

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-2018-02328
Page (1) / (83) Pages

1. Client

- Name : KAONMEDIA Co., Ltd.
- Address : KAONMEDIA Building, 884-3, Seongnam-daero, Bundang-gu, Seongnam-si, Gyeonggi-do, Korea
- Date of Receipt : 2018-05-17

2. Manufacturer

- Name : KAONMEDIA Co., Ltd.
- Address : KAONMEDIA Building, 884-3, Seongnam-daero, Bundang-gu, Seongnam-si, Gyeonggi-do, Korea

3. Use of Report : For FCC Certification

4. Test Sample / Model: KSTB2020_NCTC_STB / KSTB2020



5. Date of Test : 2018-06-25 to 2018-07-25

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

7. Testing Environment: Temp.: (23 ± 1) °C, Humidity: (48 ± 5) % 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
	Bongseok Kim: (Signature) 	Young-taek Lee: (Signature) 

2018-07-31

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-2018-02328
Page (2) / (83) Pages


REPORT REVISION HISTORY

Date	Revision	Page No
2018-07-31	Issued (CTK-2018-02328)	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.

CONTENTS

1.0 General Product Description	4
1.1 Client Information	4
1.2 Product Information.....	4
1.3 Peripheral Devices	4
2.0 Facility and Accreditations	5
2.1 Test Facility.....	5
2.2 Laboratory Accreditations and Listings	5
2.3 Calibration Details of Equipment Used for Measurement	5
3.0 Test Specifications.....	6
3.1 Standards.....	6
3.2 Mode of operation during the test.....	7
3.3 Maximum Measurement Uncertainty	7
4.0 Technical Characteristic Test	8
4.1 26dB Bandwidth and 99 % Bandwidth.....	8
4.2 Maximum Conducted Output Power	25
4.3 Power Spectral Density	41
4.4 Frequency Stability.....	57
4.5 Unwanted Emissions	58
4.6 AC Conducted Emissions	80
APPENDIX A – Test Equipment Used For Tests	83

	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-2018-02328 Page (4) / (83) Pages	
---	---	--	--

1.0 General Product Description

1.1 Client Information

Company	KAONMEDIA Co., Ltd.
Contact Point	KAONMEDIA Building, 884-3, Seongnam-daero, Bundang-gu, Seongnam-si, Gyeonggi-do, Korea
Contact Person	Name : Choi Sung Ho E-mail : shchoi@kaonmedia.com Tel : +82-31-724-8861

1.2 Product Information

FCC ID	WQTKSTB2020
Product Description	KSTB2020_NCTC_STB
Model name	KSTB2020
Variant Model name	KSTB2076 (Variant model has no difference from basic model, except for model name)
Operating Frequency	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)
RF Output Power	UNII 2A 802.11a : 13.90 dBm (24.55 mW) 802.11n(HT20) : 16.19 dBm (41.59 mW) 802.11n(HT40) : 12.30 dBm (16.98 mW) 802.11ac(VHT20) : 15.91 dBm (39.01 mW) 802.11ac(VHT40) : 14.93 dBm (31.11 mW) 802.11ac(VHT80) : 12.00 dBm (15.84 mW) UNII 2C 802.11a : 13.78 dBm (23.88 mW) 802.11n(HT20) : 16.49 dBm (44.54 mW) 802.11n(HT40) : 12.75 dBm (18.82 mW) 802.11ac(VHT20) : 16.23 dBm (41.93 mW) 802.11ac(VHT40) : 15.27 dBm (33.64 mW) 802.11ac(VHT80) : 12.65 dBm (18.43 mW)
Antenna type	PCB Antenna
Antenna gain	2 dBi (Peak)
Type of Modulation	OFDM
Power Source	DC 12 V (Adapter)

1.3 Peripheral Devices





Device	Manufacturer	Model No.	Serial No.
Note Computer	HP	15-bs563TU	CND7253R6P
AC/DC Adapter	HP	HSTNN-LA40	7628011101

2.0 Facility and Accreditations

2.1 Test Facility

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

2.2 Laboratory Accreditations and Listings

Country	Agency	Scope of Accreditation	Registration Number	Logo
USA	FCC	FCC Part 15 & 18 EMI (Electromagnetic Interference / Emission)	805871	
CANADA	ISED	ISED EMI (3/10m test site)	8737A-2	
JAPAN	VCCI	VCCI V-3 EMI (Electromagnetic Interference / Emission)	C-986 T-1843 R-3627 G-387	
KOREA	NRRA	EMI (Electromagnetic Interference / Emission) EMS (Electromagnetic Susceptibility / Immunity)	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.

3.0 Test Specifications

3.1 Standards

FCC Part Section(s)	Requirement(s)	Status (Note 1)	Test Condition
15.407	26 dB Bandwidth and 99% Bandwidth	C	
15.407(a)(1)	Conducted Output Power	C	
15.407(a)(1)	Power Spectral Density	C	
15.407(g)	Frequency Stability	C	
15.407 (b)	Undesirable emission	C	Radiated
15.209, 15.407 (b)(5),(6)	Radiated Spurious Emission	C	
15.207	AC Conducted Emissions	C	Line Conducted
<u>Note 1:</u> C=Complies NC=Not Complies NT=Not Tested NA=Not Applicable			
<u>Note 2:</u> The data in this test report are traceable to the national or international standards.			

The sample was tested according to the following specification:
FCC Part 15.407, ANSI C63.10-2013

The tests were performed according to the method of measurements prescribed in
KDB No.789033.

3.2 Mode of operation during the test

The UUT 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.
The results are only attached worst cases.

Test Frequency

- 802.11a, 802.11n HT20, 802.11ac_VHT20

Frequency Band	Lowest channel	Middle channel	Highest channel
UNII 2A	5 260 MHz	5 300 MHz	5 320 MHz
UNII 2C	5 500 MHz	5 600 MHz	5 720 MHz

- 802.11n_HT40, 802.11ac_VHT40

Frequency Band	Lowest channel	Middle channel	Highest channel
UNII 2A	5 270 MHz	-	5 310 MHz
UNII 2C	5 510 MHz	5 590 MHz	5 710 MHz

- 802.11ac_VHT80

Frequency Band	Lowest channel	Middle channel	Highest channel
UNII 2A	5 290 MHz	-	-
UNII 2C	5 530 MHz	-	5 690 MHz

Test antenna

Antenna 1	Antenna 2
ANT 0	ANT 1

Duty cycle

Mode	Duty cycle (%)	Mode	Duty cycle (%)
802.11a	81.5	802.11ac(VHT20)	78.0
802.11n(HT20)	85.3	802.11ac(VHT40)	67.1
802.11n(HT40)	77.5	802.11ac(VHT80)	41.6

3.3 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	± 1.5 dB
Power Spectral Density	± 1.5 dB
Occupied Bandwidth	± 0.1 MHz
Unwanted Emission(conducted)	± 3.0 dB
Radiated Emissions ($f \leq 1$ GHz)	± 4.0 dB
Radiated Emissions ($f > 1$ GHz)	± 5.0 dB

4.0 Technical Characteristic Test

4.1 26dB Bandwidth and 99 % Bandwidth

Test Procedures(ANSI C63.10-2013 6.9.2)

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(ANSI C63.10-2013 6.9.3)

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%.

Limit :

NA

Test Data:

[ANT 0]

802.11a

Frequency Band	Channel	Frequency [MHz]	26 dB Bandwidth [MHz]	99% Bandwidth [MHz]
UNII 2A	Low	5 260	22.28	18.13
	Middle	5 300	22.29	18.14
	High	5 320	22.30	18.12
UNII 2C	Low	5 500	22.40	18.14
	Middle	5 600	22.57	18.11
	High	5 720	22.47	18.16

802.11n(HT20)

Frequency Band	Channel	Frequency [MHz]	26 dB Bandwidth [MHz]	99% Bandwidth [MHz]
UNII 2A	Low	5 260	22.79	18.99
	Middle	5 300	22.79	19.00
	High	5 320	22.71	19.02
UNII 2C	Low	5 500	22.85	19.00
	Middle	5 600	22.66	19.10
	High	5 720	22.84	19.06

802.11n(HT40)

Frequency Band	Channel	Frequency [MHz]	26 dB Bandwidth [MHz]	99% Bandwidth [MHz]
UNII 2A	Low	5 270	40.28	36.82
	High	5 310	40.93	36.91
UNII 2C	Low	5 510	40.50	36.85
	Middle	5 590	40.14	36.78
	High	5 710	39.98	36.78

802.11ac(VHT20)

Frequency Band	Channel	Frequency [MHz]	26 dB Bandwidth [MHz]	99% Bandwidth [MHz]
UNII 2A	Low	5 260	22.44	18.88
	Middle	5 300	22.50	18.98
	High	5 320	22.35	18.89
UNII 2C	Low	5 500	22.64	18.89
	Middle	5 600	22.64	18.92
	High	5 720	22.48	18.91

802.11ac(VHT40)

Frequency Band	Channel	Frequency [MHz]	26 dB Bandwidth [MHz]	99% Bandwidth [MHz]
UNII 2A	Low	5 270	40.85	36.74
	High	5 310	40.80	36.77
UNII 2C	Low	5 510	40.91	36.79
	Middle	5 590	40.79	36.82
	High	5 710	40.87	36.86

802.11ac(VHT80)

Frequency Band	Channel	Frequency [MHz]	26 dB Bandwidth [MHz]	99% Bandwidth [MHz]
UNII 2A	-	5 290	80.94	75.99
UNII 2C	Low	5 530	80.99	75.99
	High	5 690	80.73	76.00

[ANT 1]

802.11a

Frequency Band	Channel	Frequency [MHz]	26 dB Bandwidth [MHz]	99% Bandwidth [MHz]
UNII 2A	Low	5 260	22.44	18.10
	Middle	5 300	22.41	18.11
	High	5 320	22.33	18.16
UNII 2C	Low	5 500	22.29	18.18
	Middle	5 600	22.31	18.11
	High	5 720	22.38	18.08

802.11n(HT20)

Frequency Band	Channel	Frequency [MHz]	26 dB Bandwidth [MHz]	99% Bandwidth [MHz]
UNII 2A	Low	5 260	22.43	18.72
	Middle	5 300	22.38	18.78
	High	5 320	22.51	18.77
UNII 2C	Low	5 500	22.38	18.81
	Middle	5 600	22.24	18.79
	High	5 720	22.37	18.73

802.11n(HT40)

Frequency Band	Channel	Frequency [MHz]	26 dB Bandwidth [MHz]	99% Bandwidth [MHz]
UNII 2A	Low	5 270	40.52	36.85
	High	5 310	40.28	36.83
UNII 2C	Low	5 510	40.40	36.91
	Middle	5 590	40.72	36.82
	High	5 710	40.47	36.83

802.11ac(VHT20)

Frequency Band	Channel	Frequency [MHz]	26 dB Bandwidth [MHz]	99% Bandwidth [MHz]
UNII 2A	Low	5 260	22.59	18.73
	Middle	5 300	22.61	18.76
	High	5 320	22.46	18.83
UNII 2C	Low	5 500	22.60	18.79
	Middle	5 600	22.44	18.80
	High	5 720	22.40	18.79

802.11ac(VHT40)

Frequency Band	Channel	Frequency [MHz]	26 dB Bandwidth [MHz]	99% Bandwidth [MHz]
UNII 2A	Low	5 270	40.28	36.63
	High	5 310	40.44	36.71
UNII 2C	Low	5 510	40.51	36.63
	Middle	5 590	40.17	36.61
	High	5 710	40.35	36.66

802.11ac(VHT80)

Frequency Band	Channel	Frequency [MHz]	26 dB Bandwidth [MHz]	99% Bandwidth [MHz]
UNII 2A	-	5 290	80.89	75.93
UNII 2C	Low	5 530	80.87	75.94
	High	5 690	81.13	76.03

See next pages for actual measured spectrum plots.

[ANT 0]

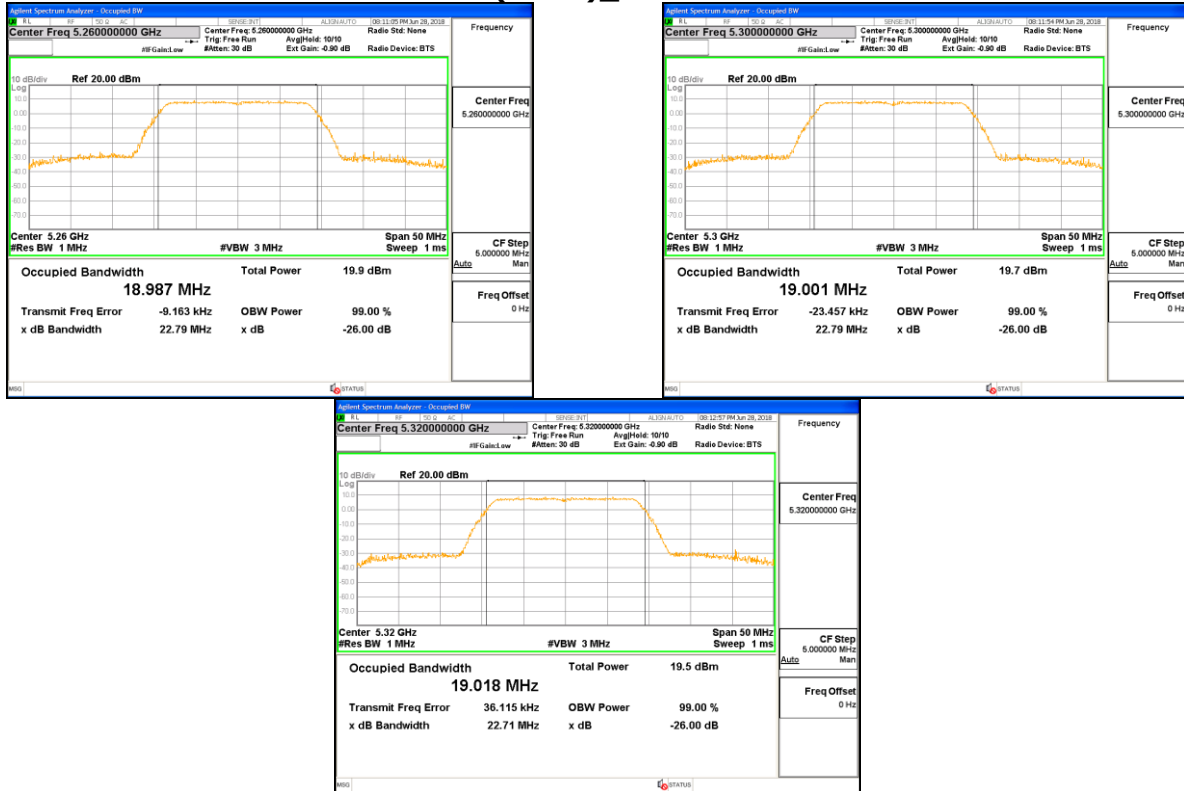
802.11a_UNII 2A Band



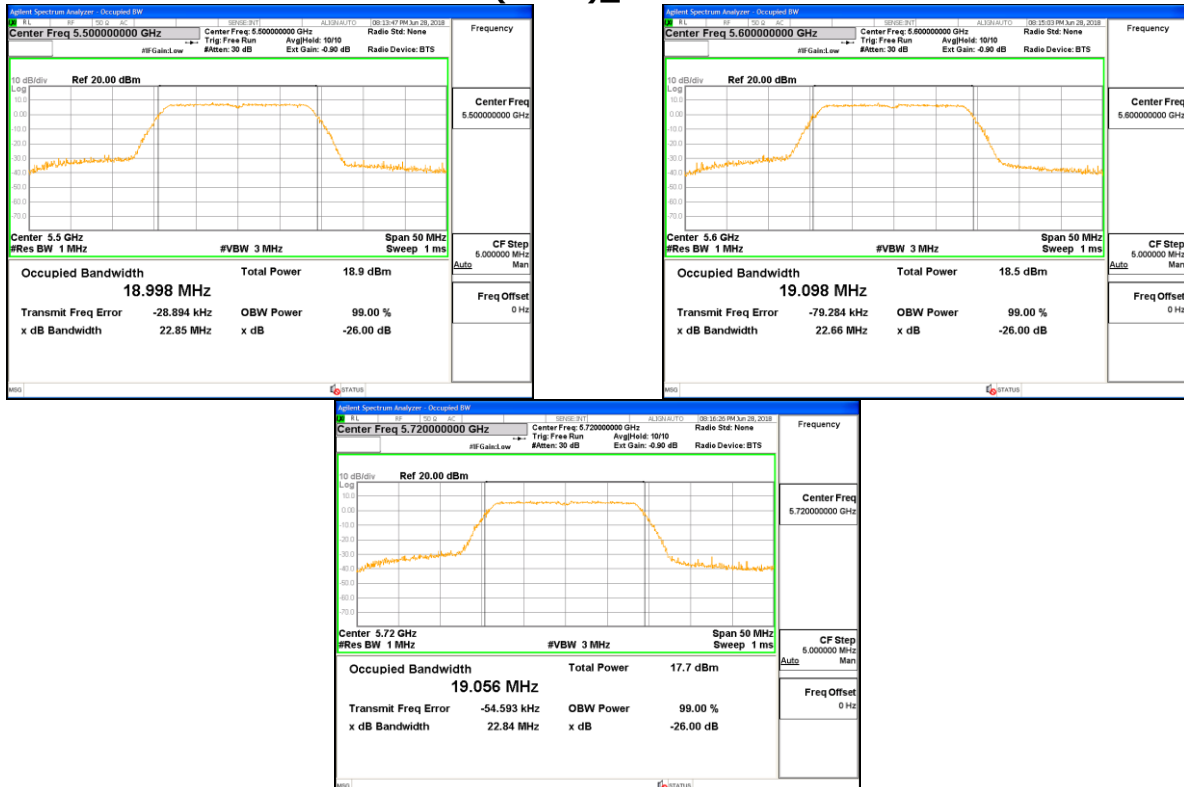
802.11a_UNII 2C Band



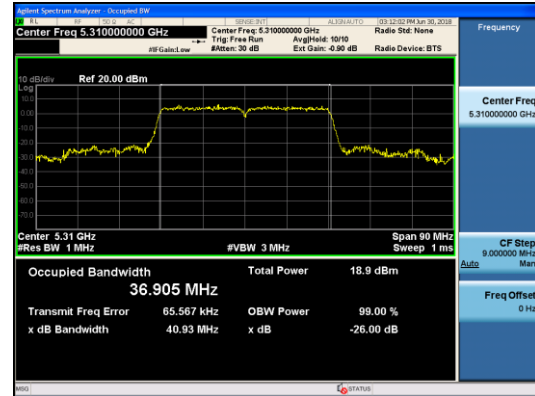
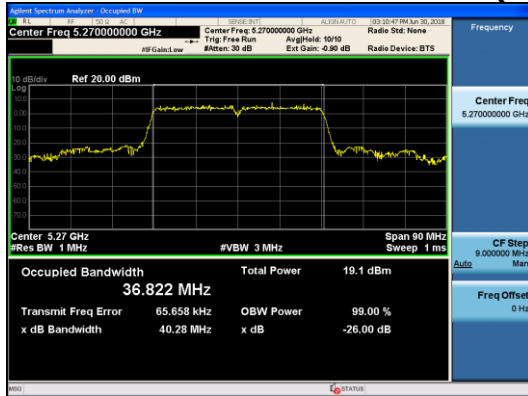
802.11n(HT20)_UNII 2A Band



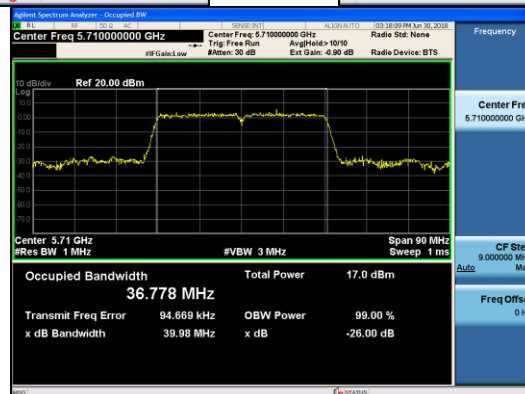
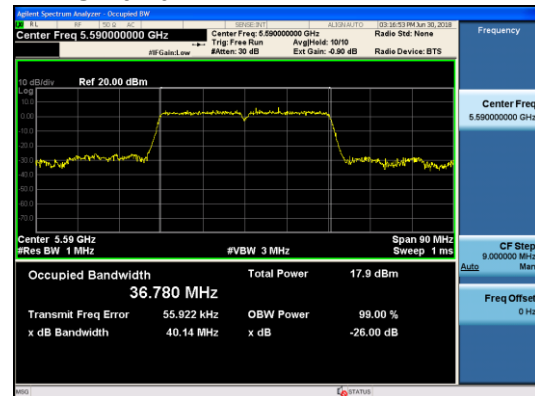
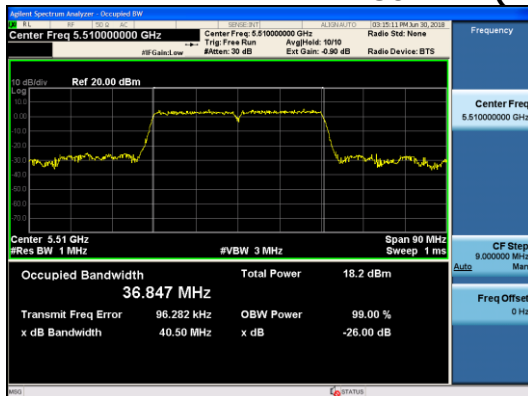
802.11n(HT20)_UNII 2C Band



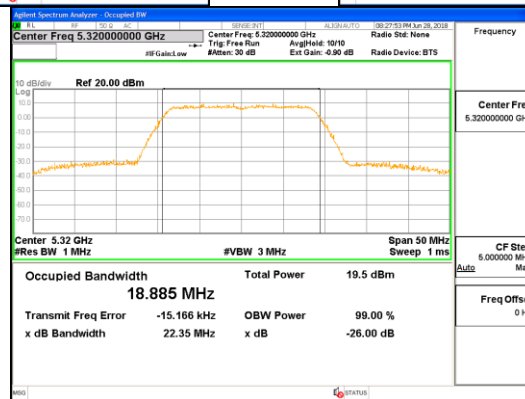
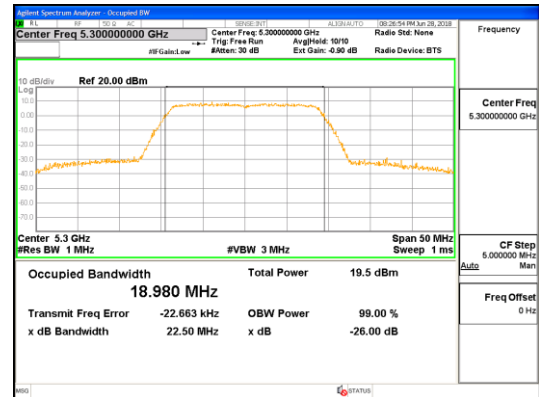
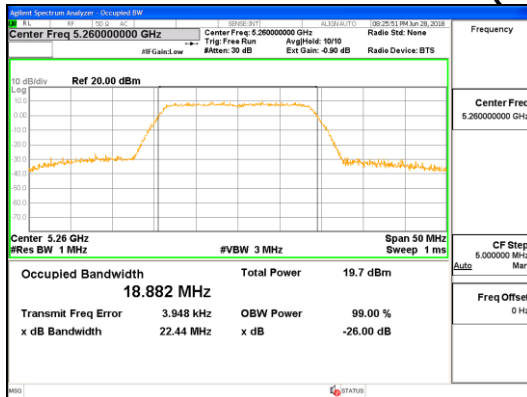
802.11n(HT40)_UNII 2A Band



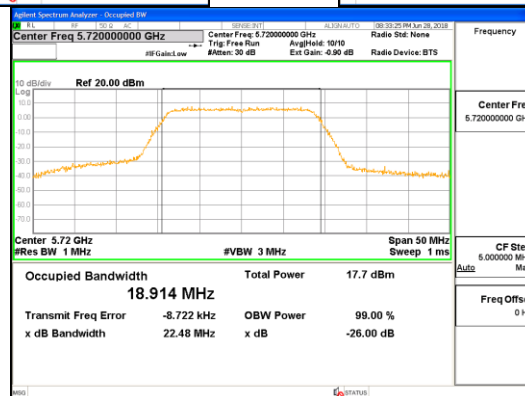
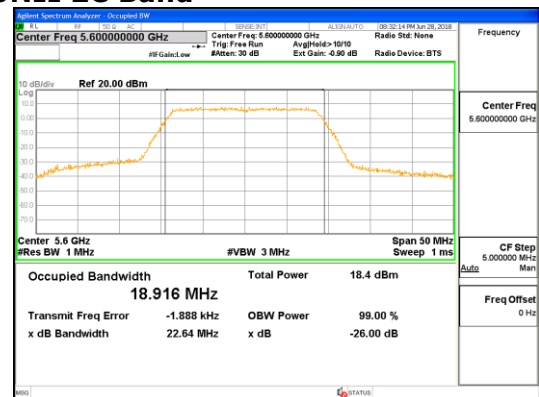
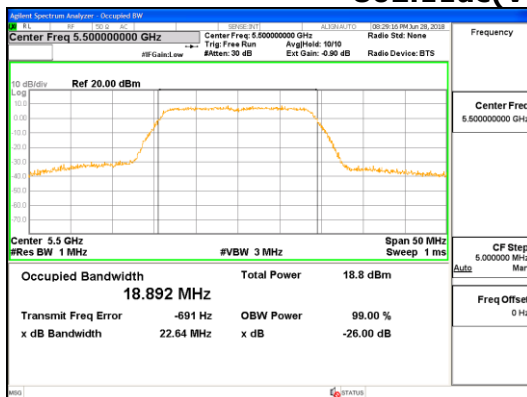
802.11n(HT40)_UNII 2C Band



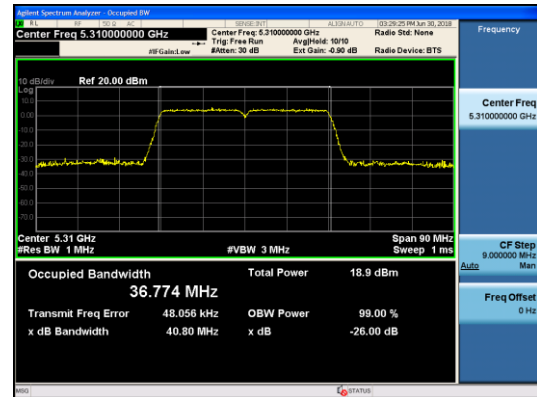
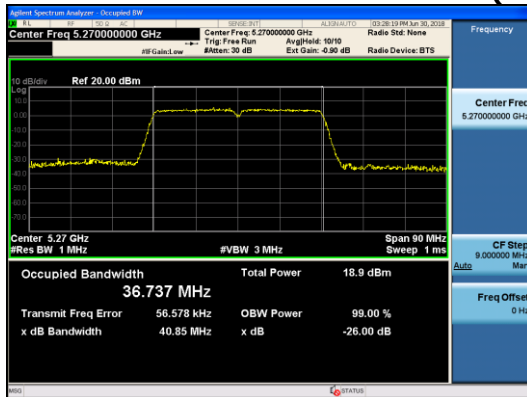
802.11ac(VHT20)_UNII 2A Band



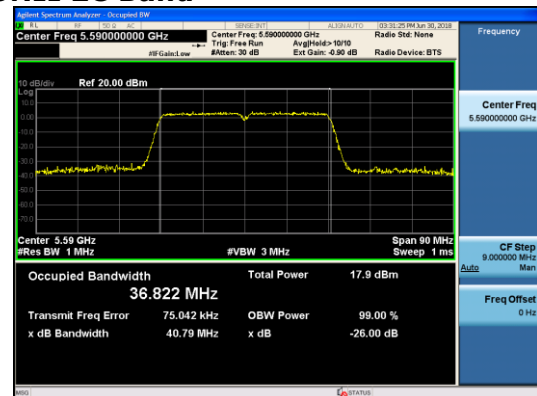
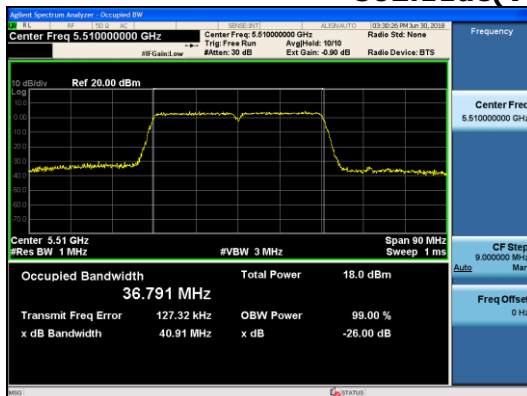
802.11ac(VHT20)_UNII 2C Band



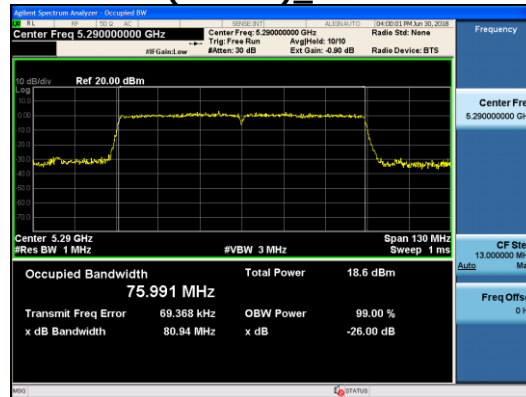
802.11ac(VHT40)_UNII 2A Band



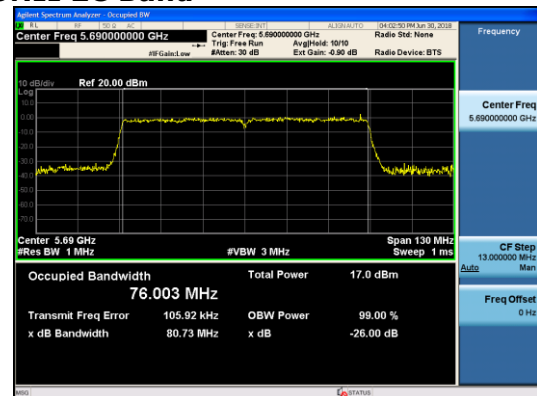
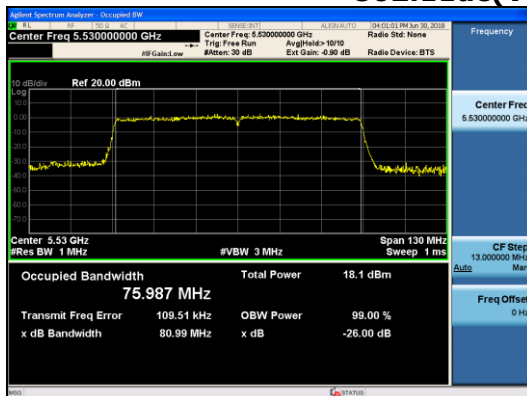
802.11ac(VHT40)_UNII 2C Band



802.11ac(VHT80)_UNII 2A Band

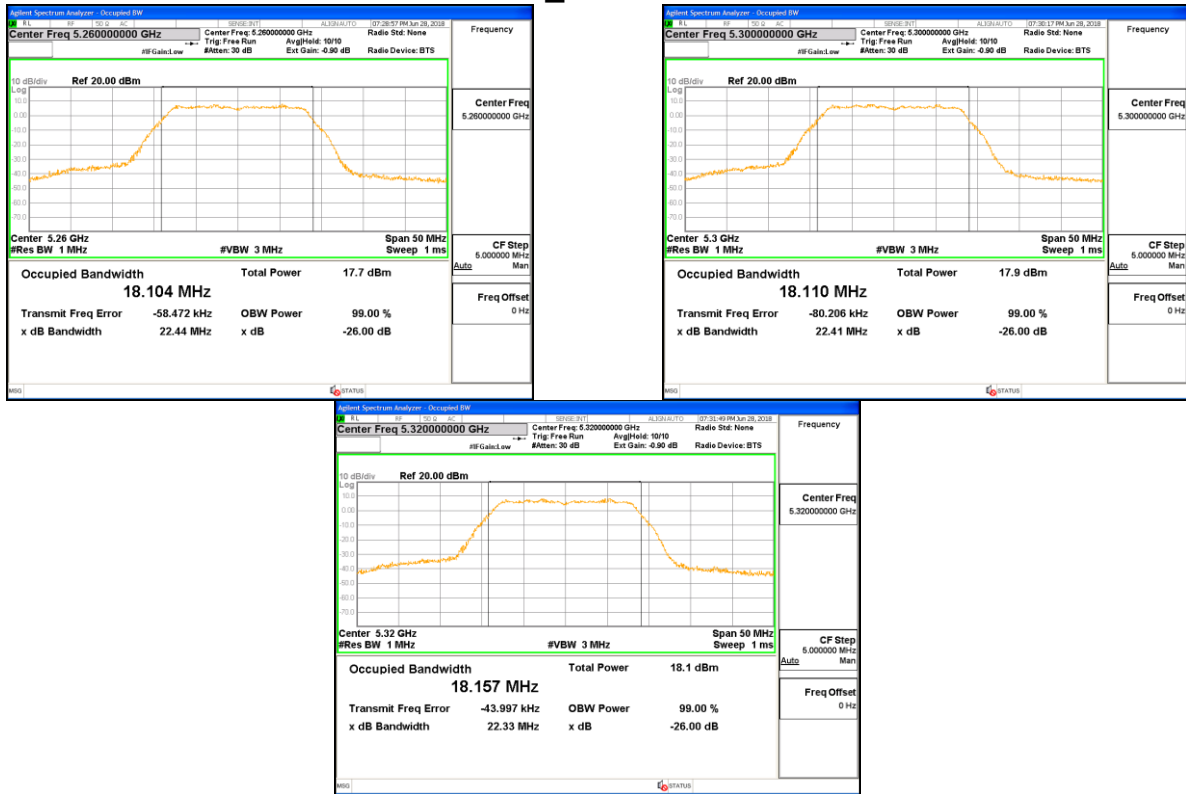


802.11ac(VHT80)_UNII 2C Band

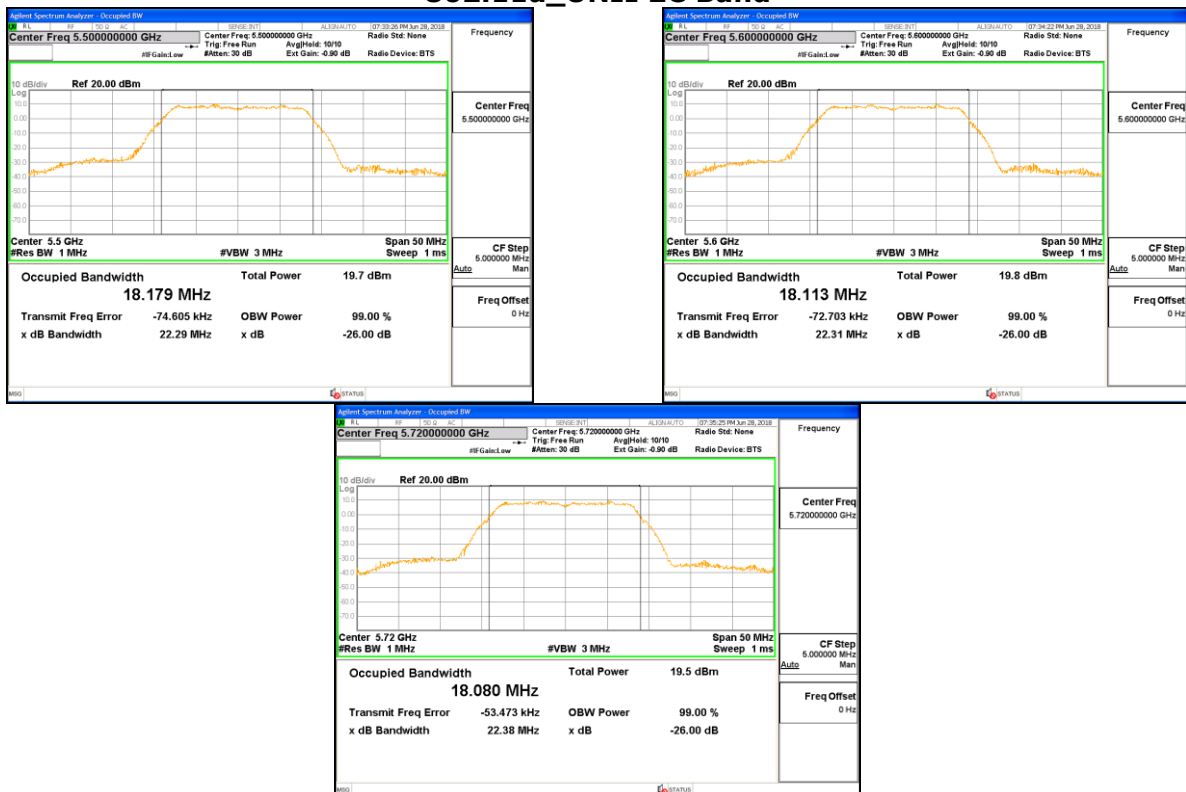


[ANT 1]

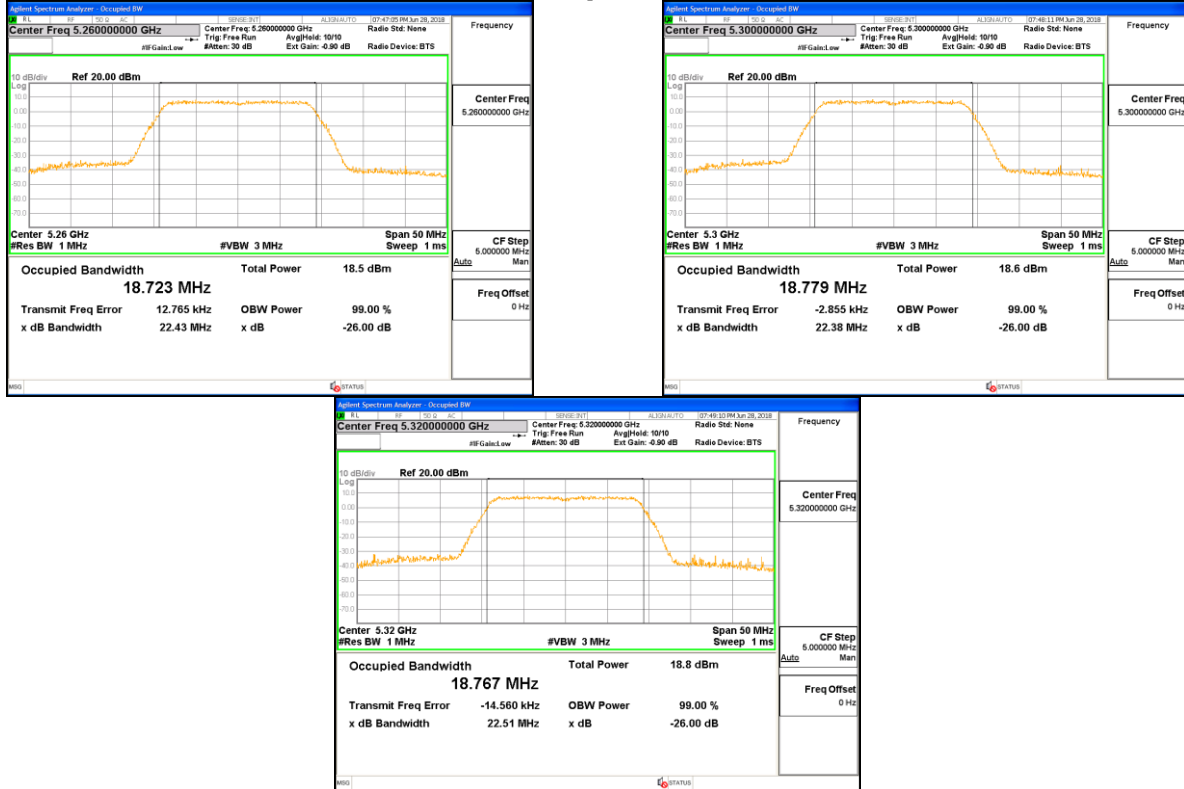
802.11a_UNII 2A Band



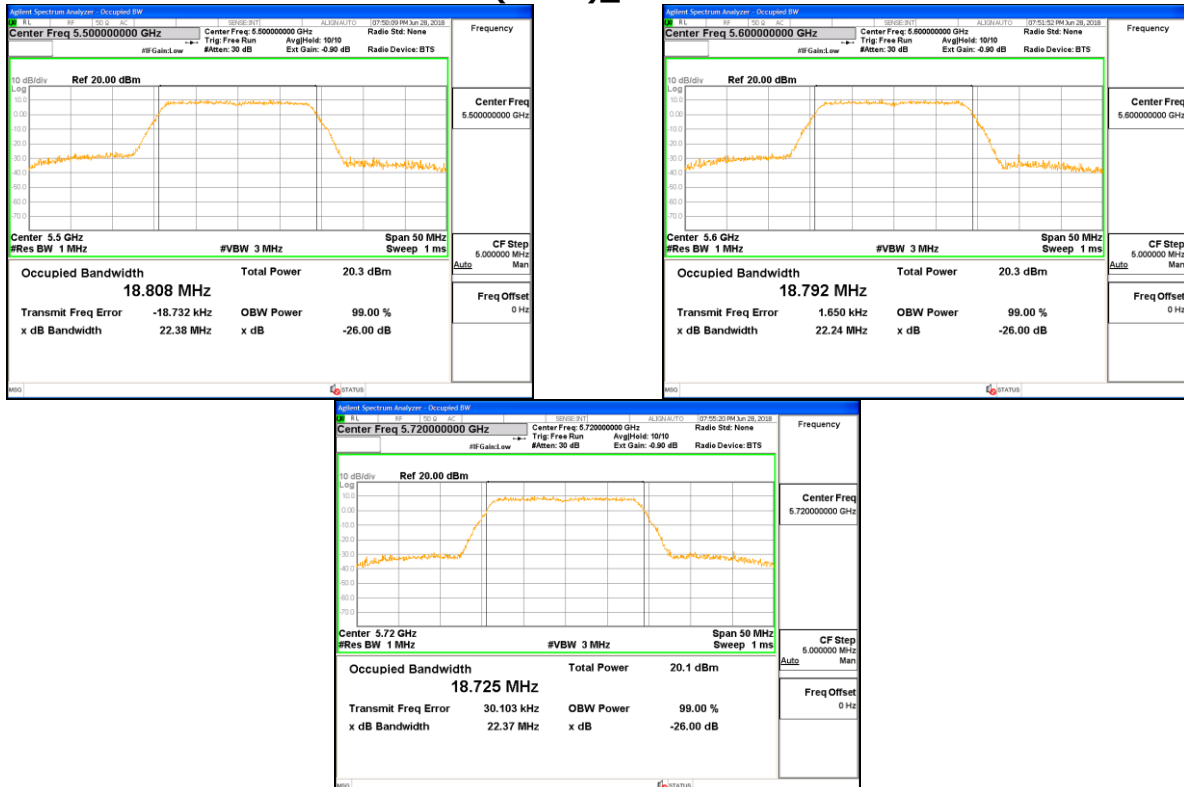
802.11a_UNII 2C Band



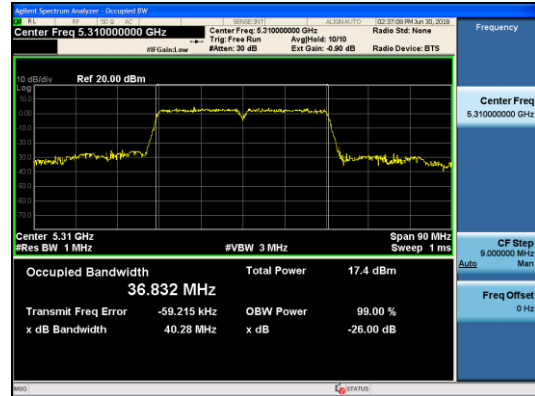
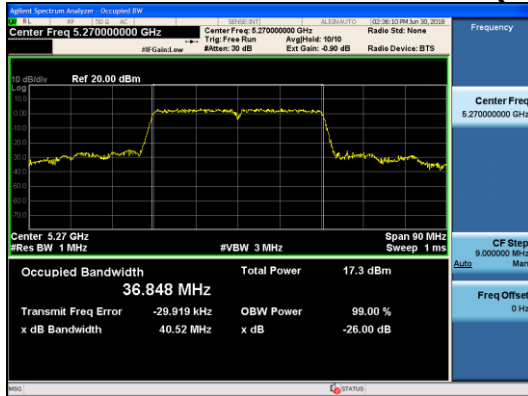
802.11n(HT20)_UNII 2A Band



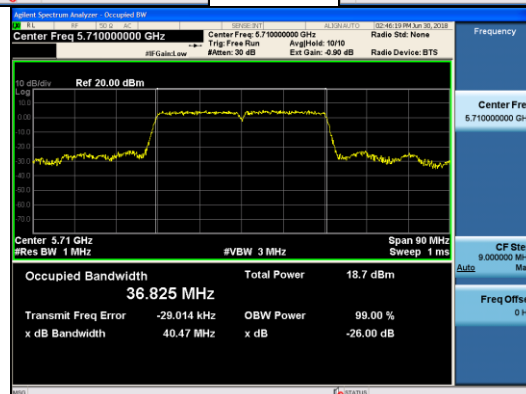
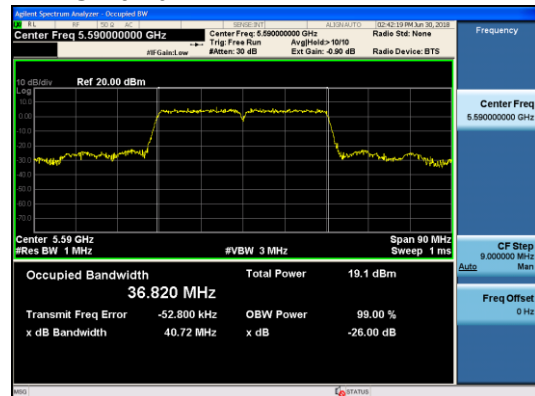
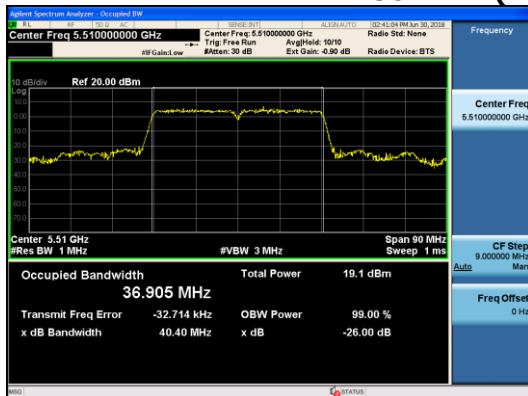
802.11n(HT20)_UNII 2C Band



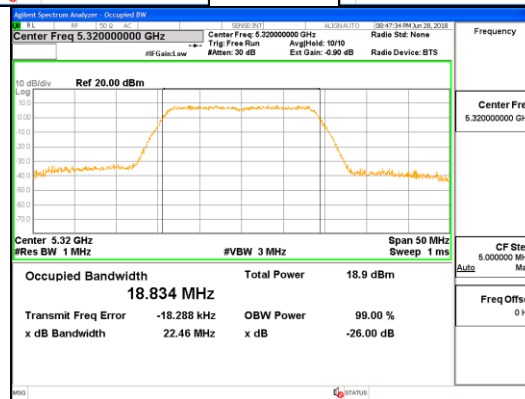
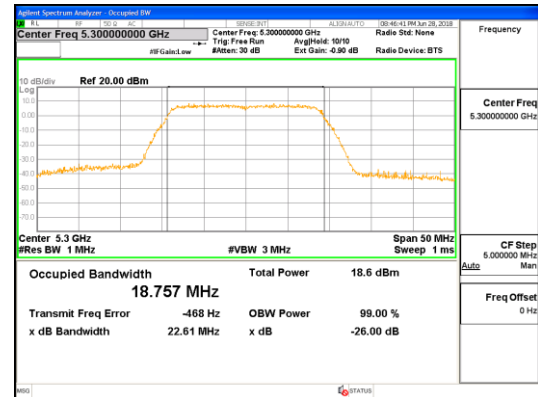
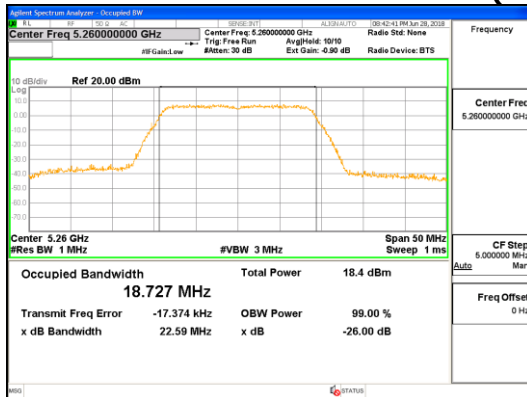
802.11n(HT40)_UNII 2A Band



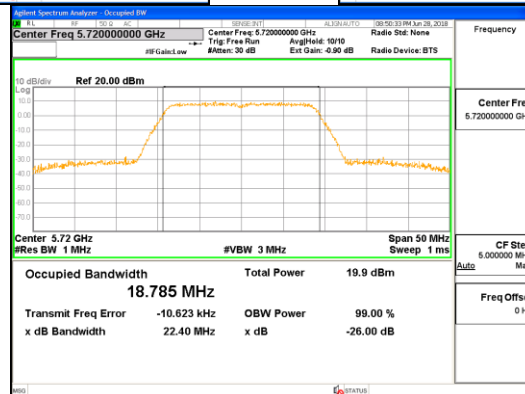
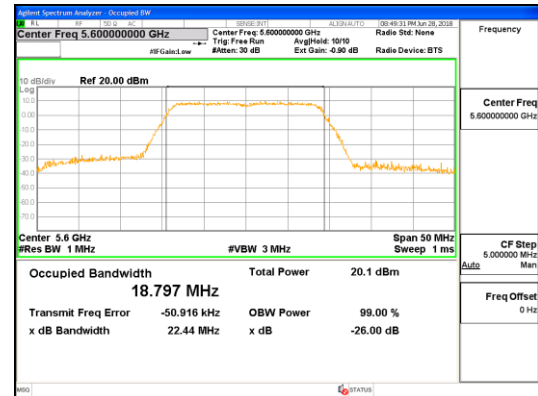
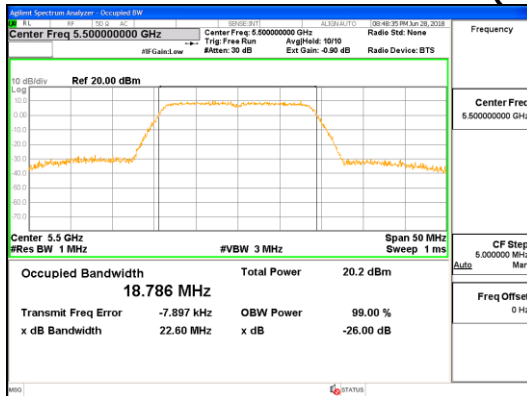
802.11n(HT40)_UNII 2C Band



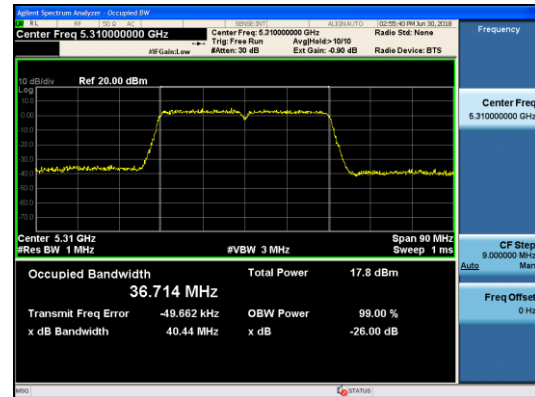
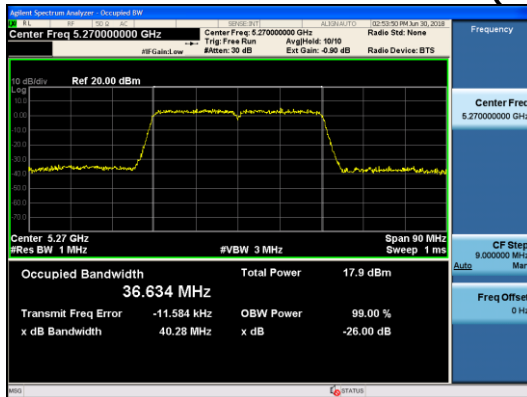
802.11ac(VHT20)_UNII 2A Band



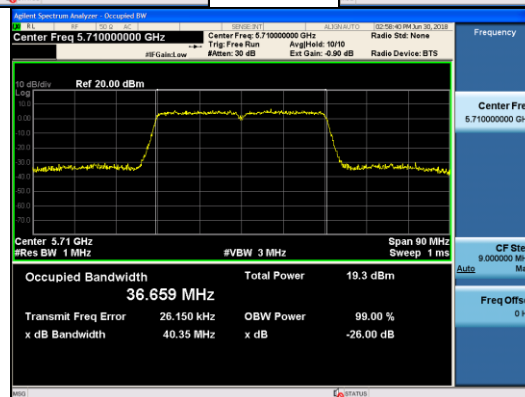
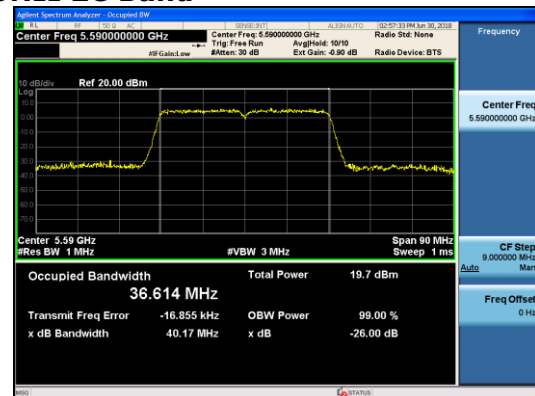
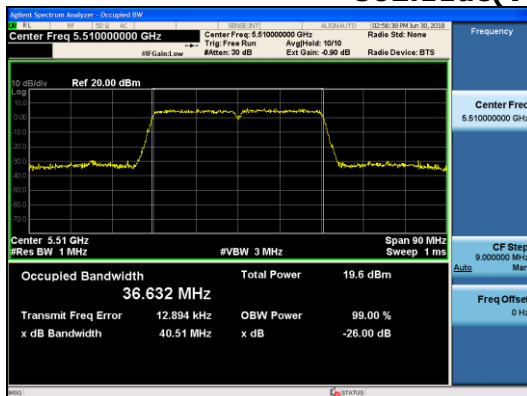
802.11ac(VHT20)_UNII 2C Band



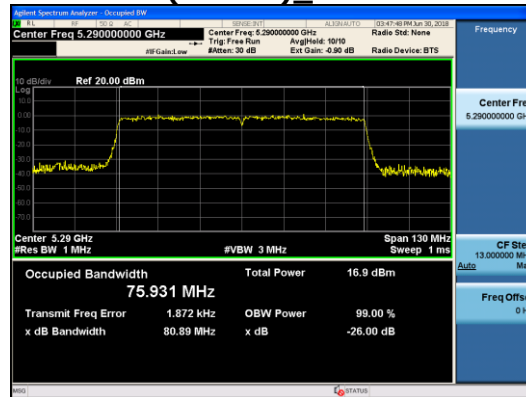
802.11ac(VHT40)_UNII 2A Band



802.11ac(VHT40)_UNII 2C Band



802.11ac(VHT80)_UNII 2A Band



802.11ac(VHT80)_UNII 2C Band

