



RF MEASUREMENT REPORT

FCC ID: 2AXJ4BE95

Applicant: TP-Link Corporation Limited

Product: BE33000 Whole Home Mesh Wi-Fi 7 System

Model No.: Deco BE95

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: 2023-01-03

Test Date: 2023-01-10 ~ 2023-03-13

Reviewed By:

Kevin Guo

Approved By:

Robin Wu



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 KDB789033. Test results reported herein relate only to the item(s) tested.

The test report shall not be reproduced except in full without the written approval of MRT Technology (Suzhou) Co., Ltd.

Revision History

Report No.	Version	Description	Issue Date	Note
2212RSU044-U6	V01	Initial Report	2023-03-27	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	BE33000 Whole Home Mesh Wi-Fi 7 System
Model No.	Deco BE95
EUT Identification No.	20230103Sample#01 (Conducted) 20230103Sample#02 (Radiated and AC conducted Emission)
Wi-Fi Specification	802.11a/b/g/n/ac/ax/be
Antenna Information	Refer to selection 1.7
Working Voltage	By Adapter
Accessory	
Adapter	Model: T150500-2-DT INPYUT: 100-240~50/60Hz 2.0A OUTPUT: DC15.0V, 5.0A
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 ~ 6415MHz, 6755 ~ 7095MHz, For 802.11ax-HE40/be-EHT40: 6125 ~ 6405MHz, 6765 ~ 7085MHz, For 802.11ax-HE80/be-EHT80: 6145 ~ 6385MHz, 6785 ~ 7025MHz, For 802.11ax-HE160/be-EHT160: 6185MHz, 6345MHz, 6825MHz, 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	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	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	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	175	6825 MHz
207	6985 MHz	--	--	--	--

802.11be-EHT320

Channel	Frequency	Channel	Frequency	Channel	Frequency
63	6265 MHz	191	6905 MHz	--	--

1.7. Antenna Details

Antenna Type	Frequency Band (MHz)	Tx Paths	Number of spatial streams	Antenna Gain (dBi)				CDD Directional Gain (dBi)	
				Ant 0	Ant 1	Ant 2	Ant 3	For Power	For PSD
Dipole Antenna	5925 ~ 6425	4	1	2.94	2.92	2.74	2.96	2.96	8.98
		4	4	2.94	2.92	2.74	2.96	2.96	2.96
	6745 ~ 7125	4	1	2.91	2.61	2.53	2.98	2.98	9.00
		4	4	2.91	2.61	2.53	2.98	2.98	2.98

Remark:

- The EUT supports Cyclic Delay Diversity (CDD) mode, and CDD signals are correlated.

Directional gain = Max. 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 $N_{ANT} \leq 4$;

- The information as above is from the antenna specifications.

2.

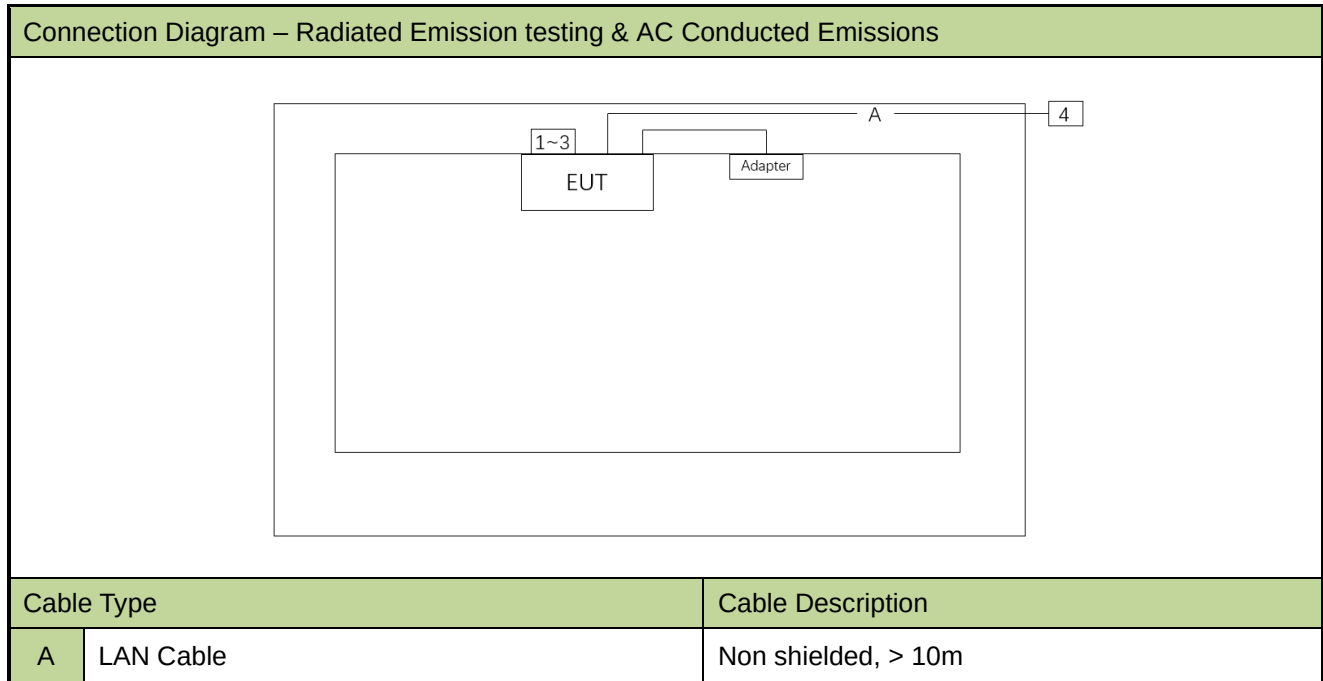
2. Test Configuration

2.1. Test Mode

Mode 1: Transmit by 802.11ax-HE20_Nss=1 (MCS0)
Mode 2: Transmit by 802.11ax-HE40_Nss=1 (MCS0)
Mode 3: Transmit by 802.11ax-HE80_Nss=1 (MCS0)
Mode 4: Transmit by 802.11ax-HE160_Nss=1 (MCS0)
Mode 5: Transmit by 802.11be-EHT20_Nss=1 (MCS0)
Mode 6: Transmit by 802.11be-EHT40_Nss=1 (MCS0)
Mode 7: Transmit by 802.11be-EHT80_Nss=1 (MCS0)
Mode 8: Transmit by 802.11be-EHT160_Nss=1 (MCS0)
Mode 9: Transmit by 802.11be-EHT320_Nss=1 (MCS0)
Mode 10: Transmit by 802.11ax-HE20_Nss=4 (MCS0)
Mode 11: Transmit by 802.11be-EHT20_Nss=4 (MCS0)
Mode 12: Transmit by 802.11be-EHT320_Nss=4 (MCS0)
Note: - For Radiated emission, the modulation and the data rate picked for testing are determined by the Max. RF conducted power. - For CDD mode, this device supports 4 Nss and power level is the same of spatial multiplexing. The worst case is Nss=1. Meanwhile, Nss=4 at 802.11ax-HE20/be-EHT20/be-ETH320 was tested in this report. - For radiated emission, only the data at Nss=4 mode is shown in this report due to the RF output power is higher at this mode. - EUT supports one configuration only in 802.11ax/be full RU mode. - 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.



2.3. Test System Details

Product	Manufacturer	Model No.
1~3	Simulated load	N/A
4	Notebook	Lenovo
		E431

2.4. Test Software

The test utility software used during testing was “QSPR”, and the version was 5.0-00202.
Final power setting please refer to operational description.

2.5. 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

2.6. 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
EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2023-12-28	WZ-AC1
Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06023	1 year	2023-08-22	WZ-AC1
Preamplifier	Agilent	83017A	MRTSUE06076	1 year	2023-05-08	WZ-AC1
TRILOG Antenna	Schwarzbeck	VULB 9168	MRTSUE06172	1 year	2023-06-21	WZ-AC1
Anechoic Chamber	TDK	WZ-AC1	MRTSUE06212	1 year	2023-04-21	WZ-AC1
Thermohygrometer	testo	608-H1	MRTSUE06403	1 year	2023-06-06	WZ-AC1
Signal Analyzer	Keysight	N9010B	MRTSUE06607	1 year	2023-12-28	WZ-AC1
Thermohygrometer	testo	608-H1	MRTSUE11039	1 year	2023-11-01	WZ-AC1
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2023-09-29	WZ-AC1
Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06597	1 year	2023-11-05	WZ-AC1
Preamplifier	EMCI	EMC184045SE	MRTSUE06640	1 year	2024-01-12	WZ-AC1
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
TRILOG Antenna	Schwarzbeck	VULB 9168	MRTSUE06645	1 year	2023-07-30	SIP-AC1

Software	Version	Function
EMI Software	V3.0.0	EMI Test Software
Controller_MF 7802	2.03C	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), (a)(6)	Maximum Equivalent Isotropically Radiated Power (e.i.r.p)		Pass
15.407(a)(5), (a)(6)	Peak Power Spectral Density (e.i.r.p)		Pass
15.407(b)(6)	In-Band Emission	Radiated	Pass
15.407(d)(6)	Contention-Based Protocol	Conducted	Pass
15.407(g)	Frequency Stability		Pass
15.407(b)(5)	Unwanted Emissions	Radiated	Pass
15.407(b)(7), (8), (9)	General Field Strength (Restricted Bands and Radiated Emission)		Pass
15.207	AC Conducted Emissions 150kHz - 30MHz	Line Conducted	Pass

Notes:

- 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.
- 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

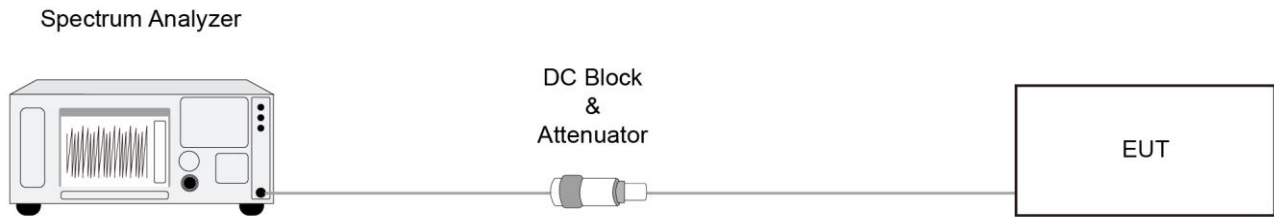
26dB Bandwidth

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. $\text{VBW} \geq 3 \times \text{RBW}$
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

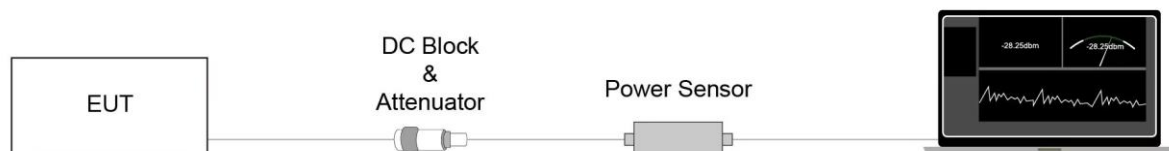
KDB 789033D02v02r01- Section II(E)3)b) Method PM-G

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.

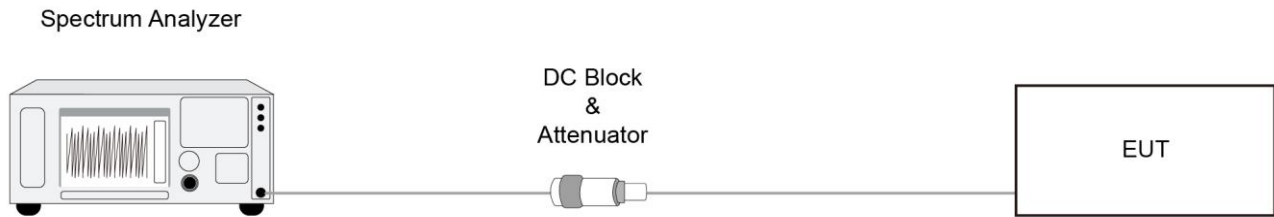
6.4.2. Test Procedure

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 $\geq 2 \times (\text{span} / \text{RBW})$
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 $10 \cdot \log(1/x)$, 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 $10 \cdot \log(1/0.25) = 6$ 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

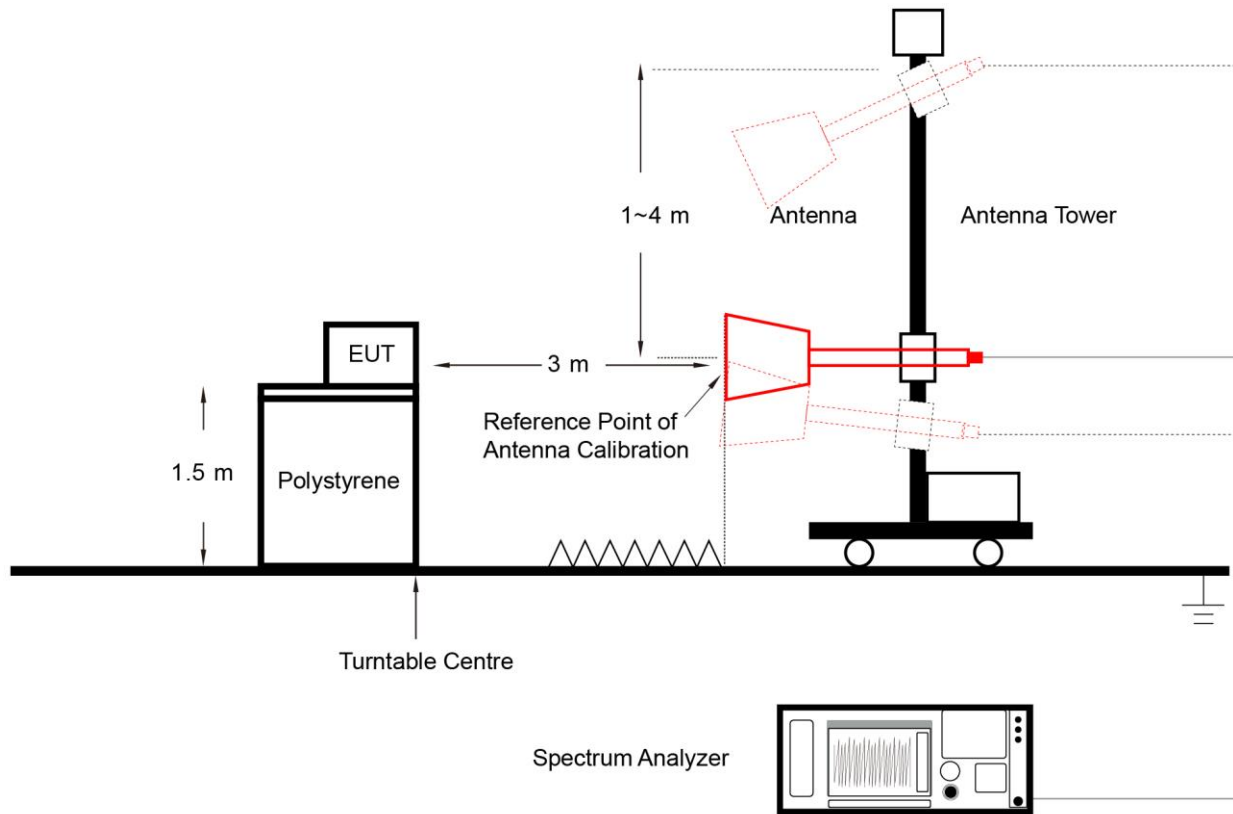
Emissions Mask Reference Level Measurement

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 $\geq 3 \times$ RBW.
4. Number of points in sweep $\geq [2 \times \text{span} / \text{RBW}]$.
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:

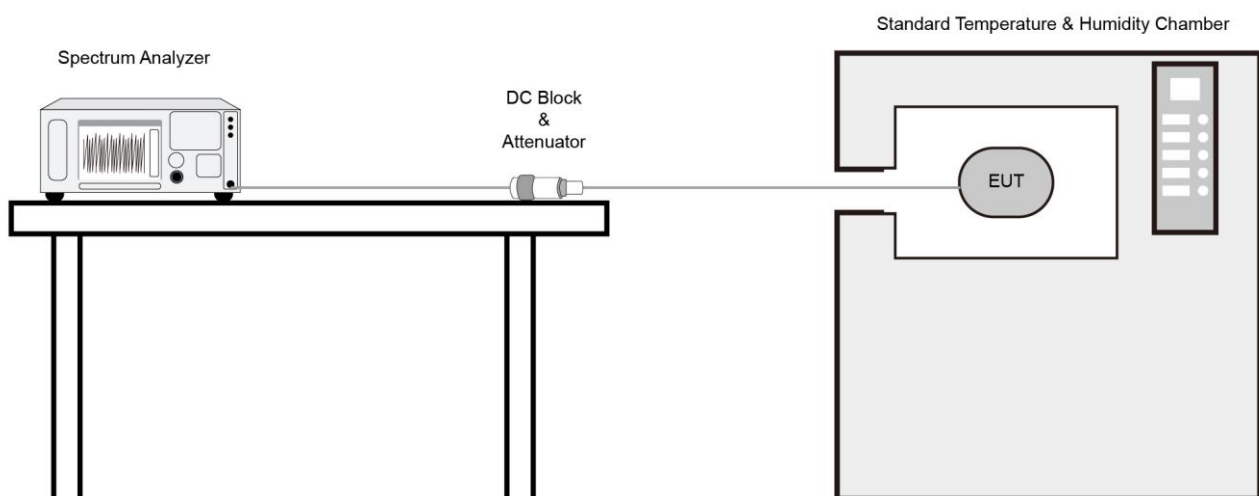
The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain 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 ($\pm 15\%$) 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

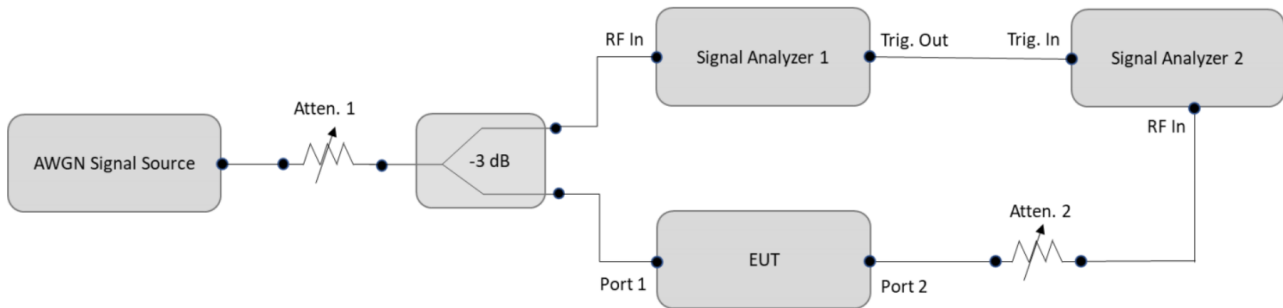
KDB 987594 D02v01- Section I

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

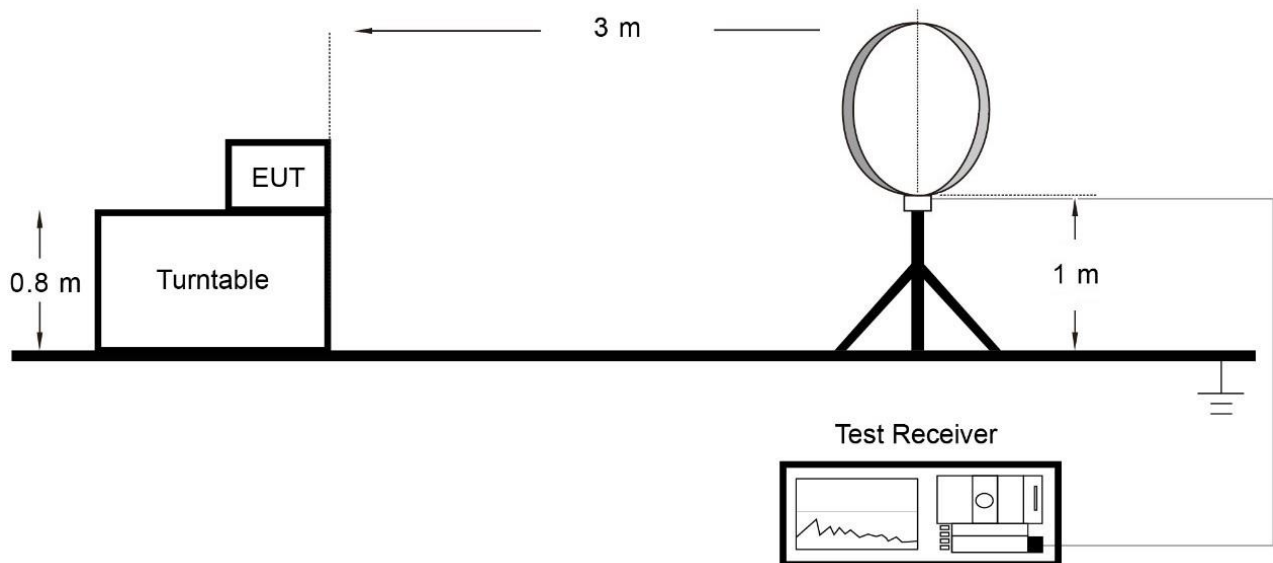
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

Average Measurements above 1GHz (Method VB)

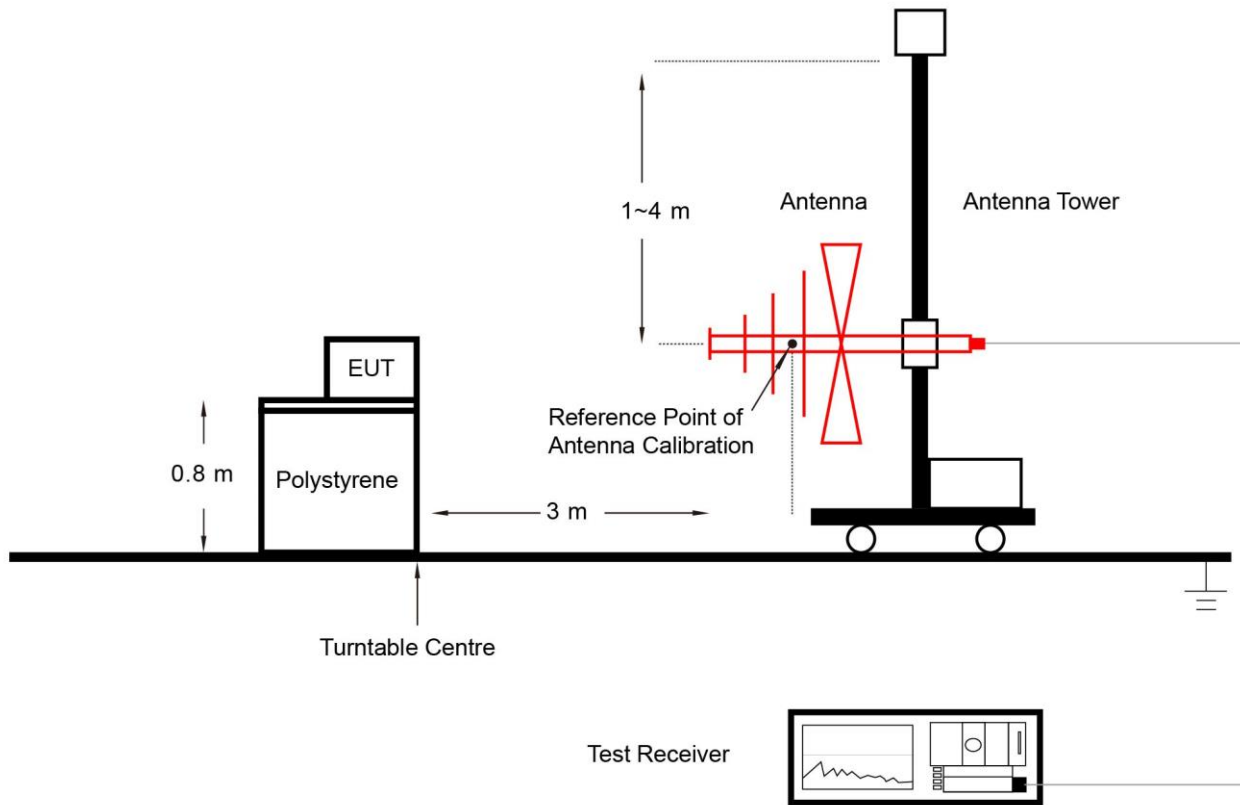
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW; If the EUT is configured to transmit with duty cycle $\geq 98\%$, set VBW = 10 Hz.
If the EUT duty cycle is $< 98\%$, set VBW $\geq 1/T$. T is the minimum transmission duration.
4.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

6.8.4. Test Setup

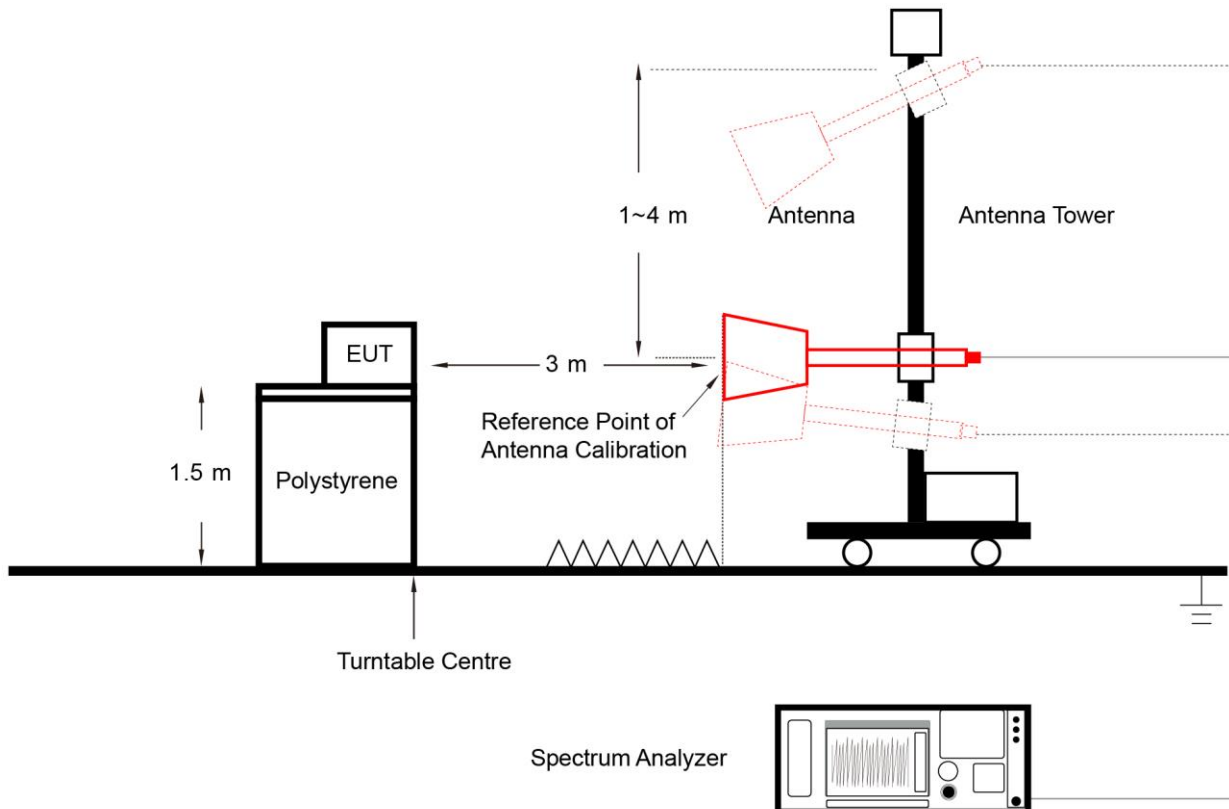
Below 30MHz Test Setup:



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

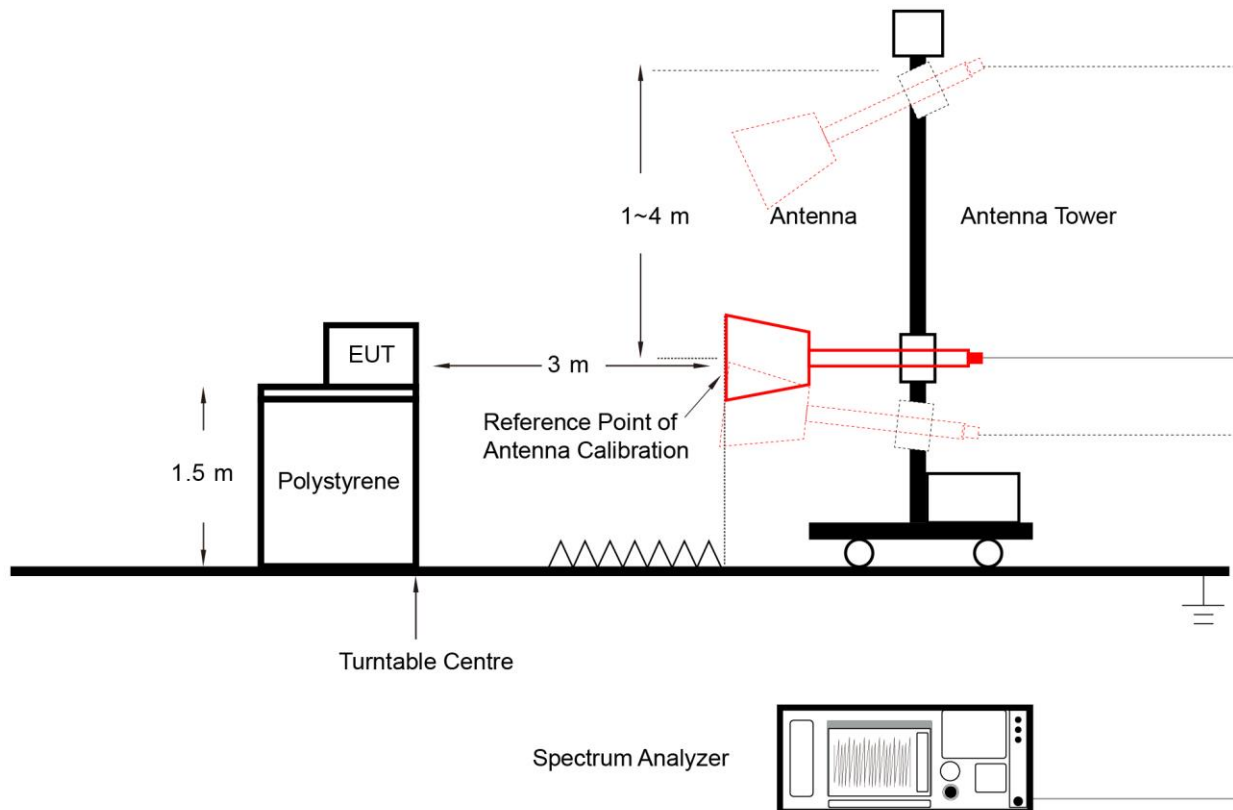
Peak Measurements above 1GHz

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 $\geq 98\%$, set VBW = 10Hz
4. If the EUT duty cycle is $< 98\%$, set VBW $\geq 1/T$. 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

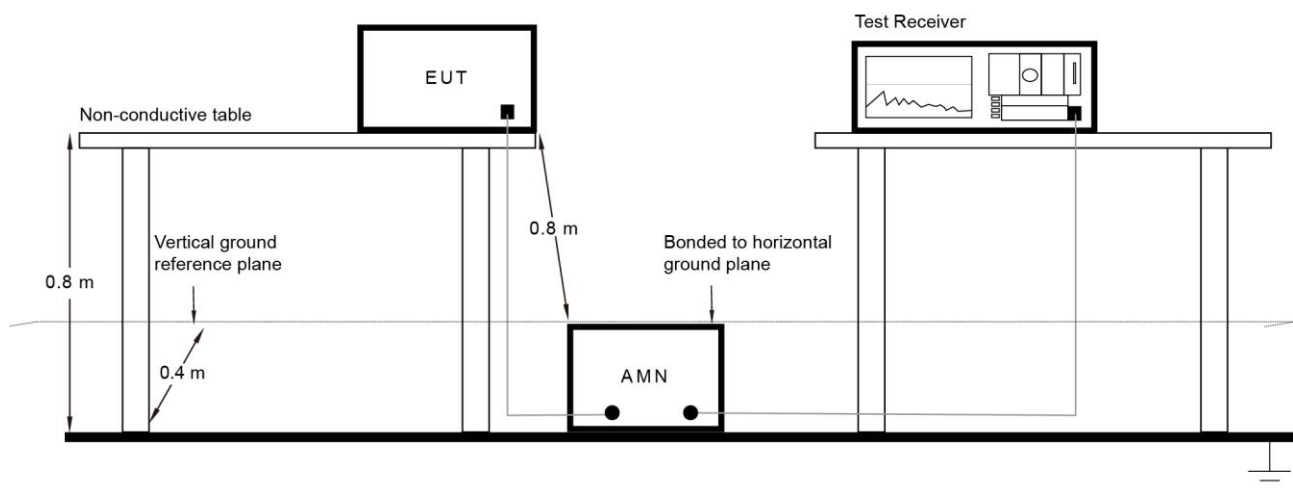
6.10.1. Test Limit

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

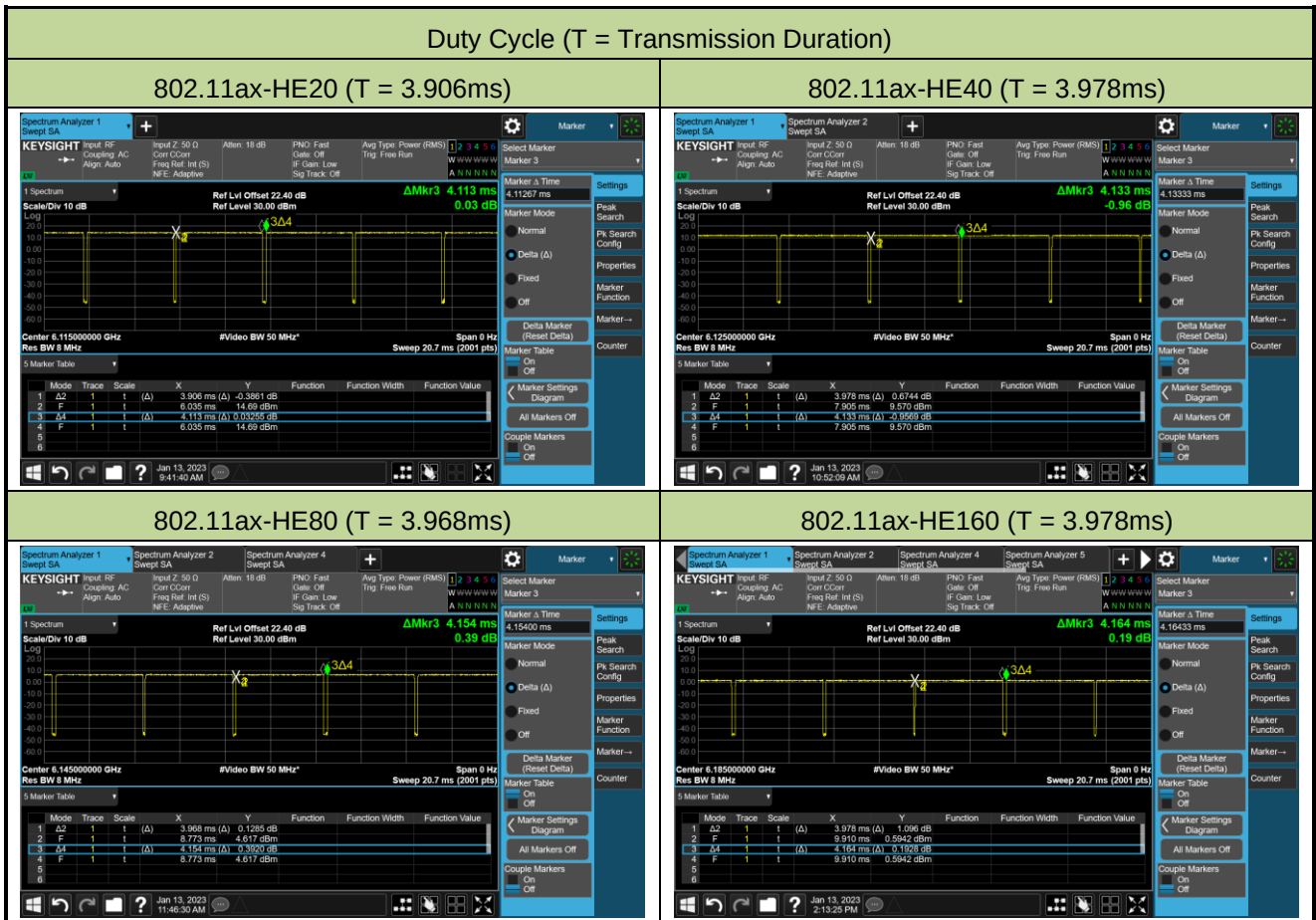
Refer to Appendix A.10.

Appendix A – Test Result

A.1 Duty Cycle Test Result

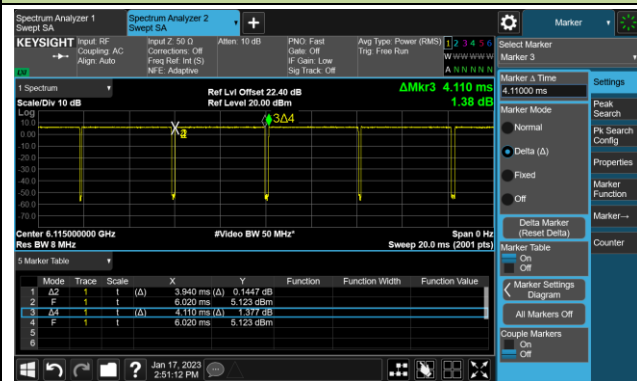
Test Site	WZ-SR5	Test Engineer	Jeff Yang
Test Date	2023-01-13	Test Mode	N _{SS} =1

Test Mode	Duty Cycle	Test Mode	Duty Cycle
802.11ax-HE20	94.97%	802.11be-EHT20	95.86%
802.11ax-HE40	96.25%	802.11be-EHT40	95.62%
802.11ax-HE80	95.52%	802.11be-EHT80	92.56%
802.11ax-HE160	95.53%	802.11be-EHT160	95.54%
--	--	802.11be-EHT320	95.67%

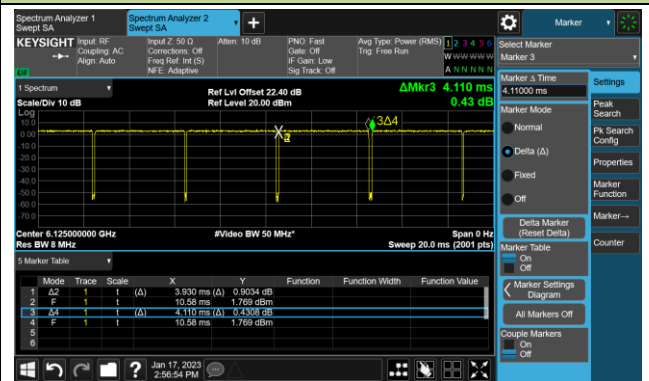


Duty Cycle (T = Transmission Duration)

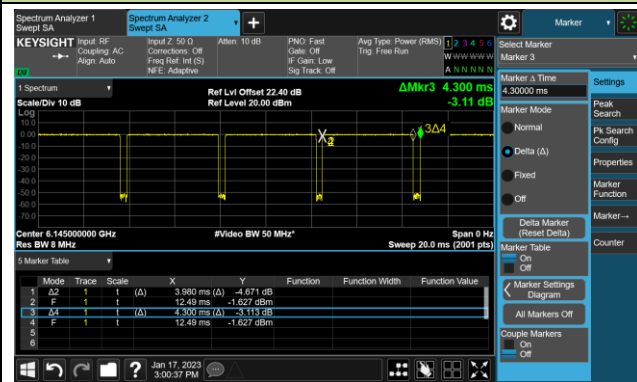
802.11be-EHT20 (T = 3.940ms)



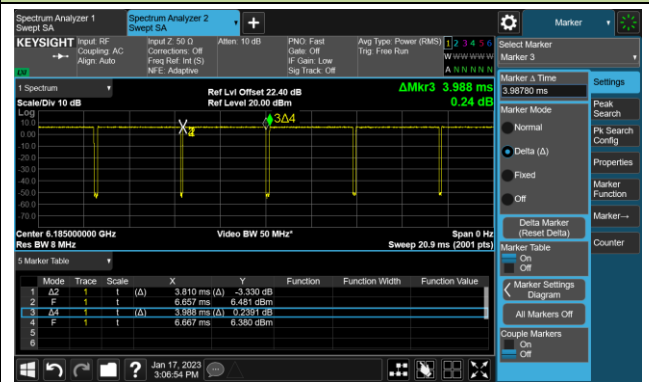
802.11be-EHT40 (T = 3.930ms)



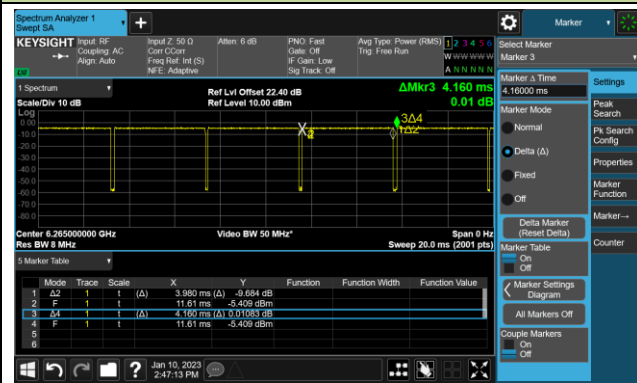
802.11be-EHT80 (T = 3.980ms)



802.11be-EHT160 (T = 3.810ms)

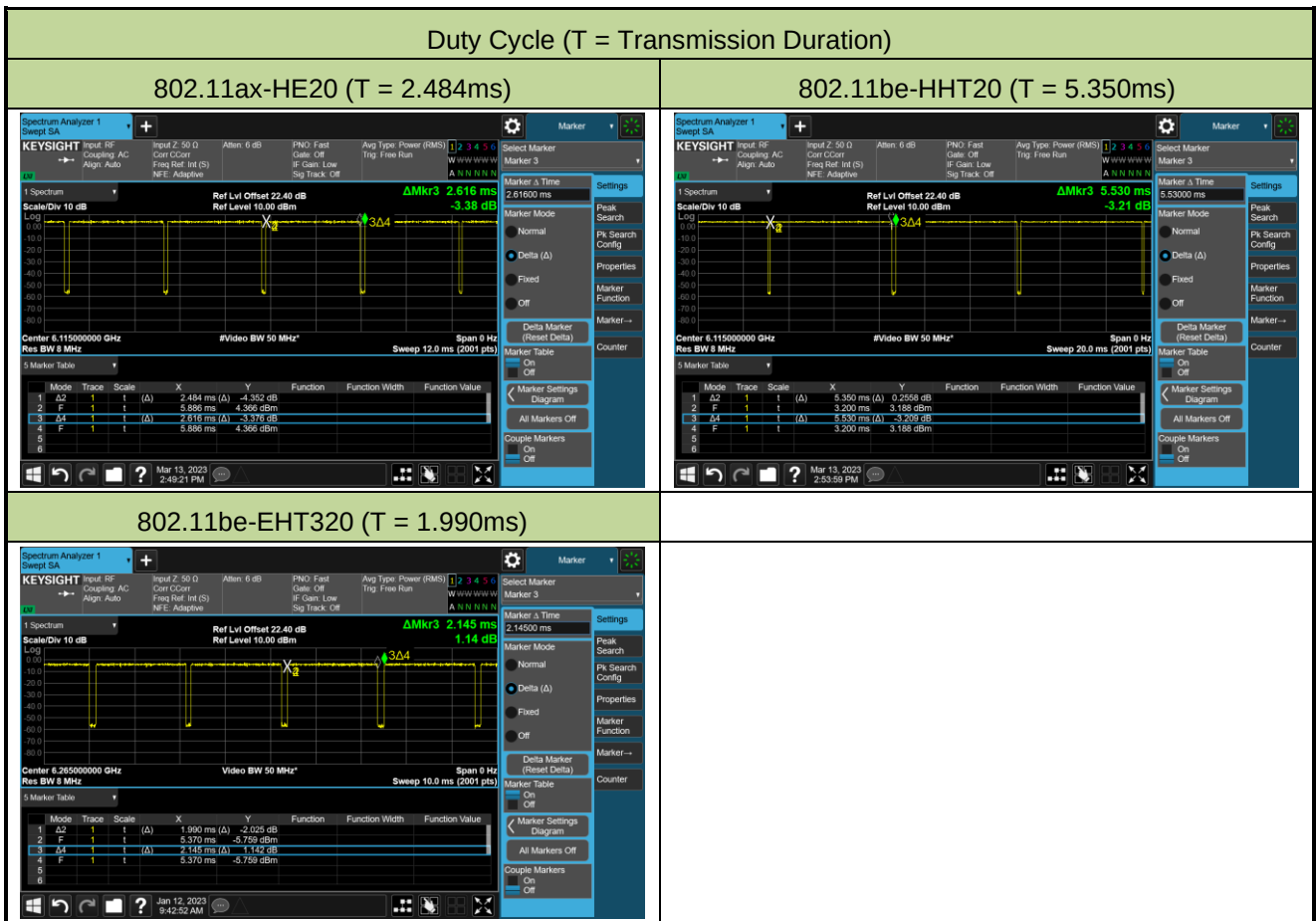


802.11be-EHT320 (T = 3.980ms)



Test Site	WZ-SR5	Test Engineer	Jeff Yang
Test Date	2023-01-12 ~ 03 -13	Test Mode	N _{SS} =4

Test Mode	Duty Cycle	Test Mode	Duty Cycle
802.11ax-HE20	94.95%	802.11be-EHT20	96.75%
802.11be-EHT320	92.77%	--	--



A.2 26dB Bandwidth Test Result

Test Site	WZ-SR5	Test Engineer	Jeff Yang
Test Date	2023-02-06	Test Mode	N _{ss} =1

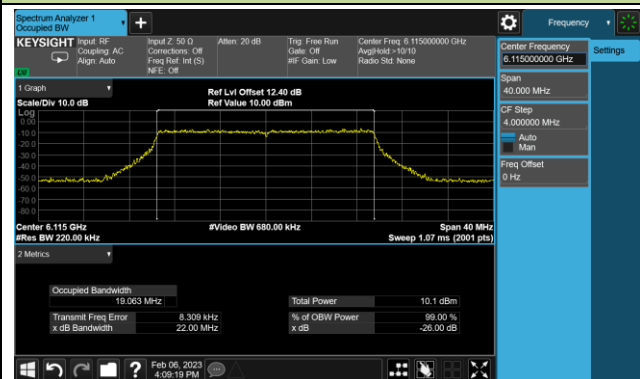
Test Mode	Data Rate/ MCS	Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
802.11ax-HE20	MCS0	33	6115	22.00	19.063
802.11ax-HE20	MCS0	61	6255	21.82	19.101
802.11ax-HE20	MCS0	93	6415	21.88	19.058
802.11ax-HE20	MCS0	161	6755	21.72	19.083
802.11ax-HE20	MCS0	169	6795	21.63	19.031
802.11ax-HE20	MCS0	177	6835	21.81	19.035
802.11ax-HE20	MCS0	181	6855	21.60	19.047
802.11ax-HE20	MCS0	185	6875	21.34	19.046
802.11ax-HE20	MCS0	189	6895	21.89	19.070
802.11ax-HE20	MCS0	213	7015	21.70	19.034
802.11ax-HE20	MCS0	229	7095	21.83	19.102
802.11ax-HE40	MCS0	35	6125	42.85	37.992
802.11ax-HE40	MCS0	59	6245	42.80	38.054
802.11ax-HE40	MCS0	91	6405	43.13	37.939
802.11ax-HE40	MCS0	163	6765	42.56	38.000
802.11ax-HE40	MCS0	171	6805	43.01	38.001
802.11ax-HE40	MCS0	179	6845	41.91	37.912
802.11ax-HE40	MCS0	187	6885	43.24	38.060
802.11ax-HE40	MCS0	211	7005	42.81	37.999
802.11ax-HE40	MCS0	227	7085	42.30	37.946
802.11ax-HE80	MCS0	39	6145	86.99	77.718
802.11ax-HE80	MCS0	55	6225	86.37	77.726
802.11ax-HE80	MCS0	87	6385	85.77	77.785
802.11ax-HE80	MCS0	167	6785	85.03	77.653
802.11ax-HE80	MCS0	183	6865	87.81	77.600
802.11ax-HE80	MCS0	199	6945	87.26	77.601
802.11ax-HE80	MCS0	215	7025	86.53	77.660

Test Mode	Data Rate/ MCS	Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
802.11ax-HE160	MCS0	47	6185	171.4	156.89
802.11ax-HE160	MCS0	79	6345	169.5	157.03
802.11ax-HE160	MCS0	175	6825	170.5	156.81
802.11ax-HE160	MCS0	207	6985	167.4	156.67
802.11be-EHT20	MCS0	33	6115	22.02	19.081
802.11be-EHT20	MCS0	61	6255	21.82	19.078
802.11be-EHT20	MCS0	93	6415	23.75	19.194
802.11be-EHT20	MCS0	161	6755	21.78	19.094
802.11be-EHT20	MCS0	169	6795	21.70	19.083
802.11be-EHT20	MCS0	177	6835	21.92	19.057
802.11be-EHT20	MCS0	181	6855	21.67	19.078
802.11be-EHT20	MCS0	185	6875	21.99	19.102
802.11be-EHT20	MCS0	189	6895	21.88	19.098
802.11be-EHT20	MCS0	213	7015	22.01	19.094
802.11be-EHT20	MCS0	229	7095	24.81	19.263
802.11be-EHT40	MCS0	35	6125	42.82	38.019
802.11be-EHT40	MCS0	59	6245	42.35	37.998
802.11be-EHT40	MCS0	91	6405	42.31	37.977
802.11be-EHT40	MCS0	163	6765	42.96	37.992
802.11be-EHT40	MCS0	171	6805	42.78	37.921
802.11be-EHT40	MCS0	179	6845	42.28	37.966
802.11be-EHT40	MCS0	187	6885	43.02	38.019
802.11be-EHT40	MCS0	211	7005	42.33	37.986
802.11be-EHT40	MCS0	227	7085	43.50	37.963
802.11be-EHT80	MCS0	39	6145	86.83	77.598
802.11be-EHT80	MCS0	55	6225	87.92	77.779
802.11be-EHT80	MCS0	87	6385	87.08	77.722
802.11be-EHT80	MCS0	167	6785	86.10	77.618
802.11be-EHT80	MCS0	183	6865	86.90	77.549
802.11be-EHT80	MCS0	199	6945	85.44	77.571
802.11be-EHT80	MCS0	215	7025	86.85	77.718
802.11be-EHT160	MCS0	47	6185	288.5	157.04
802.11be-EHT160	MCS0	79	6345	218.6	157.03
802.11be-EHT160	MCS0	175	6825	288.3	157.25
802.11be-EHT160	MCS0	207	6985	241.8	157.34

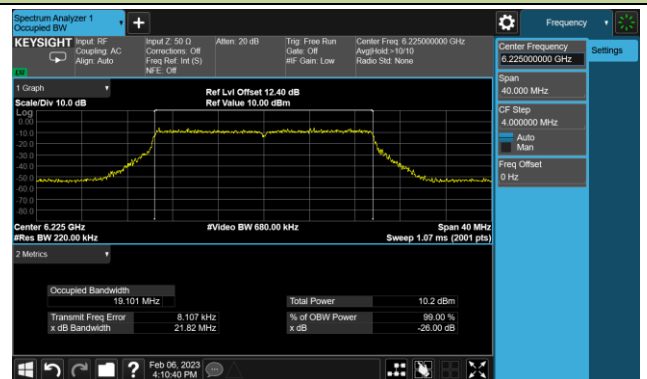
Test Mode	Data Rate/ MCS	Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
802.11be-EHT320	MCS0	63	6265	337.7	315.30
802.11be-EHT320	MCS0	191	6905	337.2	315.24

802.11ax-HE20 26dB Bandwidth

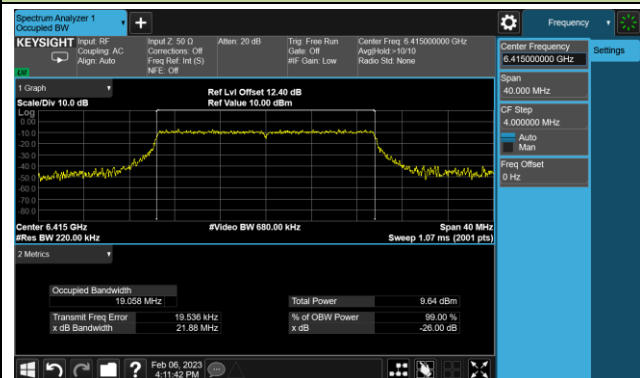
Channel 33 (6115MHz)



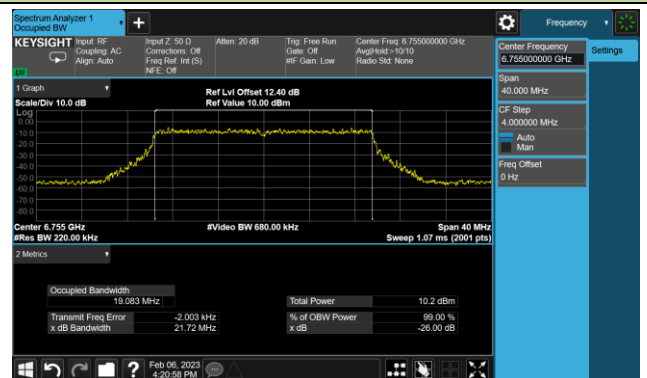
Channel 61 (6255MHz)



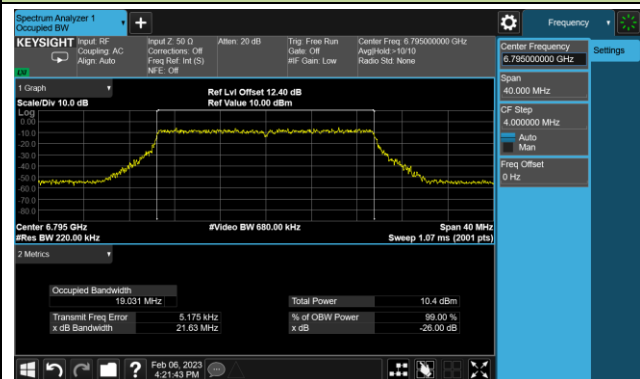
Channel 93 (6415MHz)



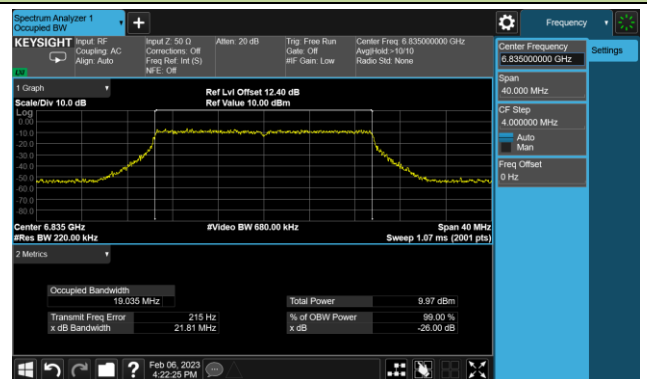
Channel 161 (6755MHz)



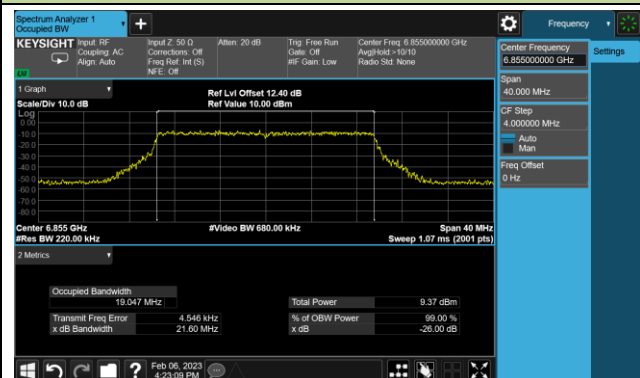
Channel 169 (6795MHz)



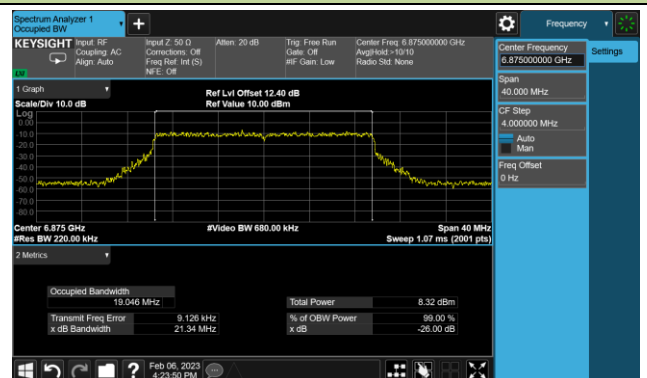
Channel 177 (6835MHz)



Channel 181 (6855MHz)

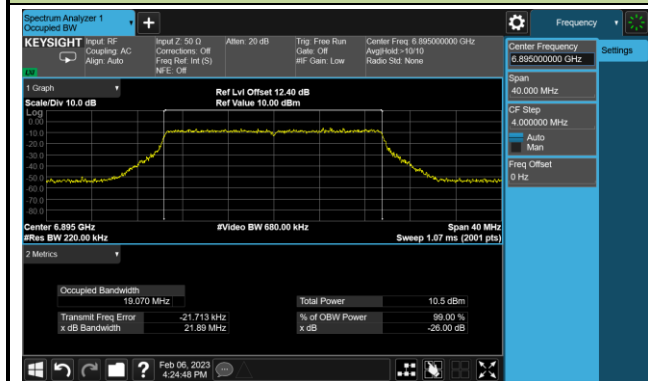


Channel 185 (6875MHz)

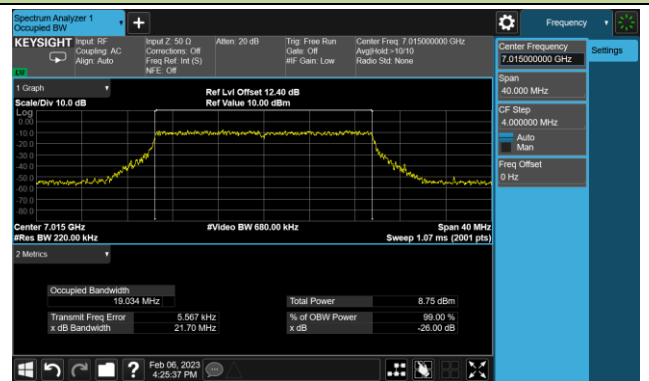


802.11ax-HE20 26dB Bandwidth

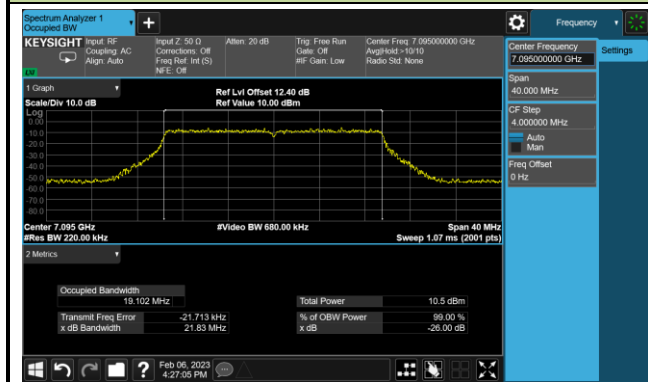
Channel 189 (6895MHz)



Channel 213 (7015MHz)

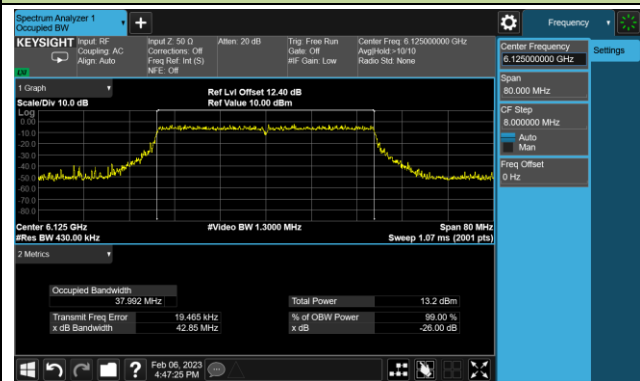


Channel 229 (7095MHz)

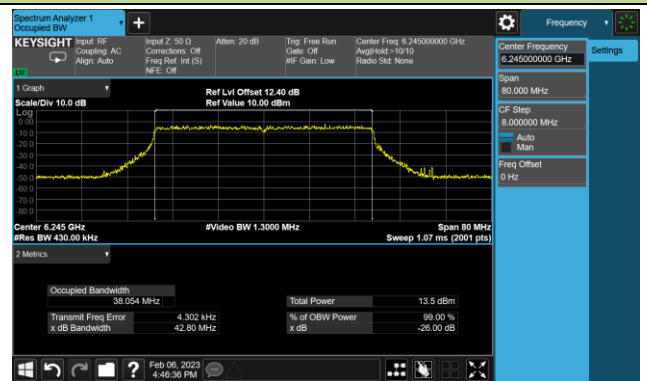


802.11ax-HE40 26dB Bandwidth

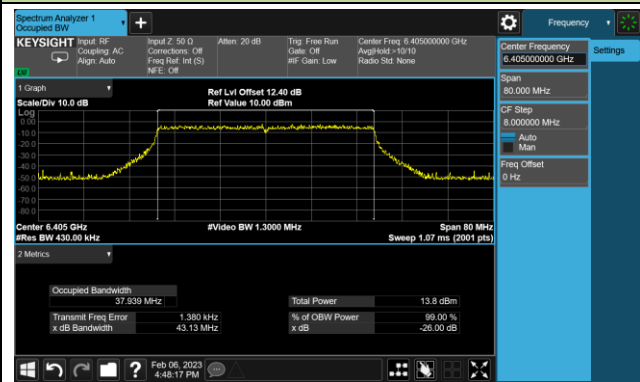
Channel 35 (6125MHz)



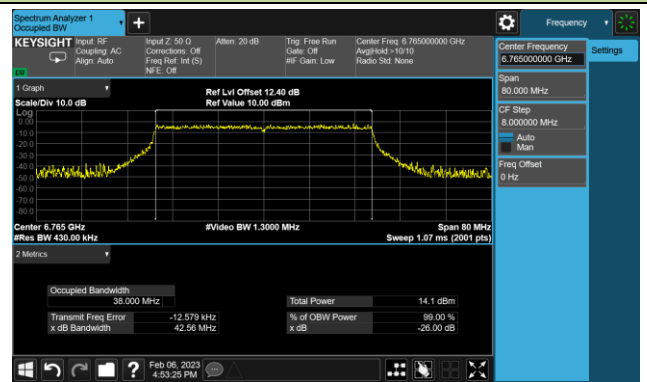
Channel 59 (6245MHz)



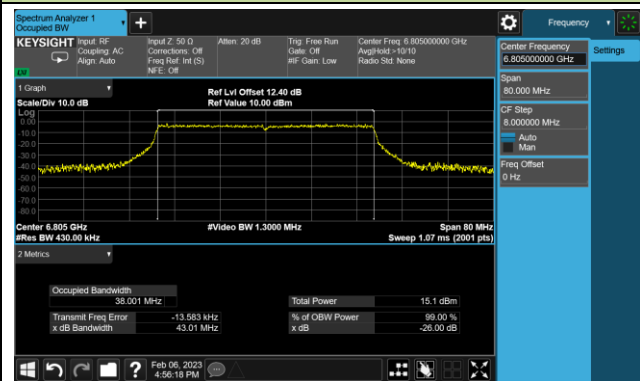
Channel 91 (6405MHz)



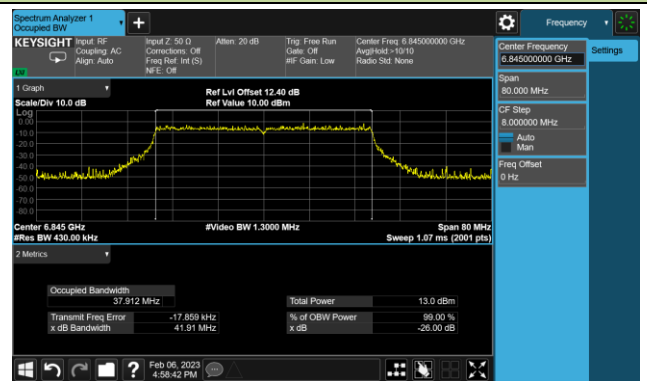
Channel 163 (6765MHz)



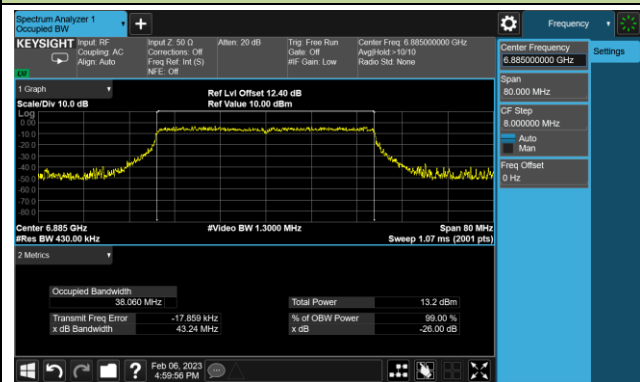
Channel 171 (6805MHz)



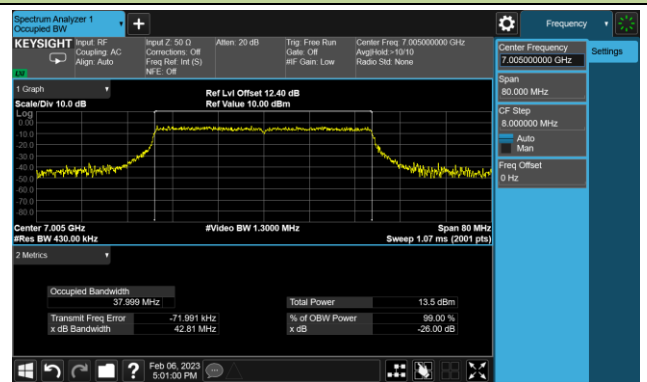
Channel 179 (6845MHz)

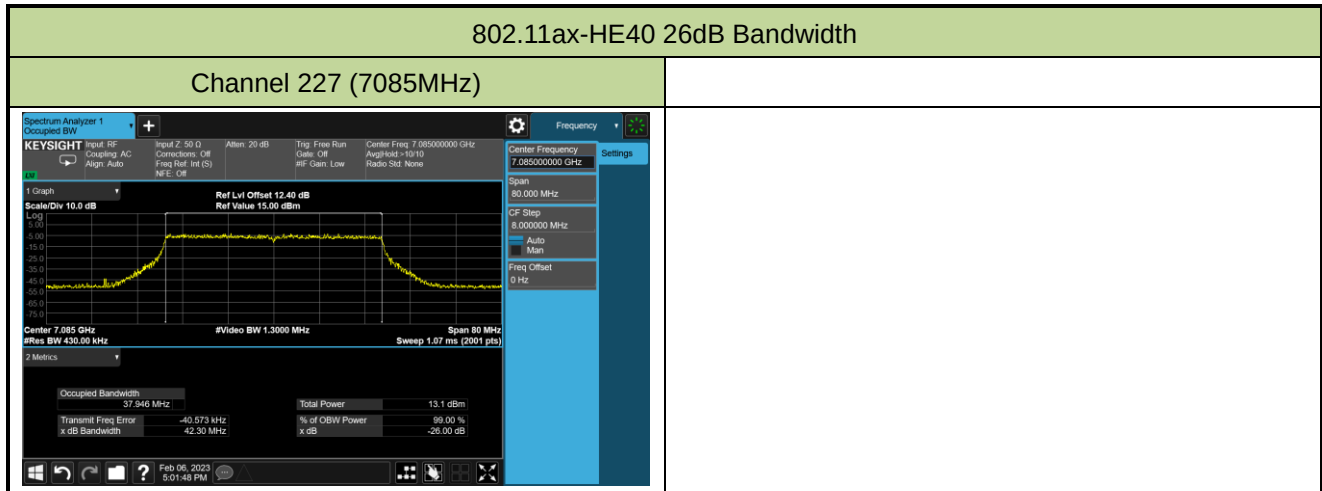


Channel 187 (6885MHz)



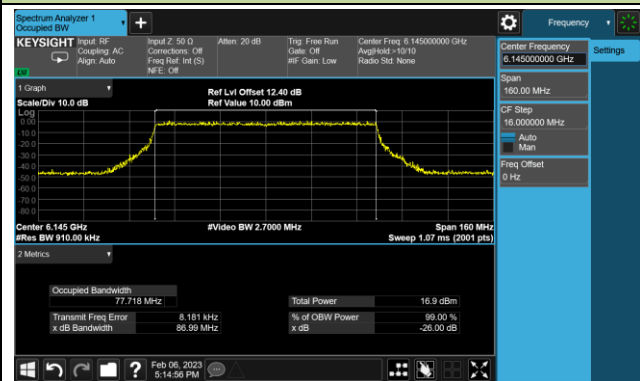
Channel 211 (7005MHz)



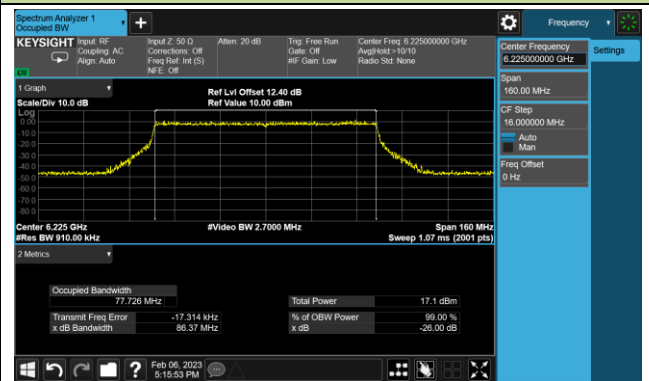


802.11ax-HE80 26dB Bandwidth

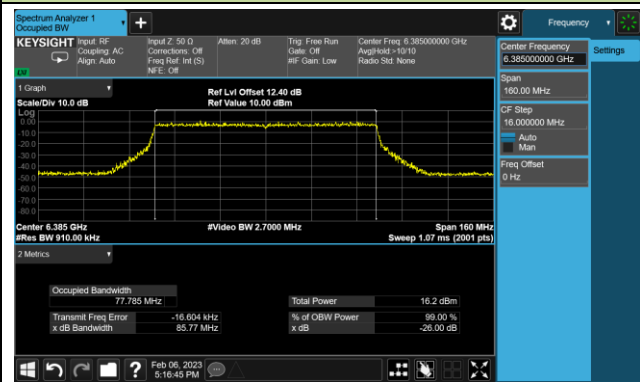
Channel 39 (6145MHz)



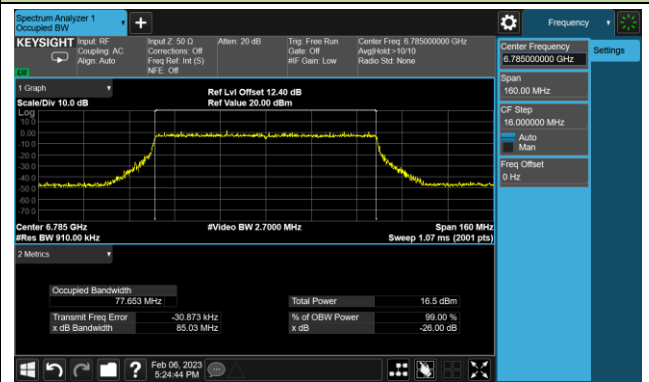
Channel 55 (6225MHz)



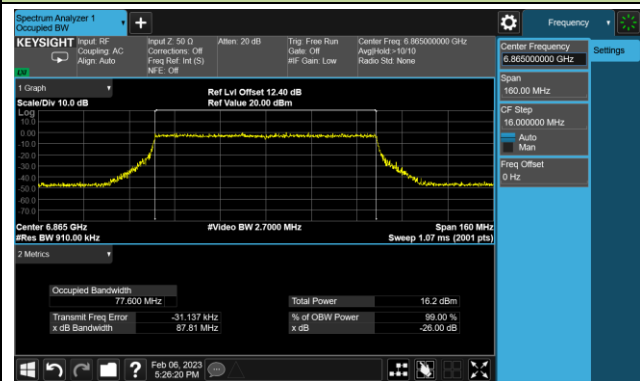
Channel 87 (6385MHz)



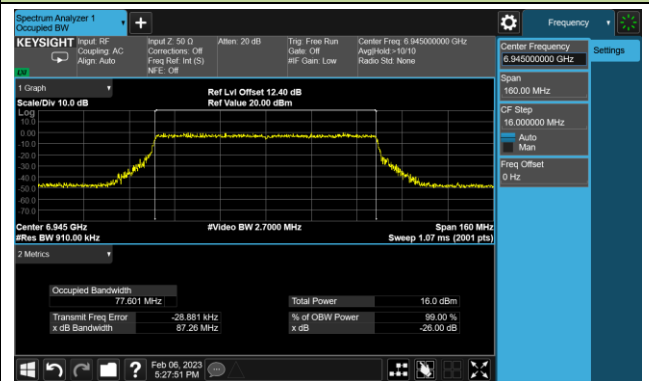
Channel 167 (6785MHz)



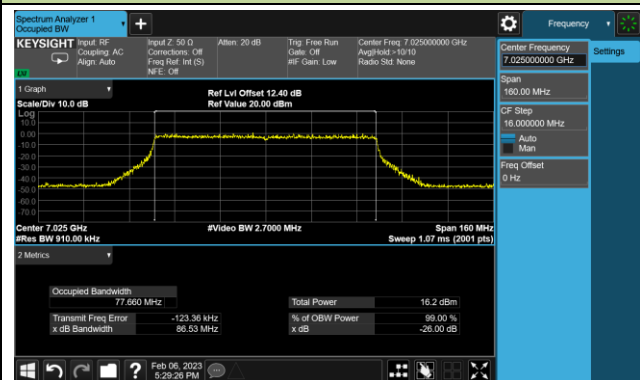
Channel 183 (6865MHz)



Channel 199 (6945MHz)

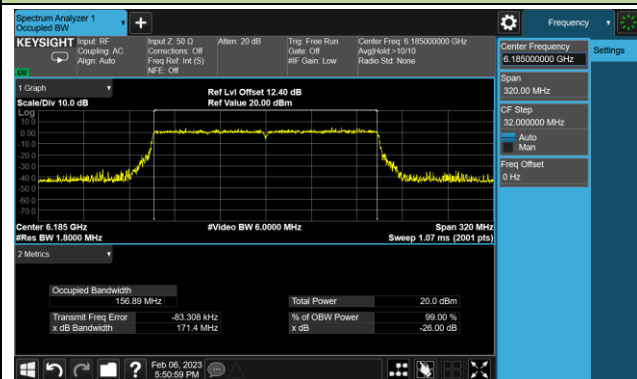


Channel 215 (7025MHz)

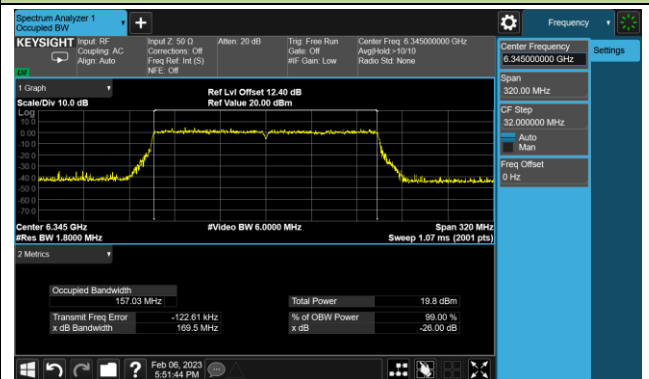


802.11ax-HE160 26dB Bandwidth

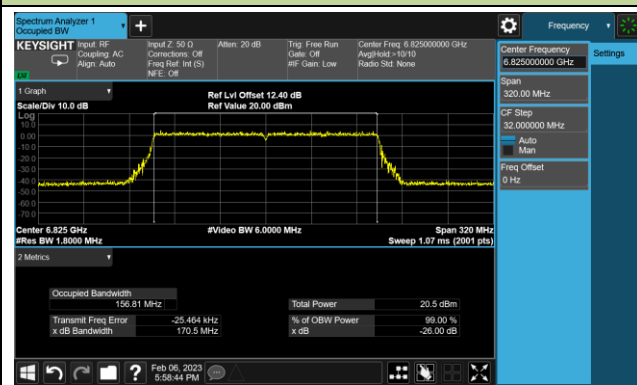
Channel 47 (6185MHz)



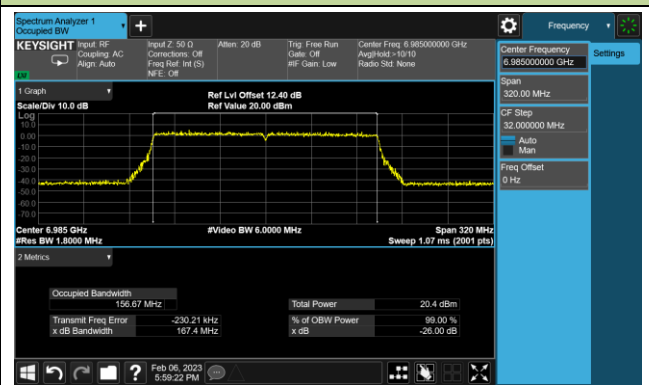
Channel 79 (6345MHz)



Channel 175 (6825MHz)

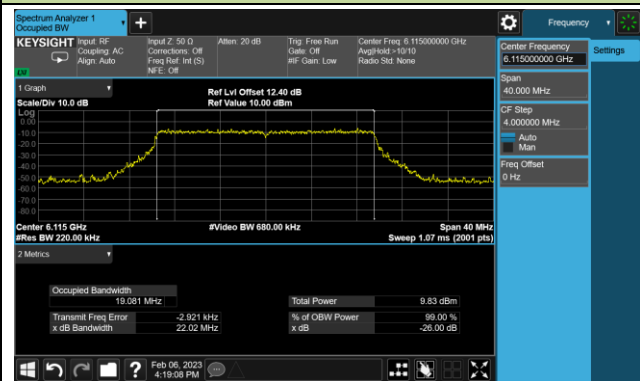


Channel 207 (6985MHz)

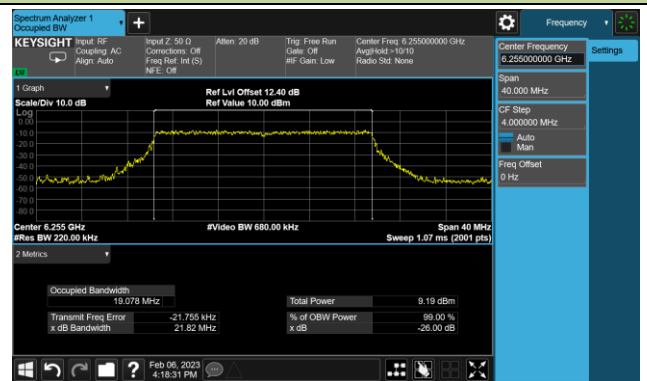


802.11be-EHT20 26dB Bandwidth

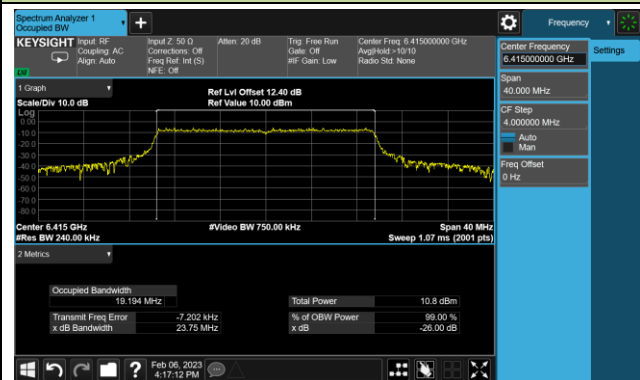
Channel 33 (6115MHz)



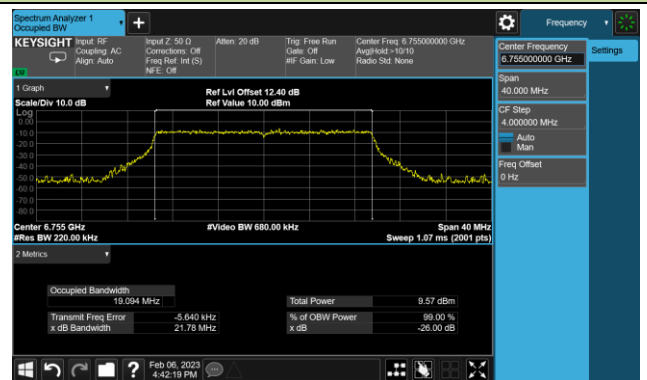
Channel 61 (6255MHz)



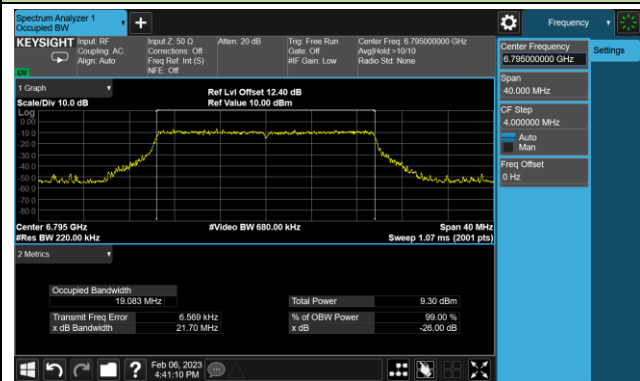
Channel 93 (6415MHz)



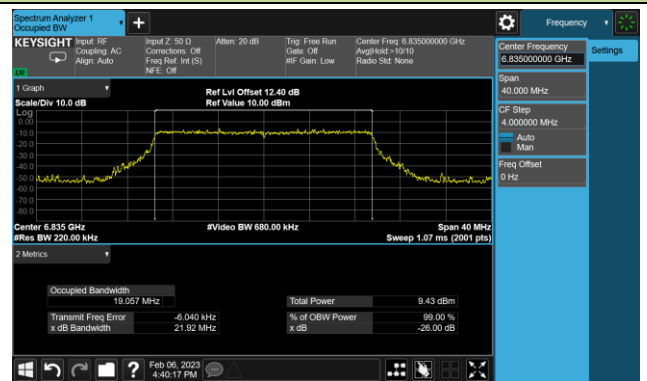
Channel 161 (6755MHz)



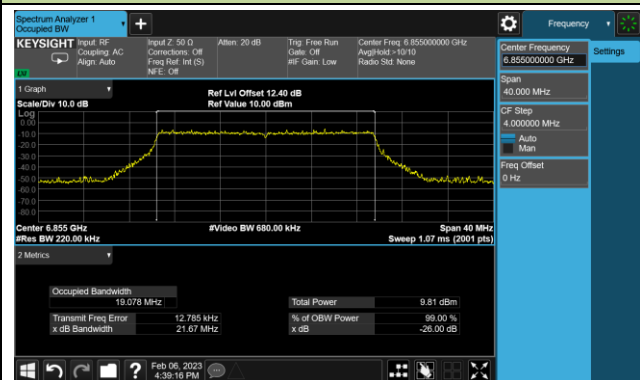
Channel 169 (6795MHz)



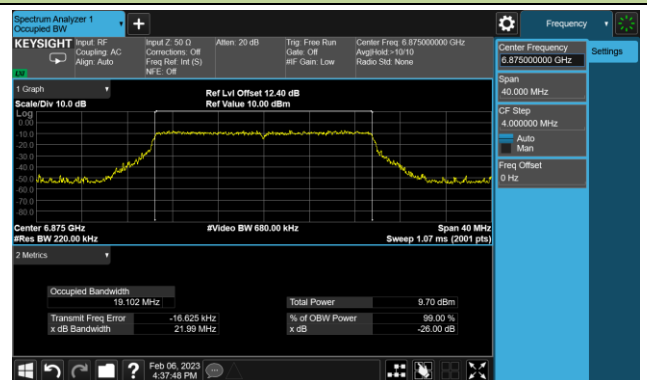
Channel 177 (6835MHz)



Channel 181 (6855MHz)

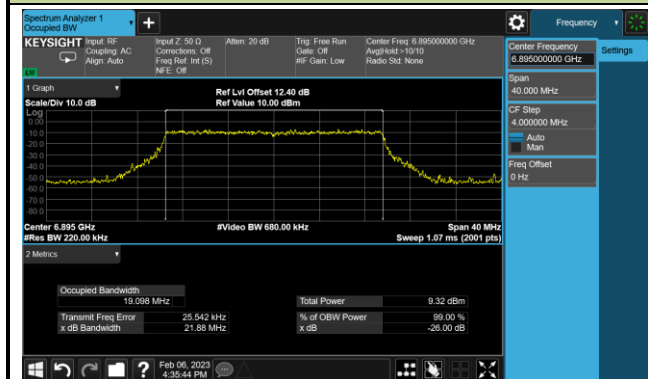


Channel 185 (6875MHz)

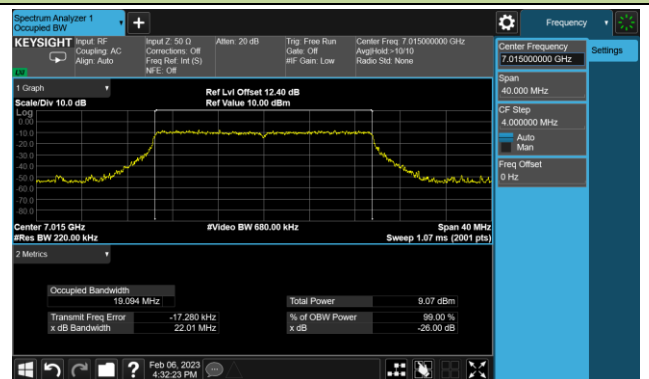


802.11be-EHT20 26dB Bandwidth

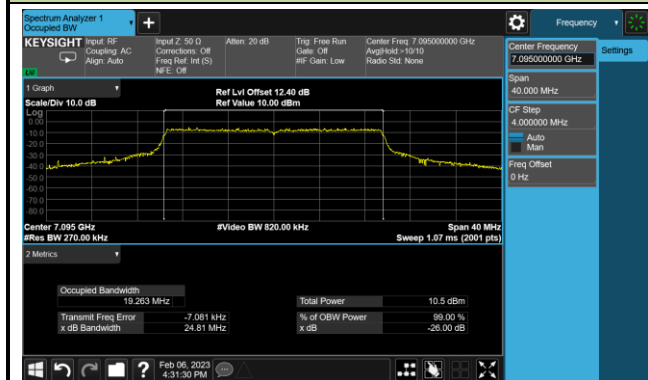
Channel 189 (6895MHz)



Channel 213 (7015MHz)

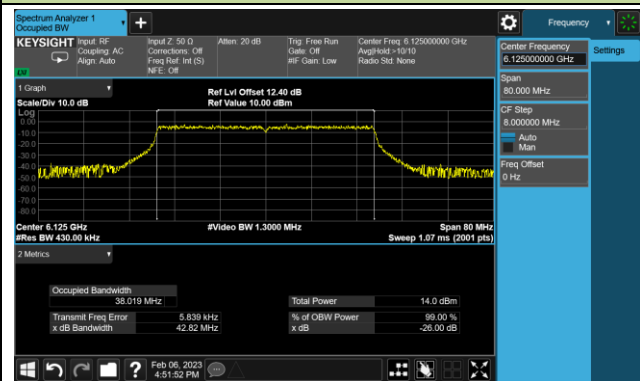


Channel 229 (7095MHz)

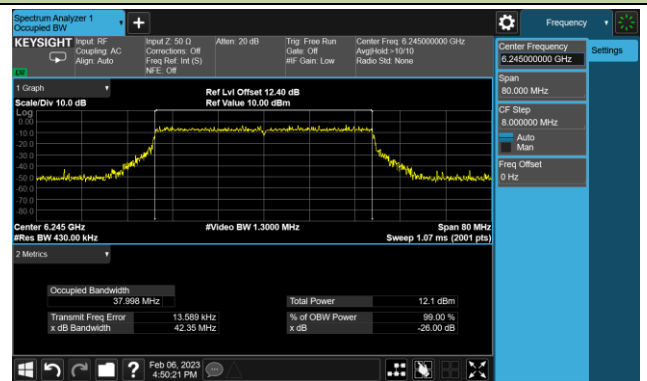


802.11be-EHT40 26dB Bandwidth

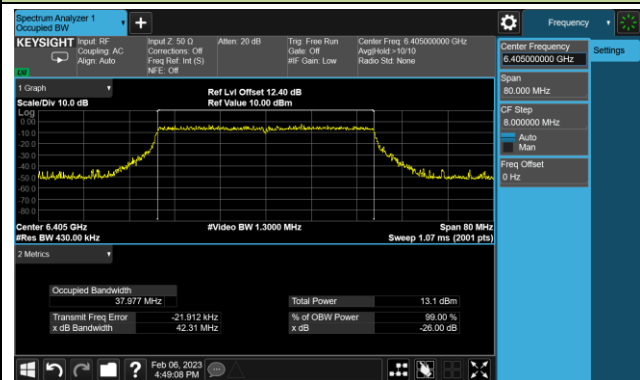
Channel 35 (6125MHz)



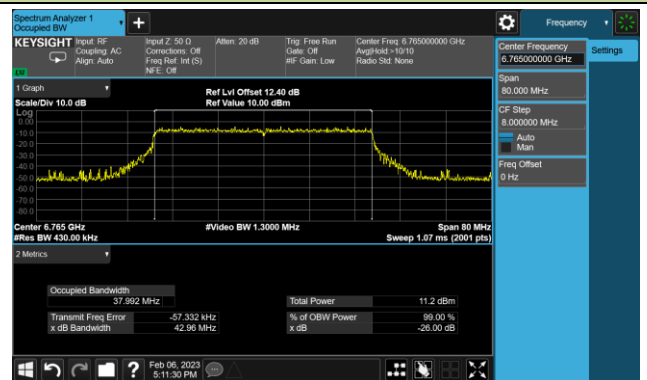
Channel 59 (6245MHz)



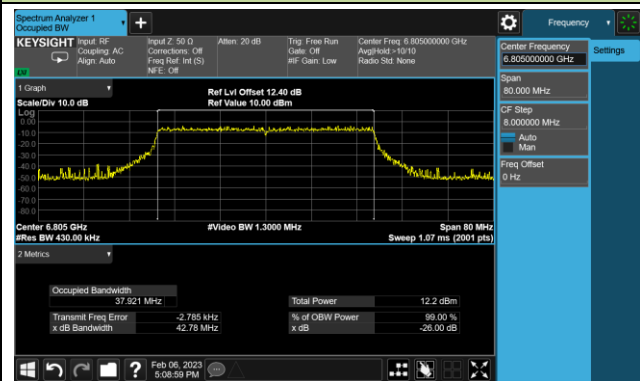
Channel 91 (6405MHz)



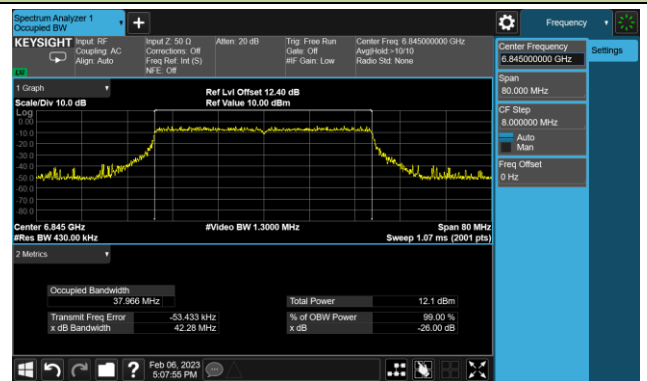
Channel 163 (6765MHz)



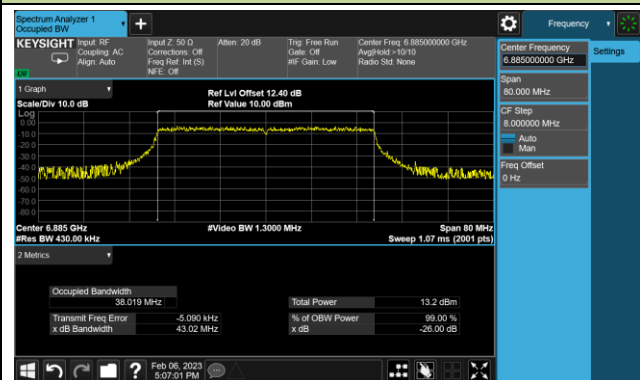
Channel 171 (6805MHz)



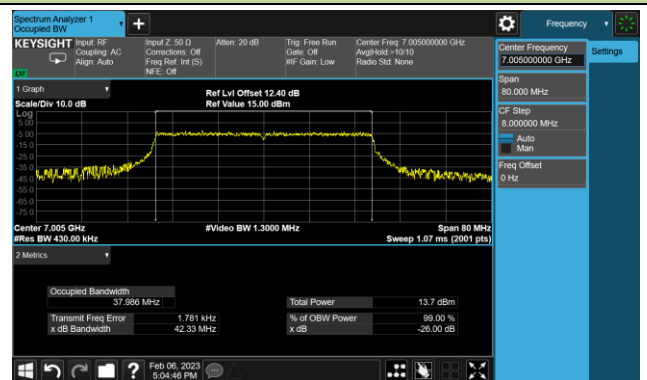
Channel 179 (6845MHz)

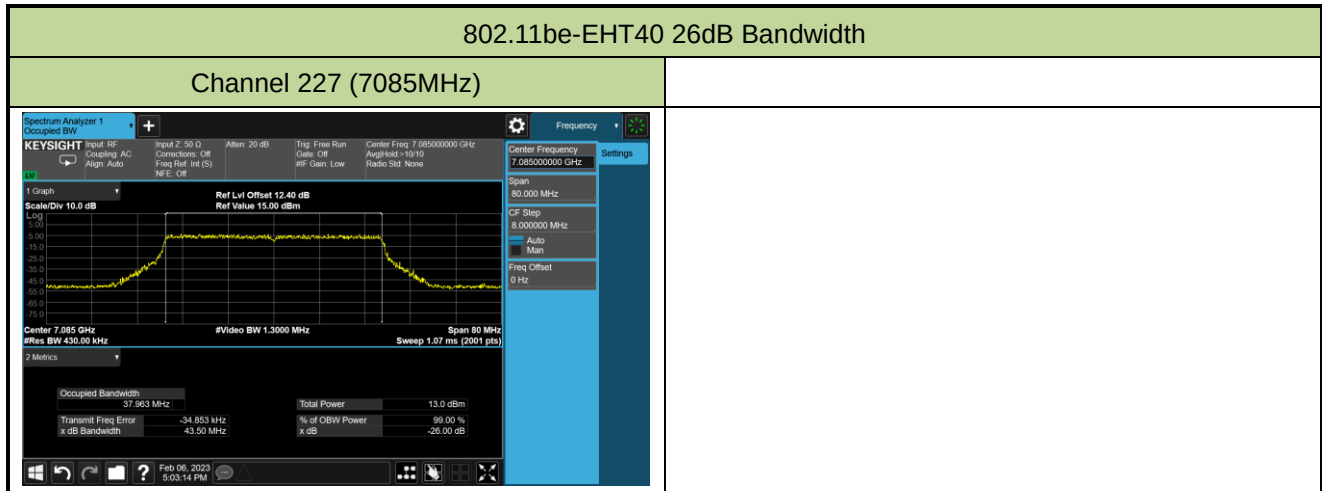


Channel 187 (6885MHz)



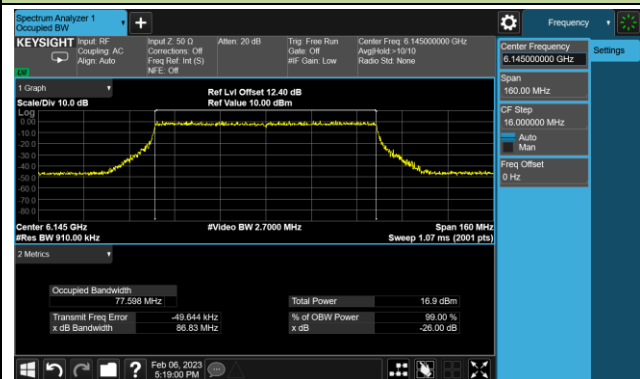
Channel 211 (7005MHz)



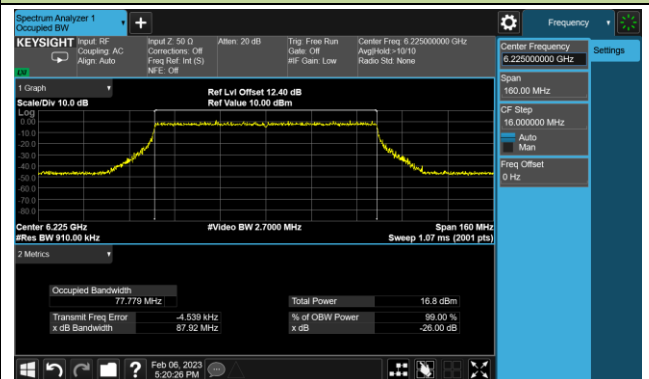


802.11be-EHT80 26dB Bandwidth

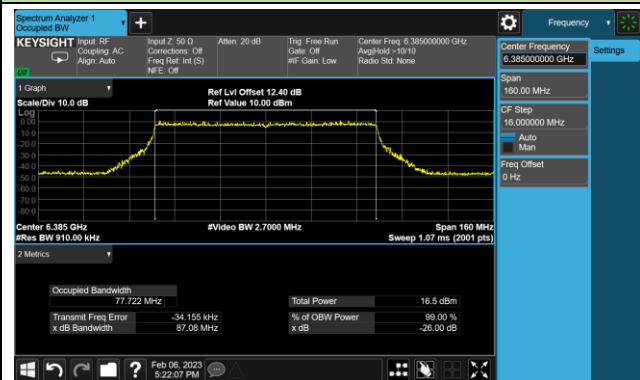
Channel 39 (6145MHz)



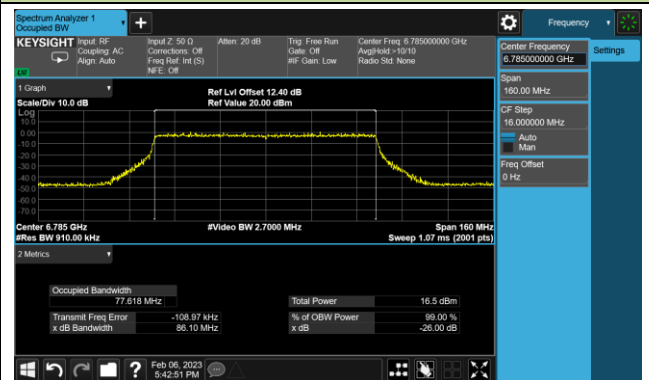
Channel 55 (6225MHz)



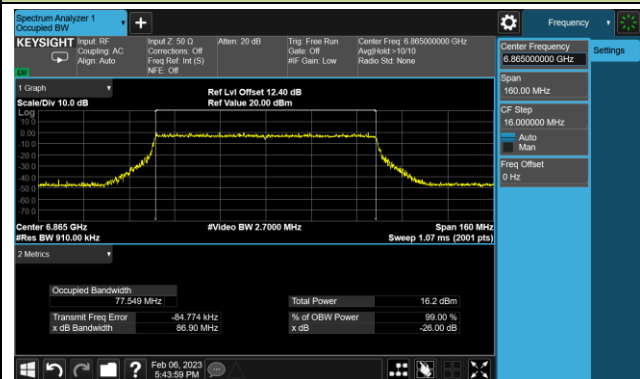
Channel 87 (6385MHz)



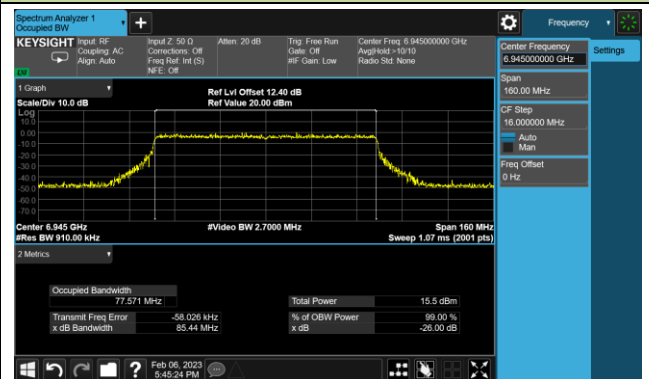
Channel 167 (6785MHz)



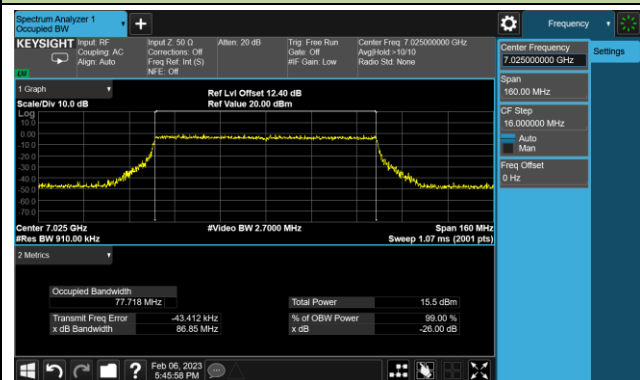
Channel 183 (6865MHz)



Channel 199 (6945MHz)

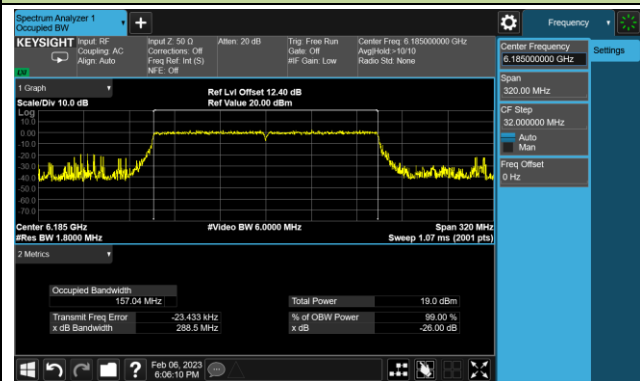


Channel 215 (7025MHz)

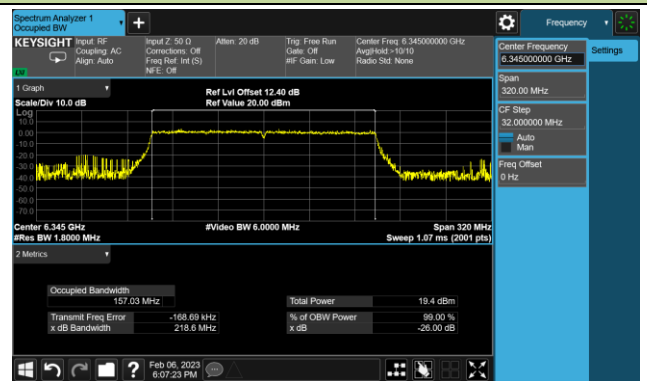


802.11be-EHT160 26dB Bandwidth

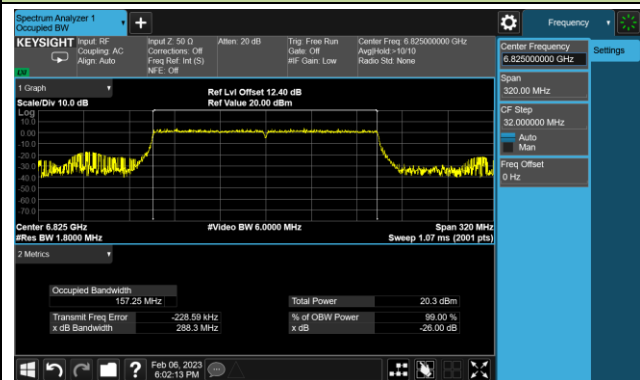
Channel 47 (6185MHz)



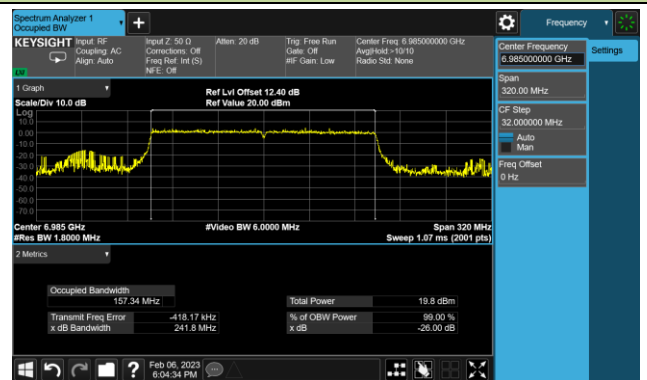
Channel 79 (6345MHz)



Channel 175 (6825MHz)

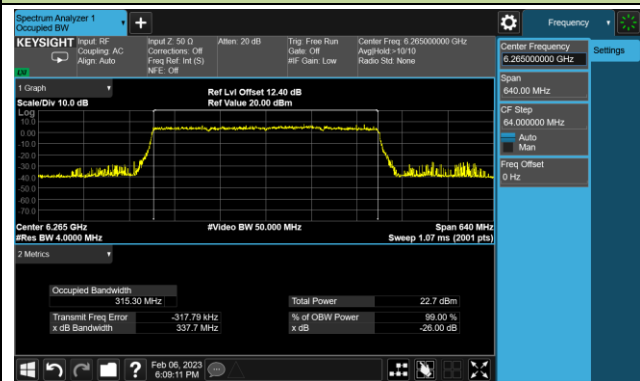


Channel 207 (6985MHz)



802.11be-EHT320 26dB Bandwidth

Channel 63 (6265MHz)



Channel 191 (6905MHz)

