

# TEST REPORT



**CTK Co., Ltd.**  
(Ho-dong), 113, Yejik-ro, Cheoin-gu,  
Yongin-si, Gyeonggi-do, Korea  
Tel: +82-31-339-9970  
Fax: +82-31-624-9501

Report No.:  
CTK-2019-04461  
Page (1) / (159) Pages

## 1. Client

- Name : Samsung Electronics Co., Ltd.
- Address : 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Republic of Korea
- Date of Receipt : 2019-10-08

## 2. Manufacturer

- Name : Samsung Electronics Co., Ltd.
- Address : 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Republic of Korea

**3. Use of Report** : For FCC Certification / ISED Certification

**4. Test Sample / Model:** Wi-Fi/BT Transceiver / WCP732M


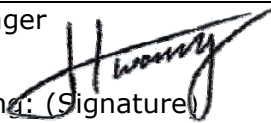
**5. Date of Test** : 2019-10-11 to 2019-11-13

**6. Test Standard(method) used** : FCC 47 CFR part 15 subpart C 15.407

**7. Testing Environment:** Temp.: (25 ± 1) °C, Humidity: (50 ± 3) % R.H

**8. Test Results** : Compliance

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This Test Report cannot be reproduced, except in full.

Affirmation	Tested by		Technical Manager	
	Ji-Hye Kim: (Signature)		Won-Jae, Hwang: (Signature)	

2019-11-13

Republic of KOREA **CTK Co., Ltd.**



**CTK Co., Ltd.**  
(Ho-dong), 113, Yejik-ro, Cheoin-gu,  
Yongin-si, Gyeonggi-do, Korea  
Tel: +82-31-339-9970  
Fax: +82-31-624-9501

Report No.:  
CTK-2019-04461  
Page (2) / (159) Pages

## REPORT REVISION HISTORY

Date	Revision	Page No
2019-11-13	Issued (CTK-2019-04461)	all

*This report shall not be reproduced except in full, without the written approval of CTK Co., Ltd. This document may be altered or revised by CTK Co., Ltd. personnel only, and shall be noted in the revision section of the document. Any alteration of this document not carried out by CTK Co., Ltd. will constitute fraud and shall nullify the document.*



**CTK Co., Ltd.**  
(Ho-dong), 113, Yejik-ro, Cheoin-gu,  
Yongin-si, Gyeonggi-do, Korea  
Tel: +82-31-339-9970  
Fax: +82-31-624-9501

Report No.:  
CTK-2019-04461  
Page (3) / (159) Pages

## CONTENTS

1. General Product Description .....	4
1.1 Client Information .....	4
1.2 Product Information.....	4
1.3 Peripheral Devices .....	5
2. Facility and Accreditations.....	6
2.1 Test Facility .....	6
2.2 Laboratory Accreditations and Listings.....	6
2.3 Calibration Details of Equipment Used for Measurement.....	6
3. Test Specifications .....	7
3.1 Standards .....	7
3.2 Mode of operation during the test .....	8
3.3 Device Modifications .....	9
3.4 Maximum Measurement Uncertainty .....	9
3.5 Test Software .....	9
4. Technical Characteristic Test.....	10
4.1 6dB Bandwidth .....	10
4.2 26 dB Bandwidth and 99% Bandwidth .....	18
4.3 OUTPUT POWER.....	44
4.4 Power Spectral Density .....	74
4.5 Frequency Stability.....	104
4.6 Unwanted Emissions .....	105
4.7 AC Conducted Emissions .....	156
APPENDIX A – Test Equipment Used For Tests .....	159



**CTK Co., Ltd.**  
(Ho-dong), 113, Yejik-ro, Cheoin-gu,  
Yongin-si, Gyeonggi-do, Korea  
Tel: +82-31-339-9970  
Fax: +82-31-624-9501

Report No.:  
CTK-2019-04461  
Page (4) / (159) Pages

## 1. General Product Description

### 1.1 Client Information

<b>Company</b>	Samsung Electronics Co., Ltd.
<b>Contact Point</b>	129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Republic of Korea
<b>Contact Person</b>	Name : Minhyung Cho E-mail : mh719.cho@samsung.com Tel : +82-277-2688 Fax : -

### 1.2 Product Information

<b>FCC ID</b>	A3LWCP732M
<b>IC</b>	649E-WCP732M
<b>Product Description</b>	Wi-Fi/BT Transceiver
<b>Model name</b>	WCP732M
<b>Operating Frequency</b>	UNII 1 : 5 180 MHz – 5 240 MHz (20 MHz_BW) 5 190 MHz – 5 230 MHz (40 MHz_BW) 5 210 MHz (80 MHz_BW) UNII 2A : 5 260 MHz – 5 320 MHz (20 MHz_BW) 5 270 MHz – 5 310 MHz (40 MHz_BW) 5 290 MHz (80 MHz_BW) UNII 2C : 5 500 MHz – 5 720 MHz (20 MHz_BW) 5 510 MHz – 5 710 MHz (40 MHz_BW) 5 530 MHz – 5 690 MHz (80 MHz_BW) UNII 3 : 5 745 MHz – 5 825 MHz (20 MHz_BW) 5 755 MHz – 5 795 MHz (40 MHz_BW) 5 775 MHz (80 MHz)
<b>RF Output Power</b>	802.11a : 21.68 dBm (147.23 mW) 802.11n_HT20 : 21.17 dBm (130.92 mW) 802.11n_HT40 : 16.59 dBm (45.60 mW) 802.11ac_VHT20 : 20.94 dBm (124.17 mW) 802.11ac_VHT40 : 17.54 dBm (56.75 mW) 802.11ac_VHT80 : 16.09 dBm (40.64 mW)
<b>Antenna Specification</b>	Antenna type : PIFA Antenna Peak Gain (5 GHz) : 0.87 dBi (ANT-L), 3.00 dBi (ANT-R)
<b>Type of Modulation</b>	OFDM
<b>Data Rate</b>	802.11a : 54 / 48 / 36 / 24 / 18 / 12 / 9 / 6 Mbps 802.11n : up to 300 Mbps 802.11ac : up to 867 Mbps
<b>Power Source</b>	DC 5 V
<b>Hardware Rev</b>	V1.5
<b>Software Rev</b>	FC4



**CTK Co., Ltd.**  
(Ho-dong), 113, Yejik-ro, Cheoin-gu,  
Yongin-si, Gyeonggi-do, Korea  
Tel: +82-31-339-9970  
Fax: +82-31-624-9501

Report No.:  
CTK-2019-04461  
Page (5) / (159) Pages

### 1.3 Peripheral Devices

Device	Manufacturer	Model No.	Serial No.
Note Computer	HP	15-bs563TU	CND7253R6N
AC/DC Adapter	HP	HSTNN-CA40	-



**CTK Co., Ltd.**  
(Ho-dong), 113, Yejik-ro, Cheoin-gu,  
Yongin-si, Gyeonggi-do, Korea  
Tel: +82-31-339-9970  
Fax: +82-31-624-9501

Report No.:  
CTK-2019-04461  
Page (6) / (159) Pages

## 2. Facility and Accreditations

### 2.1 Test Facility

The measurement facility is located at (Ho-dong), 113, Yejik-ro, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea.

### 2.2 Laboratory Accreditations and Listings

Country	Agency	Registration Number
USA	FCC	805871
CANADA	ISED	8737A-2
KOREA	NRRA	KR0025

### 2.3 Calibration Details of Equipment Used for Measurement

Test equipment and test accessories are calibrated on regular basis. The maximum time between calibrations is one year or what is recommended by the manufacturer, whichever is less. All test equipment calibrations are traceable to the Korea Research Institute of Standards and Science (KRISS), therefore, all test data recorded in this report is traceable to KRISS.



**CTK Co., Ltd.**  
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,  
 Yongin-si, Gyeonggi-do, Korea  
 Tel: +82-31-339-9970  
 Fax: +82-31-624-9501

Report No.:  
 CTK-2019-04461  
 Page (7) / (159) Pages

### 3. Test Specifications

#### 3.1 Standards

FCC Part Section(s)	ISED Part Section(s)	Requirement(s)	Limit	Status (Note 1)	Test Condition
15.407(e)	RSS-Gen 6.6	6 dB Bandwidth	> 500 kHz	C	Conducted
15.407(a)	RSS-Gen 6.6	26 dB Bandwidth and 99% Bandwidth	NA	C	
15.407(a)(1)	RSS-247 6.2.1.1, 6.2.4.1	Conducted Output Power	< 250 mW (For FCC Limit) < 200 mW (For ISED Limit) (5 150 – 5 250 MHz)  < 250 mW (5 250 – 5 350 MHz, 5 470 – 5 725 MHz)  < 1 W (5 725 – 5 850 MHz)	C	
15.407(a)(1)	RSS-247 6.2.1.1, 6.2.4.1	Power Spectral Density	< 11 dBm/MHz (For FCC Limit) < 10 dBm/MHz EIRP (For ISED Limit) (5 150 – 5 250 MHz)  < 11 dBm/MHz (5 250 – 5 350 MHz, 5 470 – 5 725 MHz)  < 30 dBm/500 KHz (5 725 – 5 850 MHz)	C	
15.407(g)	RSS-Gen 6.11	Frequency Stability	NA	C	
15.407 (b)	RSS-247 6.2.1.2, 6.2.4.2	Undesirable emission	< -27 dBm/MHz EIRP (5 150 – 5 250 MHz, 5250 – 5350 MHz, 5470 – 5725 MHz)  < -17 dBm/MHz EIRP (5715 – 5725 MHz, 5 850 – 5 860 MHz)  < -27 dBm/MHz EIRP outside (5 715 – 5 850 MHz)	C	Radiated
15.205, 15.407 (b) (5),(6)	RSS-Gen 6.13	Radiated Spurious Emission	15.209(a)	C	
15.207	RSS-Gen 8.8	AC Conducted Emissions	15.207(a)	C	Line Conducted
<i>Note 1:</i> C=Complies NC=Not Complies NT=Not Tested NA=Not Applicable					
<i>Note 2:</i> The data in this test report are traceable to the national or international standards.					
<i>Note 3:</i> The sample was tested according to the following specification: FCC Part 15.247, ANSI C63.10-2013					
<i>Note 4:</i> The tests were performed according to the method of measurements prescribed in KDB No.789033.					



### 3.2 Mode of operation during the test

The EUT is operated in a manner representative of the typical of the equipments. During at testing, system components were manipulated within the confines of typical usage to maximize each emission.

For WLAN function, the engineering test program was provided and enabled to make EUT continuous transmit.

All modulation modes were tests. The results are only attached worst cases.

#### Test Frequency

- 802.11a, 802.11n\_HT20, 802.11ac\_VHT20

	Lowest channel	Middle channel	Highest channel
<b>UNII 1</b>	5 180 MHz	5 200 MHz	5 240 MHz
<b>UNII 2A</b>	5 260 MHz	5 300 MHz	5 320 MHz
<b>UNII 2C</b>	5 500 MHz	5 600 MHz	5 720 MHz
<b>UNII 3</b>	5 745 MHz	5 785 MHz	5 825 MHz

- 802.11n\_HT40, 802.11ac\_VHT40

	Lowest channel	Middle channel	Highest channel
<b>UNII 1</b>	5 190 MHz	-	5 230 MHz
<b>UNII 2A</b>	5 270 MHz	-	5 310 MHz
<b>UNII 2C</b>	5 510 MHz	5 590 MHz	5 710 MHz
<b>UNII 3</b>	5 755 MHz	-	5 795 MHz

- 802.11ac\_VHT80

	Lowest channel	Middle channel	Highest channel
<b>UNII 1</b>	5 210 MHz	-	-
<b>UNII 2A</b>	5 290 MHz	-	-
<b>UNII 2C</b>	5 530 MHz	-	5 690 MHz
<b>UNII 3</b>	5 775 MHz	-	-

#### Test mode

Test mode	Modulation	Data rate	Duty Cycle	Duty Cycle Factor
802.11a	DSSS	1 Mbps	97.6 %	0.11 dB
802.11n_HT20	OFDM	MCS 0	97.6 %	0.11 dB
802.11n_HT40	OFDM	MCS 0	94.6 %	0.24 dB
802.11ac_VHT20	OFDM	MNSS 0	97.6 %	0.11 dB
802.11ac_VHT40	OFDM	MNSS 0	94.6 %	0.24 dB
802.11ac_VHT80	OFDM	MNSS 0	83.6 %	0.78 dB





**CTK Co., Ltd.**  
(Ho-dong), 113, Yejik-ro, Cheoin-gu,  
Yongin-si, Gyeonggi-do, Korea  
Tel: +82-31-339-9970  
Fax: +82-31-624-9501

Report No.:  
CTK-2019-04461  
Page (9) / (159) Pages

### 3.3 Device Modifications

The following modifications were necessary for compliance:

Not applicable

### 3.4 Maximum Measurement Uncertainty

The value of the measurement uncertainty for the measurement of each parameter.  
Coverage factor  $k = 2$ , Confidence levels of 95 %

Description	Uncertainty
Conducted RF Output Power	$\pm 1.5$ dB
Power Spectral Density	$\pm 1.5$ dB
Occupied Bandwidth	$\pm 0.1$ MHz
Unwanted Emission(conducted)	$\pm 3.0$ dB
Radiated Emissions ( $f \leq 1$ GHz)	$\pm 4.0$ dB
Radiated Emissions ( $f > 1$ GHz)	$\pm 5.0$ dB

### 3.5 Test Software

Conducted Test	Ics Pro Ver. 6.0.3
Radiated Test	TOYO EMI software EP5RE Ver. 6.0.1.0
Line Conducted Test	ESCI7, ESCI3 : EMC32 Ver. 8.50.0 ESR7 : EMC32 Ver. 8.53.0



**CTK Co., Ltd.**  
(Ho-dong), 113, Yejik-ro, Cheoin-gu,  
Yongin-si, Gyeonggi-do, Korea  
Tel: +82-31-339-9970  
Fax: +82-31-624-9501

Report No.:  
CTK-2019-04461  
Page (10) / (159) Pages

## 4. Technical Characteristic Test

### 4.1 6dB Bandwidth

#### Test Procedures

KDB 789033 – Section C.2  
ANSI C63.10-2013 - Section 6.9.2  
RSS-Gen – Section 6.7

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

#### Test Settings :

Center frequency = the highest, middle and the lowest channels

- a) RBW = 100 kHz
- b) VBW  $\geq 3 \times$  RBW
- c) Detector = peak
- d) Trace mode = Max hold
- e) Sweep = auto couple
- f) Allow trace to fully stabilize
- g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

#### Minimum Standard:

---

6 dB Bandwidth > 500 kHz

---



**CTK Co., Ltd.**  
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,  
 Yongin-si, Gyeonggi-do, Korea  
 Tel: +82-31-339-9970  
 Fax: +82-31-624-9501

Report No.:  
 CTK-2019-04461  
 Page (11) / (159) Pages

**Test Data:**

**ANT-R**

		6 dB Bandwidth (MHz)		
Mode		802.11a	802.11n_HT20	802.11ac_VHT20
Frequency				
5 745 MHz		15.04	15.13	15.13
5 785 MHz		14.09	15.75	15.10
5 825 MHz		15.09	15.12	15.69
Measurement uncertainty		± 0.1 MHz		

		6 dB Bandwidth (MHz)	
Mode		802.11n_HT40	802.11ac_VHT40
Frequency			
5 755 MHz		35.72	35.73
5 795 MHz		35.40	35.13
Measurement uncertainty		± 0.1 MHz	

		6 dB Bandwidth (MHz)
Mode		802.11ac_VHT80
Frequency		
5 775 MHz		76.37
Measurement uncertainty		± 0.1 MHz



**CTK Co., Ltd.**  
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,  
 Yongin-si, Gyeonggi-do, Korea  
 Tel: +82-31-339-9970  
 Fax: +82-31-624-9501

Report No.:  
 CTK-2019-04461  
 Page (12) / (159) Pages

**ANT-L**

	6 dB Bandwidth (MHz)		
Mode	802.11a	802.11n_HT20	802.11ac_VHT20
Frequency			
5 745 MHz	16.27	16.65	16.28
5 785 MHz	16.35	15.69	15.11
5 825 MHz	15.88	17.28	15.09
Measurement uncertainty	± 0.1 MHz		

	6 dB Bandwidth (MHz)	
Mode	802.11n_HT40	802.11ac_VHT40
Frequency		
5 755 MHz	36.32	35.74
5 795 MHz	36.33	35.76
Measurement uncertainty	± 0.1 MHz	

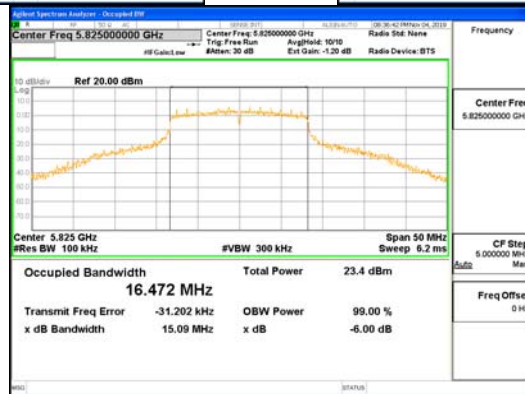
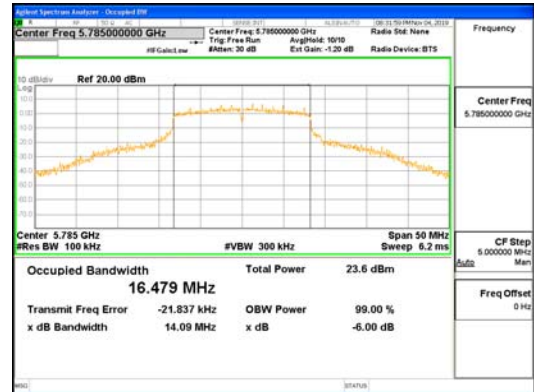
	6 dB Bandwidth (MHz)
Mode	802.11ac_VHT80
Frequency	
5 775 MHz	76.41
Measurement uncertainty	± 0.1 MHz

See next pages for actual measured spectrum plots.

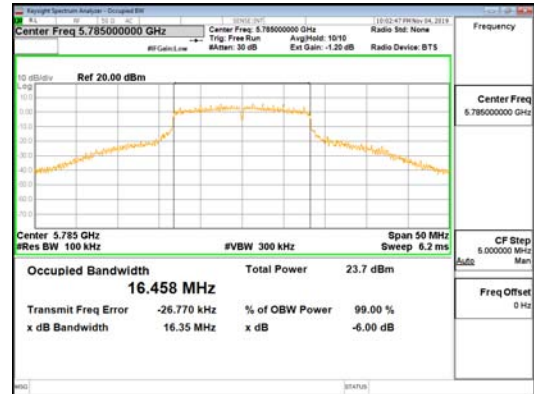
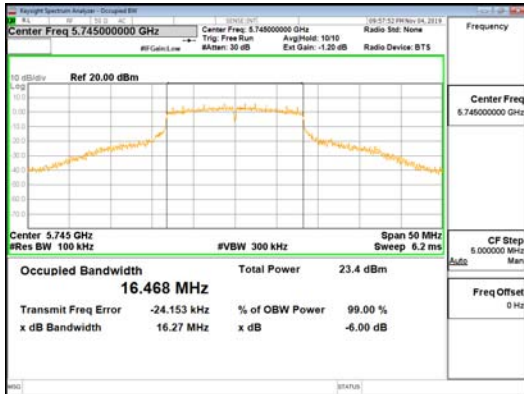


**CTK Co., Ltd.**  
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,  
 Yongin-si, Gyeonggi-do, Korea  
 Tel: +82-31-339-9970  
 Fax: +82-31-624-9501

Report No.:  
 CTK-2019-04461  
 Page (13) / (159) Pages



**ANT-R\_802.11a**



**ANT-L\_802.11a**

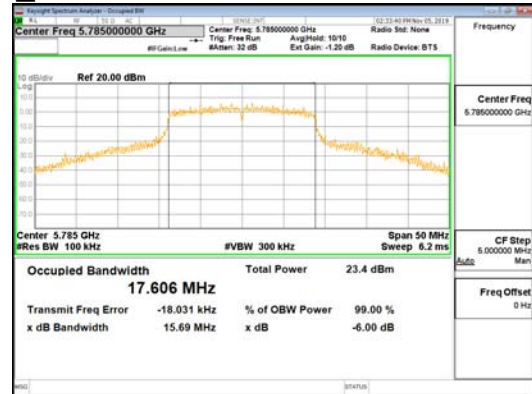
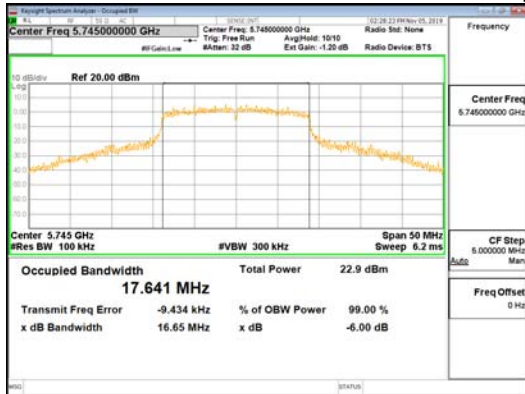


**CTK Co., Ltd.**  
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,  
 Yongin-si, Gyeonggi-do, Korea  
 Tel: +82-31-339-9970  
 Fax: +82-31-624-9501

Report No.:  
 CTK-2019-04461  
 Page (14) / (159) Pages



**ANT-R\_802.11n\_HT20**

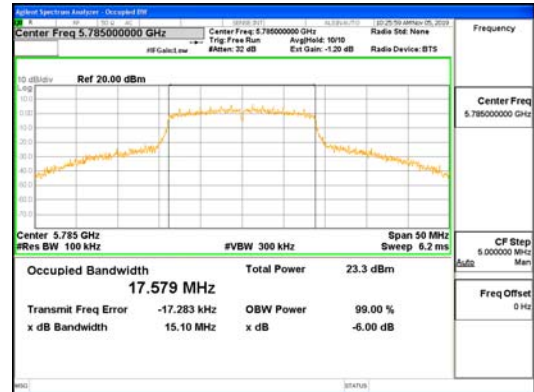


**ANT-L\_802.11n\_HT20**

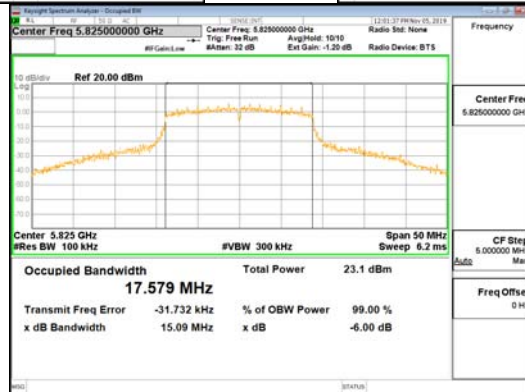
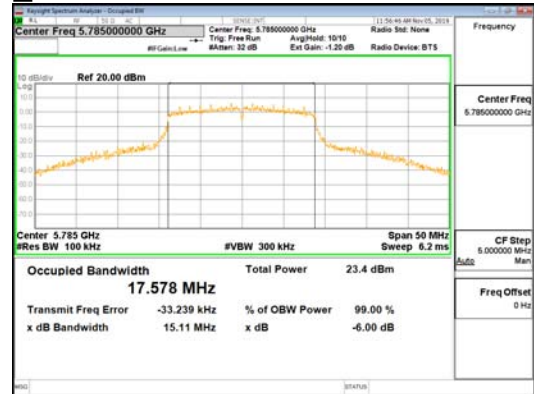
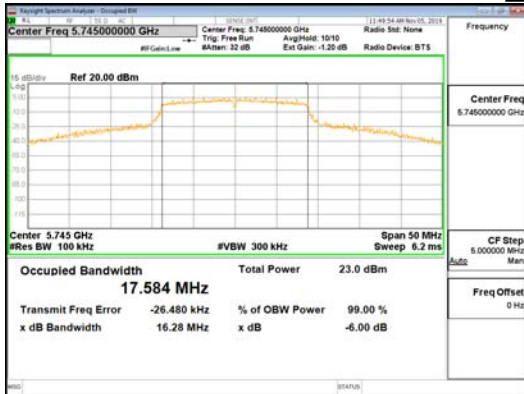


**CTK Co., Ltd.**  
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,  
 Yongin-si, Gyeonggi-do, Korea  
 Tel: +82-31-339-9970  
 Fax: +82-31-624-9501

Report No.:  
 CTK-2019-04461  
 Page (15) / (159) Pages



**ANT-R\_802.11ac\_VHT20**



**ANT-L\_802.11ac\_VHT20**

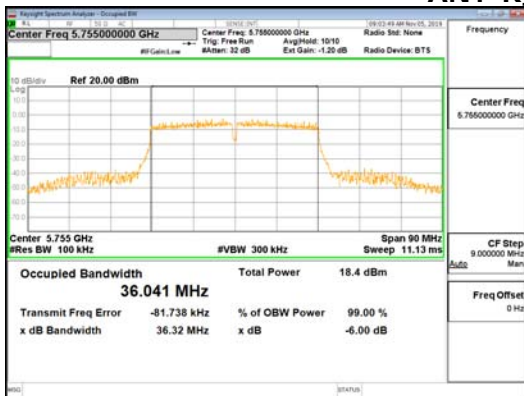


**CTK Co., Ltd.**  
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,  
 Yongin-si, Gyeonggi-do, Korea  
 Tel: +82-31-339-9970  
 Fax: +82-31-624-9501

Report No.:  
 CTK-2019-04461  
 Page (16) / (159) Pages



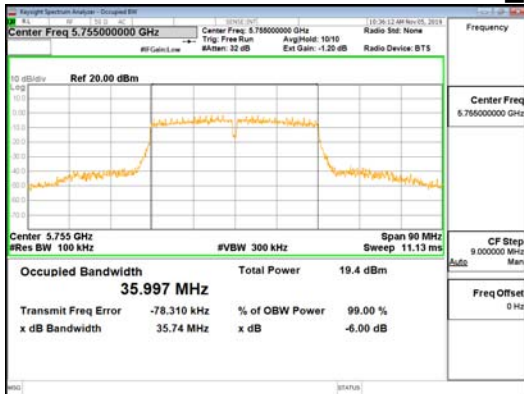
**ANT-R\_802.11n\_HT40**



**ANT-L\_802.11n\_HT40**



**ANT-R\_802.11ac\_VHT40**



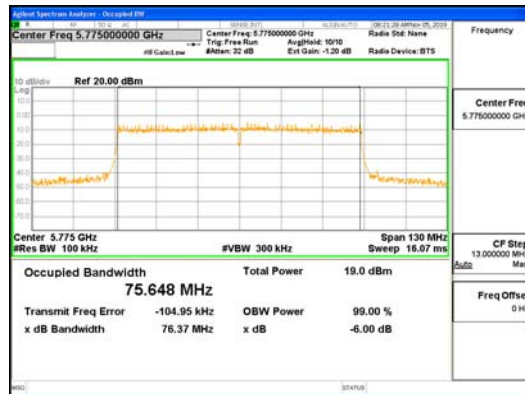
**ANT-L\_802.11ac\_VHT40**



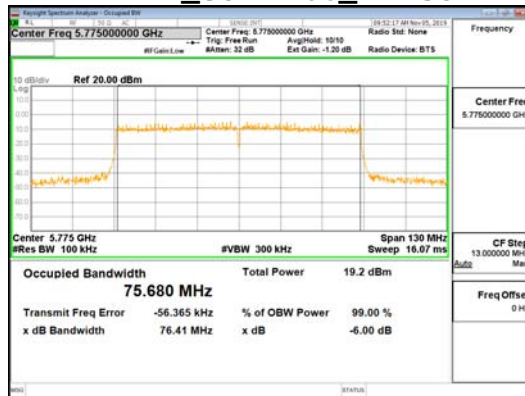


**CTK Co., Ltd.**  
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,  
 Yongin-si, Gyeonggi-do, Korea  
 Tel: +82-31-339-9970  
 Fax: +82-31-624-9501

Report No.:  
 CTK-2019-04461  
 Page (17) / (159) Pages



**ANT-R\_802.11ac\_VHT80**



**ANT-L\_802.11ac\_VHT80**



**CTK Co., Ltd.**  
(Ho-dong), 113, Yejik-ro, Cheoin-gu,  
Yongin-si, Gyeonggi-do, Korea  
Tel: +82-31-339-9970  
Fax: +82-31-624-9501

Report No.:  
CTK-2019-04461  
Page (18) / (159) Pages

## 4.2 26 dB Bandwidth and 99% Bandwidth

### Test Procedures

KDB 789033 – Section C.1  
ANSI C63.10-2013 - Section 6.9.2  
RSS-Gen – Section 6.7

Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 26 dB relative to the maximum level measured in the fundamental emission.

### Test Procedures

KDB 789033 – Section C.1  
ANSI C63.10-2013 - Section 6.9.3  
RSS-Gen – Section 6.7

The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission.

Use the 99% power bandwidth function of the instrument and report the measured bandwidth.

### Test Settings :

Center frequency = the highest, middle and the lowest channels

- a) RBW = approximately 1 % of the emission bandwidth
- b) VBW  $\geq$  RBW
- c) Detector = peak
- d) Trace mode = Max hold
- e) Measure the maximum width of the emission that is 26 dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

### Minimum Standard:

---

NA

---



**Test Data:**

**ANT-R**

Mode	26 dB Bandwidth and 99% Bandwidth (MHz)					
	802.11a		802.11n_HT20		802.11ac_VHT20	
	26 dB	99%	26 dB	99%	26 dB	99%
5 180 MHz	25.57	16.64	21.19	17.67	22.45	17.62
5 200 MHz	27.78	16.81	25.71	17.77	22.57	17.63
5 240 MHz	25.68	16.79	23.67	17.74	22.55	17.62
5 260 MHz	23.95	16.71	24.81	17.74	22.31	17.63
5 300 MHz	25.62	16.77	24.72	17.75	21.01	17.60
5 320 MHz	25.84	16.81	25.55	17.76	20.78	17.61
5 500 MHz	22.49	16.66	20.80	17.60	20.07	17.56
5 600 MHz	22.55	16.65	21.16	17.61	20.00	17.56
5 720 MHz	24.37	16.68	20.62	17.61	20.02	17.56
5 745 MHz	27.78	17.48	29.95	18.33	26.47	18.07
5 785 MHz	28.37	17.44	29.35	18.32	25.64	18.08
5 825 MHz	28.91	17.42	29.35	18.26	24.66	18.05
Measurement uncertainty	± 0.1 MHz					

Mode	26 dB Bandwidth and 99% Bandwidth (MHz)			
	802.11n_HT40		802.11ac_VHT40	
	26 dB	99 %	26 dB	99 %
5 190 MHz	40.14	36.15	40.75	36.2
5 230 MHz	40.22	36.12	40.07	36.12
5 270 MHz	40.29	36.20	40.38	36.18
5 310 MHz	40.40	36.11	40.48	36.14
5 510 MHz	40.34	36.17	40.45	36.14
5 590 MHz	40.29	36.16	40.66	36.14
5 710 MHz	40.12	36.18	40.69	36.13
5 755 MHz	40.55	36.22	40.76	36.24
5 795 MHz	40.44	36.20	40.54	36.22
Measurement uncertainty	± 0.1 MHz			



**CTK Co., Ltd.**  
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,  
 Yongin-si, Gyeonggi-do, Korea  
 Tel: +82-31-339-9970  
 Fax: +82-31-624-9501

Report No.:  
 CTK-2019-04461  
 Page (20) / (159) Pages

26 dB Bandwidth and 99% Bandwidth (MHz)		
Mode	802.11ac_VHT80	
Frequency	26 dB	99 %
5 210 MHz	80.53	75.84
5 290 MHz	80.85	75.89
5 530 MHz	80.30	75.72
5 690 MHz	80.61	75.82
5 775 MHz	80.37	75.78
Measurement uncertainty	± 0.1 MHz	

**ANT-L**

26 dB Bandwidth and 99% Bandwidth (MHz)						
Mode	802.11a		802.11n_HT20		802.11ac_VHT20	
Frequency	26 dB	99%	26 dB	99%	26 dB	99%
5 180 MHz	21.45	16.44	21.22	17.64	21.63	17.64
5 200 MHz	24.21	16.57	26.37	17.74	20.34	17.66
5 240 MHz	25.53	16.56	24.65	17.72	21.09	17.63
5 260 MHz	21.48	16.44	21.38	17.65	21.03	17.61
5 300 MHz	24.17	16.49	23.58	17.67	20.20	17.62
5 320 MHz	23.62	16.50	22.56	17.67	21.02	17.61
5 500 MHz	20.45	16.44	20.64	17.57	20.08	17.57
5 600 MHz	21.70	16.46	20.74	17.59	19.96	17.57
5 720 MHz	24.16	16.54	22.16	17.67	20.21	17.61
5 745 MHz	30.11	17.07	27.05	18.05	25.26	17.92
5 785 MHz	27.23	17.05	28.82	18.00	22.12	17.90
5 825 MHz	27.38	17.01	27.62	18.00	22.79	17.89
Measurement uncertainty	± 0.1 MHz					



**CTK Co., Ltd.**  
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,  
 Yongin-si, Gyeonggi-do, Korea  
 Tel: +82-31-339-9970  
 Fax: +82-31-624-9501

Report No.:  
 CTK-2019-04461  
 Page (21) / (159) Pages

Mode	26 dB Bandwidth and 99% Bandwidth (MHz)			
	802.11n_HT40		802.11ac_VHT40	
	26 dB	99 %	26 dB	99 %
5 190 MHz	40.00	36.15	40.20	36.01
5 230 MHz	39.85	36.16	39.93	36.11
5 270 MHz	39.93	36.13	40.32	36.05
5 310 MHz	39.93	36.18	40.15	36.05
5 510 MHz	40.09	36.16	40.01	36.06
5 590 MHz	39.99	36.19	40.14	36.09
5 710 MHz	39.78	36.19	39.99	36.07
5 755 MHz	39.97	36.23	40.32	36.10
5 795 MHz	40.00	36.23	39.84	36.10
Measurement uncertainty	± 0.1 MHz			

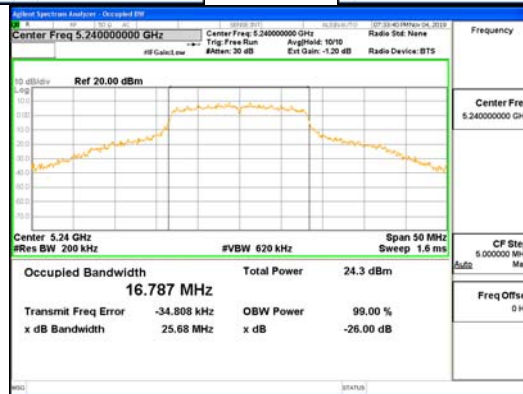
Mode	26 dB Bandwidth and 99% Bandwidth (MHz)	
	802.11ac_VHT80	
	26 dB	99 %
5 210 MHz	80.29	75.95
5 290 MHz	80.36	75.87
5 530 MHz	79.76	75.67
5 690 MHz	79.82	75.80
5 775 MHz	79.38	75.71
Measurement uncertainty	± 0.1 MHz	

See next pages for actual measured spectrum plots.

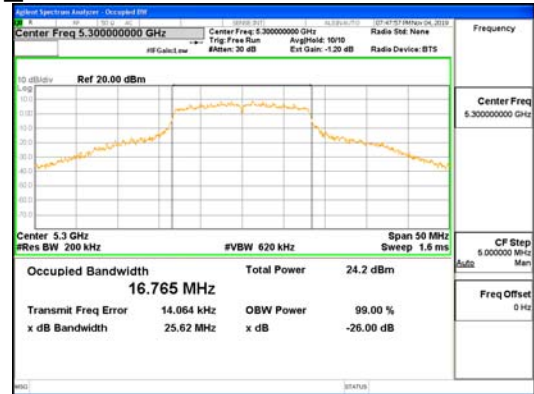
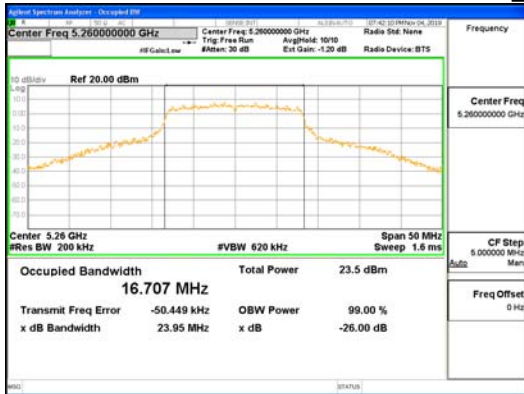


**CTK Co., Ltd.**  
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,  
 Yongin-si, Gyeonggi-do, Korea  
 Tel: +82-31-339-9970  
 Fax: +82-31-624-9501

Report No.:  
 CTK-2019-04461  
 Page (22) / (159) Pages



**ANT-R\_802.11a\_UNII 1**

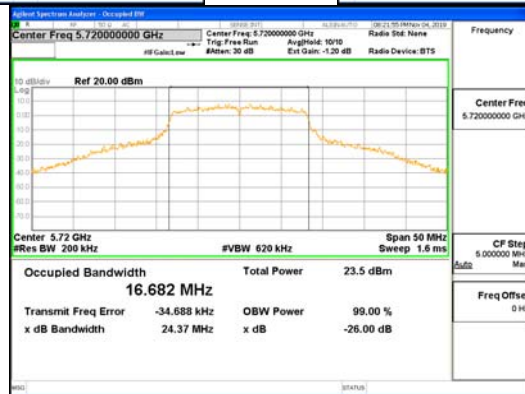


**ANT-R\_802.11a\_UNII 2A**

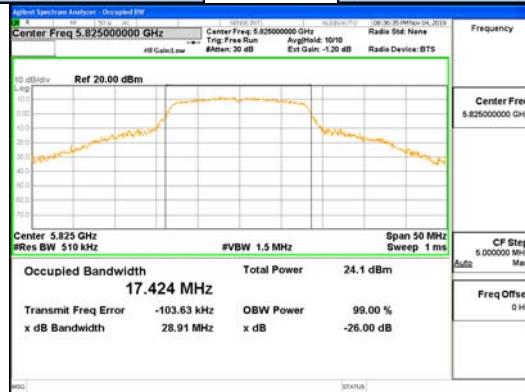
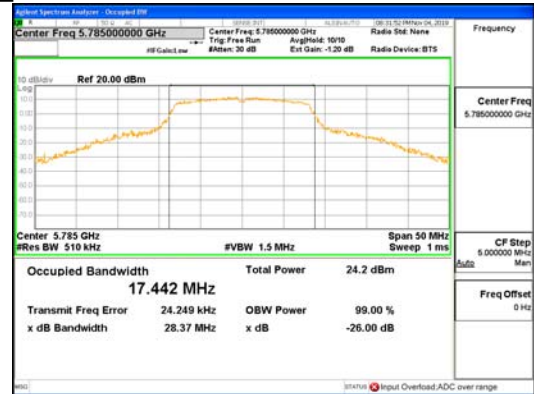
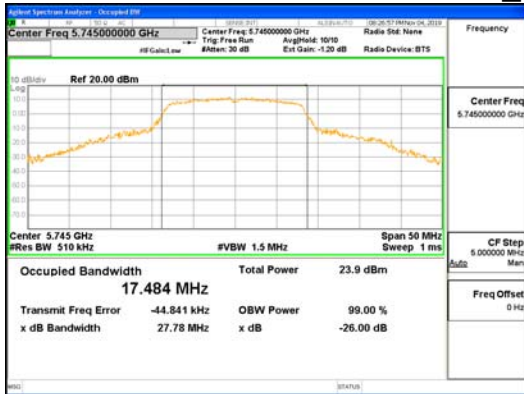


**CTK Co., Ltd.**  
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,  
 Yongin-si, Gyeonggi-do, Korea  
 Tel: +82-31-339-9970  
 Fax: +82-31-624-9501

Report No.:  
 CTK-2019-04461  
 Page (23) / (159) Pages



**ANT-R\_802.11a\_UNII 2C**

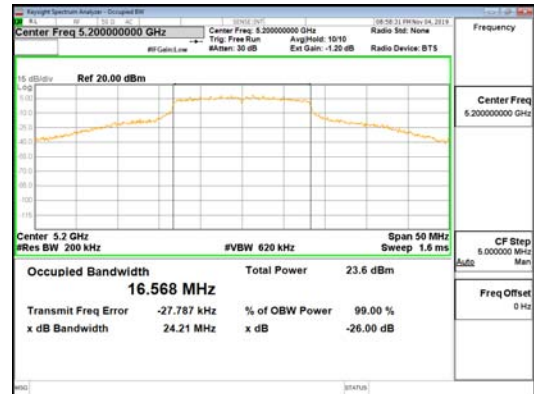


**ANT-R\_802.11a\_UNII 3**

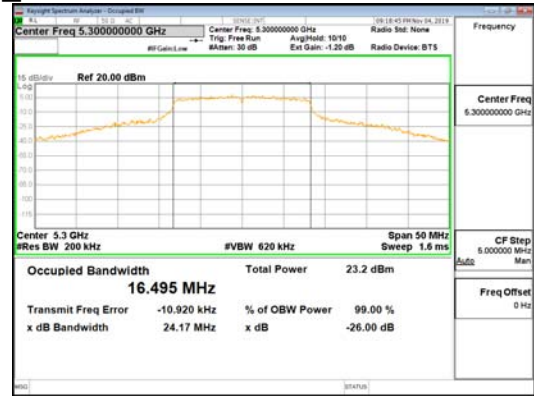


**CTK Co., Ltd.**  
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,  
 Yongin-si, Gyeonggi-do, Korea  
 Tel: +82-31-339-9970  
 Fax: +82-31-624-9501

Report No.:  
 CTK-2019-04461  
 Page (24) / (159) Pages



**ANT-L\_802.11a\_UNII 1**



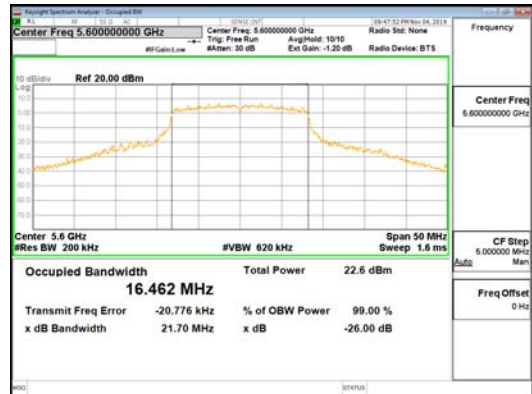
**ANT-L\_802.11a\_UNII 2A**



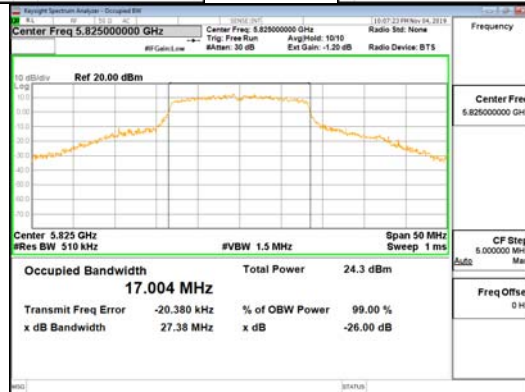
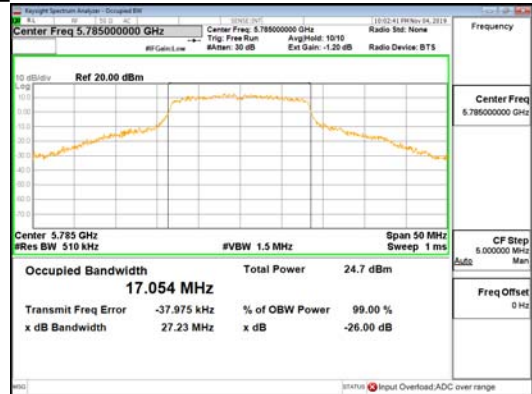
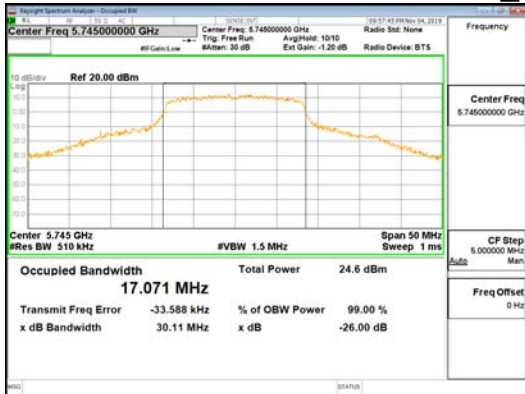


**CTK Co., Ltd.**  
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,  
 Yongin-si, Gyeonggi-do, Korea  
 Tel: +82-31-339-9970  
 Fax: +82-31-624-9501

Report No.:  
 CTK-2019-04461  
 Page (25) / (159) Pages



**ANT-L\_802.11a\_UNII 2C**

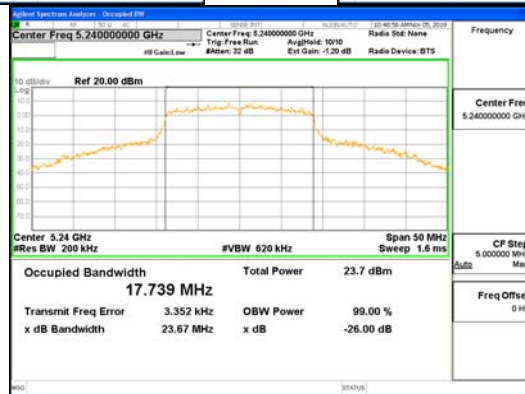
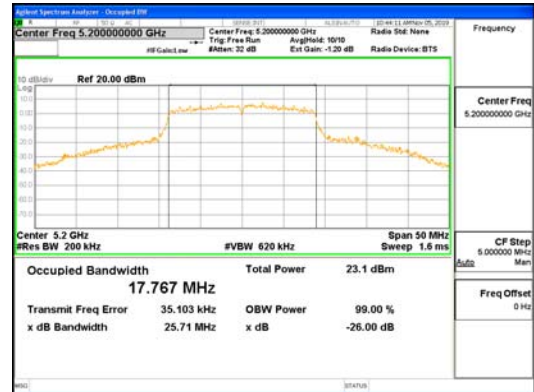


**ANT-L\_802.11a\_UNII 3**

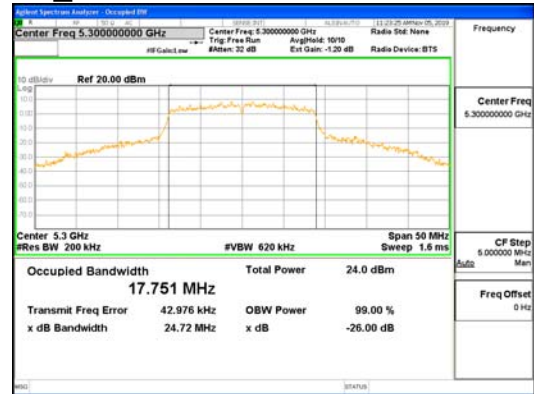
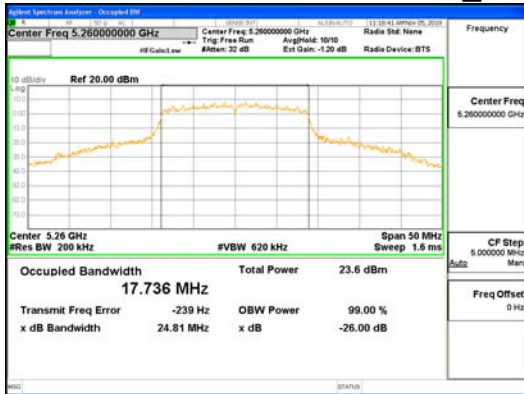


**CTK Co., Ltd.**  
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,  
 Yongin-si, Gyeonggi-do, Korea  
 Tel: +82-31-339-9970  
 Fax: +82-31-624-9501

Report No.:  
 CTK-2019-04461  
 Page (26) / (159) Pages



ANT-R\_802.11n\_HT20\_UNII 1

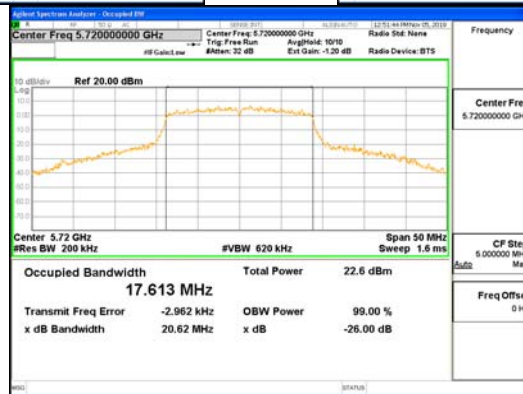
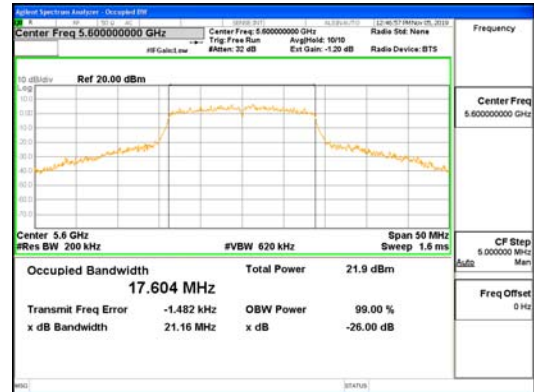
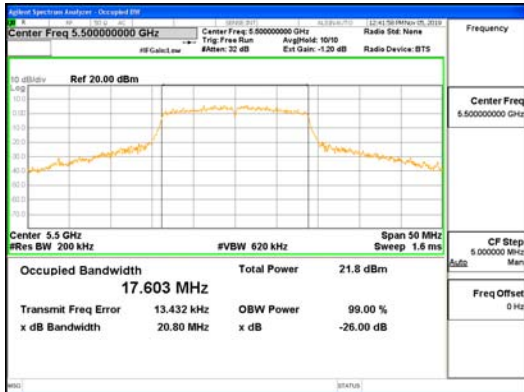


ANT-R\_802.11n\_HT20\_UNII 2A

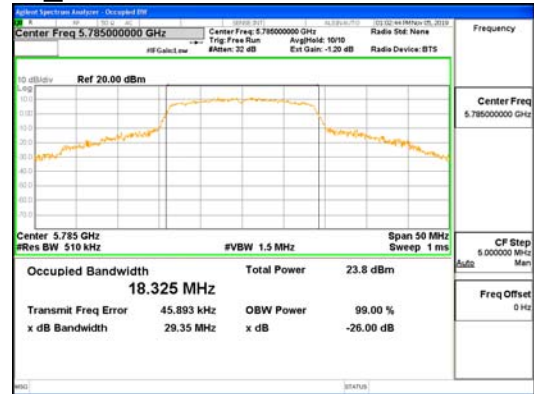
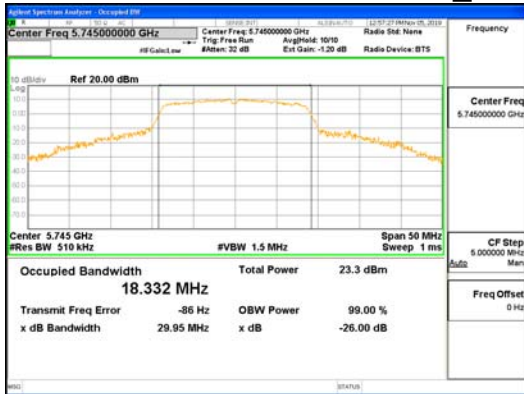


**CTK Co., Ltd.**  
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,  
 Yongin-si, Gyeonggi-do, Korea  
 Tel: +82-31-339-9970  
 Fax: +82-31-624-9501

Report No.:  
 CTK-2019-04461  
 Page (27) / (159) Pages



**ANT-R\_802.11n\_HT20\_UNII 2C**

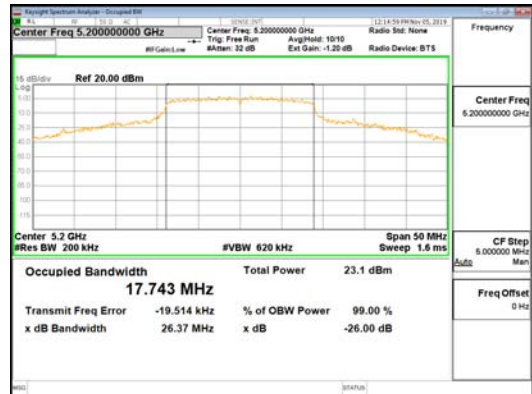


**ANT-R\_802.11n\_HT20\_UNII 3**

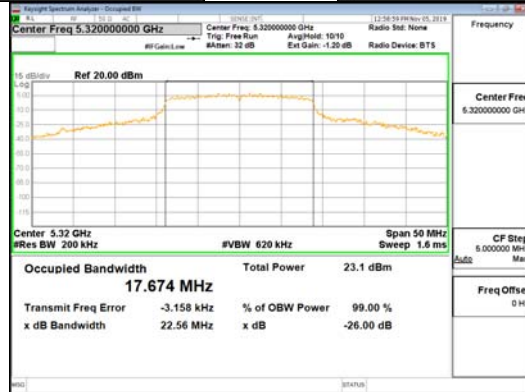


**CTK Co., Ltd.**  
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,  
 Yongin-si, Gyeonggi-do, Korea  
 Tel: +82-31-339-9970  
 Fax: +82-31-624-9501

Report No.:  
 CTK-2019-04461  
 Page (28) / (159) Pages



**ANT-L\_802.11n\_HT20\_UNII 1**

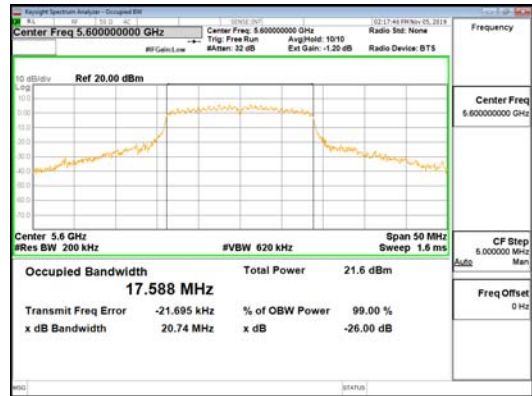
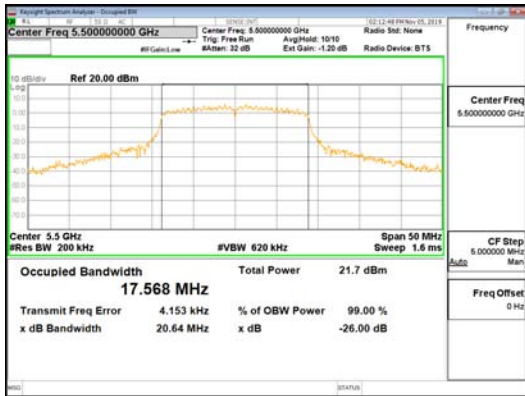


**ANT-L\_802.11n\_HT20\_UNII 2A**

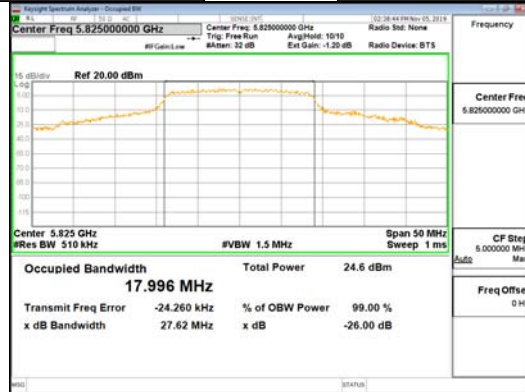
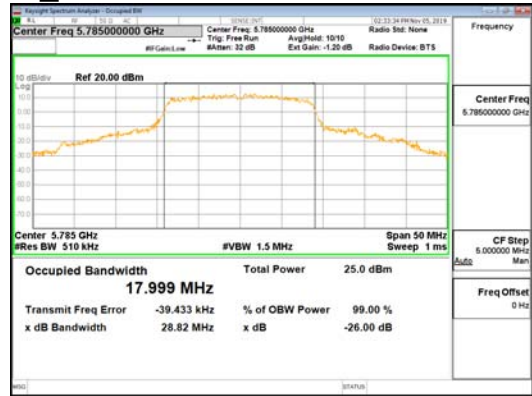


**CTK Co., Ltd.**  
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,  
 Yongin-si, Gyeonggi-do, Korea  
 Tel: +82-31-339-9970  
 Fax: +82-31-624-9501

Report No.:  
 CTK-2019-04461  
 Page (29) / (159) Pages



**ANT-L\_802.11n\_HT20\_UNI 2C**

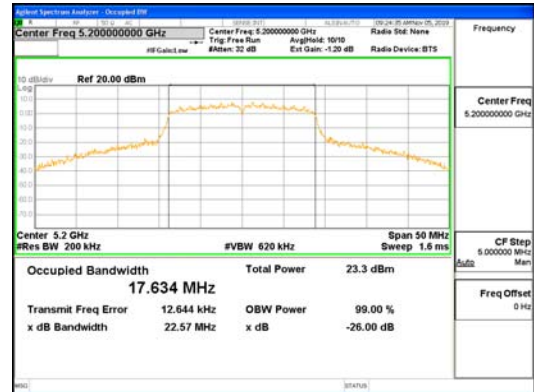
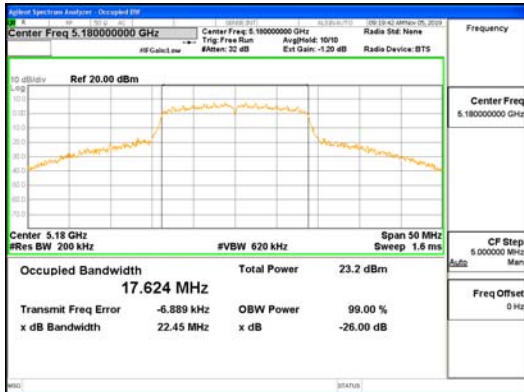


**ANT-L\_802.11n\_HT20\_UNI I 3**

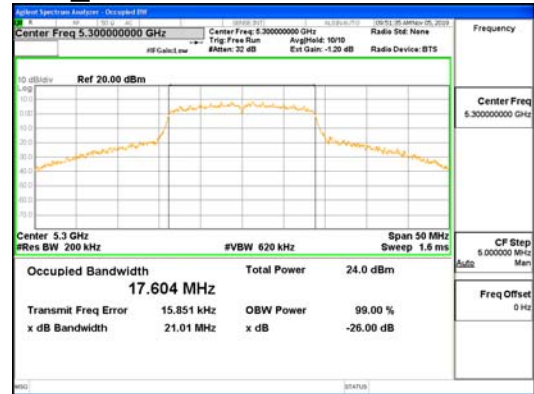
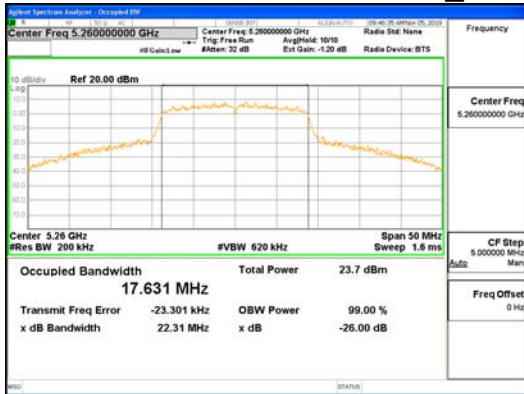


**CTK Co., Ltd.**  
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,  
 Yongin-si, Gyeonggi-do, Korea  
 Tel: +82-31-339-9970  
 Fax: +82-31-624-9501

Report No.:  
 CTK-2019-04461  
 Page (30) / (159) Pages



**ANT-R\_802.11ac\_VHT20\_UNII 1**

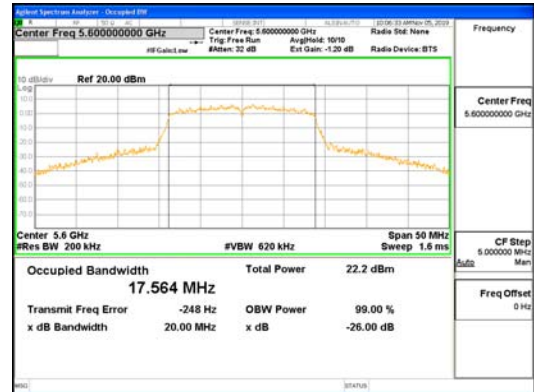
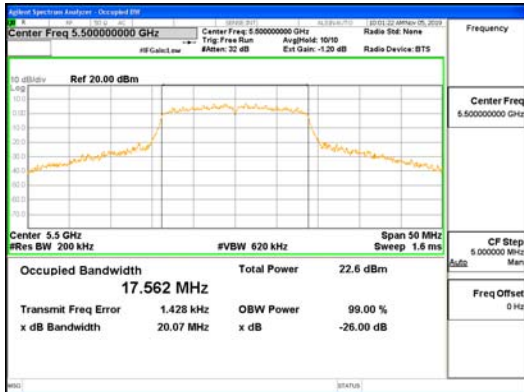


**ANT-R\_802.11ac\_VHT20\_UNII 2A**



**CTK Co., Ltd.**  
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,  
 Yongin-si, Gyeonggi-do, Korea  
 Tel: +82-31-339-9970  
 Fax: +82-31-624-9501

Report No.:  
 CTK-2019-04461  
 Page (31) / (159) Pages



ANT-R\_802.11ac\_VHT20\_UNII 2C

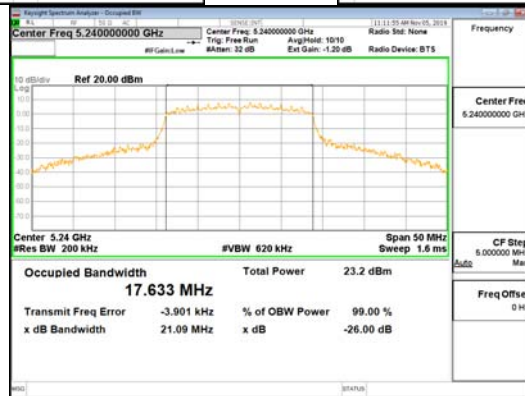
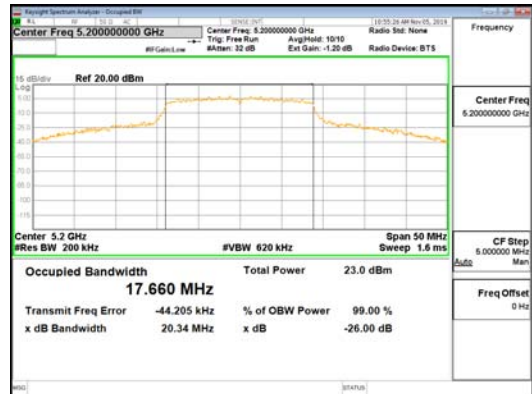


ANT-R\_802.11ac\_VHT20\_UNII 3

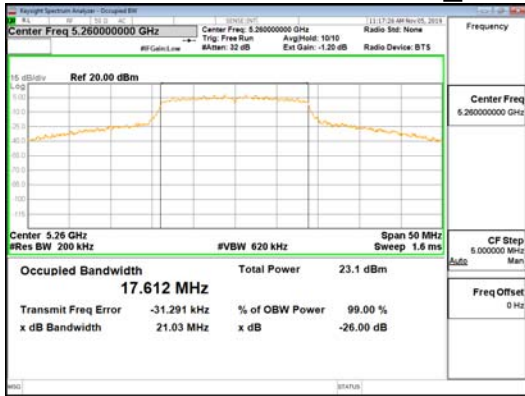


**CTK Co., Ltd.**  
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,  
 Yongin-si, Gyeonggi-do, Korea  
 Tel: +82-31-339-9970  
 Fax: +82-31-624-9501

Report No.:  
 CTK-2019-04461  
 Page (32) / (159) Pages



ANT-L\_802.11ac\_VHT20\_UNII 1



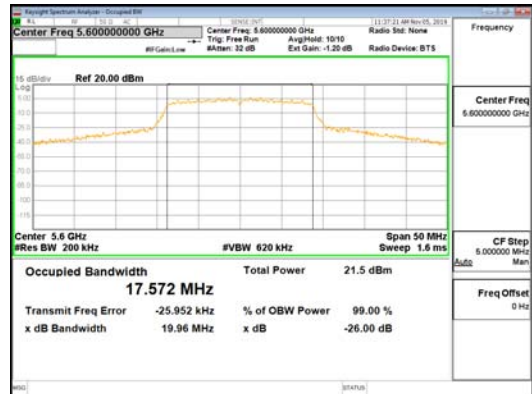
ANT-L\_802.11ac\_VHT20\_UNII 2A



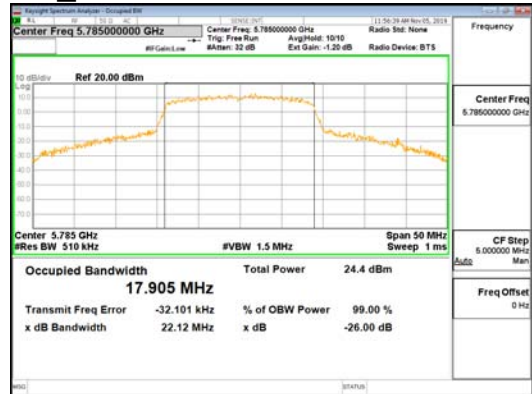
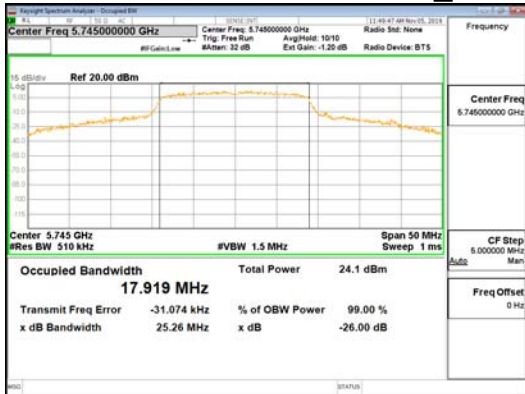


**CTK Co., Ltd.**  
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,  
 Yongin-si, Gyeonggi-do, Korea  
 Tel: +82-31-339-9970  
 Fax: +82-31-624-9501

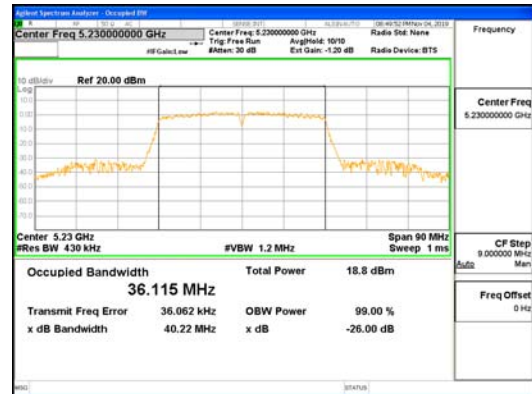
Report No.:  
 CTK-2019-04461  
 Page (33) / (159) Pages



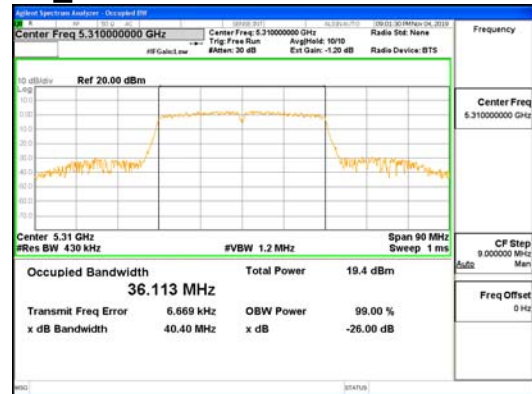
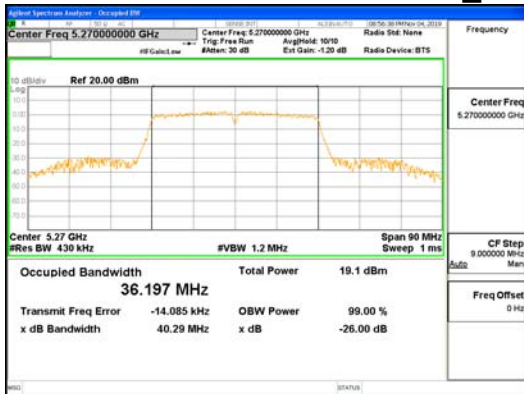
**ANT-L\_802.11ac\_VHT20\_UNII 2C**



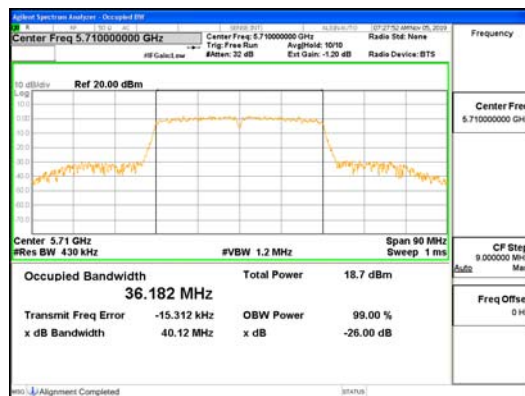
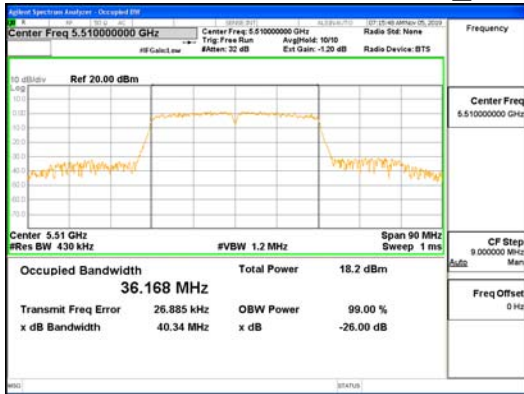
**ANT-L\_802.11ac\_VHT20\_UNII 3**



**ANT-R\_802.11n\_HT40\_UNI 1**



**ANT-R\_802.11n\_HT40\_UNI 2A**

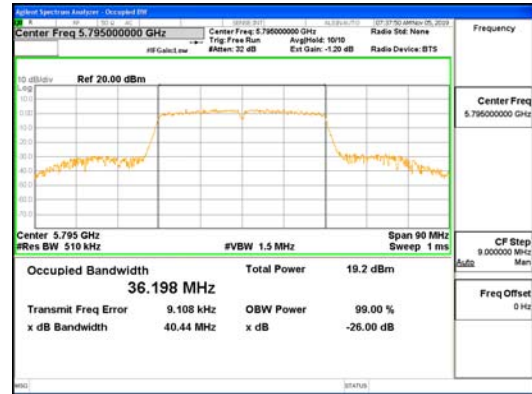
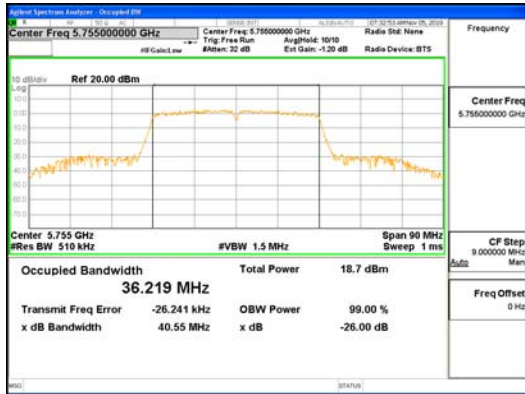


**ANT-R\_802.11n\_HT40\_UNI 2C**



**CTK Co., Ltd.**  
(Ho-dong), 113, Yejik-ro, Cheoin-gu,  
Yongin-si, Gyeonggi-do, Korea  
Tel: +82-31-339-9970  
Fax: +82-31-624-9501

Report No.:  
CTK-2019-04461  
Page (35) / (159) Pages

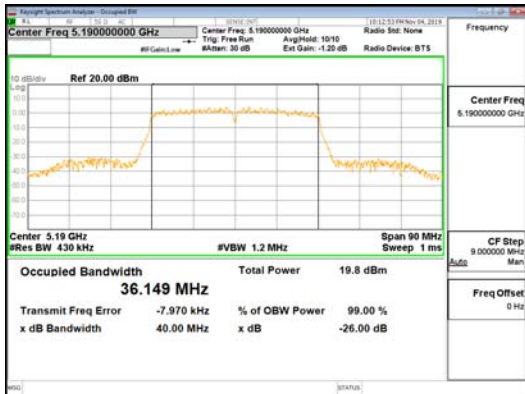


ANT-R\_802.11n\_HT40\_UNI1 3

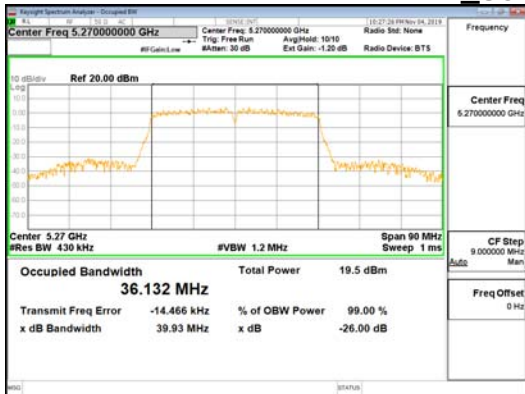


**CTK Co., Ltd.**  
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,  
 Yongin-si, Gyeonggi-do, Korea  
 Tel: +82-31-339-9970  
 Fax: +82-31-624-9501

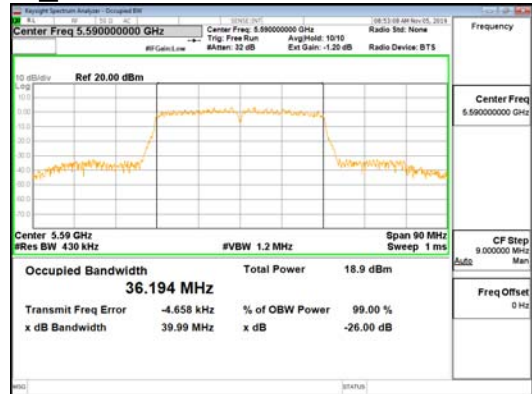
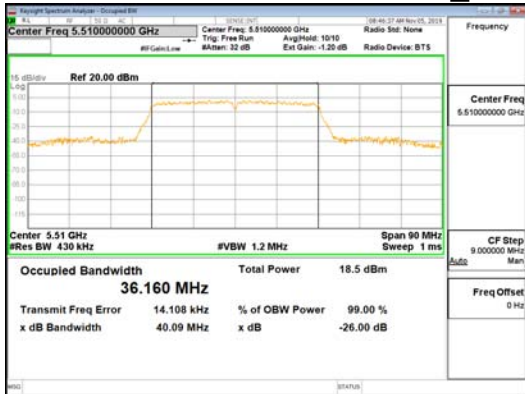
Report No.:  
 CTK-2019-04461  
 Page (36) / (159) Pages



**ANT-L\_802.11n\_HT40\_UNII 1**



**ANT-L\_802.11n\_HT40\_UNII 2A**

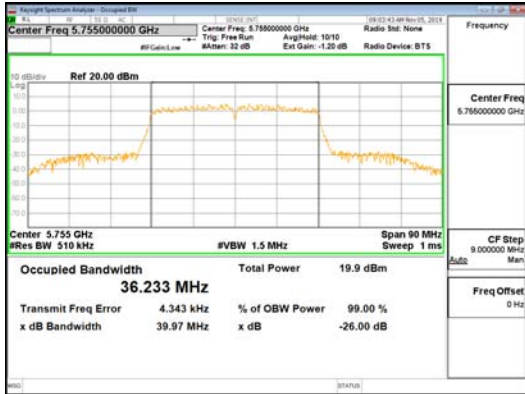


**ANT-L\_802.11n\_HT40\_UNII 2C**



**CTK Co., Ltd.**  
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,  
 Yongin-si, Gyeonggi-do, Korea  
 Tel: +82-31-339-9970  
 Fax: +82-31-624-9501

Report No.:  
 CTK-2019-04461  
 Page (37) / (159) Pages



ANT-L\_802.11n\_HT40\_UNI I 3

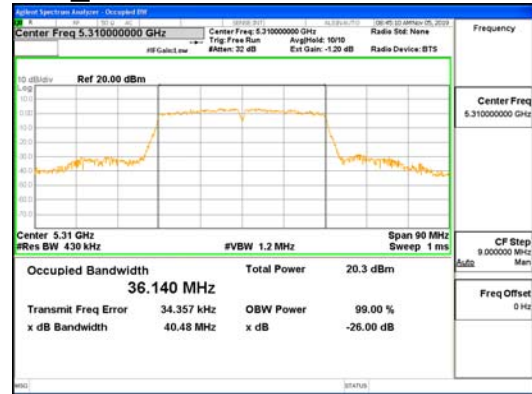
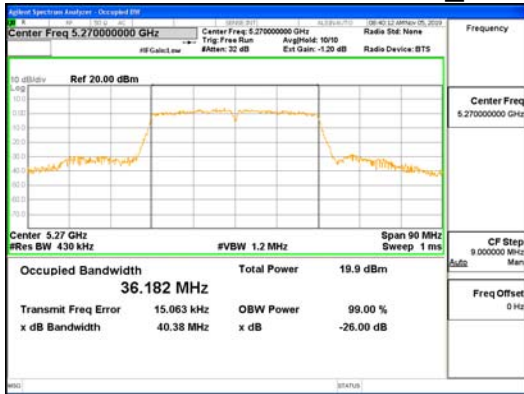


**CTK Co., Ltd.**  
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,  
 Yongin-si, Gyeonggi-do, Korea  
 Tel: +82-31-339-9970  
 Fax: +82-31-624-9501

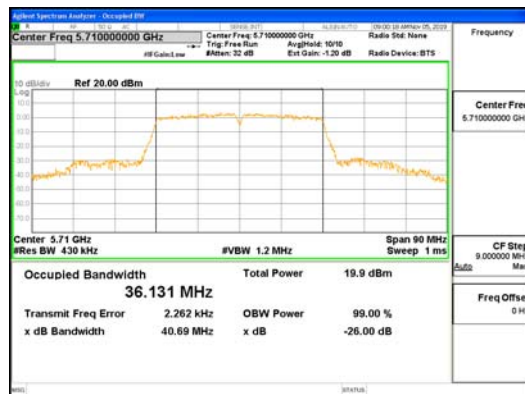
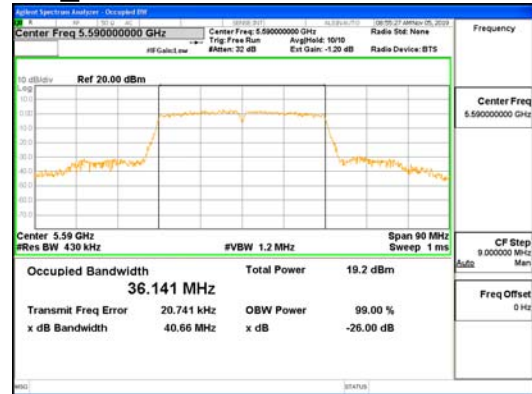
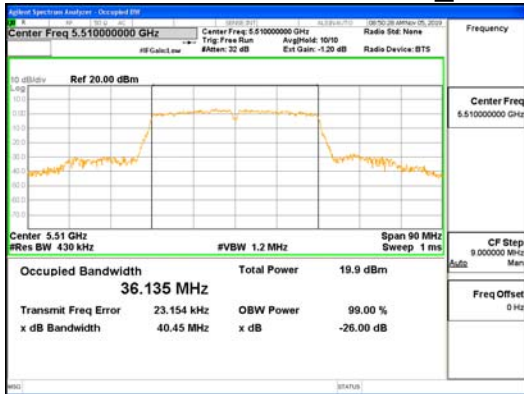
Report No.:  
 CTK-2019-04461  
 Page (38) / (159) Pages



**ANT-R\_802.11ac\_VHT40\_UNI 1**



**ANT-R\_802.11ac\_VHT40\_UNI 2A**

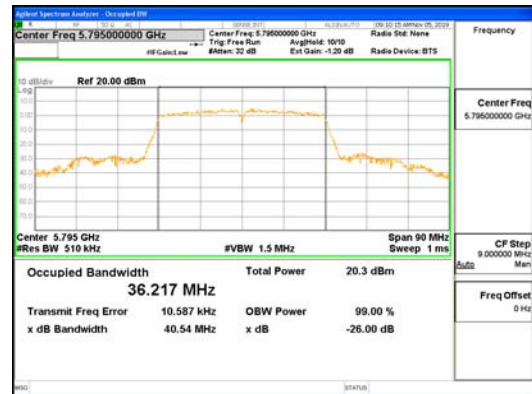
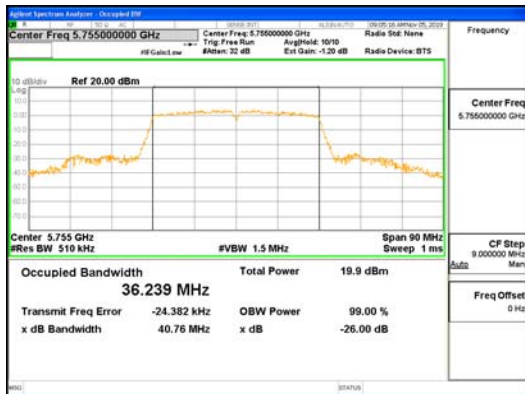


**ANT-R\_802.11ac\_VHT40\_UNI 2C**



**CTK Co., Ltd.**  
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,  
 Yongin-si, Gyeonggi-do, Korea  
 Tel: +82-31-339-9970  
 Fax: +82-31-624-9501

Report No.:  
 CTK-2019-04461  
 Page (39) / (159) Pages

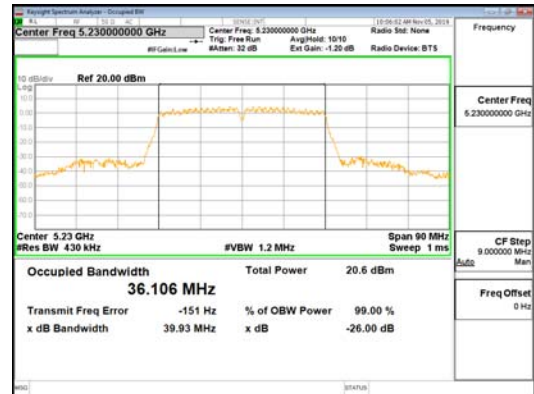
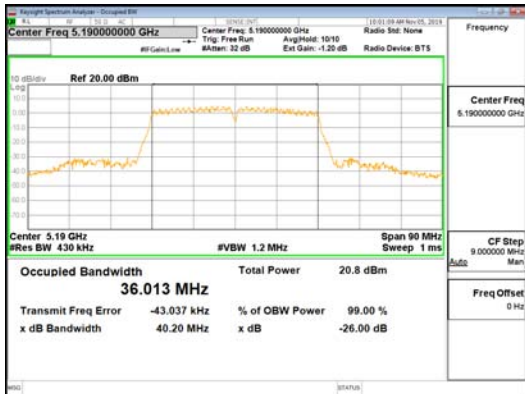


ANT-R\_802.11ac\_VHT40\_UNI 3

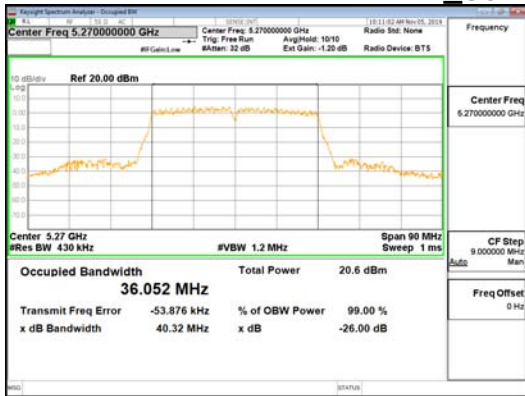


**CTK Co., Ltd.**  
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,  
 Yongin-si, Gyeonggi-do, Korea  
 Tel: +82-31-339-9970  
 Fax: +82-31-624-9501

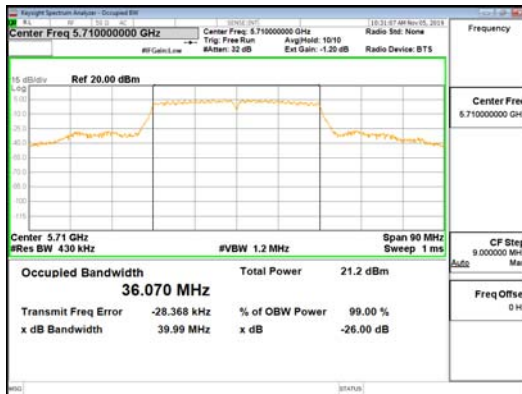
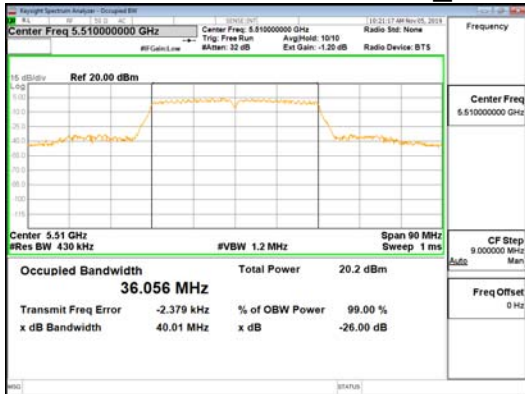
Report No.:  
 CTK-2019-04461  
 Page (40) / (159) Pages



**ANT-L\_802.11ac\_VHT40\_UNI 1**



**ANT-L\_802.11ac\_VHT40\_UNI 2A**



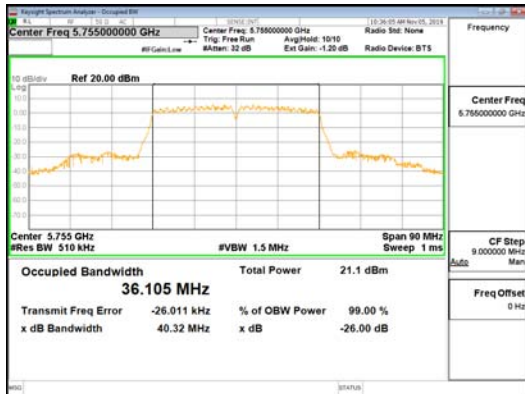
**ANT-L\_802.11ac\_VHT40\_UNI 2C**



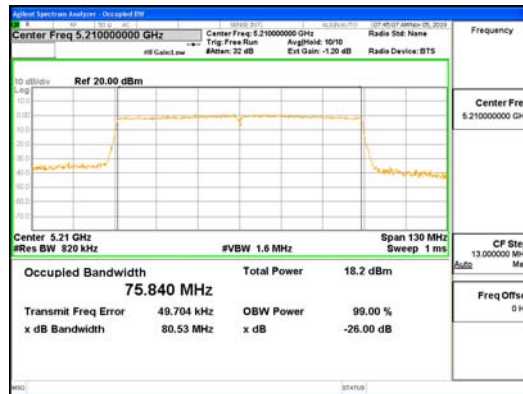


**CTK Co., Ltd.**  
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,  
 Yongin-si, Gyeonggi-do, Korea  
 Tel: +82-31-339-9970  
 Fax: +82-31-624-9501

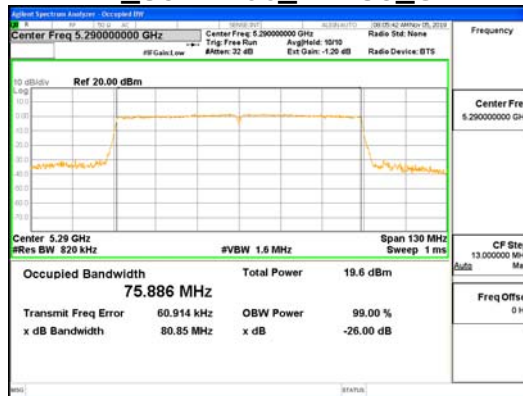
Report No.:  
 CTK-2019-04461  
 Page (41) / (159) Pages



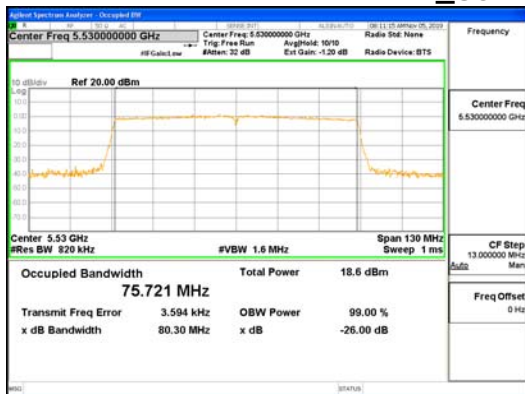
ANT-L\_802.11ac\_VHT40\_UNI 3



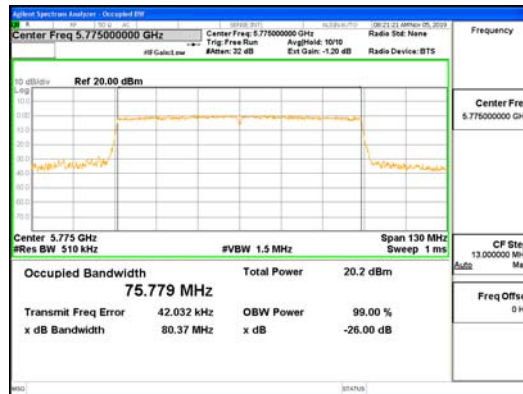
**ANT-R\_802.11ac\_VHT80\_UNI I 1**



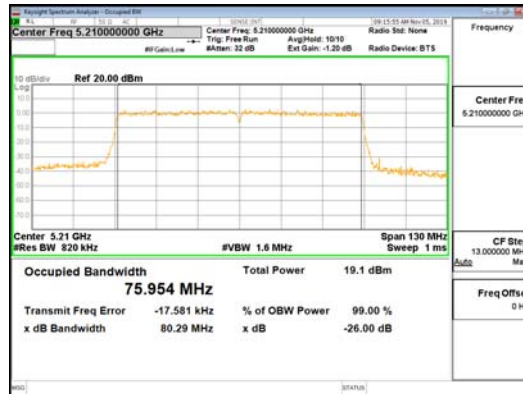
**ANT-R\_802.11ac\_VHT80\_UNI I 2A**



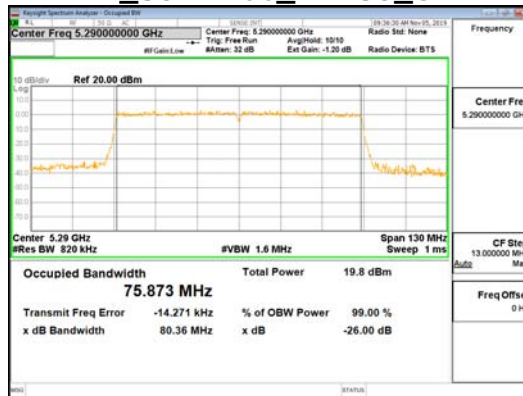
**ANT-R\_802.11ac\_VHT80\_UNI I 2C**



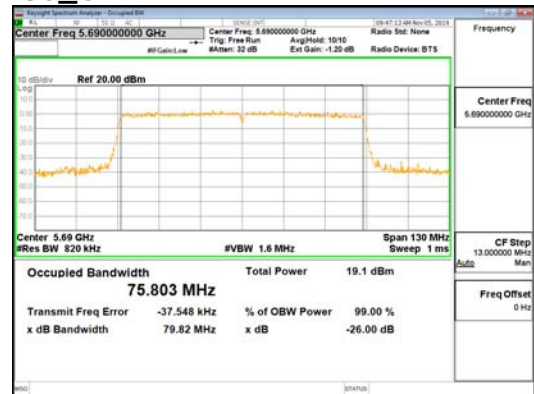
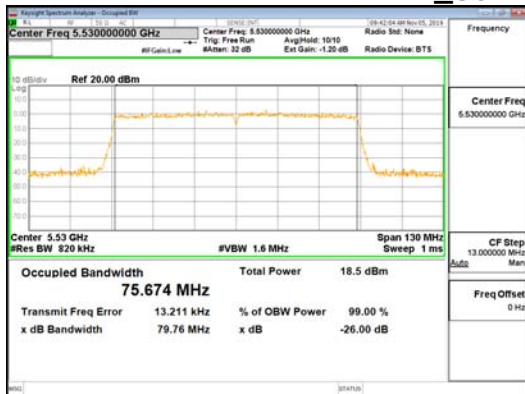
**ANT-R\_802.11ac\_VHT80\_UNI I 3**



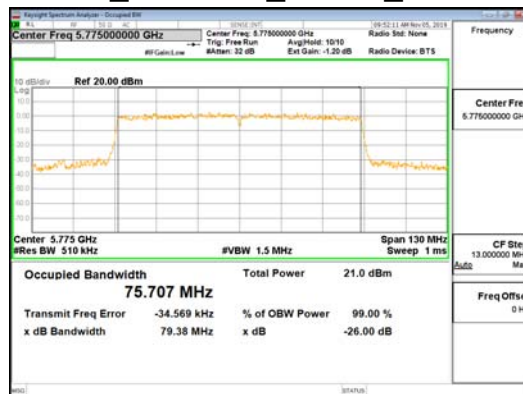
**ANT-L\_802.11ac\_VHT80\_UNII 1**



**ANT-L\_802.11ac\_VHT80\_UNII 2A**



**ANT-L\_802.11ac\_VHT80\_UNII 2C**



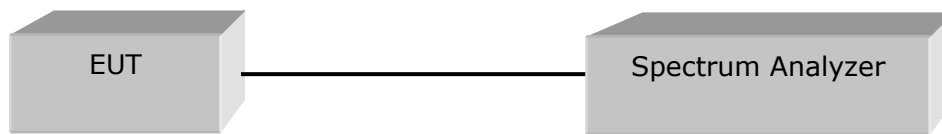
**ANT-L\_802.11ac\_VHT80\_UNII 3**

### 4.3 OUTPUT POWER

#### Test Procedures

KDB 789033 – Section E.2.d (Method SA-2, Maximum Conducted Output Power)  
KDB 662911 D01, D02 (Multiple Transmitter Output)

The transmitter output is connected to a spectrum analyzer and the analyzer's internal channel power integration function is used to integrate the power over a bandwidth greater than or equal to the 99% bandwidth.



#### Test Settings :

Center frequency = the highest, middle and the lowest channels

- a) RBW = 1 MHz
- b) VBW  $\geq 3 \times$  RBW
- c) Sweep time = auto
- d) Detector = power averaging (rms)
- e) Trace mode = Average at least 100
- f) Duty cycle factor =  $10\log(1/x)$

Test mode	Duty Cycle Factor (dB)
802.11a	0.11
802.11n_HT20	0.11
802.11n_HT40	0.24
802.11ac_VHT20	0.11
802.11ac_VHT40	0.24
802.11ac_VHT80	0.78



**CTK Co., Ltd.**  
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,  
 Yongin-si, Gyeonggi-do, Korea  
 Tel: +82-31-339-9970  
 Fax: +82-31-624-9501

Report No.:  
 CTK-2019-04461  
 Page (45) / (159) Pages

### Limit

Operating Mode	ANT Configuration	ANT Gain (dBi)	Mode	Band	Limit (dBm)
SISO	ANT-R, ANT-L	3.0, 0.87	802.11a/n/ac	UNII 1	23.00
				UNII 2A	24.00
				UNII 2C	24.00
				UNII 3	30.00
MIMO (2Tx)	ANT-R + ANT-L	5.01	802.11a/n/ac	UNII 1	23.00
				UNII 2A	24.00
				UNII 2C	24.00
				UNII 3	30.00

## Test Data

### ANT-R

Test Mode	Frequency (MHz)	Measured Output Power (dBm)	Duty cycle Factor (dB)	Result Output Power (dBm)	Limit (dBm)	Margin (dB)
802.11a	5 180	17.06	0.11	17.17	23.00	5.83
	5 200	17.32	0.11	17.43	23.00	5.57
	5 240	18.27	0.11	18.38	23.00	4.62
	5 260	17.85	0.11	17.96	24.00	6.04
	5 300	18.21	0.11	18.32	24.00	5.68
	5 320	18.73	0.11	18.84	24.00	5.16
	5 500	17.44	0.11	17.55	24.00	6.45
	5 600	17.02	0.11	17.13	24.00	6.87
	5 720	17.60	0.11	17.71	24.00	6.29
	5 745	18.15	0.11	18.26	30.00	11.74
	5 785	18.57	0.11	18.68	30.00	11.32
	5 825	18.42	0.11	18.53	30.00	11.47
802.11n _HT20	5 180	16.90	0.11	17.01	23.00	5.99
	5 200	17.15	0.11	17.26	23.00	5.74
	5 240	17.87	0.11	17.98	23.00	5.02
	5 260	17.61	0.11	17.72	24.00	6.28
	5 300	17.91	0.11	18.02	24.00	5.98
	5 320	17.97	0.11	18.08	24.00	5.92
	5 500	16.02	0.11	16.13	24.00	7.87
	5 600	15.99	0.11	16.1	24.00	7.9
	5 720	16.63	0.11	16.74	24.00	7.26
	5 745	17.37	0.11	17.48	30.00	12.52
	5 785	17.91	0.11	18.02	30.00	11.98
	5 825	17.76	0.11	17.87	30.00	12.13
802.11ac _VHT20	5 180	17.10	0.11	17.21	23.00	5.79
	5 200	17.01	0.11	17.12	23.00	5.88
	5 240	17.75	0.11	17.86	23.00	5.14
	5 260	17.53	0.11	17.64	24.00	6.36
	5 300	17.68	0.11	17.79	24.00	6.21
	5 320	17.94	0.11	18.05	24.00	5.95
	5 500	16.38	0.11	16.49	24.00	7.51
	5 600	15.90	0.11	16.01	24.00	7.99
	5 720	16.43	0.11	16.54	24.00	7.46



**CTK Co., Ltd.**  
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,  
 Yongin-si, Gyeonggi-do, Korea  
 Tel: +82-31-339-9970  
 Fax: +82-31-624-9501

Report No.:  
 CTK-2019-04461  
 Page (47) / (159) Pages

	5 745	17.43	0.11	17.54	30.00	12.46
	5 785	17.85	0.11	17.96	30.00	12.04
	5 825	17.75	0.11	17.86	30.00	12.14
802.11n _HT40	5 190	12.71	0.24	12.95	23.00	10.05
	5 230	13.03	0.24	13.27	23.00	9.73
	5 270	13.15	0.24	13.39	24.00	10.61
	5 310	13.52	0.24	13.76	24.00	10.24
	5 510	12.30	0.24	12.54	24.00	11.46
	5 590	11.95	0.24	12.19	24.00	11.81
	5 710	12.94	0.24	13.18	24.00	10.82
	5 755	12.94	0.24	13.18	30.00	16.82
	5 795	13.25	0.24	13.49	30.00	16.51
802.11ac _VHT40	5 190	13.31	0.24	13.55	23.00	9.45
	5 230	13.94	0.24	14.18	23.00	8.82
	5 270	13.78	0.24	14.02	24.00	9.98
	5 310	14.23	0.24	14.47	24.00	9.53
	5 510	13.85	0.24	14.09	24.00	9.91
	5 590	13.10	0.24	13.34	24.00	10.66
	5 710	13.74	0.24	13.98	24.00	10.02
	5 755	13.96	0.24	14.2	30.00	15.80
	5 795	14.33	0.24	14.57	30.00	15.43
802.11ac _VHT80	5 210	10.61	0.78	11.39	23.00	11.61
	5 290	12.06	0.78	12.84	24.00	11.16
	5 530	10.97	0.78	11.75	24.00	12.25
	5 690	10.74	0.78	11.52	24.00	12.48
	5 775	12.06	0.78	12.84	30.00	17.16
Measurement uncertainty		± 1.5 dB				



**ANT-L**

Test Mode	Frequency (MHz)	Measured Output Power (dBm)	Duty cycle Factor (dB)	Result Output Power (dBm)	Limit (dBm)	Margin (dB)
802.11a	5 180	17.65	0.11	17.76	23.00	5.24
	5 200	17.75	0.11	17.86	23.00	5.14
	5 240	17.84	0.11	17.95	23.00	5.05
	5 260	17.19	0.11	17.30	24.00	6.70
	5 300	17.34	0.11	17.45	24.00	6.55
	5 320	17.64	0.11	17.75	24.00	6.25
	5 500	17.19	0.11	17.30	24.00	6.70
	5 600	16.87	0.11	16.98	24.00	7.02
	5 720	17.83	0.11	17.94	24.00	6.06
	5 745	18.31	0.11	18.42	30.00	11.58
	5 785	18.54	0.11	18.65	30.00	11.35
	5 825	18.07	0.11	18.18	30.00	11.82
802.11n _HT20	5 180	17.40	0.11	17.51	23.00	5.49
	5 200	17.28	0.11	17.39	23.00	5.61
	5 240	17.47	0.11	17.58	23.00	5.42
	5 260	17.52	0.11	17.63	24.00	6.37
	5 300	17.14	0.11	17.25	24.00	6.75
	5 320	17.30	0.11	17.41	24.00	6.59
	5 500	16.01	0.11	16.12	24.00	7.88
	5 600	15.87	0.11	15.98	24.00	8.02
	5 720	16.89	0.11	17.00	24.00	7.00
	5 745	17.67	0.11	17.78	30.00	12.22
	5 785	18.18	0.11	18.29	30.00	11.71
	5 825	17.62	0.11	17.73	30.00	12.27
802.11ac _VHT20	5 180	17.36	0.11	17.47	23.00	5.53
	5 200	17.10	0.11	17.21	23.00	5.79
	5 240	17.33	0.11	17.44	23.00	5.56
	5 260	17.13	0.11	17.24	24.00	6.76
	5 300	16.86	0.11	16.97	24.00	7.03
	5 320	17.10	0.11	17.21	24.00	6.79
	5 500	15.96	0.11	16.07	24.00	7.93
	5 600	15.55	0.11	15.66	24.00	8.34
	5 720	16.64	0.11	16.75	24.00	7.25





**CTK Co., Ltd.**  
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,  
 Yongin-si, Gyeonggi-do, Korea  
 Tel: +82-31-339-9970  
 Fax: +82-31-624-9501

Report No.:  
 CTK-2019-04461  
 Page (49) / (159) Pages

	5 745	17.51	0.11	17.62	30.00	12.38
	5 785	17.78	0.11	17.89	30.00	12.11
	5 825	17.48	0.11	17.59	30.00	12.41
802.11n _HT40	5 190	12.94	0.24	13.18	23.00	9.82
	5 230	12.70	0.24	12.94	23.00	10.06
	5 270	12.84	0.24	13.08	24.00	10.92
	5 310	12.61	0.24	12.85	24.00	11.15
	5 510	11.84	0.24	12.08	24.00	11.92
	5 590	12.22	0.24	12.46	24.00	11.54
	5 710	13.25	0.24	13.49	24.00	10.51
	5 755	13.16	0.24	13.40	30.00	16.60
	5 795	13.42	0.24	13.66	30.00	16.34
802.11ac _VHT40	5 190	13.64	0.24	13.88	23.00	9.12
	5 230	13.68	0.24	13.92	23.00	9.08
	5 270	13.35	0.24	13.59	24.00	10.41
	5 310	13.38	0.24	13.62	24.00	10.38
	5 510	13.14	0.24	13.38	24.00	10.62
	5 590	13.03	0.24	13.27	24.00	10.73
	5 710	14.20	0.24	14.44	24.00	9.56
	5 755	14.04	0.24	14.28	30.00	15.72
	5 795	14.24	0.24	14.48	30.00	15.52
802.11ac _VHT80	5 210	10.85	0.78	11.63	23.00	11.37
	5 290	11.69	0.78	12.47	24.00	11.53
	5 530	10.14	0.78	10.92	24.00	13.08
	5 690	10.82	0.78	11.60	24.00	12.40
	5 775	12.52	0.78	13.30	30.00	16.70
Measurement uncertainty		± 1.5 dB				

**ANT-R + ANT-L**

Test Mode	Frequency (MHz)	Measured Output Power (dBm)	Duty cycle Factor (dB)	Result Output Power (dBm)	Limit (dBm)	Margin (dB)
802.11a	5 180	20.38	0.11	20.49	23.00	2.51
	5 200	20.55	0.11	20.66	23.00	2.34
	5 240	21.07	0.11	21.18	23.00	1.82
	5 260	20.54	0.11	20.65	24.00	3.35
	5 300	20.81	0.11	20.92	24.00	3.08
	5 320	21.23	0.11	21.34	24.00	2.66
	5 500	20.33	0.11	20.44	24.00	3.56
	5 600	19.96	0.11	20.07	24.00	3.93
	5 720	20.73	0.11	20.84	24.00	3.16
	5 745	21.24	0.11	21.35	30.00	8.65
	5 785	21.57	0.11	21.68	30.00	8.32
	5 825	21.26	0.11	21.37	30.00	8.63
802.11n _HT20	5 180	20.17	0.11	20.28	23.00	2.72
	5 200	20.23	0.11	20.34	23.00	2.66
	5 240	20.68	0.11	20.79	23.00	2.21
	5 260	20.58	0.11	20.69	24.00	3.31
	5 300	20.55	0.11	20.66	24.00	3.34
	5 320	20.66	0.11	20.77	24.00	3.23
	5 500	19.03	0.11	19.14	24.00	4.86
	5 600	18.94	0.11	19.05	24.00	4.95
	5 720	19.77	0.11	19.88	24.00	4.12
	5 745	20.53	0.11	20.64	30.00	9.36
	5 785	21.06	0.11	21.17	30.00	8.83
	5 825	20.70	0.11	20.81	30.00	9.19
802.11ac _VHT20	5 180	20.24	0.11	20.35	23.00	2.65
	5 200	20.07	0.11	20.18	23.00	2.82
	5 240	20.56	0.11	20.67	23.00	2.33
	5 260	20.34	0.11	20.45	24.00	3.55
	5 300	20.30	0.11	20.41	24.00	3.59
	5 320	20.55	0.11	20.66	24.00	3.34
	5 500	19.19	0.11	19.30	24.00	4.70
	5 600	18.74	0.11	18.85	24.00	5.15
	5 720	19.55	0.11	19.66	24.00	4.34

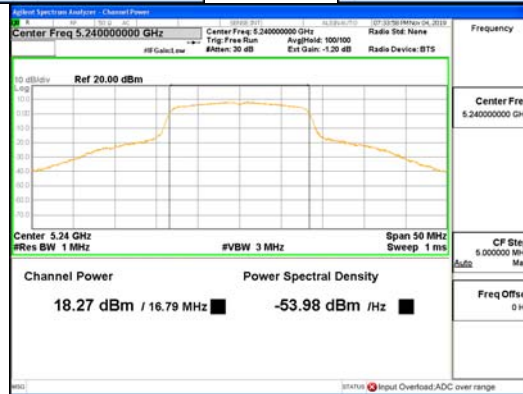
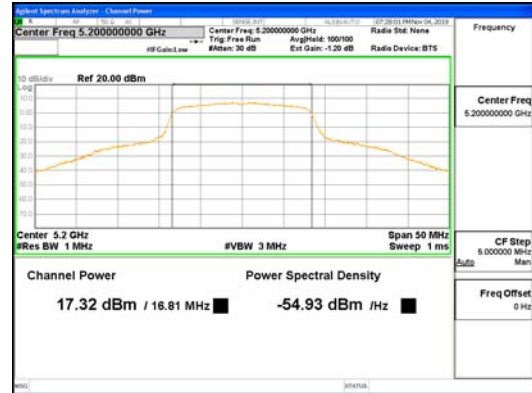


**CTK Co., Ltd.**  
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,  
 Yongin-si, Gyeonggi-do, Korea  
 Tel: +82-31-339-9970  
 Fax: +82-31-624-9501

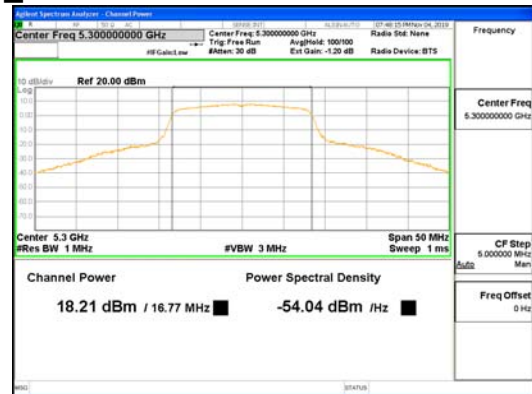
Report No.:  
 CTK-2019-04461  
 Page (51) / (159) Pages

	5 745	20.48	0.11	20.59	30.00	9.41
	5 785	20.83	0.11	20.94	30.00	9.06
	5 825	20.63	0.11	20.74	30.00	9.26
802.11n _HT40	5 190	15.84	0.24	16.08	23.00	6.92
	5 230	15.88	0.24	16.12	23.00	6.88
	5 270	16.01	0.24	16.25	24.00	7.75
	5 310	16.10	0.24	16.34	24.00	7.66
	5 510	15.09	0.24	15.33	24.00	8.67
	5 590	15.10	0.24	15.34	24.00	8.66
	5 710	16.11	0.24	16.35	24.00	7.65
	5 755	16.06	0.24	16.30	30.00	13.70
	5 795	16.35	0.24	16.59	30.00	13.41
802.11ac _VHT40	5 190	16.49	0.24	16.73	23.00	6.27
	5 230	16.82	0.24	17.06	23.00	5.94
	5 270	16.58	0.24	16.82	24.00	7.18
	5 310	16.84	0.24	17.08	24.00	6.92
	5 510	16.52	0.24	16.76	24.00	7.24
	5 590	16.08	0.24	16.32	24.00	7.68
	5 710	16.99	0.24	17.23	24.00	6.77
	5 755	17.01	0.24	17.25	30.00	12.75
5 795	17.30	0.24	17.54	30.00	12.46	
802.11ac _VHT80	5 210	13.74	0.78	14.52	23.00	8.48
	5 290	14.89	0.78	15.67	24.00	8.33
	5 530	13.59	0.78	14.37	24.00	9.63
	5 690	13.79	0.78	14.57	24.00	9.43
	5 775	15.31	0.78	16.09	30.00	13.91
Measurement uncertainty		± 1.5 dB				

See next pages for actual measured spectrum plots.



**ANT-R\_802.11a\_UNII 1**



**ANT-R\_802.11a\_UNII 2A**



**CTK Co., Ltd.**  
(Ho-dong), 113, Yejik-ro, Cheoin-gu,  
Yongin-si, Gyeonggi-do, Korea  
Tel: +82-31-339-9970  
Fax: +82-31-624-9501

Report No.:  
CTK-2019-04461  
Page (53) / (159) Pages



**ANT-R\_802.11a\_UNII 2C**

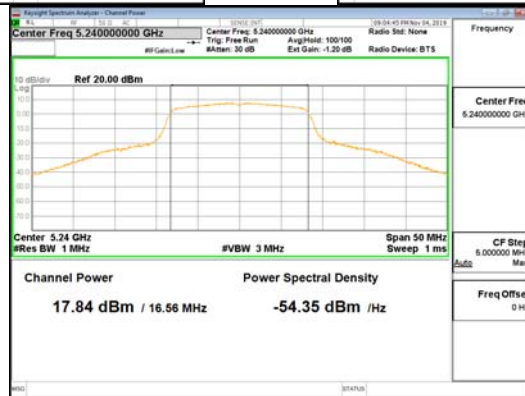
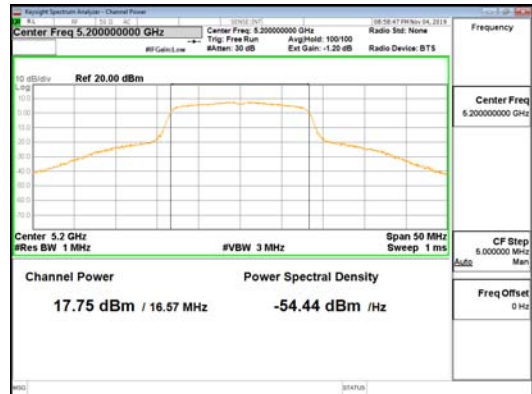


**ANT-R\_802.11a\_UNII 3**

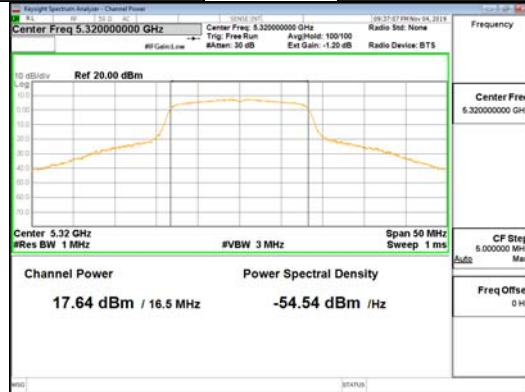
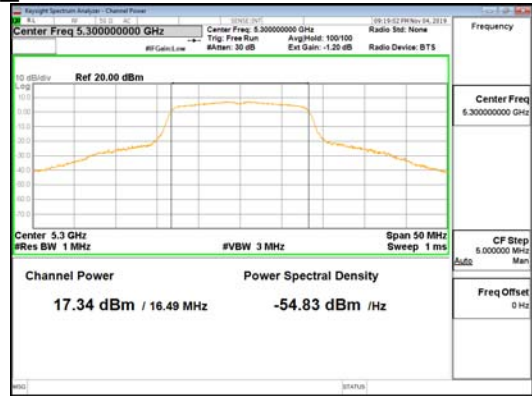
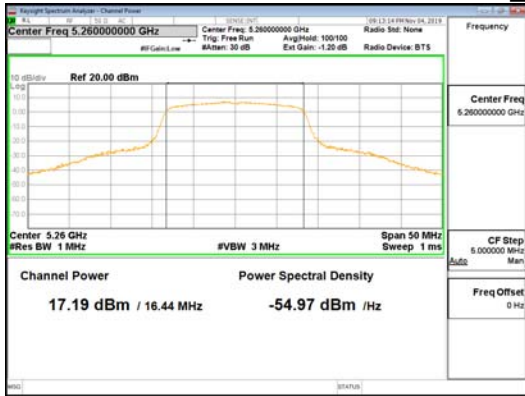


**CTK Co., Ltd.**  
(Ho-dong), 113, Yejik-ro, Cheoin-gu,  
Yongin-si, Gyeonggi-do, Korea  
Tel: +82-31-339-9970  
Fax: +82-31-624-9501

Report No.:  
CTK-2019-04461  
Page (54) / (159) Pages



**ANT-L\_802.11a\_UNII 1**

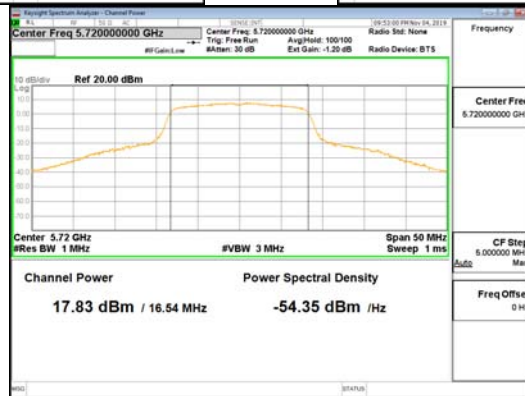
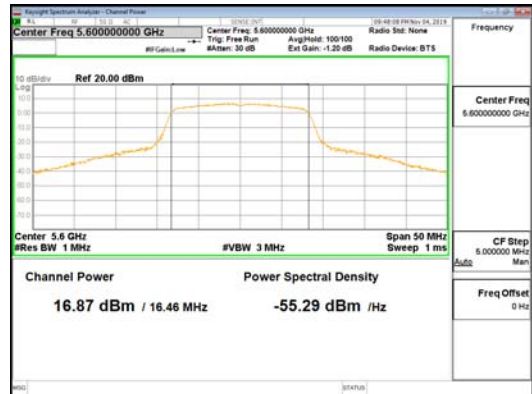


**ANT-L\_802.11a\_UNII 2A**

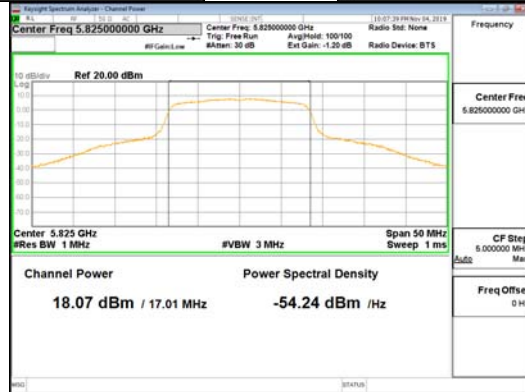
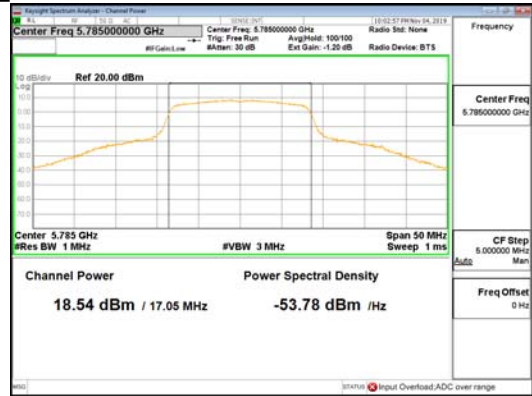
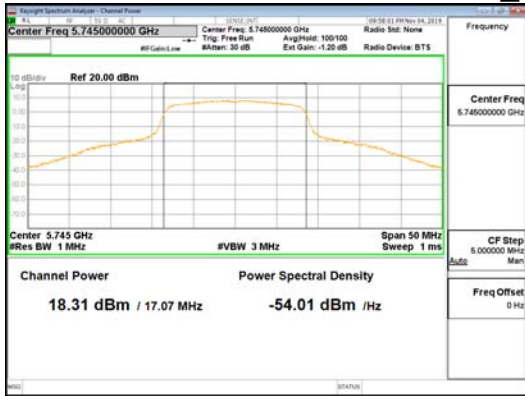


**CTK Co., Ltd.**  
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,  
 Yongin-si, Gyeonggi-do, Korea  
 Tel: +82-31-339-9970  
 Fax: +82-31-624-9501

Report No.:  
 CTK-2019-04461  
 Page (55) / (159) Pages



**ANT-L\_802.11a\_UNII 2C**



**ANT-L\_802.11a\_UNII 3**

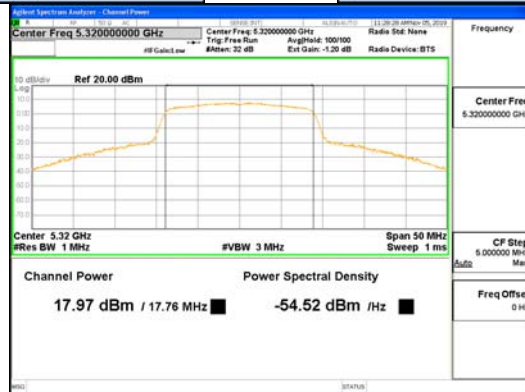
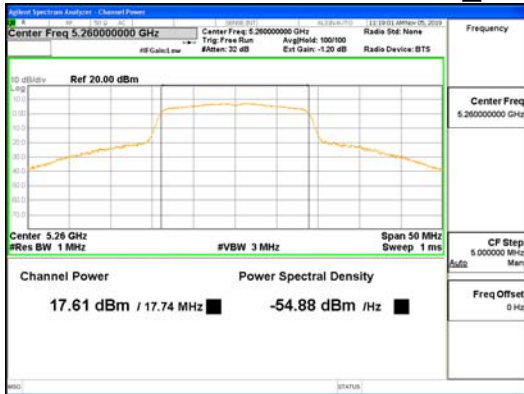


**CTK Co., Ltd.**  
 (Ho-dong), 113, Yejik-ro, Cheoin-gu,  
 Yongin-si, Gyeonggi-do, Korea  
 Tel: +82-31-339-9970  
 Fax: +82-31-624-9501

Report No.:  
 CTK-2019-04461  
 Page (56) / (159) Pages



ANT-R\_802.11n\_HT20\_UNII 1



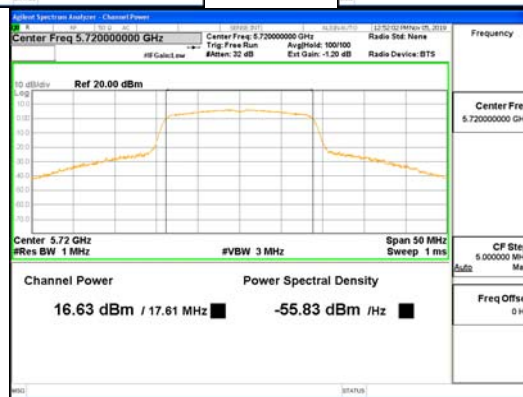
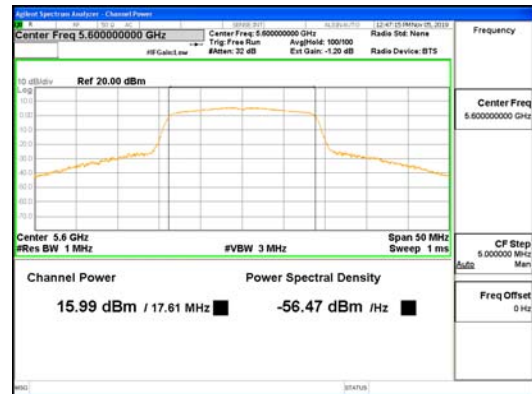
ANT-R\_802.11n\_HT20\_UNII 2A



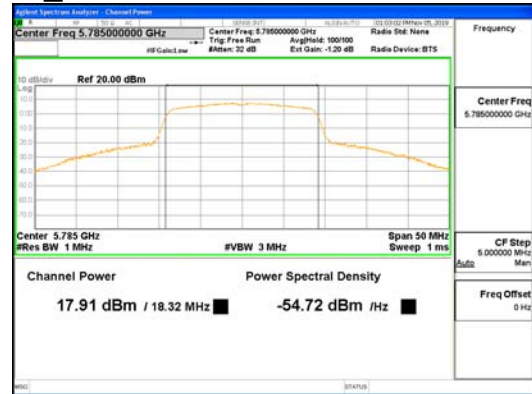


**CTK Co., Ltd.**  
(Ho-dong), 113, Yejik-ro, Cheoin-gu,  
Yongin-si, Gyeonggi-do, Korea  
Tel: +82-31-339-9970  
Fax: +82-31-624-9501

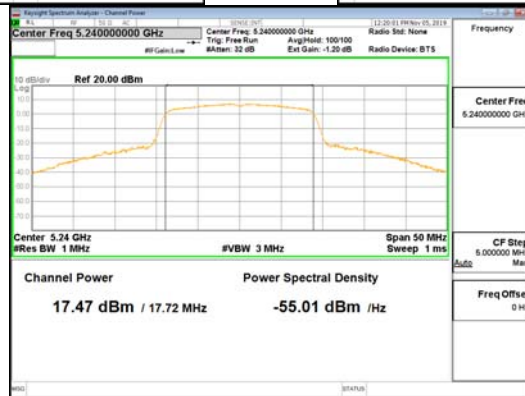
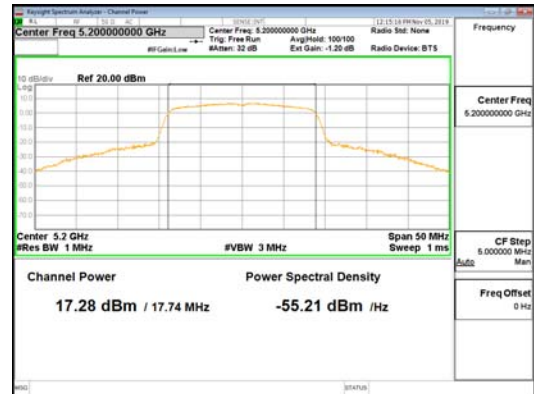
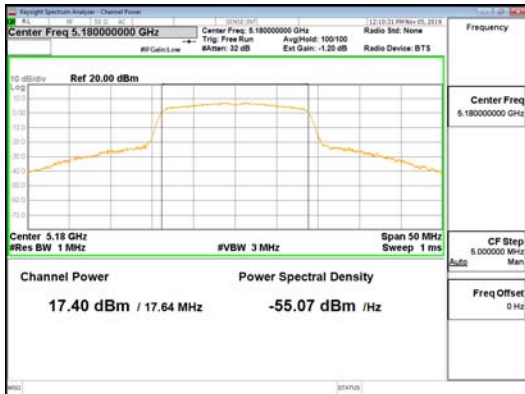
Report No.:  
CTK-2019-04461  
Page (57) / (159) Pages



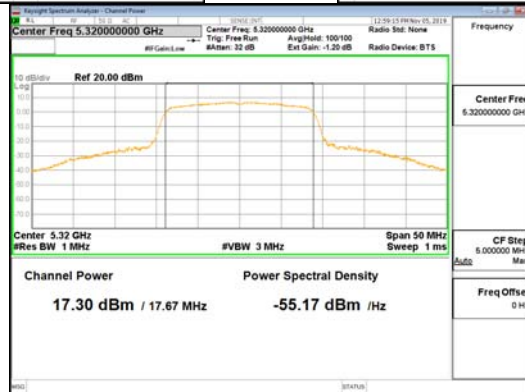
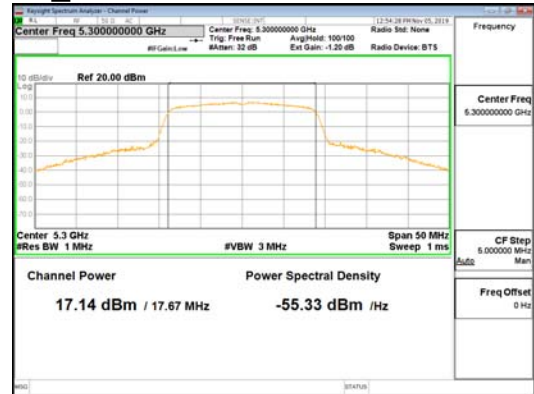
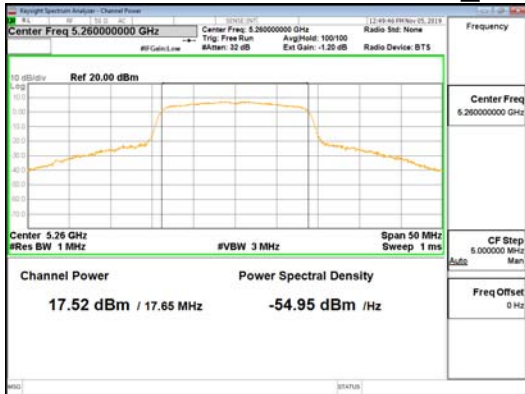
ANT-R\_802.11n\_HT20\_UNII 2C



ANT-R\_802.11n\_HT20\_UNII 3



**ANT-L\_802.11n\_HT20\_UNI I 1**



**ANT-L\_802.11n\_HT20\_UNI I 2A**