TEST REPORT

Dt&C

DT&C Co., Ltd.

42, Yurim-ro, 154Beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea, 17042
Tel : 031-321-2664, Fax : 031-321-1664

1. Report No : DRTFCC1709-0175(1)
2. Customer
   - Name (FCC) : POINTMOBILE CO., LTD. / Name (IC) : POINTMOBILE CO.,LTD
   - Address (FCC) : B-9F, Kabul Great Valley 32 Digital-ro 9-gil, Geumcheon-gu Seoul South Korea 153-709

   Address (IC) : B-9F Kabul Great Valley, 32, Digital-ro 9-gil, Geumcheon-gu Seoul Korea (Republic Of)
3. Use of Report : FCC & IC Original Grant
4. Product Name / Model Name : Mobile Computer / FCC: PM66, IC: PM66W

   FCC ID: V2X-PM66W / IC: 10664A-PM66W
5. Test Method Used : KDB 789033, ANSI C63.10-2013

   Test Specification : FCC Part 15.407 Subpart E

   RSS-247 Issue 2 (2017-02), RSS-GEN Issue 4 (2014-11)
6. Date of Test : 2017.06.12 ~ 2017.06.30
7. Testing Environment : See appended test report.
8. Test Result : Refer to the attached test result.

Affirmation	Tested by Name : SunGeun Lee (Signature)	Technical Manager Name : GeunKi Son (Signature)

2017 . 09 . 28 .

DT&C Co., Ltd.

If this report is required to confirmation of authenticity, please contact to report@dtnc.net

Test Report Version

Test Report No.	Date	Description
DRTFCC1709-0175	Sep. 07, 2017	Initial issue
DRTFCC1709-0175(1)	Sep. 28, 2017	Revised the section 7.3 and 7.4

CONTENTS

1. GENRAL INFORMATION

1.1 Testing Laboratory

DT&C Co., Ltd.		
The 3 m test site and conducted measurement facility used to collect the radiated data are located at the 42, Yurim-ro, 154beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea 17042. The site is constructed in conformance with the requirements. **- FCC MRA Accredited Test Firm No. : KR0034** **- IC Test site No. : 5740A-3**		
www.dtnc.net		
Telephone	:	+ 82-31-321-2664
FAX	:	+ 82-31-321-1664

1.2 Tested environment

Ambient Condition	
▪ Temperature	+21 ~ +23 ℃
▪ Relative Humidity	40 % ~ 47 %

1.3 Measurement Uncertainty

The measurement uncertainties shown below were calculated in accordance with requirements of ANSI C 63.4-2014 and ANSI C 63.10-2013. All measurement uncertainty values are shown with a coverage factor of *k* = 2 to indicate a 95 % level of confidence.

Test items	Measurement uncertainty
Transmitter Output Power	0.71 dB (The confidence level is about 95 %, k = 2)
AC conducted emission	2.4 dB (The confidence level is about 95 %, k = 2)
Radiated spurious emission (1 GHz Below)	5.1 dB (The confidence level is about 95 %, k = 2)
Radiated spurious emission (1 GHz ~ 18 GHz)	5.4 dB (The confidence level is about 95 %, k = 2)
Radiated spurious emission (18 GHz Above)	5.3 dB (The confidence level is about 95 %, k = 2)

1.4 Details of Applicant

Applicant (FCC)	:	POINTMOBILE CO., LTD.
Applicant (IC)		POINTMOBILE CO.,LTD
Address (FCC)	:	B-9F, Kabul Great Valley 32 Digital-ro 9-gil, Geumcheon-gu Seoul South Korea 153-709
Address (IC)		B-9F Kabul Great Valley, 32, Digital-ro 9-gil, Geumcheon-gu Seoul Korea (Republic Of)
Contact person (FCC)	:	Wilson Park
Contact person (IC)	:	Edgar Cho

1.5 Description of EUT

FCC Equipment Class	Unlicensed National Information Infrastructure (UNII)
EUT	Mobile computer
Model Name	FCC: PM66 IC: PM66W
Add Model Name	NA
Power Supply	DC 3.85V
Hardware version	MP
Software version	76.00
Frequency Range	**U-NII 1(5150 ~ 5250 MHz)** ▪ 802.11a/n(HT20): 5180 ~ 5240 MHz ▪ 802.11n(HT40): 5190 ~ 5230 MHz **U-NII 2A(5250 ~ 5350 MHz)** ▪ 802.11a/n(HT20): 5260 ~ 5320 MHz ▪ 802.11n(HT40): 5270 ~ 5310 MHz **U-NII 2C(5470 ~ 5725 MHz)** ▪ 802.11a/n(HT20): 5500 ~ 5580, 5660~5700 MHz ▪ 802.11n(HT40): 5510 ~ 5550, 5670 MHz **U-NII 3(5725 ~ 5850MHz)** ▪ 802.11a/n(HT20): 5745 ~ 5825 MHz ▪ 802.11n(HT40): 5755 ~ 5795 MHz
Modulation type	OFDM
Antenna Specification	**Antenna type**: Internal Antenna **Antenna gain** ▪ U-NII-1: 2.460 dBi ▪ U-NII 2A: 2.460 dBi ▪ U-NII 2C: 2.460 dBi ▪ U-NII-3: 2.460 dBi

2. Information about test items

2.1 Test mode

5GHz Band	Mode	Data Rate
U-NII 1	802.11a	6Mbps
	802.11n(HT20)	MCS 0
	802.11n(HT40)	MCS 0
U-NII 2A	802.11a	6Mbps
	802.11n(HT20)	MCS 0
	802.11n(HT40)	MCS 0
U-NII 2C	802.11a	6Mbps
	802.11n(HT20)	MCS 0
	802.11n(HT40)	MCS 0
U-NII 3	802.11a	6Mbps
	802.11n(HT20)	MCS 0
	802.11n(HT40)	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)	
	Channel	Frequency [MHz]	Channel	Frequency [MHz]
U-NII 1	36	5180	38	5190
	40	5200	-	-
	48	5240	46	5230
U-NII 2A	52	5260	54	5270
	60	5300	-	-
	64	5320	62	5310
U-NII 2C	100	5500	102	5510
	116	5580	110	5550
	140	5700	134	5670
U-NII 3	149	5745	151	5755
	157	5785	-	-
	165	5825	159	5795

2.3 Auxiliary equipment

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

2.4 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)	RSS Section(s)	Parameter	Limit	Test Condition	Status Note 1
I. Transmitter Mode (TX)					
15.407(a)	RSS-247[6.2.4]	Emission Bandwidth (26 dB Bandwidth)	N/A	Conducted	C
15.407(e)	RSS-247[6.2]	Minimum Emission Bandwidth (6 dB Bandwidth)	Refer to the section 7.2.		C
15.407(a)	RSS-247[6.2]	Maximum Conducted Output Power	Refer to the section 7.3.		C
15.407(a)	RSS-247[6.2]	Peak Power Spectral Density	Refer to the section 7.4.		C
-	RSS GEN[6.6]	Occupied Bandwidth (99%)	RSS Gen [6.6]		C
15.407(g)	-	Frequency Stability	N/A		C
15.407(b)	RSS-247[6.2]	Undesirable Emissions	Refer to the section 7.6.	Radiated	C Note 3
15.205 15.209 15.407(b)	RSS-247[6.2] RSS-GEN[8.9] RSS-GEN[8.10]	General Field Strength Limits(Restricted Bands and Radiated Emission Limits)	Refer to the section 7.6.		C Note 3
15.407(h)	RSS-247[6.3]	Dynamic Frequency Selection	FCC 15.407(h)	Conducted	C Note 4
15.207	RSS-GEN[8.8]	AC Conducted Emissions	Refer to the section 7.7.	AC Line Conducted	C
15.203	-	Antenna Requirements	Refer to the section 6.	-	C

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

Note 2: The test items were performed according to the KDB789033 D02 V01 and ANSI C63.10-2013.

Note 3: These test items were performed in each axis and the worst case data was reported.

Note 4: For DFS testing, please refer to DFS test report.

4. TEST METHODOLOGY

Generally the tests were performed according to the KDB789033 D02 v01r04. And ANSI C63.10-2013 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. So this test was fulfilled with the requirements in Section 6.2 of ANSI C63.10-2013.

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 0.15 MHz and 30 MHz using CISPR Quasi-peak and Average detector.

Radiated Emissions

Basically the radiated tests were performed with KDB789033 D02. 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 C63.10-2013 as stated on KDB789033 D02.

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 1 or 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. ANTENNA REQUIREMENTS

6.1 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 internal antenna is attached on the main PCB using the special spring tension. (Refer to Internal Photo file.)
Therefore this E.U.T Complies with the requirement of §15.203

7. TEST RESULT

7.1 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**.

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%.

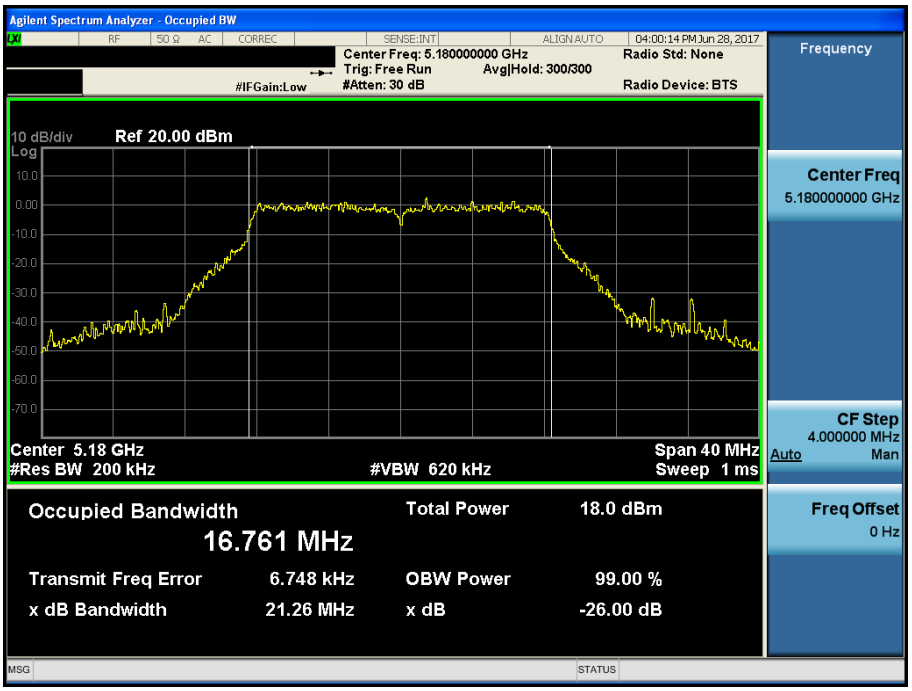
▣ **Test Results: Comply**

Mode	Band	Channel	Frequency [MHz]	Test Result [MHz]
802.11a	U-NII 1	36	5180	21.26
		40	5200	21.32
		48	5240	21.37
	U-NII 2A	52	5260	21.18
		60	5300	21.64
		64	5320	21.21
	U-NII 2C	100	5500	21.48
		116	5580	21.29
		140	5700	21.39
802.11n (HT20)	U-NII 1	36	5180	21.98
		40	5200	21.89
		48	5240	21.76
	U-NII 2A	52	5260	22.15
		60	5300	22.03
		64	5320	21.72
	U-NII 2C	100	5500	21.77
		116	5580	22.07
		140	5700	21.70
802.11n (HT40)	U-NII 1	38	5190	42.36
		46	5230	41.14
	U-NII 2A	54	5270	41.31
		62	5310	42.05
	U-NII 2C	102	5510	40.53
		110	5550	40.69
		134	5670	42.09

▣ Result Plots

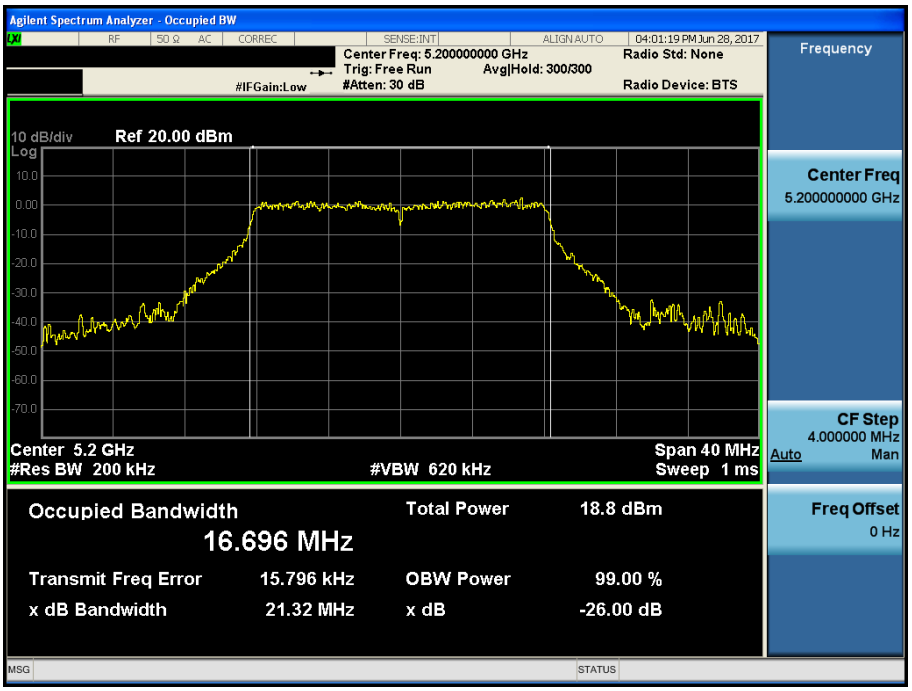
26 dB Bandwidth

Test Mode: 802.11a & Ch.36



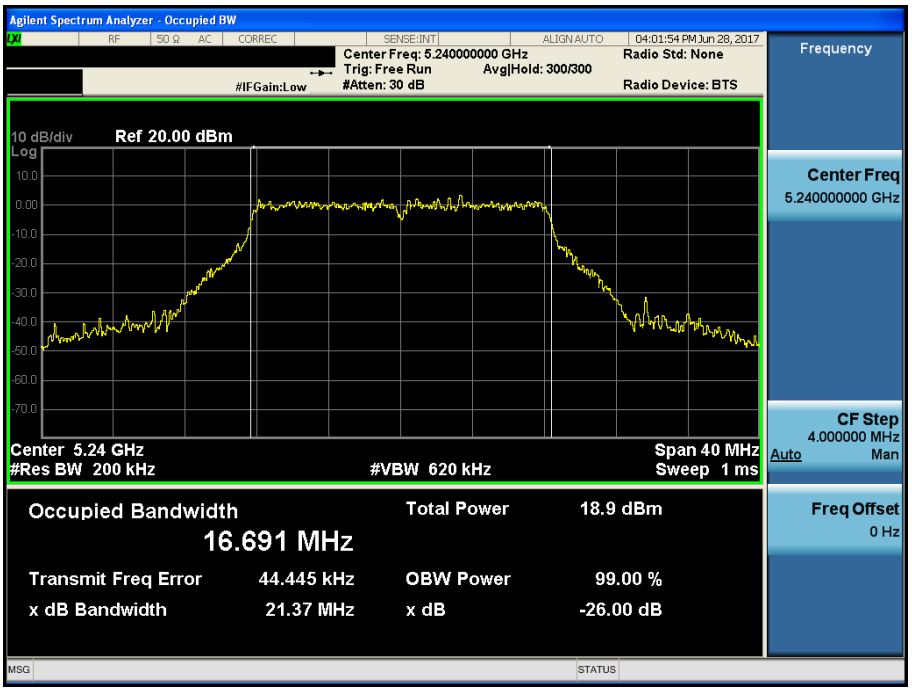
26 dB Bandwidth

Test Mode: 802.11a & Ch.40



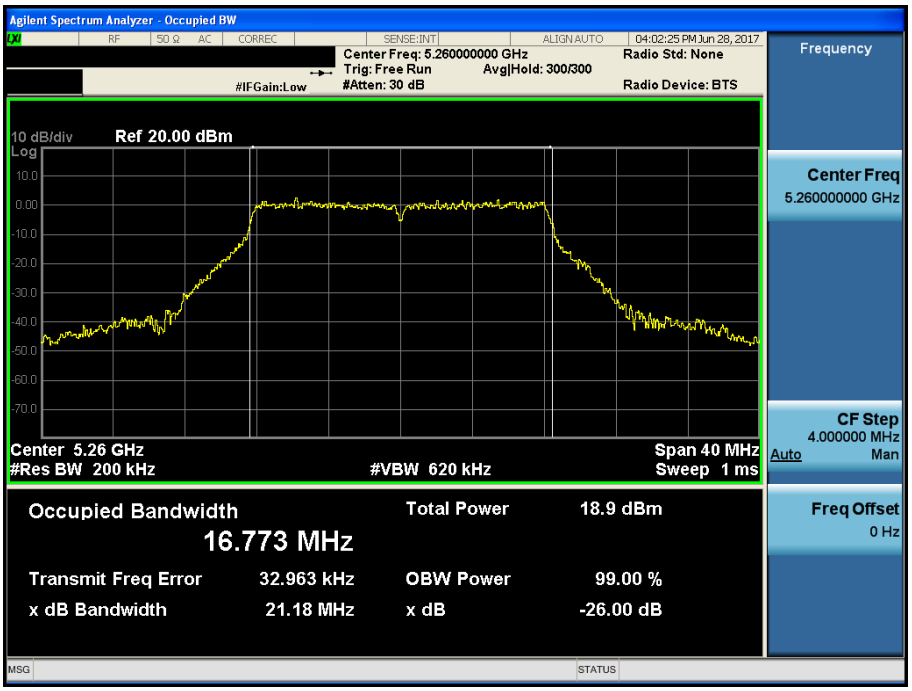
26 dB Bandwidth

Test Mode: 802.11a & Ch.48



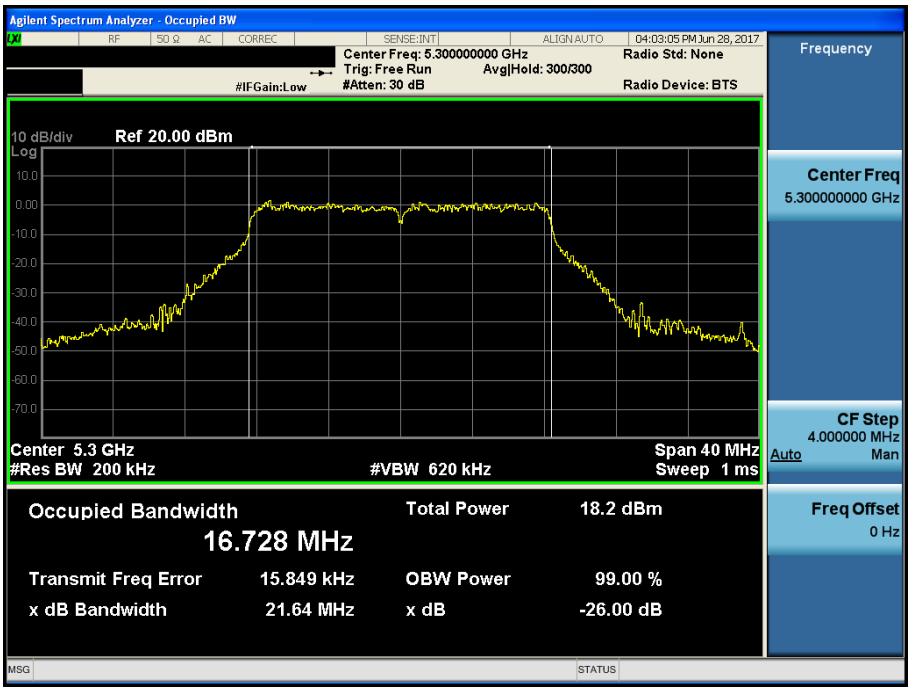
26 dB Bandwidth

Test Mode: 802.11a & Ch.52



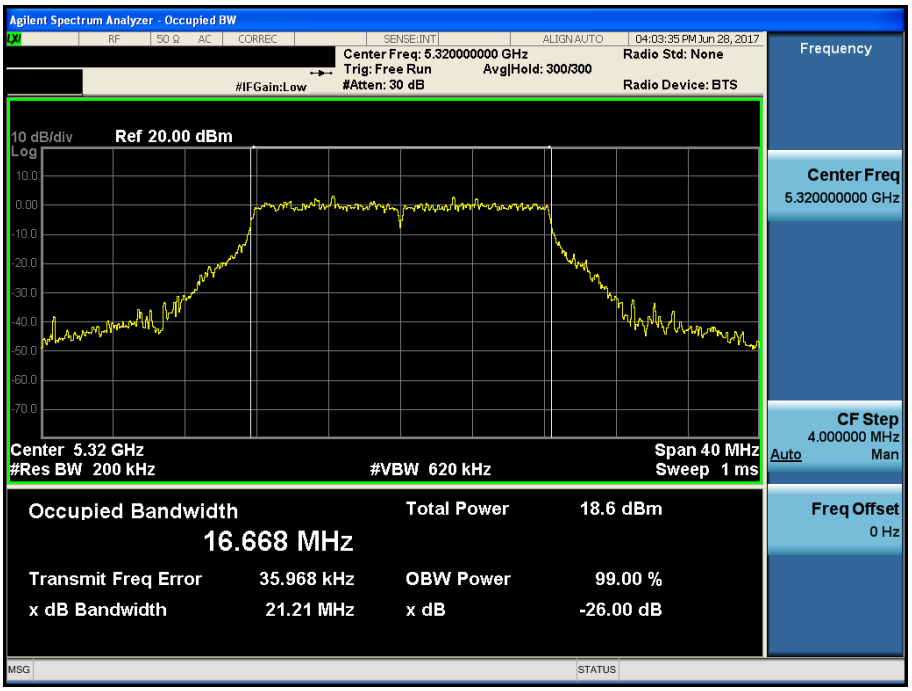
26 dB Bandwidth

Test Mode: 802.11a & Ch.60



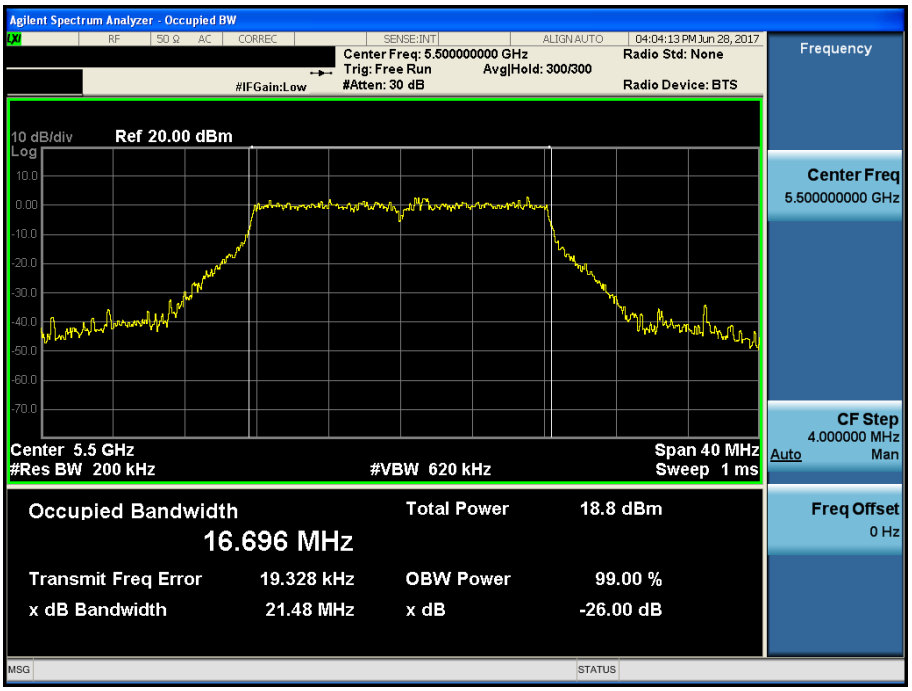
26 dB Bandwidth

Test Mode: 802.11a & Ch.64



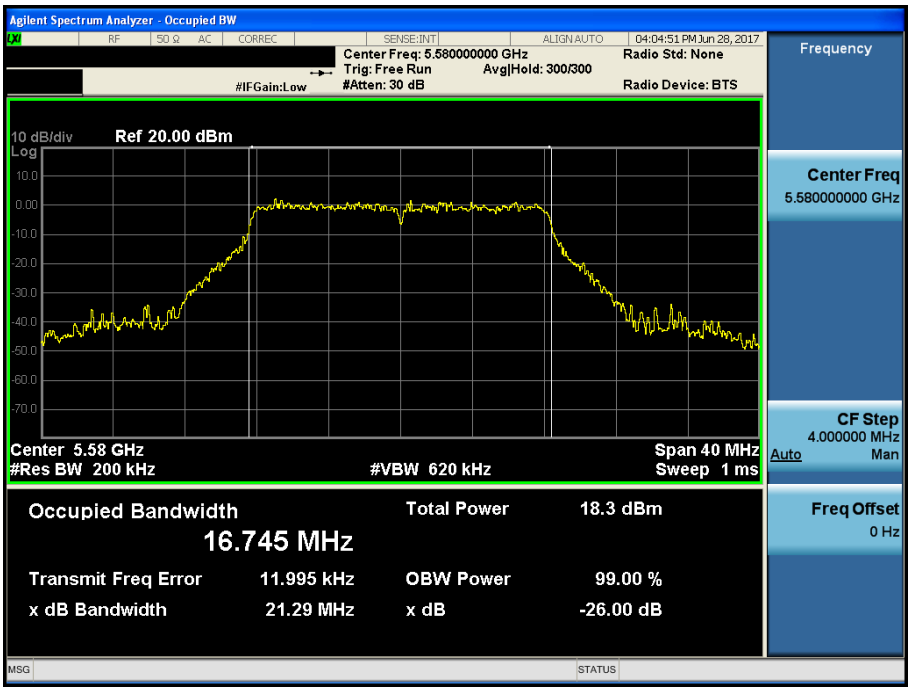
26 dB Bandwidth

Test Mode: 802.11a & Ch.100



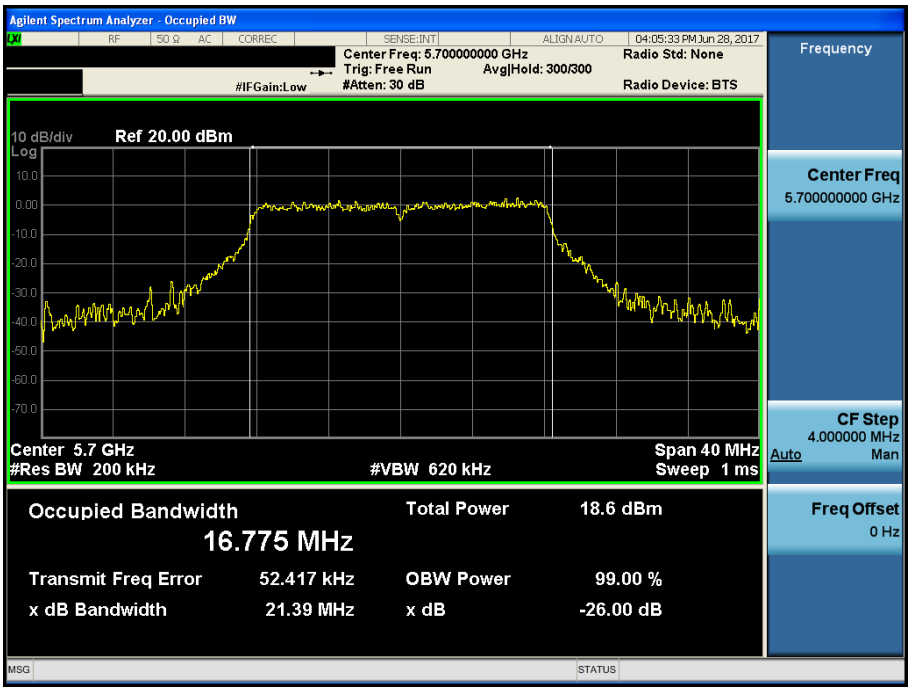
26 dB Bandwidth

Test Mode: 802.11a & Ch.116



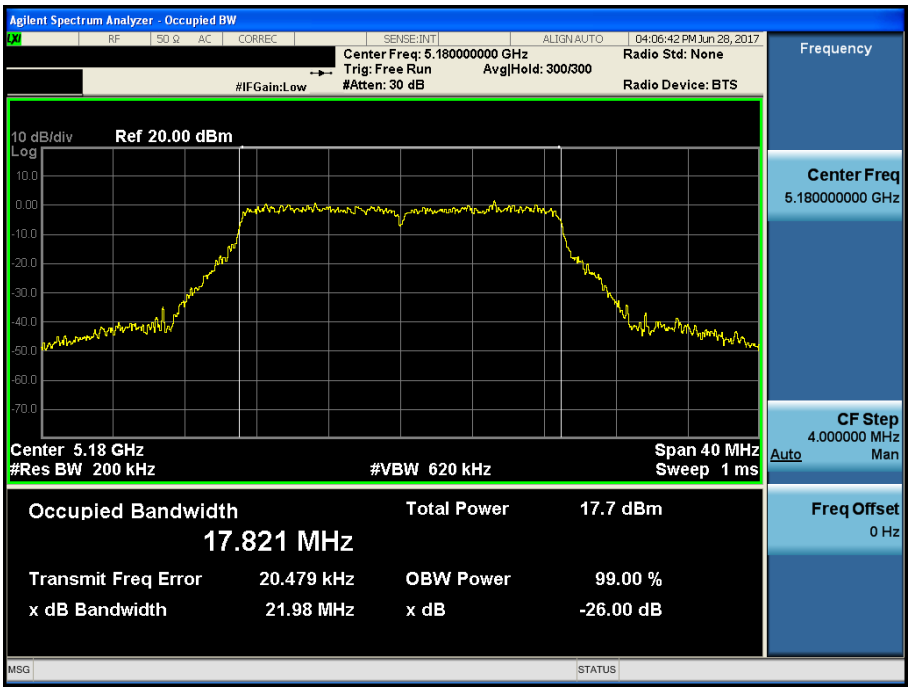
26 dB Bandwidth

Test Mode: 802.11a & Ch.140



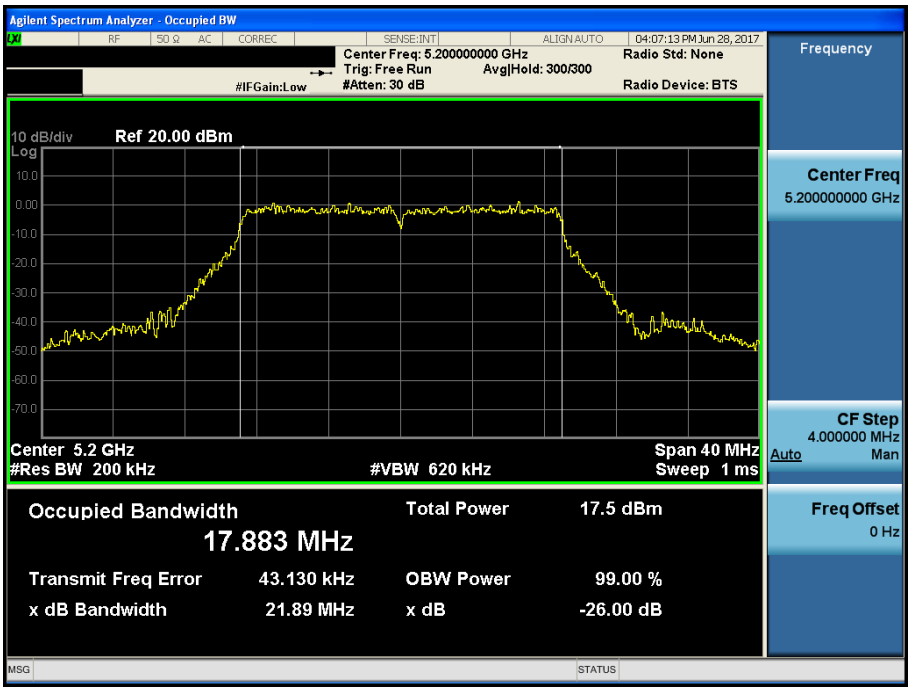
26 dB Bandwidth

Test Mode: 802.11n(HT20) & Ch.36



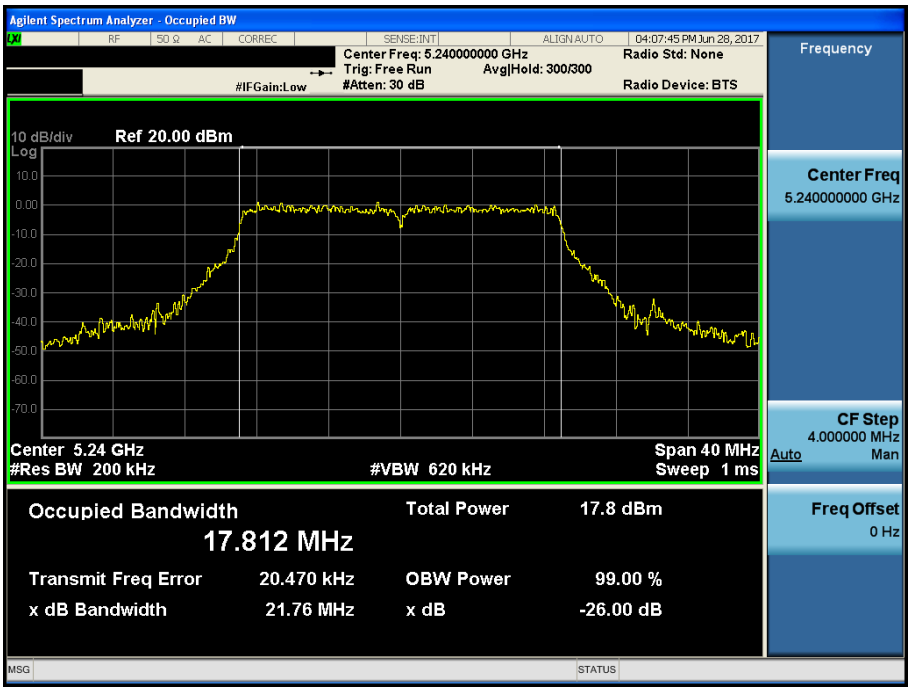
26 dB Bandwidth

Test Mode: 802.11n(HT20) & Ch.40



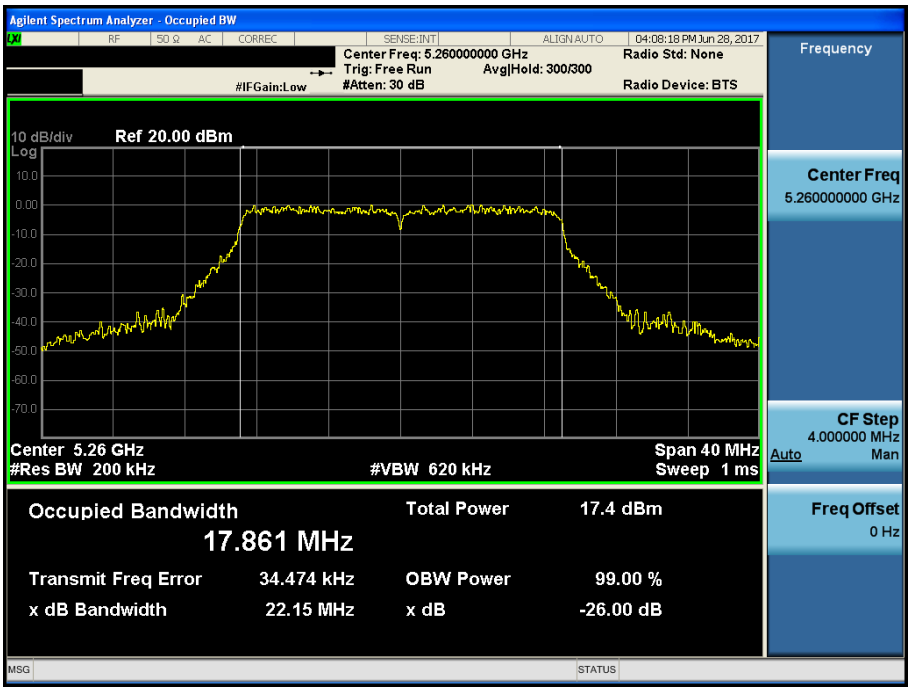
26 dB Bandwidth

Test Mode: 802.11n(HT20) & Ch.48



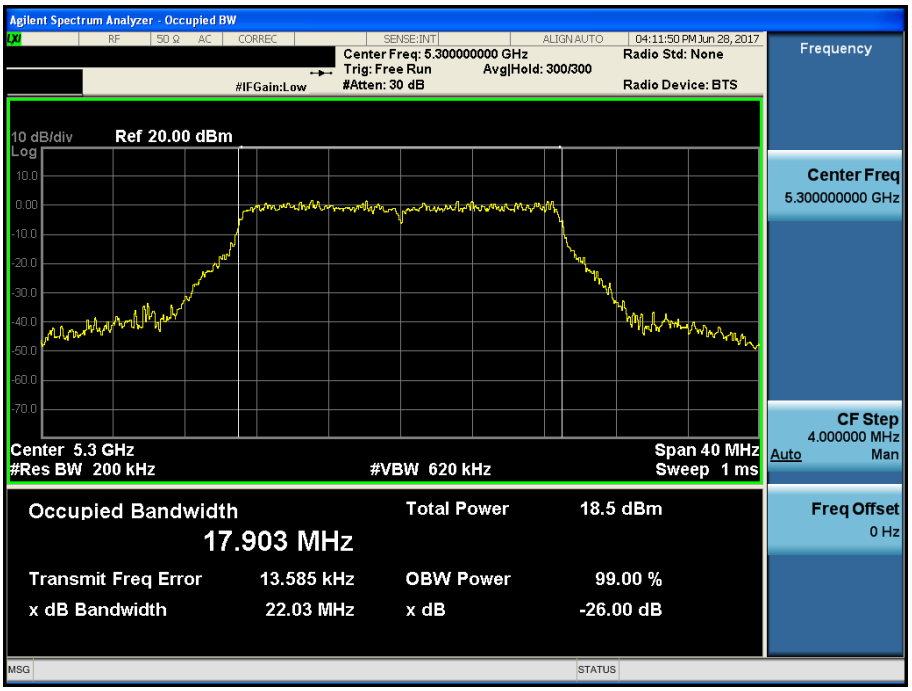
26 dB Bandwidth

Test Mode: 802.11n(HT20) & Ch.52



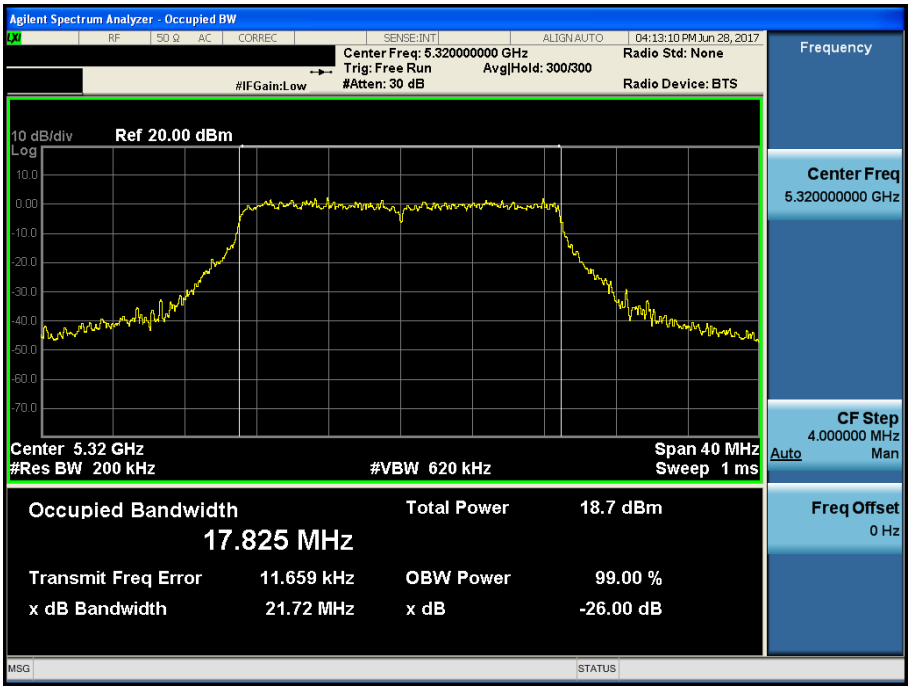
26 dB Bandwidth

Test Mode: 802.11n(HT20) & Ch.60



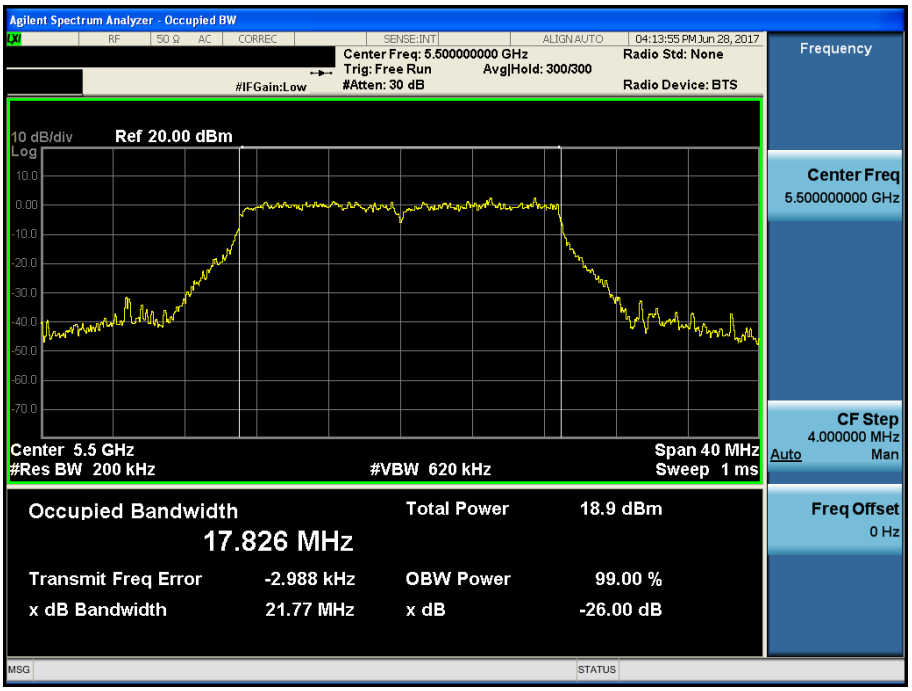
26 dB Bandwidth

Test Mode: 802.11n(HT20) & Ch.64



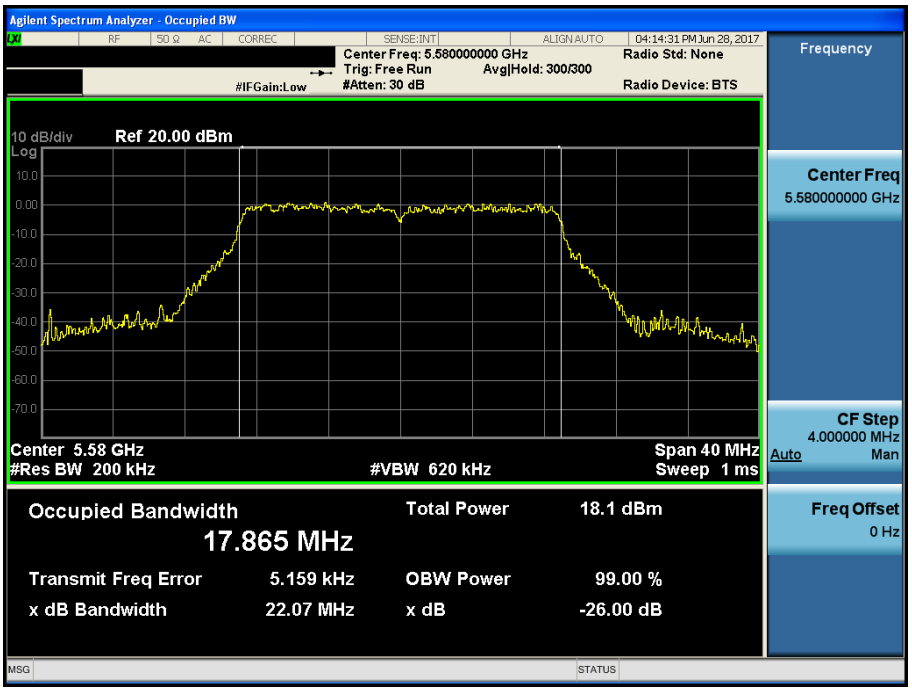
26 dB Bandwidth

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

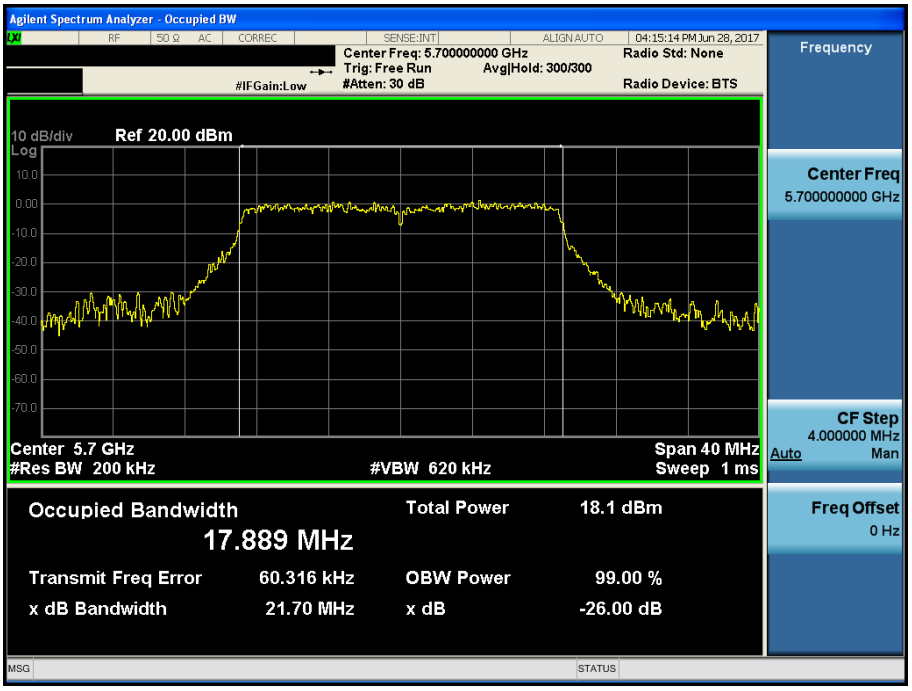


26 dB Bandwidth

Test Mode: 802.11n(HT20) & Ch.116

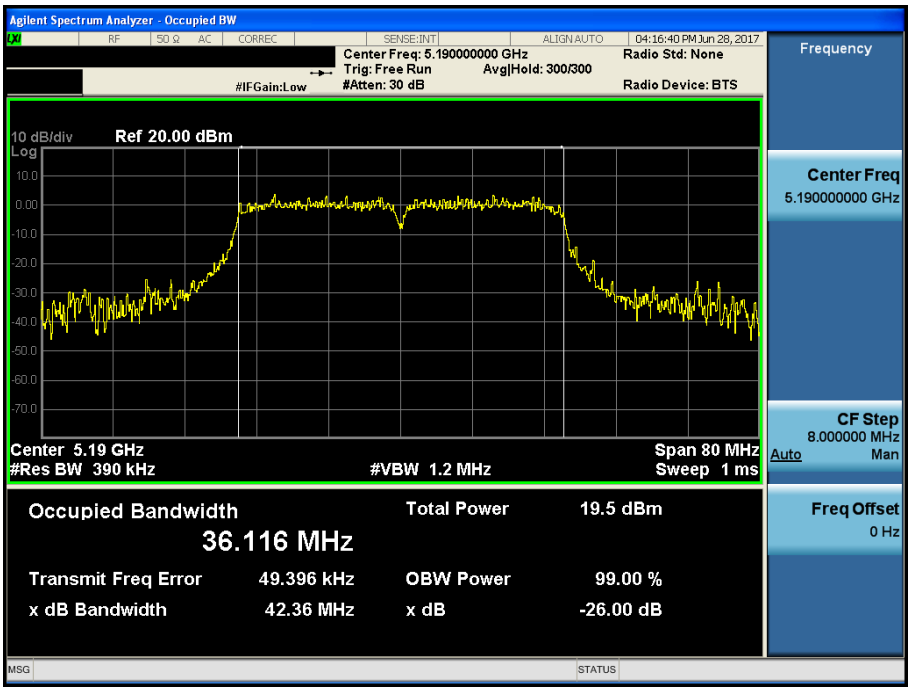


26 dB Bandwidth Test Mode: 802.11n(HT20) & Ch.140



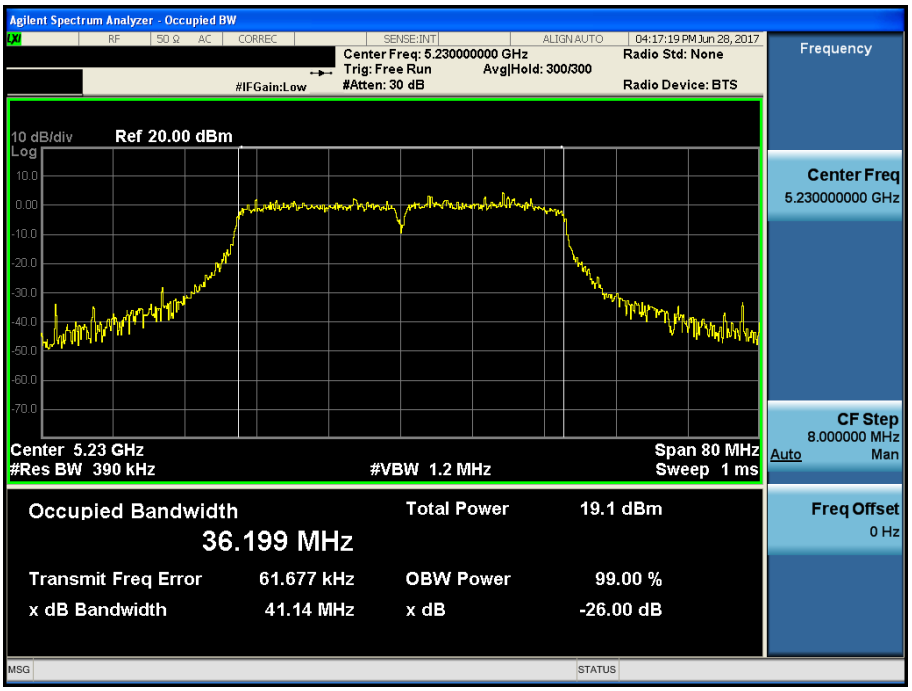
26 dB Bandwidth

Test Mode: 802.11n(HT40) & Ch.38



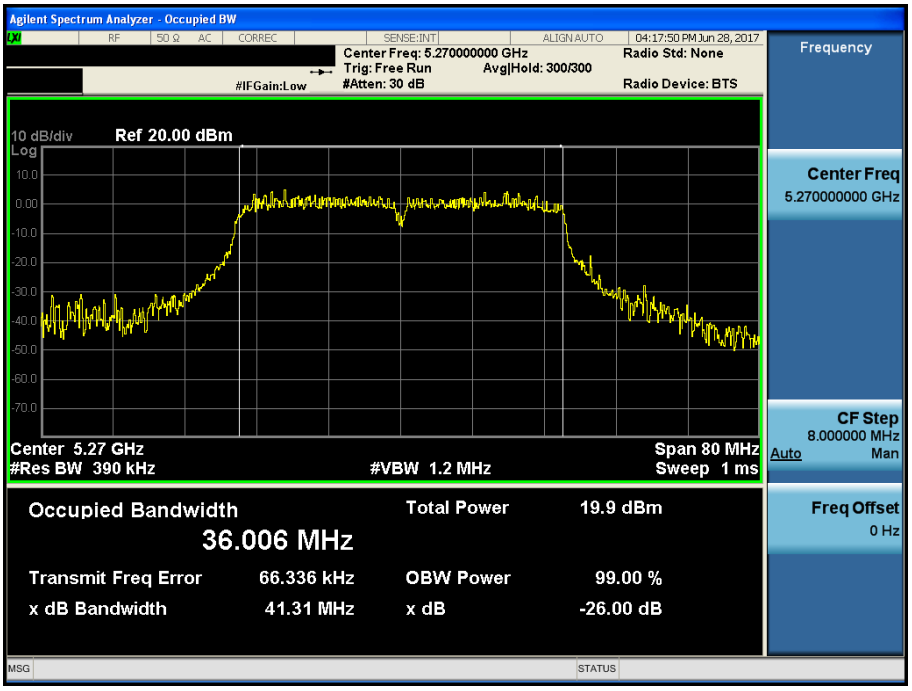
26 dB Bandwidth

Test Mode: 802.11n(HT40) & Ch.46



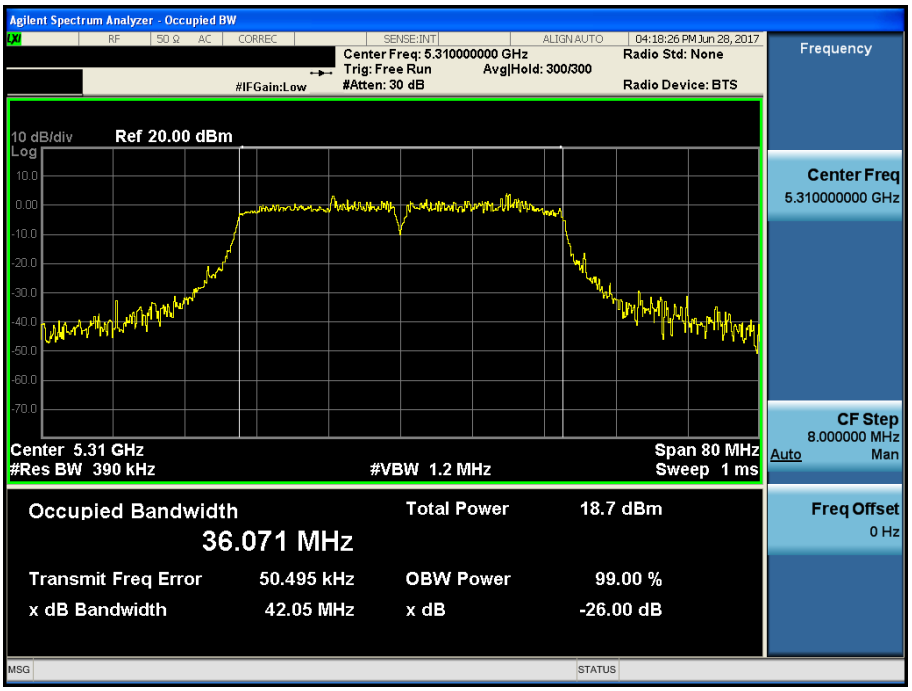
26 dB Bandwidth

Test Mode: 802.11n(HT40) & Ch.54



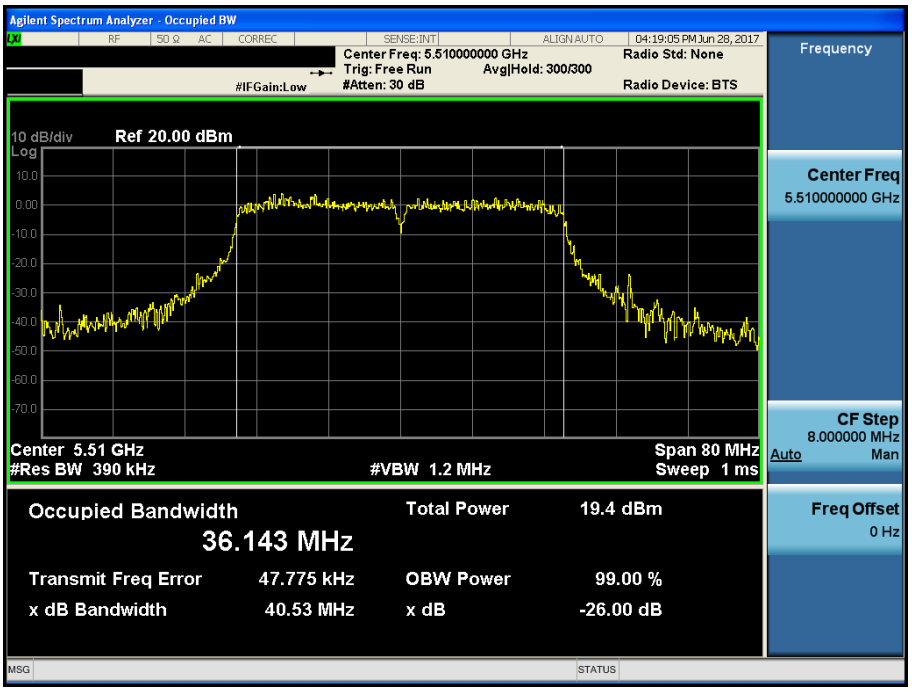
26 dB Bandwidth

Test Mode: 802.11n(HT40) & Ch.62



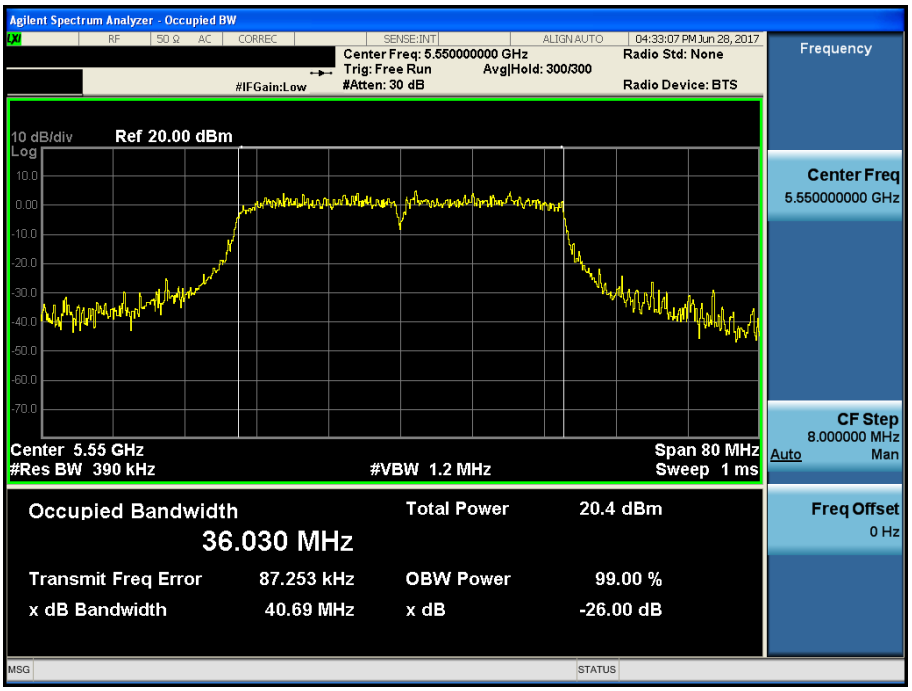
26 dB Bandwidth

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

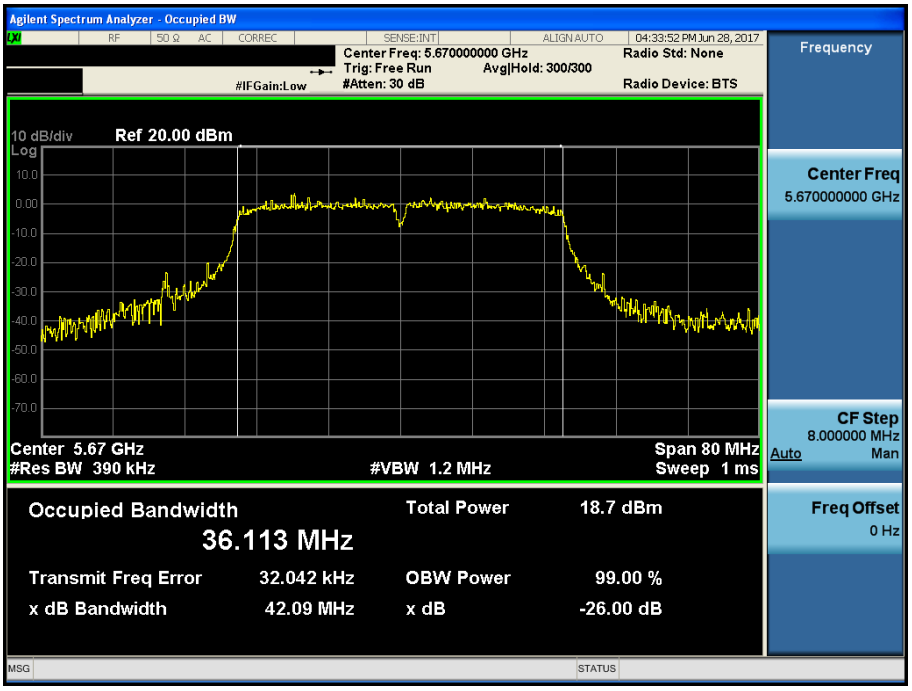


26 dB Bandwidth

Test Mode: 802.11n(HT40) & Ch.110



26 dB Bandwidth Test Mode: 802.11n(HT40) & Ch.134



7.2 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**.

1. Set resolution bandwidth (RBW) = 100 kHz
2. Set the video bandwidth **≥ 3 x 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.

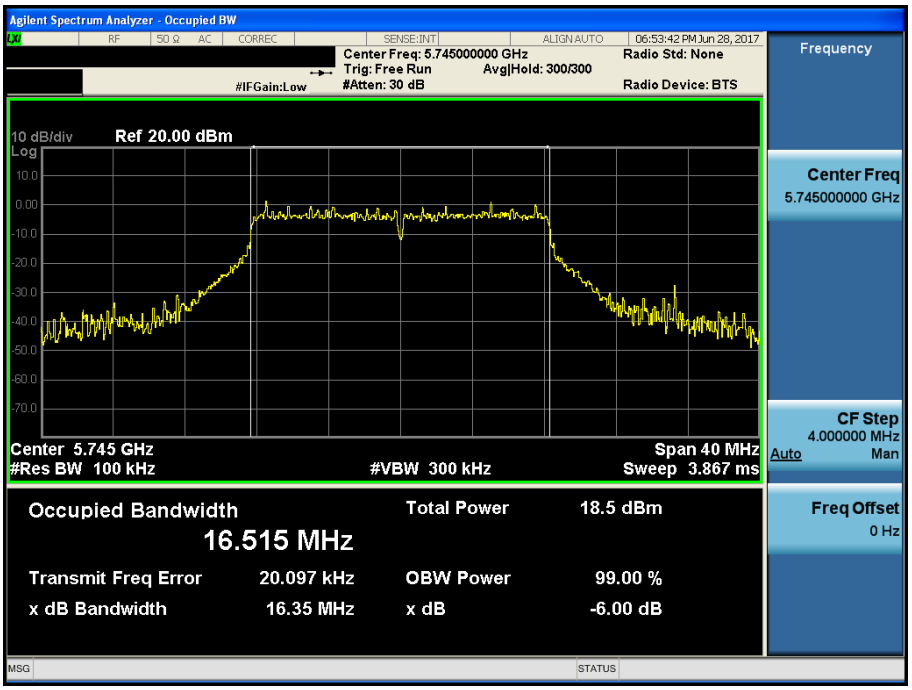
▣ Test Results: Comply

Mode	Band	Channel	Frequency [MHz]	Test Result [MHz]
802.11a	U-NII 3	149	5745	16.35
		157	5785	16.47
		165	5825	16.37
802.11n (HT20)	U-NII 3	149	5745	17.68
		157	5785	17.63
		165	5825	17.61
802.11n (HT40)	U-NII 3	151	5755	36.35
		159	5795	35.73

▣ RESULT PLOTS

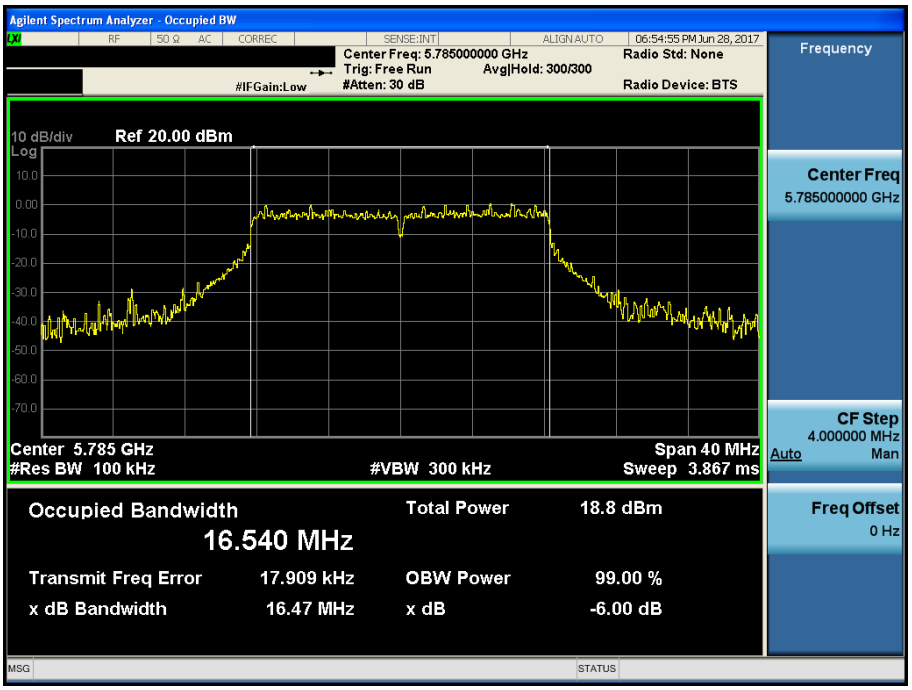
6 dB Bandwidth

Test Mode: 802.11a & Ch.149



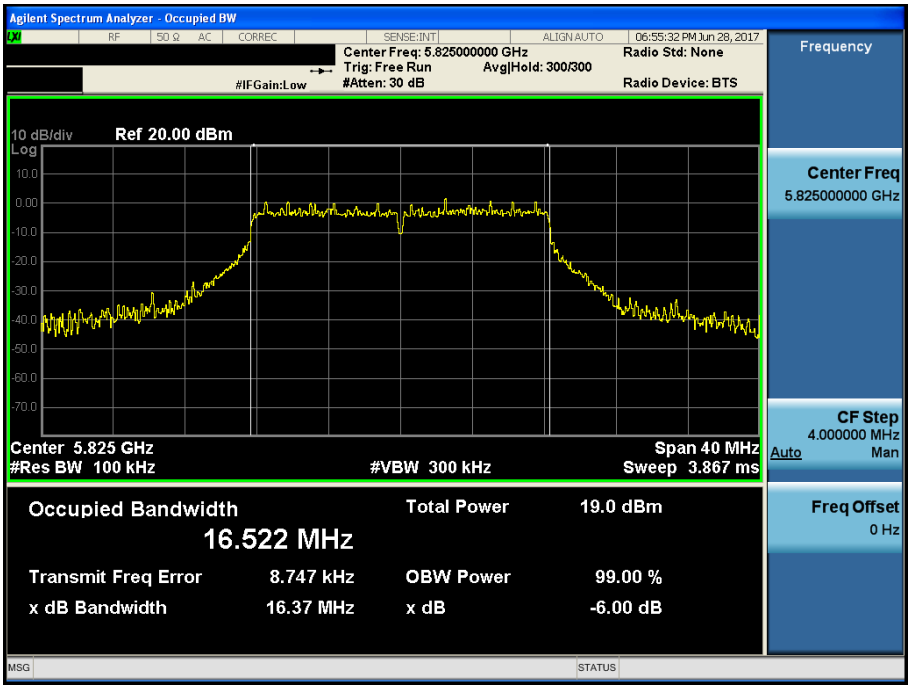
6 dB Bandwidth

Test Mode: 802.11a & Ch.157



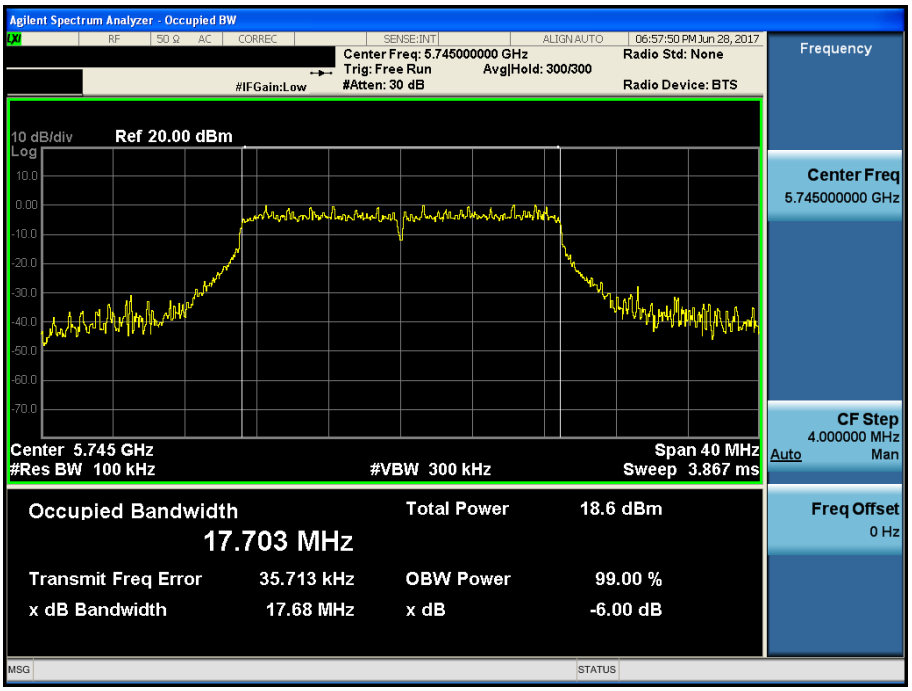
6 dB Bandwidth

Test Mode: 802.11a & Ch.165



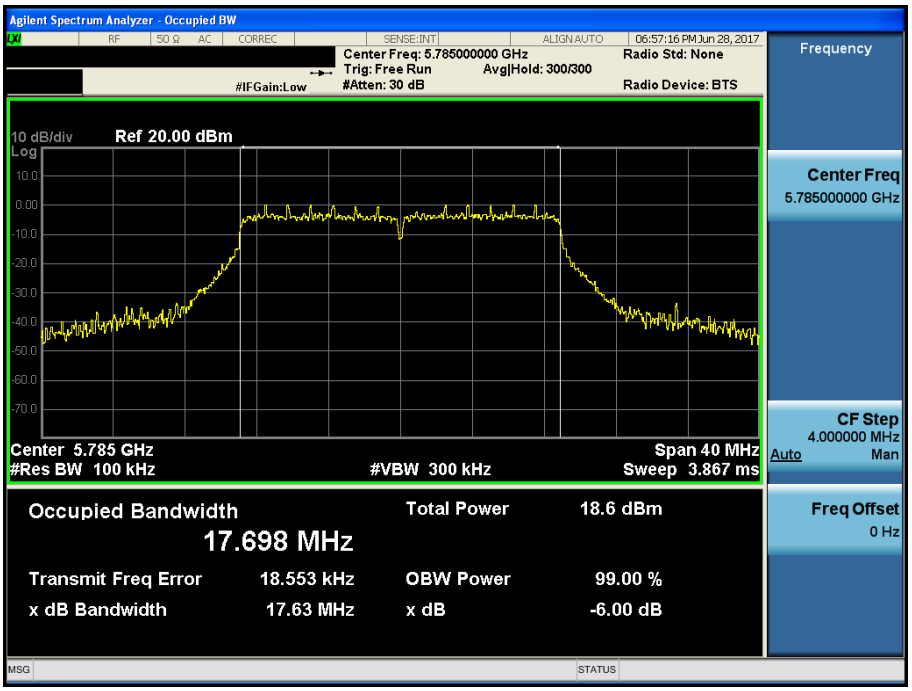
6 dB Bandwidth

Test Mode: 802.11n(HT20) & Ch.149



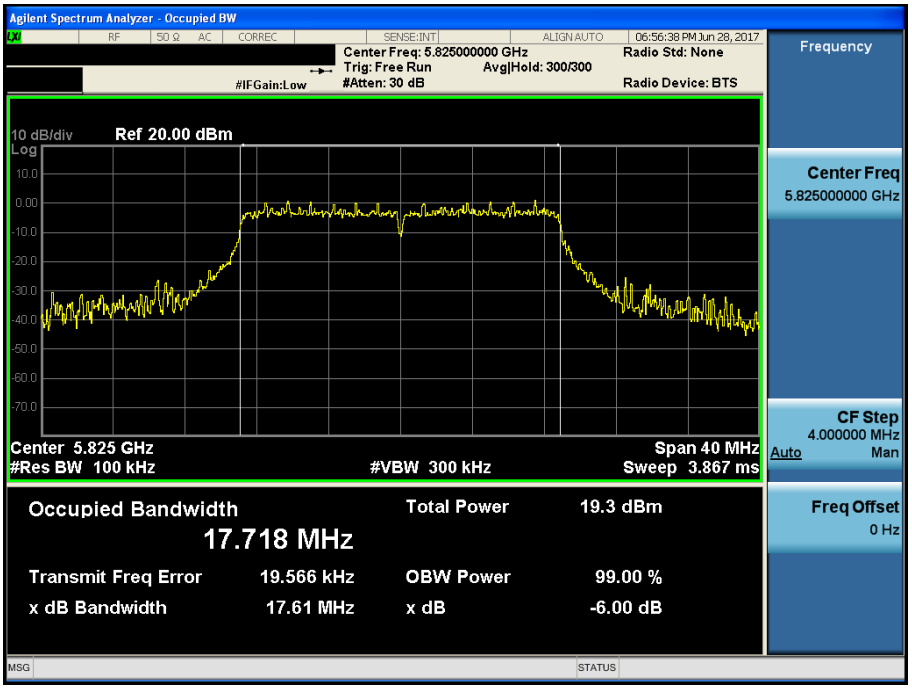
6 dB Bandwidth

Test Mode: 802.11n(HT20) & Ch.157



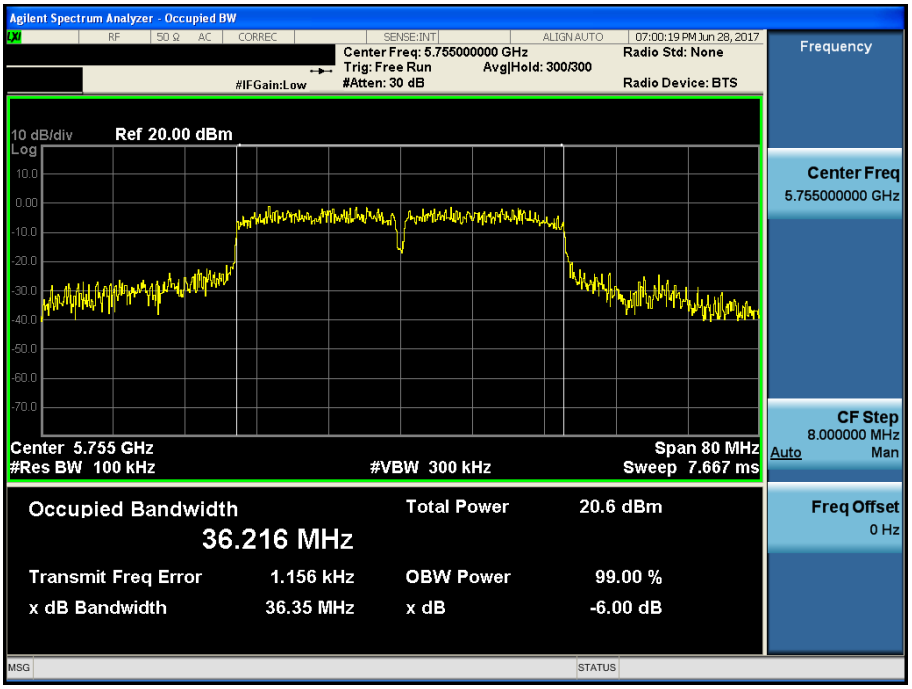
6 dB Bandwidth

Test Mode: 802.11n(HT20) & Ch.165



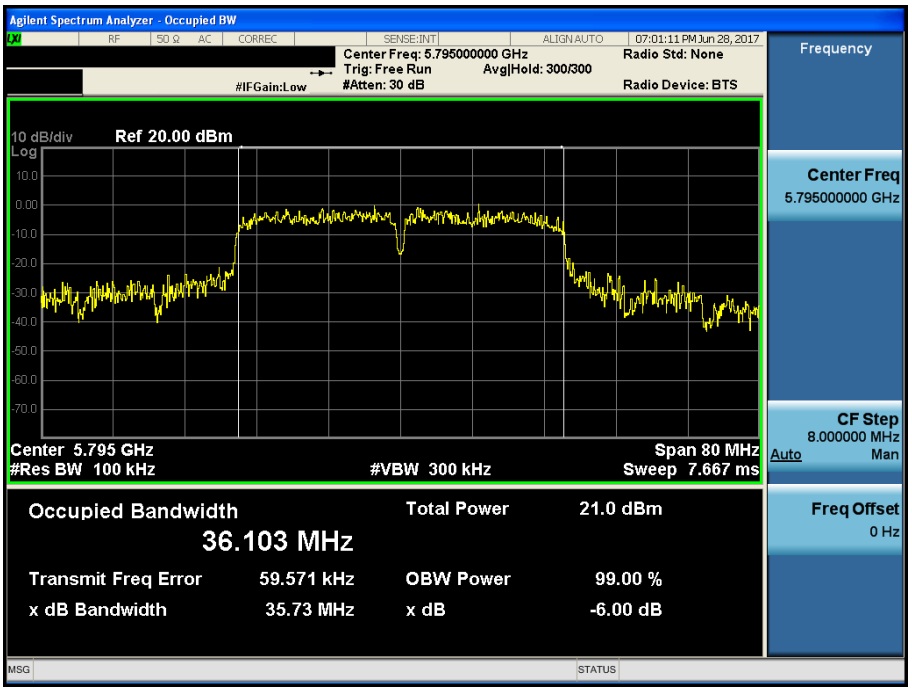
6 dB Bandwidth

Test Mode: 802.11n(HT40) & Ch.151



6 dB Bandwidth

Test Mode: 802.11n(HT40) & Ch.159



7.3 Maximum Conducted Output Power

▣ **Test Requirements, Part. 15.407(a)**

(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 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.

▣ **Test Requirements, RSS-247[6.11]**

(1) For band 5150 - 5250 MHz

The maximum e.i.r.p. shall not exceed 200 mW or 10 + 10 log10 B, dBm, whichever power is less. B is the 99 % emission bandwidth in MHz.

(2) For band 5250 - 5350 MHz

The maximum conducted output power shall not exceed 250 mW or 11 + 10 log10 B, dBm, whichever power is less.

The maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10 log10 B, dBm, whichever power is less. B is the 99 % emission bandwidth in MHz.

(3) For band 5470 - 5600 MHz and 5650 - 5725 MHz

The maximum conducted output power shall not exceed 250 mW or 11 + 10 log10 B, dBm, whichever power is less.

The maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10 log10 B, dBm, whichever power is less. B is the 99 % emission bandwidth in MHz.

(4) For band 5725 - 5850 MHz

The maximum conducted output power shall not exceed 1 W.

▣ Test Configuration

Method PM-G

▣ Test Procedure

Method PM-G of KDB789033 D02

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.

▣ Test Results: Comply

Mode	Band	Channel	Frequency [MHz]	Conducted Output Power[dBm]	Antenna Gain[dBi]	e.i.r.p [dBm]
802.11a	U-NII 1	36	5180	12.71	2.46	15.17
		40	5200	12.93	2.46	15.39
		48	5240	12.87	2.46	15.33
	U-NII 2A	52	5260	12.88	2.46	15.34
		60	5300	12.94	2.46	15.40
		64	5320	12.56	2.46	15.02
	U-NII 2C	100	5500	12.59	2.46	15.05
		116	5580	12.45	2.46	14.91
		140	5700	12.95	2.46	15.41
	U-NII 3	149	5745	12.51	2.46	14.97
		157	5785	12.61	2.46	15.07
		165	5825	12.93	2.46	15.39
802.11n HT20	U-NII 1	36	5180	12.21	2.46	14.67
		40	5200	11.84	2.46	14.30
		48	5240	11.91	2.46	14.37
	U-NII 2A	52	5260	11.84	2.46	14.30
		60	5300	12.71	2.46	15.17
		64	5320	12.58	2.46	15.04
	U-NII 2C	100	5500	12.94	2.46	15.40
		116	5580	12.41	2.46	14.87
		140	5700	12.41	2.46	14.87
	U-NII 3	149	5745	12.41	2.46	14.87
		157	5785	12.67	2.46	15.13
		165	5825	12.81	2.46	15.27
802.11n HT40	U-NII 1	38	5190	12.46	2.46	14.92
		46	5230	12.29	2.46	14.75
	U-NII 2A	54	5270	12.38	2.46	14.84
		62	5310	12.10	2.46	14.56
	U-NII 2C	102	5510	12.01	2.46	14.47
		110	5550	12.44	2.46	14.90
		134	5670	12.28	2.46	14.74
	U-NII 3	151	5755	12.37	2.46	14.83
		159	5795	12.47	2.46	14.93

Note 1: e.i.r.p = Conducted Output Power + Antenna Gain

7.4 Maximum Power Spectral Density

▣ **Test Requirements, Part. 15.407(a)**

(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.

▣ **Test Requirements, RSS-247[6.11]**

(1) For band 5150 - 5250 MHz
The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

(2) For band 5250 - 5350 MHz
The power spectral density shall not exceed 11 dBm in any 1.0 MHz band.

(3) For band 5470 - 5600 MHz and 5650 - 5725 MHz
The power spectral density shall not exceed 11 dBm in any 1.0 MHz band.

(4) For band 5725 - 5850 MHz
The power spectral density shall not exceed 30 dBm in any 500 kHz band.

▣ Test Configuration

Refer to the APPENDIX I.

▣ Test Procedure

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

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 ≥ 1/T, where T is defined in section II.B.1.a). (Refer to Appendix II)

b) Set VBW ≥ 3 RBW.

c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add 10log(500kHz/RBW) to the measured result, whereas RBW (< 500 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 10log(1MHz/RBW) to the measured result, whereas RBW (< 1 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 result: Comply**

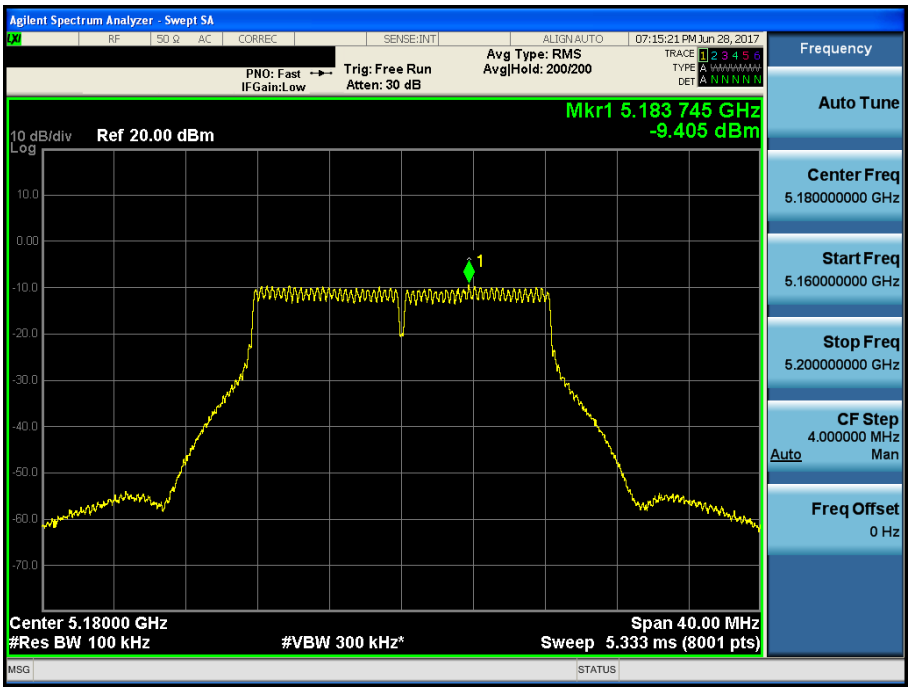
Mode	Band	Channel	Frequency [MHz]	Reading [dBm]	T.F Note 1 [dB]	Power Spectral Density[dBm]	Antenna Gain [dBi]	e.i.r.p Spectral Density [dBm]
802.11a	U-NII 1	36	5180	-9.405	10.61	1.205	2.460	3.665
		40	5200	-9.036		1.574	2.460	4.034
		48	5240	-8.738		1.872	2.460	4.332
	U-NII 2A	52	5260	-8.832		1.778	2.460	4.238
		60	5300	-9.130		1.480	2.460	3.940
		64	5320	-9.139		1.471	2.460	3.931
	U-NII 2C	100	5500	-8.810		1.800	2.460	4.260
		116	5580	-9.425		1.185	2.460	3.645
		140	5700	-8.299		2.311	2.460	4.771
	U-NII 3	149	5745	-9.218	7.60	-1.618	2.460	0.842
		157	5785	-9.075		-1.475	2.460	0.985
		165	5825	-8.609		-1.009	2.460	1.451
802.11n (HT20)	U-NII 1	36	5180	-9.964	10.66	0.696	2.460	3.156
		40	5200	-10.212		0.448	2.460	2.908
		48	5240	-10.165		0.495	2.460	2.955
	U-NII 2A	52	5260	-10.222		0.438	2.460	2.898
		60	5300	-9.226		1.434	2.460	3.894
		64	5320	-9.195		1.465	2.460	3.925
	U-NII 2C	100	5500	-8.970		1.690	2.460	4.150
		116	5580	-9.184		1.476	2.460	3.936
		140	5700	-9.291		1.369	2.460	3.829
	U-NII 3	149	5745	-9.678	7.65	-2.028	2.460	0.432
		157	5785	-9.157		-1.507	2.460	0.953
		165	5825	-8.852		-1.202	2.460	1.258
802.11n (HT40)	U-NII 1	38	5190	-12.026	11.25	-0.776	2.460	1.684
		46	5230	-11.684		-0.434	2.460	2.026
	U-NII 2A	54	5270	-12.411		-1.161	2.460	1.299
		62	5310	-13.007		-1.757	2.460	0.703
	U-NII 2C	102	5510	-12.446		-1.196	2.460	1.264
		110	5550	-11.754		-0.504	2.460	1.956
		134	5670	-12.157		-0.907	2.460	1.553
	U-NII 3	151	5755	-12.043	8.24	-3.803	2.460	-1.343
		159	5795	-11.923		-3.683	2.460	-1.223

Note 1: "U-NII 1, 2A, 2C [T.F] = 10*LOG(1MHz/100kHz) + DCCF"
"U-NII 3 [T.F] = 10*LOG(500kHz/100kHz) + DCCF"
For DCCF(Duty Cycle Correction Factor) please refer to appendix II.
Note 2: Power Spectral Density = Measurement Data + T.F
Note 3: e.i.r.p Spectral Density= Power spectral density + Antenna Gain

▣ RESULT PLOTS

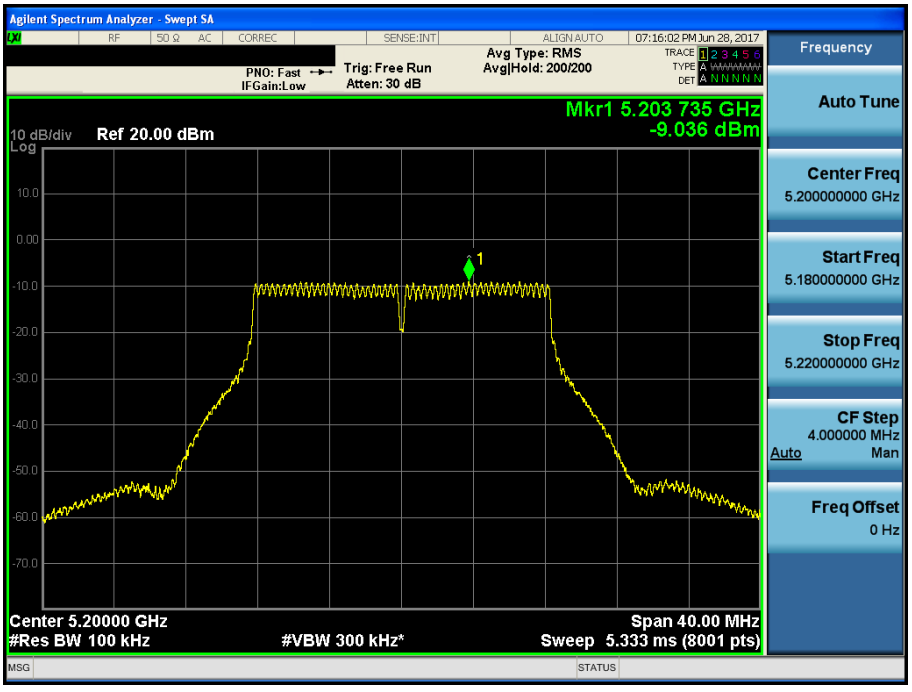
Maximum Power Spectral Density

Test Mode: 802.11a & Ch.36



Maximum Power Spectral Density

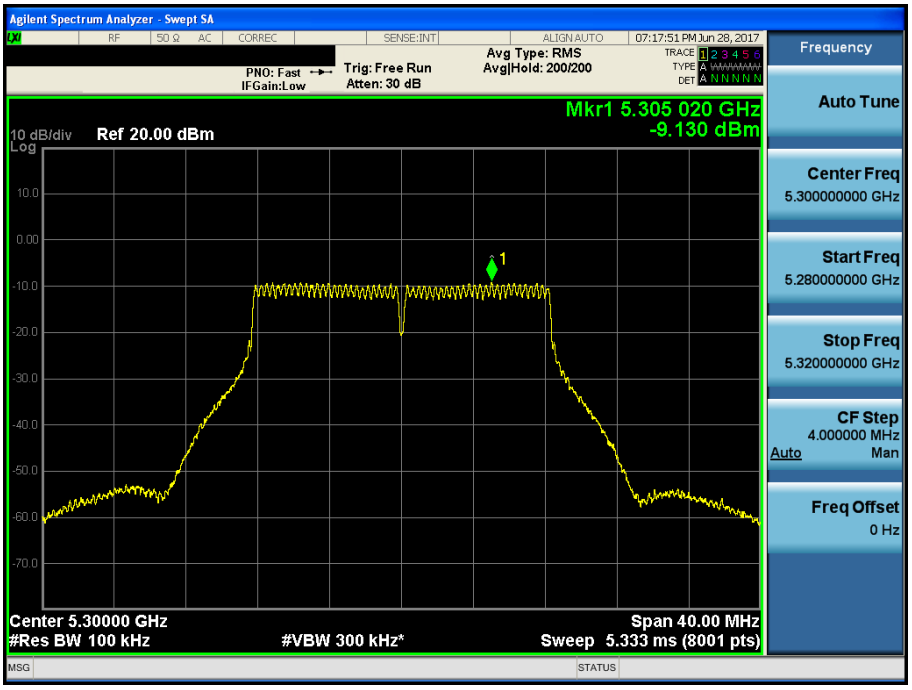
Test Mode: 802.11a & Ch.40



Maximum Power Spectral Density Test Mode: 802.11a & Ch.48

Maximum Power Spectral Density Test Mode: 802.11a & Ch.52

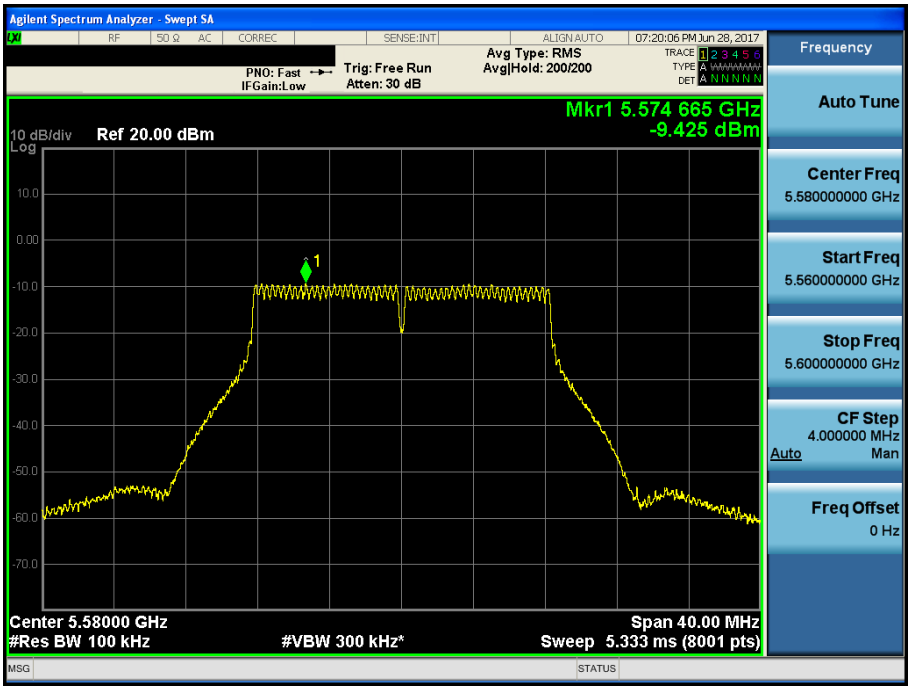
Maximum Power Spectral Density Test Mode: 802.11a & Ch.60



Maximum Power Spectral Density Test Mode: 802.11a & Ch.64

Maximum Power Spectral Density Test Mode: 802.11a & Ch.100

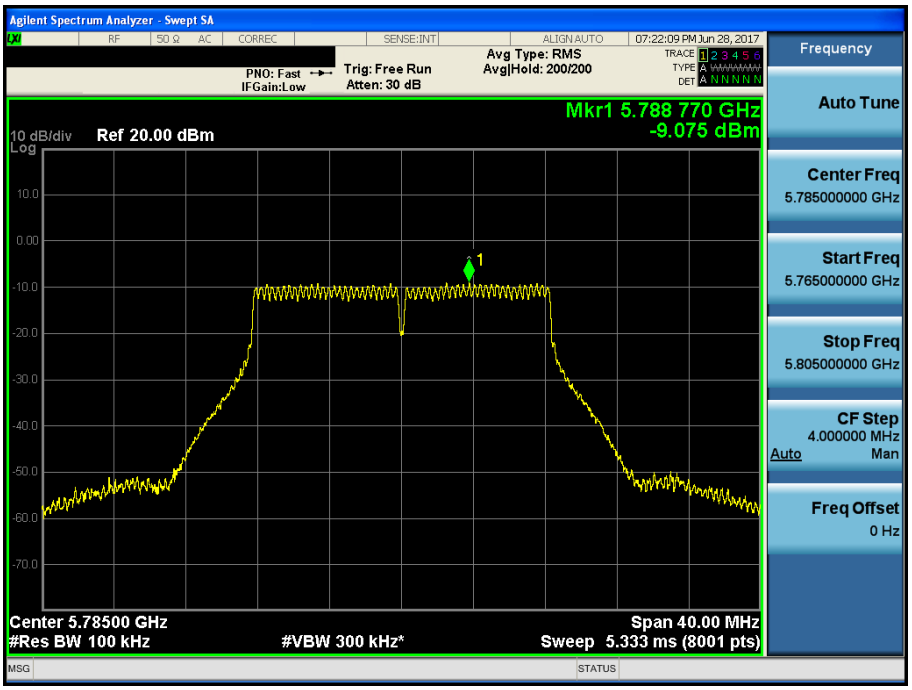
Maximum Power Spectral Density Test Mode: 802.11a & Ch.116



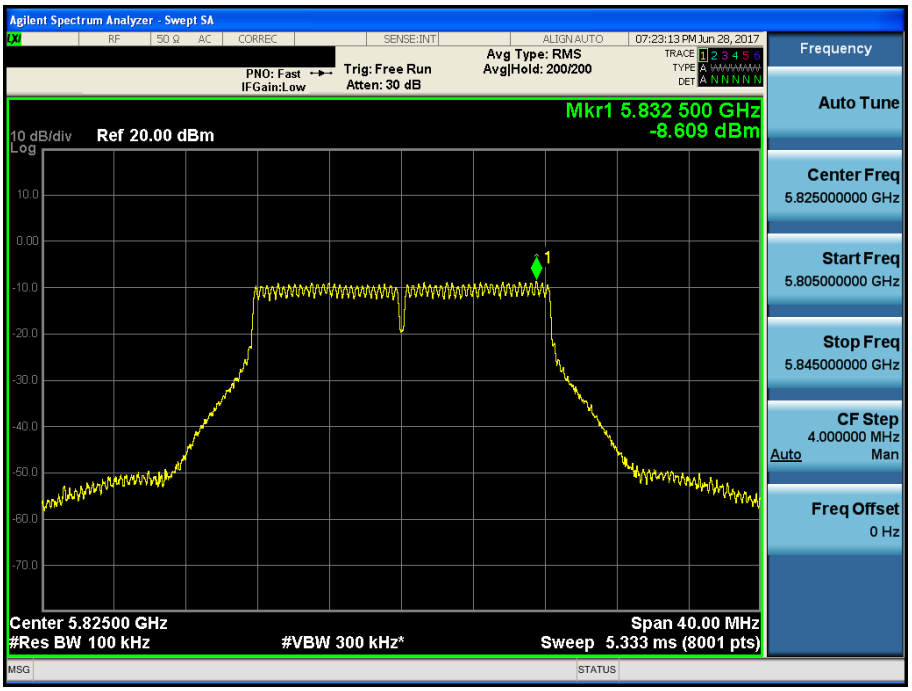
Maximum Power Spectral Density Test Mode: 802.11a & Ch.140

Maximum Power Spectral Density Test Mode: 802.11a & Ch.149

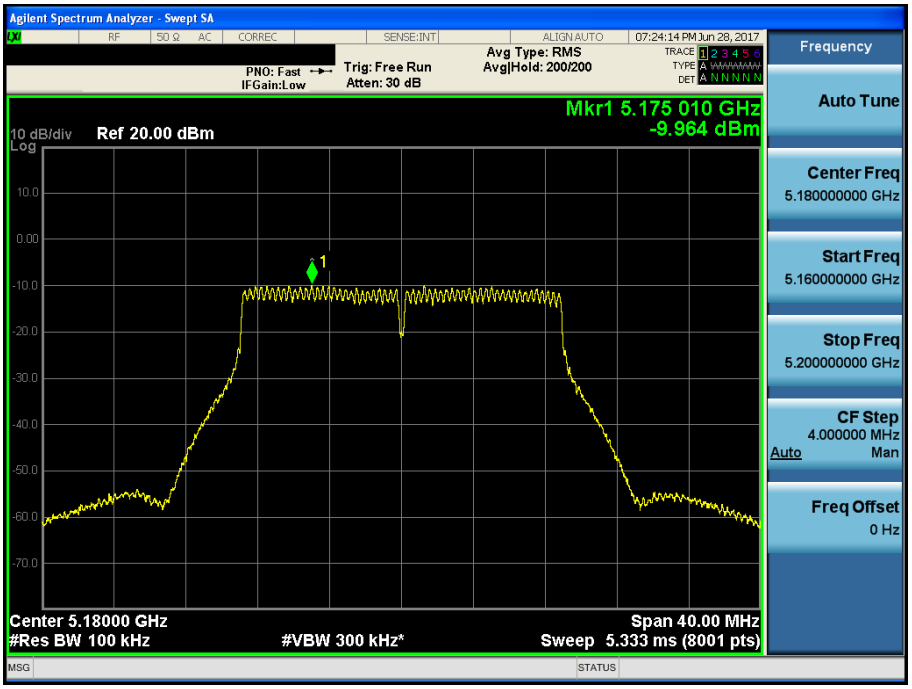
Maximum Power Spectral Density Test Mode: 802.11a & Ch.157



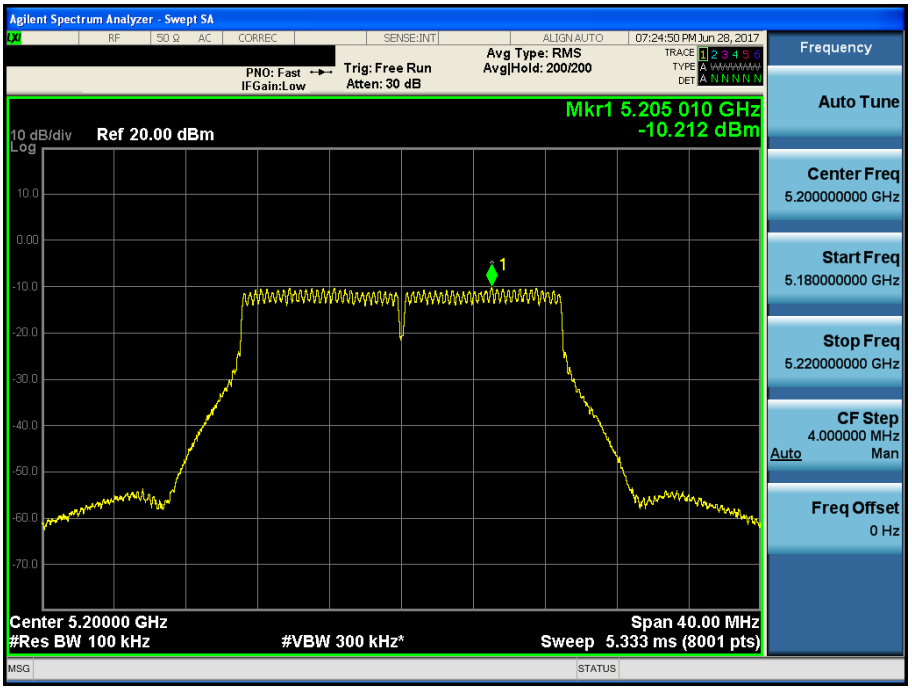
Maximum Power Spectral Density Test Mode: 802.11a & Ch.165



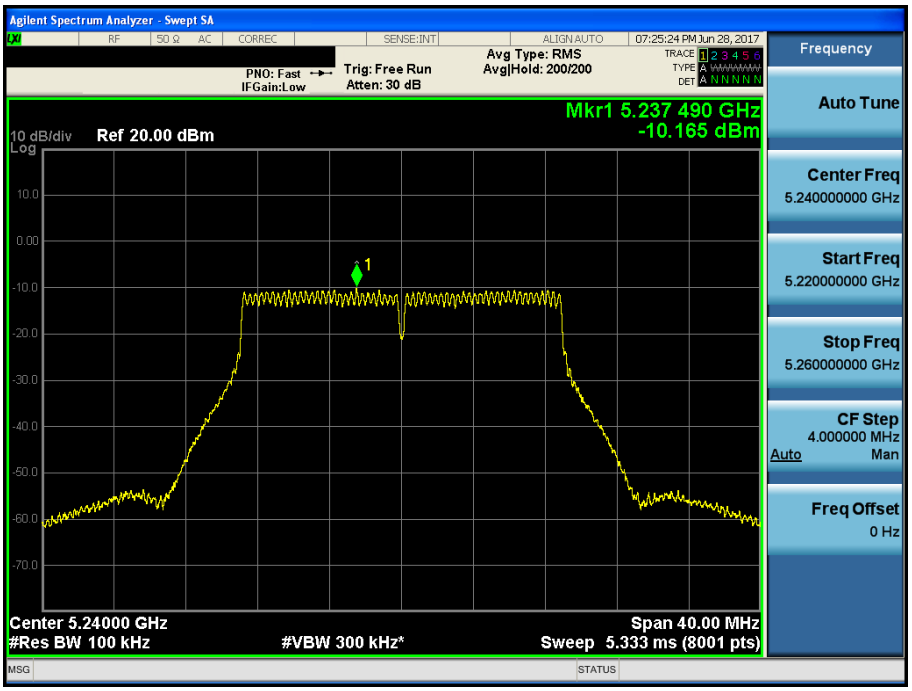
Maximum Power Spectral Density Test Mode: 802.11n(HT20) & Ch.36



Maximum Power Spectral Density Test Mode: 802.11n(HT20) & Ch.40

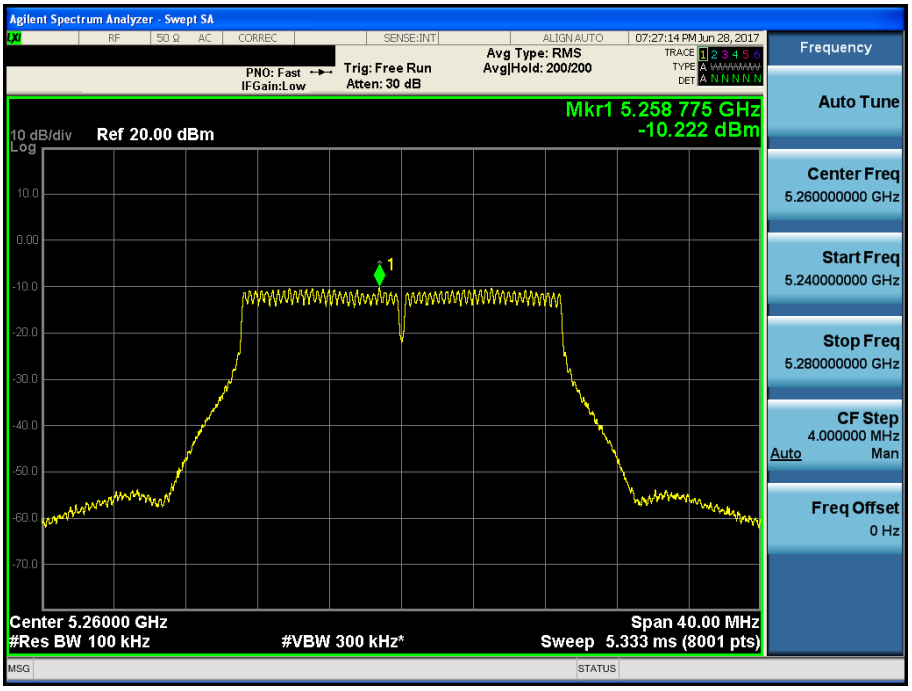


Maximum Power Spectral Density Test Mode: 802.11n(HT20) & Ch.48



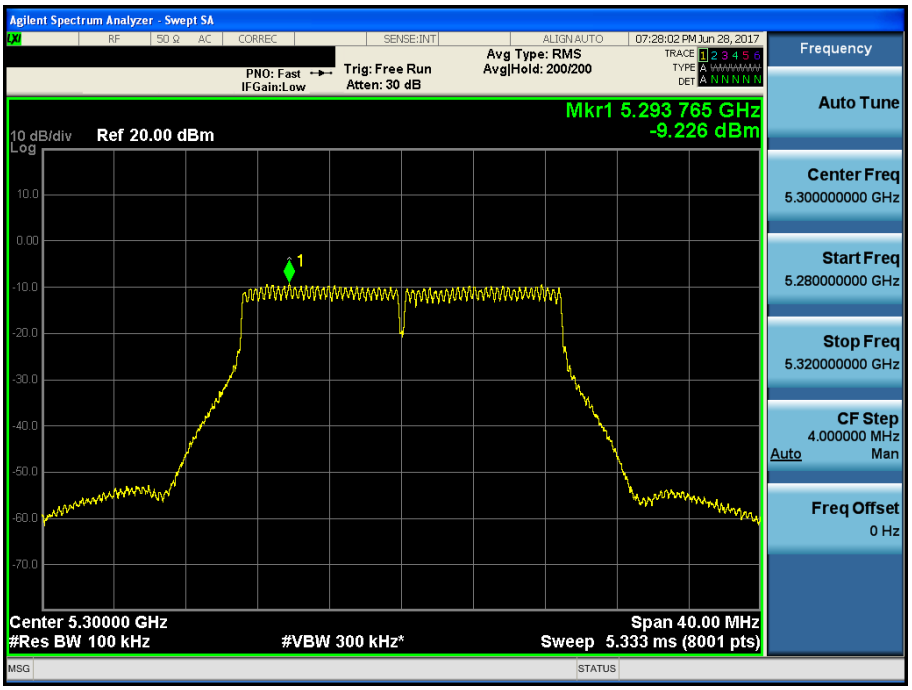
Maximum Power Spectral Density

Test Mode: 802.11n(HT20) & Ch.52



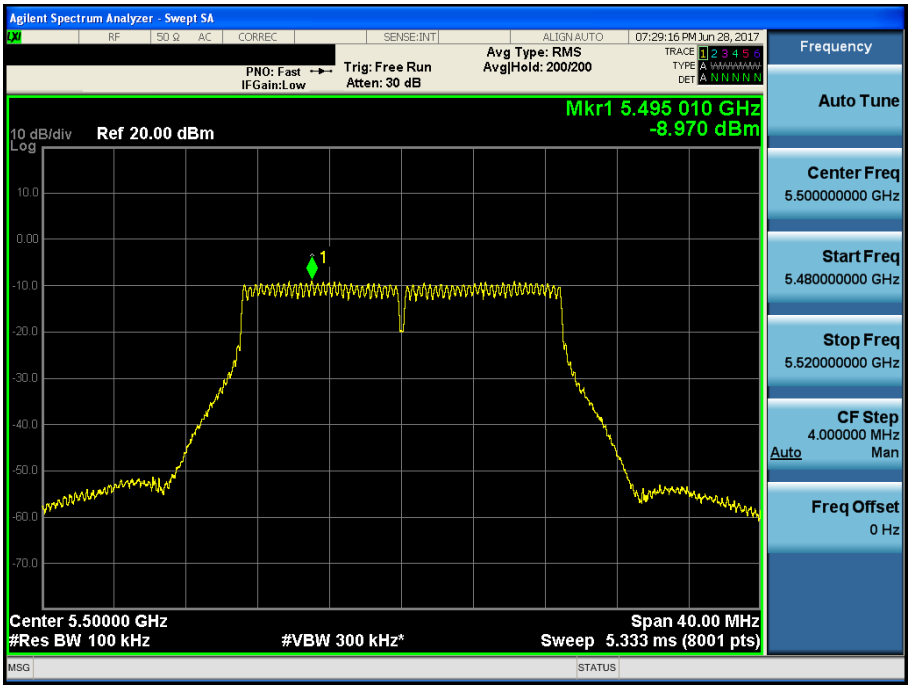
Maximum Power Spectral Density

Test Mode: 802.11n(HT20) & Ch.60



Maximum Power Spectral Density Test Mode: 802.11n(HT20) & Ch.64

Maximum Power Spectral Density Test Mode: 802.11n(HT20) & Ch.100

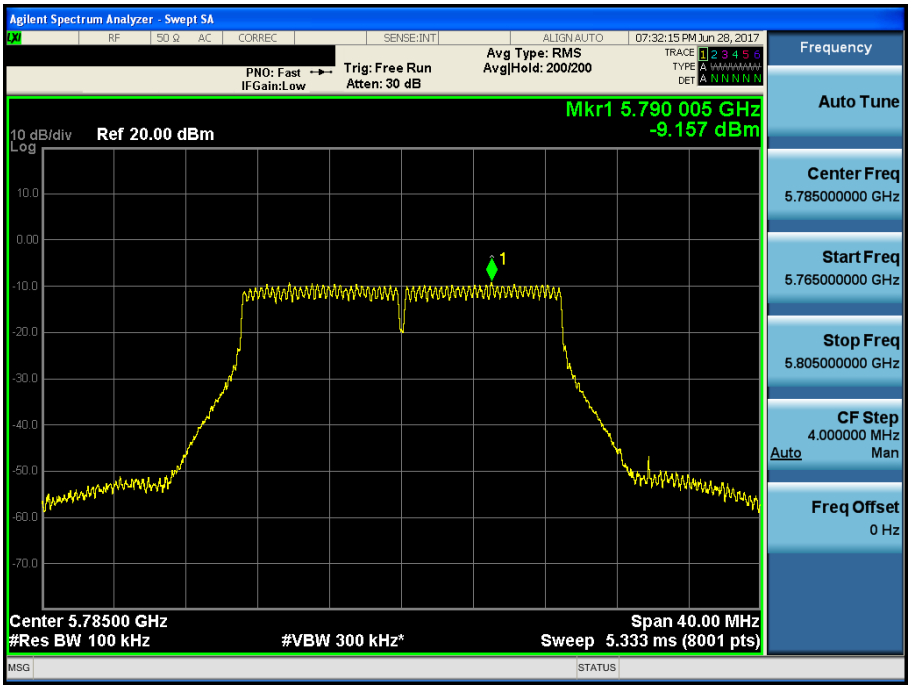


Maximum Power Spectral Density Test Mode: 802.11n HT20 & Ch.116

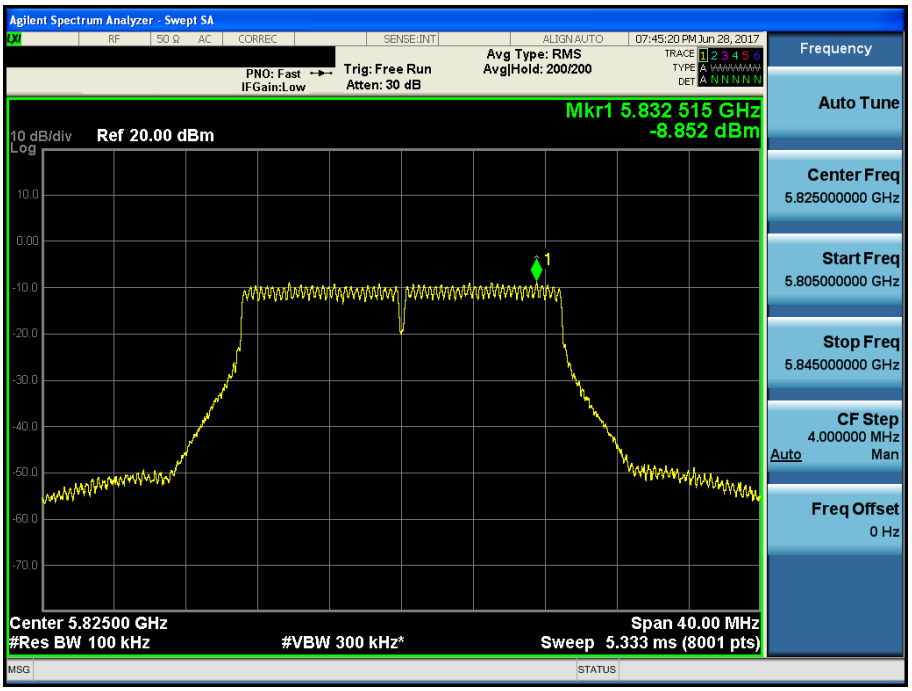
Maximum Power Spectral Density Test Mode: 802.11n(HT20) & Ch.140

Maximum Power Spectral Density Test Mode: 802.11n(HT20) & Ch.149

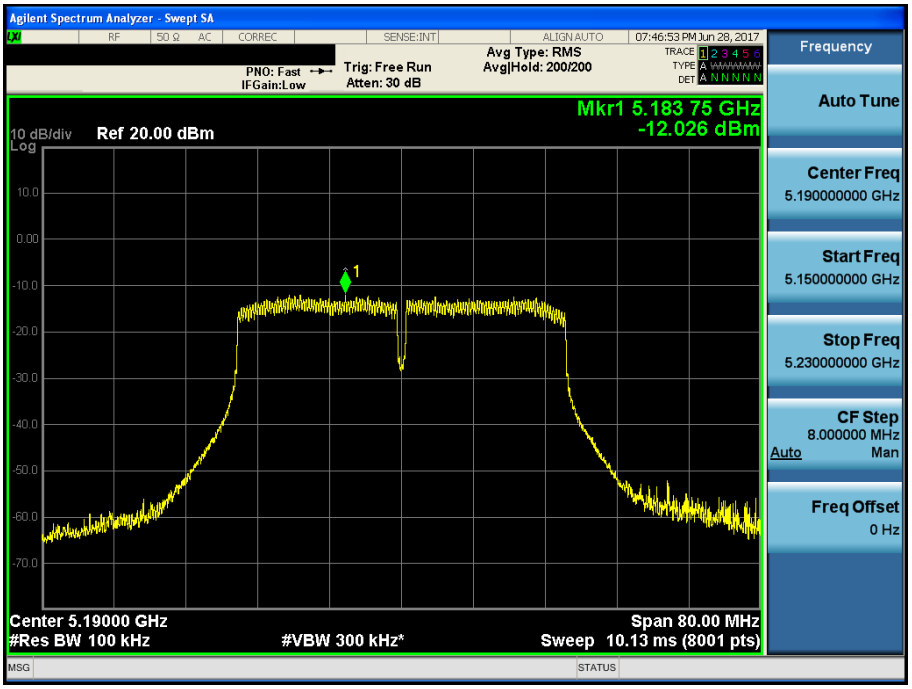
Maximum Power Spectral Density Test Mode: 802.11n(HT20) & Ch.157



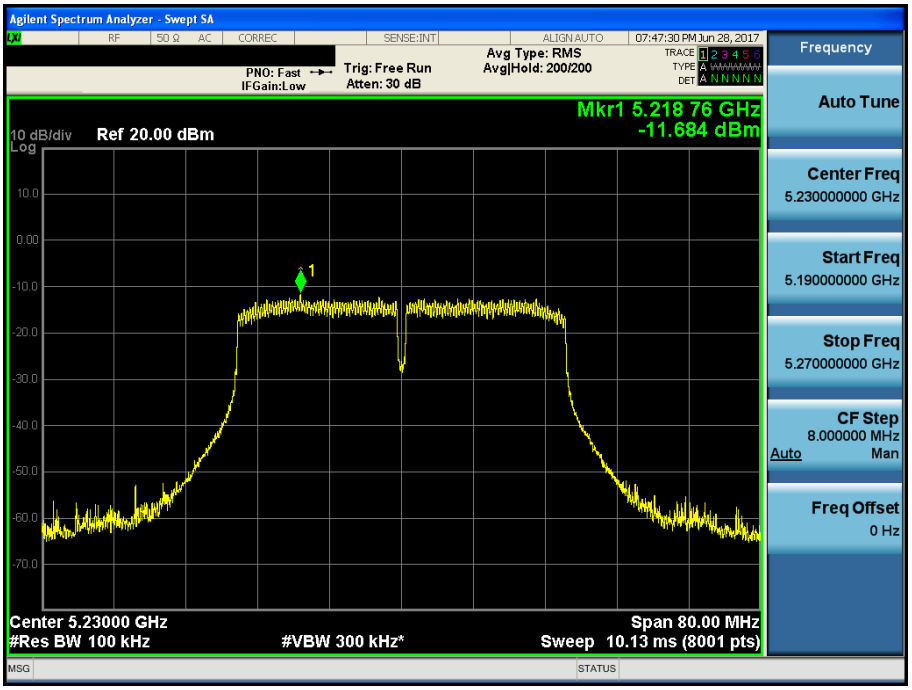
Maximum Power Spectral Density Test Mode: 802.11n(HT20) & Ch.165



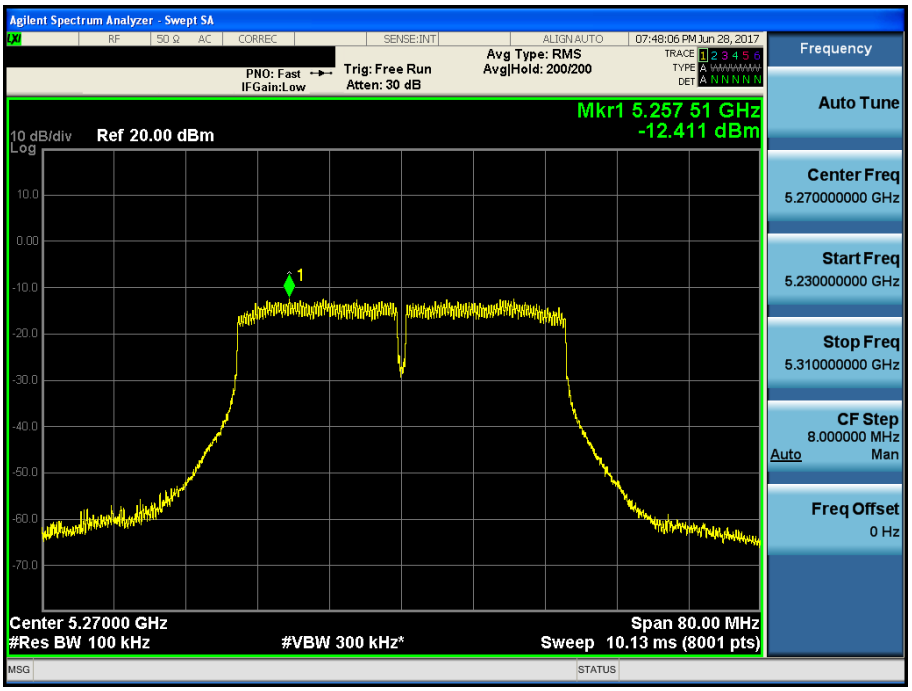
Maximum Power Spectral Density Test Mode: 802.11n(HT40) & Ch.38



Maximum Power Spectral Density Test Mode: 802.11n(HT40) & Ch.46



Maximum Power Spectral Density Test Mode: 802.11n(HT40) & Ch.54



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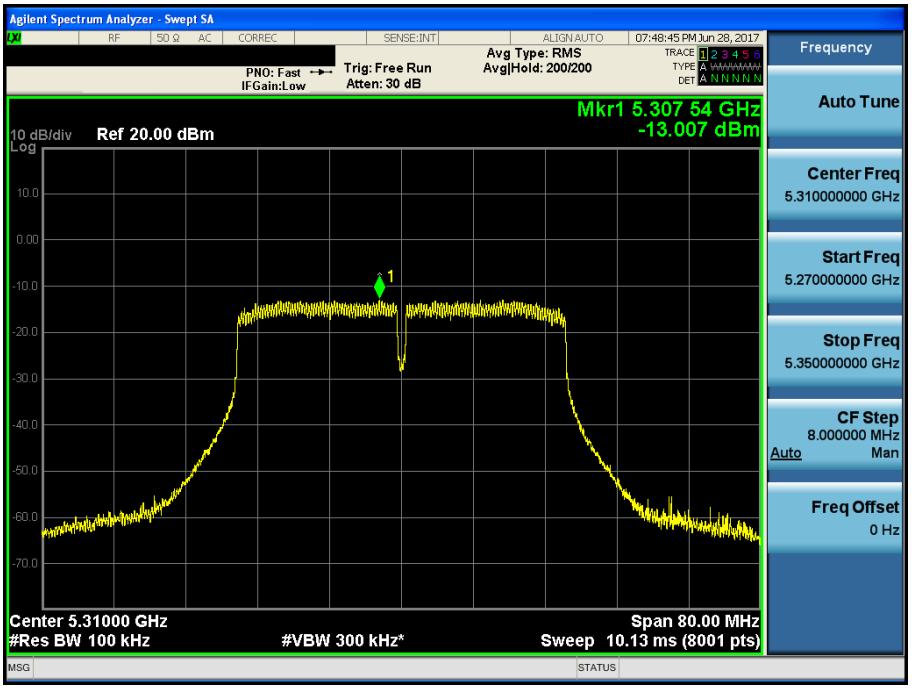
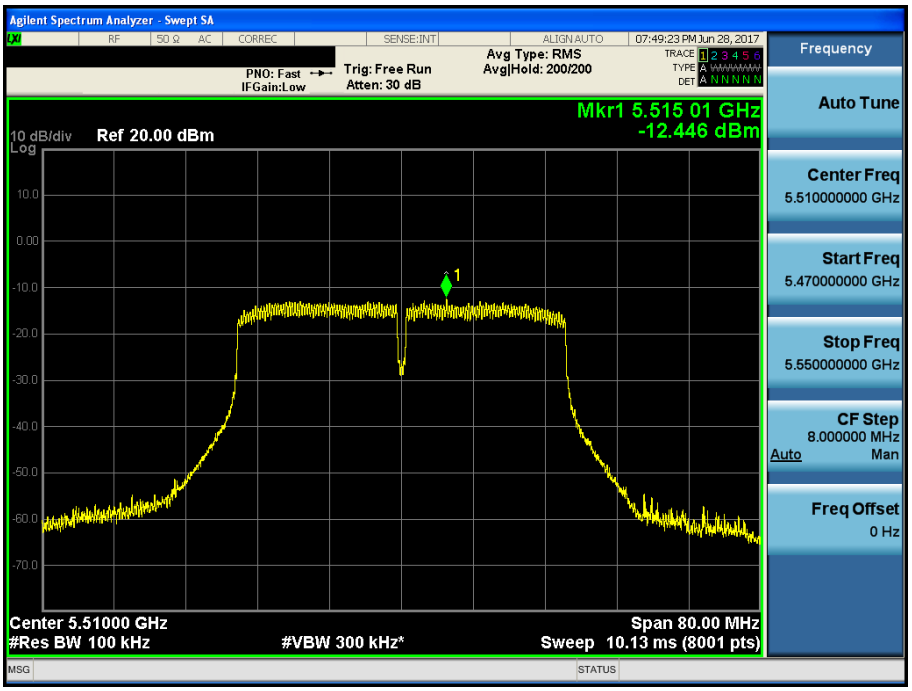
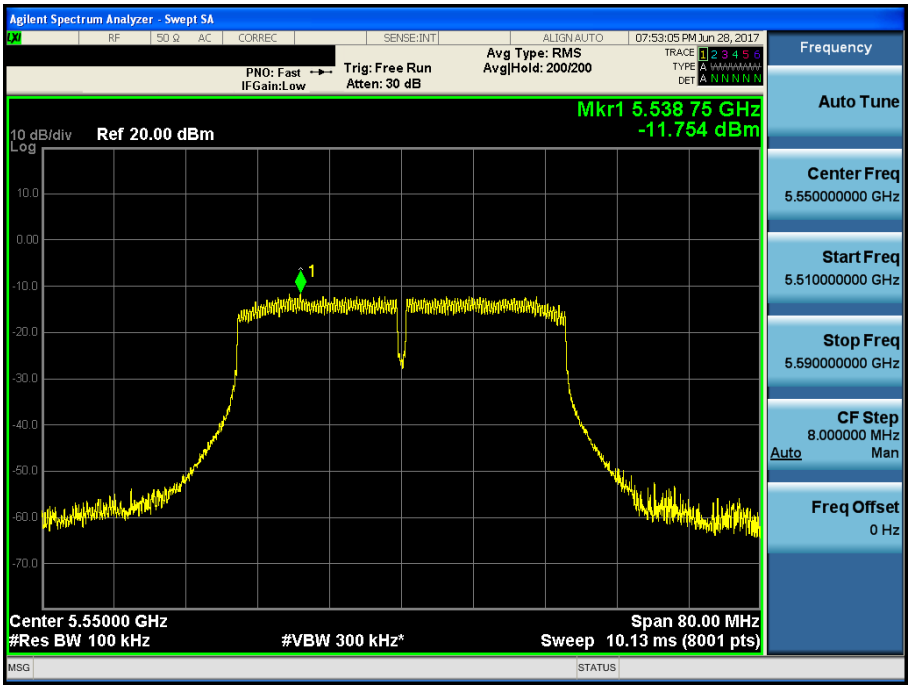


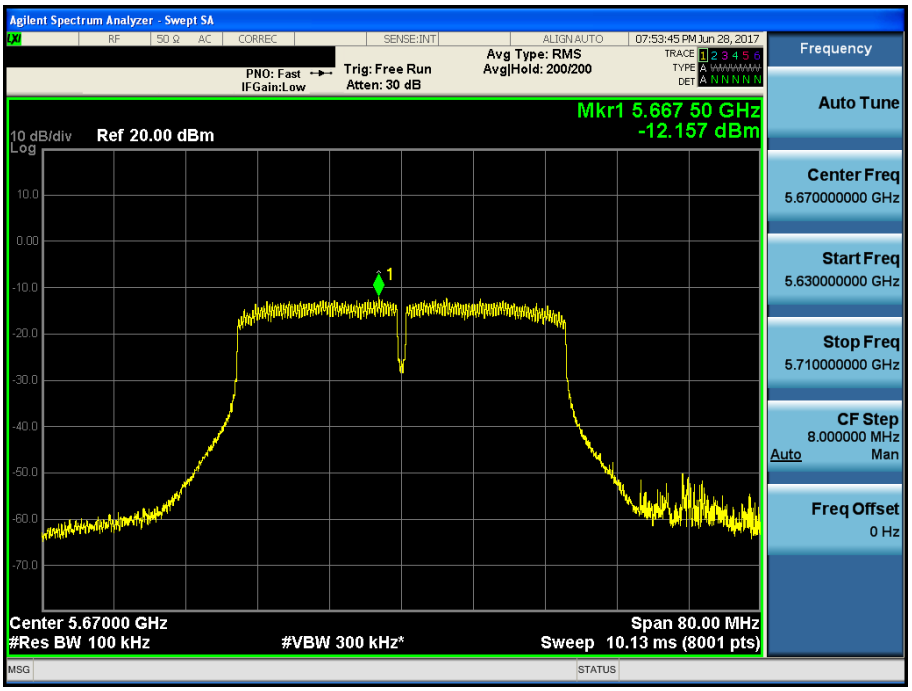
Maximum Power Spectral Density Test Mode: 802.11n(HT40) & Ch.102



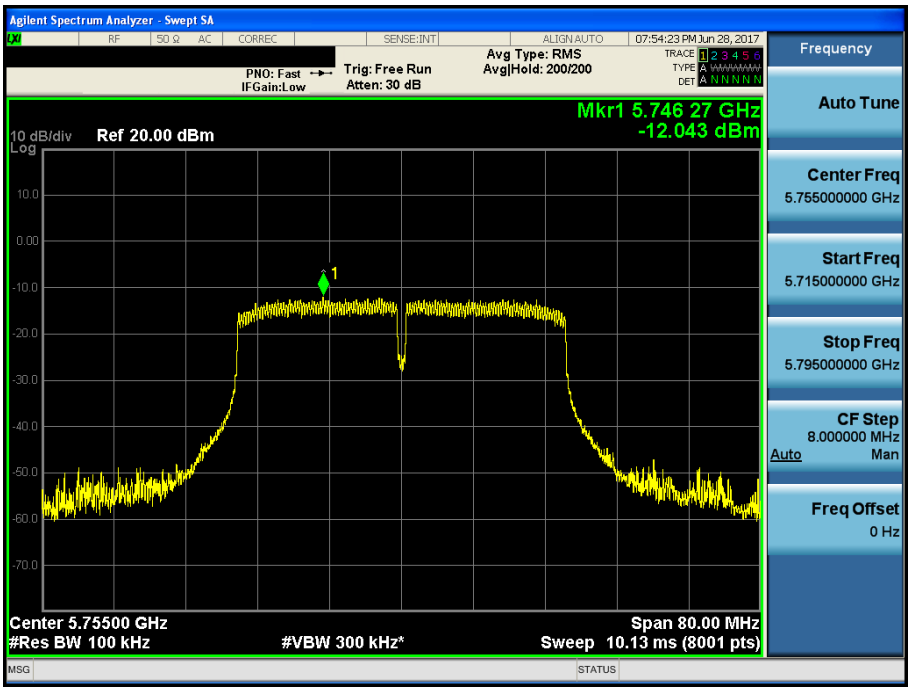
Maximum Power Spectral Density Test Mode: 802.11n(HT40) & Ch.110



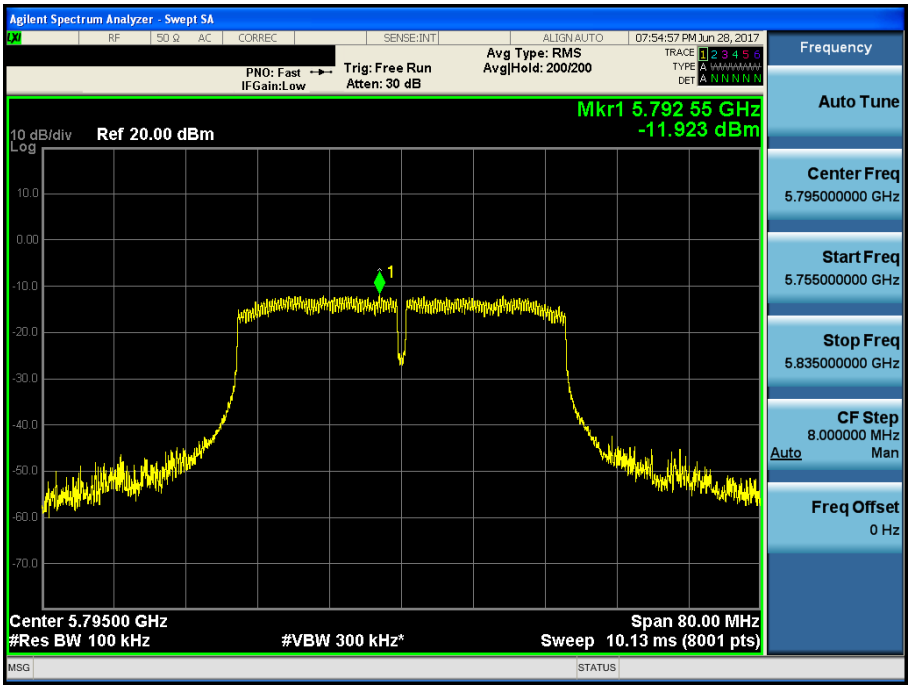
Maximum Power Spectral Density Test Mode: 802.11n(HT40) & Ch.134



Maximum Power Spectral Density Test Mode: 802.11n(HT40) & Ch.151



Maximum Power Spectral Density Test Mode: 802.11n(HT40) & Ch.159



7.5 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 -20℃ and +50℃. The temperature was incremented by 10℃ intervals and the unit was allowed to stabilize at each measurement. And the edge point of EBW(26dB or 6dB bandwidth) was reported.

▣ Test Result : Comply

U-NII-1 & U-NII-2A : (5150 MHz ~ 5350 MHz)

26 dB Bandwidth Reference	
Low edge(MHz)	**High edge(MHz)**
5169.318000	5330.765000

Supply Voltage (V DC)	TEMP (℃)	Operating Frequency					
		5180 MHz			5320 MHz		
		Measured Frequency (Hz)	Deviation (%)	26dBc low edge Note 1 (Hz)	Measured Frequency (Hz)	Deviation (%)	26dBc High edge Note 2 (Hz)
3.850	+25(Ref)	5,172,769,000	-0.139790	5,169,318,000	5,313,942,000	-0.114002	5,330,765,000
	+50	5,172,770,000	-0.139770	5,169,319,000	5,313,947,000	-0.113908	5,330,770,000
	+40	5,172,771,000	-0.139751	5,169,320,000	5,313,952,000	-0.113814	5,330,775,000
	+30	5,172,777,000	-0.139635	5,169,326,000	5,313,954,000	-0.113776	5,330,777,000
	+20	5,172,779,000	-0.139596	5,169,328,000	5,313,956,000	-0.113738	5,330,779,000
	+10	51,72,712,000	-0.140893	5,169,261,000	5,313,965,000	-0.113569	5,330,788,000
	0	5,172,769,000	-0.139790	5,169,318,000	5,313,948,000	-0.113889	5,330,771,000
	-10	5,172,778,000	-0.139616	5,169,327,000	5,313,957,000	-0.113719	5,330,780,000
	-20	5,172,778,000	-0.139616	5,169,327,000	5,313,956,000	-0.113738	5,330,779,000
3.400	+25	5,172,775,000	-0.139674	5,169,324,000	5,313,956,000	-0.113738	5,330,779,000
4.428	+25	5,172,770,000	-0.139770	5,169,319,000	5,313,961,000	-0.113644	5,330,784,000

Note 1: **26 dB Bandwidth Reference Low edge (Hz)** + (**Measured Frequency (Hz)** - **Operating Frequency (Hz)**) = **26dBc low edge (Hz)**
Note 2: **26 dB Bandwidth Reference High edge (Hz)** + (**Measured Frequency (Hz)** - **Operating Frequency (Hz)**) = **26dBc High edge (Hz)**
Note 3: **ANT1 is worst case in U-NII-1 & U-NII-2A band**

U-NII-2C : (5470 MHz ~ 5725 MHz)

26 dB Bandwidth Reference	
Low edge	**High edge**
5489.279000	5710.861000

Supply Voltage (V DC)	TEMP (℃)	Operating Frequency					
		5500 MHz			5720 MHz		
		Measured Frequency (Hz)	Deviation (%)	26dBc low edge Note 1 (Hz)	Measured Frequency (Hz)	Deviation (%)	26dBc High edge Note 2 (Hz)
3.850	+25(Ref)	5,493,765,000	-0.113492	5,489,279,000	5,704,176,000	0.073210	5,710,861,000
	+50	5,493,773,000	-0.113347	5,489,287,000	5,704,178,000	0.073245	5,710,863,000
	+40	5,493,772,000	-0.113365	5,489,286,000	5,704,181,000	0.073297	5,710,866,000
	+30	5,493,773,000	-0.113347	5,489,287,000	5,704,190,000	0.073455	5,710,875,000
	+20	5,493,776,000	-0.113292	5,489,290,000	5,704,199,000	0.073612	5,710,884,000
	+10	5,493,787,000	-0.113091	5,489,301,000	5,704,203,000	0.073683	5,710,888,000
	0	5,493,768,000	-0.113438	5,489,282,000	5,704,180,000	0.073280	5,710,865,000
	-10	5,493,766,000	-0.113474	5,489,280,000	5,704,187,000	0.073402	5,710,872,000
	-20	5,493,773,000	-0.113347	5,489,287,000	5,704,195,000	0.073542	5,710,880,000
3.400	+25	5,493,779,000	-0.113237	5,489,293,000	5,704,195,000	0.073542	5,710,880,000
4.428	+25	5,493,785,000	-0.113128	5,489,299,000	5,704,196,000	0.073560	5,710,881,000

Note 1: **26 dB Bandwidth Reference Low edge (Hz)** + (**Measured Frequency (Hz)** - **Operating Frequency (Hz)**) = **26dBc low edge (Hz)**

Note 2: **26 dB Bandwidth Reference High edge (Hz)** + (**Measured Frequency (Hz)** - **Operating Frequency (Hz)**) = **26dBc High edge (Hz)**

Note 3: **ANT1 is worst case in U-NII-2C band**

U-NII-3 : (5725 MHz ~ 5850 MHz)

6 dB Bandwidth Reference	
Low edge	**High edge**
5736.799000	5833.222000

Supply Voltage (V DC)	TEMP (℃)	Operating Frequency					
		5745 MHz			5825 MHz		
		Measured Frequency (Hz)	Deviation (%)	26dBc low edge Note 1 (Hz)	Measured Frequency (Hz)	Deviation (%)	26dBc High edge Note 2 (Hz)
3.850	+25(Ref)	5,736,799,000	-0.142954	5,736,799,000	5,832,521,000	0.128949	5,833,222,000
	+50	5,736,860,000	-0.141889	5,736,860,000	5,832,526,000	0.129035	5,833,227,000
	+40	5,736,806,000	-0.142832	5,736,806,000	5,832,530,000	0.129103	5,833,231,000
	+30	5,736,811,000	-0.142745	5,736,811,000	5,832,534,000	0.129172	5,833,235,000
	+20	5,736,810,000	-0.142762	5,736,810,000	5,832,530,000	0.129103	5,833,231,000
	+10	5,736,810,000	-0.142762	5,736,810,000	5,832,543,000	0.129326	5,833,244,000
	0	5,736,806,000	-0.142832	5,736,806,000	5,832,525,000	0.129018	5,833,226,000
	-10	5,736,809,000	-0.142780	5,736,809,000	5,832,525,000	0.129018	5,833,226,000
	-20	5,736,803,000	-0.142884	5,736,803,000	5,832,530,000	0.129103	5,833,231,000
3.400	+25	5,736,810,000	-0.142762	5,736,810,000	5,832,532,000	0.129138	5,833,233,000
4.428	+25	5,736,806,000	-0.142832	5,736,806,000	5,832,547,000	0.129395	5,833,248,000

Note 1: **6 dB Bandwidth Reference Low edge (Hz)** + (**Measured Frequency (Hz)** - **Operating Frequency (Hz)**) = **6dBc low edge (Hz)**

Note 2: **26 dB Bandwidth Reference High edge (Hz)** + (**Measured Frequency (Hz)** - **Operating Frequency (Hz)**) = **26dBc High edge (Hz)**

Note 2**: ANT1 is worst case in U-NII-3 band**

7.6 Radiated Spurious Emission Measurements

▣ Test Requirements

▪ **FCC Part 15.209 (a)**

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, 76-88MHz, 174-216MHz or 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241.

▪ **FCC Part 15.209 (b):** In the emission table above the tighter limit applies at the band edge.

▪ **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 shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.
(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 Configuration

Refer to the APPENDIX I.

▣ Test Procedure

1. The EUT is placed on a non-conductive table. For emission measurements at or below 1 GHz, the table height is 80 cm. For emission measurements above 1 GHz, the table height is 1.5 m.
2. The turn table shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 1 or 3 m away from the receiving antenna, which is varied from 1m to 4m 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**

► **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) Maximum 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 span/(# of points in sweep) ≤ 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 instruments 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.

Please refer to Appendix II for the duty cycle correction factor

▣ 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)	5127.530	H	X	PK	47.69	4.99	N/A	N/A	52.68	74.00	21.32
		5127.800	H	X	AV	38.28	4.99	0.61	N/A	43.88	54.00	10.12
		10360.093	H	Z	PK	53.89	10.66	N/A	-9.54	55.01	68.20	13.19
	40 (5200 MHz)	10400.040	H	Z	PK	54.16	10.76	N/A	-9.54	55.38	68.20	12.82
	48 (5240 MHz)	10480.175	H	Z	PK	53.92	10.94	N/A	-9.54	55.32	68.20	12.88
U-NII 2A	52 (5260 MHz)	10520.128	H	Z	PK	54.19	11.05	N/A	-9.54	55.70	68.20	12.50
	60 (5300 MHz)	10599.970	H	Z	PK	52.79	11.30	N/A	-9.54	54.55	68.20	13.65
		10600.008	H	Z	AV	48.71	11.30	0.61	-9.54	51.08	54.00	2.92
	64 (5320 MHz)	5372.400	H	X	PK	45.68	5.14	N/A	N/A	50.82	74.00	23.18
		5372.240	H	X	AV	37.39	5.14	0.61	N/A	43.14	54.00	10.86
		10640.080	H	Z	PK	52.73	11.42	N/A	-9.54	54.61	74.00	19.39
		10639.960	H	Z	AV	48.56	11.42	0.61	-9.54	51.05	54.00	2.95
U-NII 2C	100 (5500 MHz)	5447.680	V	Z	PK	48.57	5.14	N/A	N/A	53.71	74.00	20.29
		5447.680	V	Z	AV	39.77	5.14	0.61	N/A	45.52	54.00	8.48
		5469.320	V	Z	PK	48.37	5.14	N/A	N/A	53.51	68.20	14.69
		10999.875	H	X	PK	49.85	12.54	N/A	-9.54	52.85	74.00	21.15
		10999.953	H	X	AV	45.56	12.54	0.61	-9.54	49.17	54.00	4.83
	116 (5600 MHz)	11159.950	H	X	PK	49.03	12.67	N/A	-9.54	52.16	74.00	21.84
		11160.065	H	X	AV	43.94	12.67	0.61	-9.54	47.68	54.00	6.32
	140 (5700 MHz)	5752.240	V	Z	PK	48.06	5.64	N/A	N/A	53.70	68.20	14.50
		11399.838	H	X	PK	49.84	12.86	N/A	-9.54	53.16	74.00	20.84
		11400.090	H	X	AV	45.05	12.86	0.61	-9.54	48.98	54.00	5.02
U-NII 3	149 (5745 MHz)	5645.710	V	Z	PK	45.44	5.63	N/A	N/A	51.07	68.20	17.13
		11490.058	H	X	PK	49.99	12.93	N/A	-9.54	53.38	74.00	20.62
		11489.958	H	X	AV	45.14	12.93	0.61	-9.54	49.14	54.00	4.86
	157 (5785 MHz)	11570.045	H	X	PK	49.60	12.99	N/A	-9.54	53.05	74.00	20.95
		11570.083	H	X	AV	45.21	12.99	0.61	-9.54	49.27	54.00	4.73
	165 (5825 MHz)	5926.390	V	Z	PK	44.65	6.24	N/A	N/A	50.89	68.20	17.31
		11649.998	H	X	PK	49.01	13.05	N/A	-9.54	52.52	74.00	21.48
		11650.052	H	X	AV	44.02	13.05	0.61	-9.54	48.14	54.00	5.86

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(1m/3m)
4. The limit is converted to field strength.
   E[dBuV/m] = EIRP[dBm] + 95.2 dB = -27 dBm + 95.2 = 68.2 dBuV/m
5. The measured data for U-NII 3 band is satisfied with the emissions mask in 15.407(b)(4)(i), too.
   The old rule 15.407(b)(4) is more tight than the new rule 15.407(b)(4)(i).

▣ 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)	5127.870	H	X	PK	48.01	4.99	N/A	N/A	53.00	74.00	21.00
		5128.070	H	X	AV	38.66	4.99	0.66	N/A	44.31	54.00	9.69
		10360.047	H	Z	PK	53.78	10.66	N/A	-9.54	54.90	68.20	13.30
	40 (5200 MHz)	10400.152	H	Z	PK	53.97	10.76	N/A	-9.54	55.19	68.20	13.01
	48 (5240 MHz)	10480.080	H	Z	PK	54.18	10.94	N/A	-9.54	55.58	68.20	12.62
U-NII 2A	52 (5260 MHz)	10520.048	H	Z	PK	53.81	11.05	N/A	-9.54	55.32	68.20	12.88
	60 (5300 MHz)	10599.878	H	Z	PK	53.43	11.30	N/A	-9.54	55.19	68.20	13.01
		10600.053	H	Z	AV	49.33	11.30	0.66	-9.54	51.75	54.00	2.25
	64 (5320 MHz)	5372.430	H	X	PK	47.19	5.14	N/A	N/A	52.33	74.00	21.67
		5371.630	H	X	AV	38.40	5.14	0.66	N/A	44.20	54.00	9.80
		10639.960	H	Z	PK	52.67	11.42	N/A	-9.54	54.55	74.00	19.45
		10640.072	H	Z	AV	49.01	11.42	0.66	-9.54	51.55	54.00	2.45
U-NII 2C	100 (5500 MHz)	5447.520	V	Z	PK	49.35	5.14	N/A	N/A	54.49	74.00	19.51
		5448.360	V	Z	AV	40.68	5.14	0.66	N/A	46.48	54.00	7.52
		5469.440	V	Z	PK	45.49	5.14	N/A	N/A	50.63	68.20	17.57
		10999.870	H	X	PK	49.73	12.54	N/A	-9.54	52.73	74.00	21.27
		10999.932	H	X	AV	45.13	12.54	0.66	-9.54	48.79	54.00	5.21
	116 (5600 MHz)	11160.083	H	X	PK	48.63	12.67	N/A	-9.54	51.76	74.00	22.24
		11160.097	H	X	AV	43.60	12.67	0.66	-9.54	47.39	54.00	6.61
	140 (5700 MHz)	5752.107	V	Z	PK	48.62	5.64	N/A	N/A	54.26	68.20	13.94
		11399.920	H	X	PK	50.40	12.86	N/A	-9.54	53.72	74.00	20.28
		11400.033	H	X	AV	45.91	12.86	0.66	-9.54	49.89	54.00	4.11
U-NII 3	149 (5745 MHz)	5649.170	V	Z	PK	44.84	5.63	N/A	N/A	50.47	68.20	17.73
		11490.162	H	X	PK	50.20	12.93	N/A	-9.54	53.59	74.00	20.41
		11489.950	H	X	AV	45.71	12.93	0.66	-9.54	49.76	54.00	4.24
	157 (5785 MHz)	11570.305	H	X	PK	50.32	12.99	N/A	-9.54	53.77	74.00	20.23
		11570.042	H	X	AV	45.97	12.99	0.66	-9.54	50.08	54.00	3.92
	165 (5825 MHz)	5927.790	V	Z	PK	45.86	6.24	N/A	N/A	52.10	68.20	16.10
		11650.008	H	X	PK	50.29	13.05	N/A	-9.54	53.80	74.00	20.20
		11650.067	H	X	AV	44.88	13.05	0.66	-9.54	49.05	54.00	4.95

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(1m/3m)
4. The limit is converted to field strength.
   E[dBuV/m] = EIRP[dBm] + 95.2 dB = -27 dBm + 95.2 = 68.2 dBuV/m
5. The measured data for U-NII 3 band is satisfied with the emissions mask in 15.407(b)(4)(i), too.
   The old rule 15.407(b)(4) is more tight than the new rule 15.407(b)(4)(i).

▣ 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)	5149.410	H	X	PK	54.78	4.99	N/A	N/A	59.77	74.00	14.23
		5149.410	H	X	AV	38.87	4.99	1.25	N/A	45.11	54.00	8.89
		10379.857	H	Z	PK	50.94	10.71	N/A	-9.54	52.11	68.20	16.09
	46 (5230 MHz)	10460.022	H	Z	PK	51.22	10.89	N/A	-9.54	52.57	68.20	15.63
U-NII 2A	54 (5270 MHz)	10539.800	H	Z	PK	51.55	11.11	N/A	-9.54	53.12	68.20	15.08
	62 (5310 MHz)	5351.380	H	X	PK	50.86	5.14	N/A	N/A	56.00	74.00	18.00
		5350.540	H	X	AV	36.14	5.14	1.25	N/A	42.53	54.00	11.47
		10620.018	H	Z	PK	50.89	11.36	N/A	-9.54	52.71	74.00	21.29
		10620.010	H	Z	AV	46.45	11.36	1.25	-9.54	49.52	54.00	4.48
U-NII 2C	102 (5510 MHz)	5406.560	V	Z	PK	45.50	5.14	N/A	N/A	50.64	74.00	23.36
		5406.720	V	Z	AV	35.88	5.14	1.25	N/A	42.27	54.00	11.73
		5468.990	V	Z	PK	52.93	5.14	N/A	N/A	58.07	68.20	10.13
		11020.223	H	X	PK	50.44	12.56	N/A	-9.54	53.46	74.00	20.54
		11020.032	H	X	AV	45.48	12.56	1.25	-9.54	49.75	54.00	4.25
	110 (5590 MHz)	11099.967	H	X	PK	50.02	12.62	N/A	-9.54	53.10	74.00	20.90
		11100.052	H	X	AV	45.02	12.62	1.25	-9.54	49.35	54.00	4.65
	134 (5670 MHz)	5774.880	V	Z	PK	45.32	5.64	N/A	N/A	50.96	68.20	17.24
		11339.977	H	X	PK	49.46	12.81	N/A	-9.54	52.73	74.00	21.27
		11340.102	H	X	AV	44.36	12.81	1.25	-9.54	48.88	54.00	5.12
U-NII 3	151 (5755 MHz)	5648.860	V	Z	PK	46.88	5.63	N/A	N/A	52.51	68.20	15.69
		11510.065	H	X	PK	49.81	12.95	N/A	-9.54	53.22	74.00	20.78
		11510.008	H	X	AV	45.42	12.95	1.25	-9.54	50.08	54.00	3.92
	159 (5795 MHz)	5933.220	V	Z	PK	45.95	6.24	N/A	N/A	52.19	68.20	16.01
		11590.097	H	X	PK	50.19	13.01	N/A	-9.54	53.66	74.00	20.34
		11590.023	H	X	AV	45.37	13.01	1.25	-9.54	50.09	54.00	3.91

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(1m/3m)
4. The limit is converted to field strength.
   E[dBuV/m] = EIRP[dBm] + 95.2 dB = -27 dBm + 95.2 = 68.2 dBuV/m
5. The measured data for U-NII 3 band is satisfied with the emissions mask in 15.407(b)(4)(i), too.
   The old rule 15.407(b)(4) is more tight than the new rule 15.407(b)(4)(i).

7.7 AC Conducted Emission

▣ Test Requirements

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies,
within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN).

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

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

▣ Test Configuration

See test photographs for the actual connections between EUT and support equipment.

▣ Test Procedure

Conducted emissions from the EUT were measured according to the ANSI C63.10.

1. The test procedure is performed in a 6.5 m × 3.5 m × 3.5 m (L × W × H) shielded room. The EUT along with its peripherals were placed on a 1.0 m (W) × 1.5 m (L) and 0.8 m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane.
2. The EUT was connected to power mains through a line impedance stabilization network (LISN) which provides 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room.
3. All peripherals were connected to the second LISN and the chassis ground also bounded to the horizontal ground plane of shielded room.
4. The excess power cable between the EUT and the LISN was bundled. The power cables of peripherals were unbundled. All connecting cables of EUT and peripherals were moved to find the maximum emission.

▣ **Measurement Data: Comply**

AC Line Conducted Emissions (Graph)

Test Mode: U-NII 1 & 802.11n(HT20) & 5240 MHz

Results of Conducted Emission

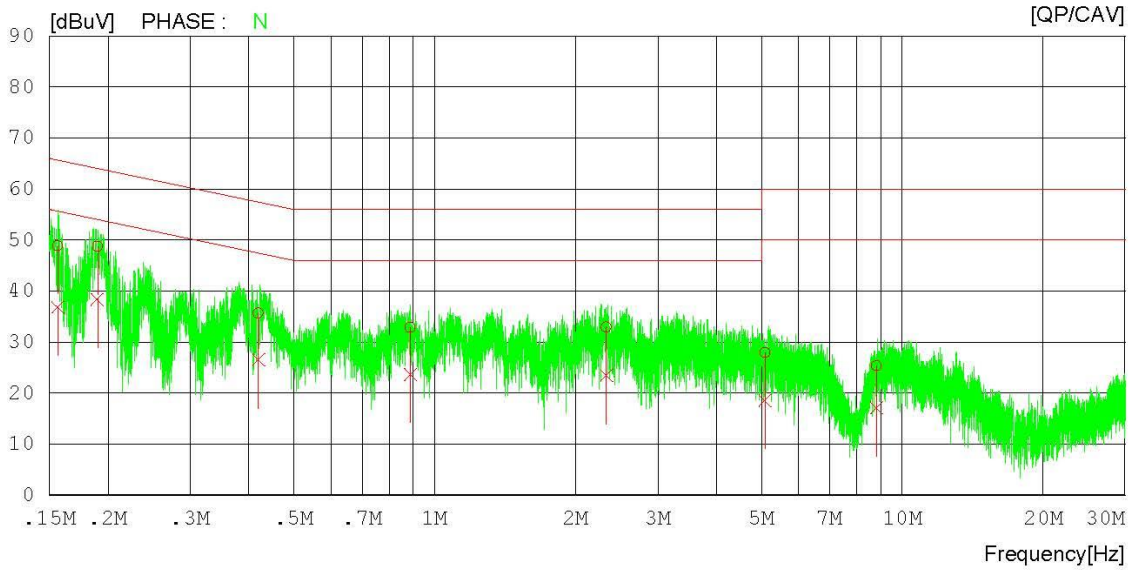
DT&C

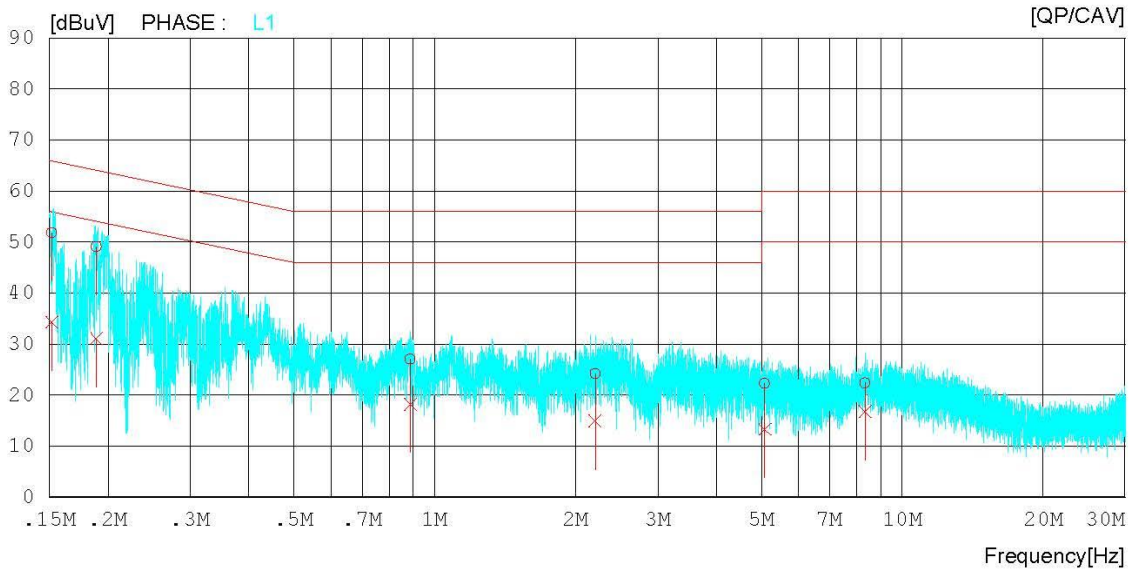
Date 2017-06-23

Model	PM66	Temp/Humi.	23 'C 47 %
Function	U-NII 1	Power Supply	AC 120 V 60 Hz
Mode	802.11a	Operator	J.W.KIM
Test condition			

Memo

LIMIT : FCC P15.207 QP
FCC P15.207 AV





AC Line Conducted Emissions (Data List)

Test Mode: U-NII 1 & 802.11n(HT20) & 5240 MHz

Results of Conducted Emission

DT&C

Date 2017-06-23

Model	PM66	Temp/Humi.	23 'C 47 %
Function	U-NII 1	Power Supply	AC 120 V 60 Hz
Mode	802.11a	Operator	J.W.KIM
Test condition			

Memo

LIMIT : FCC P15.207 QP
FCC P15.207 AV

NO	FREQ	READING QP	READING CAV	C.FACTOR	RESULT QP	RESULT CAV	LIMIT QP	LIMIT CAV	MARGIN QP	MARGIN CAV	PHASE
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	
1	0.15625	48.71	36.61	0.22	48.93	36.83	65.66	55.66	16.73	18.83	N
2	0.18981	48.61	38.19	0.20	48.81	38.39	64.04	54.04	15.23	15.65	N
3	0.42002	35.45	26.29	0.21	35.66	26.50	57.45	47.45	21.79	20.95	N
4	0.88675	32.63	23.41	0.24	32.87	23.65	56.00	46.00	23.13	22.35	N
5	2.33020	32.65	23.15	0.32	32.97	23.47	56.00	46.00	23.03	22.53	N
6	5.08560	27.52	18.14	0.44	27.96	18.58	60.00	50.00	32.04	31.42	N
7	8.80740	24.74	16.46	0.65	25.39	17.11	60.00	50.00	34.61	32.89	N
8	0.15172	51.60	34.10	0.18	51.78	34.28	65.91	55.91	14.13	21.63	L1
9	0.18910	48.93	30.89	0.17	49.10	31.06	64.08	54.08	14.98	23.02	L1
10	0.88659	26.79	18.00	0.23	27.02	18.23	56.00	46.00	28.98	27.77	L1
11	2.20380	23.90	14.56	0.30	24.20	14.86	56.00	46.00	31.80	31.14	L1
12	5.08120	21.73	12.79	0.45	22.18	13.24	60.00	50.00	37.82	36.76	L1
13	8.32860	21.69	16.03	0.68	22.37	16.71	60.00	50.00	37.63	33.29	L1