

# HCT CO., LTD.

## CERTIFICATE OF COMPLIANCE FCC Certification

<b>Applicant Name:</b> LG Electronics MobileComm U.S.A., Inc.	<b>Date of Issue:</b> September 10, 2013
<b>Address:</b> 1000 Sylvan Avenue, Englewood Cliffs NJ 07632	<b>Test Site/Location:</b> HCT CO., LTD., 105-1, Jangam-ri, Majang-Myeon, Icheon-si, Kyunggi-Do, Korea
	<b>Report No.:</b> HCTR1308FR43-2
	<b>HCT FRN:</b> 0005866421

**FCC ID : ZNFD821**

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

**FCC Model(s):** D821

**Additional FCC Model(s):** LG-D821, LGD821

**EUT Type:** GSM/WCDMA/LTE Phone with Bluetooth, WLAN(2.4GHz & 5GHz) and NFC

**Max. RF Output Power:** Wi-Fi 802.11a (5180~5240) (12.20 dBm)/ Wi-Fi 802.11a (5260~5320) (12.68 dBm)/  
Wi-Fi 802.11a (5500~5700) (11.76 dBm)/ Wi-Fi 802.11n\_20 MHz BW (5180~5240) (11.32 dBm)/  
Wi-Fi 802.11n\_20 MHz BW(5260~5320)(11.86 dBm)/ Wi-Fi 802.11n\_20 MHz BW(5500~5700)(10.79 dBm)/  
Wi-Fi 802.11n\_40 MHz BW(5190~5230) (10.33 dBm)/ Wi-Fi 802.11n\_40 MHz BW (5270~5310) (10.34 dBm)/  
Wi-Fi 802.11n\_40 MHz BW (5510~5670) (9.73 dBm)/ Wi-Fi 802.11ac (5180~5240) (11.16 dBm)/  
Wi-Fi 802.11ac (5260~5320) (11.69 dBm)/ Wi-Fi 802.11ac (5500~5720) (10.47 dBm)/  
Wi-Fi 802.11ac (5190~5230) (10.19 dBm)/ Wi-Fi 802.11ac (5270~5310) (10.38 dBm)/  
Wi-Fi 802.11ac (5510~5710) (9.94 dBm)/ Wi-Fi 802.11ac (5210) (9.53 dBm)/  
Wi-Fi 802.11ac (5290) (10.39 dBm)/ Wi-Fi 802.11ac (5530~5690) (9.50 dBm)

**Frequency Range:** 20 MHz BW: 5180 MHz - 5240 MHz (UNII 1)/ 5260 MHz - 5320 MHz (UNII 2)/  
5500 MHz - 5700 MHz (UNII 2e)/ 5500 MHz - 5720 MHz (UNII 2e)\_802.11ac  
40 MHz BW: 5190 MHz - 5230 MHz (UNII 1)/ 5270 MHz - 5310 MHz (UNII 2)/  
5510 MHz - 5670 MHz (UNII 2e)/ 5510 MHz - 5710 MHz (UNII 2e)\_802.11ac  
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**  
**: Jong Seok Lee**  
**Test engineer of RF Team**



**Approved by**  
**: Chang Seok Choi**  
**Manager of RF Team**

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FCC PT.15.247 TEST REPORT	FCC CERTIFICATION REPORT		<a href="http://www.hct.co.kr">www.hct.co.kr</a>
Test Report No. HCTR1308FR43-2	Date of Issue: September 10, 2013	EUT Type: GSM/WCDMA/LTE Phone with Bluetooth, WLAN(2.4GHz & 5GHz) and NFC	FCC ID: ZNFD821

# Version

TEST REPORT NO.	DATE	DESCRIPTION
HCTR1308FR43	September 04, 2013	- First Approval Report
HCTR1308FR43-1	September 06, 2013	- Revise EUT Type.
HCTR1308FR43-2	September 10, 2013	<ul style="list-style-type: none"> <li>- Revise the Headers on Page 23 ~ 30</li> <li>- Add Frequency Range for 802.11ac on Page 1 and 4</li> <li>- Revise the Frequency and Channel for 802.11ac(Ch.144, 142) in 26 dB BW Result Table</li> <li>- Add the Note for Ch.144, 142 and 138 of 802.11ac in each Sections</li> </ul>

# 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. SUMMARY OF TEST RESULTS .....	7
8. TEST RESULT .....	8
8.1 DUTY CYCLE.....	8
8.2 26 dB BANDWIDTH MEASUREMENT .....	1 1
8.3 OUTPUT POWER MEASUREMENT.....	3 1
8.4 POWER SPECTRAL DENSITY .....	6 0
8.5 PEAK EXCURSION RATIO.....	7 4
8.6 FREQUENCY STABILITY .....	1 0 1
8.7 RADIATED MEASUREMENT.....	1 1 0
8.7.1 RADIATED SPURIOUS EMISSIONS.....	1 1 0
8.7.2 RADIATED RESTRICTED BAND EDGE MEASUREMENTS .....	2 0 6
8.8 POWERLINE CONDUCTED EMISSIONS .....	2 2 9
9. LIST OF TEST EQUIPMENT .....	2 3 4

FCC PT.15.247 TEST REPORT		FCC CERTIFICATION REPORT		<a href="http://www.hct.co.kr">www.hct.co.kr</a>
Test Report No. HCTR1308FR43-2	Date of Issue: September 10, 2013	EUT Type: GSM/WCDMA/LTE Phone with Bluetooth, WLAN(2.4GHz & 5GHz) and NFC		FCC ID: ZNFD821



## 1. GENERAL INFORMATION

**Applicant:** LG Electronics MobileComm U.S.A., Inc.  
**Address:** 1000 Sylvan Avenue, Englewood Cliffs NJ 07632  
**FCC ID:** ZNFD821  
**EUT Type:** GSM/WCDMA/LTE Phone with Bluetooth, WLAN(2.4GHz & 5GHz) and NFC  
**Model name(s):** D821  
**Additional Model name(s):** LG-D821, LGD821  
**Date(s) of Tests:** July 05, 2013 ~ August 26, 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

<b>EUT Type</b>	GSM/WCDMA/LTE Phone with Bluetooth, WLAN(2.4GHz & 5GHz)and NFC	
<b>FCC Model Name</b>	D821	
<b>Additional FCC Model Name</b>	LG-D821, LGD821	
<b>Power Supply</b>	DC 3.8 V	
<b>Frequency Range</b>	TX_20 MHz BW:	5180 MHz - 5240 MHz (UNII 1)/ 5260 MHz - 5320 MHz (UNII 2)/ 5500 MHz - 5700 MHz (UNII 2e) where) Not supported 5600 MHz – 5640 MHz 500 MHz - 5720 MHz (UNII 2e)_802.11ac where) Not supported 5600 MHz – 5640 MHz 40 MHz BW: 5190 MHz - 5230 MHz (UNII 1)/ 5270 MHz - 5310 MHz (UNII 2)/ 5510 MHz - 5670 MHz (UNII 2e) where) Not supported 5590 MHz – 5630 MHz 80 MHz BW: 5510 MHz - 5710 MHz (UNII 2e)_802.11ac where) Not supported 5590 MHz – 5630 MHz RX_20 MHz BW: 5210 MHz(UNII 1)/ 5290 MHz(UNII 2)/ 5530 MHz - 5690 MHz(UNII 2e) where) Not supported 5610 MHz 5180 MHz - 5240 MHz (UNII 1)/ 5260 MHz - 5320 MHz (UNII 2)/ 5500 MHz - 5700 MHz (UNII 2e) where) Not supported 5600 MHz – 5640 MHz 40 MHz BW: 5500 MHz - 5720 MHz (UNII 2e)_802.11ac where) Not supported 5600 MHz – 5640 MHz 5190 MHz - 5230 MHz (UNII 1)/ 5270 MHz - 5310 MHz (UNII 2)/ 80 MHz BW: 5510 MHz - 5670 MHz (UNII 2e) where) Not supported 5590 MHz – 5630 MHz 5510 MHz - 5710 MHz (UNII 2e)_802.11ac where) Not supported 5590 MHz – 5630 MHz 5210 MHz(UNII 1)/ 5290 MHz(UNII 2)/ 5530 MHz - 5690 MHz(UNII 2e) where) Not supported 5610 MHz
<b>Max. RF Output Power:</b>	Wi-Fi 802.11a (5180~5240) (12.20 dBm)/ Wi-Fi 802.11a (5260~5320) (12.68 dBm)/ Wi-Fi 802.11a (5500~5700) (11.76 dBm)/ Wi-Fi 802.11n_20 MHz BW (5180~5240) (11.32 dBm)/ Wi-Fi 802.11n_20 MHz BW(5260~5320)(11.86 dBm)/ Wi-Fi 802.11n_20 MHz BW(5500~5700)(10.79 dBm)/ Wi-Fi 802.11n_40 MHz BW(5190~5230) (10.33 dBm)/ Wi-Fi 802.11n_40 MHz BW (5270~5310) (10.34 dBm)/ Wi-Fi 802.11n_40 MHz BW (5510~5670) (9.73 dBm)/ Wi-Fi 802.11ac (5180~5240) (11.16 dBm)/ Wi-Fi 802.11ac (5260~5320) (11.69 dBm)/ Wi-Fi 802.11ac (5500~5720) (10.47 dBm)/ Wi-Fi 802.11ac (5190~5230) (10.19 dBm)/ Wi-Fi 802.11ac (5270~5310) (10.38 dBm)/ Wi-Fi 802.11ac (5510~5710) (9.94 dBm)/ Wi-Fi 802.11ac (5210) (9.53 dBm)/ Wi-Fi 802.11ac (5290) (10.39 dBm)/ Wi-Fi 802.11ac (5530~5690) (9.50 dBm)	
<b>Modulation Type</b>	OFDM(802.11a, 802.11n, 802.11ac)	
<b>Antenna Specification</b>	Manufacturer: acetechnology A Antenna type: Built-in Antenna Peak Gain : 0.39 dBi	

<b>FCC PT.15.247 TEST REPORT</b>	<b>FCC CERTIFICATION REPORT</b>		<a href="http://www.hct.co.kr">www.hct.co.kr</a>
<b>Test Report No.</b> HCTR1308FR43-2	<b>Date of Issue:</b> September 10, 2013	<b>EUT Type:</b> GSM/WCDMA/LTE Phone with Bluetooth, WLAN(2.4GHz & 5GHz) and NFC	<b>FCC ID:</b> ZNFD821

### 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.

<b>FCC PT.15.247 TEST REPORT</b>		<b>FCC CERTIFICATION REPORT</b>		<a href="http://www.hct.co.kr">www.hct.co.kr</a>
<b>Test Report No.</b> HCTR1308FR43-2	<b>Date of Issue:</b> September 10, 2013	<b>EUT Type:</b> GSM/WCDMA/LTE Phone with Bluetooth, WLAN(2.4GHz & 5GHz) and NFC		<b>FCC ID:</b> ZNFD821



## 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

<b>FCC PT.15.247 TEST REPORT</b>	<b>FCC CERTIFICATION REPORT</b>		<a href="http://www.hct.co.kr">www.hct.co.kr</a>
<b>Test Report No.</b> HCTR1308FR43-2	<b>Date of Issue:</b> September 10, 2013	<b>EUT Type:</b> GSM/WCDMA/LTE Phone with Bluetooth, WLAN(2.4GHz & 5GHz) and NFC	<b>FCC ID:</b> ZNFD821

## 7. SUMMARY OF TEST RESULTS

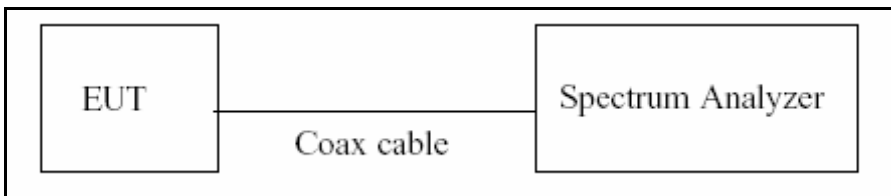
Test Description	FCC Part Section(s)	Test Limit	Test Condition	Test Result
<b>TRANSMITTER MODE(TX)</b>				
26dB Bandwidth	NA	NA	CONDUCTED	PASS
Maximum Conducted Output Power	§15.407(a)(1)	< 4+10 log <sub>10</sub> (BW) dBm (5150-5250 MHz) < 11+10 log <sub>10</sub> (BW) dBm (5250-5350 MHz) < 11+10 log <sub>10</sub> (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 =  $10 \cdot \log(1/\text{Duty Cycle})$

FCC PT.15.247 TEST REPORT		FCC CERTIFICATION REPORT		<a href="http://www.hct.co.kr">www.hct.co.kr</a>
Test Report No. HCTR1308FR43-2	Date of Issue: September 10, 2013	EUT Type: GSM/WCDMA/LTE Phone with Bluetooth, WLAN(2.4GHz & 5GHz) and NFC		FCC ID: ZNFD821



### Duty Cycle Factor

Mode	Data Rate	T <sub>on</sub> (ms)	T <sub>total</sub> (ms)	Duty Cycle	Duty Cycle Factor
802.11a Mode	6	2.065	2.165	0.95381062	0.205
	9	1.380	1.485	0.92929293	0.318
	12	1.044	1.146	0.91099476	0.405
	18	0.704	0.808	0.87128713	0.598
	24	0.532	0.635	0.83821676	0.766
	36	0.365	0.466	0.78287921	1.063
	48	0.276	0.378	0.73015873	1.366
	54	0.248	0.350	0.70857143	1.496
802.11n Mode 20 MHz BW	6.5	1.920	2.020	0.95049505	0.221
	13	0.980	1.085	0.90322581	0.442
	19.5	0.664	0.766	0.86684073	0.621
	26	0.508	0.610	0.83278689	0.795
	39	0.352	0.454	0.77533040	1.105
	52	0.271	0.374	0.72547447	1.394
	58.5	0.248	0.350	0.70857143	1.496
	65	0.228	0.330	0.69090909	1.606
802.11n Mode 40 MHz BW	13.5	0.945	1.047	0.90257880	0.445
	27	0.492	0.592	0.83108108	0.804
	40.5	0.340	0.440	0.77272727	1.120
	54	0.264	0.365	0.72266374	1.411
	81	0.188	0.289	0.65051903	1.867
	108	0.152	0.253	0.60126582	2.209
	121.5	0.140	0.241	0.58091286	2.359
	135	0.128	0.229	0.55895197	2.526

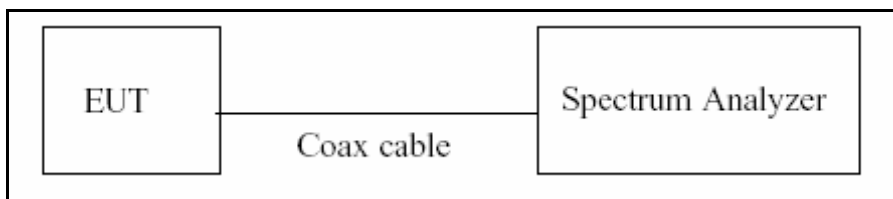
Mode	Data Rate	T <sub>on</sub> (ms)	T <sub>total</sub> (ms)	Duty Cycle	Duty Cycle Factor (dB)
802.11ac_20 MHz BW	6.5	1.930	2.035	0.94840295	0.230
	13	0.987	1.092	0.90384615	0.439
	19.5	0.672	0.776	0.86597938	0.625
	26	0.516	0.620	0.83225806	0.797
	39	0.356	0.458	0.77729258	1.094
	52	0.280	0.382	0.73298429	1.349
	58.5	0.252	0.354	0.71186441	1.476
	65	0.232	0.334	0.69461078	1.583
	78	0.200	0.303	0.66006601	1.804
802.11ac_40 MHz BW	13.5	0.952	1.052	0.90494297	0.434
	27	0.496	0.596	0.83221477	0.798
	40.5	0.344	0.444	0.77477477	1.108
	54	0.268	0.368	0.72907609	1.372
	81	0.191	0.292	0.65410959	1.843
	108	0.156	0.257	0.60747664	2.165
	121.5	0.144	0.246	0.58655804	2.317
	135	0.132	0.233	0.56652361	2.468
	162	0.116	0.217	0.53225806	2.739
802.11ac_80 MHz BW	29.3	0.460	0.560	0.82142857	0.854
	58.5	0.252	0.353	0.71307060	1.469
	87.8	0.180	0.281	0.64056940	1.934
	117	0.148	0.249	0.59485531	2.256
	175.5	0.112	0.213	0.52347418	2.811
	234	0.096	0.197	0.48730964	3.122
	263.3	0.088	0.189	0.46419098	3.333
	292.5	0.084	0.185	0.45135135	3.455
	351	0.076	0.177	0.42776204	3.688
390	0.072	0.173	0.41449275	3.825	

## 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 %.

FCC PT.15.247 TEST REPORT		FCC CERTIFICATION REPORT		<a href="http://www.hct.co.kr">www.hct.co.kr</a>
Test Report No. HCTR1308FR43-2	Date of Issue: September 10, 2013	EUT Type: GSM/WCDMA/LTE Phone with Bluetooth, WLAN(2.4GHz & 5GHz) and NFC		FCC ID: ZNFD821

**TEST RESULTS**

**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	21.43	N/A	Pass
5200	40	21.23	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	21.14	N/A	Pass
5300	60	21.36	N/A	Pass
5320	64	21.38	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	21.32	N/A	Pass
5580	116	21.26	N/A	Pass
5700	140	21.34	N/A	Pass



**TEST RESULTS**

20 MHz BW

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	21.70	N/A	Pass
5200	40	21.71	N/A	Pass
5240	48	21.51	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.			
5260	52	21.80	N/A	Pass
5300	60	21.75	N/A	Pass
5320	64	21.59	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	21.63	N/A	Pass
5580	116	21.49	N/A	Pass
5700	140	21.42	N/A	Pass

40 MHz BW

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	40.08	N/A	Pass
5230	46	39.91	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	39.82	N/A	Pass
5310	62	39.96	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	39.97	N/A	Pass
5550	110	39.81	N/A	Pass
5670	134	39.88	N/A	Pass



**TEST RESULTS**

20 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.			
5180	36	21.43	N/A	Pass
5200	40	21.62	N/A	Pass
5240	48	21.56	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	21.76	N/A	Pass
5300	60	21.64	N/A	Pass
5320	64	21.64	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	21.68	N/A	Pass
5580	116	21.66	N/A	Pass
5720	144	21.60	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	39.98	N/A	Pass
5230	46	39.69	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	39.82	N/A	Pass
5310	62	40.00	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	39.75	N/A	Pass
5550	110	39.84	N/A	Pass
5710	142	39.88	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	81.22	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	82.13	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	81.14	N/A	Pass
5690	138	81.73	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	19.25	N/A	Pass

**Conducted 20 dB Bandwidth Measurements for 802.11n\_20 MHz BW**

802.11a Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5260	52	19.95	N/A	Pass

**Conducted 20 dB Bandwidth Measurements for 802.11ac\_20 MHz BW**

802.11a Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5270	54	19.88	N/A	Pass

**Conducted 20 dB Bandwidth Measurements for 802.11n\_40 MHz BW**

802.11a Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5270	54	38.75	N/A	Pass

**Conducted 20 dB Bandwidth Measurements for 802.11ac\_40 MHz BW**

802.11a Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5270	54	38.55	N/A	Pass

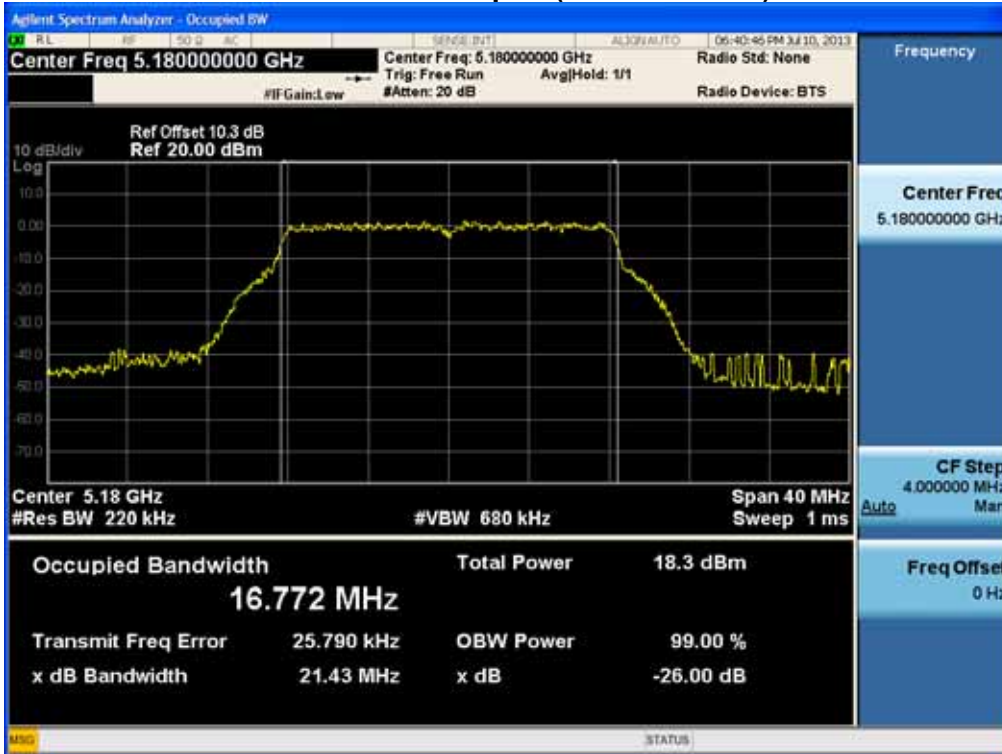
**Conducted 20 dB Bandwidth Measurements for 802.11ac\_80 MHz BW**

802.11a Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
5270	58	79.69	N/A	Pass

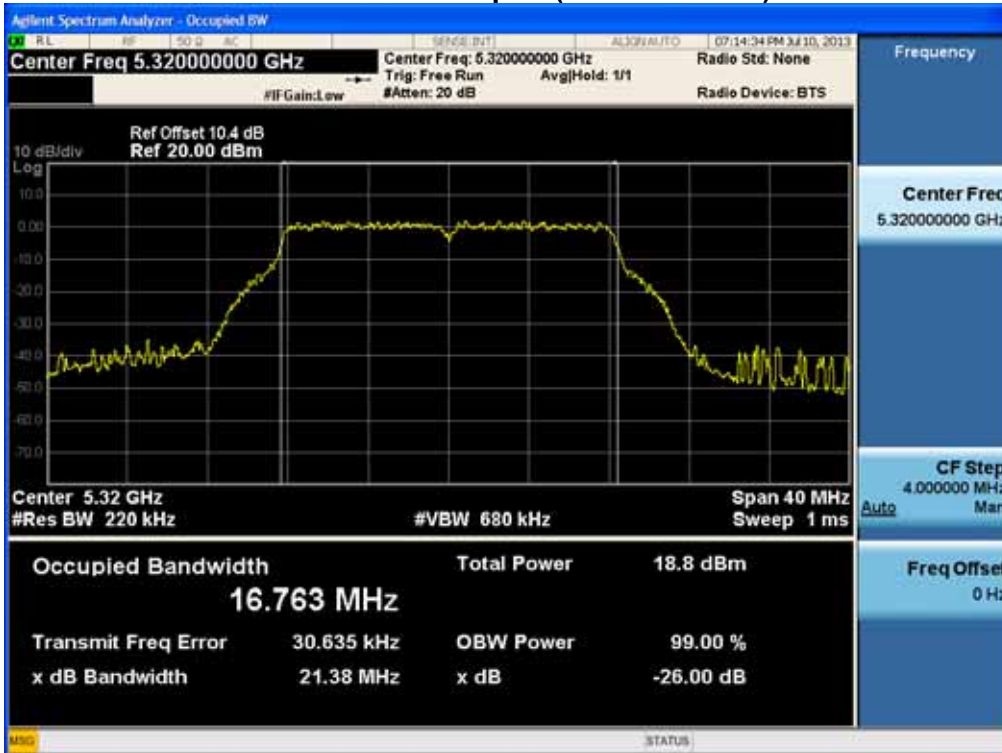
**Note : We performed the 20 dB BW test to prove that no part of the fundamental emissions of any UNII2 band signal lies within the UNII band 1.**

RESULT PLOTS

26 dB Bandwidth plot (802.11a-CH 36)

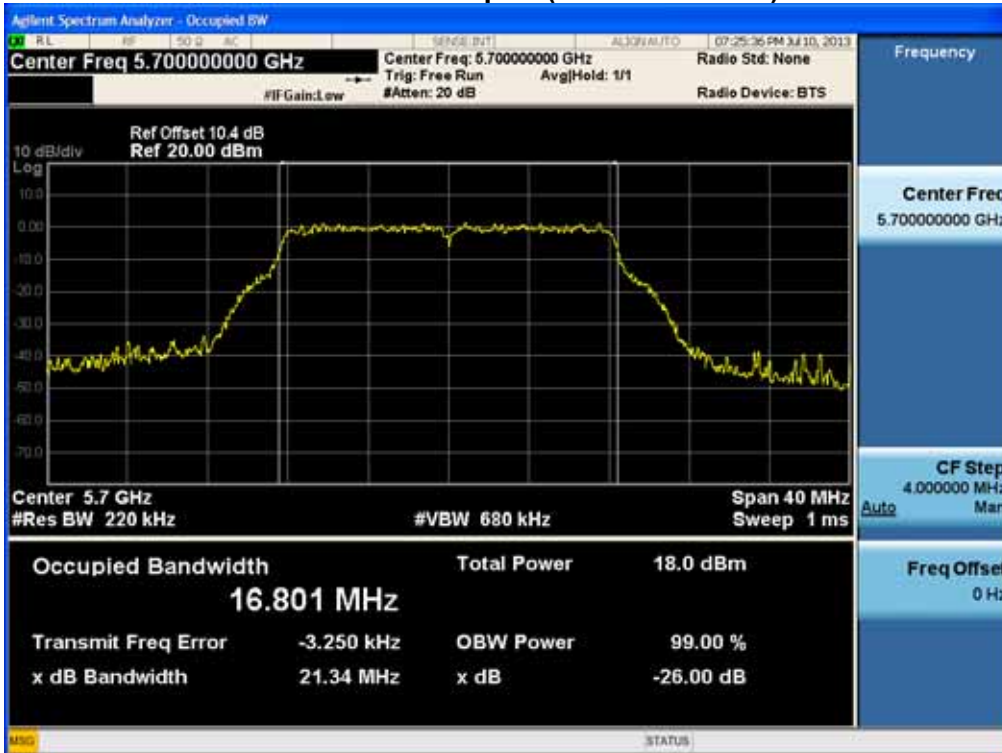


26 dB Bandwidth plot (802.11a-CH 64)



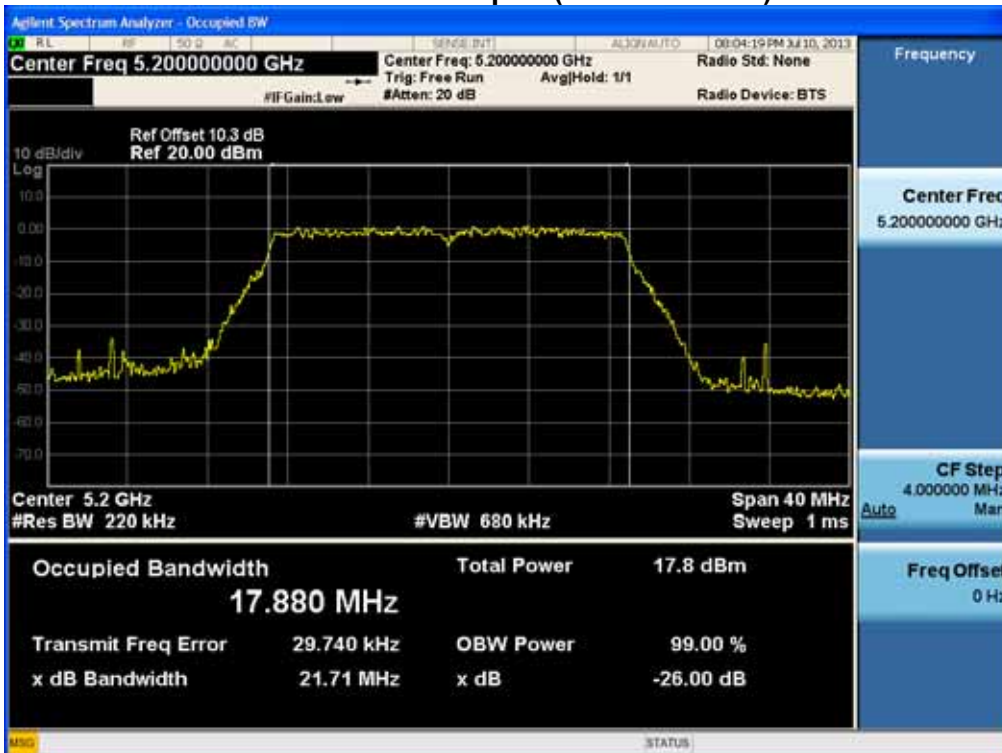
FCC PT.15.247 TEST REPORT	FCC CERTIFICATION REPORT		<a href="http://www.hct.co.kr">www.hct.co.kr</a>
Test Report No. HCTR1308FR43-2	Date of Issue: September 10, 2013	EUT Type: GSM/WCDMA/LTE Phone with Bluetooth, WLAN(2.4GHz & 5GHz) and NFC	FCC ID: ZNF0821

### 26 dB Bandwidth plot (802.11a-CH 140)



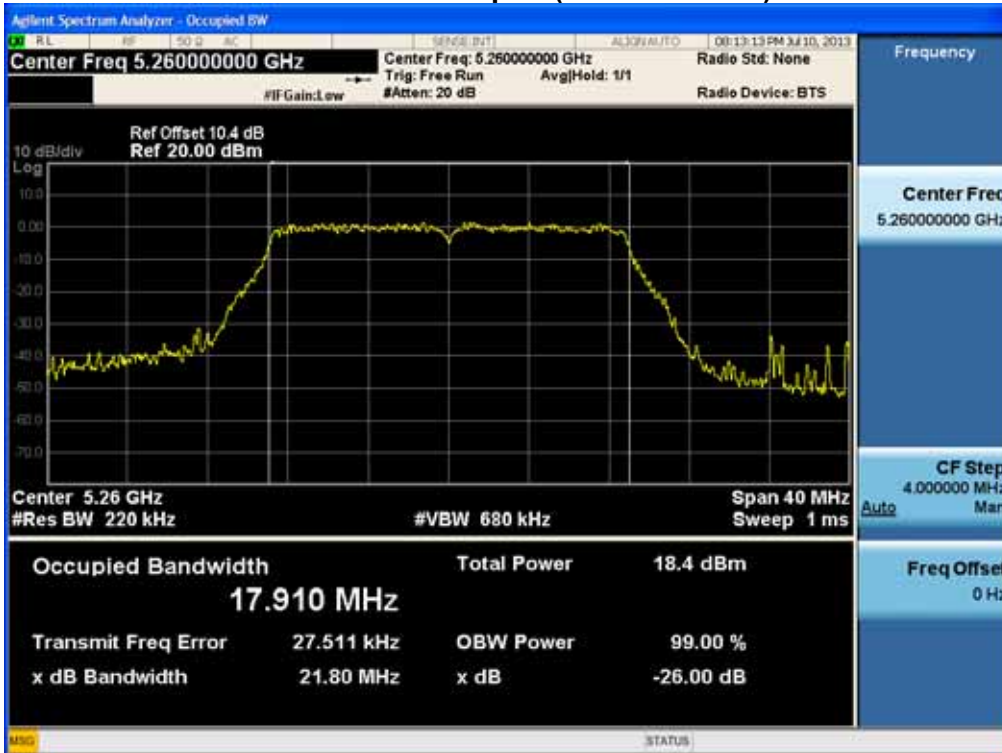
20 MHz BW

### 26 dB Bandwidth plot (802.11n-CH 40)

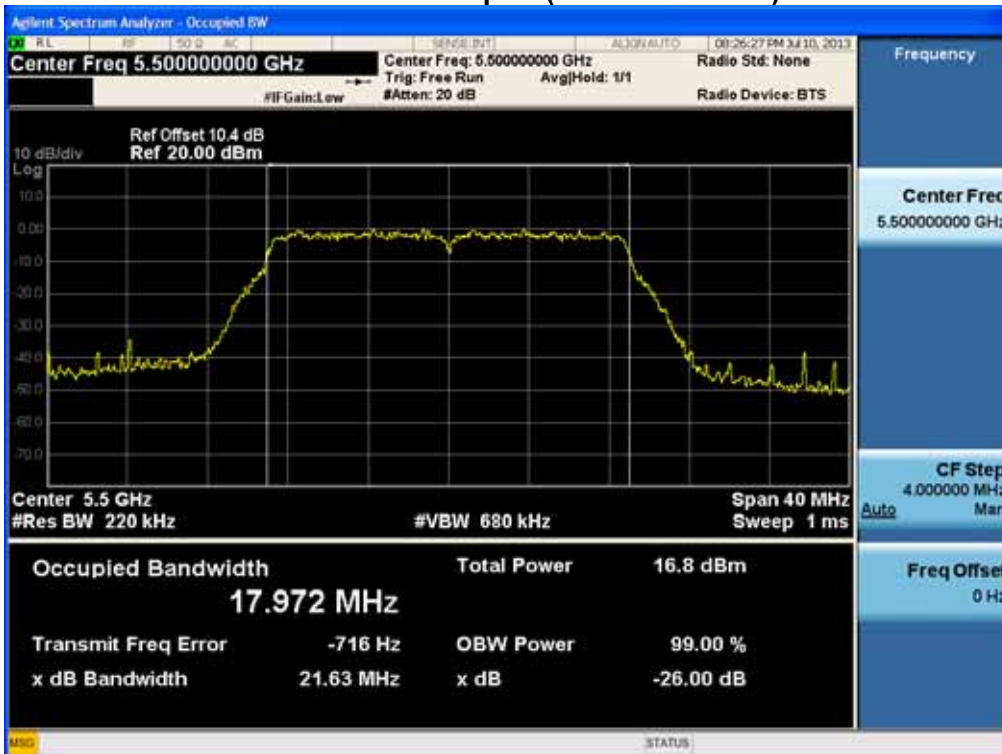


FCC PT.15.247 TEST REPORT	FCC CERTIFICATION REPORT		<a href="http://www.hct.co.kr">www.hct.co.kr</a>
Test Report No. HCTR1308FR43-2	Date of Issue: September 10, 2013	EUT Type: GSM/WCDMA/LTE Phone with Bluetooth, WLAN(2.4GHz & 5GHz) and NFC	FCC ID: ZNF0821

### 26 dB Bandwidth plot (802.11n-CH 52)

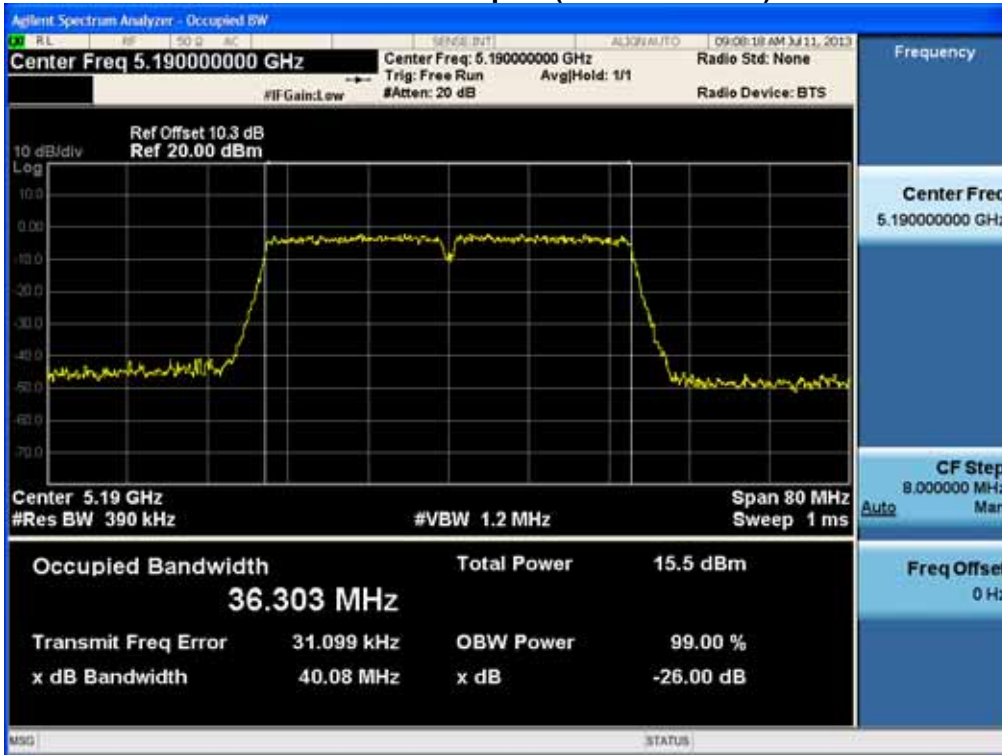


### 26 dB Bandwidth plot (802.11n-CH 100)

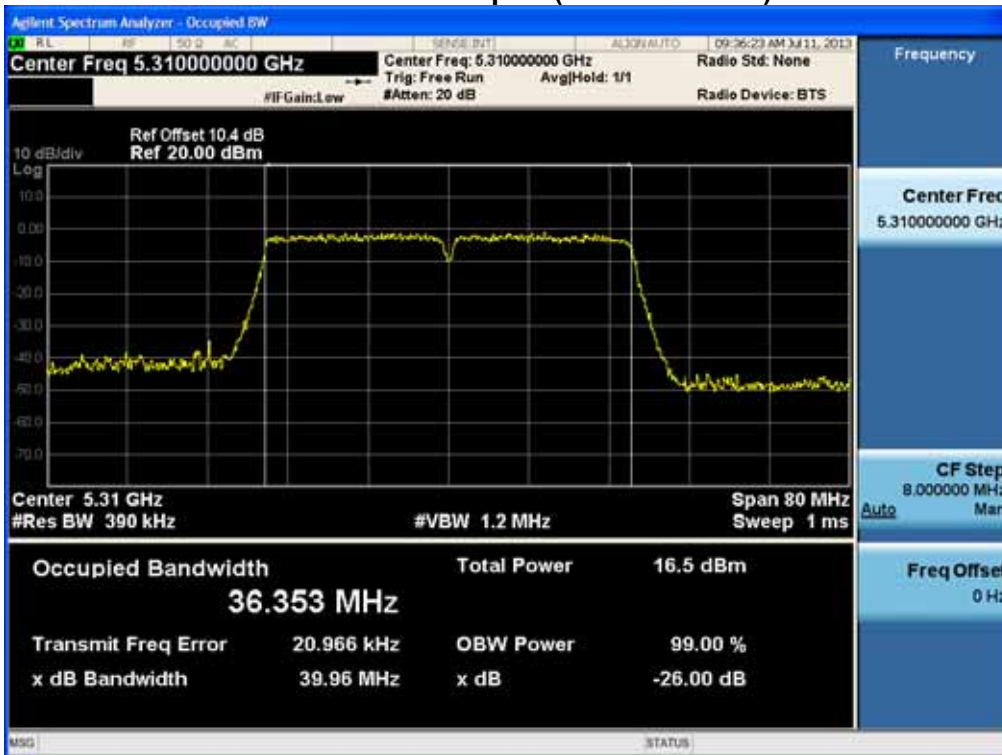


FCC PT.15.247 TEST REPORT	FCC CERTIFICATION REPORT		<a href="http://www.hct.co.kr">www.hct.co.kr</a>
Test Report No. HCTR1308FR43-2	Date of Issue: September 10, 2013	EUT Type: GSM/WCDMA/LTE Phone with Bluetooth, WLAN(2.4GHz & 5GHz) and NFC	FCC ID: ZNFD821

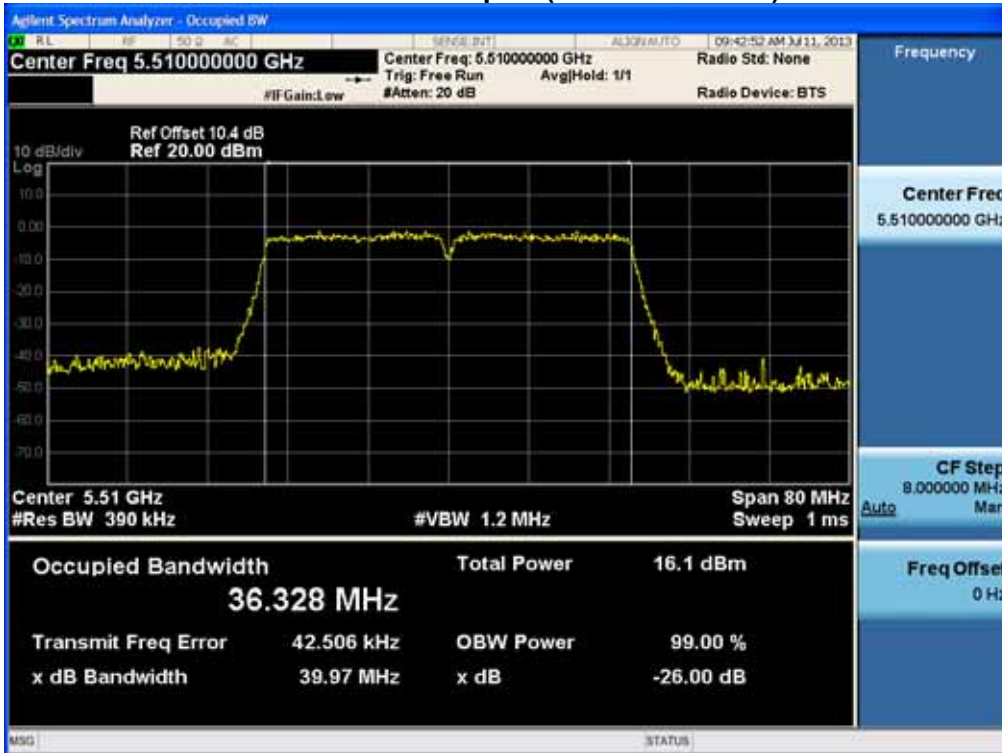
26 dB Bandwidth plot (802.11n-CH 38)



26 dB Bandwidth plot (802.11n-CH 62)

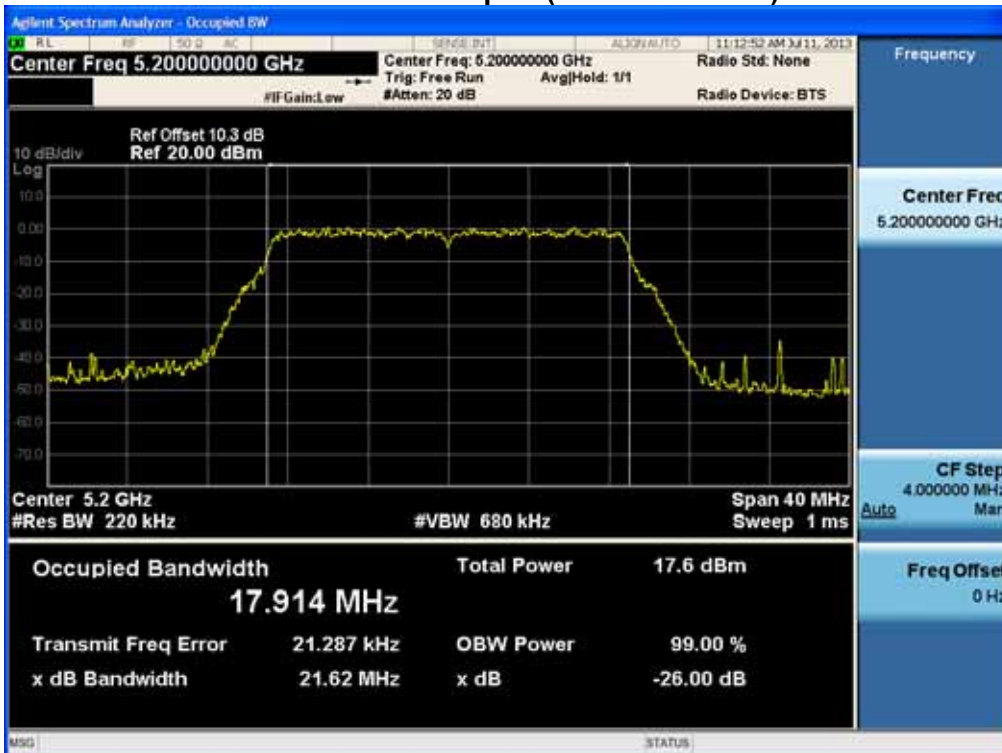


### 26 dB Bandwidth plot (802.11n-CH 102)

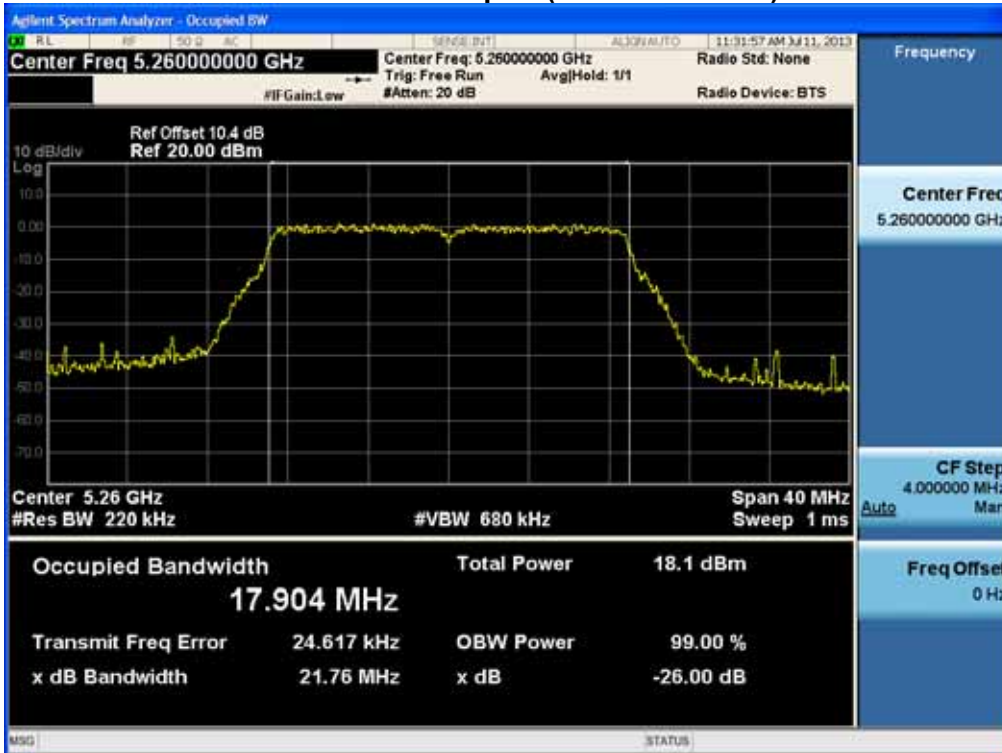


20 MHz BW

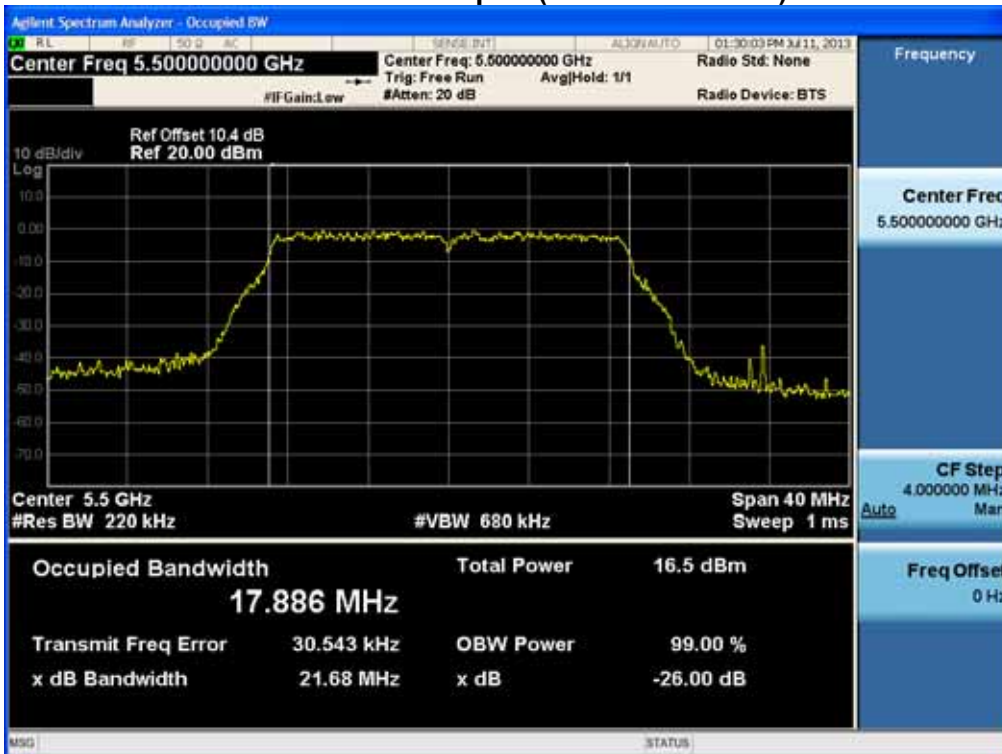
### 26 dB Bandwidth plot (802.11ac-CH 40)



### 26 dB Bandwidth plot (802.11ac-CH 52)



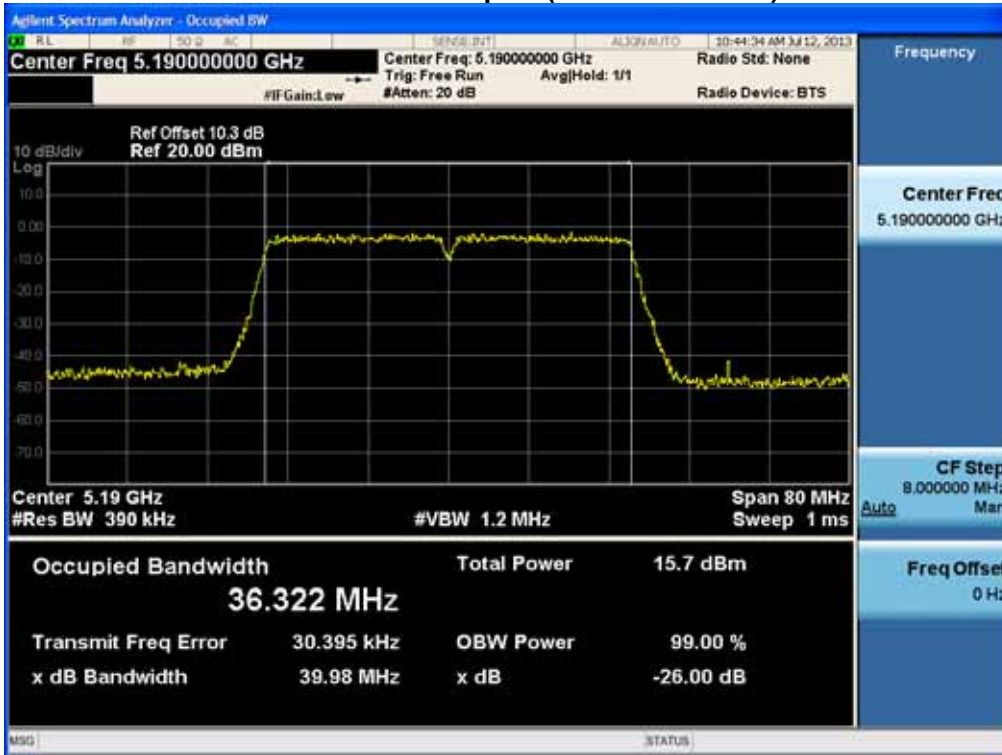
### 26 dB Bandwidth plot (802.11ac-CH 100)



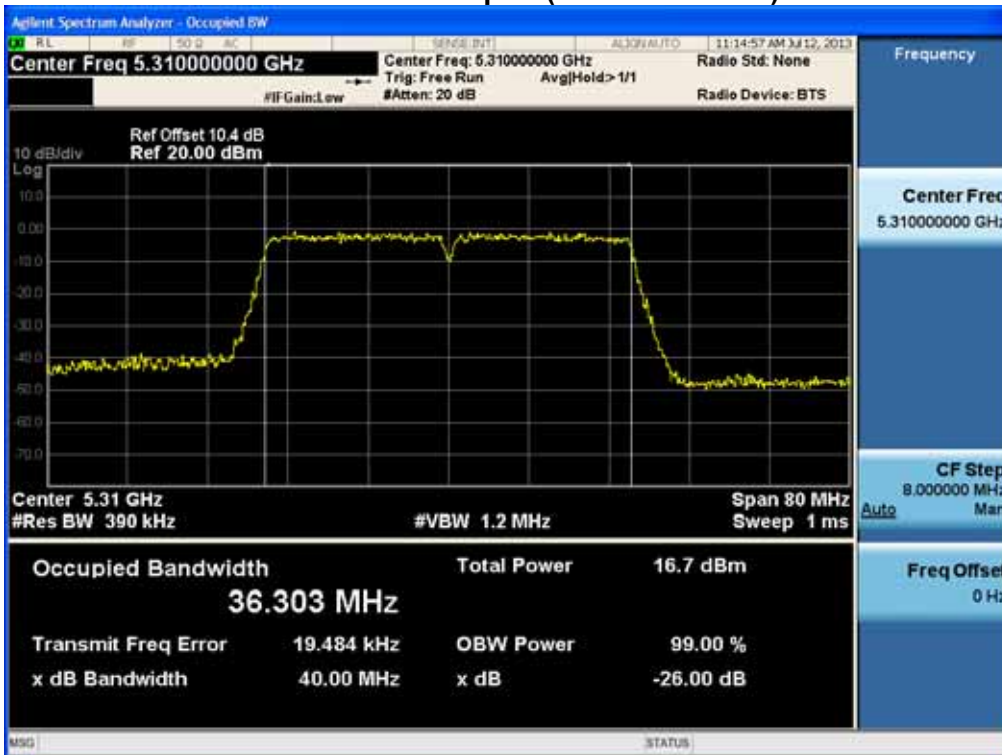
FCC PT.15.247 TEST REPORT	FCC CERTIFICATION REPORT		<a href="http://www.hct.co.kr">www.hct.co.kr</a>
Test Report No. HCTR1308FR43-2	Date of Issue: September 10, 2013	EUT Type: GSM/WCDMA/LTE Phone with Bluetooth, WLAN(2.4GHz & 5GHz) and NFC	FCC ID: ZNFD821



26 dB Bandwidth plot (802.11ac-CH 38)

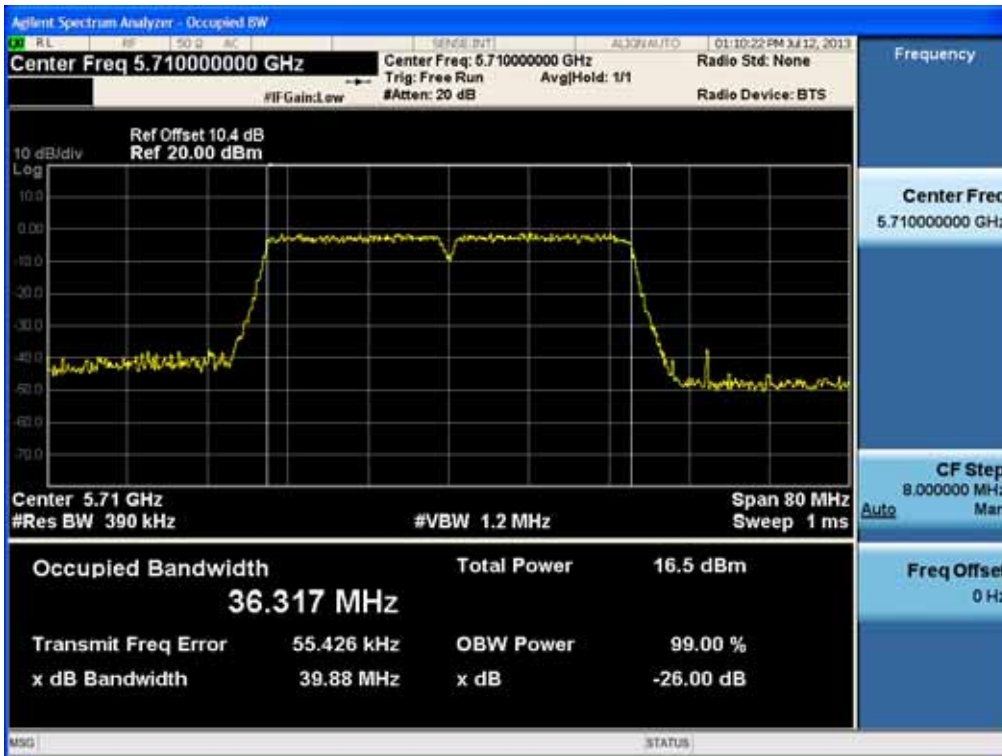


26 dB Bandwidth plot (802.11ac-CH 62)



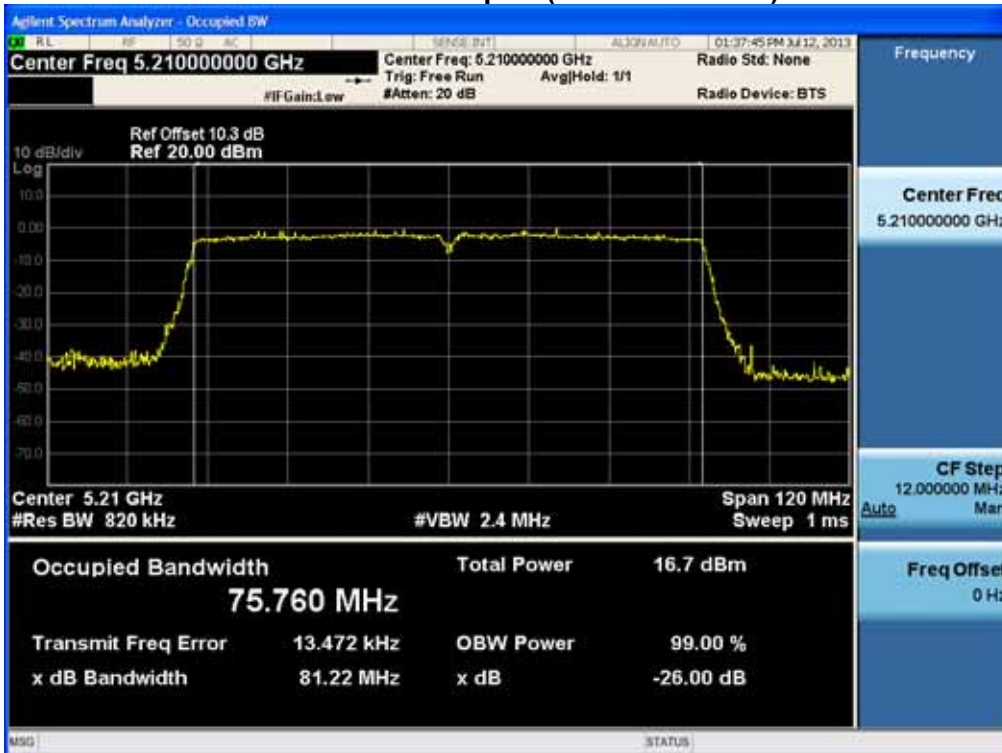
FCC PT.15.247 TEST REPORT	FCC CERTIFICATION REPORT		<a href="http://www.hct.co.kr">www.hct.co.kr</a>
Test Report No. HCTR1308FR43-2	Date of Issue: September 10, 2013	EUT Type: GSM/WCDMA/LTE Phone with Bluetooth, WLAN(2.4GHz & 5GHz) and NFC	FCC ID: ZNF0821

### 26 dB Bandwidth plot (802.11ac-CH 134)

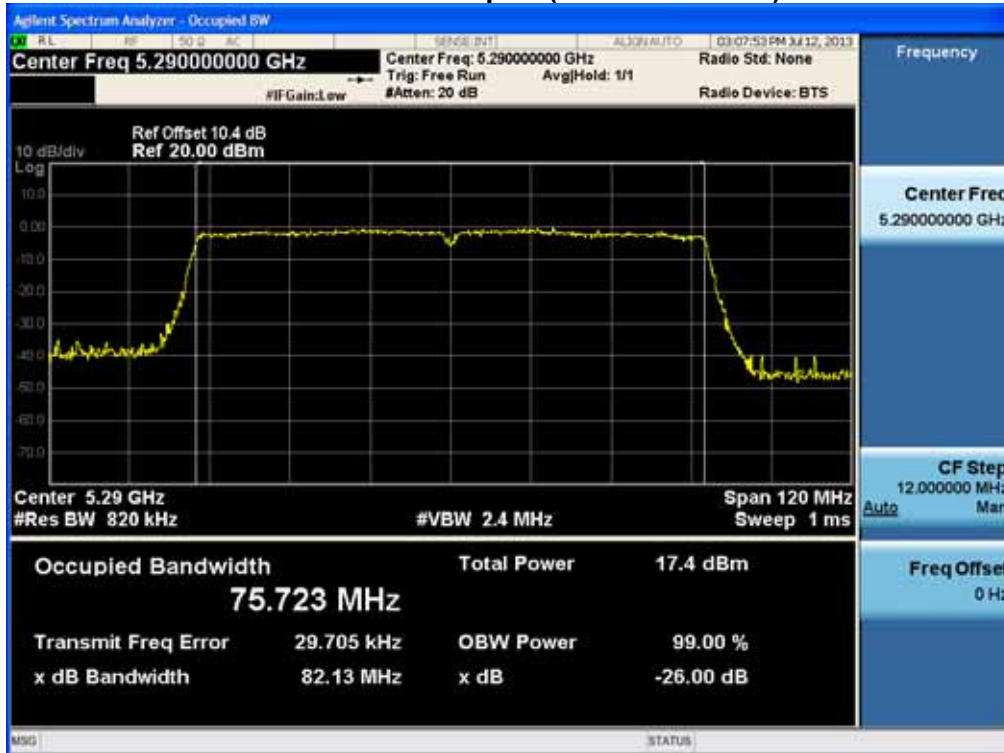


### 80 MHz BW

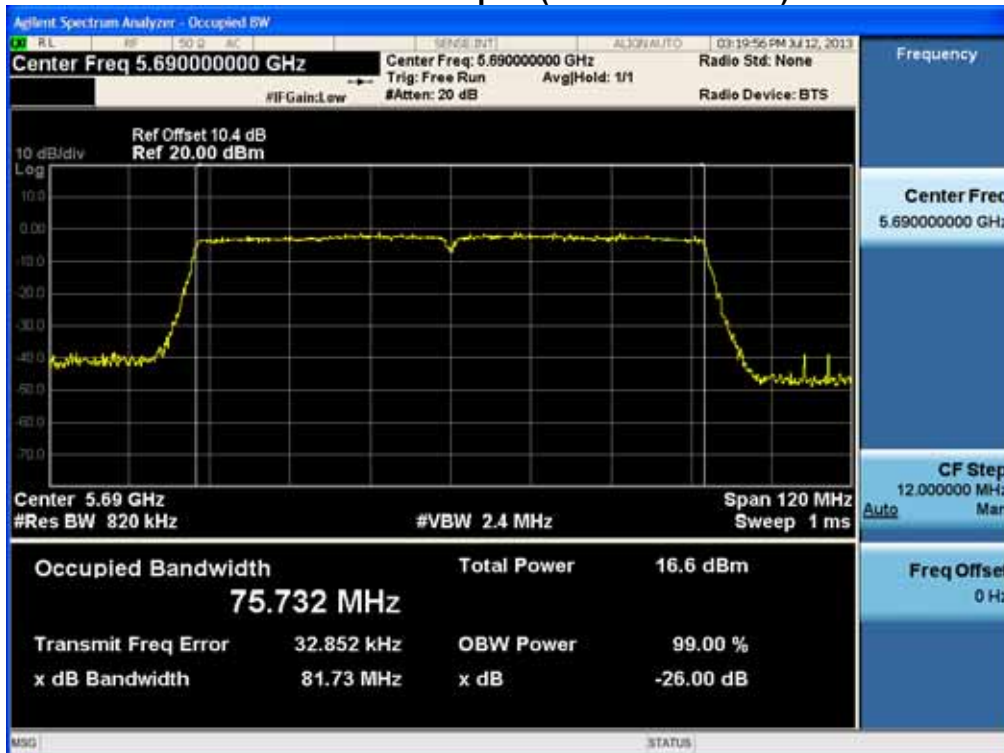
### 26 dB Bandwidth plot (802.11ac-CH 42)



### 26 dB Bandwidth plot (802.11ac-CH 58)



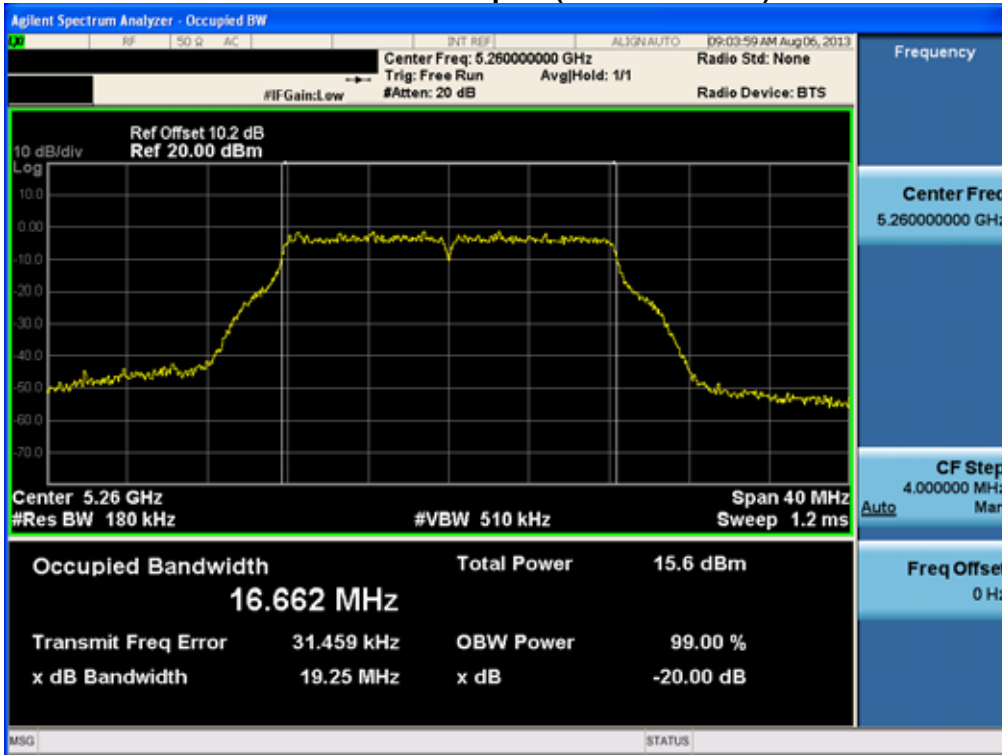
### 26 dB Bandwidth plot (802.11ac-CH 138)



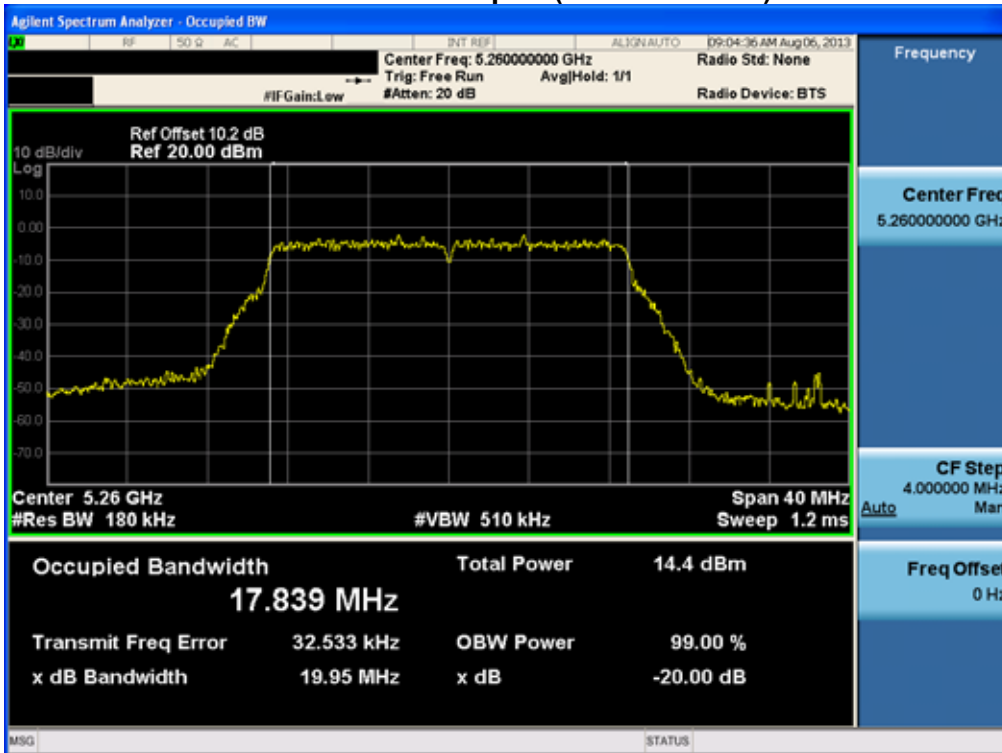
FCC PT.15.247 TEST REPORT	FCC CERTIFICATION REPORT		<a href="http://www.hct.co.kr">www.hct.co.kr</a>
Test Report No. HCTR1308FR43-2	Date of Issue: September 10, 2013	EUT Type: GSM/WCDMA/LTE Phone with Bluetooth, WLAN(2.4GHz & 5GHz) and NFC	FCC ID: ZNFD821

RESULT PLOTS(20 dB Bandwidth)

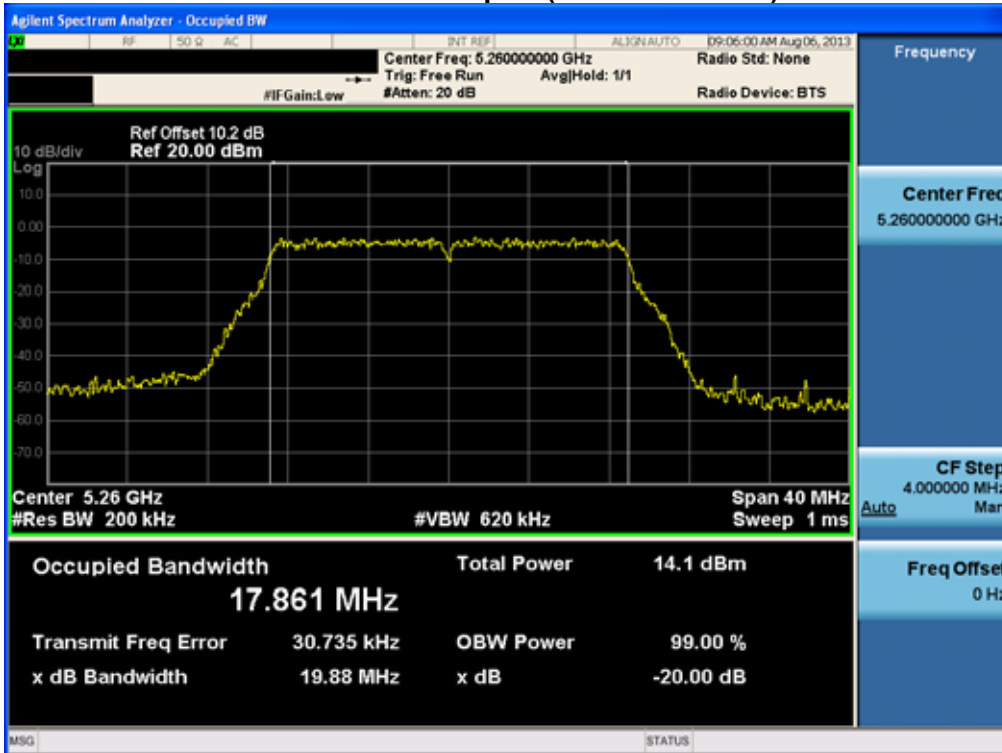
20 dB Bandwidth plot (802.11a-CH 52)



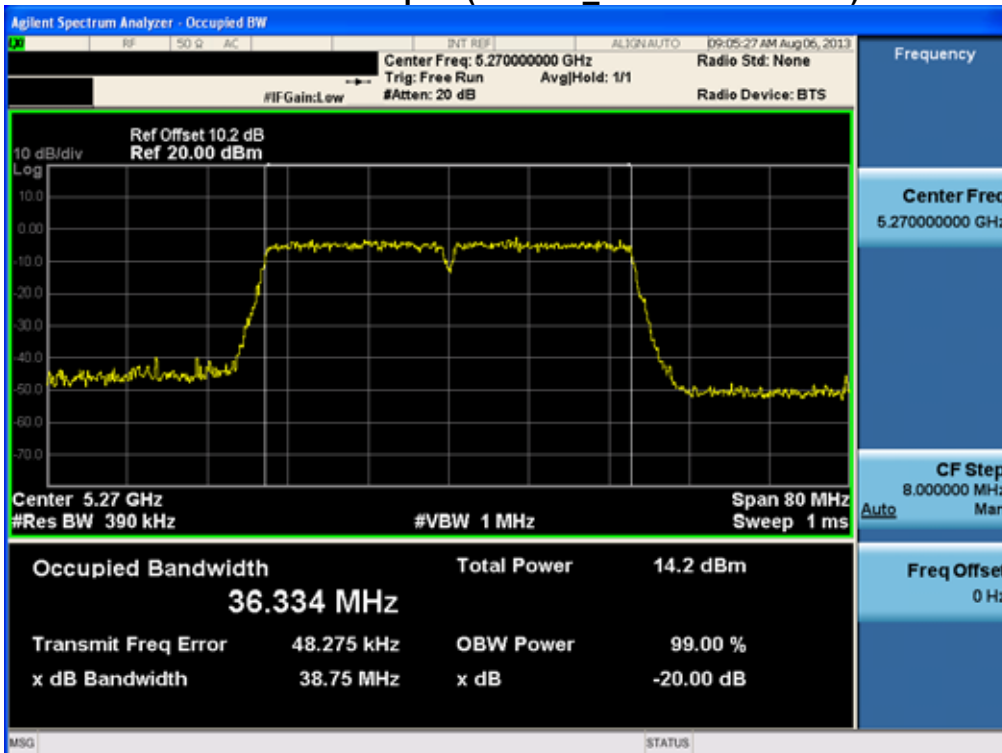
20 dB Bandwidth plot (802.11n-CH 52)



### 20 dB Bandwidth plot (802.11ac-CH 52)

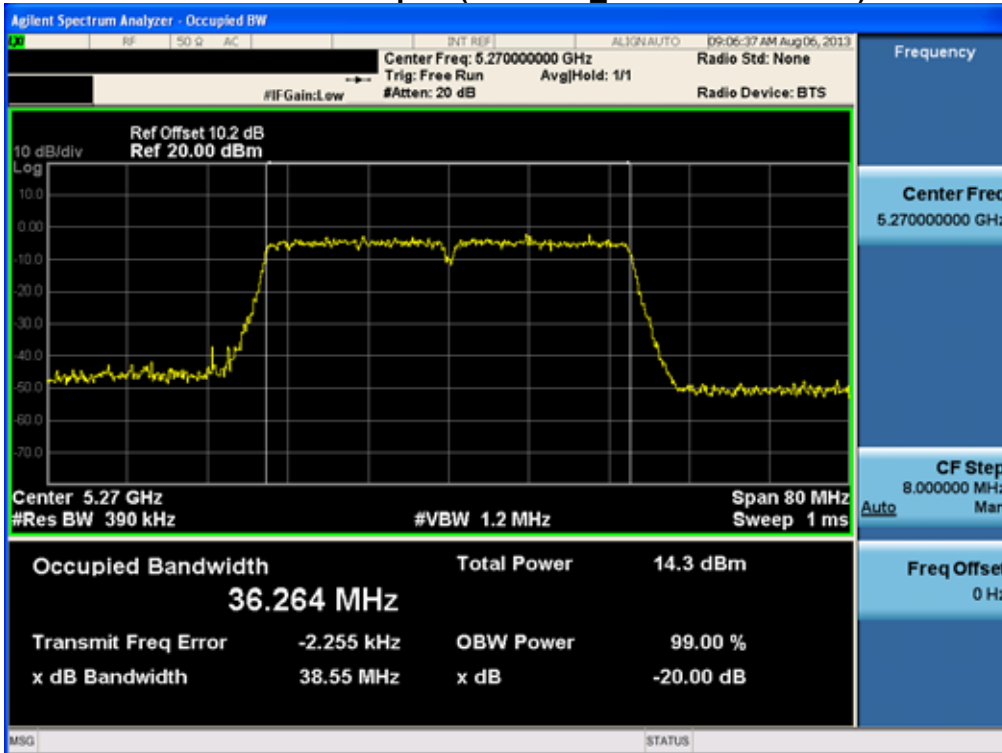


### 20 dB Bandwidth plot (802.11n\_40 MHz BW-CH 54)

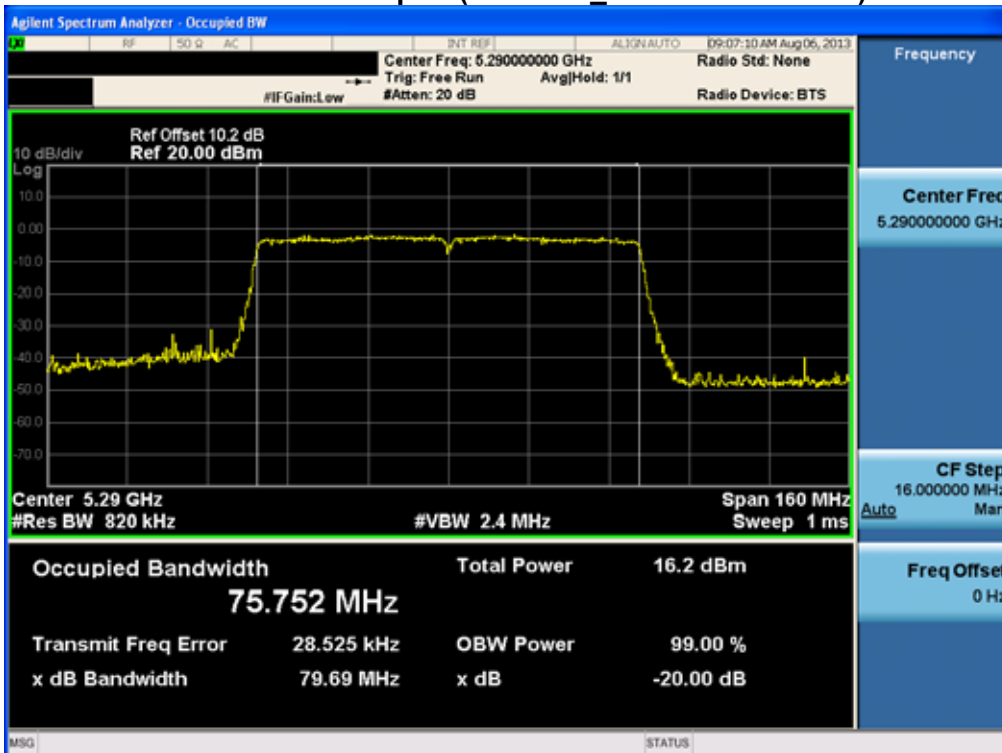


FCC PT.15.247 TEST REPORT	FCC CERTIFICATION REPORT		<a href="http://www.hct.co.kr">www.hct.co.kr</a>
Test Report No. HCTR1308FR43-2	Date of Issue: September 10, 2013	EUT Type: GSM/WCDMA/LTE Phone with Bluetooth, WLAN(2.4GHz & 5GHz) and NFC	FCC ID: ZNF821

### 20 dB Bandwidth plot (802.11ac\_40 MHz BW-CH 54)



### 20 dB Bandwidth plot (802.11ac\_80 MHz BW-CH 58)



### 8.3 OUTPUT POWER MEASUREMENT

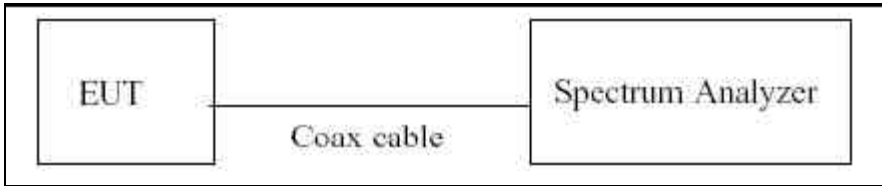
#### Test Requirements and limit, §15.247(b)(3)

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

FCC PT.15.247 TEST REPORT		FCC CERTIFICATION REPORT		<a href="http://www.hct.co.kr">www.hct.co.kr</a>
Test Report No. HCTR1308FR43-2	Date of Issue: September 10, 2013	EUT Type: GSM/WCDMA/LTE Phone with Bluetooth, WLAN(2.4GHz & 5GHz) and NFC		FCC ID: ZNFD821

### TEST CONFIGURATION



### TEST PROCEDURE

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  $\geq$  3 MHz.
  5. Number of points in sweep  $\geq$  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  $10\log(1/x)$ , where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times.

FCC PT.15.247 TEST REPORT		FCC CERTIFICATION REPORT		<a href="http://www.hct.co.kr">www.hct.co.kr</a>
Test Report No. HCTR1308FR43-2	Date of Issue: September 10, 2013	EUT Type: GSM/WCDMA/LTE Phone with Bluetooth, WLAN(2.4GHz & 5GHz) and NFC		FCC ID: ZNFD821



### Sample Calculation

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

Output Power = 10 dBm + 10 dB + 0.8 dB + 0.21 dB = 21.01 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	10.30
	5190	10.29
	5200	10.28
	5230	10.29
	5240	10.34
UNII 2	5260	10.37
	5270	10.38
	5300	10.40
	5310	10.39
	5320	10.39
UNII 2e	5500	10.35
	5510	10.36
	5550	10.41
	5580	10.43
	5670	10.43

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



**TEST RESULTS**

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	11.68	0.205	11.89	16.99
		9	11.67	0.318	11.99	16.99
		12	11.54	0.405	11.94	16.99
		18	11.57	0.598	12.16	16.99
		24	11.27	0.766	12.04	16.99
		36	11.04	1.063	12.10	16.99
		48	10.84	1.366	12.20	16.99
		54	10.53	1.496	12.02	16.99
5200	40	6	11.76	0.205	11.96	16.99
		9	11.72	0.318	12.04	16.99
		12	11.53	0.405	11.93	16.99
		18	11.40	0.598	12.00	16.99
		24	11.21	0.766	11.98	16.99
		36	10.89	1.063	11.95	16.99
		48	10.74	1.366	12.10	16.99
		54	10.45	1.496	11.94	16.99
5240	48	6	11.82	0.205	12.02	16.99
		9	11.75	0.318	12.07	16.99
		12	11.58	0.405	11.99	16.99
		18	11.35	0.598	11.95	16.99
		24	11.30	0.766	12.07	16.99
		36	10.95	1.063	12.02	16.99
		48	10.60	1.366	11.97	16.99
		54	10.45	1.496	11.95	16.99

FCC PT.15.247 TEST REPORT	FCC CERTIFICATION REPORT		<a href="http://www.hct.co.kr">www.hct.co.kr</a>
Test Report No. HCTR1308FR43-2	Date of Issue: September 10, 2013	EUT Type: GSM/WCDMA/LTE Phone with Bluetooth, WLAN(2.4GHz & 5GHz) and NFC	FCC ID: ZNF821

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	12.36	0.205	12.57	23.98
		9	12.36	0.318	12.68	23.98
		12	12.12	0.405	12.52	23.98
		18	11.99	0.598	12.59	23.98
		24	11.69	0.766	12.46	23.98
		36	11.37	1.063	12.44	23.98
		48	11.22	1.366	12.58	23.98
		54	11.00	1.496	12.50	23.98
5300	60	6	12.21	0.205	12.41	23.98
		9	12.08	0.318	12.40	23.98
		12	11.94	0.405	12.34	23.98
		18	11.86	0.598	12.46	23.98
		24	11.81	0.766	12.58	23.98
		36	11.42	1.063	12.48	23.98
		48	11.11	1.366	12.47	23.98
		54	10.89	1.496	12.39	23.98
5320	64	6	12.28	0.205	12.48	23.98
		9	12.07	0.318	12.39	23.98
		12	11.93	0.405	12.34	23.98
		18	11.76	0.598	12.36	23.98
		24	11.47	0.766	12.23	23.98
		36	11.16	1.063	12.23	23.98
		48	11.06	1.366	12.42	23.98
		54	10.83	1.496	12.33	23.98

Conducted Output Power Measurements (802.11a Mode: 5500~5700)

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	11.10	0.205	11.30	23.98
		9	11.00	0.318	11.32	23.98
		12	10.97	0.405	11.38	23.98
		18	10.81	0.598	11.41	23.98
		24	10.54	0.766	11.31	23.98
		36	10.10	1.063	11.16	23.98
		48	10.00	1.366	11.37	23.98
		54	9.70	1.496	11.20	23.98
5580	116	6	11.42	0.205	11.63	23.98
		9	11.42	0.318	11.74	23.98
		12	11.32	0.405	11.73	23.98
		18	11.16	0.598	11.76	23.98
		24	10.95	0.766	11.71	23.98
		36	10.64	1.063	11.70	23.98
		48	10.32	1.366	11.68	23.98
		54	10.21	1.496	11.71	23.98
5700	140	6	11.32	0.205	11.53	23.98
		9	11.22	0.318	11.54	23.98
		12	11.24	0.405	11.64	23.98
		18	11.07	0.598	11.67	23.98
		24	10.60	0.766	11.37	23.98
		36	10.33	1.063	11.39	23.98
		48	10.19	1.366	11.56	23.98
		54	9.91	1.496	11.41	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	11.00	0.221	11.22	16.99
		13	10.70	0.442	11.14	16.99
		19.5	10.44	0.621	11.06	16.99
		26	10.34	0.795	11.13	16.99
		39	9.99	1.105	11.10	16.99
		52	9.74	1.394	11.13	16.99
		58.5	9.63	1.496	11.13	16.99
		65	9.52	1.606	11.13	16.99
5200	40	6.5	10.92	0.221	11.14	16.99
		13	10.56	0.442	11.01	16.99
		19.5	10.37	0.621	10.99	16.99
		26	10.21	0.795	11.00	16.99
		39	9.97	1.105	11.07	16.99
		52	9.68	1.394	11.07	16.99
		58.5	9.47	1.496	10.96	16.99
		65	9.50	1.606	11.10	16.99
5240	48	6.5	10.91	0.221	11.13	16.99
		13	10.81	0.442	11.25	16.99
		19.5	10.54	0.621	11.16	16.99
		26	10.44	0.795	11.23	16.99
		39	10.17	1.105	11.28	16.99
		52	9.86	1.394	11.26	16.99
		58.5	9.82	1.496	11.32	16.99
		65	9.64	1.606	11.25	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	11.52	0.221	11.74	23.98
		13	11.36	0.442	11.80	23.98
		19.5	11.22	0.621	11.84	23.98
		26	11.03	0.795	11.83	23.98
		39	10.70	1.105	11.80	23.98
		52	10.46	1.394	11.86	23.98
		58.5	10.28	1.496	11.77	23.98
		65	10.18	1.606	11.78	23.98
5300	60	6.5	11.26	0.221	11.48	23.98
		13	11.06	0.442	11.50	23.98
		19.5	10.90	0.621	11.52	23.98
		26	10.74	0.795	11.54	23.98
		39	10.47	1.105	11.57	23.98
		52	10.22	1.394	11.62	23.98
		58.5	10.14	1.496	11.64	23.98
		65	10.02	1.606	11.62	23.98
5320	64	6.5	11.21	0.221	11.43	23.98
		13	10.99	0.442	11.44	23.98
		19.5	10.82	0.621	11.44	23.98
		26	10.67	0.795	11.46	23.98
		39	10.21	1.105	11.31	23.98
		52	9.96	1.394	11.35	23.98
		58.5	9.87	1.496	11.37	23.98
		65	9.84	1.606	11.44	23.98

Conducted Output Power Measurements (802.11n Mode: 5500~5700)

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	10.01	0.221	10.23	23.98
		13	9.86	0.442	10.30	23.98
		19.5	9.69	0.621	10.31	23.98
		26	9.53	0.795	10.32	23.98
		39	9.23	1.105	10.33	23.98
		52	8.94	1.394	10.33	23.98
		58.5	8.74	1.496	10.24	23.98
		65	8.62	1.606	10.22	23.98
5580	116	6.5	10.43	0.221	10.65	23.98
		13	10.20	0.442	10.64	23.98
		19.5	9.98	0.621	10.60	23.98
		26	9.86	0.795	10.65	23.98
		39	9.63	1.105	10.73	23.98
		52	9.36	1.394	10.75	23.98
		58.5	9.29	1.496	10.79	23.98
		65	9.05	1.606	10.66	23.98
5700	140	6.5	10.26	0.221	10.48	23.98
		13	10.12	0.442	10.56	23.98
		19.5	10.01	0.621	10.63	23.98
		26	9.79	0.795	10.58	23.98
		39	9.51	1.105	10.62	23.98
		52	9.05	1.394	10.44	23.98
		58.5	9.07	1.496	10.57	23.98
		65	8.85	1.606	10.46	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	8.54	0.445	8.98	16.99
		27	7.99	0.804	8.79	16.99
		40.5	7.68	1.120	8.80	16.99
		54	7.60	1.411	9.01	16.99
		81	6.95	1.867	8.82	16.99
		108	6.61	2.209	8.82	16.99
		121.5	6.46	2.359	8.82	16.99
		135	6.39	2.526	8.91	16.99
5230	46	13.5	9.88	0.445	10.33	16.99
		27	9.27	0.804	10.08	16.99
		40.5	8.99	1.120	10.11	16.99
		54	8.68	1.411	10.09	16.99
		81	8.25	1.867	10.12	16.99
		108	7.90	2.209	10.11	16.99
		121.5	7.77	2.359	10.12	16.99
		135	7.57	2.526	10.09	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	9.90	0.445	10.34	23.98
		27	9.45	0.804	10.25	23.98
		40.5	9.18	1.120	10.30	23.98
		54	8.78	1.411	10.19	23.98
		81	8.32	1.867	10.19	23.98
		108	8.02	2.209	10.22	23.98
		121.5	7.95	2.359	10.31	23.98
		135	7.76	2.526	10.29	23.98
5310	62	13.5	9.57	0.445	10.02	23.98
		27	9.32	0.804	10.13	23.98
		40.5	8.97	1.120	10.09	23.98
		54	8.66	1.411	10.07	23.98
		81	8.17	1.867	10.04	23.98
		108	7.82	2.209	10.03	23.98
		121.5	7.71	2.359	10.07	23.98
		135	7.45	2.526	9.98	23.98

Conducted Output Power Measurements (802.11n Mode: 5510~5670)

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	9.09	0.445	9.54	23.98
		27	8.63	0.804	9.43	23.98
		40.5	8.31	1.120	9.43	23.98
		54	8.02	1.411	9.44	23.98
		81	7.73	1.867	9.59	23.98
		108	7.05	2.209	9.26	23.98
		121.5	7.02	2.359	9.38	23.98
		135	6.76	2.526	9.29	23.98
5550	110	13.5	9.28	0.445	9.73	23.98
		27	8.80	0.804	9.60	23.98
		40.5	8.50	1.120	9.62	23.98
		54	8.21	1.411	9.62	23.98
		81	7.78	1.867	9.65	23.98
		108	7.44	2.209	9.65	23.98
		121.5	7.29	2.359	9.65	23.98
		135	7.05	2.526	9.58	23.98
5670	134	13.5	8.93	0.445	9.37	23.98
		27	8.66	0.804	9.47	23.98
		40.5	8.32	1.120	9.44	23.98
		54	7.97	1.411	9.38	23.98
		81	7.71	1.867	9.57	23.98
		108	7.26	2.209	9.47	23.98
		121.5	7.17	2.359	9.53	23.98
		135	6.97	2.526	9.50	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	10.78	0.230	11.01	16.99
		13	10.63	0.439	11.07	16.99
		19.5	10.35	0.625	10.97	16.99
		26	10.29	0.797	11.08	16.99
		39	9.81	1.094	10.90	16.99
		52	9.53	1.349	10.88	16.99
		58.5	9.65	1.476	11.13	16.99
		65	9.42	1.583	11.01	16.99
		78	9.32	1.804	11.12	16.99
5200	40	6.5	10.77	0.230	11.00	16.99
		13	10.55	0.439	10.99	16.99
		19.5	10.12	0.625	10.75	16.99
		26	10.20	0.797	10.99	16.99
		39	9.93	1.094	11.02	16.99
		52	9.57	1.349	10.92	16.99
		58.5	9.38	1.476	10.85	16.99
		65	9.31	1.583	10.89	16.99
		78	9.09	1.804	10.90	16.99
5240	48	6.5	10.84	0.230	11.07	16.99
		13	10.73	0.439	11.16	16.99
		19.5	10.24	0.625	10.86	16.99
		26	10.16	0.797	10.96	16.99
		39	9.93	1.094	11.02	16.99
		52	9.62	1.349	10.97	16.99
		58.5	9.56	1.476	11.03	16.99
		65	9.51	1.583	11.09	16.99
		78	9.19	1.804	11.00	16.99

**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	11.46	0.230	11.69	23.98
		13	11.14	0.439	11.58	23.98
		19.5	10.81	0.625	11.43	23.98
		26	10.77	0.797	11.56	23.98
		39	10.55	1.094	11.64	23.98
		52	10.30	1.349	11.65	23.98
		58.5	10.14	1.476	11.62	23.98
		65	10.01	1.583	11.59	23.98
		78	9.84	1.804	11.64	23.98
5300	60	6.5	11.19	0.230	11.42	23.98
		13	10.87	0.439	11.31	23.98
		19.5	10.66	0.625	11.28	23.98
		26	10.50	0.797	11.29	23.98
		39	10.22	1.094	11.31	23.98
		52	10.01	1.349	11.36	23.98
		58.5	9.93	1.476	11.40	23.98
		65	9.72	1.583	11.31	23.98
		78	9.45	1.804	11.25	23.98
5320	64	6.5	10.91	0.230	11.14	23.98
		13	10.74	0.439	11.18	23.98
		19.5	10.52	0.625	11.14	23.98
		26	10.27	0.797	11.07	23.98
		39	9.97	1.094	11.07	23.98
		52	9.64	1.349	10.99	23.98
		58.5	9.66	1.476	11.14	23.98
		65	9.41	1.583	11.00	23.98
		78	9.20	1.804	11.00	23.98

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	9.70	0.230	9.93	23.98
		13	9.54	0.439	9.98	23.98
		19.5	9.43	0.625	10.06	23.98
		26	9.29	0.797	10.09	23.98
		39	8.95	1.094	10.05	23.98
		52	8.70	1.349	10.05	23.98
		58.5	8.52	1.476	9.99	23.98
		65	8.39	1.583	9.97	23.98
		78	8.17	1.804	9.97	23.98
5580	116	6.5	10.09	0.230	10.32	23.98
		13	10.00	0.439	10.44	23.98
		19.5	9.70	0.625	10.32	23.98
		26	9.66	0.797	10.46	23.98
		39	9.24	1.094	10.34	23.98
		52	9.10	1.349	10.44	23.98
		58.5	8.94	1.476	10.41	23.98
		65	8.89	1.583	10.47	23.98
		78	8.49	1.804	10.30	23.98
5720	144	6.5	10.11	0.230	10.34	23.98
		13	9.77	0.439	10.21	23.98
		19.5	9.67	0.625	10.30	23.98
		26	9.56	0.797	10.36	23.98
		39	9.17	1.094	10.26	23.98
		52	9.03	1.349	10.38	23.98
		58.5	8.79	1.476	10.27	23.98
		65	8.88	1.583	10.46	23.98
		78	8.50	1.804	10.31	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	8.67	0.434	9.11	16.99
		27	8.26	0.798	9.06	16.99
		40.5	8.04	1.108	9.14	16.99
		54	7.72	1.372	9.09	16.99
		81	7.20	1.843	9.04	16.99
		108	6.80	2.165	8.96	16.99
		121.5	6.66	2.317	8.97	16.99
		135	6.56	2.468	9.03	16.99
		162	6.23	2.739	8.96	16.99
		180	6.15	2.801	8.95	16.99
5230	46	13.5	9.66	0.434	10.09	16.99
		27	9.29	0.798	10.09	16.99
		40.5	8.96	1.108	10.07	16.99
		54	8.71	1.372	10.08	16.99
		81	8.21	1.843	10.06	16.99
		108	7.96	2.165	10.13	16.99
		121.5	7.76	2.317	10.08	16.99
		135	7.61	2.468	10.08	16.99
		162	7.46	2.739	10.19	16.99
		180	7.21	2.801	10.01	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	9.91	0.434	10.34	23.98
		27	9.58	0.798	10.37	23.98
		40.5	9.23	1.108	10.34	23.98
		54	8.80	1.372	10.17	23.98
		81	8.53	1.843	10.38	23.98
		108	8.17	2.165	10.33	23.98
		121.5	7.91	2.317	10.23	23.98
		135	7.79	2.468	10.25	23.98
		162	7.52	2.739	10.26	23.98
		180	7.50	2.801	10.30	23.98
5310	62	13.5	9.70	0.434	10.13	23.98
		27	9.37	0.798	10.17	23.98
		40.5	9.03	1.108	10.14	23.98
		54	8.61	1.372	9.98	23.98
		81	8.16	1.843	10.01	23.98
		108	7.97	2.165	10.14	23.98
		121.5	7.84	2.317	10.16	23.98
		135	7.62	2.468	10.09	23.98
		162	7.37	2.739	10.11	23.98
		180	7.39	2.801	10.19	23.98

Conducted Output Power Measurements (802.11ac Mode: 5510~5670)

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	9.22	0.434	9.65	23.98
		27	8.89	0.798	9.69	23.98
		40.5	8.39	1.108	9.50	23.98
		54	8.36	1.372	9.73	23.98
		81	7.86	1.843	9.70	23.98
		108	7.32	2.165	9.49	23.98
		121.5	7.19	2.317	9.51	23.98
		135	7.07	2.468	9.54	23.98
		162	6.73	2.739	9.47	23.98
5550	110	13.5	9.27	0.434	9.71	23.98
		27	8.94	0.798	9.73	23.98
		40.5	8.77	1.108	9.88	23.98
		54	8.48	1.372	9.85	23.98
		81	8.10	1.843	9.94	23.98
		108	7.59	2.165	9.76	23.98
		121.5	7.46	2.317	9.77	23.98
		135	7.31	2.468	9.77	23.98
		162	7.03	2.739	9.77	23.98
5710	142	13.5	9.42	0.434	9.85	23.98
		27	9.06	0.798	9.85	23.98
		40.5	8.66	1.108	9.77	23.98
		54	8.43	1.372	9.80	23.98
		81	7.94	1.843	9.78	23.98
		108	7.59	2.165	9.76	23.98
		121.5	7.46	2.317	9.77	23.98
		135	7.28	2.468	9.75	23.98
		162	6.97	2.739	9.71	23.98
		180	7.03	2.801	9.83	23.98



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	8.68	0.854	9.53	16.99
		58.5	8.05	1.469	9.51	16.99
		87.8	7.51	1.934	9.45	16.99
		117	7.20	2.256	9.46	16.99
		175.5	6.66	2.811	9.47	16.99
		234	6.34	3.122	9.46	16.99
		263.3	6.09	3.333	9.42	16.99
		292.5	5.96	3.455	9.42	16.99
		351	5.71	3.688	9.39	16.99
		390	5.56	3.825	9.39	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	9.41	0.854	10.27	23.98
		58.5	8.90	1.469	10.37	23.98
		87.8	8.29	1.934	10.23	23.98
		117	8.09	2.256	10.34	23.98
		175.5	7.45	2.811	10.27	23.98
		234	7.21	3.122	10.34	23.98
		263.3	7.05	3.333	10.39	23.98
		292.5	6.77	3.455	10.22	23.98
		351	6.64	3.688	10.33	23.98
		390	6.41	3.825	10.24	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	8.19	0.854	9.04	23.98
		58.5	7.59	1.469	9.06	23.98
		87.8	7.19	1.934	9.12	23.98
		117	6.88	2.256	9.14	23.98
		175.5	6.29	2.811	9.10	23.98
		234	6.04	3.122	9.16	23.98
		263.3	5.82	3.333	9.15	23.98
		292.5	5.59	3.455	9.04	23.98
		351	5.46	3.688	9.15	23.98
		390	5.21	3.825	9.03	23.98
5690	138	29.3	8.52	0.854	9.37	23.98
		58.5	8.03	1.469	9.50	23.98
		87.8	7.37	1.934	9.30	23.98
		117	7.07	2.256	9.33	23.98
		175.5	6.50	2.811	9.31	23.98
		234	6.22	3.122	9.35	23.98
		263.3	5.88	3.333	9.22	23.98
		292.5	5.87	3.455	9.32	23.98
		351	5.61	3.688	9.30	23.98
		390	5.43	3.825	9.25	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.

**RESULT PLOTS (5180 MHz ~5240 MHz)**

**Conducted Output Power (802.11a-CH 36) 48 Mbps**



**RESULT PLOTS (5260 MHz ~5320 MHz)**

**Conducted Output Power (802.11a-CH 52) 9 Mbps**



FCC PT.15.247 TEST REPORT	FCC CERTIFICATION REPORT		<a href="http://www.hct.co.kr">www.hct.co.kr</a>
Test Report No. HCTR1308FR43-2	Date of Issue: September 10, 2013	EUT Type: GSM/WCDMA/LTE Phone with Bluetooth, WLAN(2.4GHz & 5GHz) and NFC	FCC ID: ZNF0821

**RESULT PLOTS (5500 MHz ~5700 MHz)**

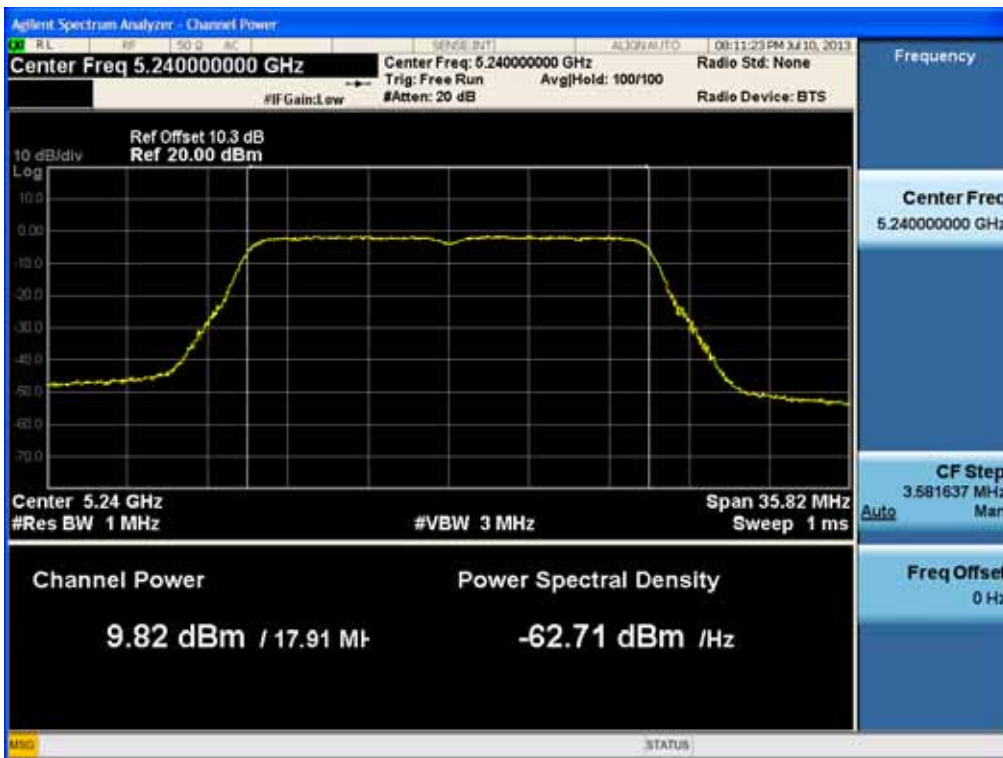
**Conducted Output Power (802.11a-CH 116) 18 Mbps**



20 MHz BW

**RESULT PLOTS (5180 MHz ~5240 MHz)**

**Conducted Output Power (802.11n-CH 48) 58.5 Mbps**



FCC PT.15.247 TEST REPORT	FCC CERTIFICATION REPORT		<a href="http://www.hct.co.kr">www.hct.co.kr</a>
Test Report No. HCTR1308FR43-2	Date of Issue: September 10, 2013	EUT Type: GSM/WCDMA/LTE Phone with Bluetooth, WLAN(2.4GHz & 5GHz) and NFC	FCC ID: ZNFD821

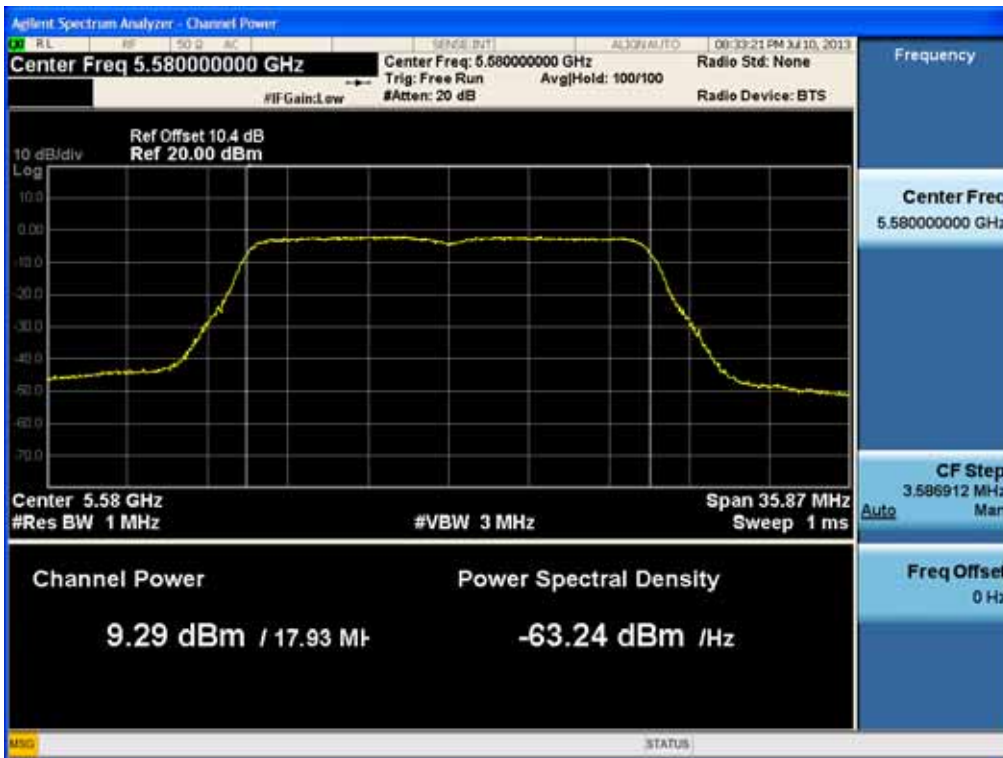
**RESULT PLOTS (5260 MHz ~5320 MHz)**

**Conducted Output Power (802.11n-CH 52) 52 Mbps**



**RESULT PLOTS (5500 MHz ~5700 MHz)**

**Conducted Output Power (802.11n-CH 116) 58.5 Mbps**

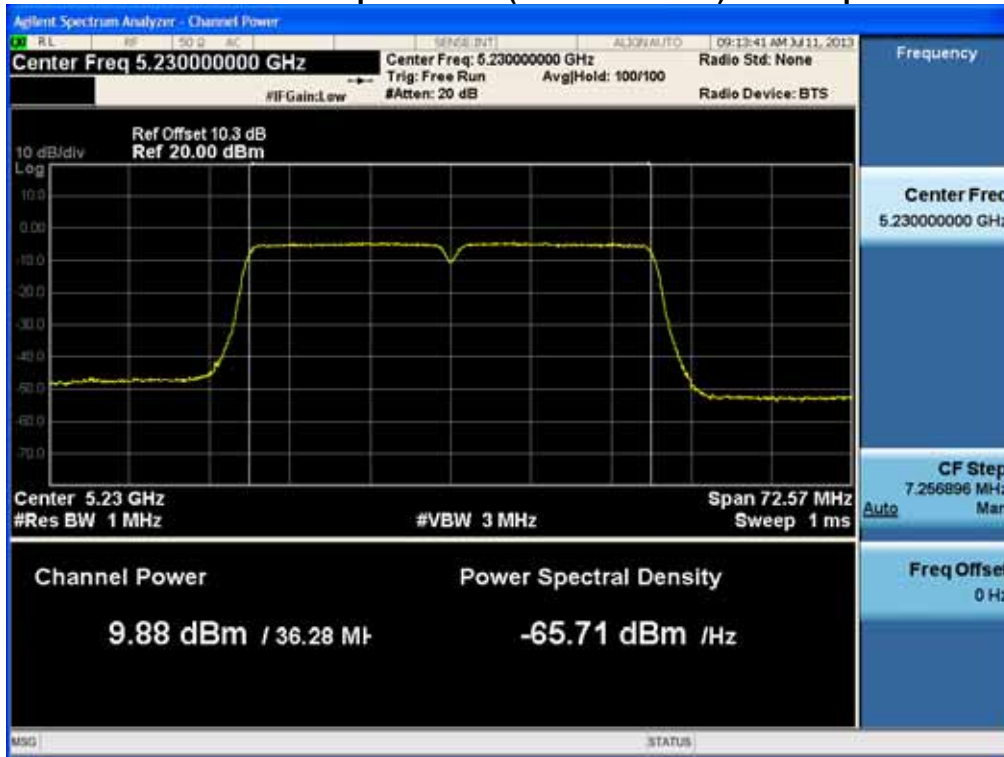


FCC PT.15.247 TEST REPORT	FCC CERTIFICATION REPORT		<a href="http://www.hct.co.kr">www.hct.co.kr</a>
Test Report No. HCTR1308FR43-2	Date of Issue: September 10, 2013	EUT Type: GSM/WCDMA/LTE Phone with Bluetooth, WLAN(2.4GHz & 5GHz) and NFC	FCC ID: ZNF0821

40 MHz BW

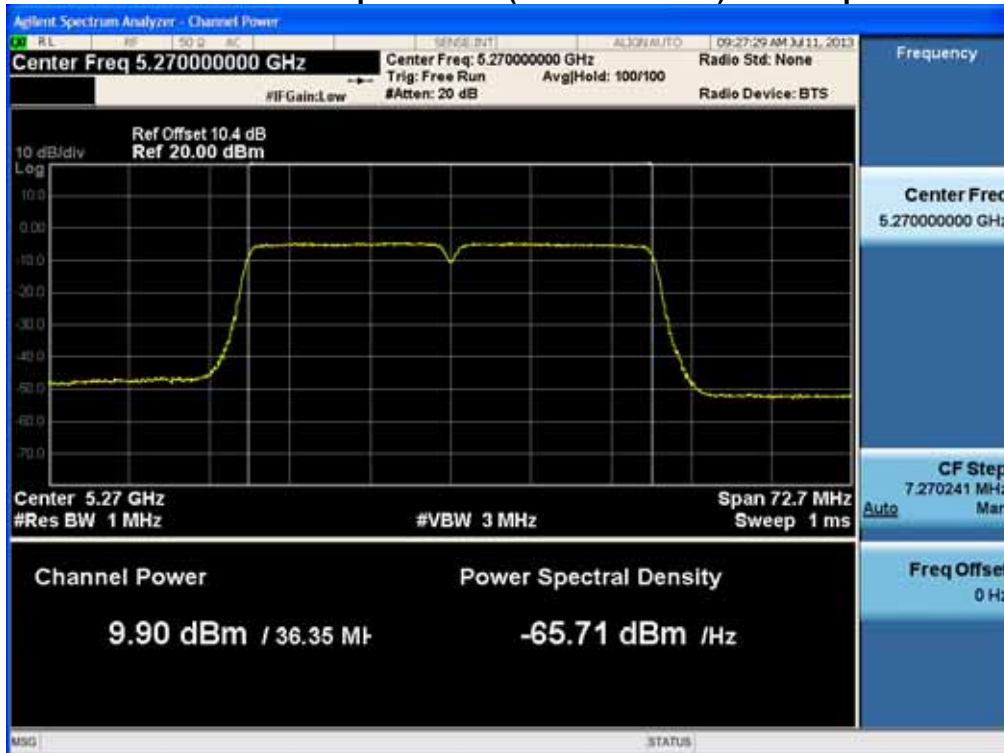
RESULT PLOTS (5190 MHz ~5230 MHz)

Conducted Output Power (802.11n-CH 46) 13.5 Mbps



RESULT PLOTS (5270 MHz ~5310 MHz)

Conducted Output Power (802.11n-CH 54) 13.5 Mbps



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Test Report No. HCTR1308FR43-2	Date of Issue: September 10, 2013	EUT Type: GSM/WCDMA/LTE Phone with Bluetooth, WLAN(2.4GHz & 5GHz) and NFC	FCC ID: ZNF0821

RESULT PLOTS (5510 MHz ~5670 MHz)

Conducted Output Power (802.11n-CH 110) 13.5 Mbps



20 MHz BW

RESULT PLOTS (5180 MHz ~5240 MHz)

Conducted Output Power (802.11ac-CH 48) 13 Mbps



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Test Report No. HCTR1308FR43-2	Date of Issue: September 10, 2013	EUT Type: GSM/WCDMA/LTE Phone with Bluetooth, WLAN(2.4GHz & 5GHz) and NFC	FCC ID: ZNF0821

**RESULT PLOTS (5260 ~ 5320 MHz)**

**Conducted Output Power (802.11ac-CH 52) 6.5 Mbps**



**RESULT PLOTS (5500 ~ 5720 MHz)**

**Conducted Output Power (802.11ac-CH 116) 65 Mbps**



FCC PT.15.247 TEST REPORT	FCC CERTIFICATION REPORT		<a href="http://www.hct.co.kr">www.hct.co.kr</a>
Test Report No. HCTR1308FR43-2	Date of Issue: September 10, 2013	EUT Type: GSM/WCDMA/LTE Phone with Bluetooth, WLAN(2.4GHz & 5GHz) and NFC	FCC ID: ZNF0821



40 MHz BW

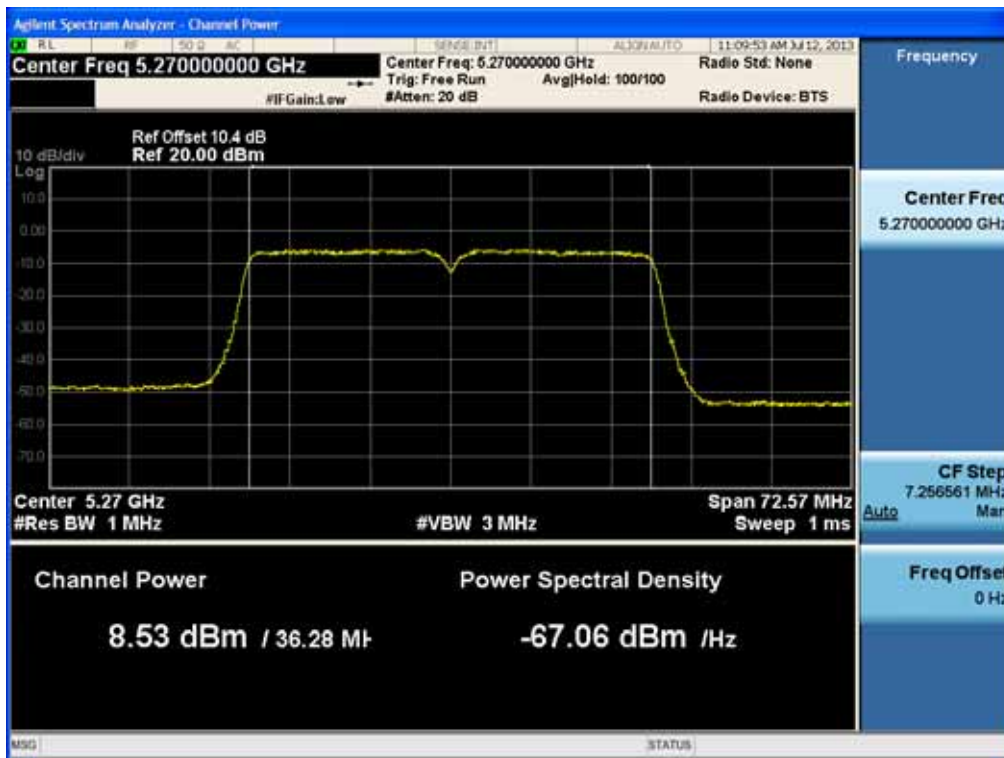
RESULT PLOTS (5190 ~ 5230 MHz)

Conducted Output Power (802.11ac-CH 46) 108 Mbps



RESULT PLOTS (5270 ~ 5310 MHz)

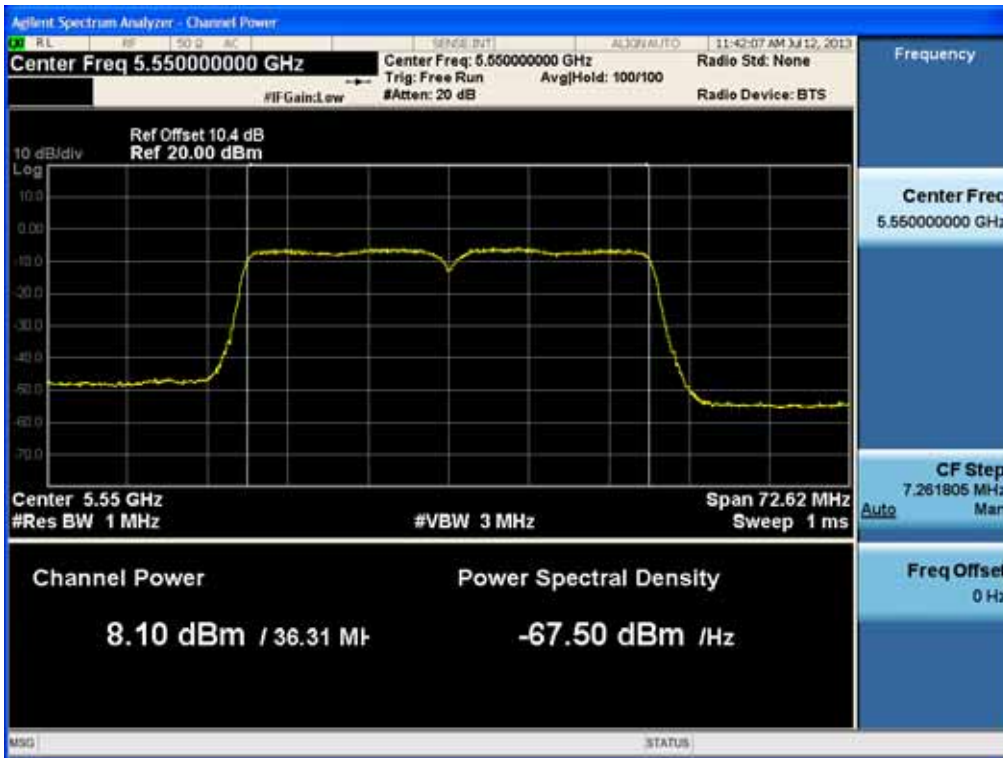
Conducted Output Power (802.11ac-CH 54) 81 Mbps



FCC PT.15.247 TEST REPORT	FCC CERTIFICATION REPORT		<a href="http://www.hct.co.kr">www.hct.co.kr</a>
Test Report No. HCTR1308FR43-2	Date of Issue: September 10, 2013	EUT Type: GSM/WCDMA/LTE Phone with Bluetooth, WLAN(2.4GHz & 5GHz) and NFC	FCC ID: ZNF0821

**RESULT PLOTS (5510 ~ 5710 MHz)**

**Conducted Output Power (802.11ac-CH 110) 81 Mbps**



80 MHz BW

**RESULT PLOTS (5210 MHz)**

**Conducted Output Power (802.11ac-CH 42) 29.3 Mbps**



FCC PT.15.247 TEST REPORT	FCC CERTIFICATION REPORT		<a href="http://www.hct.co.kr">www.hct.co.kr</a>
Test Report No. HCTR1308FR43-2	Date of Issue: September 10, 2013	EUT Type: GSM/WCDMA/LTE Phone with Bluetooth, WLAN(2.4GHz & 5GHz) and NFC	FCC ID: ZNF0821



**RESULT PLOTS (5290 MHz)**

**Conducted Output Power (802.11ac-CH 58) 263.3 Mbps**



**RESULT PLOTS (5530 MHz ~ 5690 MHz)**

**Conducted Output Power (802.11ac-CH 138) 58.5 Mbps**



FCC PT.15.247 TEST REPORT	FCC CERTIFICATION REPORT		<a href="http://www.hct.co.kr">www.hct.co.kr</a>
Test Report No. HCTR1308FR43-2	Date of Issue: September 10, 2013	EUT Type: GSM/WCDMA/LTE Phone with Bluetooth, WLAN(2.4GHz & 5GHz) and NFC	FCC ID: ZNFD821