Extron Electronics
INTERFACING, SWITCHING AND CONTROL

FCC AND IC RF TEST REPORT

Product Tested
Wi-Fi Transceiver Module

Report Number
1947-2

Prepared for:
Extron Electronics
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Anaheim, CA 92805
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Prepared by:
Extron Electronics – Compliance Lab

ACCREDITED
Testing Cert # 3429.01

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REVISION PAGE

Issue Date	Revision	Changes	By
8/3/2015	A	Initial Release	Boni Baniqued
10/12/2015	B	Updated report (extracted appendices and converted to separate exhibit files)	Boni Baniqued
10/23/2015	C	Updated page 6 section 1.4, and page 106	Boni Baniqued

CERTIFICATION

PRODUCT NAME:	Transceiver module with support for IEEE 802.11 a/b/g/n
BRAND NAME:	Extron
MODEL NUMBER:	20-2052-01LF
FCC ID:	2AE3WEXT2052CB
IC:	10862A-EXT2052CB
APPLICANT NAME:	Extron Electronics, 1025 E, Ball Road, Anaheim, CA 92805
DATE OF TESTING:	April 1-7, 2015, May 1-29, 2015
STANDARDS:	FCC Part 15 Subpart E (Section 15.407)
	IC RSS-247 Issue 1 (License-Exempt Local Area Network Devices)
	IC RSS-GEN Issue 4
OPERATING BANDS:	5150 MHz – 5250 MHz
	5250 MHz – 5350 MHz
	5470 MHz – 5725 MHz
	5725 MHz – 5850 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:

Digitally signed by Homi Ahmadi
Date: 2015.10.23 19:17:04 -07'00'

Homi Ahmadi
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Date: 2015.10.23 14:00:25 -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 Objective

The objective is to request a Class II Permissive Change (Reassessment) under the new FCC U-NII Rules and IC LE-LAN certification requirements to a single modular certified transceiver module (FCC ID: TFB-TIWI501, IC: 5969A-TIWI501) with additional antenna, carrier board (20-2052-00LF), and disabled Bluetooth 2.1+EDR and Bluetooth LE functions.

1.3 Related Submittal(s)/Grant(s) / Technical Acceptance Certificate(s)

- FCC Identifier: TFB-TIWI501; Name of Grantee: LS Research, LLC
- IC: 5969A-TIWI501; Issued to: LS Research, LLC
- Test Report #: TX 311362 E for FCC Part 15 Subpart E Test Report
- Test Report #: TX 311362 G for Dynamic Frequency Selection (DFS) Test Report

The relevant test reports, as well as other documents for this device can be found by performing a search in the FCC office of engineering and technology (OET) website, please refer to the test data for the following tests:

- Frequency Stability
- Dynamic Frequency Selection (DFS)
  a. Channel Move Time
  b. Non-Occupancy period)

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 789033 D02 General UNII Test Procedures New Rules v01, RSS-Gen Issue 4, and IC RSS-247 Issue 1.

Note: The EUT is considered an Information Technology Equipment (ITE) peripheral, because the connection to an ITE host is necessary for typical use, it has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC) and ICES-003 Issue 5. The test report has been issued separately.

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 the Extron transceiver module (P/N: 20-2052-01LF) with support for 2.4/5.5 GHz IEEE 802.11 a/b/g/n.

** The test data gathered are from Production sample, serial number A11XLLA, received from the manufacturer on April 1, 2015.*

2.2 Description of the Antenna

WLAN Embedded Antenna

Model	Manufacturer	Type	Peak Gain (dBi)		
			2.39 - 2.49 GHz	5.15 - 5.35 GHz	5.7 - 5.9 GHz
1000418	Ethertronics	Isolated Magnetic Dipole (iMD)	1.5 - 2.5	2 - 3.5	2 - 3.5

2.3 Description of Test Setup

Support Equipment List

Description	Manufacturer	Model/Part Number	Serial Number	Quantity
Laptop PC	Dell	D630	N/A	1
12VDC Desktop Power Supply	Extron	28-071-57LF	A0K80EJ	1
Control Board	Extron	20-1847-01LF	A0YL2DF	1
10/100 HUB	Bay Networks	BayStack 253	H418A00535	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 STP 50’ cable	Extron Electronics	26-669-50	N/A	1

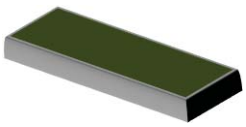
2.4 Worst Test Modes and Channel Details

Test Condition	Test Item	Modulation Mode	Data Rate (Mbps / MCS)	Test Frequency (MHz)
RF Conducted	6dB EBW and 99% OBW 26dB EBW and 99% OBW Maximum Conducted Output Power Maximum Power Spectral Density	802.11a	6 Mbps	5180 / 5200 / 5240 5280 / 5300 / 5320 5500 / 5580 / 5700 5745 / 5785 / 5825
			12 Mbps	5180 / 5200 / 5240 5280 / 5300 / 5320 5500 / 5580 / 5700 5745 / 5785 / 5825
			24 Mbps	5180 / 5200 / 5240 5280 / 5300 / 5320 5500 / 5580 / 5700 5745 / 5785 / 5825
		802.11n (HT20)	MCS0	5180 / 5200 / 5240 5280 / 5300 / 5320 5500 / 5580 / 5700 5745 / 5785 / 5825
Radiated	Radiated Emissions < 1GHz	802.11a	6 Mbps	5300
	Radiated Spurious Emissions > 1GHz	802.11a	6 Mbps	5180 / 5200 / 5240 5280 / 5300 / 5320 5500 / 5580 / 5700 5745 / 5785 / 5825
	Radiated Restricted-band band-edge	802.11a	6 Mbps	5180 / 5240 5280 / 5320 5500 / 5700 5745 / 5825
			12 Mbps	5180 / 5240 5280 / 5320 5500 / 5700 5745 / 5825
			24 Mbps	5180 / 5240 5280 / 5320 5500 / 5700 5745 / 5825
		802.11n (HT20)	MCS0	5180 / 5240 5280 / 5320 5500 / 5700 5745 / 5825
Line Conducted	AC Power-line Conducted Emissions	802.11a	6 Mbps	5300

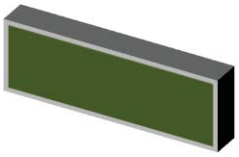
NOTE:

(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 vertical antenna orientation was the worst-case orientation; therefore, final radiated emissions testing was performed with the antenna in the vertical orientation.

Vertical (V)



Horizontal 1 (H1)



Horizontal 2 (H2)

(2) Per manufacturer, channel 52 (5260 MHz) not usable for any modulation

2.5 Equipment Modifications

None

2.6 Testing Condition

Test Item	Test Site	Environmental Condition			Tested By
		Temperature	Relative Humidity	Atmospheric Pressure	
RF Conducted Emissions	Lab A	22-25°C	40-60%	1002-1012mbar	Boni Baniqued
Radiated Spurious Emissions	Lab B	22-25°C	40-60%	1002-1012mbar	Boni Baniqued
AC Power-Line Conducted Emissions	Lab E	23°C	48%	1010mbar	Boni Baniqued

2.7 Software

• Tera Term V4.83 [SVN#5602] – for Wi-Fi Module control
• R&S EMC32 V8.53 - 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
EMI Receiver, 40 GHz	Rohde & Schwarz	ESU40	100161	8/18/2015
EMI Receiver, 26 GHz	Rohde & Schwarz	ESU26	100189	11/18/2015
Antenna – Bilog, 30MHz-1GHz	ETS-Lingren	3142D	14010	2/18/2016
Antenna – Bilog, 30MHz-1GHz	ETS-Lingren	3142D	13988	04/13/2016
Antenna, Horn, 1-18 GHz	ETS	3117	14041	02/18/2016
Antenna, Horn, 18- 40 GHz	ATM	180-442-KF/CAL	L488008-01	02/18/2016
Pre-Amplifier, 1-18 GHz	A.H. Systems, Inc	PAM-0118	274	02/17/2016
Pre-Amplifier, 1-18 GHz	Rohde & Schwarz	TS-PR18	100066	04/01/2016
Pre-Amplifier, 18-40 GHz	Rohde & Schwarz	TS-PR18-40	10001	02/18/2016
RF Cable, 0.30-18 GHz	SEMFLEX	N130SFBN10360	N/A	8/25/2015
RF Cable, 1-18 GHz	Pasternack	PE302-12	274	02/17/2016
RF Cable, 1-18 GHz	Huber-Suhner	Sucoflex 104E	232648 003	04/01/2016
RF Cable, 1-40 GHz	SEMFLEX	60637-59957	N/A	02/05/2016
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

Note: CNR – Calibration Not Required

4 TEST RESULTS SUMMARY

FCC Rule Section	IC Rule Section	Test Item Description		Limits	Test Condition	Test Results
N/A	NA	26 dB EBW & 99% OBW	5150-5250 MHz	N/A	Conducted	PASS
			5250-5350 MHz			PASS
			5470-5725 MHz			PASS
§ 15.407 (e)	247 §6.2.4 (1)	6 dB EBW & 99% OBW	5725-5850 MHz	≥ 500 kHz		PASS
§ 15.407 (a)(1) § 15.407 (a)(2) § 15.407 (a)(3)	247 §6.2.1 (1) 247 §6.2.2 (1) 247 §6.2.3 (1) 247 §6.2.4 (1)	Maximum Conducted Output Power / e.i.r.p	5150-5250 MHz	< 24dBm (250mW) / < 200mW e.i.r.p.		PASS
			5250-5350 MHz	< 24dBm (250mW) / < 1W e.i.r.p.		PASS
			5470-5725 MHz	< 24dBm (250mW) / < 1W e.i.r.p.		PASS
			5725-5850 MHz	< 30dBm (1W)		PASS
§ 15.407 (a)(1) § 15.407 (a)(2) § 15.407 (a)(3)	247 §6.2.1 (1) 247 §6.2.2 (1) 247 §6.2.3 (1) 247 §6.2.4 (1)	Maximum Power Spectral Density / e.i.r.p. Spectral Density	5150-5250 MHz	<11dBm/MHz / <10dBm/MHz (IC)		PASS
			5250-5350 MHz	<11dBm/MHz		PASS
			5470-5725 MHz	<11dBm/MHz		PASS
			5725-5850 MHz	<30dBm/500kHz		PASS
§ 15.407 (g)	N/A	Transmitter Frequency Stability		N/A		See Note 1
§ 15.407 (h)	247 §6.3	Frequency Selection (DFS)		See DFS Report		See Note 2
§ 15.407 (b)(1) § 15.407 (b)(2) § 15.407 (b)(3) § 15.407 (b)(4) § 15.407 (b)(5)	247 §6.2.1 (2) 247 §6.2.2 (2) 247 §6.2.3 (2) 247 §6.2.4 (2)	Unwanted Emissions	5150-5250 MHz	< -27dBm/MHz	Radiated	PASS
			5250-5350 MHz	< -27dBm/MHz		PASS
			5470-5725 MHz	< -27dBm/MHz		PASS
			5725-5850 MHz	< -17dBm/MHz w/in 10MHz of the band-edge		PASS
				< -27dBm/MHz		PASS
§ 15.407 (b)(5) § 15.407 (b)(6) § 15.407 (b)(7)	Gen §8.10	Unwanted Emissions in the restricted bands		FCC Part 15.209 (a) Gen 8.9 Table 4		PASS
§ 15.407 (b)(6)	Gen §8.8	AC Power-line Conducted Emissions		FCC Part 15.207 (a) Gen 8.8 Table 3	Line Conducted	PASS
§ 15.407 (f)	102 (4)	RF Exposure Requirements		FCC 1.1310 (e) 102 (4) Table 4	MPE Calculation	PASS

Note: 1. Refer to Report #: TX 311362 E (FCC ID: TFB-TIWI501)
2. Refer to Report #: TX 311362 G (FCC ID: TFB-TIWI501)

5 DUTY CYCLE

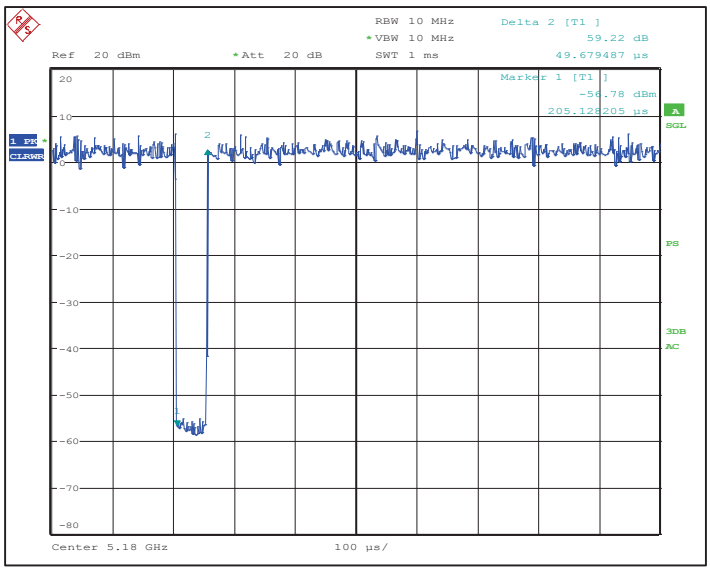
The duty cycles for all modes were determined based on measurements per KDB 789033 D02 v01 section II.B.2 b) using spectrum analyzer in zero-span mode with RBW = 10 MHz, VBW = 10 MHz, and detector = Peak. The RBW and VBW are > than 50/T and the number of sweep points across duration T exceeds 100.

802.11 Mode	Data Rate	T_{OFF} (usec)	T_{ON} (usec)	Duty Cycle [DC]	Duty Cycle (%)	DC Factor (dB)
a	6 Mbps	49.68	5530.45	0.991	99.1	NONE
	12 Mbps	49.68	2774.04	0.982	98.2	NONE
	24 Mbps	49.68	1395.83	0.966	96.6	0.15
n (20 MHz)	MCS7	50.48	536.06	0.914	91.4	0.39

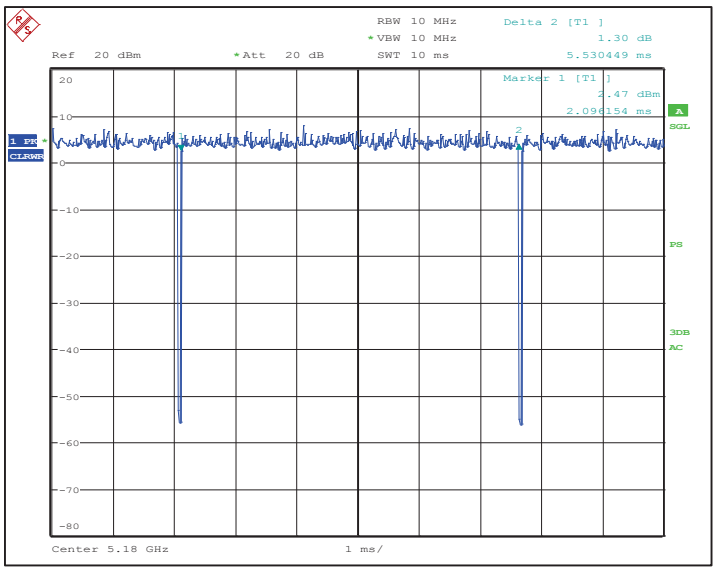
Note:
- No DC factor if the duty cycle is > 98%
- T_{OFF} – Transmission OFF time
- T_{ON} – Transmission ON time

DUTY CYCLE PLOTS

Data Rate: 6 Mbps

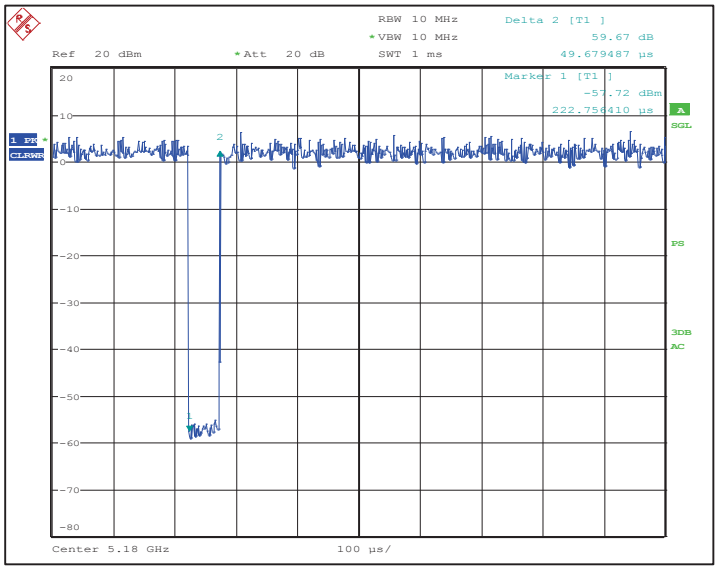


OFF Time = 49.68 us

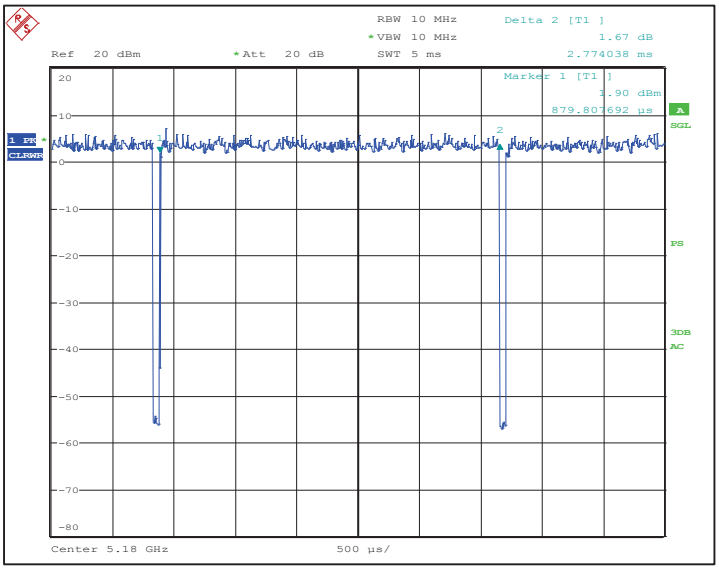


ON Time = 5530.449 us

Data Rate: 12 Mbps

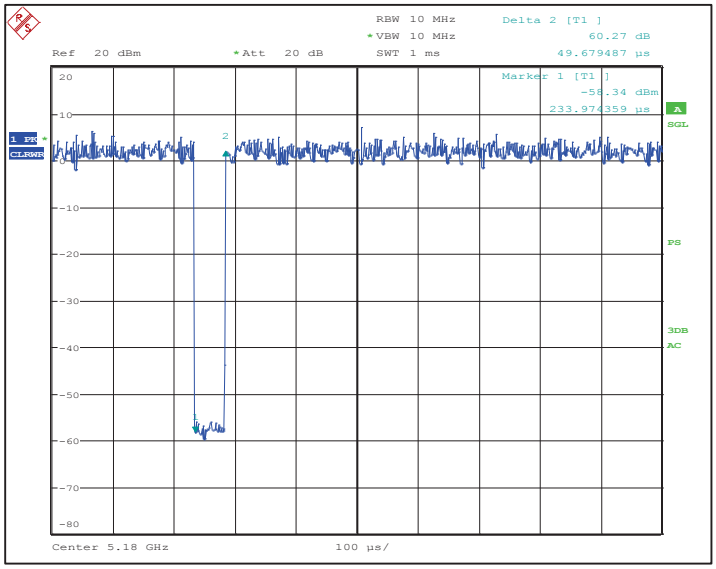


OFF Time = 49.68 us

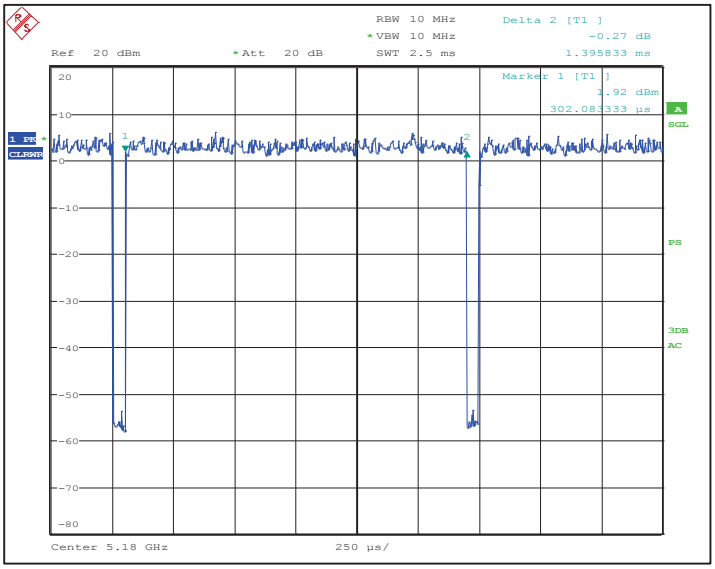


ON Time = 2774.038 us

Data Rate: 24 Mbps

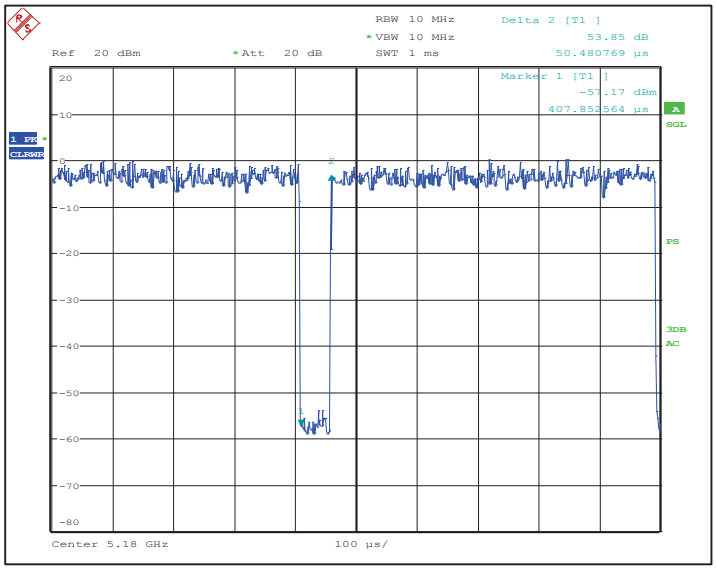


OFF Time = 49.68 us

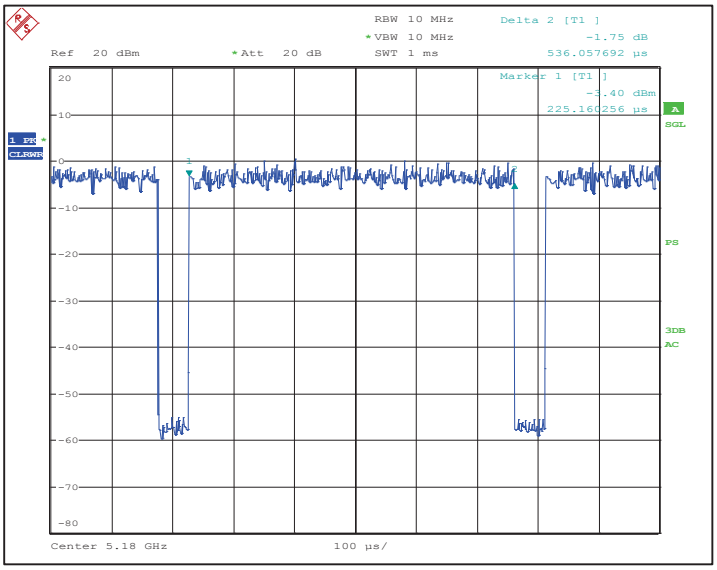


ON Time = 1395.833 us

Data Rate: MCS7



OFF Time = 50.48 us



ON Time = 536.058 us

6 TEST RESULTS

6.1 26dB Emission Bandwidth (EBW) and 99% Occupied Bandwidth (OBW)

Limits

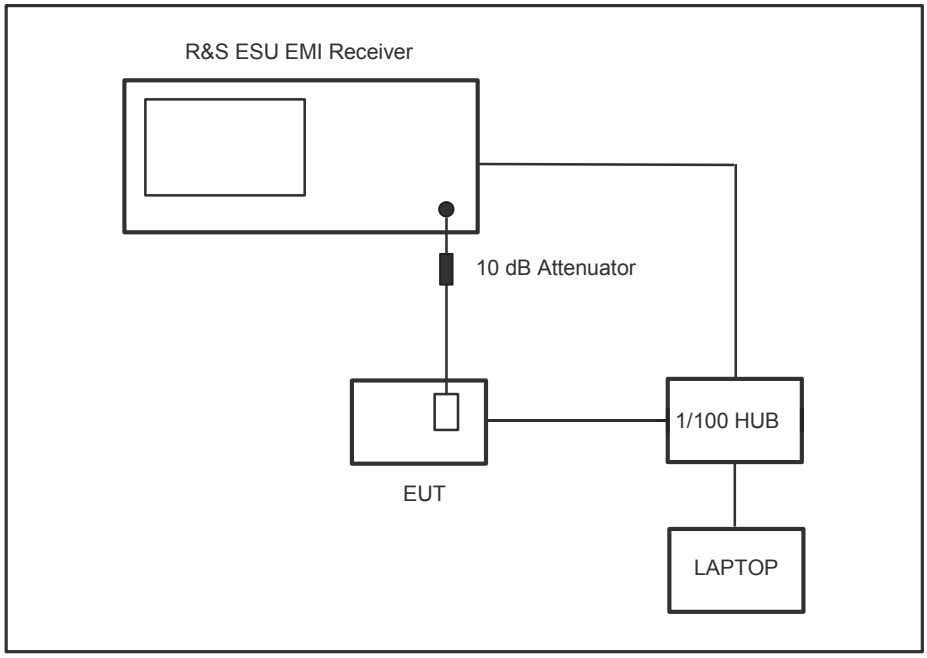
None; the 26dB is used to determine the conducted power limits

Test Procedures

KDB 789033 D02 v01 Section C.1

Note: EMI Receiver (Spectrum Analyzer) Reference Level Offset = 10.8 dB (10 dB Attenuator Pad + 0.8 cable loss)

Test Setup

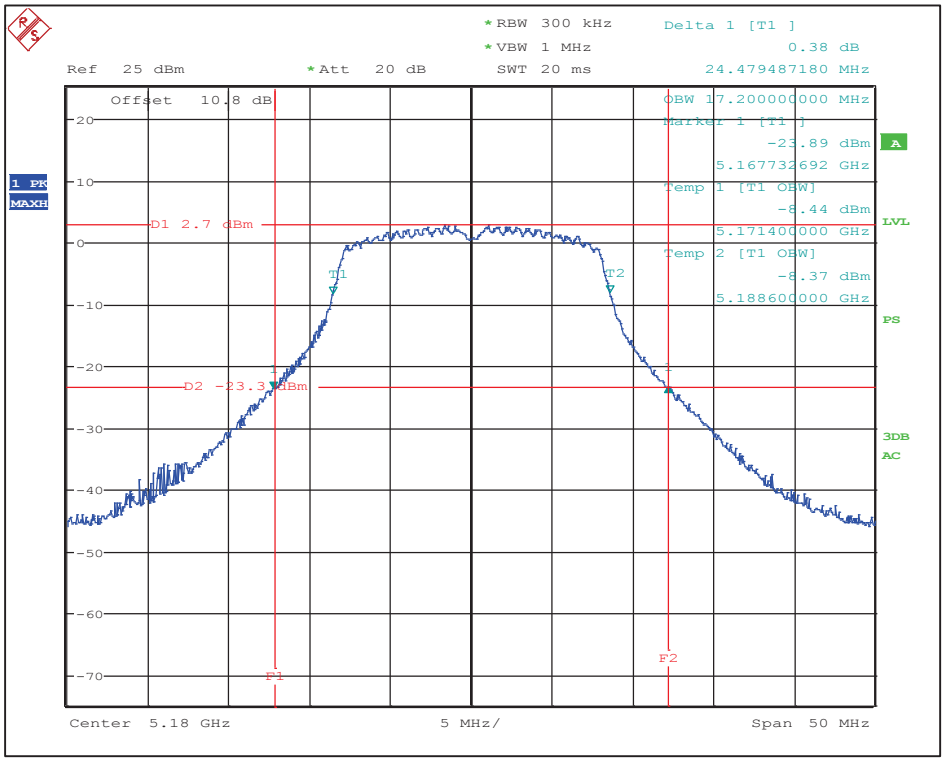


Test Results

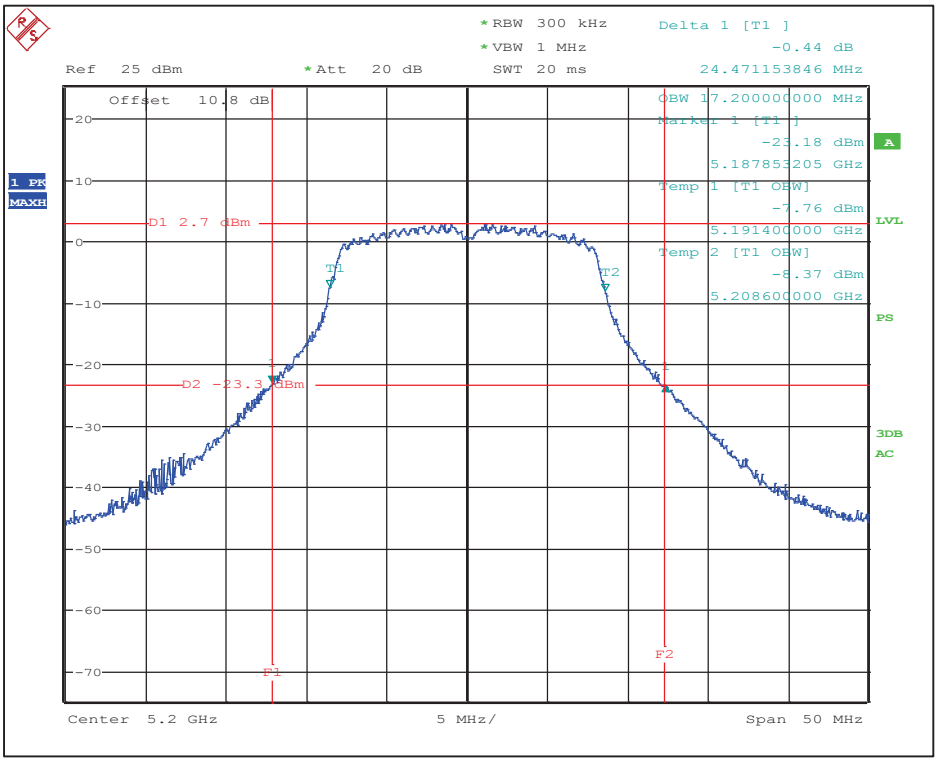
6.1.1 26dB EBW and 99% OBW in the 5.15-5.25 GHz Band

802.11 Mode	Data Rate	Channel	Frequency (MHz)	26dB EBW (MHz)	99% OBW (MHz)
a	6 Mbps	36	5180	24.5	17.2
		40	5200	24.5	17.2
		48	5240	24.5	17.1
	12 Mbps	36	5180	23.8	16.9
		40	5200	23.8	16.9
		48	5240	23.8	16.9
	24 Mbps	36	5180	22.8	16.8
		40	5200	22.8	16.8
		48	5240	22.8	16.8
n (20 MHz)	MCS7	36	5180	23.6	17.9
		40	5200	23.6	17.9
		48	5240	23.6	17.9

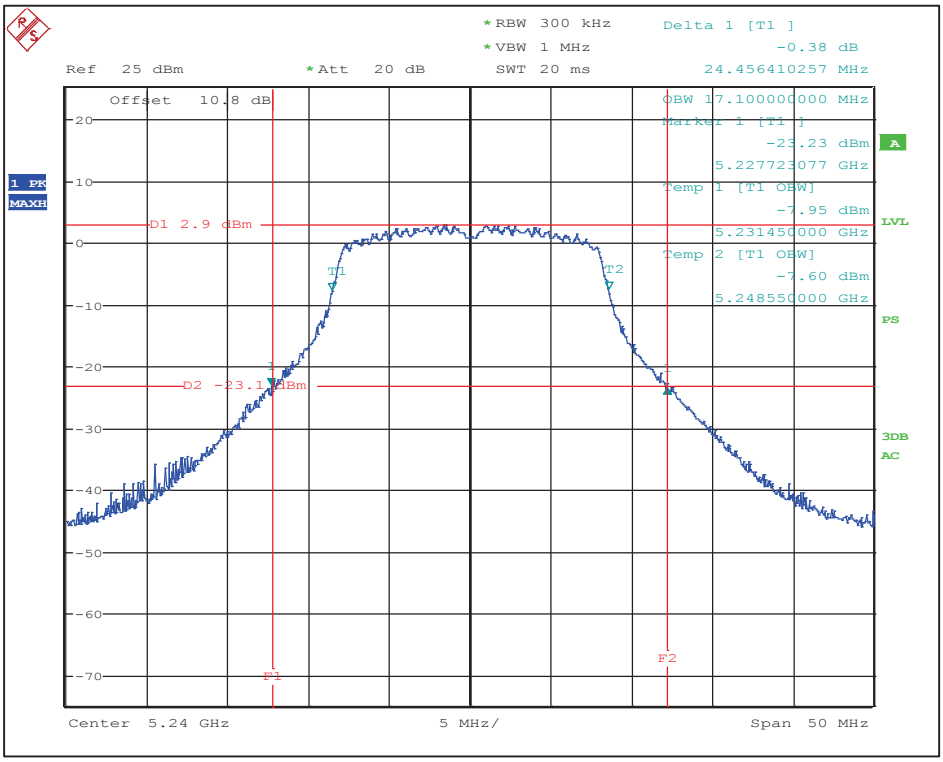
Refer to the following plots



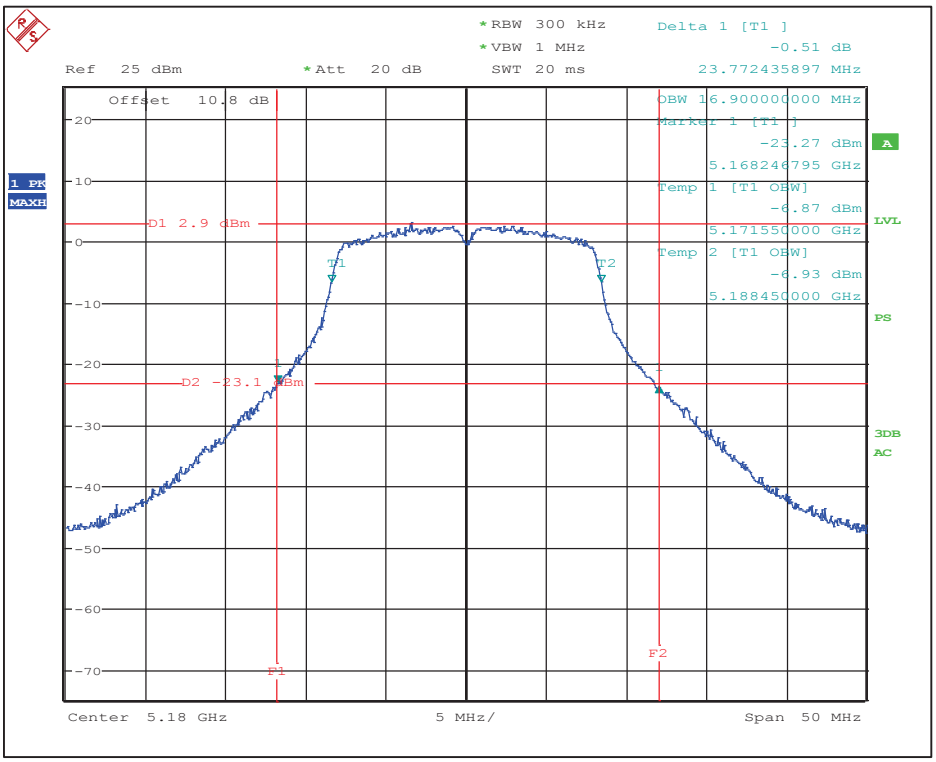
802.11a: 6Mbps – Channel 36 (5180 MHz) 26dB BW and 99% OBW



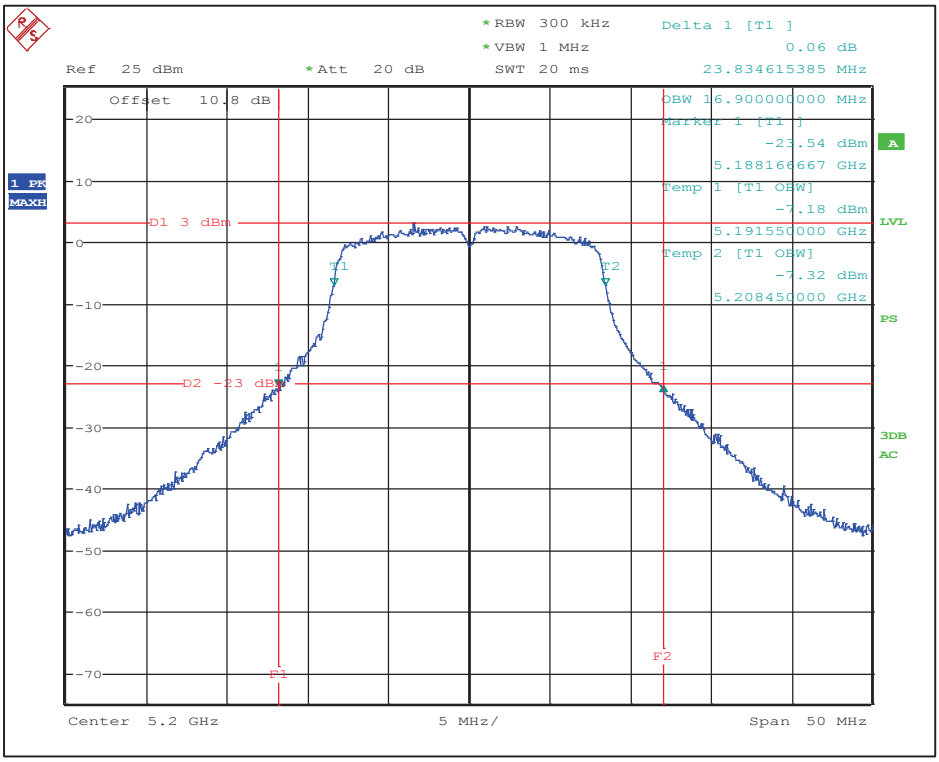
802.11a: 6Mbps – Channel 40 (5200 MHz) 26dB BW and 99% OBW



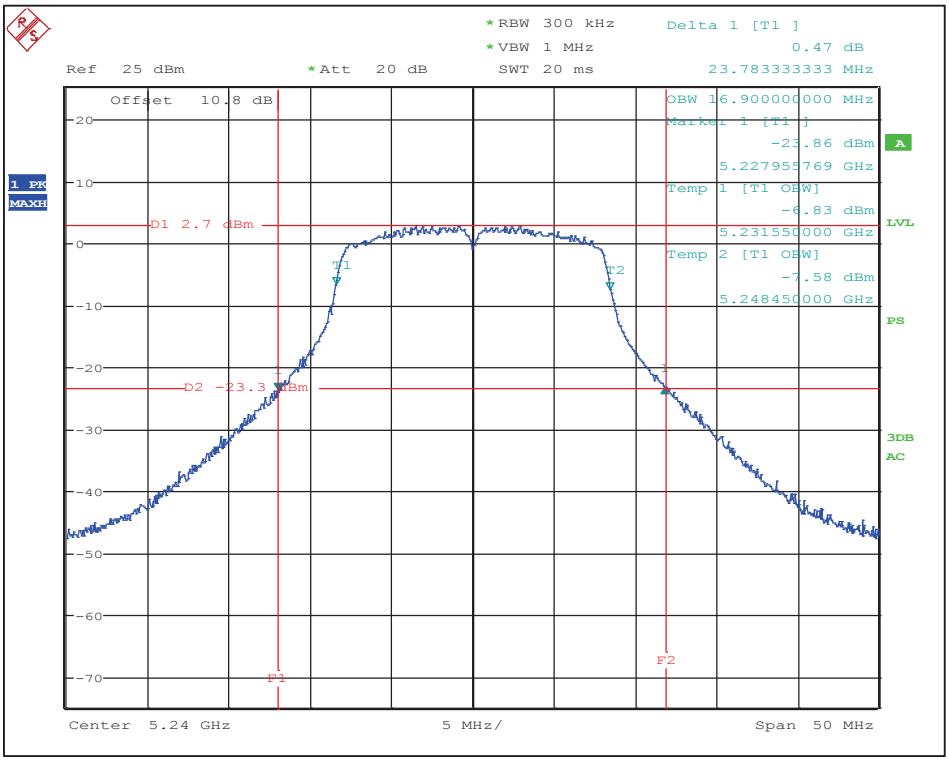
802.11a: 6Mbps – Channel 48 (5240 MHz) 26dB BW and 99% OBW



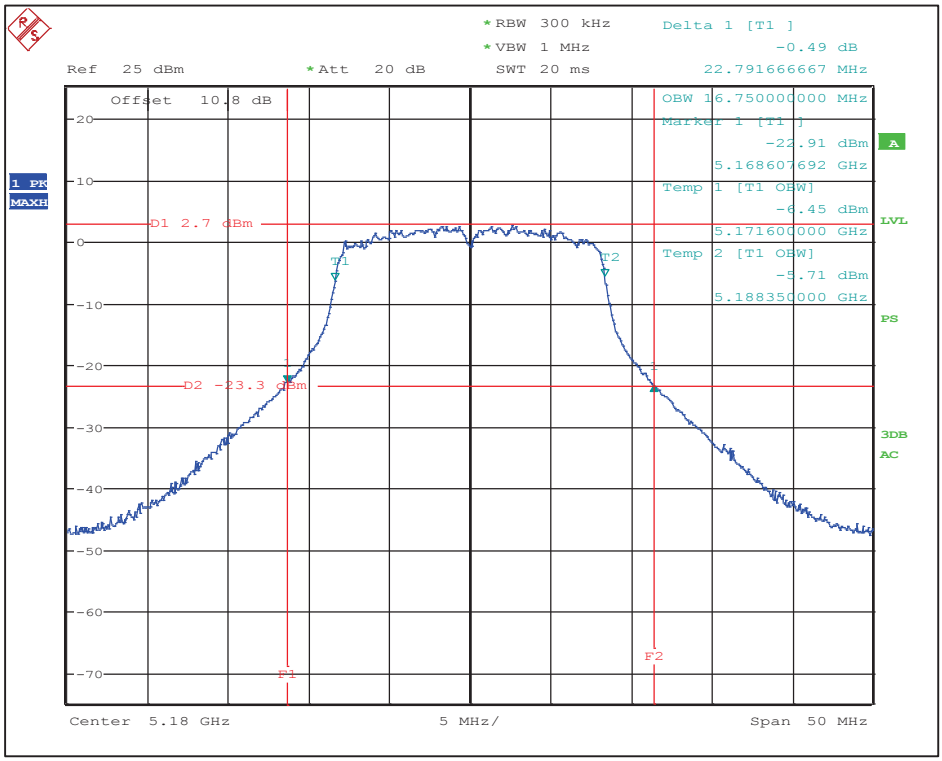
802.11a: 12Mbps – Channel 36 (5180 MHz) 26dB BW and 99% OBW



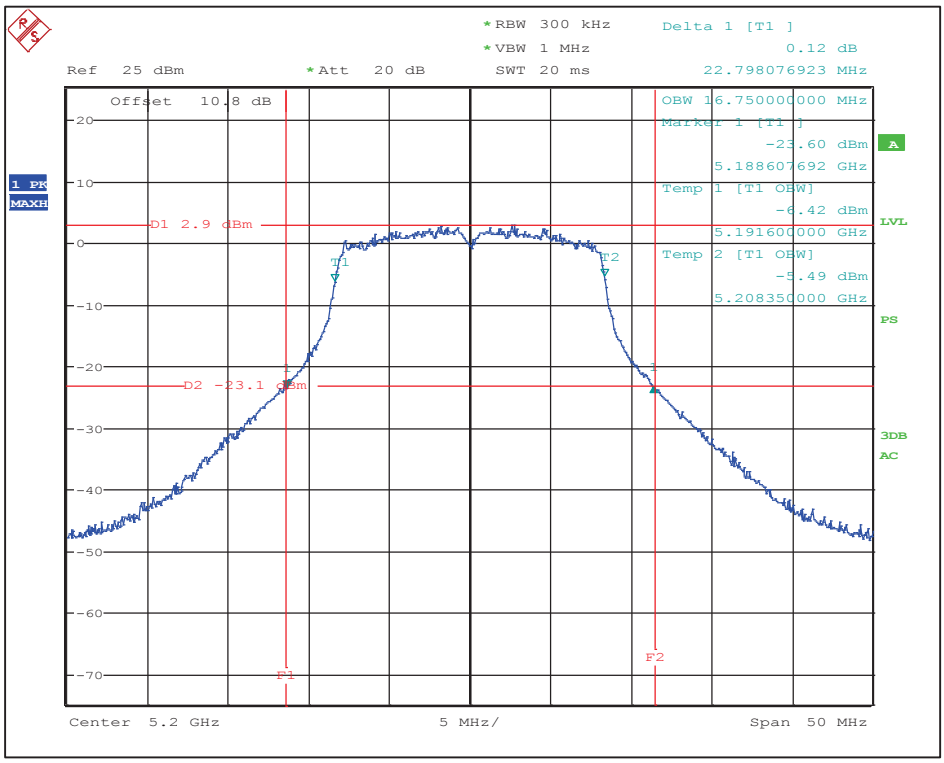
802.11a: 12Mbps – Channel 40 (5200 MHz) 26dB BW and 99% OBW



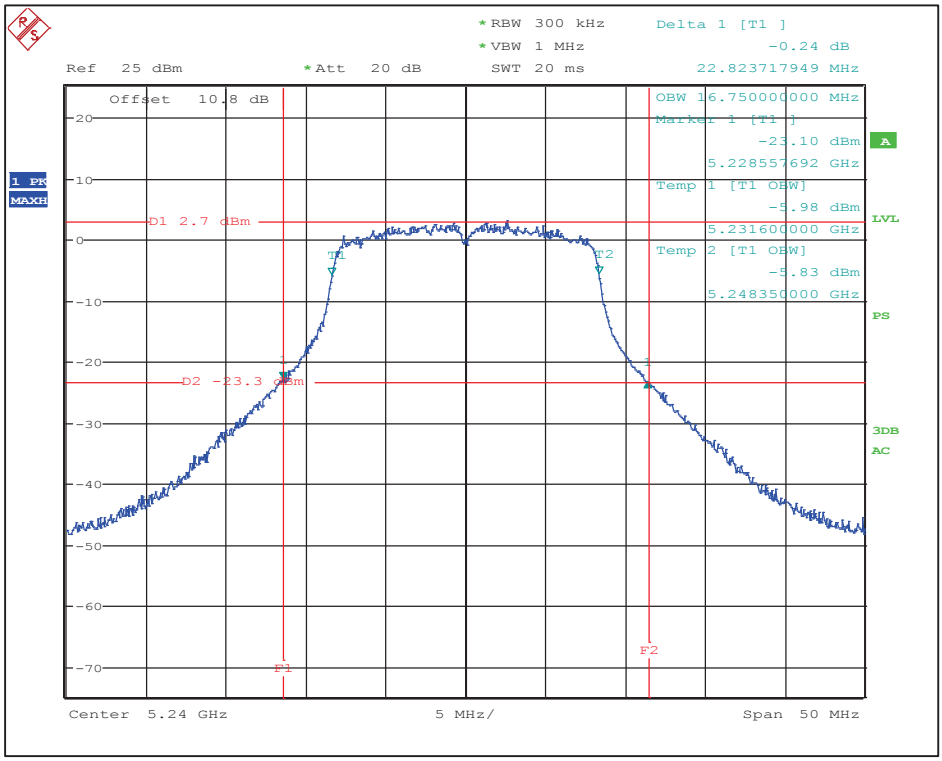
802.11a: 12Mbps – Channel 48 (5240 MHz) 26dB BW and 99% OBW



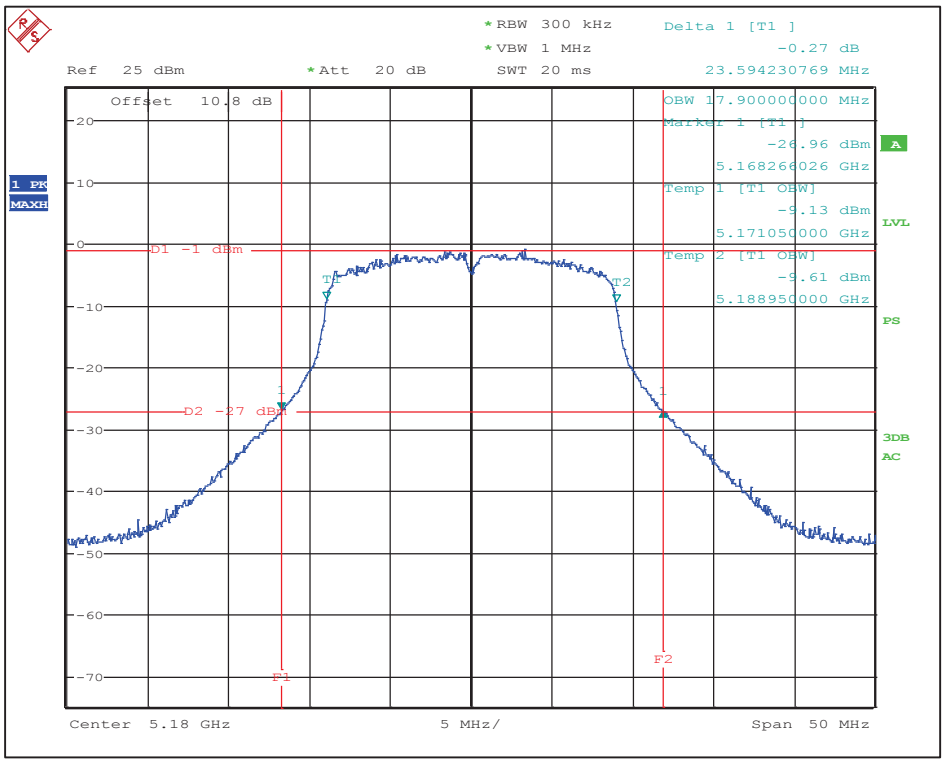
802.11a: 24Mbps – Channel 36 (5180 MHz) 26dB BW and 99% OBW



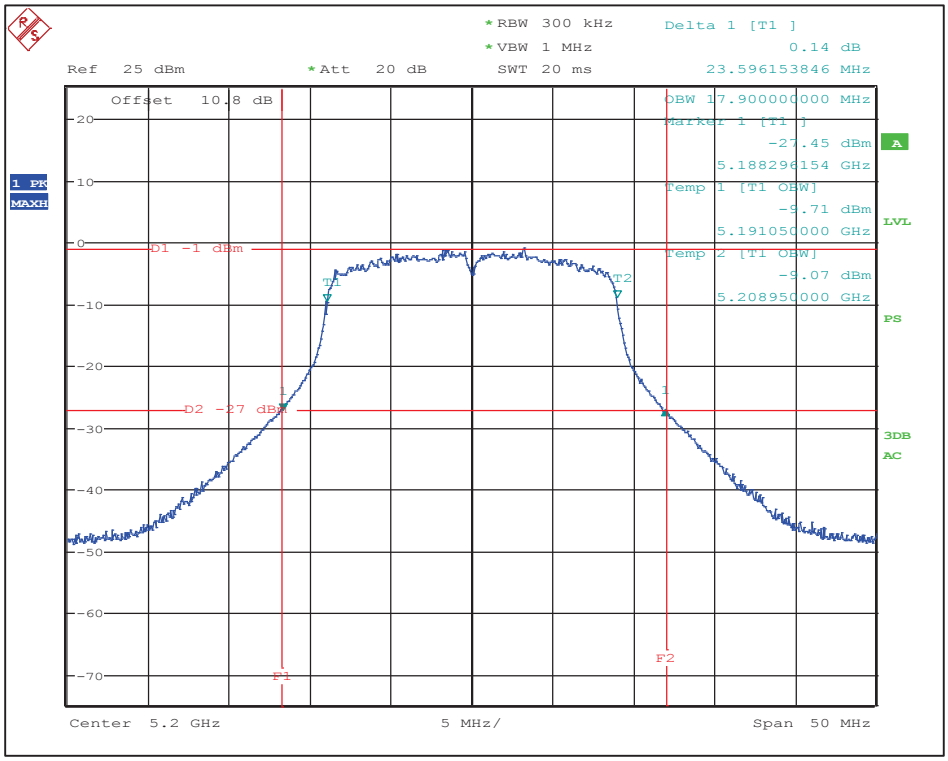
802.11a: 24Mbps – Channel 40 (5200 MHz) 26dB BW and 99% OBW



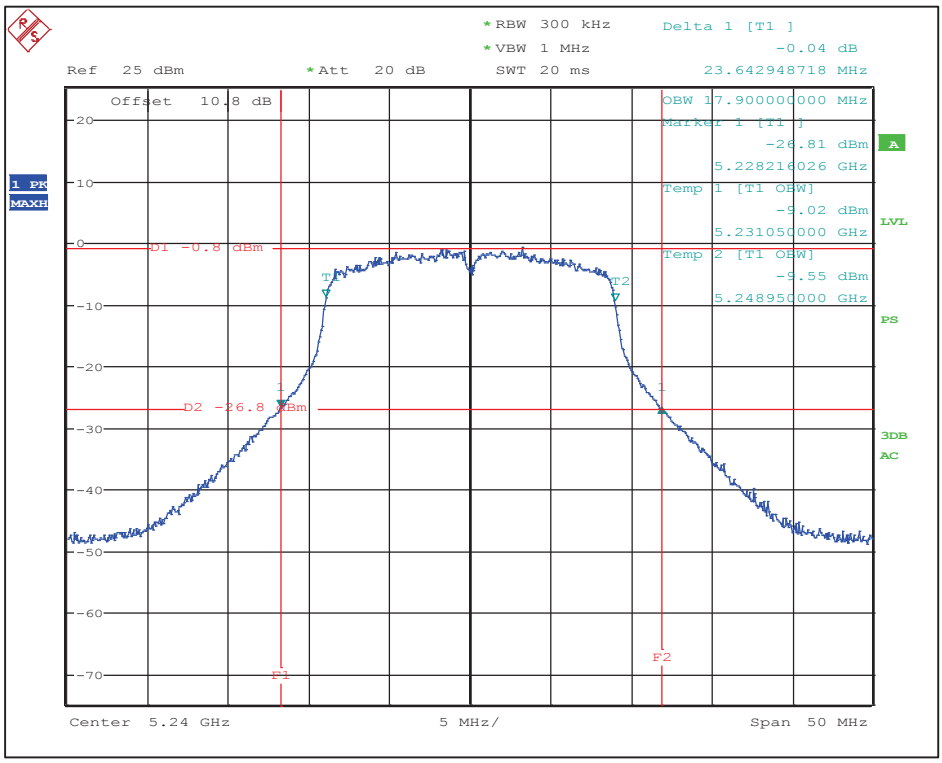
802.11a: 24Mbps – Channel 48 (5240 MHz) 26dB BW and 99% OBW



802.11n: MCS7 – Channel 36 (5180 MHz) 26dB BW and 99% OBW



802.11n: MCS7 – Channel 40 (5200 MHz) 26dB BW and 99% OBW

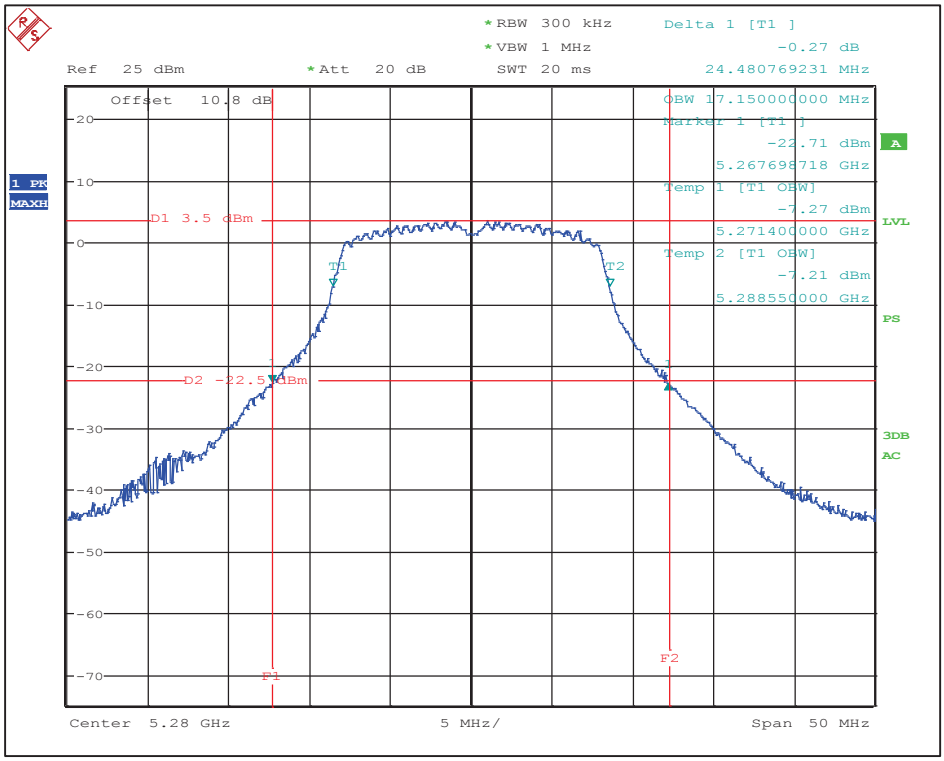


802.11n: MCS7 – Channel 48 (5240 MHz) 26dB BW and 99% OBW

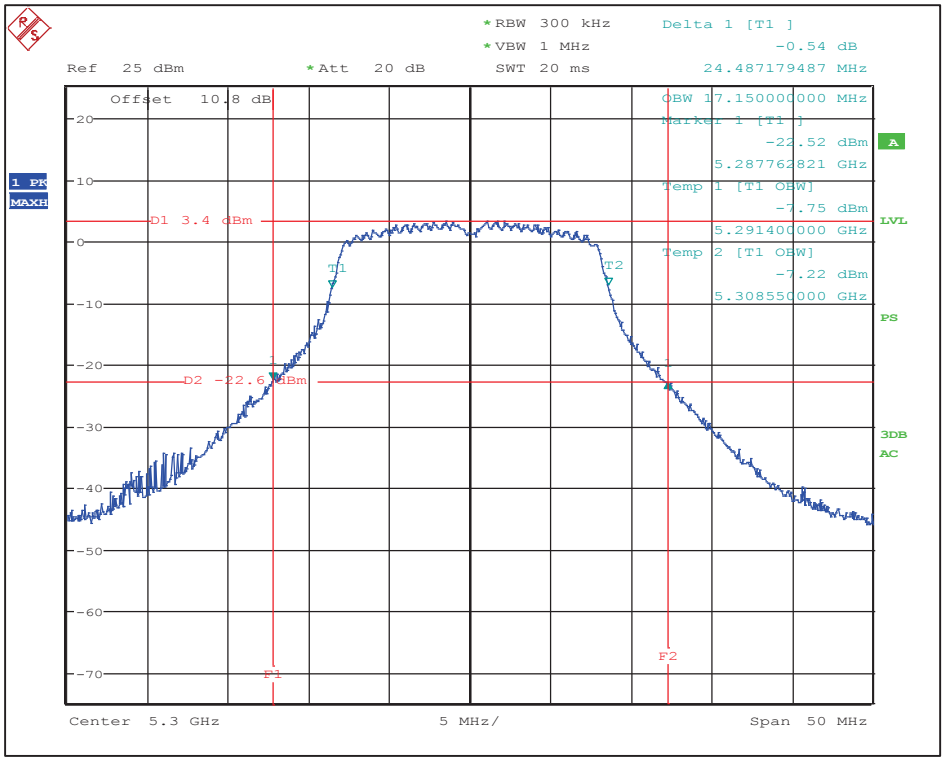
6.1.2 26dB EBW and 99% OBW in the 5.25-5.35 GHz Band

802.11 Mode	Data Rate	Channel	Frequency (MHz)	26dB EBW (MHz)	99% OBW (MHz)
a	6 Mbps	56	5280	24.5	17.2
		60	5300	24.5	17.2
		64	5320	24.5	17.2
	12 Mbps	56	5280	23.6	16.9
		60	5300	23.6	16.9
		64	5320	23.6	16.9
	24 Mbps	56	5280	23.0	16.8
		60	5300	23.0	16.8
		64	5320	23.0	16.8
n (20 MHz)	MCS7	56	5280	23.8	17.9
		60	5300	23.8	17.9
		64	5320	23.8	17.9

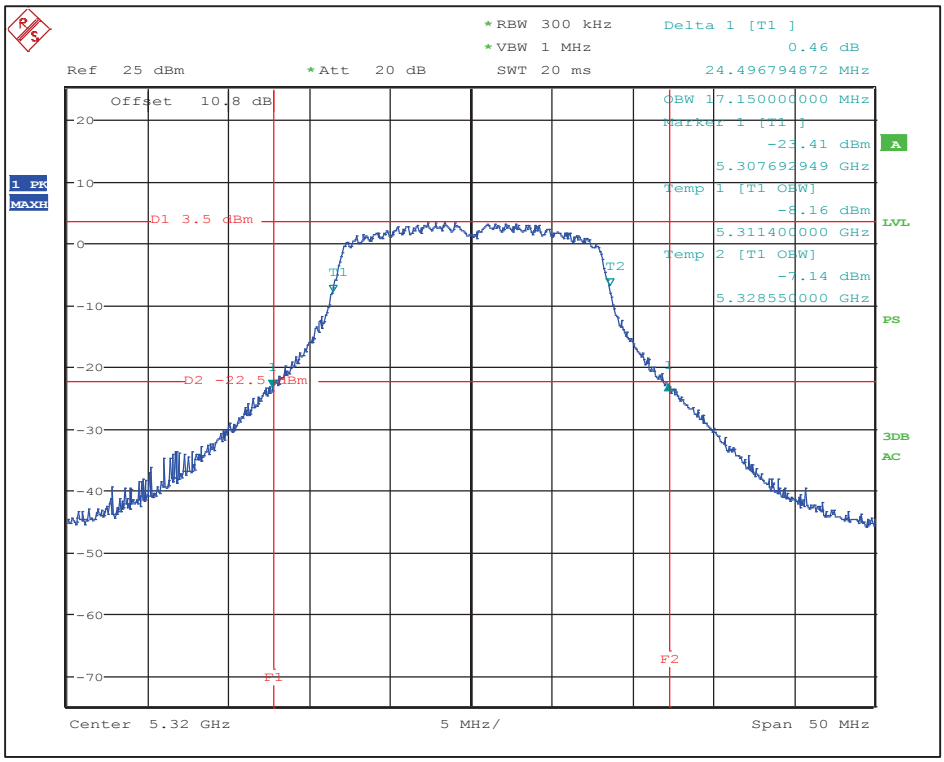
Refer to the following plots



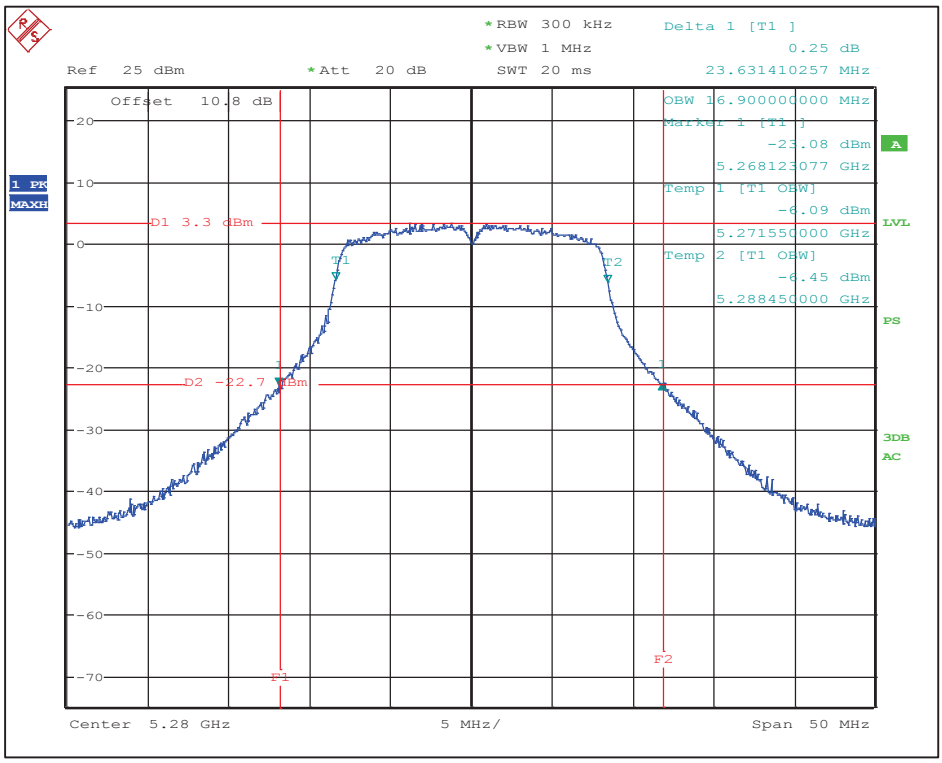
802.11a: 6Mbps – Channel 56 (5280 MHz) 26dB BW and 99% OBW



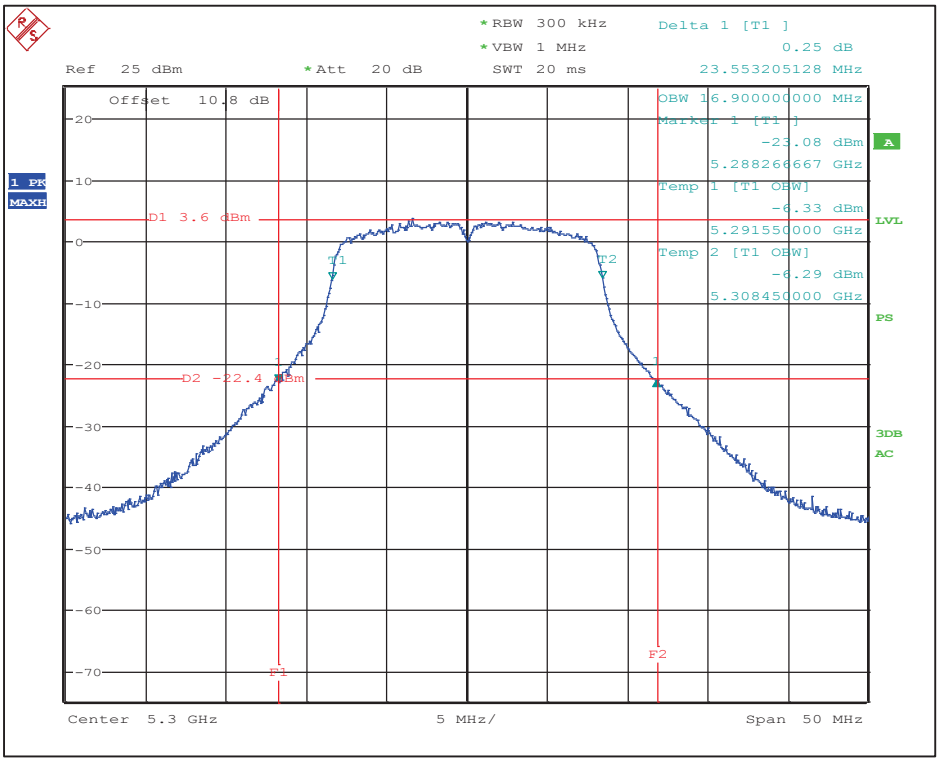
802.11a: 6Mbps – Channel 60 (5300 MHz) 26dB BW and 99% OBW



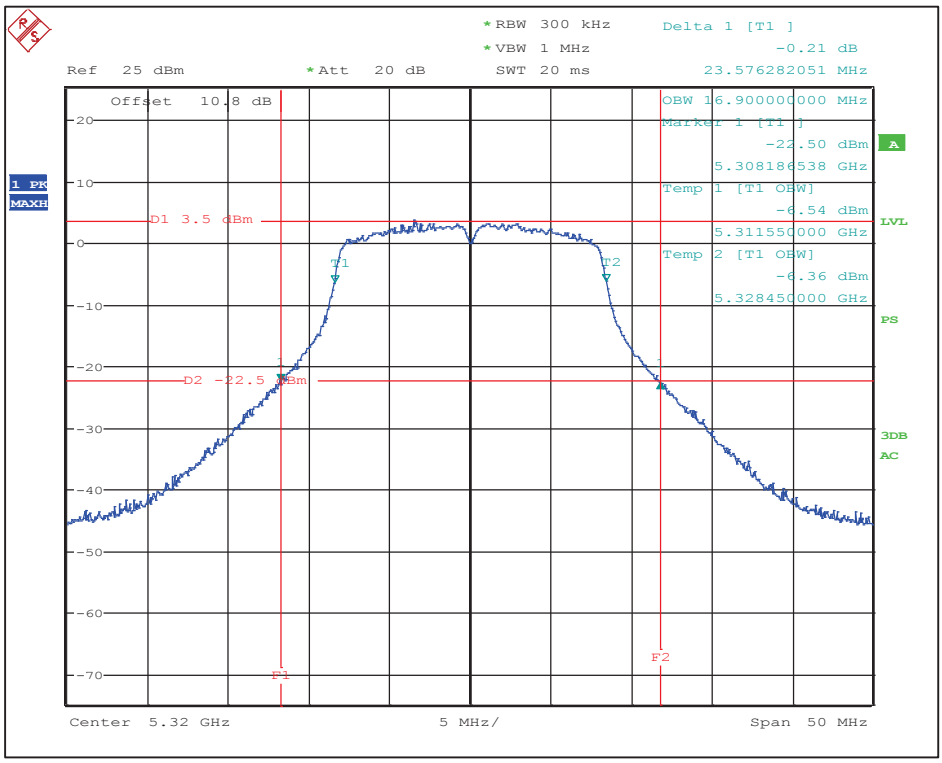
802.11a: 6Mbps – Channel 64 (5320 MHz) 26dB BW and 99% OBW



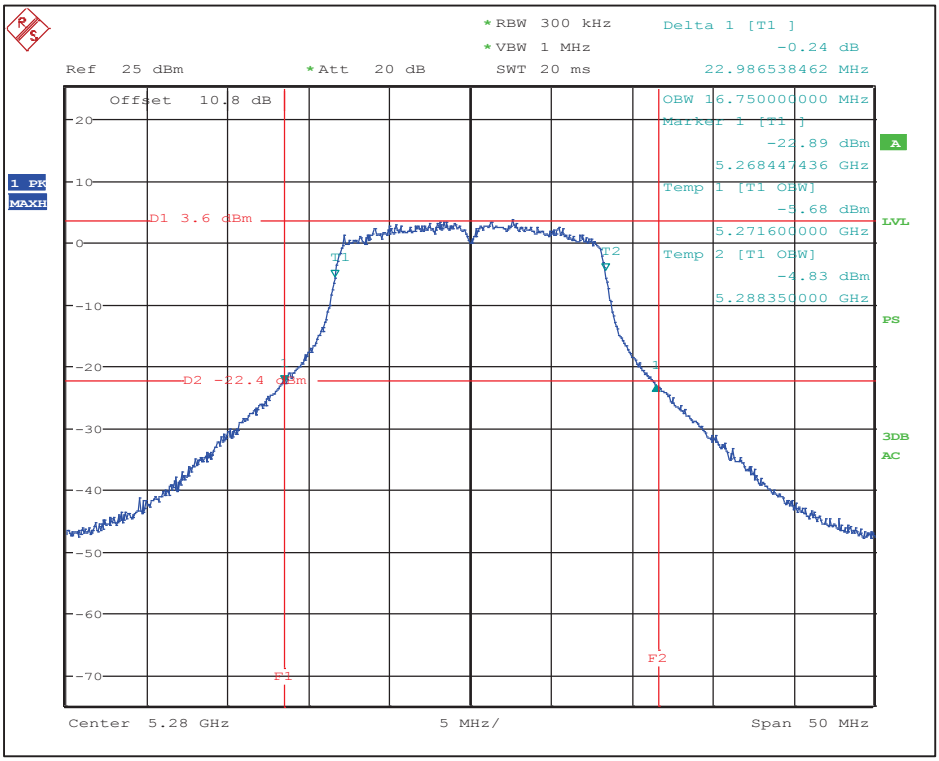
802.11a: 12Mbps – Channel 56 (5280 MHz) 26dB BW and 99% OBW



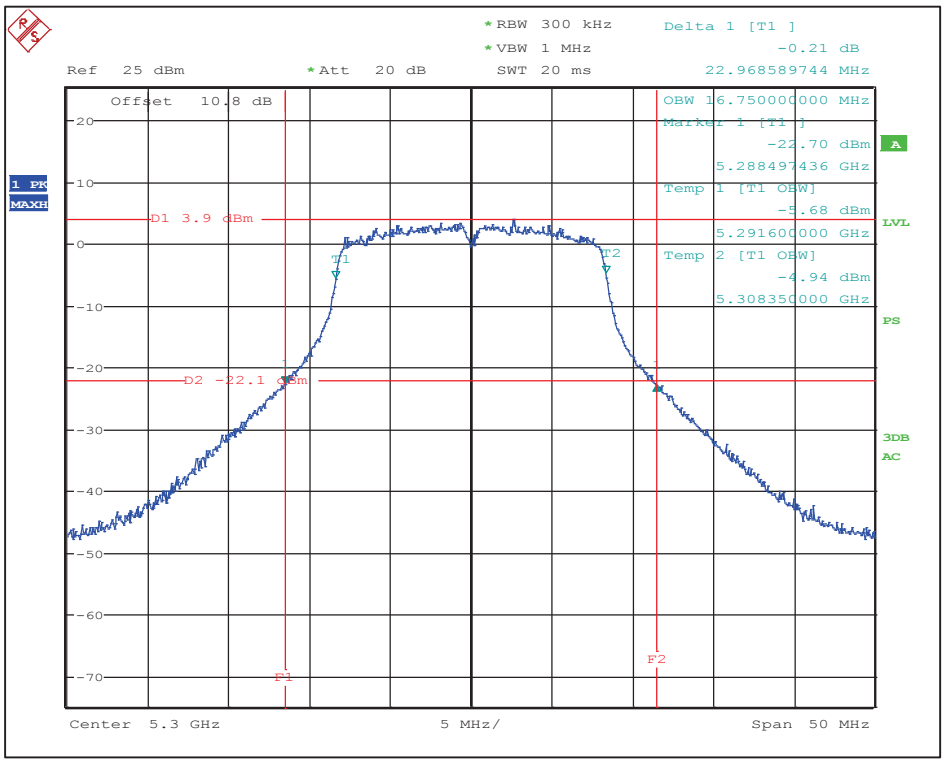
802.11a: 12Mbps – Channel 60 (5300 MHz) 26dB BW and 99% OBW



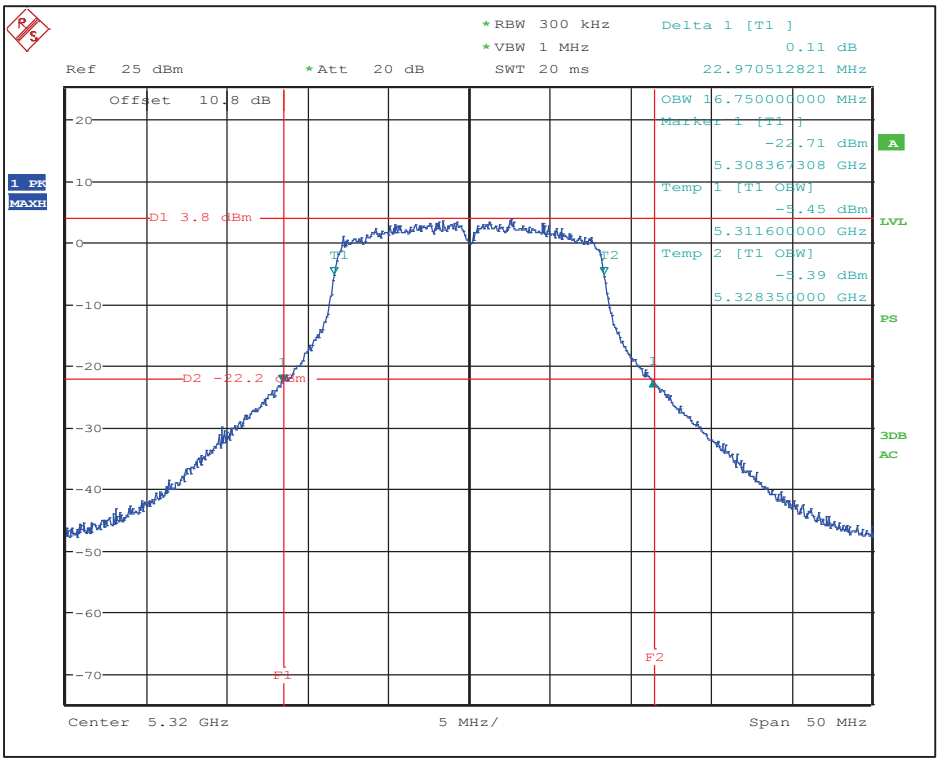
802.11a: 12Mbps – Channel 64 (5320 MHz) 26dB BW and 99% OBW



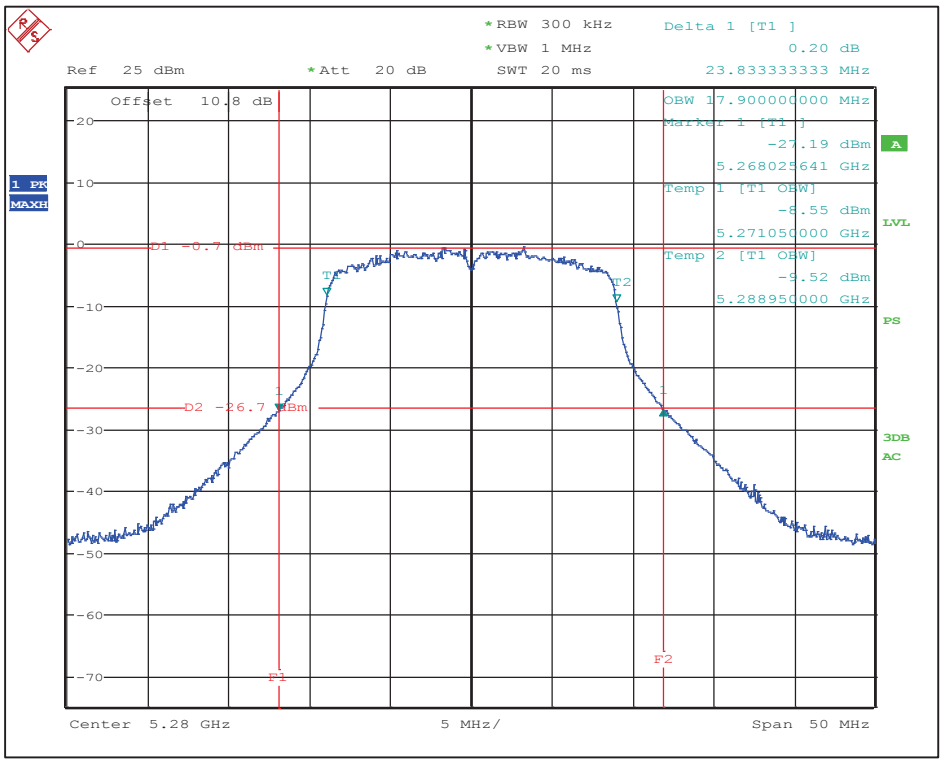
802.11a: 24Mbps – Channel 56 (5280 MHz) 26dB BW and 99% OBW



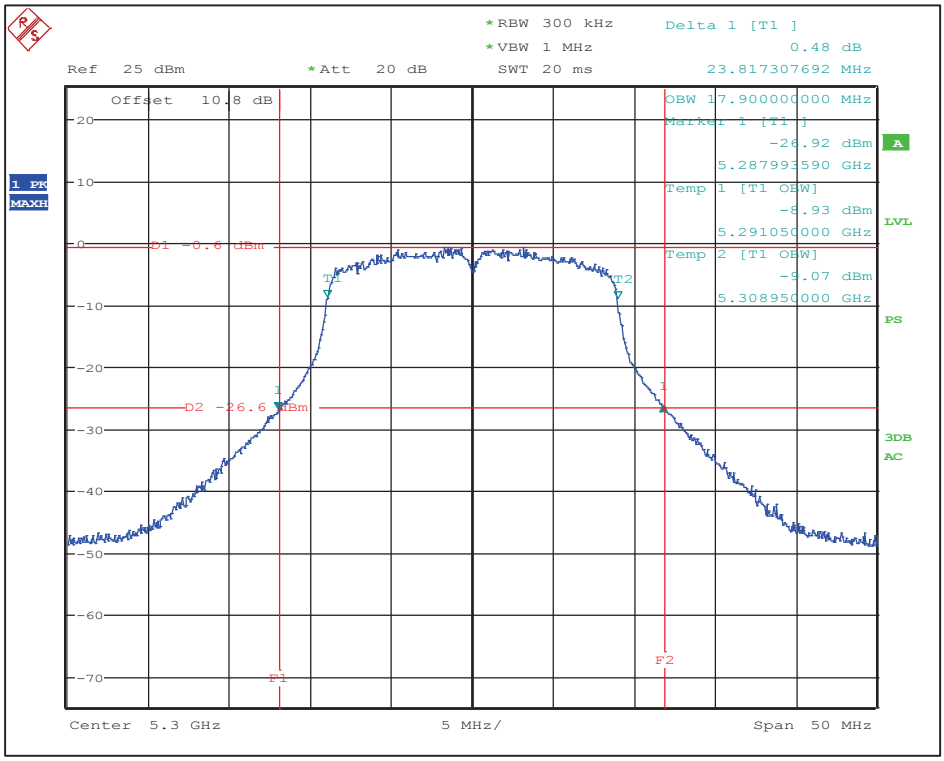
802.11a: 24Mbps – Channel 60 (5300 MHz) 26dB BW and 99% OBW



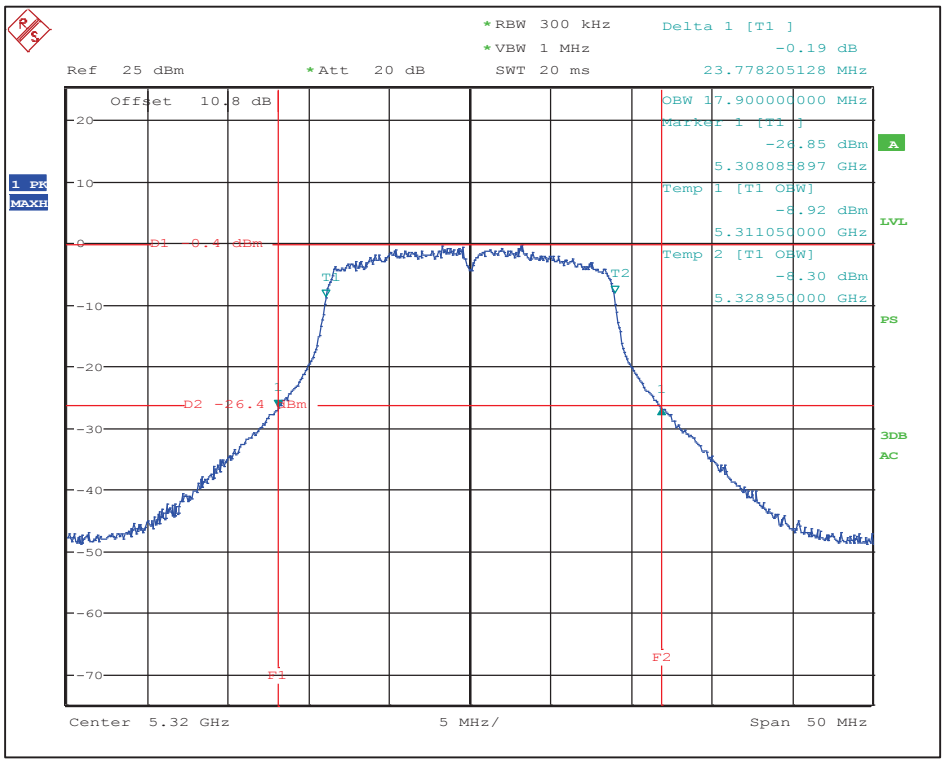
802.11a: 24Mbps – Channel 64 (5320 MHz) 26dB BW and 99% OBW



802.11n: MCS7 – Channel 56 (5280 MHz) 26dB BW and 99% OBW



802.11n: MCS7 – Channel 60 (5300 MHz) 26dB BW and 99% OBW

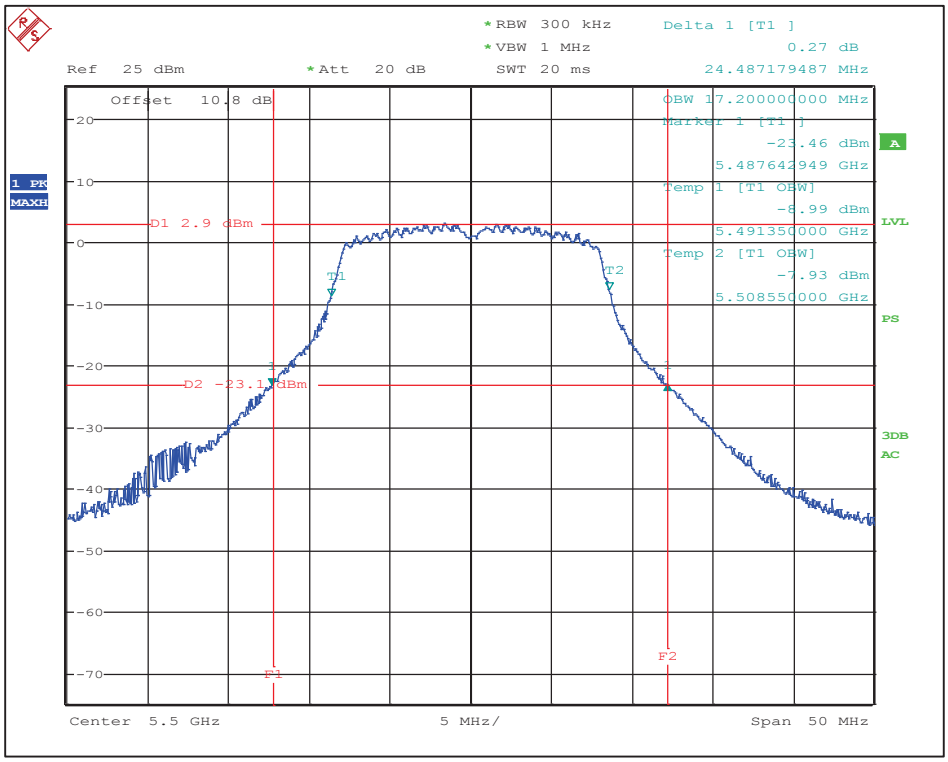


802.11n: MCS7 – Channel 64 (5320 MHz) 26dB BW and 99% OBW

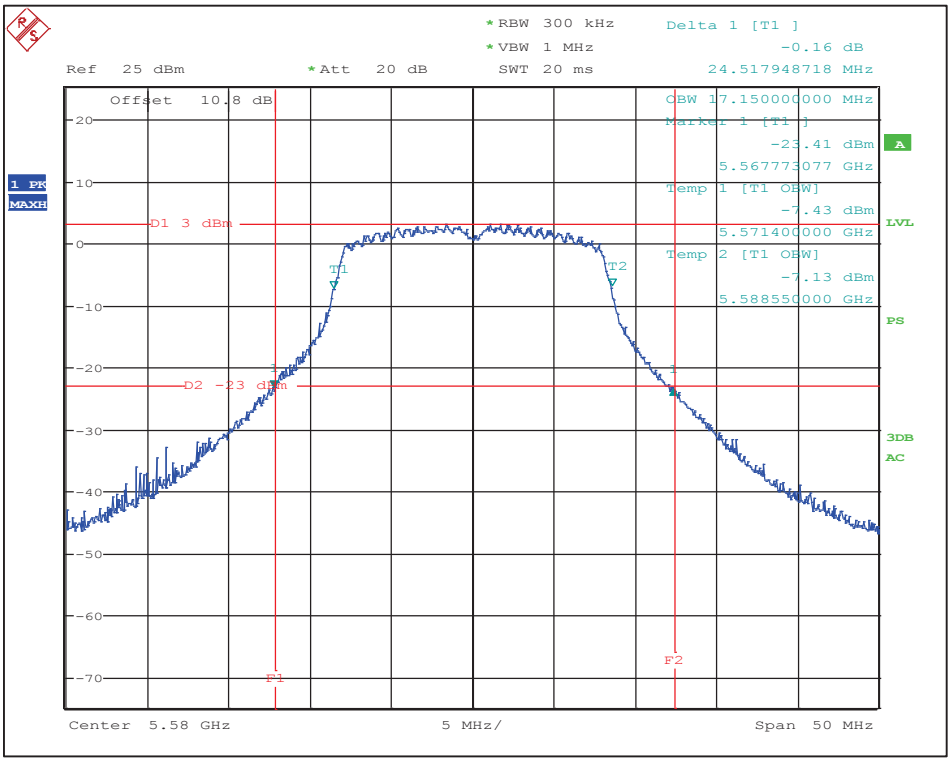
6.1.3 26dB EBW and 99% OBW in the 5.47-5.725 GHz Band

802.11 Mode	Data Rate	Channel	Frequency (MHz)	26dB EBW (MHz)	99% OBW (MHz)
a	6 Mbps	100	5500	24.5	17.2
		116	5580	24.5	17.2
		140	5700	24.5	17.2
	12 Mbps	100	5500	23.5	16.9
		116	5580	23.5	16.9
		140	5700	23.5	16.9
	24 Mbps	100	5500	23.0	16.8
		116	5580	23.0	16.7
		140	5700	23.0	16.8
n (20 MHz)	MCS7	100	5500	23.7	17.9
		116	5580	23.7	17.9
		140	5700	23.7	17.9

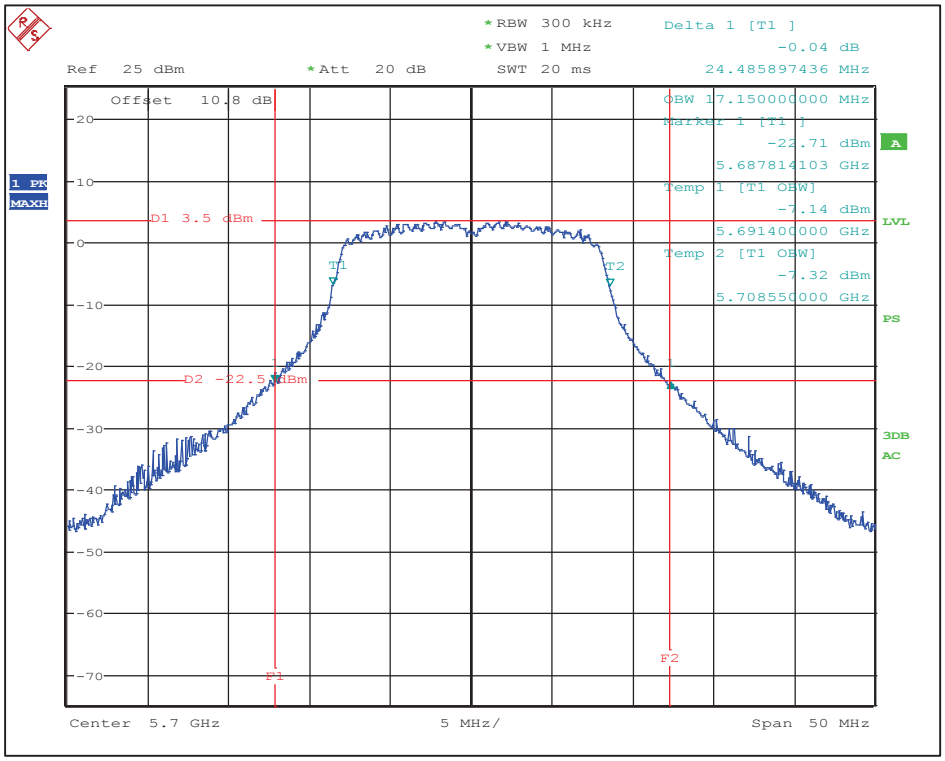
Refer to the following plots



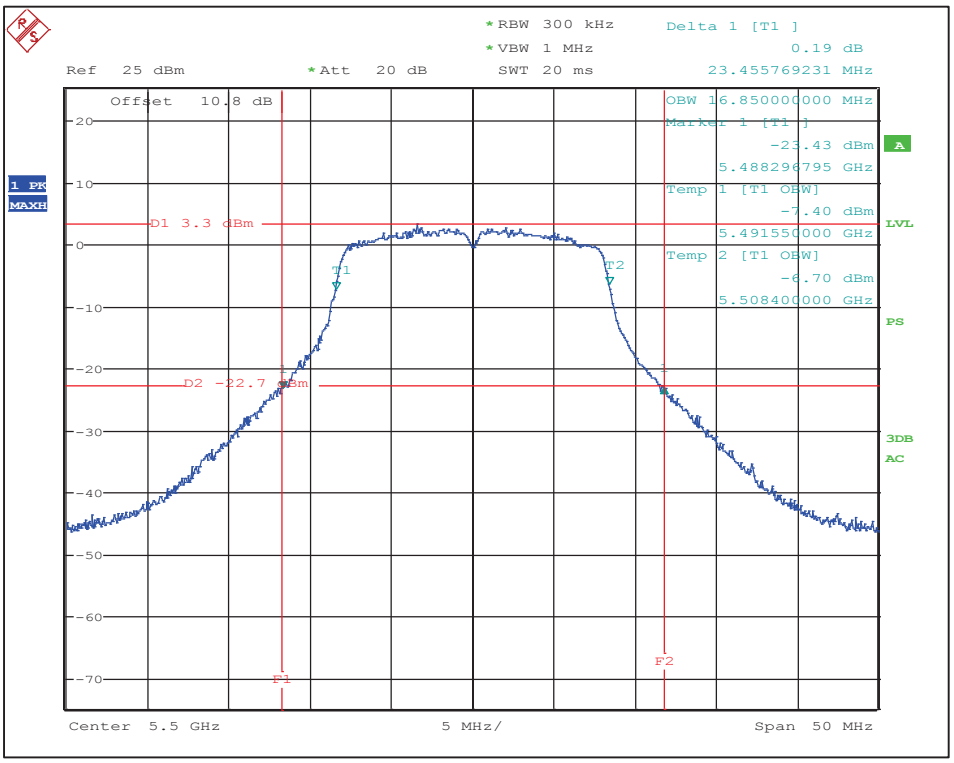
802.11a: 6Mbps – Channel 100 (5500 MHz) 26dB BW and 99% OBW



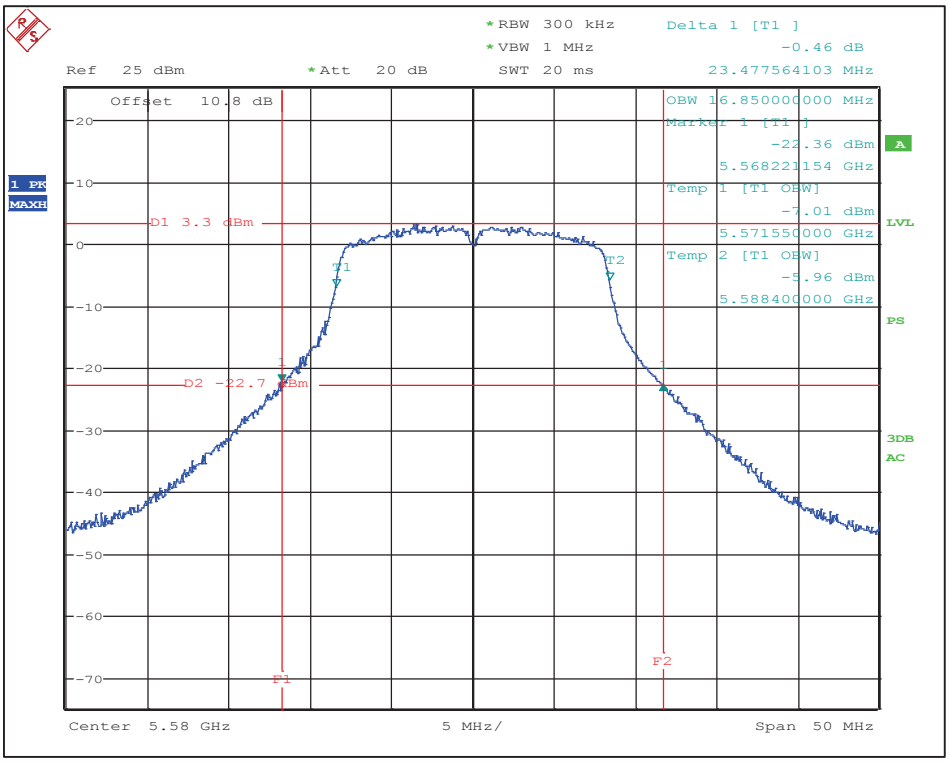
802.11a: 6Mbps – Channel 116 (5580 MHz) 26dB BW and 99% OBW



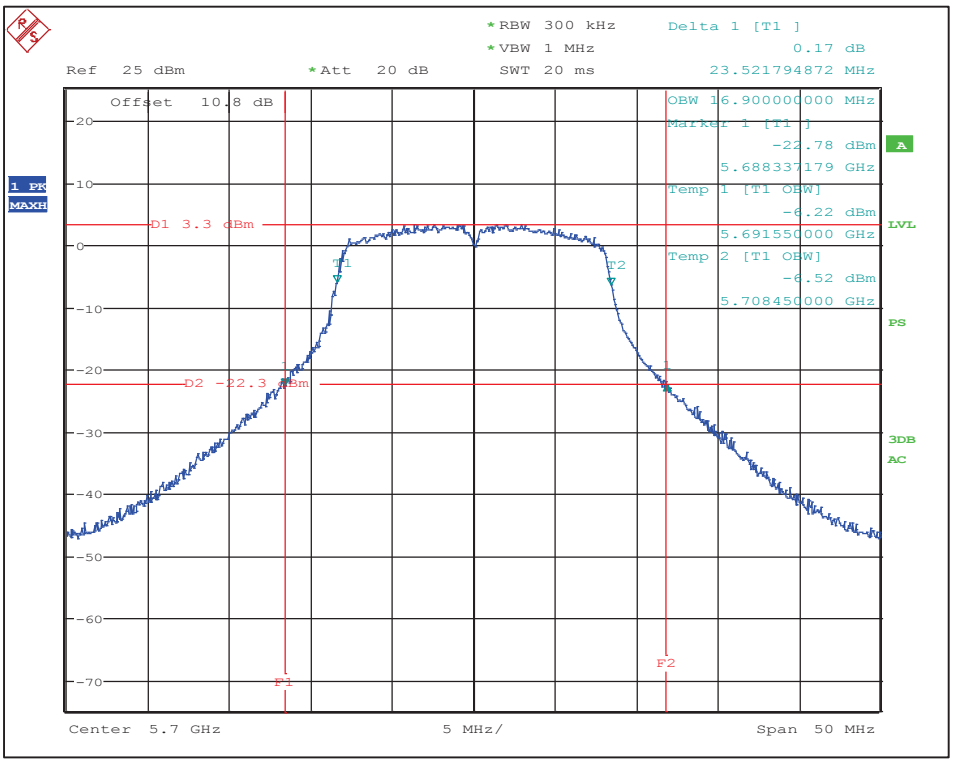
802.11a: 6Mbps – Channel 140 (5700 MHz) 26dB BW and 99% OBW



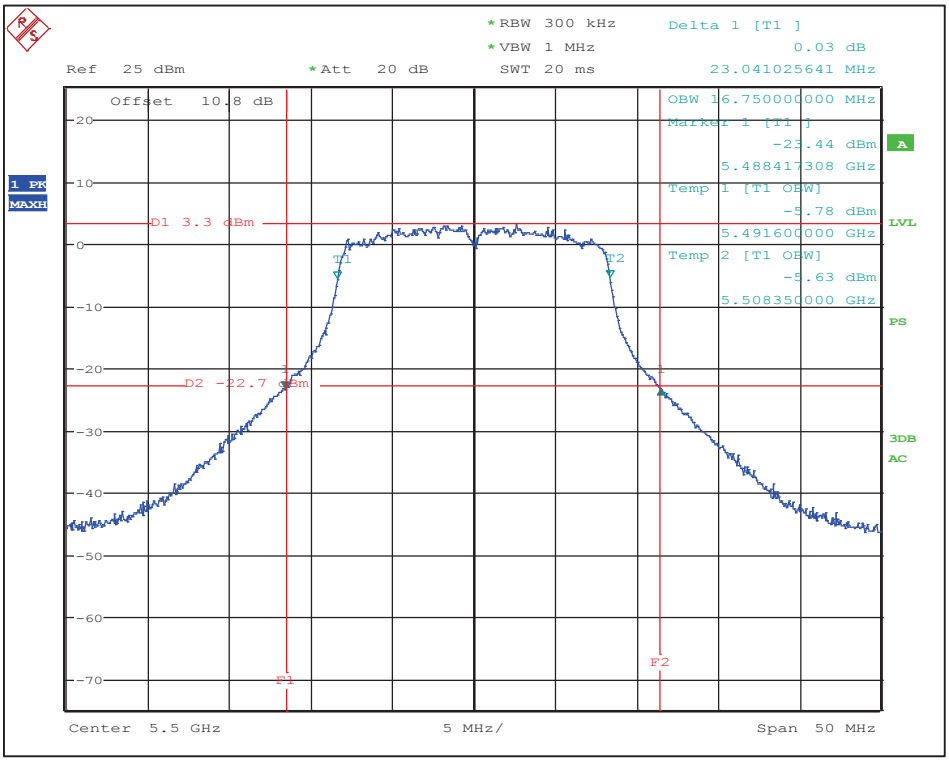
802.11a: 12Mbps – Channel 100 (5500 MHz) 26dB BW and 99% OBW



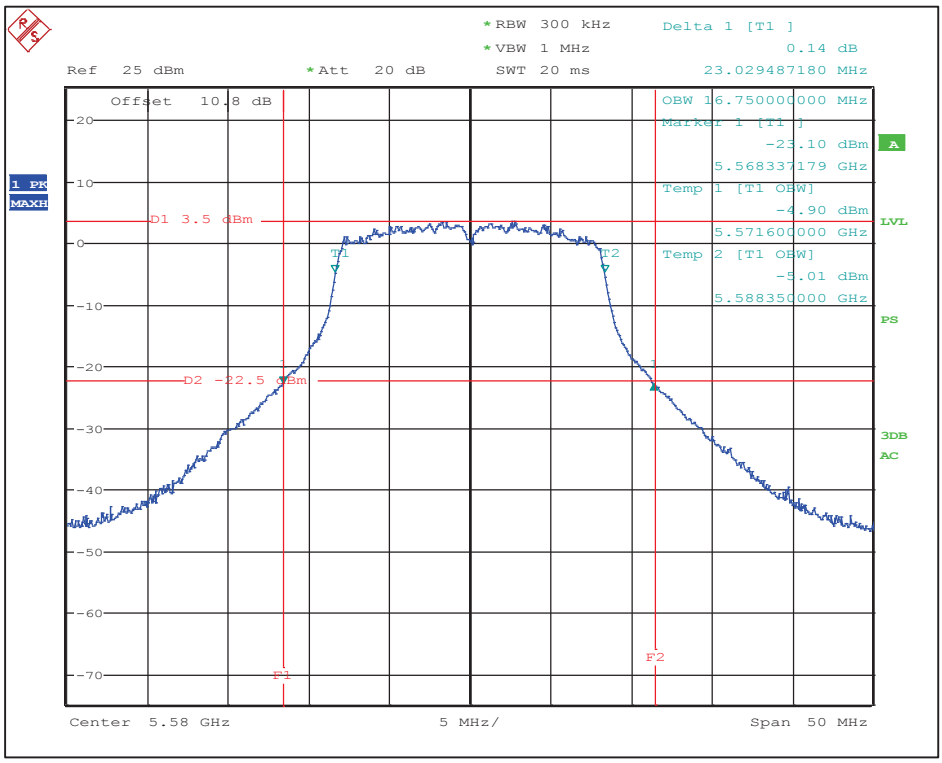
802.11a: 12Mbps – Channel 116 (5580 MHz) 26dB BW and 99% OBW



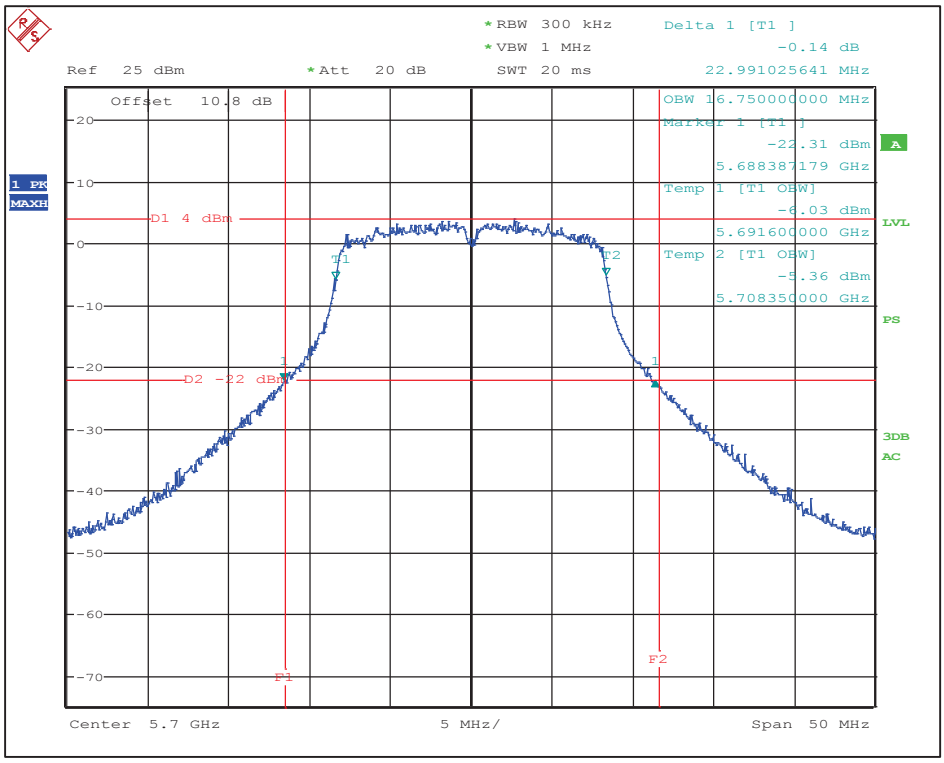
802.11a: 12Mbps – Channel 140 (5700 MHz) 26dB BW and 99% OBW



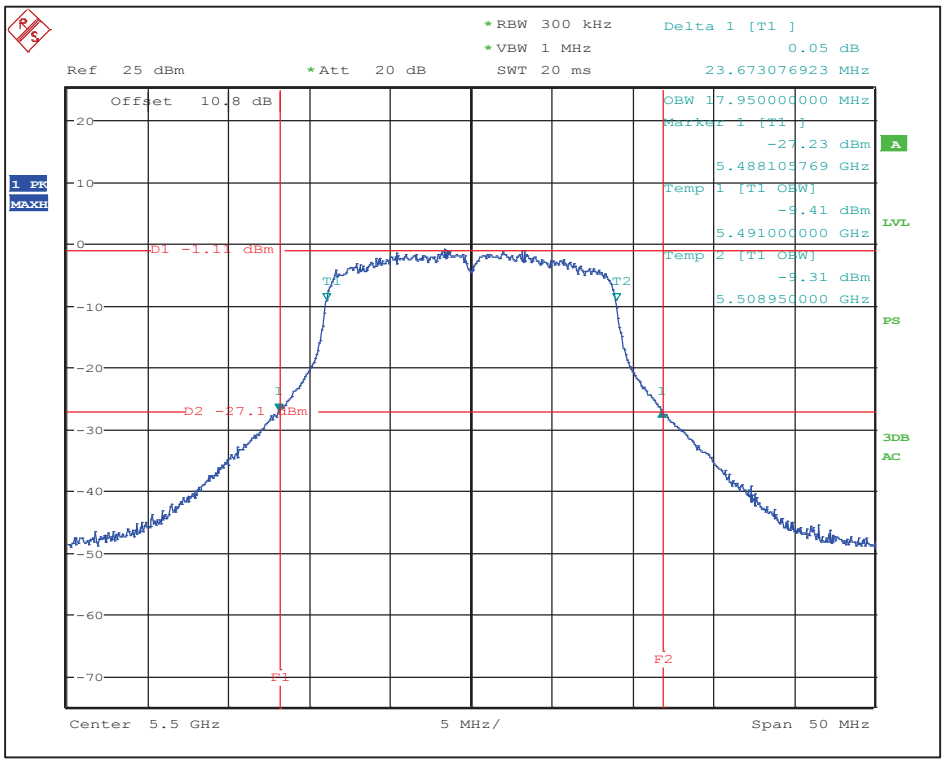
802.11a: 24Mbps – Channel 100 (5500 MHz) 26dB BW and 99% OBW



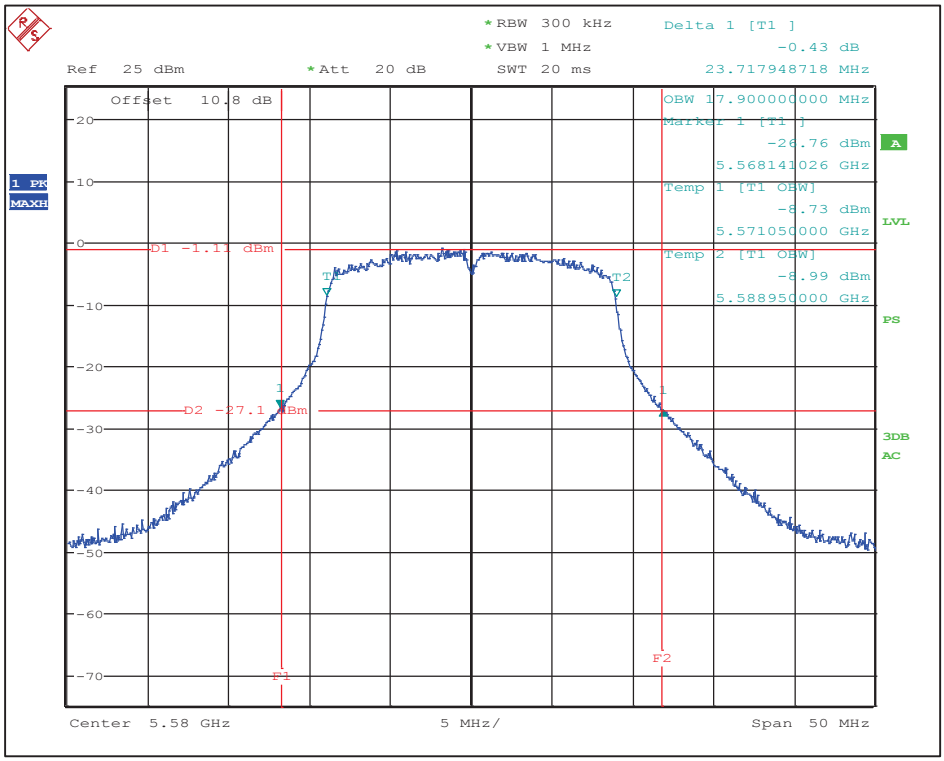
802.11a: 24Mbps – Channel 116 (5580 MHz) 26dB BW and 99% OBW



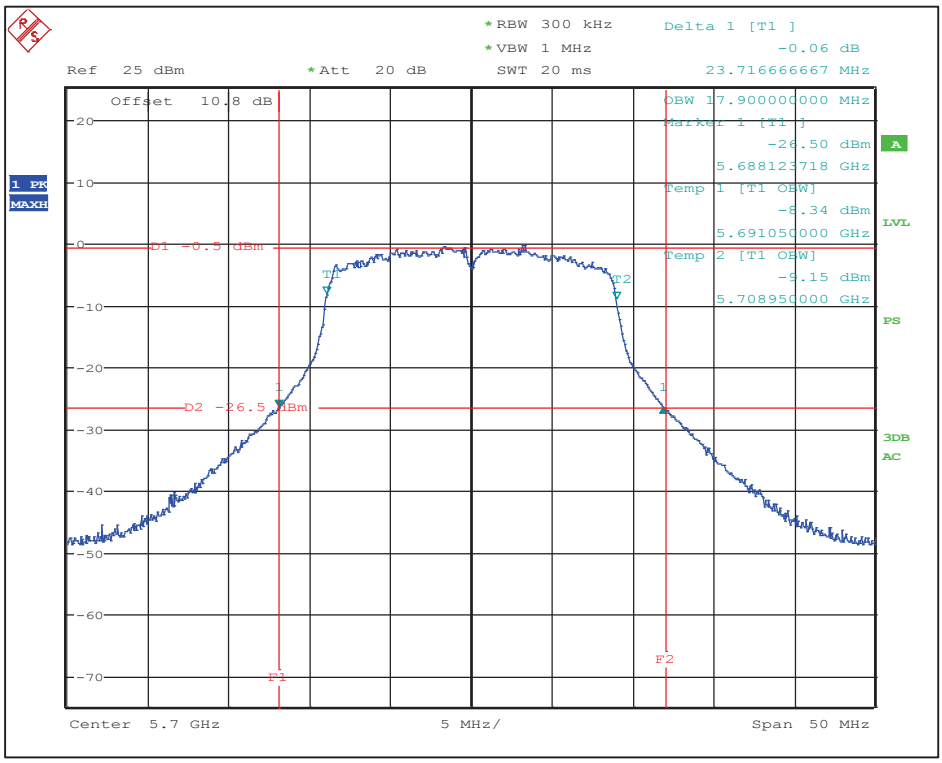
802.11a: 24Mbps – Channel 140 (5700 MHz) 26dB BW and 99% OBW



802.11n: MCS7 – Channel 100 (5500 MHz) 26dB BW and 99% OBW



802.11n: MCS7 – Channel 116 (5580 MHz) 26dB BW and 99% OBW



802.11n: MCS7 – Channel 140 (5700 MHz) 26dB BW and 99% OBW

6.2 6dB Emission Bandwidth (EBW) and 99% Occupied Bandwidth (OBW)

Limits

FCC Part 15 Subpart E §15.407 (e)

Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz

IC RSS-247 Issue 1 §6.2.4 (1)

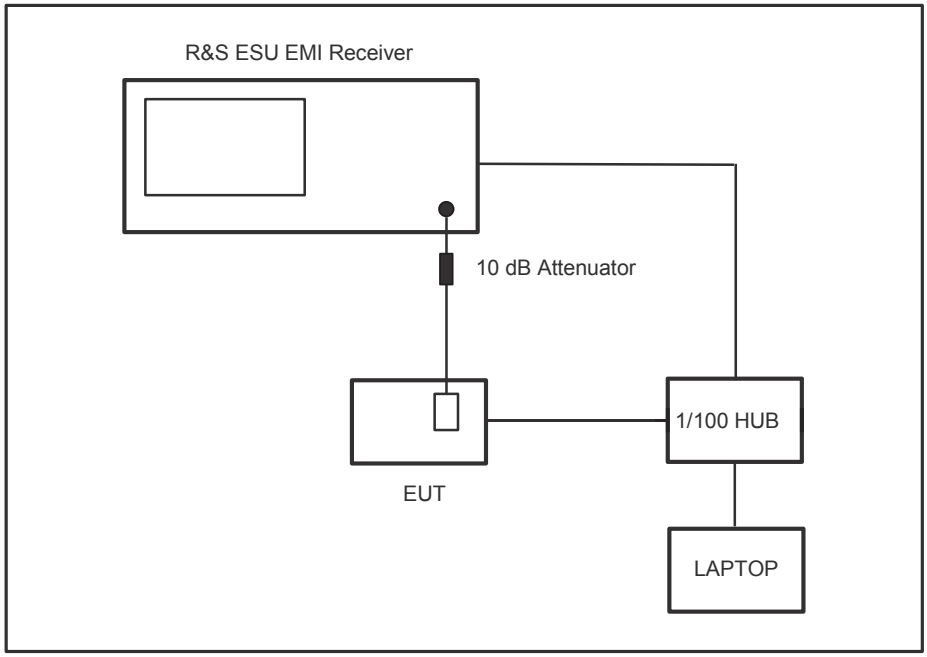
For equipment operating in the band 5725-5850 MHz, the minimum 6 dB bandwidth shall be at least 500 kHz

Test Procedures

KDB 789033 D02 v01 Section C.2

Note: EMI Receiver (Spectrum Analyzer) Reference Level Offset = 10.8 dB (10 dB Attenuator Pad + 0.8 cable loss)

Test Setup

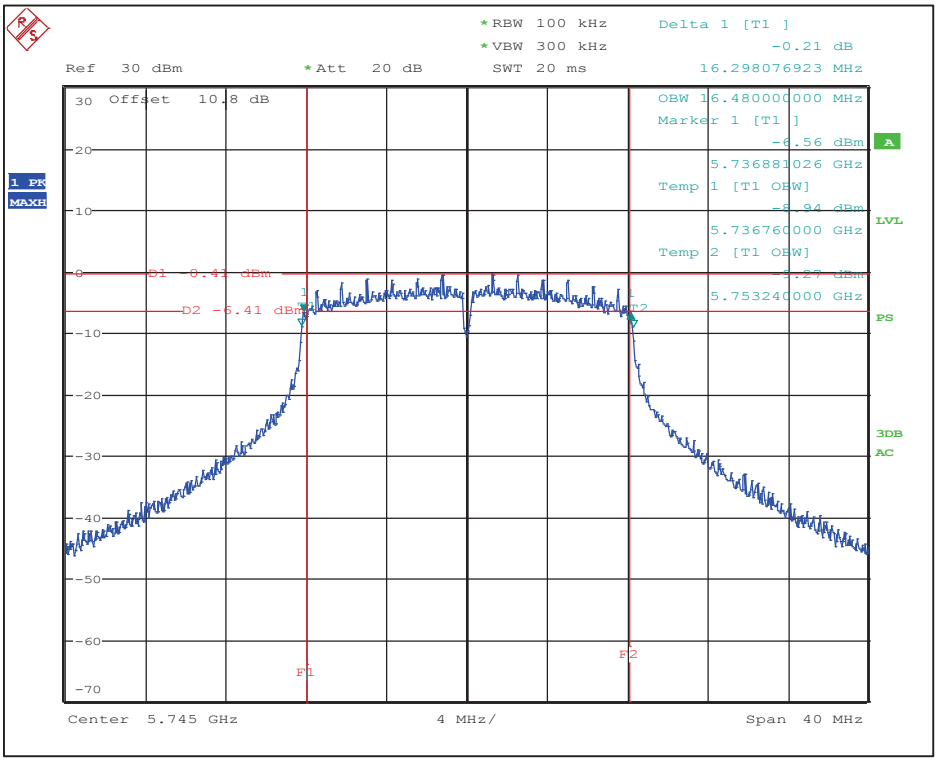


Test Results

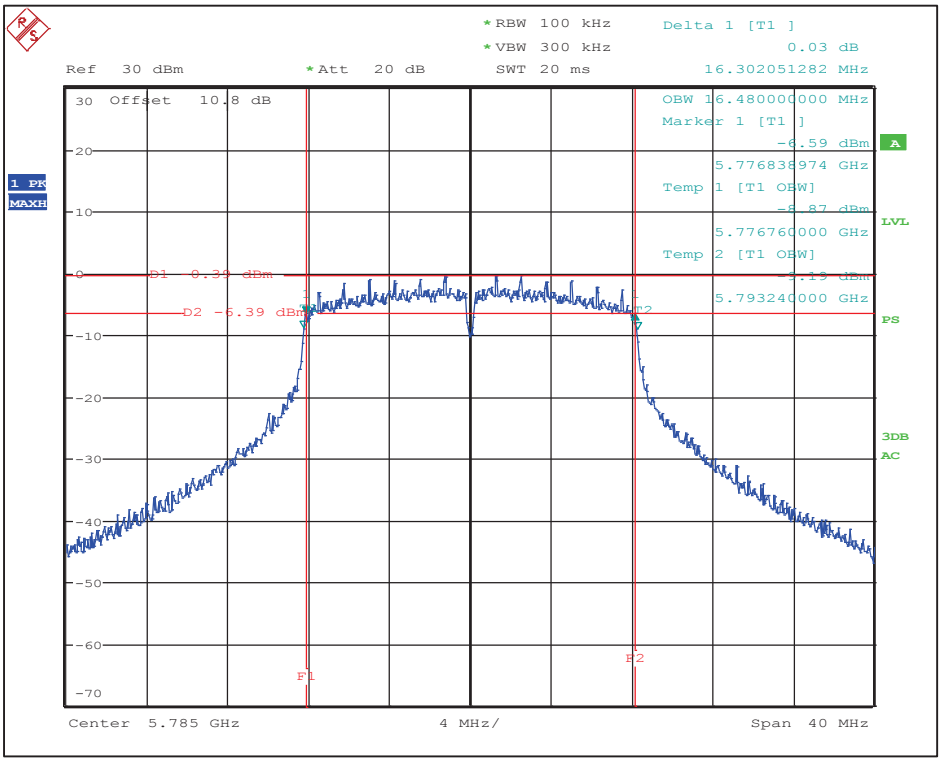
6.2.1 6dB EBW and 99% OBW in the 5.725-5.85 GHz Band

802.11 Mode	Data Rates	Channel	Frequency (MHz)	6dB EBW (MHz)	99% OBW (MHz)	6dB EBW Limit (kHz)
a	6 Mbps	149	5745	16.3	16.5	> 500
		157	5785	16.3	16.5	> 500
		165	5825	16.3	16.5	> 500
	12 Mbps	149	5745	16.4	16.4	> 500
		157	5785	16.4	16.4	> 500
		165	5825	16.4	16.4	> 500
	24 Mbps	149	5745	16.5	16.4	> 500
		157	5785	16.5	16.4	> 500
		165	5825	16.5	16.4	> 500
n (HT20)	MCS7	149	5745	17.7	17.7	> 500
		157	5785	17.7	17.6	> 500
		165	5825	17.7	17.7	> 500

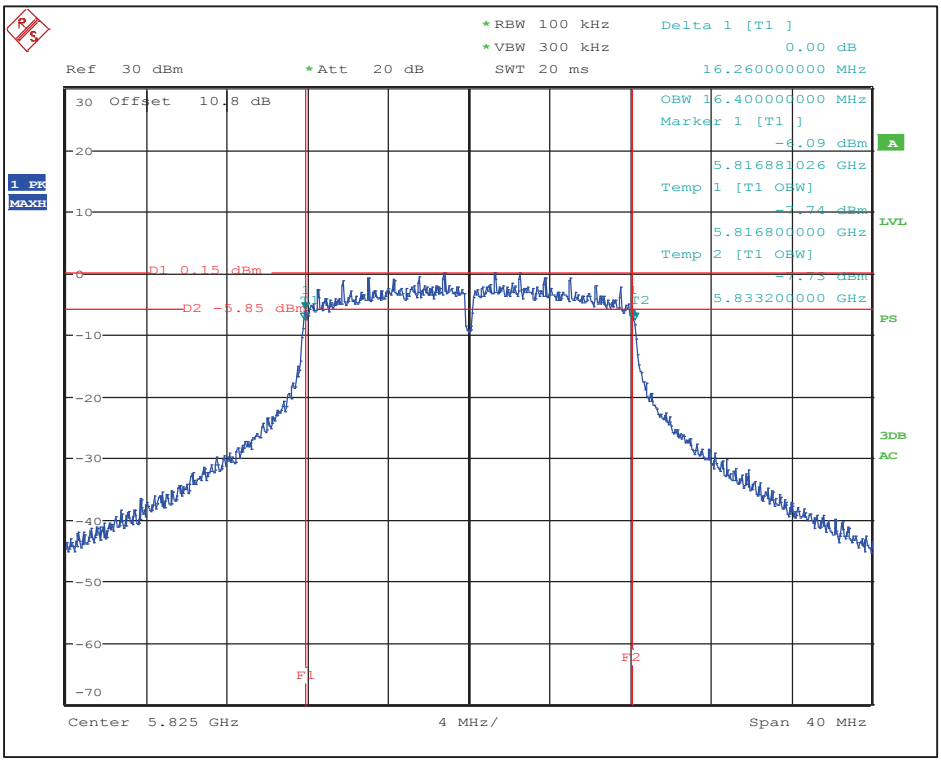
Refer to the following plots



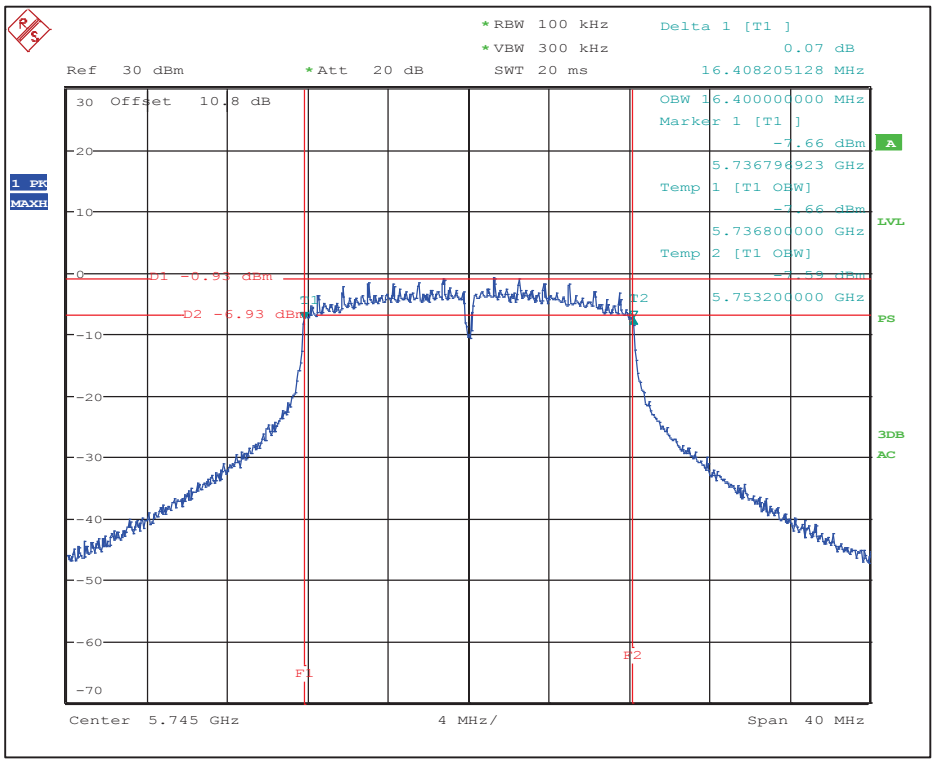
802.11a: 6 Mbps – Channel 149 (5745 MHz) 6dB DTS BW and 99% OBW



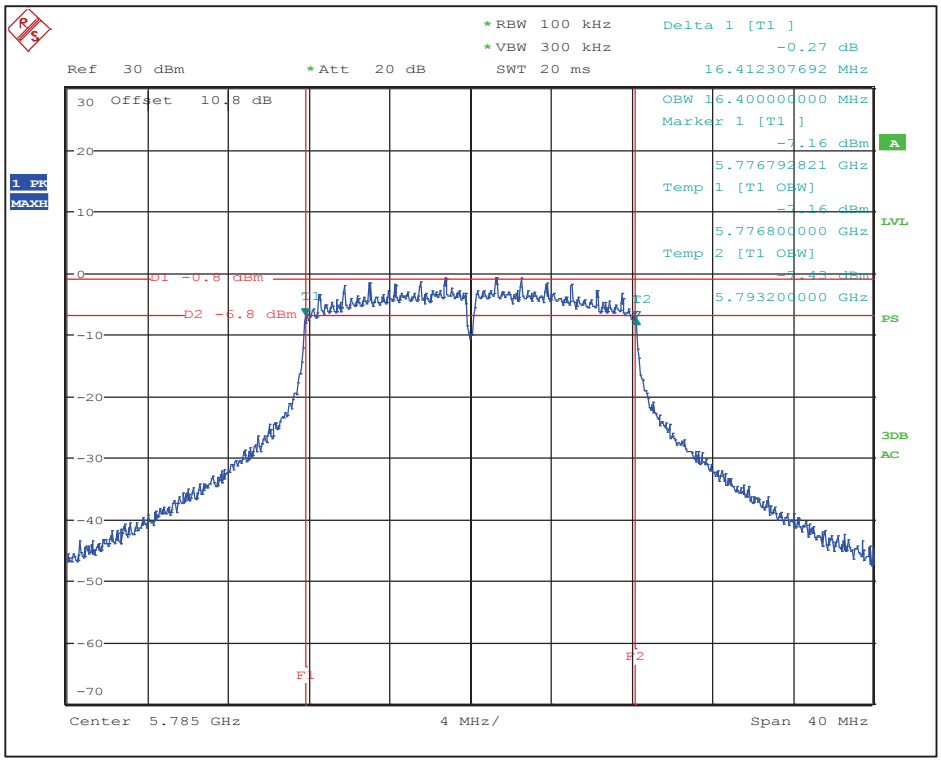
802.11a: 6 Mbps – Channel 157 (5785 MHz) 6dB DTS BW and 99% OBW



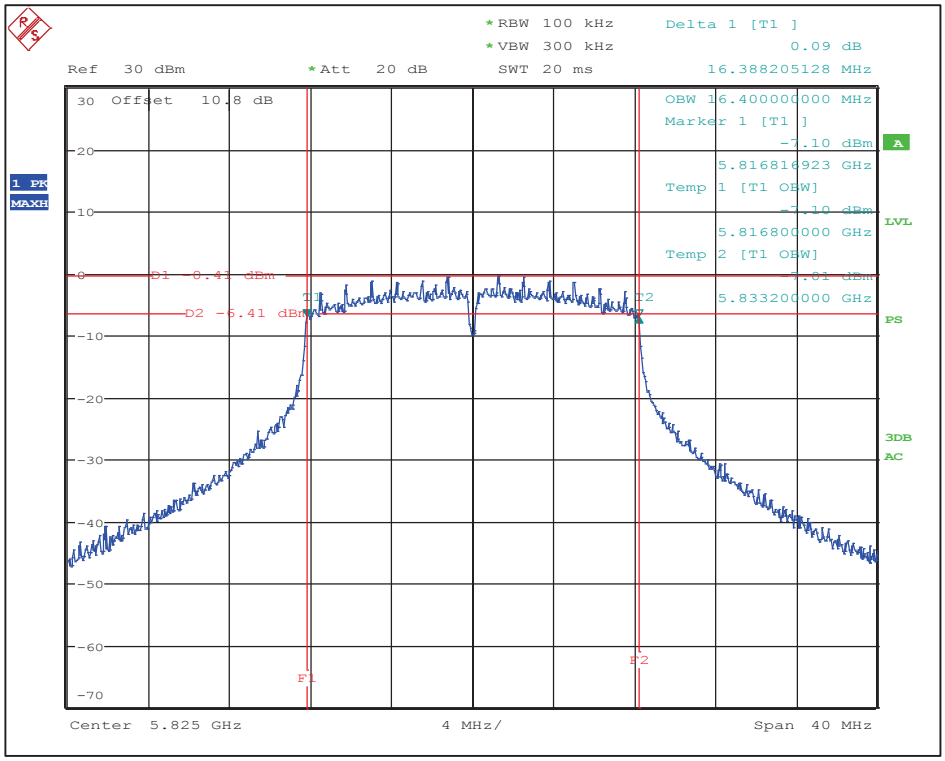
802.11a: 6 Mbps – Channel 165 (5825 MHz) 6dB DTS BW and 99% OBW



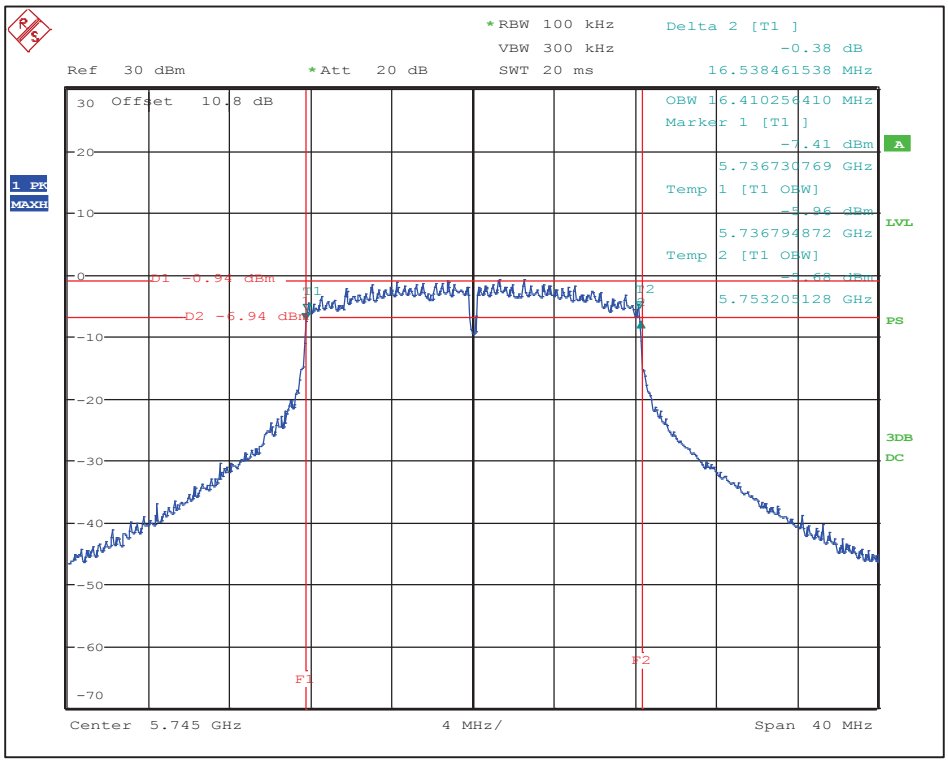
802.11a: 12 Mbps – Channel 149 (5745 MHz) 6dB DTS BW and 99% OBW



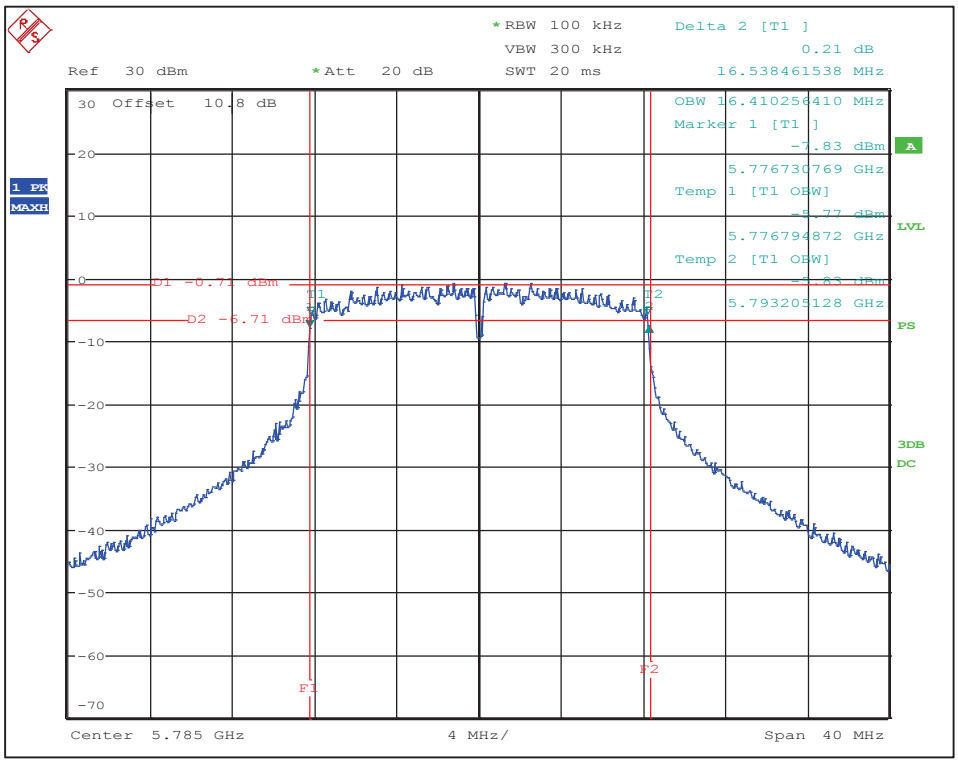
802.11a: 12 Mbps – Channel 157 (5785 MHz) 6dB DTS BW and 99% OBW



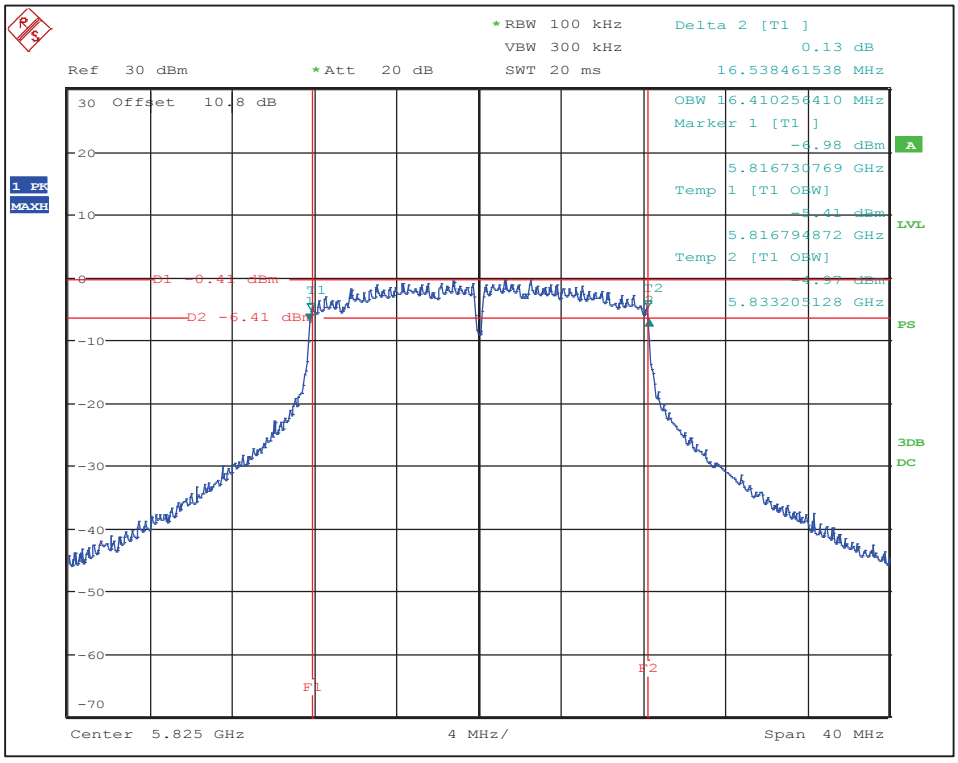
802.11a: 12 Mbps – Channel 165 (5825 MHz) 6dB DTS BW and 99% OBW



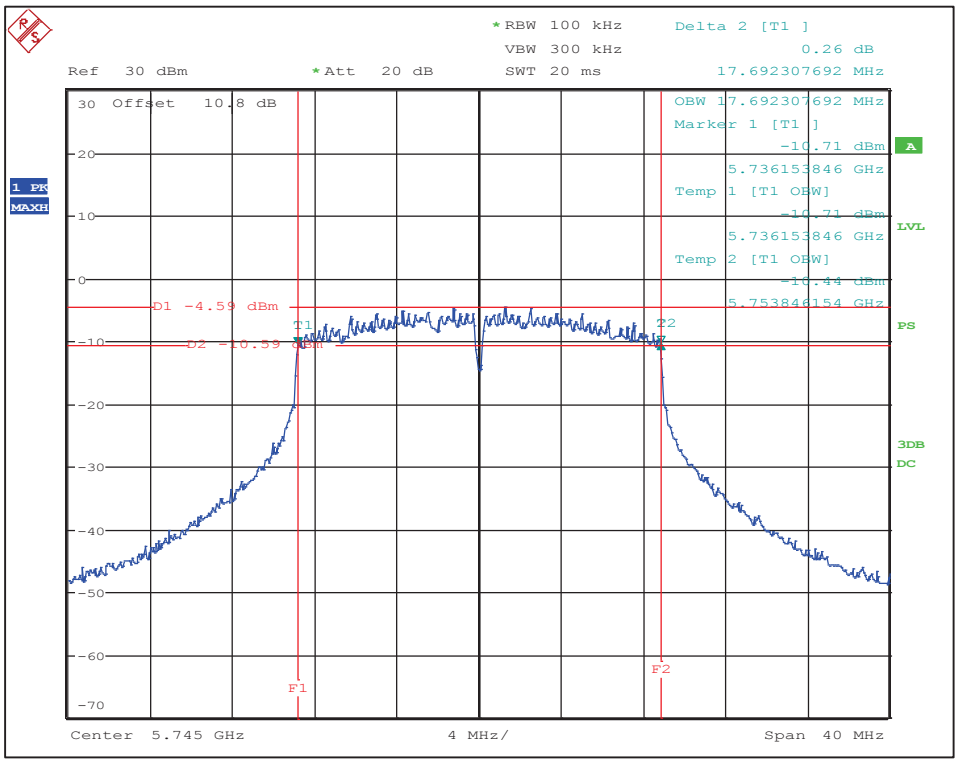
802.11a: 24 Mbps – Channel 149 (5745 MHz) 6dB EBW and 99% OBW



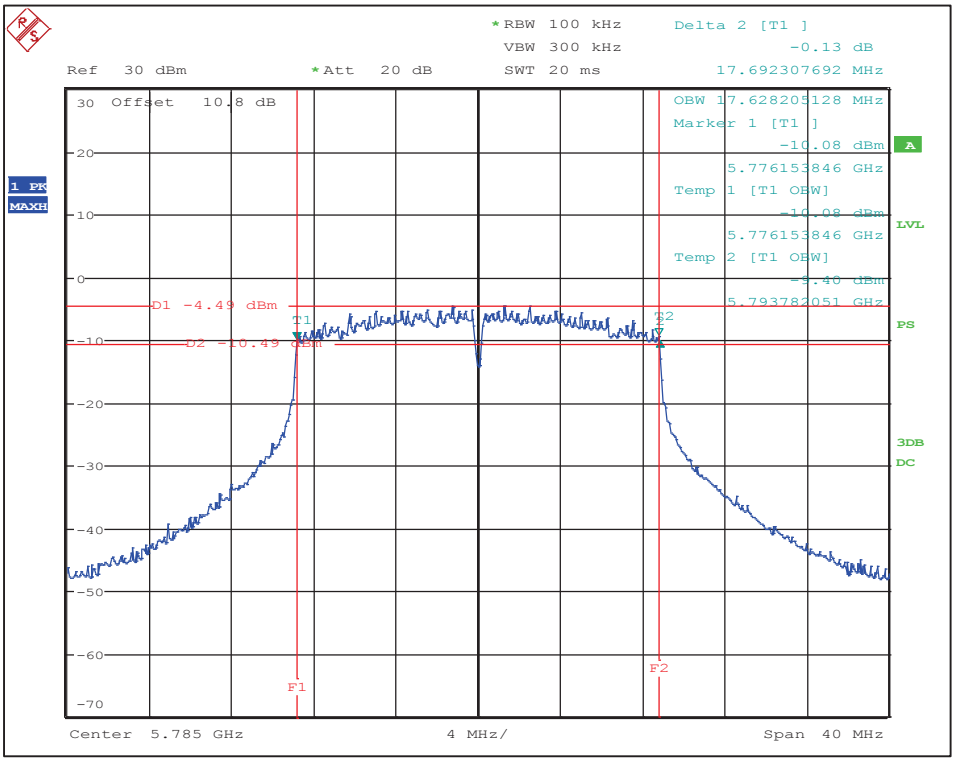
802.11a: 24 Mbps – Channel 157 (5785 MHz) 6dB EBW and 99% OBW



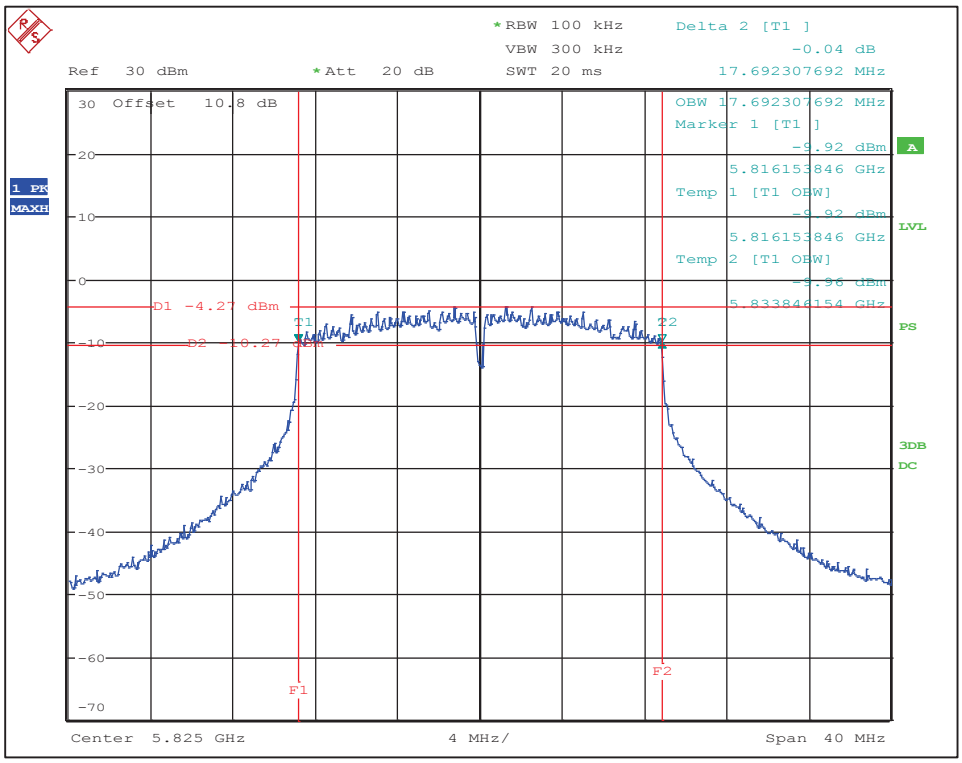
802.11a: 24 Mbps – Channel 165 (5825 MHz) 6dB EBW and 99% OBW



802.11n: MCS7 – Channel 149 (5745 MHz) 6dB EBW and 99% OBW



802.11n: MCS7 – Channel 157 (5785 MHz) 6dB EBW and 99% OBW



802.11n: MCS7 – Channel 165 (5825 MHz) 6dB EBW and 99% OBW

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

Limits

FCC Part 15 Subpart E §15.407 (a)

§15.407 (a)(1) - For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW (24 dBm).

§15.407 (a)(2) - For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz.

§15.407 (a)(3) - For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W (30dBm)

IC RSS-247 Issue 1 §6.2

§16.2.1 (1) - Frequency Band 5150-5250 MHz, the maximum e.i.r.p. shall not exceed 200 mW or 10 + 10 log10B, dBm, whichever power is less. B is the 99% emission bandwidth in megahertz.

§16.2.2 (1) - Frequency Band 5250-5350 MHz; the maximum conducted output power shall not exceed 250 mW or 11 + 10 $\log_{10}$B, dBm, whichever is less. The maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10 $\log_{10}$B, dBm, whichever is less. B is the 99% emission bandwidth in megahertz. Note that devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.

§16.2.3 (1) - Frequency Bands 5470-5600 MHz and 5650-5725 MHz; the maximum conducted output power shall not exceed 250 mW or 11 + 10 $\log_{10}$B, dBm, whichever is less.The maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10 log10B, dBm, whichever is less. B is the 99% emission bandwidth in megahertz. Note that devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W

§16.2.4 (1) - Frequency Band 5725-5850 MHz; the maximum conducted output power shall not exceed 1 W

Test Procedures

For transmit duty cycle ≥ 98%: KDB 789033 D02 v01 Section E.2.b) – Method SA-1
For transmit duty cycle ≤ 98%: KDB 789033 D02 v01 Section E.2.d) – Method SA-2

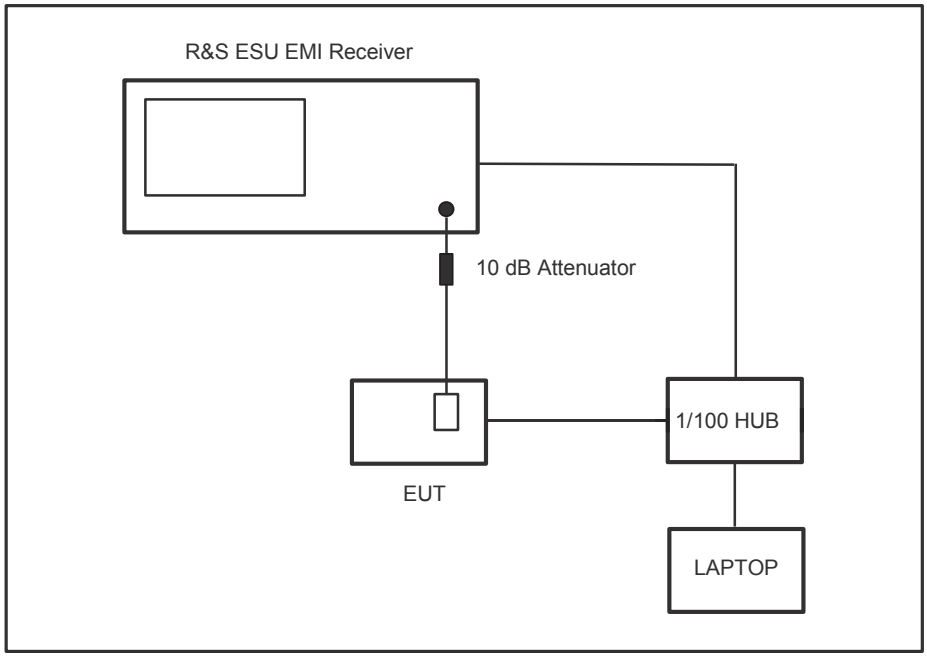
Notes:
Spectrum Analyzer Offset level Calculation:

OFFSET $_{(dB)}$ = 10.8 dB (10 dB Attenuator Pad + 0.8 dB cable loss) [for 6Mbps and 12Mbps Data Rates]
OFFSET $_{(dB)}$ = 11.0 dB (10 dB Attenuator Pad + 0.8 dB cable loss + 0.15 Duty Cycle Factor) [for 24Mbps Data Rate]
OFFSET $_{(dB)}$ = 11.2 dB (10 dB Attenuator Pad + 0.8 dB cable loss + 0.39 Duty Cycle Factor) [for MCS7 Data Rate]

Directional Antenna Gain: There is only one transmitter output therefore the directional gain is equal to the antenna gain

e.i.r.p $_{(dBm)}$ = Maximum Conducted Output Power $_{(dBm)}$ + Directional Gain $_{(dBi)}$
Margin $_{(dB)}$ = Results (e.i.r.p. or Maximum conducted output power) $_{(dBm)}$ – Limit $_{(dBm)}$

Test Setup

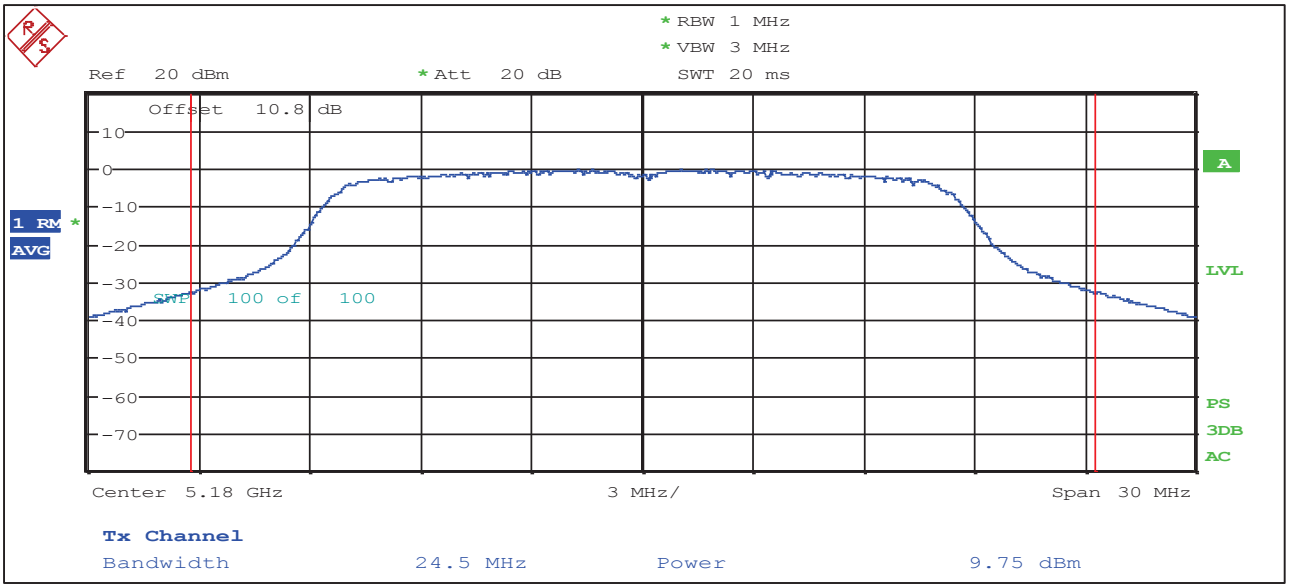


Test Results

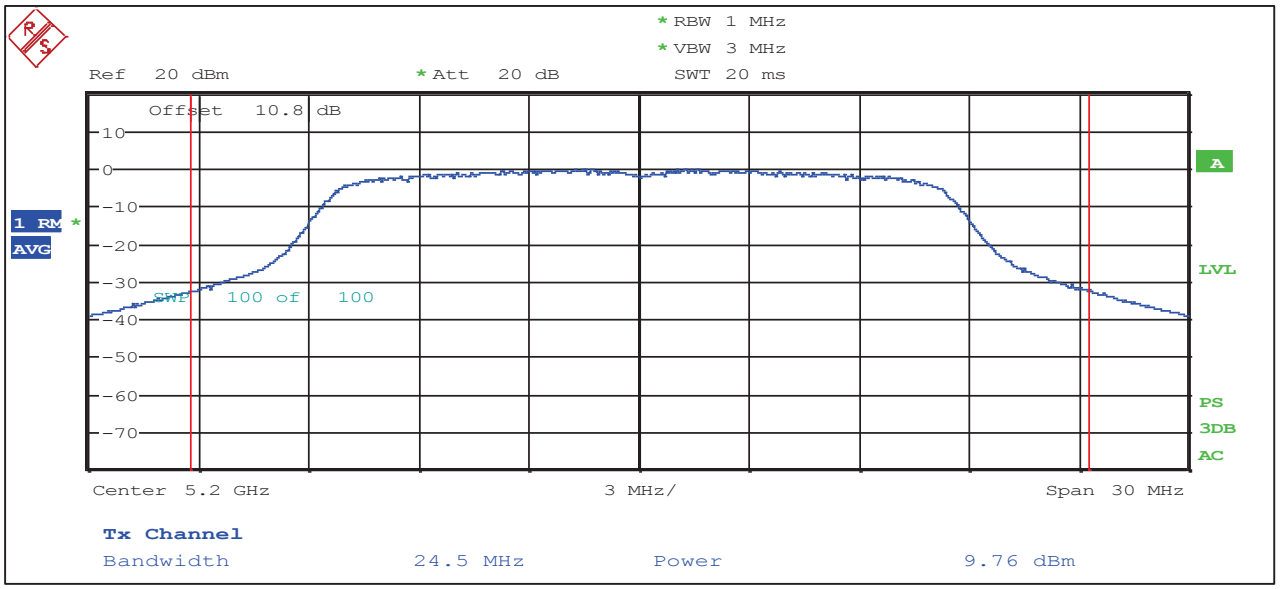
6.3.1 Maximum Conducted Output Power and e.i.r.p. in the 5.15-5.25 GHz Band

802.11 Mode	Data Rate	Channel	Frequency (MHz)	Maximum Conducted Output Power			e.i.r.p.			
				Results (dBm)	FCC Limit (dBm)	Margin (dB)	Directional Gain (dBi)	Results (dBm)	IC Limit (dBm)	Margin (dB)
a	6 Mbps	36	5180	9.75	24	-14.2	3.5	13.25	22.36	-9.11
		40	5200	9.76	24	-14.2	3.5	13.26	22.36	-9.10
		48	5240	10.10	24	-13.9	3.5	13.60	22.33	-8.73
	12 Mbps	36	5180	8.91	24	-15.1	3.5	12.41	22.28	-9.87
		40	5200	8.97	24	-15.0	3.5	12.47	22.28	-9.81
		48	5240	9.19	24	-14.8	3.5	12.69	22.28	-9.59
	24 Mbps	36	5180	7.98	24	-16.0	3.5	11.48	22.25	-10.77
		40	5200	7.90	24	-16.1	3.5	11.40	22.25	-10.85
		48	5240	8.26	24	-15.7	3.5	11.76	22.25	-10.49
n (20 MHz)	MCS7	36	5180	2.57	24	-21.4	3.5	6.07	22.53	-16.46
		40	5200	2.49	24	-21.5	3.5	5.99	22.53	-16.54
		48	5240	2.72	24	-21.3	3.5	6.22	22.53	-16.31

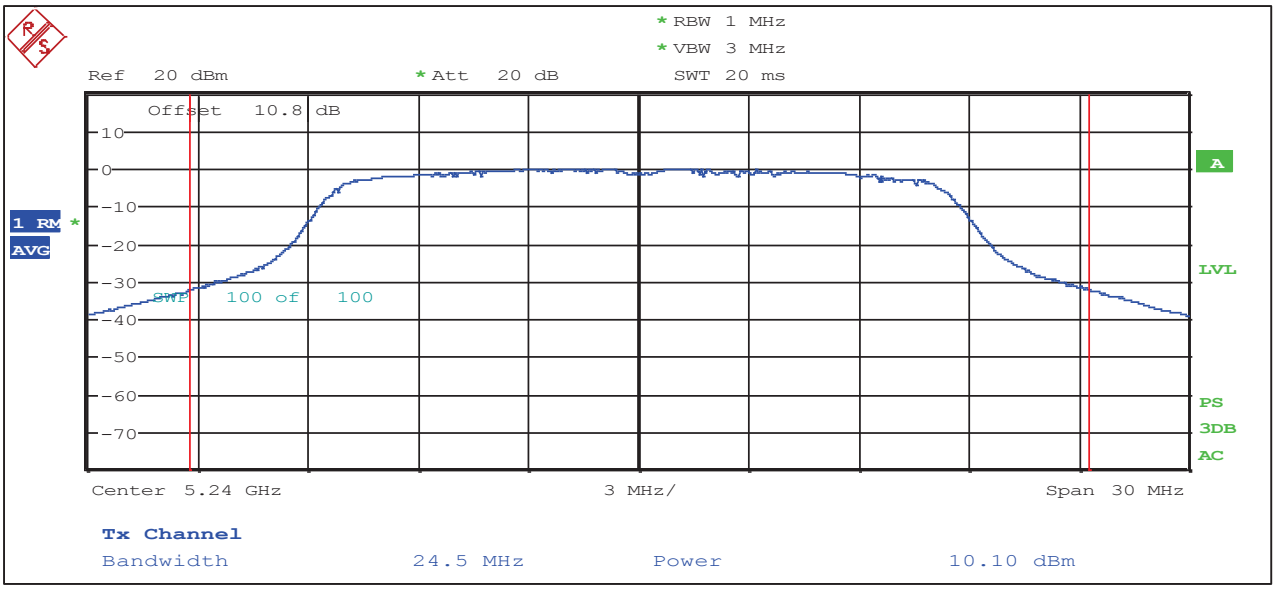
Refer to the following plots



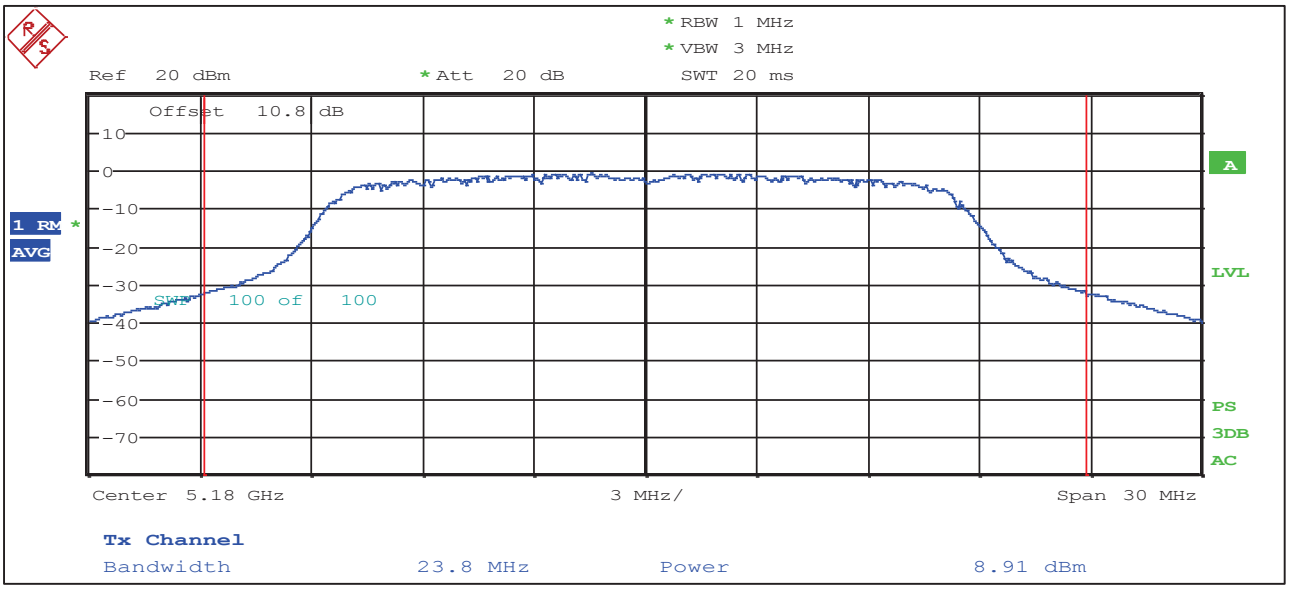
802.11a: 6 Mbps – Channel 36 (5180 MHz) Maximum Conducted Output Power



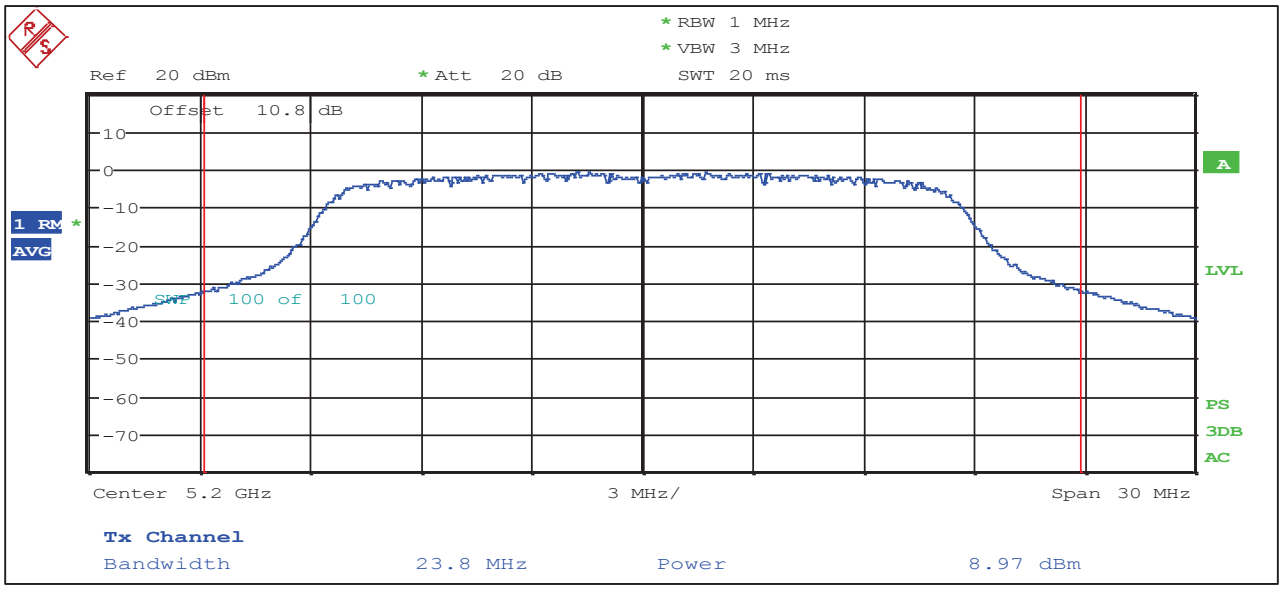
802.11a: 6 Mbps – Channel 40 (5200 MHz) Maximum Conducted Output Power



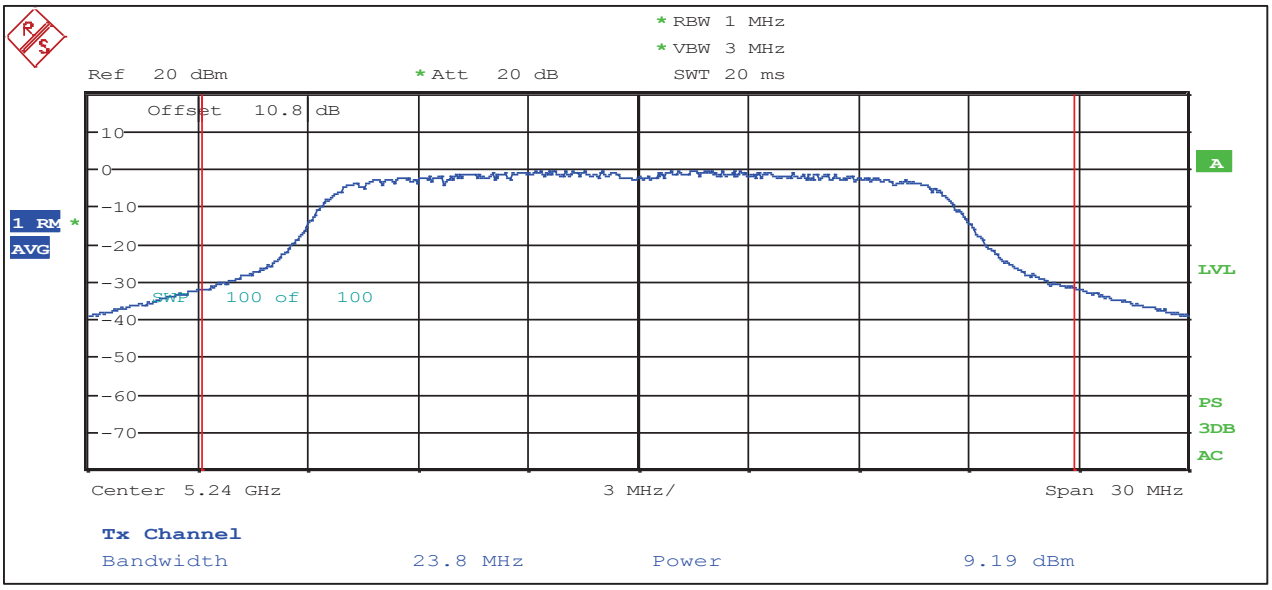
802.11a: 6 Mbps – Channel 48 (5240 MHz) Maximum Conducted Output Power



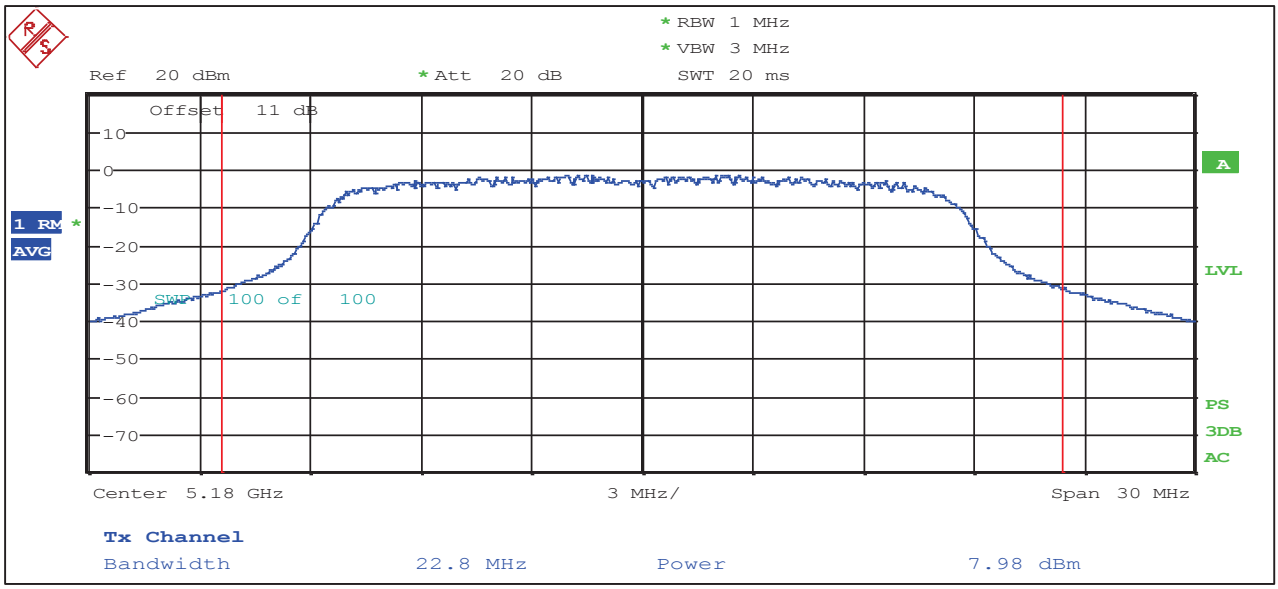
802.11a: 12 Mbps – Channel 36 (5180 MHz) Maximum Conducted Output Power



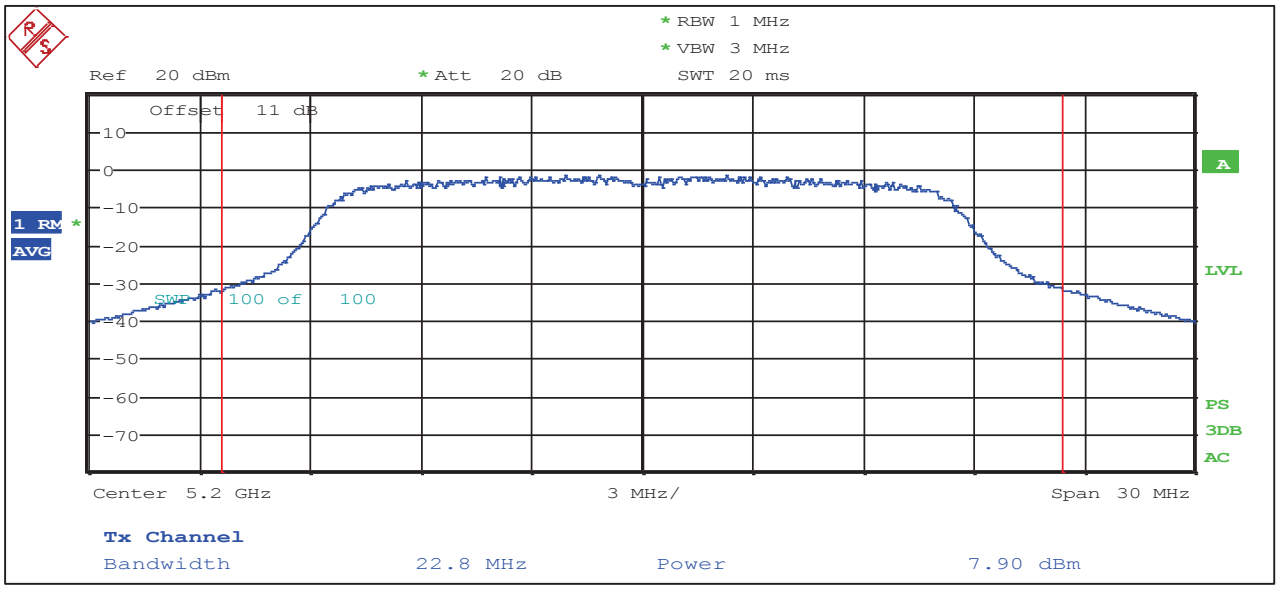
802.11a: 12 Mbps – Channel 40 (5200 MHz) Maximum Conducted Output Power



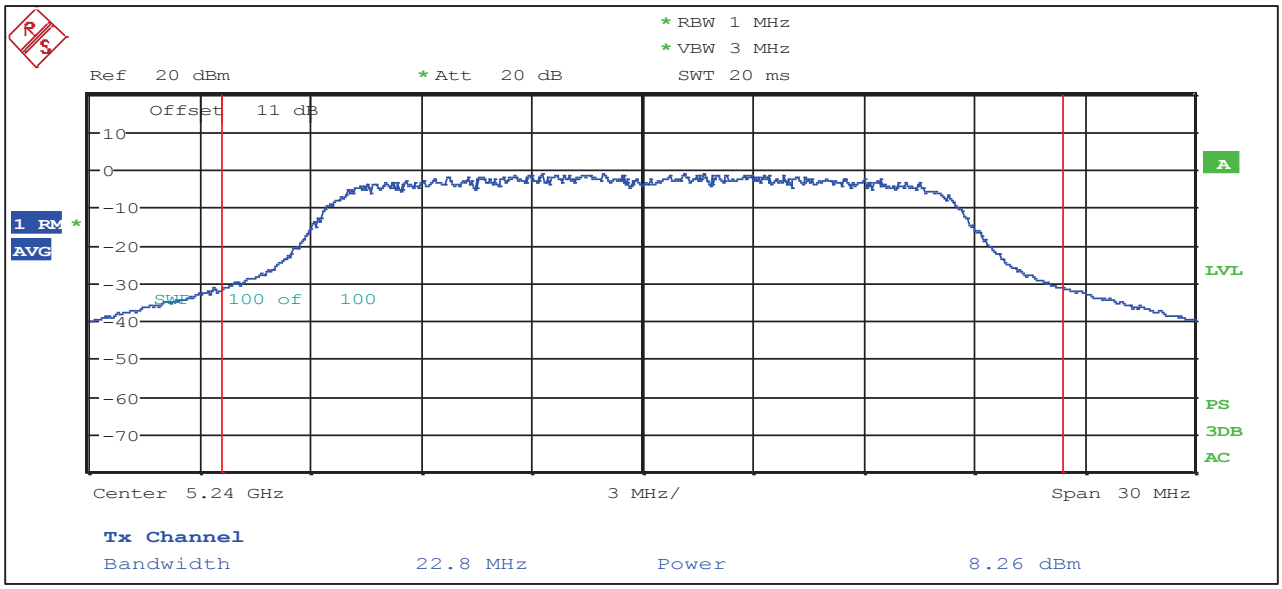
802.11a: 12 Mbps – Channel 48 (5240 MHz) Maximum Conducted Output Power



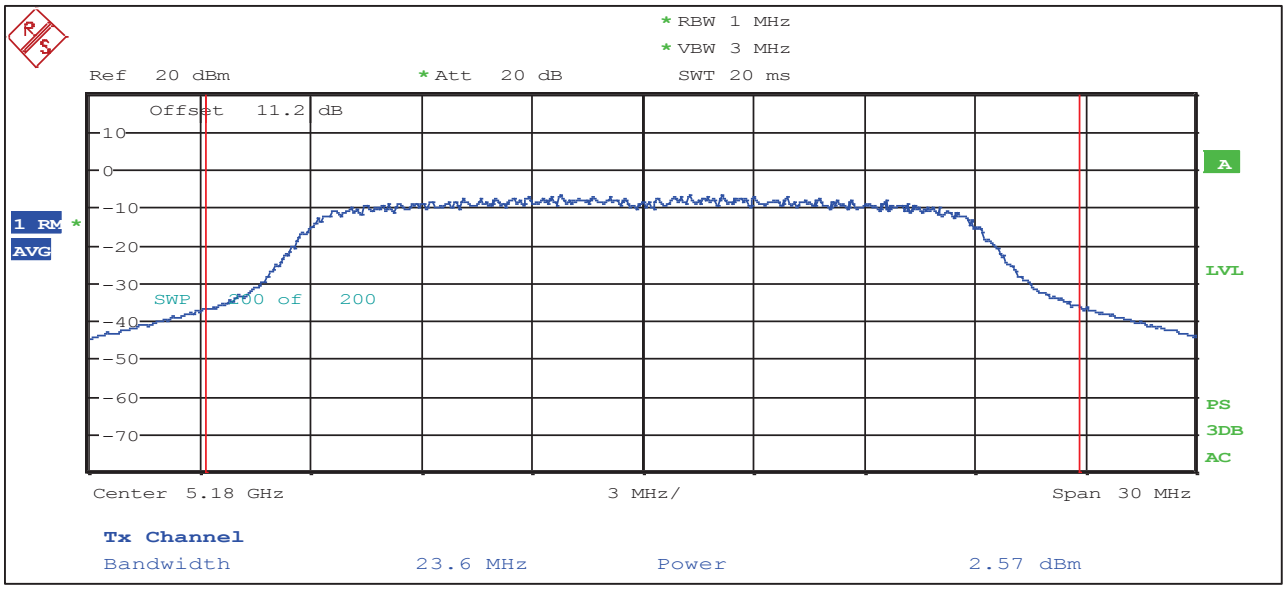
802.11a: 24 Mbps – Channel 36 (5180 MHz) Maximum Conducted Output Power



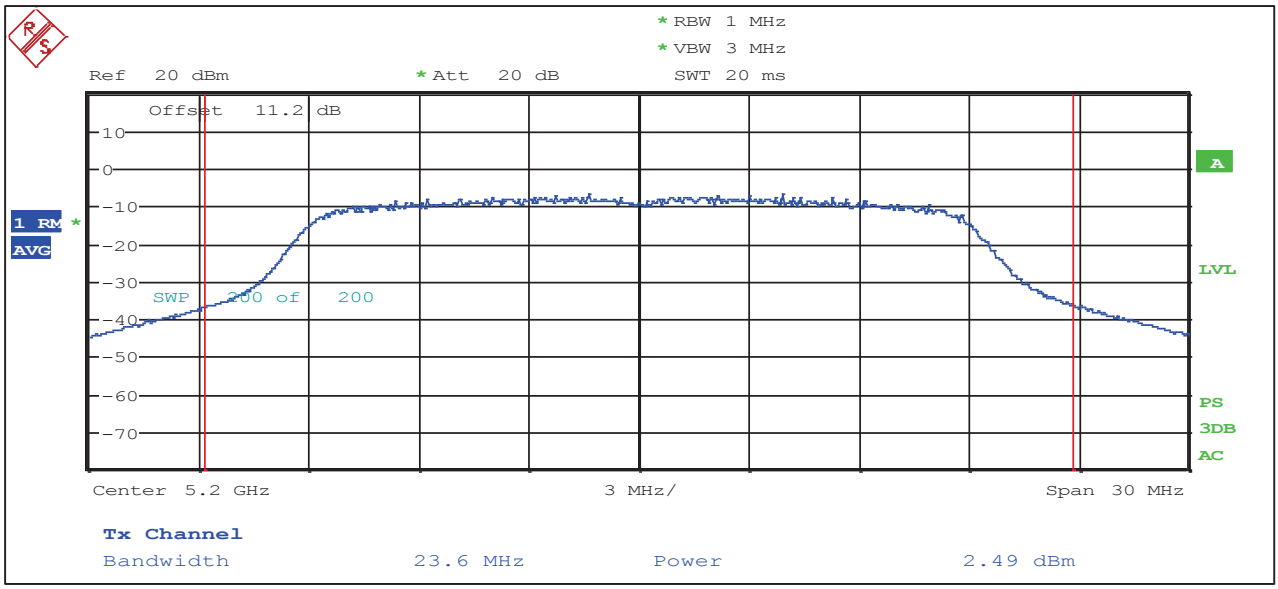
802.11a: 24 Mbps – Channel 40 (5200 MHz) Maximum Conducted Output Power



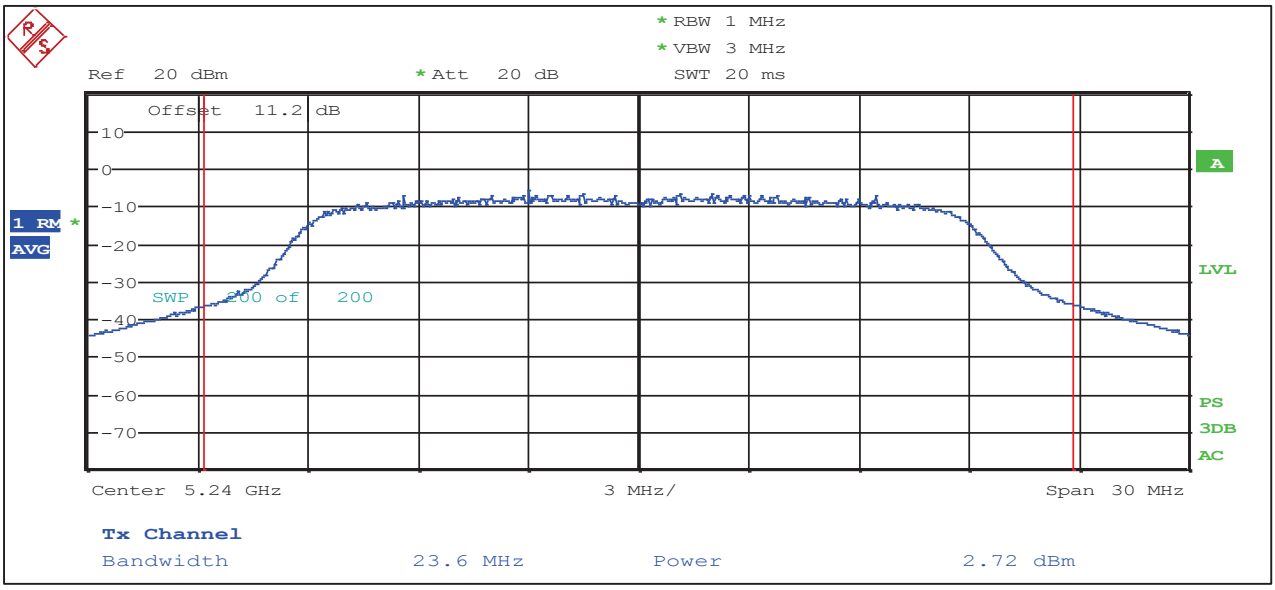
802.11a: 24 Mbps – Channel 48 (5240 MHz) Maximum Conducted Output Power



802.11n: MCS7 – Channel 36 (5180 MHz) Maximum Conducted Output Power



802.11n: MCS7 – Channel 40 (5200 MHz) Maximum Conducted Output Power

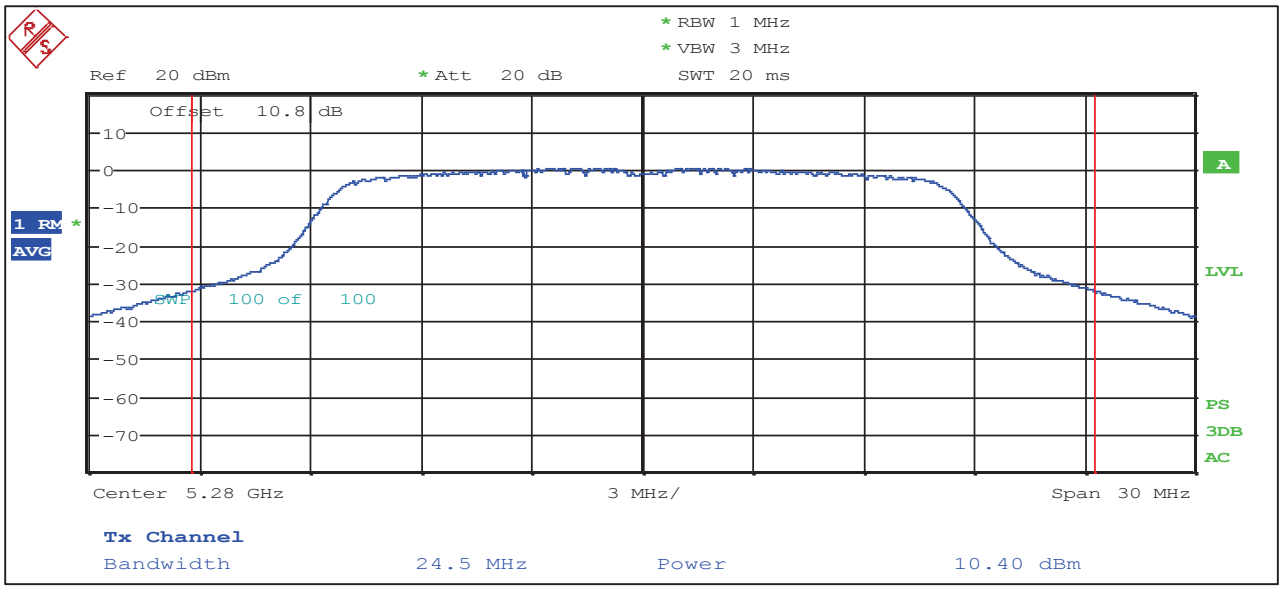


802.11n: MCS7 – Channel 48 (5240 MHz) Maximum Conducted Output Power

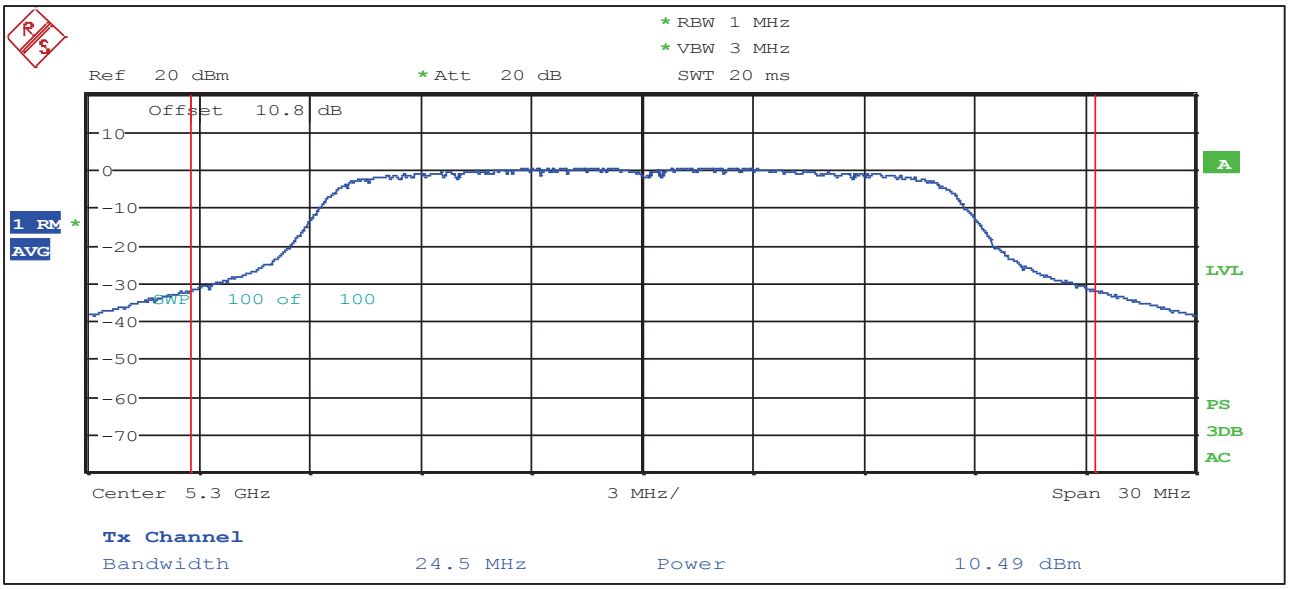
6.3.2 Maximum Conducted Output Power and e.i.r.p.in the 5.25-5.35 GHz Band

802.11 Mode	Data Rate	Channel	Frequency (MHz)	Maximum Conducted Output Power					e.i.r.p.			
				Results (dBm)	FCC Limit (dBm)	FCC Margin (dB)	IC Limit (dBm)	IC Margin (dB)	Directional Gain (dBi)	Results (dBm)	Limit (dBm)	Margin (dB)
a	6 Mbps	56	5280	10.4	24.0	-13.6	23.4	-13.0	3.5	13.9	29.4	-15.5
		60	5300	10.5	24.0	-13.5	23.4	-12.9	3.5	14.0	29.4	-15.4
		64	5320	10.5	24.0	-13.5	23.4	-12.8	3.5	14.0	29.4	-15.3
	12 Mbps	56	5280	9.5	24.0	-14.5	23.3	-13.8	3.5	13.0	29.3	-16.3
		60	5300	9.6	24.0	-14.4	23.3	-13.7	3.5	13.1	29.3	-16.2
		64	5320	9.7	24.0	-14.3	23.3	-13.6	3.5	13.2	29.3	-16.1
	24 Mbps	56	5280	8.6	24.0	-15.4	23.3	-14.7	3.5	12.1	29.3	-17.2
		60	5300	8.7	24.0	-15.3	23.3	-14.5	3.5	12.2	29.3	-17.0
		64	5320	8.7	24.0	-15.4	23.3	-14.6	3.5	12.2	29.3	-17.1
n (HT20)	MCS7	56	5280	3.1	24.0	-20.9	23.5	-20.4	3.5	6.6	29.5	-22.9
		60	5300	3.3	24.0	-20.7	23.5	-20.3	3.5	6.8	29.5	-22.8
		64	5320	3.3	24.0	-20.7	23.5	-20.2	3.5	6.8	29.5	-22.7

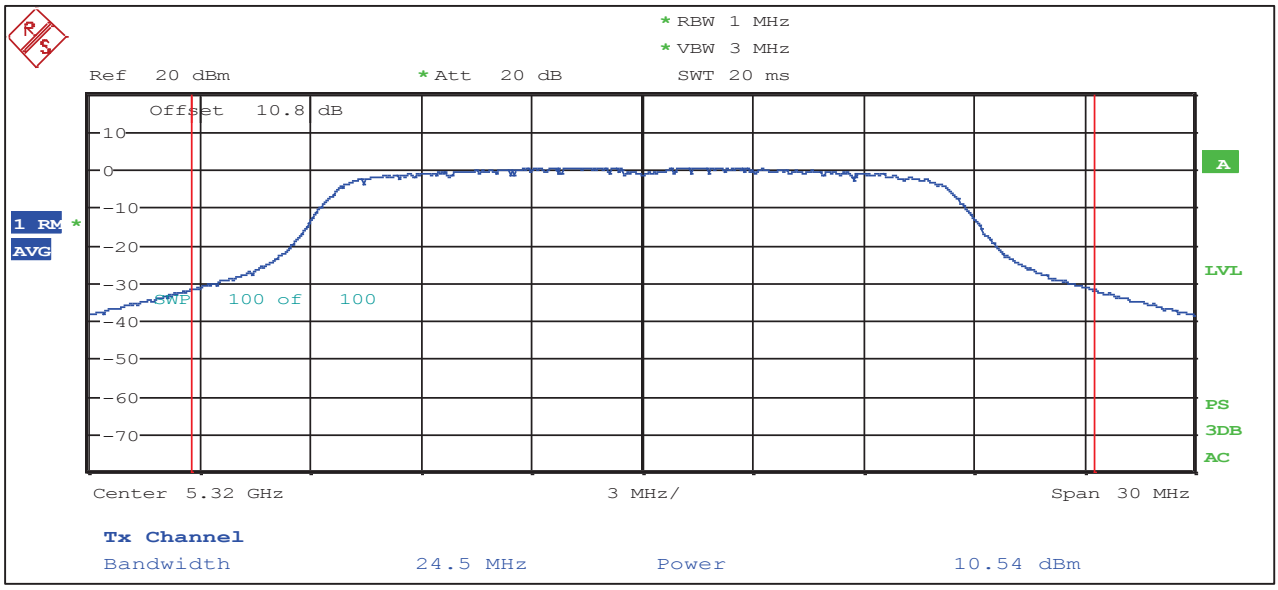
Refer to the following plots



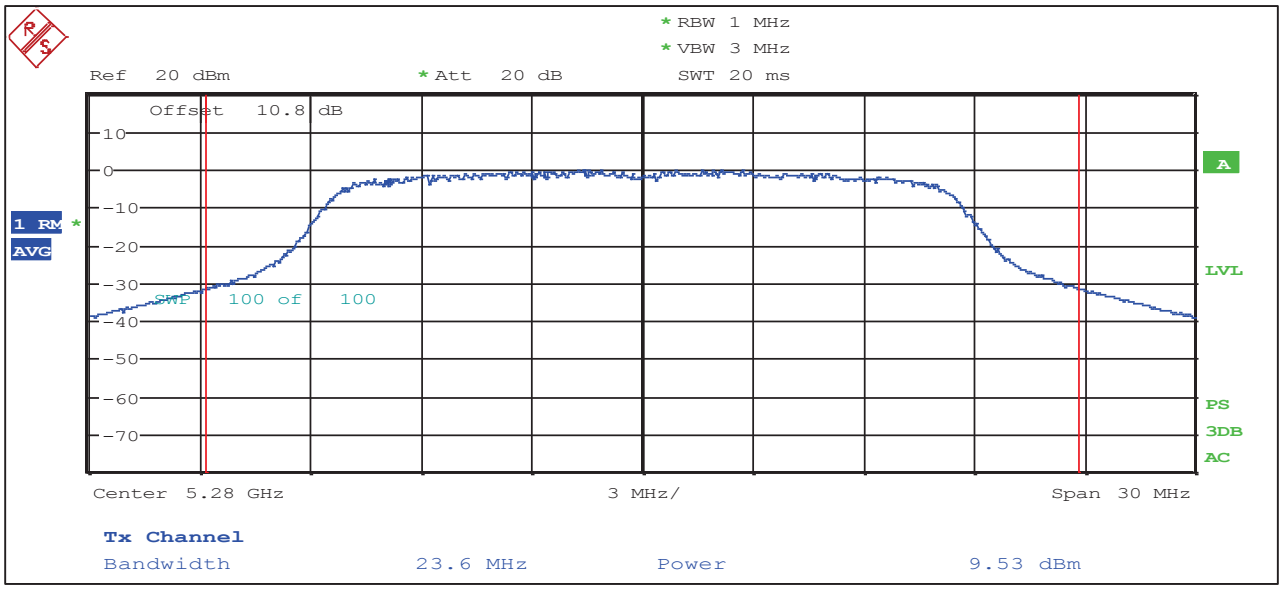
802.11a: 6 Mbps – Channel 56 (5280 MHz) Maximum Conducted Output Power



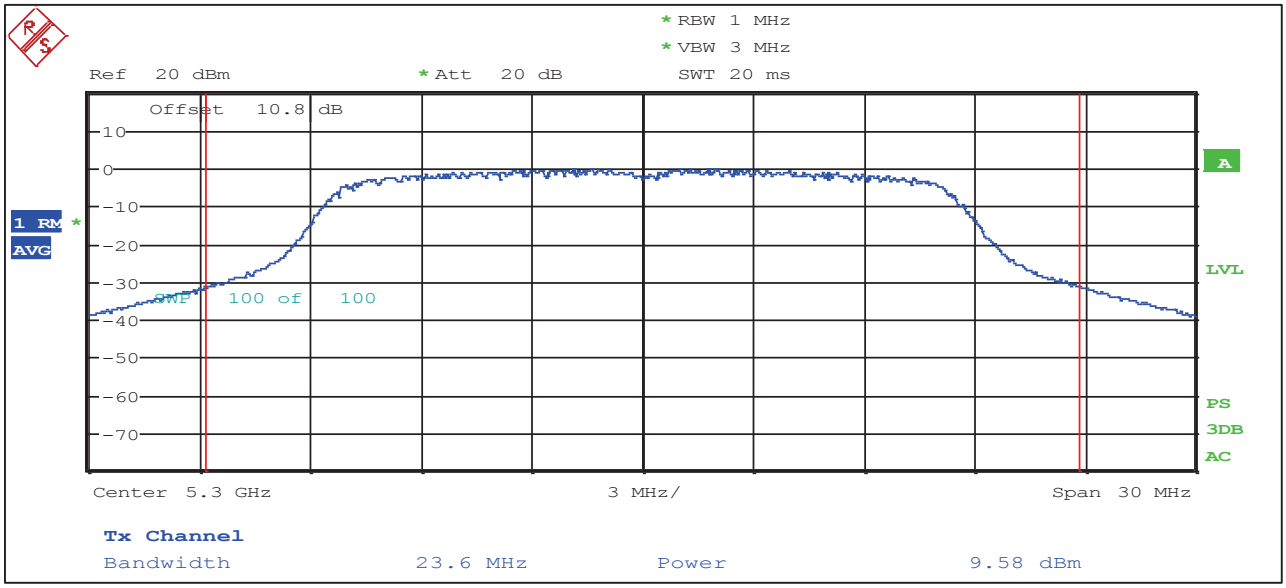
802.11a: 6 Mbps – Channel 60 (5300 MHz) Maximum Conducted Output Power



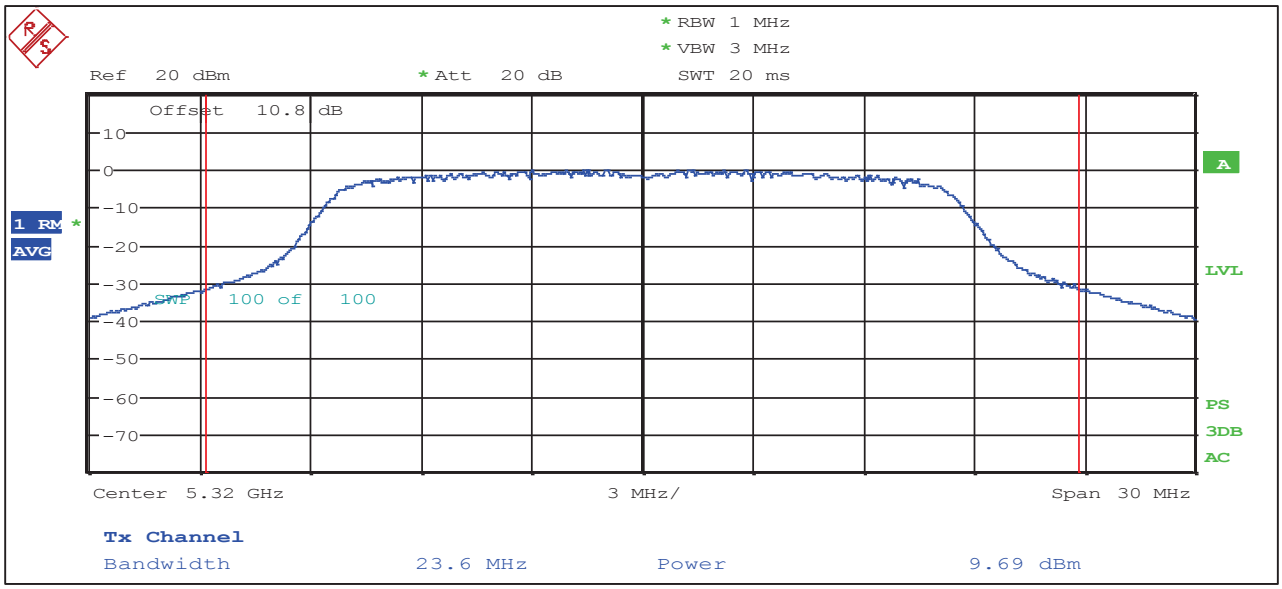
802.11a: 6 Mbps – Channel 64 (5320 MHz) Maximum Conducted Output Power



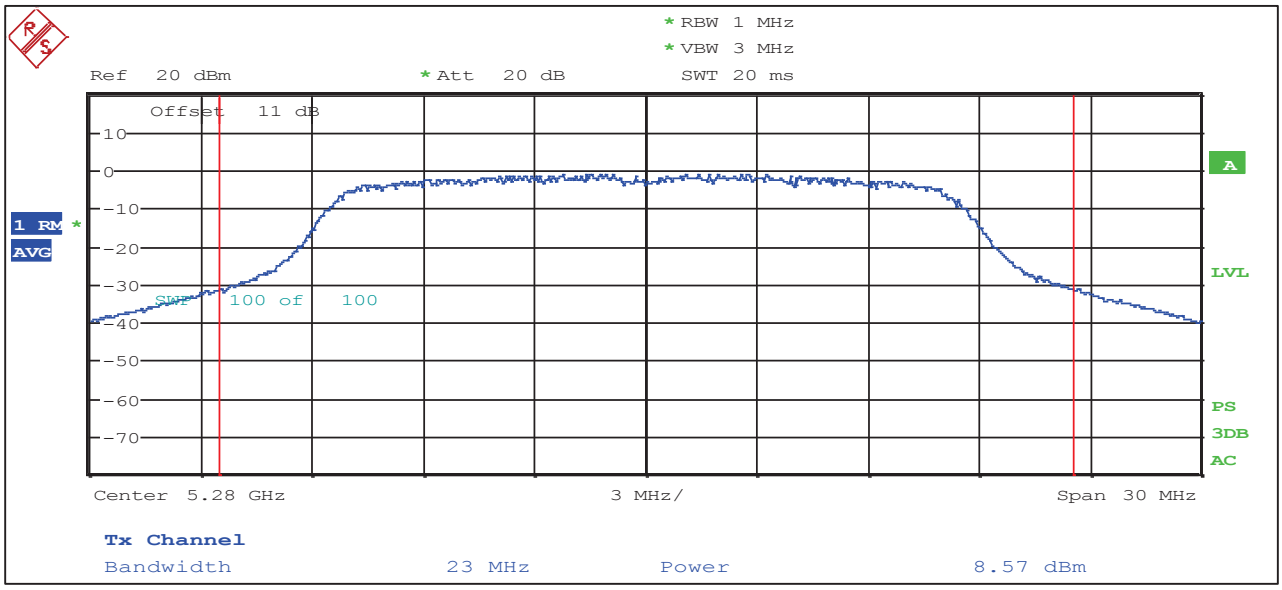
802.11a: 12 Mbps – Channel 56 (5280 MHz) Maximum Conducted Output Power



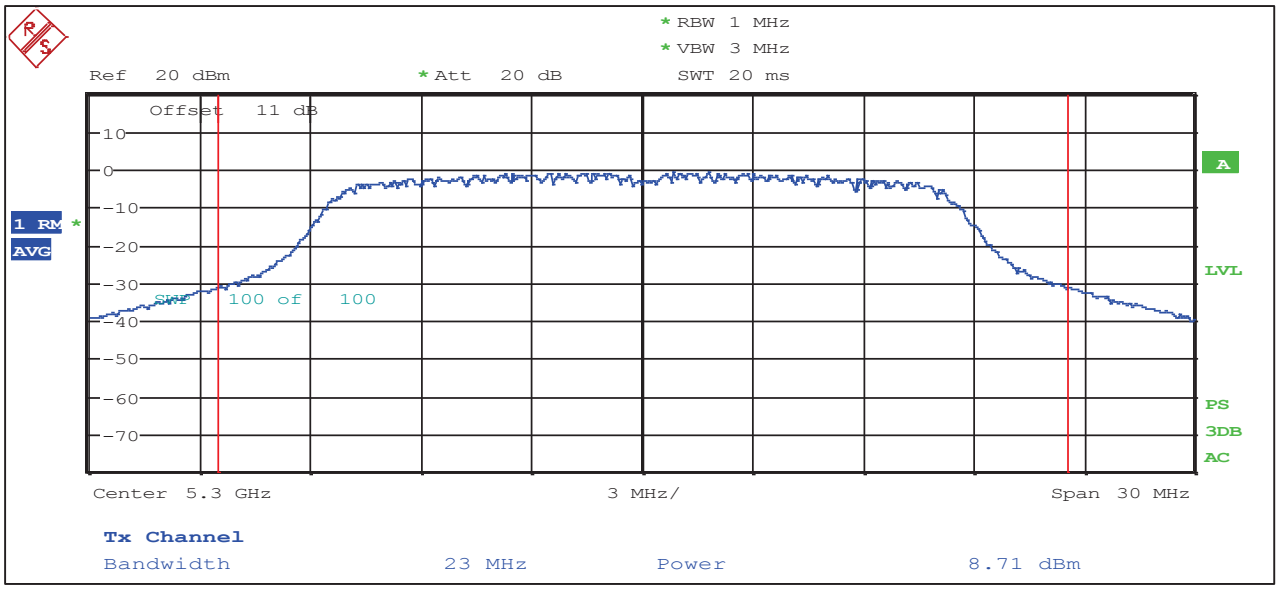
802.11a: 12 Mbps – Channel 60 (5300 MHz) Maximum Conducted Output Power



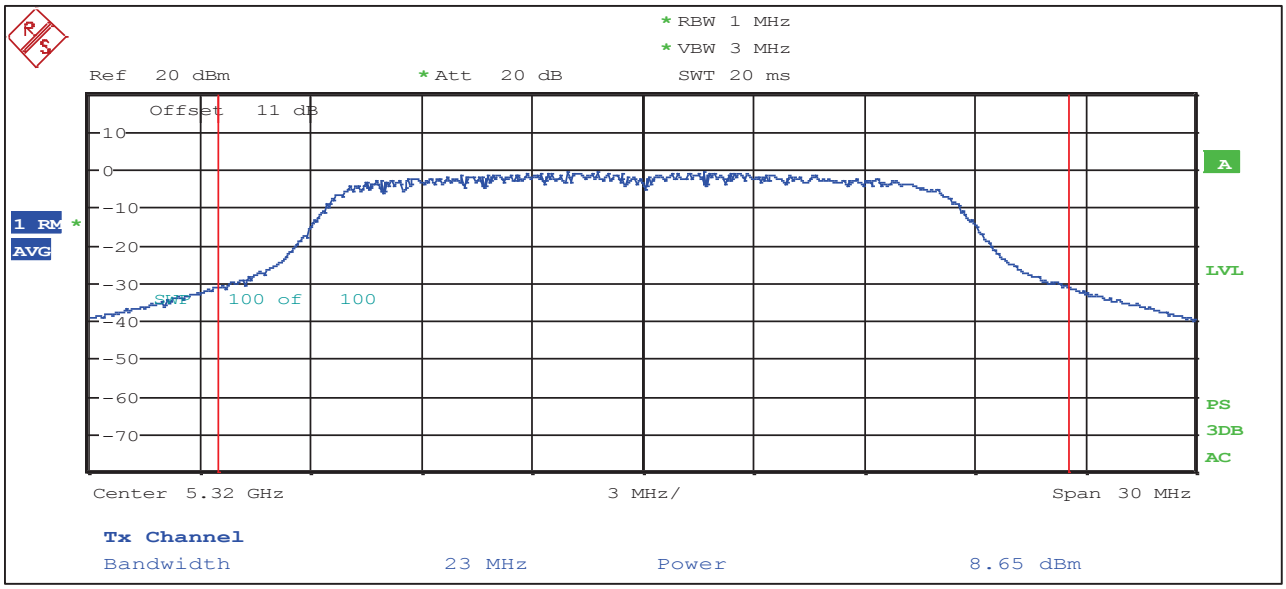
802.11a: 12 Mbps – Channel 64 (5320 MHz) Maximum Conducted Output Power



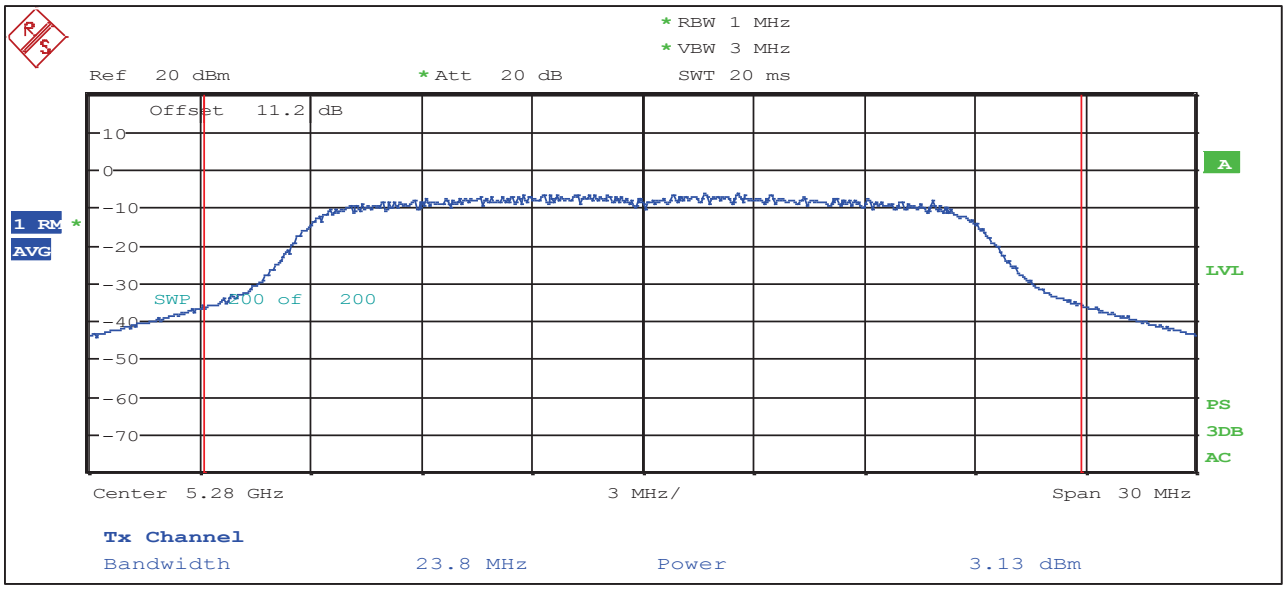
802.11a: 24 Mbps – Channel 56 (5280 MHz) Maximum Conducted Output Power



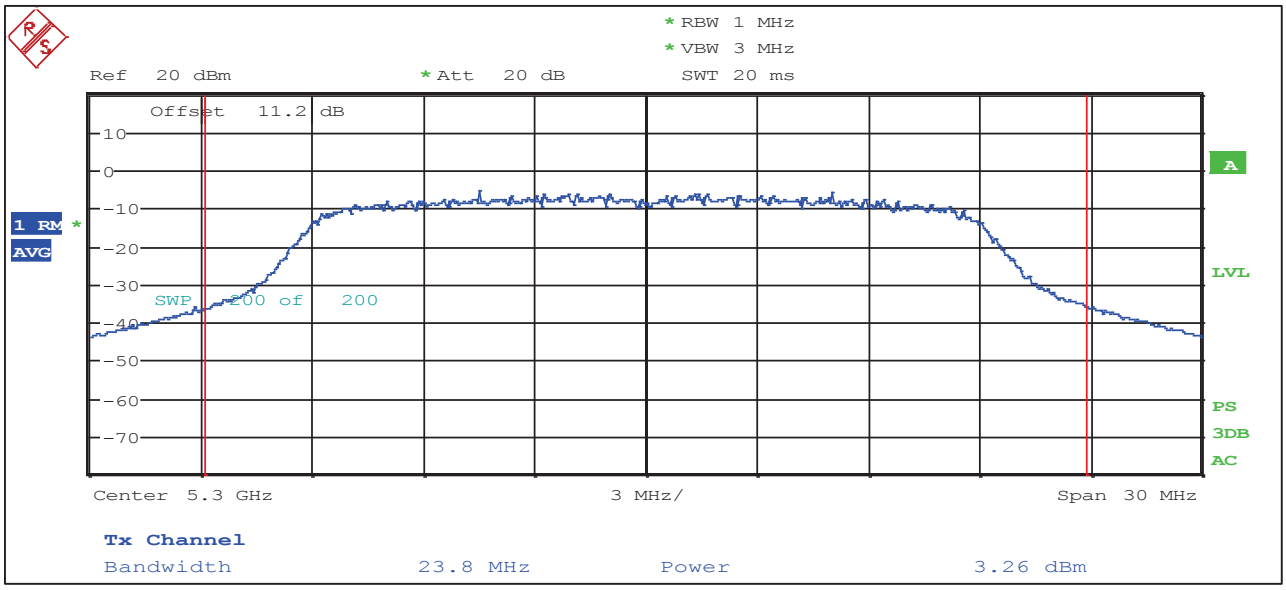
802.11a: 24 Mbps – Channel 60 (5300 MHz) Maximum Conducted Output Power



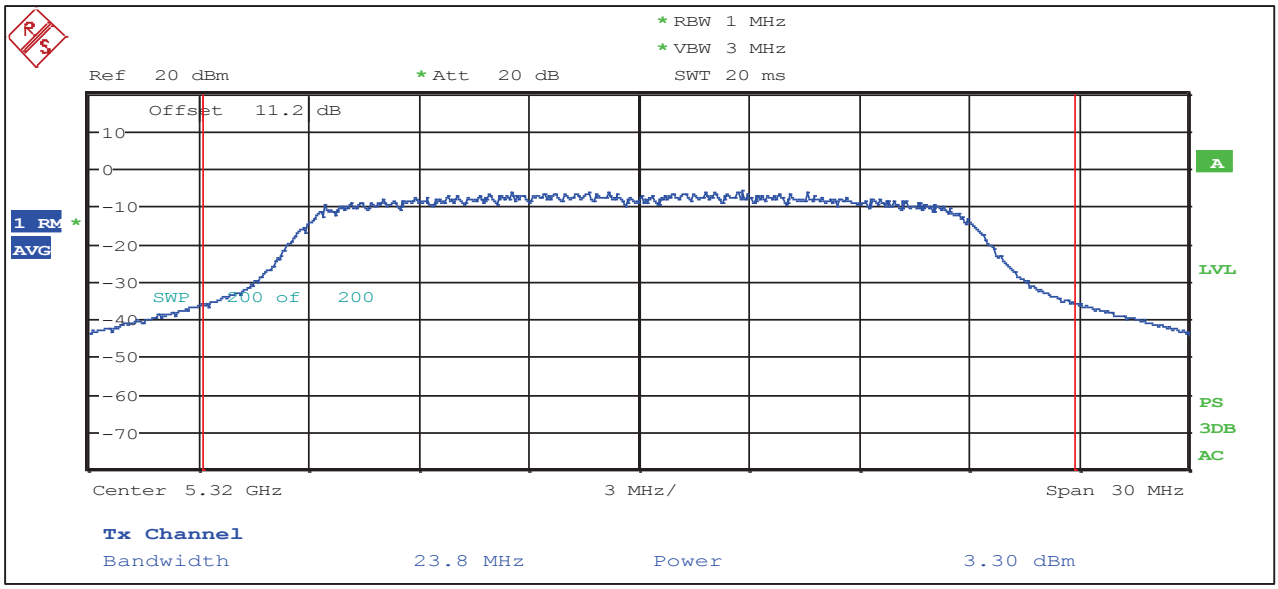
802.11a: 24 Mbps – Channel 64 (5320 MHz) Maximum Conducted Output Power



802.11n: MCS7 – Channel 56 (5280 MHz) Maximum Conducted Output Power



802.11n: MCS7 – Channel 60 (5300 MHz) Maximum Conducted Output Power

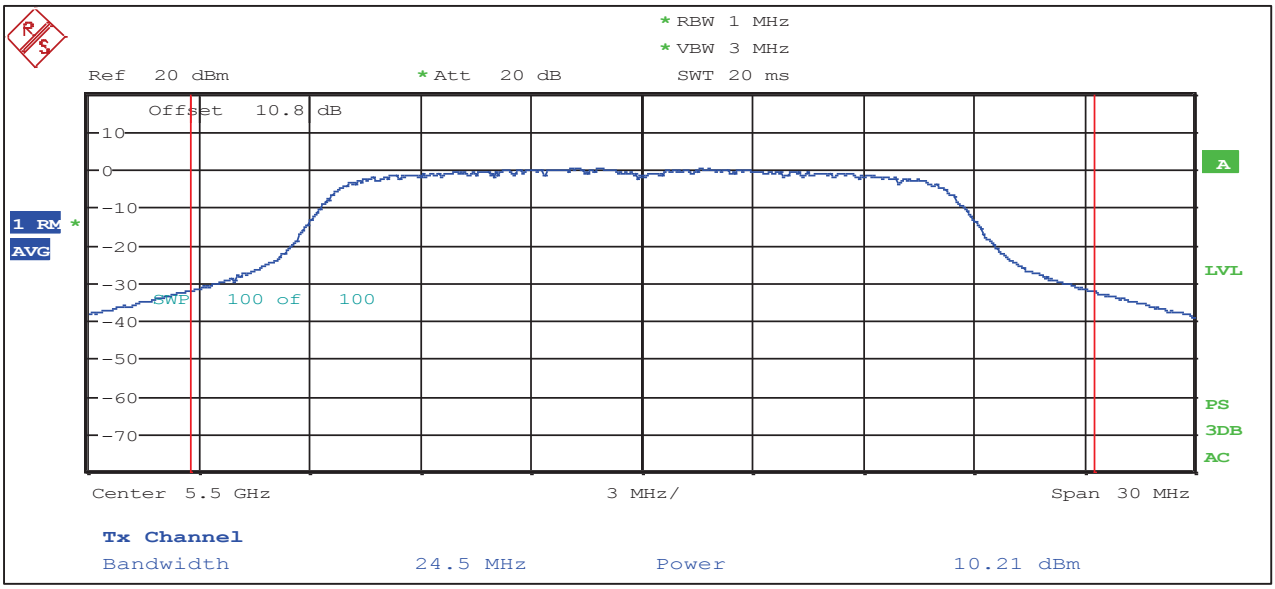


802.11n: MCS7 – Channel 64 (5320 MHz) Maximum Conducted Output Power

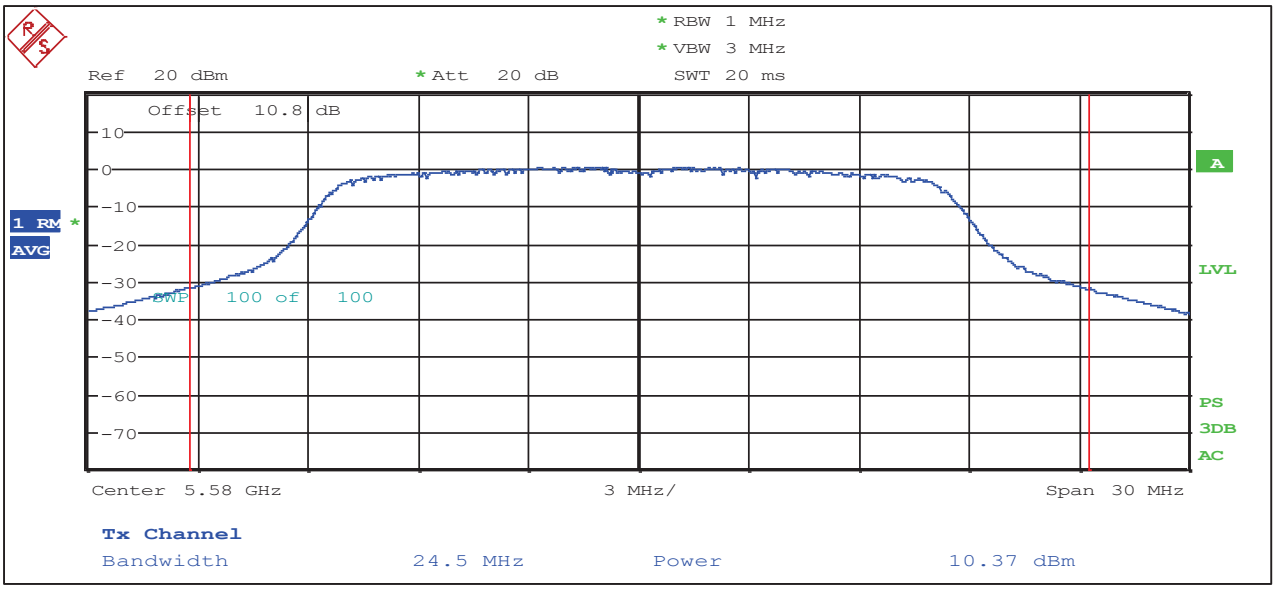
6.3.3 Maximum Conducted Output Power and e.i.r.p in the 5.47-5.725 GHz Band

802.11 Mode	Data Rate	Channel	Frequency (MHz)	Maximum Conducted Output Power					e.i.r.p.			
				Results (dBm)	FCC Limit (dBm)	FCC Margin (dB)	IC Limit (dBm)	IC Margin (dB)	Directional Gain (dBi)	Results (dBm)	Limit (dBm)	Margin (dB)
a	6 Mbps	100	5500	10.2	24.0	-13.8	23.4	-13.2	3.5	13.7	29.4	-15.7
		116	5580	10.4	24.0	-13.6	23.4	-13.0	3.5	13.9	29.4	-15.5
		140	5700	10.7	24.0	-13.3	23.4	-12.7	3.5	14.2	29.4	-15.2
	12 Mbps	100	5500	9.3	24.0	-14.7	23.3	-14.0	3.5	12.8	29.3	-16.5
		116	5580	9.4	24.0	-14.6	23.3	-13.9	3.5	12.9	29.3	-16.4
		140	5700	9.9	24.0	-14.1	23.3	-13.4	3.5	13.4	29.3	-15.9
	24 Mbps	100	5500	8.4	24.0	-15.6	23.3	-14.9	3.5	11.9	29.3	-17.4
		116	5580	8.6	24.0	-15.4	23.2	-14.6	3.5	12.1	29.2	-17.1
		140	5700	8.9	24.0	-15.1	23.3	-14.4	3.5	12.4	29.3	-16.9
n (HT20)	MCS7	100	5500	2.9	24.0	-21.2	23.5	-20.7	3.5	6.4	29.5	-23.2
		116	5580	3.1	24.0	-20.9	23.5	-20.5	3.5	6.6	29.5	-23.0
		140	5700	3.6	24.0	-20.4	23.5	-20.0	3.5	7.1	29.5	-22.5

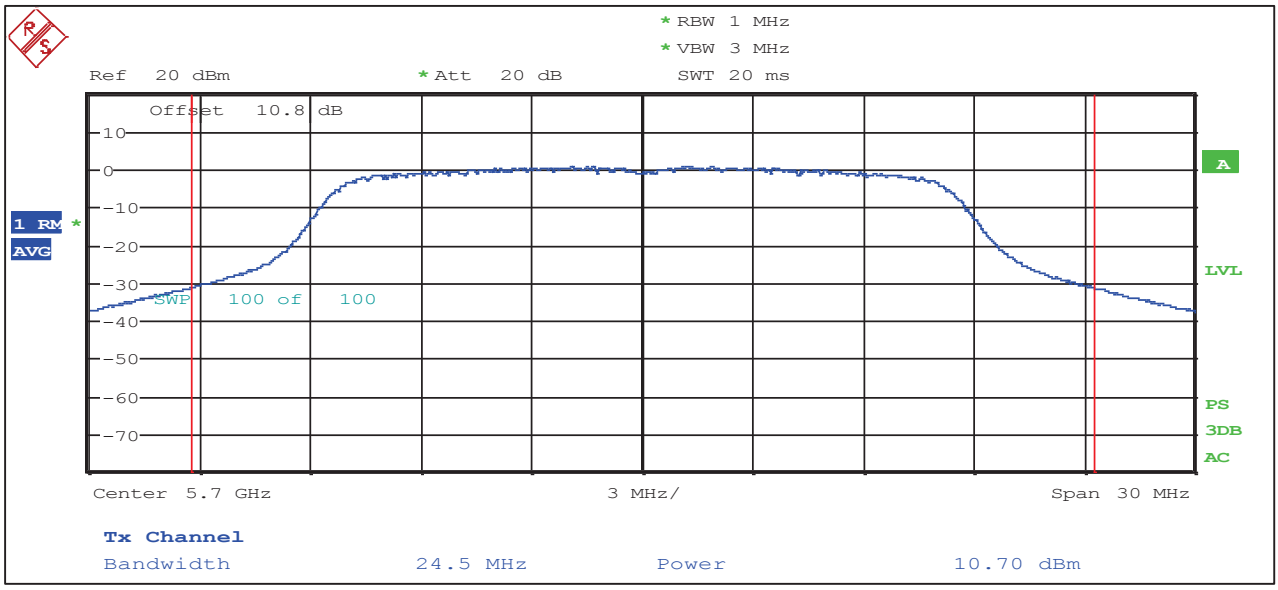
Refer to the following plots



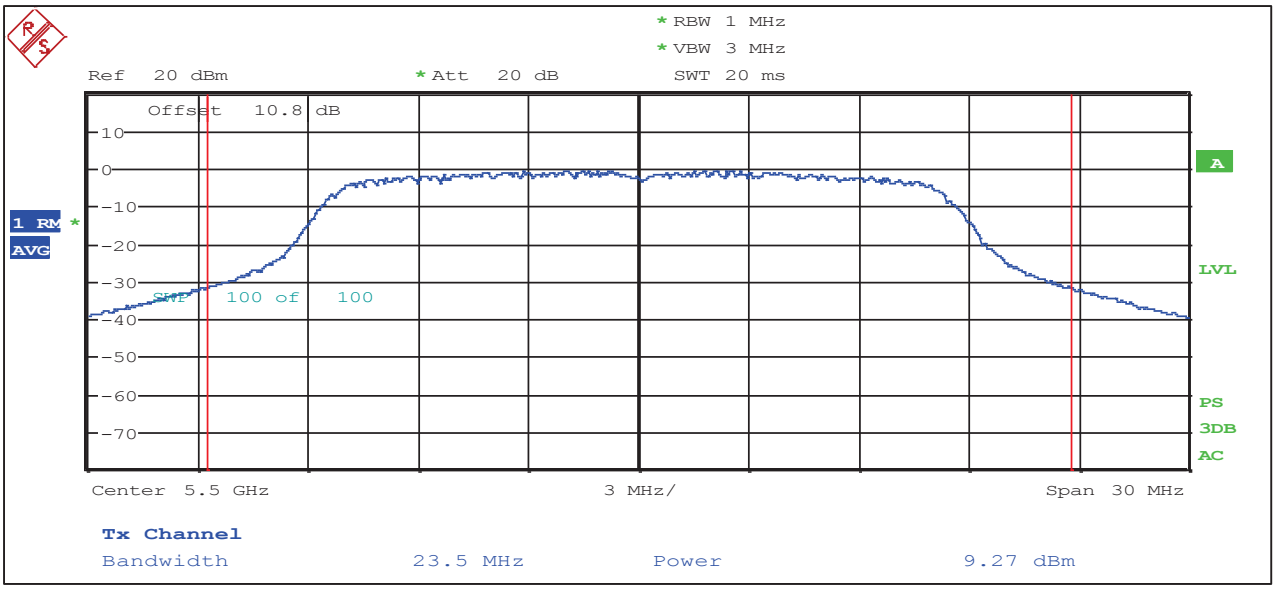
802.11a: 6 Mbps – Channel 100 (5500 MHz) Maximum Conducted Output Power



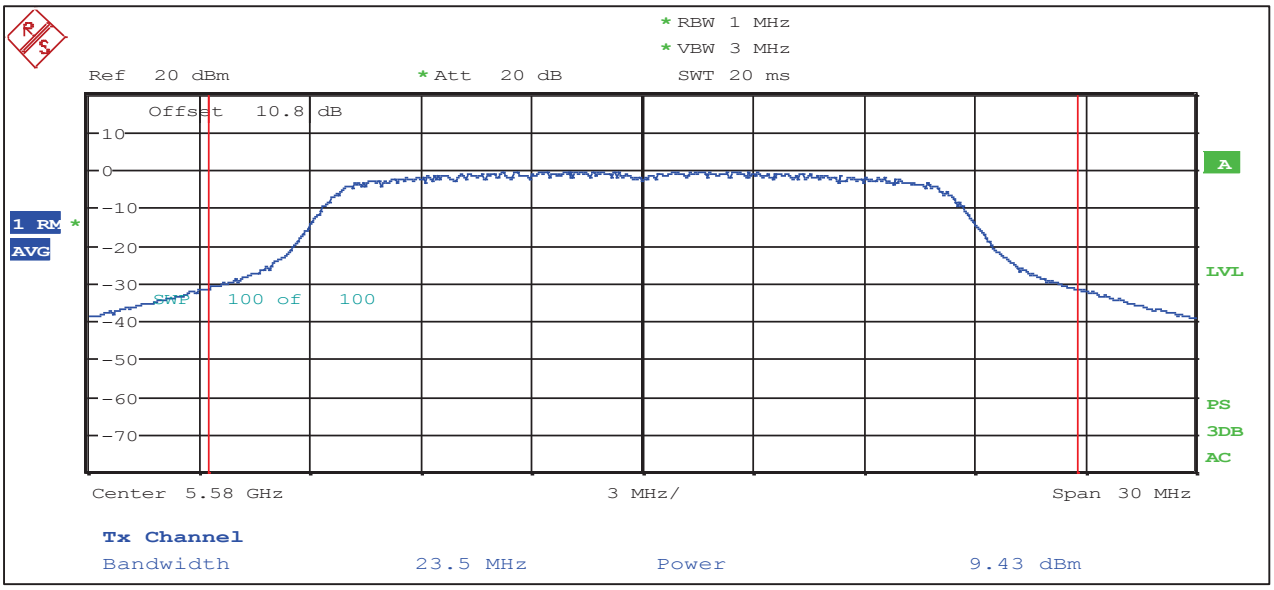
802.11a: 6 Mbps – Channel 116 (5580 MHz) Maximum Conducted Output Power



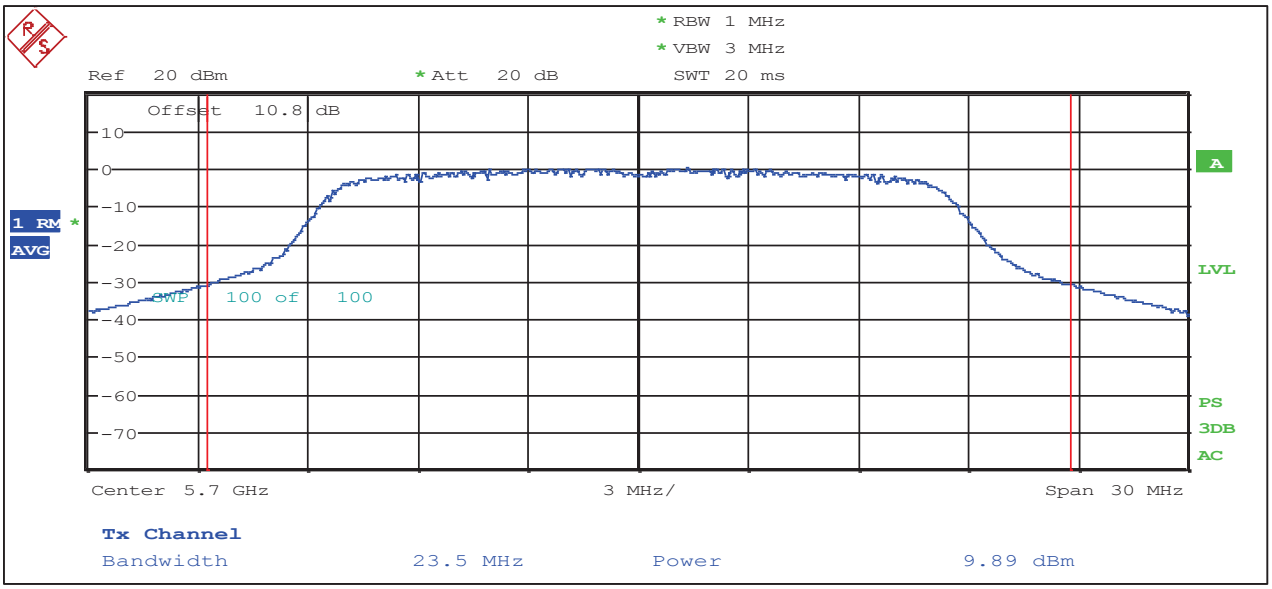
802.11a: 6 Mbps – Channel 140 (5700 MHz) Maximum Conducted Output Power



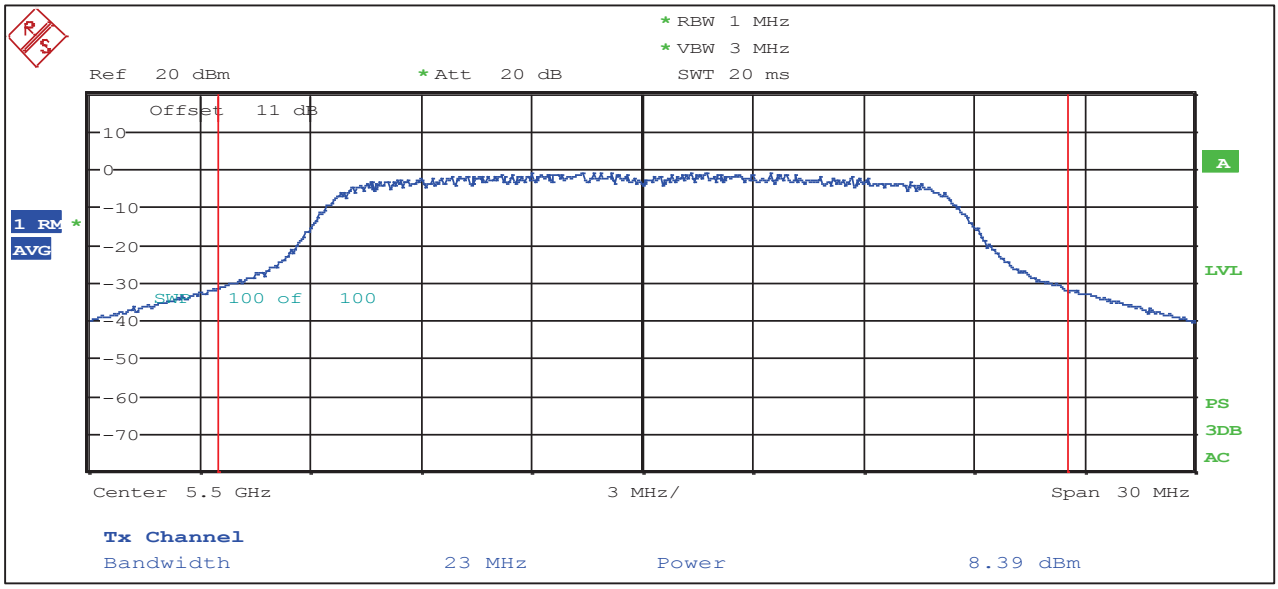
802.11a: 12 Mbps – Channel 100 (5500 MHz) Maximum Conducted Output Power



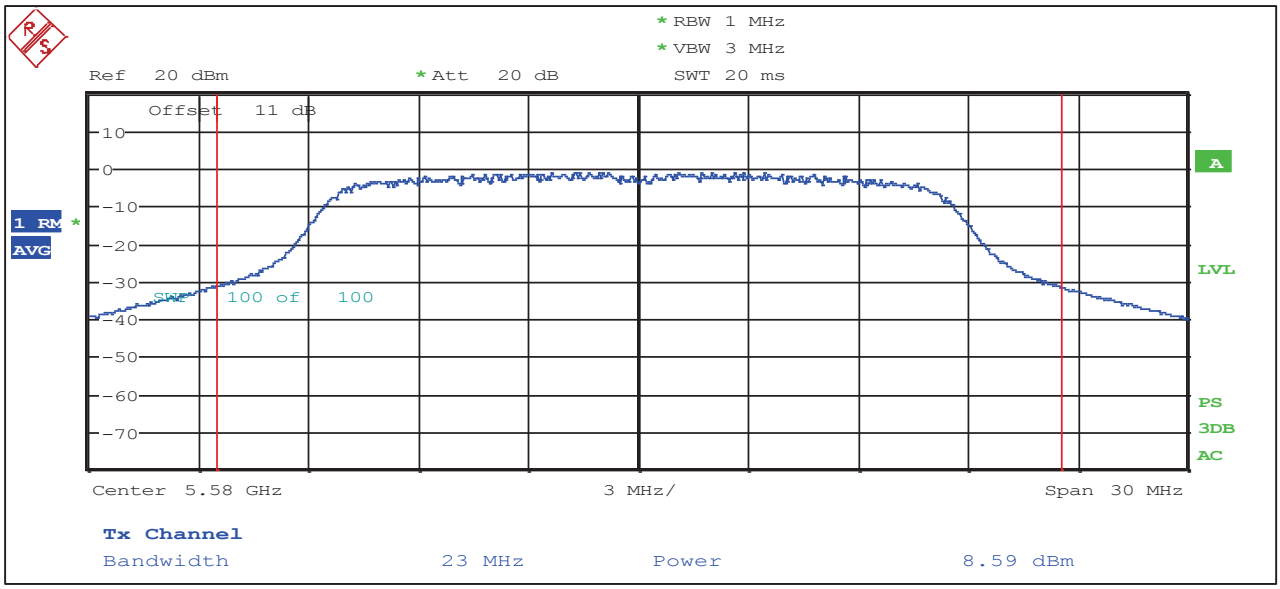
802.11a: 12 Mbps – Channel 116 (5580 MHz) Maximum Conducted Output Power



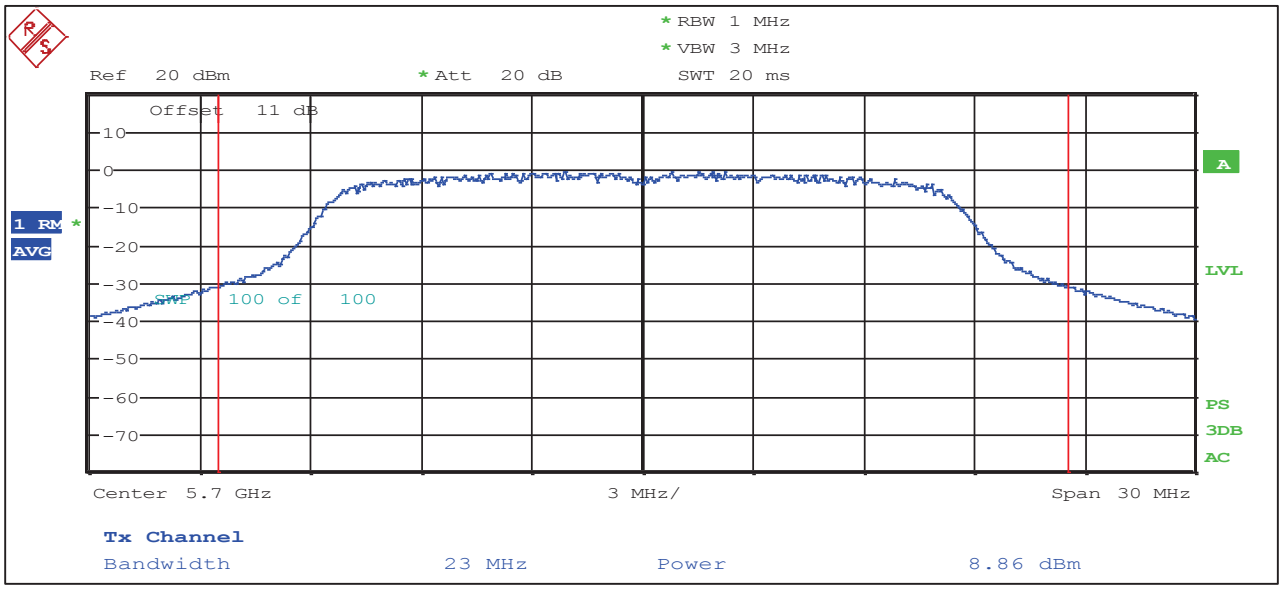
802.11a: 12 Mbps – Channel 140 (5700 MHz) Maximum Conducted Output Power



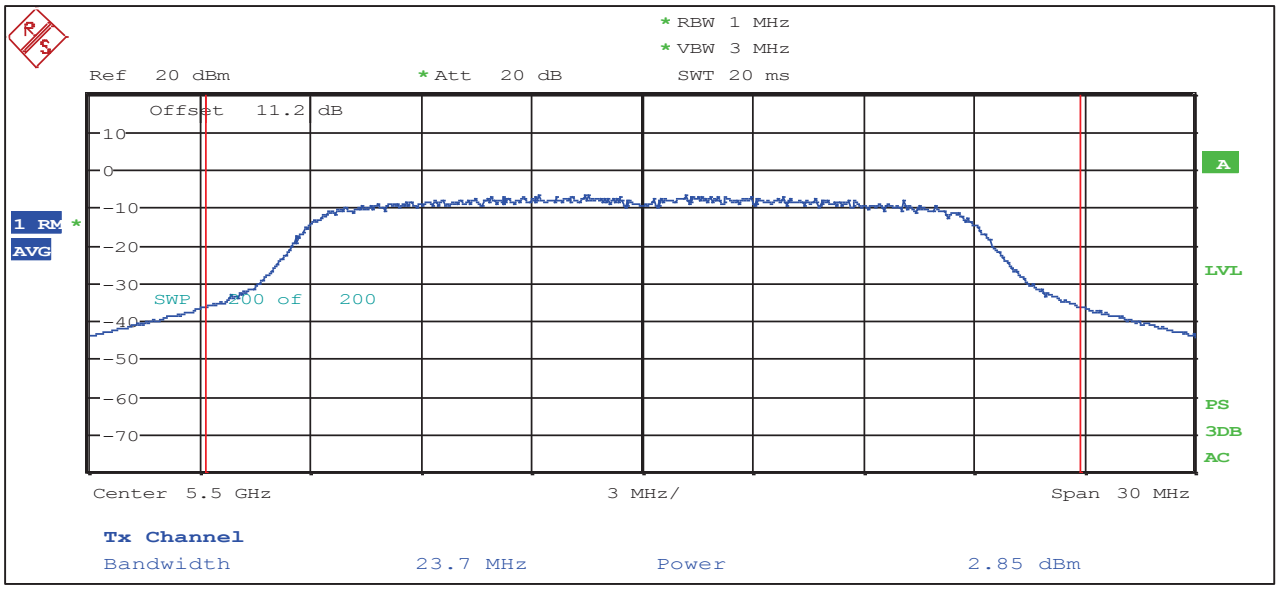
802.11a: 24 Mbps – Channel 100 (5500 MHz) Maximum Conducted Output Power



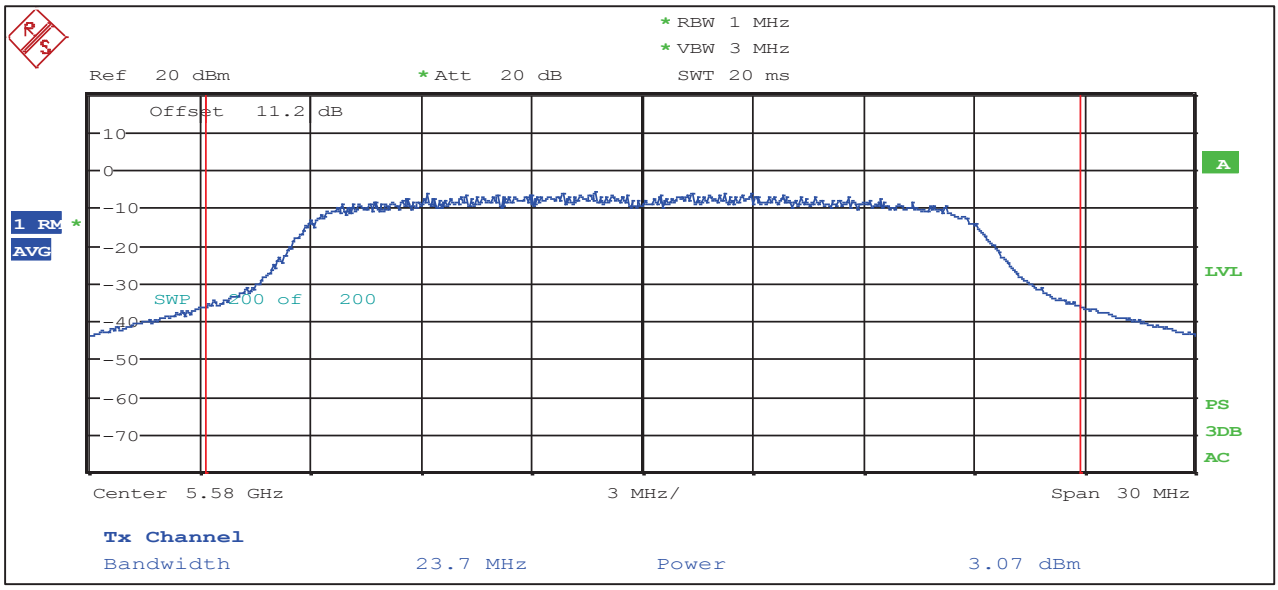
802.11a: 24 Mbps – Channel 116 (5580 MHz) Maximum Conducted Output Power



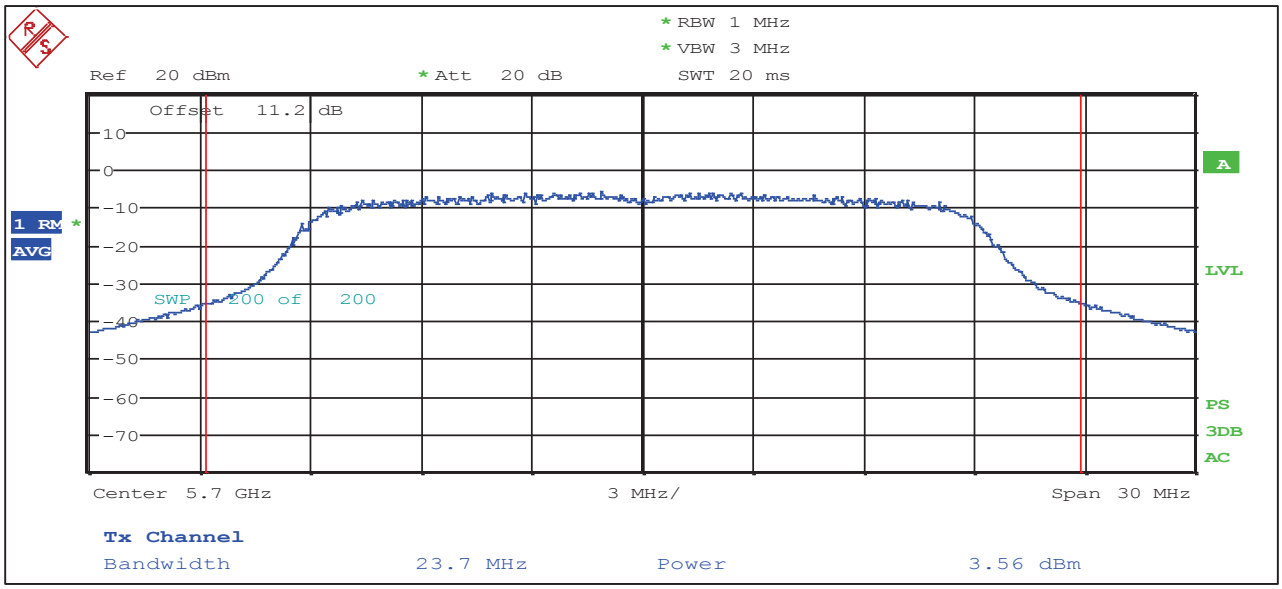
802.11a: 24 Mbps – Channel 140 (5700 MHz) Maximum Conducted Output Power



802.11n: MCS7 – Channel 100 (5500 MHz) Maximum Conducted Output Power



802.11n: MCS7 – Channel 116 (5580 MHz) Maximum Conducted Output Power

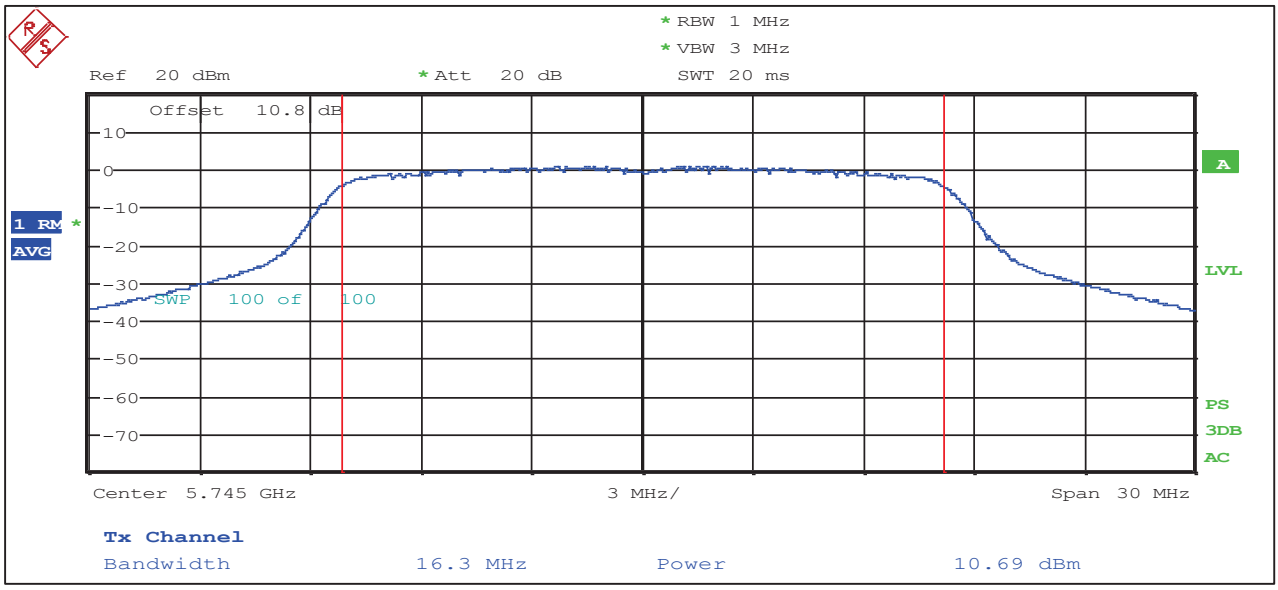


802.11n: MCS7 – Channel 140 (5700 MHz) Maximum Conducted Output Power

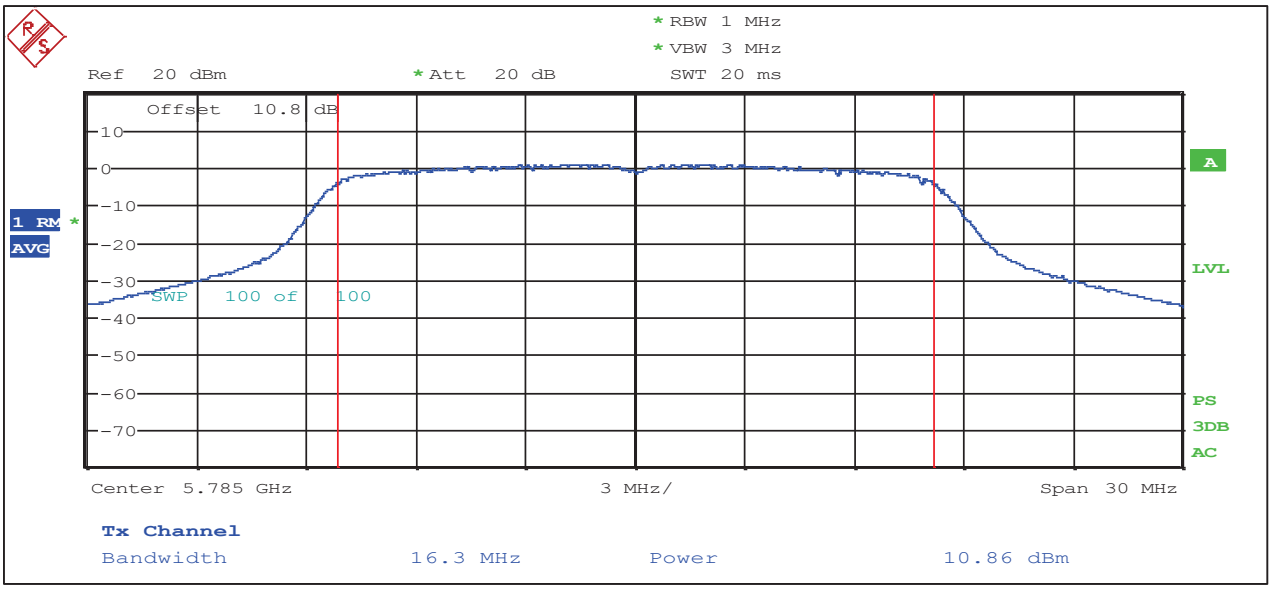
6.3.4 Maximum Conducted Output Power in the 5.725-5.85 GHz Band

802.11 Mode	Data Rate	Channel	Frequency (MHz)	Maximum Conducted Output Power		
				Results (dBm)	Limit (dBm)	Margin (dB)
a	6 Mbps	149	5745	10.69	30.0	-19.31
		157	5785	10.86	30.0	-19.14
		165	5825	11.19	30.0	-18.81
	12 Mbps	149	5745	9.83	30.0	-20.17
		157	5785	10.14	30.0	-19.86
		165	5825	10.24	30.0	-19.76
	24 Mbps	149	5745	8.81	30.0	-21.19
		157	5785	9.11	30.0	-20.89
		165	5825	9.34	30.0	-20.66
n (20 MHz)	MCS7	149	5745	3.42	30.0	-26.58
		157	5785	3.66	30.0	-26.34
		165	5825	4.00	30.0	-26.00

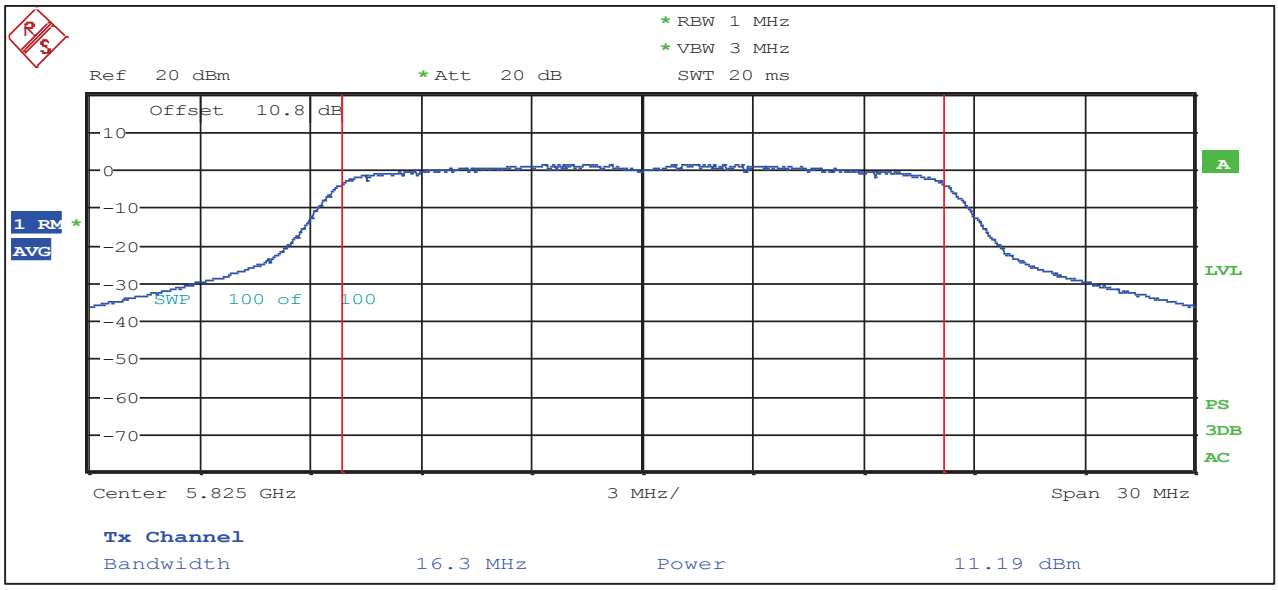
Refer to the following plots



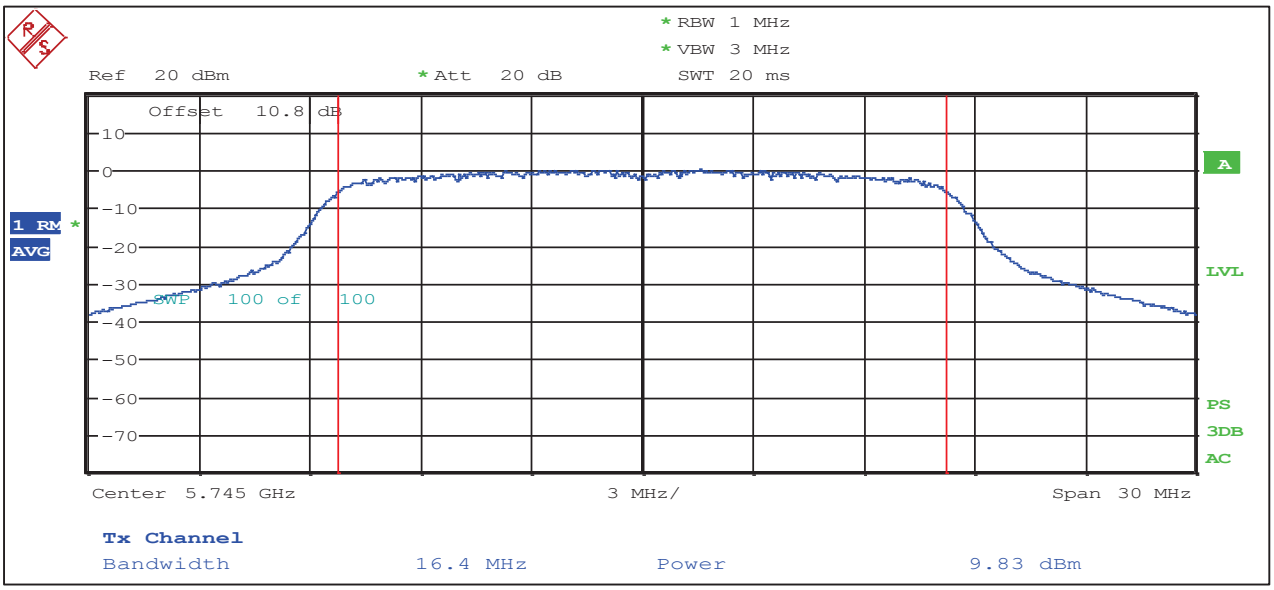
802.11a: 6 Mbps – Channel 149 (5745 MHz) Maximum Conducted Output Power



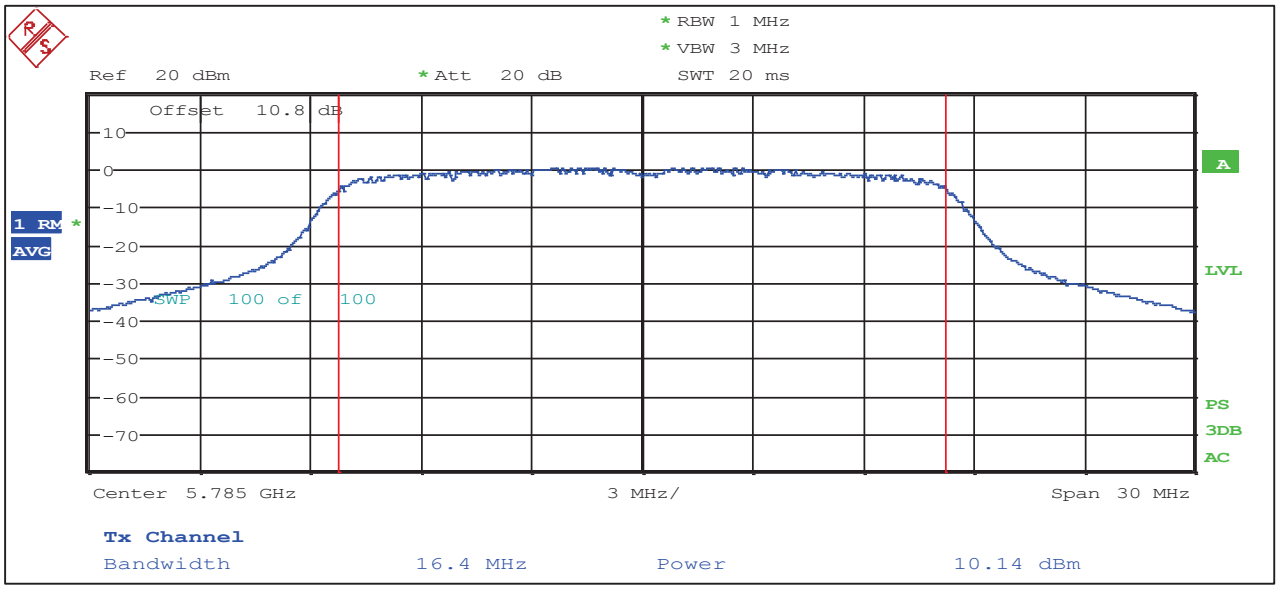
802.11a: 6 Mbps – Channel 157 (5785 MHz) Maximum Conducted Output Power



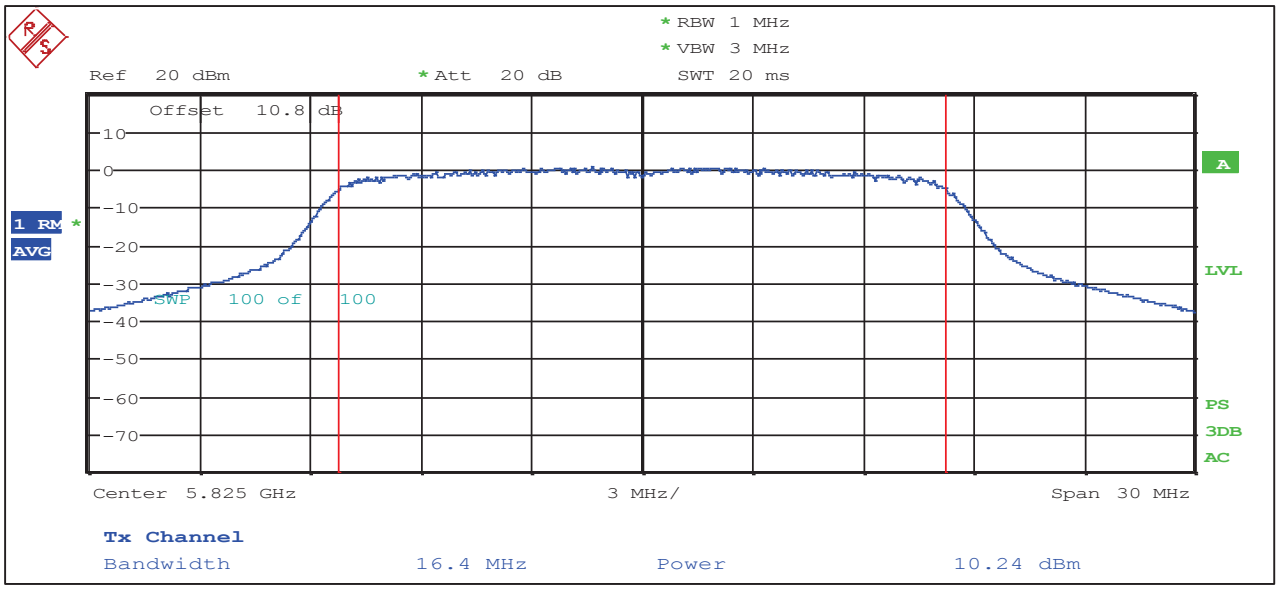
802.11a: 6 Mbps – Channel 165 (5825 MHz) Maximum Conducted Output Power



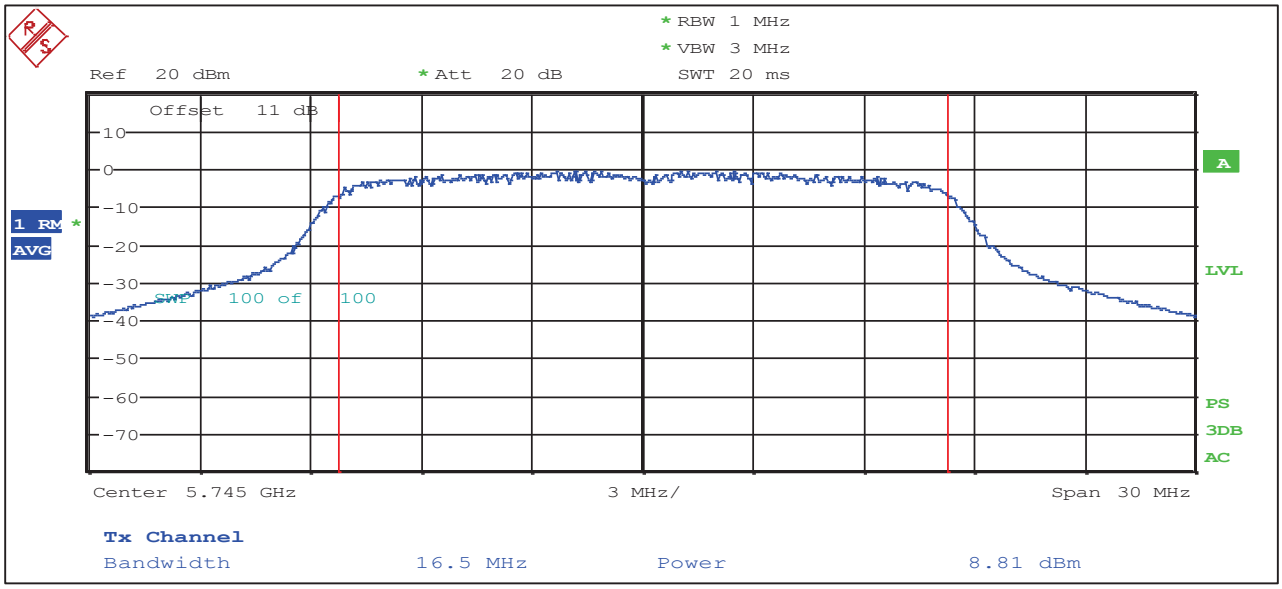
802.11a: 12 Mbps – Channel 149 (5745 MHz) Maximum Conducted Output Power



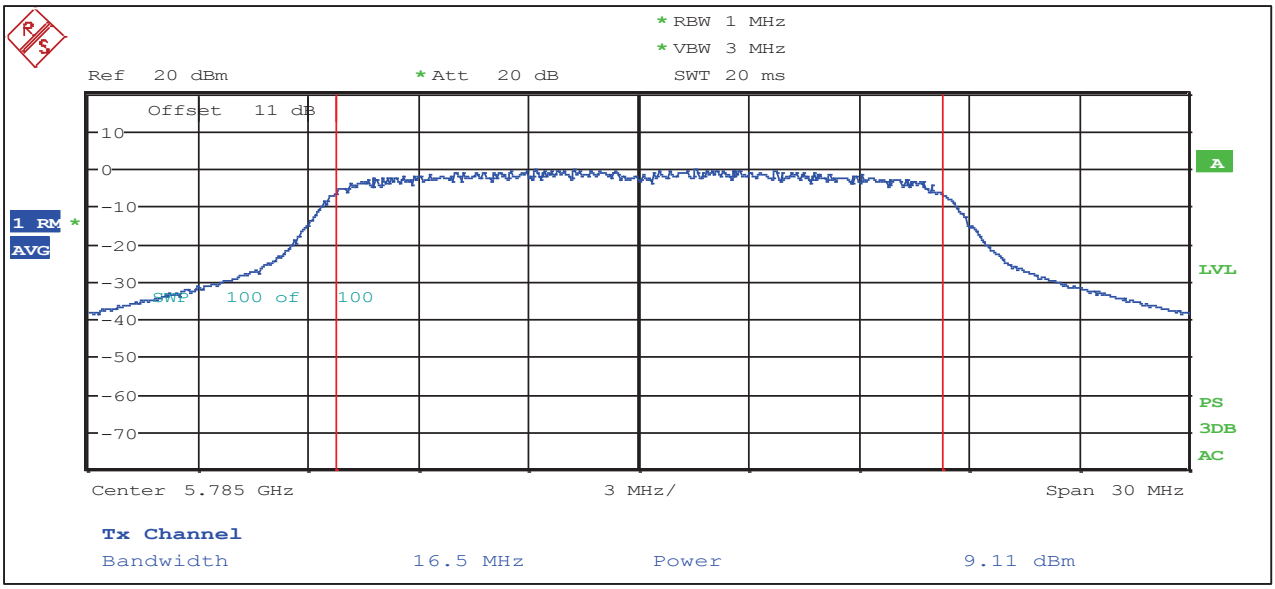
802.11a: 12 Mbps – Channel 157 (5785 MHz) Maximum Conducted Output Power



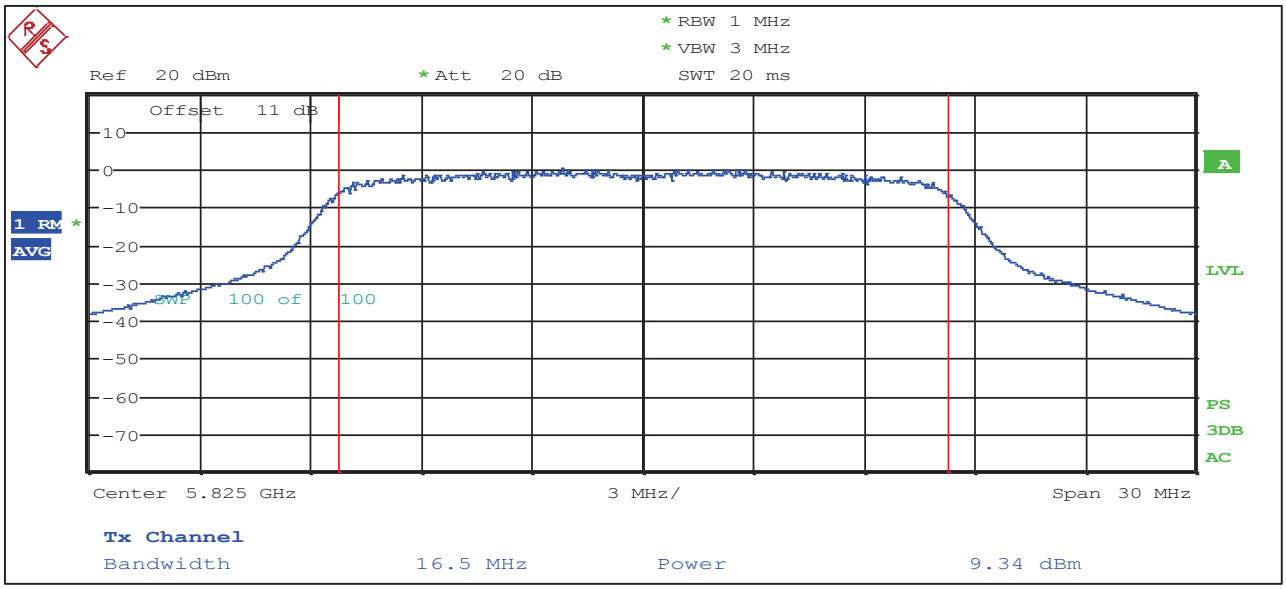
802.11a: 12 Mbps – Channel 165 (5825 MHz) Maximum Conducted Output Power



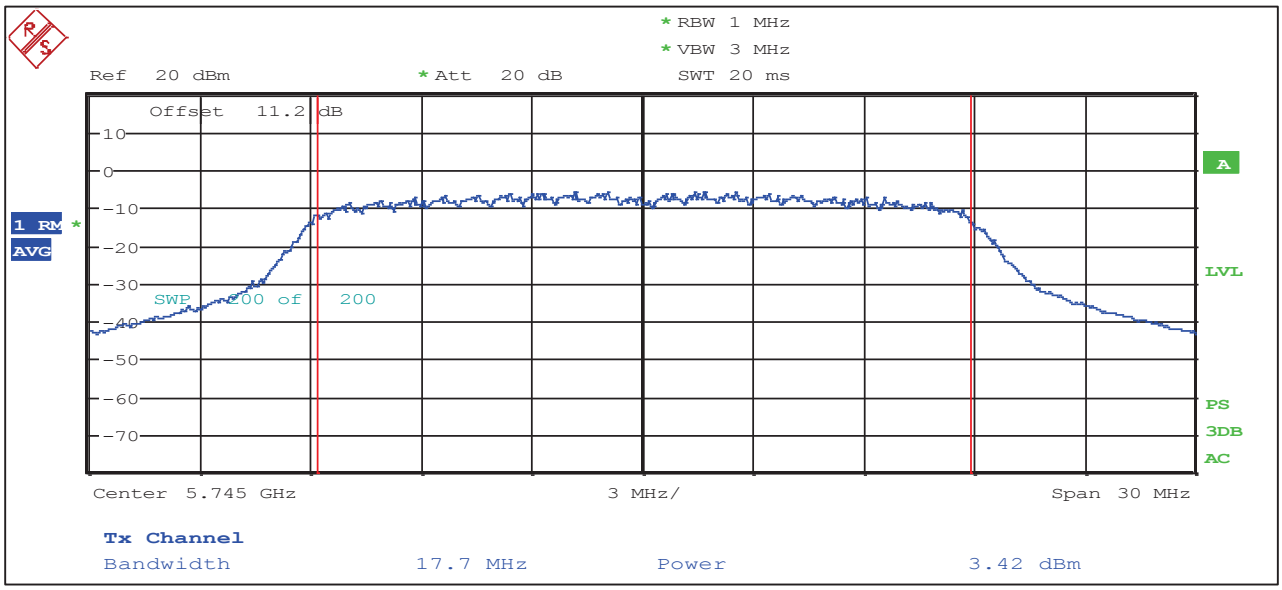
802.11a: 24 Mbps – Channel 149 (5745 MHz) Maximum Conducted Output Power



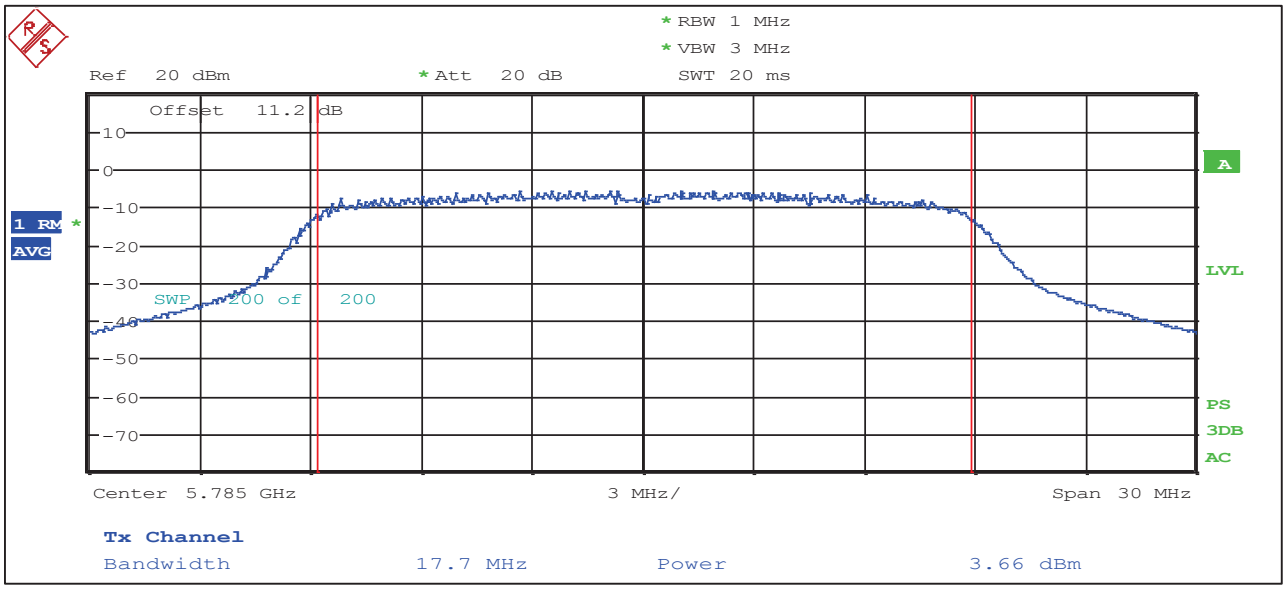
802.11a: 24 Mbps – Channel 157 (5785 MHz) Maximum Conducted Output Power



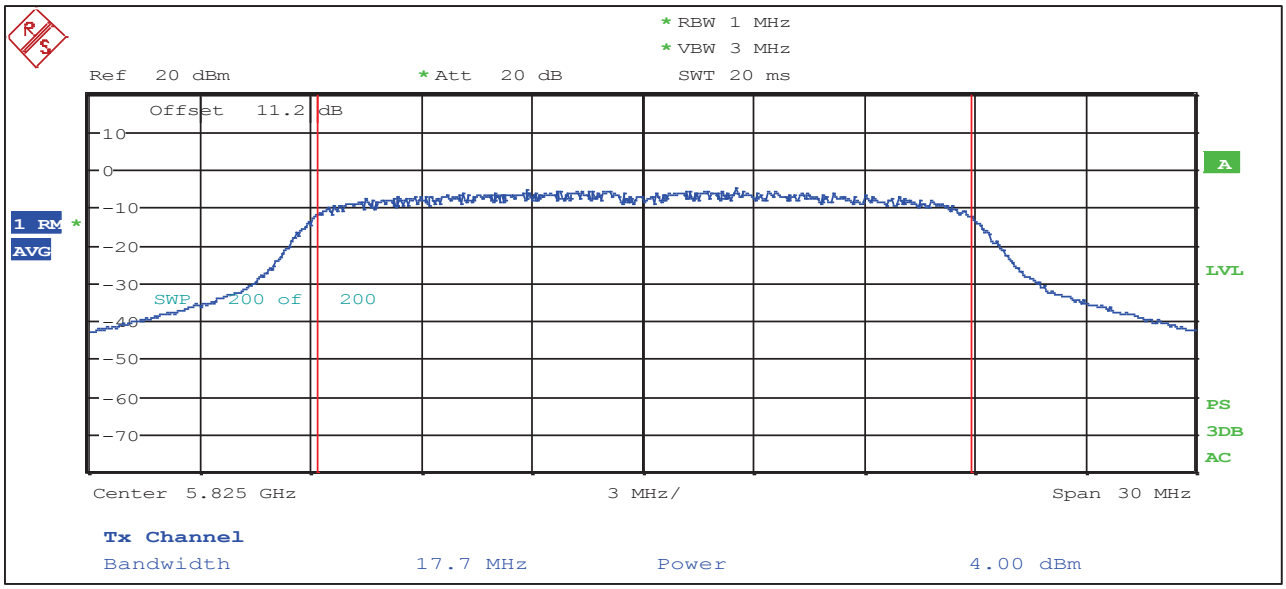
802.11a: 24 Mbps – Channel 165 (5825 MHz) Maximum Conducted Output Power



802.11a: MCS7 – Channel 149 (5745 MHz) Maximum Conducted Output Power



802.11a: MCS7– Channel 157 (5785 MHz) Maximum Conducted Output Power



802.11a: MCS7– Channel 165 (5825 MHz) Maximum Conducted Output Power

6.4 Maximum Power Spectral Density (PSD) and e.i.r.p. Spectral Density

Limits

FCC Part 15 Subpart E §15.407

§15.407 (a) (1) – For the band 5.15-5.25 GHz, the maximum power spectral density shall not exceed 11dBm/MHz

§15.407 (a) (2) – For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum power spectral density shall not exceed 11dBm/MHz

§15.407 (a) (3) – For the band 5.725-5.85 GHz band, the maximum power spectral density shall not exceed 30dBm/500kHz

IC RSS-247 Issue 1 §6.2

§16.2.1 (1) - Frequency Band 5150-5250 MHz, The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band

§16.2.2 (1) - Frequency Band 5250-5350 MHz; The power spectral density shall not exceed 11 dBm in any 1.0 MHz band

§16.2.3 (1) - Frequency Bands 5470-5600 MHz and 5650-5725 MHz; The power spectral density shall not exceed 11 dBm in any 1.0 MHz band.

§16.2.4 (1) - Frequency Band 5725-5850 MHz; The power spectral density shall not exceed 30 dBm in any 500 kHz band.

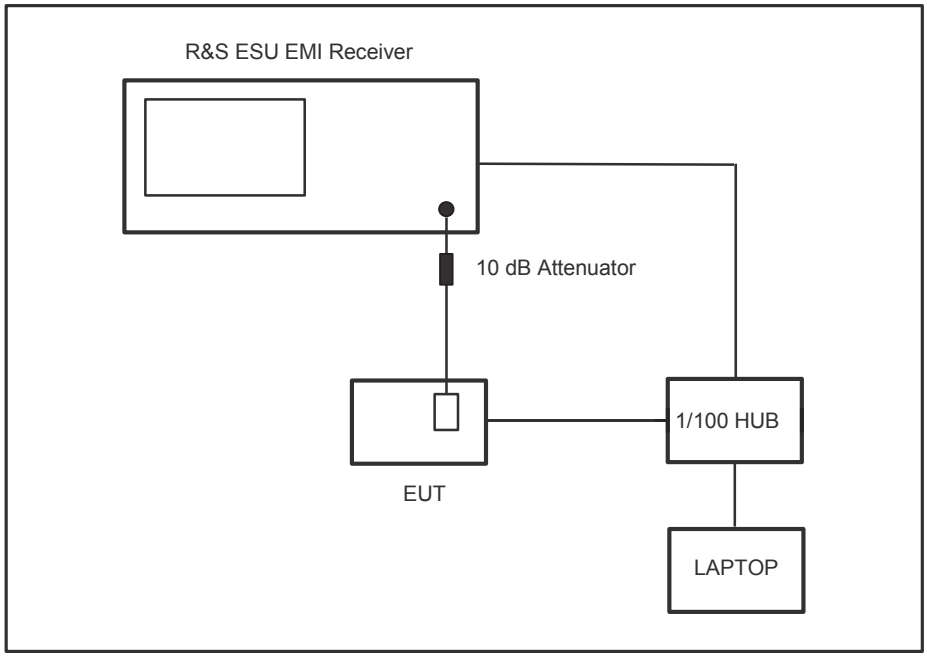
Test Procedures

KDB 789033 D02 v01 Section F

Note: Spectrum Analyzer Offset level Calculation:

OFFSET (dB) = 10.8 dB (10 dB Attenuator Pad + 0.8 dB cable loss) [for 6Mbps and 12Mbps Data Rates]
OFFSET (dB) = 11.0 dB (10 dB Attenuator Pad + 0.8 dB cable loss + 0.15 Duty Cycle Factor) [for 24Mbps Data Rate]
OFFSET (dB) = 11.2 dB (10 dB Attenuator Pad + 0.8 dB cable loss + 0.39 Duty Cycle Factor) [for MCS7 Data Rate]

Test Setup

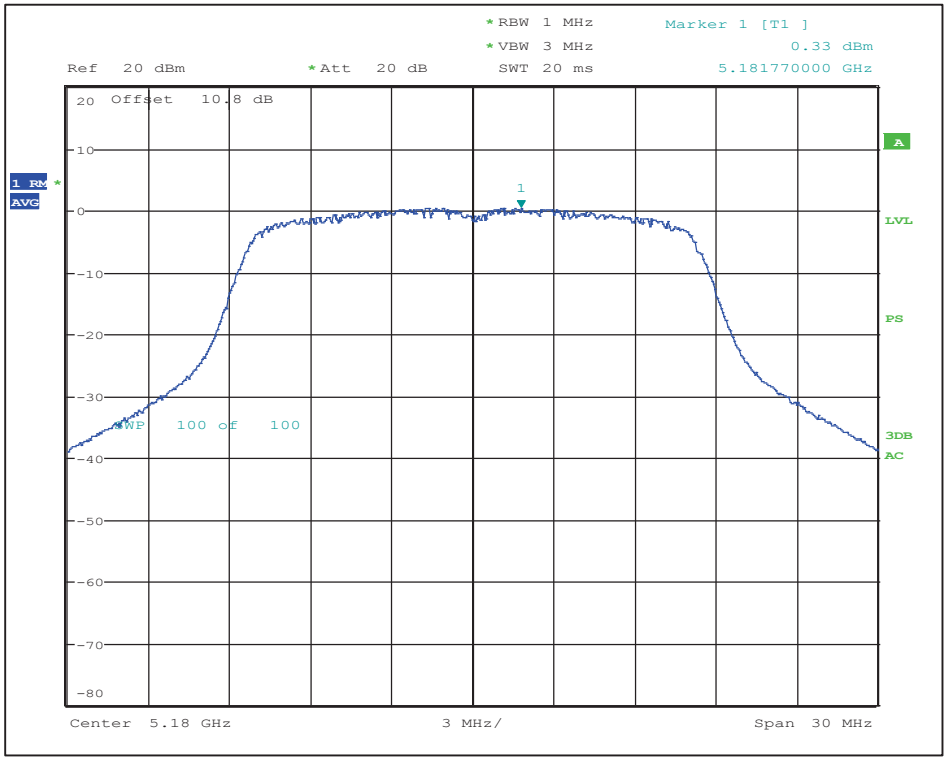


Test Results

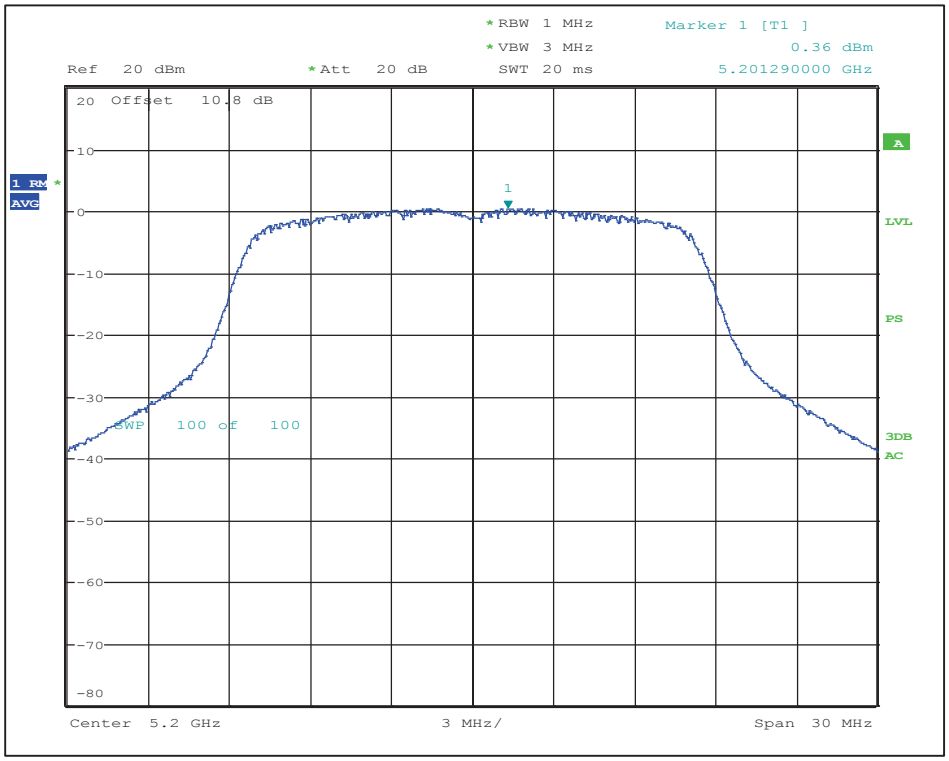
6.4.1 Maximum Power Spectral Density and e.i.r.p. Spectral Density in the 5.15-5.25 GHz Band

802.11 Mode	Data Rate	Channel	Frequency (MHz)	Maximum Power Spectral Density (PSD)			e.i.r.p. Spectral Density			
				Results (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)	Directional Gain (dBi)	Results (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)
a	6 Mbps	36	5180	0.3	11	-10.7	3.5	3.8	10	-6.2
		40	5200	0.4	11	-10.6	3.5	3.9	10	-6.1
		48	5240	0.4	11	-10.6	3.5	3.9	10	-6.1
	12 Mbps	36	5180	-0.5	11	-11.5	3.5	3.0	10	-7.0
		40	5200	-0.3	11	-11.3	3.5	3.2	10	-6.8
		48	5240	-0.3	11	-11.3	3.5	3.3	10	-6.8
	24 Mbps	36	5180	-1.5	11	-12.5	3.5	2.0	10	-8.0
		40	5200	-1.8	11	-12.8	3.5	1.7	10	-8.3
		48	5240	-1.2	11	-12.2	3.5	2.3	10	-7.7
n (20 MHz)	MCS7	36	5180	-5.3	11	-16.3	3.5	-1.8	10	-11.8
		40	5200	-5.6	11	-16.6	3.5	-2.1	10	-12.1
		48	5240	-5.1	11	-16.1	3.5	-1.6	10	-11.6

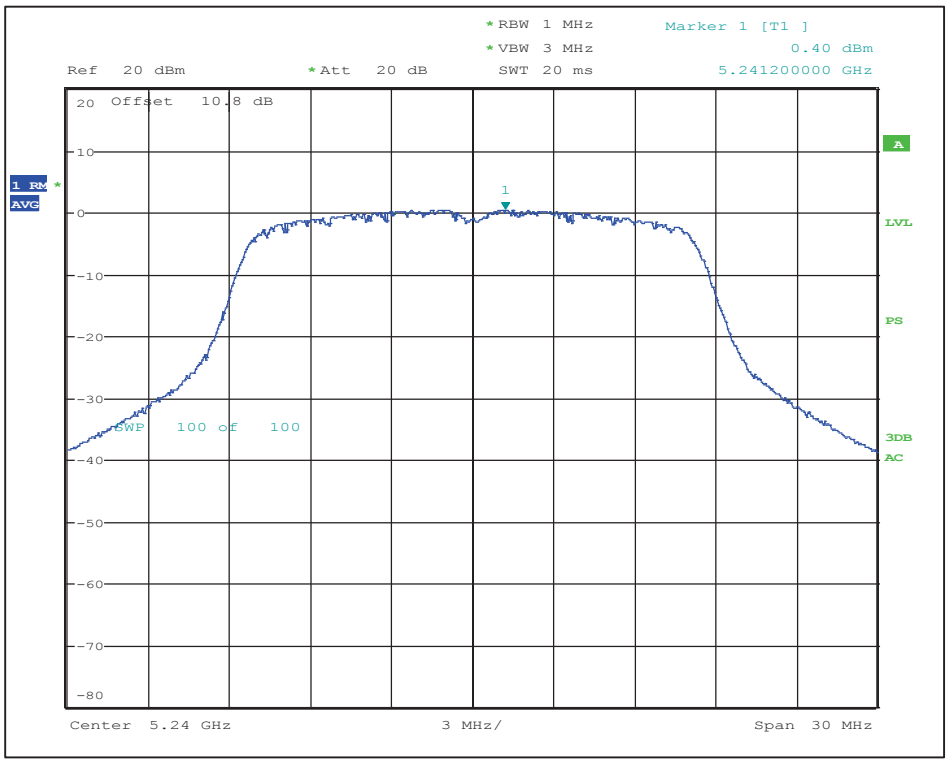
Refer to the following plots



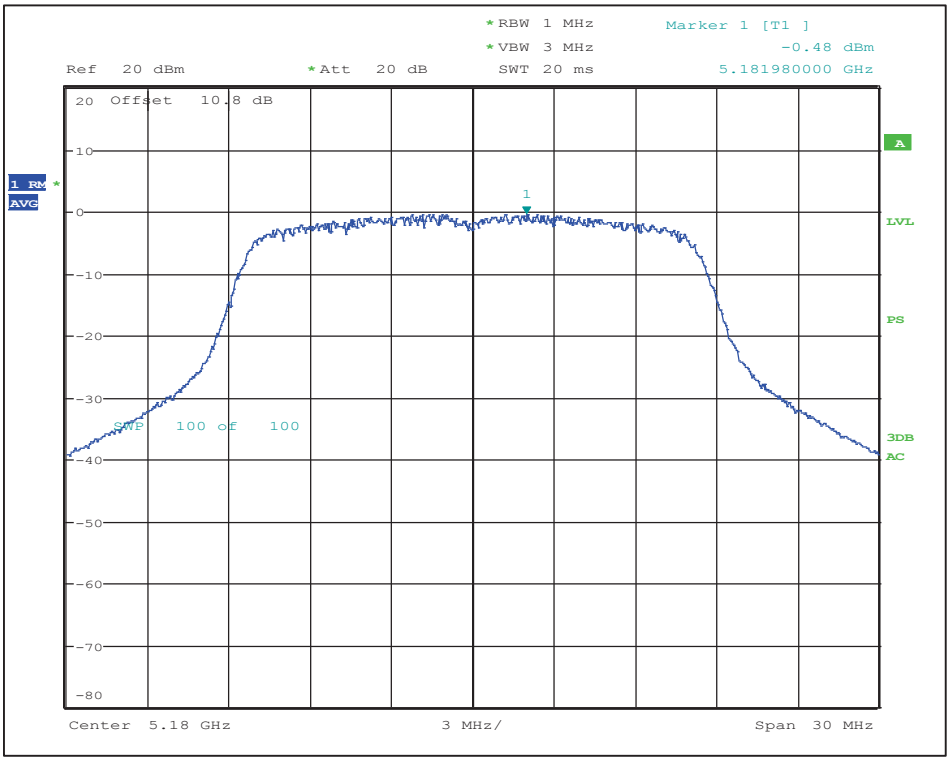
802.11a: 6 Mbps - Channel 36 (5180 MHz) Maximum PSD



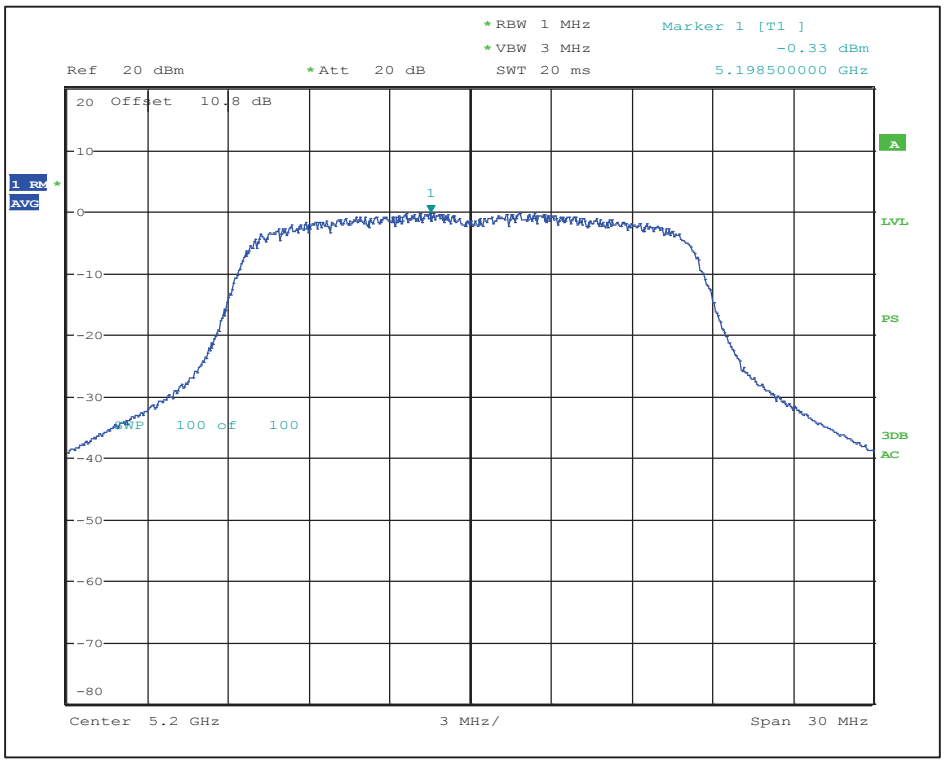
802.11a: 6 Mbps - Channel 40 (5200 MHz) Maximum PSD



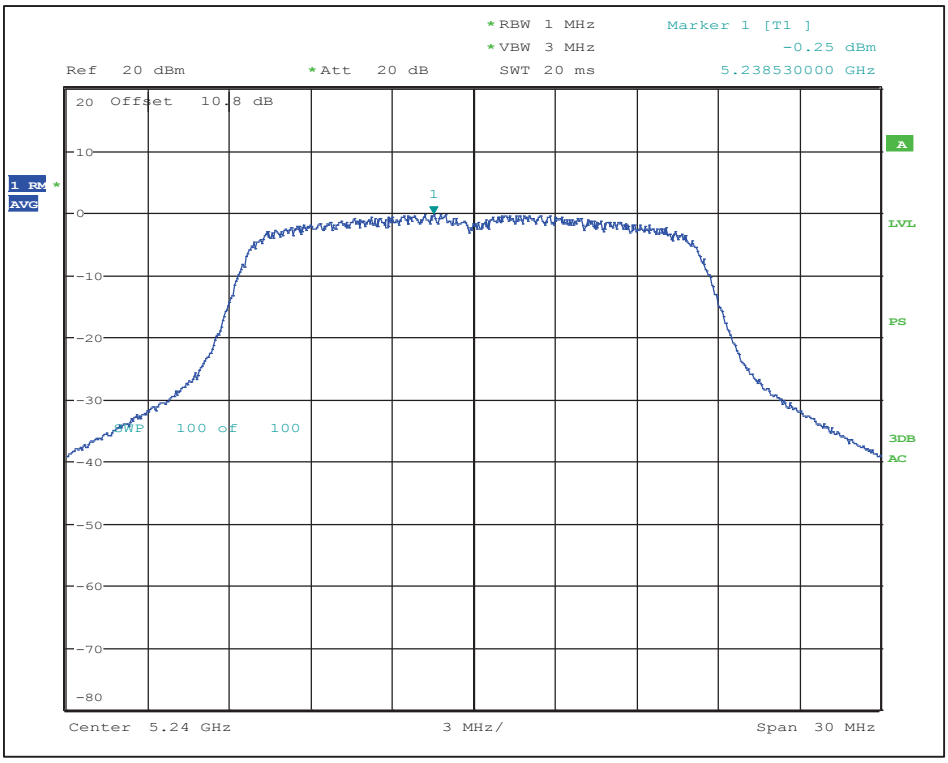
802.11a: 6 Mbps - Channel 48 (5240 MHz) Maximum PSD



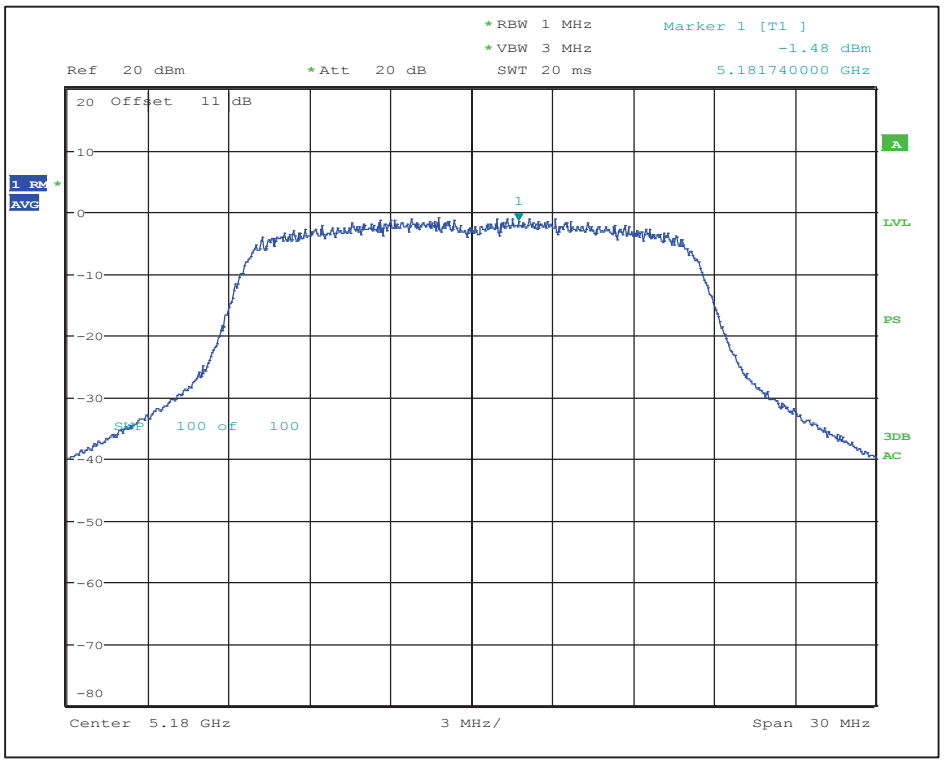
802.11a: 12 Mbps - Channel 36 (5180 MHz) Maximum PSD



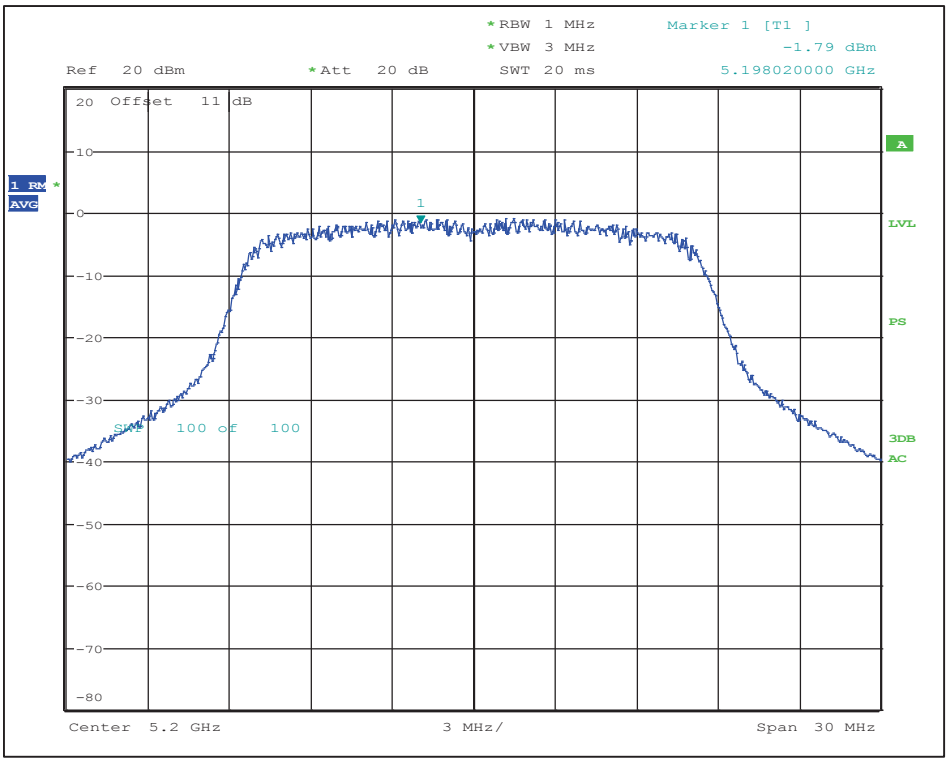
802.11a: 12 Mbps - Channel 40 (5200 MHz) Maximum PSD



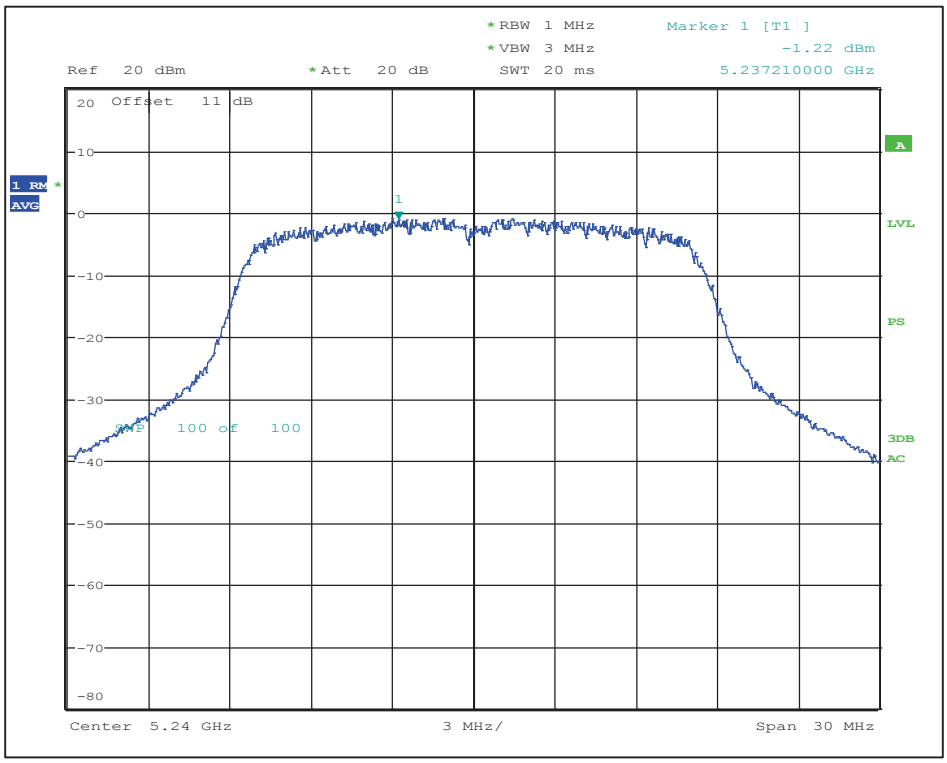
802.11a: 12 Mbps - Channel 48 (5240 MHz) Maximum PSD



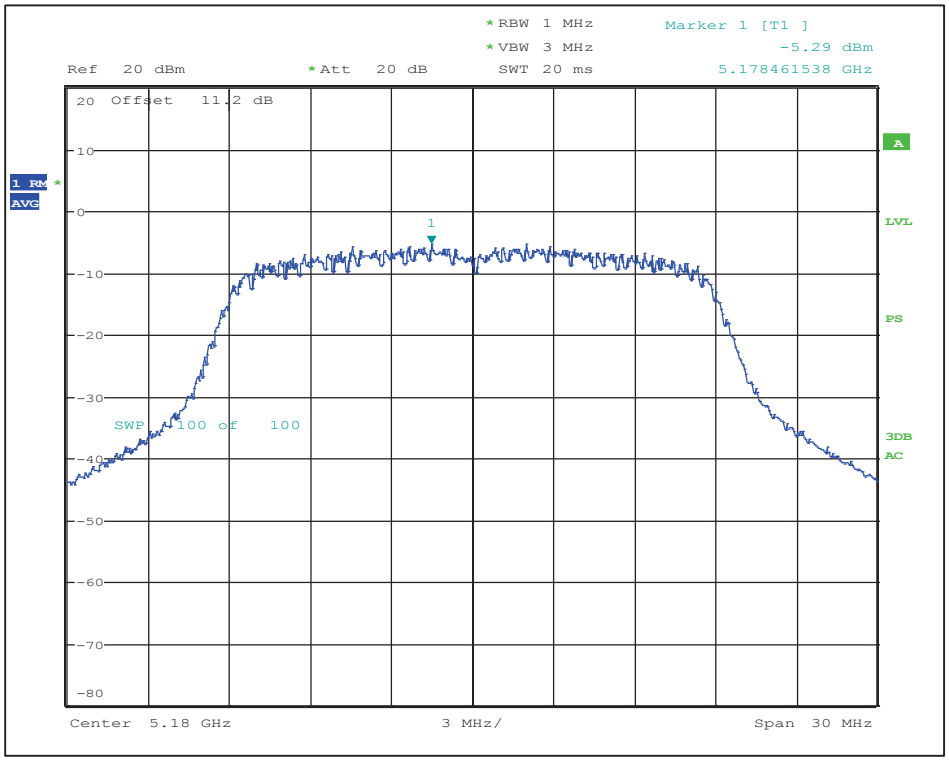
802.11a: 24 Mbps - Channel 36 (5180 MHz) Maximum PSD



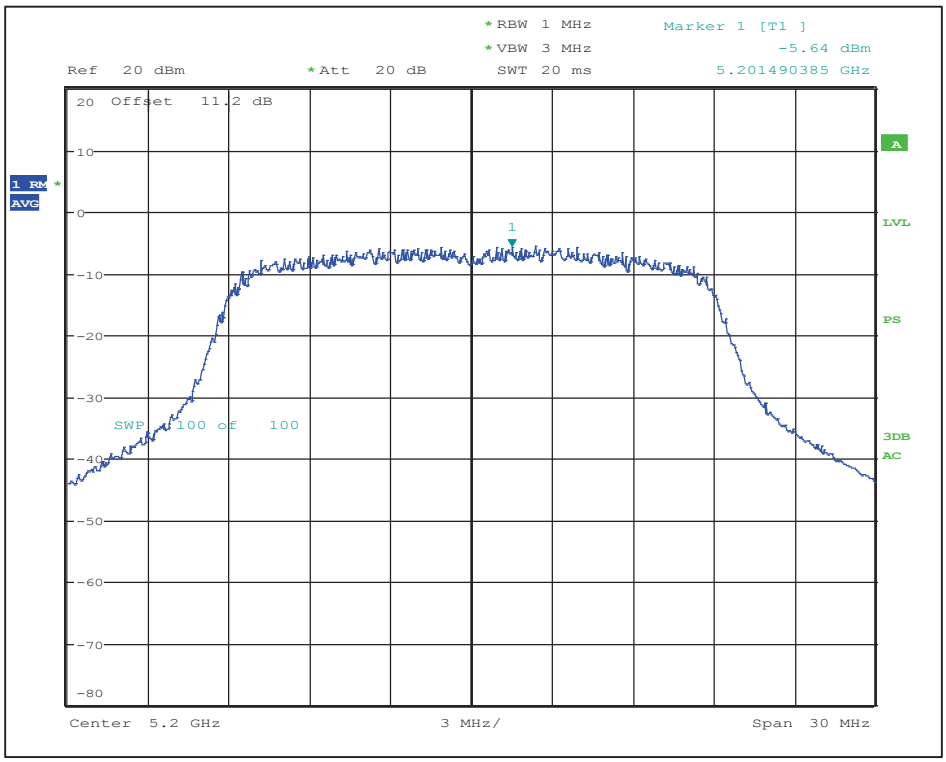
802.11a: 24 Mbps - Channel 40 (5200 MHz) Maximum PSD



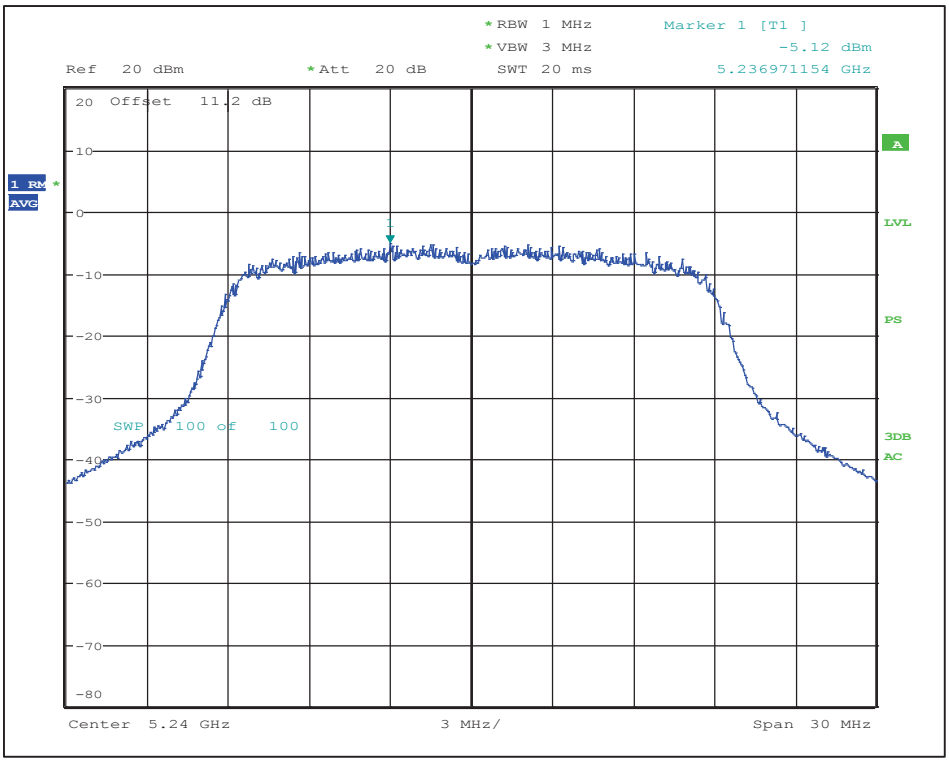
802.11a: 24 Mbps - Channel 48 (5240 MHz) Maximum PSD



802.11n: MCS7 - Channel 36 (5180 MHz) Maximum PSD



802.11n: MCS7 - Channel 40 (5200 MHz) Maximum PSD

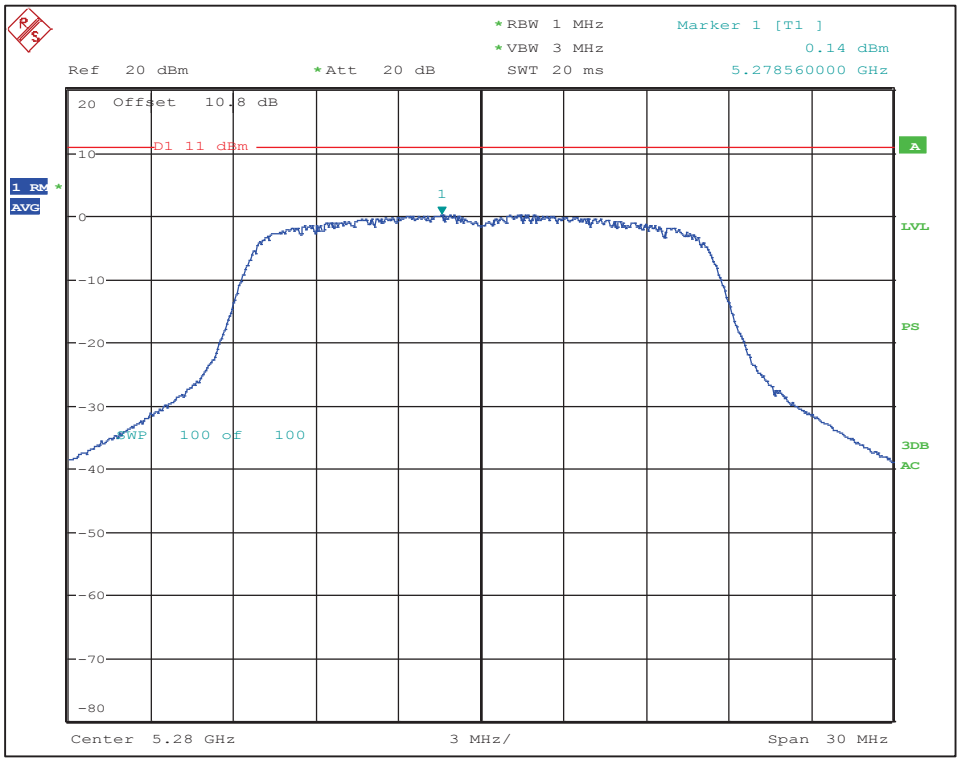


802.11n: MCS7 - Channel 48 (5240 MHz) Maximum PSD

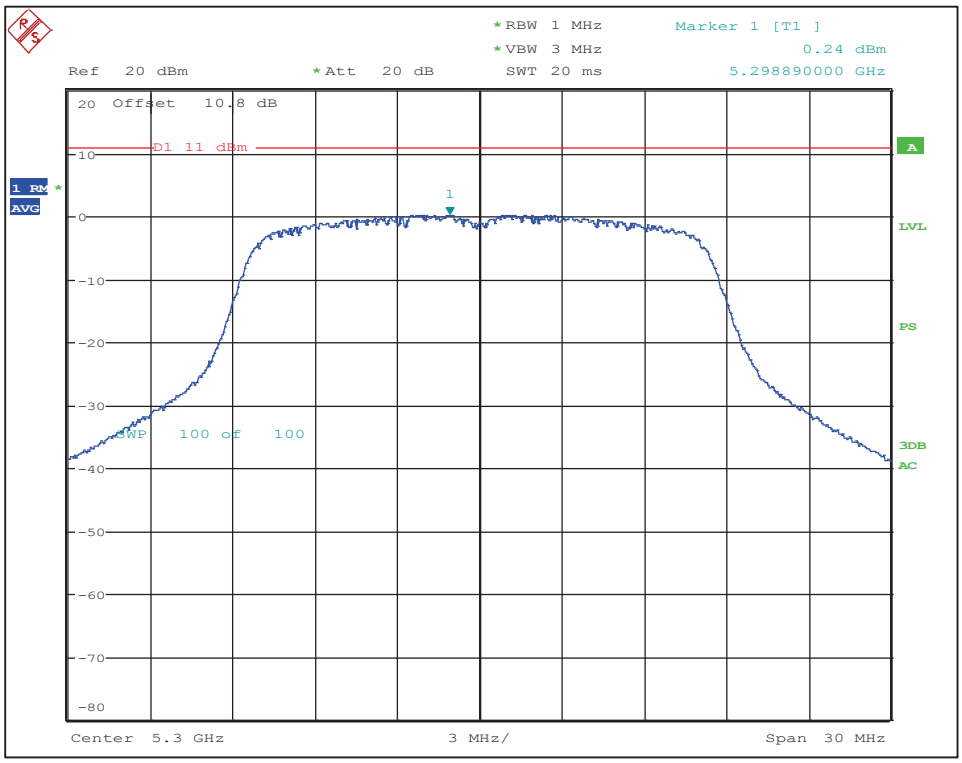
6.4.2 Maximum Power Spectral Density in the 5.25-5.35 GHz Band

802.11 Mode	Data Rate	Channel	Frequency (MHz)	Maximum PSD (dBm/MHz)	PSD Limit (dBm/MHz)	Margin (dB)
a	6 Mbps	56	5280	0.1	11	-10.9
		60	5300	0.2	11	-10.8
		64	5320	0.3	11	-10.7
	12 Mbps	56	5280	-0.5	11	-11.5
		60	5300	-0.4	11	-11.4
		64	5320	-0.2	11	-11.2
	24 Mbps	56	5280	-1.1	11	-12.1
		60	5300	-0.8	11	-11.8
		64	5320	-0.9	11	-11.9
n (20MHz)	MCS7	56	5280	-6.3	11	-17.3
		60	5300	-6.0	11	-17.0
		64	5320	-6.1	11	-17.1

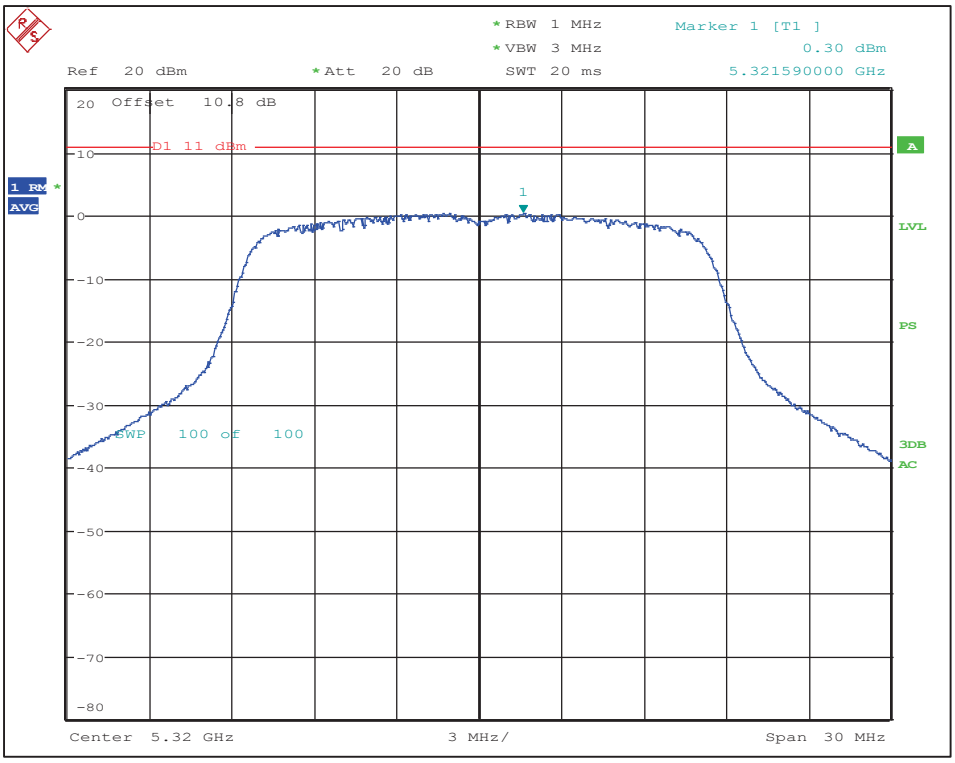
Refer to the following plots



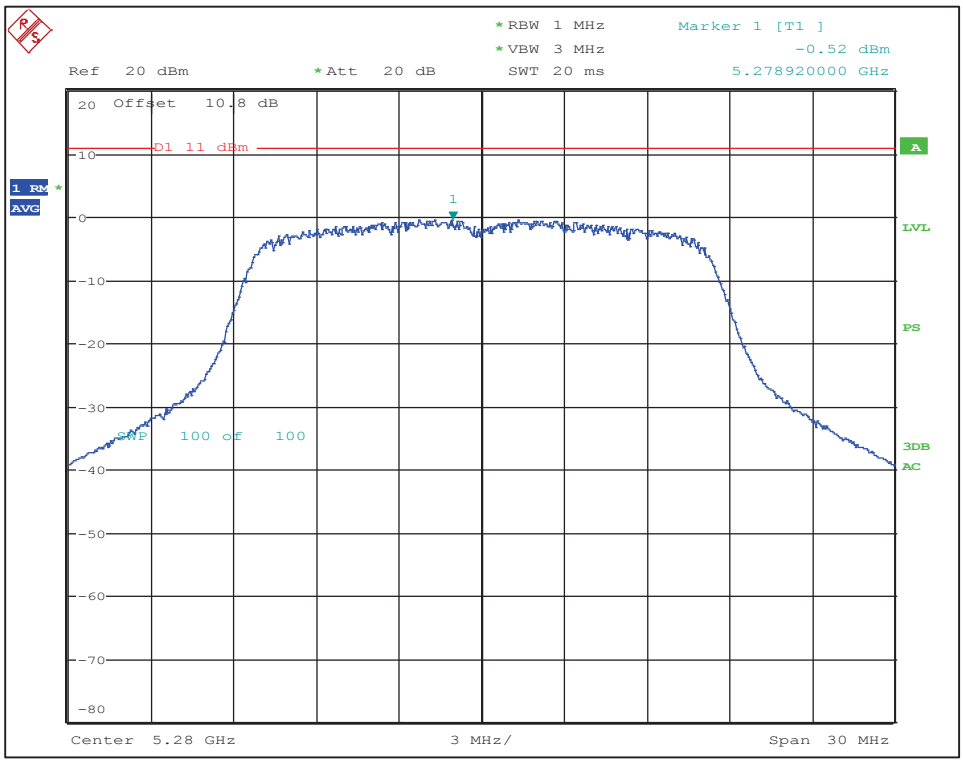
802.11a: 6 Mbps - Channel 56 (5280 MHz) Maximum PSD



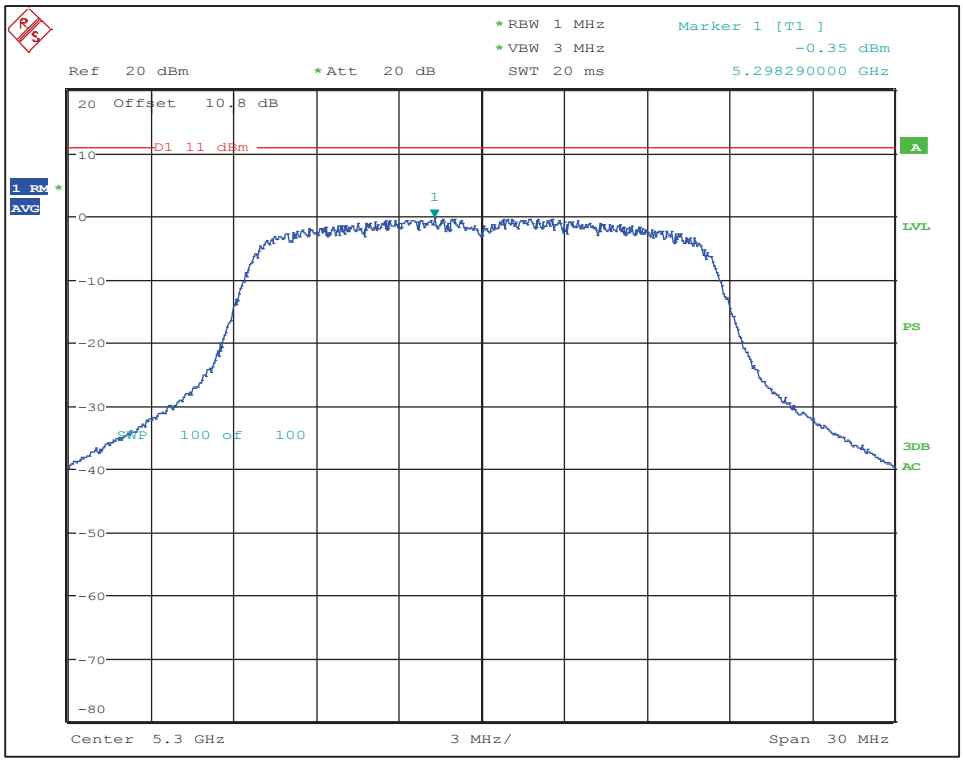
802.11a: 6 Mbps - Channel 60 (5300 MHz) Maximum PSD



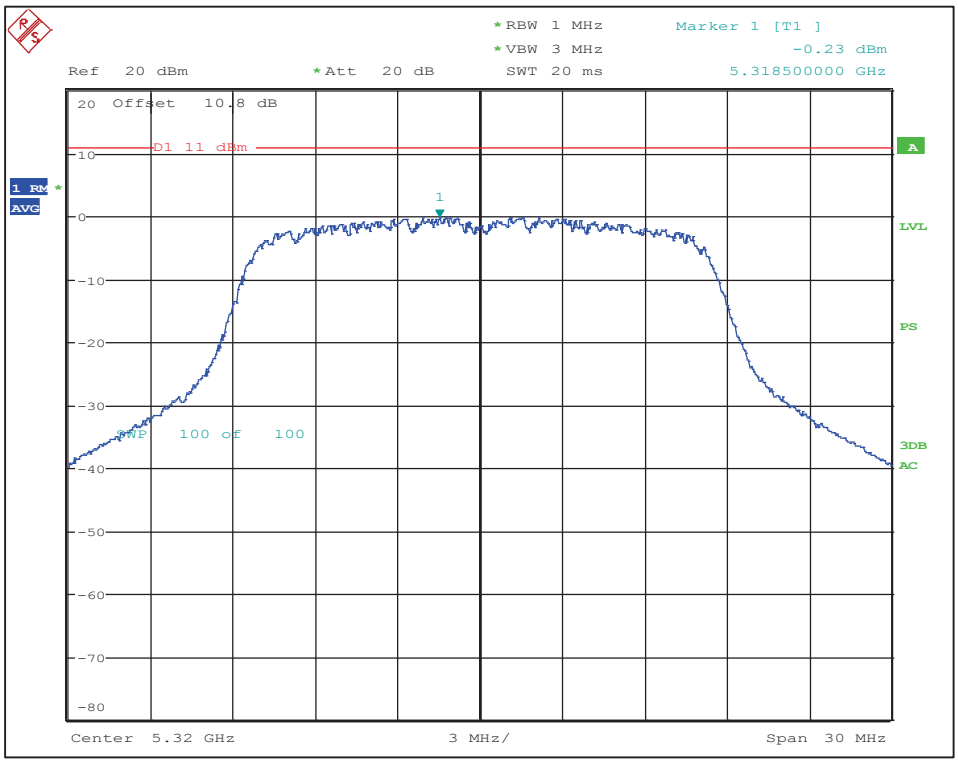
802.11a: 6 Mbps - Channel 64 (5320 MHz) Maximum PSD



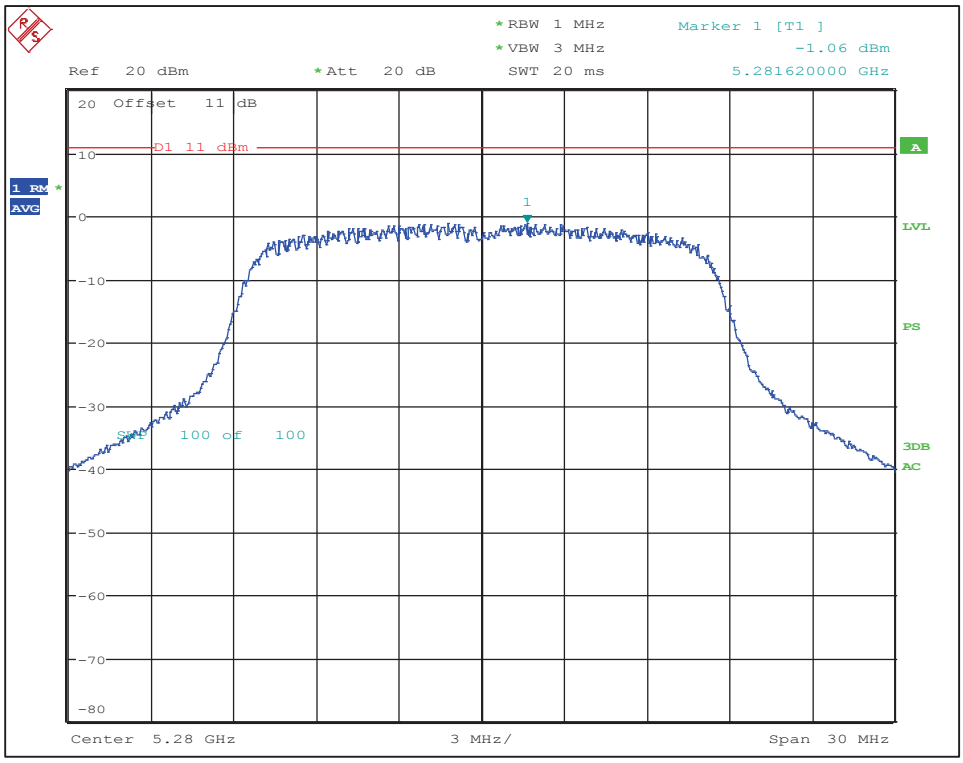
802.11a: 12 Mbps - Channel 56 (5280 MHz) Maximum PSD



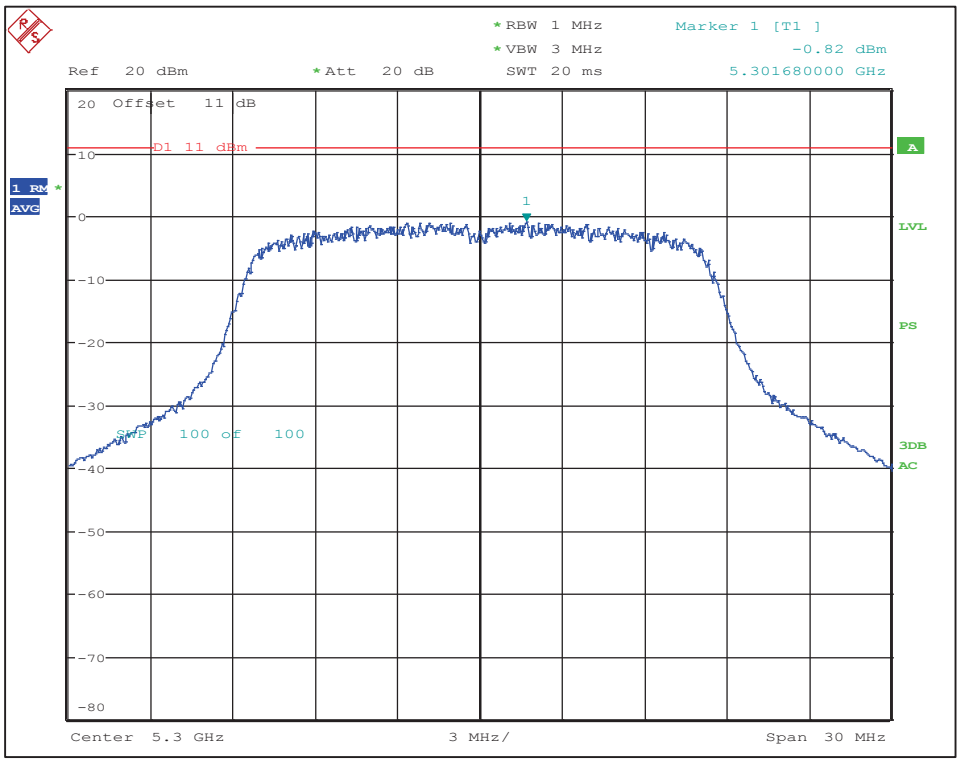
802.11a: 12 Mbps - Channel 60 (5300 MHz) Maximum PSD



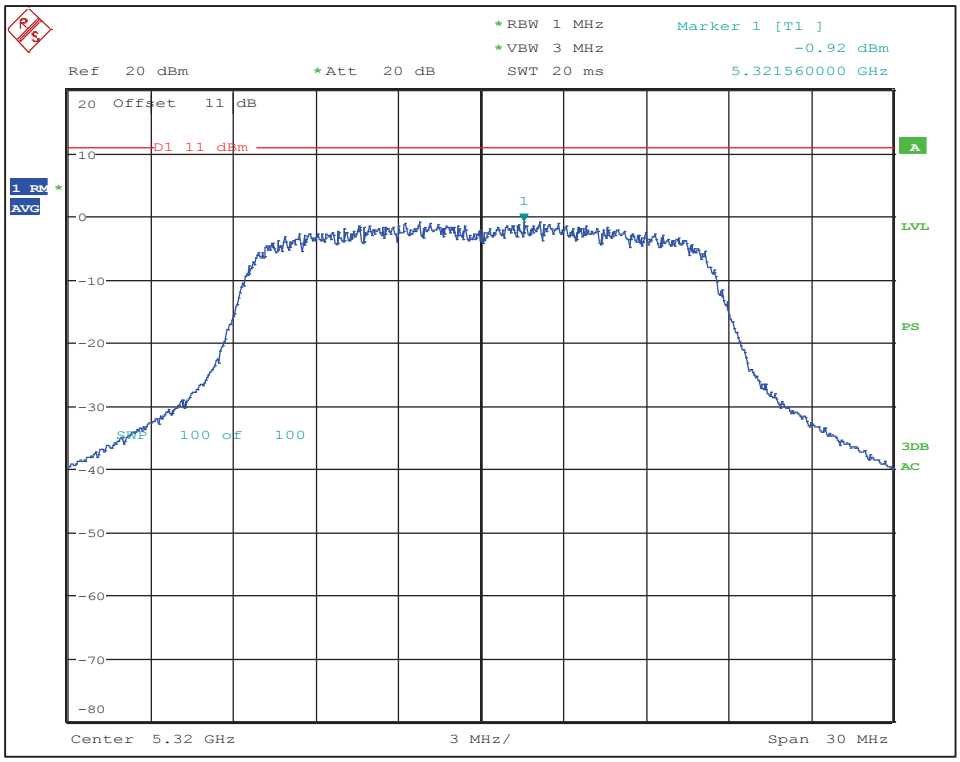
802.11a: 12 Mbps - Channel 64 (5320 MHz) Maximum PSD



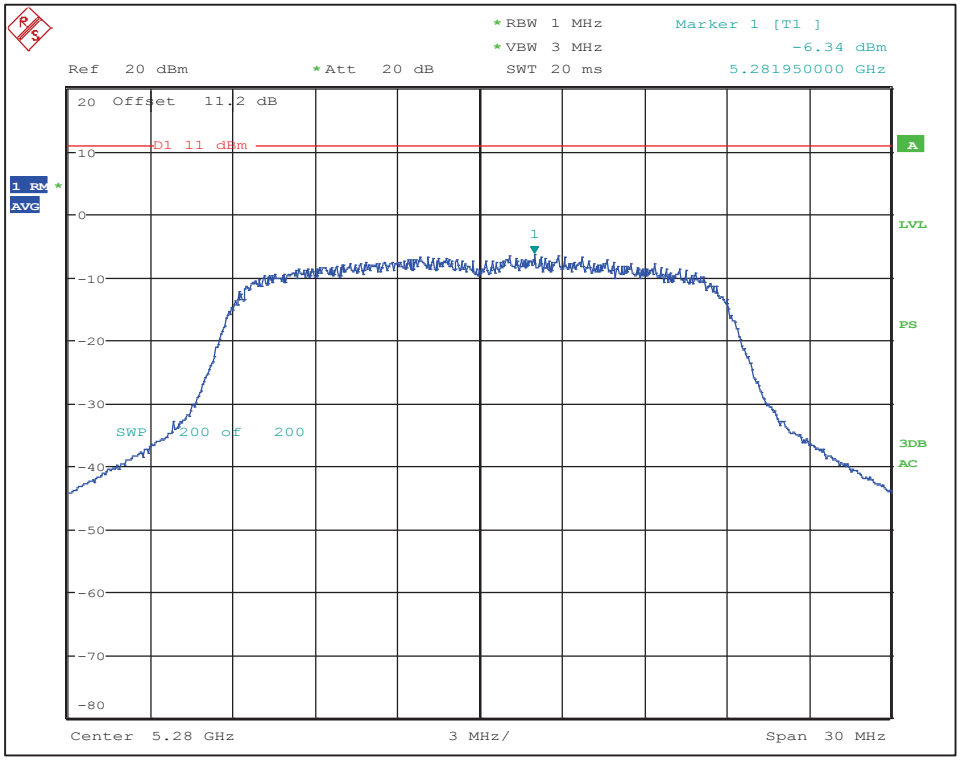
802.11a: 24 Mbps - Channel 56 (5280 MHz) Maximum PSD



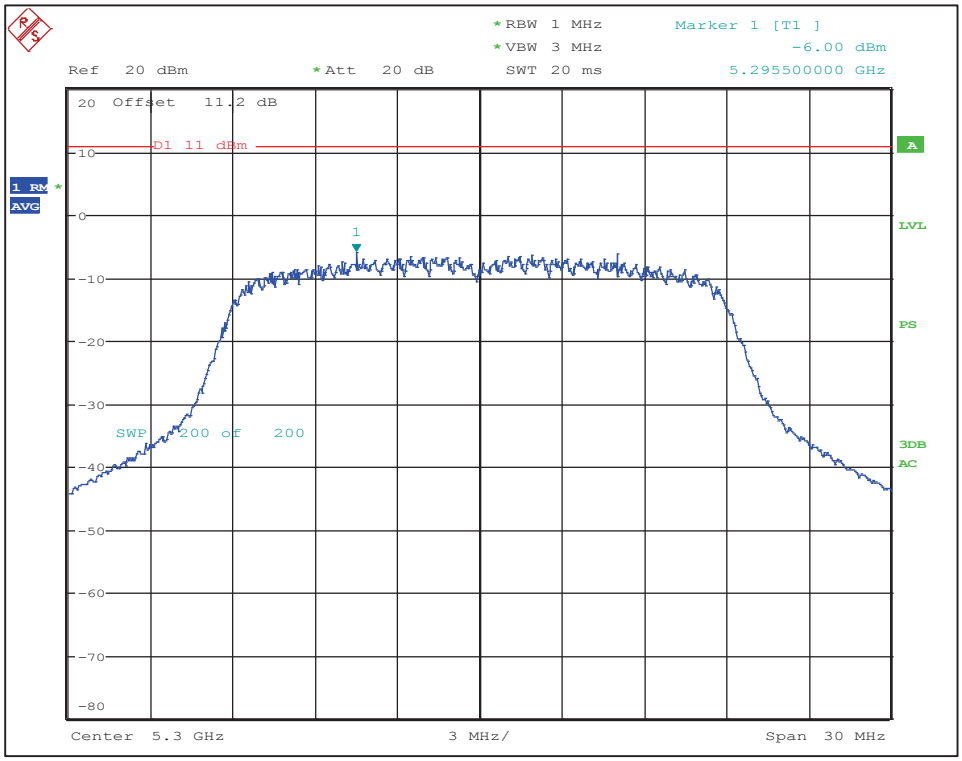
802.11a: 24 Mbps - Channel 60 (5300 MHz) Maximum PSD



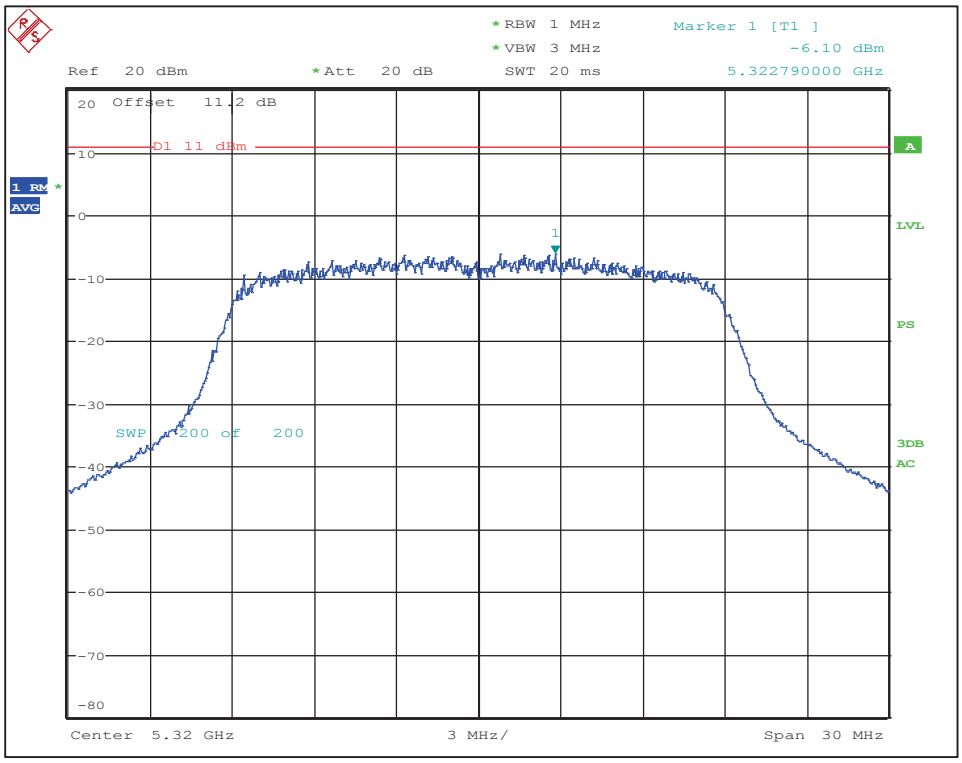
802.11a: 24 Mbps - Channel 64 (5320 MHz) Maximum PSD



802.11n: MCS7 - Channel 56 (5280 MHz) Maximum PSD



802.11n: MCS7 - Channel 60 (5300 MHz) Maximum PSD

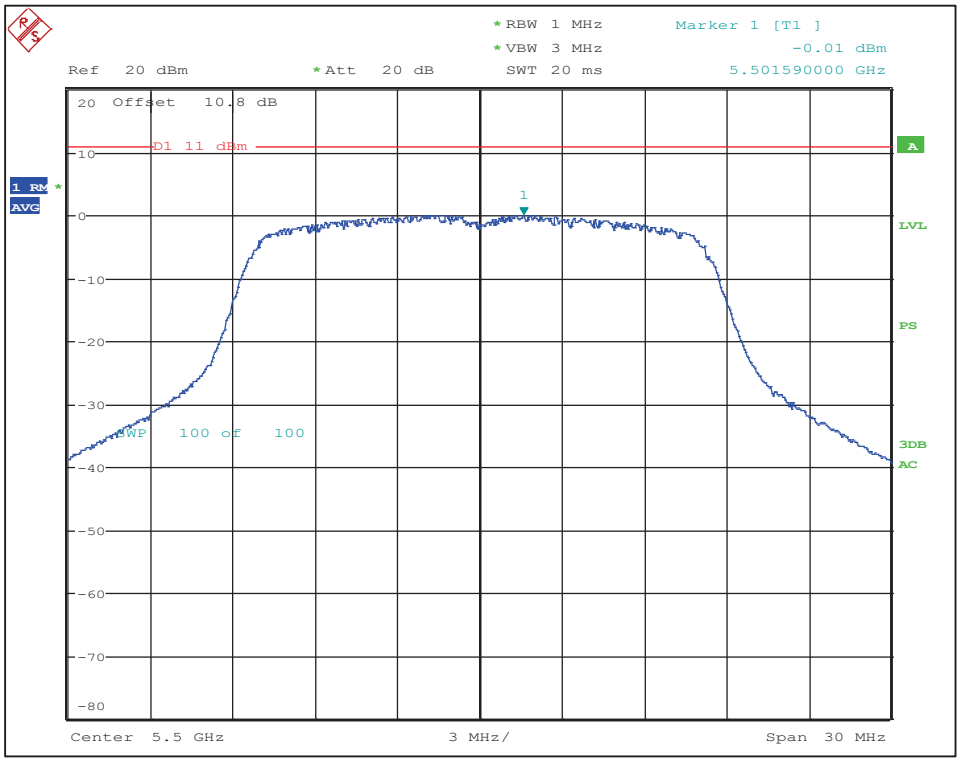


802.11n: MCS7 - Channel 64 (5320 MHz) Maximum PSD

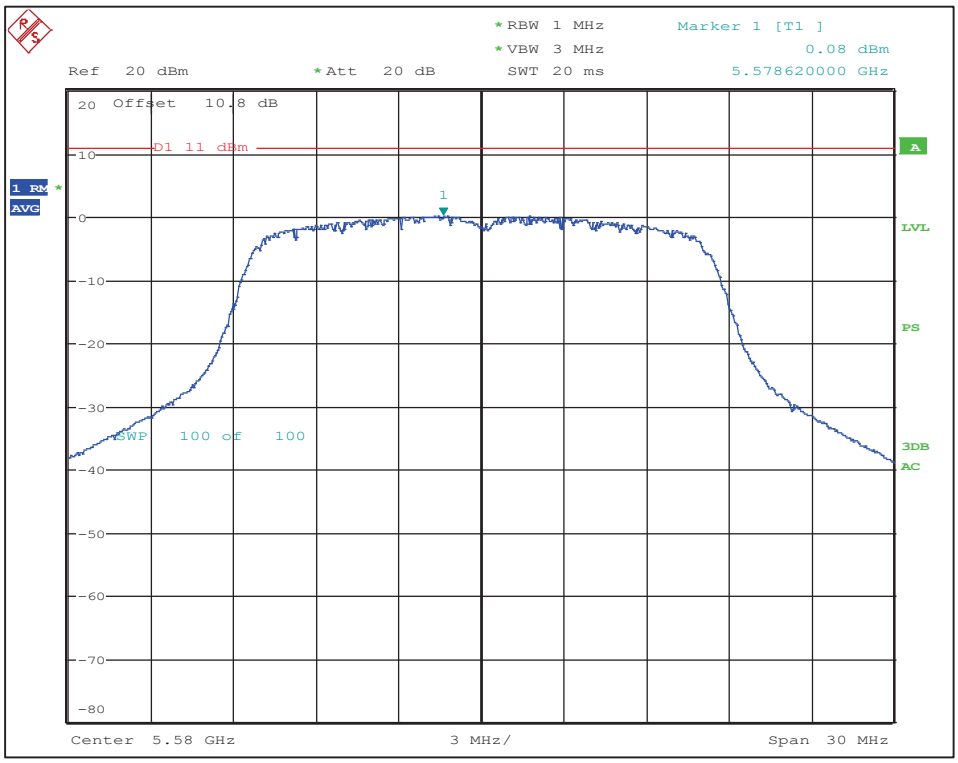
6.4.3 Maximum Power Spectral Density in the 5.47-5.725 GHz Band

802.11 Mode	Data Rate	Channel	Frequency (MHz)	Maximum PSD (dBm/MHz)	PSD Limit (dBm/MHz)	Margin (dB)
a	6 Mbps	100	5500	0.0	11	-11.0
		116	5580	0.1	11	-10.9
		140	5700	0.3	11	-10.7
	12 Mbps	100	5500	-0.6	11	-11.6
		116	5580	-0.5	11	-11.5
		140	5700	-0.1	11	-11.1
	24 Mbps	100	5500	-1.3	11	-12.3
		116	5580	-1.1	11	-12.1
		140	5700	-0.8	11	-11.8
n (20MHz)	MCS7	100	5500	-6.7	11	-17.7
		116	5580	-6.6	11	-17.6
		140	5700	-6.1	11	-17.1

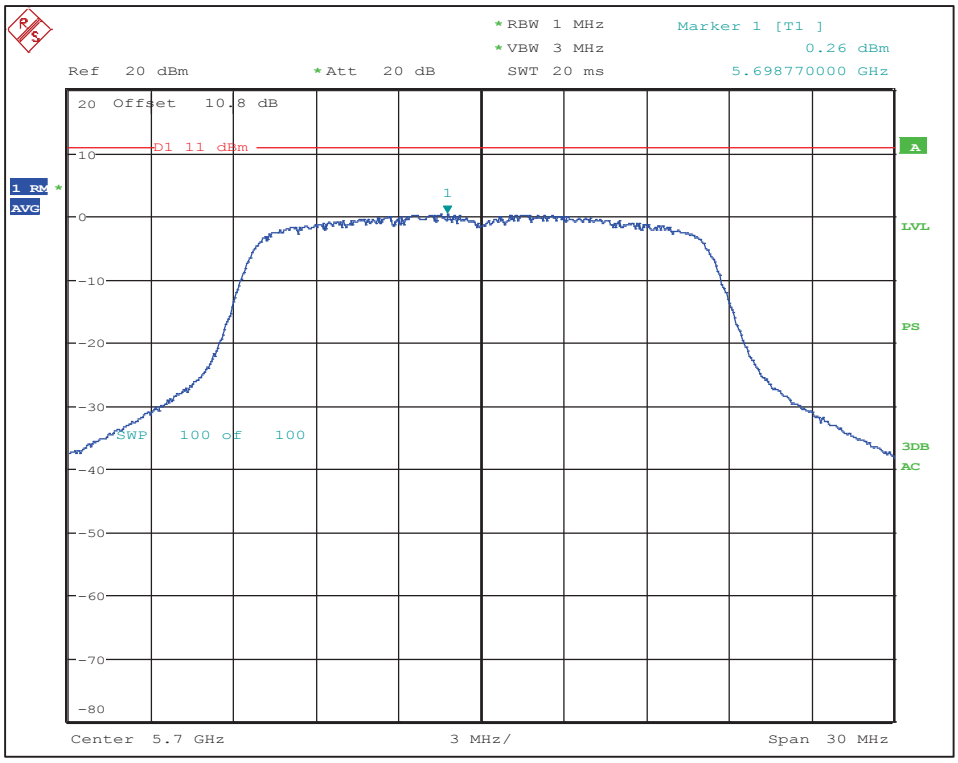
Refer to the following plots



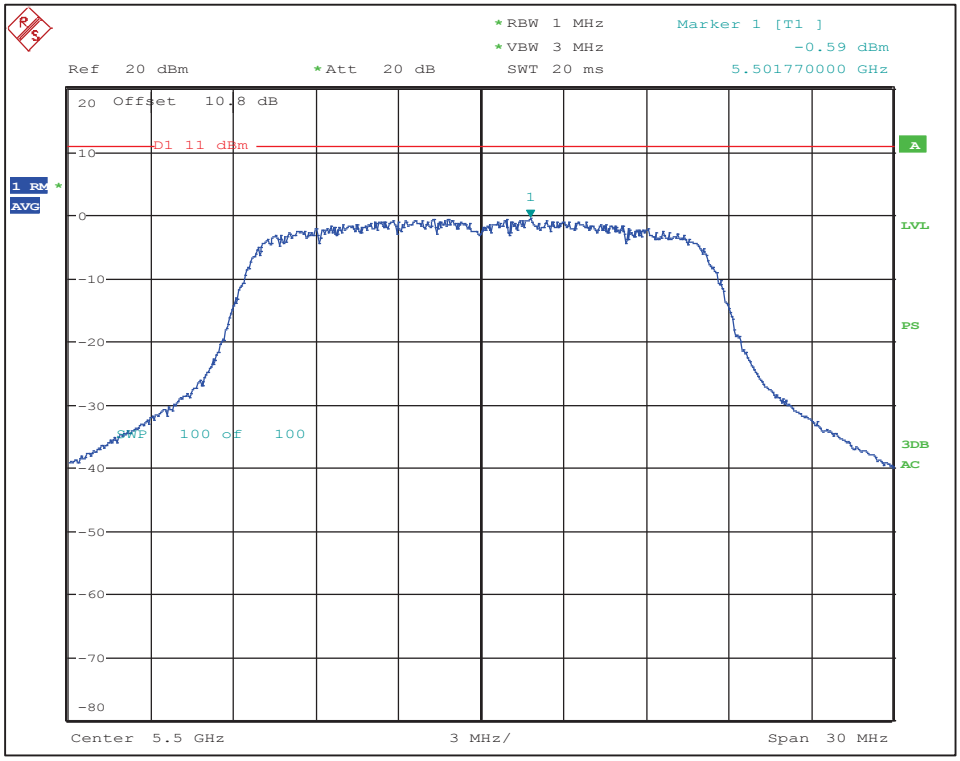
802.11a: 6 Mbps - Channel 100 (5500 MHz) Maximum PSD



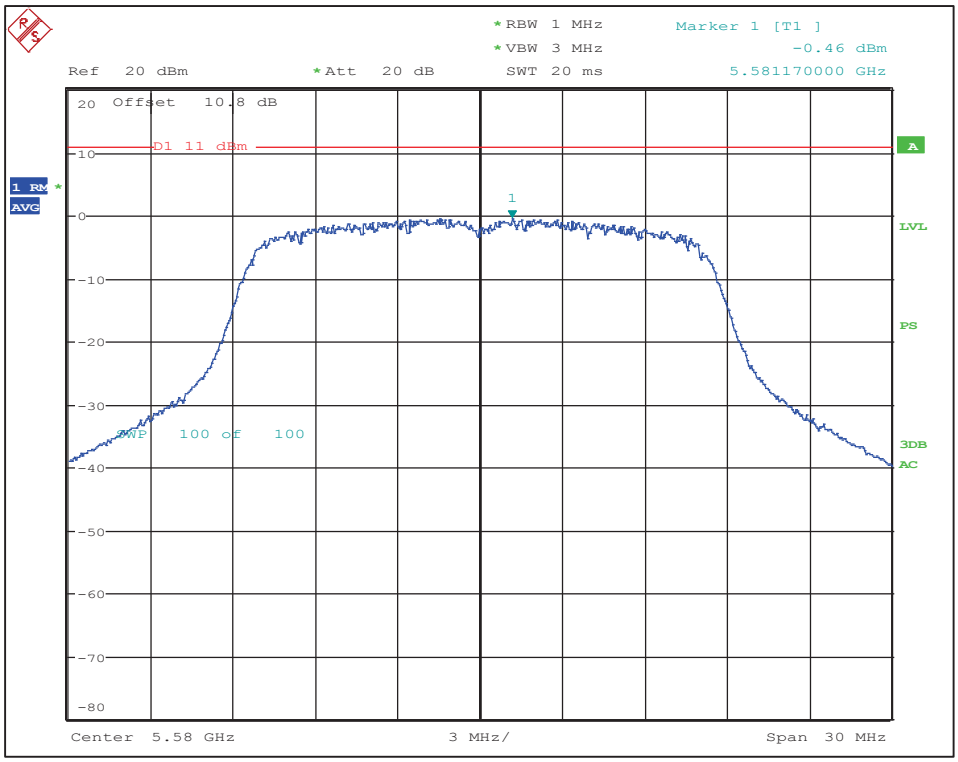
802.11a: 6 Mbps - Channel 116 (5580 MHz) Maximum PSD



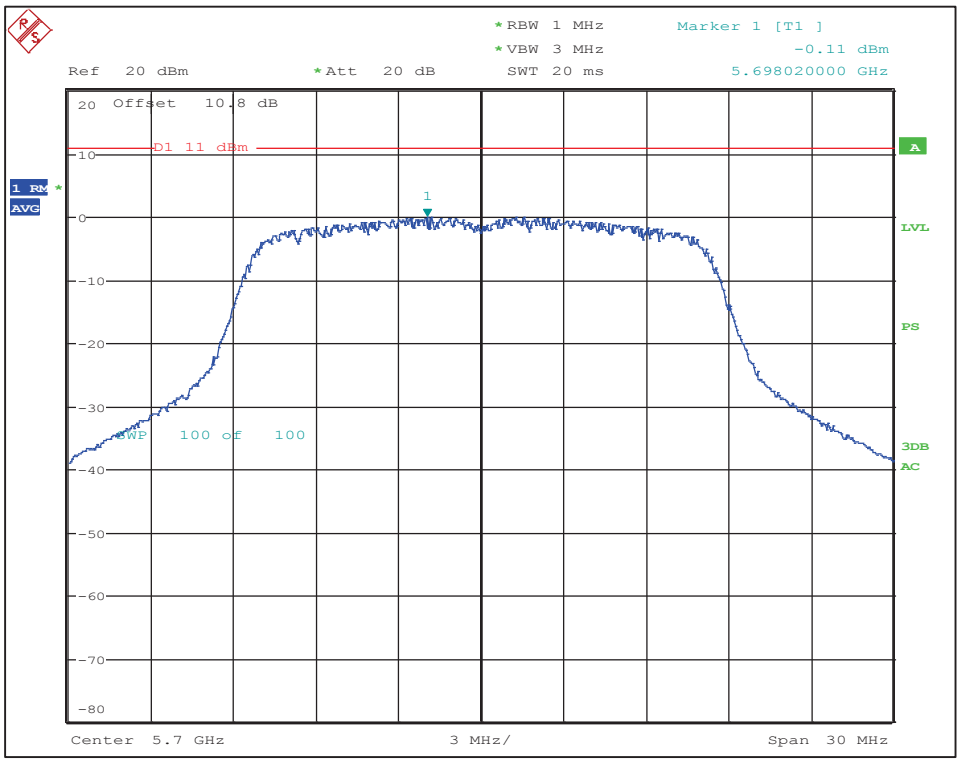
802.11a: 6 Mbps - Channel 140 (5700 MHz) Maximum PSD



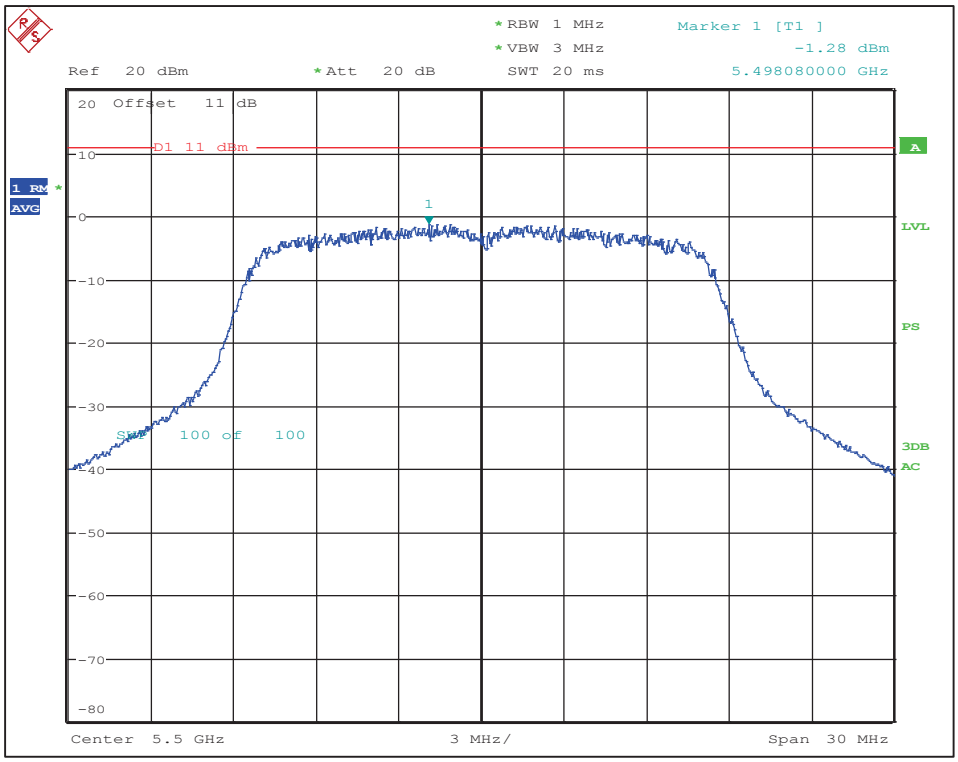
802.11a: 12 Mbps - Channel 100 (5500 MHz) Maximum PSD



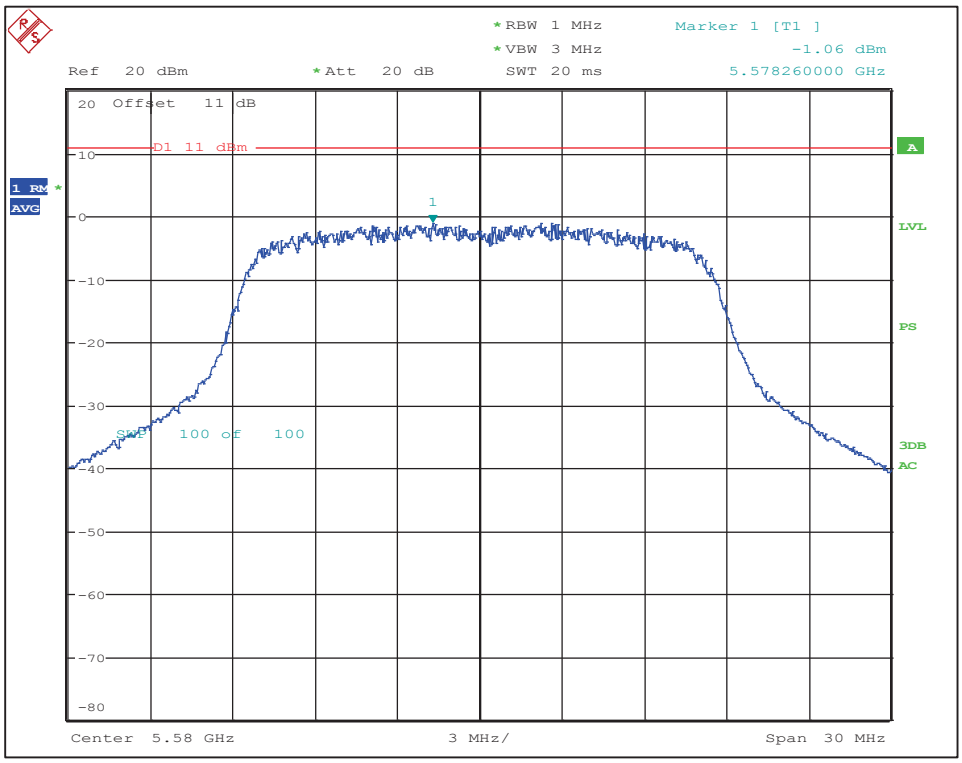
802.11a: 12 Mbps - Channel 116 (5580 MHz) Maximum PSD



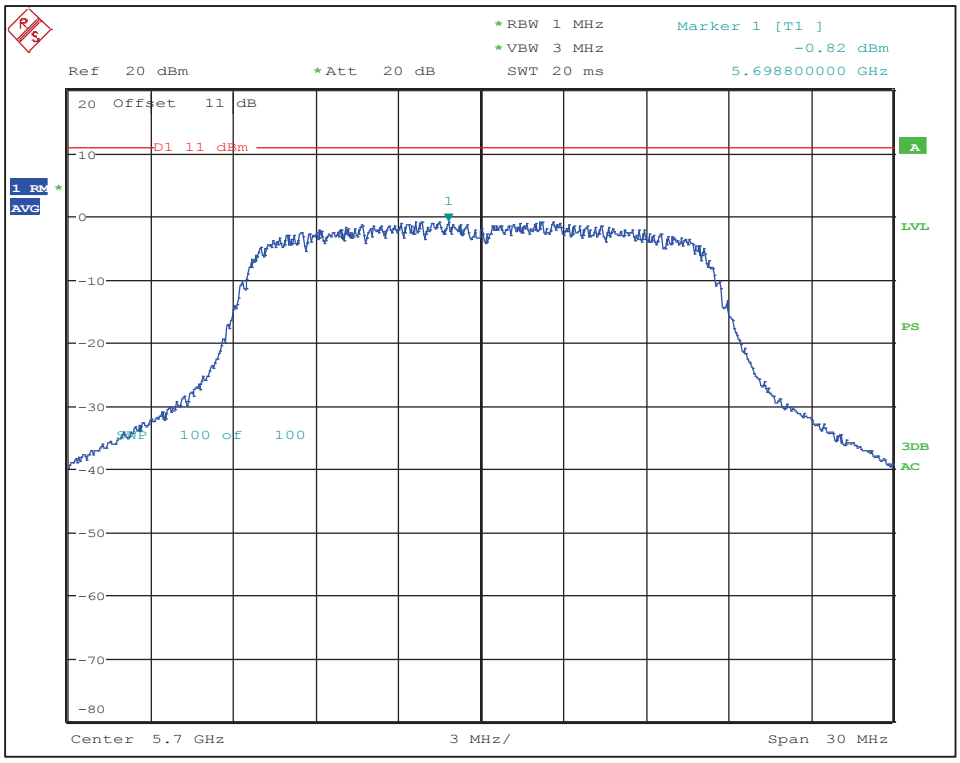
802.11a: 12 Mbps - Channel 140 (5700 MHz) Maximum PSD



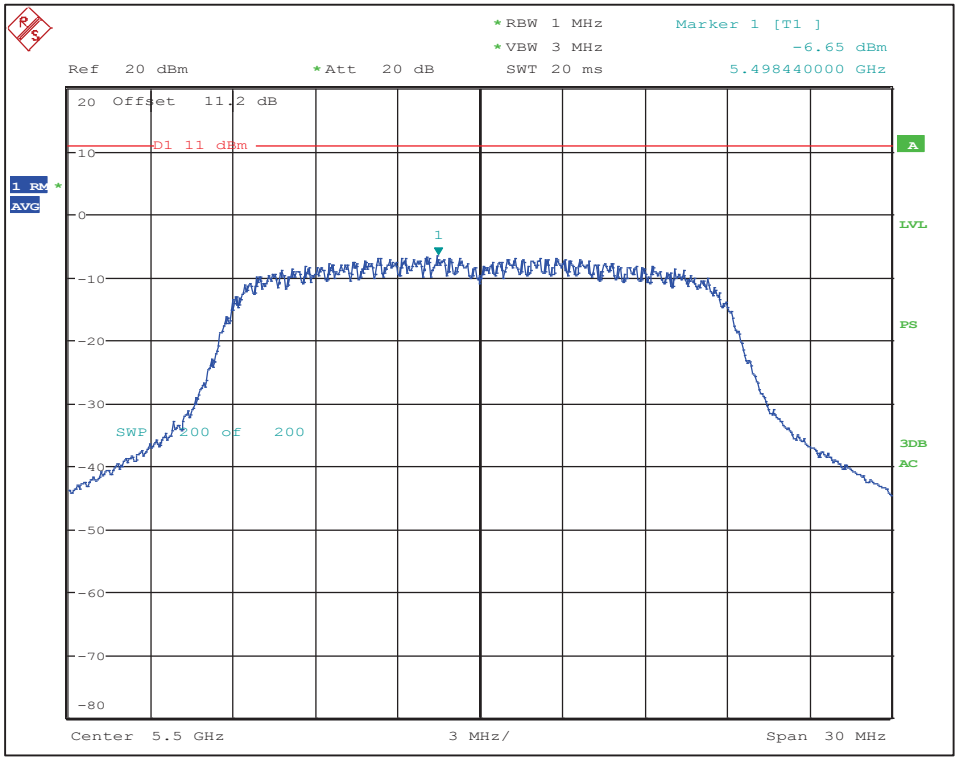
802.11a: 24 Mbps - Channel 100 (5500 MHz) Maximum PSD



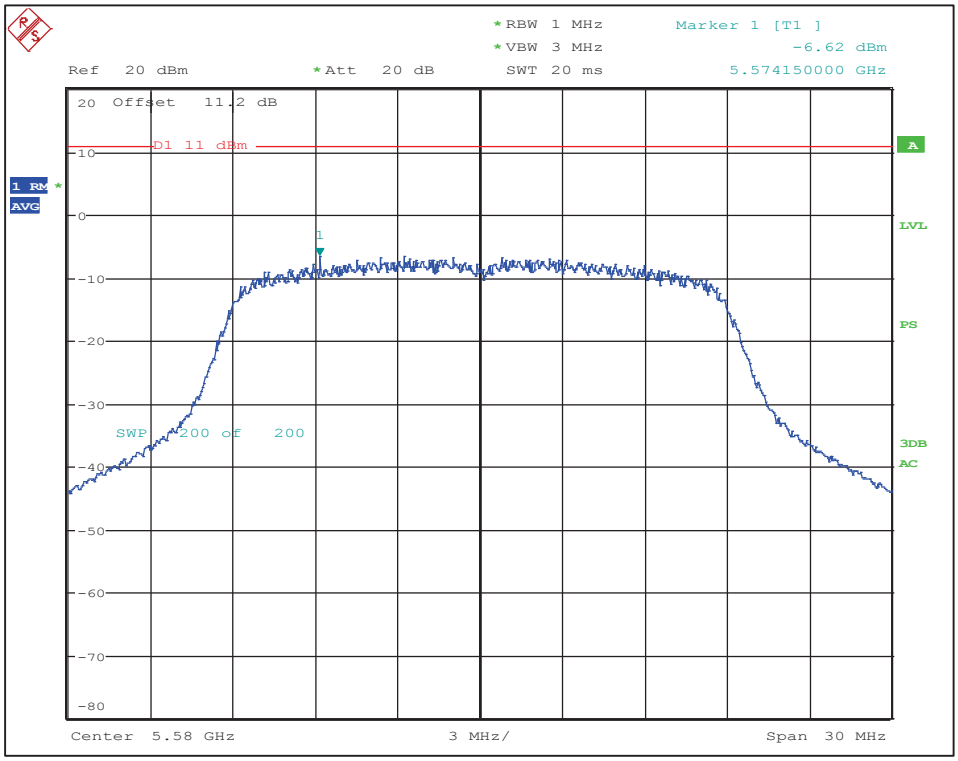
802.11a: 24 Mbps - Channel 116 (5580 MHz) Maximum PSD



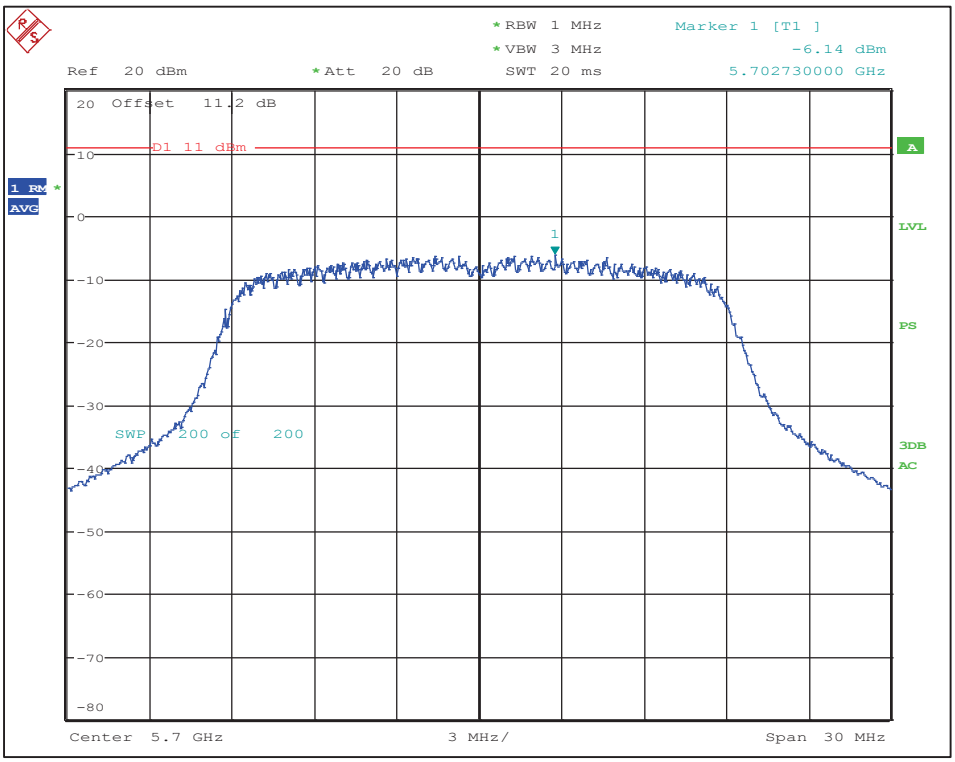
802.11a: 24 Mbps - Channel 140 (5700 MHz) Maximum PSD



802.11n: MCS7 - Channel 100 (5500 MHz) Maximum PSD



802.11n: MCS7 - Channel 116 (5580 MHz) Maximum PSD

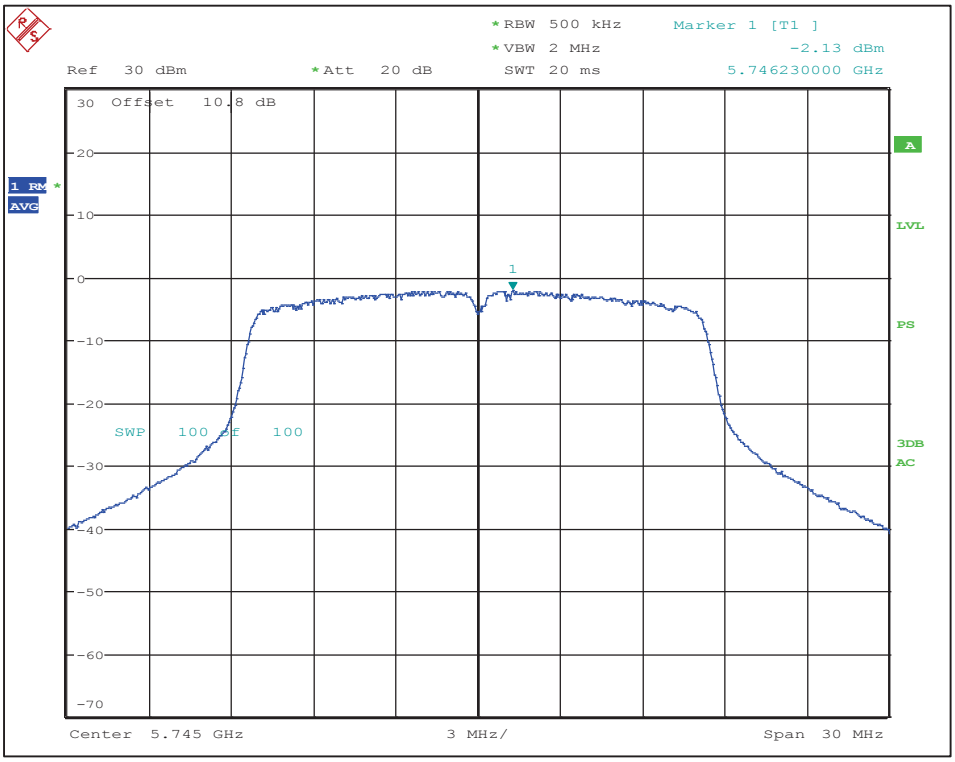


802.11n: MCS7 - Channel 140 (5700 MHz) Maximum PSD

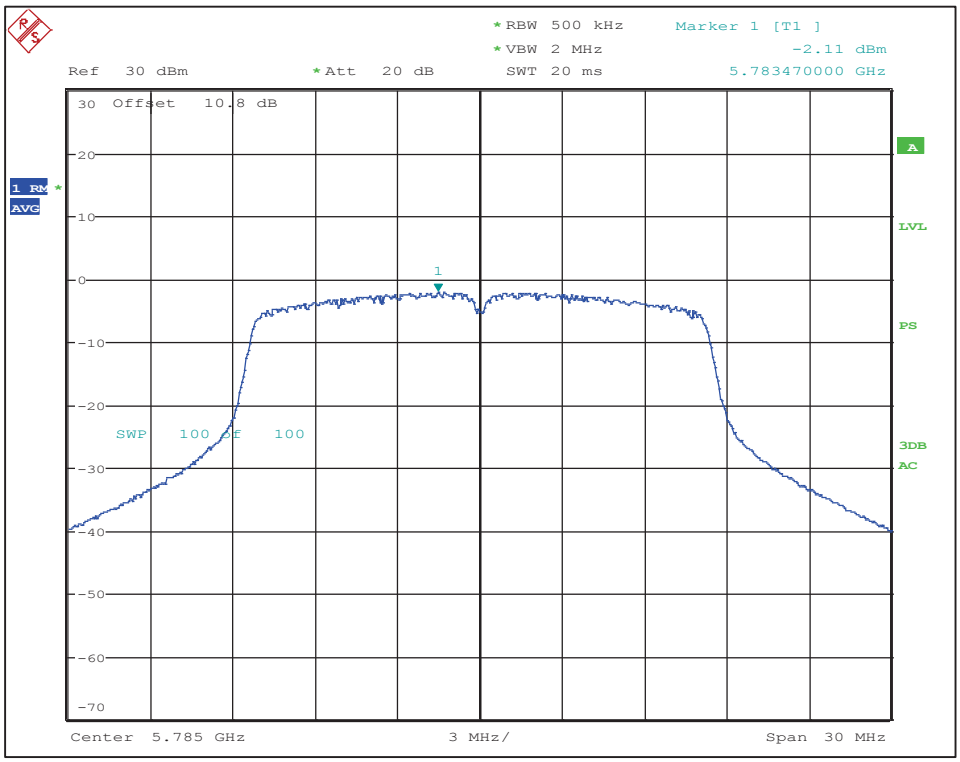
6.4.4 Maximum Power Spectral Density in the 5.725-5.85 GHz Band

802.11 Mode	Data Rate	Channel	Frequency (MHz)	Maximum PSD (dBm/500kHz)	PSD Limit (dBm/500kHz)	Margin (dB)
a	6 Mbps	149	5745	-2.1	30	-32.1
		157	5785	-2.1	30	-32.1
		165	5825	-1.9	30	-31.9
	12 Mbps	149	5745	-3.0	30	-33.0
		157	5785	-2.9	30	-32.9
		165	5825	-2.7	30	-32.7
	24 Mbps	149	5745	-3.6	30	-33.6
		157	5785	-3.4	30	-33.4
		165	5825	-3.2	30	-33.2
n (20MHz)	MCS7	149	5745	-8.6	30	-38.6
		157	5785	-8.6	30	-38.6
		165	5825	-8.5	30	-38.5

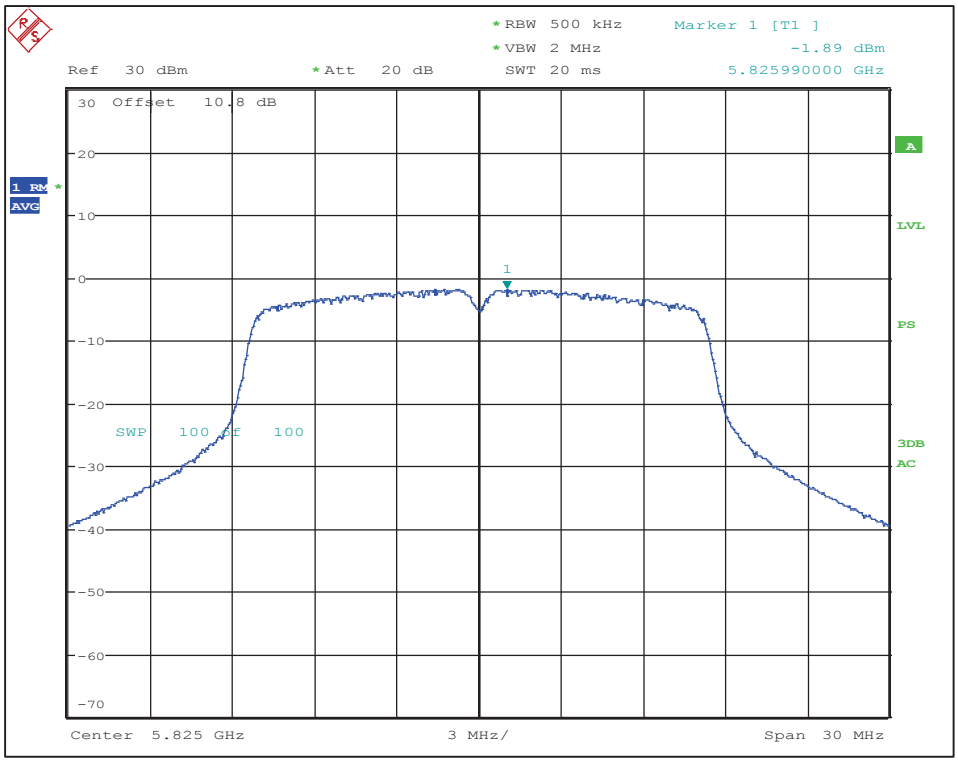
Refer to the following plots



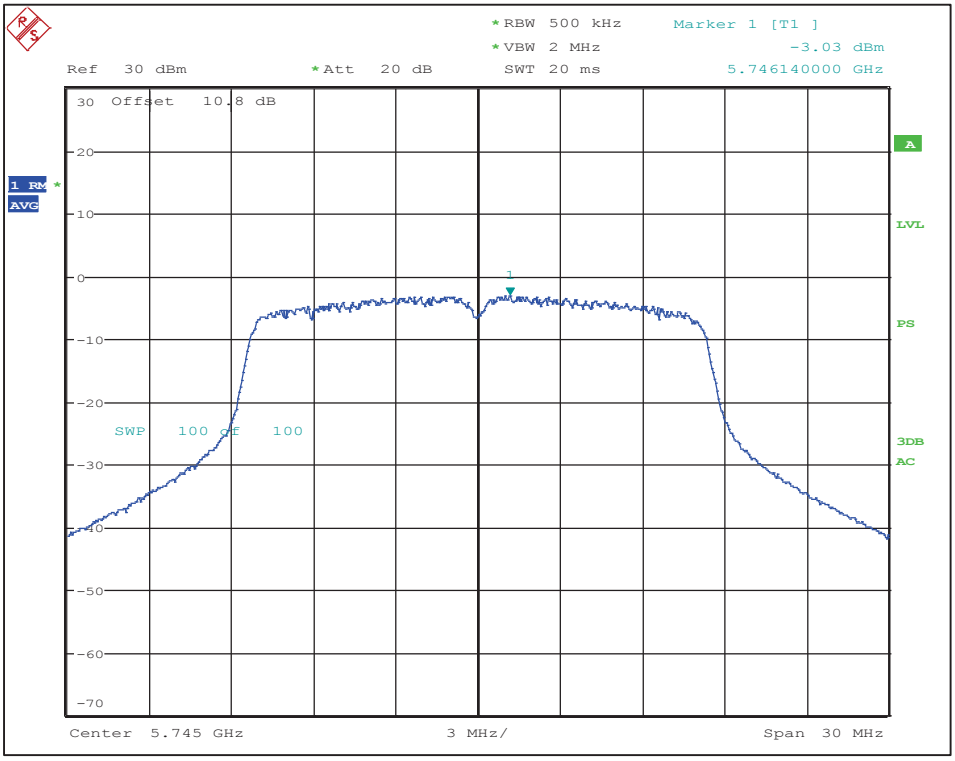
802.11a: 6 Mbps - Channel 149 (5745 MHz) Maximum PSD



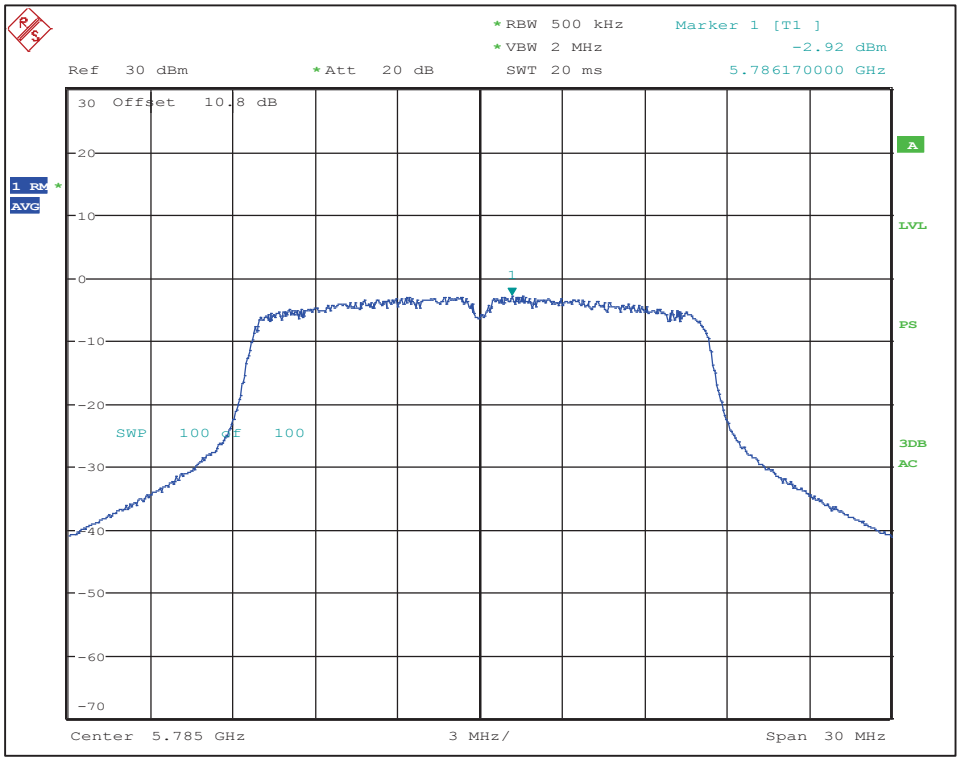
802.11a: 6 Mbps - Channel 157 (5785 MHz) Maximum PSD



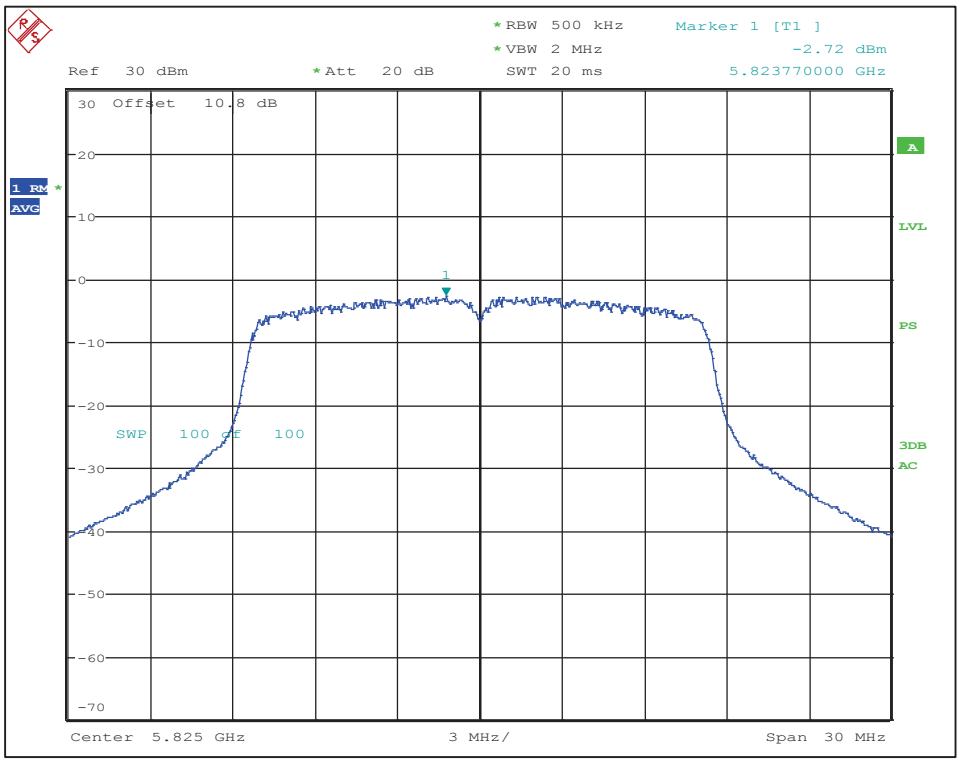
802.11a: 6 Mbps - Channel 165 (5825 MHz) Maximum PSD



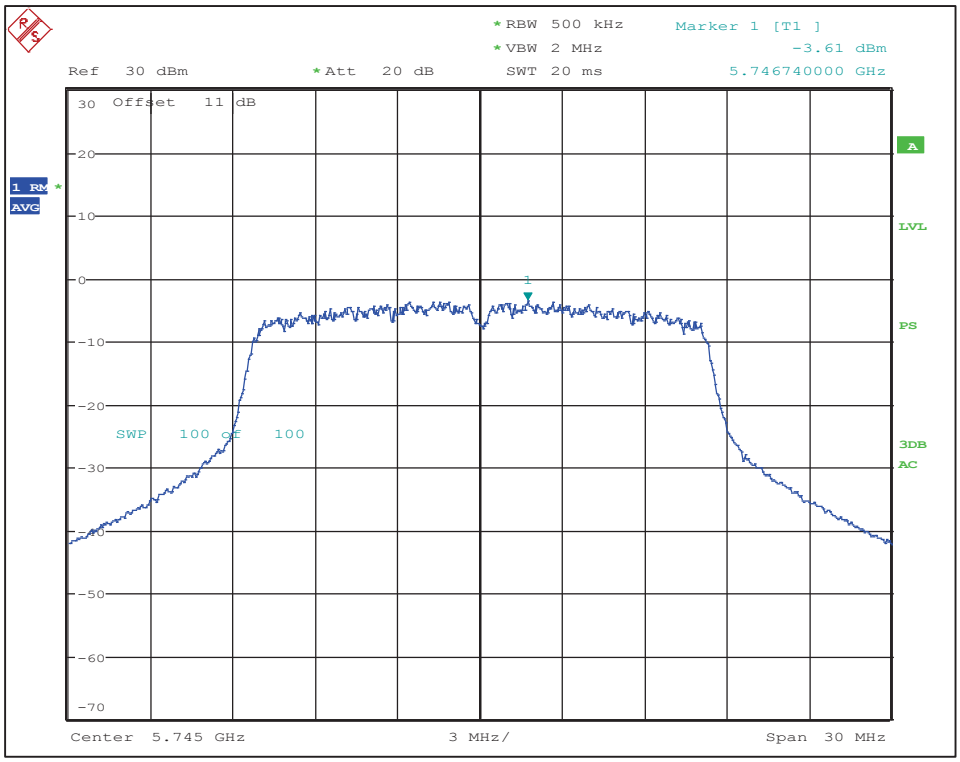
802.11a: 12 Mbps - Channel 149 (5745 MHz) Maximum PSD



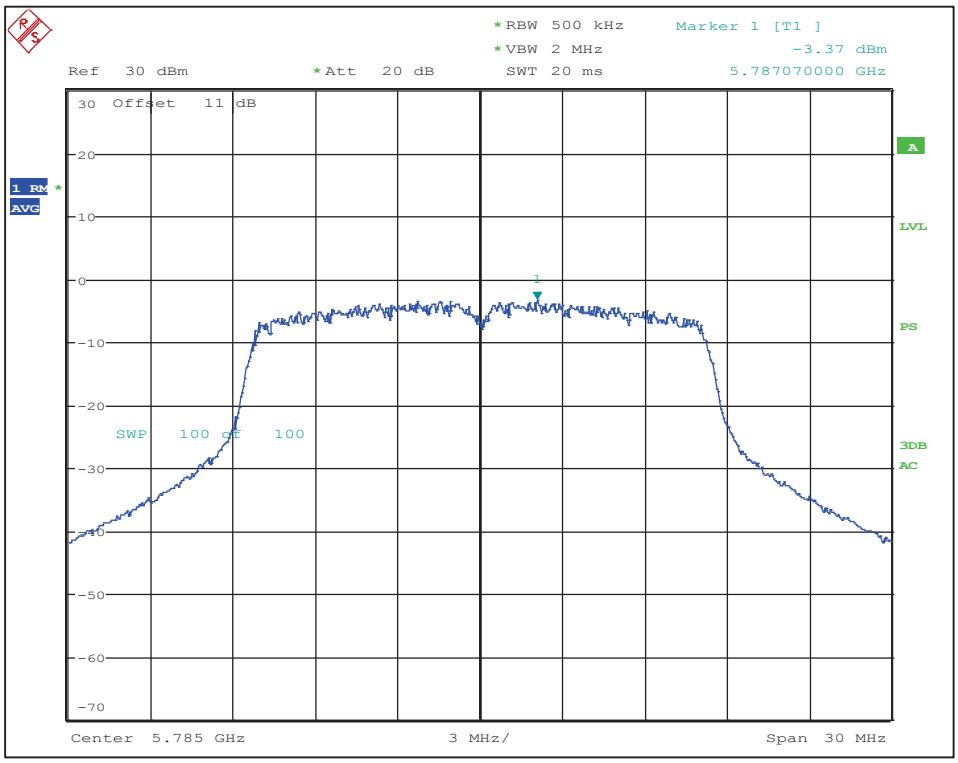
802.11a: 12 Mbps - Channel 157 (5785 MHz) Maximum PSD



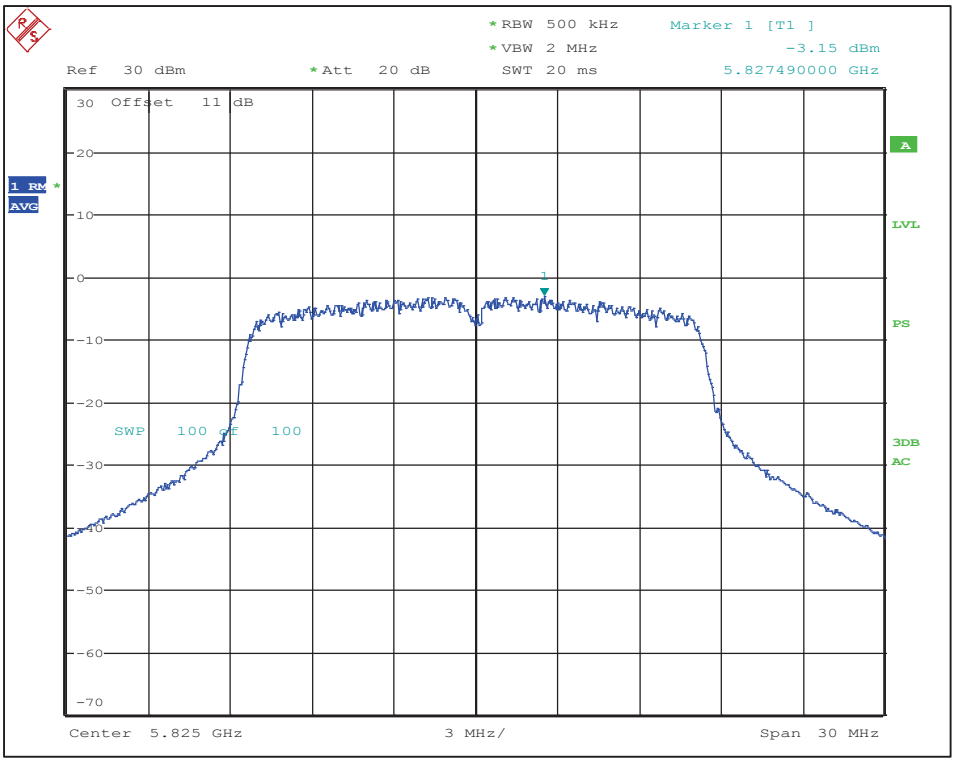
802.11a: 12 Mbps - Channel 165 (5825 MHz) Maximum PSD



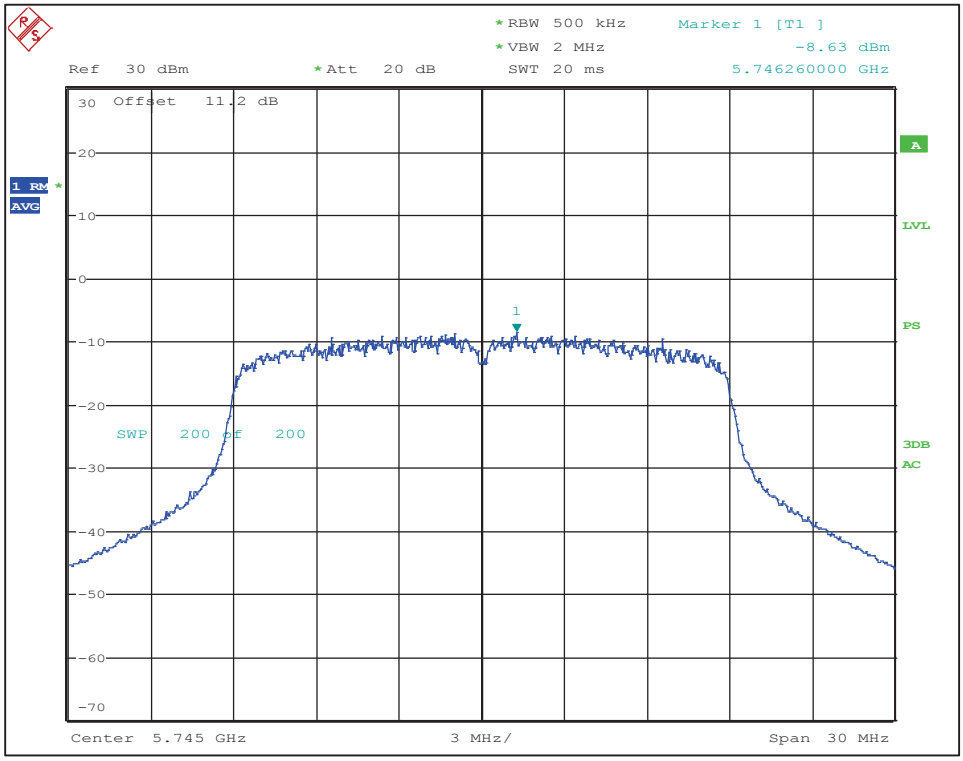
802.11a: 24 Mbps - Channel 149 (5745 MHz) Maximum PSD



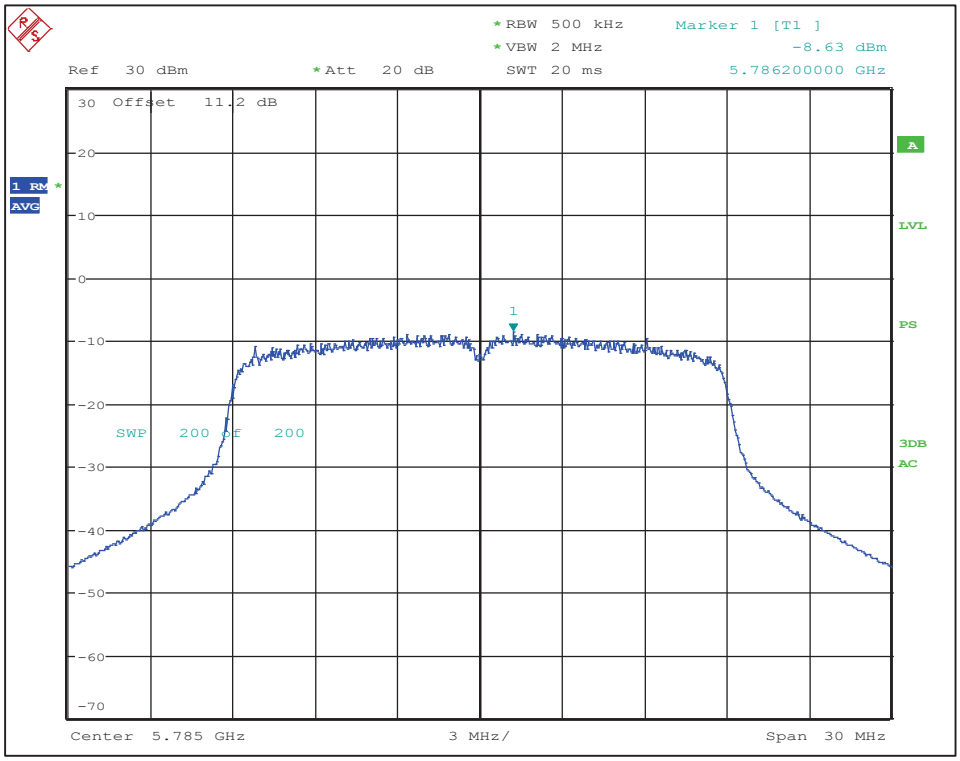
802.11a: 24 Mbps - Channel 157 (5785 MHz) Maximum PSD



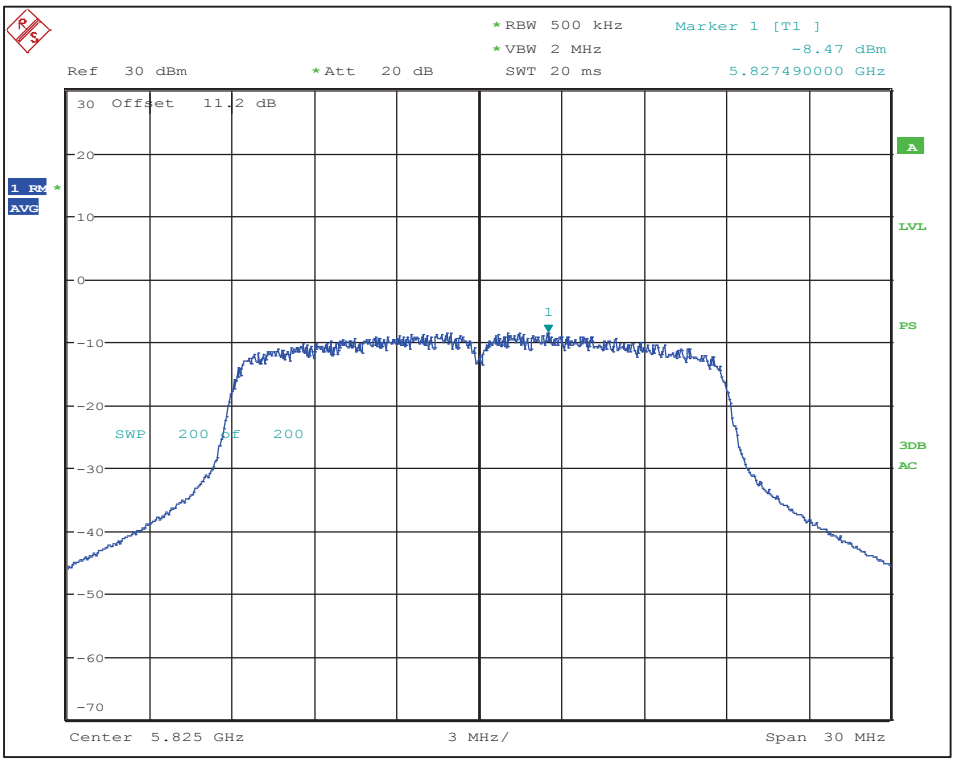
802.11a: 24 Mbps - Channel 165 (5825 MHz) Maximum PSD



802.11n: MCS7 - Channel 149 (5745 MHz) Maximum PSD



802.11n: MCS7 - Channel 157 (5785 MHz) Maximum PSD



802.11n: MCS7 - Channel 165 (5825 MHz) Maximum PSD

6.5 Unwanted Emissions

Limits

FCC Part 15 Subpart E §15.407 (b)

(1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

(2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

(3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

(4) For transmitters operating in the 5.725-5.85 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of −17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of −27 dBm/MHz.

(6) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209.

(7) The provisions of §15.205 apply to intentional radiators operating under this section.

All field strength of emissions appearing within the restricted frequency bands as specified in §15.205 shall not exceed the limits shown in the following table (§15.209 Radiated Emission limits)

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

§15.209 Radiated Emission limits

IC RSS-247 Issue 1 §6.2

6.2.1 (2) - For transmitters operating in the band 5150-5250 MHz, all emissions outside the band 5150-5350 MHz shall not exceed -27 dBm/MHz e.i.r.p. However, any unwanted emissions that fall into the band 5250-5350 MHz must be 26 dBc, when measured using a resolution bandwidth between 1 and 5% of the occupied bandwidth, above 5.25 GHz.

6.2.2 (2) - i) For devices with both operating frequencies and channel bandwidths contained within the band 5250-5350 MHz, the device shall comply with the following:

a. All emissions outside the band 5250-5350 MHz shall not exceed -27 dBm/MHz e.i.r.p. if the equipment is intended for outdoor use; or

b. All emissions outside the band 5150-5350 MHz shall not exceed -27 dBm/MHz e.i.r.p. and any emissions within the band 5150-5250 MHz shall meet the power spectral density limits of Section 6.2.1. The device shall be labelled “for indoor use only.”

ii) For devices with operating frequencies in the band 5250-5350 MHz but having a channel bandwidth that overlaps the band 5150-5250 MHz, the devices’ unwanted emission shall not exceed -27 dBm/MHz e.i.r.p. outside the band 5150-5350 MHz and its power shall comply with the spectral power density for operation within the band 5150-5250 MHz. The device shall be labelled “for indoor use only.”

6.2.3 (2) - Emissions outside the band 5470-5725 MHz shall not exceed -27 dBm/MHz e.i.r.p.

6.2.4 (2) - For the band 5725-5850 MHz, emissions at frequencies from the band edges to 10 MHz above or below the band edges shall not exceed -17 dBm/MHz e.i.r.p.

For emissions at frequencies more than 10 MHz above or below the band edges, the emissions power shall not exceed -27 dBm/MHz.

Test Procedure used

KDB 789033 D02 v01 Section II.G.1: for unwanted emissions in restricted frequency bands
KDB 789033 D02 v01 Section II.G.2: for unwanted emissions that fall outside of the restricted frequency bands

Sample Calculations

For Radiated 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

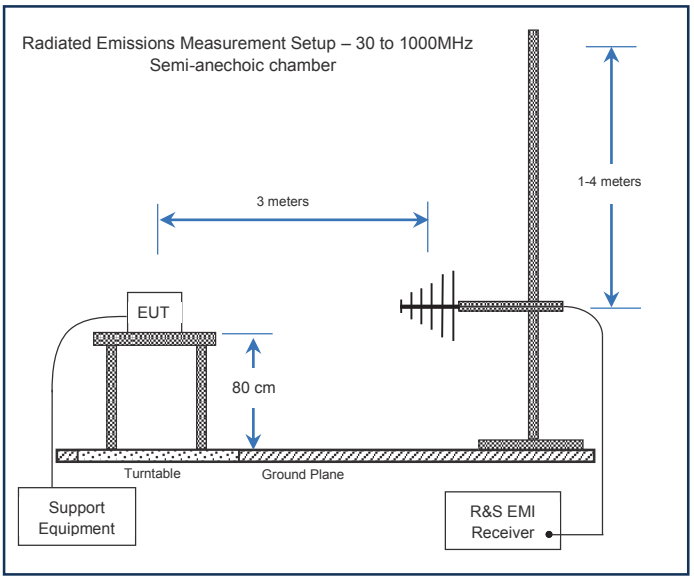
- Corrected Level $_{(dB\mu V/m)}$ = Spectrum Analyzer (SA) Reading $_{(dB\mu V/m)}$ + Correction Factor $_{(dB)}$ + Duty Cycle Factor $_{(dB)}$
- Correction Factor $_{(dB)}$ = Antenna Factor $_{(dB/m)}$ + Cable Loss $_{(dB)}$ + Filter Insertion Loss $_{(dB)}$
- Margin $_{(dB)}$ = Corrected Level $_{(dB\mu V/m)}$ – Limit $_{(dB\mu V/m)}$

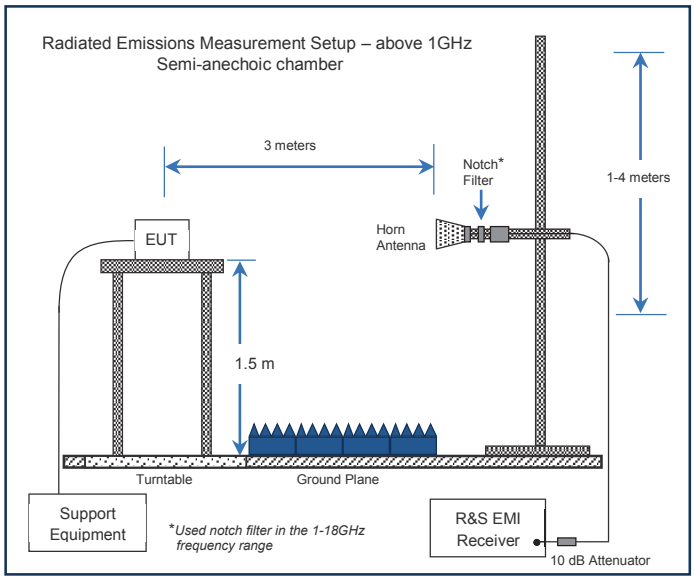
For Spurious Emissions Levels below 1GHz

- 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 $_{(dB\mu V/m)}$

Note: The general radiated emission limits above 30 MHz obtained from Title 47 CFR, Part 15.209 were applied to any signals found in the 15.205 restricted bands radiated measurements. These limits correspond to those limits listed in IC RSS-GEN.

Test Setup





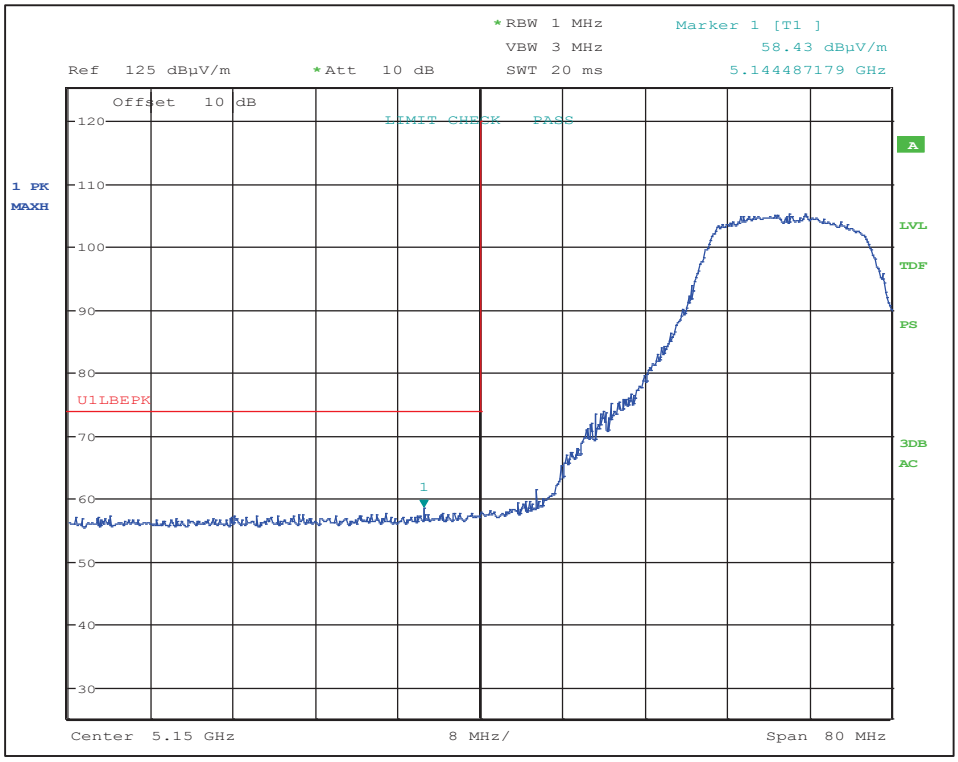
Test Results

6.5.1 Radiated Restricted Band-edge (Lower U-NII-1 Band)

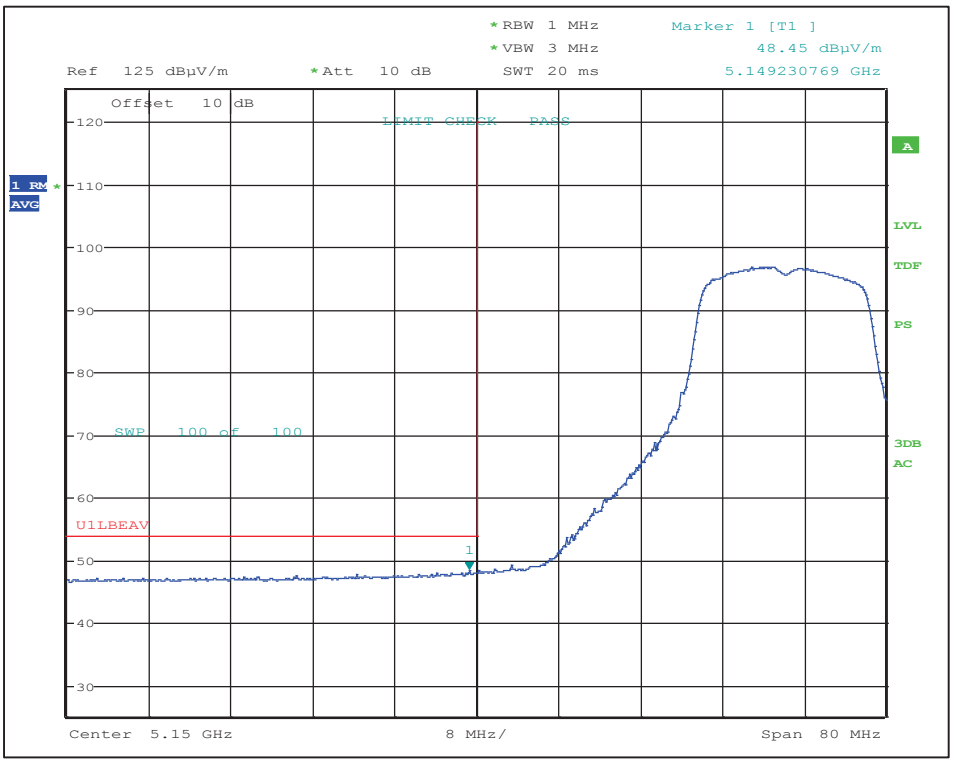
802.11a: 6Mbps, Channel 36 (5180 MHz)

Frequency (MHz)	SA Reading (dBuV/m)	Detector PK/AV	Antenna			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)						
5144.5	58.4	PK	160	V	315	V	0.00	3.9	58.4	74.0	-15.6
5149.2	48.5	AV	160	V	315	V	0.00	3.9	48.5	54.0	-5.5
5146.3	58.2	PK	180	H	36	H1	0.00	3.9	58.2	74.0	-15.8
5150.0	46.5	AV	180	H	36	H1	0.00	3.9	46.5	54.0	-7.5

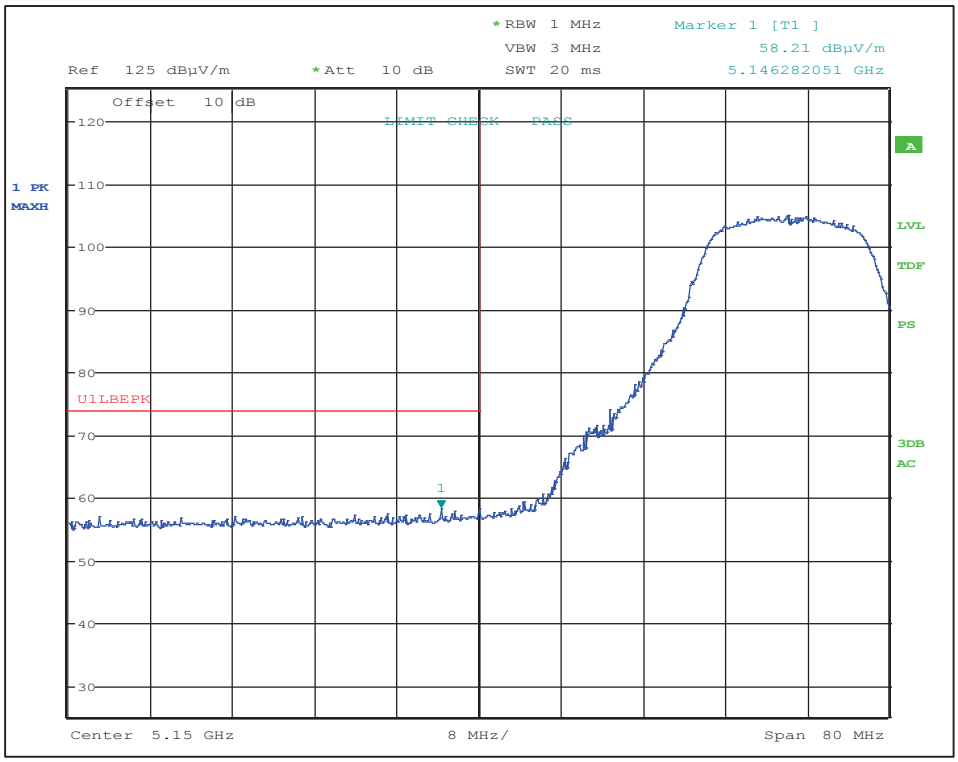
Refer to the following Plots



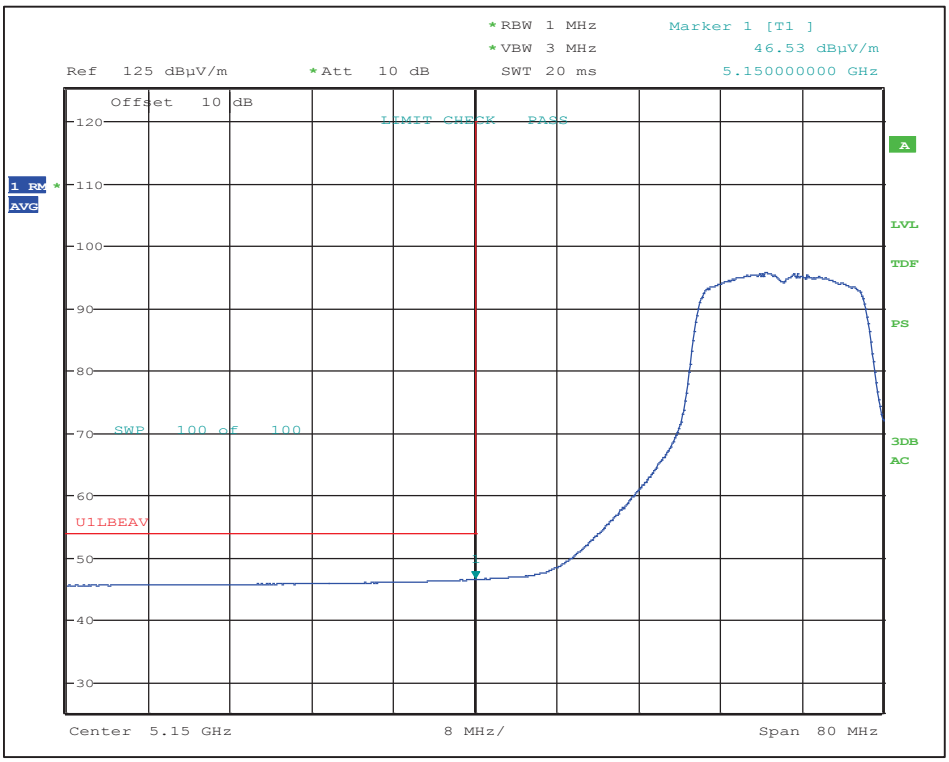
802.11a at 6Mbps – Restricted-band band-edge at channel 36 (Vertical Peak Plot)



802.11a at 6Mbps - Restricted-band band-edge at channel 36 (Vertical Average Plot)



802.11a at 6Mbps - Restricted-band band-edge at channel 36 (Horizontal Peak Plot)

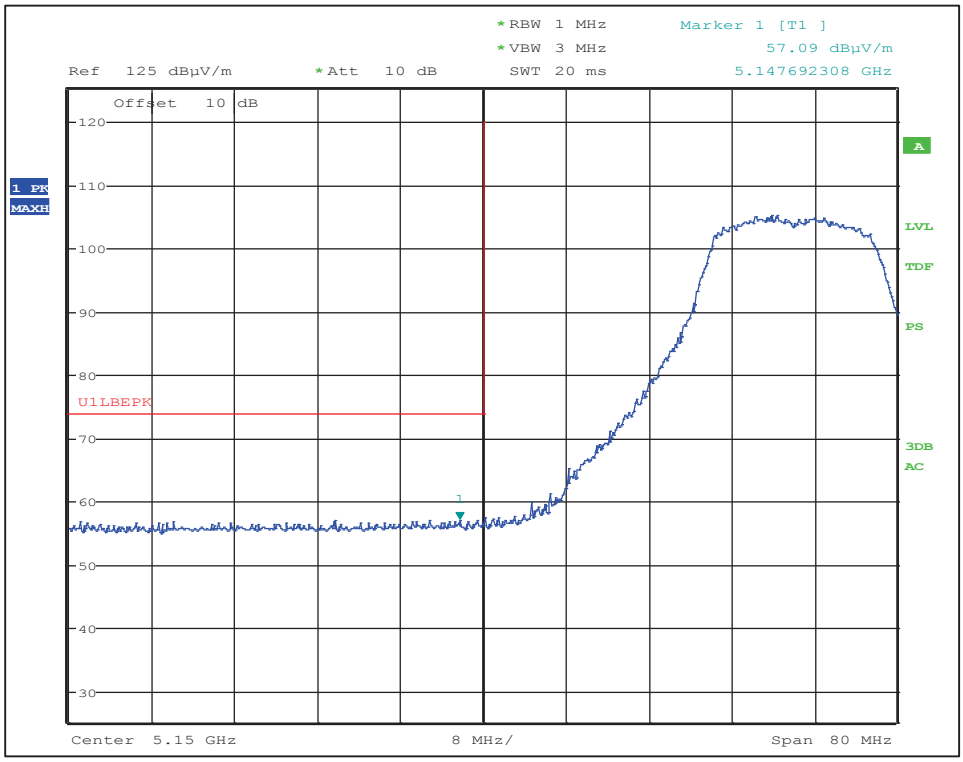


802.11a at 6Mbps - Restricted-band band-edge at channel 36 (Horizontal Average Plot)

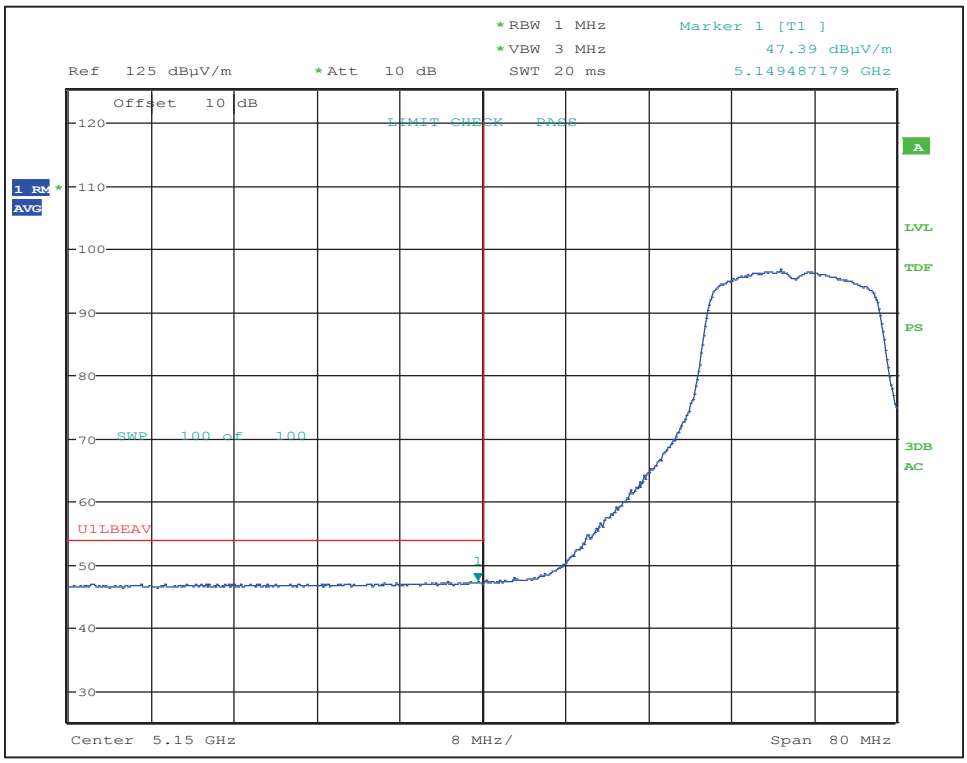
802.11a: 12Mbps, Channel 36 (5180 MHz)

Frequency (MHz)	SA Reading (dBuV/m)	Detector PK/AV	Antenna			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)						
5147.7	57.1	PK	160	V	315	V	0.00	3.9	57.1	74.0	-16.9
5149.5	47.4	AV	160	V	315	V	0.00	3.9	47.4	54.0	-6.6
5148.6	57.4	PK	180	H	36	H1	0.00	3.9	57.4	74.0	-16.6
5150.0	45.9	AV	180	H	36	H1	0.00	3.9	45.9	54.0	-8.1

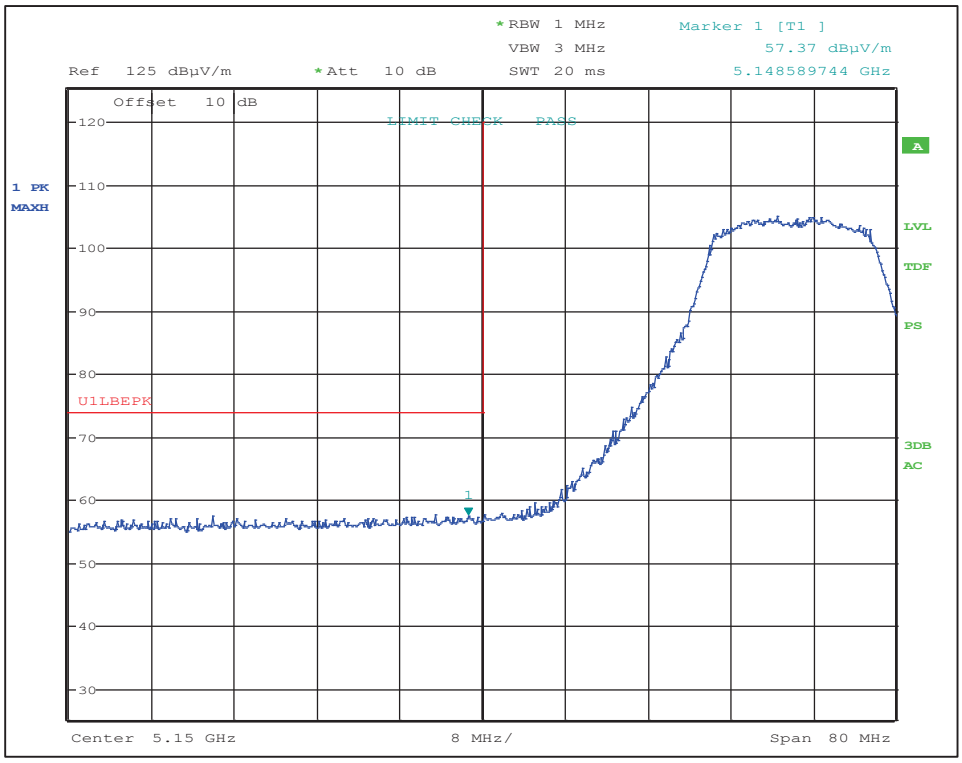
Refer to the following Plots



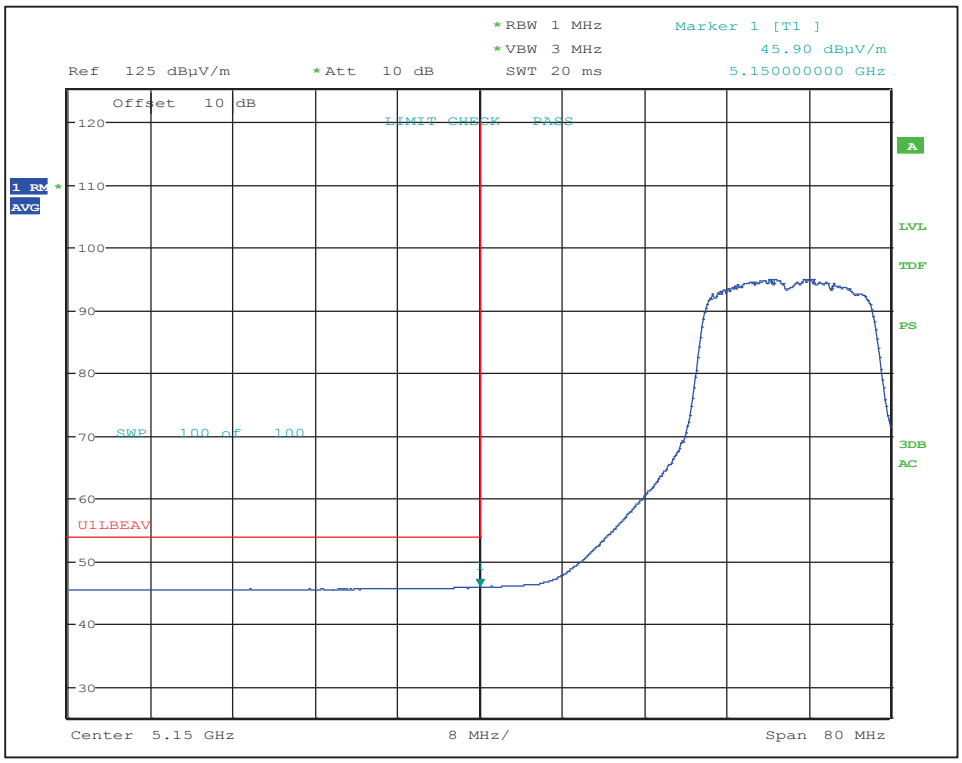
802.11a at 12Mbps - Restricted-band band-edge at channel 36 (Vertical Peak Plot)



802.11a at 12Mbps - Restricted-band band-edge at channel 36 (Vertical Average Plot)



802.11a at 12Mbps - Restricted-band band-edge at channel 36 (Horizontal Peak Plot)

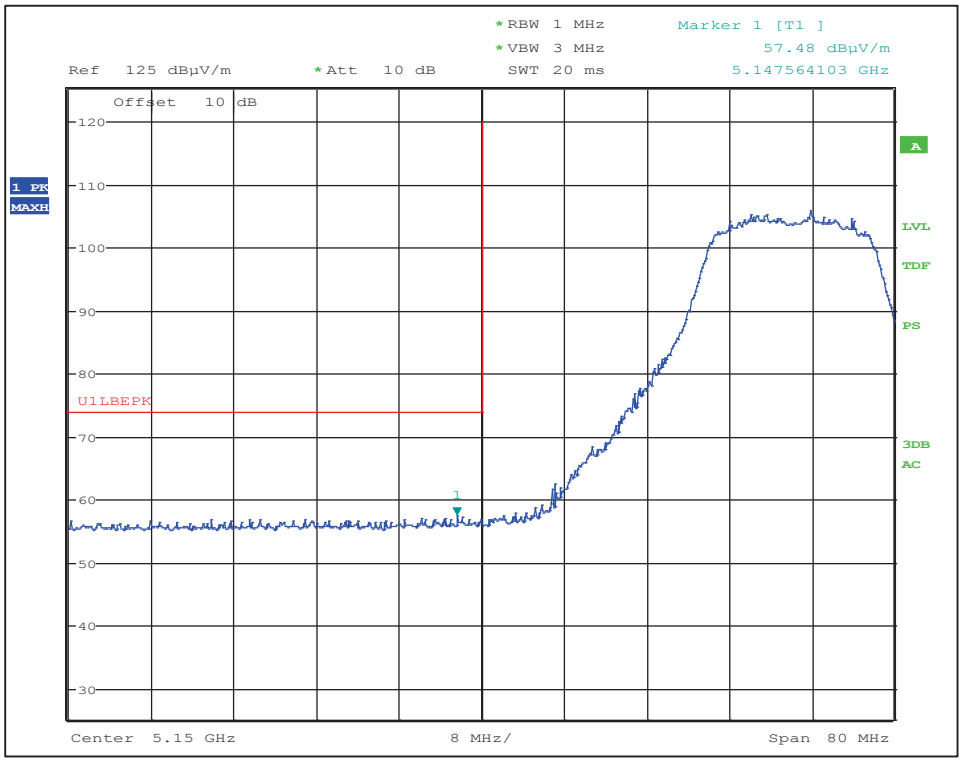


802.11a at 12Mbps - Restricted-band band-edge at channel 36 (Horizontal Average Plot)

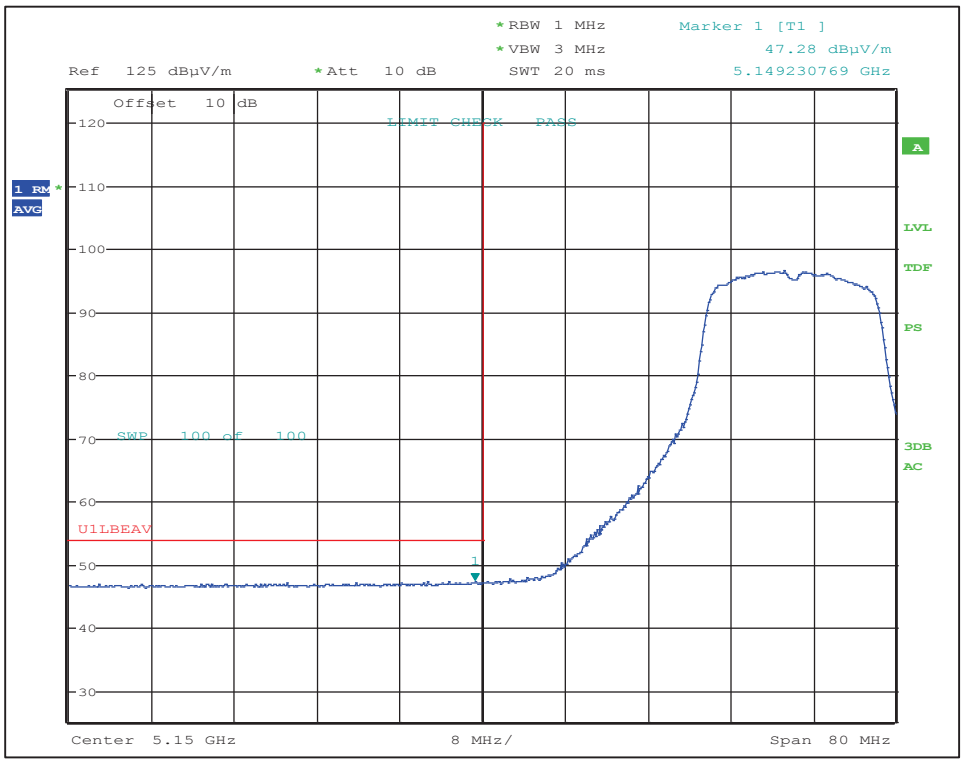
802.11a: 24Mbps, Channel 36 (5180 MHz)

Frequency (MHz)	SA Reading (dBuV/m)	Detector PK/AV	Antenna			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)						
5147.6	57.5	PK	150	V	315	V	0.00	3.9	57.5	74.0	-16.5
5149.2	47.3	AV	150	V	315	V	0.15	3.9	47.5	54.0	-6.5
5149.0	57.9	PK	180	H	36	H1	0.00	3.9	57.9	74.0	-16.1
5150.0	45.9	AV	180	H	36	H1	0.15	3.9	46.1	54.0	-7.9

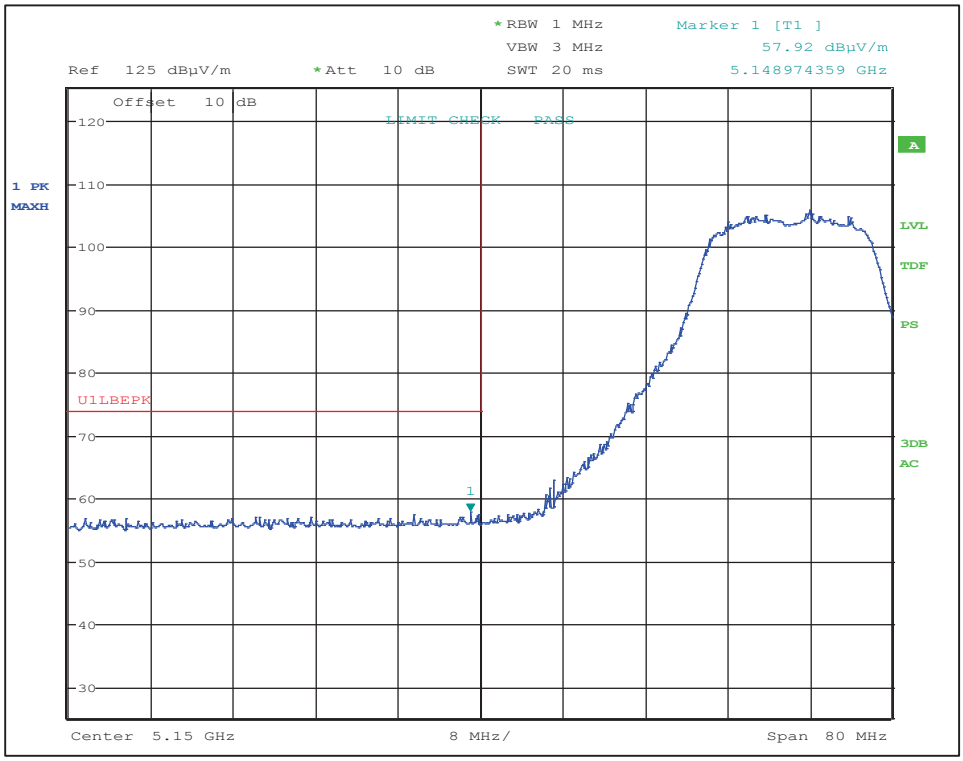
Refer to the following Plots



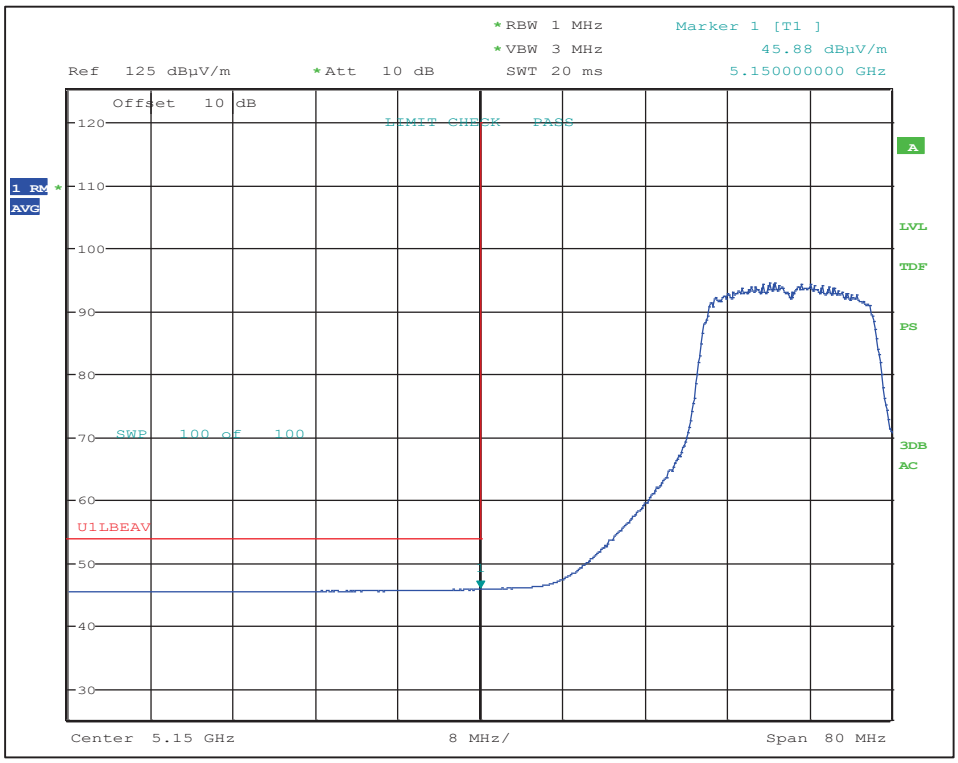
802.11a at 24Mbps - Restricted-band band-edge at channel 36 (Vertical Peak Plot)



802.11a at 24Mbps - Restricted-band band-edge at channel 36 (Vertical Average Plot)



802.11a at 24Mbps - Restricted-band band-edge at channel 36 (Horizontal Peak Plot)

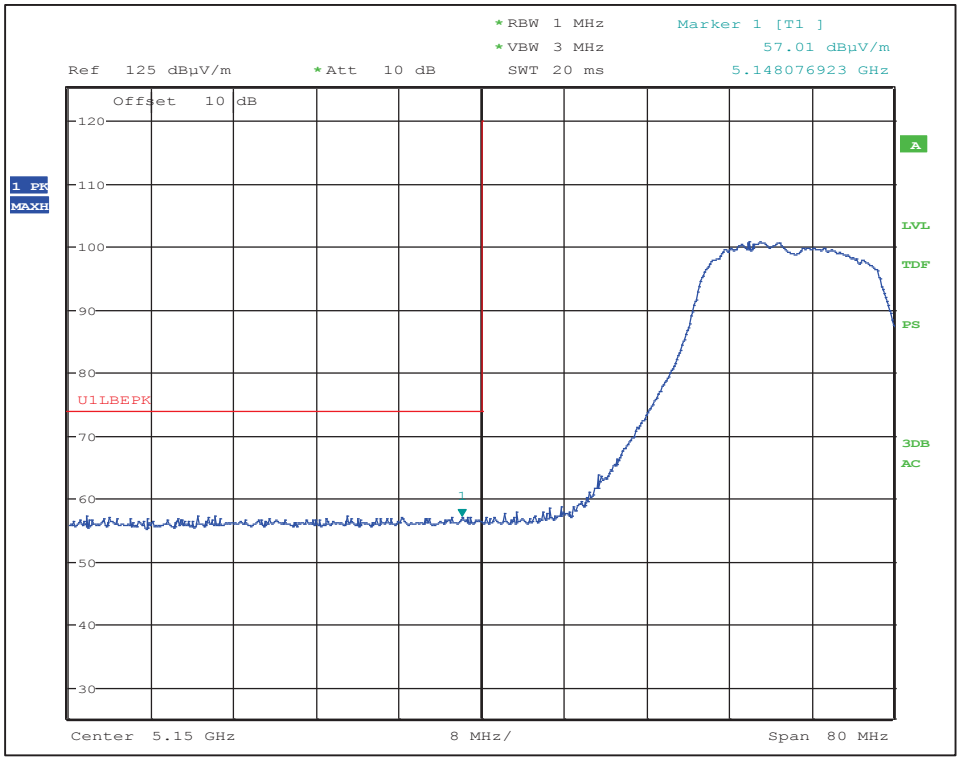


802.11a at 24Mbps - Restricted-band band-edge at channel 36 (Horizontal Average Plot)

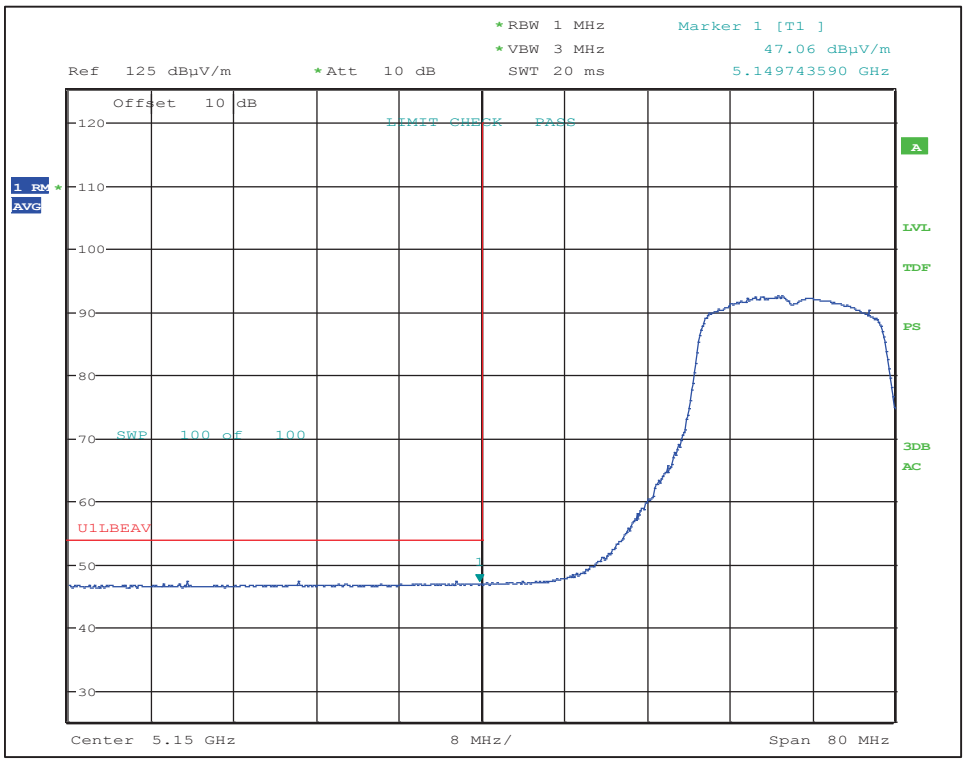
802.11a: MCS7, Channel 36 (5180 MHz)

Frequency (MHz)	SA Reading (dBuV/m)	Detector PK/AV	Antenna			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)						
5148.1	57.0	PK	145	V	315	V	0.00	3.9	57.0	74.0	-17.0
5149.7	47.1	AV	145	V	315	V	0.39	3.9	47.5	54.0	-6.5
5149.0	56.6	PK	180	H	36	H1	0.00	3.9	56.6	74.0	-17.4
5150.0	45.7	AV	180	H	36	H1	0.39	3.9	46.1	54.0	-7.9

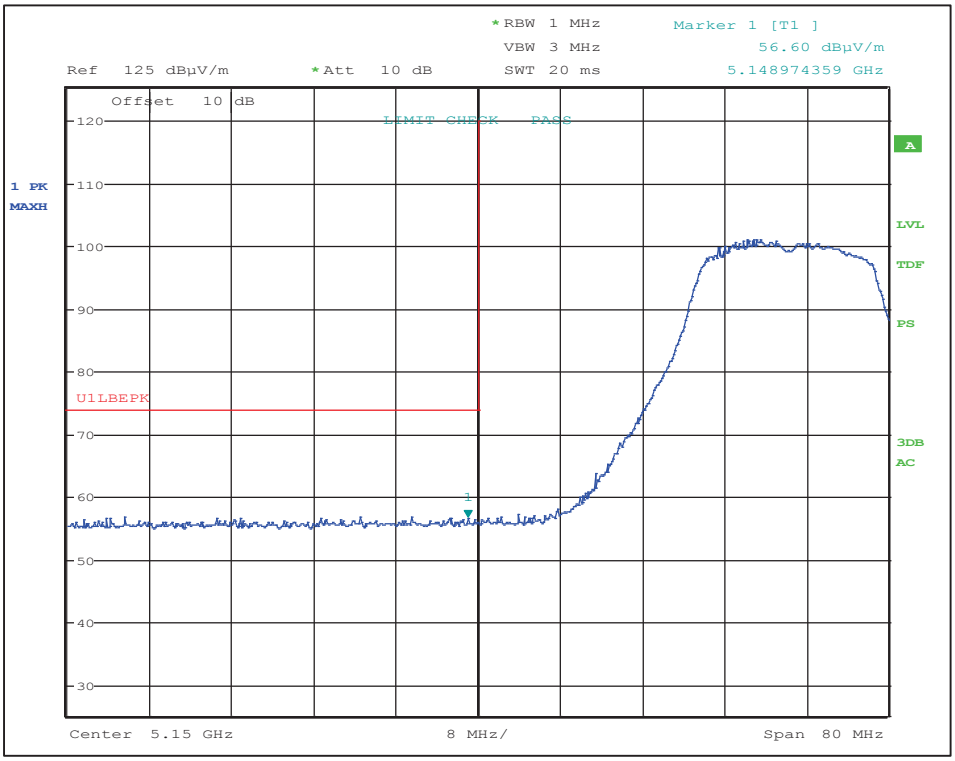
Refer to the following Plots



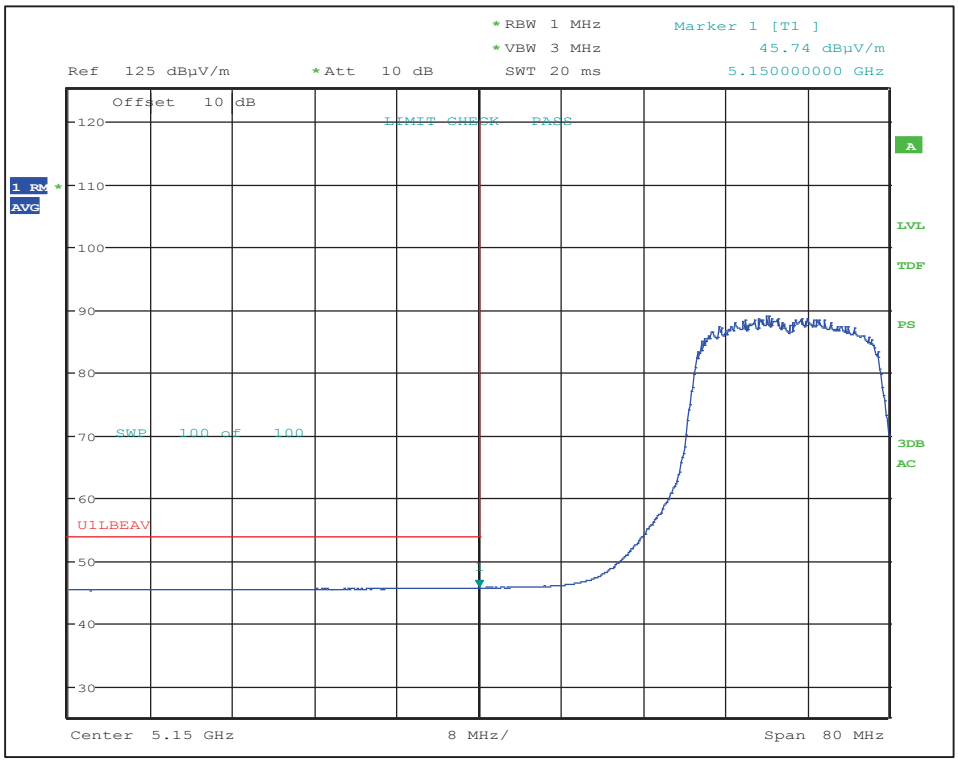
802.11n at MCS7 - Restricted-band band-edge at channel 36 (Vertical Peak Plot)



802.11n at MCS7 - Restricted-band band-edge at channel 36 (Vertical Average Plot)



802.11n at MCS7 - Restricted-band band-edge at channel 36 (Horizontal Peak Plot)



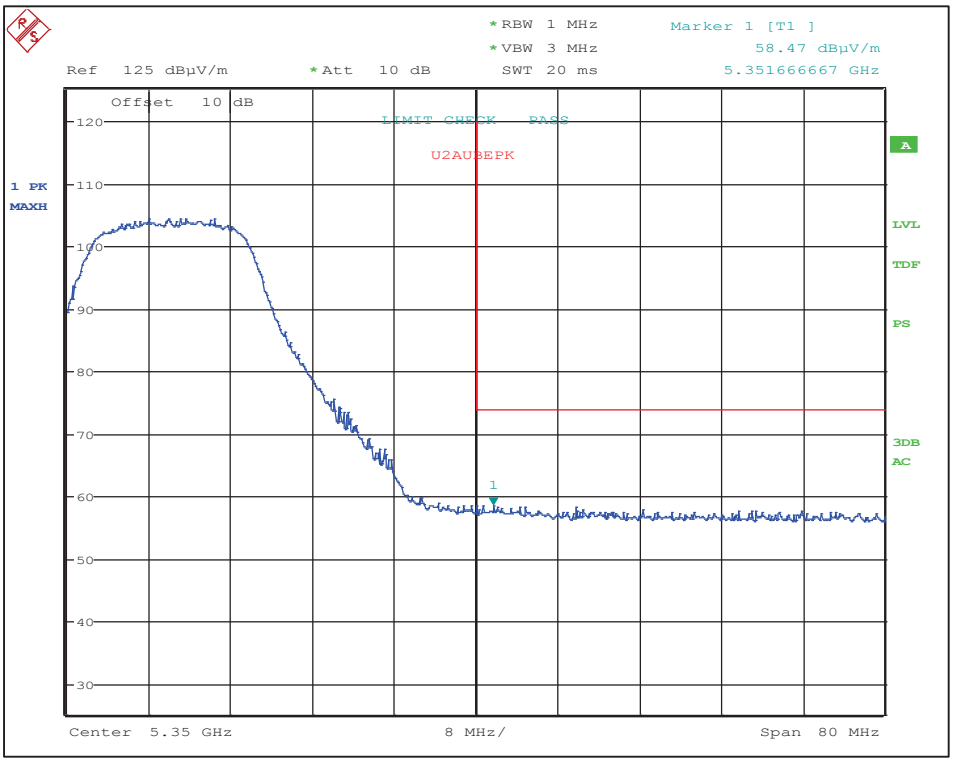
802.11n at MCS7 - Restricted-band band-edge at channel 36 (Horizontal Average Plot)

6.5.2 Radiated Restricted Band-edge (Upper U-NII-2A Band)

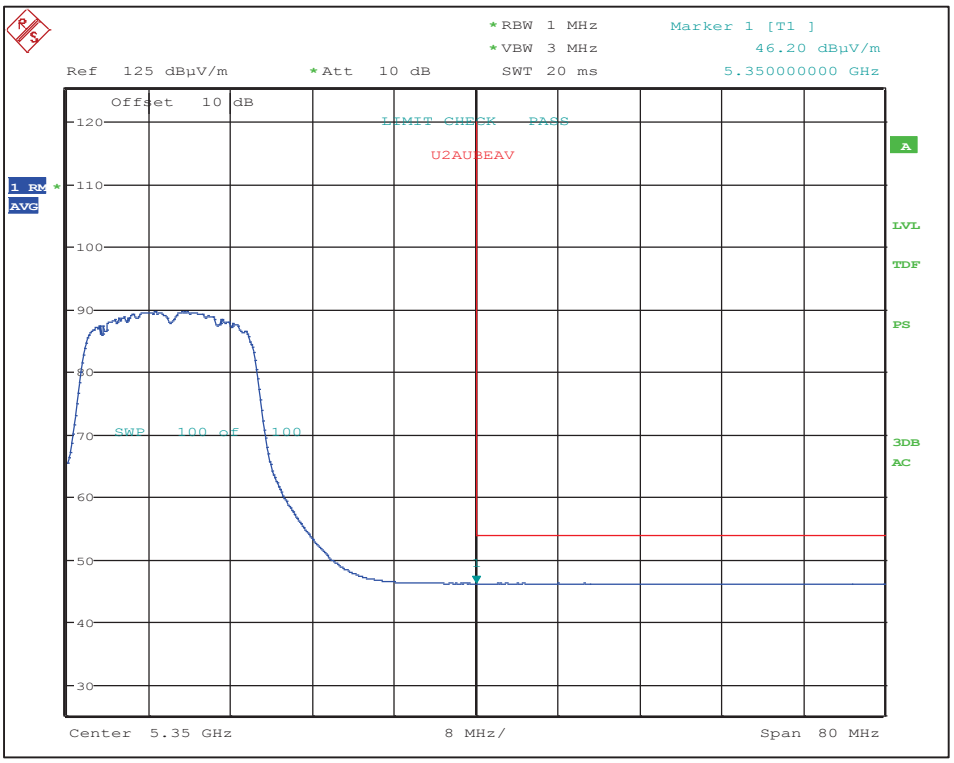
802.11a: 6 Mbps, Channel 64 (5320 MHz)

Frequency (MHz)	SA Reading (dBuV/m)	Detector PK/AV	Antenna			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)						
5351.7	58.5	PK	180	V	285	V	0.00	3.5	58.5	74.0	-15.5
5350.0	46.2	AV	180	V	285	V	0.00	3.5	46.2	54.0	-7.8
5355.1	58.2	PK	180	H	35	H1	0.00	3.4	58.2	74.0	-15.8
5350.0	46.8	AV	180	H	35	H1	0.00	3.4	46.8	54.0	-7.2

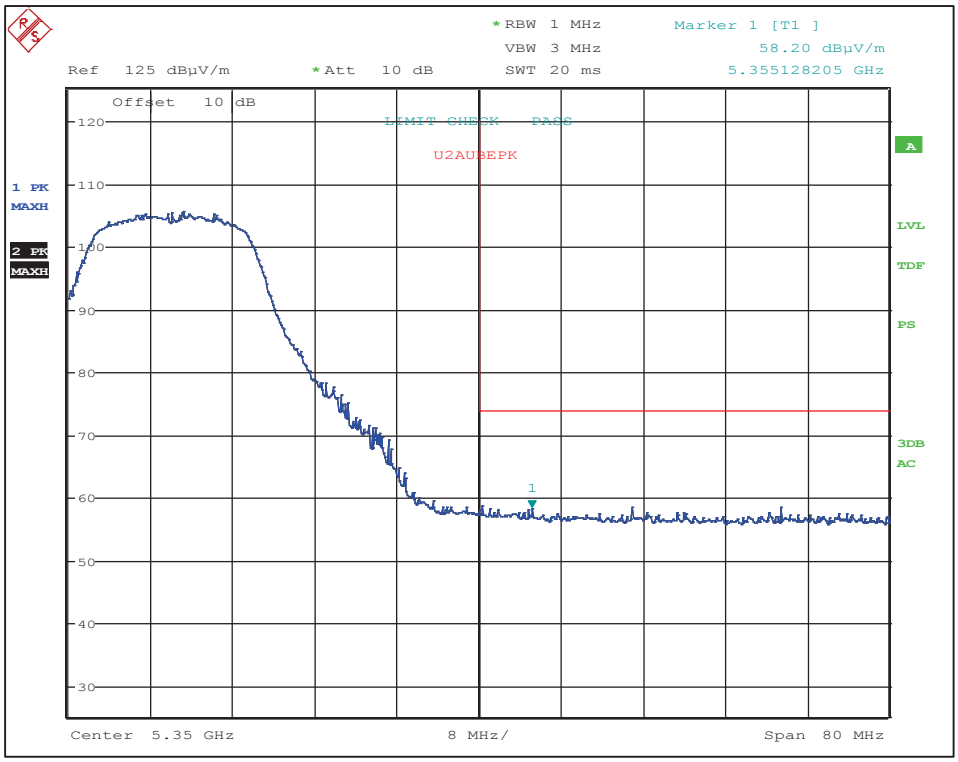
Refer to the following Plots



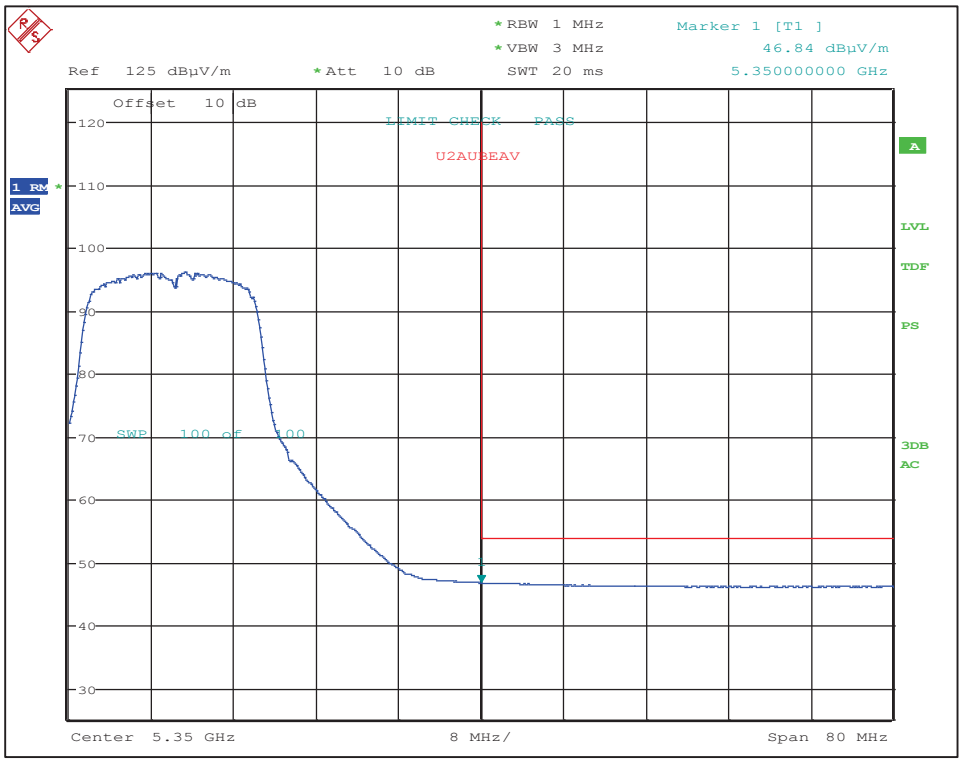
802.11a at 6Mbps - Restricted-band band-edge at channel 64 (Vertical Peak Plot)



802.11a at 6Mbps - Restricted-band band-edge at channel 64 (Vertical Average Plot)



802.11a at 6Mbps - Restricted-band band-edge at channel 64 (Horizontal Peak Plot)

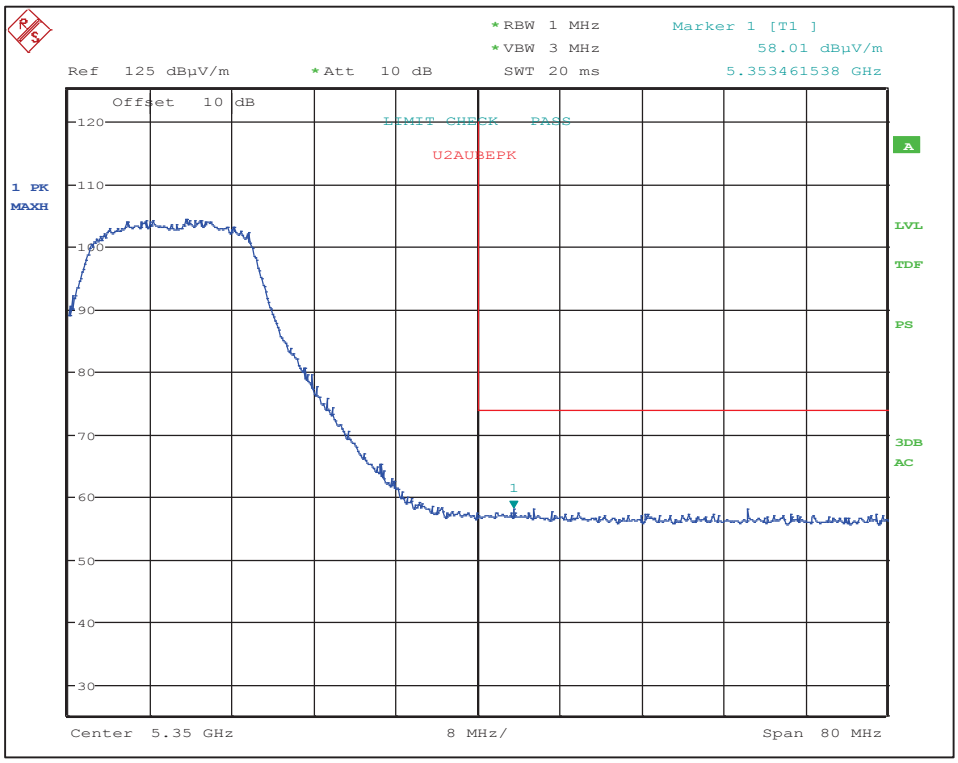


802.11a at 6Mbps - Restricted-band band-edge at channel 64 (Horizontal Average Plot)

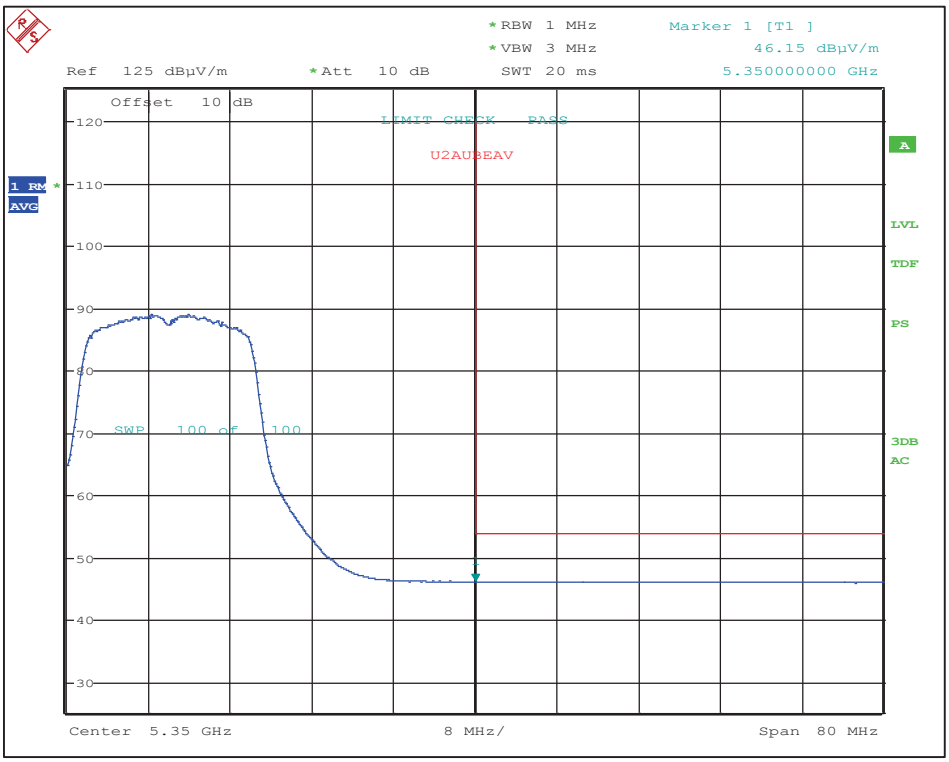
802.11a: 12 Mbps, Channel 64 (5320 MHz)

Frequency (MHz)	SA Reading (dBuV/m)	Detector PK/AV	Antenna			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)						
5353.5	58.0	PK	150	V	285	V	0.00	3.5	58.0	74.0	-16.0
5350.0	46.2	AV	150	V	285	V	0.00	3.5	46.2	54.0	-7.8
5353.1	58.3	PK	180	H	35	H1	0.00	3.4	58.3	74.0	-15.7
5350.0	46.3	AV	180	H	35	H1	0.00	3.4	46.3	54.0	-7.7

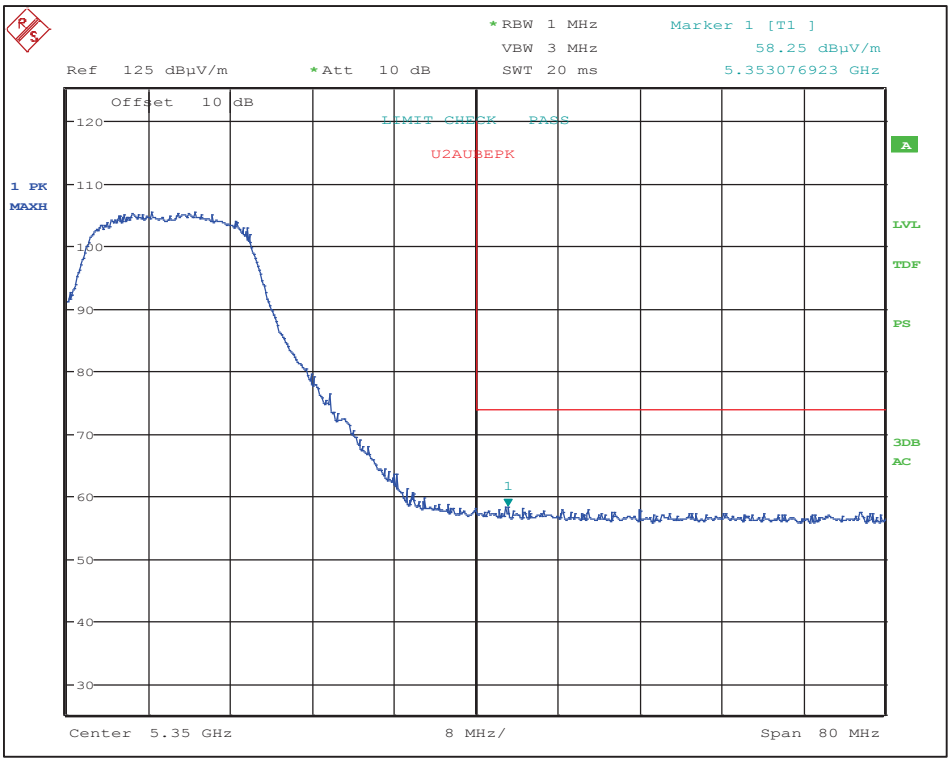
Refer to the following Plots



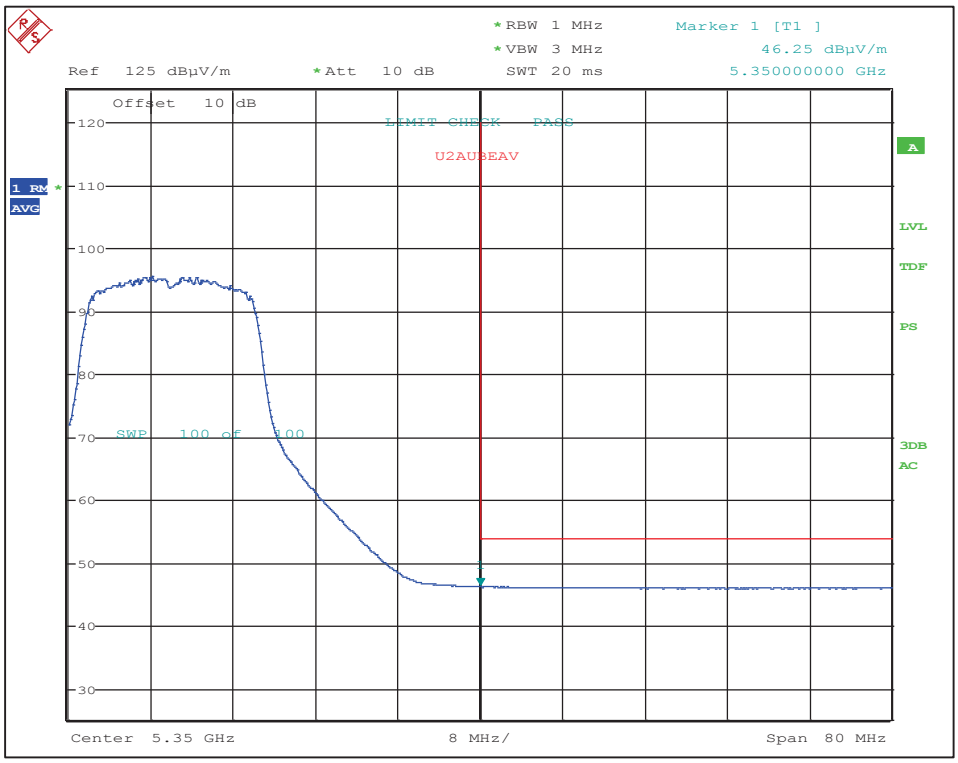
802.11a: 12Mbps - Restricted-band band-edge at channel 64 (Vertical Peak Plot)



802.11a: 12Mbps - Restricted-band band-edge at channel 64 (Vertical Average Plot)



802.11a: 12Mbps - Restricted-band band-edge at channel 64 (Horizontal Peak Plot)

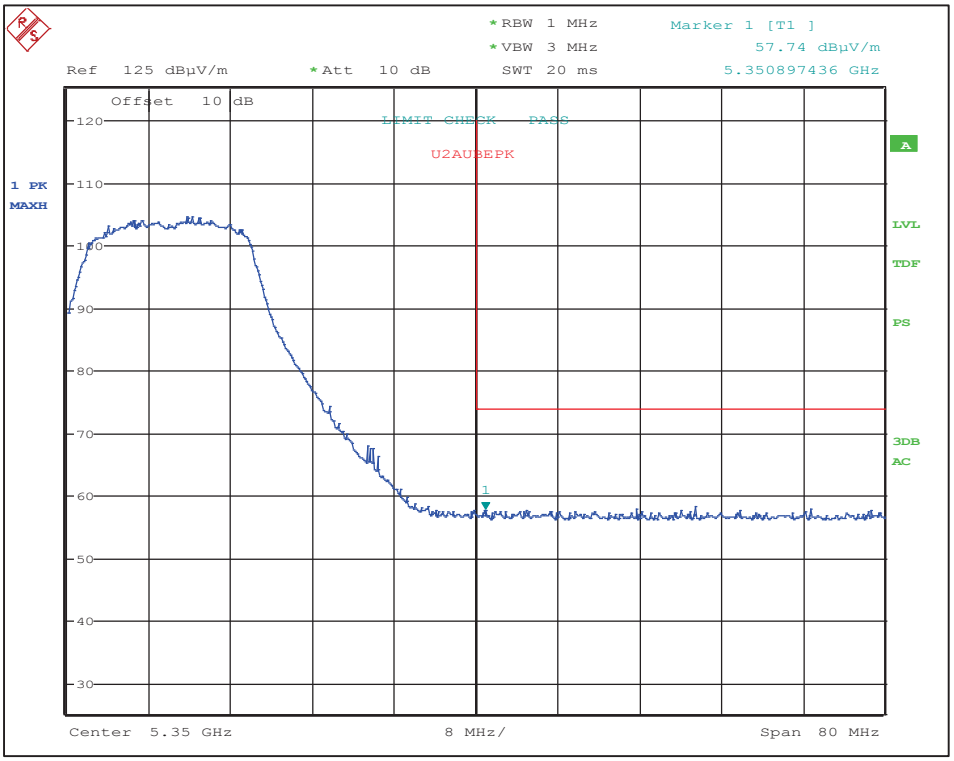


802.11a: 12Mbps - Restricted-band band-edge at channel 64 (Horizontal Average Plot)

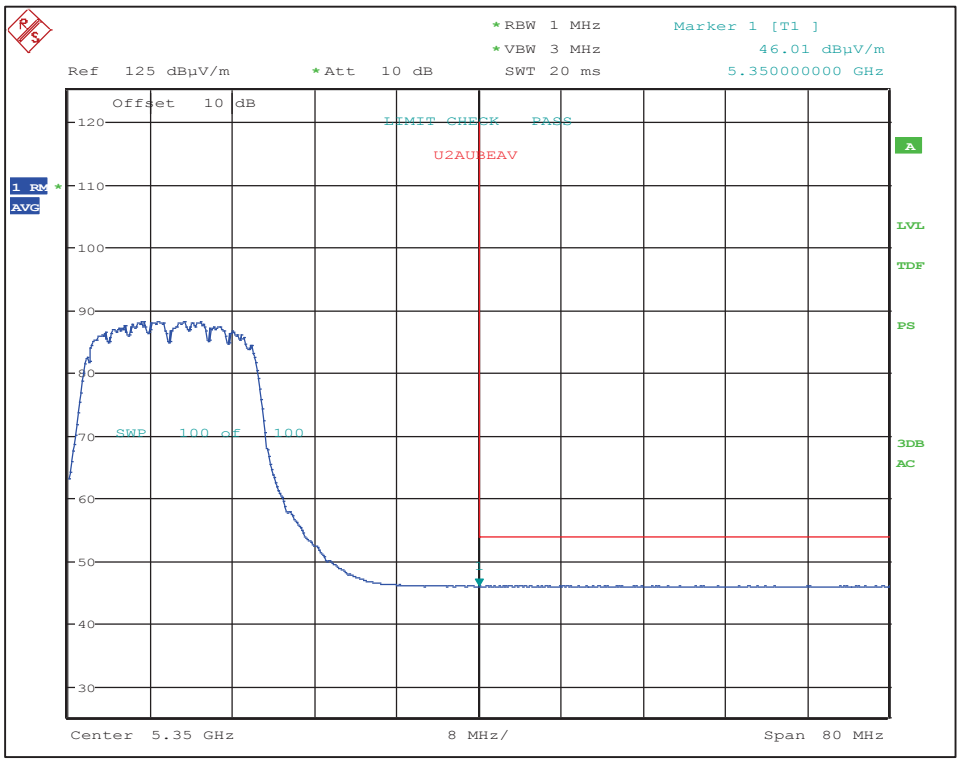
802.11a: 24 Mbps, Channel 64 (5320 MHz)

Frequency (MHz)	SA Reading (dBuV/m)	Detector PK/AV	Antenna			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)						
5350.9	57.7	PK	150	V	285	V	0.00	3.5	57.7	74.0	-16.3
5350.0	46.0	AV	150	V	285	V	0.15	3.5	46.2	54.0	-7.8
5360.5	57.2	PK	180	H	35	H1	0.00	3.4	57.2	74.0	-16.8
5350.0	46.2	AV	180	H	35	H1	0.15	3.4	46.4	54.0	-7.6

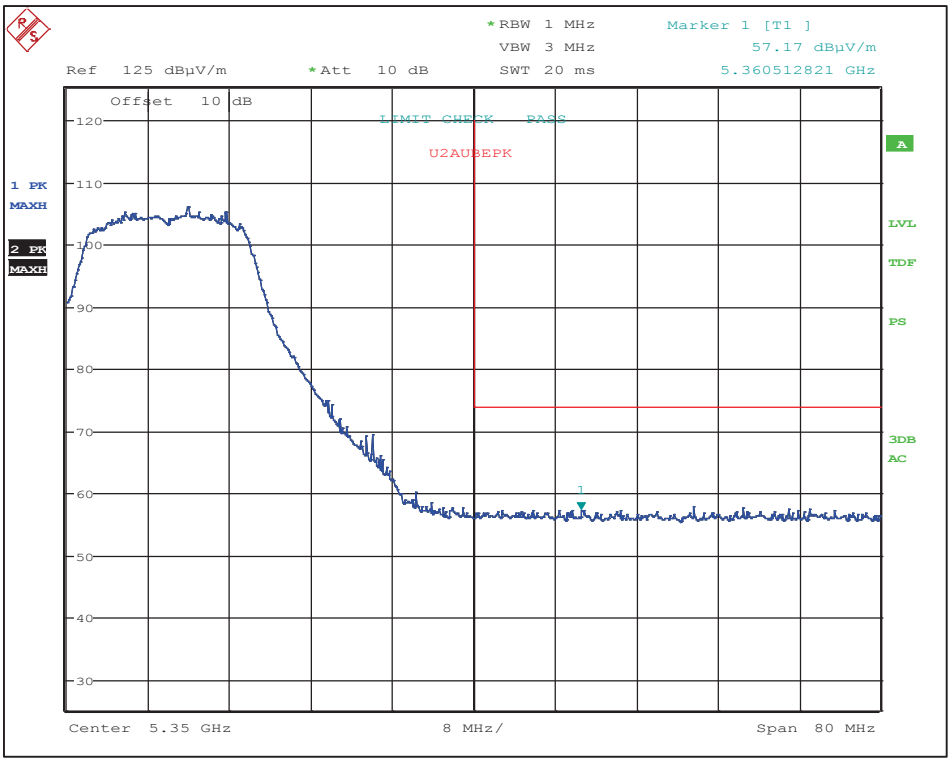
Refer to the following Plots



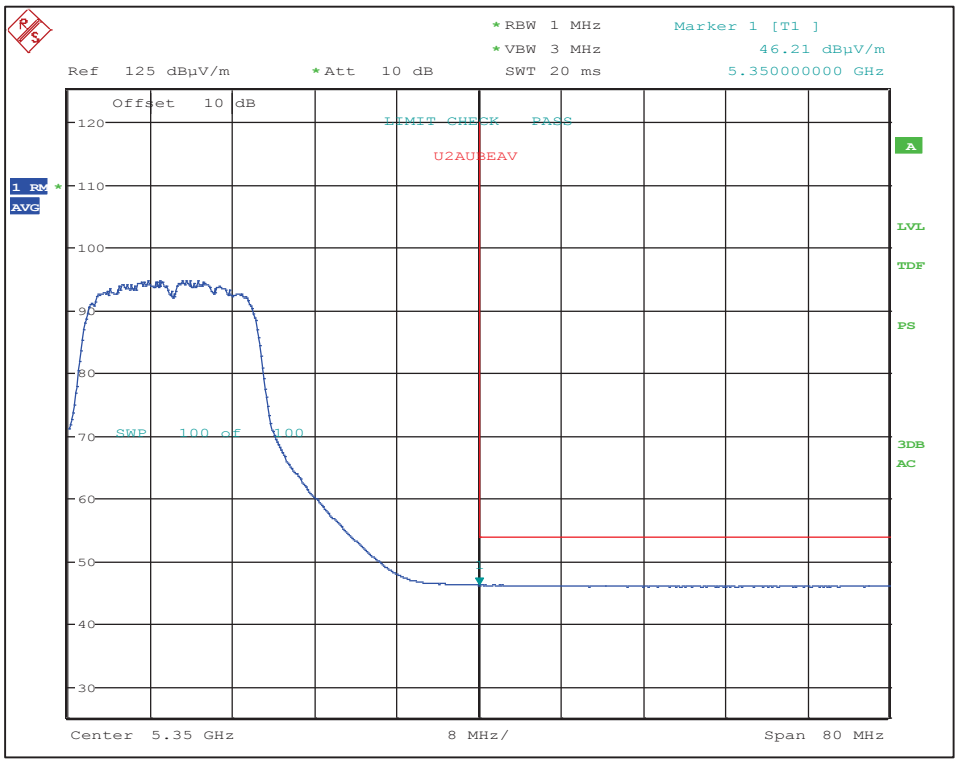
802.11a: 24Mbps - Restricted-band band-edge at channel 64 (Vertical Peak Plot)



802.11a: 24Mbps - Restricted-band band-edge at channel 64 (Vertical Average Plot)



802.11a: 24Mbps - Restricted-band band-edge at channel 64 (Horizontal Peak Plot)

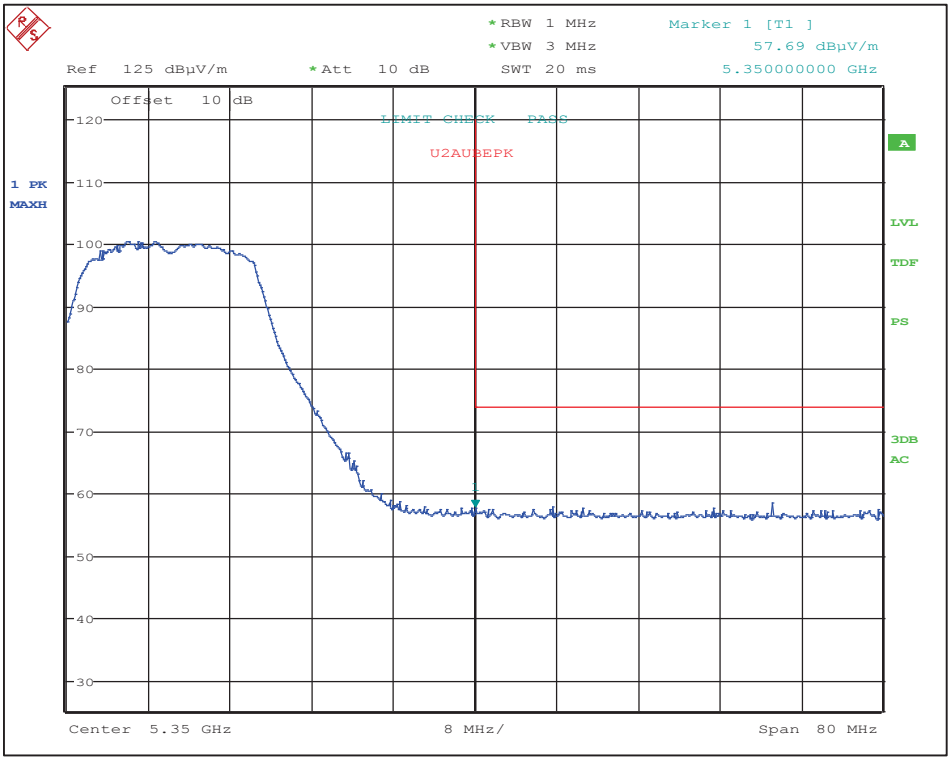


802.11a: 24Mbps - Restricted-band band-edge at channel 64 (Horizontal Average Plot)

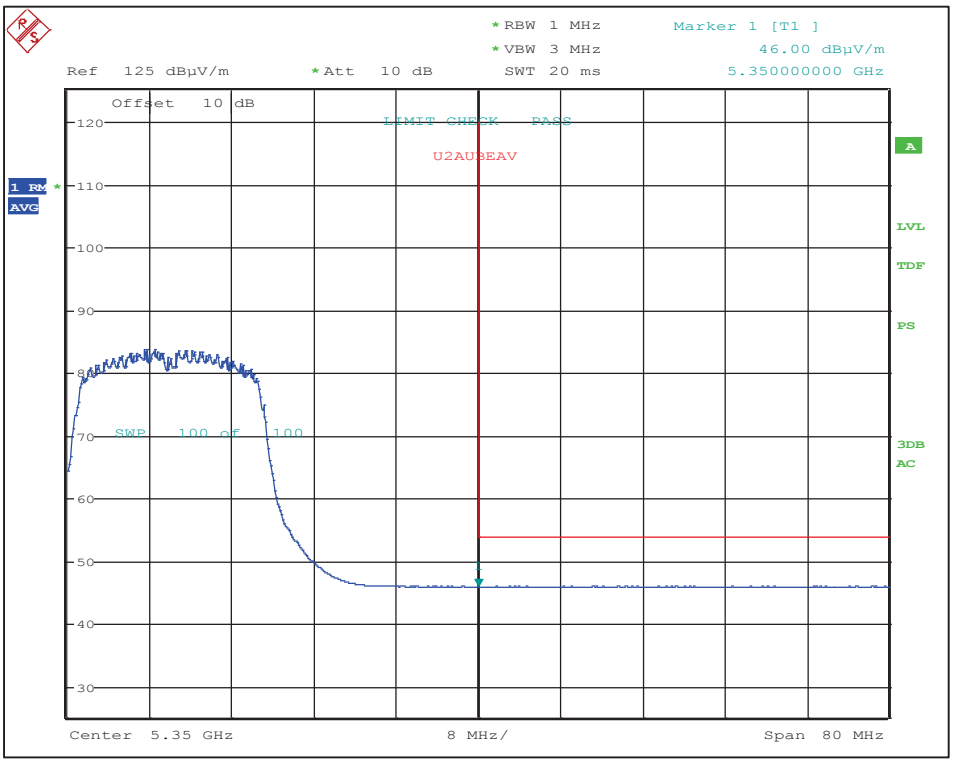
802.11a: MCS7, Channel 64 (5320 MHz)

Frequency (MHz)	SA Reading (dBuV/m)	Detector PK/AV	Antenna			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)						
5350.0	57.7	PK	150	V	285	V	0.00	3.5	57.7	74.0	-16.3
5350.0	46.0	AV	150	V	285	V	0.39	3.5	46.4	54.0	-7.6
5356.3	57.8	PK	180	H	35	H1	0.00	3.4	57.8	74.0	-16.2
5350.0	46.1	AV	180	H	35	H1	0.39	3.4	46.5	54.0	-7.5

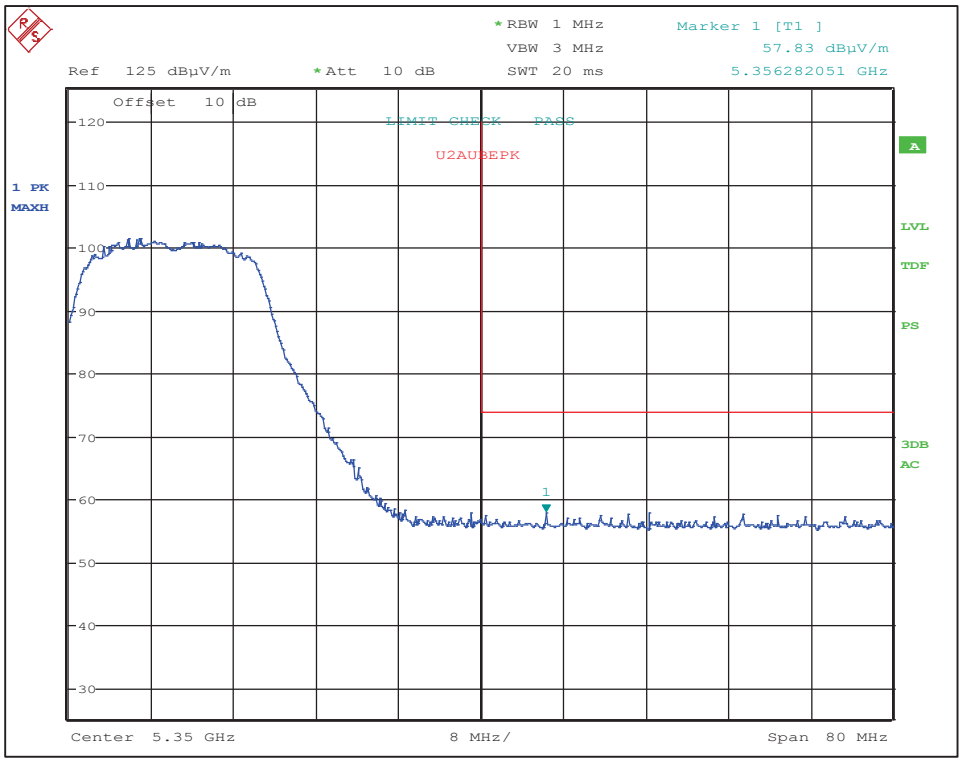
Refer to the following Plots



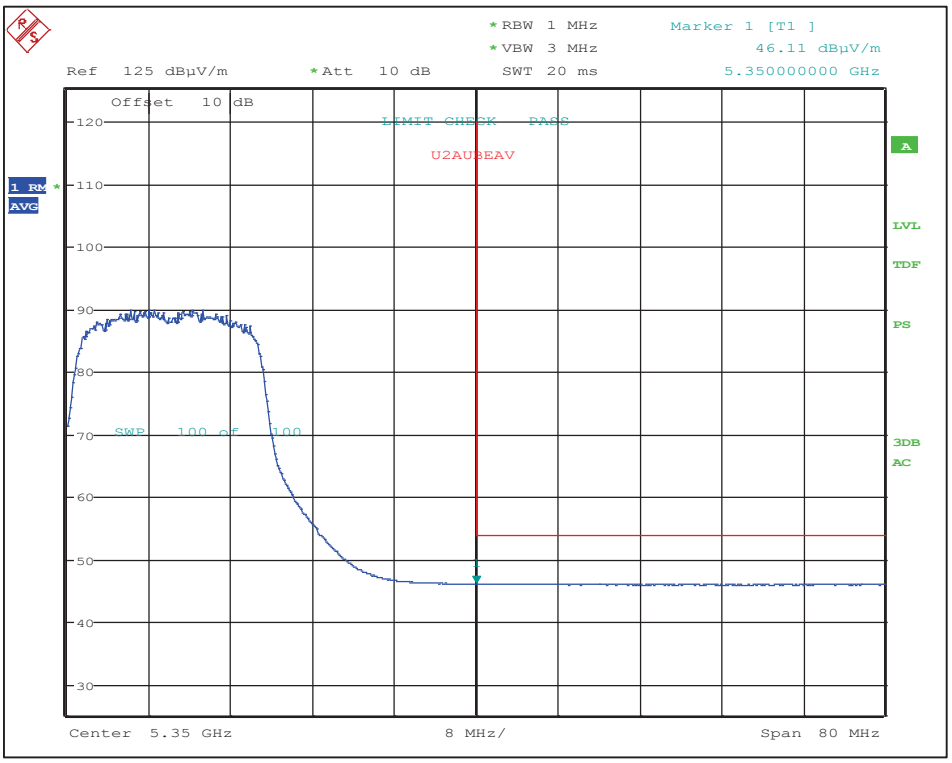
802.11n: MCS7 - Restricted-band band-edge at channel 64 (Vertical Peak Plot)



802.11n: MCS7 - Restricted-band band-edge at channel 64 (Vertical Average Plot)



802.11n: MCS7 - Restricted-band band-edge at channel 64 (Horizontal Peak Plot)



802.11n: MCS7 - Restricted-band band-edge at channel 64 (Horizontal Average Plot)

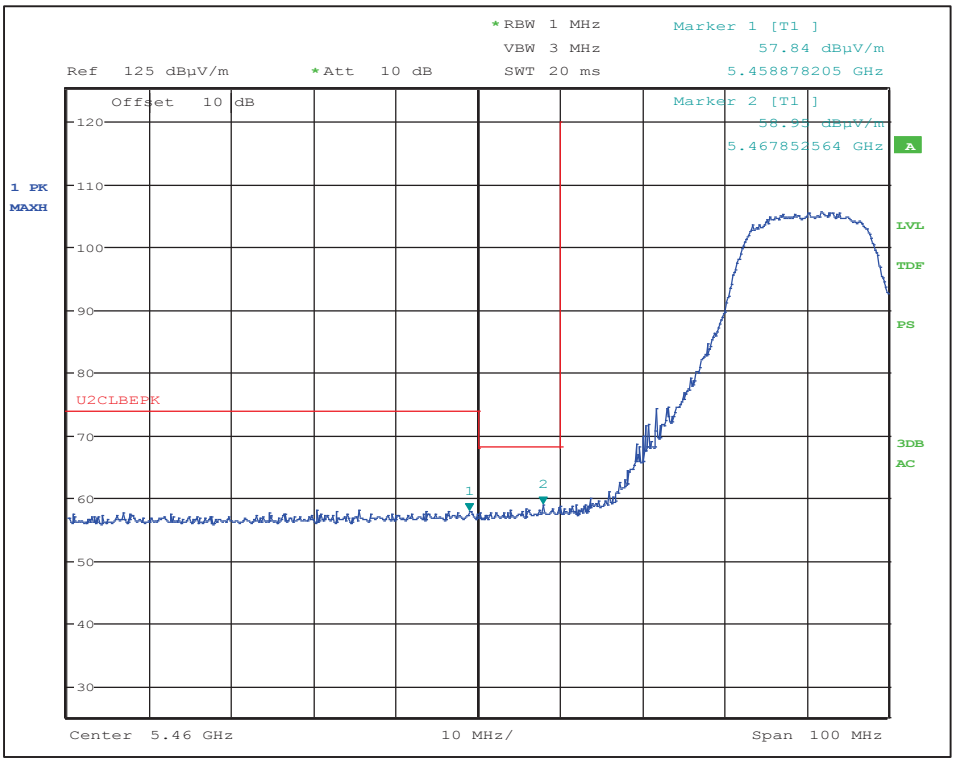
6.5.3 Radiated Restricted Band-edge (Lower U-NII-2C Band)

802.11a: 6 Mbps, Channel 100 (5500 MHz)

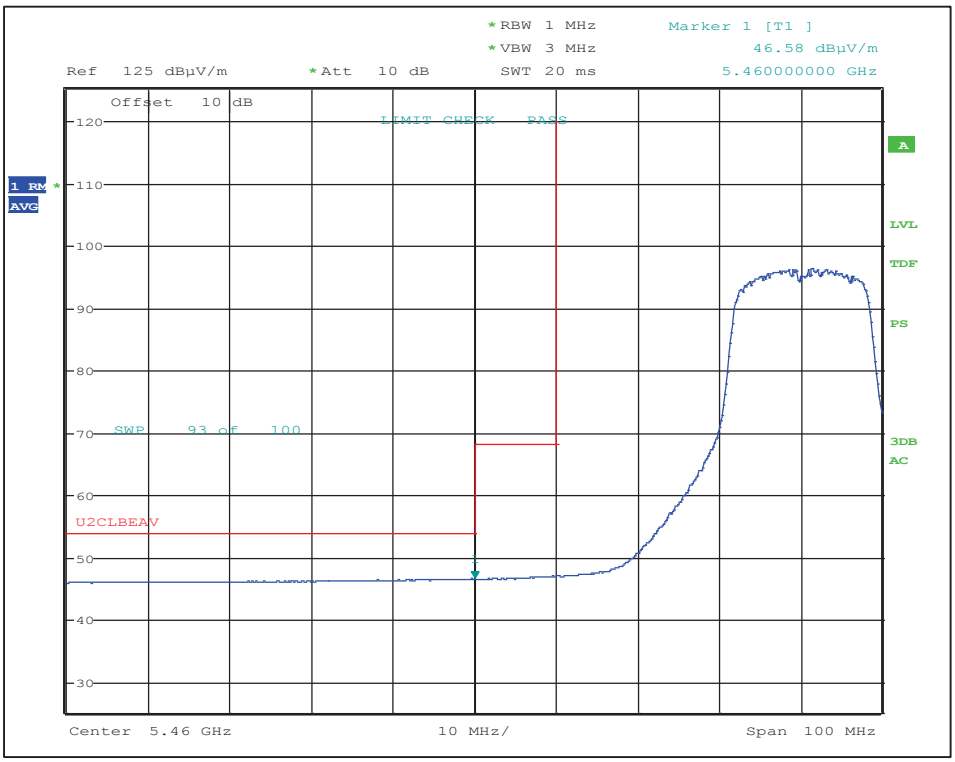
Frequency (MHz)	SA Reading (dBuV/m)	Detector PK/AV	Antenna			EUT Antenna Polarity (V/H1/H2)	DC Factor (dB)	Transducer Factor (dB)	Corrected Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
			Height (cm)	Polarity (V/H)	Azimuth (Deg)						
5458.9	57.8	PK	170	V	320	V	0.00	3.2	57.8	74.0	-16.2
5460.0	46.6	AV	170	V	320	V	0.00	3.2	46.6	54.0	-7.4
5457.4	57.6	PK	180	H	25	H1	0.00	3.0	57.6	74.0	-16.4
5460.0	46.7	AV	180	H	25	H1	0.00	3.0	46.7	54.0	-7.3
*5467.9	59.0	PK	170	V	320	V	0.00	3.2	59.0	68.2	-9.2
*5463.0	58.3	PK	180	H	25	H1	0.00	3.0	58.3	68.2	-9.9

** Out-of-Band emissions within the frequency range from the band edge to 10 MHz below the band edge.*

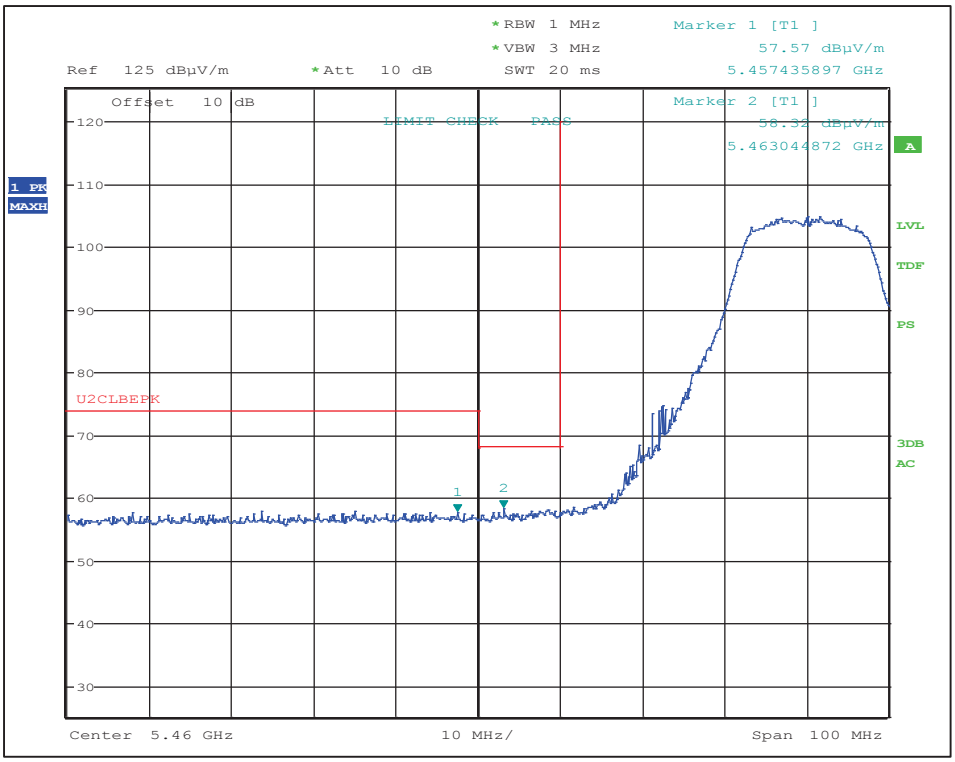
Refer to the following Plots



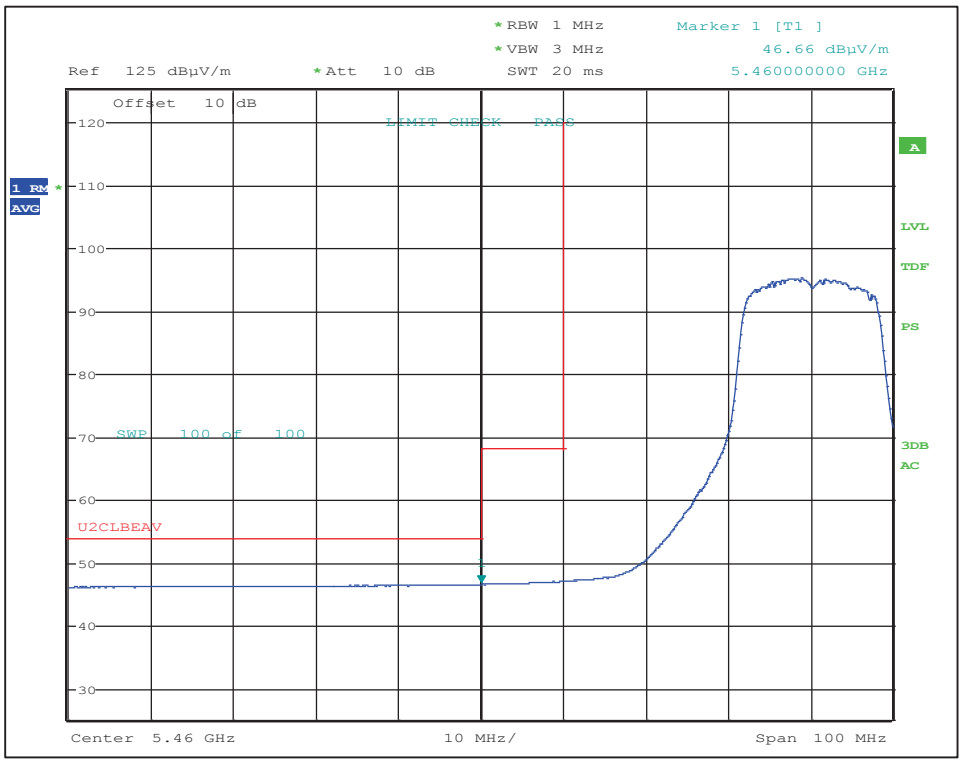
802.11a at 6Mbps – Restricted-band band-edge at channel 100 (Vertical Peak Plot)



802.11a at 6Mbps - Restricted-band band-edge at channel 100 (Vertical Average Plot)



802.11a at 6Mbps - Restricted-band band-edge at channel 100 (Horizontal Peak Plot)



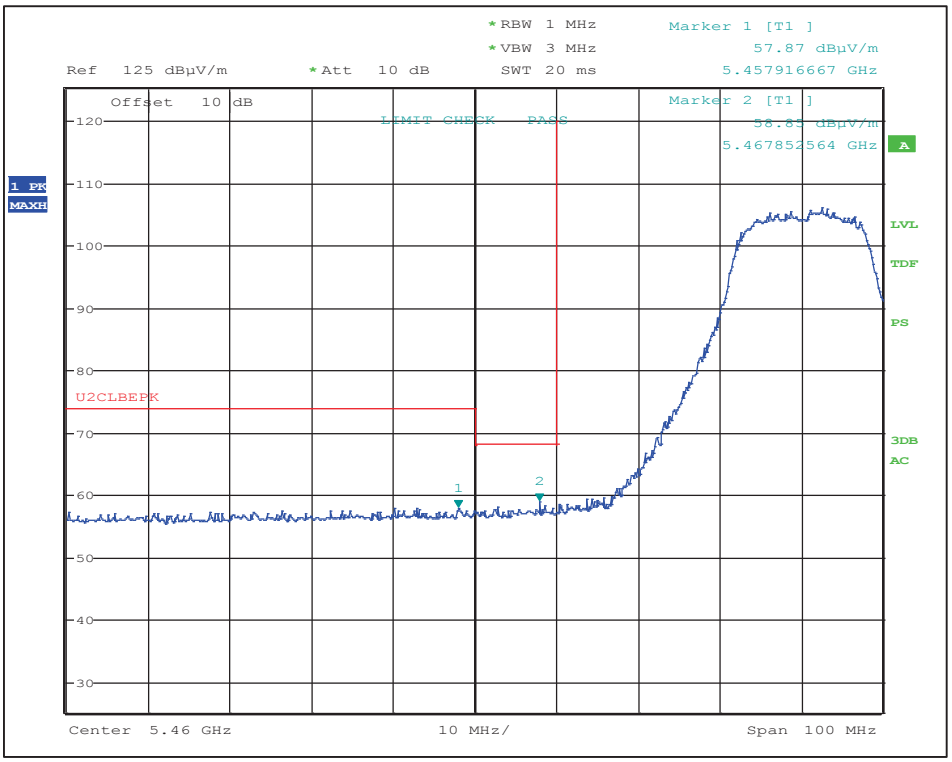
802.11a at 6Mbps - Restricted-band band-edge at channel 100 (Horizontal Average Plot)

802.11a: 12 Mbps, Channel 100 (5500 MHz)

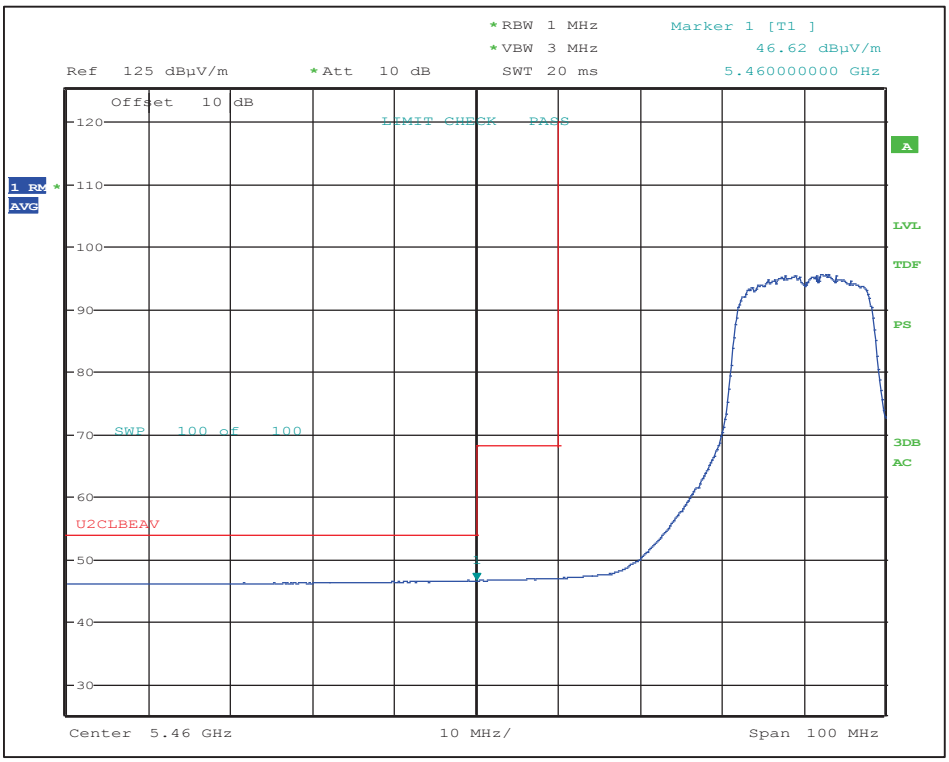
Frequency (MHz)	SA Reading (dBuV/m)	Detector PK/AV	Antenna			EUT Antenna Polarity (V/H1/H2)	DC Factor (dB)	Transducer Factor (dB)	Corrected Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
			Height (cm)	Polarity (V/H)	Azimuth (Deg)						
5457.9	57.9	PK	170	V	320	V	0.00	3.2	57.9	74.0	-16.1
5460.0	46.6	AV	170	V	320	V	0.00	3.2	46.6	54.0	-7.4
5455.8	57.8	PK	170	H	25	H1	0.00	3.0	57.8	74.0	-16.2
5460.0	46.6	AV	170	H	25	H1	0.00	3.0	46.6	54.0	-7.4
*5467.9	58.9	PK	170	V	320	V	0.00	3.2	58.9	68.2	-9.3
*5464.6	58.1	PK	170	H	25	H1	0.00	3.0	58.1	68.2	-10.1

** Out-of-Band emissions within the frequency range from the band edge to 10 MHz below the band edge.*

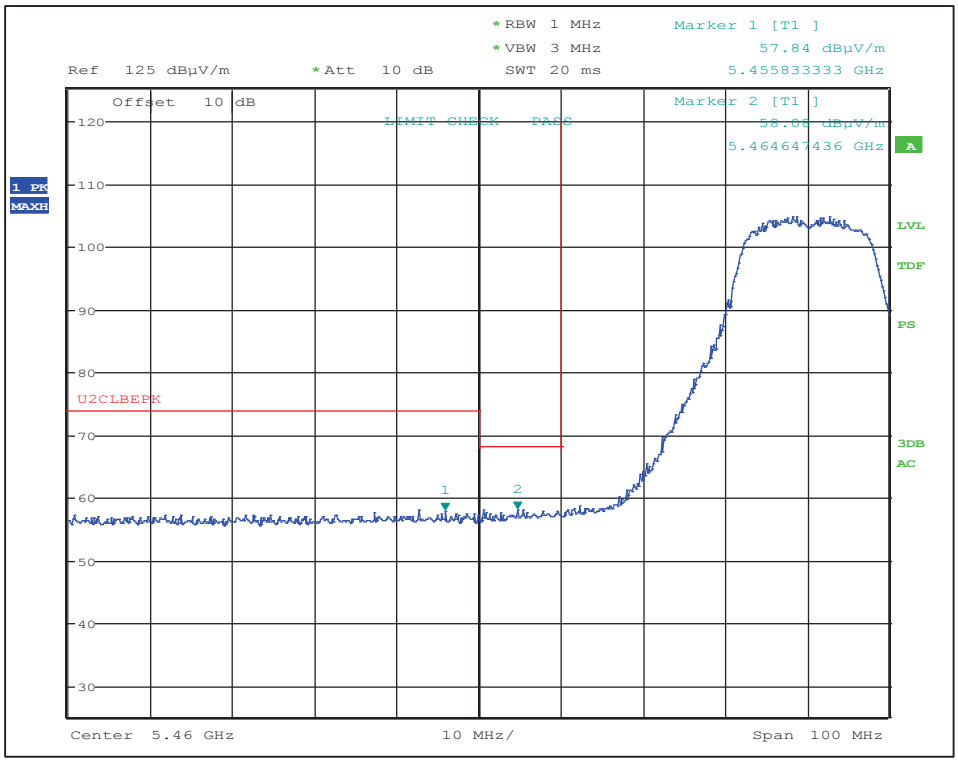
Refer to the following Plots



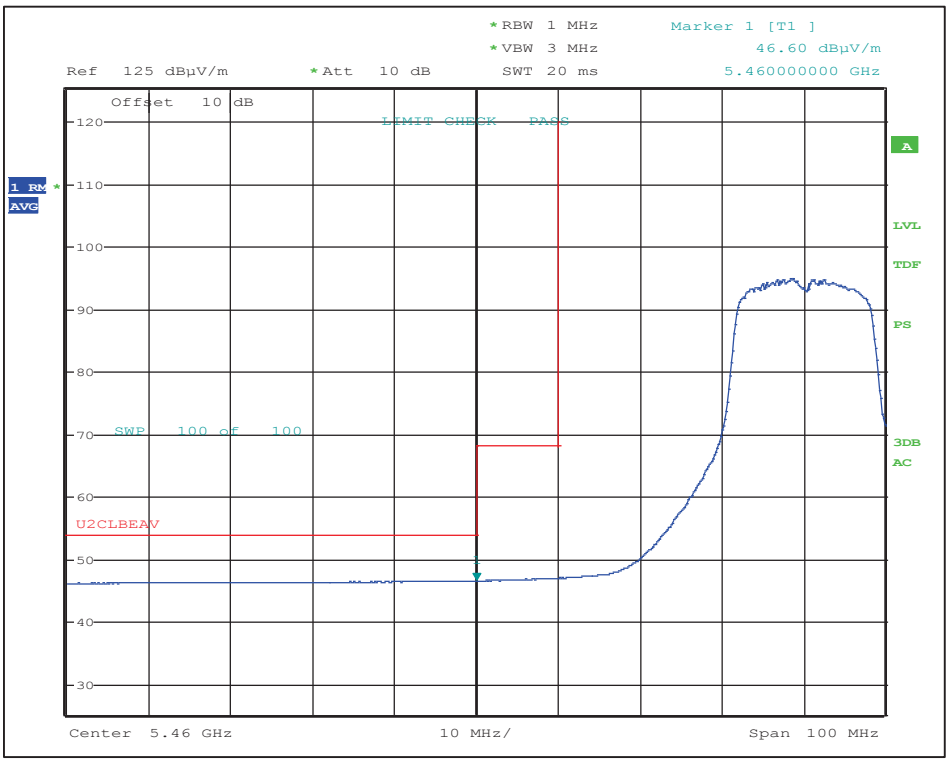
802.11a at 12Mbps - Restricted-band band-edge at channel 100 (Vertical Peak Plot)



802.11a at 12Mbps - Restricted-band band-edge at channel 100 (Vertical Average Plot)



802.11a at 12Mbps - Restricted-band band-edge at channel 100 (Horizontal Peak Plot)



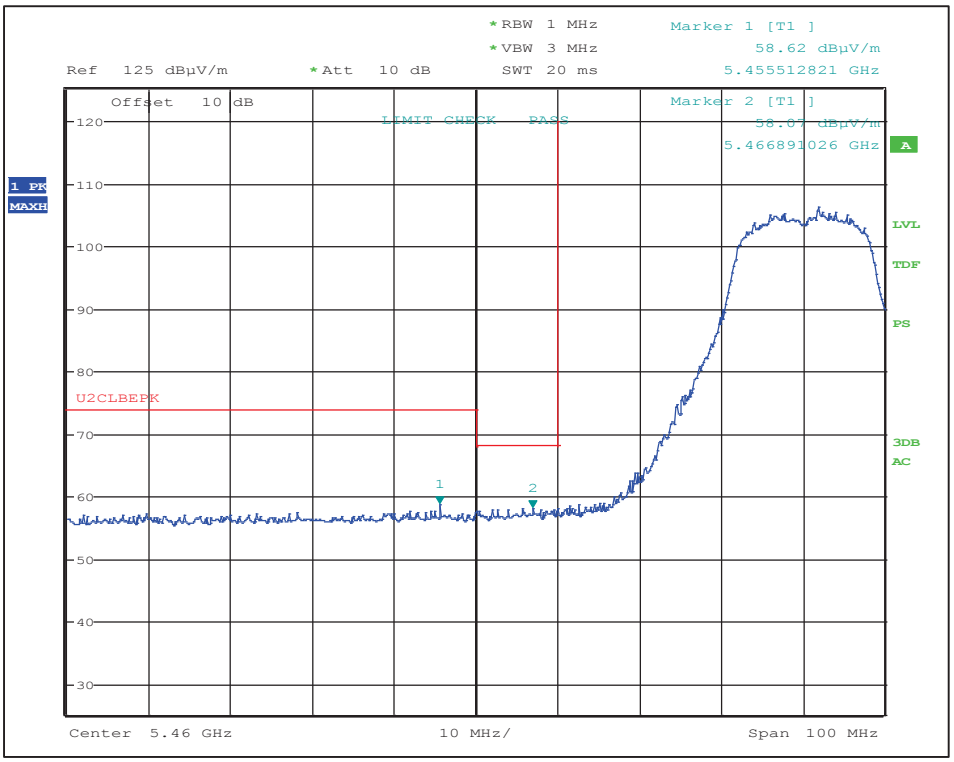
802.11a at 12Mbps - Restricted-band band-edge at channel 100 (Horizontal Average Plot)

802.11a: 24 Mbps, Channel 100 (5500 MHz)

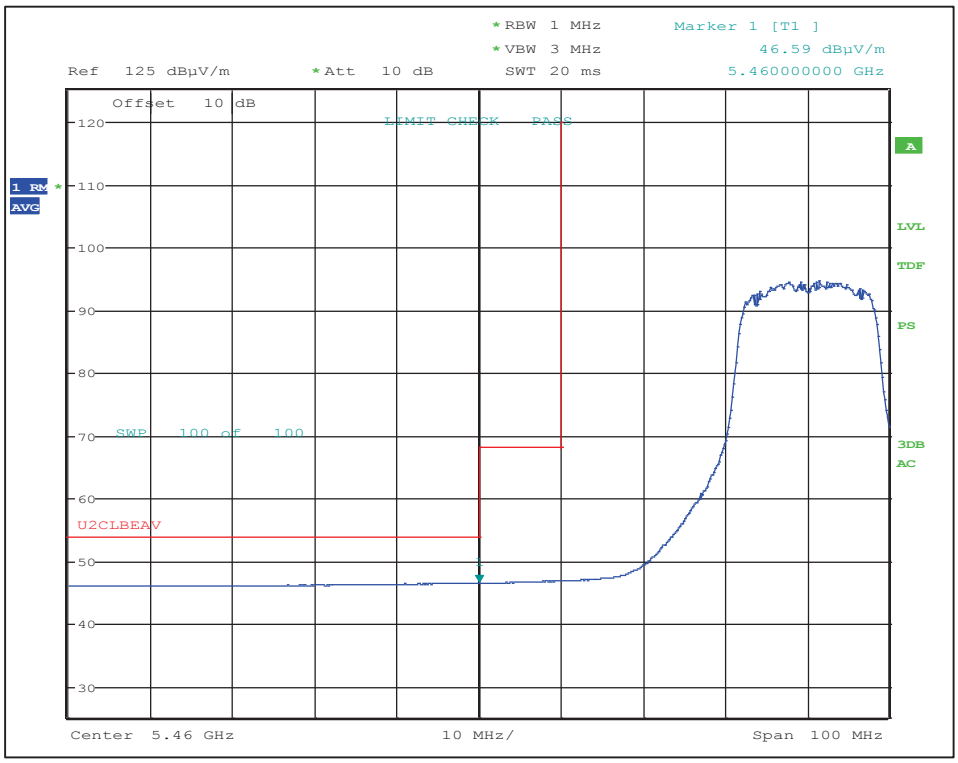
Frequency (MHz)	SA Reading (dBuV/m)	Detector PK/AV	Antenna			EUT Antenna Polarity (V/H1/H2)	DC Factor (dB)	Transducer Factor (dB)	Corrected Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
			Height (cm)	Polarity (V/H)	Azimuth (Deg)						
5455.5	58.6	PK	170	V	320	V	0.00	3.2	58.6	74.0	-15.4
5460.0	46.6	AV	170	V	320	V	0.15	3.2	46.8	54.0	-7.2
5457.3	57.6	PK	170	H	25	H1	0.00	3.0	57.6	74.0	-16.4
5460.0	46.6	AV	170	H	25	H1	0.15	3.0	46.8	54.0	-7.2
*5466.9	58.1	PK	170	V	320	V	0.00	3.2	58.1	68.2	-10.1
*5469.0	58.6	PK	170	H	25	H1	0.00	3.0	58.6	68.2	-9.6

** Out-of-Band emissions within the frequency range from the band edge to 10 MHz below the band edge.*

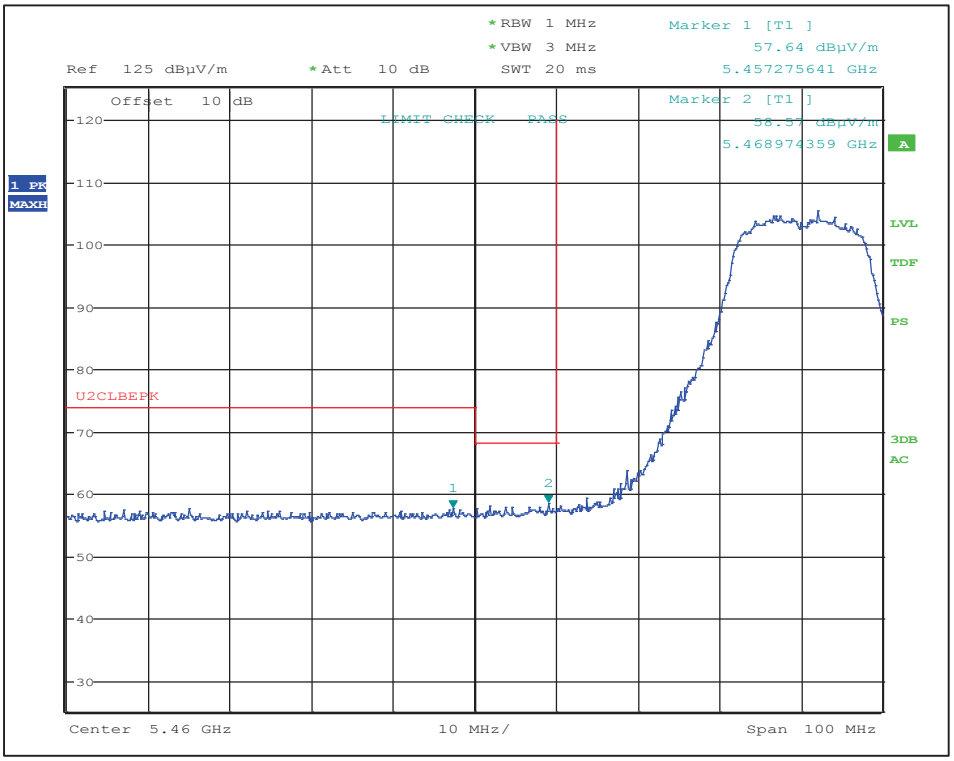
Refer to the following Plots



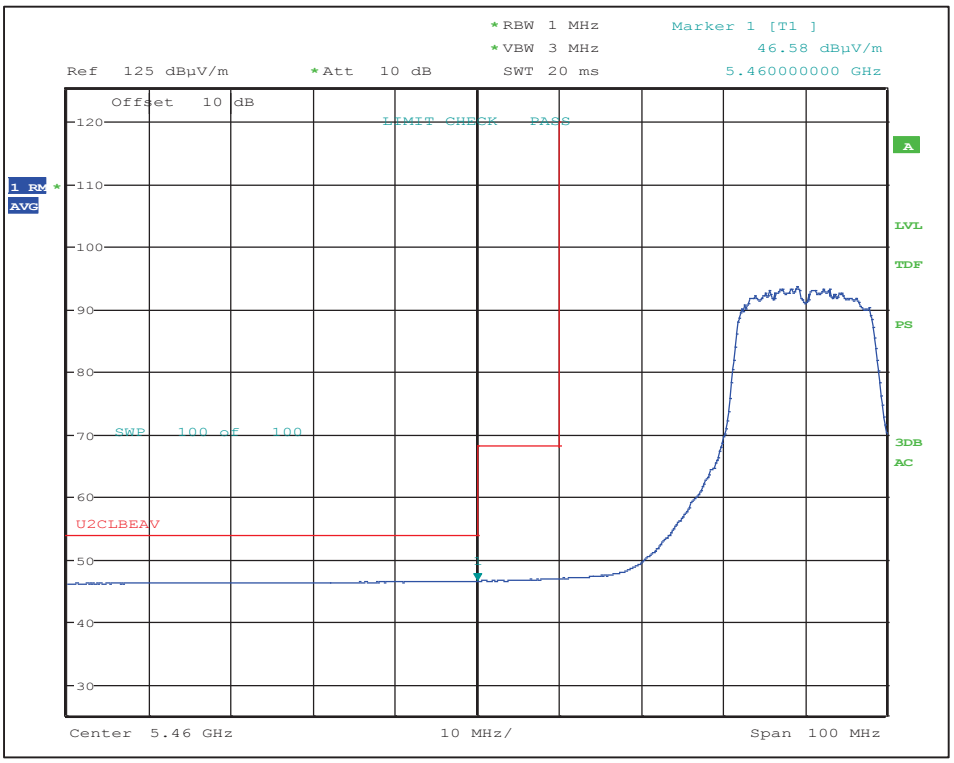
802.11a at 24Mbps - Restricted-band band-edge at channel 100 (Vertical Peak Plot)



802.11a at 24Mbps - Restricted-band band-edge at channel 100 (Vertical Average Plot)



802.11a at 24Mbps - Restricted-band band-edge at channel 100 (Horizontal Peak Plot)



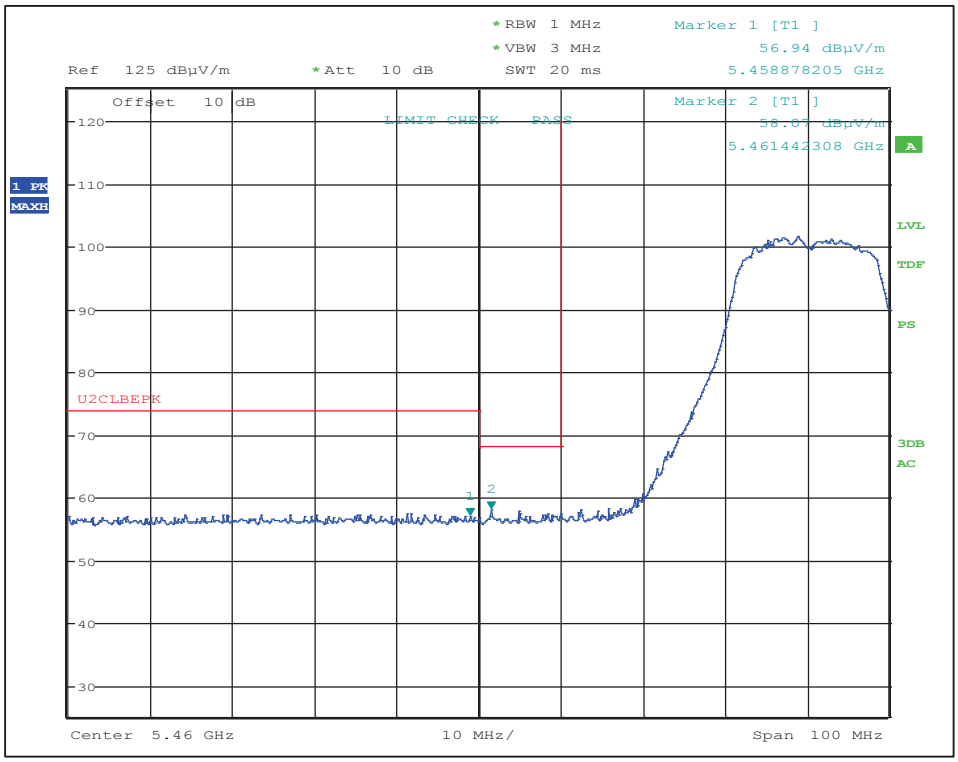
802.11a at 24Mbps - Restricted-band band-edge at channel 100 (Horizontal Average Plot)

802.11a: MCS7, Channel 100 (5500 MHz)

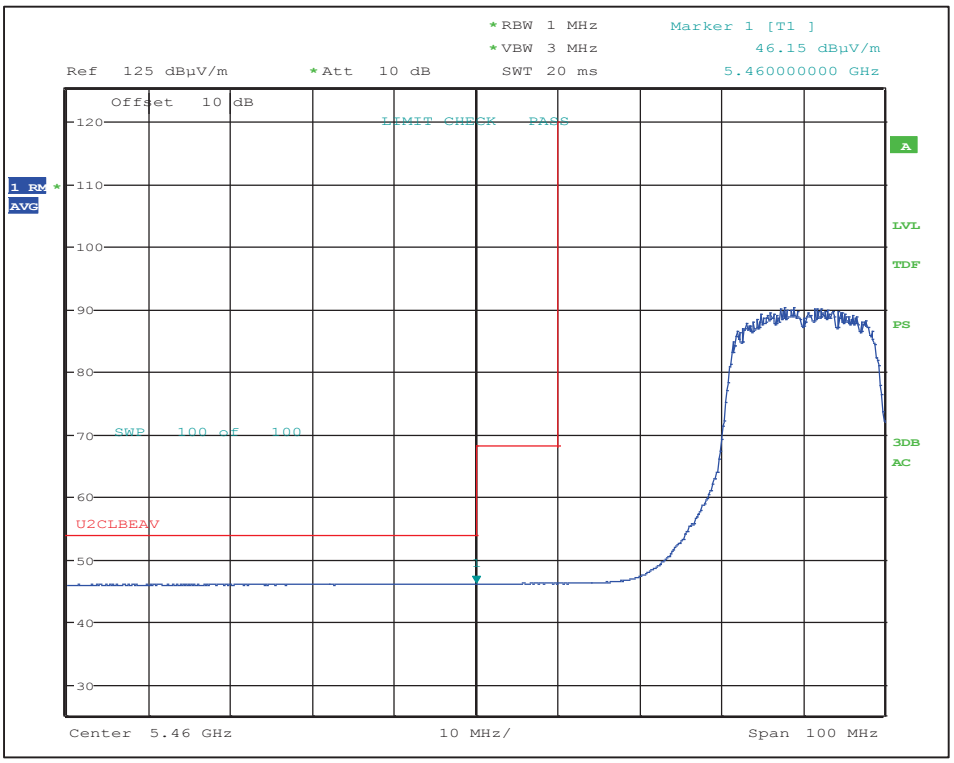
Frequency (MHz)	SA Reading (dBuV/m)	Detector PK/AV	Antenna			EUT Antenna Polarity (V/H1/H2)	DC Factor (dB)	Transducer Factor (dB)	Corrected Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
			Height (cm)	Polarity (V/H)	Azimuth (Deg)						
5458.9	56.9	PK	170	V	320	V	0.00	3.2	56.9	74.0	-17.1
5460.0	46.2	AV	170	V	320	V	0.39	3.2	46.6	54.0	-7.4
5459.7	57.3	PK	170	H	25	H1	0.00	3.0	57.3	74.0	-16.7
5460.0	46.2	AV	170	H	25	H1	0.39	3.0	46.6	54.0	-7.4
*5461.4	58.1	PK	170	V	320	V	0.00	3.2	58.1	68.2	-10.1
*5468.0	57.2	PK	170	H	25	H1	0.00	3.0	57.2	68.2	-11.0

** Out-of-Band emissions within the frequency range from the band edge to 10 MHz below the band edge.*

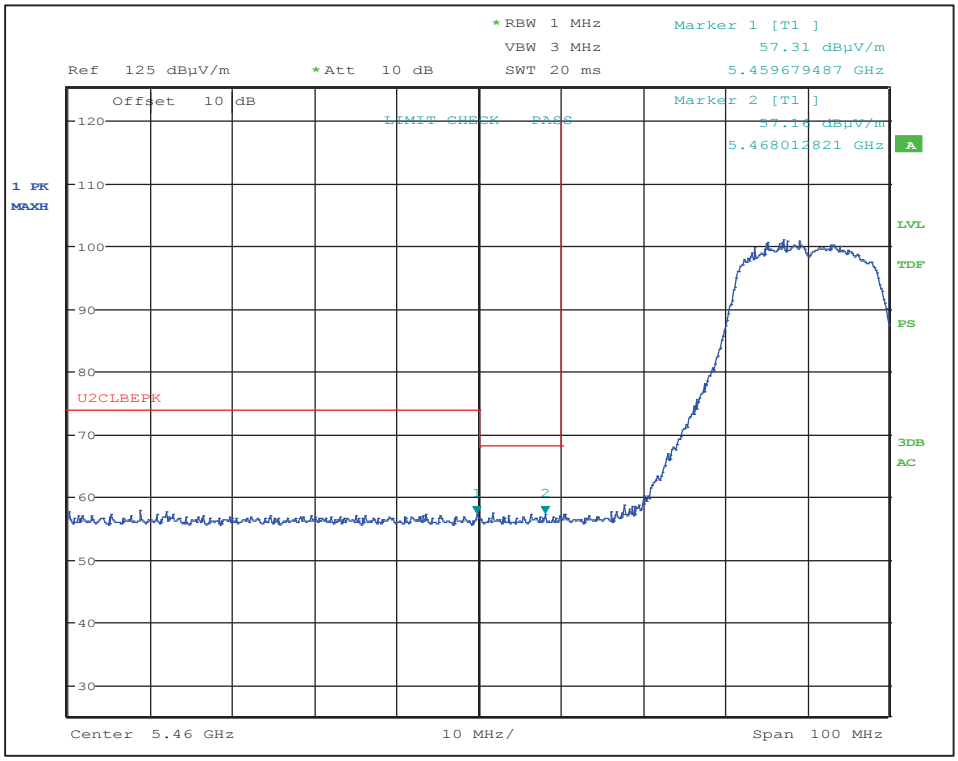
Refer to the following Plots



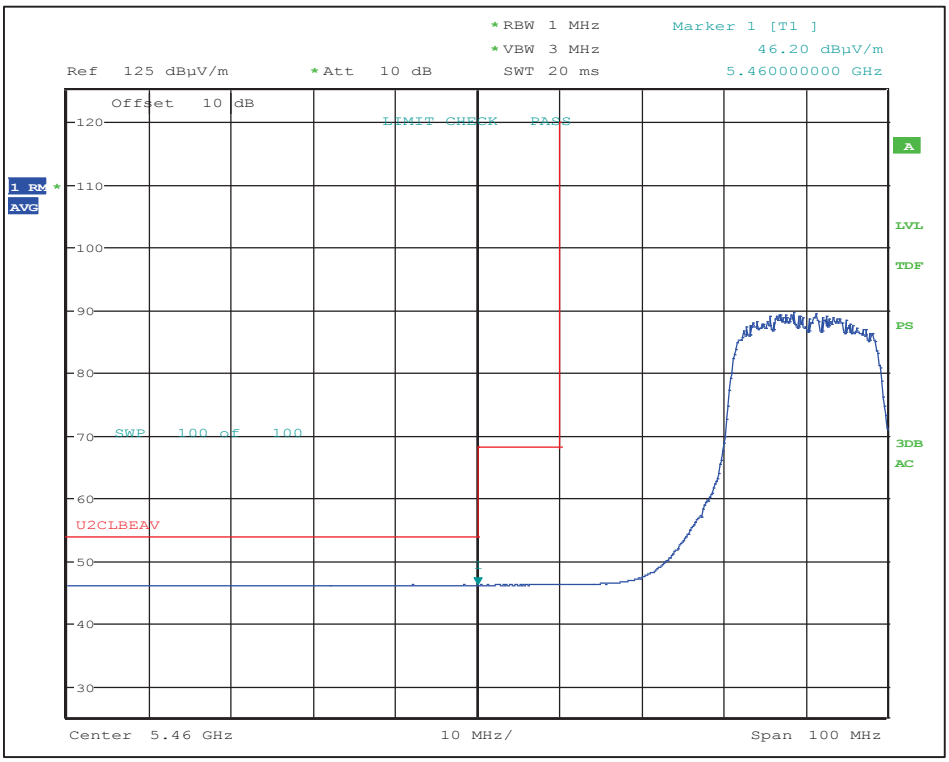
802.11n at MCS7 - Restricted-band band-edge at channel 100 (Vertical Peak Plot)



802.11n at MCS7 - Restricted-band band-edge at channel 100 (Vertical Average Plot)



802.11n at MCS7 - Restricted-band band-edge at channel 100 (Horizontal Peak Plot)



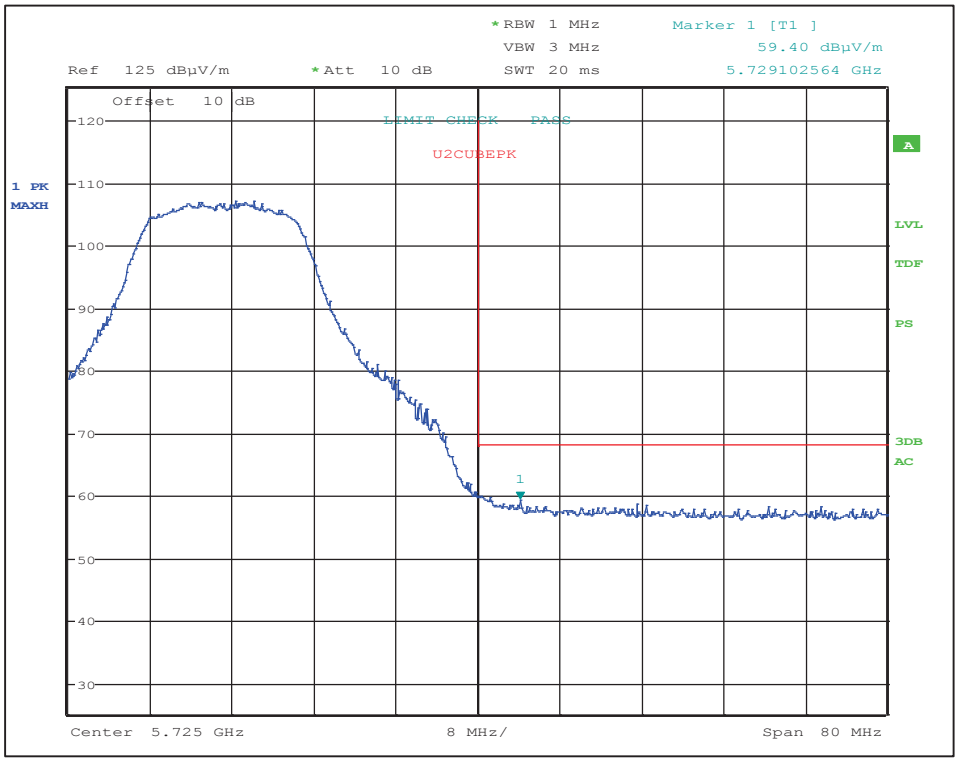
802.11n at MCS7 - Restricted-band band-edge at channel 100 (Horizontal Average Plot)

6.5.4 Radiated Authorized Band-edge (Upper U-NII-2C Band)

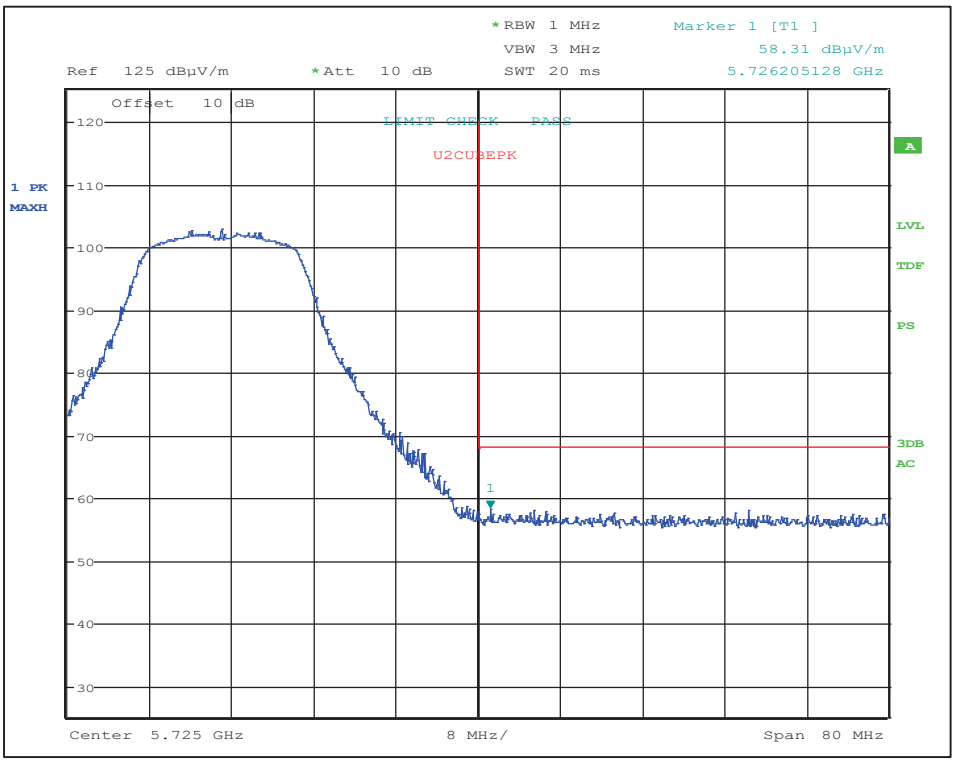
802.11a: 6 Mbps, Channel 140 (5700 MHz)

Frequency (MHz)	SA Reading (dBuV/m)	Detector PK/AV	Antenna			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)						
5729.1	59.4	PK	160	V	193	V	0.00	3.80	59.4	68.2	-8.8
5726.2	58.3	PK	170	H	30	H1	0.00	3.60	58.3	68.2	-9.9

Refer to the following Plots



802.11a at 6Mbps – Authorized band-edge at channel 140 (Vertical Peak Plot)

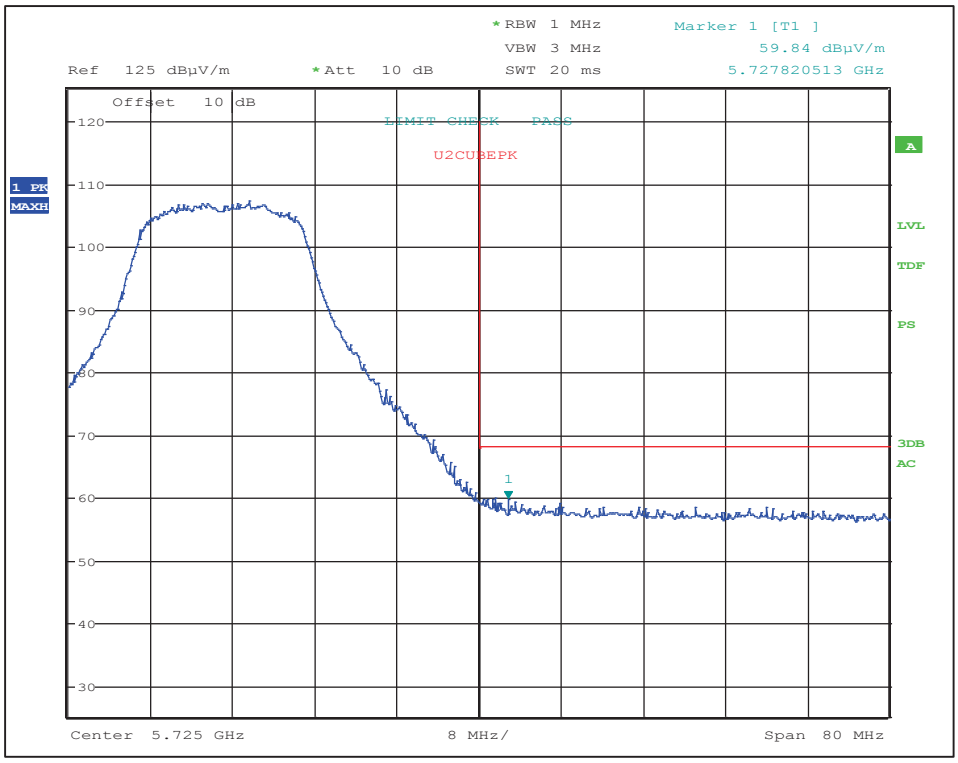


802.11a at 6Mbps - Authorized band-edge at channel 140 (Horizontal Peak Plot)

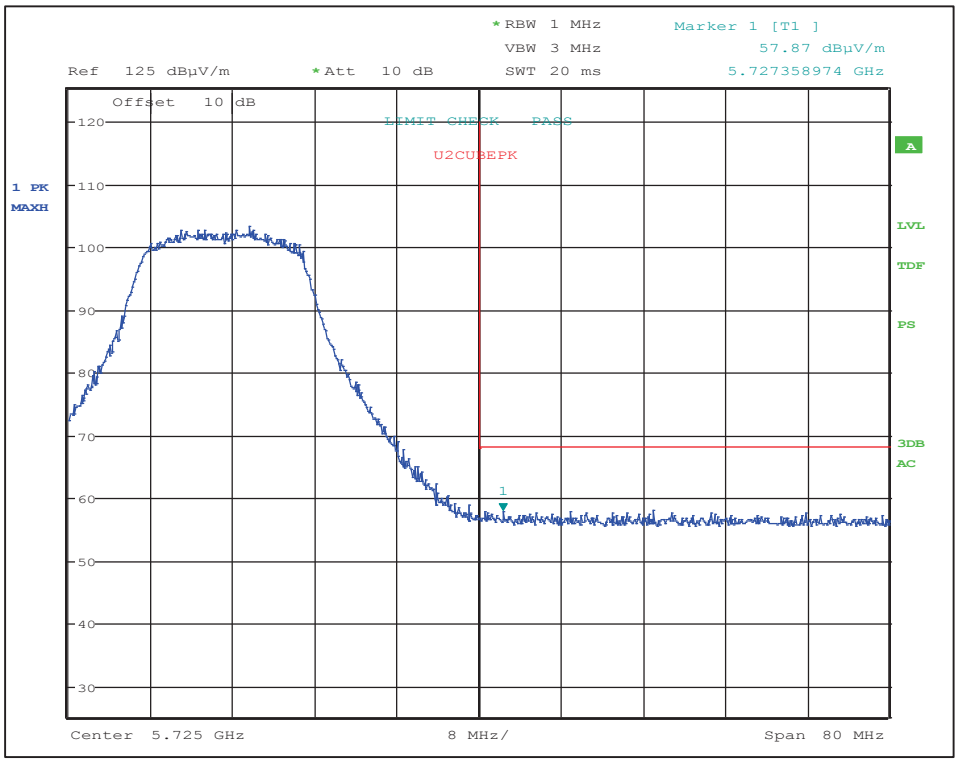
802.11a: 12 Mbps, Channel 140 (5700 MHz)

Frequency (MHz)	SA Reading (dBuV/m)	Detector PK/AV	Antenna			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)						
5727.8	59.8	PK	160	V	193	V	0.00	3.80	59.8	68.2	-8.4
5727.4	57.9	PK	170	H	30	H1	0.00	3.60	57.9	68.2	-10.3

Refer to the following Plots



802.11a at 12Mbps - Authorized band-edge at channel 140 (Vertical Peak Plot)

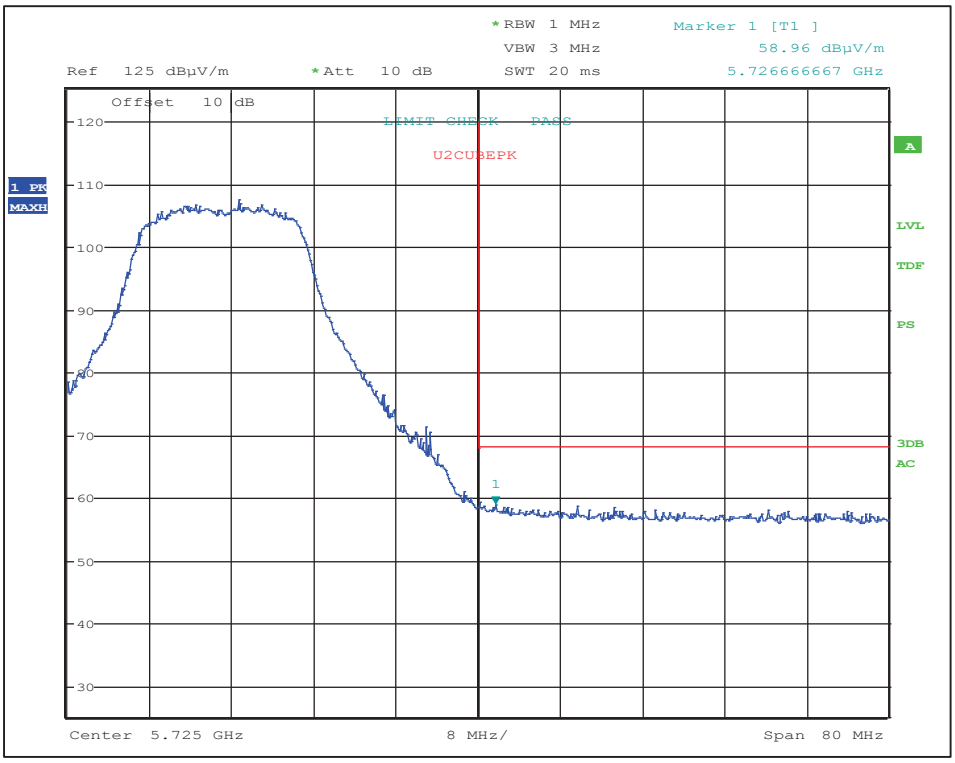


802.11a at 12Mbps - Authorized band-edge at channel 140 (Horizontal Peak Plot)

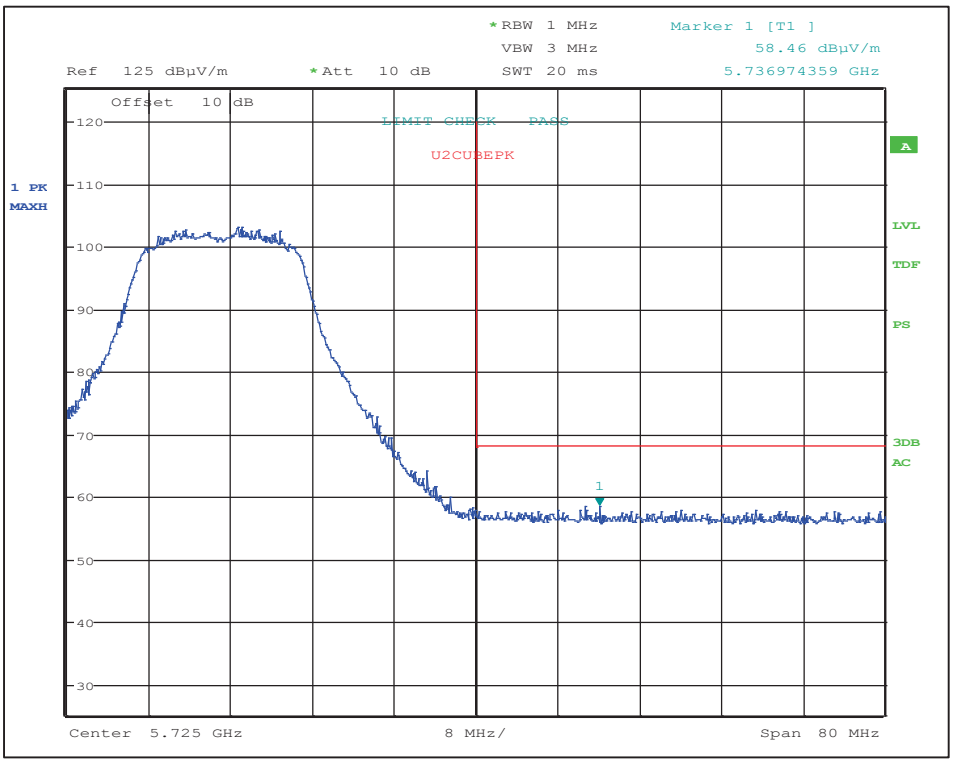
802.11a: 24 Mbps, Channel 140 (5700 MHz)

Frequency (MHz)	SA Reading (dBuV/m)	Detector PK/AV	Antenna			EUT Antenna Polarity (V/H1/H2)	DC Factor (dB)	Transducer Factor (dB)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)
			Height (cm)	Polarity (V/H)	Azimuth (Deg)						
5726.7	59.0	PK	160	V	193	V	0.00	3.80	59.0	68.2	-9.2
5737.0	58.5	PK	170	H	30	H1	0.00	3.60	58.5	68.2	-9.7

Refer to the following Plots



802.11a at 24Mbps – Authorized band-edge at channel 140 (Vertical Peak Plot)

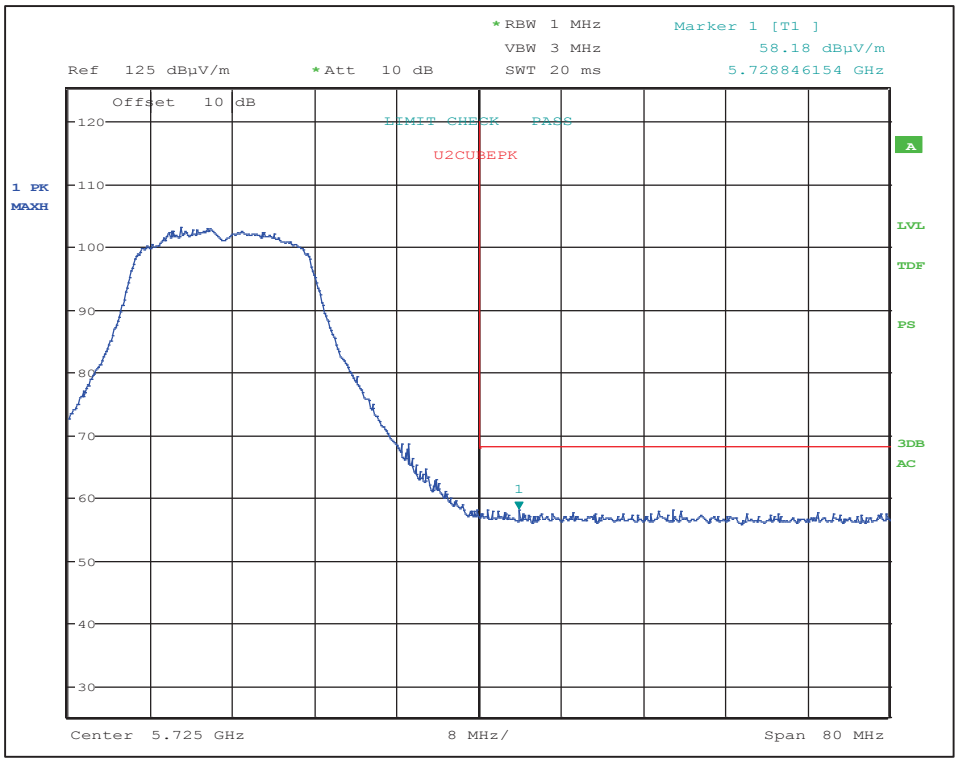


802.11a at 24Mbps - Authorized band-edge at channel 140 (Horizontal Peak Plot)

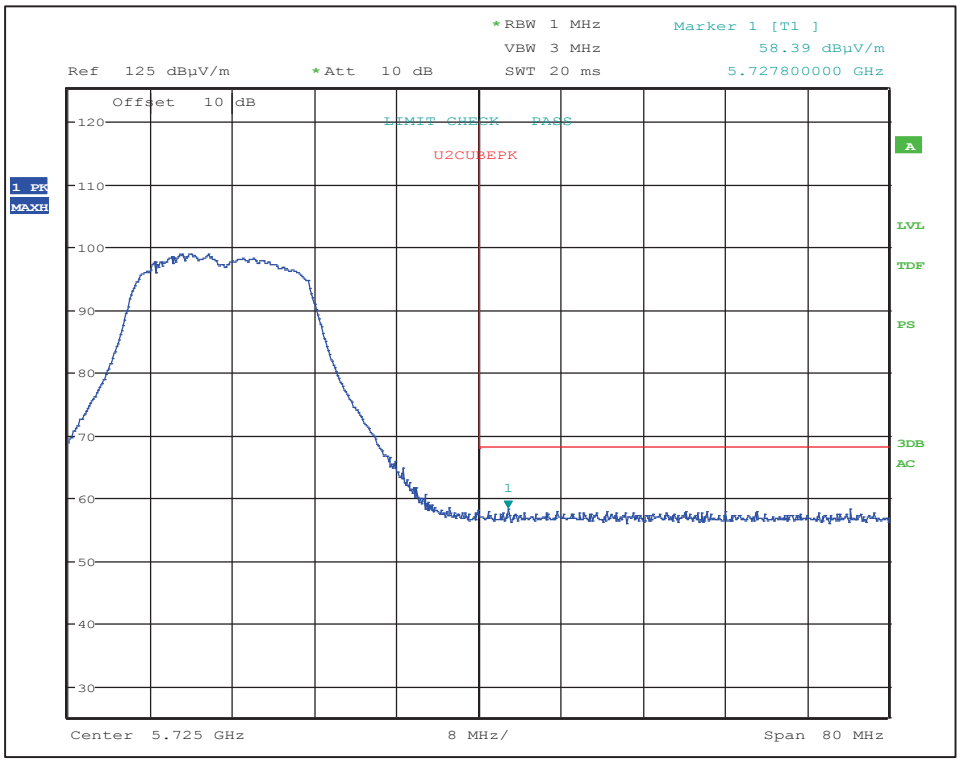
802.11a: MCS7, Channel 140 (5700 MHz)

Frequency (MHz)	SA Reading (dBuV/m)	Detector PK/AV	Antenna			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)						
5728.8	58.2	PK	160	V	193	V	0.00	3.80	58.2	68.2	-10.0
5727.8	58.4	PK	170	H	30	H1	0.00	3.60	58.4	68.2	-9.8

Refer to the following Plots



802.11a at MCS7 - Authorized band-edge at channel 140 (Vertical Peak Plot)



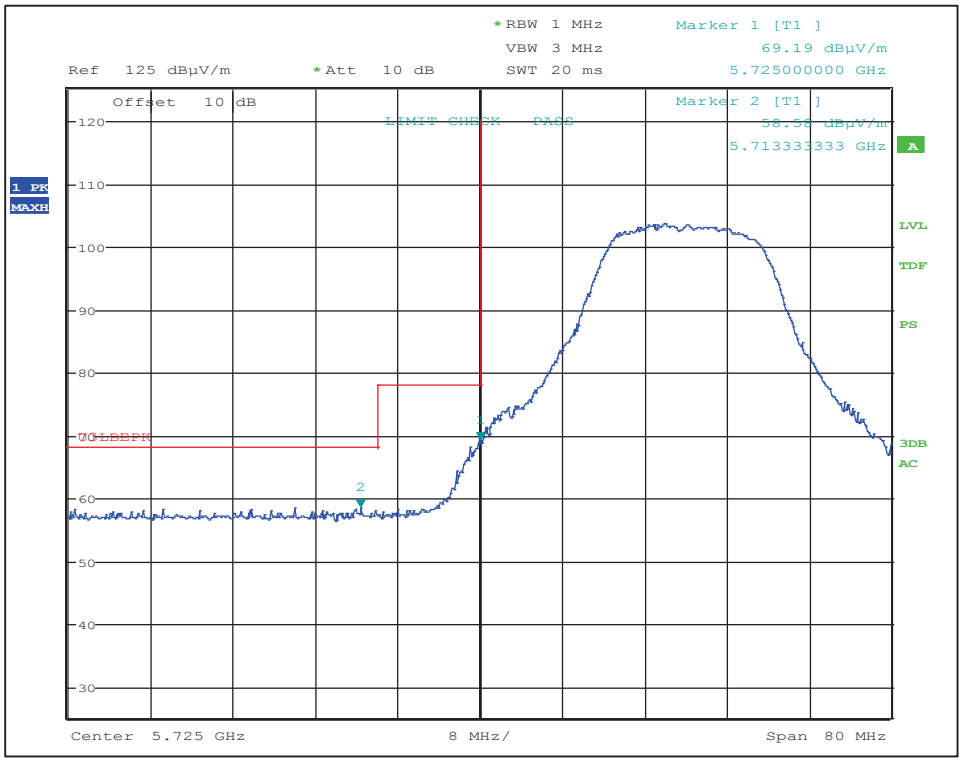
802.11a at MCS7 - Restricted-band band-edge at channel 140 (Horizontal Peak Plot)

6.5.5 Radiated Authorized Band-edge (Lower U-NII-3 Band)

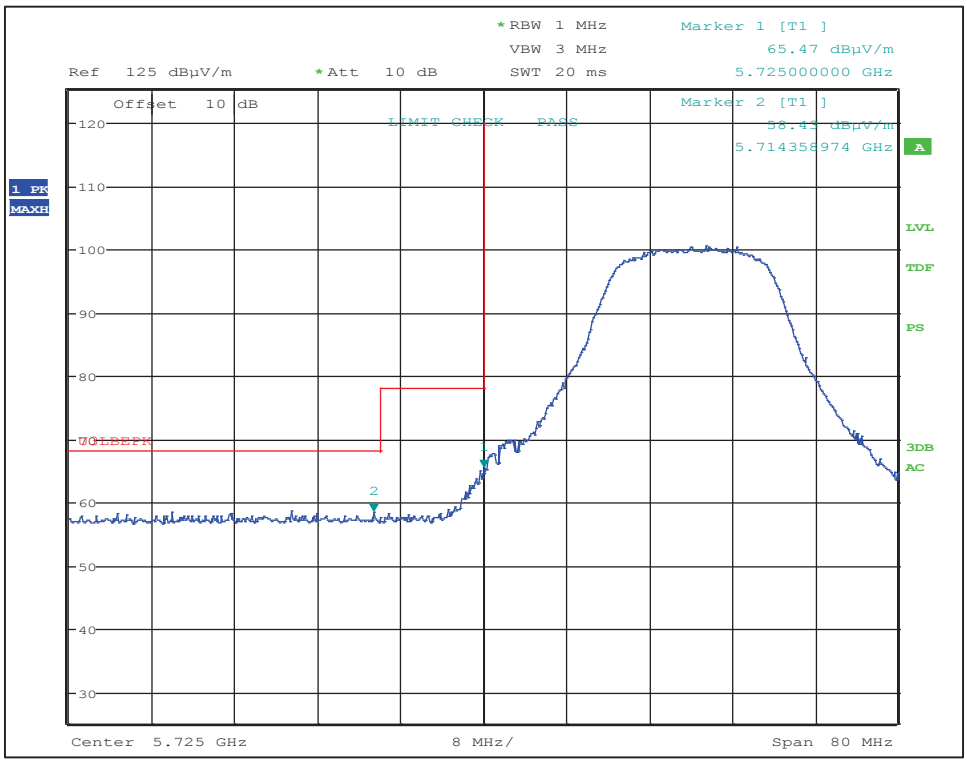
802.11a: 6 Mbps, Channel 149 (5745 MHz)

Frequency (MHz)	SA Reading (dBuV/m)	Detector PK/AV	Antenna			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)						
5725.0	69.2	PK	160	V	193.0	V	0.00	3.8	69.2	78.2	-9.0
5713.3	58.6	PK	160	V	193.0	V	0.00	3.8	58.6	68.2	-9.6
5725.0	65.5	PK	180	H	39.0	H1	0.00	3.6	65.5	78.2	-12.7
5714.4	58.4	PK	180	H	39.0	H1	0.00	3.6	58.4	68.2	-9.8

Refer to the following Plots



802.11a at 6Mbps – Authorized band-edge at channel 149 (Vertical Peak Plot)

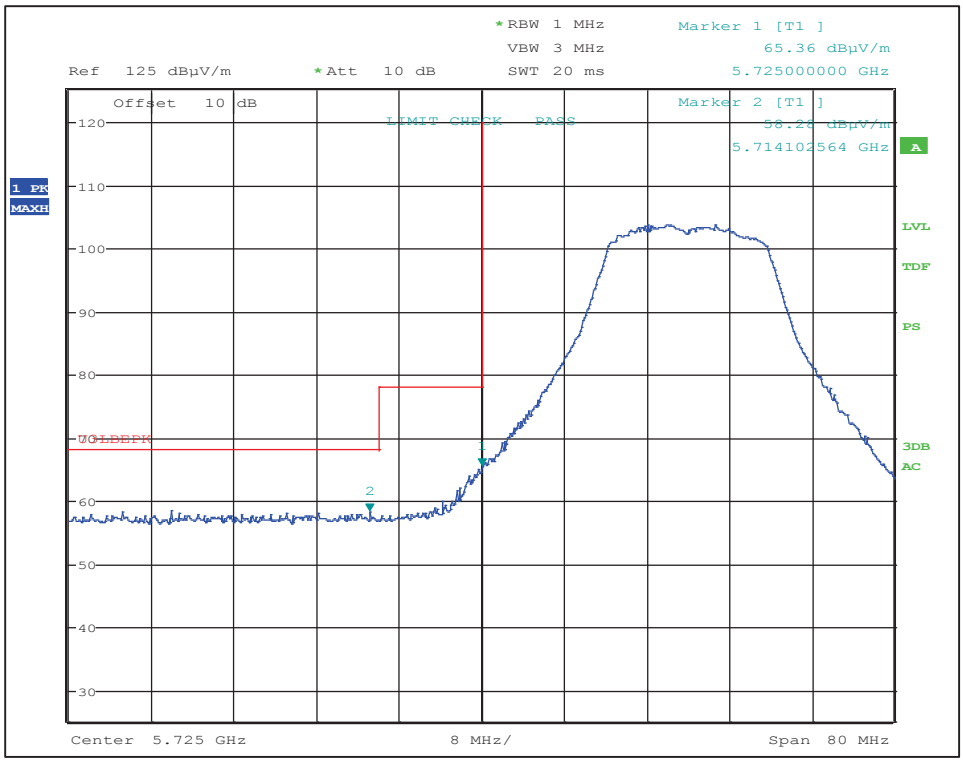


802.11a at 6Mbps - Authorized band-edge at channel 149 (Horizontal Peak Plot)

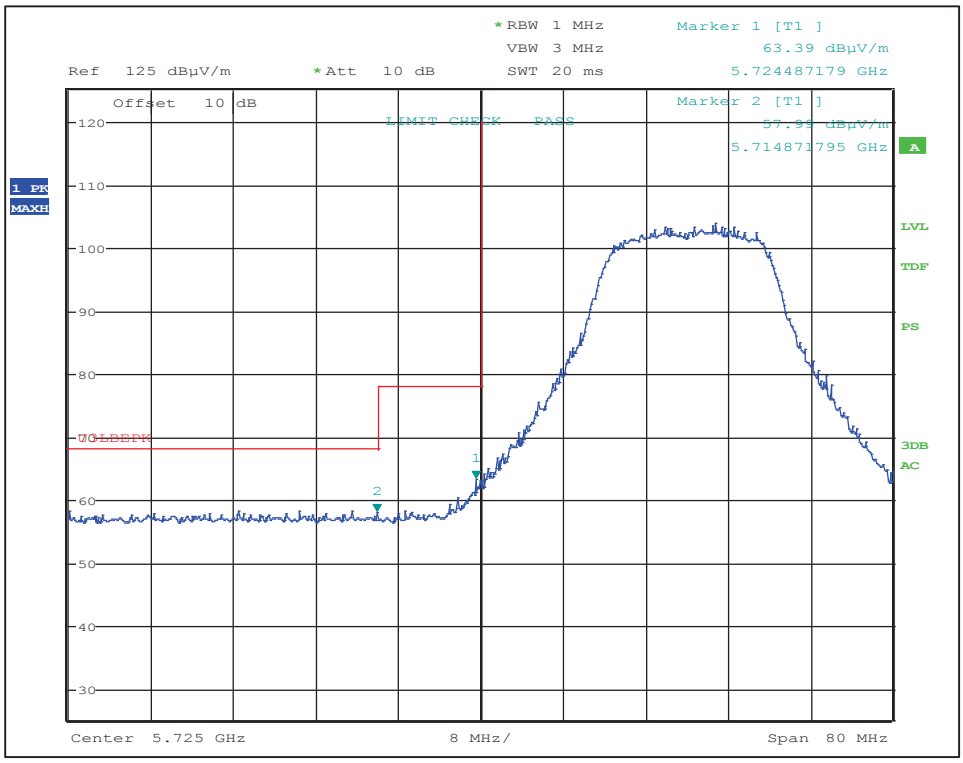
802.11a: 12 Mbps, Channel 149 (5745 MHz)

Frequency (MHz)	SA Reading (dBuV/m)	Detector PK/AV	Antenna			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)						
5725.0	65.4	PK	160	V	193.0	V	0.00	3.8	65.4	78.2	-12.8
5713.2	58.3	PK	160	V	193.0	V	0.00	3.8	58.3	68.2	-9.9
5724.5	63.4	PK	180	H	39.0	H1	0.00	3.6	63.4	78.2	-14.8
5714.9	58.0	PK	180	H	39.0	H1	0.00	3.6	58.0	68.2	-10.2

Refer to the following Plots



802.11a at 12Mbps - Authorized band-edge at channel 149 (Vertical Peak Plot)

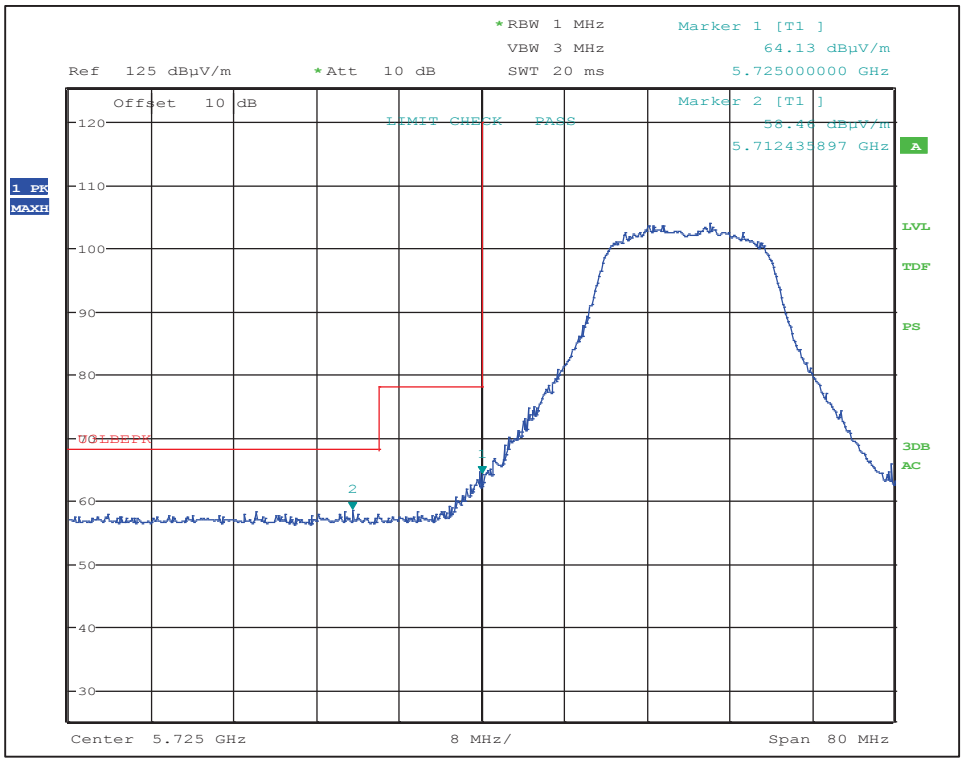


802.11a at 12Mbps - Authorized band-edge at channel 149 (Horizontal Peak Plot)

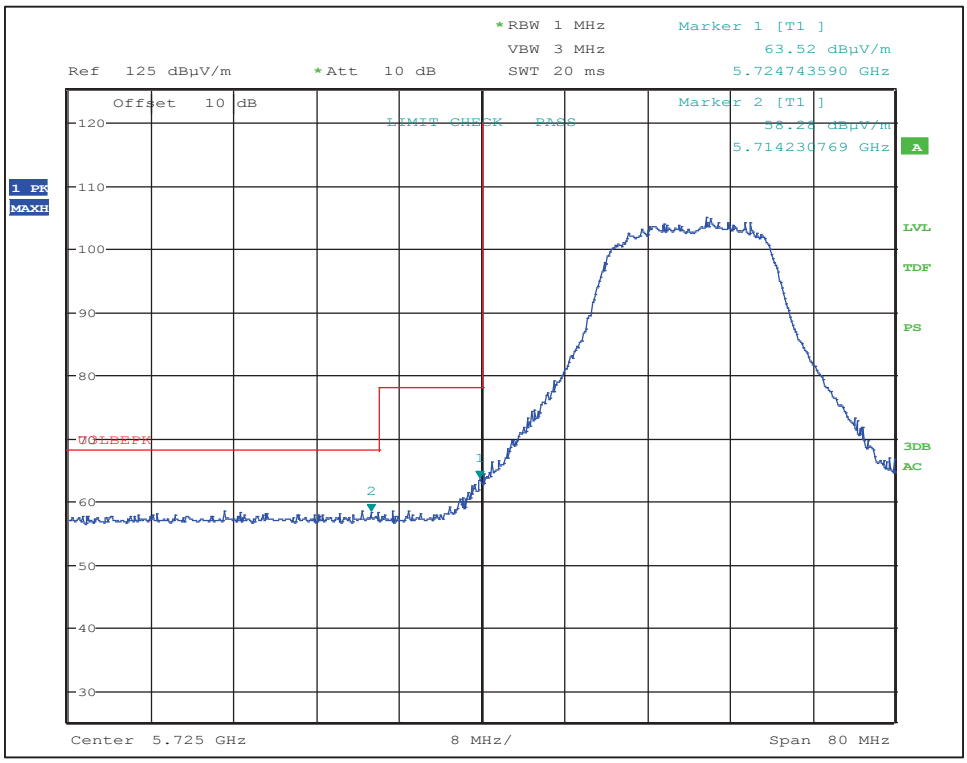
802.11a: 24 Mbps, Channel 149 (5745 MHz)

Frequency (MHz)	SA Reading (dBuV/m)	Detector PK/AV	Antenna			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)						
5725.0	64.1	PK	160	V	193.0	V	0.00	3.8	64.1	78.2	-14.1
5712.4	58.5	PK	160	V	193.0	V	0.00	3.8	58.5	68.2	-9.7
5724.7	63.5	PK	180	H	39.0	H1	0.00	3.6	63.5	78.2	-14.7
5714.2	58.3	PK	180	H	39.0	H1	0.00	3.6	58.3	68.2	-9.9

Refer to the following Plots



802.11a at 24Mbps – Authorized band-edge at channel 149 (Vertical Peak Plot)

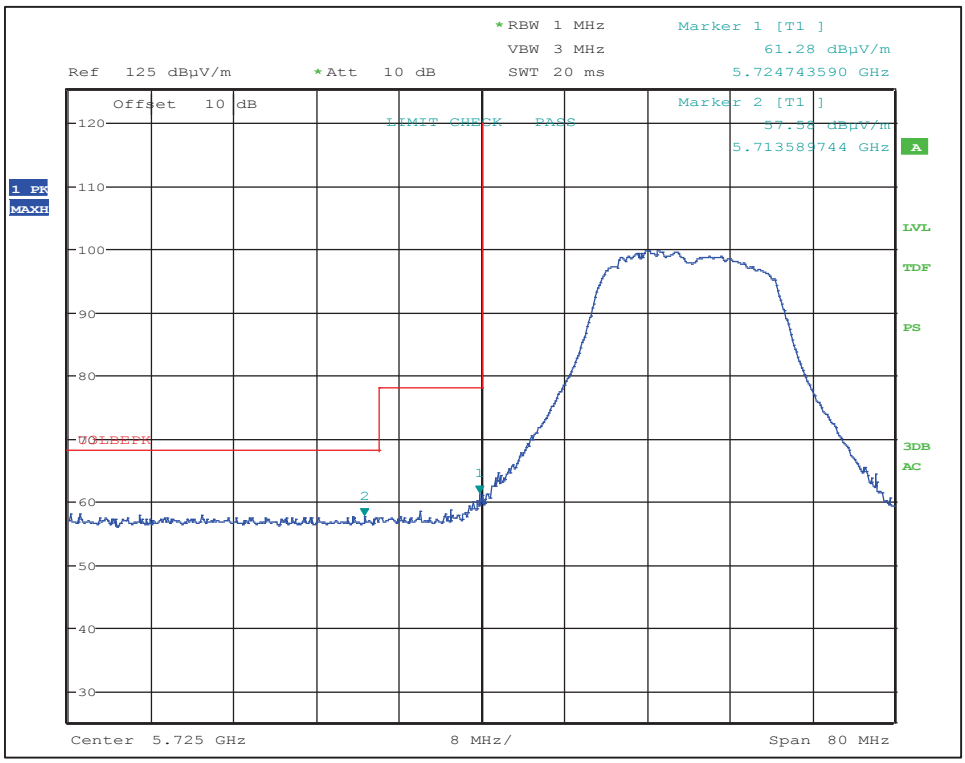


802.11a at 24Mbps - Authorized band-edge at channel 149 (Horizontal Peak Plot)

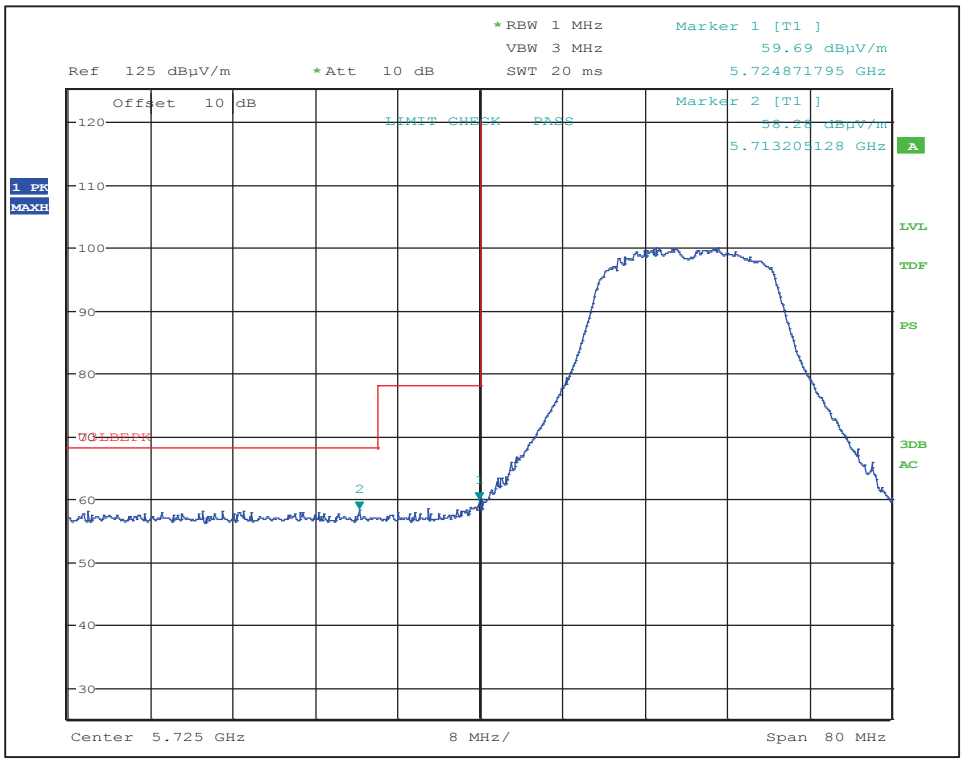
802.11a: MCS7, Channel 149 (5745 MHz)

Frequency (MHz)	SA Reading (dBuV/m)	Detector PK/AV	Antenna			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)						
5724.7	61.3	PK	160	V	193.0	V	0.00	3.8	61.3	78.2	-16.9
5713.6	57.6	PK	160	V	193.0	V	0.00	3.8	57.6	68.2	-10.6
5724.9	59.7	PK	180	H	39.0	H1	0.00	3.6	59.7	78.2	-18.5
5713.2	58.3	PK	180	H	39.0	H1	0.00	3.6	58.3	68.2	-9.9

Refer to the following Plots



802.11a at MCS7 - Authorized band-edge at channel 149 (Vertical Peak Plot)



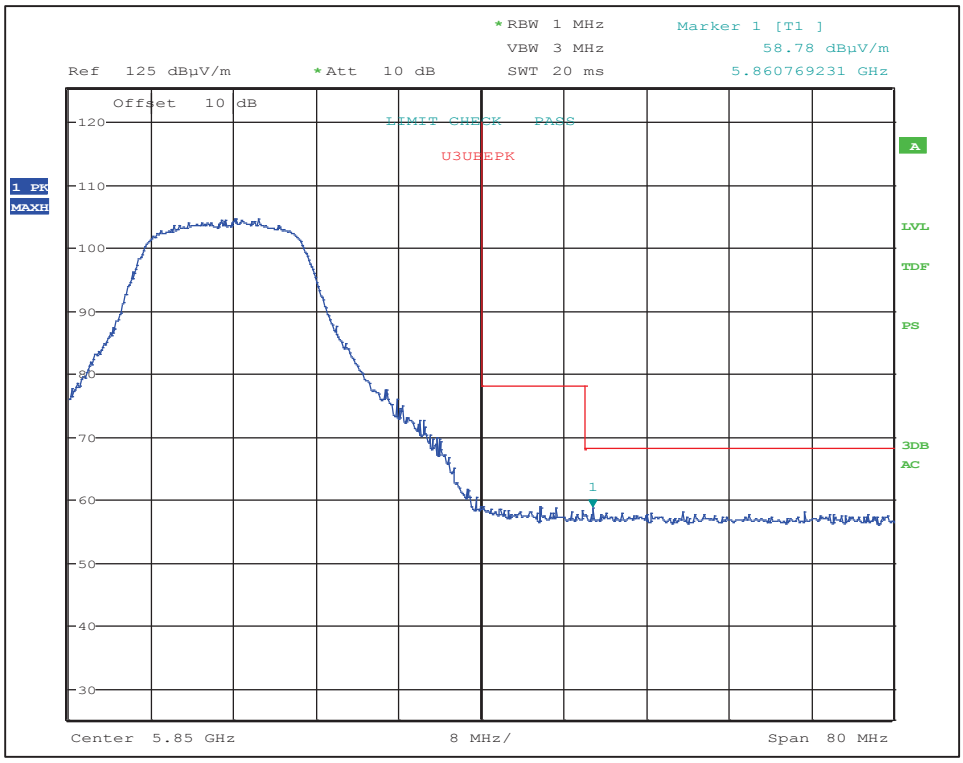
802.11a at MCS7 - Authorized band-edge at channel 149 (Horizontal Peak Plot)

6.5.6 Radiated Authorized Band-edge (Upper U-NII-3 Band)

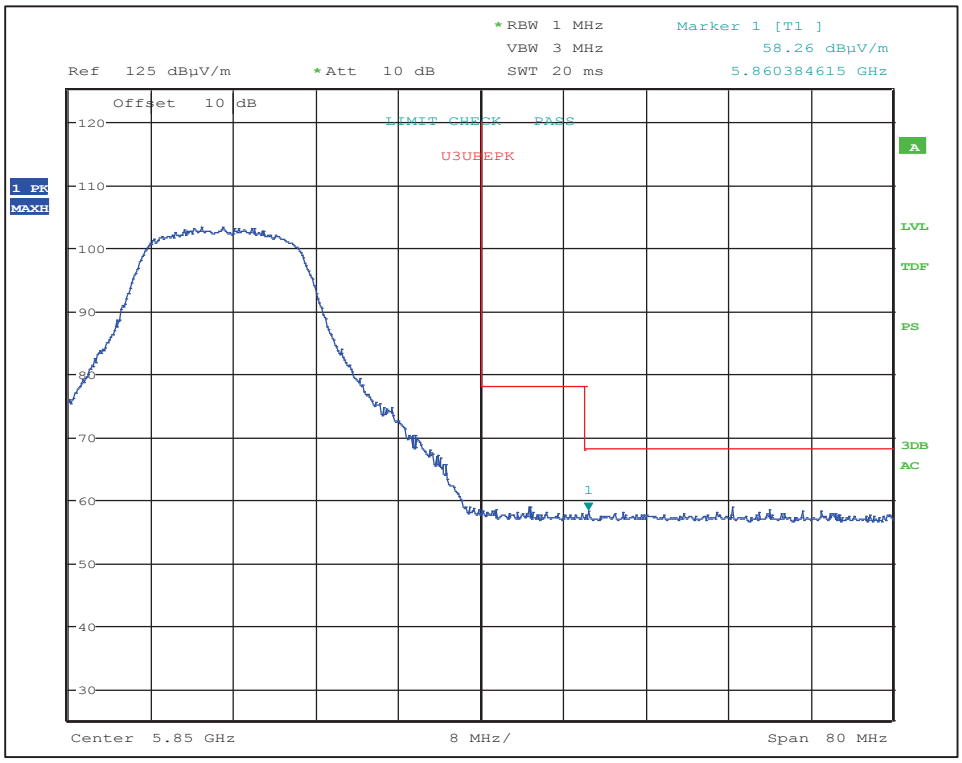
802.11a: 6 Mbps, Channel 165 (5825 MHz)

Frequency (MHz)	SA Reading (dBuV/m)	Detector PK/AV	Antenna			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)						
5871.9	58.4	PK	160	V	193	V	0.00	3.80	58.4	68.2	-9.8
5860.4	58.3	PK	170	H	40	H1	0.00	3.60	58.3	68.2	-9.9

Refer to the following Plots



802.11a at 6Mbps – Authorized band-edge at channel 165 (Vertical Peak Plot)

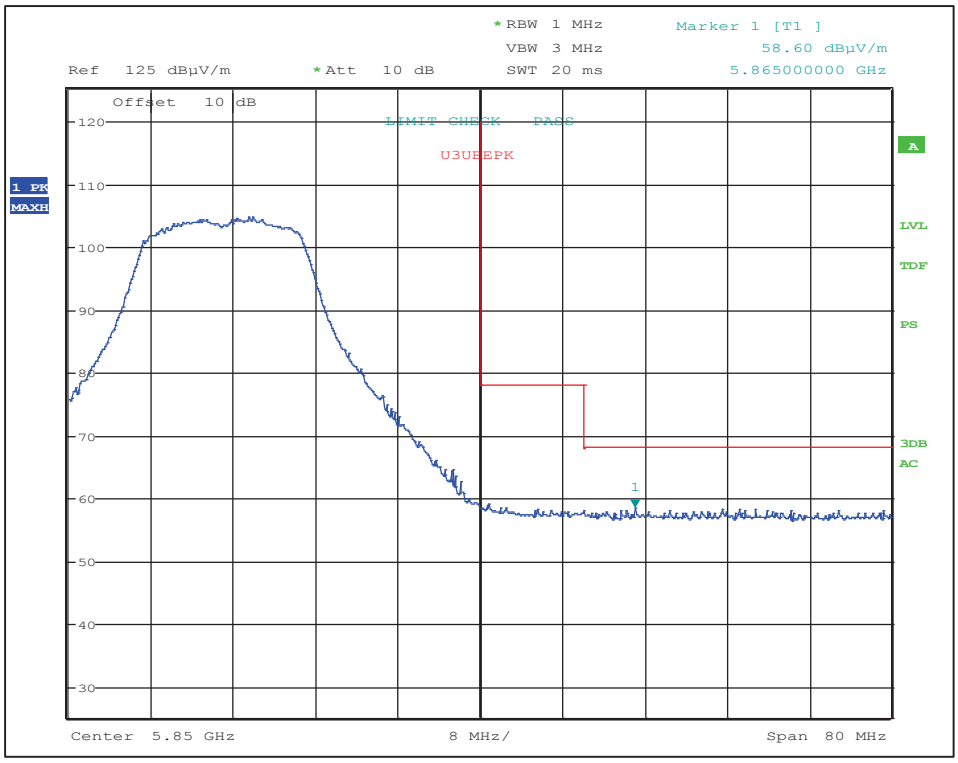


802.11a at 6Mbps - Authorized band-edge at channel 165 (Horizontal Peak Plot)

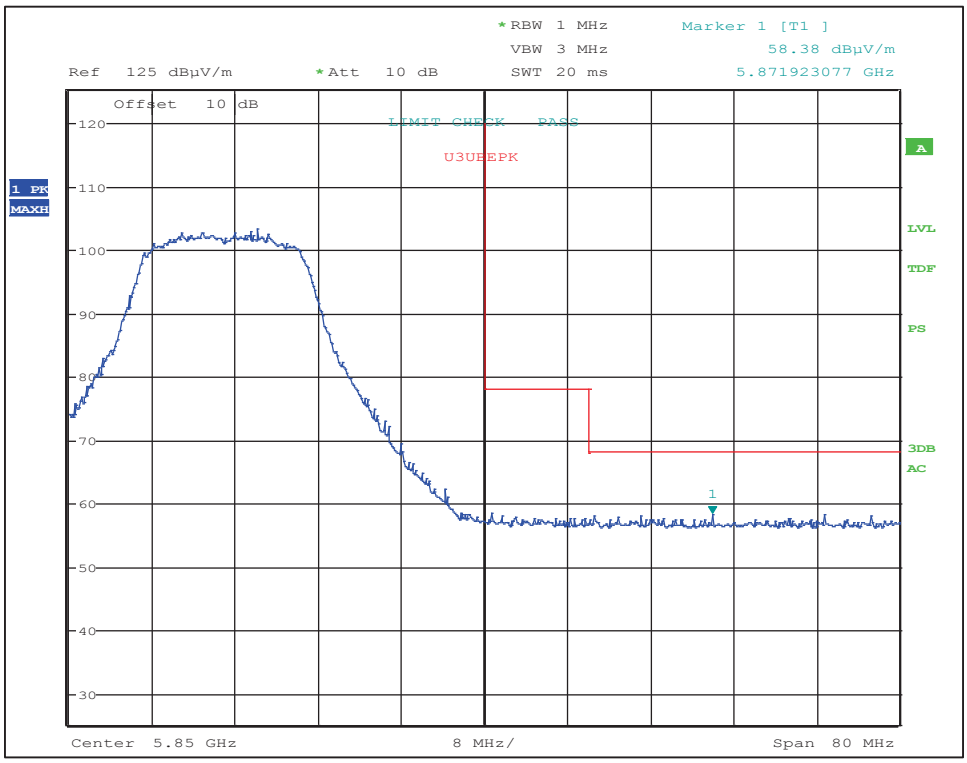
802.11a: 12 Mbps, Channel 165 (5825 MHz)

Frequency (MHz)	SA Reading (dBuV/m)	Detector PK/AV	Antenna			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)						
5865.0	58.6	PK	160	V	193	V	0.00	3.80	58.6	68.2	-9.6
5871.9	58.4	PK	170	H	40	H1	0.00	3.60	58.4	68.2	-9.8

Refer to the following Plots



802.11a at 12Mbps - Authorized band-edge at channel 165 (Vertical Peak Plot)

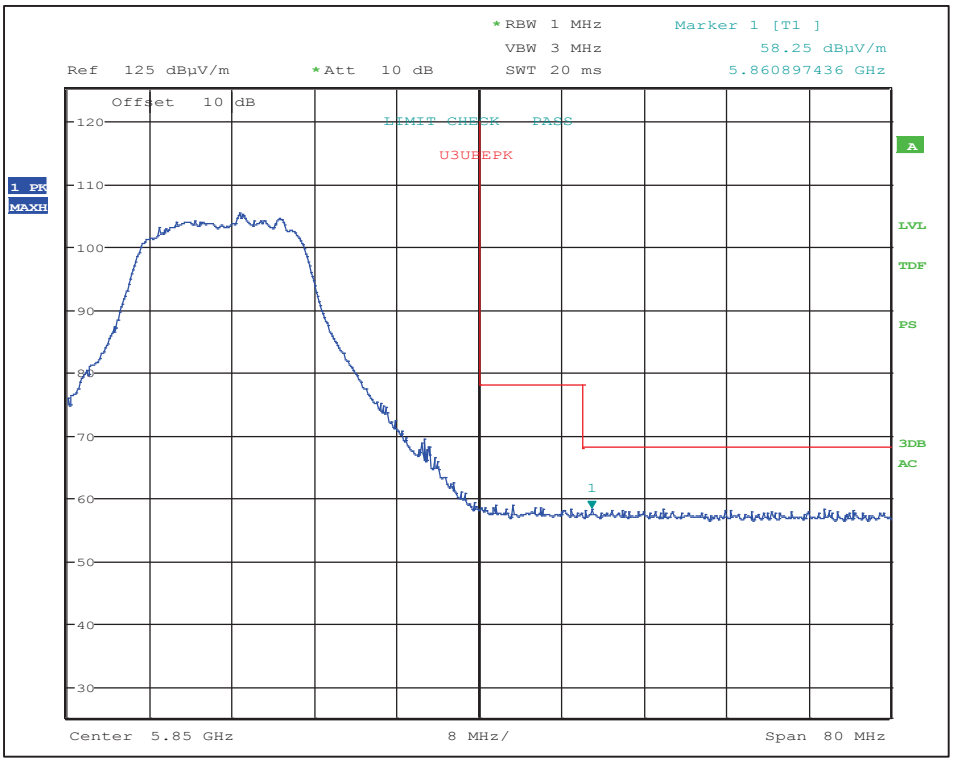


802.11a at 12Mbps - Authorized band-edge at channel 165 (Horizontal Peak Plot)

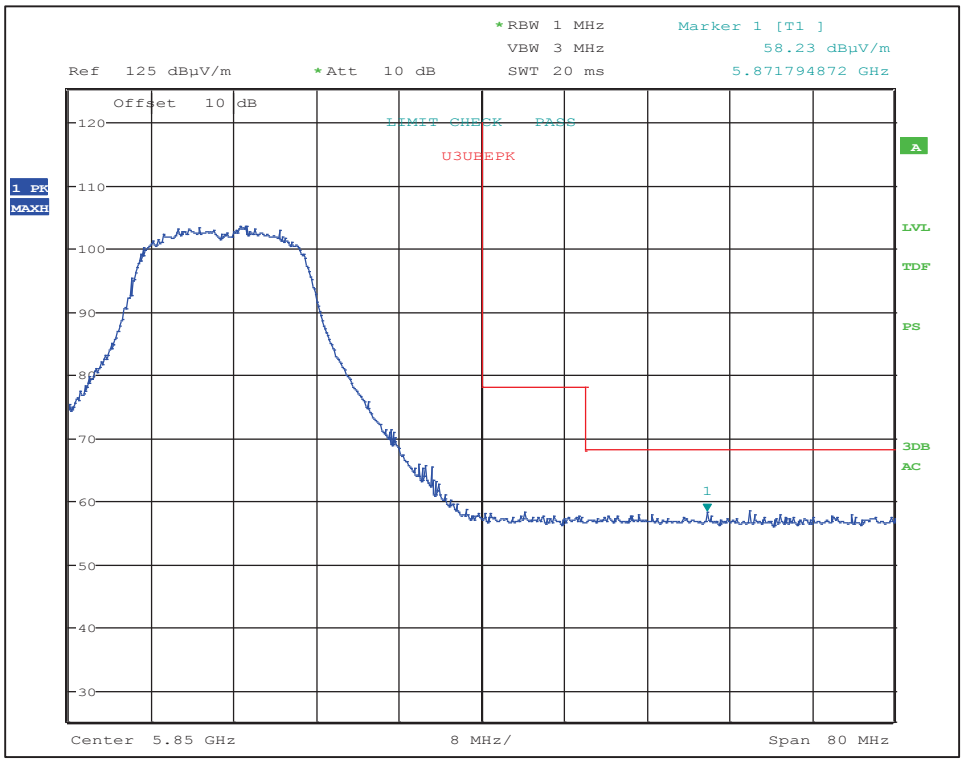
802.11a: 24 Mbps, Channel 165 (5825 MHz)

Frequency (MHz)	SA Reading (dBuV/m)	Detector PK/AV	Antenna			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)						
5860.9	58.3	PK	160	V	193	V	0.00	3.80	58.3	68.2	-9.9
5871.8	58.2	PK	170	H	40	H1	0.00	3.60	58.2	68.2	-10.0

Refer to the following Plots



802.11a at 24Mbps – Authorized band-edge at channel 165 (Vertical Peak Plot)

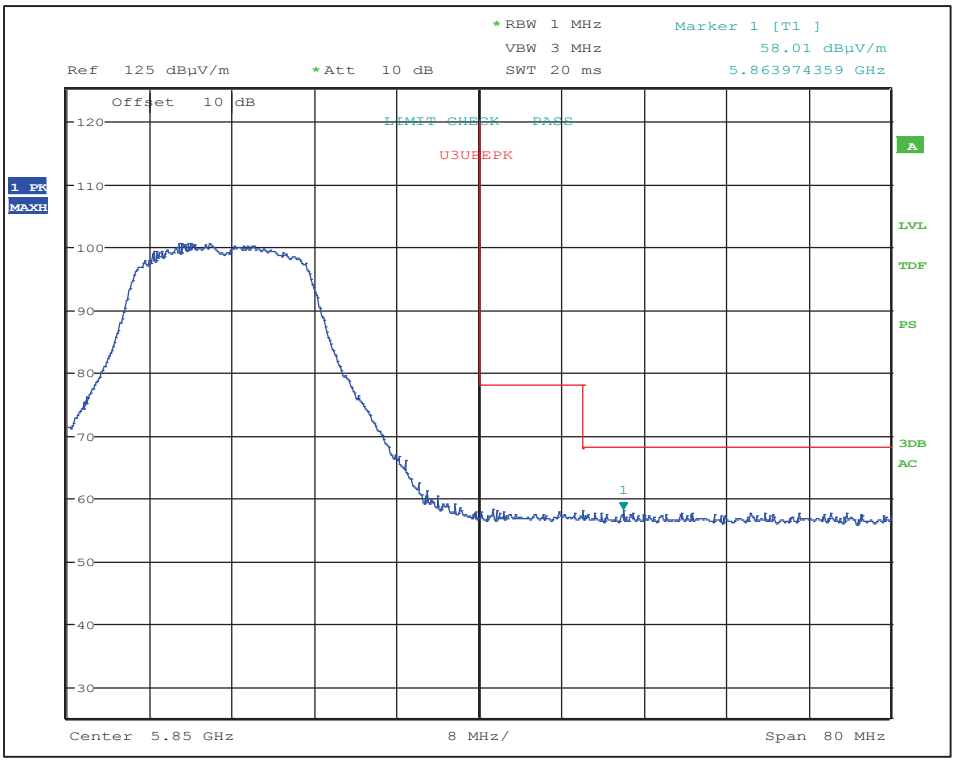


802.11a at 24Mbps - Authorized band-edge at channel 165 (Horizontal Peak Plot)

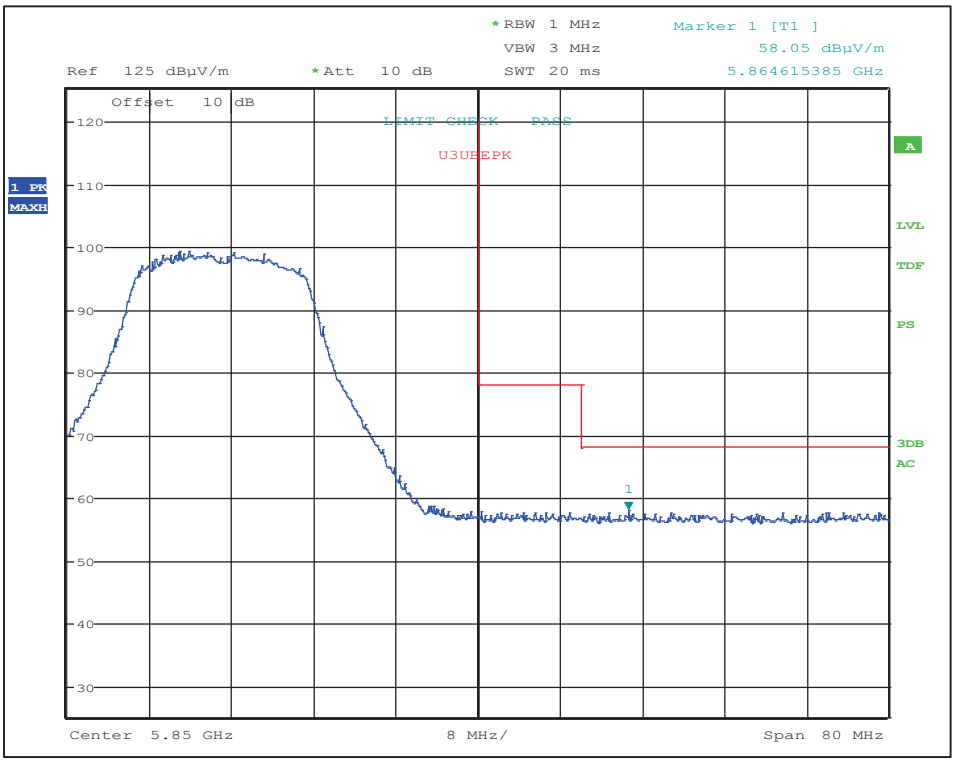
802.11a: MCS7, Channel 165 (5825 MHz)

Frequency (MHz)	SA Reading (dBuV/m)	Detector PK/AV	Antenna			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)						
5864.0	58.0	PK	160	V	193	V	0.00	3.80	58.0	68.2	-10.2
5864.6	58.1	PK	170	H	40	H1	0.00	3.60	58.1	68.2	-10.1

Refer to the following Plots



802.11a at MCS7 - Authorized band-edge at channel 165 (Vertical Peak Plot)



802.11a at MCS7 - Authorized band-edge at channel 165 (Horizontal Peak Plot)

6.5.7 Transmitter Radiated Emissions above 1 GHz (5.15-5.25 GHz Band)

Worst Case Mode:	802.11a
Data Rate:	6 Mbps
Measurement Distance:	3 meters
Operating Mode:	Continuous Transmit
Frequency Range:	1000 MHz – 40000 MHz
Note: The pre-scan plots do not show the maximized amplitude, only included for the purpose of identifying spurious emissions requiring final measurements.	

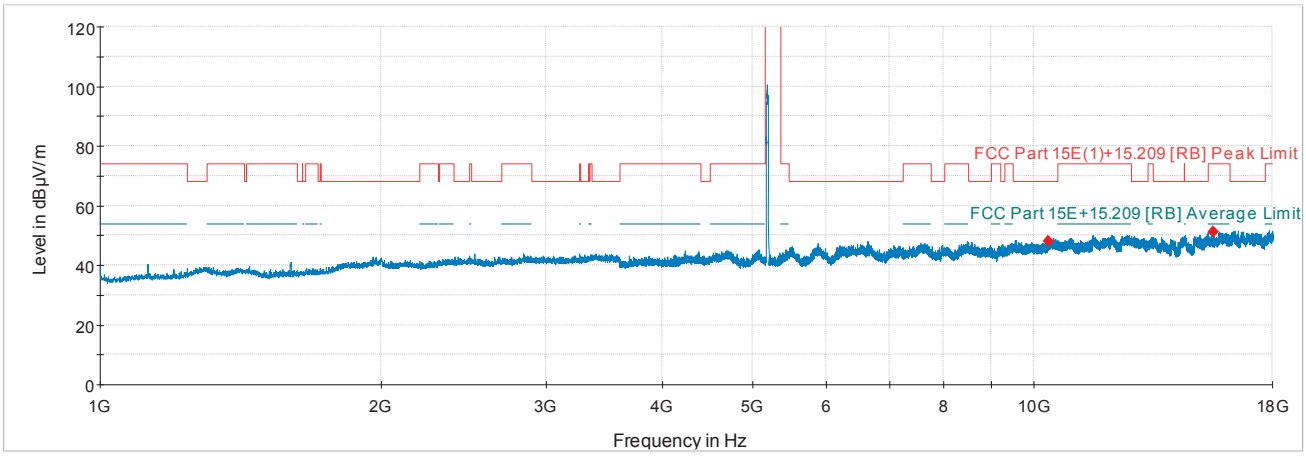
Channel 36 (5180 MHz)

Frequency (MHz)	SA Reading (dBuV/m)	Detector PK/AV	Antenna			EUT Antenna Polarity (V/H1/H2)	DC Factor (dB)	Correction Factor (dB)	Corrected Level (dBuV/m)	Limit [RB] (dBuV/m)	Limit [NRB] (dBuV/m)	Margin (dB)
			Height (cm)	Polarity (V/H)	Azimuth (Deg)							
10360.0	42.0	PK	200.0	V	190.0	V	0.0	10.2	52.2	-	68.2	-16.0
*15540.0	42.0	PK	180.0	V	90.0	V	0.0	11.9	53.9	74.0	-	-20.1
*15540.0	30.2	AV	180.0	V	90.0	V	0.0	11.9	42.1	54.0	-	-11.9
*20720.0	58.9	PK	170.0	V	85.0	V	0.0	-4.7	54.2	74.0	-	-19.8
*20720.0	52.2	AV	170.0	V	85.0	V	0.0	-4.7	47.5	54.0	-	-6.5

Note: * - indicates frequency in FCC §15.205 Restricted bands of operation; RB - Restricted Band; NRB – Non-Restricted Band

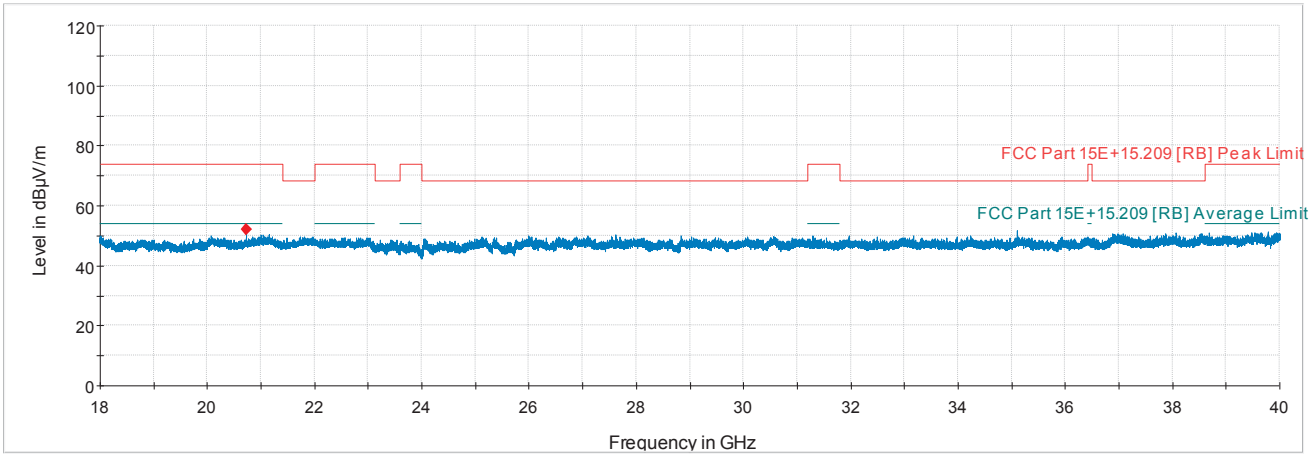
Radiated Spurious Emissions Pre-scan Vertical and Horizontal Plots

Channel 36 (5180 MHz): 1000-18000 MHz Vertical Plot



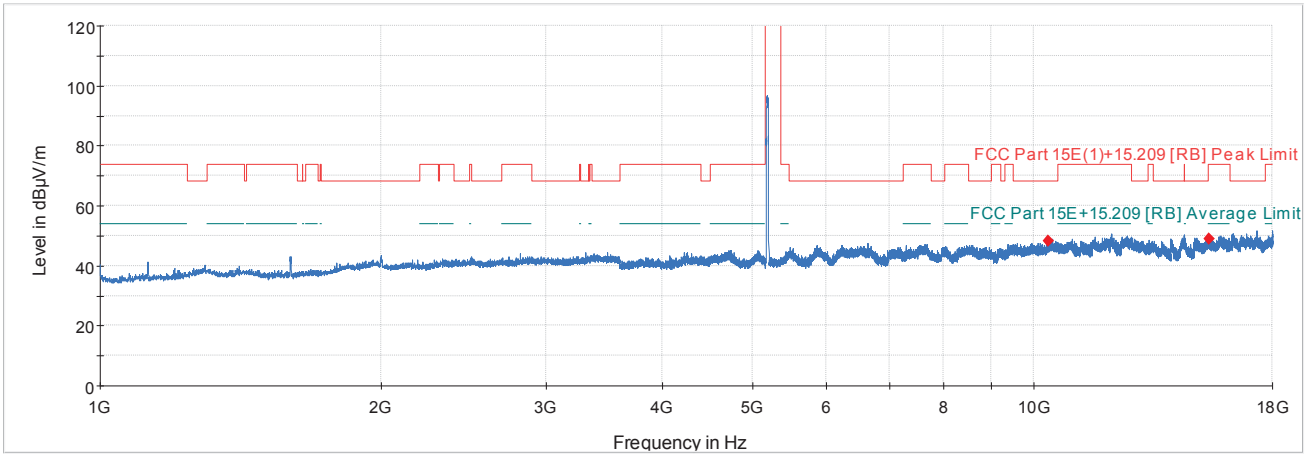
802.11a: 6Mbps - Radiated Emissions 1-18GHz at Channel 36 (Vertical)

Channel 36 (5180 MHz): 18000-40000 MHz Vertical Plot



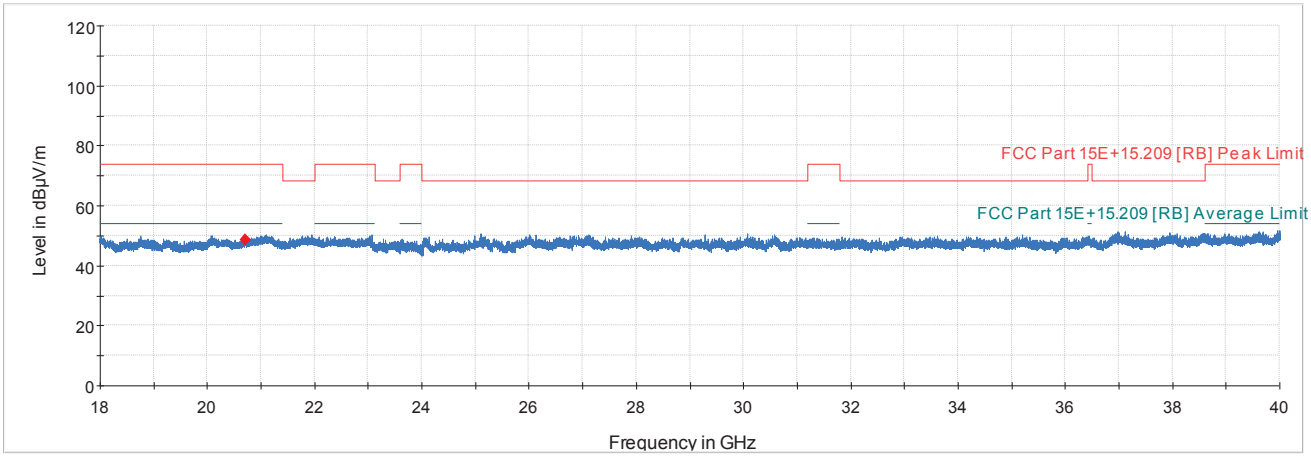
802.11a: 6Mbps - Radiated Emissions 18-40GHz at Channel 36 (Vertical)

Channel 36 (5180 MHz): 1000-18000 MHz Horizontal Plot



802.11a: 6Mbps - Radiated Emissions 1-18GHz at Channel 36 (Horizontal)

Channel 36 (5180 MHz): 18000-40000 MHz Horizontal Plot



802.11a: 6Mbps - Radiated Emissions 18 - 40 GHz at Channel 36 (Horizontal)

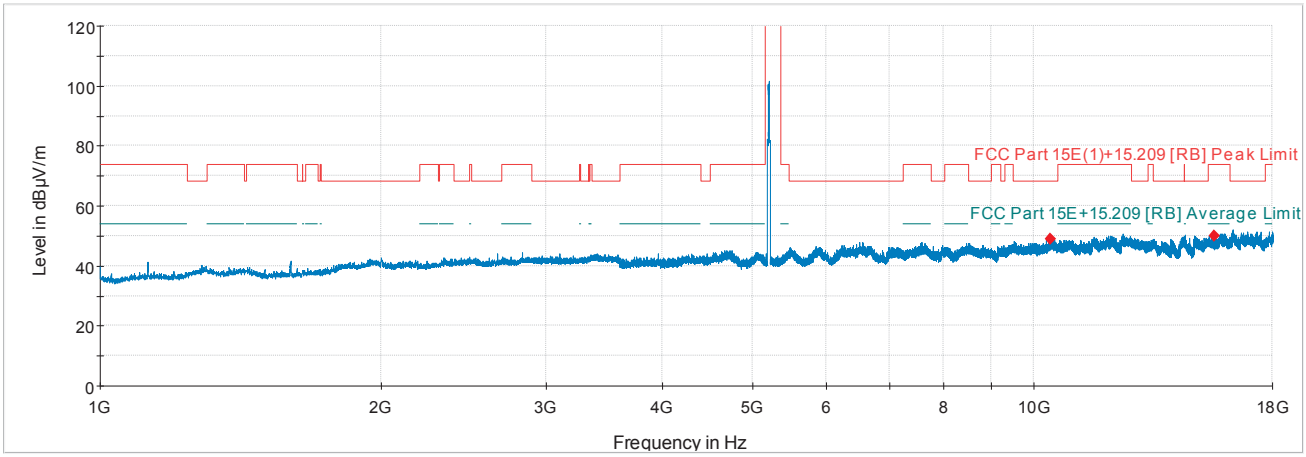
Channel 40 (5200 MHz)

Frequency (MHz)	SA Reading (dBuV/m)	Detector PK/AV	Antenna			EUT Antenna Polarity (V/H1/H2)	DC Factor (dB)	Correction Factor (dB)	Corrected Level (dBuV/m)	Limit [RB] (dBuV/m)	Limit [NRB] (dBuV/m)	Margin (dB)
			Height (cm)	Polarity (V/H)	Azimuth (Deg)							
10400.0	42.5	PK	200.0	V	190.0	V	0.0	10.5	53.0	-	68.2	-15.2
*15600.0	41.8	PK	180.0	V	90.0	V	0.0	12.1	53.9	74.0	-	-20.1
*15600.0	29.8	AV	180.0	V	90.0	V	0.0	12.1	41.9	54.0	-	-12.1
*20800.0	58.6	PK	170.0	V	85.0	V	0.0	-4.7	53.9	74.0	-	-20.1
*20800.0	52.8	AV	170.0	V	85.0	V	0.0	-4.7	48.1	54.0	-	-5.9

Note: * - indicates frequency in FCC §15.205 Restricted bands of operation; RB - Restricted Band; NRB – Non-Restricted Band

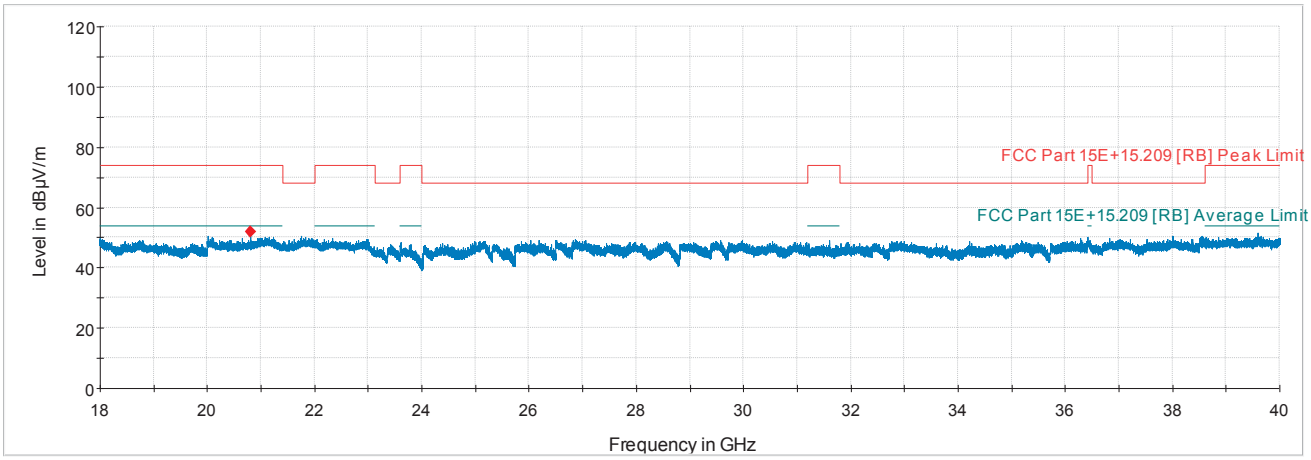
Radiated Spurious Emissions Pre-scan Vertical and Horizontal Plots

Channel 40 (5200 MHz): 1000-18000 MHz Vertical Plot



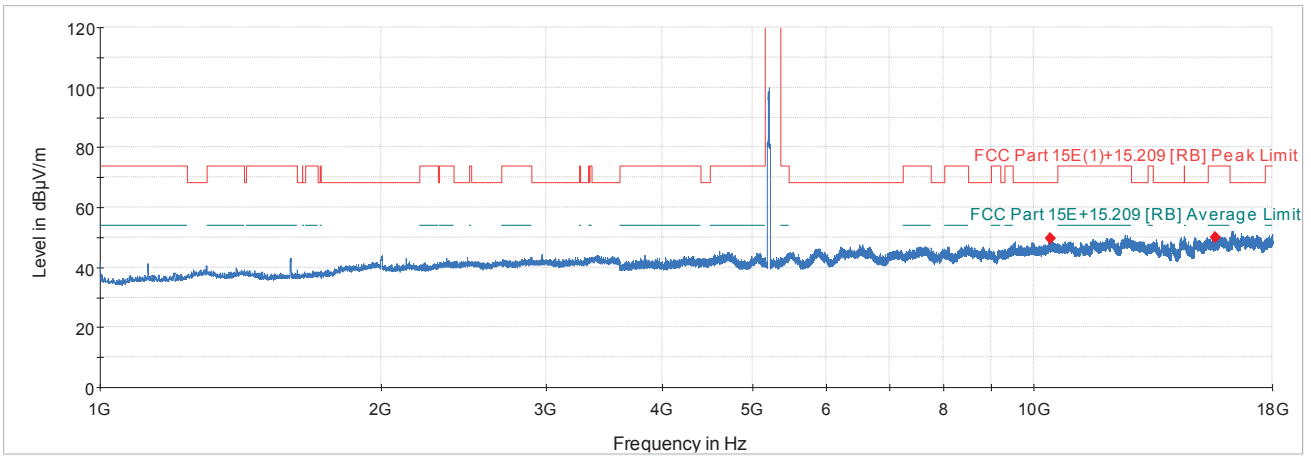
802.11a: 6Mbps - Radiated Emissions 1-18GHz at Channel 40 (Vertical)

Channel 40 (5200 MHz): 18000-40000 MHz Vertical Plot



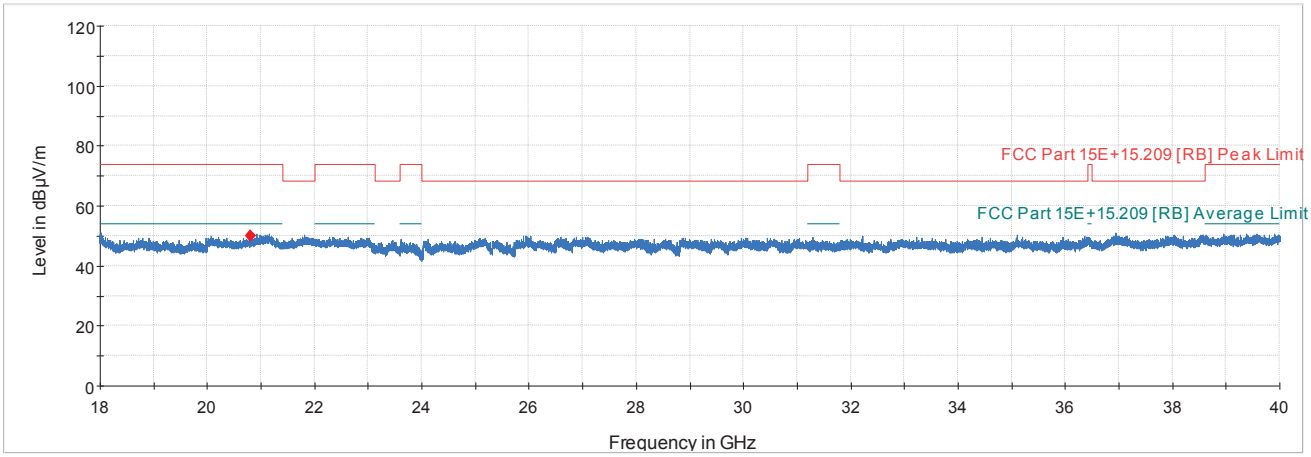
802.11a: 6Mbps - Radiated Emissions 18-40GHz at Channel 40 (Vertical)

Channel 40 (5200 MHz): 1000-18000 MHz Horizontal Plot



802.11a: 6Mbps - Radiated Emissions 1-18GHz at Channel 40 (Horizontal)

Channel 40 (5200 MHz): 18000-40000 MHz Horizontal Plot



802.11a: 6Mbps - Radiated Emissions 18-40GHz at Channel 40 (Horizontal)

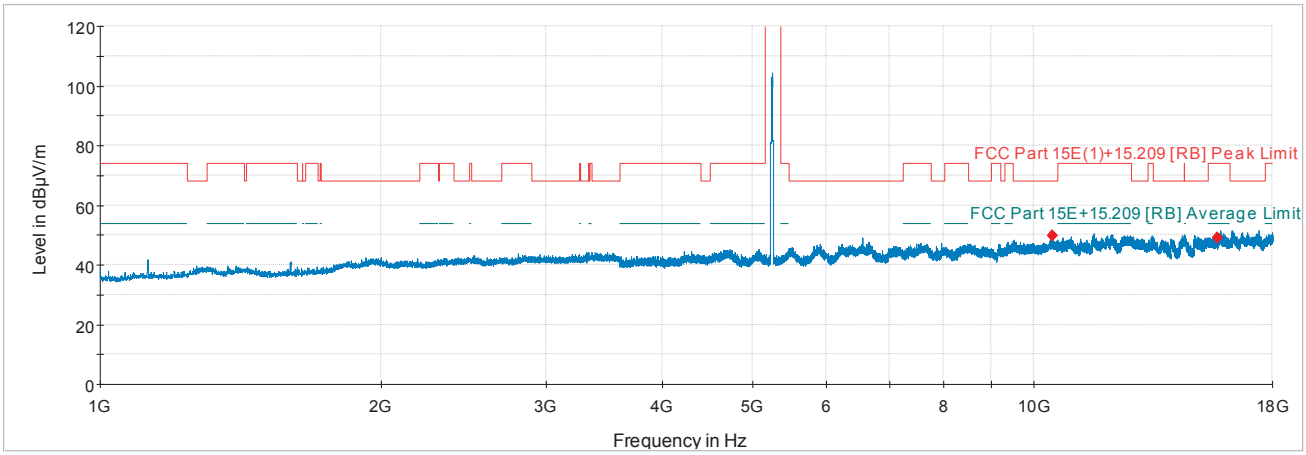
Channel 48 (5240 MHz)

Frequency (MHz)	SA Reading (dBuV/m)	Detector PK/AV	Antenna			EUT Antenna Polarity (V/H1/H2)	DC Factor (dB)	Correction Factor (dB)	Corrected Level (dBuV/m)	Limit [RB] (dBuV/m)	Limit [NRB] (dBuV/m)	Margin (dB)
			Height (cm)	Polarity (V/H)	Azimuth (Deg)							
10480.0	41.7	PK	200.0	V	190.0	V	0.0	10.6	52.3	-	68.2	-15.9
*15720.0	42.4	PK	180.0	V	90.0	V	0.0	12.4	54.8	74.0	-	-19.2
*15720.0	30.0	AV	180.0	V	90.0	V	0.0	12.4	42.4	54.0	-	-11.6
*20960.0	57.7	PK	170.0	V	85.0	V	0.0	-4.6	53.1	74.0	-	-20.9
*20960.0	49.8	AV	170.0	V	85.0	V	0.0	-4.6	45.2	54.0	-	-8.8

Note: * - indicates frequency in FCC §15.205 Restricted bands of operation; RB - Restricted Band; NRB – Non-Restricted Band

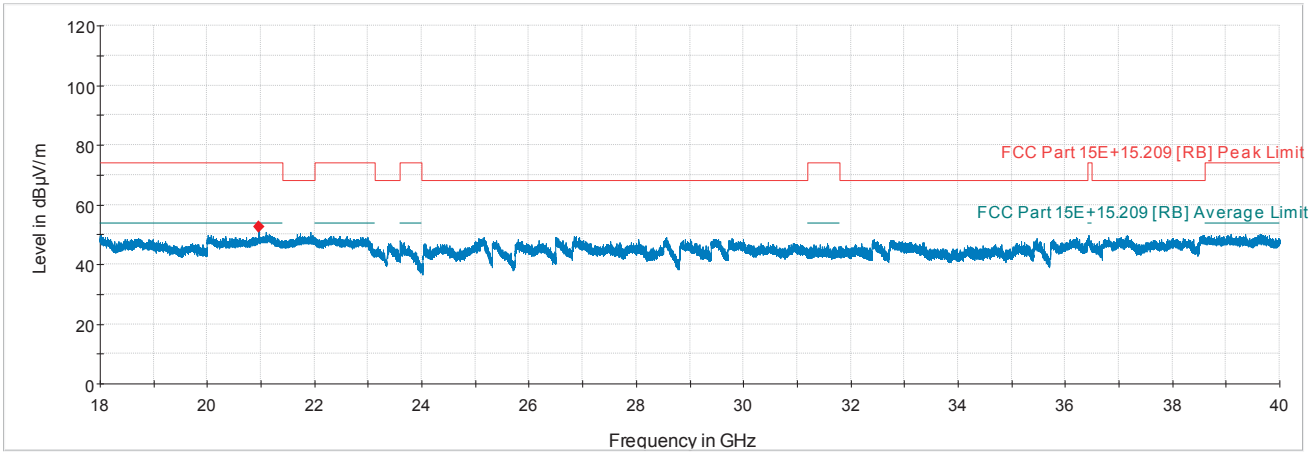
Radiated Spurious Emissions Pre-scan Vertical and Horizontal Plots

Channel 48 (5240 MHz): 1000-18000 MHz Vertical Plot



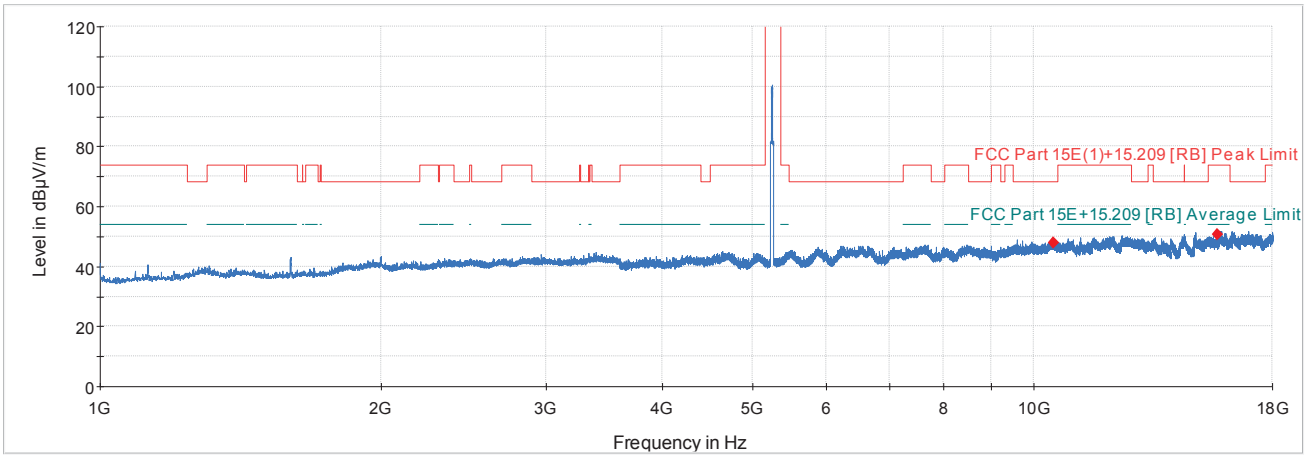
802.11a: 6Mbps - Radiated Emissions 1-18GHz at Channel 48 (Vertical)

Channel 48 (5240 MHz): 18000-40000 MHz Vertical Plot



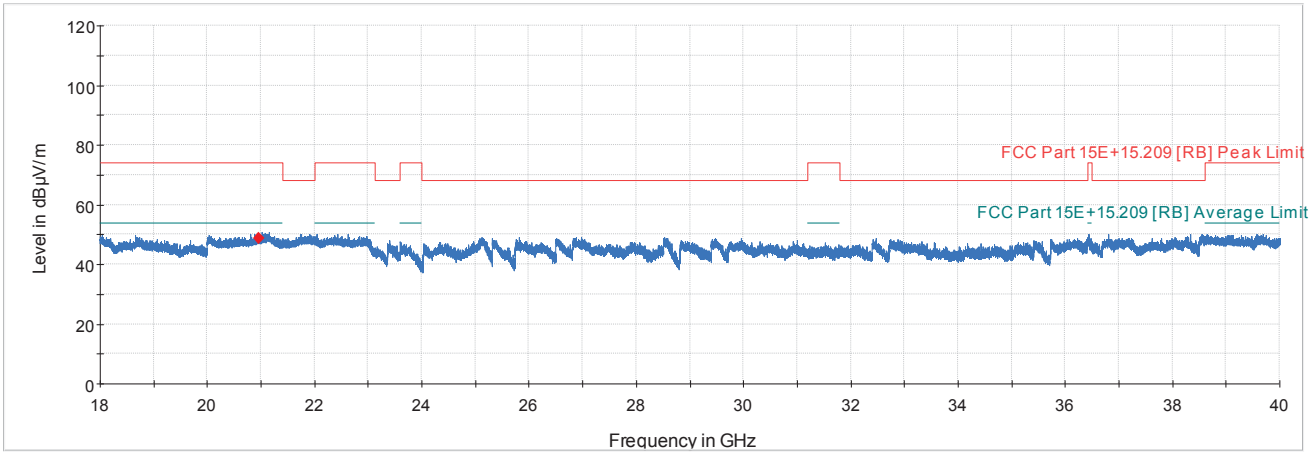
802.11a: 6Mbps - Radiated Emissions 18-40GHz at Channel 48 (Vertical)

Channel 48 (5240 MHz): 1000-18000 MHz Horizontal Plot



802.11a: 6Mbps - Radiated Emissions 1-18GHz at Channel 48 (Horizontal)

Channel 48 (5240 MHz): 18000-40000 MHz Horizontal Plot



802.11a: 6Mbps - Radiated Emissions 18 - 40 GHz at Channel 48 (Horizontal)

6.5.8 Transmitter Radiated Emissions above 1 GHz (5.25-5.35 GHz Band)

Worst Case Mode:	802.11a
Data Rate:	6 Mbps
Measurement Distance:	3 meters
Operating Mode:	Continuous Transmit
Frequency Range:	1000 MHz – 40000 MHz
Note: The pre-scan plots do not show the maximized amplitude, only included for the purpose of identifying spurious emissions requiring final measurements.	

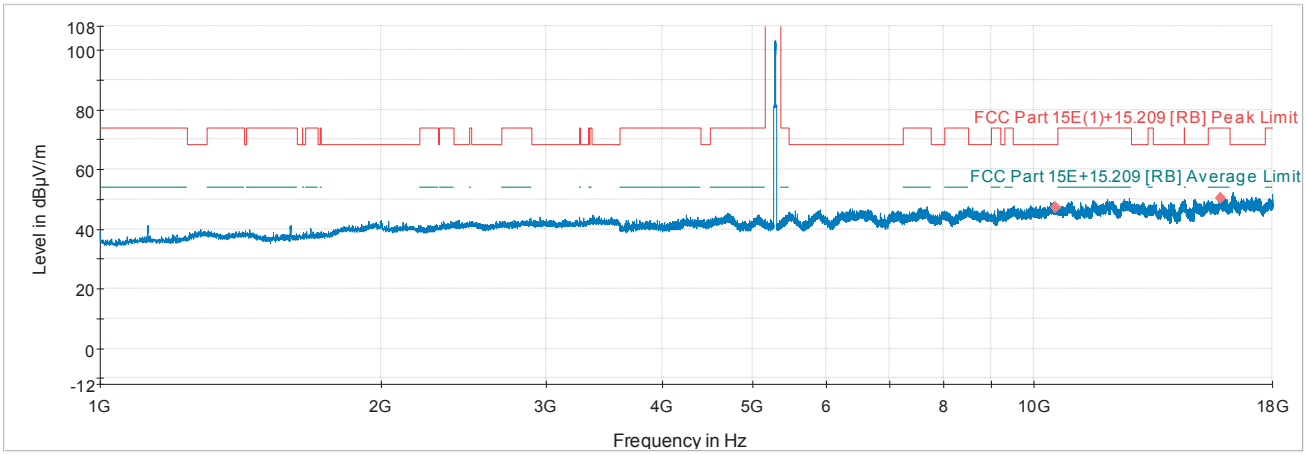
Channel 56 (5280 MHz)

Frequency (MHz)	SA Reading (dBuV/m)	Detector PK/AV	Antenna			EUT Antenna Polarity (V/H1/H2)	DC Factor (dB)	Correction Factor (dB)	Corrected Level (dBuV/m)	Limit [RB] (dBuV/m)	Limit [NRB] (dBuV/m)	Margin (dB)
			Height (cm)	Polarity (V/H)	Azimuth (Deg)							
10560.0	42.4	PK	201.0	V	190.0	V	0.0	10.5	52.9	-	68.2	-15.3
*15840.0	41.9	PK	180.0	V	90.0	V	0.0	13.1	55.0	74.0	-	-19.0
*15840.0	30.2	AV	180.0	V	90.0	V	0.0	13.1	43.3	54.0	-	-10.7
*21120.0	57.6	PK	170.0	V	98.0	V	0.0	-4.5	53.1	74.0	-	-20.9
*21120.0	50.1	AV	170.0	V	98.0	V	0.0	-4.5	45.6	54.0	-	-8.4

Note: * - indicates frequency in FCC §15.205 Restricted bands of operation; RB - Restricted Band; NRB – Non-Restricted Band

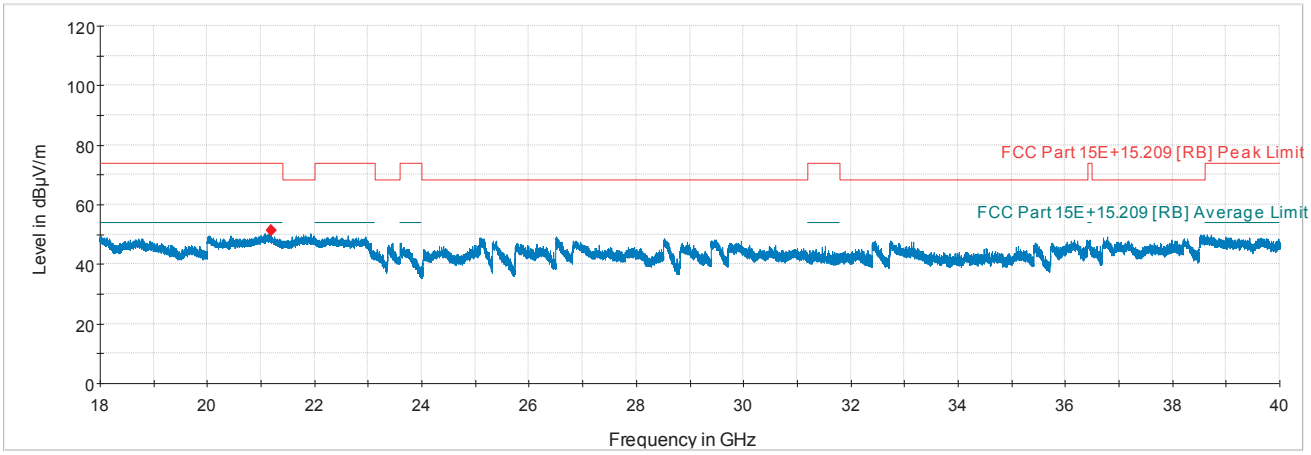
Radiated Spurious Emissions Pre-scan Vertical and Horizontal Plots

Channel 56 (5280 MHz): 1000-18000 MHz Vertical Plot



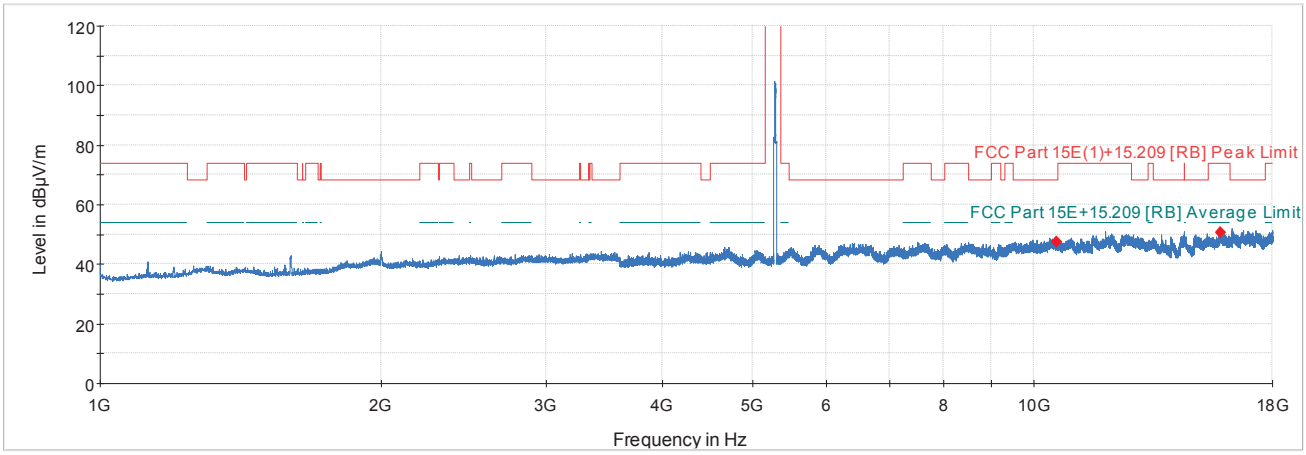
802.11a: 6Mbps - Radiated Emissions 1-18GHz at Channel 56 (Vertical)

Channel 56 (5280 MHz): 18000-40000 MHz Vertical Plot



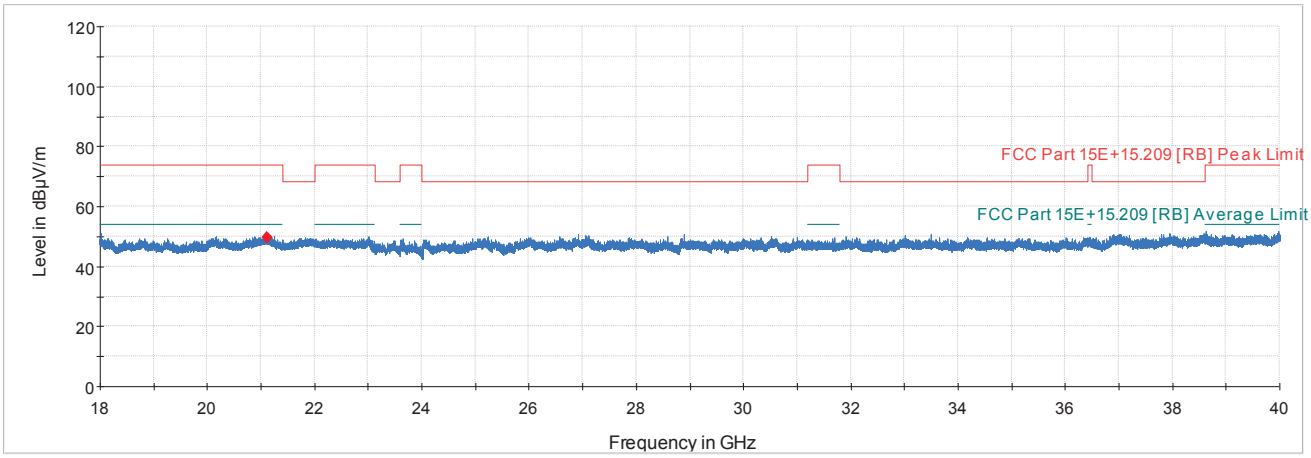
802.11a: 6Mbps - Radiated Emissions 18-40GHz at Channel 60 (Vertical)

Channel 56 (5280 MHz): 1000-18000 MHz Horizontal Plot



802.11a: 6Mbps - Radiated Emissions 1-18GHz at Channel 56 (Horizontal)

Channel 56 (5280 MHz): 18000-40000 MHz Horizontal Plot



802.11a: 6Mbps - Radiated Emissions 18-40GHz at Channel 56 (Horizontal)

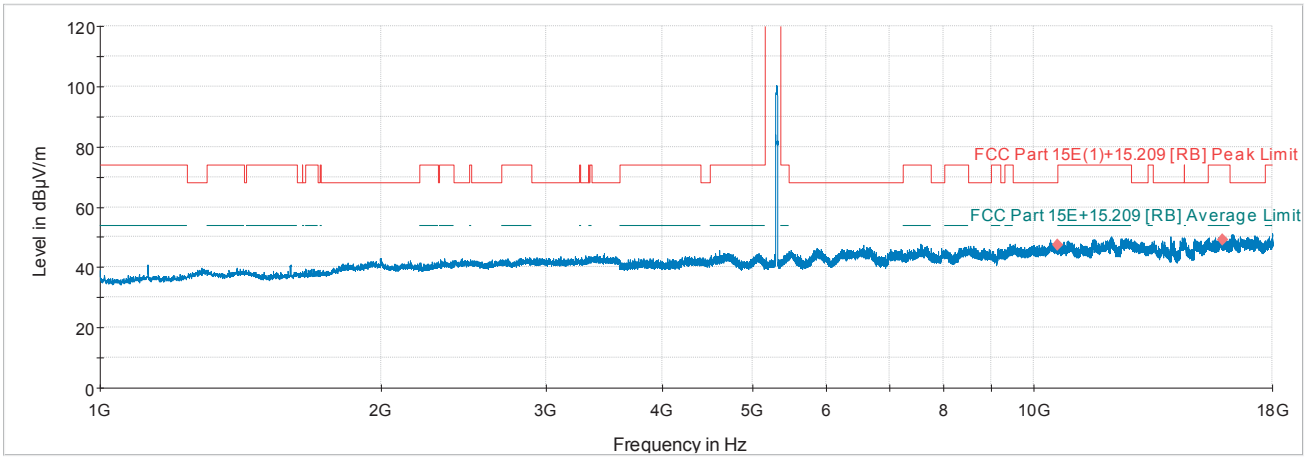
Channel 60 (5300 MHz)

Frequency (MHz)	SA Reading (dBuV/m)	Detector PK/AV	Antenna			EUT Antenna Polarity (V/H1/H2)	DC Factor (dB)	Correction Factor (dB)	Corrected Level (dBuV/m)	Limit [RB] (dBuV/m)	Limit [NRB] (dBuV/m)	Margin (dB)
			Height (cm)	Polarity (V/H)	Azimuth (Deg)							
*10600.0	42.7	PK	201.0	V	190.0	V	0.0	10.5	53.2	74.0	-	-20.8
*10600.0	32.3	AV	201.0	V	190.0	V	0.0	10.5	42.8	54.0	-	-11.2
*15900.0	41.9	PK	180.0	V	90.0	V	0.0	13.0	54.9	74.0	-	-19.1
*15900.0	29.8	AV	180.0	V	90.0	V	0.0	13.0	42.8	54.0	-	-11.2
*21200.0	57.9	PK	170.0	V	98.0	V	0.0	-4.5	53.4	74.0	-	-20.6
*21200.0	50.1	AV	170.0	V	98.0	V	0.0	-4.5	45.6	54.0	-	-8.4

Note: * - indicates frequency in FCC §15.205 Restricted bands of operation; RB - Restricted Band; NRB – Non-Restricted Band

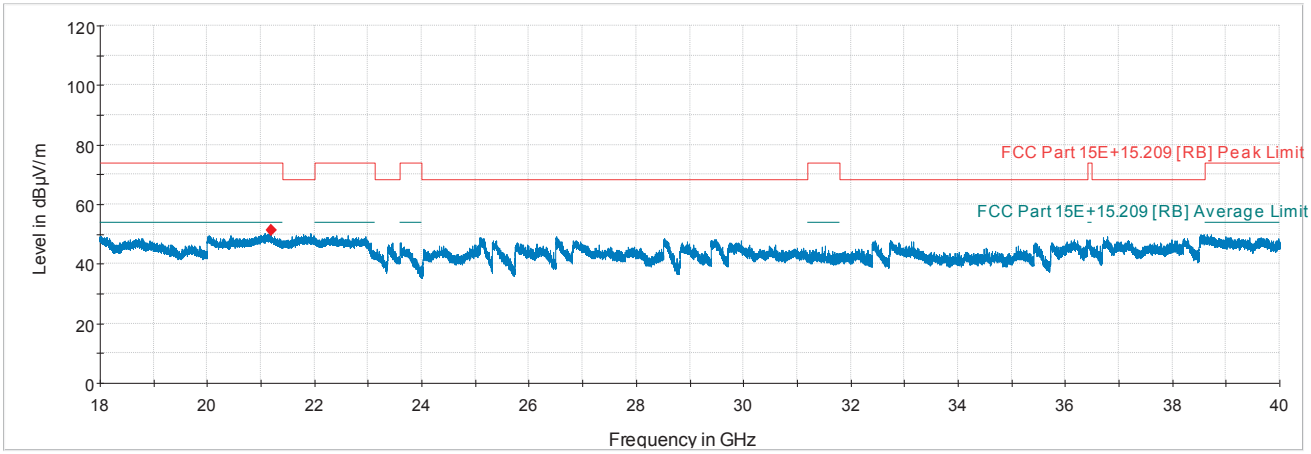
Radiated Spurious Emissions Pre-scan Vertical and Horizontal Plots

Channel 60 (5300 MHz): 1000-18000 MHz Vertical Plot



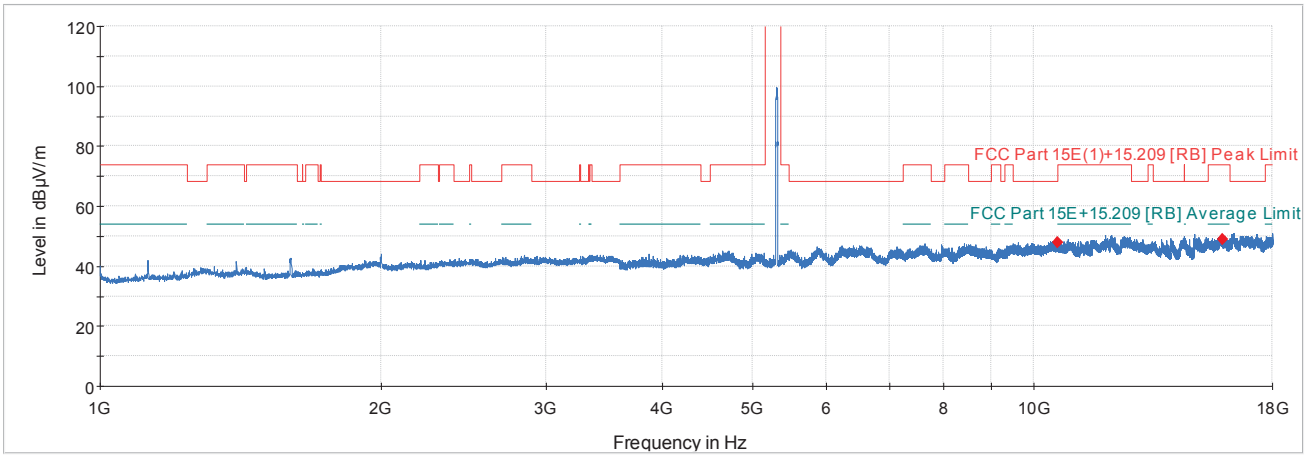
802.11a: 6Mbps - Radiated Emissions 1-18GHz at Channel 60 (Vertical)

Channel 60 (5300 MHz): 18000-40000 MHz Vertical Plot



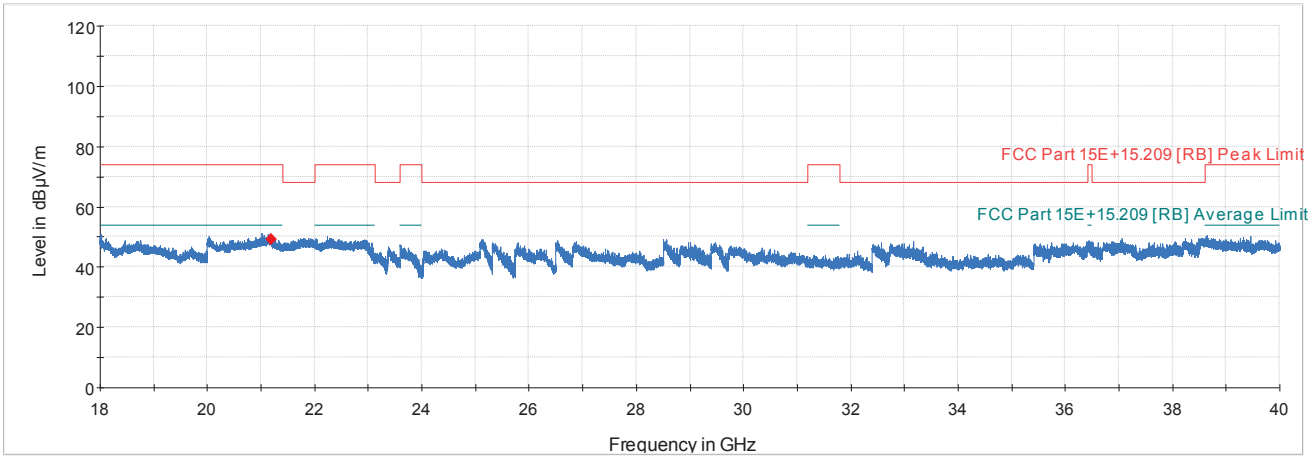
802.11a: 6Mbps - Radiated Emissions 18-40GHz at Channel 60 (Vertical)

Channel 60 (5300 MHz): 1000-18000 MHz Horizontal Plot



802.11a: 6Mbps - Radiated Emissions 1-18GHz at Channel 60 (Horizontal)

Channel 60 (5300 MHz): 18000-40000 MHz Horizontal Plot



802.11a: 6Mbps - Radiated Emissions 18-40GHz at Channel 60 (Horizontal)

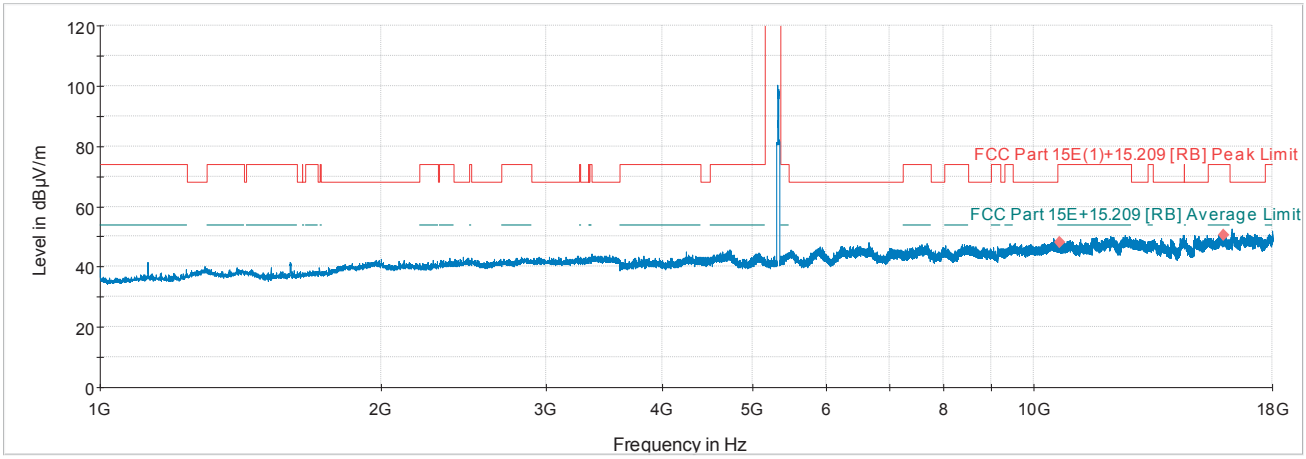
Channel 64 (5320 MHz)

Frequency (MHz)	SA Reading (dBuV/m)	Detector PK/AV	Antenna			EUT Antenna Polarity (V/H1/H2)	DC Factor (dB)	Correction Factor (dB)	Corrected Level (dBuV/m))	Limit [RB] (dBuV/m)	Limit [NRB] (dBuV/m)	Margin (dB)
			Height (cm)	Polarity (V/H)	Azimuth (Deg)							
*10640.0	42.3	PK	201.0	V	190.0	V	0.0	10.7	53.0	74.0	-	-21.0
*10640.0	32.4	AV	201.0	V	190.0	V	0.0	10.7	43.1	54.0	-	-10.9
*15960.0	42.3	PK	180.0	V	90.0	V	0.0	12.9	55.2	74.0	-	-18.8
*15960.0	29.5	AV	180.0	V	90.0	V	0.0	12.9	42.4	54.0	-	-11.6
*21280.0	57.7	PK	170.0	V	98.0	V	0.0	-4.5	53.2	74.0	-	-20.8
*21280.0	49.5	AV	170.0	V	98.0	V	0.0	-4.5	45.0	54.0	-	-9.0

Note: * - indicates frequency in FCC §15.205 Restricted bands of operation; RB - Restricted Band; NRB – Non-Restricted Band

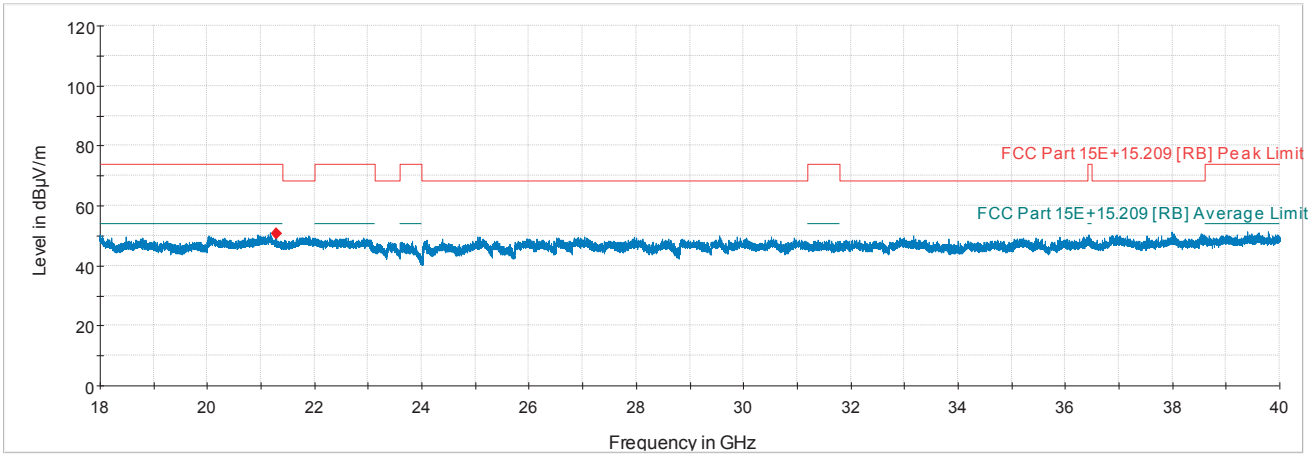
Radiated Spurious Emissions Pre-scan Vertical and Horizontal Plots

Channel 64 (5320 MHz): 1000-18000 MHz Vertical Plot



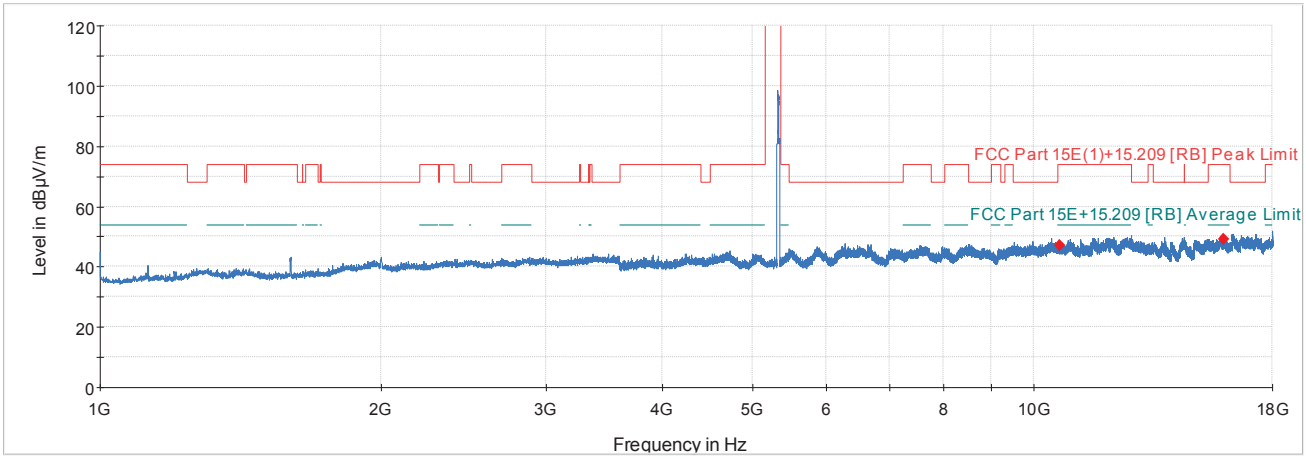
802.11a: 6Mbps - Radiated Emissions 1-18GHz at Channel 64 (Vertical)

Channel 64 (5320MHz): 18000-40000 MHz Vertical Plot



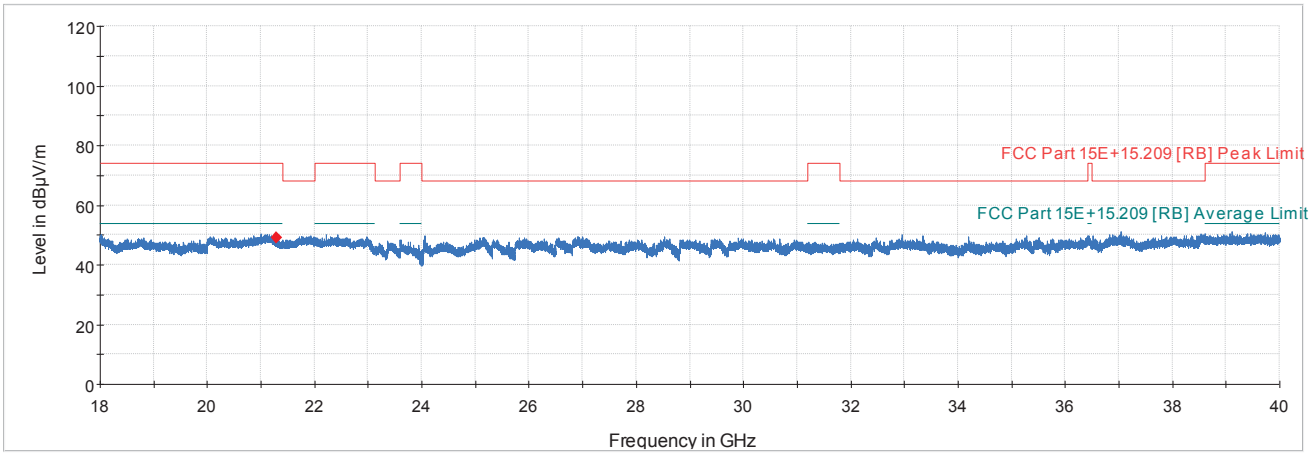
802.11a: 6Mbps - Radiated Emissions 18-40GHz at Channel 64 (Vertical)

Channel 64 (5320 MHz): 1000-18000 MHz Horizontal Plot



802.11a: 6Mbps - Radiated Emissions 1-18GHz at Channel 64 (Horizontal)

Channel 64 (5320 MHz): 18000-40000 MHz Horizontal Plot



802.11a: 6Mbps - Radiated Emissions 18-40GHz at Channel 64 (Horizontal)

6.5.9 Transmitter Radiated Emissions above 1 GHz (5.47-5.725 GHz Band)

Worst Case Mode:	802.11a
Data Rate:	6 Mbps
Measurement Distance:	3 meters
Operating Mode:	Continuous Transmit
Frequency Range:	1000 MHz – 40000 MHz
Note: The pre-scan plots do not show the maximized amplitude, only included for the purpose of identifying spurious emissions requiring final measurements.	

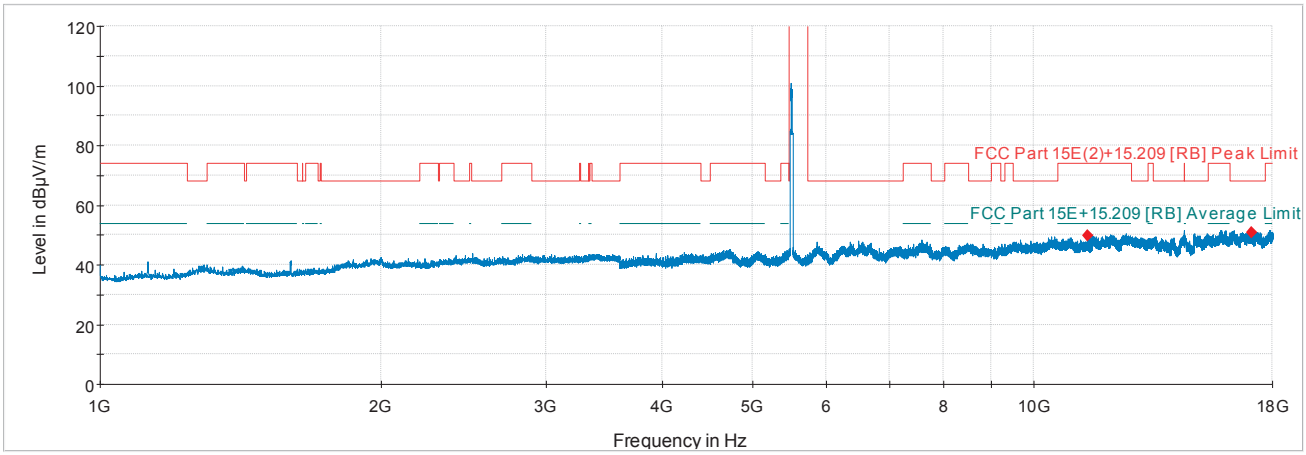
Channel 100 (5280 MHz)

Frequency (MHz)	SA Reading (dBuV/m)	Detector PK/AV	Antenna			EUT Antenna Polarity (V/H1/H2)	DC Factor (dB)	Correction Factor (dB)	Corrected Level (dBuV/m)	Limit [RB] (dBuV/m)	Limit [NRB] (dBuV/m)	Margin (dB)
			Height (cm)	Polarity (V/H)	Azimuth (Deg)							
*11000.0	43.9	PK	230.0	V	90.0	V	0.0	11.0	54.9	74.0	-	-19.1
*11000.0	34.0	AV	230.0	V	90.0	V	0.0	11.0	45.0	54.0	-	-9.0
16500.0	41.6	PK	190.0	V	85.0	V	0.0	13.4	55.0	-	68.2	-13.2
22000.0	57.7	PK	170.0	V	85.0	V	0.0	-4.3	53.4	-	68.2	-14.8

Note: * - indicates frequency in FCC §15.205 Restricted bands of operation; RB - Restricted Band; NRB – Non-Restricted Band

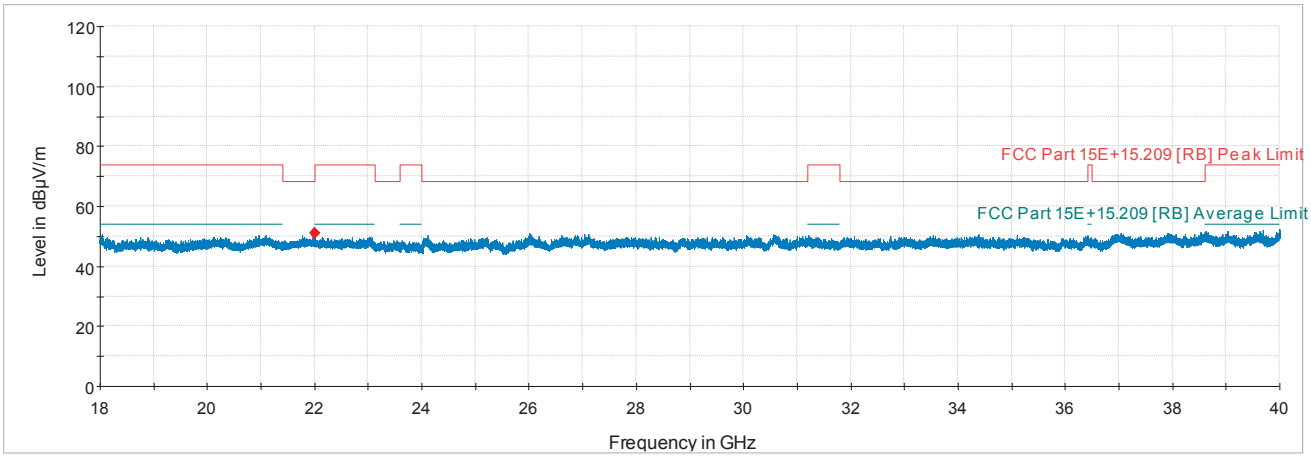
Radiated Spurious Emissions Pre-scan Vertical and Horizontal Plots

Channel 100 (5500 MHz): 1000-18000 MHz Vertical Plot



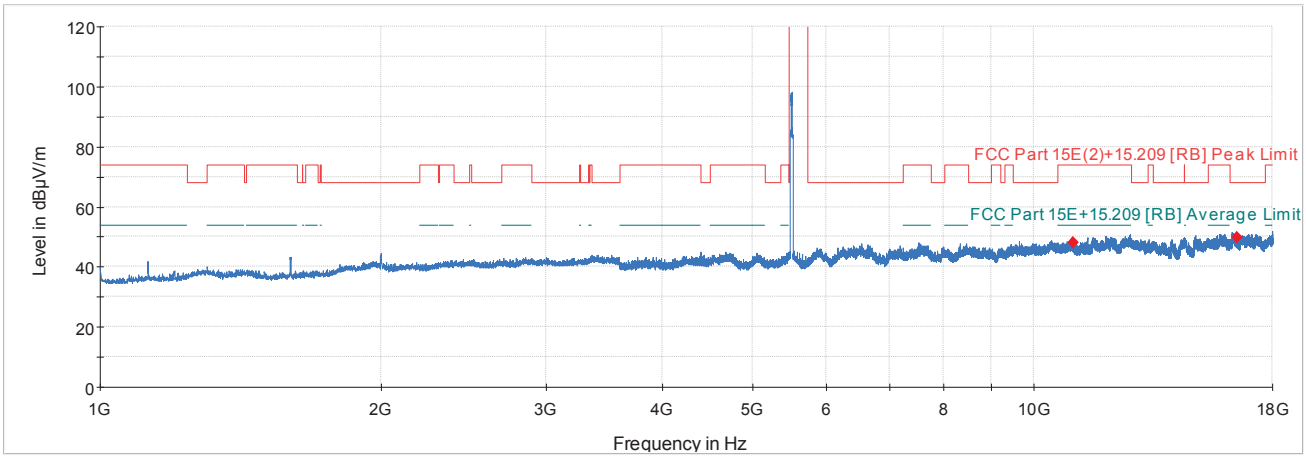
802.11a: 6Mbps - Radiated Emissions 1-18GHz at Channel 100 (Vertical)

Channel 100 (5500 MHz): 18000-40000 MHz Vertical Plot



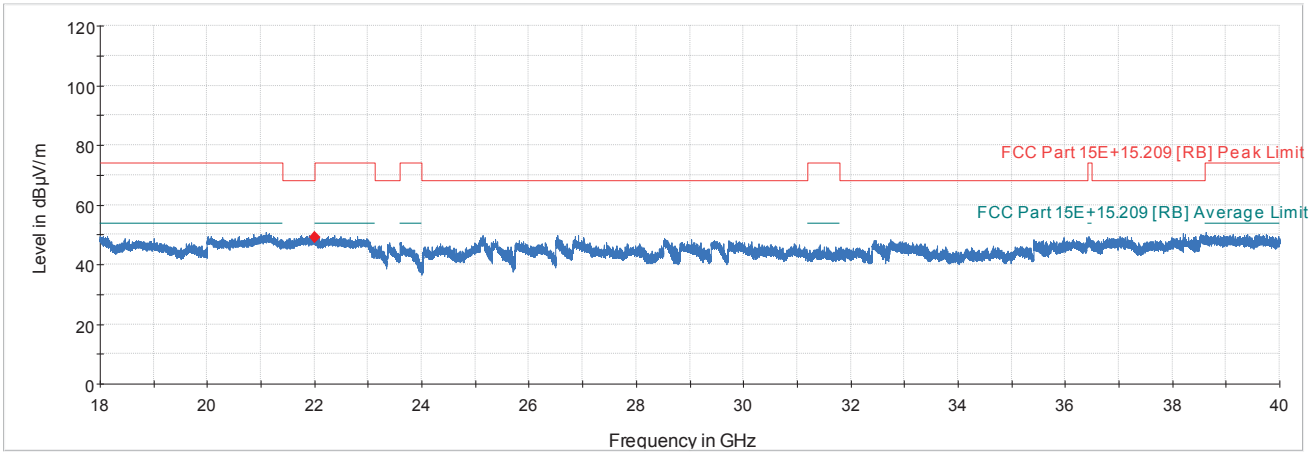
802.11a: 6Mbps - Radiated Emissions 18-40GHz at Channel 100 (Vertical)

Channel 100 (5500 MHz): 1000-18000 MHz Horizontal Plot



802.11a: 6Mbps - Radiated Emissions 1-18GHz at Channel 100 (Horizontal)

Channel 100 (5500 MHz): 18000-40000 MHz Horizontal Plot



802.11a: 6Mbps - Radiated Emissions 18-40GHz at Channel 100 (Horizontal)

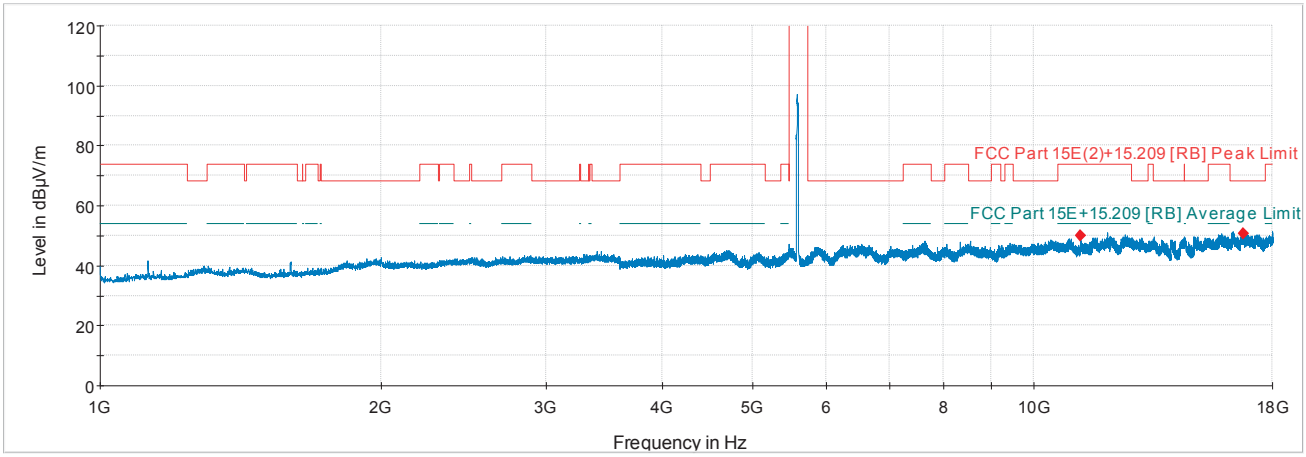
Channel 116 (5300 MHz)

Frequency (MHz)	SA Reading (dBuV/m)	Detector PK/AV	Antenna			EUT Antenna Polarity (V/H1/H2)	DC Factor (dB)	Correction Factor (dB)	Corrected Level (dBuV/m)	Limit [RB] (dBuV/m)	Limit [NRB] (dBuV/m)	Margin (dB)
			Height (cm)	Polarity (V/H)	Azimuth (Deg)							
*11160.0	42.6	PK	230.0	V	90.0	V	0.0	11.0	53.6	74.0	-	-20.4
*11160.0	32.7	AV	230.0	V	90.0	V	0.0	11.0	43.7	54.0	-	-10.3
16740.0	42.2	PK	190.0	V	90.0	V	0.0	13.5	55.7	-	68.2	-12.5
*22320.0	57.4	PK	170.0	V	85.0	V	0.0	-4.2	53.2	74.0	-	-20.8
*22320.0	50.3	AV	170.0	V	85.0	V	0.0	-4.2	46.1	54	-	-7.9

Note: * - indicates frequency in FCC §15.205 Restricted bands of operation; RB - Restricted Band; NRB – Non-Restricted Band

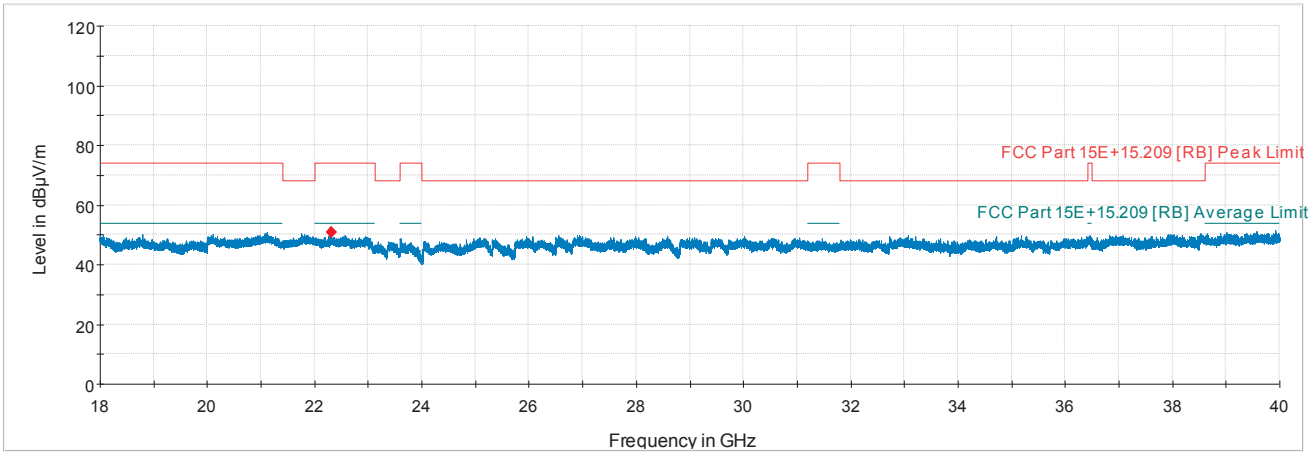
Radiated Spurious Emissions Pre-scan Vertical and Horizontal Plots

Channel 116 (5580 MHz): 1000-18000 MHz Vertical Plot



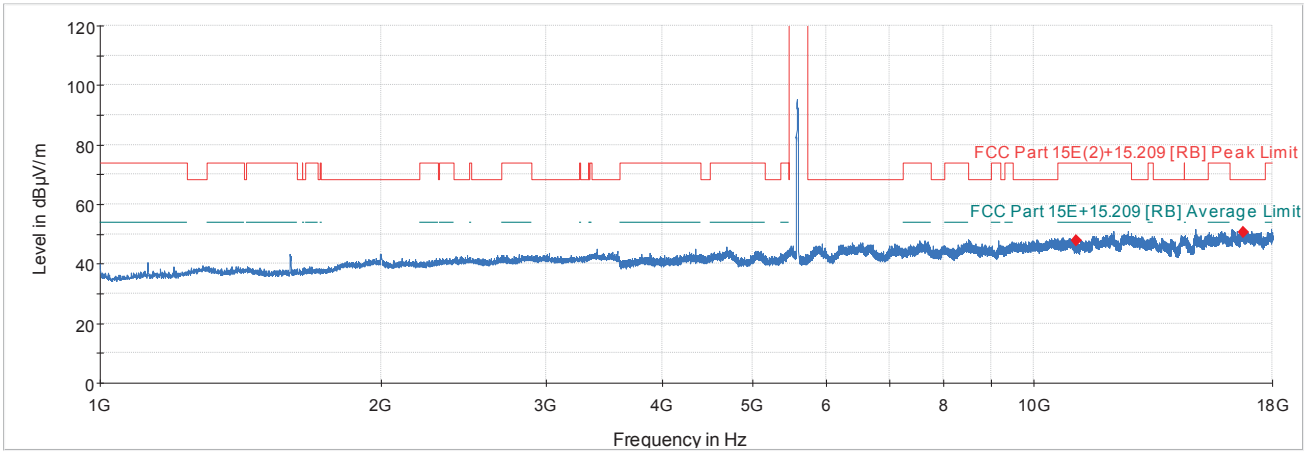
802.11a: 6Mbps - Radiated Emissions 1-18GHz at Channel 116 (Vertical)

Channel 116 (5580 MHz): 18000-40000 MHz Vertical Plot



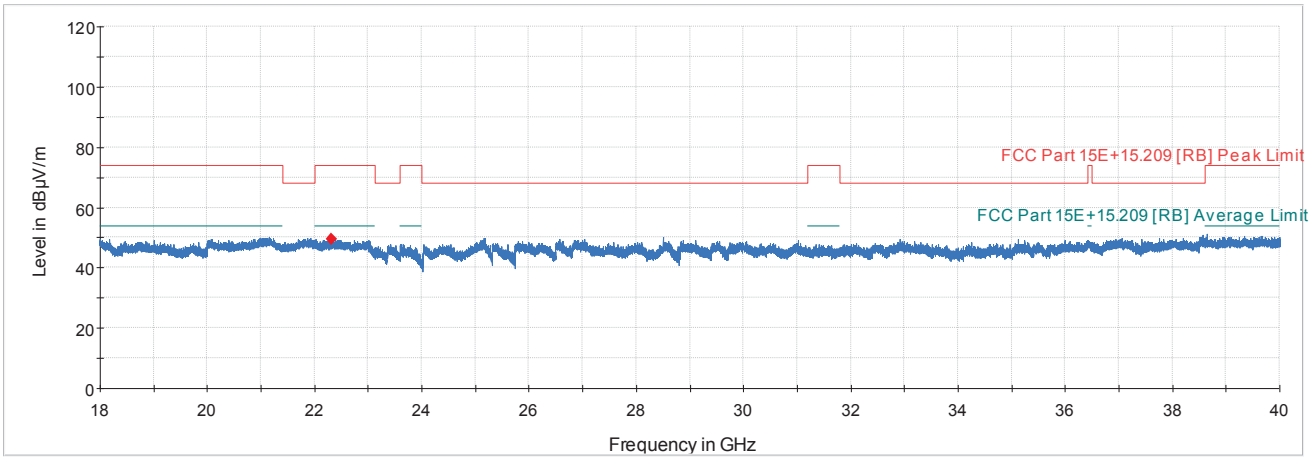
802.11a: 6Mbps - Radiated Emissions 18-40GHz at Channel 116 (Vertical)

Channel 116 (5580 MHz): 1000-18000 MHz Horizontal Plot



802.11a: 6Mbps - Radiated Emissions 1-18GHz at Channel 116 (Horizontal)

Channel 116 (5580 MHz): 18000-40000 MHz Horizontal Plot



802.11a: 6Mbps - Radiated Emissions 18-40GHz at Channel 116 (Horizontal)

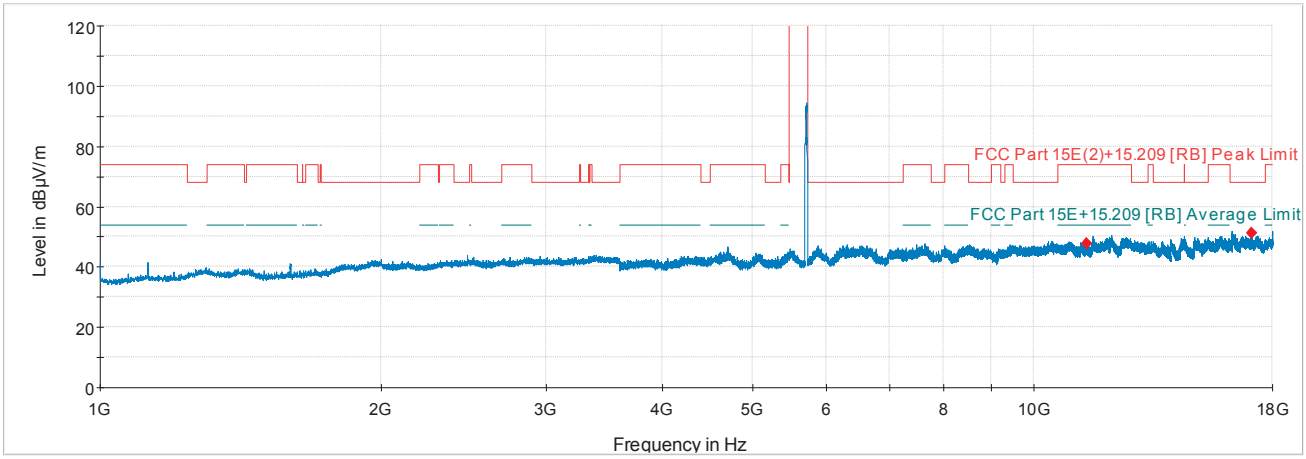
Channel 140 (5320 MHz)

Frequency (MHz)	SA Reading (dBuV/m)	Detector PK/AV	Antenna			EUT Antenna Polarity (V/H1/H2)	DC Factor (dB)	Correction Factor (dB)	Corrected Level (dBuV/m)	Limit [RB] (dBuV/m)	Limit [NRB] (dBuV/m)	Margin (dB)
			Height (cm)	Polarity (V/H)	Azimuth (Deg)							
*11400.0	42.3	PK	200.0	V	90.0	V	0.0	11.0	53.3	74.0	-	-20.7
*11400.0	33.1	AV	200.0	V	90.0	V	0.0	11.0	44.1	54.0	-	-9.9
17100.0	42.4	PK	190.0	V	90.0	V	0.0	13.4	55.8	-	68.2	-12.4
*22800.0	51.3	PK	170.0	V	85.0	V	0.0	-3.6	47.7	74.0	-	-26.3
*22800.0	45.2	AV	170.0	V	85.0	V	0.0	-3.6	41.6	54.0	-	-12.4

Note: * - indicates frequency in FCC §15.205 Restricted bands of operation; RB - Restricted Band; NRB – Non-Restricted Band

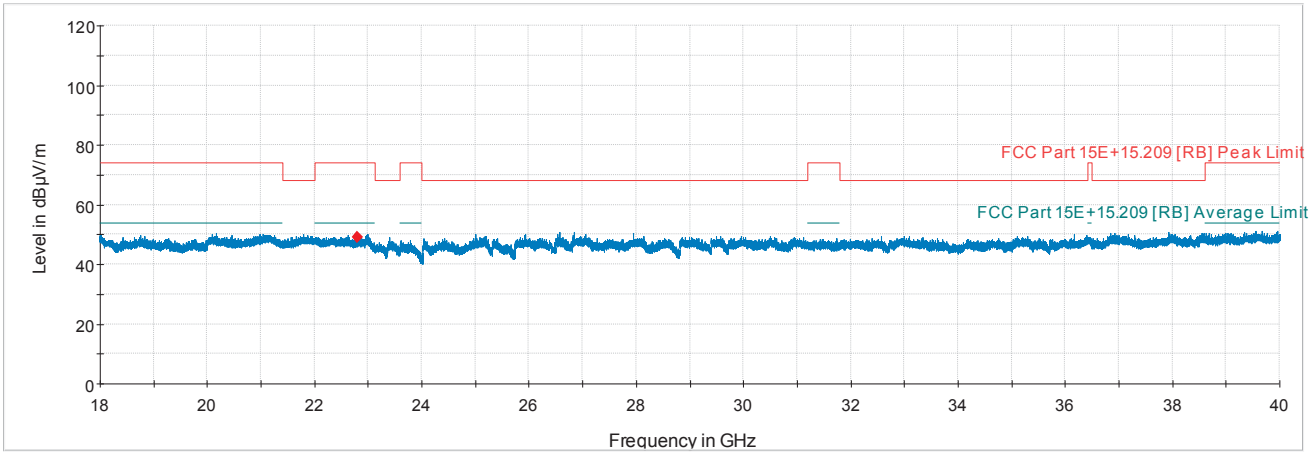
Radiated Spurious Emissions Pre-scan Vertical and Horizontal Plots

Channel 140 (5700 MHz): 1000-18000 MHz Vertical Plot



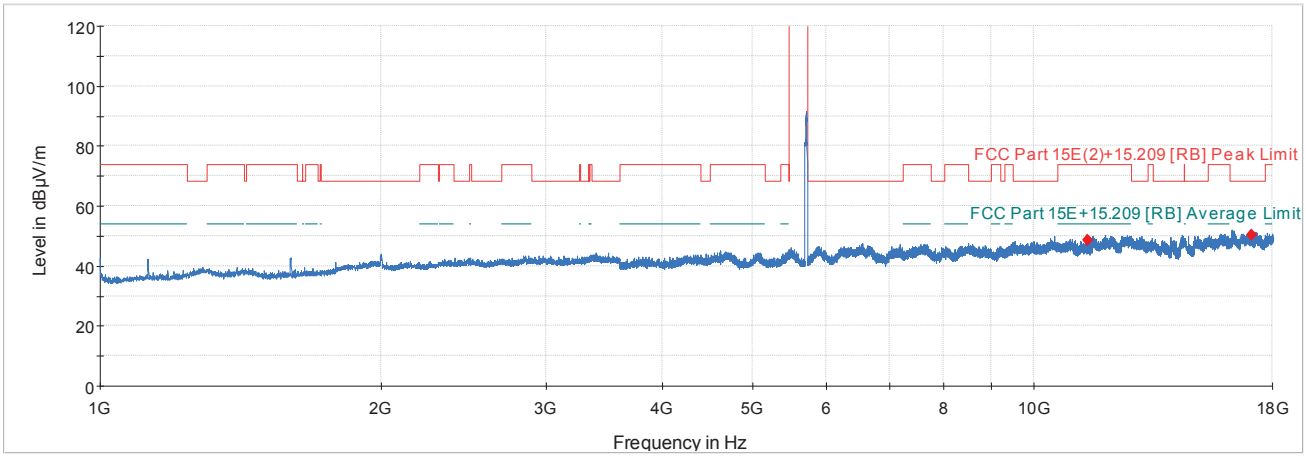
802.11a: 6Mbps - Radiated Emissions 1-18GHz at Channel 140 (Vertical)

Channel 140 (5700MHz): 18000-40000 MHz Vertical Plot



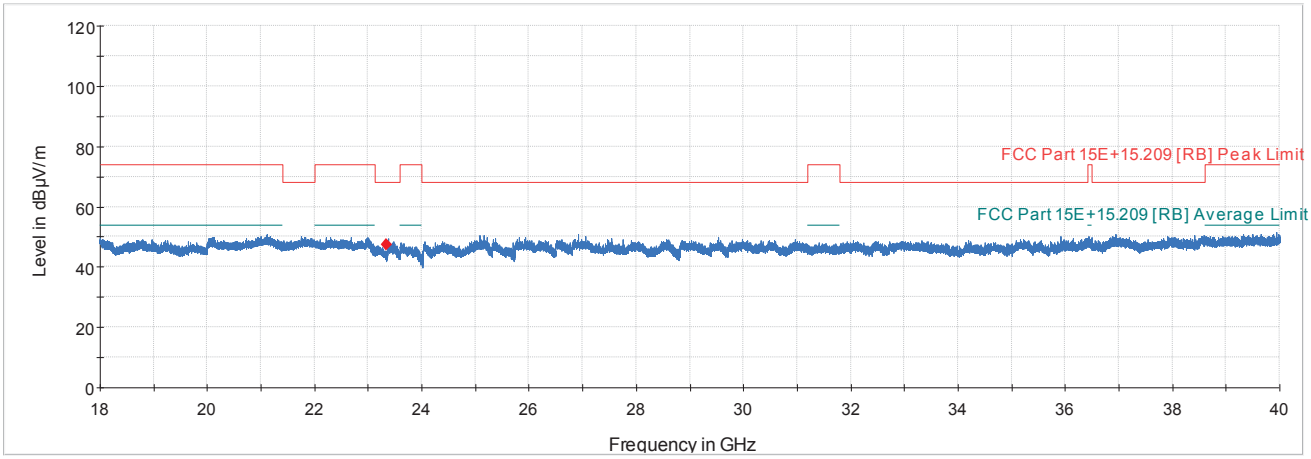
802.11a: 6Mbps - Radiated Emissions 18-40GHz at Channel 140 (Vertical)

Channel 140 (5700 MHz): 1000-18000 MHz Horizontal Plot



802.11a: 6Mbps - Radiated Emissions 1-18GHz at Channel 140 (Horizontal)

Channel 140 (5700 MHz): 18000-40000 MHz Horizontal Plot



802.11a: 6Mbps - Radiated Emissions 18-40GHz at Channel 165 (Horizontal)

6.5.10 Transmitter Radiated Emissions above 1 GHz (U-NII-3: 5.725-5.850 GHz Band)

Worst Case Mode:	802.11a
Data Rate:	6 Mbps
Measurement Distance:	3 meters
Operating Mode:	Continuous Transmit
Frequency Range:	1000 MHz – 40000 MHz
Note: The pre-scan plots do not show the maximized amplitude, only included for the purpose of identifying spurious emissions requiring final measurements.	

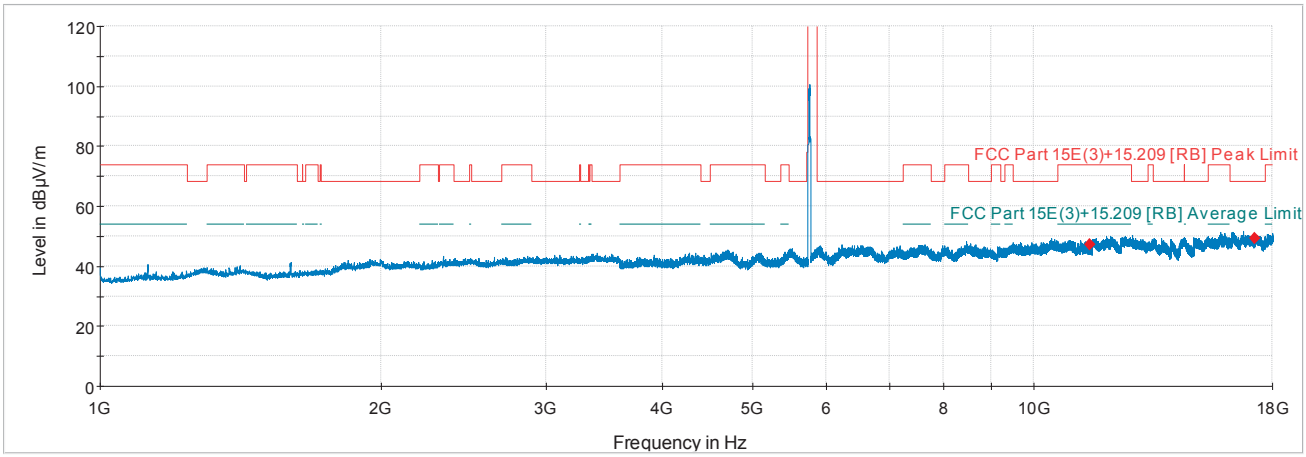
Channel 149 (5745 MHz)

Frequency (MHz)	SA Reading (dBuV/m)	Detector PK/AV	Antenna			EUT Antenna Polarity (V/H1/H2)	DC Factor (dB)	Correction Factor (dB)	Corrected Level (dBuV/m)	Limit [RB] (dBuV/m)	Limit [NRB] (dBuV/m)	Margin (dB)
			Height (cm)	Polarity (V/H)	Azimuth (Deg)							
*11490.0	43.1	PK	200.0	V	85.0	V	0.0	11.7	54.8	74.0	-	-19.2
*11490.0	32.9	AV	200.0	V	85.0	V	0.0	11.7	44.6	54.0	-	-9.4
17235.0	41.8	PK	190.0	V	85.0	V	0.0	13.6	55.4	-	68.2	-12.8
*22980.0	59.0	PK	170.0	V	322.0	V	0.0	-3.4	55.6	74.0	-	-18.4
*22980.0	54.3	AV	170.0	V	322.0	V	0.0	-3.4	50.9	54.0	-	-3.1

Note: * - indicates frequency in FCC §15.205 Restricted bands of operation; RB - Restricted Band; NRB – Non-Restricted Band

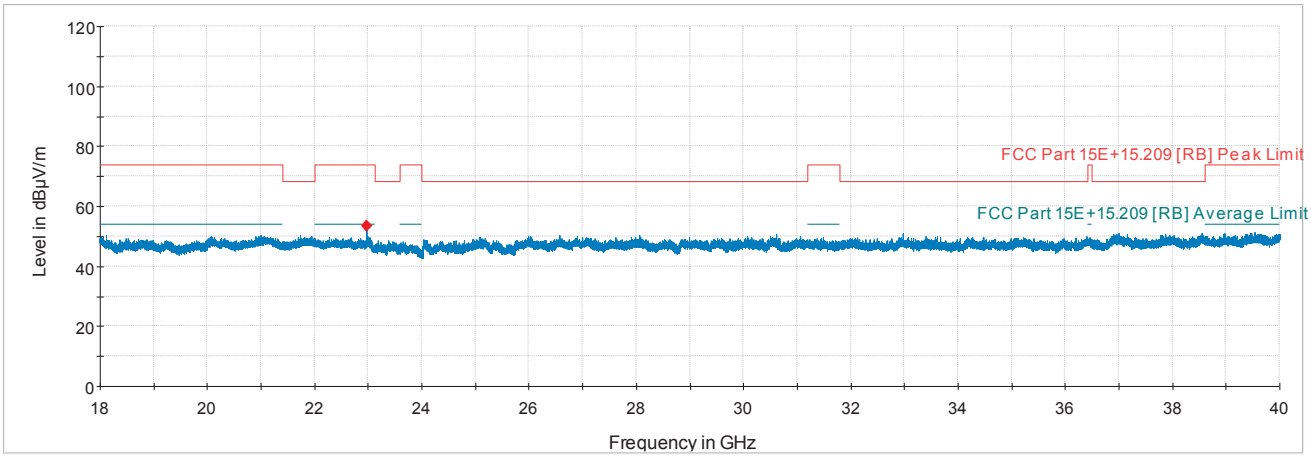
Radiated Spurious Emissions Pre-scan Vertical and Horizontal Plots

Channel 149 (5745 MHz): 1000-18000 MHz Vertical Plot



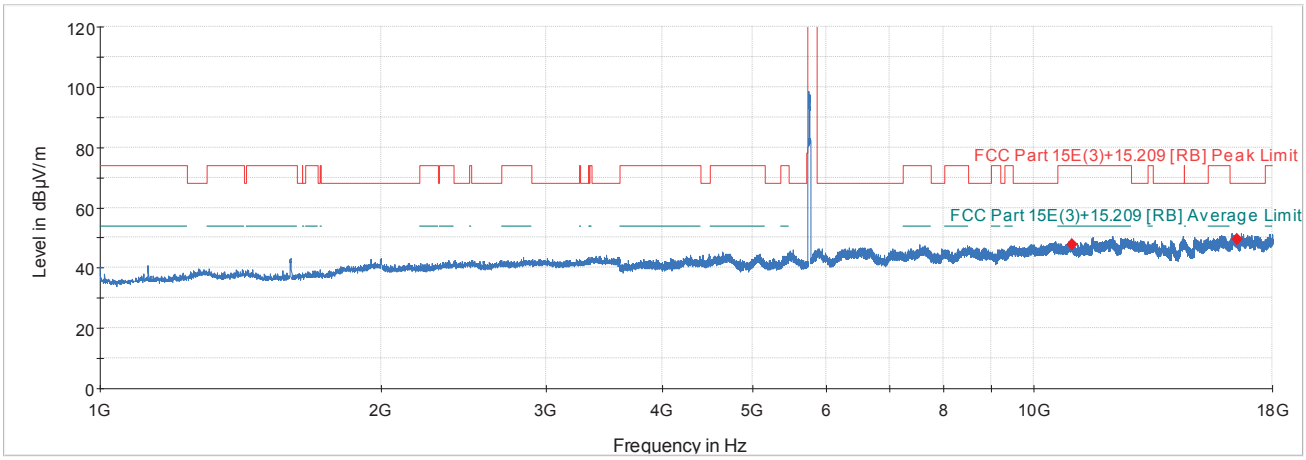
802.11a: 6Mbps - Radiated Emissions 1-18GHz at Channel 149 (Vertical)

Channel 149 (5745 MHz): 18000-40000 MHz Vertical Plot



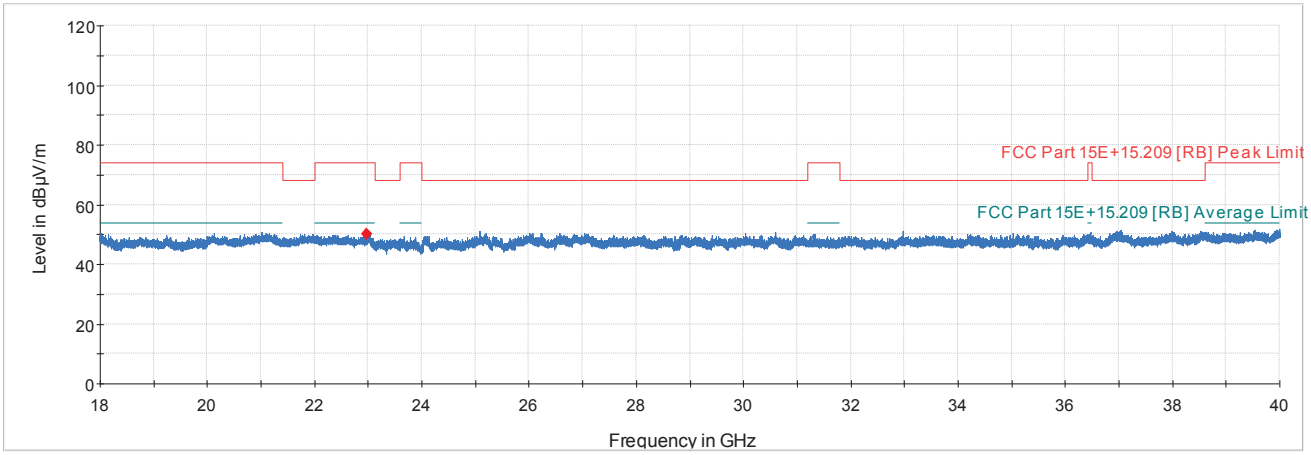
802.11a: 6Mbps - Radiated Emissions 18-40GHz at Channel 149 (Vertical)

Channel 149 (5745 MHz): 1000-18000 MHz Horizontal Plot



802.11a: 6Mbps - Radiated Emissions 1-18GHz at Channel 149 (Horizontal)

Channel 149 (5745 MHz): 18000-40000 MHz Horizontal Plot



802.11a: 6Mbps - Radiated Emissions 18-40GHz at Channel 149 (Horizontal)

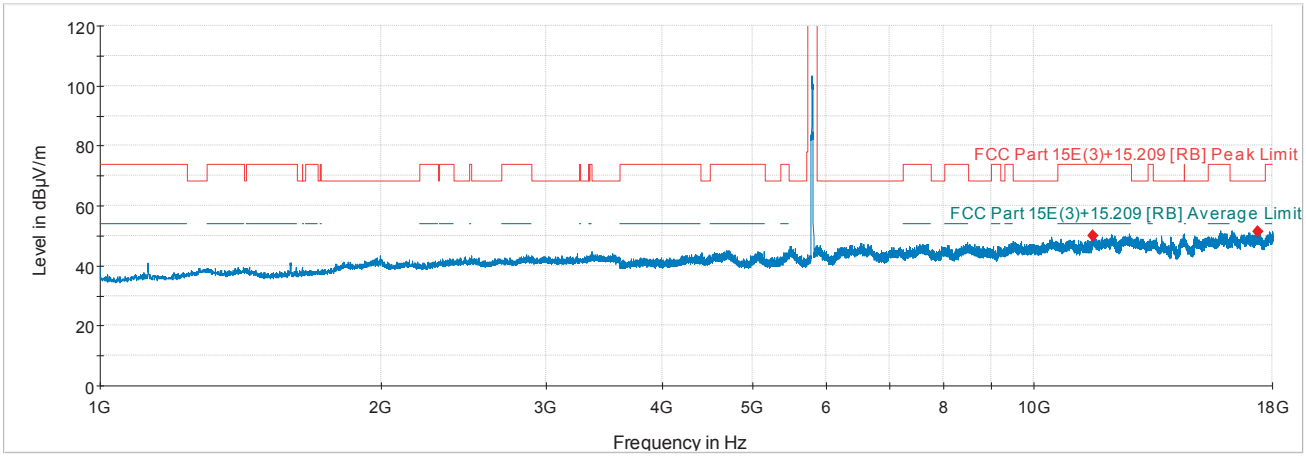
Channel 157 (5785 MHz)

Frequency (MHz)	SA Reading (dBuV/m)	Detector PK/AV	Antenna			EUT Antenna Polarity (V/H1/H2)	DC Factor (dB)	Correction Factor (dB)	Corrected Level (dBuV/m)	Limit [RB] (dBuV/m)	Limit [NRB] (dBuV/m)	Margin (dB)
			Height (cm)	Polarity (V/H)	Azimuth (Deg)							
*11570.0	43.2	PK	200.0	V	85.0	V	0.0	11.8	55.0	74.0	-	-19.0
*11570.0	33.1	AV	200.0	V	85.0	V	0.0	11.8	44.9	54.0	-	-9.1
17355.0	42.0	PK	190.0	V	85.0	V	0.0	13.7	55.7	-	68.2	-12.5
23140.0	59.62	PK	170.0	V	322.0	V	0.0	-3.4	56.2	-	68.2	-12.0

Note: * - indicates frequency in FCC § 15.205 Restricted bands of operation; RB - Restricted Band; NRB – Non-Restricted Band

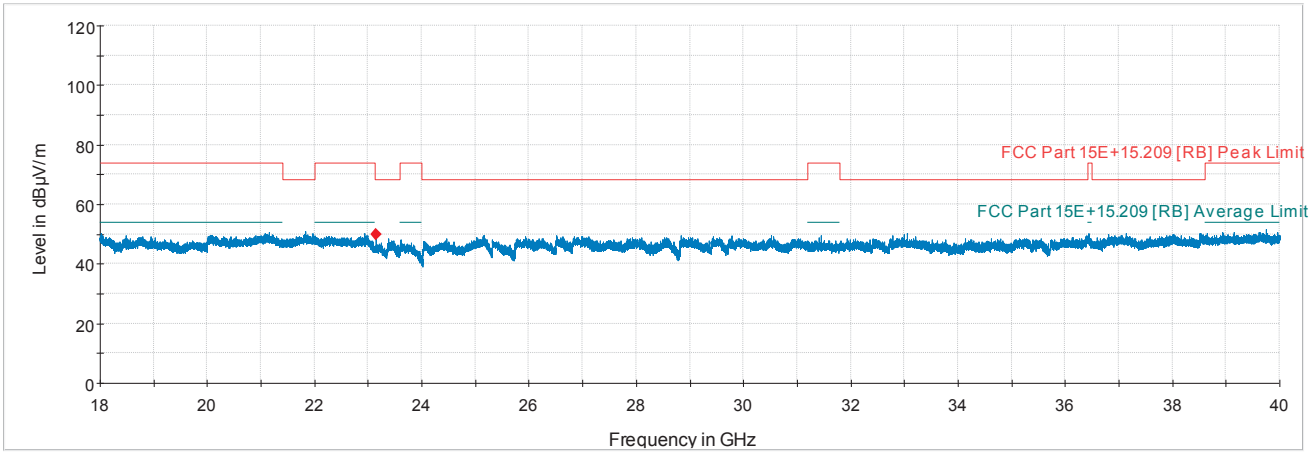
Radiated Spurious Emissions Pre-scan Vertical and Horizontal Plots

Channel 157 (5785 MHz): 1000-18000 MHz Vertical Plot



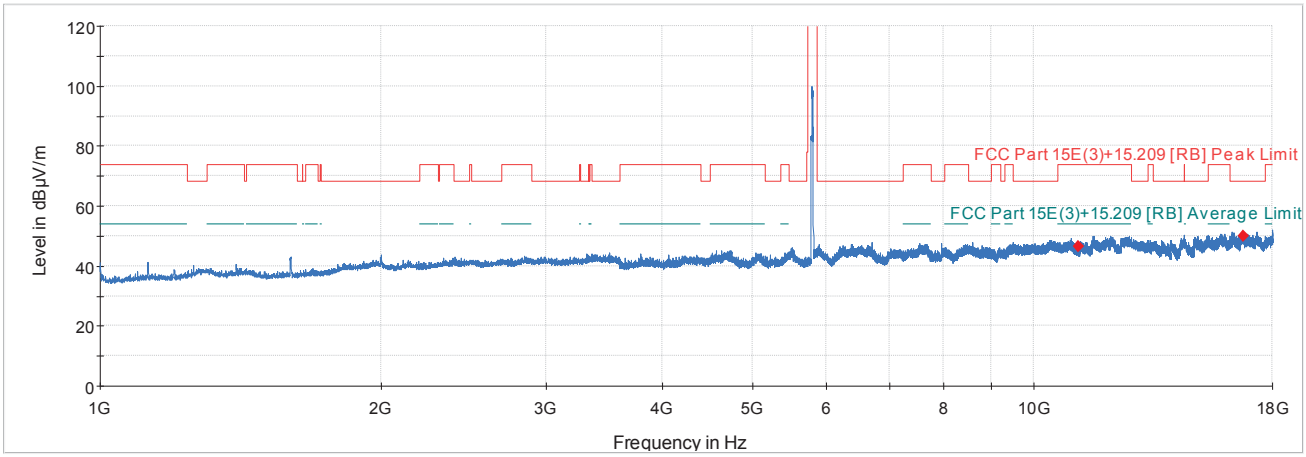
802.11a: 6Mbps - Radiated Emissions 1-18GHz at Channel 157 (Vertical)

Channel 157 (5785 MHz): 18000-40000 MHz (Vertical Plot)



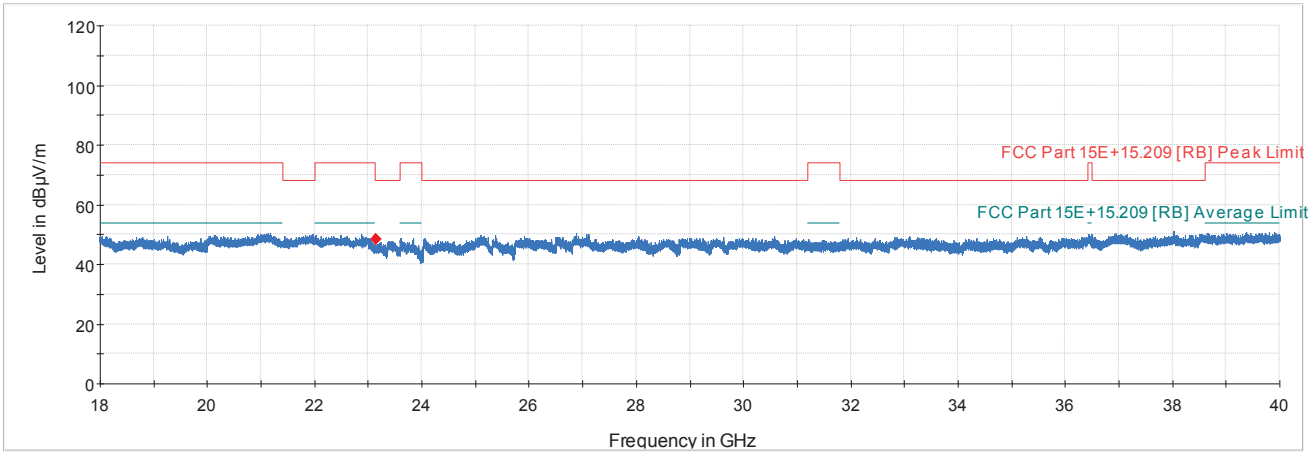
802.11a: 6Mbps - Radiated Emissions 18-40GHz at Channel 157 (Vertical)

Channel 157 (5785 MHz): 1000-18000 MHz (Horizontal Plot)



802.11a: 6Mbps - Radiated Emissions 1-18GHz at Channel 157 (Horizontal)

Channel 157 (5785 MHz): 18000-40000 MHz Horizontal Plot



802.11a: 6Mbps - Radiated Emissions 18-40GHz at Channel 157 (Horizontal)

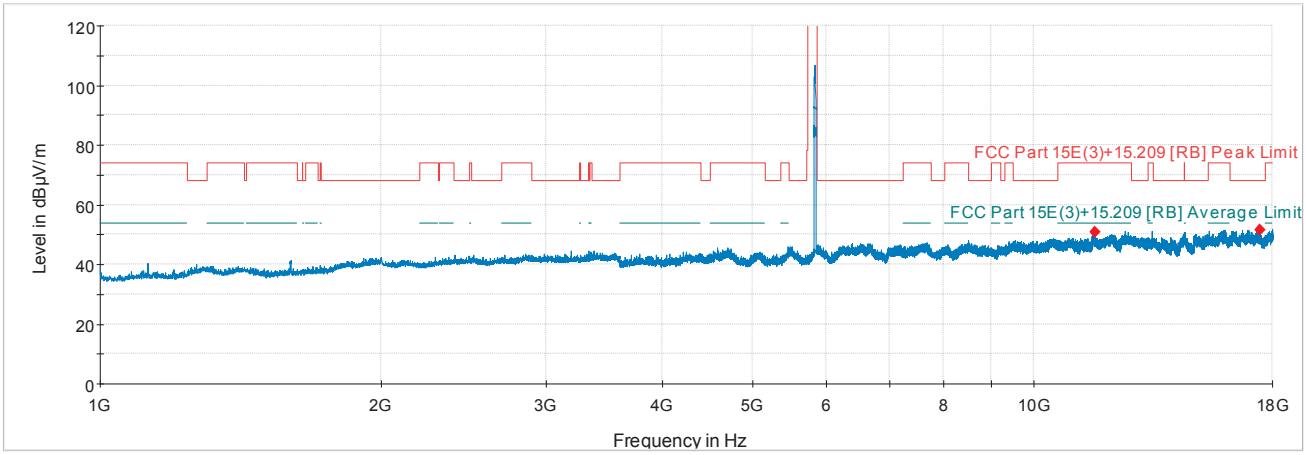
Channel 165 (5825 MHz)

Frequency (MHz)	SA Reading (dBuV/m)	Detector PK/AV	Antenna			EUT Antenna Polarity (V/H1/H2)	DC Factor (dB)	Correction Factor (dB)	Corrected Level (dBuV/m))	Limit [RB] (dBuV/m)	Limit [NRB] (dBuV/m)	Margin (dB)
			Height (cm)	Polarity (V/H)	Azimuth (Deg)							
*11650.0	42.6	PK	200.0	V	85.0	V	0.0	11.8	54.4	74.0	-	-19.6
*11650.0	32.0	AV	200.0	V	85.0	V	0.0	11.8	43.8	54.0	-	-10.2
17745.0	42.0	PK	190.0	V	85.0	V	0.0	13.7	55.7	-	68.2	-12.5
23300.0	58.2	PK	170.0	V	322.0	V	0.0	-3.3	54.9	-	68.2	-13.3

Note: * - indicates frequency in FCC § 15.205 Restricted bands of operation; RB - Restricted Band; NRB – Non-Restricted Band

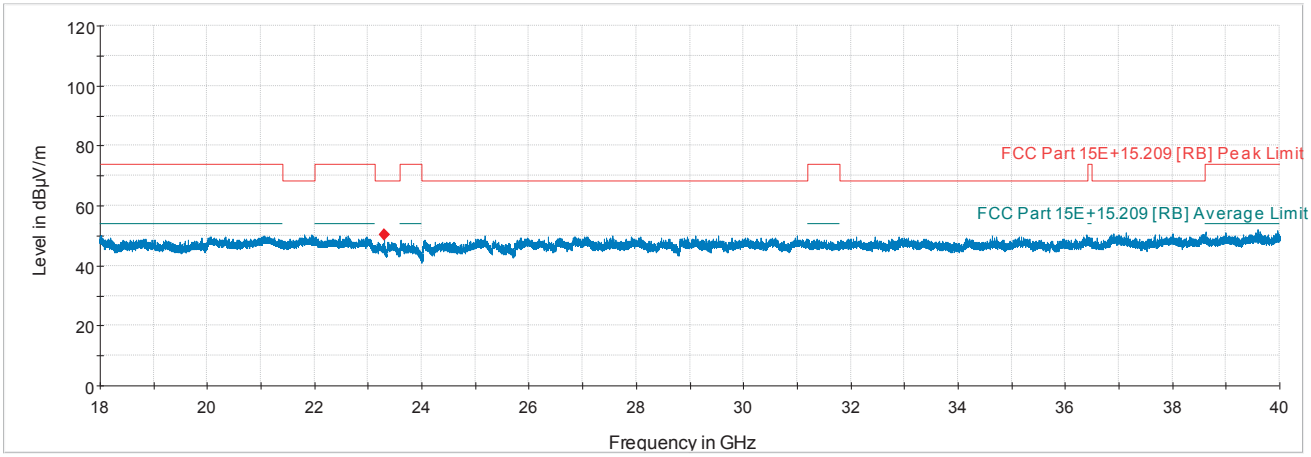
Radiated Spurious Emissions Pre-scan Vertical and Horizontal Plots

Channel 165 (5825 MHz): 1000-18000 MHz Vertical Plot



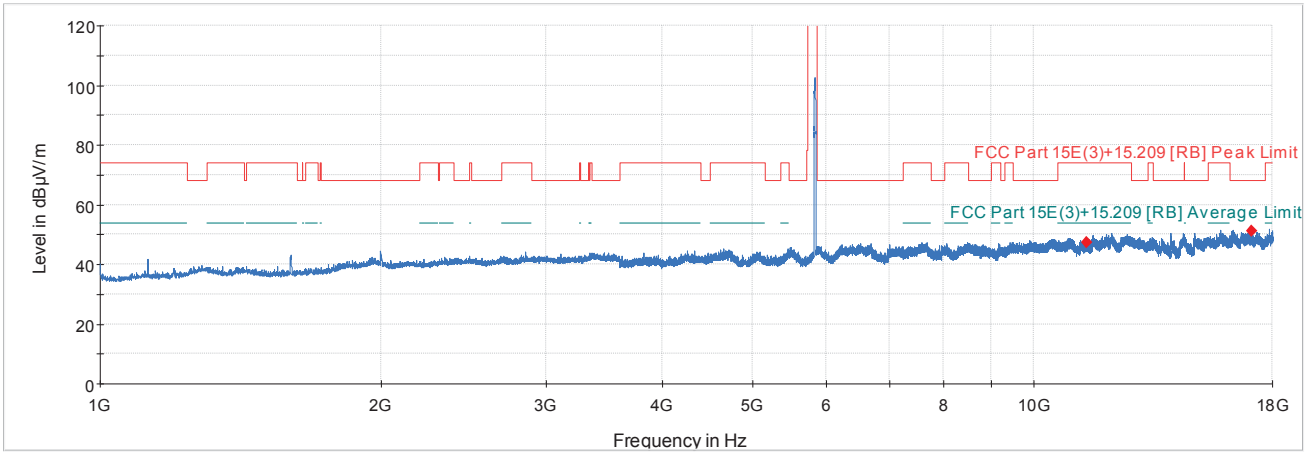
802.11a: 6Mbps - Radiated Emissions 1-18GHz at Channel 165 (Vertical)

Channel 165 (5825MHz): 18000-40000 MHz Vertical Plot



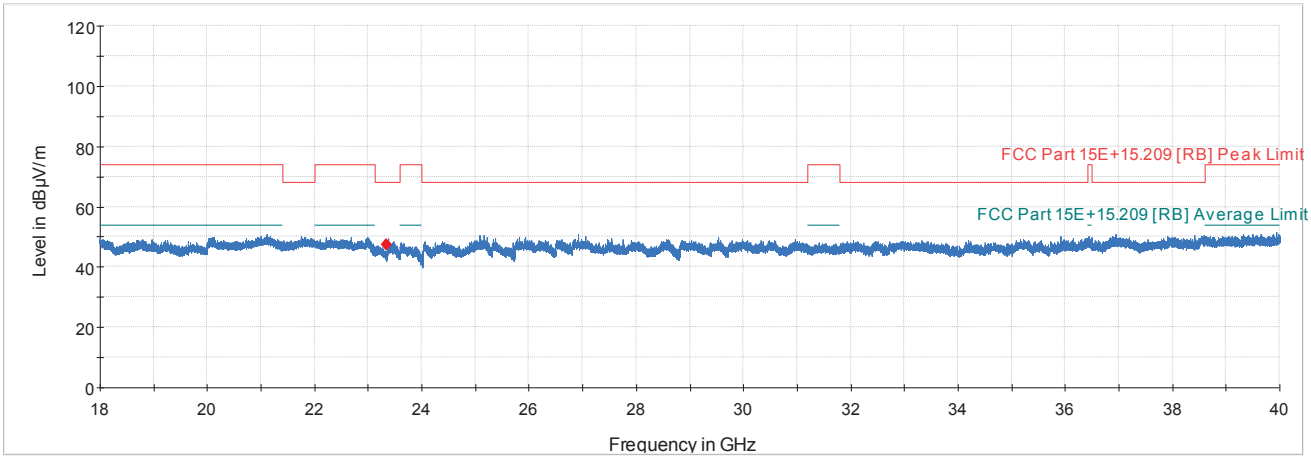
802.11a: 6Mbps - Radiated Emissions 18-40GHz at Channel 165 (Vertical)

Channel 165 (5825 MHz): 1000-18000 MHz Horizontal Plot



802.11a: 6Mbps - Radiated Emissions 1-18GHz at Channel 165 (Horizontal)

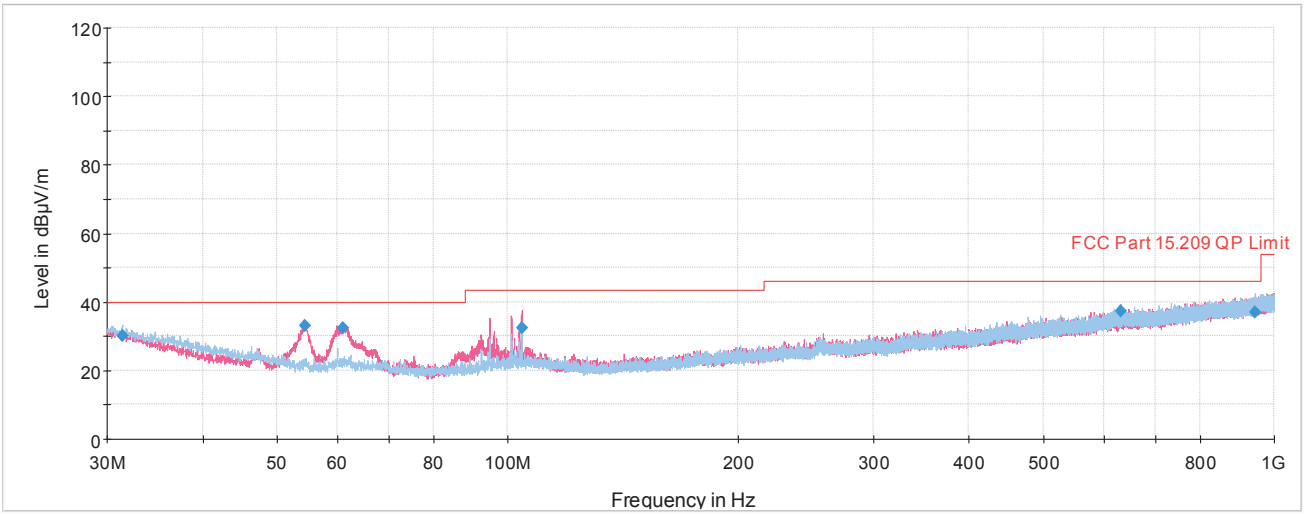
Channel 165 (5825 MHz): 18000-40000 MHz Horizontal Plot



802.11a: 6Mbps - Radiated Emissions 18-40GHz at Channel 165 (Horizontal)

6.5.11 Transmitter Radiated Emissions in the 30MHz to 1000MHz

Worst Case Mode:	802.11a
Data Rate:	6 Mbps
Measurement Distance:	3 meters
Operating Frequency:	5300 MHz
Test Channel:	60



FCC Part 15.209 QP Limit
Preview Result 1V-PK+
Preview Result 1H-PK+
Final Result 1-QPK

EUT: 20-2052-01LF (Wi-Fi Module); S/N: #1
Operating @ Channel 60, 6Mbps Data Rate
2015-05-29

Frequency (MHz)	Amplitude (dBµV)	Height (cm)	Antenna Polarization (H/V)	Azimuth (deg)	Correction Factor (dB)	Margin (dB)	Limit (dBµV/m)	Detector (QP/PK/AV)
54.444	33.1	100.0	V	279.0	8.6	-6.9	40.0	QP
60.911	32.5	148.0	V	13.0	9.0	-7.5	40.0	QP
104.334	32.4	200.0	V	296.0	10.9	-7.6	40.0	QP
631.626	37.2	200.0	V	7.0	21.9	-8.8	46.0	QP
944.387	36.9	376.0	V	0.0	26.2	-9.1	46.0	QP
31.423	30.1	190.0	H	110.0	18.0	-9.9	40.0	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

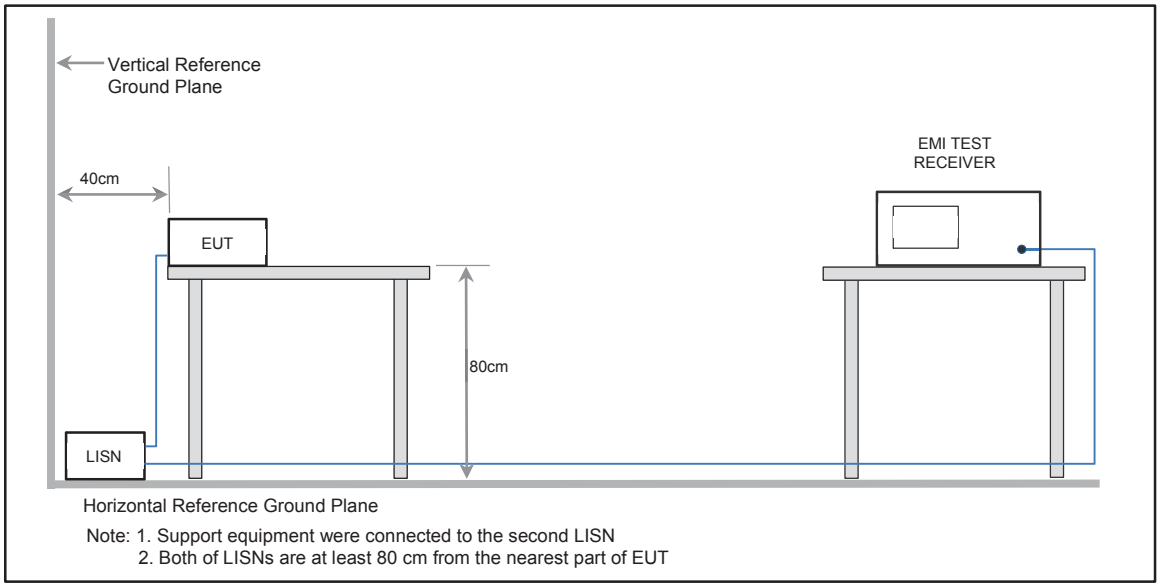
** Decreases with the logarithm of the frequency, ** A linear average detector is required*

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]* $_{(dBuV)}$

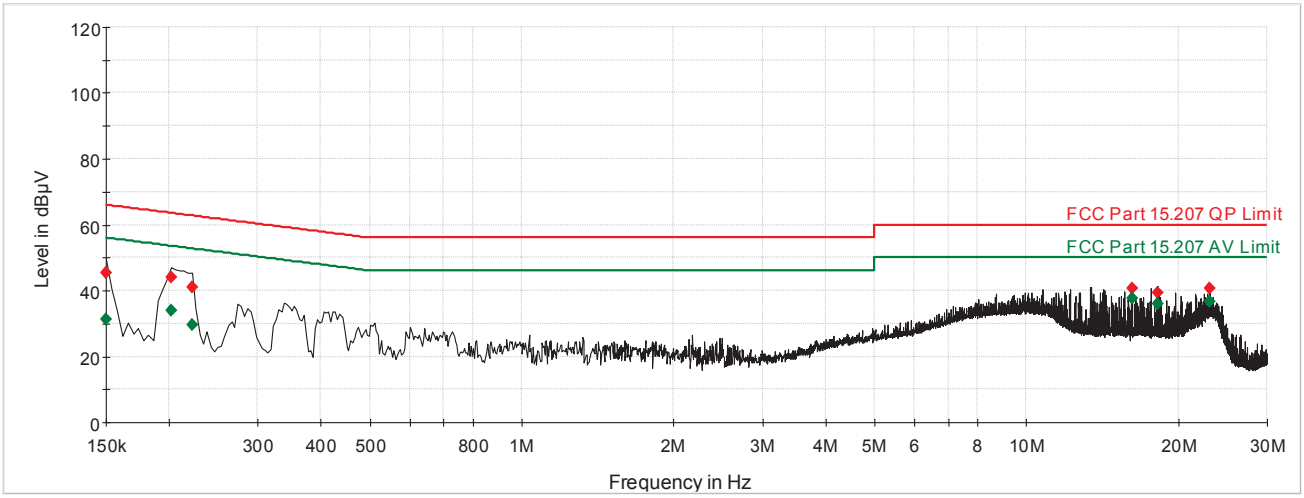


Note: 1. Support equipment were connected to the second LISN
2. Both of LISNs are at least 80 cm from the nearest part of EUT

Test Results

Worst Case Mode:	802.11a
Data Rate:	6 Mbps
Test Voltage/Frequency:	120V/60Hz
Operating Frequency:	5300 MHz
Test Channel:	60

LINE1 (L1) 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

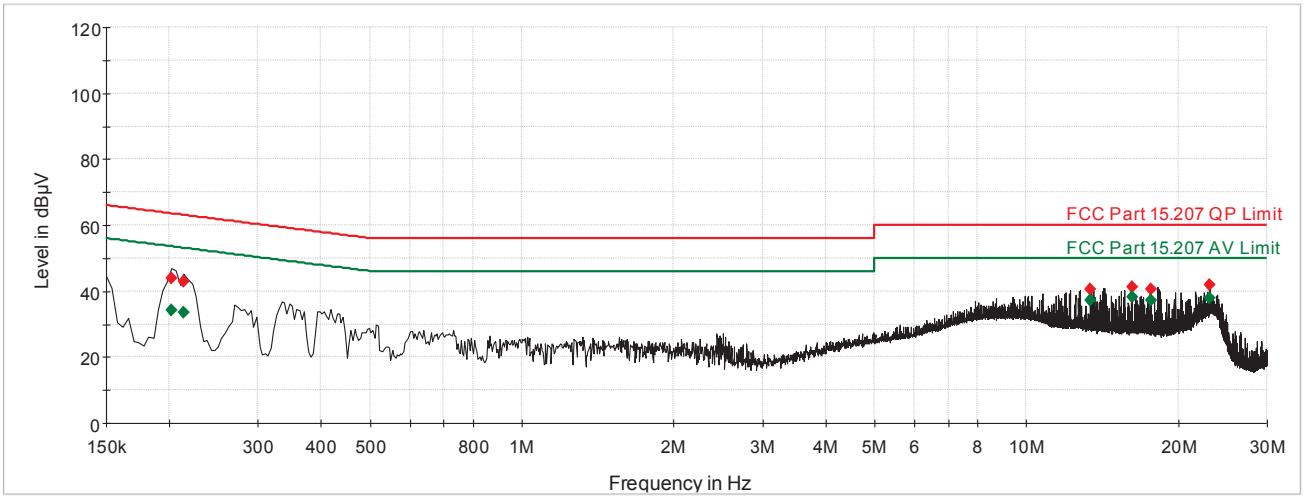
EUT: 20-2052-01LF (Wi-Fi Module); S/N: #1
Operating @ Channel 60, 6Mbps Data Rate
120VAC Input Voltage; LINE
2015-05-29

LINE1 (L1) Results

Frequency (MHz)	Amplitude (dBµV)	Line (L1/N)	Correction Factor (dB)	Margin (dB)	Limit (dBµV)	Detector (QP/AV)
23.130	40.8	L1	20.2	-19.2	60.0	QP
0.202	44.1	L1	19.9	-19.5	63.5	QP
16.230	40.5	L1	19.8	-19.5	60.0	QP
18.242	39.3	L1	19.8	-20.7	60.0	QP
0.150	45.3	L1	19.9	-20.7	66.0	QP
0.222	41.1	L1	19.9	-21.6	62.7	QP

Frequency (MHz)	Amplitude (dBµV)	Line (L1/N)	Correction Factor (dB)	Margin (dB)	Limit (dBµV)	Detector (QP/AV)
16.230	37.5	L1	19.8	-12.5	50.0	AV
23.130	36.6	L1	20.2	-13.4	50.0	AV
18.242	36.1	L1	19.8	-13.9	50.0	AV
0.202	34.0	L1	19.9	-19.6	53.5	AV
0.222	29.7	L1	19.9	-23.0	52.7	AV
0.150	31.2	L1	19.9	-24.8	56.0	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

EUT: 20-2052-01LF (Wi-Fi Module); S/N: #1
Operating @ Channel 60, 6Mbps Data Rate
120VAC Input Voltage; NEUTRAL
2015-05-29

NEUTRAL Line (N) Results

Frequency (MHz)	Amplitude (dBµV)	Line (L1/N)	Correction Factor (dB)	Margin (dB)	Limit (dBµV)	Detector (QP/AV)
23.130	42.0	N	20.4	-18.0	60.0	QP
16.230	41.2	N	19.9	-18.8	60.0	QP
0.202	44.1	N	19.8	-19.5	63.5	QP
13.358	40.5	N	20.1	-19.5	60.0	QP
17.694	40.4	N	19.9	-19.6	60.0	QP
0.214	42.9	N	19.8	-20.1	63.0	QP

Frequency (MHz)	Amplitude (dBµV)	Line (L1/N)	Correction Factor (dB)	Margin (dB)	Limit (dBµV)	Detector (QP/AV)
16.230	38.2	N	19.9	-11.8	50.0	AV
23.130	37.8	N	20.4	-12.2	50.0	AV
13.358	37.4	N	20.1	-12.6	50.0	AV
17.694	37.3	N	19.9	-12.7	50.0	AV
0.202	34.1	N	19.8	-19.4	53.5	AV
0.214	33.4	N	19.8	-19.6	53.0	AV

END OF REPORT