RF MEASUREMENT REPORT

FCC ID:	2AXJ4BE900
Applicant:	TP-Link Corporation Limited
Product:	BE24000 Quad-Band Wi-Fi 7 Router
Model No.:	Archer BE900
Brand Name:	tp-link
FCC Classification:	15E 6GHz Low Power Indoor Access Point (6ID)
FCC Rule Part(s):	Part 15 Subpart E (Section 15.407)
Result:	Complies
Received Date:	2033-01-26
Test Date:	2023-01-29 ~ 2023-02-27

Reviewed By: Kevin Guo

Approved By: Robin Wu

Revision History

Report No.	Version	Description	Issue Date	Note
2301RSU047-U4	V01	Initial Report	2023-03-01	Valid

CONTENTS

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	BE24000 Quad-Band Wi-Fi 7 Router
Model No.	Archer BE900
EUT Identification No.	20230128Sample#02 for Radiated Testing 20230128Sample#01 for Conducted Testing
Wi-Fi Specification	802.11a/b/g/n/ac/ax/be
Antenna Information	Refer to selection 1.7
Working Voltage	By Adapter
Accessories	
Adapter	Model: T150500-2-DT Input: 100-240V ~ 50/60Hz 2.0A Output: 15V=5.0A 75W
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 802.11ax-HE20/be-EHT20: 6115 ~ 7095MHz, For 802.11ax-HE40/be-EHT40: 6125 ~ 7085MHz, For 802.11ax-HE80/be-EHT80: 6145 ~ 7025MHz, For 802.11ax-HE160/be-EHT160: 6185 ~ 6985MHz, For 802.11be-EHT320: 6265 ~ 6905MHz
Type of Modulation	802.11ax/be: OFDMA
Data Rate	802.11ax: up to 4804Mbps 802.11be: up to 11528Mbps

1.6. Working Frequencies

802.11ax-HE20 / be-EHT20

Channel	Frequency	Channel	Frequency	Channel	Frequency
33	6115 MHz	37	6135 MHz	41	6155 MHz
45	6175 MHz	49	6195 MHz	53	6215 MHz
57	6235 MHz	61	6255 MHz	65	6275 MHz
69	6295 MHz	73	6315 MHz	77	6335 MHz
81	6355 MHz	85	6375 MHz	89	6395 MHz
93	6415 MHz	97	6435 MHz	101	6455 MHz
105	6475 MHz	109	5495 MHz	113	6515 MHz
117	6535 MHz	121	6555 MHz	125	6575 MHz
129	6595 MHz	133	6615 MHz	137	6635 MHz
141	6655 MHz	145	6675 MHz	149	6695 MHz
153	6715 MHz	157	6735 MHz	161	6755 MHz
165	6775 MHz	169	6795 MHz	173	6815 MHz
177	6835 MHz	181	6855 MHz	185	6875 MHz
189	6895 MHz	193	6915 MHz	197	6935 MHz
201	6955 MHz	205	6975 MHz	209	6995 MHz
213	7015 MHz	217	7035 MHz	221	7055 MHz
225	7075 MHz	229	7095 MHz	--	--

802.11ax-HE40 / be-EHT40

Channel	Frequency	Channel	Frequency	Channel	Frequency
35	6125 MHz	43	6165 MHz	51	6205 MHz
59	6245 MHz	67	6285 MHz	75	6325 MHz
83	6365 MHz	91	6405 MHz	99	6445 MHz
107	6485 MHz	115	6525 MHz	123	6565 MHz
131	6605 MHz	139	6645 MHz	147	6685 MHz
155	6725 MHz	163	6765 MHz	171	6805 MHz
179	6845 MHz	187	6885 MHz	195	6925 MHz
203	6965 MHz	211	7005 MHz	219	7045 MHz
227	7085 MHz	--	--	--	--

802.11ax-HE80 / be-EHT80

Channel	Frequency	Channel	Frequency	Channel	Frequency
39	6145 MHz	55	6225 MHz	71	6305 MHz
87	6385 MHz	103	6465 MHz	119	6545 MHz
135	6625 MHz	151	6705 MHz	167	6785 MHz
183	6865 MHz	199	6945 MHz	215	7025 MHz

802.11ax-HE160 / be-EHT160

Channel	Frequency	Channel	Frequency	Channel	Frequency
47	6185 MHz	79	6345 MHz	111	6505 MHz
143	6665 MHz	175	6825 MHz	207	6985 MHz

802.11be-EHT320

Channel	Frequency	Channel	Frequency	Channel	Frequency
63	6265 MHz	95	6425 MHz	127	6585 MHz
159	6745 MHz	191	6905 MHz	--	--

1.7. Antenna Details

Antenna Type	Frequency Band (MHz)	T_X Paths	Number of spatial streams	Max Antenna Gain (dBi)	Beamforming Directional Gain (dBi)	CDD Directional Gain (dBi)	
						For Power	For PSD
Dipole Antenna	5925 ~ 6425	4	1	3.10	9.12	3.10	9.12
		4	4	3.10	--	3.10	3.10
	6425 ~ 6525	4	1	3.03	9.05	3.03	9.05
		4	4	3.03	--	3.03	3.03
	6525 ~ 6875	4	1	3.04	9.06	3.04	9.06
		4	4	3.04	--	3.04	3.04
	6875 ~ 7125	4	1	2.93	8.95	2.93	8.95
		4	4	2.93	--	2.93	2.93

Remark:

1. The EUT supports Cyclic Delay Diversity (CDD) mode, and CDD signals are correlated.
   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;
   - For power measurements on IEEE 802.11 devices,
     Array Gain = 0 dB for $N_{ANT} \leq 4$;
2. The EUT also supports Beam Forming mode. BF Directional gain = G_{ANT} + 10 log (N_{ANT}).

Test Mode	T_X Paths	CDD Mode	Beamforming Mode
802.11ax/be (6ID)	4	√	√

2. Test Configuration

2.1. Test Mode

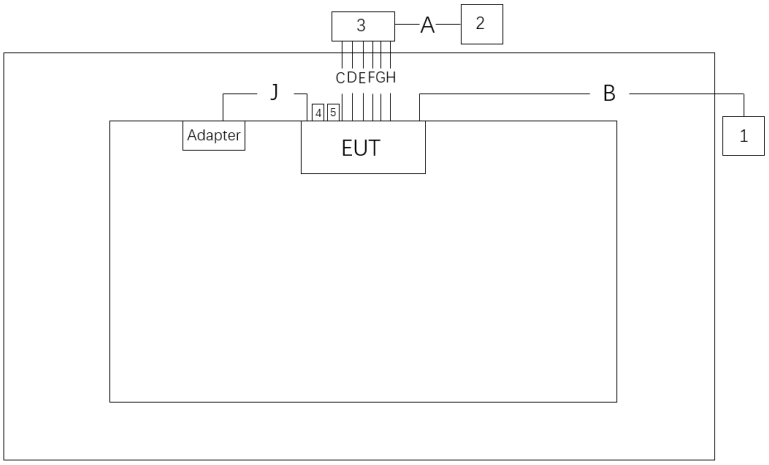
CDD Mode
Mode 1: Transmit by 802.11ax-HE20_N_{SS}=1 (MCS0)
Mode 2: Transmit by 802.11ax-HE40_N_{SS}=1 (MCS0)
Mode 3: Transmit by 802.11ax-HE80_N_{SS}=1 (MCS0)
Mode 4: Transmit by 802.11ax-HE160_N_{SS}=1 (MCS0)
Mode 5: Transmit by 802.11be-EHT20_N_{SS}=1 (MCS0)
Mode 6: Transmit by 802.11be-EHT40_N_{SS}=1 (MCS0)
Mode 7: Transmit by 802.11be-EHT80_N_{SS}=1 (MCS0)
Mode 8: Transmit by 802.11be-EHT160_N_{SS}=1 (MCS0)
Mode 9: Transmit by 802.11be-EHT320_N_{SS}=1 (MCS0)
Mode 10: Transmit by 802.11ax-HE20_N_{SS}=4 (MCS0)
Mode 11: Transmit by 802.11ax-HE40_N_{SS}=4 (MCS0)
Mode 12: Transmit by 802.11ax-HE80_N_{SS}=4 (MCS0)
Mode 13: Transmit by 802.11ax-HE160_N_{SS}=4 (MCS0)
Mode 14: Transmit by 802.11be-EHT20_N_{SS}=4 (MCS0)
Mode 15: Transmit by 802.11be-EHT40_N_{SS}=4 (MCS0)
Mode 16: Transmit by 802.11be-EHT80_N_{SS}=4 (MCS0)
Mode 17: Transmit by 802.11be-EHT160_N_{SS}=4 (MCS0)
Mode 18: Transmit by 802.11be-EHT320_N_{SS}=4 (MCS0)
Beamforming Mode
Mode 19: Transmit by 802.11ax-HE20_N_{SS}=1 (MCS0)
Mode 20: Transmit by 802.11ax-HE40_N_{SS}=1 (MCS0)
Mode 21: Transmit by 802.11ax-HE80_N_{SS}=1 (MCS0)
Mode 22: Transmit by 802.11ax-HE160_N_{SS}=1 (MCS0)
Mode 23: Transmit by 802.11be-EHT20_N_{SS}=1 (MCS0)
Mode 24: Transmit by 802.11be-EHT40_N_{SS}=1 (MCS0)
Mode 25: Transmit by 802.11be-EHT80_N_{SS}=1 (MCS0)
Mode 26: Transmit by 802.11be-EHT160_N_{SS}=1 (MCS0)
Mode 27: Transmit by 802.11be-EHT320_N_{SS}=1 (MCS0)
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 4 N_{SS}, N_{SS}=1 and N_{SS}=4 was assessed in this report. 3. For radiated emission, only the data at N_{SS}=4 mode is shown in this report due to the RF output power is higher at this mode.

4.	Due to CDD mode was the worst mode, so all test items were evaluated in this report. The beamforming mode only evaluated the RF output power.
5.	EUT supports one configuration only in 802.11ax/be full RU mode.
6.	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



Cable Type		Cable Description	
A	LAN Cable	Non shielded, > 1m	
B ~ H	LAN Cable	Non shielded, > 10m	
J	Power Cable	Non shielded, 1.5m	
Product		**Manufacturer**	**Model No.**
1	Notebook	Lenovo	E430C
2	Notebook	Lenovo	E430C
3	Switch	tp-link	TL-SG5428
4	USB flash disk	SanDisk	CZ48
5	USB flash disk	SanDisk	CZ48

2.3. Test Software

The test utility software used during testing was “accessMTool”, and the version was 3.3.0.1.
Final power setting please refer to operational description.

2.4. Applied Standards

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

- ANSI C63.10-2013
- FCC KDB 789033 D02v02r01
- FCC KDB 987594 D02v01
- FCC KDB 987594 D04v01
- FCC KDB 662911 D01v02r01
- FCC KDB 414788 D01v01r01
- FCC KDB 412172 D01v01r01

2.5. Test Environment Condition

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

3. Antenna Requirements

Excerpt from §15.407(a)(9) of the FCC Rules/Regulations:

Access points operating under the provisions of paragraphs (a)(5) and (a)(6) of this section must employ a permanently attached integrated antenna.

- The antenna of the device is built in and locked inside the enclosure.

Conclusion:

The device complies with the requirement of §15.407(a)(9).

4. Measuring Instrument

Instrument	Manufacturer	Model No.	Asset No.	Cali. Interval	Cali. Due Date	Test Site
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	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
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2023-09-29	WZ-AC2
Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06597	1 year	2023-11-05	WZ-AC2
Preamplifier	EMCI	EMC184045SE	MRTSUE06640	1 year	2024-01-12	WZ-AC2
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
EMI Test Receiver	R&S	ESR3	MRTSUE06909	1 year	2023-10-27	WZ-SR2
Thermohygrometer	testo	608-H1	MRTSUE06404	1 year	2023-06-06	WZ-SR2
Signal Analyzer	Agilent	N9020A	MRTSUE06106	1 year	2023-04-06	WZ-SR5
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	MVE	MVE2213	MRTSUE11090	1 year	2023-06-09	WZ
Attenuator	MVE	MVE2213	MRTSUE11081	1 year	2023-06-09	WZ
Anechoic Chamber	RIKEN	SIP-AC1	MRTSUE06554	1 year	2023-12-22	SIP-AC1
Preamplifier	EMCI	EMC051845SE	MRTSUE06600	1 year	2023-11-07	SIP-AC1
Horn Antenna	R&S	HF907	MRTSUE06610	1 year	2023-07-13	SIP-AC1
Thermohygrometer	testo	608-H1	MRTSUE06616	1 year	2023-11-01	SIP-AC1
Thermohygrometer	testo	608-H1	MRTSUE06620	1 year	2023-11-27	SIP-AC1
Anechoic Chamber	BOOMWAVE	NS-AC1	MRTSUE06496	1 year	2023-07-23	NS-AC1
TRILOG Antenna	Schwarzbeck	VULB 9162	MRTSUE06573	1 year	2023-06-21	NS-AC1
EMI Test Receiver	R&S	ESR3	MRTSUE06575	1 year	2023-06-19	NS-AC1
Thermohygrometer	testo	608-H1	MRTSUE11020	1 year	2023-05-15	NS-AC1
Thermohygrometer	testo	608-H1	MRTSUE11104	1 year	2023-05-03	NS-AC1

Software	Version	Function
EMI Software	V3.0.0	EMI Test Software
Controller_MF 7802	1.02	RE Antenna & Turntable
BenchVue Power Meter	2018.1	Power

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)): 2.3dB
Output Power
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 1.5dB
Power Spectrum Density
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 2.3dB
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(a)(5)	Maximum Equivalent Isotopically Radiated Power (e.i.r.p)		Pass
15.407(a)(5)	Peak Power Spectral Density (e.i.r.p)		Pass
15.407(b)(7)	In-Band Emission		Pass
15.407(g)	Frequency Stability		Pass
15.407(d)(6)	Contention-Based Protocol		Pass
15.407(b)(6)	Unwanted Emissions		Pass
15.407(b)(8), (9), (10)	General Field Strength (Restricted Bands and Radiated Emission)	Radiated	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. The test results shown in the following sections represent the worst-case emissions.

6.2. 26dB 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

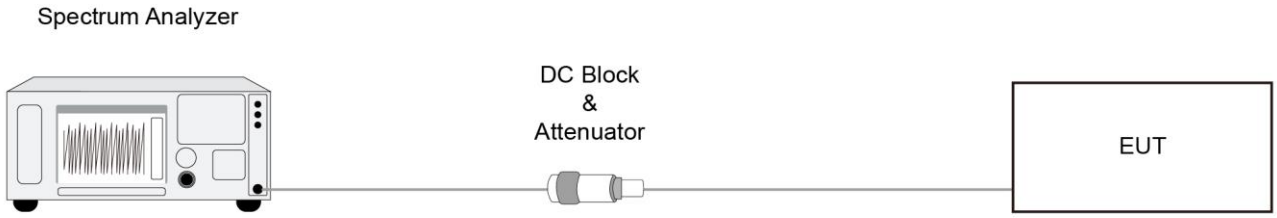
26dB Bandwidth

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. Output Power Measurement

6.3.1. Test Limit

For an indoor access point operating in the 5.925-7.125 GHz band, the maximum e.i.r.p. over the frequency band of operation must not exceed 30 dBm.

For a subordinate device operating under the control of an indoor access point in the 5.925-7.125 GHz band, the maximum e.i.r.p. over the frequency band of operation must not exceed 30 dBm.

6.3.2. Test Procedure

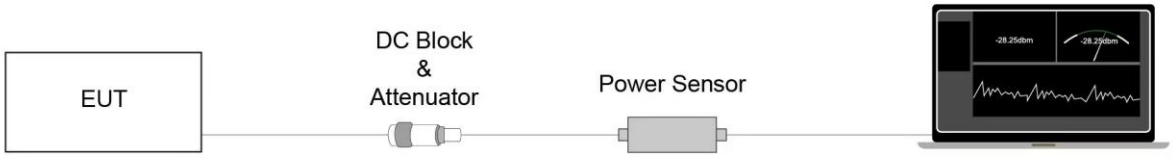
KDB 789033D02v02r01- Section Ⅱ)E)3)b) Method PM-G

6.3.3. 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.

6.3.4. Test Setup



6.3.5. Test Result

Refer to Appendix A.3.

6.4. Power Spectral Density Measurement

6.4.1. Test Limit

For an indoor access point operating in the 5.925-7.125 GHz band, the maximum power spectral density must not exceed 5 dBm e.i.r.p. in any 1-megahertz band.

For a subordinate device operating under the control of an indoor access point in the 5.925-7.125 GHz band, the maximum power spectral density must not exceed 5 dBm e.i.r.p in any 1-megahertz band.

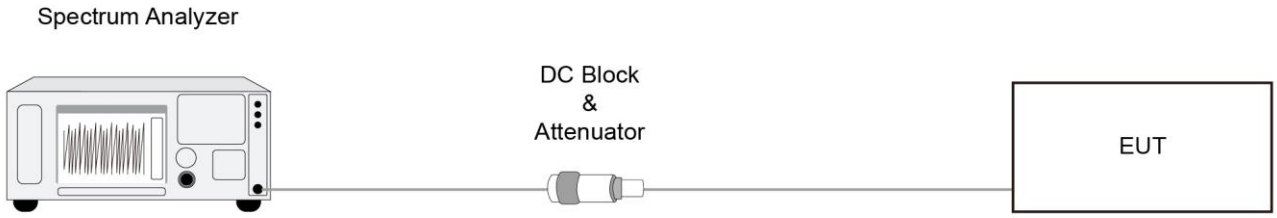
6.4.2. Test Procedure

KDB 789033 D02v02r01-Section Ⅱ)F)

6.4.3. 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
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.

6.4.4. Test Setup



6.4.5. Test Result

Refer to Appendix A.4.

6.5. In-Band Emission Measurement

6.5.1. Test Limit

Suppressed by 20 dB at 1 MHz outside of the channel edge. (The channel edge is defined as the 26-dB point on either side of the carrier center frequency.)

Suppressed by 28 dB at one channel bandwidth from the channel center.

Suppressed by 40 dB at one- and one-half times the channel bandwidth from the channel center.

6.5.2. Test Procedure

KDB 987594 D02v01r01- Section J

6.5.3. Test Setting

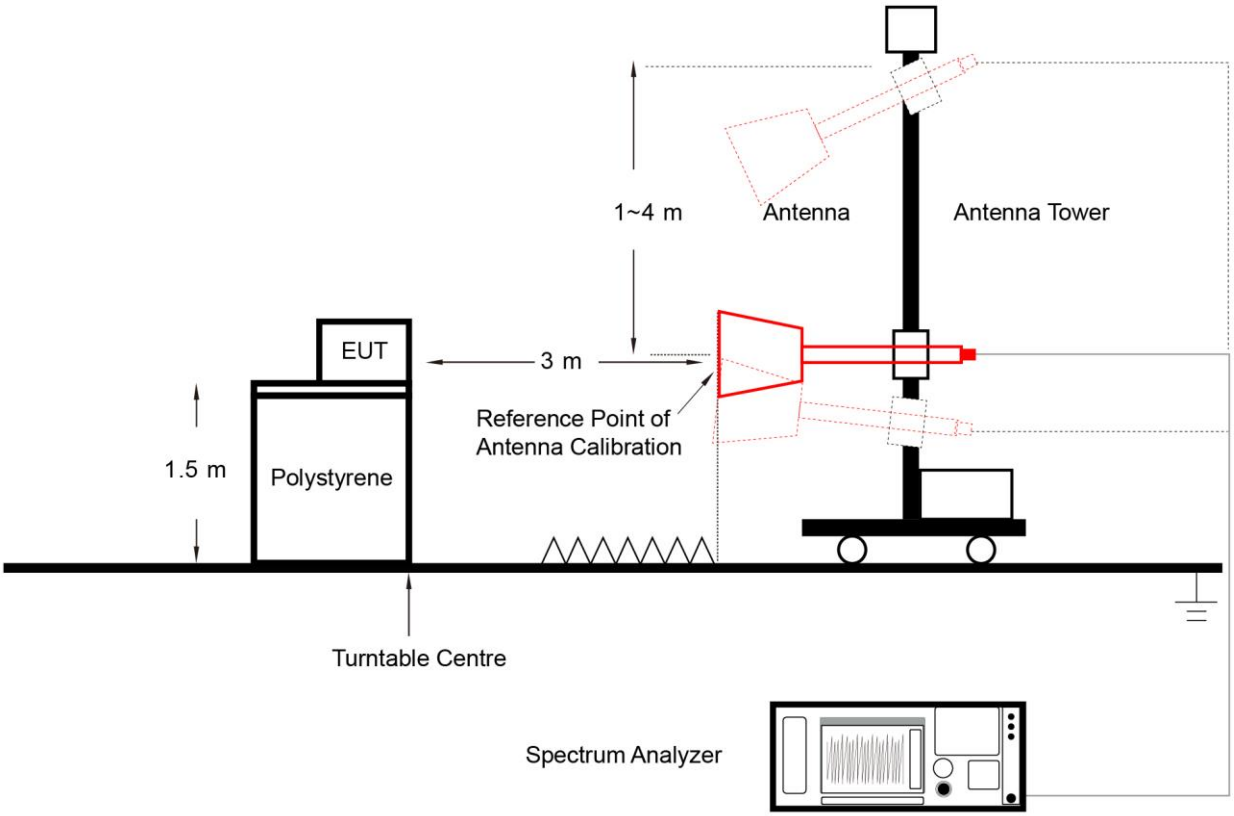
Emissions Mask Reference Level Measurement

1. Set the span to encompass the entire 26 dB EBW of the signal.
2. Set RBW = same RBW used for 26 dB EBW measurement.
3. Set VBW ≥ 3 X RBW.
4. Number of points in sweep ≥ [2 x span / RBW].
5. Sweep time = auto.
6. Detector = RMS.
7. Trace average at least 100 traces in power averaging (rms) mode.
8. Use the peak search function on the instrument to find the peak of the spectrum.

In-Band Emission

1. Using the measuring equipment limit line function, develop the emissions mask based on rule.
2. Adjust the span to encompass the entire mask as necessary.
3. Clear trace.
4. Trace average at least 100 traces in power averaging (rms) mode.
5. Adjust the reference level as necessary so that the crest of the channel touches the top of the emission mask.

6.5.4. Test Setup



6.5.5. Test Result

Refer to Appendix A.5.

6.6. Frequency Stability Measurement

6.6.1. Test Limit

Manufactures of 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.

6.6.2. Test Procedure

Frequency Stability Under Temperature Variations:

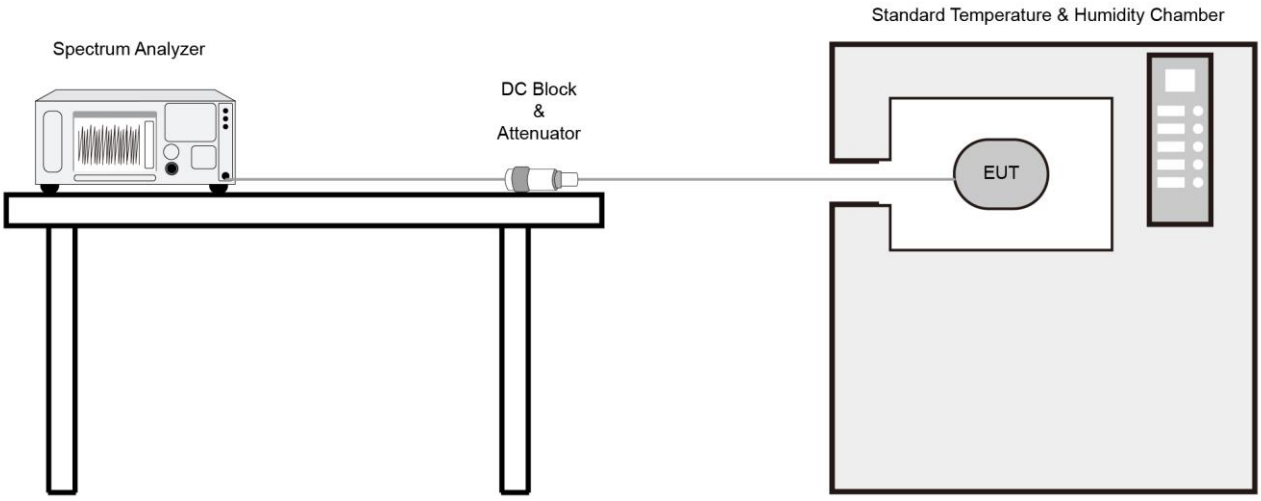
The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain 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.

6.6.3. Test Setup



6.6.4. Test Result

Refer to Appendix A.6.

6.7. Contention Based Protocol Measurement

6.7.1. Test Limit

Unlicensed indoor low power device must detect co-channel radio frequency power that is at least -62dBm (The threshold is referenced to a 0dBi antenna gain.) or low.

Indoor low power device must detect an AWGN signal with 90% (or better) level of certainty.

6.7.2. Test Procedure

KDB 987594 D02v01- Section I

6.7.3. Test Setting

1. Configure the EUT to transmit with a constant duty cycle.

2. Set the operating parameters of the EUT including power level, operating frequency, modulation and bandwidth.

3. Set the signal analyzer center frequency to the nominal EUT channel center frequency. The span range of the signal analyzer shall be between two times and five times the OBW of the EUT.

Connect the output port of the EUT to the signal analyzer 2. Ensure that the attenuator 2 provides enough attenuation to not overload the signal analyzer 2 receiver.

4. Monitoring the signal analyzer 2, verify the EUT is operating and transmitting with the parameters set at step two.

5. Using an AWGN signal source, generate a 10 MHz-wide AWGN signal. Use Table 1 of KDB 987594 to determine the center frequency of the 10 MHz AWGN signal relative to the EUT's channel bandwidth and center frequency.

6. Set the AWGN signal power to an extremely low level. Connect the AWGN signal source, via a 3-dB splitter, to the signal analyzer 1 and the EUT as shown in below figure.

7. Transmit the AWGN signal (RF ON) and verify its characteristics on the signal analyzer 1.

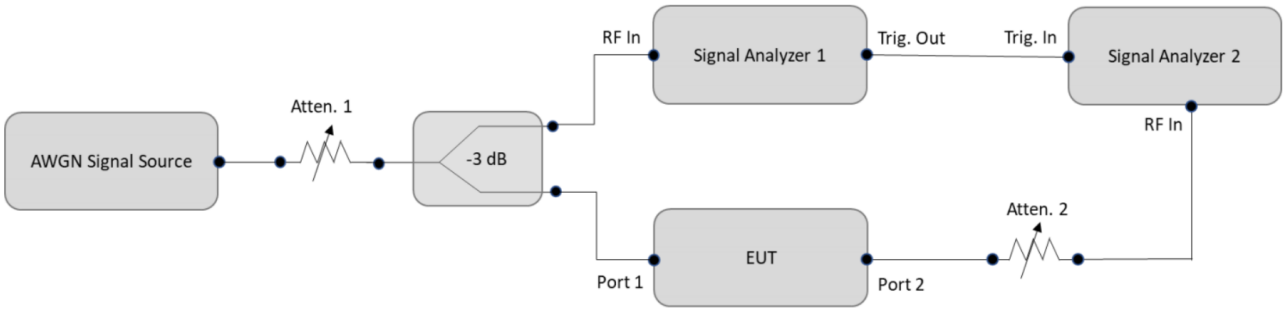
8. Monitor the signal analyzer 2 to verify if the AWGN signal has been detected and the EUT has ceased transmission. If the EUT continues to transmit, then incrementally increase the AWGN signal power level until the EUT stops transmitting.

9. Determine and record the AWGN signal power level (at the EUT's antenna port) at which the EUT ceased transmission. Repeat the procedure at least 10 times to verify the EUT can detect an AWGN signal with 90% (or better) level of certainty.

10. Refer to Table 1 to determine number of times the detection threshold testing needs to be

repeated. If testing is required more than once, then go back to step 5, choose a different center frequency for the AWGN signal and repeat the process.

6.7.4. Test Setup



6.7.5. Test Result

Refer to Appendix A.7.

6.8. Radiated Spurious Emission Measurement

6.8.1. Test Limit

For 15.407(b)(5) requirement

For transmitters operating within the 5.925-7.125 GHz band: Any emissions outside of the 5.925-7.125 GHz band must not exceed an e.i.r.p. of −27 dBm/MHz.

Refer to 987594 D02 U-NII 6GHz EMC Measurement v01 clause G

Use guidance in KDB 789033 for measurements below 1000 MHz and above 1000 MHz. Unwanted emissions outside of restricted bands are measured with a RMS detector. In addition, 15.35(b) applies where the peak emissions must be limited to no more than 20 dB above the average 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

6.8.2. 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

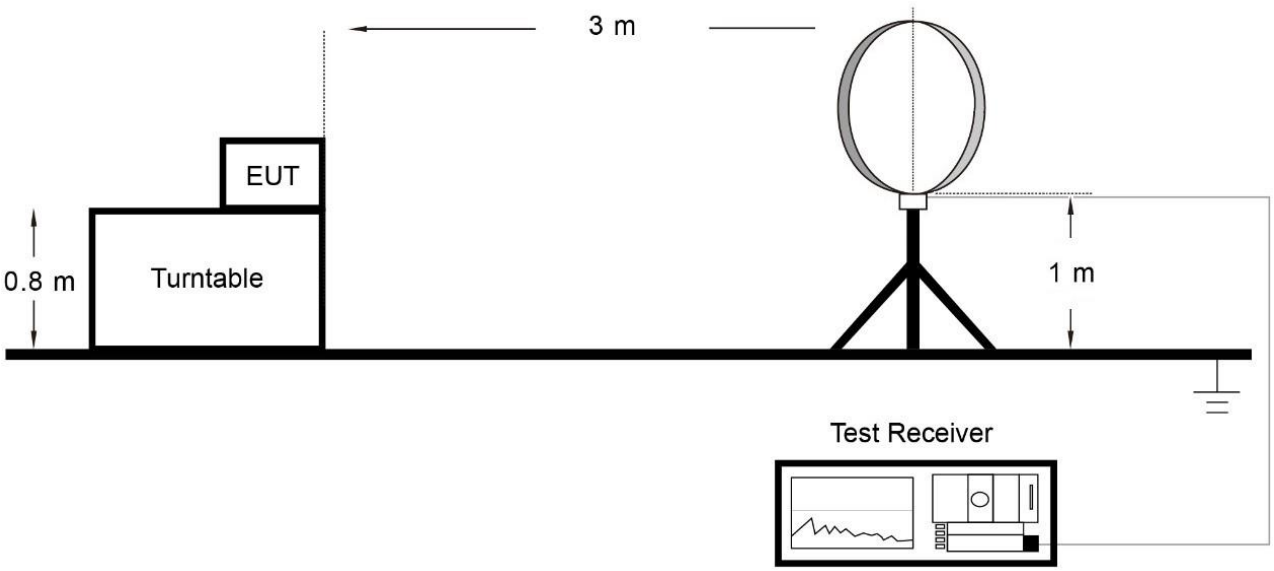
5. Sweep time = auto

6. Trace mode = max hold

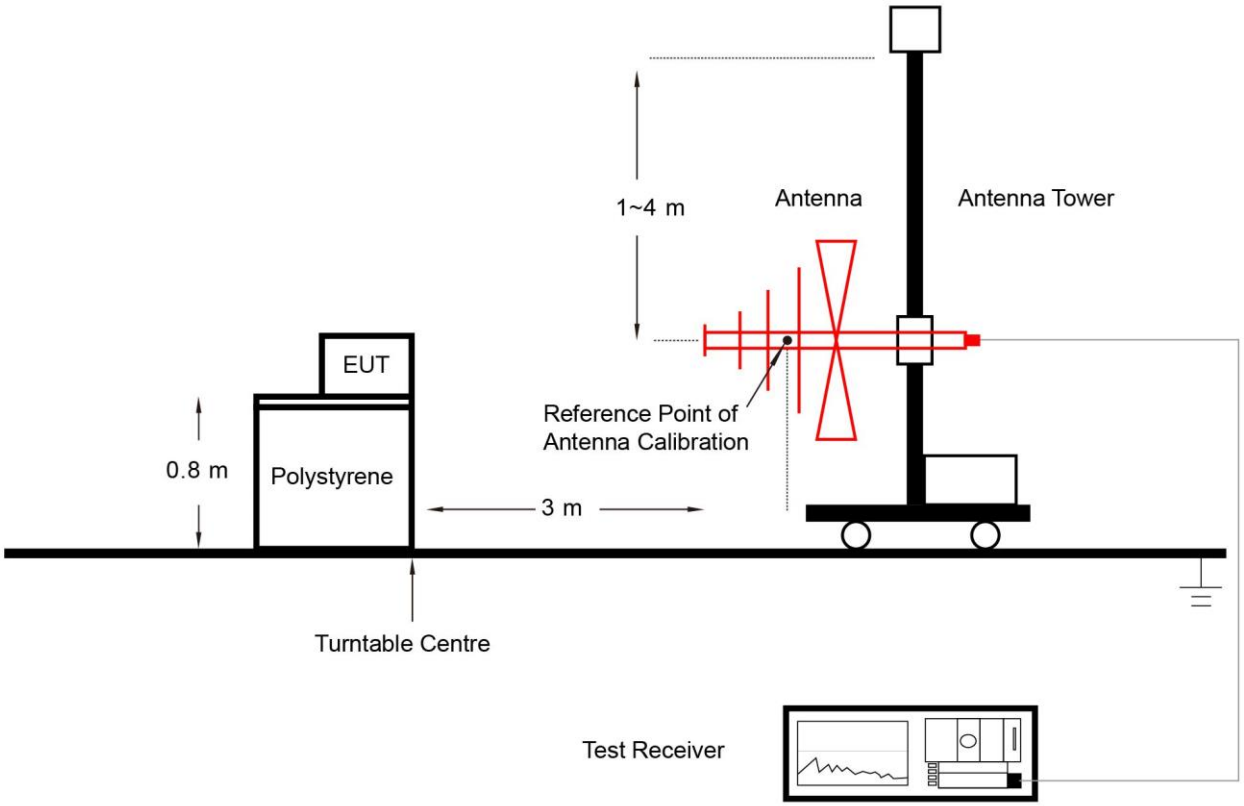
7. Trace was allowed to stabilize

6.8.4. Test Setup

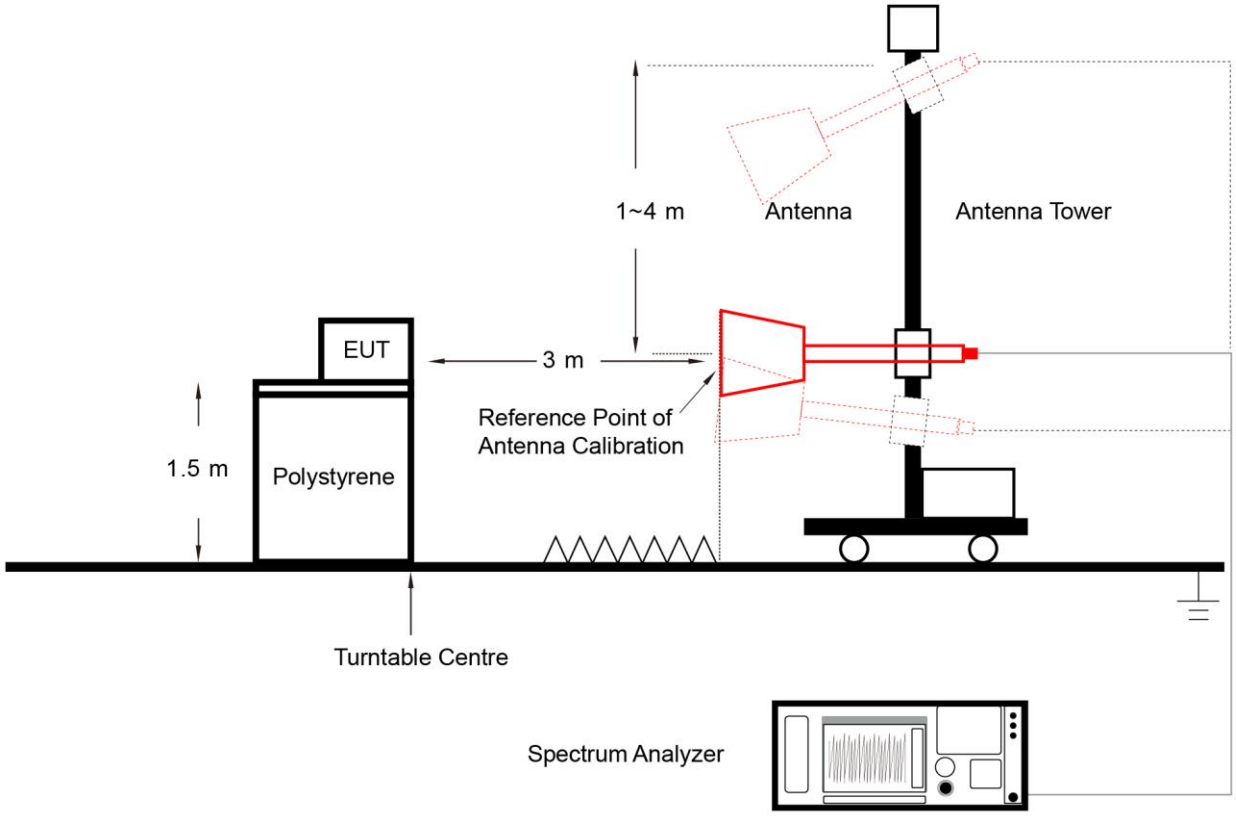
Below 30MHz Test Setup:



Below 1GHz Test Setup:



Above 1GHz Test Setup:



6.8.5. Test Result

Refer to Appendix A.8.

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)(5) requirement:

For transmitters operating within the 5.925-7.125 GHz band: Any emissions outside of the 5.925-7.125 GHz band must not exceed an e.i.r.p. of −27 dBm/MHz.

Refer to 987594 D02 U-NII 6GHz EMC Measurement v01 clause G - Unwanted Emission Measurement

Use guidance in KDB 789033 for measurements below 1000 MHz and above 1000 MHz. Unwanted emissions outside of restricted bands are measured with a RMS detector. In addition, 15.35(b) applies where the peak emissions must be limited to no more than 20 dB above the average 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

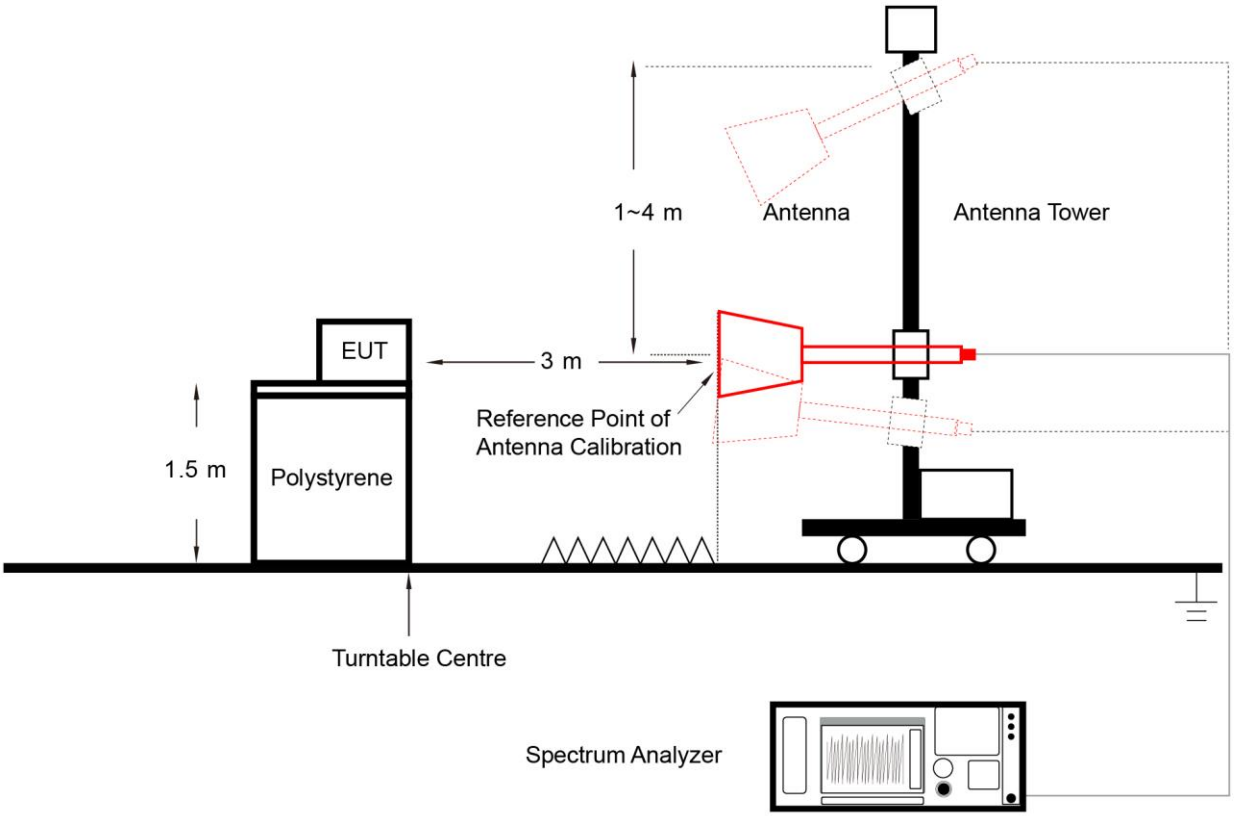
Peak Measurements above 1GHz

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

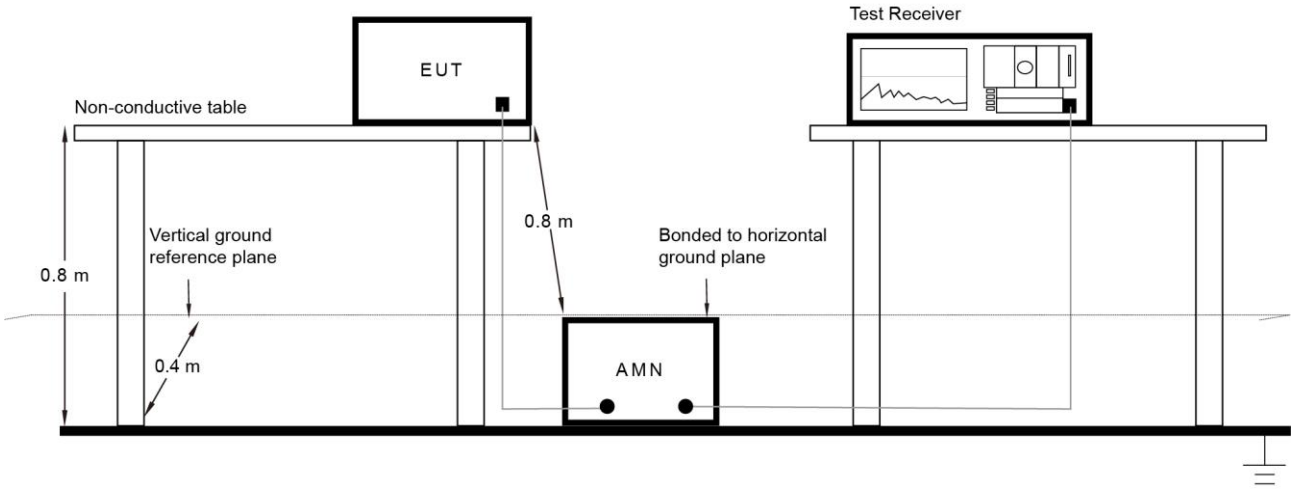
Refer to Appendix A.9.

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.10.

Appendix A – Test Result

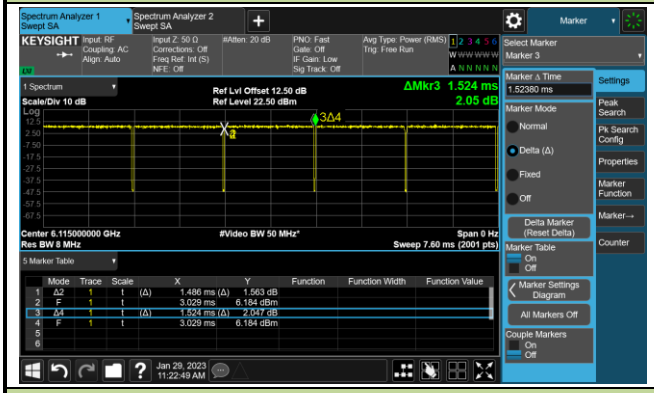
A.1 Duty Cycle Test Result

Test Site	WZ-SR5	Test Engineer	Luis Yang
Test Date	2023-01-29	Test Mode	N_{SS}=1

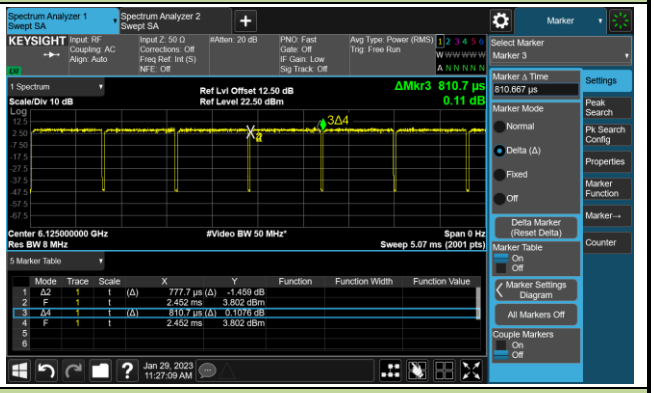
Test Mode	Duty Cycle	Test Mode	Duty Cycle
802.11ax-HE20	97.51%	802.11be-EHT20	97.71%
802.11ax-HE40	95.93%	802.11be-EHT40	95.84%
802.11ax-HE80	93.00%	802.11be-EHT80	92.31%
802.11ax-HE160	88.25%	802.11be-EHT160	87.94%
--	--	802.11be-EHT320	82.77%

Duty Cycle (T = Transmission Duration)

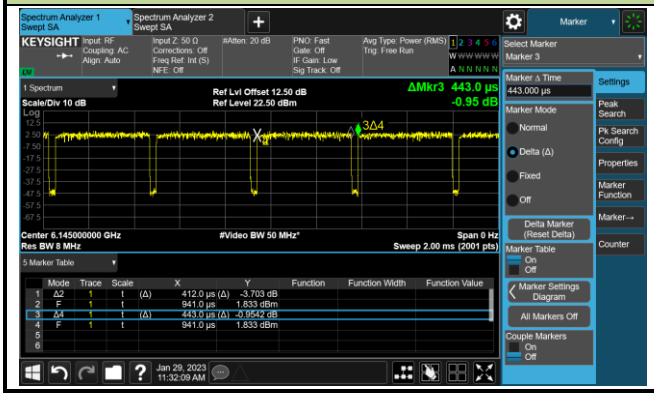
802.11ax-HE20 (T = 1.486ms)



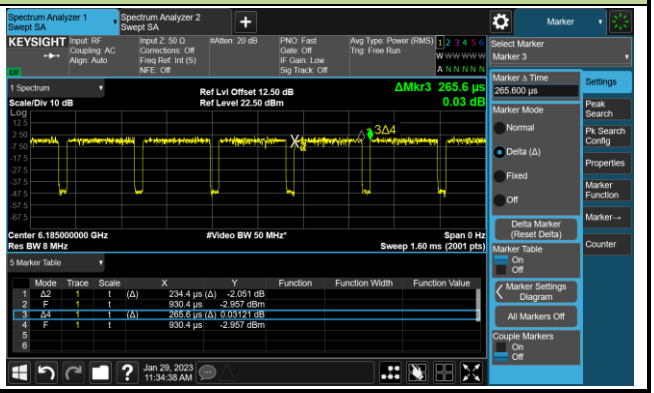
802.11ax-HE40 (T = 777.7μs)

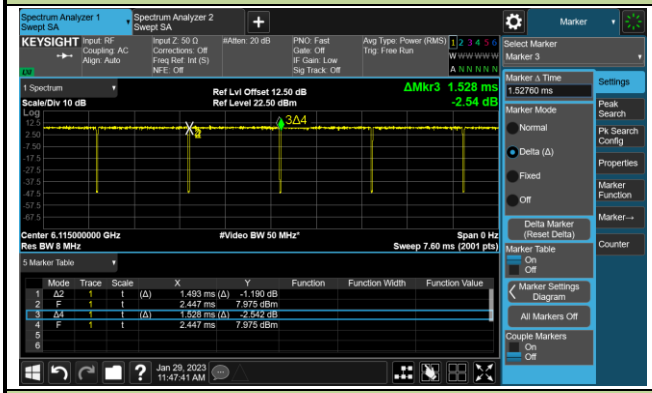
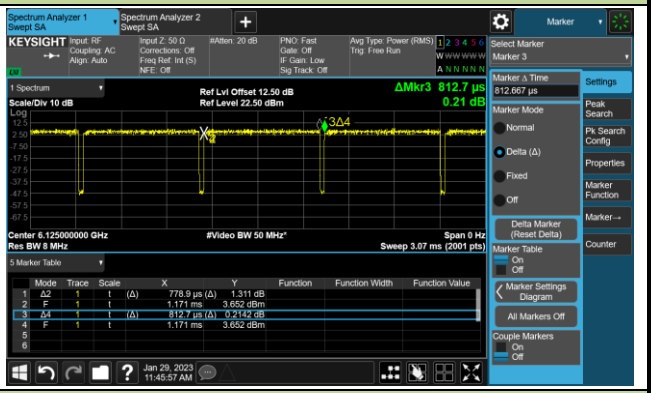
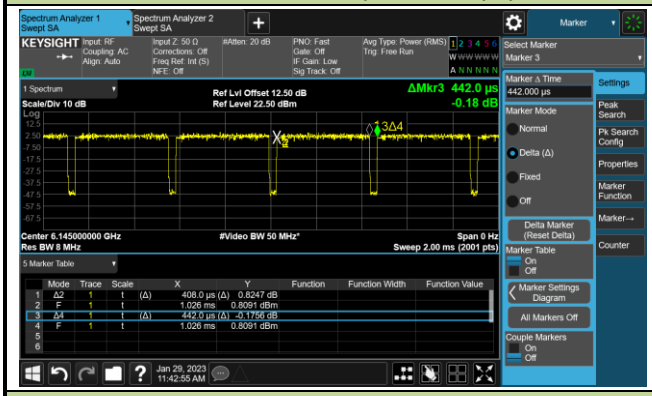
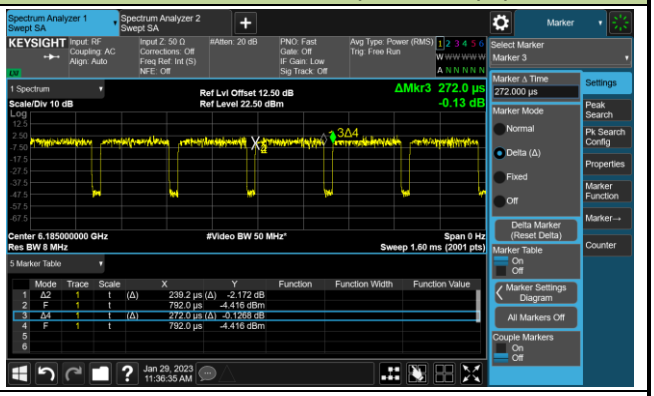
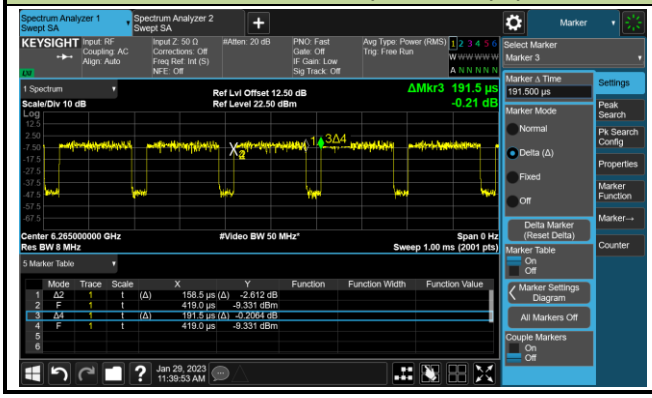


802.11ax-HE80 (T = 412.0μs)



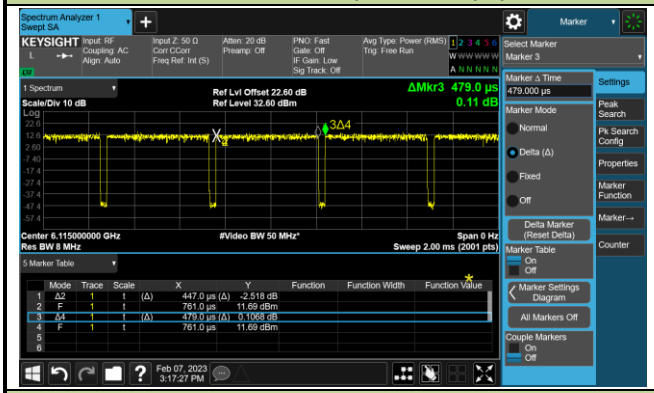
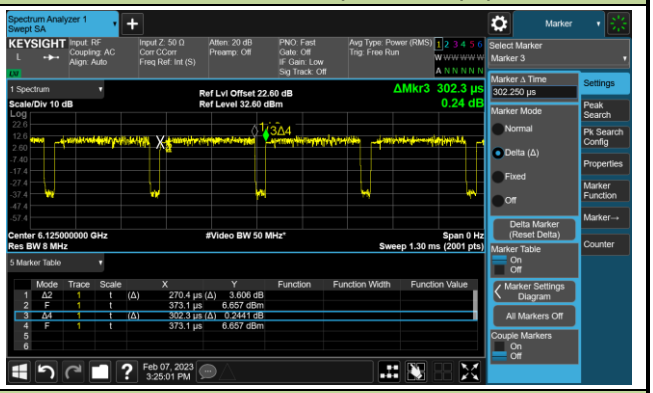
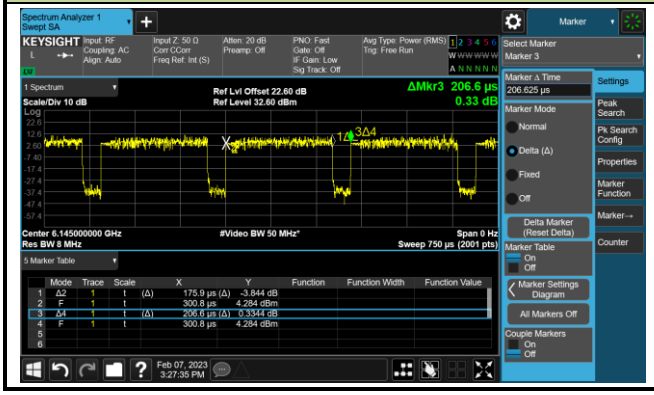
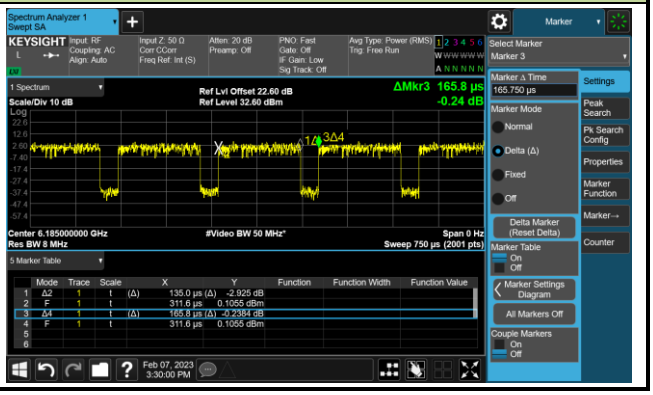
802.11ax-HE160 (T = 234.4μs)

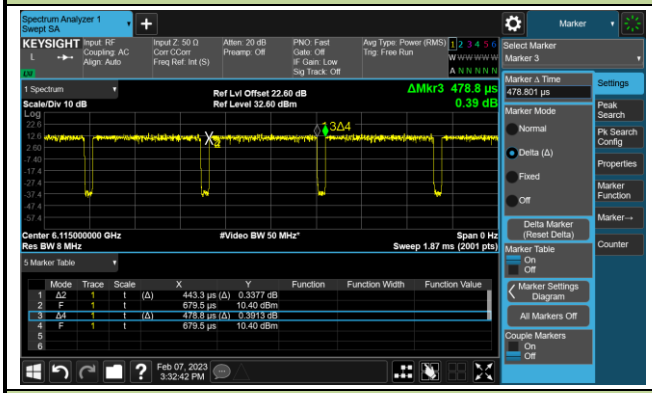
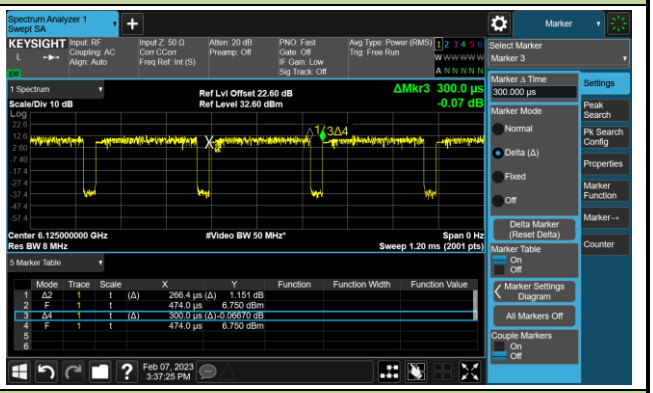
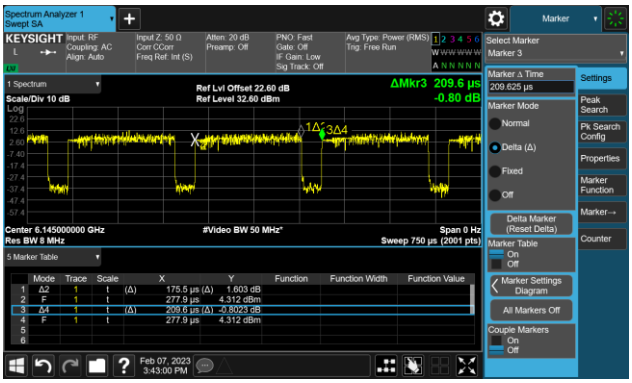
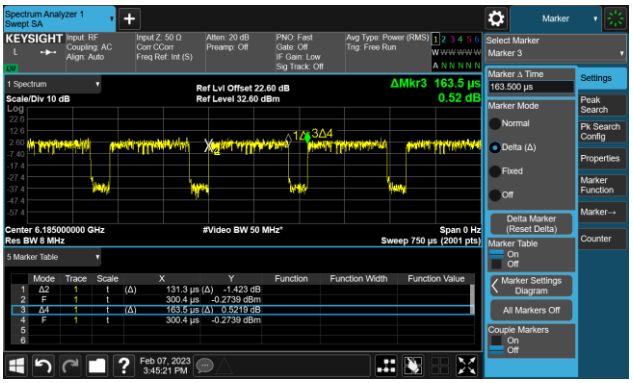
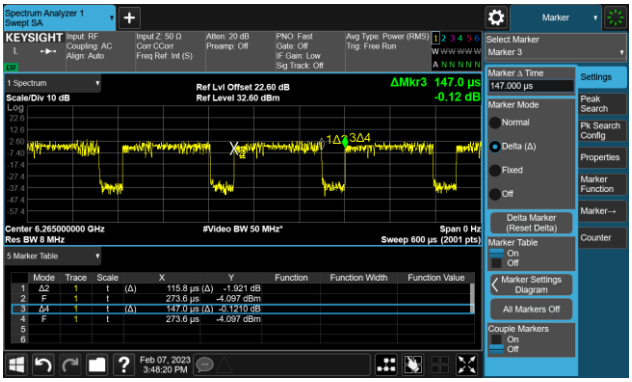


Duty Cycle (T = Transmission Duration)	
802.11be-EHT20 (T = 1.493ms)	802.11be-EHT40 (T = 778.9μs)
	
802.11be-EHT80 (T = 408.0μs)	802.11be-EHT160 (T = 239.2μs)
	
802.11be-EHT320 (T = 158.5μs)	
	

Test Site	WZ-SR5	Test Engineer	Luis Yang
Test Date	2023-02-07	Test Mode	N_{SS}=4

Test Mode	Duty Cycle	Test Mode	Duty Cycle
802.11ax-HE20	93.32%	802.11be-EHT20	92.59%
802.11ax-HE40	89.45%	802.11be-EHT40	88.80%
802.11ax-HE80	85.14%	802.11be-EHT80	83.73%
802.11ax-HE160	81.42%	802.11be-EHT160	80.31%
--	--	802.11be-EHT320	78.78%

Duty Cycle (T = Transmission Duration)	
802.11ax-HE20 (T = 447.0μs)	802.11ax-HE40 (T = 270.4μs)
	
802.11ax-HE80 (T = 175.9μs)	802.11ax-HE160 (T = 135.0μs)
	

Duty Cycle (T = Transmission Duration)	
802.11be-EHT20 (T = 443.3μs)	802.11be-EHT40 (T = 266.4μs)
	
802.11be-EHT80 (T = 175.5μs)	802.11be-EHT160 (T = 131.3μs)
	
802.11be-EHT320 (T = 115.8μs)	
	

A.2 26dB Bandwidth Test Result

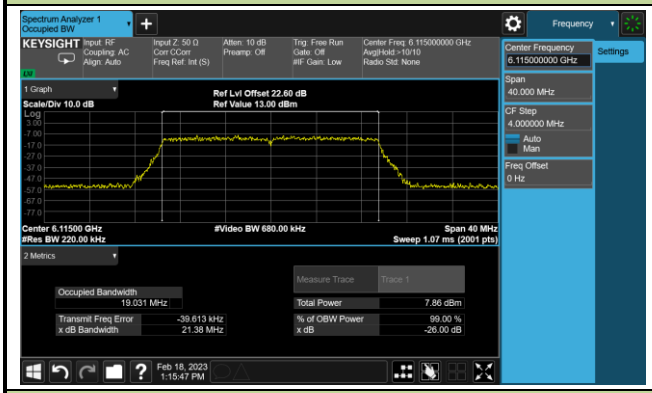
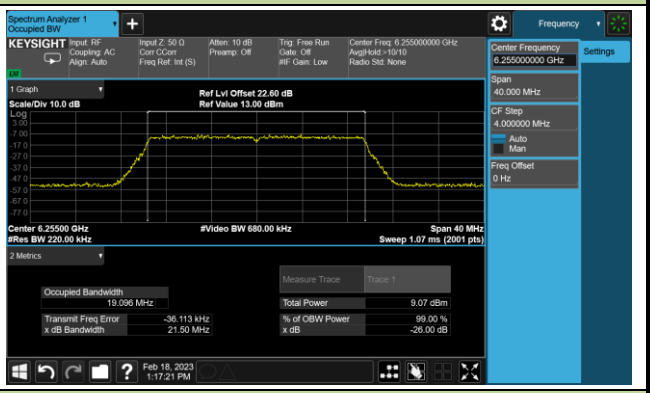
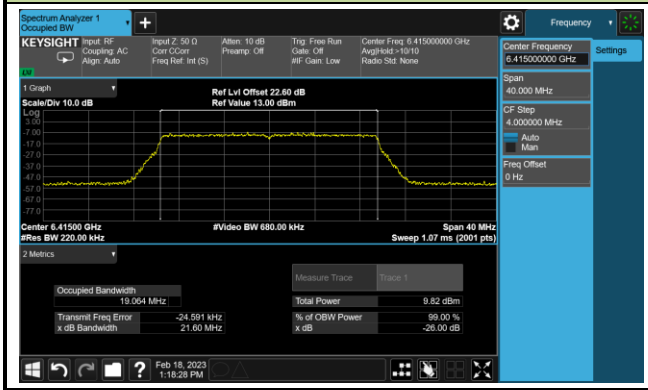
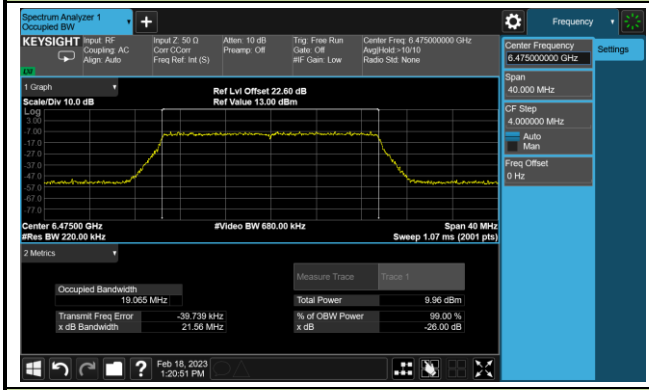
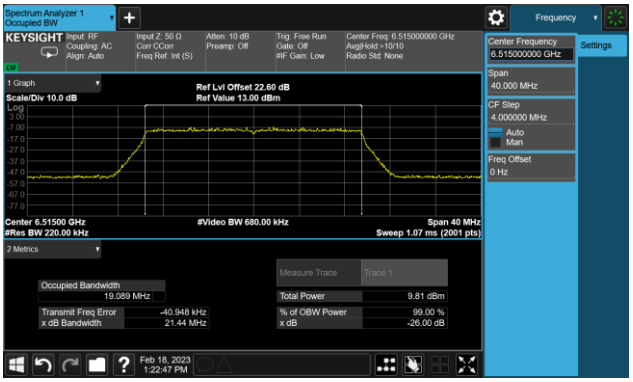
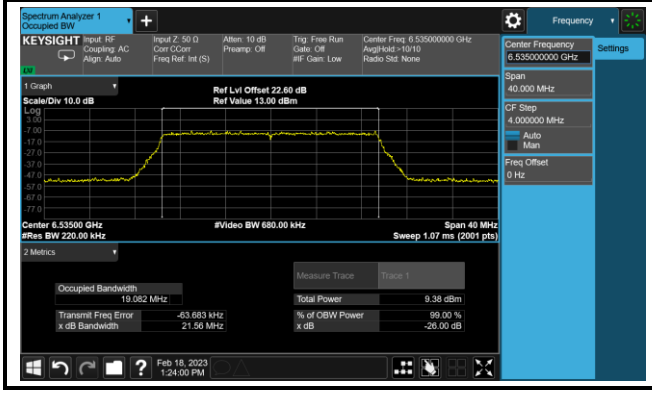
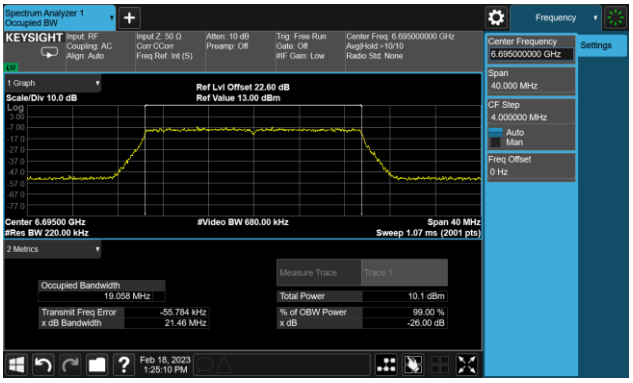
Test Site	WZ-SR5	Test Engineer	Liz Yuan
Test Date	2023-02-18	Test Mode	N_{SS}=1

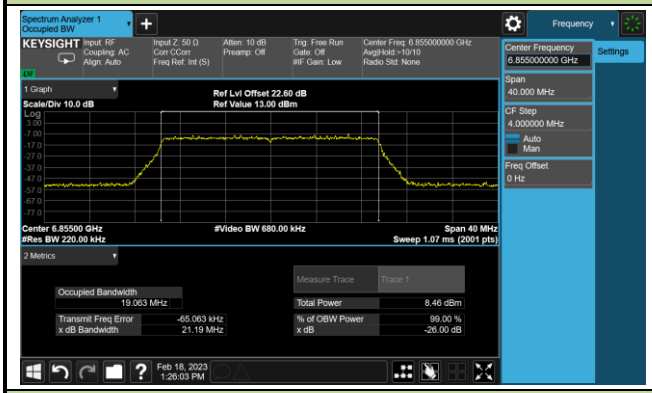
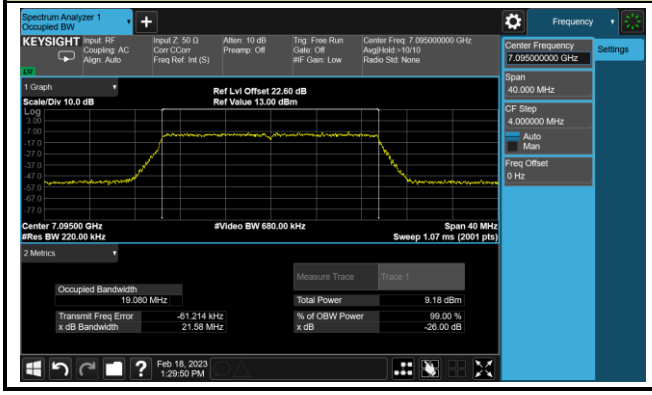
Test Mode	Data Rate/ MCS	Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
802.11ax-HE20	MCS0	33	6115	21.38	19.031
802.11ax-HE20	MCS0	61	6255	21.50	19.096
802.11ax-HE20	MCS0	93	6415	21.60	19.064
802.11ax-HE20	MCS0	97	6435	21.24	19.035
802.11ax-HE20	MCS0	105	6475	21.56	19.065
802.11ax-HE20	MCS0	113	6515	21.44	19.089
802.11ax-HE20	MCS0	117	6535	21.56	19.082
802.11ax-HE20	MCS0	149	6695	21.46	19.058
802.11ax-HE20	MCS0	181	6855	21.19	19.063
802.11ax-HE20	MCS0	185	6875	21.35	19.080
802.11ax-HE20	MCS0	189	6895	21.37	19.059
802.11ax-HE20	MCS0	213	7015	21.53	19.050
802.11ax-HE20	MCS0	229	7095	21.58	19.080
802.11ax-HE40	MCS0	35	6125	40.25	37.679
802.11ax-HE40	MCS0	59	6245	40.28	37.708
802.11ax-HE40	MCS0	91	6405	40.38	37.694
802.11ax-HE40	MCS0	99	6445	40.09	37.677
802.11ax-HE40	MCS0	107	6485	39.96	37.660
802.11ax-HE40	MCS0	115	6525	40.23	37.670
802.11ax-HE40	MCS0	123	6565	40.07	37.653
802.11ax-HE40	MCS0	147	6685	40.22	37.724
802.11ax-HE40	MCS0	179	6845	40.10	37.665
802.11ax-HE40	MCS0	187	6885	40.24	37.723
802.11ax-HE40	MCS0	195	6925	40.46	37.697
802.11ax-HE40	MCS0	211	7005	40.22	37.657
802.11ax-HE40	MCS0	227	7085	40.16	37.728

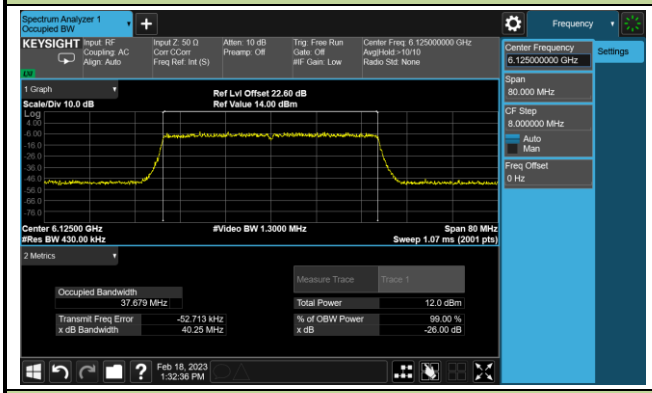
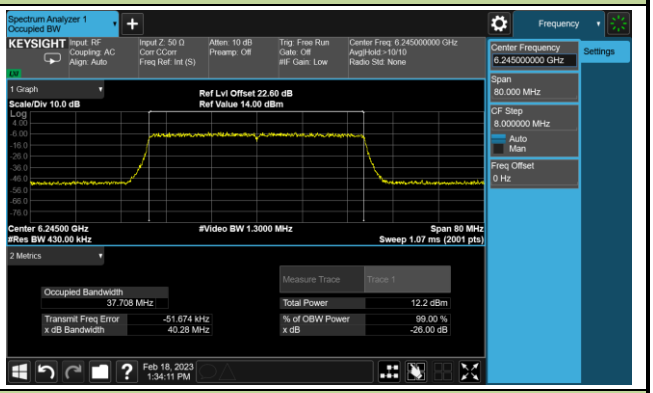
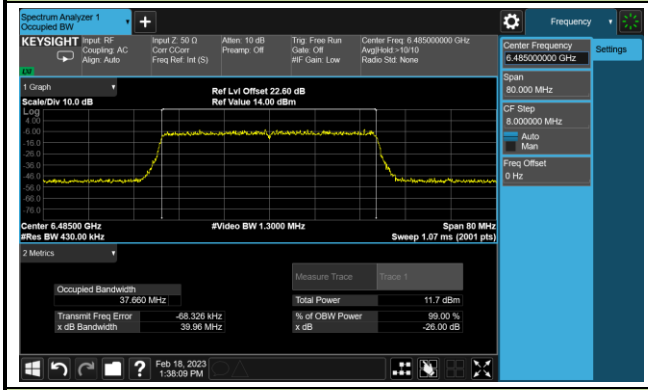
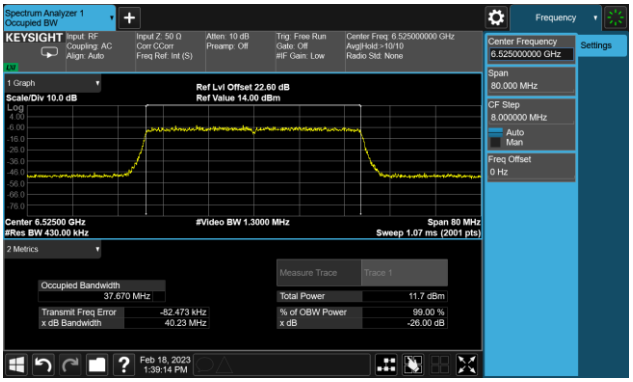
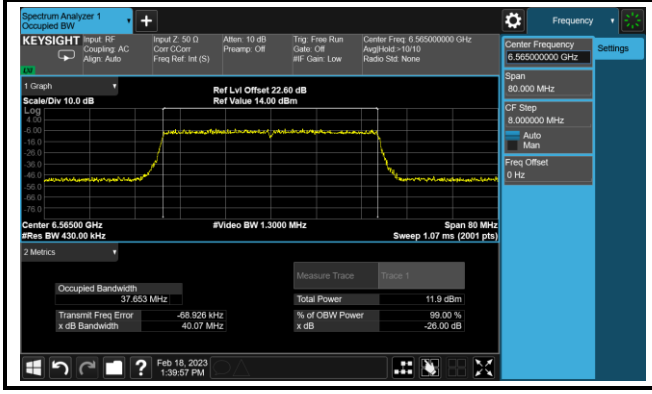
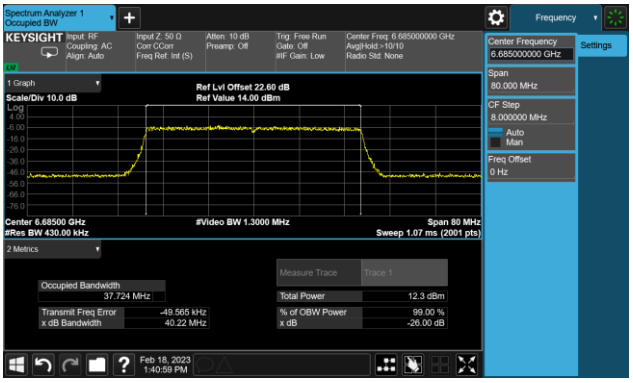
Test Mode	Data Rate/ MCS	Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
802.11ax-HE80	MCS0	39	6145	81.37	77.016
802.11ax-HE80	MCS0	55	6225	81.40	76.965
802.11ax-HE80	MCS0	87	6385	81.37	77.071
802.11ax-HE80	MCS0	103	6465	81.22	77.029
802.11ax-HE80	MCS0	119	6545	81.28	76.905
802.11ax-HE80	MCS0	135	6625	81.23	77.115
802.11ax-HE80	MCS0	151	6705	80.98	76.958
802.11ax-HE80	MCS0	167	6785	81.47	77.037
802.11ax-HE80	MCS0	183	6865	80.98	76.992
802.11ax-HE80	MCS0	199	6945	81.65	77.073
802.11ax-HE80	MCS0	215	7025	81.56	77.005
802.11ax-HE160	MCS0	47	6185	163.8	156.01
802.11ax-HE160	MCS0	79	6345	163.1	156.18
802.11ax-HE160	MCS0	111	6505	163.4	156.03
802.11ax-HE160	MCS0	143	6665	163.3	155.94
802.11ax-HE160	MCS0	175	6825	162.8	156.17
802.11ax-HE160	MCS0	207	6985	163.6	156.11
802.11be-EHT20	MCS0	33	6115	21.31	19.070
802.11be-EHT20	MCS0	61	6255	21.47	19.078
802.11be-EHT20	MCS0	93	6415	21.50	19.032
802.11be-EHT20	MCS0	97	6435	21.64	19.029
802.11be-EHT20	MCS0	105	6475	21.38	19.087
802.11be-EHT20	MCS0	113	6515	21.38	19.043
802.11be-EHT20	MCS0	117	6535	21.54	19.071
802.11be-EHT20	MCS0	149	6695	21.29	19.053
802.11be-EHT20	MCS0	181	6855	21.32	19.092
802.11be-EHT20	MCS0	185	6875	21.42	19.091
802.11be-EHT20	MCS0	189	6895	21.61	19.031
802.11be-EHT20	MCS0	213	7015	21.59	19.136
802.11be-EHT20	MCS0	229	7095	21.60	19.070

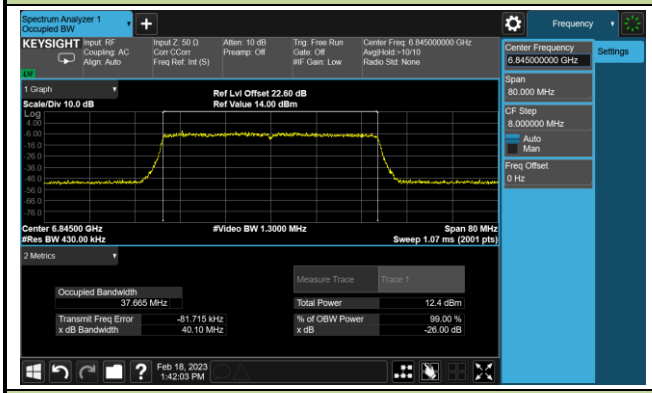
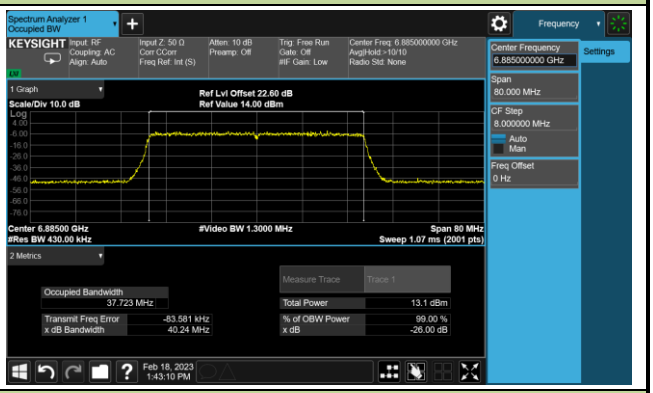
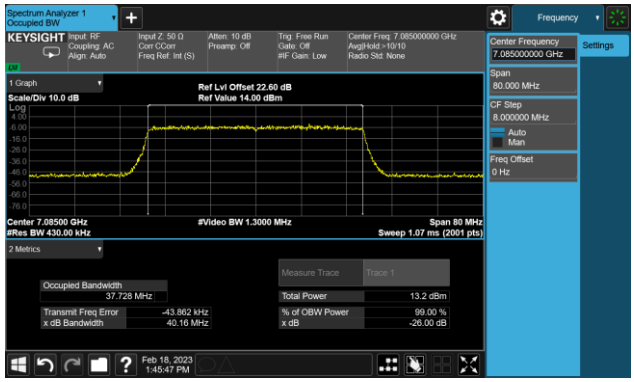
Test Mode	Data Rate/ MCS	Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
802.11be-EHT40	MCS0	35	6125	40.11	37.655
802.11be-EHT40	MCS0	59	6245	40.42	37.734
802.11be-EHT40	MCS0	91	6405	40.32	37.708
802.11be-EHT40	MCS0	99	6445	40.04	37.703
802.11be-EHT40	MCS0	107	6485	40.12	37.668
802.11be-EHT40	MCS0	115	6525	40.30	37.773
802.11be-EHT40	MCS0	123	6565	40.24	37.676
802.11be-EHT40	MCS0	147	6685	40.15	37.718
802.11be-EHT40	MCS0	179	6845	40.25	37.710
802.11be-EHT40	MCS0	187	6885	40.12	37.645
802.11be-EHT40	MCS0	195	6925	40.22	37.712
802.11be-EHT40	MCS0	211	7005	40.31	37.758
802.11be-EHT40	MCS0	227	7085	40.42	37.727
802.11be-EHT80	MCS0	39	6145	81.10	77.193
802.11be-EHT80	MCS0	55	6225	81.11	77.020
802.11be-EHT80	MCS0	87	6385	81.58	76.981
802.11be-EHT80	MCS0	103	6465	81.08	77.195
802.11be-EHT80	MCS0	119	6545	80.90	76.955
802.11be-EHT80	MCS0	135	6625	81.22	77.125
802.11be-EHT80	MCS0	151	6705	80.94	77.080
802.11be-EHT80	MCS0	167	6785	81.26	77.026
802.11be-EHT80	MCS0	183	6865	81.38	77.124
802.11be-EHT80	MCS0	199	6945	81.64	77.061
802.11be-EHT80	MCS0	215	7025	81.14	77.123
802.11be-EHT160	MCS0	47	6185	162.4	155.95
802.11be-EHT160	MCS0	79	6345	164.5	156.18
802.11be-EHT160	MCS0	111	6505	162.8	156.02
802.11be-EHT160	MCS0	143	6665	164.8	156.02
802.11be-EHT160	MCS0	175	6825	163.3	156.19
802.11be-EHT160	MCS0	207	6985	163.9	156.15

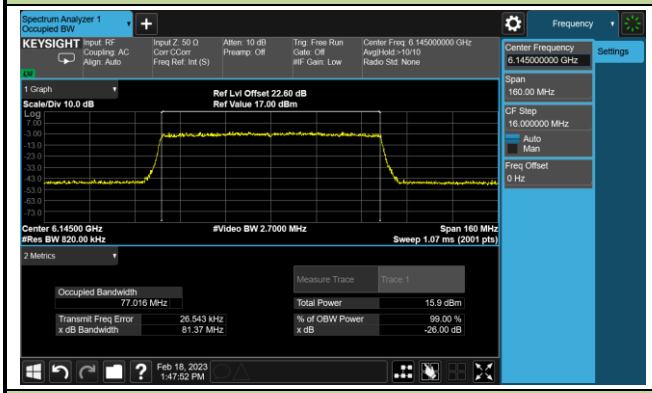
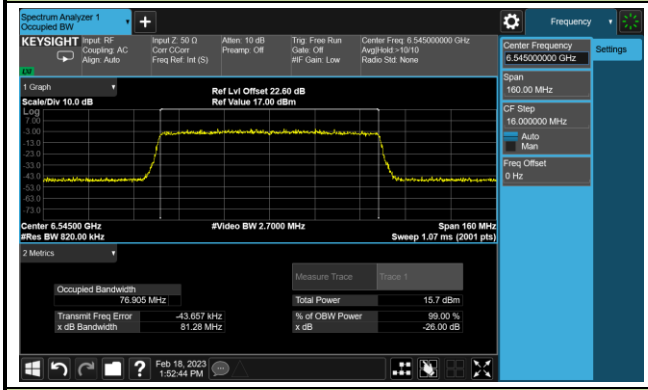
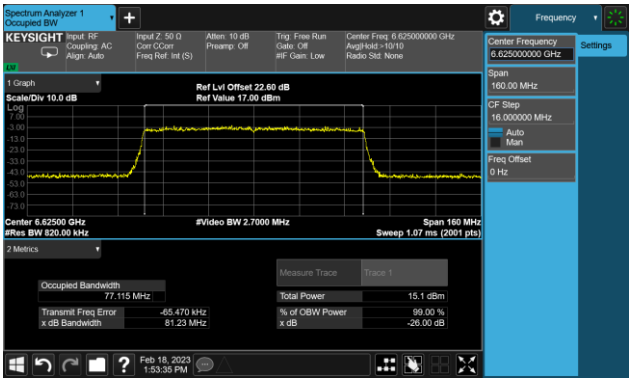
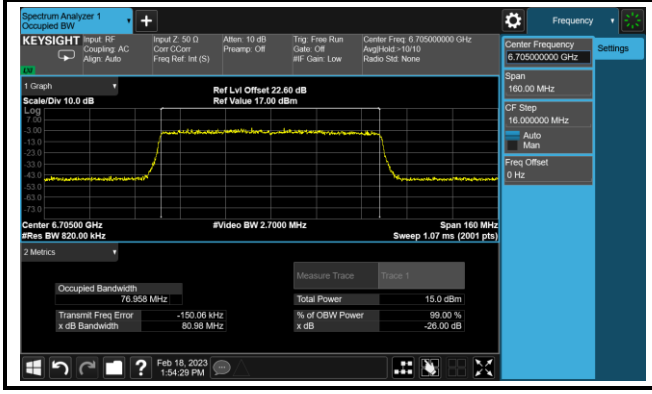
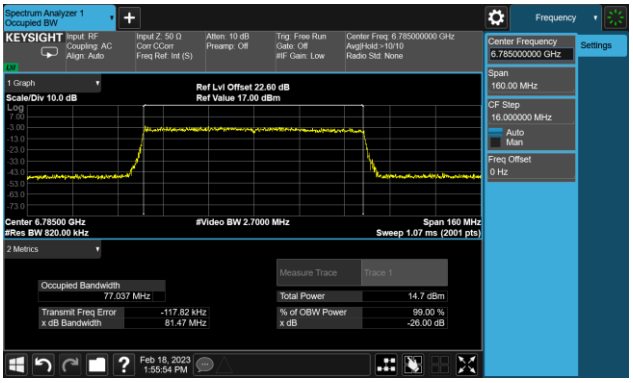
Test Mode	Data Rate/ MCS	Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
802.11be-EHT320	MCS0	63	6265	328.1	314.56
802.11be-EHT320	MCS0	95	6425	327.3	313.77
802.11be-EHT320	MCS0	127	6585	325.8	313.03
802.11be-EHT320	MCS0	159	6745	326.5	313.46
802.11be-EHT320	MCS0	191	6905	326.3	314.74

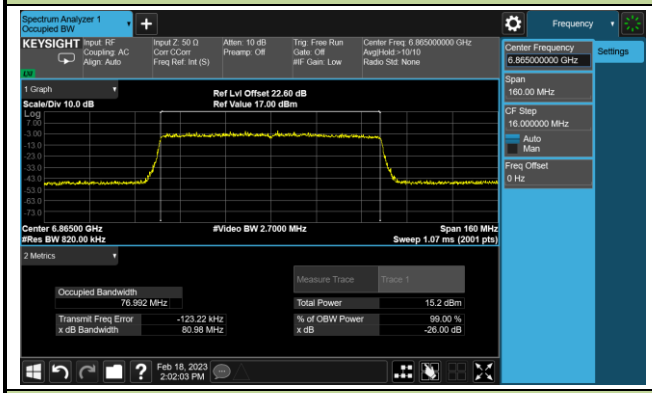
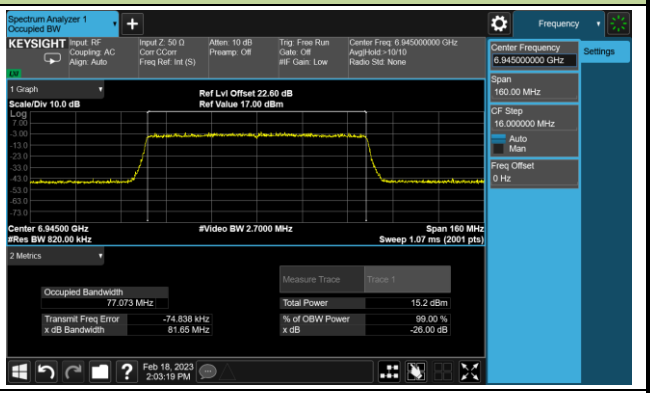
802.11ax-HE20 26dB Bandwidth	
Channel 33 (6115MHz)	Channel 61 (6255MHz)
	
Channel 93 (6415MHz)	Channel 97 (6435MHz)
	
Channel 105 (6475MHz)	Channel 113 (6515MHz)
	
Channel 117 (6535MHz)	Channel 149 (6695MHz)
	

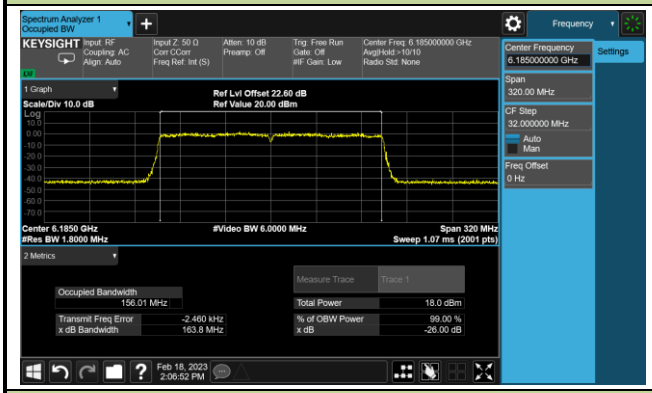
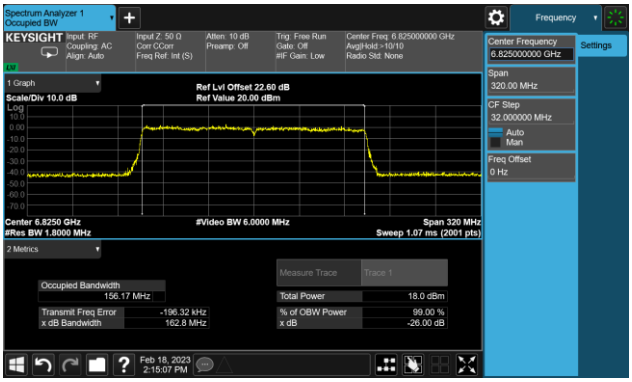
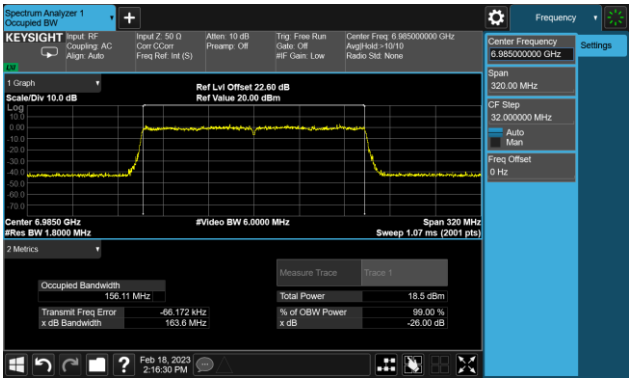
802.11ax-HE20 26dB Bandwidth	
Channel 181 (6855MHz)	Channel 185 (6875MHz)
	
Channel 189 (6895MHz)	Channel 213 (7015MHz)
	
Channel 229 (7095MHz)	
	

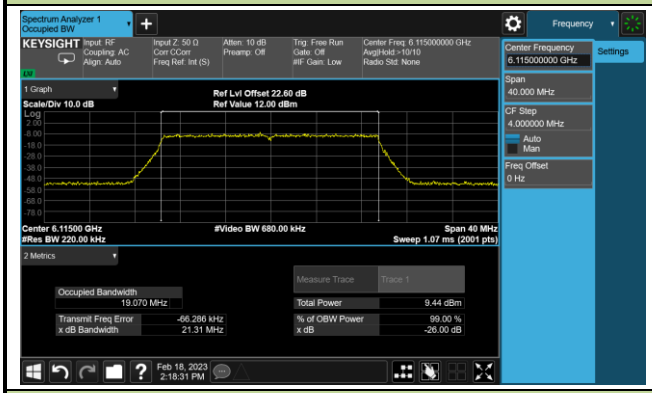
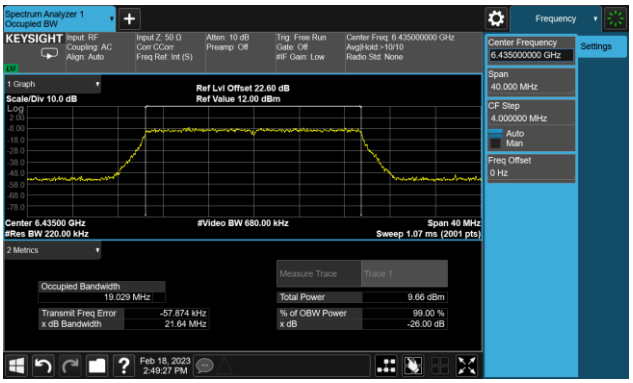
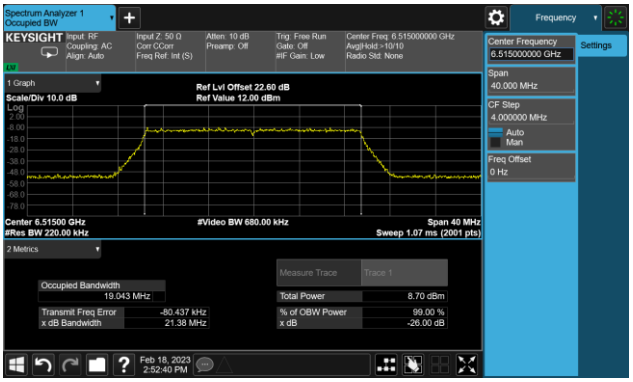
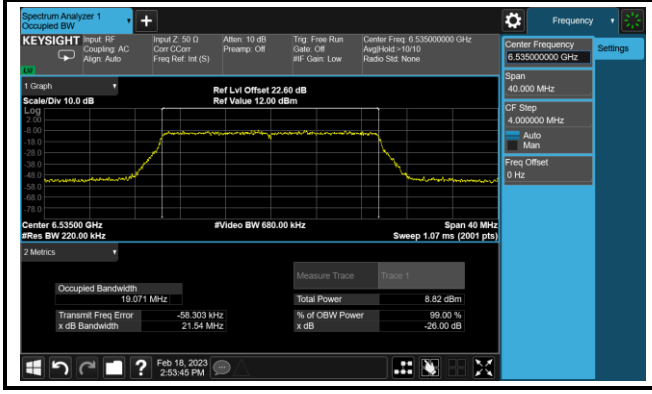
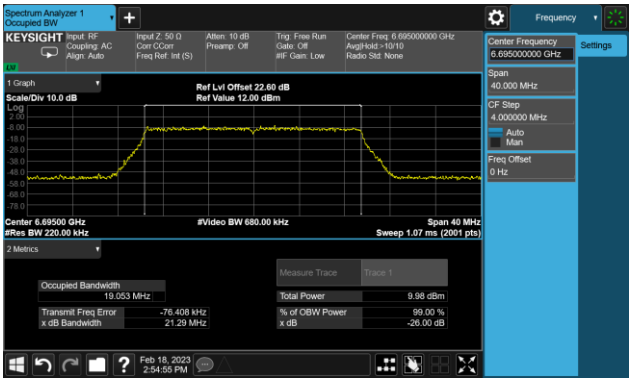
802.11ax-HE40 26dB Bandwidth	
Channel 35 (6125MHz)	Channel 59 (6245MHz)
	
Channel 91 (6405MHz)	Channel 99 (6445MHz)
	
Channel 107 (6485MHz)	Channel 115 (6525MHz)
	
Channel 123 (6565MHz)	Channel 147 (6685MHz)
	

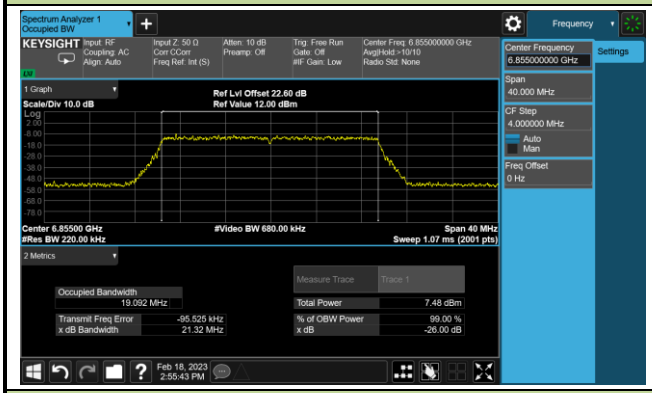
802.11ax-HE40 26dB Bandwidth	
Channel 179 (6845MHz)	Channel 187 (6885MHz)
	
Channel 195 (6925MHz)	Channel 211 (7005MHz)
	
Channel 227 (7085MHz)	
	

802.11ax-HE80 26dB Bandwidth	
Channel 39 (6145MHz)	Channel 55 (6225MHz)
	
Channel 87 (6385MHz)	Channel 103 (6465MHz)
	
Channel 119 (6545MHz)	Channel 135 (6625MHz)
	
Channel 151 (6705MHz)	Channel 167 (6785MHz)
	

802.11ax-HE80 26dB Bandwidth	
Channel 183 (6865MHz)	Channel 199 (6945MHz)
	
Channel 215 (7025MHz)	
	

802.11ax-HE160 26dB Bandwidth	
Channel 47 (6185MHz)	Channel 79 (6345MHz)
	
Channel 111 (6505MHz)	Channel 143 (6665MHz)
	
Channel 175 (6825MHz)	Channel 207 (6985MHz)
	

802.11be-EHT20 26dB Bandwidth	
Channel 33 (6115MHz)	Channel 61 (6255MHz)
	
Channel 93 (6415MHz)	Channel 97 (6435MHz)
	
Channel 105 (6475MHz)	Channel 113 (6515MHz)
	
Channel 117 (6535MHz)	Channel 149 (6695MHz)
	

802.11be-EHT20 26dB Bandwidth	
Channel 181 (6855MHz)	Channel 185 (6875MHz)
	
Channel 189 (6895MHz)	Channel 213 (7015MHz)
	
Channel 229 (7095MHz)