

RF TEST REPORT

Test item : Personal Computer
Model No. : LG22V24
Order No. : DTNC1505-02376
Date of receipt : 2015-05-12
Test duration : 2015-05-20 ~ 2015-05-28, 2015-06-18 ~ 2015-06-19
Date of issue : 2015-06-19
Use of report : FCC Original Grant

Applicant : LG Electronics USA.

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Test specification : FCC Part 15.407 Subpart E

Test environment : See appended test report

Test result : ☒ Pass ☐ Fail

The test results presented in this test report are limited only to the sample supplied by applicant and the use of this test report is inhibited other than its purpose. This test report shall not be reproduced except in full, without the written approval of DT&C Co., Ltd.

Tested by:



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Test Report Version

Test Report No.	Date	Description
DRTFCC1506-0112	Jun. 15, 2015	Initial issue
DRTFCC1506-0112(1)	Jun. 18, 2015	Added the test result for 144, 142, 138 channels

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1. EUT DESCRIPTION

FCC Equipment Class	Unlicensed National Information Infrastructure (UNII)
Product	Personal Computer
Model Name	LG22V24
Add Model Name	N/A
Hardware version	1.0
Software version	1.0
Power Supply	AC 120 V
Frequency Range	U-NII 1(5150 ~ 5250 MHz) ▪ 802.11a/n(HT20): 5180 ~ 5240 MHz ▪ 802.11n(HT40): 5190 ~ 5230 MHz ▪ 802.11ac(VHT80): 5210 MHz U-NII 2A(5250 ~ 5350 MHz) ▪ 802.11a/n(HT20): 5260 ~ 5320 MHz ▪ 802.11n(HT40): 5270 ~ 5310 MHz ▪ 802.11ac(VHT80): 5290 MHz U-NII 2C(5470 ~ 5725 MHz) ▪ 802.11a/n(HT20): 5500 ~ 5700 MHz ▪ 802.11n(HT40): 5510 ~ 5670 MHz ▪ 802.11ac(VHT80): 5530 MHz U-NII 3(5725 ~ 5850MHz) ▪ 802.11a/n(HT20): 5745 ~ 5825 MHz ▪ 802.11n(HT40): 5755 ~ 5795 MHz ▪ 802.11ac(VHT80): 5775 MHz U-NII 2C & U-NII 3 ▪ 802.11ac(VHT20): 5720 MHz ▪ 802.11ac(VHT40): 5710 MHz ▪ 802.11ac(VHT80): 5690 MHz
Modulation type	OFDM
Antenna Specification	Antenna type: Internal Antenna Antenna gain ▪ U-NII 1 band: 1.42 dBi ▪ U-NII 2A band: 1.42 dBi ▪ U-NII 2C band: 2.01 dBi ▪ U-NII 3 band: 1.55 dBi

Note: This device does not used TDWR band.

2. Information about test items

2.1 Test mode / Channel Information

5GHz Band	Mode	Data Rate
U-NII 1	802.11a	6Mbps
	802.11n(HT20)	MCS 0
	802.11n(HT40)	MCS 0
	802.11ac(VHT80)	NSS1 MCS 0
U-NII 2A	802.11a	6Mbps
	802.11n(HT20)	MCS 0
	802.11n(HT40)	MCS 0
	802.11ac(VHT80)	NSS1 MCS 0
U-NII 2C	802.11a	6Mbps
	802.11n(HT20)	MCS 0
	802.11n(HT40)	MCS 0
	802.11ac(VHT20)	NSS1 MCS 0
	802.11ac(VHT40)	NSS1 MCS 0
	802.11ac(VHT80)	NSS1 MCS 0
U-NII 3	802.11a	6Mbps
	802.11n(HT20)	MCS 0
	802.11n(HT40)	MCS 0
	802.11ac(VHT20)	NSS1 MCS 0
	802.11ac(VHT40)	NSS1 MCS 0
	802.11ac(VHT80)	NSS1 MCS 0

Note 1: The worst case data rate is determined as above test mode according to the power measurements.
And all test items were performed at the worst case data rate.

2.2 Tested Channel Information

5GHz Band	802.11a/n(HT20)		802.11n(HT40)		802.11ac(VHT80)	
	Channel	Frequency [MHz]	Channel	Frequency [MHz]	Channel	Frequency [MHz]
U-NII 1	36	5180	38	5190	-	-
	40	5200	-	-	42	5210
	48	5240	46	5230	-	-
U-NII 2A	52	5260	54	5270	-	-
	60	5300	-	-	58	5290
	64	5320	62	5310	-	-
U-NII 2C	100	5500	102	5510	-	-
	116	5580	110	5550	106	5530
	140	5700	134	5670	-	-
U-NII 3	149	5745	151	5755	-	-
	157	5785	-	-	155	5775
	165	5825	159	5795	-	-

5GHz Band	802.11ac(VHT20)		802.11ac(VHT40)		802.11ac(VHT80)	
	Channel	Frequency [MHz]	Channel	Frequency [MHz]	Channel	Frequency [MHz]
U-NII 2C / U-NII 3	144	5720	142	5710	138	5690

2.3 Auxiliary equipment

Equipment	Model No.	Serial No.	Manufacturer	Note
-	-	-	-	-

2.4 Tested environment

Temperature	: 23 °C
Relative humidity content	: 41 % ~ 43 % R.H.
Details of power supply	: AC 120 V

2.5 EMI Suppression Device(s)/Modifications

EMI suppression device(s) added and/or modifications made during testing
→ None

3. SUMMARY OF TESTS

FCC Part Section(s)	Parameter	Limit	Test Condition	Status Note 1
15.407(a)	Emission Bandwidth (26 dB Bandwidth)	N/A	Conducted	C Note 2
15.407(e)	Minimum Emission Bandwidth (6 dB Bandwidth)	> 500 kHz in 5725 ~ 5850 MHz		C
15.407(a)	Maximum Conducted Output Power	5150 ~ 5250 MHz: < 30 dBm or < 23.97 dBm 5250 ~ 5350 MHz & 5470 ~ 5725 MHz: 250 mW or < 11 + 10log ₁₀ (B) dBm 5725 ~ 5850 MHz: < 30 dBm		C Note 3
15.407(a)	Peak Power Spectral Density	5150 ~ 5250 MHz: 11 dBm/MHz or 17 dBm/MHz 5250 ~ 5350 MHz & 5470 ~ 5725 MHz: 11 dBm/MHz 5725 ~ 5850 MHz: 30 dBm/500 kHz		C Note 2,4
15.407(g)	Frequency Stability	N/A		C Note 2
15.407(b)	Undesirable Emissions	5150 ~ 5725 MHz: < -27 dBm/MHz EIRP 5725 ~ 5850 MHz: < -17 dBm/MHz EIRP and < -27 dBm/MHz EIRP	Radiated	C Note 5
15.205 15.209 15.407(b)	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209		C Note 5
15.407(h)	Dynamic Frequency Selection	FCC 15.407(h)	Conducted	NT Note 6
15.207	AC Conducted Emissions	FCC 15.207	AC Line Conducted	C
15.203	Antenna Requirements	FCC 15.203	-	C

Note 1: **C**=Comply **NC**=Not Comply **NT**=Not Tested **NA**=Not Applicable

Note 2: These test items were not performed because this device uses the granted module. Only tested U-NII 3 band and band-crossing channels.

FCC ID: PD93160NG, PD93160NGU

IC: 1000M-3610NG

Please refer to the test report of the granted module.

Note 3: (i) For access point operating in the band 5.15-5.25 GHz: < 30 dBm

(ii) For mobile and portable client devices in the 5.15-5.25 GHz band: < 23.97 dBm

Note 4: (i) For access point operating in the band 5.15-5.25 GHz: < 17 dBm/MHz

(ii) For mobile and portable client devices in the 5.15-5.25 GHz band: < 11 dBm/MHz

Note 5: These test items were performed in each axis and the worst case data was reported.

Note 6: Refer to the DFS test report.

Note 7: The test items were performed according to the KDB789033 D02 V01, KDB644545 D03 v01 and ANSI C63.10-2009.

4. TEST METHODOLOGY

Generally the tests were performed according to the KDB789033 D02 v01. And ANSI C63.10-2009 was used to reference appropriate EUT setup and maximizing procedures of radiated spurious emission and AC line conducted emission testing

4.1 EUT configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

4.2 EUT exercise

The EUT was operated in the test mode to fix the Tx frequency that was for the purpose of the measurements. According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.407 under the FCC Rules Part 15 Subpart C.

4.3 General test procedures

Conducted Emissions

The power-line conducted emission test procedure is not described on the KDB789033 D02 v01. So this test was fulfilled with the requirements in Section 6.2 of ANSI C63.10-2009.

The EUT is placed on the wooden table, which is 0.8 m above ground plane and the conducted emissions from the EUT measured in the frequency range between 0.15MHz and 30MHz using CISPR Quasi-peak and Average detector.

Radiated Emissions

Basically the radiated tests were performed with KDB789033 D02 v01. But some requirements and procedures like test site requirements, EUT setup and maximizing procedure were fulfilled with the requirements in Section 5 and 6 of the ANSI C63.10-2009 as stated on KDB789033 D02 v01.

The EUT is placed on a non-conductive table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3 m away from the receiving antenna, which varied from 1 m to 4 m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the highest emission, the relative positions of the EUT were rotated through three orthogonal axis.

4.4 Description of test modes

A test program is used to control the EUT for staying in continuous transmitting mode with maximum fixed duty cycle.

5. INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipments, which is traceable to recognized national standards.

6. FACILITIES AND ACCREDITATIONS

6.1 Facilities

The open area test site(OATS) or semi anechoic chamber and conducted measurement facility used to collect the radiated and conducted test data are located at the 42, Yurim-ro, 154beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea 449-935. The site is constructed in conformance with the requirements.

- Semi anechoic chamber registration Number: 165783 (FCC)

6.2 Equipment

Radiated emissions are measured with one or more of the following types of Linearly polarized antennas: tuned dipole, bi-conical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and peak, quasi-peak detectors are used to perform radiated measurements. Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers. Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements. All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

7. ANTENNA REQUIREMENTS

7.1 According to FCC 47 CFR §15.203:

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 EUT used two non standard antenna connectors.

Therefore this module Complies with the requirement of §15.203

8. TEST RESULT

8.1 Emission Bandwidth (26 dB Bandwidth)

■ Test Requirements

The bandwidth at 26 dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating in transmission mode at the appropriate frequencies. The 26 dB bandwidth is used to determine the conducted output power limit.

■ Test Configuration

Refer to the APPENDIX I.

■ Test Procedure

The transmitter output is connected to the Spectrum Analyzer and used following test procedure of **KDB789033 D02 V01**.

1. Set resolution bandwidth (RBW) = approximately **1 %** of the EBW.
2. Set the video bandwidth (**VBW**) > **RBW**.
3. Detector = **Peak**.
4. Trace mode = **max hold**.

Measure the maximum width of the emission that is 26 dB down from the peak of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1 %.

■ Test Results: **Comply**

Mode	Band	Channel	Frequency [MHz]	Test Result [MHz]
802.11ac (VHT20)	U-NII 2C	144	5720	17.25
802.11ac (VHT40)	U-NII 2C	142	5710	35.9
802.11ac (VHT80)	U-NII 2C	138	5690	74.7

Result Plots

26 dB Bandwidth

Test Mode: 802.11ac VHT20 & Ch.144



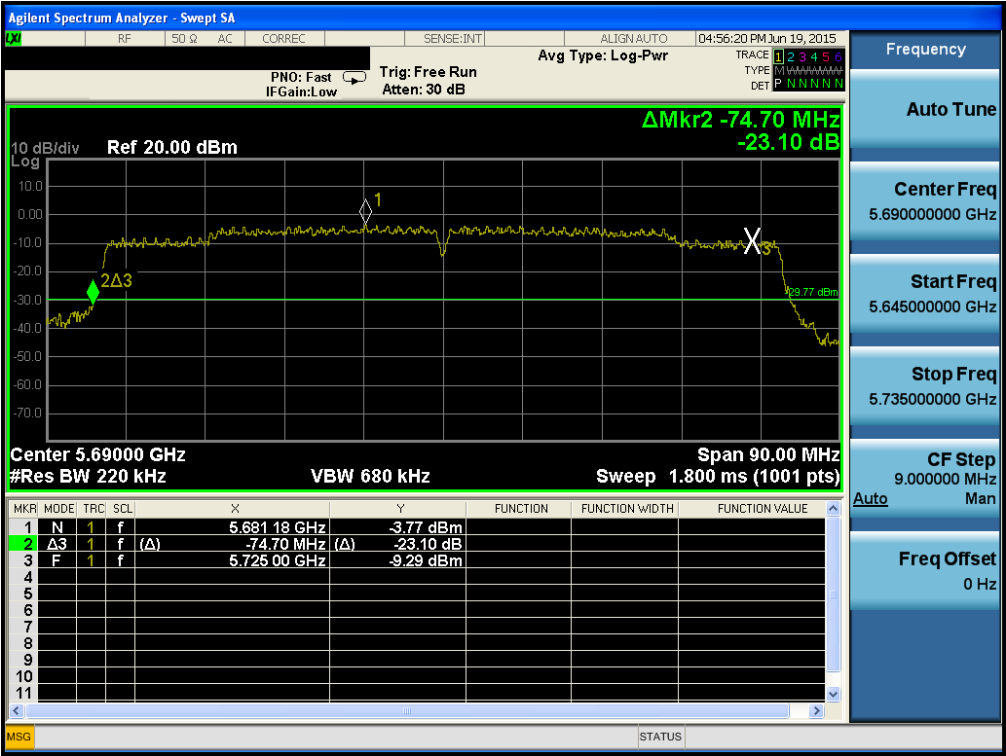
26 dB Bandwidth

Test Mode: 802.11ac VHT40 & Ch.142



26 dB Bandwidth

Test Mode: 802.11ac VHT80 & Ch.138



8.2 Minimum Emission Bandwidth (6 dB Bandwidth)**■ Test Requirements**

Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

■ TEST CONFIGURATION

Refer to the APPENDIX I.

■ TEST PROCEDURE

The transmitter output is connected to the Spectrum Analyzer and used following test procedure of **KDB789033 D02 V01**.

1. Set resolution bandwidth (RBW) = 100 kHz
2. Set the video bandwidth $\geq 3 \times \text{RBW}$.
3. Detector = **Peak**.
4. Trace mode = **max hold**.

Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

■ TEST RESULTS: Comply

Mode	Band	Channel	Frequency [MHz]	Test Result [MHz]
802.11ac (VHT20)	U-NII 3	144	5720	3.78
802.11ac (VHT40)	U-NII 3	142	5710	2.60
802.11ac (VHT80)	U-NII 3	138	5690	2.61

Mode	Band	Channel	Frequency [MHz]	Test Result [MHz]
802.11a	U-NII 3	149	5745	16.38
		157	5785	16.39
		165	5825	16.37
802.11n (HT20)	U-NII 3	149	5745	17.65
		157	5785	17.61
		165	5825	17.59
802.11n (HT40)	U-NII 3	151	5755	35.11
		159	5795	33.86
802.11ac (VHT80)	U-NII 3	155	5775	71.31

Result Plots

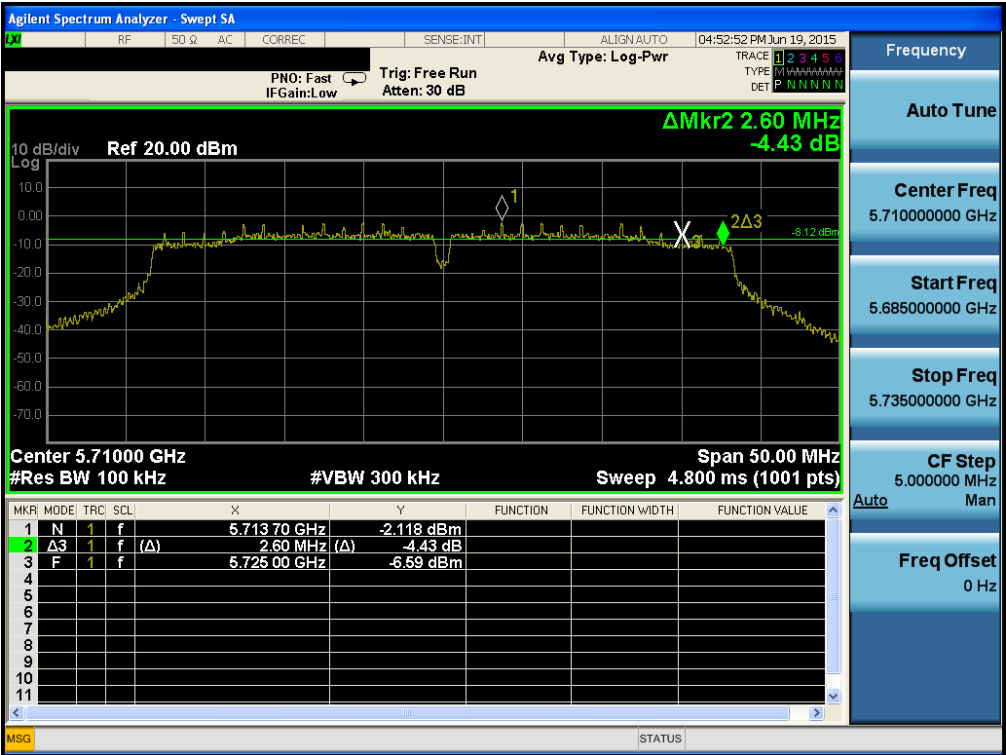
6 dB Bandwidth

Test Mode: 802.11ac VHT20 & Ch.144



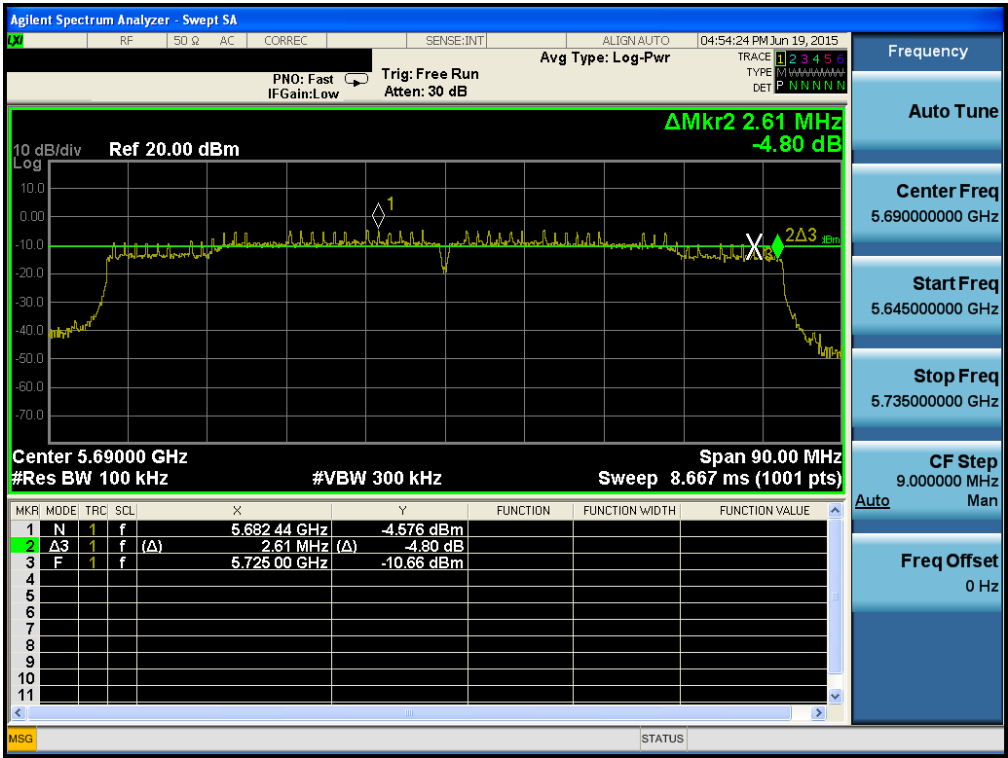
6 dB Bandwidth

Test Mode: 802.11ac VHT40 & Ch.142



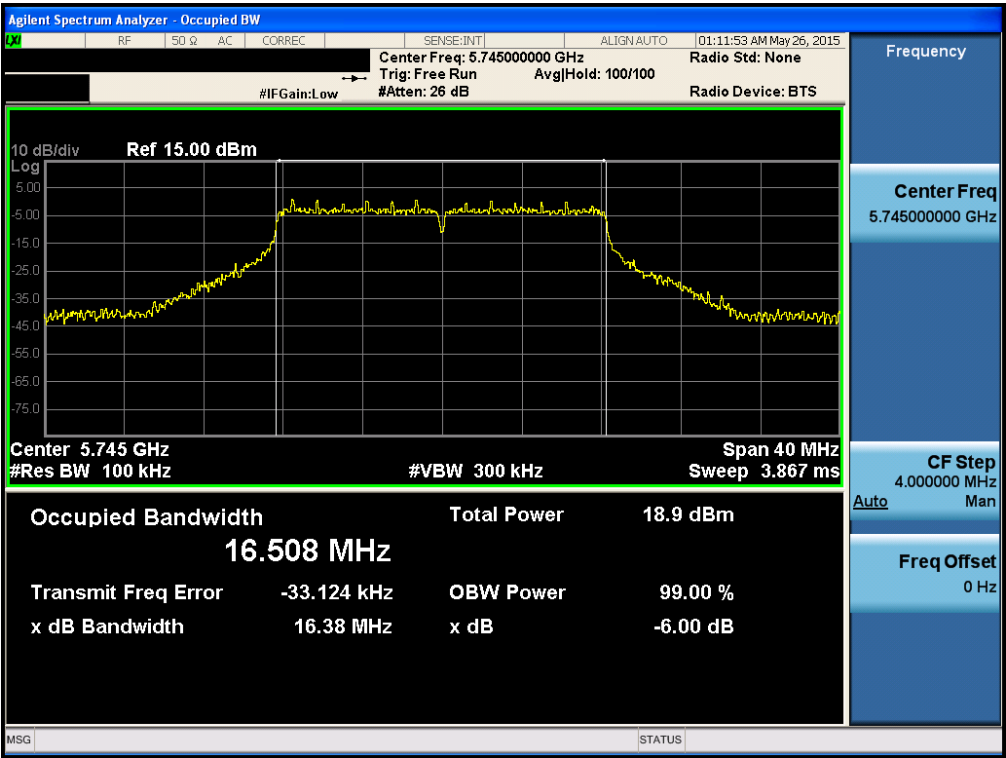
6 dB Bandwidth

Test Mode: 802.11ac VHT80 & Ch.138



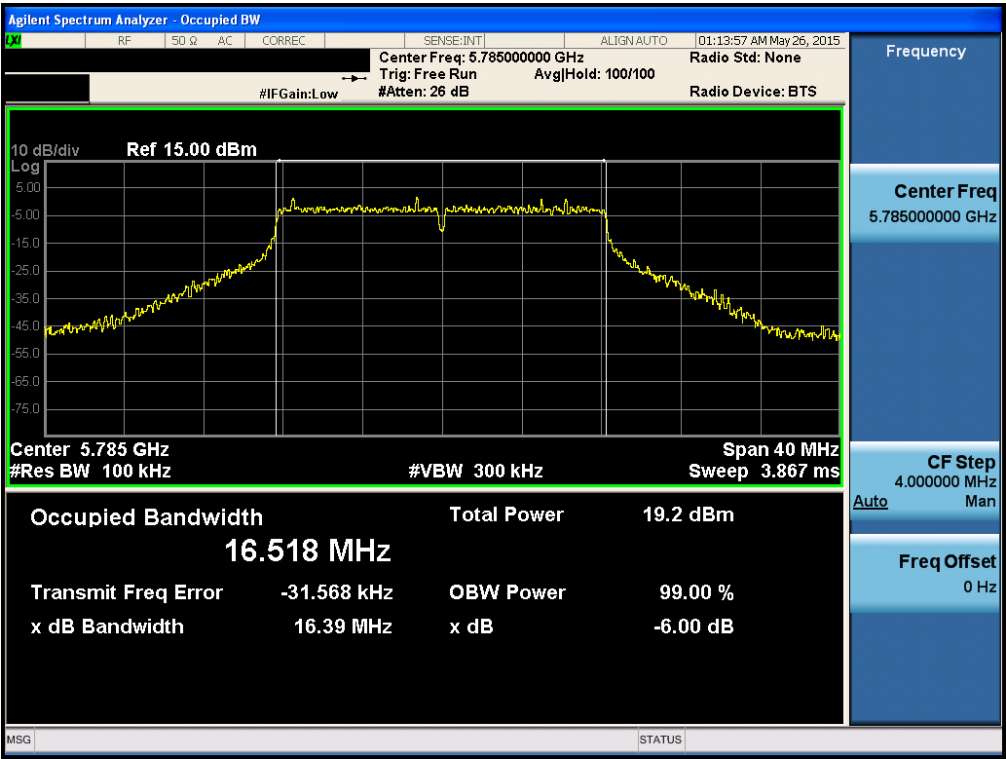
6 dB Bandwidth

Test Mode: 802.11a & Ch.149



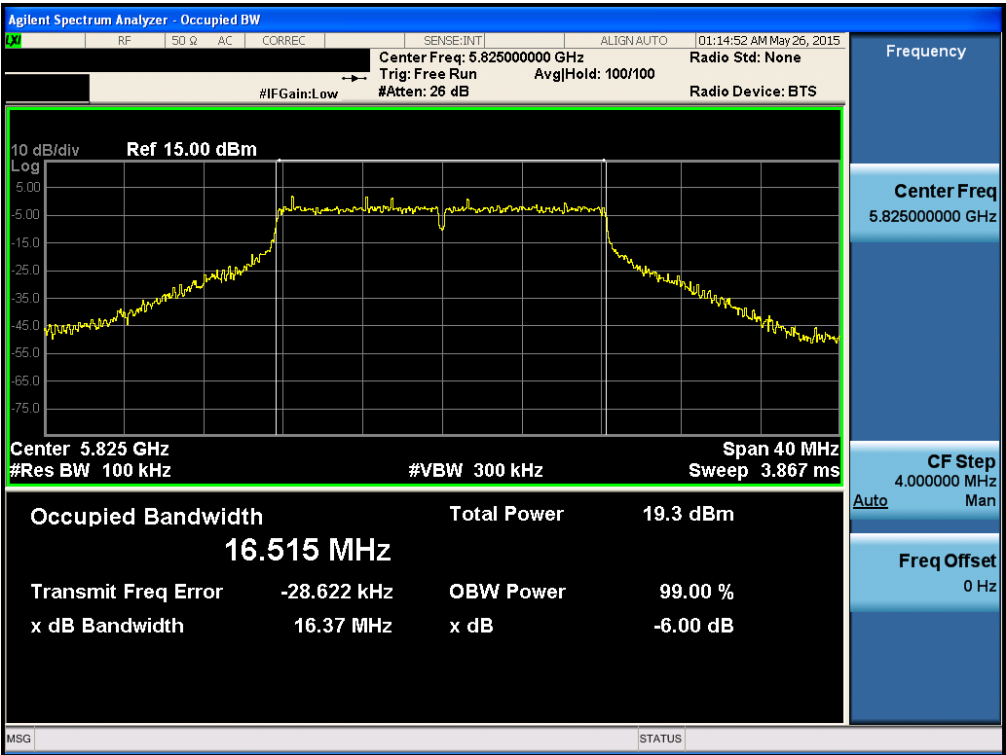
6 dB Bandwidth

Test Mode: 802.11a & Ch.157



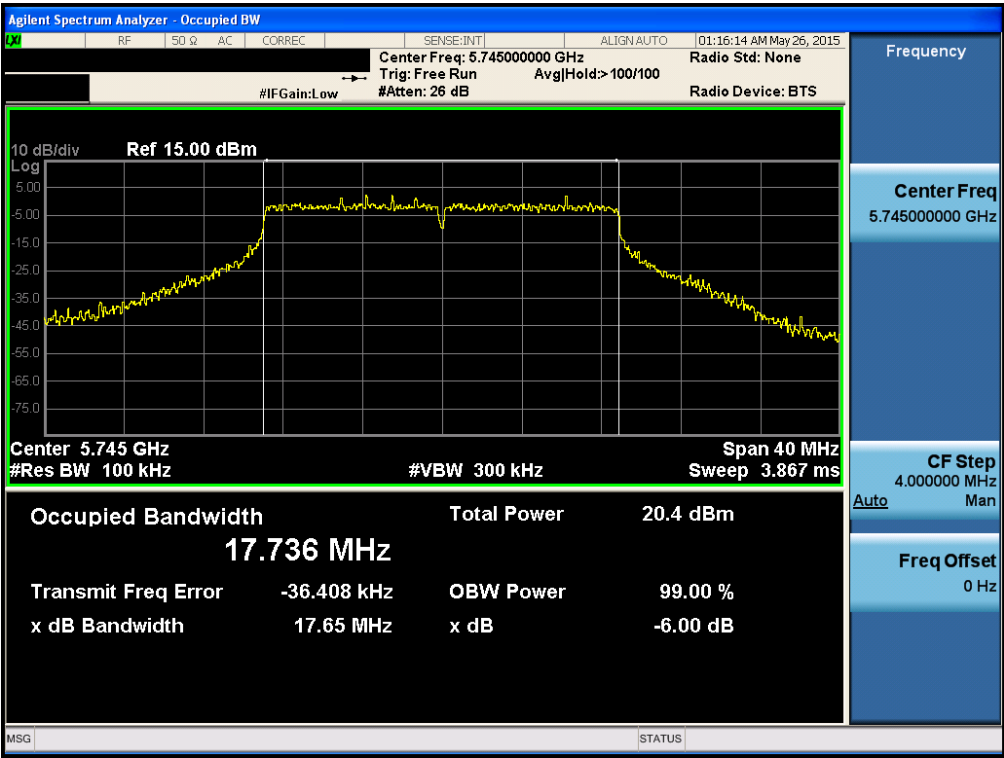
6 dB Bandwidth

Test Mode: 802.11a & Ch.165



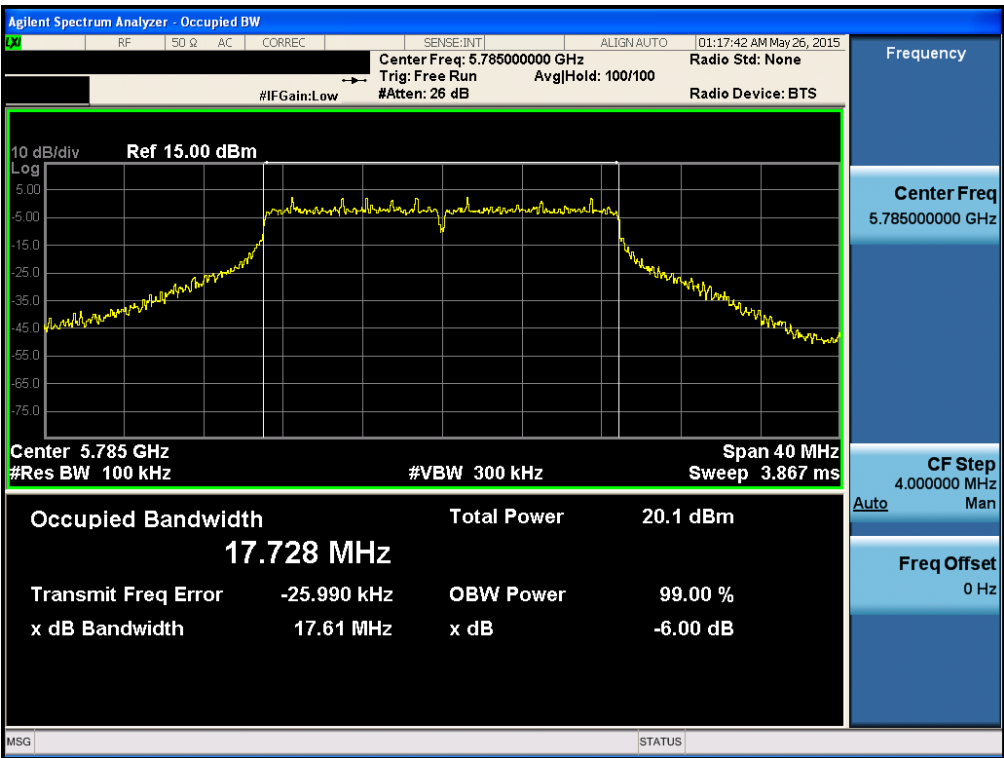
6 dB Bandwidth

Test Mode: 802.11n HT20 & Ch.149



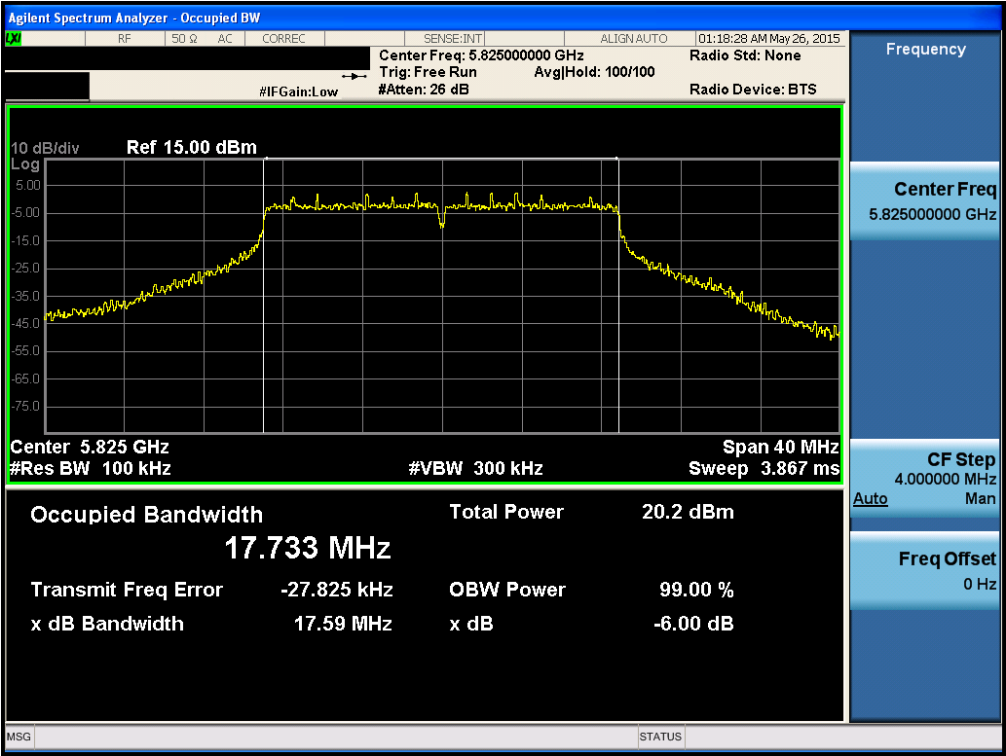
6 dB Bandwidth

Test Mode: 802.11n HT20 & Ch.157



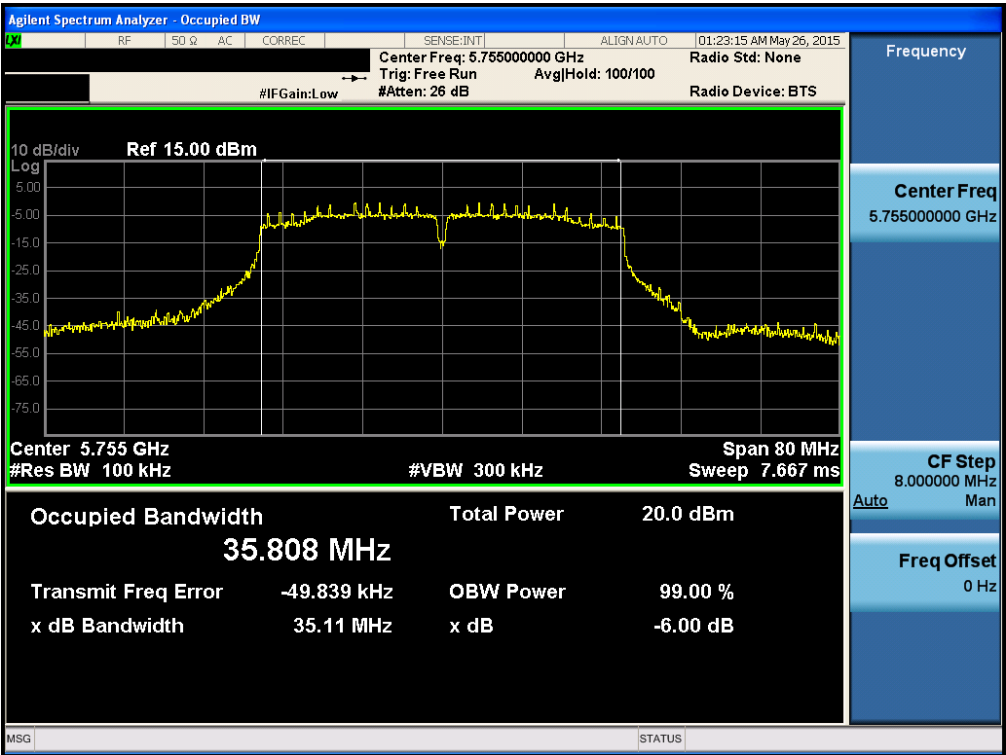
6 dB Bandwidth

Test Mode: 802.11n HT20 & Ch.165



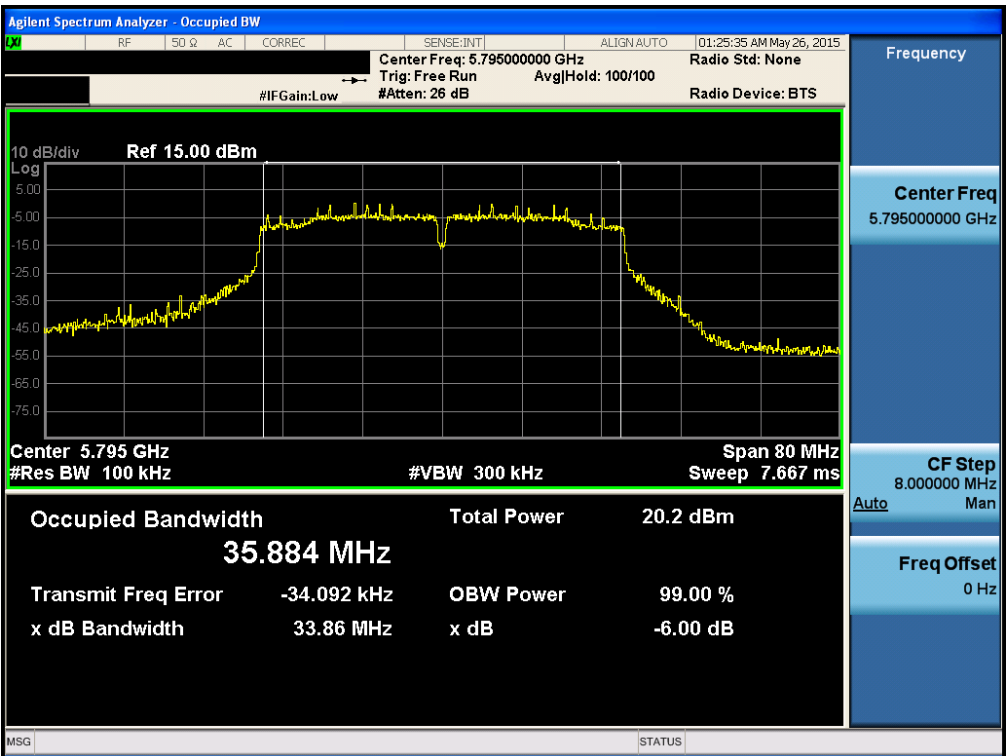
6 dB Bandwidth

Test Mode: 802.11n HT40 & Ch.151



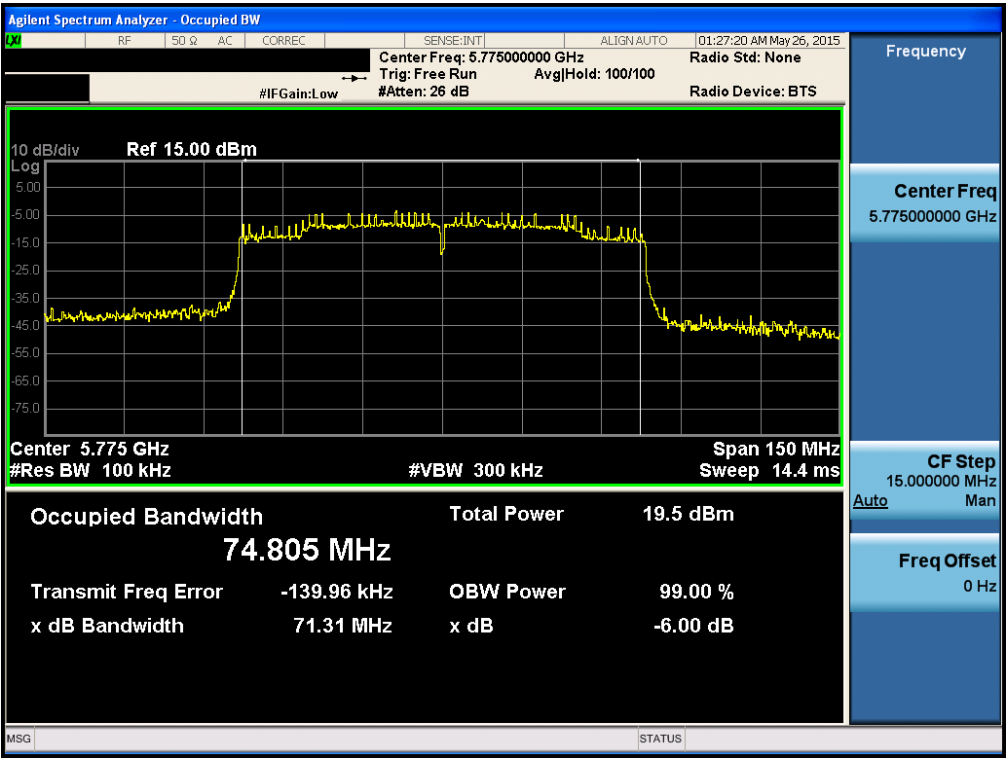
6 dB Bandwidth

Test Mode: 802.11n HT40 & Ch.159



6 dB Bandwidth

Test Mode: 802.11ac VHT80 & Ch.155



8.3 Maximum Conducted Output Power

■ Test Requirements

(1) For the band 5.15-5.25 GHz.

(i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or $11 \text{ dBm} + 10 \log B$, where B is the 26 dB emission bandwidth in megahertz. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(3) For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

- Output power Limit Calculation

Bands	Mode	Power Limit [mW]	Calculated Limit [dBm]	Antenna Gain (Worst case)	Determined Limit [dBm]
U-NII 1	802.11a	250	23.97	1.42	23.97
	802.11n(HT20)				
	802.11n(HT40)				
	802.11ac(VHT80)				

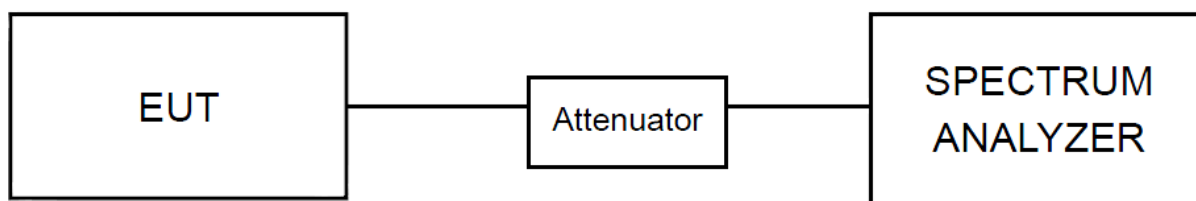
Bands	Mode	Power Limit [mW]	Calculated Limit [dBm]	Antenna Gain (Worst case)	Determined Limit [dBm]
		Least 26 dBc BW ^{Note*} [MHz]			
U-NII 2A	802.11a	250	23.97	1.42	23.97
		25.900	25.13		
	802.11n(HT20)	250	23.97		23.97
		27.100	25.32		
	802.11n(HT40)	250	23.97		23.97
		42.700	27.30		
	802.11ac(VHT80)	250	23.97		23.97
		84.200	30.25		
U-NII 2C	802.11a	250	23.97	2.01	23.97
		25.900	25.13		
	802.11n(HT20)	250	23.97		23.97
		26.900	25.29		
	802.11n(HT40)	250	23.97		23.97
		41.500	27.18		
	802.11ac(VHT20)	250	23.97		23.97
		17.250	23.36		
	802.11ac(VHT40)	250	23.97		23.97
		35.900	26.55		
	802.11ac(VHT80)	250	23.97		23.97
		74.700	29.73		

Note*: Refer to the test report of the granted module.

Bands	Mode	Power Limit [mW]	Calculated Limit [dBm]	Antenna Gain (Worst case)	Determined Limit [dBm]
U-NII 3	802.11a	1000	30.00	1.55	30
	802.11n(HT20)				
	802.11n(HT40)				
	802.11ac(VHT20)				
	802.11ac(VHT40)				
	802.11ac(VHT80)				

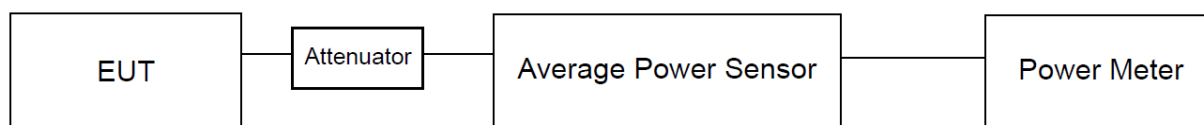
■ Test Configuration

For channel straddling CH (144, 142, 138)



Method SA-2

For other channels



Method PM-G

■ Test Procedure

Maximum Conducted Output Power is measured using Measurement Procedure **Method PM-G, Method SA-2 of KDB789033 D02 V01**

- Method SA-2

1. Set span to encompass the emission bandwidth (EBW) of the signal.
2. Set RBW = 1MHz.
3. Set the VBW $\geq 3 \times$ RBW.
4. Number of points in sweep ≥ 2 Span / RBW.
5. Sweep time = auto.
6. Detector = RMS.
7. Trace average at least 100 traces in power averaging mode
8. Compute power by integrating the spectrum across the EBW of the signal.
9. Duty factor need added to measured value (duty cycle < 98 percent).

- Method PM-G

Measurements may be performed using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

Note: The measure-and-sum technique is used for test mode with multiple transmitting.

■ Test Results: **Comply**

Mode		CH	Freq. [MHz]	Test Result [dBm]
802.11a	U-NII 1	36	5180	12.99
		40	5200	14.54
		48	5240	14.68
	U-NII 2A	52	5260	15.08
		60	5300	14.78
		64	5320	13.24
	U-NII 2C	100	5500	13.94
		116	5580	15.56
		140	5700	15.39
	U-NII 3	149	5745	15.65
		157	5785	15.13
		165	5825	15.11
802.11n(HT20)	U-NII 1	36	5180	13.71
		40	5200	15.11
		48	5240	15.56
	U-NII 2A	52	5260	15.46
		60	5300	15.69
		64	5320	13.68
	U-NII 2C	100	5500	14.34
		116	5580	16.49
		140	5700	13.68
	U-NII 3	149	5745	15.95
		157	5785	15.85
		165	5825	15.48
802.11n(HT40)	U-NII 1	38	5190	10.72
		46	5230	14.23
	U-NII 2A	54	5270	11.36
		62	5310	12.51
	U-NII 2C	102	5510	11.34
		110	5550	16.02
	U-NII 3	134	5670	16.01
		151	5755	15.98
802.11ac(VHT80)	U-NII 3	159	5795	15.98
	U-NII 1	42	5210	8.36
	U-NII 2A	58	5290	11.31
	U-NII 2C	106	5530	9.95
	U-NII 3	155	5775	13.37

Mode		CH	Freq. [MHz]	Reading [dBm]	D.C.F [dB] Note 1	Test Result [dBm]
802.11ac(VHT20)	U-NII 2C	144	5720	11.965	0.090	12.055
	U-NII 3	144	5720	6.098	0.090	6.188
802.11ac(VHT40)	U-NII 2C	142	5710	12.767	0.140	12.907
	U-NII 3	142	5710	-1.210	0.140	-1.070
802.11ac(VHT80)	U-NII 2C	138	5690	13.282	0.270	13.552
	U-NII 3	138	5690	-5.395	0.270	-5.125

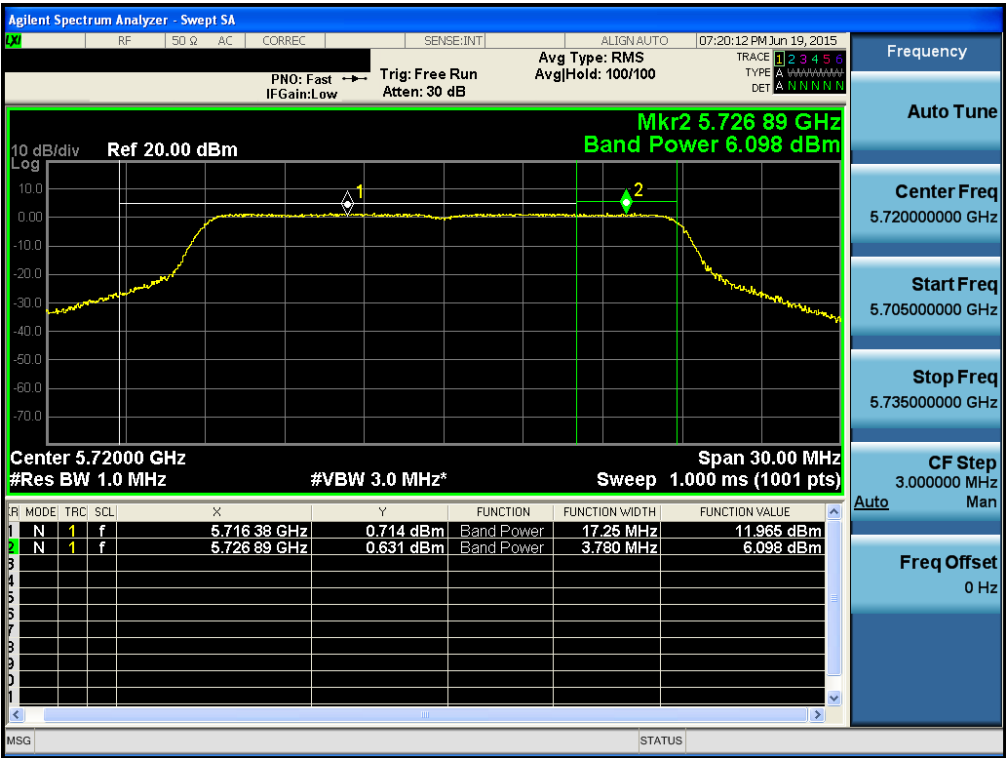
Note 1: D.C.F = $10\log(x)$ where x is the duty cycle.

Note 2: Test Result = Measurement Data + D.C.F

RESULT PLOTS

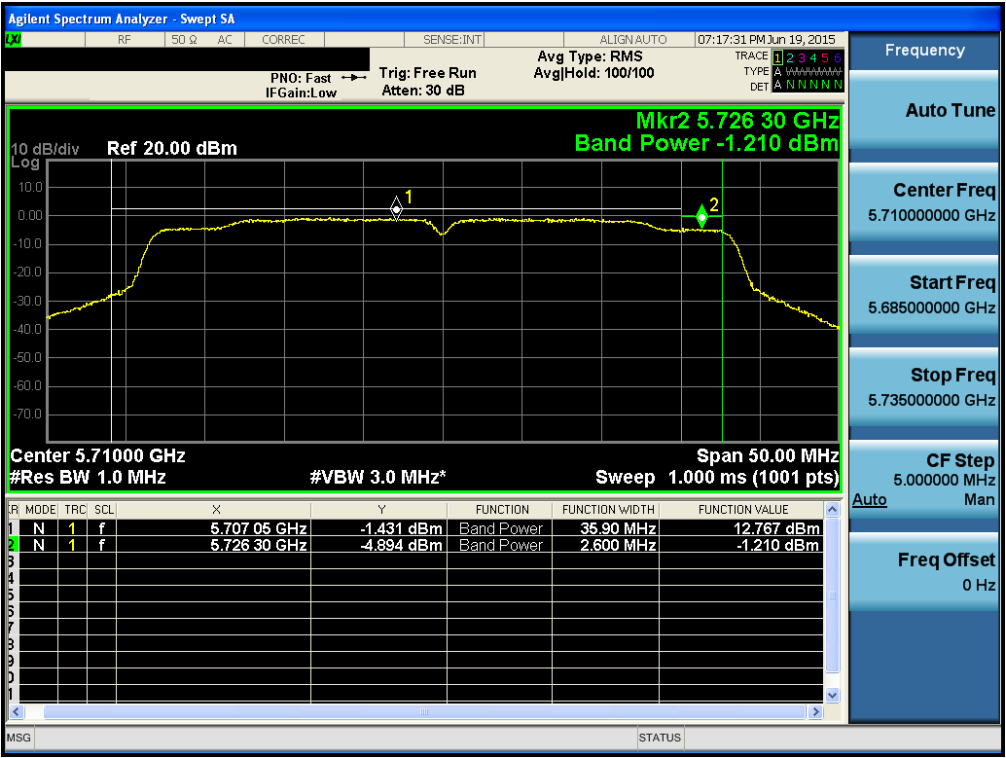
Maximum Output Power

Test Mode: 802.11ac VHT20 & Ch.144



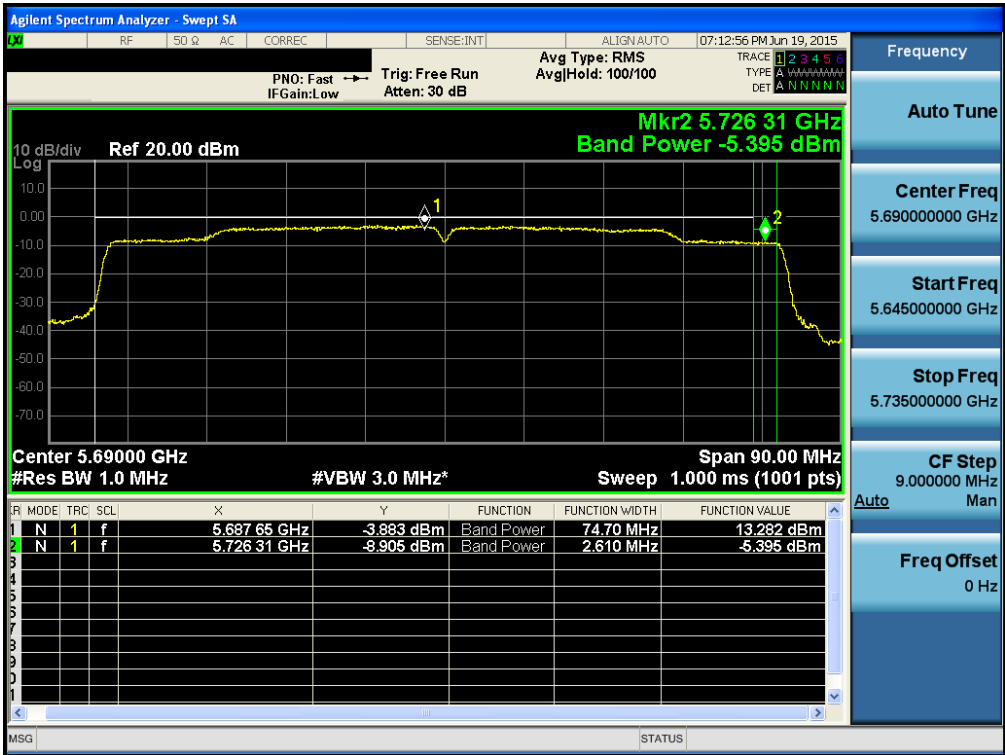
Maximum Output Power

Test Mode: 802.11ac VHT40 & Ch.142



Maximum Output Power

Test Mode: 802.11ac VHT80 & Ch.138



8.4 Maximum Power Spectral Density

■ Test requirements

(1) For the band 5.15-5.25 GHz.

(i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1MHz band.^{note1}

(ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1MHz band.^{note1}

(iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi.

(iv) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum power spectral density shall not exceed 11 dBm in any 1MHz band.^{note1}

(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the peak power spectral density shall not exceed 11 dBm in any 1 MHz band.^{note1}

(3) For the band 5.725-5.85 GHz, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band.^{note1,note2}

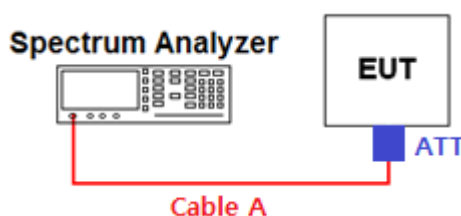
Note1: If transmitting antennas of directional gain greater than 6 dBi are used, the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Note2: fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information.

- Peak Power Spectral Density Limit Calculation

Band	Limit [dBm]	Antenna Gain (Worst case)	Determined Limit [dBm]
U-NII 1	4	1.42	4
U-NII 2A	11	1.42	11
U-NII 2C	11	2.01	11
U-NII 3	30	1.55	30

■ Test configuration



■ Test procedure

Maximum Power Spectral Density is measured using Measurement Procedure **of KDB789033 D02 V01**

- 1) Create an average power spectrum for the EUT operating mode being tested by following the instructions in section II.E.2. for measuring maximum conducted output power using a spectrum analyzer or EMI receiver: select the appropriate test method (SA-1, SA-2, SA-3, or alternatives to each) and apply it up to, but not including, the step labeled, "Compute power...". (This procedure is required even if the maximum conducted output power measurement was performed using a power meter, method PM.)
- 2) Use the peak search function on the instrument to find the peak of the spectrum and record its value.
- 3) Make the following adjustments to the peak value of the spectrum, if applicable:
 - a) If Method SA-2 or SA-2 Alternative was used, add $10 \log(1/x)$, where x is the duty cycle, to the peak of the spectrum.**
 - b) If Method SA-3 Alternative was used and the linear mode was used in step II.E.2.g)(viii), add 1 dB to the final result to compensate for the difference between linear averaging and power averaging.
- 4) The result is the Maximum PSD over 1 MHz reference bandwidth.
- 5) For devices operating in the bands 5.15-5.25 GHz, 5.25-5.35 GHz, and 5.47-5.725 GHz, the above procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in §15.407(a)(5). For devices operating in the band 5.725-5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1 MHz, or 500 kHz, "provided that the measured power is integrated over the full reference bandwidth" to show the total power over the specified measurement bandwidth (i.e., 1 MHz, or 500 kHz). If measurements are performed using a reduced resolution bandwidth (< 1 MHz, or < 500 kHz) and integrated over 1 MHz, or 500 kHz bandwidth, the following adjustments to the procedures apply:
 - a) Set $RBW \geq 1/T$, where T is defined in section II.B.1.a). (Refer to Appendix II)
 - b) Set $VBW \geq 3 RBW$.
 - c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add $10\log(500\text{kHz}/RBW)$ to the measured result, whereas $RBW (< 500 \text{ kHz})$ is the reduced resolution bandwidth of the spectrum analyzer set during measurement.
 - d) If measurement bandwidth of Maximum PSD is specified in 1 MHz, add $10\log(1\text{MHz}/RBW)$ to the measured result, whereas $RBW (< 1 \text{ MHz})$ is the reduced resolution bandwidth of spectrum analyzer set during measurement.
 - e) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.

Note: As a practical matter, it is recommended to use reduced RBW of 100 kHz for the sections 5.c) and 5.d) above, since RBW = 100 kHz is available on nearly all spectrum analyzers.

■ Test results: **Comply**

- UNII 2C Band

Mode	Channel	Frequency [MHz]	Reading [dBm]	T.F [dB] Note 1	Test Result [dBm] Note 2
802.11ac VHT20	144	5720	-9.332	10.090	0.758
802.11ac VHT40	142	5710	-11.693	10.140	-1.553
802.11ac VHT80	138	5690	-10.989	10.270	-0.719

Note 1: T.F = $10\log(1 \text{ MHz}/100 \text{ kHz}) + \text{D.C.F}$

For D.C.F., please refer to appendix II.

Note 2: Test Result = Measurement Data + T.F

- UNII 3 Band

Mode	Channel	Frequency [MHz]	Reading [dBm]	T.F [dB] Note 1	Test Result [dBm] Note 2
802.11a	149	5745	-7.070	7.080	0.010
	157	5785	-6.808	7.080	0.272
	165	5825	-6.229	7.080	0.851
802.11n HT20	149	5745	-6.670	7.080	0.410
	157	5785	-6.693	7.080	0.387
	165	5825	-6.550	7.080	0.530
802.11n HT40	151	5755	-9.640	7.130	-2.510
	159	5795	-9.190	7.130	-2.060
802.11ac VHT20	144	5720	-10.132	7.080	-3.052
802.11ac VHT40	142	5710	-15.650	7.130	-8.520
802.11ac VHT80	138	5690	-16.232	7.260	-8.972
	155	5775	-12.800	7.260	-5.540

Note 1: T.F = $10\log(0.5 \text{ MHz}/100 \text{ kHz}) + \text{D.C.F}$

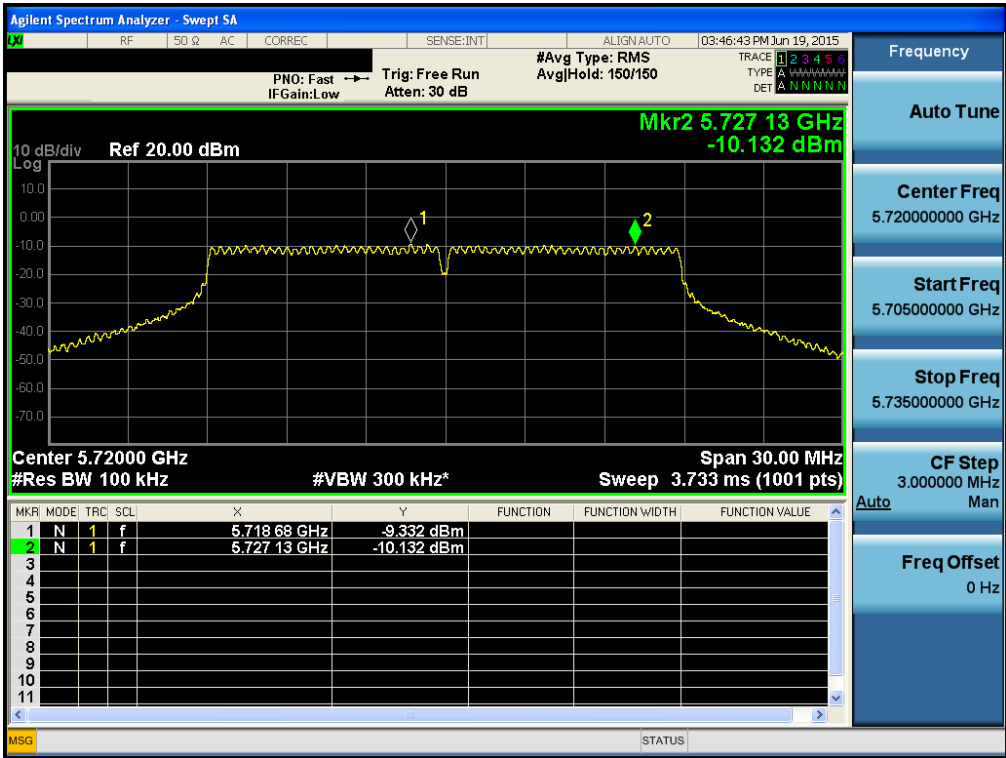
For D.C.F., please refer to appendix II.

Note 2: Test Result = Measurement Data + T.F

RESULT PLOTS

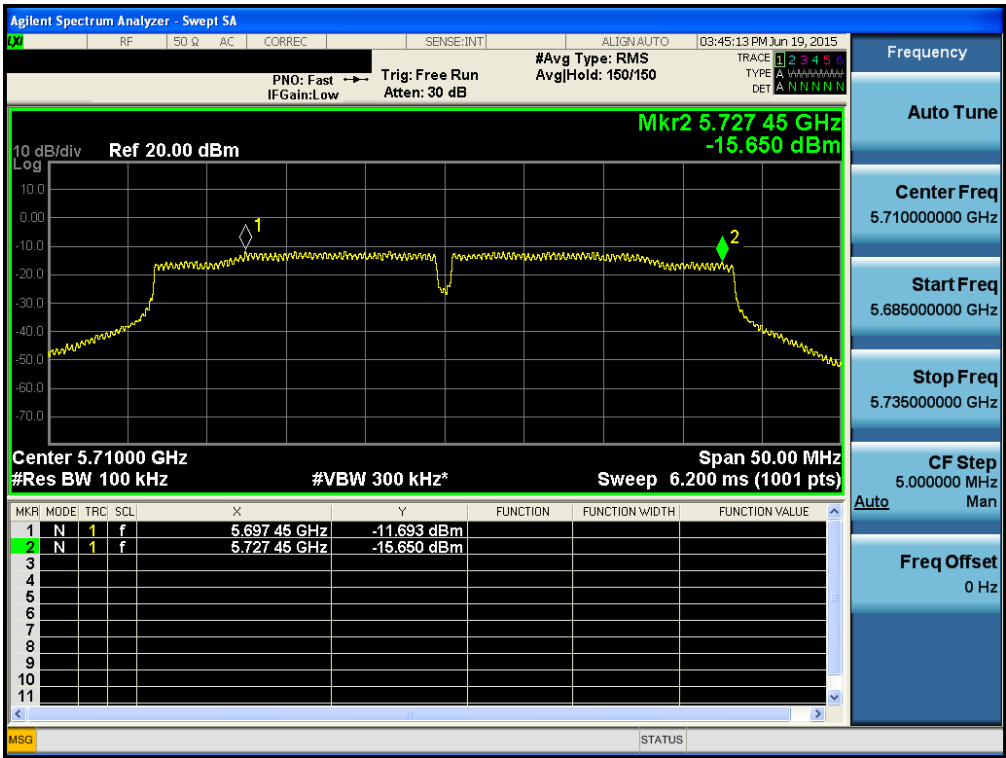
Maximum Power Spectral Density

Test Mode: 802.11ac VHT20 & Ch.144



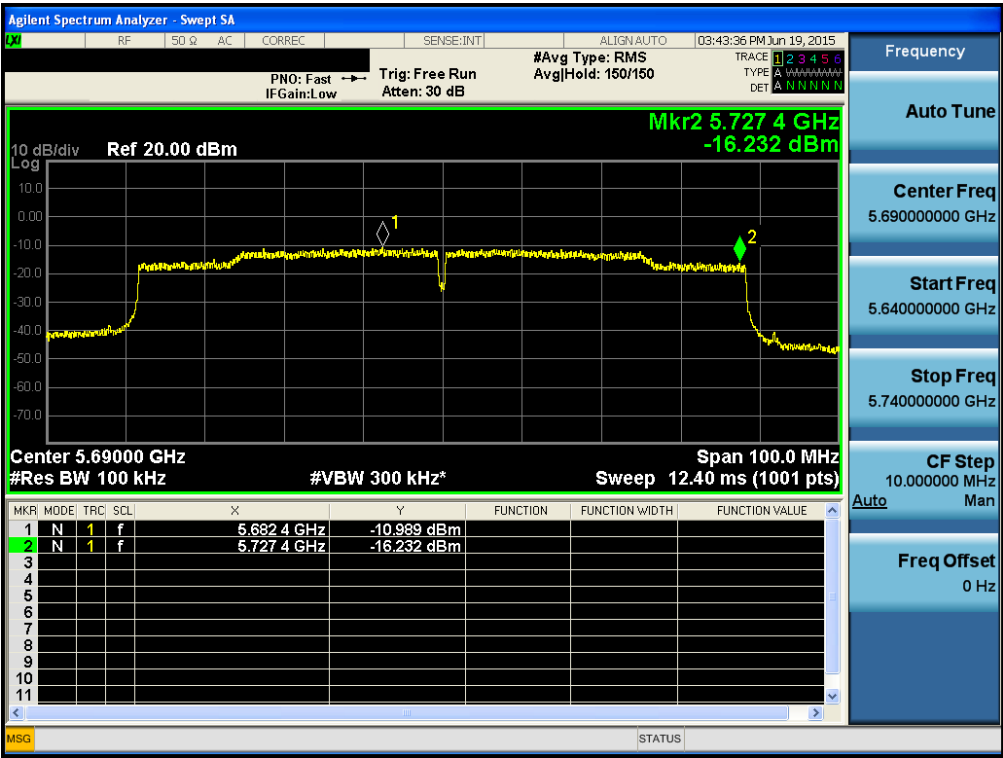
Maximum Power Spectral Density

Test Mode: 802.11ac VHT40 & Ch.142



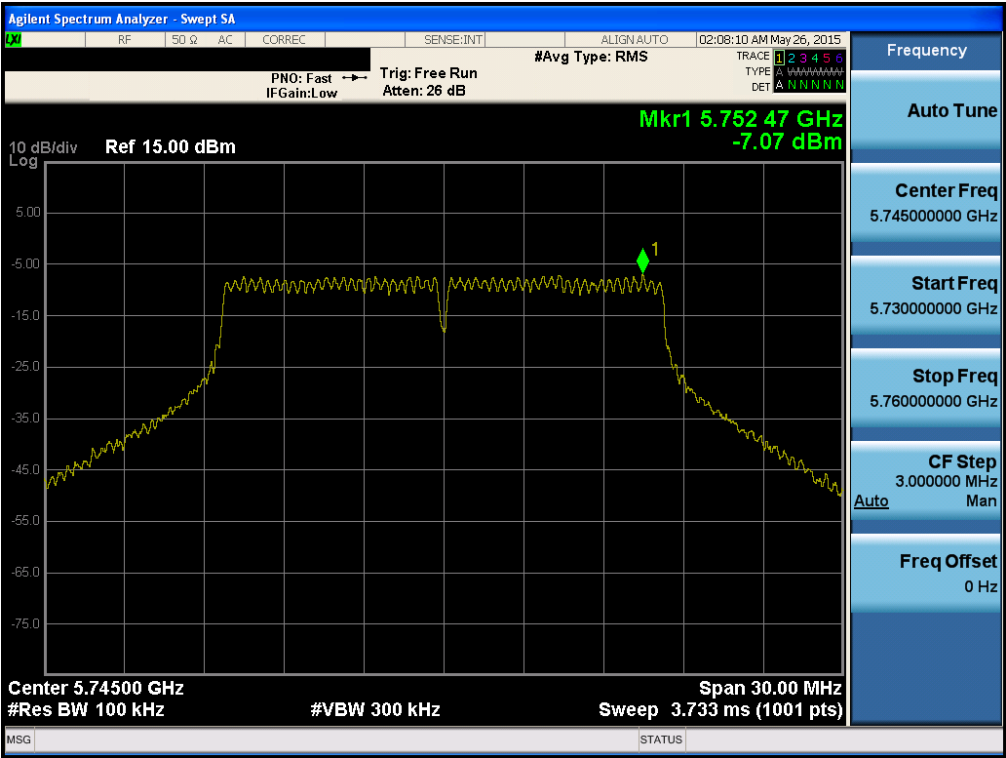
Maximum Power Spectral Density

Test Mode: 802.11ac VHT80 & Ch.138



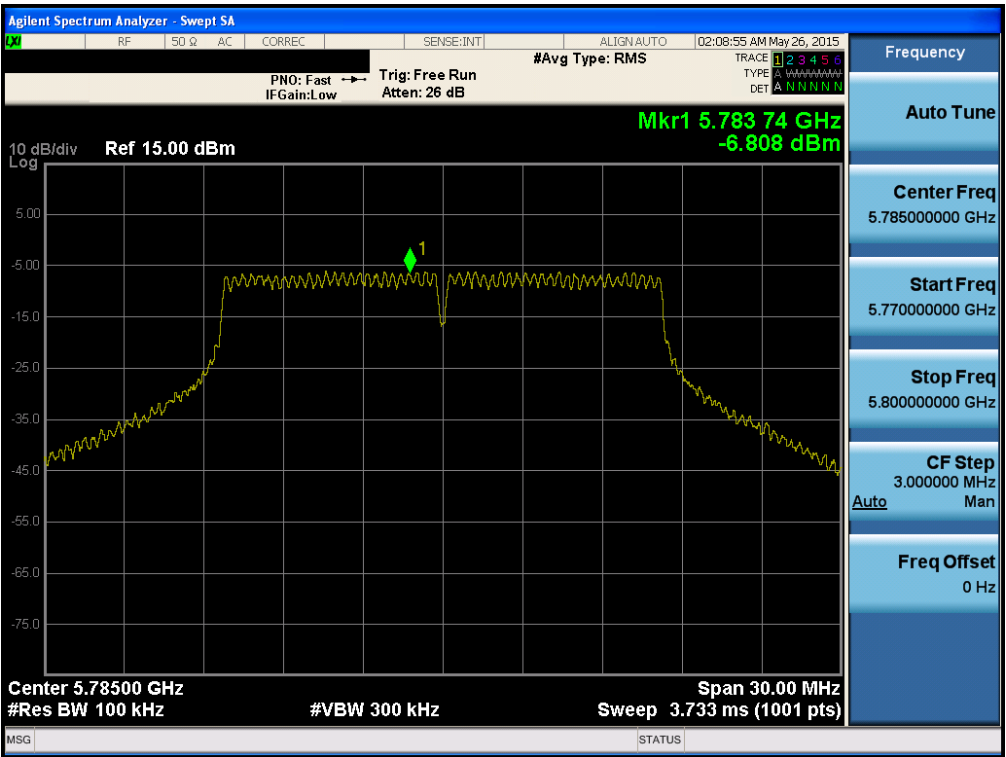
Maximum Power Spectral Density

Test Mode: 802.11a & Ch.149



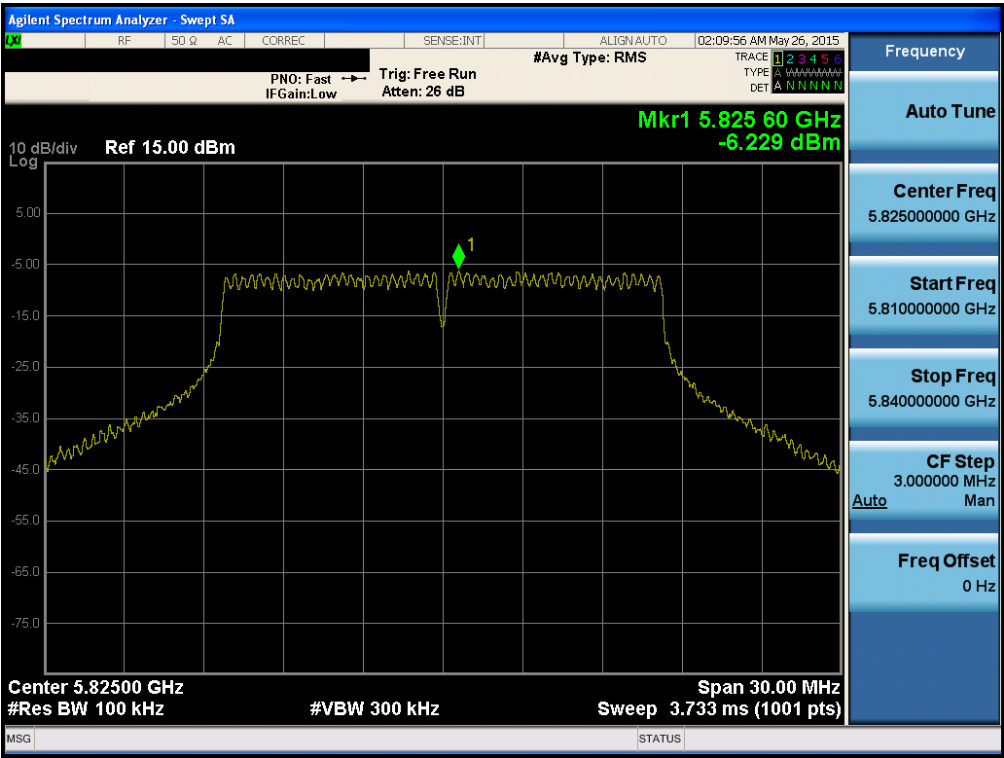
Maximum Power Spectral Density

Test Mode: 802.11a & Ch.157



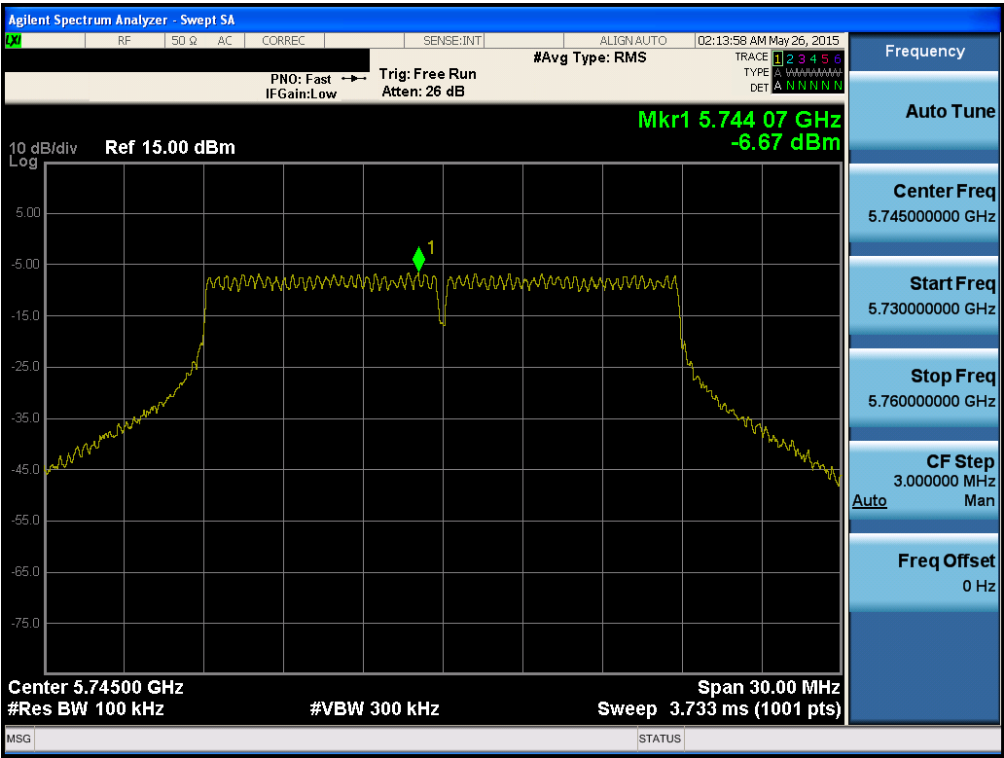
Maximum Power Spectral Density

Test Mode: 802.11a & Ch.165



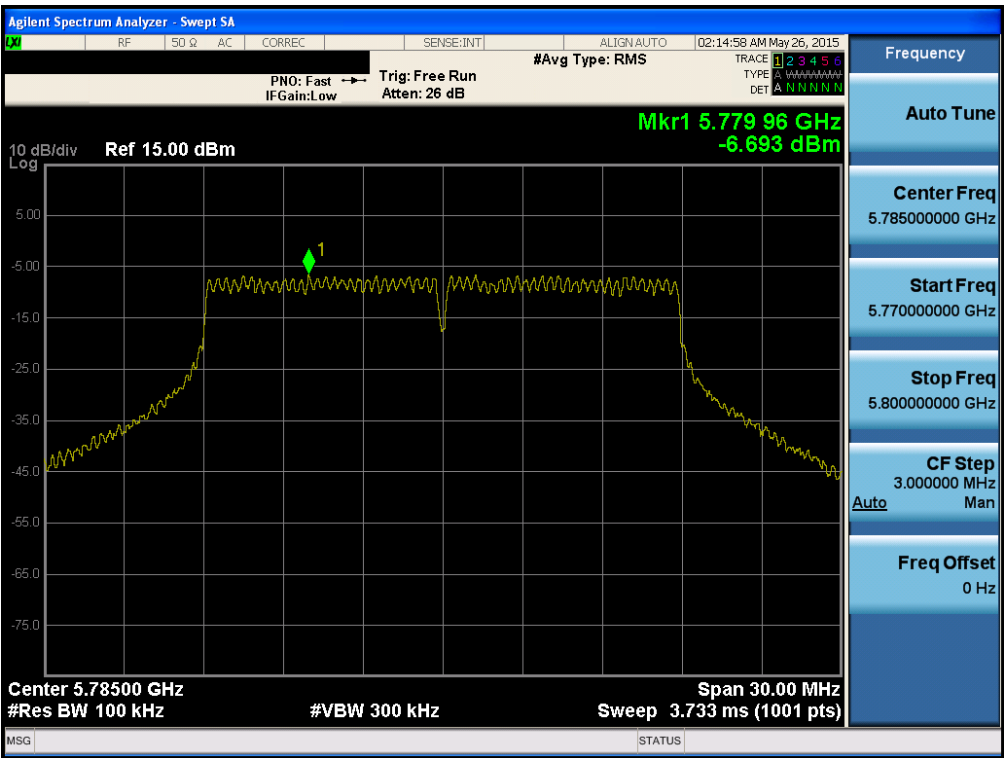
Maximum Power Spectral Density

Test Mode: 802.11n HT20 & Ch.149



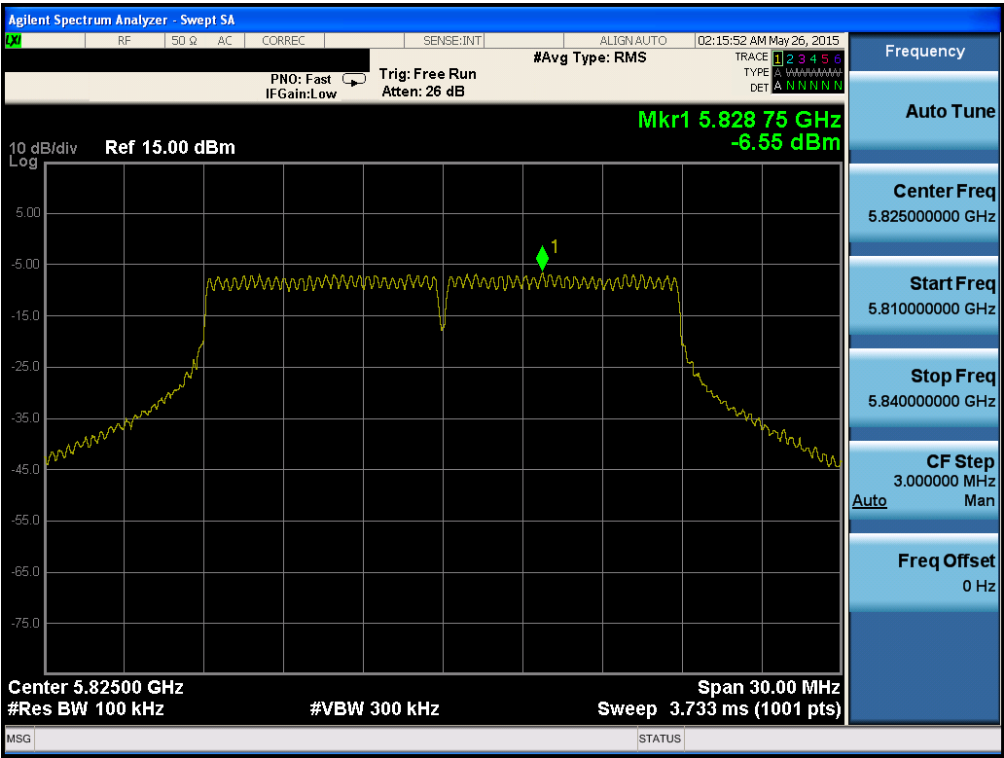
Maximum Power Spectral Density

Test Mode: 802.11n HT20 & Ch.157



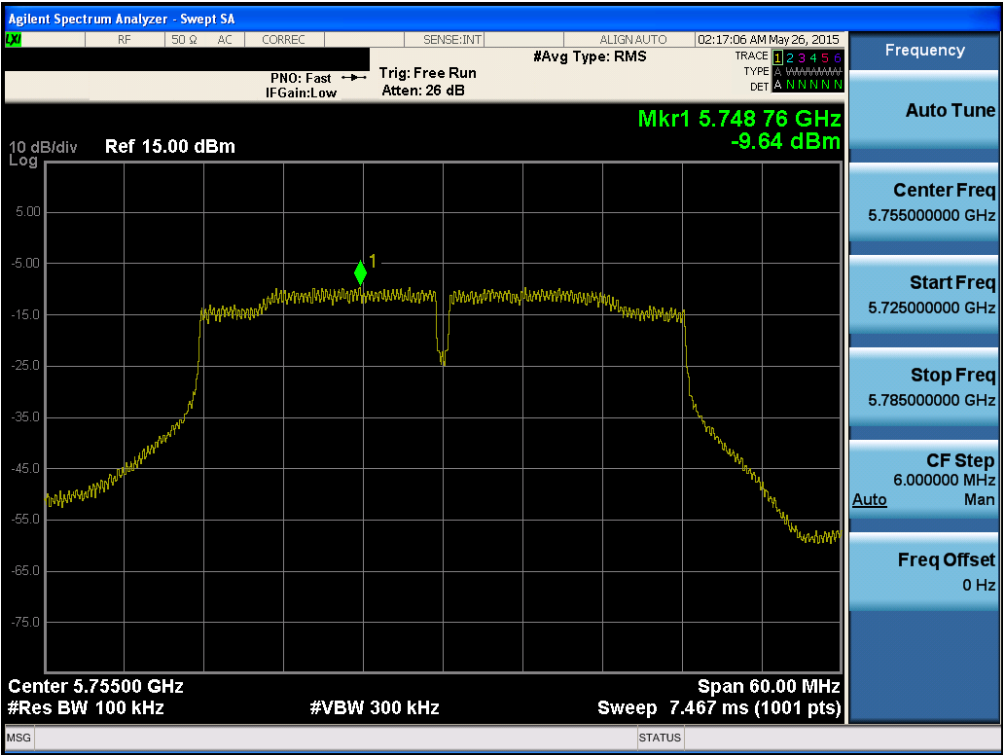
Maximum Power Spectral Density

Test Mode: 802.11n HT20 & Ch.165



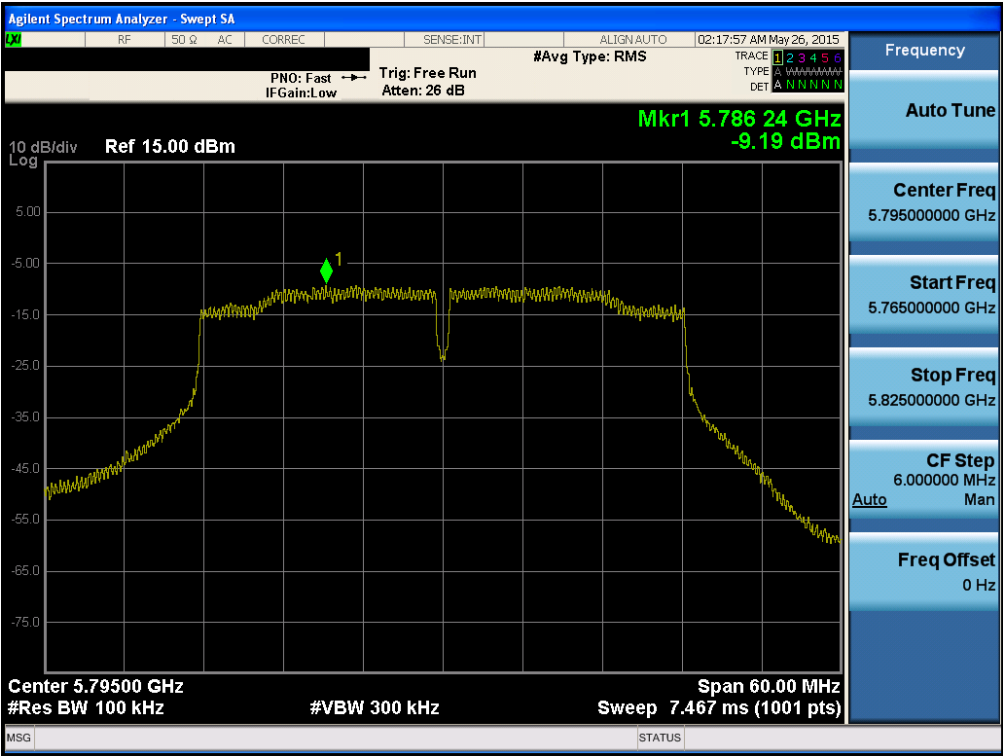
Maximum Power Spectral Density

Test Mode: 802.11n HT40 & Ch.151



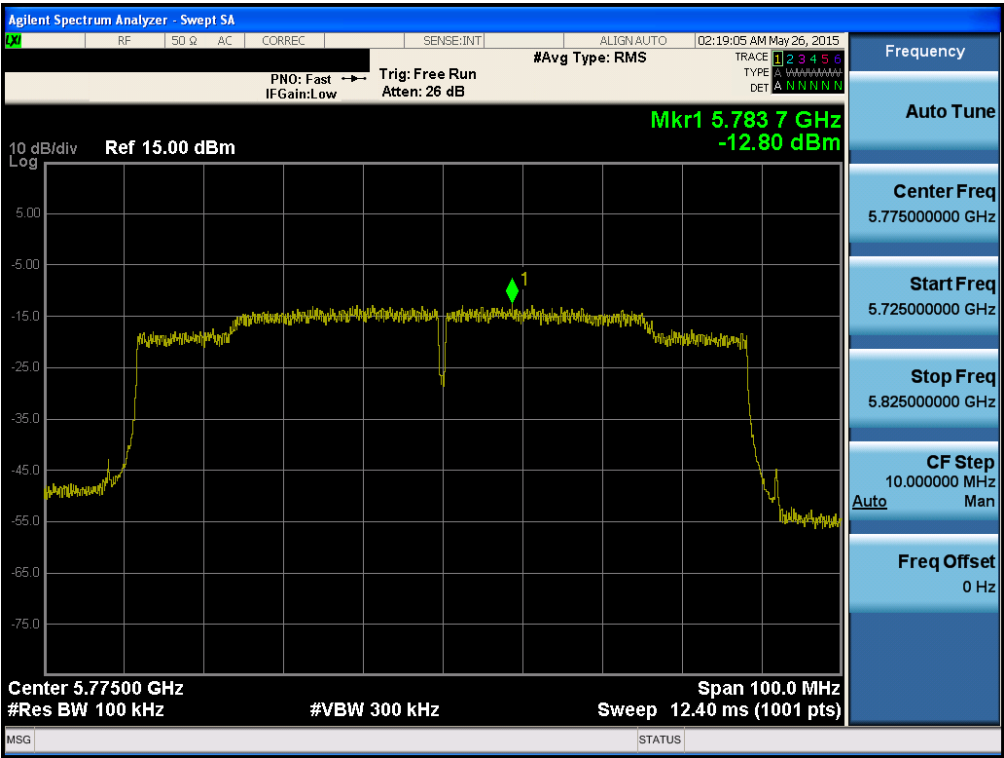
Maximum Power Spectral Density

Test Mode: 802.11n HT40 & Ch.159



Maximum Power Spectral Density

Test Mode: 802.11ac VHT80 & Ch.155



8.5 Frequency Stability

■ Test requirements

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

■ Test Procedure

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

■ Test Results: **Comply**

6 dB Bandwidth Reference ^{Note 1}	
Low edge	High edge
5,736,792,000	5,833,140,000

Supply Voltage (V AC)	TEMP (°C)	Operating Frequency					
		5745 MHz			5825 MHz		
		Measured Frequency (Hz)	Deviation (%)	6 dBc low edge ^{Note 2} (Hz)	Measured Frequency (Hz)	Deviation (%)	6 dBc high edge ^{Note 3} (Hz)
120	+25(Ref)	5,744,966,375	-0.000585	5,736,758,375	5,824,967,254	-0.000562	5,833,107,254
	+50	5,744,977,116	-0.000398	5,736,769,116	5,824,977,105	-0.000393	5,833,117,105
	+40	5,744,966,379	-0.000585	5,736,758,379	5,824,966,341	-0.000578	5,833,106,341
	+30	5,744,970,279	-0.000517	5,736,762,279	5,824,971,853	-0.000483	5,833,111,853
	+20	5,744,970,362	-0.000516	5,736,762,362	5,824,967,206	-0.000563	5,833,107,206
	+10	5,744,980,571	-0.000338	5,736,772,571	5,824,982,063	-0.000308	5,833,122,063
	0	5,744,986,852	-0.000229	5,736,778,852	5,824,986,995	-0.000223	5,833,126,995
	-10	5,744,994,207	-0.000101	5,736,786,207	5,824,991,789	-0.000141	5,833,131,789
	-20	5,744,997,563	-0.000042	5,736,789,563	5,824,997,501	-0.000043	5,833,137,501
	-30	5,744,996,206	-0.000066	5,736,788,206	5,824,996,367	-0.000062	5,833,136,367
102	+25	5,744,966,995	-0.000575	5,736,758,995	5,824,968,306	-0.000544	5,833,108,306
138	+25	5,744,966,072	-0.000591	5,736,758,072	5,824,966,074	-0.000582	5,833,106,074

Note 1: Please refer to test plot.

Note 2: 6 dB Bandwidth Reference Low edge (Hz) + (Measured Frequency (Hz) - Operating Frequency (Hz)) = 6 dBc low edge (Hz)

Note 3: 6 dB Bandwidth Reference High edge (Hz) + (Measured Frequency (Hz) - Operating Frequency (Hz)) = 6 dBc High edge (Hz)

8.6 Radiated Spurious Emission Measurements

■ Test Procedure

▪ FCC Part 15.209(a) and (b)

Frequency (MHz)	Limit (uV/m)	Measurement Distance (meter)
0.009 ~ 0.490	2400/F (kHz)	300
0.490 ~ 1.705	24000/F (kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100 **	3
88 ~ 216	150 **	3
216 ~ 960	200 **	3
Above 960	500	3

** Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241.

▪ FCC Part 15.205 (a): Only spurious emissions are permitted in any of the frequency bands listed below:

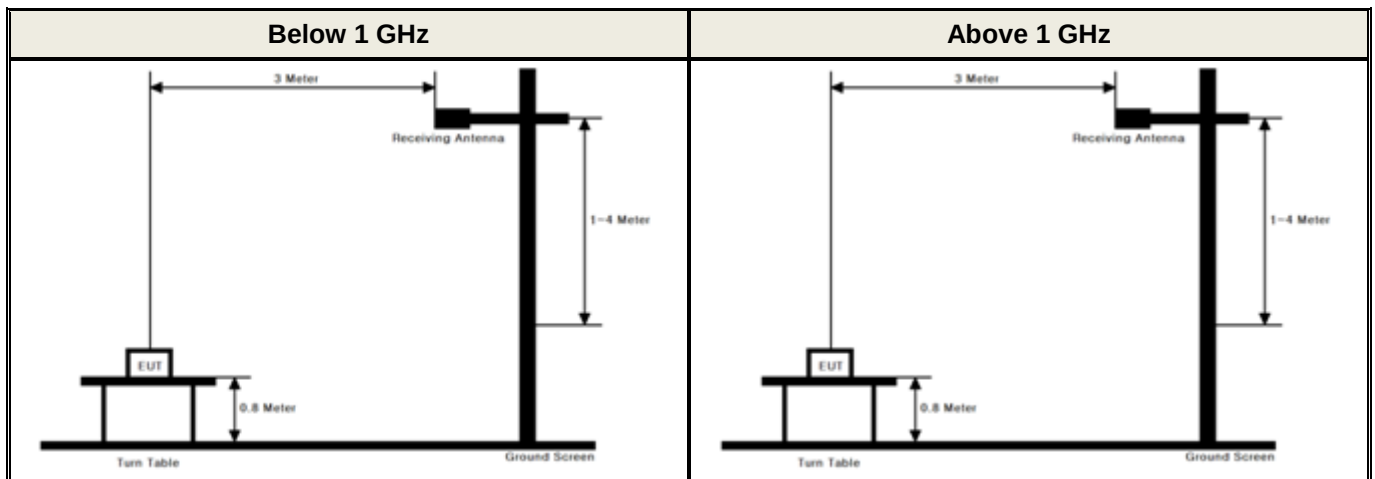
MHz	MHz	MHz	MHz	GHz	GHz
0.009 ~ 0.110	8.41425 ~ 8.41475	108 ~ 121.94	1300 ~ 1427	4.5 ~ 5.15	14.47 ~ 14.5
0.495 ~ 0.505	12.29 ~ 12.293	123 ~ 138	1435 ~ 1626.5	5.35 ~ 5.46	15.35 ~ 16.2
2.1735 ~ 2.1905	12.51975 ~	149.9 ~ 150.05	1645.5 ~ 1646.5	7.25 ~ 7.75	17.7 ~ 21.4
4.125 ~ 4.128	12.52025	160.52475 ~	1660 ~ 1710	8.025 ~ 8.5	22.01 ~ 23.12
4.17725 ~ 4.17775	12.57675 ~	160.52525	1718.8 ~ 1722.2	9.0 ~ 9.2	23.6 ~ 24.0
4.20725 ~ 4.20775	12.57725	160.7 ~ 160.9	2200 ~ 2300	9.3 ~ 9.5	31.2 ~ 31.8
6.215 ~ 6.218	13.36 ~ 13.41	162.0125 ~ 167.17	2310 ~ 2390	10.6 ~ 12.7	36.43 ~ 36.5
6.26775 ~ 6.26825	16.42 ~ 16.423	167.72 ~ 173.2	2483.5 ~ 2500	13.25 ~ 13.4	Above 38.6
6.31175 ~ 6.31225	16.69475 ~	240 ~ 285	2655 ~ 2900		
8.291 ~ 8.294	16.69525	322 ~ 335.4	3260 ~ 3267		
8.362 ~ 8.366	16.80425 ~	399.90 ~ 410	3332 ~ 3339		
8.37625 ~ 8.38675	16.80475	608 ~ 614	3345.8 ~ 3358		
	25.5 ~ 25.67	960 ~ 1240	3600 ~ 4000		
	37.5 ~ 38.25				
	73 ~ 74.6				
	74.8 ~ 75.2				

▪ **FCC Part 15.205(b):** The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in §15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in §15.35 apply to these measurements.

▪ **FCC Part 15.407 (b):** Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

- (1) For transmitters operating in the **5.15-5.25 GHz band**: all emissions outside of the **5.15-5.35 GHz band** shall not exceed an **EIRP of -27 dBm/MHz**.
- (2) For transmitters operating in the **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**.
- (3) 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**.
- (4) For transmitters operating in the **5.725-5.85 GHz band**: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of -27 dBm/MHz.
- (5) The emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.
- (6) Unwanted emissions **below 1 GHz** must comply with the general field strength limits set forth in **Section 15.209**. Further, any U-NII devices using an **AC power line** are required to comply also with the conducted limits set forth in **Section 15.207**.
- (7) The provisions of §15.205 apply to intentional radiators operating under this section
- (8) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the upper and lower frequency band edges as the design of the equipment permits.

■ Test Procedure



■ Test Procedure

1. The EUT was placed on a 0.8 m high non-conductive table inside a shielded enclosure.
2. The turn table shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3 m away from the receiving antenna, which is varied from 1 m to 4 m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.

Radiated spurious emission measured using following Measurement Procedure of **KDB789033 D02 V01**

► General Requirements for Unwanted Emissions Measurements

The following requirements apply to all unwanted emissions measurements, both in and outside of the restricted bands:

■ EUT Duty Cycle

- (1) The EUT shall be configured or modified to **transmit continuously** except as stated in (ii), below. The intent is to test at 100 percent duty cycle; however a small reduction in duty cycle (**to no lower than 98 percent**) is permitted if required by the EUT for amplitude control purposes. Manufacturers are expected to provide software to the test lab to permit such continuous operation.
- (2) If **continuous transmission (or at least 98 percent duty cycle) cannot be achieved** due to hardware limitations of the EUT (e.g., overheating), the following additions to the measurement and reporting procedures are required:
 - The EUT shall be configured to operate at the maximum achievable duty cycle.
 - Measure the duty cycle, x, of the transmitter output signal.
 - Adjustments to measurement procedures (e.g., increasing test time and number of traces averaged) shall be performed as described in the procedures below.
 - The test report shall include the following additional information:
 - The reason for the duty cycle limitation.
 - The duty cycle achieved for testing and the associated transmit duration and interval between transmissions.
 - The sweep time and the amount of time used for trace stabilization during max-hold measurements for peak emission measurements.
- (3) **Reduction of the measured emission amplitude levels to account for operational duty factor is not permitted. Compliance is based on emission levels occurring during transmission - not on an average across on and off times of the transmitter.**

► Measurements below 1000 MHz

- a) Follow the requirements in section II.G.3, "General Requirements for Unwanted Emissions Measurements".
- b) Compliance shall be demonstrated using **CISPR quasi-peak detection**; however, **peak detection** is permitted as an alternative to quasi-peak detection.

► Measurements Above 1000 MHz (Peak)

- a) Follow the requirements in section II.G.3, “General Requirements for Unwanted Emissions Measurements”.
- b) Peak emission levels are measured by setting the analyzer as follows:
 - (i) **RBW = 1 MHz.**
 - (ii) **VBW ≥ 3 MHz.**
 - (iii) **Detector = Peak.**
 - (iv) Sweep time = auto.
 - (v) Trace mode = max hold.
 - (vi) Allow sweeps to continue until the trace stabilizes. Note that if the transmission is not continuous, the time required for the trace to stabilize will increase by a factor of approximately $1/x$, where x is the duty cycle. For example, at 50 percent duty cycle, the measurement time will increase by a factor of two relative to measurement time for continuous transmission.

► Measurements Above 1000 MHz (Method AD)

- (i) **RBW = 1 MHz.**
- (ii) **VBW ≥ 3 MHz.**
- (iii) **Detector = RMS**, if $\text{span}/(\# \text{ of points in sweep}) \leq \text{RBW}/2$. Satisfying this condition may require increasing the number of points in the sweep or reducing the span. If the condition is not satisfied, the detector mode shall be set to peak.
- (iv) Averaging type = power (i.e., RMS)
 - As an alternative, the detector and averaging type may be set for linear voltage averaging. Some analyzers require linear display mode in order to use linear voltage averaging. Log or dB averaging shall not be used.
- (v) Sweep time = auto.
- (vi) Perform a trace average of at least 100 traces if the transmission is continuous. If the transmission is not continuous, the number of traces shall be increased by a factor of $1/x$, where x is the duty cycle. For example, with 50 percent duty cycle, at least 200 traces shall be averaged.
- (vii) If tests are performed with the EUT transmitting at a duty cycle less than 98 percent, a correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 percent duty cycle. The correction factor is computed as follows:
 - **If power averaging (RMS) mode was used in step (iv) above, the correction factor is $10 \log(1/x)$, where x is the duty cycle.**
For example, if the transmit duty cycle was 50 percent, then 3 dB must be added to the measured emission levels.
 - If linear voltage averaging mode was used in step (iv) above, the correction factor is $20 \log(1/x)$, where x is the duty cycle. For example, if the transmit duty cycle was 50 percent, then 6 dB must be added to the measured emission levels.
 - If a specific emission is demonstrated to be continuous (100 percent duty cycle) rather than turning on and off with the transmit cycle, no duty cycle correction is required for that emission.

■ **Measurement Data:****Radiated Spurious Emissions data(9 kHz ~ 40 GHz) : 802.11a**

Band	Tested Channel	Freq. (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	DCCF (dB)	DCF (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
U-NII 1	36 (5180 MHz)	5149.020	H	X	PK	52.19	3.77	N/A	N/A	55.96	74.00	18.04
		5149.650	H	X	AV	39.26	3.77	0.09	N/A	43.12	54.00	10.88
		10354.920	H	X	PK	44.87	9.36	N/A	-9.54	44.69	68.20	23.51
	40 (5200 MHz)	10401.080	H	X	PK	44.71	9.49	N/A	-9.54	44.66	68.20	23.54
		-	-	-	-	-	-	-	-	-	-	-
	48 (5240 MHz)	10482.080	H	X	PK	44.83	9.51	N/A	-9.54	44.80	68.20	23.40
U-NII 2A	52 (5260 MHz)	10525.280	H	X	PK	44.79	9.61	N/A	-9.54	44.86	68.20	23.34
		-	-	-	-	-	-	-	-	-	-	-
	60 (5300 MHz)	10602.800	H	X	PK	44.95	9.02	N/A	-9.54	44.43	74.00	29.57
		10603.520	H	X	AV	34.48	9.02	0.09	-9.54	34.05	54.00	19.95
	64 (5320 MHz)	5350.450	H	X	PK	51.42	3.97	N/A	N/A	55.39	74.00	18.61
		5350.440	H	X	AV	38.57	3.97	0.09	N/A	42.63	54.00	11.37
		10638.280	H	X	PK	44.26	9.45	N/A	-9.54	44.17	74.00	29.83
		10637.520	H	X	AV	34.56	9.45	0.09	-9.54	34.56	54.00	19.44
U-NII 2C	100 (5500 MHz)	5458.080	H	X	PK	52.21	3.96	N/A	N/A	56.17	74.00	17.83
		5459.820	H	X	AV	39.60	3.96	0.09	N/A	43.65	54.00	10.35
		5469.200	H	X	PK	55.75	3.97	N/A	N/A	59.72	68.20	8.48
		10998.640	H	X	PK	45.16	9.99	N/A	-9.54	45.61	74.00	28.39
		11002.840	H	X	AV	34.71	9.99	0.09	-9.54	35.25	54.00	18.75
	116 (5580 MHz)	11150.880	H	X	PK	44.37	10.46	N/A	-9.54	45.29	74.00	28.71
		11148.720	H	X	AV	34.01	10.46	0.09	-9.54	35.02	54.00	18.98
		-	-	-	-	-	-	-	-	-	-	-
	144 (5720 MHz)	11443.240	H	X	PK	45.29	10.70	N/A	-9.54	46.45	74.00	27.55
		11433.520	H	X	AV	35.10	10.70	0.09	-9.54	36.35	54.00	17.65
U-NII 3	149 (5745 MHz)	11487.080	H	X	PK	45.61	10.74	N/A	-9.54	46.81	74.00	27.19
		11484.800	H	X	AV	35.02	10.74	0.09	-9.54	36.31	54.00	17.69
	157 (5785 MHz)	11566.280	H	X	PK	45.45	11.49	N/A	-9.54	47.40	74.00	26.60
		11568.240	H	X	AV	35.11	11.49	0.09	-9.54	37.15	54.00	16.85
	165 (5825 MHz)	5860.320	H	X	PK	51.05	4.76	N/A	N/A	55.81	68.20	12.39
		11645.560	H	X	PK	45.32	11.59	N/A	-9.54	47.37	74.00	26.63
		11647.400	H	X	AV	35.31	11.59	0.09	-9.54	37.45	54.00	16.55

Note.

- No other spurious and harmonic emissions were found greater than listed emissions on above table.
- Sample Calculation.
 $\text{Margin} = \text{Limit} - \text{Result}$ / $\text{Result} = \text{Reading} + \text{T.F} + \text{DCCF} + \text{DCF}$ / $\text{T.F} = \text{AF} + \text{CL} - \text{AG}$
 Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,
 DCCF = Duty Cycle Correction Factor, DCF = Distance Correction Factor
- Measurement Distance = 3 m for below 10 GHz, Measurement Distance = 1 m for above 10 GHz.
 Therefore Distance Correction Factor(DCF) : $-9.54 \text{ dB} = 20 \cdot \log(1 \text{ m} / 3 \text{ m})$
- The limit is converted to field strength.
 $\text{E}[\text{dBuV/m}] = \text{EIRP}[\text{dBm}] + 95.2 \text{ dB} = -27 \text{ dBm} + 95.2 = 68.2 \text{ dBuV/m}$

■ Measurement Data:

Radiated Spurious Emissions data(9 kHz ~ 40 GHz) : 802.11n (HT20)

Band	Tested Channel	Freq. (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	DCCF (dB)	DCF (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
U-NII 1	36 (5180 MHz)	5148.250	H	X	PK	53.85	3.77	N/A	N/A	57.62	74.00	16.38
		5149.700	H	X	AV	39.84	3.77	0.09	N/A	43.70	54.00	10.30
		10377.600	H	X	PK	44.87	9.36	N/A	-9.54	44.69	68.20	23.51
	40 (5200 MHz)	10403.880	H	X	PK	45.51	9.49	N/A	-9.54	45.46	68.20	22.74
		-	-	-	-	-	-	-	-	-	-	-
	48 (5240 MHz)	10479.000	H	X	PK	45.17	9.51	N/A	-9.54	45.14	68.20	23.06
U-NII 2A	52 (5260 MHz)	10516.120	H	X	PK	44.05	9.61	N/A	-9.54	44.12	68.20	24.08
		-	-	-	-	-	-	-	-	-	-	-
	60 (5300 MHz)	10607.840	H	X	PK	45.05	9.02	N/A	-9.54	44.53	74.00	29.47
		10607.560	H	X	AV	34.62	9.02	0.09	-9.54	34.19	54.00	19.81
	64 (5320 MHz)	5352.540	H	X	PK	52.13	3.97	N/A	N/A	56.10	74.00	17.90
		5350.450	H	X	AV	38.86	3.97	0.09	N/A	42.92	54.00	11.08
		10636.840	H	X	PK	44.77	9.45	N/A	-9.54	44.68	74.00	29.32
		11002.840	H	X	AV	34.68	9.45	0.09	-9.54	34.68	54.00	19.32
U-NII 2C	100 (5500 MHz)	5458.110	H	X	PK	52.33	3.96	N/A	N/A	56.29	74.00	17.71
		5459.790	H	X	AV	39.47	3.96	0.09	N/A	43.52	54.00	10.48
		5469.230	H	X	PK	55.69	3.97	N/A	N/A	59.66	68.20	8.54
		10998.640	H	X	PK	44.87	9.99	N/A	-9.54	45.32	74.00	28.68
		11002.840	H	X	AV	34.62	9.99	0.09	-9.54	35.16	54.00	18.84
	116 (5580 MHz)	11163.480	H	X	PK	44.40	10.46	N/A	-9.54	45.32	74.00	28.68
		11160.880	H	X	AV	34.86	10.46	0.09	-9.54	35.87	54.00	18.13
		-	-	-	-	-	-	-	-	-	-	-
	144 (5720 MHz)	11436.160	H	X	PK	45.17	10.70	N/A	-9.54	46.33	74.00	27.67
		11430.560	H	X	AV	35.26	10.70	0.09	-9.54	36.51	54.00	17.49
U-NII 3	149 (5745 MHz)	11489.280	H	X	PK	45.73	10.74	N/A	-9.54	46.93	74.00	27.07
		11496.360	H	X	AV	35.04	10.74	0.09	-9.54	36.33	54.00	17.67
	157 (5785 MHz)	11570.480	H	X	PK	45.77	11.49	N/A	-9.54	47.72	74.00	26.28
		11571.640	H	X	AV	35.39	11.49	0.09	-9.54	37.43	54.00	16.57
	165 (5825 MHz)	5860.890	H	X	PK	51.33	4.76	N/A	N/A	56.09	68.20	12.11
		11649.400	H	X	PK	45.27	11.59	N/A	-9.54	47.32	74.00	26.68
		11650.760	H	X	AV	35.18	11.59	0.09	-9.54	37.32	54.00	16.68

Note.

1. No other spurious and harmonic emissions were found greater than listed emissions on above table.
2. Sample Calculation.
Margin = Limit – Result / Result = Reading + T.F+ DCCF + DCF / T.F = AF + CL – AG
Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,
DCCF = Duty Cycle Correction Factor, DCF = Distance Correction Factor
3. Measurement Distance = 3 m for below 10 GHz, Measurement Distance = 1 m for above 10 GHz.
Therefore Distance Correction Factor(DCF) : - 9.54 dB = 20*log(1 m / 3 m)
4. The limit is converted to field strength.
 $E[dBuV/m] = EIRP[dBm] + 95.2 \text{ dB} = -27 \text{ dBm} + 95.2 = 68.2 \text{ dBuV/m}$

■ **Measurement Data:****Radiated Spurious Emissions data(9 kHz ~ 40 GHz) : 802.11n (HT40)**

Band	Tested Channel	Freq. (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	DCCF (dB)	DCF (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
U-NII 1	38 (5190 MHz)	5149.800	H	X	PK	50.03	3.77	N/A	N/A	53.80	74.00	20.20
		5149.400	H	X	AV	40.21	3.77	0.14	N/A	44.12	54.00	9.88
		10385.080	H	X	PK	44.85	9.43	N/A	-9.54	44.74	68.20	23.46
	46 (5230 MHz)	10454.040	H	X	PK	44.76	9.51	N/A	-9.54	44.73	68.20	23.47
		-	-	-	-	-	-	-	-	-	-	-
U-NII 2A	54 (5270 MHz)	10537.720	H	X	PK	45.93	9.46	N/A	-9.54	45.85	68.20	22.35
		-	-	-	-	-	-	-	-	-	-	-
	62 (5310 MHz)	5351.200	H	X	PK	52.62	3.97	N/A	N/A	56.59	74.00	17.41
		5350.350	H	X	AV	41.44	3.97	0.14	N/A	45.55	54.00	8.45
		10623.960	H	X	PK	44.87	9.24	N/A	-9.54	44.57	74.00	29.43
U-NII 2C	102 (5510 MHz)	10615.840	H	X	AV	34.72	9.24	0.14	-9.54	34.56	54.00	19.44
		5457.540	H	X	PK	48.87	3.96	N/A	N/A	52.83	74.00	21.17
		5457.570	H	X	AV	38.55	3.96	0.14	N/A	42.65	54.00	11.35
		5468.800	H	X	PK	50.61	3.97	N/A	N/A	54.58	68.20	13.62
		11023.240	H	X	PK	44.71	10.09	N/A	-9.54	45.26	74.00	28.74
	110 (5550 MHz)	11027.840	H	X	AV	34.67	10.09	0.14	-9.54	35.36	54.00	18.64
		11103.240	H	X	PK	44.82	10.43	N/A	-9.54	45.71	74.00	28.29
		11097.800	H	X	AV	34.74	10.43	0.14	-9.54	35.77	54.00	18.23
	142 (5710 MHz)	-	-	-	-	-	-	-	-	-	-	-
		11423.440	H	X	PK	44.99	10.59	N/A	-9.54	46.04	74.00	27.96
U-NII 3	151 (5755 MHz)	11425.880	H	X	AV	34.74	10.59	0.14	-9.54	35.93	54.00	18.07
		11513.160	H	X	PK	45.26	10.93	N/A	-9.54	46.65	68.20	21.55
	159 (5795 MHz)	11514.640	H	X	AV	34.95	10.93	0.14	-9.54	36.48	74.00	37.52
		5861.520	H	X	PK	50.40	4.76	N/A	N/A	55.16	68.20	13.04
		11593.560	H	X	PK	45.94	11.52	N/A	-9.54	47.92	74.00	26.08
		11595.040	H	X	AV	34.85	11.52	0.14	-9.54	36.97	54.00	17.03

Note.

1. No other spurious and harmonic emissions were found greater than listed emissions on above table.

2. Sample Calculation.

Margin = Limit – Result / Result = Reading + T.F+ DCCF + DCF / T.F = AF + CL – AG
Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,
DCCF = Duty Cycle Correction Factor, DCF = Distance Correction Factor

3. Measurement Distance = 3 m for below 10 GHz, Measurement Distance = 1 m for above 10 GHz.

Therefore Distance Correction Factor(DCF) : - 9.54 dB = 20*log(1 m / 3 m)

4. The limit is converted to field strength.

E[dBuV/m] = EIRP[dBm] + 95.2 dB = -27 dBm + 95.2 = 68.2 dBuV/m

■ **Measurement Data:****Radiated Spurious Emissions data(9 kHz ~ 40 GHz) : 802.11ac (VHT20)**

Band	Tested Channel	Freq. (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	DCCF (dB)	DCF (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
U-NII 2C	144 (5720 MHz)	11436.360	H	X	PK	45.05	10.70	N/A	-9.54	46.21	74.00	27.79
		11433.920	H	X	AV	35.61	10.70	0.09	-9.54	36.86	54.00	17.14
		-	-	-	-	-	-	-	-	-	-	-

Radiated Spurious Emissions data(9 kHz ~ 40 GHz) : 802.11ac (VHT40)

Band	Tested Channel	Freq. (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	DCCF (dB)	DCF (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
U-NII 2C	142 (5710 MHz)	11425.560	H	X	PK	44.40	10.59	N/A	-9.54	45.45	74.00	28.55
		11420.000	H	X	AV	33.74	10.59	0.14	-9.54	34.93	54.00	19.07
		-	-	-	-	-	-	-	-	-	-	-

Radiated Spurious Emissions data(9 kHz ~ 40 GHz) : 802.11ac (VHT80)

Band	Tested Channel	Freq. (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	DCCF (dB)	DCF (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
U-NII 1	42 (5210 MHz)	5147.650	H	X	PK	47.35	3.77	N/A	N/A	51.12	74.00	22.88
		5148.650	H	X	AV	38.08	3.77	0.27	N/A	42.12	54.00	11.88
		10420.720	H	X	PK	44.20	9.50	N/A	-9.54	44.16	68.20	24.04
U-NII 2A	58 (5290 MHz)	5353.150	H	X	PK	54.65	3.97	N/A	N/A	58.62	74.00	15.38
		5350.750	H	X	AV	43.80	3.97	0.27	N/A	48.04	54.00	5.96
		10572.090	H	X	PK	44.76	9.17	N/A	-9.54	44.39	68.20	23.81
U-NII 2C	106 (5530 MHz)	5452.380	H	X	PK	52.44	3.96	N/A	N/A	56.40	74.00	17.60
		5452.320	H	X	AV	40.79	3.96	0.27	N/A	45.02	54.00	8.98
		5463.430	H	X	PK	53.06	3.97	N/A	N/A	57.03	68.20	11.17
		11057.500	H	X	PK	45.86	10.31	N/A	-9.54	46.63	74.00	27.37
		11061.100	H	X	AV	34.25	10.31	0.27	-9.54	35.29	54.00	18.71
		11389.840	H	X	PK	44.23	10.55	N/A	-9.54	45.24	74.00	28.76
	138 (5690 MHz)	11386.360	H	X	AV	34.63	10.55	0.27	-9.54	35.91	54.00	18.09
U-NII 3	155 (5775 MHz)	11544.280	H	X	PK	45.95	11.30	N/A	-9.54	47.71	74.00	26.29
		11546.720	H	X	AV	34.35	11.30	0.27	-9.54	36.38	54.00	17.62

Note.

1. No other spurious and harmonic emissions were found greater than listed emissions on above table.
2. Sample Calculation.
 $\text{Margin} = \text{Limit} - \text{Result}$ / $\text{Result} = \text{Reading} + \text{T.F} + \text{DCCF} + \text{DCF}$ / $\text{T.F} = \text{AF} + \text{CL} - \text{AG}$
 Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,
 DCCF = Duty Cycle Correction Factor, DCF = Distance Correction Factor
3. Measurement Distance = 3 m for below 10 GHz, Measurement Distance = 1 m for above 10 GHz.
 Therefore Distance Correction Factor(DCF) : - 9.54 dB = $20 \cdot \log(1 \text{ m} / 3 \text{ m})$
4. The limit is converted to field strength.
 $\text{E}[\text{dBuV/m}] = \text{EIRP}[\text{dBm}] + 95.2 \text{ dB} = -27 \text{ dBm} + 95.2 = 68.2 \text{ dBuV/m}$

8.7 AC Conducted Emissions

■ Test Procedure

The conducted emissions are measured in the shielded room with a spectrum analyzer in peak hold. Emissions closest to the limit are measured in the quasi-peak mode (QP) and average mode (AV) with the tuned receiver using a bandwidth of 9 kHz. The emissions are maximized further by cable manipulation and Exerciser operation. The highest emissions relative to the limit are listed.

■ Measurement Data: **Comply**

Note 1: See next pages for actual measured spectrum plots and data for worst case result.

■ Minimum Standard: FCC Part 15.207(a)

Frequency Range (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15 ~ 0.5	66 to 56 *	56 to 46 *
0.5 ~ 5	56	46
5 ~ 30	60	50

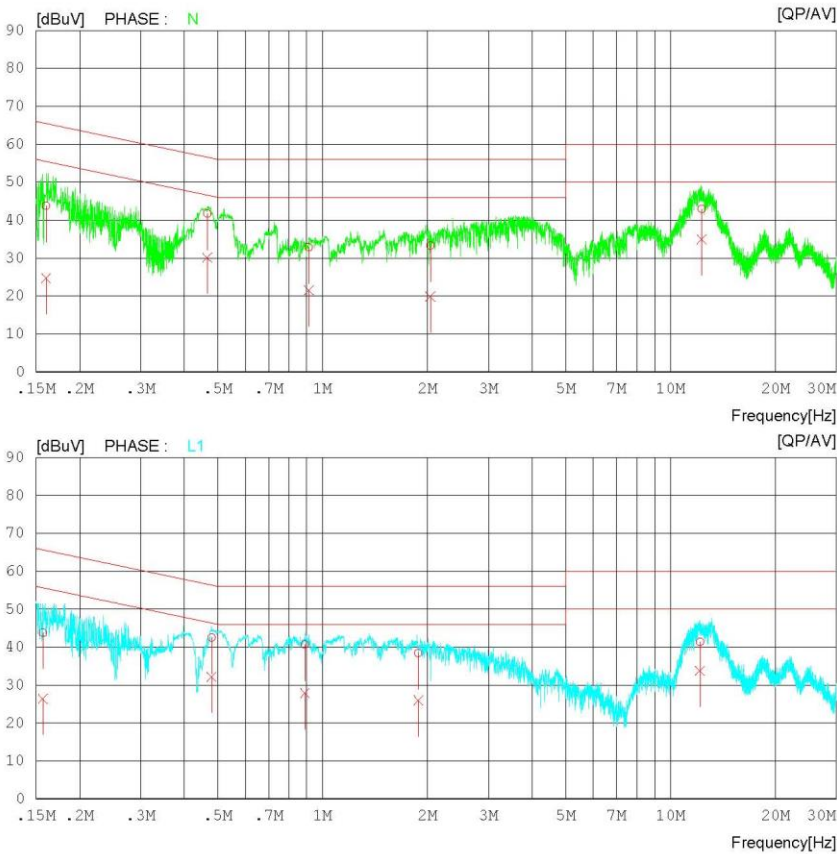
* Decreases with the logarithm of the frequency

AC Line Conducted Emissions (Graph)

Test Mode: U-NII 1 & 802.11a

Results of Conducted Emission

DTNC		Date : 2015-05-26
Order No.	:	Reference No.
Model No.	:	Power Supply
Serial No.	:	Temp/Humi.
Test Condition	:	Operator
	:	
Memo	:	
LIMIT : CISPR22_B QP		
CISPR22_B AV		



AC Line Conducted Emissions (Data List)

Test Mode: U-NII 1 & 802.11a

Results of Conducted Emission

DTNC

Date : 2015-05-26

Order No. :
Model No. : LG22V24
Serial No. : Identical prototype
Test Condition : WLAN 5.1GHz / 802.11a

Reference No. :
Power Supply : 120 V 60 Hz
Temp/Humi. : 21 'C 42 % R.H.
Operator : C.M.KIM

Memo :

LIMIT : CISPR22_B QP
CISPR22_B AV

NO	FREQ [MHz]	READING		C.FACTOR [dB]	RESULT		LIMIT		MARGIN		PHASE
		QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	
1	0.16013	33.8	14.9	9.9	43.7	24.8	65.5	55.5	21.8	30.7	N
2	0.46595	31.6	20.0	10.1	41.7	30.1	56.6	46.6	14.9	16.5	N
3	0.91268	22.7	11.5	10.1	32.8	21.6	56.0	46.0	23.2	24.4	N
4	2.04020	23.2	9.8	10.1	33.3	19.9	56.0	46.0	22.7	26.1	N
5	12.29560	32.4	24.5	10.5	42.9	35.0	60.0	50.0	17.1	15.0	N
6	0.15691	33.8	16.4	10.0	43.8	26.4	65.6	55.6	21.8	29.2	L1
7	0.47934	32.4	22.1	10.0	42.4	32.1	56.4	46.4	14.0	14.3	L1
8	0.88889	30.6	17.8	10.0	40.6	27.8	56.0	46.0	15.4	18.2	L1
9	1.88480	28.3	15.8	10.1	38.4	25.9	56.0	46.0	17.6	20.1	L1
10	12.14800	30.6	23.0	10.7	41.3	33.7	60.0	50.0	18.7	16.3	L1

AC Line Conducted Emissions (Graph)

Test Mode: U-NII 2A & 802.11a

Results of Conducted Emission

DTNC

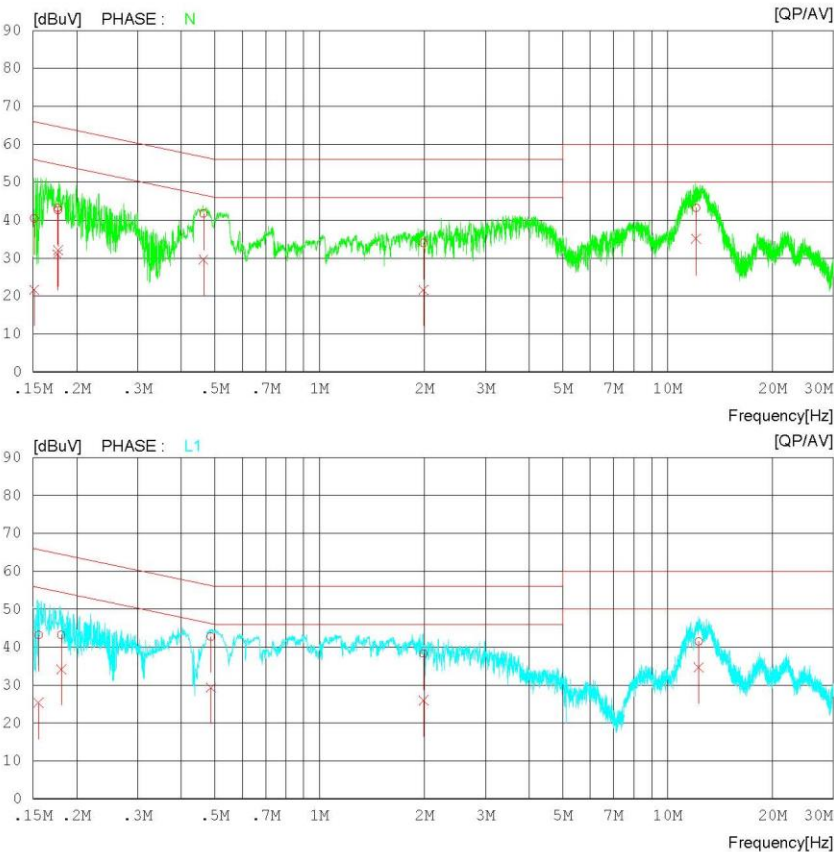
Date : 2015-05-26

Order No. :
Model No. : LG22V24
Serial No. : Identical prototype
Test Condition : WLAN 5.3GHz / 802.11a QP

Reference No. :
Power Supply : 120 V 60 Hz
Temp/Humi. : 21 'C 42 % R.H.
Operator : C.M.KIM

Memo :

LIMIT : CISPR22_B QP
CISPR22_B AV



AC Line Conducted Emissions (Data List)

Test Mode: U-NII 2A & 802.11a

Results of Conducted Emission

DTNC

Date : 2015-05-26

Order No. :
Model No. : LG22V24
Serial No. : Identical prototype
Test Condition : WLAN 5.3GHz / 802.11a QP

Reference No. :
Power Supply : 120 V 60 Hz
Temp/Humi. : 21 'C 42 % R.H.
Operator : C.M.KIM

Memo :

LIMIT : CISPR22_B QP
CISPR22_B AV

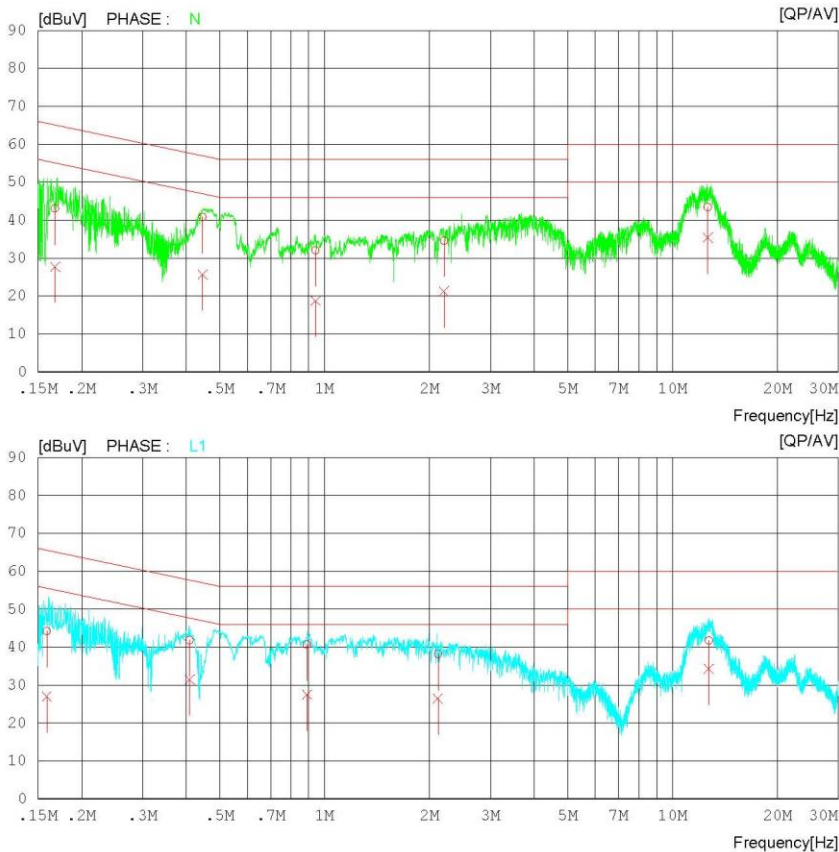
NO	FREQ [MHz]	READING		C.FACTOR [dB]	RESULT		LIMIT		MARGIN		PHASE
		QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	
1	0.15114	30.5	11.6	10.0	40.5	21.6	65.9	55.9	25.4	34.3	N
2	0.17642	33.3	21.1	9.9	43.2	31.0	64.7	54.7	21.5	23.7	N
3	0.17713	32.7	22.2	9.9	42.6	32.1	64.6	54.6	22.0	22.5	N
4	0.46363	31.6	19.5	10.1	41.7	29.6	56.6	46.6	14.9	17.0	N
5	1.98960	23.8	11.5	10.1	33.9	21.6	56.0	46.0	22.1	24.4	N
6	12.09480	32.8	24.6	10.5	43.3	35.1	60.0	50.0	16.7	14.9	N
7	0.15556	33.1	15.2	10.0	43.1	25.2	65.7	55.7	22.6	30.5	L1
8	0.18080	33.2	24.2	10.0	43.2	34.2	64.4	54.4	21.2	20.2	L1
9	0.48657	32.7	19.3	10.0	42.7	29.3	56.2	46.2	13.5	16.9	L1
10	1.98900	28.1	15.9	10.1	38.2	26.0	56.0	46.0	17.8	20.0	L1
11	12.28680	30.8	24.0	10.7	41.5	34.7	60.0	50.0	18.5	15.3	L1

AC Line Conducted Emissions (Graph)

Test Mode: U-NII 2C & 802.11a

Results of Conducted Emission

DTNC		Date : 2015-05-26
Order No.	:	
Model No.	:	LG22V24
Serial No.	:	Identical prototype
Test Condition	:	WLAN 5.5GHz / 802.11a QP
Reference No.	:	
Power Supply	:	120 V 60 Hz
Temp/Humi.	:	21 'C 42 % R.H.
Operator	:	C.M.KIM
Memo	:	
LIMIT : CISPR22_B QP		
CISPR22_B AV		



AC Line Conducted Emissions (Data List)

Test Mode: U-NII 2C & 802.11a

Results of Conducted Emission

DTNC

Date : 2015-05-26

Order No. :
Model No. : LG22V24
Serial No. : Identical prototype
Test Condition : WLAN 5.5GHz / 802.11a QP

Reference No. :
Power Supply : 120 V 60 Hz
Temp/Humi. : 21 'C 42 % R.H.
Operator : C.M.KIM

Memo :

LIMIT : CISPR22_B QP
CISPR22_B AV

NO	FREQ [MHz]	READING		C.FACTOR [dB]	RESULT		LIMIT		MARGIN		PHASE
		QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	
1	0.16779	33.1	17.9	9.9	43.0	27.8	65.1	55.1	22.1	27.3	N
2	0.44556	30.7	15.6	10.1	40.8	25.7	57.0	47.0	16.2	21.3	N
3	0.94141	22.0	8.6	10.1	32.1	18.7	56.0	46.0	23.9	27.3	N
4	2.20400	24.6	11.2	10.0	34.6	21.2	56.0	46.0	21.4	24.8	N
5	12.63920	32.9	24.9	10.5	43.4	35.4	60.0	50.0	16.6	14.6	N
6	0.15879	34.2	16.9	10.0	44.2	26.9	65.5	55.5	21.3	28.6	L1
7	0.40938	31.8	21.5	10.0	41.8	31.5	57.7	47.7	15.9	16.2	L1
8	0.88994	30.6	17.5	10.0	40.6	27.5	56.0	46.0	15.4	18.5	L1
9	2.11720	28.0	16.2	10.1	38.1	26.3	56.0	46.0	17.9	19.7	L1
10	12.72480	30.8	23.4	10.8	41.6	34.2	60.0	50.0	18.4	15.8	L1

AC Line Conducted Emissions (Graph)

Test Mode: U-NII 3 & 802.11a

Results of Conducted Emission

DTNC

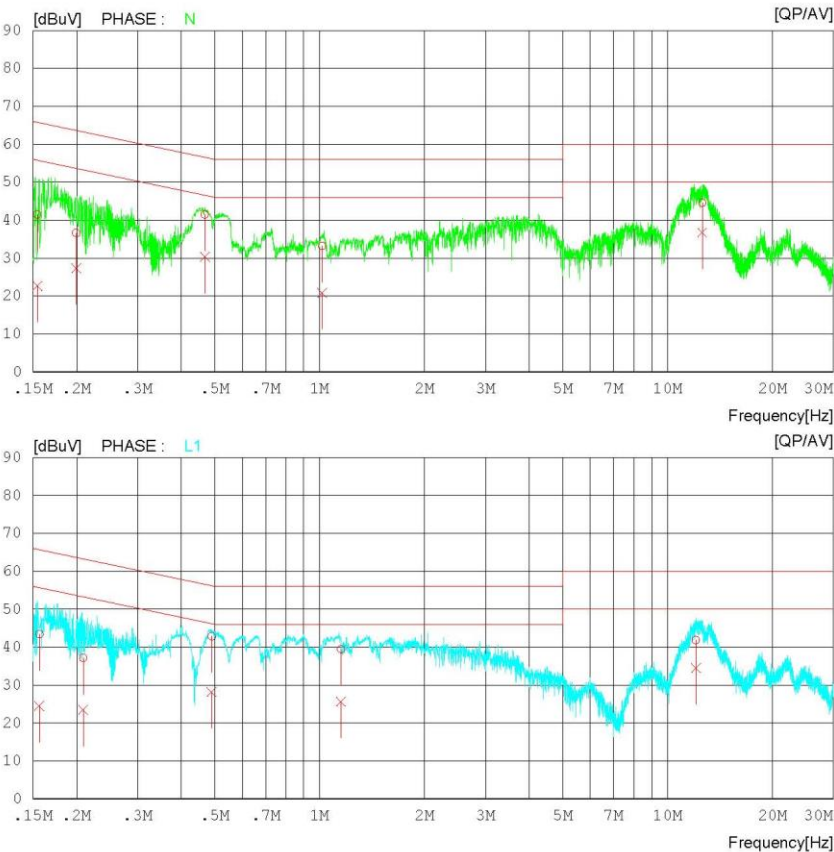
Date : 2015-05-26

Order No. :
Model No. : LG22V24
Serial No. : Identical prototype
Test Condition : WLAN 5.8GHz / 802.11a QP

Reference No. :
Power Supply : 120 V 60 Hz
Temp/Humi. : 21 'C 42 % R.H.
Operator : C.M.KIM

Memo :

LIMIT : CISPR22_B QP
CISPR22_B AV



AC Line Conducted Emissions (Data List)

Test Mode: U-NII 3 & 802.11a

Results of Conducted Emission

DTNC

Date : 2015-05-26

Order No. :
Model No. : LG22V24
Serial No. : Identical prototype
Test Condition : WLAN 5.8GHz / 802.11a QP

Reference No. :
Power Supply : 120 V 60 Hz
Temp/Humi. : 21 'C 42 % R.H.
Operator : C.M.KIM

Memo :

LIMIT : CISPR22_B QP
CISPR22_B AV

NO	FREQ [MHz]	READING		C.FACTOR [dB]	RESULT		LIMIT		MARGIN		PHASE
		QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	
1	0.15435	31.5	12.7	10.0	41.5	22.7	65.8	55.8	24.3	33.1	N
2	0.19988	26.7	17.4	9.9	36.6	27.3	63.6	53.6	27.0	26.3	N
3	0.46771	31.4	20.1	10.1	41.5	30.2	56.6	46.6	15.1	16.4	N
4	1.01600	23.0	10.8	10.1	33.1	20.9	56.0	46.0	22.9	25.1	N
5	12.58900	34.1	26.2	10.5	44.6	36.7	60.0	50.0	15.4	13.3	N
6	0.15638	33.3	14.5	10.0	43.3	24.5	65.7	55.7	22.4	31.2	L1
7	0.20899	27.1	13.4	10.0	37.1	23.4	63.2	53.2	26.1	29.8	L1
8	0.48900	32.8	18.2	10.0	42.8	28.2	56.2	46.2	13.4	18.0	L1
9	1.15160	29.3	15.5	10.1	39.4	25.6	56.0	46.0	16.6	20.4	L1
10	12.08120	31.1	23.8	10.7	41.8	34.5	60.0	50.0	18.2	15.5	L1

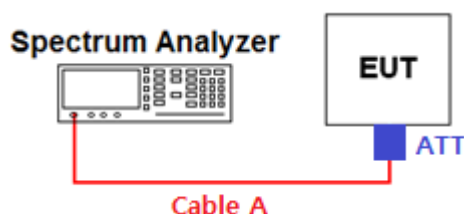
9. LIST OF TEST EQUIPMENT

Type	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal.Date (yy/mm/dd)	S/N
Spectrum Analyzer	Agilent Technologies	N9020A	15/01/19	16/01/19	MY46471096
PXA Signal Analyzer	Agilent Technologies	N9030A	14/10/21	15/10/21	MY53310140
Temp & Humi Test Chamber	SJ Science	SJ-TH-S50	14/10/21	15/10/21	SJ-TH-S50-130930
Power Meter & Wide Bandwidth Sensor	Anritsu	ML2495A/ MA2411B	14/10/21	15/10/21	1338004/ 1306053
Thermohygrometer	BODYCOM	BJ5478	15/02/26	16/02/26	1209
Digital Multimeter	FLUKE	17B	15/04/27	16/04/27	26030065WS
Signal Generator	Rohde Schwarz	SMF100A	14/07/01	15/07/01	102341
Vector Signal Generator	Rohde Schwarz	SMBV100A	15/01/06	16/01/06	255571
3dB Attenuator	SMAJK	SMAJK-2-3	14/10/21	15/10/21	3
High-pass filter	Wainwright	WHNX8.5	14/09/11	15/09/11	1
Low Noise Pre Amplifier	TSJ	MLA-010K01-B01-27	15/04/09	16/04/09	1844538
Amplifier	Agilent Technologies	8449B	14/11/06	15/11/06	3008A02108
PreAmplifier	A.H. SYSTEMS	PAM-1840VH	14/12/12	15/12/12	163
Loop Antenna	Rohde Schwarz	FMZB1513	14/04/29	16/04/29	1513-128
TRILOG Broadband Test-Antenna	Schwarzbeck	VULB 9160	14/04/04	16/04/04	3357
HORN ANT	ETS	3115	15/02/09	16/02/09	21097
HORN ANT	A.H.Systems	SAS-574	15/04/30	17/04/30	154
EMI TEST RECEIVER	Rohde Schwarz	ESR7	14/10/21	15/10/21	101109
EMI TEST RECEIVER	Rohde Schwarz	ESCI	15/02/25	16/02/25	100364
FREQUENCY CONVERTER	Taejin Electronic	CVCF	14/09/11	15/09/11	ZU0033
ARTIFICIAL MAINS NETWORK	Narda S.T.S. / PMM	PMM L2-16B	14/06/26	15/06/26	000WX20305

APPENDIX I

Conducted Test set up Diagram

Conducted Measurement



APPENDIX II

Duty Cycle Information

Test Procedure

Duty Cycle [$X = \text{On Time} / (\text{On} + \text{Off time})$] is measured using Measurement Procedure of **KDB789033 D02 V01**

1. Set the center frequency of the spectrum analyzer to the center frequency of the transmission.
2. Set RBW $\geq$ EBW if possible; otherwise, set RBW to the largest available value.
3. Set VBW $\geq$ RBW. Set detector = peak.
4. Note : The zero-span measurement method shall not be used unless both **RBW and VBW are $> 50/T$** , where T is defined in section II.B.1.a), and **the number of sweep points across duration T exceeds 100**. (For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring duty cycle shall not be used if $T \leq 16.7$ microseconds.)

T : The minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

($T = \text{On time}$ of the above table since the EUT operates with above fixed Duty Cycle and it is the minimum On time)

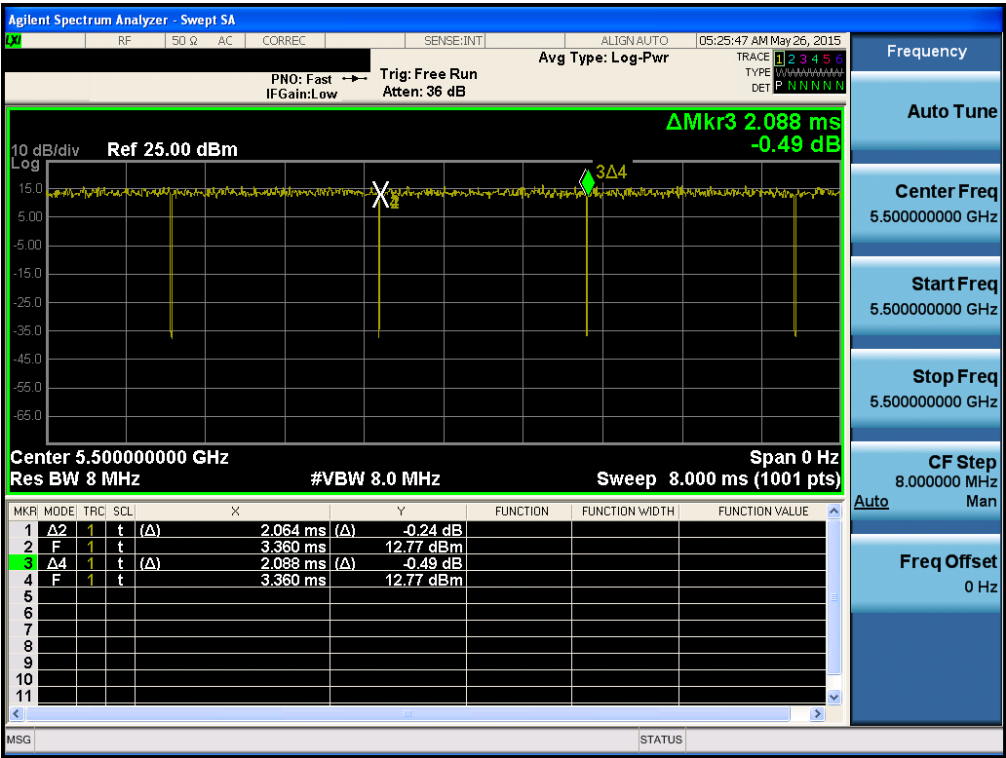
Test Results:

Mode	Channel	Rate	Tested Frequency [MHz]	Maximum Achievable Duty Cycle ($x = \text{On} / (\text{On} + \text{Off})$)			Duty Cycle Correction Factor [dB]	$1/T$ [Hz]
				On Time [ms]	On+Off Time [ms]	x		
802.11a	100	6 Mbps	5500	2.064	2.088	0.98	0.09	484.50
802.11n(HT20)	100	MCS 0	5500	1.920	1.952	0.98	0.09	520.84
802.11n(HT40)	102	MCS 0	5510	0.945	0.972	0.97	0.14	1058.21
802.11ac(VHT20)	100	MCS 0	5500	1.936	1.960	0.98	0.09	516.53
802.11ac(VHT40)	102	MCS 0	5510	0.951	0.978	0.97	0.14	1051.53
802.11ac(VHT80)	106	MCS 0	5530	0.440	0.468	0.94	0.27	2272.73

Result Plots

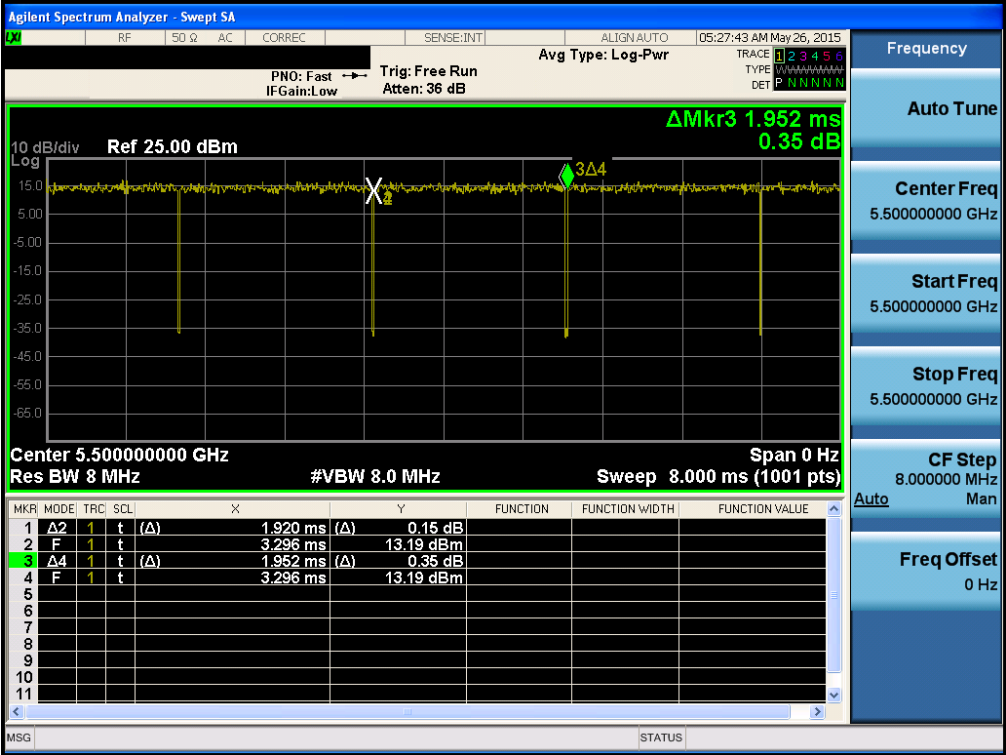
Duty Cycle

Test Mode: 802.11a & Ch.100 & 6 Mbps



Duty Cycle

Test Mode: 802.11n(HT20) & Ch.100 & MCS 0



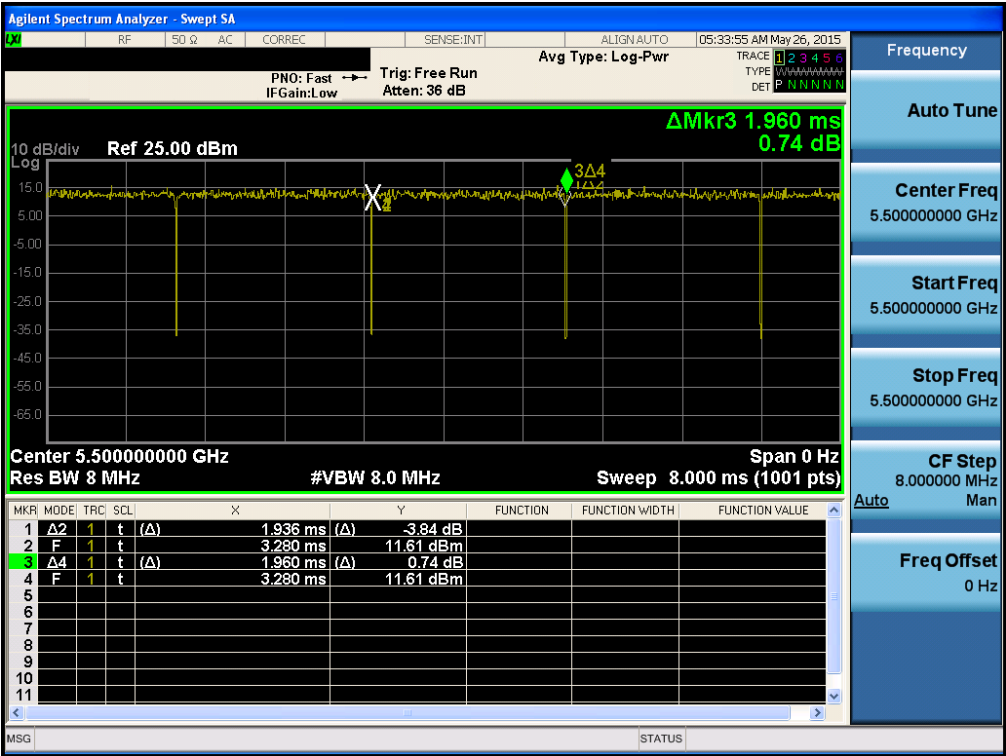
Duty Cycle

Test Mode: 802.11n(HT40) & Ch.102 & MCS 0



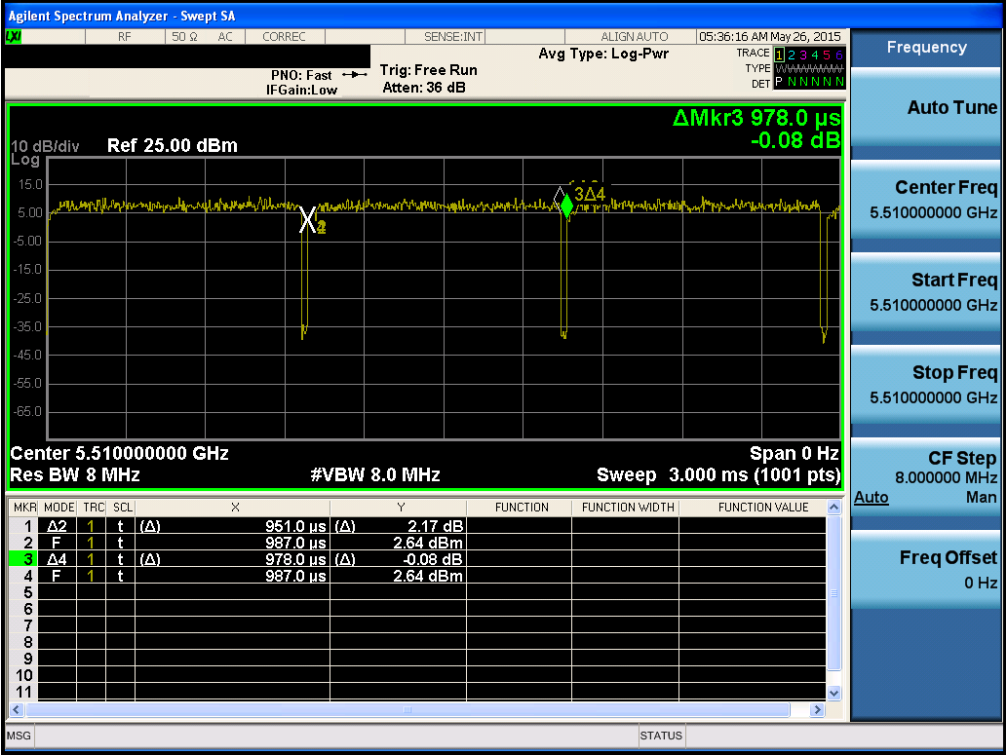
Duty Cycle

Test Mode: 802.11ac(VHT20) & Ch.100 & MCS 0



Duty Cycle

Test Mode: 802.11ac(VHT40) & Ch.102 & MCS 0



Duty Cycle

Test Mode: 802.11ac(VHT80) & Ch.106 & MCS 0

