PCTEST ENGINEERING LABORATORY, INC.

7185 Oakland Mills Road, Columbia, MD 21046 USA Tel. 410.290.6652 / Fax 410.290.6654 http://www.pctestlab.com

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: 7/12/2017-8/8/2017 Test Site/Location: PCTEST Lab, Columbia, MD, USA Test Report Serial No.: 1M1707110215-05-R1.ZNF

FCC ID:

APPLICANT:

LG Electronics MobileComm U.S.A

LGH932, H932, LG-H932PR, LGH932PR, H932PR

Unlicensed National Information Infrastructure (UNII)

ZNFH932

Certification LG-H932

Portable Handset

Application Type:
Model:
Additional Model(s):
EUT Type:
FCC Classification:
FCC Rule Part(s):

Test Procedure(s):

Part 15.407 KDB 789033 D02 v01r04, KDB 648474 D03 v01r04, KDB 662911 D01 v02r01

	<u>.</u>		AN	IT1	AN	IT2	MIMC)/CDD
UNII Band	Channel Bandwidth (MHz)	Tx Frequency (MHz)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)
1		5180 - 5240	48.417	16.85	42.756	16.31	89.638	19.52
2A		5260 - 5320	48.978	16.90	42.364	16.27	89.462	19.52
2C	20	5500 - 5580	45.394	16.57	42.073	16.24	85.507	19.32
2C		5660 - 5720	44.566	16.49	41.687	16.20	86.099	19.35
3		5745 - 5825	45.186	16.55	42.756	16.31	87.745	19.43
1		5190 - 5230	35.075	15.45	30.903	14.90	65.897	18.19
2A		5270 - 5310	34.995	15.44	31.623	15.00	66.617	18.24
2C	40	5510 - 5550	31.915	15.04	29.923	14.76	61.802	17.91
2C		5670 - 5710	33.113	15.20	31.046	14.92	63.945	18.06
3		5755 - 5795	33.729	15.28	32.063	15.06	65.714	18.18
1		5210	18.239	12.61	15.704	11.96	33.943	15.31
2A		5290	11.324	10.54	9.977	9.99	21.301	13.28
2C	80	5530	16.711	12.23	15.668	11.95	32.378	15.10
2C		5690	14.723	11.68	14.521	11.62	29.242	14.66
3		5775	14.757	11.69	14.757	11.69	29.514	14.70

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in KDB 789033 D02 v01r04. Test results reported herein relate only to the item(s) tested.

This test report S/N: 1M1707110215-05-R1.ZNF supersedes and replaces the previous version of this test report (S/N: 1M1707110215-05.ZNF). Please discard the previous version of this test report appropriately.

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

Randy Ortanez President



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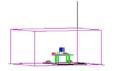
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APPLICANT:	LG Electronics MobileComm U.S.A						
APPLICANT ADDRESS:	1000 Sylvan Avenue						
	Englewood Cliffs, NJ 07632, United States						
TEST SITE:	PCTEST ENGINEERING LABORATORY, INC.						
TEST SITE ADDRESS:	7185 Oakland Mills Road, Columbia, MD 21046 USA						
FCC RULE PART(S):	Part 15.407						
BASE MODEL:	LG-H932						
FCC ID:	ZNFH932						
FCC CLASSIFICATION:	Unlicensed National Information Infrastructure (UNII)						
Test Device Serial No.:	05514, 05498, 05456 Production Pre-Production Engineering						
DATE(S) OF TEST:	7/12/2017-8/8/2017						
TEST REPORT S/N:	1M1707110215-05-R1.ZNF						

Test Facility / Accreditations

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



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



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

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1.0 INTRODUCTION

1.1 Scope

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

1.2 PCTEST Test Location

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

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

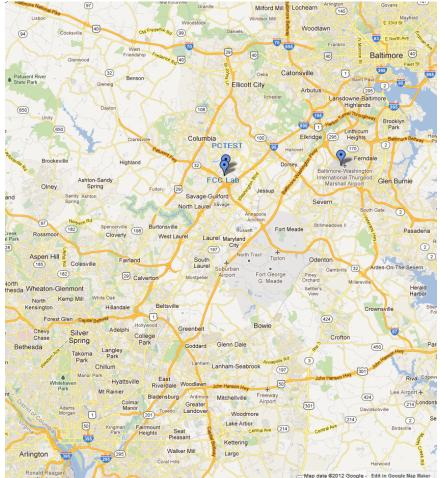


Figure 1-1. Map of the Greater Baltimore and Metropolitan Washington, D.C. area

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PRODUCT INFORMATION 2.0

2.1 **Equipment Description**

The Equipment Under Test (EUT) is the LG Portable Handset FCC ID: ZNFH932. The test data contained in this report pertains only to the emissions due to the EUT's UNII transmitter.

2.2 **Device Capabilities**

This device contains the following capabilities:

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

	Band 1		Band 2A		Band 2C		Band 3
Ch.	Frequency (MHz)						
36	5180	52	5260	100	5500	149	5745
:	:	:	:	:	:	:	:
42	5210	56	5280	116	5580	157	5785
:	:	:	:	:	:	:	:
48	5240	64	5320	144	5720	165	5825

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

Band 1 Frequency (MHz)

5190

:

5230

Ch.

38

:

46

Band 2A

Ch. Frequency (MHz) 54 5270 : : 62 5310

	Band 2C
Ch.	Frequency (MHz)
102	5510
:	:
110	5550
:	:
142	5710

- -

	Band 3
Ch.	Frequency (MHz)
151	5755
:	• •
159	5795

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

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

Table 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 KDB 789033 D02 v01r04. The RBW and VBW were both greater than 50/T, where T is the minimum transmission duration, and the number of sweep points across T was greater than 100. The duty cycles are as follows:

Maximum Achievable Duty Cycles						
802.11 Mode/Band			Duty Cycle [%]			
		ANT1	ANT2	MIMO		
	а	95.2	95.0	95.4		
	n (HT20)	94.5	94.9	94.7		
5GHz	ac (HT20)	95.0	94.9	94.2		
SGHZ	n (HT40)	92.6	93.3	92.0		
	ac (HT40)	93.2	93.3	92.1		
	ac (HT80)	91.8	91.7	92.4		

Table 2-4. Measured Duty Cycles

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

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

Table 2-5. Frequency / Channel Operations

✓ = Support ; × = NOT Support

SISO = Single Input Single Output

SDM = Spatial Diversity Multiplexing – MIMO function

CDD = Cyclic Delay Diversity - 2Tx Function

 Data Rate(s) Tested:
 6, 9, 12, 18, 24, 36, 48, 54Mbps (802.11a)

6.5/7.2, 13/14.4, 19.5/21.7, 26/28.9, 39/43.3, 52/57.8, 58.5/65, 65/72.2 (n – 20MHz)

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)

13/14.4, 26.28.9, 39/43.3, 52/57.8, 78/86.7, 104/115.6, 117/130, 130/144.4MBps (MIMO n/ac - 20MHz) 156/173Mbps (MIMO ac - 20MHz)

27/30, 54/60, 81/90, 108/120, 162/180, 216/240, 243,270, 270/300Mbps (MIMO n/ac – 40MHz) 324/360, 360/400Mbps (MIMO ac – 40MHz)

58.5/65, 117/130, 175.5/195, 234/260, 351/390, 468/520, 526.5/585, 585/650, 702/780, 780/866.7Mbps (MIMO ac - 80MHz)

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

Description	2.4 GHz Emission	5 GHz Emission
Antenna	1	2
Channel	2	48
Operating Frequency (MHz)	2417	5240
Data Rate (Mbps)	1	6
Mode	b	а

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

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

2.3 Test Configuration

The EUT was tested per the guidance of KDB 789033 D02 v01r04. 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.

This device supports wireless charging capability and, thus, is subject to the test requirements of KDB 648474 D03 v01r04. Additional radiated spurious emission measurements were performed with the EUT lying flat on a certified wireless charging pad (WCP) while operating under normal conditions in a simulated call or data transmission configuration. The worst case radiated emissions data is shown in this report.

2.4 EMI Suppression Device(s)/Modifications

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

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3.0 DESCRIPTION OF TESTS

3.1 Evaluation Procedure

The measurement procedures described in the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices (ANSI C63.10-2013) and the guidance provided in KDB 789033 D02 v01r04 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 7.9. 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. A raised turntable is used for radiated measurement. It is a continuously rotatable, remote-controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. 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. A 72.4cm high PVC support structure is placed on top of the PVC supports to bring the total height of the table to 80cm. For measurements above 1GHz, a high density expanded polystyrene block is placed on top of the test table to bring the total table height to 1.5m.

For all measurements, the spectrum was scanned through all EUT azimuths and from 1 to 4 meter receive antenna height using a broadband antenna from 30MHz up to the upper frequency shown in 15.33(b)(1) depending on the highest frequency generated or used in the device or on which the device operates or tunes. For frequencies above 1GHz, linearly polarized double ridge horn antennas were used. For frequencies below 30MHz, a calibrated loop antenna was used. When exploratory measurements were necessary, they were performed at 1 meter test distance inside the semi-anechoic chamber using broadband antennas, broadband amplifiers, and spectrum analyzers to determine the frequencies and modes producing the maximum emissions. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The test set-up was placed on top of the 1 x 1.5 meter table. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configuration, 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 C63.5-2006.

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	N9038A	MXE EMI Receiver	4/26/2017	Annual	4/26/2018	MY51210133
Agilent	N9030A	PXA Signal Analyzer (44GHz)	3/27/2017	Annual	3/27/2018	MY52350166
Anritsu	ML2495A	Power Meter	10/16/2015	Biennial	10/16/2017	941001
Anritsu	MA2411B	Pulse Power Sensor	10/14/2015	Biennial	10/14/2017	846215
Com-Power	PAM-103	Pre-Amplifier (1-1000MHz)	6/21/2017	Annual	6/21/2018	441119
Emco	3115	Horn Antenna (1-18GHz)	3/10/2016	Biennial	3/10/2018	9704-5182
Emco	3116	Horn Antenna (18 - 40GHz)	3/27/2015	Triennial	3/27/2018	9203-2178
Espec	ESX-2CA	Environmental Chamber	4/11/2017	Annual	4/11/2018	17620
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
Pasternack	NMLC-1	Line Conducted Emissions Cable (NM)	5/31/2017	Annual	5/31/2018	NMLC-1
PCTEST	-	EMC Switch System	6/21/2017	Annual	6/21/2018	NM1
Rohde & Schwarz	TS-PR18	1-18 GHz Pre-Amplifier	3/7/2017	Annual	3/7/2018	100071
Rohde & Schwarz	TS-PR26	18-26.5 GHz Pre-Amplifier	5/11/2017	Annual	5/11/2018	100040
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	4/19/2017	Annual	4/19/2018	100342
Rohde & Schwarz	TS-PR40	26.5-40 GHz Pre-Amplifier	5/11/2017	Annual	5/11/2018	100037
Rohde & Schwarz	FSW67	Signal / Spectrum Analyzer	7/27/2016	Annual	7/27/2017	103200
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	3/14/2016	Biennial	3/14/2018	A051107

Table 6-1. Annual Test Equipment Calibration Schedule

Note:

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

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7.0 TEST RESULTS

7.1 Summary

Company Name:	LG Electronics MobileComm U.S.A
FCC ID:	ZNFH932
Method/System:	Unlicensed National Information Infrastructure (UNII)

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
N/A	26dB Bandwidth	N/A	CONDUCTED	PASS	Section 7.2
15.407(e)	6dB Bandwidth	>500kHz(5725-5850MHz)		PASS	Section 7.3
15.407 (a.1.iv), (a.2), (a.3)	Maximum Conducted Output Power	Maximum conducted powers must meet the limits detailed in 15.407 (a)		PASS	Section 7.4
15.407 (a.1.iv), (a.2), (a.3)	Maximum Power Spectral Density	Maximum power spectral density must meet the limits detailed in 15.407 (a)		PASS	Section 7.5
15.407(g)	Frequency Stability	N/A		PASS	Section 7.6
15.407(h)	Dynamic Frequency Selection	See DFS Test Report		PASS	See DFS Test Report
15.407(b.1), (2), (3), (4)	Undesirable Emissions	Undesirable emissions must meet the limits detailed in 15.407(b)		PASS	Section 7.7
15.205, 15.407(b.1), (4), (5), (6)	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209	RADIATED	PASS	Section 7.7, 7.8
15.407	AC Conducted Emissions 150kHz – 30MHz	< FCC 15.207 limits	LINE CONDUCTED	PASS	Section 7.9

Table 7-1. Summary of Test Results

Notes:

- 1) All channels, modes, and modulations/data rates were investigated among all UNII bands. The test results shown in the following sections represent the worst case emissions.
- 2) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
- 3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables and attenuators.
- 4) For conducted spurious emissions, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is PCTEST "UNII Automation," Version 4.5.
- For radiated band edge, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is PCTEST "Chamber Automation," Version 1.1.5.

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

Test Overview and Limit

The bandwidth at 26dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating at its maximum duty cycle, at its maximum power control level, as defined in KDB 789033 D02 v01r04, and at the appropriate frequencies. The spectrum analyzer's bandwidth measurement function is configured to measure the 26dB bandwidth.

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

Test Procedure Used

KDB 789033 D02 v01r04 - 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.

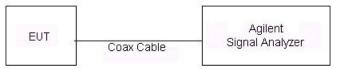


Figure 7-1. Test Instrument & Measurement Setup

Test Notes

None.

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Antenna-1 26 dB Bandwidth Measurements

	Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	Measured 26dB Bandwidth [MHz]
	5180	36	а	6	22.40
	5200	40	а	6	20.93
	5240	48	а	6	21.92
Ŧ	5180	36	n (20MHz)	6.5/7.2 (MCS0)	22.12
Band 1	5200	40	n (20MHz)	6.5/7.2 (MCS0)	21.89
ñ	5240	48	n (20MHz)	6.5/7.2 (MCS0)	23.32
	5190	38	n (40MHz)	13.5/15 (MCS0)	39.89
	5230	46	n (40MHz)	13.5/15 (MCS0)	39.95
	5210	42	ac (80MHz)	29.3/32.5 (MCS0)	82.09
	5260	52	а	6	22.29
	5280	56	а	6	22.48
	5320	64	а	6	21.98
2A	5260	52	n (20MHz)	6.5/7.2 (MCS0)	24.10
Band 2A	5280	56	n (20MHz)	6.5/7.2 (MCS0)	23.20
Ba	5320	64	n (20MHz)	6.5/7.2 (MCS0)	21.99
	5270	54	n (40MHz)	13.5/15 (MCS0)	40.40
	5310	62	n (40MHz)	13.5/15 (MCS0)	40.09
	5290	58	ac (80MHz)	29.3/32.5 (MCS0)	81.30
	5500	100	а	6	22.96
	5580	116	а	6	22.89
	5720	144	а	6	20.75
	5500	100	n (20MHz)	6.5/7.2 (MCS0)	21.29
2C	5580	116	n (20MHz)	6.5/7.2 (MCS0)	22.09
Band 2C	5720	144	n (20MHz)	6.5/7.2 (MCS0)	21.96
Ba	5510	102	n (40MHz)	13.5/15 (MCS0)	39.47
	5550	110	n (40MHz)	13.5/15 (MCS0)	40.35
	5710	142	n (40MHz)	13.5/15 (MCS0)	40.62
	5530	106	ac (80MHz)	29.3/32.5 (MCS0)	81.60
	5690	138	ac (80MHz)	29.3/32.5 (MCS0)	80.88

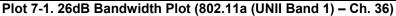
Table 7-2. Conducted Bandwidth Measurements

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w Keysight Spectrum Analyzer - Occupied BV					
K RF 50 Ω DC	Trig:	SENSE:INT er Freq: 5.180000000 GHz Free Run Avg Hold:	Radio St 100/100		Trace/Detector
	IFGain:Low #Atte	n: 20 dB	Radio De	evice: BTS	
10 dB/div Ref 20.00 dBn	•				
Log					
10.0	mannenn	m. mannan	Monore could a		Clear Write
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0			and the second se		
20.0 mm m m m			herro	and worker and	
30.0					Average
40.0					
50.0					
-60.0					Max Hold
-70.0					
Center 5.18 GHz				an 25 MHz	
#Res BW 200 kHz		/BW 2 MHz	SW	/eep 1 ms	Min Hold
Occupied Bandwidt	h	Total Power	22.4 dBm		
16	6.449 MHz				Detecto
Transmit Freq Error	-11.797 kHz	% of OBW Powe	r 99.00 %		Peakl Auto Mar
x dB Bandwidth	22.40 MHz	x dB	-26.00 dB		
		X UB	-20.00 UB		
ISG			STATUS		



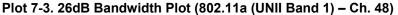


Plot 7-2. 26dB Bandwidth Plot (802.11a (UNII Band 1) - Ch. 40)

FCC ID: ZNFH932		FCC Pt. 15.407 802.11a/n/ac UNII 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: ZNFH932		FCC Pt. 15.407 802.11a/n/ac UNII MEASUREMENT REPORT (CERTIFICATION)	🔁 LG	Approved by: Quality Manager
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🤤 Keysight Spectrum Analyzer - Occupied					
ΙΧΙ RF 50 Ω DC	Cente	SENSE:INT r Freq: 5.200000000 GHz Free Run Avg Hold:	Radio	51 PMJul 17, 2017 Std: None	Trace/Detector
NFL .		n: 20 dB		Device: BTS	
10 dB/div Ref 20.00 dl	Bm				
10.0					
	www.werkersonwwww.	My was how and	mulmund		Clear Write
-10.0					
-20.0 - Antor and and and				WWWWWWWWWW	
-30.0					Average
-40.0					Average
-50.0					
-60.0					Max Hold
-70.0					
Center 5.2 GHz			S	pan 25 MHz	
#Res BW 220 kHz	v	'BW 2.2 MHz	s	weep 1 ms	Min Hold
Occupied Banduri	dth	Total Power	22.2 dBm		
Occupied Bandwi		I Otal I Owen			
	17.640 MHz				Detector Peak▶
Transmit Freq Error	-155 Hz	% of OBW Powe	er 99.00 %		Auto <u>Man</u>
x dB Bandwidth	21.89 MHz	x dB	-26.00 dB		
MSG			STATUS		

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

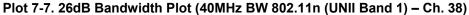


Plot 7-6. 26dB Bandwidth Plot (20MHz BW 802.11n (UNII Band 1) - Ch. 48)

FCC ID: ZNFH932		FCC Pt. 15.407 802.11a/n/ac UNII MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
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Plot 7-8. 26dB Bandwidth Plot (40MHz BW 802.11n (UNII Band 1) - Ch. 46)

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Keysight Spectrum Analyzer - Occupied BW					
X RF 50 Ω DC	+++ Trig:	SENSE:INT er Freq: 5.210000000 GHz Free Run Avg Hold: n: 20 dB	Radio Std		Trace/Detector
10 dB/div Ref 20.00 dBm					ClearWrite
0.00 -10.0 -20.0			we want the state of the second states		
-30.0 -40.0 -50.0					Average
-60.0			Spar	100 MHz	Max Hold
Occupied Bandwidt		/BW 8 MHz Total Power		eep 1 ms	Min Hold
75	.017 MHz				Detecto Peak
Transmit Freq Error	169.35 kHz	% of OBW Powe	er 99.00 %		Auto <u>Mar</u>
x dB Bandwidth	82.09 MHz	x dB	-26.00 dB		
SG			STATUS		

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

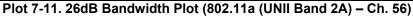


Plot 7-10. 26dB Bandwidth Plot (802.11a (UNII Band 2A) - Ch. 52)

FCC ID: ZNFH932		FCC Pt. 15.407 802.11a/n/ac UNII MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
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Keysight Spectrum Analyzer - Occupied BW					
KF 50 Ω DC		Freg: 5.28000000 GHz	07:39:20 Radio St	PMJul 17, 2017	Trace/Detector
NFE	+++ Trig: Fr	ee Run Avg Hold:	100/100		
	IFGain:Low #Atten:	20 dB	Radio De	evice: BTS	
10 dB/div Ref 20.00 dBm					
10.0					
	monorman	yan hour burn	Burghand Branc		Clear Write
10.0					
-20.0 Jon poly and a south of			Խմենու	mandal	
-30.0				- 40/FL	Average
-40.0					Averuge
-50.0					
-60.0					Max Hold
-70.0					
Center 5.28 GHz			Sp	an 25 MHz	
#Res BW 200 kHz	VE	3W 2 MHz		/eep 1 ms	Min Hold
		T-4-1 D			
Occupied Bandwidth		Total Power	22.0 dBm		
16.	460 MHz				Detector
Transmit Frog Free	-4.592 kHz	% of OBW Powe	er 99.00 %		Peak▶ Auto Man
Transmit Freq Error					Auto <u>iman</u>
x dB Bandwidth	22.48 MHz	x dB	-26.00 dB		
MSG			STATUS		





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

FCC ID: ZNFH932		FCC Pt. 15.407 802.11a/n/ac UNII MEASUREMENT REPORT (CERTIFICATION)	🔁 LG	Approved by: Quality Manager
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Keysight Spectrum Analyzer - Occu	upied BW				
ΙΧ΄ RF 50 Ω	DC CORREC	SENSE:INT Center Freq: 5.26000000 GH:	z Radio	39 PM Jul 17, 2017 Std: None	Trace/Detector
N	IFE ↔ IFGain:Low	Trig: Free Run Avg He #Atten: 20 dB	old: 100/100 Radio	Device: BTS	
10 dB/div Ref 20.00	dBm				
10.0					
0.00	marthermon	when the second	Marken marken marken		Clear Write
-10.0				h	
-20.0 pphlandhan				maner and a second and	
-30.0					Average
-40.0					
-50.0					
-60.0					Max Hold
-70.0					
Center 5.26 GHz				pan 25 MHz	
#Res BW 220 kHz		VBW 2.2 MHz		Sweep 1 ms	Min Hold
Occupied Bandy	width	Total Power	22.0 dBm		
	17.650 MH	Z			Detector
T					Peak▶ Auto Man
Transmit Freq Erro					Auto <u>Man</u>
x dB Bandwidth	24.10 MH	lz x dB	-26.00 dB		
MSG			STATUS		

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



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

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



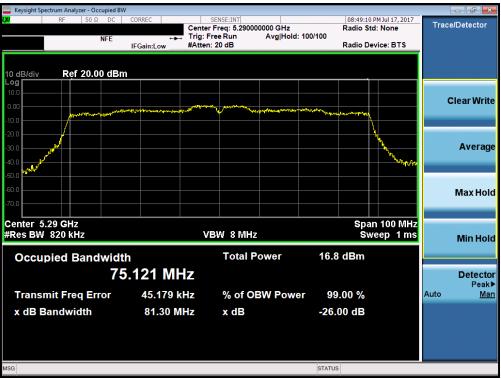
Plot 7-16. 26dB Bandwidth Plot (40MHz BW 802.11n (UNII Band 2A) - Ch. 54)

FCC ID: ZNFH932		FCC Pt. 15.407 802.11a/n/ac UNII MEASUREMENT REPORT (CERTIFICATION)	🔁 LG	Approved by: Quality Manager
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Plot 7-17. 26dB Bandwidth Plot (40MHz BW 802.11n (UNII Band 2A) - Ch. 62)

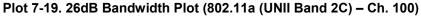


Plot 7-18. 26dB Bandwidth Plot (80MHz BW 802.11ac (UNII Band 2A) – Ch. 58)

FCC ID: ZNFH932		FCC Pt. 15.407 802.11a/n/ac UNII MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
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Keysight Spectrum Analyzer - Occupied BW XI RF 50 Ω DC NFE	Trig: F	SENSE:INT r Freq: 5.500000000 GHz Free Run Avg Hold h: 20 dB	Radio 5	09 PMJul 17, 2017 Std: None Device: BTS	Trace/Detector
10 dB/div Ref 20,00 dBm Log 100 100 100 100 100 100 100 100 100 10	man printer and property	and manufacture and and a			ClearWrite
-20.0				~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	Average
-50.0					Max Hold
Center 5.5 GHz #Res BW 200 kHz		BW 2 MHz Total Power		pan 25 MHz weep 1 ms	Min Hold
	.458 MHz				Detecto Peakl Auto Mar
Transmit Freq Error x dB Bandwidth	-7.923 kHz 22.96 MHz	% of OBW Powe x dB	er 99.00 % -26.00 dB		Auto <u>Mar</u>
SG			STATUS		



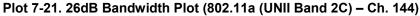


Plot 7-20. 26dB Bandwidth Plot (802.11a (UNII Band 2C) - Ch. 116)

FCC ID: ZNFH932		FCC Pt. 15.407 802.11a/n/ac UNII MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Page 25 of 209
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Keysight Spectrum Analyzer - Occupied BV	CORREC Cente	SENSE:INT r Freq: 5.720000000 GHz Free Run Avg Hold n: 20 dB	Radio d: 100/100	:33 PMJul 17, 2017 Std: None Device: BTS	Trace/Detector
10 dB/div Ref 20.00 dBr Log 10.0 0.00 -10.0	a man at a shaw	m manual market	·····		Clear Write
-20.0				when the part of t	Average
-50.0					Max Hold
Center 5.72 GHz #Res BW 160 kHz Occupied Bandwid1		BW 1.6 MHz		Span 25 MHz Sweep 1 ms	Min Hold
	5.429 MHz -16.379 kHz	% of OBW Pow	ver 99.00 %	D	Detecto Peak Auto <u>Mar</u>
x dB Bandwidth	20.75 MHz	x dB	-26.00 dE		
SG			STATUS		





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

FCC ID: ZNFH932		FCC Pt. 15.407 802.11a/n/ac UNII MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dogo 26 of 200
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Keysight Spectrum Analyzer - Occupied E	W				
χα RF 50 Ω DC	Trig:	SENSE:INT er Freq: 5.580000000 GHz Free Run Avg Hold en: 20 dB	Radio Sto 1: 100/100	PMJul 17, 2017 d: None Tr vice: BTS	ace/Detector
10 dB/div Ref 20.00 dB	m				
-10.0	Marging Born of Carl mar and	my my hour on how how			Clear Write
-20.0 100 100 100 100 100 100 100 100 100				housenny	Average
-50.0					Max Hold
Center 5.58 GHz #Res BW 200 kHz		VBW 2 MHz		an 25 MHz eep 1 ms	Min Hold
Occupied Bandwid	th 7.581 MHz	Total Power	21.8 dBm		Detector Peak►
Transmit Freq Error x dB Bandwidth	-19.015 kHz 22.09 MHz	% of OBW Powe x dB	er 99.00 % -26.00 dB	Auto	
ISG			STATUS		

Plot 7-23. 26dB Bandwidth Plot (20MHz BW 802.11n (UNII Band 2C) - Ch. 116)



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

FCC ID: ZNFH932		FCC Pt. 15.407 802.11a/n/ac UNII MEASUREMENT REPORT (CERTIFICATION)	🔁 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dogo 27 of 200
1M1707110215-05-R1.ZNF	7/12/2017-8/8/2017	Portable Handset		Page 27 of 209
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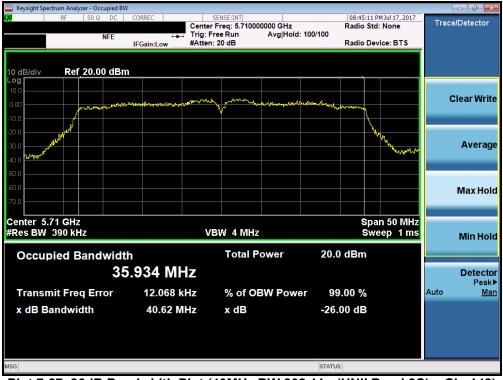
Plot 7-25. 26dB Bandwidth Plot (40MHz BW 802.11n (UNII Band 2C) - Ch. 102)



Plot 7-26. 26dB Bandwidth Plot (40MHz BW 802.11n (UNII Band 2C) - Ch. 110)

FCC ID: ZNFH932		FCC Pt. 15.407 802.11a/n/ac UNII MEASUREMENT REPORT (CERTIFICATION)	🔁 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Page 28 of 209
1M1707110215-05-R1.ZNF	7/12/2017-8/8/2017	Portable Handset		Faye 20 01 209
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Plot 7-27. 26dB Bandwidth Plot (40MHz BW 802.11n (UNII Band 2C) - Ch. 142)



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

FCC ID: ZNFH932		FCC Pt. 15.407 802.11a/n/ac UNII MEASUREMENT REPORT (CERTIFICATION)	🔁 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dege 20 of 200
1M1707110215-05-R1.ZNF	7/12/2017-8/8/2017	Portable Handset		Page 29 of 209
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Center Freq: 6.69000000 GHz Radio Std: None Radio Device: BTS Clear Write Clear	Keysight Spectrum Analyzer - Occupied B					
It is a structure #Atten: 20 dB Radio Device: BTS dB/div Ref 20.00 dBm Image: Clear Write and the structure Image: Clear Write and the structure 000000000000000000000000000000000000	RF 50 Ω DC	CORREC	SENSE:INT ter Freq: 5.69000000 GHz			Trace/Detector
ad B/div Ref 20.00 dBm ad B/div Average ad B/div Average ad B/div Span 100 MHz Average Max Hold ad B/div VBW 8 MHz Sysen 100 MHz Sweep 1 ms Occupied Bandwidth Total Power 17.3 dBm Transmit Freq Error 110.06 kHz % of OBW Power 99.00 %	NFE				vice: BTS	
28 28 29 20 <td< td=""><td></td><td>IPGalli.Low #/ teo</td><td></td><td>Tudio Be</td><td></td><td></td></td<>		IPGalli.Low #/ teo		Tudio Be		
28 28 29 20 <td< td=""><td>10 dB/dig Def 20.00 dBr</td><td>n</td><td></td><td></td><td></td><td></td></td<>	10 dB/dig Def 20.00 dBr	n				
00 00 <td< td=""><td>Log</td><td></td><td></td><td></td><td></td><td></td></td<>	Log					
Average Average Max Hold Average Max Hold Cocupied Bandwidth Total Power 17.3 dBm 75.073 MHz Transmit Freq Error 110.06 kHz % of OBW Power 99.00 %	10.0					Clear Write
Average Max Hold Average Max Hold Average Max Hold Max Hold Cocupied Bandwidth 75.073 MHz Transmit Freq Error 110.06 kHz % of OBW Power 99.00 %	0.00	an la de la constant	and the state of t	a the mark and a grade and been a		
Average Max Hold Average Max Hold Average Max Hold Average Max Hold Cocupied Bandwidth Total Power 17.3 dBm 75.073 MHz Transmit Freq Error 110.06 kHz % of OBW Power 99.00 %	-10.0			<u> </u>	h	
Image: Constraint of the second se	-20.0				h	A
Image: Constraint of the second se	-30.0				MIL	Average
Image: Constraint of the second se	-40.0				WAAA	
enter 5.69 GHz Res BW 750 kHz VBW 8 MHz Span 100 MHz Cocupied Bandwidth Total Power 17.3 dBm 75.073 MHz Transmit Freq Error 110.06 kHz % of OBW Power 99.00 %	-50.0					
enter 5.69 GHz Res BW 750 kHz VBW 8 MHz Span 100 MHz Occupied Bandwidth Total Power 17.3 dBm 75.073 MHz Transmit Freq Error 110.06 kHz % of OBW Power 99.00 %	-60.0					Max Hold
Res BW 750 kHz VBW 8 MHz Sweep 1 ms Occupied Bandwidth Total Power 17.3 dBm 75.073 MHz Detector Transmit Freq Error 110.06 kHz % of OBW Power 99.00 %	-70.0					
Occupied Bandwidth Total Power 17.3 dBm 75.073 MHz Detector Transmit Freq Error 110.06 kHz % of OBW Power 99.00 %	Center 5.69 GHz					
Transmit Freq Error 110.06 kHz % of OBW Power 99.00 %	#Res BW 750 kHz		VBW 8 MHz	Sw	eep 1 ms	Min Hold
75.073 MHz Transmit Freq Error 110.06 kHz % of OBW Power 99.00 %	Occupied Bandwid	th	Total Power	17.3 dBm		
Transmit Freq Error 110.06 kHz % of OBW Power 99.00 %						Detector
x dB Bandwidth 80.88 MHz x dB -26.00 dB	Transmit Freq Error	110.06 kHz	% of OBW Powe	er 99.00 %	/	Auto <u>Mar</u>
	x dB Bandwidth	80.88 MHz	x dB	-26.00 dB		
3 STATUS	MSG			STATUS		

Plot 7-29. 26dB Bandwidth Plot (80MHz BW 802.11ac (UNII Band 2C) - Ch. 138)

FCC ID: ZNFH932		FCC Pt. 15.407 802.11a/n/ac UNII MEASUREMENT REPORT (CERTIFICATION)	🕑 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 20 of 200
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Antenna-2 26dB Bandwidth Measurements

_	Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	Measured 26dB Bandwidth [MHz]
	5180	36	а	6	22.78
	5200	40	а	6	23.79
	5240	48	а	6	21.54
-	5180	36	n (20MHz)	6.5/7.2 (MCS0)	22.12
Band 1	5200	40	n (20MHz)	6.5/7.2 (MCS0)	21.75
ä	5240	48	n (20MHz)	6.5/7.2 (MCS0)	22.97
	5190	38	n (40MHz)	13.5/15 (MCS0)	39.76
	5230	46	n (40MHz)	13.5/15 (MCS0)	40.13
	5210	42	ac (80MHz)	29.3/32.5 (MCS0)	78.46
	5260	52	а	6	21.72
	5280	56	а	6	22.19
	5320	64	а	6	21.83
2A	5260	52	n (20MHz)	6.5/7.2 (MCS0)	23.43
Band 2A	5280	56	n (20MHz)	6.5/7.2 (MCS0)	21.52
Ba	5320	64	n (20MHz)	6.5/7.2 (MCS0)	22.36
	5270	54	n (40MHz)	13.5/15 (MCS0)	39.33
	5310	62	n (40MHz)	13.5/15 (MCS0)	39.24
	5290	58	ac (80MHz)	29.3/32.5 (MCS0)	81.30
	5500	100	а	6	22.52
	5580	116	а	6	22.12
	5720	144	а	6	22.06
	5500	100	n (20MHz)	6.5/7.2 (MCS0)	21.29
2C	5580	116	n (20MHz)	6.5/7.2 (MCS0)	23.20
Band 2C	5720	144	n (20MHz)	6.5/7.2 (MCS0)	23.56
Ba	5510	102	n (40MHz)	13.5/15 (MCS0)	39.56
	5550	110	n (40MHz)	13.5/15 (MCS0)	39.53
	5710	142	n (40MHz)	13.5/15 (MCS0)	39.37
	5530	106	ac (80MHz)	29.3/32.5 (MCS0)	78.77
	5690	138	ac (80MHz)	29.3/32.5 (MCS0)	79.48

Table 7-3. Conducted Bandwidth Measurements

FCC ID: ZNFH932		FCC Pt. 15.407 802.11a/n/ac UNII MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
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🔤 Keysight Spectrum Analyzer - Occi							
CM RF 50 Ω RBW 200.00 kHz	DC CORREC	SENSE:INT Center Freg: 5.18000	0000 GHz	09:02:08 Pf Radio Std:	4 Jul 17, 2017 None	Trace/D	etector
	NFE 🔸	Trig: Free Run	Avg Hold: 100/100)			
	IFGain:Low	#Atten: 20 dB		Radio Dev	ice: BTS		
10 dB/div Ref 20.00	0 dBm						
10.0							
0.00	www.	man han hand	warmen the horal warmen	Workrun		Cle	ar Write
-10.0							
-20.0 Anter and Anter				June Contraction	MAAA		
-30.0					Constraint Constraint Constraints		Average
-40.0							
-50.0							
-60.0							
						N	lax Hold
-70.0							
Center 5.18 GHz				Spa	n 25 MHz		
#Res BW 200 kHz		VBW 2 MHz		Swe	ep 1 ms	Ν	/lin Hold
		Total P	ower 2	1.0 dBm			
Occupied Bandy			ower 2	1.0 abm			
	16.470 M⊦	Z				I	Detector
Transmit Freq Err	or 18.876 k	Hz % of OE	3W Power	99.00 %		Auto	Peak▶ <u>Man</u>
x dB Bandwidth	22.78 M	Hz xdB	-2	26.00 dB			
мsg 連Already in Single, pre	ass Restart to initiate a	new sweep or secure	1000 ST	ATUS			
Alleady in Single, pre	ess nestan to initiate a	new sweep or sequer	517				

Plot 7-30. 26dB Bandwidth Plot (802.11a (UNII Band 1) - Ch. 36)

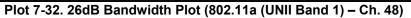


Plot 7-31. 26dB Bandwidth Plot (802.11a (UNII Band 1) - Ch. 40)

FCC ID: ZNFH932		FCC Pt. 15.407 802.11a/n/ac UNII MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dago 22 of 200
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Keysight Spectrum Analyzer - Occup				
XI RF 50 Ω	C E +++ T	SENSE:INT enter Freq: 5.240000000 GHz rig: Free Run Avg Hold: Atten: 20 dB	09:04:34 PMJul 17, 2017 Radio Std: None 100/100 Radio Device: BTS	Trace/Detector
10 dB/div Ref 20.00		Among manhand it washing m		Clear Write
0.00 10.0 20.0 www.h.wind.www.	non an	almont a walk of the second	han a second	
40.0				Averag
20.0			Dece of Mul	Max Hol
Res BW 200 kHz	vidth	VBW 2 MHz Total Power	Span 25 MHz Sweep 1 ms 21.1 dBm	Min Hol
	16.462 MHz			Detecto Peak
Transmit Freq Erro x dB Bandwidth	or 8.655 kHz 21.54 MHz		r 99.00 % -26.00 dB	Auto <u>Ma</u>
G 🗼 Already in Single, pres	ss Restart to initiate a nev	w sweep or sequence	STATUS	





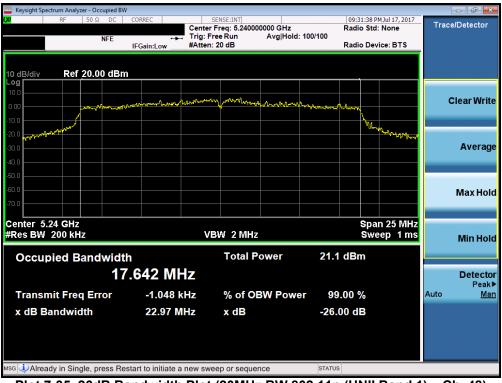
Plot 7-33. 26dB Bandwidth Plot (20MHz BW 802.11n (UNII Band 1) – Ch. 36)

FCC ID: ZNFH932		FCC Pt. 15.407 802.11a/n/ac UNII MEASUREMENT REPORT (CERTIFICATION)	🔁 LG	Approved by: Quality Manager
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Plot 7-34. 26dB Bandwidth Plot (20MHz BW 802.11n (UNII Band 1) - Ch. 40)



Plot 7-35. 26dB Bandwidth Plot (20MHz BW 802.11n (UNII Band 1) – Ch. 48)

FCC ID: ZNFH932		FCC Pt. 15.407 802.11a/n/ac UNII MEASUREMENT REPORT (CERTIFICATION)	🕑 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dega 24 of 200
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Plot 7-36. 26dB Bandwidth Plot (40MHz BW 802.11n (UNII Band 1) - Ch. 38)



Plot 7-37. 26dB Bandwidth Plot (40MHz BW 802.11n (UNII Band 1) - Ch. 46)

FCC ID: ZNFH932		FCC Pt. 15.407 802.11a/n/ac UNII MEASUREMENT REPORT (CERTIFICATION)	🔁 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dogo 25 of 200
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Plot 7-38. 26dB Bandwidth Plot (80MHz BW 802.11ac (UNII Band 1) - Ch. 42)



Plot 7-39. 26dB Bandwidth Plot (802.11a (UNII Band 2A) - Ch. 52)

FCC ID: ZNFH932		FCC Pt. 15.407 802.11a/n/ac UNII MEASUREMENT REPORT (CERTIFICATION)	🔁 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Page 36 of 209
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Keysight Spectrum Analyzer - Occupied BW	
LX RF 50 Ω DC CORREC SENSE:INT 09:15:31 PMJul 17, 20 Center Freg: 5.280000000 GHz Radio Std: None	Trace/Detector
NFE Trig: Free Run Avg Hold: 100/100	
IFGain:Low #Atten: 20 dB Radio Device: BTS	
10 dB/div Ref 20.00 dBm	
10.0	
0.00 party and a start and a s	Clear Write
-10.0	
-20.0 and the month of the second and the second an	
	Average
-40.0	J
-50.0	
60.0	
70.0	Max Hold
Center 5.28 GHz Span 25 M	
#Res BW 200 kHz VBW 2 MHz Sweep 1	ms Min Hold
Occupied Bandwidth Total Power 21.0 dBm	
o coupied Banamatin	
16.448 MHz	Detector Peak►
Transmit Freq Error -4.488 kHz % of OBW Power 99.00 %	Auto <u>Man</u>
x dB Bandwidth 22.19 MHz x dB -26.00 dB	
MSG STATUS	

Plot 7-40. 26dB Bandwidth Plot (802.11a (UNII Band 2A) - Ch. 56)



Plot 7-41. 26dB Bandwidth Plot (802.11a (UNII Band 2A) - Ch. 64)

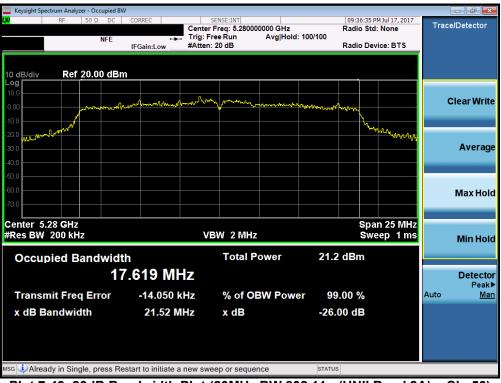
FCC ID: ZNFH932		FCC Pt. 15.407 802.11a/n/ac UNII MEASUREMENT REPORT (CERTIFICATION)	🔁 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dago 27 of 200
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Plot 7-42. 26dB Bandwidth Plot (20MHz BW 802.11n (UNII Band 2A) - Ch. 52)



Plot 7-43. 26dB Bandwidth Plot (20MHz BW 802.11n (UNII Band 2A) - Ch. 56)

FCC ID: ZNFH932		FCC Pt. 15.407 802.11a/n/ac UNII MEASUREMENT REPORT (CERTIFICATION)	🕑 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dogo 28 of 200
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Plot 7-44. 26dB Bandwidth Plot (20MHz BW 802.11n (UNII Band 2A) - Ch. 64)



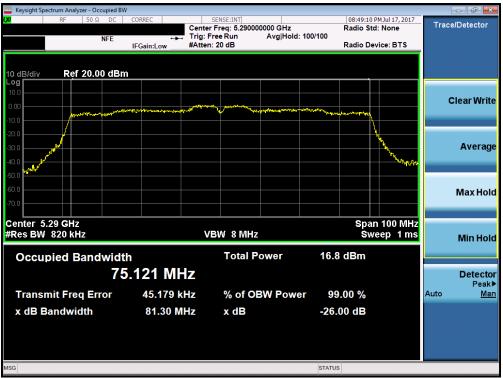
Plot 7-45. 26dB Bandwidth Plot (40MHz BW 802.11n (UNII Band 2A) - Ch. 54)

FCC ID: ZNFH932		FCC Pt. 15.407 802.11a/n/ac UNII MEASUREMENT REPORT (CERTIFICATION)	🔁 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dege 20 of 200
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Plot 7-46. 26dB Bandwidth Plot (40MHz BW 802.11n (UNII Band 2A) - Ch. 62)



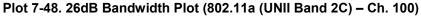
Plot 7-47. 26dB Bandwidth Plot (80MHz BW 802.11ac (UNII Band 2A) - Ch. 58)

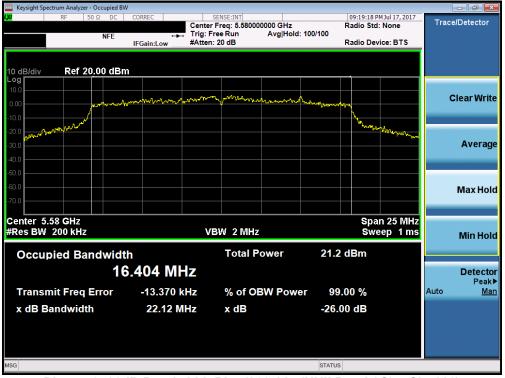
FCC ID: ZNFH932		FCC Pt. 15.407 802.11a/n/ac UNII MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 40 of 200
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Keysight Spectrum Analyzer - Occupied BV					- 5
X RF 50 Ω DC NFE	Trig: I	sense:INT er Freq: 5.500000000 GHz Free Run Avg Hold n: 20 dB	Radio St : 100/100	PMJul 17, 2017 d: None evice: BTS	Trace/Detector
10 dB/div Ref 20,00 dBr	n hardenengelagenengelagenengelagene	my poleware properties			Clear Write
-20.0				Janon providencing	Average
-40.0 -50.0 -60.0					Max Hold
Center 5.5 GHz #Res BW 200 kHz		/BW 2 MHz	Św	an 25 MHz reep 1 ms	Min Hold
Occupied Bandwidf 16 Transmit Freg Error	th 6.448 MHz -11.185 kHz	Total Power % of OBW Powe	21.0 dBm er 99.00 %		Detector Peak) Auto Mar
x dB Bandwidth	22.52 MHz	x dB	-26.00 dB		
ISG			STATUS		





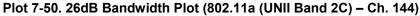
Plot 7-49. 26dB Bandwidth Plot (802.11a (UNII Band 2C) - Ch. 116)

FCC ID: ZNFH932		FCC Pt. 15.407 802.11a/n/ac UNII MEASUREMENT REPORT (CERTIFICATION)	🔁 LG	Approved by: Quality Manager
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Keysight Spectrum Analyzer - Occupied BV RF 50 Ω DC NFE	CORREC Cente	SENSE:INT r Freq: 5.72000000 GHz ree Run Avg Hold h: 20 dB	Radio d: 100/100	:14 PM Jul 17, 2017 Std: None Device: BTS	Trace/Detector
10 dB/div Ref 20.00 dBn Log 10.0 0.00 	A	w mana and			Clear Write
-10.0 -20.0 -30.0 -40.0				while the many me	Averag
-50.0					Max Hole
Center 5.72 GHz #Res BW 200 kHz Occupied Bandwidt		BW 2 MHz Total Power		span 25 MHz Sweep 1 ms	Min Hole
	5.429 MHz -13.931 kHz	% of OBW Pow			Detecto Peak Auto Mai
x dB Bandwidth	22.06 MHz	x dB	-26.00 dE		Inter
SG			STATUS		





Plot 7-51. 26dB Bandwidth Plot (20MHz BW 802.11n (UNII Band 2C) - Ch. 100)

FCC ID: ZNFH932		FCC Pt. 15.407 802.11a/n/ac UNII MEASUREMENT REPORT (CERTIFICATION)	🔁 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dago 42 of 200
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Keysight Spectrum Analyzer - Occupied E	W			
CX RF 50 Ω DC	Trig: I	SENSE:INT r Freq: 5.580000000 GHz Free Run Avg Hold: n: 20 dB	09:41:15 PM Jul 1 Radio Std: Nor 100/100 Radio Device: I	Trace/Detector
10 dB/div Ref 20.00 dB	m			
0.00	hand have north former way			Clear Write
-30.0				Average
-60.0 -70.0 Center 5.58 GHz				Max Hold
#Res BW 200 kHz		/BW 2 MHz Total Power	Span 25 Sweep 21.4 dBm	
1	7.574 MHz	% of OBW Powe	r 99.00 %	Detector Peak▶ Auto Man
Transmit Freq Error x dB Bandwidth	-11./15 KHZ 23.20 MHz	% of OBW Powe x dB	-26.00 dB	Auto Man
MSG			STATUS	

Plot 7-52. 26dB Bandwidth Plot (20MHz BW 802.11n (UNII Band 2C) - Ch. 116)



Plot 7-53. 26dB Bandwidth Plot (20MHz BW 802.11n (UNII Band 2C) - Ch. 144)

FCC ID: ZNFH932		FCC Pt. 15.407 802.11a/n/ac UNII MEASUREMENT REPORT (CERTIFICATION)	🔁 LG	Approved by: Quality Manager
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Plot 7-54. 26dB Bandwidth Plot (40MHz BW 802.11n (UNII Band 2C) - Ch. 102)



Plot 7-55. 26dB Bandwidth Plot (40MHz BW 802.11n (UNII Band 2C) - Ch. 110)

FCC ID: ZNFH932		FCC Pt. 15.407 802.11a/n/ac UNII MEASUREMENT REPORT (CERTIFICATION)	🔁 LG	Approved by: Quality Manager
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Plot 7-56. 26dB Bandwidth Plot (40MHz BW 802.11n (UNII Band 2C) - Ch. 142)



Plot 7-57. 26dB Bandwidth Plot (80MHz BW 802.11ac (UNII Band 2C) – Ch. 106)

FCC ID: ZNFH932		FCC Pt. 15.407 802.11a/n/ac UNII MEASUREMENT REPORT (CERTIFICATION)	🔁 LG	Approved by: Quality Manager
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Plot 7-58. 26dB Bandwidth Plot (80MHz BW 802.11ac (UNII Band 2C) - Ch. 138)

FCC ID: ZNFH932		FCC Pt. 15.407 802.11a/n/ac UNII MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
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7.3 6dB Bandwidth Measurement – 802.11a/n/ac §15.407 (e)

Test Overview and Limit

The bandwidth at 6dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating at its maximum duty cycle, at its maximum power control level, as defined in KDB 789033 D02 v01r04, 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 \geq 500 kHz.

Test Procedure Used

KDB 789033 D02 v01r04 - 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.

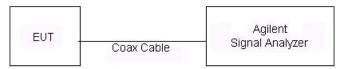


Figure 7-2. Test Instrument & Measurement Setup

Test Notes

None.

FCC ID: ZNFH932		FCC Pt. 15.407 802.11a/n/ac UNII MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager	
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Antenna-1 6 dB Bandwidth Measurements

	Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	Measured 6dB Bandwidth [MHz]
	5745	149	а	6	12.54
	5785	157	а	6	13.86
	5825	165	а	6	12.62
e	5745	149	n (20MHz)	6.5/7.2 (MCS0)	12.56
Band	5785	157	n (20MHz)	6.5/7.2 (MCS0)	15.10
ä	5825	165	n (20MHz)	6.5/7.2 (MCS0)	15.08
	5755	151	n (40MHz)	13.5/15 (MCS0)	33.82
	5795	159	n (40MHz)	13.5/15 (MCS0)	33.84
	5775	155	ac (80MHz)	29.3/32.5 (MCS0)	75.05

 Table 7-4. Conducted Bandwidth Measurements



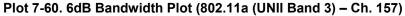
Plot 7-59. 6dB Bandwidth Plot (802.11a (UNII Band 3) - Ch. 149)

FCC ID: ZNFH932		FCC Pt. 15.407 802.11a/n/ac UNII MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
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Keysight Spectrum Analyzer - Occupied BW					
NFE	Trig: I	SENSE:INT r Freq: 5.785000000 GHz Free Run Avg Hold: n: 20 dB	Radio Std		Trace/Detector
10 dB/div Ref 20,00 dBm	han and harden	And many and some Areas			ClearWrite
			Martal Martal	WWWWW	Average
40.0					Max Hold
Center 5.785 GHz #Res BW 100 kHz		VBW 300 kHz	Swee	n 25 MHz p 2.4 ms	Min Hold
	385 MHz	Total Power	22.0 dBm		Detecto Peak
Transmit Freq Error x dB Bandwidth	9.608 kHz 13.86 MHz	% of OBW Powe x dB	ər 99.00 % -6.00 dB		Auto <u>Ma</u> i
SG			STATUS		





Plot 7-61. 6dB Bandwidth Plot (802.11a (UNII Band 3) - Ch. 165)

FCC ID: ZNFH932		FCC Pt. 15.407 802.11a/n/ac UNII MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
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Keysight Spectrum Analyzer - Occupied BW						×
(X) RF 50 Ω DC NFE	Center	SENSE:INT Freq: 5.745000000 GHz Free Run Avg Hold : 20 dB	10:53:07 F Radio Sto d: 100/100 Radio De		Trace/Detecto	or
10 dB/div Ref 20.00 dBm						
	mlandanal	m marken water			Clear Wi	rite
-20.0			<u>н</u> , ма	Borts Wally Market	Avera	age
-50.0 -60.0 -70.0					Max H	olo
Center 5.745 GHz #Res BW 100 kHz		VBW 300 kHz	Swee	an 25 MHz ep 2.4 ms	Min H	old
	.577 MHz	Total Power	22.0 dBm			ak▶
Transmit Freq Error x dB Bandwidth	3.619 kHz 12.56 MHz	% of OBW Pow x dB	er 99.00 % -6.00 dB		Auto <u>I</u>	Man
ISG			STATUS			

Plot 7-62. 6dB Bandwidth Plot (20MHz BW 802.11n (UNII Band 3) - Ch. 149)



Plot 7-63. 6dB Bandwidth Plot (20MHz BW 802.11n (UNII Band 3) - Ch. 157)

FCC ID: ZNFH932		FCC Pt. 15.407 802.11a/n/ac UNII MEASUREMENT REPORT (CERTIFICATION)	🔁 LG	Approved by: Quality Manager
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w Keysight Spectrum Analyzer - Occupied BW					
R F 50 Ω DC		SENSE:INT er Freq: 5.825000000 GHz Free Run Avg Holo	Radio Sto	M Jul 17, 2017 : None	Trace/Detector
	IFGain:Low #Atte	n: 20 dB	Radio De	vice: BTS	
10 dB/div Ref 20.00 dBm					
10.0 0.00	AN Armon Amalour And And	vin untra front form	moulonpelona		Clear Write
-10.0					
-20.0			¥	toth who who who	Average
-40.0					Average
-50.0					
-60.0					Max Hold
-70.0					
Center 5.825 GHz #Res BW 100 kHz	#	VBW 300 kHz		n 25 MHz p 2.4 ms	Min Hold
Occupied Bandwidtl		Total Power	22.0 dBm	<u> </u>	WIITHOID
	.573 MHz				Detector
					Peak▶
Transmit Freq Error	5.308 kHz	% of OBW Pow			Auto <u>Man</u>
x dB Bandwidth	15.08 MHz	x dB	-6.00 dB		
ISG			STATUS		

Plot 7-64. 6dB Bandwidth Plot (20MHz BW 802.11n (UNII Band 3) - Ch. 165)



Plot 7-65. 6dB Bandwidth Plot (40MHz BW 802.11n (UNII Band 3) - Ch. 151)

FCC ID: ZNFH932		FCC Pt. 15.407 802.11a/n/ac UNII MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
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Plot 7-66. 6dB Bandwidth Plot (40MHz BW 802.11n (UNII Band 3) - Ch. 159)



Plot 7-67. 6dB Bandwidth Plot (80MHz BW 802.11ac (UNII Band 3) - Ch. 155)

FCC ID: ZNFH932		FCC Pt. 15.407 802.11a/n/ac UNII MEASUREMENT REPORT (CERTIFICATION)	🔁 LG	Approved by: Quality Manager
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Antenna-2 6dB Bandwidth Measurements

	Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	Measured 6dB Bandwidth [MHz]
	5745	149	а	6	11.90
	5785	157	а	6	10.15
	5825	165	а	6	11.30
e	5745	149	n (20MHz)	6.5/7.2 (MCS0)	13.89
Band	5785	157	n (20MHz)	6.5/7.2 (MCS0)	15.09
ä	5825	165	n (20MHz)	6.5/7.2 (MCS0)	13.80
	5755	151	n (40MHz)	13.5/15 (MCS0)	32.61
	5795	159	n (40MHz)	13.5/15 (MCS0)	33.84
	5775	155	ac (80MHz)	29.3/32.5 (MCS0)	61.37

 Table 7-5. Conducted Bandwidth Measurements



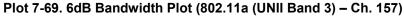
Plot 7-68. 6dB Bandwidth Plot (802.11a (UNII Band 3) - Ch. 149)

FCC ID: ZNFH932		FCC Pt. 15.407 802.11a/n/ac UNII MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager	
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Keysight Spectrum Analyzer - Occupied BW					- F
X RF 50 Ω DC NFE			Radio : 100/100	:05 PMJul 17, 2017 Std: None Device: BTS	Trace/Detector
10 dB/div Ref 20.00 dBm					
0.00		John Martin Constant	bruntower Ma		Clear Writ
-20.0				unden var halten and	Averag
50.0					Max Ho
Center 5.785 GHz Res BW 100 kHz	#V	BW 300 kHz		pan 25 MHz /eep 2.4 ms	Min Hol
Occupied Bandwidth		Total Power	21.9 dBm		
16.	386 MHz				Detecto Peak
Transmit Freq Error	7.171 kHz	% of OBW Powe	er 99.00 %)	Auto <u>Ma</u>
x dB Bandwidth	10.15 MHz	x dB	-6.00 dB		
6G			STATUS		



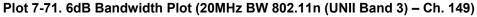


Plot 7-70. 6dB Bandwidth Plot (802.11a (UNII Band 3) - Ch. 165)

FCC ID: ZNFH932		FCC Pt. 15.407 802.11a/n/ac UNII MEASUREMENT REPORT (CERTIFICATION)	🔁 LG	Approved by: Quality Manager	
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🔤 Keysight Spectrum Analyzer - Occupied BW					
X RF 50 Ω DC	Trig: I	SENSE:INT r Freq: 5.745000000 GHz Free Run Avg Hold n: 20 dB	Radio Std:		Trace/Detector
10 dB/div Ref 20.00 dBm					ClearWrite
0.00 -10.0 -20.0	yadaalin fayna faralaa yaa	an have we have	h	warman	Clear Write
-30.0					Average
-80.0 -70.0 Center 5.745 GHz			Spa	n 25 MHz	Max Hold
#Res BW 100 kHz Occupied Bandwidtl	1	VBW 300 kHz Total Power	Swee 21.6 dBm	p 2.4 ms	Min Hold
17	.579 MHz				Detector Peak
Transmit Freq Error	-6.029 kHz	% of OBW Powe	er 99.00 %	P	Auto <u>Mar</u>
x dB Bandwidth	13.89 MHz	x dB	-6.00 dB		
ISG			STATUS		





Plot 7-72. 6dB Bandwidth Plot (20MHz BW 802.11n (UNII Band 3) - Ch. 157)

FCC ID: ZNFH932		FCC Pt. 15.407 802.11a/n/ac UNII MEASUREMENT REPORT (CERTIFICATION)	🕑 LG	Approved by: Quality Manager
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NFE Child B/div Ref 20.00 dBm Radio Device: BTS 10 dB/div Ref 20.00 dBm Cle	Detector ear Write
In Contraction #Atten: 20 dB Radio Device: BTS 10 dB/div Ref 20.00 dBm Image: Contraction of the second se	ear Write
Log 10.0 0.00 	ear Write
Log 10.0 0.00 -0.000 -0.000 -0.0	ear Write
000	ear Write
1000	
200 With Market and a second s	
	Average
-40.0	
-50.0	
-60.0	Max Hold
Center 5.825 GHz Span 25 MHz #Res BW 100 kHz \$\$ Weep 2.4 ms \$\$	
	Min Hold
Occupied Bandwidth Total Power 22.0 dBm	
17.582 MHz	Detector Peak►
Transmit Freq Error -14.225 kHz % of OBW Power 99.00 %	Man
x dB Bandwidth 13.80 MHz x dB -6.00 dB	
ASG STATUS	

Plot 7-73. 6dB Bandwidth Plot (20MHz BW 802.11n (UNII Band 3) - Ch. 165)



Plot 7-74. 6dB Bandwidth Plot (40MHz BW 802.11n (UNII Band 3) - Ch. 151)

FCC ID: ZNFH932		FCC Pt. 15.407 802.11a/n/ac UNII MEASUREMENT REPORT (CERTIFICATION)	🔁 LG	Approved by: Quality Manager	
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Plot 7-75. 6dB Bandwidth Plot (40MHz BW 802.11n (UNII Band 3) - Ch. 159)



Plot 7-76. 6dB Bandwidth Plot (80MHz BW 802.11ac (UNII Band 3) - Ch. 155)

FCC ID: ZNFH932		FCC Pt. 15.407 802.11a/n/ac UNII MEASUREMENT REPORT (CERTIFICATION)	🔁 LG	Approved by: Quality Manager	
Test Report S/N:	Test Dates:	EUT Type:		Dogo 57 of 200	
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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)

Test Overview and Limits

A transmitter antenna terminal of the EUT is connected to the input of an RF pulse power sensor. Measurement is made using a broadband average power meter while the EUT is operating at its maximum duty cycle, at its maximum power control level, as defined in KDB 789033 D02 v01r04, 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 + $10\log_{10}(26dB BW) = 11 dBm + 10\log_{10}(21.98) = 24.42dBm$.

In the 5.47 – 5.725GHz band, the maximum permissible conducted output power is the lesser of 250mW (23.98dBm) and 11 dBm + $10log_{10}(26dB BW) = 11 dBm + <math>10log_{10}(20.75) = 24.17dBm$.

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

Test Procedure Used

KDB 789033 D02 v01r04 – Section E)3)b) Method PM-G KDB 662911 v02r01 – Section E)1) Measure-and-Sum Technique

Test Settings

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

Test Setup

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

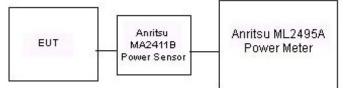


Figure 7-3. Test Instrument & Measurement Setup

Test Notes

None

FCC ID: ZNFH932		FCC Pt. 15.407 802.11a/n/ac UNII MEASUREMENT REPORT (CERTIFICATION)	🔁 LG	Approved by: Quality Manager	
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Antenna-1 Conducted Output Power Measurements

	5GHz ((20MHz) Cond	lucted Power	[dBm]	
Freq [MHz]	Channel	Detector	IEEE Transmission Mode		
Fied [winz]	Channer	Detector	802.11a	802.11n	802.11ac
5180	36	AVG	16.85	16.71	16.70
5200	40	AVG	16.84	16.69	16.65
5220	44	AVG	16.84	16.65	16.61
5240	48	AVG	16.71	16.59	16.52
5260	52	AVG	16.73	16.62	16.50
5280	56	AVG	16.90	16.74	16.71
5300	60	AVG	16.72	16.57	16.48
5320	64	AVG	16.76	16.63	16.53
5500	100	AVG	16.57	16.38	16.33
5580	116	AVG	16.38	16.17	16.19
5660	132	AVG	16.48	16.33	16.34
5720	144	AVG	16.49	16.32	16.29
5745	149	AVG	16.55	16.39	16.40
5785	157	AVG	16.28	16.13	16.12
5825	165	AVG	16.30	16.14	16.14

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

	Channel	Detector	5GHz (40MHz Power	
Freq [MHz]	Channel	Detector	ission Mode	
			802.11n	802.11ac
5190	38	AVG	13.47	13.43
5230	46	AVG	15.45	15.44
5270	54	AVG	15.44	15.39
5310	62	AVG	13.33	13.25
5510	102	AVG	13.18	13.11
5550	110	AVG	15.04	15.04
5670	134	AVG	15.20	15.18
5710	142	AVG	15.01	14.95
5755	151	AVG	15.28	15.27
5795	159	AVG	15.12	15.11

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

5GHz (80MHz) Conducted Power [dBm]						
Channel	Detector	IEEE Transmission Mode				
		802.11ac				
42	AVG	12.61				
58	AVG	10.54				
106	AVG	12.23				
138	AVG	11.68				
155	AVG	11.69				
	Channel 42 58 106 138	ChannelDetector42AVG58AVG106AVG138AVG				

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

FCC ID: ZNFH932		FCC Pt. 15.407 802.11a/n/ac UNII MEASUREMENT REPORT (CERTIFICATION)	🔁 LG	Approved by: Quality Manager
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Antenna-2 Conducted Output Power Measurements

	5GHz (20MHz) Conducted Power [dBm]						
Freq [MHz]	Channel	Detector	IEEE 1	IEEE Transmission Mode			
Fied [winz]	Channer	Detector	802.11a	802.11n	802.11ac		
5180	36	AVG	16.06	15.85	15.81		
5200	40	AVG	16.19	16.03	15.98		
5220	44	AVG	16.10	15.92	15.91		
5240	48	AVG	16.31	16.17	16.15		
5260	52	AVG	16.27	16.11	16.07		
5280	56	AVG	16.07	15.92	15.86		
5300	60	AVG	16.25	16.07	16.09		
5320	64	AVG	16.16	16.00	16.02		
5500	100	AVG	16.01	15.87	15.85		
5580	116	AVG	16.24	16.08	16.08		
5660	132	AVG	16.20	16.05	16.02		
5720	144	AVG	16.16	15.98	16.00		
5745	149	AVG	16.29	16.13	16.13		
5785	157	AVG	16.31	16.13	16.12		
5825	165	AVG	16.25	16.13	16.11		

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

	Channel	Channel Detector -		5GHz (40MHz) Conducted Power [dBm]		
Freq [MHz]	Channer	Detector	IEEE Transm	ission Mode		
			802.11n	802.11ac		
5190	38	AVG	12.70	12.69		
5230	46	AVG	14.88	14.90		
5270	54	AVG	15.00	14.99		
5310	62	AVG	12.98	12.94		
5510	102	AVG	12.81	12.82		
5550	110	AVG	14.76	14.74		
5670	134	AVG	14.89	14.91		
5710	142	AVG	14.92	14.91		
5755	151	AVG	15.04	15.06		
5795	159	AVG	14.98	14.99		

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

5GHz (80MHz) Conducted Power [dBm]						
Freq [MHz]	Channel	Detector	IEEE Transmission Mode			
			802.11ac			
5210	42	AVG	11.96			
5290	58	AVG	9.99			
5530	106	AVG	11.95			
5690	138	AVG	11.62			
5775	155	AVG	11.69			

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

FCC ID: ZNFH932		FCC Pt. 15.407 802.11a/n/ac UNII MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager	
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MIMO Maximum Conducted Output Power Measurements

	5GHz (20MHz) Conducted Power [dBm]						
Freq [MHz]	Channel	Detector	ANT1	ANT2	CDD		
5180	36	AVG	16.85	16.06	19.48		
5200	40	AVG	16.84	16.19	19.54		
5220	44	AVG	16.84	16.10	19.50		
5240	48	AVG	16.71	16.31	19.52		
5260	52	AVG	16.73	16.27	19.52		
5280	56	AVG	16.90	16.07	19.52		
5300	60	AVG	16.72	16.25	19.50		
5320	64	AVG	16.76	16.16	19.48		
5500	100	AVG	16.57	16.01	19.31		
5580	116	AVG	16.38	16.24	19.32		
5660	132	AVG	16.48	16.20	19.35		
5720	144	AVG	16.49	16.16	19.34		
5745	149	AVG	16.55	16.29	19.43		
5785	157	AVG	16.28	16.31	19.31		
5825	165	AVG	16.30	16.25	19.29		

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

5GHz (20MHz) Conducted Power [dBm]					
Freq [MHz]	Channel	Detector	ANT1	ANT2	MIMO
5180	36	AVG	16.71	15.85	19.31
5200	40	AVG	16.69	16.03	19.38
5220	44	AVG	16.65	15.92	19.31
5240	48	AVG	16.59	16.17	19.40
5260	52	AVG	16.62	16.11	19.38
5280	56	AVG	16.74	15.92	19.36
5300	60	AVG	16.57	16.07	19.34
5320	64	AVG	16.63	16.00	19.34
5500	100	AVG	16.38	15.87	19.14
5580	116	AVG	16.17	16.08	19.14
5660	132	AVG	16.33	16.05	19.20
5720	144	AVG	16.32	15.98	19.16
5745	149	AVG	16.39	16.13	19.27
5785	157	AVG	16.13	16.13	19.14
5825	165	AVG	16.14	16.13	19.15

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

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5GHz (20MHz) Conducted Power [dBm]					
Freq [MHz]	Channel	Detector	ANT1	ANT2	MIMO
5180	36	AVG	16.70	15.81	19.29
5200	40	AVG	16.65	15.98	19.34
5220	44	AVG	16.61	15.91	19.28
5240	48	AVG	16.52	16.15	19.35
5260	52	AVG	16.50	16.07	19.30
5280	56	AVG	16.71	15.86	19.32
5300	60	AVG	16.48	16.09	19.30
5320	64	AVG	16.53	16.02	19.29
5500	100	AVG	16.33	15.85	19.11
5580	116	AVG	16.19	16.08	19.15
5660	132	AVG	16.34	16.02	19.19
5720	144	AVG	16.29	16.00	19.16
5745	149	AVG	16.40	16.13	19.28
5785	157	AVG	16.12	16.12	19.13
5825	165	AVG	16.14	16.11	19.14

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

Freq [MHz]	Channel	Detector	5GHz (40N	/IHz) Conduct [dBm]	ed Power
	Channel	Detector	IEEE 1	Fransmission	Mode
			ANT1	ANT2	MIMO
5190	38	AVG	13.47	12.70	16.11
5230	46	AVG	15.45	14.88	18.18
5270	54	AVG	15.44	15.00	18.24
5310	62	AVG	13.33	12.98	16.17
5510	102	AVG	13.18	12.81	16.01
5550	110	AVG	15.04	14.76	17.91
5670	134	AVG	15.20	14.89	18.06
5710	142	AVG	15.01	14.92	17.98
5755	151	AVG	15.28	15.04	18.17
5795	159	AVG	15.12	14.98	18.06

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

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Freq [MHz]	Channel	Detector	5GHz (40MHz) Conducted [dBm]		ed Power	
Fied [MHZ]	Channer	Detector	IEEE 1	IEEE Transmission Mode		
			ANT1	ANT2	MIMO	
5190	38	AVG	13.43	12.69	16.09	
5230	46	AVG	15.44	14.90	18.19	
5270	54	AVG	15.39	14.99	18.20	
5310	62	AVG	13.25	12.94	16.11	
5510	102	AVG	13.11	12.82	15.98	
5550	110	AVG	15.04	14.74	17.90	
5670	134	AVG	15.18	14.91	18.06	
5710	142	AVG	14.95	14.91	17.94	
5755	151	AVG	15.27	15.06	18.18	
5795	159	AVG	15.11	14.99	18.06	

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

5GHz (80MHz) Conducted Power [dBm]					
Freq [MHz]	Channel	Detector	IEEE Transmission Mode		
			ANT1	ANT2	MIMO
5210	42	AVG	12.61	11.96	15.31
5290	58	AVG	10.54	9.99	13.28
5530	106	AVG	12.23	11.95	15.10
5690	138	AVG	11.68	11.62	14.66
5775	155	AVG	11.69	11.69	14.70

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

Note:

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

Sample MIMO Calculation:

At 5180MHz the average conducted output power was measured to be 16.71 dBm for Antenna-1 and 15.85 dBm for Antenna-2.

Antenna 1 + Antenna 2 = MIMO

(16.71 dBm + 15.85 dBm) = (46.88 mW + 38.46 mW) = 85.34 mW = 19.31 dBm

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7.5 Maximum Power Spectral Density – 802.11a/n/ac §15.407(a.1.iv) §15.407(a.2) §15.407(a.3)

Test Overview and Limit

The spectrum analyzer was connected to the antenna terminal while the EUT was operating at its maximum duty cycle, at its maximum power control level, as defined in KDB 789033 D02 v01r04, and at the appropriate frequencies. Method SA-1, as defined in KDB 789033 D02 v01r04, was used to measure the power spectral density.

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

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

Test Procedure Used

KDB 789033 D02 v01r04 – Section F KDB 662911 v02r01 – Section E)2) Measure-and-Sum Technique

Test Settings

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

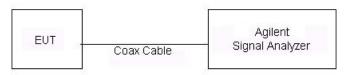


Figure 7-4. Test Instrument & Measurement Setup

Test Notes

None

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Antenna-1 Power Spectral Density Measurements

	Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	Measured Power Density [dBm]	Max Permissible Power Density [dBm/MHz]	Margin [dB]
	5180	36	а	6	7.20	11.0	-3.80
	5200	40	а	6	7.50	11.0	-3.51
	5240	48	а	6	7.20	11.0	-3.80
-	5180	36	n (20MHz)	6.5/7.2 (MCS0)	6.94	11.0	-4.06
Band 1	5200	40	n (20MHz)	6.5/7.2 (MCS0)	6.85	11.0	-4.15
ä	5240	48	n (20MHz)	6.5/7.2 (MCS0)	7.13	11.0	-3.87
	5190	38	n (40MHz)	13.5/15 (MCS0)	0.32	11.0	-10.68
	5230	46	n (40MHz)	13.5/15 (MCS0)	3.13	11.0	-7.87
	5210	42	ac (80MHz)	29.3/32.5 (MCS0)	-2.31	11.0	-13.31
	5260	52	а	6	7.37	11.0	-3.63
	5280	56	а	6	7.56	11.0	-3.44
	5320	64	а	6	7.68	11.0	-3.32
ZA	5260	52	n (20MHz)	6.5/7.2 (MCS0)	6.86	11.0	-4.14
Band 2A	5280	56	n (20MHz)	6.5/7.2 (MCS0)	7.13	11.0	-3.87
Ba	5320	64	n (20MHz)	6.5/7.2 (MCS0)	7.04	11.0	-3.96
	5270	54	n (40MHz)	13.5/15 (MCS0)	3.03	11.0	-7.97
	5310	62	n (40MHz)	13.5/15 (MCS0)	0.97	11.0	-10.03
	5290	58	ac (80MHz)	29.3/32.5 (MCS0)	-4.65	11.0	-15.65
	5500	100	а	6	7.31	11.0	-3.69
	5580	116	а	6	7.19	11.0	-3.81
	5720	144	а	6	6.78	11.0	-4.22
	5500	100	n (20MHz)	6.5/7.2 (MCS0)	7.09	11.0	-3.91
SC	5580	116	n (20MHz)	6.5/7.2 (MCS0)	6.93	11.0	-4.08
Band 2C	5720	144	n (20MHz)	6.5/7.2 (MCS0)	6.57	11.0	-4.44
Ba	5510	102	n (40MHz)	13.5/15 (MCS0)	1.07	11.0	-9.93
	5550	110	n (40MHz)	13.5/15 (MCS0)	2.80	11.0	-8.20
	5710	142	n (40MHz)	13.5/15 (MCS0)	2.23	11.0	-8.77
	5530	106	ac (80MHz)	29.3/32.5 (MCS0)	-3.10	11.0	-14.10
	5690	138	ac (80MHz)	29.3/32.5 (MCS0)	-4.04	11.0	-15.04

Table 7-18. Bands 1, 2A, 2C Conducted Power Spectral Density Measurements

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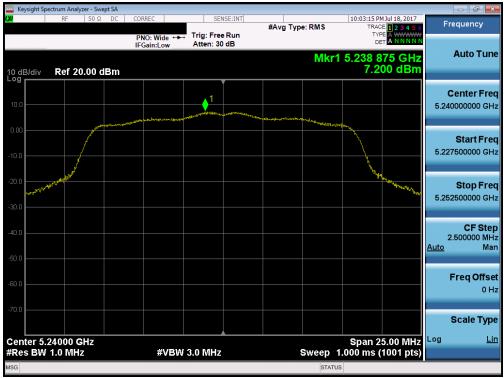




Plot 7-78. Power Spectral Density Plot (802.11a (UNII Band 1) - Ch. 40)

FCC ID: ZNFH932		FCC Pt. 15.407 802.11a/n/ac UNII MEASUREMENT REPORT (CERTIFICATION)	🕑 LG	Approved by: Quality Manager
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Plot 7-80. Power Spectral Density Plot (20MHz BW 802.11n (UNII Band 1) - Ch. 36)

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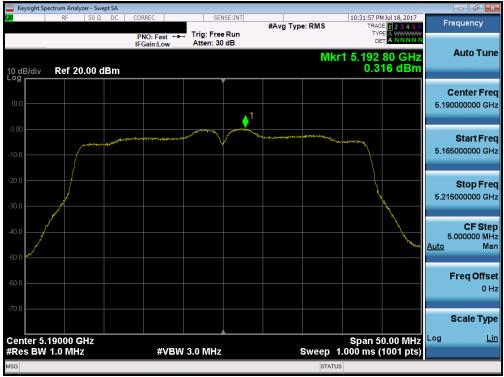
Plot 7-81. Power Spectral Density Plot (20MHz BW 802.11n (UNII Band 1) - Ch. 40)



Plot 7-82. Power Spectral Density Plot (20MHz BW 802.11n (UNII Band 1) - Ch. 48)

FCC ID: ZNFH932		FCC Pt. 15.407 802.11a/n/ac UNII MEASUREMENT REPORT (CERTIFICATION)	🔁 LG	Approved by: Quality Manager
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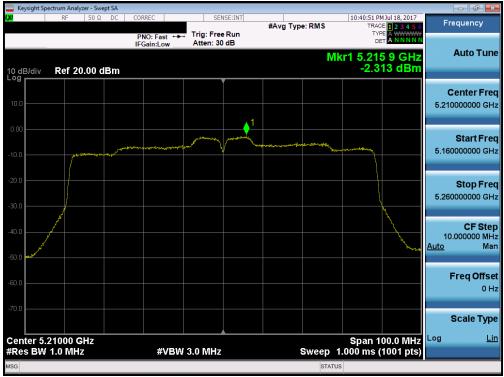




Plot 7-84. Power Spectral Density Plot (40MHz BW 802.11n (UNII Band 1) - Ch. 46)

FCC ID: ZNFH932		FCC Pt. 15.407 802.11a/n/ac UNII MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
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Plot 7-85. Power Spectral Density Plot (80MHz BW 802.11ac (UNII Band 1) - Ch. 42)



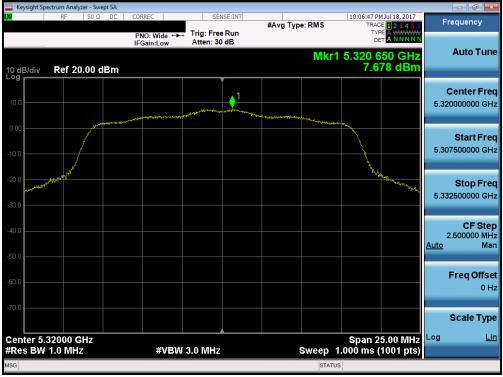
Plot 7-86. Power Spectral Density Plot (802.11a (UNII Band 2A) - Ch. 52)

FCC ID: ZNFH932		FCC Pt. 15.407 802.11a/n/ac UNII MEASUREMENT REPORT (CERTIFICATION)	🔁 LG	Approved by: Quality Manager
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Plot 7-88. Power Spectral Density Plot (802.11a (UNII Band 2A) - Ch. 64)

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Plot 7-89. Power Spectral Density Plot (20MHz BW 802.11n (UNII Band 2A) – Ch. 52)



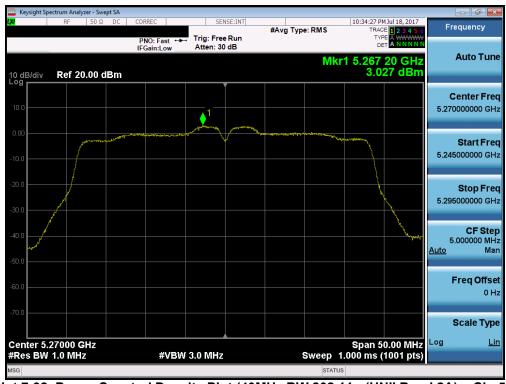
Plot 7-90. Power Spectral Density Plot (20MHz BW 802.11n (UNII Band 2A) - Ch. 56)

FCC ID: ZNFH932		FCC Pt. 15.407 802.11a/n/ac UNII MEASUREMENT REPORT (CERTIFICATION)	🔁 LG	Approved by: Quality Manager
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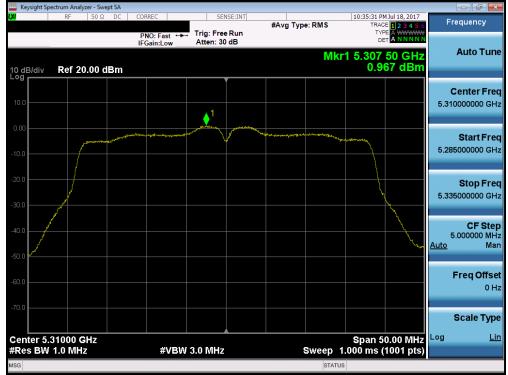
Plot 7-91. Power Spectral Density Plot (20MHz BW 802.11n (UNII Band 2A) – Ch. 64)



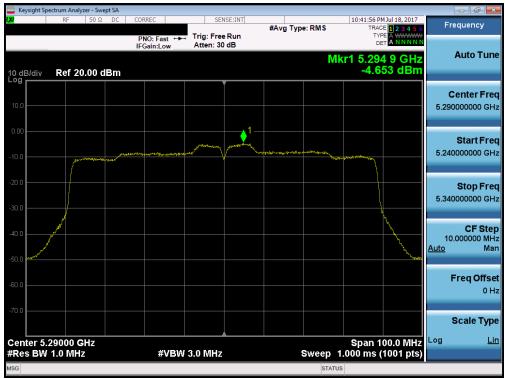
Plot 7-92. Power Spectral Density Plot (40MHz BW 802.11n (UNII Band 2A) - Ch. 54)

FCC ID: ZNFH932		FCC Pt. 15.407 802.11a/n/ac UNII MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager		
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Plot 7-94. Power Spectral Density Plot (80MHz BW 802.11ac (UNII Band 2A) - Ch. 58)

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Plot 7-96. Power Spectral Density Plot (802.11a (UNII Band 2C) - Ch. 116)

FCC ID: ZNFH932		FCC Pt. 15.407 802.11a/n/ac UNII MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager		
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Plot 7-98. Power Spectral Density Plot (20MHz BW 802.11n (UNII Band 2C) - Ch. 100)

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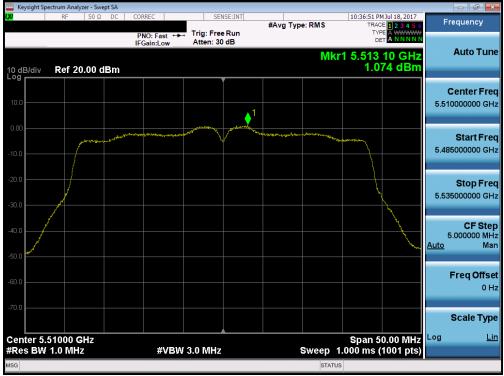
Plot 7-99. Power Spectral Density Plot (20MHz BW 802.11n (UNII Band 2C) - Ch. 116)



Plot 7-100. Power Spectral Density Plot (20MHz BW 802.11n (UNII Band 2C) - Ch. 144)

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Plot 7-101. Power Spectral Density Plot (40MHz BW 802.11n (UNII Band 2C) - Ch. 102)



Plot 7-102. Power Spectral Density Plot (40MHz BW 802.11n (UNII Band 2C) - Ch. 110)

FCC ID: ZNFH932		FCC Pt. 15.407 802.11a/n/ac UNII MEASUREMENT REPORT (CERTIFICATION)	🔁 LG	Approved by: Quality Manager		
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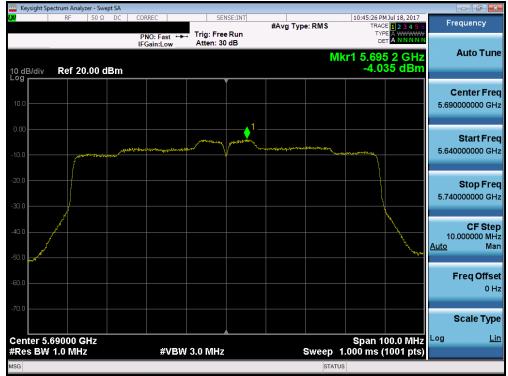
Plot 7-103. Power Spectral Density Plot (40MHz BW 802.11n (UNII Band 2C) – Ch. 142)



Plot 7-104. Power Spectral Density Plot (80MHz BW 802.11ac (UNII Band 2C) - Ch. 106)

FCC ID: ZNFH932		FCC Pt. 15.407 802.11a/n/ac UNII MEASUREMENT REPORT (CERTIFICATION)	🔁 LG	Approved by: Quality Manager		
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Plot 7-105. Power Spectral Density Plot (80MHz BW 802.11ac (UNII Band 2C) - Ch. 138)

FCC ID: ZNFH932		FCC Pt. 15.407 802.11a/n/ac UNII MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager		
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	Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]		Max Permissible Power Density [dBm/500kHz]	Margin [dB]
	5745	149	а	6	4.38	30.0	-25.63
	5785	157	а	6	4.46	30.0	-25.54
	5825	165	а	6	4.58	30.0	-25.42
e	5745	149	n (20MHz)	6.5/7.2 (MCS0)	4.36	30.0	-25.64
Band	5785	157	n (20MHz)	6.5/7.2 (MCS0)	4.58	30.0	-25.42
ä	5825	165	n (20MHz)	6.5/7.2 (MCS0)	4.15	30.0	-25.85
	5755	151	n (40MHz)	13.5/15 (MCS0)	0.29	30.0	-29.71
	5795	159	n (40MHz)	13.5/15 (MCS0)	-0.01	30.0	-30.01
	5775	155	ac (80MHz)	29.3/32.5 (MCS0)	-6.21	30.0	-36.21

Table 7-19. Band 3 Conducted Power Spectral Density Measurements



Plot 7-106. Power Spectral Density Plot (802.11a (UNII Band 3) - Ch. 149)

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Plot 7-108. Power Spectral Density Plot (802.11a (UNII Band 3) - Ch. 165)

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Plot 7-110. Power Spectral Density Plot (20MHz BW 802.11n (UNII Band 3) - Ch. 157)

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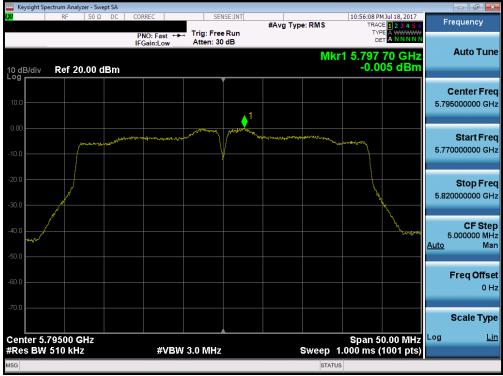




Plot 7-112. Power Spectral Density Plot (40MHz BW 802.11n (UNII Band 3) - Ch. 151)

FCC ID: ZNFH932		FCC Pt. 15.407 802.11a/n/ac UNII MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager	
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Plot 7-114. Power Spectral Density Plot (80MHz BW 802.11ac (UNII Band 3) - Ch. 155)

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Test Report S/N:	Test Dates:	EUT Type:		Dogo 95 of 200	
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