

FCC UNII REPORT

FCC Certification

Applicant Name:

SAMSUNG Electronics Co., Ltd.

Date of Issue:

June 30, 2017

Test Site/Location:

HCT CO., LTD., 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA

Address:

129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea

Report No.: HCT-R-1706-F107**HCT FRN:** 0005866421**FCC ID : A3LSMJ330KOR****APPLICANT : SAMSUNG Electronics Co., Ltd.****Model:**

SM-J330L

EUT Type:

Mobile Phone

Modulation type

OFDM

FCC Classification:

Unlicensed National Information Infrastructure(UNII)

FCC Rule Part(s):

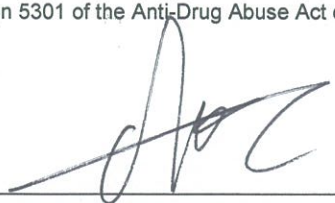
Part 15.407

Band	Mode	Frequency Range (MHz)	Power (dBm)	Power (W)
UNII1	802.11a	5180 – 5240	14.44	0.02777
	802.11n_HT20	5180 – 5240	14.38	0.02744
	802.11n_HT40	5190 – 5230	11.54	0.01424
UNII2A	802.11a	5260 – 5320	14.34	0.02719
	802.11n_HT20	5260 – 5320	14.32	0.02706
	802.11n_HT40	5270 – 5310	11.33	0.01359
UNII2C	802.11a	5500 – 5720	15.39	0.03457
	802.11n_HT20	5500 – 5720	15.15	0.03276
	802.11n_HT40	5510 – 5710	12.95	0.01970
UNII3	802.11a	5745 – 5825	15.61	0.03642
	802.11n_HT20	5745 – 5825	15.38	0.03451
	802.11n_HT40	5755 – 5795	13.57	0.02273

Engineering Statement:

The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them.

HCT CO., LTD. Certifies that no party to this application has subject to a denial of Federal benefits that includes FCC benefits pursuant to section 5301 of the Anti-Drug Abuse Act of 1998, 21 U.S.C. 853(a)


Report prepared by : Jung Lae Cho**Engineer of Telecommunication testing center**
Approved by : Jong Seok Lee**Manager of Telecommunication testing center**

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Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-R-1706-F107	June 30, 2017	- First Approval Report

Table of Contents

1. GENERAL INFORMATION	4
2. EUT DESCRIPTION	4
3. TEST METHODOLOGY	5
3.1 EUT CONFIGURATION	5
3.2 EUT EXERCISE	5
3.3 GENERAL TEST PROCEDURES	5
3.4 DESCRIPTION OF TEST MODES	5
4. INSTRUMENT CALIBRATION.....	6
5. FACILITIES AND ACCREDITATIONS	6
5.1 FACILITIES	6
5.2 EQUIPMENT	6
6. ANTENNA REQUIREMENTS	6
7. MEASUREMENT UNCERTAINTY	7
8. SUMMARY OF TEST RESULTS	8
9. TEST RESULT	9
9.1 DUTY CYCLE.....	9
9.2 EMISSION BANDWIDTH AND MINIMUM EMISSION BANDWIDTH MEASUREMENT	11
9.3 OUTPUT POWER MEASUREMENT	23
9.4 POWER SPECTRAL DENSITY	41
9.5 FREQUENCY STABILITY	52
9.6 RADIATED MEASUREMENT.....	60
9.6.1 RADIATED SPURIOUS EMISSIONS.....	60
9.6.2 RADIATED RESTRICTED BAND EDGE MEASUREMENTS	99
9.7 POWERLINE CONDUCTED EMISSIONS	110
10. LIST OF TEST EQUIPMENT	115
10.1 LIST OF TEST EQUIPMENT(Conducted Test)	115
10.2 LIST OF TEST EQUIPMENT(Radiated Test).....	116

1. GENERAL INFORMATION

Applicant: SAMSUNG Electronics Co.,Ltd.
Address: 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
FCC ID: A3LSMJ330KOR
EUT Type: Mobile Phone
Model: SM-J330L
Date(s) of Tests: May 22 ~ June 30, 2017
Place of Tests: HCT Co., Ltd.
74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Korea

2. EUT DESCRIPTION

Model	SM-J330L	
EUT Type	Mobile Phone	
Power Supply	DC 3.85 V	
Battery Information	Model: EB-BJ33CABA Type: Lithium ion polymer cell	
Frequency Range	TX_20 MHz BW:	5180 MHz - 5240 MHz (UNII 1)/ 5260 MHz - 5320 MHz (UNII 2A)/ 5500 MHz - 5720 MHz (UNII 2C)/ 5745 MHz - 5825 MHz (UNII 3)
	40 MHz BW:	5190 MHz - 5230 MHz (UNII 1)/ 5270 MHz - 5310 MHz (UNII 2A)/ 5510 MHz - 5710 MHz (UNII 2C) / 5755 MHz - 5795 MHz (UNII 3)
	RX_20 MHz BW:	5180 MHz - 5240 MHz (UNII 1)/ 5260 MHz - 5320 MHz (UNII 2A)/ 5500 MHz - 5720 MHz (UNII 2C)/ 5745 MHz - 5825 MHz (UNII 3)
	40 MHz BW:	5190 MHz - 5230 MHz (UNII 1)/ 5270 MHz - 5310 MHz (UNII 2A)/ 5510 MHz - 5710 MHz (UNII 2C) / 5755 MHz - 5795 MHz (UNII 3)
Modulation Type	OFDM(802.11a, 802.11n)	
Antenna Specification	Manufacturer: ethertronics Antenna type: LDS Peak Gain : -1.6 dBi (UNII 1) / 0.0 dBi(UNII 2A) / 2.8 dBi(UNII 2C) / 3.1 dBi(UNII 3)	

3. TEST METHODOLOGY

The measurement procedure described in FCC KDB 789033 D02 General UNII Test Procedures New Rules v01r04 dated May 2, 2017 entitled “Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices Part15, Subpart E” and ANSI C63.10(Version : 2013) ‘the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices’ were used in the measurement. For 802.11ac, KDB644545 D03 v01 dated August 14, 2014.

3.1 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.

3.2 EUT EXERCISE

The EUT was operated in the engineering 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 E.

3.3 GENERAL TEST PROCEDURES

Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 6.2 of ANSI C63.10. (Version :2013) Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane below 1GHz. Above 1GHz with 1.5m using absorbers between the EUT and receive antenna. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3.75 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 max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes according to the requirements in Section 8 of ANSI C63.10. (Version: 2013)

Conducted Antenna Terminal

See Section from 8.1 to 8.4.(KDB 789033 D02 v01r04)

3.4 DESCRIPTION OF TEST MODES

The EUT has been tested under operating condition. Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

Channel low, mid and high with highest data rate (worst case) is chosen for full testing.

4. 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

Especially, all antenna for measurement is calibrated in accordance with the requirements of C63.5 (Version : 2006).

5. FACILITIES AND ACCREDITATIONS

5.1 FACILITIES

The SAC(Semi-Anechoic Chamber) and conducted measurement facility used to collect the radiated data are located at the 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Korea. The site is constructed in conformance with the requirements of ANSI C63.4. (Version :2014) and CISPR Publication 22. Detailed description of test facility was submitted to the Commission and accepted dated July 07, 2015 (Registration Number: 90661)

5.2 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 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."

6. ANTENNA REQUIREMENTS

According to FCC 47 CFR §15.203, §15.407

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

* The antennas of this E.U.T are permanently attached.

* The E.U.T Complies with the requirement of §15.203, §15.407

7. MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4:2014.

All measurement uncertainty values are shown with a coverage factor of $k = 2$ to indicate a 95 % level of confidence.

Parameter	Expanded Uncertainty ($\pm$ dB)
Conducted Disturbance (150 kHz ~ 30 MHz)	1.82
Radiated Disturbance (9 kHz ~ 30 MHz)	3.40
Radiated Disturbance (30 MHz ~ 1 GHz)	4.80
Radiated Disturbance (1 GHz ~ 18 GHz)	5.70

8. SUMMARY OF TEST RESULTS

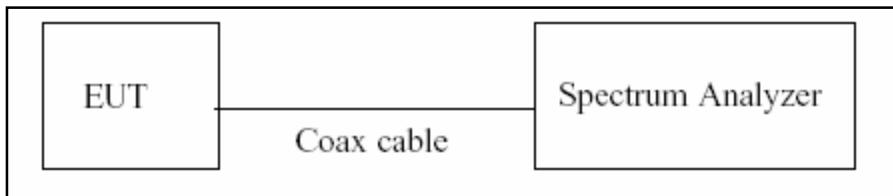
Test Description	FCC Part Section(s)	Test Limit	Test Condition	Test Result
26dB Bandwidth	§15.407 (for Power Measurement)	N/A	CONDUCTED	PASS
6 dB Bandwidth	§15.407(e)	>500 kHz (5725-5850 MHz)		PASS
Maximum Conducted Output Power	§15.407(a)(1)	< 250 mW (5150-5250 MHz) < 250 mW or 11+10 log log ₁₀ (BW) dBm (5250-5350 MHz) < 250 mW or 11+10 log log ₁₀ (BW) dBm (5470-5725 MHz) <1 W (5725-5850 MHz)		PASS
Peak Power Spectral Density	§15.407(a)(1),(5)	<11 dBm/ MHz (5150-5250 MHz) <11 dBm/ MHz (5250-5350 MHz) <11 dBm/ MHz (5470-5725 MHz) <30 dBm/500 kHz(5725-5850 MHz)		PASS
Frequency Stability	§15.407(g)	NA		PASS
AC Conducted Emissions 150 kHz-30 MHz	15.207	<FCC 15.207 limits		PASS
Undesirable Emissions	§15.407(b)	<-27 dBm/MHz EIRP (UNII1, 2A, 2C) <-27 dBm/MHz EIRP(Worst) (UNII 3)	RADIATED	PASS
General Field Strength Limits(Restricted Bands and Radiated Emission Limits)	15.205, 15.407(b)(5), (6)	Emissions in restricted bands must meet the radiated limits detailed in 15.209		PASS

9. TEST RESULT

9.1 DUTY CYCLE

The zero-span mode on a spectrum analyzer or EMI receiver ,if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the on and off times of the transmitted signal. Set the center frequency of the instrument to the center frequency of the transmission. Set $RBW \geq EBW$ if possible; otherwise, set RBW to the largest available value. Set $VBW \geq RBW$. Set detector = peak or average. The zero-span measurement method shall not be used unless both RBW and VBW are $> 50/T$, where T is defined in section 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.)

■ TEST CONFIGURATION



■ TEST PROCEDURE

The transmitter output is connected to the Spectrum Analyzer. We tested according to the zero-span measurement method, (B.2 in KDB 789033 D02 v01r04)

The largest available value of RBW is 8 MHz and VBW is 50 MHz. The zero-span method of measuring duty cycle shall not be used if $T \leq 6.25$ microseconds. ($50/6.25 = 8$)

The zero-span method was used because all measured T data are > 6.25 microseconds and both RBW and VBW are $> 50/T$.

1. RBW = 8 MHz (the largest available value)
2. VBW = 8 MHz ($\geq$ RBW)
3. SPAN = 0 Hz
4. Detector = Peak
5. Number of points in sweep > 100
6. Trace mode = Clear write
7. Measure T_{total} and T_{on}
8. Calculate Duty Cycle = T_{on} / T_{total} and Duty Cycle Factor = $10 \cdot \log(1/\text{Duty Cycle})$

Duty Cycle Factor

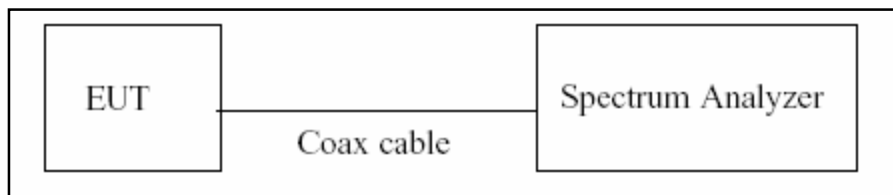
Mode	Data Rate (Mbps)	T _{on} (ms)	T _{total} (ms)	Duty Cycle	Duty Cycle Factor (dB)
802.11a	6	1.429	1.463	0.97694148	0.101
	9	0.960	0.995	0.96456152	0.157
	12	0.724	0.759	0.95353491	0.207
	18	0.492	0.527	0.93319834	0.300
	24	0.372	0.408	0.91187125	0.401
	36	0.256	0.290	0.88131198	0.549
	48	0.196	0.231	0.84807774	0.716
	54	0.180	0.215	0.83850672	0.765
Mode	MCS INDEX	T _{on} (ms)	T _{total} (ms)	Duty Cycle	Duty Cycle Factor (dB)
802.11n_HT20	0	1.334	1.371	0.97315436	0.118
	1	0.687	0.724	0.94915252	0.227
	2	0.473	0.509	0.92872052	0.321
	3	0.364	0.400	0.90933250	0.413
	4	0.256	0.290	0.88131198	0.549
	5	0.200	0.235	0.85227031	0.694
	6	0.184	0.219	0.84146085	0.750
	7	0.168	0.203	0.82894464	0.815
802.11n_HT40	0	0.662	0.732	0.90372798	0.440
	1	0.351	0.411	0.85397907	0.686
	2	0.248	0.300	0.82737896	0.823
	3	0.196	0.256	0.76631497	1.156
	4	0.145	0.222	0.65282167	1.852
	5	0.116	0.194	0.59769996	2.235
	6	0.109	0.186	0.58324382	2.341
	7	0.100	0.162	0.61785185	2.091

9.2 EMISSION BANDWIDTH AND MINIMUM EMISSION BANDWIDTH MEASUREMENT

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 at its maximum power control level, as defined in KDB 789033 D02 v01r04, at the appropriate frequencies. The spectrum analyzer's bandwidth measurement function is configured to measure the 26 dB bandwidth.

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

■ TEST CONFIGURATION



■ TEST PROCEDURE (26dB Bandwidth)

The transmitter output is connected to the Spectrum Analyzer.

The Spectrum Analyzer is set to (C.1 in KDB 789033 D02 v01r04)

1. RBW = approximately 1 % of the emission bandwidth
2. VBW > RBW
3. Detector = Peak
4. Trace mode = max hold
5. Measure the maximum width of the emission that is 26 dB down from the maximum 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 %.

Note : We tested 26 dB bandwidth using the automatic bandwidth measurement capability of a spectrum analyzer. X dB is set 26 dB.

1. In order to simplify the report, attached plots were only the most wide channel.
2. DFS test channels should be defined. So, We performed the OBW test to prove that no part of the fundamental emissions of any channels belong to UNII1 and UNII3 band for DFS.

■ TEST PROCEDURE (for the band 5.725-5.85 GHz, 6 dB Bandwidth)

The transmitter output is connected to the Spectrum Analyzer.

The Spectrum Analyzer is set to(C.2 in KDB 789033 D02 v01r04)

1. RBW = 100 kHz
2. VBW $\geq$ 3*RBW
3. Detector = Peak
4. Trace mode = max hold
5. Allow the trace to stabilize
6. 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.

Note : We tested 6 dB bandwidth using the automatic bandwidth measurement capability of a spectrum analyzer. X dB is set 6 dB.

TEST RESULTS for 802.11a

Conducted 26 dB Bandwidth Measurements for 802.11a

802.11a Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5180	36	22.69	N/A	Pass
5200	40	21.33	N/A	Pass
5240	48	21.40	N/A	Pass

Conducted 26 dB Bandwidth Measurements for 802.11a

802.11a Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5260	52	22.99	N/A	Pass
5300	60	23.02	N/A	Pass
5320	64	22.18	N/A	Pass

Conducted 26 dB Bandwidth Measurements for 802.11a

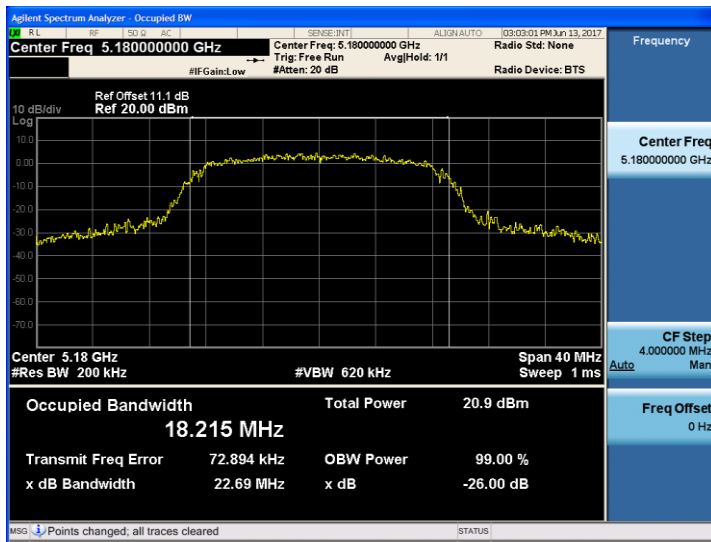
802.11a Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5500	100	23.01	N/A	Pass
5600	120	21.54	N/A	Pass
5720	144	22.65	N/A	Pass

Conducted 26 dB Bandwidth Measurements for 802.11a

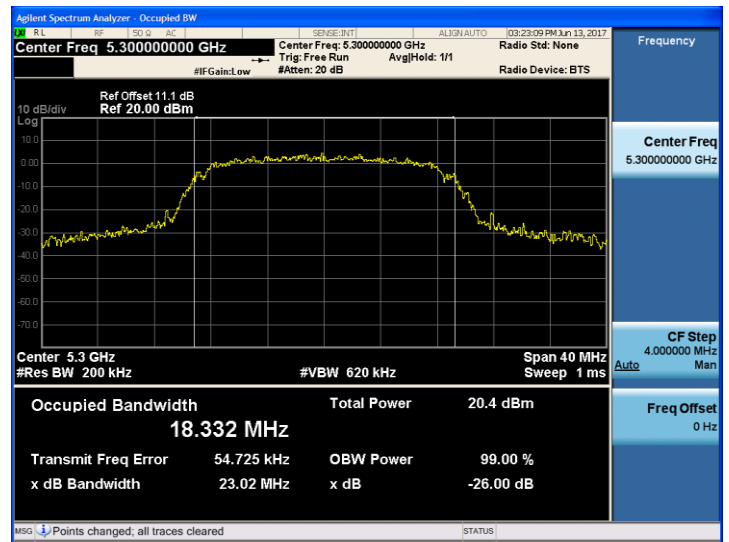
802.11a Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	22.55	N/A	Pass
5785	157	22.83	N/A	Pass
5825	165	23.34	N/A	Pass

■ TEST Plot for 802.11a

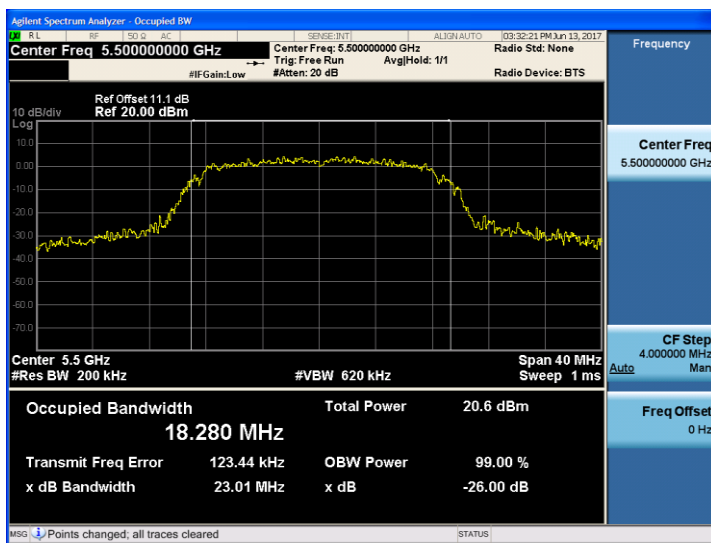
802.11a UNII 1 BAND 26dB Bandwidth (CH 36)



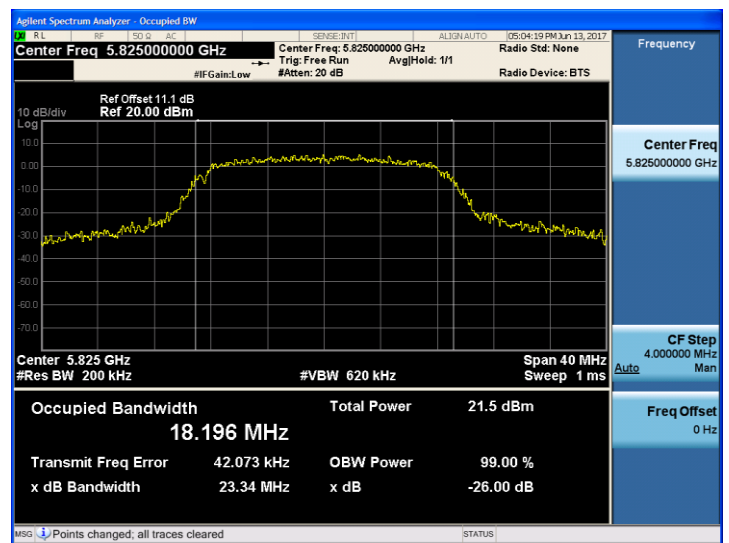
802.11a UNII 2A BAND 26dB Bandwidth (CH 60)



802.11a UNII 2C BAND 26dB Bandwidth (CH 100)



802.11a UNII 3 BAND 26dB Bandwidth (CH 165)



Note : In order to simplify the report, attached plots were only the most wide channel.

■ TEST RESULTS for 802.11n_HT20

Conducted 26 dB Bandwidth Measurements for 802.11n_HT20

802.11n_HT20 Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5180	36	22.32	N/A	Pass
5200	40	22.44	N/A	Pass
5240	48	23.29	N/A	Pass

Conducted 26 dB Bandwidth Measurements for 802.11n_HT20

802.11n_HT20 Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5260	52	23.70	N/A	Pass
5300	60	23.69	N/A	Pass
5320	64	21.80	N/A	Pass

Conducted 26 dB Bandwidth Measurements for 802.11n_HT20

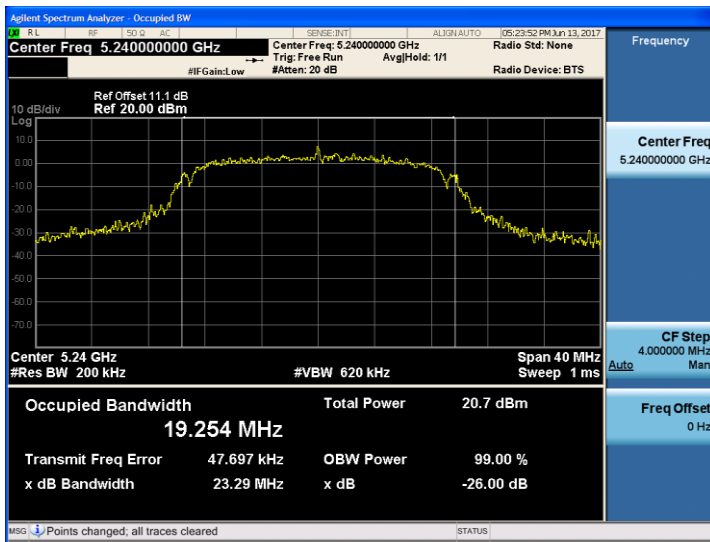
802.11n_HT20 Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5500	100	23.92	N/A	Pass
5600	120	24.34	N/A	Pass
5720	144	22.95	N/A	Pass

Conducted 26 dB Bandwidth Measurements for 802.11n_HT20

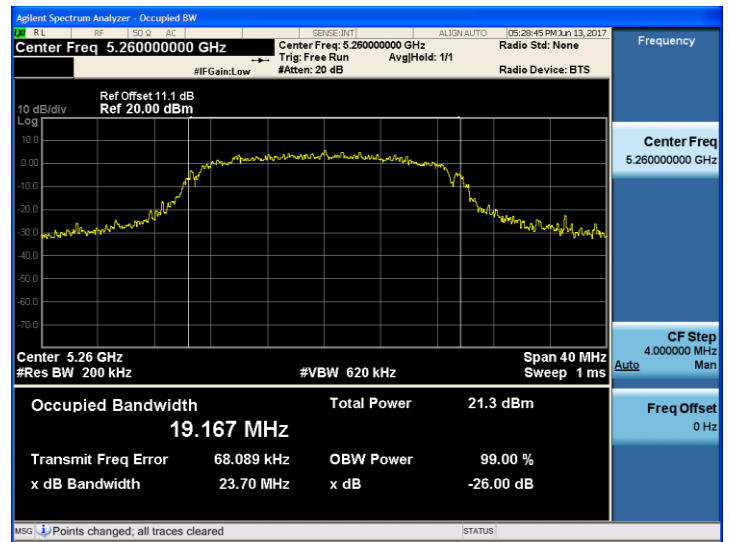
802.11n_HT20 Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	23.59	N/A	Pass
5785	157	23.24	N/A	Pass
5825	165	23.09	N/A	Pass

■ TEST Plot for 802.11n_HT20

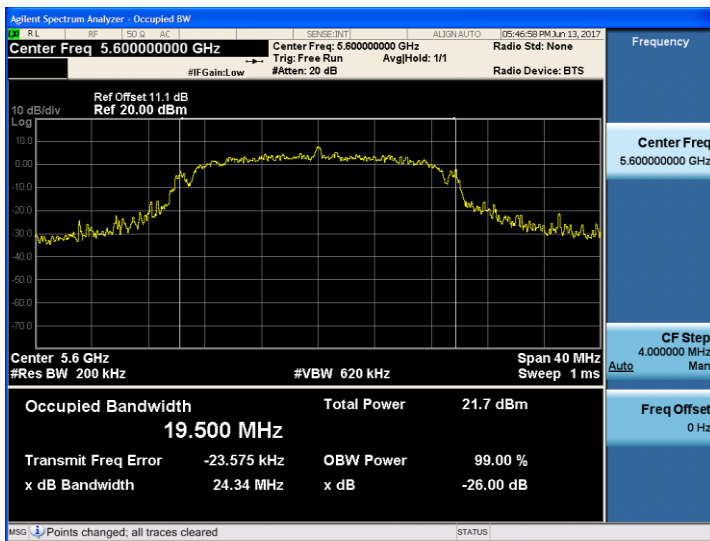
802.11n_HT20 UNII 1 BAND 26dB Bandwidth(CH 48)



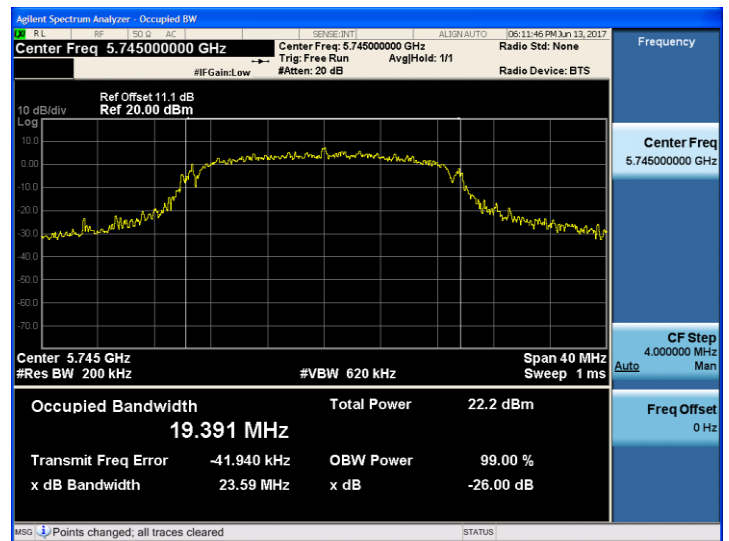
802.11n_HT20 UNII 2A BAND 26dB Bandwidth(CH 52)



802.11n_HT20 UNII 2C BAND 26dB Bandwidth(CH 120)



802.11n_HT20 UNII 3 BAND 26dB Bandwidth(CH 149)



Note : In order to simplify the report, attached plots were only the most wide channel.

■ TEST RESULTS for 802.11n_HT40

Conducted 26 dB Bandwidth Measurements for 802.11n_HT40

802.11n_HT40 Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5190	38	49.43	N/A	Pass
5230	46	49.56	N/A	Pass

Conducted 26 dB Bandwidth Measurements for 802.11n_HT40

802.11n_HT40 Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5270	54	47.50	N/A	Pass
5310	62	49.58	N/A	Pass

Conducted 26 dB Bandwidth Measurements for 802.11n_HT40

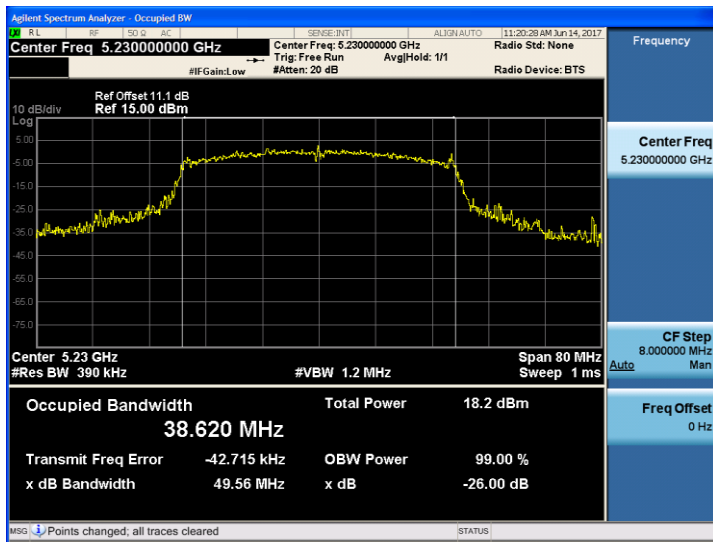
802.11n_HT40 Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5510	102	53.84	N/A	Pass
5590	118	66.76	N/A	Pass
5710	142	52.74	N/A	Pass

Conducted 26 dB Bandwidth Measurements for 802.11n_HT40

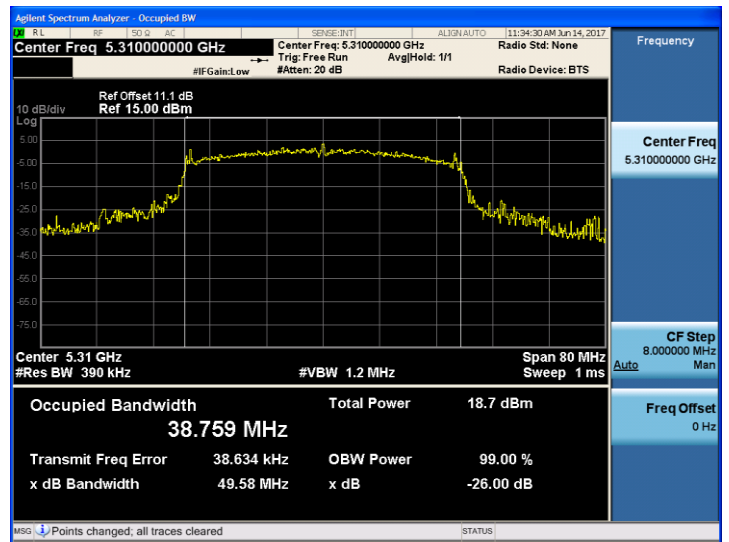
802.11n_HT40 Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5755	151	60.81	N/A	Pass
5795	159	52.63	N/A	Pass

■ TEST Plot for 802.11n_HT40

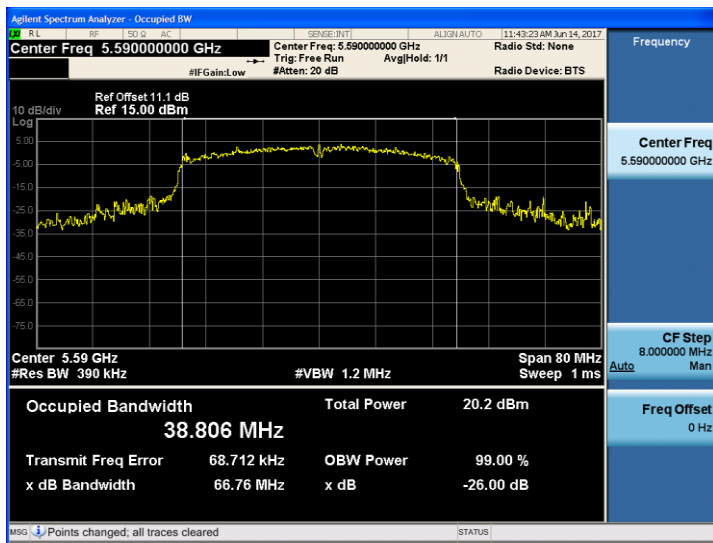
802.11n_HT40 UNII 1 BAND 26dB Bandwidth(CH 46)



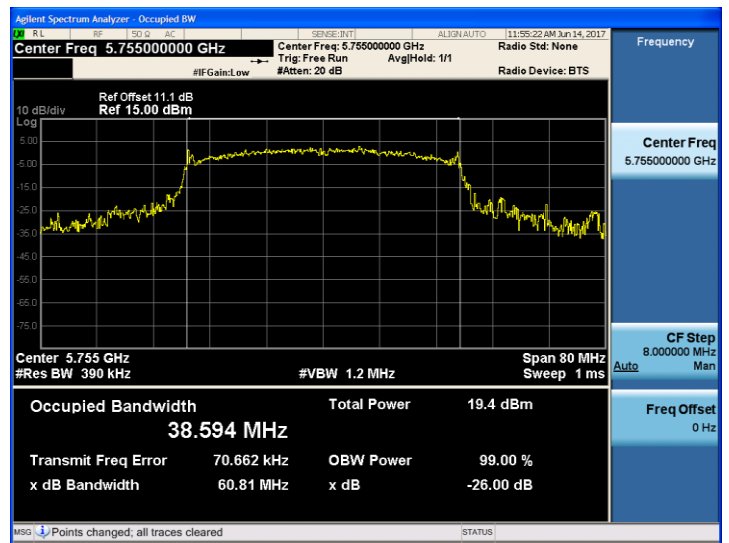
802.11n_HT40 UNII 2A BAND 26dB Bandwidth (CH 62)



802.11n_HT40 UNII 2C BAND 26dB Bandwidth(CH 118)



802.11n_HT40 UNII 3 BAND 26dB Bandwidth (CH 151)



Note : In order to simplify the report, attached plots were only the most wide channel.

TEST RESULTS for 802.11a/n_HT20

Conducted 6 dB Bandwidth Measurements for 802.11a

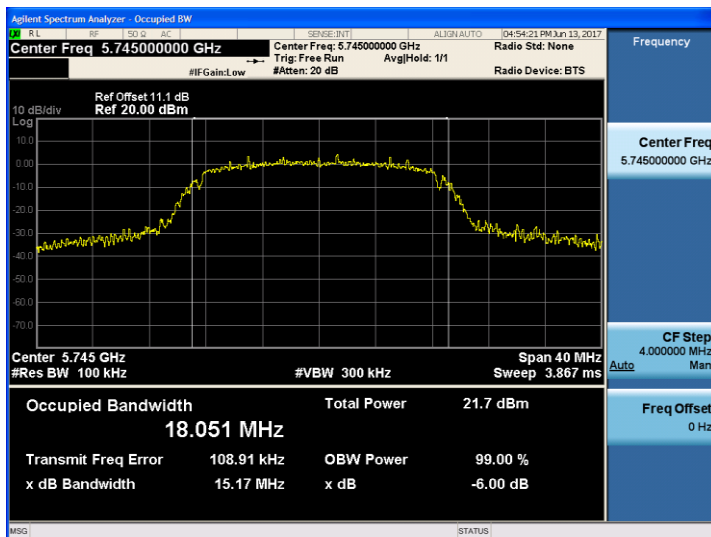
802.11a Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	15.17	0.5	Pass
5785	157	15.17	0.5	Pass
5825	165	15.04	0.5	Pass

Conducted 6 dB Bandwidth Measurements for 802.11n_HT20

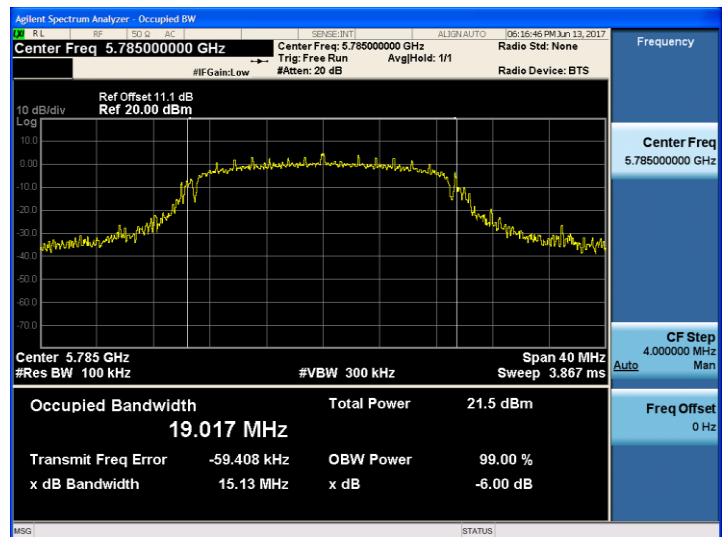
802.11n_HT20 Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5745	149	14.99	0.5	Pass
5785	157	15.13	0.5	Pass
5825	165	15.06	0.5	Pass

TEST Plot for 802.11a/n_HT20

802.11a UNII 3 BAND 6dB Bandwidth (CH.149)



802.11n_HT20 UNII 3 BAND 6dB Bandwidth(CH.157)



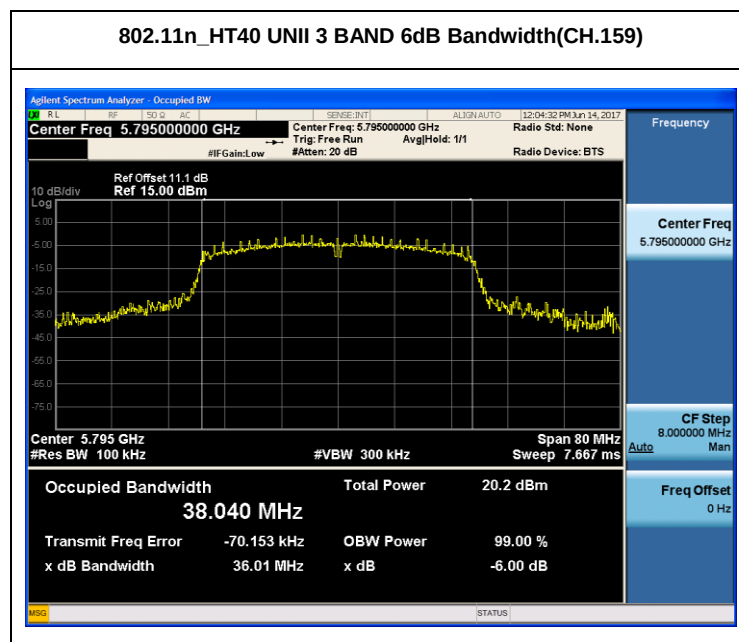
Note : In order to simplify the report, attached plots were only the most wide channel.

TEST RESULTS for 802.11n_HT40

Conducted 6 dB Bandwidth Measurements for 802.11n_HT40

802.11n_HT40 Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5755	151	35.99	0.5	Pass
5795	159	36.01	0.5	Pass

TEST Plot for 802.11n_HT40



Note : In order to simplify the report, attached plots were only the most wide channel.

Straddle channels TEST RESULTS

Conducted Bandwidth Measurements for 802.11a/n_HT20 (UNII 2C Band)

Mode	Frequency [MHz]	Channel No.	Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
802.11a	5720	144	15.44	N/A	Pass
802.11n			15.72	N/A	Pass

Conducted Bandwidth Measurements for 802.11a/n (UNII 3 Band)

Mode	Frequency [MHz]	Channel No.	Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
802.11a	5720	144	5.72	N/A	Pass
802.11n			6.04	N/A	Pass

Straddle channels TEST Plot for 802.11a/n_HT20/

802.11a CH.144 Bandwidth



802.11n_HT20 CH.144 Bandwidth



Straddle channels TEST RESULTS

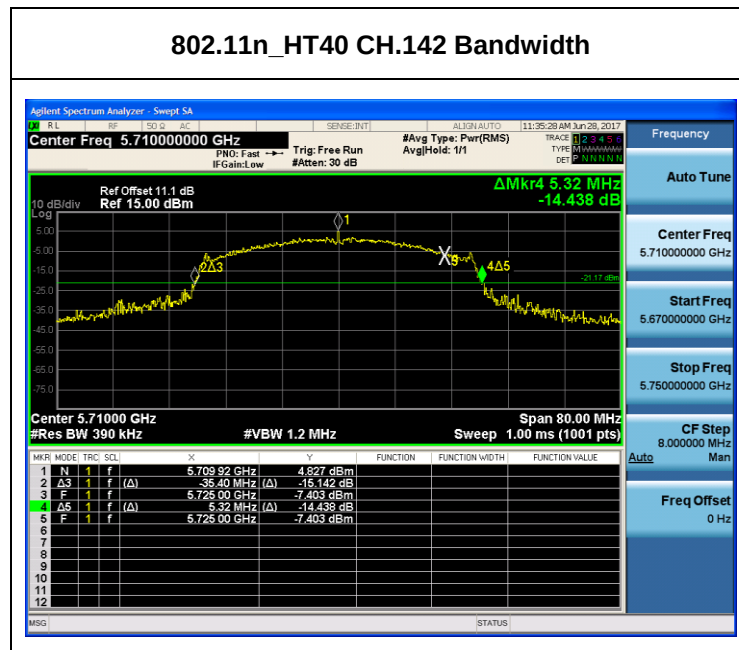
Conducted Bandwidth Measurements for 802.11n_HT40 (UNII 2C Band)

Mode	Frequency [MHz]	Channel No.	Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
802.11n	5710	142	35.40	N/A	Pass

Conducted Bandwidth Measurements for 802.11n_HT40 (UNII 3 Band)

Mode	Frequency [MHz]	Channel No.	Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
802.11n	5710	142	5.32	N/A	Pass

Straddle channels TEST Plot for 802.11n_HT40



9.3 OUTPUT POWER MEASUREMENT

Test Requirements and limit, §15.407(a)(1)

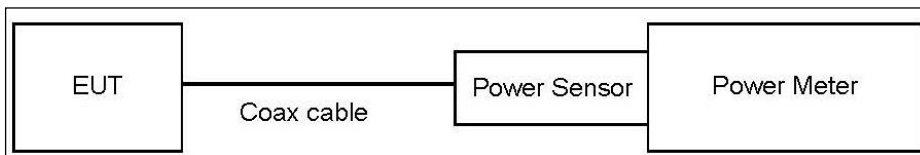
A transmitter antenna terminal of EUT is connected to the input of a Power meter or Spectrum Analyzer .Measurement is made while the EUT is operating in transmission mode at the appropriate frequencies.

■ Limit

Band	Mode	Limit (dBm)
UNII 1, 2A, 2C	802.11a,n	23.98
UNII 3	802.11a,n	30.00

Note : According to KDB644545 D03 v01, the limit on maximum conducted output power in each U-NII band for straddle channel is computed based on the portion of the emission bandwidth contained within that band.

■ TEST CONFIGURATION(20 MHz BW)



■ TEST PROCEDURE(20 MHz BW)

- Average Power (Procedure E.3.a in KDB 789033 D02 v01r04).
 1. Measure the duty cycle.
 2. Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.
 3. Add $10 \log (1/x)$, where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times.

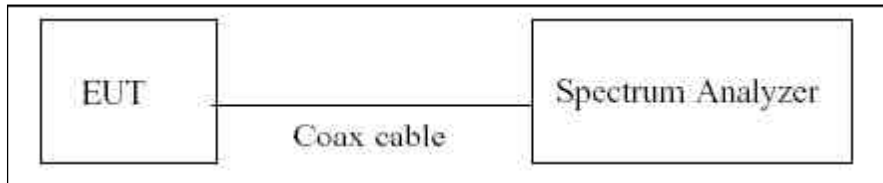
Note :

1. Actual value of loss for the attenuator and cable combination is below table.

Band	Loss(dB)
UNII 1, 2A, 2C, 3	12.1

(Actual value of loss for the attenuator and cable combination)

■ TEST CONFIGURATION(40 MHz BW)



■ TEST PROCEDURE(40 MHz BW)

▪ Average Power

The transmitter output is connected to the Spectrum Analyzer. We use the spectrum analyzer's integrated band power measurement function. We tested according to Method SA-2 in KDB 789033 D02 v01r04.

The Spectrum Analyzer is set to

1. Measure the duty cycle.
2. Set span to encompass the 26 dB EBW of the signal.
3. RBW = 1 MHz.
4. VBW $\geq$ 3 MHz.
5. Number of points in sweep $\geq 2 \times \text{span} / \text{RBW}$.
6. Sweep time = auto.
7. Detector = RMS.
8. Do not use sweep triggering. Allow the sweep to "free run".
9. Trace average at least 100 traces in power averaging(RMS) mode
10. Integrated bandwidth = OBW
11. Add $10\log(1/x)$, where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times.

■ Sample Calculation (Conducted)

Output Power = Reading Value + ATT loss + Cable loss(1 ea) + Duty Cycle Factor

Note: 1. Spectrum reading values are not plot data. The power results in plot is already including the actual values of loss for the attenuator and cable combination.

2. Spectrum offset = Attenuator loss + Cable loss

3. Actual value of loss for the attenuator and cable combination is below table.

Band	Loss(dB)
UNII 1, 2A, 2C, 3	12.1

(Actual value of loss for the attenuator and cable combination)

802.11a (UNII 1)

■ TEST RESULTS

Conducted Output Power Measurements (802.11a Mode: 5180~5240)

802.11a Mode		Rate (Mbps)	Measured Power (dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
5180	36	6	14.14	0.10	14.24	23.98
		9	13.58	0.16	13.74	23.98
		12	13.76	0.21	13.97	23.98
		18	13.87	0.30	14.17	23.98
		24	13.45	0.40	13.85	23.98
		36	13.38	0.55	13.93	23.98
		48	11.61	0.72	12.33	23.98
		54	11.55	0.76	12.31	23.98
5200	40	6	13.87	0.10	13.97	23.98
		9	13.82	0.16	13.98	23.98
		12	13.79	0.21	13.99	23.98
		18	13.40	0.30	13.70	23.98
		24	13.43	0.40	13.83	23.98
		36	13.15	0.55	13.70	23.98
		48	11.53	0.72	12.25	23.98
		54	11.40	0.76	12.16	23.98
5240	48	6	14.05	0.10	14.15	23.98
		9	14.06	0.16	14.21	23.98
		12	13.50	0.21	13.70	23.98
		18	14.14	0.30	14.44	23.98
		24	13.63	0.40	14.03	23.98
		36	13.44	0.55	13.99	23.98
		48	12.06	0.72	12.78	23.98
		54	11.83	0.76	12.60	23.98

802.11a (UNII 2A)

■ TEST RESULTS

Conducted Output Power Measurements (802.11a Mode: 5260~5320)

802.11a Mode		Rate (Mbps)	Measured Power (dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
5260	52	6	14.24	0.10	14.34	23.98
		9	13.51	0.16	13.67	23.98
		12	13.90	0.21	14.11	23.98
		18	13.72	0.30	14.02	23.98
		24	13.56	0.40	13.96	23.98
		36	13.57	0.55	14.12	23.98
		48	11.67	0.72	12.38	23.98
		54	11.86	0.76	12.62	23.98
5300	60	6	13.69	0.10	13.79	23.98
		9	13.55	0.16	13.70	23.98
		12	13.49	0.21	13.70	23.98
		18	13.89	0.30	14.19	23.98
		24	13.44	0.40	13.84	23.98
		36	13.02	0.55	13.57	23.98
		48	11.68	0.72	12.40	23.98
		54	11.68	0.76	12.45	23.98
5320	64	6	13.74	0.10	13.85	23.98
		9	13.38	0.16	13.54	23.98
		12	13.63	0.21	13.84	23.98
		18	13.60	0.30	13.90	23.98
		24	12.91	0.40	13.31	23.98
		36	13.11	0.55	13.66	23.98
		48	11.25	0.72	11.97	23.98
		54	11.34	0.76	12.10	23.98

802.11a (UNII 2C)

■ TEST RESULTS

Conducted Output Power Measurements (802.11a Mode: 5500~5720)

802.11a Mode		Rate (Mbps)	Measured Power (dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
5500	100	6	13.87	0.10	13.97	23.98
		9	13.69	0.16	13.85	23.98
		12	13.78	0.21	13.99	23.98
		18	14.10	0.30	14.40	23.98
		24	13.85	0.40	14.25	23.98
		36	13.50	0.55	14.05	23.98
		48	11.66	0.72	12.38	23.98
		54	11.40	0.76	12.16	23.98
5600	120	6	14.40	0.10	14.50	23.98
		9	14.57	0.16	14.72	23.98
		12	14.49	0.21	14.69	23.98
		18	14.34	0.30	14.64	23.98
		24	14.35	0.40	14.75	23.98
		36	13.72	0.55	14.27	23.98
		48	11.74	0.72	12.46	23.98
		54	12.48	0.76	13.25	23.98
5720	144	6	15.17	0.10	15.27	23.98
		9	14.94	0.16	15.09	23.98
		12	15.18	0.21	15.39	23.98
		18	15.03	0.30	15.33	23.98
		24	14.71	0.40	15.11	23.98
		36	14.54	0.55	15.09	23.98
		48	12.88	0.72	13.59	23.98
		54	12.62	0.76	13.38	23.98

802.11a (UNII 3)

■ TEST RESULTS

Conducted Output Power Measurements (802.11a Mode: 5745~5825)

802.11a Mode		Rate (Mbps)	Measured Power (dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
5745	149	6	15.00	0.10	15.10	30
		9	15.21	0.16	15.36	30
		12	14.98	0.21	15.19	30
		18	15.31	0.30	15.61	30
		24	14.87	0.40	15.27	30
		36	14.81	0.55	15.36	30
		48	12.90	0.72	13.62	30
		54	12.86	0.76	13.63	30
5785	157	6	14.72	0.10	14.82	30
		9	14.50	0.16	14.65	30
		12	14.80	0.21	15.00	30
		18	14.03	0.30	14.33	30
		24	14.32	0.40	14.72	30
		36	14.58	0.55	15.13	30
		48	13.01	0.72	13.72	30
		54	12.57	0.76	13.33	30
5825	165	6	14.72	0.10	14.82	30
		9	15.15	0.16	15.31	30
		12	14.88	0.21	15.09	30
		18	14.79	0.30	15.09	30
		24	14.46	0.40	14.86	30
		36	14.24	0.55	14.79	30
		48	12.55	0.72	13.26	30
		54	12.52	0.76	13.29	30

802.11n_HT20 (UNII 1)

■ TEST RESULTS

Conducted Output Power Measurements (802.11n_HT20 Mode: 5180~5240)

802.11n_HT20 Mode		MCS Index	Measured Power (dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
5180	36	0	13.40	0.12	13.52	23.98
		1	13.65	0.23	13.88	23.98
		2	13.28	0.32	13.60	23.98
		3	13.60	0.41	14.01	23.98
		4	13.42	0.55	13.97	23.98
		5	11.38	0.69	12.07	23.98
		6	10.71	0.75	11.46	23.98
		7	11.39	0.81	12.21	23.98
5200	40	0	13.79	0.12	13.90	23.98
		1	13.44	0.23	13.67	23.98
		2	13.18	0.32	13.50	23.98
		3	13.25	0.41	13.67	23.98
		4	13.34	0.55	13.88	23.98
		5	11.68	0.69	12.37	23.98
		6	11.51	0.75	12.26	23.98
		7	11.37	0.81	12.19	23.98
5240	48	0	13.86	0.12	13.98	23.98
		1	13.58	0.23	13.81	23.98
		2	14.06	0.32	14.38	23.98
		3	13.92	0.41	14.33	23.98
		4	13.43	0.55	13.98	23.98
		5	12.10	0.69	12.80	23.98
		6	11.90	0.75	12.65	23.98
		7	11.87	0.81	12.69	23.98

802.11n_HT20 (UNII 2A)

■ TEST RESULTS

Conducted Output Power Measurements (802.11n_HT20 Mode: 5260~5320)

802.11n_HT20 Mode		MCS Index	Measured Power (dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
5260	52	0	14.20	0.12	14.32	23.98
		1	13.14	0.23	13.37	23.98
		2	13.61	0.32	13.93	23.98
		3	13.89	0.41	14.31	23.98
		4	13.11	0.55	13.66	23.98
		5	11.92	0.69	12.61	23.98
		6	11.59	0.75	12.34	23.98
		7	11.70	0.81	12.51	23.98
5300	60	0	13.54	0.12	13.65	23.98
		1	13.82	0.23	14.04	23.98
		2	13.57	0.32	13.89	23.98
		3	13.38	0.41	13.79	23.98
		4	12.85	0.55	13.40	23.98
		5	11.43	0.69	12.13	23.98
		6	12.13	0.75	12.88	23.98
		7	11.32	0.81	12.13	23.98
5320	64	0	13.19	0.12	13.31	23.98
		1	13.36	0.23	13.59	23.98
		2	13.10	0.32	13.43	23.98
		3	13.30	0.41	13.72	23.98
		4	13.12	0.55	13.67	23.98
		5	11.41	0.69	12.10	23.98
		6	11.49	0.75	12.24	23.98
		7	11.43	0.81	12.25	23.98

802.11n_HT20 (UNII 2C)

■ TEST RESULTS

Conducted Output Power Measurements (802.11n_HT20 Mode: 5500~5720)

802.11n_HT20 Mode		MCS Index	Measured Power (dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
5500	100	0	13.91	0.12	14.03	23.98
		1	13.81	0.23	14.04	23.98
		2	13.54	0.32	13.87	23.98
		3	13.23	0.41	13.64	23.98
		4	13.33	0.55	13.88	23.98
		5	11.59	0.69	12.29	23.98
		6	11.26	0.75	12.01	23.98
		7	11.69	0.81	12.51	23.98
5600	120	0	14.58	0.12	14.70	23.98
		1	14.18	0.23	14.41	23.98
		2	14.50	0.32	14.82	23.98
		3	14.33	0.41	14.74	23.98
		4	13.97	0.55	14.52	23.98
		5	11.91	0.69	12.61	23.98
		6	12.16	0.75	12.91	23.98
		7	12.25	0.81	13.06	23.98
5720	144	0	14.99	0.12	15.11	23.98
		1	14.93	0.23	15.15	23.98
		2	14.66	0.32	14.98	23.98
		3	14.72	0.41	15.13	23.98
		4	14.57	0.55	15.12	23.98
		5	12.90	0.69	13.60	23.98
		6	12.49	0.75	13.24	23.98
		7	12.80	0.81	13.62	23.98

802.11n_HT20 (UNII 3)

■ TEST RESULTS

Conducted Output Power Measurements (802.11n_HT20 Mode: 5745~5825)

802.11n_HT20 Mode		MCS Index	Measured Power (dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
5745	149	0	15.26	0.12	15.38	30
		1	14.79	0.23	15.01	30
		2	14.64	0.32	14.96	30
		3	14.57	0.41	14.98	30
		4	14.14	0.55	14.69	30
		5	12.91	0.69	13.60	30
		6	12.59	0.75	13.34	30
		7	12.74	0.81	13.56	30
5785	157	0	14.28	0.12	14.40	30
		1	14.35	0.23	14.58	30
		2	14.17	0.32	14.49	30
		3	13.94	0.41	14.35	30
		4	14.11	0.55	14.66	30
		5	12.93	0.69	13.62	30
		6	12.18	0.75	12.93	30
		7	12.52	0.81	13.34	30
5825	165	0	14.53	0.12	14.65	30
		1	14.61	0.23	14.84	30
		2	14.56	0.32	14.88	30
		3	14.33	0.41	14.74	30
		4	14.25	0.55	14.80	30
		5	12.89	0.69	13.59	30
		6	12.09	0.75	12.84	30
		7	12.60	0.81	13.42	30

802.11n_HT40 (UNII 1)
■ TEST RESULTS
Conducted Output Power Measurements (802.11n_HT40 Mode: 5190~5230)

802.11n_HT40 Mode		MCS Index	Measured Power (dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
5190	38	0	10.44	0.44	10.88	23.98
		1	9.81	0.69	10.50	23.98
		2	10.71	0.82	11.54	23.98
		3	9.67	1.16	10.83	23.98
		4	8.57	1.85	10.42	23.98
		5	6.69	2.24	8.93	23.98
		6	6.76	2.34	9.10	23.98
		7	7.70	2.09	9.79	23.98
5230	46	0	11.03	0.44	11.47	23.98
		1	9.10	0.69	9.79	23.98
		2	10.30	0.82	11.13	23.98
		3	9.29	1.16	10.45	23.98
		4	8.88	1.85	10.74	23.98
		5	7.31	2.24	9.54	23.98
		6	9.01	2.34	11.35	23.98
		7	8.52	2.09	10.61	23.98

802.11n_HT40 (UNII 2A)

■ TEST RESULTS

Conducted Output Power Measurements (802.11n_HT40 Mode: 5270~5310)

802.11n_HT40 Mode		MCS Index	Measured Power (dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
5270	54	0	9.45	0.44	9.89	23.98
		1	10.63	0.69	11.31	23.98
		2	9.94	0.82	10.76	23.98
		3	10.18	1.16	11.33	23.98
		4	9.25	1.85	11.11	23.98
		5	7.77	2.24	10.01	23.98
		6	7.35	2.34	9.69	23.98
		7	7.14	2.09	9.23	23.98
5310	62	0	9.67	0.44	10.11	23.98
		1	9.87	0.69	10.56	23.98
		2	9.68	0.82	10.51	23.98
		3	9.37	1.16	10.53	23.98
		4	8.98	1.85	10.83	23.98
		5	7.47	2.24	9.71	23.98
		6	6.72	2.34	9.06	23.98
		7	7.08	2.09	9.17	23.98

802.11n_HT40 (UNII 2C)

■ TEST RESULTS

Conducted Output Power Measurements (802.11n_HT40 Mode: 5510~5710)

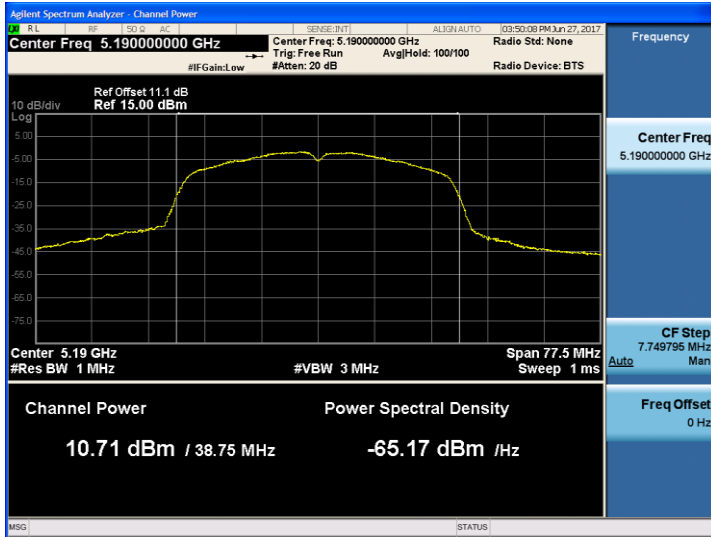
802.11n_HT40 Mode		MCS Index	Measured Power (dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
5510	102	0	11.32	0.44	11.76	23.98
		1	10.44	0.69	11.12	23.98
		2	11.07	0.82	11.90	23.98
		3	10.50	1.16	11.66	23.98
		4	8.13	1.85	9.98	23.98
		5	7.79	2.24	10.02	23.98
		6	7.86	2.34	10.20	23.98
		7	7.69	2.09	9.78	23.98
5590	118	0	10.96	0.44	11.40	23.98
		1	11.74	0.69	12.43	23.98
		2	11.20	0.82	12.03	23.98
		3	10.19	1.16	11.35	23.98
		4	10.61	1.85	12.46	23.98
		5	7.84	2.24	10.07	23.98
		6	8.02	2.34	10.36	23.98
		7	8.09	2.09	10.18	23.98
5710	142	0	10.67	0.44	11.11	23.98
		1	10.76	0.69	11.45	23.98
		2	10.18	0.82	11.01	23.98
		3	9.68	1.16	10.84	23.98
		4	11.09	1.85	12.95	23.98
		5	8.10	2.24	10.33	23.98
		6	8.15	2.34	10.49	23.98
		7	8.20	2.09	10.29	23.98

802.11n_HT40 (UNII 3)
■ TEST RESULTS
Conducted Output Power Measurements (802.11n_HT40 Mode: 5755~5795)

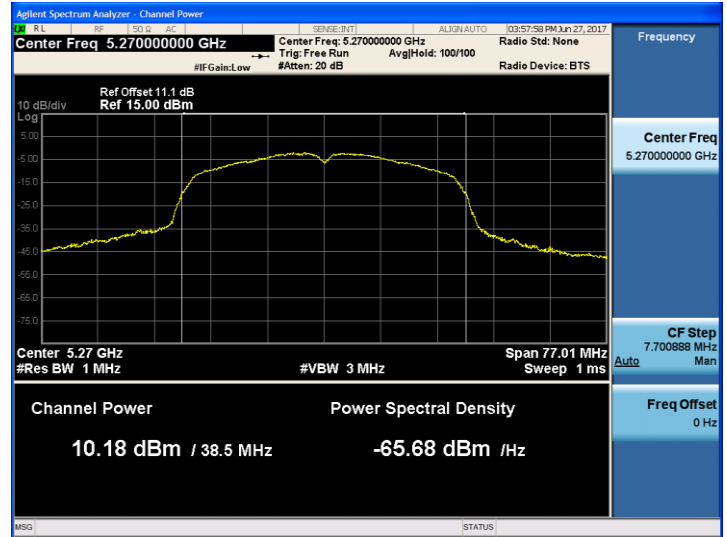
802.11n_HT40 Mode		MCS Index	Measured Power (dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
Frequency [MHz]	Channel No.					
5755	151	0	11.94	0.44	12.38	30
		1	10.77	0.69	11.45	30
		2	10.98	0.82	11.80	30
		3	11.49	1.16	12.64	30
		4	11.37	1.85	13.22	30
		5	7.52	2.24	9.76	30
		6	8.93	2.34	11.27	30
		7	8.82	2.09	10.91	30
5795	159	0	11.83	0.44	12.27	30
		1	12.06	0.69	12.75	30
		2	11.37	0.82	12.19	30
		3	11.39	1.16	12.54	30
		4	11.71	1.85	13.57	30
		5	9.10	2.24	11.33	30
		6	8.17	2.34	10.51	30
		7	9.60	2.09	11.69	30

TEST Plot _802.11n_HT40

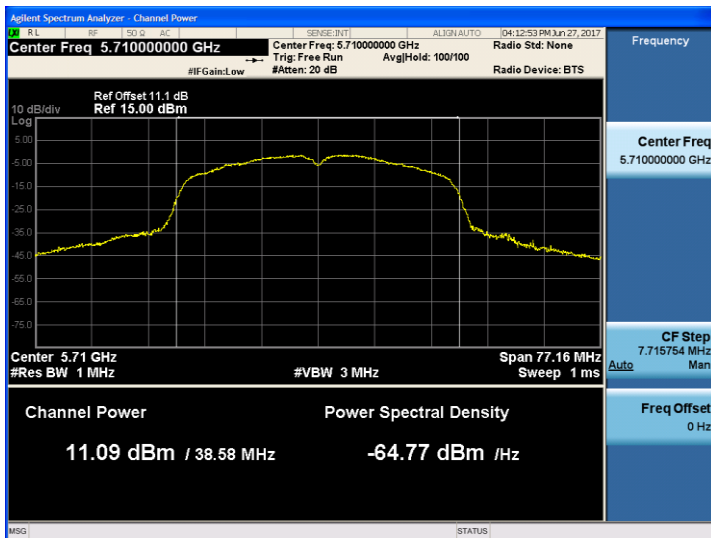
802.11n_HT40 UNII 1 BAND Average Power (5190 MHz ~5230 MHz) CH 38 MCS2



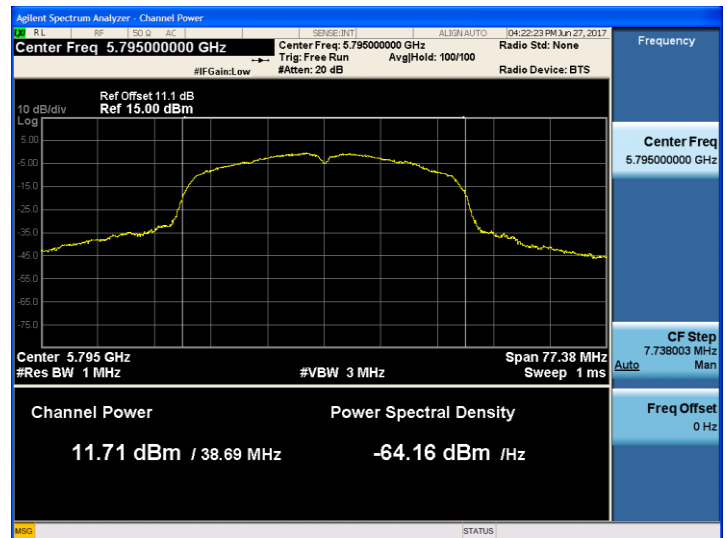
802.11n_HT40 UNII 2A BAND Average Power (5270 MHz ~5310 MHz) CH 54 MCS3



802.11n_HT40 UNII 2C BAND Average Power (5510 MHz ~5710 MHz) CH 142 MCS4



802.11n_HT40 UNII 3 BAND Average Power (5755 MHz ~5795 MHz) CH 159 MCS4



Straddle channels TEST RESULTS

Conducted Output Power Measurements (802.11a/n_HT20 Mode: UNII 2C Band 5720MHz)

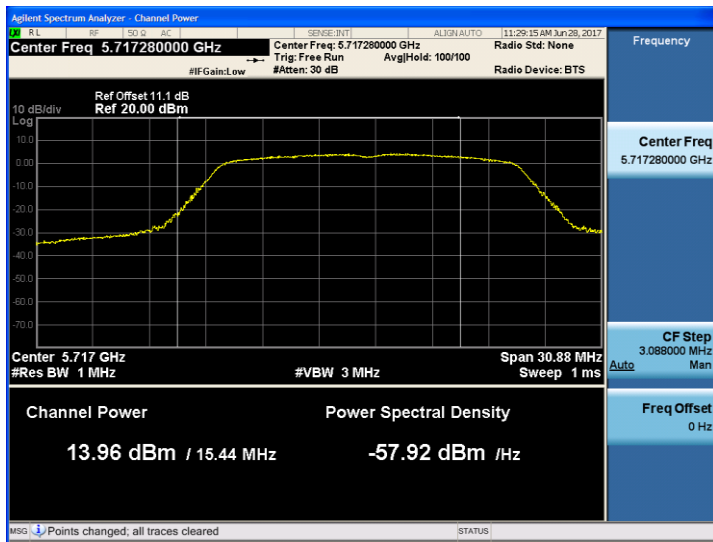
Mode	Frequency [MHz]	Channel No.	Measured Power (dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
802.11a	5720	144	13.96	0.207	14.17	22.61
802.11n			14.13	0.227	14.36	22.57

Conducted Output Power Measurements (802.11a/n_HT20 Mode: UNII 3 Band 5720MHz)

Mode	Frequency [MHz]	Channel No.	Measured Power (dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
802.11a	5720	144	6.44	0.207	6.65	24.32
802.11n			6.83	0.227	7.06	24.43

■ Straddle channels TEST Plot for 802.11a/n_HT20

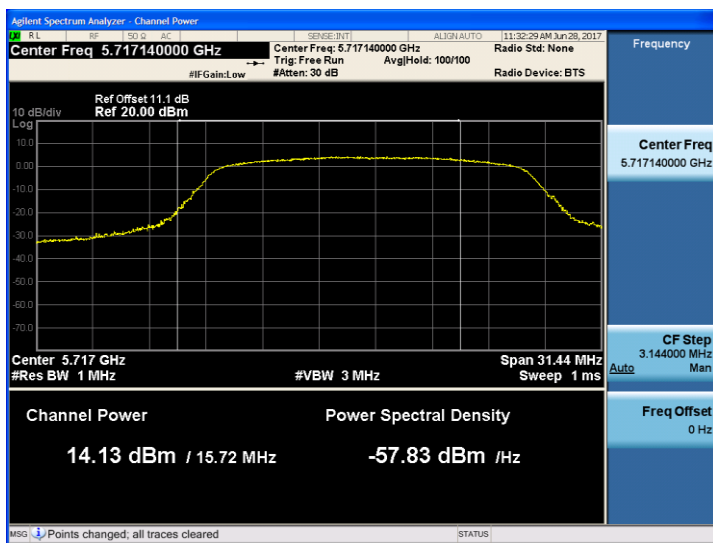
802.11a UNII 2C Band Average Power CH.144



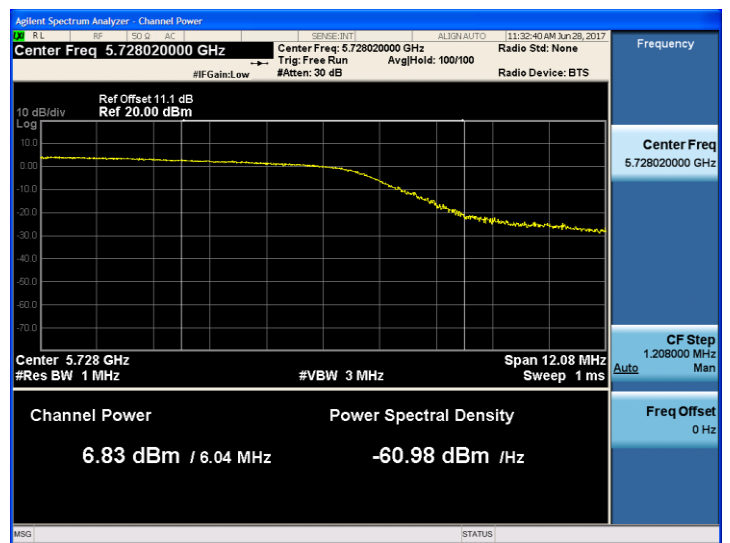
802.11a UNII 3 Band Average Power CH.144



802.11n_HT20 UNII 2C Band Average Power CH.144



802.11n_HT20 UNII 3 Band Average Power CH.144



Straddle channels TEST RESULTS

Conducted Output Power Measurements (802.11n_HT40 Mode: UNII 2C Band 5710MHz)

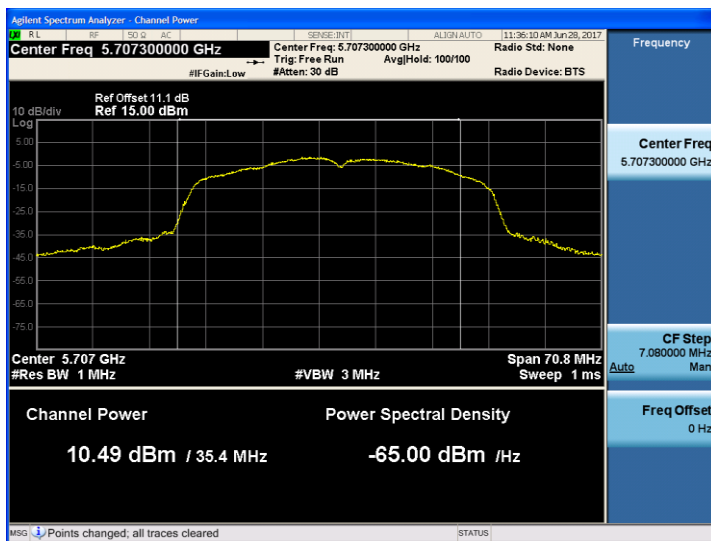
Mode	Frequency [MHz]	Channel No.	Measured Power (dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
802.11n	5710	142	10.49	1.852	12.34	23.37

Conducted Output Power Measurements (802.11n_HT40 Mode: UNII 3 Band 5710MHz)

Mode	Frequency [MHz]	Channel No.	Measured Power (dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor(dB)	Limit (dBm)
802.11n	5710	142	-5.50	1.852	-3.65	21.16

Straddle channels TEST Plot for 802.11n_HT40

802.11n_HT40 UNII 2C Band Average Power CH.142



802.11n_HT40 UNII 3 Band Average Power CH.142



9.4 POWER SPECTRAL DENSITY

The peak power 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 maximum permissible peak power spectral density is 11 dBm/ MHz for UNII 1,2A, 2C and 30 dBm/500 kHz for UNII 3.

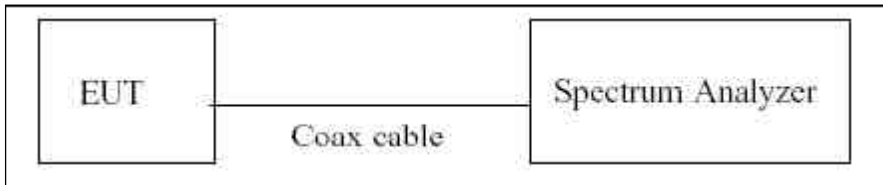
■ Limit

Power Spectral Density

Band	Mode	Limit
UNII 1	802.11a,n	11 dBm/MHz
UNII 2A	802.11a,n	11 dBm/MHz
UNII 2C	802.11a,n	11 dBm/MHz
UNII 3	802.11a,n	30 dBm/500 kHz

Note : Note : According to KDB644545 D03 v01, emission for straddle channels in each band shall comply with the PSD limits applicable to that band under the appropriate rule section.

■ TEST CONFIGURATION



■ TEST PROCEDURE

We tested according to Method in KDB 789033 D02 v01r04.

The spectrum analyzer is set to :

1. Set span to encompass the entire emission bandwidth(EBW) of the signal.
2. RBW = 1 MHz(510 kHz for UNII 3)
3. VBW $\geq$ 3 MHz
4. Number of points in sweep $\geq 2 \times \text{span} / \text{RBW}$.
5. Sweep time = auto.
6. Detector = RMS(i.e., power averaging), if available. Otherwise, use sample detector mode.
7. Do not use sweep triggering. Allow the sweep to “free run”.
8. Trace average at least 100 traces in power averaging(RMS) mode
9. Use the peak search function on the spectrum analyzer to find the peak of the spectrum.
10. If Method SA-2 was used, add $10 \log(1/x)$, where x is the duty cycle, to the peak of the spectrum.

■ Sample Calculation

PSD = Reading Value + ATT loss + Cable loss(1 ea) + Duty Cycle Factor

Output Power = 5 dBm + 10 dB + 0.8 dB + 0.21 dB = 16.01 dBm

Note :

1. Spectrum reading values are not plot data. The PSD results in plot is already including the actual values of loss for the attenuator and cable combination.
2. Spectrum offset = Attenuator loss + Cable loss
3. We apply to the offset in the 5.2 GHz, 5.3 GHz and 5.6 GHz range that was rounded off to the closest tenth dB. Actual value of loss for the attenuator and cable combination is below table.

Band	Loss(dB)
UNII 1, 2A , 2C, 3	12.1

(Actual value of loss for the attenuator and cable combination)

■ 802.11a

■ TEST RESULTS

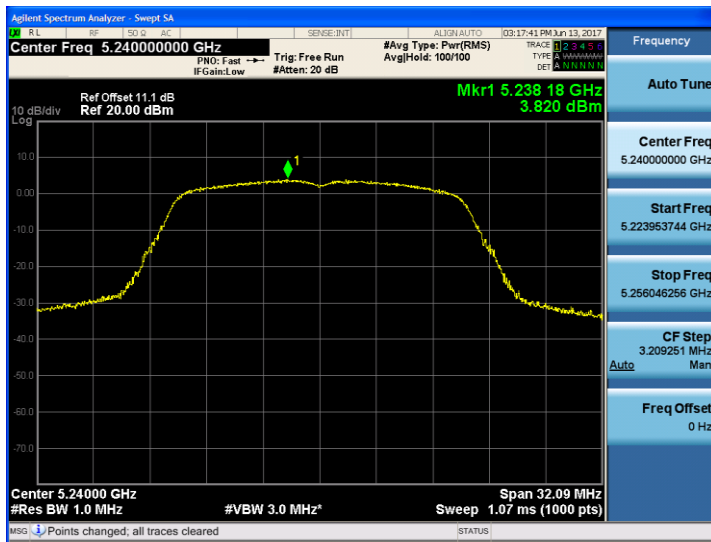
Conducted Power Density Measurements

Frequency (MHz)	Channel No.	Mode	Test Result				
			Measured Power Density (dBm)	Duty Cycle Factor (dB)	Measured Power Density(dBm) + Duty Cycle Factor	Limit (dBm)	Pass/Fail
5180	36	802.11a	3.537	0.101	3.638	11	Pass
5200	40		3.460	0.207	3.667		Pass
5240	48		3.820	0.300	4.120		Pass
5260	52		3.675	0.101	3.776	11	Pass
5300	60		3.667	0.300	3.967		Pass
5320	64		3.121	0.300	3.421		Pass
5500	100		3.393	0.300	3.693	11	Pass
5600	120		3.953	0.401	4.354		Pass
5720	144		4.547	0.207	4.754		Pass
5745	149		1.584	0.300	1.884	30	Pass
5785	157		0.331	0.549	0.880		Pass
5825	165		1.531	0.157	1.688		Pass

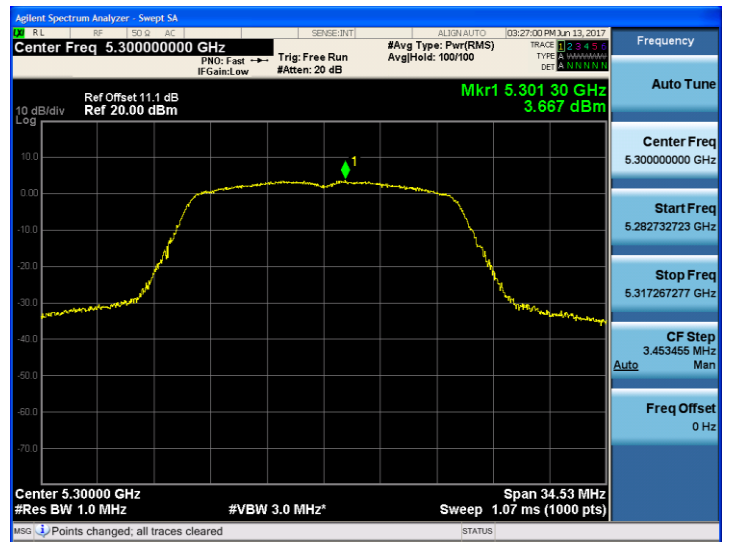
Note : Please refer to the straddle channels test results for the measurements of ch.144

■ TEST Plot for 802.11a

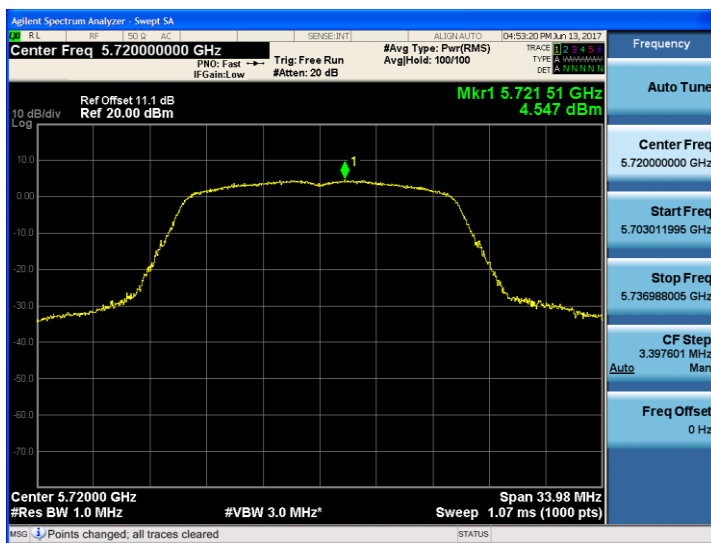
802.11a UNII 1 BAND PSD CH 48



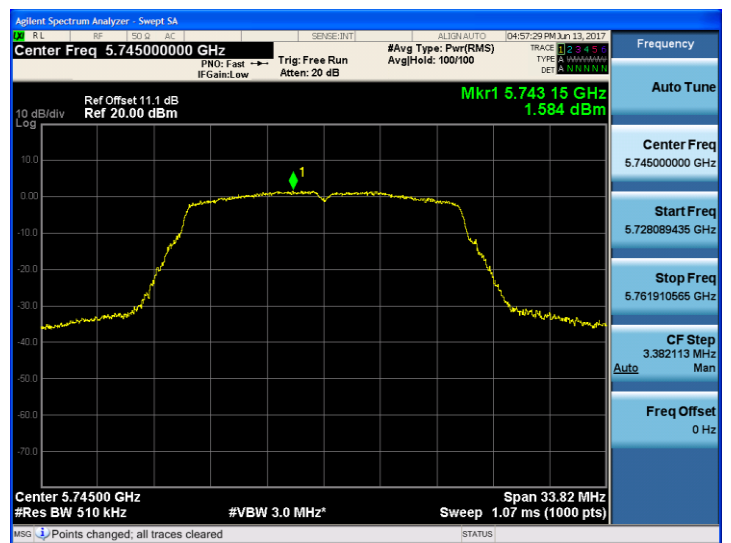
802.11a UNII 2A BAND PSD CH 60



802.11a UNII 2C BAND PSD CH 144



802.11a UNII 3 BAND PSD CH 149



802.11n_HT20

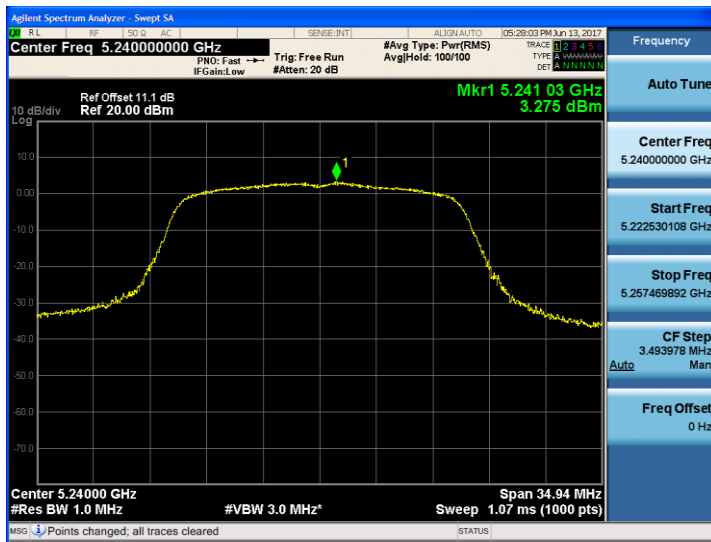
TEST RESULTS

Conducted Power Density Measurements

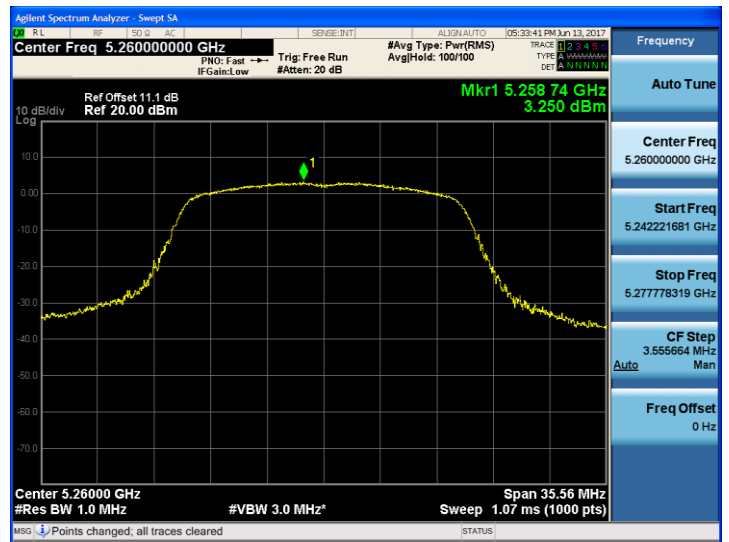
Frequency (MHz)	Channel No.	Mode	Test Result				
			Measured Power Density (dBm)	Duty Cycle Factor (dB)	Measured Power Density(dBm) + Duty Cycle Factor	Limit (dBm)	Pass/Fail
5180	36	802.11n _HT20	2.946	0.413	3.359	11	Pass
5200	40		2.702	0.118	2.820		Pass
5240	48		3.275	0.321	3.596		Pass
5260	52		3.250	0.118	3.368	11	Pass
5300	60		3.054	0.227	3.281		Pass
5320	64		2.622	0.413	3.035		Pass
5500	100		3.315	0.227	3.542	11	Pass
5600	120		3.929	0.321	4.250		Pass
5720	144		4.213	0.227	4.440		Pass
5745	149		1.628	0.118	1.746	30	Pass
5785	157		0.256	0.549	0.805		Pass
5825	165		1.325	0.321	1.646		Pass

■ TEST Plot for 802.11n_HT20

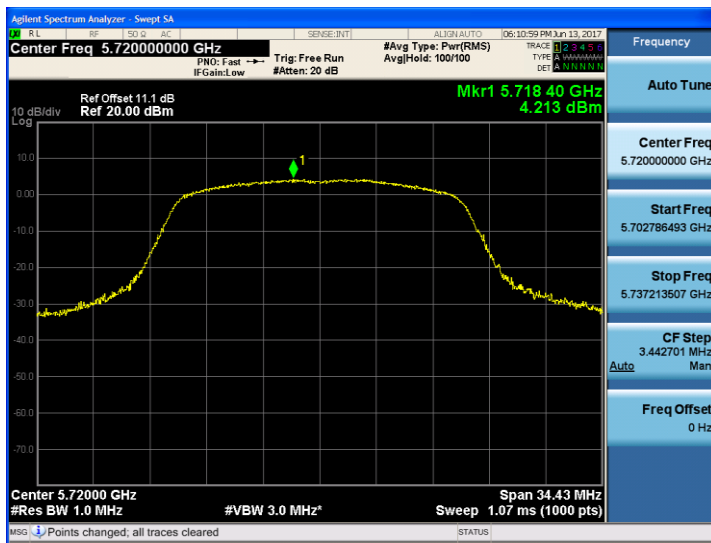
802.11n_HT20 UNII 1 BAND PSD CH 48



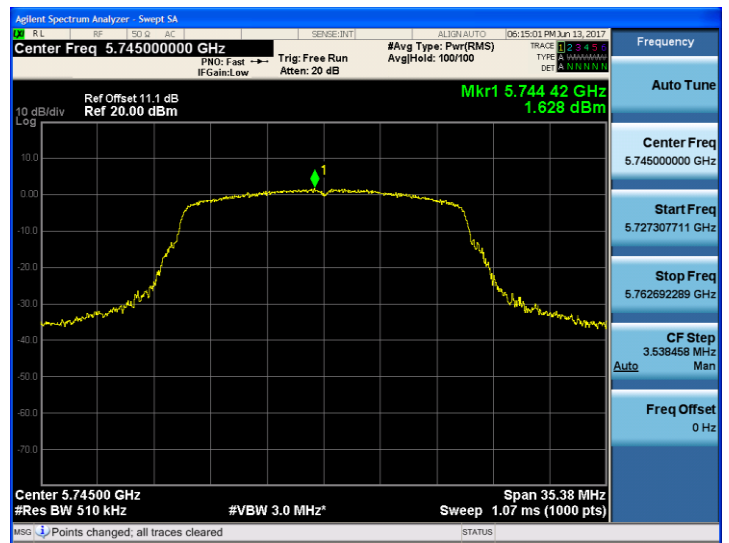
802.11n_HT20 UNII 2A BAND PSD CH 52



802.11n_HT20 UNII 2C BAND PSD CH 144



802.11n_HT20 UNII 3 BAND PSD CH 149



■ 802.11n_HT40

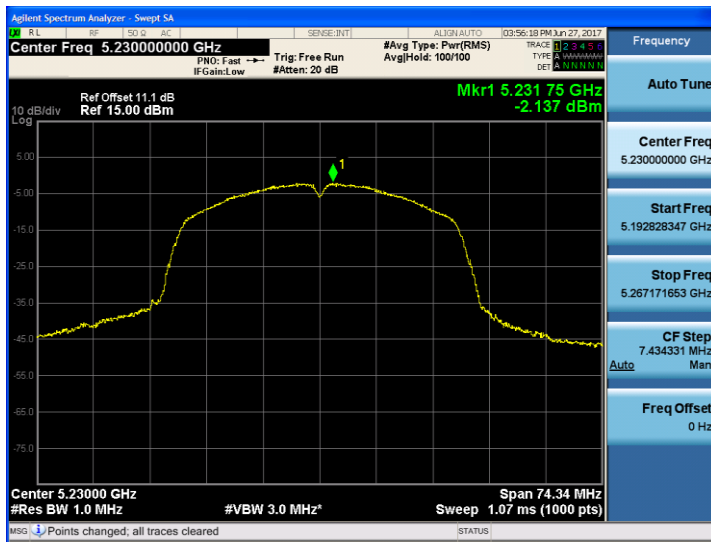
■ TEST RESULTS

Conducted Power Density Measurements

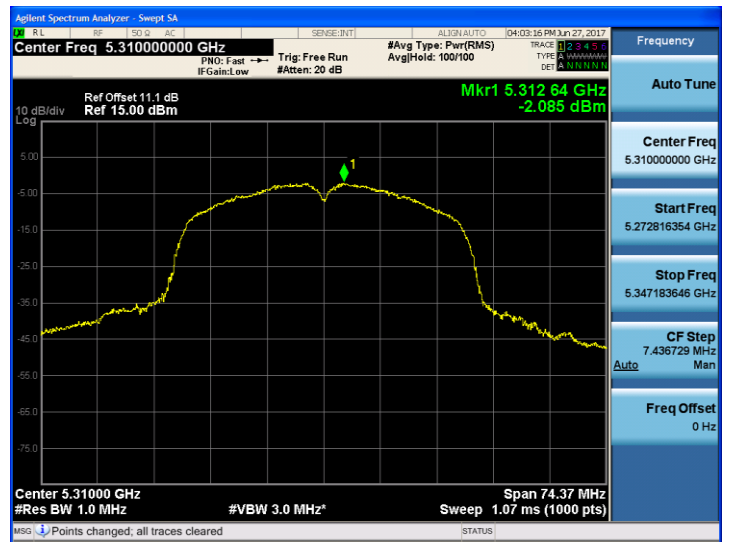
Frequency (MHz)	Channel No.	Mode	Test Result				
			Measured Power Density (dBm)	Duty Cycle Factor (dB)	Measured Power Density(dBm) + Duty Cycle Factor	Limit (dBm)	Pass/Fail
5190	38	802.11n _HT40	-2.941	0.823	-2.118	11	Pass
5230	46		-2.137	0.440	-1.697		Pass
5270	54		-3.055	1.156	-1.899	11	Pass
5310	62		-2.085	1.852	-0.233		Pass
5510	102		-3.131	0.823	-2.308	11	Pass
5590	118		-2.432	1.852	-0.580		Pass
5710	142		-1.859	1.852	-0.007		Pass
5755	151		-4.943	1.852	-3.091	30	Pass
5795	159		-3.504	1.852	-1.652		Pass

■ TEST Plot for 802.11n_HT40

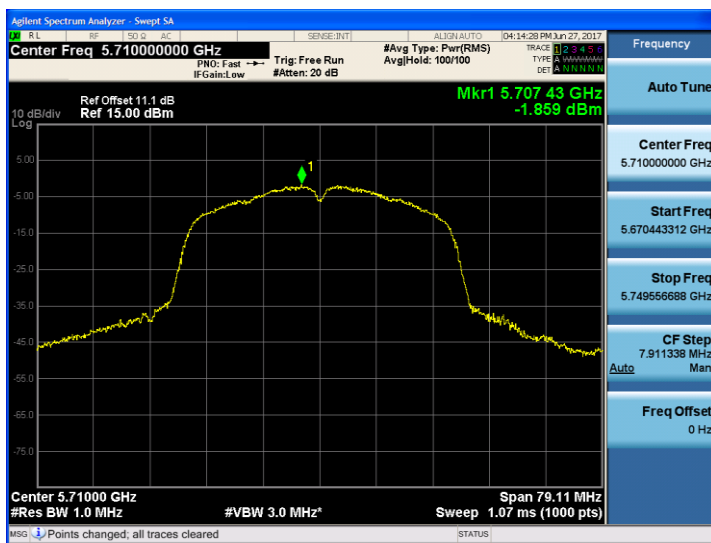
802.11n_HT40 UNII 1 BAND PSD CH 46



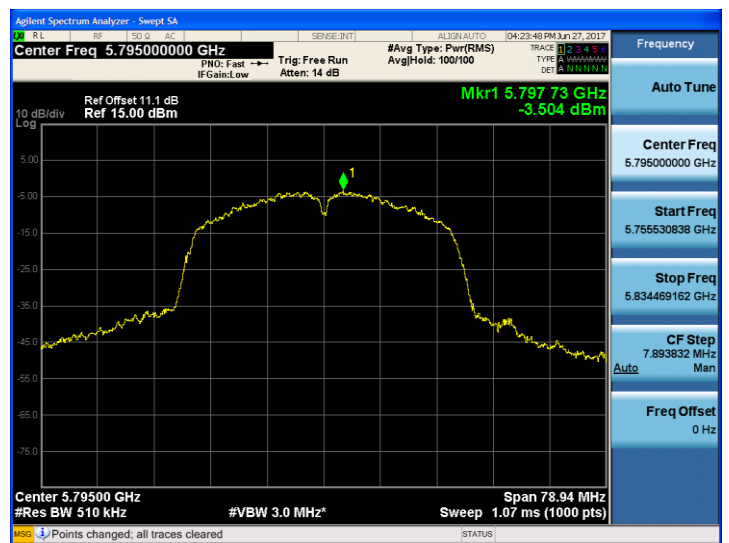
802.11n_HT40 UNII 2A BAND PSD CH 62



802.11n_HT40 UNII 2C BAND PSD CH 142



802.11n_HT40 UNII 3 BAND PSD CH 159



■ Straddle channels TEST RESULTS for 802.11a/n_HT20
Conducted Power Density Measurements (UNII 2C Band 5720MHz)

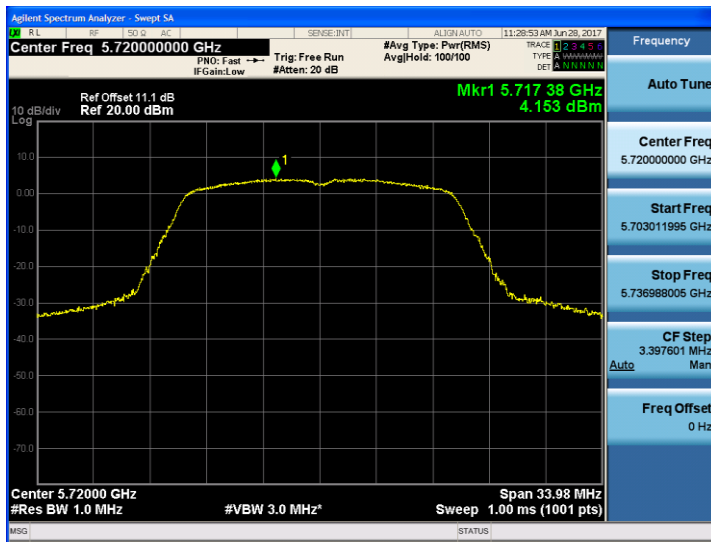
Frequency (MHz)	Channel No.	Mode	Test Result				
			Measured Power Density (dBm)	Duty Cycle Factor (dB)	Measured Power Density(dBm) + Duty Cycle Factor	Limit (dBm)	Pass/Fail
5720	144	802.11a	4.153	0.207	4.360	11	Pass
		802.11n	4.429	0.227	4.656	11	Pass

Conducted Power Density Measurements (UNII 3 Band 5720MHz)

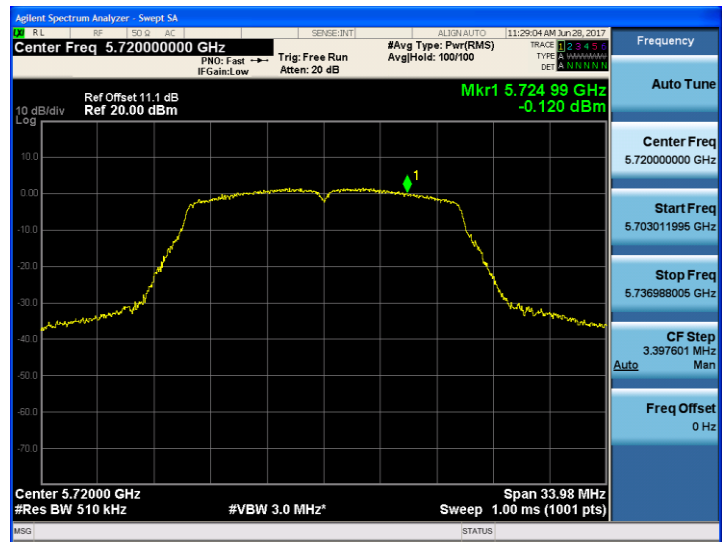
Frequency (MHz)	Channel No.	Mode	Test Result				
			Measured Power Density (dBm)	Duty Cycle Factor (dB)	Measured Power Density(dBm) + Duty Cycle Factor	Limit (dBm)	Pass/Fail
5720	144	802.11a	-0.120	0.207	0.087	30	Pass
		802.11n	0.029	0.227	0.256	30	Pass

■ Straddle channels TEST Plot for 802.11a/n_HT20

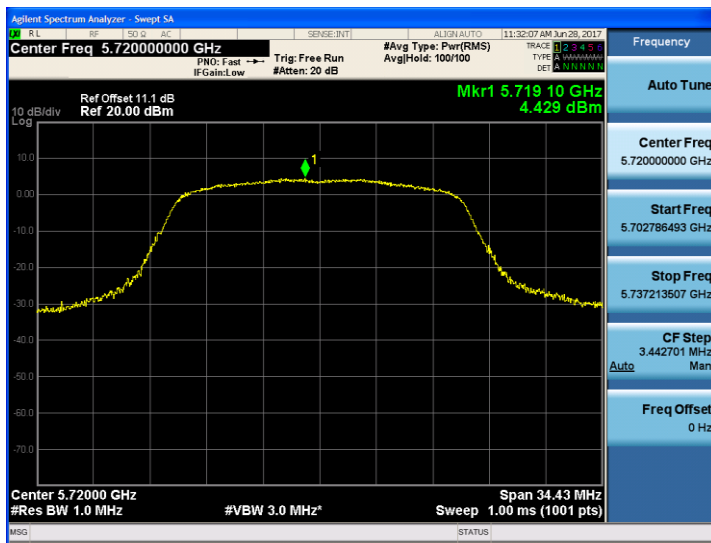
802.11a UNII 2C Band PSD CH.144



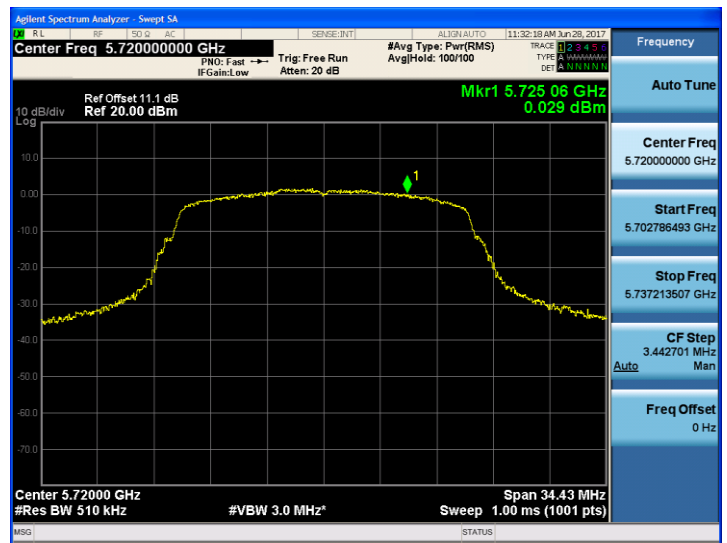
802.11a UNII 3 Band PSD CH.144



802.11n_HT20 UNII 2C Band PSD CH.144



802.11n_HT20 UNII 3 Band PSD CH.144



Straddle channels TEST RESULTS for 802.11n_HT40

Conducted Power Density Measurements (UNII 2C Band 5710MHz)

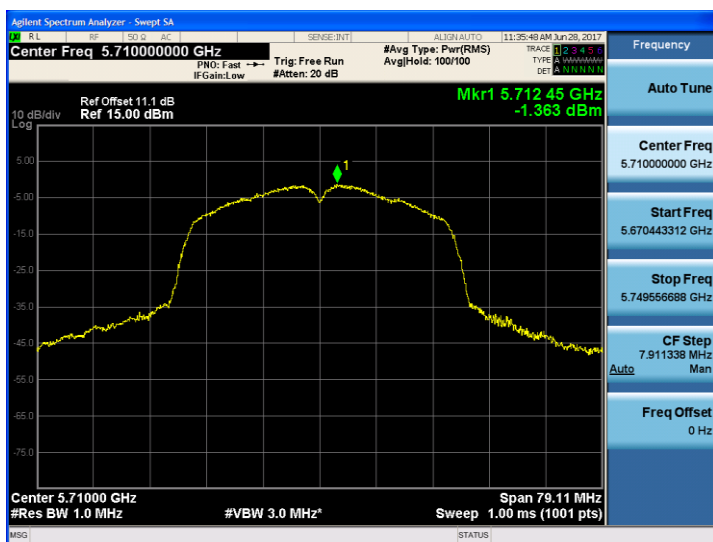
Frequency (MHz)	Channel No.	Mode	Test Result				
			Measured Power Density (dBm)	Duty Cycle Factor (dB)	Measured Power Density(dBm) + Duty Cycle Factor	Limit (dBm)	Pass/Fail
5710	142	802.11n	-1.363	1.852	0.489	11	Pass

Conducted Power Density Measurements (UNII 3 Band 5710MHz)

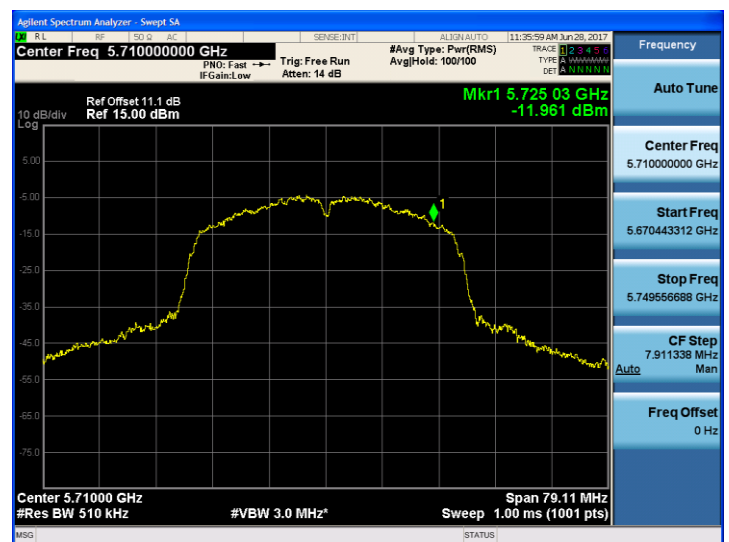
Frequency (MHz)	Channel No.	Mode	Test Result				
			Measured Power Density (dBm)	Duty Cycle Factor (dB)	Measured Power Density(dBm) + Duty Cycle Factor	Limit (dBm)	Pass/Fail
5710	142	802.11n	-11.961	1.852	-10.109	30	Pass

Straddle channels TEST Plot for 802.11n_HT40

A2.11n_HT40 UNII 2C Band PSD CH.142



802.11n_HT40 UNII 3 Band PSD CH.142



9.5 FREQUENCY STABILITY

The EUT was placed inside 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 temperature before each measurement. The center frequency of the transmitting channel was evaluated at each temperature and the frequency deviation from the channel's center frequency was recorded.

20 MHz BW

OPERATING BAND:	UNII Band 1
OPERATING FREQUENCY:	5,180,000,000 Hz
CHANNEL:	36
REFERENCE VOLTAGE:	3.85 VDC

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	3.85	+20(Ref)	5180045.10	45.1
100%		-30	5180014.60	14.6
100%		-20	5180021.90	21.9
100%		-10	5180027.30	27.3
100%		0	5180034.80	34.8
100%		+10	5180040.80	40.8
100%		+30	5180049.80	49.8
100%		+40	5180057.70	57.7
100%		+50	5180063.40	63.4
HIGH	3.465	+20	5180037.60	37.6
LOW	4.235	+20	5180032.00	32.0

Note:

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

OPERATING BAND: UNII Band 2A
OPERATING FREQUENCY: 5,260,000,000 Hz
CHANNEL: 52
REFERENCE VOLTAGE: 3.85 VDC

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	3.85	+20(Ref)	5260038.40	38.4
100%		-30	5260007.40	7.4
100%		-20	5260015.30	15.3
100%		-10	5260022.50	22.5
100%		0	5260028.10	28.1
100%		+10	5260032.20	32.2
100%		+30	5260044.80	44.8
100%		+40	5260050.90	50.9
100%		+50	5260055.20	55.2
HIGH	3.465	+20	5260032.80	32.8
LOW	4.235	+20	5260028.90	28.9

Note:

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

OPERATING BAND: UNII Band 2C
 OPERATING FREQUENCY: 5,500,000,000 Hz
 CHANNEL: 100
 REFERENCE VOLTAGE: 3.85 VDC

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	3.85	+20(Ref)	5500040.70	40.7
100%		-30	5500008.10	8.1
100%		-20	5500015.90	15.9
100%		-10	5500021.50	21.5
100%		0	5500026.80	26.8
100%		+10	5500034.40	34.4
100%		+30	5500048.60	48.6
100%		+40	5500052.70	52.7
100%		+50	5500057.40	57.4
HIGH	3.465	+20	5500035.40	35.4
LOW	4.235	+20	5500029.40	29.4

Note:

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

OPERATING BAND:	<u>UNII Band 3</u>
OPERATING FREQUENCY:	<u>5,745,000,000 Hz</u>
CHANNEL:	<u>149</u>
REFERENCE VOLTAGE:	<u>3.85 VDC</u>

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	3.85	+20(Ref)	5745046.20	46.2
100%		-30	5745020.90	20.9
100%		-20	5745025.50	25.5
100%		-10	5745030.20	30.2
100%		0	5745034.60	34.6
100%		+10	5745040.90	40.9
100%		+30	5745050.40	50.4
100%		+40	5745055.70	55.7
100%		+50	5745062.00	62.0
HIGH	3.465	+20	5745041.80	41.8
LOW	4.235	+20	5745034.40	34.4

Note:

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

40 MHz BW

OPERATING BAND:	UNII Band 1
OPERATING FREQUENCY:	5,190,000,000 Hz
CHANNEL:	38
REFERENCE VOLTAGE:	3.85 VDC

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	3.85	+20(Ref)	5190044.10	44.1
100%		-30	5190015.40	15.4
100%		-20	5190020.20	20.2
100%		-10	5190026.80	26.8
100%		0	5190034.30	34.3
100%		+10	5190039.60	39.6
100%		+30	5190050.80	50.8
100%		+40	5190055.00	55.0
100%		+50	5190062.60	62.6
HIGH	3.465	+20	5190036.60	36.6
LOW	4.235	+20	5190033.50	33.5

Note:

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

OPERATING BAND: UNII Band 2A
OPERATING FREQUENCY: 5,270,000,000 Hz
CHANNEL: 54
REFERENCE VOLTAGE: 3.85 VDC

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	3.85	+20(Ref)	5270042.80	42.8
100%		-30	5270009.00	9.0
100%		-20	5270017.00	17.0
100%		-10	5270024.20	24.2
100%		0	5270029.00	29.0
100%		+10	5270036.00	36.0
100%		+30	5270050.40	50.4
100%		+40	5270055.70	55.7
100%		+50	5270060.60	60.6
HIGH	3.465	+20	5270038.00	38.0
LOW	4.235	+20	5270031.80	31.8

Note:

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

OPERATING BAND:	UNII Band 2C
OPERATING FREQUENCY:	5,510,000,000 Hz
CHANNEL:	102
REFERENCE VOLTAGE:	3.85 VDC

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	3.85	+20(Ref)	5510047.80	47.8
100%		-30	5510019.00	19.0
100%		-20	5510025.60	25.6
100%		-10	5510030.70	30.7
100%		0	5510035.40	35.4
100%		+10	5510040.20	40.2
100%		+30	5510052.60	52.6
100%		+40	5510060.20	60.2
100%		+50	5510066.50	66.5
HIGH	3.465	+20	5510043.10	43.1
LOW	4.235	+20	5510035.50	35.5

Note:

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

OPERATING BAND:	<u>UNII Band 3</u>
OPERATING FREQUENCY:	<u>5,755,000,000 Hz</u>
CHANNEL:	<u>151</u>
REFERENCE VOLTAGE:	<u>3.85 VDC</u>

Voltage (%)	Power (VDC)	Temp. (°C)	Frequency (kHz)	Frequency Error (kHz)
100%	3.85	+20(Ref)	5755045.60	45.6
100%		-30	5755013.90	13.9
100%		-20	5755020.60	20.6
100%		-10	5755027.20	27.2
100%		0	5755033.50	33.5
100%		+10	5755041.30	41.3
100%		+30	5755050.40	50.4
100%		+40	5755056.00	56.0
100%		+50	5755063.70	63.7
HIGH	3.465	+20	5755039.30	39.3
LOW	4.235	+20	5755032.00	32.0

Note:

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

9.6 RADIATED MEASUREMENT

9.6.1 RADIATED SPURIOUS EMISSIONS.

Test Requirements and limit, §15.205, §15.209, §15.407

Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

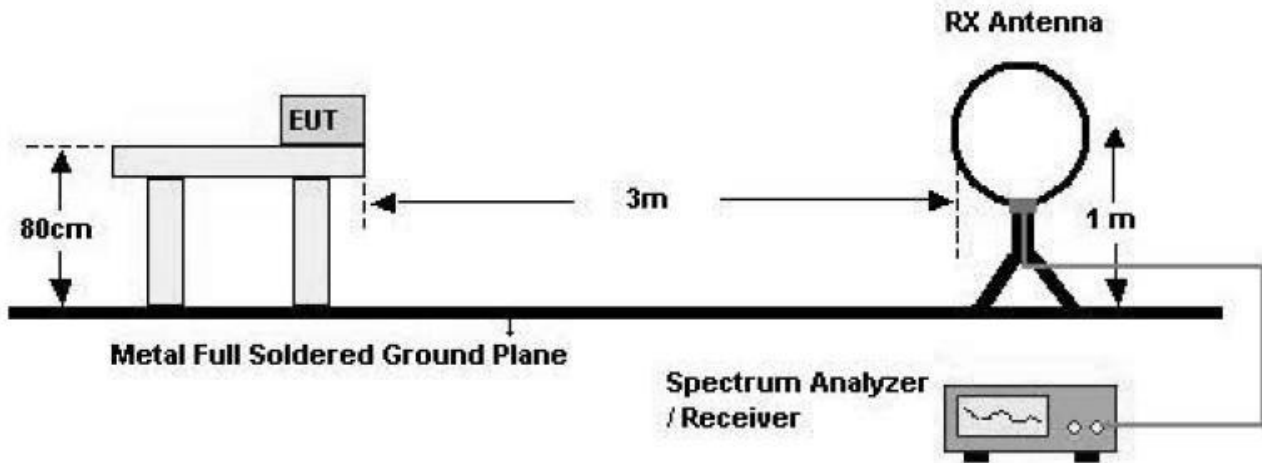
■ §15.407, KDB 789033 D02

All harmonics that do not lie in a restricted band are subject to a peak limit of -27 dBm/MHz. At a distance of 3 meters the field strength limit in dBμV/m can be determined by adding a “conversion” factor of 95.2 dB to the EIRP limit of -27 dBm/MHz to obtain the limit for out of band spurious emissions of 68.2 dBμV/m.

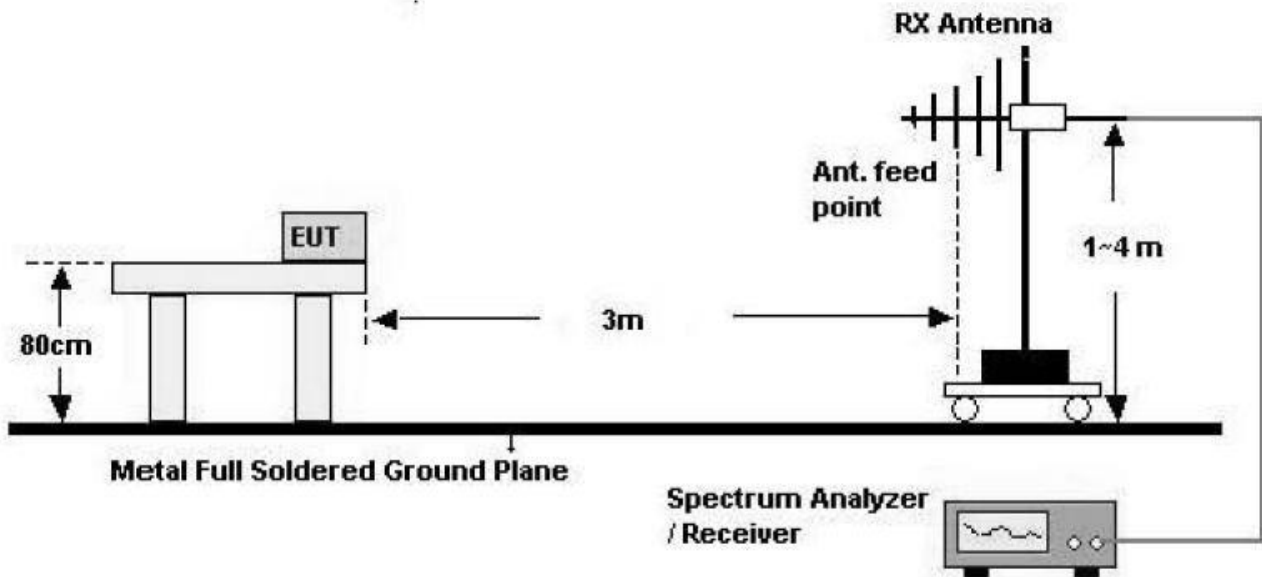
Especially, for transmitter operating in the 5725 Mhz – 5850 MHz : all emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of -17 dBm/MHz; for frequency 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of -27 dBm/MHz.

Test Configuration

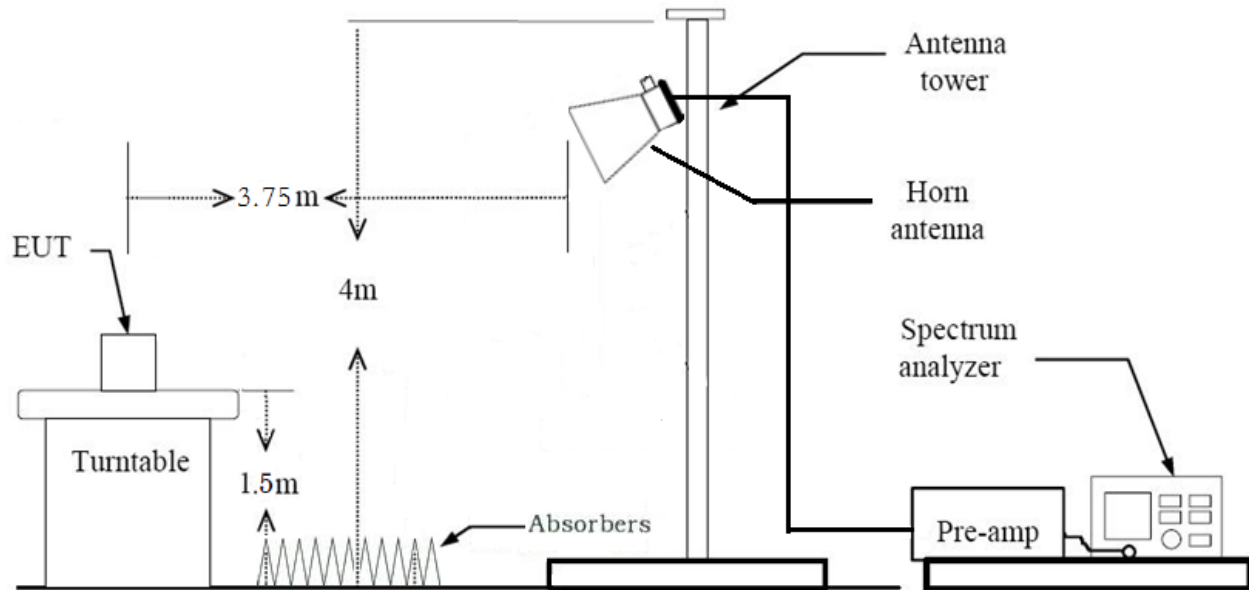
Below 30 MHz



30 MHz - 1 GHz



Above 1 GHz



TEST PROCEDURE USED

ANSI C63.10:2013

Method G)5) in KDB 789033 D02 v01r04 (Peak)

Method G)6)d) in KDB 789033 D02 v01r04 (Average)

. Spectrum setting:

- Peak.

1. RBW = 1 MHz

2. VBW $\geq$ 3 MHz

3. Detector = Peak

4. Sweep Time = auto

5. Trace mode = max hold

6. Allow sweeps to continue until the trace stabilizes.

7. 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.

- Average (Method VB :Averaging using reduced video bandwidth)

1. RBW = 1 MHz

2. VBW

2.1. If the EUT is configured to transmit with duty cycle $\geq$ 98 percent, set VBW $\leq$ RBW/100(i.e., 10 kHz) but not less than 10 Hz.

2.2. If the EUT duty cycle is $<$ 98 percent, set VBW $\geq$ $1/T$, where T is the minimum transmission

duration.

3. The analyzer is set to linear detector mode.
4. Detector = Peak.
5. Sweep time = auto.
6. Trace mode = max hold.
7. Allow max hold to run for at least 50 traces if the transmitted signal is continuous or has at least 98 percent duty cycle. For lower duty cycles, increase the minimum number of traces by a factor of $1/x$, where x is the duty cycle.

Note :

1. We used the Method VB for 802.11a/n_HT20, n_HT40 mode to perform the average field strength measurements.
2. The actual setting value of VBW for 802.11a/n_HT20, n_HT40
3. According to SVSWR requirement in ANSI 63.4-2014, We performed the radiated test at 3.75 m distance from center of turn table. So, we applied the distance factor(reference distance : 3 m).
4. Distance extrapolation factor = $20 \log (\text{test distance} / \text{specific distance})$ (dB)

Mode	Worst Data rate (Mbps)	T _{on} (ms)	T _{total} (ms)	Duty Cycle (%)	VBW(1/T) (Hz)	The actual setting value of VBW (Hz)
a	6	1.429	1.463	0.97694148	700	1000
n_HT20	MCS 0	1.334	1.371	0.97315436	750	1000
n_HT40	MCS 0	0.662	0.732	0.90372798	1511	3000

TEST RESULTS

9 kHz – 30MHz

Operation Mode: Normal Mode

Frequency	Reading	Ant. factor	Cable loss	Ant. POL	Total	Limit	Margin
MHz	$\text{dB}\mu\text{V}$	dB /m	dB	(H/V)	$\text{dB}\mu\text{V/m}$	$\text{dB}\mu\text{V/m}$	dB
No Critical peaks found							

Notes:

1. Measuring frequencies from 9 kHz to the 30MHz.
2. The reading of emissions are attenuated more than 20 dB below the permissible limits or the field strength is too small to be measured.
3. Distance extrapolation factor = $40 \log (\text{specific distance} / \text{test distance})$ (dB)
4. Limit line = specific Limits (dBuV) + Distance extrapolation factor
5. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
6. The test results for below 30 MHz is correlated to an open site.

The result on OATS is about 2 dB higher than semi-anechoic chamber (10 m chamber)

TEST RESULTS**Below 1 GHz****Operation Mode:** Normal Mode

Frequency	Reading	Ant. factor	Cable loss	Ant. POL	Total	Limit	Margin
MHz	$\text{dB}\mu\text{V}$	dB /m	dB	(H/V)	$\text{dB}\mu\text{V/m}$	$\text{dB}\mu\text{V/m}$	dB
No Critical peaks found							

Notes:

1. Measuring frequencies from 30 MHz to the 1 GHz.
2. Radiated emissions measured in frequency range from 30 MHz to 1000 MHz were made with an instrument using Quasi peak detector mode.
3. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

Above 1 GHz

Band :	UNII 1
Operation Mode:	802.11 a
Transfer Rate:	6 Mbps
Operating Frequency	5180 MHz
Channel No.	36 Ch

Frequency [MHz]	Reading [dBuV]	AN.+CL-Amp G.+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
10360	57.49	-2.49	V	55.00	68.20	13.20	PK
15540	52.75	-2.80	V	49.95	73.98	24.03	PK
15540	38.75	-2.80	V	35.95	53.98	18.03	AV
10360	56.83	-2.49	H	54.34	68.20	13.86	PK
15540	53.00	-2.80	H	50.20	73.98	23.78	PK
15540	39.15	-2.80	H	36.35	53.98	17.63	AV

*AN. : Antenna Factor / CL : Cable Loss / Amp.G. : Amplifier Gain / D.F. : Distance Factor

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. We have done all data rate in 802.11a. Worst case is 6 Mbps in 802.11a.
6. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
7. Distance extrapolation factor = $20 \log (\text{test distance} / \text{specific distance})$ (dB)

Band :	UNII 1
Operation Mode:	802.11 a
Transfer Rate:	6 Mbps
Operating Frequency	5200 MHz
Channel No.	40 Ch

Frequency [MHz]	Reading [dBuV]	AN.+CL-Amp G.+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
10400	56.28	-2.40	V	53.88	68.20	14.32	PK
15600	52.50	-4.04	V	48.46	73.98	25.52	PK
15600	38.59	-4.04	V	34.55	53.98	19.43	AV
10400	55.64	-2.40	H	53.24	68.20	14.96	PK
15600	52.70	-4.04	H	48.66	73.98	25.32	PK
15600	38.81	-4.04	H	34.77	53.98	19.21	AV

*AN. : Antenna Factor / CL : Cable Loss / Amp.G. : Amplifier Gain / D.F. : Distance Factor

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. We have done all data rate in 802.11a. Worst case is 6 Mbps in 802.11a.
6. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
7. Distance extrapolation factor = $20 \log (\text{test distance} / \text{specific distance})$ (dB)

Band :	UNII 1
Operation Mode:	802.11 a
Transfer Rate:	6 Mbps
Operating Frequency	5240 MHz
Channel No.	48 Ch

Frequency [MHz]	Reading [dBuV]	AN.+CL-Amp G.+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
10480	57.08	-3.56	V	53.52	68.20	14.68	PK
15720	52.53	-4.05	V	48.48	73.98	25.50	PK
15720	39.12	-4.05	V	35.07	53.98	18.91	AV
10480	56.38	-3.56	H	52.82	68.20	15.38	PK
15720	53.44	-4.05	H	49.39	73.98	24.59	PK
15720	39.34	-4.05	H	35.29	53.98	18.69	AV

*AN. : Antenna Factor / CL : Cable Loss / Amp.G. : Amplifier Gain / D.F. : Distance Factor

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. We have done all data rate in 802.11a. Worst case is 6 Mbps in 802.11a.
6. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna
7. Distance extrapolation factor = $20 \log (\text{test distance} / \text{specific distance})$ (dB)

Band :	UNII 1
Operation Mode:	802.11 n_HT20
Transfer MCS Index:	0
Operating Frequency	5180 MHz
Channel No.	36 Ch

Frequency [MHz]	Reading [dBuV]	AN.+CL-Amp G.+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
10360	56.77	-2.49	V	54.28	68.20	13.92	PK
15540	52.70	-2.80	V	49.90	73.98	24.08	PK
15540	38.72	-2.80	V	35.92	53.98	18.06	AV
10360	56.41	-2.49	H	53.92	68.20	14.28	PK
15540	53.02	-2.80	H	50.22	73.98	23.76	PK
15540	39.09	-2.80	H	36.29	53.98	17.69	AV

*AN. : Antenna Factor / CL : Cable Loss / Amp.G. : Amplifier Gain / D.F. : Distance Factor

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. We have done all data rate in 802.11n_HT20. Worst case is MCS0 in 802.11n_HT20.
6. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
7. Distance extrapolation factor = $20 \log (\text{test distance} / \text{specific distance})$ (dB)

Band :	UNII 1
Operation Mode:	802.11 n_ HT20
Transfer MCS Index:	0
Operating Frequency	5200 MHz
Channel No.	40 Ch

Frequency [MHz]	Reading [dBuV]	AN.+CL-Amp G.+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
10400	56.42	-2.40	V	54.02	68.20	14.18	PK
15600	52.45	-4.04	V	48.41	73.98	25.57	PK
15600	38.56	-4.04	V	34.52	53.98	19.46	AV
10400	56.21	-2.40	H	53.81	68.20	14.39	PK
15600	52.72	-4.04	H	48.68	73.98	25.30	PK
15600	38.75	-4.04	H	34.71	53.98	19.27	AV

*AN. : Antenna Factor / CL : Cable Loss / Amp.G. : Amplifier Gain / D.F. : Distance Factor

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. We have done all data rate in 802.11n_ HT20. Worst case is MCS0 in 802.11n_ HT20.
6. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
7. Distance extrapolation factor = $20 \log (\text{test distance} / \text{specific distance})$ (dB)

Band :	UNII 1
Operation Mode:	802.11 n_ HT20
Transfer MCS Index:	0
Operating Frequency	5240 MHz
Channel No.	48 Ch

Frequency [MHz]	Reading [dBuV]	AN.+CL-Amp G.+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
10480	57.34	-3.56	V	53.78	68.20	14.42	PK
15720	52.48	-4.05	V	48.43	73.98	25.55	PK
15720	39.09	-4.05	V	35.04	53.98	18.94	AV
10480	56.97	-3.56	H	53.41	68.20	14.79	PK
15720	53.46	-4.05	H	49.41	73.98	24.57	PK
15720	39.28	-4.05	H	35.23	53.98	18.75	AV

*AN. : Antenna Factor / CL : Cable Loss / Amp.G. : Amplifier Gain / D.F. : Distance Factor

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. We have done all data rate in 802.11n_ HT20. Worst case is MCS0 in 802.11n_ HT20.
6. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
7. Distance extrapolation factor = $20 \log (\text{test distance} / \text{specific distance})$ (dB)

Band :	UNII 1
Operation Mode:	802.11n_HT40
Transfer MCS Index:	0
Operating Frequency	5190 MHz
Channel No.	38 Ch

Frequency [MHz]	Reading [dBuV]	AN.+CL-Amp G.+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
10380	58.38	-2.40	V	55.98	68.20	12.22	PK
15570	52.41	-2.80	V	49.61	73.98	24.37	PK
15570	40.14	-2.80	V	37.34	53.98	16.64	AV
10380	57.89	-2.40	H	55.49	68.20	12.71	PK
15570	52.87	-2.80	H	50.07	73.98	23.91	PK
15570	40.36	-2.80	H	37.56	53.98	16.42	AV

*AN. : Antenna Factor / CL : Cable Loss / Amp.G. : Amplifier Gain / D.F. : Distance Factor

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. We have done all data rate in 802.11n_HT40. Worst case is MCS0 in 802.11n_HT40.
6. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
7. Distance extrapolation factor = $20 \log (\text{test distance} / \text{specific distance})$ (dB)

Band :	UNII 1
Operation Mode:	802.11n_ HT40
Transfer MCS Index:	0
Operating Frequency	5230 MHz
Channel No.	46 Ch

Frequency [MHz]	Reading [dBuV]	AN.+CL-Amp G.+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
10460	58.28	-2.40	V	55.88	68.20	12.32	PK
15690	52.67	-4.04	V	48.63	73.98	25.35	PK
15690	40.40	-4.04	V	36.36	53.98	17.62	AV
10460	57.80	-2.40	H	55.40	68.20	12.80	PK
15690	53.08	-4.04	H	49.04	73.98	24.94	PK
15690	40.71	-4.04	H	36.67	53.98	17.31	AV

*AN. : Antenna Factor / CL : Cable Loss / Amp.G. : Amplifier Gain / D.F. : Distance Factor

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. We have done all data rate in 802.11n_ HT40. Worst case is MCS0 in 802.11n_ HT40.
6. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
7. Distance extrapolation factor = $20 \log (\text{test distance} / \text{specific distance})$ (dB)

Band :	UNII 2A
Operation Mode:	802.11 a
Transfer MCS Index:	6 Mbps
Operating Frequency	5260 MHz
Channel No.	52 Ch

Frequency [MHz]	Reading [dBuV]	AN.+CL-Amp G.+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
10520	56.63	-3.05	V	53.58	68.20	14.62	PK
15780	53.29	-3.08	V	50.21	73.98	23.77	PK
15780	39.55	-3.08	V	36.47	53.98	17.51	AV
10520	56.48	-3.05	H	53.43	68.20	14.77	PK
15780	53.71	-3.08	H	50.63	73.98	23.35	PK
15780	39.31	-3.08	H	36.23	53.98	17.75	AV

*AN. : Antenna Factor / CL : Cable Loss / Amp.G. : Amplifier Gain / D.F. : Distance Factor

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. We have done all data rate in 802.11a. Worst case is 6 Mbps in 802.11a.
6. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
7. Distance extrapolation factor = $20 \log (\text{test distance} / \text{specific distance})$ (dB)

Band :	UNII 2A
Operation Mode:	802.11 a
Transfer Rate:	6 Mbps
Operating Frequency	5300 MHz
Channel No.	60 Ch

Frequency [MHz]	Reading [dBuV]	AN.+CL-Amp G.+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
10600	56.25	-3.42	V	52.83	73.98	21.15	PK
10600	45.58	-3.42	V	42.16	53.98	11.82	AV
15900	52.60	-3.29	V	49.31	73.98	24.67	PK
15900	39.01	-3.29	V	35.72	53.98	18.26	AV
10600	56.11	-3.42	H	52.69	73.98	21.29	PK
10600	45.38	-3.42	H	41.96	53.98	12.02	AV
15900	52.84	-3.29	H	49.55	73.98	24.43	PK
15900	39.24	-3.29	H	35.95	53.98	18.03	AV

*AN. : Antenna Factor / CL : Cable Loss / Amp.G. : Amplifier Gain / D.F. : Distance Factor

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. We have done all data rate in 802.11a. Worst case is 6 Mbps in 802.11a.
6. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
7. Distance extrapolation factor = $20 \log (\text{test distance} / \text{specific distance})$ (dB)

Band :	UNII 2A
Operation Mode:	802.11 a
Transfer Rate:	6 Mbps
Operating Frequency	5320 MHz
Channel No.	64 Ch

Frequency [MHz]	Reading [dBuV]	AN.+CL-Amp G.+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
10640	57.71	-3.53	V	54.18	73.98	19.80	PK
10640	47.10	-3.53	V	43.57	53.98	10.41	AV
15960	51.52	-3.45	V	48.07	73.98	25.91	PK
15960	37.85	-3.45	V	34.40	53.98	19.58	AV
10640	57.53	-3.53	H	54.00	73.98	19.98	PK
10640	46.92	-3.53	H	43.39	53.98	10.59	AV
15960	52.19	-3.45	H	48.74	73.98	25.24	PK
15960	38.32	-3.45	H	34.87	53.98	19.11	AV

*AN. : Antenna Factor / CL : Cable Loss / Amp.G. : Amplifier Gain / D.F. : Distance Factor

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. We have done all data rate in 802.11a. Worst case is 6 Mbps in 802.11a.
6. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna
7. Distance extrapolation factor = $20 \log (\text{test distance} / \text{specific distance})$ (dB)

Band :	UNII 2A
Operation Mode:	802.11 n_HT20
Transfer MCS Index:	0
Operating Frequency	5260 MHz
Channel No.	52 Ch

Frequency [MHz]	Reading [dBuV]	AN.+CL-Amp G.+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
10520	56.29	-3.05	V	53.24	68.20	14.96	PK
15780	53.66	-3.08	V	50.58	73.98	23.40	PK
15780	39.28	-3.08	V	36.20	53.98	17.78	AV
10520	55.87	-3.05	H	52.82	68.20	15.38	PK
15780	53.31	-3.08	H	50.23	73.98	23.75	PK
15780	39.49	-3.08	H	36.41	53.98	17.57	AV

*AN. : Antenna Factor / CL : Cable Loss / Amp.G. : Amplifier Gain / D.F. : Distance Factor

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. We have done all data rate in 802.11n_HT20. Worst case is MCS0 in 802.11n_HT20.
6. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
7. Distance extrapolation factor = $20 \log (\text{test distance} / \text{specific distance})$ (dB)

Band :	UNII 2A
Operation Mode:	802.11 n_ HT20
Transfer MCS Index:	0
Operating Frequency	5300 MHz
Channel No.	60 Ch

Frequency [MHz]	Reading [dBuV]	AN.+CL-Amp G.+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
10600	55.85	-3.42	V	52.43	73.98	21.55	PK
10600	45.09	-3.42	V	41.67	53.98	12.31	AV
15900	52.55	-3.29	V	49.26	73.98	24.72	PK
15900	38.98	-3.29	V	35.69	53.98	18.29	AV
10600	55.49	-3.42	H	52.07	73.98	21.91	PK
10600	44.67	-3.42	H	41.25	53.98	12.73	AV
15900	52.86	-3.29	H	49.57	73.98	24.41	PK
15900	39.18	-3.29	H	35.89	53.98	18.09	AV

*AN. : Antenna Factor / CL : Cable Loss / Amp.G. : Amplifier Gain / D.F. : Distance Factor

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. We have done all data rate in 802.11n_ HT20. Worst case is MCS0 in 802.11n_ HT20.
6. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
7. Distance extrapolation factor = $20 \log (\text{test distance} / \text{specific distance})$ (dB)

Band :	UNII 2A
Operation Mode:	802.11 n_ HT20
Transfer MCS Index:	0
Operating Frequency	5320 MHz
Channel No.	64 Ch

Frequency [MHz]	Reading [dBuV]	AN.+CL-Amp G.+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
10640	57.41	-3.53	V	53.88	73.98	20.10	PK
10640	46.63	-3.53	V	43.10	53.98	10.88	AV
15960	51.47	-3.45	V	48.02	73.98	25.96	PK
15960	37.82	-3.45	V	34.37	53.98	19.61	AV
10640	57.10	-3.53	H	53.57	73.98	20.41	PK
10640	46.31	-3.53	H	42.78	53.98	11.20	AV
15960	52.21	-3.45	H	48.76	73.98	25.22	PK
15960	38.26	-3.45	H	34.81	53.98	19.17	AV

*AN. : Antenna Factor / CL : Cable Loss / Amp.G. : Amplifier Gain / D.F. : Distance Factor

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. We have done all data rate in 802.11n_ HT20. Worst case is MCS0 in 802.11n_ HT20.
6. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
7. Distance extrapolation factor = $20 \log (\text{test distance} / \text{specific distance})$ (dB)

Band :	UNII 2A
Operation Mode:	802.11n_HT40
Transfer MCS Index:	0
Operating Frequency	5270 MHz
Channel No.	54 Ch

Frequency [MHz]	Reading [dBuV]	AN.+CL-Amp G.+D.F. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
10540	57.31	-3.05	V	54.26	68.20	13.94	PK
15810	52.92	-3.08	V	49.84	73.98	24.14	PK
15810	40.63	-3.08	V	37.55	53.98	16.43	AV
10540	56.96	-3.05	H	53.91	68.20	14.29	PK
15810	53.49	-3.08	H	50.41	73.98	23.57	PK
15810	40.94	-3.08	H	37.86	53.98	16.12	AV

*AN. : Antenna Factor / CL : Cable Loss / Amp.G. : Amplifier Gain / D.F. : Distance Factor

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. We have done all data rate in 802.11n_HT40. Worst case is MCS0 in 802.11n_HT40.
6. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
7. Distance extrapolation factor = $20 \log (\text{test distance} / \text{specific distance})$ (dB)