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MEASUREMENT REPORT
FCC Part 15.407 / ISED RSS-247 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:
5/9-6/13/2018
Test Site/Location:
PCTEST Lab. Columbia, MD, USA
Test Report Serial No.:
1M1805080100-03.A3L

FCC ID:	**A3LETWV525**
IC:	**649E-ETWV525**
APPLICANT:	**Samsung Electronics Co., Ltd.**

Application Type:	Certification
Model / HVIN:	ET-WV525
EUT Type:	Indoor Access Point
Frequency Range:	5180 – 5825MHz
FCC Classification:	Unlicensed National Information Infrastructure (UNII)
FCC Rule Part(s):	Part 15.407
ISED Specification:	RSS-247 Issue 2
Test Procedure(s):	ANSI C63.10-2013, KDB 789033 D02 v02r01 KDB 662911 D01 v02r01

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 ANSI C63.10-2013 and KDB 789033 D02 v02r01. 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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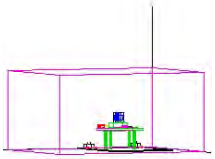
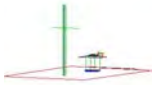


MEASUREMENT REPORT



UNII Band	Channel Bandwidth (MHz)	Tx Frequency (MHz)	ANT1		ANT2		MIMO / CDD	
			Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)
1	20	5180 - 5240	122.744	20.89	121.339	20.84	62.379	17.95
3		5745 - 5825	198.153	22.97	198.609	22.98	396.762	25.99
1	40	5190 - 5230	179.887	22.55	199.067	22.99	65.258	18.15
3		5755 - 5795	198.153	22.97	189.671	22.78	387.823	25.89
1	80	5210	65.917	18.19	68.391	18.35	70.078	18.46
3		5775	90.991	19.59	89.743	19.53	180.734	22.57

EUT Overview

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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 Innovation, Science and Economic Development Canada.

1.2 PCTEST Test Location

These measurement tests were conducted at the PCTEST Engineering Laboratory, Inc. facility located at 7185 Oakland Mills Road, Columbia, MD 21046. The measurement facility is compliant with the test site requirements specified in ANSI C63.4-2014.

1.3 Test Facility / Accreditations

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

- PCTEST is an ISO 17025-2005 accredited test facility under the American Association for Laboratory Accreditation (A2LA) with Certificate number 2041.01 for Specific Absorption Rate (SAR), Hearing Aid Compatibility (HAC) testing, where applicable, and Electromagnetic Compatibility (EMC) testing for FCC and Innovation, Science, and Economic Development Canada rules.

- PCTEST TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC 17065-2012 by A2LA (Certificate number 2041.03) in all scopes of FCC Rules and ISED Standards (RSS).

- PCTEST facility is a registered (2451B) test laboratory with the site description on file with ISED.

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2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Indoor Access Point FCC ID: A3LETWV525**. The test data contained in this report pertains only to the emissions due to the EUT's UNII transmitter.

Test Device Serial No.: 5HX3S, 79YX3S, 1VX3S, AWX3S, BNX3S, 6PX3S, 5HX3S

2.2 Device Capabilities

This device contains the following capabilities:

802.11b/g/n/ac WLAN, 802.11a/n/ac UNII, Bluetooth (LE), Zigbee, Zwave

Band 1		Band 3	
Ch.	**Frequency (MHz)**	**Ch.**	**Frequency (MHz)**
36	5180	149	5745
:	:	:	:
42	5210	157	5785
:	:	:	:
48	5240	165	5825

Table 2-1. 802.11a (20MHz) Frequency / Channel Operations

Band 1		Band 3	
Ch.	**Frequency (MHz)**	**Ch.**	**Frequency (MHz)**
38	5190	151	5755
:	:	:	:
46	5230	159	5795

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

Band 1		Band 3	
Ch.	**Frequency (MHz)**	**Ch.**	**Frequency (MHz)**
42	5210	155	5775

Table 2-3. 802.11ac (80MHz BW) Frequency / Channel Operations

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Notes:

1. 5GHz NII operation is possible in 20MHz channel bandwidth. 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 ANSI C63.10-2013 and KDB 789033 D02 v02r01. The RBW and VBW were both greater than 50/T, where T is the minimum transmission duration, and the number of sweep points across T was greater than 100. The duty cycles are as follows:

Maximum Achievable Duty Cycles				
802.11 Mode/Band		Duty Cycle [%]		
		ANT1	ANT2	MIMO / CDD
5GHz	a	97.9	97.1	97.9
	n (HT20)	97.9	97.1	97.9
	ac (HT20)	97.9	97.1	97.9
	n (HT40)	98.1	90.1	98.7
	ac (HT40)	98.1	90.1	98.7
	ac (HT80)	82.8	94.2	97.0

Table 2-4. Measured Duty Cycles

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

WiFi Configurations		SISO		SDM		CDD	
		ANT1	ANT2	ANT1	ANT2	ANT1	ANT2
5GHz	11a	✓	✓	×	×	✓	✓
	11n (20MHz)	✓	✓	✓	✓	✓	✓
	11n (40MHz)	✓	✓	✓	✓	✓	✓
	11ac (80MHz)	✓	✓	✓	✓	✓	✓

Table 2-5. Frequency / Channel Operations

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

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)
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)
13/14.4, 26.28.9, 39/43.3, 52/57.8, 78/86.7, 104/115.6, 117/130, 130/144.4MBps (MIMO n/ac – 20MHz) 156/173Mbps (MIMO ac – 20MHz)
58.5/65, 117/130, 175.5/195, 234/260, 351/390, 468/520, 526.5/585, 585/650, 702/780, 780/866.7Mbps (MIMO ac – 80MHz)

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

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

Description	2.4 GHz Emission	5 GHz Emission
Antenna	1	2
Channel	6	40
Operating Frequency (MHz)	2437	5200
Data Rate (Mbps)	1	6
Mode	b	a

Table 2-6. Config-1 (ANT1 2.4GHz & ANT2 5GHz)

Configuration 2: ANT1 transmitting in 5GHz mode and ANT2 in 2.4GHz mode

Description	2.4 GHz Emission	5 GHz Emission
Antenna	2	1
Channel	6	40
Operating Frequency (MHz)	2437	5200
Data Rate (Mbps)	1	6
Mode	b	a

Table 2-7. Config-2 (ANT1 5GHz & ANT2 2.4GHz)

Configuration 3: ANT1 and ANT2 both transmitting in 2.4GHz and 5GHz modes simultaneously

Description	2.4 GHz Emission	5 GHz Emission
Antenna	1, 2	1, 2
Channel	6	40
Operating Frequency (MHz)	2437	5200
Data Rate (Mbps)	1	6
Mode	b	a

Table 2-8. Config-3 (ANT1 MIMO & ANT2 MIMO)

2.3 Test Configuration

The EUT was tested per the guidance of KDB 789033 D02 v02r01. 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 of Procedures for Compliance Testing of Unlicensed Wireless Devices (ANSI C63.10-2013) and the guidance provided in KDB 789033 D02 v02r01 were used in the measurement of the EUT.

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. 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 7.8. The EMI Receiver mode of the Agilent MXE was used to perform AC line conducted emissions testing.

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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. 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. An 80cm tall test table made of Styrodur is placed on top of the turn table. For measurements above 1GHz, an additional Styrodur pedestal is placed on top of the test table to bring the total table height to 1.5m.

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

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

3.4 Environmental Conditions

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

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4.0 ANTENNA REQUIREMENTS

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

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

Conclusion:

The EUT complies with the requirement of §15.203.

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5.0 MEASUREMENT UNCERTAINTY

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

Contribution	Expanded Uncertainty (±dB)
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). Measurements antennas used during testing were calibrated in accordance to the requirements of ANSI C63.5-2017.

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	WL25-1	Conducted Cable Set (25GHz)	6/14/2017	Annual	6/14/2018	WL25-1
Agilent	N9020A	MXA Signal Analyzer	1/24/2018	Annual	1/24/2019	US46470561
Agilent	N9030A	PXA Signal Analyzer (44GHz)	5/25/2018	Annual	5/25/2019	MY52350166
Emco	3115	Horn Antenna (1-18GHz)	3/28/2018	Biennial	3/28/2020	9704-5182
EMCO	3160-09	Small Horn (18 - 26.5GHz)	8/23/2016	Biennial	8/23/2018	135427
EMCO	3160-10	Small Horn (26.5 - 40GHz)	8/23/2016	Biennial	8/23/2018	130993
Keysight Technologies	N9038A	MXE EMI Receiver (3Hz-44GHz)	4/30/2018	Annual	4/30/2019	MY5640070
Pasternack	NMLC-2	Line Conducted Emissions Cable (NM)	1/23/2018	Annual	1/23/2019	NMLC-2
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	7/31/2017	Annual	7/31/2018	100348
Rohde & Schwarz	FSW67	Signal / Spectrum Analyzer	8/11/2017	Annual	8/11/2018	103200
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	7/3/2017	Annual	7/3/2018	102134
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	7/3/2017	Annual	7/3/2018	102133
Rohde & Schwarz	TS-PR8	Preamplifier (30MHz-8GHz)	10/19/2017	Annual	10/19/2018	102324
Rohde & Schwarz	TS-PR26	18-26.5 GHz Pre-Amplifier	1/24/2018	Annual	1/24/2019	100040
Rohde & Schwarz	TS-PR40	26.5-40 GHz Pre-Amplifier	1/24/2018	Annual	1/24/2019	100037
Seekonk	NC-100	Torque Wrench 5/16", 8" lbs	1/22/2018	Annual	1/22/2019	N/A
Solar Electronics	8012-50-R-24-BNC	Line Impedance Stabilization Network	8/14/2017	Biennial	8/14/2019	310233
Sunol	DRH-118	Horn Antenna (1-18GHz)	8/11/2017	Biennial	8/11/2019	A050307
Sunol Sciences	JB6	JB6 Antenna	9/27/2016	Biennial	9/27/2018	A082816

Table 6-1. Annual Test Equipment Calibration Schedule

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7.0 TEST RESULTS

7.1 Summary

Company Name: Samsung Electronics Co., Ltd.
FCC ID: A3LETWV525
IC: 649E-ETWV525
FCC Classification: Unlicensed National Information Infrastructure (UNII)

FCC Part Section(s)	RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
N/A	RSS-Gen [6.6]	26dB Bandwidth	N/A	CONDUCTED	PASS	Section 7.2
15.407(e)	RSS-Gen [6.6]	6dB Bandwidth	>500kHz(5725-5850MHz)		PASS	Section 7.3
15.407 (a.1.iv), (a.2), (a.3)	RSS-247 [6.2]	Maximum Conducted Output Power	Maximum conducted powers must meet the limits detailed in 15.407 (a) (RSS-247 [6.2])		PASS	Section 7.4
15.407 (a.1.iv), (a.2), (a.3)	RSS-247 [6.2]	Maximum Power Spectral Density	Maximum power spectral density must meet the limits detailed in 15.407 (a) (RSS-247 [6.2])		PASS	Section 7.5
15.407(b.1), (2), (3), (4)	RSS-247 [6.2]	Undesirable Emissions	Undesirable emissions must meet the limits detailed in 15.407(b) (RSS-247 [6.2])	RADIATED	PASS	Section 7.6
15.205, 15.407(b.1), (4), (5), (6)	RSS-Gen [8.9]	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209 (RSS-Gen [8.9])		PASS	Section 7.6, 7.7
15.407	RSS-Gen [8.8]	AC Conducted Emissions 150kHz – 30MHz	< FCC 15.207 (RSS-Gen [8.8]) limits	LINE CONDUCTED	PASS	Section 7.8

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 4.6.
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 0.2.8.

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

RSS-Gen [6.2]

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 ANSI C63.10-2013 and KDB 789033 D02 v02r01, 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

ANSI C63.10-2013 – Section 12.4
KDB 789033 D02 v02r01 – 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.

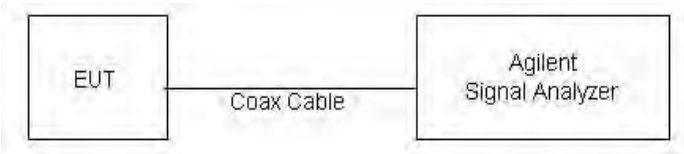

Figure 7-1. Test Instrument & Measurement Setup

Test Notes

None.

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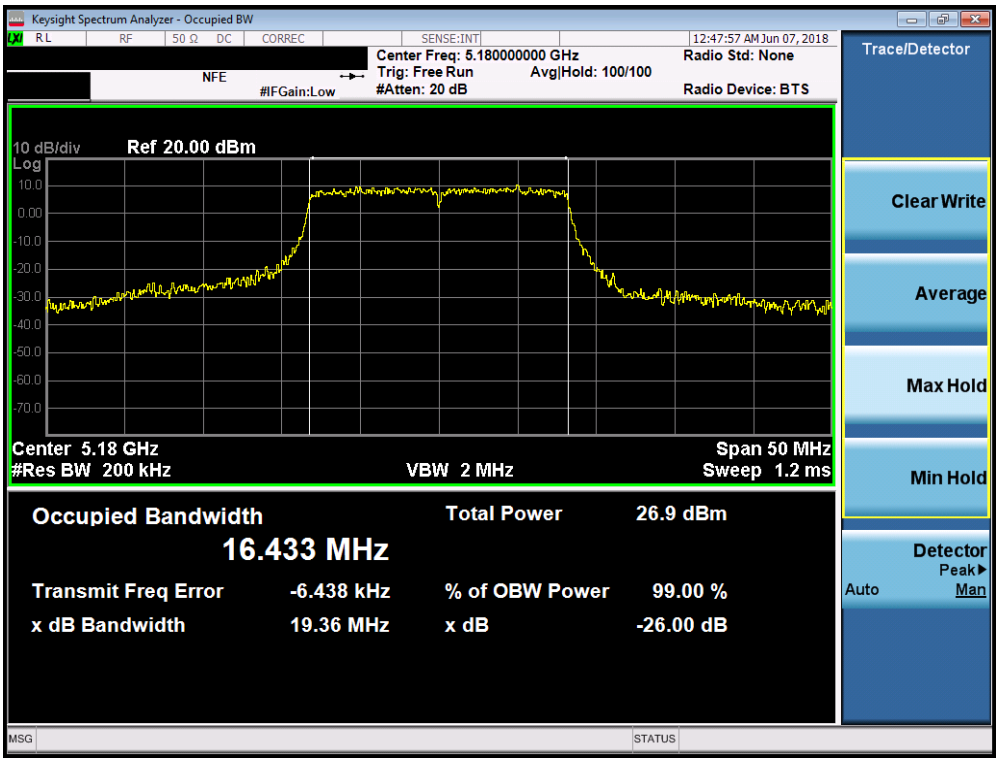
Antenna-1 26 dB Bandwidth Measurements

	Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	Measured 26dB Bandwidth [MHz]
Band 1	5180	36	a	6	19.36
	5200	40	a	6	20.21
	5240	48	a	6	19.76
	5180	36	n (20MHz)	6.5/7.2 (MCS0)	19.85
	5200	40	n (20MHz)	6.5/7.2 (MCS0)	20.35
	5240	48	n (20MHz)	6.5/7.2 (MCS0)	20.16
	5190	38	n (40MHz)	13.5/15 (MCS0)	39.97
	5230	46	n (40MHz)	13.5/15 (MCS0)	39.31
	5210	42	ac (80MHz)	29.3/32.5 (MCS0)	83.77

Table 7-2. Conducted Bandwidth Measurements



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

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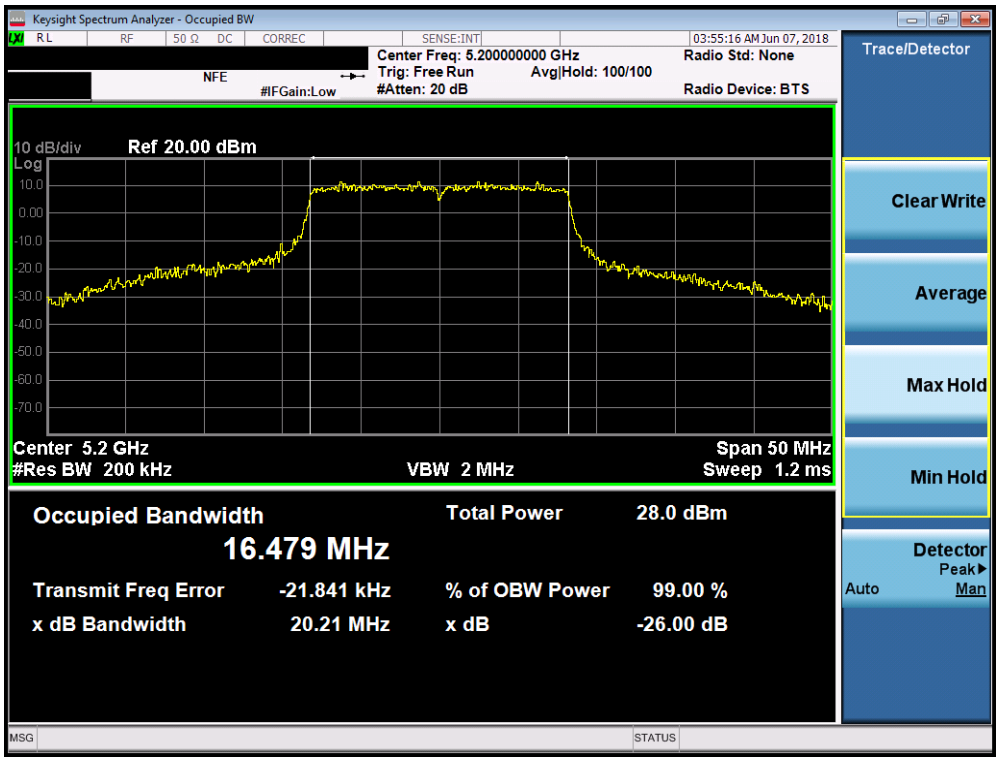
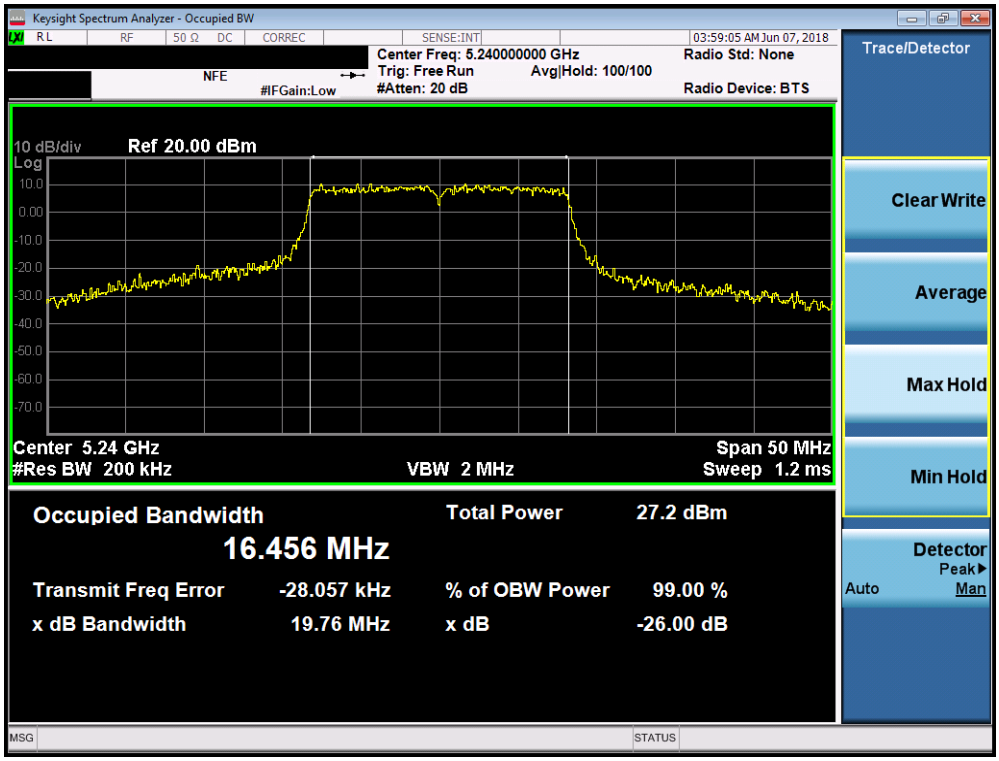


Plot 7-2. 26dB Bandwidth Plot (802.11a (UNII Band 1) – Ch. 40)



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

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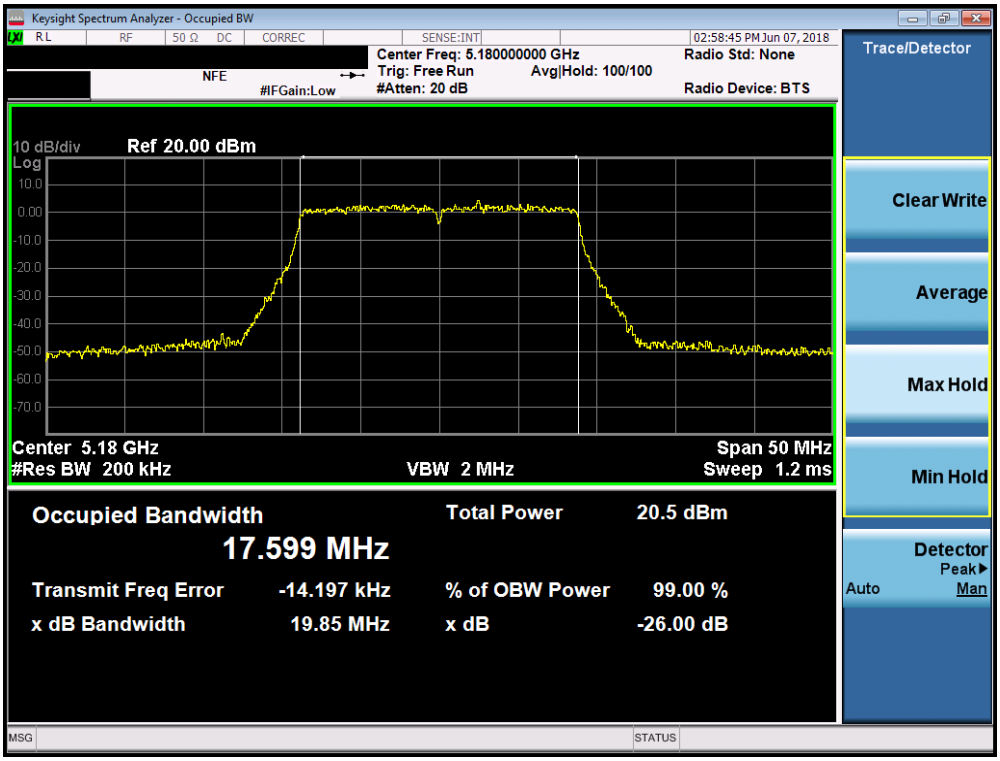
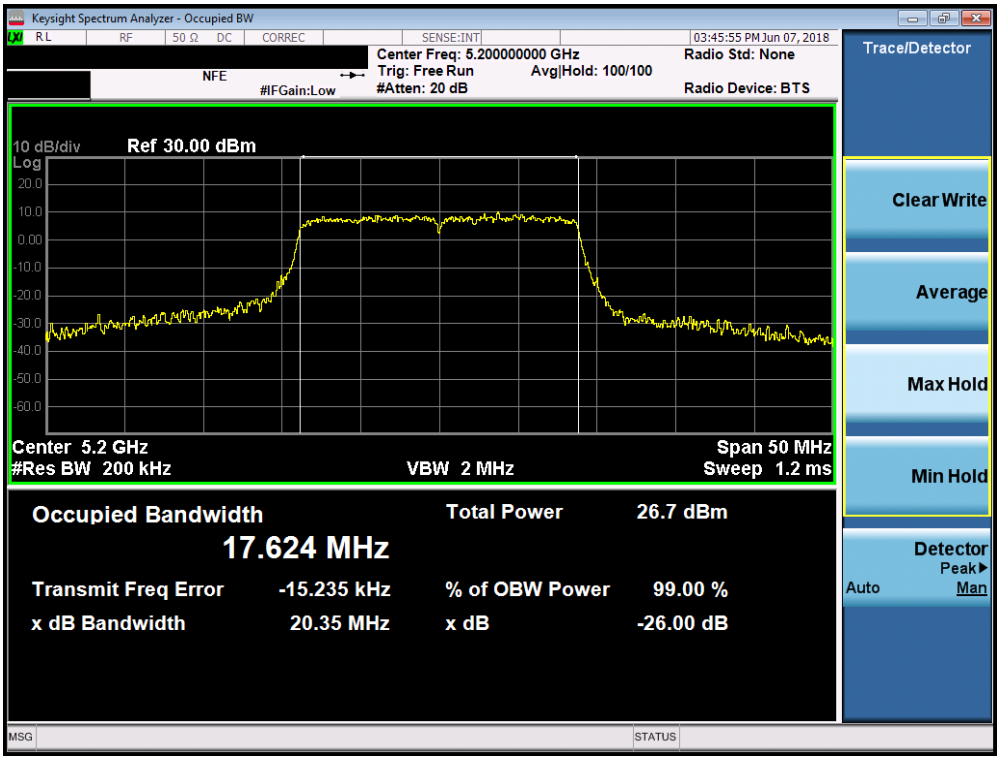


Plot 7-4. 26dB Bandwidth Plot (20MHz 802.11n (UNII Band 1) – Ch. 36)



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

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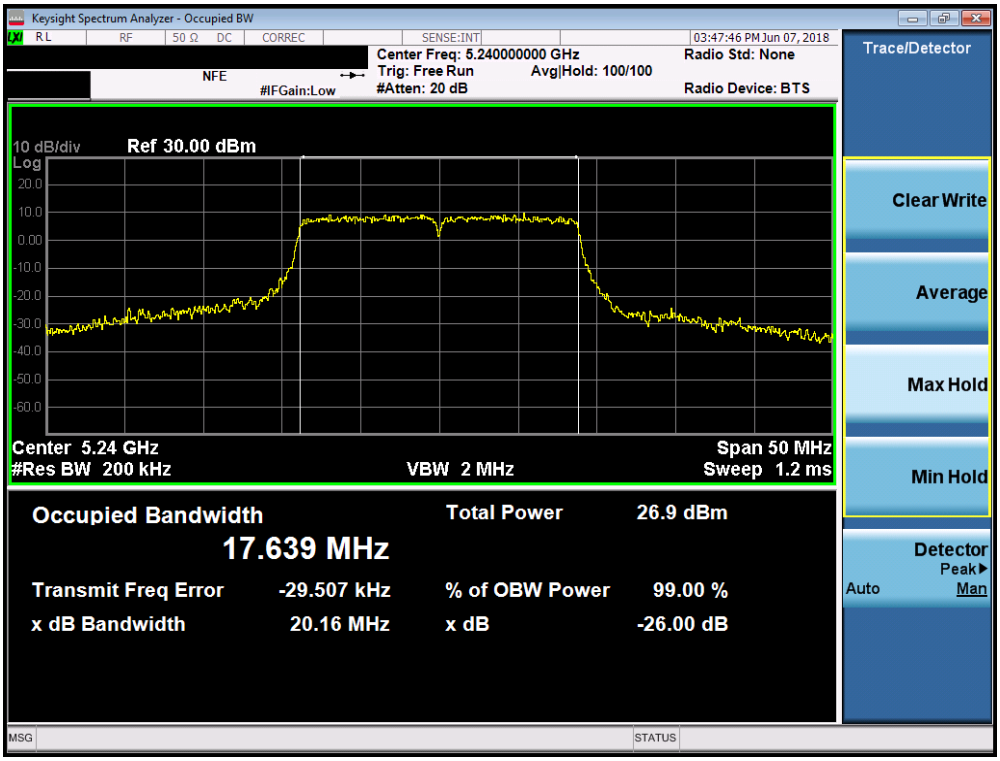
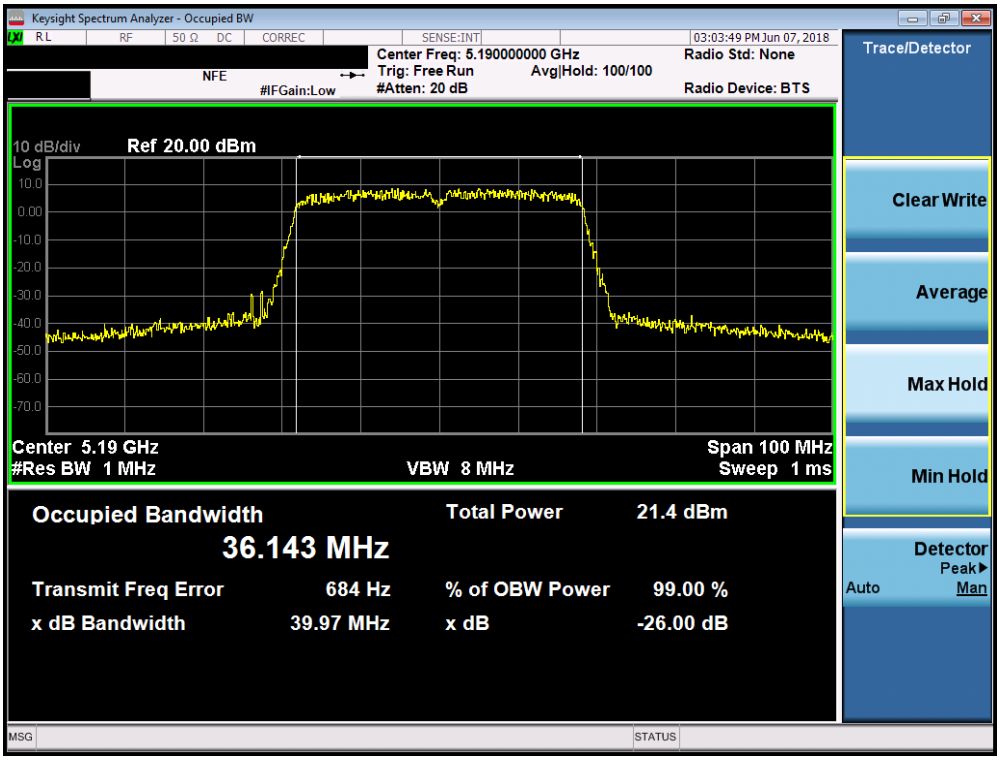


Plot 7-6. 26dB Bandwidth Plot (20MHz 802.11n (UNII Band 1) – Ch. 48)



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

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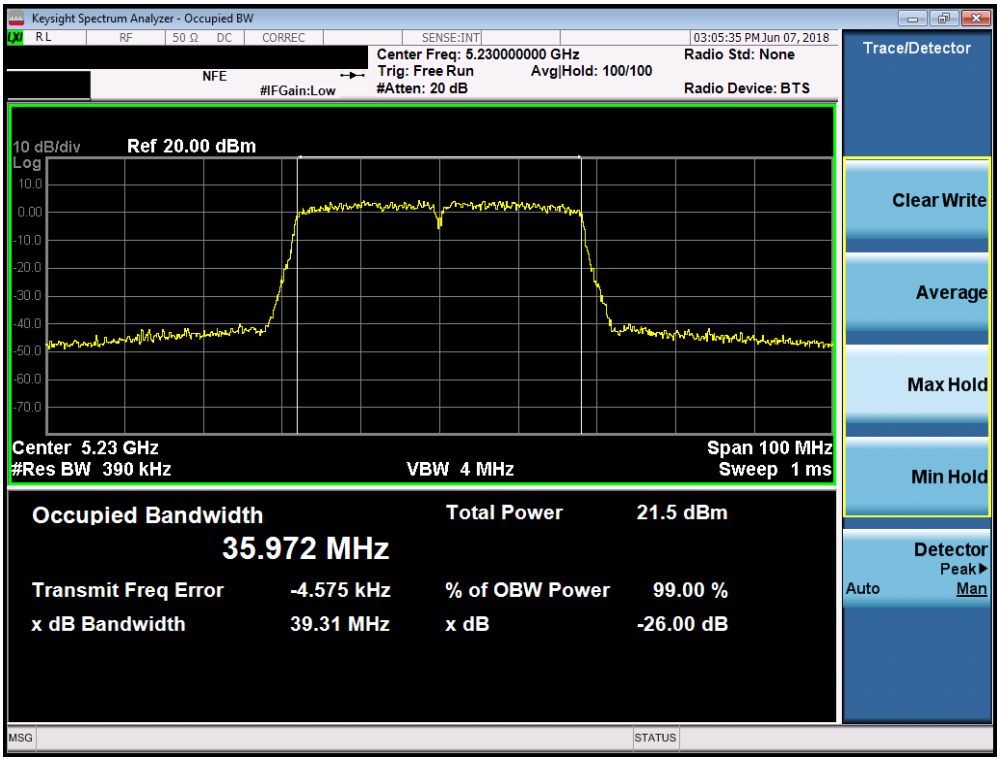
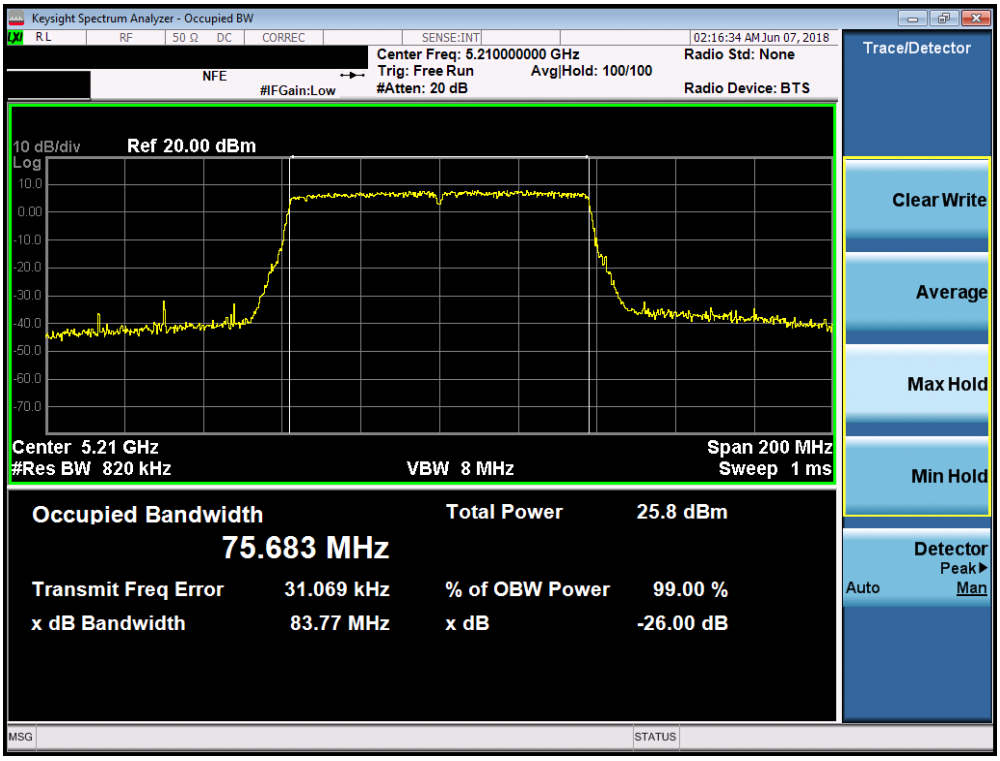


Plot 7-8. 26dB Bandwidth Plot (40MHz 802.11n (UNII Band 1) – Ch. 46)



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

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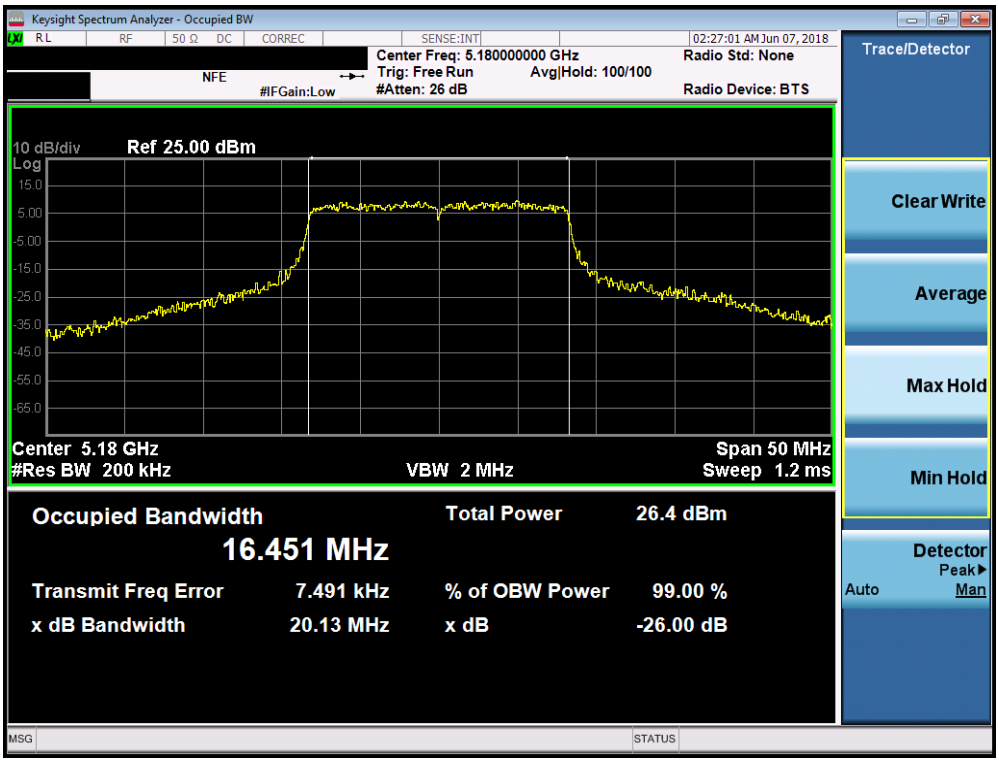
Antenna-2 26dB Bandwidth Measurements

	Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	Measured 26dB Bandwidth [MHz]
Band 1	5180	36	a	6	20.13
	5200	40	a	6	19.03
	5240	48	a	6	20.02
	5180	36	n (20MHz)	6.5/7.2 (MCS0)	19.74
	5200	40	n (20MHz)	6.5/7.2 (MCS0)	19.93
	5240	48	n (20MHz)	6.5/7.2 (MCS0)	19.85
	5190	38	n (40MHz)	13.5/15 (MCS0)	38.99
	5230	46	n (40MHz)	13.5/15 (MCS0)	38.97
	5210	42	ac (80MHz)	29.3/32.5 (MCS0)	82.91

Table 7-3. Conducted Bandwidth Measurements



Plot 7-10. 26dB Bandwidth Plot (802.11a (UNII Band 1) – Ch. 36)

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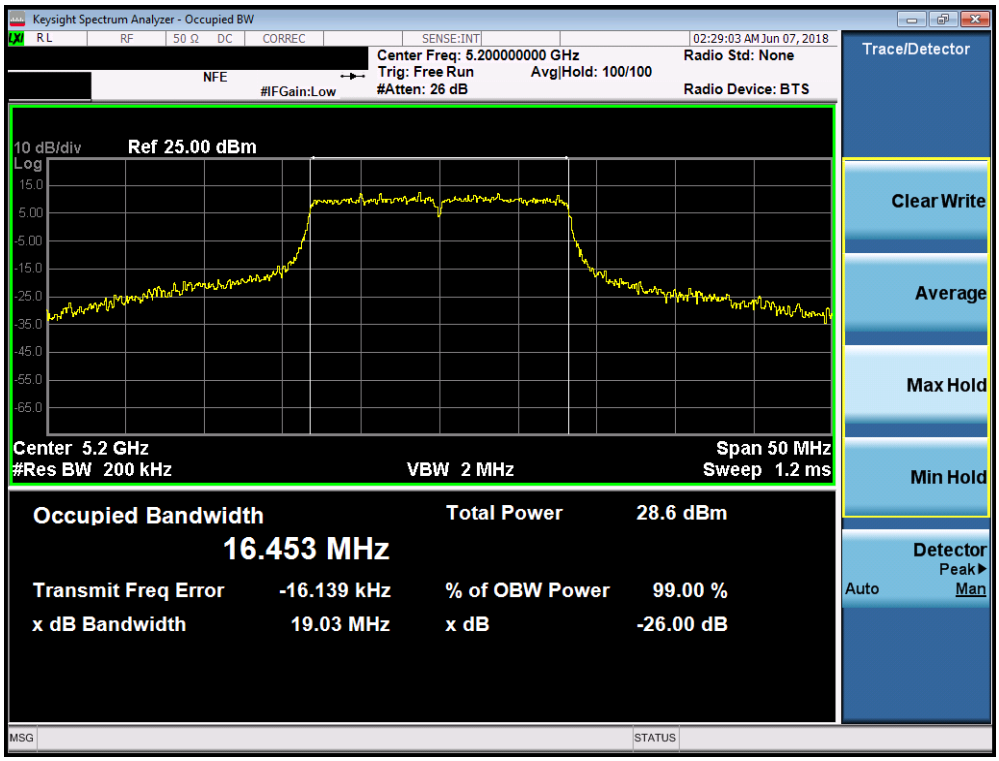
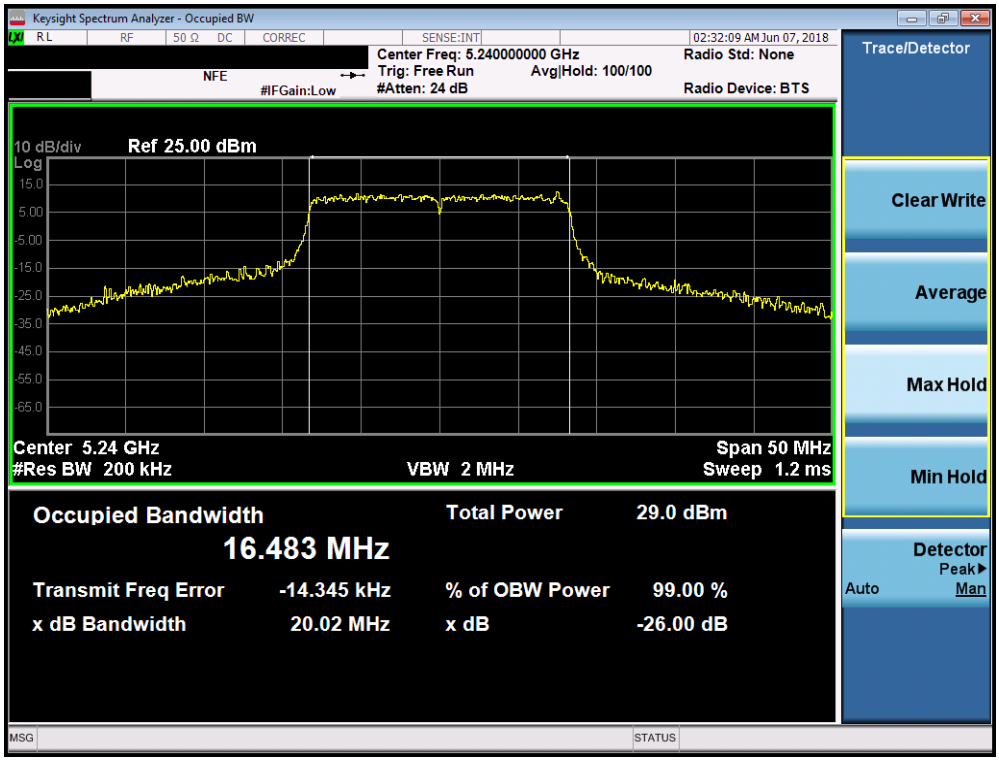


Plot 7-11. 26dB Bandwidth Plot (802.11a (UNII Band 1) – Ch. 40)



Plot 7-12. 26dB Bandwidth Plot (802.11a (UNII Band 1) – Ch. 48)

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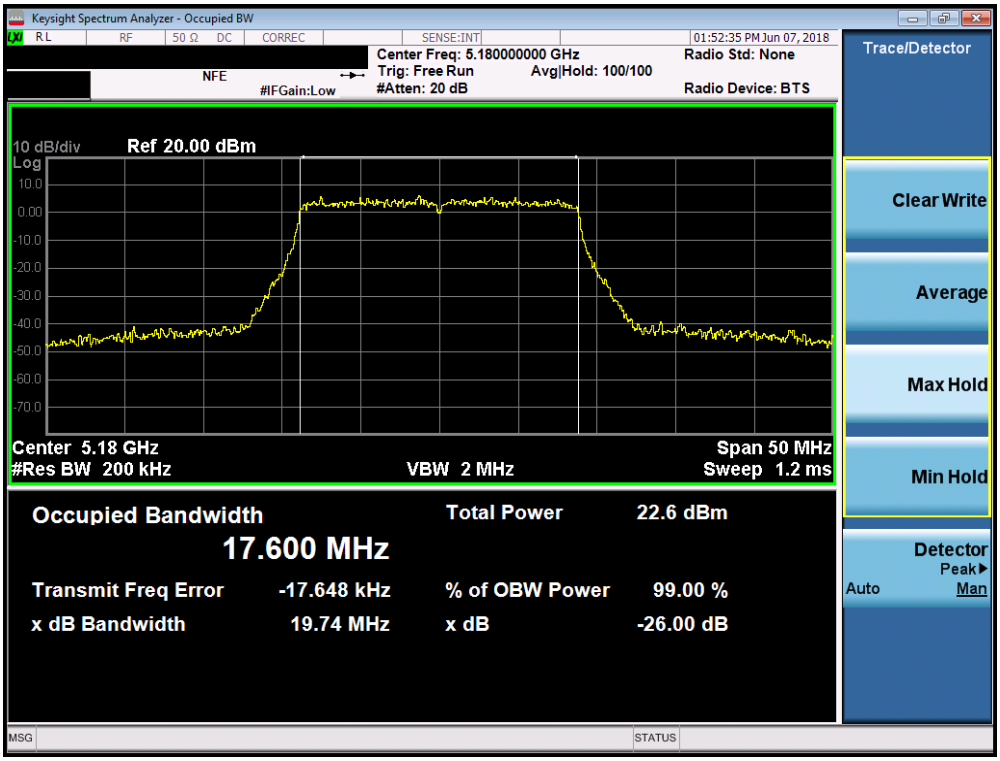
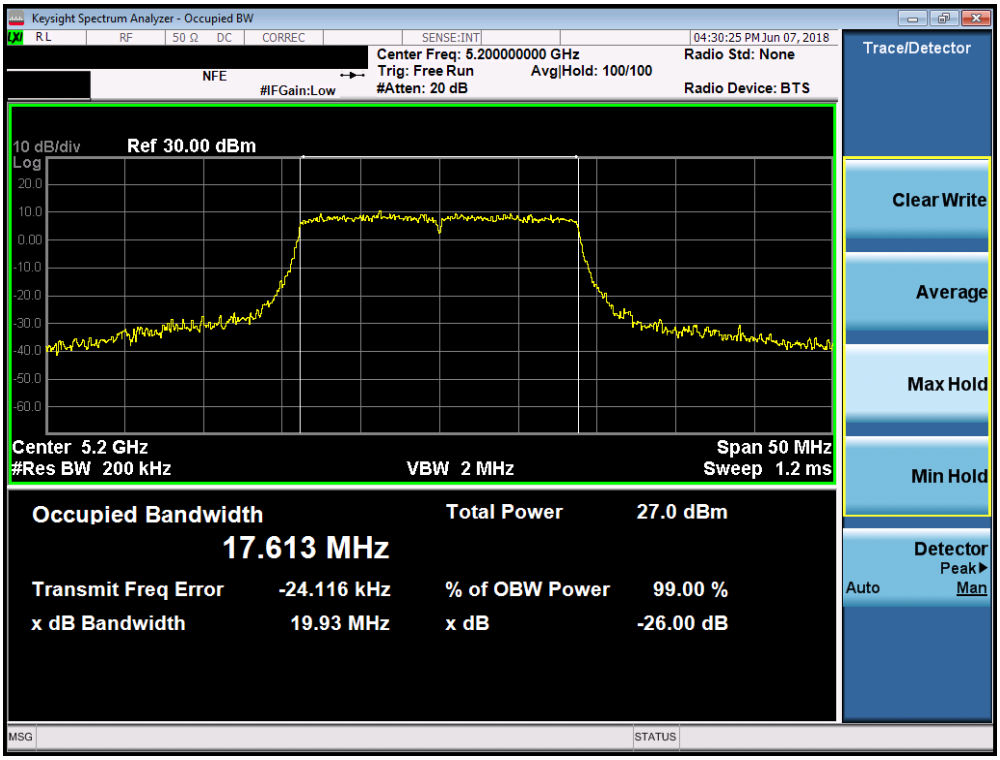


Plot 7-13. 26dB Bandwidth Plot (20MHz 802.11n (UNII Band 1) – Ch. 36)



Plot 7-14. 26dB Bandwidth Plot (20MHz 802.11n (UNII Band 1) – Ch. 40)

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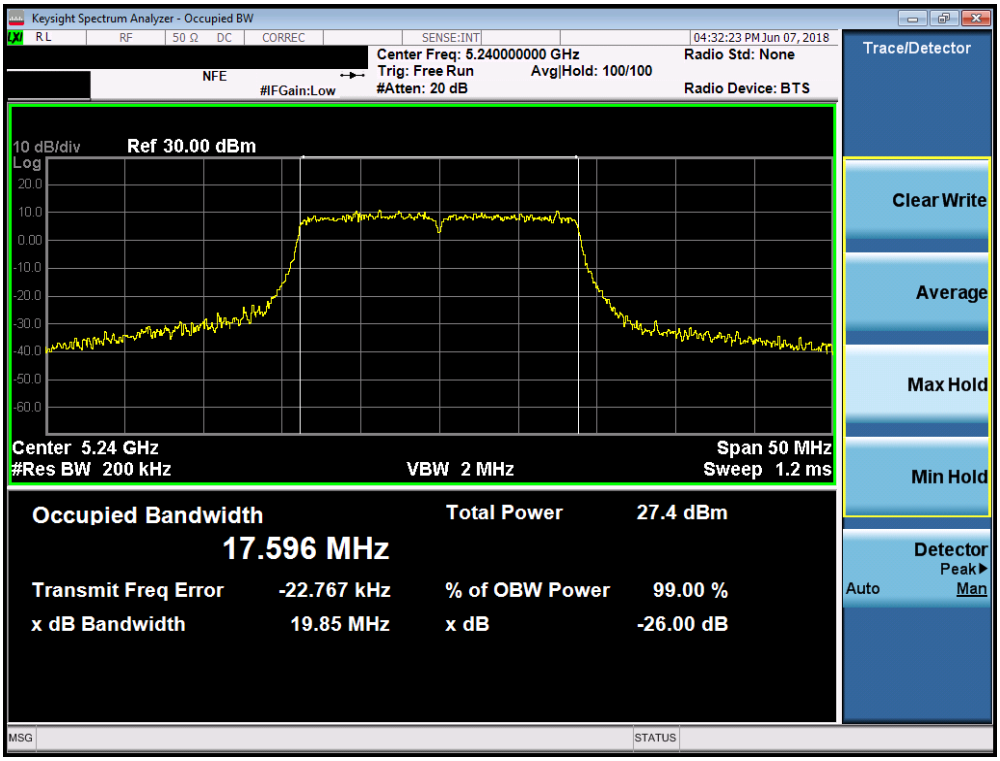
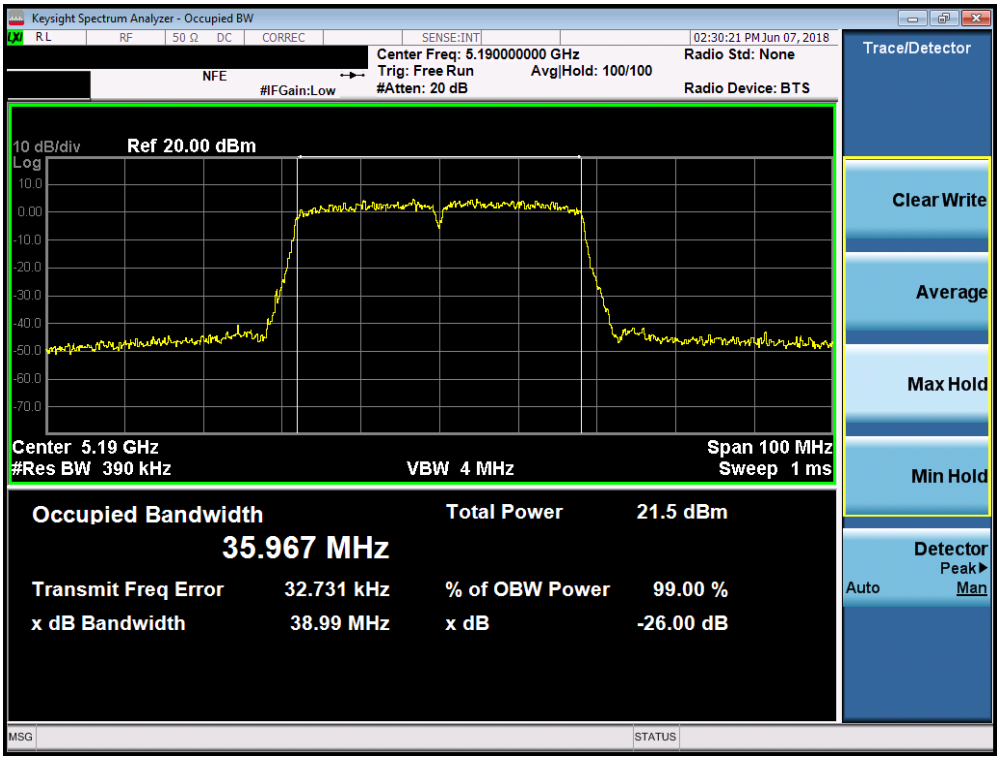


Plot 7-15. 26dB Bandwidth Plot (20MHz 802.11n (UNII Band 1) – Ch. 48)



Plot 7-16. 26dB Bandwidth Plot (40MHz 802.11n (UNII Band 1) – Ch. 38)

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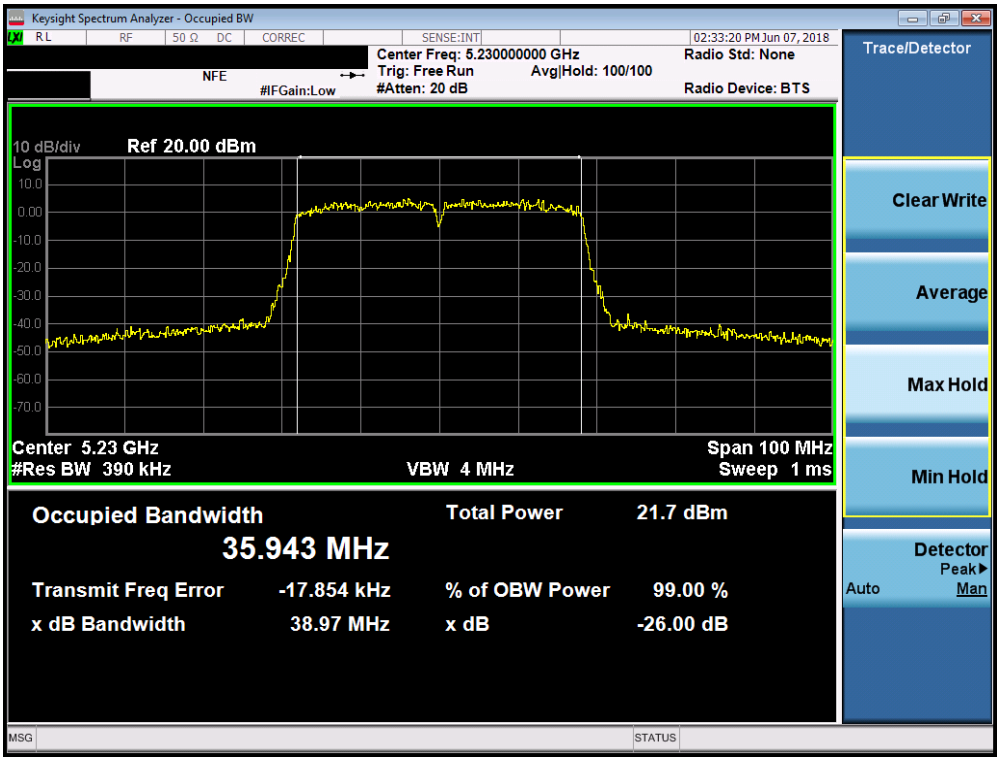
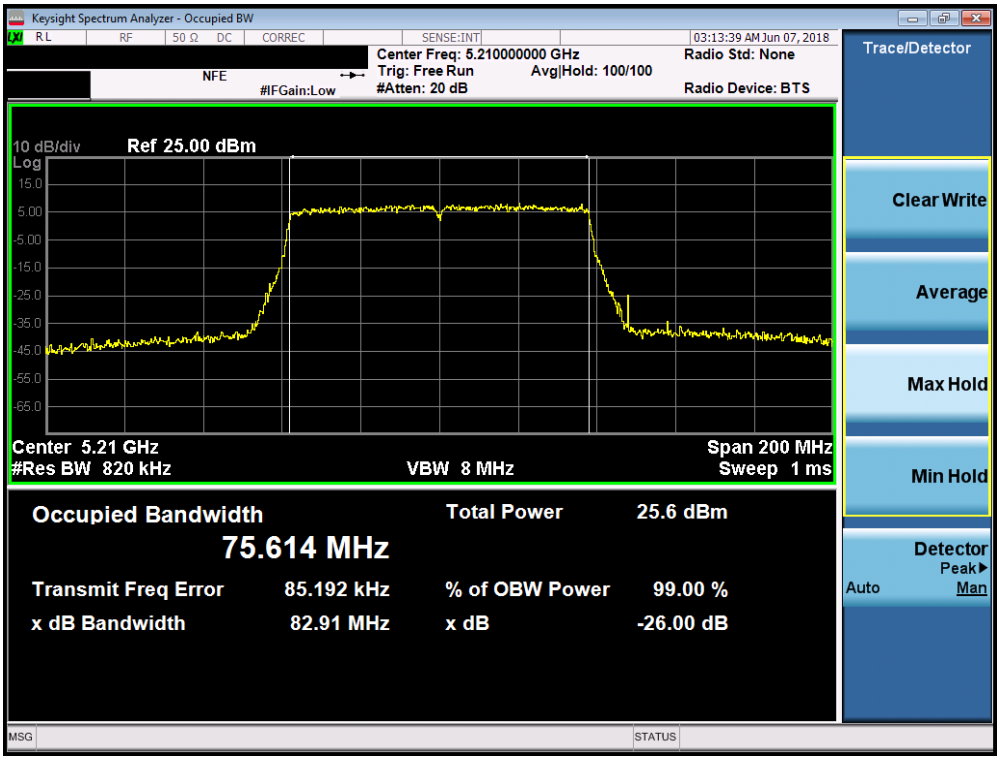


Plot 7-17. 26dB Bandwidth Plot (40MHz 802.11n (UNII Band 1) – Ch. 46)



Plot 7-18. 26dB Bandwidth Plot (80MHz BW 802.11ac (UNII Band 1) – Ch. 42)

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

§15.407 (e); RSS-Gen [6.2]

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 ANSI C63.10-2013 and KDB 789033 D02 v02r01, 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

ANSI C63.10-2013 – Section 6.9.2
KDB 789033 D02 v02r01 – 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.

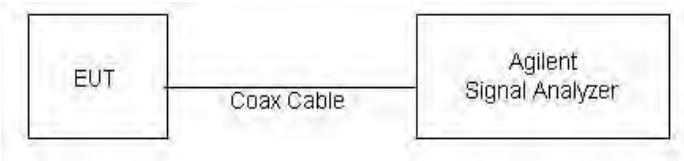

Figure 7-2. Test Instrument & Measurement Setup

Test Notes

None.

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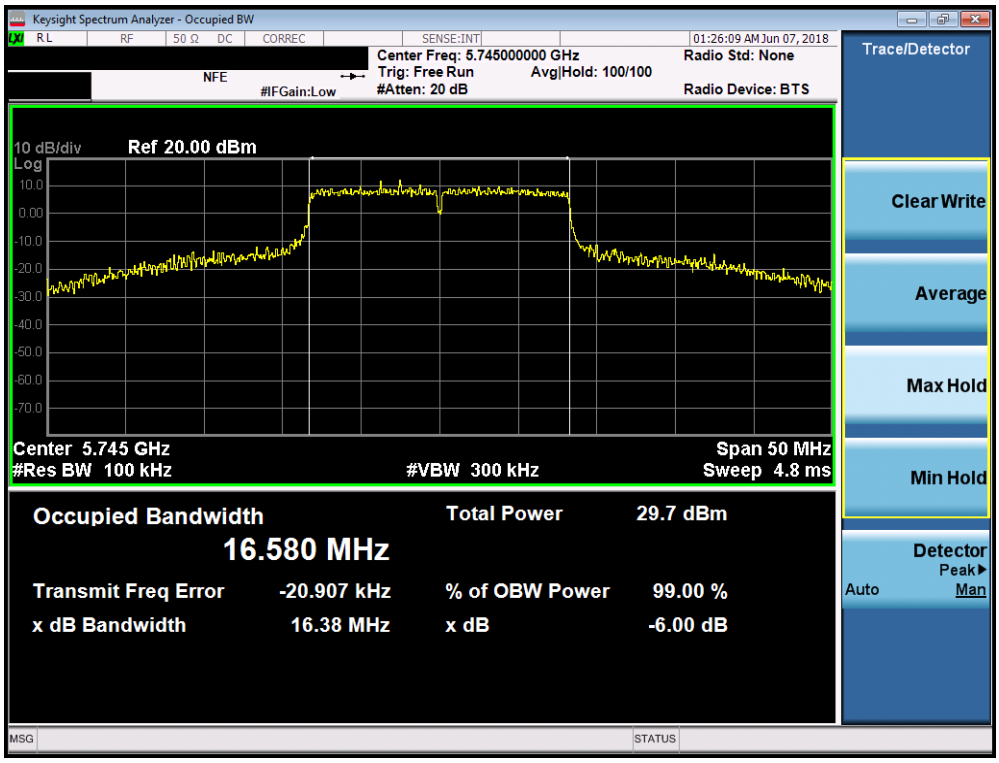
Antenna-1 6 dB Bandwidth Measurements

	Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	Measured 6dB Bandwidth [MHz]
Band 3	5745	149	a	6	16.38
	5785	157	a	6	16.36
	5825	165	a	6	16.35
	5745	149	n (20MHz)	6.5/7.2 (MCS0)	17.62
	5785	157	n (20MHz)	6.5/7.2 (MCS0)	17.21
	5825	165	n (20MHz)	6.5/7.2 (MCS0)	17.37
	5755	151	n (40MHz)	13.5/15 (MCS0)	35.38
	5795	159	n (40MHz)	13.5/15 (MCS0)	36.33
	5775	155	ac (80MHz)	29.3/32.5 (MCS0)	75.33

Table 7-4. Conducted Bandwidth Measurements



Plot 7-19. 6dB Bandwidth Plot (802.11a (UNII Band 3) – Ch. 149)

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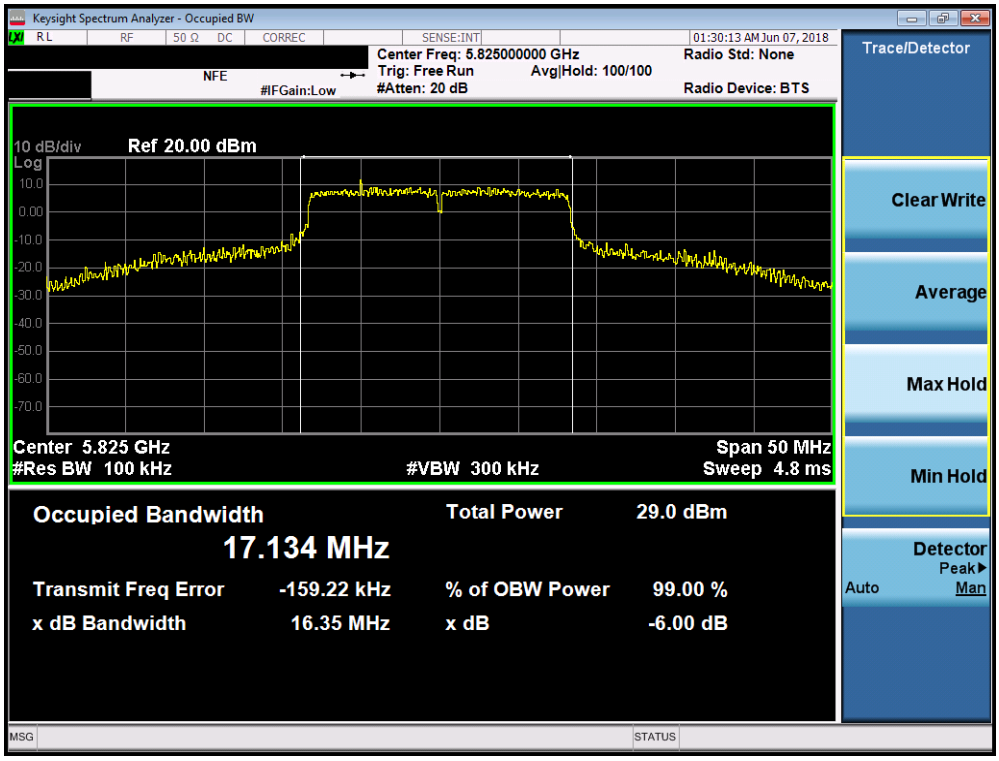
Plot 7-20. 6dB Bandwidth Plot (802.11a (UNII Band 3) – Ch. 157)



Plot 7-21. 6dB Bandwidth Plot (802.11a (UNII Band 3) – Ch. 165)

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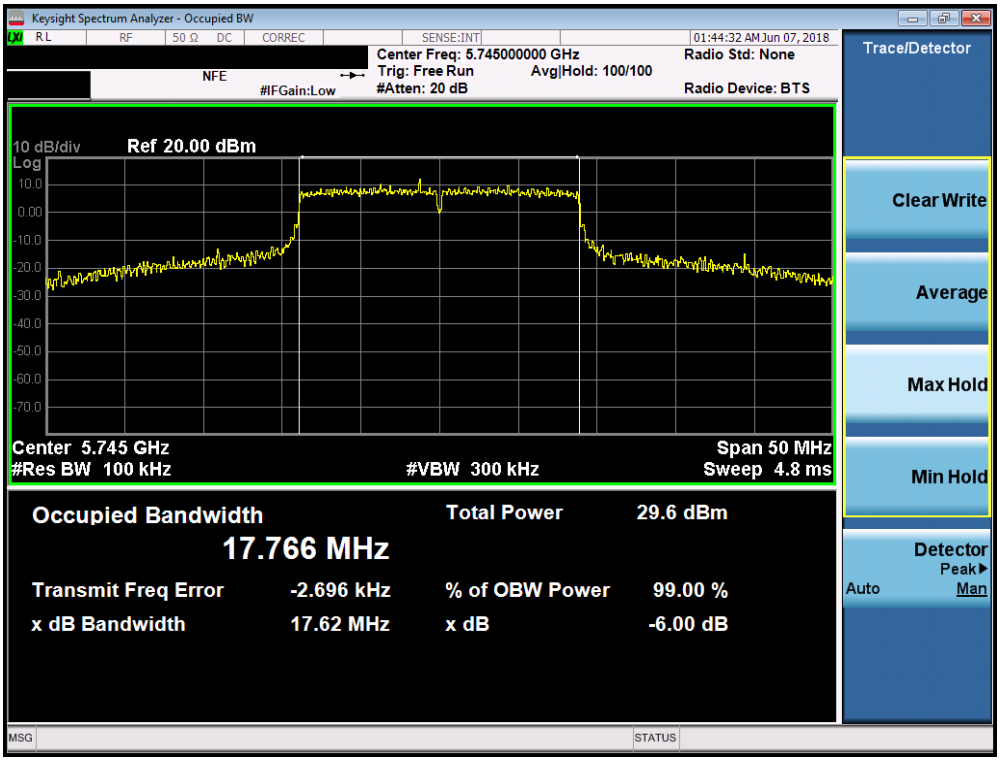
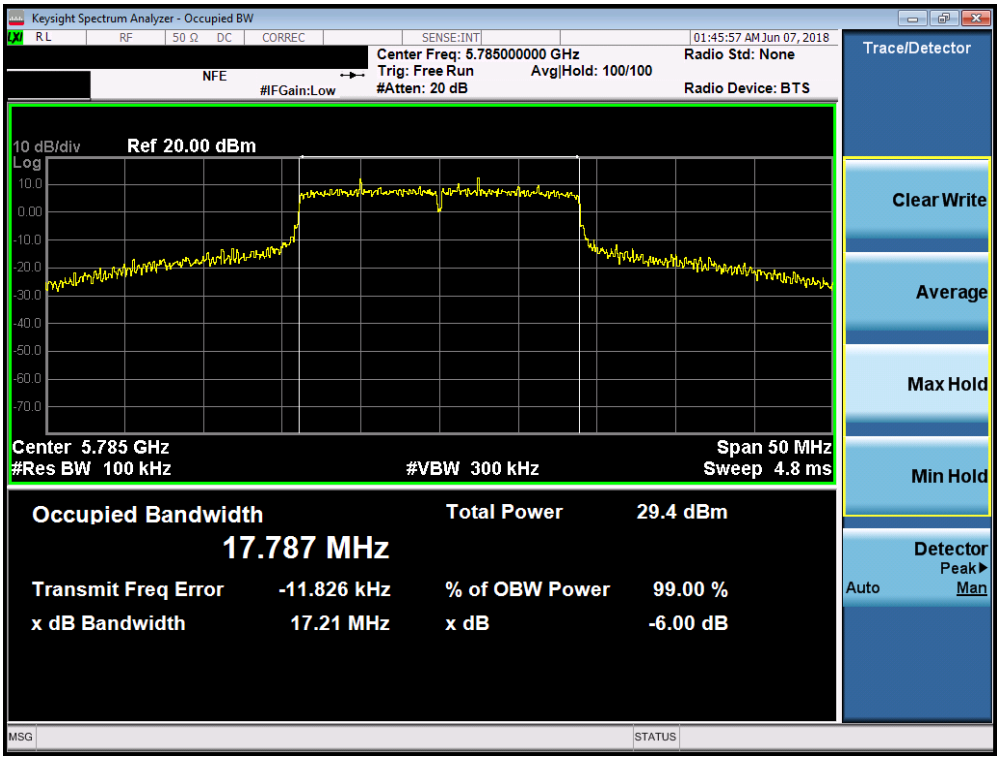


Plot 7-22. 6dB Bandwidth Plot (20MHz 802.11n (UNII Band 3) – Ch. 149)



Plot 7-23. 6dB Bandwidth Plot (20MHz 802.11n (UNII Band 3) – Ch. 157)

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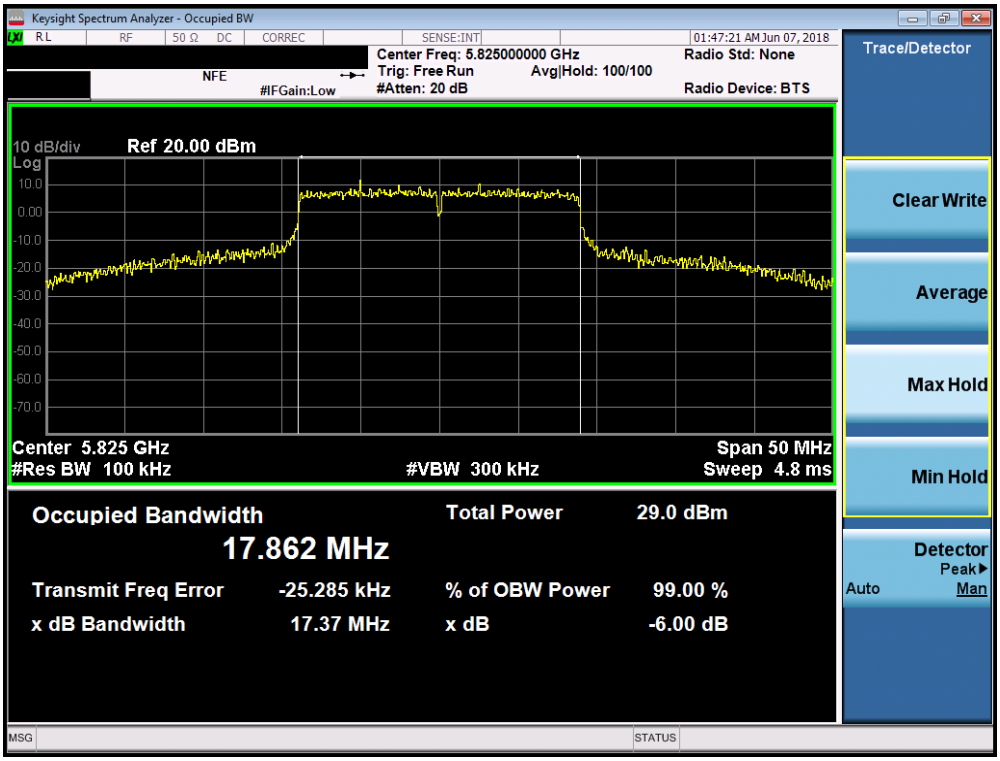
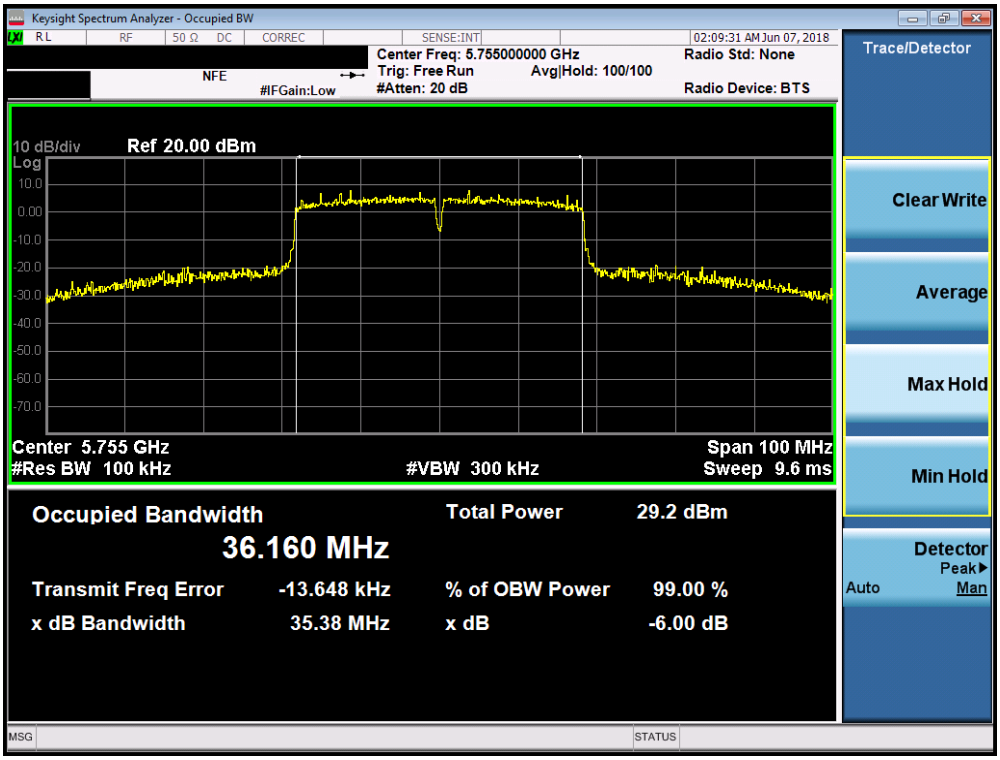


Plot 7-24. 6dB Bandwidth Plot (20MHz 802.11n (UNII Band 3) – Ch. 165)



Plot 7-25. 6dB Bandwidth Plot (40MHz 802.11n (UNII Band 3) – Ch. 151)

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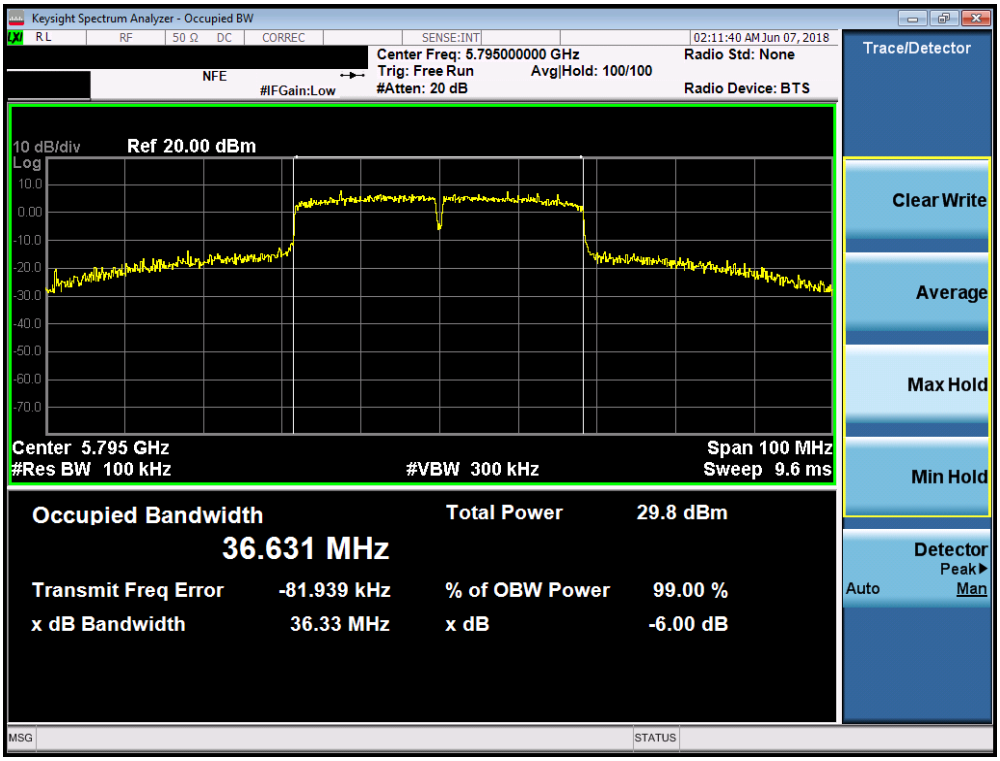
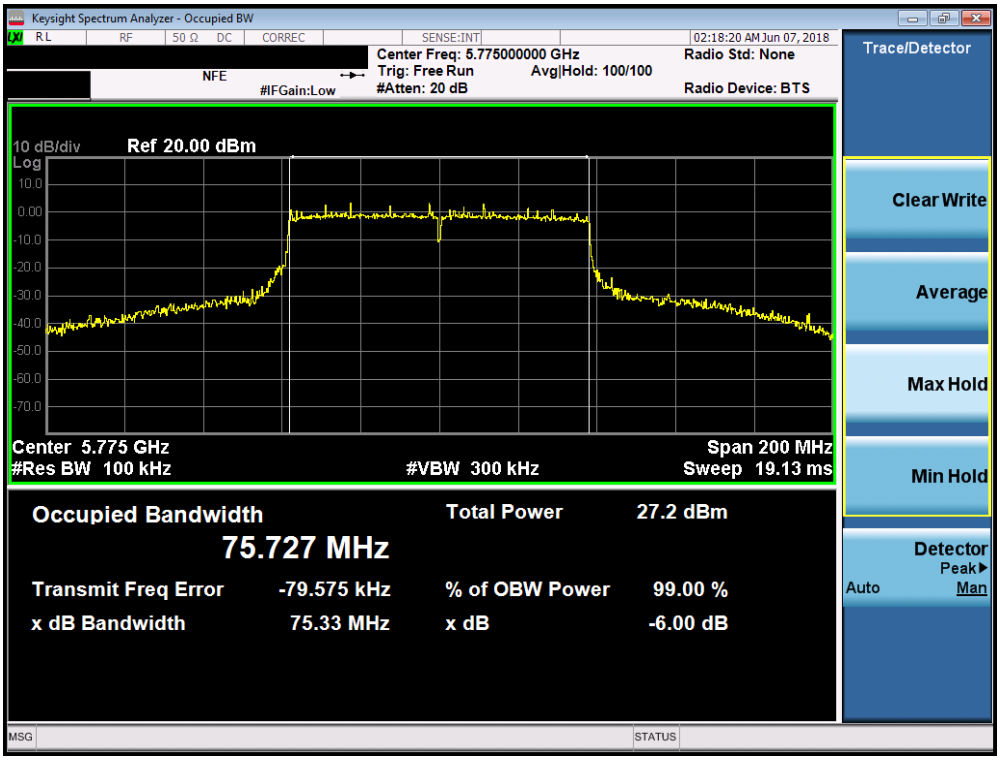


Plot 7-26. 6dB Bandwidth Plot (40MHz 802.11n (UNII Band 3) – Ch. 159)



Plot 7-27. 6dB Bandwidth Plot (80MHz 802.11n (UNII Band 3) – Ch. 155)

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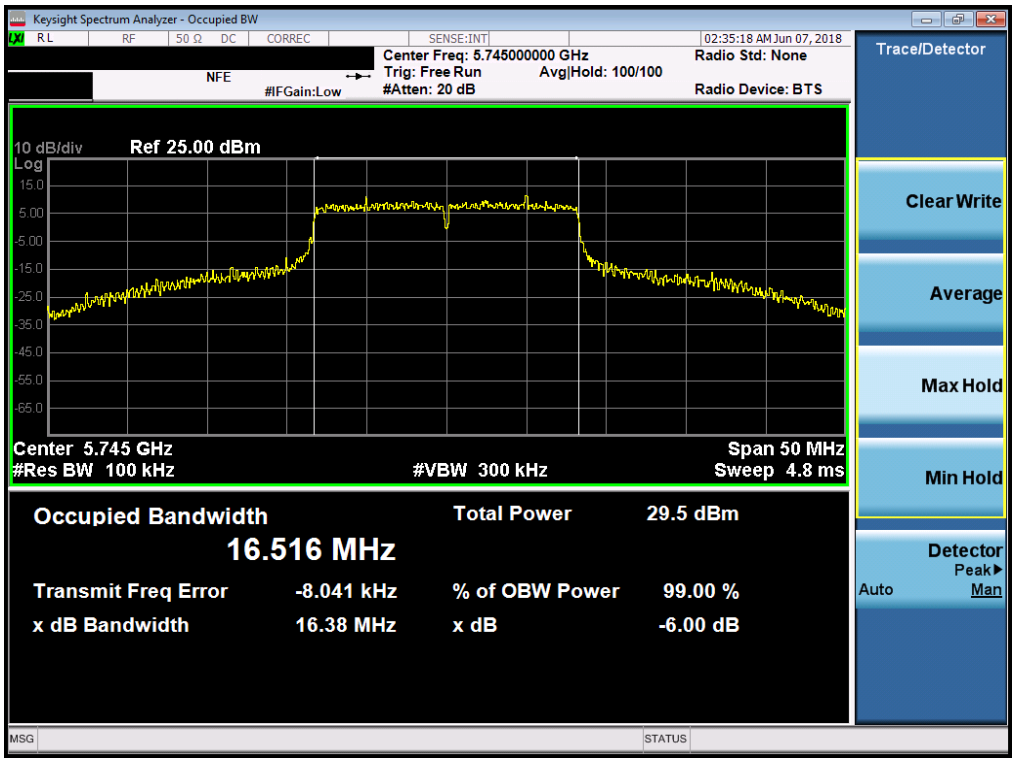
Antenna-2 6dB Bandwidth Measurements

	Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	Measured 6dB Bandwidth [MHz]
Band 3	5745	149	a	6	16.38
	5785	157	a	6	16.37
	5825	165	a	6	16.35
	5745	149	n (20MHz)	6.5/7.2 (MCS0)	17.60
	5785	157	n (20MHz)	6.5/7.2 (MCS0)	17.30
	5825	165	n (20MHz)	6.5/7.2 (MCS0)	17.31
	5755	151	n (40MHz)	13.5/15 (MCS0)	32.83
	5795	159	n (40MHz)	13.5/15 (MCS0)	34.46
	5775	155	ac (80MHz)	29.3/32.5 (MCS0)	75.94

Table 7-5. Conducted Bandwidth Measurements



Plot 7-28. 6dB Bandwidth Plot (802.11a (UNII Band 3) – Ch. 149)

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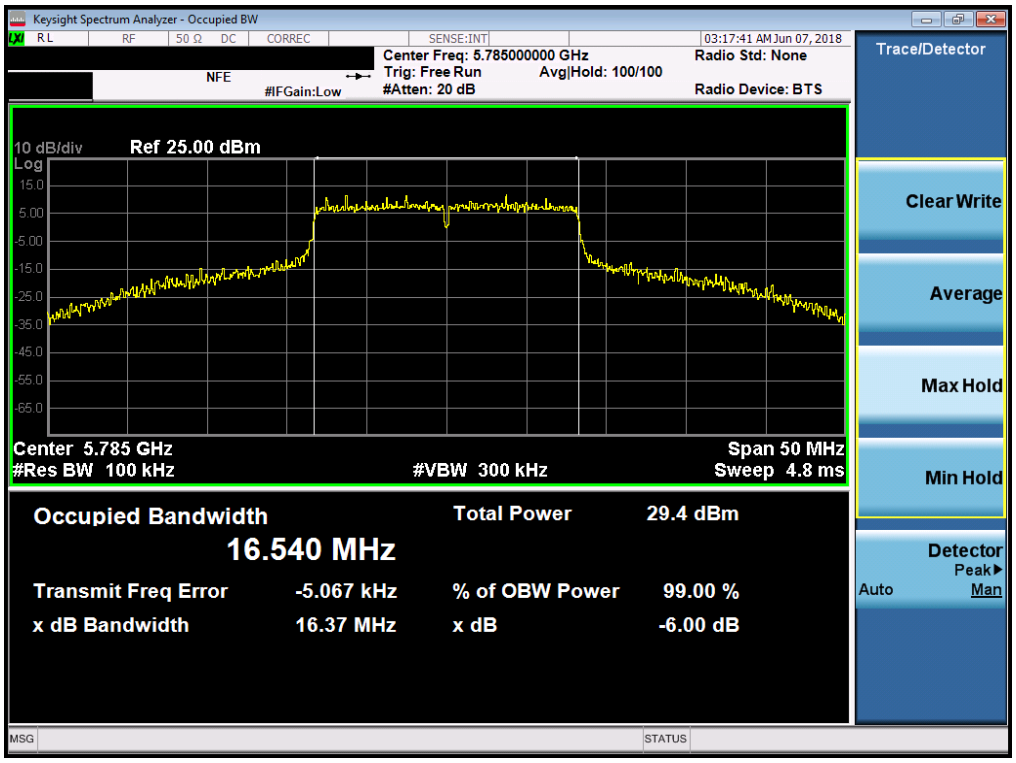
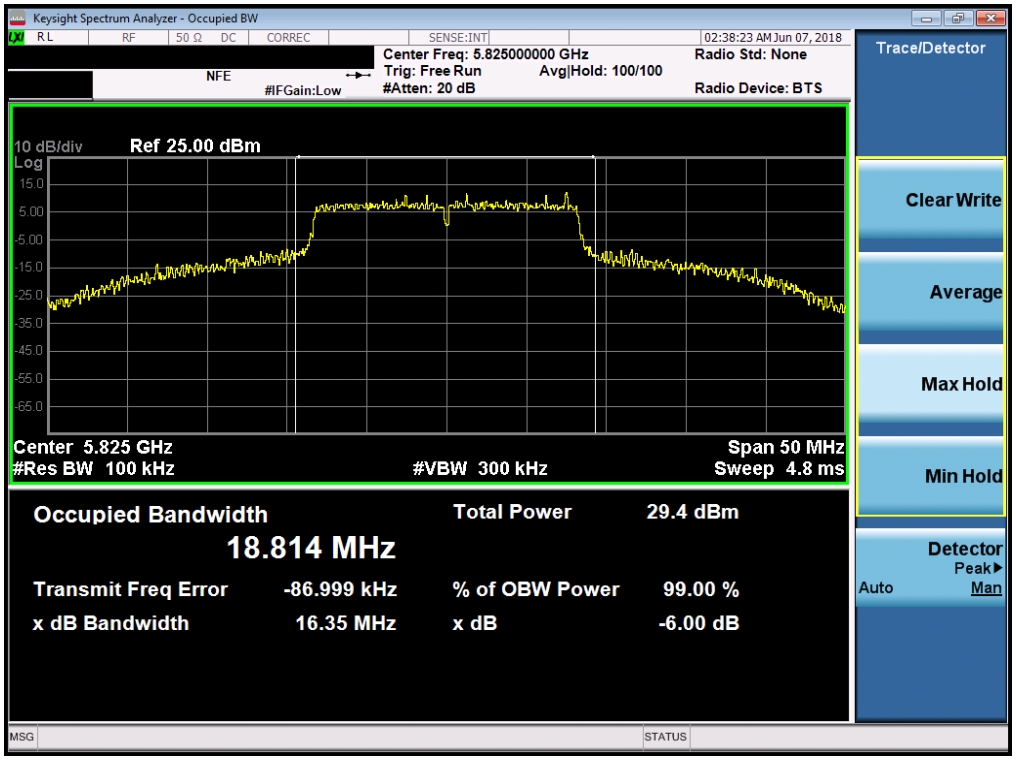


Plot 7-29. 6dB Bandwidth Plot (802.11a (UNII Band 3) – Ch. 157)



Plot 7-30. 6dB Bandwidth Plot (802.11a (UNII Band 3) – Ch. 165)

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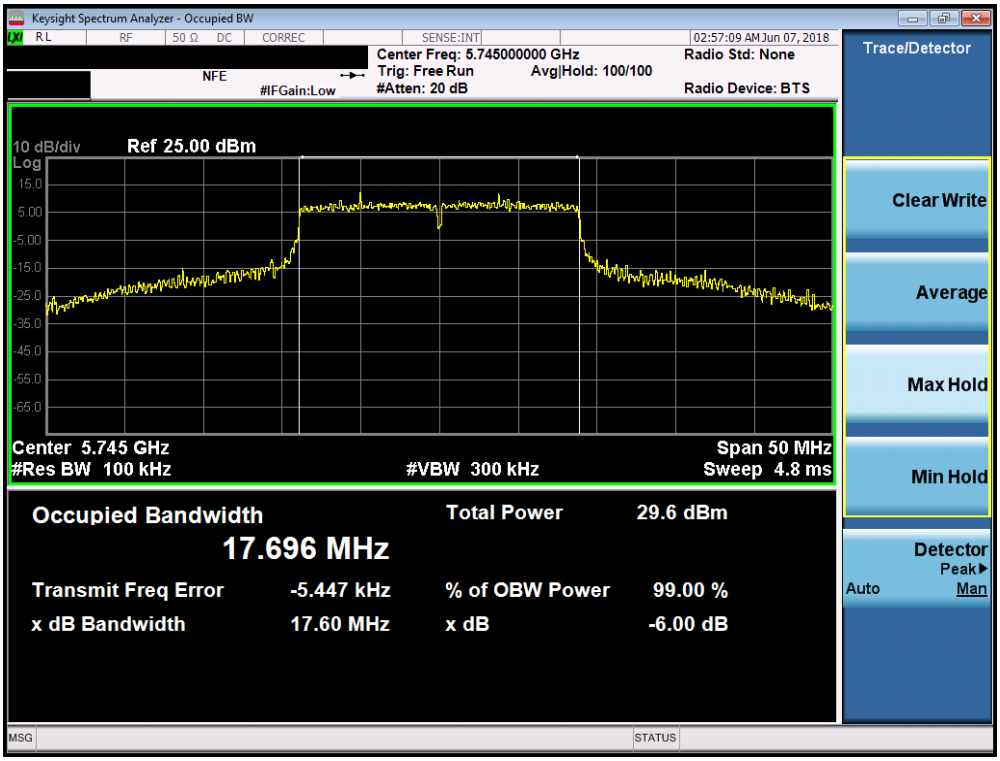
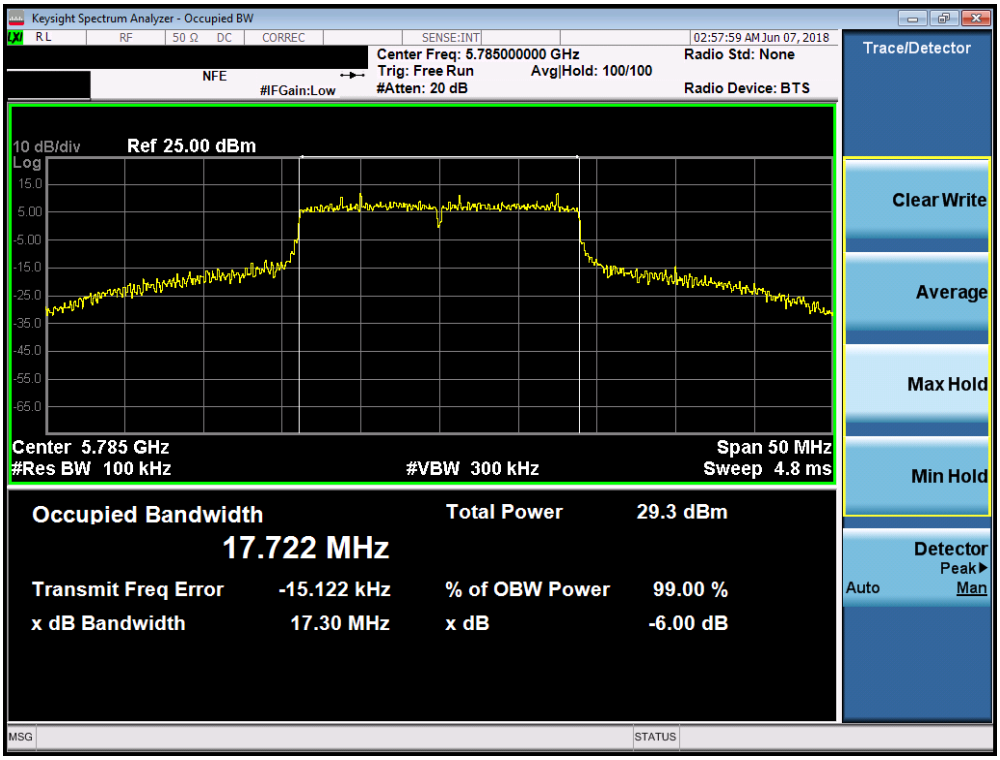


Plot 7-31. 6dB Bandwidth Plot (20MHz 802.11n (UNII Band 3) – Ch. 149)



Plot 7-32. 6dB Bandwidth Plot (20MHz 802.11n (UNII Band 3) – Ch. 157)

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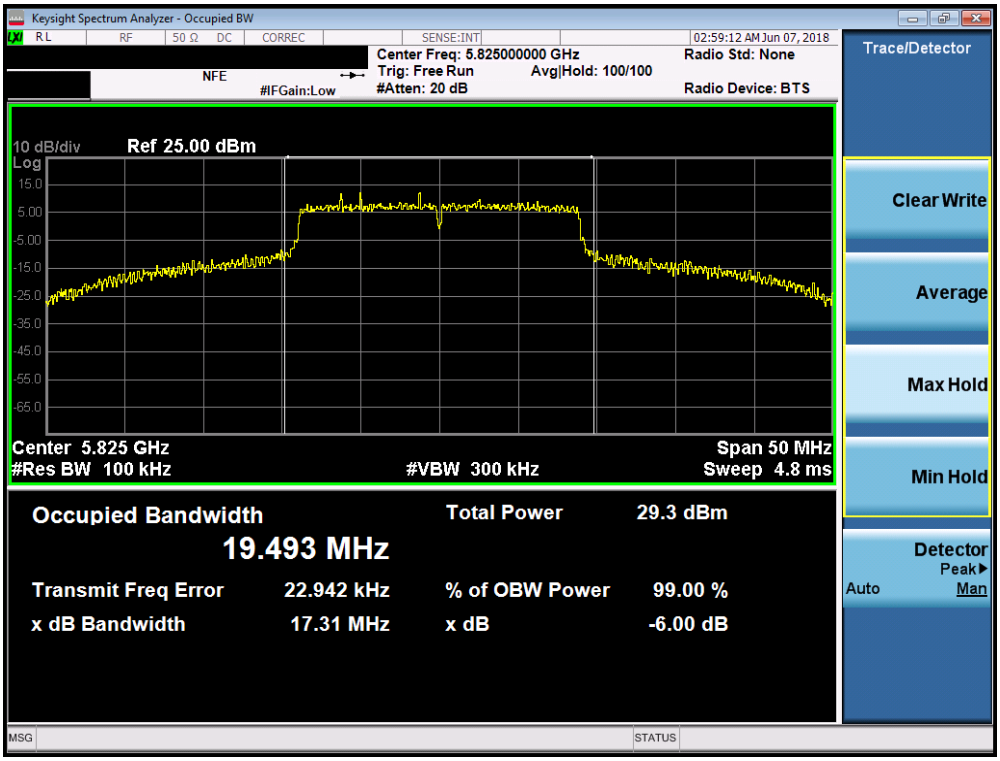
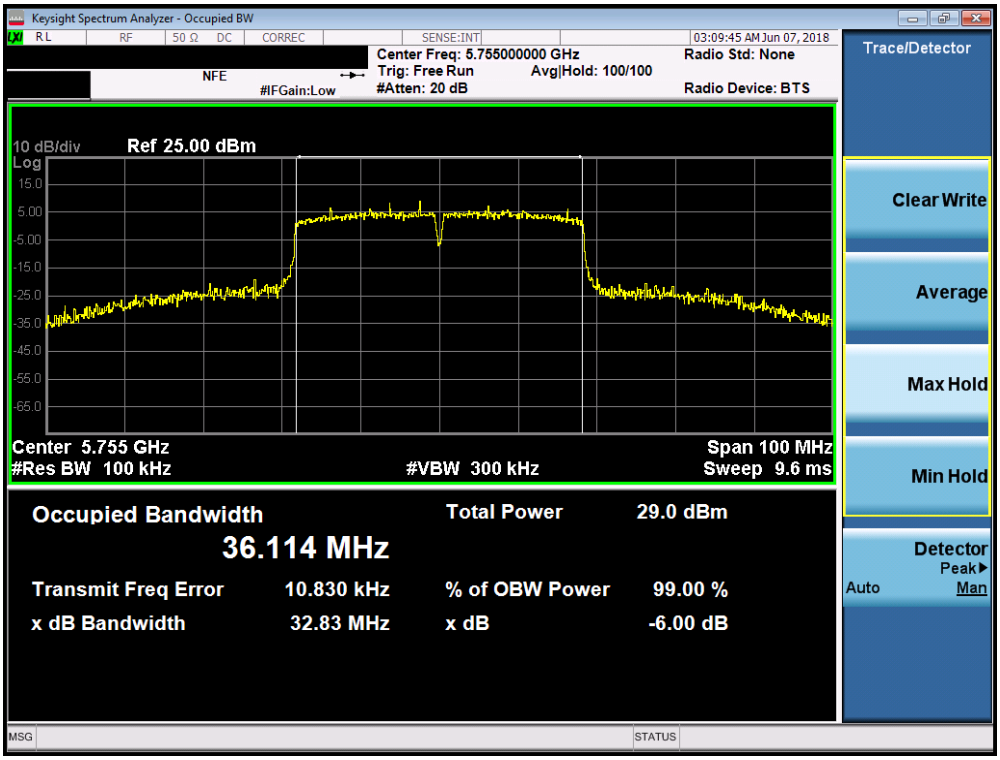


Plot 7-33. 6dB Bandwidth Plot (20MHz 802.11n (UNII Band 3) – Ch. 165)



Plot 7-34. 6dB Bandwidth Plot (40MHz 802.11n (UNII Band 3) – Ch. 151)

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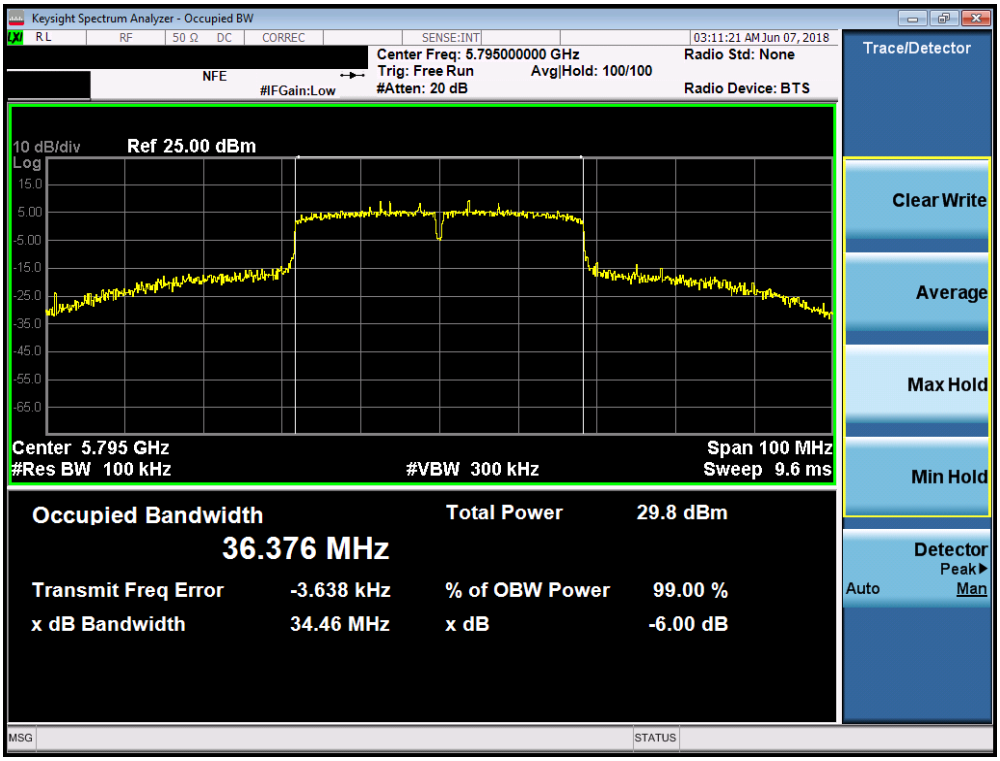
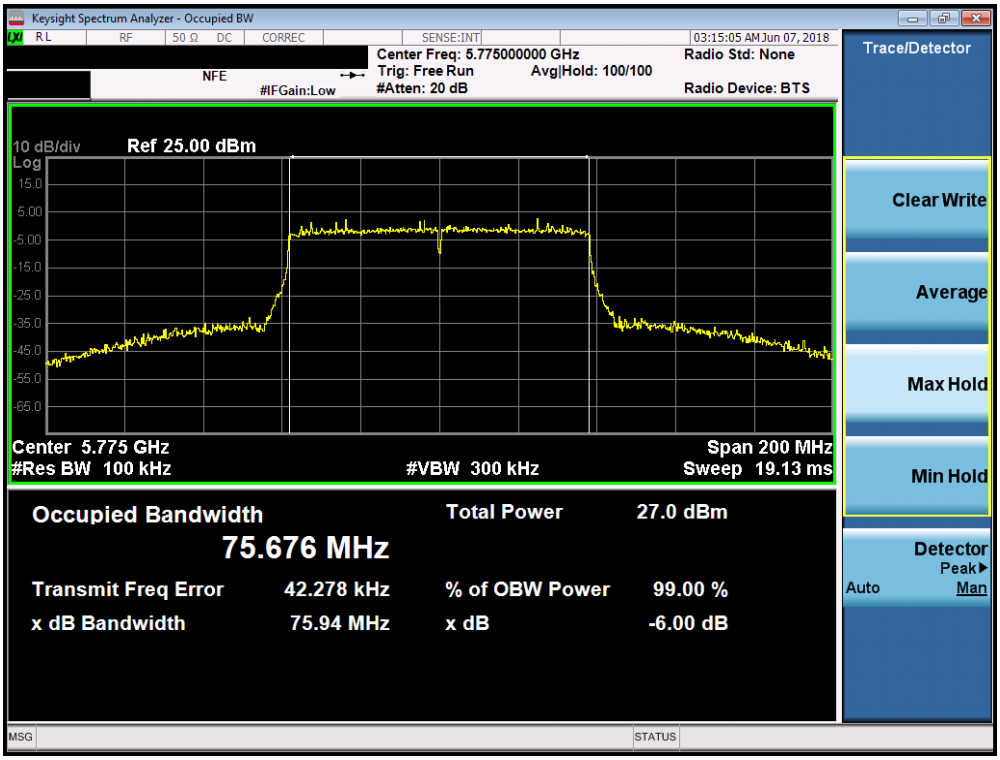


Plot 7-35. 6dB Bandwidth Plot (40MHz 802.11n (UNII Band 3) – Ch. 159)



Plot 7-36. 6dB Bandwidth Plot (80MHz 802.11n (UNII Band 3) – Ch. 155)

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

§15.407(a.1.iv) §15.407(a.2) §15.407(a.3); RSS-247 [6.2]

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 ANSI C63.10-2013 and KDB 789033 D02 v02r01, and at the appropriate frequencies.

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

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

Test Procedure Used

ANSI C63.10-2013 – Section 12.3.3.2 Method PM-G
KDB 789033 D02 v02r01 – Section E)3)b) Method PM-G
ANSI C63.10-2013 – Section 14.2 Measure-and-Sum Technique
KDB 662911 v02r01 – Section E)1) Measure-and-Sum Technique

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.

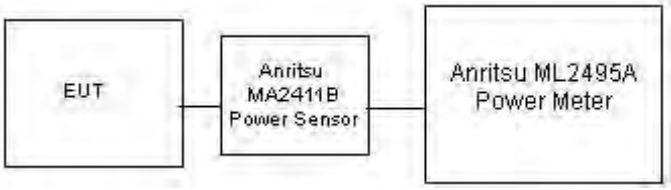

Figure 7-3. Test Instrument & Measurement Setup

Test Notes

None

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Antenna-1 Conducted Output Power Measurements

5GHz (20MHz Bandwidth)	Freq [MHz]	Channel	Detector	IEEE Transmission Mode			Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Ant. Gain [dBi]	Max e.i.r.p. [dBm]	Max e.i.r.p. Limit [dBm]	e.i.r.p. Margin [dB]
				802.11a	802.11n	802.11ac						
	5180	36	AVG	20.89	20.67	20.48	23.98	-3.09	-0.60	20.29	23.01	-2.72
	5200	40	AVG	20.74	20.81	20.79	23.98	-3.17	-0.60	20.21	23.01	-2.80
	5220	44	AVG	20.71	20.77	20.83	23.98	-3.15	-0.60	20.23	23.01	-2.78
	5240	48	AVG	20.79	20.78	20.88	23.98	-3.10	-0.60	20.28	23.01	-2.73
	5745	149	AVG	22.97	22.91	22.90	30.00	-7.03	-0.10	22.87	-	-
	5785	157	AVG	22.58	22.36	22.42	30.00	-7.42	-0.10	22.48	-	-
	5825	165	AVG	22.61	22.50	22.52	30.00	-7.39	-0.10	22.51	-	-

Table 7-6. 20MHz BW (UNII) Maximum Conducted Output Power

5GHz (40MHz Bandwidth)	Freq [MHz]	Channel	Detector	IEEE Transmission Mode		Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Ant. Gain [dBi]	Max e.i.r.p. [dBm]	Max e.i.r.p. Limit [dBm]	e.i.r.p. Margin [dB]
				802.11n	802.11ac						
	5190	38	AVG	14.57	14.58	23.98	-9.40	-0.60	13.98	23.01	-9.03
	5230	46	AVG	22.55	22.51	23.98	-1.43	-0.60	21.95	23.01	-1.06
	5755	151	AVG	22.35	22.28	30.00	-7.65	-0.10	22.25	-	-
	5795	159	AVG	22.97	22.73	30.00	-7.03	-0.10	22.87	-	-

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

5GHz (80MHz Bandwidth)	Freq [MHz]	Channel	Detector	IEEE Transmission Mode	Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Ant. Gain [dBi]	Max e.i.r.p. [dBm]	Max e.i.r.p. Limit [dBm]	e.i.r.p. Margin [dB]
				802.11ac						
	5210	42	AVG	18.19	23.98	-5.79	-0.60	17.59	23.01	-5.42
	5775	155	AVG	19.59	30.00	-10.41	-0.10	19.49	-	-

Table 7-8. 80MHz BW (UNII) Maximum Conducted Output Power

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Antenna-2 Conducted Output Power Measurements

5GHz (20MHz Bandwidth)	Freq [MHz]	Channel	Detector	IEEE Transmission Mode			Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Ant. Gain [dBi]	Max e.i.r.p. [dBm]	Max e.i.r.p. Limit [dBm]	e.i.r.p. Margin [dB]
				802.11a	802.11n	802.11ac						
	5180	36	AVG	20.68	20.74	20.68	23.98	-3.24	-1.60	19.14	23.01	-3.87
	5200	40	AVG	20.54	20.55	20.65	23.98	-3.33	-1.60	19.05	23.01	-3.96
	5220	44	AVG	20.65	20.69	20.61	23.98	-3.29	-1.60	19.09	23.01	-3.92
	5240	48	AVG	20.84	20.81	20.75	23.98	-3.14	-1.60	19.24	23.01	-3.77
	5745	149	AVG	22.98	22.97	22.96	30.00	-7.02	-0.60	22.38	-	-
	5785	157	AVG	22.59	22.59	22.56	30.00	-7.41	-0.60	21.99	-	-
	5825	165	AVG	22.93	22.88	22.92	30.00	-7.07	-0.60	22.33	-	-

Table 7-9. 20MHz BW (UNII) Maximum Conducted Output Power

5GHz (40MHz Bandwidth)	Freq [MHz]	Channel	Detector	IEEE Transmission Mode		Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Ant. Gain [dBi]	Max e.i.r.p. [dBm]	Max e.i.r.p. Limit [dBm]	e.i.r.p. Margin [dB]
				802.11n	802.11ac						
	5190	38	AVG	14.68	14.67	23.98	-9.30	-1.60	13.08	23.01	-9.93
	5230	46	AVG	22.99	22.99	23.98	-0.99	-1.60	21.39	23.01	-1.62
	5755	151	AVG	22.32	22.29	30.00	-7.68	-1.60	-0.60	-	-
	5795	159	AVG	22.78	22.72	30.00	-7.22	-1.60	21.18	-	-

Table 7-10. 40MHz BW (UNII) Maximum Conducted Output Power

5GHz (80MHz Bandwidth)	Freq [MHz]	Channel	Detector	IEEE Transmission Mode	Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Ant. Gain [dBi]	Max e.i.r.p. [dBm]	Max e.i.r.p. Limit [dBm]	e.i.r.p. Margin [dB]
				802.11ac						
	5210	42	AVG	18.35	23.98	-5.63	-1.60	16.75	23.01	-6.26
	5775	155	AVG	19.53	30.00	-10.47	-0.60	18.93	-	-

Table 7-11. 80MHz BW (UNII) Maximum Conducted Output Power

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MIMO/CDD Maximum Conducted Output Power Measurements

5GHz (20MHz Bandwidth)	Freq [MHz]	Channel	Detector	Conducted Power [dBm]			Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Directional Ant. Gain [dBi]	Max e.i.r.p. [dBm]	Max e.i.r.p. Limit [dBm]	e.i.r.p. Margin [dB]
				ANT1	ANT2	MIMO						
	5180	36	AVG	14.92	14.71	17.83	23.98	-6.15	1.92	19.75	23.01	-3.26
	5200	40	AVG	14.93	14.85	17.90	23.98	-6.08	1.92	19.82	23.01	-3.19
	5220	44	AVG	14.97	14.91	17.95	23.98	-6.03	1.92	19.87	23.01	-3.14
	5240	48	AVG	14.89	14.98	17.95	23.98	-6.03	1.92	19.87	23.01	-3.14
	5745	149	AVG	22.97	22.98	25.99	30.00	-4.01	2.66	28.65	-	-
	5785	157	AVG	22.58	22.59	25.60	30.00	-4.40	2.66	28.26	-	-
	5825	165	AVG	22.61	22.93	25.78	30.00	-4.22	2.66	28.44	-	-

Table 7-12. CDD 20MHz BW 802.11a (UNII) Maximum Conducted Output Power

5GHz (20MHz Bandwidth)	Freq [MHz]	Channel	Detector	Conducted Power [dBm]			Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Directional Ant. Gain [dBi]	Max e.i.r.p. [dBm]	Max e.i.r.p. Limit [dBm]	e.i.r.p. Margin [dB]
				ANT1	ANT2	MIMO						
	5180	36	AVG	14.72	14.51	17.63	23.98	-6.35	1.92	19.55	23.01	-3.46
	5200	40	AVG	14.74	14.61	17.69	23.98	-6.29	1.92	19.61	23.01	-3.40
	5220	44	AVG	14.80	14.67	17.75	23.98	-6.23	1.92	19.67	23.01	-3.34
	5240	48	AVG	14.76	14.91	17.85	23.98	-6.13	1.92	19.77	23.01	-3.24
	5745	149	AVG	22.91	22.97	25.95	30.00	-4.05	2.66	28.61	-	-
	5785	157	AVG	22.36	22.59	25.49	30.00	-4.51	2.66	28.15	-	-
	5825	165	AVG	22.50	22.88	25.70	30.00	-4.30	2.66	28.36	-	-

Table 7-13. MIMO 20MHz BW 802.11n (UNII) Maximum Conducted Output Power

5GHz (20MHz Bandwidth)	Freq [MHz]	Channel	Detector	Conducted Power [dBm]			Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Directional Ant. Gain [dBi]	Max e.i.r.p. [dBm]	Max e.i.r.p. Limit [dBm]	e.i.r.p. Margin [dB]
				ANT1	ANT2	MIMO						
	5180	36	AVG	14.79	14.60	17.71	23.98	-6.27	1.92	19.63	23.01	-3.38
	5200	40	AVG	14.83	14.74	17.80	23.98	-6.18	1.92	19.72	23.01	-3.29
	5220	44	AVG	14.91	14.72	17.83	23.98	-6.15	1.92	19.75	23.01	-3.26
	5240	48	AVG	14.84	14.96	17.91	23.98	-6.07	1.92	19.83	23.01	-3.18
	5745	149	AVG	22.90	22.96	25.94	30.00	-4.06	2.66	28.60	-	-
	5785	157	AVG	22.42	22.56	25.50	30.00	-4.50	2.66	28.16	-	-
	5825	165	AVG	22.52	22.92	25.73	30.00	-4.27	2.66	28.39	-	-

Table 7-14. MIMO 20MHz BW 802.11ac (UNII) Maximum Conducted Output Power

5GHz (40MHz Bandwidth)	Freq [MHz]	Channel	Detector	Conducted Power [dBm]			Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Directional Ant. Gain [dBi]	Max e.i.r.p. [dBm]	Max e.i.r.p. Limit [dBm]	e.i.r.p. Margin [dB]
				ANT1	ANT2	MIMO						
	5190	38	AVG	11.75	11.60	14.69	23.98	-9.29	1.92	16.61	23.01	-6.40
	5230	46	AVG	14.79	14.89	17.85	23.98	-6.13	1.92	19.77	23.01	-3.24
	5755	151	AVG	22.35	22.32	25.35	30.00	-4.65	2.66	28.01	-	-
	5795	159	AVG	22.97	22.78	25.89	30.00	-4.11	2.66	28.55	-	-

Table 7-15. MIMO 40MHz BW 802.11n (UNII) Maximum Conducted Output Power

5GHz (40MHz Bandwidth)	Freq [MHz]	Channel	Detector	Conducted Power [dBm]			Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Directional Ant. Gain [dBi]	Max e.i.r.p. [dBm]	Max e.i.r.p. Limit [dBm]	e.i.r.p. Margin [dB]
				ANT1	ANT2	MIMO						
	5190	38	AVG	12.07	12.21	15.15	23.98	-8.83	1.92	17.07	23.01	-5.94
	5230	46	AVG	15.04	15.23	18.15	23.98	-5.83	1.92	20.07	23.01	-2.94
	5755	151	AVG	22.28	22.29	25.30	30.00	-4.70	2.66	27.96	-	-
	5795	159	AVG	22.73	22.72	25.74	30.00	-4.26	2.66	28.40	-	-

Table 7-16. MIMO 40MHz BW 802.11ac (UNII) Maximum Conducted Output Power

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5GHz (80MHz Bandwidth)	Freq [MHz]	Channel	Detector	Conducted Power [dBm]			Conducted Power Limit [dBm]	Conducted Power Margin [dB]	Directional Ant. Gain [dBi]	Max e.i.r.p. [dBm]	Max e.i.r.p. Limit [dBm]	e.i.r.p. Margin [dB]
				ANT1	ANT2	MIMO						
	5210	42	AVG	15.38	15.51	18.46	23.98	-5.52	1.92	20.38	23.01	-2.63
	5775	155	AVG	19.59	19.53	22.57	30.00	-7.43	2.66	25.23	-	-

Table 7-17. MIMO 80MHz BW 802.11ac (UNII) Maximum Conducted Output Power

Note:

Per ANSI C63.10-2013 and KDB 662911 v02r01 Section E)1), the conducted powers at Antenna 1 and Antenna 2 were first measured separately during MIMO transmission as shown in the section above. The measured values were then summed in linear power units then converted back to dBm.

Per ANSI C63.10-2013 Section 14.4.3, the directional gain is calculated using the following formula, where G_N is the gain of the nth antenna and N_{ANT}, the total number of antennas used.

$$\text{Directional gain} = 10 \log[(10^{G_1/20} + 10^{G_2/20} + \ldots + 10^{G_N/20})^2 / N_{ANT}] \text{ dBi}$$

Sample MIMO Calculation:

At 5180MHz in 802.11n (20MHz BW) mode, the average conducted output power was measured to be 14.72 dBm for Antenna-1 and 14.51 dBm for Antenna-2.

Antenna 1 + Antenna 2 = MIMO

(14.72 dBm + 14.51 dBm) = (29.65 mW + 28.25 mW) = 57.90 mW = 17.63 dBm

Sample e.i.r.p. Calculation:

At 5180MHz in 802.11n (20MHz BW) mode, the average MIMO conducted power was calculated to be 17.63 dBm with directional gain of 1.92 dBi.

e.i.r.p. (dBm) = Conducted Power (dBm) + Ant gain (dBi)

17.63 dBm + 1.92 dBi = 19.55 dBm

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

§15.407(a.1.iv) §15.407(a.2) §15.407(a.3); RSS-247 [6.2]

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 ANSI C63.10-2013 and KDB 789033 D02 v02r01, and at the appropriate frequencies. Method SA-1, as defined in ANSI C63.10-2013 and KDB 789033 D02 v02r01, was used to measure the power spectral density.

In the 5.15 – 5.25GHz band, 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

ANSI C63.10-2013 – Section 12.3.2.2
KDB 789033 D02 v02r01 – Section F
ANSI C63.10-2013 – Section 14.3.2.2 Measure-and-Sum Technique
KDB 662911 v02r01 – Section E)2) Measure-and-Sum Technique

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 ≥ 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.

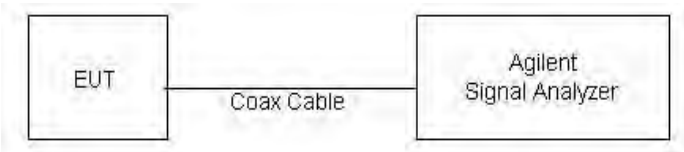

Figure 7-4. Test Instrument & Measurement Setup

Test Notes

None

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Antenna-1 Power Spectral Density Measurements

	Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	Measured Power Density [dBm]	Max Power Density [dBm/MHz]	Margin [dB]
Band 1	5180	36	a	6	9.55	11.0	-1.45
	5200	40	a	6	9.33	11.0	-1.67
	5240	48	a	6	9.50	11.0	-1.50
	5180	36	n (20MHz)	6.5/7.2 (MCS0)	9.79	11.0	-1.21
	5200	40	n (20MHz)	6.5/7.2 (MCS0)	9.15	11.0	-1.85
	5240	48	n (20MHz)	6.5/7.2 (MCS0)	9.46	11.0	-1.54
	5190	38	n (40MHz)	13.5/15 (MCS0)	0.97	11.0	-10.03
	5230	46	n (40MHz)	13.5/15 (MCS0)	9.07	11.0	-1.93
	5210	42	ac (80MHz)	29.3/32.5 (MCS0)	2.00	11.0	-9.00

Table 7-18. Bands 1 Conducted Power Spectral Density Measurements

	Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	Measured Power Density [dBm]	Antenna Gain [dBi]	e.i.r.p. Power Density [dBm/MHz]	ISED Max e.i.r.p. Power Density [dBm/MHz]	Margin [dB]
Band 1	5180	36	a	6	9.55	-0.60	8.95	10.0	-1.05
	5200	40	a	6	9.33	-0.60	8.73	10.0	-1.27
	5240	48	a	6	9.50	-0.60	8.90	10.0	-1.10
	5180	36	n (20MHz)	6.5/7.2 (MCS0)	9.79	-0.60	9.19	10.0	-0.81
	5200	40	n (20MHz)	6.5/7.2 (MCS0)	9.15	-0.60	8.55	10.0	-1.45
	5240	48	n (20MHz)	6.5/7.2 (MCS0)	9.46	-0.60	8.86	10.0	-1.14
	5190	38	n (40MHz)	13.5/15 (MCS0)	0.97	-0.60	0.37	10.0	-9.63
	5230	46	n (40MHz)	13.5/15 (MCS0)	9.07	-0.60	8.47	10.0	-1.53
	5210	42	ac (80MHz)	29.3/32.5 (MCS0)	2.00	-0.60	1.40	10.0	-8.60

Table 7-19. Band 1 e.i.r.p. Conducted Power Spectral Density Measurements (ISED)

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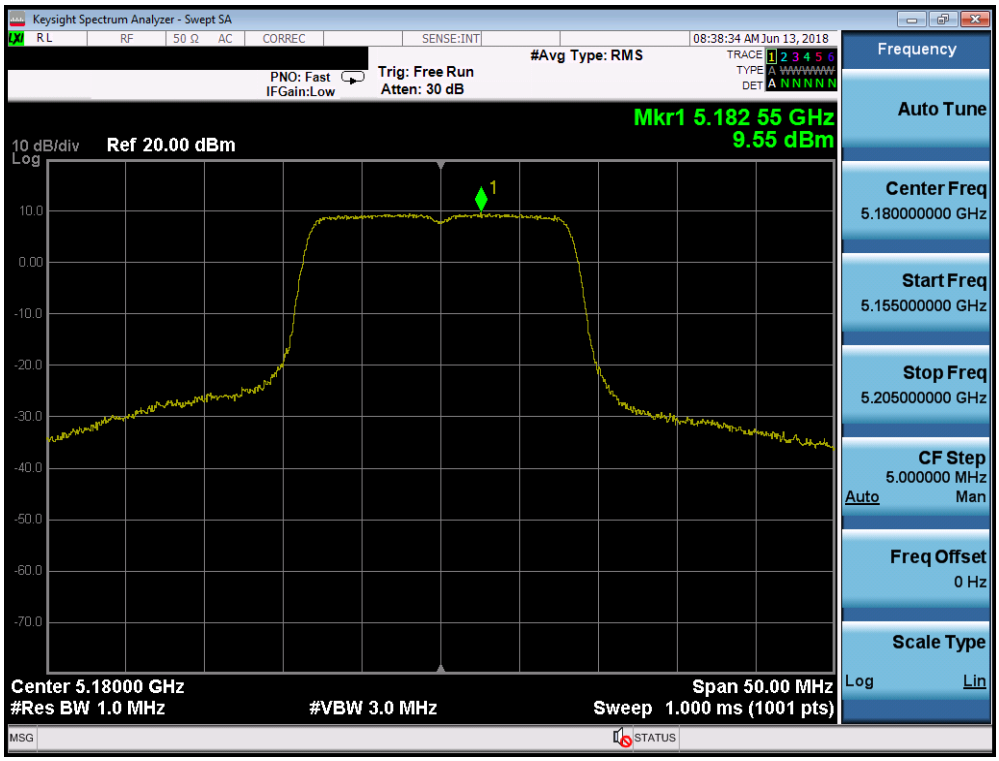
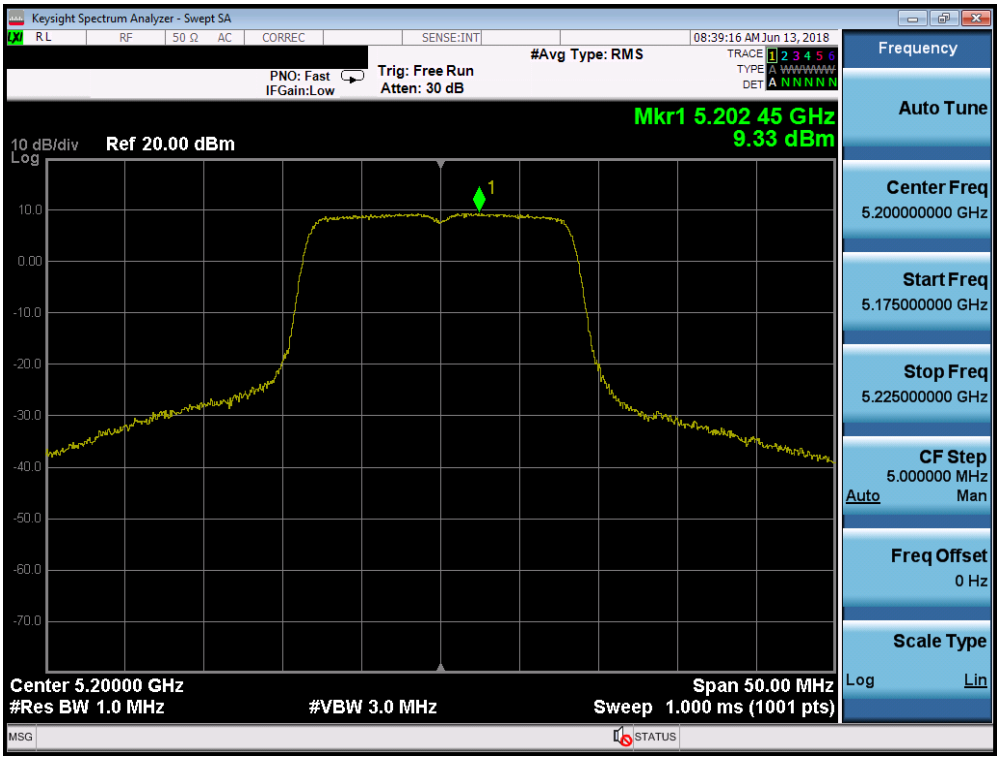


Plot 7-37. Power Spectral Density Plot (802.11a (UNII Band 1) – Ch. 36)



Plot 7-38. Power Spectral Density Plot (802.11a (UNII Band 1) – Ch. 40)

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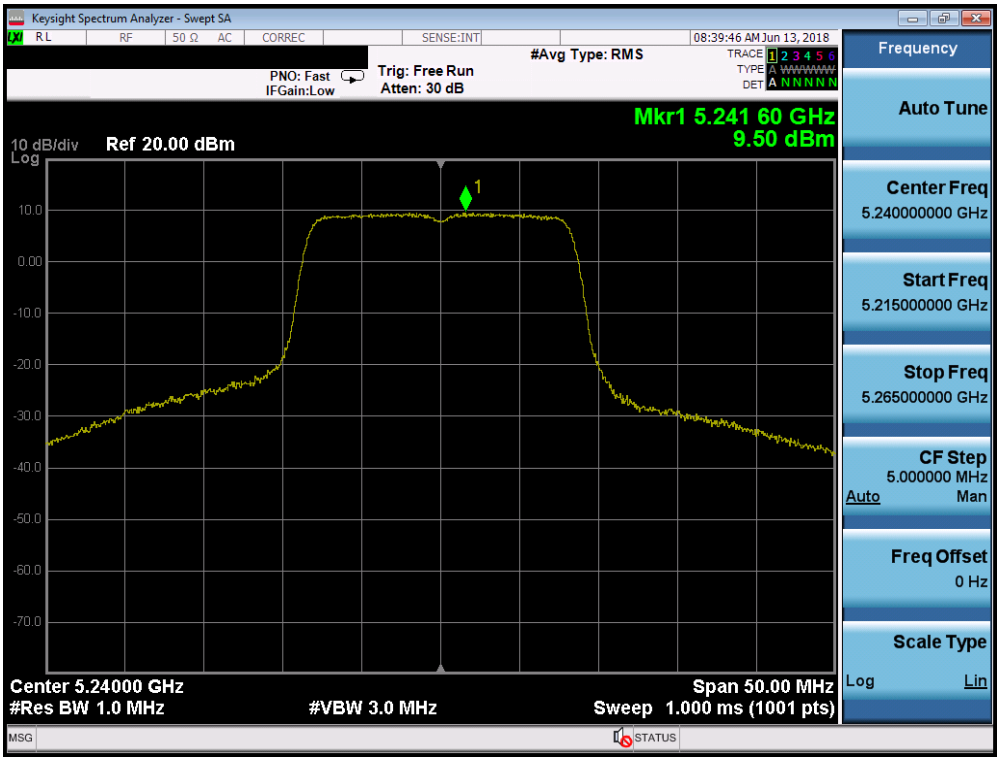
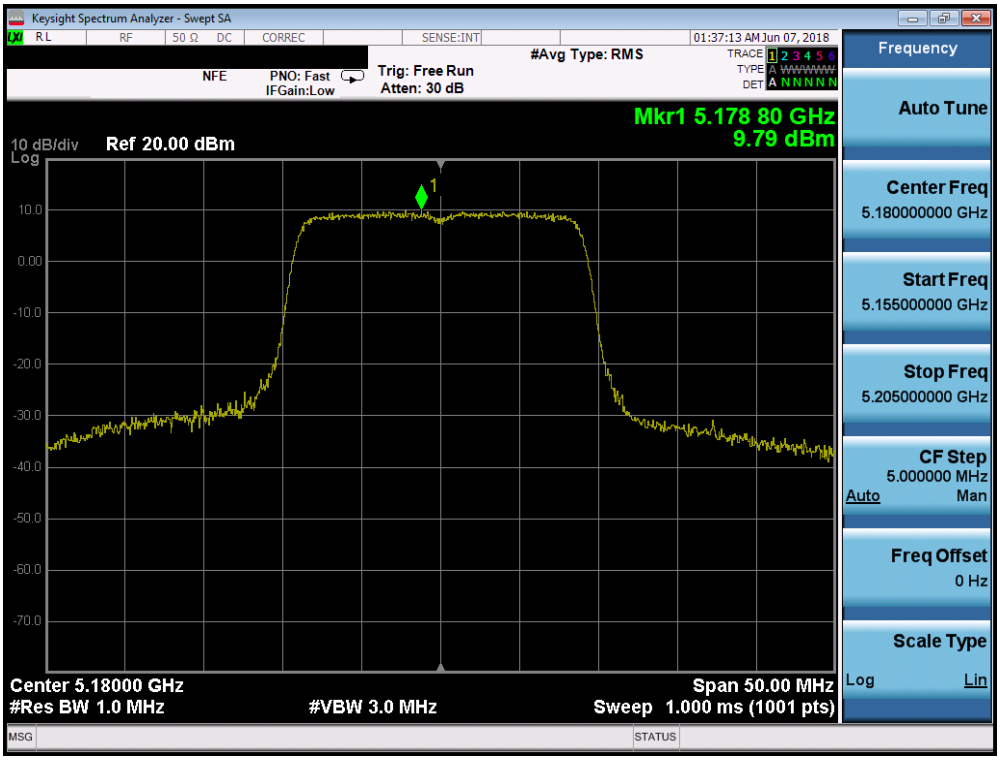


Plot 7-39. Power Spectral Density Plot (802.11a (UNII Band 1) – Ch. 48)



Plot 7-40. Power Spectral Density Plot (20MHz 802.11n (UNII Band 1) – Ch. 36)

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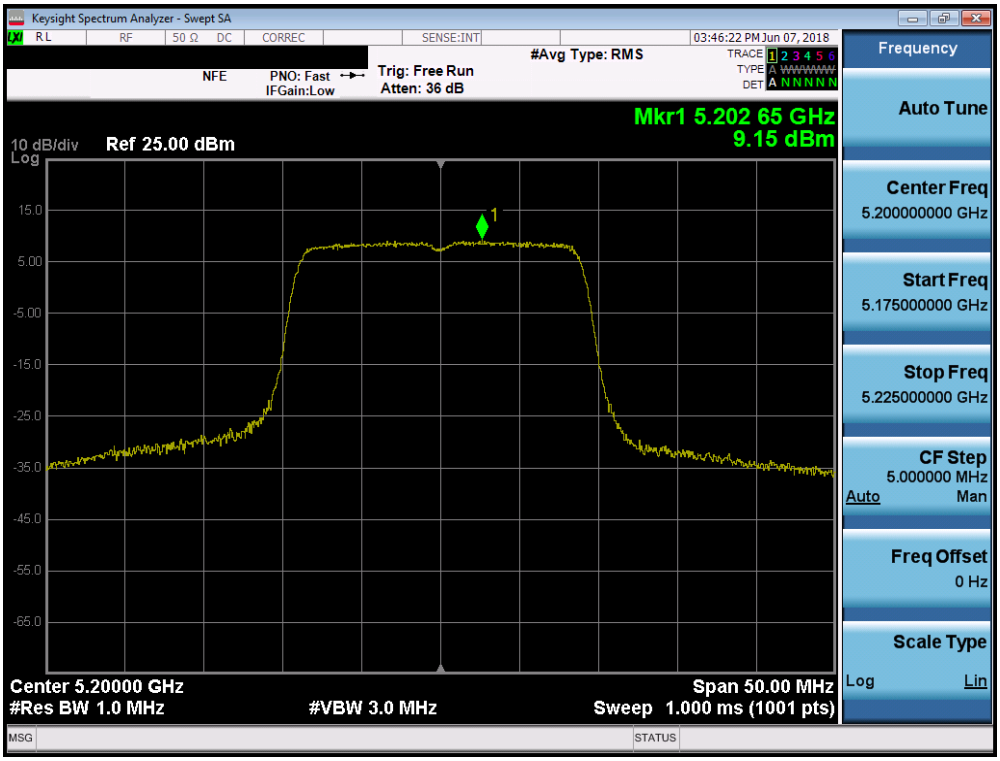
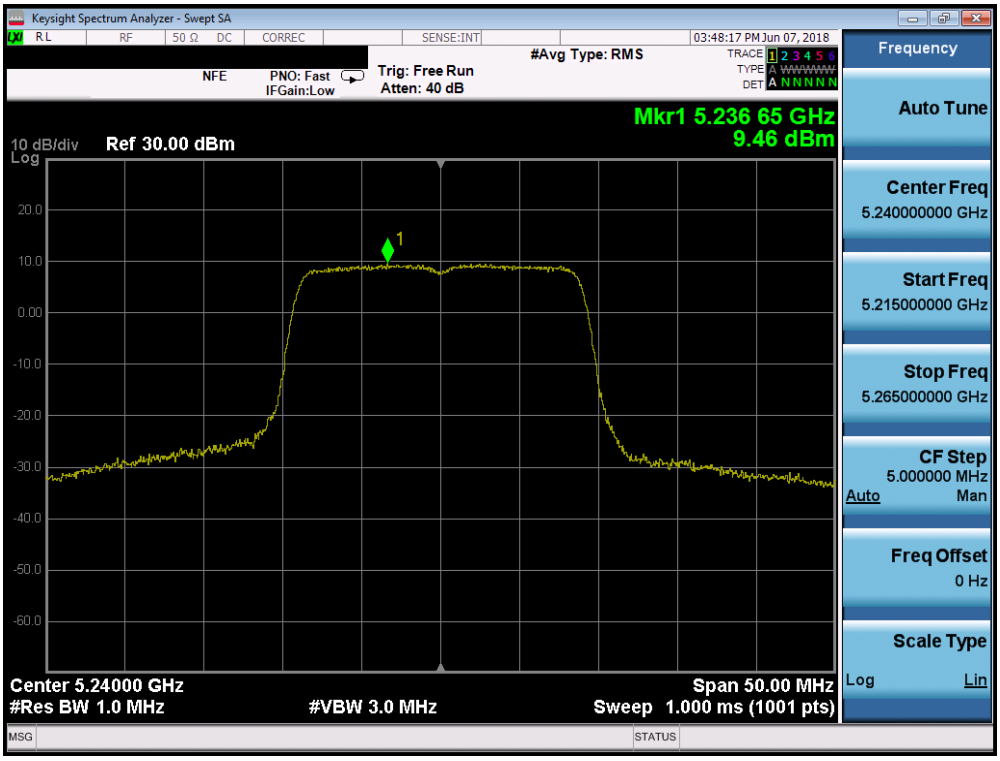


Plot 7-41. Power Spectral Density Plot (20MHz 802.11n (UNII Band 1) – Ch. 40)



Plot 7-42. Power Spectral Density Plot (20MHz 802.11n (UNII Band 1) – Ch. 48)

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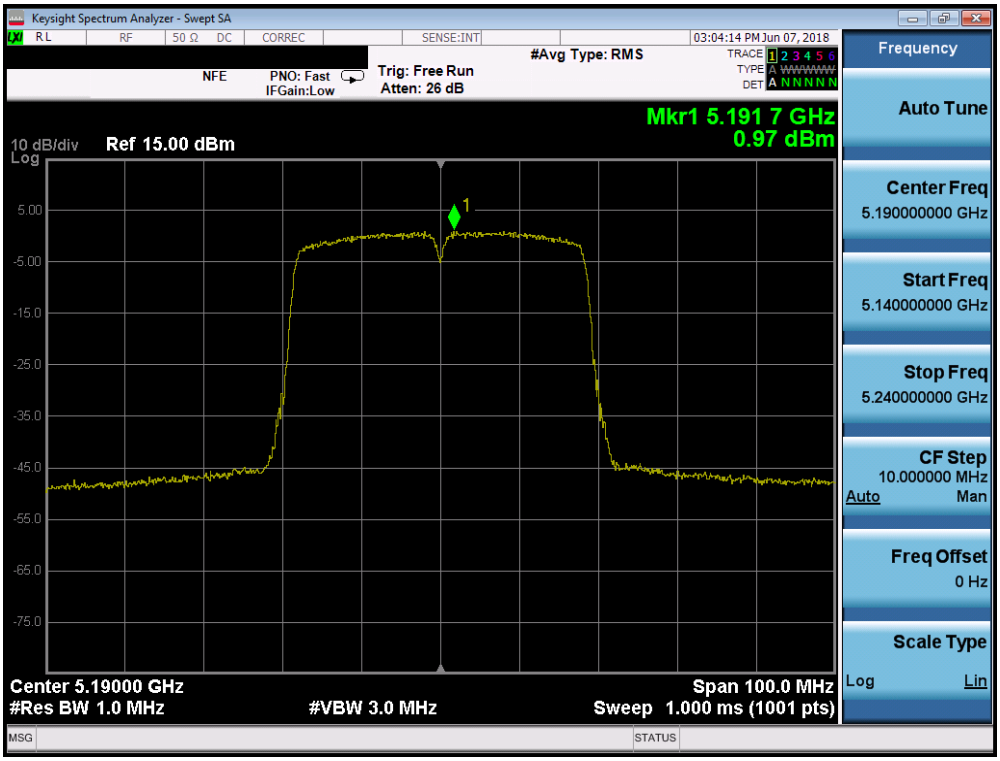
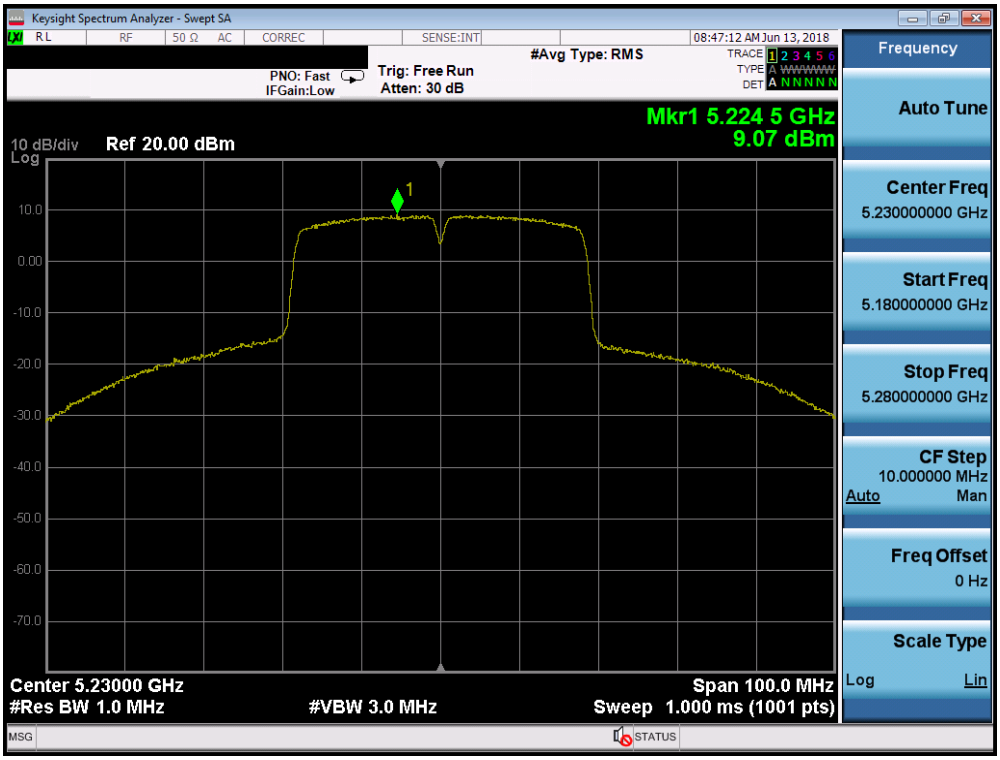


Plot 7-43. Power Spectral Density Plot (40MHz 802.11n (UNII Band 1) – Ch. 38)



Plot 7-44. Power Spectral Density Plot (40MHz 802.11n (UNII Band 1) – Ch. 46)

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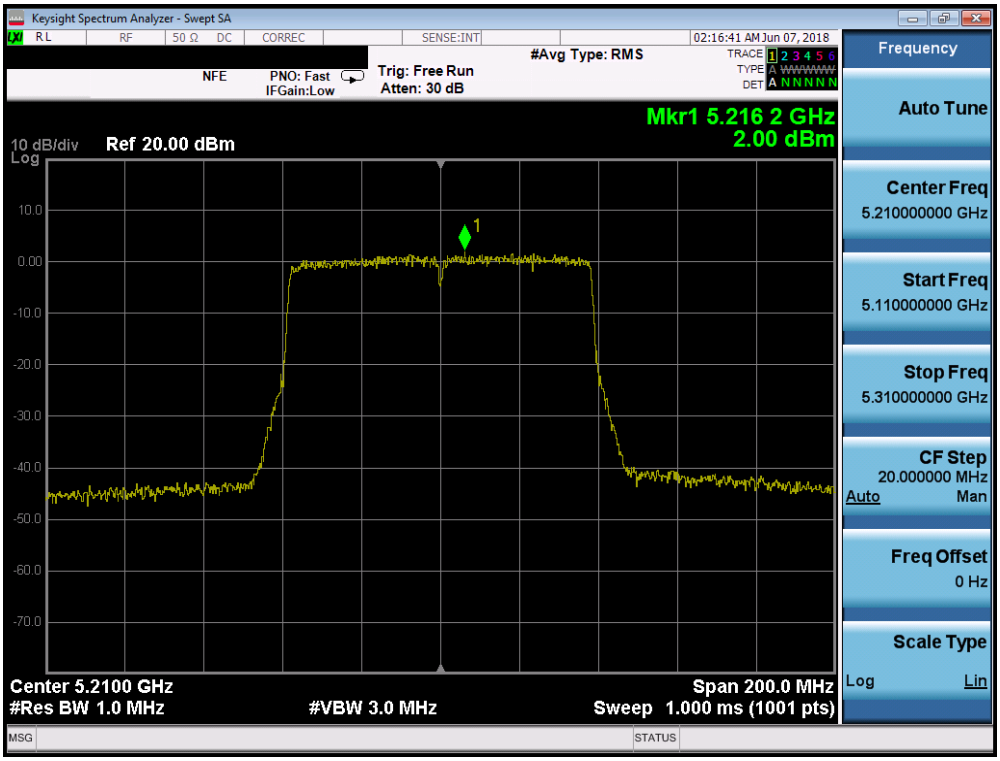

Plot 7-45. Power Spectral Density Plot (80MHz 802.11ac (UNII Band 1) – Ch. 42)

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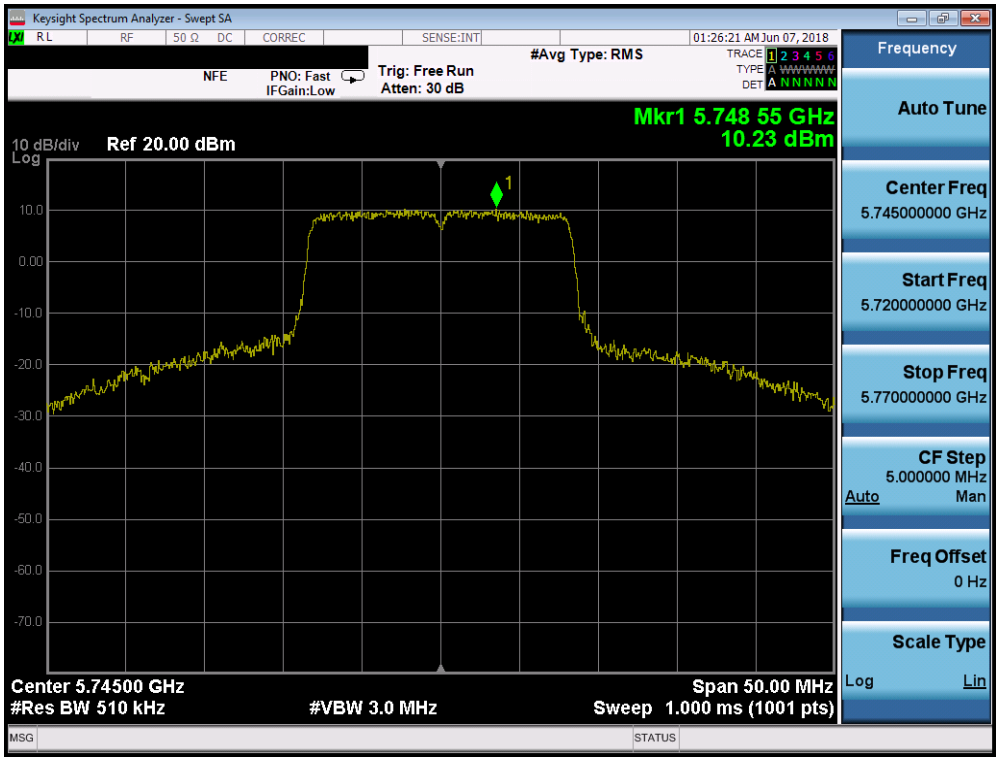
	Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	Measured Power Density [dBm]	Max Permissible Power Density [dBm/500kHz]	Margin [dB]
Band 3	5745	149	a	6	10.23	30.0	-19.77
	5785	157	a	6	9.97	30.0	-20.03
	5825	165	a	6	9.56	30.0	-20.44
	5745	149	n (20MHz)	6.5/7.2 (MCS0)	9.89	30.0	-20.11
	5785	157	n (20MHz)	6.5/7.2 (MCS0)	10.01	30.0	-19.99
	5825	165	n (20MHz)	6.5/7.2 (MCS0)	9.52	30.0	-20.48
	5755	151	n (40MHz)	13.5/15 (MCS0)	6.42	30.0	-23.58
	5795	159	n (40MHz)	13.5/15 (MCS0)	6.85	30.0	-23.15
	5775	155	ac (80MHz)	29.3/32.5 (MCS0)	2.49	30.0	-27.51

Table 7-20. Band 3 Conducted Power Spectral Density Measurements



Plot 7-46. Power Spectral Density Plot (802.11a (UNII Band 3) – Ch. 149)

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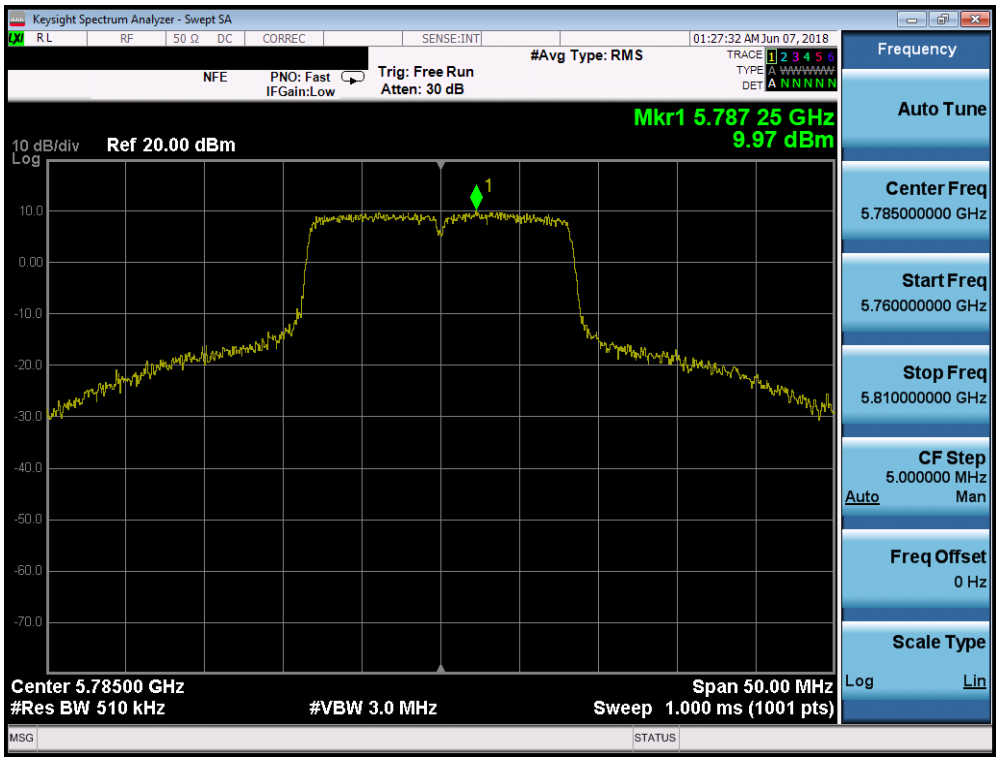
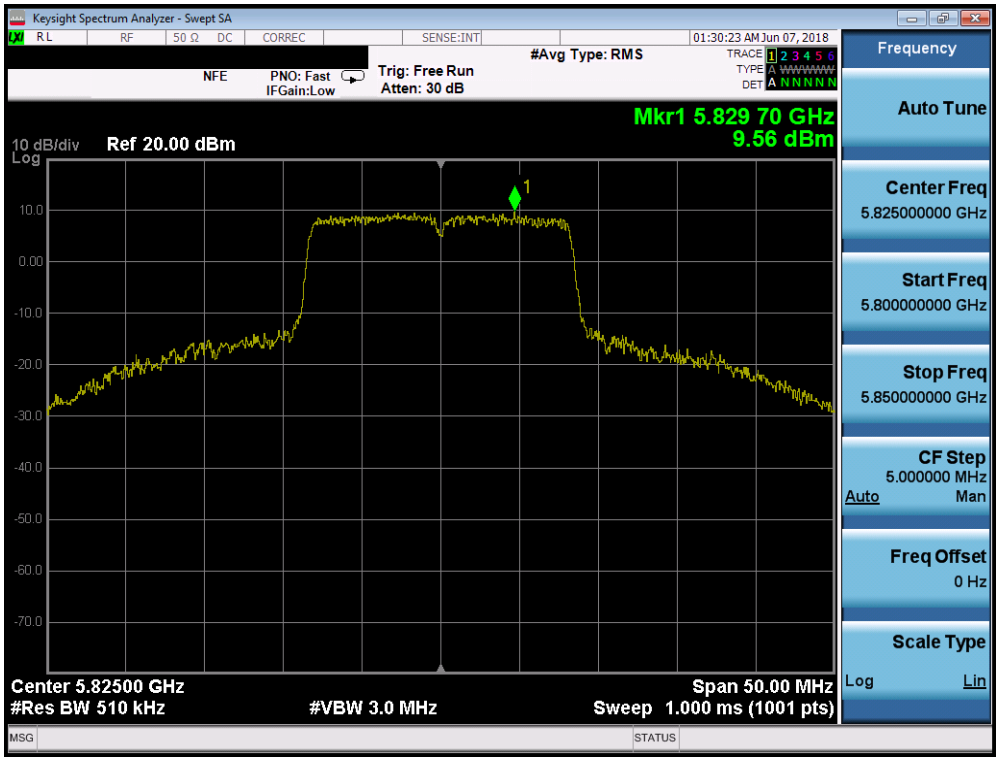


Plot 7-47. Power Spectral Density Plot (802.11a (UNII Band 3) – Ch. 157)



Plot 7-48. Power Spectral Density Plot (802.11a (UNII Band 3) – Ch. 165)

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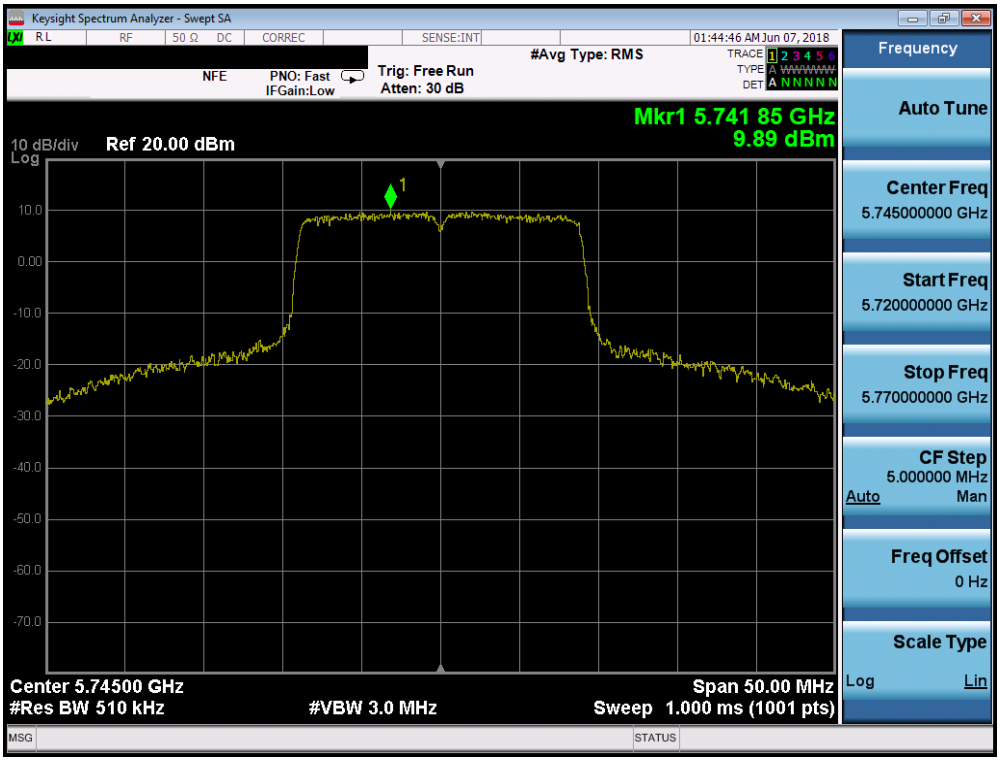
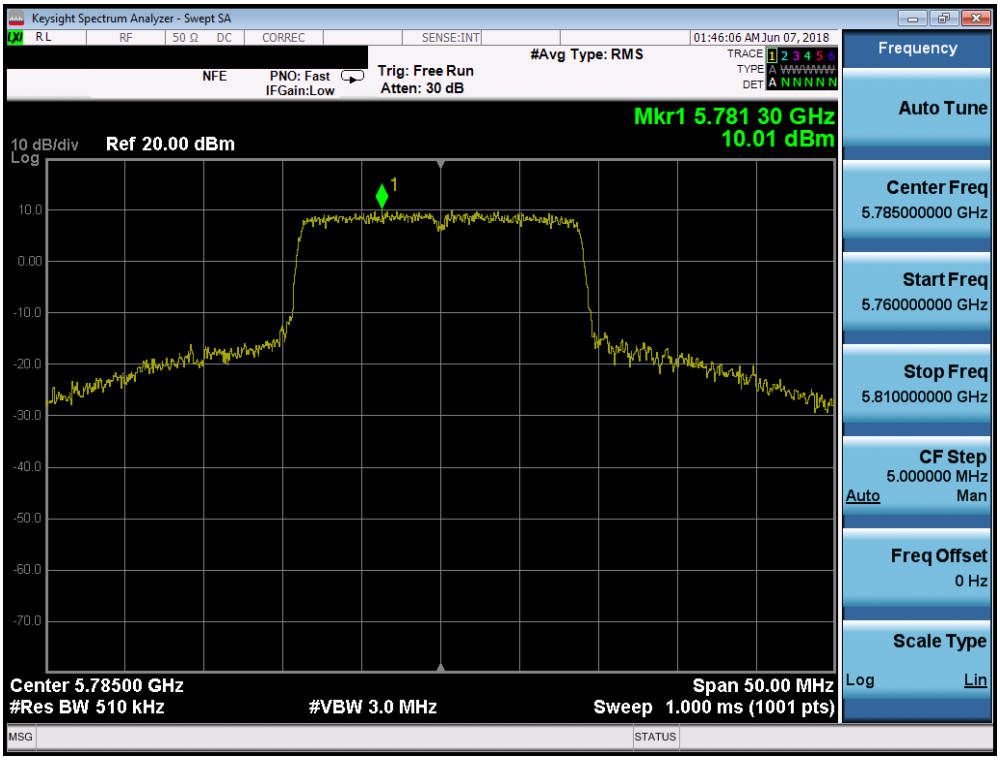


Plot 7-49. Power Spectral Density Plot (20MHz BW 802.11n (UNII Band 3) – Ch. 149)



Plot 7-50. Power Spectral Density Plot (20MHz BW 802.11n (UNII Band 3) – Ch. 157)

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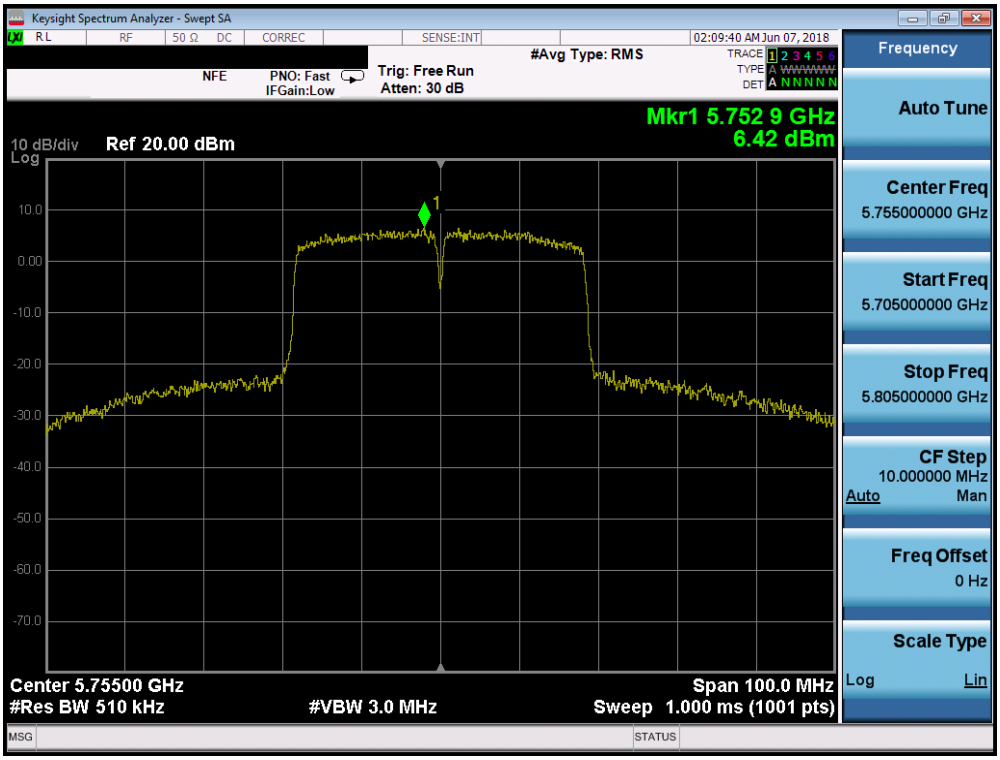
Plot 7-51. Power Spectral Density Plot (20MHz BW 802.11n (UNII Band 3) – Ch. 165)



Plot 7-52. Power Spectral Density Plot (40MHz BW 802.11n (UNII Band 3) – Ch. 151)

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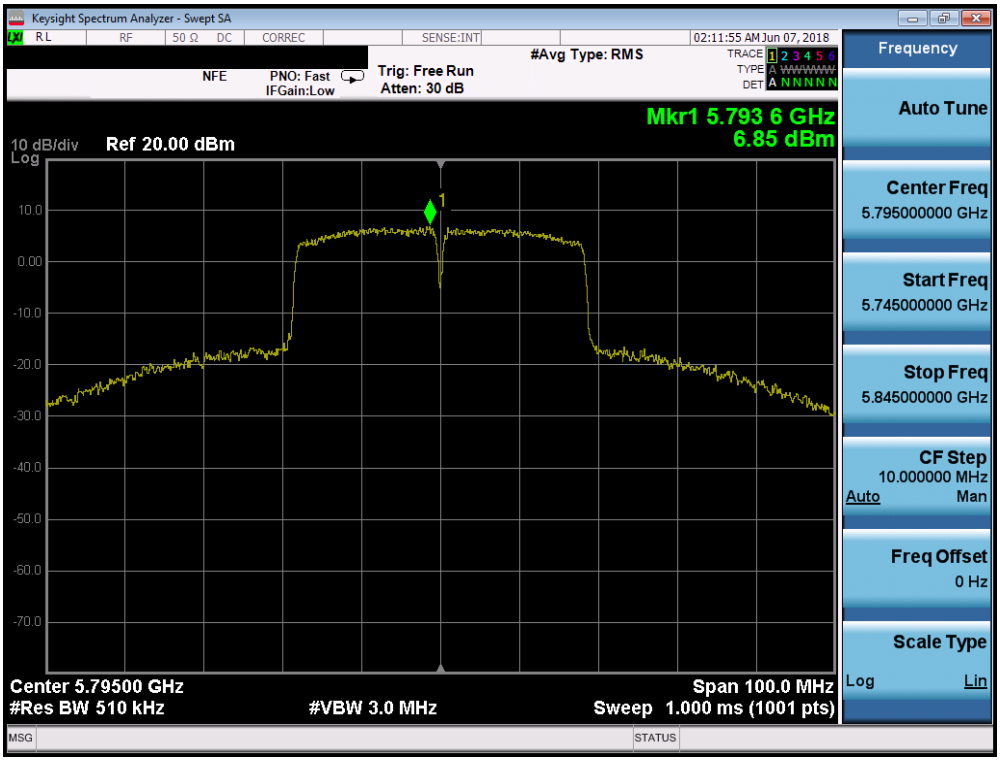
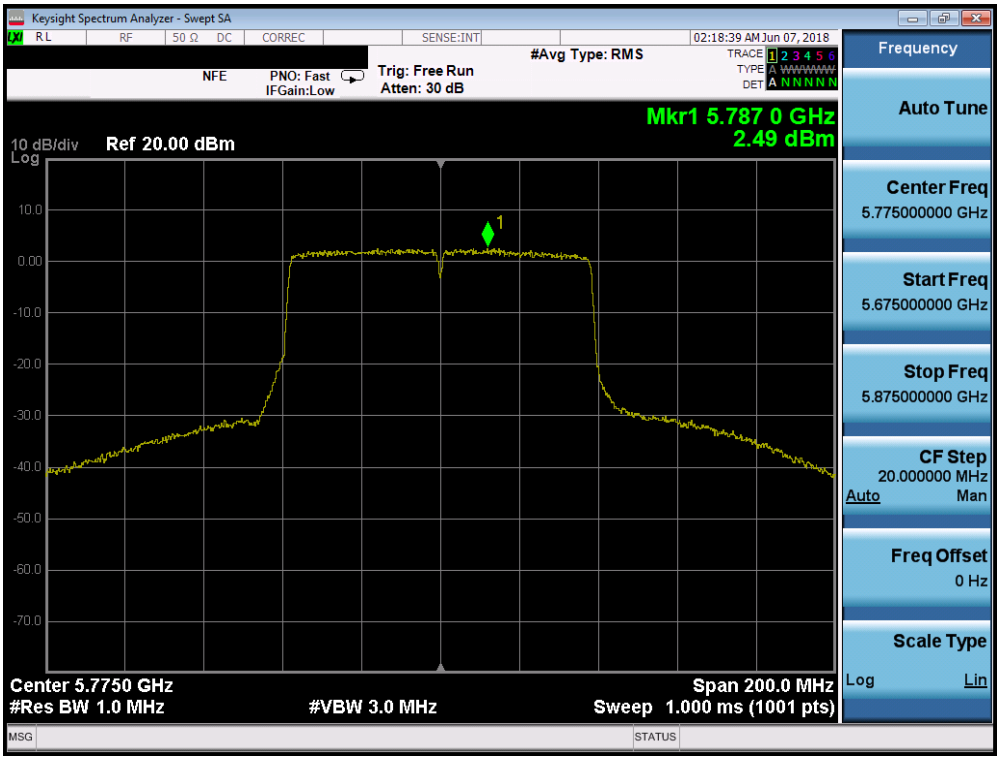


Plot 7-53. Power Spectral Density Plot (40MHz BW 802.11n (UNII Band 3) – Ch. 159)



Plot 7-54. Power Spectral Density Plot (80MHz BW 802.11ac (UNII Band 3) – Ch. 155)

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Antenna-2 Power Spectral Density Measurements

	Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	Measured Power Density [dBm]	Max Power Density [dBm/MHz]	Margin [dB]
Band 1	5180	36	a	6	9.85	11.0	-1.15
	5200	40	a	6	9.66	11.0	-1.34
	5240	48	a	6	9.94	11.0	-1.06
	5180	36	n (20MHz)	6.5/7.2 (MCS0)	8.97	11.0	-2.03
	5200	40	n (20MHz)	6.5/7.2 (MCS0)	8.82	11.0	-2.18
	5240	48	n (20MHz)	6.5/7.2 (MCS0)	9.37	11.0	-1.63
	5190	38	n (40MHz)	13.5/15 (MCS0)	1.09	11.0	-9.91
	5230	46	n (40MHz)	13.5/15 (MCS0)	9.36	11.0	-1.64
	5210	42	ac (80MHz)	29.3/32.5 (MCS0)	1.20	11.0	-9.80

Table 7-21. Band 1 Conducted Power Spectral Density Measurements

	Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	Measured Power Density [dBm]	Antenna Gain [dBi]	e.i.r.p. Power Density [dBm/MHz]	ISED Max e.i.r.p. Power Density [dBm/MHz]	Margin [dB]
Band 1	5180	36	a	6	9.85	-1.60	8.25	10.0	-1.75
	5200	40	a	6	9.66	-1.60	8.06	10.0	-1.94
	5240	48	a	6	9.94	-1.60	8.34	10.0	-1.66
	5180	36	n (20MHz)	6.5/7.2 (MCS0)	8.97	-1.60	7.37	10.0	-2.63
	5200	40	n (20MHz)	6.5/7.2 (MCS0)	8.82	-1.60	7.22	10.0	-2.78
	5240	48	n (20MHz)	6.5/7.2 (MCS0)	9.37	-1.60	7.77	10.0	-2.23
	5190	38	n (40MHz)	13.5/15 (MCS0)	1.09	-1.60	-0.51	10.0	-10.51
	5230	46	n (40MHz)	13.5/15 (MCS0)	9.36	-1.60	7.76	10.0	-2.24
	5210	42	ac (80MHz)	29.3/32.5 (MCS0)	1.20	-1.60	-0.40	10.0	-10.40

Table 7-22. Band 1 e.i.r.p. Conducted Power Spectral Density Measurements (ISED)

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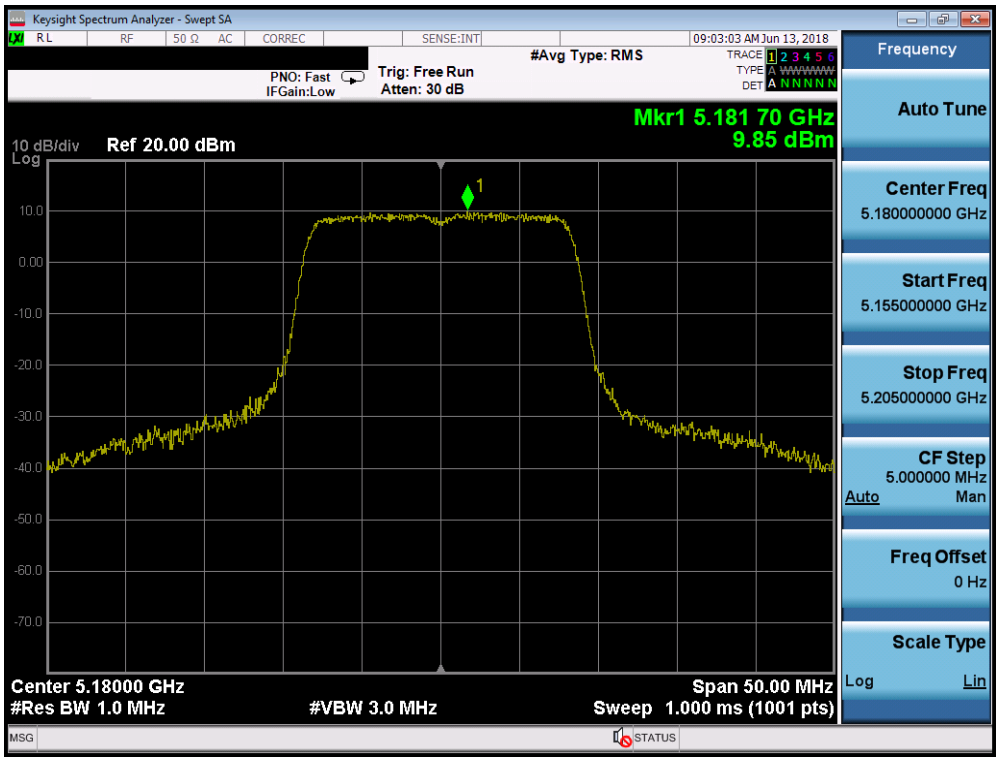
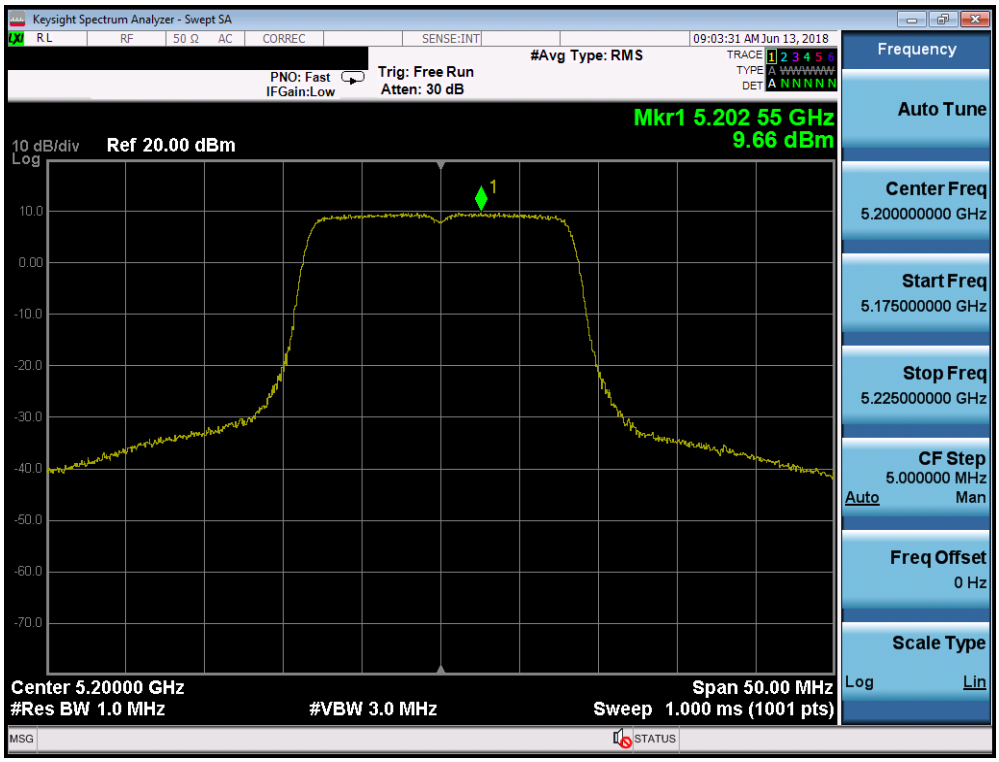


Plot 7-55. Power Spectral Density Plot (802.11a (UNII Band 1) – Ch. 36)



Plot 7-56. Power Spectral Density Plot (802.11a (UNII Band 1) – Ch. 40)

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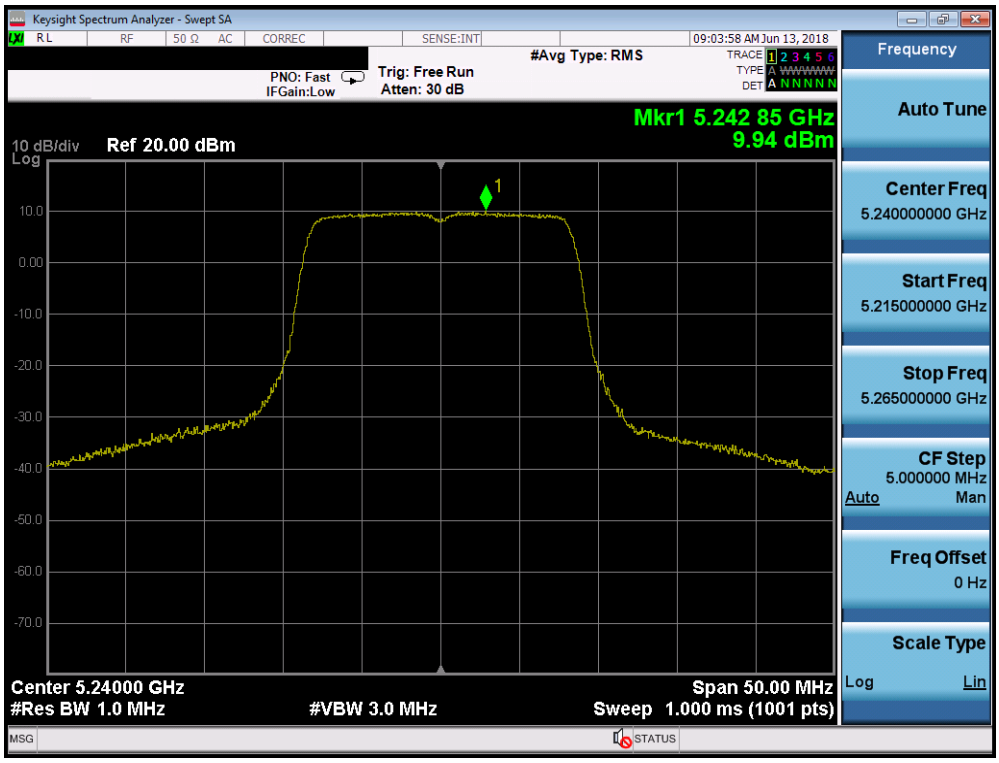
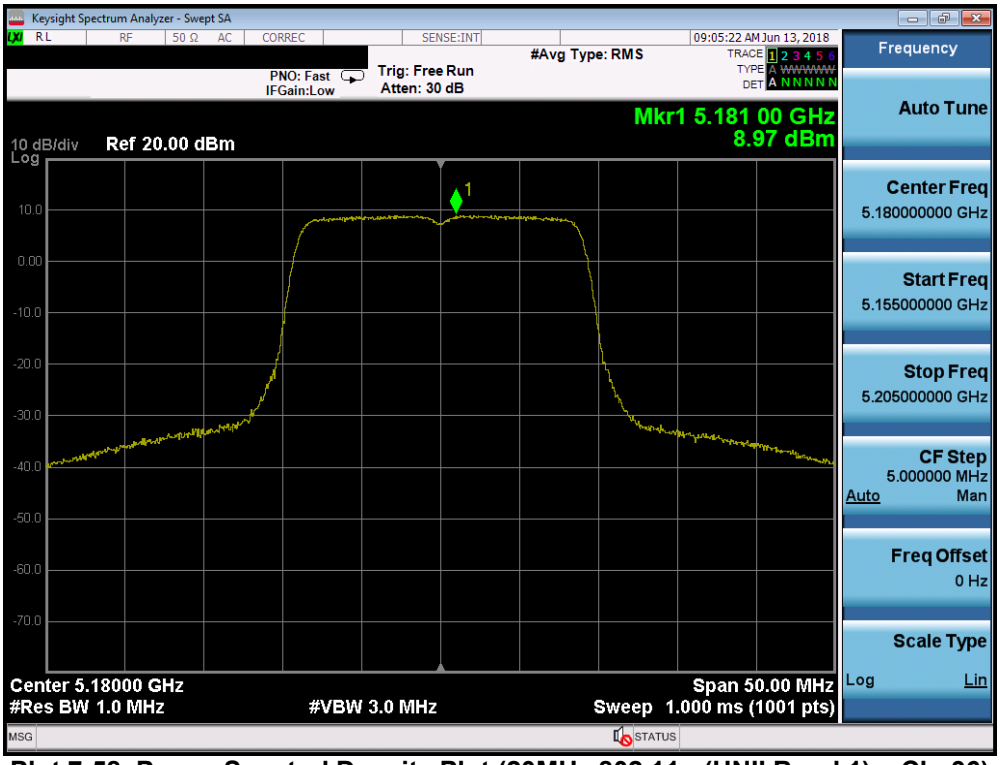


Plot 7-57. Power Spectral Density Plot (802.11a (UNII Band 1) – Ch. 48)



Plot 7-58. Power Spectral Density Plot (20MHz 802.11n (UNII Band 1) – Ch. 36)

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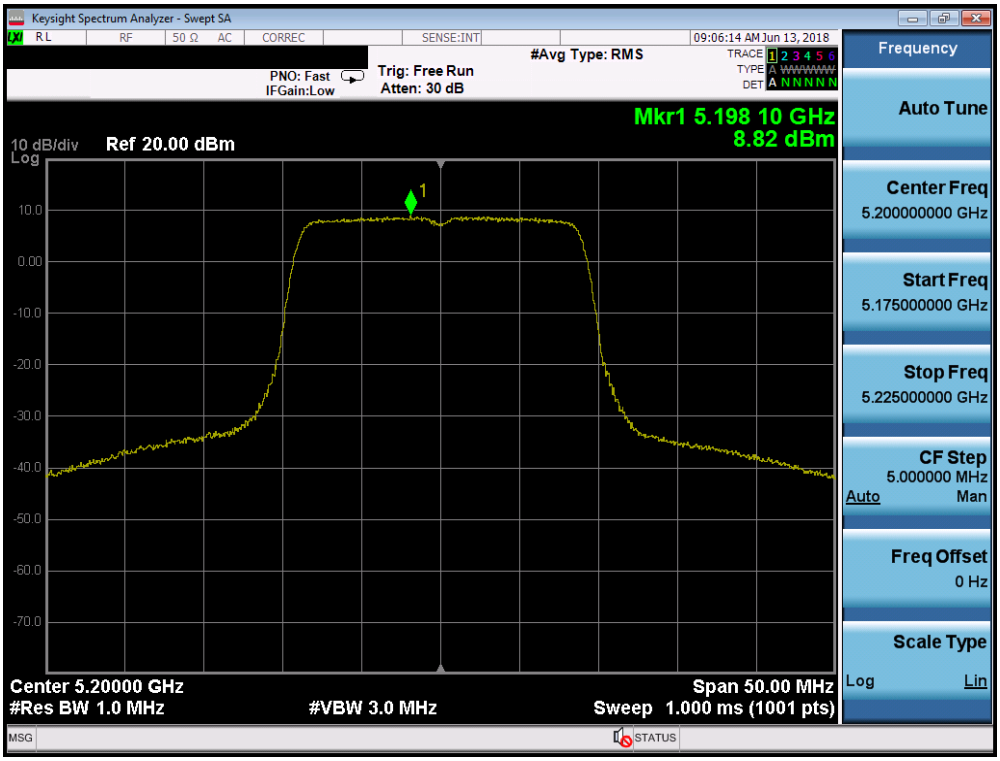
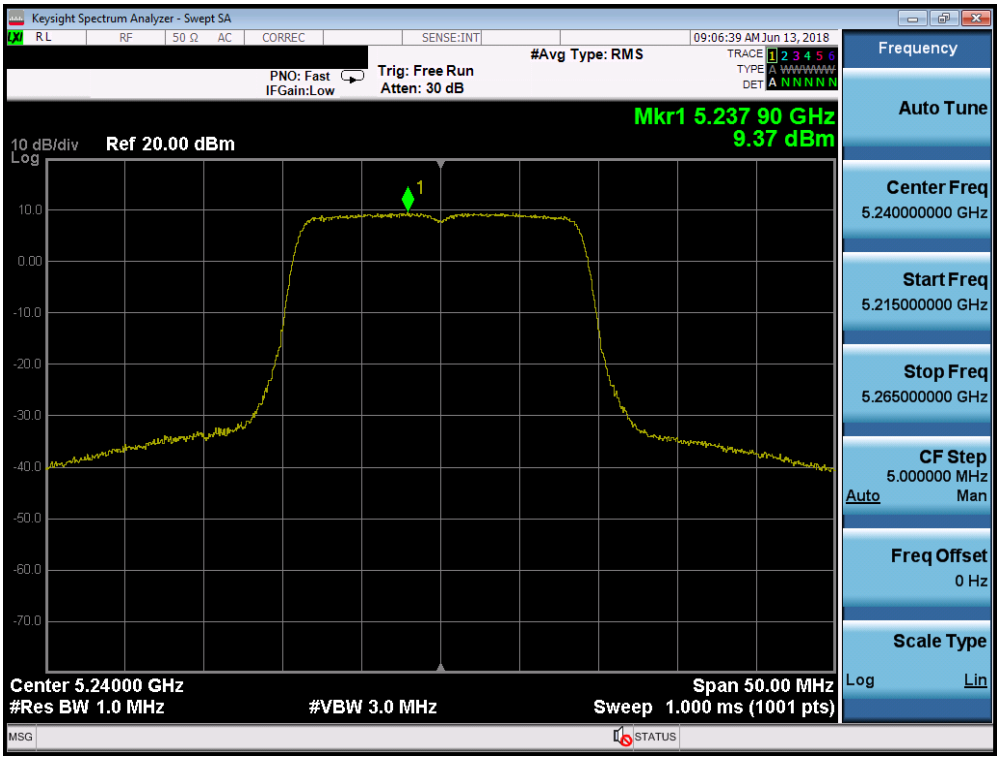


Plot 7-59. Power Spectral Density Plot (20MHz 802.11n (UNII Band 1) – Ch. 40)



Plot 7-60. Power Spectral Density Plot (20MHz 802.11n (UNII Band 1) – Ch. 48)

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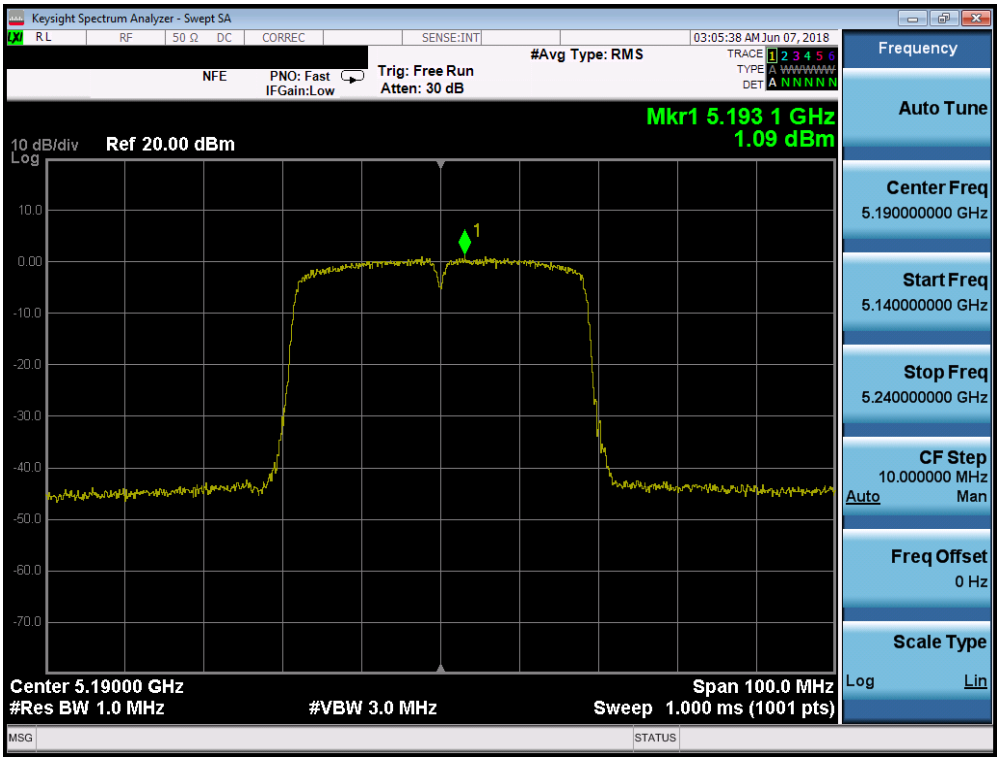
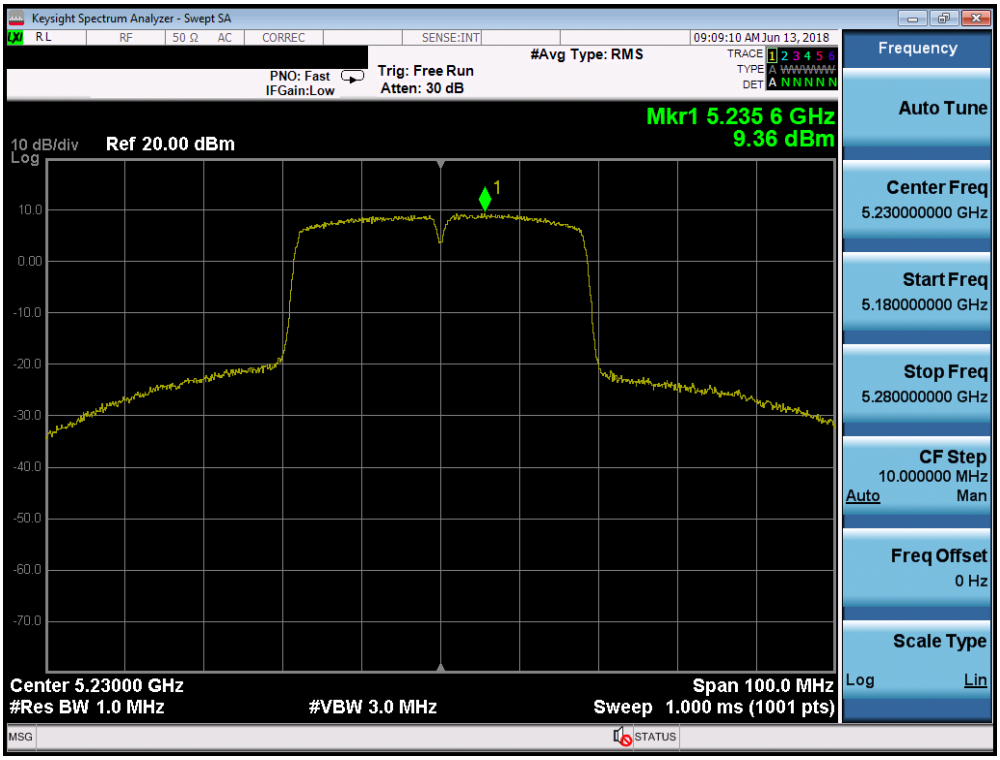


Plot 7-61. Power Spectral Density Plot (40MHz 802.11n (UNII Band 1) – Ch. 38)



Plot 7-62. Power Spectral Density Plot (40MHz 802.11n (UNII Band 1) – Ch. 46)

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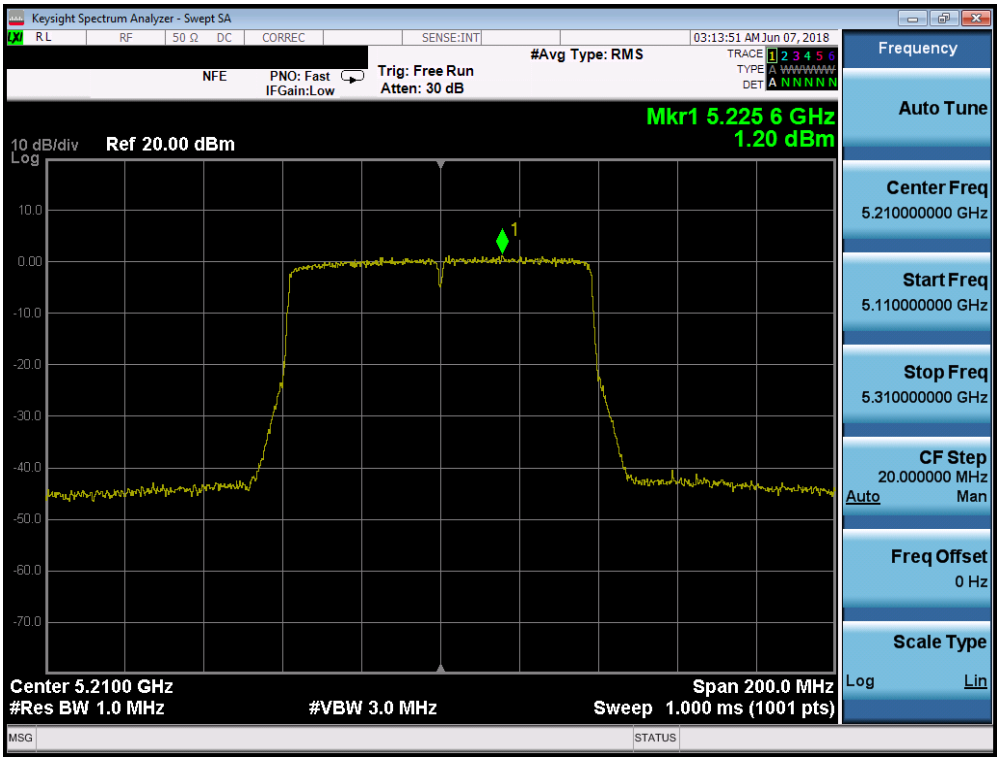

Plot 7-63. Power Spectral Density Plot (80MHz 802.11ac (UNII Band 1) – Ch. 42)

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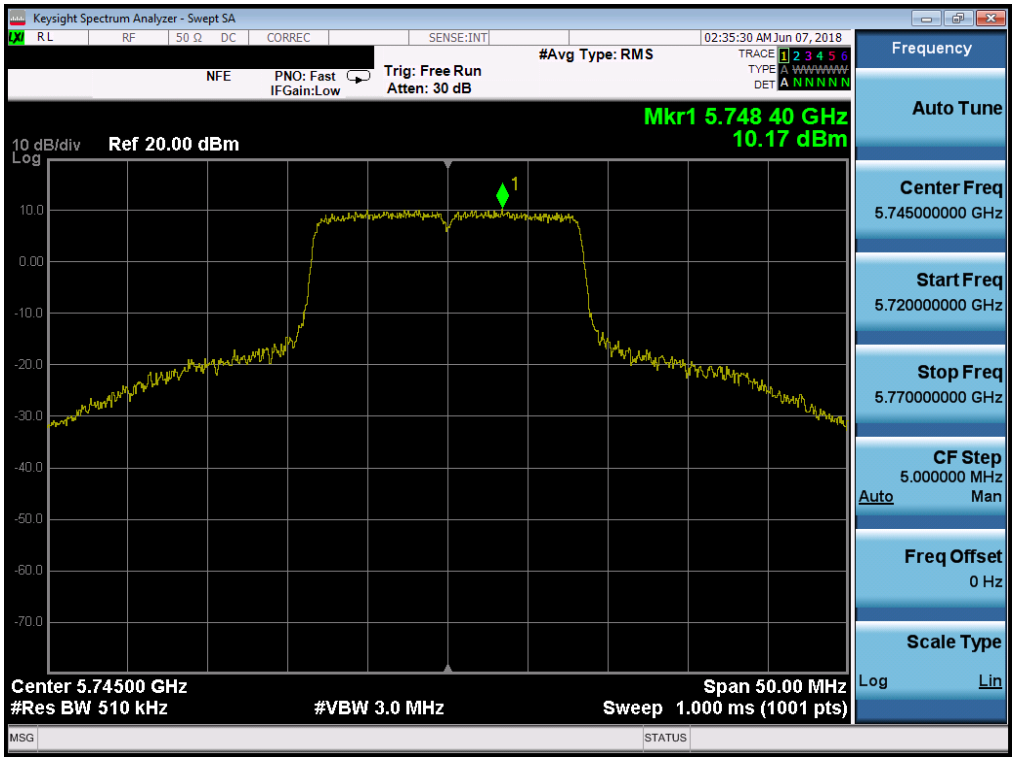
	Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	Measured Power Density [dBm]	Max Permissible Power Density [dBm/500kHz]	Margin [dB]
Band 3	5745	149	a	6	10.17	30.0	-19.83
	5785	157	a	6	9.23	30.0	-20.77
	5825	165	a	6	9.32	30.0	-20.68
	5745	149	n (20MHz)	6.5/7.2 (MCS0)	10.19	30.0	-19.81
	5785	157	n (20MHz)	6.5/7.2 (MCS0)	9.42	30.0	-20.58
	5825	165	n (20MHz)	6.5/7.2 (MCS0)	8.95	30.0	-21.05
	5755	151	n (40MHz)	13.5/15 (MCS0)	6.49	30.0	-23.51
	5795	159	n (40MHz)	13.5/15 (MCS0)	6.66	30.0	-23.34
	5775	155	ac (80MHz)	29.3/32.5 (MCS0)	2.73	30.0	-27.27

Table 7-23. Band 3 Conducted Power Spectral Density Measurements



Plot 7-64. Power Spectral Density Plot (802.11a (UNII Band 3) – Ch. 149)

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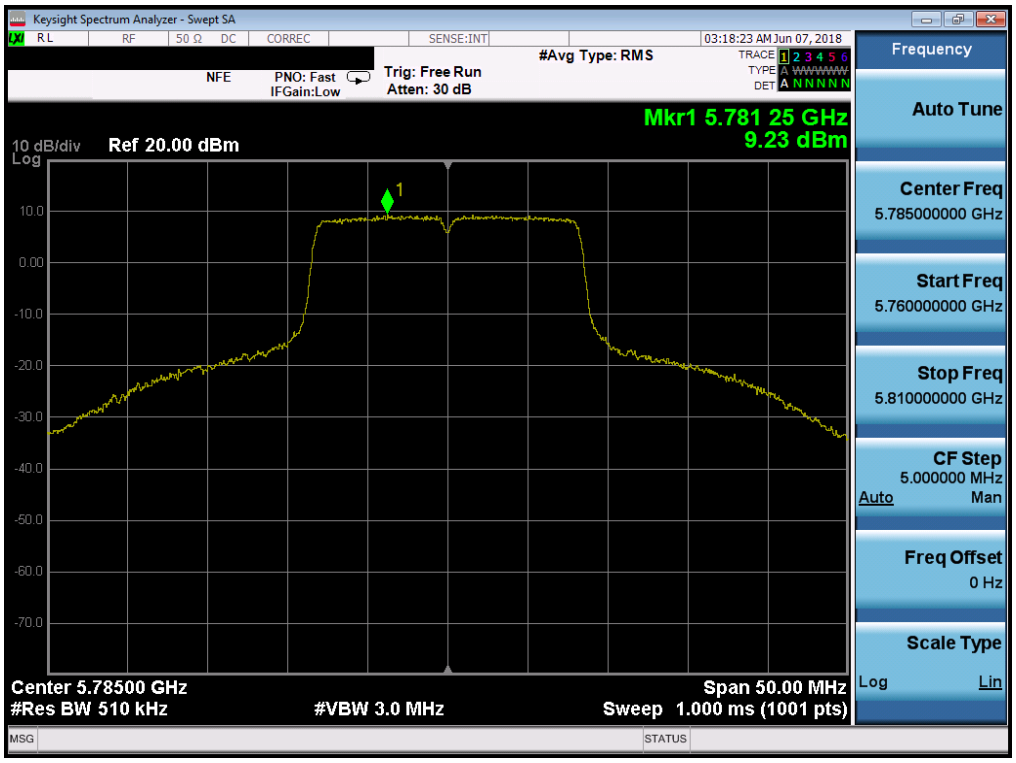
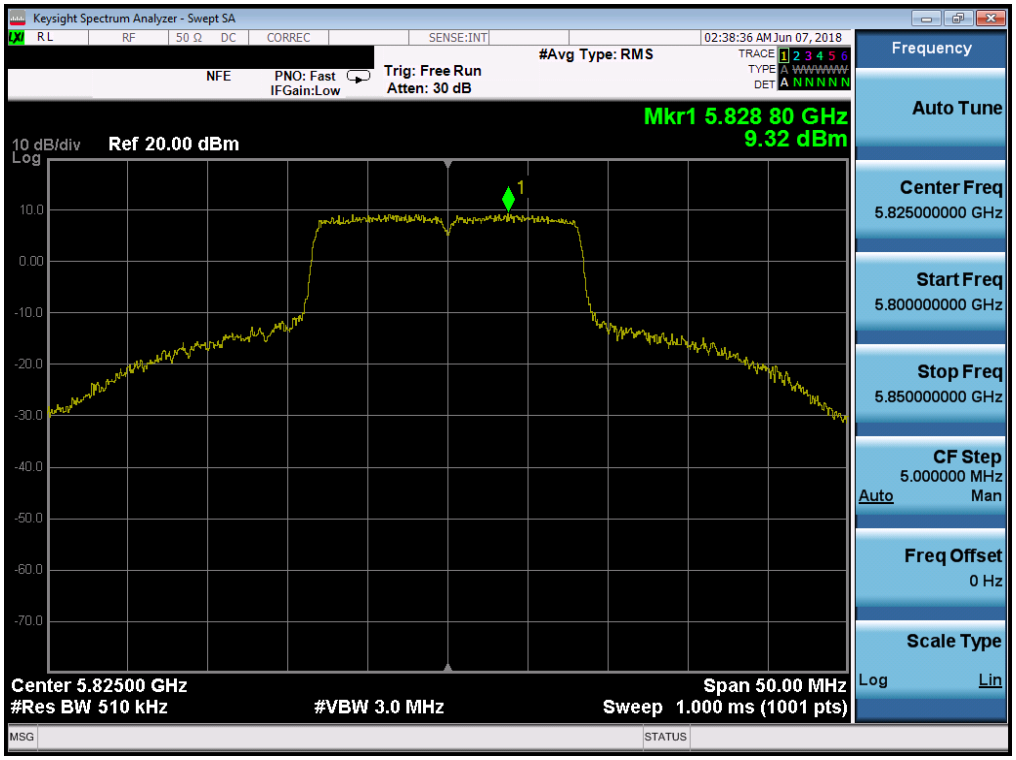


Plot 7-65. Power Spectral Density Plot (802.11a (UNII Band 3) – Ch. 157)



Plot 7-66. Power Spectral Density Plot (802.11a (UNII Band 3) – Ch. 165)

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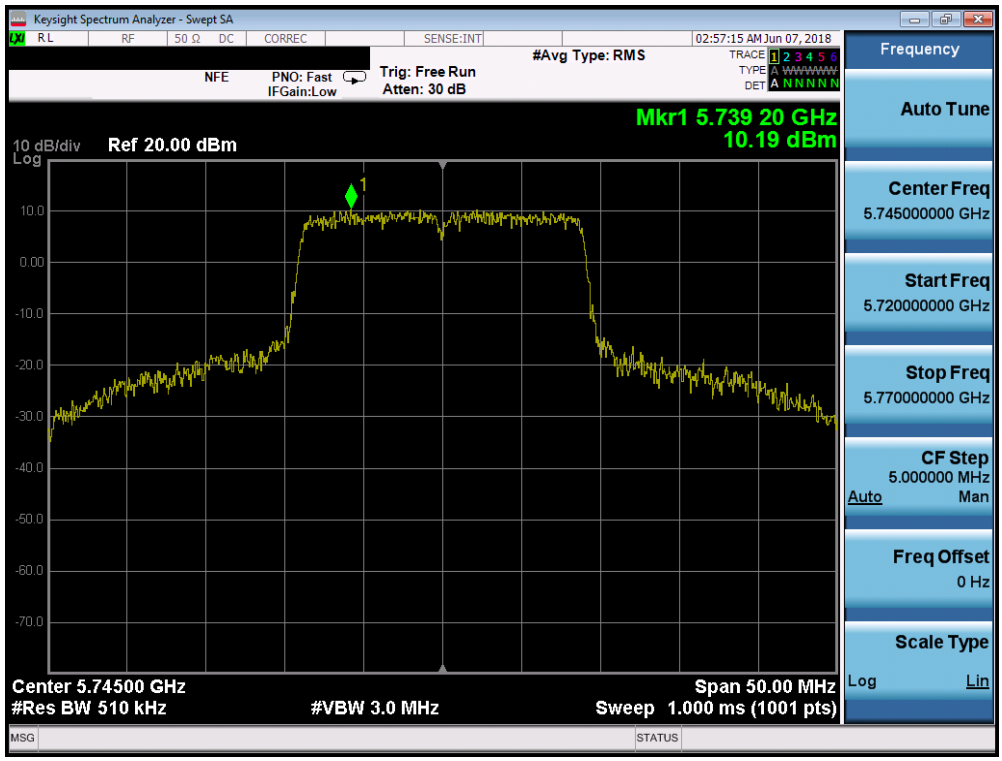
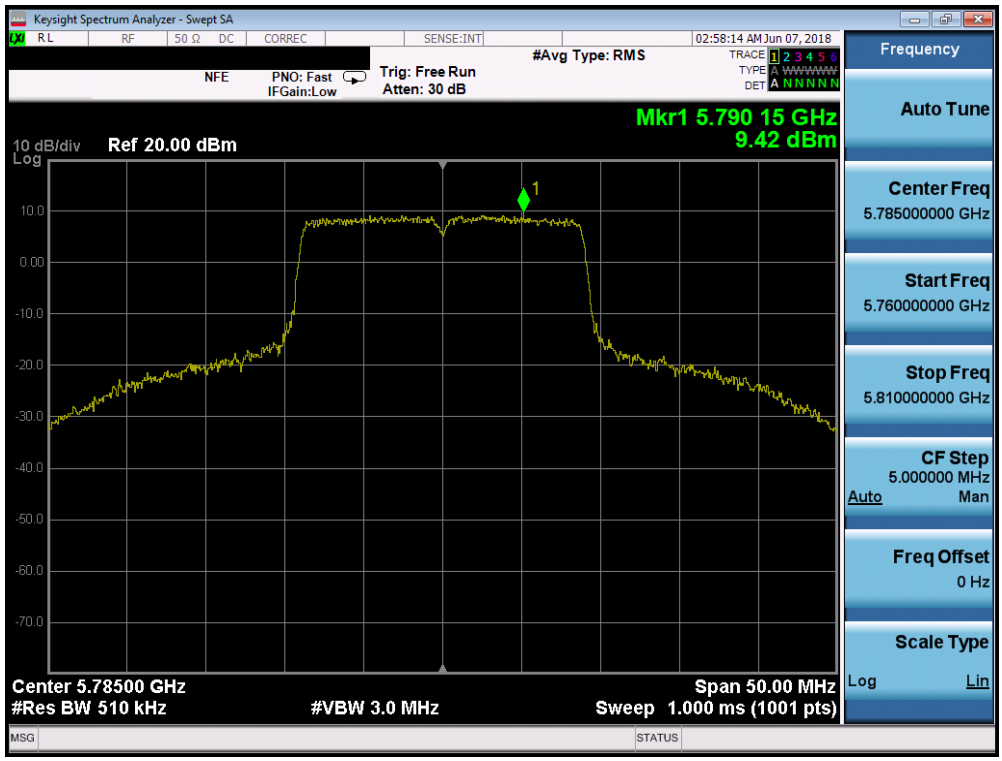


Plot 7-67. Power Spectral Density Plot (20MHz BW 802.11n (UNII Band 3) – Ch. 149)



Plot 7-68. Power Spectral Density Plot (20MHz BW 802.11n (UNII Band 3) – Ch. 157)

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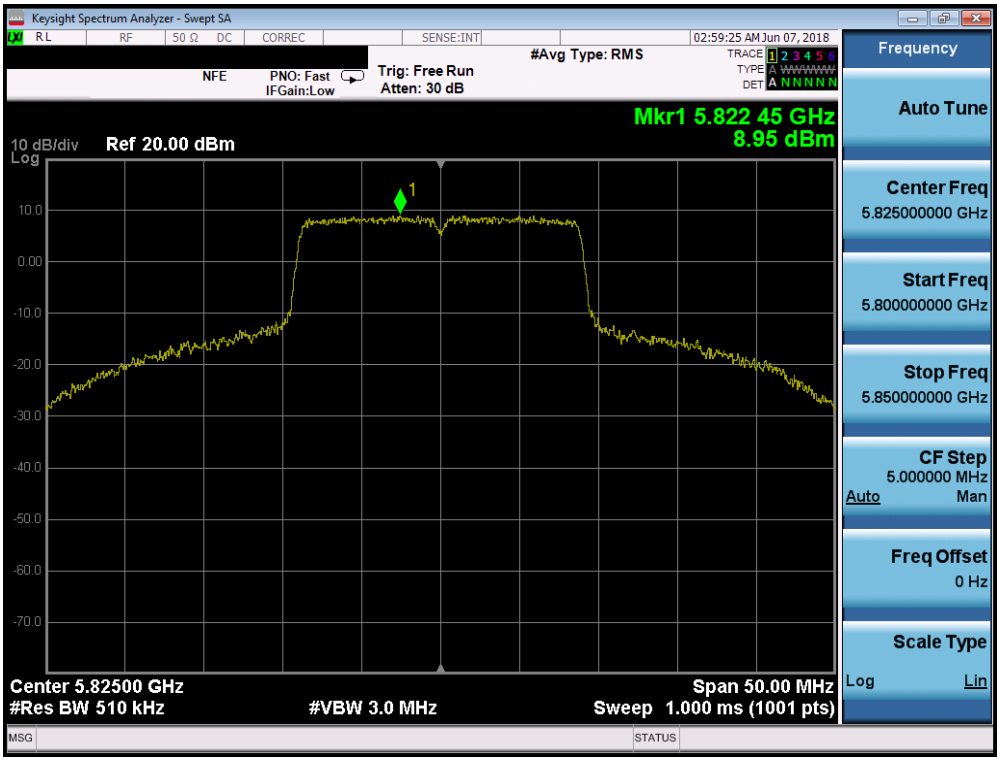
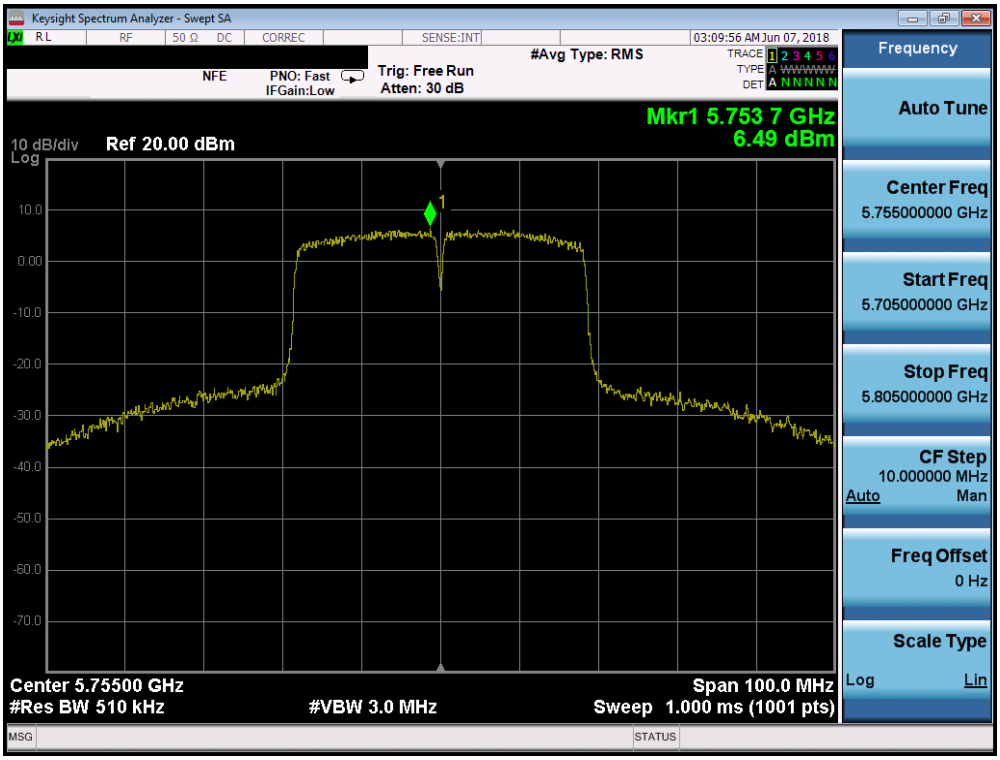


Plot 7-69. Power Spectral Density Plot (20MHz BW 802.11n (UNII Band 3) – Ch. 165)



Plot 7-70. Power Spectral Density Plot (40MHz BW 802.11n (UNII Band 3) – Ch. 151)

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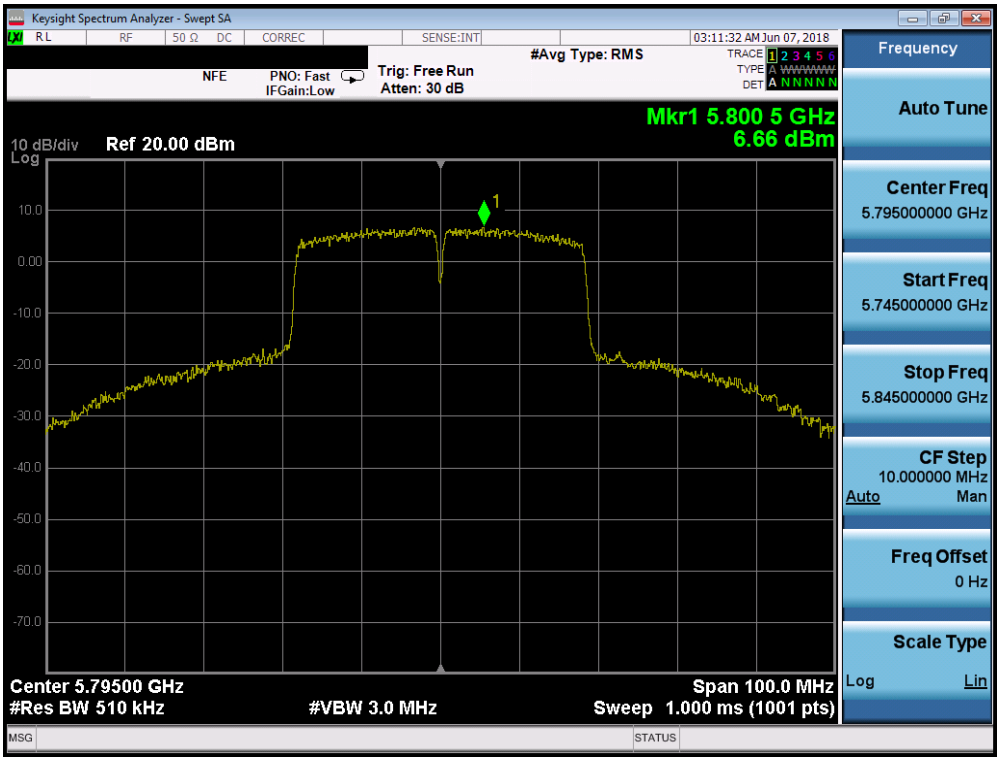
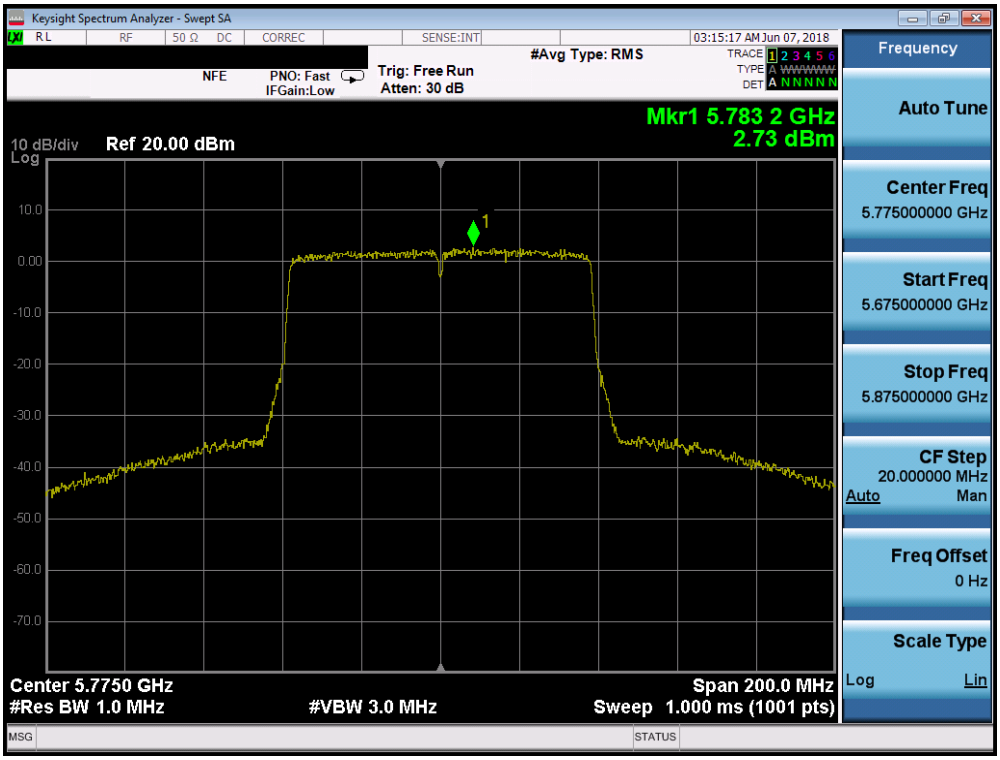


Plot 7-71. Power Spectral Density Plot (40MHz BW 802.11n (UNII Band 3) – Ch. 159)



Plot 7-72. Power Spectral Density Plot (80MHz BW 802.11ac (UNII Band 3) – Ch. 155)

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Summed MIMO/CDD Power Spectral Density Measurements

	Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	Antenna-1 Power Density [dBm]	Antenna-2 Power Density [dBm]	Summed MIMO Power Density [dBm]	Max Power Density [dBm/MHz]	Margin [dB]
Band 1	5180	36	a	6.5/7.2 (MCS0)	3.80	4.04	6.93	11.0	-4.07
	5200	40	a	6.5/7.2 (MCS0)	3.68	3.75	6.73	11.0	-4.27
	5240	48	a	6.5/7.2 (MCS0)	3.91	4.23	7.08	11.0	-3.92
	5180	36	n (20MHz)	6.5/7.2 (MCS0)	3.07	3.40	6.25	11.0	-4.75
	5200	40	n (20MHz)	6.5/7.2 (MCS0)	3.58	4.08	6.85	11.0	-4.15
	5240	48	n (20MHz)	6.5/7.2 (MCS0)	3.64	3.85	6.76	11.0	-4.24
	5190	38	n (40MHz)	13.5/15 (MCS0)	0.97	1.24	4.11	11.0	-6.89
	5230	46	n (40MHz)	13.5/15 (MCS0)	0.89	1.21	4.06	11.0	-6.94
	5210	42	ac (80MHz)	29.3/32.5 (MCS0)	-3.03	-2.26	0.38	11.0	-10.62

Table 7-24. Band 1 MIMO/CDD Conducted Power Spectral Density Measurements

	Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	Antenna-1 Power Density [dBm]	Antenna-2 Power Density [dBm]	Summed MIMO Power Density [dBm]	Directional Gain [dBi]	e.i.r.p. Power Density [dBm/MHz]	Max Power Density [dBm/MHz]	e.i.r.p. Power Density Margin [dB]
Band 1	5180	36	a	6.5/7.2 (MCS0)	3.80	4.04	6.93	1.92	8.85	10.0	-1.15
	5200	40	a	6.5/7.2 (MCS0)	3.68	3.75	6.73	1.92	8.65	10.0	-1.35
	5240	48	a	6.5/7.2 (MCS0)	3.91	4.23	7.08	1.92	9.00	10.0	-1.00
	5180	36	n (20MHz)	6.5/7.2 (MCS0)	3.07	3.40	6.25	1.92	8.17	10.0	-1.83
	5200	40	n (20MHz)	6.5/7.2 (MCS0)	3.58	4.08	6.85	1.92	8.77	10.0	-1.23
	5240	48	n (20MHz)	6.5/7.2 (MCS0)	3.64	3.85	6.76	1.92	8.68	10.0	-1.32
	5190	38	n (40MHz)	13.5/15 (MCS0)	0.97	1.24	4.11	1.92	6.03	10.0	-3.97
	5230	46	n (40MHz)	13.5/15 (MCS0)	0.89	1.21	4.06	1.92	5.98	10.0	-4.02
	5210	42	ac (80MHz)	29.3/32.5 (MCS0)	-3.03	-2.26	0.38	1.92	2.30	10.0	-7.70

Table 7-25. Band 1 MIMO/CDD e.i.r.p. Conducted Power Spectral Density Measurements (ISED)

	Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	Antenn-1 Power Density [dBm]	Antenn-2 Power Density [dBm]	Summed MIMO Power Density [dBm]	Max Permissible Power Density [dBm/500kHz]	Margin [dB]
Band 3	5745	149	a	6.5/7.2 (MCS0)	10.23	10.17	13.21	30.0	-16.79
	5785	157	a	6.5/7.2 (MCS0)	9.97	9.23	12.63	30.0	-17.37
	5825	165	a	6.5/7.2 (MCS0)	9.56	9.32	12.45	30.0	-17.55
	5745	149	n (20MHz)	6.5/7.2 (MCS0)	9.89	10.19	13.05	30.0	-16.95
	5785	157	n (20MHz)	6.5/7.2 (MCS0)	10.01	9.42	12.74	30.0	-17.26
	5825	165	n (20MHz)	6.5/7.2 (MCS0)	9.52	8.95	12.25	30.0	-17.75
	5755	151	n (40MHz)	13.5/15 (MCS0)	6.42	6.49	9.47	30.0	-20.53
	5795	159	n (40MHz)	13.5/15 (MCS0)	6.85	6.66	9.77	30.0	-20.23
	5775	155	ac (80MHz)	29.3/32.5 (MCS0)	2.49	2.73	5.62	30.0	-24.38

Table 7-26. Band 3 MIMO Conducted Power Spectral Density Measurements

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Note:

Per ANSI C63.10-2013 Section 14.3.2.2 and KDB 662911 v02r01 Section E)2), the power spectral density at Antenna 1 and Antenna 2 were first measured separately as shown in the section above. The measured values were then summed in linear power units then converted back to dBm.

Sample MIMO Calculation:

At 5180MHz in 802.11n (20MHz BW) mode, the average conducted power spectral density was measured to be 3.07 dBm for Antenna-1 and 3.40 dBm for Antenna-2.

Antenna 1 + Antenna 2 = MIMO

(3.07 dBm + 3.40 dBm) = (2.03 mW + 2.19 mW) = 4.22 mW = 6.25 dBm

Sample e.i.r.p Power Spectral Density Calculation:

At 5180MHz in 802.11n (20MHz BW) mode, the average MIMO power density was calculated to be 6.25 dBm with directional gain of 1.92 dBi.

e.i.r.p. Power Spectral Density(dBm) = Power Spectral Density (dBm) + Ant gain (dBi)

6.25 dBm + 1.92 dBi = 8.17 dBm

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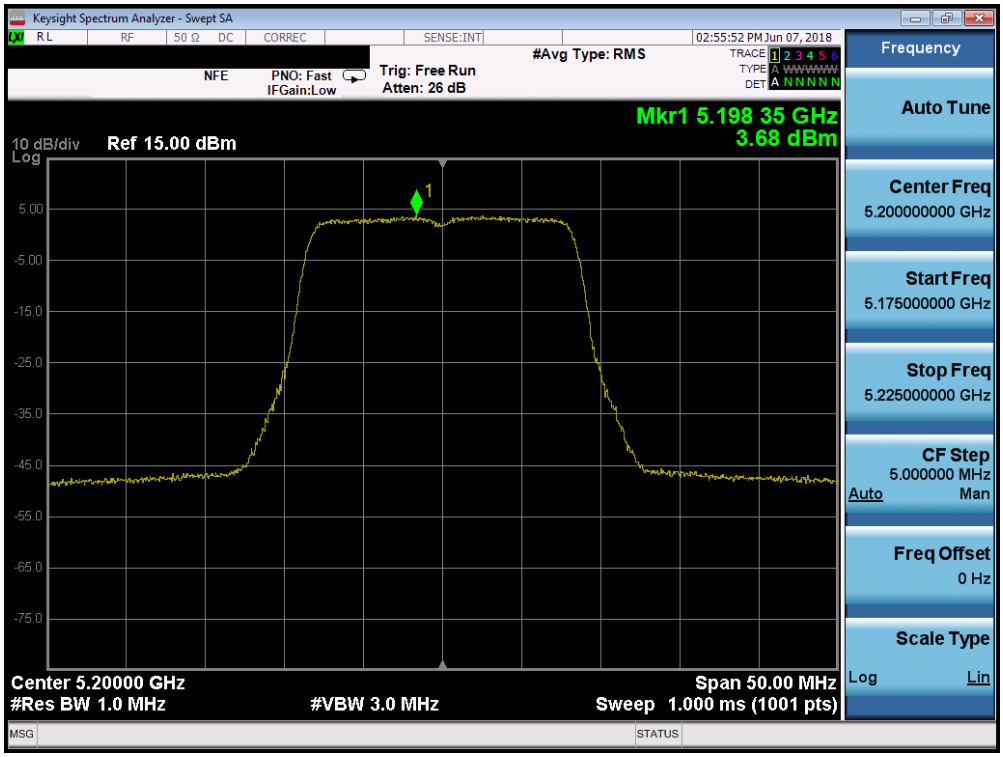
Plot 7-73. ANT 1 Power Spectral Density Plot (802.11a (UNII Band 1) – Ch. 36)



Plot 7-74. ANT 1 Power Spectral Density Plot (802.11a (UNII Band 1) – Ch. 40)

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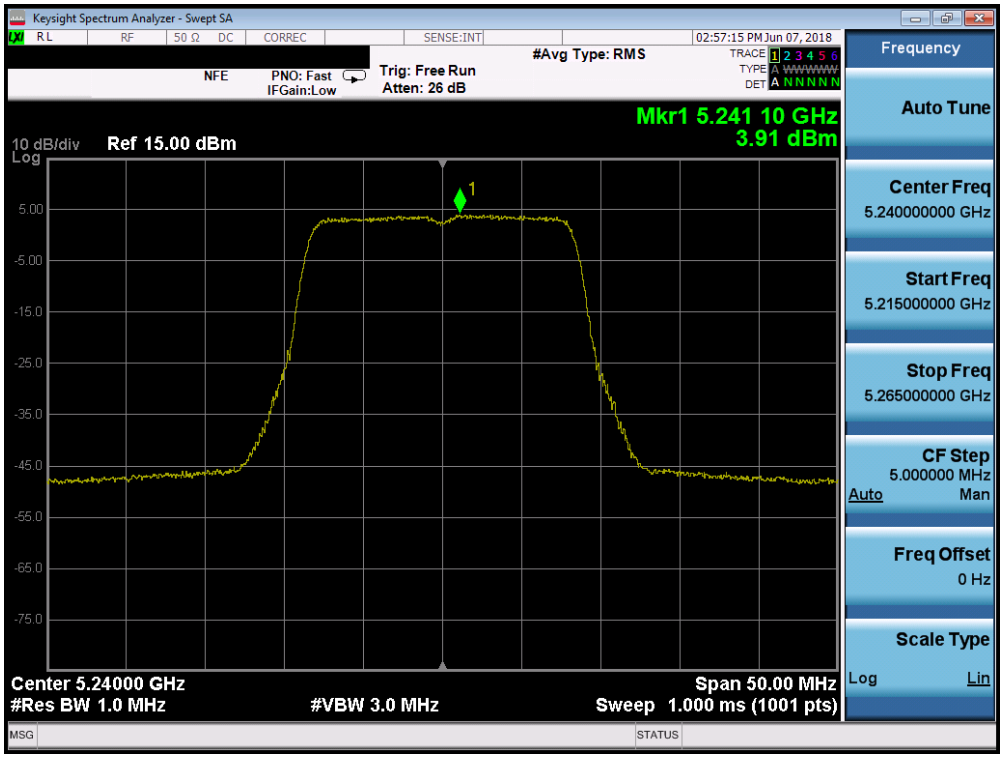
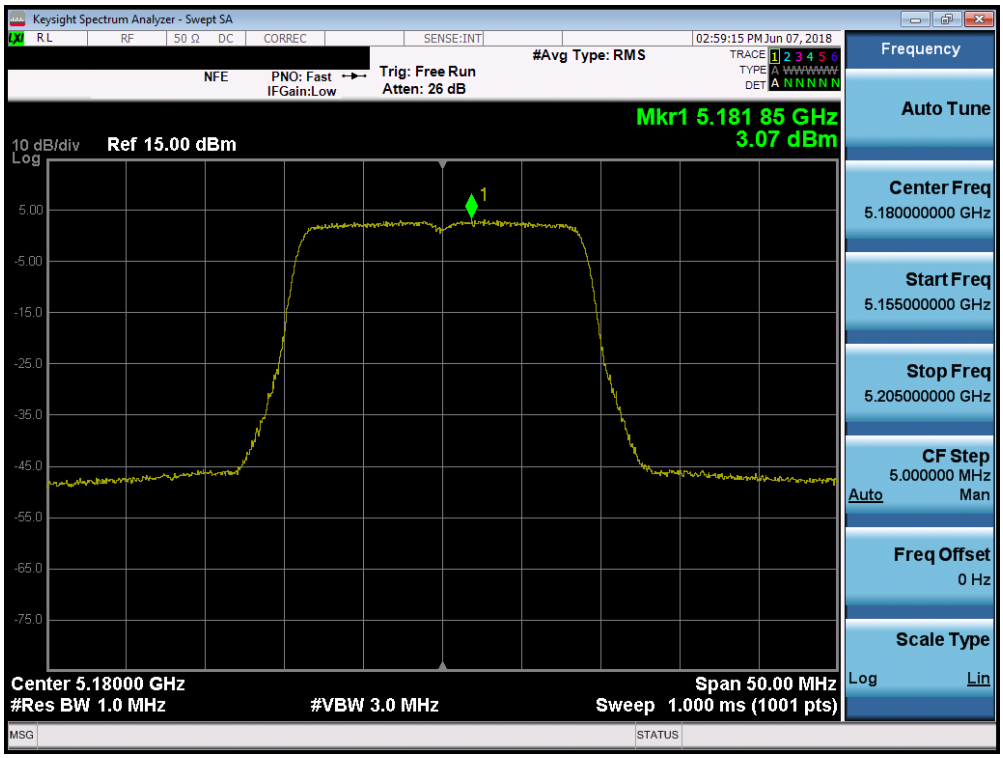


Plot 7-75. ANT 1 Power Spectral Density Plot (802.11a (UNII Band 1) – Ch. 48)



Plot 7-76. ANT 1 Power Spectral Density Plot (20MHz 802.11n (UNII Band 1) – Ch. 36)

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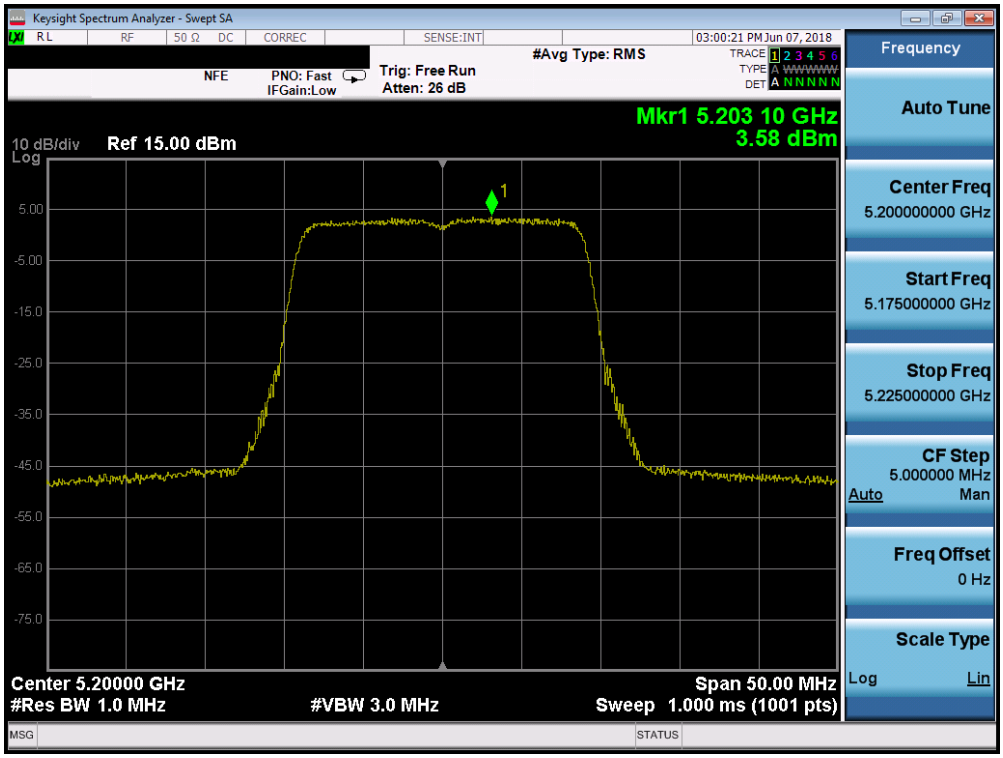
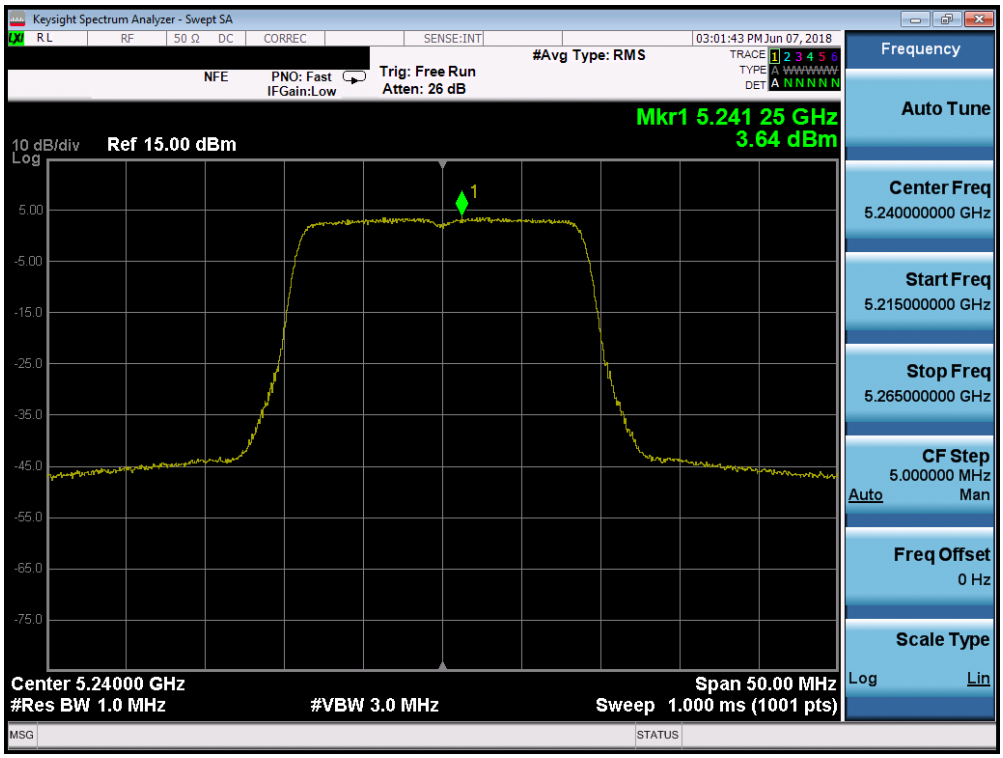


Plot 7-77. ANT 1 Power Spectral Density Plot (20MHz 802.11n (UNII Band 1) – Ch. 40)



Plot 7-78. ANT 1 Power Spectral Density Plot (20MHz 802.11n (UNII Band 1) – Ch. 48)

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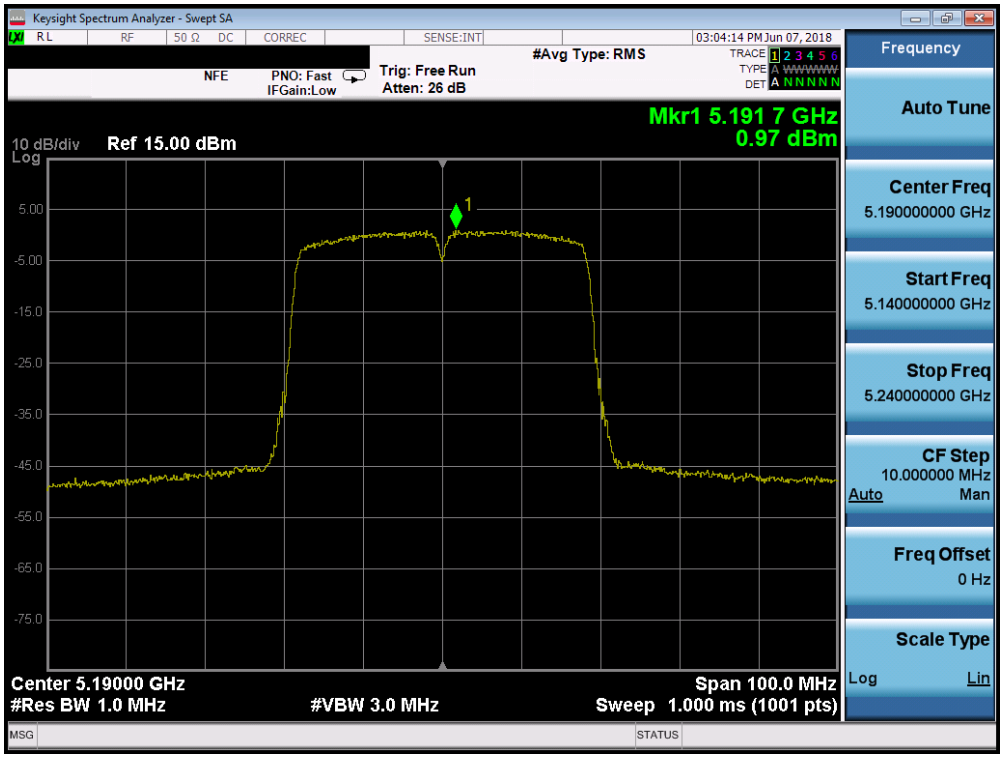
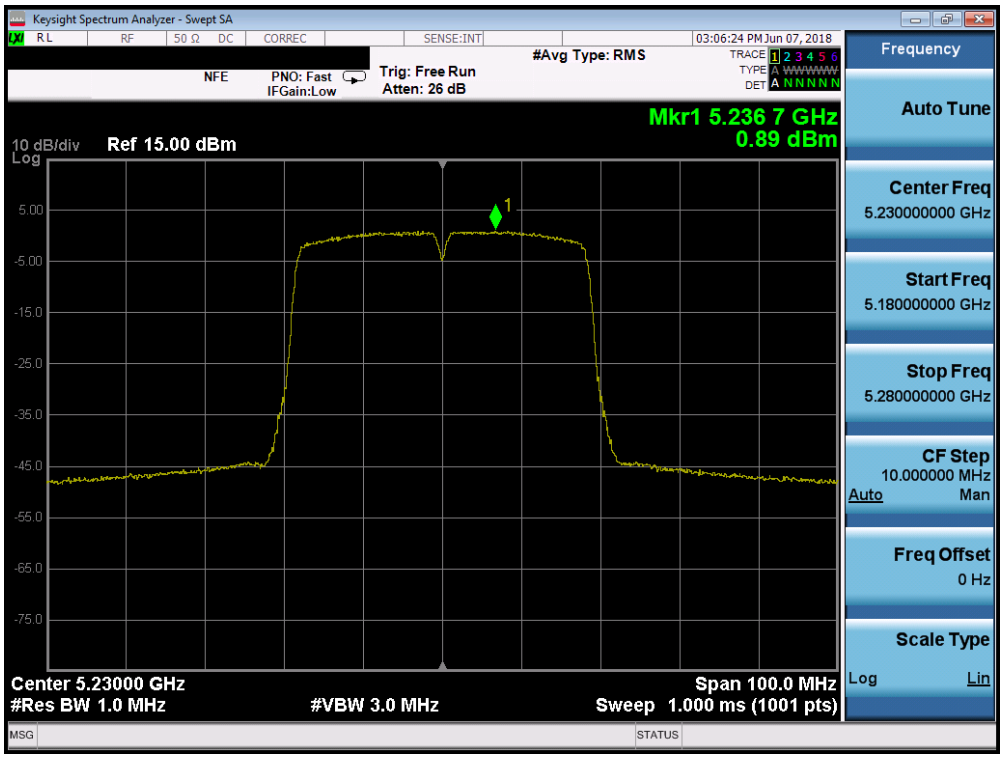


Plot 7-79. ANT 1 Power Spectral Density Plot (40MHz 802.11n (UNII Band 1) – Ch. 38)



Plot 7-80. ANT 1 Power Spectral Density Plot (40MHz 802.11n (UNII Band 1) – Ch. 46)

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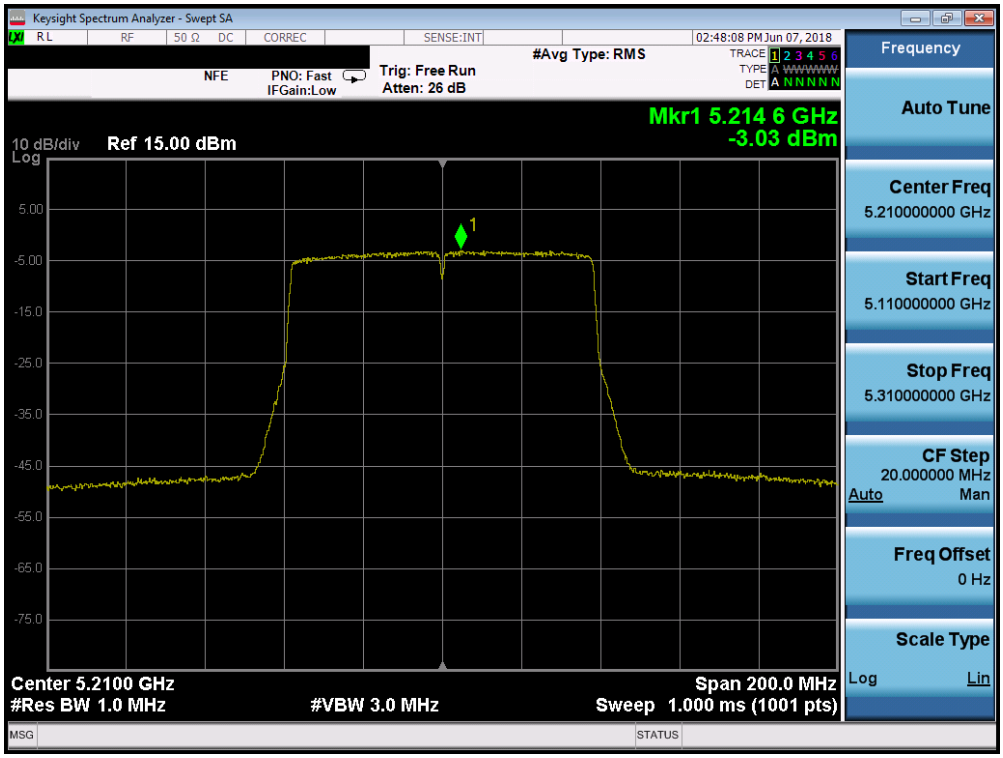

Plot 7-81. ANT 1 Power Spectral Density Plot (80MHz 802.11ac (UNII Band 1) – Ch. 42)

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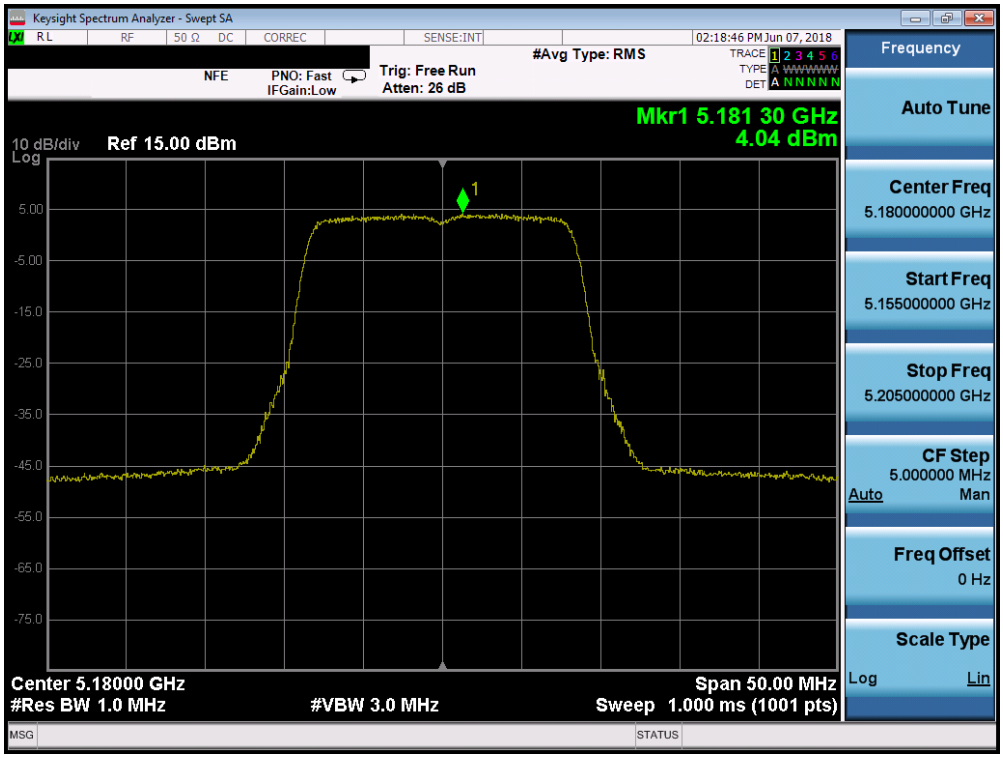
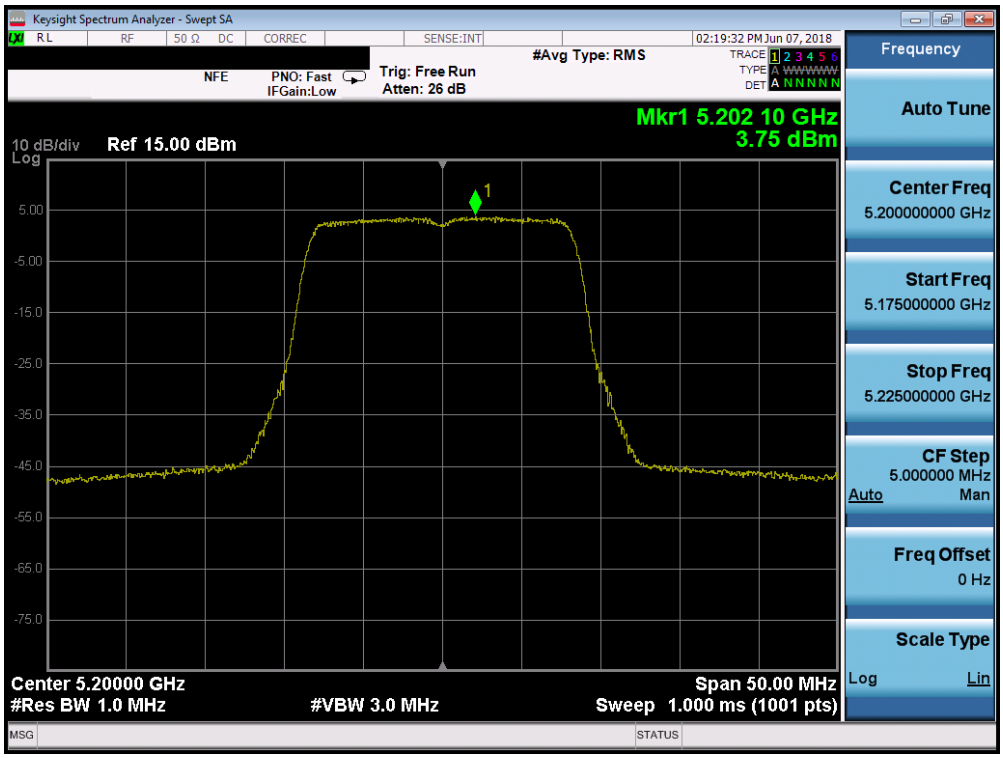


Plot 7-82. ANT 2 Power Spectral Density Plot (802.11a (UNII Band 1) – Ch. 36)



Plot 7-83. ANT 2 Power Spectral Density Plot (802.11a (UNII Band 1) – Ch. 40)

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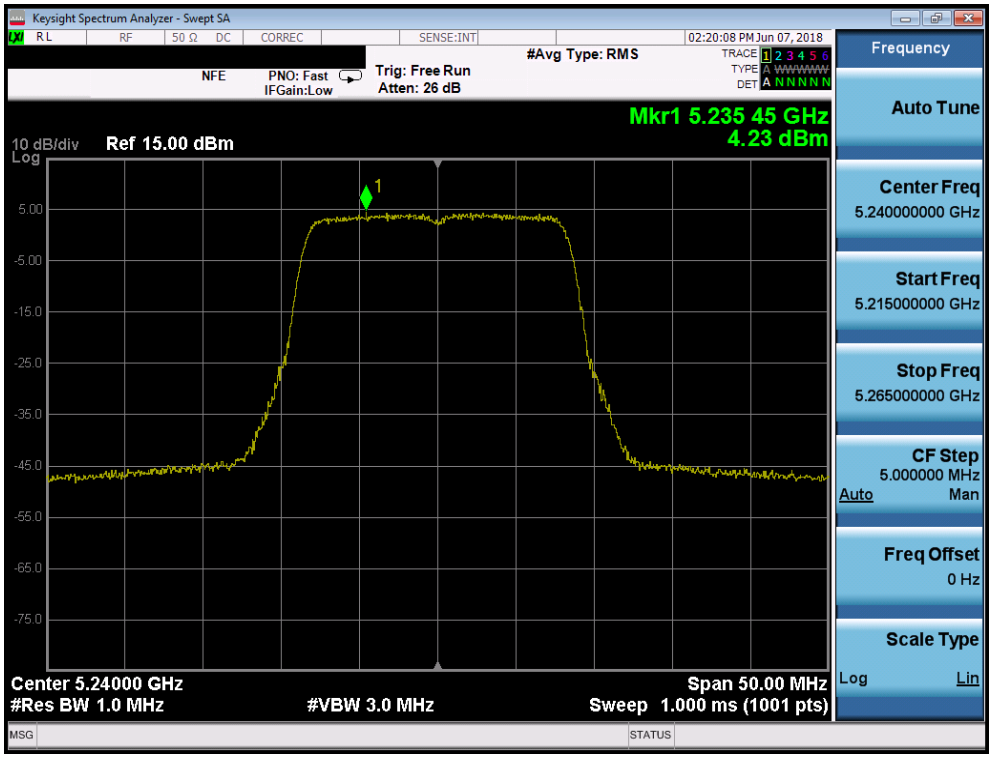
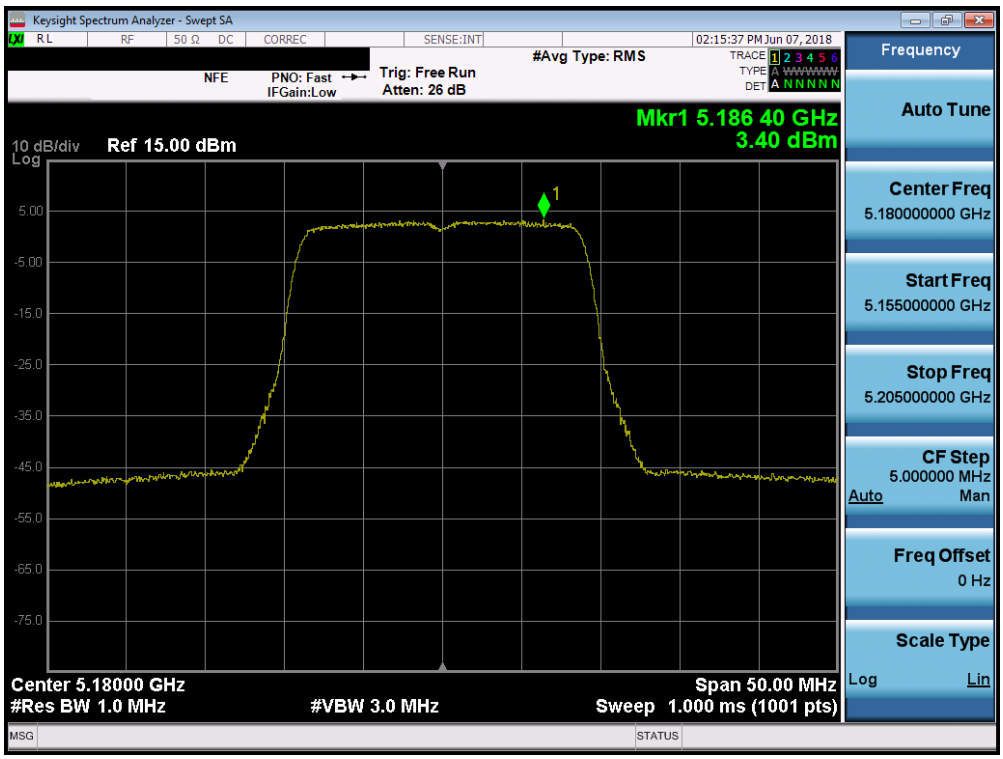


Plot 7-84. ANT 2 Power Spectral Density Plot (802.11a (UNII Band 1) – Ch. 48)



Plot 7-85. ANT 2 Power Spectral Density Plot (20MHz 802.11n (UNII Band 1) – Ch. 36)

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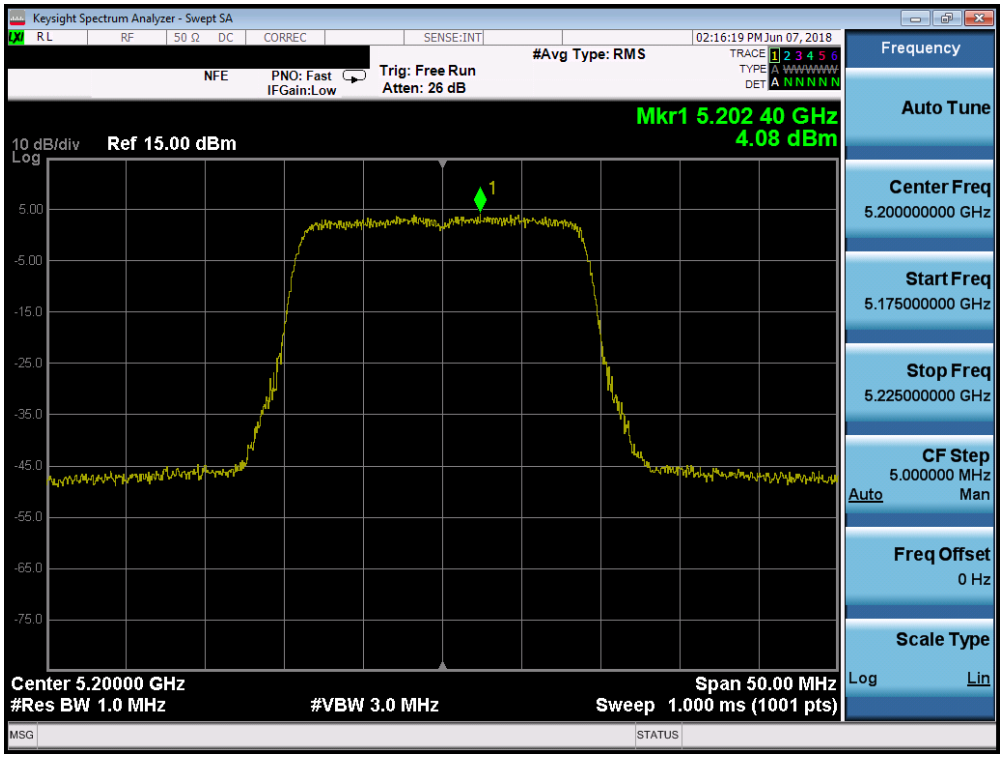
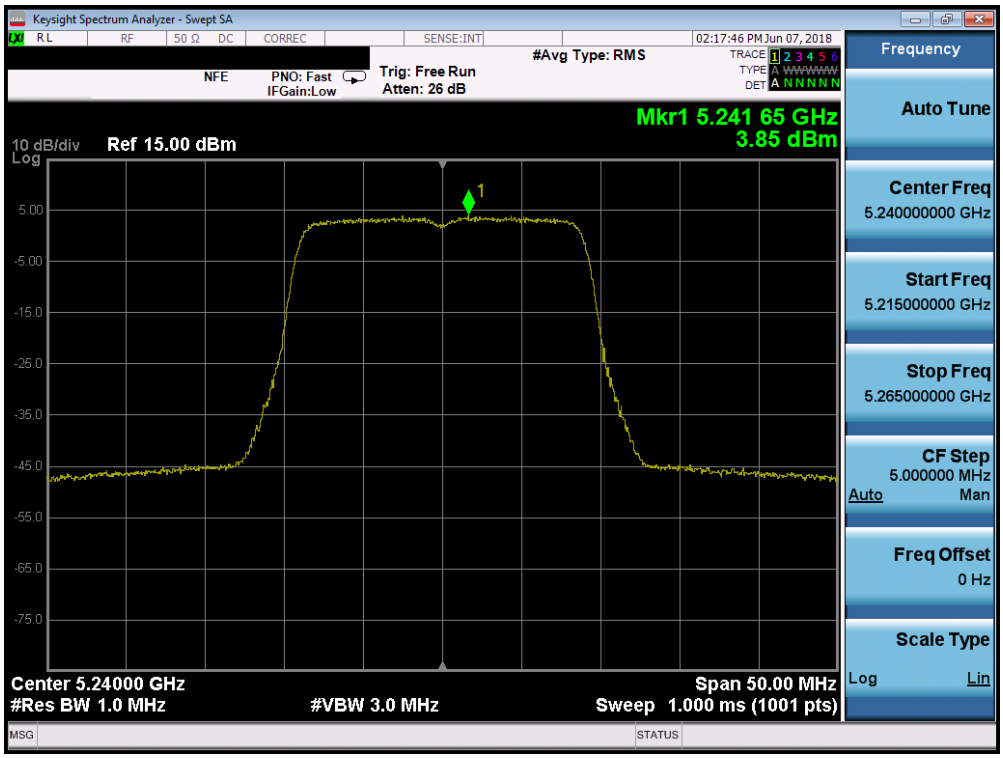


Plot 7-86. ANT 2 Power Spectral Density Plot (20MHz 802.11n (UNII Band 1) – Ch. 40)



Plot 7-87. ANT 2 Power Spectral Density Plot (20MHz 802.11n (UNII Band 1) – Ch. 48)

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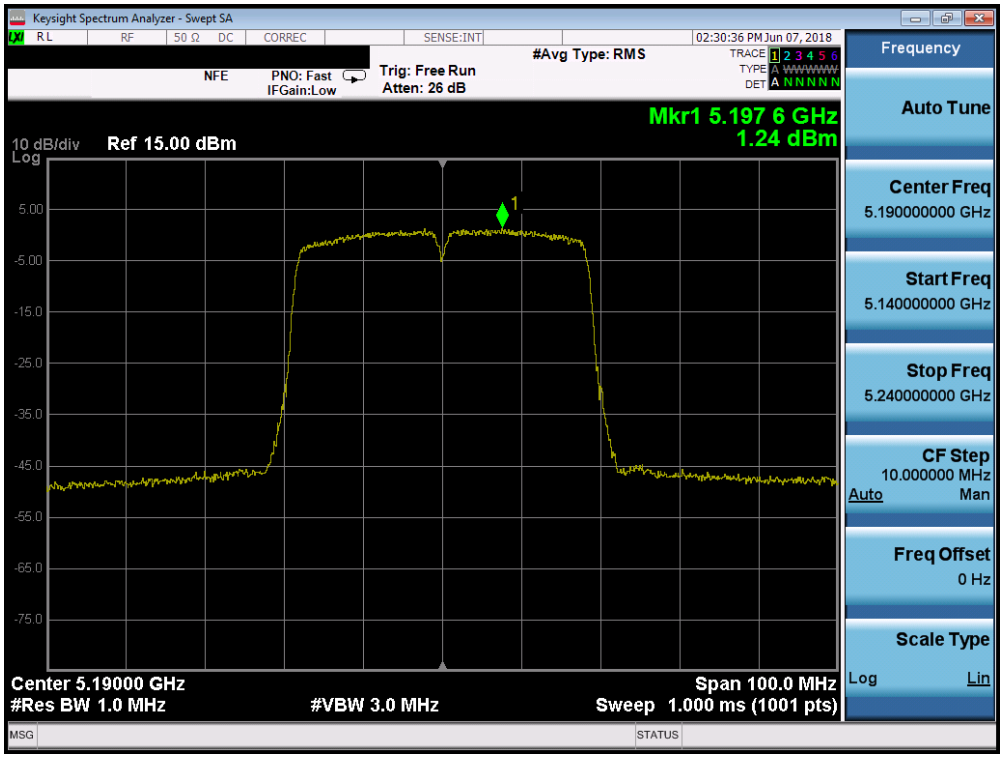
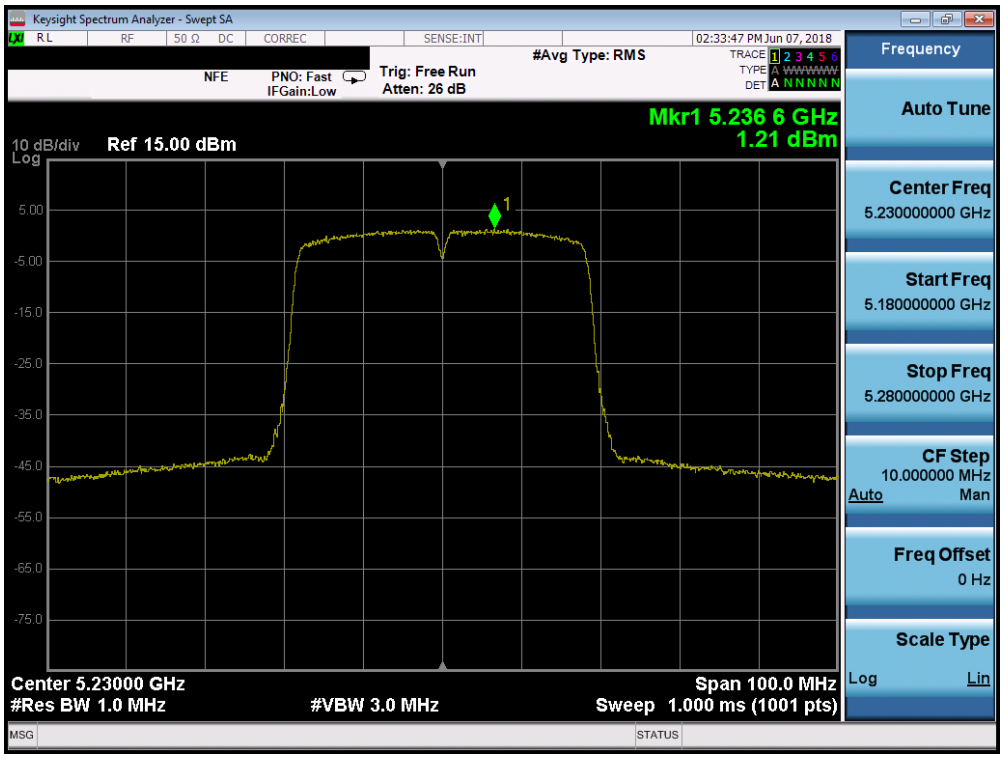


Plot 7-88. ANT 2 Power Spectral Density Plot (40MHz 802.11n (UNII Band 1) – Ch. 38)



Plot 7-89. ANT 2 Power Spectral Density Plot (40MHz 802.11n (UNII Band 1) – Ch. 46)

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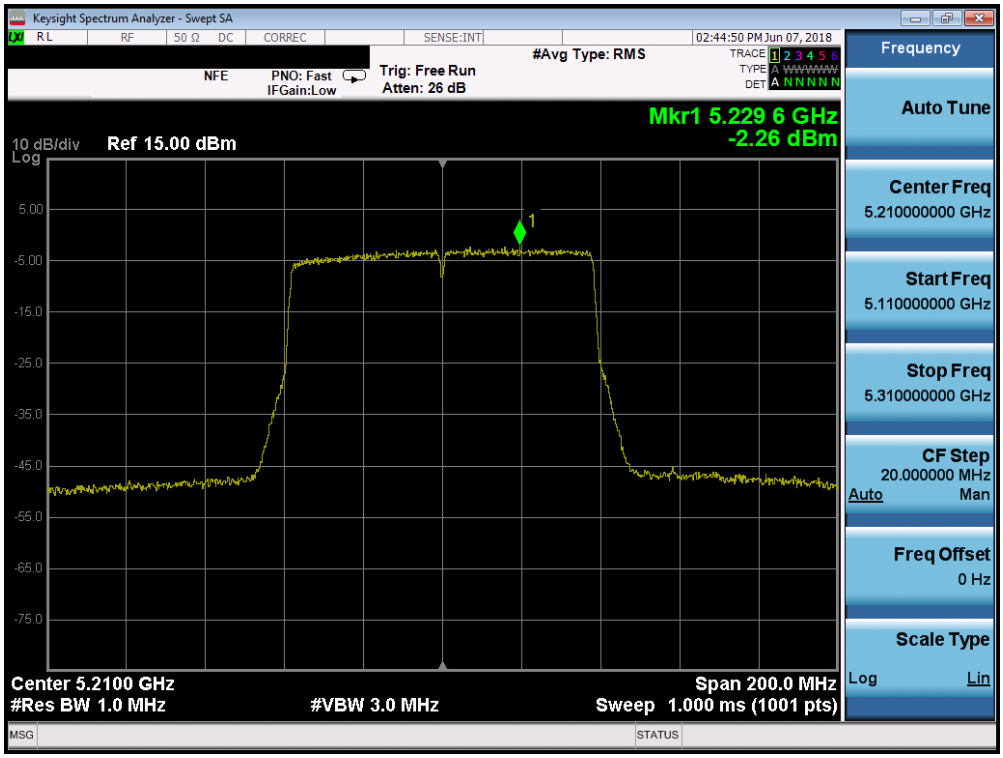

Plot 7-90. ANT 2 Power Spectral Density Plot (80MHz 802.11ac (UNII Band 1) – Ch. 42)

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7.6 Radiated Spurious Emission Measurements – Above 1GHz

§15.407(b) §15.205 §15.209; RSS-Gen [8.9]

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 ANSI C63.10-2013 and KDB 789033 D02 v02r01, 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.

For transmitters operating in the 5.15-5.25 GHz: All emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of −27 dBm/MHz.

For transmitters operating in the 5.725-5.85 GHz band: All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR and Table 6 of RSS-Gen (8.10) must not exceed the limits shown in Table 7-27 per Section 15.209 and RSS-Gen (8.9).

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

Table 7-27. Radiated Limits

Test Procedures Used

ANSI C63.10-2013 – Sections 12.7.7.2, 12.7.6, 12.7.5
KDB 789033 D02 v02r01 – 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

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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

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.

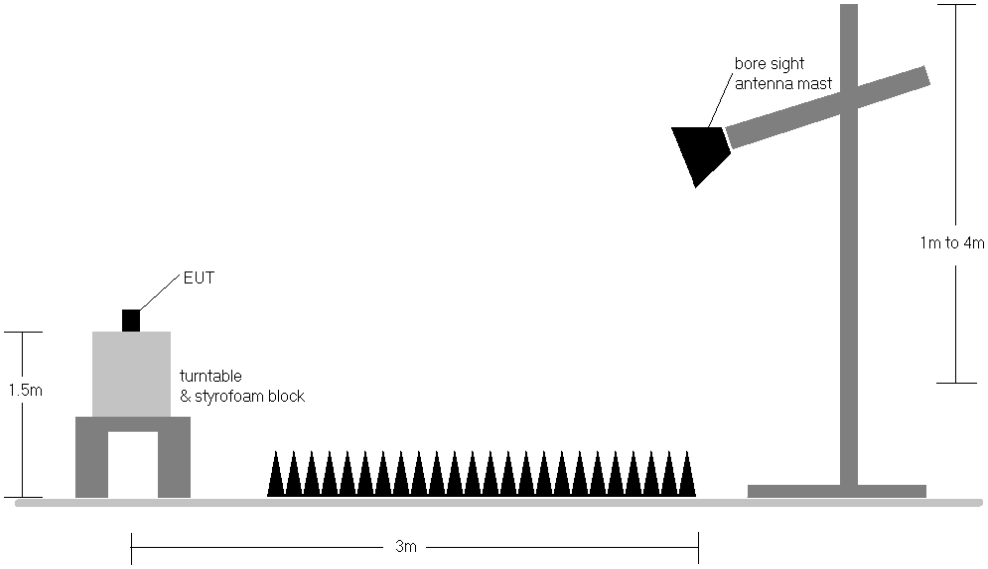

Figure 7-5. Test Instrument & Measurement Setup

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Test Notes

1. All emissions that lie in the restricted bands (denoted by a * next to the frequency) specified in §15.205 and Section 8.10 of RSS-Gen are below the limit shown in Table 7-27.
2. All spurious emissions lying in restricted bands specified in §15.205 and Section 8.10 of RSS-Gen are below the limit shown in Table 7-27. 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.
3. The antenna is manipulated through typical positions, polarity and length during the tests. The EUT is manipulated through three orthogonal planes.
4. This unit was tested while powered by an AC power source.
5. The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter using CISPR quasi peak detector below 1GHz. Above 1 GHz, average and peak measurements were taken using linearly polarized horn antennas. The worst-case emissions are reported however emissions whose levels were not within 20dB of the respective limits were not reported.
6. Emissions below 18GHz were measured at a 3 meter test distance while emissions above 18GHz were measured at a 1 meter test distance with the application of a distance correction factor.
7. Radiated spurious emissions were investigated while operating in MIMO mode, however, it was determined that single antenna operation produced the worst case emissions. Since the emissions produced from MIMO operation were found to be more than 20dB below the limit, the MIMO emissions are not reported.
8. The wide spectrum spurious emissions plots shown on the following pages are used only for the purpose of emission identification. Any emissions found to be within 20dB of the limit are fully investigated and the results are shown in this section.
9. The "-" shown in the following RSE tables are used to denote a noise floor measurement.

Sample Calculations

Determining Spurious Emissions Levels

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

Radiated Band Edge Measurement Offset

- The amplitude offset shown in the radiated restricted band edge plots in Section 7.6 was calculated using the formula:
  Offset (dB) = (Antenna Factor + Cable Loss + Attenuator) – Preamplifier Gain

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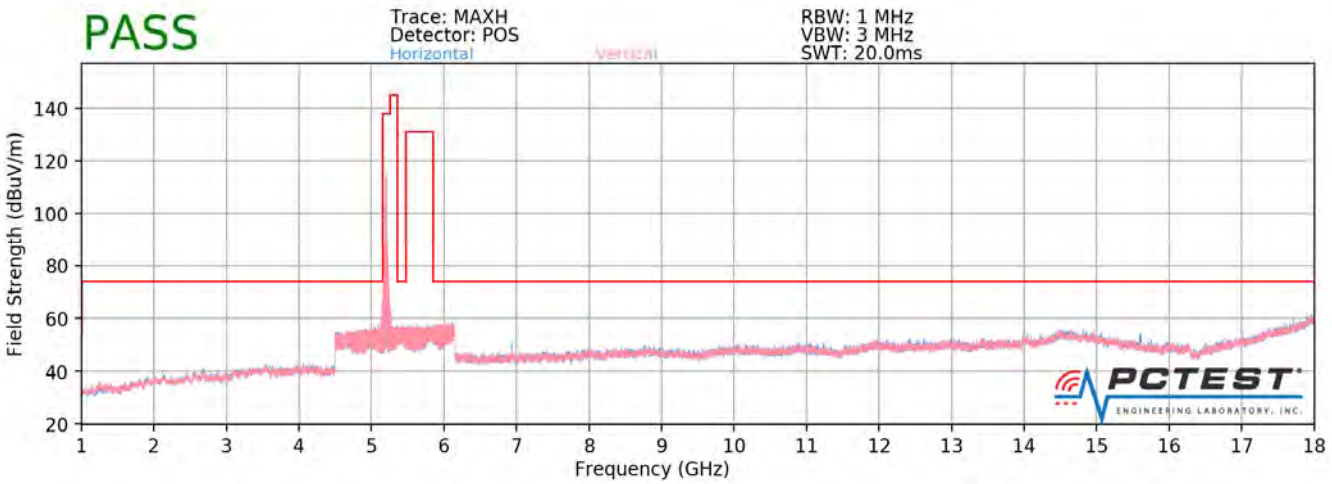
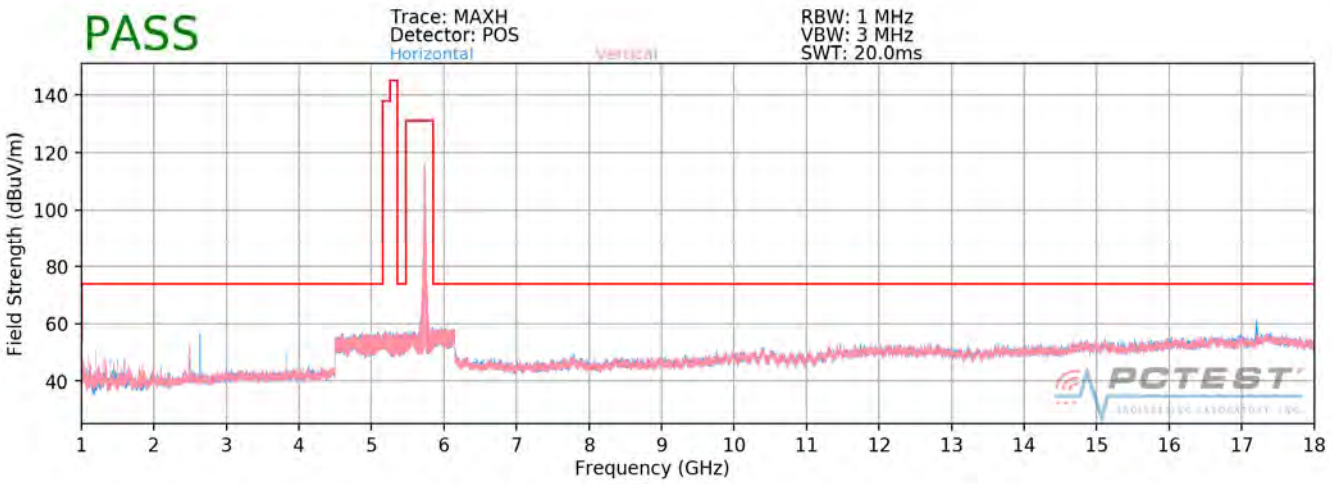
7.7.1 Antenna-1 Radiated Spurious Emission Measurements



Plot 7-91. Radiated Spurious Plot above 1GHz (802.11a – U1 Ch. 40)



Plot 7-92. Radiated Spurious Plot above 1GHz (802.11a – U3 Ch. 157)

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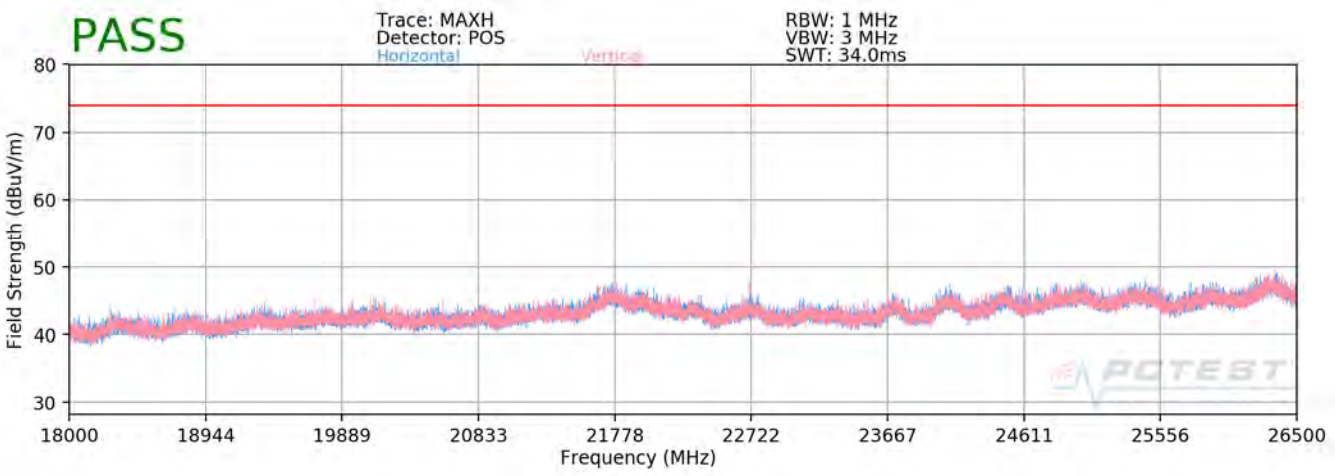
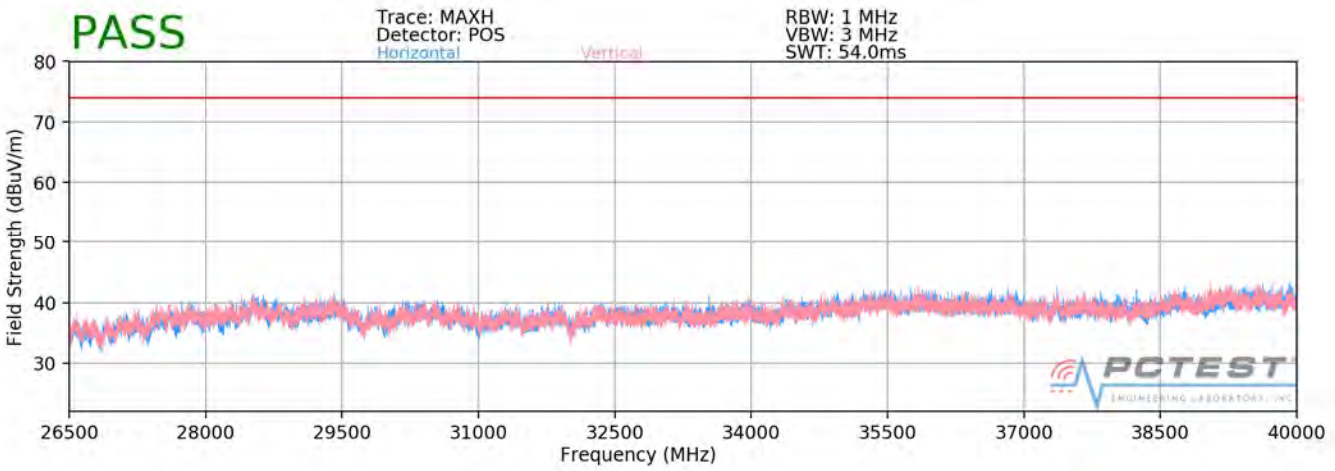
Antenna-1 Radiated Spurious Emissions Measurements (Above 18GHz)



Plot 7-93. Radiated Spurious Plot 18GHz - 26.5GHz (802.11a)



Plot 7-94. Radiated Spurious Plot 26.5GHz - 40GHz (802.11a)

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Antenna-1 Radiated Spurious Emission Measurements

§15.407(b) §15.205 & §15.209; RSS-Gen [8.9]

Worst Case Mode: 802.11a
Worst Case Transfer Rate: 6Mbps
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	-	-	-65.46	11.48	0.00	53.02	68.20	-15.18
*	15540.00	Average	H	-	-	-77.62	13.68	0.00	43.06	53.98	-10.92
*	15540.00	Peak	H	-	-	-65.30	13.68	0.00	55.38	73.98	-18.60
*	20720.00	Average	H	100	212	-69.58	7.94	-9.54	35.82	53.98	-18.16
*	20720.00	Peak	H	100	212	-59.45	7.94	-9.54	45.95	73.98	-28.03
	25900.00	Peak	H	-	-	-57.22	8.46	-9.54	48.70	68.20	-19.50

Table 7-28. Radiated Measurements

Worst Case Mode: 802.11a
Worst Case Transfer Rate: 6Mbps
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	210	71	-65.76	11.67	0.00	52.91	68.20	-15.29
*	15600.00	Average	H	122	121	-74.52	13.27	0.00	45.75	53.98	-8.23
*	15600.00	Peak	H	122	121	-62.21	13.27	0.00	58.06	73.98	-15.92
*	20800.00	Average	H	-	-	-70.30	7.95	-9.54	35.11	53.98	-18.87
*	20800.00	Peak	H	100	103	-59.65	7.95	-9.54	45.76	73.98	-28.22
	26000.00	Peak	H	-	-	-57.44	8.60	-9.54	48.62	68.20	-19.58

Table 7-29. Radiated Measurements

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Worst Case Mode: 802.11a
Worst Case Transfer Rate: 6Mbps
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	269	74	-66.07	11.70	0.00	52.63	68.20	-15.57
*	15720.00	Average	H	149	135	-74.09	12.83	0.00	45.74	53.98	-8.24
*	15720.00	Peak	H	149	135	-59.87	12.83	0.00	59.96	73.98	-14.02
*	20960.00	Average	H	100	98	-70.60	7.91	-9.54	34.77	53.98	-19.21
*	20960.00	Peak	H	100	98	-59.71	7.91	-9.54	45.66	73.98	-28.32
	26200.00	Peak	H	-	-	-56.79	8.62	-9.54	49.29	68.20	-18.91

Table 7-30. Radiated Measurements

Worst Case Mode: 802.11a
Worst Case Transfer Rate: 6Mbps
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	186	293	-73.13	11.70	0.00	45.57	53.98	-8.41
*	11490.00	Peak	H	186	293	-62.10	11.70	0.00	56.60	73.98	-17.38
	17235.00	Peak	H	167	140	-58.97	17.09	0.00	65.12	68.20	-3.08
*	22980.00	Average	H	-	-	-59.75	8.16	-9.54	45.87	53.98	-8.11
*	22980.00	Peak	H	-	-	-71.35	8.16	-9.54	34.27	73.98	-39.71
	28725.00	Peak	H	-	-	-46.93	-9.24	-9.54	41.29	68.20	-26.91

Table 7-31. Radiated Measurements

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Worst Case Mode: 802.11a
Worst Case Transfer Rate: 6Mbps
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	149	294	-72.63	11.91	0.00	46.28	53.98	-7.70
*	11570.00	Peak	H	149	294	-62.16	11.91	0.00	56.75	73.98	-17.23
	17355.00	Peak	H	191	153	-61.05	18.72	0.00	64.67	68.20	-3.53
	23140.00	Peak	H	-	-	-59.74	8.37	-9.54	46.09	68.20	-22.11
	28925.00	Peak	H	-	-	-48.19	-9.65	-9.54	39.62	68.20	-28.58

Table 7-32. Radiated Measurements

Worst Case Mode: 802.11a
Worst Case Transfer Rate: 6Mbps
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	136	300	-73.32	12.16	0.00	45.84	53.98	-8.14
*	11650.00	Peak	H	136	300	-61.61	12.16	0.00	57.55	73.98	-16.43
	17475.00	Peak	H	163	329	-60.38	18.51	0.00	65.13	68.20	-3.07
	23300.00	Peak	H	100	199	-54.69	8.50	-9.54	51.27	68.20	-16.93
	29125.00	Peak	H	-	-	-47.13	-9.87	-9.54	40.46	68.20	-27.74

Table 7-33. Radiated Measurements

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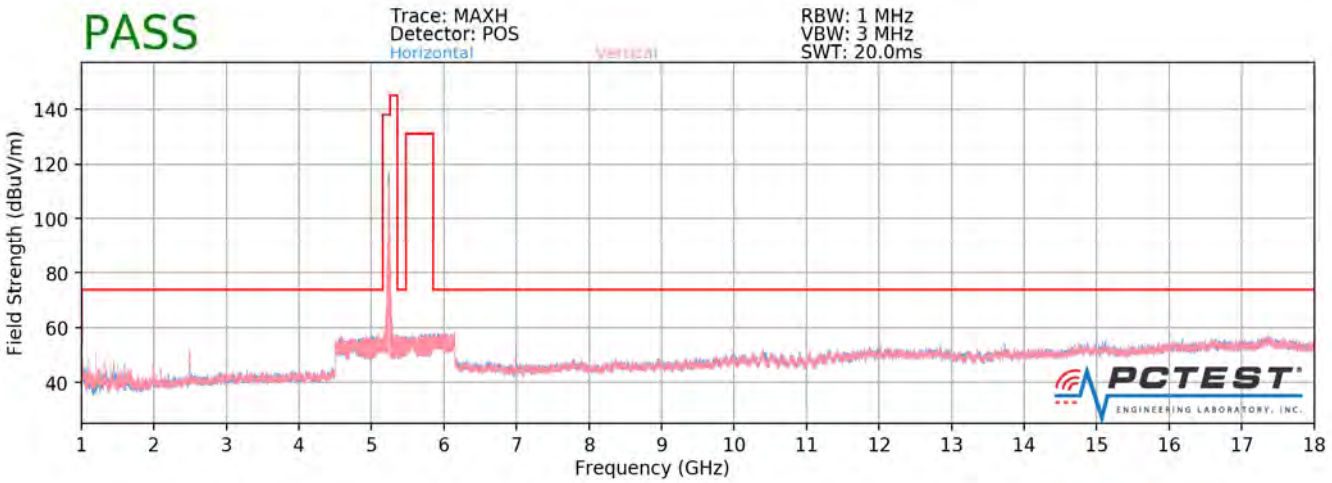
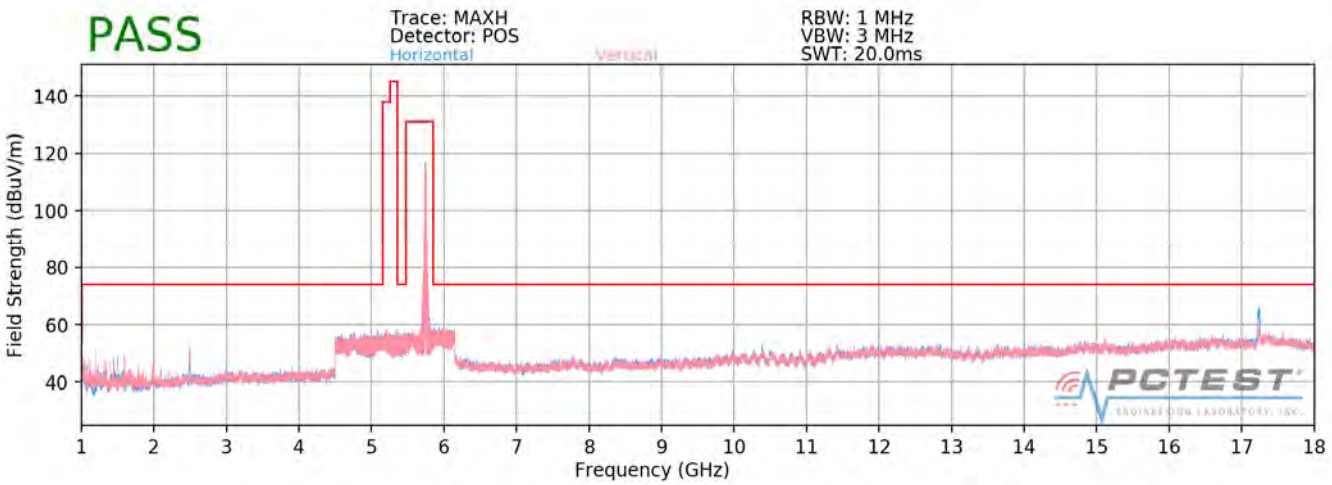
7.7.2 Antenna-2 Radiated Spurious Emission Measurements



Plot 7-95. Radiated Spurious Plot above 1GHz (802.11a – U1 Ch. 40)



Plot 7-96. Radiated Spurious Plot above 1GHz (802.11a – U3 Ch. 157)

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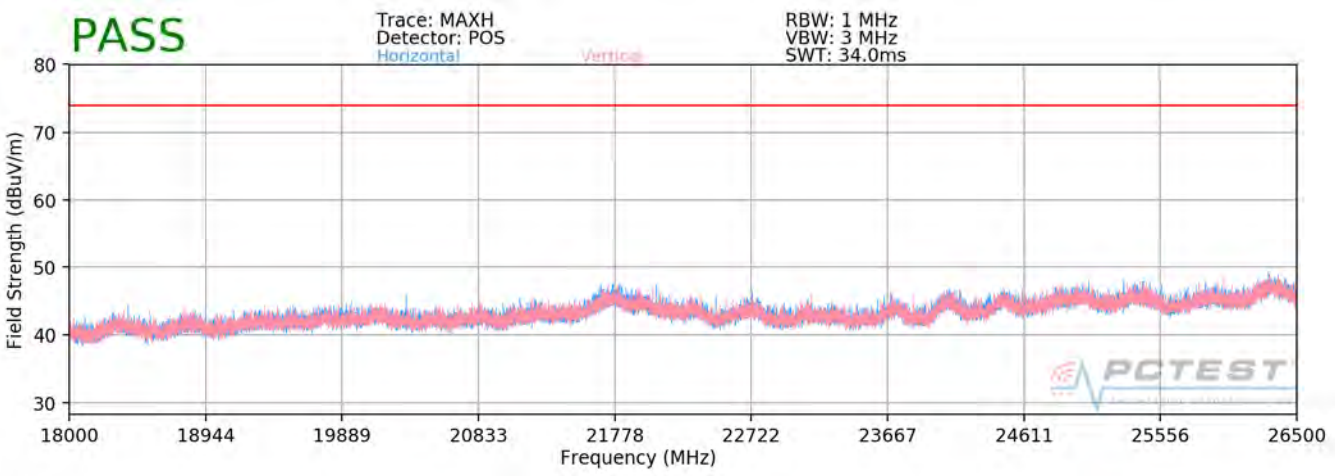
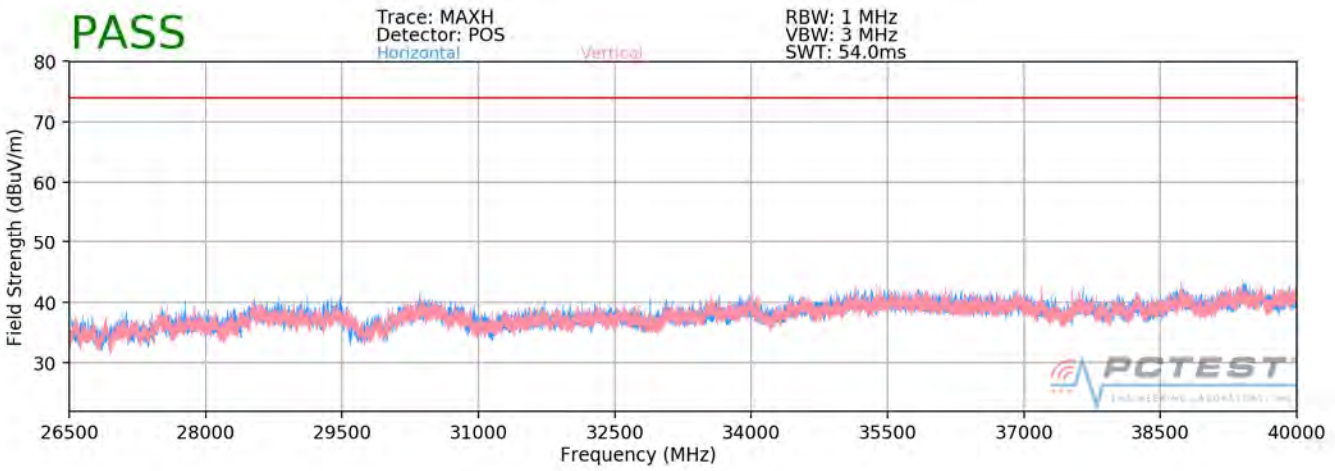
Antenna-2 Radiated Spurious Emissions Measurements (Above 18GHz)



Plot 7-97. Radiated Spurious Plot above 18GHz - 26.5GHz (802.11a)



Plot 7-98. Radiated Spurious Plot 26.5GHz - 40GHz (802.11a)

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Antenna-2 Radiated Spurious Emission Measurements

§15.407(b) §15.205 & §15.209; RSS-Gen [8.9]

Worst Case Mode: 802.11a
Worst Case Transfer Rate: 6Mbps
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	-	-	-68.24	11.48	0.00	50.24	68.20	-17.96
*	15540.00	Average	H	-	-	-79.82	13.68	0.00	40.86	53.98	-13.12
*	15540.00	Peak	H	-	-	-68.84	13.68	0.00	51.84	73.98	-22.14
*	20720.00	Average	H	100	207	-69.62	7.94	-9.54	35.78	53.98	-18.20
*	20720.00	Peak	H	100	207	-59.04	7.94	-9.54	46.36	73.98	-27.62
	25900.00	Peak	H	-	-	-56.96	8.46	-9.54	48.96	68.20	-19.24

Table 7-34. Radiated Measurements

Worst Case Mode: 802.11a
Worst Case Transfer Rate: 6Mbps
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	-	-	-68.99	11.67	0.00	49.68	68.20	-18.52
*	15600.00	Average	H	-	-	-79.62	13.27	0.00	40.65	53.98	-13.33
*	15600.00	Peak	H	-	-	-67.88	13.27	0.00	52.39	73.98	-21.59
*	20800.00	Average	H	100	212	-69.59	7.95	-9.54	35.82	53.98	-18.16
*	20800.00	Peak	H	100	212	-59.20	7.95	-9.54	46.21	73.98	-27.77
	26000.00	Peak	H	-	-	-57.30	8.60	-9.54	48.76	68.20	-19.44

Table 7-35. Radiated Measurements

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Worst Case Mode: 802.11a
Worst Case Transfer Rate: 6Mbps
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	-	-	-68.48	11.70	0.00	50.22	68.20	-17.98
*	15720.00	Average	H	-	-	-80.43	12.83	0.00	39.40	53.98	-14.58
*	15720.00	Peak	H	-	-	-67.74	12.83	0.00	52.09	73.98	-21.89
*	20960.00	Average	H	100	209	-70.58	7.91	-9.54	34.79	53.98	-19.19
*	20960.00	Peak	H	100	209	-60.44	7.91	-9.54	44.93	73.98	-29.05
	26200.00	Peak	H	-	-	-57.34	8.62	-9.54	48.74	68.20	-19.46

Table 7-36. Radiated Measurements

Worst Case Mode: 802.11a
Worst Case Transfer Rate: 6Mbps
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	153	115	-72.55	11.70	0.00	46.15	53.98	-7.83
*	11490.00	Peak	H	153	115	-61.38	11.70	0.00	57.32	73.98	-16.66
	17235.00	Peak	H	149	110	-65.01	17.09	0.00	59.08	68.20	-9.12
*	22980.00	Average	H	100	213	-69.88	8.16	-9.54	35.74	53.98	-18.24
*	22980.00	Peak	H	100	213	-59.45	8.16	-9.54	46.17	73.98	-27.81
	28725.00	Peak	H	-	-	-45.55	-9.24	-9.54	42.67	68.20	-25.53

Table 7-37. Radiated Measurements

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Worst Case Mode: 802.11a
Worst Case Transfer Rate: 6Mbps
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	186	116	-70.97	11.91	0.00	47.94	53.98	-6.04
*	11570.00	Peak	H	186	116	-59.87	11.91	0.00	59.04	73.98	-14.94
	17355.00	Peak	H	158	152	-64.46	18.72	0.00	61.26	68.20	-6.94
	23140.00	Peak	H	-	-	-60.17	8.37	-9.54	45.66	68.20	-22.54
	28925.00	Peak	H	-	-	-45.93	-9.65	-9.54	41.88	68.20	-26.32

Table 7-38. Radiated Measurements

Worst Case Mode: 802.11a
Worst Case Transfer Rate: 6Mbps
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	120	89	-71.75	12.16	0.00	47.41	53.98	-6.57
*	11650.00	Peak	H	120	89	-59.96	12.16	0.00	59.20	73.98	-14.78
	17475.00	Peak	H	168	149	-65.90	18.73	0.00	59.83	68.20	-8.37
	23300.00	Peak	H	-	-	-60.01	8.50	-9.54	45.95	68.20	-22.25
	29125.00	Peak	H	-	-	-45.56	-9.87	-9.54	42.03	68.20	-26.17

Table 7-39. Radiated Measurements

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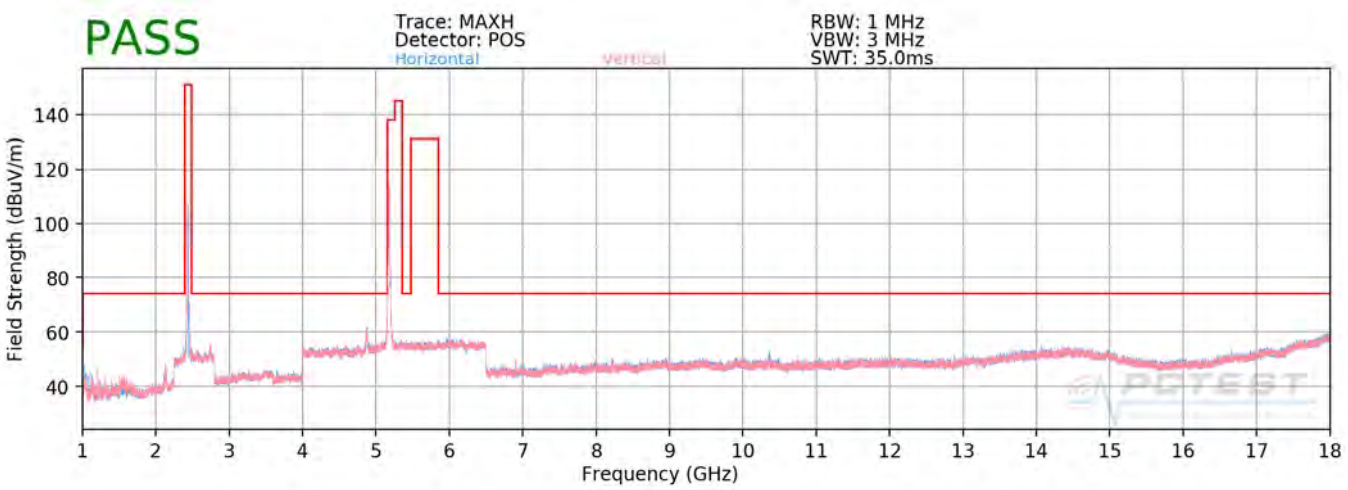
7.7.3 Simultaneous Tx Radiated Spurious Emissions Measurements

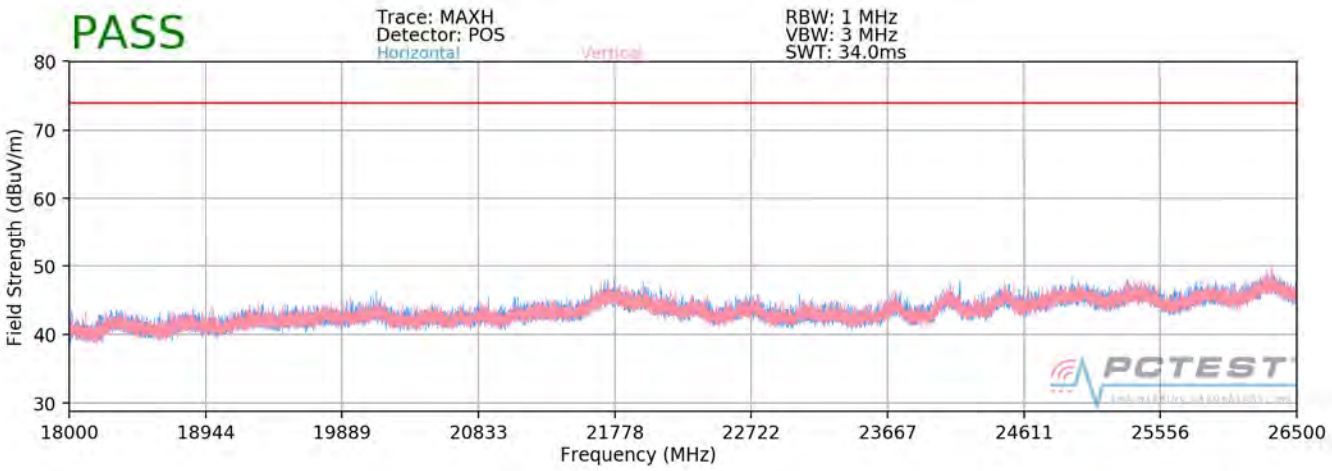
§15.407(b) §15.205 & §15.209; RSS-Gen [8.9]

Description	2.4 GHz Emission	5 GHz Emission
Antenna	1	2
Channel	6	40
Operating Frequency (MHz)	2437	5200
Data Rate (Mbps)	1	6
Mode	b	a

Table 7-40. Simultaneous Transmission Config-1



Plot 7-99. Radiated Spurious Plot above 1GHz (2.4GHz – 5GHz)



Plot 7-100. Radiated Spurious Plot 18GHz – 26.5GHz (2.4GHz – 5GHz)

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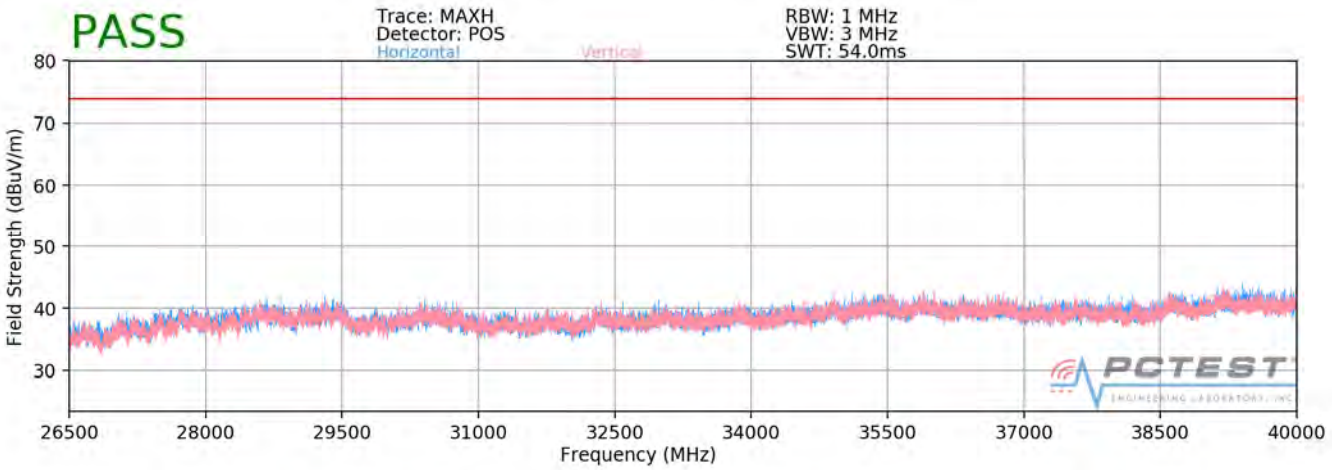

Plot 7-101. Radiated Spurious Plot above 26.5GHz (2.4GHz – 5GHz)

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
3049.00	Peak	H	-	-	-63.73	0.20	43.47	53.98	-10.51
5792.00	Peak	H	-	-	-65.35	5.38	47.03	53.98	-6.95
7923.00	Peak	H	-	-	-67.13	9.51	49.38	53.98	-4.60
8535.00	Peak	H	-	-	-67.24	10.27	50.03	53.98	-3.94

Table 7-41. Radiated Measurements (ANT1 2.4GHz – ANT2 5GHz)

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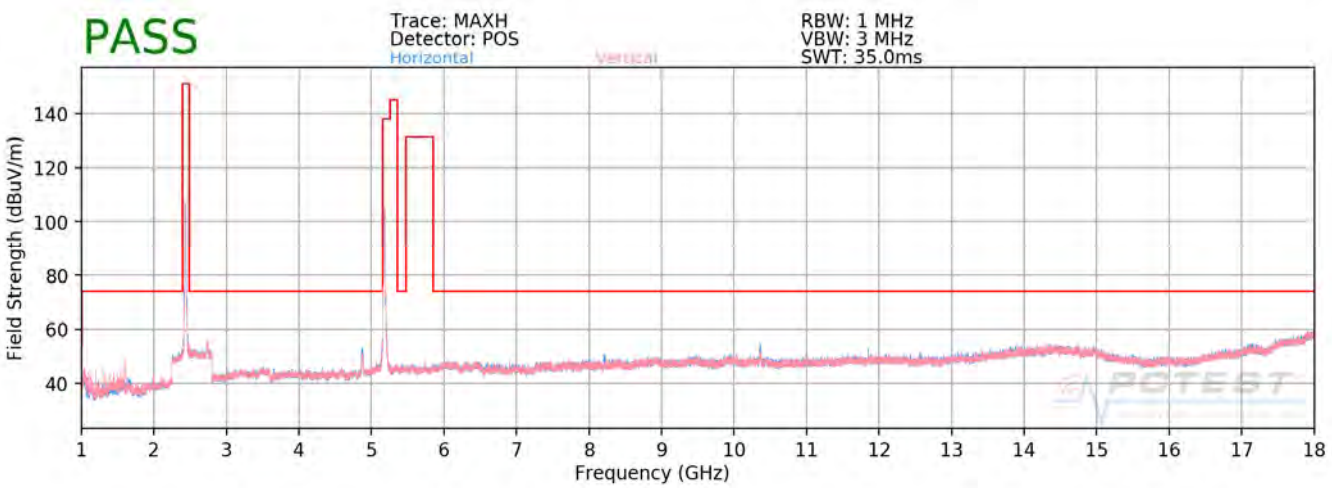
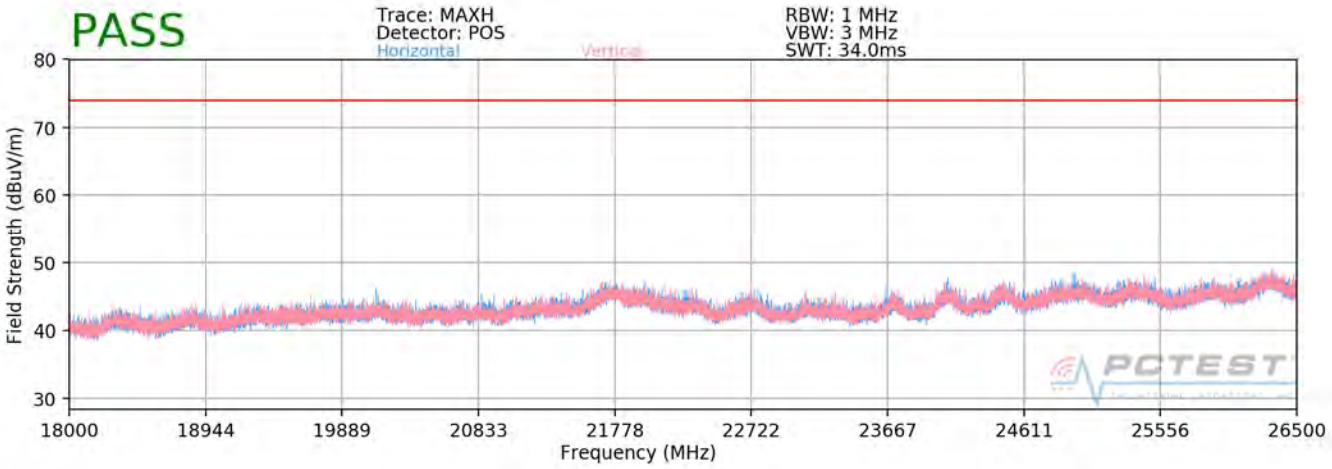
Description	2.4 GHz Emission	5 GHz Emission
Antenna	2	2
Channel	6	40
Operating Frequency (MHz)	2437	5200
Data Rate (Mbps)	1	6
Mode	b	a

Table 7-42. Simultaneous Transmission Config-2



Plot 7-102. Radiated Spurious Plot above 1GHz (5GHz – 2.4 GHz)



Plot 7-103. Radiated Spurious Plot 18GHz – 26.5GHz (5GHz – 2.4 GHz)

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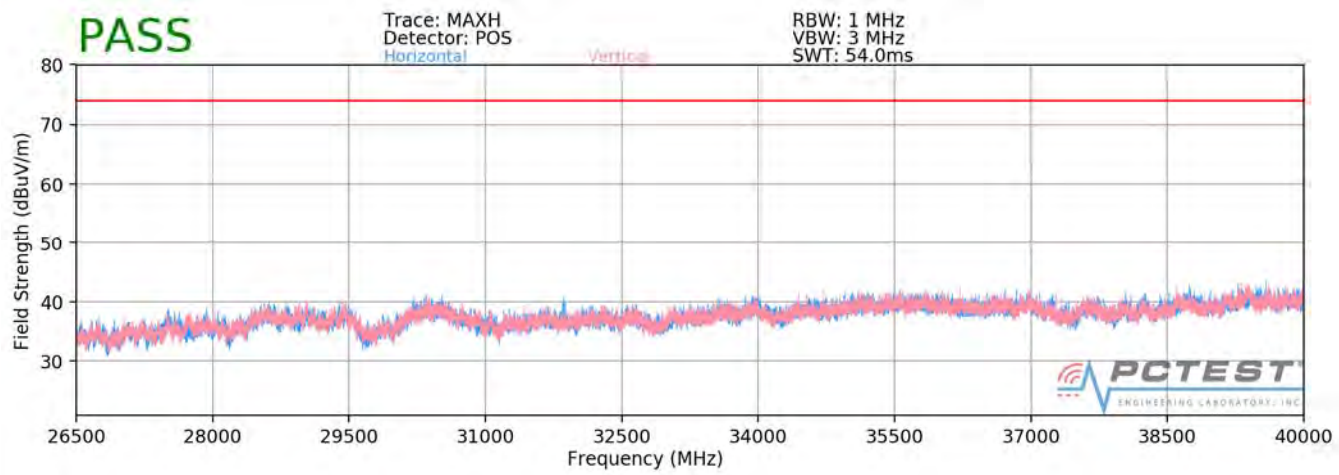

Plot 7-104. Radiated Spurious Plot above 26.5GHz (5GHz – 2.4 GHz)

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
3049.00	Peak	H	-	-	-63.46	0.20	43.74	53.98	-10.24
5792.00	Peak	H	-	-	-65.09	5.38	47.29	53.98	-6.69
7923.00	Peak	H	-	-	-66.74	9.51	49.77	53.98	-4.21
8535.00	Peak	H	-	-	-66.89	10.27	50.38	53.98	-3.59

Table 7-43. Radiated Measurements (ANT1 5GHz – ANT2 2.4GHz)

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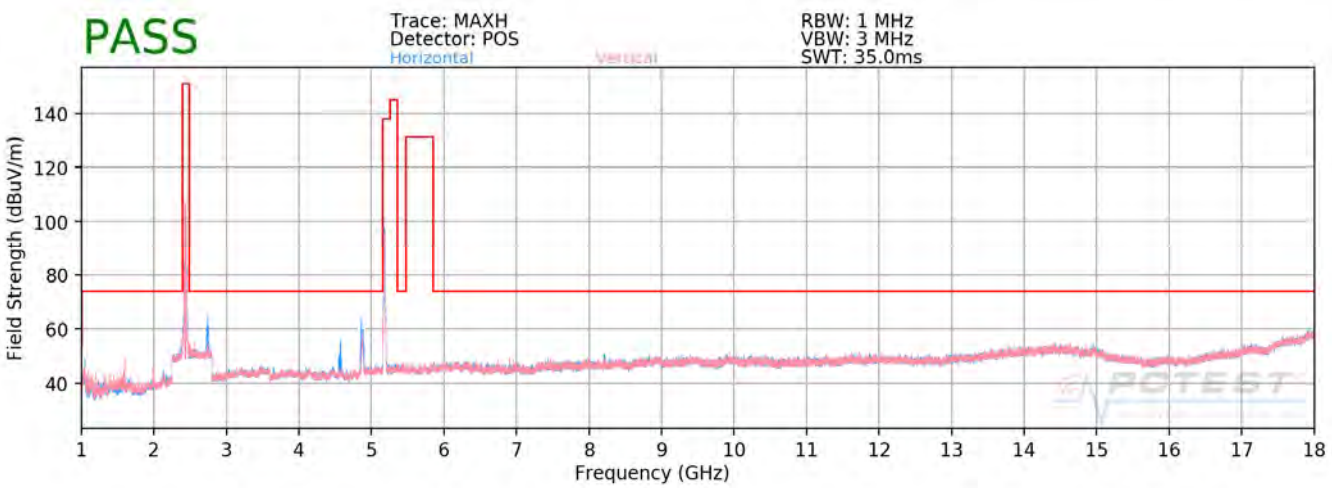
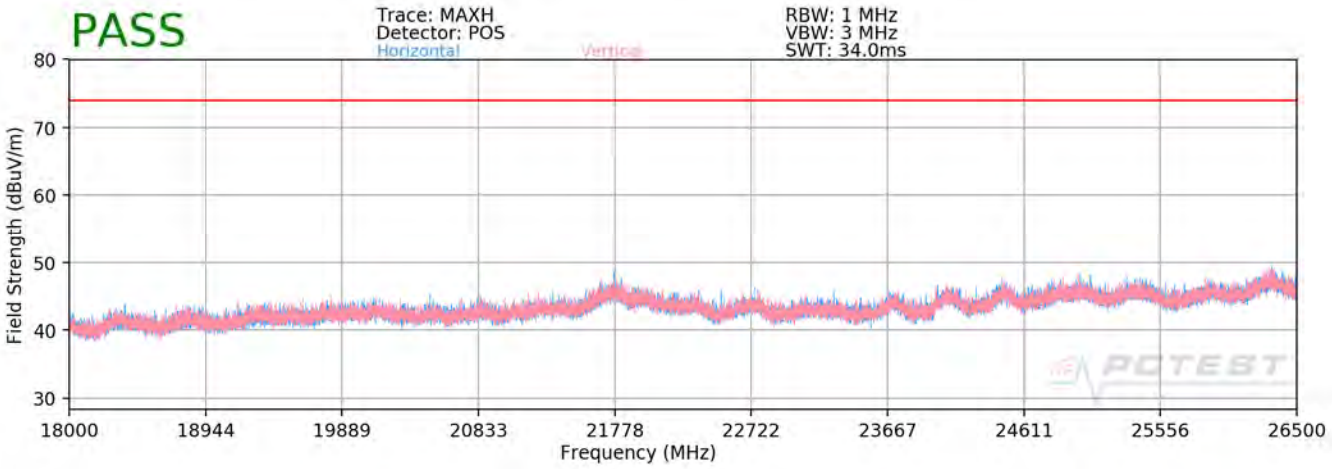
Description	2.4 GHz Emission	5 GHz Emission
Antenna	1, 2	1, 2
Channel	6	40
Operating Frequency (MHz)	2437	5200
Data Rate (Mbps)	1	6
Mode	b	a

Table 7-44. Dual Band Simultaneous Transmission



Plot 7-105. Radiated Spurious Plot above 1GHz (Dual Band Simult. Tx)



Plot 7-106. Radiated Spurious Plot 18GHz – 26.5GHz (Dual Band Simult. Tx)

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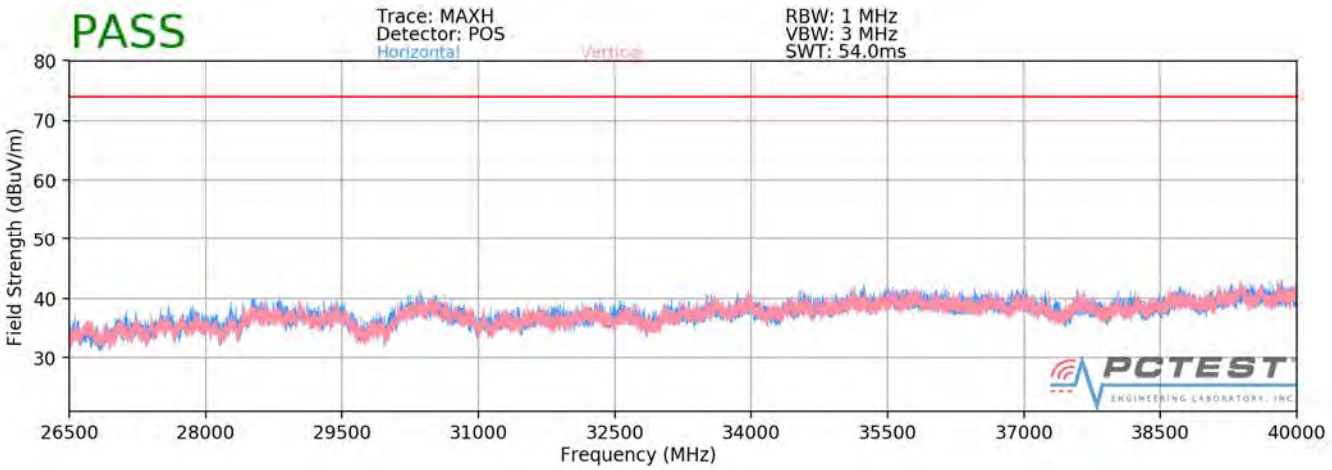

Plot 7-107. Radiated Spurious Plot above 26.5GHz (Dual Band Simult. Tx)

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
3049.00	Peak	H	-	-	-62.78	0.20	44.42	53.98	-9.56
5792.00	Peak	H	-	-	-65.24	5.38	47.14	53.98	-6.84
7923.00	Peak	H	-	-	-66.89	9.51	49.62	53.98	-4.36
8535.00	Peak	H	-	-	-66.74	10.27	50.53	53.98	-3.44

Table 7-45. Radiated Measurements (Dual Band Simult. Tx)

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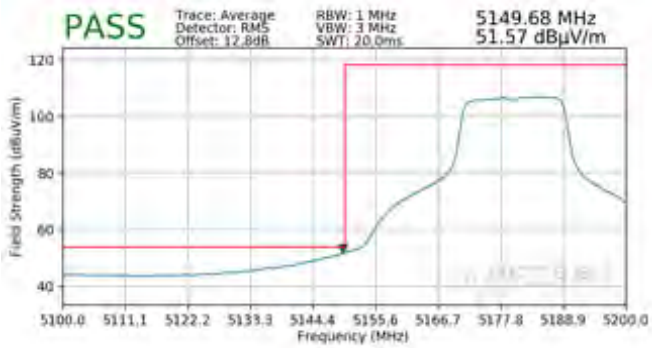
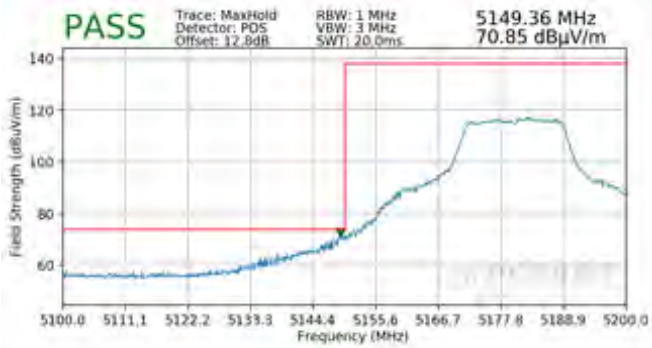
7.7.4 Antenna-1 Radiated Band Edge Measurements (20MHz BW)

§15.407(b.1)(b.2) §15.205 §15.209; RSS-Gen [8.9]; RSS-Gen [8.9]

Worst Case Mode:	802.11n
Worst Case Transfer Rate:	MCS0
Distance of Measurements:	3 Meters
Operating Frequency:	5180MHz
Channel:	36

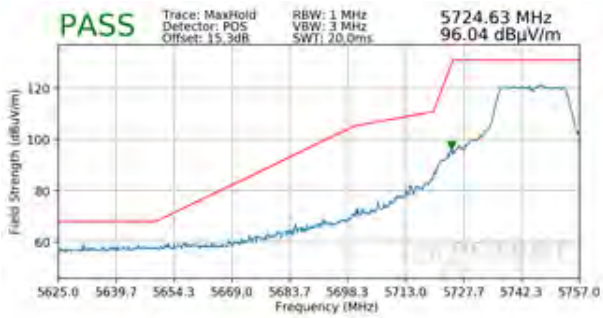


Plot 7-108. Radiated Lower Band Edge Plot (Average – UNII Band 1)



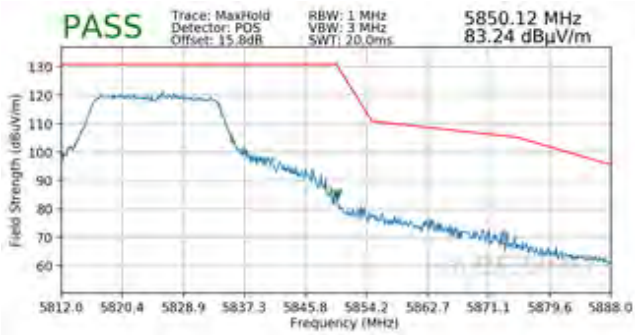
Plot 7-109. Radiated Lower Band Edge Plot (Peak – UNII Band 1)

Worst Case Mode:	802.11n
Worst Case Transfer Rate:	MCS0
Distance of Measurements:	3 Meters
Operating Frequency:	5500MHz
Channel:	149



Plot 7-110. Radiated Lower Band Edge Plot (Peak – UNII Band 3)

Worst Case Mode:	802.11n
Worst Case Transfer Rate:	MCS0
Distance of Measurements:	3 Meters
Operating Frequency:	5825MHz
Channel:	165



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

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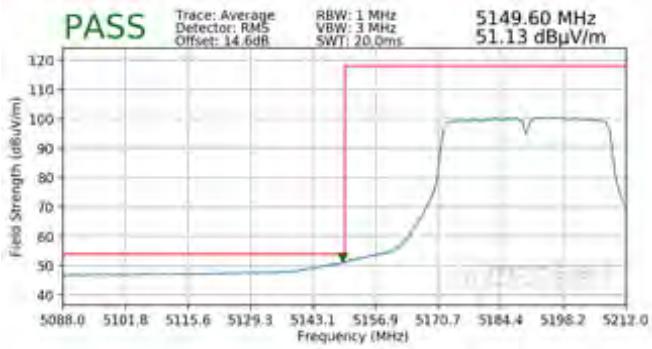
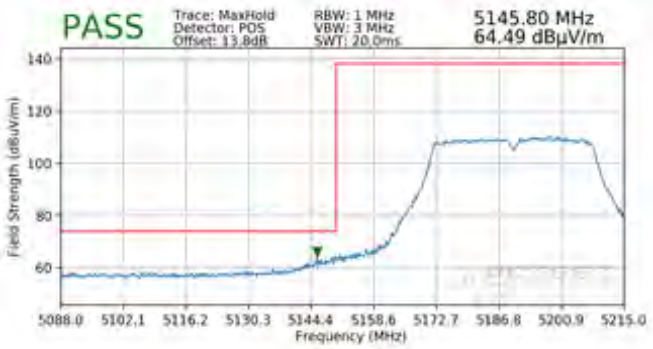
7.7.5 Antenna-1 Radiated Band Edge Measurements (40MHz BW)

§15.407(b.1)(b.2) §15.205 §15.209; RSS-Gen [8.9]

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

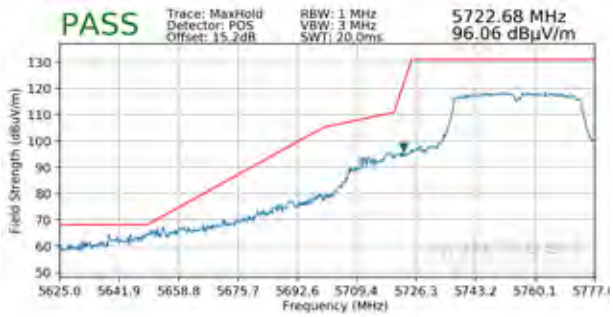


Plot 7-112. Radiated Lower Band Edge Plot (Average – UNII Band 1)



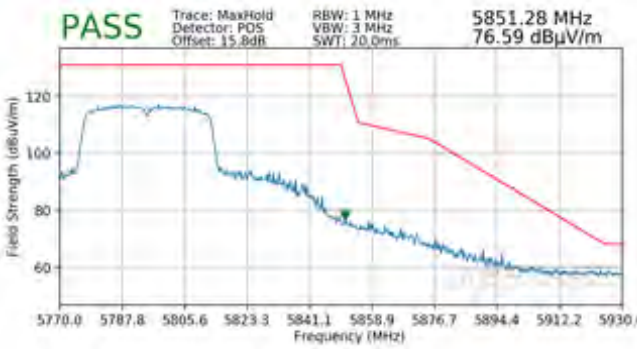
Plot 7-113. Radiated Lower Band Edge Plot (Peak – UNII Band 1)

Worst Case Mode:	802.11n
Worst Case Transfer Rate:	MCS0
Distance of Measurements:	3 Meters
Operating Frequency:	5755MHz
Channel:	151



Plot 7-114. Radiated Lower Band Edge Plot (Peak – UNII Band 2)

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



Plot 7-115. Radiated Upper Band Edge Plot (Peak – UNII Band 3)

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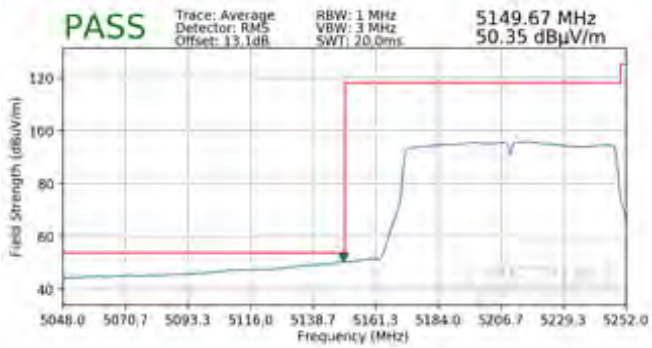
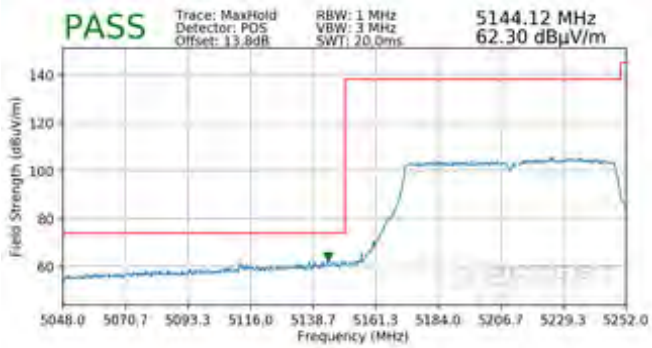
7.7.6 Antenna-1 Radiated Band Edge Measurements (80MHz BW)

§15.407(b.1)(b.2) §15.205 §15.209; RSS-Gen [8.9]

Worst Case Mode:	802.11ac
Worst Case Transfer Rate:	MCS0
Distance of Measurements:	3 Meters
Operating Frequency:	5210MHz
Channel:	42

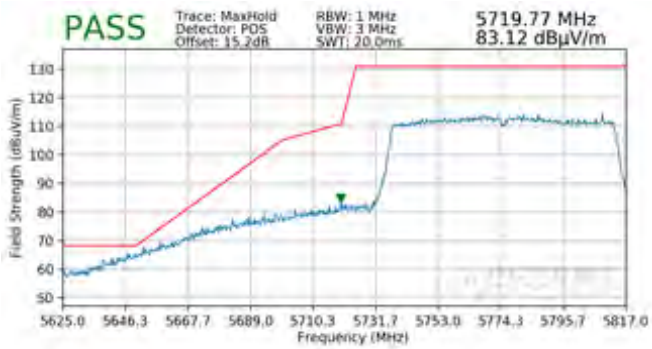


Plot 7-116. Radiated Lower Band Edge Plot (Average – UNII Band 1)

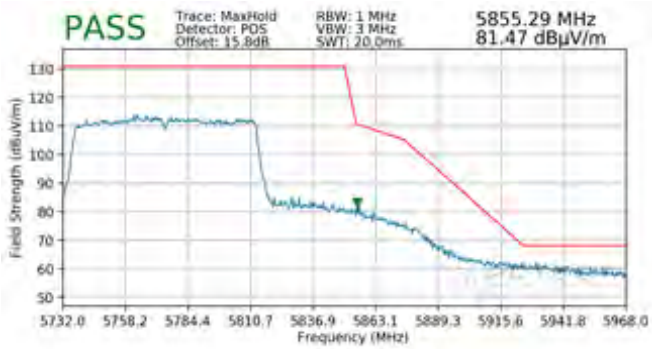


Plot 7-117. Radiated Lower Band Edge Plot (Peak – UNII Band 1)

Worst Case Mode:	802.11n
Worst Case Transfer Rate:	MCS0
Distance of Measurements:	3 Meters
Operating Frequency:	5775MHz
Channel:	155



Plot 7-118. Radiated Lower Band Edge Plot (Peak – UNII Band 3)



Plot 7-119. Radiated Upper Band Edge Plot (Peak – UNII Band 3)

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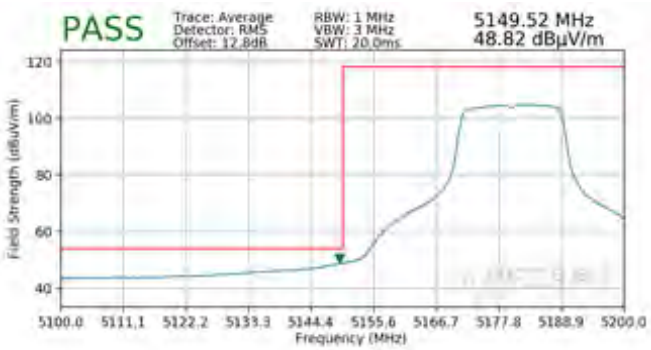
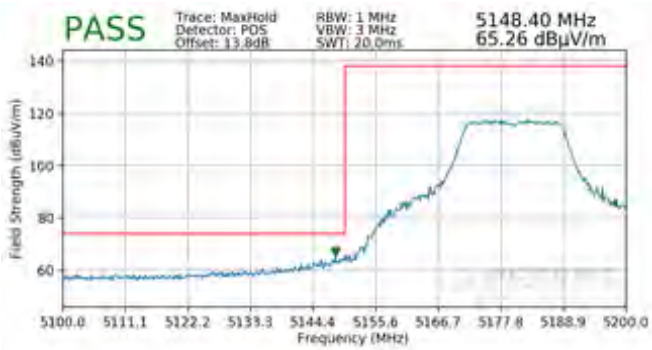
7.7.7 Antenna-2 Radiated Band Edge Measurements (20MHz BW)

§15.407(b.1)(b.2) §15.205 §15.209; RSS-Gen [8.9]

Worst Case Mode:	802.11n
Worst Case Transfer Rate:	MCS0
Distance of Measurements:	3 Meters
Operating Frequency:	5180MHz
Channel:	36

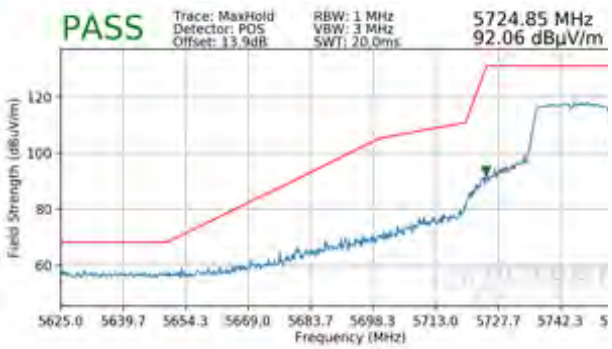


Plot 7-120. Radiated Lower Band Edge Plot (Average – UNII Band 1)



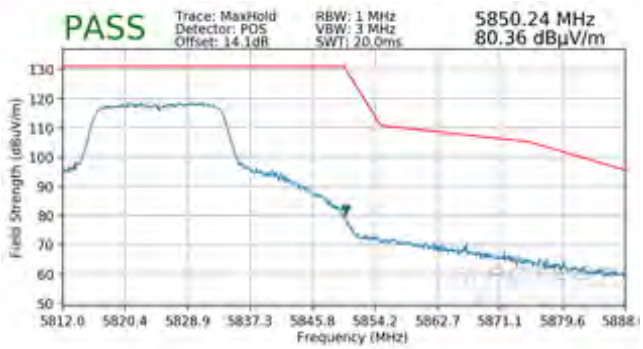
Plot 7-121. Radiated Lower Band Edge Plot (Peak – UNII Band 1)

Worst Case Mode:	802.11n
Worst Case Transfer Rate:	MCS0
Distance of Measurements:	3 Meters
Operating Frequency:	5745MHz
Channel:	149



Plot 7-122. Radiated Lower Band Edge Plot (Peak – UNII Band 3)

Worst Case Mode:	802.11n
Worst Case Transfer Rate:	MCS0
Distance of Measurements:	3 Meters
Operating Frequency:	5825MHz
Channel:	165



Plot 7-123. Radiated Upper Band Edge Plot (Peak – UNII Band 3)

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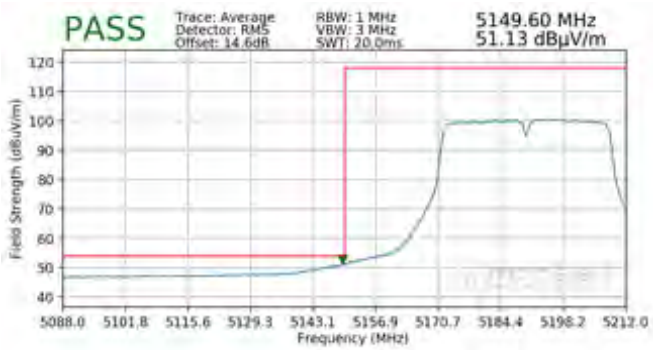
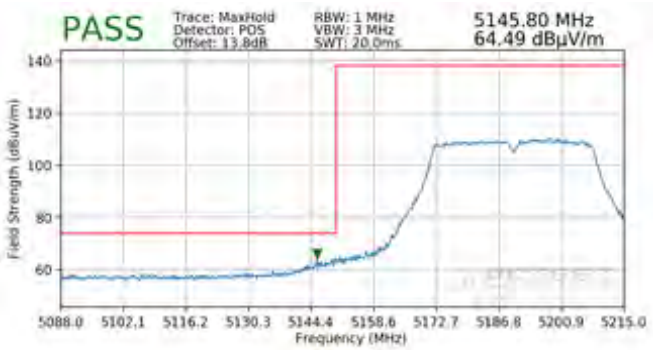
7.7.8 Antenna-2 Radiated Band Edge Measurements (40MHz BW)

§15.407(b.1)(b.2) §15.205 §15.209; RSS-Gen [8.9]

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

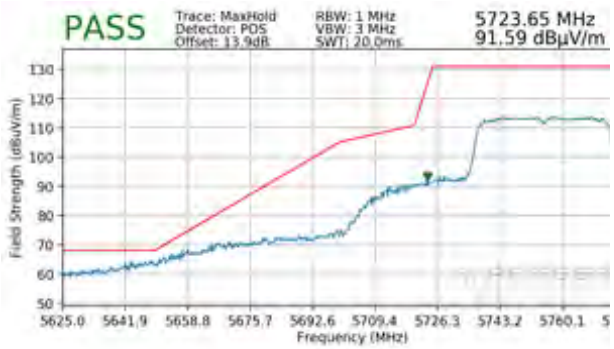


Plot 7-124. Radiated Lower Band Edge Plot (Average – UNII Band 1)



Plot 7-125. Radiated Lower Band Edge Plot (Peak – UNII Band 1)

Worst Case Mode:	802.11n
Worst Case Transfer Rate:	MCS0
Distance of Measurements:	3 Meters
Operating Frequency:	5755MHz
Channel:	151



Plot 7-126. Radiated Lower Band Edge Plot (Peak – UNII Band 3)

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

Plot 7-127. Radiated Upper Band Edge Plot (Peak – UNII Band 3)

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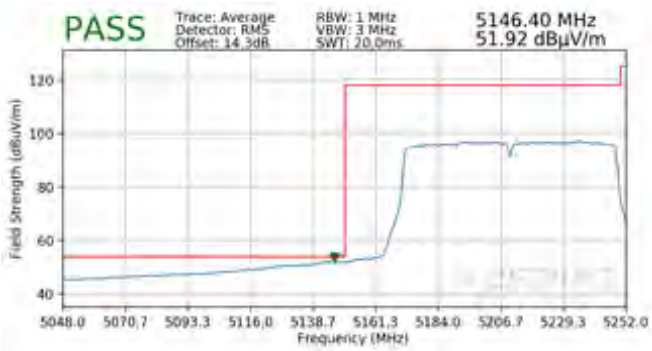
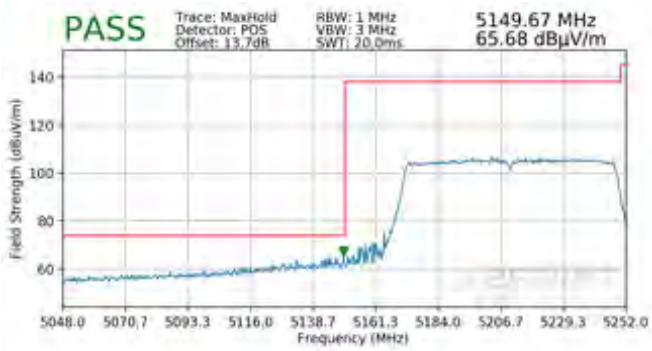
7.7.9 Antenna-2 Radiated Band Edge Measurements (80MHz BW)

§15.407(b.1)(b.2) §15.205 §15.209; RSS-Gen [8.9]

Worst Case Mode:	802.11ac
Worst Case Transfer Rate:	MCS0
Distance of Measurements:	3 Meters
Operating Frequency:	5210MHz
Channel:	42

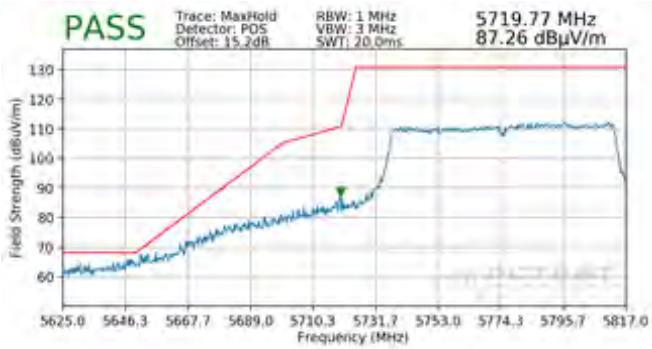


Plot 7-128. Radiated Lower Band Edge Plot (Average – UNII Band 1)

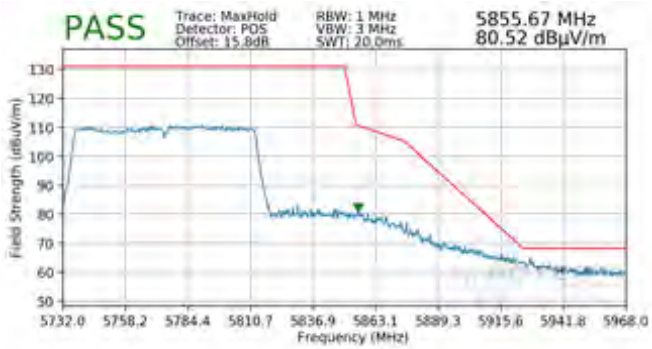


Plot 7-129. Radiated Lower Band Edge Plot (Peak – UNII Band 1)

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



Plot 7-130. Radiated Lower Band Edge Plot (Peak – UNII Band 3)



Plot 7-131. Radiated Upper Band Edge Plot (Peak – UNII Band 3)

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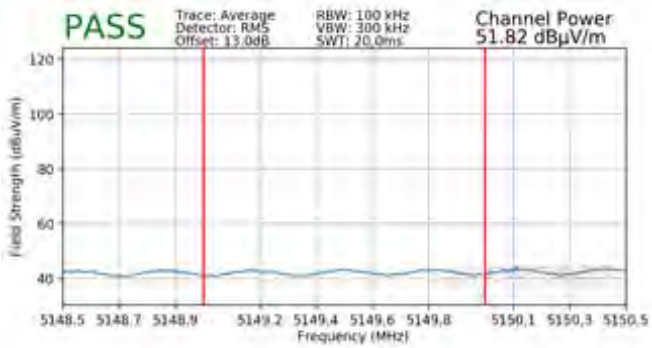
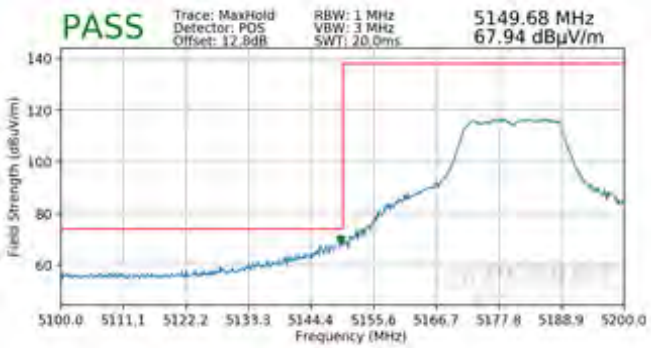
7.7.10 MIMO Radiated Band Edge Measurements (20MHz BW)

§15.407(b.1)(b.2) §15.205 §15.209; RSS-Gen [8.9]

Worst Case Mode:	802.11n
Worst Case Transfer Rate:	MCS9
Distance of Measurements:	3 Meters
Operating Frequency:	5180MHz
Channel:	36

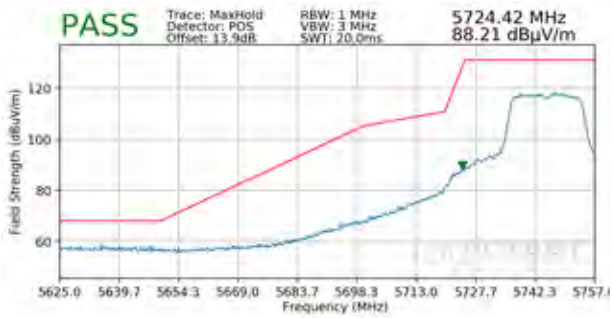


Plot 7-132. Radiated Lower Band Edge Plot (Average – UNII Band 1)



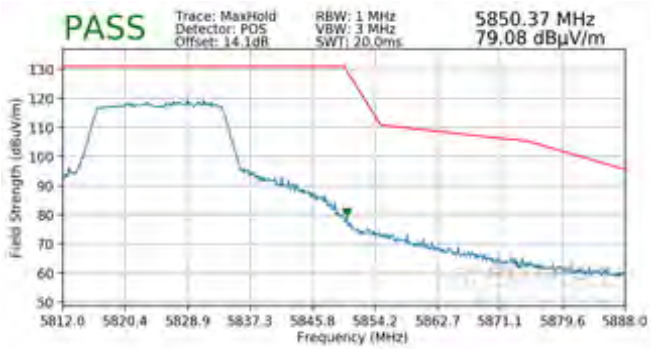
Plot 7-133. Radiated Lower Band Edge Plot (Peak – UNII Band 1)

Worst Case Mode:	802.11n
Worst Case Transfer Rate:	MCS9
Distance of Measurements:	3 Meters
Operating Frequency:	5745MHz
Channel:	149



Plot 7-134. Radiated Lower Band Edge Plot (Peak – UNII Band 3)

Worst Case Mode:	802.11n
Worst Case Transfer Rate:	MCS9
Distance of Measurements:	3 Meters
Operating Frequency:	5825MHz
Channel:	165



Plot 7-135. Radiated Upper Band Edge Plot (Peak – UNII Band 3)

Note:
Per KDB 789033 Section II (G)(3)(d)(ii), integration method was used to determine compliance with out-of band emission limits.

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7.7.11 CDD Radiated Band Edge Measurements (20MHz BW)

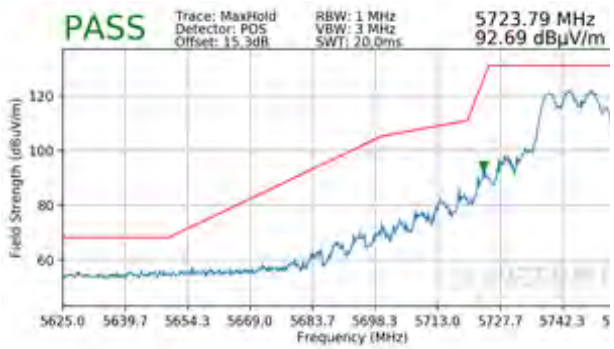
§15.407(b.1)(b.2) §15.205 §15.209; RSS-Gen [8.9]

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

Plot 7-136. Radiated Lower Band Edge Plot (Average – UNII Band 1)

Plot 7-137. Radiated Lower Band Edge Plot (Peak – UNII Band 1)

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



Plot 7-138. Radiated Lower Band Edge Plot (Peak – UNII Band 3)

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

Plot 7-139. Radiated Upper Band Edge Plot (Peak – UNII Band 3)

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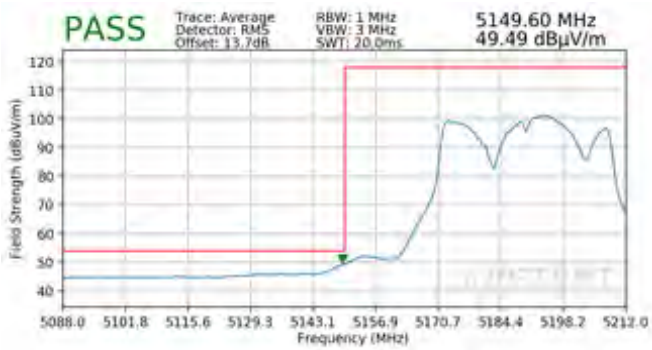
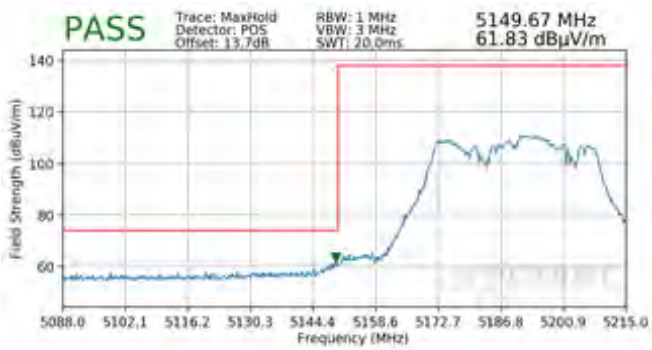
7.7.12 MIMO Radiated Band Edge Measurements (40MHz BW)

§15.407(b.1)(b.2) §15.205 §15.209; RSS-Gen [8.9]

Worst Case Mode:	802.11n
Worst Case Transfer Rate:	MCS8
Distance of Measurements:	3 Meters
Operating Frequency:	5190MHz
Channel:	38



Plot 7-140. Radiated Lower Band Edge Plot (Average – UNII Band 1)

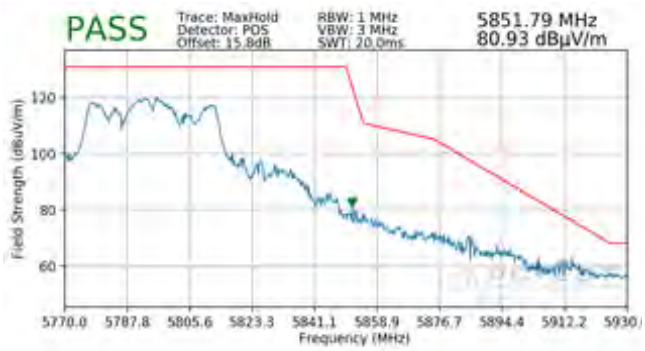


Plot 7-141. Radiated Lower Band Edge Plot (Peak – UNII Band 1)

Worst Case Mode:	802.11n
Worst Case Transfer Rate:	MCS8
Distance of Measurements:	3 Meters
Operating Frequency:	5755MHz
Channel:	151

Plot 7-142. Radiated Lower Band Edge Plot (Peak – UNII Band 3)

Worst Case Mode:	802.11n
Worst Case Transfer Rate:	MCS8
Distance of Measurements:	3 Meters
Operating Frequency:	5795MHz
Channel:	159



Plot 7-143. Radiated Upper Band Edge Plot (Peak – UNII Band 3)

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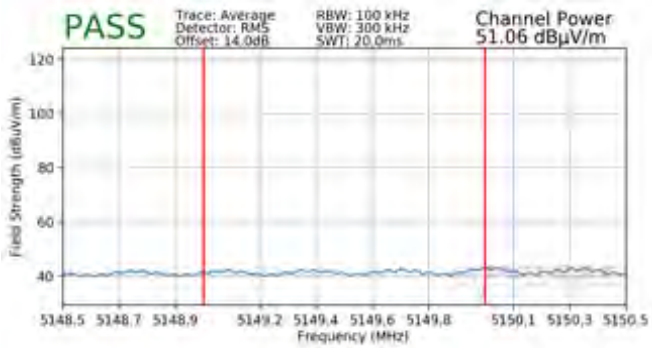
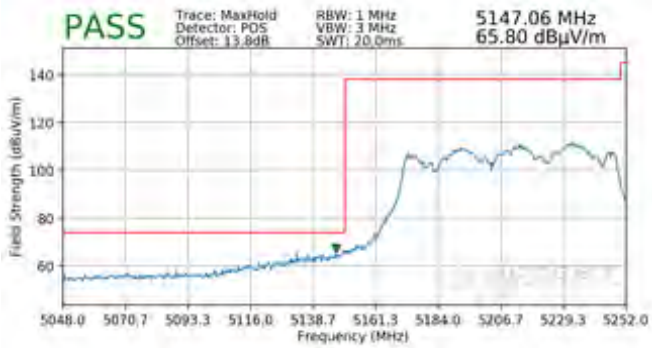
7.7.13 MIMO Radiated Band Edge Measurements (80MHz BW)

§15.407(b.1)(b.2) §15.205 §15.209; RSS-Gen [8.9]

Worst Case Mode:	802.11ac
Worst Case Transfer Rate:	MCS8
Distance of Measurements:	3 Meters
Operating Frequency:	5210MHz
Channel:	42

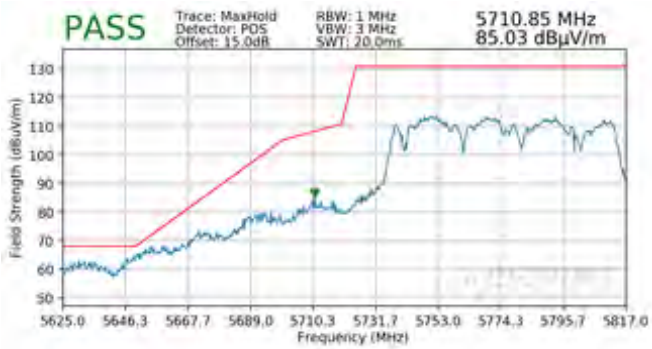


Plot 7-144. Radiated Lower Band Edge Plot (Average – UNII Band 1)

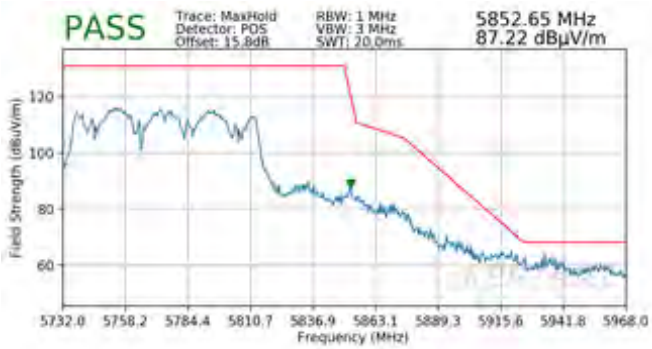


Plot 7-145. Radiated Lower Band Edge Plot (Peak – UNII Band 1)

Worst Case Mode:	802.11ac
Worst Case Transfer Rate:	MCS8
Distance of Measurements:	3 Meters
Operating Frequency:	5775MHz
Channel:	155



Plot 7-146. Radiated Lower Band Edge Plot (Peak – UNII Band 3)



Plot 7-147. Radiated Upper Band Edge Plot (Peak – UNII Band 3)

Note:
Per KDB 789033 Section II (G)(3)(d)(ii), integration method was used to determine compliance with out-of band emission limits.

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7.7 Radiated Spurious Emissions Measurements – Below 1GHz

§15.209; RSS-Gen [8.9]

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 and Table 6 of RSS-Gen (8.10) must not exceed the limits shown in Table 7-46 per Section 15.209 and RSS-Gen (8.9).

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 7-46. 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.

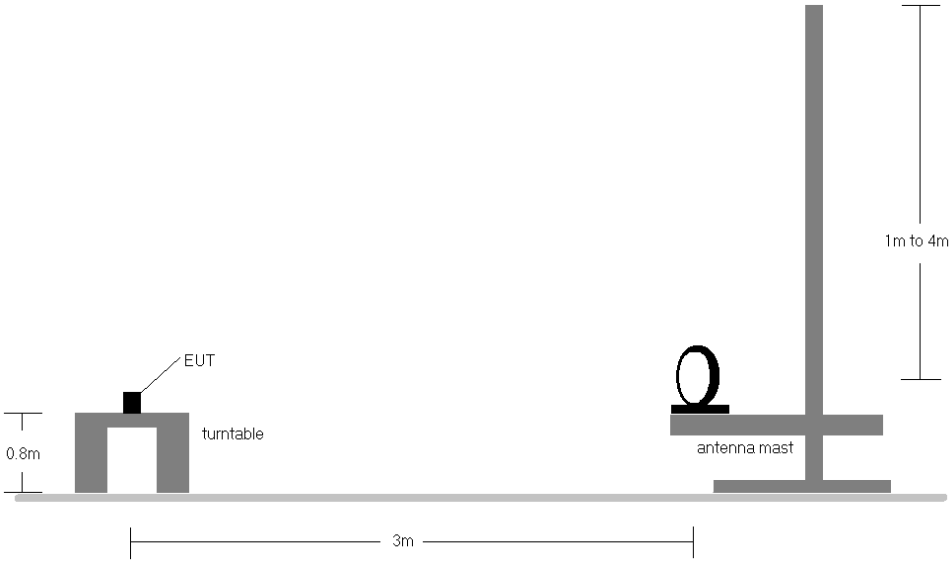

Figure 7-6. Radiated Test Setup < 30MHz

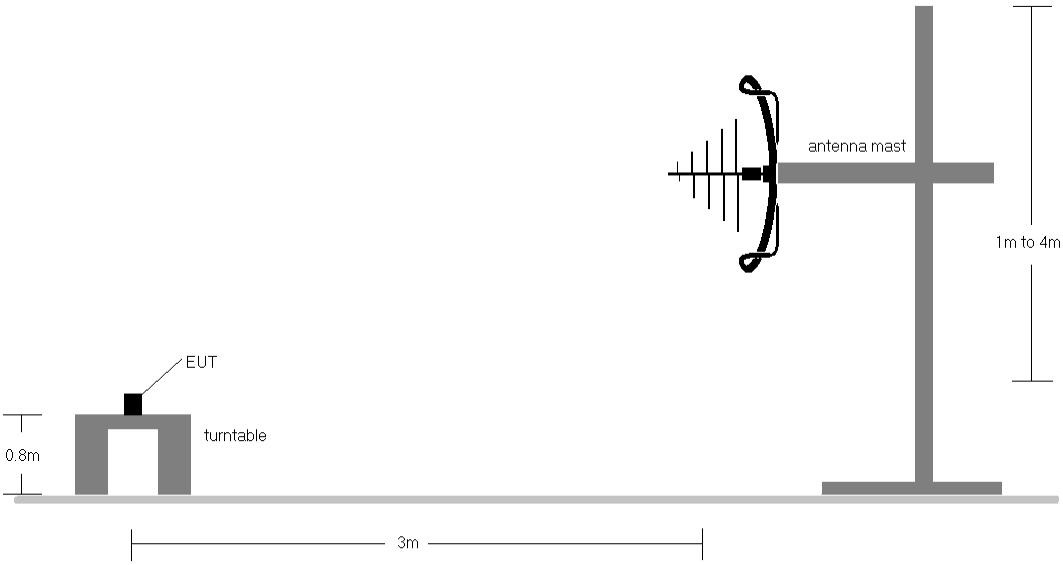

Figure 7-7. Radiated Test Setup < 1GHz

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Test Notes

1. All emissions lying in restricted bands specified in §15.205 and RSS-Gen (8.10) are below the limit shown in Table 7-46.
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 while powered by an AC power source.
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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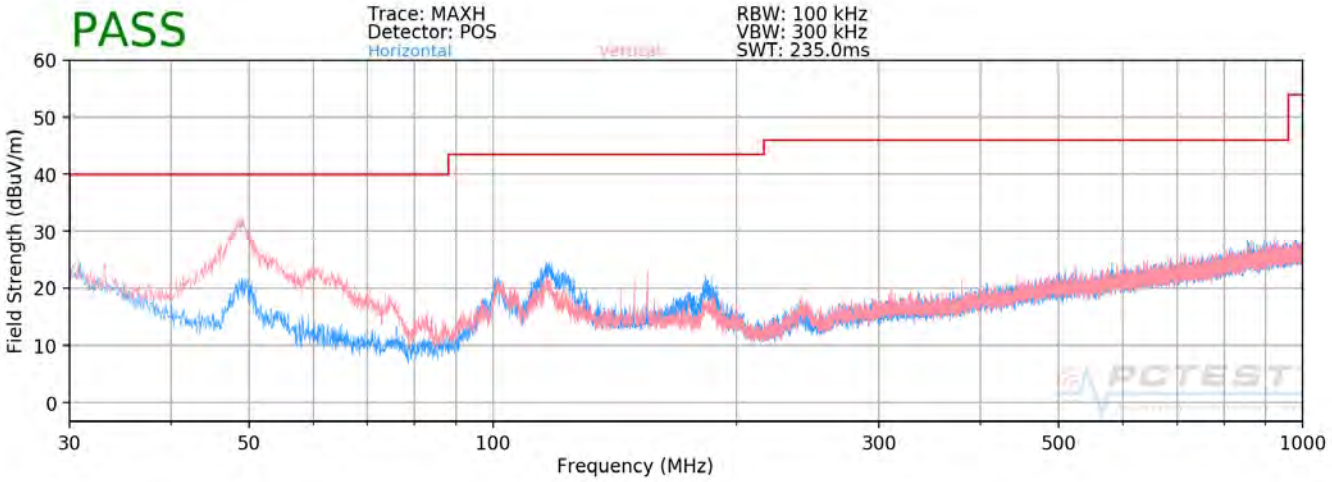
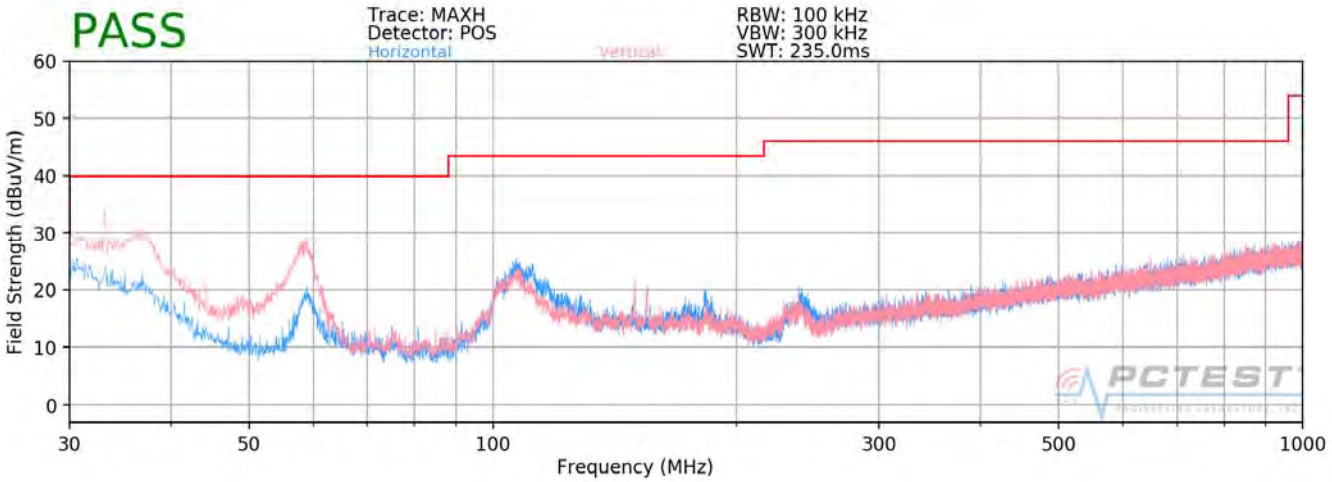
Radiated Spurious Emissions Measurements (Below 1GHz)

§15.209; RSS-Gen [8.9]



Plot 7-148. Radiated Spurious Plot below 1GHz (802.11a – U3 Ch. 157) - Ant1



Plot 7-149. Radiated Spurious Plot below 1GHz (802.11a – U3 Ch. 157) – Ant2

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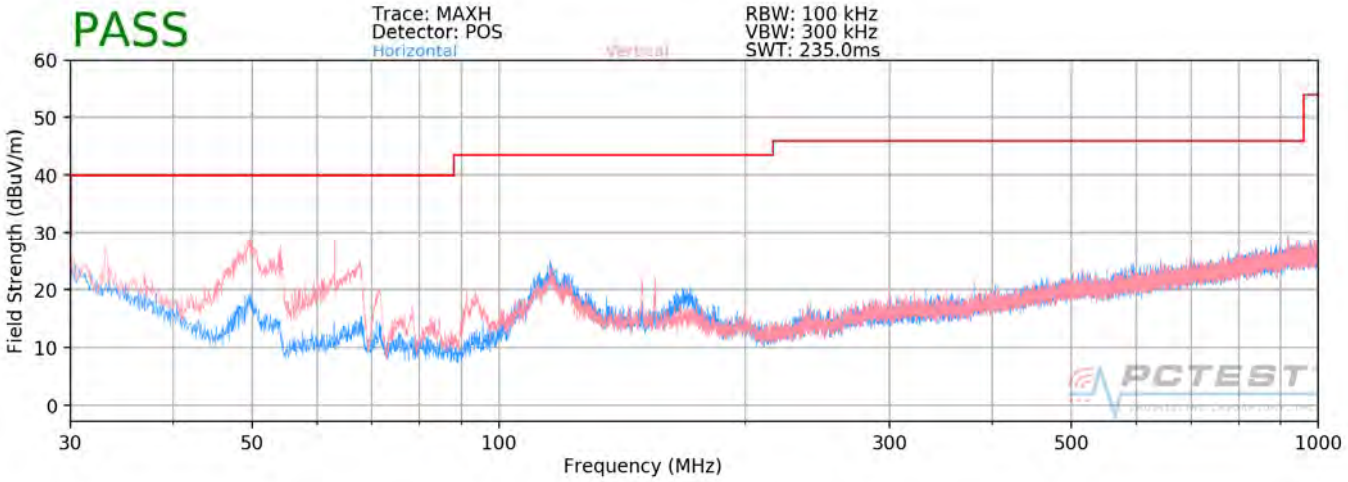
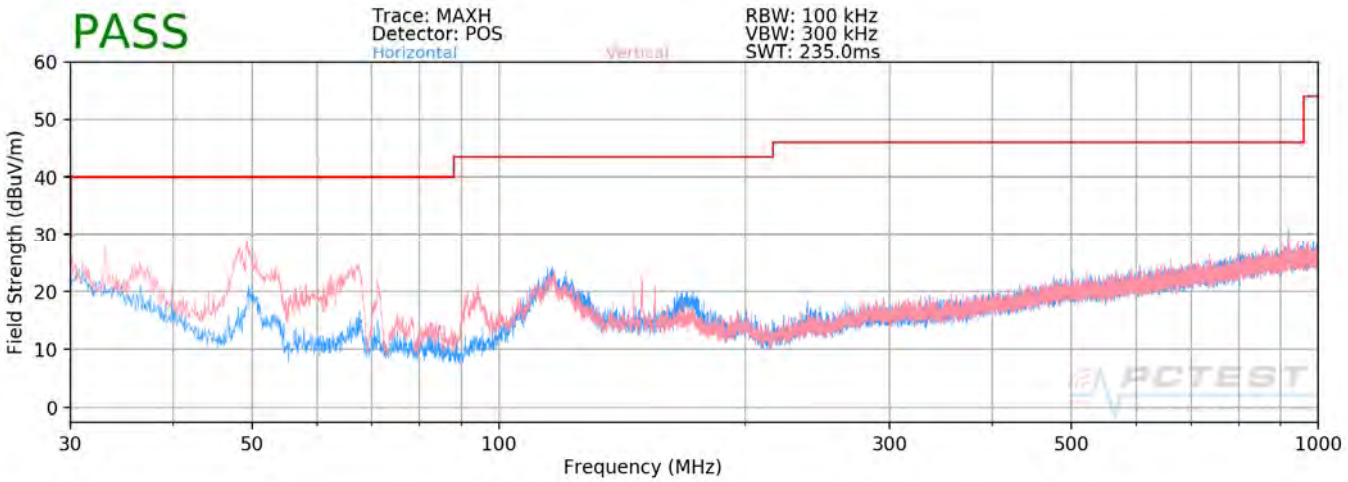
Simultaneous Tx Radiated Spurious Emissions Measurements (Below 1GHz)

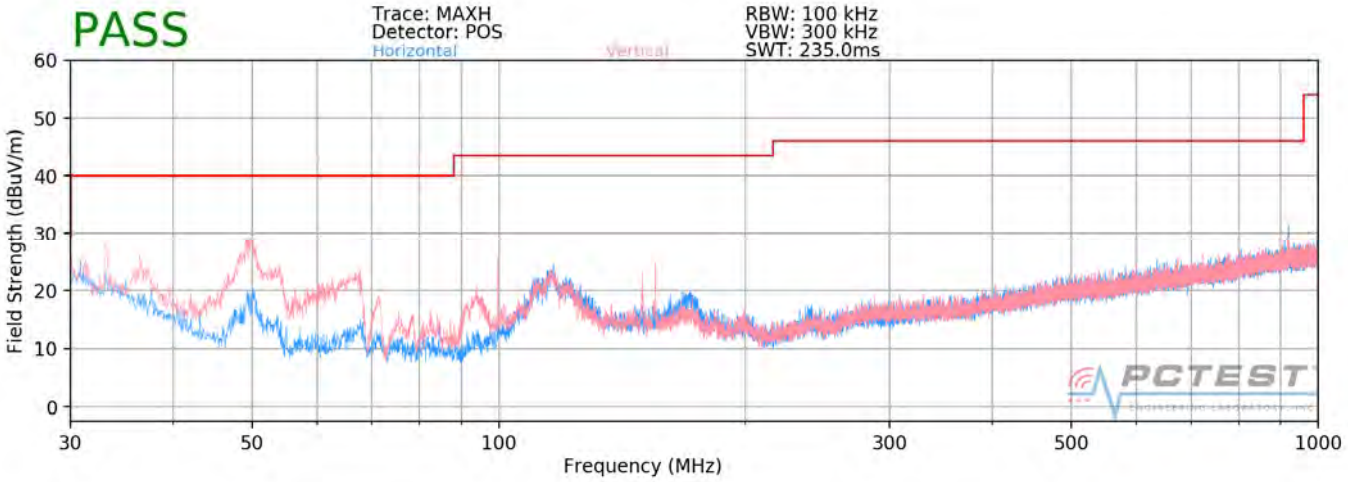
§15.209; RSS-Gen [8.9]



Plot 7-150. Radiated Spurious Plot below 1GHz (2.4GHz – 5GHz)



Plot 7-151. Radiated Spurious Plot below 1GHz (5GHz – 2.4 GHz)



Plot 7-152. Radiated Spurious Plot below 1GHz (Dual Band Simult. Tx)

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7.8 Line-Conducted Test Data

§15.407; RSS-Gen [8.8]

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 and RSS-Gen (8.8).

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 7-47. 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.

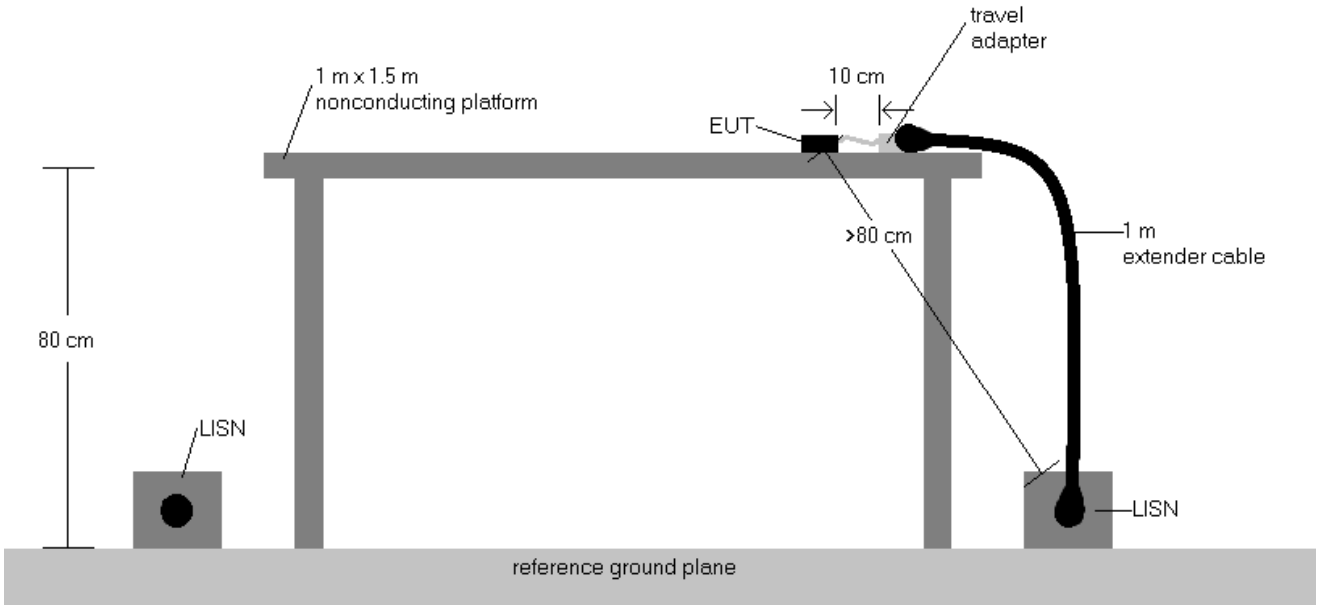

Figure 7-8. Test Instrument & Measurement Setup

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 and RSS-Gen (8.8).
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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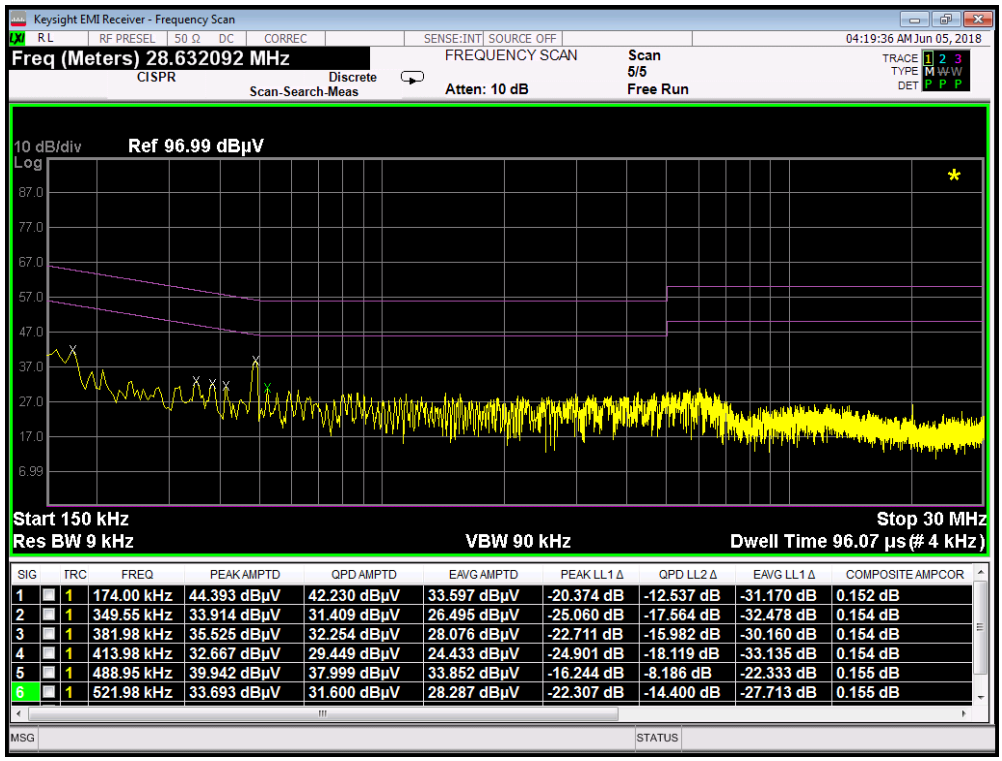
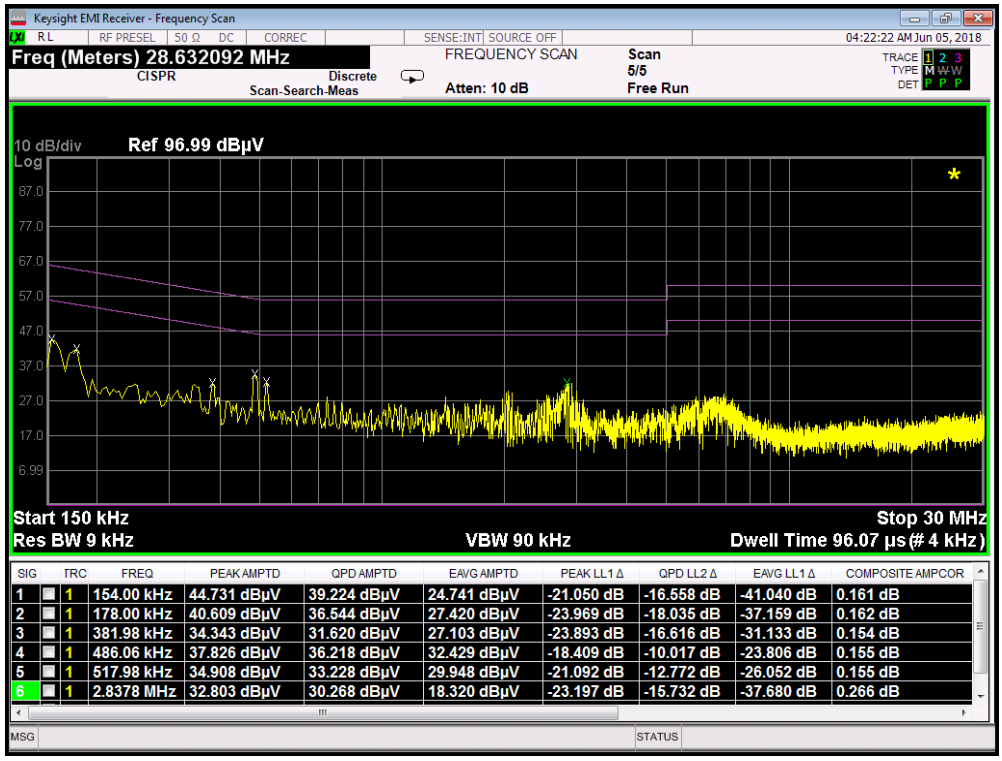


SIG	TRC	FREQ	PEAK AMPTD	QPD AMPTD	EAVG AMPTD	PEAK LL1 Δ	QPD LL2 Δ	EAVG LL1 Δ	COMPOSITE AMPCOR
1	1	174.00 kHz	44.393 dBµV	42.230 dBµV	33.597 dBµV	-20.374 dB	-12.537 dB	-31.170 dB	0.152 dB
2	1	349.55 kHz	33.914 dBµV	31.409 dBµV	26.495 dBµV	-25.060 dB	-17.564 dB	-32.478 dB	0.154 dB
3	1	381.98 kHz	35.525 dBµV	32.254 dBµV	28.076 dBµV	-22.711 dB	-15.982 dB	-30.160 dB	0.154 dB
4	1	413.98 kHz	32.667 dBµV	29.449 dBµV	24.433 dBµV	-24.901 dB	-18.119 dB	-33.135 dB	0.154 dB
5	1	488.95 kHz	39.942 dBµV	37.999 dBµV	33.852 dBµV	-16.244 dB	-8.186 dB	-22.333 dB	0.155 dB
6	1	521.98 kHz	33.693 dBµV	31.600 dBµV	28.287 dBµV	-22.307 dB	-14.400 dB	-27.713 dB	0.155 dB

Plot 7-153. Line Conducted Plot with 802.11a UNII Band 1 (L1)



SIG	TRC	FREQ	PEAK AMPTD	QPD AMPTD	EAVG AMPTD	PEAK LL1 Δ	QPD LL2 Δ	EAVG LL1 Δ	COMPOSITE AMPCOR
1	1	154.00 kHz	44.731 dBµV	39.224 dBµV	24.741 dBµV	-21.050 dB	-16.558 dB	-41.040 dB	0.161 dB
2	1	178.00 kHz	40.609 dBµV	36.544 dBµV	27.420 dBµV	-23.969 dB	-18.035 dB	-37.159 dB	0.162 dB
3	1	381.98 kHz	34.343 dBµV	31.620 dBµV	27.103 dBµV	-23.893 dB	-16.616 dB	-31.133 dB	0.154 dB
4	1	486.06 kHz	37.826 dBµV	36.218 dBµV	32.429 dBµV	-18.409 dB	-10.017 dB	-23.806 dB	0.155 dB
5	1	517.98 kHz	34.908 dBµV	33.228 dBµV	29.948 dBµV	-21.092 dB	-12.772 dB	-26.052 dB	0.155 dB
6	1	2.8378 MHz	32.803 dBµV	30.268 dBµV	18.320 dBµV	-23.197 dB	-15.732 dB	-37.680 dB	0.266 dB

Plot 7-154. Line Conducted Plot with 802.11a UNII Band 1 (N)

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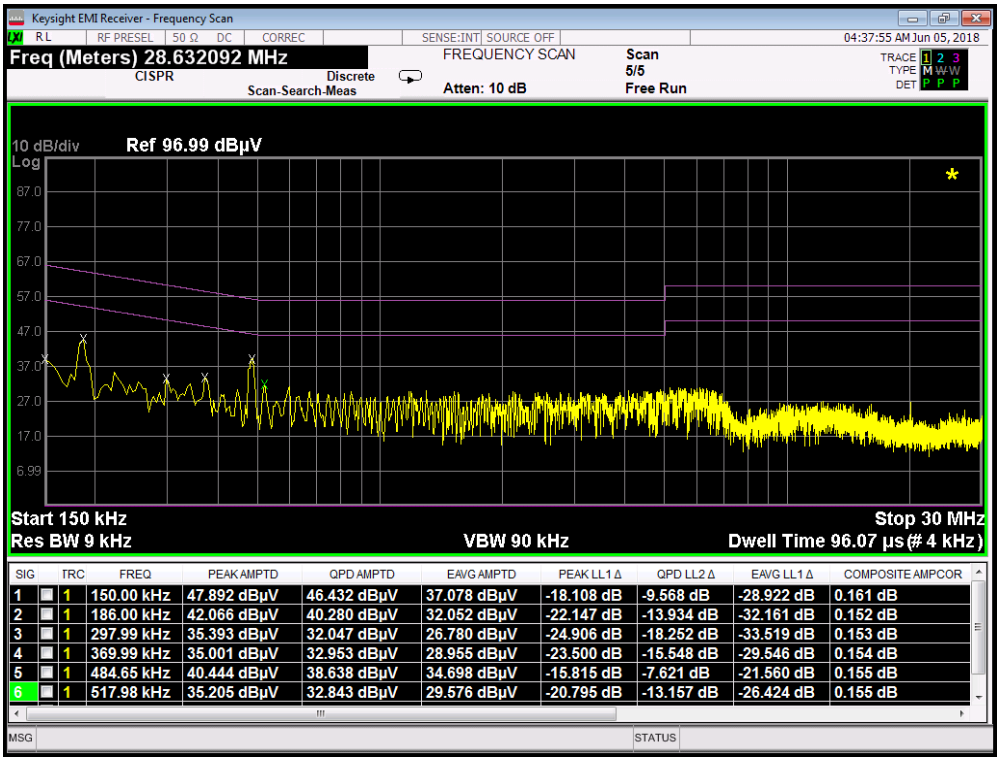
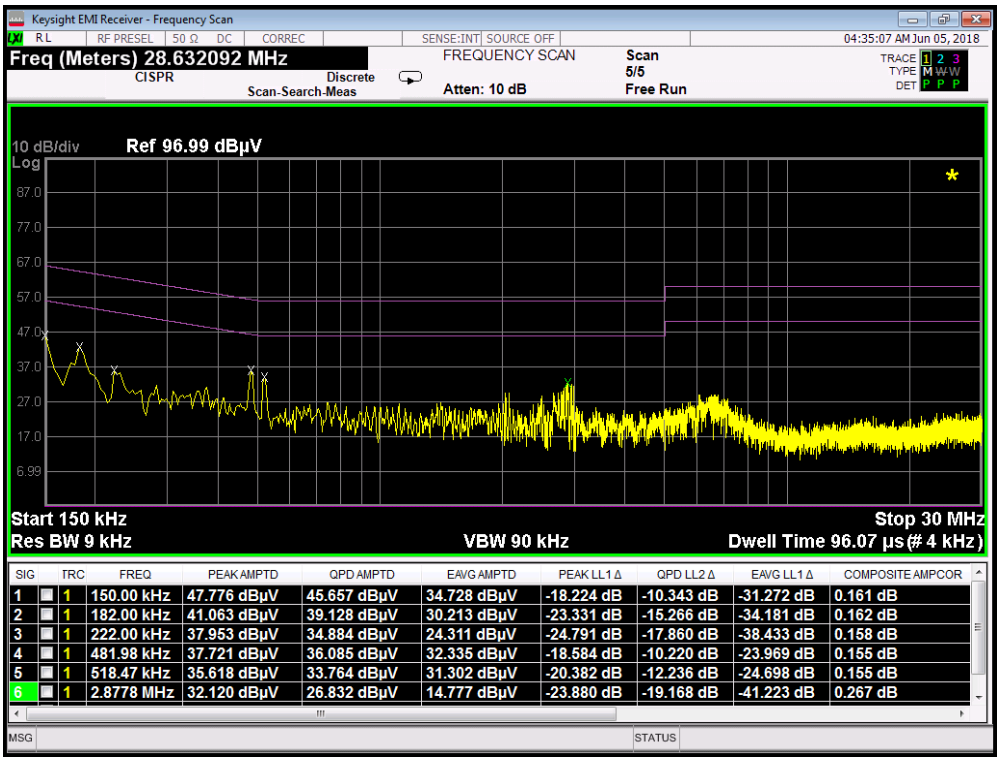


SIG	TRC	FREQ	PEAK AMPTD	QPD AMPTD	EAVG AMPTD	PEAK LL1 Δ	QPD LL2 Δ	EAVG LL1 Δ	COMPOSITE AMPCOR
1	1	150.00 kHz	47.892 dBµV	46.432 dBµV	37.078 dBµV	-18.108 dB	-9.568 dB	-28.922 dB	0.161 dB
2	1	186.00 kHz	42.066 dBµV	40.280 dBµV	32.052 dBµV	-22.147 dB	-13.934 dB	-32.161 dB	0.152 dB
3	1	297.99 kHz	35.393 dBµV	32.047 dBµV	26.780 dBµV	-24.906 dB	-18.252 dB	-33.519 dB	0.153 dB
4	1	369.99 kHz	35.001 dBµV	32.953 dBµV	28.955 dBµV	-23.500 dB	-15.548 dB	-29.546 dB	0.154 dB
5	1	484.65 kHz	40.444 dBµV	38.638 dBµV	34.698 dBµV	-15.815 dB	-7.621 dB	-21.560 dB	0.155 dB
6	1	517.98 kHz	35.205 dBµV	32.843 dBµV	29.576 dBµV	-20.795 dB	-13.157 dB	-26.424 dB	0.155 dB

Plot 7-155. Line Conducted Plot with 802.11a UNII Band 3 (L1)



SIG	TRC	FREQ	PEAK AMPTD	QPD AMPTD	EAVG AMPTD	PEAK LL1 Δ	QPD LL2 Δ	EAVG LL1 Δ	COMPOSITE AMPCOR
1	1	150.00 kHz	47.776 dBµV	45.657 dBµV	34.728 dBµV	-18.224 dB	-10.343 dB	-31.272 dB	0.161 dB
2	1	182.00 kHz	41.063 dBµV	39.128 dBµV	30.213 dBµV	-23.331 dB	-15.266 dB	-34.181 dB	0.162 dB
3	1	222.00 kHz	37.953 dBµV	34.884 dBµV	24.311 dBµV	-24.791 dB	-17.860 dB	-38.433 dB	0.158 dB
4	1	481.98 kHz	37.721 dBµV	36.085 dBµV	32.335 dBµV	-18.584 dB	-10.220 dB	-23.969 dB	0.155 dB
5	1	518.47 kHz	35.618 dBµV	33.764 dBµV	31.302 dBµV	-20.382 dB	-12.236 dB	-24.698 dB	0.155 dB
6	1	2.8778 MHz	32.120 dBµV	26.832 dBµV	14.777 dBµV	-23.880 dB	-19.168 dB	-41.223 dB	0.267 dB

Plot 7-156. 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 Indoor Access Point FCC ID: A3LETWV525** is in compliance with Part 15E of the FCC Rules and RSS-247 of the Innovation, Science and Economic Development Canada Rules.

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