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MEASUREMENT REPORT
FCC Part 15.407 UNII 802.11a/n

Applicant Name:
Samsung Electronics, Co. Ltd.
129, Samsung-ro, Maetan dong,
Yeongtong-gu, Suwon-si
Gyeonggi-do 443-742, Korea

Date of Testing:
04/20-05/14/2014
Test Site/Location:
PCTEST Lab, Columbia, MD, USA
Test Report Serial No.:
0Y1404300875.A3L

FCC ID: **A3LSMB780A**

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

Application Type: Certification
Model(s): SM-B780A
EUT Type: Portable Handset
FCC Classification: Unlicensed National Information Infrastructure (UNII)
FCC Rule Part(s): Part 15.407
Test Procedure(s): KDB 789033 v01r03, KDB 644545 v01r02

Mode	UNII Band	Channel Bandwidth (MHz)	Tx Frequency (MHz)	Conducted Power	
				Max. Power (mW)	Max. Power (dBm)
802.11a	1	20	5180 - 5240	16.144	12.08
	2A	20	5260 - 5320	16.482	12.17
	2C	20	5500 - 5700	17.258	12.37
802.11n	1	20	5180 - 5240	16.181	12.09
	2A	20	5260 - 5320	17.179	12.35
	2C	20	5500 - 5700	17.338	12.39

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in KDB 789033 v01r03 and KDB 644545 v01r02. Test results reported herein relate only to the item(s) tested.

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

Randy Ortanez
President

ACCREDITED
TESTING CERT#2041.01

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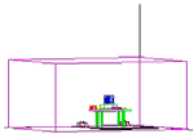

MEASUREMENT REPORT
FCC Part 15.407

§ 2.1033 General Information

APPLICANT:	Samsung Electronics, Co. Ltd.
APPLICANT ADDRESS:	129, Samsung-ro, Maetan dong,
	Yeongtong-gu, Suwon-si, Gyeonggi-do 443-742, Korea
TEST SITE:	PCTEST ENGINEERING LABORATORY, INC.
TEST SITE ADDRESS:	7185 Oakland Mills Road, Columbia, MD 21046 USA
FCC RULE PART(S):	Part 15.407
BASE MODEL:	SM-B780A
FCC ID:	A3LSMB780A
FCC CLASSIFICATION:	Unlicensed National Information Infrastructure (UNII)
Test Device Serial No.:	21, 28 ☐ Production ☒ Pre-Production ☐ Engineering
DATE(S) OF TEST:	04/20-05/14/2014
TEST REPORT S/N:	0Y1404300875.A3L

Test Facility / Accreditations

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

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

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

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1.0 INTRODUCTION

1.1 Scope

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

1.2 PCTEST Test Location

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

These measurement tests were conducted at the PCTEST Engineering Laboratory, Inc. facility located at 7185 Oakland Mills Road, Columbia, MD 21046. The site coordinates are 39° 10'23" N latitude and 76° 49'50" W longitude. The facility is 0.4 miles North of the FCC laboratory, and the ambient signal and ambient signal strength are approximately equal to those of the FCC laboratory. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4-2009 on February 15, 2012.

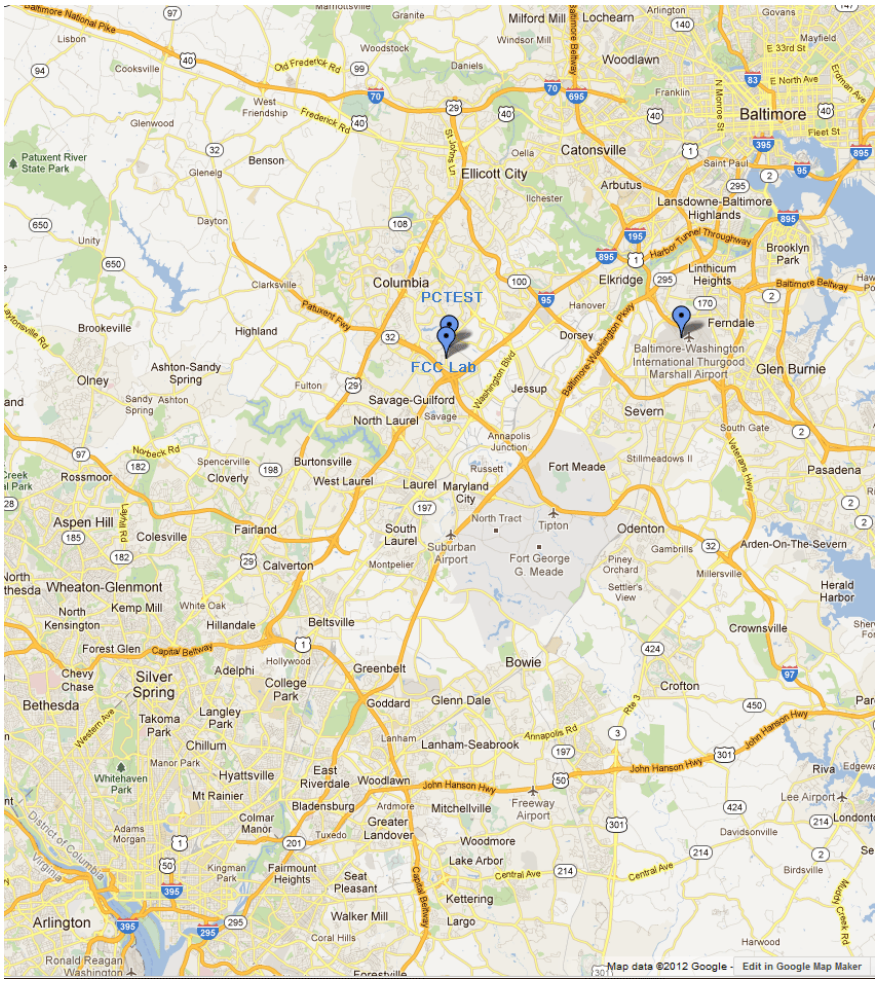

Figure 1-1. Map of the Greater Baltimore and Metropolitan Washington, D.C. area

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2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Handset FCC ID: A3LSMB780A**. The test data contained in this report pertains only to the emissions due to the EUT's UNII transmitter.

2.2 Device Capabilities

This device contains the following capabilities:

850/1900 GSM/GPRS/EDGE, 850/1900 WCDMA, 802.11a/b/g/n WLAN, 802.11a/n UNII, Bluetooth (1x, EDR)

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

- 802.11a/n 20MHz Bandwidth – 99.7 %

2.3 Test Configuration

The Samsung Portable Handset FCC ID: A3LSMB780A was tested per the guidance of KDB 789033 v01r03. ANSI C63.10-2009 was used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing. See Sections 3.2, 3.3, and 6.1 of this test report for a description of the AC line conducted emissions, radiated emissions, and antenna port conducted emissions test setups, respectively.

2.4 EMI Suppression Device(s)/Modifications

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

2.5 Labeling Requirements

Per 2.1074 & 15.19; Docket 95-19

The label shall be permanently affixed at a conspicuous location on the device; instruction manual or pamphlet supplied to the user and be readily visible to the purchaser at the time of purchase. However, when the device is so small wherein placement of the label with specified statement is not practical, only the trade name and FCC ID must be displayed on the device per Section 15.19(a)(5). Please see attachment for FCC ID label and label location.

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3.0 DESCRIPTION OF TEST

3.1 Evaluation Procedure

The measurement procedures described in the American National Standard for Testing Unlicensed Wireless Devices (ANSI C63.10-2009) and the guidance provided in KDB 789033 v01r03 were used in the measurement of **Samsung Portable Handset FCC ID: A3LSMB780A.**

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

3.2 AC Line Conducted Emissions

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

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

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

Line conducted emissions test results are shown in Section 6.9. Automated test software was used to perform the AC line conducted emissions testing. Automated measurement software utilized is Rohde & Schwarz EMC32, Version 8.51.0.

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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. For measurements above 1GHz absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1GHz, the absorbers are removed. An ETS Lindgren Model 2188 raised turntable is used for radiated measurement. It is a continuously rotatable, remote-controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. A 78cm high PVC support structure is placed on top of the turntable. A ¾" (~1.9cm) sheet of high density polyethylene is used as the table top and is placed on top of the PVC supports to bring the total height of the table to 80cm.

For 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 0.8 meter high, 1 x 1.5 meter table. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configuration, clock speed, mode of operation or video resolution, if applicable, turntable azimuth, and receive antenna height was noted for each frequency found.

Final measurements were made in the semi-anechoic chamber using calibrated, linearly polarized broadband and horn antennas. The test setup was configured to the setup that produced the worst case emissions. The spectrum analyzer was set to investigate all frequencies required for testing to compare the highest radiated disturbances with respect to the specified limits. The turntable containing the EUT was rotated through 360 degrees and the height of the receive antenna was varied 1 to 4 meters and stopped at the azimuth and height producing the maximum emission. Each emission was maximized by changing the orientation of the EUT through three orthogonal planes and changing the polarity of the receive antenna, whichever produced the worst-case emissions. For the EUT positioning, "H" is defined with the EUT lying flat on the test surface, "H2" is defined with the EUT standing up on its side, and "V" is defined with the EUT standing upright.

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4.0 ANTENNA REQUIREMENTS

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

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

Conclusion:

The **Samsung Portable Handset FCC ID: A3LSMB780A** unit complies with the requirement of §15.203.

Ch.	Frequency (MHz)	Ch.	Frequency (MHz)	Ch.	Frequency (MHz)
36	5180	52	5260	100	5500
:	:	:	:	:	:
42	5210	56	5280	116	5580
:	:	:	:	:	:
48	5240	64	5320	140	5700

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

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5.0 ST EQUIPMENT CALIBRATION DATA

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

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	RE1	Radiated Emissions Cable Set (UHF/EHF)	3/25/2014	Annual	3/25/2015	N/A
-	WL25-1	Conducted Cable Set (25GHz)	1/29/2014	Annual	1/29/2015	N/A
-	WL40-1	Conducted Cable Set (40GHz)	1/29/2014	Annual	1/29/2015	N/A
Agilent	8447D	Broadband Amplifier	5/31/2013	Annual	5/31/2014	2443A01900
Agilent	N9020A	MXA Signal Analyzer	10/29/2013	Annual	10/29/2014	US46470561
Agilent	N9030A	PXA Signal Analyzer (44GHz)	1/17/2014	Annual	1/17/2015	MY52350166
Anritsu	MA2411B	Pulse Sensor	4/8/2014	Annual	4/8/2015	846215
Anritsu	ML2495A	Power Meter	7/12/2013	Annual	7/12/2014	1328004
Com-Power	AL-130	9kHz - 30MHz Loop Antenna	6/26/2013	Annual	6/26/2014	121034
Emco	3115	Horn Antenna (1-18GHz)	1/30/2014	Biennial	1/30/2016	9704-5182
Espec	ESX-2CA	Environmental Chamber	4/16/2014	Annual	4/16/2015	17620
ETS Lindgren	3160-09	18-26.5 GHz Standard Gain Horn	5/30/2012	Biennial	5/30/2014	135427
ETS Lindgren	3160-10	26.5-40 GHz Standard Gain Horn	6/6/2012	Biennial	6/6/2014	130993
Huber+Suhner	Sucoflex 102A	40GHz Radiated Cable	1/30/2014	Annual	1/30/2015	251425001
K & L	6000/T18000	High Pass Filter	2/7/2014	Annual	2/7/2015	1
Mini-Circuits	VHF-3100+	High Pass Filter	1/27/2014	Annual	1/27/2015	30841
Pasternack	NMLC-1	Line Conducted Emissions Cable (NM)	1/28/2014	Annual	1/28/2015	N/A
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	1/27/2014	Annual	1/27/2015	100342
Rohde & Schwarz	TS-PR18	1-18 GHz Pre-Amplifier	5/31/2013	Annual	5/31/2014	100071
Rohde & Schwarz	TS-PR26	18-26.5 GHz Pre-Amplifier	5/31/2013	Annual	5/31/2014	100040
Rohde & Schwarz	TS-PR40	26.5-40 GHz Pre-Amplifier	6/6/2012	Biennial	6/6/2014	100037
Seekonk	NC-100	Torque Wrench (8" lb)	4/16/2014	Biennial	4/16/2016	N/A
Solar Electronics	8012-50-R-24-BNC	Line Impedance Stabilization Network	6/20/2013	Biennial	6/20/2015	310233
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	1/28/2014	Biennial	1/28/2016	A051107

Table 5-1. Annual Test Equipment Calibration Schedule

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6.0 TEST RESULTS

6.1 Summary

Company Name: Samsung Electronics, Co. Ltd.
FCC ID: A3LSMB780A
Method/System: Unlicensed National Information Infrastructure (UNII)
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)

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
TRANSMITTER MODE (TX)					
N/A	26dB Bandwidth	N/A	CONDUCTED	PASS	Section 6.2
15.407 (a.1)	Maximum Conducted Output Power	< 4 + 10log$_{10}$(BW) dBm (5150-5250MHz) [FCC] < 10 + 10log$_{10}$(BW) dBm (5150-5250MHz) [IC] < 11 + 10log$_{10}$(B) dBm (5250-5350MHz, 5470 – 5725MHz)		PASS	Section 6.3
15.407 (a.1), (5)	Peak Power Spectral Density	< 4 dBm/MHz (5150-5250) [FCC] < 10dBm/MHz (5150-5250) [IC] < 11dBm/MHz (5250-5350) < 11dBm/MHz (5470-5725)		PASS	Section 6.4
15.407(a.6)	Peak Excursion	< 13 dB/MHz maximum difference		PASS	Section 6.5
15.407(g)	Frequency Stability	N/A		PASS	Section 6.6
15.407(h)	Dynamic Frequency Selection	See DFS Test Report		PASS	See DFS Test Report
15.407(b.1), (2),(3)	Undesirable Emissions	< -27 dBm/MHz EIRP (5150-5350MHz, 5470-5725MHz)	RADIATED	PASS	Section 6.7
15.205, 15.407(b.1), (5), (6)	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209 (RSS-210 table 3 limits)		PASS	Section 6.8
15.407	AC Conducted Emissions 150kHz – 30MHz	< FCC 15.207 limits or < RSS-Gen table 2 limits	LINE CONDUCTED	PASS	Section 6.9

Table 6-1. 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 2.7.

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6.2 26dB Bandwidth Measurement – 802.11a/n

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 (>98%), at its maximum power control level, as defined in KDB 789033 v01r03, and at the appropriate frequencies. The spectrum analyzer's bandwidth measurement function is configured to measure the 26dB bandwidth.

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

Test Procedure Used

KDB 789033 v01r03 – 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.

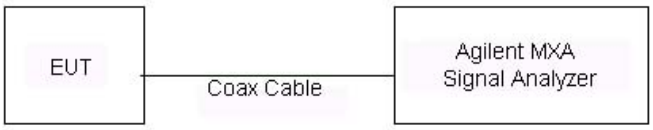

Figure 6-1. Test Instrument & Measurement Setup

Test Notes

Per KDB 644545 v01r01 and 15.215(c), a 20dB bandwidth measurement can be performed to demonstrate that the entire emission of one channel lies solely within a particular band. 20dB bandwidth plots are included at the end of this section to show that the DFS requirements are not applicable in UNII Band 1 since the Band 1 channel does not cross over into Band 2A. Another 20dB bandwidth plot is also included to show that no emissions are present within the 5600 – 5650MHz TDWR band.

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	Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	Measured 26dB Bandwidth [MHz]
Band 1	5180	36	a	6	18.65
	5200	40	a	6	18.66
	5240	48	a	6	18.69
	5180	36	n (20MHz)	6.5/7.2 (MCS0)	18.93
	5200	40	n (20MHz)	6.5/7.2 (MCS0)	19.06
	5240	48	n (20MHz)	6.5/7.2 (MCS0)	19.06
Band 2A	5260	52	a	6	18.63
	5280	56	a	6	18.54
	5320	64	a	6	18.63
	5260	52	n (20MHz)	6.5/7.2 (MCS0)	19.02
	5280	56	n (20MHz)	6.5/7.2 (MCS0)	18.97
	5320	64	n (20MHz)	6.5/7.2 (MCS0)	18.96
Band 2C	5500	100	a	6	18.65
	5580	116	a	6	18.56
	5700	140	a	6	18.53
	5500	100	n (20MHz)	6.5/7.2 (MCS0)	18.94
	5580	116	n (20MHz)	6.5/7.2 (MCS0)	19.05
	5700	140	n (20MHz)	6.5/7.2 (MCS0)	18.84

Table 6-2. Conducted Bandwidth Measurements

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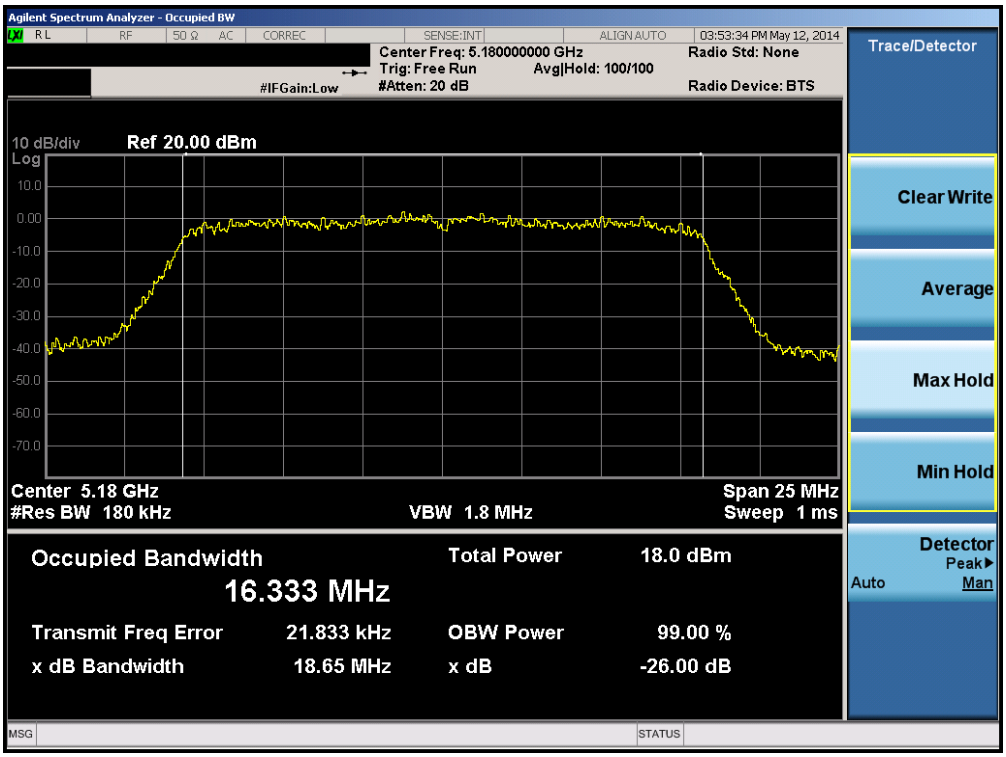
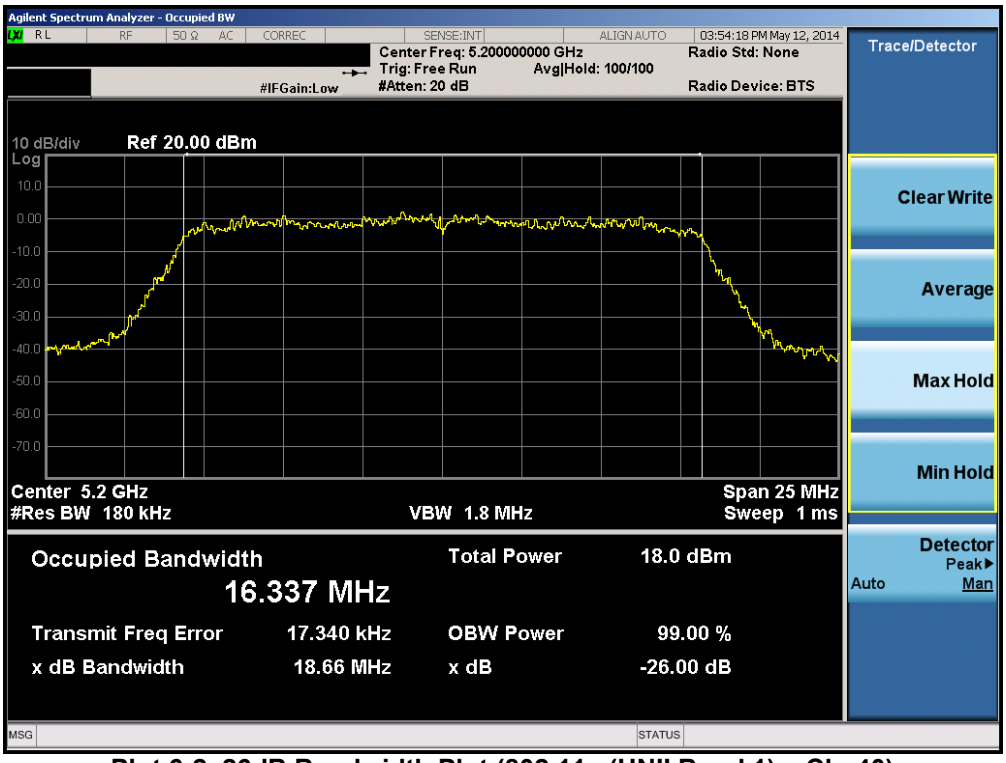


Plot 6-1. 26dB Bandwidth Plot (802.11a (UNII Band 1) – Ch. 36)



Plot 6-2. 26dB Bandwidth Plot (802.11a (UNII Band 1) – Ch. 40)

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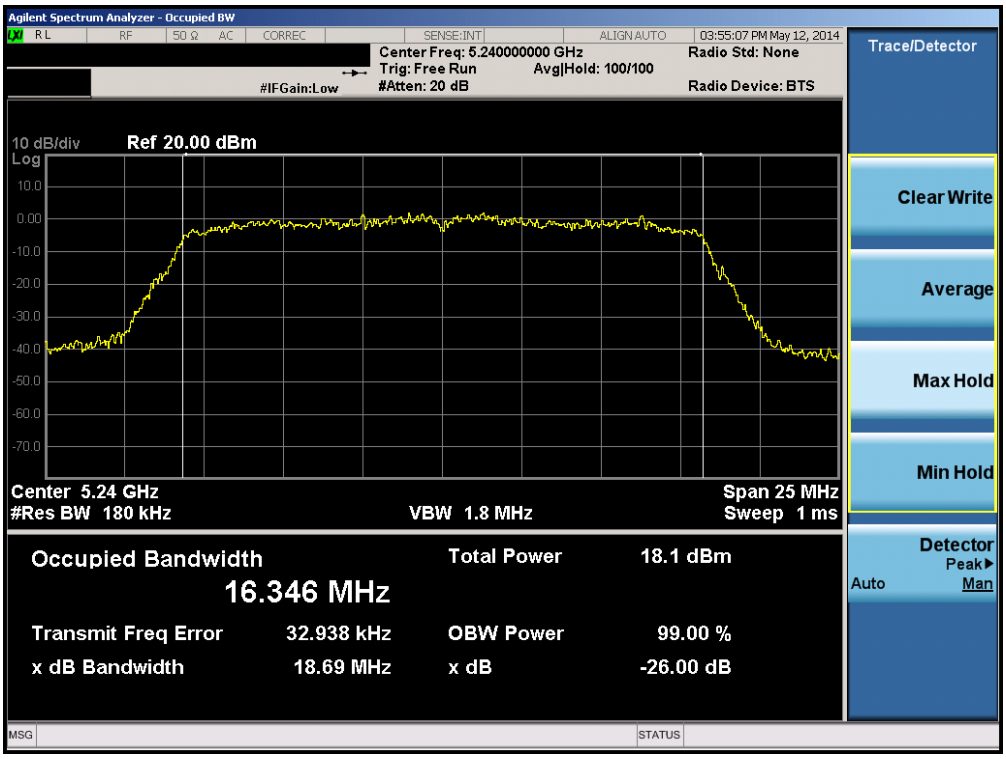
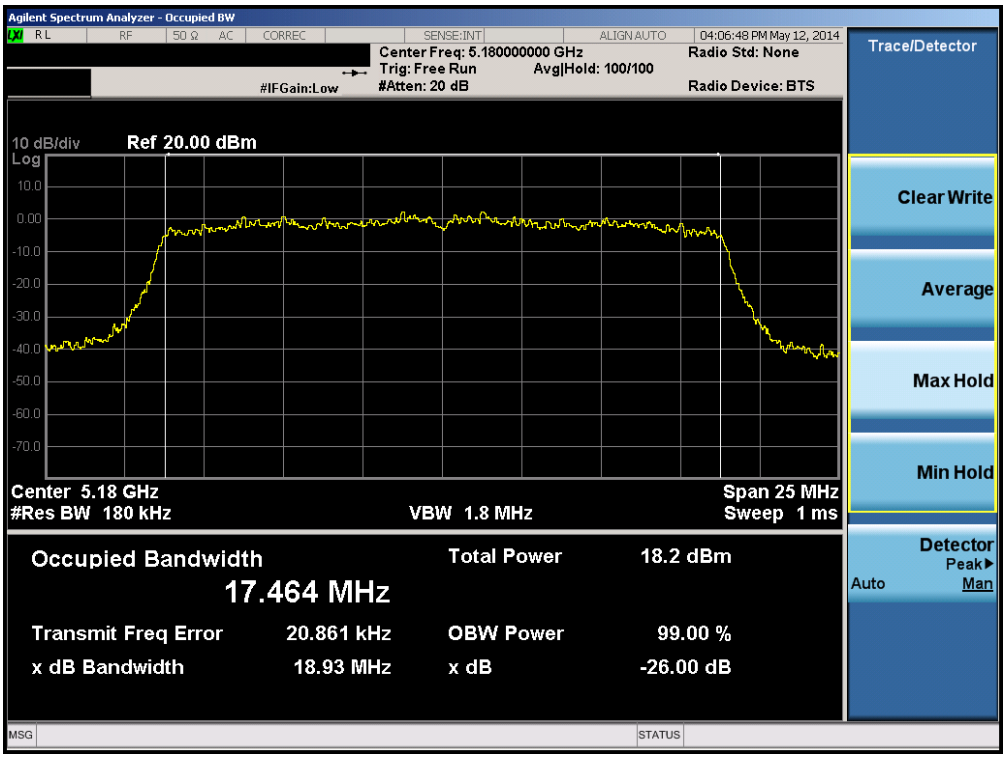


Plot 6-3. 26dB Bandwidth Plot (802.11a (UNII Band 1) – Ch. 48)



Plot 6-4. 26dB Bandwidth Plot (20MHz BW 802.11n (UNII Band 1) – Ch. 36)

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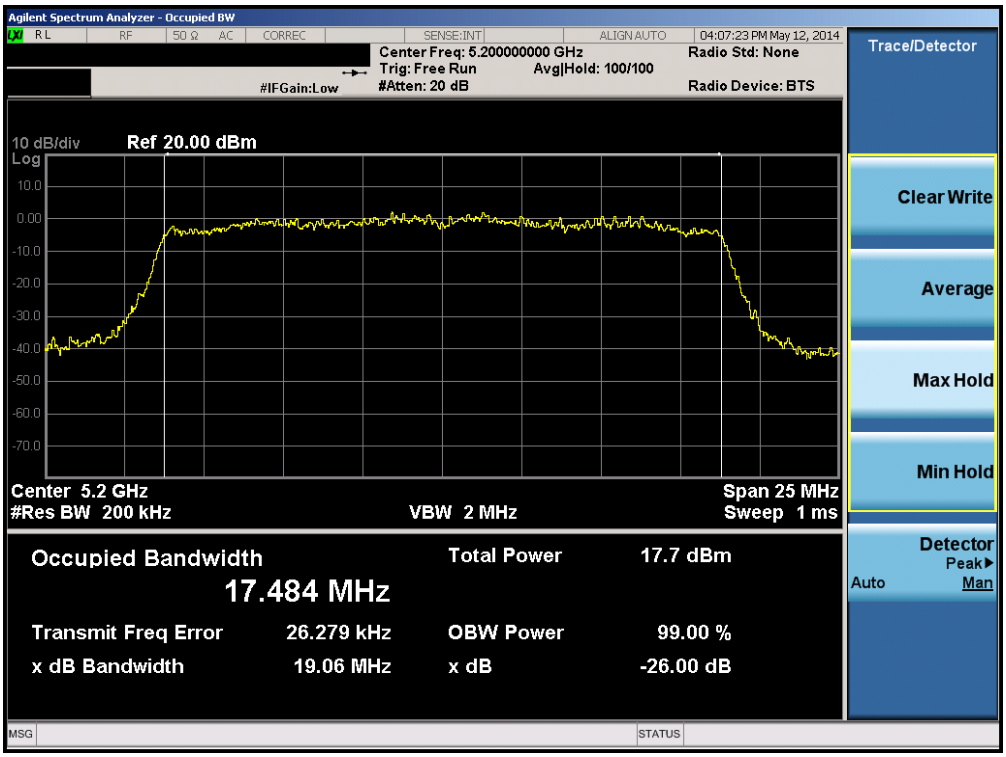
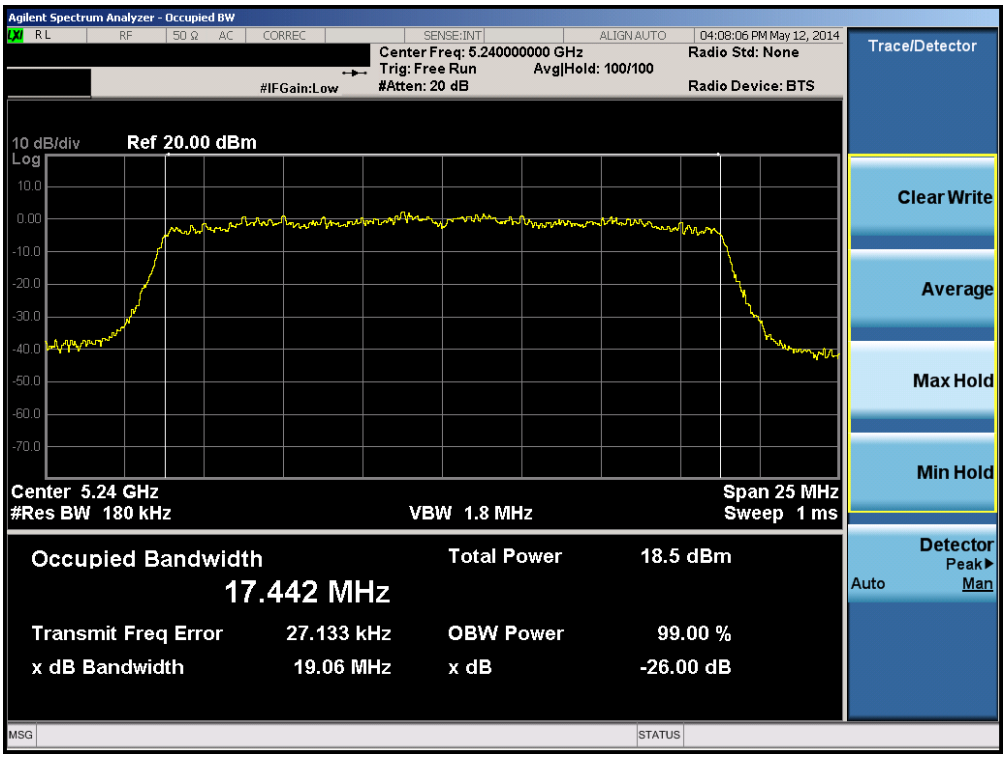


Plot 6-5. 26dB Bandwidth Plot (20MHz BW 802.11n (UNII Band 1) – Ch. 40)



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

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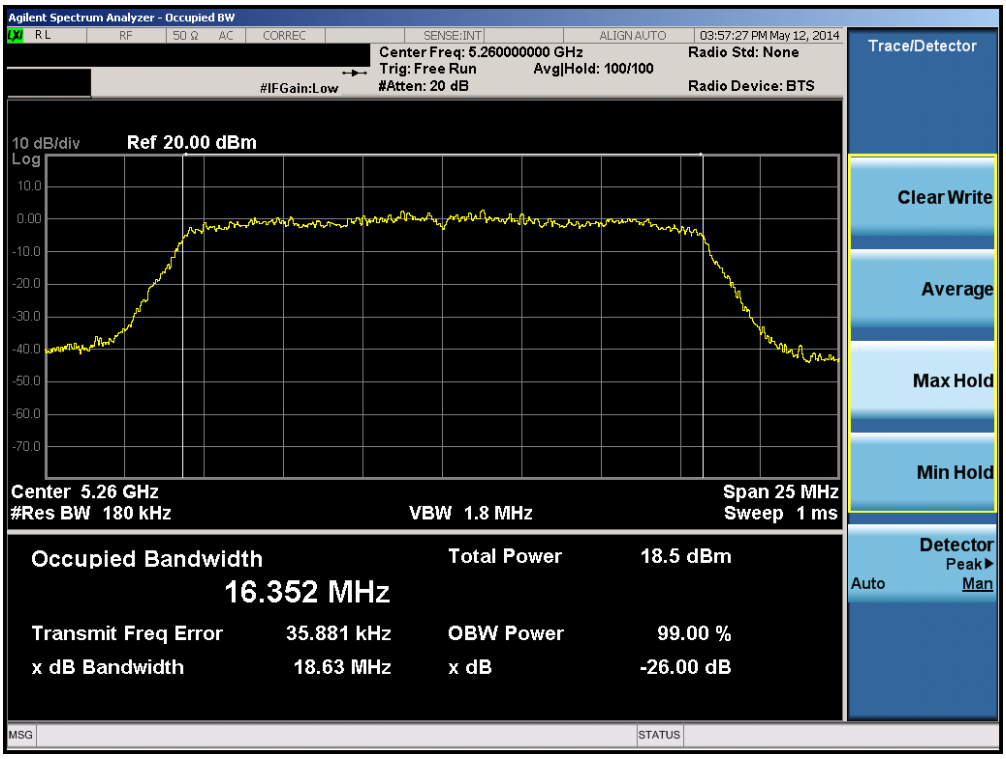
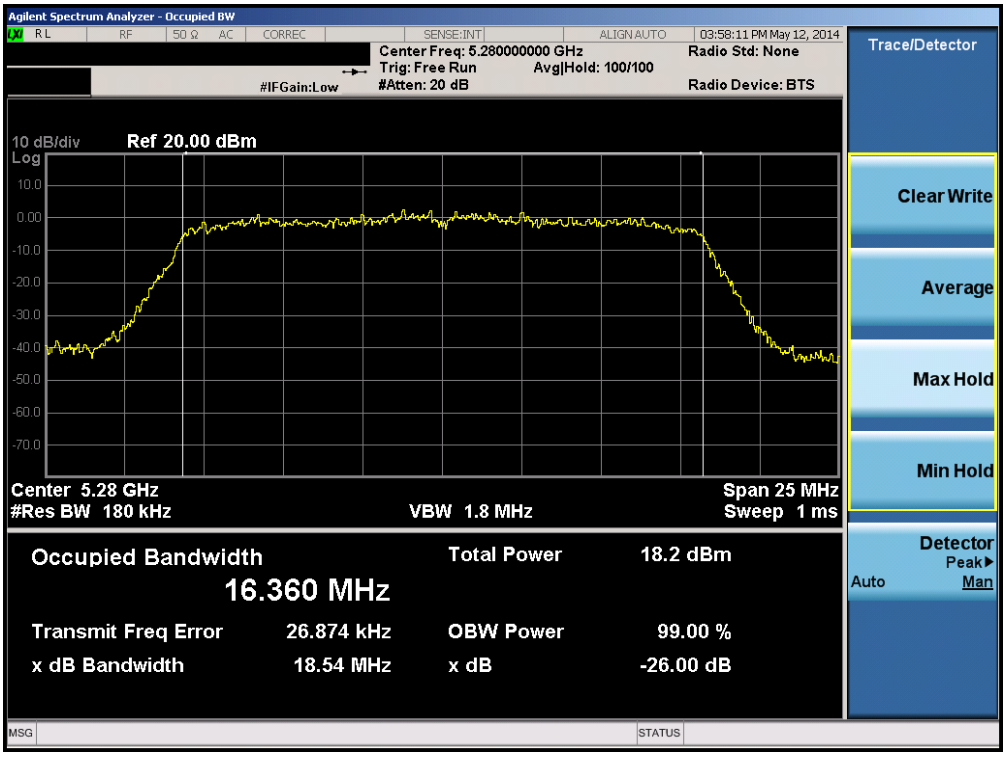


Plot 6-7. 26dB Bandwidth Plot (802.11a (UNII Band 2A) – Ch. 52)



Plot 6-8. 26dB Bandwidth Plot (802.11a (UNII Band 2A) – Ch. 56)

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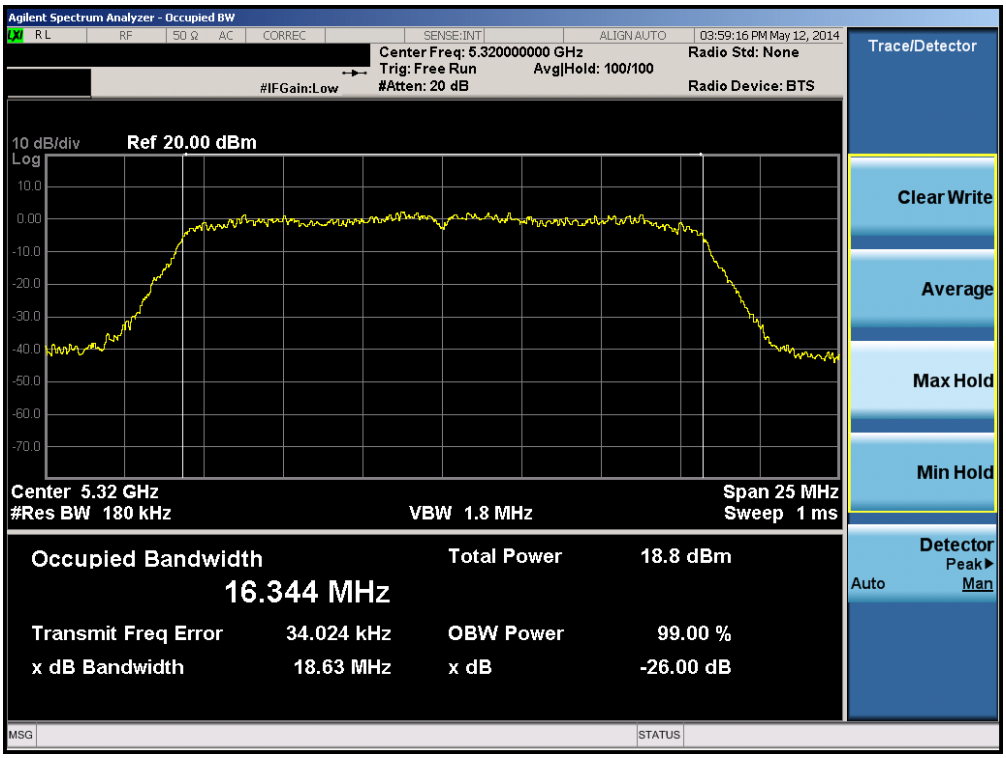
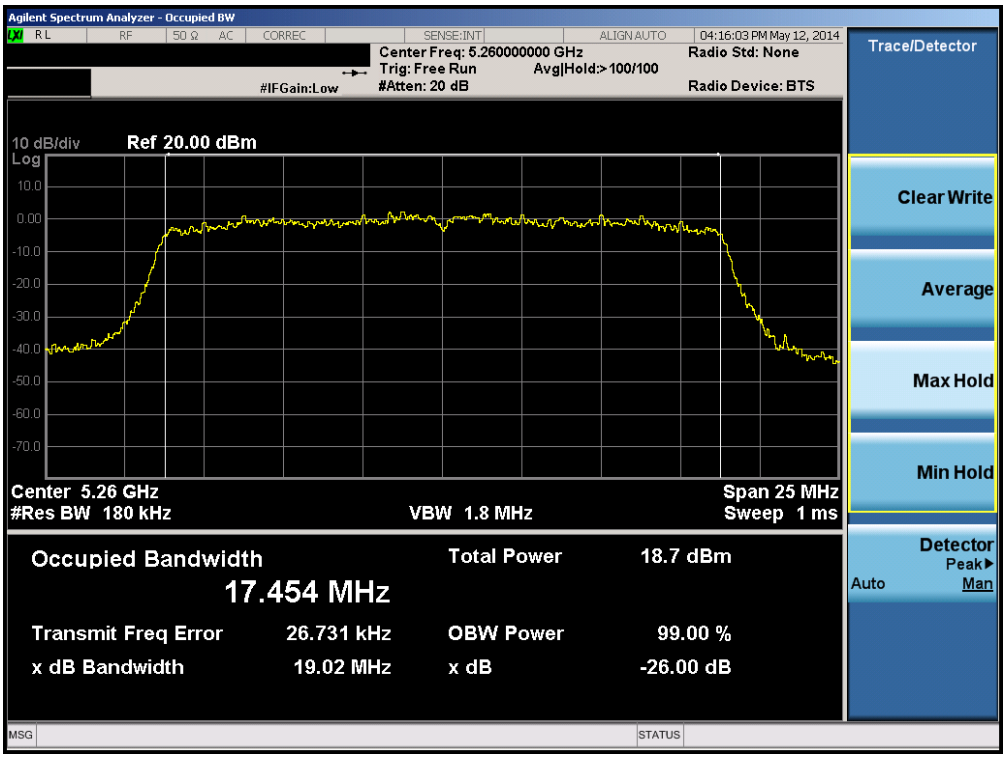


Plot 6-9. 26dB Bandwidth Plot (802.11a (UNII Band 2A) – Ch. 64)



Plot 6-10. 26dB Bandwidth Plot (20MHz BW 802.11n (UNII Band 2A) – Ch. 52)

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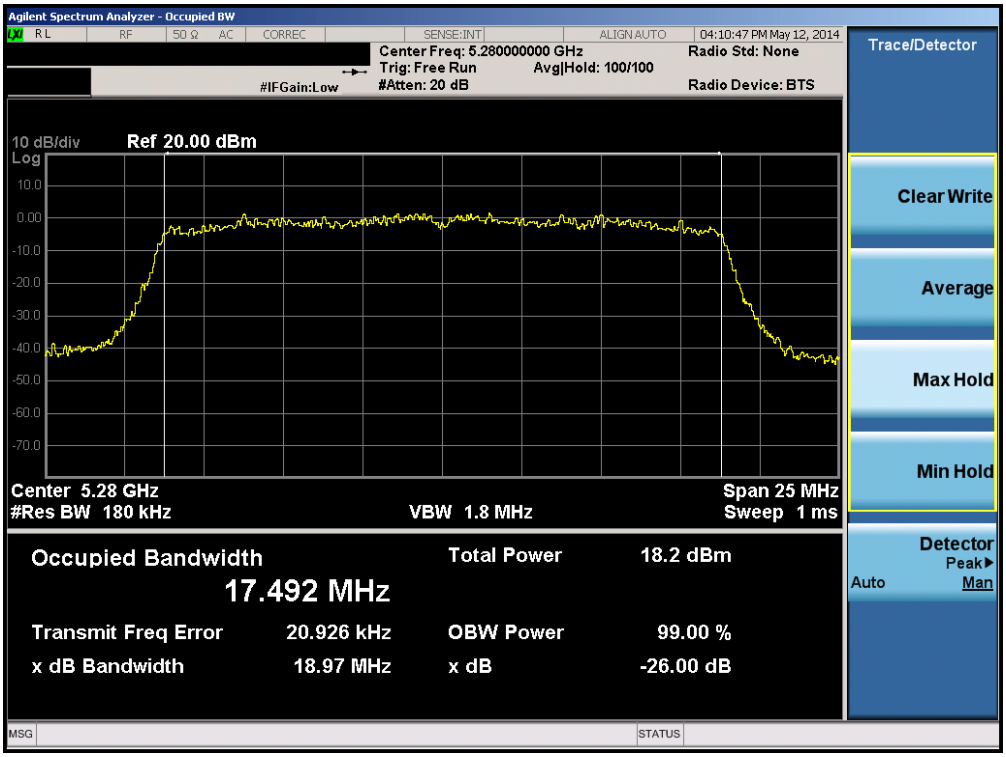
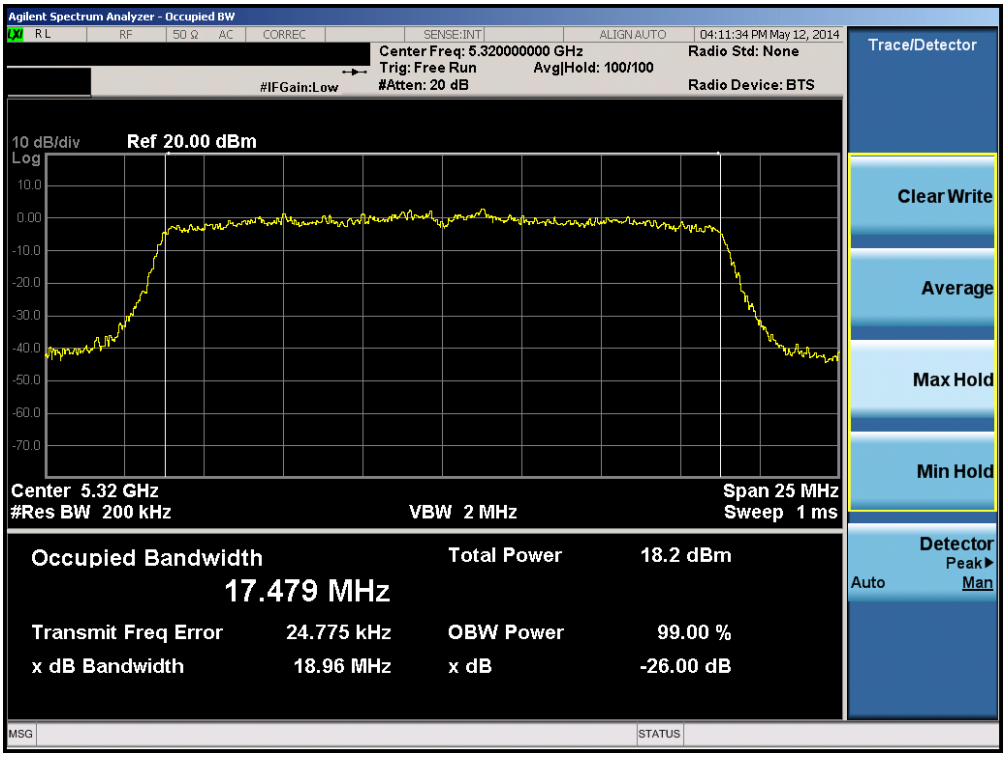


Plot 6-11. 26dB Bandwidth Plot (20MHz BW 802.11n (UNII Band 2A) – Ch. 56)



Plot 6-12. 26dB Bandwidth Plot (20MHz BW 802.11n (UNII Band 2A) – Ch. 64)

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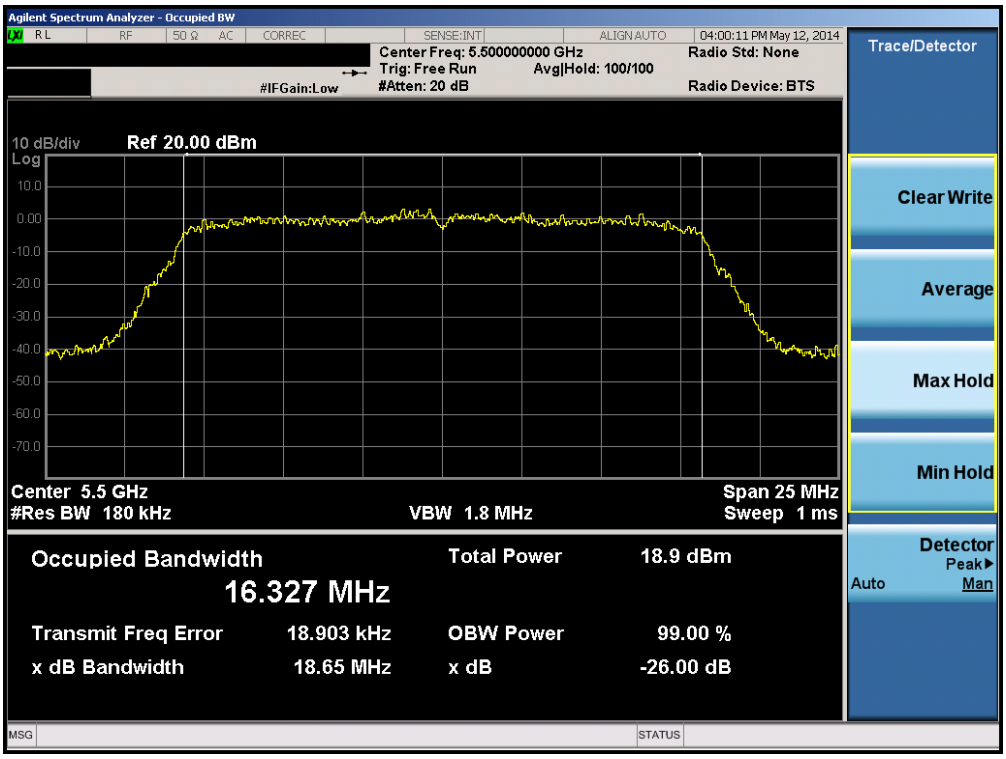
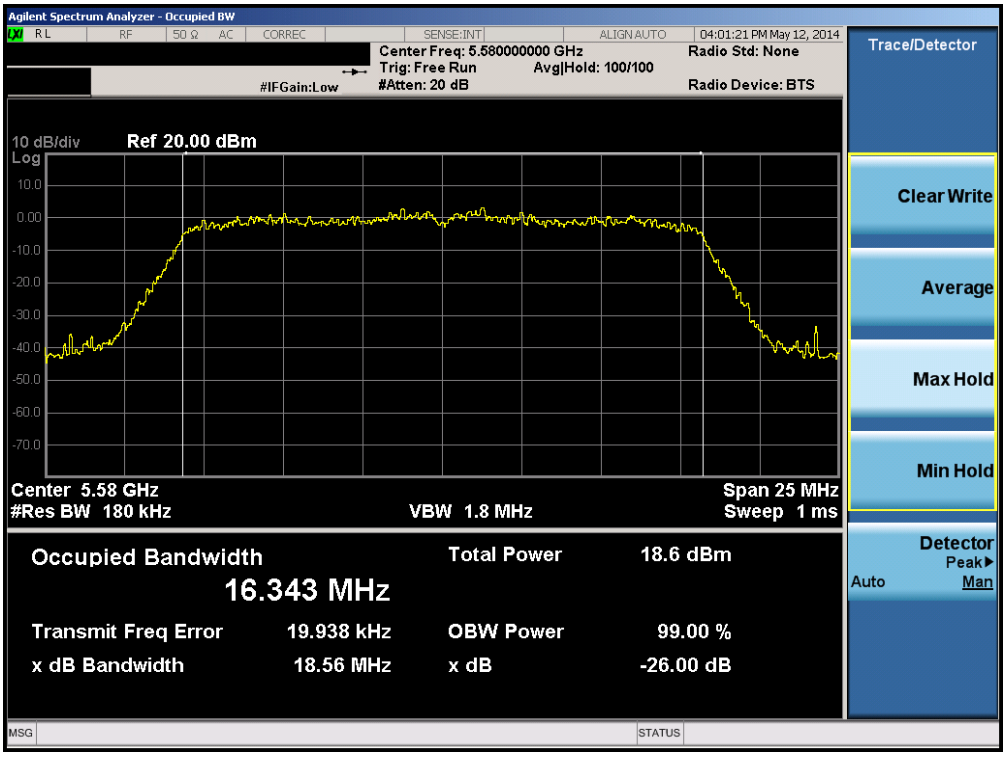


Plot 6-13. 26dB Bandwidth Plot (802.11a (UNII Band 2C) – Ch. 100)



Plot 6-14. 26dB Bandwidth Plot (802.11a (UNII Band 2C) – Ch. 116)

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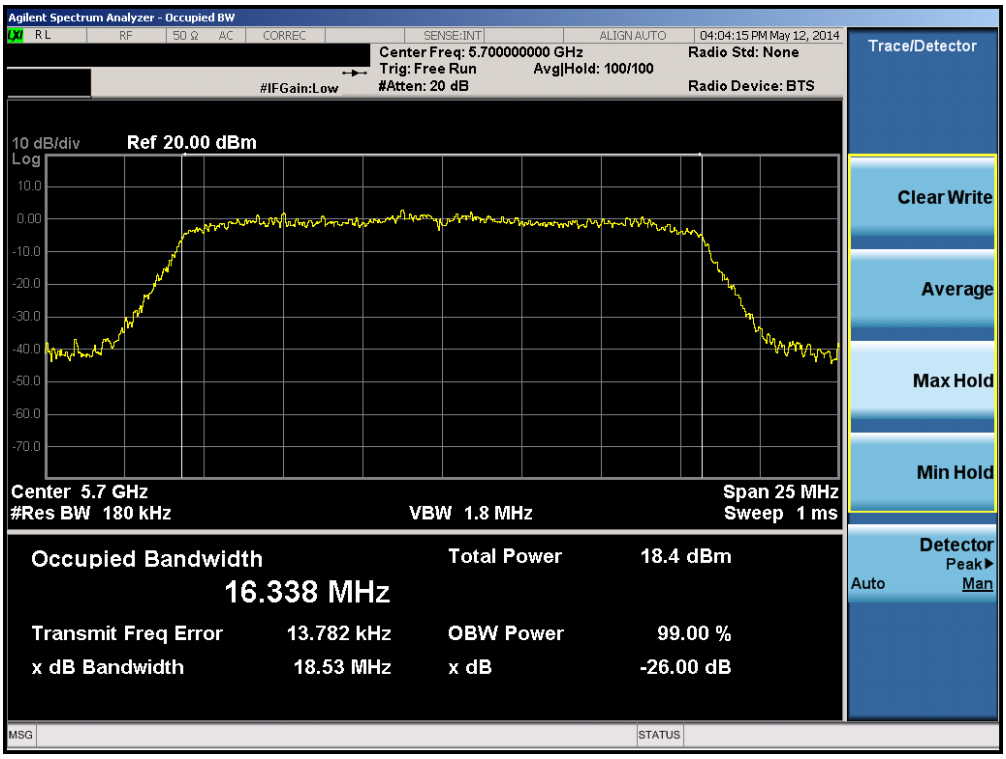
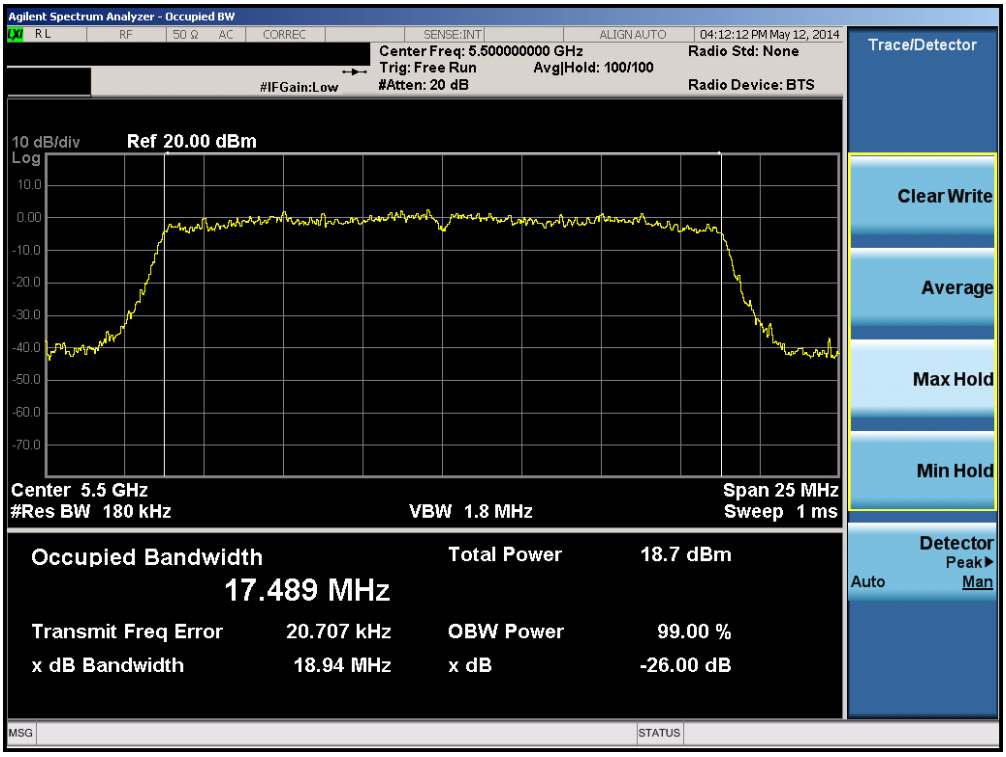


Plot 6-15. 26dB Bandwidth Plot (802.11a (UNII Band 2C) – Ch. 140)



Plot 6-16. 26dB Bandwidth Plot (20MHz BW 802.11n (UNII Band 2C) – Ch. 100)

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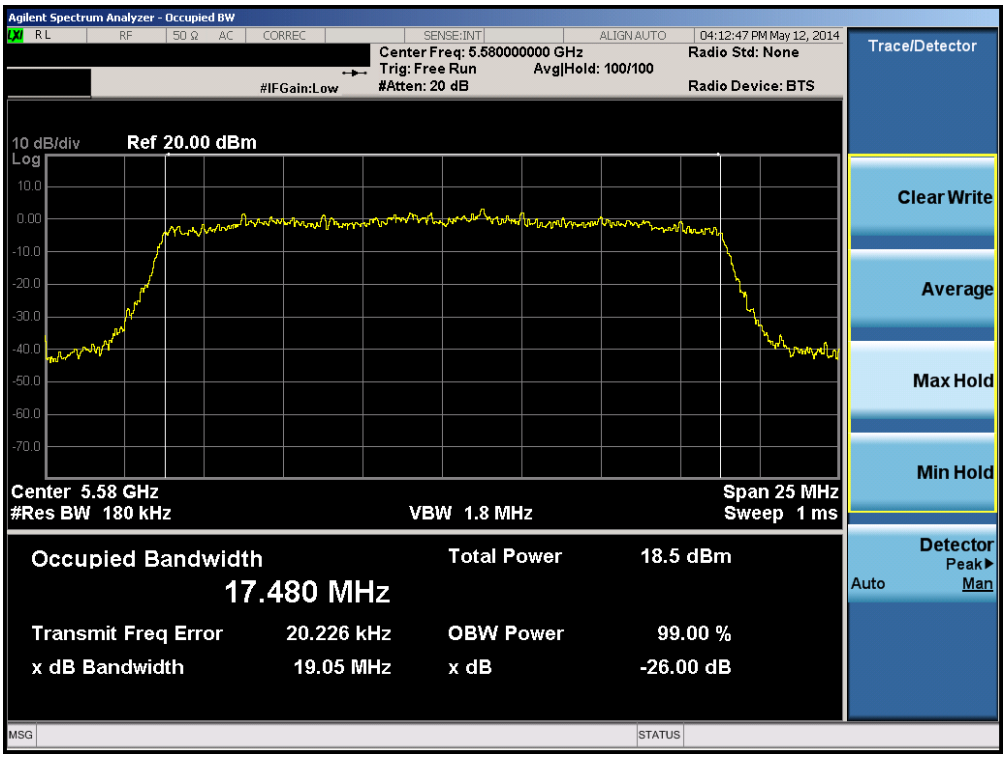
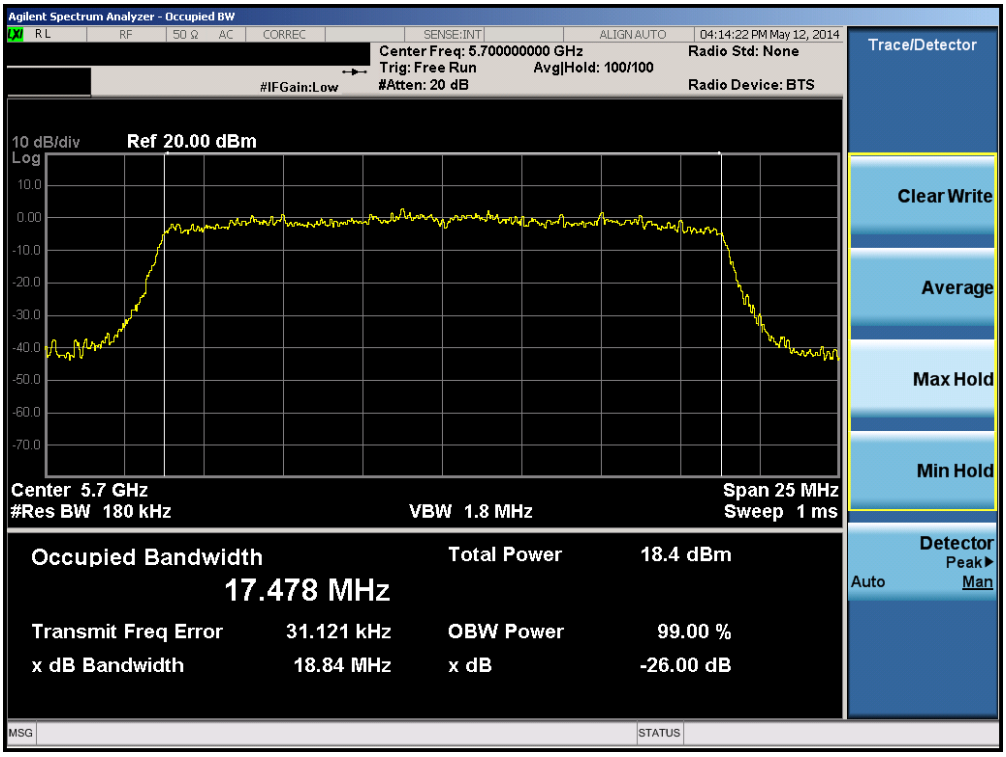


Plot 6-17. 26dB Bandwidth Plot (20MHz BW 802.11n (UNII Band 2C) – Ch. 116)



Plot 6-18. 26dB Bandwidth Plot (20MHz BW 802.11n (UNII Band 2C) – Ch. 140)

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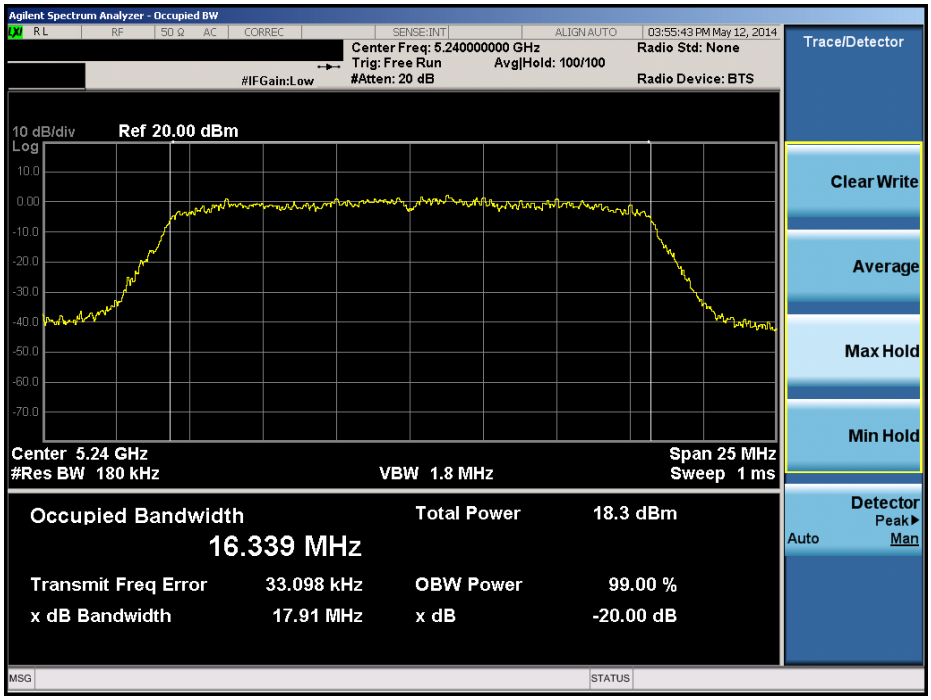
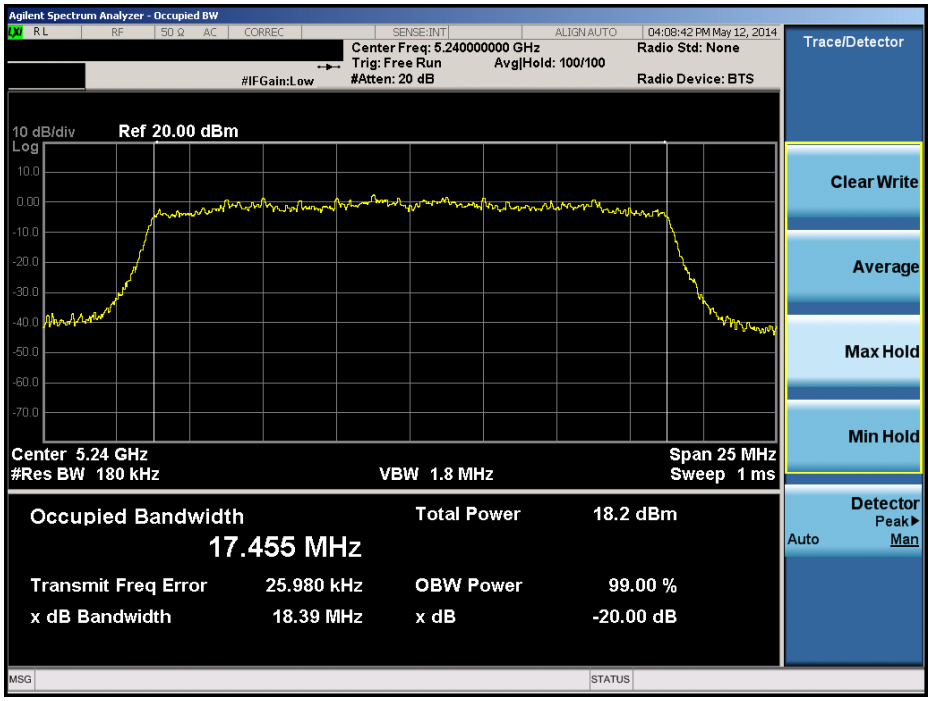


Plot 6-19. 20dB Bandwidth Plot (20MHz BW 802.11a (UNII Band 1) – Ch. 48)

Note: The 20dB bandwidth plot of the UNII Band 1 high channel was found to be within 20MHz and is, therefore, operating solely within the UNII Band 1 frequencies as per KDB 644545 v01r02.



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

Note: The 20dB bandwidth plot of the UNII Band 1 high channel was found to be within 20MHz and is, therefore, operating solely within the UNII Band 1 frequencies as per KDB 644545 v01r02.

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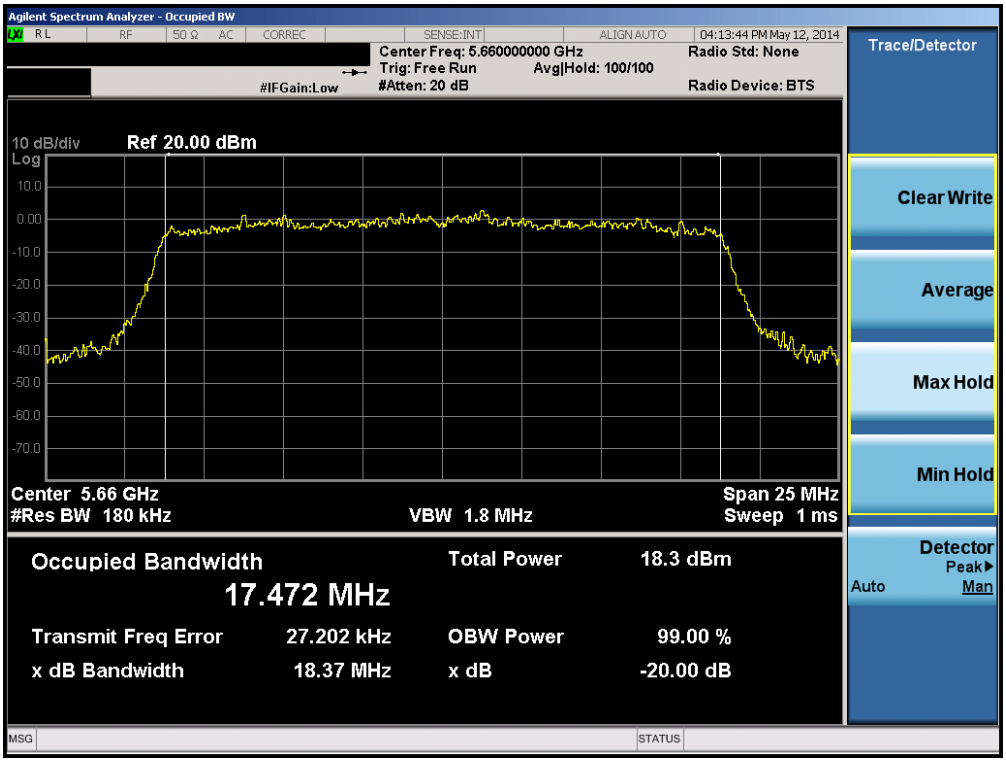

Plot 6-21. 20dB Bandwidth Plot (20MHz BW 802.11n (UNII Band 2C) – Ch. 132)

Note: The 20dB bandwidth plot of the UNII Band 2C channel 132 was found to be within 20MHz and is, therefore, is not found to be operating within the 5600 – 5650MHz TDWR band.

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6.3 Output Power Measurement – 802.11a/n

§15.407 (a.1)

Test Overview and Limits

A transmitter antenna terminal of the EUT is connected to the input of an RF pulse power sensor. Measurement is made using a broadband average power meter while the EUT is operating at its maximum duty cycle (>98%), at its maximum power control level, as defined in KDB 789033 v01r03, and at the appropriate frequencies.

In the 5.15 – 5.25GHz band, the maximum permissible conducted output power is the lesser of 50mW (16.99dBm) and 4 dBm + 10log$_{10}$(26dB BW) = 4 dBm + 10log$_{10}$(18.65) = 16.71dBm.

In the 5.25 – 5.35GHz band, the maximum permissible conducted output power is the lesser of 250mW (23.98dBm) and 11 dBm + 10log$_{10}$(26dB BW) = 11 dBm + 10log$_{10}$(18.54) = 16.68dBm.

In the 5.47 – 5.725GHz band, the maximum permissible conducted output power is the lesser of 250mW (23.98dBm) and 11 dBm + 10log$_{10}$(26dB BW) = 11 dBm + 10log$_{10}$(18.53) = 16.68dBm.

Test Procedure Used

KDB 789033 v01r03 – Section E)3)b) Method PM-G

Test Settings

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

Test Setup

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

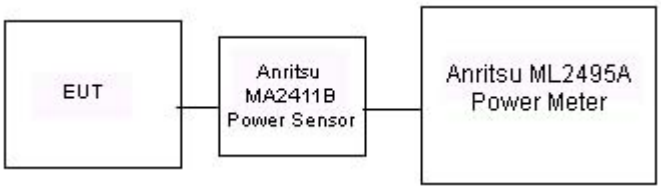

Figure 6-2. Test Instrument & Measurement Setup

Test Notes

None

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Mode	Freq [MHz]	Channel	Detector	802.11a Conducted Power [dBm]							
				Data Rate [Mbps]							
				6	9	12	18	24	36	48	54
802.11a	5180	36	AVG	11.99	11.94	11.98	11.89	11.91	11.93	12.00	11.67
802.11a	5200	40	AVG	12.02	12.00	11.93	11.99	12.00	11.93	12.02	11.78
802.11a	5220	44	AVG	11.90	11.86	11.96	11.81	11.87	11.82	11.95	11.67
802.11a	5240	48	AVG	12.06	12.04	12.03	11.93	11.99	12.04	12.08	11.78
802.11a	5260	52	AVG	11.97	11.97	11.97	11.87	11.97	11.93	11.98	11.60
802.11a	5280	56	AVG	12.05	11.94	12.02	11.98	11.96	11.95	12.02	11.66
802.11a	5300	60	AVG	12.17	12.16	12.16	12.07	12.12	12.10	12.17	11.84
802.11a	5320	64	AVG	12.10	11.99	12.10	12.06	12.09	12.05	12.04	11.73
802.11a	5500	100	AVG	12.35	12.30	12.27	12.20	12.22	12.27	12.37	12.04
802.11a	5520	104	AVG	12.31	12.18	12.35	12.17	12.24	12.28	12.33	12.01
802.11a	5540	108	AVG	12.20	12.16	12.27	12.11	12.10	12.21	12.20	11.87
802.11a	5560	112	AVG	12.11	12.10	12.08	11.99	12.08	12.03	12.16	11.87
802.11a	5580	116	AVG	11.96	11.94	11.95	11.91	11.86	11.91	12.03	11.68
802.11a	5660	132	AVG	11.84	12.24	11.73	11.66	11.66	11.83	11.88	11.53
802.11a	5680	136	AVG	12.03	12.04	11.98	11.86	11.91	11.98	11.99	11.77
802.11a	5700	140	AVG	12.12	12.11	12.11	11.97	12.00	11.99	12.09	11.90

Table 6-3. 802.11a (UNII) Maximum Conducted Output Power

Mode	Freq [MHz]	Channel	Detector	20MHz BW 802.11n (5GHz) Conducted Power [dBm]							
				Data Rate [Mbps]							
				6.5	13	19.5	26	39	52	58.5	65
802.11n	5180	36	AVG	12.00	11.91	11.99	11.91	11.90	11.95	11.98	11.70
802.11n	5200	40	AVG	12.07	11.92	12.09	12.02	11.94	12.01	12.05	11.79
802.11n	5220	44	AVG	12.04	11.97	11.94	11.96	12.01	11.98	12.06	11.77
802.11n	5240	48	AVG	12.08	12.00	11.98	12.03	11.96	12.03	12.06	11.78
802.11n	5260	52	AVG	12.09	11.99	12.10	11.97	11.99	12.10	12.00	11.82
802.11n	5280	56	AVG	12.16	12.08	12.09	12.06	12.14	12.11	12.10	11.89
802.11n	5300	60	AVG	12.29	12.15	12.35	12.20	12.12	12.32	12.22	11.98
802.11n	5320	64	AVG	12.27	12.16	12.33	12.19	12.09	12.25	12.27	12.00
802.11n	5500	100	AVG	12.39	12.32	12.38	12.34	12.28	12.35	12.35	12.10
802.11n	5520	104	AVG	12.31	12.24	12.30	12.23	12.18	12.27	12.26	12.05
802.11n	5540	108	AVG	12.25	12.14	12.22	12.15	12.21	12.15	12.25	11.92
802.11n	5560	112	AVG	12.16	12.07	12.13	12.05	12.08	12.19	12.10	11.88
802.11n	5580	116	AVG	11.96	11.85	11.91	11.81	11.79	11.89	11.93	11.68
802.11n	5660	132	AVG	12.22	12.14	12.21	12.22	12.13	12.16	12.26	11.90
802.11n	5680	136	AVG	12.00	11.87	12.05	11.99	11.85	11.99	12.03	11.73
802.11n	5700	140	AVG	12.10	12.07	12.12	12.03	11.98	12.10	12.10	11.83

Table 6-4. 20MHz BW 802.11n (UNII) Maximum Conducted Output Power

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6.4 Peak Power Spectral Density – 802.11a/n

§15.407(a.1)(2.5)

Test Overview and Limit

The spectrum analyzer was connected to the antenna terminal while the EUT was operating at its maximum duty cycle (>98%), at its maximum power control level, as defined in KDB 789033 v01r03, and at the appropriate frequencies. Method SA-1, as defined in KDB 789033 v01r03, was used to measure the power spectral density.

In the 5.15 – 5.25GHz band, the maximum permissible power spectral density is 4dBm/MHz.

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

Test Procedure Used

KDB 789033 v01r03 – Section F

Test Settings

1. Analyzer was set to the center frequency of the UNII channel under investigation
2. Span was set to encompass the entire emission bandwidth of the signal
3. RBW = 1MHz
4. VBW = 3MHz
5. Number of sweep points ≥ 2 x (span/RBW)
6. Sweep time = auto
7. Detector = power averaging (RMS)
8. Trigger was set to free run since the EUT was operating at a duty cycle ≥ 98%
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.

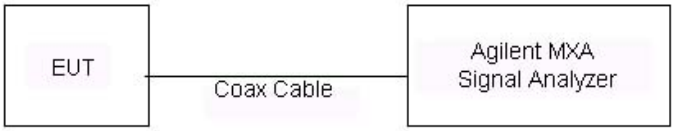

Figure 6-3. Test Instrument & Measurement Setup

Test Notes

None

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	Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	Measured Power Density [dBm]	Max Permissible Power Density [dBm/MHz]	Margin [dB]	Pass / Fail
Band 1	5180	36	a	6	1.54	4.0	-2.46	Pass
	5200	40	a	6	1.82	4.0	-2.18	Pass
	5240	48	a	6	1.86	4.0	-2.14	Pass
	5180	36	n (20MHz)	6.5/7.2 (MCS0)	1.27	4.0	-2.73	Pass
	5200	40	n (20MHz)	6.5/7.2 (MCS0)	1.53	4.0	-2.47	Pass
	5240	48	n (20MHz)	6.5/7.2 (MCS0)	1.48	4.0	-2.52	Pass
Band 2A	5260	52	a	6	1.92	11.0	-9.08	Pass
	5280	56	a	6	2.16	11.0	-8.84	Pass
	5320	64	a	6	2.55	11.0	-8.45	Pass
	5260	52	n (20MHz)	6.5/7.2 (MCS0)	1.66	11.0	-9.34	Pass
	5280	56	n (20MHz)	6.5/7.2 (MCS0)	1.95	11.0	-9.05	Pass
	5320	64	n (20MHz)	6.5/7.2 (MCS0)	1.81	11.0	-9.19	Pass
Band 2C	5500	100	a	6	2.80	11.0	-8.20	Pass
	5580	116	a	6	2.52	11.0	-8.48	Pass
	5700	140	a	6	2.23	11.0	-8.77	Pass
	5500	100	n (20MHz)	6.5/7.2 (MCS0)	2.47	11.0	-8.53	Pass
	5580	116	n (20MHz)	6.5/7.2 (MCS0)	2.40	11.0	-8.60	Pass
	5700	140	n (20MHz)	6.5/7.2 (MCS0)	2.00	11.0	-9.00	Pass

Table 6-5. Conducted Power Spectral Density Measurements

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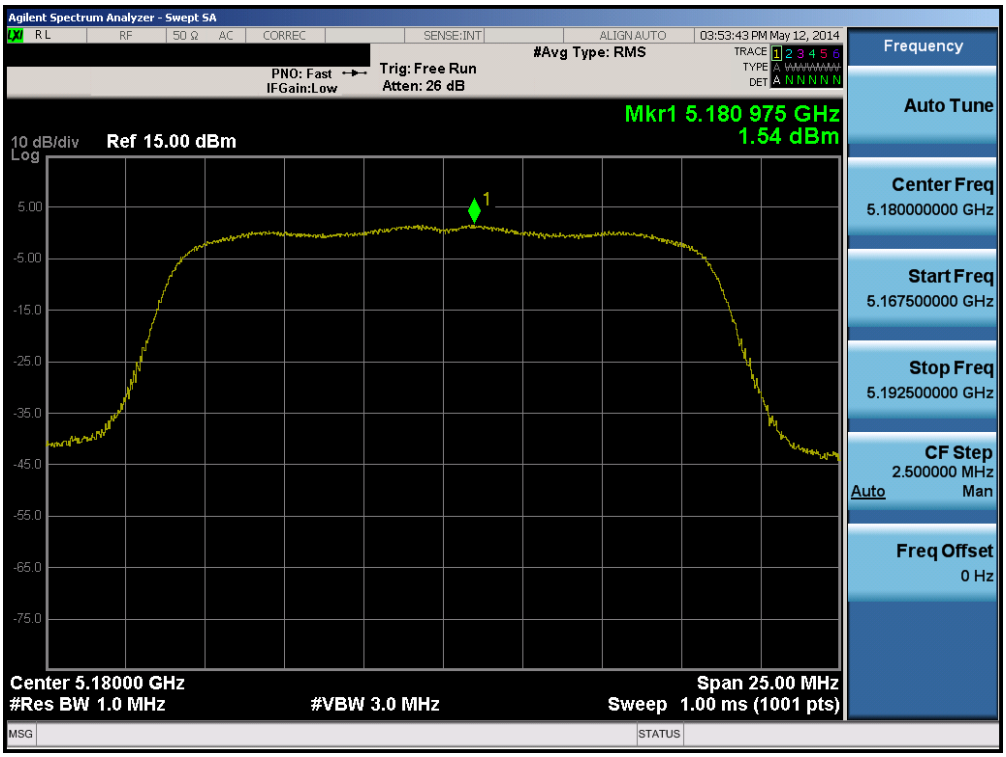
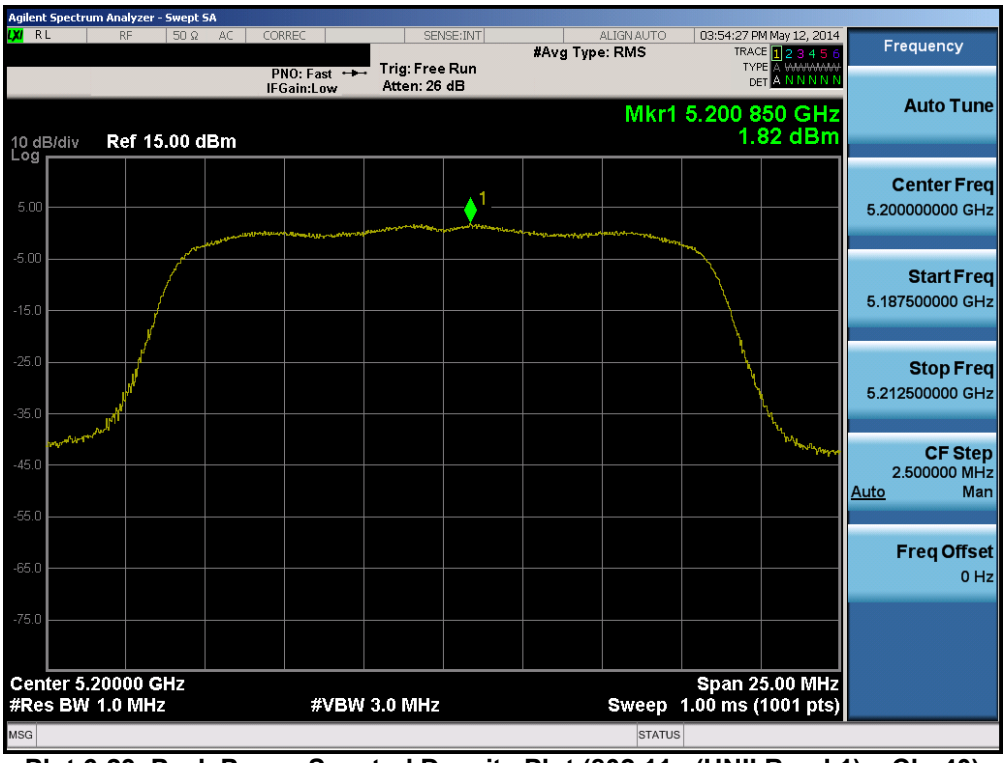


Plot 6-22. Peak Power Spectral Density Plot (802.11a (UNII Band 1) – Ch. 36)



Plot 6-23. Peak Power Spectral Density Plot (802.11a (UNII Band 1) – Ch. 40)

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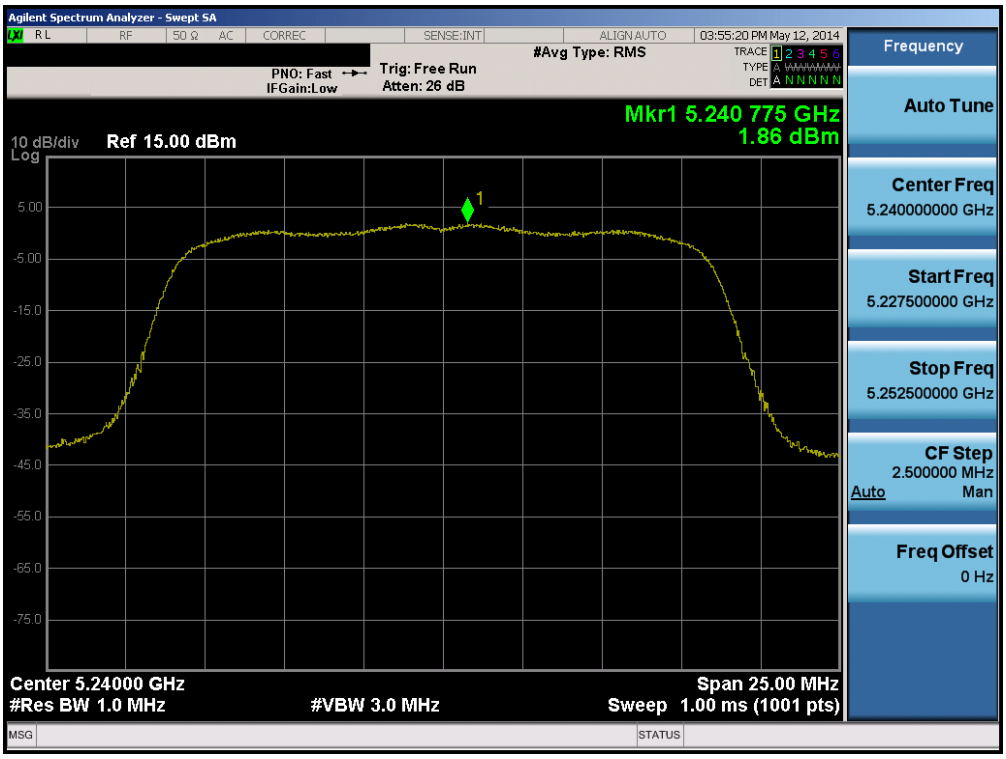
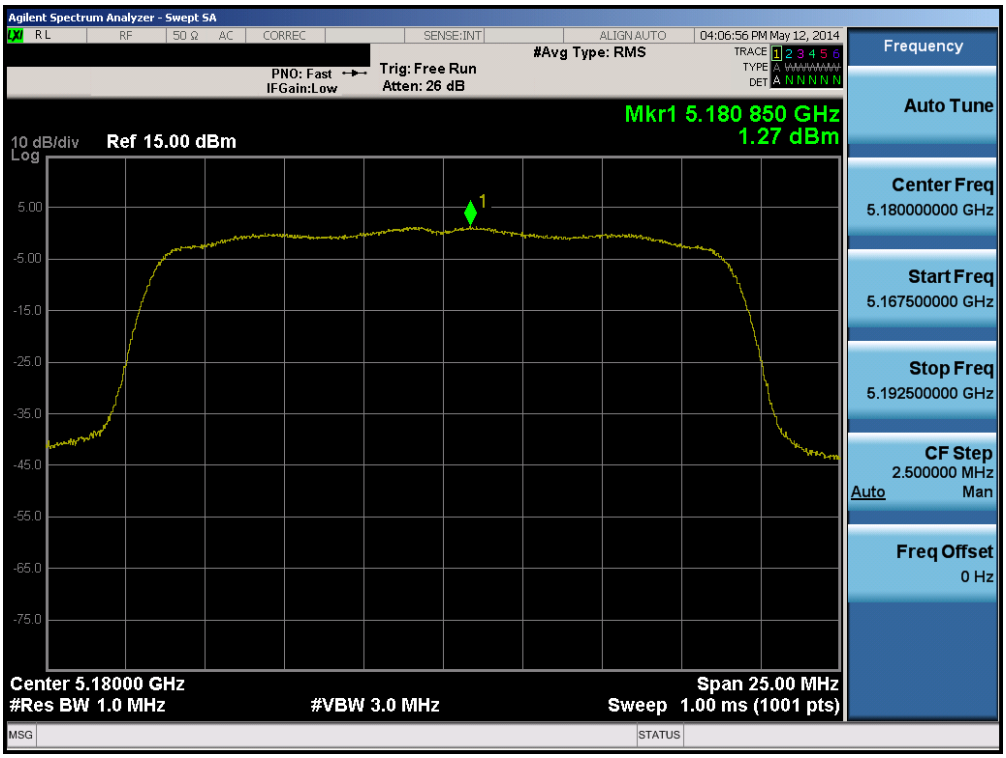


Plot 6-24. Peak Power Spectral Density Plot (802.11a (UNII Band 1) – Ch. 48)



Plot 6-25. Peak Power Spectral Density Plot (20MHz BW 802.11n (UNII Band 1) – Ch. 36)

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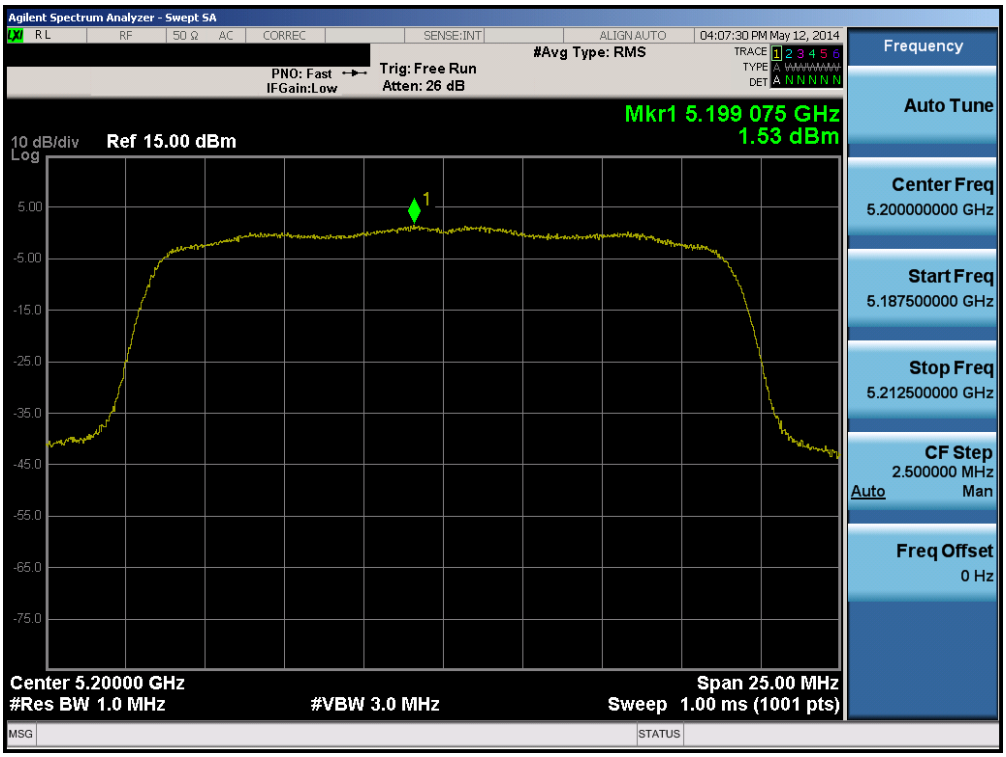
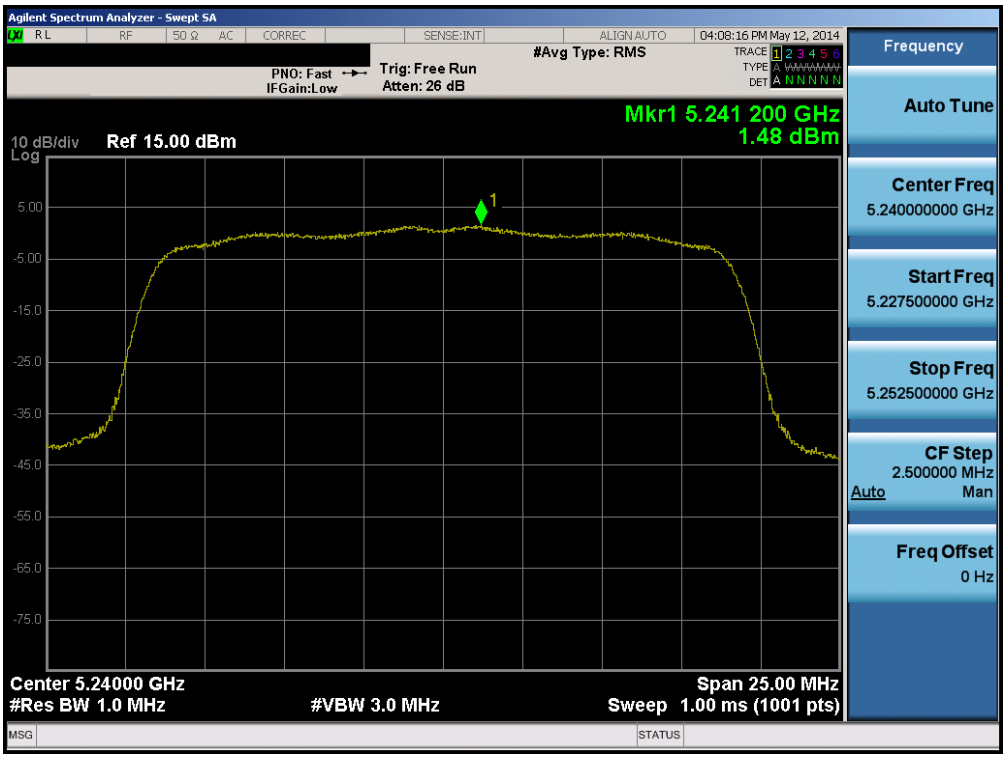


Plot 6-26. Peak Power Spectral Density Plot (20MHz BW 802.11n (UNII Band 1) – Ch. 40)



Plot 6-27. Peak Power Spectral Density Plot (20MHz BW 802.11n (UNII Band 1) – Ch. 48)

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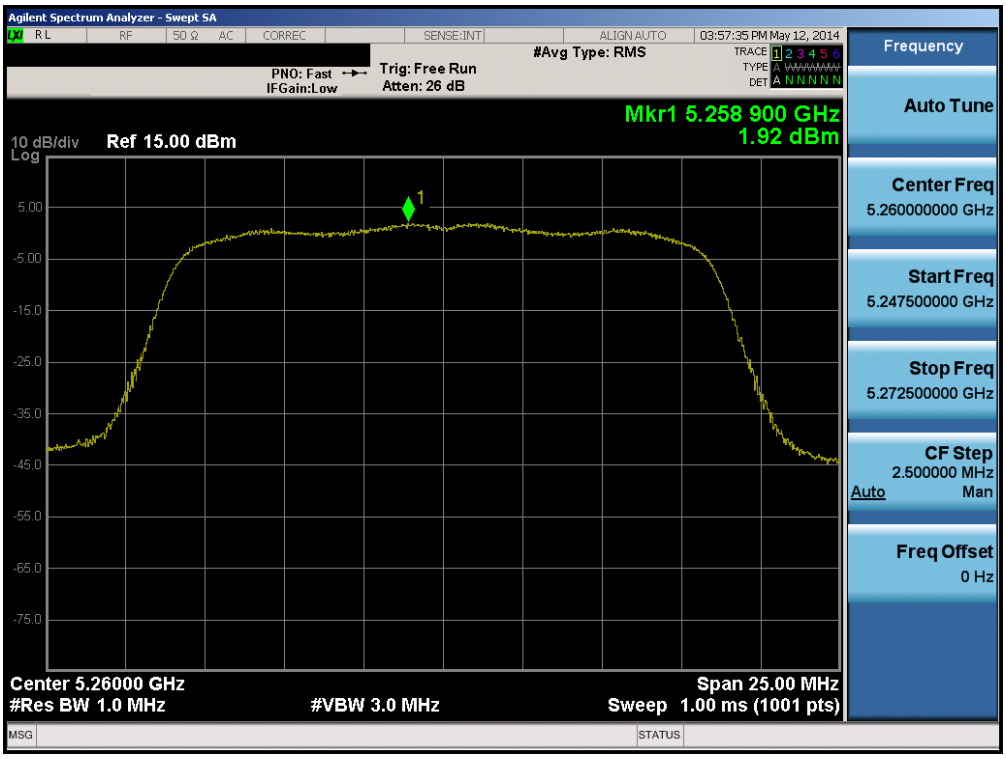
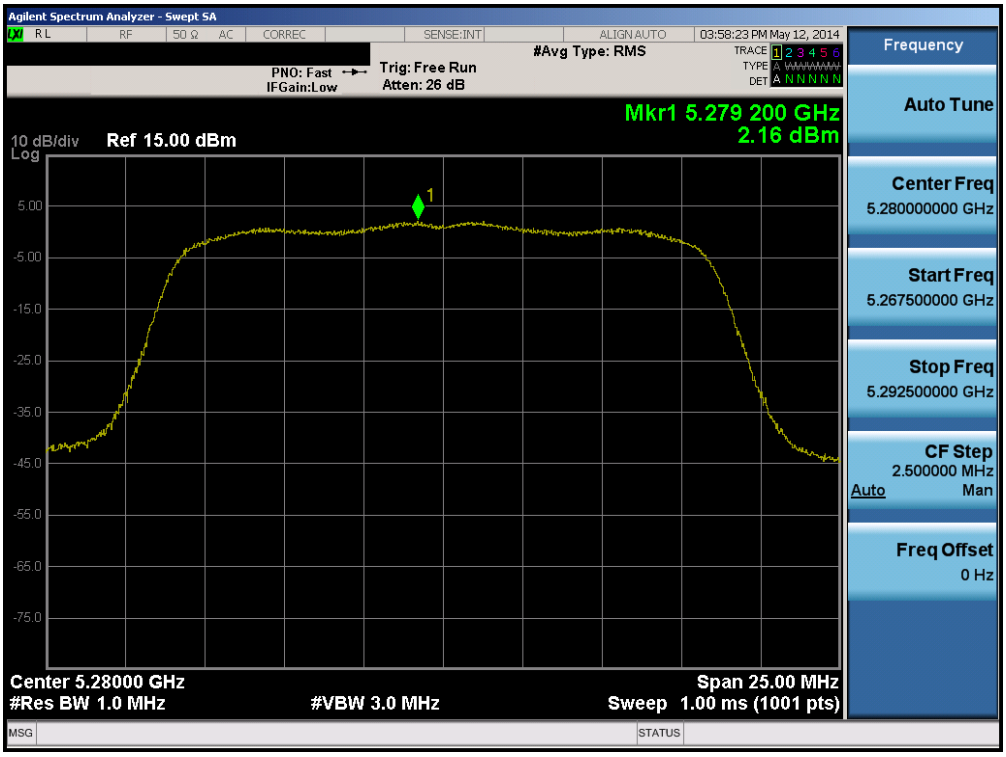


Plot 6-28. Peak Power Spectral Density Plot (802.11a (UNII Band 2A) – Ch. 52)



Plot 6-29. Peak Power Spectral Density Plot (802.11a (UNII Band 2A) – Ch. 56)

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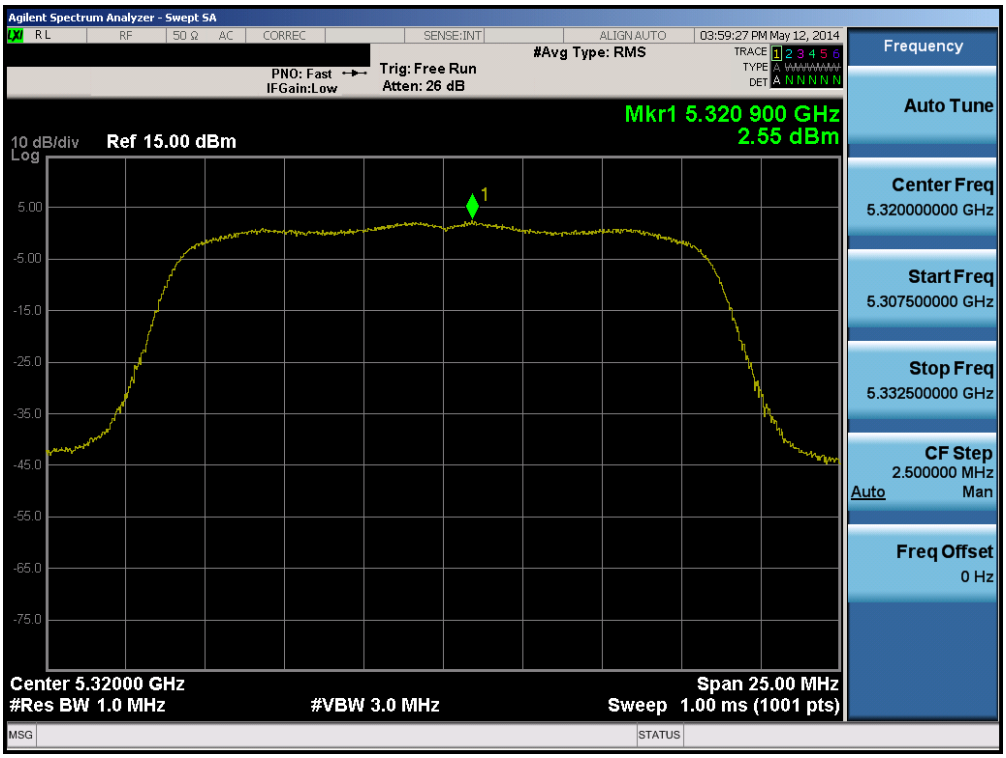
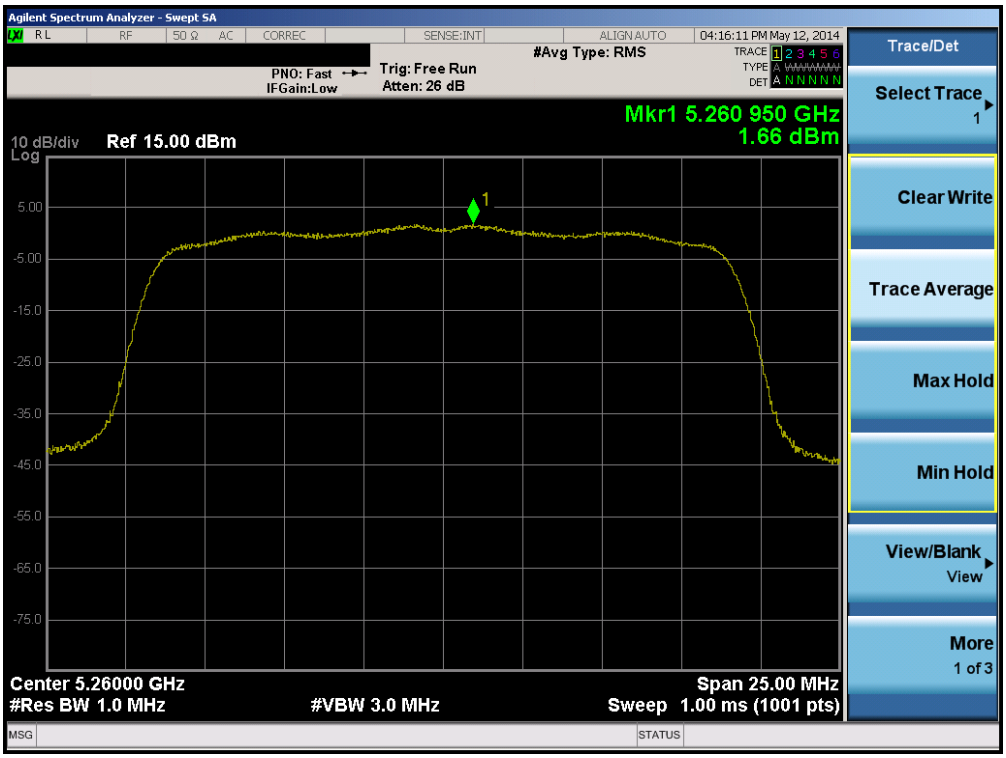


Plot 6-30. Peak Power Spectral Density Plot (802.11a (UNII Band 2A) – Ch. 64)



Plot 6-31. Peak Power Spectral Density Plot (20MHz BW 802.11n (UNII Band 2A) – Ch. 52)

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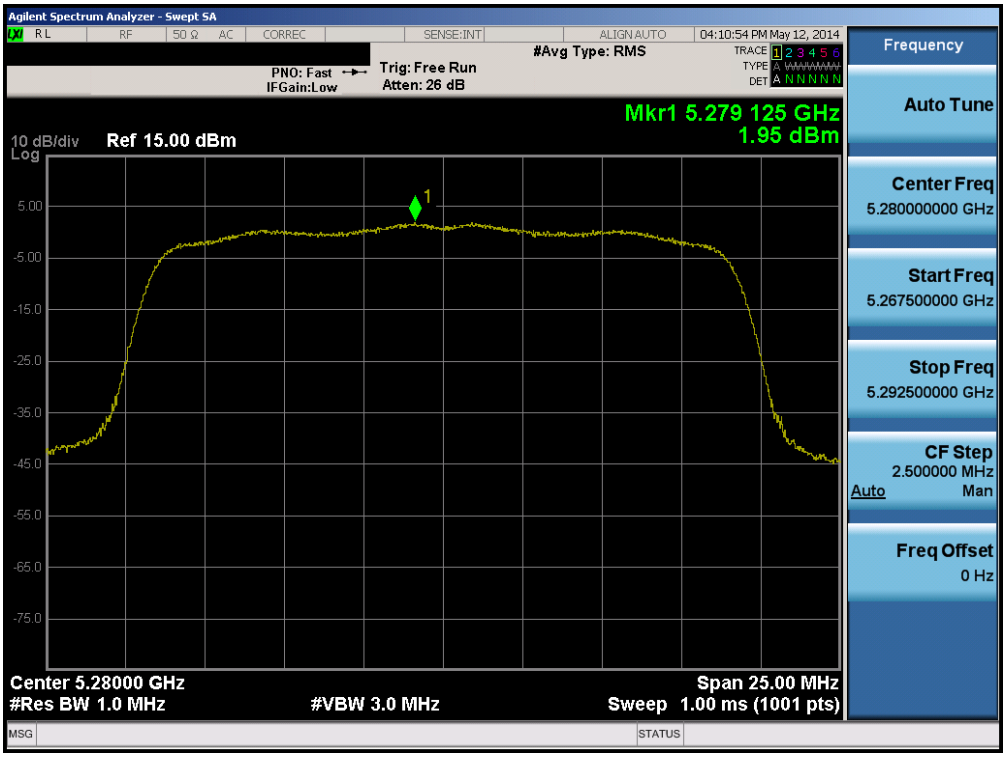
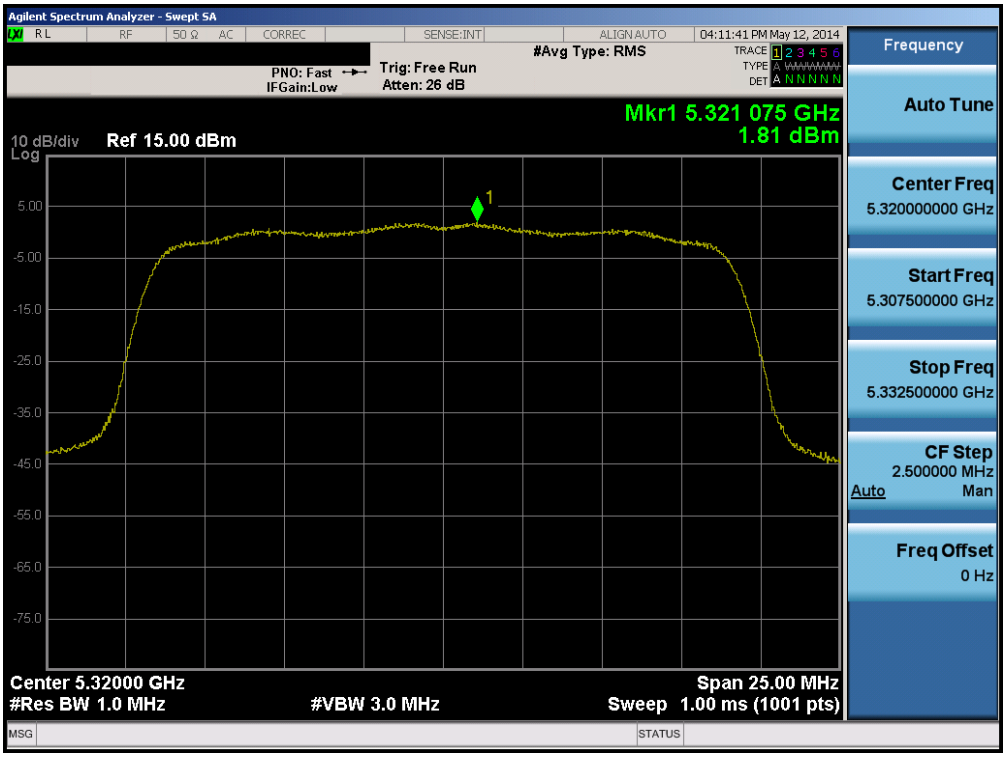


Plot 6-32. Peak Power Spectral Density Plot (20MHz BW 802.11n (UNII Band 2A) – Ch. 56)



Plot 6-33. Peak Power Spectral Density Plot (20MHz BW 802.11n (UNII Band 2A) – Ch. 64)

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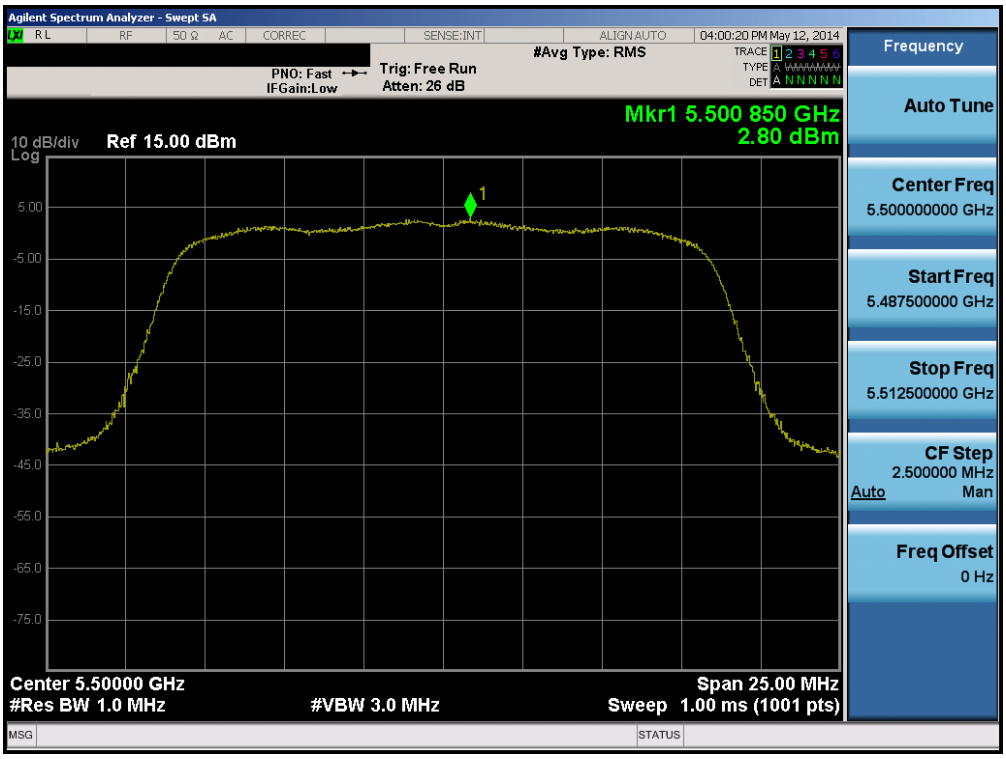
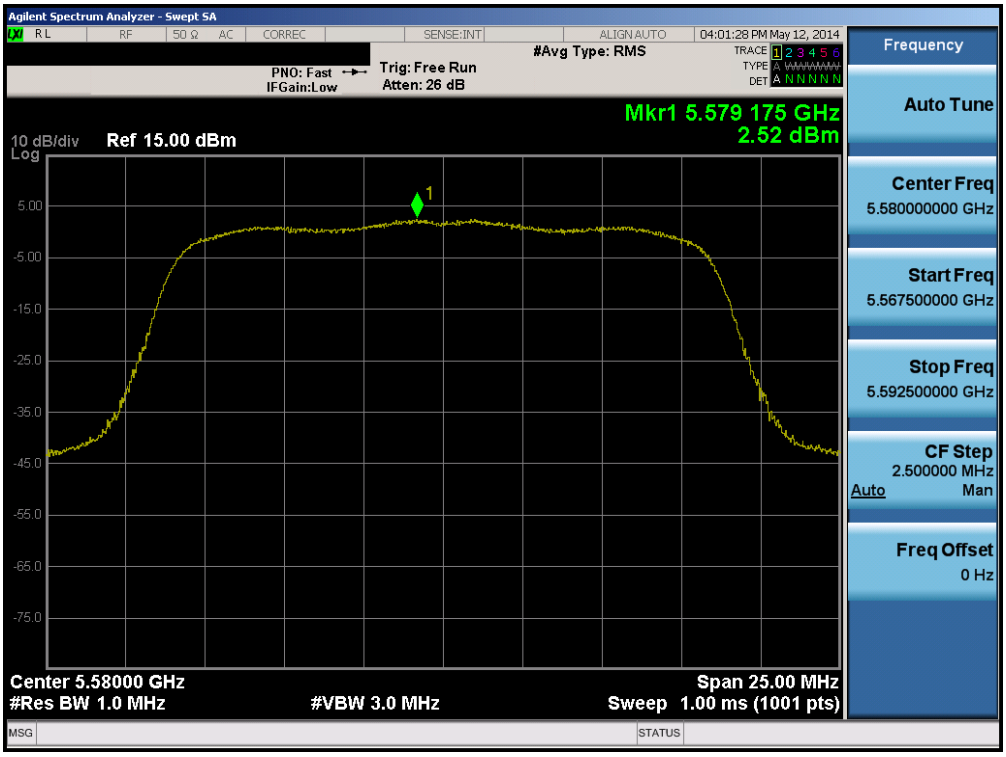


Plot 6-34. Peak Power Spectral Density Plot (802.11a (UNII Band 2C) – Ch. 100)



Plot 6-35. Peak Power Spectral Density Plot (802.11a (UNII Band 2C) – Ch. 116)

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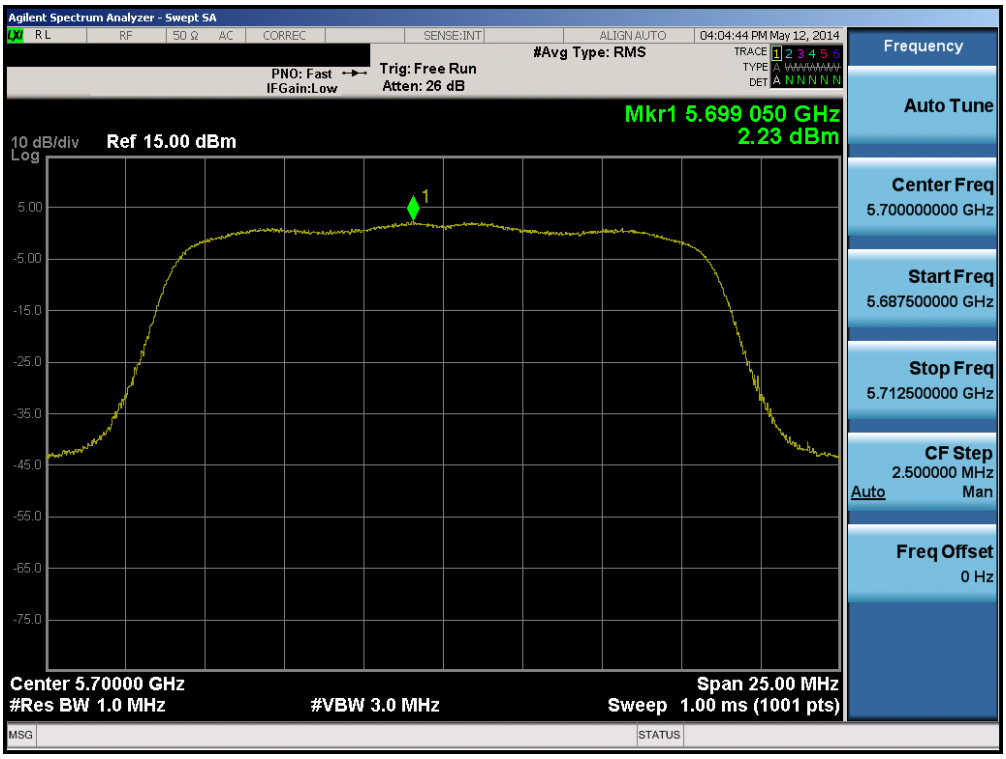
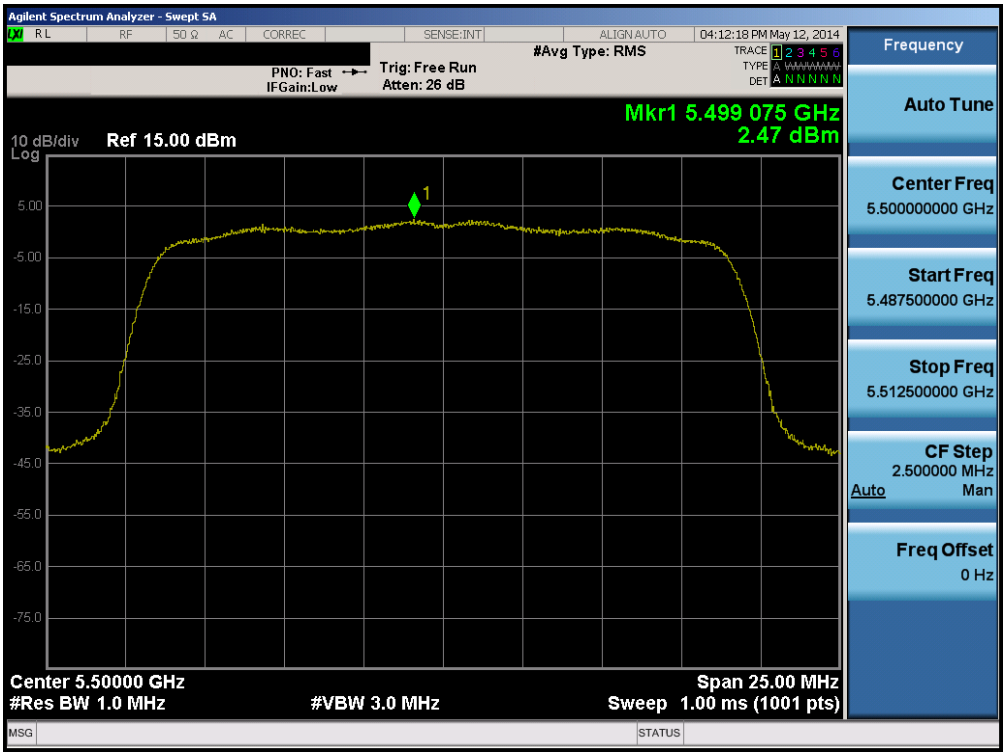


Plot 6-36. Peak Power Spectral Density Plot (802.11a (UNII Band 2C) – Ch. 140)



Plot 6-37. Peak Power Spectral Density Plot (20MHz BW 802.11n (UNII Band 2C) – Ch. 100)

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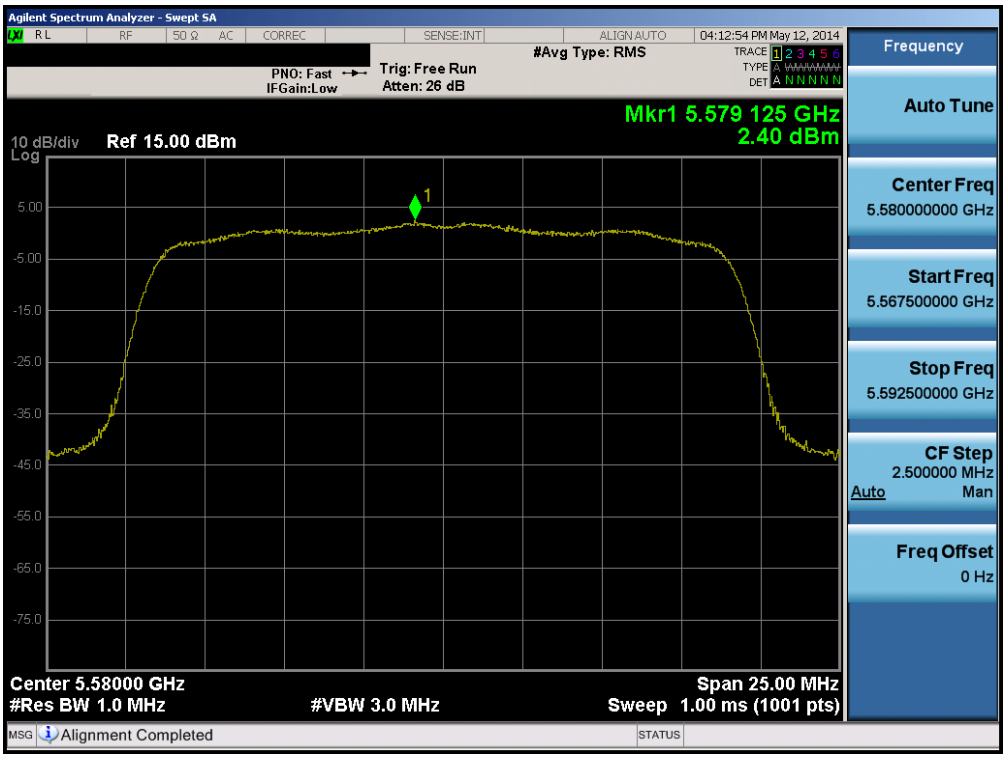
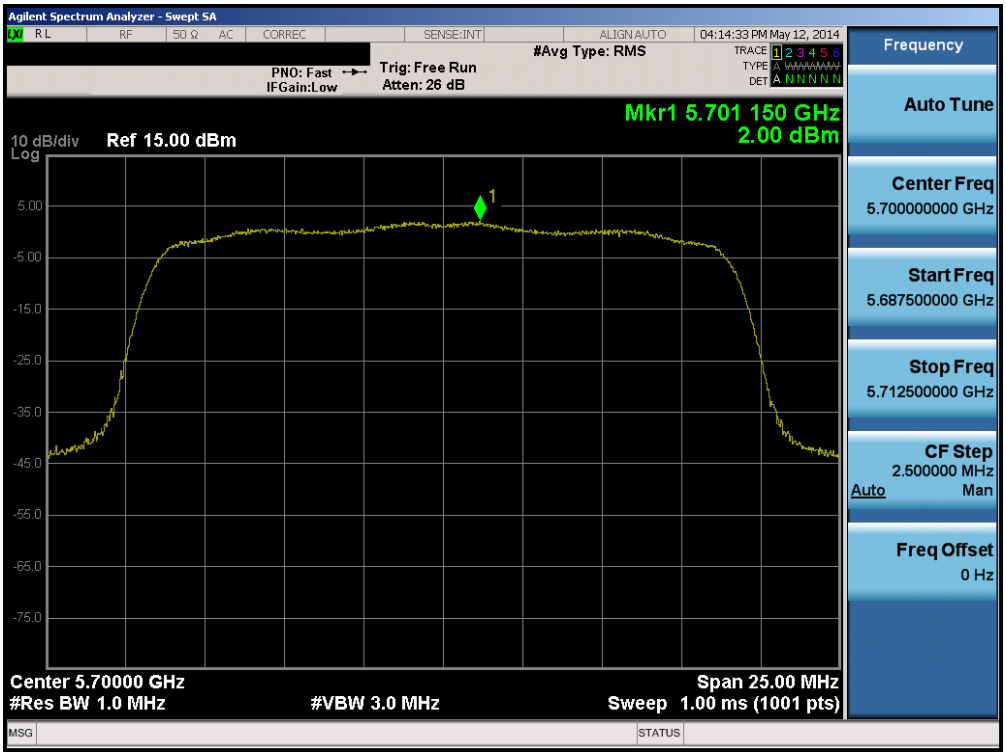


Plot 6-38. Peak Power Spectral Density Plot (20MHz BW 802.11n (UNII Band 2C) – Ch. 116)



Plot 6-39. Peak Power Spectral Density Plot (20MHz BW 802.11n (UNII Band 2C) – Ch. 140)

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6.5 Peak Excursion Ratio – 802.11a/n

§15.407(a.6)

Test Overview and Limit

The spectrum analyzer was connected to the antenna terminal while the EUT was operating at its maximum duty cycle (>98%), at its maximum power control level, as defined in KDB 789033 v01r03, and at the appropriate frequencies. Method SA-1, as defined in KDB 789033 v01r03, was used to capture the average trace used to make the peak excursion measurement.

The largest permissible difference between the modulation envelope (measured using a peak hold function) and the maximum power spectral density is 13 dBm/MHz.

Test Procedure Used

KDB 789033 v01r03 – Section G

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. Detector = peak
6. Trace mode = max hold
7. Trace was allowed to stabilize
8. The peak search function of the spectrum analyzer was used to find the peak of the spectrum. This level was compared to the peak power density level found from the previous section to determine the peak excursion.

Test Setup

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

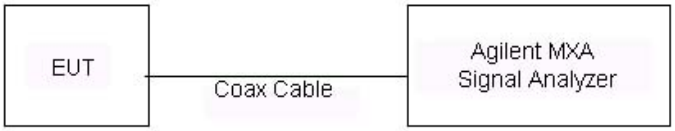

Figure 6-4. Test Instrument & Measurement Setup

Test Notes

The peak excursion was investigated for all signal types, modulation types, channel bandwidths, and variations in signal parameters and the worst case data is shown below. Only the worst case modulation mode on a single channel among all bands is reported since that is sufficient to demonstrate compliance to the peak excursion requirement per KDB 789033 v01r03.

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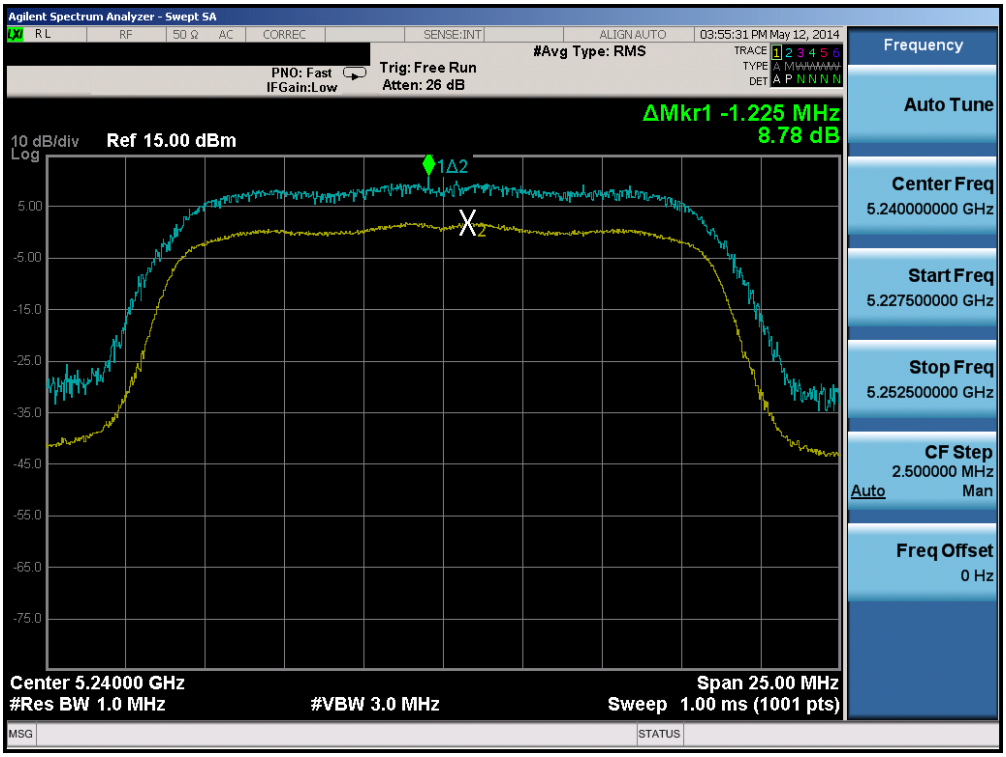
Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	Measured Peak Excursion Ratio [dBm]	Max Permissible Peak Excursion Ratio [dBm/MHz]	Margin [dB]	Pass / Fail
5240	48	a	6	8.78	13.0	-4.22	Pass
5580	116	n (20MHz)	6.5/7.2 (MCS0)	8.36	13.0	-4.64	Pass

Table 6-6. Conducted Peak Excursion Ratio Measurements



Plot 6-40. Peak Excursion Ratio Plot (802.11a (UNII Band 1) – Ch. 48)

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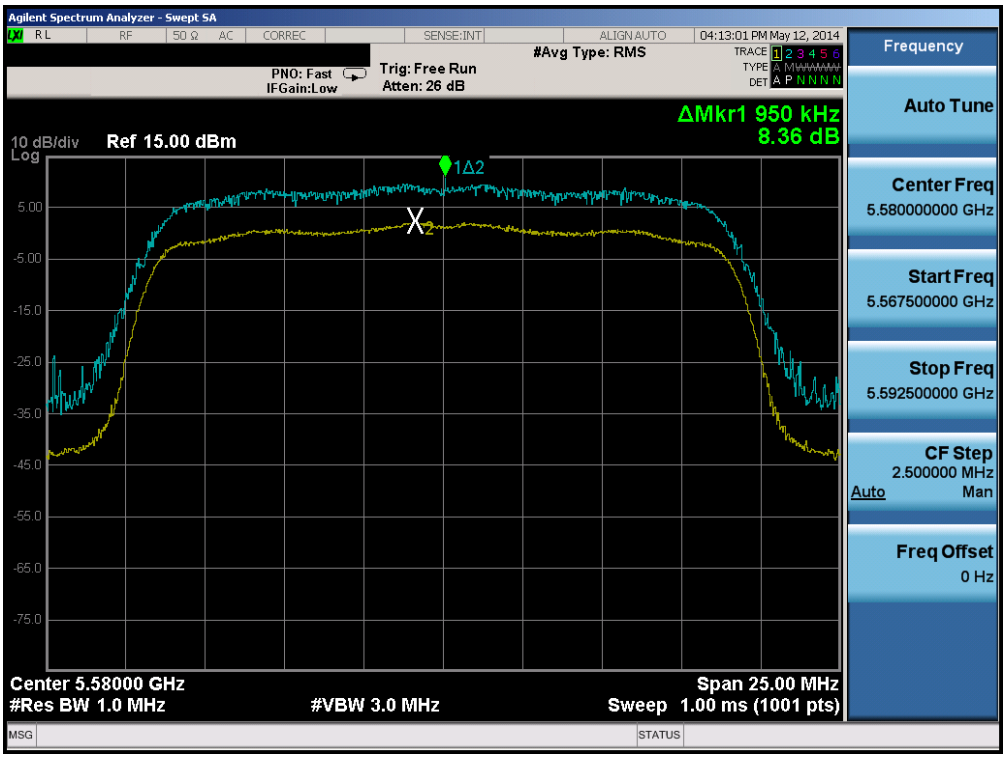

Plot 6-41. Peak Excursion Ratio Plot (20MHz BW 802.11n (UNII Band 2C) – Ch. 116)

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6.6 Frequency Stability

§15.407(g)

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

OPERATING FREQUENCY: 5,180,000,000 Hz

CHANNEL: 36

REFERENCE VOLTAGE: 3.70 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.70	+ 20 (Ref)	5,179,999,989	-11	-0.00000021
100 %		- 30	5,179,999,990	-10	-0.00000019
100 %		- 20	5,180,000,016	16	0.00000031
100 %		- 10	5,179,999,983	-17	-0.00000033
100 %		0	5,179,999,980	-20	-0.00000039
100 %		+ 10	5,180,000,013	13	0.00000025
100 %		+ 20	5,179,999,991	-9	-0.00000017
100 %		+ 30	5,179,999,981	-19	-0.00000037
100 %		+ 40	5,180,000,011	11	0.00000021
100 %		+ 50	5,179,999,998	-2	-0.00000004
115 %	4.26	+ 20	5,180,000,022	22	0.00000042
BATT. ENDPOINT	3.40	+ 20	5,180,000,010	10	0.00000019

Table 6-7. Frequency Stability Measurements for UNII Band 1 (Ch. 36)

Note:

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

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Frequency Stability
§15.407(g)

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

OPERATING FREQUENCY: 5,260,000,000 Hz

CHANNEL: 52

REFERENCE VOLTAGE: 3.70 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.70	+ 20 (Ref)	5,260,000,018	18	0.00000034
100 %		- 30	5,260,000,024	24	0.00000046
100 %		- 20	5,260,000,004	4	0.00000008
100 %		- 10	5,260,000,026	26	0.00000049
100 %		0	5,260,000,025	25	0.00000048
100 %		+ 10	5,259,999,986	-14	-0.00000027
100 %		+ 20	5,259,999,980	-20	-0.00000038
100 %		+ 30	5,259,999,987	-13	-0.00000025
100 %		+ 40	5,260,000,015	15	0.00000029
100 %		+ 50	5,260,000,019	19	0.00000036
115 %	4.26	+ 20	5,260,000,018	18	0.00000034
BATT. ENDPOINT	3.40	+ 20	5,259,999,971	-29	-0.00000055

Table 6-8. Frequency Stability Measurements for UNII Band 2A (Ch. 52)

Note:

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

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Frequency Stability
§15.407(g)

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

OPERATING FREQUENCY: 5,500,000,000 Hz

CHANNEL: 100

REFERENCE VOLTAGE: 3.70 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.70	+ 20 (Ref)	5,500,000,014	14	0.00000025
100 %		- 30	5,499,999,981	-19	-0.00000035
100 %		- 20	5,500,000,017	17	0.00000031
100 %		- 10	5,500,000,024	24	0.00000044
100 %		0	5,499,999,999	-1	-0.00000002
100 %		+ 10	5,500,000,005	5	0.00000009
100 %		+ 20	5,499,999,988	-12	-0.00000022
100 %		+ 30	5,500,000,011	11	0.00000020
100 %		+ 40	5,499,999,998	-2	-0.00000004
100 %		+ 50	5,500,000,020	20	0.00000036
115 %	4.26	+ 20	5,500,000,012	12	0.00000022
BATT. ENDPOINT	3.40	+ 20	5,500,000,012	12	0.00000022

Table 6-9. Frequency Stability Measurements for UNII Band 2C (Ch. 100)

Note:

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

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6.7 Radiated Spurious Emission Measurements

§15.407(b.1)(b.6) §15.205 §15.209

Test Overview and Limit

All out of band radiated spurious emissions are measured with a spectrum analyzer connected to a receive antenna while the EUT is operating at its maximum duty cycle (>98%), at its maximum power control level, as defined in KDB 789033 v01r03, and at the appropriate frequencies. All channels, modes (e.g. 802.11a, 802.11n (20MHz BW) and 802.11n (40MHz BW)), and modulations/data rates were investigated among all UNII bands. Only the radiated emissions of the configuration that produced the worst case emissions are reported in this section.

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR must not exceed the limits shown in Table 6-10 per Section 15.209.

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

Table 6-10. Radiated Limits

Test Procedures Used

KDB 789033 v01r03 – Section H

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.

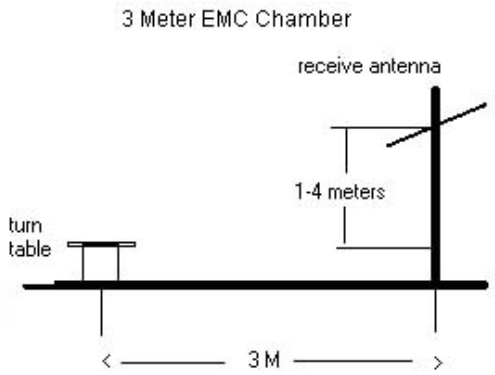

Figure 6-5. Test Instrument & Measurement Setup

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Test Notes

1. All radiated spurious emissions levels were measured in a radiated test setup per the guidance of KDB 789033 v01r03 Section H.
2. All emissions that lie in the restricted bands (denoted by a * next to the frequency) specified in §15.205 are below the limit shown in Table 6-10.
3. All spurious emissions lying in restricted bands specified in §15.205 are below the limit shown in Table 6-11. All spurious emissions that do not lie in a restricted band are subject to a peak limit of -27dBm/MHz. At a distance of 3 meters, the field strength limit in dBμV/m can be determined by adding a "conversion" factor of 95.2dB to the EIRP limit of -27dBm/MHz to obtain the limit for out of band spurious emissions of 68.2dBμV/m.
4. The antenna is manipulated through typical positions, polarity and length during the tests. The EUT is manipulated through three orthogonal planes.
5. This unit was tested with its standard battery.
6. The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter using CISPR quasi peak detector below 1GHz. Above 1 GHz, average and peak measurements were taken using linearly polarized horn antennas. The worst-case emissions are reported however emissions whose levels were not within 20dB of the respective limits were not reported.
7. Emissions below 18GHz were measured at a 3 meter test distance while emissions above 18GHz were measured at a 1 meter test distance with the application of a distance correction factor.
8. The worst case setup was found in the horizontal, clam shell closed configuration

Sample Calculations

Determining Spurious Emissions Levels

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

Radiated Band Edge Measurement Offset

- The amplitude offset shown in the radiated restricted band edge plots in Section 6.8 was calculated using the formula:

  Offset (dB) = (Antenna Factor + Cable Loss + 10 dB Attenuator) – Preamplifier Gain

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

	Frequency [MHz]	Analyzer Level [dBm]	Detector	Ant. Pol. [H/V]	EUT Pol. [H/H2/V]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
	10360.00	-104.80	Peak	H	H	46.86	49.06	68.20	-19.14
*	15540.00	-119.19	Average	H	H	50.97	38.78	53.98	-15.20
*	15540.00	-105.58	Peak	H	H	50.97	52.39	73.98	-21.59

Table 6-11. Radiated Measurements

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

	Frequency [MHz]	Analyzer Level [dBm]	Detector	Ant. Pol. [H/V]	EUT Pol. [H/H2/V]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
	10400.00	-104.28	Peak	H	H	46.81	49.54	68.20	-18.66
*	15600.00	-118.67	Average	H	H	51.01	39.35	53.98	-14.63
*	15600.00	-104.88	Peak	H	H	51.01	53.14	73.98	-20.84

Table 6-12. Radiated Measurements

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

	Frequency [MHz]	Analyzer Level [dBm]	Detector	Ant. Pol. [H/V]	EUT Pol. [H/H2/V]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
	10480.00	-103.67	Peak	H	H	46.73	50.06	68.20	-18.14
*	15720.00	-118.34	Average	H	H	49.90	38.56	53.98	-15.42
*	15720.00	-104.87	Peak	H	H	49.90	52.03	73.98	-21.95

Table 6-13. Radiated Measurements

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

	Frequency [MHz]	Analyzer Level [dBm]	Detector	Ant. Pol. [H/V]	EUT Pol. [H/H2/V]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
	10520.00	-104.20	Peak	H	H	46.70	49.50	68.20	-18.70
*	15780.00	-117.39	Average	H	H	49.90	39.52	53.98	-14.46
*	15780.00	-107.02	Peak	H	H	49.90	49.89	73.98	-24.09

Table 6-14. Radiated Measurements

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

	Frequency [MHz]	Analyzer Level [dBm]	Detector	Ant. Pol. [H/V]	EUT Pol. [H/H2/V]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
	10560.00	-103.19	Peak	H	H	46.84	50.65	68.20	-17.55
*	15840.00	-117.16	Average	H	H	50.07	39.90	53.98	-14.08
*	15840.00	-106.19	Peak	H	H	50.07	50.87	73.98	-23.11

Table 6-15. Radiated Measurements

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

	Frequency [MHz]	Analyzer Level [dBm]	Detector	Ant. Pol. [H/V]	EUT Pol. [H/H2/V]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
*	10640.00	-114.85	Average	H	H	47.16	39.31	53.98	-14.67
*	10640.00	-102.42	Peak	H	H	47.16	51.74	73.98	-22.24
*	15960.00	-118.00	Average	H	H	49.71	38.71	53.98	-15.27
*	15960.00	-105.40	Peak	H	H	49.71	51.31	73.98	-22.67

Table 6-16. Radiated Measurements

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

	Frequency [MHz]	Analyzer Level [dBm]	Detector	Ant. Pol. [H/V]	EUT Pol. [H/H2/V]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
*	11000.00	-116.37	Average	H	H	47.11	37.74	53.98	-16.24
*	11000.00	-103.66	Peak	H	H	47.11	50.45	73.98	-23.53
	16500.00	-105.38	Peak	H	H	51.60	53.22	68.20	-14.98

Table 6-17. Radiated Measurements

Worst Case Mode: 802.11a
Worst Case Transfer Rate: 6 Mbps
Distance of Measurements: 1 & 3 Meters
Operating Frequency: 5580MHz
Channel: 116

	Frequency [MHz]	Analyzer Level [dBm]	Detector	Ant. Pol. [H/V]	EUT Pol. [H/H2/V]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
*	11160.00	-116.27	Average	H	H	47.43	38.17	53.98	-15.81
*	11160.00	-104.27	Peak	H	H	47.43	50.17	73.98	-23.81
	16740.00	-106.74	Peak	H	H	52.71	52.97	68.20	-15.23

Table 6-18. Radiated Measurements

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Worst Case Mode:	802.11a
Worst Case Transfer Rate:	6 Mbps
Distance of Measurements:	1 & 3 Meters
Operating Frequency:	5700MHz
Channel:	140

	Frequency [MHz]	Analyzer Level [dBm]	Detector	Ant. Pol. [H/V]	EUT Pol. [H/H2/V]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
*	11400.00	-117.97	Average	H	H	47.68	36.72	53.98	-17.26
*	11400.00	-104.51	Peak	H	H	47.68	50.18	73.98	-23.80
	17100.00	-106.75	Peak	H	H	54.03	54.28	68.20	-13.92

Table 6-19. Radiated Measurements

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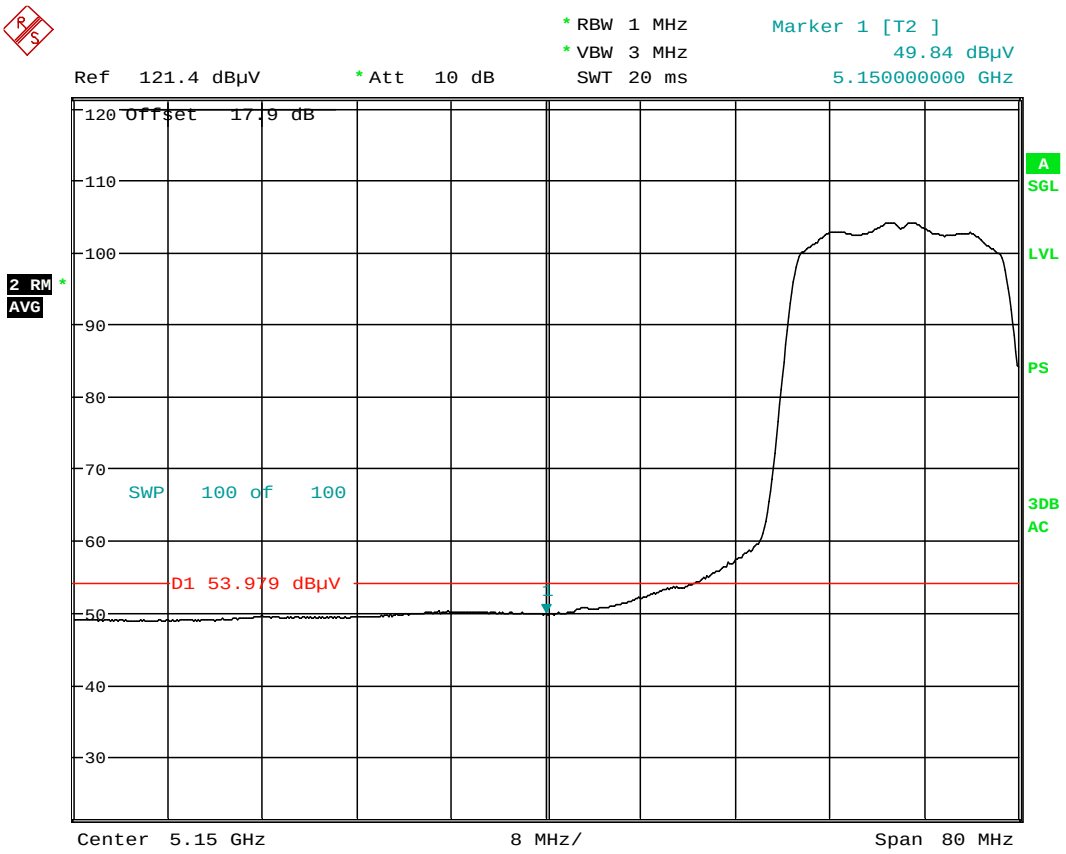
6.8 Radiated Band Edge Measurements (20MHz BW)

§15.407(b.1)(b.2) §15.205 §15.209

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



Date: 12.MAY.2014 17:45:54

Plot 6-42. Radiated Restricted Lower Band Edge Plot (Average – UNII Band 1)

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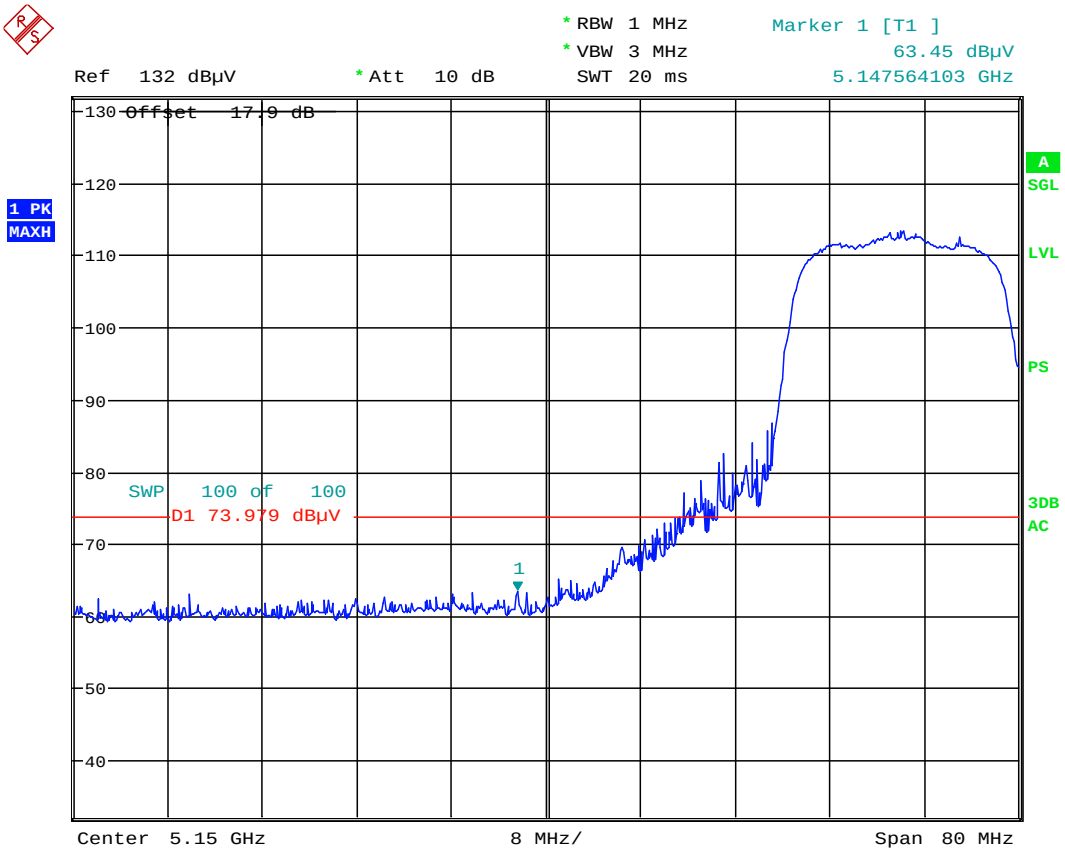
Radiated Band Edge Measurements (20MHz BW)

§15.407(b.1)(b.2) §15.205 §15.209



Date: 12.MAY.2014 17:47:28

Plot 6-43. Radiated Restricted Lower Band Edge Plot (Peak – UNII Band 1)

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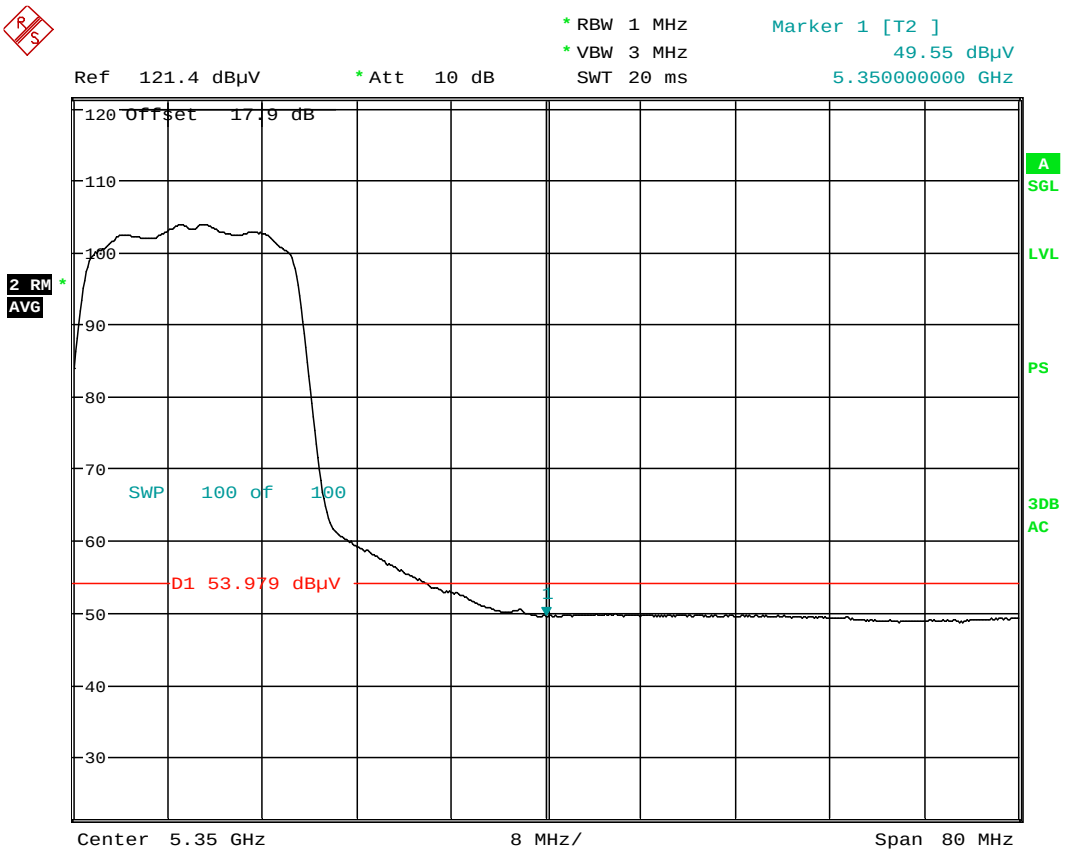
Radiated Band Edge Measurements (20MHz BW)

§15.407(b.1)(b.2) §15.205 §15.209

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



Date: 12.MAY.2014 17:53:11

Plot 6-44. Radiated Restricted Upper Band Edge Plot (Average – UNII Band 2A)

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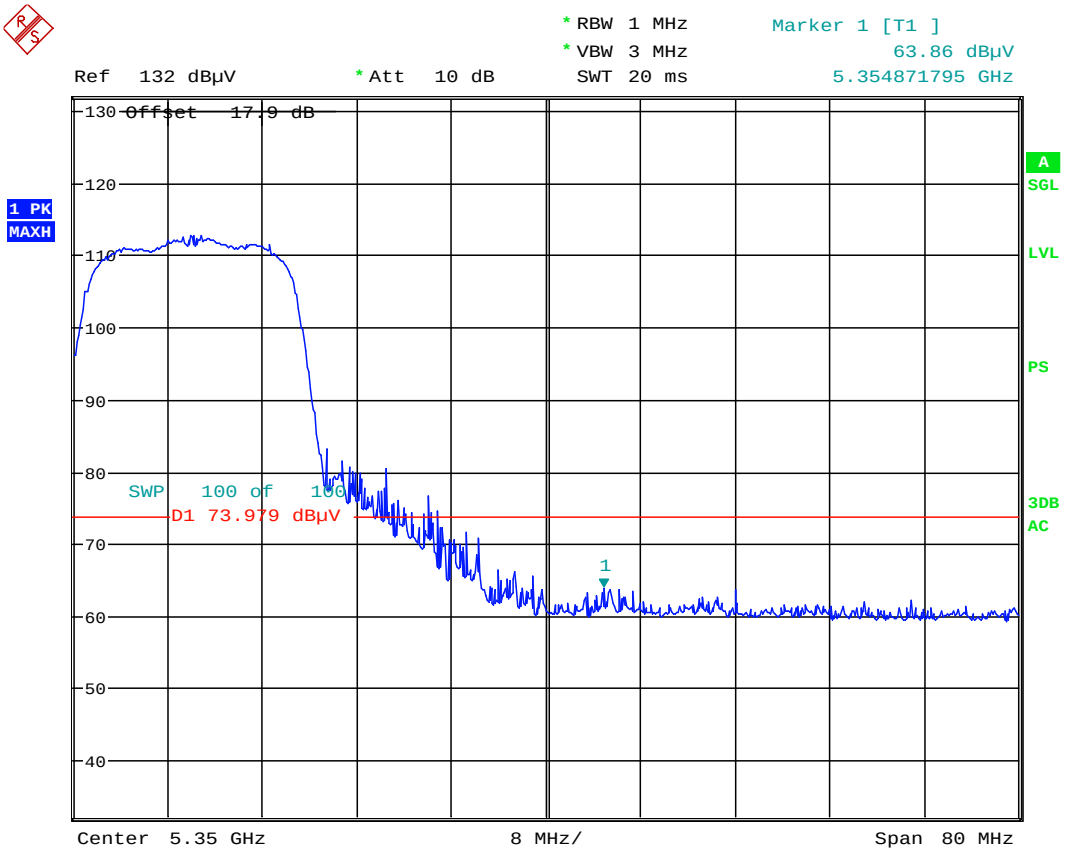
Radiated Band Edge Measurements (20MHz BW)

§15.407(b.1)(b.2) §15.205 §15.209



Date: 12.MAY.2014 17:54:34

Plot 6-45. Radiated Restricted Upper Band Edge Plot (Peak – UNII Band 2A)

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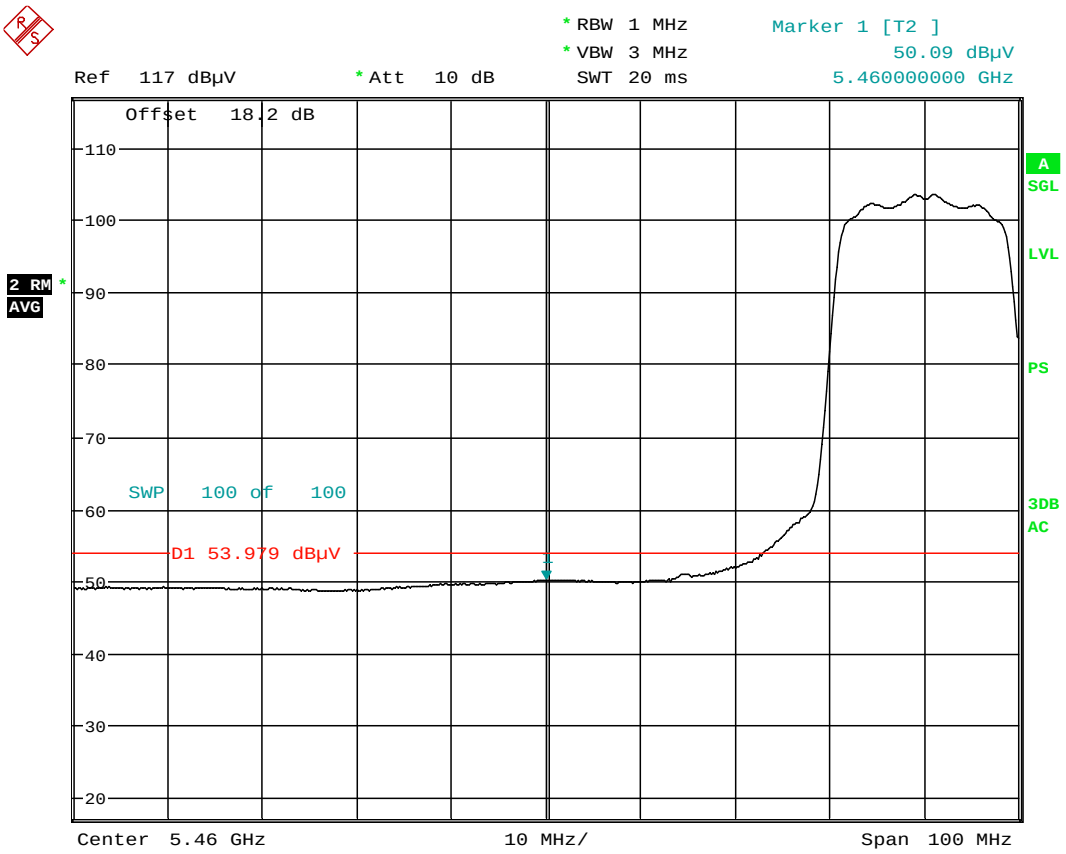
Radiated Band Edge Measurements (20MHz BW)

§15.407(b.1)(b.2) §15.205 §15.209

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



Date: 12.MAY.2014 18:01:24

Plot 6-46. Radiated Restricted Lower Band Edge Plot (Average – UNII Band 2C)

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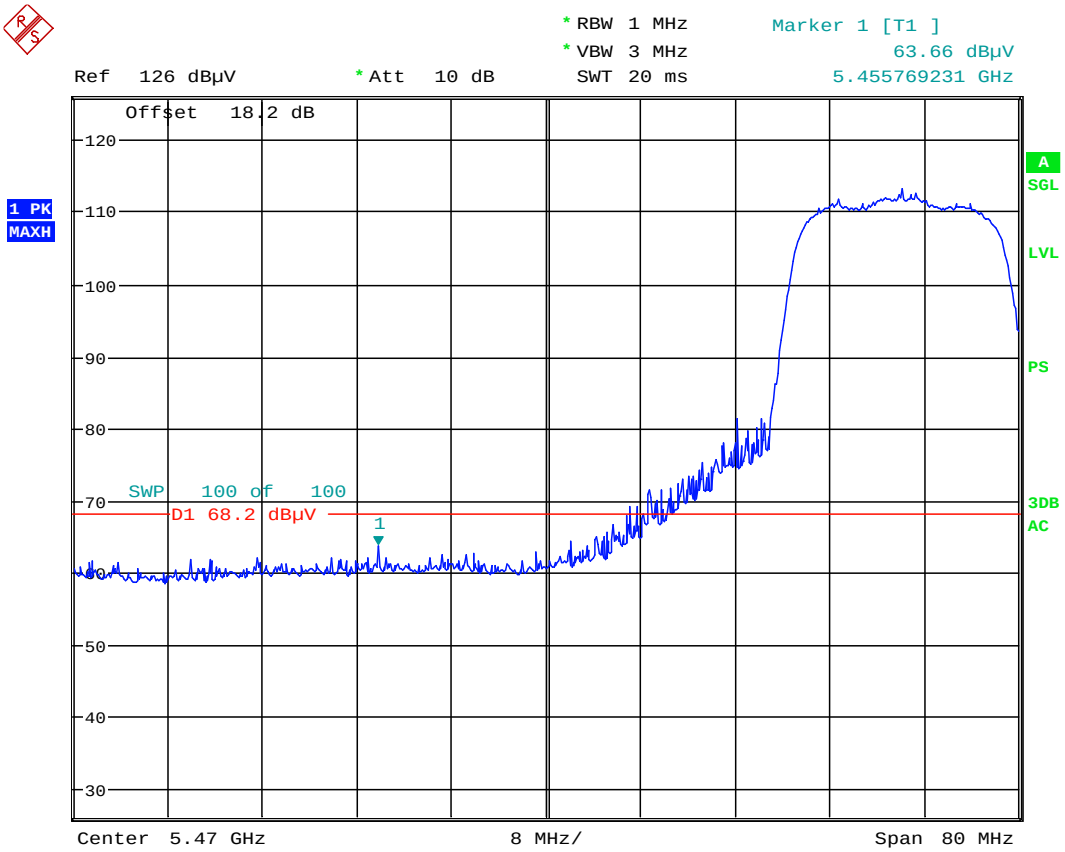
Radiated Band Edge Measurements (20MHz BW)

§15.407(b.1)(b.2) §15.205 §15.209



Date: 12.MAY.2014 18:02:40

Plot 6-47. Radiated Restricted Lower Band Edge Plot (Peak – UNII Band 2C)

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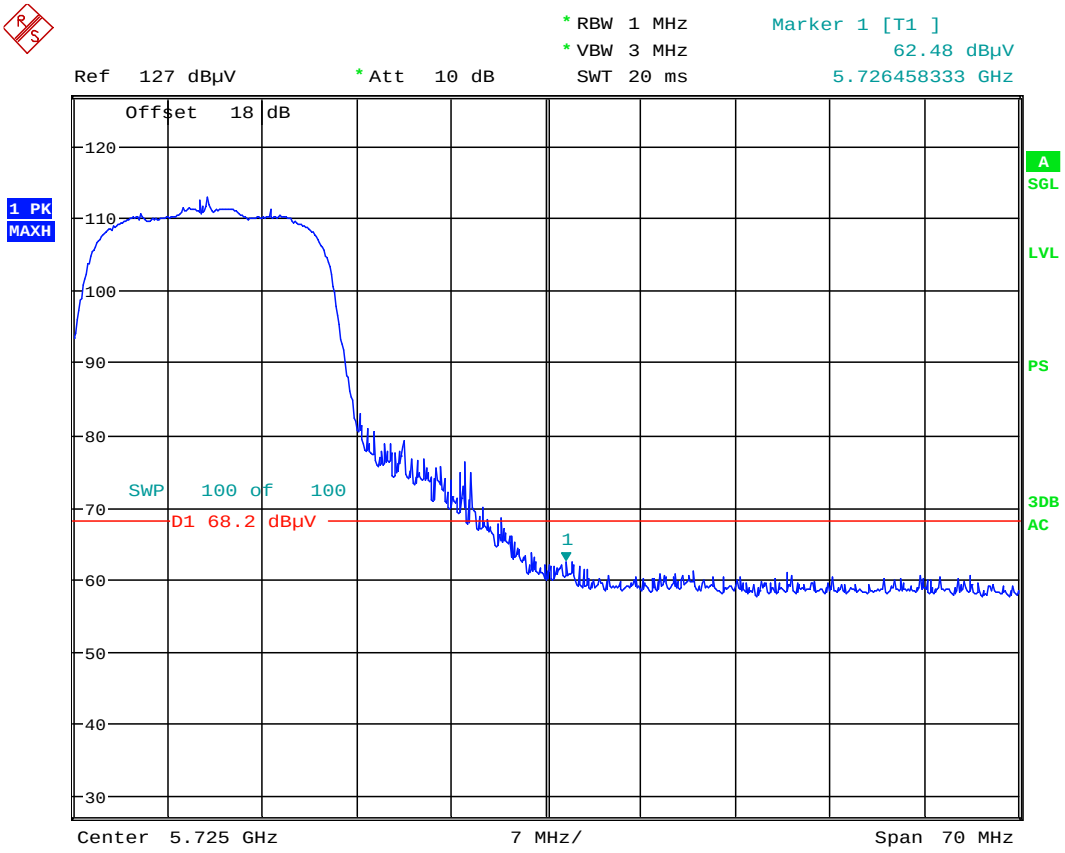
Radiated Band Edge Measurements (20MHz BW)

§15.407(b.1)(b.2) §15.205 §15.209

Worst Case Mode:	802.11a
Worst Case Transfer Rate:	6 Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	5700MHz
Channel:	140



Date: 12.MAY.2014 17:58:45

Plot 6-48. Radiated Upper Band Edge Plot (Peak – UNII Band 2C)

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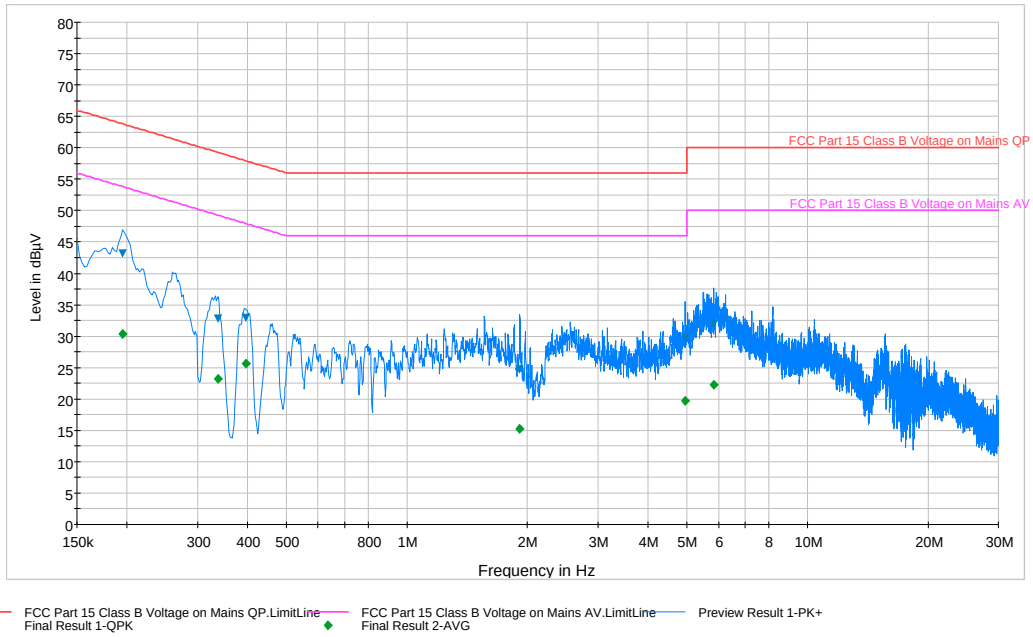
6.9 Line-Conducted Test Data

§15.407



Plot 6-49. Line Conducted Plot with 802.11a UNII Band 1 (L1)

Frequency MHz	Line	Corr. dB	QuasiPeak dBµV	Limit dBµV	Margin dB	Average dBµV	Limit dBµV	Margin dB
0.195	L1	0.2	43.20	63.80	20.60	30.30	53.80	23.50
0.337	L1	0.1	32.80	59.30	26.50	23.10	49.30	26.10
0.395	L1	0.1	33.00	58.00	25.00	25.60	48.00	22.40
1.914	L1	0.1	24.70	56.00	31.30	15.30	46.00	30.70
4.952	L1	0.2	29.60	56.00	26.40	19.70	46.00	26.30
5.831	L1	0.2	32.00	60.00	28.00	22.20	50.00	27.80

Table 6-20. Line Conducted Data with 802.11a UNII Band 1 (L1)

Notes:

1. All modes of operation, data rates, and test channels were investigated and the worst-case emissions are reported in 802.11a mode using 6Mbps on Channel 36. The emissions found were not affected by the choice of channel used during testing.
2. The limit for Class B device(s) from 150kHz to 30MHz are specified in Section 15.207 of the Title 47 CFR.
3. L1 = Phase; N = Neutral
4. Corr. (dB) = Cable loss (dB) + LISN insertion factor (dB)
5. QP/AV Level (dBµV) = QP/AV Analyzer/Receiver Level (dBµV) + Corr. (dB)
6. Margin (dB) = QP/AVLimit (dBµV) - QP/AV Level (dBµV)
7. Traces shown in plot are made using a peak detector.
8. Deviations to the Specifications: None.

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Line-Conducted Test Data

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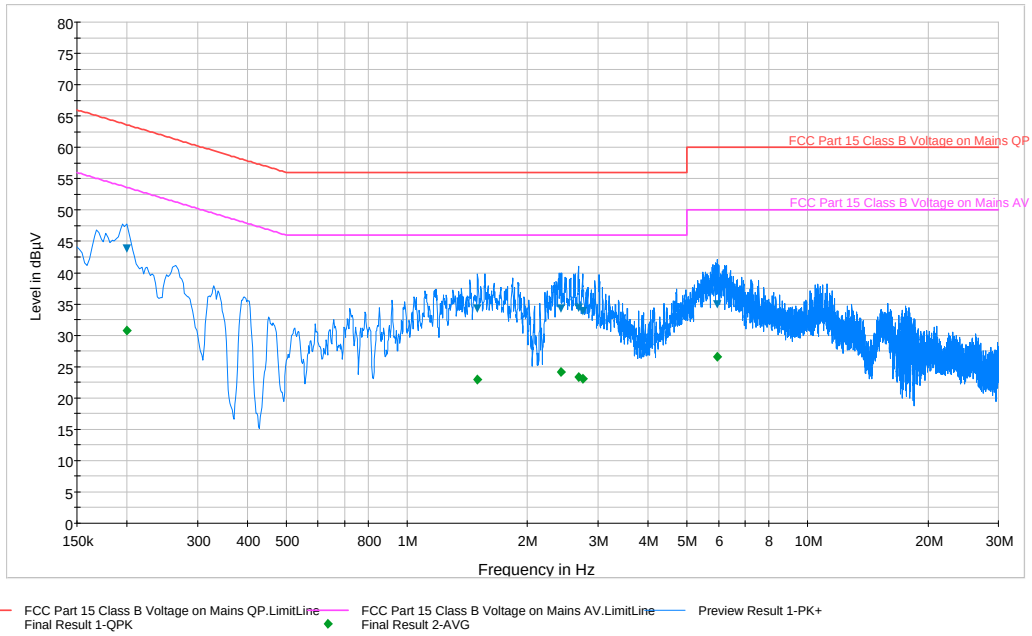

Plot 6-50. Line Conducted Plot with 802.11a UNII Band 1 (N)

Frequency MHz	Line	Corr. dB	QuasiPeak dBµV	Limit dBµV	Margin dB	Average dBµV	Limit dBµV	Margin dB
0.200	N	0.2	43.90	63.60	19.70	30.70	53.60	22.90
1.502	N	0.2	34.30	56.00	21.70	23.00	46.00	23.00
2.423	N	0.2	34.30	56.00	21.70	24.10	46.00	21.90
2.679	N	0.2	34.40	56.00	21.60	23.30	46.00	22.70
2.747	N	0.2	33.80	56.00	22.20	23.10	46.00	22.90
5.946	N	0.3	35.00	60.00	25.00	26.60	50.00	23.40

Table 6-21. Line Conducted Data with 802.11a UNII Band 1 (N)

Notes:

1. All modes of operation, data rates, and test channels were investigated and the worst-case emissions are reported in 802.11a mode using 6Mbps on Channel 36. The emissions found were not affected by the choice of channel used during testing.
2. The limit for Class B device(s) from 150kHz to 30MHz are specified in Section 15.207 of the Title 47 CFR.
3. L1 = Phase; N = Neutral
4. Corr. (dB) = Cable loss (dB) + LISN insertion factor (dB)
5. QP/AV Level (dBµV) = QP/AV Analyzer/Receiver Level (dBµV) + Corr. (dB)
6. Margin (dB) = QP/AVLimit (dBµV) - QP/AV Level (dBµV)
7. Traces shown in plot are made using a peak detector.
8. Deviations to the Specifications: None.

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Line-Conducted Test Data

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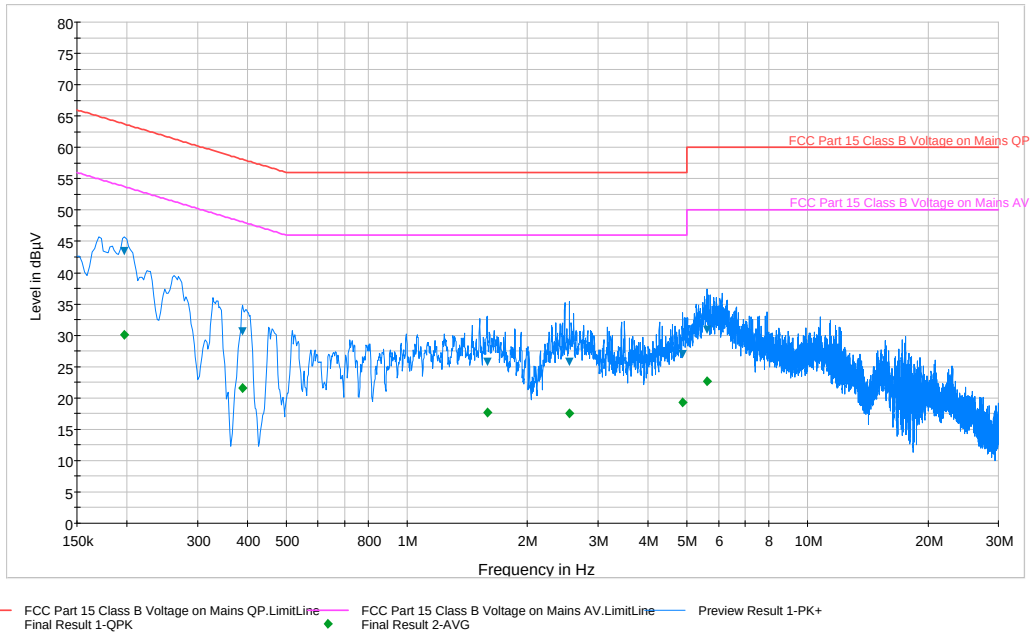

Plot 6-51. Line Conducted Plot with 802.11a UNII Band 2A (L1)

Frequency MHz	Line	Corr. dB	QuasiPeak dBµV	Limit dBµV	Margin dB	Average dBµV	Limit dBµV	Margin dB
0.197	L1	0.2	43.40	63.70	20.30	30.10	53.70	23.60
0.389	L1	0.1	30.60	58.10	27.50	21.60	48.10	26.50
1.586	L1	0.1	25.80	56.00	30.20	17.60	46.00	28.40
2.546	L1	0.1	25.80	56.00	30.20	17.60	46.00	28.40
4.880	L1	0.2	26.90	56.00	29.10	19.30	46.00	26.70
5.611	L1	0.2	31.00	60.00	29.00	22.70	50.00	27.30

Table 6-22. Line Conducted Data with 802.11a UNII Band 2A (L1)

Notes:

1. All modes of operation, data rates, and test channels were investigated and the worst-case emissions are reported in 802.11a mode using 6Mbps on Channel 52. The emissions found were not affected by the choice of channel used during testing.
2. The limit for Class B device(s) from 150kHz to 30MHz are specified in Section 15.207 of the Title 47 CFR.
3. L1 = Phase; N = Neutral
4. Corr. (dB) = Cable loss (dB) + LISN insertion factor (dB)
5. QP/AV Level (dBµV) = QP/AV Analyzer/Receiver Level (dBµV) + Corr. (dB)
6. Margin (dB) = QP/AVLimit (dBµV) - QP/AV Level (dBµV)
7. Traces shown in plot are made using a peak detector.
8. Deviations to the Specifications: None.

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Line-Conducted Test Data

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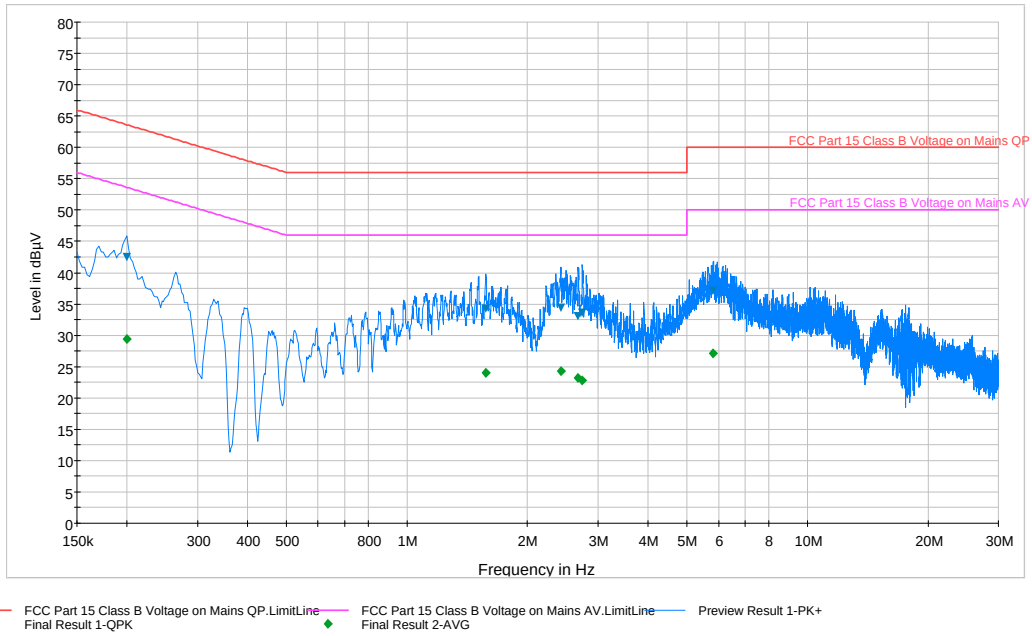

Plot 6-52. Line Conducted Plot with 802.11a UNII Band 2A (N)

Frequency MHz	Line	Corr. dB	QuasiPeak dBµV	Limit dBµV	Margin dB	Average dBµV	Limit dBµV	Margin dB
0.200	N	0.2	42.50	63.60	21.10	29.40	53.60	24.20
1.577	N	0.2	34.20	56.00	21.80	24.00	46.00	22.00
2.423	N	0.2	34.40	56.00	21.60	24.30	46.00	21.70
2.677	N	0.2	33.10	56.00	22.90	23.10	46.00	22.90
2.742	N	0.2	33.60	56.00	22.40	22.70	46.00	23.30
5.825	N	0.3	37.00	60.00	23.00	27.20	50.00	22.80

Table 6-23. Line Conducted Data with 802.11a UNII Band 2A (N)

Notes:

1. All modes of operation, data rates, and test channels were investigated and the worst-case emissions are reported in 802.11a mode using 6Mbps on Channel 52. The emissions found were not affected by the choice of channel used during testing.
2. The limit for Class B device(s) from 150kHz to 30MHz are specified in Section 15.207 of the Title 47 CFR.
3. L1 = Phase; N = Neutral
4. Corr. (dB) = Cable loss (dB) + LISN insertion factor (dB)
5. QP/AV Level (dBµV) = QP/AV Analyzer/Receiver Level (dBµV) + Corr. (dB)
6. Margin (dB) = QP/AVLimit (dBµV) - QP/AV Level (dBµV)
7. Traces shown in plot are made using a peak detector.
8. Deviations to the Specifications: None.

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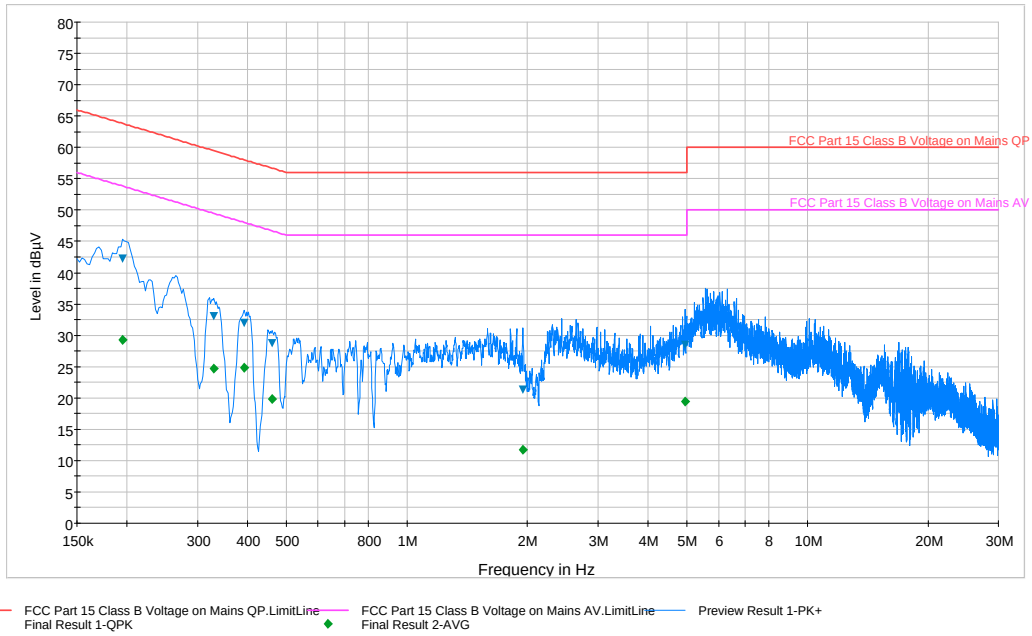
Line-Conducted Test Data

§15.407



Plot 6-53. Line Conducted Plot with 802.11a UNII Band 2C (L1)

Frequency MHz	Line	Corr. dB	QuasiPeak dBµV	Limit dBµV	Margin dB	Average dBµV	Limit dBµV	Margin dB
0.195	L1	0.2	42.30	63.80	21.50	29.20	53.80	24.60
0.330	L1	0.1	33.10	59.50	26.40	24.70	49.50	24.70
0.393	L1	0.1	32.00	58.00	26.00	24.80	48.00	23.20
0.461	L1	0.1	28.70	56.70	28.00	19.90	46.70	26.80
1.948	L1	0.1	21.30	56.00	34.70	11.70	46.00	34.30
4.949	L1	0.2	28.50	56.00	27.50	19.40	46.00	26.60

Table 6-24. Line Conducted Plot with 802.11a UNII Band 2C (L1)

Notes:

1. All modes of operation, data rates, and test channels were investigated and the worst-case emissions are reported in 802.11a mode using 6Mbps on Channel 100. The emissions found were not affected by the choice of channel used during testing.
2. The limit for Class B device(s) from 150kHz to 30MHz are specified in Section 15.207 of the Title 47 CFR.
3. L1 = Phase; N = Neutral
4. Corr. (dB) = Cable loss (dB) + LISN insertion factor (dB)
5. QP/AV Level (dBµV) = QP/AV Analyzer/Receiver Level (dBµV) + Corr. (dB)
6. Margin (dB) = QP/AVLimit (dBµV) - QP/AV Level (dBµV)
7. Traces shown in plot are made using a peak detector.
8. Deviations to the Specifications: None.

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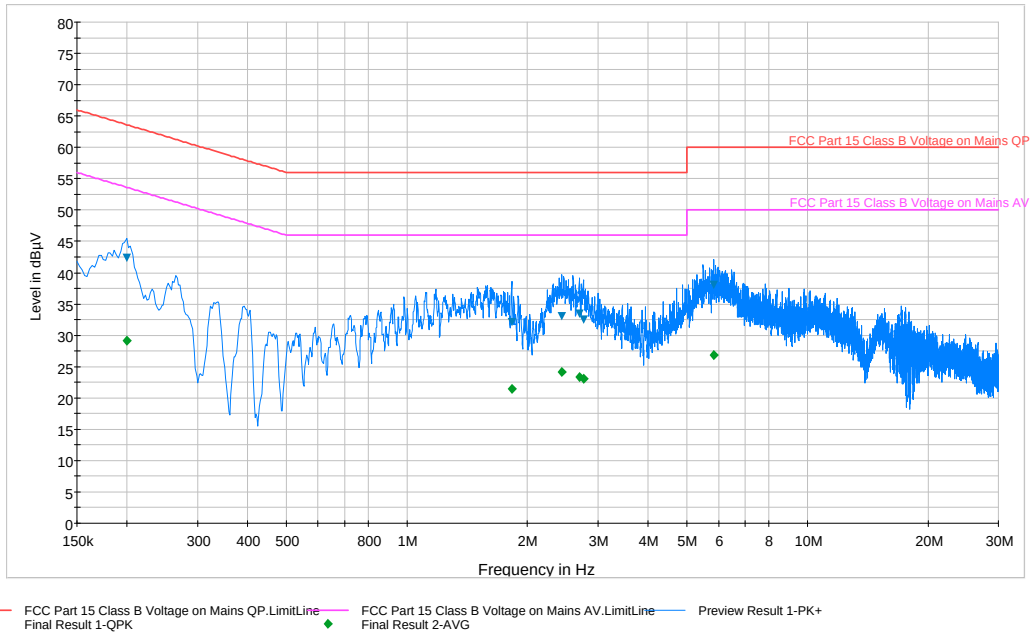
Line-Conducted Test Data

§15.407



Plot 6-54. Line Conducted Plot with 802.11a UNII Band 2C (N)

Frequency MHz	Line	Corr. dB	QuasiPeak dBµV	Limit dBµV	Margin dB	Average dBµV	Limit dBµV	Margin dB
0.200	N	0.2	42.40	63.60	21.20	29.20	53.60	24.40
1.829	N	0.2	32.20	56.00	23.80	21.40	46.00	24.60
2.434	N	0.2	33.10	56.00	22.90	24.20	46.00	21.80
2.695	N	0.2	33.40	56.00	22.60	23.30	46.00	22.70
2.760	N	0.2	32.60	56.00	23.40	23.10	46.00	22.90
5.829	N	0.3	38.10	60.00	21.90	26.90	50.00	23.10

Table 6-25. Line Conducted Data with 802.11a UNII Band 2C (N)

Notes:

1. All modes of operation, data rates, and test channels were investigated and the worst-case emissions are reported in 802.11a mode using 6Mbps on Channel 100. The emissions found were not affected by the choice of channel used during testing.
2. The limit for Class B device(s) from 150kHz to 30MHz are specified in Section 15.207 of the Title 47 CFR.
3. L1 = Phase; N = Neutral
4. Corr. (dB) = Cable loss (dB) + LISN insertion factor (dB)
5. QP/AV Level (dBµV) = QP/AV Analyzer/Receiver Level (dBµV) + Corr. (dB)
6. Margin (dB) = QP/AVLimit (dBµV) - QP/AV Level (dBµV)
7. Traces shown in plot are made using a peak detector.
8. Deviations to the Specifications: None.

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7.0 CONCLUSION

The data collected relate only the item(s) tested and show that the **Samsung Portable Handset FCC ID: A3LSMB780A** is in compliance with Part 15E of the FCC Rules.

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