

RF MEASUREMENT REPORT

FCC ID: 2BAXN-MR0005

Applicant: Willand (Beijing) Technology Co., LTD.

Product: Segway Navimow X3 Series

Model No.: X315N, X330N, X350N, X390N

Brand Name: Segway Navimow

FCC Classification: Unlicensed National Information Infrastructure (NII)

FCC Rule Part(s): Part 15 Subpart E (Section 15.407)

Result: Complies

Received Date: 2024-11-04

Test Date: 2024-12-11 ~ 2024-12-31

Reviewed By:

Vincent Yu

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
2411RSU003-U5	V01	Initial Report	2025-01-10	Valid

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1. General Information

1.1. Applicant

Willand (Beijing) Technology Co., LTD.

Room 203, A1 Bldg. Zhongguancun Dongsheng Technology Park (Northern Territory), No. 66, Xixiaokou Rd, Haidian Dist., Beijing, China.

1.2. Manufacturer

Willand (Beijing) Technology Co., LTD.

Room 203, A1 Bldg. Zhongguancun Dongsheng Technology Park (Northern Territory), No. 66, Xixiaokou Rd, Haidian Dist., Beijing, China.

Navimow B.V.

Dynamostraat 7. 1014 BN Amsterdam, The Netherlands

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 Location (Suzhou - Wujiang) Building 1, No.1 Xingdong Road, Wujiang, Suzhou, Jiangsu, People’s Republic of China
	Laboratory Accreditations
	A2LA: 3628.01 FCC: CN1166 VCCI: ☐ R-20025 ☐ G-20034 ☐ C-20020 ☐ T-20020 ☐ R-20141 ☐ G-20134 ☐ C-20103 ☐ T-20104
	CNAS: L10551 ISED: CN0001
☐	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 FCC: CN1284
CNAS: L10551 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: 3261 FCC: 291082, TW3261
ISED: TW3261	

1.4. Product Information

Product Name	Segway Navimow X3 Series
Model No.	X315N, X330N, X350N, X390N
Brand Name	Segway Navimow
EUT Identification No.	20241104Sample#09
Wi-Fi Specification	802.11a/b/g/n/ac/ax
Bluetooth Version	Bluetooth-LE only
SRD Specification	915.05 ~ 917.9MHz
3GPP Specification	WCDMA Band 2/4/5 LTE Band 2/4/5/12/13/14/66/71
Antenna Information	Refer to section 1.7
Operating Temp.	0 ~ 40°C
Power Type	By Battery
Accessories	
Charging Station	Product Name: Navimow Charging Station Model No.: X3C00G Input: 32V = 7.0A MAX Output: 25.2V = 7.0A MAX
Adapter	Model No.: NBW32D007D0N01-US Input: 100 ~ 240V, 50/60Hz, 4.0A MAX Output: 32.0V = 7.0A
Li-ion Battery Pack	Model No.: NBCF2213A Capacitance: 12800mAh / 276.5Wh Charging Voltage: 21.6VDC
Trimmer	Product Name: Trimmer Model No.: X3A10N
Antenna	Product Name: Antenna Model No.: X3R00G Power Type: 12VDC, 1A
Notes:	
1. The information of EUT was provided by the manufacturer, and the accuracy of the information shall be the responsibility of the manufacturer. 2. The manufacturer states that the difference between the four models are only the battery capacity. The manufacturer selected the model X390N for testing. 3. For WWAN part, this device Contains FCC ID: XMR201909EC25AFX. 4. The adapter model used in the actual test is NBW32D007D0N01-EU. According to the manufacturer's statement, the only difference between NBW32D007D0N01-EU and NBW32D007D0N01-US is the	

connector of the AC cable, the others are identical.

1.5. Radio Specification under Test

Frequency Range	For 802.11a/n-HT20/ac-VHT20/ax-HE20: 5180~5240MHz, 5260~5320MHz, 5500~5720MHz, 5745~5825MHz For 802.11n-HT40/ac-VHT40/ax-HE40: 5190~5230MHz, 5270~5310MHz, 5510~5710MHz, 5755~5795MHz For 802.11ac-VHT80/ax-HE80: 5210MHz, 5290MHz, 5530MHz, 5610 MHz, 5690MHz, 5775MHz	
Type of Modulation	802.11a/n/ac: OFDM 802.11ax: OFDMA	
Data Rate	802.11a: 6/9/12/18/24/36/48/54Mbps 802.11n: up to 150Mbps 802.11ac: up to 433.3Mbps 802.11ax: up to 601Mbps	
Channel Puncturing Function	☐ Supported	☒ Unsupported
Support RU	☒ Full RU	☐ Partial RU

1.6. Working Frequencies

802.11a/n-HT20/ac-VHT20/ax-HE20

Channel	Frequency	Channel	Frequency	Channel	Frequency
36	5180 MHz	40	5200 MHz	44	5220 MHz
48	5240 MHz	52	5260 MHz	56	5280 MHz
60	5300 MHz	64	5320 MHz	100	5500 MHz
104	5520 MHz	108	5540 MHz	112	5560 MHz
116	5580 MHz	120	5600 MHz	124	5620 MHz
128	5640 MHz	132	5660 MHz	136	5680 MHz
140	5700 MHz	144	5720 MHz	149	5745 MHz
153	5765 MHz	157	5785 MHz	161	5805 MHz
165	5825 MHz	--	--	--	--

802.11n-HT40/ac-VHT40/ax-HE40

Channel	Frequency	Channel	Frequency	Channel	Frequency
38	5190 MHz	46	5230 MHz	54	5270 MHz
62	5310 MHz	102	5510 MHz	110	5550MHz
118	5590 MHz	126	5630 MHz	134	5670 MHz
142	5710 MHz	151	5755 MHz	159	5795 MHz

802.11ac-VHT80/ax-HE80

Channel	Frequency	Channel	Frequency	Channel	Frequency
42	5210 MHz	58	5290 MHz	106	5530 MHz
122	5610 MHz	138	5690 MHz	155	5775 MHz

1.7. Antenna Details

Antenna Type	Frequency Range (MHz)	Tx Paths	Antenna Gain (dBi)
Wi-Fi Antenna			
PCB	2400 ~ 2483.5	1	3.55
	5150 ~ 5250	1	3.85
	5250 ~ 5350	1	3.85
	5470 ~ 5725	1	3.85
	5725 ~ 5850	1	3.85
Note: All antenna information is provided by the manufacturer.			

2. Test Configuration

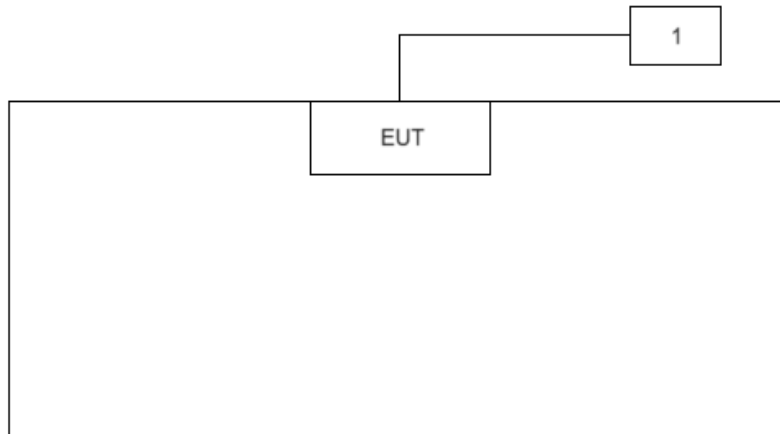
2.1. Test Mode

Mode 1: Transmit by 802.11a (6Mbps)
Mode 2: Transmit by 802.11ac-VHT20 (MCS0)
Mode 3: Transmit by 802.11ac-VHT40 (MCS0)
Mode 4: Transmit by 802.11ac-VHT80 (MCS0)
Mode 5: Transmit by 802.11ax-HE20 (MCS0)
Mode 6: Transmit by 802.11ax-HE40 (MCS0)
Mode 7: Transmit by 802.11ax-HE80 (MCS0)
Notes: 1. 802.11n and 802.11ac have same modulation type and same power value, so we only show 802.11ac test data in report. 2. As Designated by manufacturer, the lowest data rate was the worst condition, so all the tests were done with lowest data rate.

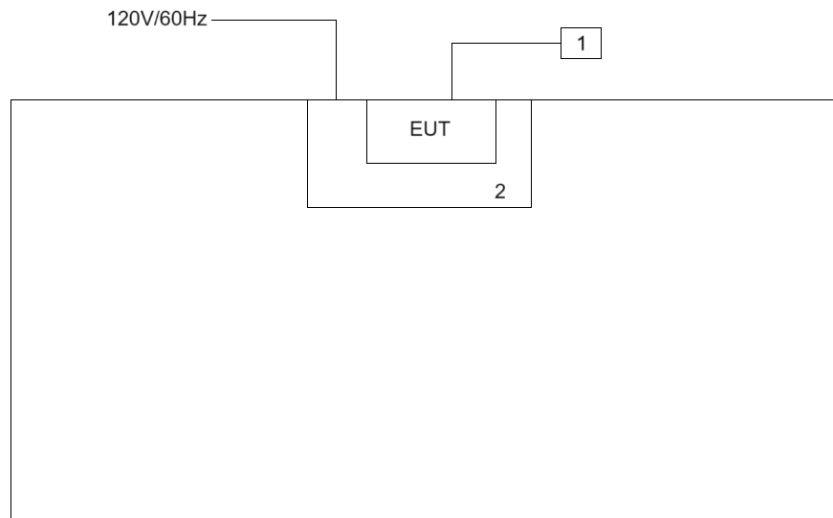
2.2. Test System Connection Diagram

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

Connection Diagram - Radiated emissions testing



Connection Diagram - AC line conducted testing



Product	Manufacturer	Model No.
1 Notebook	HP	445R G6
2 Navimow Charging Station	Navimow B.V.	X3C00G

2.3. Test Software

The test utility software used during testing was “Windows PowerShell”, and the version was 1.27.2.

2.4. Applied Standards

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

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

2.5. Test Environment Condition

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

3. Antenna Requirements

Excerpt from §15.203 of the FCC Rules/Regulations:

“An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.”

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

Conclusion:

The unit complies with the requirement of §15.203.

4. Measuring Instrument

Instrument	Manufacturer	Model No.	Asset No.	Cali. Interval	Cali. Due Date	Test Site
EMI Test Receiver	R&S	ESR3	MRTSUE06185	1 year	2025-12-05	SIP-AC2
Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06598	1 year	2025-11-03	SIP-AC2
Preamplifier	EMCI	EMC184045SE	MRTSUE06602	1 year	2025-10-08	SIP-AC2
Signal Analyzer	Keysight	N9010B	MRTSUE06603	1 year	2025-09-05	SIP-AC2
Thermohygrometer	testo	608-H1	MRTSUE06622	1 year	2025-10-29	SIP-AC2
TRILOG Antenna	Schwarzbeck	VULB 9168	MRTSUE06647	1 year	2025-06-15	SIP-AC2
Active Loop Antenna	Schwarzbeck	FMZB 1519-60 D	MRTSUE07075	1 year	2025-11-19	SIP-AC2
Anechoic Chamber	RIKEN	SIP-AC2	MRTSUE06781	1 year	2024-12-21	SIP-AC2
				1 year	2025-12-20	SIP-AC2
Cable	HUBER+SUHNER	SF106	MRTSUE06522	1 year	2025-05-07	SIP-AC2
Cable	HUBER+SUHNER	SF106	MRTSUE06875	1 year	2024-12-21	SIP-AC2
				1 year	2025-12-20	SIP-AC2
Signal Analyzer	Keysight	N9010B	MRTSUE06559	1 year	2025-05-08	SIP-AC3
Horn Antenna	R&S	HF907	MRTSUE06611	1 year	2025-07-07	SIP-AC3
Thermohygrometer	testo	608-H1	MRTSUE06619	1 year	2025-10-16	SIP-AC3
Preamplifier	EMCI	EMC012645SE	MRTSUE06642	1 year	2025-01-11	SIP-AC3
Anechoic Chamber	RIKEN	SIP-AC3	MRTSUE06782	1 year	2024-12-21	SIP-AC3
				1 year	2025-12-20	SIP-AC3
Cable	HUBER+SUHNER	SF106	MRTSUE06873	1 year	2024-12-21	SIP-AC3
				1 year	2025-12-20	SIP-AC3
Cable	HUBER+SUHNER	SF106	MRTSUE06878	1 year	2024-12-21	SIP-AC3
				1 year	2025-12-20	SIP-AC3
Signal Analyzer	Keysight	N9030B	MRTSUE06395	1 year	2025-06-21	SIP-TR1
Thermohygrometer	testo	608-H1	MRTSUE11022	1 year	2025-10-16	SIP-TR1
USB Power Sensor	Keysight	U2021XA	MRTSUE06596	1 year	2025-07-23	SIP-TR1
Attenuator	MVE	MVE2213	MRTSUE11101	1 year	2025-06-06	SIP-TR1
Two-Line V-Network	R&S	ENV216	MRTSUE06003	1 year	2025-05-08	SIP-SR2
EMI Test Receiver	R&S	ESR3	MRTSUE06612	1 year	2025-05-08	SIP-SR2
Four-Line V-Network	R&S	ENV432	MRTSUE06614	1 year	2025-10-13	SIP-SR2
Thermohygrometer	testo	608-H1	MRTSUE06621	1 year	2025-10-29	SIP-SR2
Shielding Room	MIX-BEP	SIP-SR2	MRTSUE06949	5 years	2029-10-13	SIP-SR2

Software	Version	Function
e3	230711	EMI Test Software
Controller_MF 7802BS	1.02	RE Antenna & Turntable
Agilent Power Analyzer/Agilent Power Panel	V R03.09.00	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: 2.61dB Coplanar: 9kHz~30MHz: 2.62dB Horizontal: 30MHz~200MHz: 3.79dB 200MHz~1GHz: 3.91dB 1GHz~40GHz: 4.99dB Vertical: 30MHz~200MHz: 4.06dB 200MHz~1GHz: 5.21dB 1GHz~40GHz: 4.90dB
Spurious Emissions, Conducted
Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$): 2.2dB
Output Power
Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$): 1.4dB
Power Spectrum Density
Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$): 2.2dB
Occupied Bandwidth
Measuring Uncertainty for a Level of Confidence of 95% ($U=2U_c(y)$): 2.7%

6. Test Result

6.1. Summary

FCC Section(s)	Test Description	Test Condition	Verdict
15.407(a)	26dB Bandwidth	Conducted	Pass
15.407(e)	6dB Bandwidth		Pass
15.407(a)(1)(iv), (2), (3)(i)	Maximum Conducted Output Power		Pass
15.407(h)(1)	Transmit Power Control		Pass
15.407(g)	Frequency Stability		Pass
15.407(a)(1)(iv), (2), (3)(i), (13)	Peak Power Spectral Density		Pass
15.407(h)(2)	Dynamic Frequency Selection (DFS)		Pass ^{Note 2}
15.407(b)(1), (2), (3), (4)(i)	Undesirable Emissions	Radiated	Pass
15.205, 15.209 15.407(b)(8), (9), (10)	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)		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.
- DFS report refer to 2411RSU003-U6.

6.2. 26dB & 99% Bandwidth Measurement

6.2.1. Test Limit

N/A

6.2.2. Test Procedure

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

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

6.2.3. Test Setting

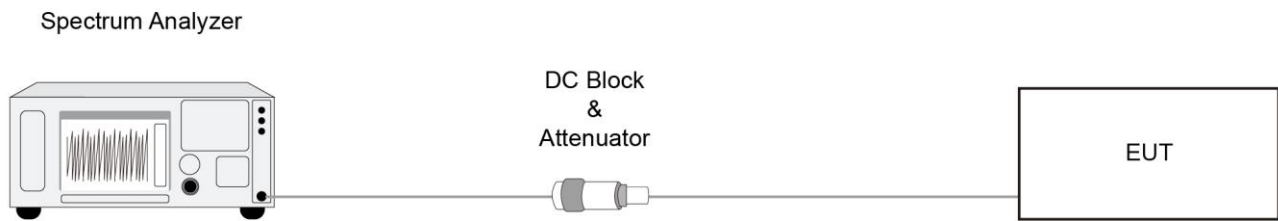
26dB Bandwidth

1. The analyzers' automatic bandwidth measurement capability was used to perform the 26dB bandwidth
2. RBW = approximately 1% of the emission bandwidth.
3. VBW > RBW
4. Detector = Peak.
5. Trace mode = max hold.
6. Measure the maximum width of the emission that is 26 dB down from the maximum of the emission.
Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

99% Bandwidth

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

6.2.4. Test Setup



6.2.5. Test Result

Refer to Appendix A.2.

6.3. 6dB Bandwidth Measurement

6.3.1. Test Limit

The minimum 6dB bandwidth shall be at least 500 kHz.

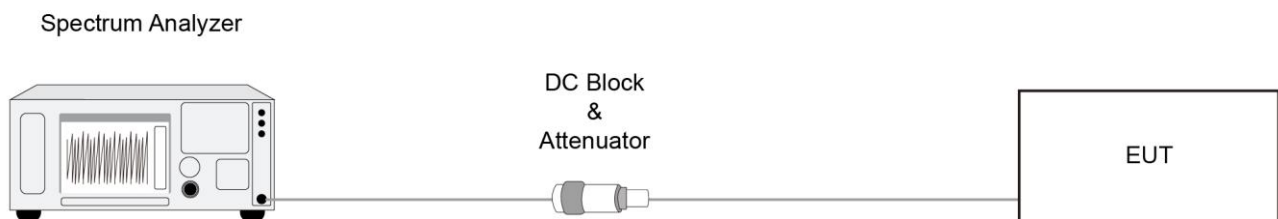
6.3.2. Test Procedure

KDB 789033 D02v02r01- Section II)C)2)

6.3.3. Test Setting

1. Set center frequency to the nominal EUT channel center frequency.
2. RBW = 100 kHz.
3. VBW $\geq 3 \times$ RBW.
4. Detector = Peak.
5. Trace mode = max hold.
6. Sweep = auto couple.
7. Allow the trace to stabilize.
8. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

6.3.4. Test Setup



6.3.5. Test Result

Refer to Appendix A.3.

6.4. Output Power Measurement

6.4.1. Test Limit

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

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

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

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

6.4.2. Test Procedure

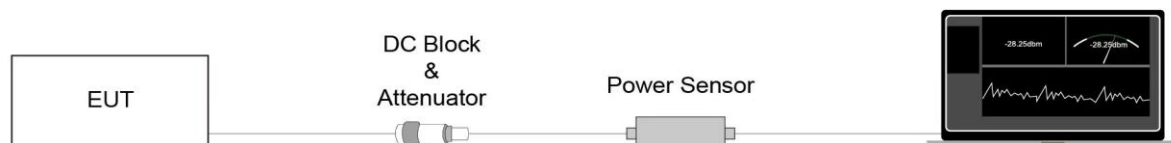
KDB 789033D02v02r01- Section II)E)3)b) Method PM-G

6.4.3. Test Setting

Average Power Measurement

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

6.4.4. Test Setup



6.4.5. Test Result

Refer to Appendix A.4.

6.5. Transmit Power Control Measurement

6.5.1. Test Limit

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

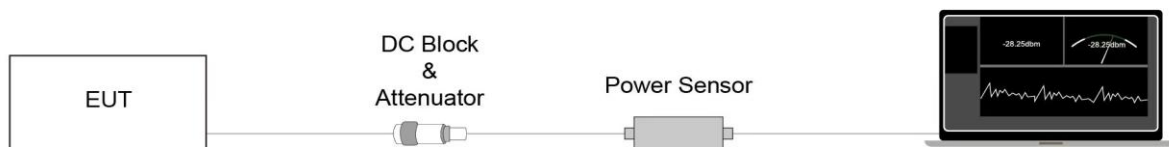
6.5.2. Test Procedure

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

6.5.3. Test Setting

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

6.5.4. Test Setup



6.5.5. Test Result

Device supports TPC mechanism, details refer to the operational description.

6.6. Power Spectral Density Measurement

6.6.1. Test Limit

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

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

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

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

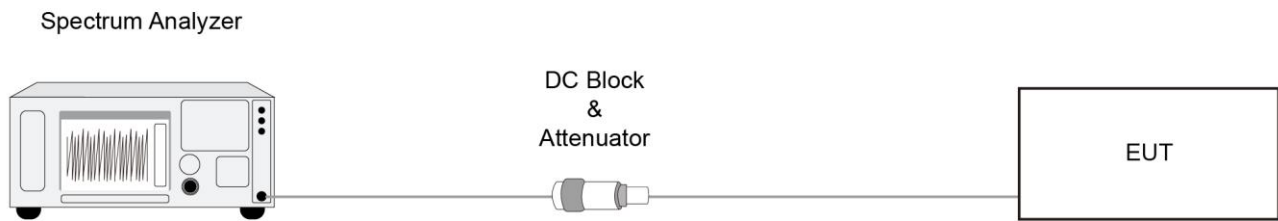
6.6.2. Test Procedure

KDB 789033 D02v02r01-Section II)F)

6.6.3. Test Setting

1. Analyzer was set to the center frequency of the UNII channel under investigation
2. Span was set to encompass the entire 26dB EBW of the signal.
3. RBW = 1MHz (510kHz, if measurement bandwidth of Maximum PSD is specified in 500 kHz)
4. VBW = $3 \times \text{RBW}$
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 $10 \cdot \log(1/0.25) = 6 \text{ dB}$ if the duty cycle is 25 percent.

6.6.4. Test Setup



6.6.5. Test Result

Refer to Appendix A.5.

6.7. Frequency Stability Measurement

6.7.1. Test Limit

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

6.7.2. Test Procedure

Frequency Stability Under Temperature Variations:

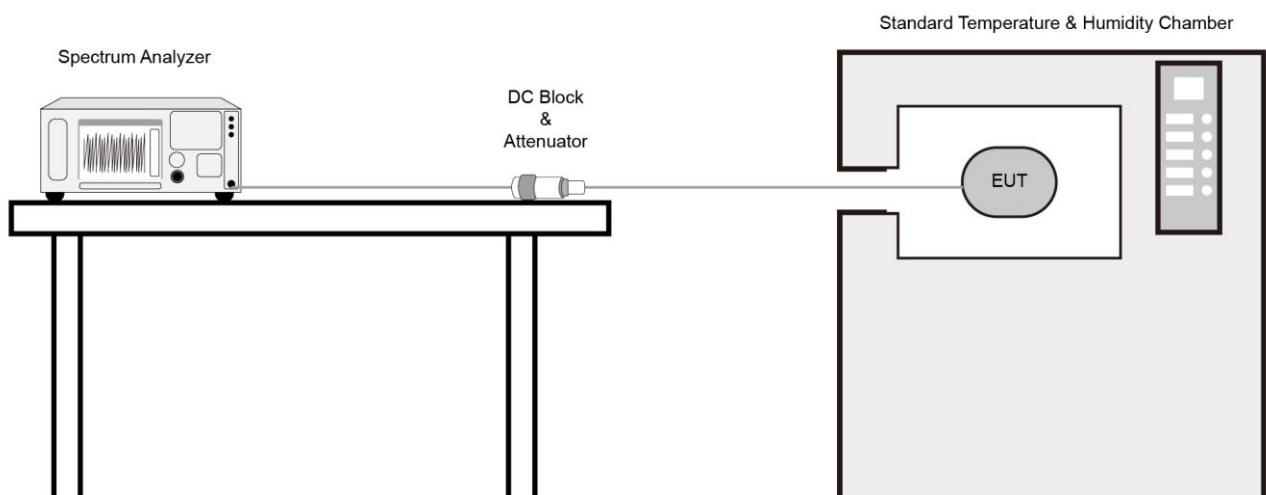
The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain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

Frequency Stability Under Voltage Variations:

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

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

6.7.3. Test Setup



6.7.4. Test Result

Refer to Appendix A.6.

6.8. Radiated Spurious Emission Measurement

6.8.1. Test Limit

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

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

6.8.2. Test Procedure

KDB 789033 D02v02r01- Section II)G)

6.8.3. Test Setting

Table 1 - RBW as a function of frequency

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

Quasi-Peak Measurements below 1GHz

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. Span was set greater than 1MHz
3. RBW = as specified in Table 1
4. Detector = CISPR quasi-peak
5. Sweep time = auto couple
6. Trace was allowed to stabilize

Peak Measurements above 1GHz

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

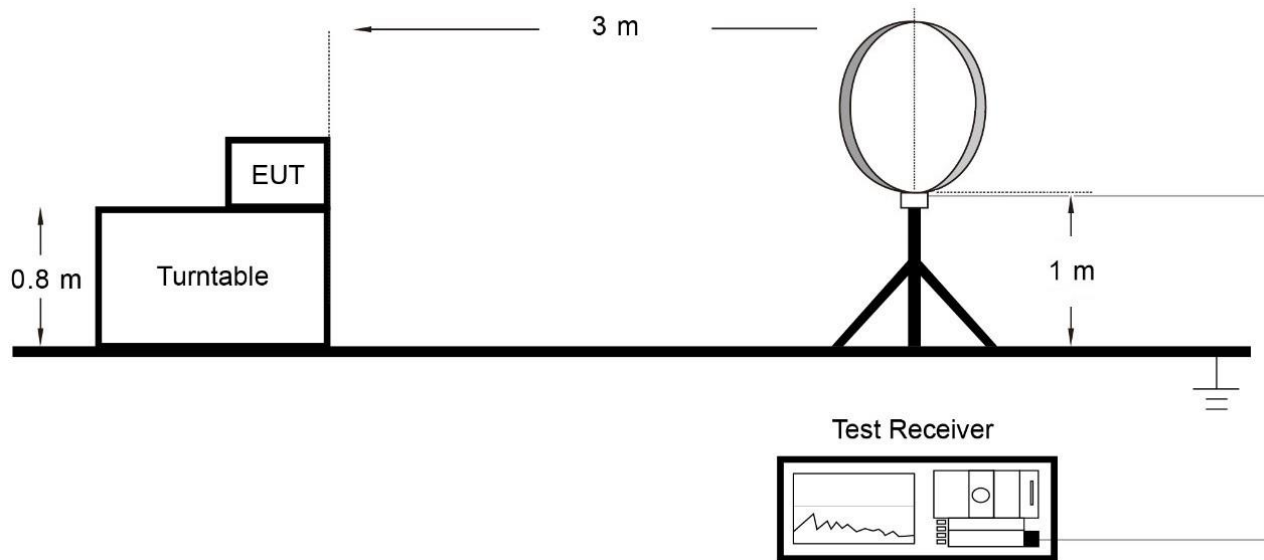
Average Measurements above 1GHz (Method VB)

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW; if the EUT is configured to transmit with duty cycle $\geq 98\%$, set VBW = 10Hz

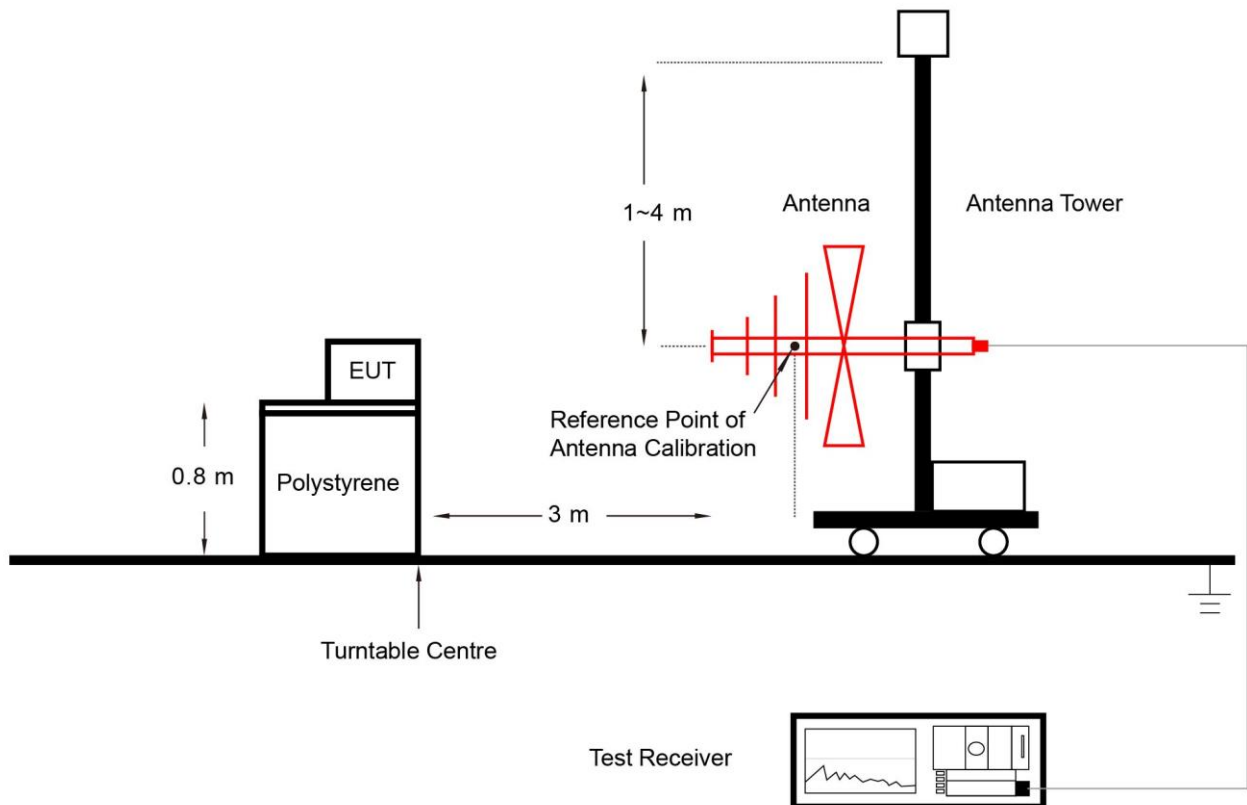
If the EUT duty cycle is $< 98\%$, set $VBW \geq 1/T$. T is the minimum transmission duration.
4. As an alternative, the instrument may be set to linear detector mode. Ensure that video filtering is applied in linear voltage domain (rather than in a log or dB domain). Some instruments require linear display mode in order to accomplish this. Others have a setting for Average-VBW Type, which can be set to "Voltage" regardless of the display mode
5. Detector = Peak
6. Sweep time = Auto
7. Trace mode = Max hold
8. Trace was allowed to stabilize

6.8.4. Test Setup

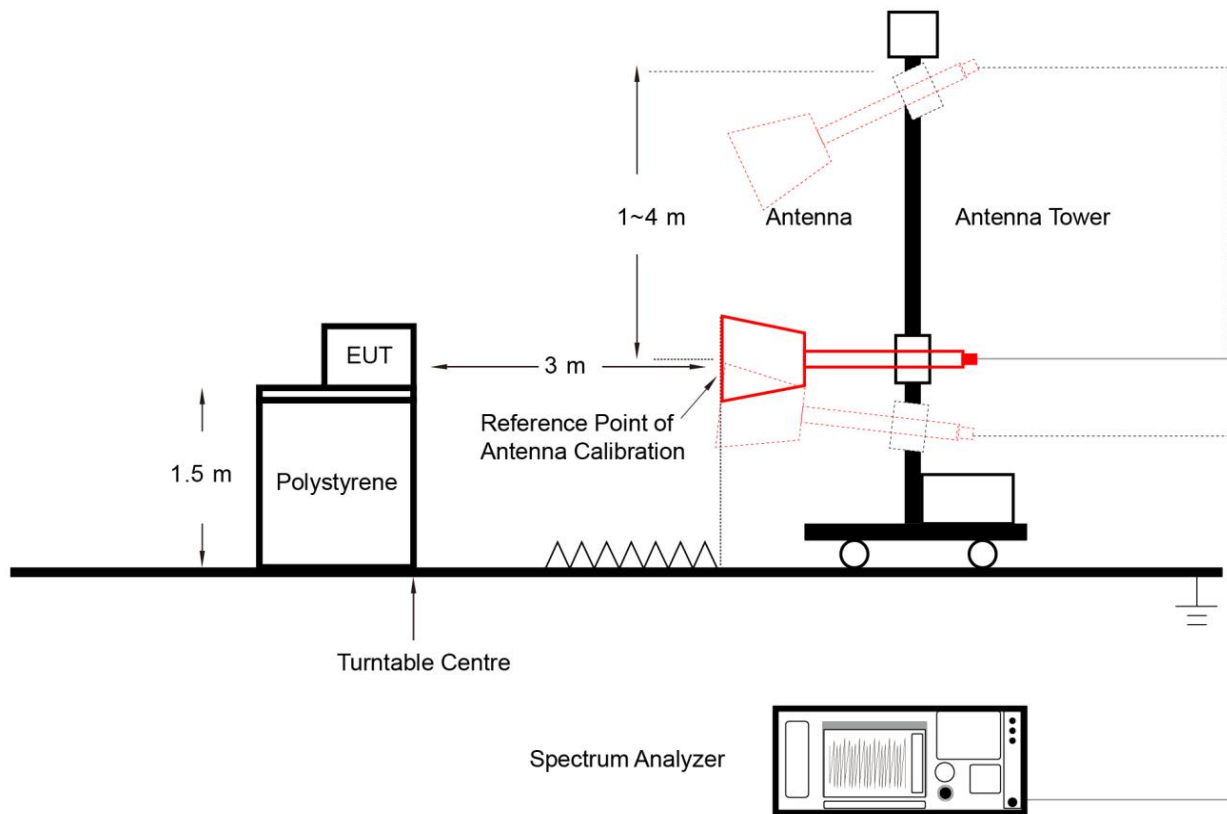
Below 30MHz Test Setup:



Below 1GHz Test Setup:



Above 1GHz Test Setup:



6.8.5. Test Result

Refer to Appendix A.7.

6.9. Radiated Restricted Band Edge Measurement

6.9.1. Test Limit

For 15.205 requirement:

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

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

For 15.407(b) requirement:

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

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

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

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

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

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

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

6.9.2. Test Procedure

KDB 789033 D02v02r01- Section II)G)

6.9.3. Test Setting

Peak Field Strength Measurements

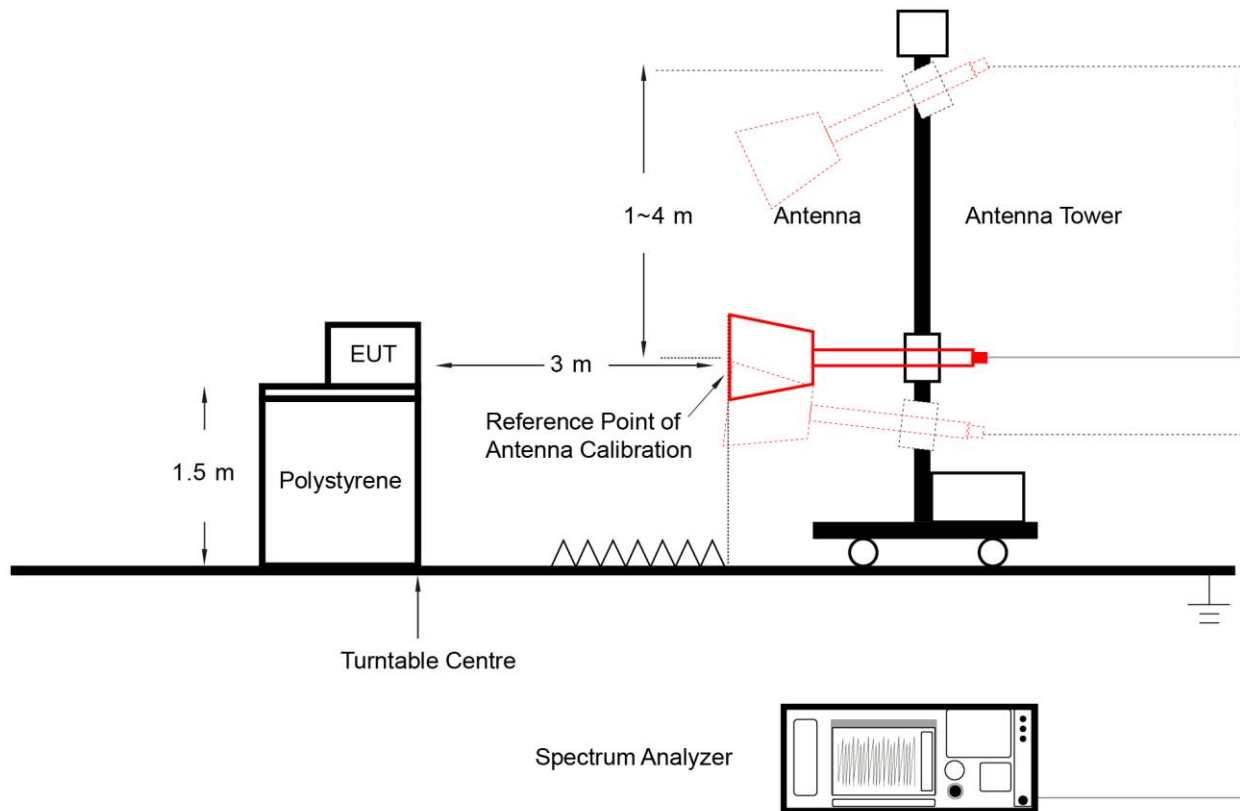
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

Average Field Strength Measurements

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 $\text{VBW} \geq 1/T$. T is the minimum transmission duration.
4. As an alternative, the instrument may be set to linear detector mode. Ensure that video filtering is applied in linear voltage domain (rather than in a log or dB domain). Some instruments require linear display mode in order to accomplish this. Others have a setting for Average-VBW Type, which can be set to "Voltage" regardless of the display mode
5. Detector = Peak
6. Sweep time = auto
7. Trace mode = max hold
8. Allow max hold to run for at least 50 times (1/duty cycle) traces

6.9.4. Test Setup



6.9.5. Test Result

Refer to Appendix A.8.

6.10. AC Conducted Emissions Measurement

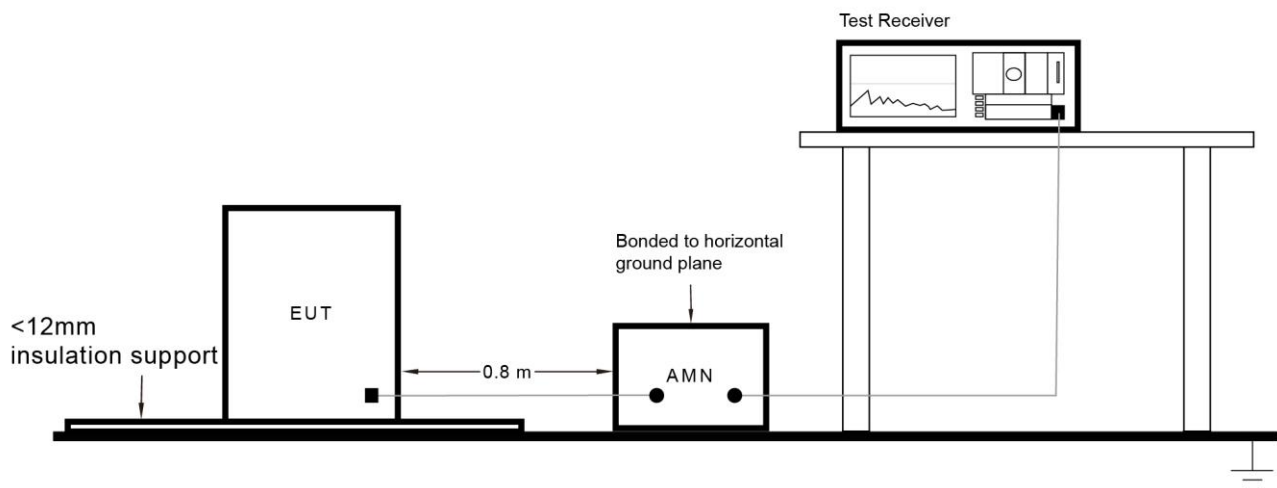
6.10.1. Test Limit

FCC Part 15.207 Limits		
Frequency (MHz)	QP (dBuV)	AV (dBuV)
0.15 - 0.50	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30	60	50

Note 1: The lower limit shall apply at the transition frequencies.

Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz.

6.10.2. Test Setup



6.10.3. Test Result

Refer to Appendix A.9.

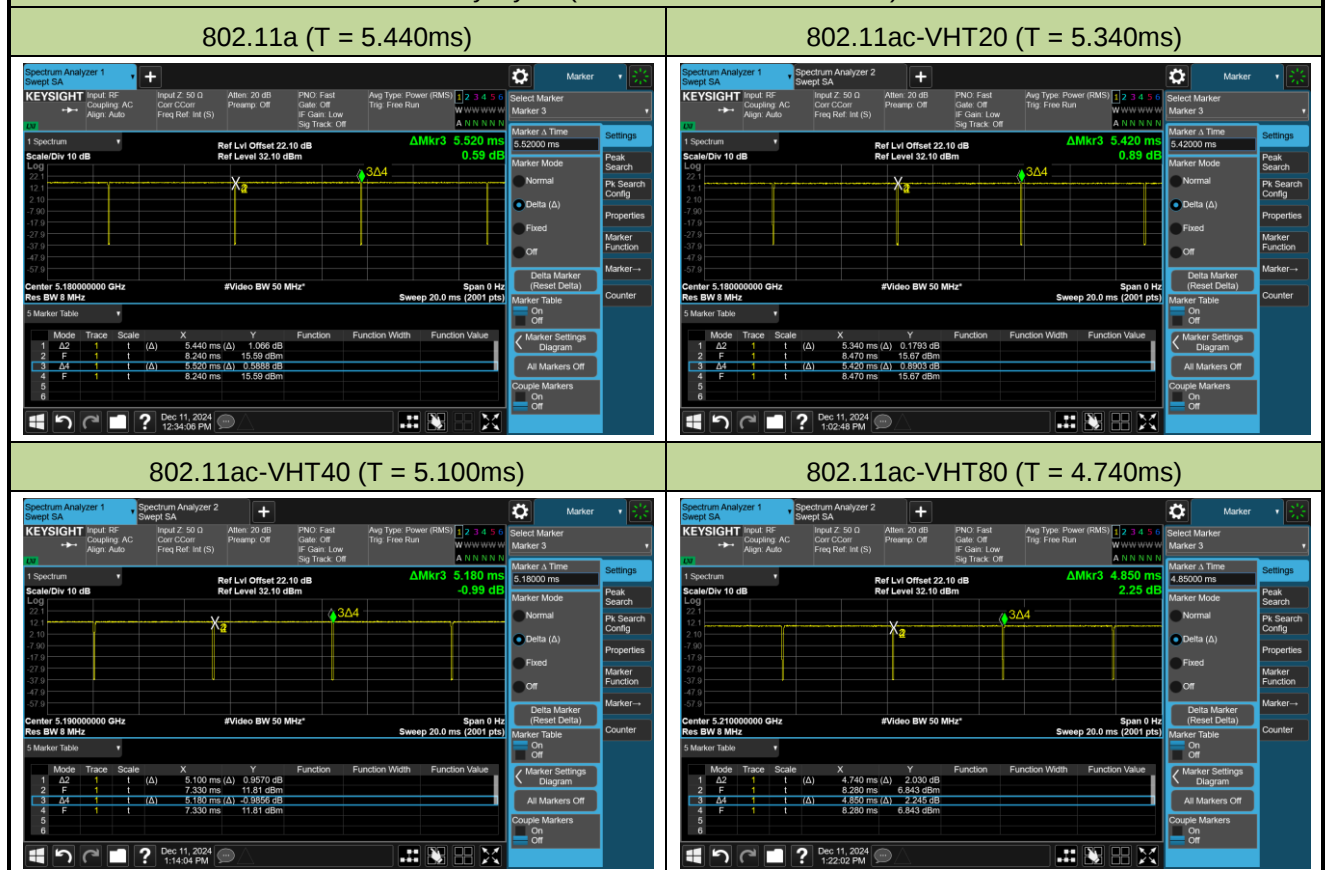
Appendix A – Test Result

A.1 Duty Cycle Test Result

Test Site	SIP-TR1	Test Engineer	Alan Yu
Test Date	2024-12-14		

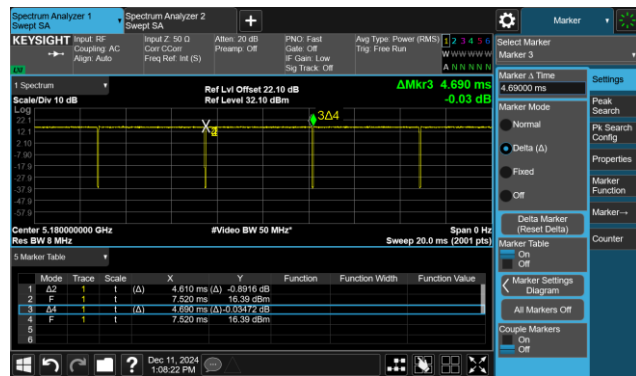
Test Mode	Duty Cycle
802.11a	98.55%
802.11ac-VHT20	98.52%
802.11ac-VHT40	98.46%
802.11ac-VHT80	97.73%
802.11ax-HE20	98.29%
802.11ax-HE40	98.29%
802.11ax-HE80	97.99%

Duty Cycle (T = Transmission Duration)

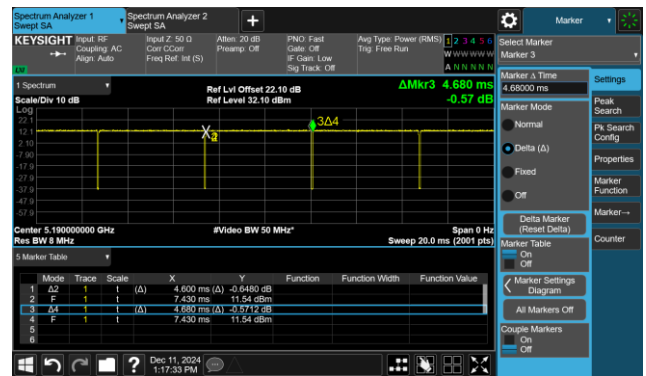


Duty Cycle (T = Transmission Duration)

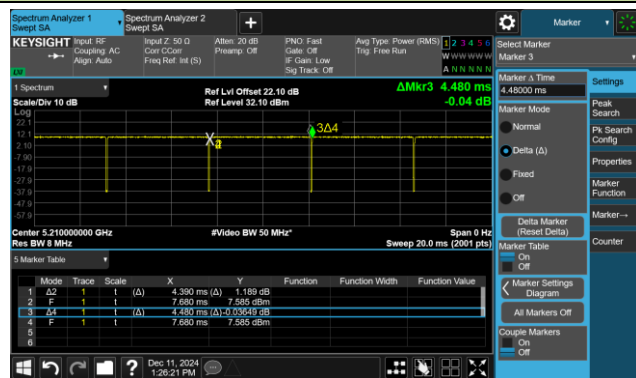
802.11ax-HE20 (T = 4.610ms)



802.11ax-HE40 (T = 4.600ms)



802.11ax-HE80 (T = 4.390ms)



A.2 26dB Bandwidth Test Result

Test Site	SIP-TR1	Test Engineer	Alan Yu
Test Date	2024-12-25 ~ 2024-12-26		

Test Mode	Data Rate/ MCS	Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
11a	6Mbps	36	5180	22.20	17.680
11a	6Mbps	44	5220	37.37	19.188
11a	6Mbps	48	5240	38.05	18.629
11a	6Mbps	52	5260	35.81	18.683
11a	6Mbps	60	5300	34.38	18.221
11a	6Mbps	64	5320	21.52	16.916
11a	6Mbps	100	5500	21.46	16.792
11a	6Mbps	116	5580	21.37	16.927
11a	6Mbps	140	5700	24.38	17.316
11a	6Mbps	144	5720	24.40	17.389
11a	6Mbps	149	5745	21.89	17.216
11a	6Mbps	157	5785	23.86	17.416
11a	6Mbps	165	5825	23.40	17.358
11ac-VHT20	MCS0	36	5180	21.83	18.014
11ac-VHT20	MCS0	44	5220	39.82	19.435
11ac-VHT20	MCS0	48	5240	38.20	19.193
11ac-VHT20	MCS0	52	5260	38.51	19.090
11ac-VHT20	MCS0	60	5300	36.07	18.719
11ac-VHT20	MCS0	64	5320	21.59	17.929
11ac-VHT20	MCS0	100	5500	21.57	17.918
11ac-VHT20	MCS0	116	5580	22.68	18.525
11ac-VHT20	MCS0	140	5700	21.80	17.904
11ac-VHT20	MCS0	144	5720	22.91	18.493
11ac-VHT20	MCS0	149	5745	22.71	18.427
11ac-VHT20	MCS0	157	5785	22.65	18.535
11ac-VHT20	MCS0	165	5825	22.59	18.504

Test Mode	Data Rate/ MCS	Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
11ac-VHT40	MCS0	38	5190	40.73	36.452
11ac-VHT40	MCS0	46	5230	79.69	38.486
11ac-VHT40	MCS0	54	5270	77.15	37.532
11ac-VHT40	MCS0	62	5310	40.31	36.380
11ac-VHT40	MCS0	102	5510	40.22	36.228
11ac-VHT40	MCS0	110	5550	41.22	36.850
11ac-VHT40	MCS0	134	5670	41.11	36.832
11ac-VHT40	MCS0	142	5710	41.48	36.758
11ac-VHT40	MCS0	151	5755	41.09	36.809
11ac-VHT40	MCS0	159	5795	41.31	36.743
11ac-VHT80	MCS0	42	5210	80.99	75.603
11ac-VHT80	MCS0	58	5290	80.56	75.522
11ac-VHT80	MCS0	106	5530	81.26	75.494
11ac-VHT80	MCS0	122	5610	80.78	75.342
11ac-VHT80	MCS0	138	5690	80.54	75.436
11ac-VHT80	MCS0	155	5775	81.13	75.666
11ax-HE20	MCS0	36	5180	22.33	19.137
11ax-HE20	MCS0	44	5220	32.49	19.360
11ax-HE20	MCS0	48	5240	30.78	19.321
11ax-HE20	MCS0	52	5260	27.32	19.341
11ax-HE20	MCS0	60	5300	34.88	19.494
11ax-HE20	MCS0	64	5320	22.51	19.305
11ax-HE20	MCS0	100	5500	22.49	19.290
11ax-HE20	MCS0	116	5580	22.95	19.344
11ax-HE20	MCS0	140	5700	23.00	19.275
11ax-HE20	MCS0	144	5720	22.69	19.310
11ax-HE20	MCS0	149	5745	22.71	19.350
11ax-HE20	MCS0	157	5785	22.51	19.250
11ax-HE20	MCS0	165	5825	22.36	19.308

Test Mode	Data Rate/ MCS	Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
11ax-HE40	MCS0	38	5190	41.44	37.933
11ax-HE40	MCS0	46	5230	78.08	38.826
11ax-HE40	MCS0	54	5270	68.22	38.582
11ax-HE40	MCS0	62	5310	41.18	37.957
11ax-HE40	MCS0	102	5510	41.07	37.984
11ax-HE40	MCS0	110	5550	41.73	38.099
11ax-HE40	MCS0	134	5670	41.21	37.970
11ax-HE40	MCS0	142	5710	41.32	37.912
11ax-HE40	MCS0	151	5755	41.20	37.894
11ax-HE40	MCS0	159	5795	41.44	37.909
11ax-HE80	MCS0	42	5210	82.67	77.575
11ax-HE80	MCS0	58	5290	82.44	77.397
11ax-HE80	MCS0	106	5530	82.54	77.336
11ax-HE80	MCS0	122	5610	82.42	77.476
11ax-HE80	MCS0	138	5690	82.49	77.472
11ax-HE80	MCS0	155	5775	82.48	77.614

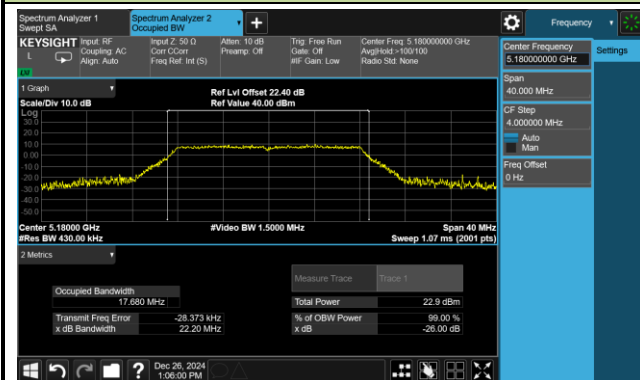
Test Mode	Data Rate/ MCS	Channel No.	Frequency (MHz)	F _H (MHz)	Limit (MHz)
802.11a	6Mbps	48	5240	5249.31	< 5250
802.11ac-VHT20	MCS0	48	5240	5249.60	< 5250
802.11ac-VHT40	MCS0	46	5230	5249.24	< 5250
802.11ac-VHT80	MCS0	42	5210	5247.80	< 5250
802.11ax-HE20	MCS0	48	5240	5249.66	< 5250
802.11ax-HE40	MCS0	46	5230	5249.41	< 5250
802.11ax-HE80	MCS0	42	5210	5248.79	< 5250

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

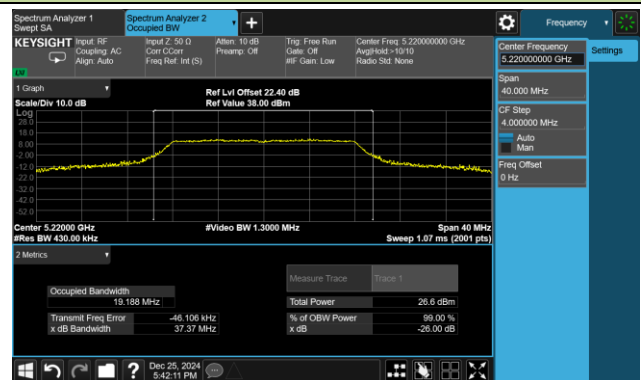
For example, 802.11a 5240MHz, F_H = 5240 MHz + 18.629 MHz / 2 = 5249.32 MHz.

802.11a 26dB Bandwidth & 99% Bandwidth

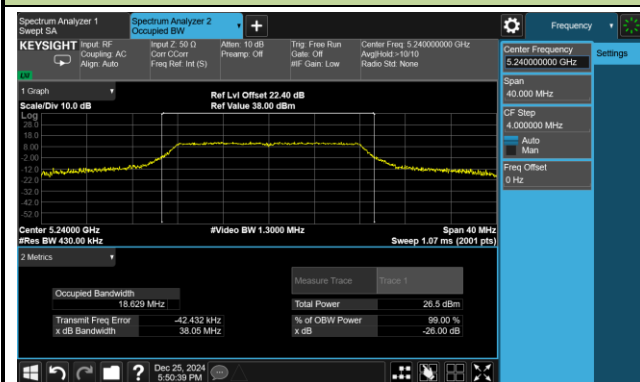
Channel 36 (5180MHz)



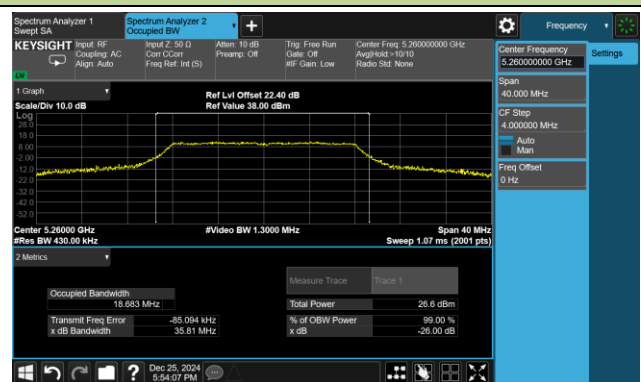
Channel 44 (5220MHz)



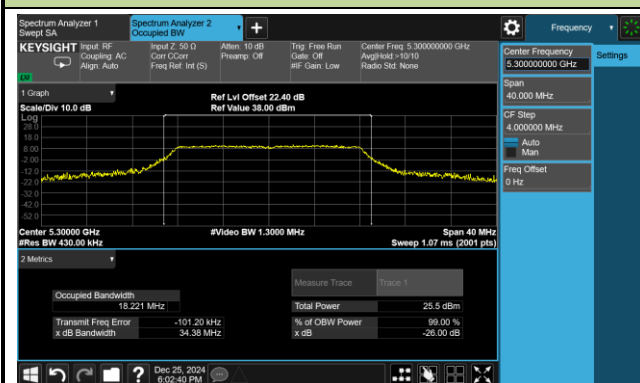
Channel 48 (5240MHz)



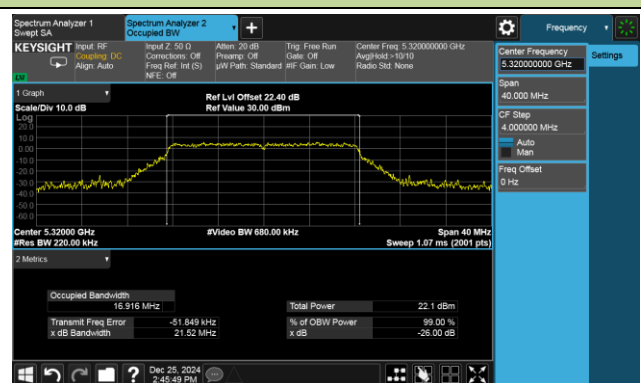
Channel 52 (5260MHz)



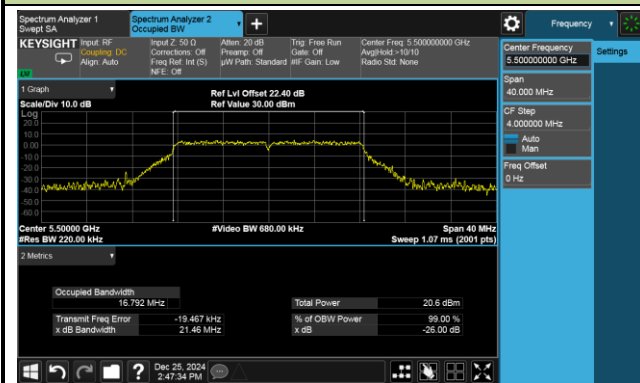
Channel 60 (5300MHz)



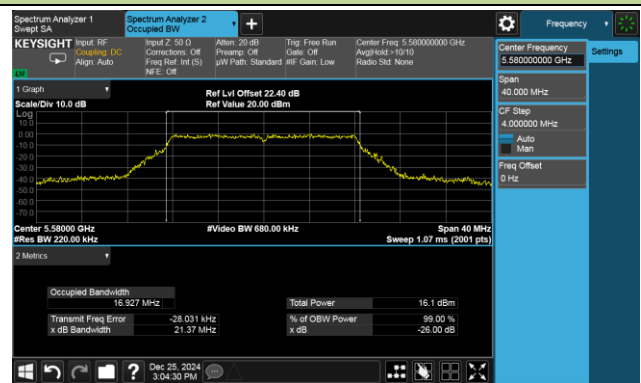
Channel 64 (5320MHz)



Channel 100 (5500MHz)

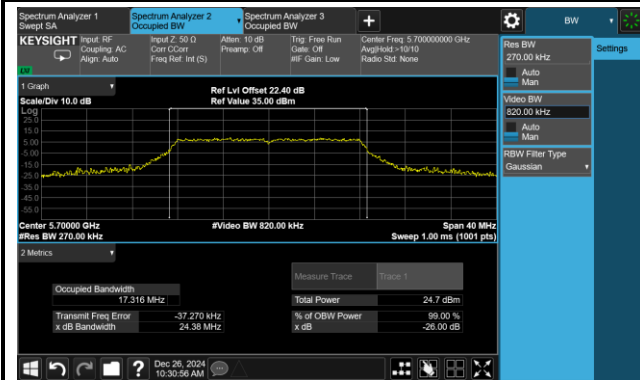


Channel 116 (5580MHz)

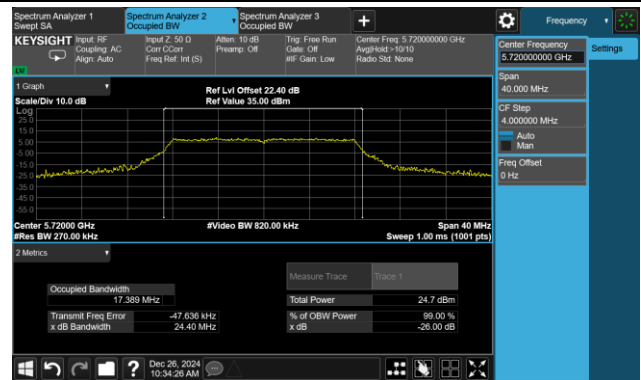


802.11a 26dB Bandwidth & 99% Bandwidth

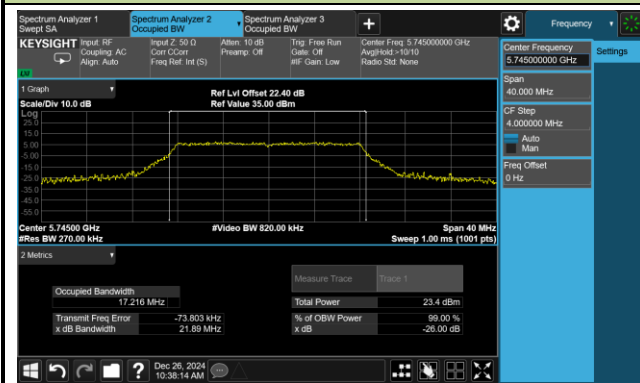
Channel 140 (5700MHz)



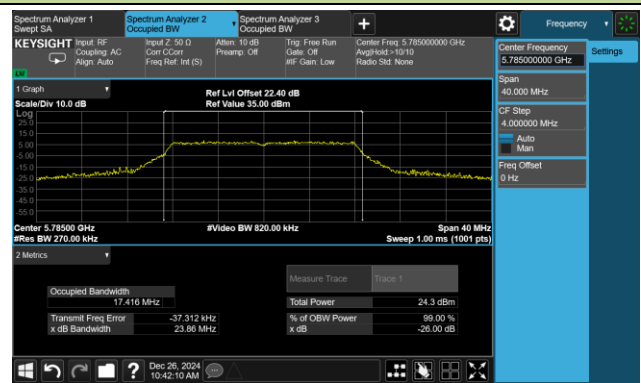
Channel 144(5720MHz)



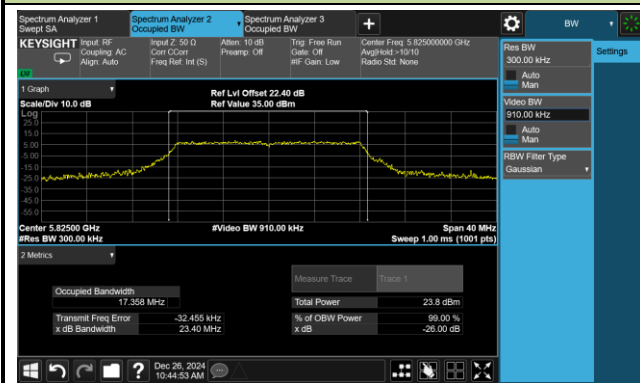
Channel 149 (5745MHz)



Channel 157 (5785MHz)

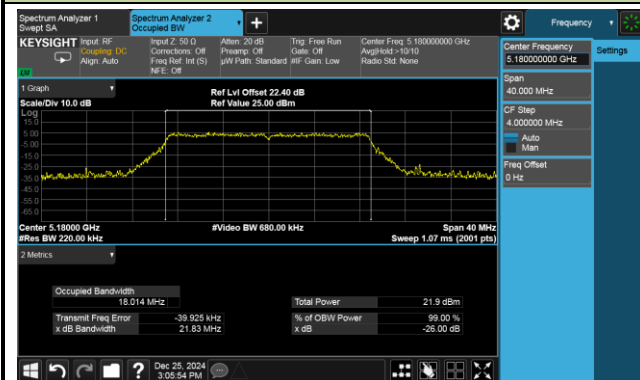


Channel 165 (5825MHz)

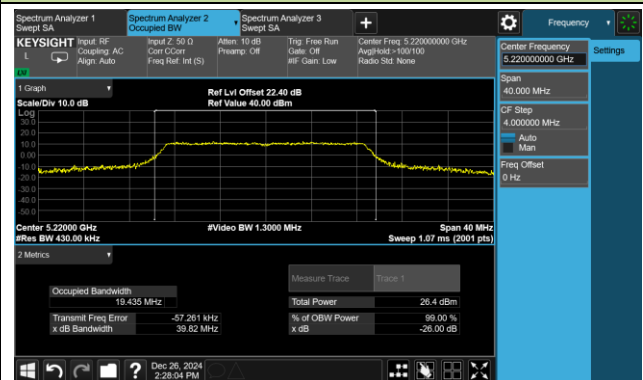


802.11ac-VHT20 26dB Bandwidth & 99% Bandwidth

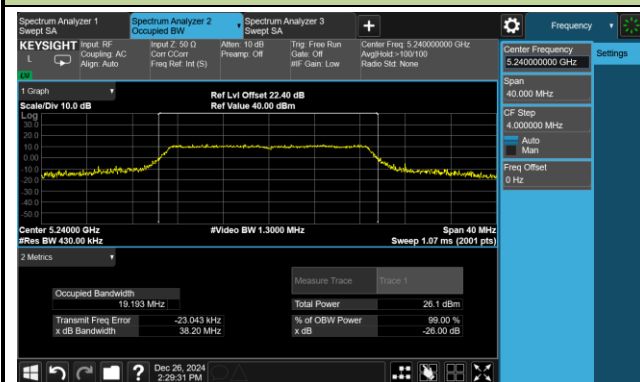
Channel 36 (5180MHz)



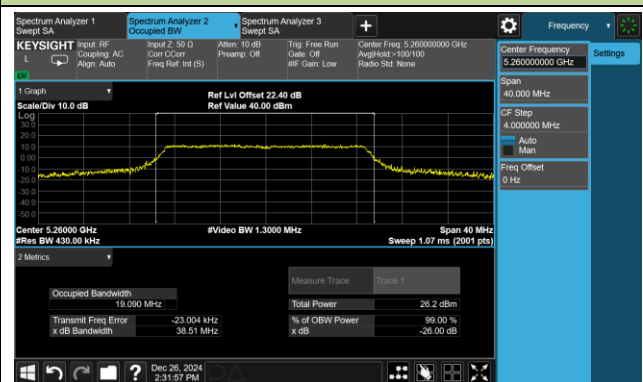
Channel 44 (5220MHz)



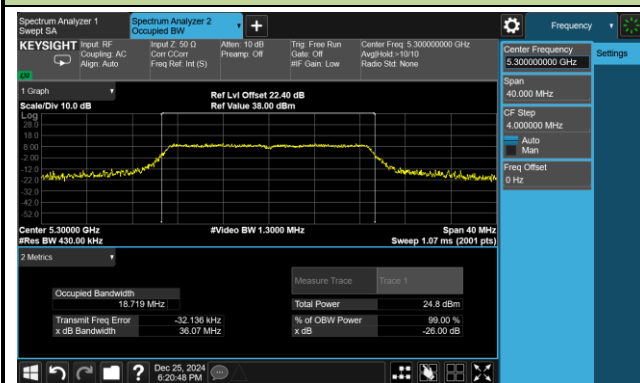
Channel 48 (5240MHz)



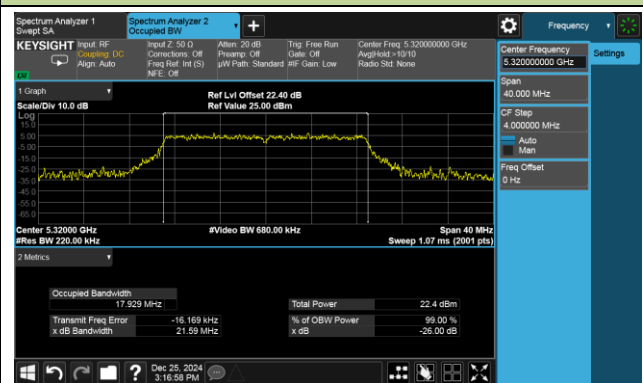
Channel 52 (5260MHz)



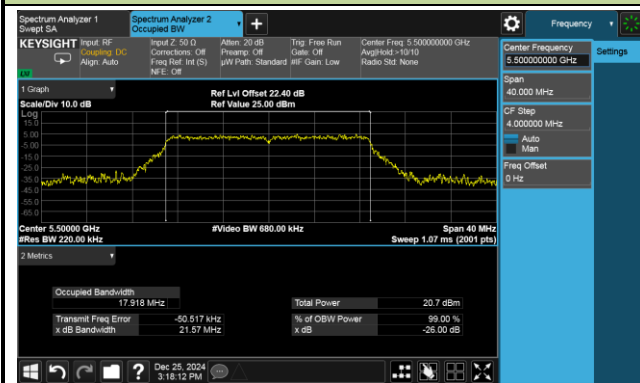
Channel 60 (5300MHz)



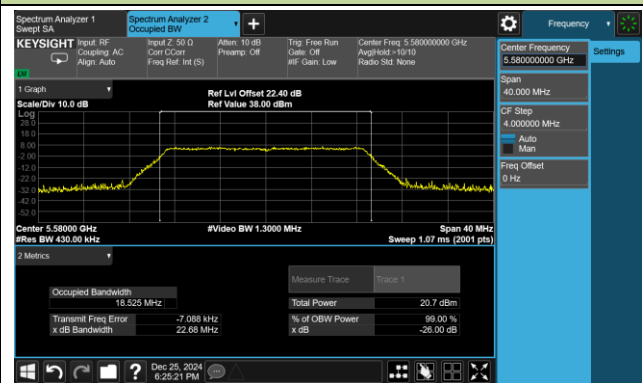
Channel 64 (5320MHz)



Channel 100 (5500MHz)

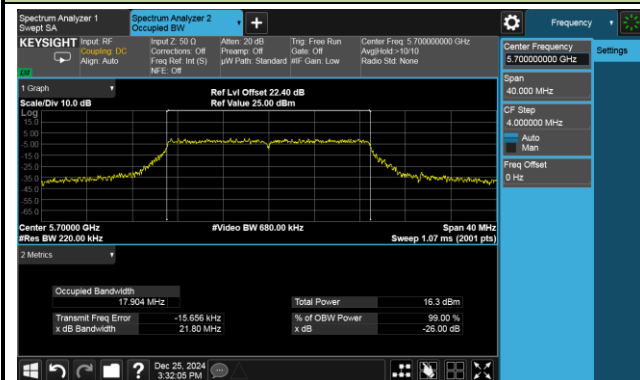


Channel 116 (5580MHz)

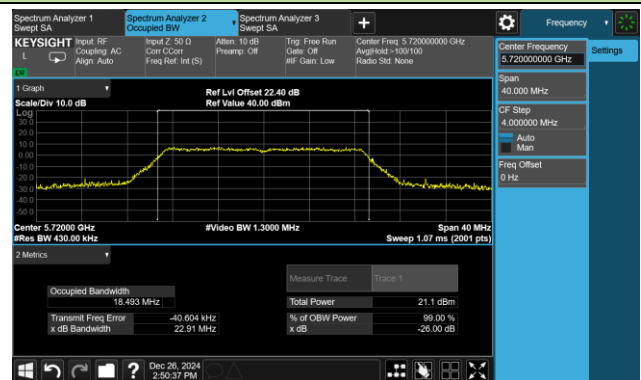


802.11ac-VHT20 26dB Bandwidth & 99% Bandwidth

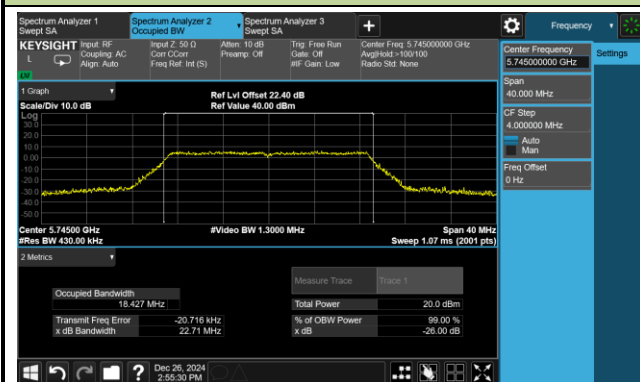
Channel 140 (5700MHz)



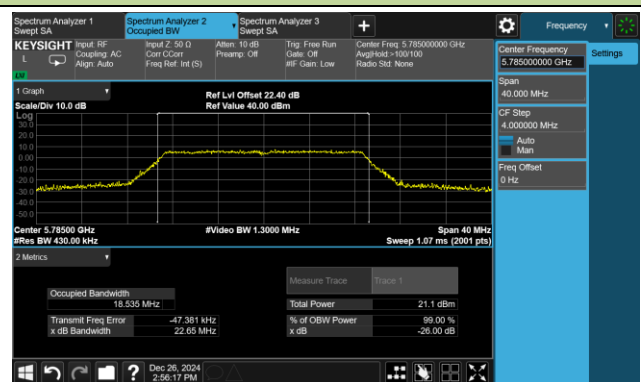
Channel 144(5720MHz)



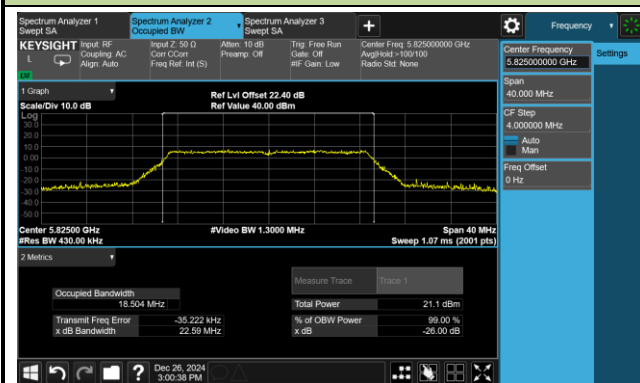
Channel 149 (5745MHz)



Channel 157 (5785MHz)

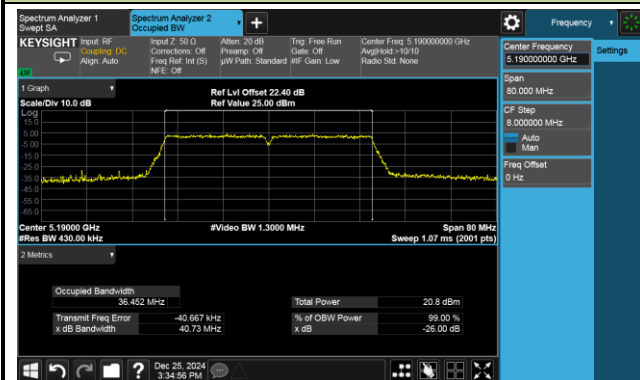


Channel 165 (5825MHz)

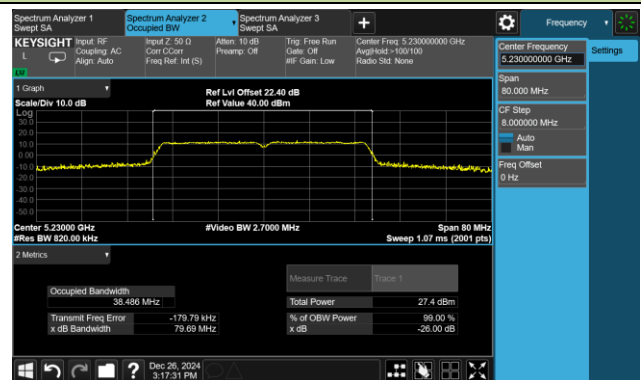


802.11ac-VHT40 26dB Bandwidth & 99% Bandwidth

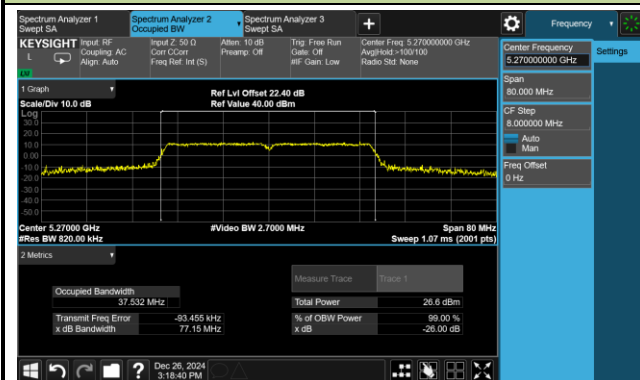
Channel 38 (5190MHz)



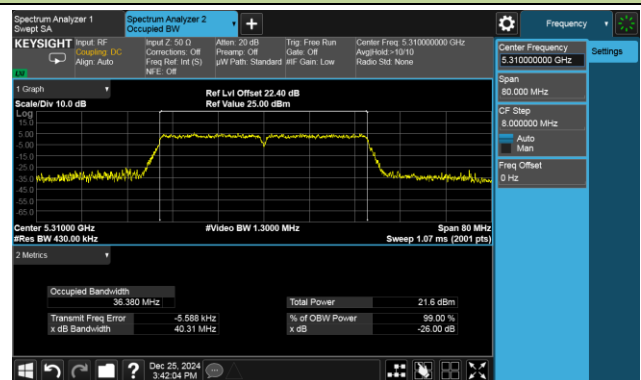
Channel 46 (5230MHz)



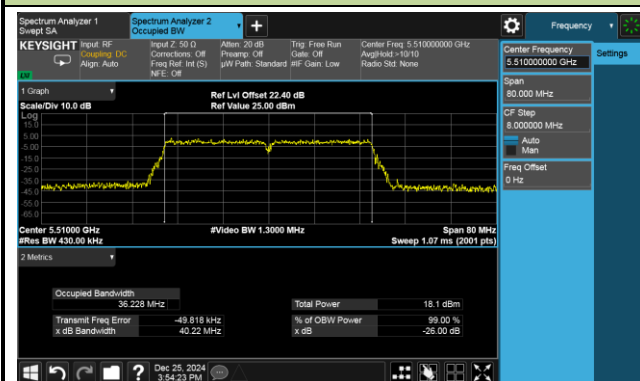
Channel 54 (5270MHz)



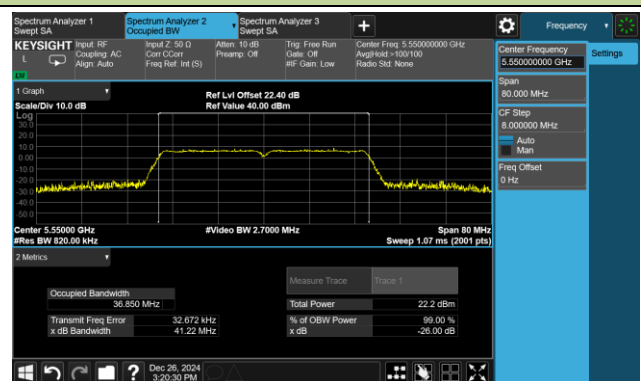
Channel 62 (5310MHz)



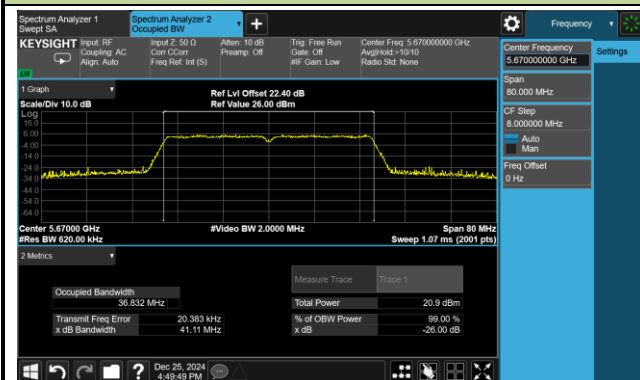
Channel 102 (5510MHz)



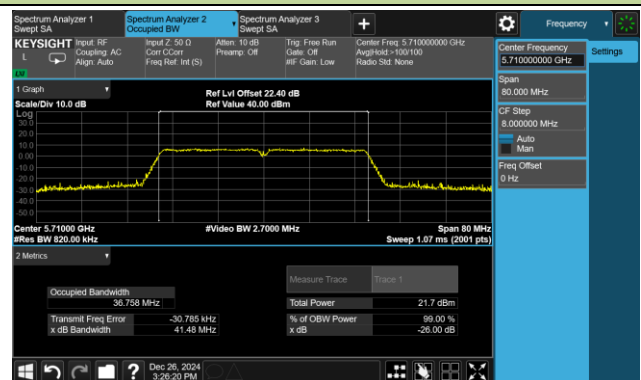
Channel 110 (5550MHz)

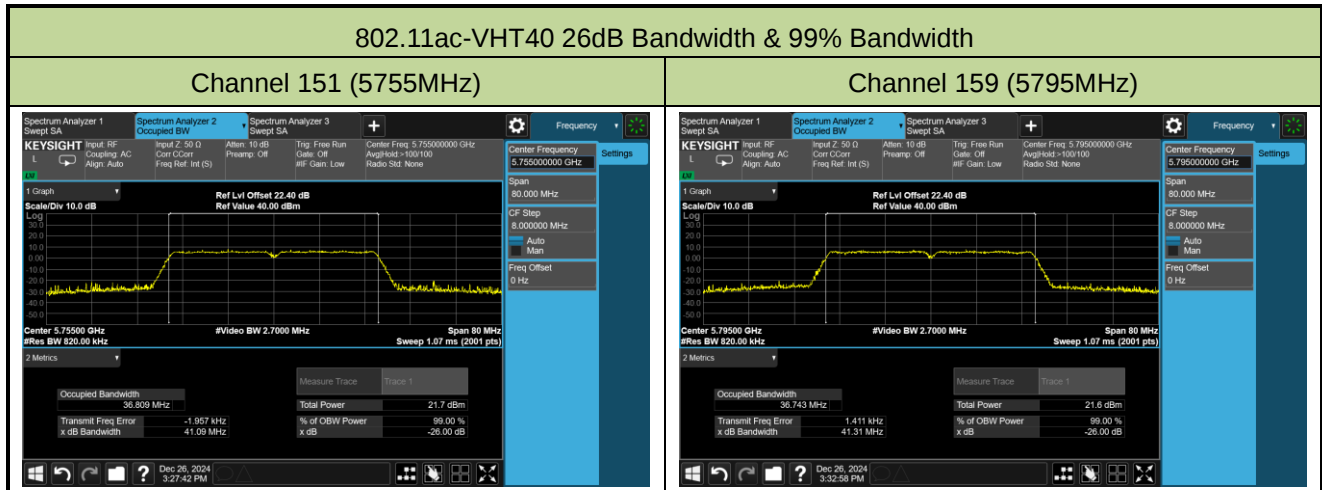


Channel 134 (5670MHz)



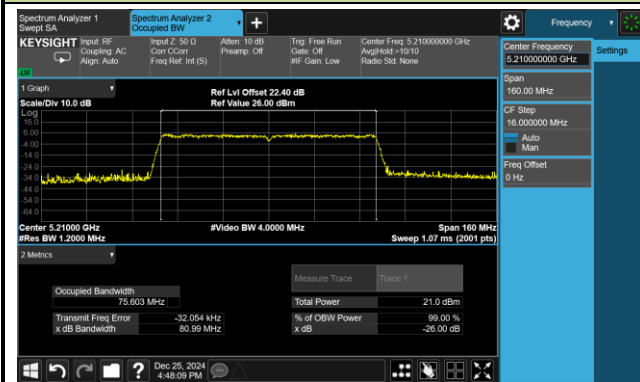
Channel 142(5710MHz)



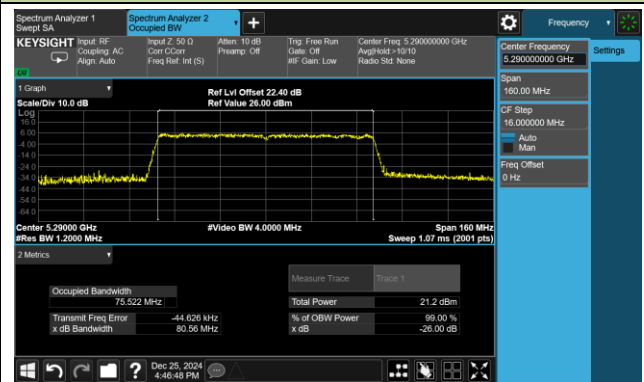


802.11ac-VHT80 26dB Bandwidth & 99% Bandwidth

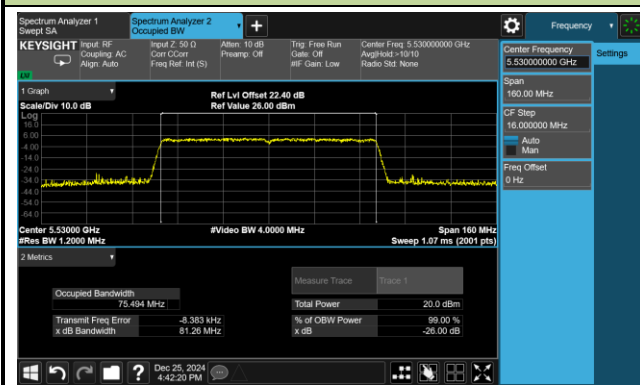
Channel 42 (5210MHz)



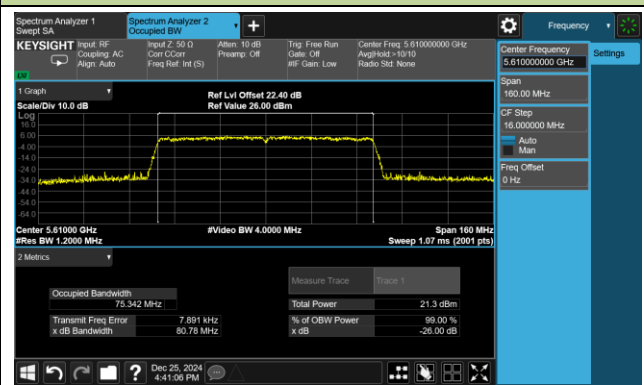
Channel 58 (5290MHz)



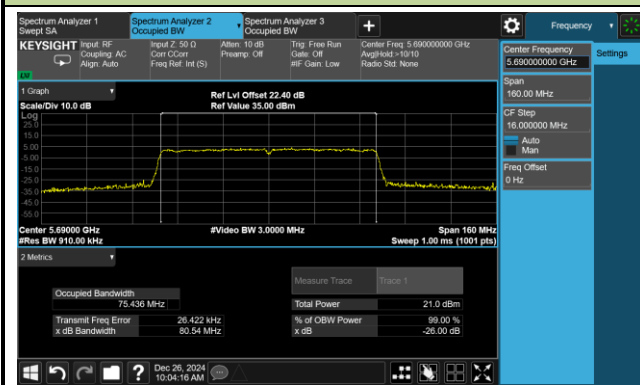
Channel 106 (5530MHz)



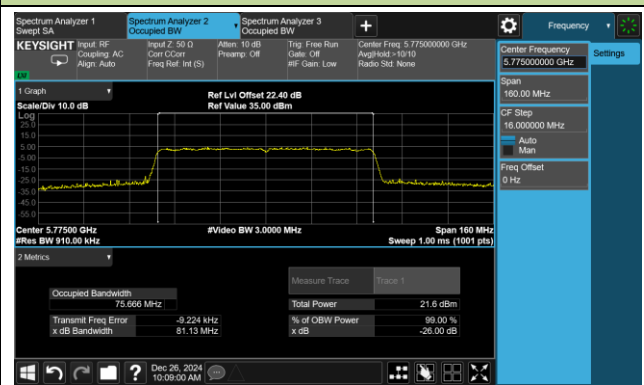
Channel 122 (5610MHz)



Channel 138 (5690MHz)

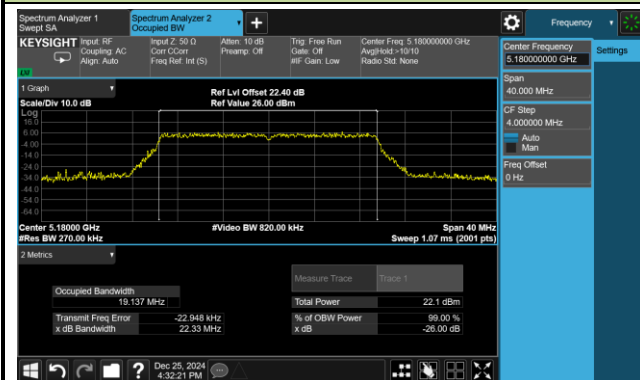


Channel 155 (5775MHz)

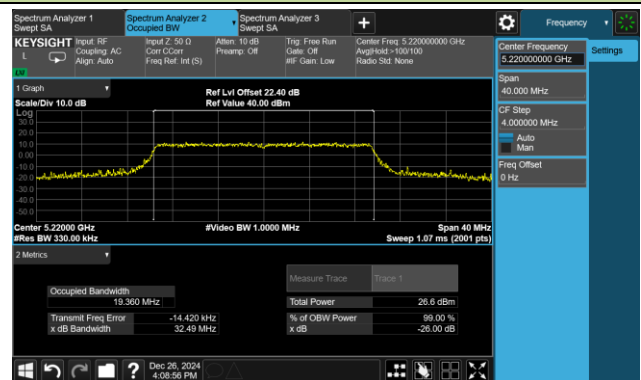


802.11ax-HE20 26dB Bandwidth & 99% Bandwidth

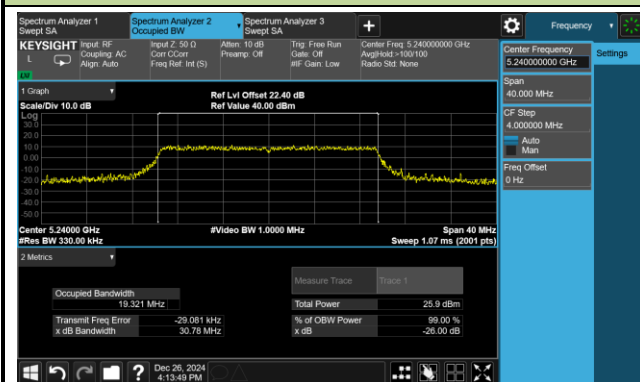
Channel 36 (5180MHz)



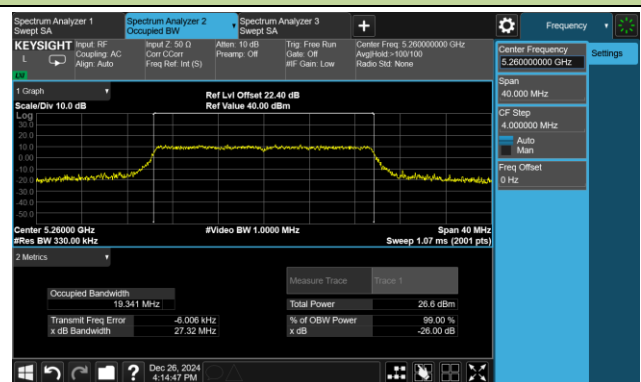
Channel 44 (5220MHz)



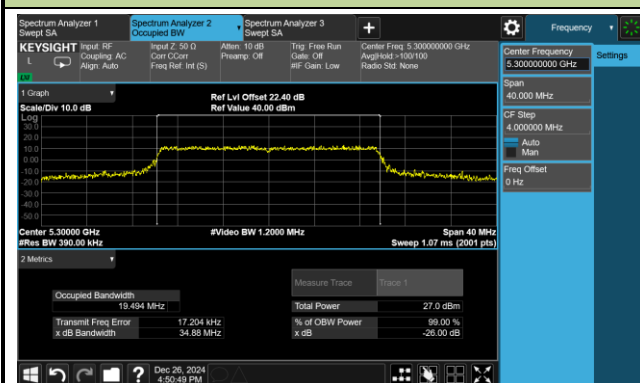
Channel 48 (5240MHz)



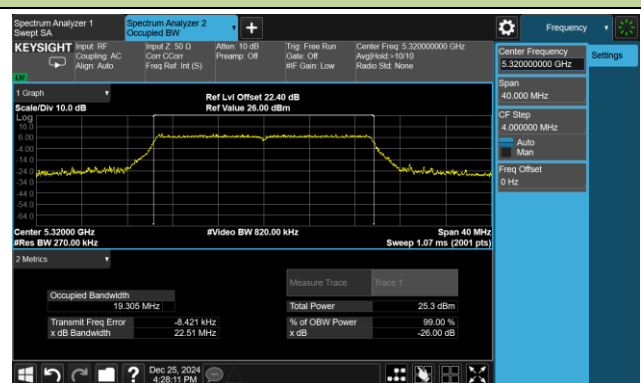
Channel 52 (5260MHz)



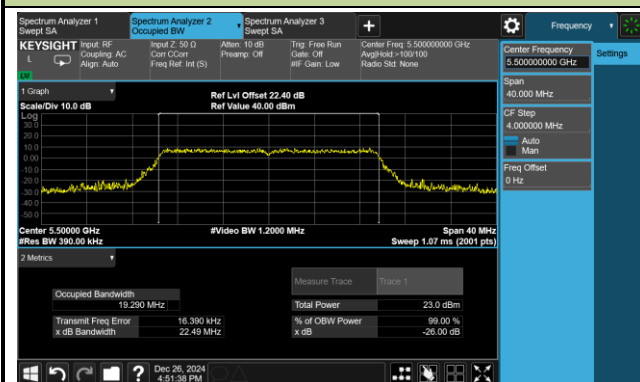
Channel 60 (5300MHz)



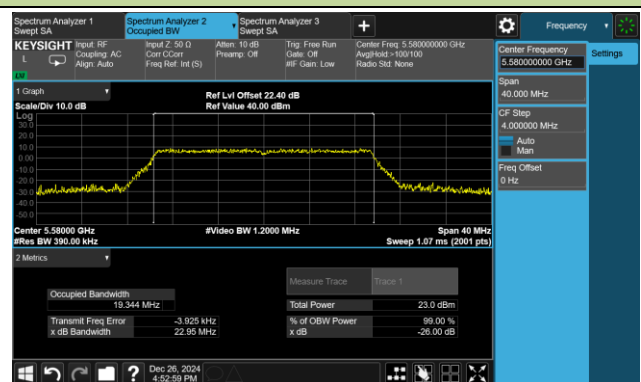
Channel 64 (5320MHz)



Channel 100 (5500MHz)

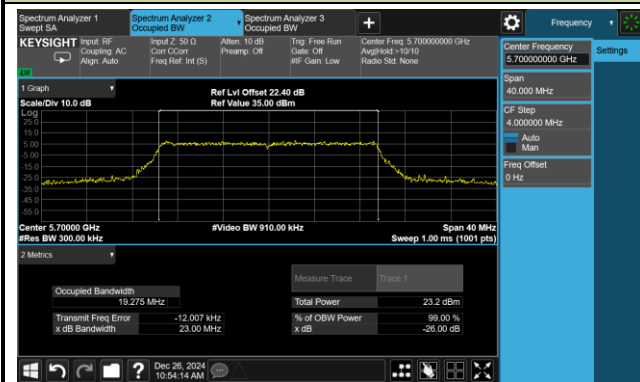


Channel 116 (5580MHz)

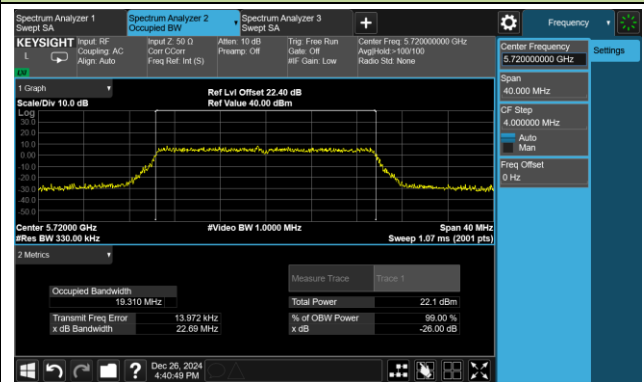


802.11ax-HE20 26dB Bandwidth & 99% Bandwidth

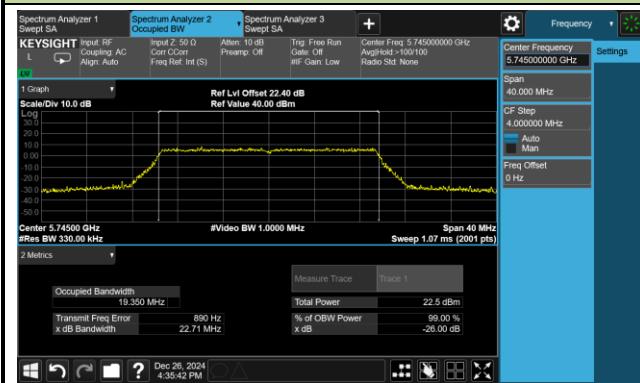
Channel 140 (5700MHz)



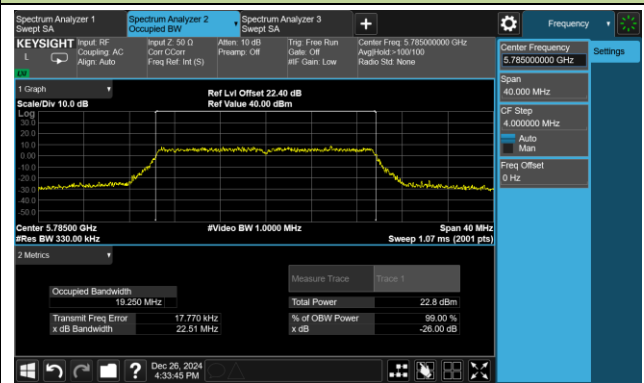
Channel 144(5720MHz)



Channel 149 (5745MHz)



Channel 157 (5785MHz)



Channel 165 (5825MHz)

