



# FCC TEST REPORT

## FCC ID: 2ATOQ-R30

Product	:	Robotic Vacuum Cleaner
Model Name	:	R30,R31,R32,R33,R34,R35,R36,R37,R38,R39,K30,K31
Brand	:	N/A
Report No.	:	PTC21081205903E-FC01
<b>Prepared for</b>		
Dongguan Xinsu Technology Co., Ltd		
Room 106, Chuangtou Building, No.8th Industrial South Road, Songshan Lake High-tech Industrial Development Zone,Dongguan		
<b>Prepared by</b>		
Precise Testing & Certification Co., Ltd		
Building 1, No. 6, Tongxin Road, Dongcheng Street, Dongguan, Guangdong, China		



## 1 TEST RESULT CERTIFICATION

Applicant's name : Dongguan Xinsu Technology Co., Ltd  
Address : Room 106, Chuangtou Building, No.8th Industrial South Road, Songshan Lake High-tech Industrial Development Zone,Dongguan  
Manufacture's name : Dongguan Xinsu Technology Co., Ltd. Dalingshan Branch  
Address : Room 103,building5,No.136 Yongjun Road,Dalingshan Town,Dongguan City,Guangdong Province  
Product name : Robotic Vacuum Cleaner  
Model name : URF02,URF03,URF04,UR02,UR03,UR04,UF02,UP03, F04,UZ01,UZ02,  
Serial Model : UZ03,UZ04,UB01,UB02; AC520-02, AC520-03, AC520-04  
Standards : FCC CFR47 Part 15 Section 15.247  
Test procedure : ANSI C63.10:2013  
Test Date : Oct. 18, 2021 to Nov. 02, 2021  
Date of Issue : Nov. 03, 2021  
Test Result : Pass

This device described above has been tested by PTC, 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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Test Engineer:

Leo Yang / Engineer

Technical Manager:

Chris Du / Manager

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## 2 Test Summary

Test Items	Test Requirement	Result
Conduct Emission	15.207	PASS
Radiated Spurious Emissions	15.205(a) 15.209 15.247(d)	PASS
Conducted Spurious Emission	15.247(d)	PASS
Band edge	15.247(d) 15.205(a)	PASS
6dB Bandwidth	15.247(a)(2)	PASS
Maximum Peak Output Power	15.247(b)(1)	PASS
Power Spectral Density	15.247(e)	PASS
Antenna Requirement	15.203	PASS
Remark: N/A: Not Applicable		



### 3 General Information

#### 3.1 General Description of E.U.T.

Product Name	:	Robotic Vacuum Cleaner
Model Name	:	R30,R31,R32,R33,R34,R35,R36,R37,R38,R39,K30,K31
Specification	:	802.11b/g/n HT20
Operation Frequency	:	2412-2462MHz for 802.11b/g/n(HT20)
Number of Channel	:	11 channels for 802.11b/g/n(HT20)
Type of Modulation	:	DSSS with DBPSK/DQPSK/CCK for 802.11b; OFDM with BPSK/QPSK/16QAM/64QAM for 802.11g/n;
Antenna installation	:	FPCB Antenna
Antenna Gain	:	2.5dBi
Power supply	:	Li-18650 3200mAh 14.8V 4S1P/47.36Wh(J&Y TECHNOLOGY CO., LTD) 19V DC 600mA via Adaptor input:100-240~50/60HZ 0.4A MAX (model: KA121900600EU/Shenzhen Keyu Power Supply Technology Co.,Ltd)
Hardware Version	:	V1.0
Software Version	:	V1.0



### 3.2 Channel List

The EUT has been tested under its typical operating condition.

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

The Transmitter was operated in the normal operating mode. The TX frequency was fixed which was for the purpose of the measurements.

Test of channel included the lowest and middle and highest frequency to perform the test, then record on this report.

Pre-defined engineering program for regulatory testing used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

Frequency and Channel list :

802.11b/g/n(HT20)	
Channel	Frequency (MHz)
<b>1</b>	<b>2412</b>
2	2417
3	2422
4	2427
5	2432
<b>6</b>	<b>2437</b>
7	2442
8	2447
9	2452
10	2457
<b>11</b>	<b>2462</b>



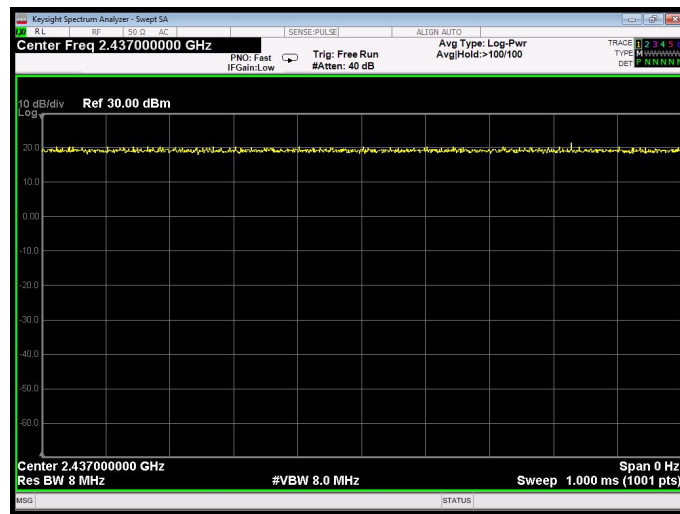
The maximum duty cycle as following table:

Test Mode	T <sub>on</sub> (ms)	T <sub>on+off</sub> (ms)	Duty Cycle(%)
802.11b	100	100	100%
802.11g	100	100	100%
802.11n(HT20)	100	100	100%

802.11b



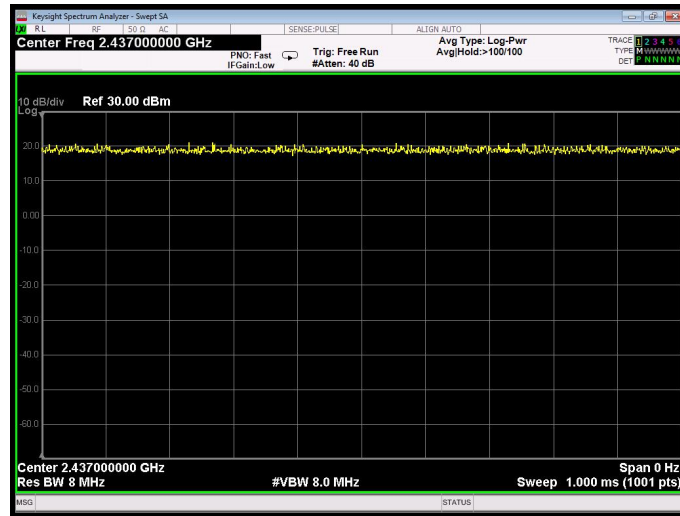
802.11g







### 802.11n(HT20)



### 3.3 Test Site

Precise Testing & Certification Co., Ltd

Building 1, No. 6, Tongxin Road, Dongcheng Street, Dongguan, Guangdong, China

FCC Registration Number: 790290

A2LA Certificate No.: 4408.01

IC Registration Number: 12191A-1



## 4 Equipment During Test

### 4.1 Equipments List

RF Conducted Test

Name of Equipment	Manufacturer	Model	Serial No.	Last calibration	Calibration Due	Calibration period
MXA Signal Analyzer	Agilent	N9020A	MY56070279	Aug. 21, 2021	Aug. 20, 2022	1 year
Coaxial Cable	CDS	79254	46107086	Aug. 21, 2021	Aug. 20, 2022	1 year
Power Meter	Anritsu	ML2495A	0949003	Aug. 21, 2021	Aug. 20, 2022	1 year
Power Sensor	Anritsu	MA2411B	0917017	Aug. 21, 2021	Aug. 20, 2022	1 year
Spectrum Analyzer	Rohde&Schwarz	FSU26	1166.1660.26	Aug. 21, 2021	Aug. 20, 2022	1 year

Remark: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.  
Radiated Emissions

Name of Equipment	Manufacturer	Model	Serial No.	Last calibration	Calibration Due	Calibration period
EMI Test Receiver	Rohde&Schwarz	ESCI	101417	Aug. 21, 2021	Aug. 20, 2022	1 year
Loop Antenna	Schwarzbeck	FMZB 1519	012	Aug. 21, 2021	Aug. 20, 2022	1 year
Bilog Antenna	SCHWARZBECK	VULB9160	9160-3355	Aug. 21, 2021	Aug. 20, 2022	1 year
Preamplifier (low frequency)	SCHWARZBECK	BBV 9475	9745-0013	Aug. 21, 2021	Aug. 20, 2022	1 year
Cable	Schwarzbeck	PLF-100	549489	Aug. 21, 2021	Aug. 20, 2022	1 year
Spectrum Analyzer	Agilent	E4407B	MY45109572	Aug. 21, 2021	Aug. 20, 2022	1 year
Horn Antenna	SCHWARZBECK	9120D	9120D-1246	Aug. 21, 2021	Aug. 20, 2022	1 year
Power Amplifier	LUNAR EM	LNA1G18-40	J10100000081	Aug. 21, 2021	Aug. 20, 2022	1 year
Horn Antenna	SCHWARZBECK	BBHA 9170	9170-181	Aug. 21, 2021	Aug. 20, 2022	1 year
Amplifier	SCHWARZBECK	BBV 9721	9721-205	Aug. 21, 2021	Aug. 20, 2022	1 year
Cable	H+S	CBL-26	N/A	Aug. 21, 2021	Aug. 20, 2022	1 year



RF Cable	R&S	R204	R21X	Aug. 21, 2021	Aug. 20, 2022	1 year
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Conducted Emissions

<b>Name of Equipment</b>	<b>Manufacturer</b>	<b>Model</b>	<b>Serial No.</b>	<b>Last calibration</b>	<b>Calibration Due</b>	<b>Calibration period</b>
EMI Test Receiver	Rohde&Schwarz	ESCI	101417	Aug. 21, 2021	Aug. 20, 2022	1 year
Artificial Mains Network	Rohde&Schwarz	L2-16B	000WX31025	Aug. 21, 2021	Aug. 20, 2022	1 year
Artificial Mains Network	Rohde&Schwarz	ENV216	101342	Aug. 21, 2021	Aug. 20, 2022	1 year



## 4.2 Measurement Uncertainty

Parameter	Uncertainty
RF output power, conducted	±1.0dB
Power Spectral Density, conducted	±2.2dB
Radio Frequency	± 1 x 10 <sup>-6</sup>
Bandwidth	± 1.5 x 10 <sup>-6</sup>
Time	±2%
Duty Cycle	±2%
Temperature	±1°C
Humidity	±5%
DC and low frequency voltages	±3%
Conducted Emissions (150kHz~30MHz)	±3.64dB
Radiated Emission(30MHz~1GHz)	±5.03dB
Radiated Emission(1GHz~25GHz)	±4.74dB



### 4.3 Description of Support Units

Equipment	Model No.	Series No.
N/A	N/A	N/A

## 5 Conducted Emission

Test Requirement: : FCC CFR 47 Part 15 Section 15.207  
 Test Method : ANSI C63.10: 2013  
 Test Result : PASS  
 Frequency Range : 150kHz to 30MHz  
 Class/Severity : Class B

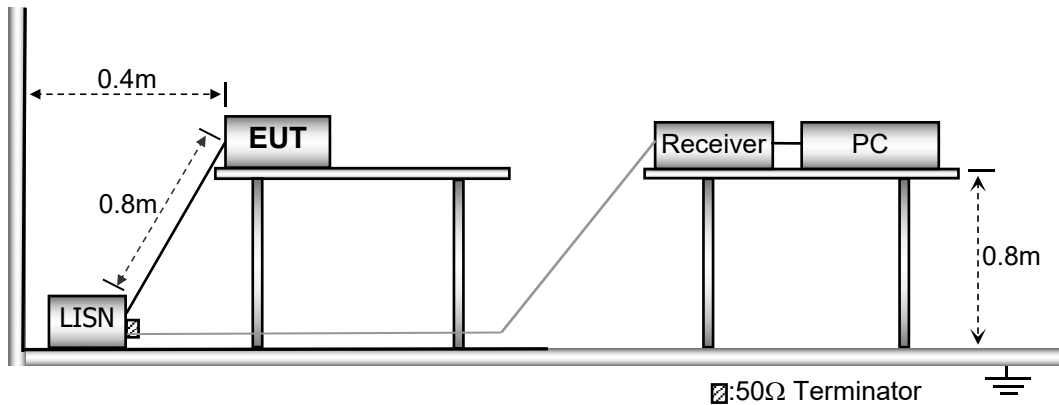
### 5.1 E.U.T. Operation

Operating Environment :

Temperature : 25.5 °C  
 Humidity : 51 % RH  
 Atmospheric Pressure : 101.2kPa

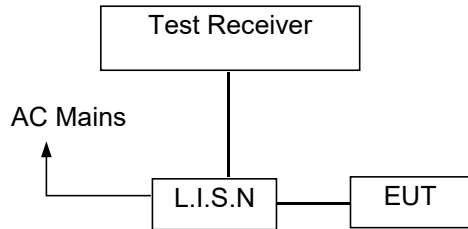
### 5.2 EUT Setup

The conducted emission tests were performed using the setup accordance with the ANSI C63.10:2013.





### 5.3 Test SET-UP (Block Diagram of Configuration)



### 5.4 Measurement Procedure

1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured was complete.

### 5.5 Conducted Emission Limit

#### Conducted Emission

Frequency(MHz)	Quasi-peak	Average
0.15-0.5	66-56	56-46
0.5-5.0	56	46
5.0-30.0	60	50

#### Note:

1. The lower limit shall apply at the transition frequencies
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

### 5.6 Measurement Description

The maximised peak emissions from the EUT was scanned with AC 230V 50Hz and AC 120V 60Hz, and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line. The worst case was recorded by 802.11b/CH01 with AC 120V 60Hz.

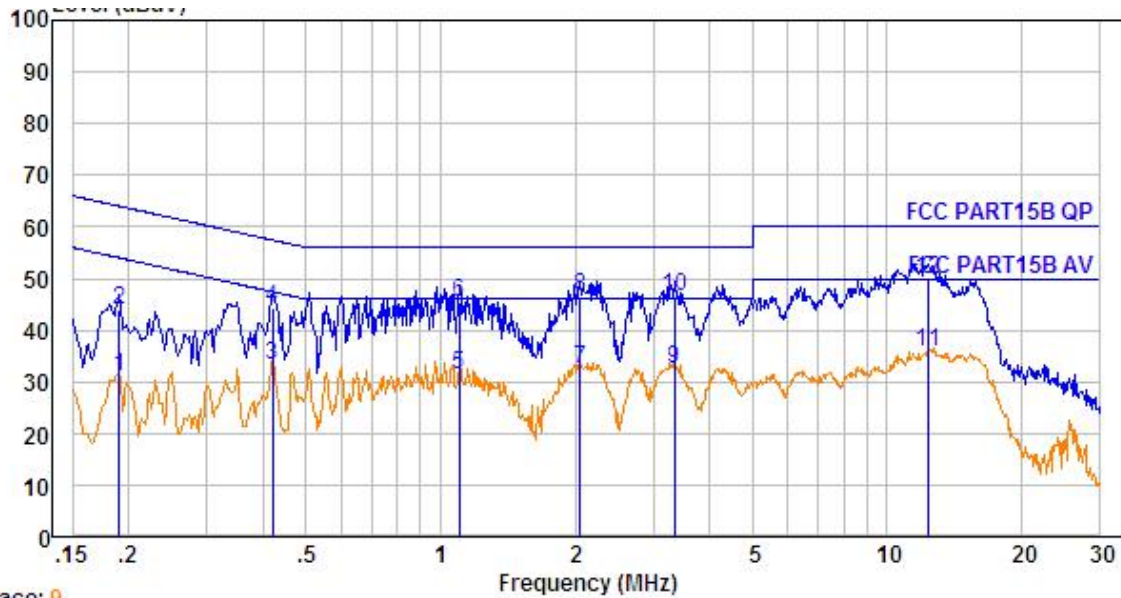
### 5.7 Conducted Emission Test Result

Pass.

Please refer to the following pages.



Line-AC 120V/60Hz



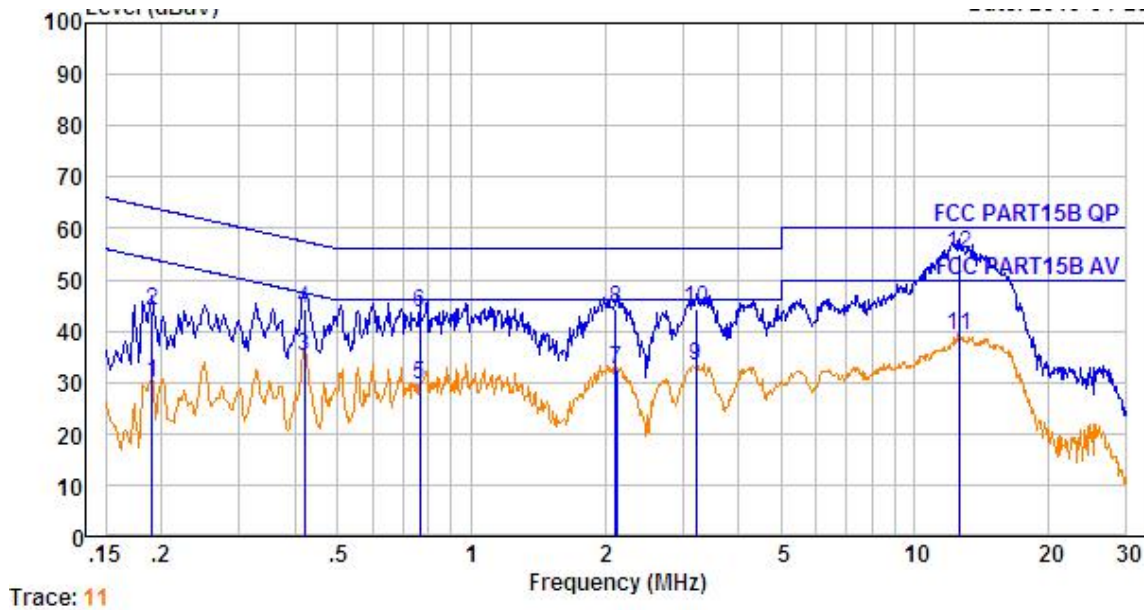
Trace: 9

No.	Freq MHz	Cable Loss dB	AMN Factor dB	Receiver Reading dBuV	Emission Level dBuV	Limit dBuV	Over Limit dB	Remark
1.	0.190	0.27	9.57	21.06	30.90	54.02	-23.12	Average
2.	0.190	0.27	9.57	34.08	43.92	64.02	-20.10	QP
3.	0.421	0.41	9.74	23.06	33.21	47.42	-14.21	Average
4.	0.421	0.41	9.74	34.09	44.24	57.42	-13.18	QP
5.	1.100	0.46	9.82	21.04	31.32	46.00	-14.68	Average
6.	1.100	0.46	9.82	35.07	45.35	56.00	-10.65	QP
7.	2.055	0.47	9.85	22.01	32.33	46.00	-13.67	Average
8.	2.055	0.47	9.85	36.06	46.38	56.00	-9.62	QP
9.	3.346	0.47	9.88	22.21	32.56	46.00	-13.44	Average
10.	3.346	0.47	9.88	36.27	46.62	56.00	-9.38	QP
11.	12.318	0.56	9.99	25.13	35.68	50.00	-14.32	Average
12.	12.318	0.56	9.99	39.16	49.71	60.00	-10.29	QP





Neutral-AC 120V/60Hz



Trace: 11

No.	Freq MHz	Cable Loss dB	AMN Factor dB	Receiver Reading dBuV	Emission Level dBuV	Limit dBuV	Over Limit dB	Remark
1.	0.190	0.27	9.60	20.02	29.89	54.02	-24.13	Average
2.	0.190	0.27	9.60	34.05	43.92	64.02	-20.10	QP
3.	0.421	0.41	9.77	25.06	35.24	47.42	-12.18	Average
4.	0.421	0.41	9.77	34.09	44.27	57.42	-13.15	QP
5.	0.767	0.45	9.84	19.33	29.62	46.00	-16.38	Average
6.	0.767	0.45	9.84	33.36	43.65	56.00	-12.35	QP
7.	2.121	0.47	9.89	21.94	32.30	46.00	-13.70	Average
8.	2.121	0.47	9.89	33.97	44.33	56.00	-11.67	QP
9.	3.207	0.47	9.92	22.74	33.13	46.00	-12.87	Average
10.	3.207	0.47	9.92	33.77	44.16	56.00	-11.84	QP
11.	12.582	0.56	10.05	28.48	39.09	50.00	-10.91	Average
12.	12.582	0.56	10.05	44.45	55.06	60.00	-4.94	QP



## 6 Radiated Spurious Emissions

Test Requirement : FCC CFR47 Part 15 Section 15.209 & 15.247  
 Test Method : ANSI C63.10:2013  
 Test Result : PASS  
 Measurement Distance : 3m  
 Limit : See the follow table

Frequency (MHz)	Field Strength		Field Strength Limit at 3m Measurement Dist	
	uV/m	Distance (m)	uV/m	dBuV/m
0.009 ~ 0.490	$2400/F(\text{kHz})$	300	$10000 * 2400/F(\text{kHz})$	$20\log^{(2400/F(\text{kHz}))} + 80$
0.490 ~ 1.705	$24000/F(\text{kHz})$	30	$100 * 24000/F(\text{kHz})$	$20\log^{(24000/F(\text{kHz}))} + 40$
1.705 ~ 30	30	30	$100 * 30$	$20\log^{(30)} + 40$
30 ~ 88	100	3	100	$20\log^{(100)}$
88 ~ 216	150	3	150	$20\log^{(150)}$
216 ~ 960	200	3	200	$20\log^{(200)}$
Above 960	500	3	500	$20\log^{(500)}$

### 6.1 EUT Operation

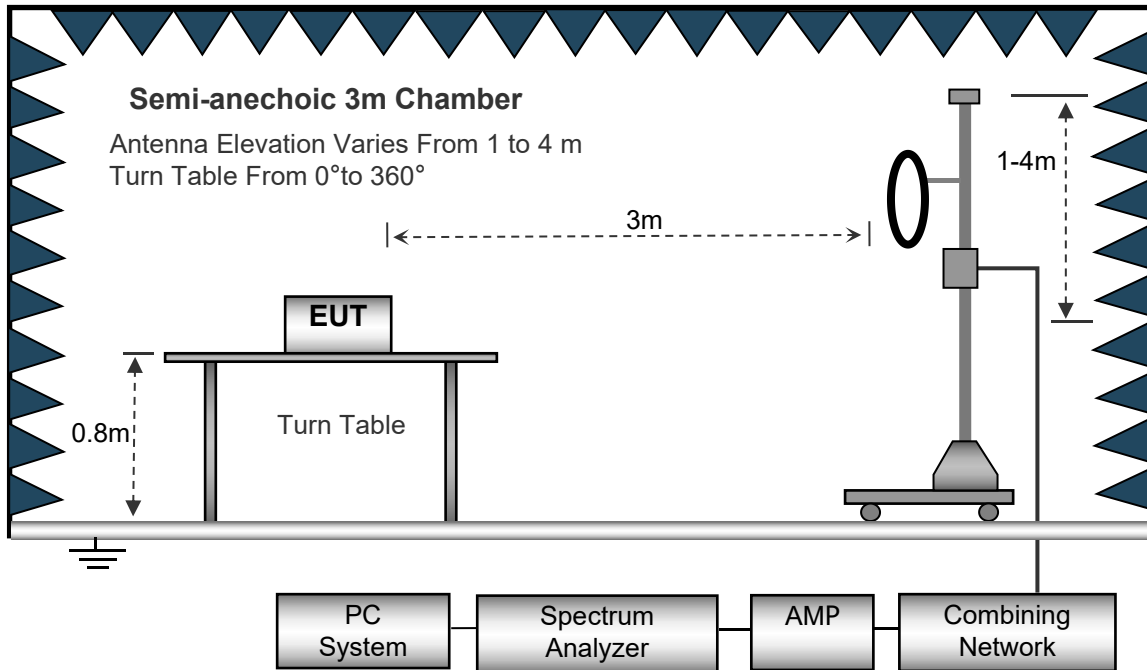
Operating Environment :

Temperature: : 23.5 °C  
 Humidity: : 51.1 % RH  
 Atmospheric Pressure: : 101.2kPa

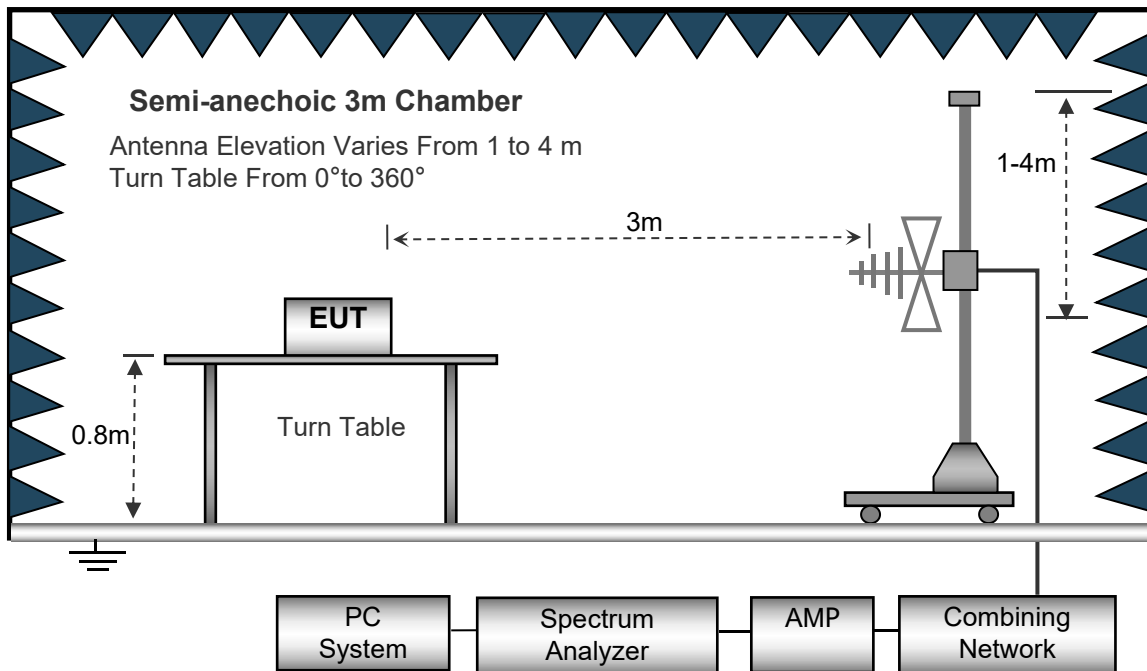
## 6.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site

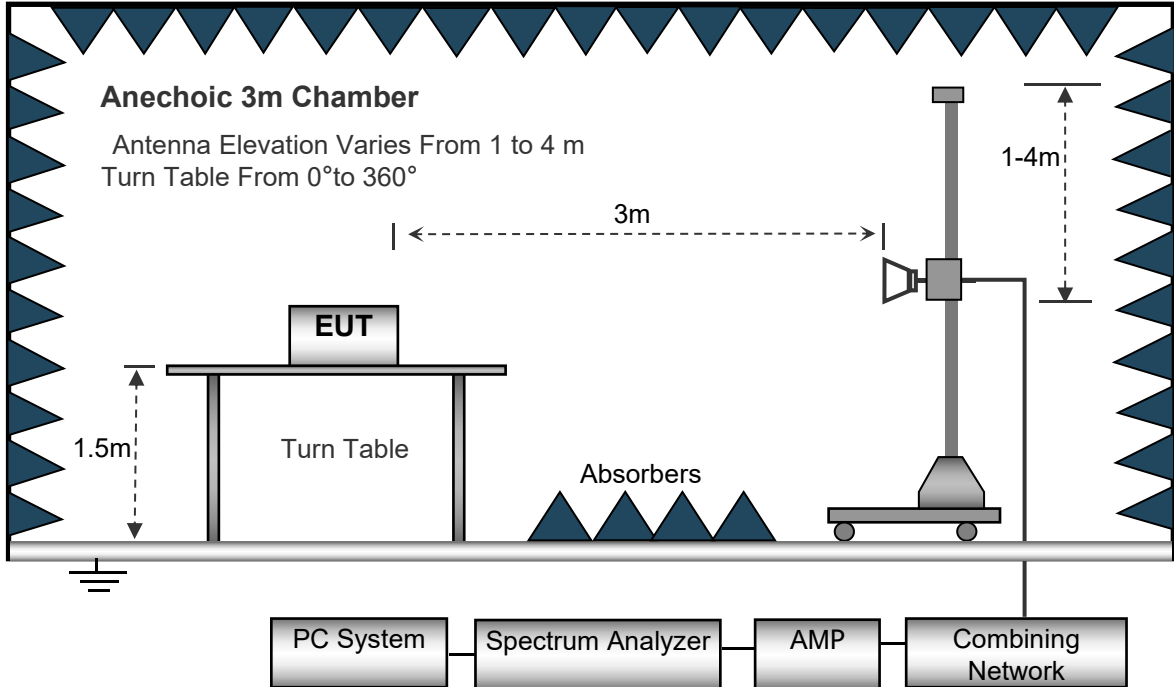
The test setup for emission measurement below 30MHz



The test setup for emission measurement from 30 MHz to 1 GHz.



The test setup for emission measurement above 1 GHz



### 6.3 Spectrum Analyzer Setup

	Frequency	Detector	RBW	VBW	Remark
Receiver Setup	Below 30MHz	--	10kHz	10kHz	--
	30MHz ~ 1GHz	Quasi-peak	120kHz	300kHz	Quasi-peak Value
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
		RMS	1MHz	3MHz	Average Value



## 6.4 Test Procedure

1. Below 1000MHz, The EUT was placed on a turn table which is 0.8m above ground plane, And above 1000MHz, The EUT was placed on a styrofoam table which is 1.5m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions. The spectrum was investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. The radiation measurements are tested under 3-axes(X,Y,Z) position(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand), After pre-test, It was found that the worse radiation emission was get at the X position. So the data shown was the X position only.
8. The test above 1GHz must be use the fully anechoic room, and the test below 1GHz use the half anechoic room



## 6.5 Summary of Test Results

### Test Frequency: 9KHz-30MHz

Freq. (MHz)	Ant.Pol. H/V	Emission Level (dBuV/m)	Limit 3m (dBuV/m)	Over (dB)
--	--	--	--	>20

Note:

The amplitude of spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.

Distance extrapolation factor =  $40\log(\text{Specific distance} / \text{test distance})$  (dB);

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

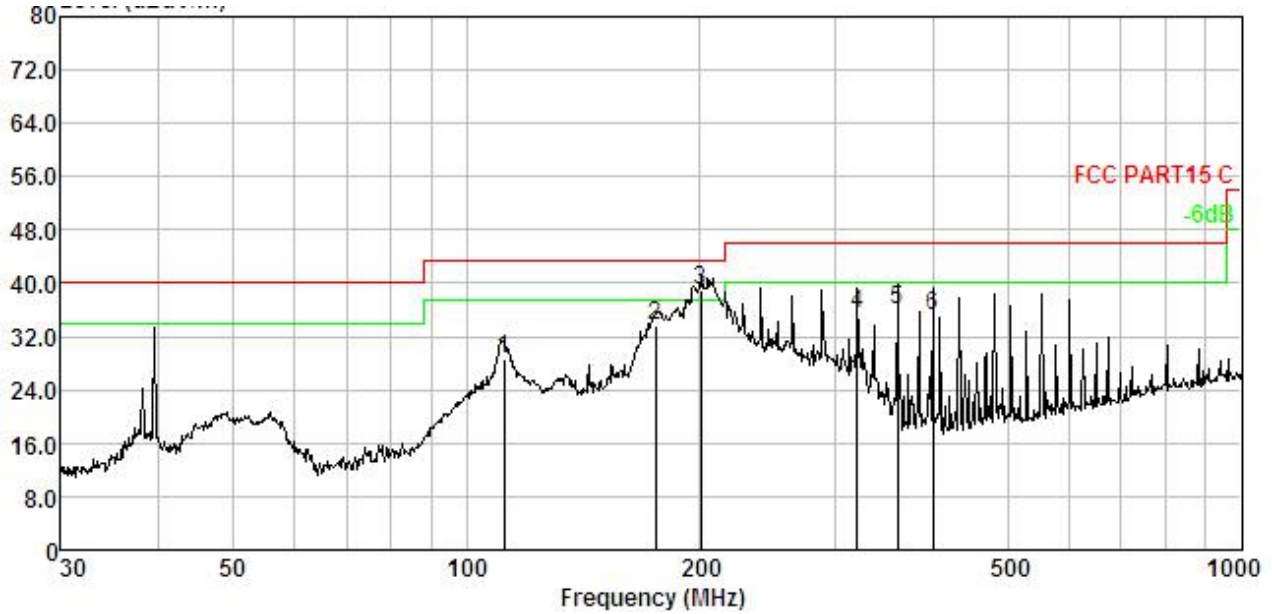
### Test Frequency: 30MHz ~ 1GHz

All the modulation modes were tested the data of the worst mode (TX 802.11b Low Channel) are recorded in the following pages and the others modulation methods do not exceed the limits.

Please refer to the following test plots:



Antenna Polarization: Horizontal

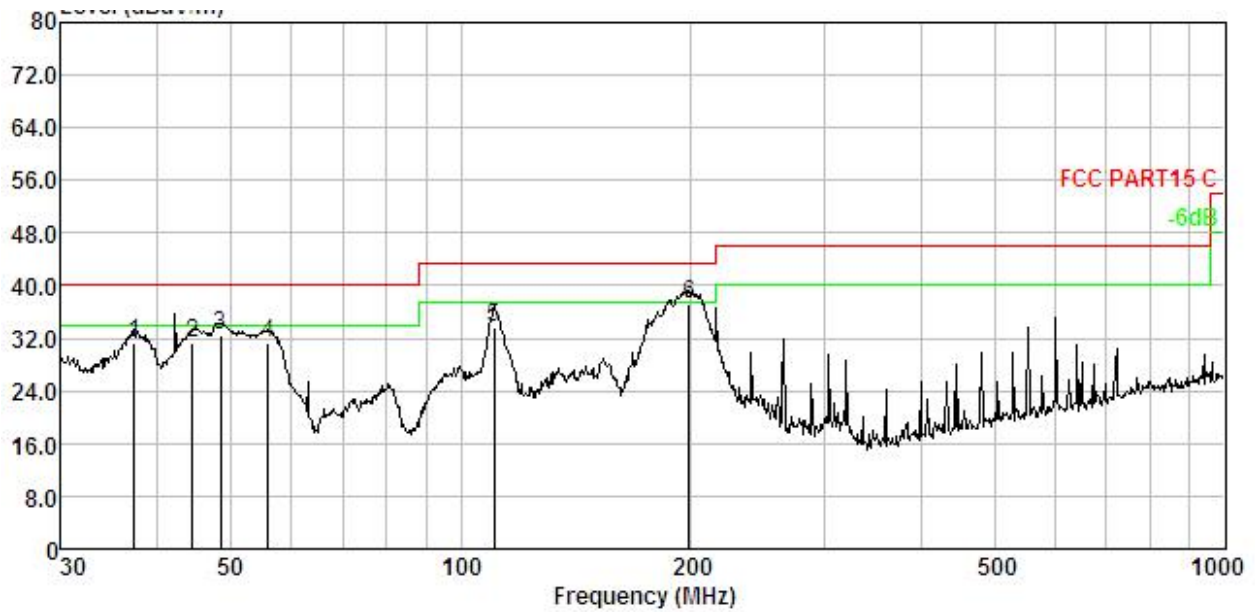


No.	Freq MHz	Cable Loss dB	ANT Factor dB/m	Receiver Reading dBuV	Preamplifier Factor dB	Emission Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark
1.	111.738	3.46	11.24	44.38	30.43	28.65	43.50	-14.85	QP
2.	175.652	4.24	12.82	47.27	30.58	33.75	43.50	-9.75	QP
3.	200.688	4.47	10.39	54.68	30.63	38.91	43.50	-4.59	QP
4.	319.937	5.27	13.65	47.23	30.79	35.36	46.00	-10.64	QP
5.	360.448	5.48	14.40	46.83	30.83	35.88	46.00	-10.12	QP
6.	400.432	5.66	15.33	45.03	30.87	35.15	46.00	-10.85	QP

Remark: Emission Level = Reading + Cable Loss + ANT Factor - AMP Factor



Antenna Polarization: Vertical



No.	Freq MHz	Cable Loss dB	ANT Factor dB/m	Receiver Reading dBuV	Preamp Factor dB	Emission Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark
1.	37.416	1.58	13.51	46.21	30.05	31.25	40.00	-8.75	QP
2.	44.587	1.88	13.29	46.26	30.11	31.32	40.00	-8.68	QP
3.	48.502	2.03	12.55	47.95	30.14	32.39	40.00	-7.61	QP
4.	56.001	2.28	11.96	47.23	30.19	31.28	40.00	-8.72	QP
5.	110.569	3.45	11.13	49.63	30.42	33.79	43.50	-9.71	QP
6.	199.286	4.46	10.43	53.03	30.63	37.29	43.50	-6.21	QP

Remark: Emission Level = Reading + Cable Loss + ANT Factor - AMP Factor





**Test Frequency: From 1GHz to 18GHz**

**Low Channel (2412MHz) Worst case 802.11B**

Frequency (MHz)	S.A Reading (dBuV)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4824	25.12	AV	V	9.08	7.89	8.69	39.87	54	-14.13
4824	27.22	AV	H	9.08	7.89	8.69	37.45	54	-16.55
4824	31.43	PK	V	9.08	7.89	8.69	55.56	74	-18.44
4824	32.87	PK	H	9.08	7.89	8.69	56.32	74	-17.68
14238	28.37	AV	V	9.64	8.11	10.03	41.24	54	-12.76
14238	29.55	AV	H	9.64	8.11	10.03	43.67	54	-10.33
14238	33.18	PK	V	9.64	8.11	10.03	57.98	74	-16.02
14238	35.63	PK	H	9.64	8.11	10.03	58.35	74	-15.65

**Middle Channel (2437MHz) Worst case 802.11n (HT20)**

Frequency (MHz)	S.A Reading (dBuV)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4874	28.34	AV	V	9.08	8.29	9.23	42.14	54	-11.86
4874	29.37	AV	H	9.08	8.29	9.23	44.17	54	-9.83
4874	32.16	PK	V	9.08	8.29	9.23	58.54	74	-15.46
4874	36.02	PK	H	9.08	8.29	9.23	57.39	74	-16.61
15876	28.12	AV	V	11.35	9.15	10.48	43.75	54	-10.25
15876	30.55	AV	H	11.35	9.15	10.48	44.29	54	-9.71
15876	34.87	PK	V	11.35	9.15	10.48	59.89	74	-14.11
15876	36.61	PK	H	11.35	9.15	10.48	58.63	74	-15.37

**High Channel (2462MHz) Worst case 802.11G**

Frequency (MHz)	S.A Reading (dBuV)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4924	26.83	AV	V	9.05	8.29	8.97	43.33	54	-10.67
4924	28.52	AV	H	9.05	8.29	8.97	44.57	54	-9.43
4924	32.48	PK	V	9.05	8.29	8.97	57.35	74	-16.65
4924	35.26	PK	H	9.05	8.29	8.97	58.32	74	-15.68
13263	27.42	AV	V	10.43	9.68	10.46	44.09	54	-9.91
13263	31.27	AV	H	10.43	9.68	10.46	45.12	54	-8.88
13263	33.82	PK	V	10.43	9.68	10.46	59.34	74	-14.66
13263	40.27	PK	H	10.43	9.68	10.46	59.26	74	-14.74

**Note:**

1. The testing has been conformed to 10\*2462MHz=24620MHz.
2. All other emissions more than 30dB below the limit.
3. Factor = Antenna Factor + Cable Loss – Pre-amplifier.  
Emission Level = Reading + Factor  
Margin=Emission Level-Limit
4. X-Axis, Y-Axis and Z-Axis were investigated. The results above show only the worst case.



Spurious Emission in Restricted Band 2310-2390MHz and 2483.5-2500MHz

2.4G WiFi (802.11b/g/n)mode have been tested, and the worst result(802.11g) was report as below

Test Mode: 802.11g Low Channel 2412MHz								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over (dB)	Polarity H/V	Test Value
2310.00	29.22	27.27	6.62	65.65	74	-8.35	V	Peak
2390.00	27.14	27.53	6.75	63.68	74	-10.32	V	
2310.00	28.98	27.27	6.62	60.14	74	-13.86	H	
2390.00	27.55	27.53	6.75	61.08	74	-12.92	H	
2310.00	12.32	27.27	6.62	45.24	54	-8.76	V	Average
2390.00	13.07	27.53	6.75	44.98	54	-9.02	V	
2310.00	12.14	27.27	6.62	45.53	54	-8.47	H	
2390.00	11.56	27.53	6.75	45.89	54	-8.11	H	

Test Mode: 802.11g High Channel 2462MHz								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over (dB)	Polarity H/V	Test Value
2483.50	28.25	27.85	6.83	64.98	74	-9.02	V	Peak
2500.00	26.21	27.9	6.84	65.22	74	-8.78	V	
2483.50	26.89	27.85	6.83	63.67	74	-10.33	H	
2500.00	29.22	27.9	6.84	64.79	74	-9.21	H	
2483.50	13.12	27.85	6.83	46.02	54	-7.98	V	Average
2500.00	11.34	27.9	6.84	46.26	54	-7.74	V	
2483.50	13.08	27.85	6.83	47.04	54	-6.96	H	
2500.00	10.74	27.9	6.84	46.17	54	-7.83	H	

**Test Frequency: From 18GHz to 25GHz**

The measurements were more than 20dB below the limit and not reported.



## 7 Conducted Spurious Emission

Test Requirement	:	FCC CFR47 Part 15 Section 15.247
Test Method	:	ANSI C63.10:2013
Test Limit	:	Regulation 15.247 (d), In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, 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)).

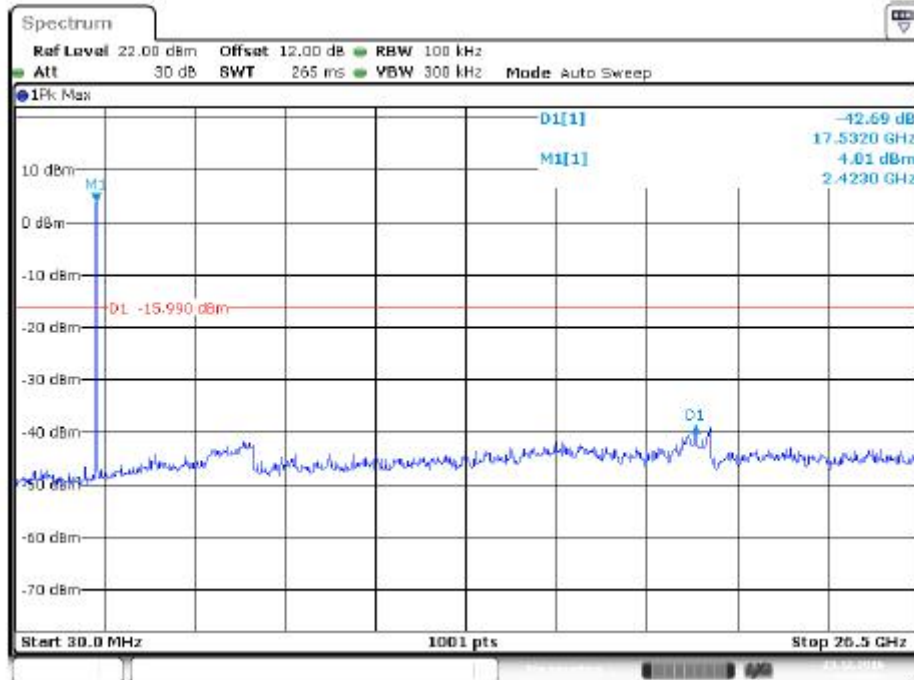
### 7.1 Test Procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 100kHz, VBW = 300kHz, Sweep = auto  
Detector function = peak, Trace = max hold

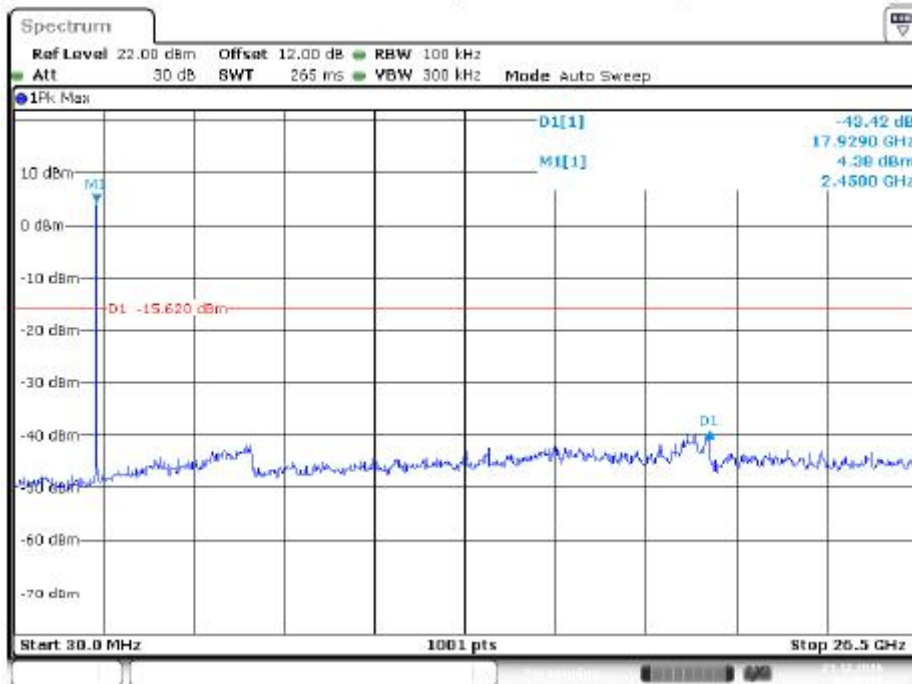
### 7.2 Test Result



802.11 b  
Low Channel

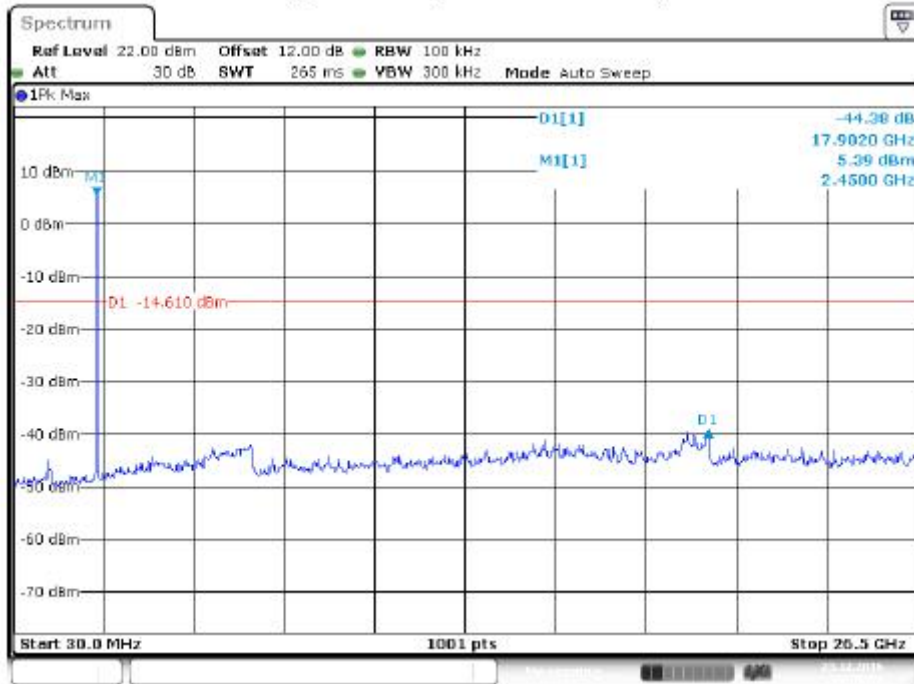


Middle Channel



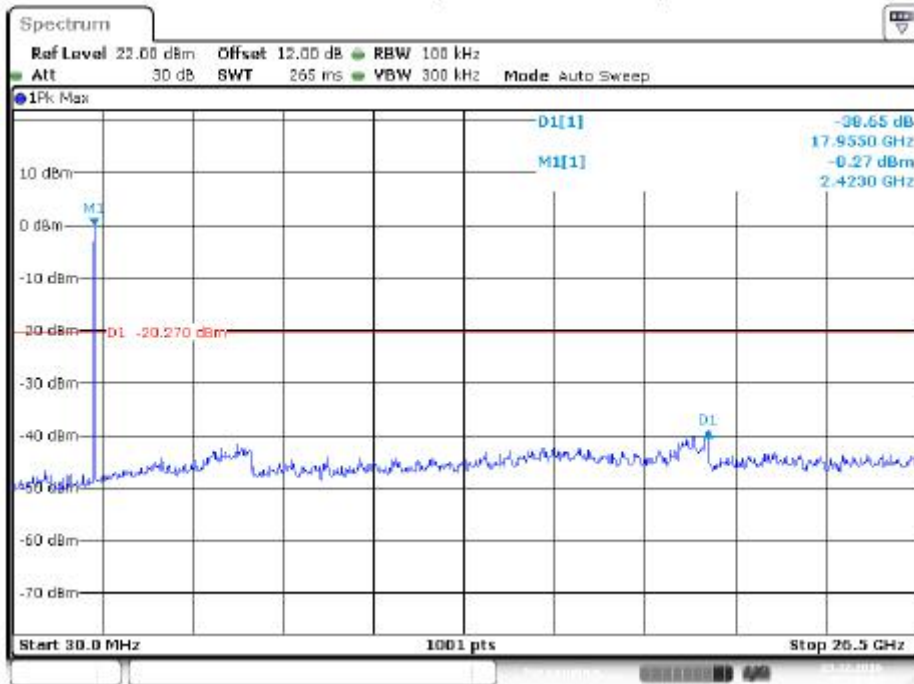


### High Channel



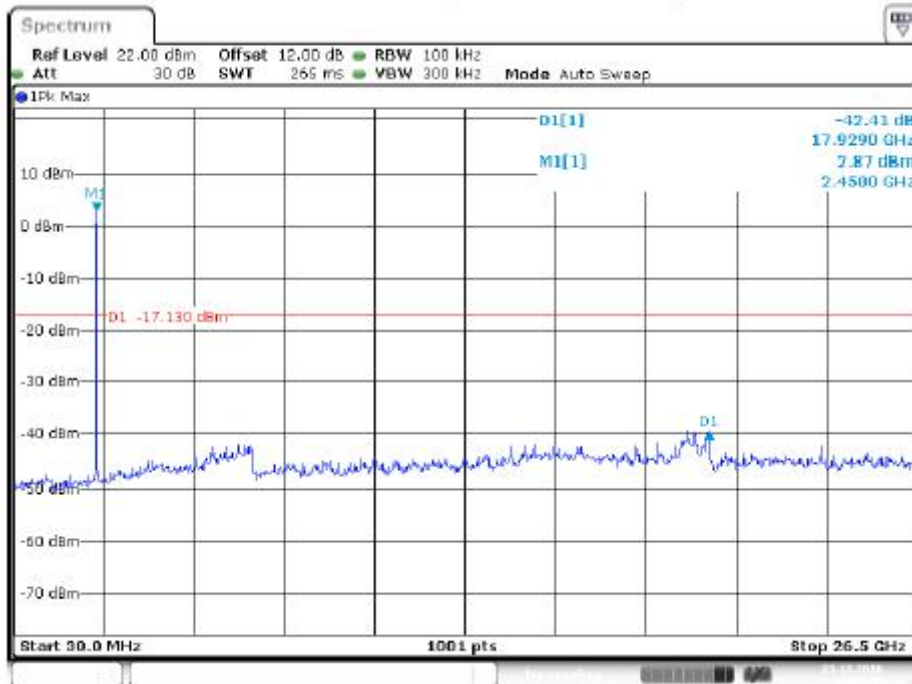
802.11g

### Low Channel

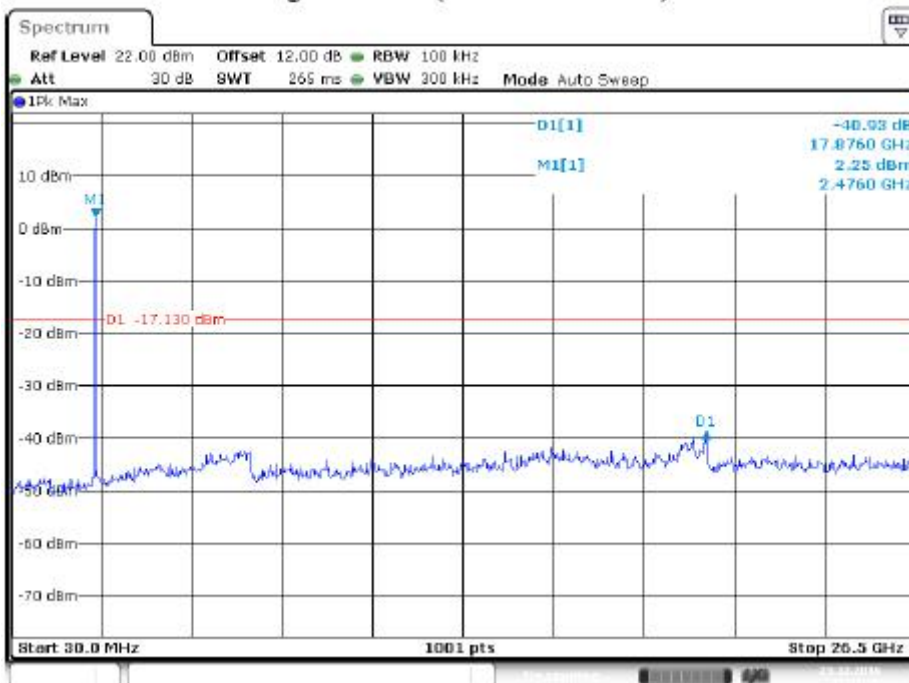




### Middle Channel



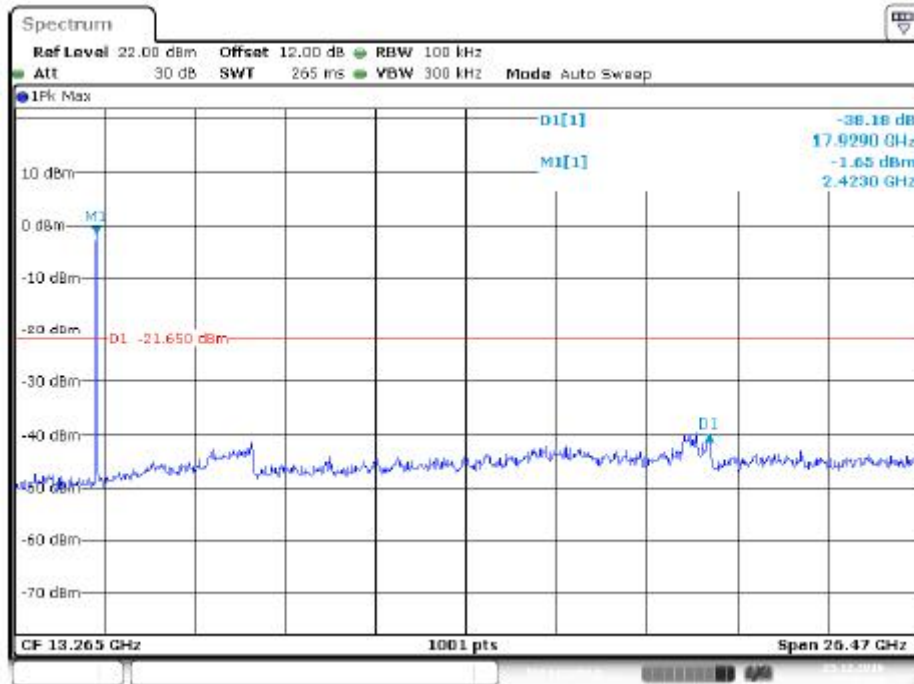
### High Channel



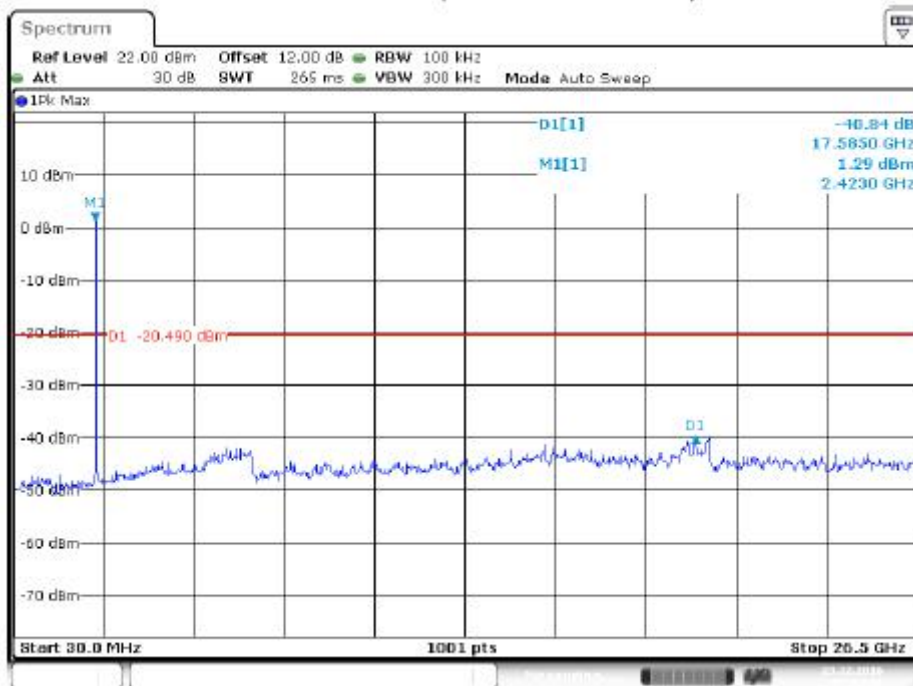


### 802.11n-HT20

#### Low Channel

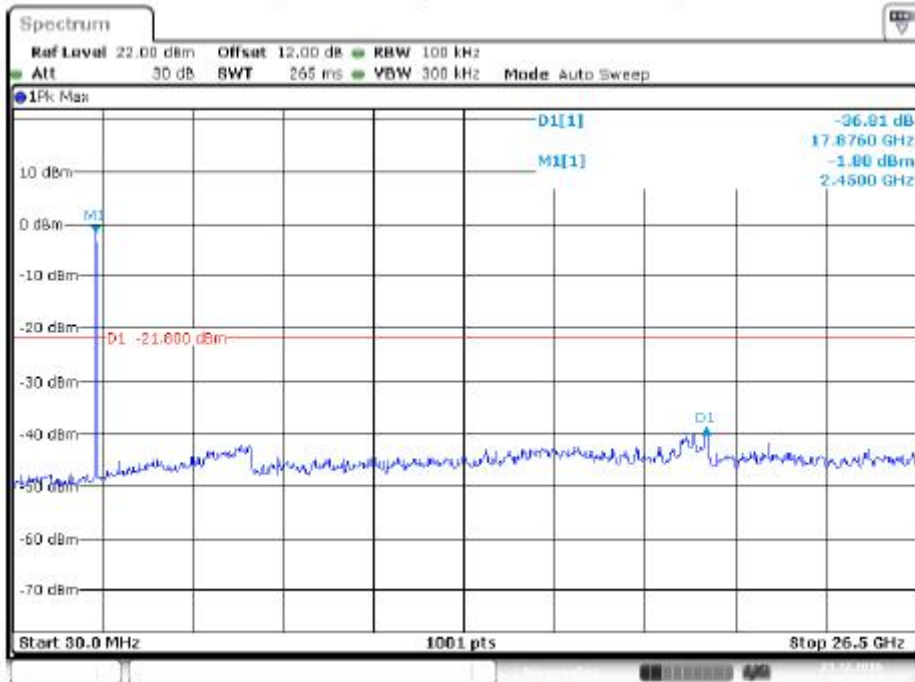


#### Middle Channel





### High Channel







## 8 Band Edge Measurement

Test Requirement	: Section 15.247(d) In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).
Test Method	: ANSI C63.10:2013
Test Limit	: Regulation 15.247 (d), In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, 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)).

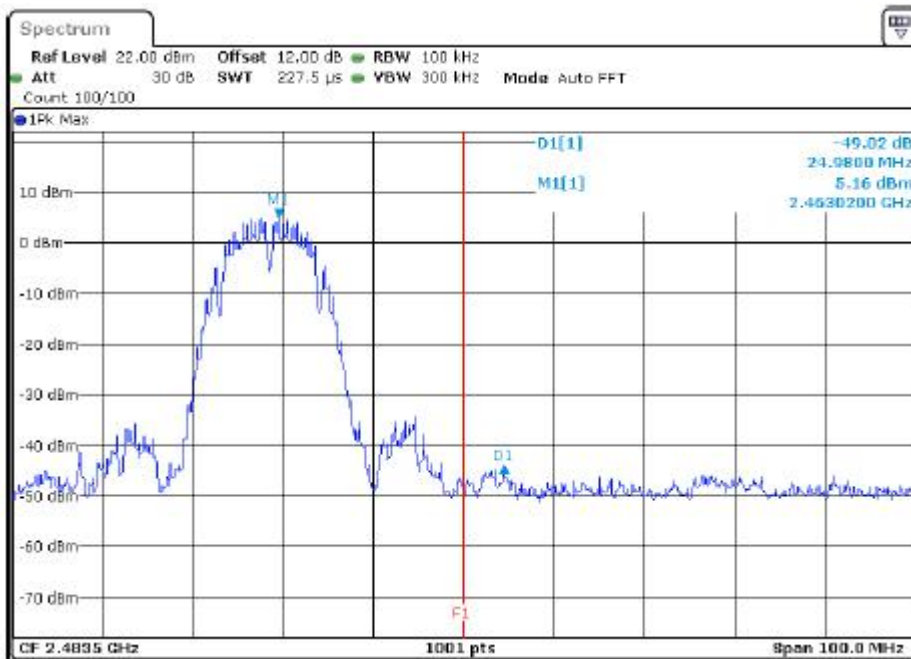
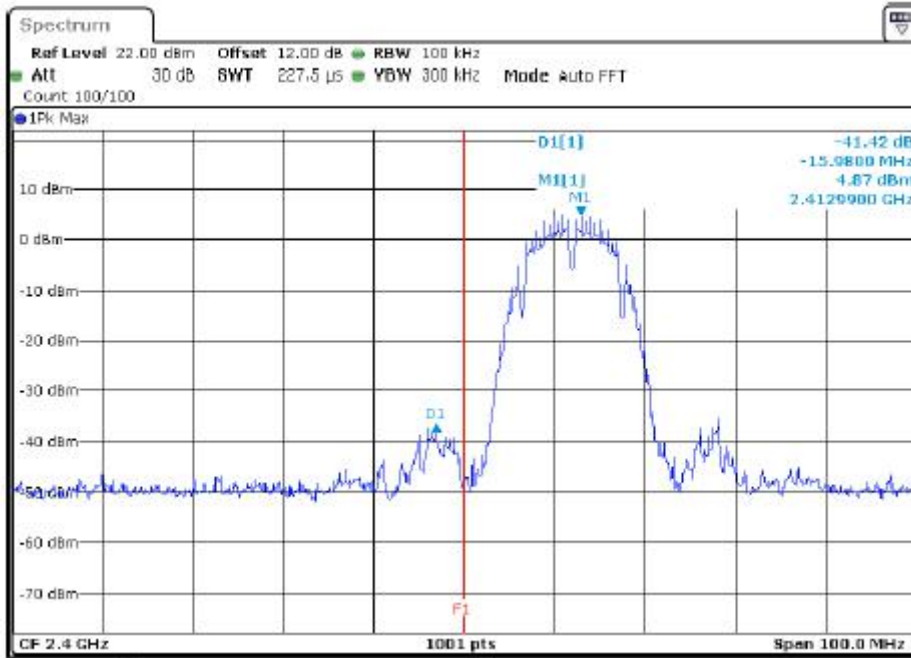
### 8.1 Test Procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 100kHz, VBW = 300kHz, Sweep = auto  
Detector function = peak, Trace = max hold



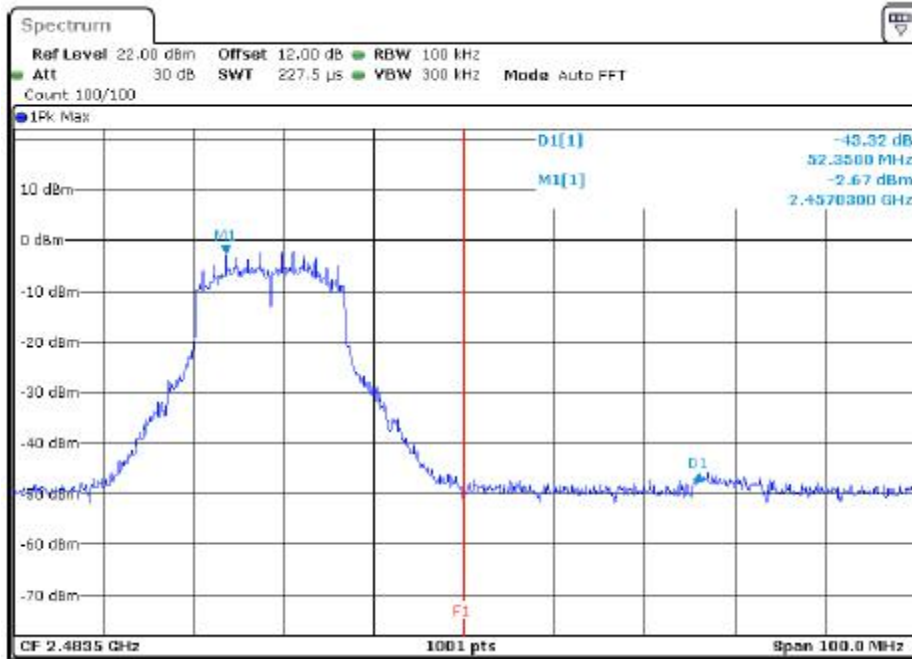
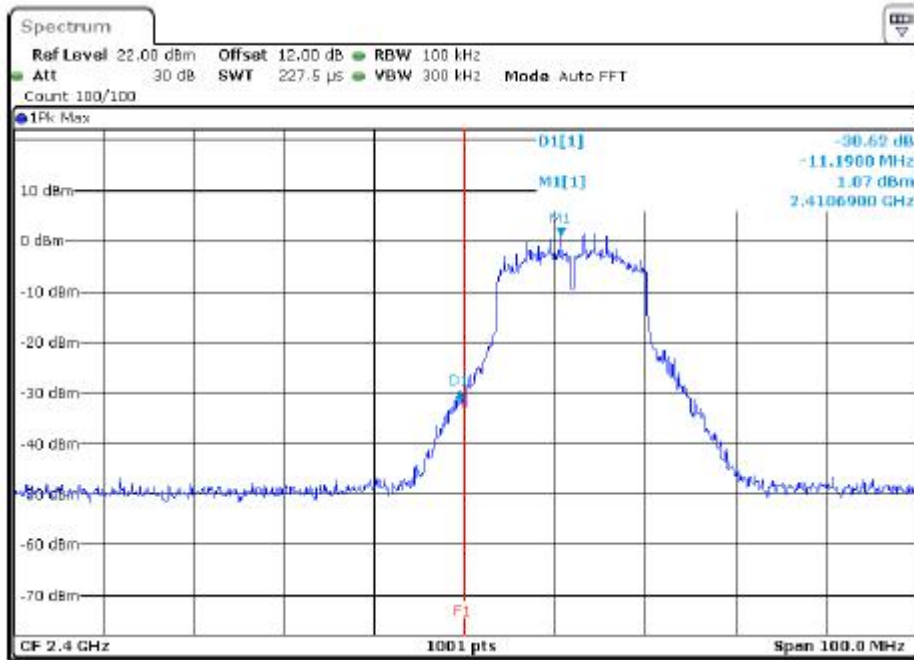
### 8.2 Test Result

802.11b



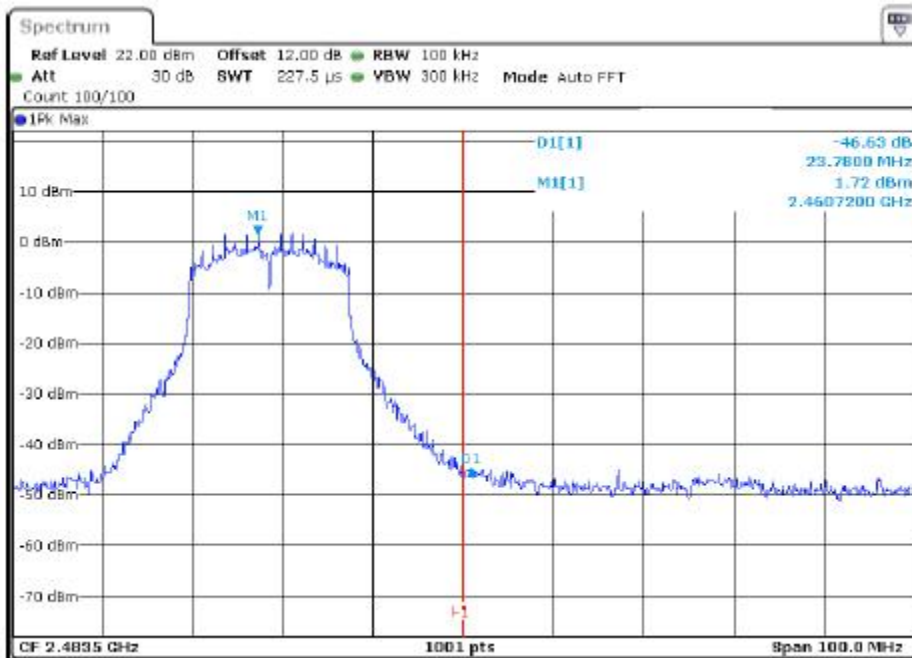
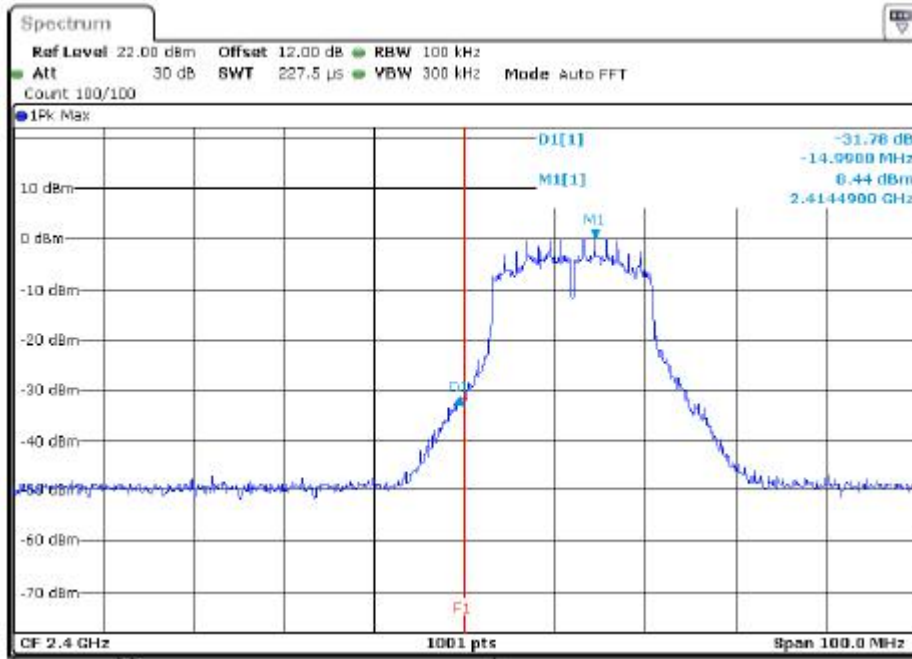


802.11g





802.11n-HT20





## 9 6dB Bandwidth Measurement

Test Requirement : FCC CFR47 Part 15 Section 15.247

Test Method : ANSI C63.10:2013

Test Limit : Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

### 9.1 Test Procedure

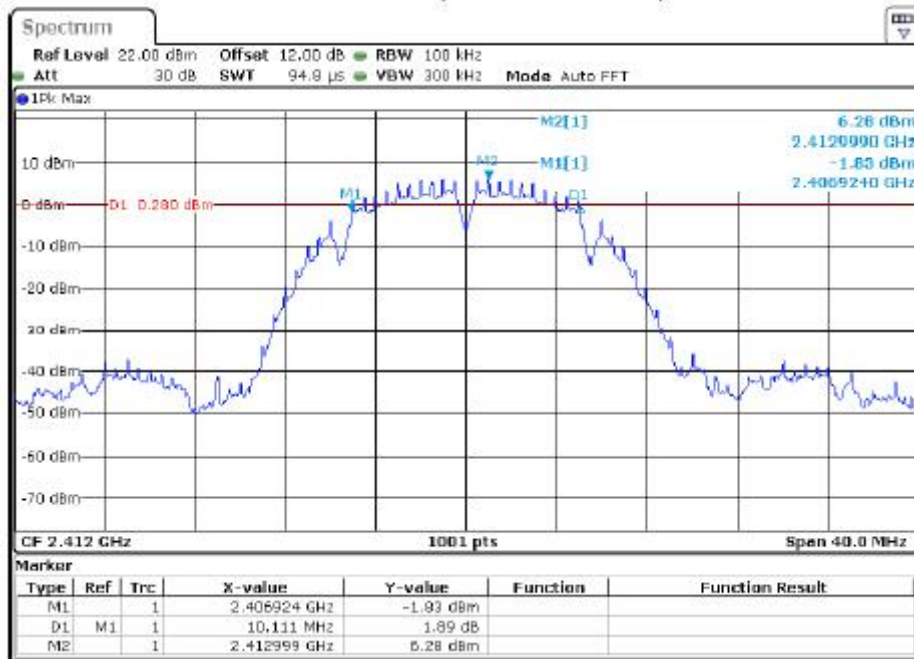
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 100kHz, VBW = 300kHz

### 9.2 Test Result

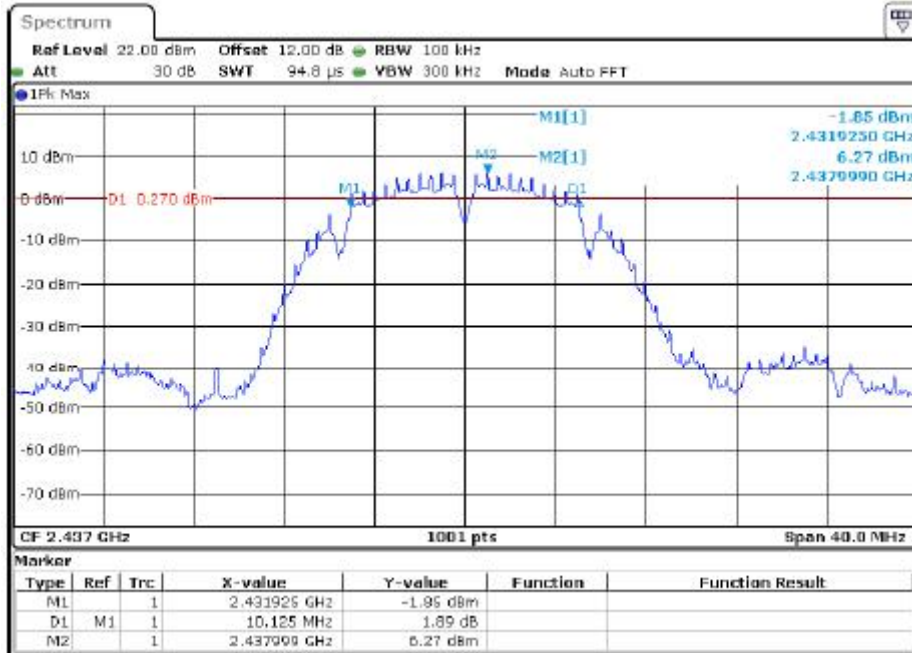
Modulation	Bandwidth(MHz)			Limit
	Low Channel	Middle Channel	High Channel	
802.11b	10.11	10.13	10.10	≥500kHz
802.11g	15.93	15.80	15.77	≥500kHz
802.11n-HT20	15.94	15.80	17.05	≥500kHz



802.11b Low Channel

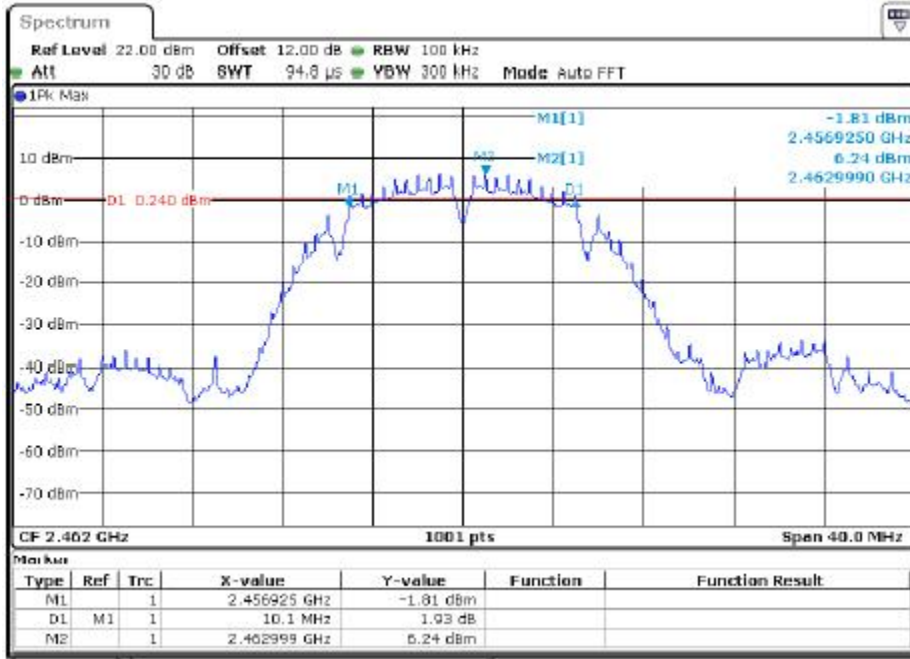


802.11b Middle Channel

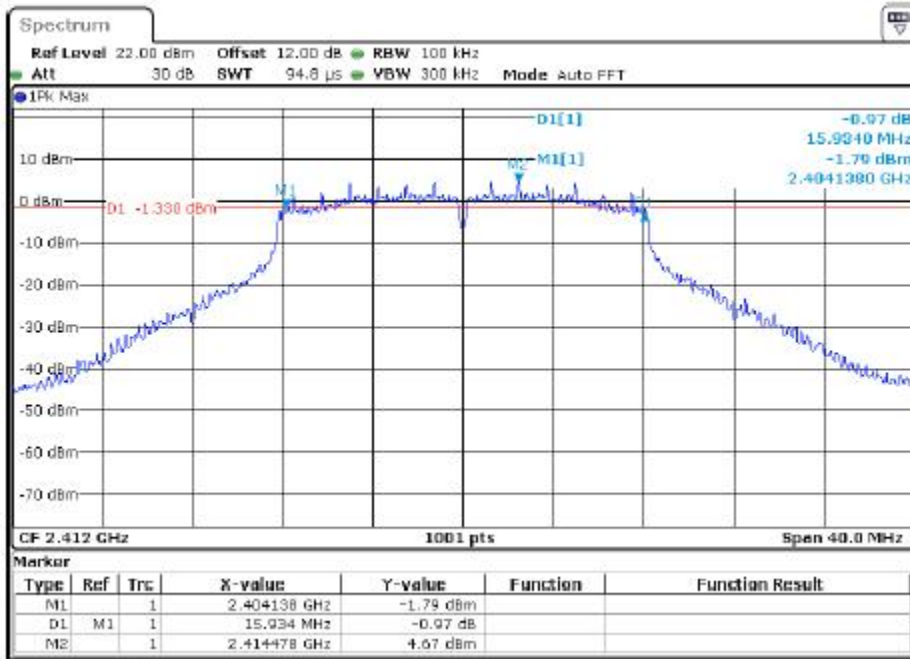




802.11b High Channel

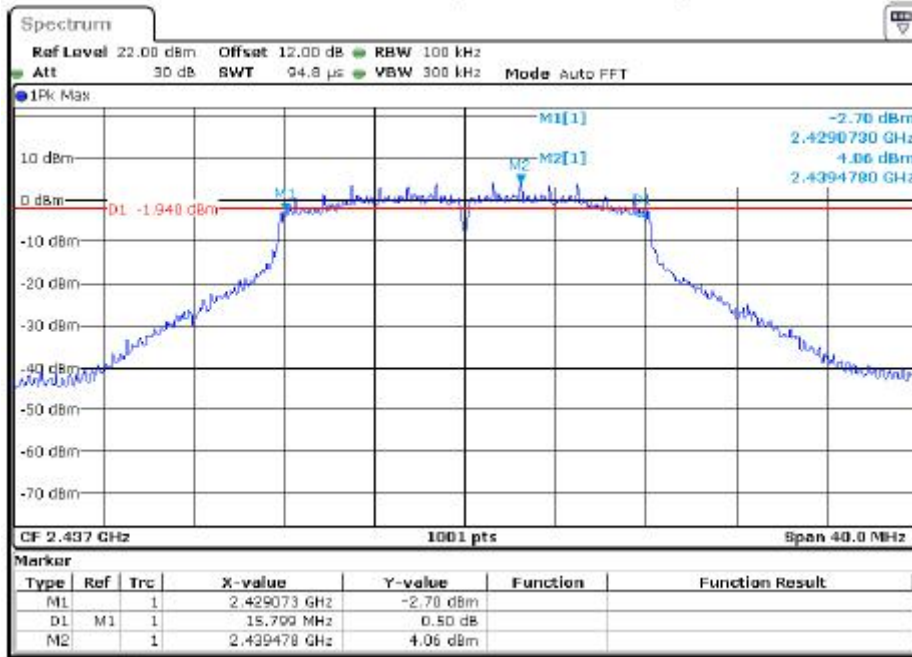


802.11g Low Channel

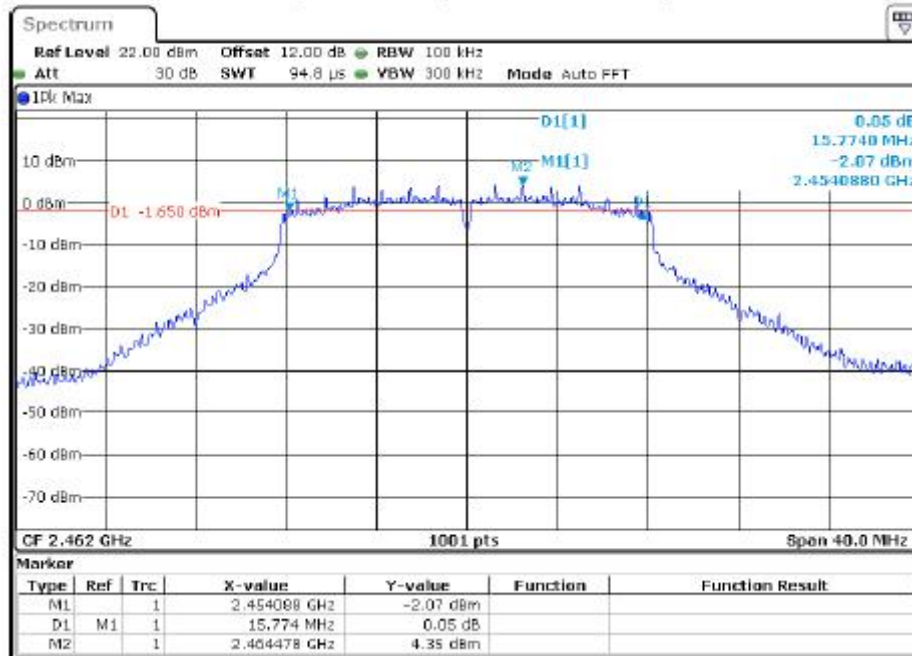




802.11g Middle Channel



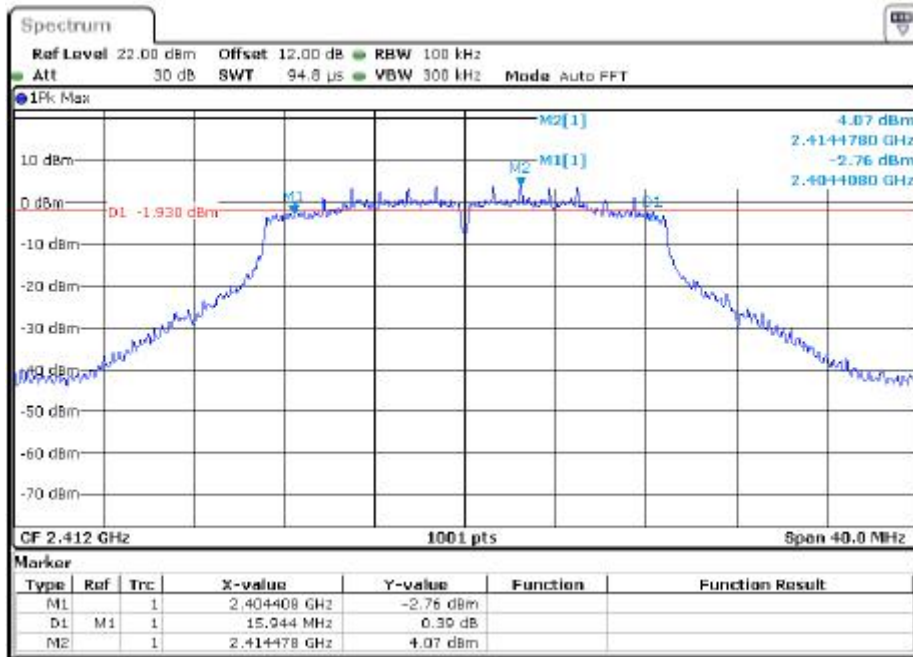
802.11g High Channel



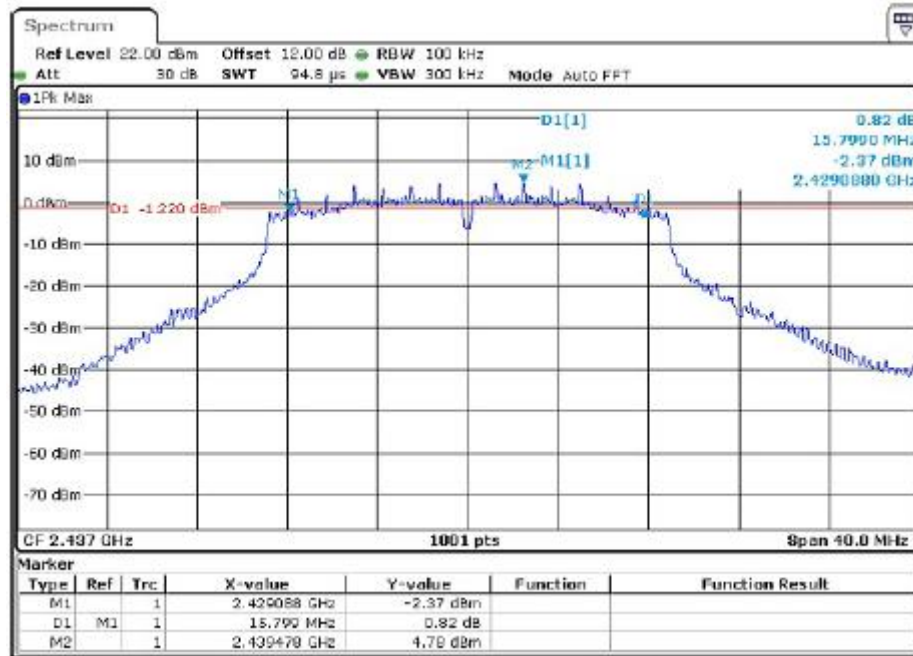




802.11n-HT20 Low Channel

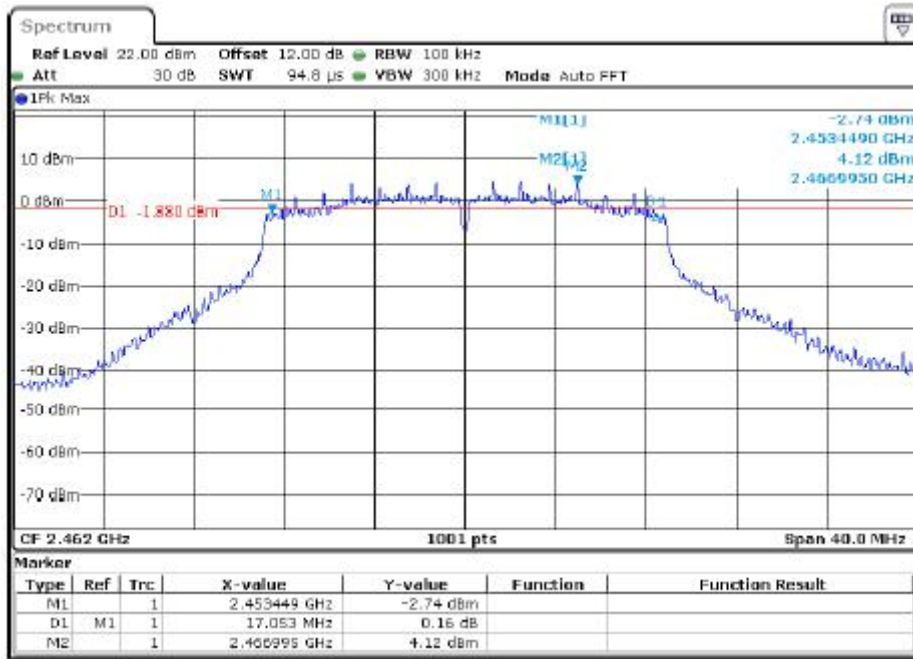


802.11n-HT20 Middle Channel





802.11n-HT20 High Channel





## 10 Maximum Peak Output Power

Test Requirement : FCC CFR47 Part 15 Section 15.247  
Test Method : ANSI C63.10:2013  
Test Limit : Regulation 15.247 (b)(3), For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power.

### 10.1 Test Procedure

1. The testing follows the Measurement Procedure of FCC KDB No. 558074 DTS D01 Meas. Guidance v05 section 9.1.2 PKPM1 Peak Power meter method.
2. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Measure the conducted output power and record the results in the test report.

### 10.2 Test Result

Modulation	Maximum Peak Output Power (dBm)			Limit
	Low Channel	Middle Channel	High Channel	
802.11b	16.68	16.79	16.82	1W(30dBm)
802.11g	15.52	15.47	15.81	1W(30dBm)
802.11n-HT20	14.34	14.76	14.38	1W(30dBm)



## 11 Power Spectral density

- Test Requirement : FCC CFR47 Part 15 Section 15.247
- Test Method : ANSI C63.10:2013
- Test Limit : Regulation 15.247(f) The power spectral density conducted from the intentional radiator to the antenna due to the digital modulation operation of the hybrid system, with the frequency hopping operation turned off, shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

### 11.1 Test Procedure

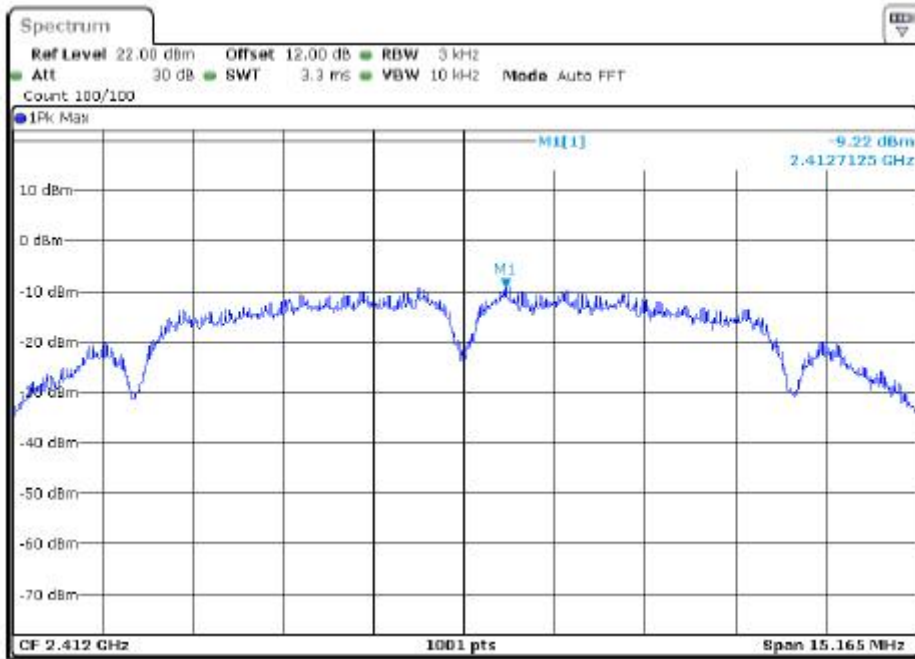
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 3kHz. VBW = 10kHz, Span = 1.5 times the DTS channel bandwidth(6 dB bandwidth). Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section Submit this plot.

### 11.2 Test Result

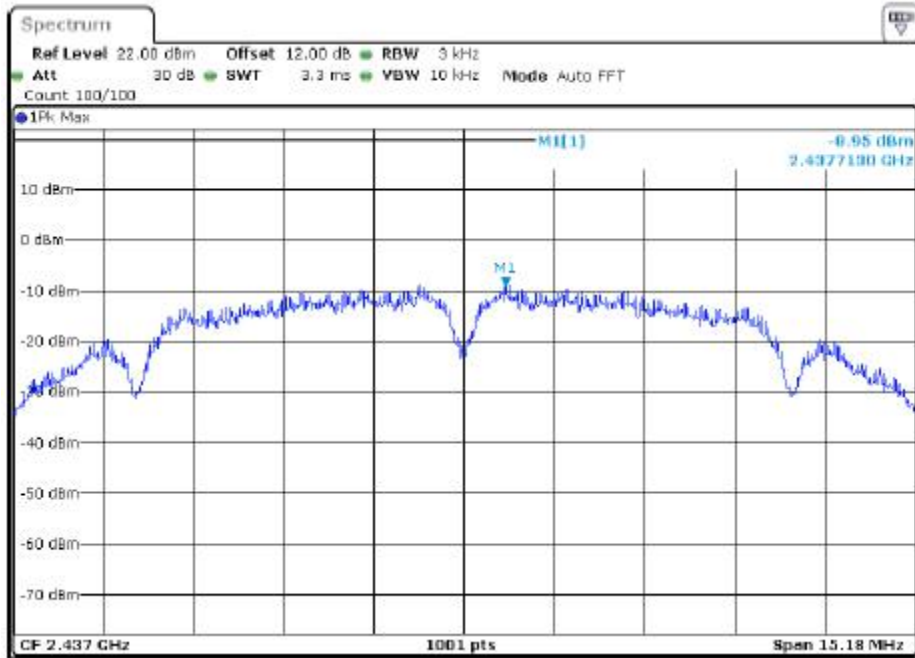
Modulation	Power Spectral density (dBm/3kHz)			Limit
	Low Channel	Middle Channel	High Channel	
802.11b	-9.22	-8.95	-9.08	8dBm/3kHz
802.11g	-14.10	-11.69	-15.98	8dBm/3kHz
802.11n-HT20	-12.63	-11.91	-13.57	8dBm/3kHz



### 802.11b Low Channel

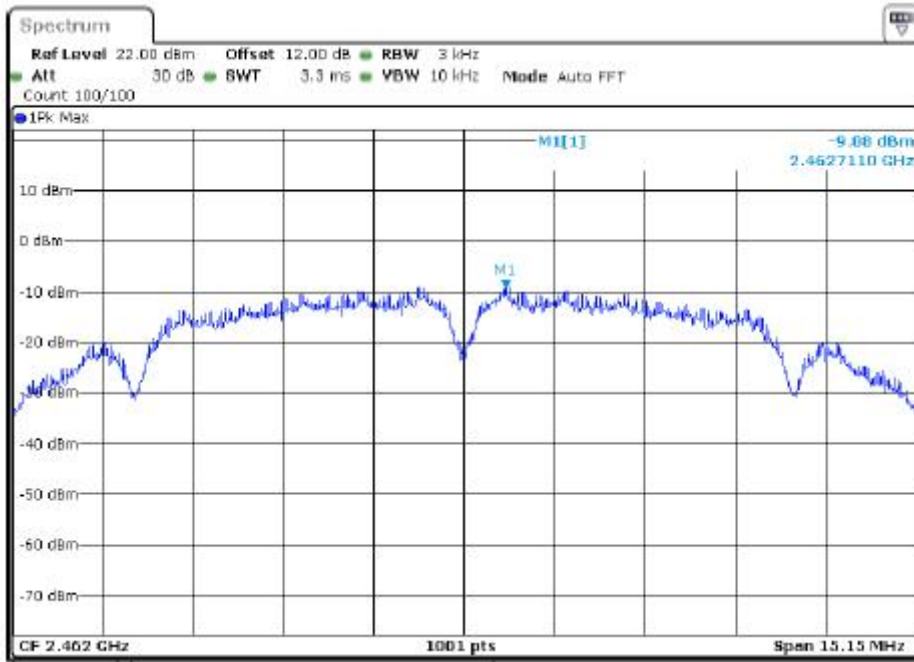


### 802.11b Middle Channel

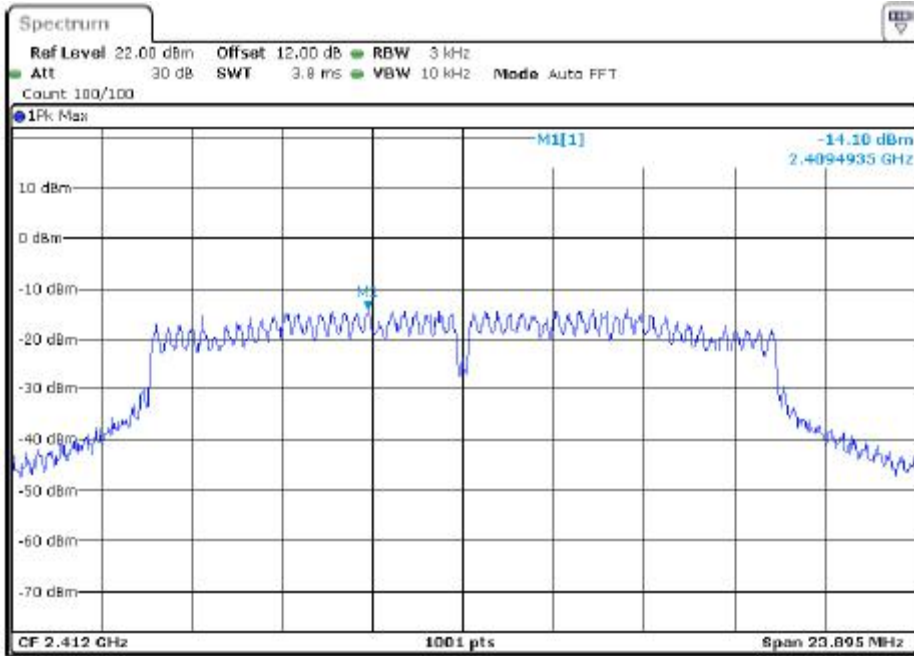




### 802.11b High Channel

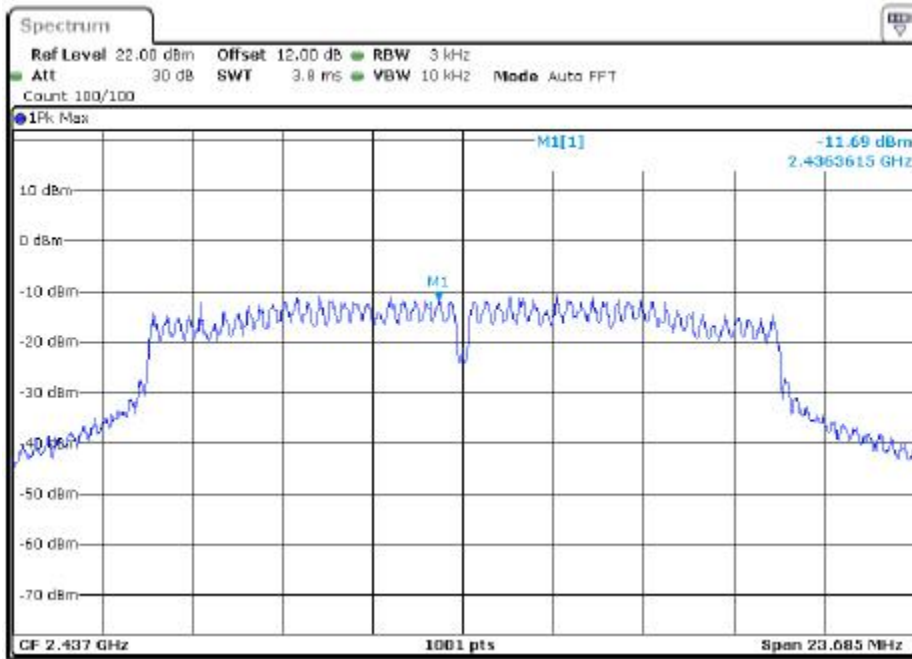


### 802.11g Low Channel

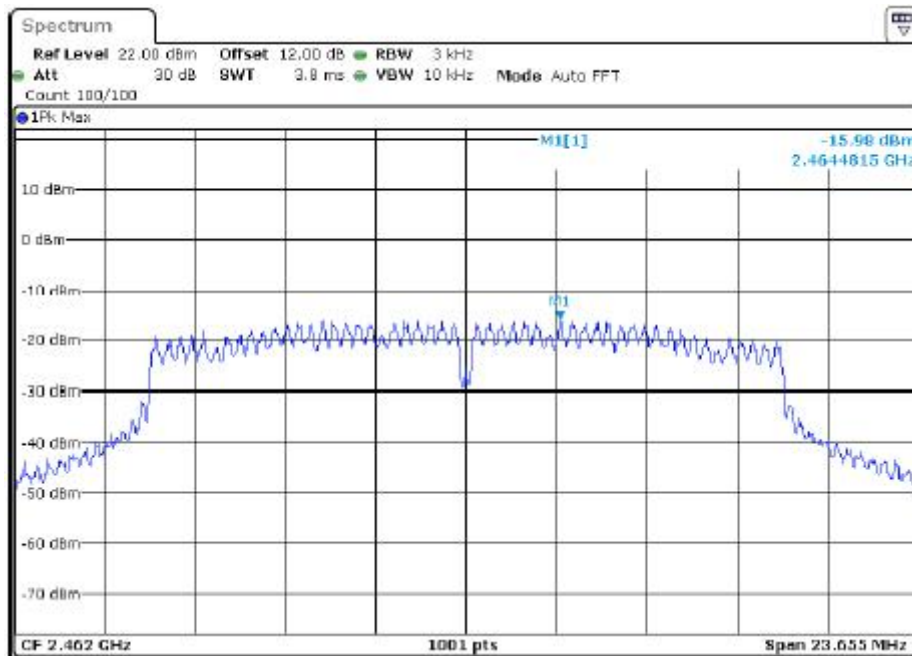




### 802.11g Middle Channel

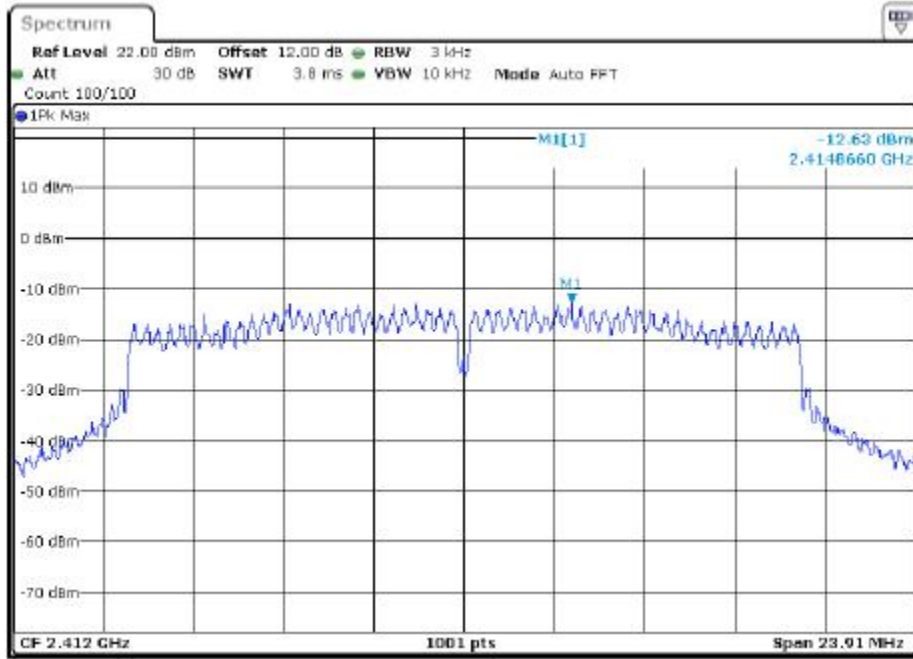


### 802.11g High Channel

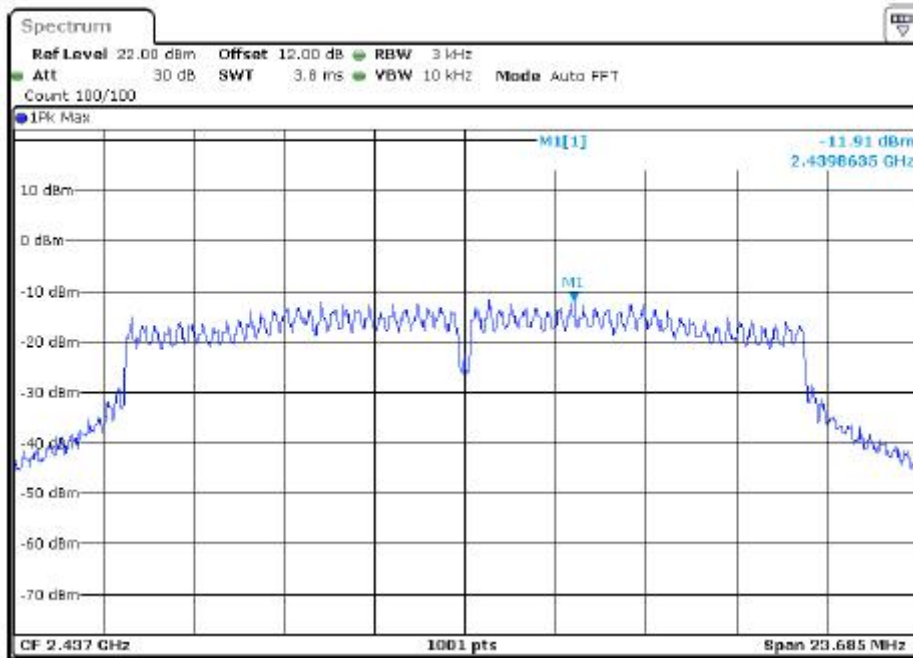




### 802.11n-HT20 Low Channel



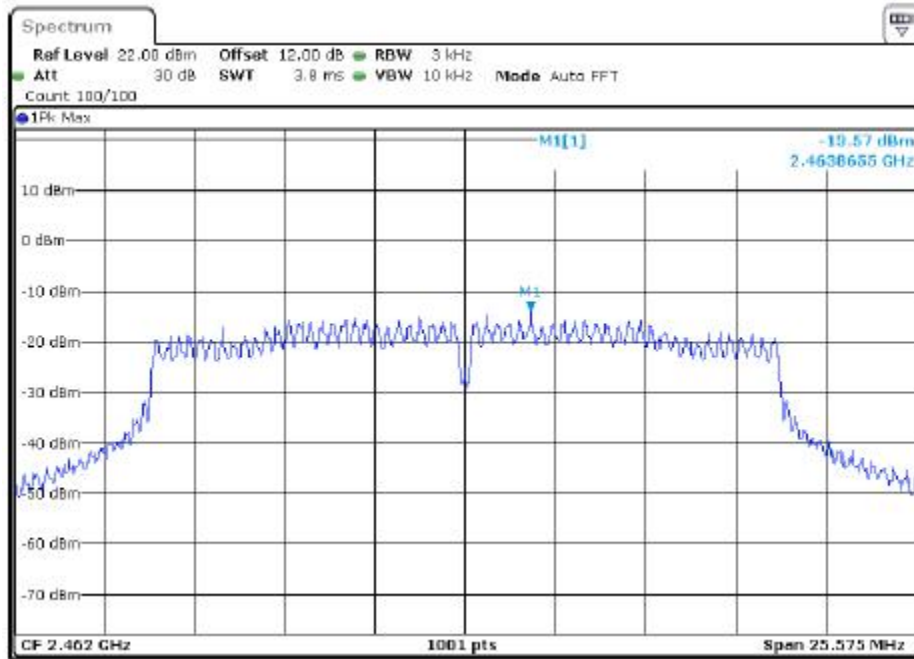
### 802.11n-HT20 Middle Channel







802.11n-HT20 High Channel





## **12 Antenna Application**

### **12.1 Antenna Requirement**

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

### **12.2 Result**

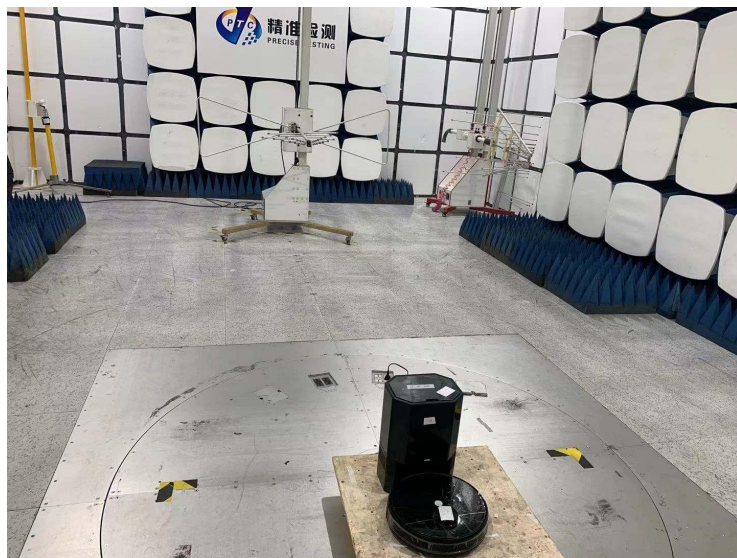
The EUT'S antenna, permanent attached antenna, is FPCB antenna. The antenna's gain is 2.5dBi and meets the requirement.

### 13 Test Setup

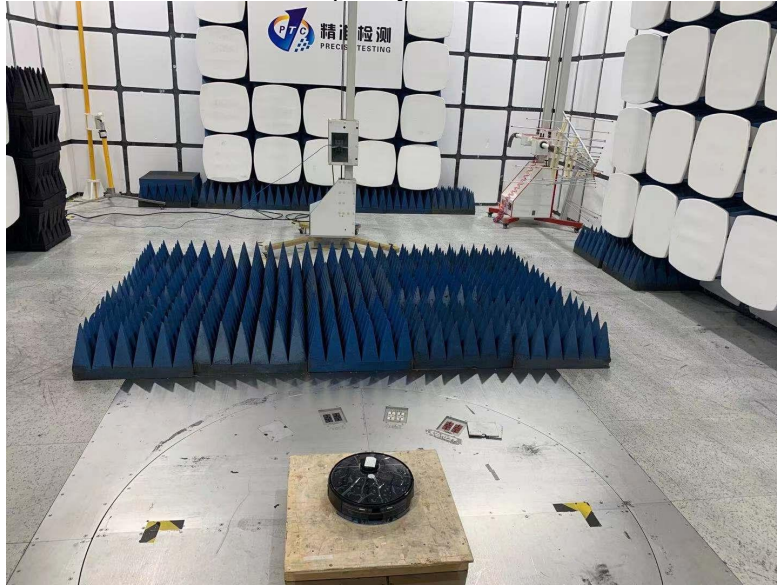
#### Conducted Emissions



#### Test frequency from 30MHz-1000MHz



Test frequency above 1GHz





## 14 EUT Photos

Reference the file of "EUT PHOTOS".

**\*\*\*\*\*THE END REPORT\*\*\*\*\***