

HCT CO., LTD.

CERTIFICATE OF COMPLIANCE FCC Certification

Applicant Name: LG Electronics MobileComm U.S.A., Inc.	Date of Issue: November 19, 2013
Address: 1000 Sylvan Avenue, Englewood Cliffs NJ 07632	Test Site/Location: HCT CO., LTD., 105-1, Jangam-ri, Majang-Myeon, Icheon-si, Kyunggi-Do, Korea
	Report No.: HCTR1310FR20-3
	HCT FRN: 0005866421

FCC ID : ZNFKS1301

APPLICANT : LG Electronics MobileComm U.S.A., Inc.

FCC Model(s): KS1301
EUT Type: Cellular/PCS GSM/ GPRS/EDGE, Cellular WCDMA/HSDPA/HSUPA Phone with Bluetooth/WLAN/NFC
Max. RF Output Power: Wi-Fi 802.11a (5180~5240) (9.29 dBm)/ Wi-Fi 802.11a (5260~5320) (9.47 dBm)/
Wi-Fi 802.11a (5500~5720) (9.33 dBm)/ Wi-Fi 802.11n_20 MHz BW (5180~5240) (9.36 dBm)/
Wi-Fi 802.11n_20 MHz BW(5260~5320)(9.60 dBm)/ Wi-Fi 802.11n_20 MHz BW(5500~5720)(9.42 dBm)/
Wi-Fi 802.11n_40 MHz BW(5190~5230) (9.40 dBm)/ Wi-Fi 802.11n_40 MHz BW (5270~5310) (9.69 dBm)/
Wi-Fi 802.11n_40 MHz BW (5510~5710) (8.29 dBm)/ Wi-Fi 802.11ac (5180~5240) (8.48 dBm)/
Wi-Fi 802.11ac (5260~5320) (8.54 dBm)/ Wi-Fi 802.11ac (5500~5720) (8.32 dBm)/
Wi-Fi 802.11ac (5190~5230) (8.43 dBm)/ Wi-Fi 802.11ac (5270~5310) (8.99 dBm)/
Wi-Fi 802.11ac (5510~5710) (7.88 dBm)/ Wi-Fi 802.11ac (5210) (7.65 dBm)/
Wi-Fi 802.11ac (5290) (7.72 dBm)/ Wi-Fi 802.11ac (5530~5690) (7.08 dBm)
Frequency Range: 20 MHz BW: 5180 MHz - 5240 MHz (UNII 1)/ 5260 MHz - 5320 MHz (UNII 2)/
5500 MHz - 5720 MHz (UNII 2e)
40 MHz BW: 5190 MHz - 5230 MHz (UNII 1)/ 5270 MHz - 5310 MHz (UNII 2)/
5510 MHz - 5710 MHz (UNII 2e)
80 MHz BW: 5210 MHz(UNII 1)/ 5290 MHz(UNII 2)/ 5530 MHz - 5690 MHz(UNII 2e)
Modulation type OFDM
FCC Classification: Unlicensed National Information Infrastructure(UNII)
FCC Rule Part(s): Part 15.407

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
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Test engineer of RF Team



Approved by
: Chang Seok Choi
Manager of RF Team

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Version

TEST REPORT NO.	DATE	DESCRIPTION
HCTR1310FR20	October 28, 2013	- First Approval Report
HCTR1310FR20-1	November 11, 2013	- Revised the Max. RF Output Power in page 1 and 4 - Added the 20 dBc Bandwidth of the 802.11ac_80M BW at 5690 MHz in Section 8.2 - Revised the list of test equipment in Section 9.
HCTR1310FR20-2	November 15, 2013	- Retest the 20 dBc Bandwidth using accurate RBW - Retest the Conducted Output Power for 40 MHz and 80 MHz BW using the Spectrum Analyzer
HCTR1310FR20-3	November 19, 2013	- Revised Power Table on Page 48

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1. GENERAL INFORMATION

Applicant: LG Electronics MobileComm U.S.A., Inc.
Address: 1000 Sylvan Avenue, Englewood Cliffs NJ 07632
FCC ID: ZNFKS1301
EUT Type: Cellular/PCS GSM/ GPRS/EDGE, Cellular WCDMA/HSDPA/HSUPA Phone with Bluetooth/WLAN/NFC
Model name(s): KS1301
Date(s) of Tests: September 26, 2013 ~ November 11, 2013
Place of Tests: HCT Co., Ltd.
 105-1, Jangam-ri , Majang-Myeon, Icheon-si, Kyunggi-Do, 467-811, KOREA.
 (IC Recognition No. : 5944A-3)

2. EUT DESCRIPTION

EUT Type	Cellular/PCS GSM/ GPRS/EDGE, Cellular WCDMA/HSDPA/HSUPA Phone with Bluetooth/WLAN/NFC	
FCC Model Name	KS1301	
Power Supply	DC 3.8 V	
Battery type	Li-ion Battery(Standard)	
Frequency Range	TX_20 MHz BW:	5180 MHz - 5240 MHz (UNII 1)/ 5260 MHz - 5320 MHz (UNII 2)/ 5500 MHz - 5720 MHz (UNII 2e) where) Not supported 5600 MHz – 5640 MHz
	40 MHz BW:	5190 MHz - 5230 MHz (UNII 1)/ 5270 MHz - 5310 MHz (UNII 2)/ 5510 MHz - 5710 MHz (UNII 2e) where) Not supported 5590 MHz – 5630 MHz
	80 MHz BW:	5210 MHz(UNII 1)/ 5290 MHz(UNII 2)/ 5530 MHz - 5690 MHz(UNII 2e) where) Not supported 5610 MHz
	RX_20 MHz BW:	5180 MHz - 5240 MHz (UNII 1)/ 5260 MHz - 5320 MHz (UNII 2)/ 5500 MHz - 5720 MHz (UNII 2e) where) Not supported 5600 MHz – 5640 MHz
	40 MHz BW:	5190 MHz - 5230 MHz (UNII 1)/ 5270 MHz - 5310 MHz (UNII 2)/ 5510 MHz - 5710 MHz (UNII 2e) where) Not supported 5590 MHz – 5630 MHz
	80 MHz BW:	5210 MHz(UNII 1)/ 5290 MHz(UNII 2)/ 5530 MHz - 5690 MHz(UNII 2e) where) Not supported 5610 MHz
Max. RF Output Power:	Wi-Fi 802.11a (5180~5240) (9.29 dBm)/ Wi-Fi 802.11a (5260~5320) (9.47 dBm)/ Wi-Fi 802.11a (5500~5720) (9.33 dBm)/ Wi-Fi 802.11n_20 MHz BW (5180~5240) (9.36 dBm)/ Wi-Fi 802.11n_20 MHz BW(5260~5320)(9.60 dBm)/ Wi-Fi 802.11n_20 MHz BW(5500~5720)(9.42 dBm)/ Wi-Fi 802.11n_40 MHz BW(5190~5230) (9.40 dBm)/ Wi-Fi 802.11n_40 MHz BW (5270~5310) (9.69 dBm)/ Wi-Fi 802.11n_40 MHz BW (5510~5710) (8.29 dBm)/ Wi-Fi 802.11ac (5180~5240) (8.48 dBm)/ Wi-Fi 802.11ac (5260~5320) (8.54 dBm)/ Wi-Fi 802.11ac (5500~5720) (8.32 dBm)/ Wi-Fi 802.11ac (5190~5230) (8.43 dBm)/ Wi-Fi 802.11ac (5270~5310) (8.99 dBm)/ Wi-Fi 802.11ac (5510~5710) (7.88 dBm)/ Wi-Fi 802.11ac (5210) (7.65 dBm)/ Wi-Fi 802.11ac (5290) (7.72 dBm)/ Wi-Fi 802.11ac (5530~5690) (7.08 dBm)	
Modulation Type	OFDM(802.11a, 802.11n, 802.11ac)	
Antenna Specification	Manufacturer: LS Mtron Co. Ltd. Antenna type: Internal Antenna Peak Gain : -3.22 dBi	

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3. TEST METHODOLOGY

The measurement procedure described in FCC KDB 789033 D01 General UNII Test Procedures v01r03 dated April 08, 2013 entitled “ Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices, the American National Standard for Testing Unlicensed Wireless Devices(ANSI C63.4-2003) – Part 15, Subpart E” were used in the measurement. For 802.11ac, KDB644545 D01 v01r01 dated April 08, 2013.

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 13.1.4.1 of ANSI C63.4. (Version :2003) 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. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3 m away from the receiving antenna, which varied from 1 m to 4 m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes according to the requirements in Section 13.1.4.1 of ANSI C63.4. (Version: 2003)

Conducted Antenna Terminal

See Section from 8.1 to 8.4.(KDB 789033)

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.

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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

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 105-1, Jangam-ri, Majang-Myeon, Icheon-si, Kyunggi-Do, 467-811, Korea. The site is constructed in conformance with the requirements of ANSI C63.4. (Version :2003) and CISPR Publication 22. Detailed description of test facility was submitted to the Commission and accepted dated March 02, 2011 (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:

"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

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7. SUMMARY OF TEST RESULTS

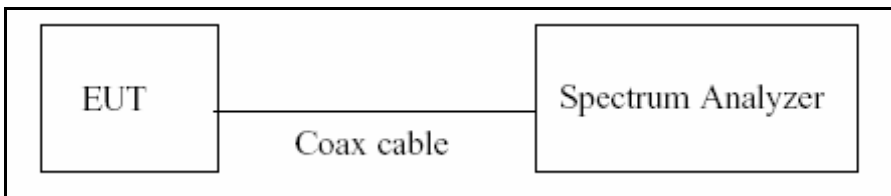
Test Description	FCC Part Section(s)	Test Limit	Test Condition	Test Result
<u>TRANSMITTER MODE(TX)</u>				
26dB Bandwidth	NA	NA	CONDUCTED	PASS
Maximum Conducted Output Power	§15.407(a)(1)	< 4+10 log ₁₀ (BW) dBm (5150-5250 MHz) < 11+10 log ₁₀ (BW) dBm (5250-5350 MHz) < 11+10 log ₁₀ (BW) dBm (5470-5725 MHz)		PASS
Peak Power Spectral Density	§15.407(a)(1), (5)	<4 dBm/ MHz (5150-5250) <11 dBm/ MHz (5250-5350) <11 dBm/ MHz (5470-5725)		PASS
Peak Excursion	§15.407(a)(6)	<13 dB/ MHz maximum difference		PASS
Frequency Stability	§15.407(g)	NA		PASS
Undesirable Emissions	§15.407(b)(1), (2), (3)	<-27 dBm/ MHz EIRP (5150-5350 MHz, 5470-5725 MHz)	RADIATED	PASS
General Field Strength Limits(Restricted Bands and Radiated Emission Limits)	15.205, 5.407(b)(1), (5), (6)	Emissions in restricted bands must meet the radiated limits detailed in 15.209		PASS
AC Conducted Emissions 150 kHz-30 MHz	15.207	<FCC 15.207 limits	LINE CONDUCTED	PASS

8. TEST RESULT

8.1 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(issued 04/08/2013)

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 = $10 \cdot \log(1/\text{Duty Cycle})$

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Duty Cycle Factor

Mode	Data Rate	T _{on} (ms)	T _{total} (ms)	Duty Cycle	Duty Cycle Factor
802.11a	6	2.060	2.165	0.95150115	0.216
	9	1.375	1.485	0.92592593	0.334
	12	1.038	1.143	0.90813648	0.418
	18	0.700	0.804	0.87064677	0.602
	24	0.529	0.633	0.83570300	0.779
	36	0.363	0.464	0.78232759	1.066
	48	0.275	0.378	0.72751323	1.382
	54	0.247	0.349	0.70773639	1.501
802.11n_20 MHz BW	6.5	1.917	2.019	0.94947994	0.225
	13	0.978	1.080	0.90555556	0.431
	19.5	0.662	0.766	0.86422977	0.634
	26	0.508	0.610	0.83278689	0.795
	39	0.350	0.452	0.77433628	1.111
	52	0.271	0.374	0.72459893	1.399
	58.5	0.248	0.350	0.70857143	1.496
	65	0.227	0.329	0.68996960	1.612
802.11n_40 MHz BW	13.5	0.942	1.044	0.90229885	0.446
	27	0.491	0.592	0.82939189	0.812
	40.5	0.339	0.440	0.77045455	1.133
	54	0.262	0.364	0.71978022	1.428
	81	0.187	0.288	0.64930556	1.876
	108	0.151	0.252	0.59920635	2.224
	121.5	0.139	0.240	0.57916667	2.372
	135	0.128	0.228	0.56140351	2.507

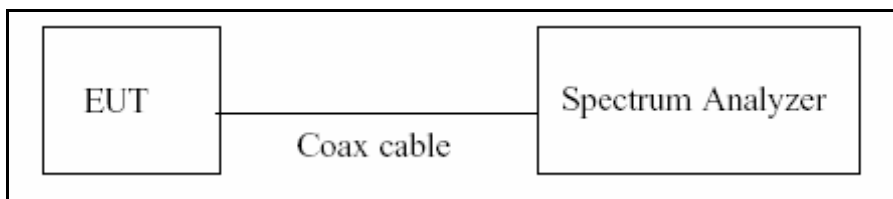
Mode	Data Rate	T _{on} (ms)	T _{total} (ms)	Duty Cycle	Duty Cycle Factor (dB)
802.11ac_20 MHz BW	6.5	1.926	2.031	0.94830133	0.231
	13	0.984	1.086	0.90607735	0.428
	19.5	0.672	0.772	0.87046632	0.602
	26	0.512	0.616	0.83116883	0.803
	39	0.355	0.456	0.77850877	1.087
	52	0.279	0.381	0.73228346	1.353
	58.5	0.251	0.352	0.71306818	1.469
	65	0.231	0.332	0.69578313	1.575
	78	0.200	0.301	0.66445183	1.775
5.8 GHz Band 802.11ac_40 MHz BW	13.5	0.951	1.053	0.90313390	0.442
	27	0.495	0.596	0.83053691	0.806
	40.5	0.343	0.444	0.77252252	1.121
	54	0.266	0.368	0.72282609	1.410
	81	0.190	0.291	0.65292096	1.851
	108	0.155	0.256	0.60546875	2.179
	121.5	0.143	0.244	0.58606557	2.321
	135	0.131	0.232	0.56465517	2.482
	162	0.116	0.216	0.53703704	2.700
5.8 GHz Band 802.11ac_80 MHz BW	29.3	0.459	0.560	0.81964286	0.864
	58.5	0.251	0.351	0.71509972	1.456
	87.8	0.179	0.280	0.63928571	1.943
	117	0.148	0.248	0.59677419	2.242
	175.5	0.112	0.212	0.52830189	2.771
	234	0.096	0.196	0.48724490	3.123
	263.3	0.088	0.188	0.46808511	3.297
	292.5	0.084	0.184	0.45652174	3.405
	351	0.076	0.176	0.43181818	3.647
390	0.072	0.172	0.41860465	3.782	

8.2 26 dB 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(issued 04/08/2013), 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

The transmitter output is connected to the Spectrum Analyzer.

The Spectrum Analyzer is set to(Page 3 in KDB 789033, issued 04/08/2013)

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 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

20 MHz BW

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	20.32	N/A	Pass
5200	40	20.31	N/A	Pass
5240	48	20.36	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	20.41	N/A	Pass
5300	60	20.20	N/A	Pass
5320	64	20.23	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	20.37	N/A	Pass
5580	116	20.39	N/A	Pass
5720	144	20.58	N/A	Pass

Conducted 26 dB Bandwidth Measurements for 802.11n

802.11n Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5180	36	20.66	N/A	Pass
5200	40	20.45	N/A	Pass
5240	48	20.65	N/A	Pass

Conducted 26 dB Bandwidth Measurements for 802.11n

802.11n Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5260	52	20.62	N/A	Pass
5300	60	20.67	N/A	Pass
5320	64	20.63	N/A	Pass

Conducted 26 dB Bandwidth Measurements for 802.11n

802.11n Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5500	100	20.73	N/A	Pass
5580	116	20.60	N/A	Pass
5720	144	20.96	N/A	Pass

Conducted 26 dB Bandwidth Measurements for 802.11ac

802.11ac Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5180	36	20.55	N/A	Pass
5200	40	20.79	N/A	Pass
5240	48	20.57	N/A	Pass

Conducted 26 dB Bandwidth Measurements for 802.11ac

802.11ac Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5260	52	20.87	N/A	Pass
5300	60	20.62	N/A	Pass
5320	64	20.70	N/A	Pass

Conducted 26 dB Bandwidth Measurements for 802.11ac

802.11ac Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5500	100	20.77	N/A	Pass
5580	116	20.58	N/A	Pass
5720	144	20.67	N/A	Pass

Conducted 26 dB Bandwidth Measurements for 802.11n

802.11n Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5190	38	39.59	N/A	Pass
5230	46	39.51	N/A	Pass

Conducted 26 dB Bandwidth Measurements for 802.11n

802.11n Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5270	54	39.67	N/A	Pass
5310	62	39.54	N/A	Pass

Conducted 26 dB Bandwidth Measurements for 802.11n

802.11n Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5510	102	39.42	N/A	Pass
5550	110	39.53	N/A	Pass
5710	142	39.39	N/A	Pass



Conducted 26 dB Bandwidth Measurements for 802.11ac

802.11ac Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5190	38	39.87	N/A	Pass
5230	46	39.40	N/A	Pass

Conducted 26 dB Bandwidth Measurements for 802.11ac

802.11ac Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5270	54	39.70	N/A	Pass
5310	62	39.89	N/A	Pass

Conducted 26 dB Bandwidth Measurements for 802.11ac

802.11ac Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5510	102	39.48	N/A	Pass
5550	110	39.45	N/A	Pass
5710	142	39.59	N/A	Pass

80 MHz BW

Conducted 26 dB Bandwidth Measurements for 802.11ac

802.11ac Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5210	42	82.32	N/A	Pass

Conducted 26 dB Bandwidth Measurements for 802.11ac

802.11ac Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5290	58	81.67	N/A	Pass

Conducted 26 dB Bandwidth Measurements for 802.11ac

802.11ac Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5530	106	81.95	N/A	Pass
5690	138	81.91	N/A	Pass

Note :

1. In order to simplify the report, attached plots were only the most wide channel.
2. We applied the 15.407 for Ch.144, 142 and 138 in 802.11ac according to KDB 644545 D01 v01r01.

20 dB BW TEST RESULTS(Additional Test)

Conducted 20 dB Bandwidth Measurements for 802.11a

802.11a Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5260	52	19.15	N/A	Pass

Conducted 20 dB Bandwidth Measurements for 802.11n_20 MHz BW

802.11n Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5260	52	19.88	N/A	Pass

Conducted 20 dB Bandwidth Measurements for 802.11ac_20 MHz BW

802.11ac Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5270	54	19.73	N/A	Pass

Conducted 20 dB Bandwidth Measurements for 802.11n_40 MHz BW

802.11n Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5270	54	38.51	N/A	Pass

Conducted 20 dB Bandwidth Measurements for 802.11ac_40 MHz BW

802.11ac Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5270	54	38.41	N/A	Pass

Conducted 20 dB Bandwidth Measurements for 802.11ac_80 MHz BW

802.11ac Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5290	58	79.68	N/A	Pass

Note : We performed the 20 dB BW test to prove that no part of the fundamental emissions of any UNII2 band signal lies within the UNII band 1.



Conducted 20 dB Bandwidth Measurements for 802.11ac_80 MHz BW

802.11a Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5690	138	79.99	N/A	Pass

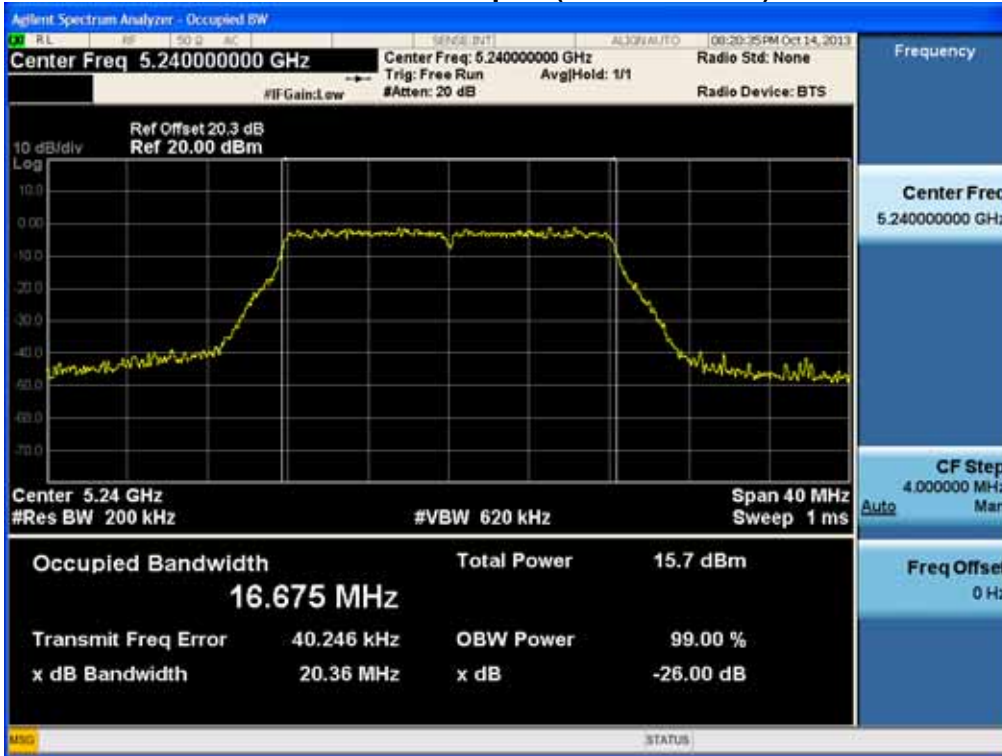
Note : We performed the 20 dB BW test to prove that no part of the fundamental emissions of any UNII 2C band signal lies within the frequency range 5600-5650 MHz(Terminal Doppler Weather Radars (TDWRs)) according to KDB 443999 D01 v01 and KDB 644545 D01 v01r01

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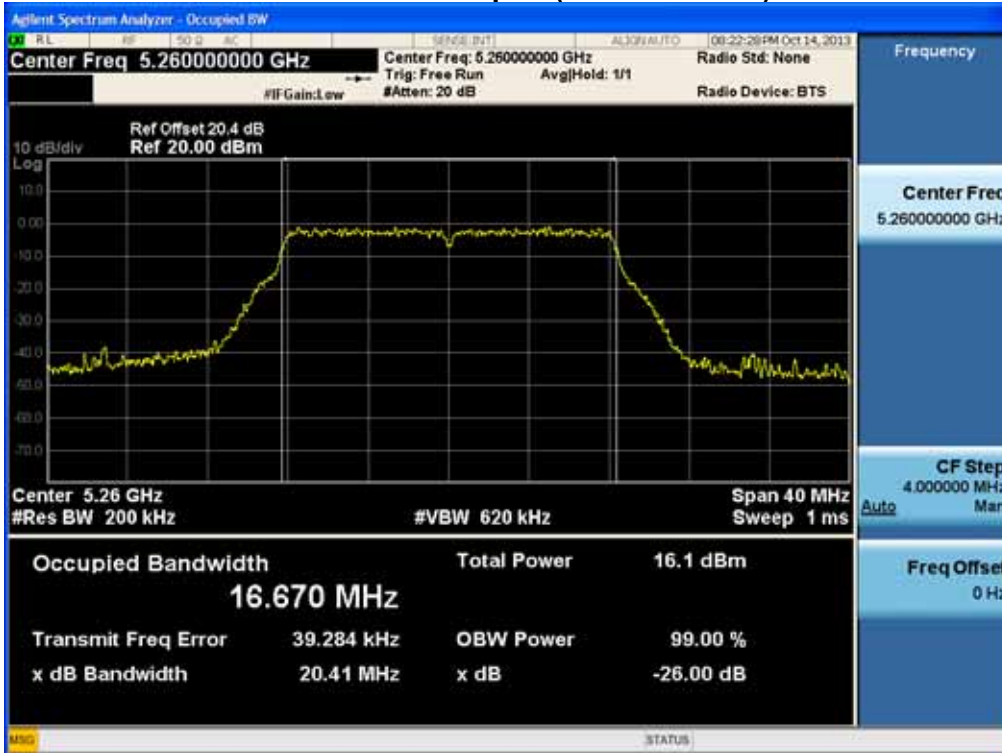


RESULT PLOTS
20 MHz BW

26 dB Bandwidth plot (802.11a-CH 48)

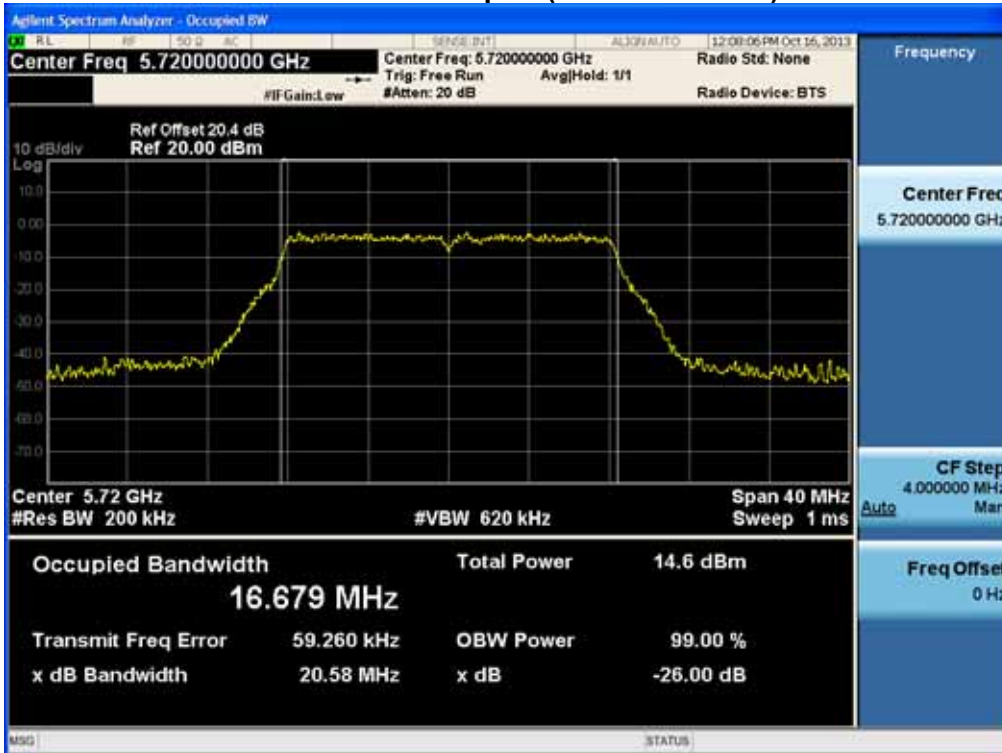


26 dB Bandwidth plot (802.11a-CH 52)

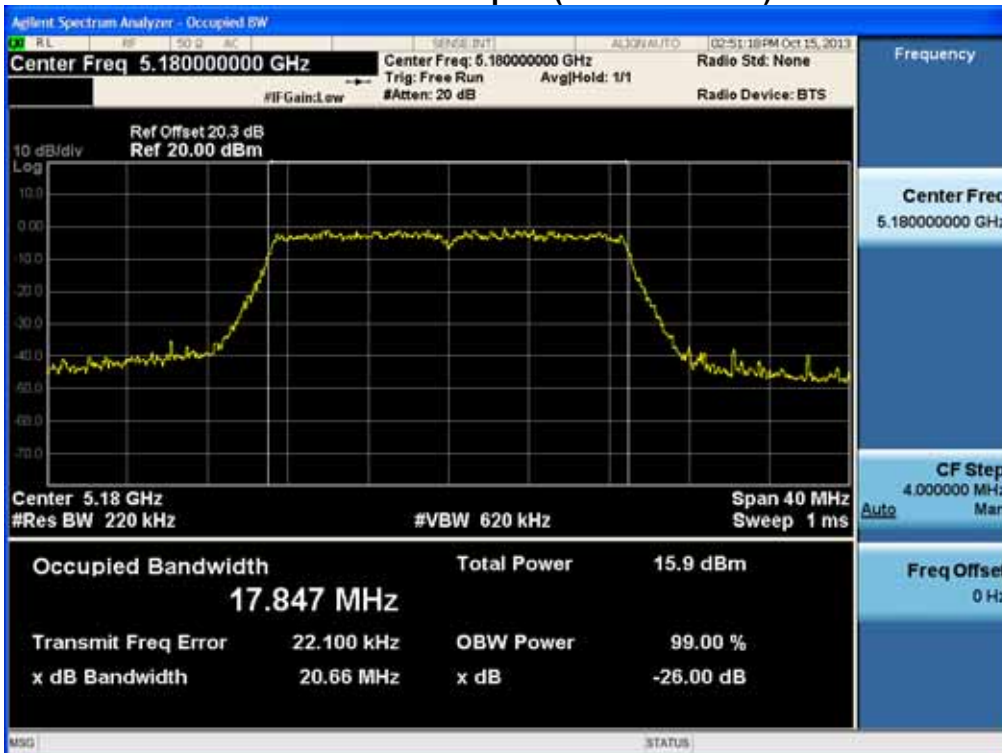


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26 dB Bandwidth plot (802.11a-CH 144)

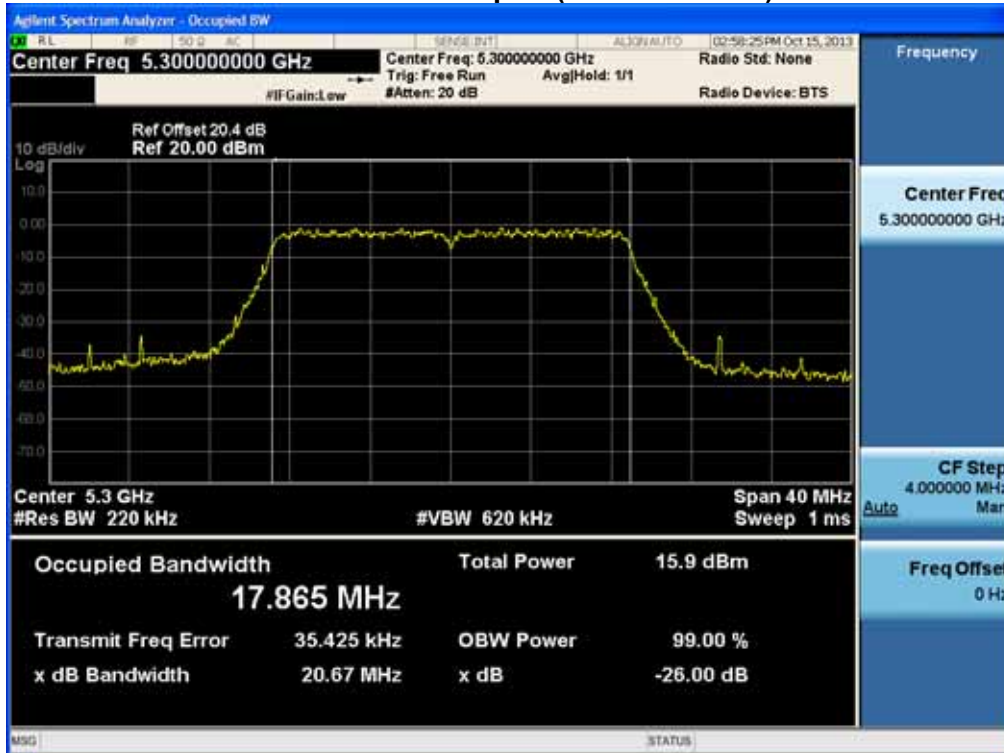


26 dB Bandwidth plot (802.11n-CH 36)

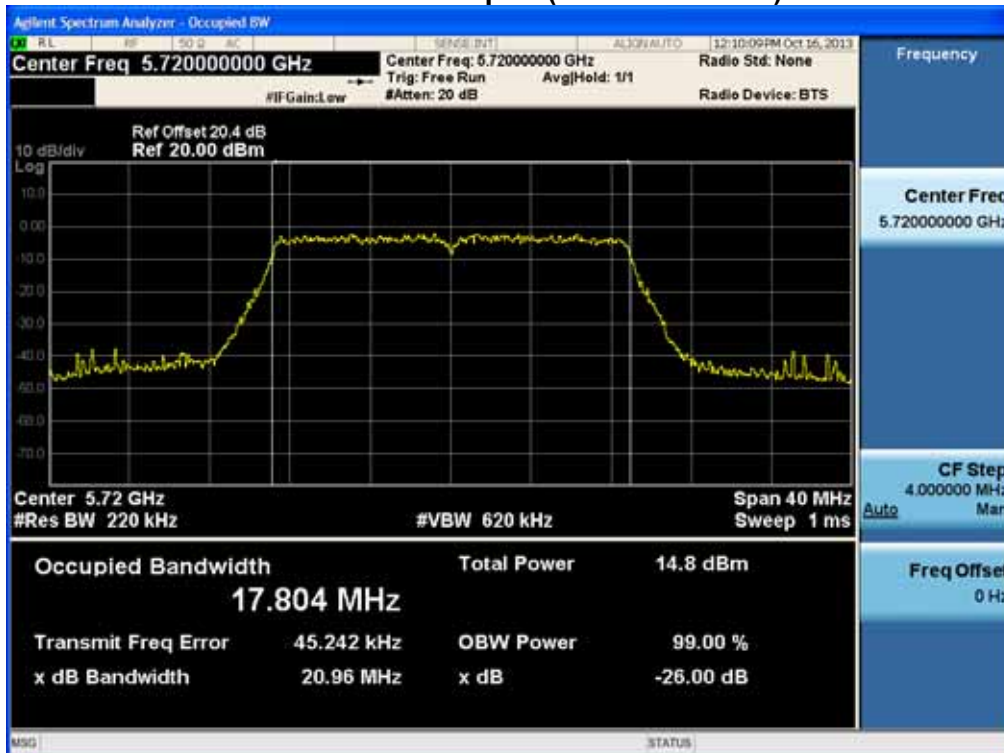


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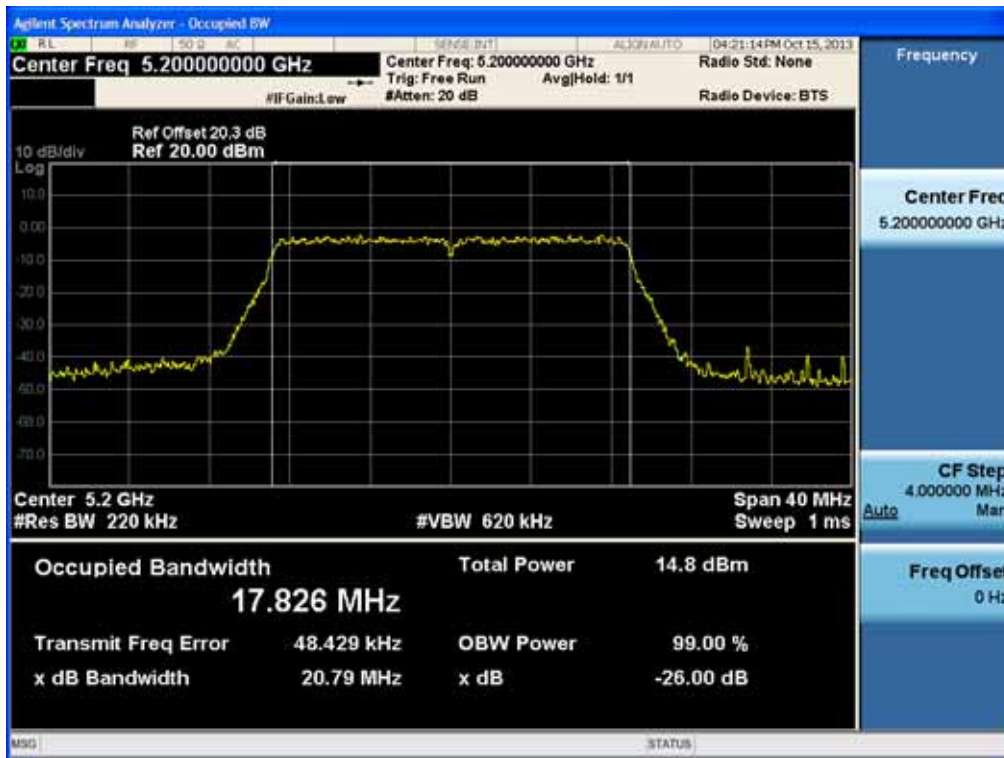
26 dB Bandwidth plot (802.11n-CH 60)



26 dB Bandwidth plot (802.11n-CH 144)



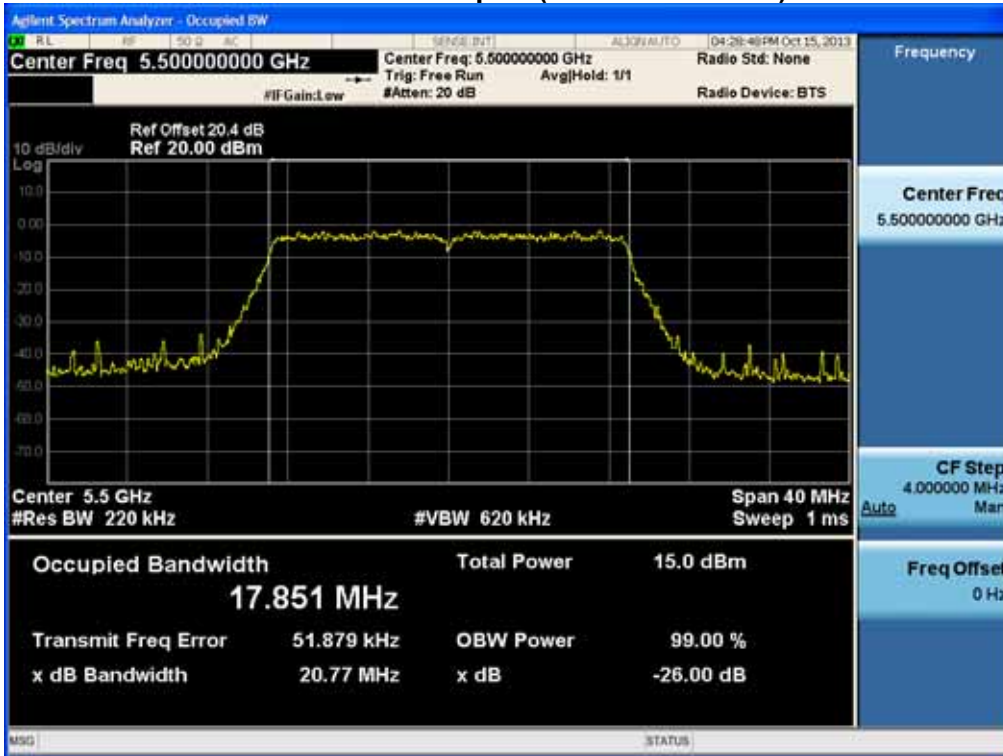
26 dB Bandwidth plot (802.11ac-CH 40)



26 dB Bandwidth plot (802.11ac-CH 52)

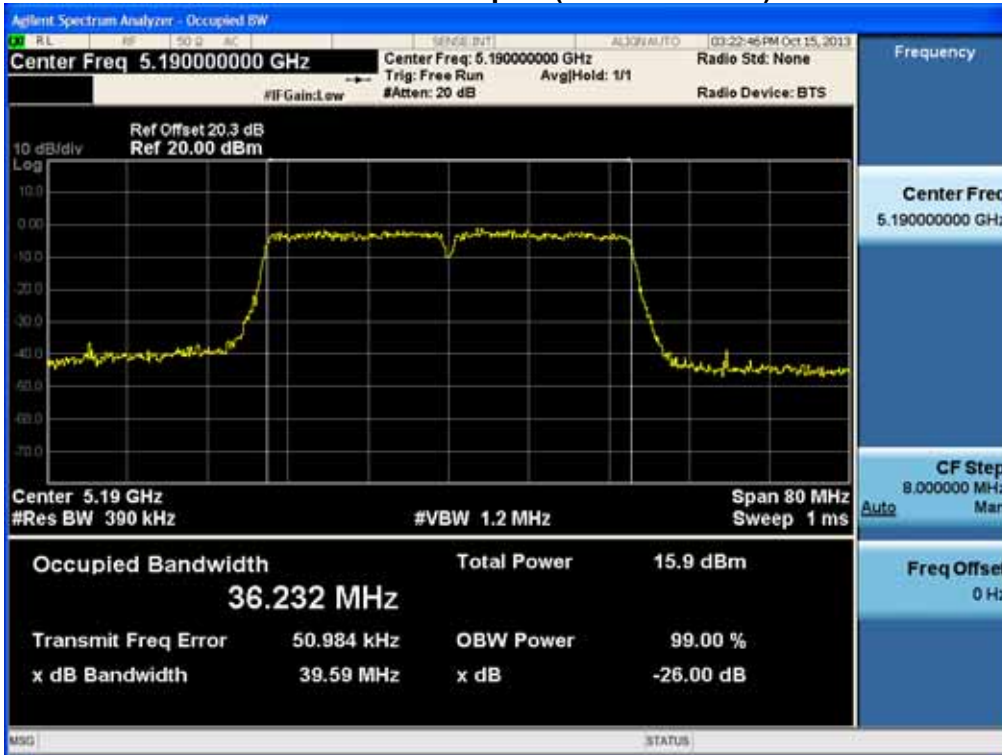


26 dB Bandwidth plot (802.11ac-CH 100)

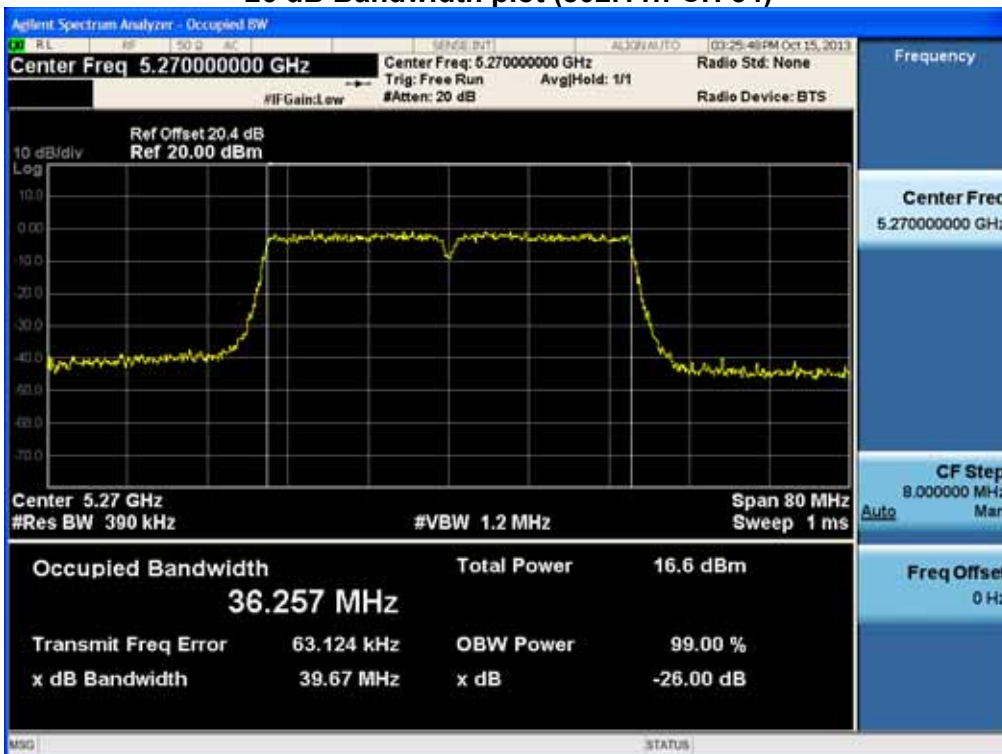


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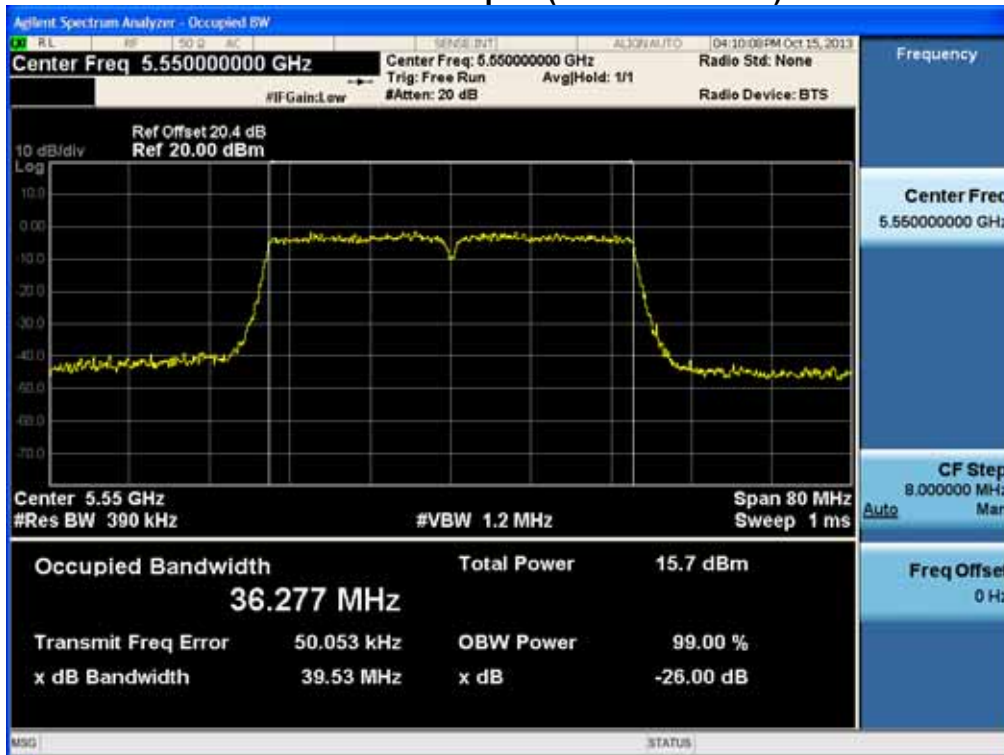
26 dB Bandwidth plot (802.11n-CH 38)



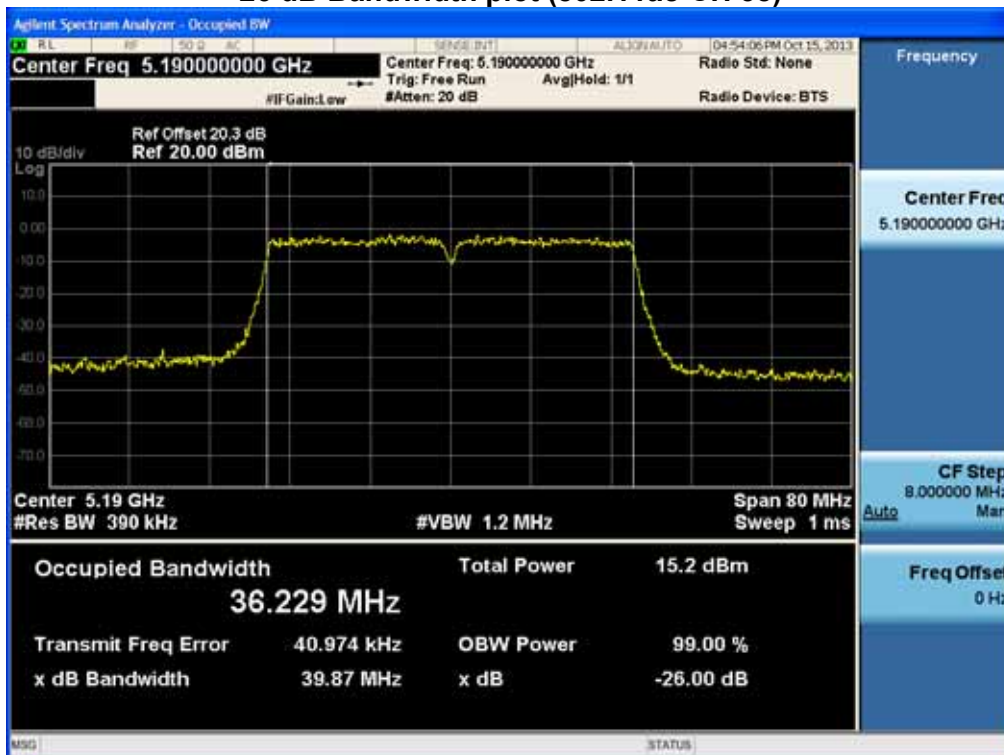
26 dB Bandwidth plot (802.11n-CH 54)



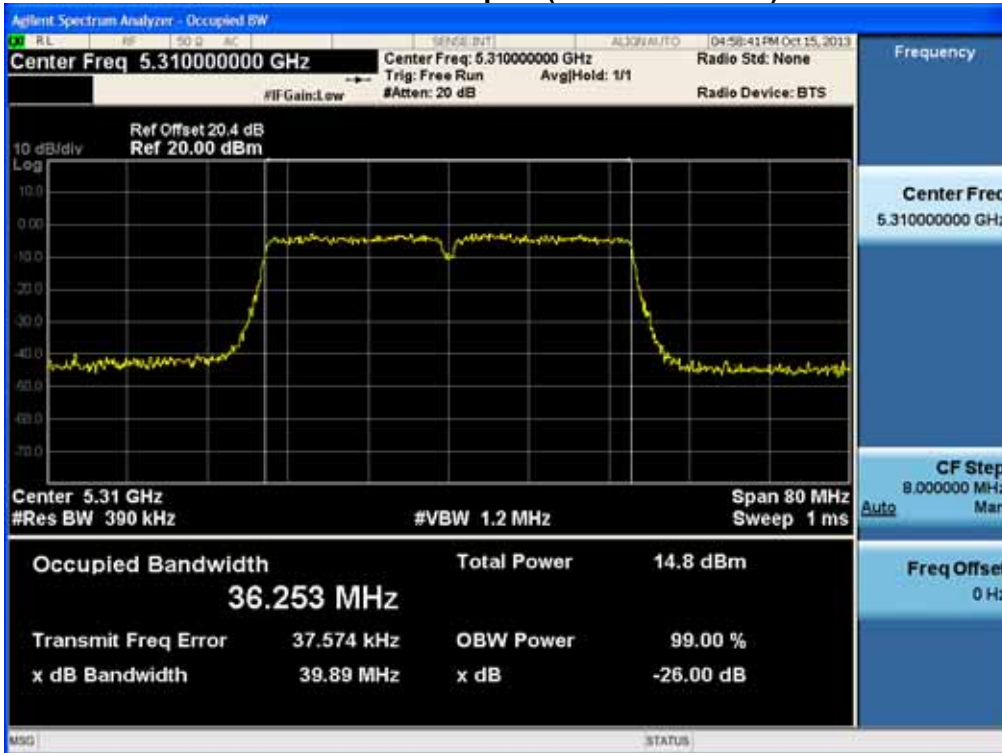
26 dB Bandwidth plot (802.11n-CH 110)



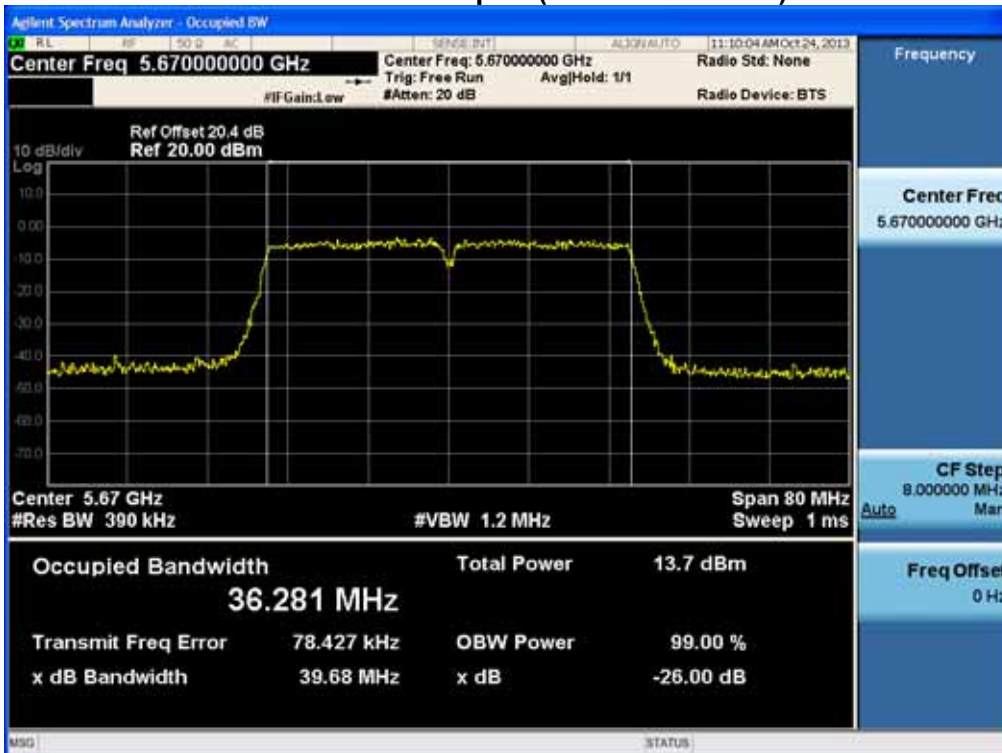
26 dB Bandwidth plot (802.11ac-CH 38)



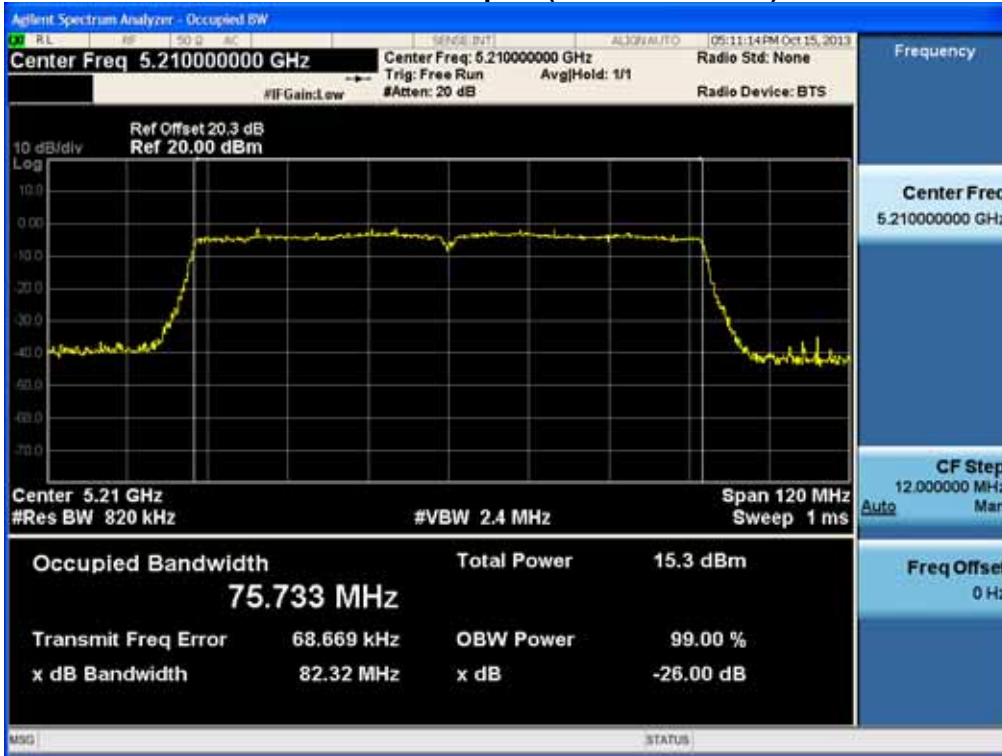
26 dB Bandwidth plot (802.11ac-CH 62)



26 dB Bandwidth plot (802.11ac-CH 142)



26 dB Bandwidth plot (802.11ac-CH 42)



26 dB Bandwidth plot (802.11ac-CH 58)



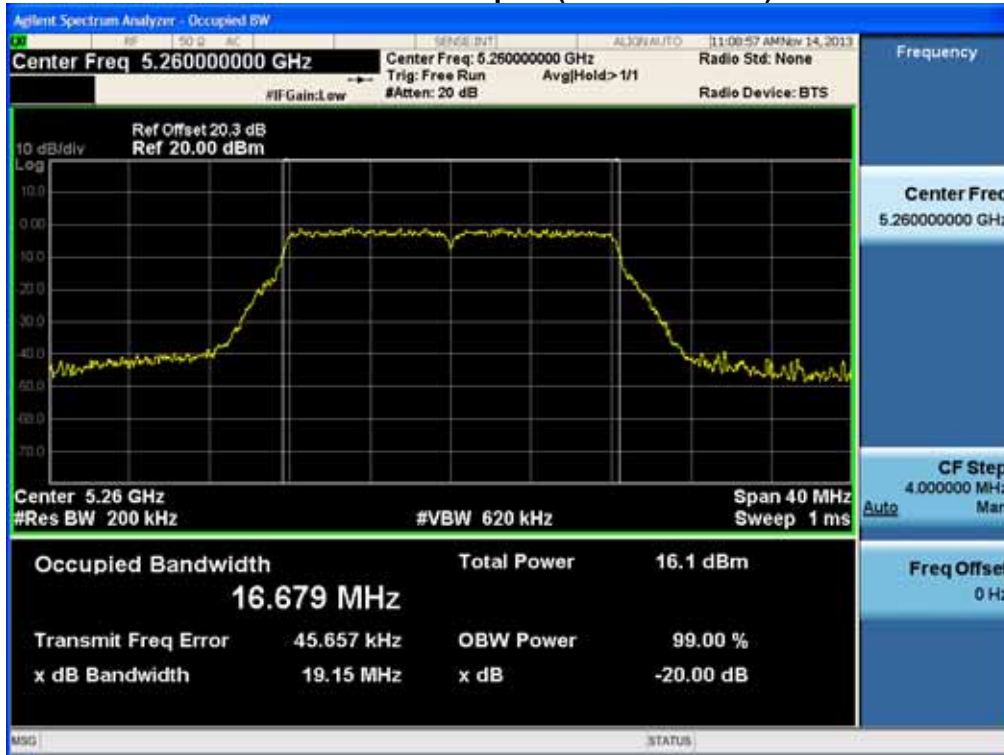
26 dB Bandwidth plot (802.11ac-CH 106)



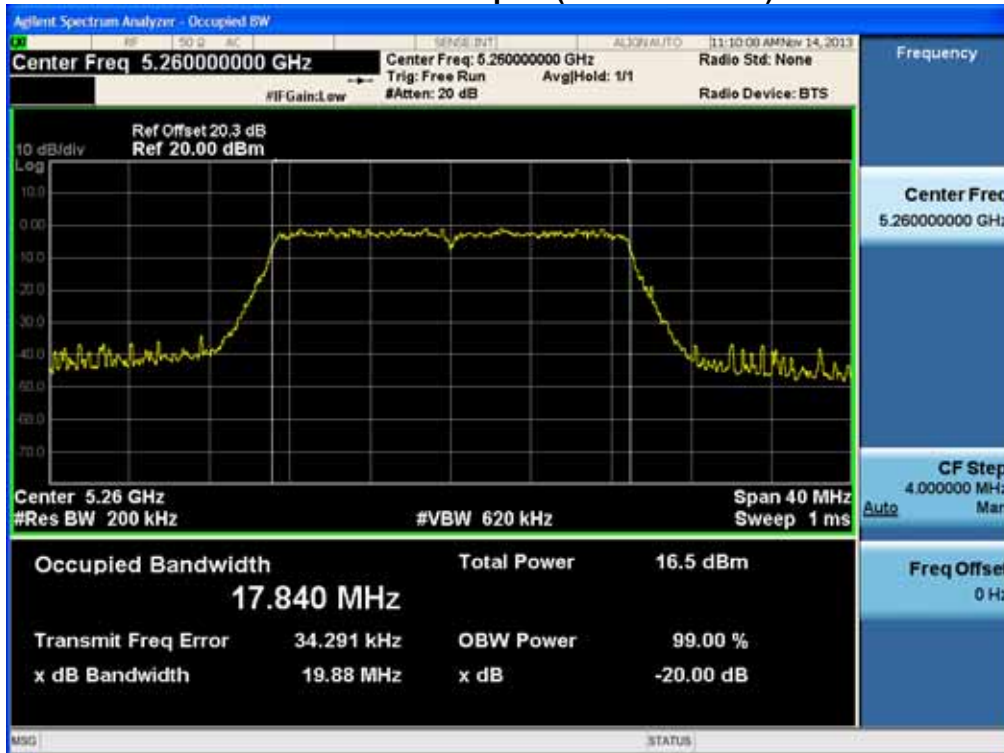
FCC PT.15.407 TEST REPORT	FCC CERTIFICATION REPORT		www.hct.co.kr
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RESULT PLOTS(20 dB Bandwidth)

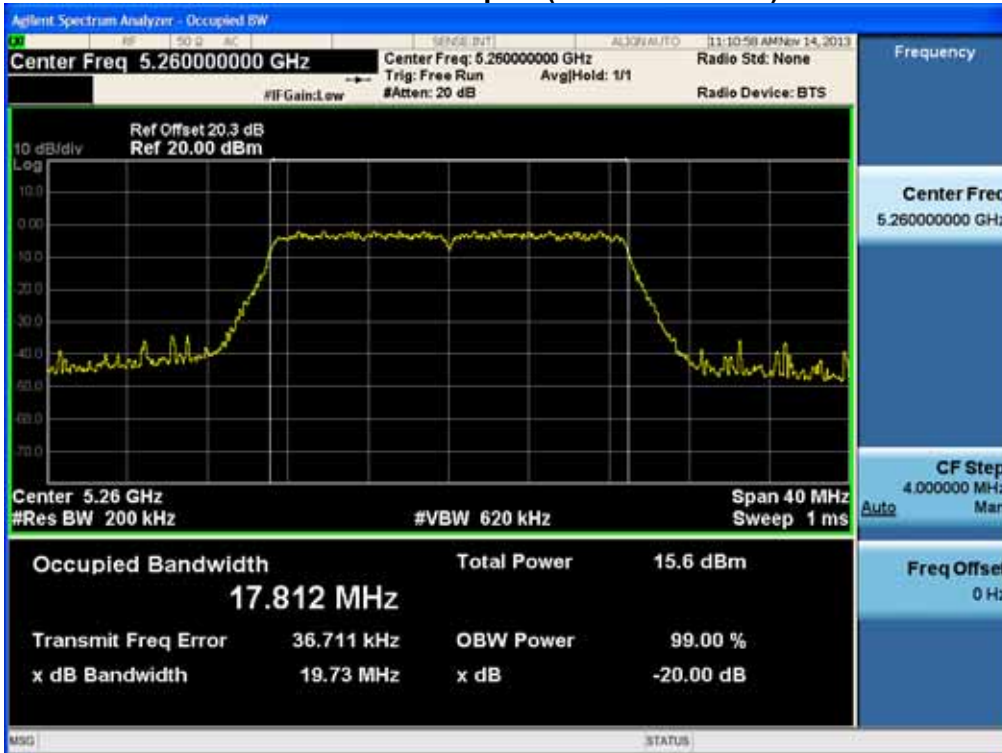
20 dB Bandwidth plot (802.11a-CH 52)



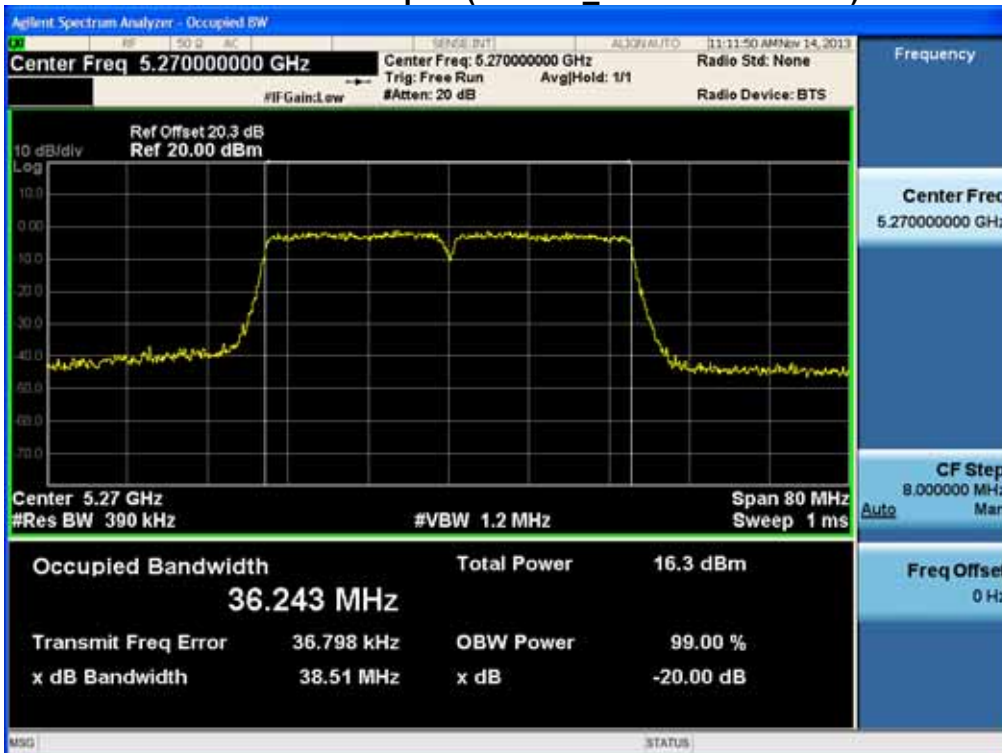
20 dB Bandwidth plot (802.11n-CH 52)



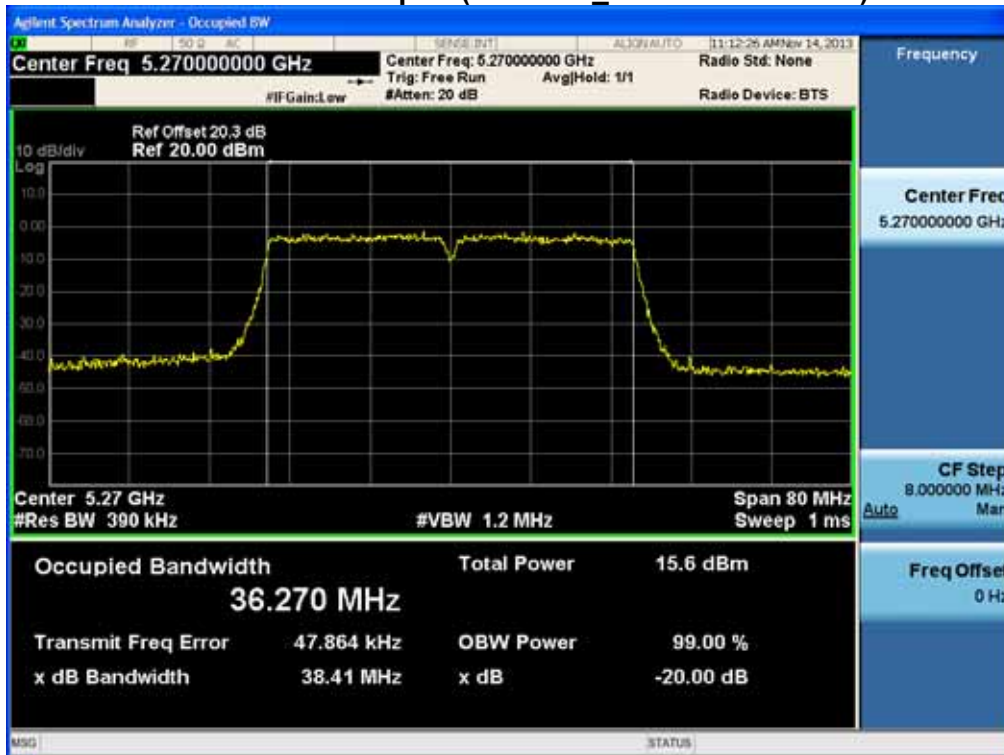
20 dB Bandwidth plot (802.11ac-CH 52)



20 dB Bandwidth plot (802.11n_40 MHz BW-CH 54)



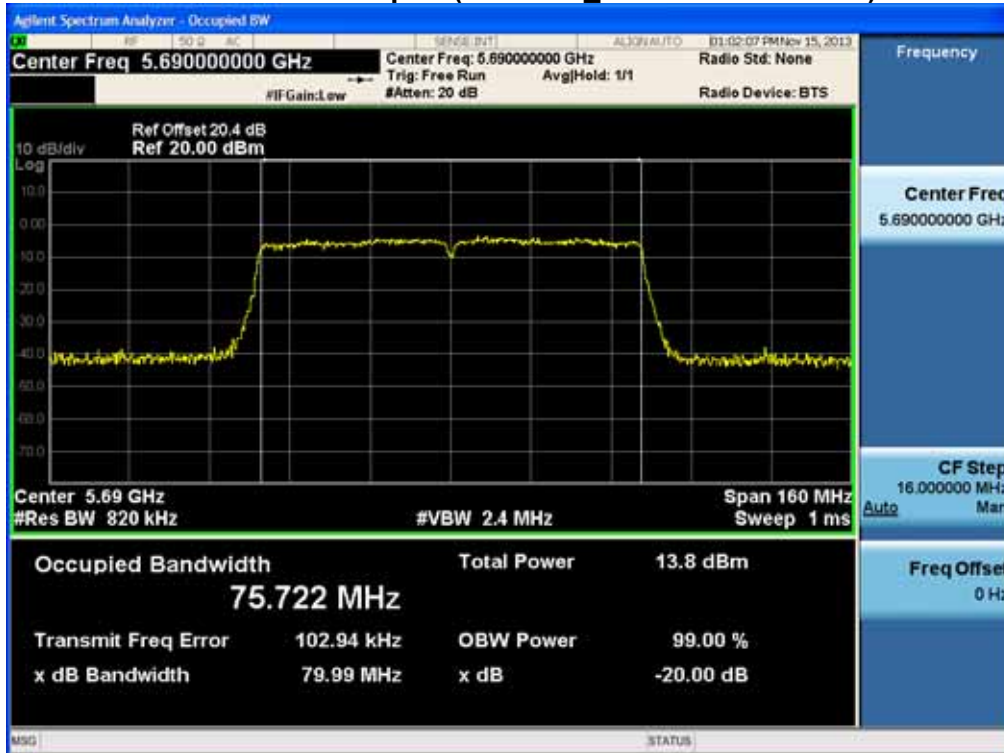
20 dB Bandwidth plot (802.11ac_40 MHz BW-CH 54)



20 dB Bandwidth plot (802.11ac_80 MHz BW-CH 58)



20 dB Bandwidth plot (802.11ac_80 MHz BW-CH 138)



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8.3 OUTPUT POWER MEASUREMENT

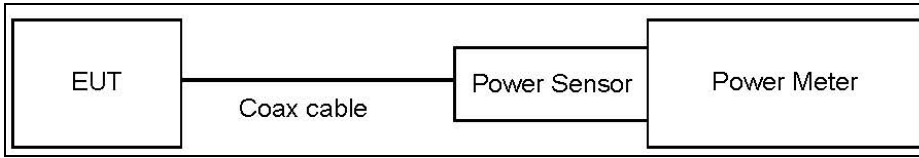
Test Requirements and limit, §15.247(b)(3)

A transmitter antenna terminal of EUT is connected to the input of a Spectrum Analyzer. Measurement is made while the EUT is operating in transmission mode at the appropriate frequencies. In the 5.15 – 5.25 GHz band, the maximum permissible conducted output power is the lesser of 50 mW ((16.99 dBm) and $4 \text{ dBm} + 10 \log_{10} (26 \text{ dB BW})$ frequencies. In the 5.25 – 5.35 GHz band, the maximum permissible conducted output power is the lesser of 250 mW (23.98 dBm) and $11 \text{ dBm} + 10 \log_{10} (26 \text{ dB BW})$ frequencies. In the 5.47 – 5.725 GHz band, the maximum permissible conducted output power is the lesser of 250 mW (23.98 dBm) and $11 \text{ dBm} + 10 \log_{10} (26 \text{ dB BW})$

- Limit : 802.11a_UNII-1 = 16.99 dBm
- 802.11n_UNII-1_20 MHz BW = 16.99 dBm
- 802.11n_UNII-1_40 MHz BW = 16.99 dBm
- 802.11ac_UNII-1_20 MHz BW =16.99 dBm
- 802.11ac_UNII-1_40 MHz BW =16.99 dBm
- 802.11ac_UNII-1_80 MHz BW =16.99 dBm
- 802.11a_UNII-2 = 23.98 dBm
- 802.11n_UNII-2_20 MHz BW = 23.98dBm
- 802.11n_UNII-2_40 MHz BW = 23.98 dBm
- 802.11ac_UNII-2_20 MHz BW =23.98 dBm
- 802.11ac_UNII-2_40 MHz BW =23.98 dBm
- 802.11ac_UNII-2_80 MHz BW =23.98 dBm
- 802.11a_UNII-2e = 23.98dBm
- 802.11n_UNII-2e_20 MHz BW = 23.98 dBm
- 802.11n_UNII-2e_40 MHz BW = 23.98 dBm
- 802.11ac_UNII-2e_20 MHz BW =23.98 dBm
- 802.11ac_UNII-2e_40 MHz BW =23.98 dBm
- 802.11ac_UNII-2e_80 MHz BW =23.98 dBm

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TEST CONFIGURATION(20 MHz BW)



TEST PROCEDURE(20 MHz BW)

We tested according to Method E)3)a) in KDB 789033(issued 04/08/2013).

▪ Average Power

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.

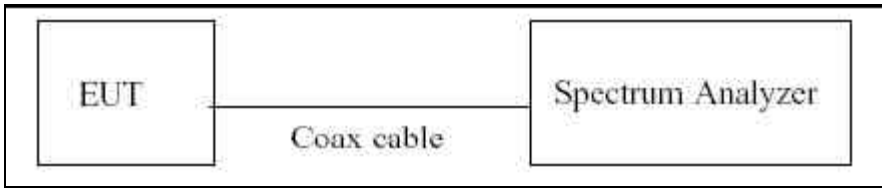
Note :

1. 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	Frequency(MHz)	Loss(dB)
UNII 1	5180	20.30
	5190	20.29
	5200	20.28
	5230	20.29
	5240	20.34
UNII 2	5260	20.37
	5270	20.38
	5300	20.40
	5310	20.39
	5320	20.39
UNII 2e	5500	20.35
	5510	20.36
	5550	20.41
	5580	20.43
	5670	20.43

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

TEST CONFIGURATION(40 MHz BW & 80 MHz BW)



TEST PROCEDURE(40 MHz BW & 80 MHz BW)

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(issued 04/08/2013).

The Spectrum Analyzer is set to

- Average Power
 1. Measure the duty cycle.
 2. Set span to encompass the 26 dB EBW of the signal.
 3. RBW = 1 MHz.
 4. VBW ≥ 3 MHz.
 5. Number of points in sweep ≥ 2*span/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 10log(1/x), where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times.

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Sample Calculation

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

Output Power = 10 dBm + 20 dB + 0.8 dB + 0.21 dB = 31.01 dBm

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. 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	Frequency(MHz)	Loss(dB)
UNII 1	5180	20.30
	5190	20.29
	5200	20.28
	5230	20.29
	5240	20.34
UNII 2	5260	20.37
	5270	20.38
	5300	20.40
	5310	20.39
	5320	20.39
UNII 2e	5500	20.35
	5510	20.36
	5550	20.41
	5580	20.43
	5670	20.43

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



TEST RESULTS

20 MHz BW

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

802.11a Mode		Rate (Mbps)	Measured Power(dBm)	Duty Cycle Factor	Measured Power(dBm) + Duty Cycle Factor	Limit (dBm)
Frequency [MHz]	Channel No.					
5180	36	6	9.03	0.216	9.25	16.99
		9	8.73	0.334	9.06	16.99
		12	8.75	0.418	9.17	16.99
		18	8.51	0.602	9.11	16.99
		24	8.30	0.779	9.08	16.99
		36	7.90	1.066	8.96	16.99
		48	7.91	1.382	9.29	16.99
		54	7.62	1.501	9.12	16.99
5200	40	6	8.99	0.216	9.21	16.99
		9	8.77	0.334	9.10	16.99
		12	8.77	0.418	9.19	16.99
		18	8.62	0.602	9.22	16.99
		24	8.29	0.779	9.07	16.99
		36	8.00	1.066	9.06	16.99
		48	7.70	1.382	9.08	16.99
		54	7.51	1.501	9.01	16.99
5240	48	6	8.86	0.216	9.08	16.99
		9	8.61	0.334	8.94	16.99
		12	8.66	0.418	9.08	16.99
		18	8.34	0.602	8.94	16.99
		24	8.20	0.779	8.98	16.99
		36	7.73	1.066	8.79	16.99
		48	7.75	1.382	9.13	16.99
		54	7.47	1.501	8.97	16.99

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

802.11a Mode		Rate (Mbps)	Measured Power(dBm)	Duty Cycle Factor	Measured Power(dBm) + Duty Cycle Factor	Limit (dBm)
Frequency [MHz]	Channel No.					
5260	52	6	9.20	0.216	9.41	23.98
		9	9.14	0.334	9.47	23.98
		12	8.86	0.418	9.28	23.98
		18	8.80	0.602	9.40	23.98
		24	8.56	0.779	9.34	23.98
		36	8.38	1.066	9.45	23.98
		48	8.02	1.382	9.40	23.98
		54	7.78	1.501	9.28	23.98
5300	60	6	9.23	0.216	9.45	23.98
		9	8.95	0.334	9.29	23.98
		12	8.83	0.418	9.25	23.98
		18	8.61	0.602	9.21	23.98
		24	8.42	0.779	9.20	23.98
		36	8.12	1.066	9.19	23.98
		48	7.91	1.382	9.29	23.98
		54	7.74	1.501	9.24	23.98
5320	64	6	8.97	0.216	9.18	23.98
		9	8.94	0.334	9.28	23.98
		12	8.91	0.418	9.33	23.98
		18	8.64	0.602	9.25	23.98
		24	8.45	0.779	9.23	23.98
		36	8.13	1.066	9.20	23.98
		48	7.93	1.382	9.31	23.98
		54	7.77	1.501	9.27	23.98

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

802.11a Mode		Rate (Mbps)	Measured Power(dBm)	Duty Cycle Factor	Measured Power(dBm) + Duty Cycle Factor	Limit (dBm)
Frequency [MHz]	Channel No.					
5500	100	6	8.95	0.216	9.17	23.98
		9	8.90	0.334	9.23	23.98
		12	8.72	0.418	9.13	23.98
		18	8.50	0.602	9.10	23.98
		24	8.34	0.779	9.12	23.98
		36	8.08	1.066	9.15	23.98
		48	7.95	1.382	9.33	23.98
		54	7.73	1.501	9.23	23.98
5580	116	6	8.69	0.216	8.90	23.98
		9	8.65	0.334	8.98	23.98
		12	8.68	0.418	9.09	23.98
		18	8.36	0.602	8.97	23.98
		24	8.26	0.779	9.04	23.98
		36	7.98	1.066	9.05	23.98
		48	7.70	1.382	9.08	23.98
		54	7.45	1.501	8.95	23.98
5720	144	6	8.84	0.216	9.05	23.98
		9	8.69	0.334	9.02	23.98
		12	8.78	0.418	9.20	23.98
		18	8.68	0.602	9.28	23.98
		24	8.42	0.779	9.20	23.98
		36	8.12	1.066	9.19	23.98
		48	7.91	1.382	9.29	23.98
		54	7.65	1.501	9.15	23.98

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

802.11n Mode		Rate (Mbps)	Measured Power(dBm)	Duty Cycle Factor	Measured Power(dBm) + Duty Cycle Factor	Limit (dBm)
Frequency [MHz]	Channel No.					
5180	36	6.5	8.93	0.225	9.15	16.99
		13	8.76	0.431	9.19	16.99
		19.5	8.55	0.634	9.18	16.99
		26	8.45	0.795	9.25	16.99
		39	8.12	1.111	9.23	16.99
		52	7.78	1.399	9.18	16.99
		58.5	7.86	1.496	9.36	16.99
		65	7.51	1.612	9.12	16.99
5200	40	6.5	8.94	0.225	9.17	16.99
		13	8.84	0.431	9.27	16.99
		19.5	8.43	0.634	9.07	16.99
		26	8.37	0.795	9.16	16.99
		39	8.05	1.111	9.16	16.99
		52	7.87	1.399	9.27	16.99
		58.5	7.62	1.496	9.12	16.99
		65	7.56	1.612	9.17	16.99
5240	48	6.5	8.94	0.225	9.16	16.99
		13	8.57	0.431	9.00	16.99
		19.5	8.35	0.634	8.99	16.99
		26	8.27	0.795	9.06	16.99
		39	7.95	1.111	9.06	16.99
		52	7.68	1.399	9.08	16.99
		58.5	7.65	1.496	9.15	16.99
		65	7.52	1.612	9.13	16.99



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

802.11n Mode		Rate (Mbps)	Measured Power(dBm)	Duty Cycle Factor	Measured Power(dBm) + Duty Cycle Factor	Limit (dBm)
Frequency [MHz]	Channel No.					
5260	52	6.5	9.27	0.225	9.49	23.98
		13	8.93	0.431	9.36	23.98
		19.5	8.71	0.634	9.34	23.98
		26	8.55	0.795	9.35	23.98
		39	8.31	1.111	9.42	23.98
		52	8.20	1.399	9.60	23.98
		58.5	7.94	1.496	9.43	23.98
		65	7.85	1.612	9.46	23.98
5300	60	6.5	9.22	0.225	9.45	23.98
		13	9.03	0.431	9.46	23.98
		19.5	8.60	0.634	9.23	23.98
		26	8.45	0.795	9.24	23.98
		39	8.18	1.111	9.29	23.98
		52	8.07	1.399	9.47	23.98
		58.5	7.93	1.496	9.43	23.98
		65	7.67	1.612	9.28	23.98
5320	64	6.5	9.05	0.225	9.27	23.98
		13	8.95	0.431	9.38	23.98
		19.5	8.51	0.634	9.15	23.98
		26	8.57	0.795	9.36	23.98
		39	8.19	1.111	9.30	23.98
		52	7.93	1.399	9.33	23.98
		58.5	7.75	1.496	9.25	23.98
		65	7.73	1.612	9.34	23.98

FCC PT.15.407 TEST REPORT	FCC CERTIFICATION REPORT		www.hct.co.kr
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Conducted Output Power Measurements (802.11n Mode: 5500~5720)

802.11n Mode		Rate (Mbps)	Measured Power(dBm)	Duty Cycle Factor	Measured Power(dBm) + Duty Cycle Factor	Limit (dBm)
Frequency [MHz]	Channel No.					
5500	100	6.5	8.85	0.225	9.08	23.98
		13	8.83	0.431	9.26	23.98
		19.5	8.50	0.634	9.13	23.98
		26	8.62	0.795	9.42	23.98
		39	8.23	1.111	9.34	23.98
		52	7.88	1.399	9.28	23.98
		58.5	7.76	1.496	9.26	23.98
		65	7.51	1.612	9.13	23.98
5580	116	6.5	8.76	0.225	8.99	23.98
		13	8.45	0.431	8.89	23.98
		19.5	8.28	0.634	8.91	23.98
		26	8.27	0.795	9.06	23.98
		39	7.92	1.111	9.03	23.98
		52	7.52	1.399	8.92	23.98
		58.5	7.41	1.496	8.90	23.98
		65	7.36	1.612	8.97	23.98
5720	144	6.5	8.86	0.225	9.09	23.98
		13	8.62	0.431	9.05	23.98
		19.5	8.56	0.634	9.19	23.98
		26	8.29	0.795	9.08	23.98
		39	8.07	1.111	9.18	23.98
		52	7.79	1.399	9.19	23.98
		58.5	7.82	1.496	9.32	23.98
		65	7.57	1.612	9.18	23.98



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

802.11ac Mode		Rate (Mbps)	Measured Power(dBm)	Duty Cycle Factor	Measured Power(dBm) + Duty Cycle Factor	Limit (dBm)
Frequency [MHz]	Channel No.					
5180	36	6.5	8.11	0.231	8.34	16.99
		13	7.95	0.428	8.38	16.99
		19.5	7.60	0.602	8.20	16.99
		26	7.57	0.803	8.37	16.99
		39	7.10	1.087	8.19	16.99
		52	7.11	1.353	8.46	16.99
		58.5	6.92	1.469	8.39	16.99
		65	6.67	1.575	8.24	16.99
		78	6.49	1.775	8.26	16.99
5200	40	6.5	8.25	0.231	8.48	16.99
		13	7.75	0.428	8.18	16.99
		19.5	7.66	0.602	8.27	16.99
		26	7.54	0.803	8.35	16.99
		39	7.34	1.087	8.43	16.99
		52	6.86	1.353	8.21	16.99
		58.5	6.75	1.469	8.22	16.99
		65	6.60	1.575	8.18	16.99
		78	6.42	1.775	8.19	16.99
5240	48	6.5	8.11	0.231	8.34	16.99
		13	7.66	0.428	8.09	16.99
		19.5	7.46	0.602	8.06	16.99
		26	7.30	0.803	8.10	16.99
		39	7.06	1.087	8.15	16.99
		52	6.87	1.353	8.22	16.99
		58.5	6.56	1.469	8.02	16.99
		65	6.61	1.575	8.18	16.99
		78	6.51	1.775	8.28	16.99

FCC PT.15.407 TEST REPORT	FCC CERTIFICATION REPORT		www.hct.co.kr
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Conducted Output Power Measurements (802.11ac Mode: 5260~5320)

802.11ac Mode		Rate (Mbps)	Measured Power(dBm)	Duty Cycle Factor	Measured Power(dBm) + Duty Cycle Factor	Limit (dBm)
Frequency [MHz]	Channel No.					
5260	52	6.5	8.19	0.231	8.42	23.98
		13	8.02	0.428	8.45	23.98
		19.5	7.75	0.602	8.35	23.98
		26	7.67	0.803	8.47	23.98
		39	7.31	1.087	8.40	23.98
		52	7.19	1.353	8.54	23.98
		58.5	6.85	1.469	8.32	23.98
		65	6.85	1.575	8.43	23.98
		78	6.67	1.775	8.45	23.98
5300	60	6.5	8.00	0.231	8.23	23.98
		13	7.89	0.428	8.32	23.98
		19.5	7.63	0.602	8.23	23.98
		26	7.56	0.803	8.36	23.98
		39	7.26	1.087	8.35	23.98
		52	6.91	1.353	8.26	23.98
		58.5	6.89	1.469	8.36	23.98
		65	6.68	1.575	8.26	23.98
		78	6.55	1.775	8.33	23.98
5320	64	6.5	7.98	0.231	8.21	23.98
		13	7.79	0.428	8.22	23.98
		19.5	7.71	0.602	8.31	23.98
		26	7.48	0.803	8.28	23.98
		39	7.28	1.087	8.36	23.98
		52	6.86	1.353	8.22	23.98
		58.5	6.89	1.469	8.36	23.98
		65	6.78	1.575	8.36	23.98
		78	6.35	1.775	8.13	23.98

FCC PT.15.407 TEST REPORT	FCC CERTIFICATION REPORT		www.hct.co.kr
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Conducted Output Power Measurements (802.11ac Mode: 5500~5720)

802.11ac Mode		Rate (Mbps)	Measured Power(dBm)	Duty Cycle Factor	Measured Power(dBm) + Duty Cycle Factor	Limit (dBm)
Frequency [MHz]	Channel No.					
5500	100	6.5	7.96	0.231	8.19	23.98
		13	7.69	0.428	8.12	23.98
		19.5	7.53	0.602	8.14	23.98
		26	7.29	0.803	8.09	23.98
		39	7.08	1.087	8.17	23.98
		52	6.73	1.353	8.09	23.98
		58.5	6.80	1.469	8.27	23.98
		65	6.49	1.575	8.07	23.98
		78	6.55	1.775	8.32	23.98
5580	116	6.5	7.82	0.231	8.05	23.98
		13	7.50	0.428	7.93	23.98
		19.5	7.29	0.602	7.90	23.98
		26	7.13	0.803	7.94	23.98
		39	6.84	1.087	7.93	23.98
		52	6.48	1.353	7.83	23.98
		58.5	6.45	1.469	7.92	23.98
		65	6.38	1.575	7.95	23.98
		78	6.19	1.775	7.97	23.98
5720	144	6.5	7.26	0.231	7.49	23.98
		13	7.12	0.428	7.55	23.98
		19.5	6.95	0.602	7.56	23.98
		26	6.79	0.803	7.59	23.98
		39	6.28	1.087	7.37	23.98
		52	6.07	1.353	7.43	23.98
		58.5	5.90	1.469	7.37	23.98
		65	5.78	1.575	7.35	23.98
		78	5.76	1.775	7.54	23.98

Conducted Output Power Measurements (802.11n Mode: 5190~5230)

802.11n Mode		Rate (Mbps)	Measured Power(dBm)	Duty Cycle Factor	Measured Power(dBm) + Duty Cycle Factor	Limit (dBm)
Frequency [MHz]	Channel No.					
5190	38	13.5	8.69	0.446	9.14	16.99
		27	8.44	0.812	9.25	16.99
		40.5	8.27	1.133	9.40	16.99
		54	7.83	1.428	9.26	16.99
		81	7.01	1.876	8.89	16.99
		108	7.09	2.224	9.31	16.99
		121.5	7.02	2.372	9.39	16.99
		135	6.44	2.507	8.95	16.99
5230	46	13.5	8.2	0.446	8.65	16.99
		27	7.76	0.812	8.57	16.99
		40.5	7.96	1.133	9.09	16.99
		54	7.36	1.428	8.79	16.99
		81	6.74	1.876	8.62	16.99
		108	6.49	2.224	8.71	16.99
		121.5	6.52	2.372	8.89	16.99
		135	6.04	2.507	8.55	16.99

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

802.11n Mode		Rate (Mbps)	Measured Power(dBm)	Duty Cycle Factor	Measured Power(dBm) + Duty Cycle Factor	Limit (dBm)
Frequency [MHz]	Channel No.					
5270	54	13.5	9.18	0.446	9.63	23.98
		27	8.77	0.812	9.58	23.98
		40.5	8.56	1.133	9.69	23.98
		54	8.20	1.428	9.63	23.98
		81	7.71	1.876	9.59	23.98
		108	7.19	2.224	9.41	23.98
		121.5	7.06	2.372	9.43	23.98
		135	6.91	2.507	9.42	23.98
5310	62	13.5	9.10	0.446	9.55	23.98
		27	8.61	0.812	9.42	23.98
		40.5	8.12	1.133	9.25	23.98
		54	8.14	1.428	9.57	23.98
		81	7.70	1.876	9.58	23.98
		108	6.84	2.224	9.06	23.98
		121.5	7.02	2.372	9.39	23.98
		135	6.95	2.507	9.46	23.98

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

802.11n Mode		Rate (Mbps)	Measured Power(dBm)	Duty Cycle Factor	Measured Power(dBm) + Duty Cycle Factor	Limit (dBm)
Frequency [MHz]	Channel No.					
5510	102	13.5	7.40	0.446	7.85	23.98
		27	7.04	0.812	7.85	23.98
		40.5	6.72	1.133	7.85	23.98
		54	6.50	1.428	7.93	23.98
		81	6.00	1.876	7.88	23.98
		108	5.64	2.224	7.86	23.98
		121.5	5.42	2.372	7.79	23.98
		135	5.19	2.507	7.70	23.98
5550	110	13.5	7.51	0.446	7.96	23.98
		27	7.21	0.812	8.02	23.98
		40.5	6.87	1.133	8.00	23.98
		54	6.59	1.428	8.02	23.98
		81	5.96	1.876	7.84	23.98
		108	5.55	2.224	7.77	23.98
		121.5	5.70	2.372	8.07	23.98
		135	5.53	2.507	8.04	23.98
5710	142	13.5	7.29	0.446	7.74	23.98
		27	6.93	0.812	7.74	23.98
		40.5	6.67	1.133	7.80	23.98
		54	6.50	1.428	7.93	23.98
		81	6.25	1.876	8.13	23.98
		108	6.07	2.224	8.29	23.98
		121.5	5.63	2.372	8.00	23.98
		135	5.43	2.507	7.94	23.98

Conducted Output Power Measurements (802.11ac Mode: 5190~5230)

802.11ac Mode		Rate (Mbps)	Measured Power(dBm)	Duty Cycle Factor	Measured Power(dBm) + Duty Cycle Factor	Limit (dBm)
Frequency [MHz]	Channel No.					
5190	38	13.5	7.51	0.442	7.95	16.99
		27	7.62	0.806	8.43	16.99
		40.5	7.03	1.121	8.15	16.99
		54	6.78	1.41	8.19	16.99
		81	6.56	1.851	8.41	16.99
		108	5.73	2.179	7.91	16.99
		121.5	5.88	2.321	8.20	16.99
		135	5.32	2.482	7.80	16.99
		162	5.59	2.7	8.29	16.99
		180	5.14	2.771	7.91	16.99
5230	46	13.5	7.72	0.442	8.16	16.99
		27	7.19	0.806	8.00	16.99
		40.5	6.95	1.121	8.07	16.99
		54	6.3	1.41	7.71	16.99
		81	5.84	1.851	7.69	16.99
		108	5.63	2.179	7.81	16.99
		121.5	5.76	2.321	8.08	16.99
		135	5.62	2.482	8.10	16.99
		162	5.5	2.7	8.20	16.99
		180	4.75	2.771	7.52	16.99

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

802.11ac Mode		Rate (Mbps)	Measured Power(dBm)	Duty Cycle Factor	Measured Power(dBm) + Duty Cycle Factor	Limit (dBm)
Frequency [MHz]	Channel No.					
5270	54	13.5	7.85	0.442	8.29	23.98
		27	7.53	0.806	8.34	23.98
		40.5	7.16	1.121	8.28	23.98
		54	7.29	1.41	8.70	23.98
		81	6.66	1.851	8.51	23.98
		108	6.48	2.179	8.66	23.98
		121.5	6.35	2.321	8.67	23.98
		135	6.18	2.482	8.66	23.98
		162	6.29	2.7	8.99	23.98
		180	5.95	2.771	8.72	23.98
5310	62	13.5	7.88	0.442	8.32	23.98
		27	7.56	0.806	8.37	23.98
		40.5	7.36	1.121	8.48	23.98
		54	7.01	1.41	8.42	23.98
		81	6.56	1.851	8.41	23.98
		108	5.95	2.179	8.13	23.98
		121.5	5.85	2.321	8.17	23.98
		135	5.95	2.482	8.43	23.98
		162	5.38	2.7	8.08	23.98
		180	5.63	2.771	8.40	23.98



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

802.11ac Mode		Rate (Mbps)	Measured Power(dBm)	Duty Cycle Factor	Measured Power(dBm) + Duty Cycle Factor	Limit (dBm)
Frequency [MHz]	Channel No.					
5510	102	13.5	7.31	0.442	7.75	23.98
		27	6.69	0.806	7.50	23.98
		40.5	6.44	1.121	7.56	23.98
		54	6.14	1.41	7.55	23.98
		81	5.81	1.851	7.66	23.98
		108	5.39	2.179	7.57	23.98
		121.5	5.21	2.321	7.53	23.98
		135	5.00	2.482	7.48	23.98
		162	4.81	2.7	7.51	23.98
		180	4.73	2.771	7.50	23.98
5550	110	13.5	7.17	0.442	7.61	23.98
		27	7.07	0.806	7.88	23.98
		40.5	6.47	1.121	7.59	23.98
		54	6.42	1.41	7.83	23.98
		81	5.85	1.851	7.70	23.98
		108	5.59	2.179	7.77	23.98
		121.5	5.22	2.321	7.54	23.98
		135	5.26	2.482	7.74	23.98
		162	5.10	2.7	7.80	23.98
		180	4.94	2.771	7.71	23.98
5710	142	13.5	6.53	0.442	6.97	23.98
		27	6.28	0.806	7.09	23.98
		40.5	5.83	1.121	6.95	23.98
		54	5.46	1.41	6.87	23.98
		81	5.12	1.851	6.97	23.98
		108	4.81	2.179	6.99	23.98
		121.5	4.81	2.321	7.13	23.98
		135	4.40	2.482	6.88	23.98
		162	4.17	2.7	6.87	23.98
		180	4.38	2.771	7.15	23.98

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Conducted Output Power Measurements (802.11ac Mode: 5210)

802.11ac Mode		Rate (Mbps)	Measured Power(dBm)	Duty Cycle Factor	Measured Power(dBm) + Duty Cycle Factor	Limit (dBm)
Frequency [MHz]	Channel No.					
5210	42	29.3	6.70	0.864	7.56	16.99
		58.5	6.11	1.456	7.57	16.99
		87.8	5.64	1.943	7.58	16.99
		117	5.29	2.242	7.53	16.99
		175.5	4.68	2.771	7.45	16.99
		234	4.48	3.123	7.60	16.99
		263.3	4.35	3.297	7.65	16.99
		292.5	4.15	3.405	7.56	16.99
		351	3.95	3.647	7.60	16.99
390	3.80	3.782	7.58	16.99		

Conducted Output Power Measurements (802.11ac Mode: 5290)

802.11ac Mode		Rate (Mbps)	Measured Power(dBm)	Duty Cycle Factor	Measured Power(dBm) + Duty Cycle Factor	Limit (dBm)
Frequency [MHz]	Channel No.					
5290	58	29.3	6.73	0.864	7.59	23.98
		58.5	6.14	1.456	7.60	23.98
		87.8	5.69	1.943	7.63	23.98
		117	5.37	2.242	7.61	23.98
		175.5	4.95	2.771	7.72	23.98
		234	4.55	3.123	7.67	23.98
		263.3	4.29	3.297	7.59	23.98
		292.5	4.21	3.405	7.62	23.98
		351	3.95	3.647	7.60	23.98
390	3.78	3.782	7.56	23.98		

Conducted Output Power Measurements (802.11ac Mode: 5530~5690)

802.11ac Mode		Rate (Mbps)	Measured Power(dBm)	Duty Cycle Factor	Measured Power(dBm) + Duty Cycle Factor	Limit (dBm)
Frequency [MHz]	Channel No.					
5530	106	29.3	6.10	0.864	6.96	23.98
		58.5	5.50	1.456	6.96	23.98
		87.8	5.11	1.943	7.05	23.98
		117	4.84	2.242	7.08	23.98
		175.5	4.22	2.771	6.99	23.98
		234	3.91	3.123	7.03	23.98
		263.3	3.76	3.297	7.06	23.98
		292.5	3.59	3.405	7.00	23.98
		351	3.43	3.647	7.08	23.98
		390	3.27	3.782	7.05	23.98
5690	138	29.3	5.61	0.864	6.47	23.98
		58.5	5.04	1.456	6.50	23.98
		87.8	4.65	1.943	6.59	23.98
		117	4.22	2.242	6.46	23.98
		175.5	3.64	2.771	6.41	23.98
		234	3.27	3.123	6.39	23.98
		263.3	3.09	3.297	6.39	23.98
		292.5	3.01	3.405	6.42	23.98
		351	2.77	3.647	6.42	23.98
		390	2.76	3.782	6.54	23.98

Note :

1. In order to simplify the report, attached plots were only the highest conducted power channel and data rate.
2. We applied the 15.407 for Ch.144, 142 and 138 in 802.11ac according to KDB 644545 D01 v01r01.

40 MHz BW

RESULT PLOTS (5190 MHz ~5230 MHz)

Conducted Output Power (802.11n-CH 38) 40.5 Mbps



RESULT PLOTS (5270 MHz ~5310 MHz)

Conducted Output Power (802.11n-CH 54) 40.5 Mbps



FCC PT.15.407 TEST REPORT	FCC CERTIFICATION REPORT		www.hct.co.kr
Test Report No. HCTR1310FR20-3	Date of Issue: November 19, 2013	EUT Type: Cellular/PCS GSM/ GPRS/EDGE, Cellular WCDMA/HSDPA/HSUPA Phone with Bluetooth/WLAN/NFC	FCC ID: ZNFKS1301

RESULT PLOTS (5510 MHz ~5670 MHz)

Conducted Output Power (802.11n-CH 142) 108 Mbps



RESULT PLOTS (5190 ~ 5230 MHz)

Conducted Output Power (802.11ac-CH 38) 27 Mbps



FCC PT.15.407 TEST REPORT	FCC CERTIFICATION REPORT		www.hct.co.kr
Test Report No. HCTR1310FR20-3	Date of Issue: November 19, 2013	EUT Type: Cellular/PCS GSM/ GPRS/EDGE, Cellular WCDMA/HSDPA/HSUPA Phone with Bluetooth/WLAN/NFC	FCC ID: ZNFKS1301

RESULT PLOTS (5270 ~ 5310 MHz)

Conducted Output Power (802.11ac-CH 54) 162 Mbps



RESULT PLOTS (5510 ~ 5710 MHz)

Conducted Output Power (802.11ac-CH 110) 27 Mbps





80 MHz BW

RESULT PLOTS (5210 MHz)

Conducted Output Power (802.11ac-CH 42) 263.3 Mbps



RESULT PLOTS (5290 MHz)

Conducted Output Power (802.11ac-CH 58) 175.5 Mbps



FCC PT.15.407 TEST REPORT	FCC CERTIFICATION REPORT		www.hct.co.kr
Test Report No. HCTR1310FR20-3	Date of Issue: November 19, 2013	EUT Type: Cellular/PCS GSM/ GPRS/EDGE, Cellular WCDMA/HSDPA/HSUPA Phone with Bluetooth/WLAN/NFC	FCC ID: ZNFKS1301



RESULT PLOTS (5530 MHz ~ 5690 MHz)

Conducted Output Power (802.11ac-CH 106) 117 Mbps

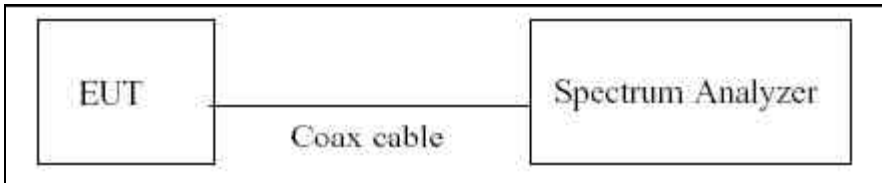


FCC PT.15.407 TEST REPORT		FCC CERTIFICATION REPORT		www.hct.co.kr
Test Report No. HCTR1310FR20-3	Date of Issue: November 19, 2013	EUT Type: Cellular/PCS GSM/ GPRS/EDGE, Cellular WCDMA/HSDPA/HSUPA Phone with Bluetooth/WLAN/NFC		FCC ID: ZNFKS1301

8.4 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 4 dBm/ MHz in the 5.15 GHz – 5.25 GHz band and 11 dBm/ MHz in the 5.25 GHz – 5.35 GHz and 5.47 GHz – 5.725 GHz bands

TEST CONFIGURATION



TEST PROCEDURE

We tested according to Method in KDB 789033(issued 04/08/2013).

The spectrum analyzer is set to :

1. Set span to encompass the entire emission bandwidth(EBW) of the signal.
2. RBW = 1 MHz.
3. VBW ≥ 3 MHz.
4. Number of points in sweep ≥ 2*span/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.

FCC PT.15.407 TEST REPORT		FCC CERTIFICATION REPORT		www.hct.co.kr
Test Report No. HCTR1310FR20-3	Date of Issue: November 19, 2013	EUT Type: Cellular/PCS GSM/ GPRS/EDGE, Cellular WCDMA/HSDPA/HSUPA Phone with Bluetooth/WLAN/NFC		FCC ID: ZNFKS1301

Band	Frequency(MHz)	Loss(dB)
UNII 1	5180	20.30
	5190	20.29
	5200	20.28
	5230	20.29
	5240	20.34
UNII 2	5260	20.37
	5270	20.38
	5300	20.40
	5310	20.39
	5320	20.39
UNII 2e	5500	20.35
	5510	20.36
	5550	20.41
	5580	20.43
	5670	20.43
	5700	20.30

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



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	-2.792	1.3816	-1.410	4	Pass
5200	40		-2.577	0.6016	-1.975	4	Pass
5240	48		-2.845	1.3816	-1.463	4	Pass
5260	52	802.11a	-1.804	0.3342	-1.470	11	Pass
5300	60		-1.773	0.2159	-1.557	11	Pass
5320	64		-2.292	0.4185	-1.874	11	Pass
5500	100	802.11a	-2.488	1.3816	-1.106	11	Pass
5580	116		-2.105	0.4185	-1.687	11	Pass
5720	144		-3.866	1.3816	-2.484	11	Pass

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	-3.463	1.4962	-1.967	4	Pass
5200	40	20MHz BW	-2.892	1.3990	-1.493	4	Pass
5240	48		-2.400	0.2251	-2.175	4	Pass
5260	52	802.11n	-2.357	1.3990	-0.958	11	Pass
5300	60	20MHz	-3.016	1.3990	-1.617	11	Pass
5320	64	BW	-2.417	0.4309	-1.986	11	Pass
5500	100	802.11n	-2.826	0.7947	-2.031	11	Pass
5580	116	20MHz	-2.776	0.7947	-1.981	11	Pass
5720	144	BW	-4.182	1.4962	-2.686	11	Pass

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 40MHz BW	-6.461	2.3720	-4.089	4	Pass
5230	46		-5.770	1.1325	-4.637	4	Pass
5270	54	802.11n 40MHz BW	-5.379	1.1325	-4.246	11	Pass
5310	62		-6.195	1.4280	-4.767	11	Pass
5510	102	802.11n 40MHz BW	-6.233	1.4280	-4.805	11	Pass
5550	110		-6.799	2.3720	-4.427	11	Pass
5710	142		-7.370	2.2242	-5.146	11	Pass

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	802.11ac 20MHz BW	-4.245	1.3532	-2.892	4	Pass
5200	40		-3.559	0.2305	-3.328	4	Pass
5240	48		-3.284	0.2305	-3.053	4	Pass
5260	52	802.11ac 20MHz BW	-3.802	1.3532	-2.449	11	Pass
5300	60		-3.563	0.8031	-2.760	11	Pass
5320	64		-4.099	1.0874	-3.012	11	Pass
5500	100	802.11ac 20MHz BW	-4.746	1.7754	-2.971	11	Pass
5580	116		-3.591	0.2305	-3.360	11	Pass
5720	144		-4.477	0.8031	-3.674	11	Pass

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	802.11ac 40MHz BW	-6.240	0.8064	-5.434	4	Pass
5230	46		-7.817	2.7000	-5.117	4	Pass
5270	54	802.11ac 40MHz BW	-7.892	2.7000	-5.192	11	Pass
5310	62		-6.757	1.1209	-5.636	11	Pass
5510	102	802.11ac 40MHz BW	-6.804	0.4425	-6.362	11	Pass
5550	110		-6.388	0.8064	-5.582	11	Pass
5710	142		-9.411	2.7712	-6.640	11	Pass

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
5210	42	802.11ac 80MHz BW	-12.230	3.2968	-8.933	4	Pass
5290	58	802.11ac 80MHz BW	-11.485	2.7712	-8.714	11	Pass
5530	106	802.11ac 80MHz BW	-11.039	2.2419	-8.797	11	Pass
5690	138	802.11ac 80MHz BW	-11.786	1.9431	-9.843	11	Pass

Note :

1. In order to simplify the report, attached plots were only the highest PSD channel.
2. We applied the 15.407 for Ch.144, 142 and 138 in 802.11ac according to KDB 644545 D01 v01r01.