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MEASUREMENT REPORT
FCC Part 15.247 WLAN 802.11b/g/n/ac

Applicant Name:
LG Electronics MobileComm U.S.A
1000 Sylvan Avenue
Englewood Cliffs, NJ 07632
United States

Date of Testing:
7/20 - 8/11/2017
Test Site/Location:
PCTEST Lab, Columbia, MD, USA
Test Report Serial No.:
1M1707180221-04-R1.ZNF

FCC ID:	**ZNFV30A**
APPLICANT:	**LG Electronics MobileComm U.S.A**

Application Type:	Class II Permissive Change
Model:	LG-H931
Additional Model(s):	LGH931, H931, H933, LG-H933, LGH933, LG-VS996, LGVS996, VS996, LG-US998, LGUS998, US998
EUT Type:	Portable Handset
FCC Classification:	Digital Transmission System (DTS)
FCC Rule Part(s):	Part 15.247
Test Procedure(s):	KDB 558074 D01 v04, KDB 662911 D01 v02r01, KDB 648474 D03 v01r04
Class II Permissive Change:	Please see FCC change document

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in KDB 558074 D01 v04. Test results reported herein relate only to the item(s) tested.

This revised Test Report (S/N: 1M1707180221-04-R1.ZNF) supersedes and replaces the previously issued test report (S/N: 1M1707180221-04.ZNF) on the same subject device for the same type of testing as indicated. Please discard the previously issued test report(s).

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Randy Ortanez
President

ACCREDITED
TESTING CERT#2041.01

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07/14/2017

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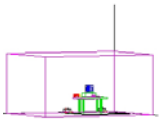

MEASUREMENT REPORT
FCC Part 15.247

§ 2.1033 General Information

APPLICANT:	LG Electronics MobileComm U.S.A
APPLICANT ADDRESS:	1000 Sylvan Avenue Englewood Cliffs, NJ 07632, United States
TEST SITE:	PCTEST ENGINEERING LABORATORY, INC.
TEST SITE ADDRESS:	7185 Oakland Mills Road, Columbia, MD 21046 USA
FCC RULE PART(S):	Part 15.247
BASE MODEL:	LG-H931
FCC ID:	ZNFV30A
FCC CLASSIFICATION:	Digital Transmission System (DTS)
Test Device Serial No.:	15532, 15482, 15490, 15508, 15482 ☐ Production ☒ Pre-Production ☐ Engineering
DATE(S) OF TEST:	7/20 - 8/11/2017
TEST REPORT S/N:	1M1707180221-04-R1.ZNF

Test Facility / Accreditations

Measurements were performed at PCTEST Engineering Lab located in Columbia, MD 21046, U.S.A.

- PCTEST facility is an FCC registered (PCTEST Reg. No. 159966) test facility with the site description report on file and has met all the requirements specified in Section 2.948 of the FCC Rules and Industry Canada (2451B-1).
- PCTEST Lab is accredited to ISO 17025 by U.S. National Institute of Standards and Technology (NIST) under the National Voluntary Laboratory Accreditation Program (NVLAP Lab code: 100431-0) in EMC, FCC and Telecommunications.
- PCTEST Lab is accredited to ISO 17025-2005 by the American Association for Laboratory Accreditation (A2LA) in Specific Absorption Rate (SAR) testing, Hearing Aid Compatibility (HAC) testing, CTIA Test Plans, and wireless testing for FCC and Industry Canada Rules.
- PCTEST Lab is a recognized U.S. Conformity Assessment Body (CAB) in EMC and R&TTE (n.b. 0982) under the U.S.-EU Mutual Recognition Agreement (MRA).
- PCTEST TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC Guide 65 by the American National Standards Institute (ANSI) in all scopes of FCC Rules and Industry Canada Standards (RSS).
- PCTEST facility is an IC registered (2451B-1) test laboratory with the site description on file at Industry Canada.
- PCTEST is a CTIA Authorized Test Laboratory (CATL) for AMPS, CDMA, and EvDO wireless devices and for Over-the-Air (OTA) Antenna Performance testing for AMPS, CDMA, GSM, GPRS, EGPRS, UMTS (W-CDMA), CDMA 1xEVDO, and CDMA 1xRTT.

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1.0 INTRODUCTION

1.1 Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Industry Canada Certification and Engineering Bureau.

1.2 PCTEST Test Location

The map below shows the location of the PCTEST LABORATORY, its proximity to the FCC Laboratory, the Columbia vicinity, the Baltimore-Washington Internt'l (BWI) airport, the city of Baltimore and the Washington, DC area. (See *Figure 1-1*).

These measurement tests were conducted at the PCTEST Engineering Laboratory, Inc. facility located at 7185 Oakland Mills Road, Columbia, MD 21046. The site coordinates are 39º 10'23" N latitude and 76º 49'50" W longitude. The facility is 0.4 miles North of the FCC laboratory, and the ambient signal and ambient signal strength are approximately equal to those of the FCC laboratory. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4-2014 on January 22, 2015.

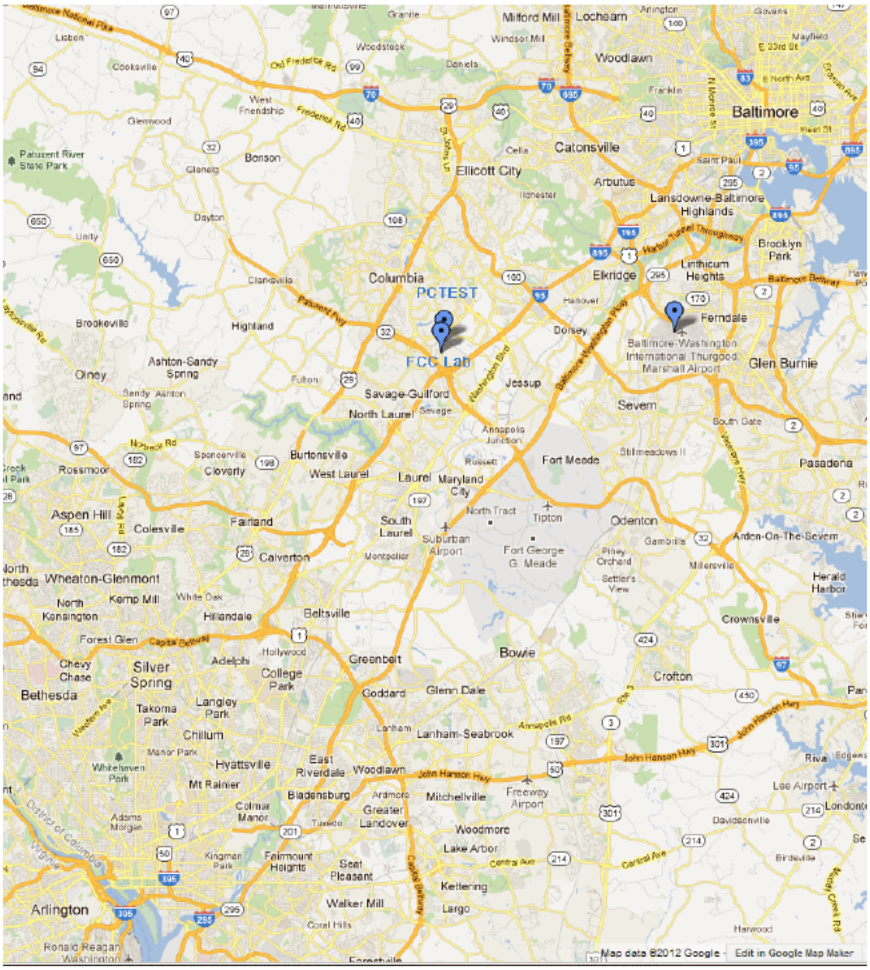

Figure 1-1. Map of the Greater Baltimore and Metropolitan Washington, D.C. area

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2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **LG Portable Handset FCC ID: ZNFV30A**. The test data contained in this report pertains only to the emissions due to the EUT's WLAN (DTS) transmitter.

2.2 Device Capabilities

This device contains the following capabilities:

850/1900 CDMA/EvDO Rev0/A, 1x Advanced (BC0, BC1), 850/1900 GPRS/EDGE, 850/1700/1900 WCDMA/HSPA, Multi-band LTE, 802.11b/g/n/ac WLAN, 802.11a/n/ac UNII, Bluetooth (1x, EDR, LE), NFC

Ch.	Frequency (MHz)	Ch.	Frequency (MHz)
1	2412	7	2442
2	2417	8	2447
3	2422	9	2452
4	2427	10	2457
5	2432	11	2462
6	2437		

Table 2-1. Frequency/ Channel Operations

Note: The maximum achievable duty cycles for all modes were determined based on measurements performed on a spectrum analyzer in zero-span mode with RBW = 8MHz, VBW = 50MHz, and detector = peak per the guidance of Section 6.0 b) of KDB 558074 D01 v04. The RBW and VBW were both greater than 50/T, where T is the minimum transmission duration, and the number of sweep points across T was greater than 100. The duty cycles are as follows:

Maximum Achievable Duty Cycles				
802.11 Mode/Band		Duty Cycle [%]		
		ANT1	ANT2	MIMO
2.4GHz	b	99.0	99.0	99.1
	g	94.3	94.0	94.2
	n	93.5	93.4	94.3
	ac	93.4	93.5	90.4

Table 2-2. Measured Duty Cycles

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The device employs MIMO technology. Below are the possible configurations.

WiFi Configurations		SISO		SDM		CDD	
		ANT1	ANT2	ANT1	ANT2	ANT1	ANT2
2.4GHz	11b	✓	✓	×	×	✓	✓
	11g	✓	✓	×	×	✓	✓
	11n	✓	✓	✓	✓	✓	✓
	11ac	✓	✓	✓	✓	✓	✓

Table 2-3. Frequency / Channel Operations

✓= Support ; × = NOT Support
SISO = Single Input Single Output
SDM = Spatial Diversity Multiplexing – MIMO function
CDD = Cyclic Delay Diversity - 2Tx Function

Data Rates Supported: 1Mbps, 2Mbps, 5.5Mbps, 11Mbps (b)
6Mbps, 9Mbps, 12Mbps, 18Mbps, 24Mbps, 36Mbps, 48Mbps, 54Mbps (g)
6.5/7.2Mbps, 13/14.4Mbps, 19.5/21.7Mbps, 26/28.9Mbps, 39/43.3Mbps, 52/57.8Mbps, 58.5/65Mbps, 65/72.2Mbps (n)
13/14.4Mbps, 26/28.9Mbps, 39/43.3Mbps, 52/57.8Mbps, 78/86.7Mbps, 104/115.6Mbps, 117/130Mbps, 130/144.4Mbps (MIMO n)

This device supports simultaneous transmission operation, which allows for two SISO channels to operate independent of one another in the 2.4GHz and 5GHz bands simultaneously on each antenna. The following tables show the worst case configurations determined during testing. The data for these configurations is contained in the UNII test report.

Configuration 1: ANT1 transmitting in 2.4GHz mode and ANT2 in 5GHz mode

Description	2.4 GHz Emission	5 GHz Emission
Antenna	1	2
Channel	6	48
Operating Frequency (MHz)	2437	5240
Data Rate (Mbps)	6.5/7.2	6.5/7.2
Mode	802.11n	802.11n

Table 2-4. Config-1 (ANT1 2.4GHz & ANT2 5GHz)

2.3 Test Configuration

The EUT was tested per the guidance of KDB 558074 D01 v04. ANSI C63.10-2013 was used to reference the appropriate EUT setup for radiated spurious emissions testing. See Section 3.2 for radiated emissions test setups.

This device supports wireless charging capability and, thus, is subject to the test requirements of KDB 648474 D03 v01r04. Additional radiated spurious emission measurements were performed with the EUT lying flat on a certified wireless charging pad (WCP) while operating under normal conditions in a simulated call or data transmission configuration. The worst case radiated emissions data is shown in this report.

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2.4 EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and/or no modifications were made during testing.

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3.0 DESCRIPTION OF TESTS

3.1 Evaluation Procedure

The measurement procedures described in the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices (ANSI C63.10-2013) and the guidance provided in KDB 558074 D01 v04 were used in the measurement of the EUT.

Deviation from measurement procedure.....None

3.2 Radiated Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. The test site inside the chamber is a 6m x 5.2m elliptical, obstruction-free area in accordance with Figure 5.7 of Clause 5 in ANSI C63.4-2014. A raised turntable is used for radiated measurement. It is a continuously rotatable, remote-controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. Absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections for measurements above 1GHz. A 72.4cm high PVC support structure is placed on top of the turntable. A 3" (~7.6cm) sheet of high density polystyrene is used as the table top and is placed on top of the PVC supports to bring the total height of the table to 80cm. For measurements above 1GHz, a high density expanded polystyrene block is placed on top of the test table to bring the total table height to 1.5m.

For all measurements, the spectrum was scanned through all EUT azimuths and from 1 to 4 meter receive antenna height using a broadband antenna from 30MHz up to the upper frequency shown in 15.33(b)(1) depending on the highest frequency generated or used in the device or on which the device operates or tunes. For frequencies above 1GHz, linearly polarized double ridge horn antennas were used. For frequencies below 30MHz, a calibrated loop antenna was used. When exploratory measurements were necessary, they were performed at 1 meter test distance inside the semi-anechoic chamber using broadband antennas, broadband amplifiers, and spectrum analyzers to determine the frequencies and modes producing the maximum emissions. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The test set-up was placed on top of the 1 x 1.5 meter table. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configuration, mode of operation, turntable azimuth, and receive antenna height was noted for each frequency found.

Final measurements were made in the semi-anechoic chamber using calibrated, linearly polarized broadband and horn antennas. The test setup was configured to the setup that produced the worst case emissions. The spectrum analyzer was set to investigate all frequencies required for testing to compare the highest radiated disturbances with respect to the specified limits. The turntable containing the EUT was rotated through 360 degrees and the height of the receive antenna was varied 1 to 4 meters and stopped at the azimuth and height producing the maximum emission. Each emission was maximized by changing the orientation of the EUT through three orthogonal planes and changing the polarity of the receive antenna, whichever produced the worst-case emissions.

3.3 Environmental Conditions

The temperature is controlled within range of 15ºC to 35ºC. The relative humidity is controlled within range of 10% to 75%. The atmospheric pressure is monitored within the range 86-106kPa (860-1060mbar).

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4.0 ANTENNA REQUIREMENTS

Excerpt from §15.203 of the FCC Rules/Regulations:
"An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section."

- The antennas of the EUT are **permanently attached.**
- There are no provisions for connections to an external antenna.

Conclusion:

The EUT unit complies with the requirement of §15.203.

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5.0 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013. All measurement uncertainty values are shown with a coverage factor of k = 2 to indicate a 95% level of confidence. The measurement uncertainty shown below meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Contribution	Expanded Uncertainty (±dB)
Radiated Disturbance (<1GHz)	4.98
Radiated Disturbance (>1GHz)	5.07
Radiated Disturbance (>18GHz)	5.09

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6.0 TEST EQUIPMENT CALIBRATION DATA

Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST). Measurements antennas used during testing were calibrated in accordance to the requirements of ANSI C63.5-2006.

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	RE1	Radiated Emissions Cable Set (UHF/EHF)	6/21/2017	Annual	6/21/2018	RE1
Agilent	N9020A	MXA Signal Analyzer	10/28/2016	Annual	10/28/2017	US46470561
Agilent	N9038A	MXE EMI Receiver	4/26/2017	Annual	4/26/2018	MY51210133
Anritsu	ML2495A	Power Meter	10/16/2015	Biennial	10/16/2017	941001
Emco	6502	Active Loop Antenna (10k - 30 MHz)	8/9/2016	Biennial	8/9/2018	2936
Emco	3115	Horn Antenna (1-18GHz)	3/10/2016	Biennial	3/10/2018	9704-5182
ETS Lindgren	3160-09	18-26.5 GHz Standard Gain Horn	8/23/2016	Biennial	8/23/2018	135427
Huber+Suhner	Sucoflex 102A	40GHz Radiated Cable	10/3/2016	Annual	10/3/2017	251425001
PCTEST	-	EMC Switch System	6/21/2017	Annual	6/21/2018	NM1
PCTEST	-	EMC Switch System	6/21/2017	Annual	6/21/2018	NM2
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	7/31/2017	Annual	7/31/2018	100348
Rohde & Schwarz	FSW67	Signal / Spectrum Analyzer	7/27/2016	Annual	7/27/2017	103200
Rohde & Schwarz	TS-PR26	18-26.5 GHz Pre-Amplifier	5/11/2017	Annual	5/11/2018	100040
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	3/14/2016	Biennial	3/14/2018	A051107

Table 6-1. Annual Test Equipment Calibration Schedule

Note:

For equipment listed above that has a calibration date or calibration due date that falls within the test date range, care was taken to ensure that this equipment was used after the calibration date and before the calibration due date.

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7.0 TEST RESULTS

7.1 Summary

Company Name: LG Electronics MobileComm U.S.A
FCC ID: ZNFV30A
FCC Classification: Digital Transmission System (DTS)

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
15.205 15.209	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209	RADIATED	PASS	Sections 7.2, 7.3

Table 7-1. Summary of Test Results

Notes:

1) All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.

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7.2 Radiated Spurious Emission Measurements – Above 1 GHz

§15.247(d) §15.205 & §15.209

Test Overview and Limit

All out of band radiated spurious emissions are measured with a spectrum analyzer connected to a receive antenna while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates and modes were investigated for radiated spurious emissions. Only the radiated emissions of the configuration that produced the worst case emissions are reported in this section.

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR must not exceed the limits shown in Table 7-2 per Section 15.209.

Frequency	Field Strength [µV/m]	Measured Distance [Meters]
Above 960.0 MHz	500	3

Table 7-2. Radiated Limits

Test Procedures Used

KDB 558074 D01 v04 – Section 12.1, 12.2.7

Test Settings

Average Field Strength Measurements per Section 12.2.5.1 of KDB 558074 D01 v04

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = power average (RMS)
5. Number of measurement points = 1001 (Number of points must be ≥ 2 x span/RBW)
6. Sweep time = auto
7. Trace (RMS) averaging was performed over at least 100 traces

Peak Field Strength Measurements per Section 12.2.4 of KDB 558074 D01 v04

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

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Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

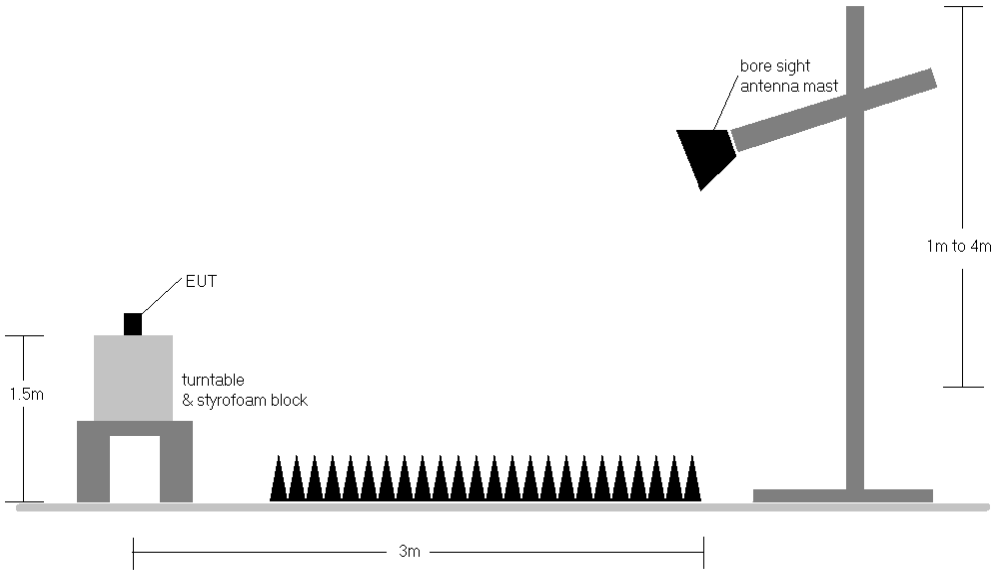

Figure 7-1. Test Instrument & Measurement Setup

Test Notes

1. The optional test procedures for antenna port conducted measurements of unwanted emissions per the guidance of KDB 558074 D01 v04 were not used to evaluate this device for compliance to radiated limits. All radiated spurious emissions levels were measured in a radiated test setup.
2. All emissions lying in restricted bands specified in §15.205 are below the limit shown in Table 7-2.
3. The antenna is manipulated through typical positions, polarity and length during the tests. The EUT is manipulated through three orthogonal planes.
4. This unit was tested with its standard battery.
5. The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter using CISPR quasi peak detector below 1GHz. Above 1 GHz, average and peak measurements were taken using linearly polarized horn antennas. The worst-case emissions are reported however emissions whose levels were not within 20dB of the respective limits were not reported.
6. Emissions below 18GHz were measured at a 3 meter test distance while emissions above 18GHz were measured at a 1 meter test distance with the application of a distance correction factor.
7. Radiated spurious emissions were investigated while operating in MIMO mode, however, it was determined that single antenna operation produced the worst case emissions. Since the emissions

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produced from MIMO operation were found to be more than 20dB below the limit, the MIMO emissions are not reported.

8. The wide spectrum spurious emissions plots shown on the following pages are used only for the purpose of emission identification. Any emissions found to be within 20dB of the limit are fully investigated and the results are shown in this section. Rohde & Schwarz EMC32, Version 9.15.00 automated test software was used to perform the Radiated Spurious Emissions Pre-Scan testing.
9. The "-" shown in the following RSE tables are used to denote a noise floor measurement.

Sample Calculations

Determining Spurious Emissions Levels

- Field Strength Level $_{[dB\mu V/m]}$ = Analyzer Level $_{[dBm]}$ + 107 + AFCL $_{[dB/m]}$
- AFCL $_{[dB/m]}$ = Antenna Factor $_{[dB/m]}$ + Cable Loss $_{[dB]}$
- Margin $_{[dB]}$ = Field Strength Level $_{[dB\mu V/m]}$ – Limit $_{[dB\mu V/m]}$

Radiated Band Edge Measurement Offset

- The amplitude offset shown in the radiated restricted band edge plots in Section 7.2 was calculated using the formula:
  Offset (dB) = (Antenna Factor + Cable Loss + Attenuator) – Preamplifier Gain

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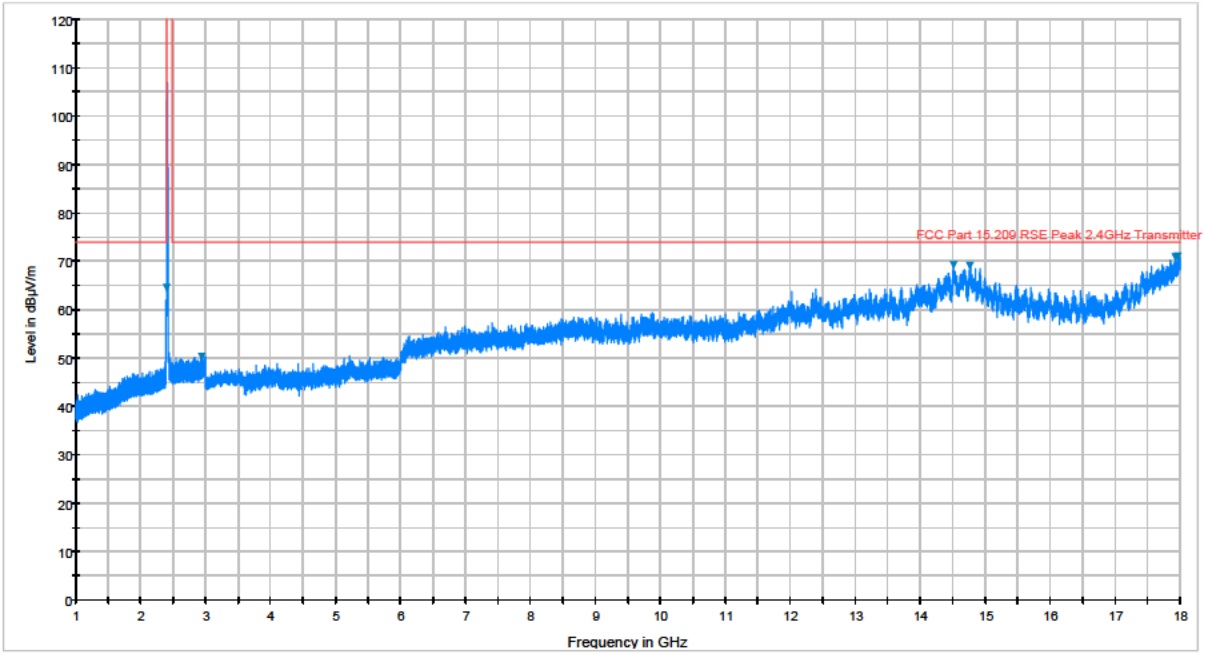
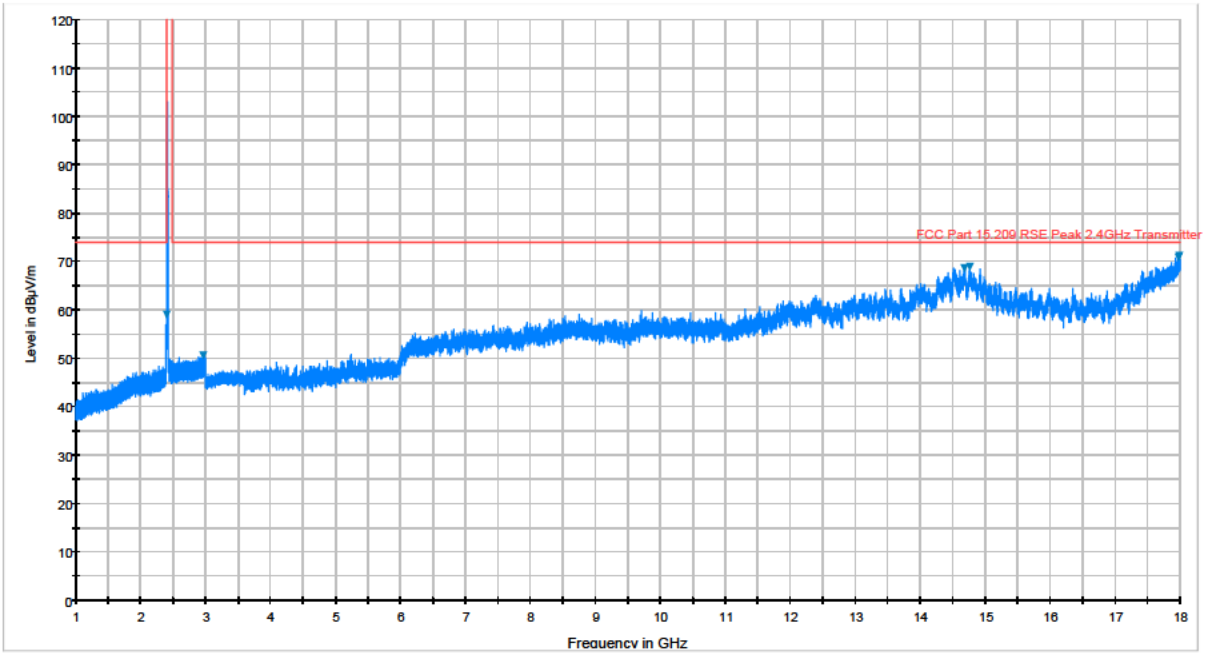
7.2.1 Antenna-1 Radiated Spurious Emission Measurements

§15.247(d) §15.205 & §15.209



Plot 7-1. Radiated Spurious Plot above 1GHz (802.11b – Ch. 1, Ant. Pol. H)



Plot 7-2. Radiated Spurious Plot above 1GHz (802.11b – Ch. 1, Ant. Pol. V)

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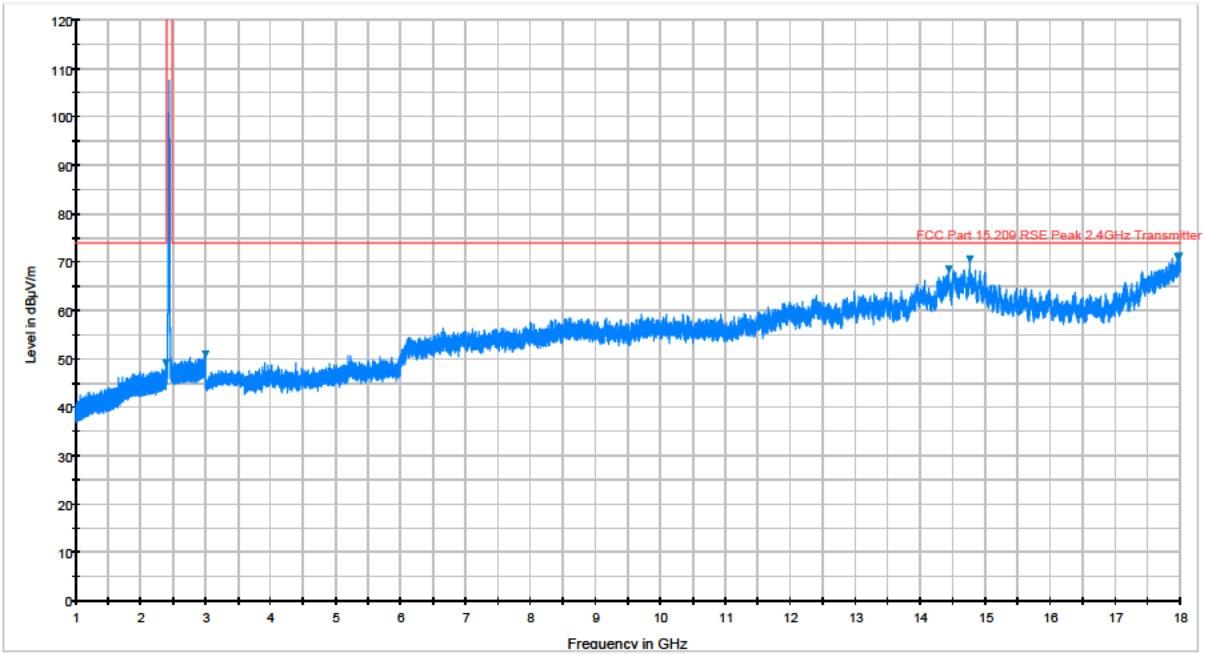
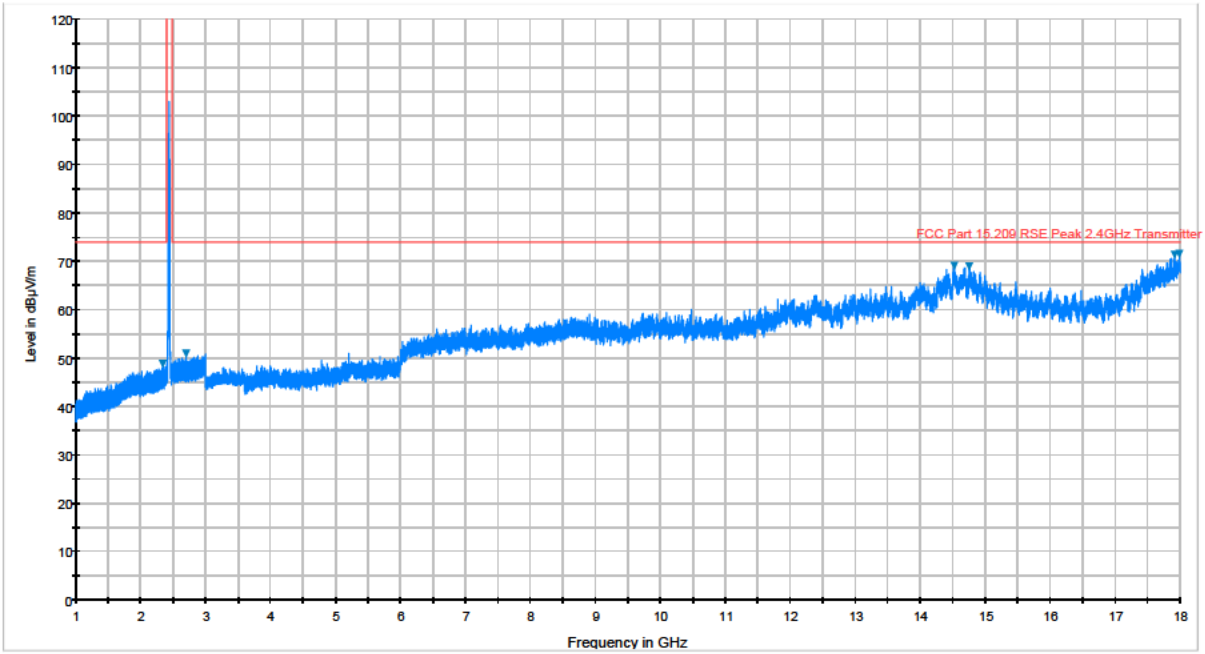


Plot 7-3. Radiated Spurious Plot above 1GHz (802.11b – Ch. 6, Ant. Pol. H)



Plot 7-4. Radiated Spurious Plot above 1GHz (802.11b – Ch. 6, Ant. Pol. V)

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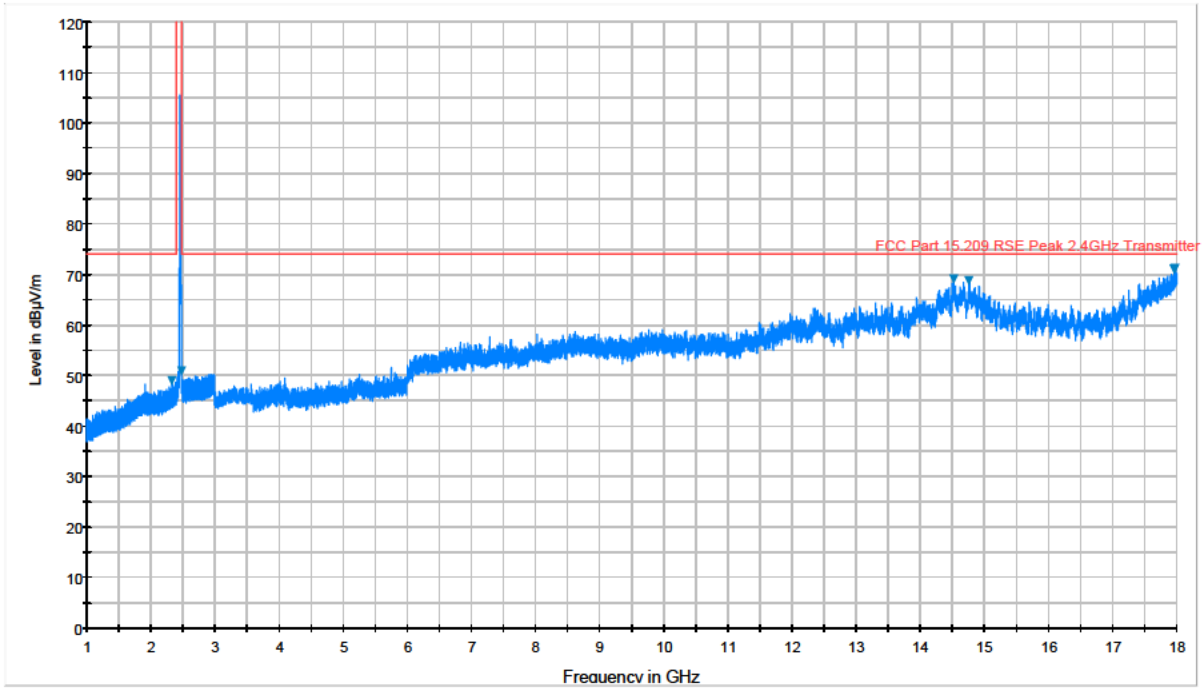
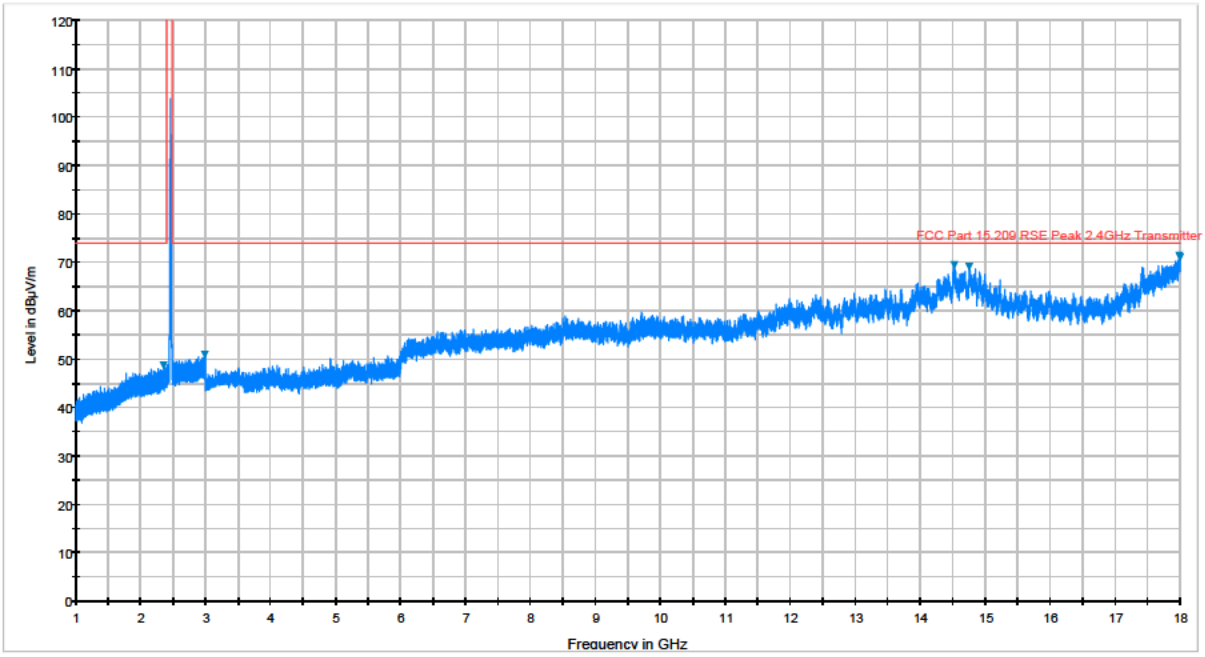


Plot 7-5. Radiated Spurious Plot above 1GHz (802.11b – Ch. 11, Ant. Pol. H)



Plot 7-6. Radiated Spurious Plot above 1GHz (802.11b – Ch. 11, Ant. Pol. V)

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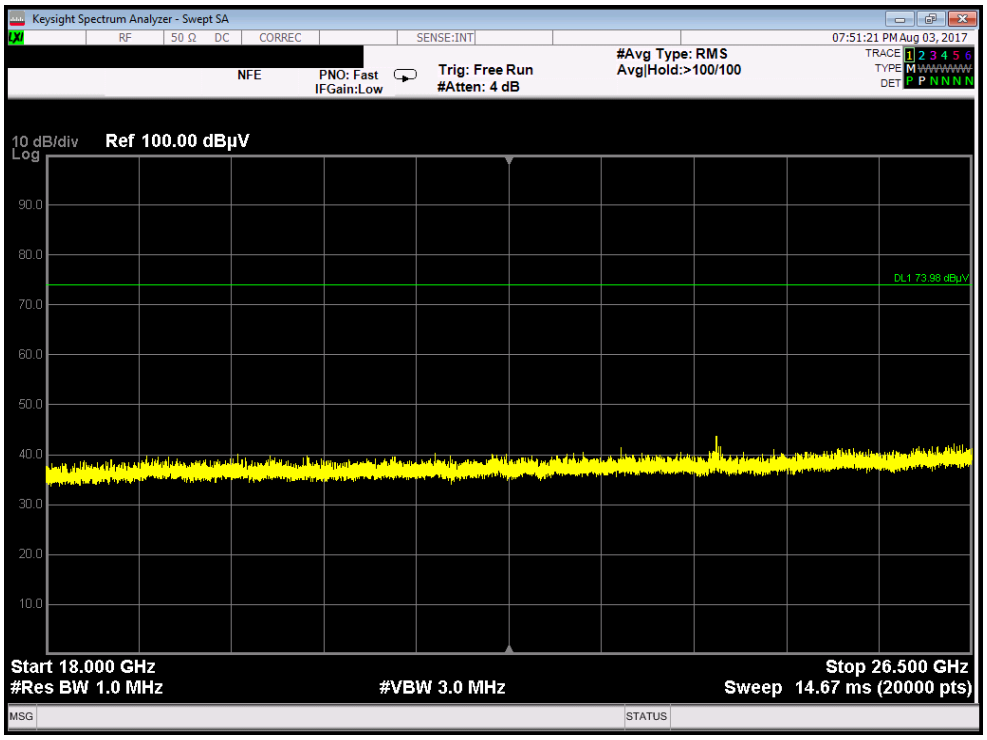
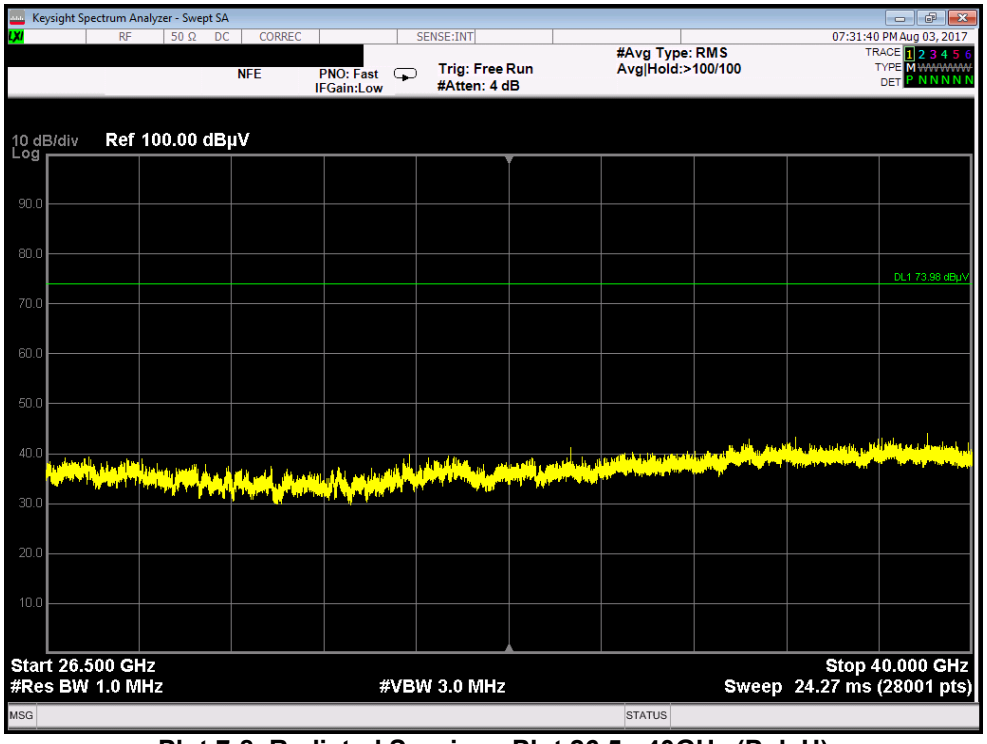
Antenna-1 Radiated Spurious Emissions Measurements (Above 18GHz)

§15.209



Plot 7-7. Radiated Spurious Plot above 18 – 26.5 GHz (Pol. H)



Plot 7-8. Radiated Spurious Plot 26.5 - 40GHz (Pol. H)

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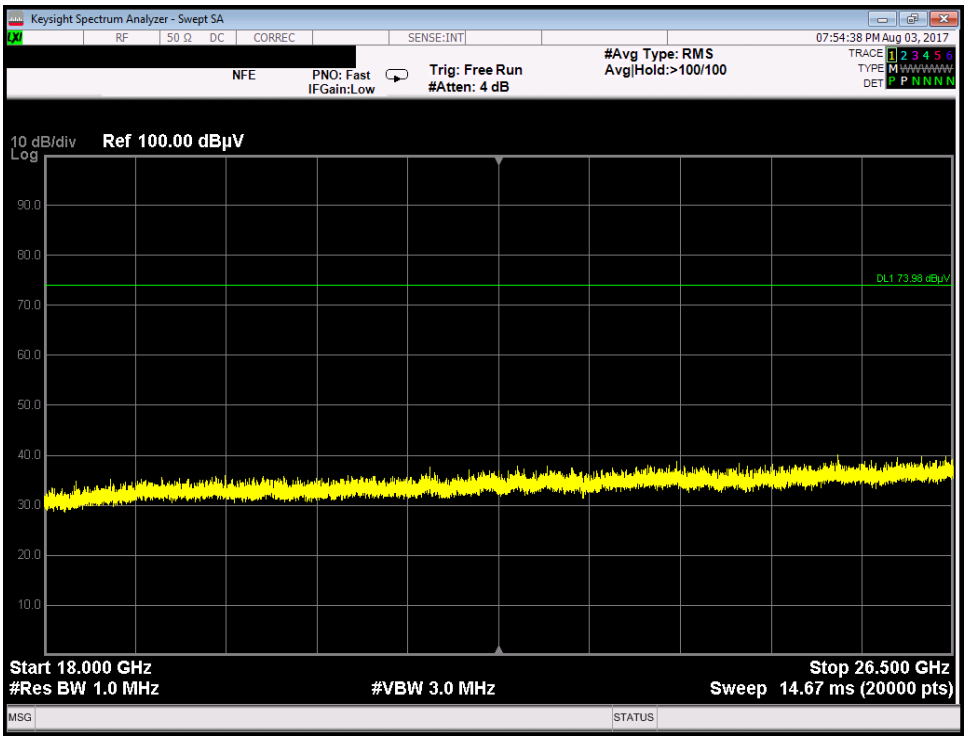
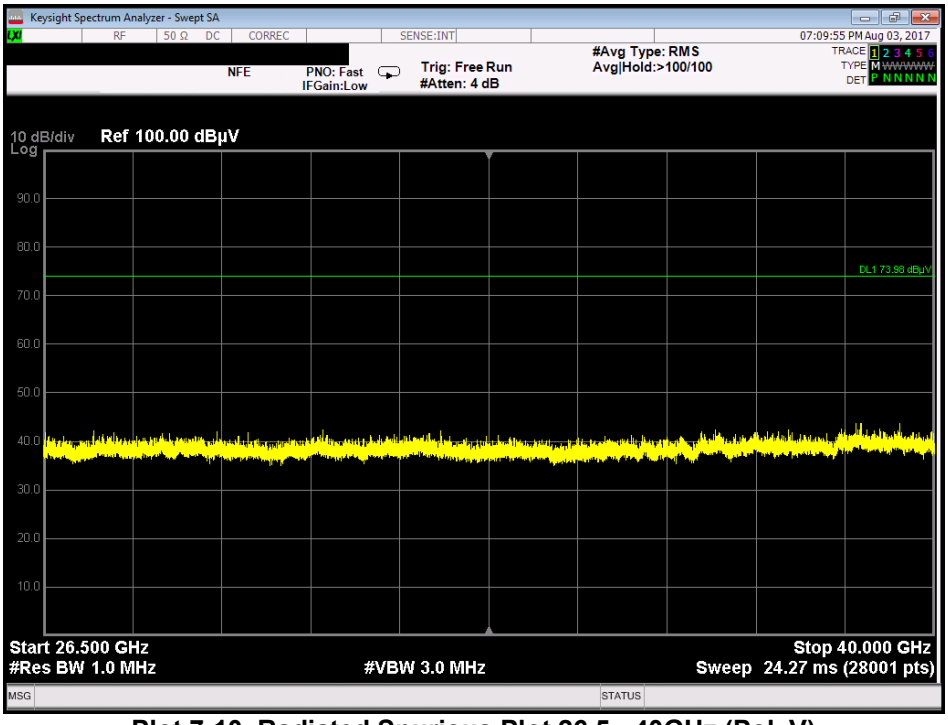


Plot 7-9. Radiated Spurious Plot above 18 – 26.5 GHz (Pol. V)



Plot 7-10. Radiated Spurious Plot 26.5 - 40GHz (Pol. V)

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Antenna-1 Radiated Spurious Emission Measurements

§15.247(d) §15.205 & §15.209

Worst Case Mode:	802.11b
Worst Case Transfer Rate:	1 Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2412MHz
Channel:	01

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
4824.00	Avg	H	110	110	-65.20	0.63	42.43	53.98	-11.54
4824.00	Peak	H	110	110	-55.99	0.63	51.64	73.98	-22.33
12060.00	Avg	H	-	-	-72.01	15.81	50.80	53.98	-3.18
12060.00	Peak	H	-	-	-58.98	15.81	63.83	73.98	-10.15

Table 7-3. Radiated Measurements

Worst Case Mode:	802.11b
Worst Case Transfer Rate:	1 Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2437MHz
Channel:	06

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
4874.00	Avg	H	110	115	-64.82	1.19	43.37	53.98	-10.61
4874.00	Peak	H	110	115	-55.86	1.19	52.33	73.98	-21.65
7311.00	Avg	H	-	-	-70.95	9.97	46.02	53.98	-7.96
7311.00	Peak	H	-	-	-58.72	9.97	58.25	73.98	-15.73
12185.00	Avg	H	-	-	-72.44	16.32	50.88	53.98	-3.10
12185.00	Peak	H	-	-	-59.36	16.32	63.96	73.98	-10.02

Table 7-4. Radiated Measurements

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Worst Case Mode:	802.11b
Worst Case Transfer Rate:	1 Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2462MHz
Channel:	11

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
4924.00	Avg	H	129	141	-63.95	1.16	44.21	53.98	-9.77
4924.00	Peak	H	129	141	-57.08	1.16	51.08	73.98	-22.90
7386.00	Avg	H	-	-	-71.55	9.96	45.41	53.98	-8.57
7386.00	Peak	H	-	-	-59.78	9.96	57.18	73.98	-16.80
12310.00	Avg	H	-	-	-72.20	15.99	50.79	53.98	-3.19
12310.00	Peak	H	-	-	-60.07	15.99	62.92	73.98	-11.06

Table 7-5. Radiated Measurements

Worst Case Mode:	802.11b
Worst Case Transfer Rate:	1 Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2462MHz
Channel:	11

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
4924.00	Avg	H	150	288	-64.04	0.45	43.41	53.98	-10.57
4924.00	Peak	H	150	288	-57.05	0.45	50.40	73.98	-23.58
7386.00	Avg	H	-	-	-70.58	10.25	46.67	53.98	-7.31
7386.00	Peak	H	-	-	-58.76	10.25	58.49	73.98	-15.49
12310.00	Avg	H	-	-	-70.70	14.59	50.89	53.98	-3.09
12310.00	Peak	H	-	-	-58.43	14.59	63.16	73.98	-10.82

Table 7-6. Radiated Measurements with WCP

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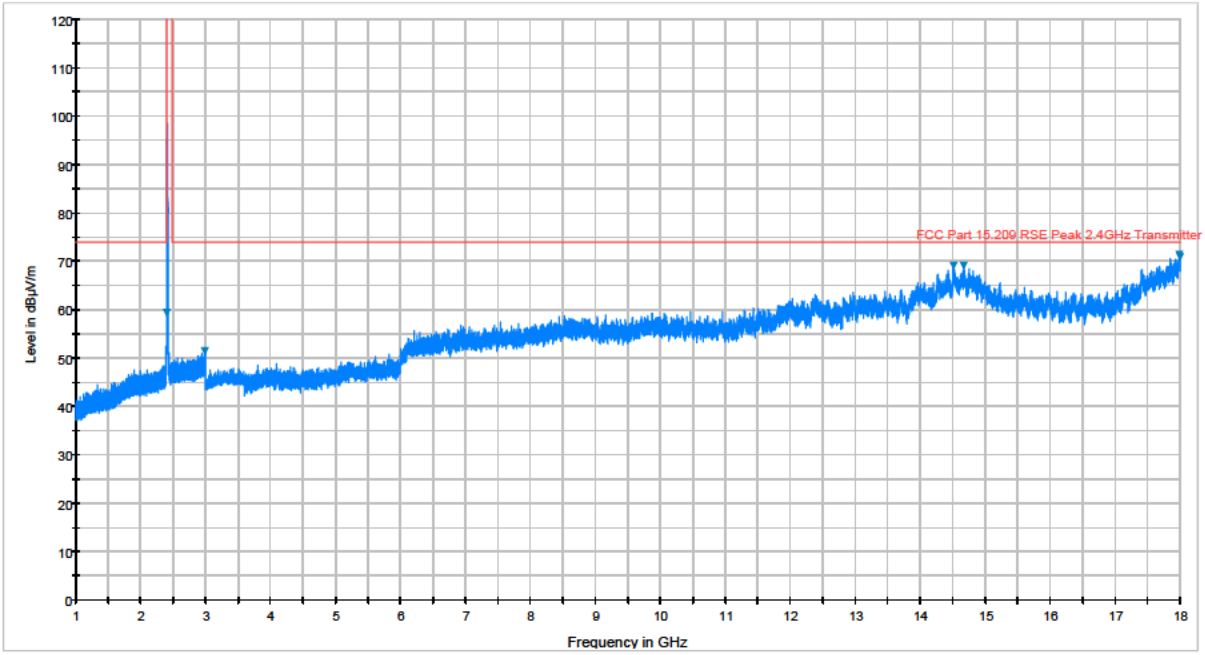
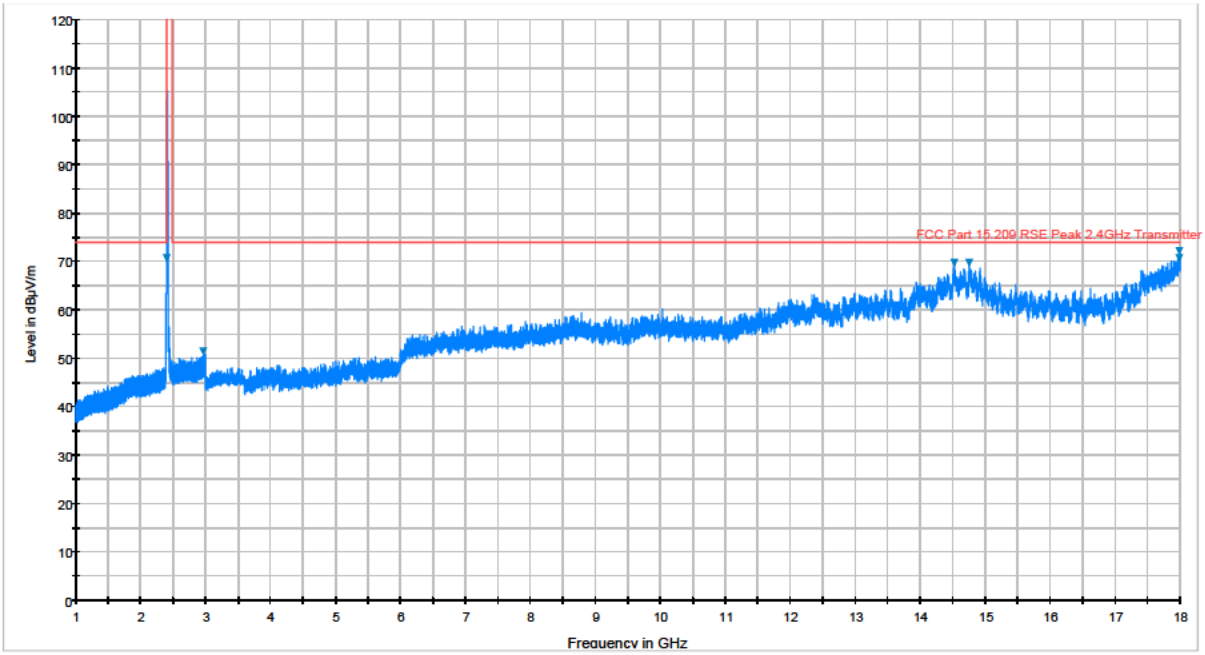
7.2.2 Antenna-2 Radiated Spurious Emission Measurements

§15.247(d) §15.205 & §15.209



Plot 7-11. Radiated Spurious Plot above 1GHz (802.11b – Ch. 1, Ant. Pol. H)



Plot 7-12. Radiated Spurious Plot above 1GHz (802.11b – Ch. 1, Ant. Pol. V)

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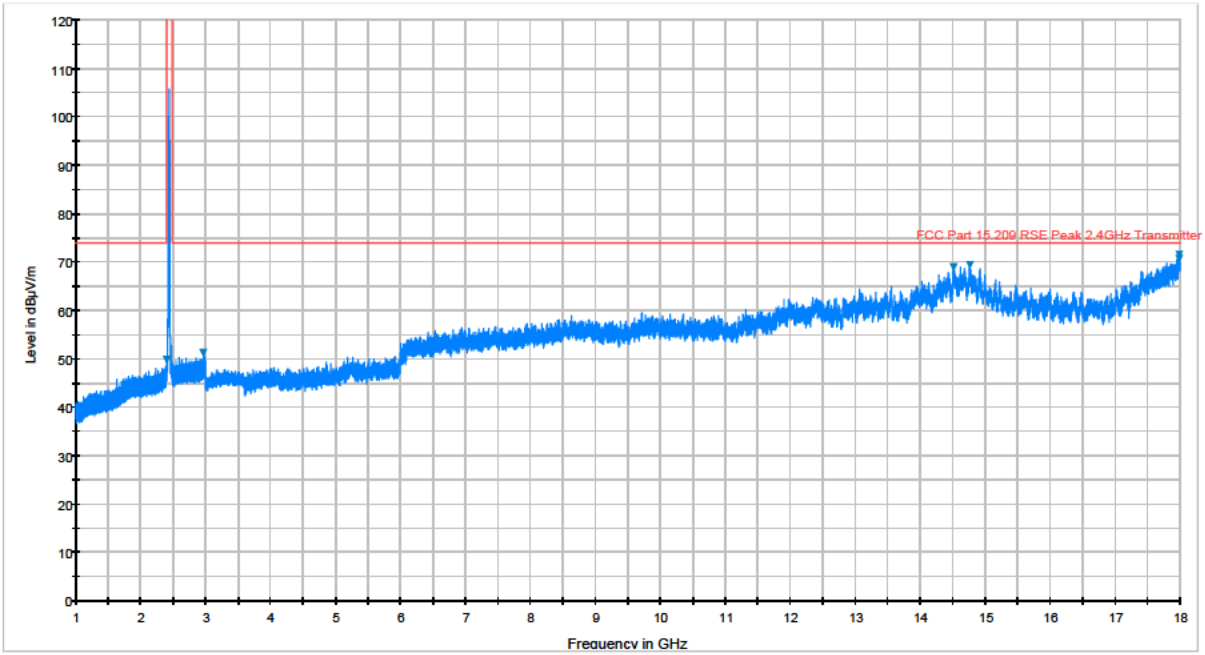
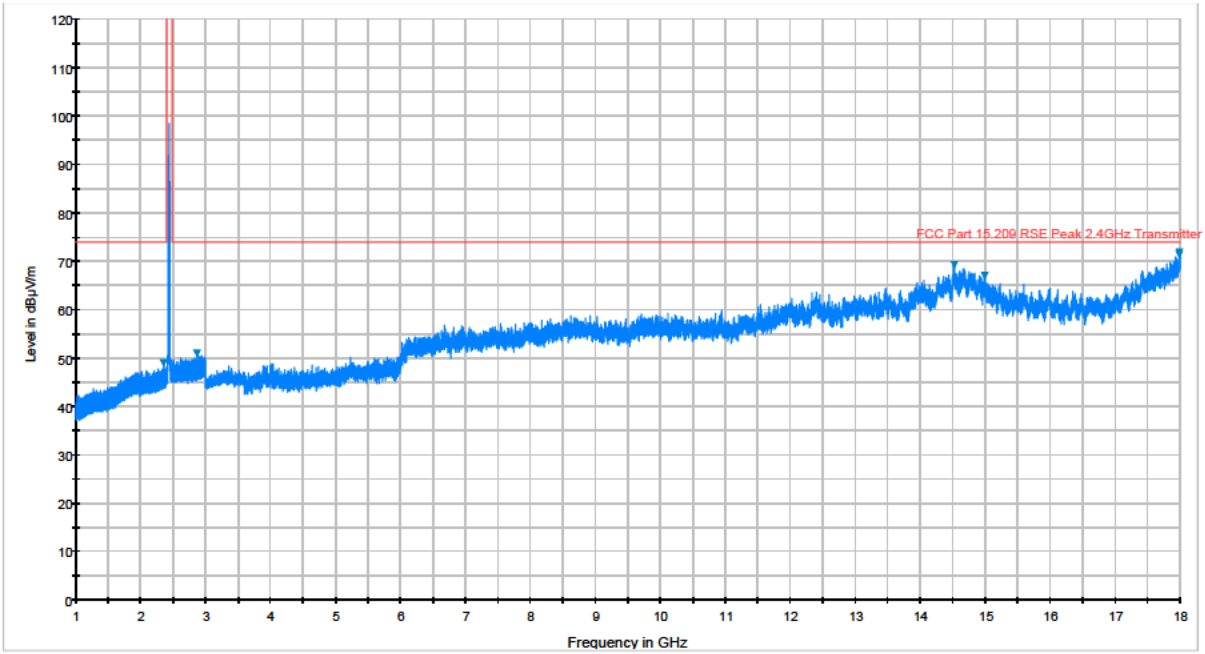


Plot 7-13. Radiated Spurious Plot above 1GHz (802.11b – Ch. 6, Ant. Pol. H)



Plot 7-14. Radiated Spurious Plot above 1GHz (802.11b – Ch. 6, Ant. Pol. V)

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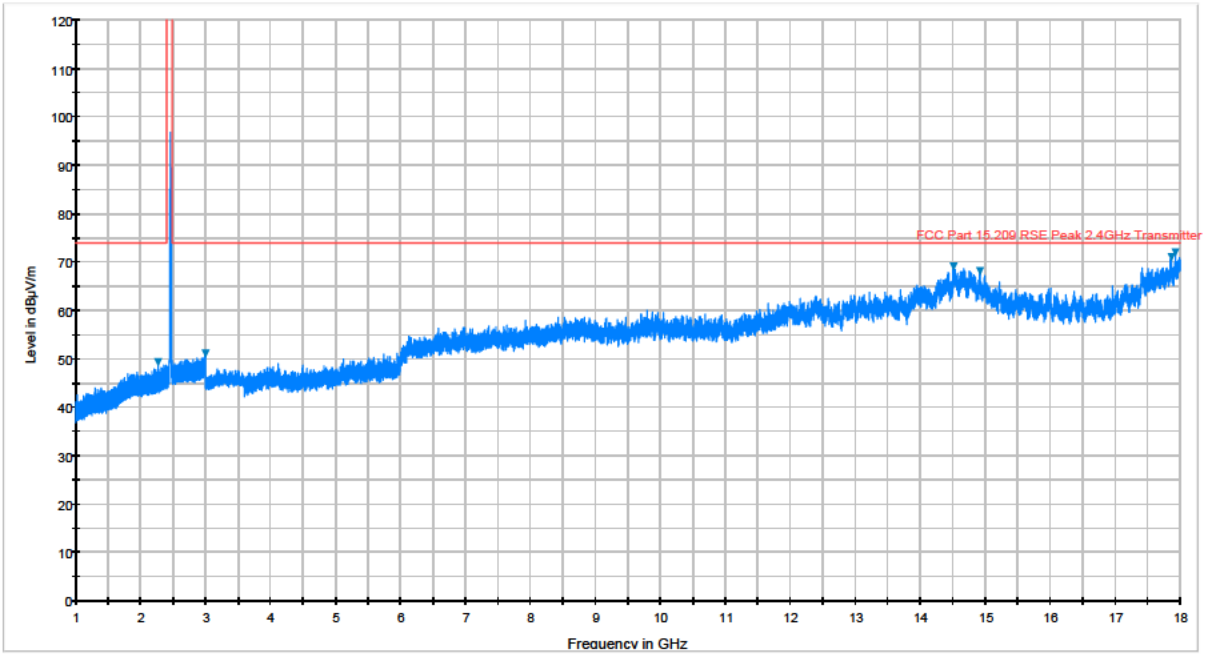
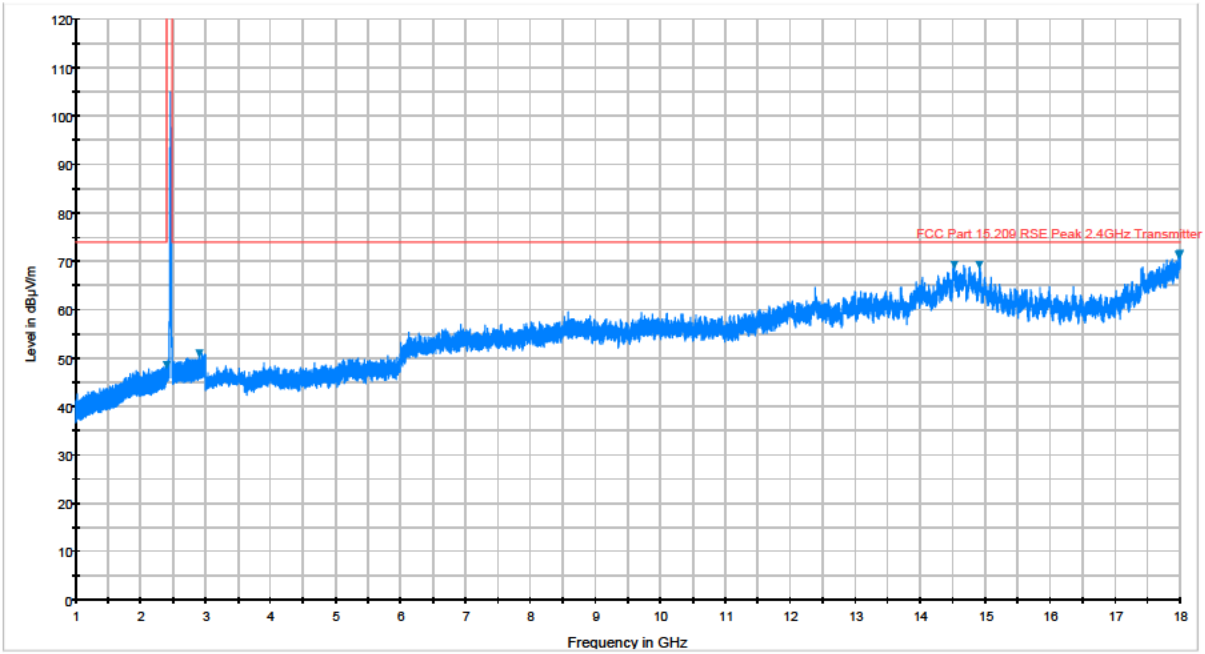


Plot 7-15. Radiated Spurious Plot above 1GHz (802.11b – Ch. 11, Ant. Pol. H)



Plot 7-16. Radiated Spurious Plot above 1GHz (802.11b – Ch. 11, Ant. Pol. V)

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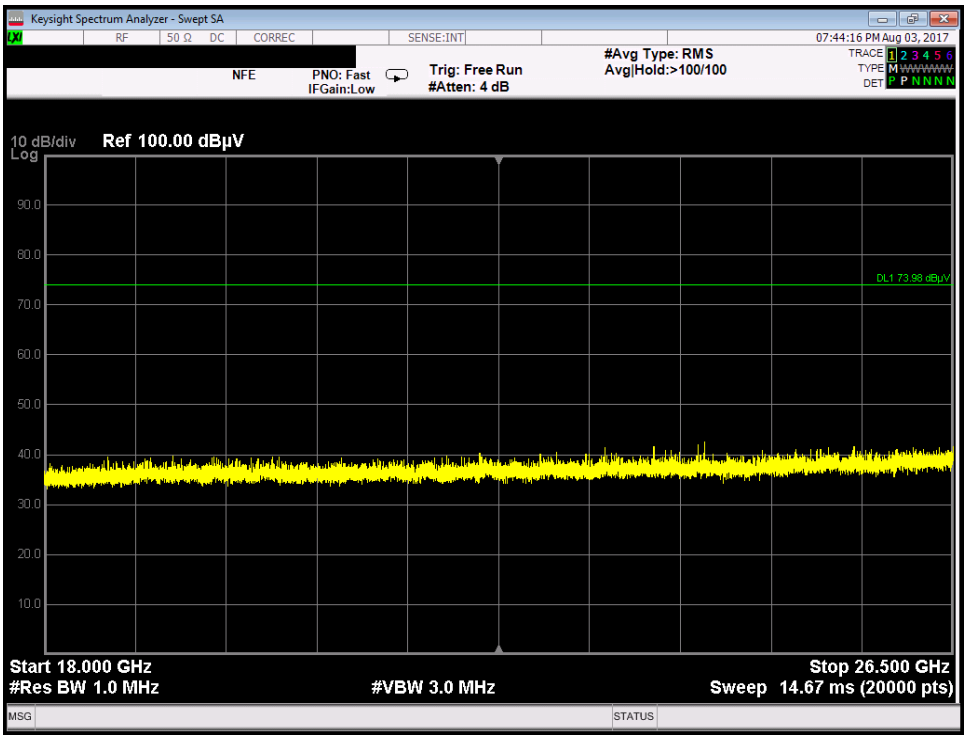
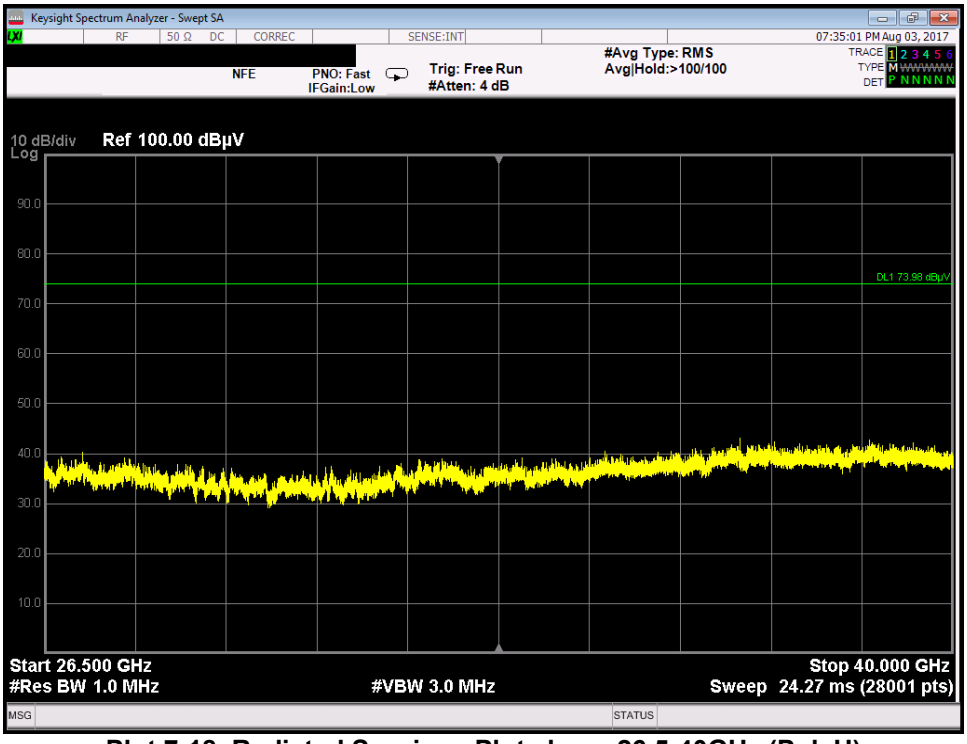
Antenna-2 Radiated Spurious Emissions Measurements (Above 18GHz)

§15.209



Plot 7-17. Radiated Spurious Plot above 18-26.5 GHz (Pol. H)



Plot 7-18. Radiated Spurious Plot above 26.5-40GHz (Pol. H)

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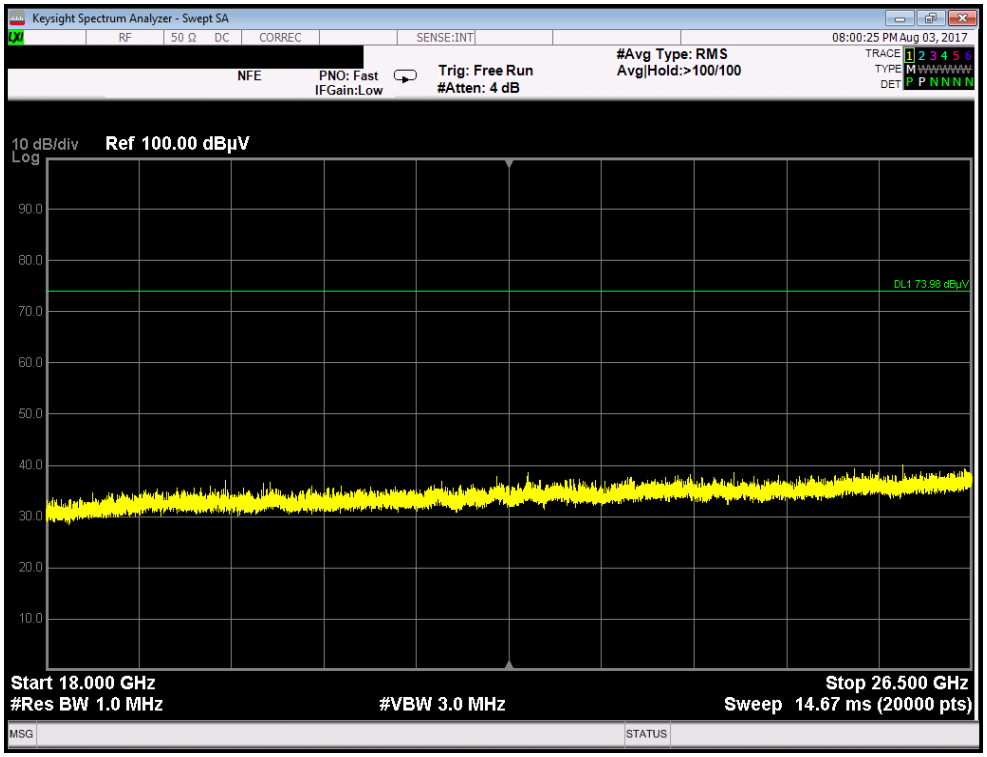
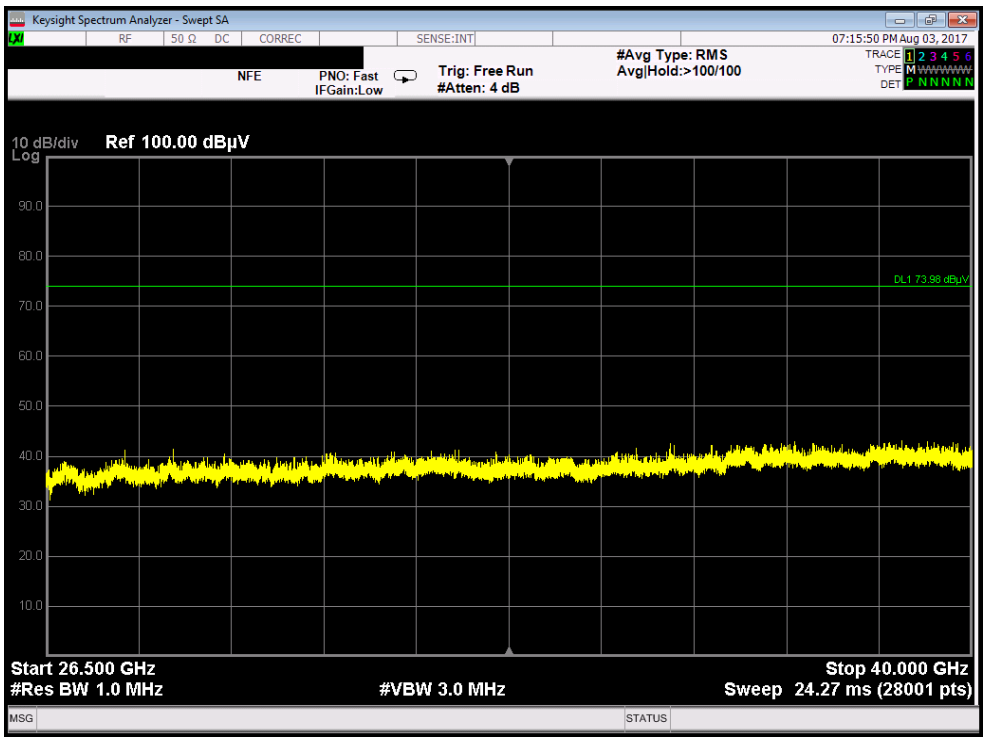


Plot 7-19. Radiated Spurious Plot above 18-26.5 GHz (Pol. V)



Plot 7-20. Radiated Spurious Plot above 26.5-40GHz (Pol. V)

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Antenna-2 Radiated Spurious Emission Measurements

§15.247(d) §15.205 & §15.209

Worst Case Mode:	802.11b
Worst Case Transfer Rate:	1 Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2412MHz
Channel:	01

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
4824.00	Avg	H	100	136	-64.24	0.63	43.39	53.98	-10.58
4824.00	Peak	H	100	136	-55.68	0.63	51.95	73.98	-22.02
12060.00	Avg	H	-	-	-71.85	15.81	50.96	53.98	-3.02
12060.00	Peak	H	-	-	-59.53	15.81	63.28	73.98	-10.70

Table 7-7. Radiated Measurements

Worst Case Mode:	802.11b
Worst Case Transfer Rate:	1 Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2437MHz
Channel:	06

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
4874.00	Avg	H	105	136	-63.57	1.19	44.62	53.98	-9.36
4874.00	Peak	H	105	136	-55.58	1.19	52.61	73.98	-21.37
7311.00	Avg	H	-	-	-70.87	9.97	46.10	53.98	-7.88
7311.00	Peak	H	-	-	-58.93	9.97	58.04	73.98	-15.94
12185.00	Avg	H	-	-	-72.41	16.32	50.91	53.98	-3.07
12185.00	Peak	H	-	-	-59.16	16.32	64.16	73.98	-9.82

Table 7-8. Radiated Measurements

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Worst Case Mode:	802.11b
Worst Case Transfer Rate:	1 Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2462MHz
Channel:	11

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
4924.00	Avg	H	112	143	-63.91	1.16	44.25	53.98	-9.73
4924.00	Peak	H	112	143	-56.80	1.16	51.36	73.98	-22.62
7386.00	Avg	H	-	-	-71.46	9.96	45.50	53.98	-8.48
7386.00	Peak	H	-	-	-59.98	9.96	56.98	73.98	-17.00
12310.00	Avg	H	-	-	-72.30	15.99	50.69	53.98	-3.29
12310.00	Peak	H	-	-	-60.02	15.99	62.97	73.98	-11.01

Table 7-9. Radiated Measurements

Worst Case Mode:	802.11b
Worst Case Transfer Rate:	1 Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2437MHz
Channel:	06

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
4874.00	Avg	H	110	228	-66.52	0.25	40.73	53.98	-13.25
4874.00	Peak	H	110	228	-58.09	0.25	49.16	73.98	-24.82
7311.00	Avg	H	-	-	-70.96	10.11	46.15	53.98	-7.83
7311.00	Peak	H	-	-	-59.22	10.11	57.89	73.98	-16.09
12185.00	Avg	H	-	-	-72.81	16.73	50.92	53.98	-3.06
12185.00	Peak	H	-	-	-59.65	16.73	64.08	73.98	-9.90

Table 7-10. Radiated Measurements with WCP

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CDD Radiated Spurious Emission Measurements

§15.247(d) §15.205 & §15.209

Worst Case Mode:	802.11b
Worst Case Transfer Rate:	1 Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2412MHz
Channel:	01

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
4824.00	Avg	H	111	314	-63.90	0.67	43.77	53.98	-10.21
4824.00	Peak	H	111	314	-56.26	0.67	51.41	73.98	-22.57
12060.00	Avg	H	-	-	-70.83	14.53	50.70	53.98	-3.28
12060.00	Peak	H	-	-	-59.43	14.53	62.10	73.98	-11.88

Table 7-11. Radiated Measurements

Worst Case Mode:	802.11b
Worst Case Transfer Rate:	1 Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2437MHz
Channel:	06

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
4874.00	Avg	H	121	348	-64.91	0.77	42.86	53.98	-11.11
4874.00	Peak	H	121	348	-57.14	0.77	50.63	73.98	-23.34
7311.00	Avg	H	115	146	-68.85	9.77	47.92	53.98	-6.06
7311.00	Peak	H	115	146	-57.97	9.77	58.80	73.98	-15.18
12185.00	Avg	H	-	-	-72.43	16.13	50.70	53.98	-3.28
12185.00	Peak	H	-	-	-58.60	16.13	64.53	73.98	-9.45

Table 7-12. Radiated Measurements

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Worst Case Mode:	802.11b
Worst Case Transfer Rate:	1 Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2462MHz
Channel:	11

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
4924.00	Avg	H	114	313	-66.72	1.03	41.31	53.98	-12.67
4924.00	Peak	H	114	313	-57.77	1.03	50.26	73.98	-23.72
7386.00	Avg	H	111	228	-69.39	9.89	47.50	53.98	-6.48
7386.00	Peak	H	111	228	-58.65	9.89	58.24	73.98	-15.74
12310.00	Avg	H	-	-	-71.18	14.83	50.65	53.98	-3.33
12310.00	Peak	H	-	-	-58.38	14.83	63.45	73.98	-10.53

Table 7-13. Radiated Measurements

Worst Case Mode:	802.11b
Worst Case Transfer Rate:	1 Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2437MHz
Channel:	06

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
4824.00	Avg	H	324	215	-65.43	1.03	42.60	53.98	-11.38
4824.00	Peak	H	324	215	-56.44	1.03	51.59	73.98	-22.39
12060.00	Avg	H	-	-	-70.84	9.89	46.05	53.98	-7.93
12060.00	Peak	H	-	-	-58.44	9.89	58.45	73.98	-15.53

Table 7-14. Radiated Measurements with WCP

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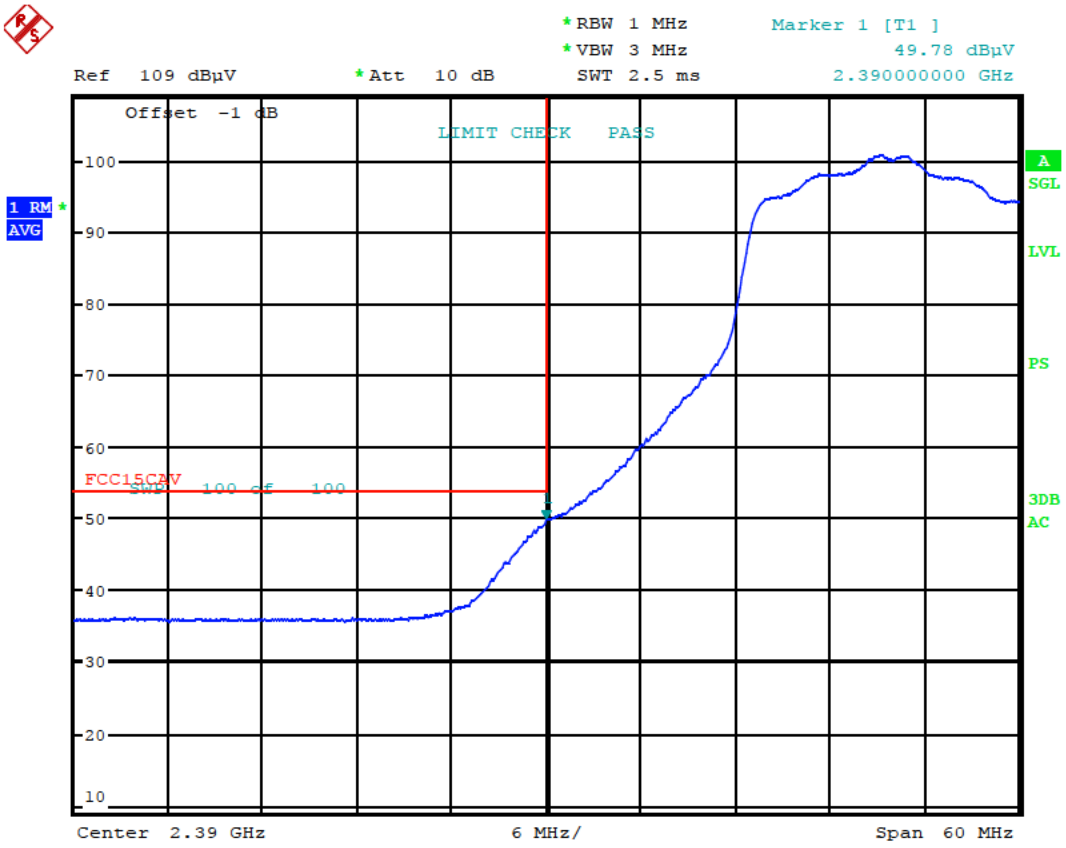
7.2.3 Antenna-1 Radiated Restricted Band Edge Measurements

§15.205 §15.209

The radiated restricted band edge measurements are measured with an EMI test receiver connected to the receive antenna while the EUT is transmitting.

Worst Case Mode:	802.11g
Worst Case Transfer Rate:	6 Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2412MHz
Channel:	1



Date: 24.JUL.2017 23:14:55

Plot 7-21. Radiated Restricted Lower Band Edge Measurement (Average)

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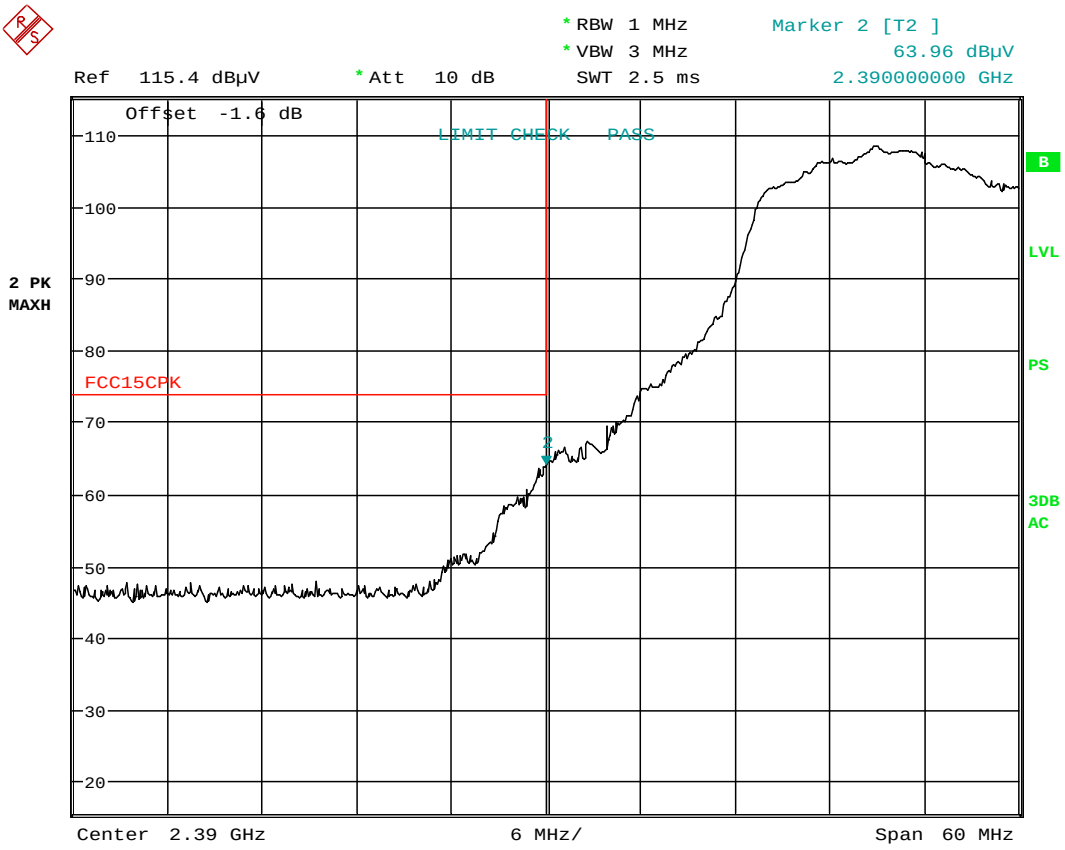
Antenna-1 Radiated Restricted Band Edge Measurements

§15.205 §15.209



Plot 7-22. Radiated Restricted Lower Band Edge Measurement (Peak)

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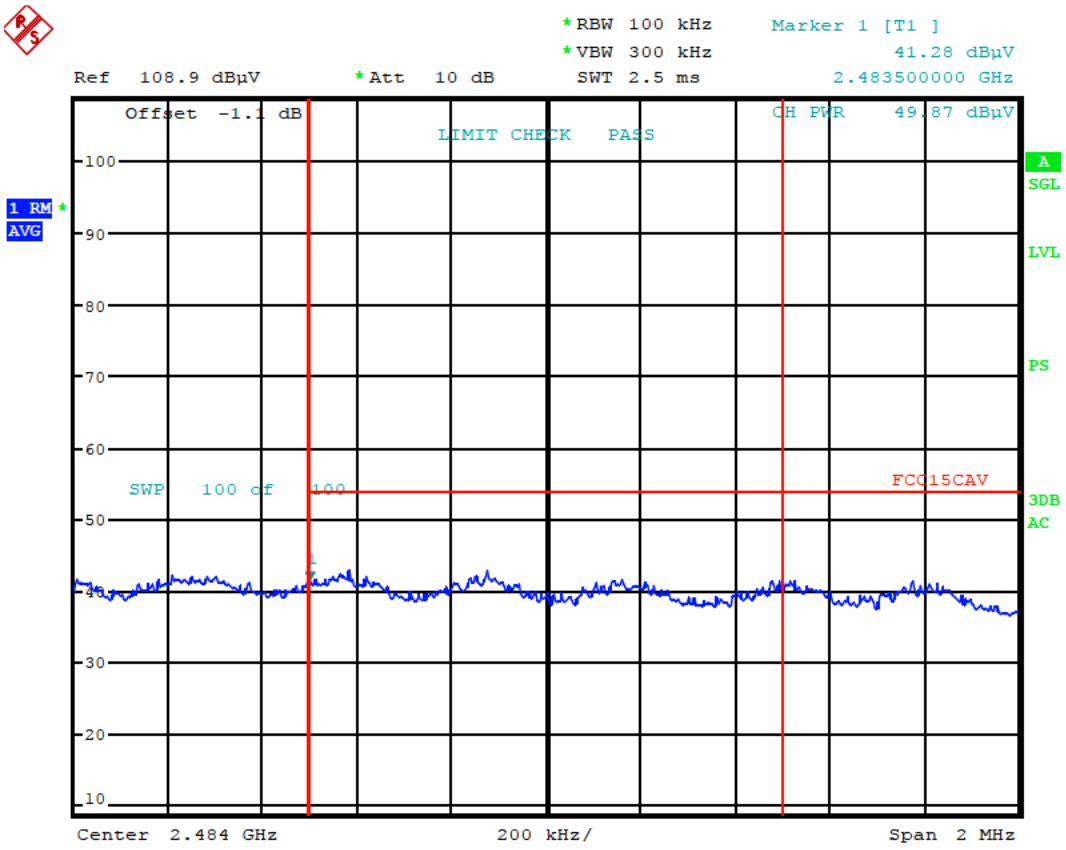
Antenna-1 Radiated Restricted Band Edge Measurements

§15.205 §15.209

Worst Case Mode:	802.11g
Worst Case Transfer Rate:	6 Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2462MHz
Channel:	11



Date: 24.JUL.2017 23:20:37

Plot 7-23. Radiated Restricted Upper Band Edge Measurement (Average)

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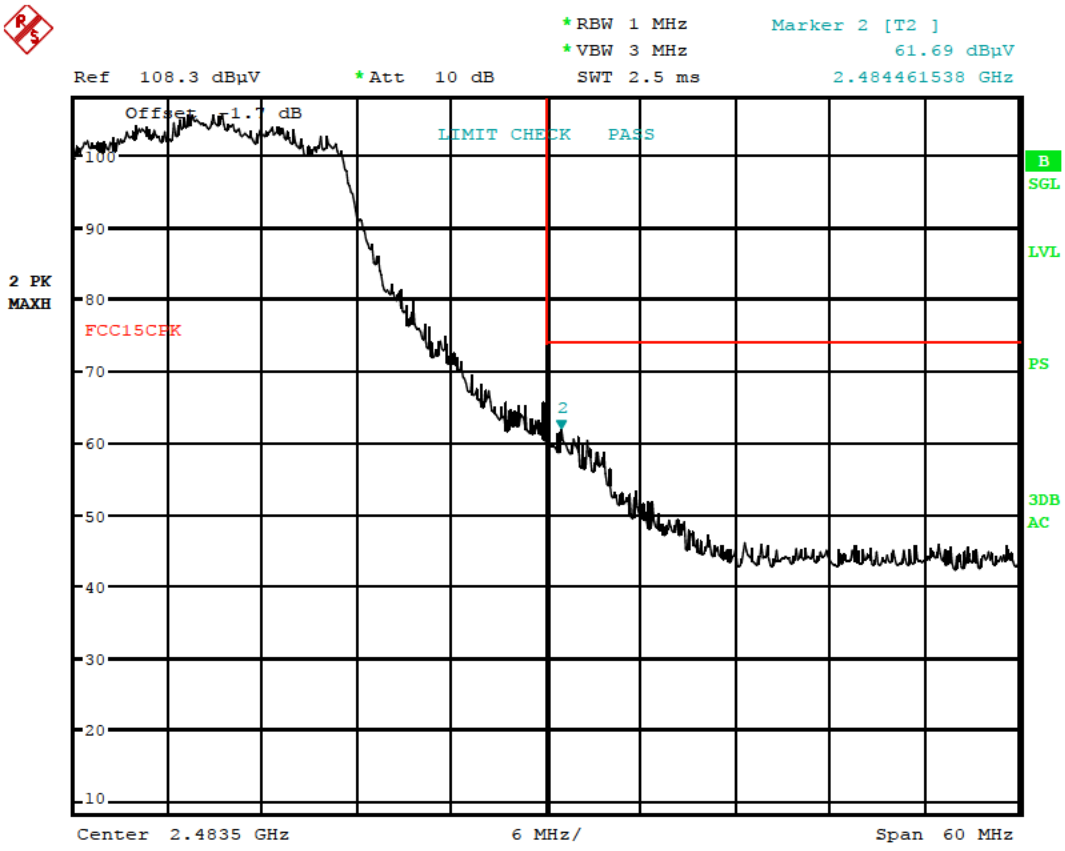
Antenna-1 Radiated Restricted Band Edge Measurements
§15.205 §15.209



Date: 24.JUL.2017 23:21:13

Plot 7-24. Radiated Restricted Upper Band Edge Measurement (Peak)

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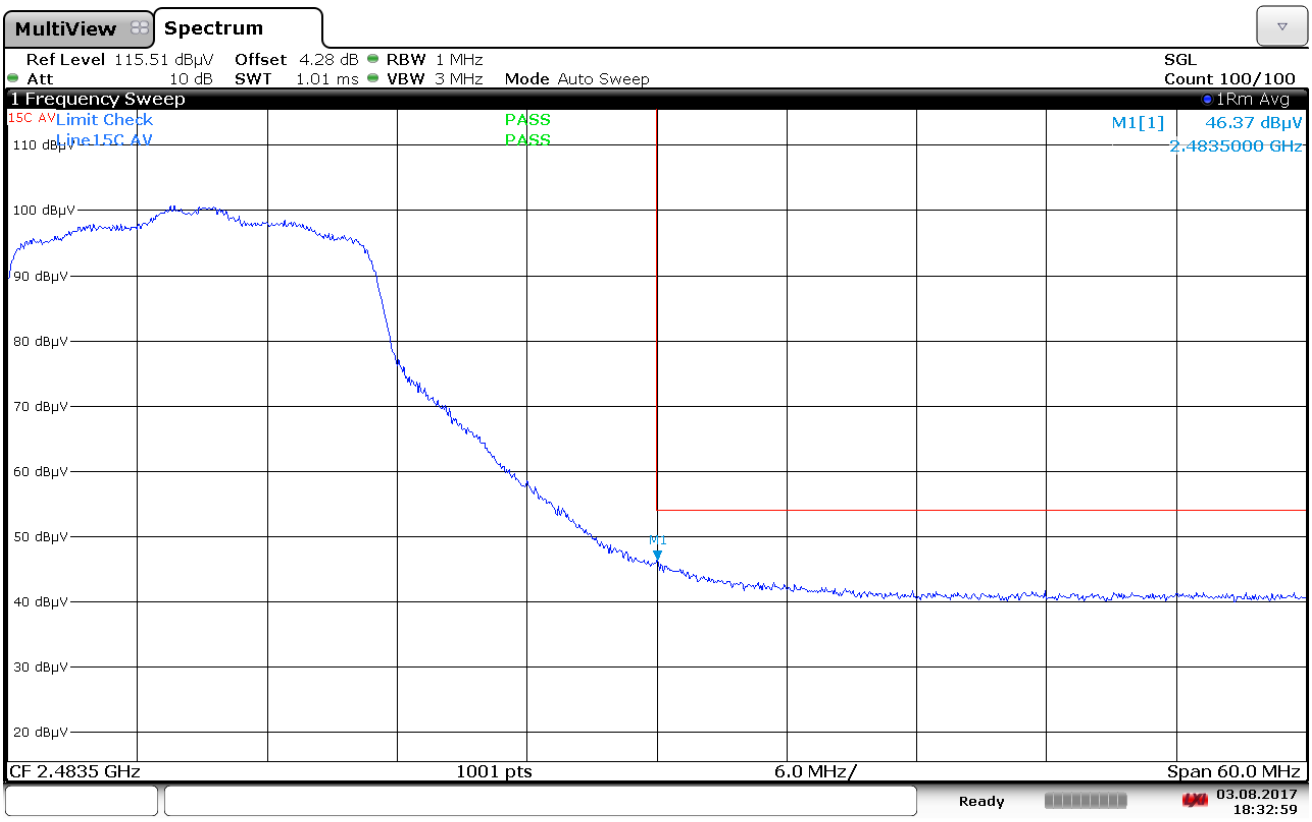
Antenna-1 WCP Radiated Restricted Band Edge Measurements

§15.205 §15.209

Worst Case Mode:	802.11g
Worst Case Transfer Rate:	6 Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2462 MHz
Channel:	11



18:33:00 03.08.2017

Plot 7-25. Radiated Restricted Band Edge Measurement with WCP (Average)

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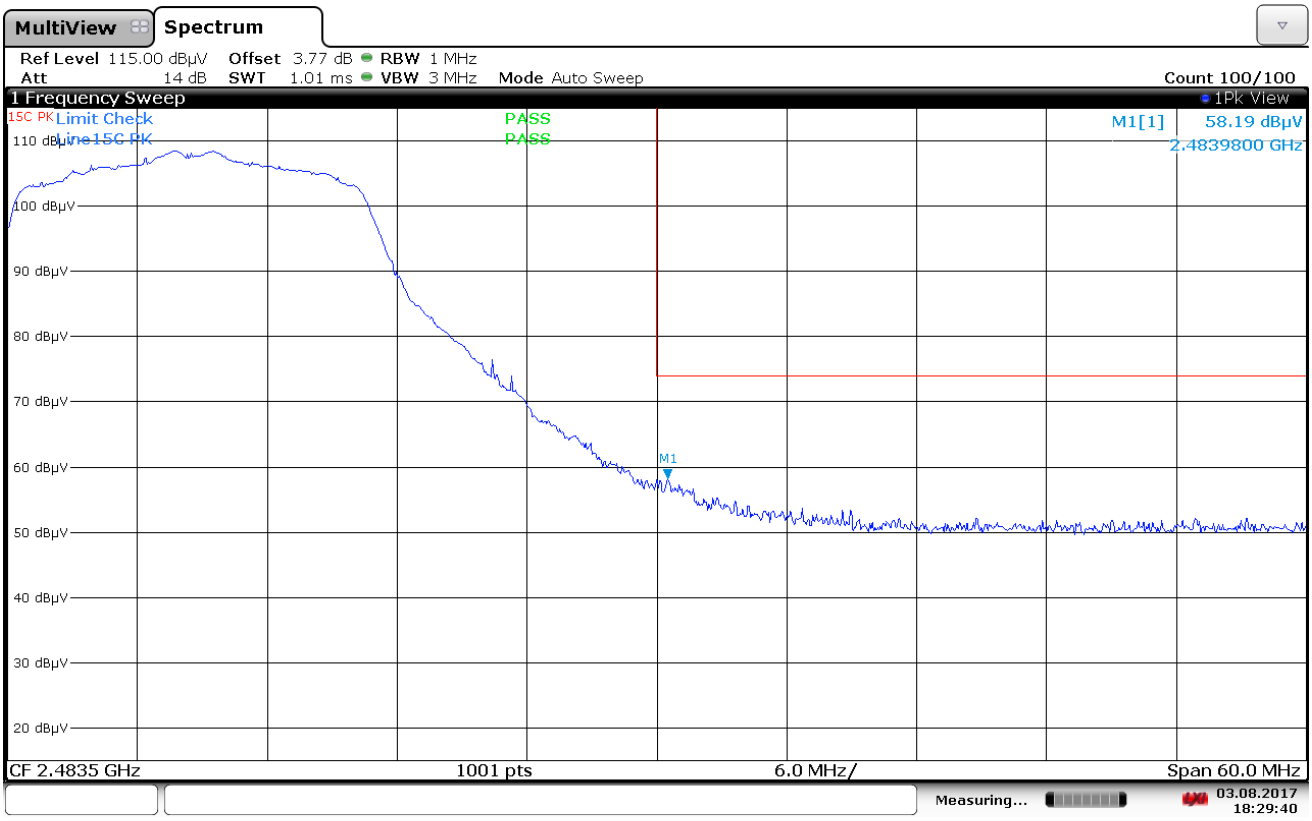
Antenna-1 WCP Radiated Restricted Band Edge Measurements

§15.205 §15.209



18:29:40 03.08.2017

Plot 7-26. Radiated Restricted Band Edge Measurement with WCP (Peak)

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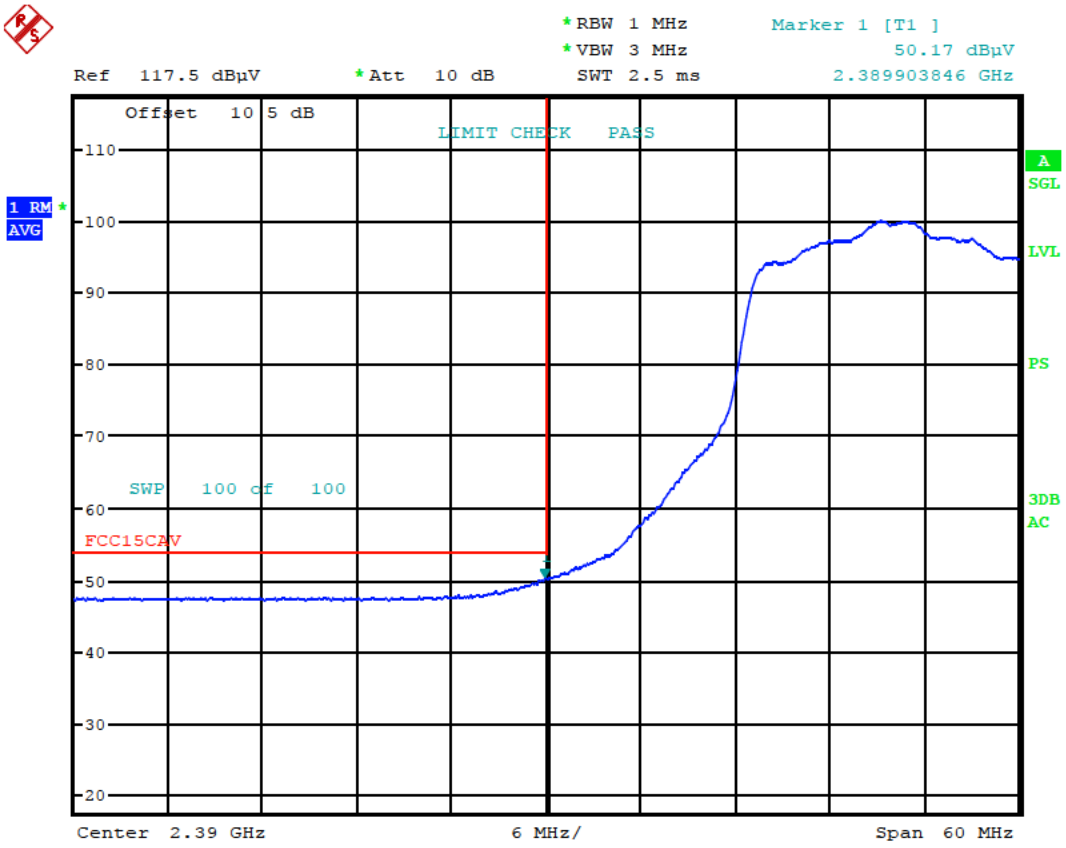
7.2.4 Antenna-2 Radiated Restricted Band Edge Measurements

§15.205 §15.209

The radiated restricted band edge measurements are measured with an EMI test receiver connected to the receive antenna while the EUT is transmitting.

Worst Case Mode:	802.11g
Worst Case Transfer Rate:	6 Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2412MHz
Channel:	1



Date: 26.JUL.2017 22:13:46

Plot 7-27. Radiated Restricted Lower Band Edge Measurement (Average)

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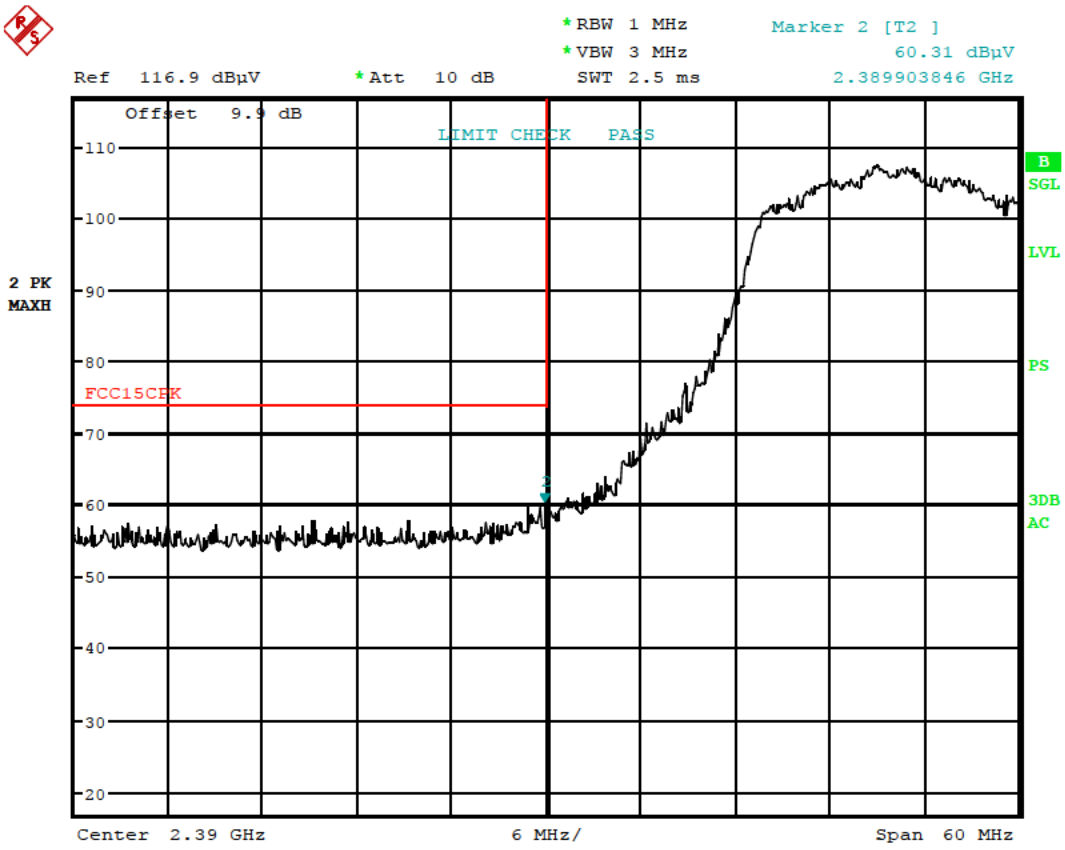
Antenna-2 Radiated Restricted Band Edge Measurements

§15.205 §15.209



Date: 26.JUL.2017 22:13:25

Plot 7-28. Radiated Restricted Lower Band Edge Measurement (Peak)

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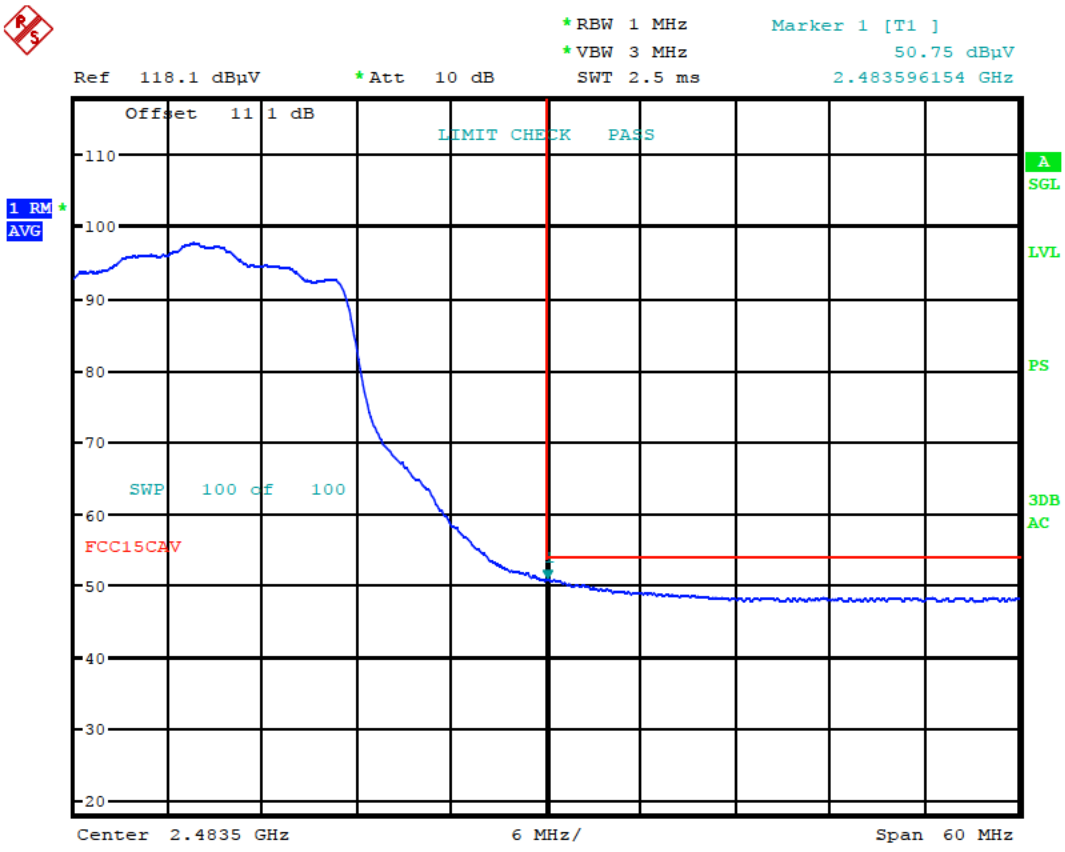
Antenna-2 Radiated Restricted Band Edge Measurements
§15.205 §15.209

Worst Case Mode:	802.11g
Worst Case Transfer Rate:	6 Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2462MHz
Channel:	11



Date: 26.JUL.2017 22:25:46

Plot 7-29. Radiated Restricted Upper Band Edge Measurement (Average)

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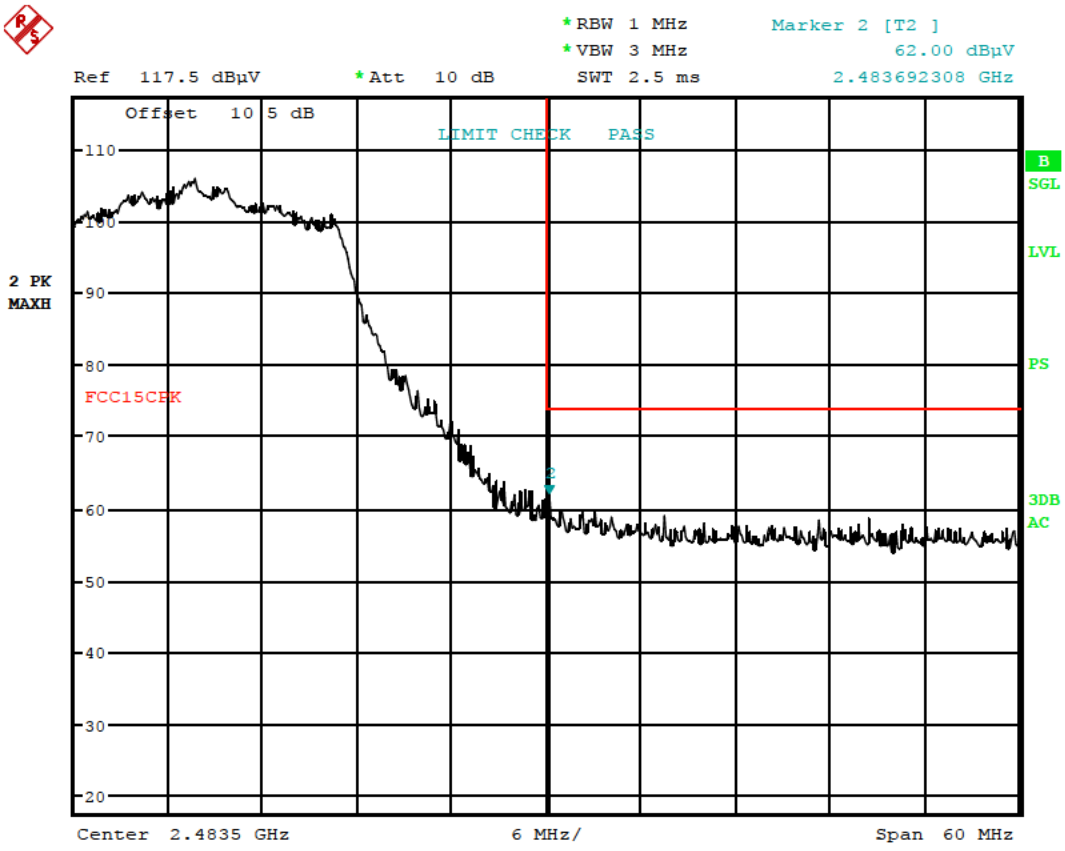
Antenna-2 Radiated Restricted Band Edge Measurements

§15.205 §15.209



Date: 26.JUL.2017 22:26:26

Plot 7-30. Radiated Restricted Upper Band Edge Measurement (Peak)

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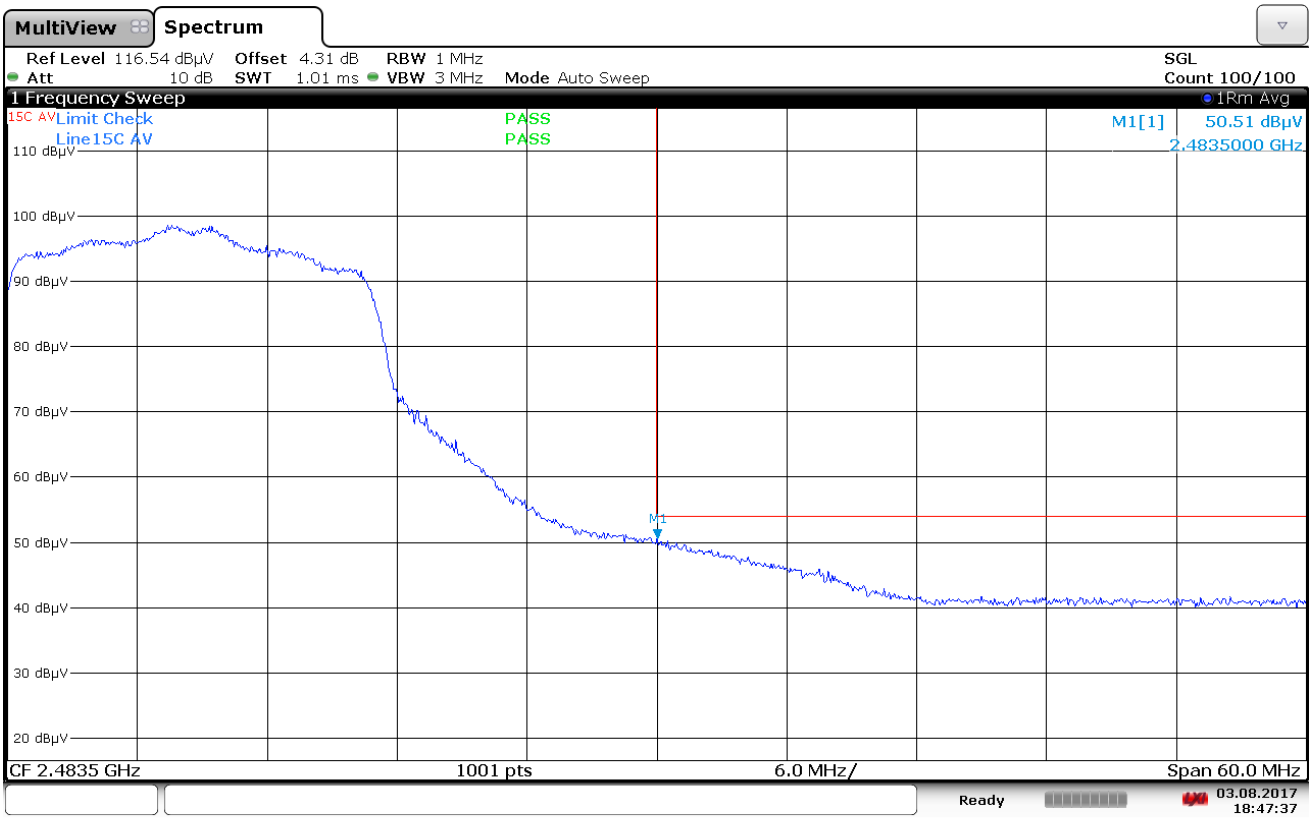
Antenna-2 WCP Radiated Restricted Band Edge Measurements

§15.205 §15.209

Worst Case Mode:	802.11g
Worst Case Transfer Rate:	6 Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2462MHz
Channel:	11



18:47:38 03.08.2017

Plot 7-31. Radiated Restricted Band Edge Measurement with WCP (Average)

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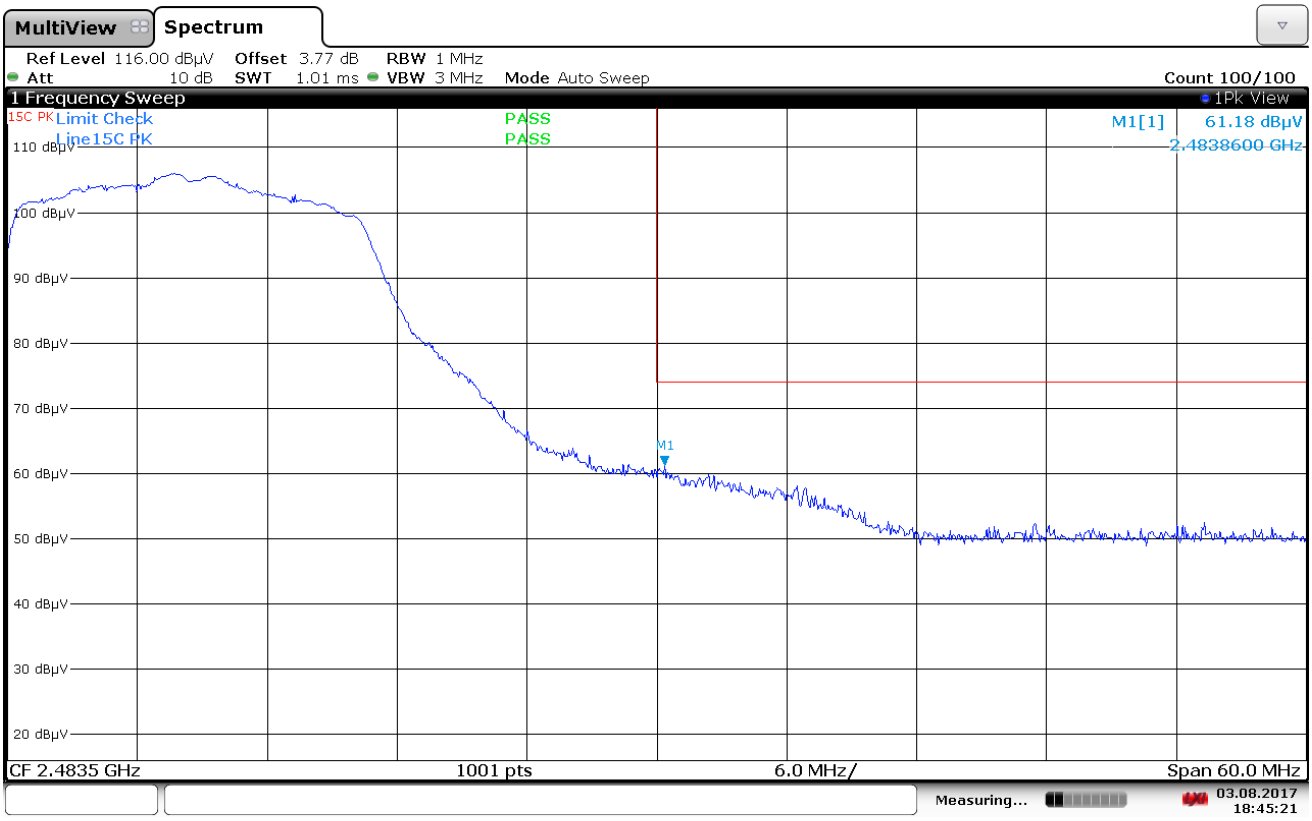
Antenna-2 WCP Radiated Restricted Band Edge Measurements

§15.205 §15.209



18:45:22 03.08.2017

Plot 7-32. Radiated Restricted Band Edge Measurement with WCP (Peak)

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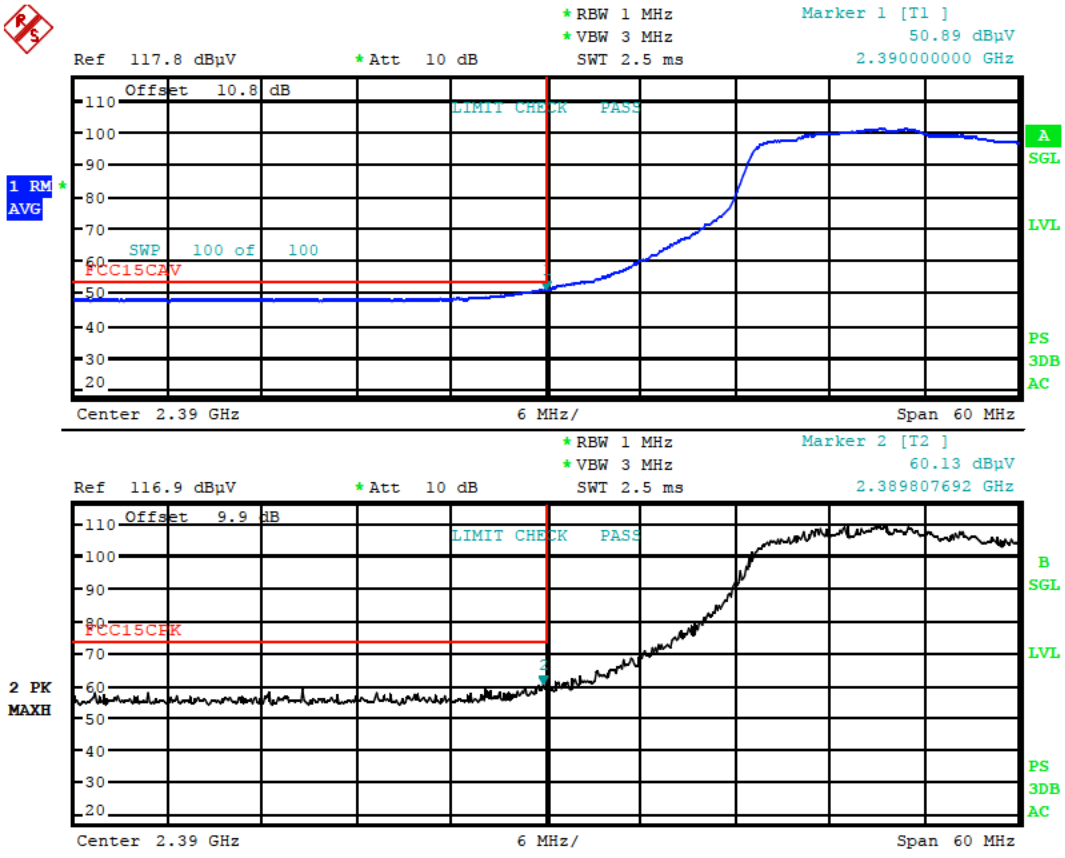
7.2.5 MIMO Radiated Restricted Band Edge Measurements

§15.205 §15.209

The radiated restricted band edge measurements are measured with an EMI test receiver connected to the receive antenna while the EUT is transmitting.

Worst Case Mode:	802.11n
Worst Case Transfer Rate:	MCS8
Distance of Measurements:	3 Meters
Operating Frequency:	2412MHz
Channel:	1



Date: 26.JUL.2017 23:14:21

Plot 7-33. Radiated Restricted Lower Band Edge Measurement (Average)

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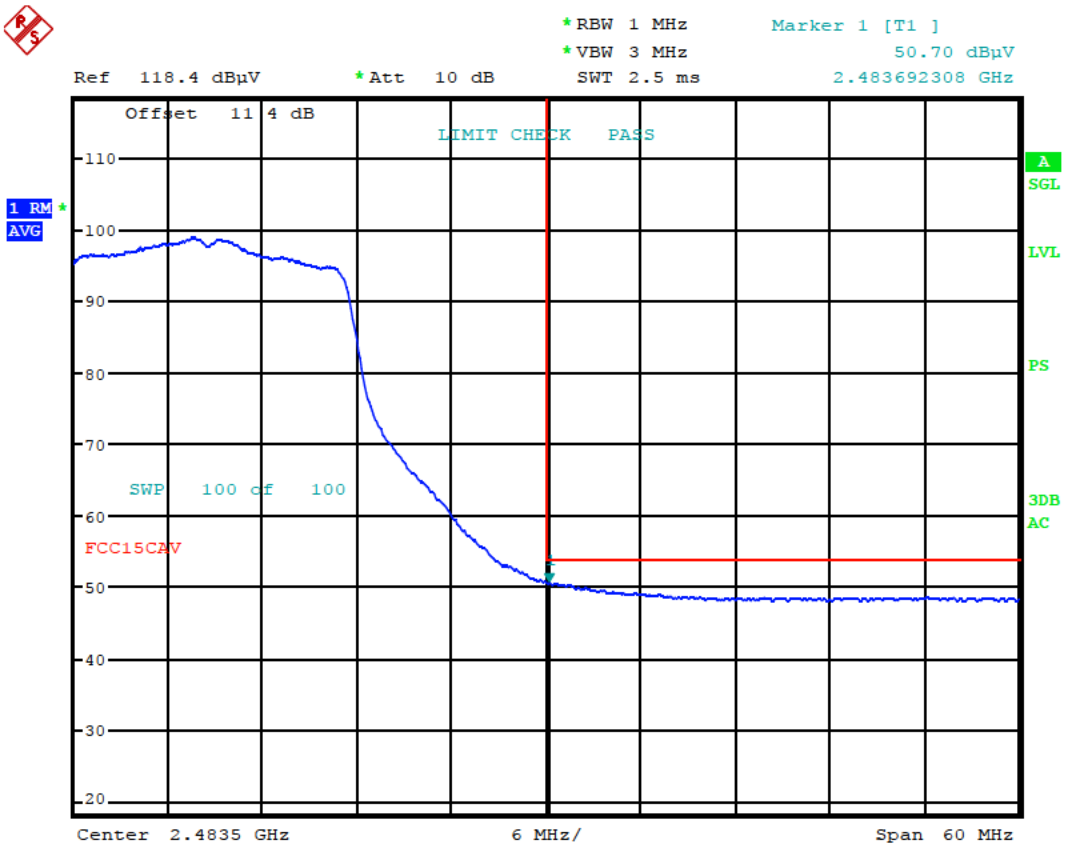
MIMO Radiated Restricted Band Edge Measurements

§15.205 §15.209

Worst Case Mode:	802.11n
Worst Case Transfer Rate:	MCS8
Distance of Measurements:	3 Meters
Operating Frequency:	2462MHz
Channel:	11



Date: 26.JUL.2017 22:54:24

Plot 7-34. Radiated Restricted Upper Band Edge Measurement (Average)

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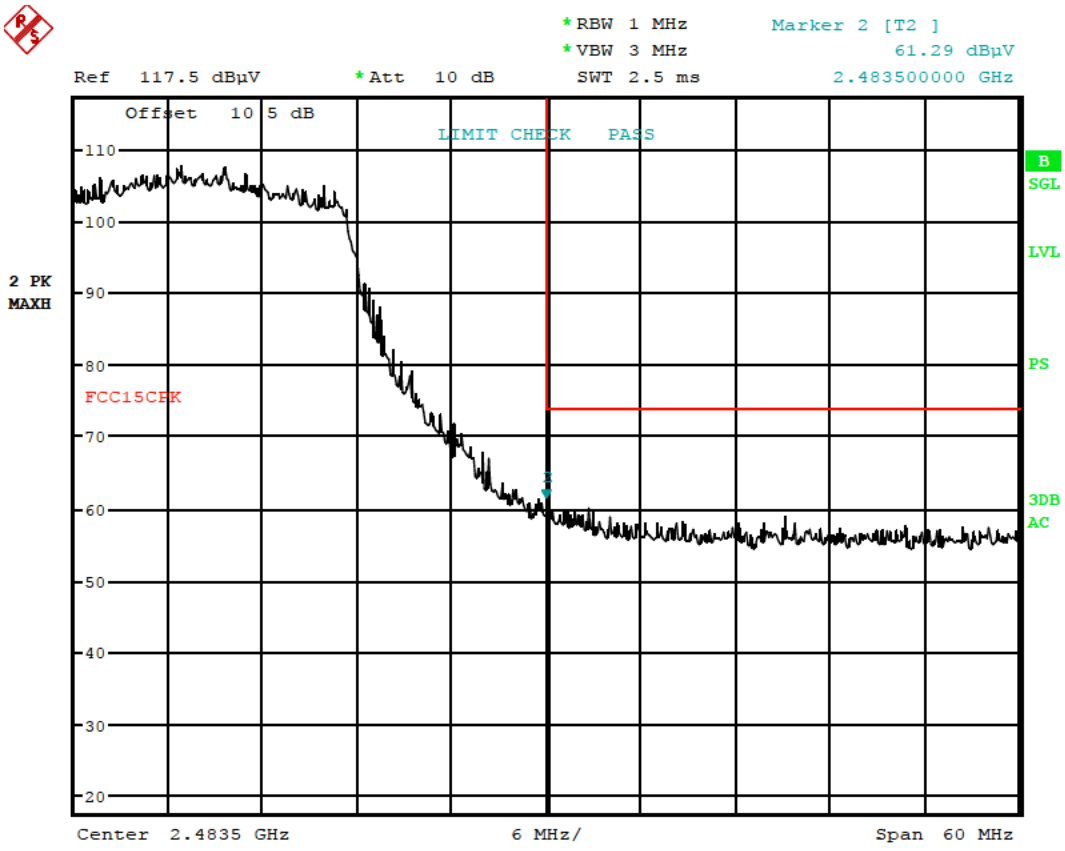
MIMO Radiated Restricted Band Edge Measurements

§15.205 §15.209



Plot 7-35. Radiated Restricted Upper Band Edge Measurement (Peak)

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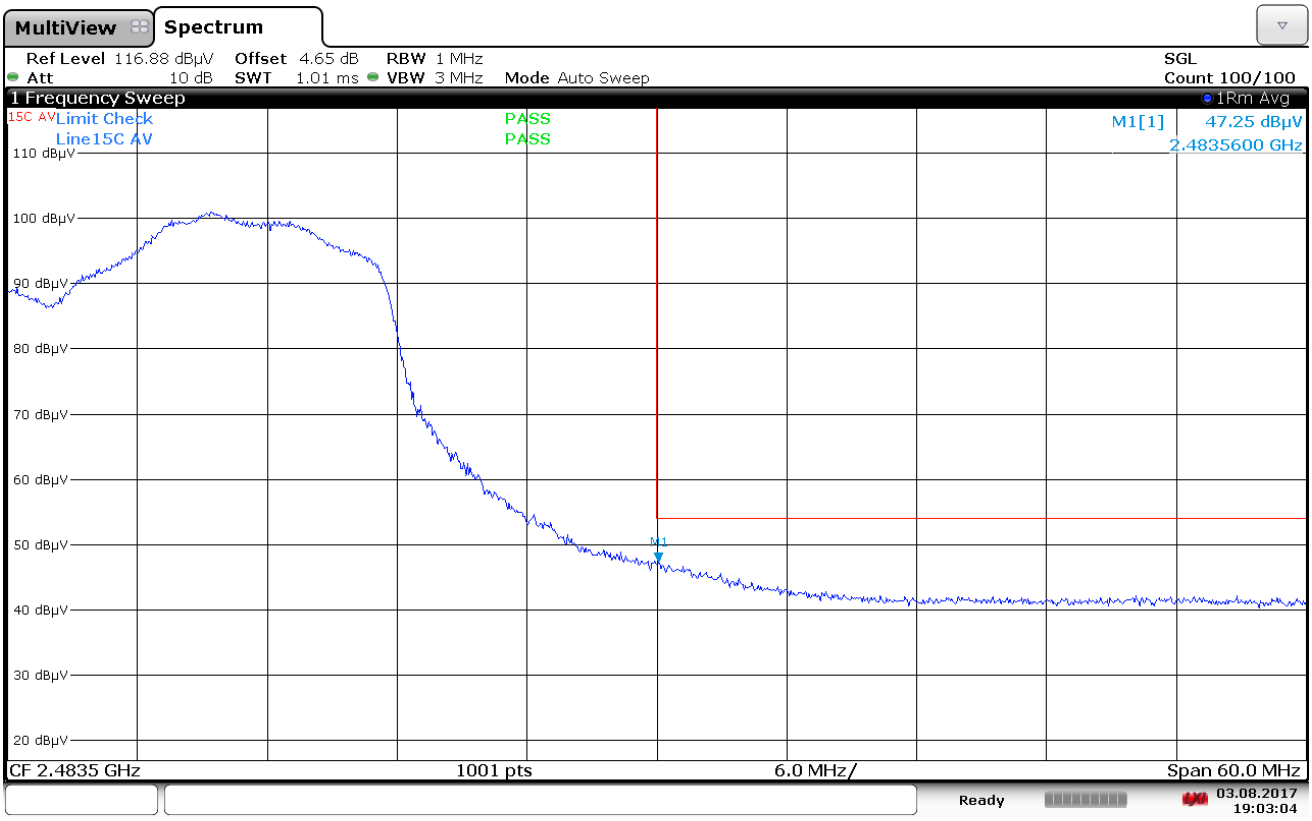
MIMO WCP Radiated Restricted Band Edge Measurements

§15.205 §15.209

Worst Case Mode:	802.11n
Worst Case Transfer Rate:	Mcs8
Distance of Measurements:	3 Meters
Operating Frequency:	2462MHz
Channel:	11



19:03:05 03.08.2017

Plot 7-36. Radiated Restricted Band Edge Measurement with WCP (Average)

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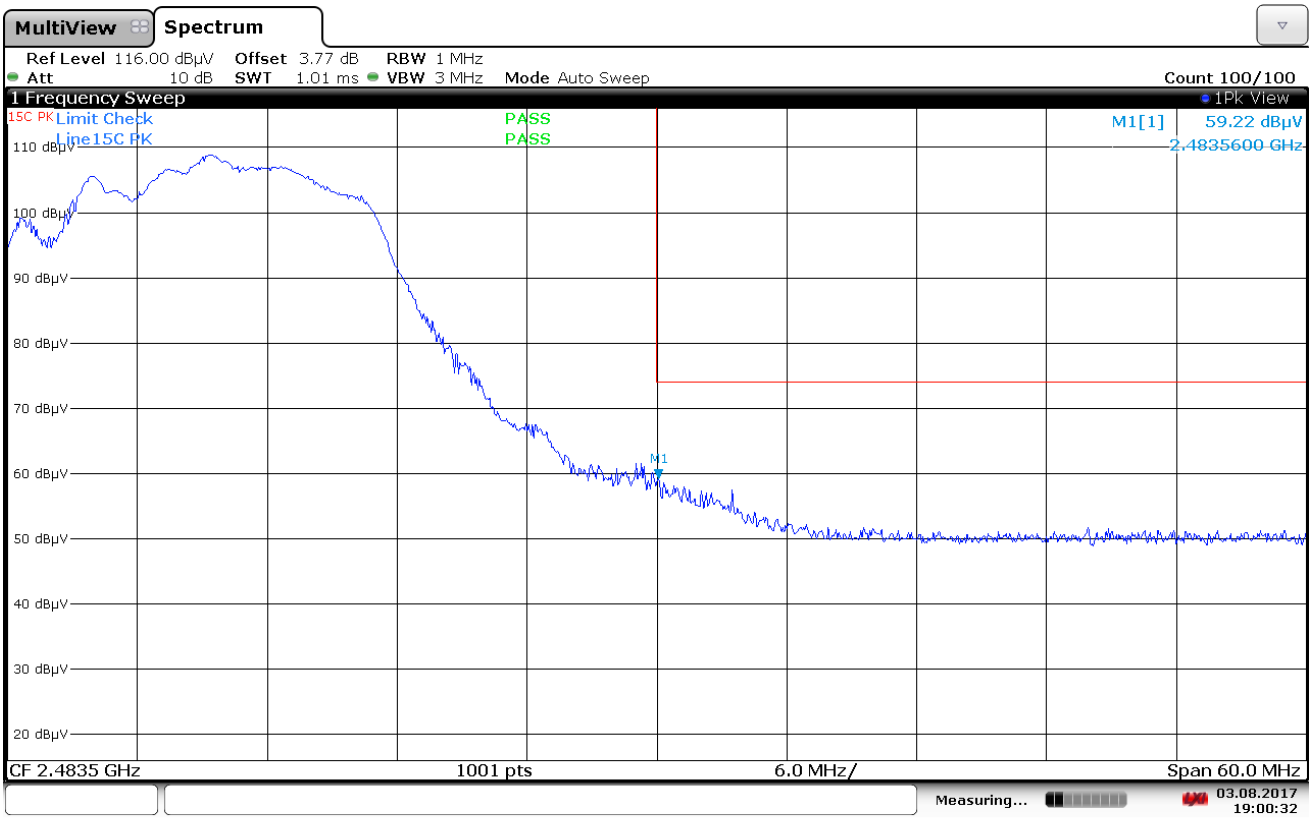
MIMO WCP Radiated Restricted Band Edge Measurements

§15.205 §15.209



19:00:32 03.08.2017

Plot 7-37. Radiated Restricted Band Edge Measurement with WCP (Peak)

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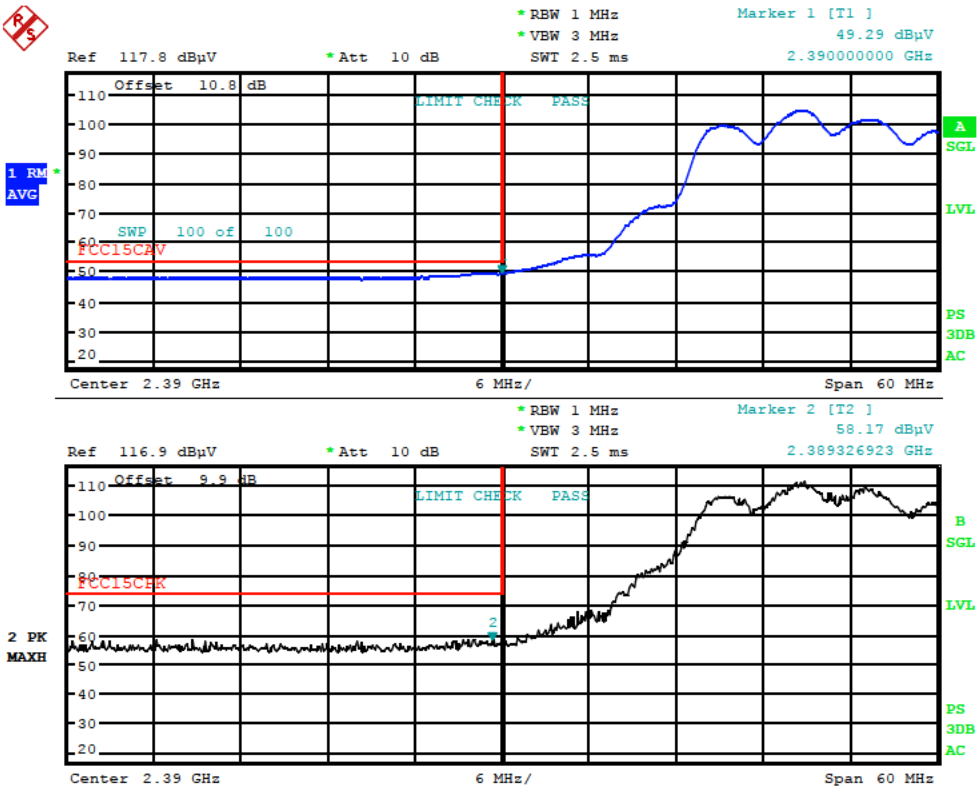
7.2.6 CDD Radiated Restricted Band Edge Measurements

§15.205 §15.209

The radiated restricted band edge measurements are measured with an EMI test receiver connected to the receive antenna while the EUT is transmitting.

Worst Case Mode:	802.11g
Worst Case Transfer Rate:	6Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2412MHz
Channel:	1



Date: 26.JUL.2017 23:05:08

Plot 7-38. Radiated Restricted Lower Band Edge Measurement (Average)

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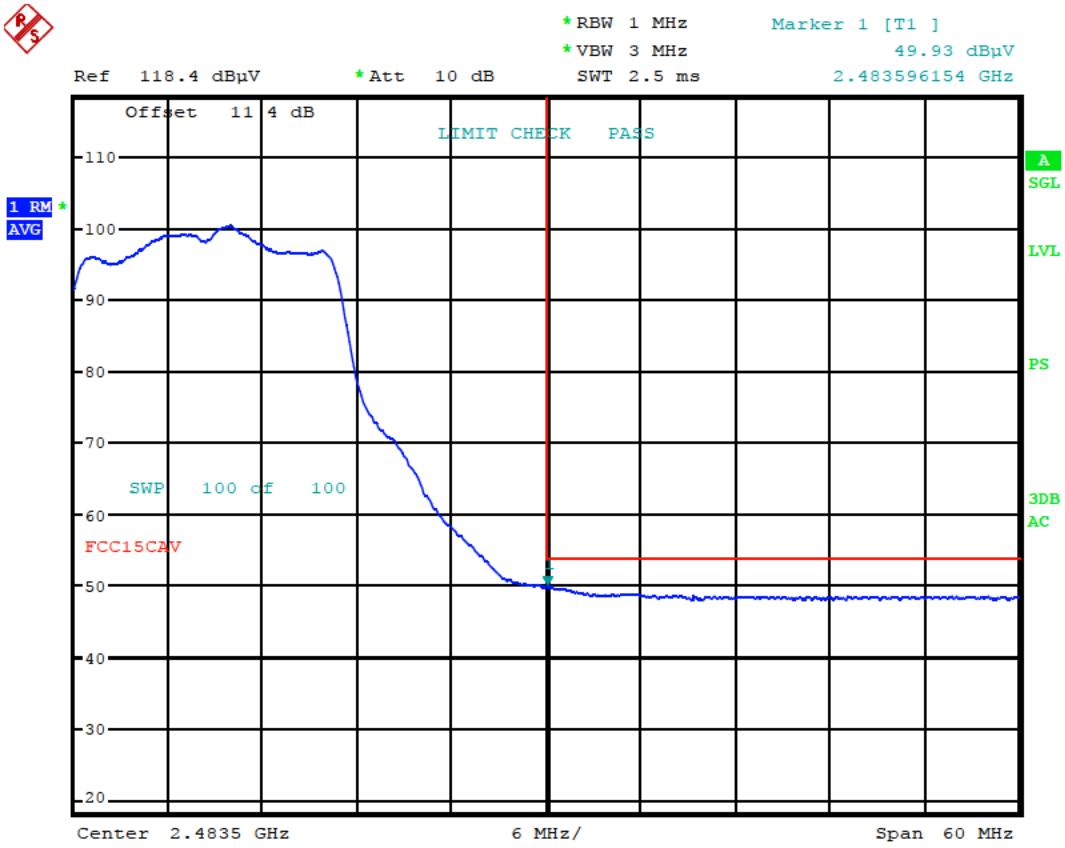
CDD Radiated Restricted Band Edge Measurements

§15.205 §15.209

Worst Case Mode:	802.11g
Worst Case Transfer Rate:	6Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2462MHz
Channel:	11



Plot 7-39. Radiated Restricted Upper Band Edge Measurement (Average)

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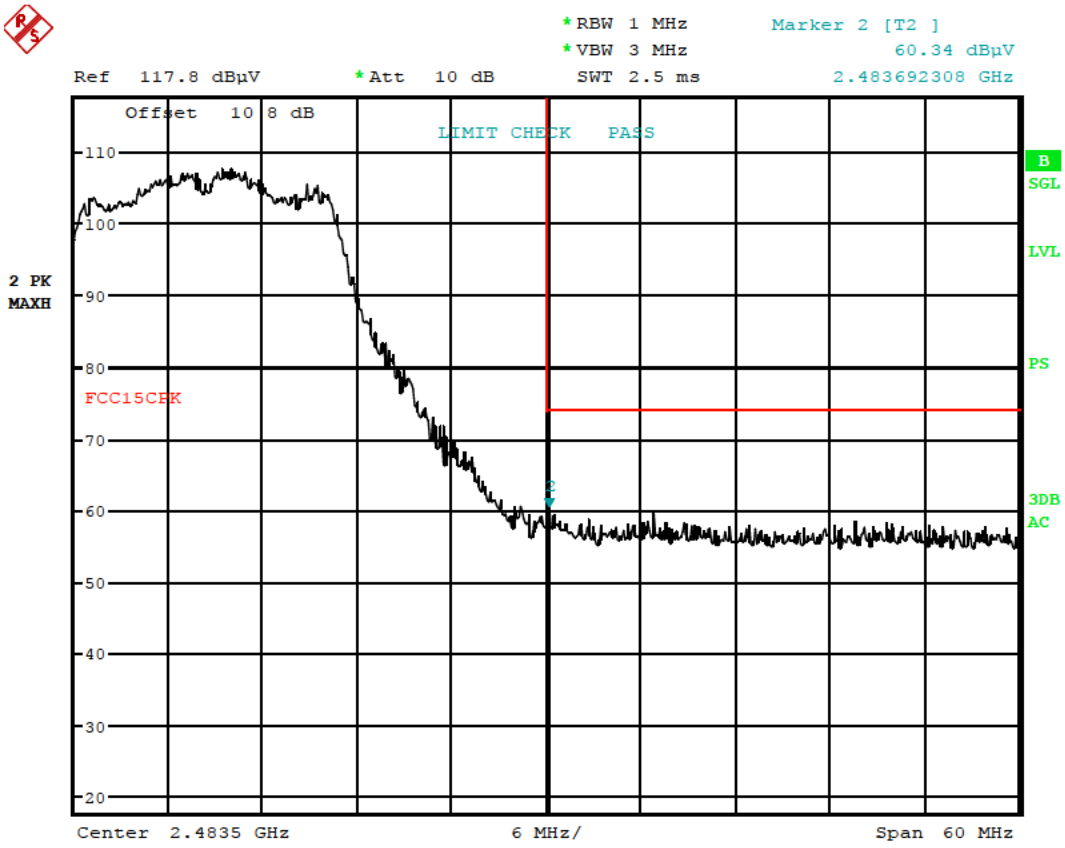
CDD Radiated Restricted Band Edge Measurements
§15.205 §15.209



Plot 7-40. Radiated Restricted Upper Band Edge Measurement (Peak)

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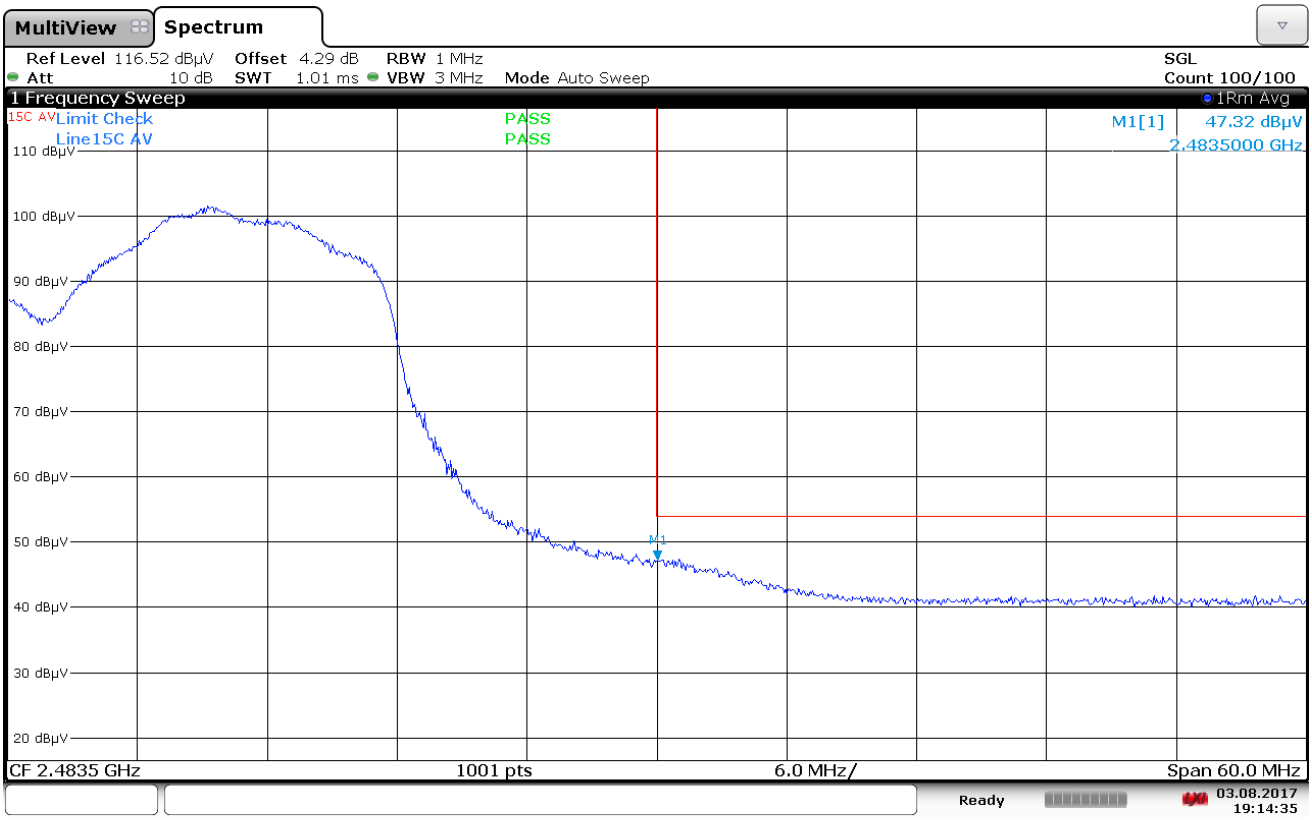
CDD WCP Radiated Restricted Band Edge Measurements

§15.205 §15.209

Worst Case Mode:	802.11g
Worst Case Transfer Rate:	6Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2462MHz
Channel:	11



19:14:35 03.08.2017

Plot 7-41. Radiated Restricted Band Edge Measurement with WCP (Average)

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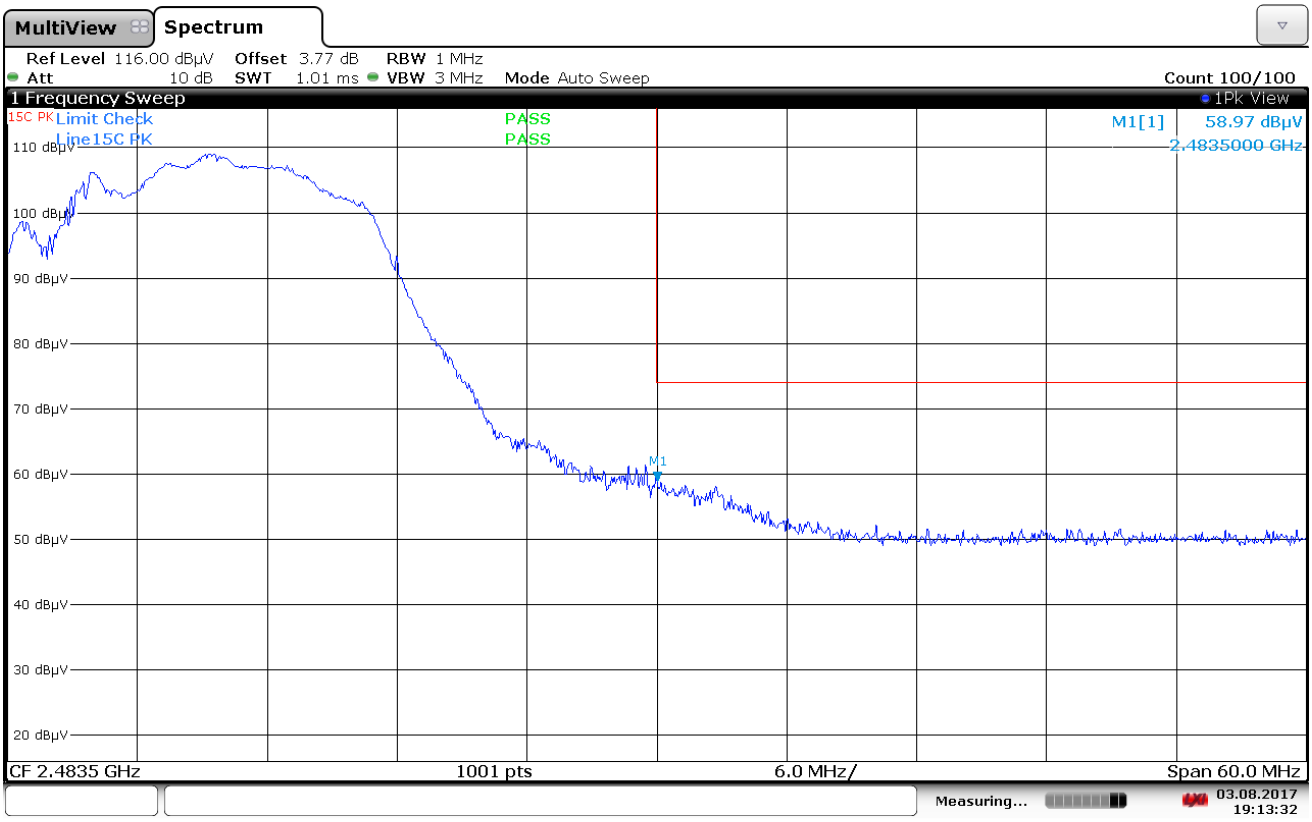
CDD WCP Radiated Restricted Band Edge Measurements

§15.205 §15.209



19:13:32 03.08.2017

Plot 7-42. Radiated Restricted Band Edge Measurement with WCP (Average)

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7.3 Radiated Spurious Emissions Measurements – Below 1GHz

§15.209

Test Overview and Limit

All out of band radiated spurious emissions are measured with a spectrum analyzer connected to a receive antenna while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates and modes were investigated for radiated spurious emissions. Only the radiated emissions of the configuration that produced the worst case emissions are reported in this section.

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR must not exceed the limits shown in Table 7-15 per Section 15.209.

Frequency	Field Strength [μV/m]	Measured Distance [Meters]
0.009 – 0.490 MHz	2400/F (kHz)	300
0.490 – 1.705 MHz	24000/F (kHz)	30
1.705 – 30.00 MHz	30	30
30.00 – 88.00 MHz	100	3
88.00 – 216.0 MHz	150	3
216.0 – 960.0 MHz	200	3
Above 960.0 MHz	500	3

Table 7-15. Radiated Limits

Test Procedures Used

ANSI C63.10-2013

Test Settings

Quasi-Peak Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 120kHz (for emissions from 30MHz – 1GHz)
3. Detector = quasi-peak
4. Sweep time = auto couple
5. Trace mode = max hold
6. Trace was allowed to stabilize

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Test Setup

The EUT and measurement equipment were set up as shown in the diagrams below.

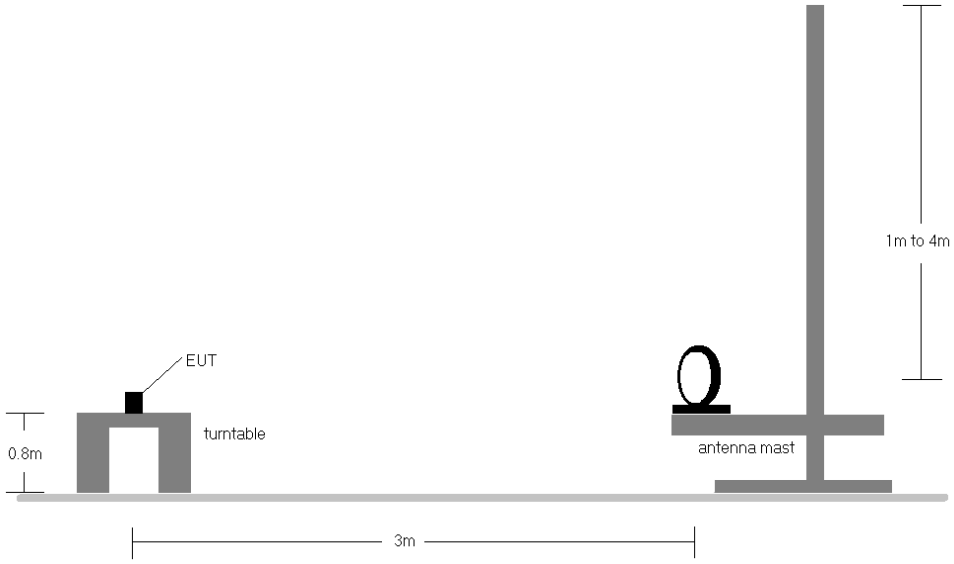

Figure 7-2. Radiated Test Setup < 30Mhz

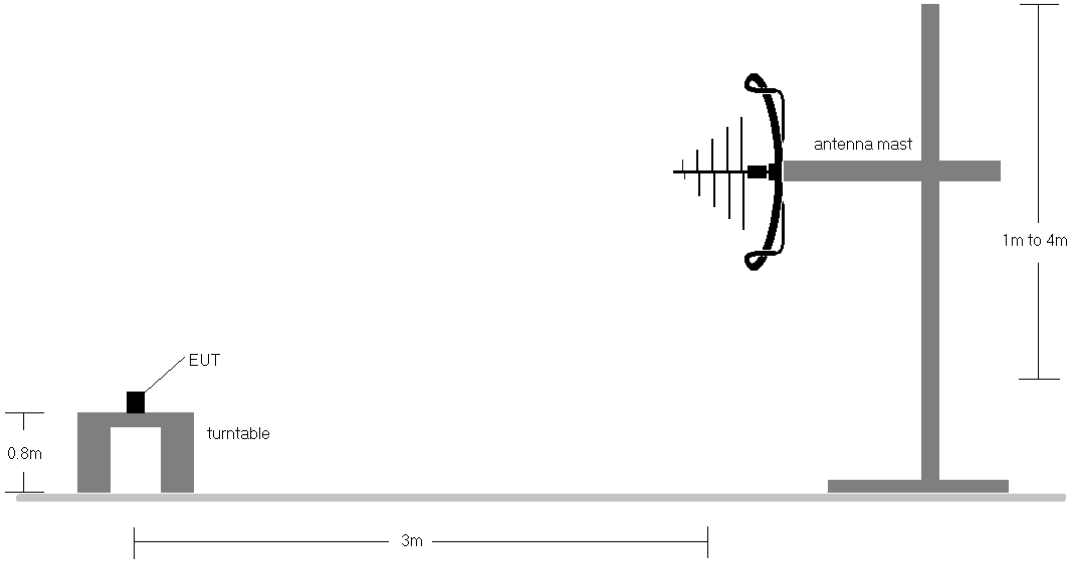

Figure 7-3. Radiated Test Setup < 1GHz

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Test Notes

1. All emissions lying in restricted bands specified in §15.205 are below the limit shown in Table 7-15.
2. The broadband receive antenna is manipulated through vertical and horizontal polarizations during the tests. The EUT is manipulated through three orthogonal planes.
3. This unit was tested with its standard battery.
4. The spectrum is investigated using a peak detector and final measurements are recorded using CISPR quasi peak detector. The worst-case emissions are reported however emissions whose levels were not within 20dB of the respective limits were not reported.
5. Emissions were measured at a 3 meter test distance.
6. Emissions are investigated while operating on the center channel of the mode, band, and modulation that produced the worst case results during the transmitter spurious emissions testing.
7. No spurious emissions were detected within 20dB of the limit below 30MHz.
8. The results recorded using the broadband antenna is known to correlate with the results obtained by using a tuned dipole with an acceptable degree of accuracy. The VSWR for the measurement antenna was found to be less than 2:1.
9. The wide spectrum spurious emissions plots shown on the following pages are used only for the purpose of emission identification. There were no emissions detected in the 30MHz – 1GHz frequency range, as shown in the subsequent plots.

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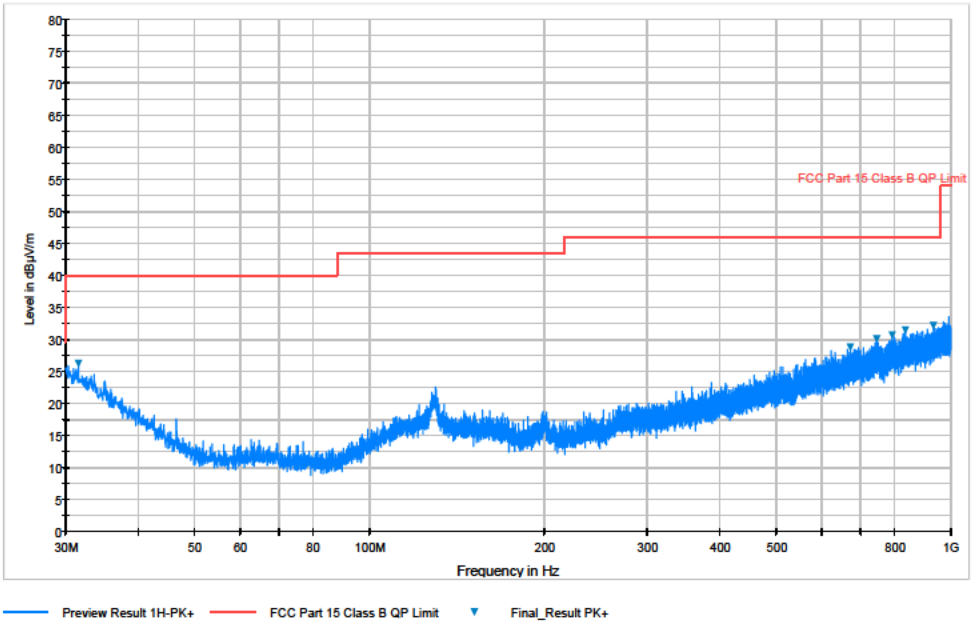
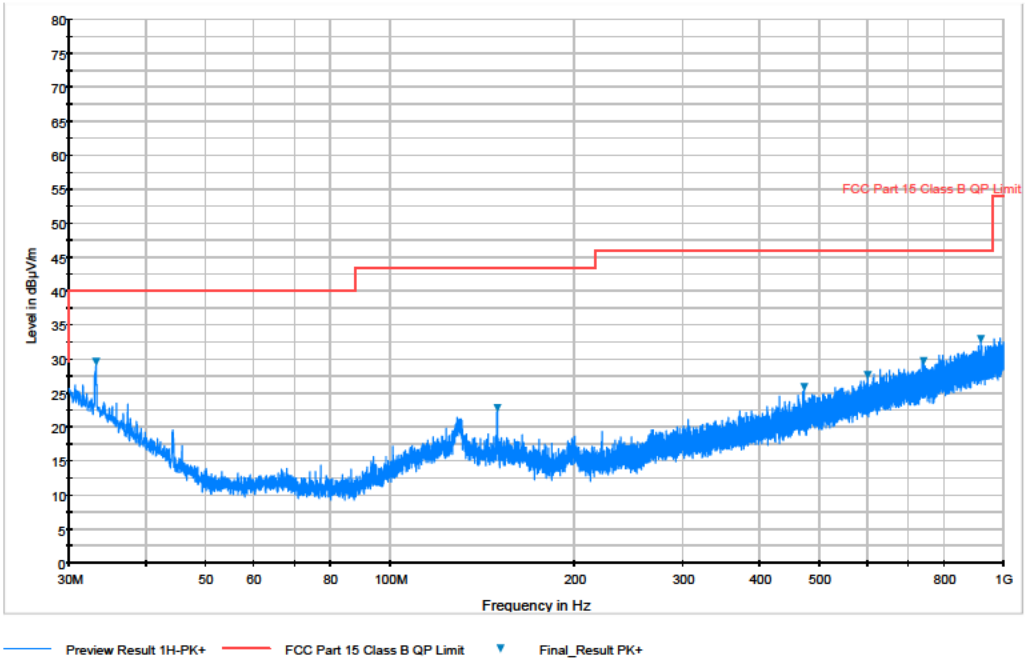
Antenna-1 Radiated Spurious Emissions Measurements (Below 1GHz)
§15.209



Plot 7-43. Radiated Spurious Plot below 1GHz (Pol. H)



Plot 7-44. Radiated Spurious Plot below 1GHz (Pol. V)

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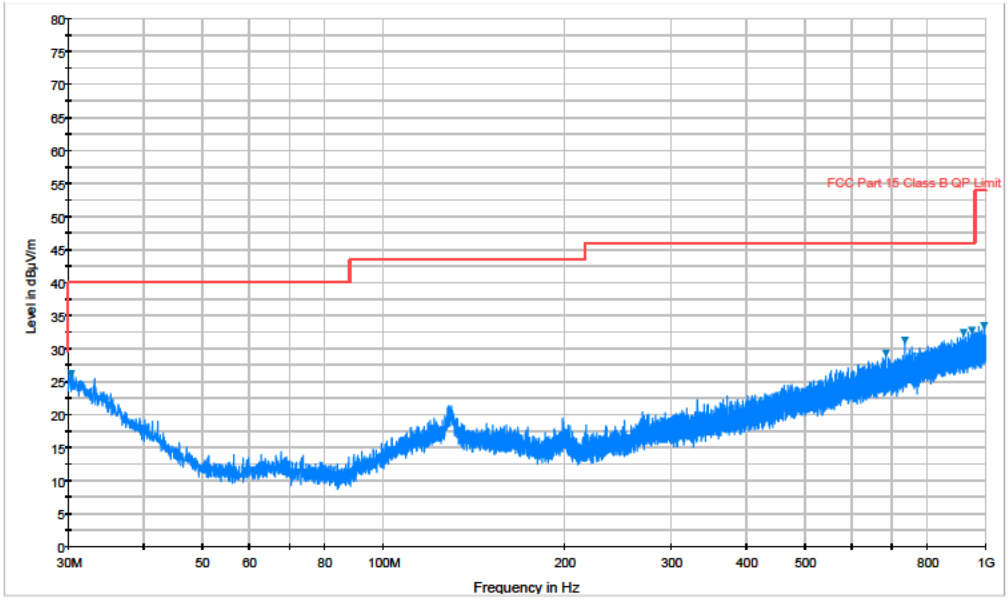
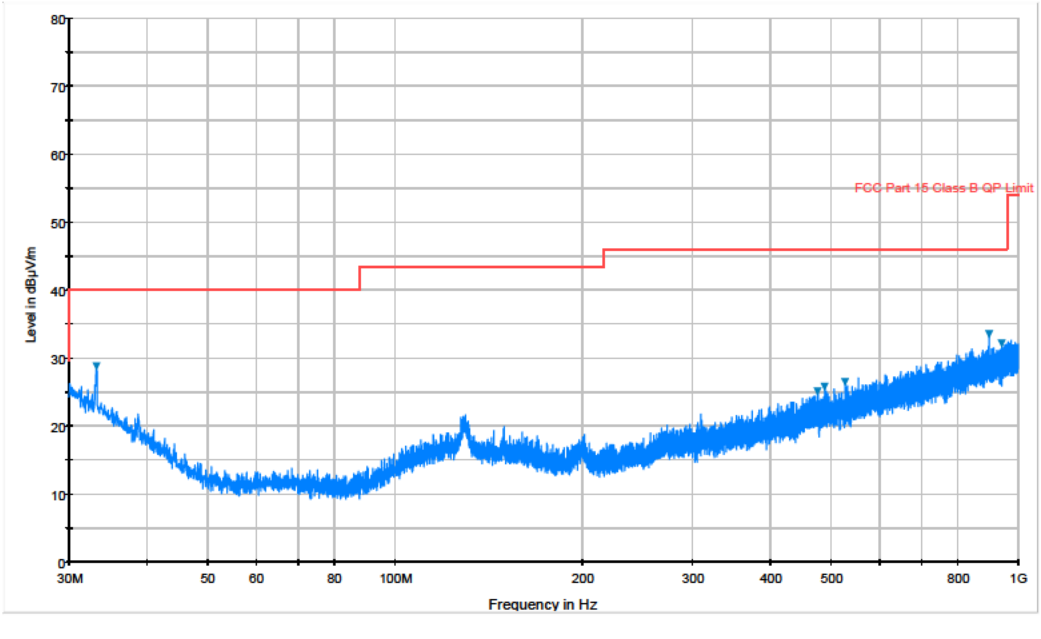
Antenna-2 Radiated Spurious Emissions Measurements (Below 1GHz)
§15.209



Plot 7-45. Radiated Spurious Plot below 1GHz (Pol. H)



Plot 7-46. Radiated Spurious Plot below 1GHz (Pol. V)

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8.0 CONCLUSION

The data collected relate only the item(s) tested and show that the **LG Portable Handset FCC ID: ZNFV30A** is in compliance with Part 15C of the FCC Rules.

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