



# FCC TEST REPORT

## FCC ID:2A48T-BW11

Report Number..... : ZKT-240929L12496E-2

Date of Test..... September 24 to October 28, 2024

Date of issue..... : October 28, 2024

Total number of pages..... 61

Test Result ..... : PASS

Testing Laboratory..... : Shenzhen ZKT Technology Co., Ltd.

Address ..... : 1/F, No. 101, Building B, No. 6, Tangwei Community Industrial Avenue, Fuhai Street, Bao'an District, Shenzhen, China

Applicant's name ..... : **Shenzhen Bo Lian Sheng Technology Co. LTD**

Address ..... : 403, Floor 4, Building 63, Fumin Industrial Zone, Pinghu Street, Longgang District, Shenzhen

Manufacturer's name ..... : **Shenzhen Bo Lian Sheng Technology Co. LTD**

Address ..... : 403, Floor 4, Building 63, Fumin Industrial Zone, Pinghu Street, Longgang District, Shenzhen

Factory's name ..... : **Dongguan Mingzhi Precision Manufacturing Co., LTD**

Address ..... : Room 301, Building 1, No.4 Jizhi North Road, Humen Town, Dongguan City, Guangdong Province

Test specification:

Standard..... : FCC CFR Title 47 Part 15 Subpart C Section 15.407  
ANSI C63.10:2013  
KDB 789033 D02 v01r02

Test procedure..... : /

Non-standard test method ..... : N/A

Test Report Form No..... : TRF-EL-113\_V0

Test Report Form(s) Originator..... : ZKT Testing

Master TRF ..... : Dated: 2020-01-06

This device described above has been tested by ZKT, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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Product name..... : **USB wireless card**

Trademark ..... : N/A

Model/Type reference..... : BW11



Ratings..... : DC5V from Notebook AC120V/60Hz

Testing procedure and testing location:

Testing Laboratory..... : Shenzhen ZKT Technology Co., Ltd.

Address..... : 1/F, No. 101, Building B, No. 6, Tangwei Community  
Industrial Avenue, Fuhai Street, Bao'an District,  
Shenzhen, China

Tested by (name + signature)..... : Alen He

Reviewer (name + signature)..... : Joe Liu

Approved (name + signature)..... : Lake Xie





Table of Contents	Page
<b>1. VERSION</b>	<b>5</b>
<b>2.SUMMARY OF TEST RESULTS</b>	<b>6</b>
2.1 TEST FACILITY	7
2.2 MEASUREMENT UNCERTAINTY	7
<b>3. GENERAL INFORMATION</b>	<b>8</b>
3.1 GENERAL DESCRIPTION OF EUT	8
3.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED	11
3.4 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE)	11
3.5 EQUIPMENTS LIST FOR ALL TEST ITEMS	12
<b>4.EMC EMISSION TEST</b>	<b>14</b>
4.1 CONDUCTED EMISSION MEASUREMENT	14
4.1.1 POWER LINE CONDUCTED EMISSION LIMITS	14
4.1.2 TEST PROCEDURE	14
4.1.3 DEVIATION FROM TEST STANDARD	14
4.1.4 TEST SETUP	15
4.1.5 EUT OPERATING CONDITIONS	15
4.1.6 TEST RESULT	16
4.2 RADIATED EMISSION MEASUREMENT	18
4.2.1 APPLICABLE STANDARD	18
4.2.2 CONFORMANCE LIMIT	18
4.2.3 MEASURING INSTRUMENTS	18
4.2.4 TEST CONFIGURATION	19
4.2.5 TEST PROCEDURE	20
4.2.6 TEST RESULT	21
<b>5.POWER SPECTRAL DENSITY TEST</b>	<b>26</b>
5.1 APPLIED PROCEDURES / LIMIT	26
5.2 TEST PROCEDURE	27
5.3 DEVIATION FROM STANDARD	27
5.4 TEST SETUP	27
5.5 EUT OPERATION CONDITIONS	27
5.6 TEST RESULTS	28
<b>6. 26DB &amp; 99% EMISSION BANDWIDTH</b>	<b>34</b>
6.1 APPLIED PROCEDURES / LIMIT	34
6.2 TEST PROCEDURE	34
6.3 EUT OPERATION CONDITIONS	35
6.4 TEST RESULTS	35



Table of Contents	Page
<b>7.MAXIMUM CONDUCTED OUTPUT POWER</b>	<b>39</b>
7.1 PPLIED PROCEDURES / LIMIT	39
7.2 TEST PROCEDURE	39
7.3 DEVIATION FROM STANDARD	40
7.4 TEST SETUP	40
7.5 EUT OPERATION CONDITIONS	40
7.6 TEST RESULTS	41
<b>8.OUT OF BAND EMISSIONS</b>	<b>42</b>
8.1 APPLICABLE STANDARD	42
8.2 TEST PROCEDURE	42
8.3 DEVIATION FROM STANDARD	42
8.4 TEST SETUP	42
8.5 EUT OPERATION CONDITIONS	43
8.6 TEST RESULTS	43
<b>9.SPURIOUS RF CONDUCTED EMISSIONS</b>	<b>47</b>
9.1 CONFORMANCE LIMIT	47
9.2 MEASURING INSTRUMENTS	47
9.3 TEST SETUP	47
9.4 TEST PROCEDURE	47
9.5 TEST RESULTS	47
<b>10.FREQUENCY STABILITY MEASUREMENT</b>	<b>54</b>
10.1 LIMIT	54
10.2 TEST PROCEDURES	54
10.3 TEST SETUP LAYOUT	54
10.4 EUT OPERATION DURING TEST	54
10.5 TEST RESULTS	54
<b>11.ANTENNA REQUIREMENT</b>	<b>60</b>
<b>12. TEST SETUP PHOTO</b>	<b>61</b>
<b>13. EUT CONSTRUCTIONAL DETAILS</b>	<b>61</b>



1. VERSION

Report No.	Version	Description	Approved
ZKT-240929L12496E-2	Rev.01	Initial issue of report	October 28, 2024



## 2.SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

FCC Part15 (15.407) , Subpart E			
Standard Section	Test Item	Judgment	Remark
15.209(a), 15.407 (b)(1)	Spurious Radiated Emissions	PASS	
15.207, 15.407 (b)(9)	Conducted Emission	PASS	
15.407 (a)(12)	26 dB and 99% Emission Bandwidth	PASS	
15.407 (a)(1)	Maximum Conducted Output Power	PASS	
15.407(b)(1)	Band Edge	PASS	
15.407 (a)(1)	Power Spectral Density	PASS	
15.407(b)	Spurious Emissions at Antenna Terminals	PASS	
15.203	Antenna Requirement	PASS	

NOTE:

(1)" N/A" denotes test is not applicable in this Test Report



## 2.1 TEST FACILITY

Shenzhen ZKT Technology Co., Ltd.

Add. : 1/F, No. 101, Building B, No. 6, Tangwei Community Industrial Avenue, Fuhai Street, Bao'an District, Shenzhen, China

FCC Test Firm Registration Number: 692225

Designation Number: CN1299

IC Registered No.: 27033

CAB identifier: CN0110

## 2.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement  $y \pm U$ , where expanded uncertainty  $U$  is based on a standard uncertainty multiplied by a coverage factor of  $k=2$ , providing a level of confidence of approximately 95 %.

No.	Item	Uncertain
	3m chamber Radiated spurious emission(9KHz-30MHz)	U=4.5dB
2	3m chamber Radiated spurious emission(30MHz-1GHz)	U=4.8dB
3	3m chamber Radiated spurious emission(1GHz-6GHz)	U=4.9dB
4	3m chamber Radiated spurious emission(6GHz-40GHz)	U=5.0dB
5	Conducted disturbance	U=3.2dB
6	RF Band Edge	U=1.68dB
7	RF power conducted	U=1.86dB
8	RF conducted Spurious Emission	U=2.2dB
9	RF Occupied Bandwidth	U=1.8dB
10	RF Power Spectral Density	U=1.75dB
11	humidity uncertainty	U=5.3%
12	Temperature uncertainty	U=0.59°C





### 3. GENERAL INFORMATION

#### 3.1 GENERAL DESCRIPTION OF EUT

Product Name:	USB wireless card	
Model No.:	BW11	
Model Different.:	N/A	
Sample ID	ZKT-240929L12496E-2	
Sample(s) Status:	Engineer sample	
Product Description	IEEE 802.11 WLAN Mode Supporte	<input checked="" type="checkbox"/> 802.11a/ac/n (20MHz channel bandwidth) <input checked="" type="checkbox"/> 802.11ac/n (40MHz channel bandwidth) <input checked="" type="checkbox"/> 802.11ac(80MHz channel bandwidth)
	Data Rate	802.11a 802.11/ac/n(HT20/HT40):MCS0-MCS15; 802.11ac(VHT80):NSS1, MCS0-MCS9
	Modulation	OFDM with BPSK/QPSK/16QAM/64QAM/256QAM for 802.11a/n/ac;
	Operating Frequency Range	<input checked="" type="checkbox"/> 5180-5240MHz for 802.11a/ac/n(HT20); 5190-5230MHz for 802.11ac/n(HT40); 5210MHz for 802.11 ac80;
	Number of Channels	<input checked="" type="checkbox"/> 4 channels for 802.11a/ac/n20 in the 5180-5240MHz band ; 2 channels for 802.11 ac/n40 in the 5190-5230 MHz band ; 1 channels for 802.11 ac80 in the 5210MHz band ;
Channel List	Please refer to the Note 2.	
Antenna Type:	Integral Antenna	
Antenna gain:	The 5G WIFI 802.11a, working in SISO model, then the antenna gain as below: 802.11a ANT1: 3.7dBi 802.11a ANT2: 3.7dBi	
	The 5G WIFI 802.11n20, 802.11n40 802.11ac20 802.11ac40 802.11ac80 can MIMO model, then the antenna gain as below: Array Gain = $10 \log(N_{ANT}/N_{SS})$ dB.	
	For power spectral density (PSD) measurements on all devices. Directional Gain= $G_{ANT} + \text{Array Gain}$ =3.7dBi+10log(2/1)=6.71dBi	
	For power measurements on IEEE 802.11 devices, <sup>1,2</sup> Array Gain =0 dB (i.e., no array gain) for $N_{ANT} \leq 4$ ; Array Gain =0 dB (i.e., no array gain) for channel widths > 40 MHz for any $N_{ANT}$ ;	





	Array Gain = $5 \log(N_{\text{ANT}}/N_{\text{SS}})$ dB or 3 dB, whichever is less, for 20-MHz channel widths; Directional Gain= $G_{\text{ANT}} + \text{Array Gain}=3.7\text{dBi}+0=3.7\text{dBi}$
Power supply:	DC5V from Notebook AC120V/60Hz
SWITCHING POWER ADAPTER:	N/A
Battery:	N/A

**Note:**

For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

802.11a/ac/n( 20MHz) Frequency Channel							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
36	5180	44	5220	-	-	-	-
40	5200	48	5240	-	-	-	-

802.11ac/n(40MHz) Frequency Channel							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
38	5190	-	-	-	-	-	-
46	5230	-	-	-	-	-	-

802.11ac (80MHz) Frequency Channel	
Channel	Frequency (MHz)
42	5210



### 3.2 DESCRIPTION OF TEST MODES

Transmitting mode	Keep the EUT in continuously transmitting mode
Remark: During the test, the duty cycle >98%, the test voltage was tuned from 85% to 115% of the nominal rated supply voltage, and found that the worst case was under the nominal rated supply condition. So the report just shows that condition's data.	

Pretest Mode	Description
Mode 1	802.11a /ac / n 20 CH36/ CH40/ CH 48
Mode 2	802.11ac / n 40 CH38/ CH 46
Mode 3	802.11 ac80 CH 42
Mode 4	Link Mode

Conducted Emission	
Final Test Mode	Description
Mode 5	Link Mode

For Radiated Emission	
Final Test Mode	Description
Mode 1	802.11a /ac / n 20 CH36/ CH40/ CH 48
Mode 2	802.11ac / n 40 CH38/ CH 46
Mode 3	802.11 ac80 CH 42

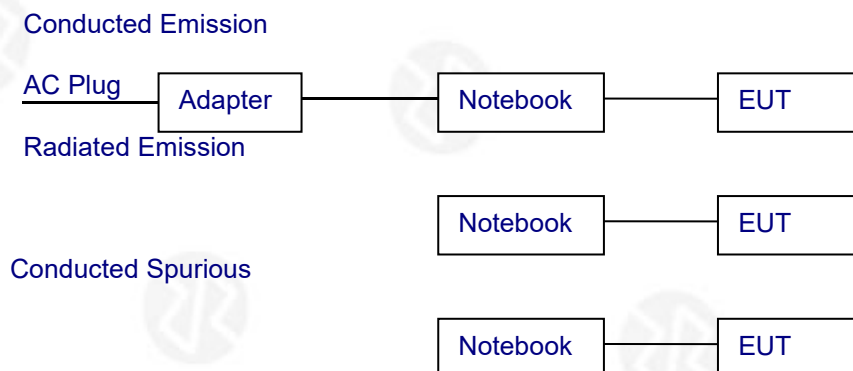
Note:

(1) The measurements are performed at all Bit Rate of Transmitter, the worst data was reported.



Test Software	Realtek Test Tool
Power level setup	<10dBm

### 3.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



### 3.4 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE)

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Note
E-1	USB wireless card	CIARA	BW11	USB wireless card	EUT
E-2	Adapter	ASUS	X401A		
E-3	Notebook	ASUS	EXA0703YH		

Item	Shielded Type	Ferrite Core	Length	Note
C-1	NO	NO	0.8M	DC Line
C-2	NO	NO	0.8M	DC Line

Note:

- (1) The support equipment was authorized by Declaration of Confirmation.
- (2) For detachable type I/O cable should be specified the length in cm in 『Length』 column.



## 3.5 EQUIPMENTS LIST FOR ALL TEST ITEMS

## Radiation emissions&amp; Radio Test equipment

Item	Equipment	Manufacturer	Type No.	Serial No.	Firmware Version	Last calibration	Calibrated until
1	Spectrum Analyzer (9kHz-26.5GHz)	KEYSIGHT	9020A	MY55370835	A.17.05	Nov. 02, 2023	Nov. 01, 2024
2	Spectrum Analyzer (10kHz-39.9GHz)	R&S	FSV40-N	100363	1.71 SP2	Nov. 02, 2023	Nov. 01, 2024
3	EMI Test Receiver (9kHz-7GHz)	R&S	ESCI7	100969	4.32	Nov. 02, 2023	Nov. 01, 2024
4	Bilog Antenna (30MHz-1500MHz)	Schwarzbeck	VULB9168	N/A	N/A	Nov. 13, 2023	Nov. 12, 2024
5	Horn Antenna (1GHz-18GHz)	Agilent	AH-118	071145	N/A	Nov. 13, 2023	Nov. 12, 2024
6	Horn Antenna (15GHz-40GHz)	A.H.System	SAS-574	588	N/A	Nov. 13, 2023	Nov. 12, 2024
7	Loop Antenna	TESEQ	HLA6121	58357	N/A	Nov. 16, 2023	Nov. 15, 2024
8	Amplifier (30-1000MHz)	EM Electronics	EM330 Amplifier	60747	N/A	Nov. 02, 2023	Nov. 01, 2024
9	Amplifier (1GHz-26.5GHz)	HuiPu	8449B	3008A00315	N/A	Nov. 02, 2023	Nov. 01, 2024
10	Amplifier (500MHz-40GHz)	QuanJuDa	DLE-161	097	N/A	Nov. 02, 2023	Nov. 01, 2024
11	Test Cable	N/A	R-01	N/A	N/A	Nov. 02, 2023	Nov. 01, 2024
12	Test Cable	N/A	R-02	N/A	N/A	Nov. 02, 2023	Nov. 01, 2024
13	Test Cable	N/A	R-03	N/A	N/A	Nov. 02, 2023	Nov. 01, 2024
14	Test Cable	N/A	RF-01	N/A	N/A	Nov. 02, 2023	Nov. 01, 2024
15	Test Cable	N/A	RF-02	N/A	N/A	Nov. 02, 2023	Nov. 01, 2024
16	Test Cable	N/A	RF-03	N/A	N/A	Nov. 02, 2023	Nov. 01, 2024
17	ESG Signal Generator	Agilent	E4421B	N/A	B.03.84	Nov. 02, 2023	Nov. 01, 2024
18	Signal Generator	Agilent	N5182A	N/A	A.01.87	Nov. 02, 2023	Nov. 01, 2024
19	Magnetic Field Probe Tester	Narda	ELT-400	0-0344	N/A	Nov. 16, 2023	Nov. 15, 2024
20	Wideband Radio Communication Test	R&S	CMW500	106504	V 3.7.22	Nov. 02, 2023	Nov. 01, 2024
21	MWRF Power Meter Test system	MW	MW100-RF CB	N/A	N/A	Nov. 02, 2023	Nov. 01, 2024
22	D.C. Power Supply	LongWei	TPR-6405D	N/A	N/A	\	\
23	EMC Software	Frad	EZ-EMC	Ver.EMC-CO N 3A1.1	N/A	\	\
24	RF Software	MW	MTS8310	V2.0.0.0	N/A	\	\
25	Turntable	MF	MF-7802BS	N/A	N/A	\	\
26	Antenna tower	MF	MF-7802BS	N/A	N/A	\	\
27	Power Meter	KEYSIGHT	N1912AP	N/A	A.05.00	Nov. 02, 2023	Nov. 01, 2024



### Conducted emissions Test

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Firmware Version	Last calibration	Calibrated until
1	LISN	R&S	ENV216	101471	N/A	Nov. 14, 2023	Nov. 13, 2024
2	LISN	CYBERTEK	EM5040A	E1850400149	N/A	Nov. 02, 2023	Nov. 01, 2024
3	Test Cable	N/A	C-01	N/A	N/A	Nov. 02, 2023	Nov. 01, 2024
4	Test Cable	N/A	C-02	N/A	N/A	Nov. 02, 2023	Nov. 01, 2024
5	Test Cable	N/A	C-03	N/A	N/A	Nov. 02, 2023	Nov. 01, 2024
6	EMI Test Receiver	R&S	ESCI3	101393	4.42 SP3	Nov. 02, 2023	Nov. 01, 2024
7	Triple-Loop Antenna	N/A	RF300	N/A	N/A	Nov. 02, 2023	Nov. 01, 2024
8	Absorbing Clamp	DZ	ZN23201	15034	N/A	Nov. 07, 2023	Nov. 06, 2024
9	EMC Software	Frad	EZ-EMC	Ver.EMC-CON 3A1.1	N/A	\	\



## 4.EMC EMISSION TEST

### 4.1 CONDUCTED EMISSION MEASUREMENT

Test Requirement:	FCC Part15 C Section 15.207
Test Method:	ANSI C63.10:2013
Test Frequency Range:	150KHz to 30MHz
Receiver setup:	RBW=9KHz, VBW=30KHz, Sweep time=auto

#### 4.1.1 POWER LINE CONDUCTED EMISSION Limits

FREQUENCY (MHz)	Limit (dBuV)		Standard
	Quasi-peak	Average	
0.15 -0.5	66 - 56 *	56 - 46 *	FCC
0.50 -5.0	56.00	46.00	FCC
5.0 -30.0	60.00	50.00	FCC

Note:

(1) \*Decreases with the logarithm of the frequency.

#### 4.1.2 TEST PROCEDURE

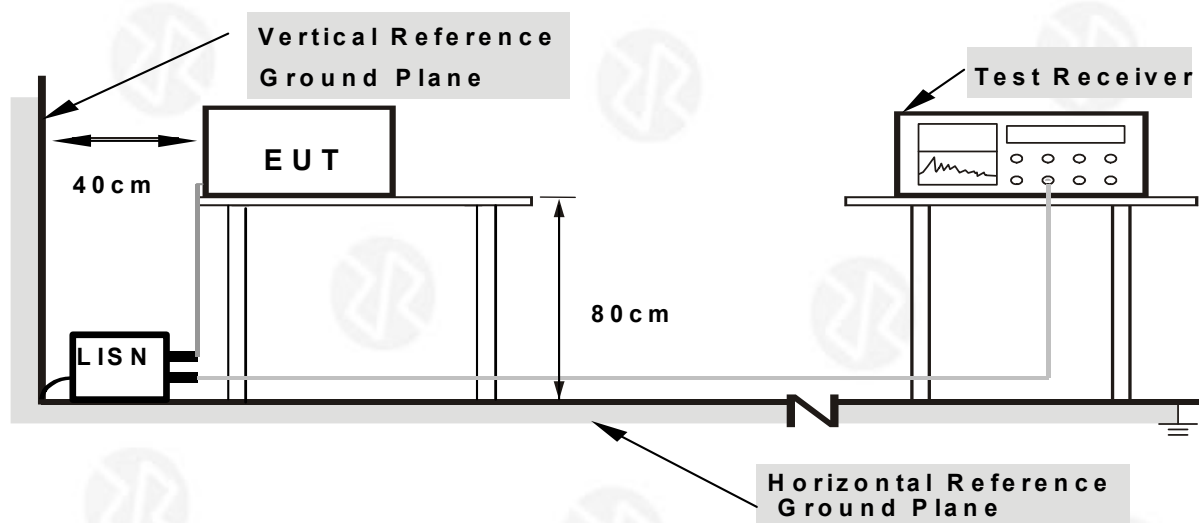
- The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- LISN at least 80 cm from nearest part of EUT chassis.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

#### 4.1.3 DEVIATION FROM TEST STANDARD

No deviation



#### 4.1.4 TEST SETUP



**Note: 1.Support units were connected to second LISN.**

**2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes**

#### 4.1.5 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

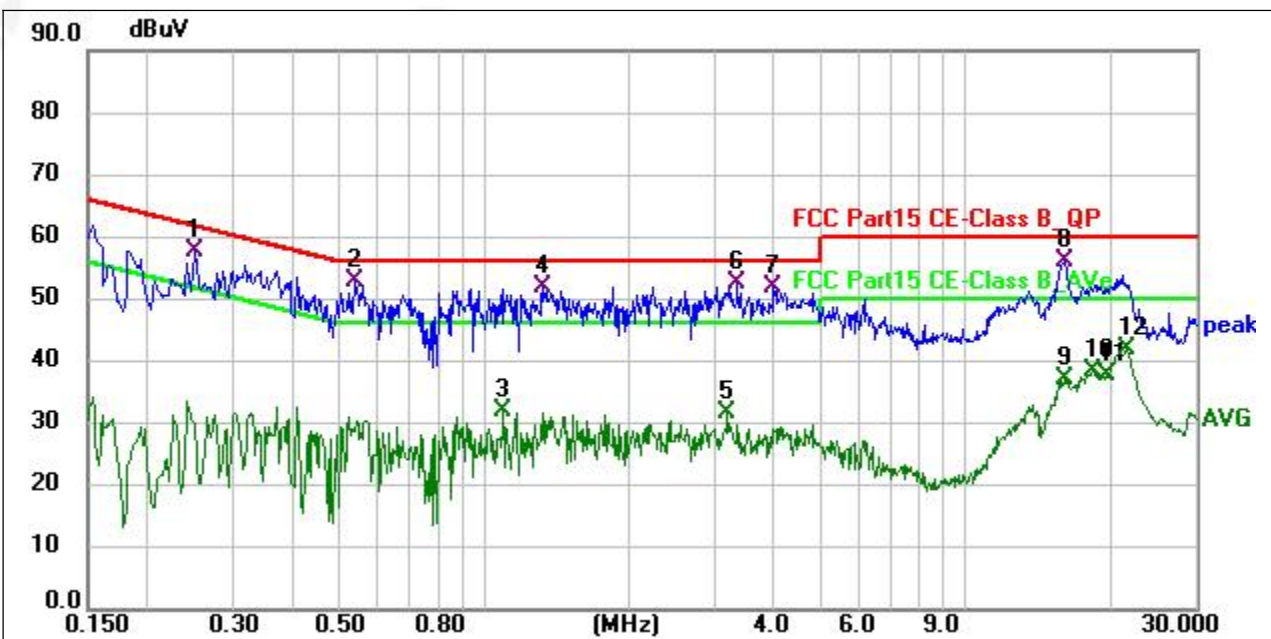
We pretest AC 120V and AC 230V, the worst voltage was AC 120V and the data recording in the report.





#### 4.1.6 TEST RESULT

Temperature :	26℃	Relative Humidity:	54%
Pressure :	101kPa	Phase :	L
Test Voltage :	AC 120V/60Hz		



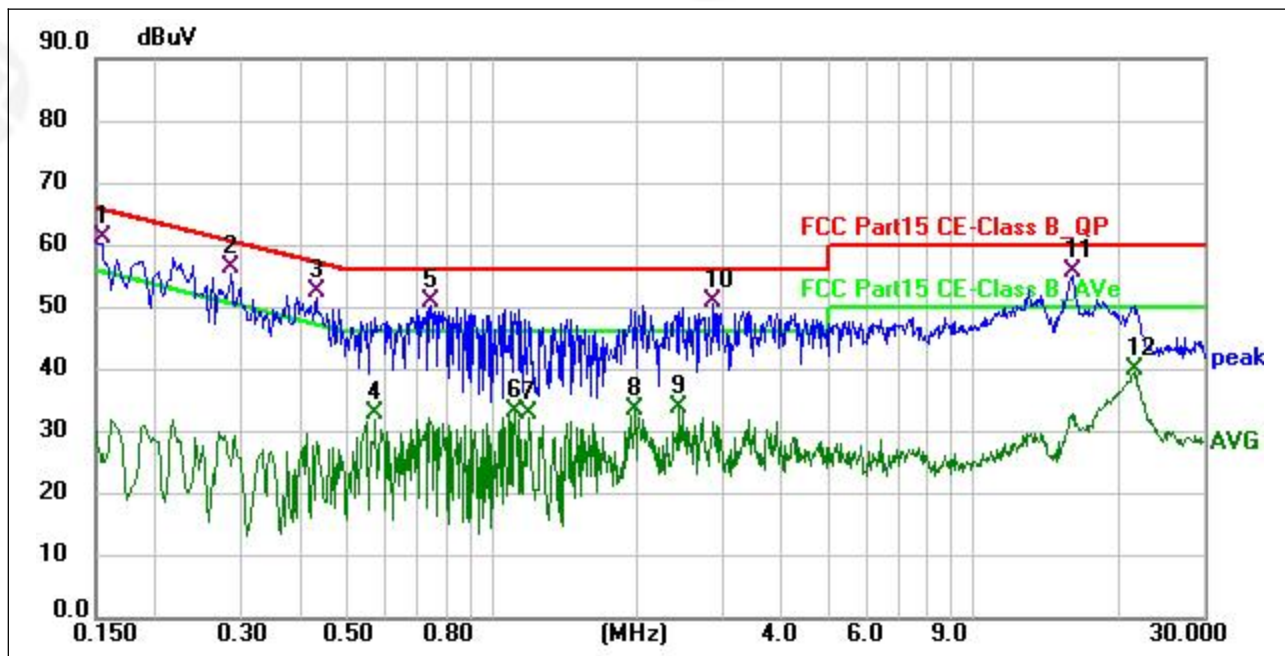
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.250	47.66	10.16	57.82	61.76	-3.94	QP	P
2 *	0.538	42.69	10.16	52.85	56.00	-3.15	QP	P
3	1.098	21.66	10.17	31.83	46.00	-14.17	AVG	P
4	1.322	41.87	10.17	52.04	56.00	-3.96	QP	P
5	3.194	21.54	10.21	31.75	46.00	-14.25	AVG	P
6	3.358	42.50	10.21	52.71	56.00	-3.29	QP	P
7	3.994	41.80	10.22	52.02	56.00	-3.98	QP	P
8	16.014	45.66	10.47	56.13	60.00	-3.87	QP	P
9	16.014	26.67	10.47	37.14	50.00	-12.86	AVG	P
10	18.370	27.75	10.52	38.27	50.00	-11.73	AVG	P
11	19.534	27.29	10.55	37.84	50.00	-12.16	AVG	P
12	21.490	31.37	10.59	41.96	50.00	-8.04	AVG	P

**Notes:**

- 1.An initial pre-scan was performed on the line and neutral lines with peak detector.
- 2.Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
- 3.Measurement Level = Reading level + Correct Factor



Temperature :	26℃	Relative Humidity:	54%
Pressure :	101kPa	Phase :	N
Test Voltage :	AC 120V/60Hz		



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.155	51.11	10.15	61.26	65.73	-4.47	QP	P
2 *	0.286	46.26	10.15	56.41	60.64	-4.23	QP	P
3	0.430	42.33	10.16	52.49	57.25	-4.76	QP	P
4	0.570	22.74	10.16	32.90	46.00	-13.10	AVG	P
5	0.750	40.78	10.16	50.94	56.00	-5.06	QP	P
6	1.118	23.25	10.17	33.42	46.00	-12.58	AVG	P
7	1.190	22.71	10.17	32.88	46.00	-13.12	AVG	P
8	1.982	23.46	10.18	33.64	46.00	-12.36	AVG	P
9	2.458	23.71	10.20	33.91	46.00	-12.09	AVG	P
10	2.874	40.88	10.20	51.08	56.00	-4.92	QP	P
11	16.034	45.22	10.48	55.70	60.00	-4.30	QP	P
12	21.594	29.43	10.61	40.04	50.00	-9.96	AVG	P

**Notes:**

- 1.An initial pre-scan was performed on the line and neutral lines with peak detector.
- 2.Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
- 3.Mesurement Level = Reading level + Correct Factor



## 4.2 RADIATED EMISSION MEASUREMENT

### 4.2.1 APPLICABLE STANDARD

According to FCC Part 15.407(d) and 15.209

### 4.2.2 CONFORMANCE LIMIT

According to FCC Part 15.407(b)(7): radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

According to FCC Part 15.205, Restricted bands

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
10.495-0.505	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	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			

20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Restricted Frequency(MHz)	Field Strength (μV/m)	Field Strength (dBμV/m)	Measurement Distance
0.009~0.490	2400/F(KHz)	20 log (uV/m)	300
0.490~1.705	2400/F(KHz)	20 log (uV/m)	30
1.705~30.0	30	29.5	30
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

Limits of Radiated Emission Measurement(Above 1000MHz)

Frequency(MHz)	Class B (dBuV/m) (at 3M)	
	PEAK	AVERAGE
Above 1000	74	54

Remark :1. Emission level in dBuV/m=20 log (uV/m)

2. Measurement was performed at an antenna to the closed point of EUT distance of meters.

3. Distance extrapolation factor =40log(Specific distance/ test distance)( dB);

Limit line=Specific limits(dBuV) + distance extrapolation factor.

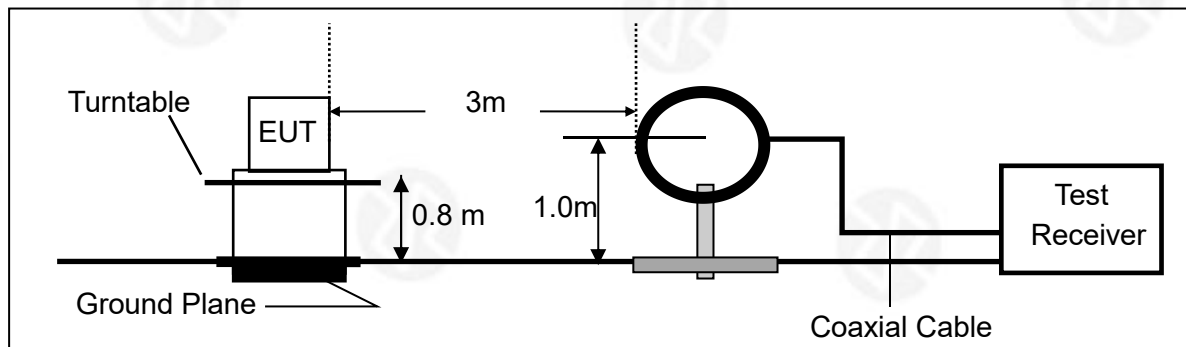
### 4.2.3 MEASURING INSTRUMENTS

The Measuring equipment is listed in the section 6.3 of this test report.

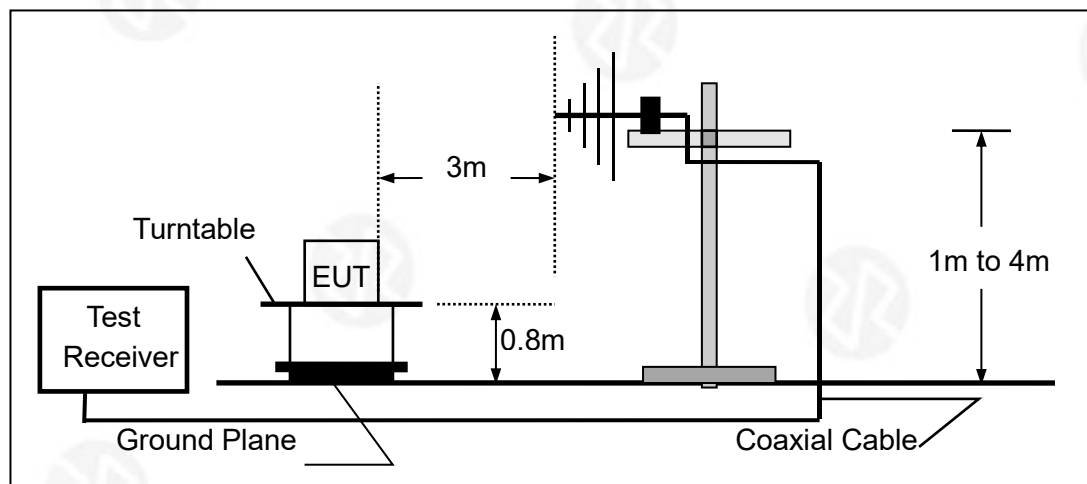


#### 4.2.4 TEST CONFIGURATION

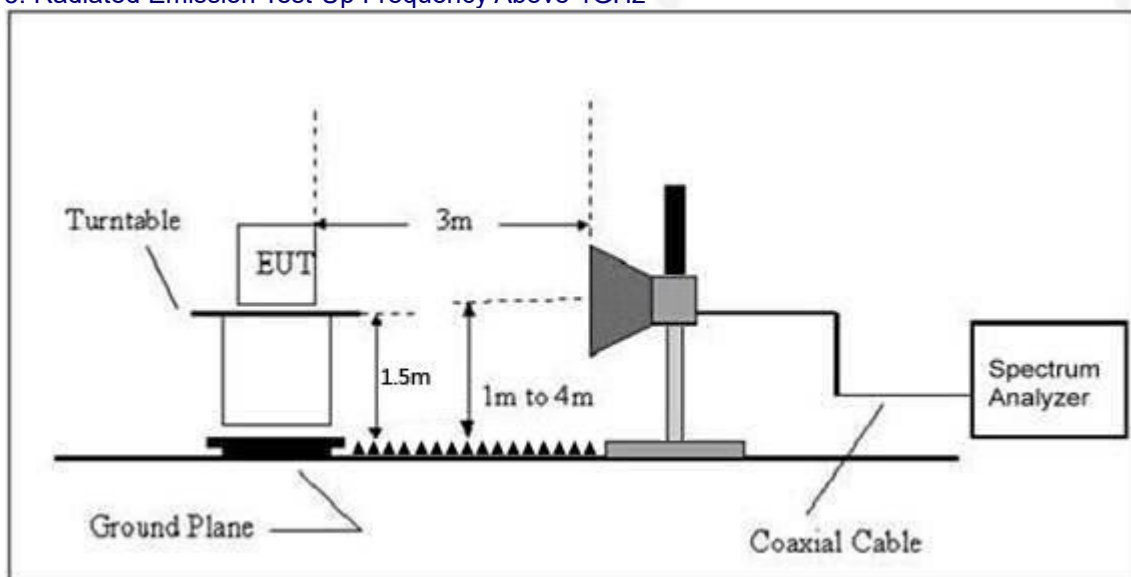
##### 1. For radiated emissions below 30MHz



##### 2. For radiated emissions from 30MHz to 1000MHz



##### 3. Radiated Emission Test-Up Frequency Above 1GHz







#### 4.2.5 TEST PROCEDURE

The test site semi-anechoic chamber has met the requirement of NSA tolerance 4 dB according to the standards: ANSI C63.10-2013. The test distance is 3m. The setup is according to the requirements in Section 13.1.4.1 of ANSI C63.10-2013 and CAN/CSA-CEI/IEC CISPR 22.

This test is required for any spurious emission that falls in a Restricted Band, as defined in Section 15.205. It must be performed with the highest gain of each type of antenna proposed for use with the EUT.

Use the following spectrum analyzer settings:

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (emission in restricted band)	1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

- The measuring distance of at 3 m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
- The EUT was placed on the top of a rotating table 0.8 m for below 1GHz and 1.5m for above 1GHz the ground at a 3 meter. The table was rotated 360 degrees to determine the position of the highest radiation.
- The height of the equipment or of the substitution antenna shall be 0.8 m for below 1GHz and 1.5m for above 1GHz; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

Note:

Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported

During the radiated emission test, the Spectrum Analyzer was set with the following configurations:

Frequency Band (MHz)	Function	Resolution bandwidth	Video Bandwidth
30 to 1000	QP	120 kHz	300 kHz
Above 1000	Peak	1 MHz	1 MHz
	Average	1 MHz	10 Hz

Note: for the frequency ranges below 30 MHz, a narrower RBW is used for these ranges but the measured value should add a RBW correction factor (RBWCF) where  $RBWCF [dB] = 10 \cdot \lg(100 [kHz] / \text{narrower RBW [kHz]})$ . , the narrower RBW is 1 kHz and RBWCF is 20 dB for the frequency 9 kHz to 150 kHz, and the narrower RBW is 10 kHz and RBWCF is 10 dB for the frequency 150 kHz to 30 MHz.



#### 4.2.6 TEST RESULT

Between 9KHz – 30MHz

The emission from 9 kHz to 30MHz was pre-tested and found the result was 20dB lower than the limit, and according to 15.31(o) & RSS-Gen 6.13, the test result no need to reported.



Between 30MHz – 1GHz

Temperature:	26℃	Relative Humidity:	54%
Pressure:	101 kPa	Polarization:	Horizontal
Test Voltage:	AC 120V/60Hz		



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1 !	30.317	48.78	-13.90	34.88	40.00	-5.12	QP
2 !	32.979	48.11	-13.83	34.28	40.00	-5.72	QP
3 !	36.254	47.81	-13.61	34.20	40.00	-5.80	QP
4 *	41.132	49.37	-13.22	36.15	40.00	-3.85	QP
5 !	72.847	52.21	-16.71	35.50	40.00	-4.50	QP
6 !	191.074	54.25	-15.89	38.36	43.50	-5.14	QP





Temperature:	26℃	Relative Humidity:	54%
Pressure:	101kPa	Polarization:	Vertical
Test Voltage:	AC 120V/60Hz		



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1 !	30.105	49.39	-13.91	35.48	40.00	-4.52	QP
2 !	41.276	48.93	-13.23	35.70	40.00	-4.30	QP
3 *	97.115	56.45	-16.99	39.46	43.50	-4.04	QP
4 !	113.316	54.57	-15.33	39.24	43.50	-4.26	QP
5 !	213.015	54.84	-15.91	38.93	43.50	-4.57	QP
6 !	276.123	55.04	-13.44	41.60	46.00	-4.40	QP

Remarks:

- 1.Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
- 2.The emission levels of other frequencies are very lower than the limit and not show in test report.
- 3.The test data shows only the worst case 802.11n20 mode



Between 1GHz – 40GHz

Temperature :	26℃	Relative Humidity :	54%
Pressure :	1010 hPa	Test Voltage :	AC 120V/60Hz
Test Mode :	5.2G TX- 802.11n20		

## 802.11n20

Polar (H/V)	Frequency	Meter Reading	Pre-ampl ifier	Cable Loss	Antenna Factor	Emission Level	Limits	Margin	Detect or Type
	(MHz)	(dBuV)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/ m)	(dB)	
Low Channel:5180MHz									
V	5150.00	44.28	30.45	8.77	38.66	61.26	74.00	-12.74	PK
V	5150.00	34.72	30.45	8.77	38.66	51.70	54.00	-2.30	AV
V	10360.00	54.00	30.55	5.77	24.66	53.88	74.00	-20.12	PK
V	10360.00	43.75	30.55	5.77	24.66	43.63	54.00	-10.37	AV
V	15540.00	52.14	30.33	6.32	24.55	52.68	74.00	-21.32	PK
V	15540.00	43.19	30.33	6.32	24.55	43.73	54.00	-10.27	AV
V	20720.00	50.25	30.85	7.45	24.69	51.54	74.00	-22.46	PK
V	20720.00	43.25	30.85	7.45	24.69	44.54	54.00	-9.46	AV
V	25900.00	50.72	31.02	8.99	25.57	54.26	74.00	-19.74	PK
V	25900.00	43.43	31.02	8.99	25.57	46.97	54.00	-7.03	AV
H	5150.00	42.22	30.45	8.77	38.66	59.20	74.00	-14.80	PK
H	5150.00	32.58	30.45	8.77	38.66	49.56	54.00	-4.44	AV
H	10360.00	54.20	30.55	5.77	24.66	54.08	74.00	-19.92	PK
H	10360.00	43.78	30.55	5.77	24.66	43.66	54.00	-10.34	AV
H	15540.00	53.07	30.33	6.32	24.55	53.61	74.00	-20.39	PK
H	15540.00	43.41	30.33	6.32	24.55	43.95	54.00	-10.05	AV
H	20720.00	51.75	30.85	7.45	24.69	53.04	74.00	-20.96	PK
H	20720.00	43.92	30.85	7.45	24.69	45.21	54.00	-8.79	AV
H	25900.00	51.94	31.02	8.99	25.57	55.48	74.00	-18.52	PK
H	25900.00	43.09	31.02	8.99	25.57	46.63	54.00	-7.37	AV

Polar (H/V)	Frequency	Meter Reading	Pre-ampl ifier	Cable Loss	Antenna Factor	Emission Level	Limits	Margin	Detect or Type
	(MHz)	(dBuV)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/ m)	(dB)	
Middle Channel:5200MHz									
V	5150.00	42.46	30.45	8.77	38.66	59.44	74.00	-14.56	PK
V	5150.00	32.80	30.45	8.77	38.66	49.78	54.00	-4.22	AV
V	10400.00	53.68	30.55	5.77	24.66	53.56	74.00	-20.44	PK
V	10400.00	43.13	30.55	5.77	24.66	43.01	54.00	-10.99	AV
V	15600.00	54.10	30.33	6.32	24.55	54.64	74.00	-19.36	PK
V	15600.00	44.05	30.33	6.32	24.55	44.59	54.00	-9.41	AV
V	20800.00	52.71	30.85	7.45	24.69	54.00	74.00	-20.00	PK
V	20800.00	43.12	30.85	7.45	24.69	44.41	54.00	-9.59	AV
V	26000.00	51.67	31.02	8.99	25.57	55.21	74.00	-18.79	PK
V	26000.00	44.10	31.02	8.99	25.57	47.64	54.00	-6.36	AV
H	5150.00	43.37	30.45	8.77	38.66	60.35	74.00	-13.65	PK
H	5150.00	33.56	30.45	8.77	38.66	50.54	54.00	-3.46	AV
H	10400.00	53.21	30.55	5.77	24.66	53.09	74.00	-20.91	PK
H	10400.00	43.11	30.55	5.77	24.66	42.99	54.00	-11.01	AV
H	15600.00	51.52	30.33	6.32	24.55	52.06	74.00	-21.94	PK



H	15600.00	43.96	30.33	6.32	24.55	44.50	54.00	-9.50	AV
H	20800.00	54.10	30.85	7.45	24.69	55.39	74.00	-18.61	PK
H	20800.00	43.43	30.85	7.45	24.69	44.72	54.00	-9.28	AV
H	26000.00	52.65	31.02	8.99	25.57	56.19	74.00	-17.81	PK
H	26000.00	43.85	31.02	8.99	25.57	47.39	54.00	-6.61	AV

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-ampli fier (dB)	Cable Loss (dB)	Antenna Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/ m)	Margin (dB)	Detect or Type
High Channel:5240MHz									
V	5350.00	42.66	30.45	8.77	38.66	59.64	74.00	-14.36	PK
V	5350.00	32.18	30.45	8.77	38.66	49.16	54.00	-4.84	AV
V	10480.00	52.68	30.55	5.77	24.66	52.56	74.00	-21.44	PK
V	10480.00	43.51	30.55	5.77	24.66	43.39	54.00	-10.61	AV
V	15720.00	53.92	30.33	6.32	24.55	54.46	74.00	-19.54	PK
V	15720.00	43.61	30.33	6.32	24.55	44.15	54.00	-9.85	AV
V	20960.00	50.09	30.85	7.45	24.69	51.38	74.00	-22.62	PK
V	20960.00	43.38	30.85	7.45	24.69	44.67	54.00	-9.33	AV
V	26200.00	52.37	31.02	8.99	25.57	55.91	74.00	-18.09	PK
V	26200.00	43.70	31.02	8.99	25.57	47.24	54.00	-6.76	AV
H	5350.00	41.89	30.45	8.77	38.66	58.87	74.00	-15.13	PK
H	5350.00	32.26	30.45	8.77	38.66	49.24	54.00	-4.76	AV
H	10480.00	50.52	30.55	5.77	24.66	50.40	74.00	-23.60	PK
H	10480.00	43.43	30.55	5.77	24.66	43.31	54.00	-10.69	AV
H	15720.00	53.42	30.33	6.32	24.55	53.96	74.00	-20.04	PK
H	15720.00	43.58	30.33	6.32	24.55	44.12	54.00	-9.88	AV
H	20960.00	51.09	30.85	7.45	24.69	52.38	74.00	-21.62	PK
H	20960.00	43.66	30.85	7.45	24.69	44.95	54.00	-9.05	AV
H	26200.00	50.42	31.02	8.99	25.57	53.96	74.00	-20.04	PK
H	26200.00	42.80	31.02	8.99	25.57	46.34	54.00	-7.66	AV

## Remark:

1. Emission Level = Meter Reading + Antenna Factor + Cable Loss – Pre-amplifier, Margin= Emission Level - Limit
2. If peak below the average limit, the average emission was no test.
3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
4. The worst mode is 802.11n20 ANT1, only the worst data is recorded.



## 5. POWER SPECTRAL DENSITY TEST

### 5.1 APPLIED PROCEDURES / LIMIT

According to FCC §15.407(3)

Power limits:

(1) For the band 5.15-5.25 GHz.

(i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

(ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(iv) For client devices in the 5.15-5.25 GHz band, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(2) 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. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(3) For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.





## 5.2 TEST PROCEDURE

For devices operating in the bands 5.15-5.25 GHz, 5.25-5.35 GHz, and 5.47-5.725 GHz, the above procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in § 15.407(a)(5). For devices operating in the band 5.725-5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1 MHz, or 500 kHz, “provided that the measured power is integrated over the full reference bandwidth” to show the total power over the specified measurement bandwidth (i.e., 1 MHz, or 500 kHz). If measurements are performed using a reduced resolution bandwidth (< 1 MHz, or < 500 kHz) and integrated over 1 MHz, or 500 KHz bandwidth, the following adjustments to the procedures apply:

- a) Set  $RBW \geq 1/T$ , where T is defined in section II.B.I.a).
- b) Set  $VBW \geq 3 RBW$ .
- c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add  $10\log(500\text{kHz}/RBW)$  to the measured result, whereas RBW (< 500 KHz) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.
- d) If measurement bandwidth of Maximum PSD is specified in 1 MHz, add  $10\log(1\text{MHz}/RBW)$  to the measured result, whereas RBW (< 1 MHz) is the reduced resolution bandwidth of spectrum analyzer set during measurement.
- e) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.

Note: As a practical matter, it is recommended to use reduced RBW of 100 KHz for the sections 5.c) and 5.d) above, since RBW=100 KHZ is available on nearly all spectrum analyzers.

## 5.3 DEVIATION FROM STANDARD

No deviation.

## 5.4 TEST SETUP



## 5.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.1 Unless otherwise a special operating condition is specified in the follows during the testing.



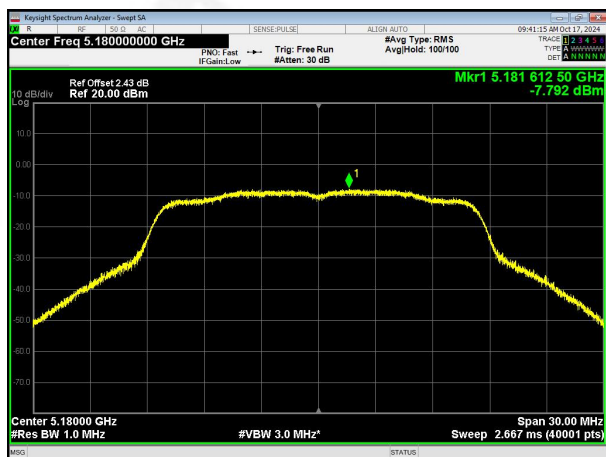
## 5.6 TEST RESULTS

Temperature :	26 ℃	Relative Humidity :	54%
Pressure :	1015 hPa	Test Voltage :	AC 120V/60Hz
Test Mode :	TX		

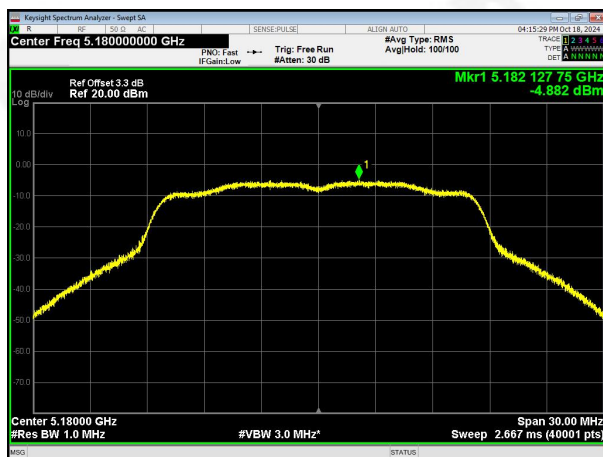
Test mode	Test Channel (MHz)	PSD [dBm/MHz]			Limit (dBm/MHz)	Result
		ANT1	ANT2	Total		
802.11a	5180	-7.792	-4.882	\	11	Pass
	5200	-7.880	-4.730	\	11	Pass
	5240	-7.104	-4.647	\	11	Pass
802.11n(HT20)	5180	-7.759	-5.168	-3.260	10.29	Pass
	5200	-8.172	-5.404	-3.565	10.29	Pass
	5240	-7.608	-4.943	-3.062	10.29	Pass
802.11n(HT40)	5190	-11.118	-8.584	-6.655	10.29	Pass
	5230	-10.818	-8.298	-6.363	10.29	Pass
802.11ac(VH20)	5180	-7.989	-5.255	-3.400	10.29	Pass
	5200	-7.939	-5.399	-3.477	10.29	Pass
	5240	-7.591	-4.941	-3.053	10.29	Pass
802.11ac(VH40)	5190	-11.342	-8.723	-6.819	10.29	Pass
	5230	-10.940	-8.227	-6.363	10.29	Pass
802.11ac(VH80)	5210	-13.718	-11.323	-9.355	10.29	Pass



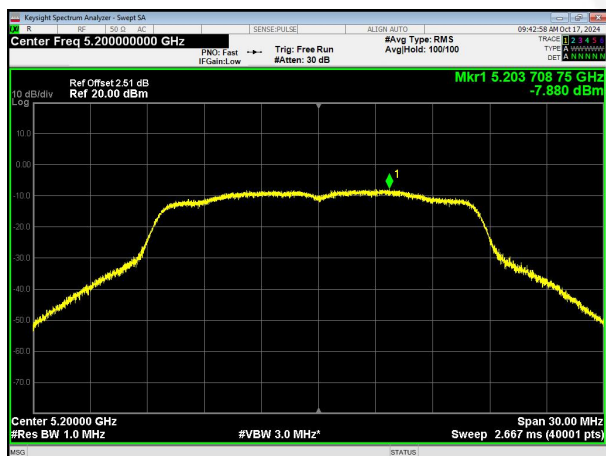
ANT1 (802.11a) PSD plot on channel 36



ANT2 (802.11a) PSD plot on channel 36



(802.11a) PSD plot on channel 40



(802.11a) PSD plot on channel 40



(802.11a) PSD plot on channel 48



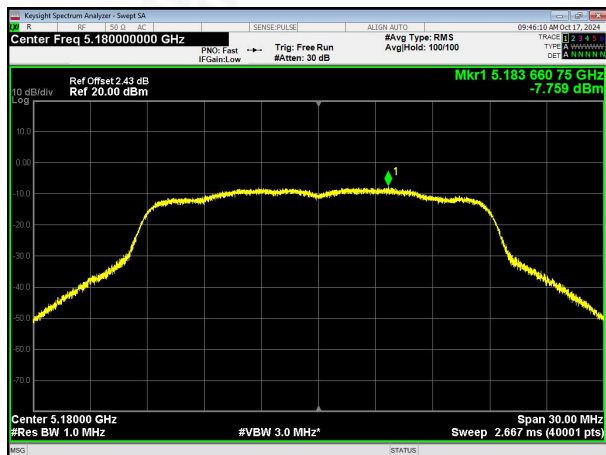
(802.11a) PSD plot on channel 48



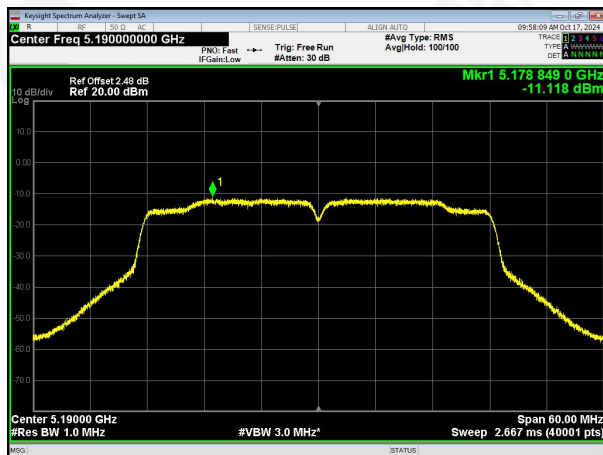




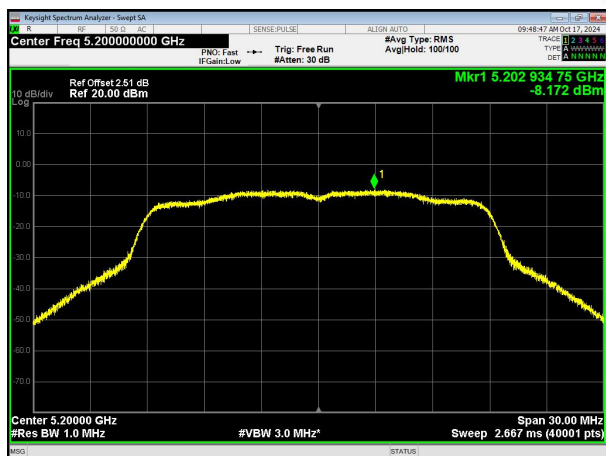
ANT1 (802.11n20) PSD plot on channel 36



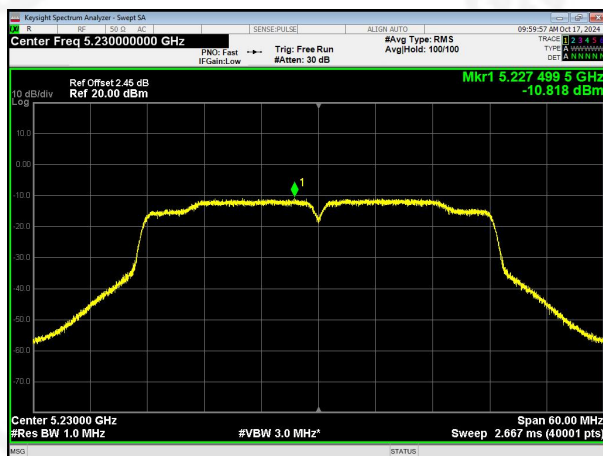
ANT1 (802.11n40) PSD plot on channel 38



(802.11n20) PSD plot on channel 40



(802.11n40) PSD plot on channel 46

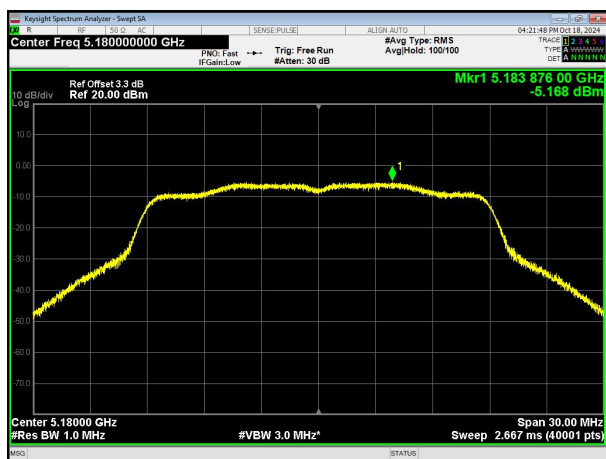


(802.11n20) PSD plot on channel 48

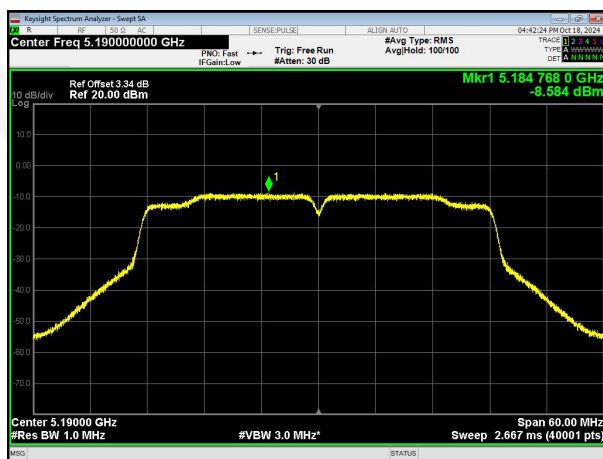




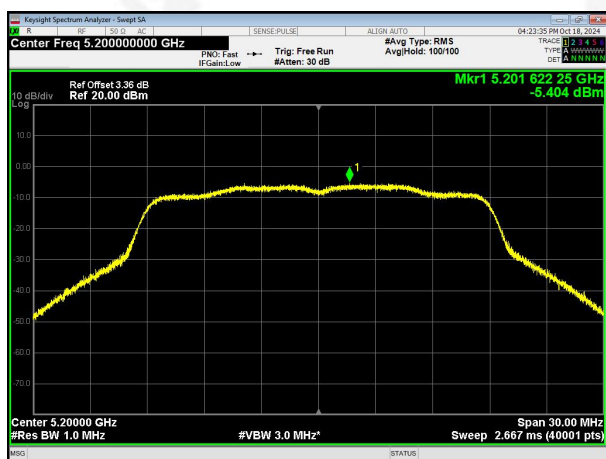
ANT2 (802.11n20) PSD plot on channel 36



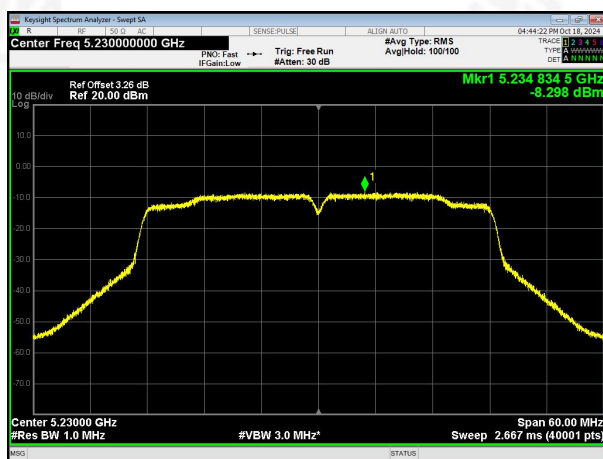
ANT2 (802.11n40) PSD plot on channel 38



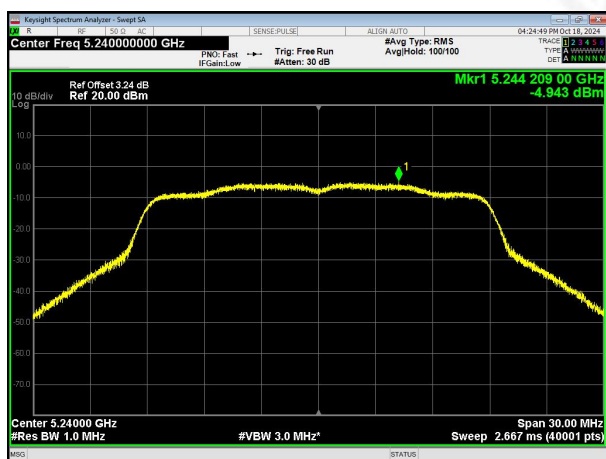
(802.11n20) PSD plot on channel 40



(802.11n40) PSD plot on channel 46

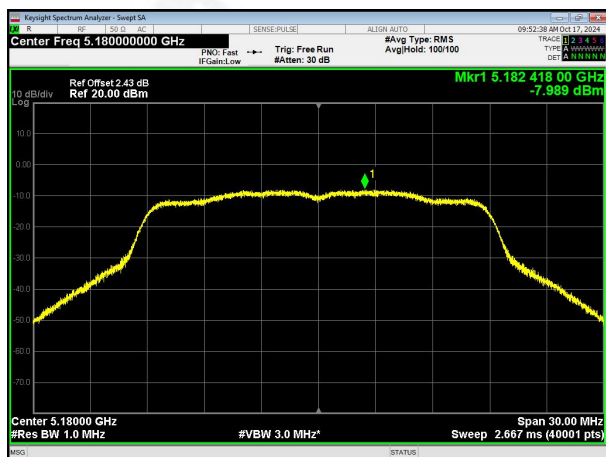


(802.11n20) PSD plot on channel 48

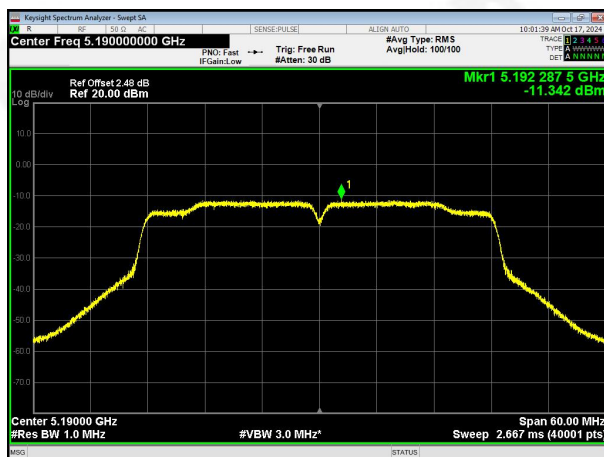




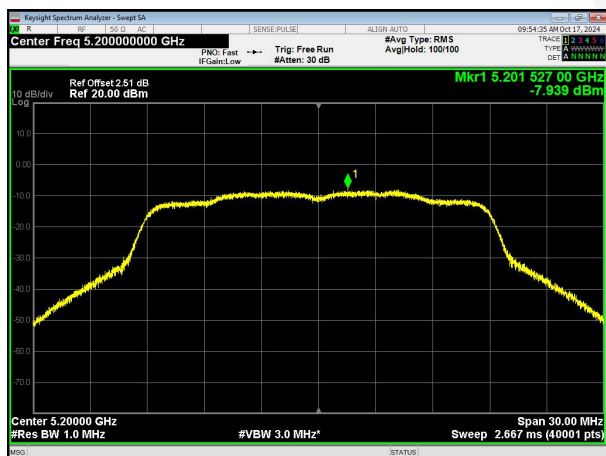
ANT1 (802.11ac20) PSD plot on channel 36



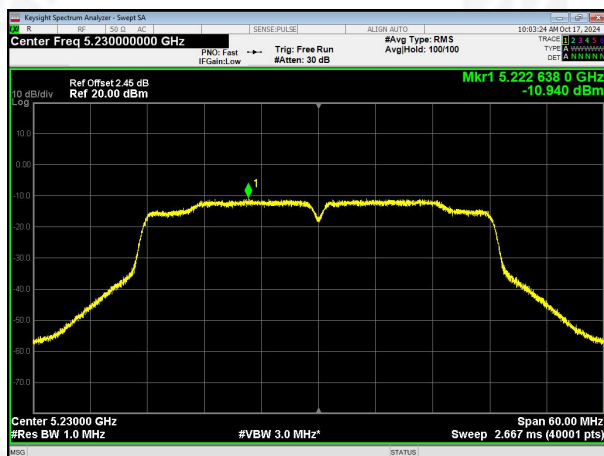
ANT1 (802.11ac40) PSD plot on channel 38



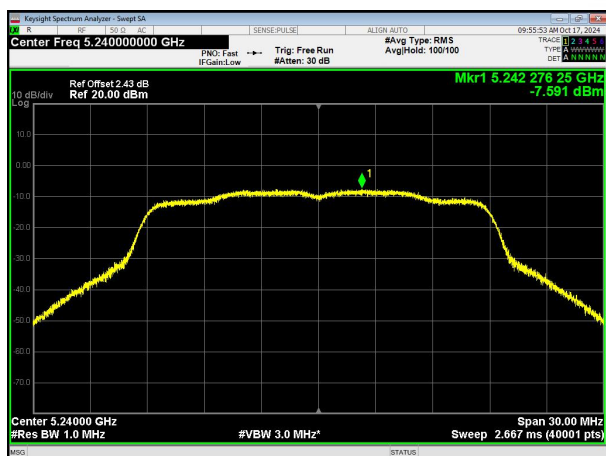
(802.11ac20) PSD plot on channel 40



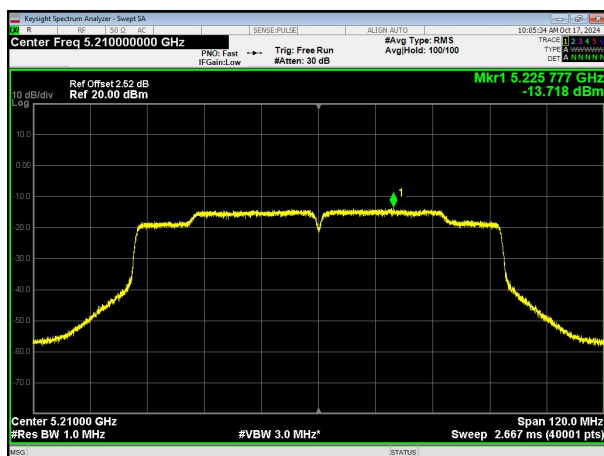
(802.11ac40) PSD plot on channel 46



(802.11ac20) PSD plot on channel 48

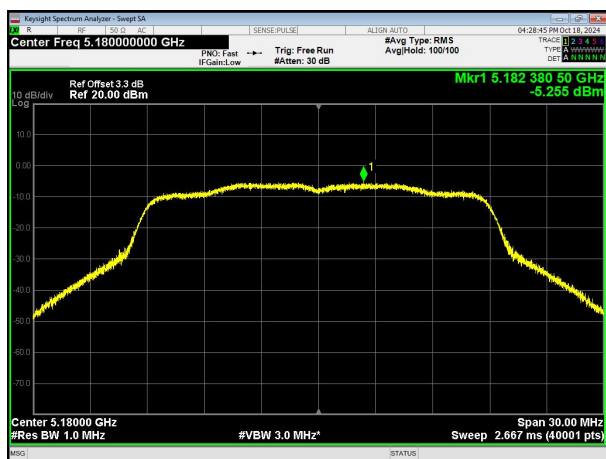


ANT1 (802.11ac80) PSD plot on channel 42

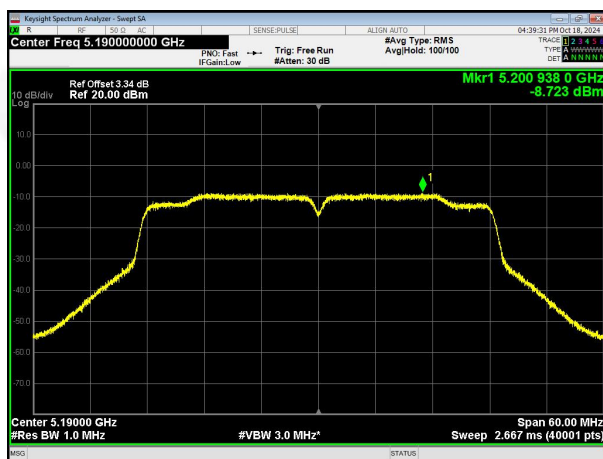




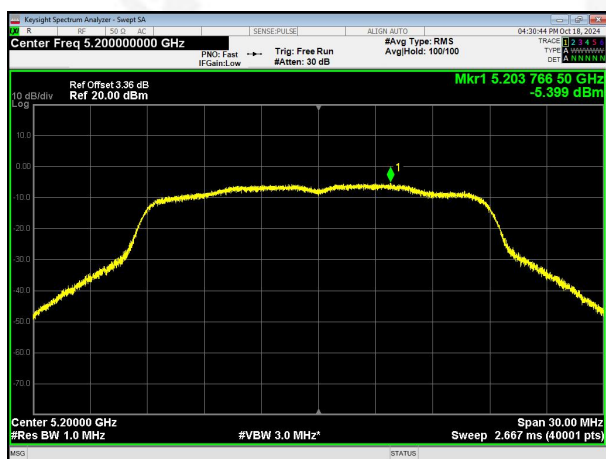
ANT2 (802.11ac20) PSD plot on channel 36



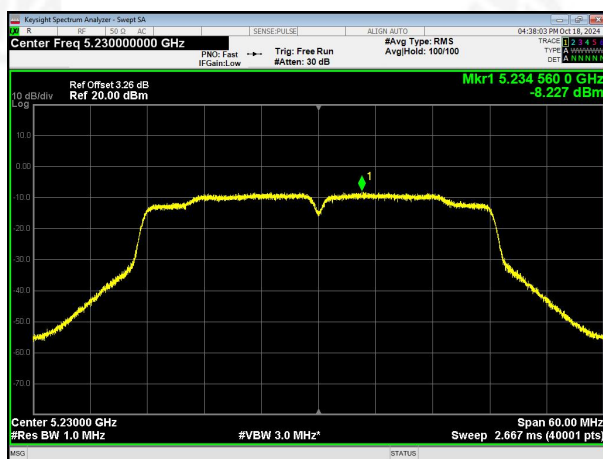
ANT2 (802.11ac40) PSD plot on channel 38



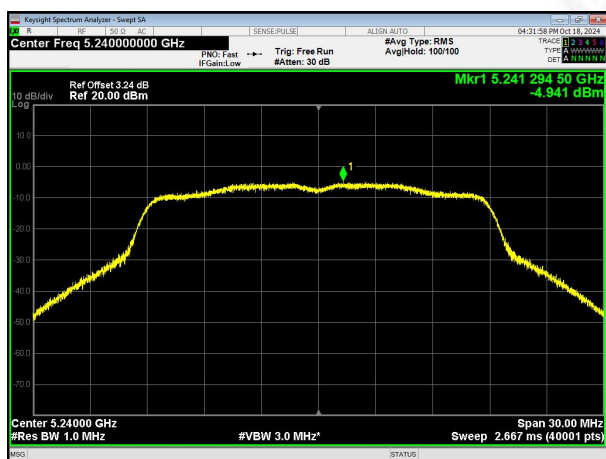
(802.11ac20) PSD plot on channel 40



(802.11ac40) PSD plot on channel 46



(802.11ac20) PSD plot on channel 48



ANT2 (802.11ac80) PSD plot on channel 42

