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MEASUREMENT REPORT
FCC Part 15.407 UNII 802.11a/n/ac

Applicant Name:
Samsung Electronics Co., Ltd.
129, Samsung-ro,
Yeongtong-gu, Suwon-si
Gyeonggi-do, 16677, Korea

Date of Testing:
3/10-4/28/2016
Test Site/Location:
PCTEST Lab, Columbia, MD, USA
Test Report Serial No.:
0Y1604250823.A3L

FCC ID: **A3LSMT580**

APPLICANT: **Samsung Electronics Co., Ltd.**

Application Type: Certification
Model(s): SM-T580
EUT Type: Portable Tablet
FCC Classification: Unlicensed National Information Infrastructure (UNII)
FCC Rule Part(s): Part 15.407
Test Procedure(s): KDB 789033 D02 v01 r02

Mode	UNII Band	Channel Bandwidth (MHz)	Conducted Power	Conducted Power	
				Max. Power (mW)	Max. Power (dBm)
802.11a	1	20	5180 - 5240	34.754	15.41
	2A	20	5260 - 5320	34.995	15.44
	2C	20	5500 - 5720	34.041	15.32
	3	20	5745 - 5825	32.211	15.08
802.11n	1	20	5180 - 5240	35.156	15.46
	2A	20	5260 - 5320	33.266	15.22
	2C	20	5500 - 5720	35.075	15.45
	3	20	5745 - 5825	34.041	15.32
802.11ac	1	20	5180 - 5240	31.696	15.01
	2A	20	5260 - 5320	31.333	14.96
	2C	20	5500 - 5720	33.266	15.22
	3	20	5745 - 5825	31.477	14.98
802.11n	1	40	5190 - 5230	14.757	11.69
	2A	40	5270 - 5310	15.488	11.90
	2C	40	5510 - 5710	17.061	12.32
	3	40	5755 - 5795	17.378	12.40
802.11ac	1	40	5190 - 5230	14.555	11.63
	2A	40	5270 - 5310	17.378	12.40
	2C	40	5510 - 5710	16.293	12.12
	3	40	5755 - 5795	17.701	12.48
802.11ac	1	80	5210	11.350	10.55
	2A	80	5290	11.298	10.53
	2C	80	5530 - 5690	11.482	10.60
	3	80	5775	11.508	10.61

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in KDB 789033 D02 v01 r02. Test results reported herein relate only to the item(s) tested.

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

Randy Ortanez
President

ACCREDITED
TESTING CERT#2041.01

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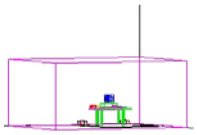


MEASUREMENT REPORT
FCC Part 15.407

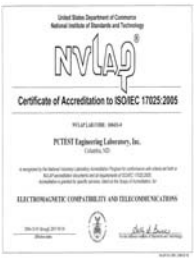
§ 2.1033 General Information

APPLICANT:	Samsung Electronics Co., Ltd.
APPLICANT ADDRESS:	129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea
TEST SITE:	PCTEST ENGINEERING LABORATORY, INC.
TEST SITE ADDRESS:	7185 Oakland Mills Road, Columbia, MD 21046 USA
FCC RULE PART(S):	Part 15.407
BASE MODEL:	SM-T580
FCC ID:	A3LSMT580
FCC CLASSIFICATION:	Unlicensed National Information Infrastructure (UNII)
Test Device Serial No.:	19695, 02519, 02881, 12047, 0EABL ☐ Production ☒ Pre-Production ☐ Engineering
DATE(S) OF TEST:	3/10-4/28/2016
TEST REPORT S/N:	0Y1604250823.A3L

Test Facility / Accreditations

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

- PCTEST facility is an FCC registered (PCTEST Reg. No. 159966) test facility with the site description report on file and has met all the requirements specified in Section 2.948 of the FCC Rules and Industry Canada (2451B-1).
- PCTEST Lab is accredited to ISO 17025 by U.S. National Institute of Standards and Technology (NIST) under the National Voluntary Laboratory Accreditation Program (NVLAP Lab code: 100431-0) in EMC, FCC and Telecommunications.
- PCTEST Lab is accredited to ISO 17025-2005 by the American Association for Laboratory Accreditation (A2LA) in Specific Absorption Rate (SAR) testing, Hearing Aid Compatibility (HAC) testing, CTIA Test Plans, and wireless testing for FCC and Industry Canada Rules.



- PCTEST Lab is a recognized U.S. Conformity Assessment Body (CAB) in EMC and R&TTE (n.b. 0982) under the U.S.-EU Mutual Recognition Agreement (MRA).
- PCTEST TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC Guide 65 by the American National Standards Institute (ANSI) in all scopes of FCC Rules and Industry Canada Standards (RSS).
- PCTEST facility is an IC registered (2451B-1) test laboratory with the site description on file at Industry Canada.
- PCTEST is a CTIA Authorized Test Laboratory (CATL) for AMPS, CDMA, and EvDO wireless devices and for Over-the-Air (OTA) Antenna Performance testing for AMPS, CDMA, GSM, GPRS, EGPRS, UMTS (W-CDMA), CDMA 1xEVDO, and CDMA 1xRTT.

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1.0 INTRODUCTION

1.1 Scope

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

1.2 PCTEST Test Location

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

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

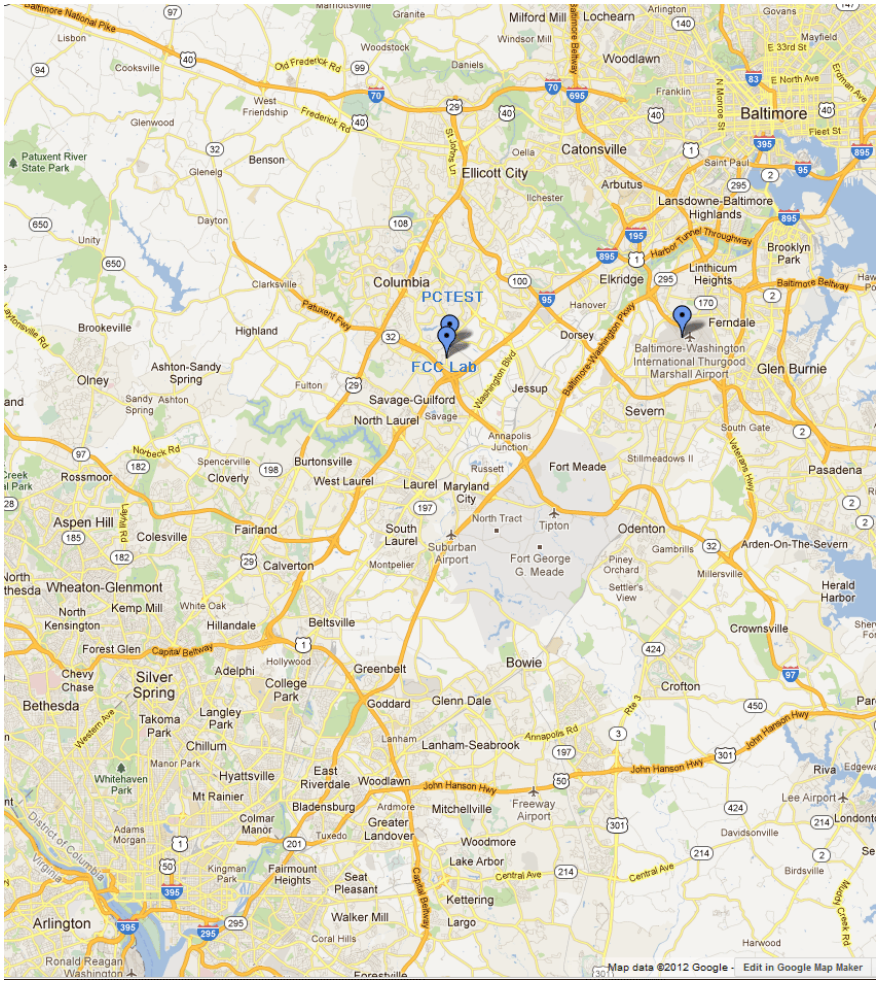

Figure 1-1. Map of the Greater Baltimore and Metropolitan Washington, D.C. area

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2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Tablet FCC ID: A3LSMT580**. The test data contained in this report pertains only to the emissions due to the EUT's UNII transmitter.

2.2 Device Capabilities

This device contains the following capabilities:

802.11b/g/n WLAN, 802.11a/n/ac UNII, Bluetooth (1x, EDR, LE), ANT+

Notes:

1. 5GHz NII operation is possible in 20MHz, and 40MHz, and 80MHz channel bandwidths. The maximum achievable duty cycles for all modes were determined based on measurements performed on a spectrum analyzer in zero-span mode with RBW = 8MHz, VBW = 50MHz, and detector = peak per the guidance of Section B)2)b) of KDB 789033. The RBW and VBW were both greater than 50/T, where T is the minimum transmission duration, and the number of sweep points across T was greater than 100. The duty cycles are as follows:

Maximum Achievable Duty Cycles		
802.11 Mode/Band		Duty Cycle
		ANT1
5GHz	a	94.1
	n (HT20)	91.8
	n (HT40)	87.0
	ac (HT80)	85.2

Data Rate(s) Tested: 6, 9, 12, 18, 24, 36, 48, 54Mbps (802.11a)
6.5/7.2, 13/14.4, 19.5/21.7, 26/28.9, 39/43.3, 52/57.8, 58.5/65, 65/72.2 (n – 20MHz)
13.5/15, 27/30, 40.5/45, 54/60, 81/90, 108/120, 121.5/135, 135/150 (n – 40MHz BW)
29.3/32.5, 58.5/65, 87.8/97.5, 117/130, 175.5/195, 234/260, 263.3/292.5, 292.5/325, 351/390, 390/433.3 (ac – 80MHz BW)

2.3 Test Configuration

The Samsung Portable Tablet FCC ID: A3LSMT580 was tested per the guidance of KDB 789033 D02 v01 r02. ANSI C63.10-2013 was used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing. See Sections 3.2 for AC line conducted emissions test setups, 3.3 for radiated emissions test setups, and 7.2, 7.3, 7.4, and 7.5 for antenna port conducted emissions test setups.

2.4 EMI Suppression Device(s)/Modifications

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

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3.0 DESCRIPTION OF TESTS

3.1 Evaluation Procedure

The measurement procedures described in the American National Standard for Testing Unlicensed Wireless Devices (ANSI C63.10-2013) and the guidance provided in KDB 789033 D02 v01 r02 were used in the measurement of **Samsung Portable Tablet FCC ID: A3LSMT580.**

Deviation from measurement procedure……..…….....None

3.2 AC Line Conducted Emissions

The line-conducted facility is located inside a 10'x16'x9' shielded enclosure. The shielded enclosure is manufactured by ETS Lindgren RF Enclosures. The shielding effectiveness of the shielded room is in accordance with MIL-Std-285 or NSA 65-5. A 1m x 1.5m wooden table 80cm high is placed 40cm away from the vertical wall and 80cm away from the sidewall of the shielded room. Two 10kHz-30MHz, 50Ω/50μH Line-Impedance Stabilization Networks (LISNs) are bonded to the shielded room floor. Power to the LISNs is filtered by external high-current high-insertion loss power line filters. The external power line filter is an ETS Lindgren Model LPRX-4X30 (100dB Attenuation, 14kHz-18GHz) and the two EMI/RFI filters are ETS Lindgren Model LRW-2030-S1 (100dB Minimum Insertion Loss, 14kHz – 10GHz). These filters attenuate ambient signal noise from entering the measurement lines. These filters are also bonded to the shielded enclosure.

The EUT is powered from one LISN and the support equipment is powered from the second LISN. If the EUT is a DC-powered device, power will be derived from the source power supply it normally will be powered from and this supply line(s) will be connected to the second LISN. All interconnecting cables more than 1 meter were shortened to a 1 meter length by non-inductive bundling (serpentine fashion) and draped over the back edge of the test table. All cables were at least 40cm above the horizontal reference groundplane. Power cables for support equipment were routed down to the second LISN while ensuring that that cables were not draped over the second LISN.

Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the spectrum analyzer and exploratory measurements were made to determine the frequencies producing the maximum emission from the EUT. The spectrum was scanned from 150kHz to 30MHz with a spectrum analyzer. The detector function was set to peak mode for exploratory measurements while the bandwidth of the analyzer was set to 10kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Each emission was also maximized by varying: power lines, the mode of operation or resolution, clock or data exchange speed, scrolling H pattern to the EUT and/or support equipment whichever determined the worst-case emission. Once the worst case emissions have been identified, the one EUT cable configuration/arrangement and mode of operation that produced these emissions is used for final measurements on the same test site. The analyzer is set to CISPR quasi-peak and average detectors with a 9kHz resolution bandwidth for final measurements.

Line conducted emissions test results are shown in Section 7.9.

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3.3 Radiated Emissions

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

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

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

3.4 Environmental Conditions

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

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4.0 ANTENNA REQUIREMENTS

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

- The antennas of the Portable Tablet are **permanently attached.**
- There are no provisions for connection to an external antenna.

Conclusion:

The **Samsung Portable Tablet FCC ID: A3LSMT580** unit complies with the requirement of §15.203.

Band 1		Band 2A		Band 2C		Band 3	
Ch.	Frequency (MHz)	Ch.	Frequency (MHz)	Ch.	Frequency (MHz)	Ch.	Frequency (MHz)
36	5180	52	5260	100	5500	149	5745
:	:	:	:	:	:	:	:
42	5210	56	5280	120	5600	157	5785
:	:	:	:	:	:	:	:
48	5240	64	5320	144	5720	165	5825

Table 4-1. 802.11a / 802.11n / 802.11ac (20MHz) Frequency / Channel Operations

Band 1		Band 2A		Band 2C		Band 3	
Ch.	Frequency (MHz)	Ch.	Frequency (MHz)	Ch.	Frequency (MHz)	Ch.	Frequency (MHz)
38	5190	54	5270	102	5510	151	5755
:	:	:	:	:	:	:	:
46	5230	62	5310	118	5590	159	5795
				:	:		
				142	5710		

Table 4-2. 802.11n / 802.11ac (40MHz BW) Frequency / Channel Operations

Band 1		Band 2A		Band 2C		Band 3	
Ch.	Frequency (MHz)	Ch.	Frequency (MHz)	Ch.	Frequency (MHz)	Ch.	Frequency (MHz)
42	5210	58	5290	106	5530	155	5775
				:	:		
				138	5690		

Table 4-3. 802.11ac (80MHz BW) Frequency / Channel Operations

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5.0 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4-2014. All measurement uncertainty values are shown with a coverage factor of k = 2 to indicate a 95% level of confidence. The measurement data shown herein meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Contribution	Expanded Uncertainty (±dB)
Conducted Bench Top Measurements	1.13
Line Conducted Disturbance	3.09
Radiated Disturbance (<1GHz)	4.98
Radiated Disturbance (>1GHz)	5.07
Radiated Disturbance (>18GHz)	5.09

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6.0 TEST EQUIPMENT CALIBRATION DATA

Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST).

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	RE1	Radiated Emissions Cable Set (UHF/EHF)	4/28/2015	Annual	4/28/2016	RE1
-	WL25-1	Conducted Cable Set (25GHz)	4/8/2015	Annual	4/8/2016	WL25-1
Agilent	8447D	Broadband Amplifier	6/12/2015	Annual	6/12/2016	1937A03348
Agilent	N9020A	MXA Signal Analyzer	11/5/2015	Annual	11/5/2016	US46470561
Agilent	N9038A	MXE EMI Receiver	4/24/2015	Annual	4/24/2016	MY51210133
Agilent	N9030A	PXA Signal Analyzer (26.5GHz)	7/22/2015	Annual	7/22/2016	MY49432391
Anritsu	ML2495A	Power Meter	10/16/2015	Biennial	10/16/2017	941001
Anritsu	MA2411B	Pulse Power Sensor	10/14/2015	Biennial	10/14/2017	846215
Com-Power	AL-130	9kHz - 30MHz Loop Antenna	7/30/2015	Biennial	7/30/2017	121034
Espec	ESX-2CA	Environmental Chamber	3/4/2016	Annual	3/4/2017	17620
ETS Lindgren	3117	1-18 GHz DRG Horn (Medium)	4/8/2014	Biennial	4/8/2016	125518
ETS Lindgren	3160-09	18-26.5 GHz Standard Gain Horn	6/17/2014	Biennial	6/17/2016	135427
ETS Lindgren	3160-10	26.5-40 GHz Standard Gain Horn	6/17/2014	Biennial	6/17/2016	130993
ETS-Lindgren	3816/2NM	Line Impedance Stabilization Network	11/11/2014	Biennial	11/11/2016	114451
Huber+Suhner	Sucoflex 102A	40GHz Radiated Cable	4/20/2015	Annual	4/20/2016	251425001
K & L	11SH10-6000/T18000	High Pass Filter	7/18/2015	Annual	7/18/2016	11SH10-6000/T18000-1
Pasternack	NMLC-1	Line Conducted Emissions Cable (NM)	4/28/2015	Annual	4/28/2016	NMLC-1
Rhode & Schwarz	TS-PR18	Pre-Amplifier	3/7/2016	Annual	3/7/2017	101622
Rohde & Schwarz	TS-PR26	18-26.5 GHz Pre-Amplifier	3/7/2016	Annual	3/7/2017	100040
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	3/12/2015	Annual	3/12/2016	100342
Rohde & Schwarz	TS-PR40	26.5-40 GHz Pre-Amplifier	3/7/2016	Annual	3/7/2017	100037
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	7/17/2015	Annual	7/17/2016	100348
Rohde & Schwarz	FSW67	Signal / Spectrum Analyzer	6/2/2015	Annual	6/2/2016	103200
Seekonk	NC-100	Torque Wrench 5/16", 8" lbs	3/2/2016	Biennial	3/2/2018	N/A
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	3/14/2016	Biennial	3/14/2018	A051107

Table 6-1. Annual Test Equipment Calibration Schedule

Note:

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

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7.0 TEST RESULTS

7.1 Summary

Company Name: Samsung Electronics Co., Ltd.
FCC ID: A3LSMT580
Method/System: Unlicensed National Information Infrastructure (UNII)

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
TRANSMITTER MODE (TX)					
N/A	26dB Bandwidth	N/A	CONDUCTED	PASS	Section 7.2
15.407(e)	6dB Bandwidth	>500kHz(5725-5850MHz)		PASS	Section 7.3
15.407 (a.1)	Maximum Conducted Output Power	< 250mW (23.98dBm) (5150-5250MHz) < 11 + 11log10(B) dBm (5250-5350MHz) < 11 + 11log10(B) dBm (5470-5725MHz) < 1W (30dBm) (5725-5850MHz)		PASS	Section 7.4
15.407 (a.1), (5)	Maximum Power Spectral Density	< 11 dBm/MHz (5150-5250MHz, 5250-5350MHz, 5470-5725MHz) < 30 dBm/500kHz (5725-5850MHz)		PASS	Section 7.5
15.407(g)	Frequency Stability	N/A		PASS	Section 7.6
15.407(h)	Dynamic Frequency Selection	See DFS Test Report		PASS	See DFS Test Report
15.407(b.1), (2),(3)	Undesirable Emissions	< -27 dBm/MHz EIRP (outside 5150-5350MHz, 5470-5725MHz, 5715-5860MHz) < -17 dBm/MHz EIRP (within 5715-5725MHz and 5850-5860MHz)	RADIATED	PASS	Section 7.7
15.205, 15.407(b.1), (5), (6)	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209		PASS	Section 7.7, 7.8
15.407	AC Conducted Emissions 150kHz – 30MHz	< FCC 15.207 limits	LINE CONDUCTED	PASS	Section 7.9

Table 7-1. Summary of Test Results

Notes:

1) All channels, modes, and modulations/data rates were investigated among all UNII bands. The test results shown in the following sections represent the worst case emissions.
2) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables and attenuators.
4) For conducted spurious emissions, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is PCTEST "UNII Automation," Version 3.9.
5) For radiated band edge, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is PCTEST "Chamber Automation," Version 1.1.2.

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7.2 26dB Bandwidth Measurement – 802.11a/n/ac

Test Overview and Limit

The bandwidth at 26dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating at its maximum duty cycle, at its maximum power control level, as defined in KDB 789033 D02 v01 r02, and at the appropriate frequencies. The spectrum analyzer's bandwidth measurement function is configured to measure the 26dB bandwidth.

The 26dB bandwidth is used to determine the conducted power limits.

Test Procedure Used

KDB 789033 D02 v01 r02 – Section C

Test Settings

1. The signal analyzers' automatic bandwidth measurement capability was used to perform the 26dB bandwidth measurement. The "X" dB bandwidth parameter was set to X = 26. The automatic bandwidth measurement function also has the capability of simultaneously measuring the 99% occupied bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = approximately 1% of the emission bandwidth
3. VBW $\geq$ 3 x RBW
4. Detector = Peak
5. Trace mode = max hold

Test Setup

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

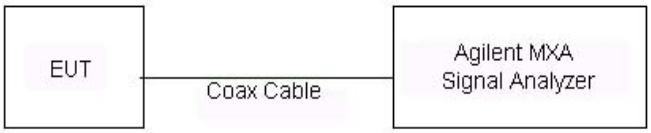

Figure 7-1. Test Instrument & Measurement Setup

Test Notes

None.

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	Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	Measured 26dB Bandwidth [MHz]
Band 1	5180	36	a	6	19.42
	5200	40	a	6	19.24
	5240	48	a	6	19.15
	5180	36	n (20MHz)	6.5/7.2 (MCS0)	19.78
	5200	40	n (20MHz)	6.5/7.2 (MCS0)	19.98
	5240	48	n (20MHz)	6.5/7.2 (MCS0)	19.58
	5190	38	n (40MHz)	13.5/15 (MCS0)	40.44
	5230	46	n (40MHz)	13.5/15 (MCS0)	41.90
	5210	42	ac (80MHz)	29.3/32.5 (MCS0)	82.95
Band 2A	5260	52	a	6	19.10
	5280	56	a	6	19.75
	5320	64	a	6	18.87
	5260	52	n (20MHz)	6.5/7.2 (MCS0)	19.36
	5280	56	n (20MHz)	6.5/7.2 (MCS0)	20.91
	5320	64	n (20MHz)	6.5/7.2 (MCS0)	19.73
	5270	54	n (40MHz)	13.5/15 (MCS0)	41.62
	5310	62	n (40MHz)	13.5/15 (MCS0)	40.43
	5290	58	ac (80MHz)	29.3/32.5 (MCS0)	83.20
Band 2C	5500	100	a	6	18.82
	5600	120	a	6	19.05
	5720	144	a	6	19.48
	5500	100	n (20MHz)	6.5/7.2 (MCS0)	19.54
	5600	120	n (20MHz)	6.5/7.2 (MCS0)	19.77
	5720	144	n (20MHz)	6.5/7.2 (MCS0)	19.72
	5510	102	n (40MHz)	13.5/15 (MCS0)	40.84
	5590	118	n (40MHz)	13.5/15 (MCS0)	43.05
	5710	142	n (40MHz)	13.5/15 (MCS0)	40.32
	5530	106	ac (80MHz)	29.3/32.5 (MCS0)	83.35
	5610	122	ac (80MHz)	29.3/32.5 (MCS0)	82.79
	5690	138	ac (80MHz)	29.3/32.5 (MCS0)	82.22

Table 7-2. Conducted Bandwidth Measurements

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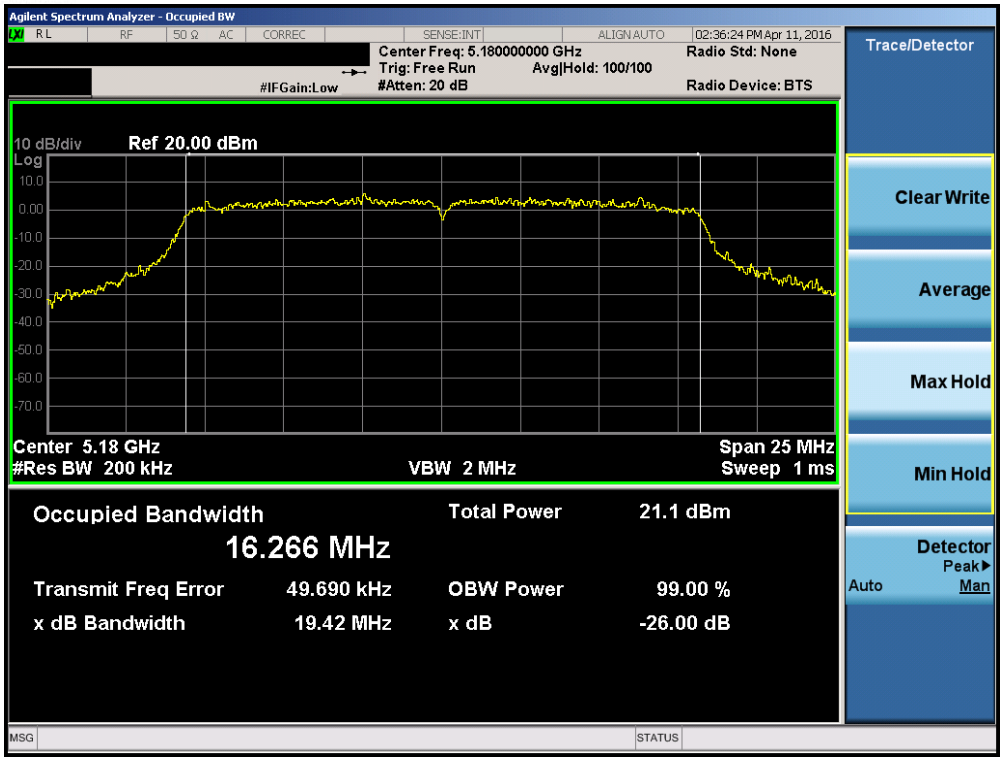
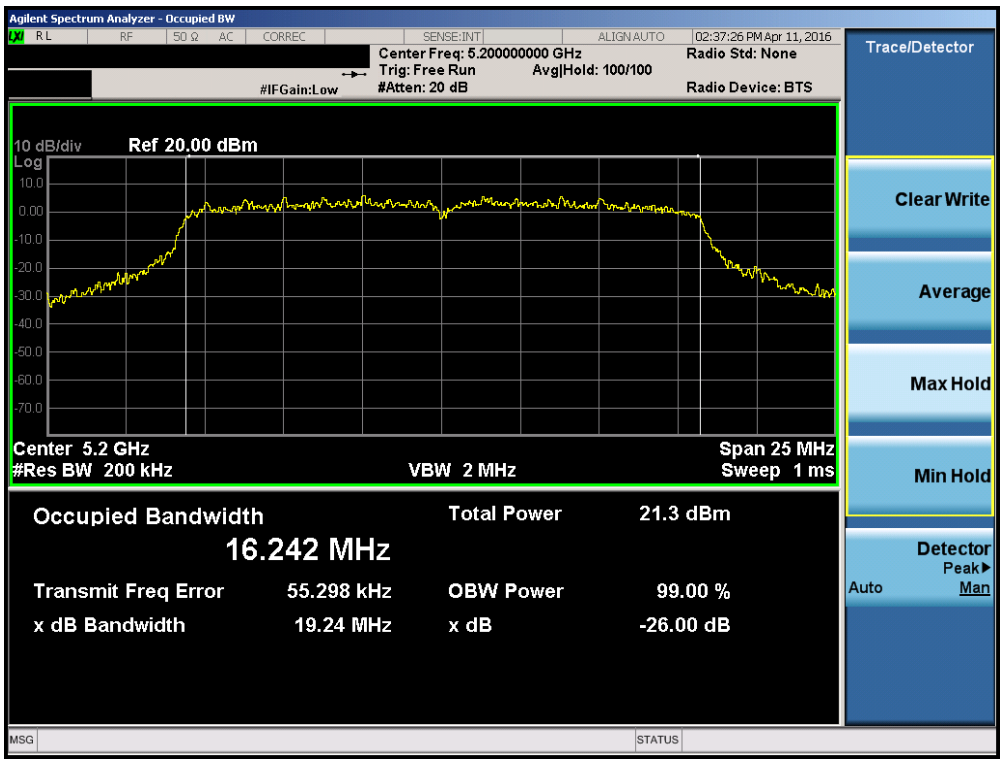


Plot 7-1. 26dB Bandwidth Plot (802.11a (UNII Band 1) – Ch. 36)



Plot 7-2. 26dB Bandwidth Plot (802.11a (UNII Band 1) – Ch. 40)

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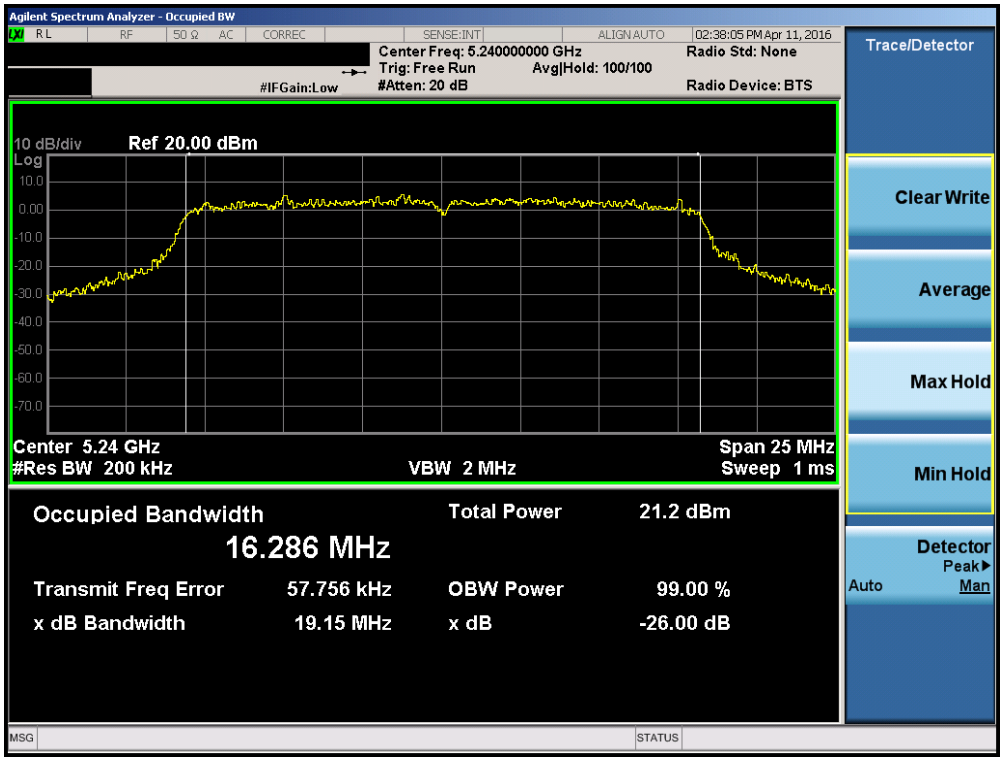
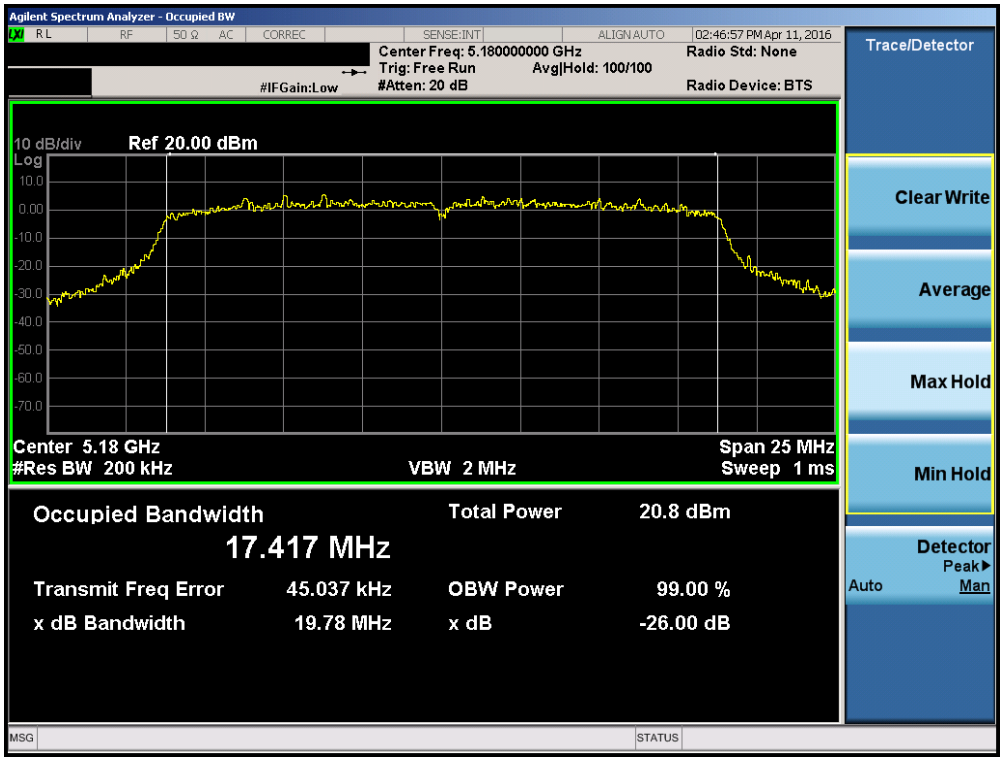


Plot 7-3. 26dB Bandwidth Plot (802.11a (UNII Band 1) – Ch. 48)



Plot 7-4. 26dB Bandwidth Plot (20MHz BW 802.11n (UNII Band 1) – Ch. 36)

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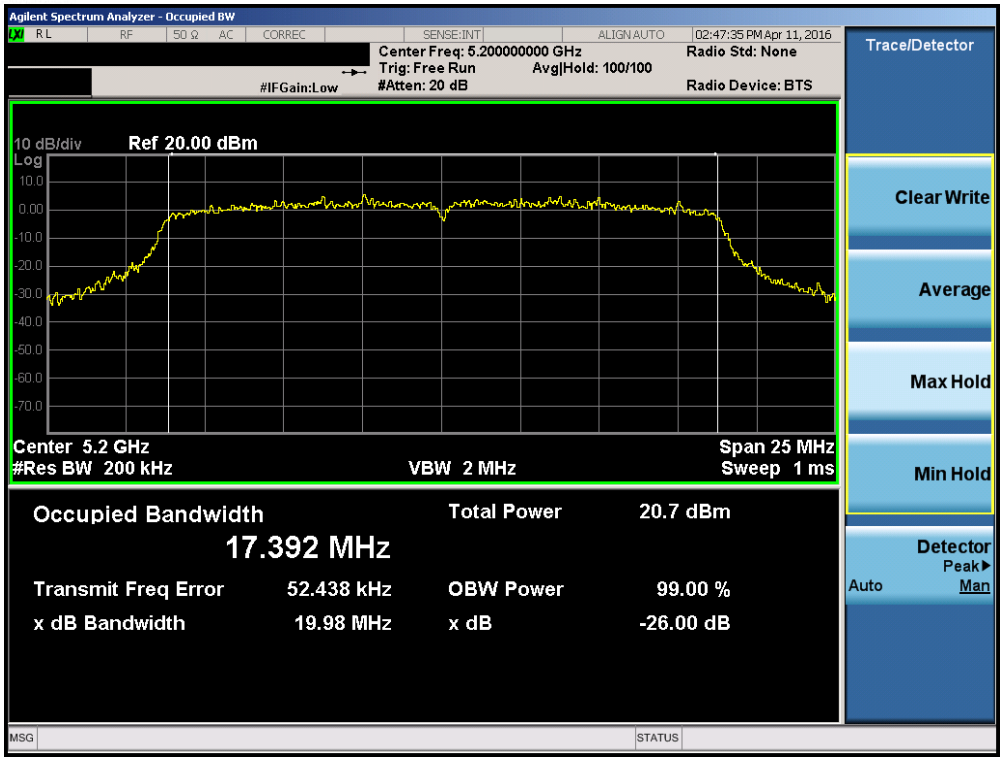
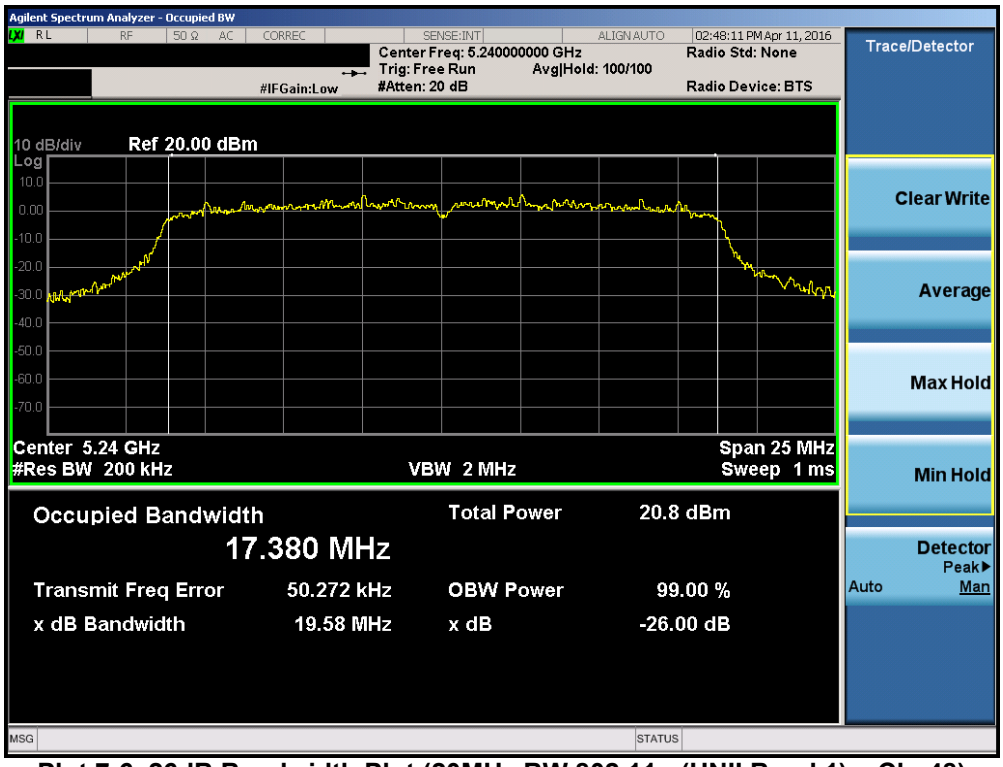


Plot 7-5. 26dB Bandwidth Plot (20MHz BW 802.11n (UNII Band 1) – Ch. 40)



Plot 7-6. 26dB Bandwidth Plot (20MHz BW 802.11n (UNII Band 1) – Ch. 48)

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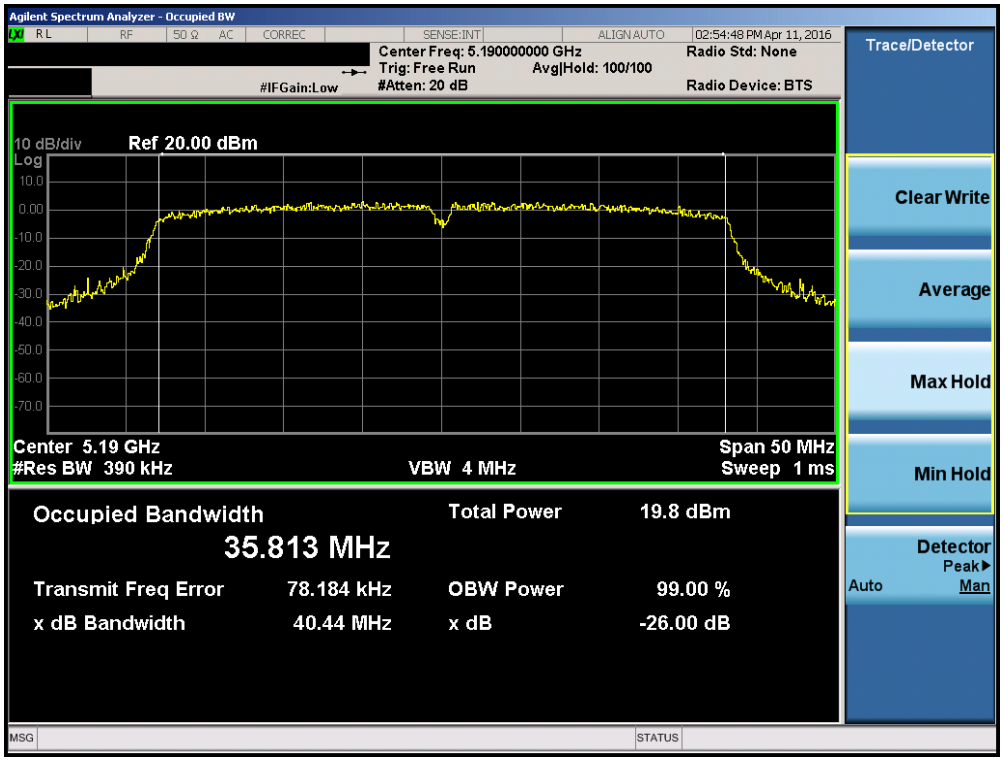
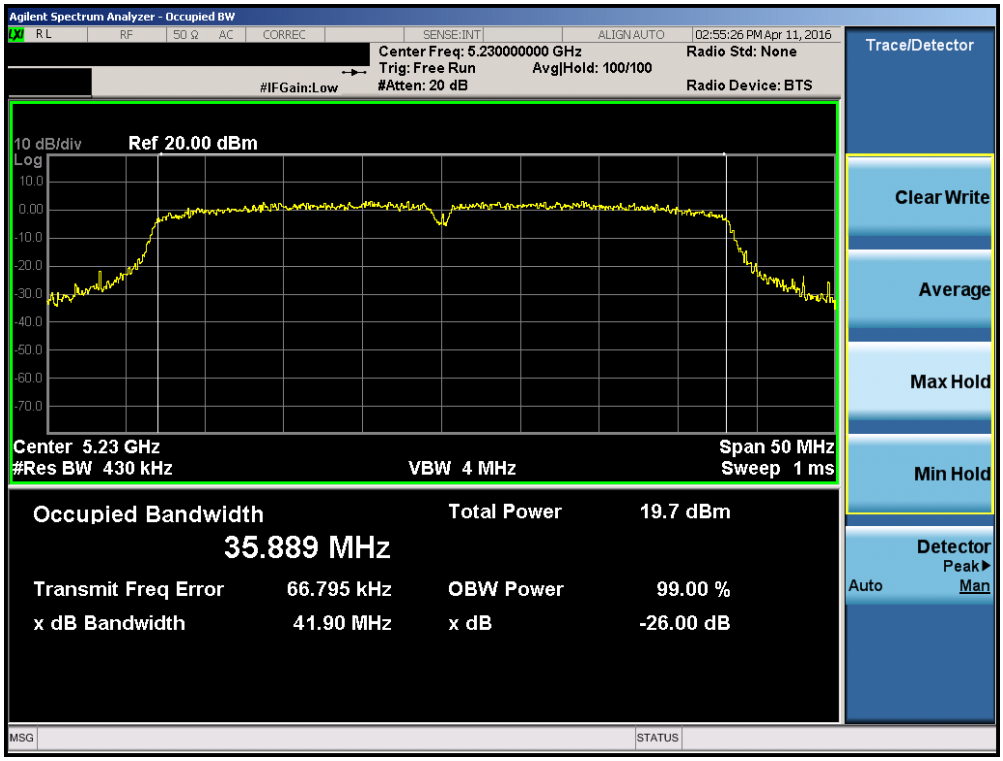


Plot 7-7. 26dB Bandwidth Plot (40MHz BW 802.11n (UNII Band 1) – Ch. 38)



Plot 7-8. 26dB Bandwidth Plot (40MHz BW 802.11n (UNII Band 1) – Ch. 46)

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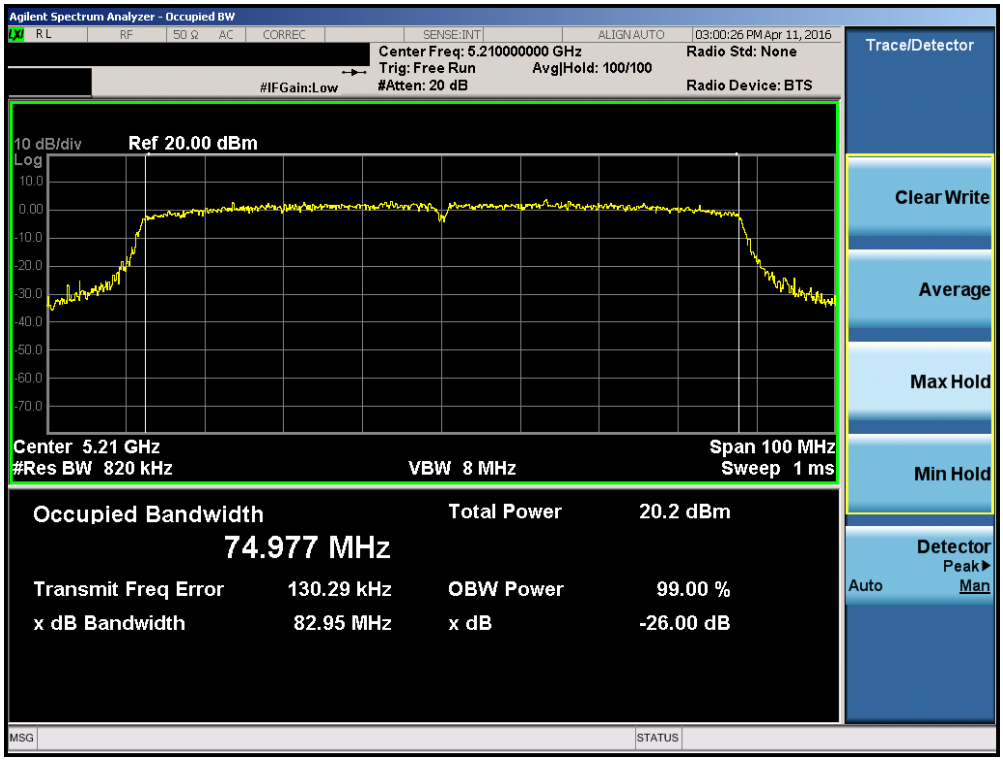
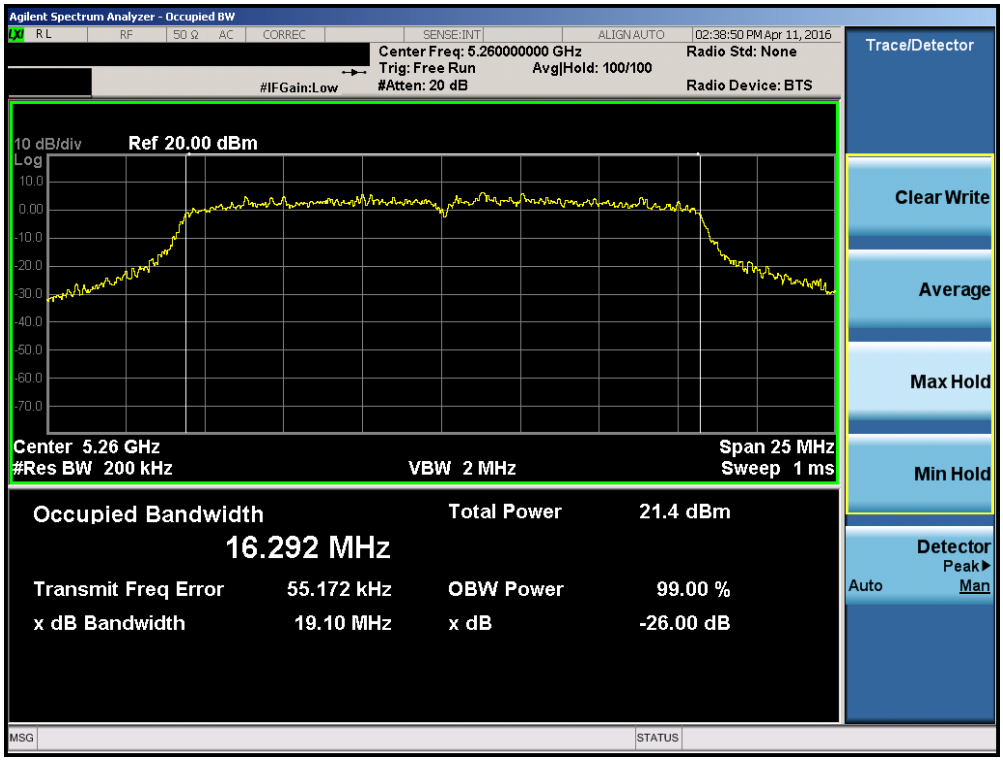


Plot 7-9. 26dB Bandwidth Plot (80MHz BW 802.11ac (UNII Band 1) – Ch. 42)



Plot 7-10. 26dB Bandwidth Plot (802.11a (UNII Band 2A) – Ch. 52)

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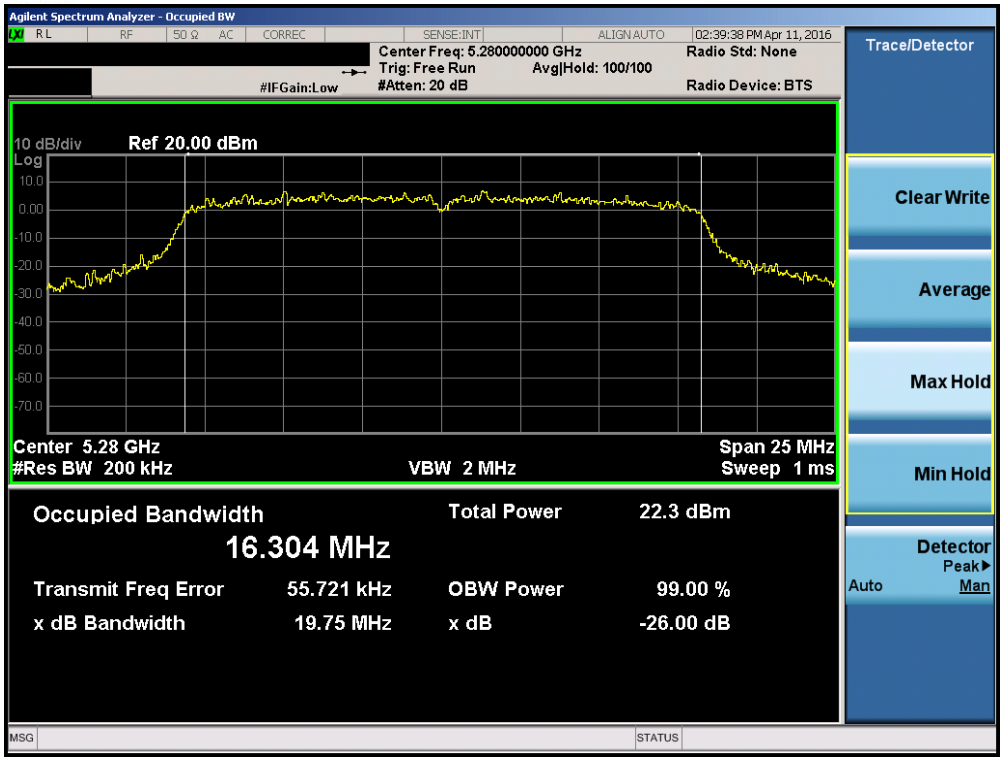
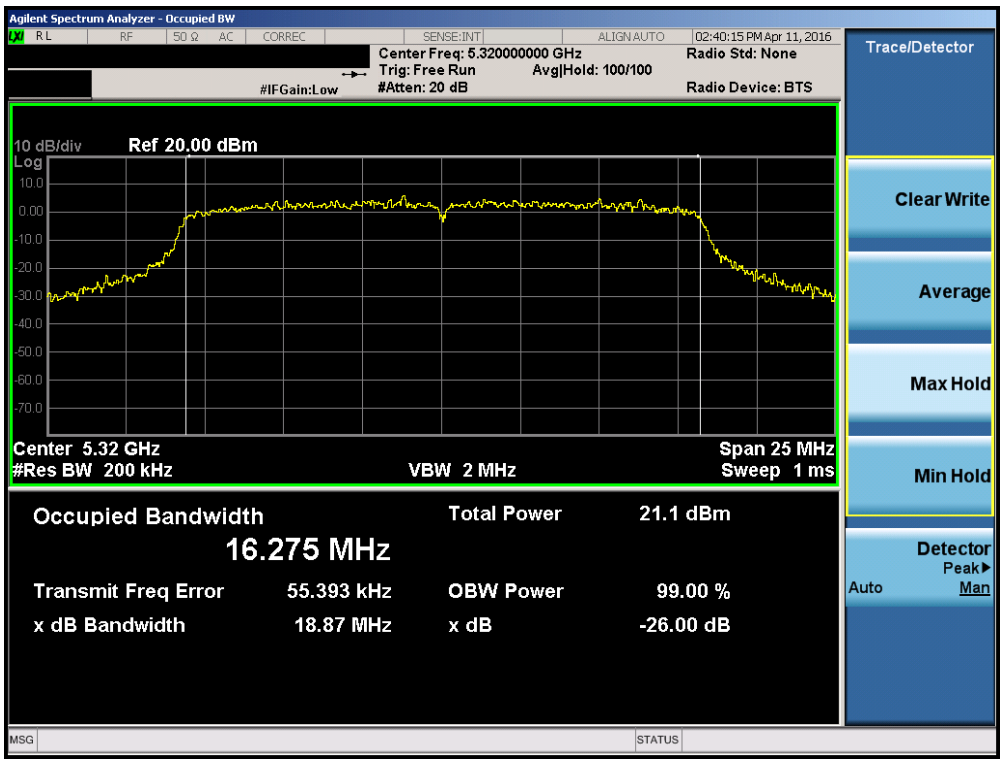


Plot 7-11. 26dB Bandwidth Plot (802.11a (UNII Band 2A) – Ch. 56)



Plot 7-12. 26dB Bandwidth Plot (802.11a (UNII Band 2A) – Ch. 64)

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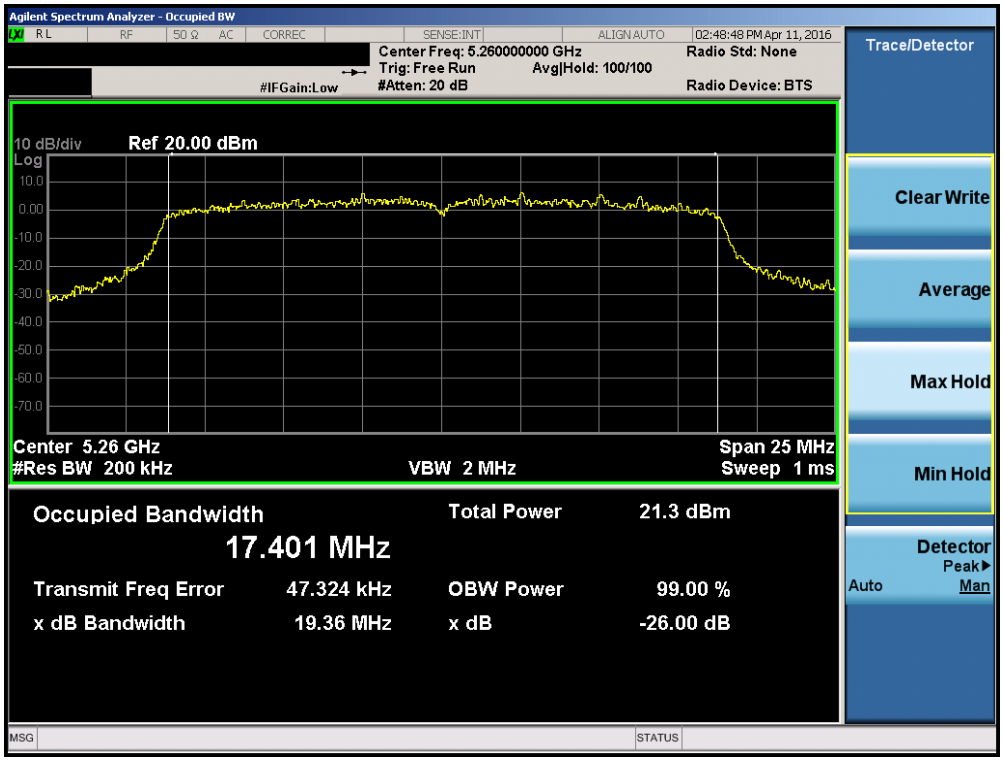

Plot 7-13. 26dB Bandwidth Plot (20MHz BW 802.11n (UNII Band 2A) – Ch. 52)

Plot 7-14. 26dB Bandwidth Plot (20MHz BW 802.11n (UNII Band 2A) – Ch. 56)

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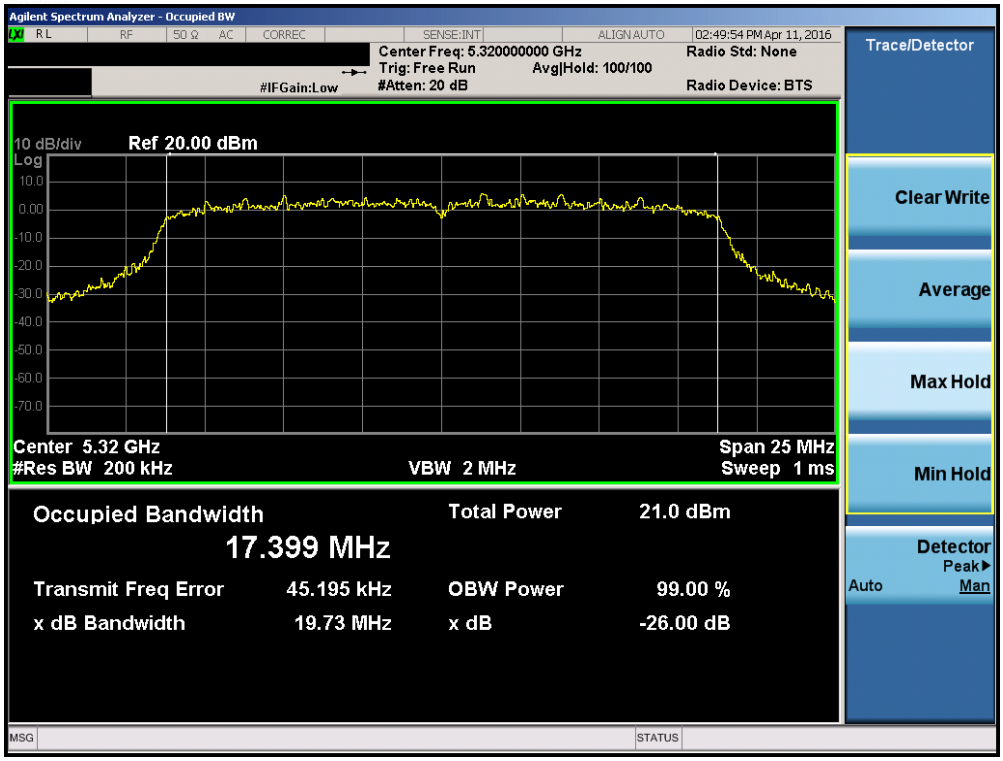
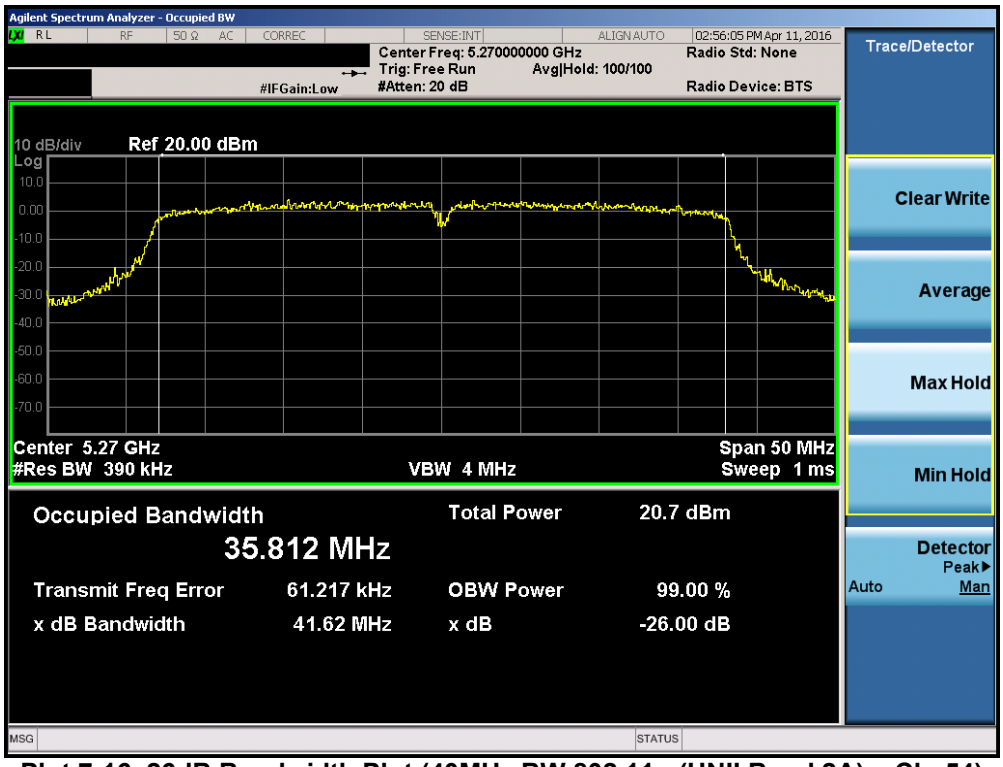


Plot 7-15. 26dB Bandwidth Plot (20MHz BW 802.11n (UNII Band 2A) – Ch. 64)



Plot 7-16. 26dB Bandwidth Plot (40MHz BW 802.11n (UNII Band 2A) – Ch. 54)

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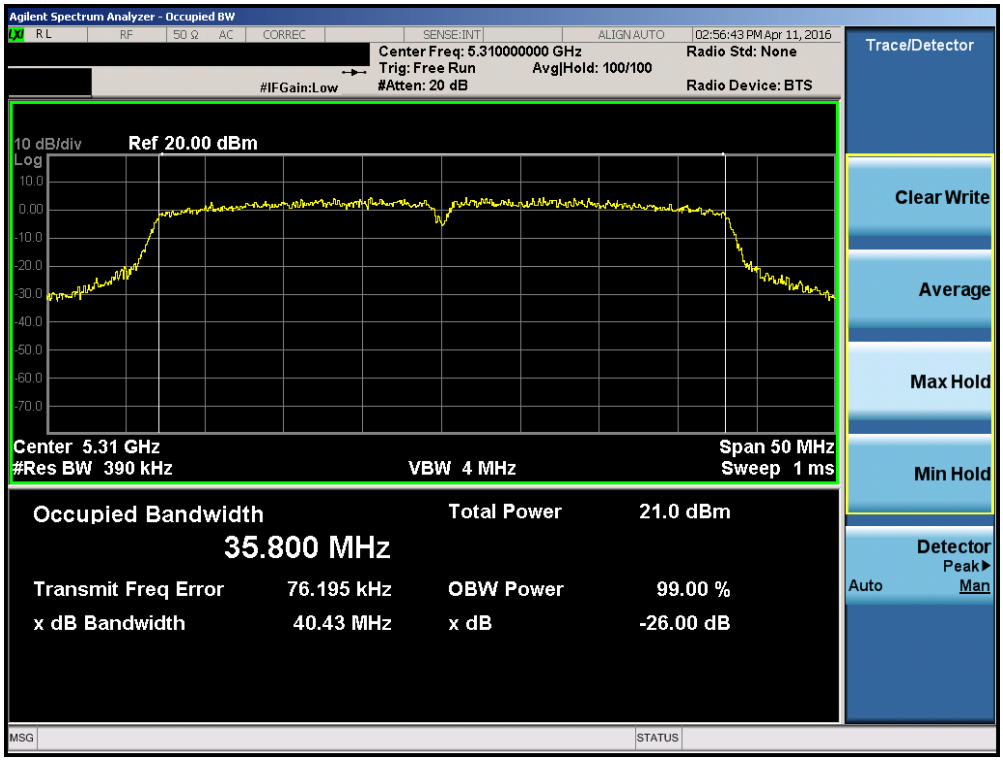
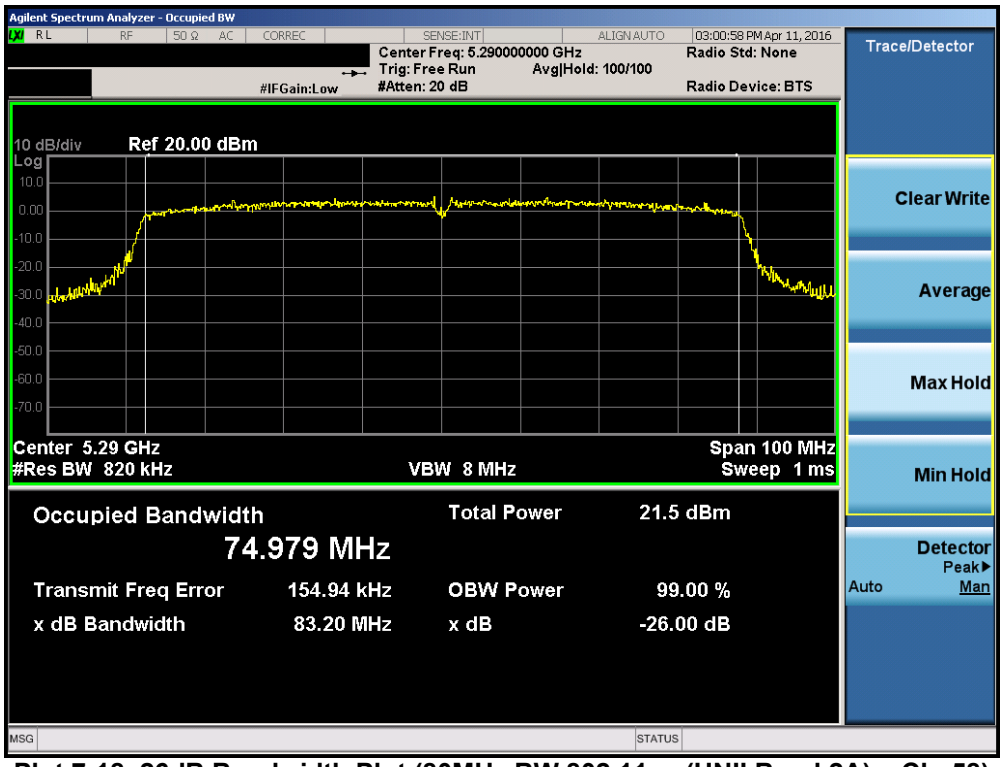


Plot 7-17. 26dB Bandwidth Plot (40MHz BW 802.11n (UNII Band 2A) – Ch. 62)



Plot 7-18. 26dB Bandwidth Plot (80MHz BW 802.11ac (UNII Band 2A) – Ch. 58)

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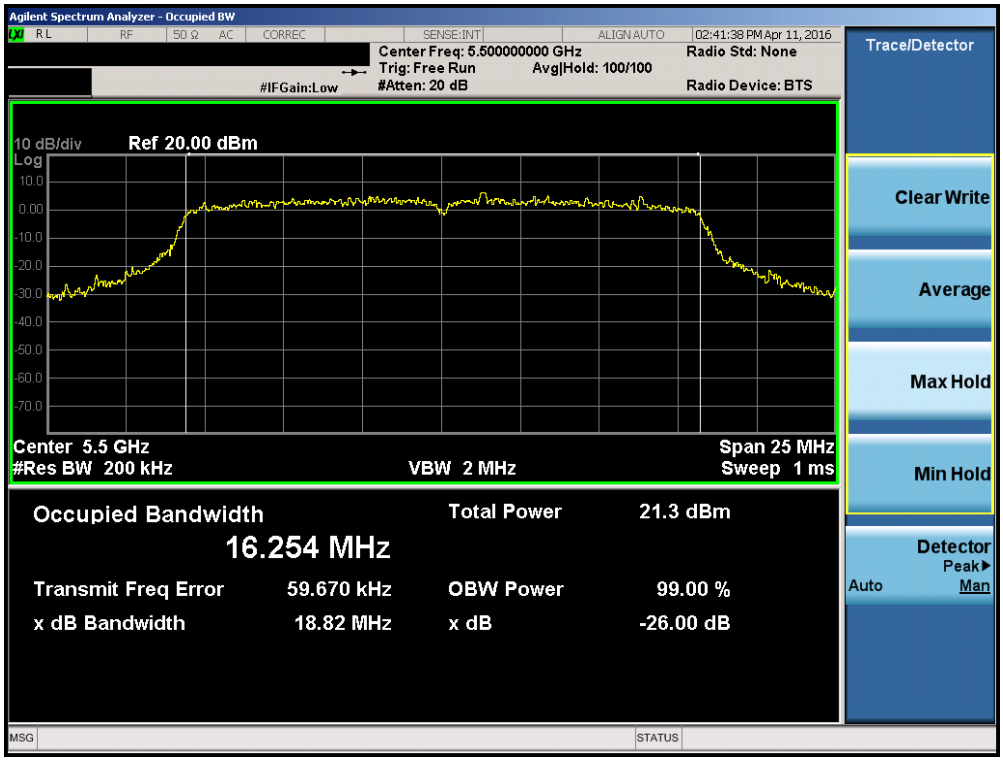
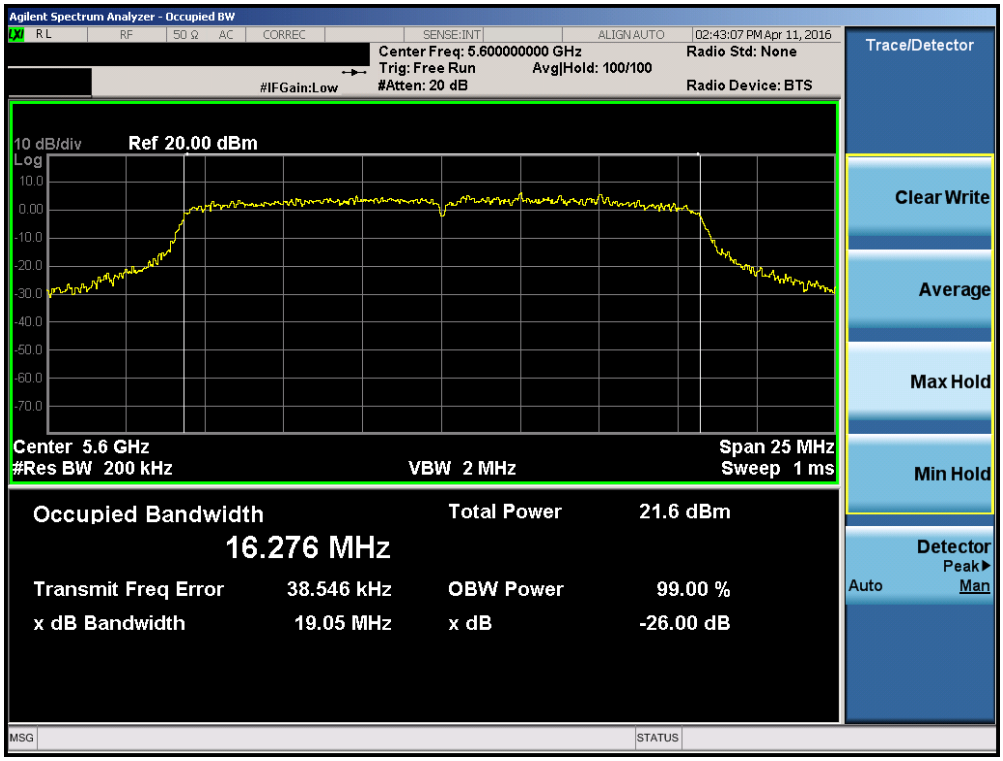


Plot 7-19. 26dB Bandwidth Plot (802.11a (UNII Band 2C) – Ch. 100)



Plot 7-20. 26dB Bandwidth Plot (802.11a (UNII Band 2C) – Ch. 120)

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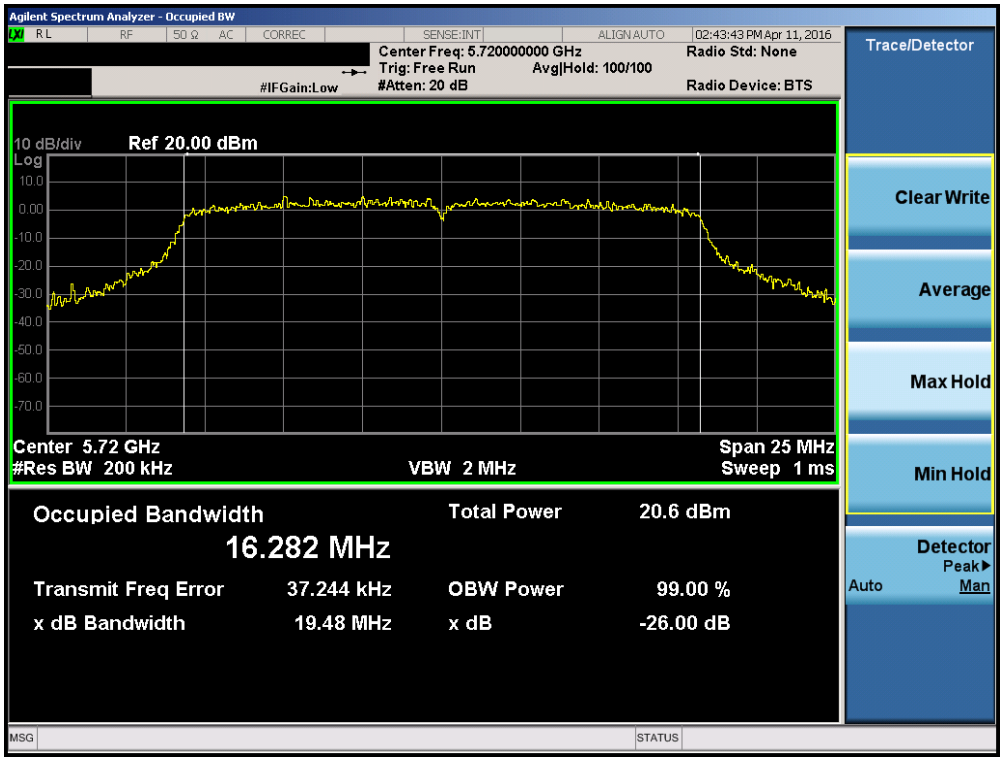
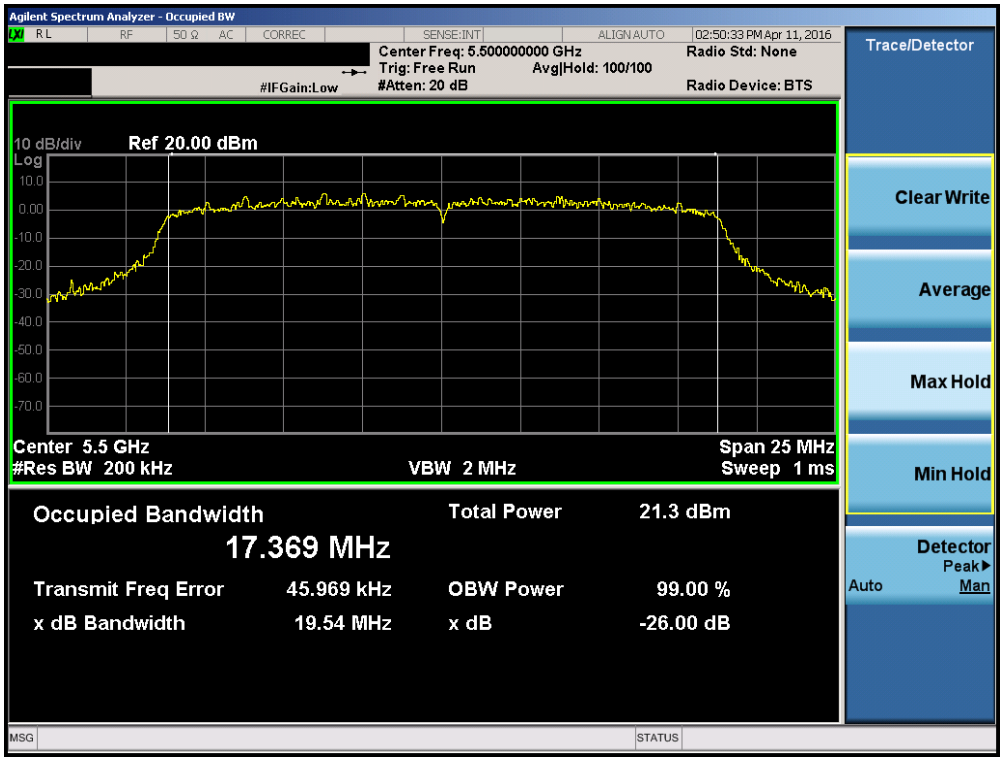


Plot 7-21. 26dB Bandwidth Plot (802.11a (UNII Band 2C) – Ch. 144)



Plot 7-22. 26dB Bandwidth Plot (20MHz BW 802.11n (UNII Band 2C) – Ch. 100)

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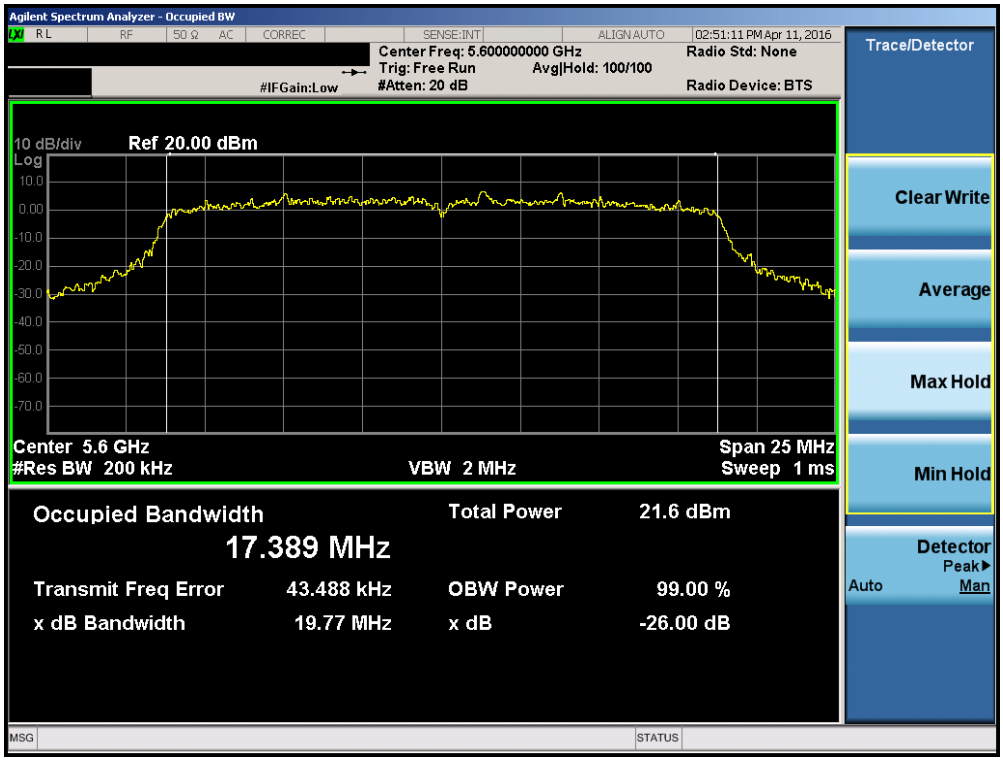
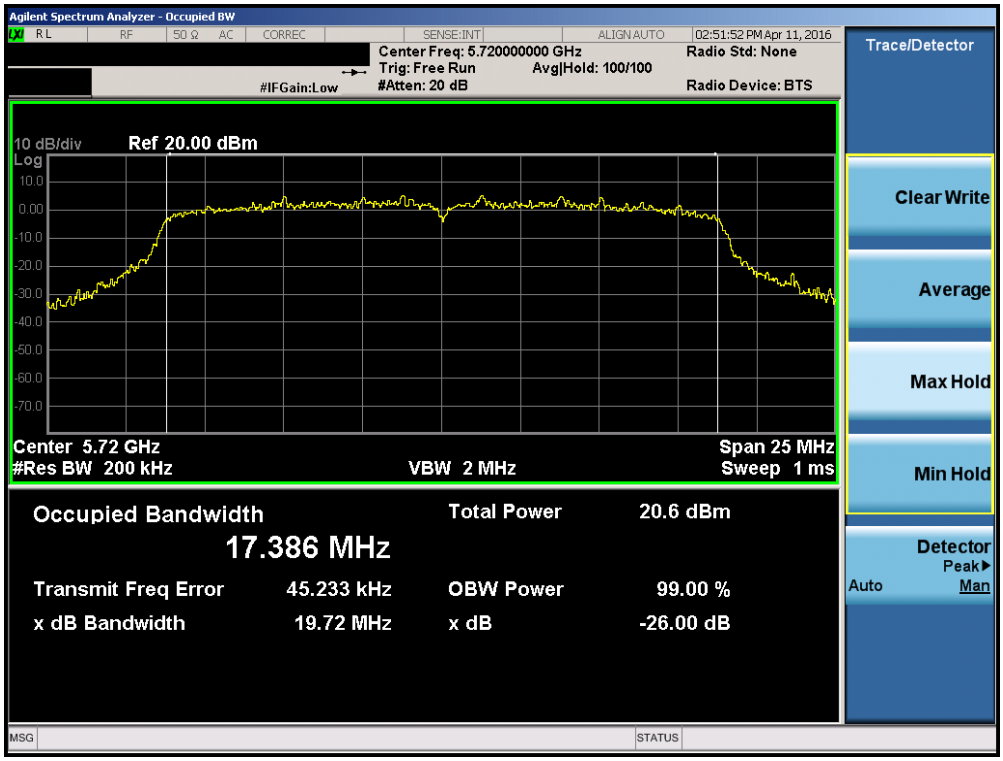


Plot 7-23. 26dB Bandwidth Plot (20MHz BW 802.11n (UNII Band 2C) – Ch. 120)



Plot 7-24. 26dB Bandwidth Plot (20MHz BW 802.11n (UNII Band 2C) – Ch. 144)

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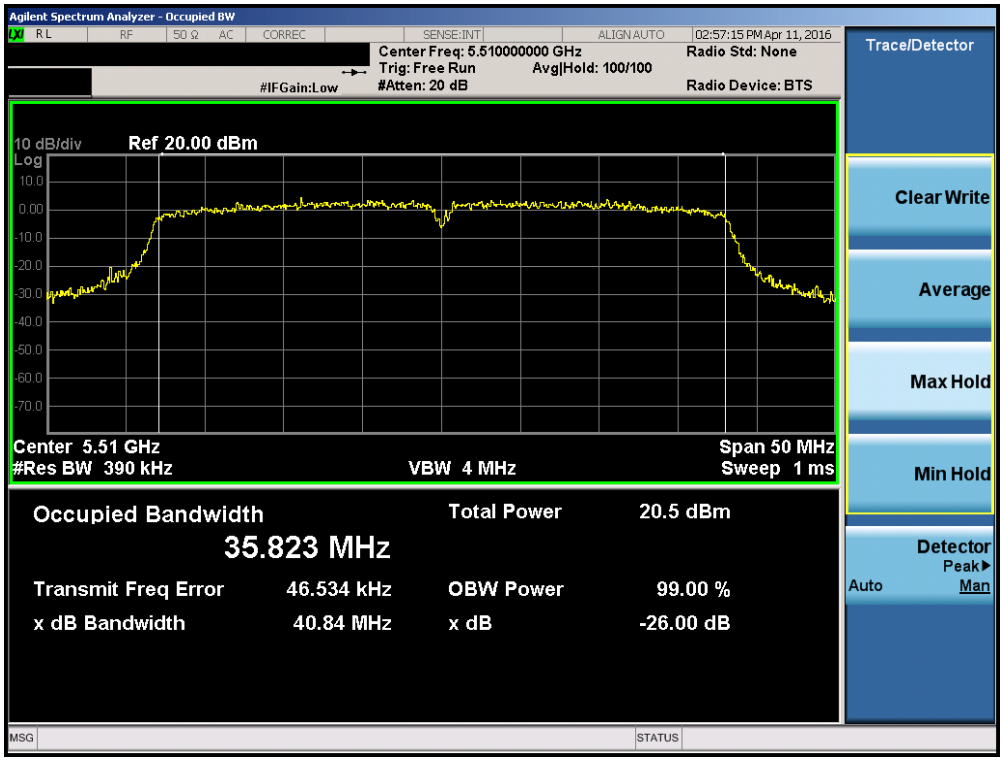
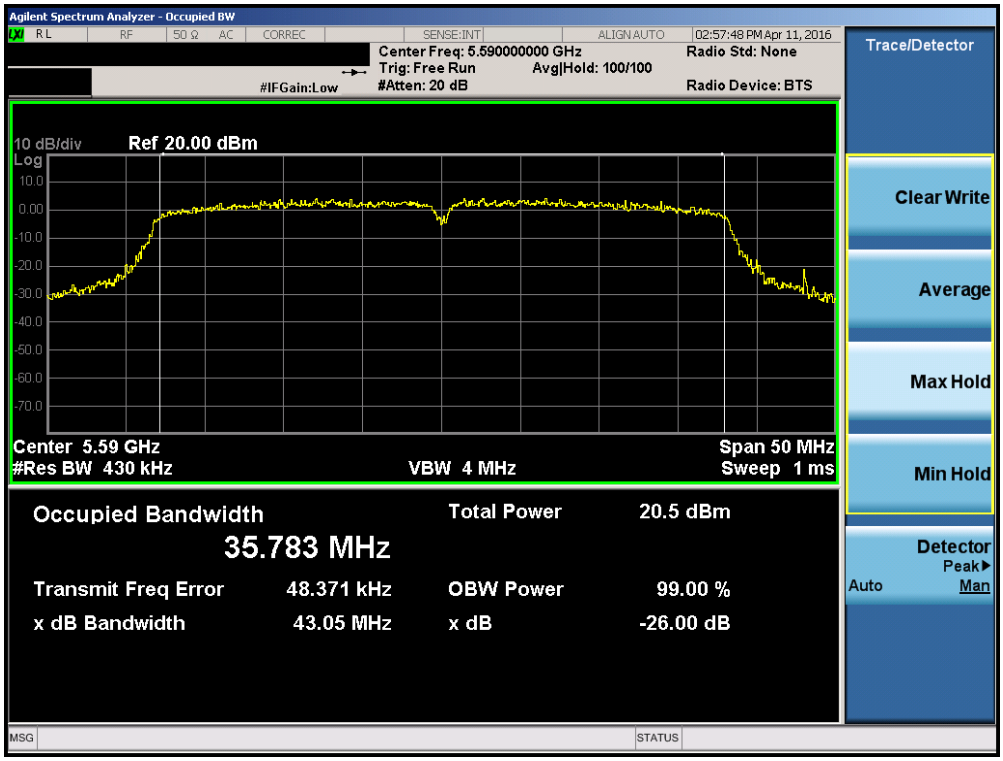


Plot 7-25. 26dB Bandwidth Plot (40MHz BW 802.11n (UNII Band 2C) – Ch. 102)



Plot 7-26. 26dB Bandwidth Plot (40MHz BW 802.11n (UNII Band 2C) – Ch. 118)

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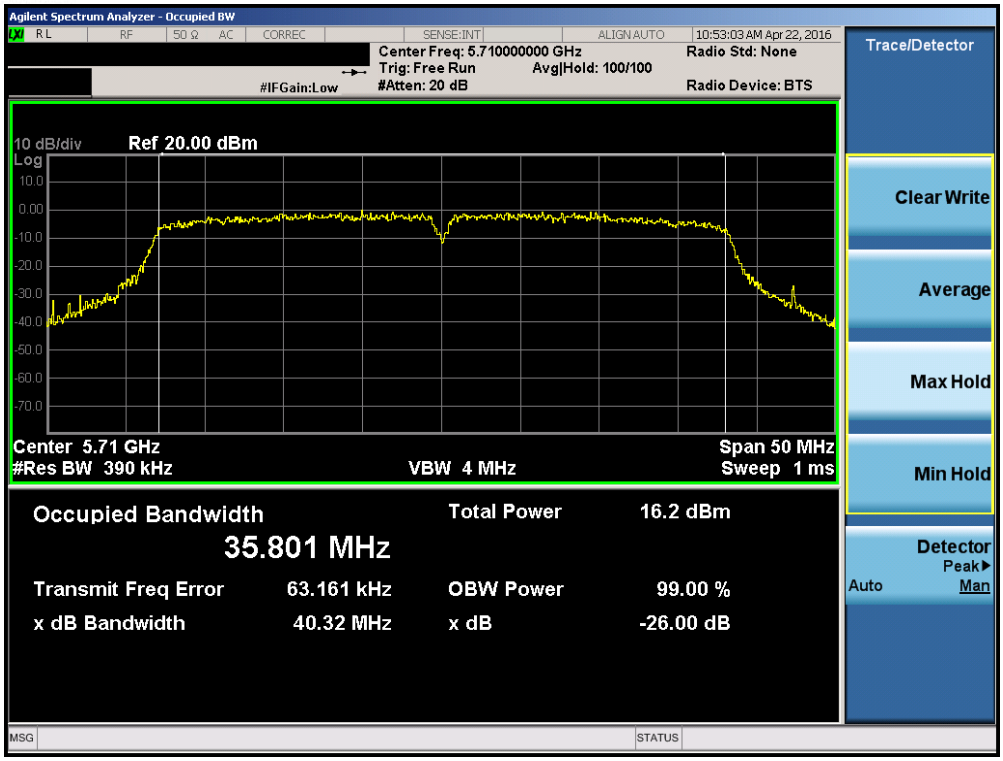
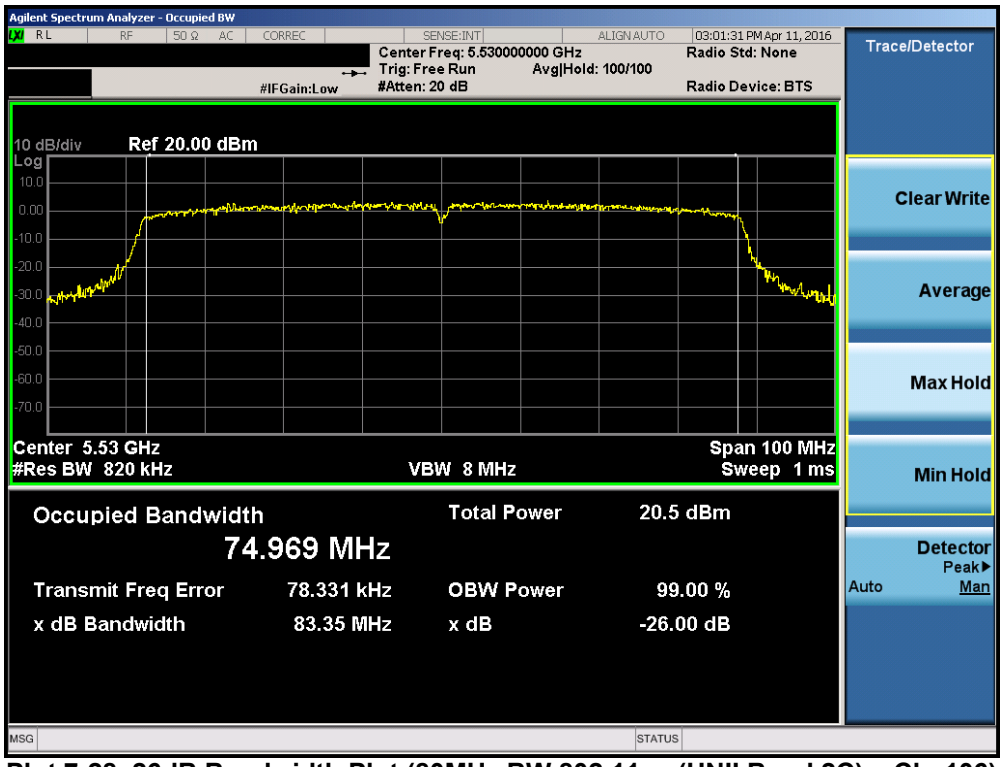


Plot 7-27. 26dB Bandwidth Plot (40MHz BW 802.11n (UNII Band 2C) – Ch. 142)



Plot 7-28. 26dB Bandwidth Plot (80MHz BW 802.11ac (UNII Band 2C) – Ch. 106)

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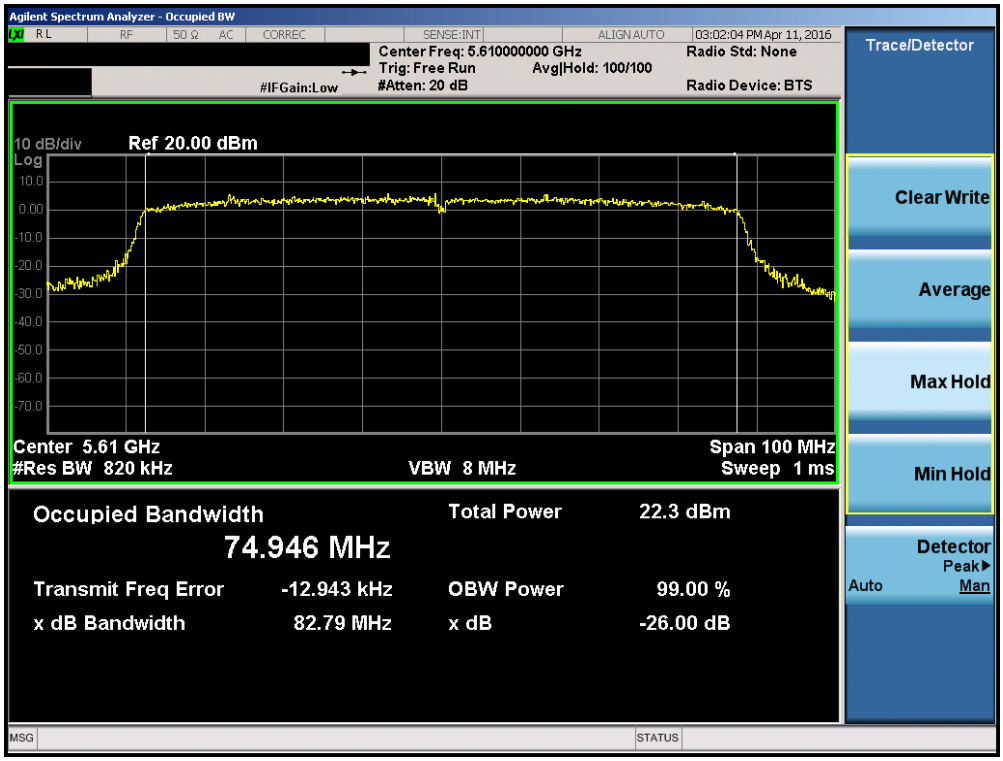
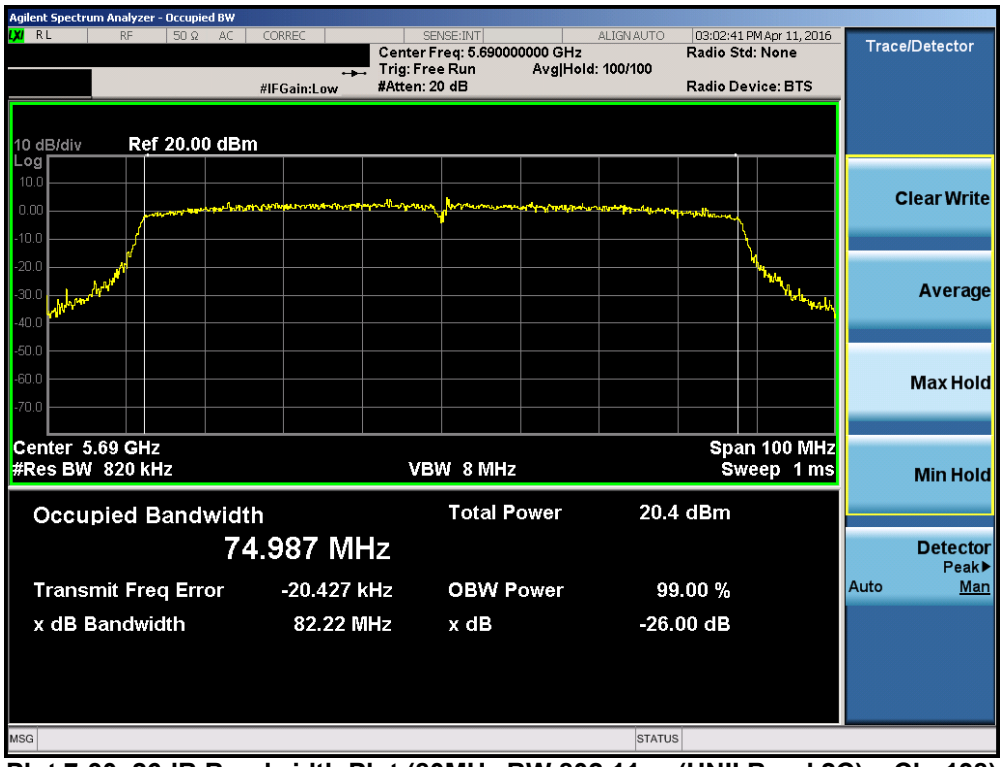


Plot 7-29. 26dB Bandwidth Plot (80MHz BW 802.11ac (UNII Band 2C) – Ch. 122)



Plot 7-30. 26dB Bandwidth Plot (80MHz BW 802.11ac (UNII Band 2C) – Ch. 138)

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7.3 6dB Bandwidth Measurement – 802.11a/n/ac

§15.407 (e)

Test Overview and Limit

The bandwidth at 6dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating at its maximum duty cycle, at its maximum power control level, as defined in KDB 789033 D02 v01 r02, and at the appropriate frequencies. The spectrum analyzer's bandwidth measurement function is configured to measure the 6dB bandwidth.

In the 5.725 – 5.850GHz band, the 6dB bandwidth must be ≥ 500 kHz.

Test Procedure Used

KDB 789033 D02 v01 r02 – Section C

Test Settings

1. The signal analyzers' automatic bandwidth measurement capability was used to perform the 6dB bandwidth measurement. The "X" dB bandwidth parameter was set to X = 6. The automatic bandwidth measurement function also has the capability of simultaneously measuring the 99% occupied bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 100 kHz
3. VBW ≥ 3 x RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple

Test Setup

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

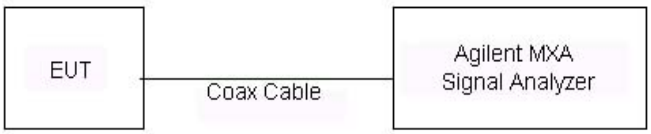

Figure 7-2. Test Instrument & Measurement Setup

Test Notes

None.

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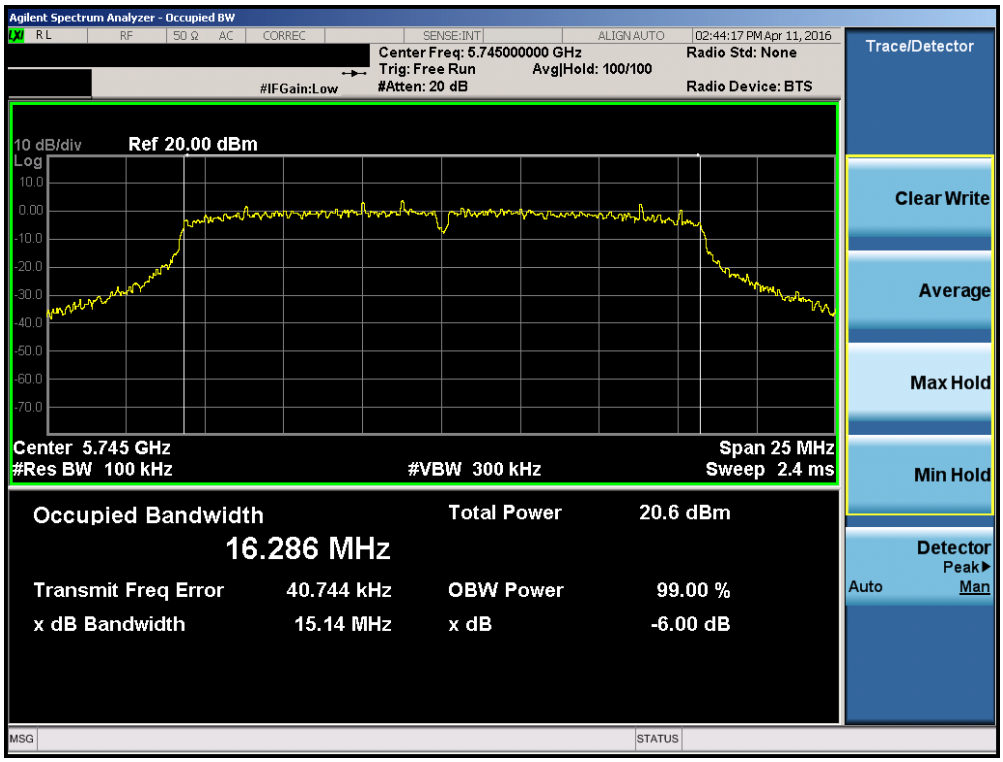
6 dB Bandwidth Measurements

	Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	Measured 6dB Bandwidth [MHz]
Band 3	5745	149	a	6	15.14
	5785	157	a	6	15.54
	5825	165	a	6	15.06
	5745	149	n (20MHz)	6.5/7.2 (MCS0)	15.01
	5785	157	n (20MHz)	6.5/7.2 (MCS0)	14.40
	5825	165	n (20MHz)	6.5/7.2 (MCS0)	14.46
	5755	151	n (40MHz)	13.5/15 (MCS0)	35.13
	5795	159	n (40MHz)	13.5/15 (MCS0)	34.98
	5775	155	ac (80MHz)	29.3/32.5 (MCS0)	75.17

Table 7-3. Conducted Bandwidth Measurements



Plot 7-31. 6dB Bandwidth Plot (802.11a (UNII Band 3) – Ch. 149)

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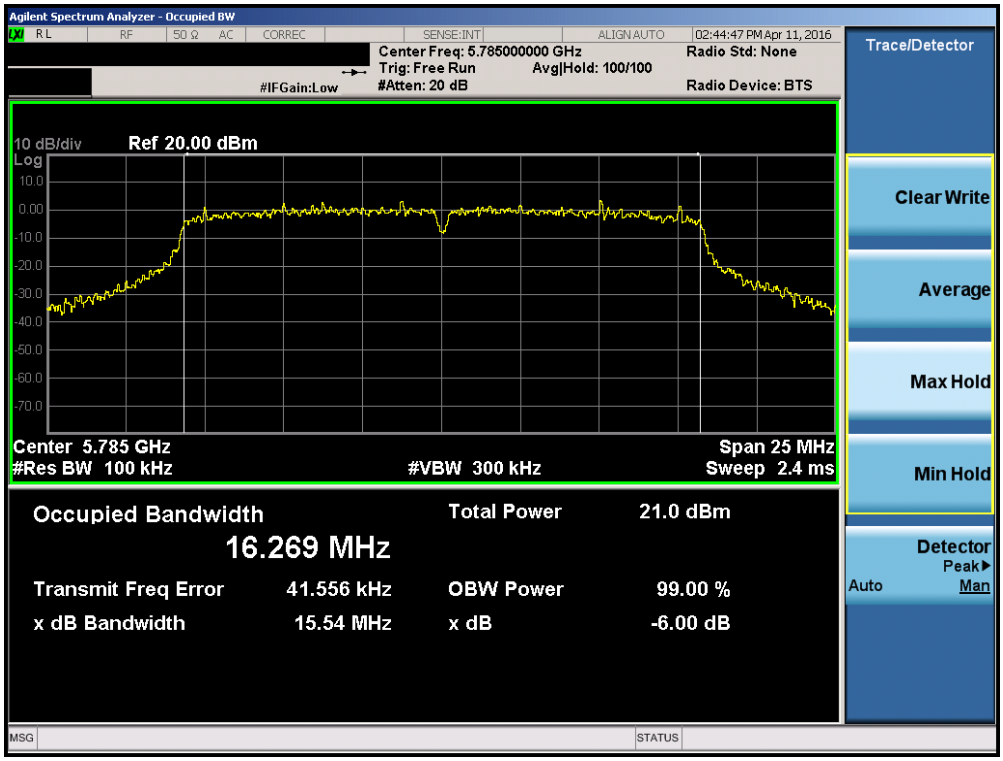

Plot 7-32. 6dB Bandwidth Plot (802.11a (UNII Band 3) – Ch. 157)

Plot 7-33. 6dB Bandwidth Plot (802.11a (UNII Band 3) – Ch. 165)

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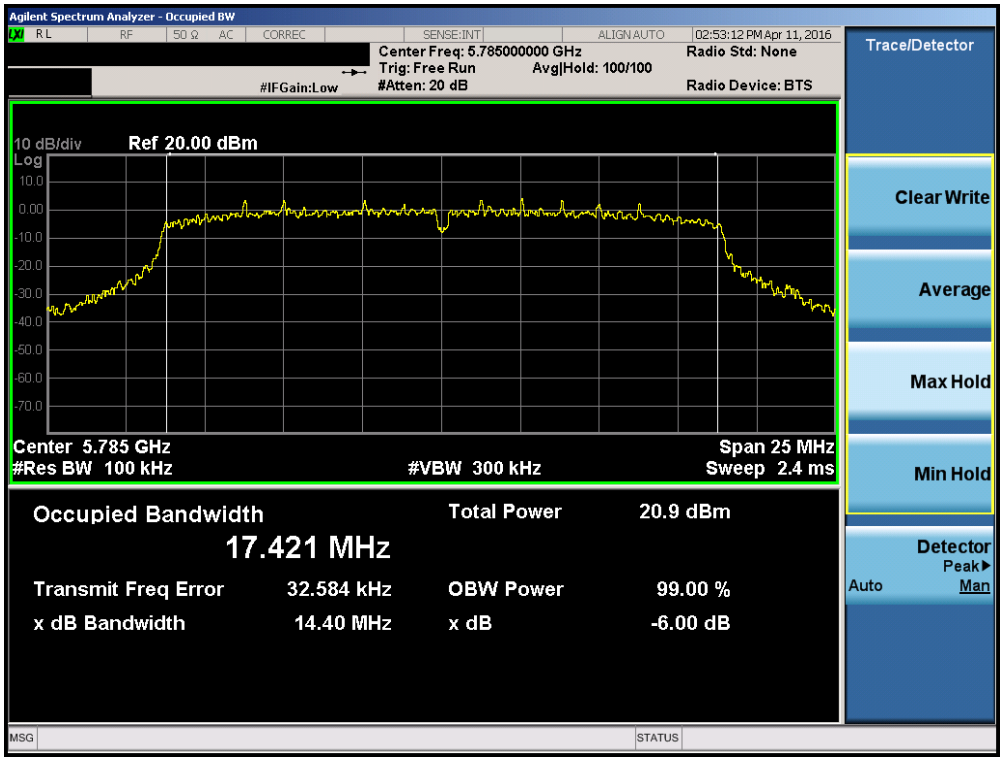
Plot 7-34. 6dB Bandwidth Plot (20MHz BW 802.11n (UNII Band 3) – Ch. 149)



Plot 7-35. 6dB Bandwidth Plot (20MHz BW 802.11n (UNII Band 3) – Ch. 157)

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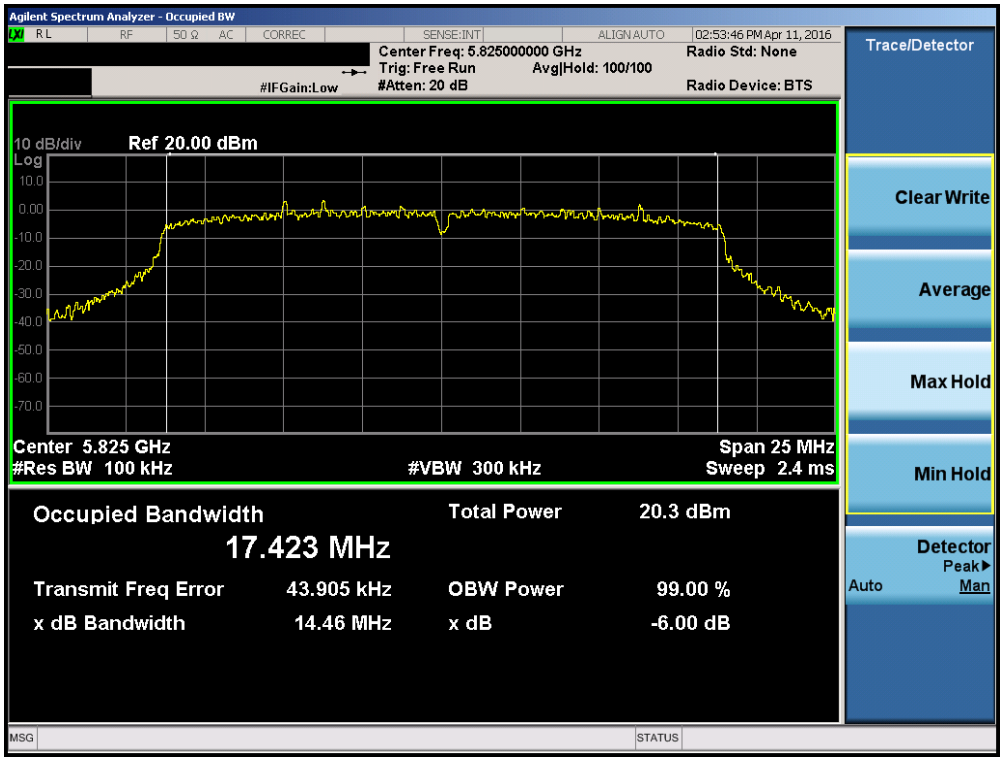

Plot 7-36. 6dB Bandwidth Plot (20MHz BW 802.11n (UNII Band 3) – Ch. 165)

Plot 7-37. 6dB Bandwidth Plot (40MHz BW 802.11n (UNII Band 3) – Ch. 151)

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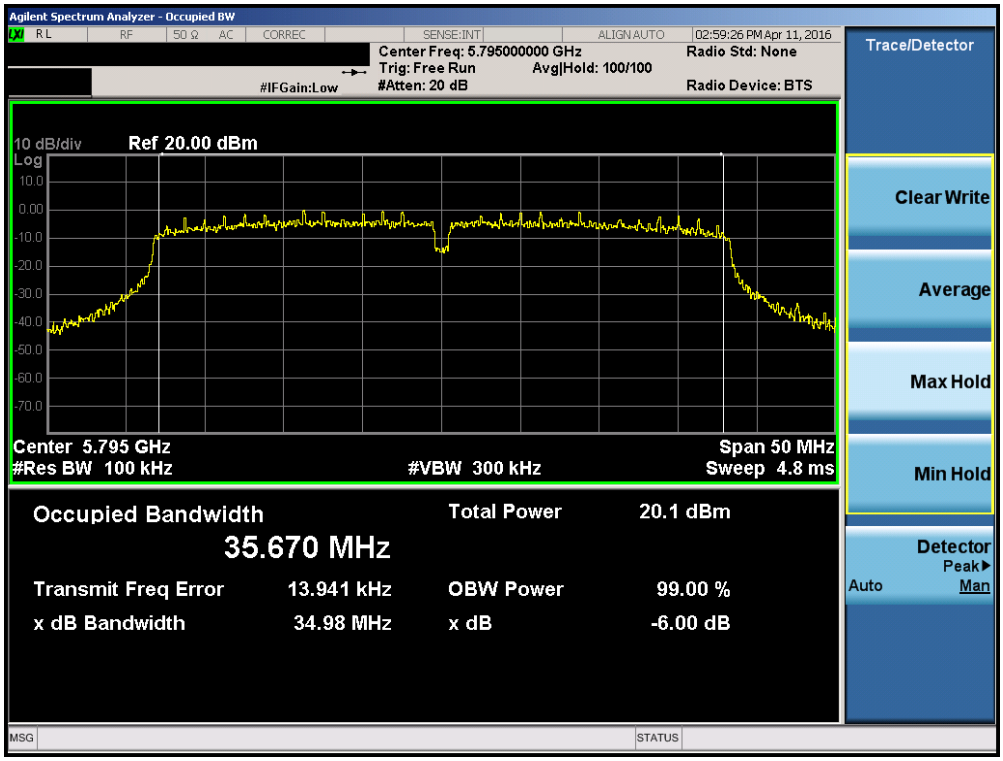
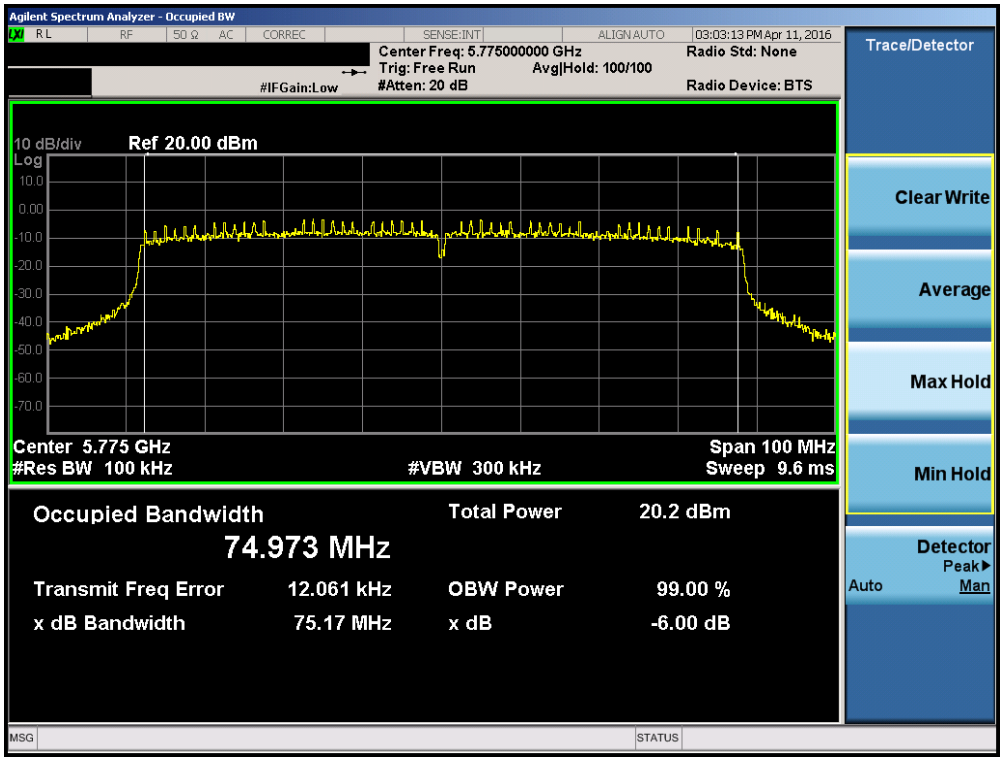


Plot 7-38. 6dB Bandwidth Plot (40MHz BW 802.11n (UNII Band 3) – Ch. 159)



Plot 7-39. 6dB Bandwidth Plot (80MHz BW 802.11ac (UNII Band 3) – Ch. 155)

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7.4 UNII Output Power Measurement – 802.11a/n/ac

§15.407 (a.1)

Test Overview and Limits

A transmitter antenna terminal of the EUT is connected to the input of an RF pulse power sensor. Measurement is made using a broadband average power meter while the EUT is operating at its maximum duty cycle, at its maximum power control level, as defined in KDB 789033 D02 v01 r02, and at the appropriate frequencies.

In the 5.15 – 5.25GHz band, the maximum permissible conducted output power is 250mW (23.98dBm).

In the 5.25 – 5.35GHz band, the maximum permissible conducted output power is the lesser of 250mW (23.98dBm) and 11 dBm + 10log$_{10}$(26dB BW) = 11 dBm + 10log$_{10}$(18.87) = 23.76dBm.

In the 5.47 – 5.725GHz band, the maximum permissible conducted output power is the lesser of 250mW (23.98dBm) and 11 dBm + 10log$_{10}$(26dB BW) = 11 dBm + 10log$_{10}$(18.82) = 23.75dBm.

In the 5.725 – 5.850GHz band, the maximum permissible conducted output power is 1W (30dBm).

Test Procedure Used

KDB 789033 D02 v01 r02 – Section E)3)b) Method PM-G

Test Settings

Average power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The power meter implemented triggering and gating capabilities which were set up such that power measurements were recorded only during the ON time of the transmitter. The trace was averaged over 100 traces to obtain the final measured average power.

Test Setup

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

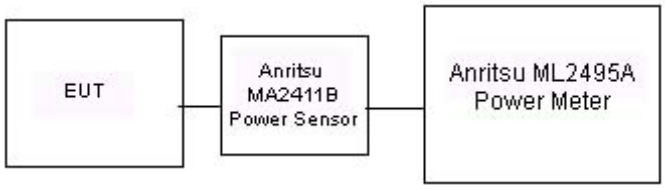

Figure 7-3. Test Instrument & Measurement Setup

Test Notes

None

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Freq [MHz]	Channel	Detector	5GHz (20MHz) Conducted Power [dBm]		
			IEEE Transmission Mode		
			802.11a	802.11n	802.11ac
5180	36	AVG	15.41	15.03	14.66
5200	40	AVG	14.88	15.46	14.79
5220	44	AVG	14.96	14.74	15.01
5240	48	AVG	14.96	15.42	14.50
5260	52	AVG	14.98	14.64	14.55
5280	56	AVG	15.28	14.79	14.54
5300	60	AVG	15.44	15.22	14.96
5320	64	AVG	14.56	14.52	14.67
5500	100	AVG	14.95	15.45	15.03
5560	112	AVG	14.39	15.17	14.73
5580	116	AVG	15.13	14.81	15.08
5600	120	AVG	15.01	14.62	14.54
5620	124	AVG	14.80	14.66	15.22
5640	128	AVG	15.17	14.42	14.72
5660	132	AVG	14.91	14.68	14.64
5700	140	AVG	14.88	15.21	15.10
5720	144	AVG	15.32	14.15	15.07
5745	149	AVG	15.08	14.56	14.90
5785	157	AVG	14.55	15.32	14.98
5825	165	AVG	15.07	14.57	14.50

Table 7-4. 20MHz BW (UNII) Maximum Conducted Output Power

Freq [MHz]	Channel	Detector	5GHz (40MHz) Conducted Power [dBm]	
			IEEE Transmission Mode	
			802.11n	802.11ac
5190	38	AVG	11.68	11.58
5230	46	AVG	11.69	11.63
5270	54	AVG	11.90	12.20
5310	62	AVG	11.73	12.40
5510	102	AVG	12.32	11.75
5590	118	AVG	11.58	12.08
5630	126	AVG	12.06	11.77
5710	142	AVG	11.56	12.12
5755	151	AVG	12.40	12.48
5795	159	AVG	12.31	11.91

Table 7-5. 40MHz BW (UNII) Maximum Conducted Output Power

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5GHz (80MHz) Conducted Power [dBm]			
Freq [MHz]	Channel	Detector	IEEE Transmission Mode
			802.11ac
5210	42	AVG	10.55
5290	58	AVG	10.53
5530	106	AVG	10.59
5610	122	AVG	10.60
5690	138	AVG	10.56
5775	155	AVG	10.61

Table 7-6. 80MHz BW (UNII) Maximum Conducted Output Power

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7.5 Maximum Power Spectral Density – 802.11a/n/ac

§15.407(a.1)(2.5)

Test Overview and Limit

The spectrum analyzer was connected to the antenna terminal while the EUT was operating at its maximum duty cycle, at its maximum power control level, as defined in KDB 789033 D02 v01 r02, and at the appropriate frequencies. Method SA-1, as defined in KDB 789033 D02 v01 r02, was used to measure the power spectral density.

In the 5.15 – 5.25GHz, 5.25 – 5.35GHz, 5.47 – 5.725GHz bands, the maximum permissible power spectral density is 11dBm/MHz.

In the 5.725 – 5.850GHz band, the maximum permissible power spectral density is 30dBm/500kHz.

Test Procedure Used

KDB 789033 D02 v01 r02 – Section F

Test Settings

1. Analyzer was set to the center frequency of the UNII channel under investigation
2. Span was set to encompass the entire emission bandwidth of the signal
3. RBW = 1MHz
4. VBW = 3MHz
5. Number of sweep points $\geq$ 2 x (span/RBW)
6. Sweep time = auto
7. Detector = power averaging (RMS)
8. Trigger was set to free run for all modes
9. Trace was averaged over 100 sweeps
10. The peak search function of the spectrum analyzer was used to find the peak of the spectrum.

Test Setup

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

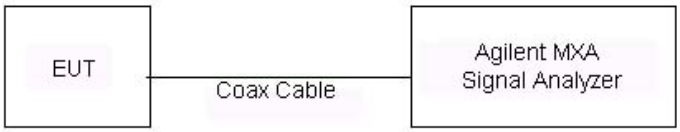

Figure 7-4. Test Instrument & Measurement Setup

Test Notes

None

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	Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	Measured Power Density [dBm]	Max Permissible Power Density [dBm/MHz]	Margin [dB]	Pass / Fail
Band 1	5180	36	a	6	4.29	11.0	-6.71	Pass
	5200	40	a	6	4.37	11.0	-6.63	Pass
	5240	48	a	6	4.26	11.0	-6.74	Pass
	5180	36	n (20MHz)	6.5/7.2 (MCS0)	3.61	11.0	-7.39	Pass
	5200	40	n (20MHz)	6.5/7.2 (MCS0)	3.55	11.0	-7.45	Pass
	5240	48	n (20MHz)	6.5/7.2 (MCS0)	3.85	11.0	-7.15	Pass
	5190	38	n (40MHz)	13.5/15 (MCS0)	-0.88	11.0	-11.88	Pass
	5230	46	n (40MHz)	13.5/15 (MCS0)	-0.72	11.0	-11.72	Pass
	5210	42	ac (80MHz)	29.3/32.5 (MCS0)	-4.74	11.0	-15.74	Pass
Band 2A	5260	52	a	6	4.62	11.0	-6.38	Pass
	5280	56	a	6	5.47	11.0	-5.53	Pass
	5320	64	a	6	4.20	11.0	-6.80	Pass
	5260	52	n (20MHz)	6.5/7.2 (MCS0)	4.32	11.0	-6.69	Pass
	5280	56	n (20MHz)	6.5/7.2 (MCS0)	5.00	11.0	-6.00	Pass
	5320	64	n (20MHz)	6.5/7.2 (MCS0)	3.74	11.0	-7.26	Pass
	5270	54	n (40MHz)	13.5/15 (MCS0)	0.15	11.0	-10.85	Pass
	5310	62	n (40MHz)	13.5/15 (MCS0)	0.01	11.0	-10.99	Pass
	5290	58	ac (80MHz)	29.3/32.5 (MCS0)	-3.59	11.0	-14.59	Pass
Band 2C	5500	100	a	6	4.50	11.0	-6.50	Pass
	5600	120	a	6	4.98	11.0	-6.02	Pass
	5720	144	a	6	3.66	11.0	-7.34	Pass
	5500	100	n (20MHz)	6.5/7.2 (MCS0)	3.87	11.0	-7.13	Pass
	5600	120	n (20MHz)	6.5/7.2 (MCS0)	4.51	11.0	-6.49	Pass
	5720	144	n (20MHz)	6.5/7.2 (MCS0)	3.44	11.0	-7.56	Pass
	5510	102	n (40MHz)	13.5/15 (MCS0)	0.13	11.0	-10.87	Pass
	5590	118	n (40MHz)	13.5/15 (MCS0)	0.11	11.0	-10.89	Pass
	5710	142	n (40MHz)	13.5/15 (MCS0)	-4.39	11.0	-15.39	Pass
	5530	106	ac (80MHz)	29.3/32.5 (MCS0)	-4.36	11.0	-15.36	Pass
	5610	122	ac (80MHz)	29.3/32.5 (MCS0)	-2.83	11.0	-13.83	Pass
	5690	138	ac (80MHz)	29.3/32.5 (MCS0)	-7.29	11.0	-18.29	Pass

Table 7-7. Bands 1, 2A, 2C Conducted Power Spectral Density Measurements

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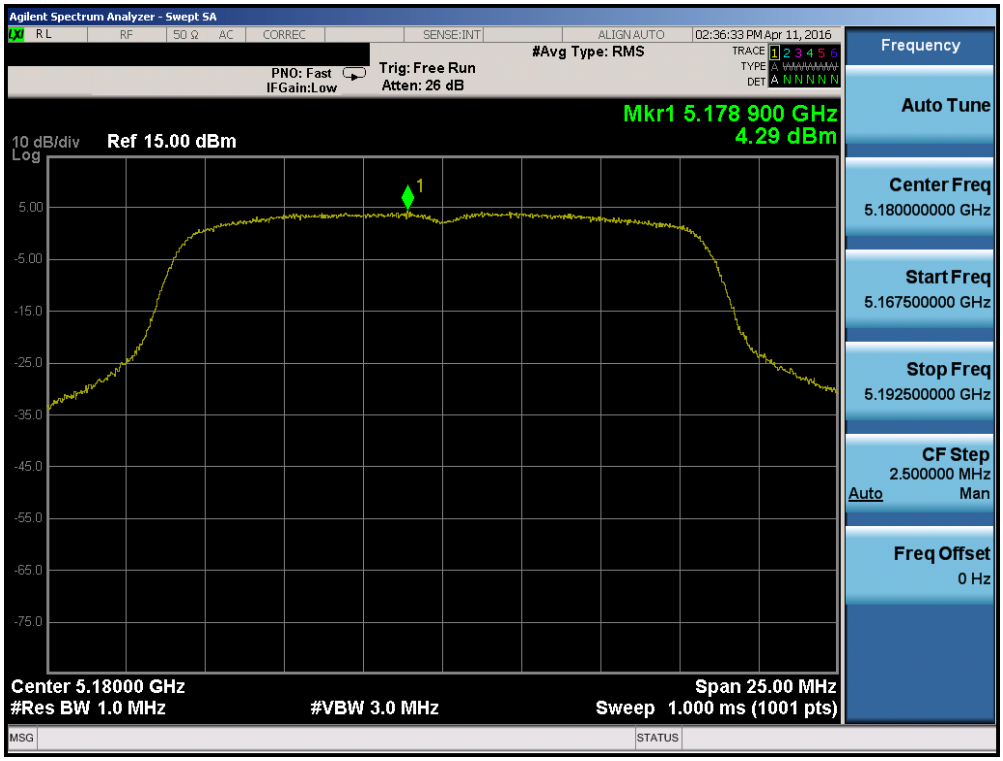
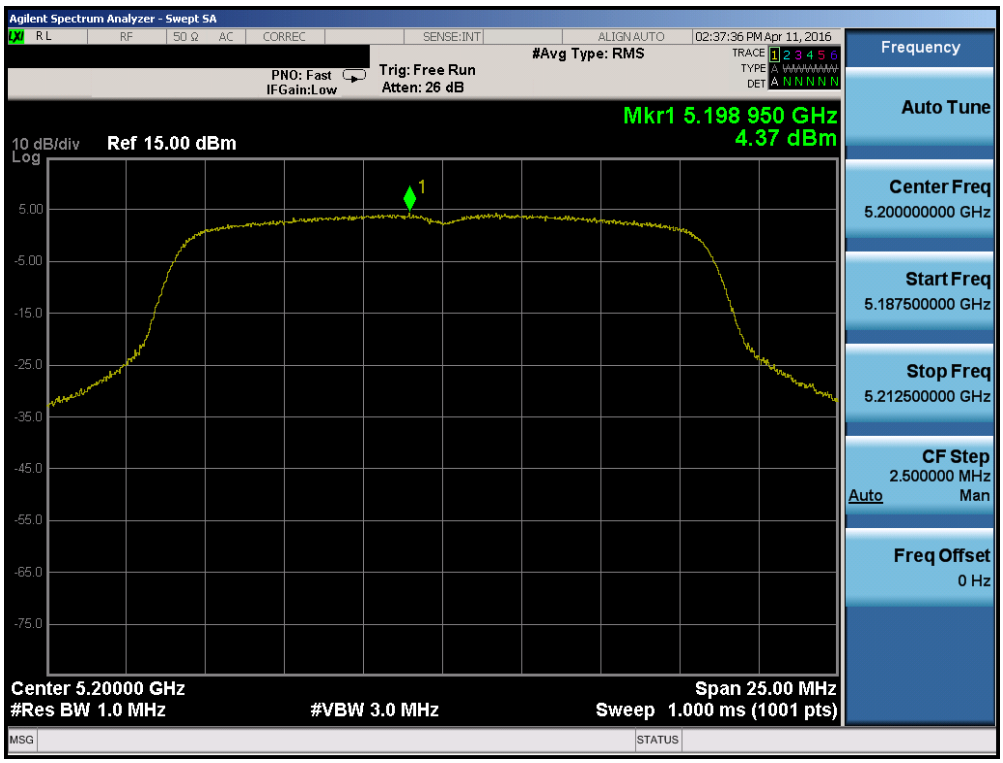


Plot 7-40. Power Spectral Density Plot (802.11a (UNII Band 1) – Ch. 36)



Plot 7-41. Power Spectral Density Plot (802.11a (UNII Band 1) – Ch. 40)

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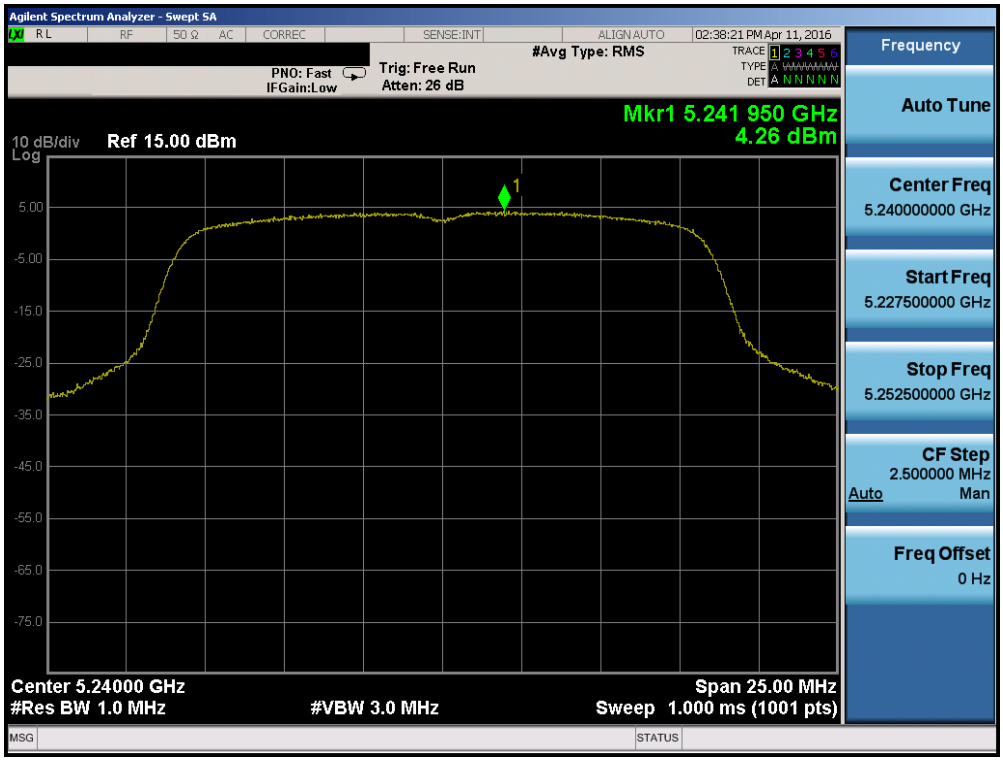
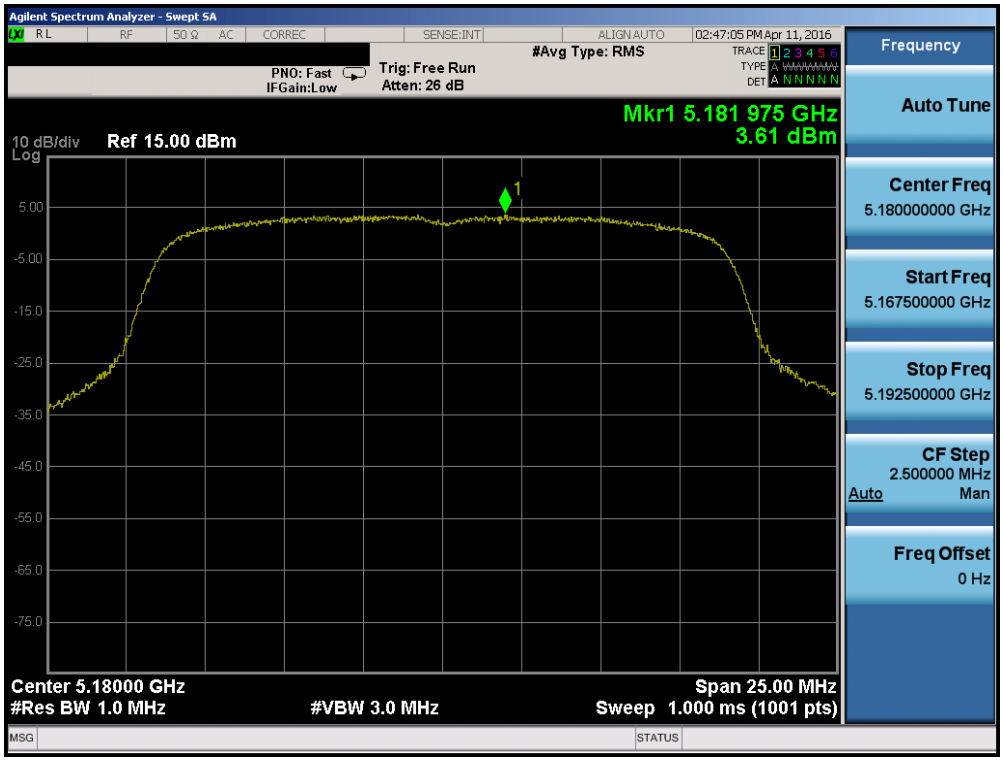


Plot 7-42. Power Spectral Density Plot (802.11a (UNII Band 1) – Ch. 48)



Plot 7-43. Power Spectral Density Plot (20MHz BW 802.11n (UNII Band 1) – Ch. 36)

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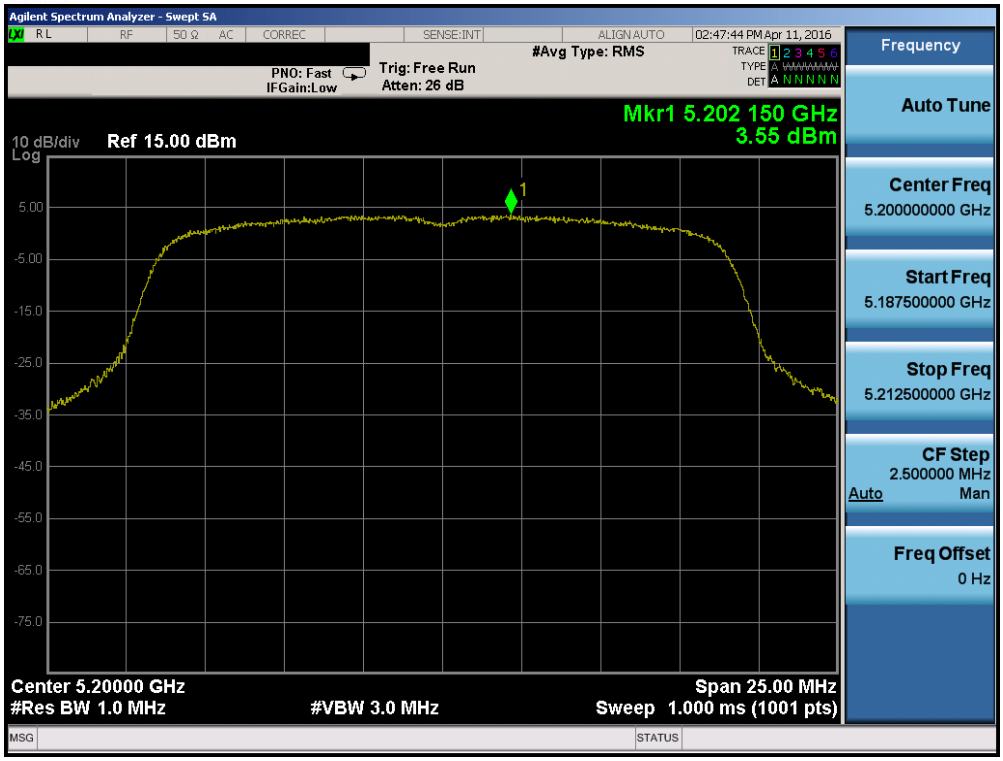
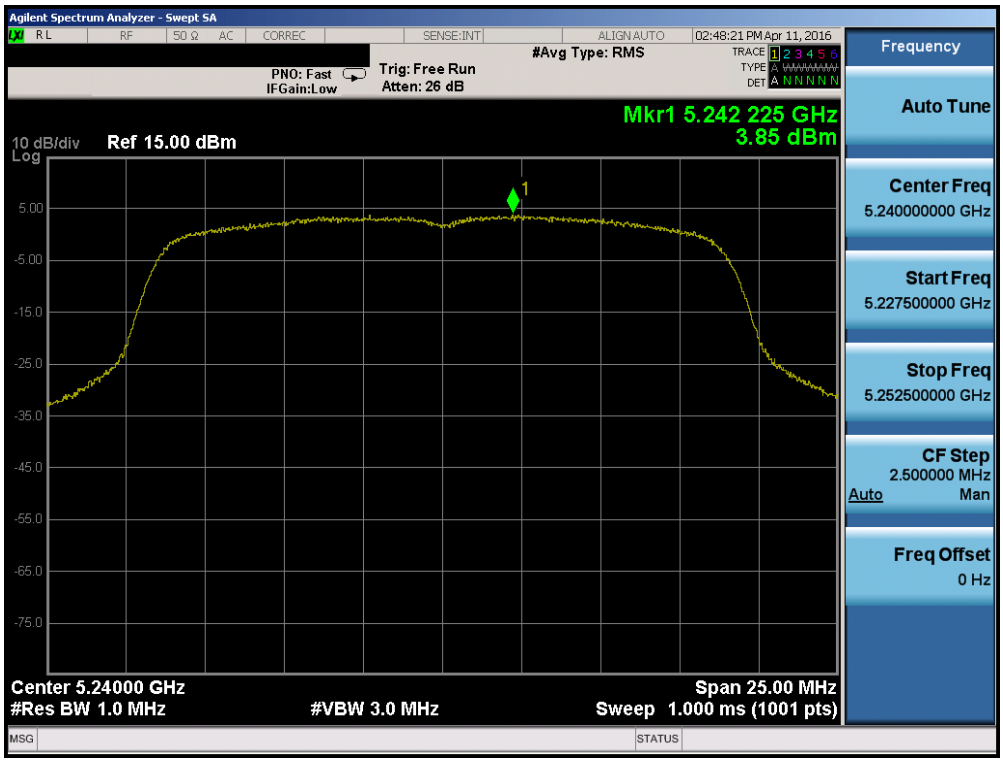


Plot 7-44. Power Spectral Density Plot (20MHz BW 802.11n (UNII Band 1) – Ch. 40)



Plot 7-45. Power Spectral Density Plot (20MHz BW 802.11n (UNII Band 1) – Ch. 48)

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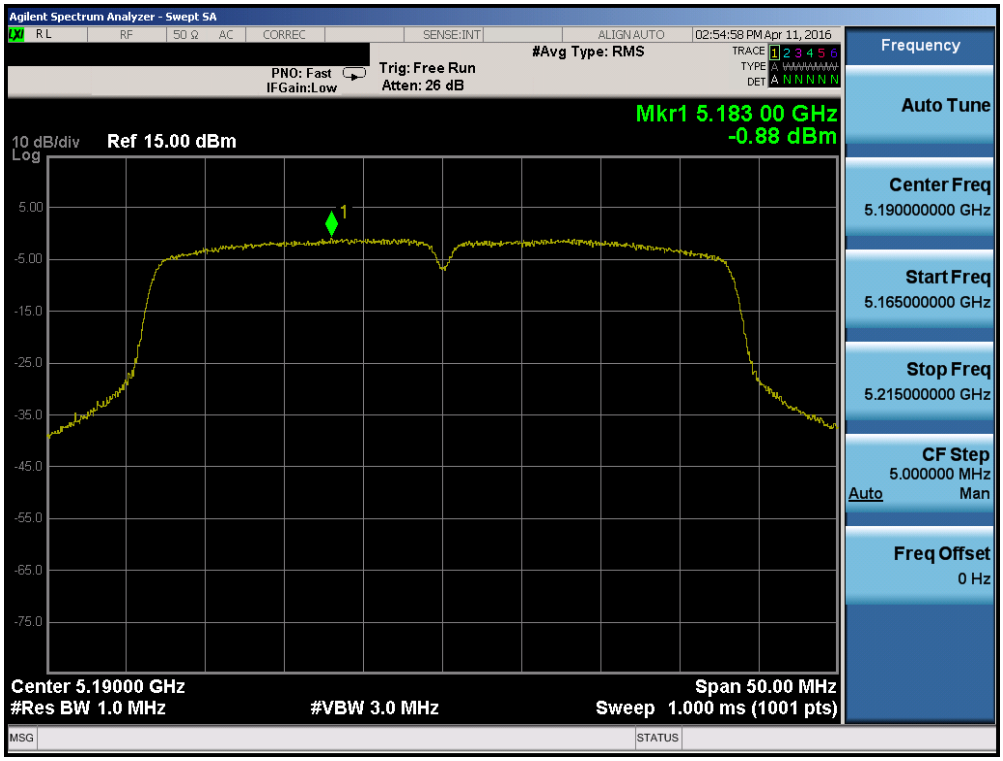
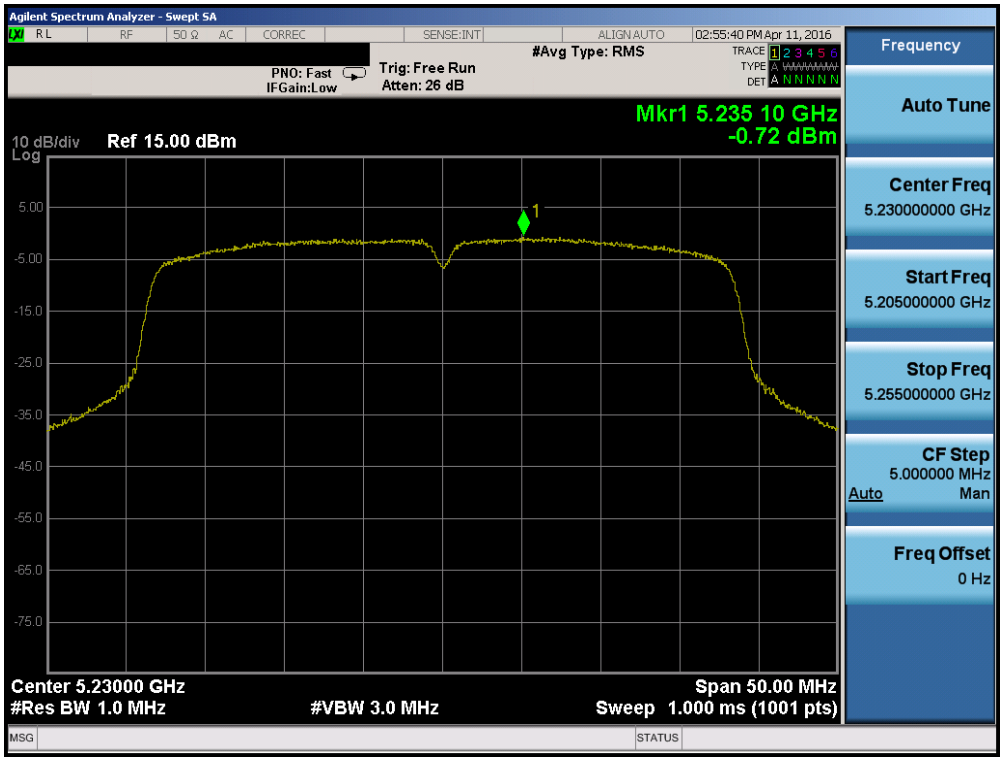


Plot 7-46. Power Spectral Density Plot (40MHz BW 802.11n (UNII Band 1) – Ch. 38)



Plot 7-47. Power Spectral Density Plot (40MHz BW 802.11n (UNII Band 1) – Ch. 46)

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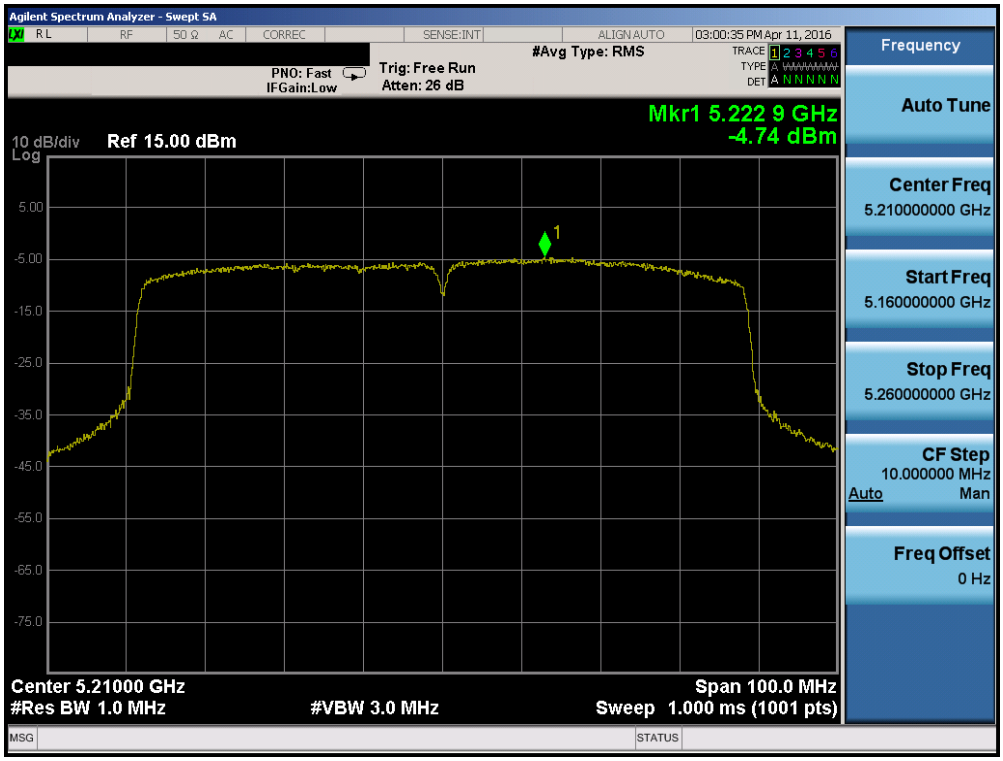
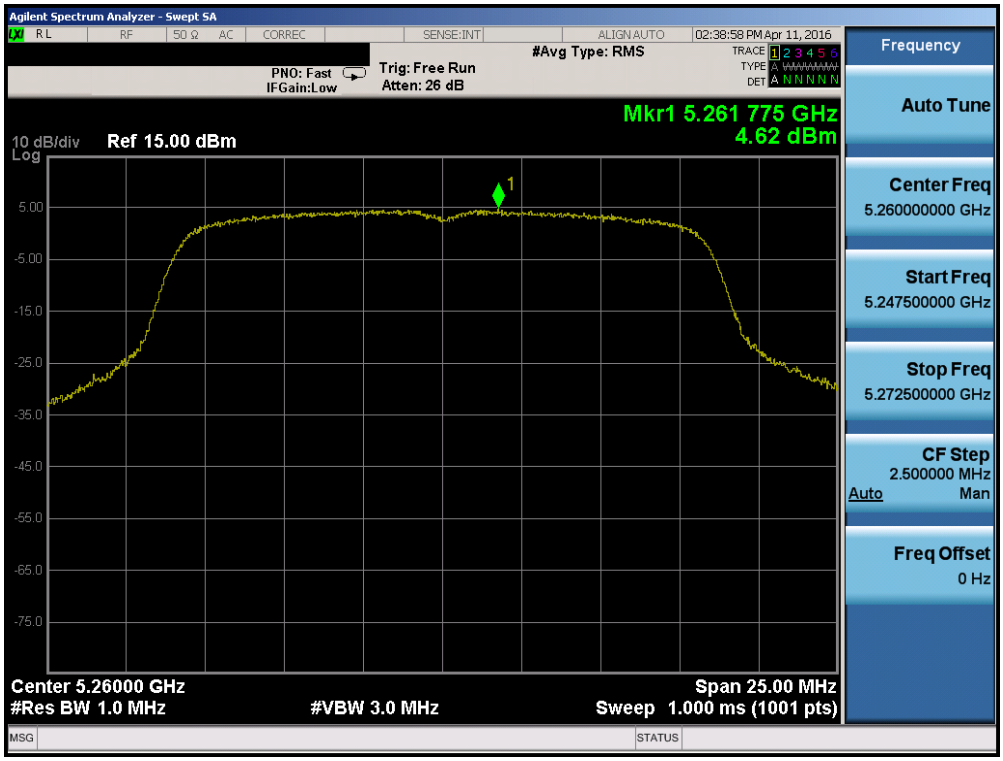


Plot 7-48. Power Spectral Density Plot (80MHz BW 802.11ac (UNII Band 1) – Ch. 42)



Plot 7-49. Power Spectral Density Plot (802.11a (UNII Band 2A) – Ch. 52)

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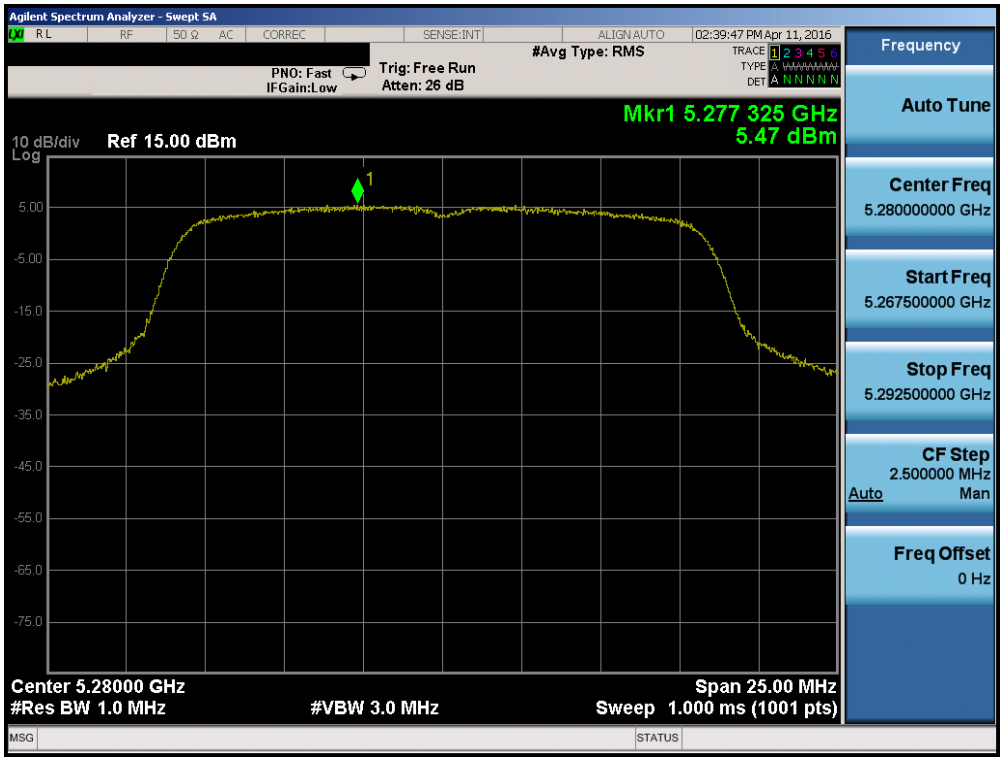
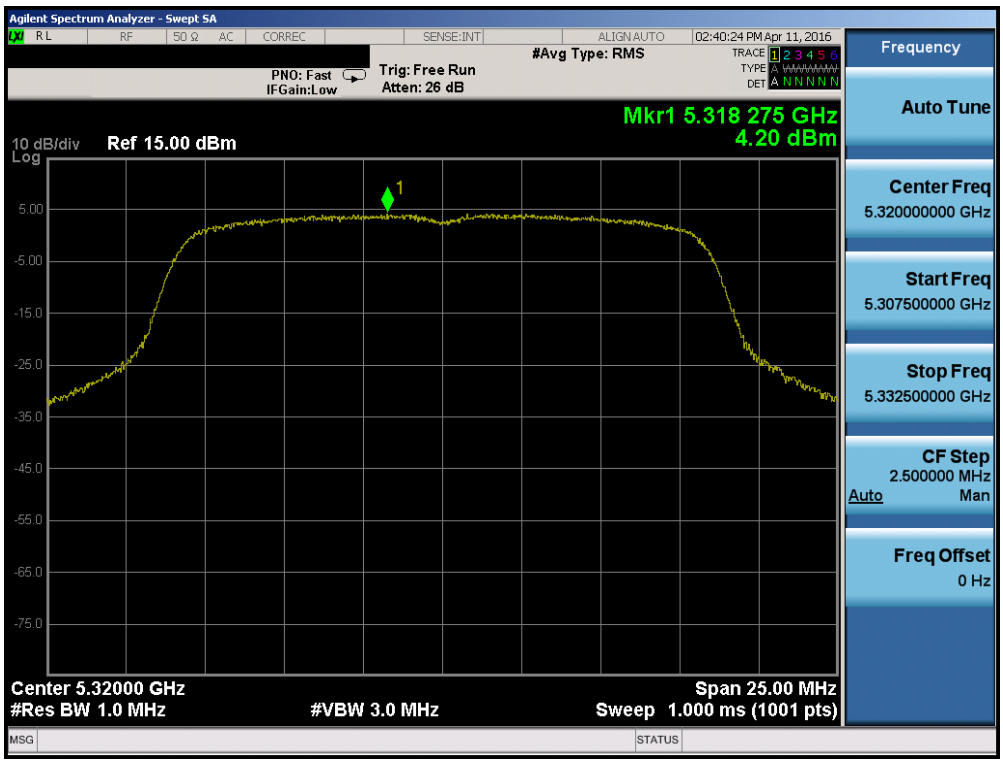


Plot 7-50. Power Spectral Density Plot (802.11a (UNII Band 2A) – Ch. 56)



Plot 7-51. Power Spectral Density Plot (802.11a (UNII Band 2A) – Ch. 64)

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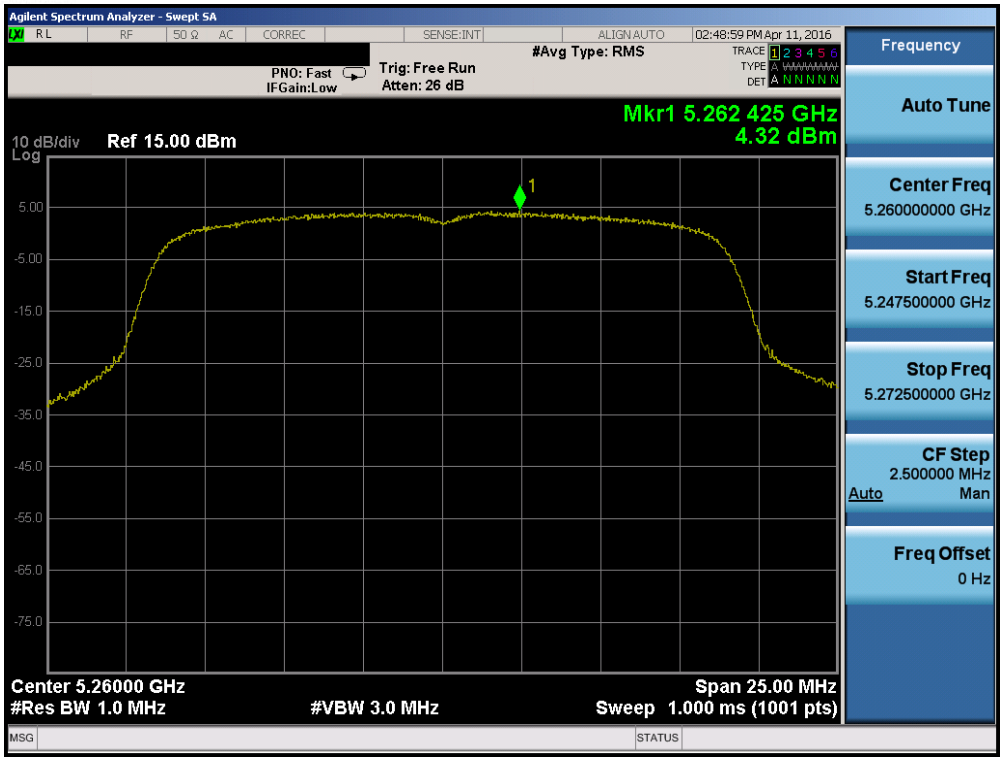
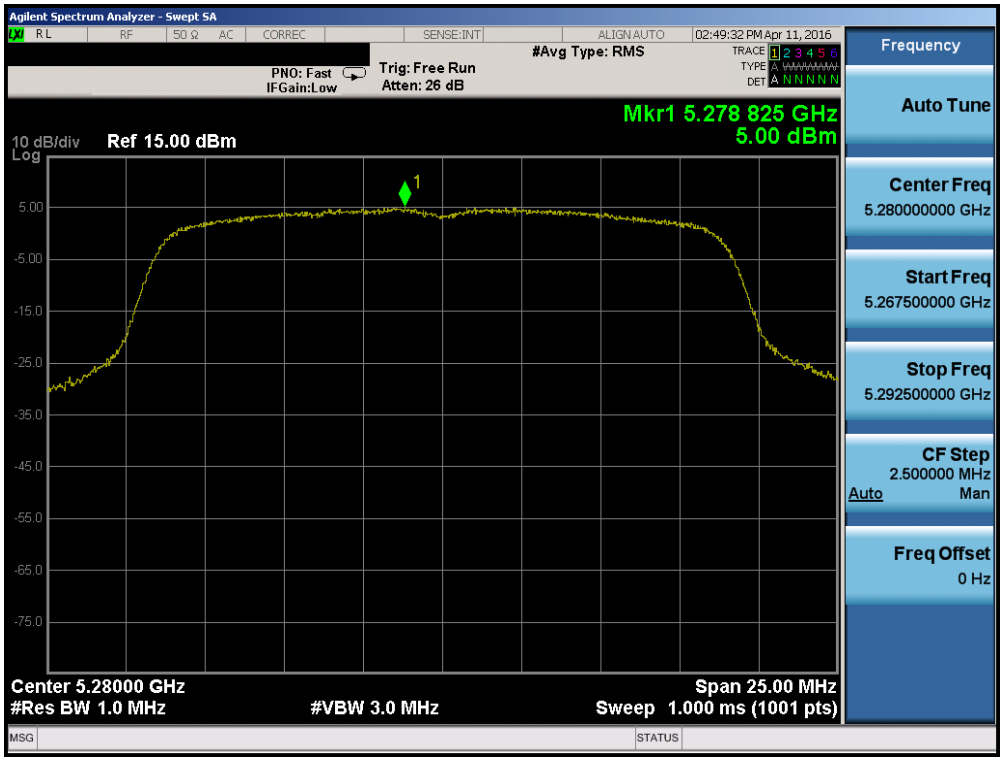


Plot 7-52. Power Spectral Density Plot (20MHz BW 802.11n (UNII Band 2A) – Ch. 52)



Plot 7-53. Power Spectral Density Plot (20MHz BW 802.11n (UNII Band 2A) – Ch. 56)

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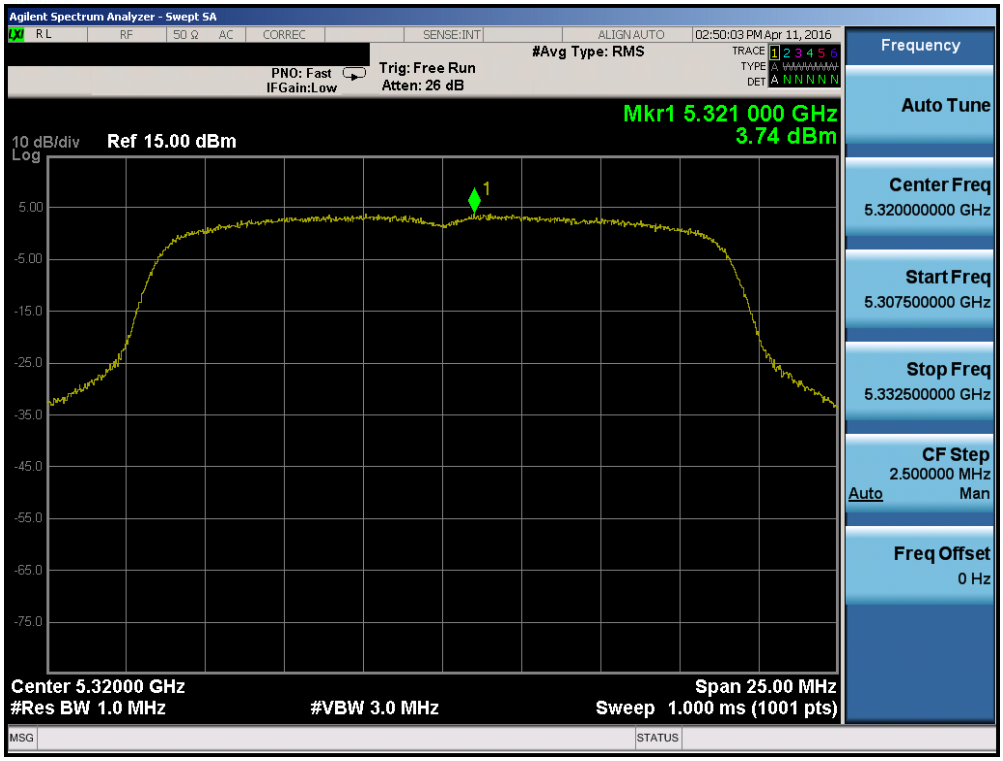
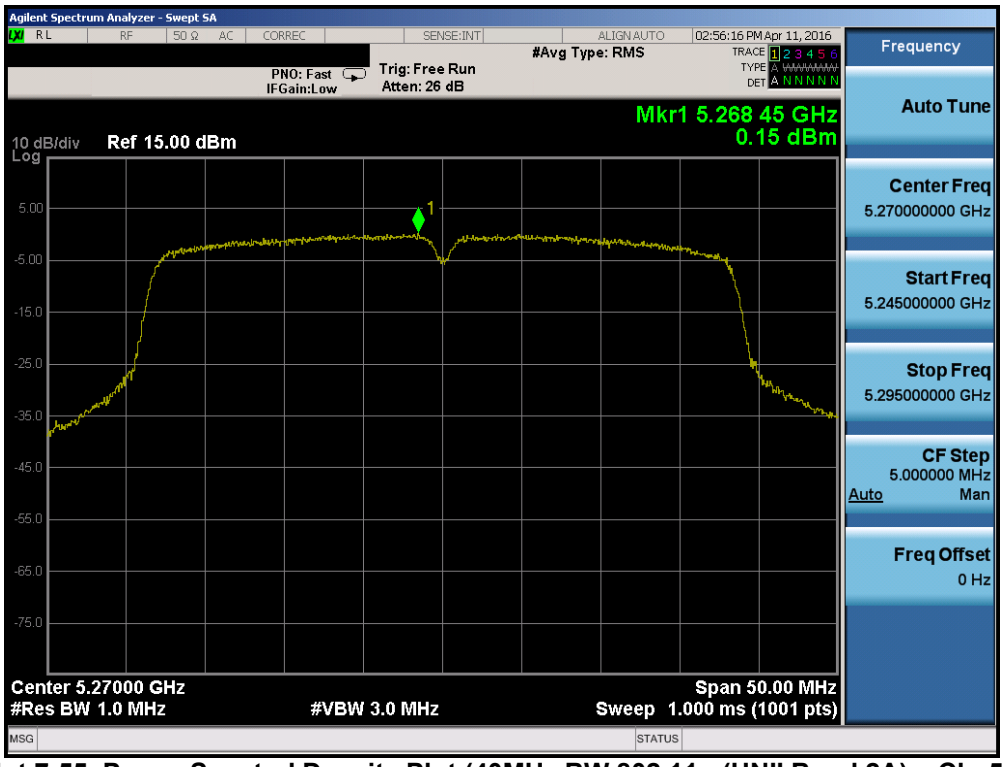


Plot 7-54. Power Spectral Density Plot (20MHz BW 802.11n (UNII Band 2A) – Ch. 64)



Plot 7-55. Power Spectral Density Plot (40MHz BW 802.11n (UNII Band 2A) – Ch. 54)

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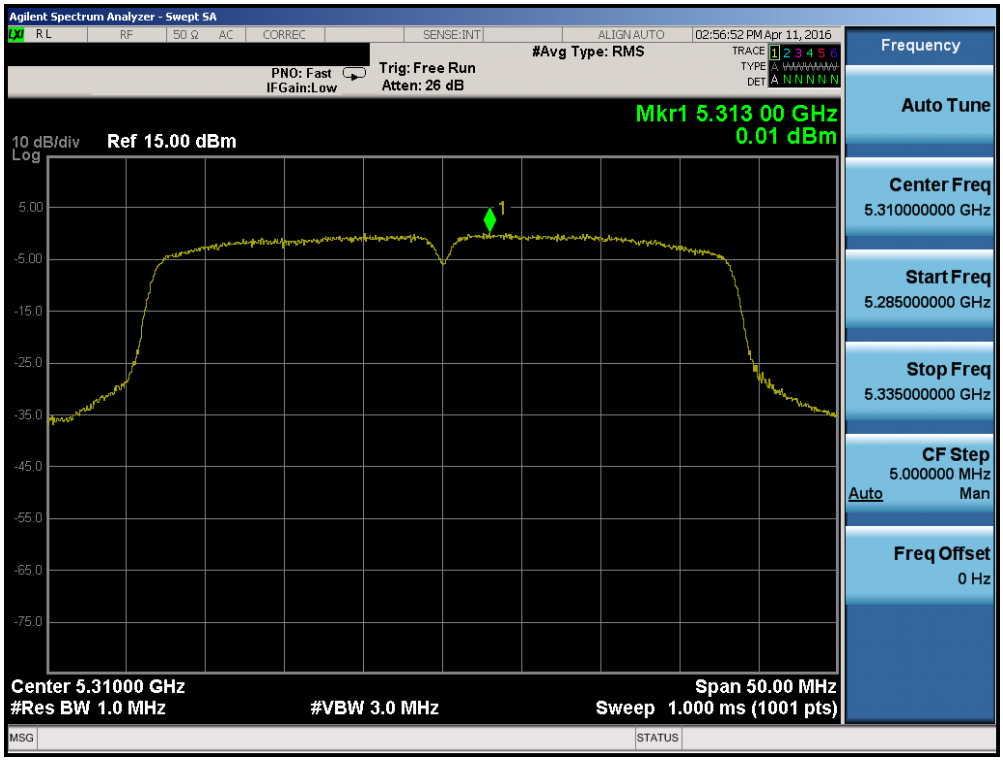
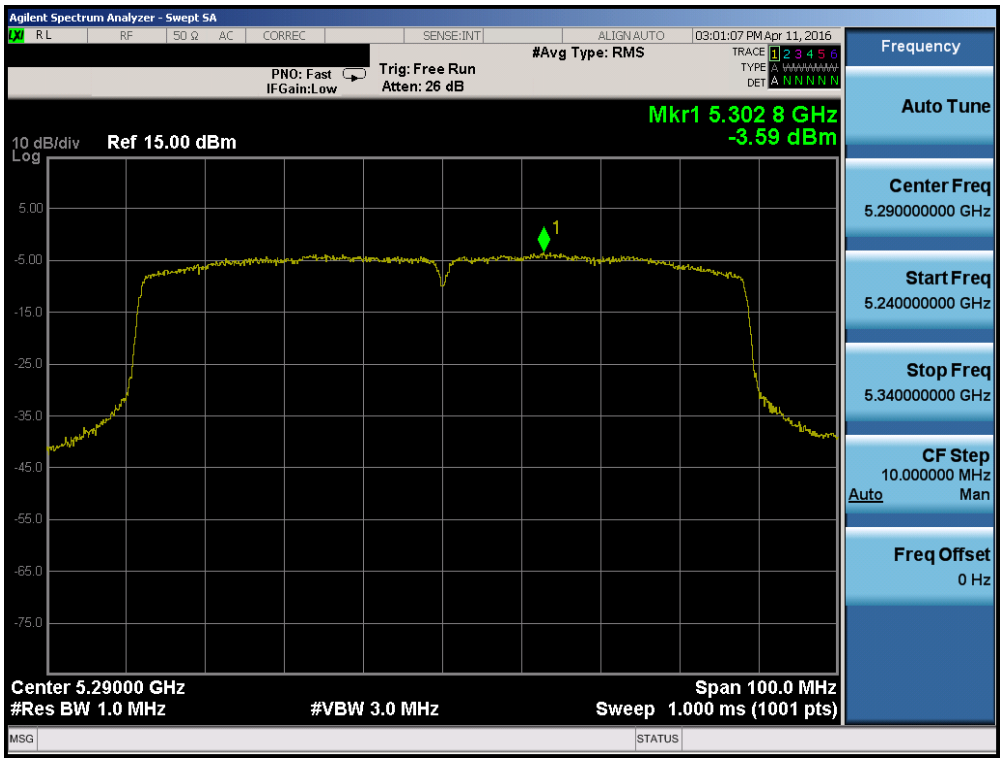


Plot 7-56. Power Spectral Density Plot (40MHz BW 802.11n (UNII Band 2A) – Ch. 62)



Plot 7-57. Power Spectral Density Plot (80MHz BW 802.11ac (UNII Band 2A) – Ch. 58)

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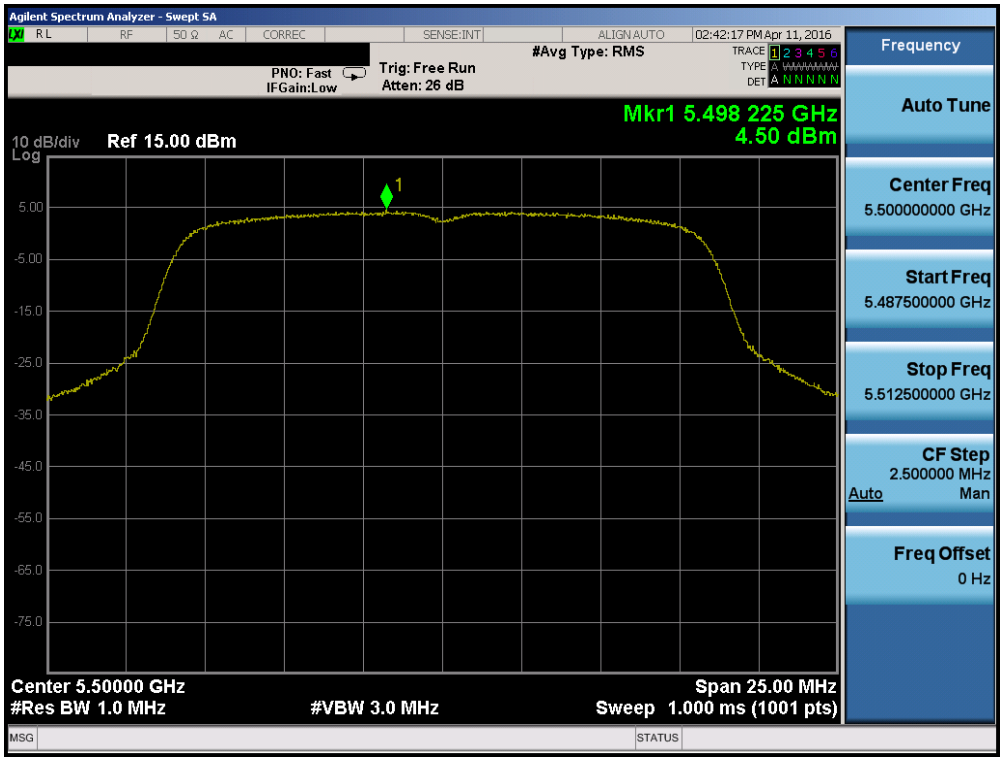
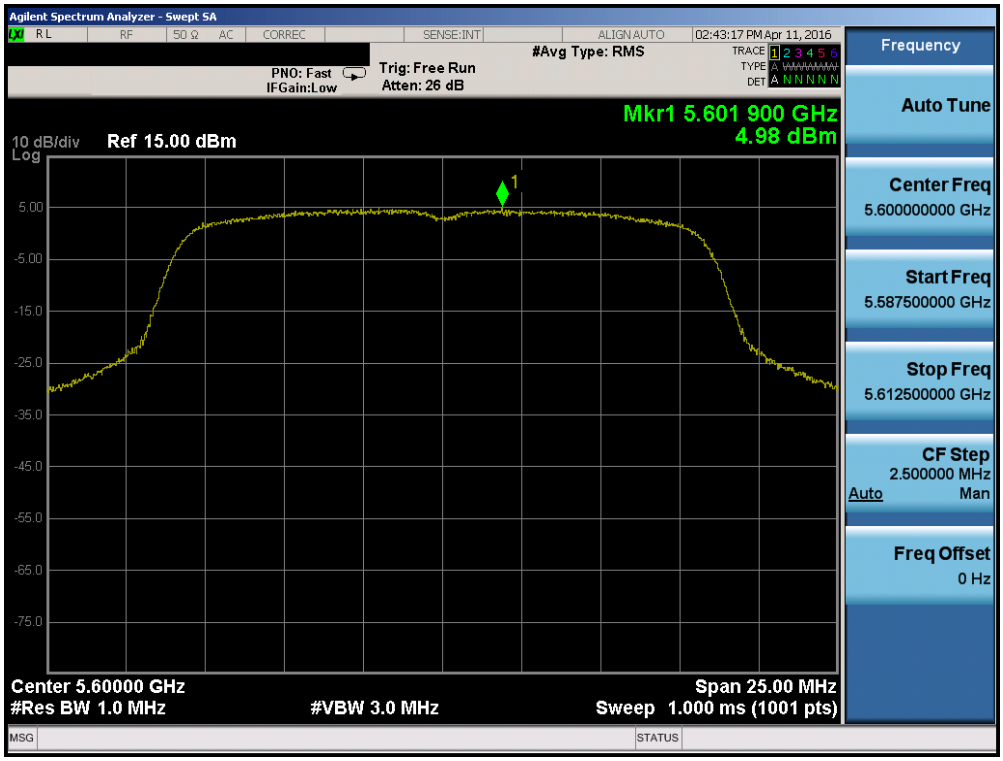


Plot 7-58. Power Spectral Density Plot (802.11a (UNII Band 2C) – Ch. 100)



Plot 7-59. Power Spectral Density Plot (802.11a (UNII Band 2C) – Ch. 120)

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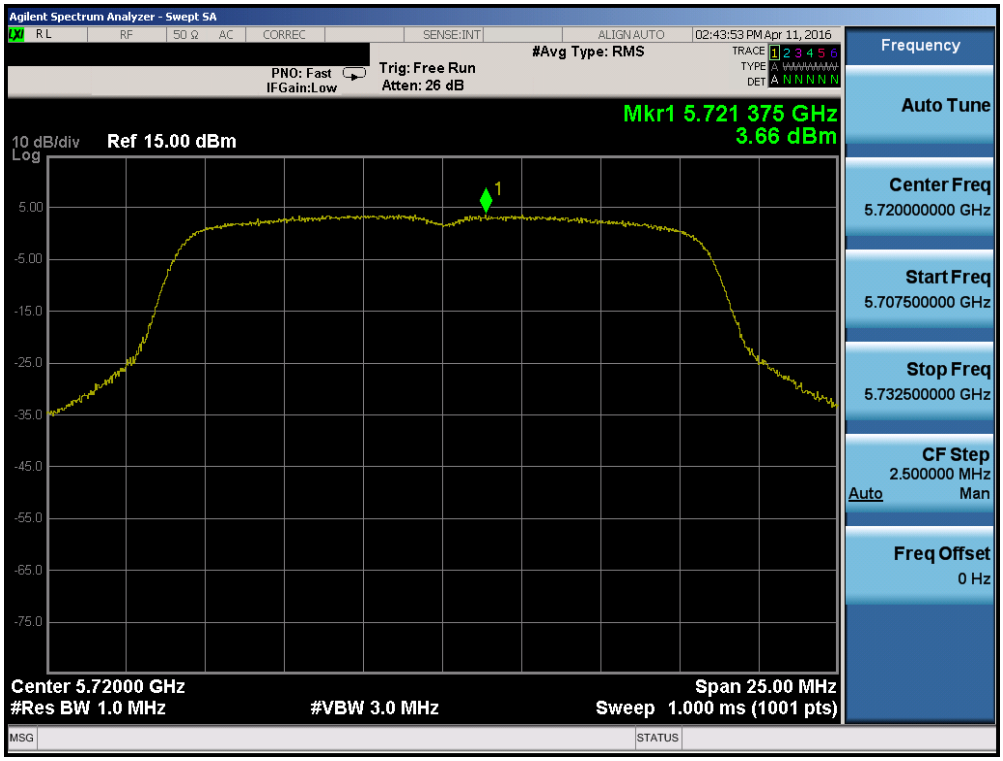
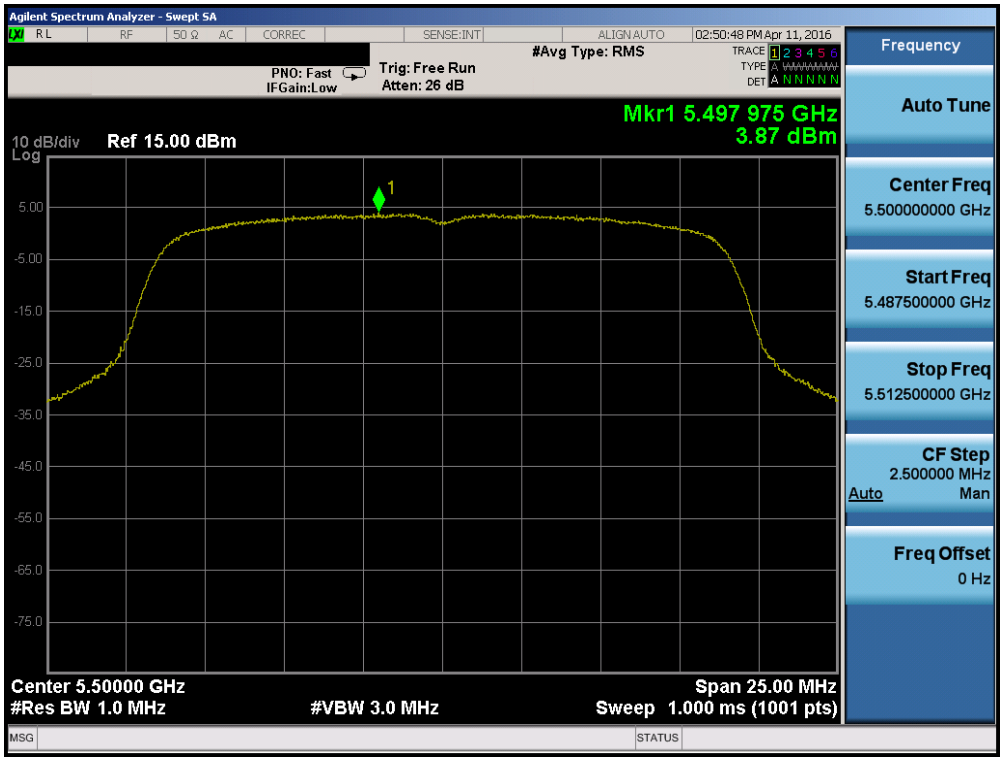


Plot 7-60. Power Spectral Density Plot (802.11a (UNII Band 2C) – Ch. 144)



Plot 7-61. Power Spectral Density Plot (20MHz BW 802.11n (UNII Band 2C) – Ch. 100)

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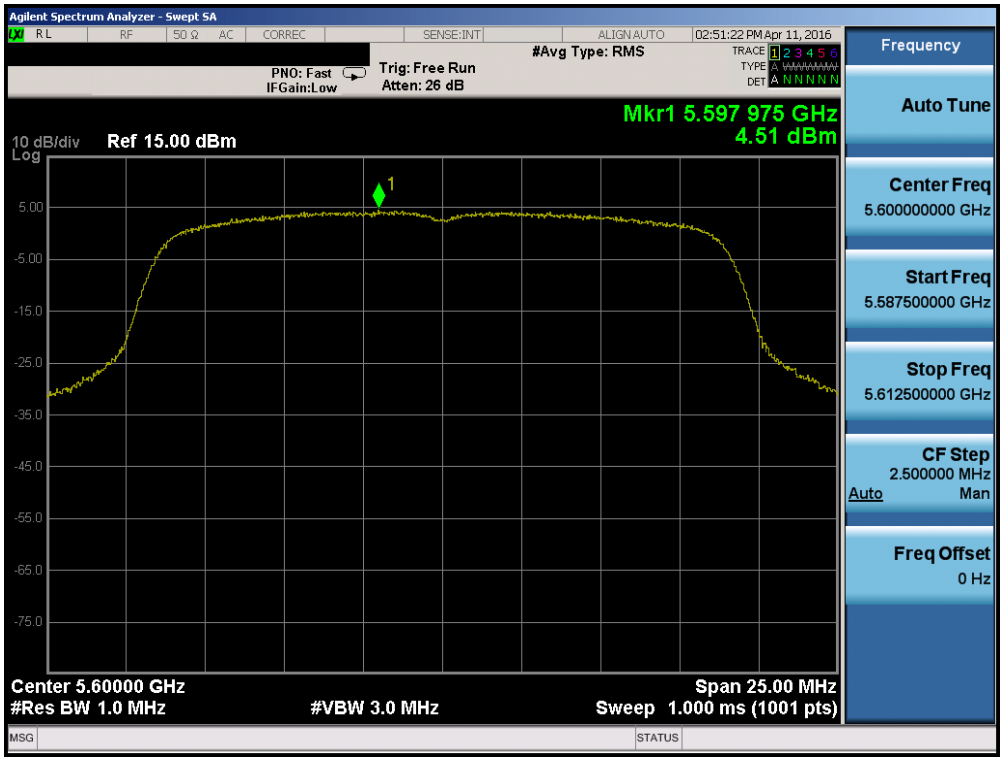
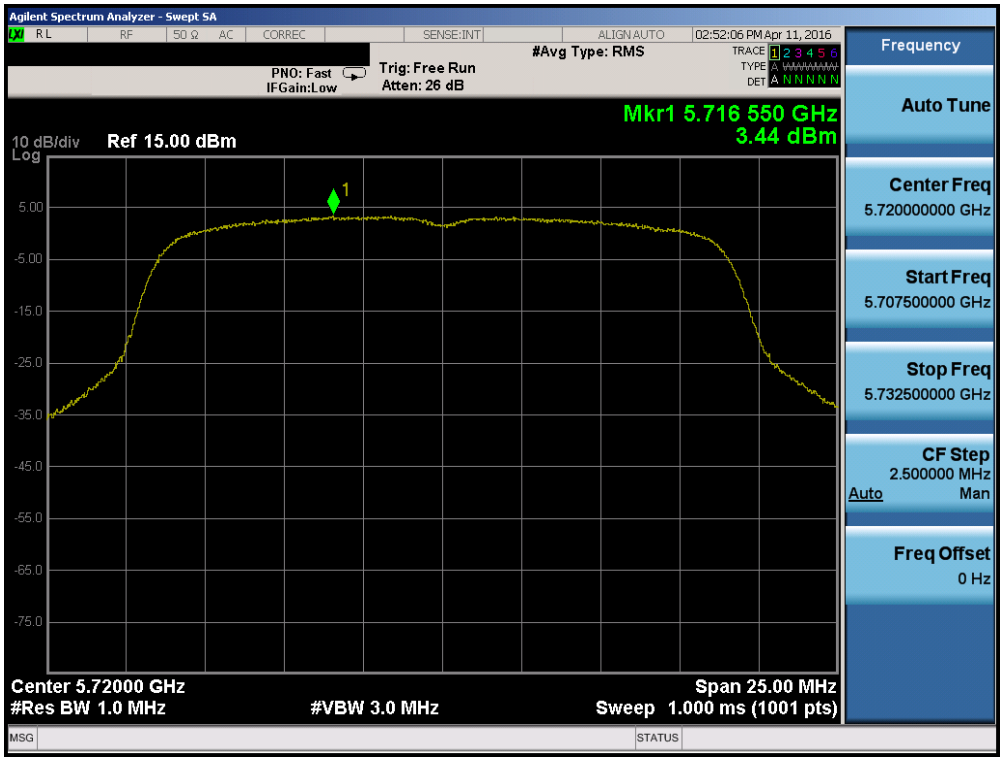


Plot 7-62. Power Spectral Density Plot (20MHz BW 802.11n (UNII Band 2C) – Ch. 120)



Plot 7-63. Power Spectral Density Plot (20MHz BW 802.11n (UNII Band 2C) – Ch. 144)

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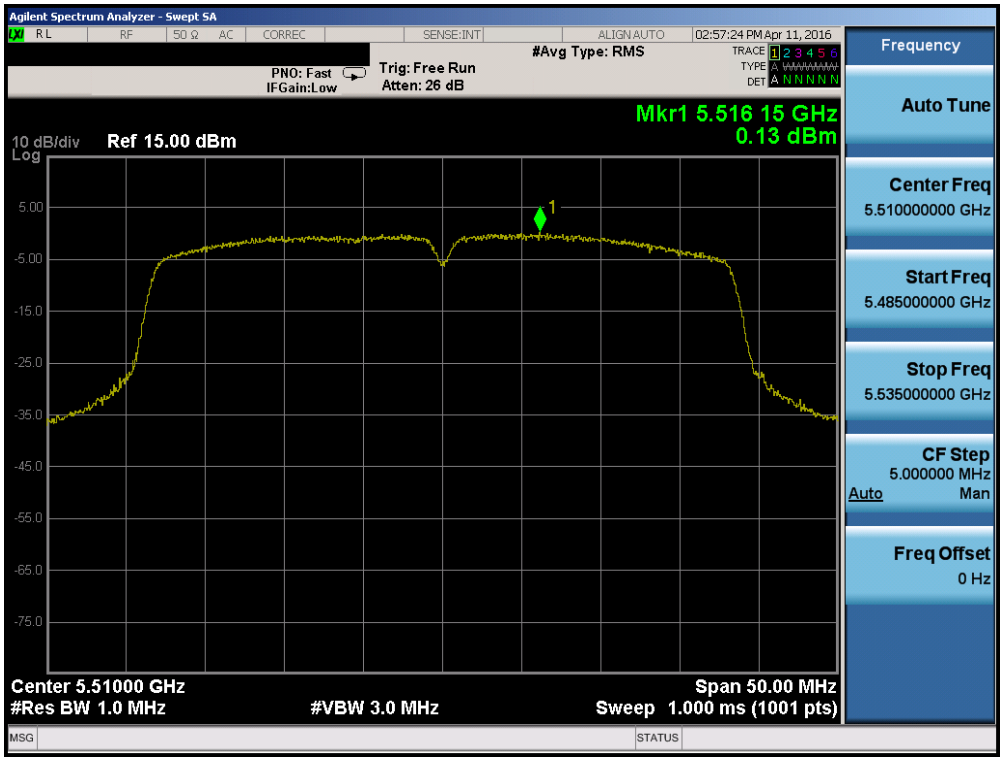
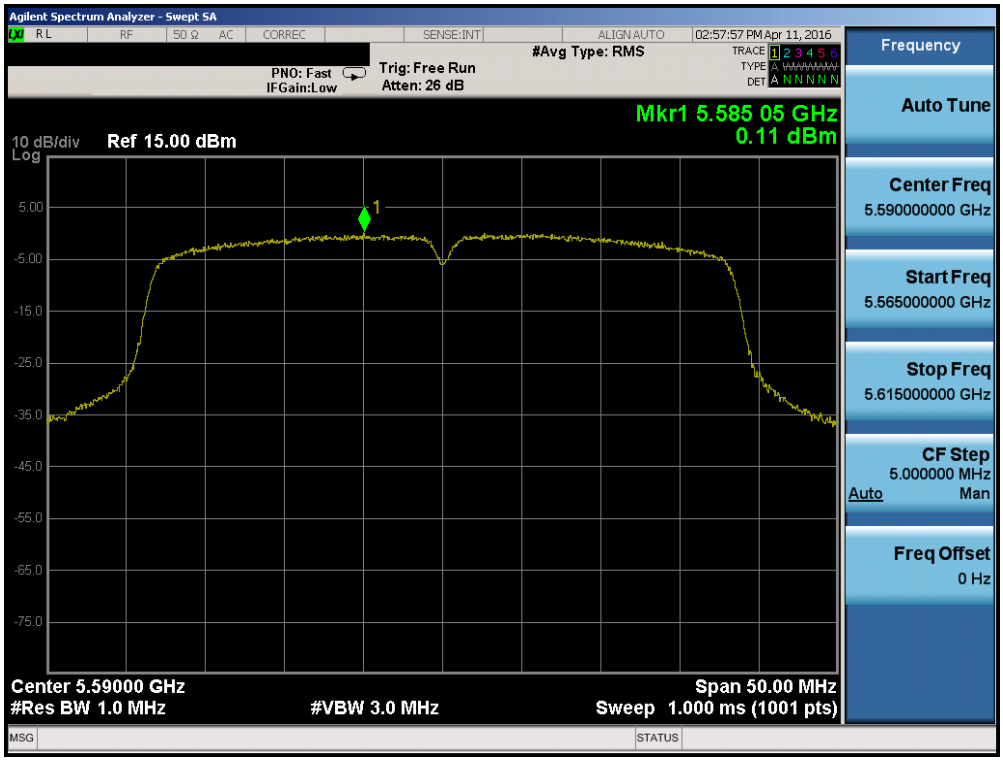


Plot 7-64. Power Spectral Density Plot (40MHz BW 802.11n (UNII Band 2C) – Ch. 102)



Plot 7-65. Power Spectral Density Plot (40MHz BW 802.11n (UNII Band 2C) – Ch. 118)

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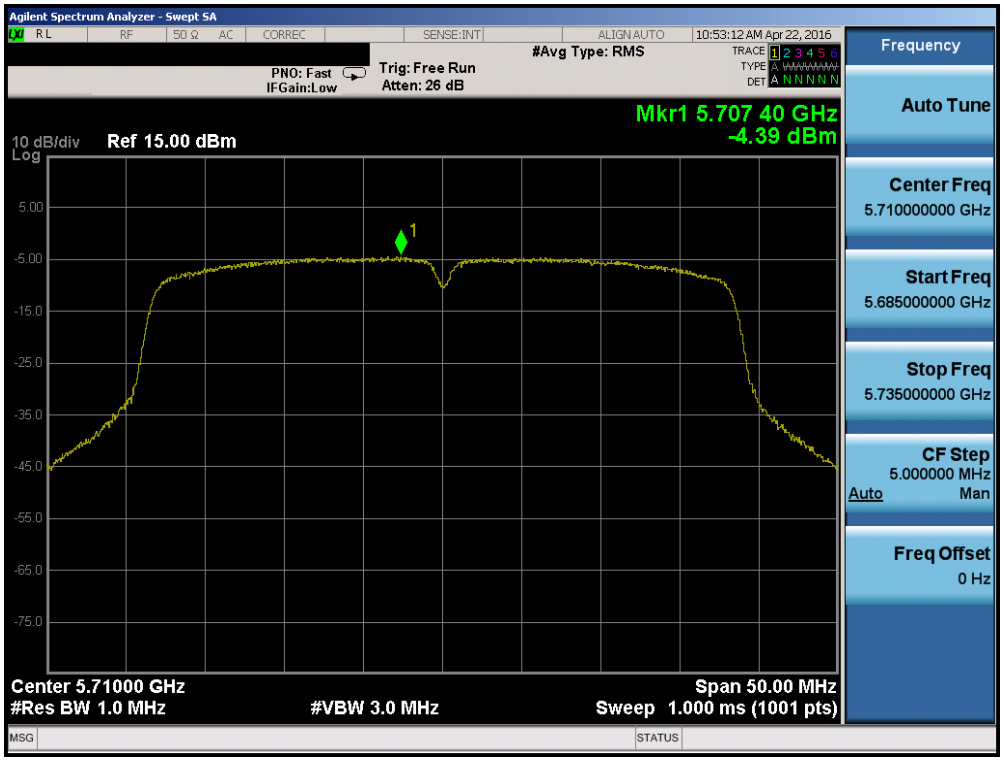
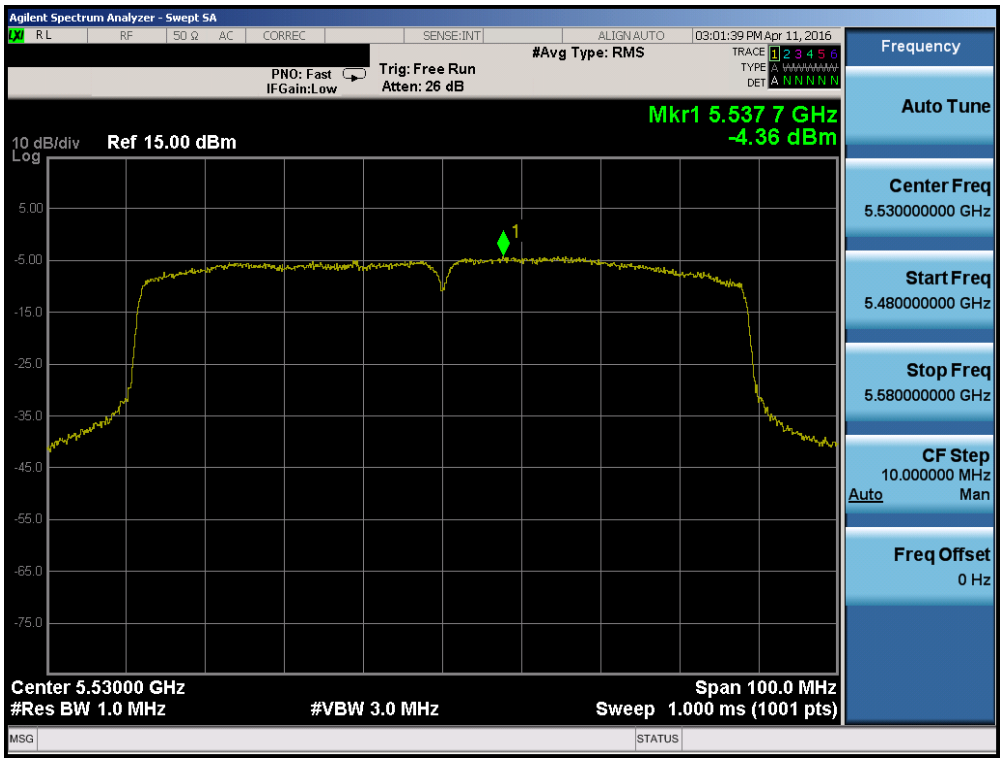


Plot 7-66. Power Spectral Density Plot (40MHz BW 802.11n (UNII Band 2C) – Ch. 142)



Plot 7-67. Power Spectral Density Plot (80MHz BW 802.11ac (UNII Band 2C) – Ch. 106)

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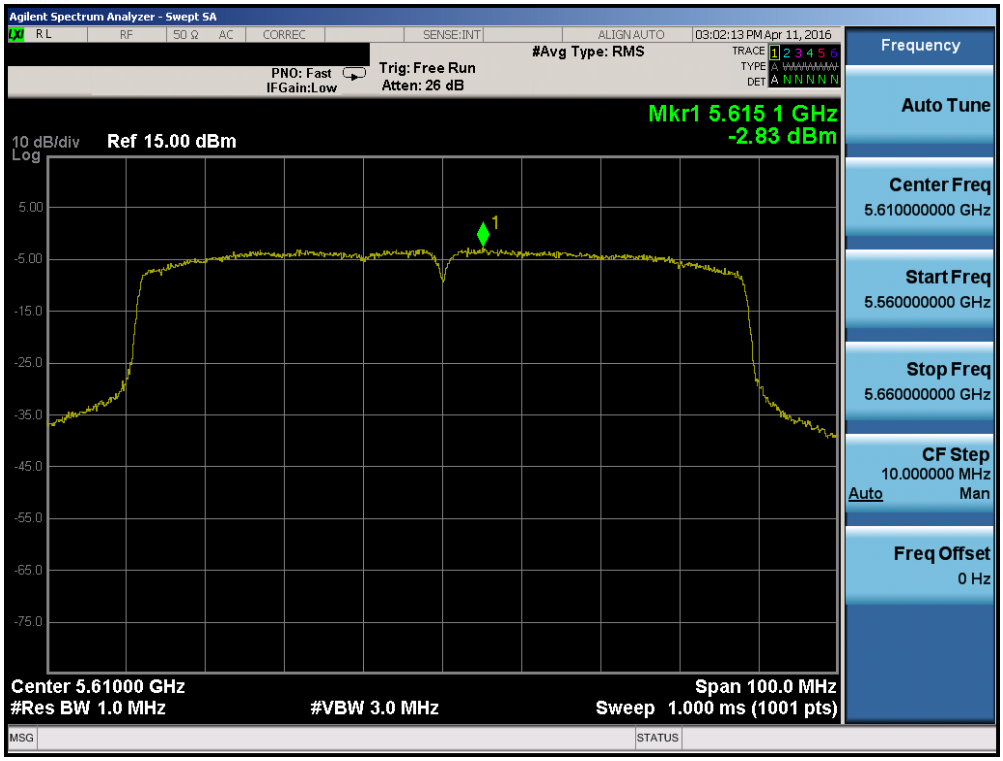
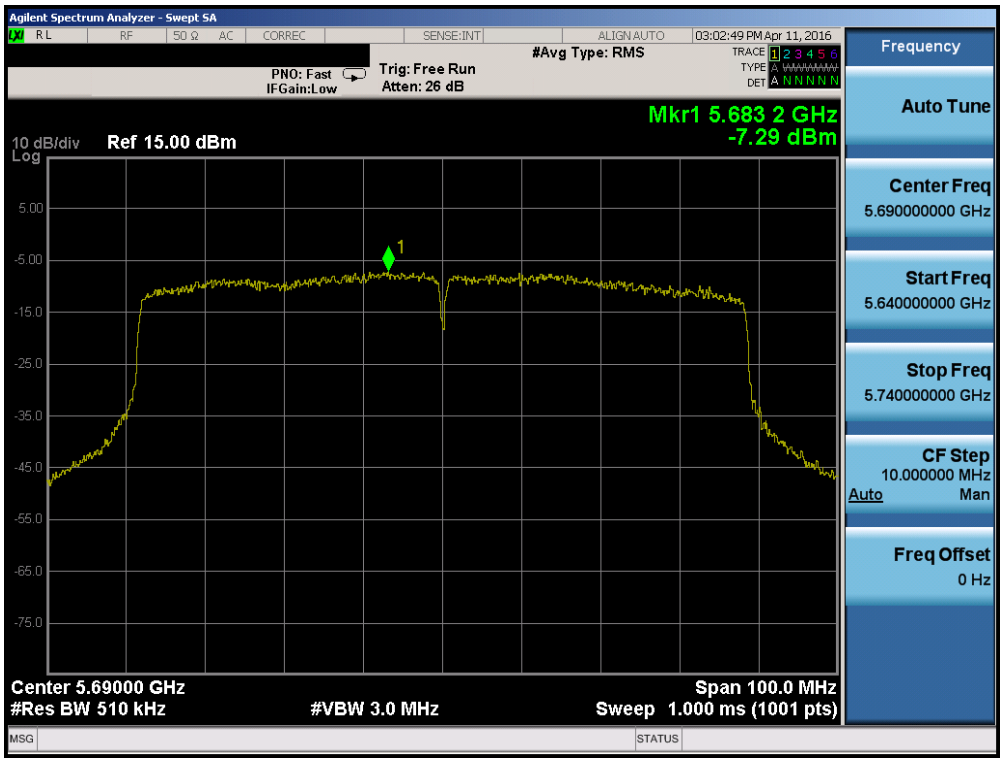


Plot 7-68. Power Spectral Density Plot (80MHz BW 802.11ac (UNII Band 2C) – Ch. 122)



Plot 7-69. Power Spectral Density Plot (80MHz BW 802.11ac (UNII Band 2C) – Ch. 138)

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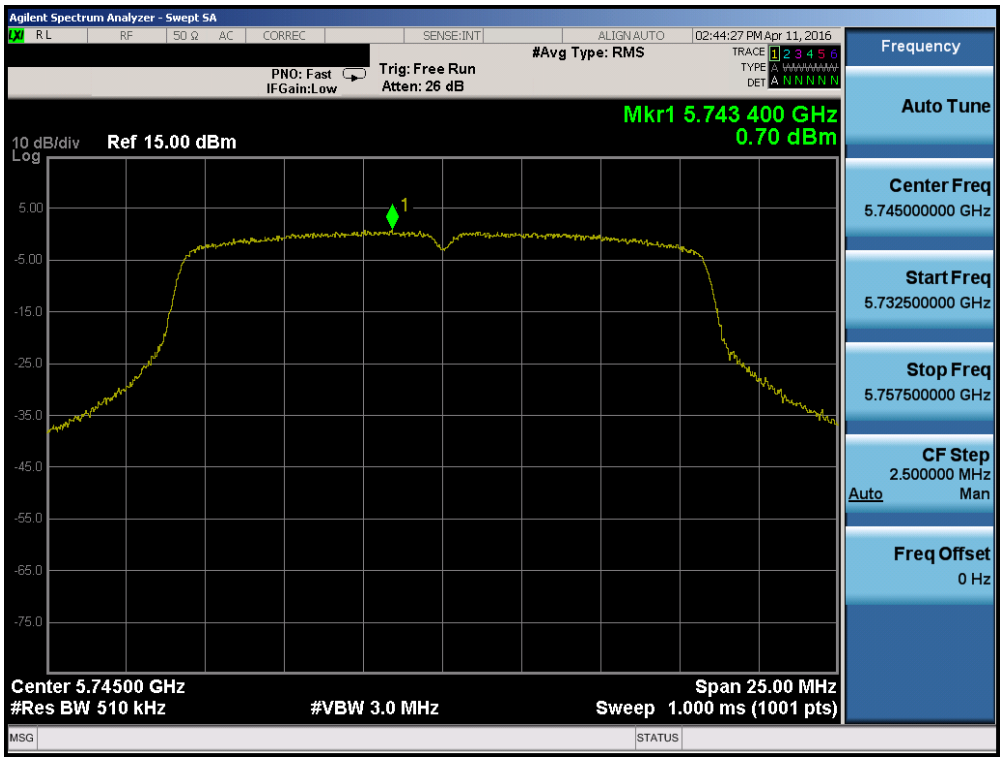
	Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	Measured Power Density [dBm]	Max Permissible Power Density [dBm/500kHz]	Margin [dB]	Pass / Fail
Band 3	5745	149	a	6	0.70	30.0	-29.30	Pass
	5785	157	a	6	1.20	30.0	-28.80	Pass
	5825	165	a	6	0.32	30.0	-29.68	Pass
	5745	149	n (20MHz)	6.5/7.2 (MCS0)	0.36	30.0	-29.64	Pass
	5785	157	n (20MHz)	6.5/7.2 (MCS0)	0.76	30.0	-29.24	Pass
	5825	165	n (20MHz)	6.5/7.2 (MCS0)	0.18	30.0	-29.82	Pass
	5755	151	n (40MHz)	13.5/15 (MCS0)	-3.13	30.0	-33.13	Pass
	5795	159	n (40MHz)	13.5/15 (MCS0)	-4.03	30.0	-34.03	Pass
	5775	155	ac (80MHz)	29.3/32.5 (MCS0)	-5.15	30.0	-35.15	Pass

Table 7-8. Band 3 Conducted Power Spectral Density Measurements



Plot 7-70. Power Spectral Density Plot (802.11a (UNII Band 3) – Ch. 149)

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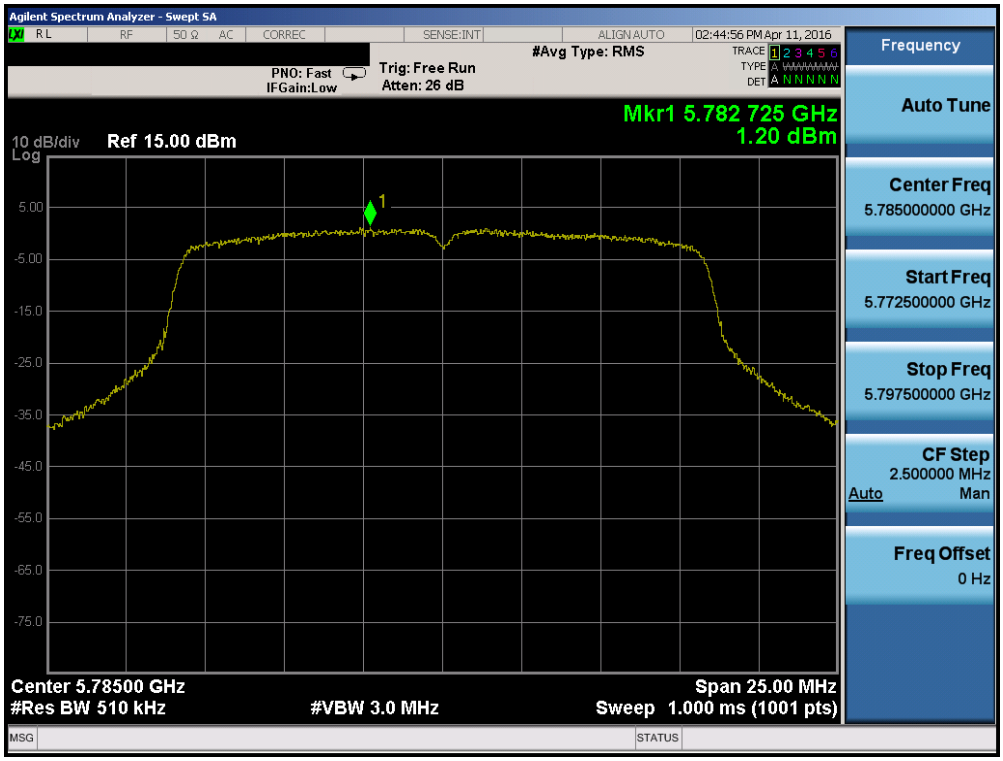
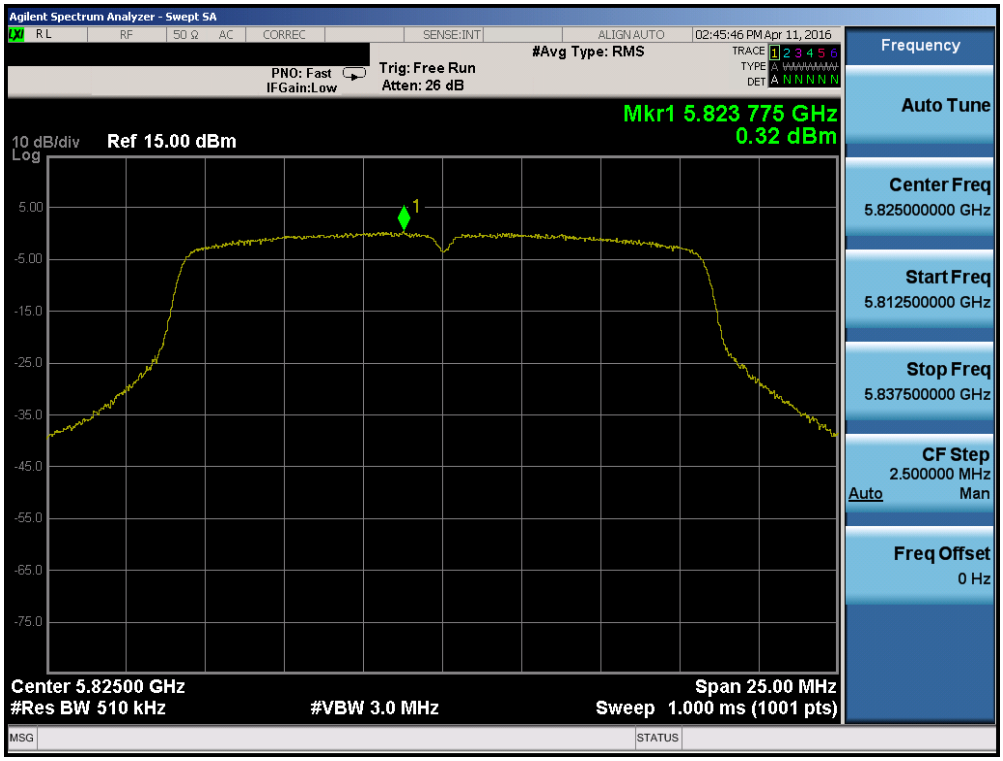


Plot 7-71. Power Spectral Density Plot (802.11a (UNII Band 3) – Ch. 157)



Plot 7-72. Power Spectral Density Plot (802.11a (UNII Band 3) – Ch. 165)

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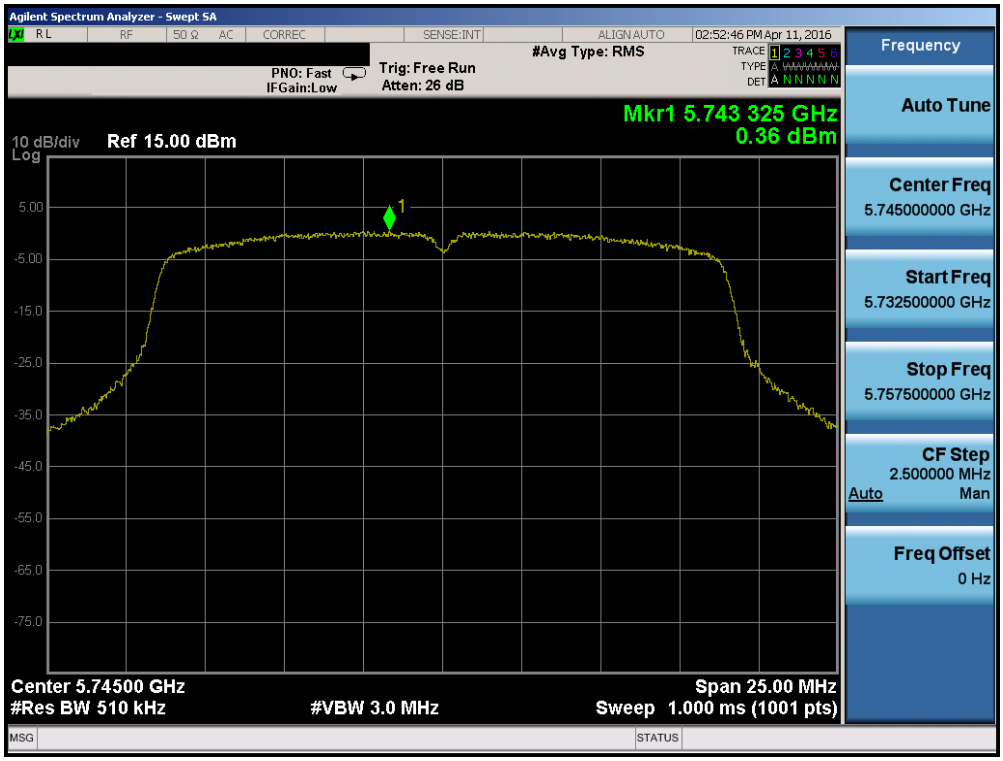
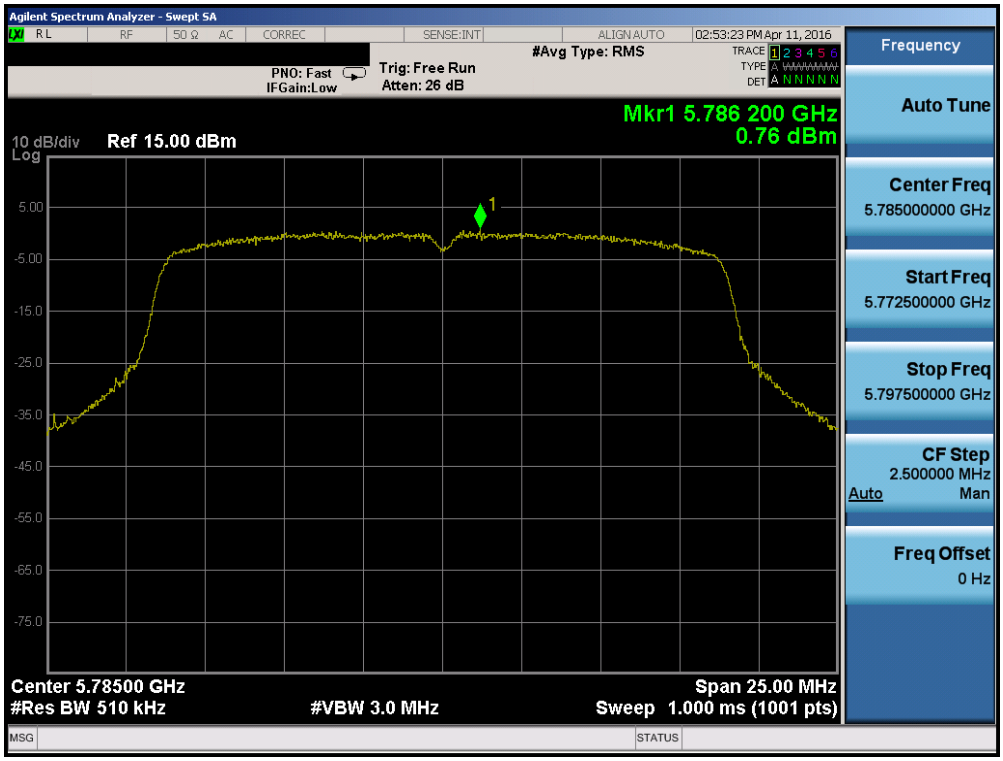


Plot 7-73. Power Spectral Density Plot (20MHz BW 802.11n (UNII Band 3) – Ch. 149)



Plot 7-74. Power Spectral Density Plot (20MHz BW 802.11n (UNII Band 3) – Ch. 157)

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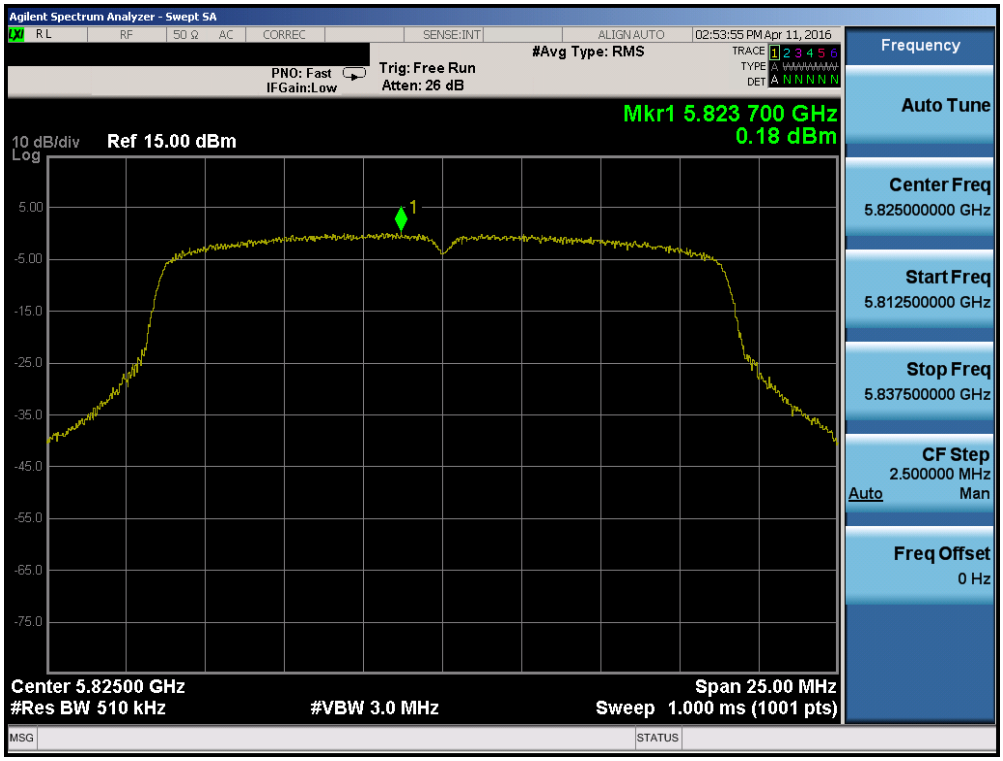
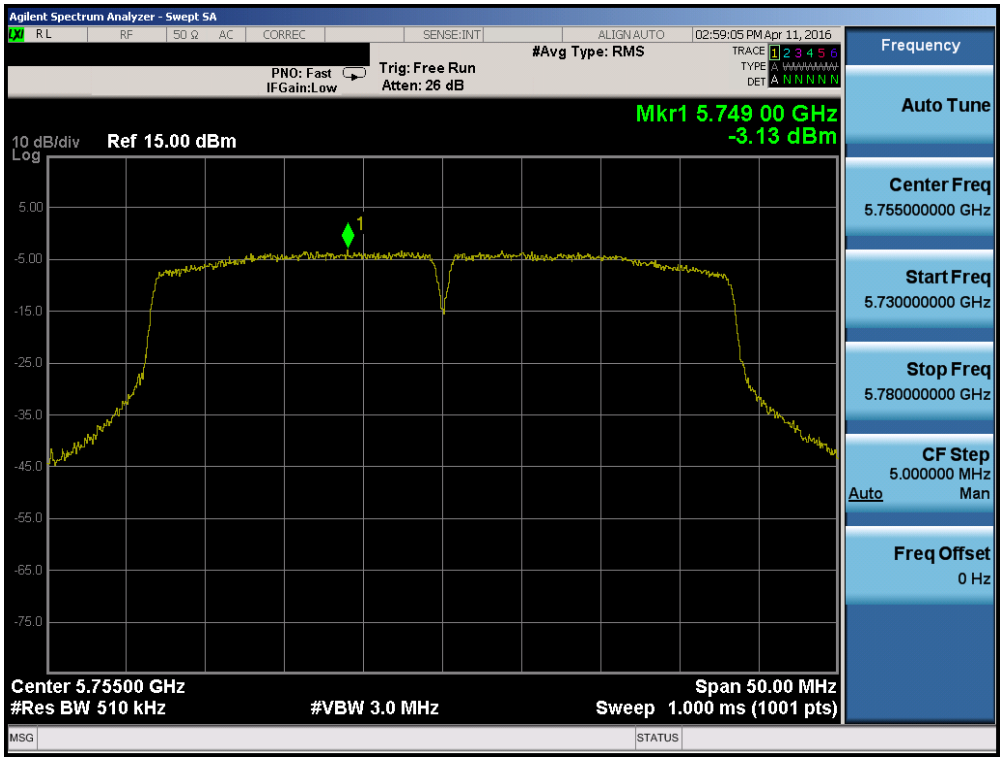


Plot 7-75. Power Spectral Density Plot (20MHz BW 802.11n (UNII Band 3) – Ch. 165)



Plot 7-76. Power Spectral Density Plot (40MHz BW 802.11n (UNII Band 3) – Ch. 151)

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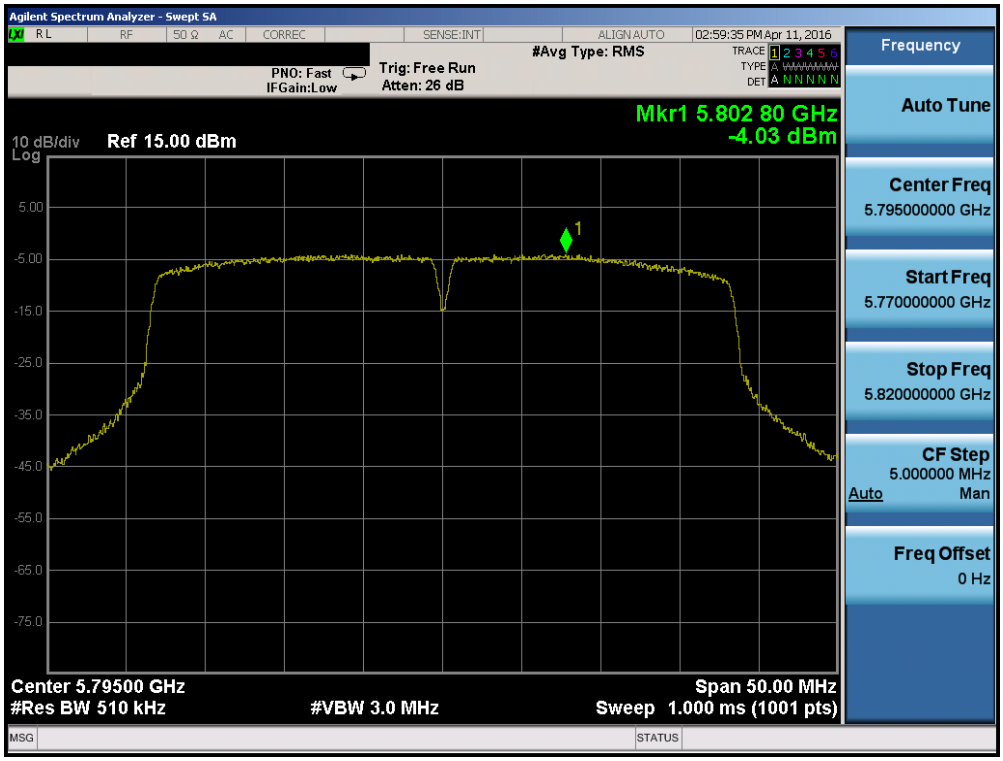
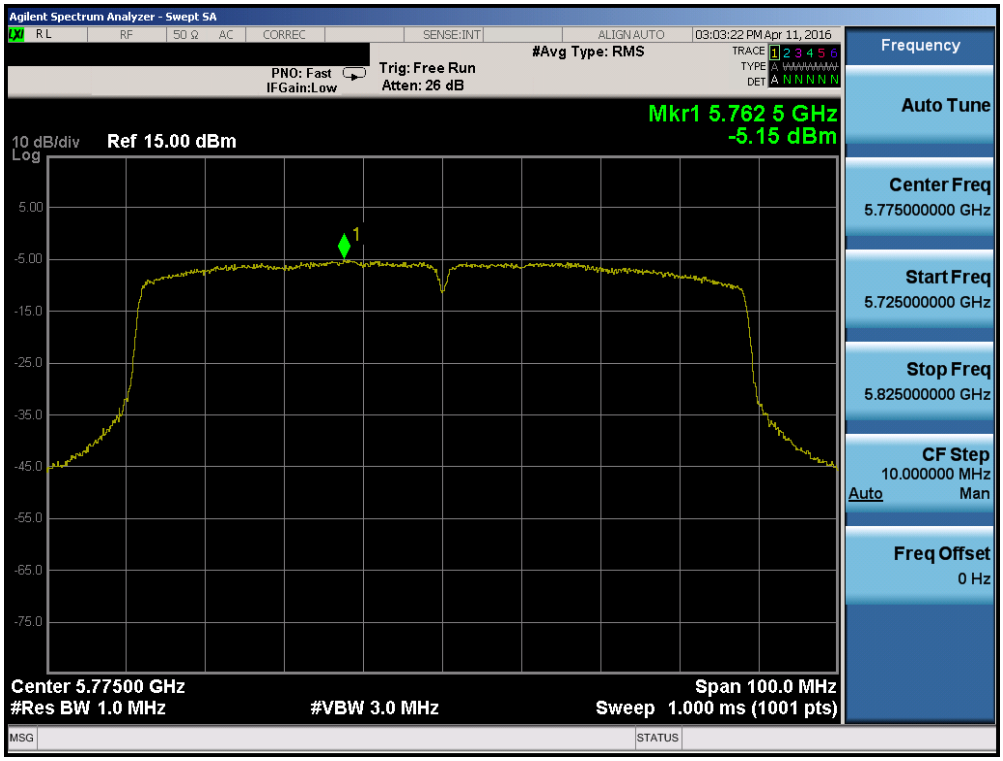


Plot 7-77. Power Spectral Density Plot (40MHz BW 802.11n (UNII Band 3) – Ch. 159)



Plot 7-78. Power Spectral Density Plot (80MHz BW 802.11ac (UNII Band 3) – Ch. 155)

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7.6 Frequency Stability

§15.407(g)

The EUT was placed inside of an environmental chamber as the temperature in the chamber was varied between -30°C and +50°C. The temperature was incremented by 10° intervals and the unit was allowed to stabilize at each temperature before each measurement. The center frequency of the transmitting channel was evaluated at each temperature and the frequency deviation from the channel's center frequency was recorded. Data for the worst case channel is shown below.

OPERATING FREQUENCY: 5,180,000,000 Hz

CHANNEL: 36

REFERENCE VOLTAGE: 3.80 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.80	+ 20 (Ref)	5,179,999,995	-5	-0.00000010
100 %		- 30	5,179,999,874	-126	-0.00000243
100 %		- 20	5,180,000,080	80	0.00000154
100 %		- 10	5,179,999,905	-95	-0.00000183
100 %		0	5,179,999,933	-67	-0.00000129
100 %		+ 10	5,179,999,920	-80	-0.00000154
100 %		+ 20	5,180,000,039	39	0.00000075
100 %		+ 30	5,180,000,024	24	0.00000046
100 %		+ 40	5,180,000,039	39	0.00000075
100 %		+ 50	5,180,000,033	33	0.00000064
BATT. ENDPOINT	3.40	+ 20	5,179,999,993	-7	-0.00000014

Table 7-9. Frequency Stability Measurements for UNII Band 1 (Ch. 36)

Note:

Based on the results of the frequency stability test shown above the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency deviation noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

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Frequency Stability
§15.407(g)

The EUT was placed inside of an environmental chamber as the temperature in the chamber was varied between -30°C and +50°C. The temperature was incremented by 10° intervals and the unit was allowed to stabilize at each temperature before each measurement. The center frequency of the transmitting channel was evaluated at each temperature and the frequency deviation from the channel's center frequency was recorded. Data for the worst case channel is shown below.

OPERATING FREQUENCY: 5,260,000,000 Hz

CHANNEL: 52

REFERENCE VOLTAGE: 3.80 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.80	+ 20 (Ref)	5,259,999,867	-133	-0.00000253
100 %		- 30	5,259,999,976	-24	-0.00000046
100 %		- 20	5,259,999,994	-6	-0.00000011
100 %		- 10	5,260,000,112	112	0.00000213
100 %		0	5,260,000,088	88	0.00000167
100 %		+ 10	5,260,000,138	138	0.00000262
100 %		+ 20	5,259,999,954	-46	-0.00000087
100 %		+ 30	5,259,999,994	-6	-0.00000011
100 %		+ 40	5,260,000,070	70	0.00000133
100 %		+ 50	5,260,000,131	131	0.00000249
BATT. ENDPOINT	3.40	+ 20	5,259,999,960	-40	-0.00000076

Table 7-10. Frequency Stability Measurements for UNII Band 2A (Ch. 52)

Note:

Based on the results of the frequency stability test shown above the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency deviation noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

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Frequency Stability
§15.407(g)

The EUT was placed inside of an environmental chamber as the temperature in the chamber was varied between -30°C and +50°C. The temperature was incremented by 10° intervals and the unit was allowed to stabilize at each temperature before each measurement. The center frequency of the transmitting channel was evaluated at each temperature and the frequency deviation from the channel's center frequency was recorded. Data for the worst case channel is shown below.

OPERATING FREQUENCY: 5,500,000,000 Hz

CHANNEL: 100

REFERENCE VOLTAGE: 3.80 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.80	+ 20 (Ref)	5,500,000,024	24	0.00000044
100 %		- 30	5,499,999,891	-109	-0.00000198
100 %		- 20	5,500,000,036	36	0.00000065
100 %		- 10	5,499,999,904	-96	-0.00000175
100 %		0	5,499,999,899	-101	-0.00000184
100 %		+ 10	5,500,000,049	49	0.00000089
100 %		+ 20	5,499,999,928	-72	-0.00000131
100 %		+ 30	5,499,999,913	-87	-0.00000158
100 %		+ 40	5,499,999,987	-13	-0.00000024
100 %		+ 50	5,499,999,954	-46	-0.00000084
BATT. ENDPOINT	3.40	+ 20	5,499,999,940	-60	-0.00000109

Table 7-11. Frequency Stability Measurements for UNII Band 2C (Ch. 100)

Note:

Based on the results of the frequency stability test shown above the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency deviation noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

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Frequency Stability
§15.407(g)

The EUT was placed inside of an environmental chamber as the temperature in the chamber was varied between -30ºC and +50ºC. The temperature was incremented by 10º intervals and the unit was allowed to stabilize at each temperature before each measurement. The center frequency of the transmitting channel was evaluated at each temperature and the frequency deviation from the channel's center frequency was recorded. Data for the worst case channel is shown below.

OPERATING FREQUENCY: 5,745,000,000 Hz

CHANNEL: 149

REFERENCE VOLTAGE: 3.80 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.80	+ 20 (Ref)	5,744,999,901	-99	-0.00000172
100 %		- 30	5,745,000,094	94	0.00000164
100 %		- 20	5,745,000,018	18	0.00000031
100 %		- 10	5,745,000,051	51	0.00000089
100 %		0	5,744,999,901	-99	-0.00000172
100 %		+ 10	5,745,000,065	65	0.00000113
100 %		+ 20	5,744,999,877	-123	-0.00000214
100 %		+ 30	5,745,000,028	28	0.00000049
100 %		+ 40	5,745,000,034	34	0.00000059
100 %		+ 50	5,744,999,862	-138	-0.00000240
BATT. ENDPOINT	3.40	+ 20	5,745,000,128	128	0.00000223

Table 7-12. Frequency Stability Measurements for UNII Band 3 (Ch. 149)

Note:

Based on the results of the frequency stability test shown above the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency deviation noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

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7.7 Radiated Spurious Emission Measurements – Above 1GHz

§15.407(b.1)(b.6) §15.205 §15.209

Test Overview and Limit

All out of band radiated spurious emissions are measured with a spectrum analyzer connected to a receive antenna while the EUT is operating at its maximum duty cycle, at its maximum power control level, as defined in KDB 789033 D02 v01 r02, and at the appropriate frequencies. All channels, modes (e.g. 802.11a, 802.11n (20MHz BW), 802.11n (40MHz BW), and 802.11ac (80MHz)), and modulations/data rates were investigated among all UNII bands. Only the radiated emissions of the configuration that produced the worst case emissions are reported in this section.

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR must not exceed the limits shown in Table 7-13 per Section 15.209.

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

Table 7-13. Radiated Limits

Test Procedures Used

KDB 789033 D02 v01 r02 – Section G

Test Settings

Average Measurements above 1GHz (Method AD)

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

Peak Measurements above 1GHz

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

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Peak Measurements below 1GHz

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. Span was set greater than 1MHz
3. RBW = 120kHz
4. Detector = CISPR quasi-peak
5. Sweep time = auto couple
6. Trace was allowed to stabilize

Test Setup

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

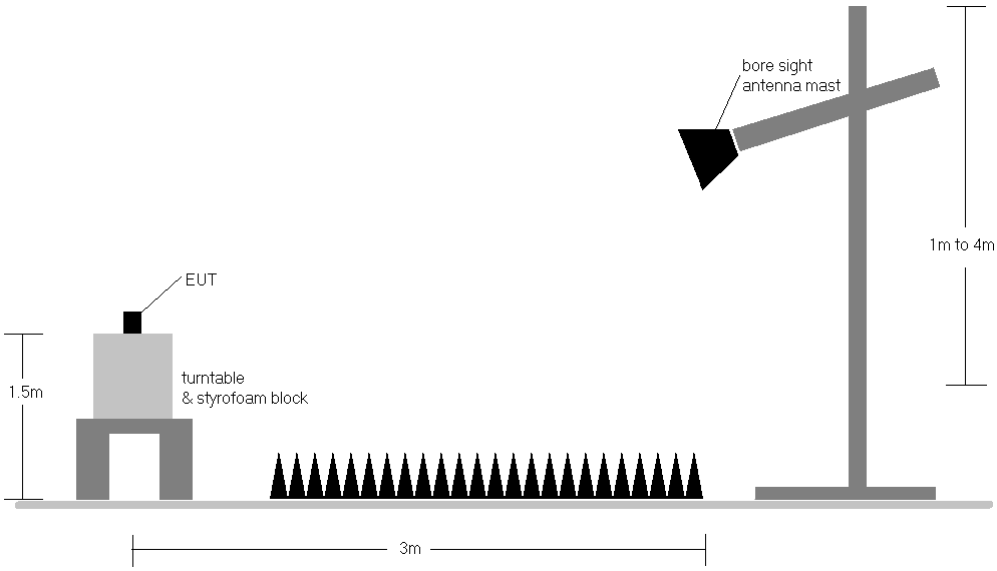

Figure 7-5. Test Instrument & Measurement Setup

Test Notes

1. All radiated spurious emissions levels were measured in a radiated test setup per the guidance of KDB 789033 D02 v01 r02 Section H.
2. All emissions that lie in the restricted bands (denoted by a * next to the frequency) specified in §15.205 are below the limit shown in Table 7-13.
3. All spurious emissions lying in restricted bands specified in §15.205 are below the limit shown in Table 6-11. All spurious emissions that do not lie in a restricted band are subject to a peak limit of -27dBm/MHz. At a distance of 3 meters, the field strength limit in dBμV/m can be determined by adding a “conversion” factor of 95.2dB to the EIRP limit of -27dBm/MHz to obtain the limit for out of band spurious emissions of 68.2dBμV/m.

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4. The antenna is manipulated through typical positions, polarity and length during the tests. The EUT is manipulated through three orthogonal planes.
5. This unit was tested with its standard battery.
6. The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter using CISPR quasi peak detector below 1GHz. Above 1 GHz, average and peak measurements were taken using linearly polarized horn antennas. The worst-case emissions are reported however emissions whose levels were not within 20dB of the respective limits were not reported.
7. Emissions below 18GHz were measured at a 3 meter test distance while emissions above 18GHz were measured at a 1 meter test distance with the application of a distance correction factor.
8. The wide spectrum spurious emissions plots shown on the following pages are used only for the purpose of emission identification. Any emissions found to be within 20dB of the limit are fully investigated and the results are shown in this section. Rohde & Schwarz EMC32, Version 9.15.00 automated test software was used to perform the Radiated Spurious Emissions Pre-Scan testing.
9. The "-" shown in the following RSE tables are used to represent a noise floor measurement.

Sample Calculations

Determining Spurious Emissions Levels

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

Radiated Band Edge Measurement Offset

- The amplitude offset shown in the radiated restricted band edge plots in Section 6.8 was calculated using the formula:
  Offset (dB) = (Antenna Factor + Cable Loss + 10 dB Attenuator) – Preamplifier Gain

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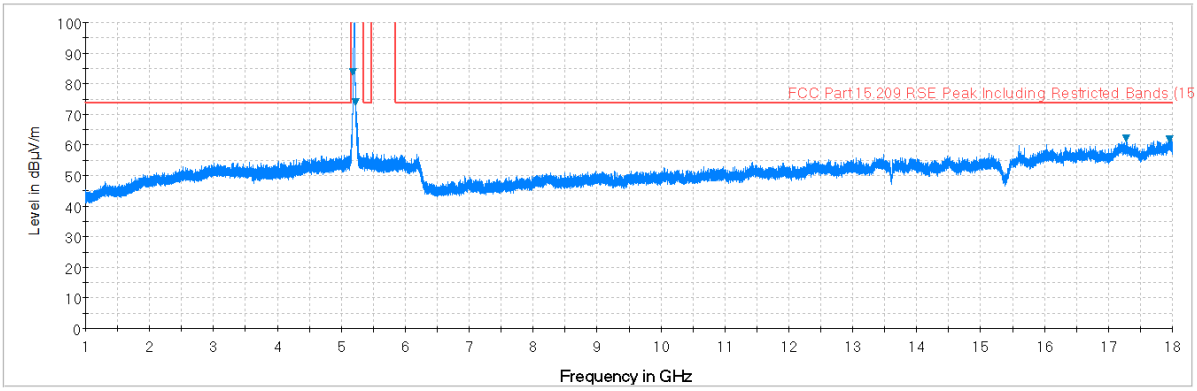
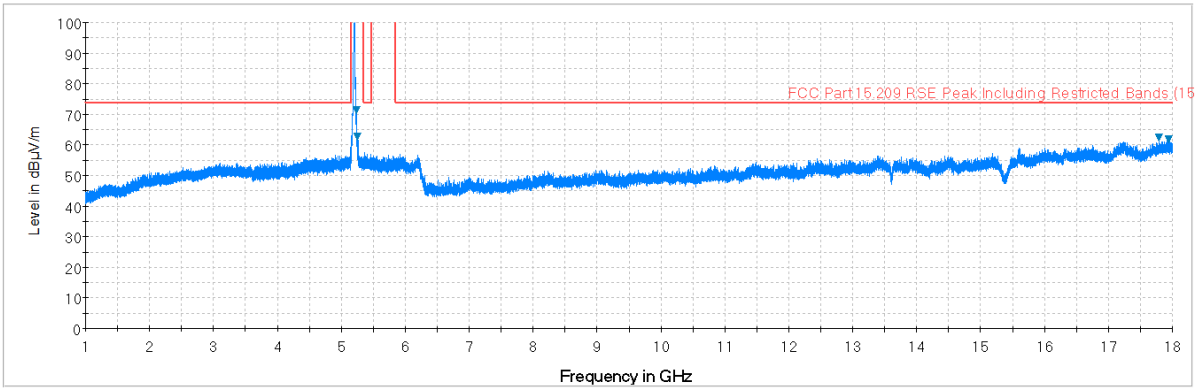
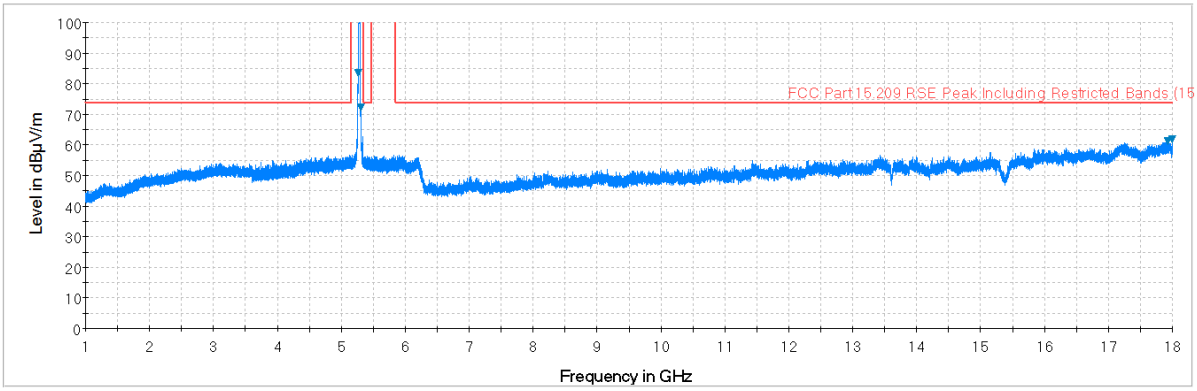
7.7.1 Radiated Spurious Emission Measurements



Plot 7-79. Radiated Spurious Plot above 1GHz (802.11a – U1 Ch. 40, Ant. Pol. H)



Plot 7-80. Radiated Spurious Plot above 1GHz (802.11a – U1 Ch. 40, Ant. Pol. V)



Plot 7-81. Radiated Spurious Plot above 1GHz (802.11a – U2A Ch. 56, Ant. Pol. H)

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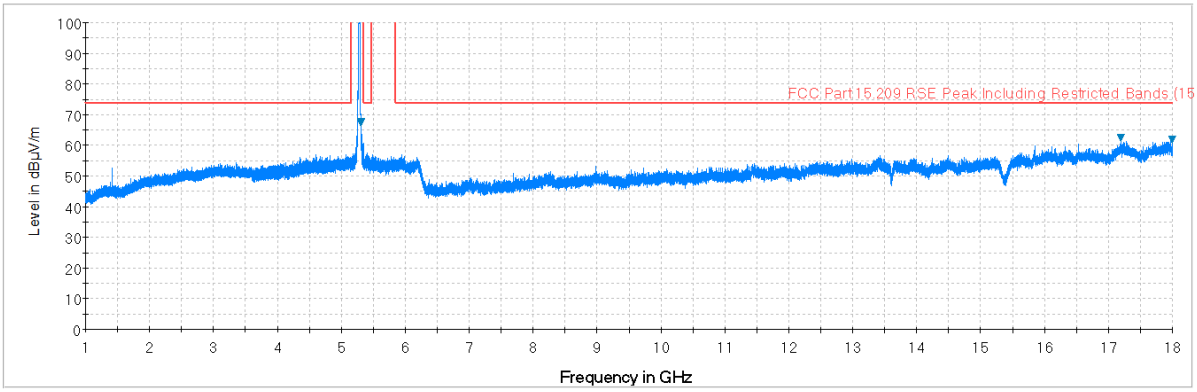
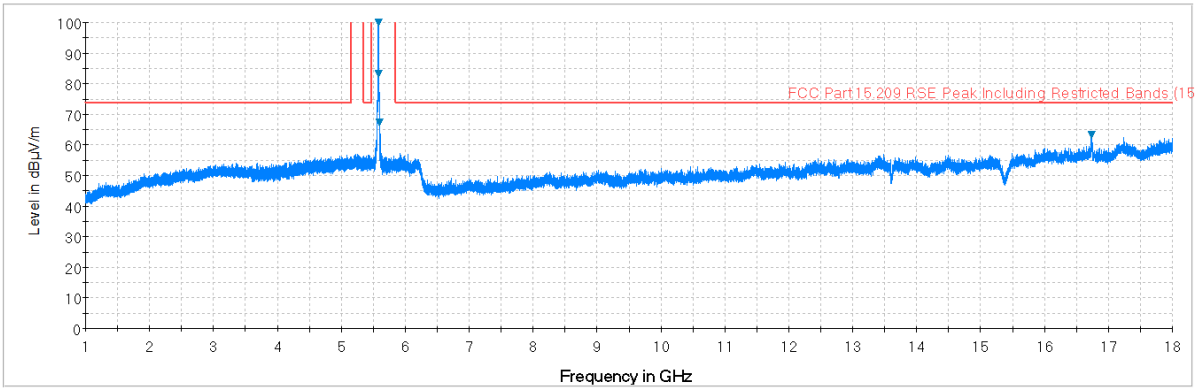
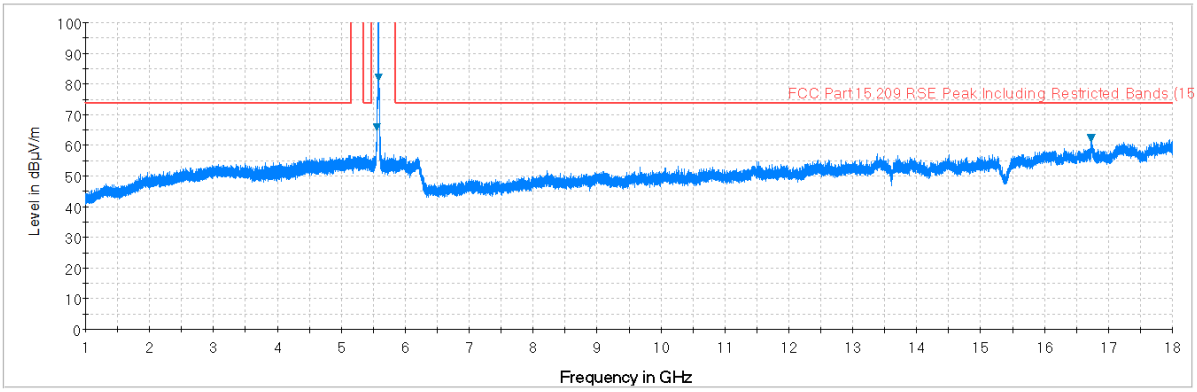


Plot 7-82. Radiated Spurious Plot above 1GHz (802.11a – U2A Ch. 56, Ant. Pol. V)



Plot 7-83. Radiated Spurious Plot above 1GHz (802.11a – U2C Ch. 120, Ant. Pol. H)



Plot 7-84. Radiated Spurious Plot above 1GHz (802.11a – U2C Ch. 120, Ant. Pol. V)

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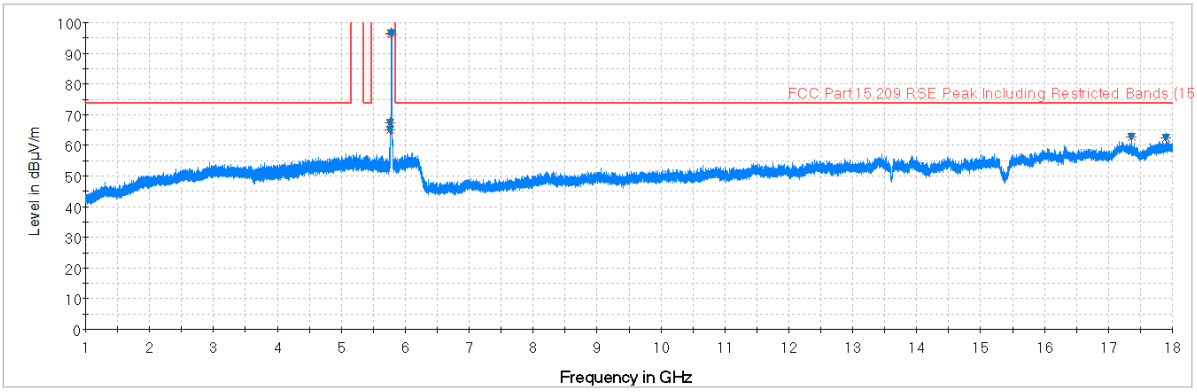
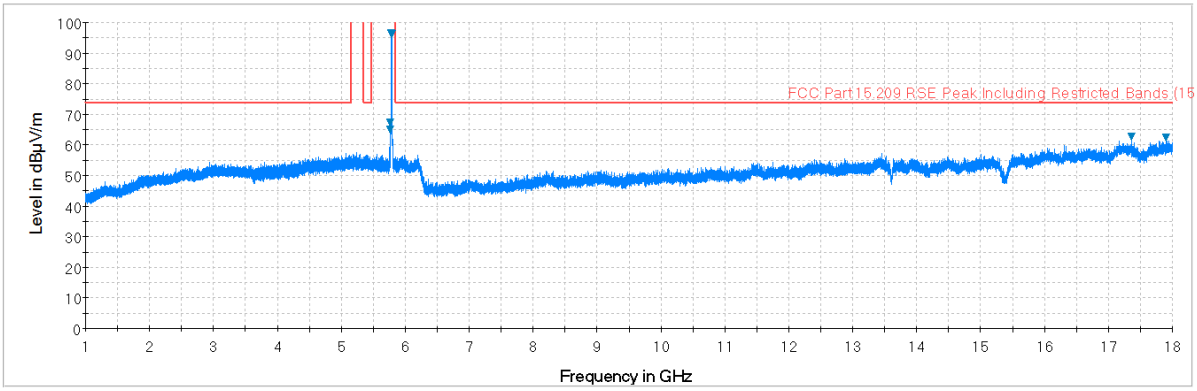


Plot 7-85. Radiated Spurious Plot above 1GHz (802.11a – U3 Ch. 157, Ant. Pol. H)



Plot 7-86. Radiated Spurious Plot above 1GHz (802.11a – U3 Ch. 157, Ant. Pol. V)

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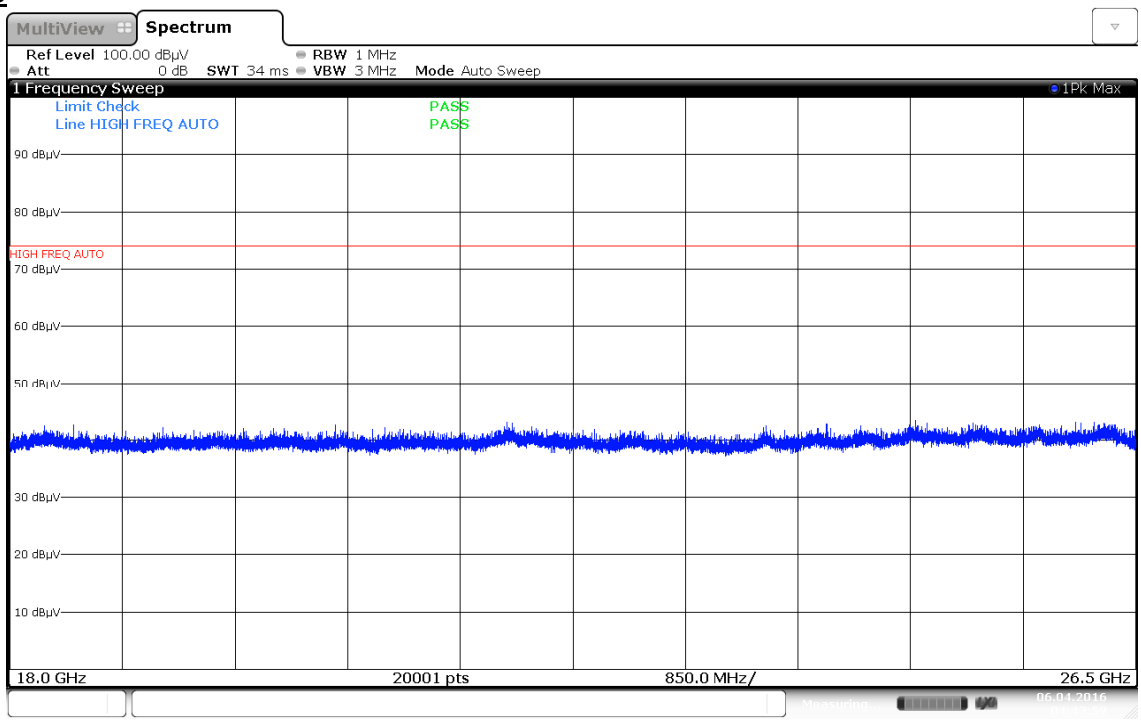
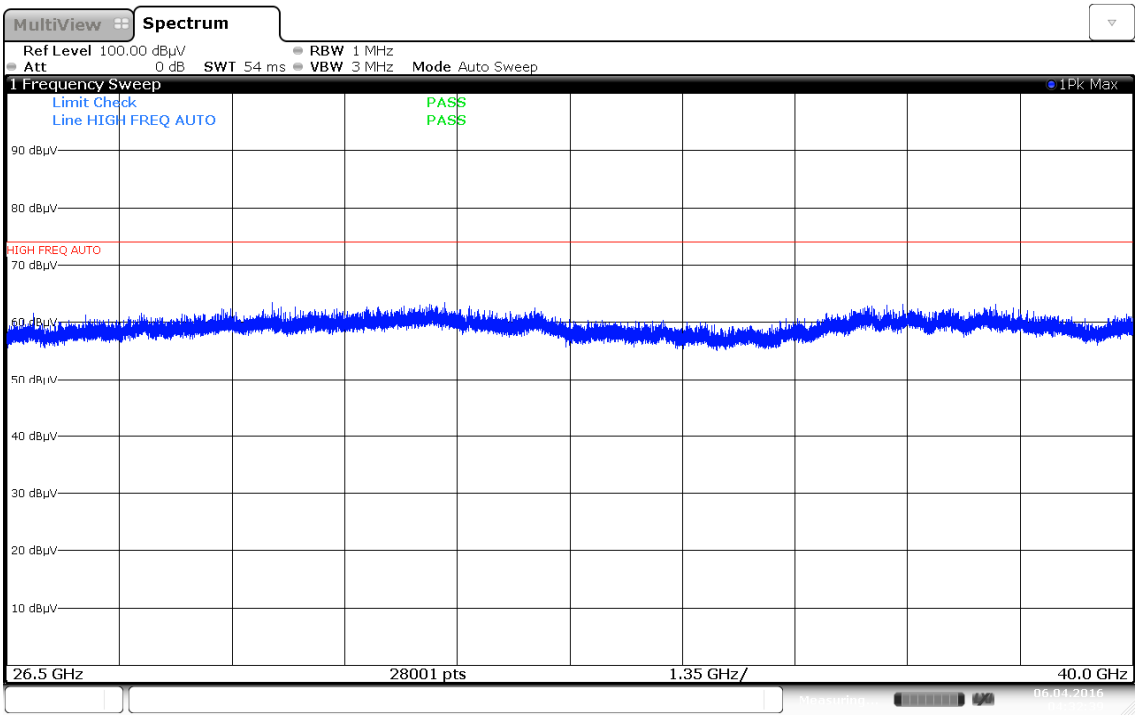
Radiated Spurious Emissions Measurements (Above 18GHz)

§15.209



Date: 6.APR.2016 04:43:59

Plot 7-87. Radiated Spurious Plot above 18GHz (802.11a – Ant. Pol. H)



Date: 6.APR.2016 04:32:39

Plot 7-88. Radiated Spurious Plot above 18GHz (802.11a – Ant. Pol. H)

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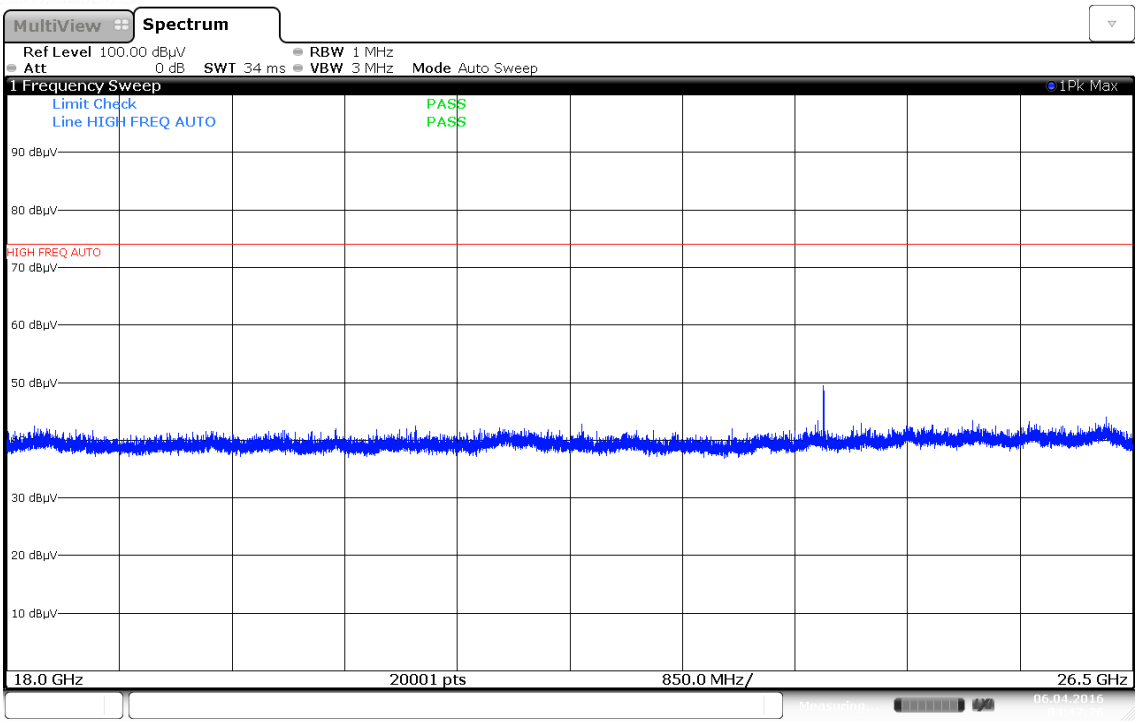
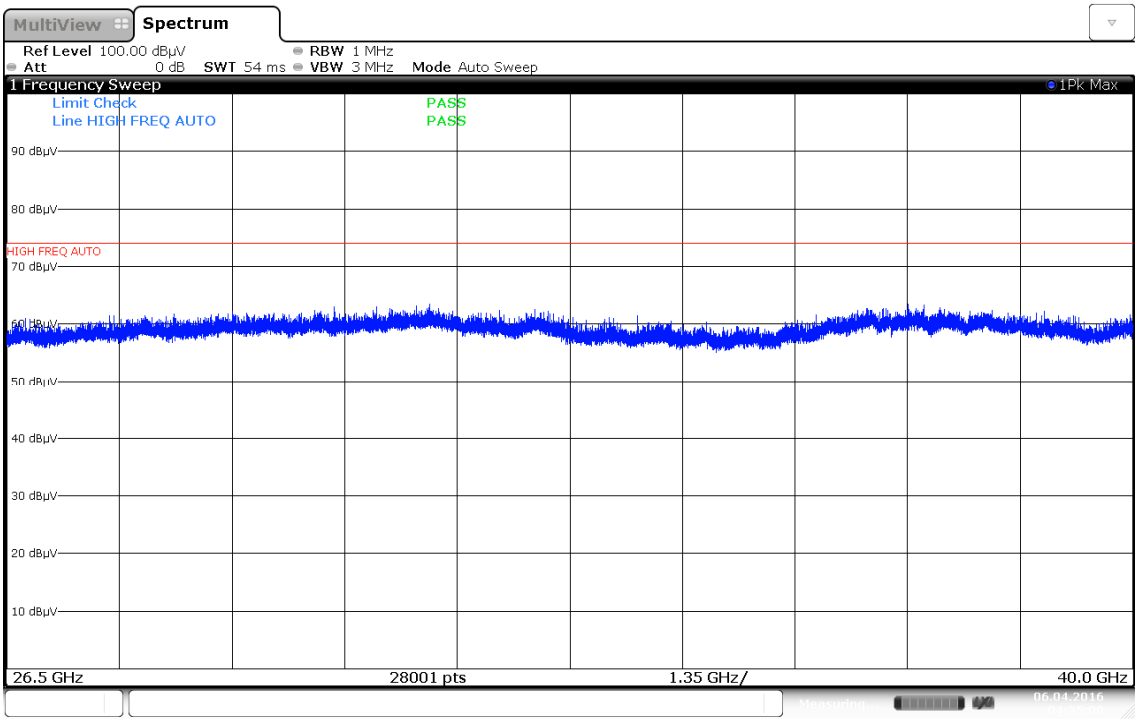


Date: 6.APR.2016 04:47:26

Plot 7-89. Radiated Spurious Plot above 18GHz (802.11a – Ant. Pol. V)



Date: 6.APR.2016 04:35:01

Plot 7-90. Radiated Spurious Plot above 18GHz (802.11a – Ant. Pol. V)

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Radiated Spurious Emission Measurements

§15.247(d) §15.205 & §15.209

Worst Case Mode: 802.11a
Worst Case Transfer Rate: 6 Mbps
Distance of Measurements: 1 & 3 Meters
Operating Frequency: 5180MHz
Channel: 36

	Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Distance Correction Factor [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
	10360.00	Peak	H	-	-	-93.72	47.84	0.00	61.12	68.20	-7.08
*	15540.00	Average	H	-	-	-111.68	55.31	0.00	50.63	53.98	-3.35
*	15540.00	Peak	H	-	-	-94.70	55.31	0.00	67.61	73.98	-6.37
*	20720.00	Average	H	-	-	-107.89	44.39	-9.54	33.95	53.98	-20.03
*	20720.00	Peak	H	-	-	-96.16	44.39	-9.54	45.68	73.98	-28.30
	25900.00	Peak	H	-	-	-93.77	45.11	-9.54	48.80	68.20	-19.40

Table 7-14. Radiated Measurements

Worst Case Mode: 802.11a
Worst Case Transfer Rate: 6 Mbps
Distance of Measurements: 1 & 3 Meters
Operating Frequency: 5200MHz
Channel: 40

	Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Distance Correction Factor [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
	10400.00	Peak	H	-	-	-94.23	47.98	0.00	60.75	68.20	-7.45
*	15600.00	Average	H	-	-	-112.24	55.62	0.00	50.39	53.98	-3.59
*	15600.00	Peak	H	-	-	-94.81	55.62	0.00	67.82	73.98	-6.16
*	20800.00	Average	H	-	-	-107.80	44.39	-9.54	34.05	53.98	-19.93
*	20800.00	Peak	H	-	-	-95.53	44.39	-9.54	46.32	73.98	-27.66
	26000.00	Peak	H	-	-	-93.67	45.12	-9.54	48.90	68.20	-19.30

Table 7-15. Radiated Measurements

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Worst Case Mode: 802.11a
Worst Case Transfer Rate: 6 Mbps
Distance of Measurements: 1 & 3 Meters
Operating Frequency: 5240MHz
Channel: 48

	Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Distance Correction Factor [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
	10480.00	Peak	H	-	-	-94.05	48.49	0.00	61.44	68.20	-6.76
*	15720.00	Average	H	-	-	-111.76	54.63	0.00	49.87	53.98	-4.11
*	15720.00	Peak	H	-	-	-94.82	54.63	0.00	66.81	73.98	-7.17
*	20960.00	Average	H	-	-	-107.95	44.31	-9.54	33.82	53.98	-20.16
*	20960.00	Peak	H	-	-	-95.95	44.31	-9.54	45.82	73.98	-28.16
	26200.00	Peak	H	-	-	-93.47	45.01	-9.54	49.00	68.20	-19.20

Table 7-16. Radiated Measurements

Worst Case Mode: 802.11a
Worst Case Transfer Rate: 6 Mbps
Distance of Measurements: 1 & 3 Meters
Operating Frequency: 5260MHz
Channel: 52

	Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Distance Correction Factor [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
	10520.00	Peak	H	-	-	-94.19	48.56	0.00	61.38	68.20	-6.82
*	15780.00	Average	H	-	-	-111.63	54.68	0.00	50.05	53.98	-3.93
*	15780.00	Peak	H	-	-	-95.28	54.68	0.00	66.40	73.98	-7.58
*	21040.00	Average	H	-	-	-107.66	44.29	-9.54	34.09	53.98	-19.89
*	21040.00	Peak	H	-	-	-96.81	44.29	-9.54	44.94	73.98	-29.04
	26300.00	Peak	H	-	-	-92.28	45.00	-9.54	50.17	68.20	-18.03

Table 7-17. Radiated Measurements

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Worst Case Mode: 802.11a
Worst Case Transfer Rate: 6 Mbps
Distance of Measurements: 1 & 3 Meters
Operating Frequency: 5280MHz
Channel: 56

	Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Distance Correction Factor [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
	10560.00	Peak	H	-	-	-97.23	48.47	0.00	58.24	68.20	-9.96
*	15840.00	Average	H	-	-	-111.69	54.71	0.00	50.02	53.98	-3.96
*	15840.00	Peak	H	-	-	-94.52	54.71	0.00	67.19	73.98	-6.79
*	21120.00	Average	H	-	-	-106.96	44.28	-9.54	34.77	53.98	-19.21
*	21120.00	Peak	H	-	-	-96.45	44.28	-9.54	45.28	73.98	-28.70
	26400.00	Peak	H	-	-	-92.67	45.02	-9.54	49.81	68.20	-18.39

Table 7-18. Radiated Measurements

Worst Case Mode: 802.11a
Worst Case Transfer Rate: 6 Mbps
Distance of Measurements: 1 & 3 Meters
Operating Frequency: 5320MHz
Channel: 64

	Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Distance Correction Factor [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
*	10640.00	Average	H	-	-	-108.25	48.31	0.00	47.06	53.98	-6.92
*	10640.00	Peak	H	-	-	-97.37	48.31	0.00	57.94	73.98	-16.04
*	15960.00	Average	H	-	-	-111.45	55.08	0.00	50.63	53.98	-3.35
*	15960.00	Peak	H	-	-	-94.22	55.08	0.00	67.86	73.98	-6.12
*	21280.00	Average	H	-	-	-106.58	44.26	-9.54	35.14	53.98	-18.83
*	21280.00	Peak	H	-	-	-95.97	44.26	-9.54	45.75	73.98	-28.22
	26600.00	Peak	H	-	-	-114.26	47.61	-9.54	30.80	68.20	-37.40

Table 7-19. Radiated Measurements

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Worst Case Mode: 802.11a
Worst Case Transfer Rate: 6 Mbps
Distance of Measurements: 1 & 3 Meters
Operating Frequency: 5500MHz
Channel: 100

	Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Distance Correction Factor [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
*	11000.00	Average	H	-	-	-106.32	48.61	0.00	49.29	53.98	-4.69
*	11000.00	Peak	H	-	-	-94.41	48.61	0.00	61.20	73.98	-12.78
	16500.00	Peak	H	-	-	-104.56	55.34	0.00	57.78	68.20	-10.42
	22000.00	Peak	H	-	-	-94.25	44.50	-9.54	47.71	68.20	-20.49
	27500.00	Peak	H	-	-	-103.49	47.97	-9.54	41.94	68.20	-26.26

Table 7-20. Radiated Measurements

Worst Case Mode: 802.11a
Worst Case Transfer Rate: 6 Mbps
Distance of Measurements: 1 & 3 Meters
Operating Frequency: 5600MHz
Channel: 120

	Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Distance Correction Factor [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
*	11200.00	Average	H	-	-	-106.24	48.34	0.00	49.10	53.98	-4.88
*	11200.00	Peak	H	-	-	-93.93	48.34	0.00	61.41	73.98	-12.57
	16800.00	Peak	H	-	-	-104.32	56.87	0.00	59.55	68.20	-8.65
*	22400.00	Average	H	-	-	-107.28	44.57	-9.54	34.75	53.98	-19.23
*	22400.00	Peak	H	-	-	-95.68	44.57	-9.54	46.35	73.98	-27.63
	28000.00	Peak	H	-	-	-102.93	48.11	-9.54	42.64	68.20	-25.56

Table 7-21. Radiated Measurements

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Worst Case Mode: 802.11a
Worst Case Transfer Rate: 6 Mbps
Distance of Measurements: 1 & 3 Meters
Operating Frequency: 5720MHz
Channel: 144

	Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Distance Correction Factor [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
*	11440.00	Average	H	-	-	-105.59	49.21	0.00	50.62	53.98	-3.36
*	11440.00	Peak	H	-	-	-93.79	49.21	0.00	62.42	73.98	-11.56
	17160.00	Peak	H	-	-	-104.81	57.84	0.00	60.03	68.20	-8.17
*	22880.00	Average	H	-	-	-108.26	44.61	-9.54	33.81	53.98	-20.17
*	22880.00	Peak	H	-	-	-96.64	44.61	-9.54	45.43	73.98	-28.55
	28600.00	Peak	H	-	-	-102.40	48.29	-9.54	43.35	68.20	-24.85

Table 7-22. Radiated Measurements

Worst Case Mode: 802.11a
Worst Case Transfer Rate: 6 Mbps
Distance of Measurements: 1 & 3 Meters
Operating Frequency: 5745MHz
Channel: 149

	Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Distance Correction Factor [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
*	11490.00	Average	H	-	-	-105.71	49.47	0.00	50.76	53.98	-3.22
*	11490.00	Peak	H	-	-	-93.56	49.47	0.00	62.91	73.98	-11.07
	17235.00	Peak	H	-	-	-104.83	57.93	0.00	60.10	68.20	-8.10
*	22980.00	Average	H	-	-	-108.41	44.68	-9.54	33.73	53.98	-20.25
*	22980.00	Peak	H	-	-	-96.56	44.68	-9.54	45.58	73.98	-28.40
	28725.00	Peak	H	-	-	-102.85	48.26	-9.54	42.87	68.20	-25.33

Table 7-23. Radiated Measurements

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Worst Case Mode: 802.11a
Worst Case Transfer Rate: 6 Mbps
Distance of Measurements: 1 & 3 Meters
Operating Frequency: 5785MHz
Channel: 157

	Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Distance Correction Factor [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
*	11570.00	Average	H	-	-	-105.63	49.31	0.00	50.68	53.98	-3.30
*	11570.00	Peak	H	-	-	-93.58	49.31	0.00	62.73	73.98	-11.25
	17355.00	Peak	H	-	-	-104.92	59.31	0.00	61.38	68.20	-6.82
	23140.00	Peak	H	-	-	-96.32	44.75	-9.54	45.89	68.20	-22.31
	28925.00	Peak	H	-	-	-102.46	48.29	-9.54	43.29	68.20	-24.91

Table 7-24. Radiated Measurements

Worst Case Mode: 802.11a
Worst Case Transfer Rate: 6 Mbps
Distance of Measurements: 1 & 3 Meters
Operating Frequency: 5825MHz
Channel: 165

	Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Distance Correction Factor [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
*	11650.00	Average	H	-	-	-105.79	49.33	0.00	50.54	53.98	-3.44
*	11650.00	Peak	H	-	-	-92.52	49.33	0.00	63.81	73.98	-10.17
	17475.00	Peak	H	-	-	-104.87	60.35	0.00	62.48	68.20	-5.72
	23300.00	Peak	H	-	-	-95.98	44.75	-9.54	46.23	68.20	-21.97
	29125.00	Peak	H	-	-	-102.45	48.28	-9.54	43.29	68.20	-24.91

Table 7-25. Radiated Measurements

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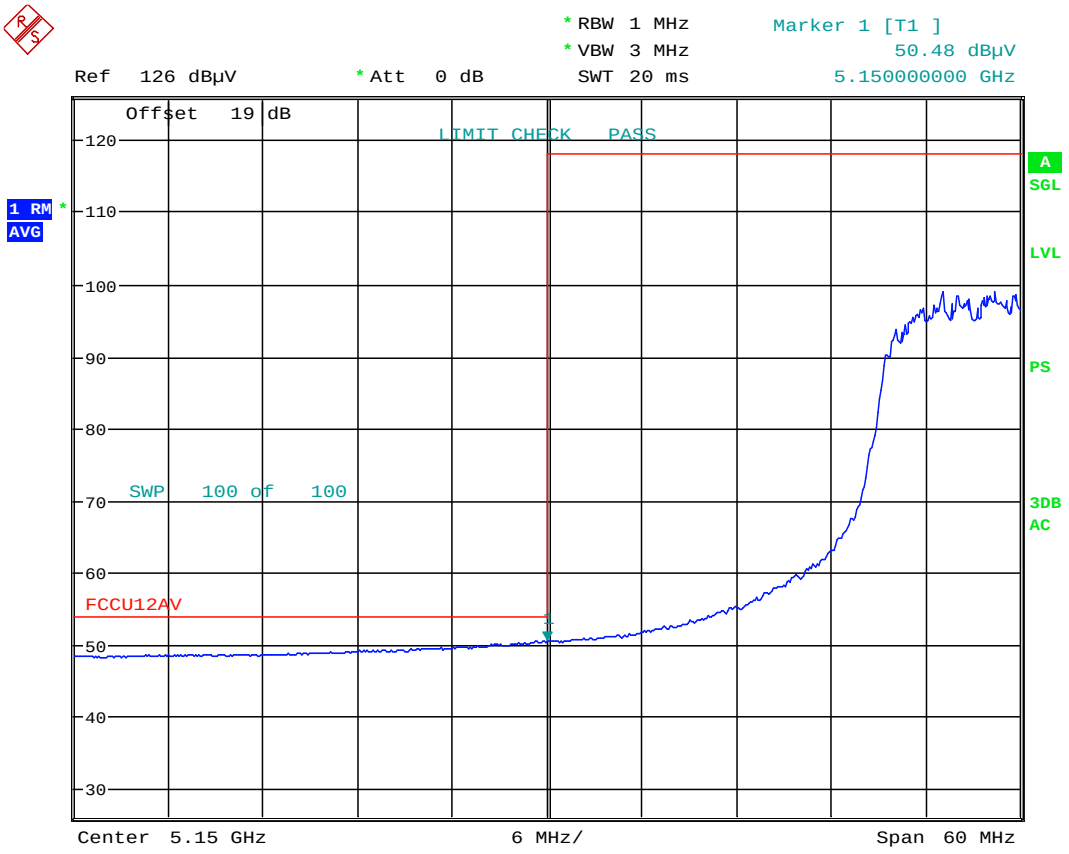
7.7.2 Radiated Band Edge Measurements (20MHz BW)

§15.407(b.1)(b.2) §15.205 §15.209

Worst Case Mode:	802.11a
Worst Case Transfer Rate:	6 Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	5180MHz
Channel:	36



Date: 12.APR.2016 15:53:41

Plot 7-91. Radiated Restricted Lower Band Edge Plot (Average – UNII Band 1)

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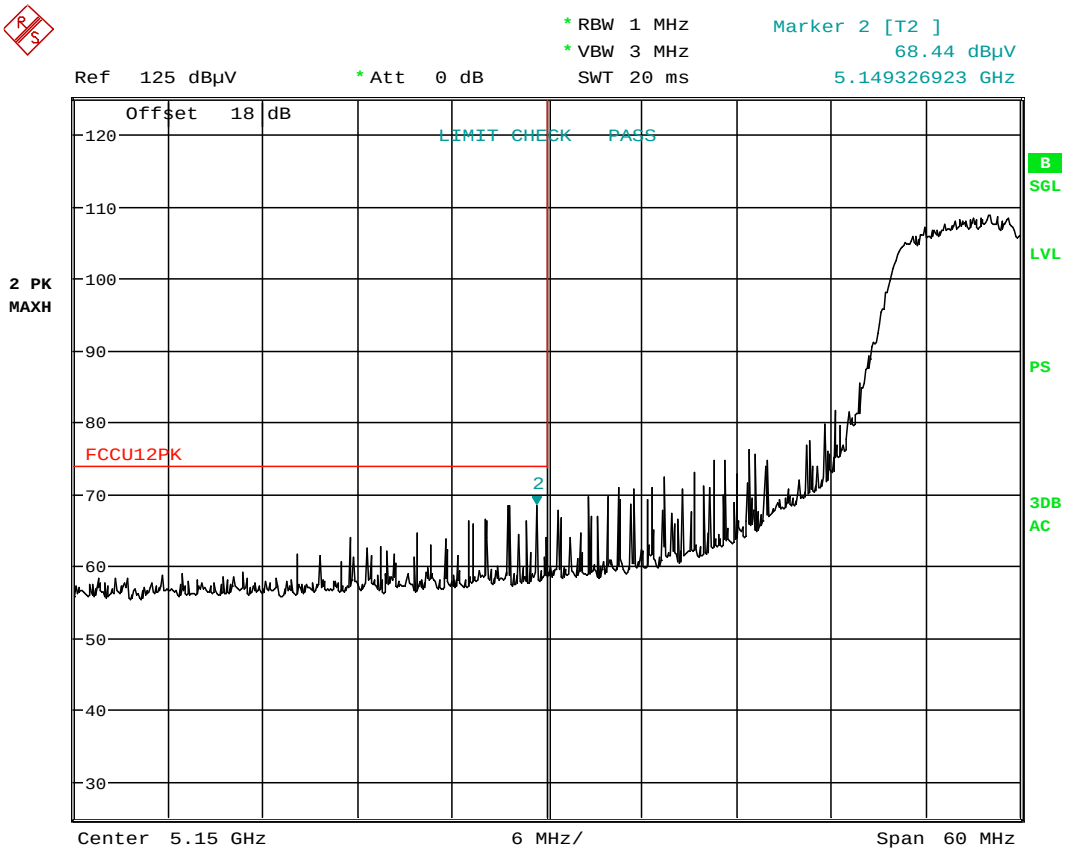
Radiated Band Edge Measurements (20MHz BW)

§15.407(b.1)(b.2) §15.205 §15.209



Date: 12.APR.2016 15:54:10

Plot 7-92. Radiated Restricted Lower Band Edge Plot (Peak – UNII Band 1)

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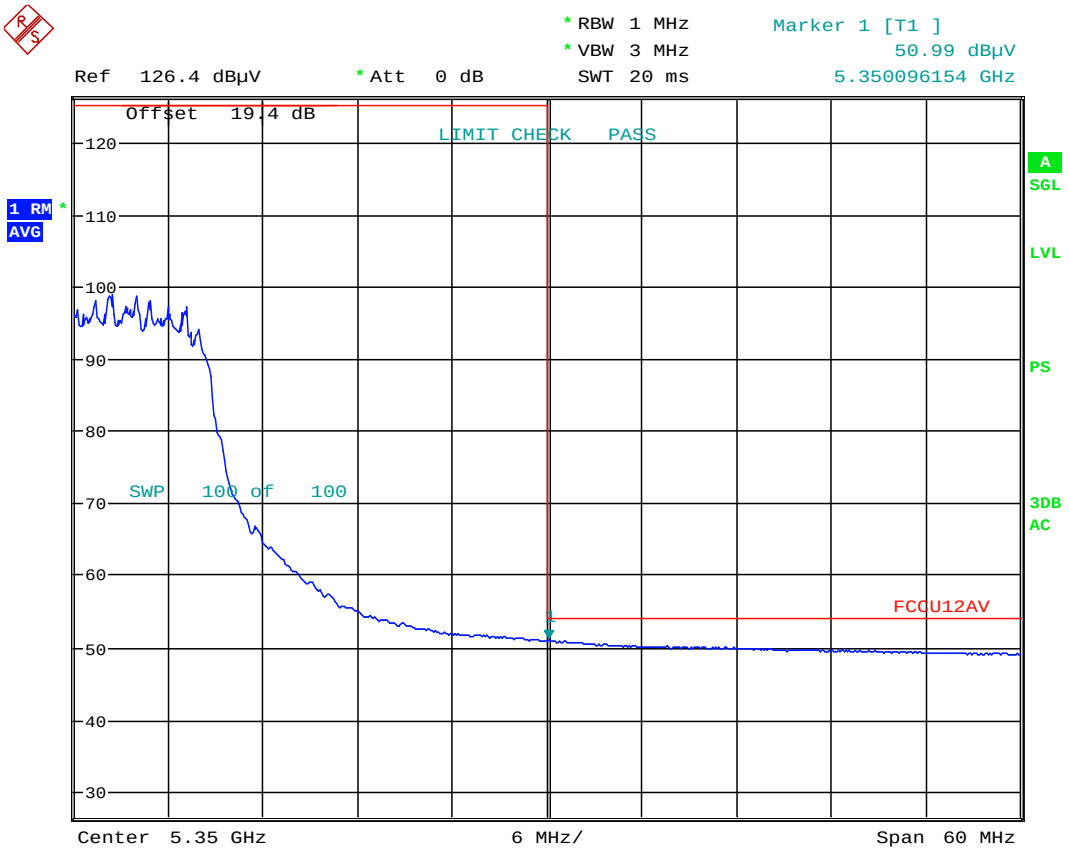
Radiated Band Edge Measurements (20MHz BW)

§15.407(b.1)(b.2) §15.205 §15.209

Worst Case Mode:	802.11a
Worst Case Transfer Rate:	6 Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	5320MHz
Channel:	64



Date: 12.APR.2016 16:17:49

Plot 7-93. Radiated Restricted Upper Band Edge Plot (Average – UNII Band 2A)

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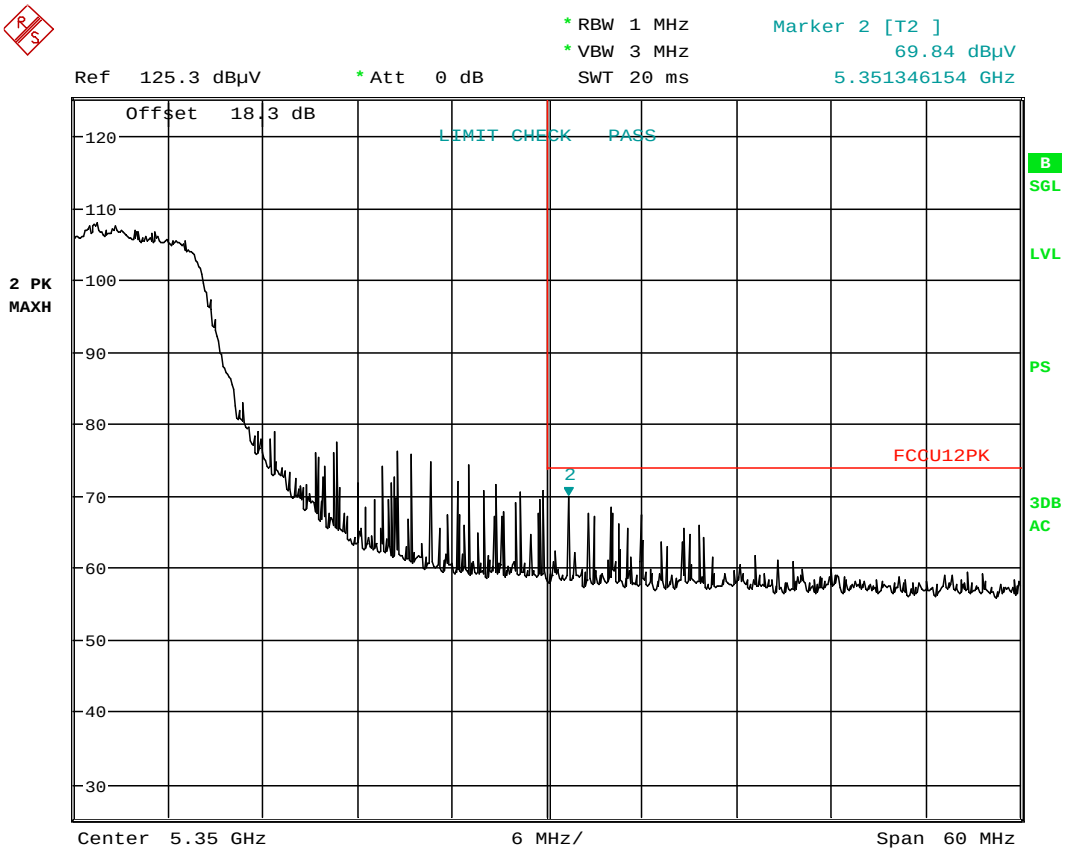
Radiated Band Edge Measurements (20MHz BW)

§15.407(b.1)(b.2) §15.205 §15.209



Date: 12.APR.2016 16:18:00

Plot 7-94. Radiated Restricted Upper Band Edge Plot (Peak – UNII Band 2A)

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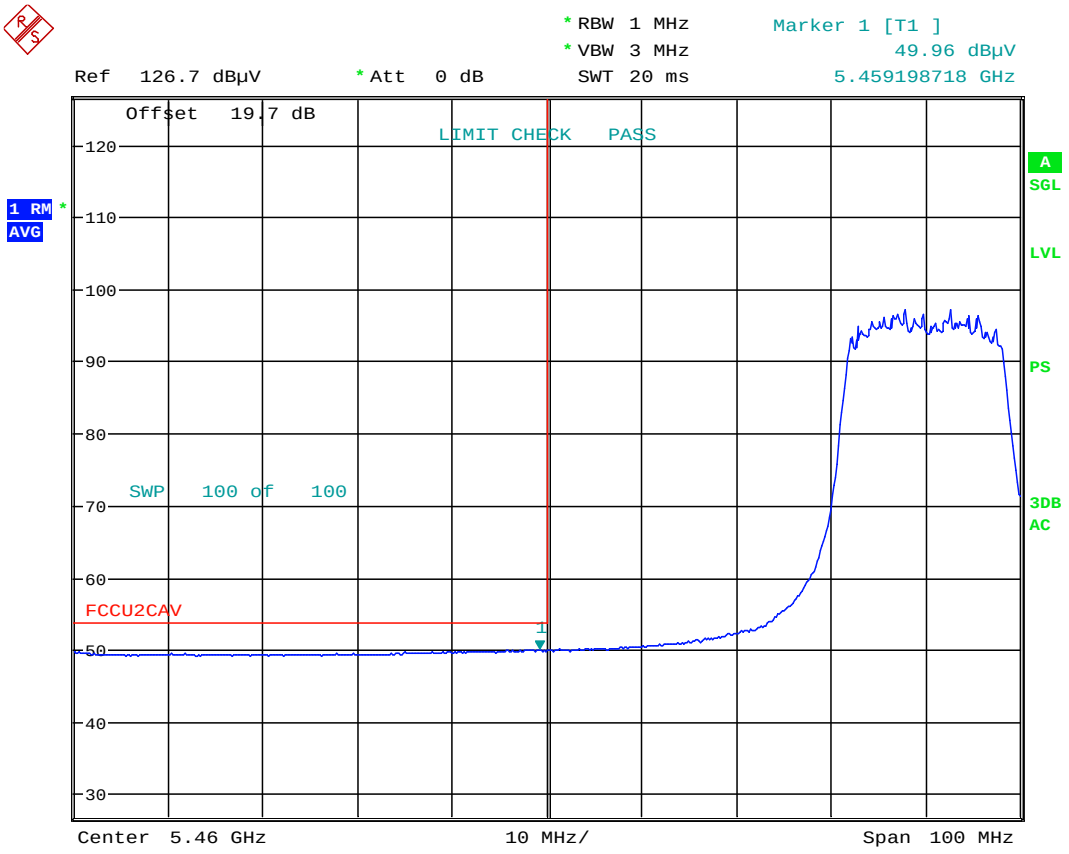
Radiated Band Edge Measurements (20MHz BW)

§15.407(b.1)(b.2) §15.205 §15.209

Worst Case Mode:	802.11a
Worst Case Transfer Rate:	6 Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	5500MHz
Channel:	100



Date: 12.APR.2016 16:33:31

Plot 7-95. Radiated Restricted Lower Band Edge Plot (Average – UNII Band 2C)

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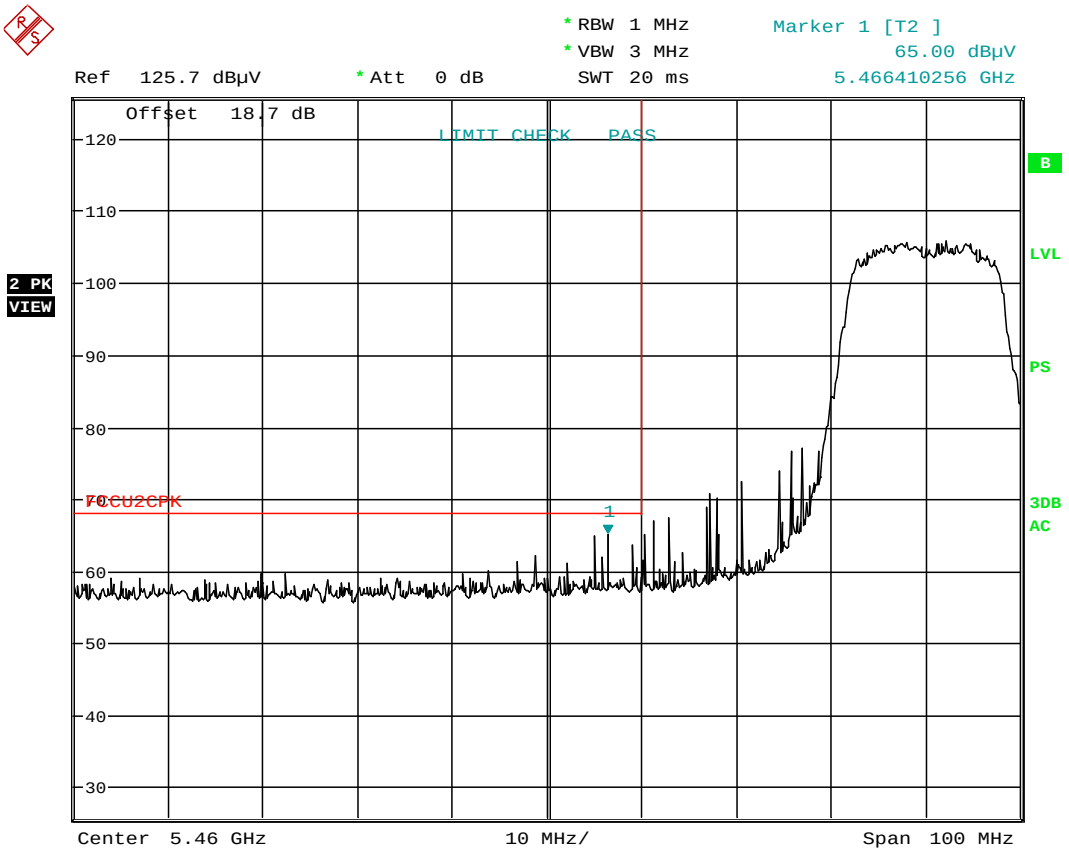
Radiated Band Edge Measurements (20MHz BW)

§15.407(b.1)(b.2) §15.205 §15.209



Date: 12.APR.2016 16:34:33

Plot 7-96. Radiated Restricted Lower Band Edge Plot (Peak – UNII Band 2C)

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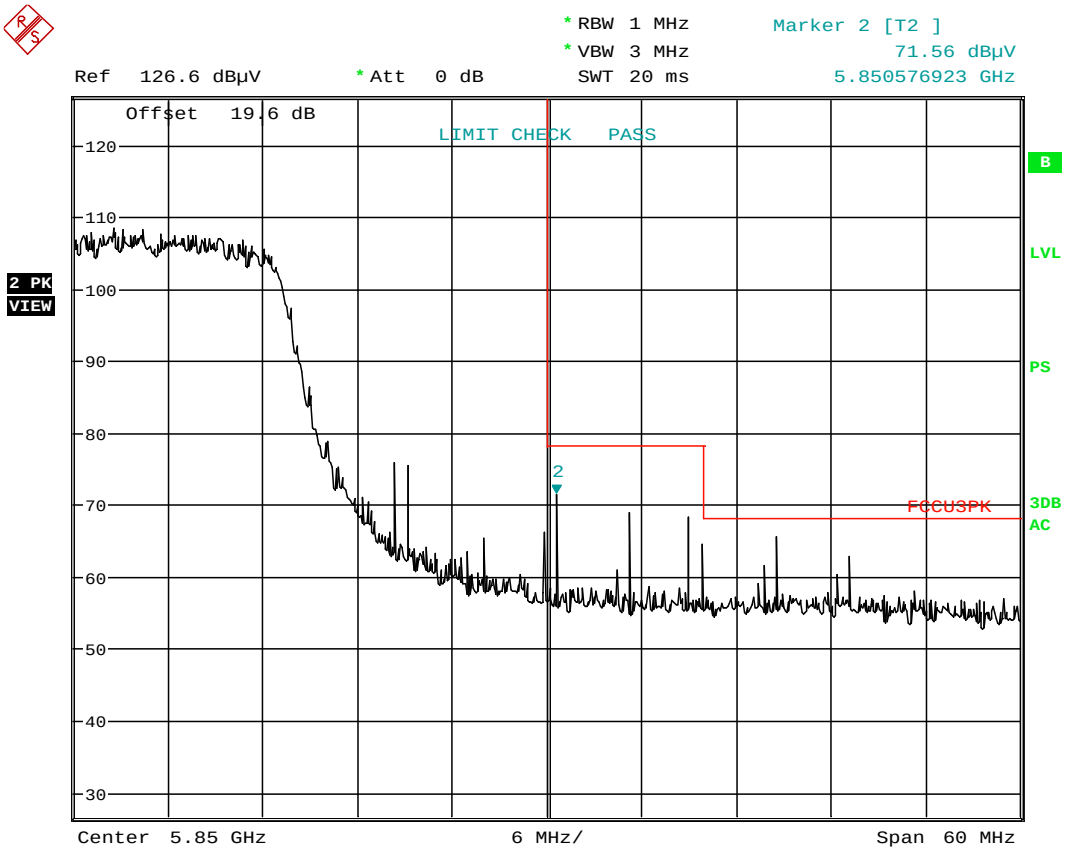
Radiated Band Edge Measurements (20MHz BW)

§15.407(b.1)(b.2) §15.205 §15.209

Worst Case Mode:	802.11a
Worst Case Transfer Rate:	6 Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	5825MHz
Channel:	165



Date: 12.APR.2016 16:46:27

Plot 7-97. Radiated Upper Band Edge Plot (Peak – UNII Band 3)

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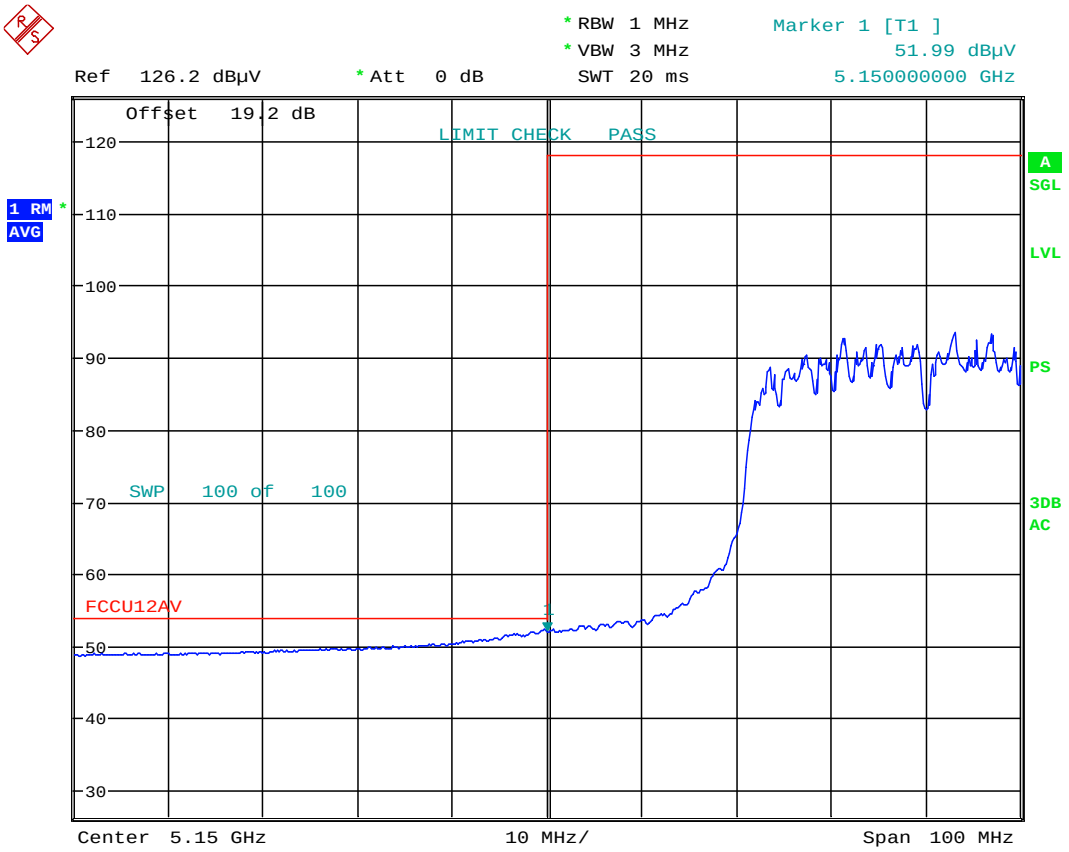
7.7.3 Radiated Band Edge Measurements (40MHz BW)

§15.407(b.1)(b.2) §15.205 §15.209

Worst Case Mode:	802.11n (40MHz)
Worst Case Transfer Rate:	MCS0
Distance of Measurements:	3 Meters
Operating Frequency:	5190MHz
Channel:	38



Date: 12.APR.2016 16:01:37

Plot 7-98. Radiated Restricted Lower Band Edge Plot (Average – UNII Band 1)

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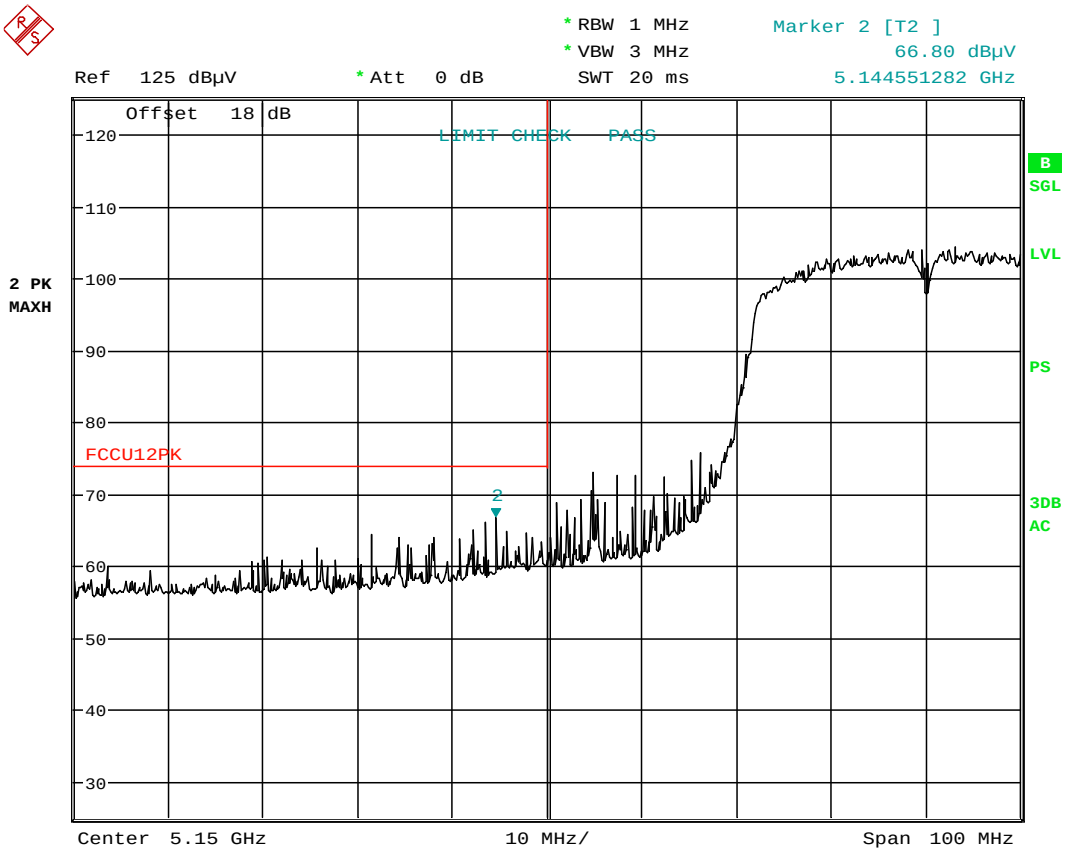
Radiated Band Edge Measurements (40MHz BW)

§15.407(b.1)(b.2) §15.205 §15.209



Date: 12.APR.2016 16:02:09

Plot 7-99. Radiated Restricted Lower Band Edge Plot (Peak – UNII Band 1)

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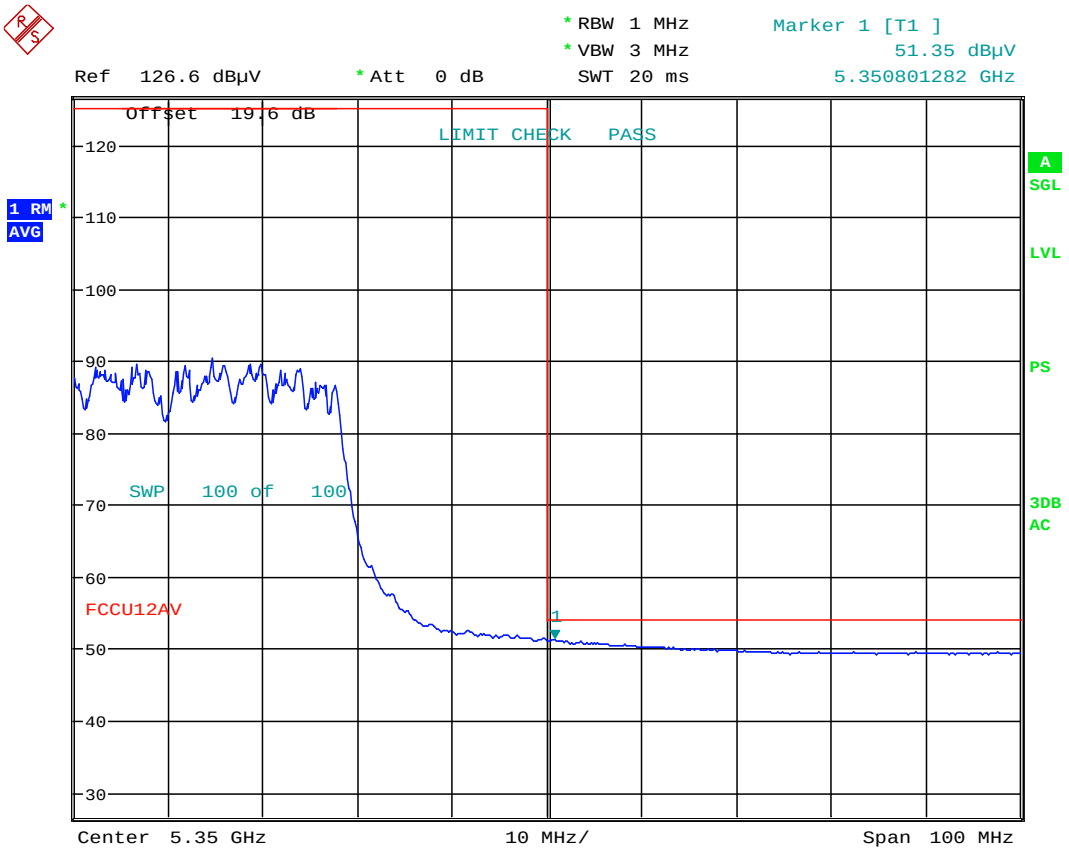
Radiated Band Edge Measurements (40MHz BW)

§15.407(b.1)(b.2) §15.205 §15.209

Worst Case Mode:	802.11n (40MHz)
Worst Case Transfer Rate:	MCS0
Distance of Measurements:	3 Meters
Operating Frequency:	5310MHz
Channel:	62



Date: 12.APR.2016 16:21:47

Plot 7-100. Radiated Restricted Upper Band Edge Plot (Average – UNII Band 2A)

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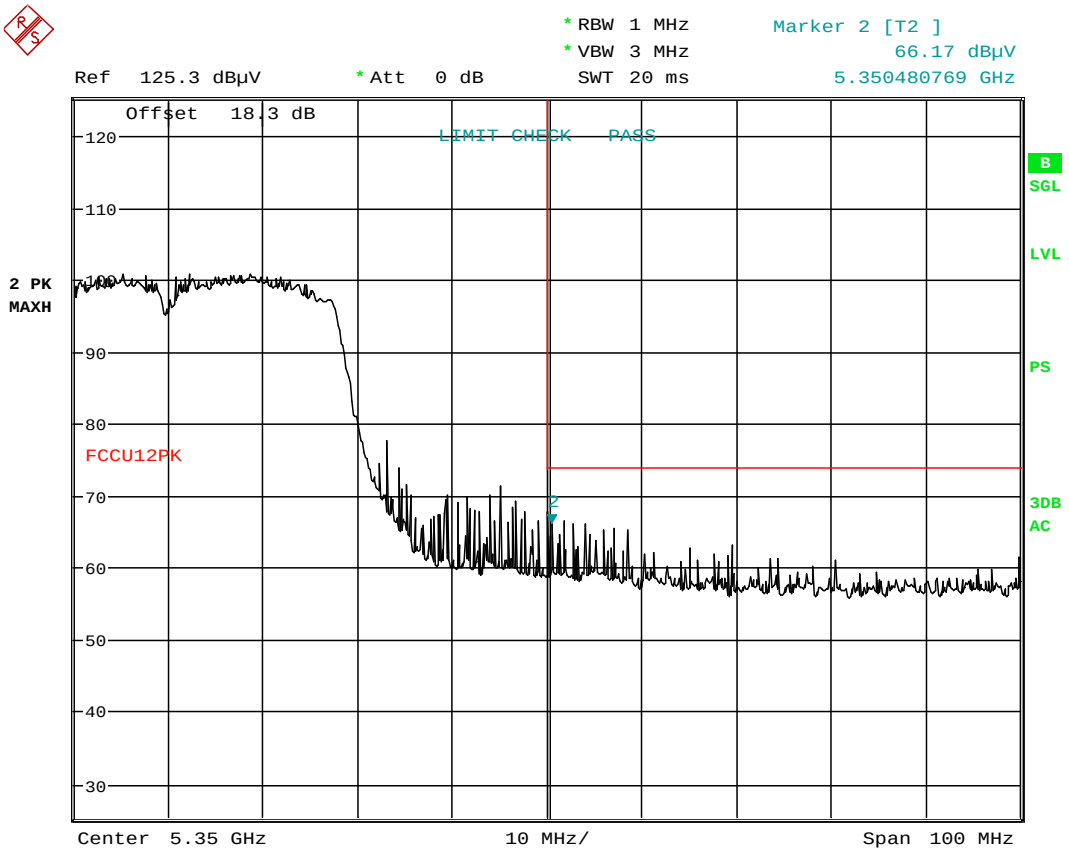
Radiated Band Edge Measurements (40MHz BW)

§15.407(b.1)(b.2) §15.205 §15.209



Date: 12.APR.2016 16:22:13

Plot 7-101. Radiated Restricted Upper Band Edge Plot (Peak – UNII Band 2A)

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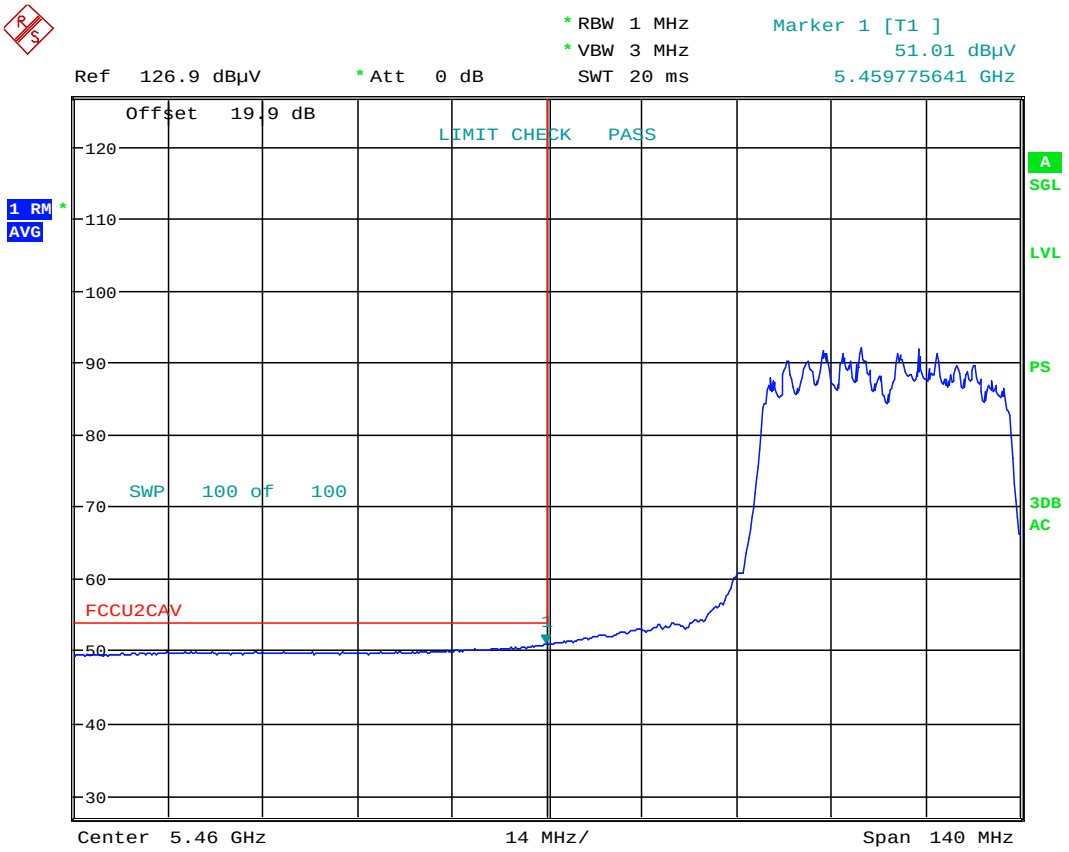
Radiated Band Edge Measurements (40MHz BW)

§15.407(b.1)(b.2) §15.205 §15.209

Worst Case Mode:	802.11n (40MHz)
Worst Case Transfer Rate:	MCS0
Distance of Measurements:	3 Meters
Operating Frequency:	5510MHz
Channel:	102



Date: 12.APR.2016 16:36:40

Plot 7-102. Radiated Restricted Lower Band Edge Plot (Average – UNII Band 2C)

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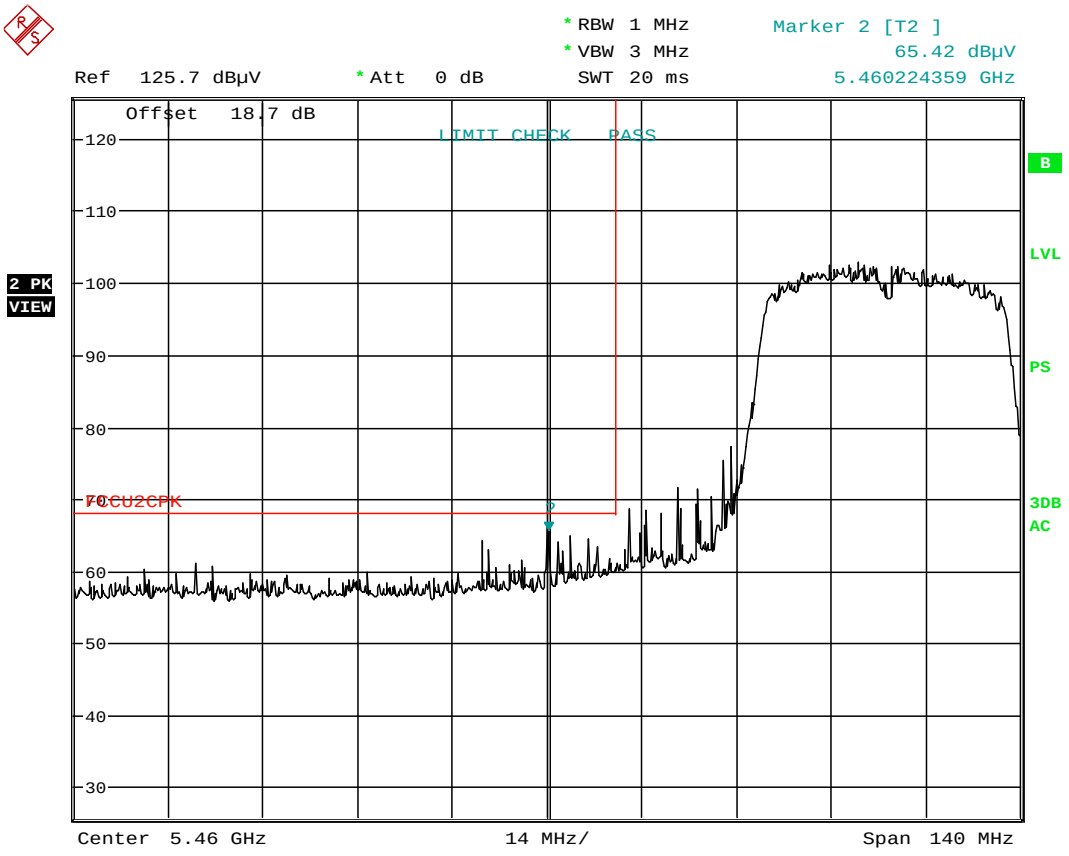
Radiated Band Edge Measurements (40MHz BW)

§15.407(b.1)(b.2) §15.205 §15.209



Date: 12.APR.2016 16:37:09

Plot 7-103. Radiated Restricted Lower Band Edge Plot (Peak – UNII Band 2C)

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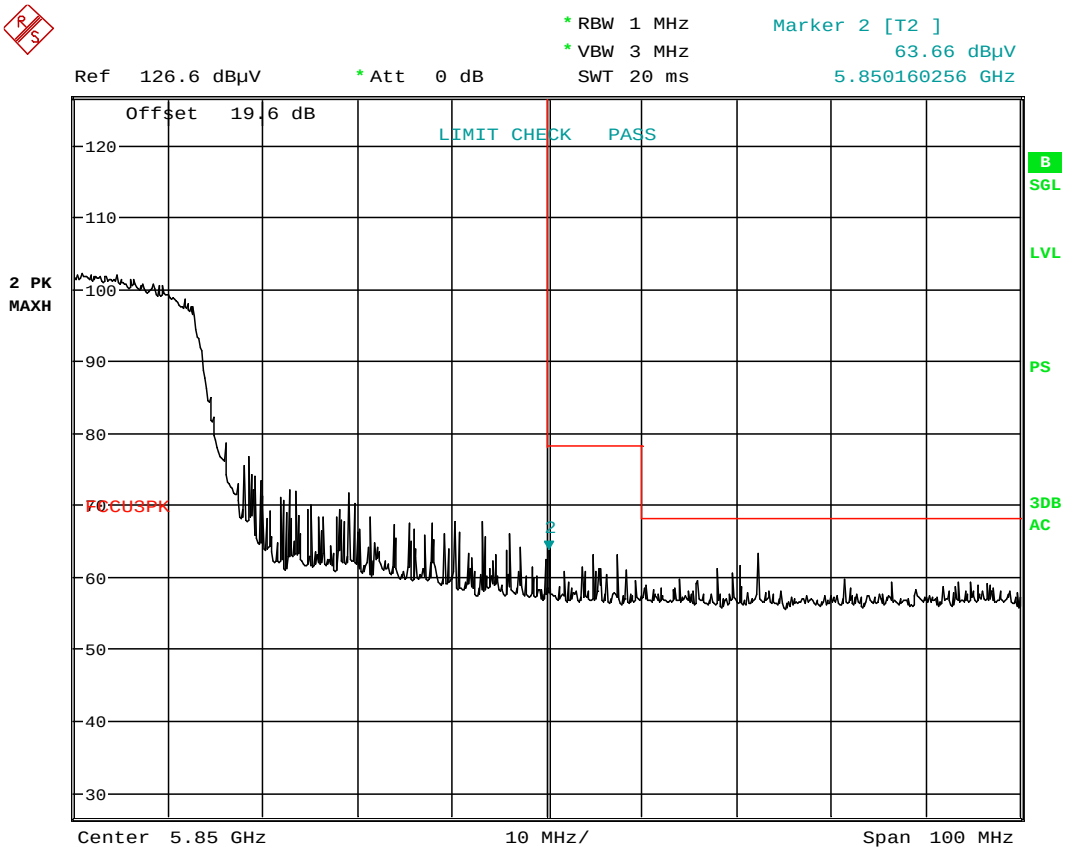
Radiated Band Edge Measurements (40MHz BW)

§15.407(b.1)(b.2) §15.205 §15.209

Worst Case Mode:	802.11n (40MHz)
Worst Case Transfer Rate:	MCS0
Distance of Measurements:	3 Meters
Operating Frequency:	5795MHz
Channel:	159



Date: 12.APR.2016 16:47:35

Plot 7-104. Radiated Upper Band Edge Plot (Peak – UNII Band 3)

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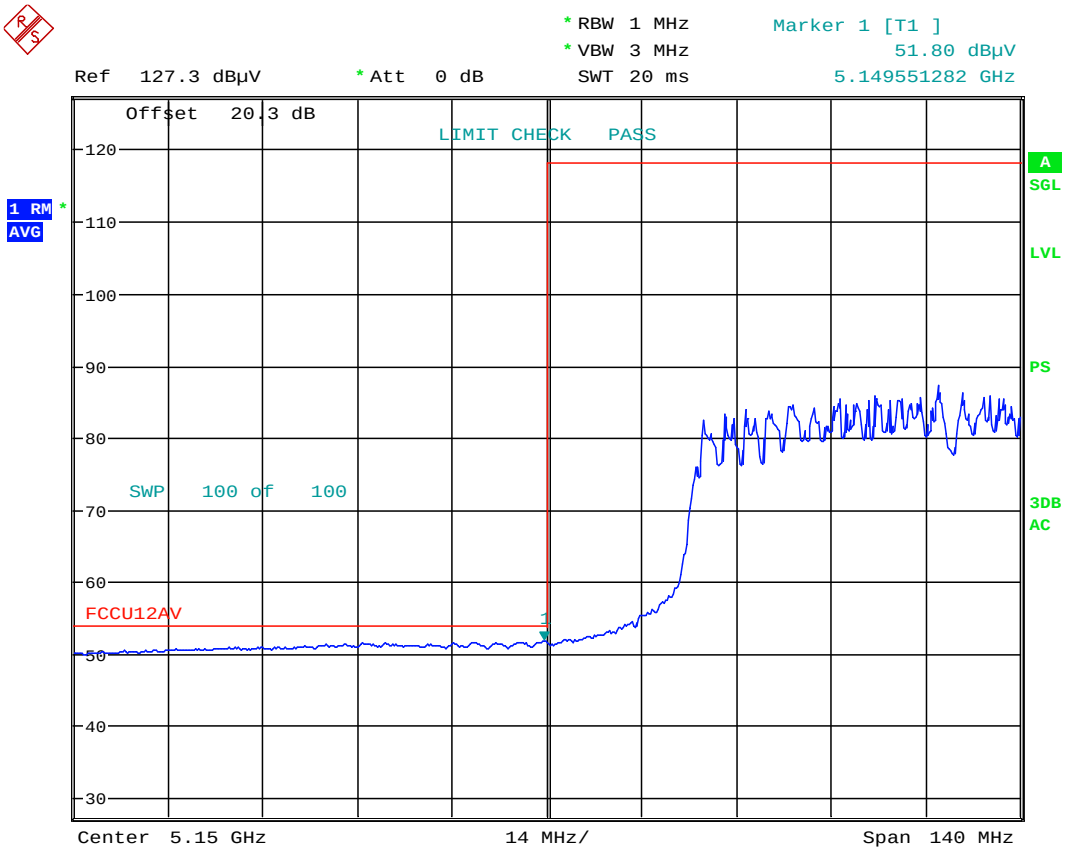
7.7.4 Radiated Band Edge Measurements (80MHz BW)

§15.407(b.1)(b.2) §15.205 §15.209

Worst Case Mode:	802.11n (80MHz)
Worst Case Transfer Rate:	MCS0
Distance of Measurements:	3 Meters
Operating Frequency:	5210MHz
Channel:	42



Date: 12.APR.2016 16:11:56

Plot 7-105. Radiated Restricted Lower Band Edge Plot (Average – UNII Band 1)

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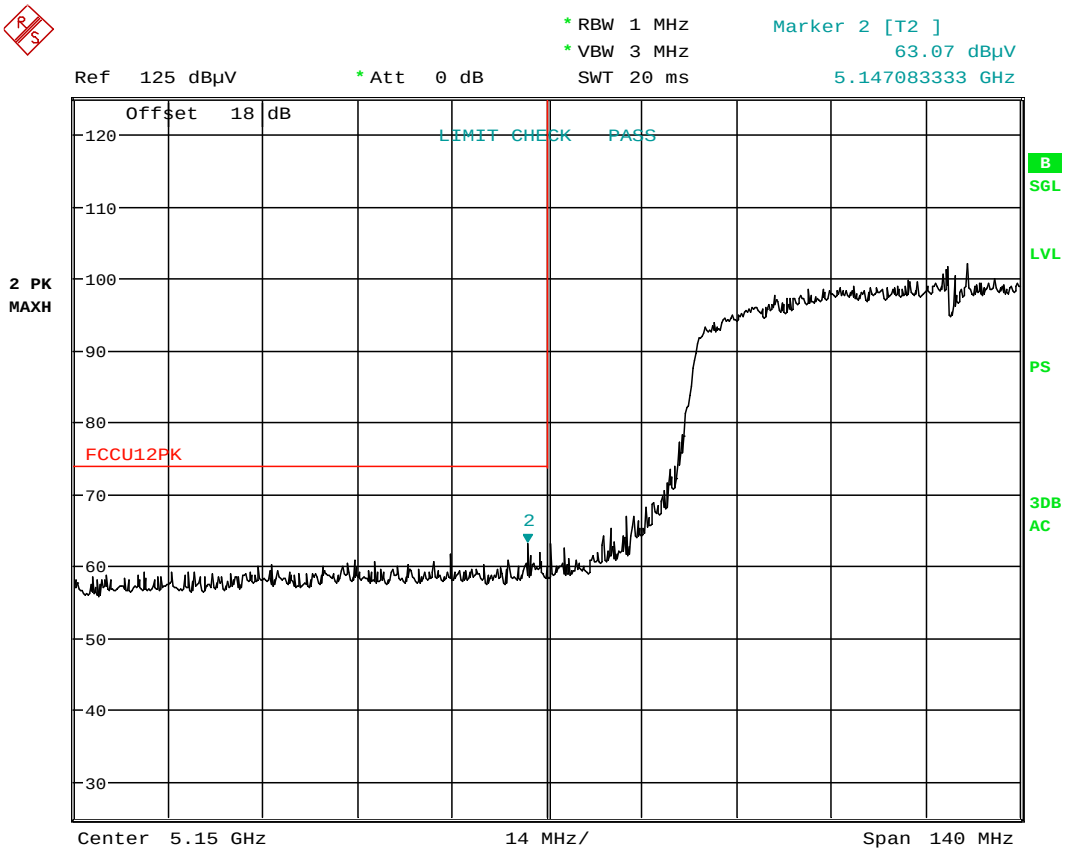
Radiated Band Edge Measurements (80MHz BW)

§15.407(b.1)(b.2) §15.205 §15.209



Date: 12.APR.2016 16:12:05

Plot 7-106. Radiated Restricted Lower Band Edge Plot (Peak – UNII Band 1)

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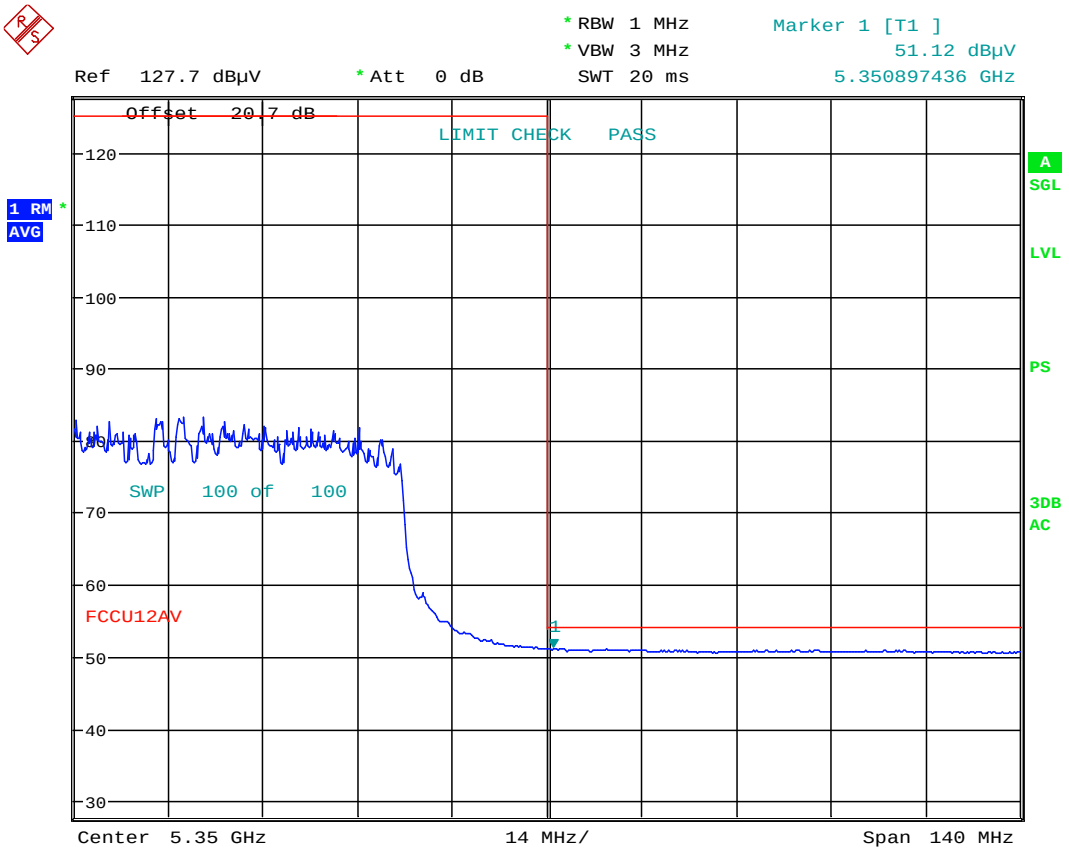
Radiated Band Edge Measurements (80MHz BW)

§15.407(b.1)(b.2) §15.205 §15.209

Worst Case Mode:	802.11ac (80MHz)
Worst Case Transfer Rate:	MCS0
Distance of Measurements:	3 Meters
Operating Frequency:	5290MHz
Channel:	58



Date: 12.APR.2016 16:28:29

Plot 7-107. Radiated Restricted Upper Band Edge Plot (Average – UNII Band 2A)

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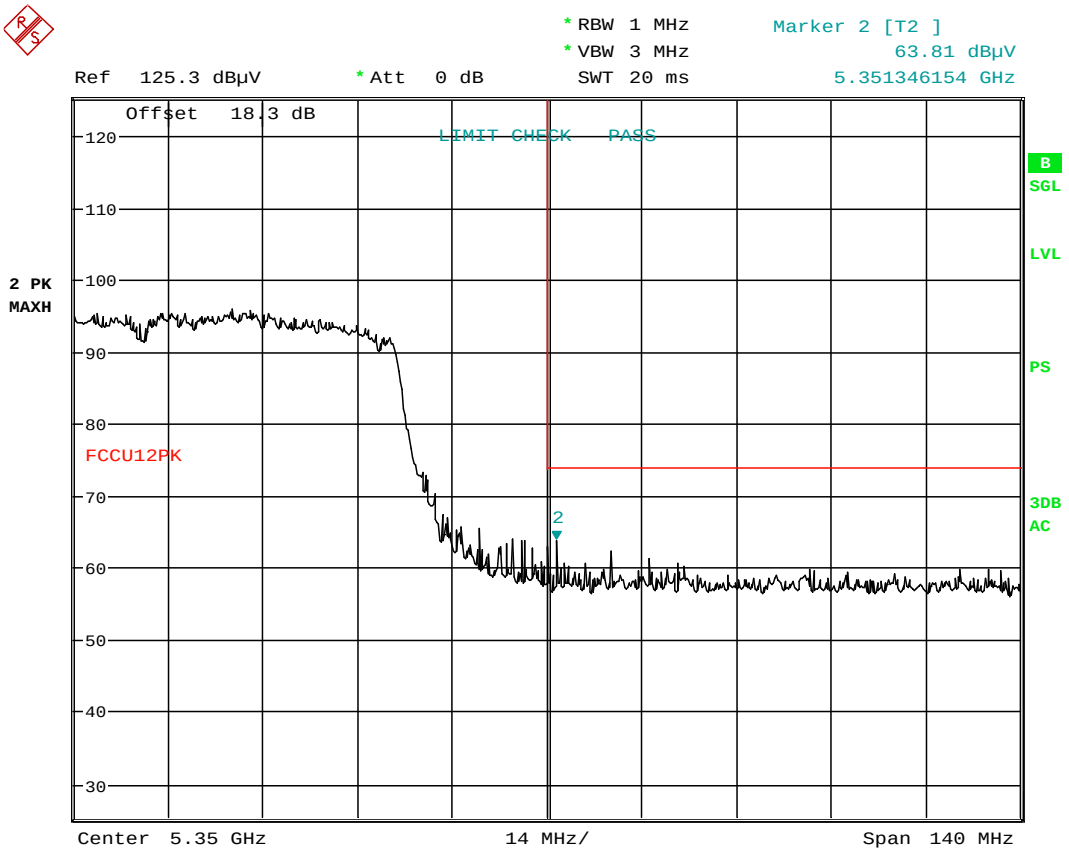
Radiated Band Edge Measurements (80MHz BW)

§15.407(b.1)(b.2) §15.205 §15.209



Date: 12.APR.2016 16:28:48

Plot 7-108. Radiated Restricted Upper Band Edge Plot (Peak – UNII Band 2A)

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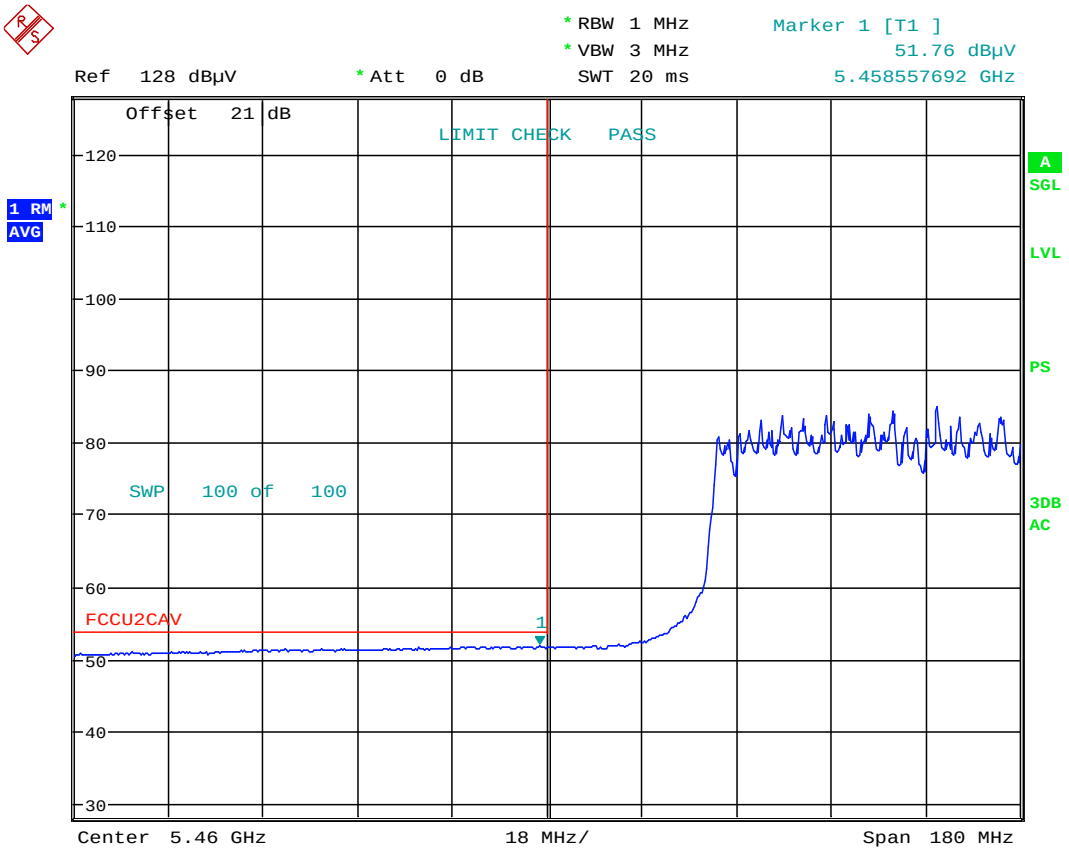
Radiated Band Edge Measurements (80MHz BW)

§15.407(b.1)(b.2) §15.205 §15.209

Worst Case Mode:	802.11ac (80MHz)
Worst Case Transfer Rate:	MCS0
Distance of Measurements:	3 Meters
Operating Frequency:	5530MHz
Channel:	106



Date: 12.APR.2016 16:41:14

Plot 7-109. Radiated Restricted Lower Band Edge Plot (Average – UNII Band 2C)

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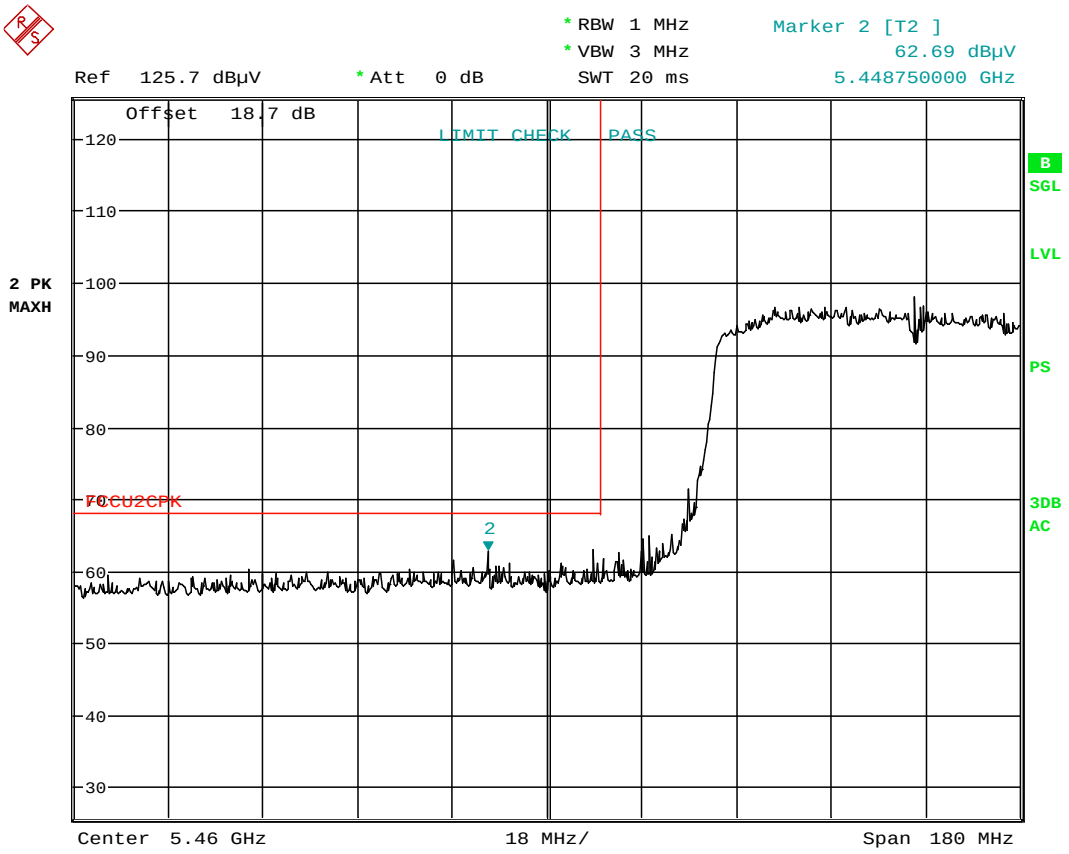
Radiated Band Edge Measurements (80MHz BW)

§15.407(b.1)(b.2) §15.205 §15.209



Date: 12.APR.2016 16:41:26

Plot 7-110. Radiated Restricted Lower Band Edge Plot (Peak – UNII Band 2C)

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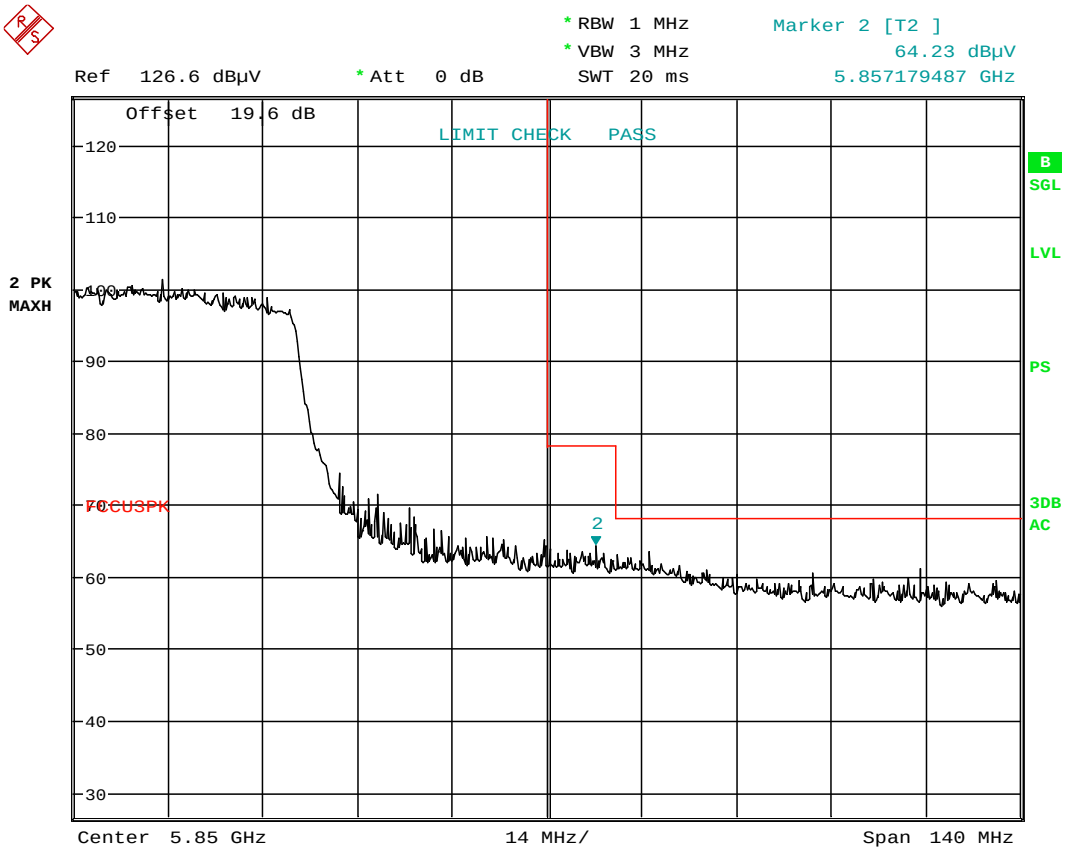
Radiated Band Edge Measurements (80MHz BW)

§15.407(b.1)(b.2) §15.205 §15.209

Worst Case Mode:	802.11ac (80MHz)
Worst Case Transfer Rate:	MCS0
Distance of Measurements:	3 Meters
Operating Frequency:	5775MHz
Channel:	155



Date: 12.APR.2016 16:48:35

Plot 7-111. Radiated Upper Band Edge Plot (Peak – UNII Band 3)

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7.8 Radiated Spurious Emissions Measurements – Below 1GHz

§15.209

Test Overview and Limit

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

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR must not exceed the limits shown in Table 7-26 per Section 15.209.

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

Table 7-26. Radiated Limits

Test Procedures Used

ANSI C63.10-2013

Test Settings

Quasi-Peak Field Strength Measurements

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

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Test Setup

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

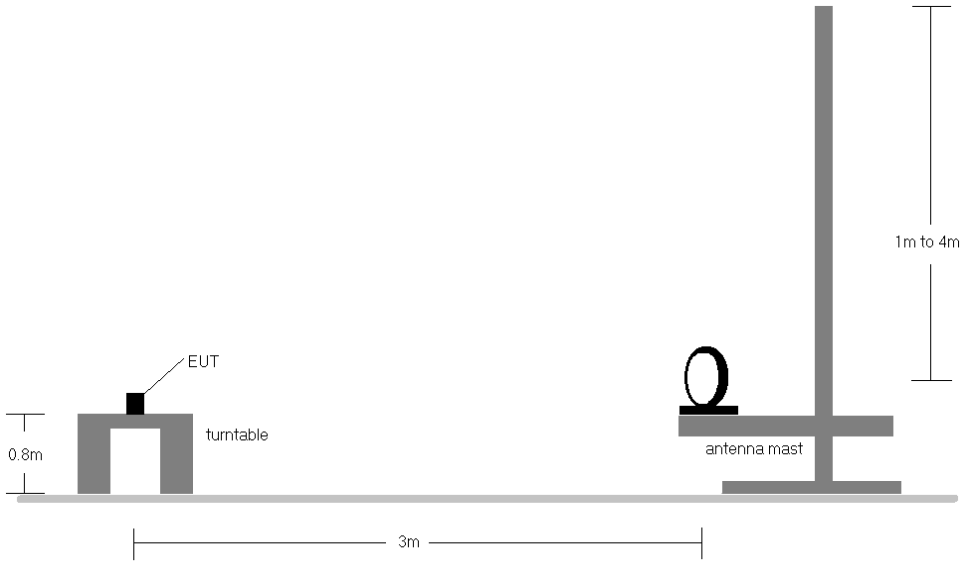

Figure 7-6. Radiated Test Setup < 30MHz

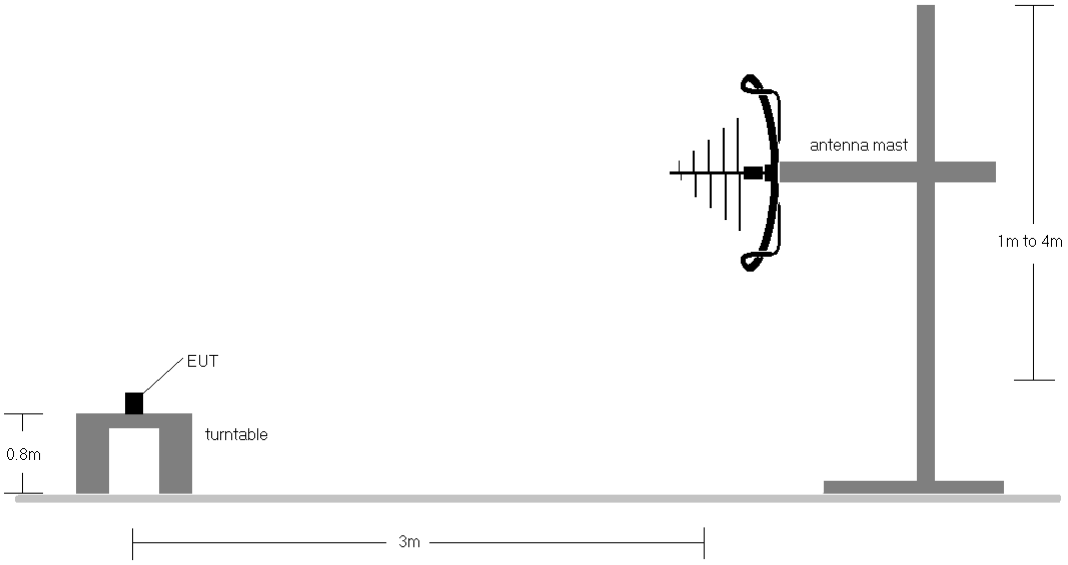

Figure 7-7. Radiated Test Setup < 1GHz

Test Notes

1. All emissions lying in restricted bands specified in §15.205 are below the limit shown in Table 7-13.
2. The broadband receive antenna is manipulated through vertical and horizontal polarizations during the tests. The EUT is manipulated through three orthogonal planes.
3. This unit was tested with its standard battery.

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

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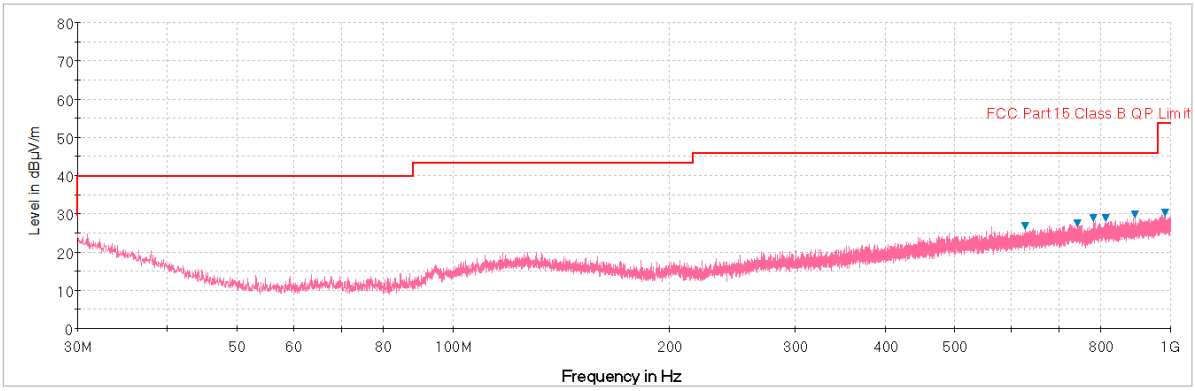
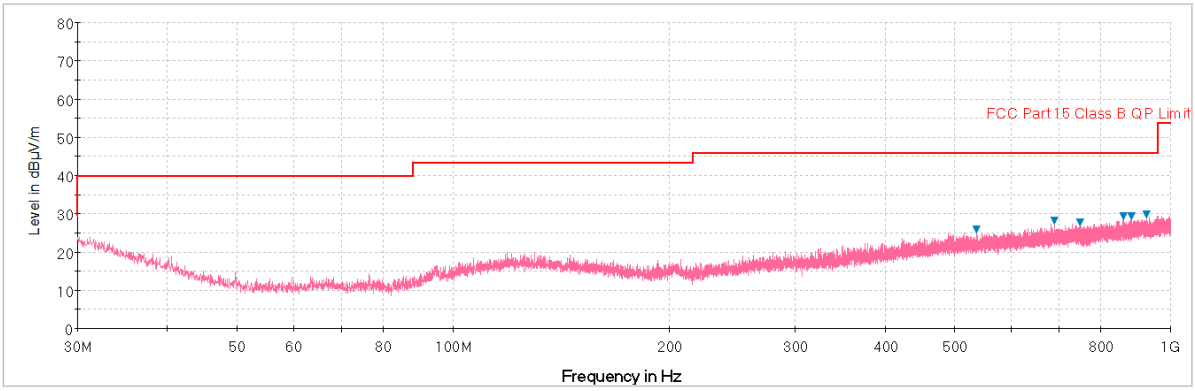
Radiated Spurious Emissions Measurements (Below 1GHz)

§15.209



Plot 7-112. Radiated Spurious Plot below 1GHz (802.11a – U3 Ch. 157, Ant. Pol. H)



Plot 7-113. Radiated Spurious Plot below 1GHz (802.11a – U3 Ch. 157, Ant. Pol. V)

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7.9 Line-Conducted Test Data

§15.407

Test Overview and Limit

All AC line conducted spurious emissions are measured with a receiver connected to a grounded LISN while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates and modes were investigated for conducted spurious emissions. Only the conducted emissions of the configuration that produced the worst case emissions are reported in this section.

All conducted emissions must not exceed the limits shown in the table below, per Section 15.207.

Frequency of emission (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

Table 7-27. Conducted Limits

*Decreases with the logarithm of the frequency.

Test Procedures Used

ANSI C63.10-2013, Section 6.2

Test Settings

Quasi-Peak Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the spurious emission of interest
2. RBW = 9kHz (for emissions from 150kHz – 30MHz)
3. Detector = quasi-peak
4. Sweep time = auto couple
5. Trace mode = max hold
6. Trace was allowed to stabilize

Average Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the spurious emission of interest
2. RBW = 9kHz (for emissions from 150kHz – 30MHz)
3. Detector = RMS
4. Sweep time = auto couple
5. Trace mode = max hold
6. Trace was allowed to stabilize

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Test Setup

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

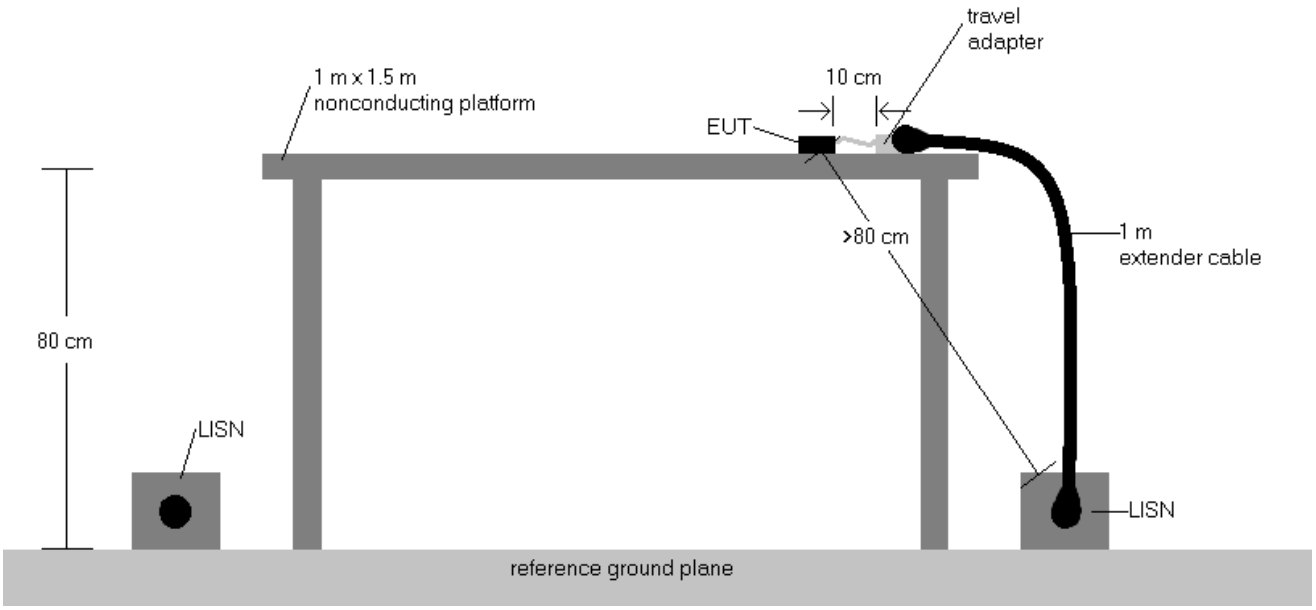

Figure 7-8. Test Instrument & Measurement Setup

Test Notes

1. All modes of operation were investigated and the worst-case emissions are reported using mid channel. The emissions found were not affected by the choice of channel used during testing.
2. The limit for an intentional radiator from 150kHz to 30MHz are specified in 15.207.
3. Corr. (dB) = Cable loss (dB) + LISN insertion factor (dB)
4. QP/AV Level (dBμV) = QP/AV Analyzer/Receiver Level (dBμV) + Corr. (dB)
5. Margin (dB) = QP/AV Limit (dBμV) - QP/AV Level (dBμV)
6. Traces shown in plot are made using a peak detector.
7. Deviations to the Specifications: None.

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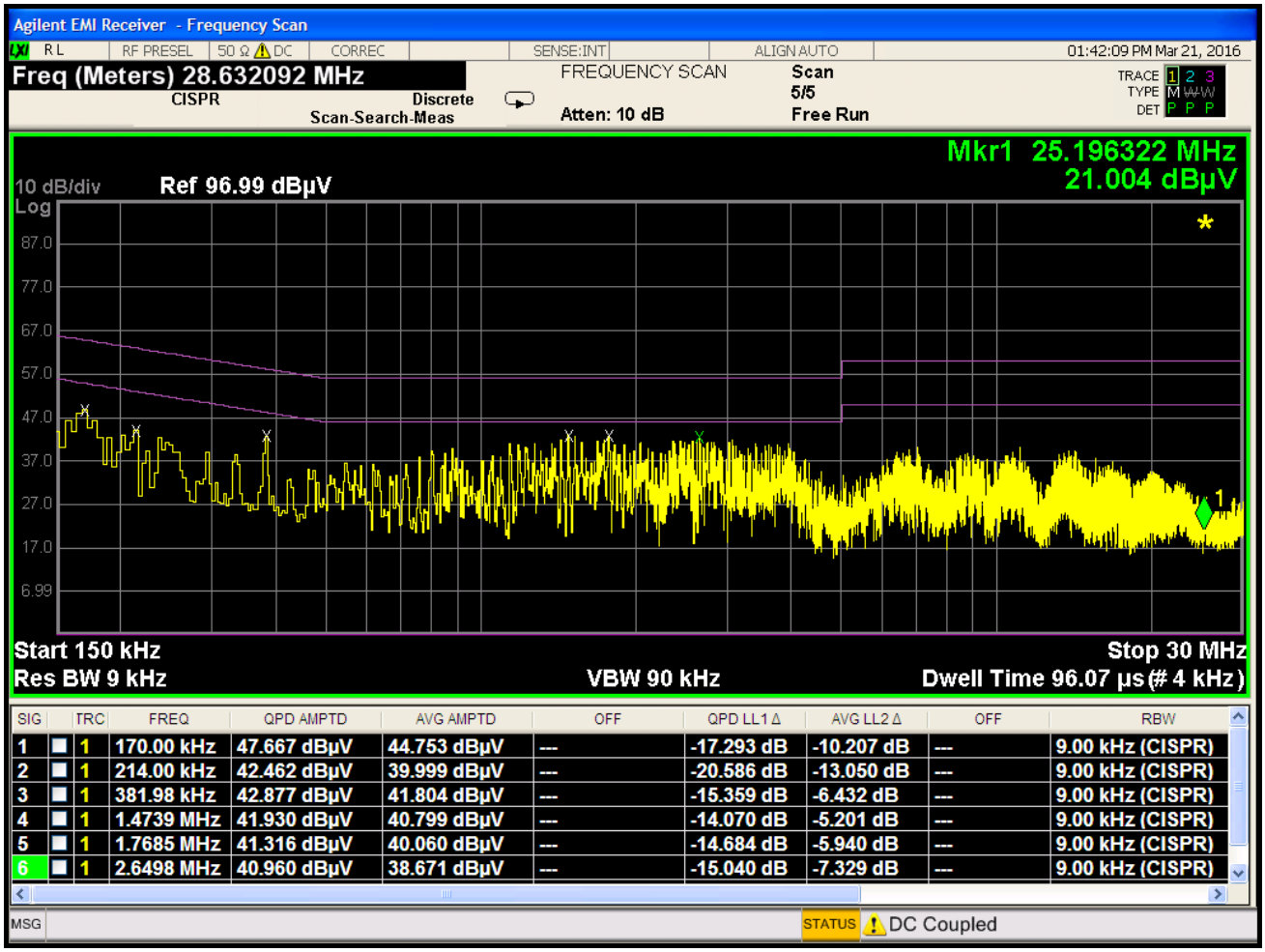
Line-Conducted Test Data

§15.407



SIG		TRC	FREQ	QPD AMPTD	AVG AMPTD	OFF	QPD LL1 Δ	AVG LL2 Δ	OFF	RBW
1	■	1	170.00 kHz	47.667 dBµV	44.753 dBµV	---	-17.293 dB	-10.207 dB	---	9.00 kHz (CISPR)
2	■	1	214.00 kHz	42.462 dBµV	39.999 dBµV	---	-20.586 dB	-13.050 dB	---	9.00 kHz (CISPR)
3	■	1	381.98 kHz	42.877 dBµV	41.804 dBµV	---	-15.359 dB	-6.432 dB	---	9.00 kHz (CISPR)
4	■	1	1.4739 MHz	41.930 dBµV	40.799 dBµV	---	-14.070 dB	-5.201 dB	---	9.00 kHz (CISPR)
5	■	1	1.7685 MHz	41.316 dBµV	40.060 dBµV	---	-14.684 dB	-5.940 dB	---	9.00 kHz (CISPR)
6	■	1	2.6498 MHz	40.960 dBµV	38.671 dBµV	---	-15.040 dB	-7.329 dB	---	9.00 kHz (CISPR)

Plot 7-114. Line Conducted Plot with 802.11a UNII Band 1 (L1)

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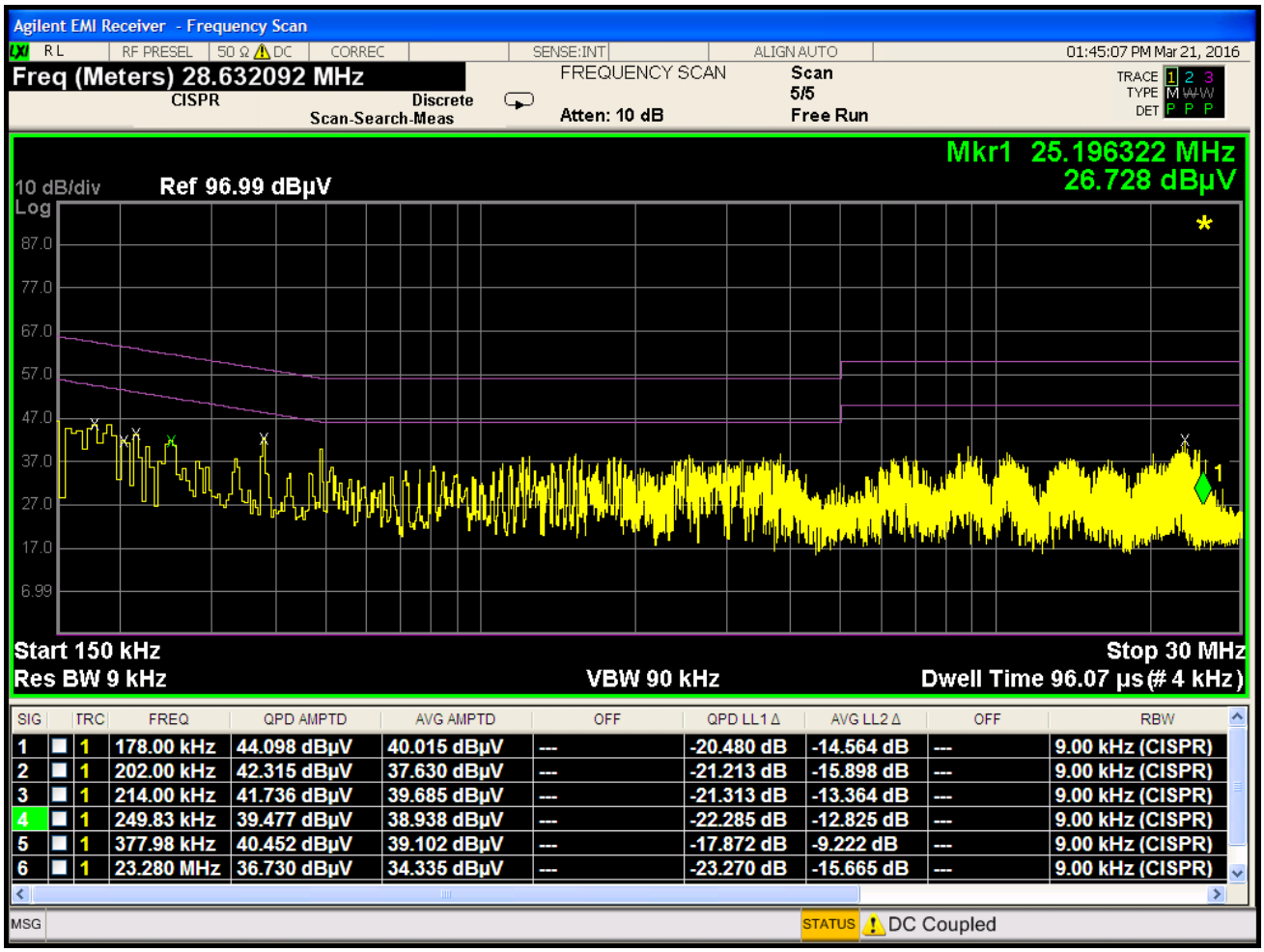
Line-Conducted Test Data

§15.407



SIG		TRC	FREQ	QPD AMPTD	AVG AMPTD	OFF	QPD LL1 Δ	AVG LL2 Δ	OFF	RBW
1	■	1	178.00 kHz	44.098 dBµV	40.015 dBµV	---	-20.480 dB	-14.564 dB	---	9.00 kHz (CISPR)
2	■	1	202.00 kHz	42.315 dBµV	37.630 dBµV	---	-21.213 dB	-15.898 dB	---	9.00 kHz (CISPR)
3	■	1	214.00 kHz	41.736 dBµV	39.685 dBµV	---	-21.313 dB	-13.364 dB	---	9.00 kHz (CISPR)
4	■	1	249.83 kHz	39.477 dBµV	38.938 dBµV	---	-22.285 dB	-12.825 dB	---	9.00 kHz (CISPR)
5	■	1	377.98 kHz	40.452 dBµV	39.102 dBµV	---	-17.872 dB	-9.222 dB	---	9.00 kHz (CISPR)
6	■	1	23.280 MHz	36.730 dBµV	34.335 dBµV	---	-23.270 dB	-15.665 dB	---	9.00 kHz (CISPR)

Plot 7-115. Line Conducted Plot with 802.11a UNII Band 1 (N)

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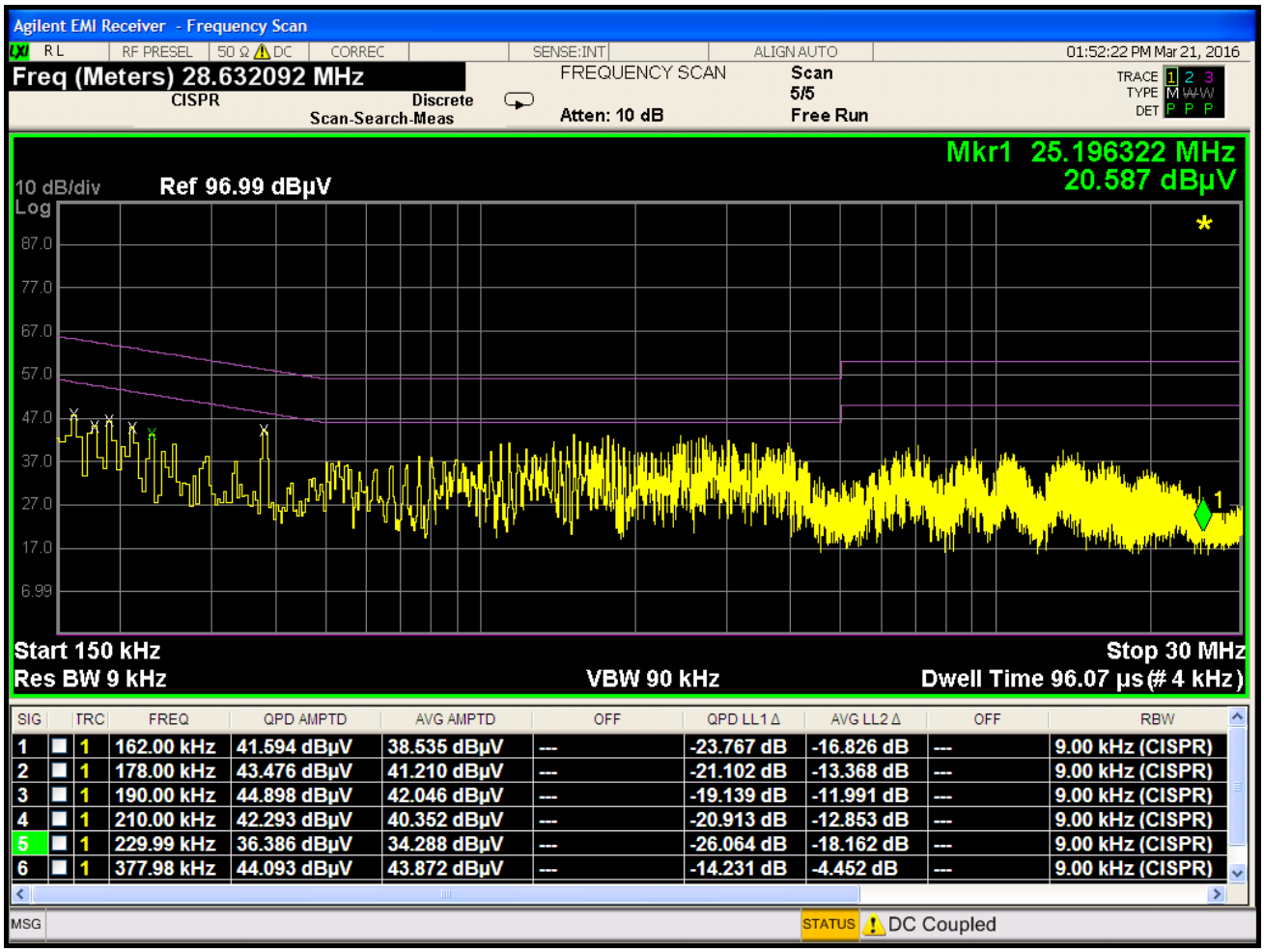
Line-Conducted Test Data

§15.407



SIG		TRC	FREQ	QPD AMPTD	AVG AMPTD	OFF	QPD LL1 Δ	AVG LL2 Δ	OFF	RBW
1	■	1	162.00 kHz	41.594 dBµV	38.535 dBµV	---	-23.767 dB	-16.826 dB	---	9.00 kHz (CISPR)
2	■	1	178.00 kHz	43.476 dBµV	41.210 dBµV	---	-21.102 dB	-13.368 dB	---	9.00 kHz (CISPR)
3	■	1	190.00 kHz	44.898 dBµV	42.046 dBµV	---	-19.139 dB	-11.991 dB	---	9.00 kHz (CISPR)
4	■	1	210.00 kHz	42.293 dBµV	40.352 dBµV	---	-20.913 dB	-12.853 dB	---	9.00 kHz (CISPR)
5	■	1	229.99 kHz	36.386 dBµV	34.288 dBµV	---	-26.064 dB	-18.162 dB	---	9.00 kHz (CISPR)
6	■	1	377.98 kHz	44.093 dBµV	43.872 dBµV	---	-14.231 dB	-4.452 dB	---	9.00 kHz (CISPR)

Plot 7-116. Line Conducted Plot with 802.11a UNII Band 2A (L1)

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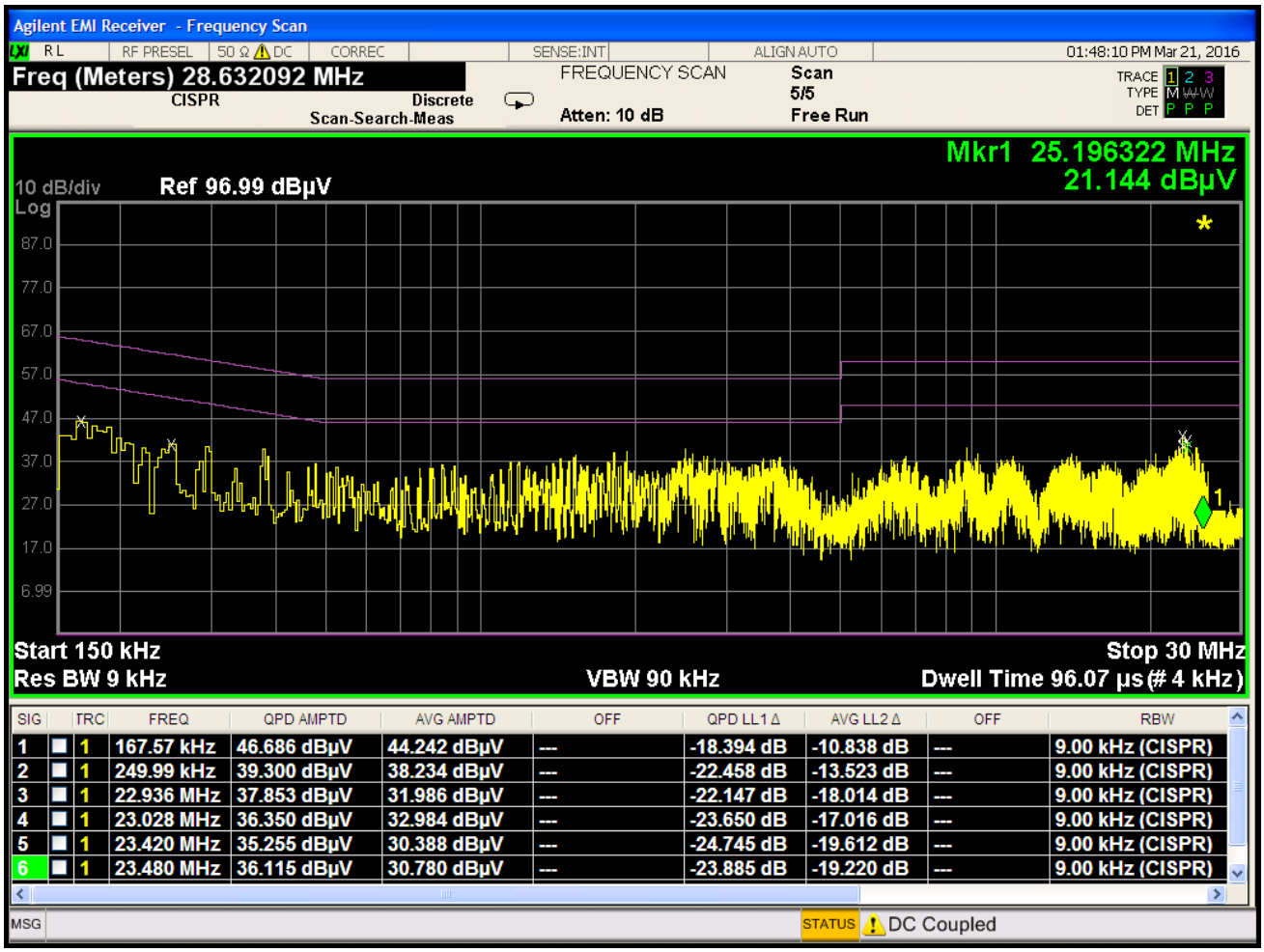
Line-Conducted Test Data

§15.407



SIG		TRC	FREQ	QPD AMPTD	AVG AMPTD	OFF	QPD LL1 Δ	AVG LL2 Δ	OFF	RBW
1	■	1	167.57 kHz	46.686 dBµV	44.242 dBµV	---	-18.394 dB	-10.838 dB	---	9.00 kHz (CISPR)
2	■	1	249.99 kHz	39.300 dBµV	38.234 dBµV	---	-22.458 dB	-13.523 dB	---	9.00 kHz (CISPR)
3	■	1	22.936 MHz	37.853 dBµV	31.986 dBµV	---	-22.147 dB	-18.014 dB	---	9.00 kHz (CISPR)
4	■	1	23.028 MHz	36.350 dBµV	32.984 dBµV	---	-23.650 dB	-17.016 dB	---	9.00 kHz (CISPR)
5	■	1	23.420 MHz	35.255 dBµV	30.388 dBµV	---	-24.745 dB	-19.612 dB	---	9.00 kHz (CISPR)
6	■	1	23.480 MHz	36.115 dBµV	30.780 dBµV	---	-23.885 dB	-19.220 dB	---	9.00 kHz (CISPR)

Plot 7-117. Line Conducted Plot with 802.11a UNII Band 2A (N)

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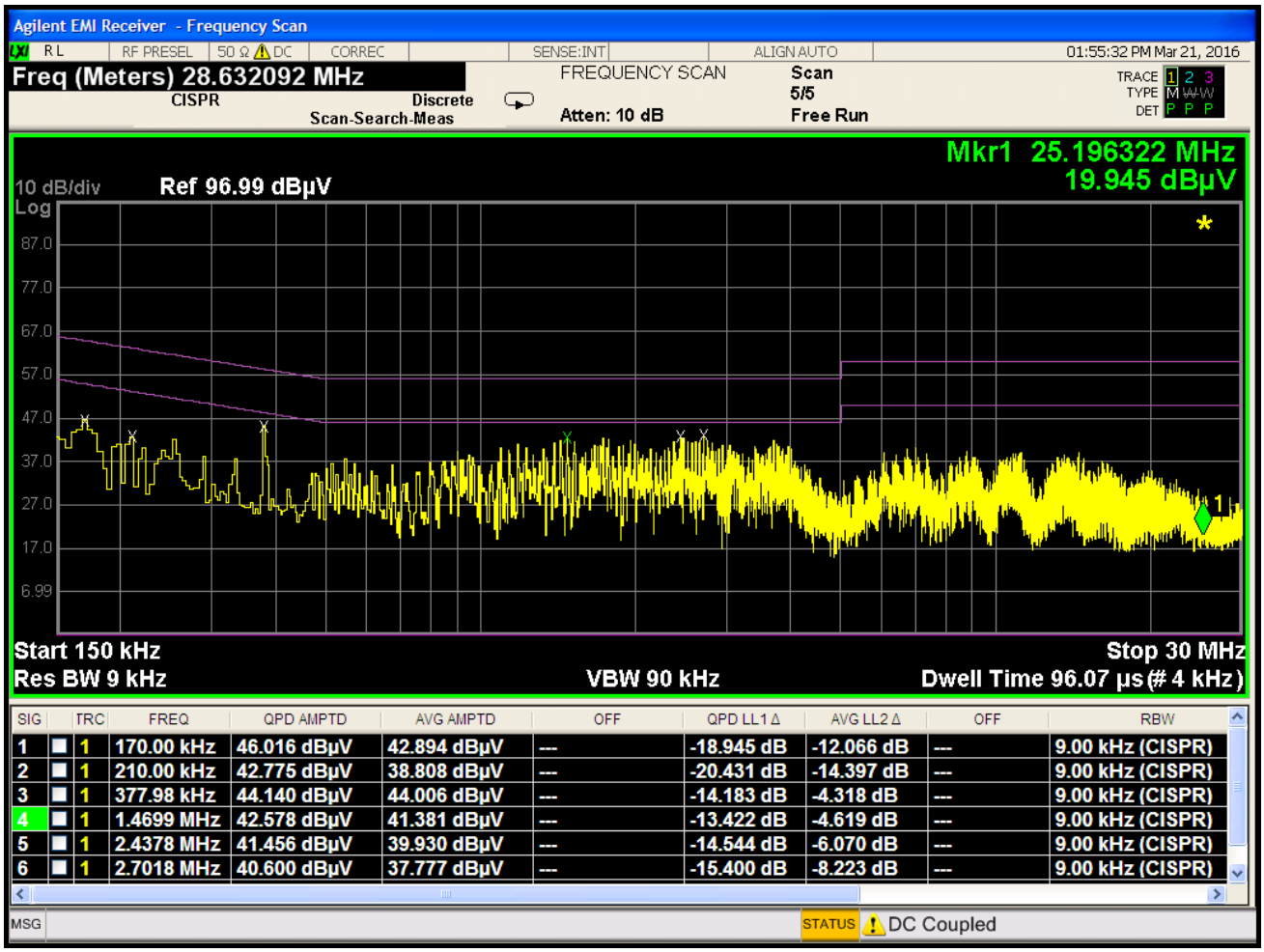
Line-Conducted Test Data

§15.407



SIG		TRC	FREQ	QPD AMPTD	AVG AMPTD	OFF	QPD LL1 Δ	AVG LL2 Δ	OFF	RBW
1	■	1	170.00 kHz	46.016 dBµV	42.894 dBµV	---	-18.945 dB	-12.066 dB	---	9.00 kHz (CISPR)
2	■	1	210.00 kHz	42.775 dBµV	38.808 dBµV	---	-20.431 dB	-14.397 dB	---	9.00 kHz (CISPR)
3	■	1	377.98 kHz	44.140 dBµV	44.006 dBµV	---	-14.183 dB	-4.318 dB	---	9.00 kHz (CISPR)
4	■	1	1.4699 MHz	42.578 dBµV	41.381 dBµV	---	-13.422 dB	-4.619 dB	---	9.00 kHz (CISPR)
5	■	1	2.4378 MHz	41.456 dBµV	39.930 dBµV	---	-14.544 dB	-6.070 dB	---	9.00 kHz (CISPR)
6	■	1	2.7018 MHz	40.600 dBµV	37.777 dBµV	---	-15.400 dB	-8.223 dB	---	9.00 kHz (CISPR)

Plot 7-118. Line Conducted Plot with 802.11a UNII Band 2C (L1)

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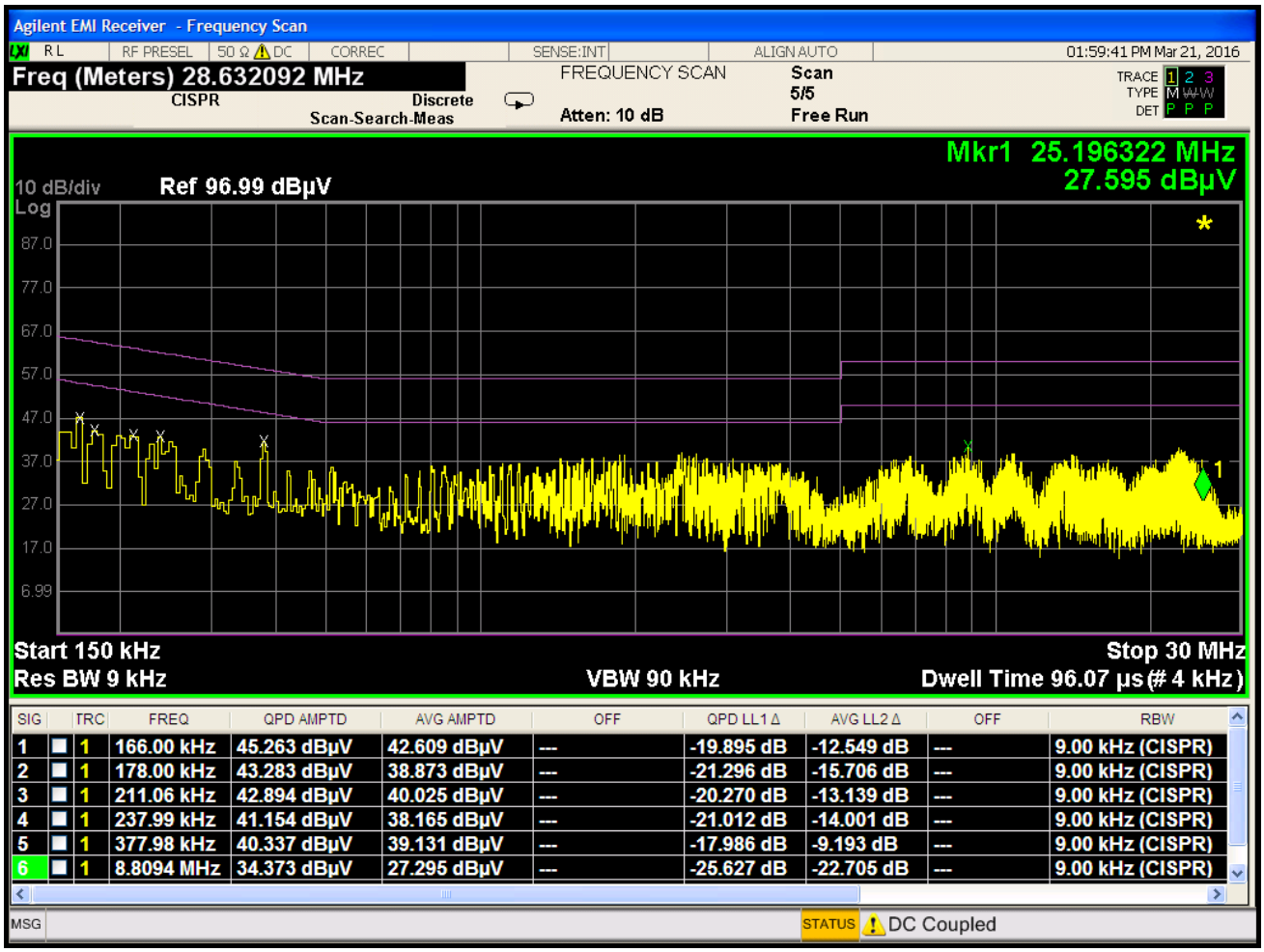
Line-Conducted Test Data

§15.407



SIG		TRC	FREQ	QPD AMPTD	AVG AMPTD	OFF	QPD LL1 Δ	AVG LL2 Δ	OFF	RBW
1	■	1	166.00 kHz	45.263 dBµV	42.609 dBµV	---	-19.895 dB	-12.549 dB	---	9.00 kHz (CISPR)
2	■	1	178.00 kHz	43.283 dBµV	38.873 dBµV	---	-21.296 dB	-15.706 dB	---	9.00 kHz (CISPR)
3	■	1	211.06 kHz	42.894 dBµV	40.025 dBµV	---	-20.270 dB	-13.139 dB	---	9.00 kHz (CISPR)
4	■	1	237.99 kHz	41.154 dBµV	38.165 dBµV	---	-21.012 dB	-14.001 dB	---	9.00 kHz (CISPR)
5	■	1	377.98 kHz	40.337 dBµV	39.131 dBµV	---	-17.986 dB	-9.193 dB	---	9.00 kHz (CISPR)
6	■	1	8.8094 MHz	34.373 dBµV	27.295 dBµV	---	-25.627 dB	-22.705 dB	---	9.00 kHz (CISPR)

Plot 7-119. Line Conducted Plot with 802.11a UNII Band 2C (N)

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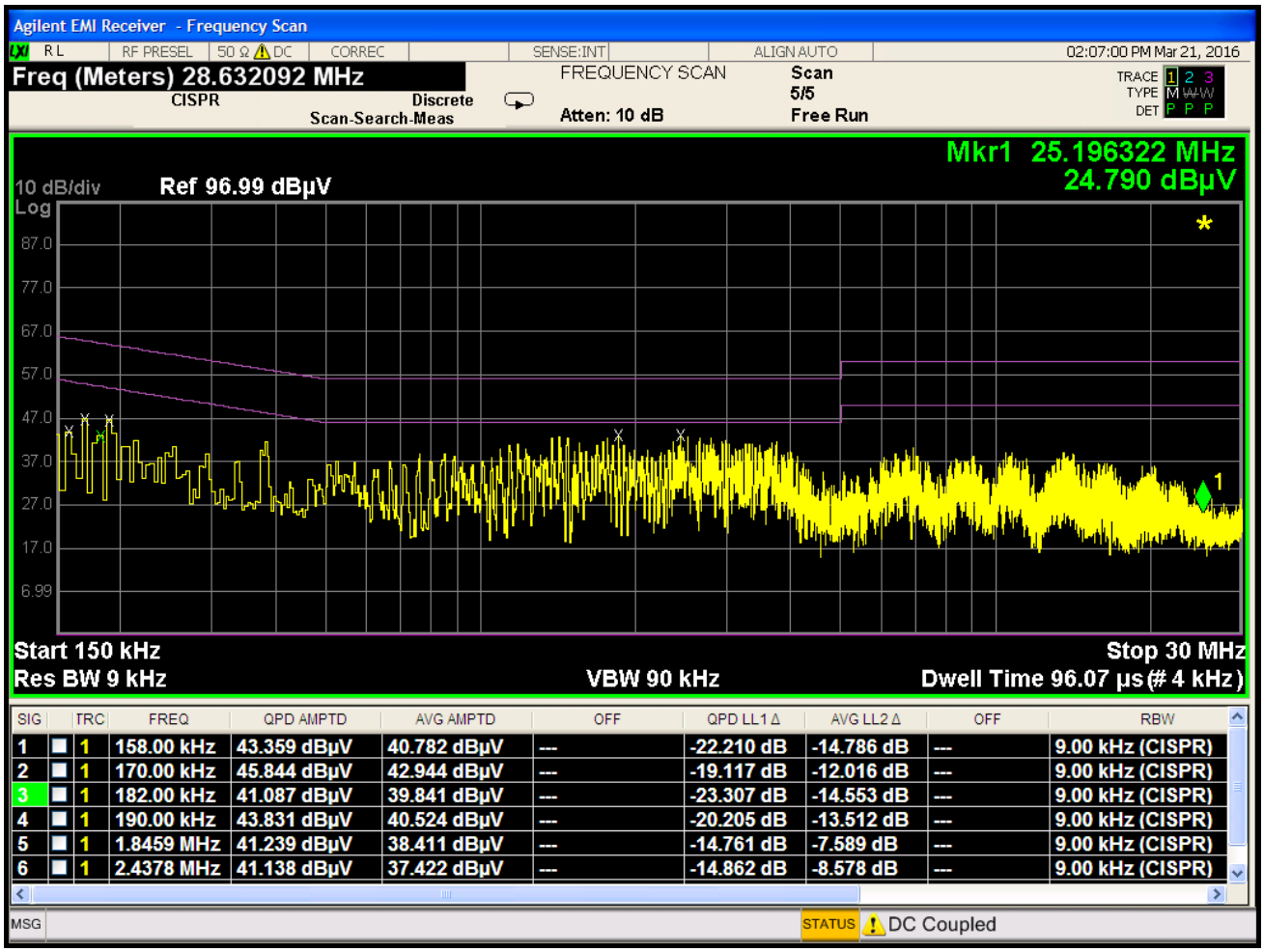
Line-Conducted Test Data

§15.407



SIG		TRC	FREQ	QPD AMPTD	AVG AMPTD	OFF	QPD LL1 Δ	AVG LL2 Δ	OFF	RBW
1	■	1	158.00 kHz	43.359 dBµV	40.782 dBµV	---	-22.210 dB	-14.786 dB	---	9.00 kHz (CISPR)
2	■	1	170.00 kHz	45.844 dBµV	42.944 dBµV	---	-19.117 dB	-12.016 dB	---	9.00 kHz (CISPR)
3	■	1	182.00 kHz	41.087 dBµV	39.841 dBµV	---	-23.307 dB	-14.553 dB	---	9.00 kHz (CISPR)
4	■	1	190.00 kHz	43.831 dBµV	40.524 dBµV	---	-20.205 dB	-13.512 dB	---	9.00 kHz (CISPR)
5	■	1	1.8459 MHz	41.239 dBµV	38.411 dBµV	---	-14.761 dB	-7.589 dB	---	9.00 kHz (CISPR)
6	■	1	2.4378 MHz	41.138 dBµV	37.422 dBµV	---	-14.862 dB	-8.578 dB	---	9.00 kHz (CISPR)

Plot 7-120. Line Conducted Plot with 802.11a UNII Band 3 (L1)

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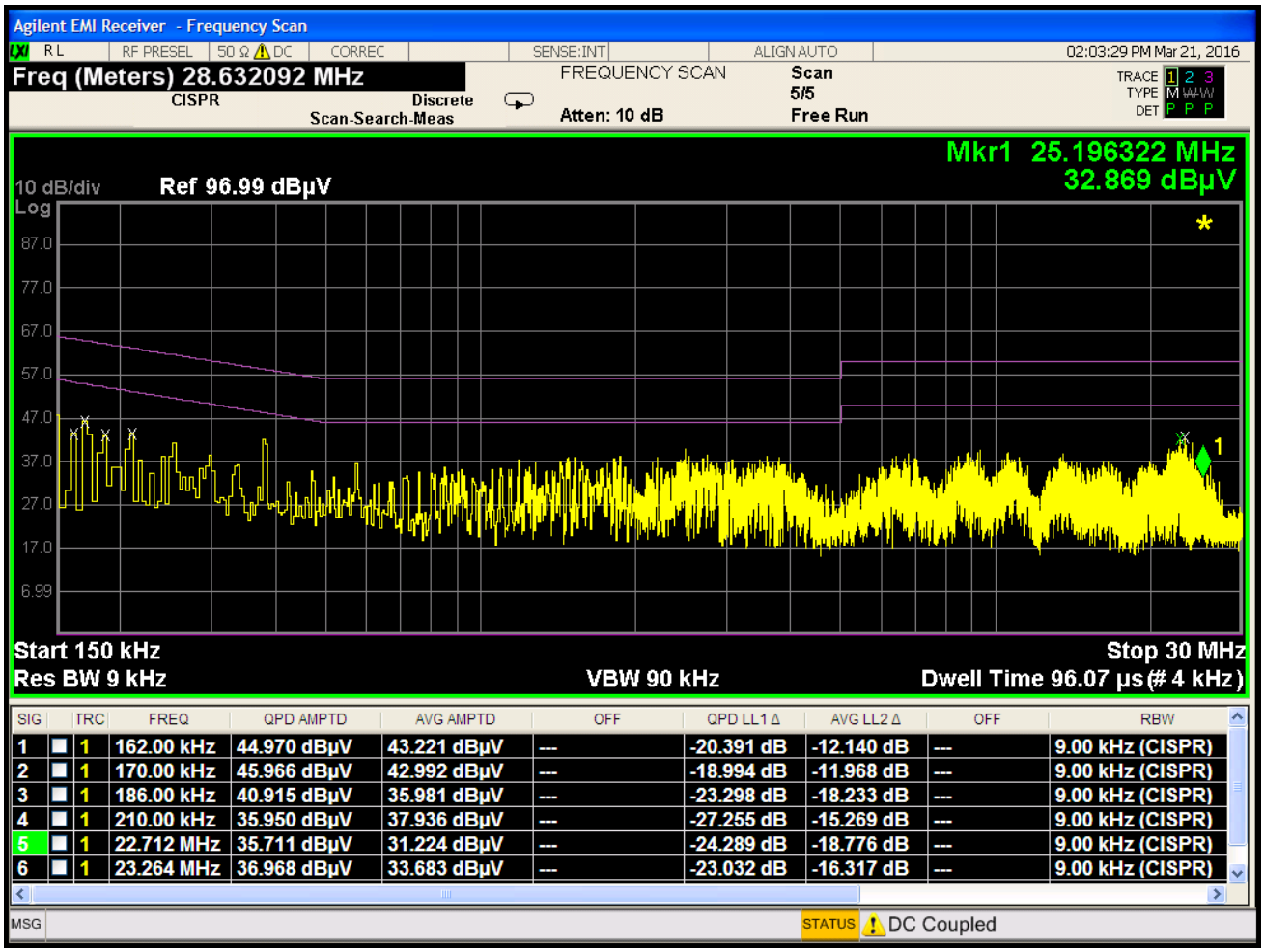
Line-Conducted Test Data

§15.407



SIG	TRC	FREQ	QPD AMPTD	AVG AMPTD	OFF	QPD LL1 Δ	AVG LL2 Δ	OFF	RBW
1	1	162.00 kHz	44.970 dBµV	43.221 dBµV	---	-20.391 dB	-12.140 dB	---	9.00 kHz (CISPR)
2	1	170.00 kHz	45.966 dBµV	42.992 dBµV	---	-18.994 dB	-11.968 dB	---	9.00 kHz (CISPR)
3	1	186.00 kHz	40.915 dBµV	35.981 dBµV	---	-23.298 dB	-18.233 dB	---	9.00 kHz (CISPR)
4	1	210.00 kHz	35.950 dBµV	37.936 dBµV	---	-27.255 dB	-15.269 dB	---	9.00 kHz (CISPR)
5	1	22.712 MHz	35.711 dBµV	31.224 dBµV	---	-24.289 dB	-18.776 dB	---	9.00 kHz (CISPR)
6	1	23.264 MHz	36.968 dBµV	33.683 dBµV	---	-23.032 dB	-16.317 dB	---	9.00 kHz (CISPR)

Plot 7-121. Line Conducted Plot with 802.11a UNII Band 3 (N)

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8.0 CONCLUSION

The data collected relate only the item(s) tested and show that the **Samsung Portable Tablet FCC ID: A3LSMT580** is in compliance with Part 15E of the FCC Rules.

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