

# TEST REPORT

Reference No..... : WTD21D09101438W001  
FCC ID ..... : EROUC-ENGINE-A  
Applicant..... : Crestron Electronics Inc  
Address..... : 15 Volvo Drive, Rockleigh, NJ 07647, United States of America  
Manufacturer ..... : SMART Wireless Computing Inc.  
Address..... : 39870 Eureka Dr, Newark, CA 94560, United States of America  
Product..... : UC-ENGINE-A  
Model(s) ..... : M202138002(SKU: UC-ENGINE-A-T, UC-ENGINE-A-Z)  
Brand name ..... : Crestron  
Standards..... : FCC CFR47 Part 15.247  
Date of Receipt sample .... : 2021-09-24  
Date of Test ..... : 2021-09-24 to 2021-10-27  
Date of Issue..... : 2021-10-27  
Test Result..... : **Pass**  
Remark..... : This report is based on the original report WTD21D01009766W001 V2, Change the Applicant, manufacturer, product name, model, and EUT some ports and functions have Change, For details, please refer to section 4.3 of the report

Remarks:

The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

Prepared By:  
**Waltek Testing Group Co., Ltd.**

Address: No. 77, Houjie Section, Guantai Road, Houjie Town, Dongguan City, Guangdong, China

Tel: +86-769-2267 6998

Fax: +86-769-2267 6828

Compiled by:

*Levi Xiao*

Levi Xiao / Project Engineer

Approved by:



*Daniel Liu*

Daniel Liu / Designated Reviewer

## 2 Contents

	<b>Page</b>
<b>1 COVER PAGE</b> .....	<b>1</b>
<b>2 CONTENTS</b> .....	<b>2</b>
<b>3 REVISION HISTORY</b> .....	<b>3</b>
<b>4 GENERAL INFORMATION</b> .....	<b>4</b>
4.1 GENERAL DESCRIPTION OF E.U.T. ....	4
4.2 DETAILS OF E.U.T. ....	4
4.3 PRODUCT INFORMATION .....	5
4.4 CHANNEL LIST .....	5
4.5 TEST MODE .....	6
<b>5 TEST SUMMARY</b> .....	<b>7</b>
<b>6 EQUIPMENT USED DURING TEST</b> .....	<b>8</b>
6.1 EQUIPMENTS LIST .....	8
6.2 DESCRIPTION OF SUPPORT UNITS .....	8
6.3 MEASUREMENT UNCERTAINTY .....	9
6.4 TEST FACILITY.....	9
6.5 TEST EQUIPMENT CALIBRATION .....	9
<b>7 RADIATED EMISSIONS</b> .....	<b>10</b>
7.1 EUT OPERATION.....	10
7.2 TEST SETUP .....	11
7.3 SPECTRUM ANALYZER SETUP .....	12
7.4 TEST PROCEDURE .....	13
7.5 CORRECTED AMPLITUDE & MARGIN CALCULATION .....	13
7.6 SUMMARY OF TEST RESULTS .....	14
<b>8 CONDUCTED SPURIOUS EMISSIONS</b> .....	<b>30</b>
8.1 TEST PROCEDURE .....	30
8.2 TEST RESULT .....	31
<b>9 BAND EDGE MEASUREMENT</b> .....	<b>32</b>
9.1 TEST PROCEDURE.....	32
9.2 TEST RESULT .....	33
<b>10 6 DB BANDWIDTH AND 99% BANDWIDTH MEASUREMENT</b> .....	<b>34</b>
10.1 TEST PROCEDURE:.....	34
10.2 TEST RESULT: .....	34
<b>11 MAXIMUM PEAK OUTPUT POWER</b> .....	<b>35</b>
11.1 TEST PROCEDURE:.....	35
11.2 TEST RESULT: .....	36
<b>12 POWER SPECTRAL DENSITY</b> .....	<b>37</b>
12.1 TEST PROCEDURE:.....	37
12.2 TEST RESULT: .....	37
<b>13 ANTENNA REQUIREMENT</b> .....	<b>38</b>
<b>14 RF EXPOSURE</b> .....	<b>39</b>
<b>15 PHOTOGRAPHS OF TEST SETUP AND EUT</b> .....	<b>39</b>

### 3 Revision History

Test report No.	Date of Receipt sample	Date of Test	Date of Issue	Purpose	Comment	Approved
WTD21D09101438 W001	2021-09-24	2021-09-24 to 2021-10-27	2021-10-27	Original	-	Valid

## 4 General Information

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

Product:	UC-ENGINE-A
Model(s):	M202138002(SKU: UC-ENGINE-A-T, UC-ENGINE-A-Z)
Wi-Fi Specification:	2.4G-802.11b/g/n HT20/n HT40 5G-802.11a/n/ac HT20 /n/ac HT40 /ac HT80
Bluetooth Version:	Bluetooth v5.0 with BLE
Hardware Version:	CRE6720-XX-P1
Software Version:	Android 10

### 4.2 Details of E.U.T.

Operation Frequency:	WiFi: 802.11b/g/n HT20: 2412~2462MHz 802.11n HT40: 2422~2452MHz BLE:2402-2480MHz
Max. RF output power:	WiFi(2.4G): ANT 0: 18.60dBm ANT 1: 17.61dBm Total:25.47dBm BLE: 5.84 dBm
Type of Modulation:	WiFi: DSSS, OFDM BLE:GFSK
Antenna installation:	WiFi/BLE: External antenna with RP-SMA connector
Antenna Gain:	5.3dBi
Ratings:	DC 12V For Battery

### 4.3 Product information

Removed the below interfaces

1)1\*MIPI-CSI Camera connector

2)1\*30-pin Expansion connector

3)1\*SMA(GPS)

4)1\*M.2 SATA SSD slot

5)Micro sd Card removed and added one Type A USB to connect Mouse

Remark: Based on the above information, only the Radiated Spurious Emissions was tested, Please refer to the original report WTD21D01009766W001 V2 for other test data

### 4.4 Channel List

#### WIFI

Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
1	2412	2	2417	3	2422	4	2427
5	2432	6	2437	7	2442	8	2447
9	2452	10	2457	11	2462	12	-

#### BT BLE

Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
0	2402	1	2404	2	2406	3	2408
4	2410	5	2412	6	2414	7	2416
8	2418	9	2420	10	2422	11	2424
12	2426	13	2428	14	2430	15	2432
16	2434	17	2436	18	2438	19	2440
20	2442	21	2444	22	2446	23	2448
24	2450	25	2452	26	2454	27	2456
28	2458	29	2460	30	2462	31	2464
32	2466	33	2468	34	2470	35	2472
36	2474	37	2476	38	2478	39	2480

## 4.5 Test Mode

Table 1 Tests Carried Out Under FCC part 15.247

Test Items	Mode	Data Rate	Channel	TX/RX
Maximum Peak Output Power	802.11b	1 Mbps	1/6/11	TX
	802.11g	6 Mbps	1/6/11	TX
	802.11n HT20	108 Mbps	1/6/11	TX
	802.11n HT40	150 Mbps	3/6/9	TX
Power Spectral Density	802.11b	1 Mbps	1/6/11	TX
	802.11g	6 Mbps	1/6/11	TX
	802.11n HT20	108 Mbps	1/6/11	TX
	802.11n HT40	150 Mbps	3/6/9	TX
6dB Bandwidth	802.11b	1 Mbps	1/6/11	TX
	802.11g	6 Mbps	1/6/11	TX
	802.11n HT20	108 Mbps	1/6/11	TX
	802.11n HT40	150 Mbps	3/6/9	TX
Band Edge	802.11b	1 Mbps	1/6/11	TX
	802.11g	6 Mbps	1/6/11	TX
	802.11n HT20	108 Mbps	1/6/11	TX
	802.11n HT40	150 Mbps	3/6/9	TX
Transmitter Spurious Emissions	802.11b	1 Mbps	1/6/11	TX
	802.11g	6 Mbps	1/6/11	TX
	802.11n HT20	108 Mbps	1/6/11	TX
	802.11n HT40	150 Mbps	3/6/9	TX

Table 2 Tests Carried Out Under FCC part 15.247

Test Items	Mode	Data Rate	Channel	TX/RX
Maximum Peak Output Power	BT BLE	1 Mbps	0/19/39	TX
Power Spectral Density	BT BLE	1 Mbps	0/19/39	TX
6dB Bandwidth	BT BLE	1 Mbps	0/19/39	TX
Band Edge	BT BLE	1 Mbps	0/19/39	TX
Transmitter Spurious Emissions	BT BLE	1 Mbps	0/19/39	TX

**Note** :Parameters set by test software during channel & power tests, the software provided by the customer was used to set the operating channels as well as the output power level. The RF output power set is the power expected by the manufacturer and is going to be fixed on the firmware of the final product .

## 5 Test Summary

Test Items	Test Requirement	Result
Radiated Spurious Emissions	15.247(d) 15.205(a) 15.209(a)	PASS
Conducted Spurious Emissions	15.247(d)	PASS
Conducted Emissions	15.207(a)	N/A
6dB Bandwidth	15.247(a)(2)	PASS
Maximum Peak Output Power	15.247(b)(3),(4)	PASS
Power Spectral Density	15.247(e)	PASS
Band Edge	15.247(d)	PASS
Antenna Requirement	15.203	PASS
Maximum Permissible Exposure (Exposure of Humans to RF Fields)	1.1307(b)(1)	PASS

## 6 Equipment Used during Test

### 6.1 Equipments List

3m Semi-anechoic Chamber for Radiation Emissions Test site 1#						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1	Spectrum Analyzer	R&S	FSP30	100091	2021-04-26	2022-04-25
2	Amplifier	Agilent	8447D	2944A10178	2021-04-26	2022-04-25
3	Trilog Broadband Antenna	SCHWARZBECK	VULB9163	336	2021-08-23	2022-08-23
4	Coaxial Cable (below 1GHz)	Top	TYPE16(13M)	-	2021-04-26	2022-04-25
5	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	667	2021-04-26	2022-04-25
6	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9170	335	2021-04-26	2022-04-25
7	Broadband Preamplifier	COMPLIANCE DIRECTION	PAP-1G18	2004	2021-04-26	2022-04-25
8	Coaxial Cable (above 1GHz)	ZT26-NJ-NJ-8M/FA	1GHz-18GHz	NA	2021-04-26	2022-04-25
3m Semi-anechoic Chamber for Radiation Emissions Test site 2#						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1	Test Receiver	R&S	ESCI	101296	2021-04-26	2022-04-25
2	Trilog Broadband Antenna	SCHWARZBECK	VULB9160	9160-3325	2021-04-26	2022-04-25
3	Active Loop Antenna	Com-Power Corp.	AL-130R	10160007	2021-04-26	2022-04-25
4	Amplifier	ANRITSU	MH648A	M43381	2021-04-26	2022-04-25
5	Cable	HUBER+SUHNER	CBL2	525178	2021-04-26	2022-04-25
RF Conducted Testing						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1.	EMC Analyzer (9k~26.5GHz)	Agilent	E7405A	MY45114943	2021-04-26	2022-04-25
2.	Spectrum Analyzer	R&S	FSP30	100091	2021-04-26	2022-04-25
3.	EXA Signal Analyzer	Malaysia Keysight	N9010A	MY50520207	2021-04-26	2022-04-25

### 6.2 Description of Support Units

Equipment	Manufacturer	Model No.	Series No.
Computer	Dell	K053	/
Mouse	Lenovo	AP01	/



### 6.3 Measurement Uncertainty

Parameter	Uncertainty
Radio Frequency	$\pm 1 \times 10^{-6}$
RF Power	$\pm 1.0$ dB
RF Power Density	$\pm 2.2$ dB
Radiated Spurious Emissions test	$\pm 5.03$ dB (Bilog antenna 30M~1000MHz)
	$\pm 5.47$ dB (Horn antenna 1000M~25000MHz)
Conducted Emissions test	$\pm 3.64$ dB (AC mains 150KHz~30MHz)
Conducted Spurious Emissions test	$\pm 3.12$ dB (9kHz~30MHz)
	$\pm 4.21$ dB (30M~1000MHz)
	$\pm 5.14$ dB (1000M~26500MHz)

### 6.4 Test Facility

The test facility has a test site registered with the following organizations:

**ISED CAB identifier: CN0013. Test Firm Registration No.: 7760A.**

Waltek Testing Group Co., Ltd. Has been registered and fully described in a report filed with the Industry Canada. The acceptance letter from the Industry Canada is maintained in our files. Registration number 7760A, October 15, 2016.

**FCC Designation No.: CN1201. Test Firm Registration No.: 523476. Certificate Number: 4243.01**

Waltek Testing Group Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration number 523476, September 10, 2019.

### 6.5 Test Equipment Calibration

All the test equipments used are valid and calibrated by CEPREI Certification Body that address is No.110 Dongguan Zhuang RD. Guangzhou, P.R.China.

## 7 Radiated Emissions

Test Requirement: FCC CFR47 Part 15 Section 15.209 & 15.247  
 Test Method: KDB 558074 D01 15.247 Meas Guidance v05 August 24, 2018;  
 ANSI C63.10:2013  
 Test Result: PASS  
 Measurement Distance: 3m

Limit:

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(kHz)	300	10000 * 2400/F(kHz)	20log <sup>(2400/F(kHz))</sup> + 80
0.490 ~ 1.705	24000/F(kHz)	30	100 * 24000/F(kHz)	20log <sup>(24000/F(kHz))</sup> + 40
1.705 ~ 30	30	30	100 * 30	20log <sup>(30)</sup> + 40
30 ~ 88	100	3	100	20log <sup>(100)</sup>
88 ~ 216	150	3	150	20log <sup>(150)</sup>
216 ~ 960	200	3	200	20log <sup>(200)</sup>
Above 960	500	3	500	20log <sup>(500)</sup>

### 7.1 EUT Operation

Operating Environment :

Temperature: 23.5 °C  
 Humidity: 52.1 % RH  
 Atmospheric Pressure: 101.2kPa

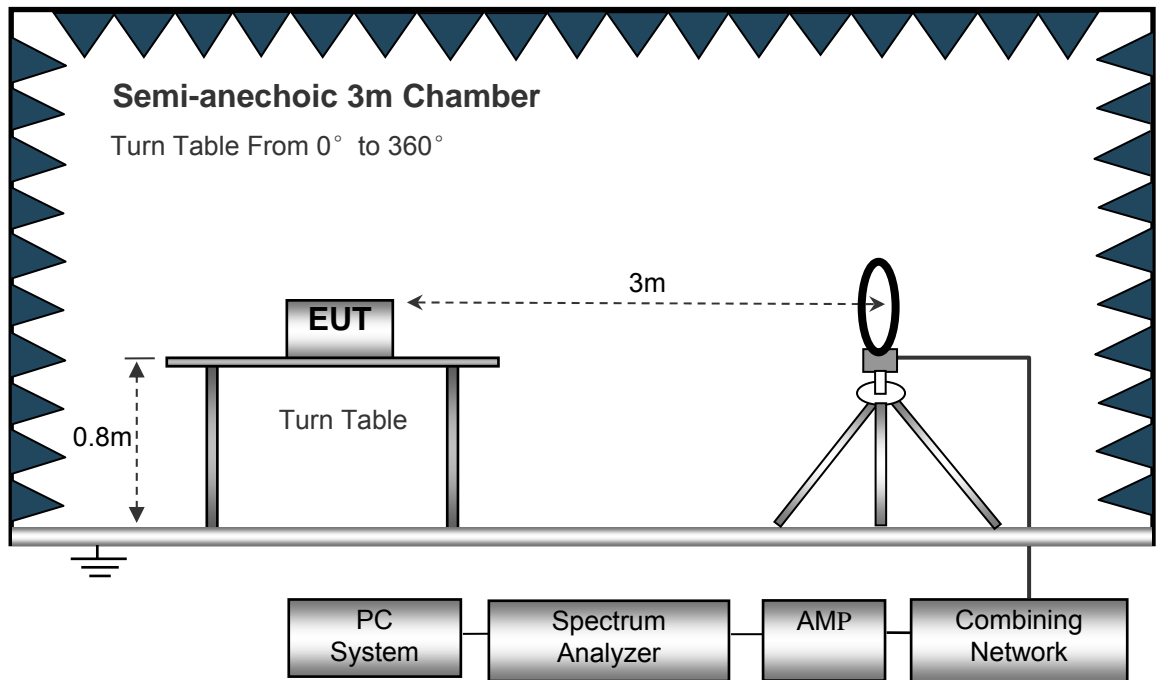
EUT Operation :

The test was performed in WIFI link and BLE link mode, the test data were shown in the report.

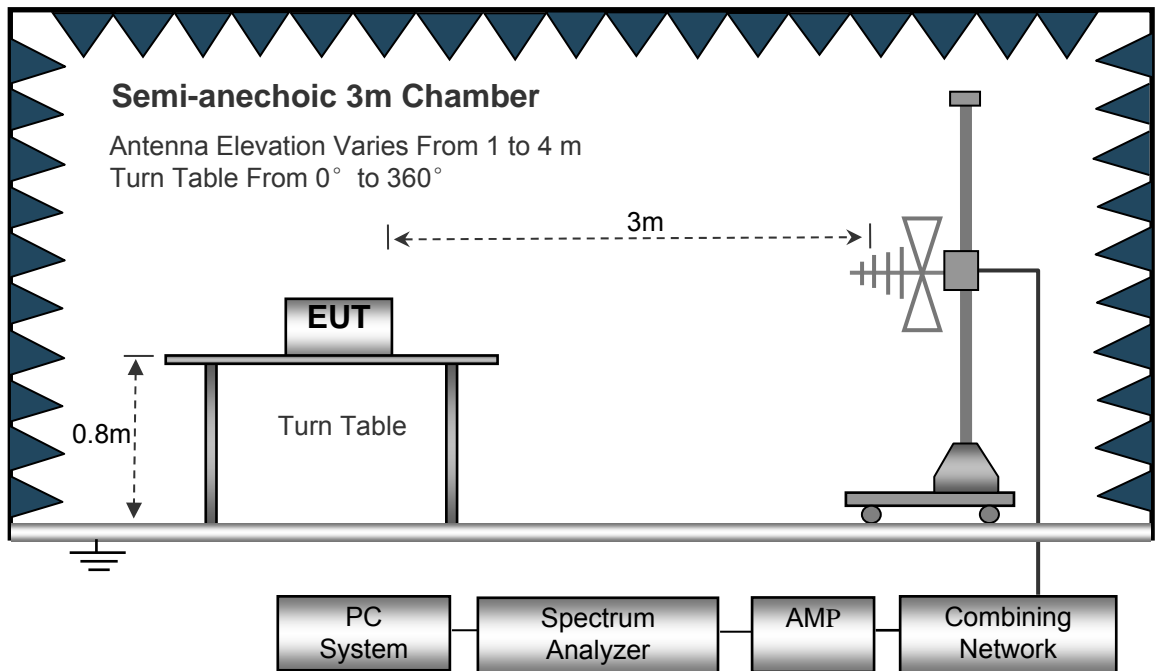
## 7.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.10.

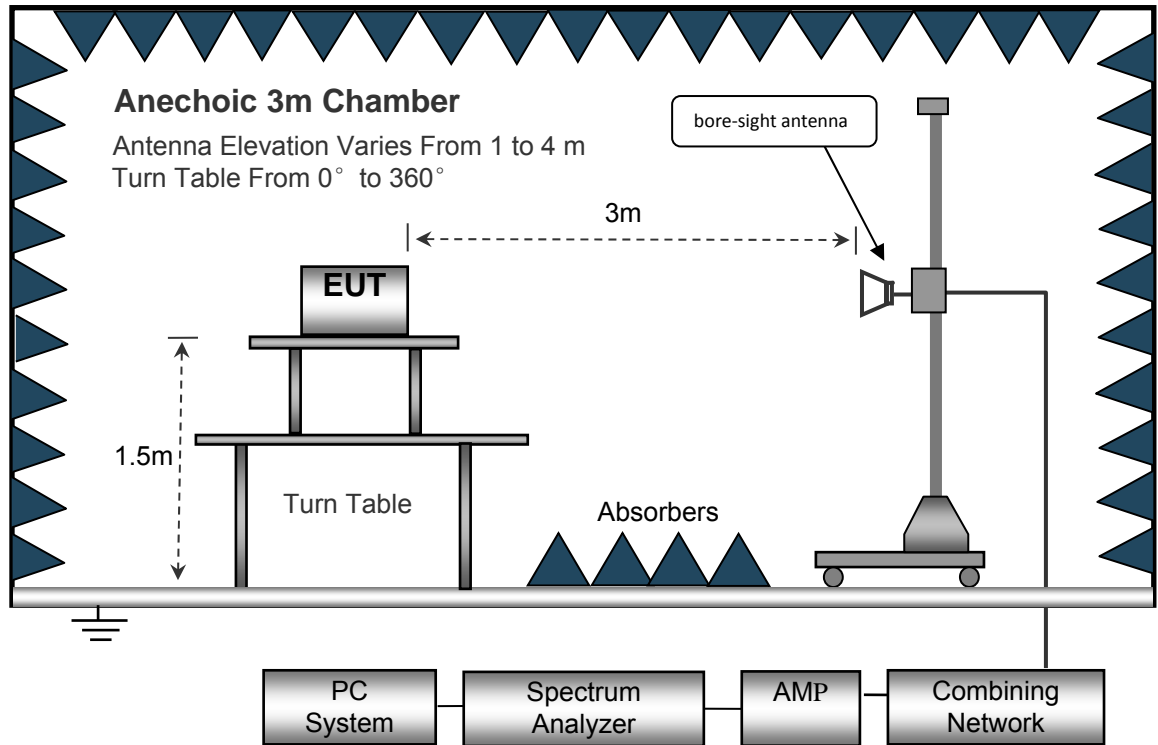
The test setup for emission measurement below 30MHz.



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



The test setup for emission measurement above 1 GHz.



### 7.3 Spectrum Analyzer Setup

Below 30MHz

Sweep Speed ..... Auto  
 IF Bandwidth..... 10kHz  
 Video Bandwidth..... 10kHz  
 Resolution Bandwidth..... 10kHz

30MHz ~ 1GHz

Sweep Speed ..... Auto  
 Detector ..... PK  
 Resolution Bandwidth..... 100kHz  
 Video Bandwidth..... 300kHz

Above 1GHz

Sweep Speed ..... Auto  
 Detector ..... PK  
 Resolution Bandwidth..... 1MHz  
 Video Bandwidth..... 3MHz  
 Detector ..... Ave.  
 Resolution Bandwidth..... 1MHz  
 Video Bandwidth..... 10Hz

## 7.4 Test Procedure

1. The EUT is placed on a turntable, which is 0.8m above ground plane for below 1GHz and 1.5m for above 1GHz.
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.
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 performed in X,Y and Z axis positioning(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand),the worst condition was tested putting the eut in Z axis,so the worst data were shown as follow.
8. A 2.4GHz high –pass filter is used during radiated emissions above 1GHz measurement.

## 7.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain}$$

The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the maximum limit for Class B. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{Limit}$$

### 7.6 Summary of Test Results

Remark: For the WIFI, Both antenna 0 and antenna 1 are tested, and only the worst data antenna 0 is put in the report

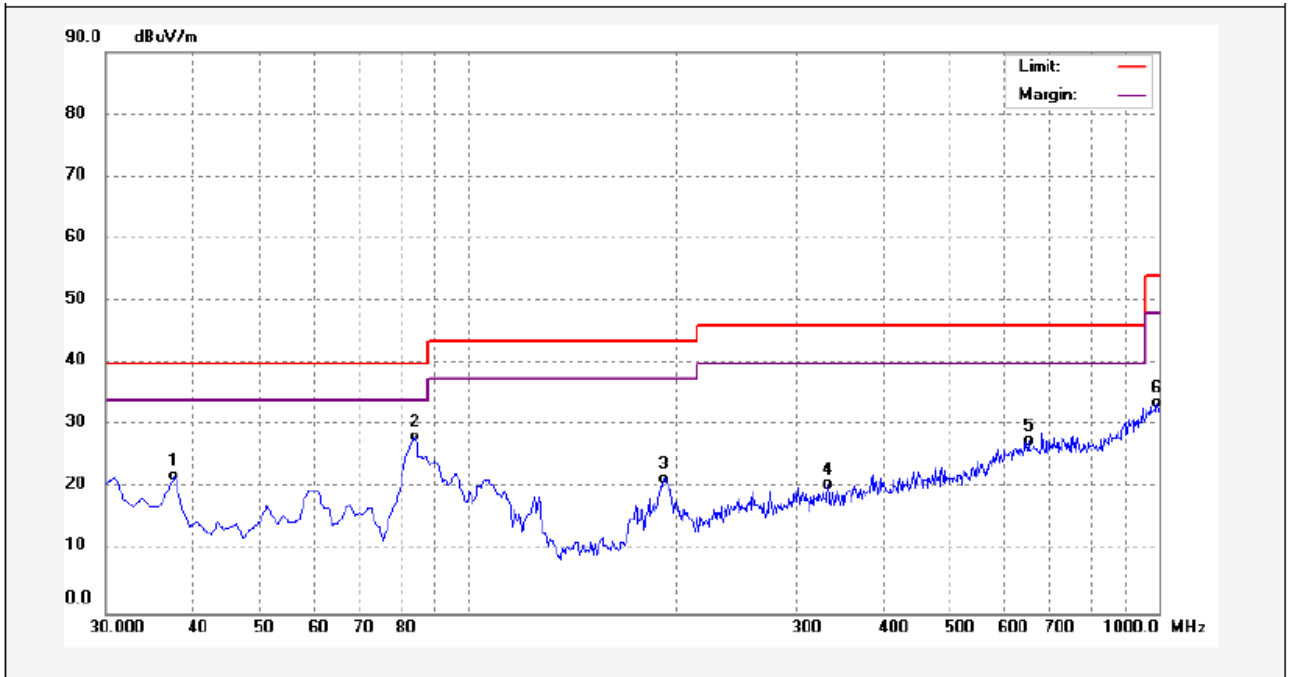
**Wifi:**

**Test Frequency: 9KHz~30MHz**

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

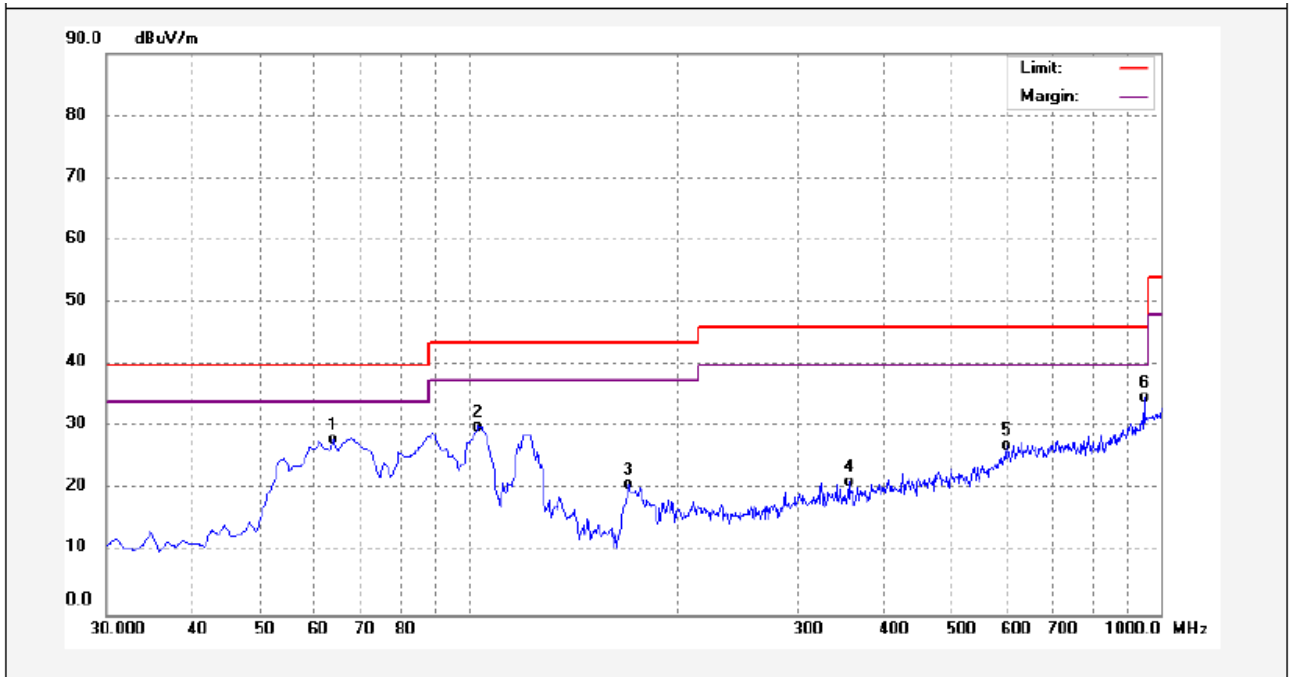
**Test Frequency : 30MHz ~ 1GHz (only the worst-case plots for each mode)**

**802.11b: Low Channel 2412MHz (Vertical)**



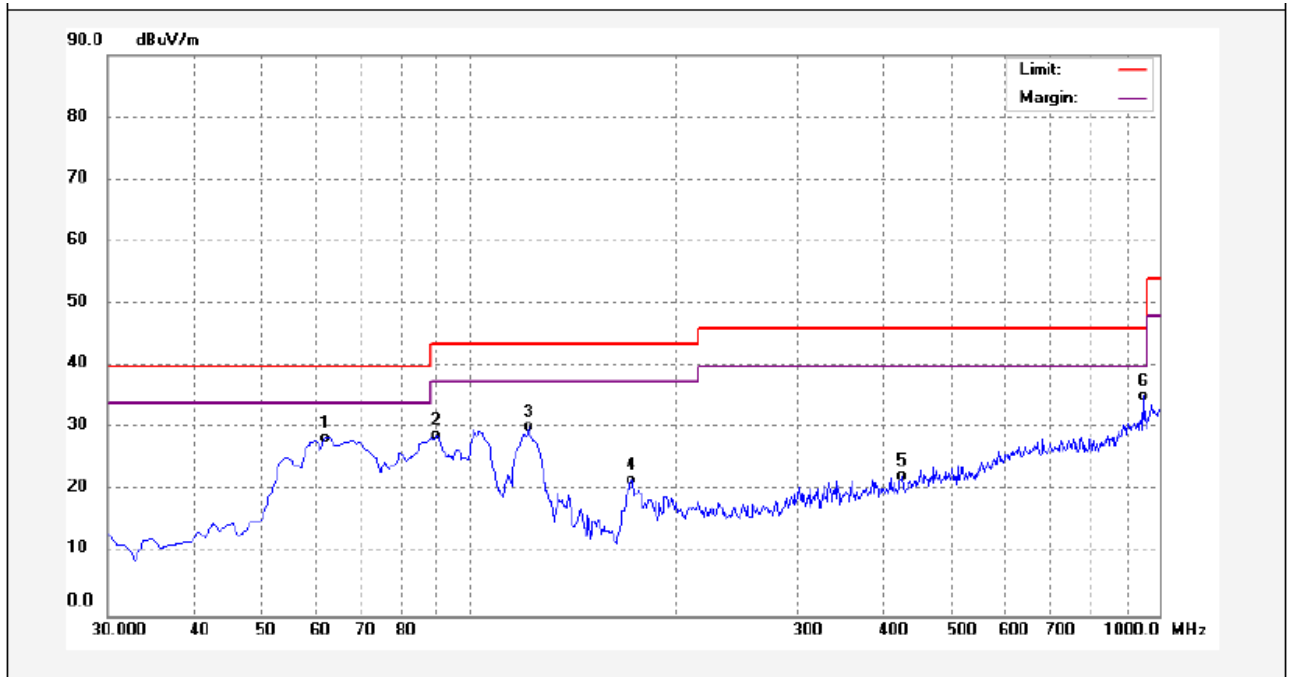
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	37.7599	36.88	-14.92	21.96	40.00	-18.04	QP	
2	84.3198	44.37	-16.15	28.22	40.00	-11.78	QP	
3	192.9600	34.36	-12.88	21.48	43.50	-22.02	QP	
4	332.6399	28.11	-7.47	20.64	46.00	-25.36	QP	
5	647.8899	28.43	-0.77	27.66	46.00	-18.34	QP	
6	995.1499	27.49	6.18	33.67	54.00	-20.33	QP	

**802.11b: Low Channel 2412MHz (Horizontal)**



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	63.9500	42.35	-14.25	28.10	40.00	-11.90	QP	
2	103.7199	43.39	-13.24	30.15	43.50	-13.35	QP	
3	170.8500	35.93	-15.10	20.83	43.50	-22.67	QP	
4	354.9499	28.43	-7.21	21.22	46.00	-24.78	QP	
5	599.3899	28.50	-1.31	27.19	46.00	-18.81	QP	
6	945.8799	30.80	4.05	34.85	48.00	-11.15	QP	

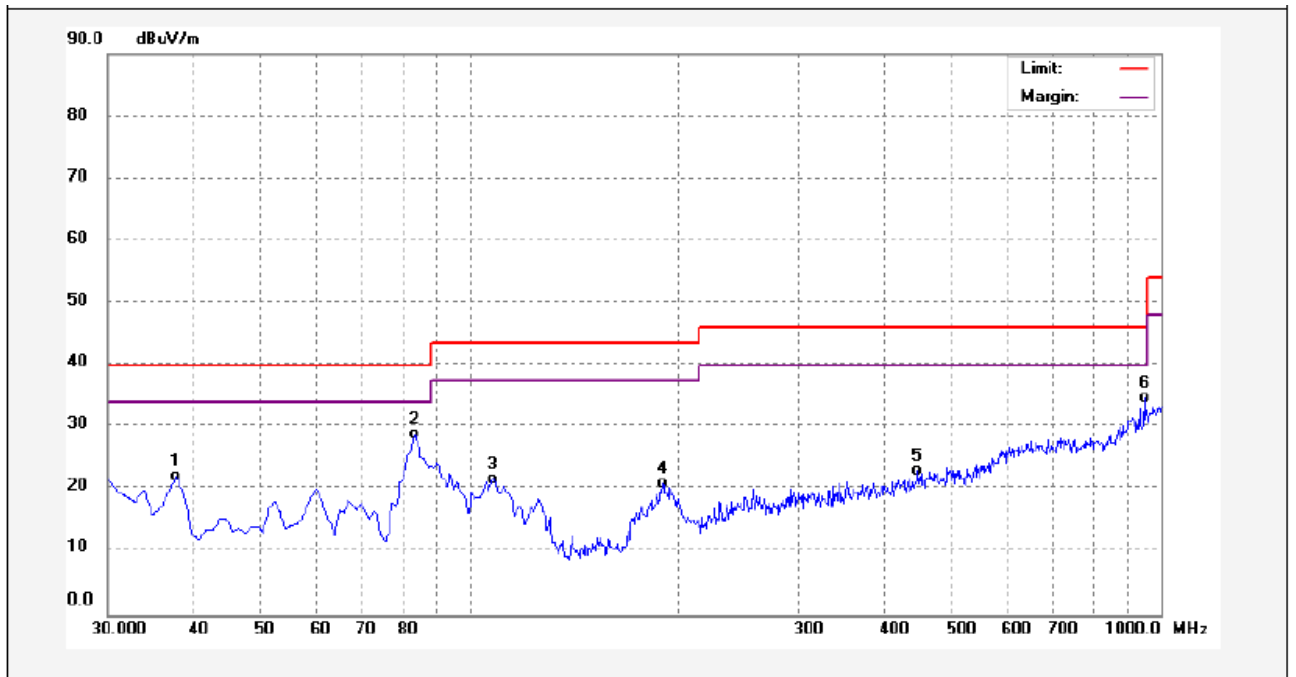
**802.11g: Low Channel 2412MHz (Vertical)**



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	62.0099	42.31	-13.86	28.45	40.00	-11.55	QP	
2	90.1400	43.90	-14.88	29.02	43.50	-14.48	QP	
3	122.1500	45.30	-15.08	30.22	43.50	-13.28	QP	
4	172.5900	36.67	-14.97	21.70	43.50	-21.80	QP	
5	424.7900	28.34	-6.05	22.29	46.00	-23.71	QP	
6	948.5900	31.10	4.13	35.23	46.00	-10.77	QP	

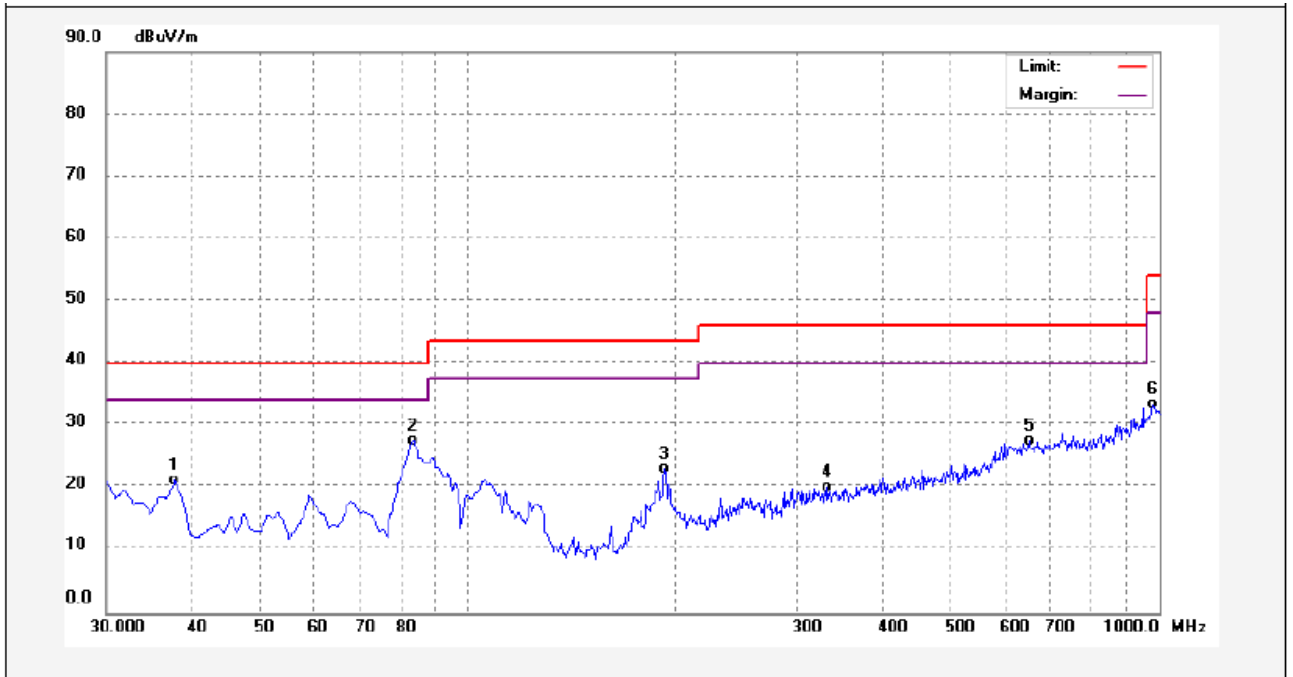


**802.11g: Low Channel 2412MHz (Horizontal)**



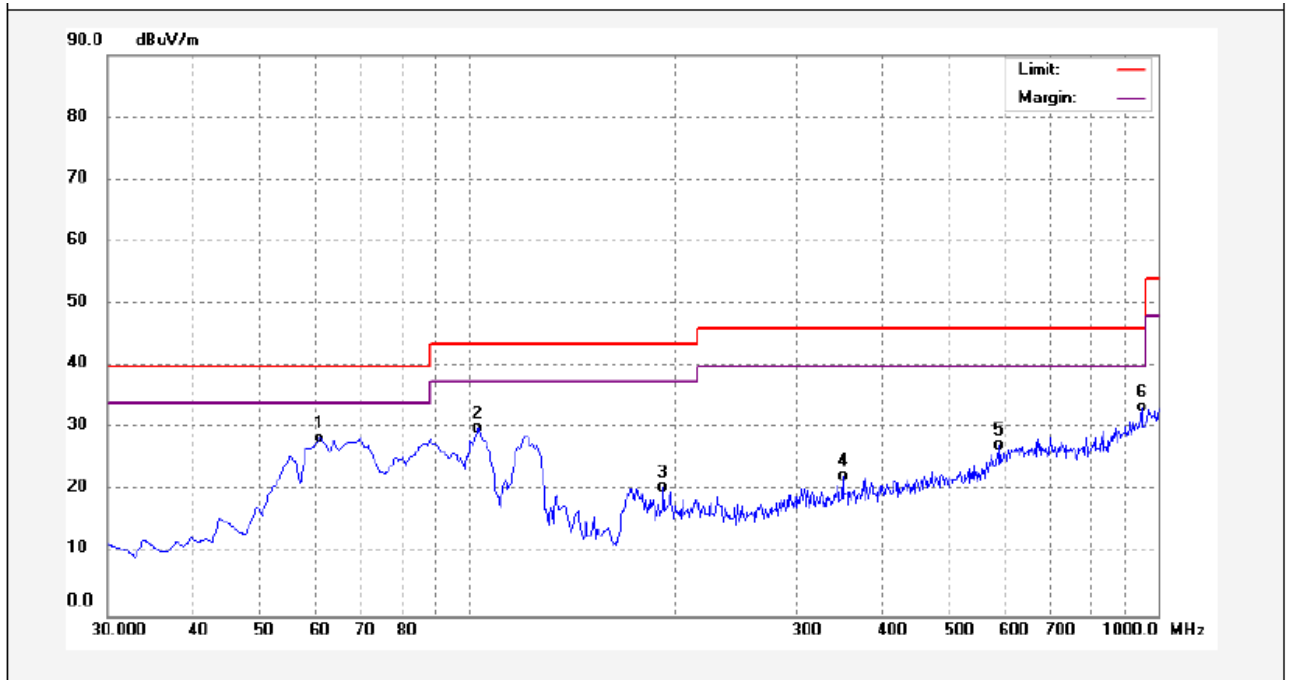
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	37.7599	37.08	-14.92	22.16	40.00	-17.84	QP	
2	83.3499	45.22	-16.33	28.89	40.00	-11.11	QP	
3	108.5899	35.29	-13.51	21.78	43.50	-21.72	QP	
4	191.0200	34.04	-13.05	20.99	43.50	-22.51	QP	
5	445.1600	28.80	-5.77	23.03	46.00	-22.97	QP	
6	948.5900	30.56	4.13	34.69	46.00	-11.31	QP	

**802.11n20: Low Channel 2412MHz (Vertical)**



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	37.7599	36.18	-14.92	21.26	40.00	-18.74	QP	
2	83.3499	43.98	-16.33	27.65	40.00	-12.35	QP	
3	192.9600	35.89	-12.88	23.01	43.50	-20.49	QP	
4	331.6700	27.74	-7.49	20.25	46.00	-25.75	QP	
5	648.8600	28.27	-0.76	27.51	46.00	-18.49	QP	
6	982.5399	27.71	5.62	33.33	54.00	-20.67	QP	

**802.11n20: Low Channel 2412MHz (Horizontal)**

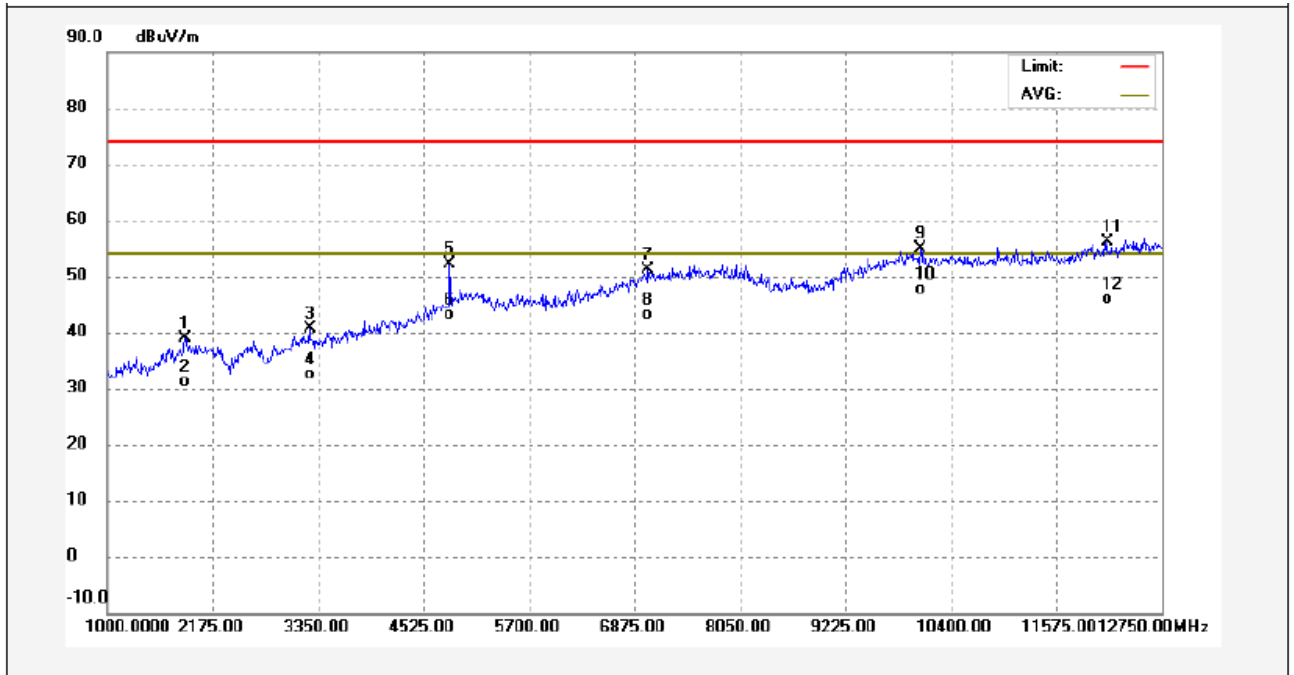


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	61.0399	42.15	-13.67	28.48	40.00	-11.52	QP	
2	103.7199	43.35	-13.24	30.11	43.50	-13.39	QP	
3	191.9900	33.60	-12.96	20.64	43.50	-22.86	QP	
4	350.1000	29.63	-7.30	22.33	46.00	-23.67	QP	
5	589.6900	29.26	-1.93	27.33	46.00	-18.67	QP	
6	948.5900	29.22	4.13	33.35	46.00	-12.65	QP	

**Test Frequency: 1GHz~12.75GHz (only the worst-case plots for each mode)**

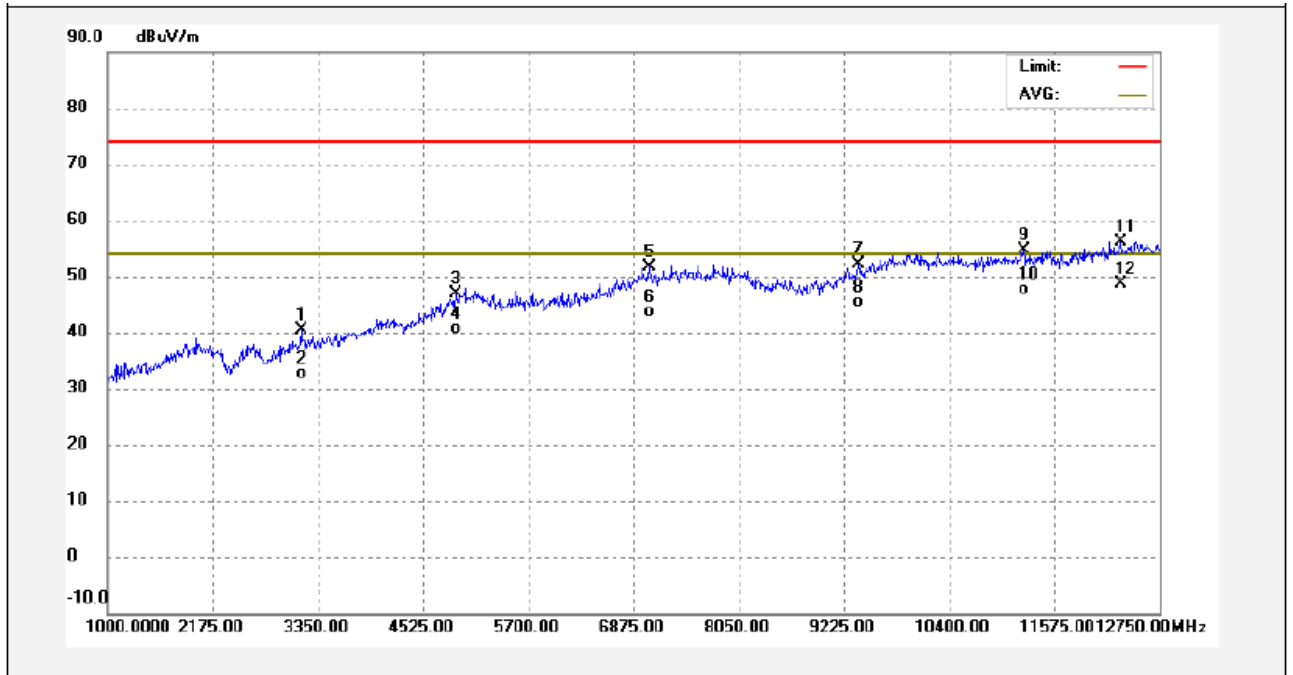
**Remark: The current test plots doesn't have the fundamental signal, It's blocked by the filter**

**802.11b: Low Channel 2412MHz (Vertical)**



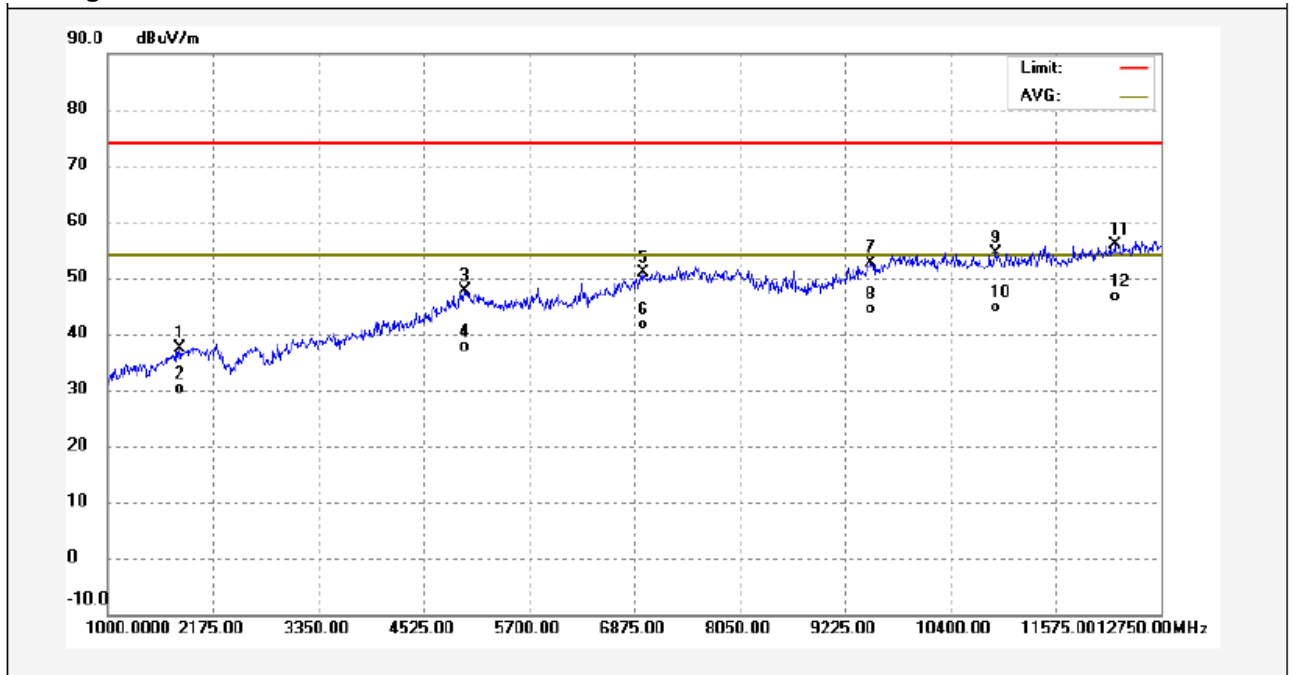
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	1889.500	50.13	-11.24	38.89	74.00	-35.11	peak	
2	1889.500	42.26	-11.24	31.02	54.00	-22.98	AVG	
3	3256.000	50.46	-9.93	40.53	74.00	-33.47	peak	
4	3256.000	42.37	-9.93	32.44	54.00	-21.56	AVG	
5	4818.750	54.92	-2.77	52.15	74.00	-21.85	peak	
6	4818.750	45.99	-2.77	43.22	54.00	-10.78	AVG	
7	7027.750	48.60	2.57	51.17	74.00	-22.83	peak	
8	7027.750	40.64	2.57	43.21	54.00	-10.79	AVG	
9	10059.250	50.84	3.97	54.81	74.00	-19.19	peak	
10	10059.250	43.77	3.97	47.74	54.00	-6.26	AVG	
11	12139.000	49.51	6.51	56.02	74.00	-17.98	peak	
12	12139.000	39.44	6.51	45.95	54.00	-8.05	AVG	

**802.11b: Low Channel 2412MHz (Horizontal)**



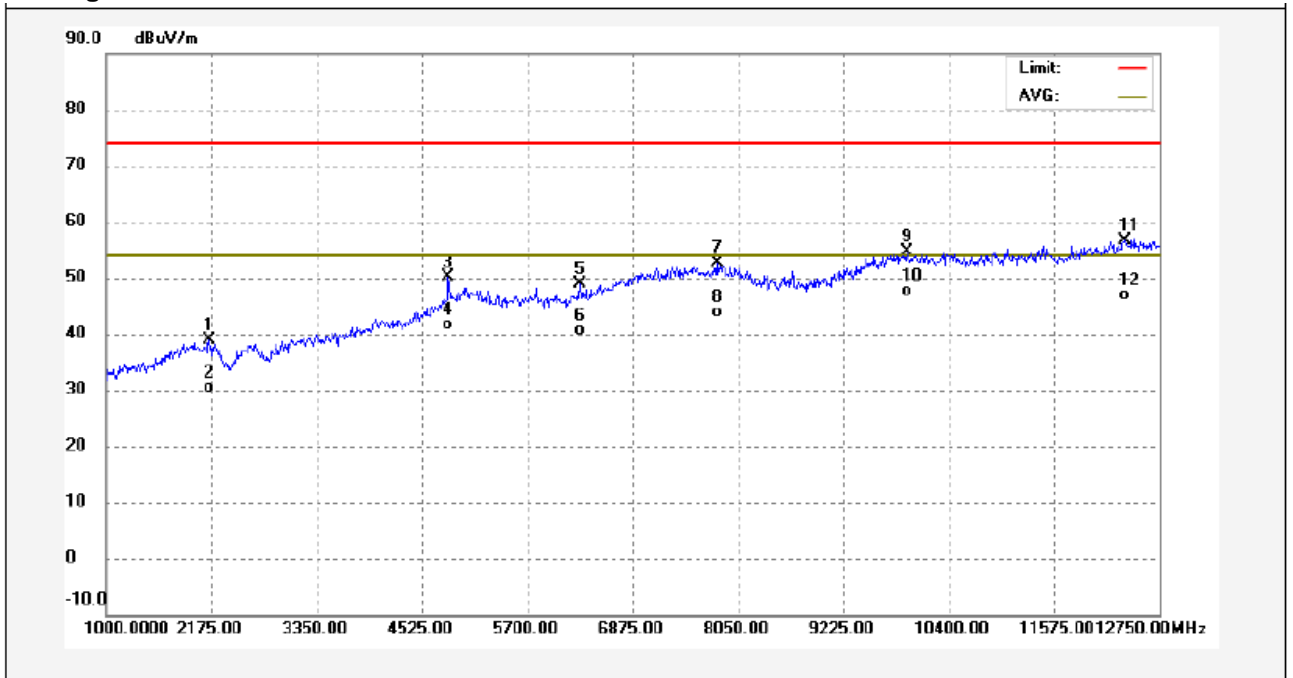
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	3162.000	47.65	-7.25	40.40	74.00	-33.60	peak	
2	3162.000	39.82	-7.25	32.57	54.00	-21.43	AVG	
3	4889.250	51.38	-4.38	47.00	74.00	-27.00	peak	
4	4889.250	44.97	-4.38	40.59	54.00	-13.41	AVG	
5	7051.250	49.16	2.36	51.52	74.00	-22.48	peak	
6	7051.250	41.33	2.36	43.69	54.00	-10.31	AVG	
7	9389.500	48.06	4.16	52.22	74.00	-21.78	peak	
8	9389.500	41.18	4.16	45.34	54.00	-8.66	AVG	
9	11234.250	48.39	6.34	54.73	74.00	-19.27	peak	
10	11234.250	41.18	6.34	47.52	54.00	-6.48	AVG	
11	12315.250	49.45	6.66	56.11	74.00	-17.89	peak	
12	12315.250	41.91	6.66	48.57	74.00	-25.43	peak	

**802.11g: Low Channel 2412MHz (Vertical)**



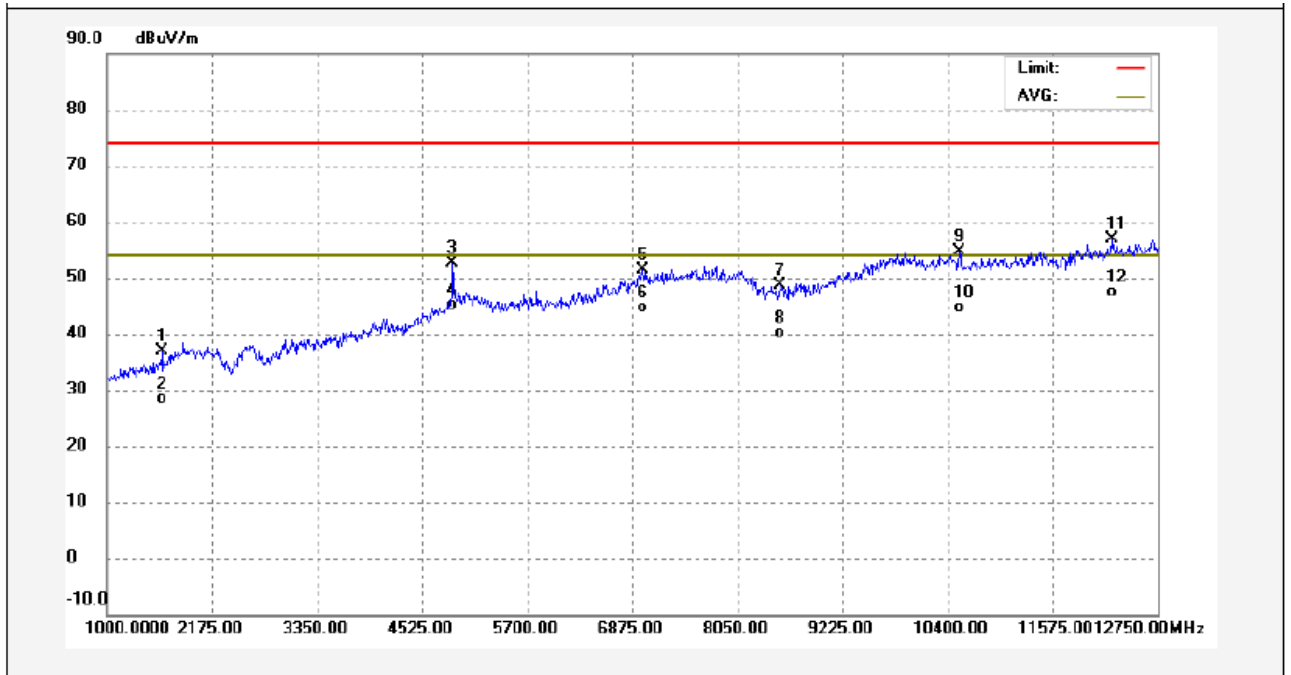
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	1810.750	47.11	-9.72	37.39	74.00	-36.61	peak	
2	1810.750	39.82	-9.72	30.10	54.00	-23.90	AVG	
3	4983.250	51.74	-4.10	47.64	74.00	-26.36	peak	
4	4983.250	41.69	-4.10	37.59	54.00	-16.41	AVG	
5	6969.000	48.83	2.15	50.98	74.00	-23.02	peak	
6	6969.000	39.36	2.15	41.51	54.00	-12.49	AVG	
7	9518.750	48.27	4.32	52.59	74.00	-21.41	peak	
8	9518.750	39.95	4.32	44.27	54.00	-9.73	AVG	
9	10905.250	48.42	5.98	54.40	74.00	-19.60	peak	
10	10905.250	38.59	5.98	44.57	54.00	-9.43	AVG	
11	12233.000	49.24	6.56	55.80	74.00	-18.20	peak	
12	12233.000	39.95	6.56	46.51	54.00	-7.49	AVG	

802.11g: Low Channel 2412MHz (Horizontal)



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2151.500	49.83	-10.92	38.91	74.00	-35.09	peak	
2	2151.500	41.39	-10.92	30.47	54.00	-23.53	AVG	
3	4818.750	52.91	-2.77	50.14	74.00	-23.86	peak	
4	4818.750	44.29	-2.77	41.52	54.00	-12.48	AVG	
5	6287.500	49.48	-0.56	48.92	74.00	-25.08	peak	
6	6287.500	41.11	-0.56	40.55	54.00	-13.45	AVG	
7	7815.000	50.42	2.15	52.57	74.00	-21.43	peak	
8	7815.000	41.72	2.15	43.87	54.00	-10.13	AVG	
9	9941.750	50.81	3.83	54.64	74.00	-19.36	peak	
10	9941.750	43.68	3.83	47.51	54.00	-6.49	AVG	
11	12362.250	49.72	6.85	56.57	74.00	-17.43	peak	
12	12362.250	39.92	6.85	46.77	54.00	-7.23	AVG	

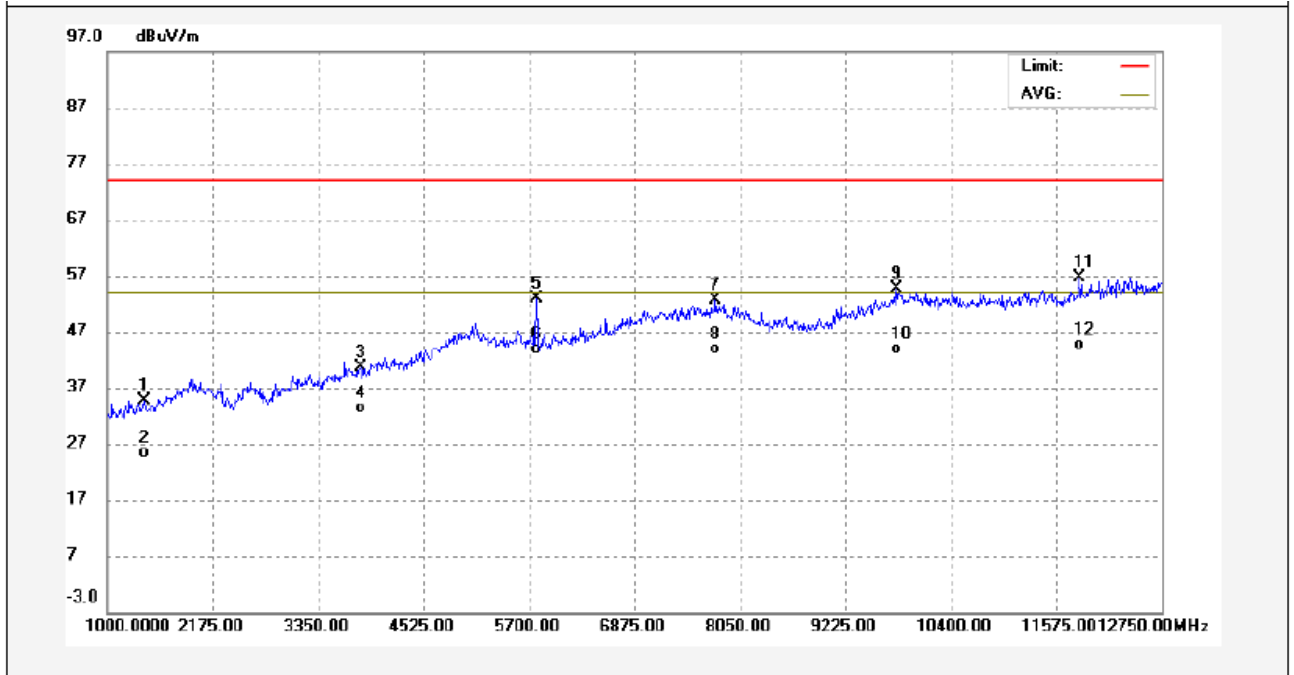
802.11 n20: Low Channel 2412MHz (Vertical)



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	1622.750	49.77	-12.90	36.87	74.00	-37.13	peak	
2	1622.750	41.35	-12.90	28.45	54.00	-25.55	AVG	
3	4865.750	54.94	-2.40	52.54	74.00	-21.46	peak	
4	4865.750	47.61	-2.40	45.21	54.00	-8.79	AVG	
5	6992.500	48.68	2.58	51.26	74.00	-22.74	peak	
6	6992.500	41.94	2.58	44.52	54.00	-9.48	AVG	
7	8520.000	46.94	1.65	48.59	74.00	-25.41	peak	
8	8520.000	38.46	1.65	40.11	54.00	-13.89	AVG	
9	10529.250	49.88	4.68	54.56	74.00	-19.44	peak	
10	10529.250	40.07	4.68	44.75	54.00	-9.25	AVG	
11	12233.000	50.33	6.65	56.98	74.00	-17.02	peak	
12	12233.000	40.77	6.65	47.42	54.00	-6.58	AVG	



**802.11 n20: Low Channel 2412MHz (Horizontal)**



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	1411.250	46.80	-12.07	34.73	74.00	-39.27	peak	
2	1411.250	37.43	-12.07	25.36	54.00	-28.64	AVG	
3	3820.000	47.30	-6.70	40.60	74.00	-33.40	peak	
4	3820.000	40.20	-6.70	33.50	54.00	-20.50	AVG	
5	5782.250	55.44	-2.68	52.76	74.00	-21.24	peak	
6	5782.250	46.49	-2.68	43.81	54.00	-10.19	AVG	
7	7779.750	49.71	2.80	52.51	74.00	-21.49	peak	
8	7779.750	41.15	2.80	43.95	54.00	-10.05	AVG	
9	9800.750	49.89	4.76	54.65	74.00	-19.35	peak	
10	9800.750	39.09	4.76	43.85	54.00	-10.15	AVG	
11	11833.500	50.24	6.42	56.66	74.00	-17.34	peak	
12	11833.500	38.27	6.42	44.69	54.00	-9.31	AVG	

**Test Frequency : 12.75GHz ~ 25GHz**

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

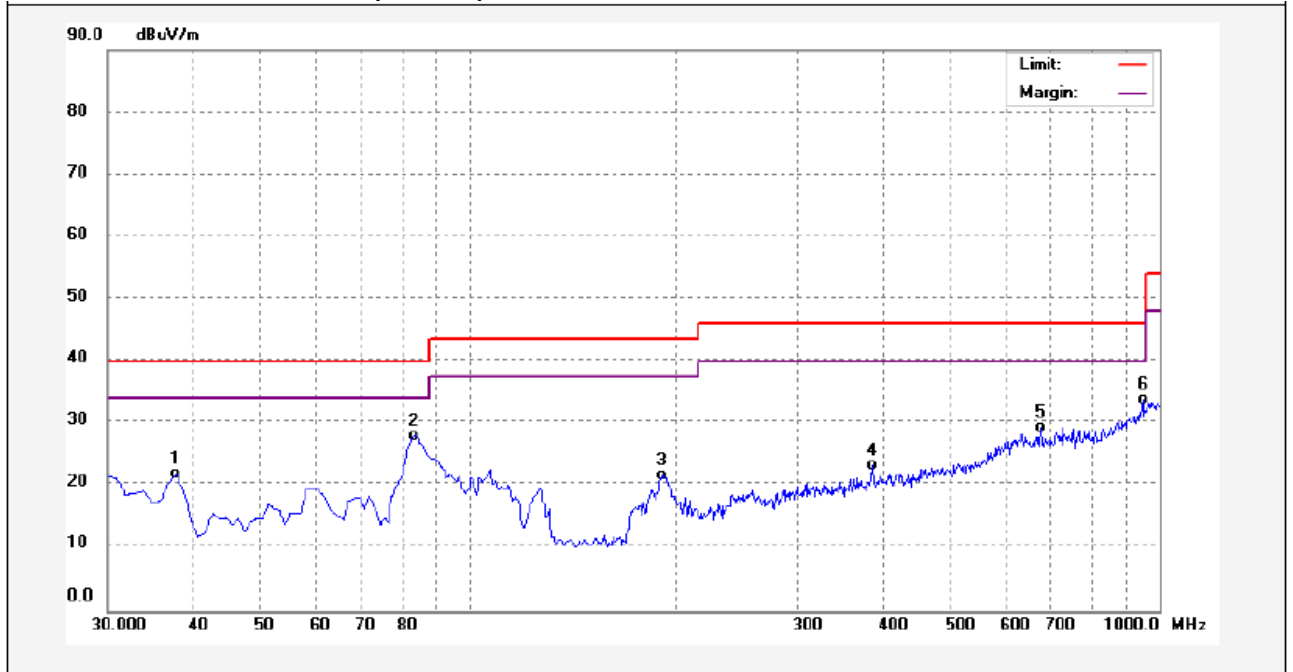
**BT BLE:**

**Test Frequency: 9KHz~30MHz**

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

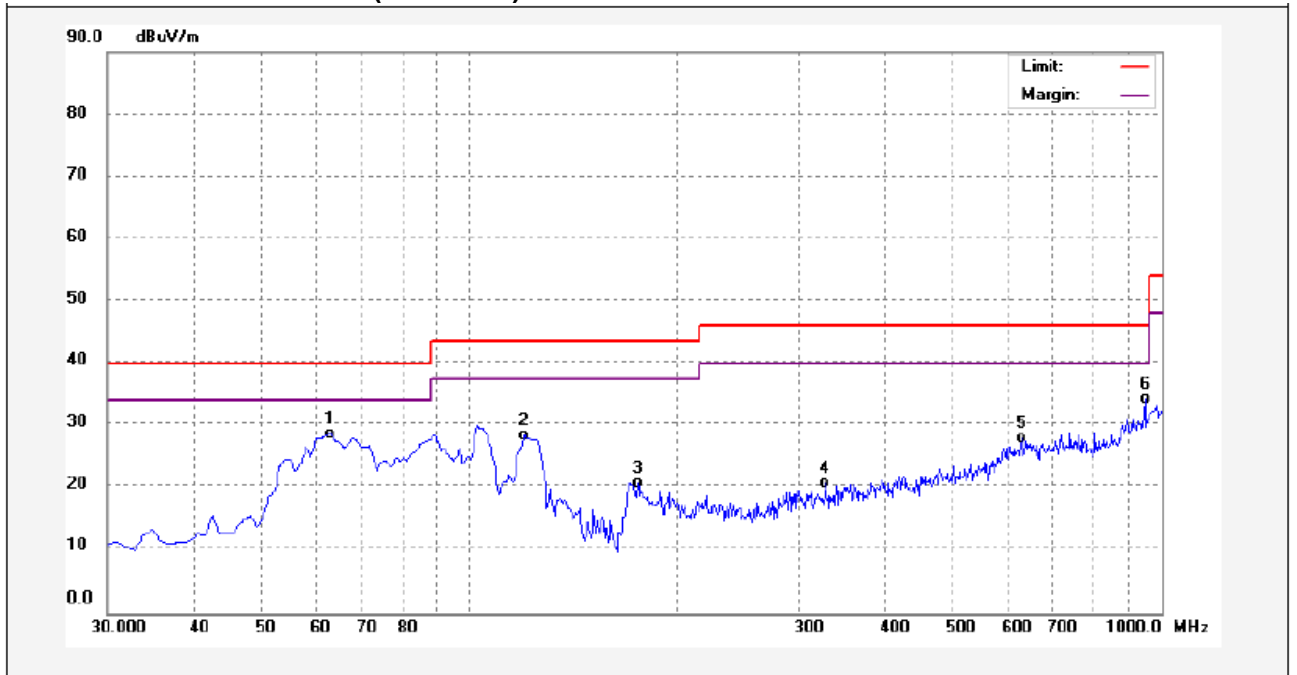
**Test Frequency : 30MHz ~ 1GHz**

**GFSK Low Channel 2402MHz(Vertical)**



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	37.7599	36.95	-14.92	22.03	40.00	-17.97	QP	
2	83.3499	44.43	-16.33	28.10	40.00	-11.90	QP	
3	191.0200	34.83	-13.05	21.78	43.50	-21.72	QP	
4	384.0500	30.07	-6.69	23.38	46.00	-22.62	QP	
5	674.0800	29.90	-0.53	29.37	46.00	-16.63	QP	
6	948.5900	29.84	4.13	33.97	46.00	-12.03	QP	

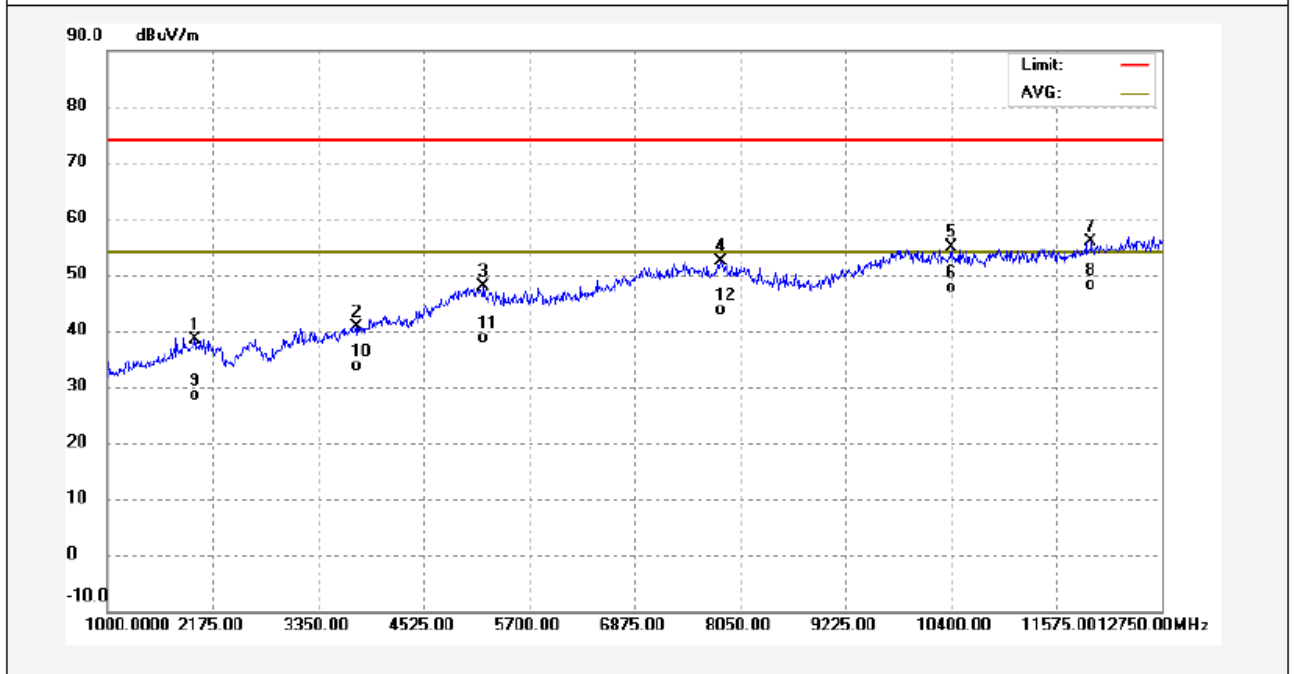
**GFSK Low Channel 2402MHz(Horizontal)**



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	62.9799	42.80	-14.07	28.73	40.00	-11.27	QP	
2	120.2099	42.84	-14.26	28.38	43.50	-15.12	QP	
3	175.5000	35.53	-14.77	20.76	43.50	-22.74	QP	
4	326.8199	28.25	-7.54	20.71	46.00	-25.29	QP	
5	629.4600	29.07	-0.96	28.11	46.00	-17.89	QP	
6	945.6799	30.17	4.05	34.22	46.00	-11.78	QP	

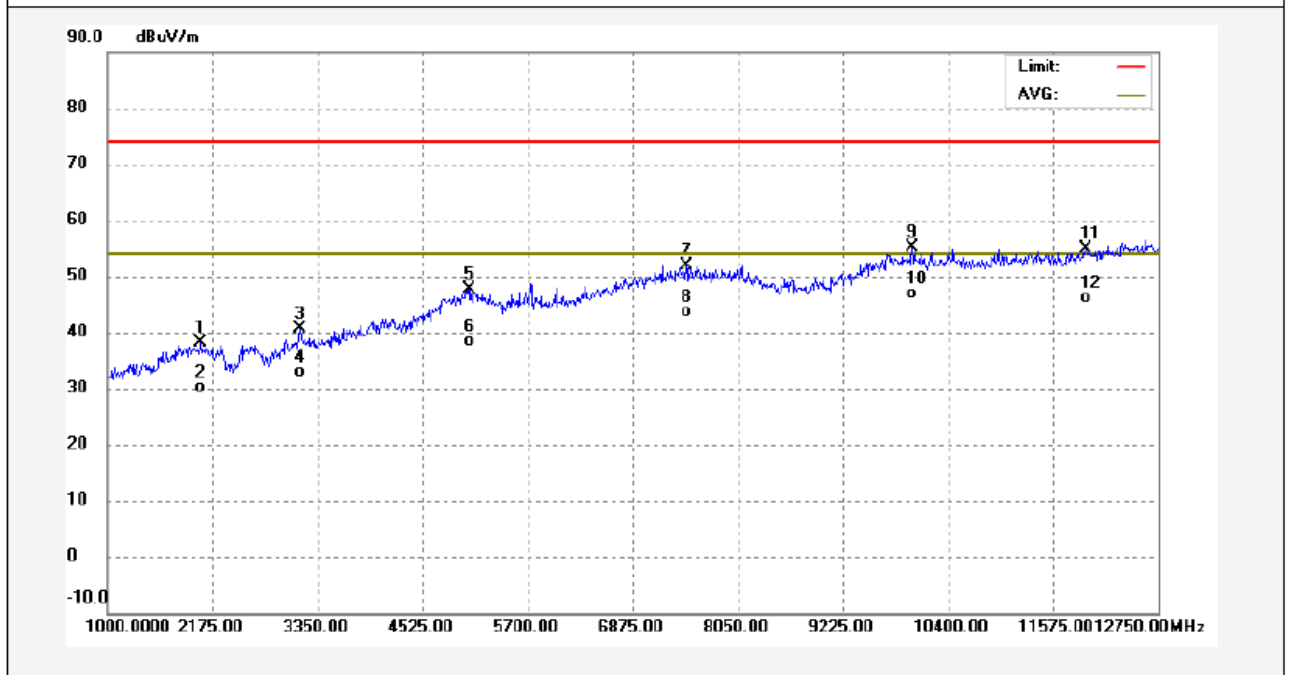
**Test Frequency : 1GHz ~ 12.75GHz**

**Remark: The current test plots doesn't have the fundamental signal, It's blocked by the filter  
GFSK Low Channel 2402MHz(Vertical)**



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	1975.250	47.04	-8.72	38.32	74.00	-35.68	peak	
2	3773.000	47.46	-6.75	40.71	74.00	-33.29	peak	
3	5194.750	51.38	-3.62	47.76	74.00	-26.24	peak	
4	7838.500	49.62	2.82	52.44	74.00	-21.56	peak	
5	10400.000	49.31	5.51	54.82	74.00	-19.18	peak	
6	10400.000	42.03	5.51	47.54	54.00	-6.46	AVG	
7	11962.750	49.50	6.32	55.82	74.00	-18.18	peak	
8	11962.750	41.92	6.32	48.24	54.00	-5.76	AVG	
9	1975.250	37.19	-8.72	28.47	54.00	-25.53	AVG	
10	3773.000	40.27	-6.75	33.52	54.00	-20.48	AVG	
11	5194.750	42.14	-3.62	38.52	54.00	-15.48	AVG	
12	7838.500	40.75	2.82	43.57	54.00	-10.43	AVG	

**GFSK Low Channel 2402MHz(Horizontal)**



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2045.750	48.77	-10.54	38.23	74.00	-35.77	peak	
2	2045.750	40.78	-10.54	30.24	54.00	-23.76	AVG	
3	3150.250	50.90	-10.22	40.68	74.00	-33.32	peak	
4	3150.250	43.06	-10.22	32.84	54.00	-21.16	AVG	
5	5053.750	49.21	-1.55	47.66	74.00	-26.34	peak	
6	5053.750	39.83	-1.55	38.28	54.00	-15.72	AVG	
7	7474.250	49.96	1.97	51.93	74.00	-22.07	peak	
8	7474.250	41.61	1.97	43.58	54.00	-10.42	AVG	
9	10000.500	51.19	3.88	55.07	74.00	-18.93	peak	
10	10000.500	43.00	3.88	46.88	54.00	-7.12	AVG	
11	11939.250	48.61	6.26	54.87	74.00	-19.13	peak	
12	11939.250	39.99	6.26	46.25	54.00	-7.75	AVG	

**Test Frequency: 12.75GHz~25GHz**

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

## 8 Conducted Spurious Emissions

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: KDB 558074 D01 15.247 Meas Guidance v05 August 24, 2018;  
ANSI C63.10:2013

Test Result: PASS

Limit:

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 Section 15.209(a) is not required. 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)).

### 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:
  - a) Set instrument center frequency to DTS channel center frequency.
  - b) Set the span to  $\approx 1.5$  times the DTS bandwidth.
  - c) Set the RBW = 100 kHz.
  - d) Set the VBW  $\approx [3 \times \text{RBW}]$ .
  - e) Detector = peak.
  - f) Sweep time = auto couple.
  - g) Trace mode = max hold.
  - h) Allow trace to fully stabilize.
  - i) Use the peak marker function to determine the maximum PSD level.

Note that the channel found to contain the maximum PSD level can be used to establish the reference level.

## 8.2 Test Result

Remark: Refer to Original report WTD21D01009766W001 V2

## 9 Band Edge Measurement

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: KDB 558074 D01 15.247 Meas Guidance v05 August 24, 2018;  
ANSI C63.10:2013

Test Limit: Regulation 15.247 (d), In any 100 kHz bandwidth outside the frequency band 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)).

Test Mode: Transmitting

### 9.1 Test Produce

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.



## 9.2 Test Result

Remark: Refer to Original report WTD21D01009766W001 V2

## **10 6 dB Bandwidth and 99% Bandwidth Measurement**

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: KDB 558074 D01 15.247 Meas Guidance v05 August 24, 2018;

ANSI C63.10:2013

### **10.1 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

### **10.2 Test Result:**

Remark: Refer to Original report WTD21D01009766W001 V2

## 11 Maximum Peak Output Power

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: KDB 558074 D01 15.247 Meas Guidance v05 August 24, 2018;  
ANSI C63.10:2013

### 11.1 Test Procedure:

KDB 558074 D01 15.247 Meas Guidance v05 August 24, 2018

section 8.3.1.1 (For BLE)

This procedure shall be used when the measurement instrument has available a resolution bandwidth that is greater than the DTS bandwidth.

- a) Set the RBW  $\geq$  DTS bandwidth.
- b) Set VBW  $\geq 3$  RBW.
- c) Set span  $\geq 3 \times$  RBW
- d) Sweep time = auto couple.
- e) Detector = peak.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
- h) Use peak marker function to determine the peak amplitude level.

section 8.3.1.2 (For WIFI)

This procedure may be used when the maximum available RBW of the measurement instrument is less than the DTS bandwidth.

- a) Set the RBW = 1% to 5% of the OBW, not to exceed 1 MHz..
- b) Set the VBW  $\geq 3 \times$  RBW
- c) Set the span  $\geq 1.5 \times$  OBW.
- d) Detector = RMS.
- e) Sweep time = auto couple.
- f) trigger = free run..
- g) Number of points in sweep  $\geq [2 \times \text{span} / \text{RBW}]$ . (This gives bin-to-bin spacing  $\geq \text{RBW} / 2$ , so that narrowband signals are not lost between frequency bins.)
- h) Trace average at least 100 traces in power averaging (rms) mode.
- i) Compute power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function, with band limits set equal to the OBW band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at intervals equal to the RBW extending across the entire OBW of the spectrum..

## **11.2 Test Result:**

Remark: Refer to Original report WTD21D01009766W001 V2

## 12 Power Spectral density

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: KDB 558074 D01 15.247 Meas Guidance v05 August 24, 2018;  
ANSI C63.10:2013

### 12.1 Test Procedure:

KDB 558074 D01 DTS Meas Guidance v04 April 5, 2017 section 10.2

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.

### 12.2 Test Result:

Remark: Refer to Original report WTD21D01009766W001 V2

## **13 Antenna Requirement**

According to the FCC Part 15 Paragraph 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. This product has an integrated antenna fulfill the requirement of this section.

## **14 RF Exposure**

Remark: refer to MPE test report: WTD21D01009766W005

## **15 Photographs of test setup and EUT.**

Note: Please refer to appendix: Appendix- M202138002-Photos.

=====**End of Report**=====