RF MEASUREMENT REPORT

FCC ID:	2AXJ4T4UPLUSV2
Applicant:	TP-Link Corporation Limited
Product:	AC1300 Dual Antennas High Gain Wireless USB Adapter
Model No.:	Archer T4U Plus
Brand Name:	tp-link
FCC Classification:	Unlicensed National Information Infrastructure (NII)
FCC Rule Part(s):	Part 15 Subpart E (Section 15.407)
Result:	Complies
Received Date:	2022-11-14
Test Date:	2022-11-21 ~ 2022-12-19

Reviewed By: Kevin Guo

Approved By: Robin Wu

ACCREDITED
TESTING LABORATORY
CERTIFICATE #3628.01

The test results relate only to the samples tested.

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.10-2013. Test results reported herein relate only to the item(s) tested.

Revision History

Report No.	Version	Description	Issue Date	Note
2211RSU036-U2	V01	Initial Report	2023-01-31	Valid

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1. General Information

1.1. Applicant

TP-Link Corporation Limited

Room 901, 9/F., New East Ocean Centre, 9 Science Museum Road, Tsim Sha Tsui, Kowloon, Hongkong

1.2. Manufacturer

TP-Link Corporation Limited

Room 901, 9/F., New East Ocean Centre, 9 Science Museum Road, Tsim Sha Tsui, Kowloon, Hongkong

1.3. Testing Facility

☒	**Test Site – MRT Suzhou Laboratory**				
	Laboratory Location (Suzhou - Wuzhong) D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China **Laboratory Location (Suzhou - SIP)** 4b Building, Liando U Valley, No.200 Xingpu Rd., Shengpu Town, Suzhou Industrial Park, China				
	Laboratory Accreditations				
	A2LA: 3628.01		CNAS: L10551		
	FCC: CN1166		ISED: CN0001		
	VCCI:	☐R-20025	☐G-20034	☐C-20020	☐T-20020
		☐R-20141	☐G-20134	☐C-20103	☐T-20104
☐	**Test Site – MRT Shenzhen Laboratory**				
	Laboratory Location (Shenzhen) 1G, Building A, Junxiangda Building, Zhongshanyuan Road West, Nanshan District, Shenzhen, China				
	Laboratory Accreditations				
	A2LA: 3628.02		CNAS: L10551		
	FCC: CN1284		ISED: CN0105		
☐	**Test Site – MRT Taiwan Laboratory**				
	Laboratory Location (Taiwan) No. 38, Fuxing 2nd Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)				
	Laboratory Accreditations				
	TAF: L3261-190725				
	FCC: 291082, TW3261		ISED: TW3261		

1.4. Product Information

Product Name	AC1300 Dual Antennas High Gain Wireless USB Adapter
Model No.	Archer T4U Plus
EUT Identification No.	20221114Sample#017 (Conducted) 20221114Sample#014 (Radiated)
Wi-Fi Specification	802.11a/b/g/n/ac
Antenna Information	Refer to Section 1.7
Working Voltage	By USB (DC 5V)
Note: The information of EUT was provided by the manufacturer, and the accuracy of the information shall be the responsibility of the manufacturer.	

1.5. Radio Specification under Test

Frequency Range	For 802.11a/n-HT20/ac-VHT20: 5180~5240MHz, 5260~5320MHz, 5500~5700MHz, 5745~5825MHz For 802.11n-HT40/ac-VHT40: 5190~5230MHz, 5270~5310MHz, 5510~5670MHz, 5755~5795MHz For 802.11ac-VHT80: 5210MHz, 5290MHz, 5530MHz, 5610 MHz, 5775MHz
Type of Modulation	802.11a/n/ac: OFDM
Data Rate	802.11a: 6/9/12/18/24/36/48/54Mbps 802.11n: up to 300Mbps 802.11ac: up to 866.6Mbps

1.6. Working Frequencies

802.11a/n-HT20/ac-VHT20

Channel	Frequency	Channel	Frequency	Channel	Frequency
36	5180 MHz	40	5200 MHz	44	5220 MHz
48	5240 MHz	52	5260 MHz	56	5280 MHz
60	5300 MHz	64	5320 MHz	100	5500 MHz
104	5520 MHz	108	5540 MHz	112	5560 MHz
116	5580 MHz	120	5600 MHz	124	5620 MHz
128	5640 MHz	132	5660 MHz	136	5680 MHz
140	5700 MHz	149	5745 MHz	153	5765 MHz
157	5785 MHz	161	5805 MHz	165	5825 MHz

802.11n-HT40/ac-VHT40

Channel	Frequency	Channel	Frequency	Channel	Frequency
38	5190 MHz	46	5230 MHz	54	5270 MHz
62	5310 MHz	102	5510 MHz	110	5550 MHz
118	5590 MHz	126	5630 MHz	134	5670 MHz
151	5755 MHz	159	5795 MHz	--	--

802.11ac-VHT80

Channel	Frequency	Channel	Frequency	Channel	Frequency
42	5210 MHz	58	5290 MHz	106	5530 MHz
122	5610 MHz	155	5775 MHz	--	--

1.7. Antenna Details

Antenna Type	Frequency Band (MHz)	Mode	Tx Path	Antenna Gain (dBi)	CDD Directional Gain (dBi)	
					For Power	For PSD
Dipole	2.400 ~ 2483.5	802.11b/g	1	2.00	--	--
	2.400 ~ 2483.5	802.11n	2	2.00	2.00	5.01
	5150 ~ 5850	802.11a	1	3.00	--	--
	5150 ~ 5850	802.11n/ac	2	3.00	3.00	6.01

Note: The EUT supports SISO Mode for 802.11a/b/g and Cyclic Delay Diversity (CDD) mode for 802.11n/ac.

For CDD transmissions, directional gain is calculated as follows, N_{ANT} = 2, N_{SS} = 1.

If all antennas have the same gain, G_{ANT}, Directional gain = G_{ANT} + Array Gain, where Array Gain is as follows.

- For power spectral density (PSD) measurements on all devices,

  Array Gain = 10 log (N_{ANT}/ N_{SS}) dB = 3.01;
- For power measurements on IEEE 802.11 devices,

  Array Gain = 0 dB for N_{ANT} ≤ 4;

Test Mode	T_X Paths	SISO Mode	CDD Mode
802.11b/g	1	√	X
802.11n	2	X	√
802.11a	1	√	X
802.11n/ac	2	X	√

2. Test Configuration

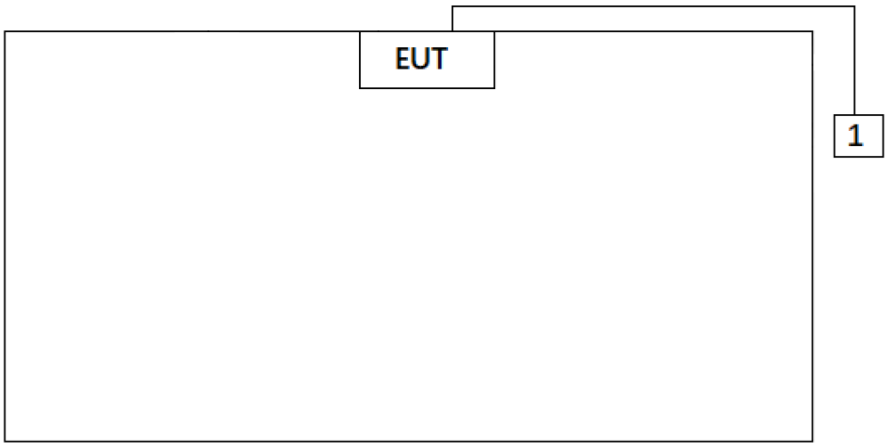
2.1. Test Mode

Mode 1: Transmit by 802.11a (6Mbps) - Ant 0 – SISO Mode
Mode 2: Transmit by 802.11ac-VHT20 _ Nss = 1 (MCS0) – CDD Mode
Mode 3: Transmit by 802.11ac-VHT40 _ Nss = 1 (MCS0) – CDD Mode
Mode 4: Transmit by 802.11ac-VHT80 _ Nss = 1 (MCS0) – CDD Mode
Note: 1. For Radiated emission, the modulation and the data rate picked for testing are determined by the Max. RF conducted power. 2. For CDD mode, this device supports 2 N_{SS} and power level is the same of spatial multiplexing. The worst case is N_{SS}=1. 3. Due to the same modulation between 802.11n, so 802.11n-HT20 and HT40 are covered by 802.11ac-VHT20 and VHT40 in this report, meanwhile, power setting for 802.11n-HT20 and HT40 will not be greater than 802.11ac-VHT20 and VHT40. 4. As Designated by manufacturer, the lowest data rate was the worst condition, so all the tests were done with lowest data rate.

2.2. Test System Connection Diagram

The device was tested per the guidance ANSI C63.10: 2013 was used to reference the appropriate EUT setup for radiated emissions testing and AC line conducted testing.

Connection Diagram – Radiated Emission testing & AC Conducted Emissions



Product		Manufacturer	Model No.
1	Notebook	Lenovo	E431

2.3. Test Software

The test utility software used during testing was “REALTEK 11ac 8812AU USB WLAN NIC Massproduction Kit”, and the version was 0.0000.03.20170927.

2.4. Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 15.407
- KDB 789033 D02v02r01
- ANSI C63.10-2013
- KDB 662911 D01v02r01

2.5. Test Environment Condition

Ambient Temperature	15 ~ 35°C
Relative Humidity	20 ~ 75%RH

3. Antenna Requirements

Excerpt from §15.203 of the FCC Rules/Regulations:

"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 antenna of the device is **permanently attached.**
- There are no provisions for connection to an external antenna.

Conclusion:

The unit complies with the requirement of §15.203.

4. Measuring Instrument

Instrument	Manufacturer	Model No.	Asset No.	Cali. Interval	Cali. Due Date	Test Site
Two-Line V-Network	R&S	ENV216	MRTSUE06002	1 year	2023-06-04	WZ-SR2
Shielding Room	MIX-BEP	WZ-SR2	MRTSUE06215	5 years	2026-12-20	WZ-SR2
Thermohygrometer	testo	608-H1	MRTSUE06404	1 year	2023-06-06	WZ-SR2
Four-Line V-Network	R&S	ENV432	MRTSUE06615	1 year	2023-10-08	WZ-SR2
EMI Test Receiver	R&S	ESR3	MRTSUE06909	1 year	2023-10-27	WZ-SR2
TRILOG Antenna	Schwarzbeck	VULB 9162	MRTSUE06022	1 year	2023-05-20	WZ-AC2
EMI Test Receiver	Agilent	N9038A	MRTSUE06125	1 year	2023-06-04	WZ-AC2
Thermohygrometer	Mingle	ETH529	MRTSUE06170	1 year	2022-12-01	WZ-AC2
Thermohygrometer	Mingle	ETH529	MRTSUE06170	1 year	2023-11-27	WZ-AC2
Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06171	1 year	2023-10-13	WZ-AC2
Preamplifier	Schwarzbeck	BBV 9718	MRTSUE06176	1 year	2023-05-08	WZ-AC2
Anechoic Chamber	RIKEN	WZ-AC2	MRTSUE06213	1 year	2023-04-21	WZ-AC2
Thermohygrometer	testo	608-H1	MRTSUE11038	1 year	2023-11-01	WZ-AC2
Signal Analyzer	Agilent	N9020A	MRTSUE06106	1 year	2023-04-06	WZ-SR5/WZ-TR3
Thermohygrometer	testo	608-H1	MRTSUE06402	1 year	2023-06-06	WZ-SR5
Shielding Room	HUAMING	WZ-SR5	MRTSUE06442	N/A	N/A	WZ-SR5
USB Power Sensor	Keysight	U2021XA	MRTSUE06446	1 year	2023-06-04	WZ-SR5
Attenuator	SHX	WDTS100-20dB-6G-B	MRTSUE06677	1 year	2023-03-02	WZ-SR5
Attenuator	SHX	WDTS100-20dB-6G-B	MRTSUE06678	1 year	2023-03-02	WZ-SR5
Temperature Chamber	BAOYT	BYH-150CL	MRTSUE06051	1 year	2023-10-08	WZ-TR3
Thermohygrometer	testo	608-H1	MRTSUE06401	1 year	2023-06-06	WZ-TR3

Software	Version	Function
EMI Software	V3.0.0	EMI Test Software
Controller_MF 7802	1.02	RE Antenna & Turntable

5. Decision Rules and Measurement Uncertainty

5.1. Decision Rules

The Decision Rule is based on Simple Acceptance in accordance with ISO Guide 98-4: 2012 Clause 8.2. (Measurement uncertainty is not taken into account when stating conformity with a specified requirement.)

5.2. Measurement Uncertainty

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k = 2.

AC Conducted Emission Measurement
The maximum measurement uncertainty is evaluated as: 9kHz~150kHz: 3.58dB 150kHz~30MHz: 3.20dB
Radiated Emission Measurement
The maximum measurement uncertainty is evaluated as: Coaxial: 9kHz~30MHz: 2.59dB Coplanar: 9kHz~30MHz: 2.60dB Horizontal: 30MHz~200MHz: 3.85dB 200MHz~1GHz: 4.36dB 1GHz~40GHz: 4.98dB Vertical: 30MHz~200MHz: 4.06dB 200MHz~1GHz: 5.28dB 1GHz~40GHz: 4.91dB
Spurious Emissions, Conducted
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 2.3 dB
Output Power
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 1.5 dB
Power Spectrum Density
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 2.3 dB
Occupied Bandwidth
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 3.2 %

6. Test Result

6.1. Summary

FCC Section(s)	Test Description	Test Condition	Verdict
15.407(a)	26dB Bandwidth	Conducted	Pass
15.407(e)	6dB Bandwidth		Pass
15.407(a)(1)(iv), (2), (3)(i)	Maximum Conducted Output Power		Pass
15.407(h)(1)	Transmit Power Control		N/A
15.407(a)(1)(iv), (2), (3)(i), (12)	Peak Power Spectral Density		Pass
15.407(g)	Frequency Stability		Pass
15.407(b)(1), (2), (3), (4)(i)	Undesirable Emissions	Radiated	Pass
15.205, 15.209 15.407(b)(9), (10), (11)	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)		Pass
15.207	AC Conducted Emissions 150kHz - 30MHz	Line Conducted	Pass

Notes:

1. The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
2. For radiated emission test, every axis (X, Y, Z) was also verified. The test results shown in the following sections represent the worst-case emissions.
3. “N/A” means that the test item is not applicable, and the detailed information refers to relevant section.

6.2. 26dB & 99% Bandwidth Measurement

6.2.1. Test Limit

N/A

6.2.2. Test Procedure

KDB 789033 D02v02r01- Section II)C)1) (26dB Bandwidth)

KDB 789033 D02v02r01- Section II)D) (99% Bandwidth)

6.2.3. Test Setting

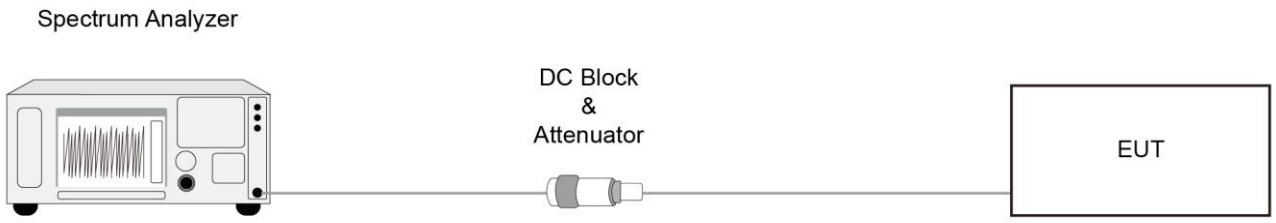
26dB Bandwidth

1. The analyzers' automatic bandwidth measurement capability was used to perform the 26dB bandwidth
2. RBW = approximately 1% of the emission bandwidth.
3. VBW > RBW
4. Detector = Peak.
5. Trace mode = max hold.
6. 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%.

99% Bandwidth

1. Set center frequency to the nominal EUT channel center frequency.
2. RBW = 1% to 5% of the OBW
3. VBW ≥ 3 × RBW
4. Span = 1.5 times to 5 times the OBW
5. Detector = peak
6. Trace mode = max hold
7. Allow the trace to stabilize
8. Use the 99% power bandwidth function of the instrument.

6.2.4. Test Setup



6.2.5. Test Result

Refer to Appendix A.2.

6.3. 6dB Bandwidth Measurement

6.3.1. Test Limit

The minimum 6dBbandwidth shall be at least 500 kHz.

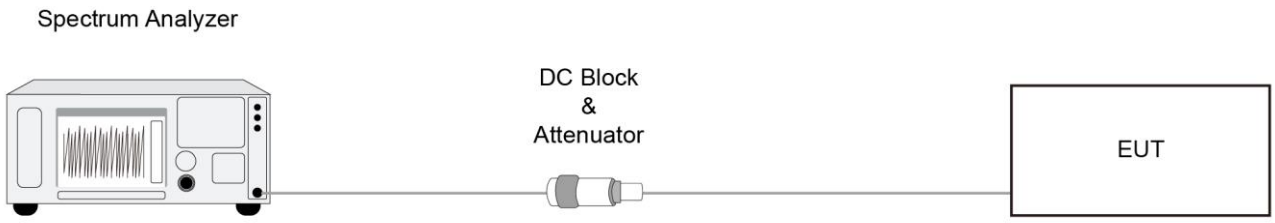
6.3.2. Test Procedure

KDB 789033 D02v02r01- Section II)C)2)

6.3.3. Test Setting

1. Set center frequency to the nominal EUT channel center frequency.
2. RBW = 100 kHz.
3. VBW 3 × RBW.
4. Detector = Peak.
5. Trace mode = max hold.
6. Sweep = auto couple.
7. Allow the trace to stabilize.
8. 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.

6.3.4. Test Setup



6.3.5. Test Result

Refer to Appendix A.3.

6.4. Output Power Measurement

6.4.1. Test Limit

For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi.

For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz.

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W (30dBm).

If transmitting antennas of directional gain greater than 6dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

6.4.2. Test Procedure

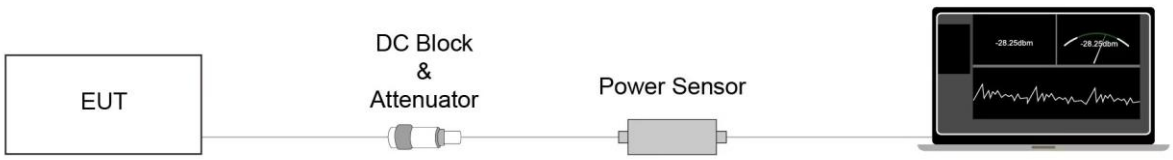
KDB 789033D02v02r01- Section II)E)3)b) Method PM-G

6.4.3. Test Setting

Average Power Measurement

Average power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The power meter implemented triggering and gating capabilities which were set up such that power measurements were recorded only during the ON time of the transmitter.

6.4.4. Test Setup



6.4.5. Test Result

Refer to Appendix A.4.

6.5. Transmit Power Control Measurement

6.5.1. Test Limit

The U-NII device is required to have the capability to operate at least 6 dB below the mean EIRP value of 30 dBm.

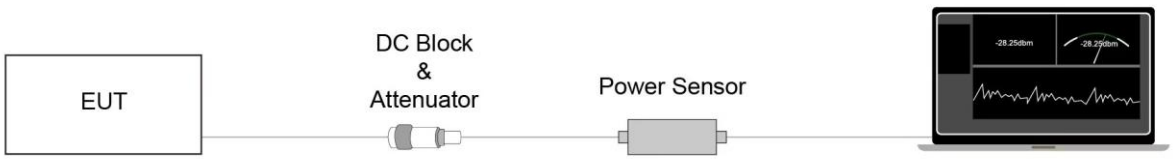
6.5.2. Test Procedure

KDB 789033 D02v01- Section II)E)3)b) Method PM-G

6.5.3. Test Setting

Average power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The power meter implemented triggering and gating capabilities which were set up such that power measurements were recorded only during the ON time of the transmitter. The trace was averaged over 100 traces to obtain the final measured average power.

6.5.4. Test Setup



6.5.5. Test Result

The maximum e.i.r.p. is less than 500mW, so TPC function is not required.

6.6. Power Spectral Density Measurement

6.6.1. Test Limit

For client devices in the 5.15-5.25 GHz band, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band.

For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band.

For the band 5.725-5.85 GHz, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band.

If transmitting antennas of directional gain greater than 6dBi are used, the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

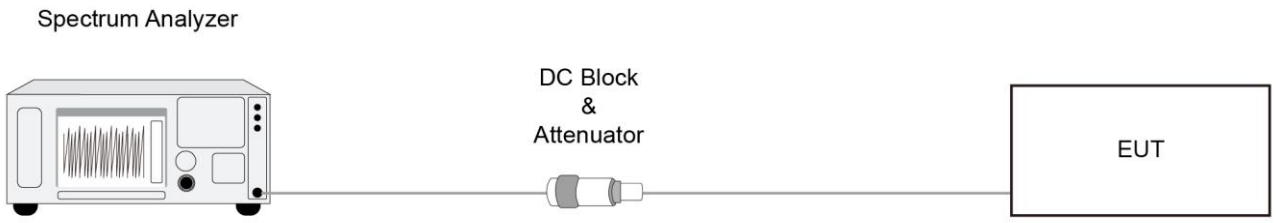
6.6.2. Test Procedure

KDB 789033 D02v02r01-Section Ⅱ)F)

6.6.3. Test Setting

1. Analyzer was set to the center frequency of the UNII channel under investigation
2. Span was set to encompass the entire 26dB EBW of the signal
3. RBW = 1MHz (510kHz, if measurement bandwidth of Maximum PSD is specified in 500 kHz)
4. VBW = 3MHz
5. Number of sweep points ≥ 2 × (span / RBW)
6. Detector = power averaging (Average)
7. Sweep time = auto
8. Trigger = free run
9. Trace average at least 100 traces in power averaging (rms) mode; however, the number of traces to be averaged shall be increased above 100 as needed to ensure that the average accurately represents the true average over the on and off periods of the transmitter.
10. Use the peak search function on the instrument to find the peak of the spectrum and record its value.
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 (because the measurement represents an average over both the on and off times of the transmission). For example, add 10*log(1/0.25) = 6 dB if the duty cycle is 25 percent.

6.6.4. Test Setup



6.6.5. Test Result

Refer to Appendix A.5.

6.7. Frequency Stability Measurement

6.7.1. Test Limit

Manufactures of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

6.7.2. Test Procedure

Frequency Stability Under Temperature Variations:

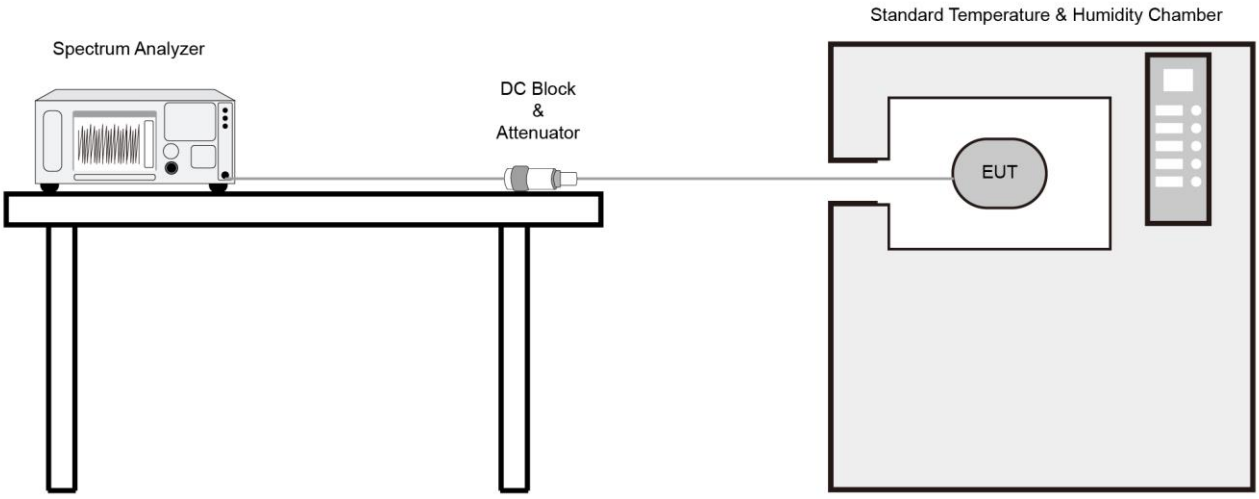
The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 20°C operating frequency as reference frequency. Turn EUT off and set the chamber temperature to highest. After the temperature stabilized for approximately 30 minutes recorded the frequency. Repeat step measure with 10°C decreased per stage until the lowest temperature reached.

Frequency Stability Under Voltage Variations:

Set chamber temperature to 20°C. Use a variable AC power supply / DC power source to power the EUT and set the voltage to rated voltage. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency.

Reduce the input voltage to specify extreme voltage variation (±15%) and endpoint, record the maximum frequency change.

6.7.3. Test Setup



6.7.4. Test Result

Refer to Appendix A.6.

6.8. Radiated Spurious Emission Measurement

6.8.1. Test Limit

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR must not exceed the limits shown in Table per Section 15.209.

FCC Part 15 Subpart C Paragraph 15.209		
Frequency [MHz]	Field Strength [uV/m]	Measured Distance [Meters]
0.009 - 0.490	2400/F (kHz)	300
0.490 - 1.705	24000/F (kHz)	30
1.705 - 30	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

6.8.2. Test Procedure

KDB 789033 D02v02r01- Section II)G)

6.8.3. Test Setting

Table 1 - RBW as a function of frequency

Frequency	RBW
9 ~ 150 kHz	200 ~ 300 Hz
0.15 ~ 30 MHz	9 ~ 10 kHz
30 ~ 1000 MHz	100 ~ 120 kHz
> 1000MHz	1MHz

Quasi-Peak Measurements below 1GHz

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest

2. Span was set greater than 1MHz

3. RBW = as specified in Table 1

4. Detector = CISPR quasi-peak

5. Sweep time = auto couple

6. Trace was allowed to stabilize

Peak Measurements above 1GHz

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest

2. RBW = 1MHz

3. VBW = 3MHz

4. Detector = peak

5. Sweep time = auto couple

6. Trace mode = max hold

7. Trace was allowed to stabilize

Average Measurements above 1GHz (Method VB)

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest

2. RBW = 1MHz

3. VBW; If the EUT is configured to transmit with duty cycle ≥ 98%, set VBW = 10 Hz.

If the EUT duty cycle is < 98%, set VBW ≥ 1/T. T is the minimum transmission duration.

4. Detector = Peak

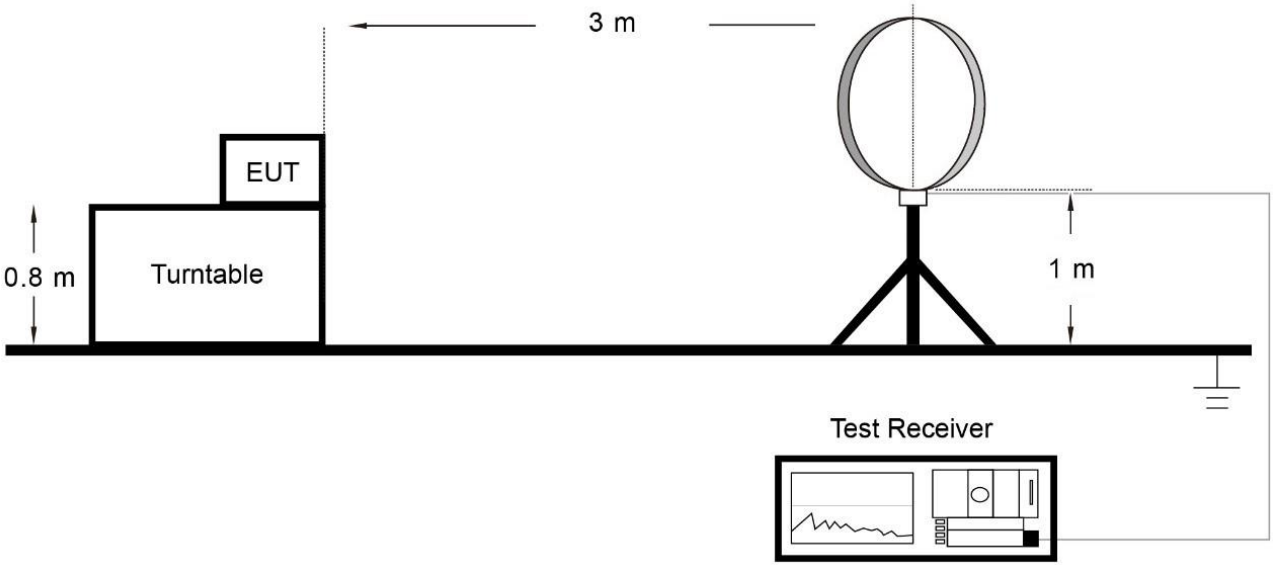
5. Sweep time = auto

6. Trace mode = max hold

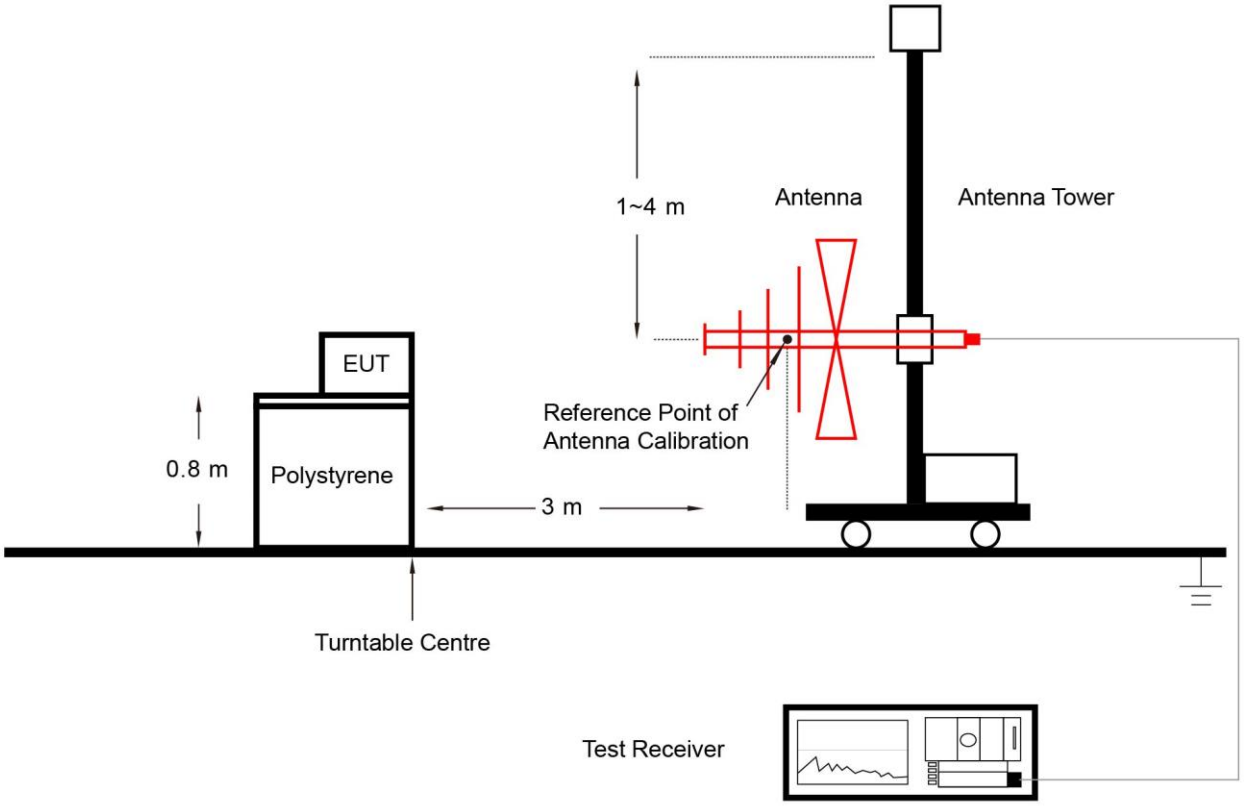
7. Trace was allowed to stabilize

6.8.4. Test Setup

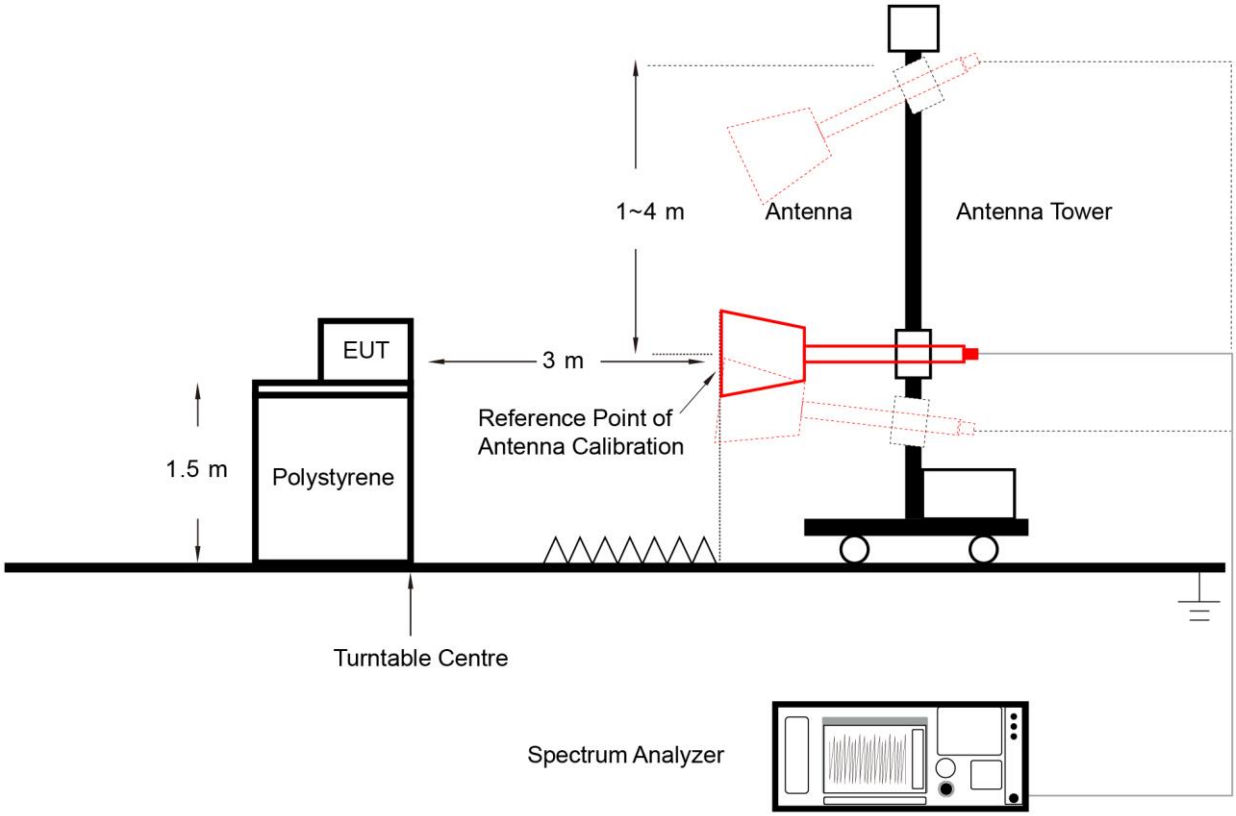
Below 30MHz Test Setup:



Below 1GHz Test Setup:



Above 1GHz Test Setup:



6.8.5. Test Result

Refer to Appendix A.7.

6.9. Radiated Restricted Band Edge Measurement

6.9.1. Test Limit

For 15.205 requirement:

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a) of FCC part 15, must also comply with the radiated emission limits specified in Section 15.209(a).

Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (GHz)
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1] 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	([2])
13.36 - 13.41	--	--	--

For 15.407(b) requirement:

For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

For transmitters operating in the 5.725-5.85 GHz band: All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

Refer to KDB 789033 D02v02r01 G)2)c), as specified in § 15.407(b), emissions above 1000 MHz that are outside of the restricted bands are subject to a maximum emission limit of -27 dBm/MHz (or -17 dBm/MHz as specified in § 15.407(b)(4)). However, an out-of-band emission that complies with both the peak and average limits of § 15.209 is not required to satisfy the -27 dBm/MHz or -17 dBm/MHz maximum emission limit.

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47CFR must not exceed the limits shown in Table per Section 15.209.

FCC Part 15 Subpart C Paragraph 15.209		
Frequency [MHz]	Field Strength [uV/m]	Measured Distance [Meters]
0.009 - 0.490	2400/F (kHz)	300
0.490 - 1.705	24000/F (kHz)	30
1.705 - 30	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

6.9.2. Test Procedure

KDB 789033 D02v02r01- Section II)G)

6.9.3. Test Setting

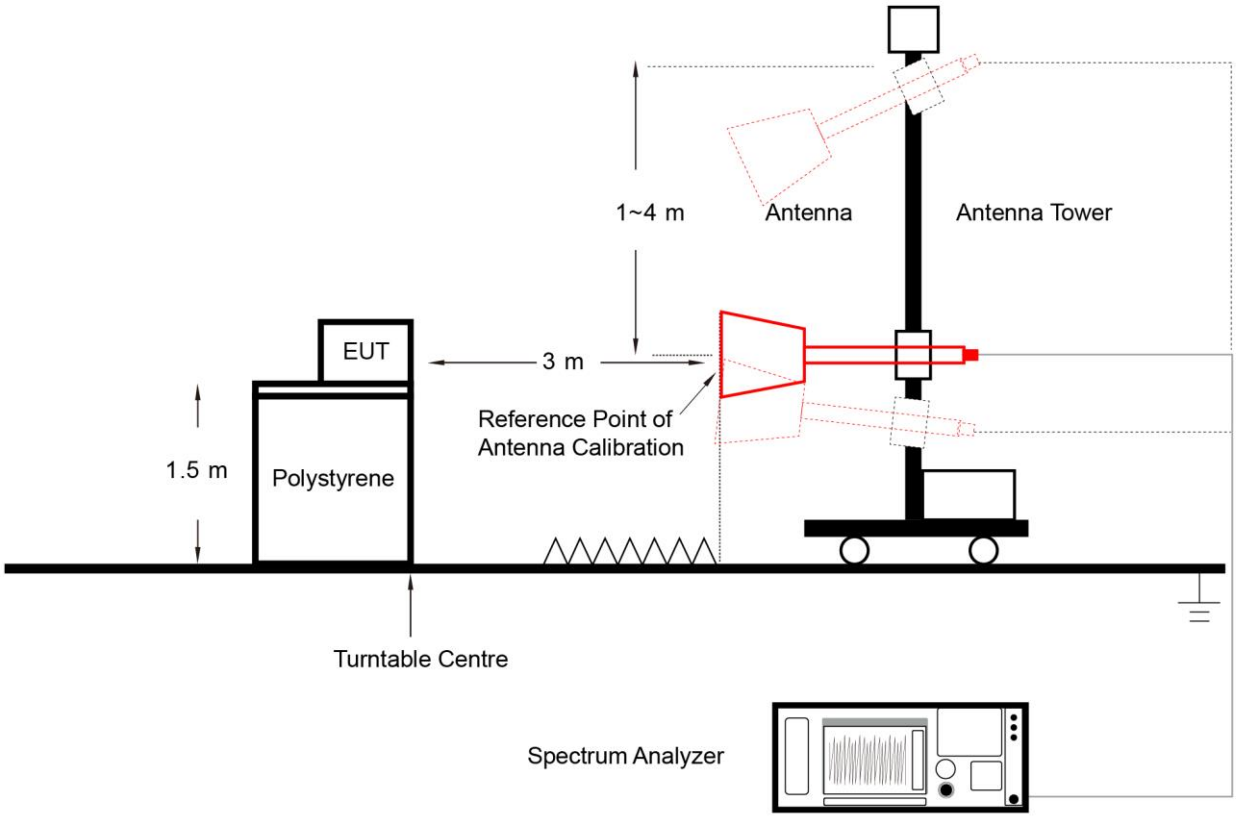
Peak Measurements above 1GHz

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = Peak
5. Sweep time = Auto couple
6. Trace mode = Max hold
7. Trace was allowed to stabilize

Average Measurements above 1GHz (Method VB)

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW; if the EUT is configured to transmit with duty cycle ≥ 98%, set VBW = 10Hz
4. If the EUT duty cycle is < 98%, set VBW ≥ 1/T. T is the minimum transmission duration
5. Detector = Peak
6. Sweep time = Auto
7. Trace mode = Max hold
8. Trace was allowed to stabilize

6.9.4. Test Setup



6.9.5. Test Result

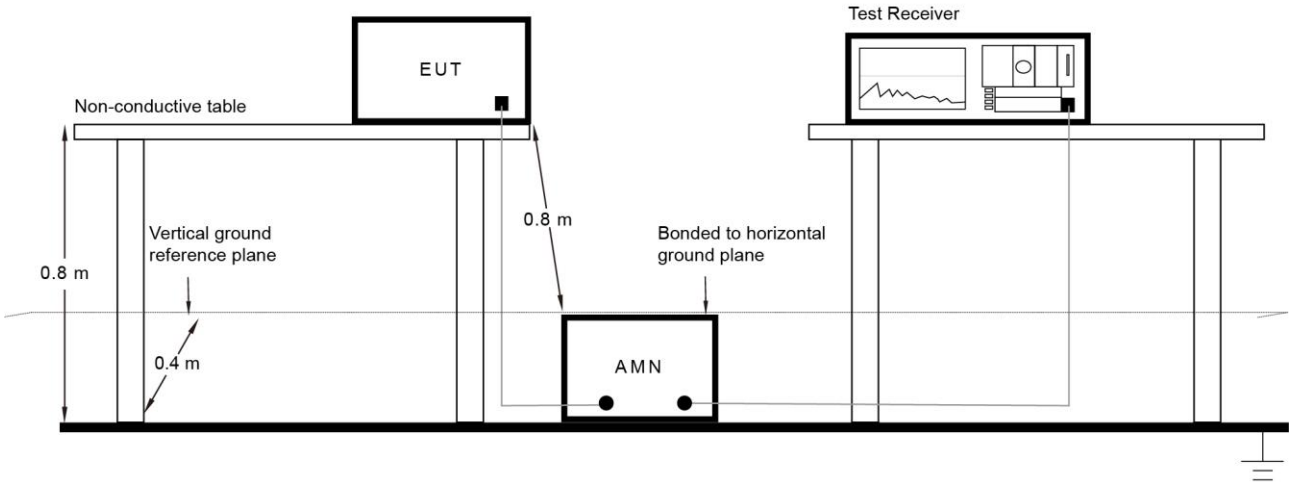
Refer to Appendix A.8.

6.10. AC Conducted Emissions Measurement

6.10.1. Test Limit

FCC Part 15.207 Limits		
Frequency (MHz)	QP (dBuV)	AV (dBuV)
0.15 - 0.50	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30	60	50
Note 1: The lower limit shall apply at the transition frequencies.		
Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz.		

6.10.2. Test Setup



6.10.3. Test Result

Refer to Appendix A.9.

Appendix A – Test Result

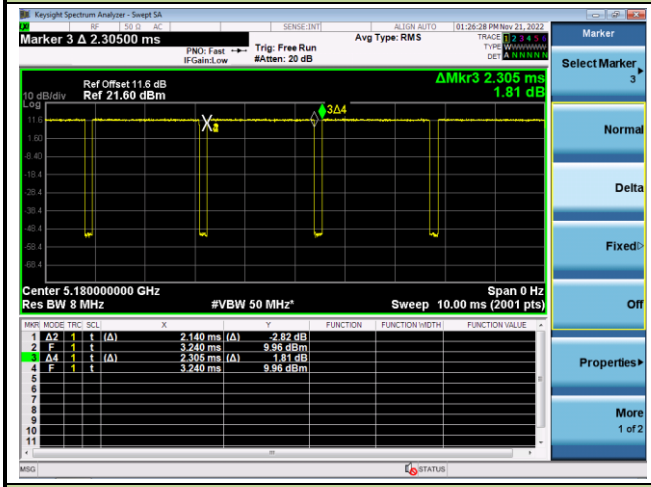
A.1 Duty Cycle Test Result

Test Site	WZ-SR5	Test Engineer	Lynn Yang
Test Date	2022-11-21		

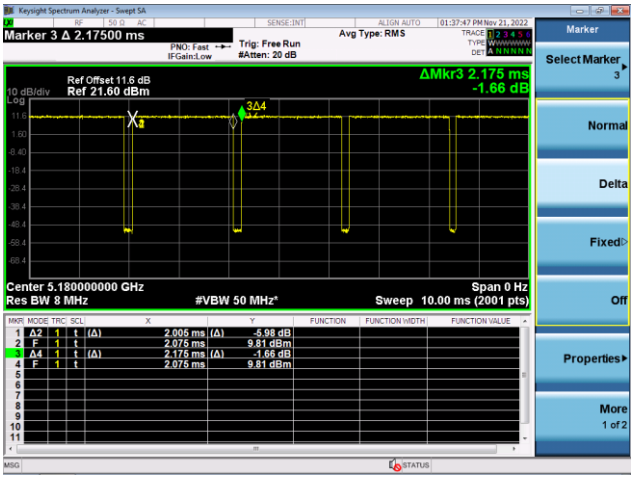
Test Mode	Duty Cycle	Test Mode	Duty Cycle
802.11a	92.84%	802.11ac-VHT20	92.18%
802.11ac-VHT40	84.92%	802.1ac-VHT80	80.25%

Duty Cycle (T = Transmission Duration)

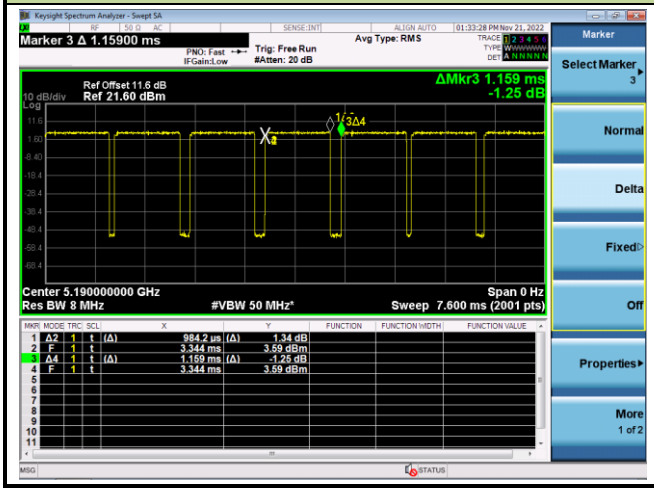
802.11a (T = 2.140ms)



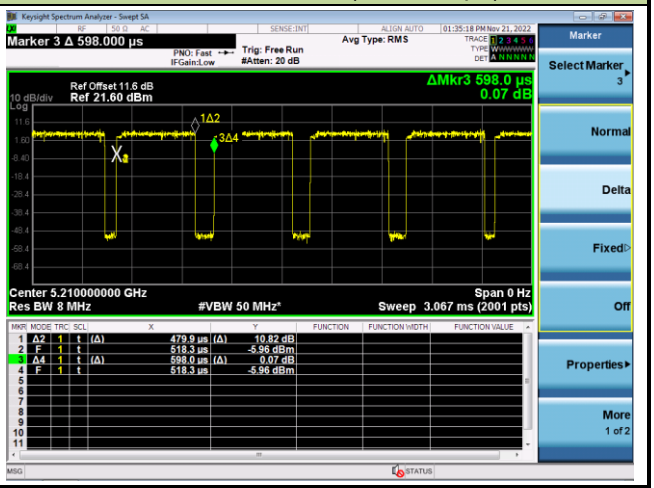
802.11ac-VHT20 (T = 2.005ms)



802.11ac-VHT40 (T = 984.2μs)



802.11ac-VHT80 (T =479.9μs)



A.2 26dB & 99% Bandwidth Test Result

Test Site	WZ-SR5	Test Engineer	Lynn Yang
Test Date	2022-12-16		

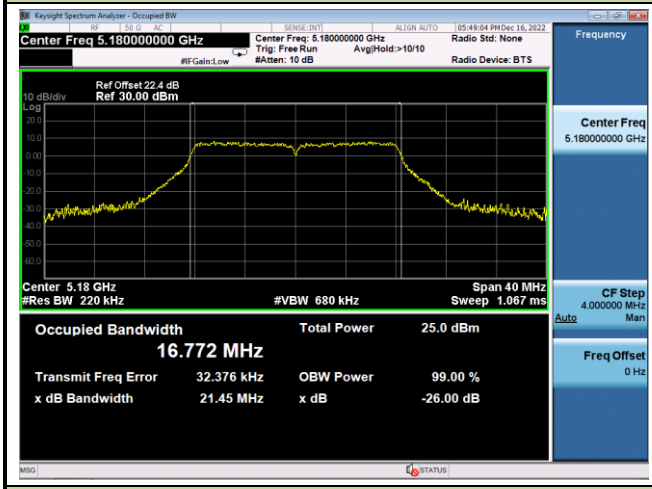
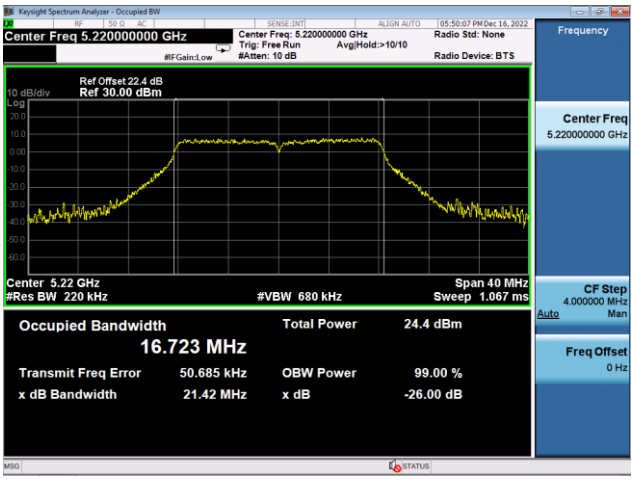
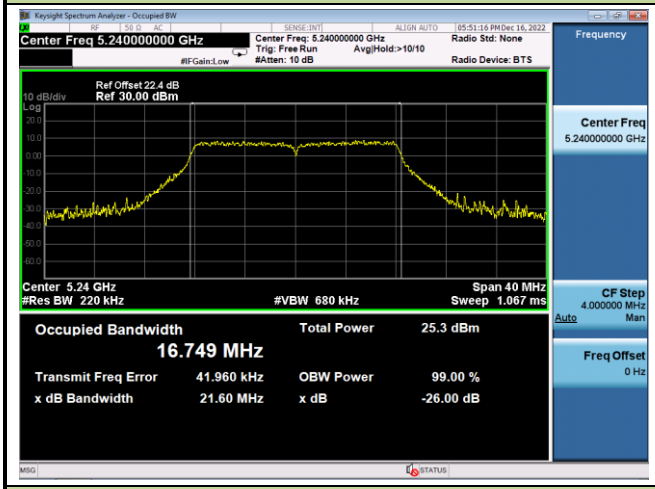
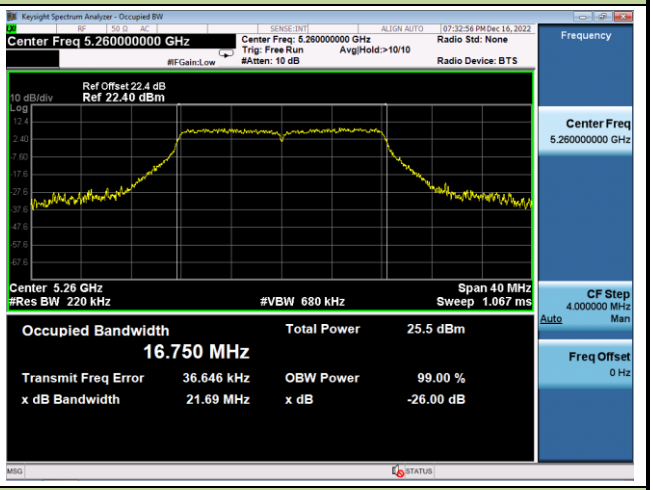
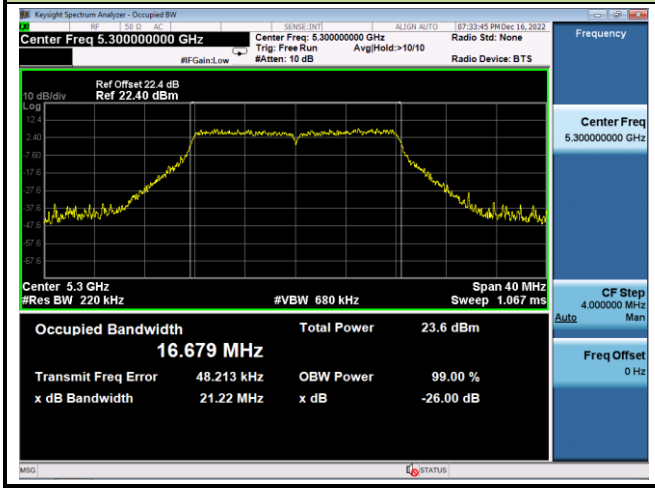
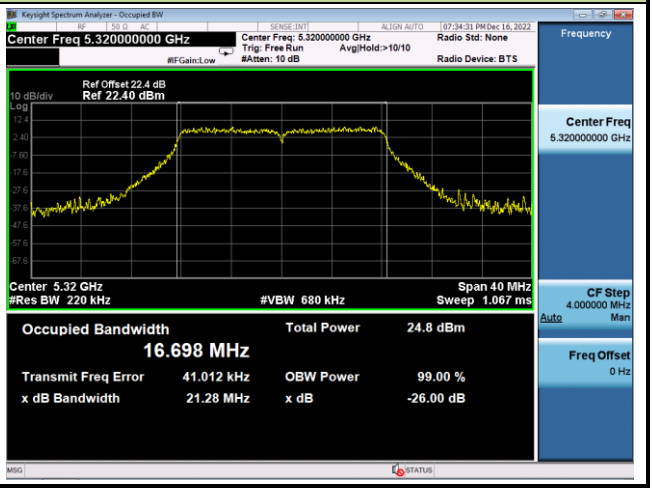
Test Mode	Data Rate/ MCS	Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
802.11a	6Mbps	36	5180	21.45	16.772
802.11a	6Mbps	44	5220	21.42	16.723
802.11a	6Mbps	48	5240	21.60	16.749
802.11a	6Mbps	52	5260	21.69	16.750
802.11a	6Mbps	60	5300	21.22	16.679
802.11a	6Mbps	64	5320	21.28	16.698
802.11a	6Mbps	100	5500	21.37	16.674
802.11a	6Mbps	116	5580	21.99	16.788
802.11a	6Mbps	140	5700	21.65	16.741
802.11a	6Mbps	149	5745	21.25	16.700
802.11a	6Mbps	157	5785	21.35	16.714
802.11a	6Mbps	165	5825	21.67	16.678
802.11ac-VHT20	MCS0	36	5180	22.11	17.797
802.11ac-VHT20	MCS0	44	5220	21.86	17.804
802.11ac-VHT20	MCS0	48	5240	21.73	17.764
802.11ac-VHT20	MCS0	52	5260	21.41	17.738
802.11ac-VHT20	MCS0	60	5300	21.59	17.746
802.11ac-VHT20	MCS0	64	5320	21.74	17.779
802.11ac-VHT20	MCS0	100	5500	21.73	17.744
802.11ac-VHT20	MCS0	116	5580	21.89	17.769
802.11ac-VHT20	MCS0	140	5700	21.52	17.756
802.11ac-VHT20	MCS0	149	5745	22.02	17.763
802.11ac-VHT20	MCS0	157	5785	22.04	17.750
802.11ac-VHT20	MCS0	165	5825	21.97	17.763

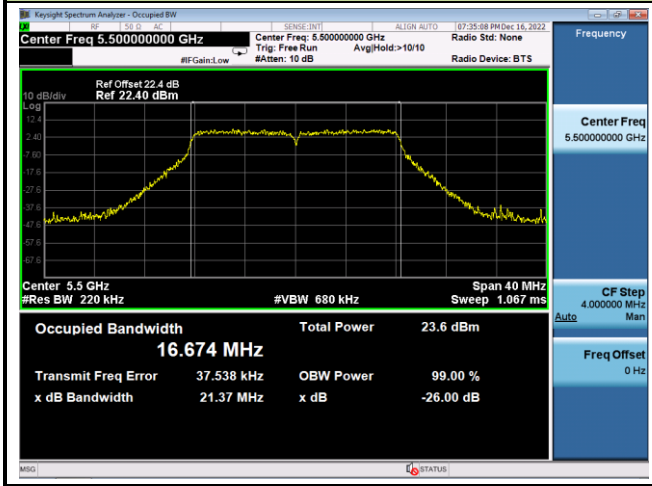
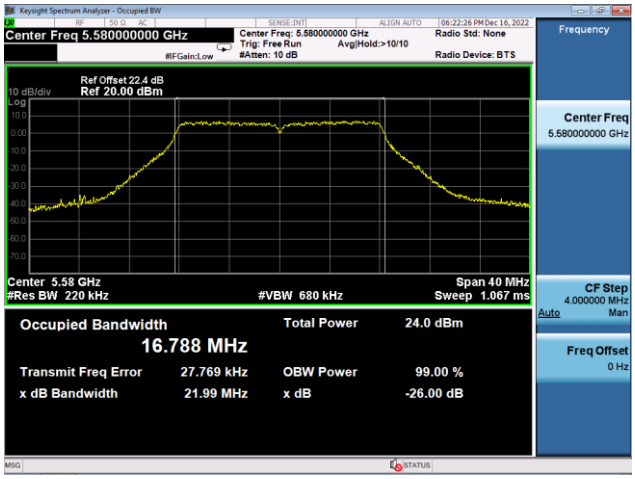
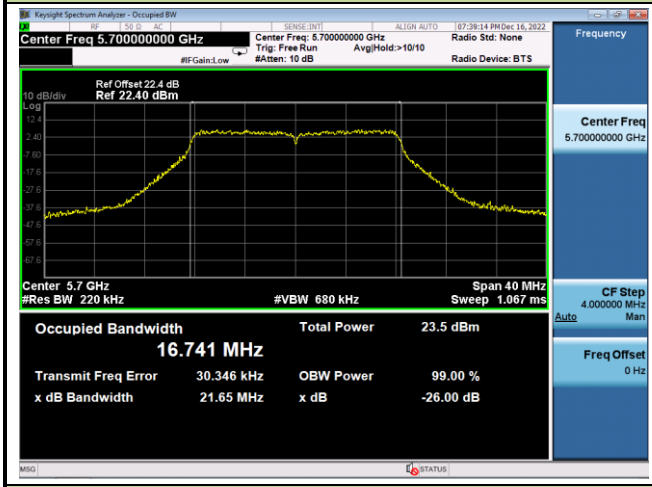
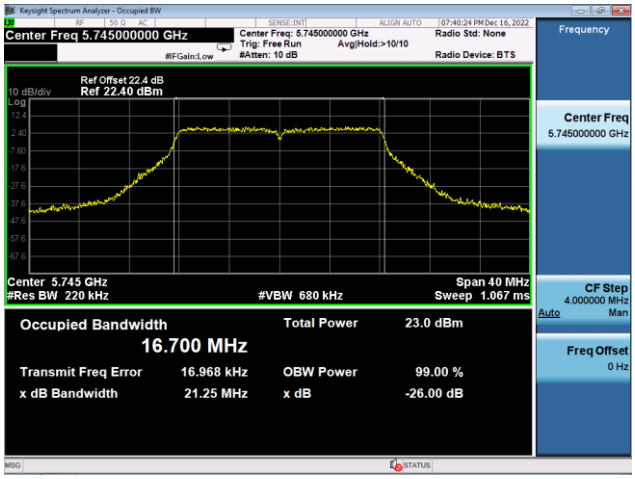
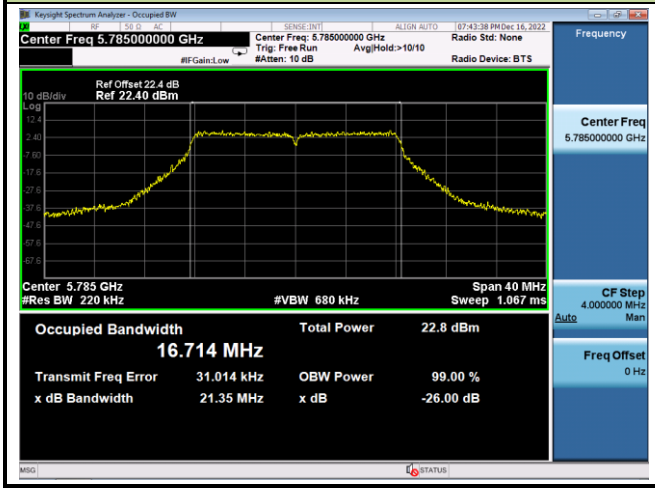
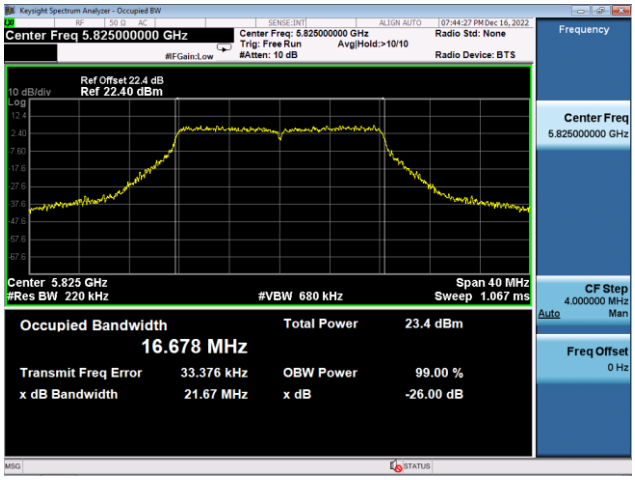
Test Mode	Data Rate/ MCS	Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
802.11ac-VHT40	MCS0	38	5190	44.59	36.630
802.11ac-VHT40	MCS0	46	5230	43.46	36.496
802.11ac-VHT40	MCS0	54	5270	43.04	36.433
802.11ac-VHT40	MCS0	62	5310	43.20	36.501
802.11ac-VHT40	MCS0	102	5510	43.80	36.530
802.11ac-VHT40	MCS0	110	5550	43.64	36.502
802.11ac-VHT40	MCS0	134	5670	44.25	36.506
802.11ac-VHT40	MCS0	151	5755	42.59	36.449
802.11ac-VHT40	MCS0	159	5795	43.17	36.435
802.11ac-VHT80	MCS0	42	5210	81.07	75.300
802.11ac-VHT80	MCS0	58	5290	81.25	75.164
802.11ac-VHT80	MCS0	106	5530	80.71	75.235
802.11ac-VHT80	MCS0	122	5610	81.34	75.195
802.11ac-VHT80	MCS0	155	5775	81.37	75.134

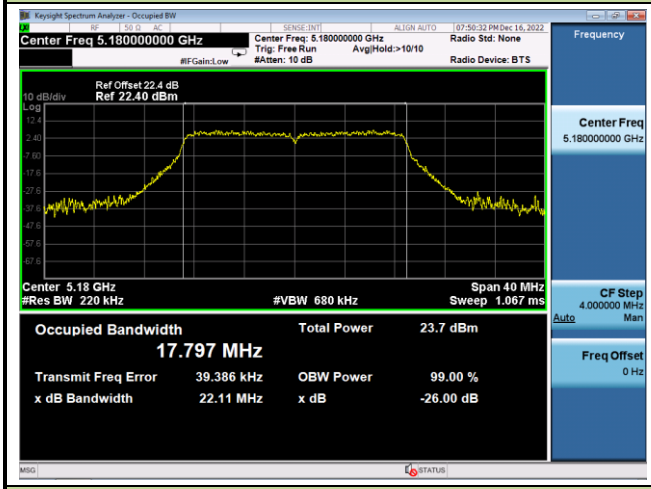
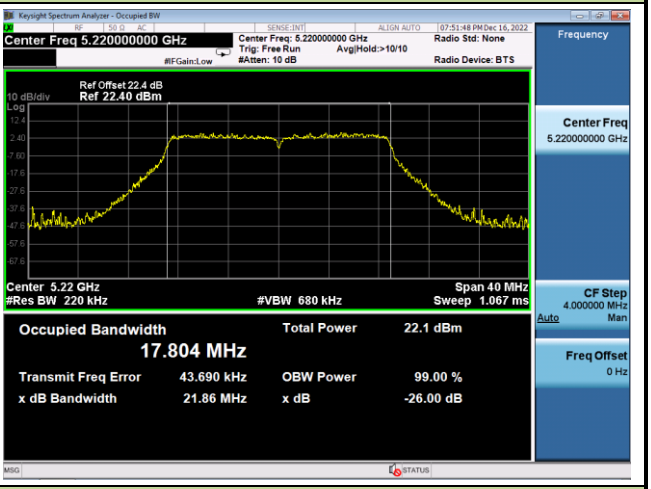
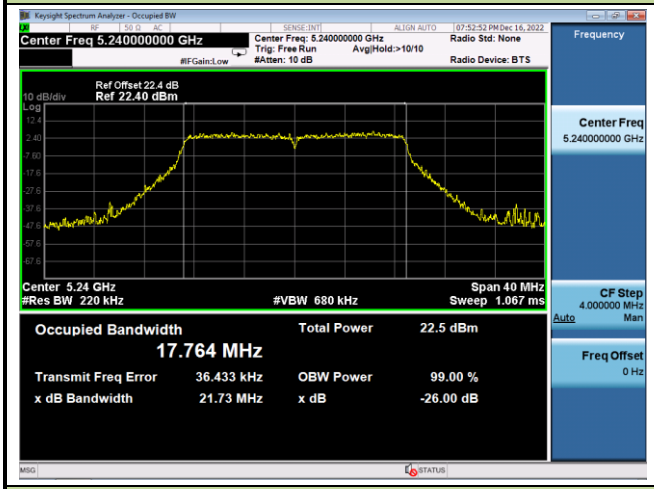
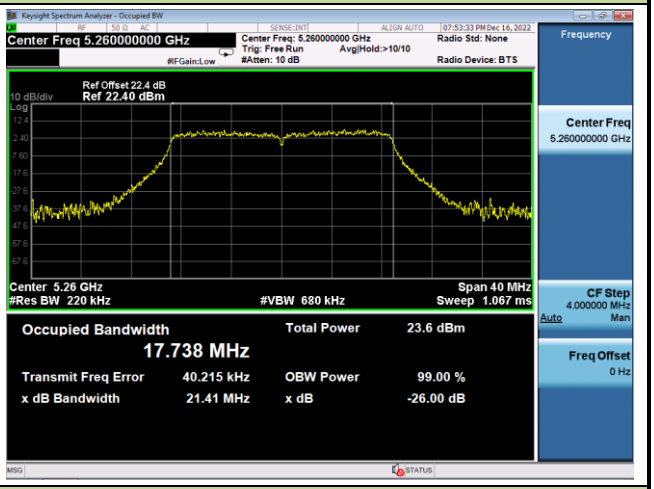
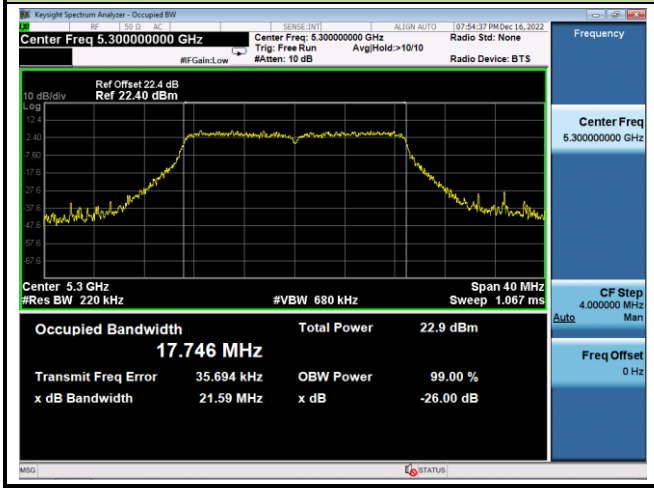
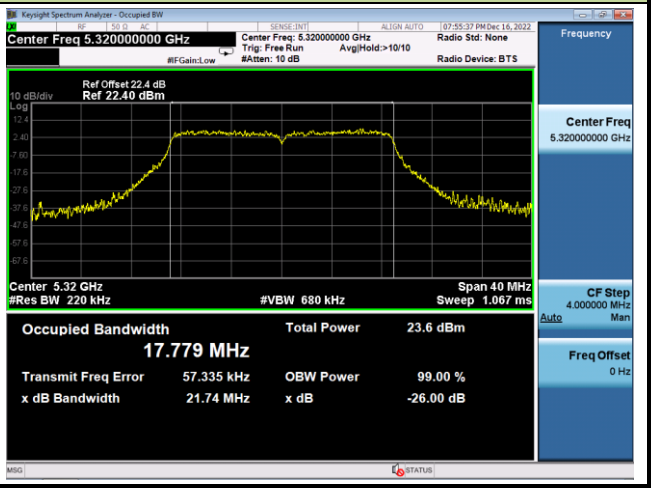
Test Mode	Data Rate/ MCS	Channel No.	Frequency (MHz)	F_H (MHz)	Limit (MHz)
802.11a	6Mbps	48	5240	5248.375	< 5250
802.11ac-VHT20	MCS0	48	5240	5248.882	< 5250
802.11ac-VHT40	MCS0	46	5230	5248.248	< 5250
802.11ac-VHT80	MCS0	42	5210	5247.650	< 5250

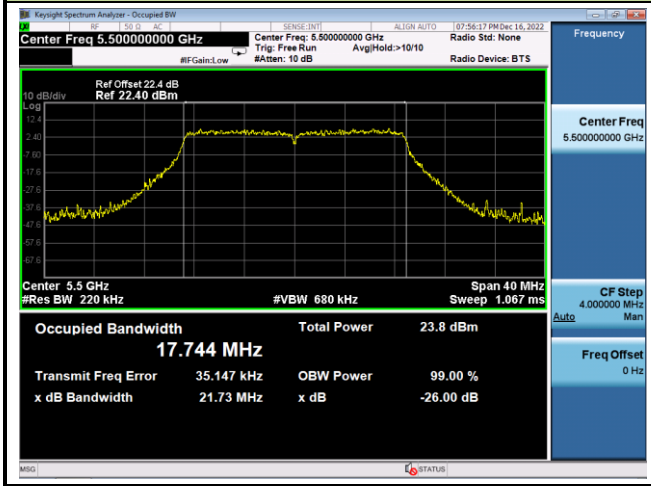
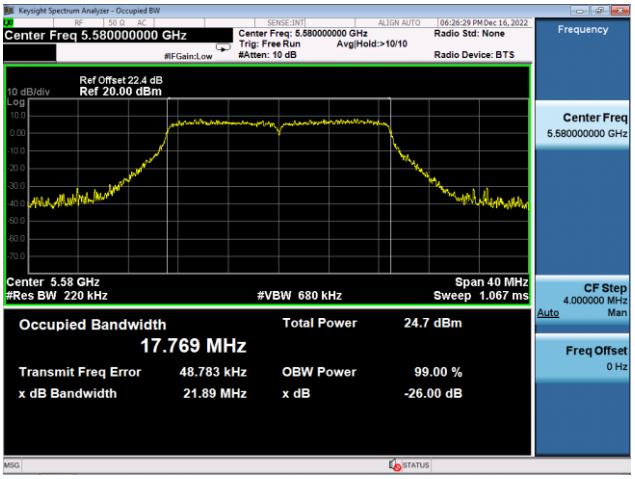
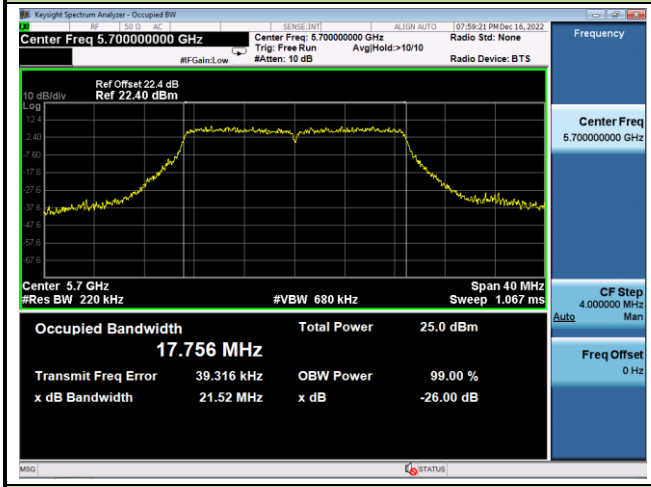
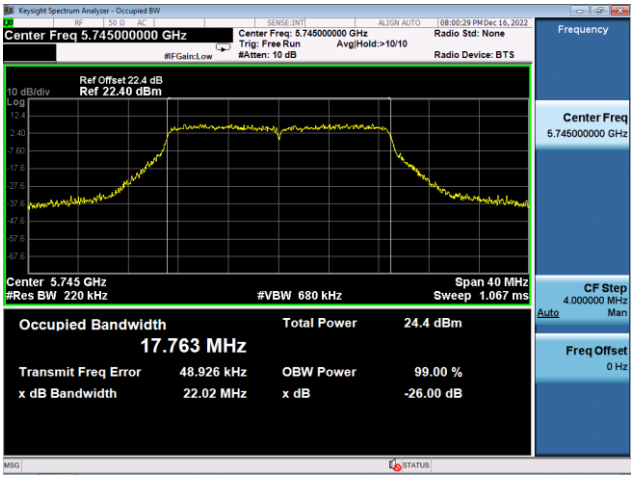
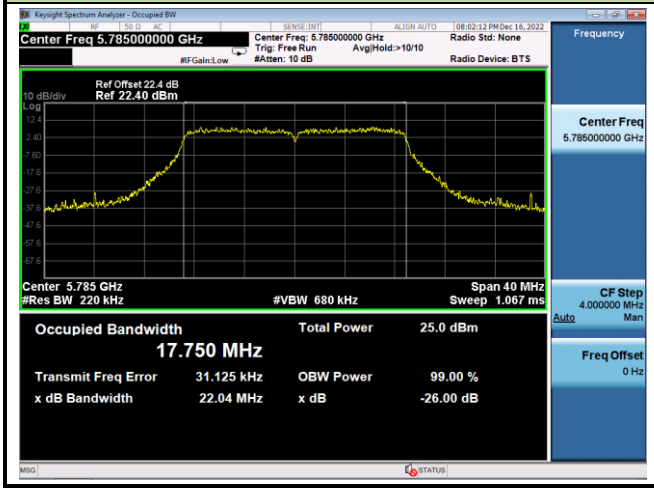
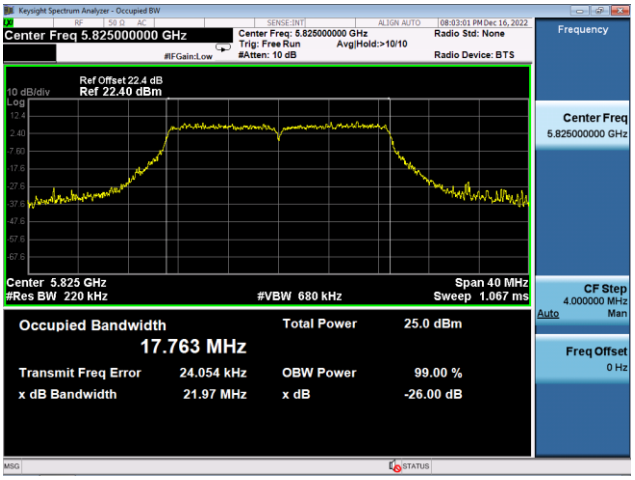
Note: F_H = Centre frequency + 99% OBW / 2

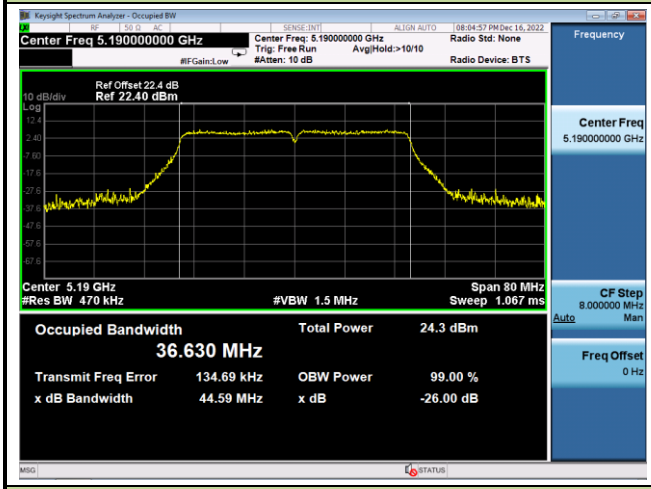
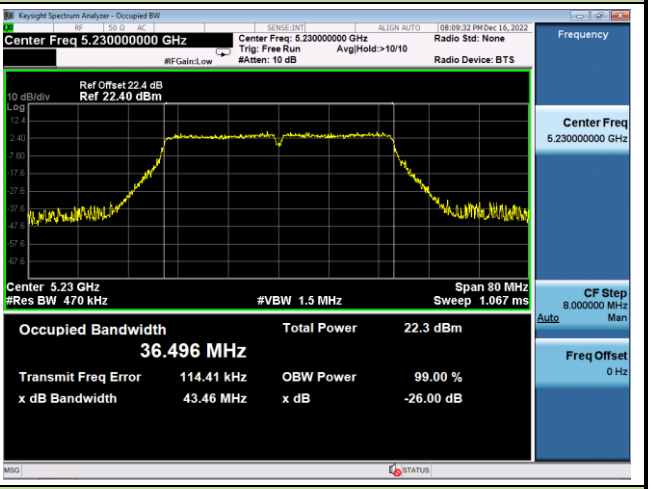
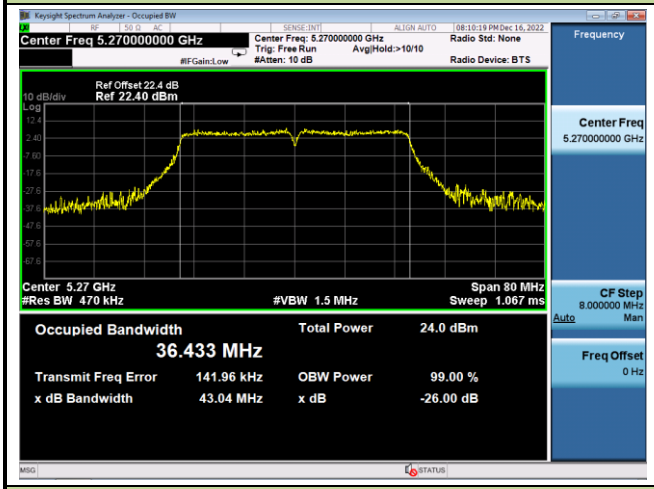
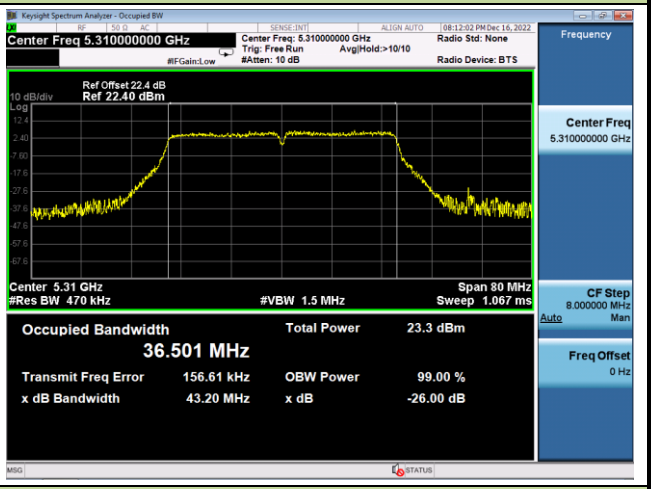
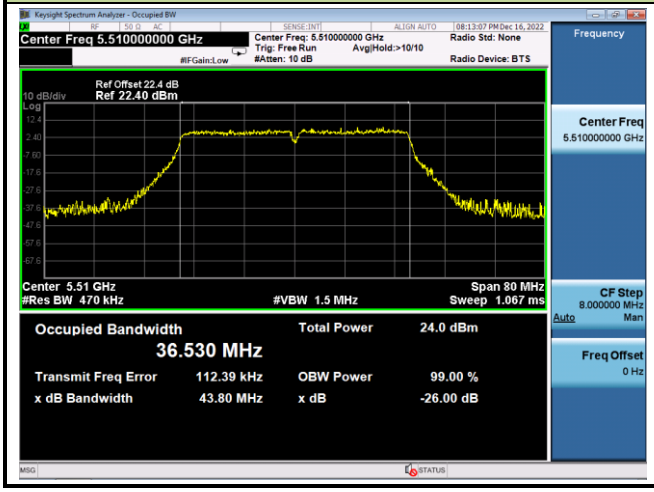
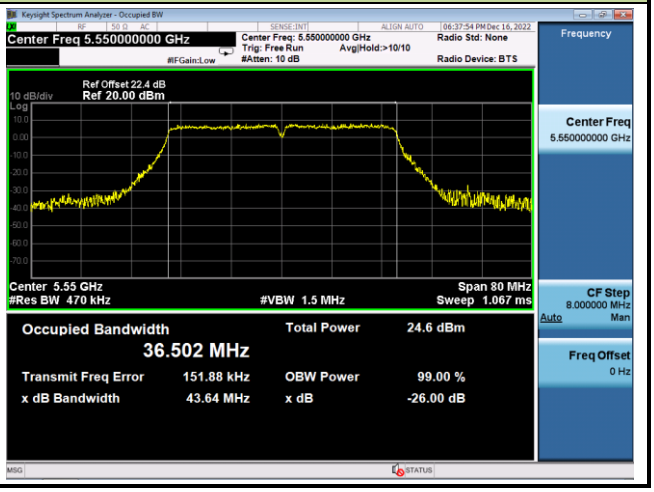
For example, 802.11a 5240MHz, F_H = 5240 MHz + 16.749 MHz / 2 = 5248.375 MHz.

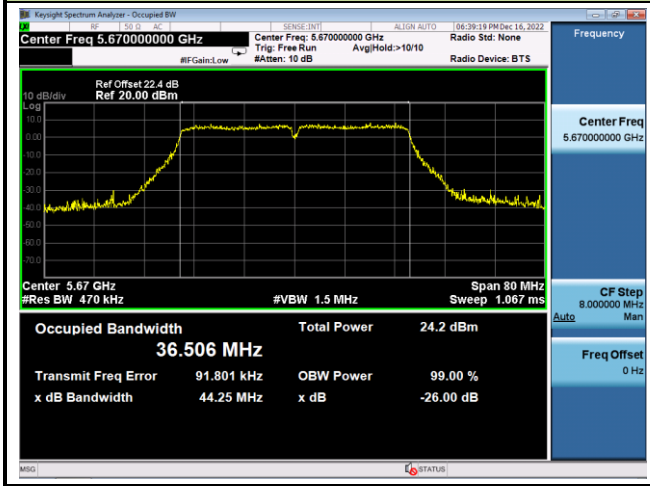
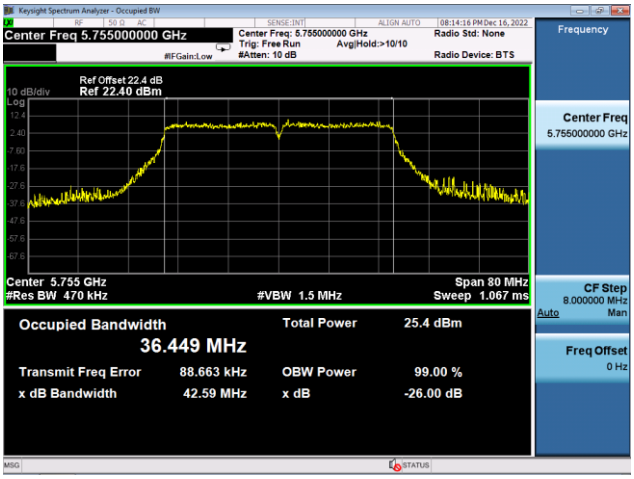
802.11a 26dB & 99% Bandwidth	
Channel 36 (5180MHz)	Channel 44 (5220MHz)
	
Channel 48 (5240MHz)	Channel 52 (5260MHz)
	
Channel 60 (5300MHz)	Channel 64 (5320MHz)
	

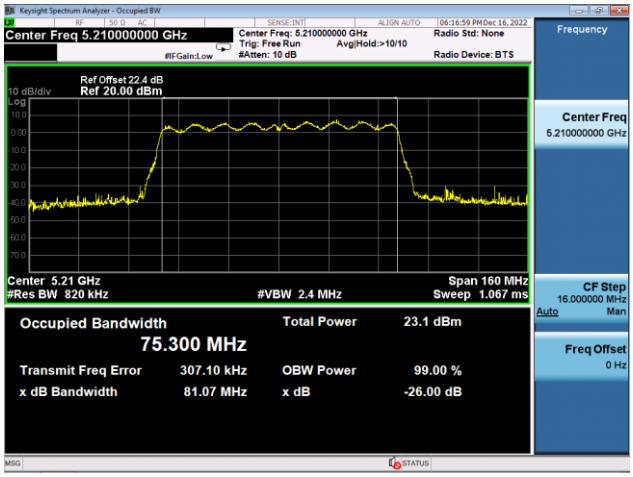
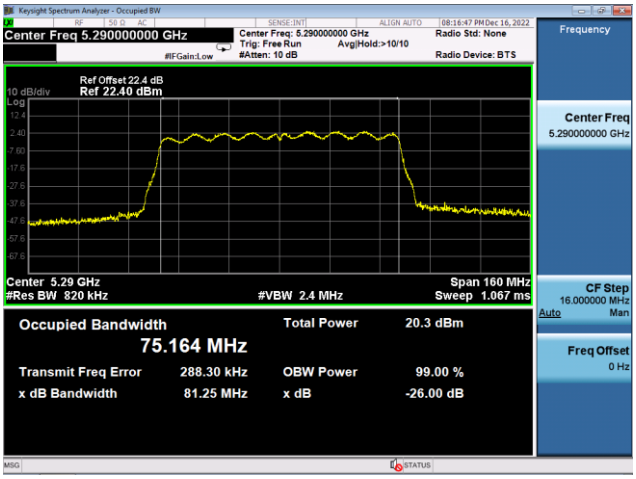
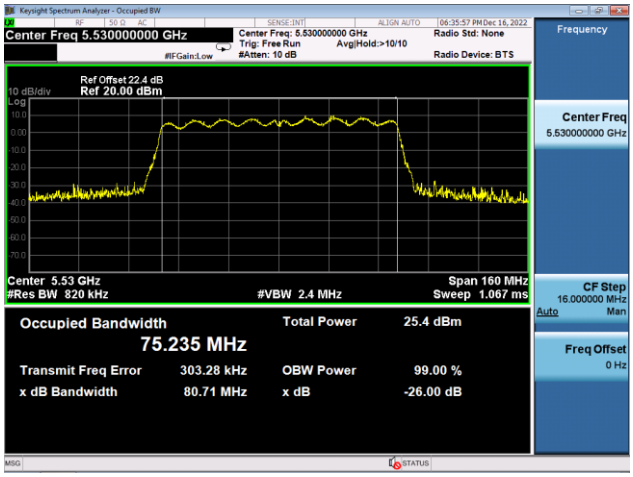
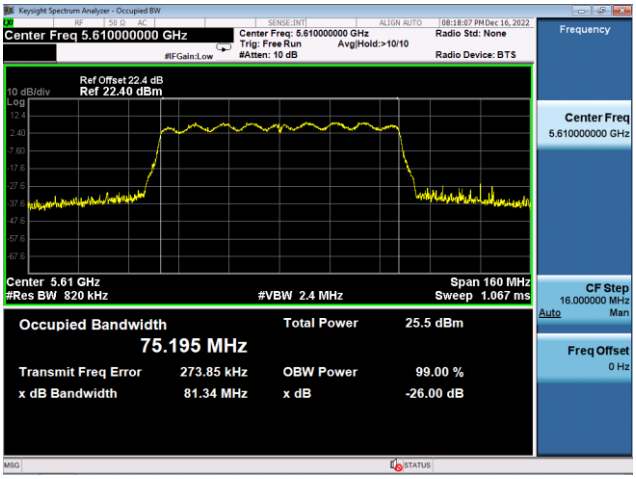
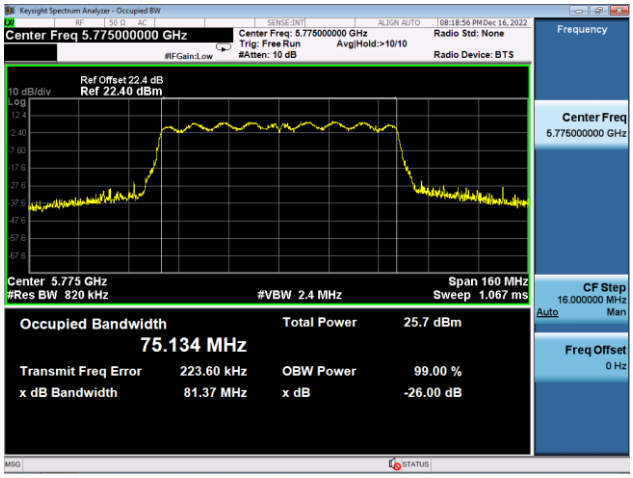
Channel 100 (5500MHz)	Channel 116 (5580MHz)
	
Channel 140 (5700MHz)	**Channel 149 (5745MHz)**
	
Channel 157 (5785MHz)	**Channel 165 (5825MHz)**
	

802.11ac-VHT20 26dB & 99% Bandwidth	
Channel 36 (5180MHz)	Channel 44 (5220MHz)
	
Channel 48 (5240MHz)	Channel 52 (5260MHz)
	
Channel 60 (5300MHz)	Channel 64 (5320MHz)
	

Channel 100 (5500MHz)	Channel 116 (5580MHz)
	
Channel 140 (5700MHz)	**Channel 149 (5745MHz)**
	
Channel 157 (5785MHz)	**Channel 165 (5825MHz)**
	

802.11ac-VHT40 26dB & 99% Bandwidth	
Channel 38 (5190MHz)	Channel 46 (5230MHz)
	
Channel 54 (5270MHz)	Channel 62 (5310MHz)
	
Channel 102 (5510MHz)	Channel 110 (5550MHz)
	

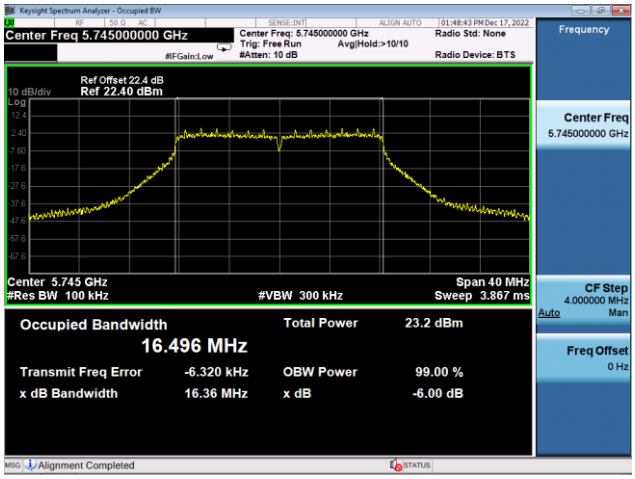
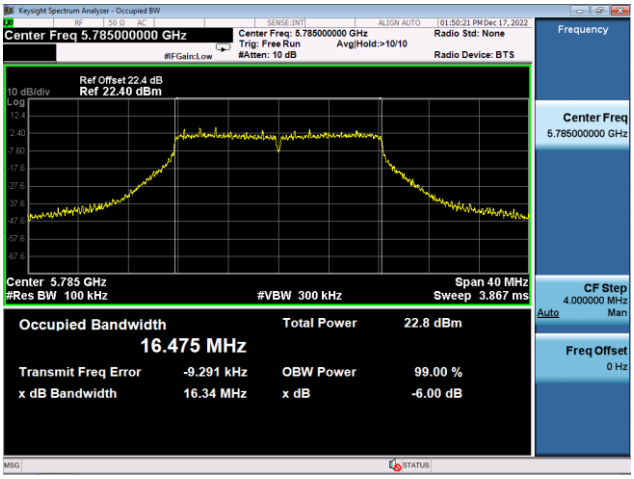
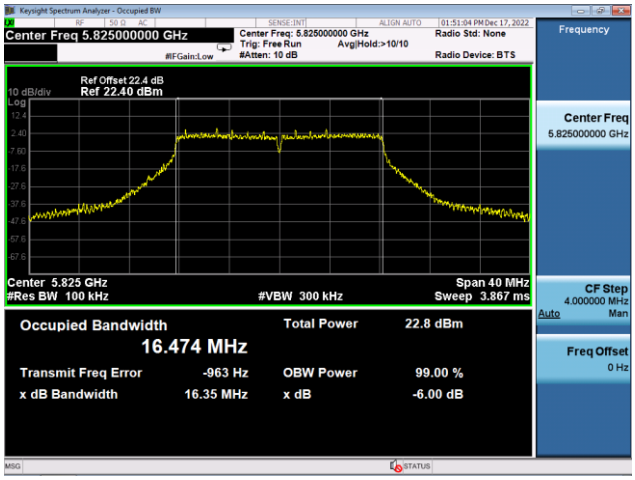
Channel 134 (5670MHz)	Channel 151 (5755MHz)
	
Channel 159 (5795MHz)	
	

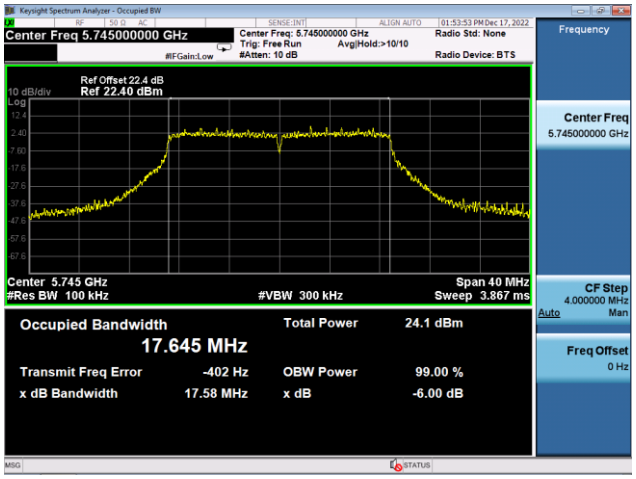
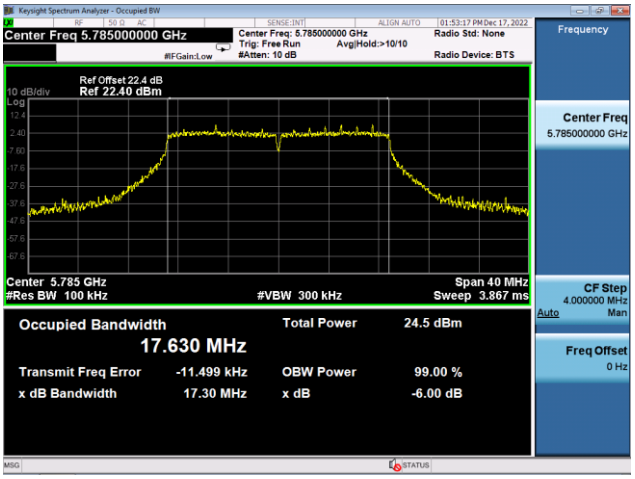
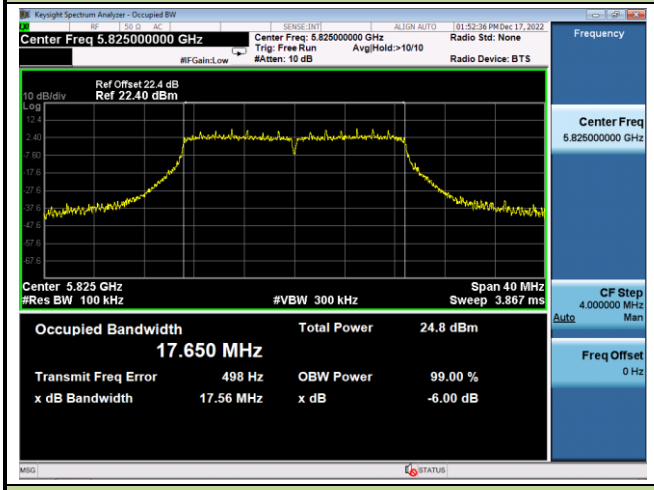
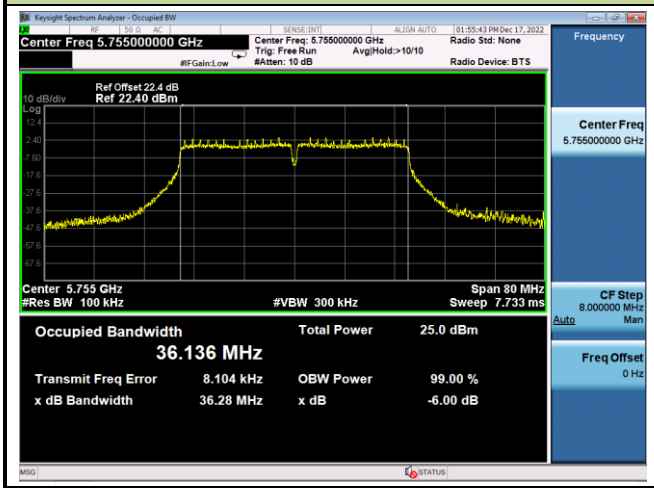
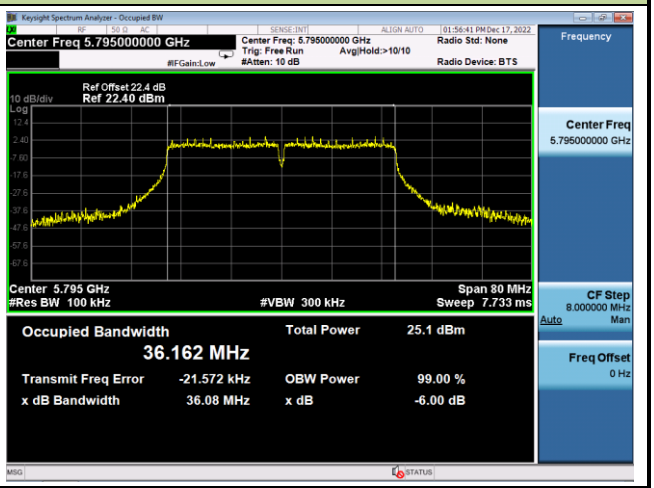
802.11ac-VHT80 26dB & 99% Bandwidth	
Channel 42 (5210MHz)	Channel 58 (5290MHz)
	
Channel 106 (5530MHz)	Channel 122 (5610MHz)
	
Channel 155 (5775MHz)	
	

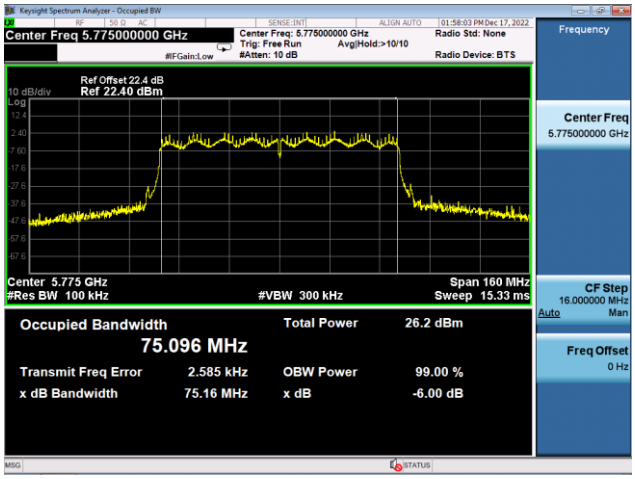
A.3 6dB Bandwidth Test Result

Test Site	WZ-SR5	Test Engineer	Lynn Yang
Test Date	2022-12-17		

Test Mode	Data Rate/ MCS	Channel No.	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Result
802.11a	6Mbps	149	5745	16.36	≥ 0.5	Pass
802.11a	6Mbps	157	5785	16.34	≥ 0.5	Pass
802.11a	6Mbps	165	5825	16.35	≥ 0.5	Pass
802.11ac-VHT20	MCS0	149	5745	17.58	≥ 0.5	Pass
802.11ac-VHT20	MCS0	157	5785	17.30	≥ 0.5	Pass
802.11ac-VHT20	MCS0	165	5825	17.56	≥ 0.5	Pass
802.11ac-VHT40	MCS0	151	5755	36.28	≥ 0.5	Pass
802.11ac-VHT40	MCS0	159	5795	36.08	≥ 0.5	Pass
802.11ac-VHT80	MCS0	155	5775	75.16	≥ 0.5	Pass

802.11a 6dB Bandwidth	
Channel 149 (5745MHz)	Channel 157 (5785MHz)
	
Channel 165 (5825MHz)	
	

802.11ac-VHT20 6dB Bandwidth	
Channel 149 (5745MHz)	Channel 157 (5785MHz)
	
Channel 165 (5825MHz)	
	
802.11ac-VHT40 6dB Bandwidth	
Channel 151 (5755MHz)	Channel 159 (5795MHz)
	

802.11ac-VHT80 6dB Bandwidth	
Channel 155 (5775MHz)	
	

A.4 Output Power Test Result

Test Site	WZ-SR5	Test Engineer	Lynn Yang
Test Date	2022-11-22 ~ 2022-12-09	Test Mode	802.11a

Test Mode	Data Rate/ MCS	Ch. No.	Freq. (MHz)	Average Power (dBm)	Average Power Limit (dBm)	EIRP (dBm)
11a	6Mbps	36	5180	18.71	≤ 23.98	21.71
11a	6Mbps	44	5220	18.63	≤ 23.98	21.63
11a	6Mbps	48	5240	18.80	≤ 23.98	21.80
11a	6Mbps	52	5260	18.65	≤ 23.98	21.65
11a	6Mbps	60	5300	18.70	≤ 23.98	21.70
11a	6Mbps	64	5320	18.86	≤ 23.98	21.86
11a	6Mbps	100	5500	17.06	≤ 23.98	20.06
11a	6Mbps	116	5580	16.73	≤ 23.98	19.73
11a	6Mbps	140	5700	16.38	≤ 23.98	19.38
11a	6Mbps	149	5745	15.38	≤ 30.00	18.38
11a	6Mbps	157	5785	15.90	≤ 30.00	18.90
11a	6Mbps	165	5825	16.38	≤ 30.00	19.38

Note: For 5250 - 5350 & 5470 - 5725 MHz, the conducted power limit is as below, where B is the 26 dB emission bandwidth in megahertz.

$11 + 10 \log_{10} (B) > 23.98\text{dBm}$

Test Site	WZ-SR5	Test Engineer	Lynn Yang
Test Date	2022-11-22 ~ 2022-12-09	Test Mode	802.11ac

Test Mode	Data Rate/ MCS	Ch. No.	Freq. (MHz)	Ant 0 Average Power (dBm)	Ant 1 Average Power (dBm)	Total Average Power (dBm)	Power Limit (dBm)
11ac-VHT20	MCS0	36	5180	16.74	16.61	19.69	≤ 23.98
11ac-VHT20	MCS0	44	5220	16.73	16.89	19.82	≤ 23.98
11ac-VHT20	MCS0	48	5240	16.82	16.75	19.80	≤ 23.98
11ac-VHT20	MCS0	52	5260	16.87	16.64	19.77	≤ 23.98
11ac-VHT20	MCS0	60	5300	16.78	16.72	19.76	≤ 23.98
11ac-VHT20	MCS0	64	5320	16.77	16.89	19.84	≤ 23.98
11ac-VHT20	MCS0	100	5500	17.71	17.59	20.66	≤ 23.98
11ac-VHT20	MCS0	116	5580	17.72	17.54	20.64	≤ 23.98
11ac-VHT20	MCS0	140	5700	17.79	17.85	20.83	≤ 23.98
11ac-VHT20	MCS0	149	5745	17.56	17.84	20.71	≤ 30.00
11ac-VHT20	MCS0	157	5785	17.79	17.58	20.70	≤ 30.00
11ac-VHT20	MCS0	165	5825	17.76	17.84	20.81	≤ 30.00
11ac-VHT40	MCS0	38	5190	16.83	16.74	19.80	≤ 23.98
11ac-VHT40	MCS0	46	5230	16.79	16.82	19.82	≤ 23.98
11ac-VHT40	MCS0	54	5270	16.52	16.61	19.58	≤ 23.98
11ac-VHT40	MCS0	62	5310	16.61	16.84	19.74	≤ 23.98
11ac-VHT40	MCS0	102	5510	17.71	17.52	20.63	≤ 23.98
11ac-VHT40	MCS0	110	5550	17.86	17.58	20.73	≤ 23.98
11ac-VHT40	MCS0	134	5670	17.57	17.83	20.71	≤ 23.98
11ac-VHT40	MCS0	151	5755	17.64	17.81	20.74	≤ 30.00
11ac-VHT40	MCS0	159	5795	17.52	17.85	20.70	≤ 30.00
11ac-VHT80	MCS0	42	5210	16.53	16.87	19.71	≤ 23.98
11ac-VHT80	MCS0	58	5290	13.08	13.67	16.40	≤ 23.98
11ac-VHT80	MCS0	106	5530	17.84	17.82	20.84	≤ 23.98
11ac-VHT80	MCS0	122	5610	17.89	17.64	20.78	≤ 23.98
11ac-VHT80	MCS0	155	5775	17.66	17.58	20.63	≤ 30.00

Note 1: Total Average Power (dBm) = $10*\log\{10^{(\text{Ant 0 Average Power }/10)} + 10^{(\text{Ant 1 Average Power }/10)}\}$.

Note 2: For 5250 - 5350 & 5470 - 5725 MHz, the conducted power limit is as below, where B is the 26 dB emission bandwidth in megahertz.

$11 + 10 \log10 (B) > 23.98\text{dBm}$

A.5 Power Spectral Density Test Result

Test Site	WZ-SR5	Test Engineer	Lynn Yang
Test Date	2022-11-22 ~ 2022-12-09	Test Mode	802.11a

Test Mode	Data Rate/ MCS	Ch. No.	Freq. (MHz)	PSD (dBm / MHz)	Duty Cycle (%)	Final PSD (dBm / MHz)	PSD Limit (dBm / MHz)
For NII-1/-2a/-2c Bands:							
11a	6Mbps	36	5180	7.11	92.84	7.43	≤ 17.00
11a	6Mbps	44	5220	6.67	92.84	6.99	≤ 17.00
11a	6Mbps	48	5240	6.90	92.84	7.22	≤ 17.00
11a	6Mbps	52	5260	6.96	92.84	7.28	≤ 11.00
11a	6Mbps	60	5300	7.56	92.84	7.88	≤ 11.00
11a	6Mbps	64	5320	7.18	92.84	7.50	≤ 11.00
11a	6Mbps	100	5500	7.35	92.84	7.68	≤ 11.00
11a	6Mbps	116	5580	7.56	92.84	7.88	≤ 11.00
11a	6Mbps	140	5700	7.34	92.84	7.66	≤ 11.00

Note: When EUT duty cycle < 98%, the Final PSD (dBm / MHz) = PSD (dBm / MHz) +10*log (1/Duty cycle).

Test Mode	Data Rate/ MCS	Ch. No.	Freq. (MHz)	PSD (dBm / 510kHz)	Duty Cycle (%)	Final PSD (dBm / 510kHz)	PSD Limit (dBm / 500kHz)
For NII-3 Band:							
11a	6Mbps	149	5745	4.07	92.84	4.39	≤ 30.00
11a	6Mbps	157	5785	4.28	92.84	4.60	≤ 30.00
11a	6Mbps	165	5825	4.52	92.84	4.85	≤ 30.00

Note: When EUT duty cycle < 98%, the Final PSD (dBm / 510kHz) = PSD (dBm / 510kHz) +10*log (1/Duty cycle).

Test Site	WZ-SR5	Test Engineer	Lynn Yang
Test Date	2022-11-22 ~ 2022-12-09	Test Mode	802.11ac

Test Mode	Data Rate/ MCS	Ch. No.	Freq. (MHz)	Ant 0 PSD (dBm / MHz)	Ant 1 PSD (dBm / MHz)	Duty Cycle (%)	Total PSD (dBm / MHz)	PSD Limit (dBm / MHz)
For NII-1/-2a/-2c Bands:								
11ac-VHT20	MCS0	36	5180	5.16	4.17	92.18	8.06	≤ 16.99
11ac-VHT20	MCS0	44	5220	4.24	4.62	92.18	7.80	≤ 16.99
11ac-VHT20	MCS0	48	5240	4.40	4.46	92.18	7.79	≤ 16.99
11ac-VHT20	MCS0	52	5260	5.35	4.57	92.18	8.34	≤ 10.99
11ac-VHT20	MCS0	60	5300	4.73	5.01	92.18	8.23	≤ 10.99
11ac-VHT20	MCS0	64	5320	5.25	5.01	92.18	8.49	≤ 10.99
11ac-VHT20	MCS0	100	5500	5.77	5.58	92.18	9.04	≤ 10.99
11ac-VHT20	MCS0	116	5580	7.00	5.25	92.18	9.57	≤ 10.99
11ac-VHT20	MCS0	140	5700	5.24	6.05	92.18	9.03	≤ 10.99
11ac-VHT40	MCS0	38	5190	2.00	1.16	84.92	5.32	≤ 16.99
11ac-VHT40	MCS0	46	5230	0.94	1.41	84.92	4.90	≤ 16.99
11ac-VHT40	MCS0	54	5270	1.95	1.54	84.92	5.47	≤ 10.99
11ac-VHT40	MCS0	62	5310	1.51	1.56	84.92	5.25	≤ 10.99
11ac-VHT40	MCS0	102	5510	2.35	2.10	84.92	5.95	≤ 10.99
11ac-VHT40	MCS0	110	5550	2.15	2.47	84.92	6.03	≤ 10.99
11ac-VHT40	MCS0	134	5670	2.64	2.75	84.92	6.42	≤ 10.99
11ac-VHT80	MCS0	42	5210	-0.91	-0.36	80.25	3.34	≤ 16.99
11ac-VHT80	MCS0	58	5290	-5.93	-5.75	80.25	-1.87	≤ 10.99
11ac-VHT80	MCS0	106	5530	1.32	0.92	80.25	5.09	≤ 10.99
11ac-VHT80	MCS0	122	5610	1.36	0.87	80.25	5.08	≤ 10.99

Note: When EUT duty cycle < 98%, the total PSD (dBm / MHz) = $10*\log\{10^{(\text{Ant 0 PSD} / 10)} + 10^{(\text{Ant 1 PSD} / 10)}\}$ +10*log (1/Duty cycle).

Test Mode	Data Rate/ MCS	Ch. No.	Freq. (MHz)	Ant 0 PSD (dBm / 510kHz)	Ant 1 PSD (dBm / 510kHz)	Duty Cycle (%)	Total PSD (dBm / 510kHz)	PSD Limit (dBm / 500kHz)
For NII-3 Band:								
11ac-VHT20	MCS0	149	5745	3.15	3.48	92.18	6.68	≤ 29.99
11ac-VHT20	MCS0	157	5785	2.97	3.02	92.18	6.35	≤ 29.99
11ac-VHT20	MCS0	165	5825	2.97	3.08	92.18	6.39	≤ 29.99
11ac-VHT40	MCS0	151	5755	-0.90	0.19	84.92	3.40	≤ 29.99
11ac-VHT40	MCS0	159	5795	-0.94	-0.18	84.92	3.17	≤ 29.99
11ac-VHT80	MCS0	155	5775	-2.47	-1.92	80.25	1.78	≤ 29.99

Note: When EUT duty cycle < 98%, the total PSD (dBm / 510kHz) = $10*\log \{10^{(\text{Ant 0 PSD} / 10)} + 10^{(\text{Ant 1 PSD} / 10)}\}$ +10*log (1/Duty cycle).