

PCTEST ENGINEERING LABORATORY, INC.

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

Applicant Name:

LG Electronics MobileComm U.S.A 1000 Sylvan Avenue Englewood Cliffs, NJ 07632 United States Date of Testing: 4/24 - 5/9/2018 Test Site/Location: PCTEST Lab. Columbia, MD, USA Test Report Serial No.: 1M1804200078-06.ZNF

FCC ID:

ZNFX410CS

APPLICANT:

LG Electronics MobileComm U.S.A

Application Type: Model: Additional Model(s): EUT Type: Frequency Range: FCC Classification: FCC Rule Part(s): Test Procedure(s): Certification LM-X410CS LMX410CS, X410CS Portable Handset 5180 – 5825MHz Unlicensed National Information Infrastructure (UNII) Part 15 Subpart E (15.407) ANSI C63.10-2013, KDB 789033 D02 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.



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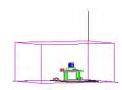


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	Ohannal		Conducte	ed Power
UNII Band	Channel Bandwidth (MHz)	Tx Frequency (MHz)	Max. Power (mW)	Max. Power (dBm)
1		5180 - 5240	10.839	10.35
2A	20	5260 - 5320	10.765	10.32
2C		5500 - 5700	10.740	10.31
3		5745 - 5825	9.817	9.92
1		5190 - 5230	9.594	9.82
2A	40	5270 - 5310	9.376	9.72
2C	40	5510 - 5670	9.376	9.72
3		5755 - 5795	8.433	9.26
1		5210	9.204	9.64
2A	80	5290	9.099	9.59
2C		5530 - 5610	8.831	9.46
3		5775	8.110	9.09

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 **LG Portable Handset FCC ID: ZNFX410CS**. The test data contained in this report pertains only to the emissions due to the EUT's UNII transmitter.

Test Device Serial No.: 00425, 00532, 00524, 00425

2.2 Device Capabilities

This device contains the following capabilities:

850/1900 GPRS/EDGE, 850/1700/1900 WCDMA/HSPA, Multi-band LTE, 802.11b/g/n WLAN, 802.11a/n/ac UNII, Bluetooth (1x, EDR, LE)

	Band 1		Band 2A		Band 2C		Band 3
Ch.	Frequency (MHz)						
36	5180	52	5260	100	5500	149	5745
:	:	:	:	:	:	:	:
42	5210	56	5280	120	5600	157	5785
:	:	:	:	:	:	:	:
48	5240	64	5320	140	5700	165	5825

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

Band 1

Ch.

54

•

62

Frequency (MHz)

5190

5230

Ch.

38

: 46 Band 2A

Frequency (MHz)

5270

5310

 Band 2C

 Ch.
 Frequency (MHz)

 102
 5510

 :
 :

 118
 5590

 :
 :

 134
 5670

Ch.	Frequency (MHz)				
151	5755				
:					
159	5795				
erations					

Band 3

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

	Band 1		Band 2A		Band 2C		Band 3
Ch.	Frequency (MHz)						
42	5210	58	5290	106	5530	155	5775
				:	:		
				122	5610		

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

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Notes:

5GHz NII operation is possible in 20MHz, and 40MHz, and 80MHz channel bandwidths. The maximum achievable duty cycles for all modes were determined based on measurements performed on a spectrum analyzer in zero-span mode with RBW = 8MHz, VBW = 50MHz, and detector = peak per the guidance of Section B)2)b) of 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 M	802.11 Mode/Band				
	а	99.1			
	n (HT20)	99.1			
5GHz	ac (HT20)	99.1			
2012	n (HT40)	99.1			
	ac (HT40)	96.2			
	ac (HT80)	92.6			
Table 0.4	Magging d. D.	4 · · · · · · · · · ·			

 Table 2-4. Measured Duty Cycles

Data Rate(s) Tested:

6.5/7.2, 13/14.4, 19.5/21.7, 26/28.9, 39/43.3, 52/57.8, 58.5/65, 65/72.2 (n – 20MHz) 13.5/15, 27/30, 40.5/45, 54/60, 81/90, 108/120, 121.5/135, 135/150 (n – 40MHz BW) 29.3/32.5, 58.5/65, 87.8/97.5, 117/130, 175.5/195, 234/260, 263.3/292.5, 292.5/325, 351/390, 390/433.3 (ac

– 80MHz BW)

2.3 Test Configuration

The 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.

6, 9, 12, 18, 24, 36, 48, 54Mbps (802.11a)

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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, $50\Omega/50\mu$ H 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
-	RE1	Radiated Emissions Cable Set (UHF/EHF)	6/21/2017	Annual	6/21/2018	RE1
-	WL40-1	Conducted Cable Set (40GHz)	6/14/2017	Annual	6/14/2018	WL40-1
Agilent	N9020A	MXA Signal Analyzer	1/24/2018	Annual	1/24/2019	US46470561
Agilent	N9030A	PXA Signal Analyzer (26.5GHz)	8/28/2017	Annual	8/28/2018	MY49432391
Emco	3115	Horn Antenna (1-18GHz)	3/28/2018	Biennial	3/28/2020	9704-5182
ETS Lindgren	3117	1-18 GHz DRG Horn (Medium)	12/1/2016	Biennial	12/1/2018	125518
ETS-Lindgren	3816/2NM	Line Impedance Stabilization Network	12/27/2016	Biennial	12/27/2018	114451
Huber+Suhner	Sucoflex 102A	40GHz Radiated Cable	5/19/2017	Annual	5/19/2018	251425001
Keysight Technologies	N9030A	3Hz-44GHz PXA Signal Analyzer	3/20/2018	Annual	3/20/2019	MY49430494
Pasternack	NMLC-1	Line Conducted Emissions Cable (NM)	5/31/2017	Annual	5/31/2018	NMLC-1
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	5/19/2017	Annual	5/19/2018	100342
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-PR26	18-26.5 GHz Pre-Amplifier	5/11/2017	Annual	5/11/2018	100040
Rohde & Schwarz	TS-PR40	26.5-40 GHz Pre-Amplifier	5/11/2017	Annual	5/11/2018	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	JB5	Bi-Log Antenna (30M - 5GHz)	4/19/2018	Biennial	4/19/2020	A051107

Table 6-1. Annual Test Equipment Calibration Schedule

Note:

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

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7.0 TEST RESULTS

7.1 Summary

Company Name:	LG Electronics MobileComm U.S.A
FCC ID:	ZNFX410CS
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		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])	CONDUCTED	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(h)	RSS-247 [6.3]	Dynamic Frequency Selection	See DFS Test Report		PASS	See DFS Test Report
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])		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])	RADIATED	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

Notes:

Table 7-1. Summary of Test Results

- 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

- 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 <u>></u> 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.

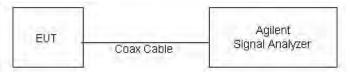


Figure 7-1. Test Instrument & Measurement Setup

Test Notes

None.

FCC ID: ZNFX410CS		MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
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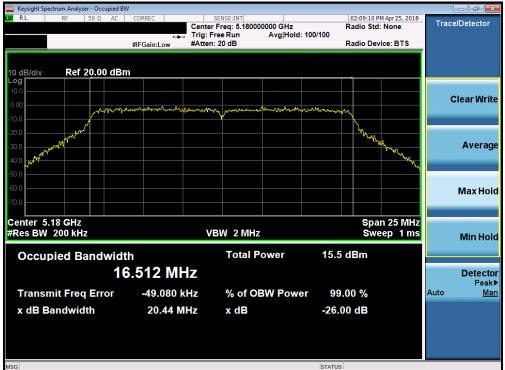


	Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	Measured 26dB Bandwidth [MHz]
	5180	36	а	6	20.44
	5200	40	а	6	20.57
	5240	48	а	6	20.39
Ξ	5180	36	n (20MHz)	6.5/7.2 (MCS0)	20.56
Band	5200	40	n (20MHz)	6.5/7.2 (MCS0)	20.65
ä	5240	48	n (20MHz)	6.5/7.2 (MCS0)	20.60
	5190	38	n (40MHz)	13.5/15 (MCS0)	42.15
	5230	46	n (40MHz)	13.5/15 (MCS0)	42.70
	5210	42	ac (80MHz)	29.3/32.5 (MCS0)	82.96
	5260	52	а	6	20.40
	5280	56	а	6	20.41
	5320	64	а	6	20.54
2A	5260	52	n (20MHz)	6.5/7.2 (MCS0)	20.61
Band 2A	5280	56	n (20MHz)	6.5/7.2 (MCS0)	20.78
Ba	5320	64	n (20MHz)	6.5/7.2 (MCS0)	20.66
	5270	54	n (40MHz)	13.5/15 (MCS0)	42.57
	5310	62	n (40MHz)	13.5/15 (MCS0)	42.51
	5290	58	ac (80MHz)	29.3/32.5 (MCS0)	83.63
	5500	100	а	6	20.66
	5600	120	а	6	20.27
	5700	140	а	6	20.66
	5500	100	n (20MHz)	6.5/7.2 (MCS0)	20.58
2C	5600	120	n (20MHz)	6.5/7.2 (MCS0)	20.39
Band 2C	5700	140	n (20MHz)	6.5/7.2 (MCS0)	21.02
Ba	5510	102	n (40MHz)	13.5/15 (MCS0)	42.30
	5590	118	n (40MHz)	13.5/15 (MCS0)	43.63
	5670	134	n (40MHz)	13.5/15 (MCS0)	42.58
	5530	106	ac (80MHz)	29.3/32.5 (MCS0)	83.31
	5610	122	ac (80MHz)	29.3/32.5 (MCS0)	83.58

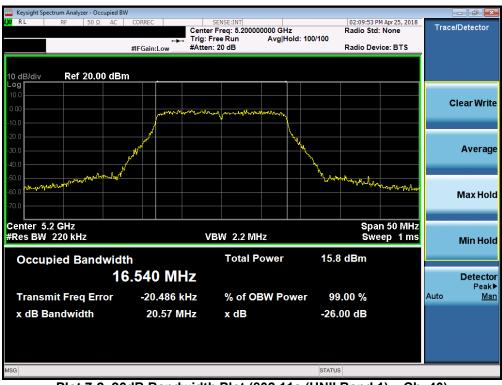
Table 7-2. Conducted Bandwidth Measurements

FCC ID: ZNFX410CS		MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 14 of 00
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Plot 7-1. 26dB Bandwidth Plot (802.11a (UNII Band 1) - Ch. 36)

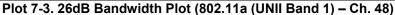


Plot 7-2. 26dB Bandwidth Plot (802.11a (UNII Band 1) - Ch. 40)

FCC ID: ZNFX410CS		MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
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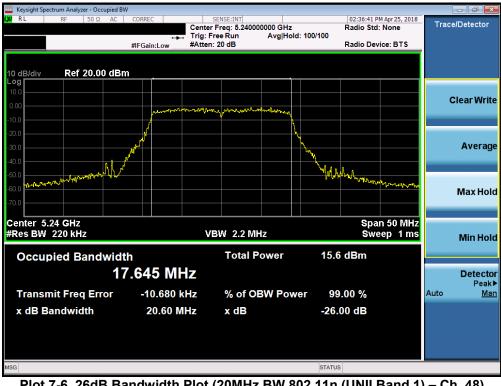
Plot 7-4. 26dB Bandwidth Plot (20MHz BW 802.11n (UNII Band 1) - Ch. 36)

FCC ID: ZNFX410CS		MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 16 of 00
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Plot 7-5. 26dB Bandwidth Plot (20MHz BW 802.11n (UNII Band 1) - Ch. 40)

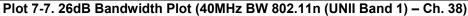


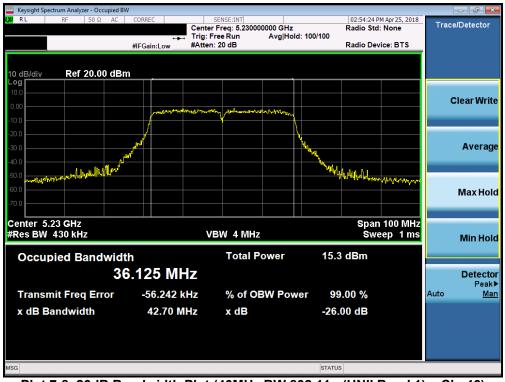
Plot 7-6. 26dB Bandwidth Plot (20MHz BW 802.11n (UNII Band 1) - Ch. 48)

FCC ID: ZNFX410CS		MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 17 of 00
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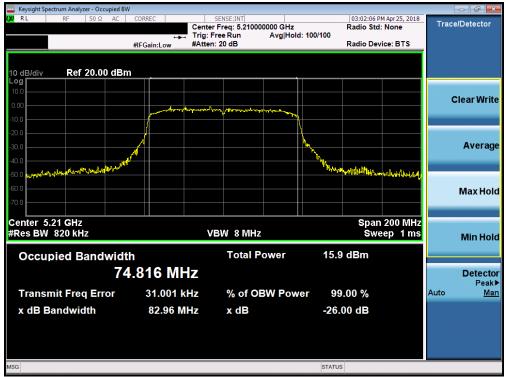




Plot 7-8. 26dB Bandwidth Plot (40MHz BW 802.11n (UNII Band 1) - Ch. 46)

FCC ID: ZNFX410CS		MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
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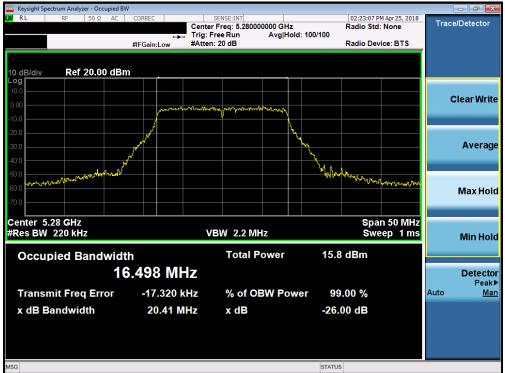




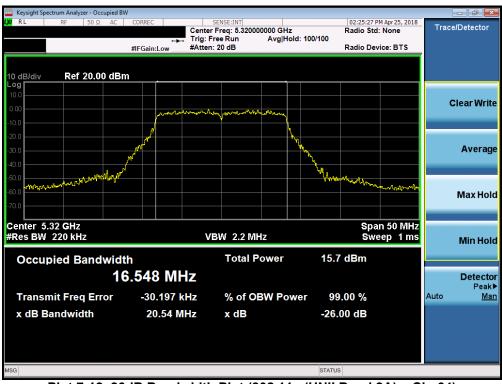
Plot 7-10. 26dB Bandwidth Plot (802.11a (UNII Band 2A) - Ch. 52)

FCC ID: ZNFX410CS		MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dega 10 of 00
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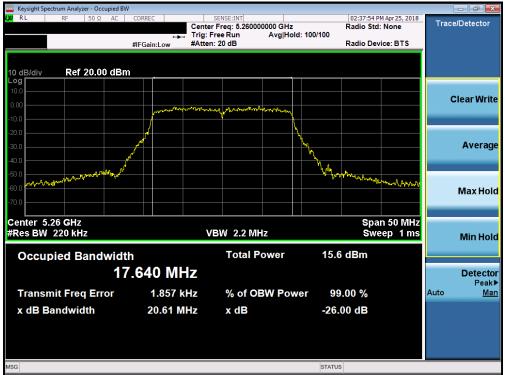
Plot 7-11. 26dB Bandwidth Plot (802.11a (UNII Band 2A) - Ch. 56)



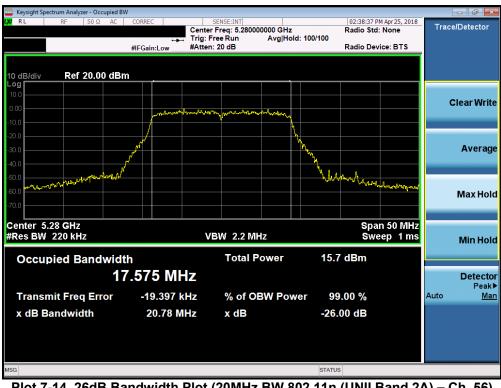
Plot 7-12. 26dB Bandwidth Plot (802.11a (UNII Band 2A) - Ch. 64)

FCC ID: ZNFX410CS		MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 20 of 00
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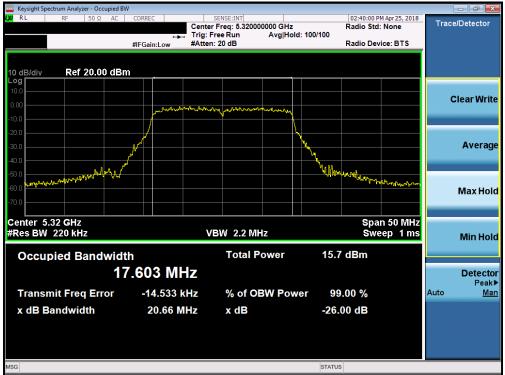
Plot 7-13. 26dB Bandwidth Plot (20MHz BW 802.11n (UNII Band 2A) - Ch. 52)



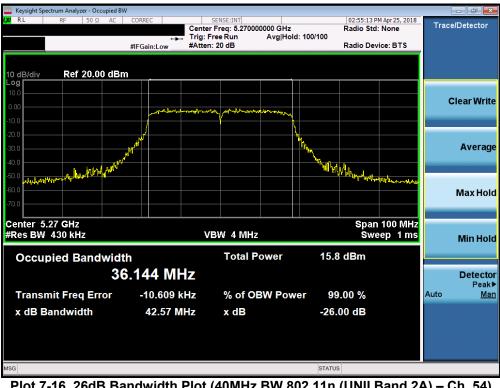
Plot 7-14. 26dB Bandwidth Plot (20MHz BW 802.11n (UNII Band 2A) - Ch. 56)

FCC ID: ZNFX410CS		MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
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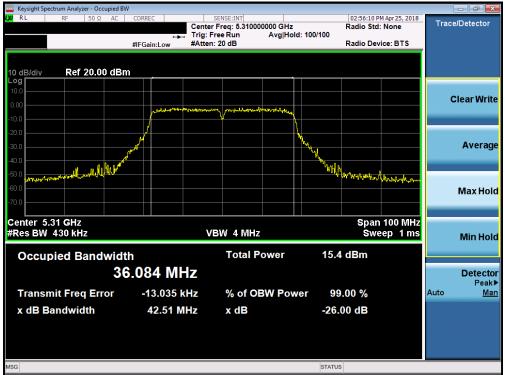
Plot 7-15. 26dB Bandwidth Plot (20MHz BW 802.11n (UNII Band 2A) - Ch. 64)



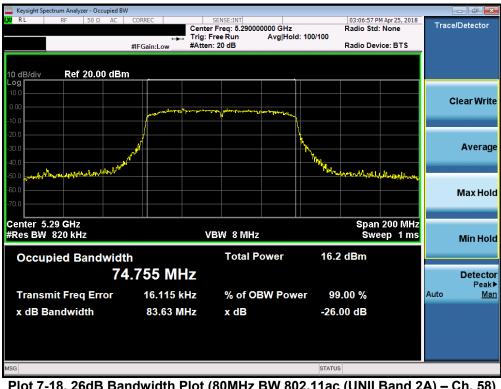
Plot 7-16. 26dB Bandwidth Plot (40MHz BW 802.11n (UNII Band 2A) – Ch. 54)

FCC ID: ZNFX410CS		MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 22 of 00
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Plot 7-17. 26dB Bandwidth Plot (40MHz BW 802.11n (UNII Band 2A) - Ch. 62)



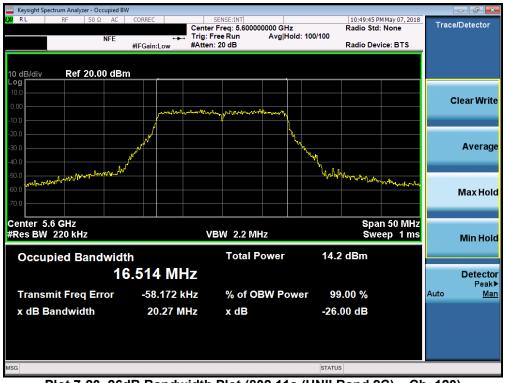
Plot 7-18. 26dB Bandwidth Plot (80MHz BW 802.11ac (UNII Band 2A) - Ch. 58)

FCC ID: ZNFX410CS		MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 22 of 00
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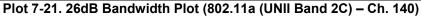


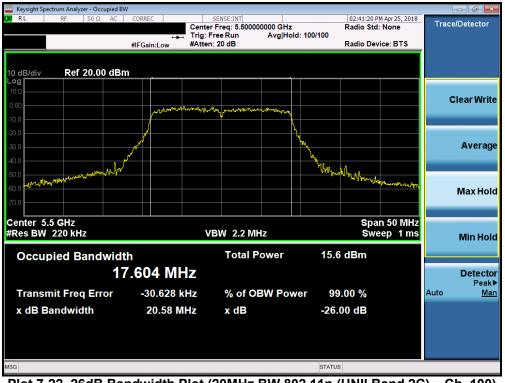
Plot 7-20. 26dB Bandwidth Plot (802.11a (UNII Band 2C) - Ch. 120)

FCC ID: ZNFX410CS		MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dega 24 of 00
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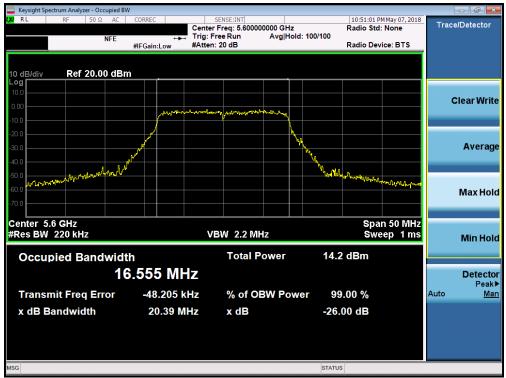




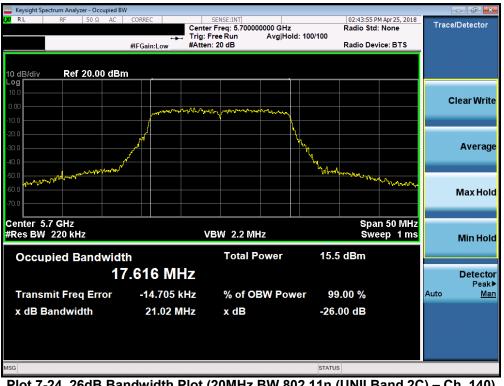
Plot 7-22. 26dB Bandwidth Plot (20MHz BW 802.11n (UNII Band 2C) - Ch. 100)

FCC ID: ZNFX410CS		MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 25 of 00
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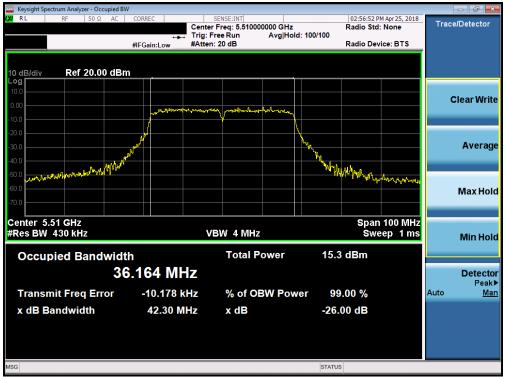
Plot 7-23. 26dB Bandwidth Plot (20MHz BW 802.11n (UNII Band 2C) - Ch. 120)



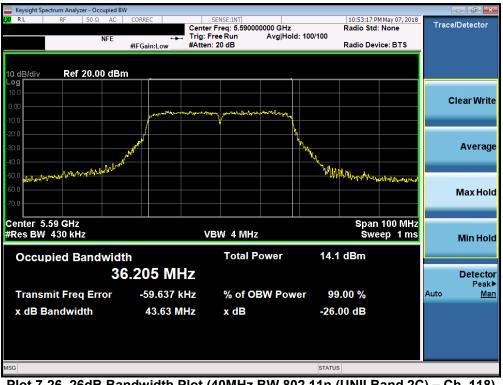
Plot 7-24. 26dB Bandwidth Plot (20MHz BW 802.11n (UNII Band 2C) - Ch. 140)

FCC ID: ZNFX410CS		MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 26 of 00
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Plot 7-25. 26dB Bandwidth Plot (40MHz BW 802.11n (UNII Band 2C) - Ch. 102)



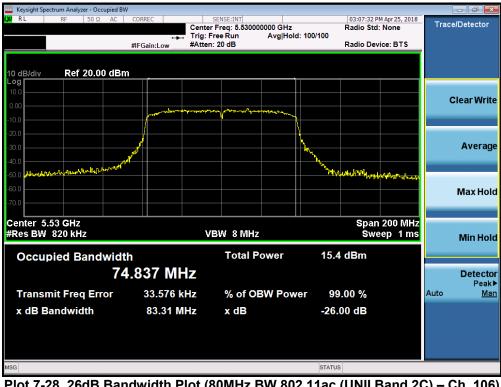
Plot 7-26. 26dB Bandwidth Plot (40MHz BW 802.11n (UNII Band 2C) - Ch. 118)

FCC ID: ZNFX410CS		MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 27 of 00
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Plot 7-27. 26dB Bandwidth Plot (40MHz BW 802.11n (UNII Band 2C) - Ch. 134)



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

FCC ID: ZNFX410CS		MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 28 of 00
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Keysight Spectrum Analyzer - Occupied BV					
X/RL RF 50Ω AC	CORREC Cente	SENSE:INT r Freg: 5.61000000 GH	Ηz	10:56:37 PM May 07, 2 Radio Std: None	Trace/Detector
NFE		Free Run Avg H n: 20 dB	lold: 100/100	Radio Device: BTS	
	#IFGain:Low #Atter	1. 20 08		Radio Device. B13	
10 dB/div Ref 20.00 dBn					
10.0					Clear Wr
0.00	المور و معید الرو الم و معید الرو ال	man anterior and	_		Clear Wr
10.0	- from the second				
20.0			- <u>\</u>		
30.0	A				Avera
40.0	/*		- IN		
50.0 wall walter mal the physical and the			"hulab	where helpedown and property and	*** *
60.0					Max Ho
-70.0					
Center 5.61 GHz				Span 200 M	Hz
Res BW 820 kHz	v	BW 8 MHz		Sweep 1 r	
Occupied Bandwidt		Total Power	15.1	dBm	
74	.764 MHz				Detect
Transmit Freq Error	-2.305 kHz	% of OBW Po	ower 99.	00 %	Pea Auto <u>M</u>
x dB Bandwidth	83.58 MHz	x dB	-26.0		
	03.30 MHZ	X UB	-20.0	U UB	
sg			STATUS		

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

FCC ID: ZNFX410CS		MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
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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

- 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 <u>></u> 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.

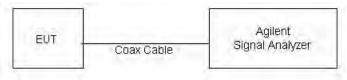


Figure 7-2. Test Instrument & Measurement Setup

Test Notes

None.

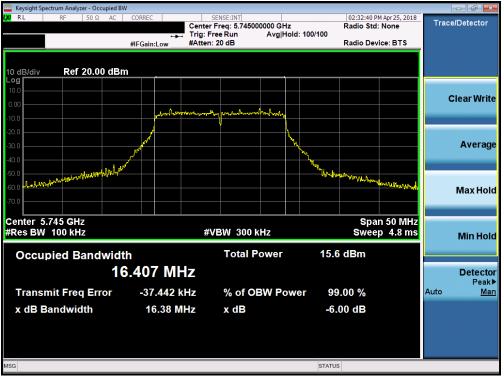
FCC ID: ZNFX410CS		MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 20 of 00
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6 dB Bandwidth Measurements

	Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	Measured 6dB Bandwidth [MHz]
	5745	149	а	6	16.38
	5785	157	а	6	16.33
	5825	165	а	6	16.35
e	5745	149	n (20MHz)	6.5/7.2 (MCS0)	16.73
Band	5785	157	n (20MHz)	6.5/7.2 (MCS0)	16.74
ä	5825	165	n (20MHz)	6.5/7.2 (MCS0)	16.98
	5755	151	n (40MHz)	13.5/15 (MCS0)	34.56
	5795	159	n (40MHz)	13.5/15 (MCS0)	35.22
	5775	155	ac (80MHz)	29.3/32.5 (MCS0)	75.35

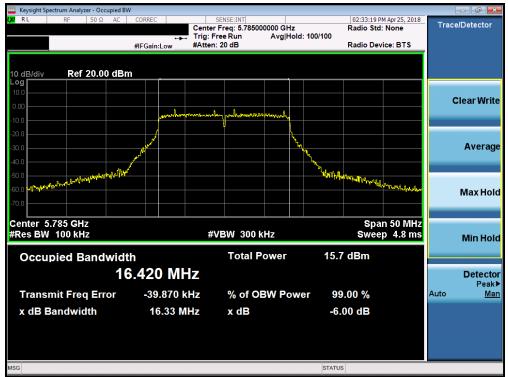
Table 7-3. Conducted Bandwidth Measurements

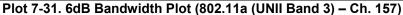


Plot 7-30. 6dB Bandwidth Plot (802.11a (UNII Band 3) - Ch. 149)

FCC ID: ZNFX410CS		MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
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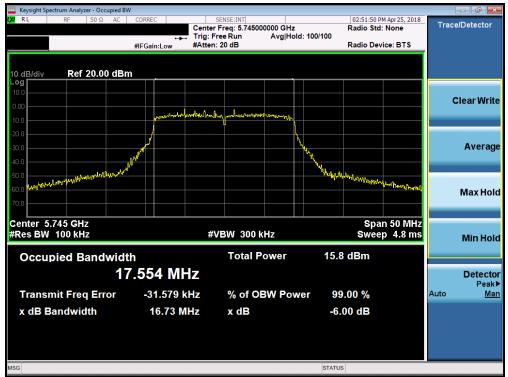


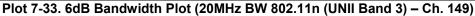


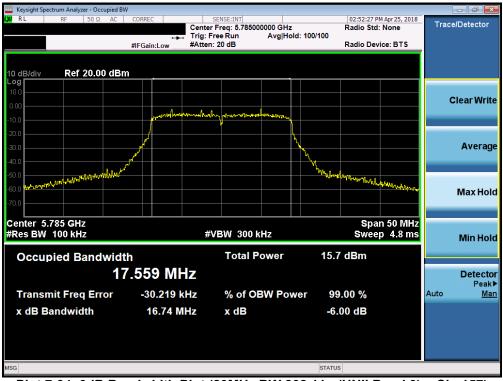
Plot 7-32. 6dB Bandwidth Plot (802.11a (UNII Band 3) - Ch. 165)

FCC ID: ZNFX410CS		MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 22 of 00
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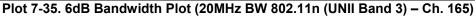


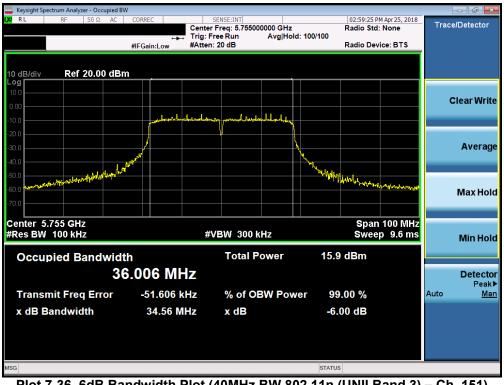
Plot 7-34. 6dB Bandwidth Plot (20MHz BW 802.11n (UNII Band 3) - Ch. 157)

FCC ID: ZNFX410CS		MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
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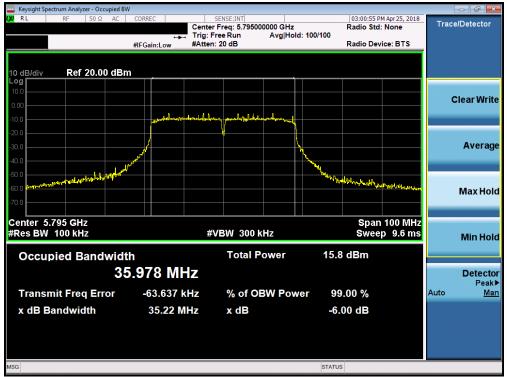


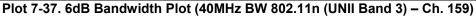


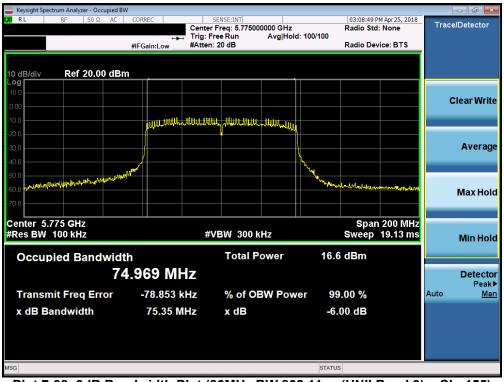
Plot 7-36. 6dB Bandwidth Plot (40MHz BW 802.11n (UNII Band 3) - Ch. 151)

FCC ID: ZNFX410CS		MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
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Plot 7-38. 6dB Bandwidth Plot (80MHz BW 802.11ac (UNII Band 3) - Ch. 155)

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Test Report S/N:	Test Dates:	EUT Type:		Dage 25 of 00
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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 5.25 – 5.35GHz band, the maximum permissible conducted output power is the lesser of 250mW (23.98dBm) and 11 dBm + $10log_{10}(26dB BW) = 11 dBm + <math>10log_{10}(20.40) = 24.10dBm$.

In the 5.47 – 5.725GHz band, the maximum permissible conducted output power is the lesser of 250mW (23.98dBm) and 11 dBm + $10\log_{10}(26dB BW) = 11 dBm + 10\log_{10}(20.24) = 24.06dBm$.

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

Test Settings

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

Test Setup

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

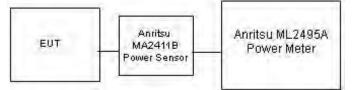


Figure 7-3. Test Instrument & Measurement Setup

Test Notes

None

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)	Freq [MHz] Channel		Freq [MHz] Channel Detector		IEEE	Transmission	Mode	Conducted Power Limit	Conducted Power
Ţ,				802.11a	802.11n	802.11ac	[dBm]	Margin [dB]	
id	5180	36	AVG	10.22	10.30	10.35	23.98	-13.63	
3	5200	40	AVG	10.16	10.29	10.25	23.98	-13.69	
p	5220	44	AVG	10.07	10.05	10.11	23.98	-13.87	
Bandwidth	5240	48	AVG	10.15	10.31	10.24	23.98	-13.67	
	5260	52	AVG	10.19	10.30	10.15	23.98	-13.68	
Hz	5280	56	AVG	10.11	10.32	10.05	23.98	-13.66	
4	5300	60	AVG	10.08	10.10	10.01	23.98	-13.88	
(20M	5320	64	AVG	10.17	10.28	10.16	23.98	-13.70	
5	5500	100	AVG	10.31	10.26	10.29	23.98	-13.67	
Hz	5600	120	AVG	9.88	9.73	9.88	23.98	-14.10	
Ъ Ч	5700	140	AVG	9.69	9.91	9.75	23.98	-14.07	
50	5745	149	AVG	9.87	9.86	9.92	30.00	-20.08	
	5785	157	AVG	9.70	9.67	9.68	30.00	-20.30	
	5825	165	AVG	9.60	9.63	9.64	30.00	-20.36	

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

	Freq [MHz]	Channel	Detector	IEEE Transn	nission Mode	Conducted Power Limit	Conducted Power
N				802.11n	802.11ac	[dBm]	Margin [dB]
T	5190	38	AVG	9.82	9.44	23.98	-14.16
Ę₹	5230	46	AVG	9.77	9.38	23.98	-14.21
(40MI width	5270	54	AVG	9.72	9.42	23.98	-14.26
\mathbf{T}	5310	62	AVG	9.64	9.36	23.98	-14.34
Hz and	5510	102	AVG	9.72	9.52	23.98	-14.26
См	5590	118	AVG	9.67	9.38	23.98	-14.31
Ŝ	5670	134	AVG	9.40	9.15	23.98	-14.58
	5755	151	AVG	9.24	9.03	30.00	-20.76
	5795	159	AVG	9.26	8.96	30.00	-20.74

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

5GHz (80MHz Bandwidth)	Freq [MHz]	Channel	Detector	IEEE Transmission <u>Mode</u> 802.11ac	Conducted Power Limit [dBm]	Conducted Power Margin [dB]
801 vid	5210	42	AVG	9.64	23.98	-14.34
) zl	5290	58	AVG	9.59	23.98	-14.39
G F Bai	5530	106	AVG	9.46	23.98	-14.52
- N	5610	122	AVG	9.4	23.98	-14.58
	5775	155	AVG	9.09	30.00	-20.91

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

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7.5 Maximum Power Spectral Density – 802.11a/n/ac §15.407(a.1.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, 5.25 – 5.35GHz, 5.47 – 5.725GHz bands, the maximum permissible power spectral density is 11dBm/MHz.

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

Test Procedure Used

ANSI C63.10-2013 – Section 12.3.2.2 KDB 789033 D02 v02r01 – Section F

Test Settings

- 1. Analyzer was set to the center frequency of the UNII channel under investigation
- 2. Span was set to encompass the entire emission bandwidth of the signal
- 3. RBW = 1MHz
- 4. VBW = 3MHz
- 5. Number of sweep points $\geq 2 \times (\text{span/RBW})$
- 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.

FUT		Agilent Signal Analyzer
EUT .	Coax Cable	 Signal Analyzer

Figure 7-4. Test Instrument & Measurement Setup

Test Notes

None

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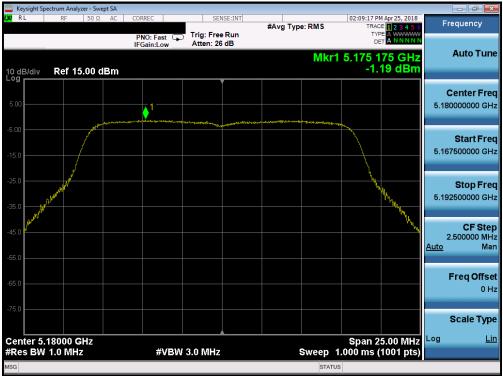


	Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	Measured Power Density [dBm]	Max Power Density [dBm/MHz]	Margin [dB]
	5180	36	а	6	-1.19	11.0	-12.19
	5200	40	а	6	-1.33	11.0	-12.33
	5240	48	а	6	-1.46	11.0	-12.46
-	5180	36	n (20MHz)	6.5/7.2 (MCS0)	-1.73	11.0	-12.73
Band 1	5200	40	n (20MHz)	6.5/7.2 (MCS0)	-2.06	11.0	-13.06
ä	5240	48	n (20MHz)	6.5/7.2 (MCS0)	-1.86	11.0	-12.86
	5190	38	n (40MHz)	13.5/15 (MCS0)	-5.13	11.0	-16.13
	5230	46	n (40MHz)	13.5/15 (MCS0)	-5.38	11.0	-16.38
	5210	42	ac (80MHz)	29.3/32.5 (MCS0)	-8.49	11.0	-19.49
	5260	52	а	6	-1.53	11.0	-12.53
	5280	56	а	6	-1.47	11.0	-12.47
	5320	64	а	6	-1.37	11.0	-12.37
2A	5260	52	n (20MHz)	6.5/7.2 (MCS0)	-1.89	11.0	-12.89
Band 2A	5280	56	n (20MHz)	6.5/7.2 (MCS0)	-1.80	11.0	-12.80
Ba	5320	64	n (20MHz)	6.5/7.2 (MCS0)	-1.86	11.0	-12.86
	5270	54	n (40MHz)	13.5/15 (MCS0)	-4.93	11.0	-15.93
	5310	62	n (40MHz)	13.5/15 (MCS0)	-5.12	11.0	-16.12
	5290	58	ac (80MHz)	29.3/32.5 (MCS0)	-8.31	11.0	-19.31
	5500	100	а	6	-1.74	11.0	-12.74
	5600	120	а	6	-2.78	11.0	-13.78
	5700	140	а	6	-1.87	11.0	-12.87
	5500	100	n (20MHz)	6.5/7.2 (MCS0)	-1.87	11.0	-12.87
2C	5600	120	n (20MHz)	6.5/7.2 (MCS0)	-2.71	11.0	-13.71
Band 2C	5700	140	n (20MHz)	6.5/7.2 (MCS0)	-2.04	11.0	-13.04
Ba	5510	102	n (40MHz)	13.5/15 (MCS0)	-5.50	11.0	-16.50
	5590	118	n (40MHz)	13.5/15 (MCS0)	-6.35	11.0	-17.35
	5670	134	n (40MHz)	13.5/15 (MCS0)	-5.29	11.0	-16.29
	5530	106	ac (80MHz)	29.3/32.5 (MCS0)	-9.22	11.0	-20.22
	5610	122	ac (80MHz)	29.3/32.5 (MCS0)	-9.47	11.0	-20.47

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

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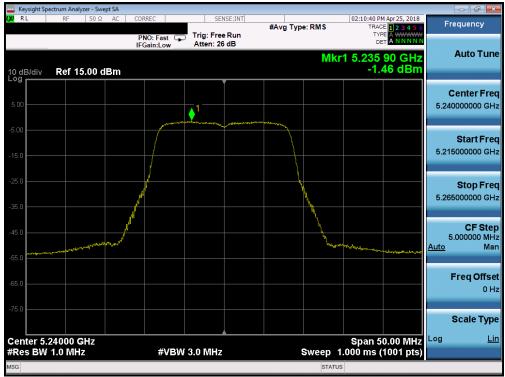
Plot 7-39. Power Spectral Density Plot (802.11a (UNII Band 1) - Ch. 36)



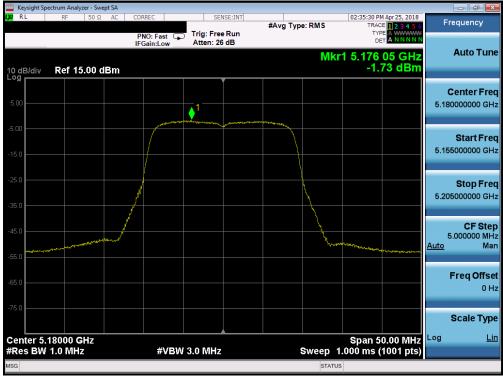
Plot 7-40. Power Spectral Density Plot (802.11a (UNII Band 1) - Ch. 40)

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Plot 7-41. Power Spectral Density Plot (802.11a (UNII Band 1) – Ch. 48	Plot 7-41.	Power Sp	ectral Density	v Plot (802.11a	(UNII Band 1) - Ch. 48
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Plot 7-42. Power Spectral Density Plot (20MHz BW 802.11n (UNII Band 1) - Ch. 36)

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🤤 Keysight Spectrum Analyzer - Si					
LX RL RF 50 9	Ω AC CORREC	SENSE:INT	#Avg Type: RMS	02:36:11 PM Apr 25, 2018 TRACE 1 2 3 4 5 6	Frequency
	PNO: Fast 🕞 IFGain:Low	Trig: Free Run Atten: 26 dB		TYPE A WWWWW DET A NNNNN	Auto Tune
10 dB/div Ref 15.00	dBm		Mkr	1 5.195 55 GHz -2.06 dBm	Auto Tune
5.00		↓1			Center Freq 5.200000000 GHz
-5.00					Start Freq 5.175000000 GHz
-25.0	- Wed		have been a second seco		Stop Freq 5.225000000 GHz
-45.0				alling to the second	CF Step 5.000000 MHz <u>Auto</u> Mar
-65.0					Freq Offset 0 Hz
-75.0					Scale Type
Center 5.20000 GHz #Res BW 1.0 MHz	#VBW	3.0 MHz	Sweep 1	Span 50.00 MHz .000 ms (1001 pts)	Log <u>Lin</u>
MSG			STATUS	3	

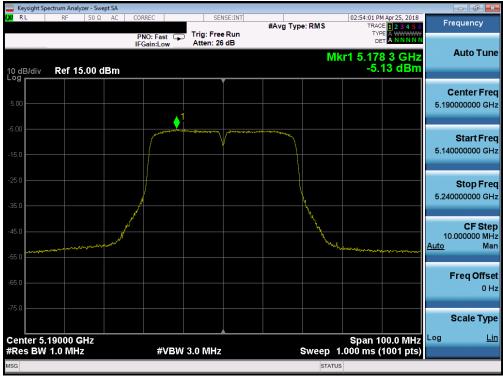
Plot 7-43. Power Spectral Density Plot (20MHz BW 802.11n (UNII Band 1) - Ch. 40)



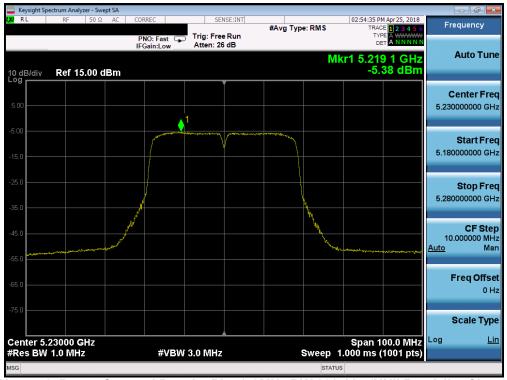
Plot 7-44. Power Spectral Density Plot (20MHz BW 802.11n (UNII Band 1) - Ch. 48)

FCC ID: ZNFX410CS		MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
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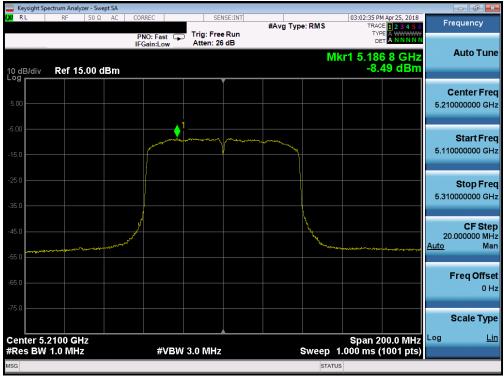
Plot 7-45. Power Spectral Density Plot (40MHz BW 802.11n (UNII Band 1) - Ch. 38)



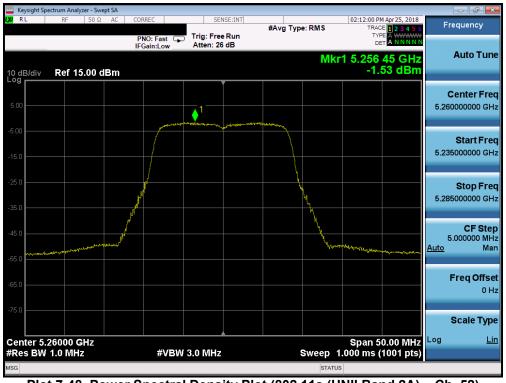
Plot 7-46. Power Spectral Density Plot (40MHz BW 802.11n (UNII Band 1) - Ch. 46)

FCC ID: ZNFX410CS		MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
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Plot 7-47. Power Spectral Density Plot (80MHz BW 802.11ac (UNII Band 1) - Ch. 42)



Plot 7-48. Power Spectral Density Plot (802.11a (UNII Band 2A) - Ch. 52)

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	oectrum Analyzer - S						
XI RL	RF 50 9	P	RREC NO: Fast 😱 Gain:Low	SENSE:INT Trig: Free Run Atten: 26 dB	#Avg Type: RMS	02:24:54 PM Apr 25, 2018 TRACE 1 2 3 4 5 6 TYPE A WWWW DET A N N N N N	Frequency
10 dB/div Log	Ref 15.00		Gain:Low	Atten: 20 dB	Mk	r1 5.274 70 GHz -1.47 dBm	Auto Tune
5.00				1	shine-himper.		Center Fred 5.280000000 GHz
-5.00							Start Fred 5.255000000 GH;
-25.0							Stop Fred 5.305000000 GH;
-45.0	Mart and a stranger of the first	an a			\	and the second of the second o	CF Step 5.000000 MH: <u>Auto</u> Mar
65.0							Freq Offse 0 H
-75.0 Center 5	.28000 GHz					Span 50.00 MHz	Scale Type
#Res BW	1.0 MHz		#VBW	3.0 MHz	Sweep	1.000 ms (1001 pts)	
MSG					STATU	IS	

Plot 7-49. Power Spectral Density Plot (802.11a (UNII Band 2A) – Ch. 56)



Plot 7-50. Power Spectral Density Plot (802.11a (UNII Band 2A) - Ch. 64)

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🔤 Keysight Spectrum Analyzer - Swej					
Χ RL RF 50 Ω	AC CORREC	SENSE:INT	#Avg Type: RMS	02:38:00 PM Apr 25, 2018 TRACE 1 2 3 4 5 6	Frequency
		Trig: Free Run Atten: 26 dB		DET A WWWWW	
10 dB/div Ref 15.00 d	Bm		Mkı	1 5.256 15 GHz -1.89 dBm	Auto Tune
5.00		1			Center Fred 5.260000000 GH;
-5.00					Start Free 5.235000000 GH
-25.0					Stop Free 5.285000000 GH:
-45.0	conset			Willing the stand of the stand	CF Stej 5.000000 MH <u>Auto</u> Ma
-65.0					Freq Offse 0 H
-75.0					Scale Type
Center 5.26000 GHz #Res BW 1.0 MHz	#VBW 3	.0 MHz	Sweep 1	Span 50.00 MHz .000 ms (1001 pts)	Log <u>Lir</u>
MSG			STATU		

Plot 7-51. Power Spectral Density Plot (20MHz BW 802.11n (UNII Band 2A) - Ch. 52)



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Odd B/div Ref 15.00 dBm -1.86 dBm 600 -1.86 dBm -1.86 dBm 610 -1.86 dBm -1.86 dBm 620 -1.86 dBm -1.86 dBm 650 -1.86 dBm -1.86 dBm	🔤 Keysight Spectrum Analyz							
Industry Mikr1 5.315 20 GHz Auto Tun 0 dB/div Ref 15.00 dBm -1.86 dBm Center Fre 5.00 -1.86 dBm 5.32000000 GH Start Fre 5.00 -1.86 dBm -1.86 dBm Start Fre 5.00 -1.86 dBm -1.86 dBm Start Fre 5.00 -1.86 dBm -1.86 dBm Start Fre 5.00 -1.90 -1.90 -1.90 Start Fre 5.000000 GH -1.90 -1.90 -1.90 Start Fre 5.000000 HHz -1.90 -1.90 -1.90 -1.90 -1.90 Start Fre 5.34500000 GH -1.90 -1.90 -1.90 -1.90 -1.90 Start Fre -1.90 -	XURL RF	PN	0: Fast 🕞 Trig: F	ree Run	#Avg Type	RMS	TRACE 1 2 3 4 5	6 Frequency
Center Fre 5.32000000 GH 5.29500000 GH 5.2950000 GH 5.2950000 GH 5.2950000 GH 5.2950000 GH 5.2950000 GH 5.295000 G	10 dB/div Ref 15.		am:Low Atten.	20 00		Mkr	5.315 20 GH	Auto Tune
150 Start Fre 150 Stop Fre 250 Stop Fre 200 Stop Fre <td>5.00</td> <td></td> <td>1</td> <td></td> <td>mg/ headfand date</td> <td></td> <td></td> <td>Center Free 5.320000000 GH</td>	5.00		1		mg/ headfand date			Center Free 5.320000000 GH
Stop Fre 5.34500000 GH CF Ste 5.00000 MH Auto Mato Mato Scale Typ Log Log Log Log Log	-5.00							Start Fre 5.295000000 GH
Auto 5.000000 MH Auto Ma Freq Offse 0 H Scale Typ Center 5.32000 GHz Res BW 1.0 MHz #VBW 3.0 MHz Sweep 1.000 ms (1001 pts)	-25.0					A A A A A A A A A A A A A A A A A A A		Stop Fre 5.345000000 GH
550 750 Senter 5.32000 GHz Res BW 1.0 MHz #VBW 3.0 MHz Sweep 1.000 ms (1001 pts)	45.0	~~~				har and the second seco	and and and a second	5.000000 MH
Center 5.32000 GHz Res BW 1.0 MHz #VBW 3.0 MHz Sweep 1.000 ms (1001 pts)	65.0							
Res BW 1.0 MHz #VBW 3.0 MHz Sweep 1.000 ms (1001 pts)	Center 5.32000 G						Span 50.00 MH	z Log <u>Li</u>
	#Res BW 1.0 MHz		#VBW 3.0 MH	Iz	8	Sweep 1.	000 ms (1001 pts	

Plot 7-53. Power Spectral Density Plot (20MHz BW 802.11n (UNII Band 2A) - Ch. 64)

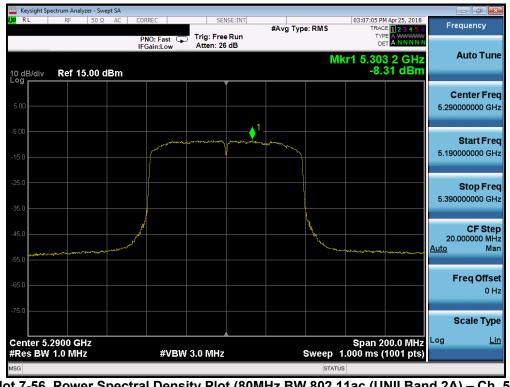


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Keysight Spectrum Analy						– é ×
LXI RL RF	50 Ω AC CC	ORREC	SENSE:INT	#Avg Type: RM		
	F	NO: Fast 🖵 Gain:Low	Trig: Free Run Atten: 26 dB		DET A NNNN	N
40 JEAN Dof 4	5.00 dBm				Mkr1 5.298 0 GHz -5.12 dBm	Auto Tune
10 dB/div Ref 1:	5.00 dBm				0.12 001	
						Center Free
5.00		▲1				5.310000000 GH
-5.00		(manual man		ware a free man and a free free free free free free free fr		Start Free
-15.0			V			5.26000000 GH
-25.0						Stop Fre
-35.0		Å		L X		5.360000000 GH
-35.0	× ×			- Article - Arti		
-45.0				- Mr.		CF Ste 10.000000 MH
and the second and th	and a star and a star and a star a				Veryman where man for an and when the	Auto Ma
-55.0						-
-65.0						Freq Offse
						0 H
-75.0						Out Tra
						Scale Typ
Center 5.31000 C					Span 100.0 MHz	Log <u>Li</u>
#Res BW 1.0 MH	Z	#VBW	3.0 MHz		ep 1.000 ms (1001 pts	
ISG					STATUS	

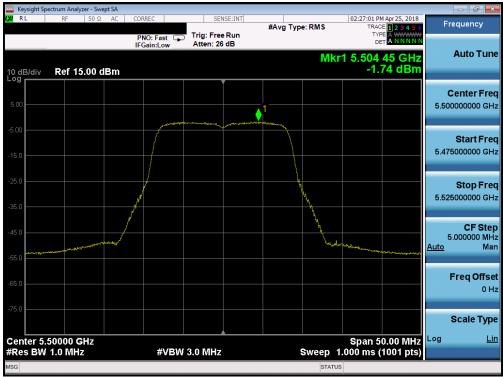
Plot 7-55. Power Spectral Density Plot (40MHz BW 802.11n (UNII Band 2A) - Ch. 62)



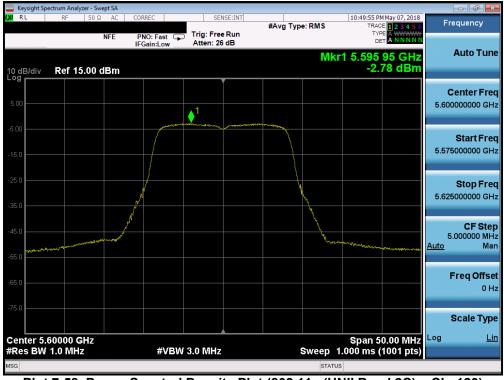
Plot 7-56. Power Spectral Density Plot (80MHz BW 802.11ac (UNII Band 2A) - Ch. 58)

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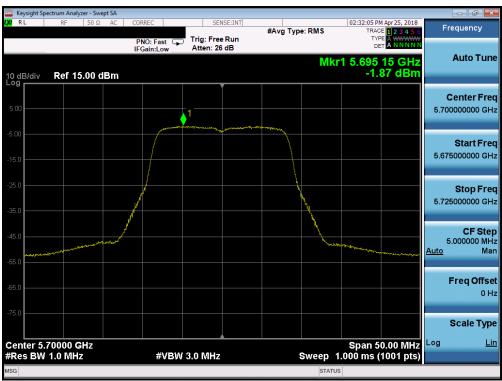




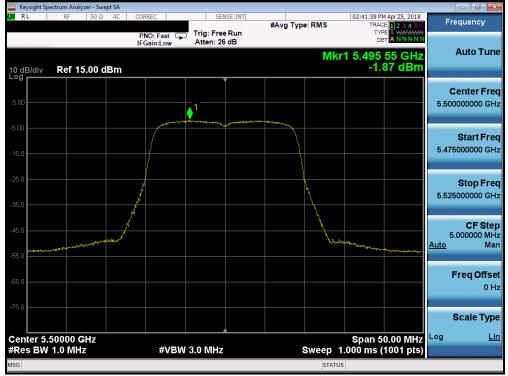
Plot 7-58. Power Spectral Density Plot (802.11a (UNII Band 2C) - Ch. 120)

FCC ID: ZNFX410CS		MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
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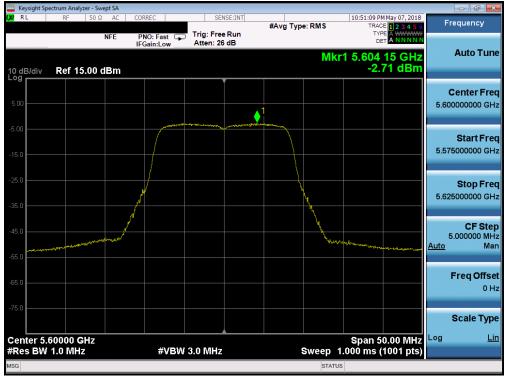
Plot 7-59. Power Spectral Density Plot (802.11a (UNII Band 2C) – Ch. 140
--



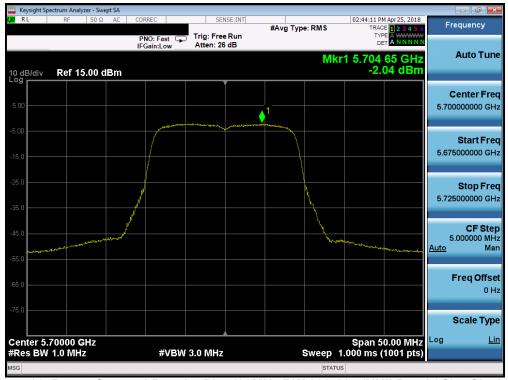
Plot 7-60. Power Spectral Density Plot (20MHz BW 802.11n (UNII Band 2C) - Ch. 100)

FCC ID: ZNFX410CS		MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
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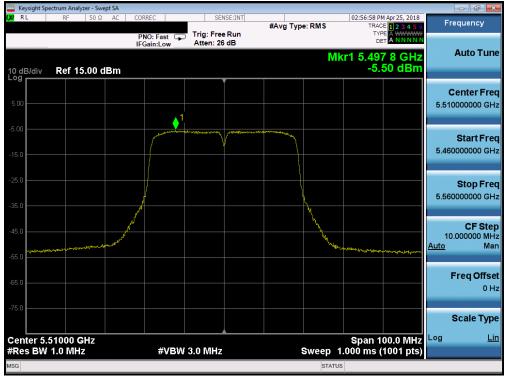
Plot 7-61. Power Spectral Density Plot (20MHz BW 802.11n (UNII Band 2C) – Ch. 120)



Plot 7-62. Power Spectral Density Plot (20MHz BW 802.11n (UNII Band 2C) - Ch. 140)

FCC ID: ZNFX410CS		MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager	
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Plot 7-63. Power Spectral Density Plot (40MHz BW 802.11n (UNII Band 2C) – Ch. 102)



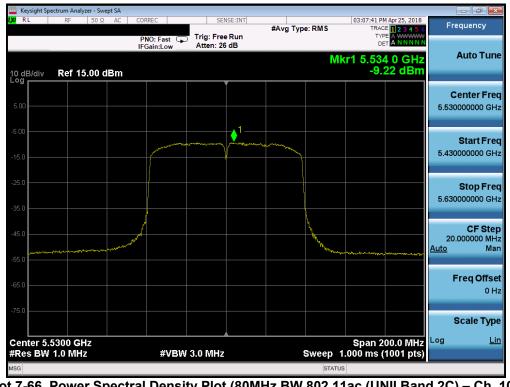
Plot 7-64. Power Spectral Density Plot (40MHz BW 802.11n (UNII Band 2C) - Ch. 118)

FCC ID: ZNFX410CS		MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
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	rum Analyzer - Sw										
X/RL	RF 50 Ω	AC C	ORREC		ISE:INT	#Avg Typ	e: RMS	TRA	PM Apr 25, 2018 ACE 1 2 3 4 5 6	Frequ	iency
			PNO: Fast 🖵 FGain:Low	Atten: 26				T			
10 dB/div Log	Ref 15.00 (dBm					Μ	kr1 5.65 -5	58 2 GHz .29 dBm	AL	ito Tune
										Cer	iter Fred
5.00			1							5.67000	0000 GH
-5.00			(marked	mannen						Si	art Fre
-15.0										5.62000	0000 GH
-25.0										S	top Fre
-35.0			/				V A				0000 GH
		Å					H. H.				CF Ste
-45.0	and a state of the	and a constant					A A A A A A A A A A A A A A A A A A A	Stra Maralana Angelan	hannen		0000 MH Ma
										Fre	qOffse
-65.0											он
-75.0										80	ale Typ
				ļ,							uie ryp <u>Li</u>
Center 5.67 Res BW 1			#VBW	3.0 MHz			Sweep	Span 1.000 ms	100.0 MHz (1001 pts)	LUg	
ISG							STAT	JS			

Plot 7-65. Power Spectral Density Plot (40MHz BW 802.11n (UNII Band 2C) - Ch. 134)



Plot 7-66. Power Spectral Density Plot (80MHz BW 802.11ac (UNII Band 2C) - Ch. 106)

FCC ID: ZNFX410CS		MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
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		zer - Swept SA						
XI RL	RF	50 Ω AC	CORREC PNO: Fast	Trig: Free Run Atten: 26 dB	#Avg Type	e: RMS	10:56:49 PM May 07, 2018 TRACE 1 2 3 4 5 6 TYPE A WWWWW DET A NNNN	Frequency
10 dB/div	Ref 15	.00 dBm	in Gameow			Mk	r1 5.612 8 GHz -9.47 dBm	Auto Tune
5.00								Center Fred 5.610000000 GH:
-5.00				,	manage and and the second			Start Fre 5.510000000 GH
-25.0								Stop Fre 5.710000000 GH
45.0 55.0	and the state of the	n-general activities	or mark			h h h h h h h h h h h h h h h h h h h	angene-balligen, barreterergenge	СF Ste 20.000000 МН <u>Auto</u> Ма
65.0								Freq Offse 0 H
-75.0 Center 5.	6100 GH	7					Span 200.0 MHz	Scale Type
#Res BW			#VBW	3.0 MHz	\$	Sweep 1	.000 ms (1001 pts)	
ISG						STATUS		

Plot 7-67. Power Spectral Density Plot (80MHz BW 802.11ac (UNII Band 2C) – Ch. 122)

FCC ID: ZNFX410CS		MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
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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]
	5745	149	а	6	-4.61	30.0	-34.61
	5785	157	а	6	-4.56	30.0	-34.56
	5825	165	а	6	-4.51	30.0	-34.51
e	5745	149	n (20MHz)	6.5/7.2 (MCS0)	-4.86	30.0	-34.86
Band	5785	157	n (20MHz)	6.5/7.2 (MCS0)	-4.68	30.0	-34.68
ä	5825	165	n (20MHz)	6.5/7.2 (MCS0)	-4.82	30.0	-34.82
	5755	151	n (40MHz)	13.5/15 (MCS0)	-8.24	30.0	-38.24
	5795	159	n (40MHz)	13.5/15 (MCS0)	-8.38	30.0	-38.38
	5775	155	ac (80MHz)	29.3/32.5 (MCS0)	-8.58	30.0	-38.58

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



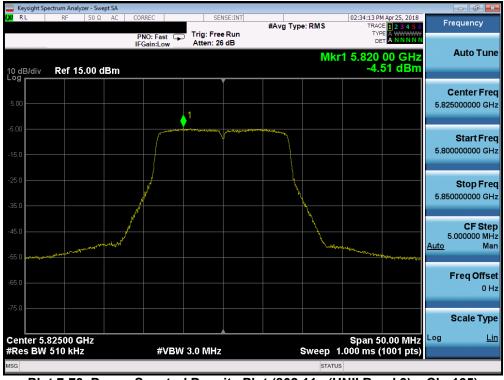
Plot 7-68. Power Spectral Density Plot (802.11a (UNII Band 3) - Ch. 149)

FCC ID: ZNFX410CS		MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
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Keysight Spectrum Analyzer - :					
XIRL RF 50	Ω AC CORREC	SENSE:INT	#Avg Type: RMS	02:33:32 PM Apr 25, 2018 TRACE 1 2 3 4 5 6 TYPE A WWWW DET A N N N N N	Frequency
	IFGain:Low	Atten: 26 dB			Auto Tune
10 dB/div Ref 15.00) dBm		Mki	r1 5.780 10 GHz -4.56 dBm	Autorune
5.00		1			Center Fred 5.785000000 GH:
-5.00		**************************************			Start Fre 5.760000000 GH
-25.0					Stop Free 5.810000000 GH
-45.0			- Out	and the second second second second	CF Stej 5.000000 MH <u>Auto</u> Ma
-65.0					Freq Offse 0 H
-75.0					Scale Typ
Center 5.78500 GHz #Res BW 510 kHz		3.0 MHz	Sweep 7	Span 50.00 MHz 1.000 ms (1001 pts)	Log <u>Li</u>
ASG			STATU		

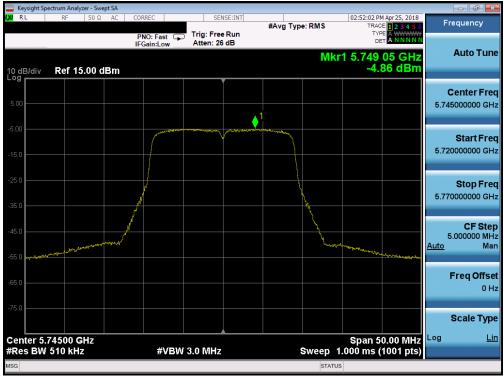




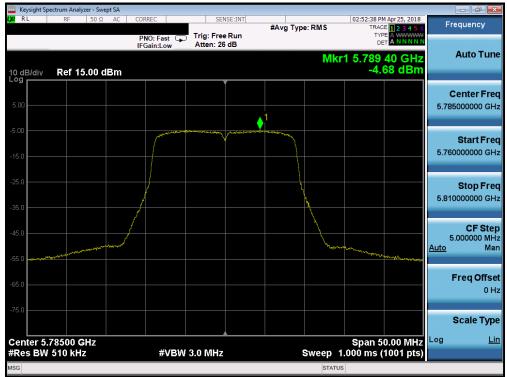
Plot 7-70. Power Spectral Density Plot (802.11a (UNII Band 3) - Ch. 165)

FCC ID: ZNFX410CS		MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
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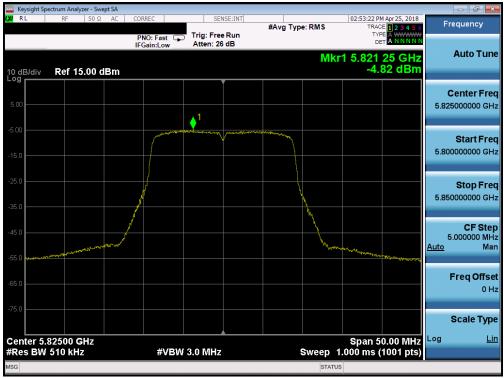
Plot 7-71. Power Spectral Density Plot (20MHz BW 802.11n (UNII Band 3) - Ch. 149)



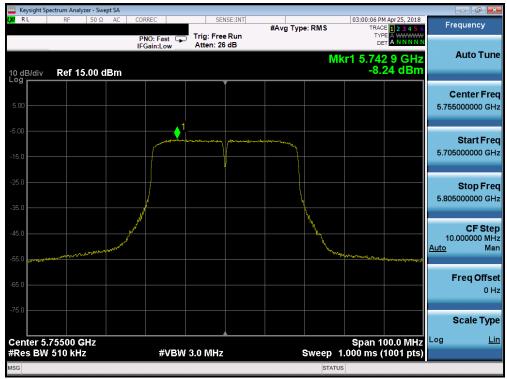
Plot 7-72. Power Spectral Density Plot (20MHz BW 802.11n (UNII Band 3) - Ch. 157)

FCC ID: ZNFX410CS		MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager	
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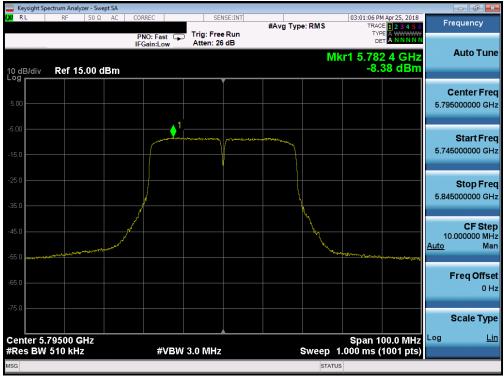
Plot 7-73. Power Spectral Density Plot (20MHz BW 802.11n (UNII Band 3) - Ch. 165)



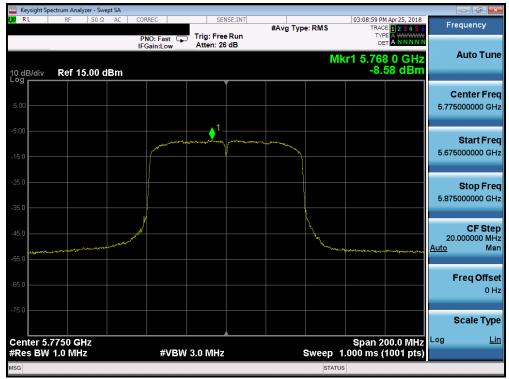
Plot 7-74. Power Spectral Density Plot (40MHz BW 802.11n (UNII Band 3) - Ch. 151)

FCC ID: ZNFX410CS		MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager	
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Plot 7-75. Power Spectral Density Plot (40MHz BW 802.11n (UNII Band 3) - Ch. 159)



Plot 7-76. Power Spectral Density Plot (80MHz BW 802.11ac (UNII Band 3) - Ch. 155)

FCC ID: ZNFX410CS		MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
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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 and 5.25-5.35 GHz band: 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 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 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 5 MHz above or below 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 7-9 per Section 15.209 and RSS-Gen (8.9).

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

Table 7-9. 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 $\geq 2 \times \text{span/RBW}$)
- 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.

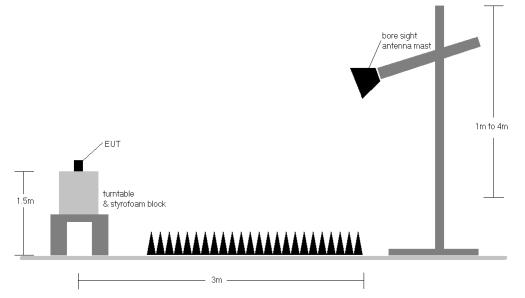


Figure 7-5. Test Instrument & Measurement Setup

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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 7-9.
- 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 7-9. 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 with its standard battery.
- 5. The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter using CISPR quasi peak detector below 1GHz. Above 1 GHz, average and peak measurements were taken using linearly polarized horn antennas. The worst-case emissions are reported however emissions whose levels were not within 20dB of the respective limits were not reported.
- 6. Emissions below 18GHz were measured at a 3 meter test distance while emissions above 18GHz were measured at a 1 meter test distance with the application of a distance correction factor.
- 7. 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.
- 8. The "-" shown in the following RSE tables are used to denote a noise floor measurement.

Sample Calculations

Determining Spurious Emissions Levels

- ο Field Strength Level [dBµV/m] = Analyzer Level [dBm] + 107 + AFCL [dB/m]
- AFCL [dB/m] = Antenna Factor [dB/m] + Cable Loss [dB]
- ο Margin [dB] = Field Strength Level [dBμV/m] Limit [dBμV/m]

Radiated Band Edge Measurement Offset

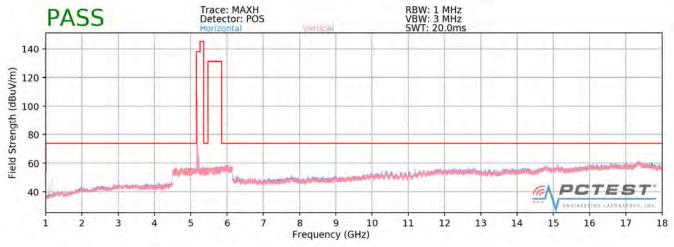
• The amplitude offset shown in the radiated restricted band edge plots in Section 7.6 was calculated using the formula:

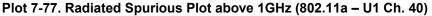
Offset (dB) = (Antenna Factor + Cable Loss + Attenuator) – Preamplifier Gain

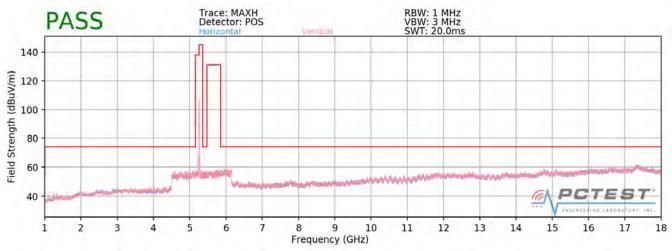
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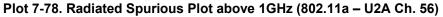


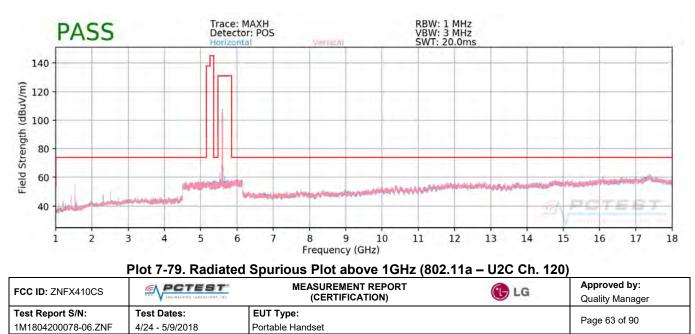
7.7.1 Radiated Spurious Emission Measurements





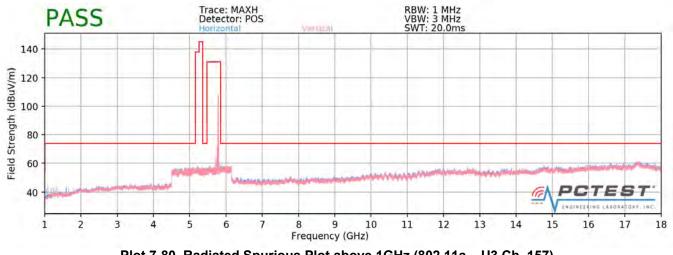






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Plot 7-80. Radiated Spurious Plot above 1GHz (802.11a - U3 Ch. 157)

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Radiated Spurious Emissions Measurements (Above 18GHz)



Plot 7-82. Radiated Spurious Plot 26.5GHz - 40GHz (802.11a)

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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 1	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	н	-	-	-71.77	11.48	0.00	46.71	68.20	-21.49
*	15540.00	Average	Н	-	-	-83.28	13.68	0.00	37.40	53.98	-16.58
*	15540.00	Peak	Н	-	-	-72.36	13.68	0.00	48.32	73.98	-25.66
*	20720.00	Average	Н	100	151	-69.17	7.94	-9.54	36.23	53.98	-17.75
*	20720.00	Peak	Н	100	151	-60.38	7.94	-9.54	45.02	73.98	-28.96
	25900.00	Peak	Н	-	-	-57.89	8.46	-9.54	48.03	68.20	-20.17

Table 7-10. Radiated Measurements

Worst Case Mode: Worst Case Transfer Rate: Distance of Measurements: Operating Frequency: Channel:

802.11a
6Mbps
1 & 3 Meters
5200MHz
40

	Frequency [MHz]	Detector	Ant. Pol. [H/V 1	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	н	-	-	-63.31	11.67	0.00	55.36	68.20	-12.84
*	15600.00	Average	Н	-	-	-75.49	13.27	0.00	44.78	53.98	-9.20
*	15600.00	Peak	Н	-	-	-63.80	13.27	0.00	56.47	73.98	-17.51
*	20800.00	Average	Н	100	150	-68.91	7.95	-9.54	36.50	53.98	-17.48
*	20800.00	Peak	Н	100	150	-60.92	7.95	-9.54	44.49	73.98	-29.49
	26000.00	Peak	Н	-	-	-58.64	8.60	-9.54	47.42	68.20	-20.78

Table 7-11. 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 1	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	н	-	-	-63.52	11.70	0.00	55.18	68.20	-13.02
*	15720.00	Average	Н	-	-	-75.54	12.83	0.00	44.29	53.98	-9.69
*	15720.00	Peak	н	-	-	-63.64	12.83	0.00	56.19	73.98	-17.79
*	20960.00	Average	Н	100	150	-69.69	7.91	-9.54	35.68	53.98	-18.30
*	20960.00	Peak	Н	100	150	-60.96	7.91	-9.54	44.41	73.98	-29.57
	26200.00	Peak	Н	-	-	-58.72	8.62	-9.54	47.36	68.20	-20.84

Table 7-12. Radiated Measurements

802.11a 6Mbps 1 & 3 Meters 5260MHz 52

	Frequency [MHz]	Detector	Ant. Pol. [H/V 1	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Distance Correction Factor [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
	10520.00	Peak	н	-	-	-63.49	11.68	0.00	55.19	68.20	-13.01
*	15780.00	Average	Н	-	-	-75.66	12.91	0.00	44.25	53.98	-9.73
*	15780.00	Peak	Н	-	-	-64.19	12.91	0.00	55.72	73.98	-18.26
*	21040.00	Average	Н	100	148	-69.37	7.92	-9.54	36.01	53.98	-17.97
*	21040.00	Peak	Н	100	148	-60.41	7.92	-9.54	44.97	73.98	-29.01
	26300.00	Peak	Н	-	-	-57.19	8.73	-9.54	49.00	68.20	-19.20

Table 7-13. Radiated Measurements

FCC ID: ZNFX410CS		MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 67 of 00
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Worst Case Mode:	802.11a
Worst Case Transfer Rate:	6Mbps
Distance of Measurements:	1 & 3 Meters
Operating Frequency:	5280MHz
Channel:	56

	Frequency [MHz]	Detector	Ant. Pol. [H/V 1	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Distance Correction Factor [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
	10560.00	Peak	Н	-	-	-63.38	11.56	0.00	55.18	68.20	-13.02
*	15840.00	Average	Н	-	-	-75.46	12.86	0.00	44.40	53.98	-9.58
*	15840.00	Peak	н	-	-	-64.12	12.86	0.00	55.74	73.98	-18.24
*	21120.00	Average	Н	100	148	-68.67	7.96	-9.54	36.75	53.98	-17.23
*	21120.00	Peak	Н	100	148	-58.86	7.96	-9.54	46.56	73.98	-27.42
	26400.00	Peak	Н	-	-	-56.98	8.94	-9.54	49.42	68.20	-18.78

Table 7-14. Radiated Measurements

802.11a 6Mbps 1 & 3 Meters 5320MHz 64

	Frequency [MHz]	Detector	Ant. Pol. [H/V 1	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Distance Correction Factor [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
*	10640.00	Average	н	-	-	-75.59	11.80	0.00	43.21	53.98	-10.77
*	10640.00	Peak	Н	-	-	-63.59	11.80	0.00	55.21	73.98	-18.77
*	15960.00	Average	Н	-	-	-75.33	13.23	0.00	44.90	53.98	-9.07
*	15960.00	Peak	Н	-	-	-63.37	13.23	0.00	56.86	73.98	-17.11
*	21280.00	Average	Н	100	148	-68.21	8.04	-9.54	37.29	53.98	-16.69
*	21280.00	Peak	Н	100	148	-59.41	8.04	-9.54	46.09	73.98	-27.89
	26600.00	Peak	Н	-	-	-49.23	-8.30	-9.54	39.92	68.20	-28.28

Table 7-15. Radiated Measurements

FCC ID: ZNFX410CS		MEASUREMENT REPORT (CERTIFICATION)	C LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dege 69 of 00
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Worst Case Mode:	802.11a			
Worst Case Transfer Rate:	6Mbps			
Distance of Measurements:	1 & 3 Meters			
Operating Frequency:	5500MHz			
Channel:	100			

	Frequency [MHz]	Detector	Ant. Pol. [H/V 1	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Distance Correction Factor [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
*	11000.00	Average	Н	-	-	-75.35	12.04	0.00	43.69	53.98	-10.29
*	11000.00	Peak	Н	-	-	-63.39	12.04	0.00	55.65	73.98	-18.33
	16500.00	Peak	Н	-	-	-63.68	12.28	0.00	55.60	68.20	-12.60
	22000.00	Peak	Н	-	-	-59.67	8.43	-9.54	46.21	68.20	-21.99
	27500.00	Peak	Н	100	147	-46.72	-8.80	-9.54	41.94	68.20	-26.26

Table 7-16. Radiated	Measurements
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802.11a 6Mbps 1 & 3 Meters 600MHz 120

	Frequency [MHz]	Detector	Ant. Pol. [H/V 1	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Distance Correction Factor [dB]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
*	11200.00	Average	н	-	-	-74.94	11.28	0.00	43.34	53.98	-10.64
*	11200.00	Peak	Н	-	-	-63.68	11.28	0.00	54.60	73.98	-19.38
	16800.00	Peak	Н	-	-	-63.35	13.32	0.00	56.97	68.20	-11.23
*	22400.00	Average	Н	-	-	-70.09	8.08	-9.54	35.45	53.98	-18.53
*	22400.00	Peak	Н	-	-	-59.88	8.08	-9.54	45.66	73.98	-28.32
	28000.00	Peak	н	100	144	-46.33	-9.08	-9.54	42.05	68.20	-26.15

Table 7-17. Radiated Measurements

FCC ID: ZNFX410CS		MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
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Worst Case Mode:	802.11a
Worst Case Transfer Rate:	6Mbps
Distance of Measurements:	1 & 3 Meters
Operating Frequency:	5700MHz
Channel:	140

	Frequency [MHz]	Detector	Ant. Pol. [H/V 1	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]
*	11400.00	Average	Н	-	-	-75.53	11.73	0.00	43.20	53.98	-10.78
*	11400.00	Peak	Н	-	-	-63.97	11.73	0.00	54.76	73.98	-19.22
	17100.00	Peak	Н	-	-	-64.00	15.44	0.00	58.44	68.20	-9.76
*	22800.00	Average	Н	100	133	-69.77	8.37	-9.54	36.06	53.98	-17.92
*	22800.00	Peak	Н	100	133	-59.77	8.37	-9.54	46.06	73.98	-27.92
	28500.00	Peak	Н	100	143	-45.98	-8.95	-9.54	42.53	68.20	-25.67

Table 7-18. Radiated Measurements

802.11a 6Mbps 1 & 3 Meters 5745MHz 149

	Frequency [MHz]	Detector	Ant. Pol. [H/V 1	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	н	-	-	-75.10	11.70	0.00	43.60	53.98	-10.38
*	11490.00	Peak	Н	-	-	-63.65	11.70	0.00	55.05	73.98	-18.93
	17235.00	Peak	Н	-	-	-64.09	17.09	0.00	60.00	68.20	-8.20
*	22980.00	Average	Н	100	132	-69.35	8.16	-9.54	36.27	53.98	-17.71
*	22980.00	Peak	Н	100	132	-60.80	8.16	-9.54	44.82	73.98	-29.16
	28725.00	Peak	Н	100	142	-45.34	-9.24	-9.54	42.88	68.20	-25.32

Table 7-19. Radiated Measurements

FCC ID: ZNFX410CS		MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager	
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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 1	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	Н	-	-	-75.02	11.91	0.00	43.89	53.98	-10.09
*	11570.00	Peak	Н	-	-	-63.37	11.91	0.00	55.54	73.98	-18.44
	17355.00	Peak	Н	-	-	-63.29	18.72	0.00	62.43	68.20	-5.77
	23140.00	Peak	Н	100	134	-59.02	8.37	-9.54	46.81	68.20	-21.39
	28925.00	Peak	Н	100	140	-45.73	-9.65	-9.54	42.08	68.20	-26.12

802.11a 6Mbps 1 & 3 Meters 5825MHz 165

	Frequency [MHz]	Detector	Ant. Pol. [H/V 1	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	н	-	-	-75.57	12.16	0.00	43.59	53.98	-10.39
*	11650.00	Peak	н	-	-	-63.55	12.16	0.00	55.61	73.98	-18.37
	17475.00	Peak	Н	-	-	-63.73	18.73	0.00	62.00	68.20	-6.20
	23300.00	Peak	н	100	131	-59.99	8.50	-9.54	45.97	68.20	-22.23
	29125.00	Peak	н	100	142	-45.84	-9.87	-9.54	41.75	68.20	-26.45

Table 7-21. Radiated Measurements

FCC ID: ZNFX410CS		MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
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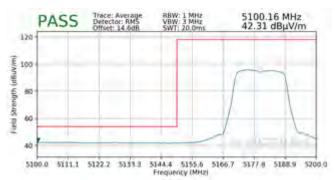


Worst Case Mode:

Worst Case Transfer Rate:

7.7.2 Radiated Band Edge Measurements (20MHz BW) §15.407(b.1)(b.2) §15.205 §15.209; RSS-Gen [8.9]; RSS-Gen [8.9]

802.11ac
MCS0
3 Meters
5180MHz
36

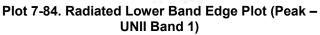


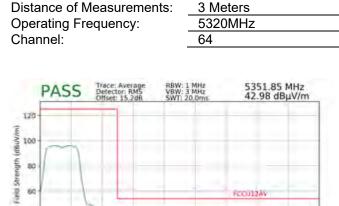
Plot 7-83. Radiated Lower Band Edge Plot (Average – UNII Band 1)

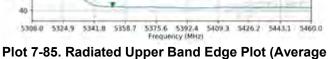
802.11ac

MCS0

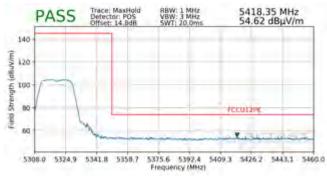












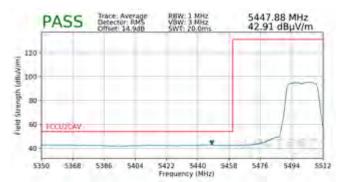


FCC ID: ZNFX410CS		MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
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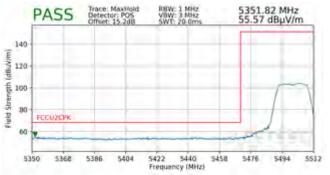


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Worst Case Mode:	802.11ac
Worst Case Transfer Rate:	MCS0
Distance of Measurements:	3 Meters
Operating Frequency:	5500MHz
Channel:	100



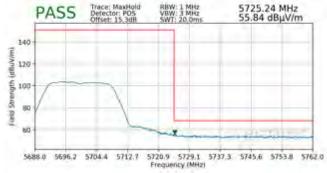
Plot 7-87. Radiated Lower Band Edge Plot (Average - UNII Band 2C)



Plot 7-88. Radiated Lower Band Edge Plot (Peak -UNII Band 2C)

Worst Case Mode:	802.11ac
Worst Case Transfer Rate:	MCS0
Distance of Measurements:	3 Meters
Operating Frequency:	5700MHz
Channel:	140

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



Plot 7-89. Radiated Upper Band Edge Plot (Peak – UNII Band 2C)



Plot 7-90. Radiated Lower Band Edge Plot (Peak – UNII Band 3)

FCC ID: ZNFX410CS		MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
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Worst Case Mode:	802.11ac
Worst Case Transfer Rate:	MCS0
Distance of Measurements:	3 Meters
Operating Frequency:	5825MHz
Channel:	165



Plot 7-91. Radiated Upper Band Edge Plot (Peak – UNII Band 3)

FCC ID: ZNFX410CS		MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dara 74 af 00
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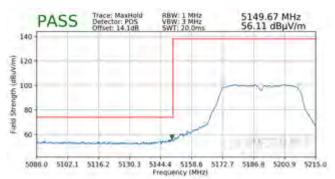


7.7.3 Radiated Band Edge Measurements (40MHz BW) §15.407(b.1)(b.2) §15.205 §15.209; RSS-Gen [8.9]

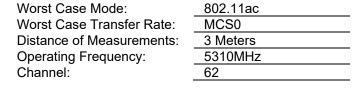
Worst Case Mode:	802.11ac
Worst Case Transfer Rate:	MCS0
Distance of Measurements:	3 Meters
Operating Frequency:	5190MHz
Channel:	38

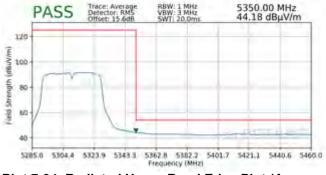


Plot 7-92. Radiated Lower Band Edge Plot (Average – UNII Band 1)

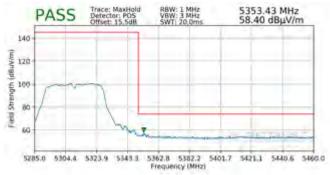


Plot 7-93. Radiated Lower Band Edge Plot (Peak – UNII Band 1)











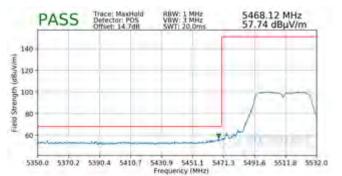
FCC ID: ZNFX410CS		MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 75 of 00
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Worst Case Mode:	802.11ac
Worst Case Transfer Rate:	MCS0
Distance of Measurements:	3 Meters
Operating Frequency:	5510MHz
Channel:	102

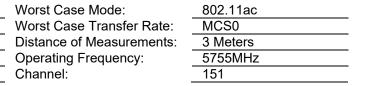


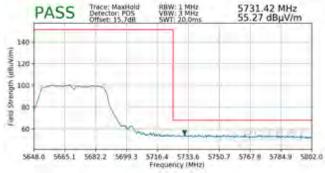




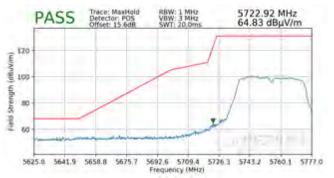
Plot 7-97. Radiated Lower Band Edge Plot (Peak – UNII Band 2C)

Worst Case Mode:	802.11ac
Worst Case Transfer Rate:	MCS0
Distance of Measurements:	3 Meters
Operating Frequency:	5670MHz
Channel:	134





Plot 7-98. Radiated Upper Band Edge Plot (Peak – UNII Band 2C)

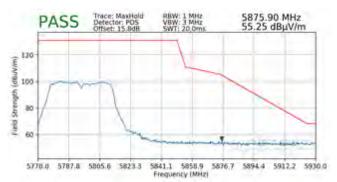


Plot 7-99. Radiated Lower Band Edge Plot (Peak – UNII Band 3)

FCC ID: ZNFX410CS		MEASUREMENT REPORT (CERTIFICATION)	C LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 76 of 00
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Worst Case Mode:	802.11ac
Worst Case Transfer Rate:	MCS0
Distance of Measurements:	3 Meters
Operating Frequency:	5795MHz
Channel:	159



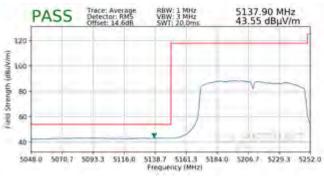
Plot 7-100. Radiated Upper Band Edge Plot (Peak – UNII Band 3)

FCC ID: ZNFX410CS		MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dega 77 of 00
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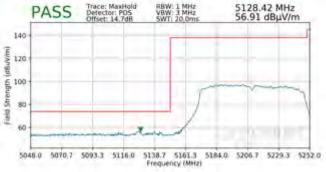


7.7.4 Radiated Band Edge Measurements (80MHz BW) §15.407(b.1)(b.2) §15.205 §15.209; RSS-Gen [8.9]

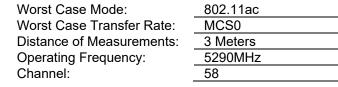
Worst Case Mode:	802.11ac
Worst Case Transfer Rate:	MCS0
Distance of Measurements:	3 Meters
Operating Frequency:	5210MHz
Channel:	42

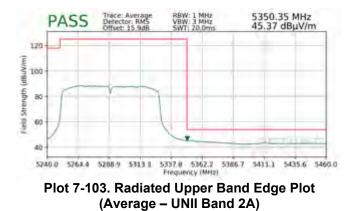


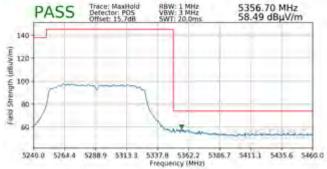
Plot 7-101. Radiated Lower Band Edge Plot (Average – UNII Band 1)













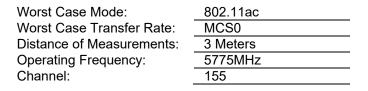
FCC ID: ZNFX410CS		MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Daga 79 of 00
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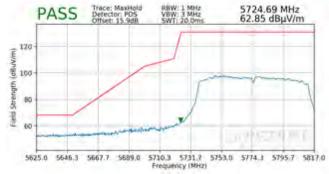


Worst Case Mode:	802.11ac
Worst Case Transfer Rate:	MCS0
Distance of Measurements:	3 Meters
Operating Frequency:	5530MHz
Channel:	106

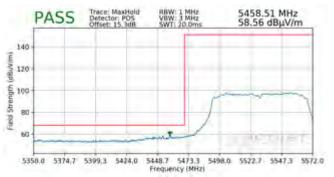


Plot 7-105. Radiated Lower Band Edge Plot (Peak Average – UNII Band 2C)

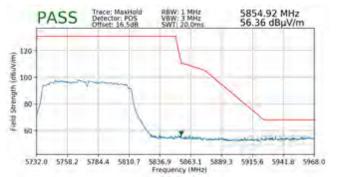




Plot 7-107. Radiated Lower Band Edge Plot (Peak – UNII Band 3)







Plot 7-108. Radiated Upper Band Edge Plot (Peak – UNII Band 3)

FCC ID: ZNFX410CS		MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
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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 7-22 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 7-22. 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.

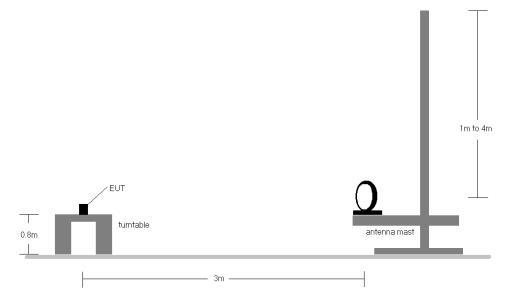
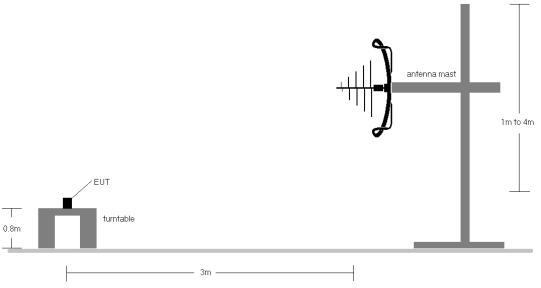
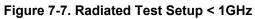


Figure 7-6. Radiated Test Setup < 30MHz





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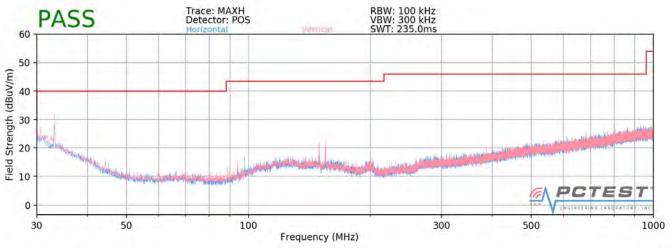


- 1. All emissions lying in restricted bands specified in §15.205 and RSS-Gen (8.10) are below the limit shown in Table 7-22.
- 2. The broadband receive antenna is manipulated through vertical and horizontal polarizations during the tests. The EUT is manipulated through three orthogonal planes.
- 3. This unit was tested with its standard battery.
- 4. The spectrum is investigated using a peak detector and final measurements are recorded using CISPR quasi peak detector. The worst-case emissions are reported however emissions whose levels were not within 20dB of the respective limits were not reported.
- 5. Emissions were measured at a 3 meter test distance.
- 6. Emissions are investigated while operating on the center channel of the mode, band, and modulation that produced the worst case results during the transmitter spurious emissions testing.
- 7. No spurious emissions were detected within 20dB of the limit below 30MHz.
- 8. The results recorded using the broadband antenna is known to correlate with the results obtained by using a tuned dipole with an acceptable degree of accuracy. The VSWR for the measurement antenna was found to be less than 2:1.
- 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 7-109. Radiated Spurious Plot below 1GHz (802.11a - U3 Ch. 157)

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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	Conducted Limit (dBµV)		
(MHz)	Quasi-peak	Average	
0.15 – 0.5	66 to 56*	56 to 46*	
0.5 – 5	56	46	
5 – 30	60	50	

Table 7-23. 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

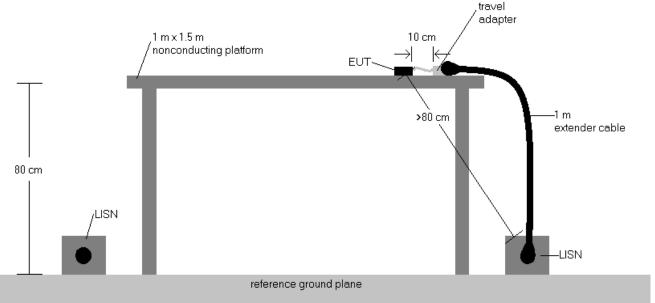
- 1. Analyzer center frequency was set to the frequency of the spurious emission of interest
- 2. RBW = 9kHz (for emissions from 150kHz 30MHz)
- 3. Detector = RMS
- 4. Sweep time = auto couple
- 5. Trace mode = max hold
- 6. Trace was allowed to stabilize

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Test Setup

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





Test Notes

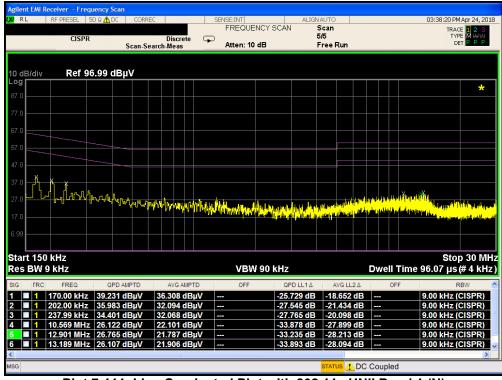
- 1. All modes of operation were investigated and the worst-case emissions are reported using mid channel. The emissions found were not affected by the choice of channel used during testing.
- 2. The limit for an intentional radiator from 150kHz to 30MHz are specified in 15.207 and RSS-Gen (8.8).
- 3. Corr. (dB) = Cable loss (dB) + LISN insertion factor (dB)
- 4. QP/AV Level (dB μ V) = QP/AV Analyzer/Receiver Level (dB μ V) + Corr. (dB)
- 5. Margin (dB) = QP/AV Limit (dB μ V) QP/AV Level (dB μ V)
- 6. Traces shown in plot are made using a peak detector.
- 7. Deviations to the Specifications: None.

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9	Agilent EMI Receiver - Frequency Scan																						
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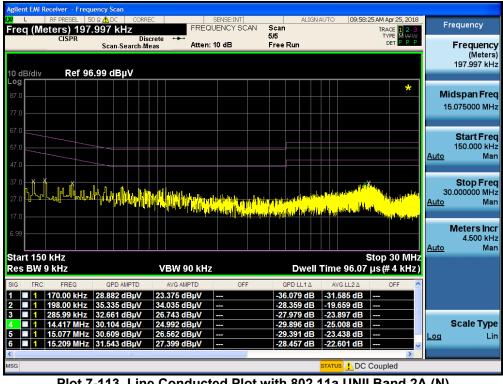
Plot 7-111. Line Conducted Plot with 802.11a UNII Band 1 (N)

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gilent EMI R	Receiver - Freq								
rea (Me	RF PRESEL 5				SENSE:INT	Scan	IAUTO 09:51	:30 AM Apr 25, 2018 TRACE 1 2 3 TYPE M WW	Frequency
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	637.97 kHz 1.0699 MHz			26.312 dBµV 28.510 dBµV		-25.401 dB -23.253 dB	-19.688 dB -17.490 dB		
	13.967 MHz			26.534 dBµV		-29.989 dB	-23.466 dB		Scale Ty
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Plot 7-112. Line Conducted Plot with 802.11a UNII Band 2A (L1)



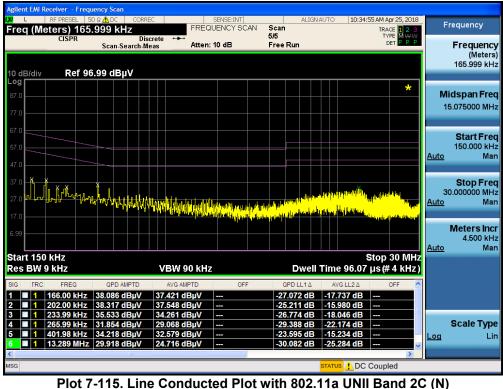
Plot 7-113. Line Conducted Plot with 802.11a UNII Band 2A (N)

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Agilent EMI Receiver - Frequency Scan				
🚺 L RFPRESEL 50 Ω <u>Λ</u> DC C Freq (Meters) 161.999 kHz	ORREC SENSE:IN			
CISPR	Discrete +++	5/5	TRACE 1 2 3 TYPE MWWW DET P P F	
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10 dB/div Ref 96.99 dBµV				
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77.0				15.075000 101-12
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1 📕 1 162.00 kHz 28.971 dBµ		-36.390 dB	-31.173 dB	
2 📕 1 190.00 kHz 34.814 dBµ		-29.223 dB	-30.869 dB	
3 ■ 1 14.241 MHz 29.916 dBµ 4 ■ 1 15.053 MHz 30.228 dBµ		-30.084 dB -29.772 dB	-23.125 dB -23.345 dB	Scale Type
5 1 15.417 MHz 29.477 dBµ		-30.523 dB	-24.794 dB	Log Lir
6 🔳 1 15.781 MHz 28.401 dBµ		-31.599 dB	-25.662 dB	×
×			>	
MSG			STATUS 🥂 DC Coupled	

Plot 7-114. Line Conducted Plot with 802.11a UNII Band 2C (L1)



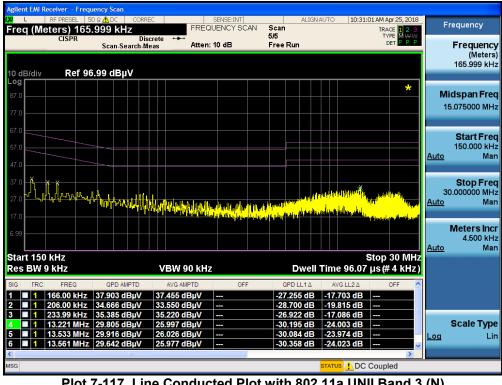
Plot 7-115. Line Conducted Plot with 802.11a UNII Band 2C (N)

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10 Ref 96.99 dBµV Midsp 87.0	quency (Meters .997 kH
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Start 150 kHz Stop 30 MHz Res BW 9 kHz Dwell Time 96.07 µs(# 4 kHz)	
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■ 1 13.041 MHz 28.318 dBµV 23.064 dBµV31.682 dB -26.936 dB	
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Plot 7-116. Line Conducted Plot with 802.11a UNII Band 3 (L1)



Plot 7-117. 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 **LG Portable Handset FCC ID: ZNFX410CS** is in compliance with Part 15 Subpart C (15.407) of the FCC Rules.

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