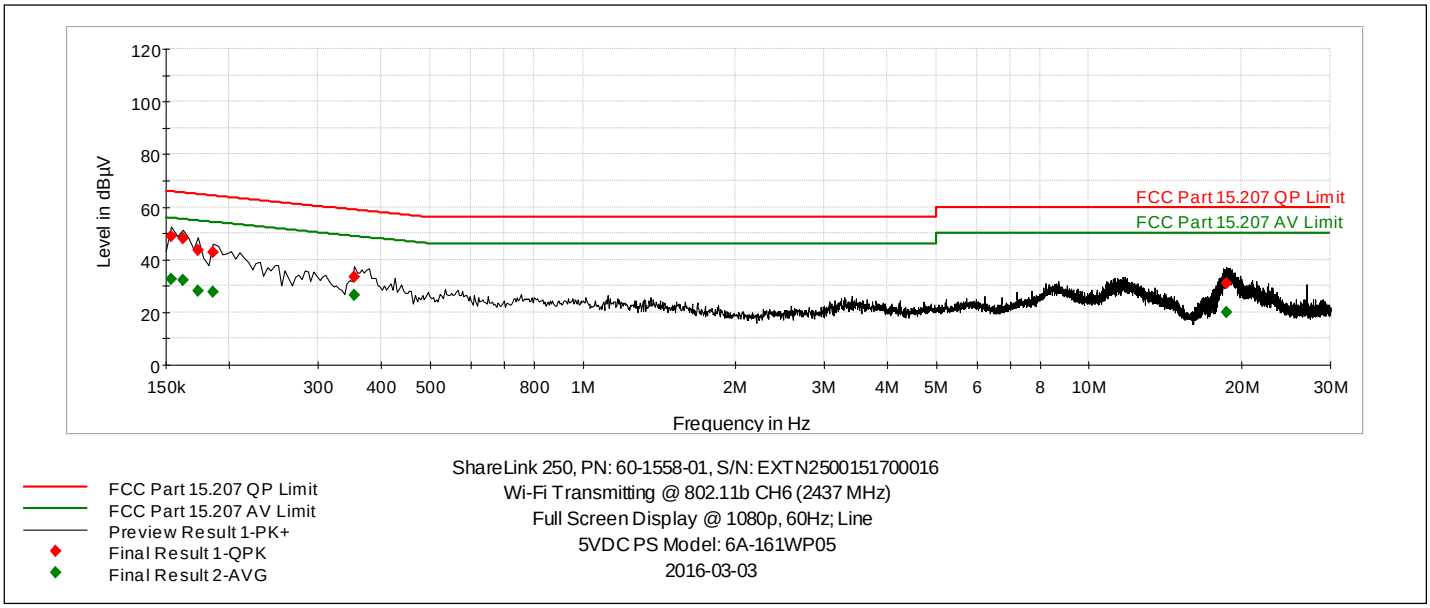
- HDMI OUT connected to LCD monitor #1 with 15’ HDMI Ultra cable.
- VGA OUT connected to LCD monitor #2 with 35’ VGA cable.
- Audio OUT connected to LCD monitor #2 (PC Audio IN) with 25’ Audio mini cable
- USB 1 with USB keyboard
- USB 2 with USB mouse
- USB 3 with USB Flash Drive
- Laptop #2 (receive mode) connected to EUT via Wi-Fi
- LAN/POE connected to PoE Power Supply with 10’ CAT-5e UTP cable
- PoE Power Supply connected to Laptop with 10’ CAT-5e UTP cable

Test Results

A. Adapter Power Supply

Wi-Fi Operating Mode:	802.11b	Test Date(s):	03/03/2016
Wi-Fi Operating Frequency:	2437 MHz	Test Location (Lab):	Lab E
Wi-Fi Channel	6	Temperature (°C):	23
Test Voltage/Frequency:	120Vac/60Hz	Humidity (%):	46
Power Supply:	Model: 6A-161WP05	Atmospheric pressure (mbar):	1018
Note: EUT at Full Screen Display with 1080p, 60Hz resolution; W-Fi Transmitter ON; LAN at 1GB Connection			

LINE1 (L1) Plot

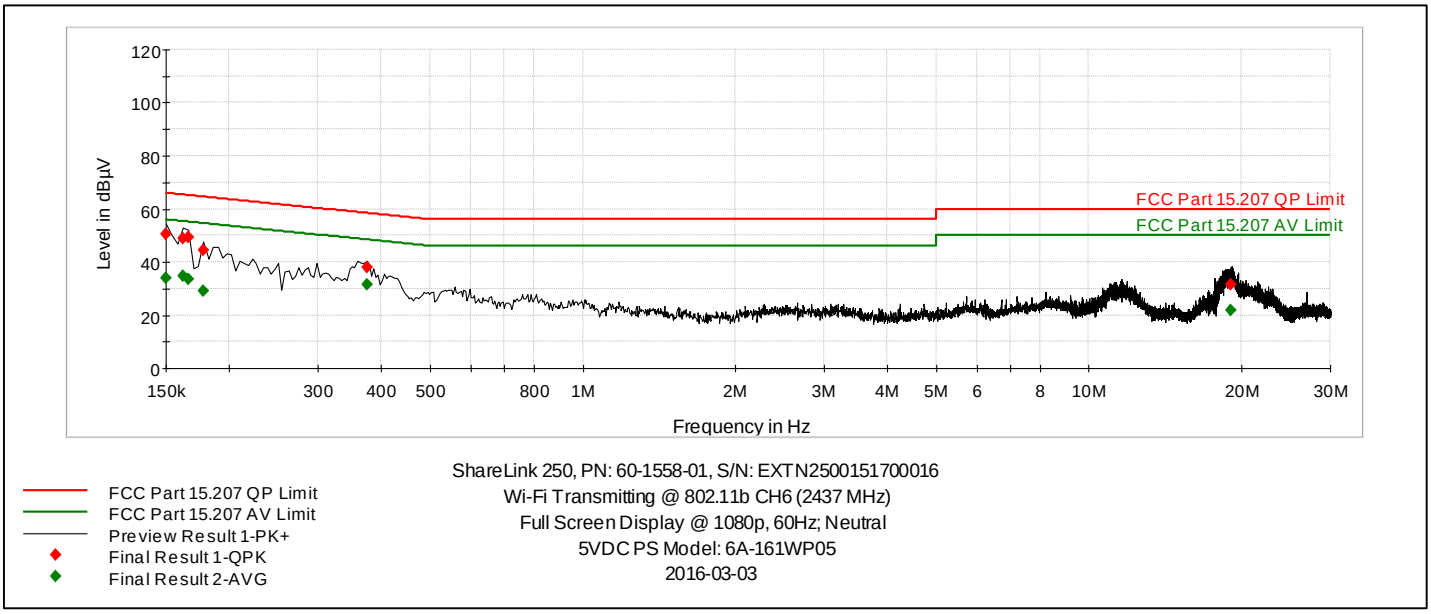


LINE1 (L1) Results

Frequency (MHz)	Amplitude (dBµV)	Line (L1/N)	Correction Factor (dB)	Margin (dB)	Limit (dBµV)	Detector (QP/AV)
0.154	49.0	L1	19.9	-16.8	65.8	QP
0.162	47.9	L1	19.9	-17.5	65.4	QP
0.174	43.5	L1	19.9	-21.3	64.8	QP
0.186	42.5	L1	19.8	-21.7	64.2	QP
0.354	33.2	L1	19.8	-25.7	58.9	QP
18.730	30.9	L1	20.0	-29.1	60.0	QP

Frequency (MHz)	Amplitude (dBµV)	Line (L1/N)	Correction Factor (dB)	Margin (dB)	Limit (dBµV)	Detector (QP/AV)
0.354	26.3	L1	19.8	-22.5	48.9	AV
0.162	32.3	L1	19.9	-23.0	55.4	AV
0.154	32.5	L1	19.9	-23.3	55.8	AV
0.174	28.2	L1	19.9	-26.5	54.8	AV
0.186	27.5	L1	19.8	-26.7	54.2	AV
18.730	20.0	L1	20.0	-30.0	50.0	AV

NEUTRAL Line (N) Plot



NEUTRAL Line (N) Results

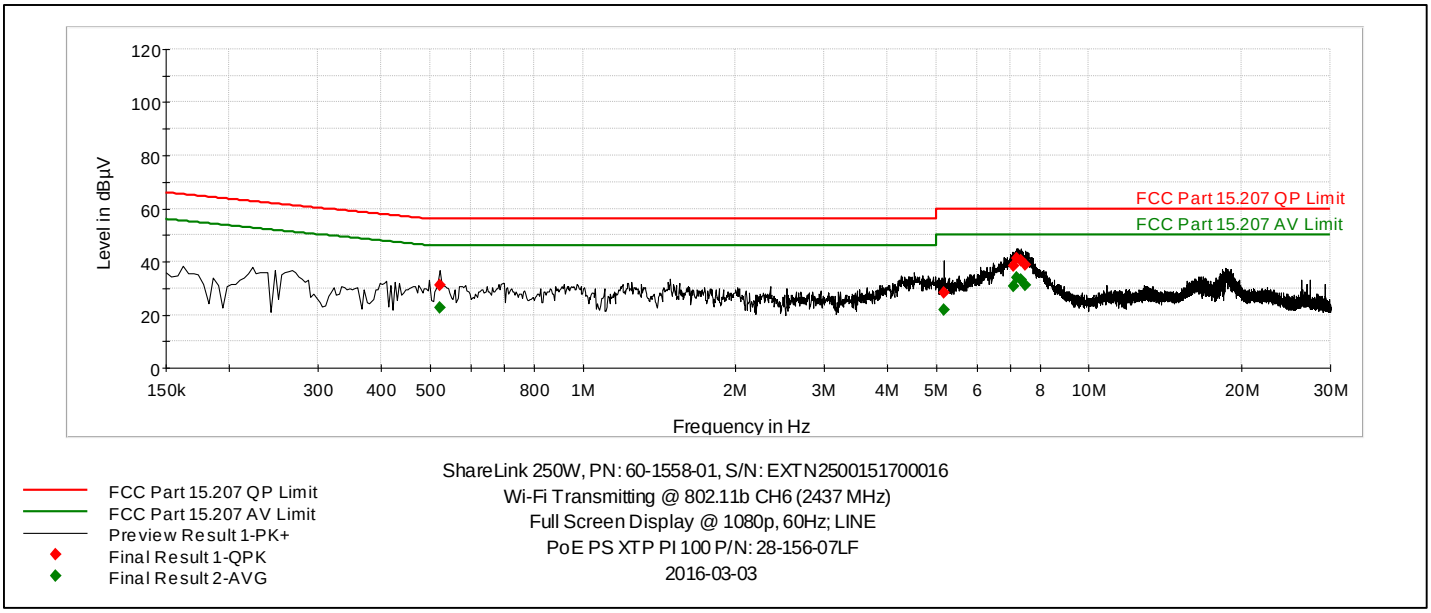
Frequency (MHz)	Amplitude (dBµV)	Line (L1/N)	Correction Factor (dB)	Margin (dB)	Limit (dBµV)	Detector (QP/AV)
0.150	50.5	N	19.8	-15.5	66.0	QP
0.166	49.3	N	19.8	-15.9	65.2	QP
0.162	49.0	N	19.8	-16.3	65.4	QP
0.374	38.2	N	19.8	-20.2	58.4	QP
0.178	44.3	N	19.8	-20.3	64.6	QP
19.042	31.5	N	20.1	-28.5	60.0	QP

Frequency (MHz)	Amplitude (dBµV)	Line (L1/N)	Correction Factor (dB)	Margin (dB)	Limit (dBµV)	Detector (QP/AV)
0.374	31.4	N	19.8	-17.0	48.4	AV
0.162	34.7	N	19.8	-20.7	55.4	AV
0.166	33.4	N	19.8	-21.7	55.2	AV
0.150	33.8	N	19.8	-22.2	56.0	AV
0.178	29.1	N	19.8	-25.4	54.6	AV
19.042	21.6	N	20.1	-28.4	50.0	AV

B. Using PoE Power Supply

Wi-Fi Operating Mode:	802.11b	Test Date(s):	03/03/2016
Wi-Fi Operating Frequency:	2437 MHz	Test Location (Lab):	Lab E
Wi-Fi Channel	6	Temperature (°C):	23
Test Voltage/Frequency:	120Vac/60Hz	Humidity (%):	46
Power Supply:	PoE PS Model: XTP PI 100	Atmospheric pressure (mbar):	1018
Note: EUT at Full Screen Display with 1080p, 60Hz resolution; W-Fi Transmitter ON; LAN at 1GB Connection			

LINE1 (L1) Plot

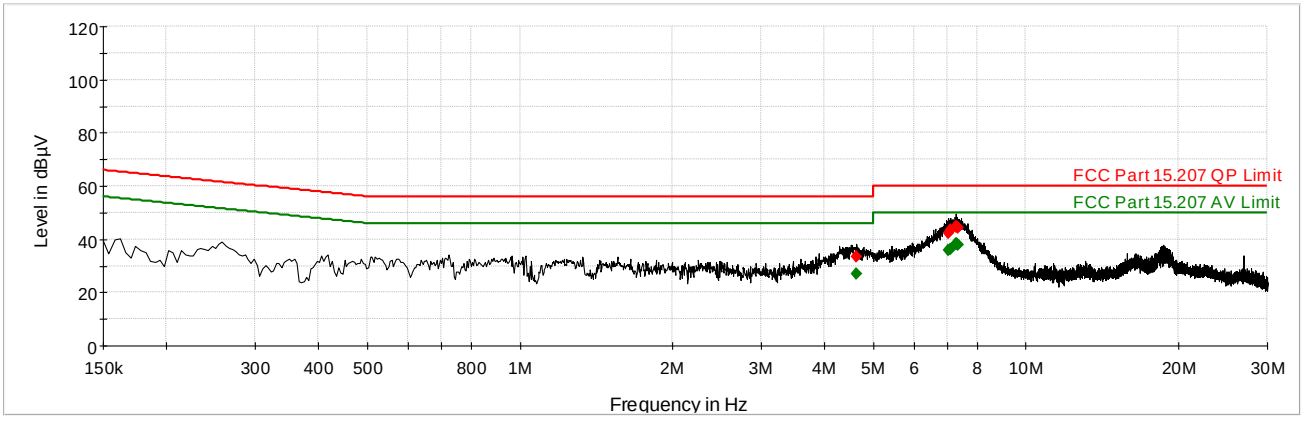


LINE1 (L1) Results

Frequency (MHz)	Amplitude (dBµV)	Line (L1/N)	Correction Factor (dB)	Margin (dB)	Limit (dBµV)	Detector (QP/AV)
7.214	41.1	L1	20.0	-18.9	60.0	QP
7.342	40.3	L1	20.0	-19.7	60.0	QP
7.478	38.6	L1	20.0	-21.4	60.0	QP
7.098	38.5	L1	20.0	-21.5	60.0	QP
0.522	31.2	L1	19.9	-24.8	56.0	QP
5.170	28.3	L1	20.1	-31.7	60.0	QP

Frequency (MHz)	Amplitude (dBµV)	Line (L1/N)	Correction Factor (dB)	Margin (dB)	Limit (dBµV)	Detector (QP/AV)
7.214	33.8	L1	20.0	-16.2	50.0	AV
7.342	33.2	L1	20.0	-16.8	50.0	AV
7.478	31.1	L1	20.0	-18.9	50.0	AV
7.098	30.7	L1	20.0	-19.3	50.0	AV
0.522	22.6	L1	19.9	-23.4	46.0	AV
5.170	21.7	L1	20.1	-28.3	50.0	AV

NEUTRAL Line (N) Plot



FCC Part 15.207 QP Limit
FCC Part 15.207 AV Limit
Preview Result 1-PK+
Final Result 1-QPK
Final Result 2-AVG

ShareLink 250W, PN: 60-1558-01, S/N: EXTN2500151700016
Wi-Fi Transmitting @ 802.11b CH6 (2437 MHz)
Full Screen Display @ 1080p, 60Hz; NEUTRAL
PoE PS XTP PI 100 P/N: 28-156-07LF
2016-03-03

NEUTRAL Line (N) Results

Frequency (MHz)	Amplitude (dBµV)	Line (L1/N)	Correction Factor (dB)	Margin (dB)	Limit (dBµV)	Detector (QP/AV)
7.262	44.8	N	20.0	-15.2	60.0	QP
7.298	44.8	N	20.0	-15.2	60.0	QP
7.350	44.3	N	20.0	-15.7	60.0	QP
7.106	43.3	N	20.0	-16.7	60.0	QP
7.014	42.4	N	20.0	-17.6	60.0	QP
4.634	33.3	N	20.1	-22.7	56.0	QP

Frequency (MHz)	Amplitude (dBµV)	Line (L1/N)	Correction Factor (dB)	Margin (dB)	Limit (dBµV)	Detector (QP/AV)
7.298	38.3	N	20.0	-11.7	50.0	AV
7.262	38.2	N	20.0	-11.8	50.0	AV
7.350	38.0	N	20.0	-12.0	50.0	AV
7.106	36.2	N	20.0	-13.8	50.0	AV
7.014	35.9	N	20.0	-14.1	50.0	AV
4.634	26.9	N	20.1	-19.1	46.0	AV

--- END OF REPORT ---