

# TEST REPORT

Reference No. .... : WTD21D09101438W003  
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 E Section 15.407  
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 WTD21D01009766W003  
... V1, 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:

Approved by:

*Levi Xiao*

Levi Xiao / Project Engineer



*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 .....	6
<b>5 TEST MODE DESCRIPTION:</b> .....	<b>8</b>
5.1 TEST FACILITY .....	8
<b>6 EQUIPMENT USED DURING TEST</b> .....	<b>9</b>
6.1 EQUIPMENTS LIST .....	9
6.2 MEASUREMENT UNCERTAINTY .....	10
6.3 TEST EQUIPMENT CALIBRATION .....	10
<b>7 TEST SUMMARY</b> .....	<b>11</b>
<b>8 RADIATED EMISSIONS</b> .....	<b>12</b>
8.1 EUT OPERATION.....	12
8.2 TEST SETUP .....	13
8.3 SPECTRUM ANALYZER SETUP .....	14
8.4 TEST PROCEDURE .....	15
8.5 CORRECTED AMPLITUDE & MARGIN CALCULATION .....	15
8.6 SUMMARY OF TEST RESULTS .....	16
<b>9 DUTY CYCLE</b> .....	<b>28</b>
9.1 SUMMARY OF TEST RESULTS .....	29
<b>10 BAND EDGE</b> .....	<b>30</b>
10.1 TEST PROCEDURE .....	30
10.2 TEST RESULT .....	31
<b>11 6 DB BANDWIDTH</b> .....	<b>32</b>
11.1 TEST PROCEDURE:.....	32
11.2 TEST RESULT: .....	32
<b>12 26 DB BANDWIDTH AND 99% OCCUPIED BANDWIDTH</b> .....	<b>33</b>
12.1 TEST PROCEDURE:.....	33
12.2 TEST RESULT: .....	33
<b>13 CONDUCTED OUTPUT POWER</b> .....	<b>34</b>
13.1 TEST PROCEDURE:.....	34
13.2 TEST RESULT : .....	35
<b>14 POWER SPECTRAL DENSITY</b> .....	<b>36</b>
14.1 TEST PROCEDURE:.....	36
14.2 TEST RESULT: .....	37
<b>15 FREQUENCY STABILITY</b> .....	<b>38</b>
<b>16 ANTENNA REQUIREMENT</b> .....	<b>39</b>
<b>17 PHOTOGRAPHS OF TEST SETUP AND EUT</b> .....	<b>40</b>

### 3 Revision History

Test report No.	Date of Receipt sample	Date of Test	Date of Issue	Purpose	Comment	Approved
WTD21D09101438 W003	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:	802.11a/n/ac (HT20): U-NII-1: 5150-5250MHz, U-NII-2A: 5250-5350MHz(DFS), U-NII-2C: 5470-5725MHz(DFS), U-NII-3:5725-5850MHz 802.11n/ac (HT40): U-NII-1: 5190-5230MHz, U-NII-2A: 5270-5310MHz(DFS), U-NII-2C: 5510-5670MHz(DFS), U-NII-3: 5755-5795MHz 802.11ac (HT80): U-NII-1: 5210MHz, U-NII-2A: 5290MHz(DFS), U-NII-2C: 5530-5610MHz, U-NII-3: 5775MHz
Max. RF output power:	ANT 0: 17.21dBm ANT 1: 16.71dbm Total:19.88dBm
Type of Modulation:	OFDM
Antenna installation:	External antenna with RP-SMA connector
Antenna Gain:	4.5dBi
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 WTD21D01009766W003 V1 for other test data

#### 4.4 Channel List

U-NII-1 (5.15-5.25GHz)			
channel	Frequency(MHz)	channel	Frequency(MHz)
36	5180	38	5190
40	5200	42	5210
44	5220	46	5230
48	5240		

U-NII-2A (5.25-5.35GHz)			
channel	Frequency(MHz)	channel	Frequency(MHz)
52	5260	54	5270
56	5280	58	5290
60	5300	62	5310
64	5320		

U-NII-2C (5.47-5.725GHz)			
channel	Frequency(MHz)	channel	Frequency(MHz)
100	5500	102	5510
104	5520	108	5540
110	5550	112	5560
116	5580	118	5590
120	5600	124	5620
126	5630	128	5640
132	5660	134	5670
136	5680	140	5700

U-NII-3 (5.725-5.85GHz)			
channel	Frequency(MHz)	channel	Frequency(MHz)
149	5745	151	5755
153	5765	155	5775
157	5785	159	5795
161	5805	165	5825

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

For 802.11a/n/ac(HT20):

channel	Frequency(MHz)	channel	Frequency(MHz)
36	5180	40	5200
48	5240		

channel	Frequency(MHz)	channel	Frequency(MHz)
52	5260	56	5280
64	5320		

channel	Frequency(MHz)	channel	Frequency(MHz)
100	5500	120	5600
140	5700		

channel	Frequency(MHz)	channel	Frequency(MHz)
149	5745	157	5785
165	5825		

For 802.11n/ac(HT40)/ ac(HT80):

channel	Frequency(MHz)	channel	Frequency(MHz)
38	5190	42	5210
46	5230		

channel	Frequency(MHz)	channel	Frequency(MHz)
54	5270	58	5290
62	5310		

channel	Frequency(MHz)	channel	Frequency(MHz)
102	5510	106	5530
110	5550	134	5670

channel	Frequency(MHz)	channel	Frequency(MHz)
151	5755	155	5775
159	5795		

## 5 Test Mode Description:

During testing, Channel and Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

Transmitting duty cycle is no less 98%.

The software is installed in operation system, named "QRCT4.exe", Version 4

Test Items	Mode	Data Rate	TX/RX
Radiated Emissions	802.11a (HT20)	6 Mbps	TX
	802.11n/ac(HT20/40/80)	MCS0	TX
Duty Cycle	802.11a (HT20)	6 Mbps	TX
	802.11n/ac(HT20/40/80)	MCS0	TX
Band Edge	802.11a (HT20)	6 Mbps	TX
	802.11n/ac(HT20/40/80)	MCS0	TX
6dB Bandwidth	802.11a (HT20)	6 Mbps	TX
	802.11n/ac(HT20/40/80)	MCS0	TX
26dB Bandwidth and 99% Occupied Bandwidth	802.11a (HT20)	6 Mbps	TX
	802.11n/ac(HT20/40/80)	MCS0	TX
Conducted Output Power	802.11a (HT20)	6 Mbps	TX
	802.11n/ac(HT20/40/80)	MCS0	TX
Power Spectral Density	802.11a (HT20)	6 Mbps	TX
	802.11n/ac(HT20/40/80)	MCS0	TX
Frequency Stability	Un-modulation	/	TX

### 5.1 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.**

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 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 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 (30M~1000MHz)
	$\pm 5.47$ dB (1000M~25000MHz)
Conducted Spurious Emissions test	$\pm 3.64$ dB (AC mains 150KHz~30MHz)

## 6.3 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 Test Summary

Test Items	Test Requirement	Result
Conducted Emissions	15.207(a)	N/A
Radiated Emissions	15.407(a) 15.205(a) 15.209(a)	PASS
Duty Cycle	KDB 789033	--
6dB Bandwidth	15.407(a)	PASS
26 dB Emission Bandwidth & 99% Occupied Bandwidth	15.407(a)	PASS
Maximum Conducted Output Power	15.407(a)	PASS
Power Spectral Density	15.407(a)	PASS
Unwanted Emissions that fall Outside of the Restricted Bands	15.407(a)	PASS
Antenna Requirement	15.203	PASS
Maximum Permissible Exposure (Exposure of Humans to RF Fields)	1.1307(b)(1)	PASS

## 8 Radiated Emissions

Test Requirement: FCC CFR47 Part 15 Section 15.209 & 15.407

Test Method: ANSI C63.10:2013

Test Result: PASS

Measurement Distance: 3m

Limit:

Frequency (MHz)	Field Strength		Field Strength Limit at 3m Measurement Distance	
	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>

### 8.1 EUT Operation

Operating Environment :

Temperature: 23.5 °C

Humidity: 52.1 % RH

Atmospheric Pressure: 101.2kPa

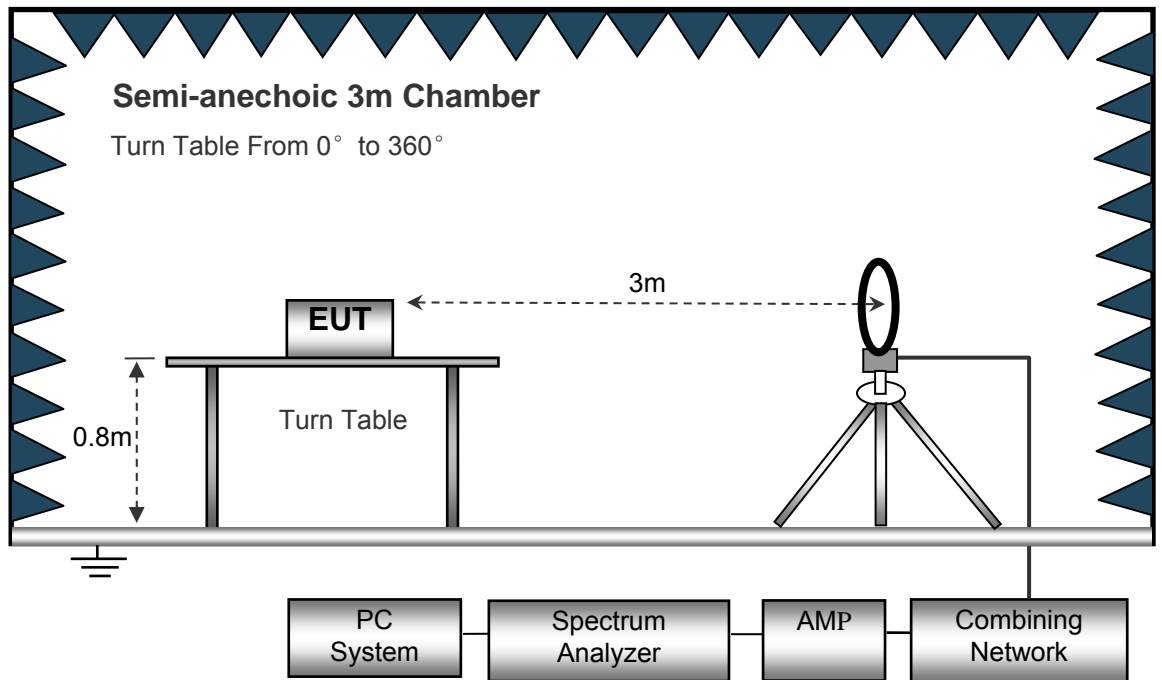
EUT Operation :

The test was performed in transmitting mode, the test data were shown in the report.

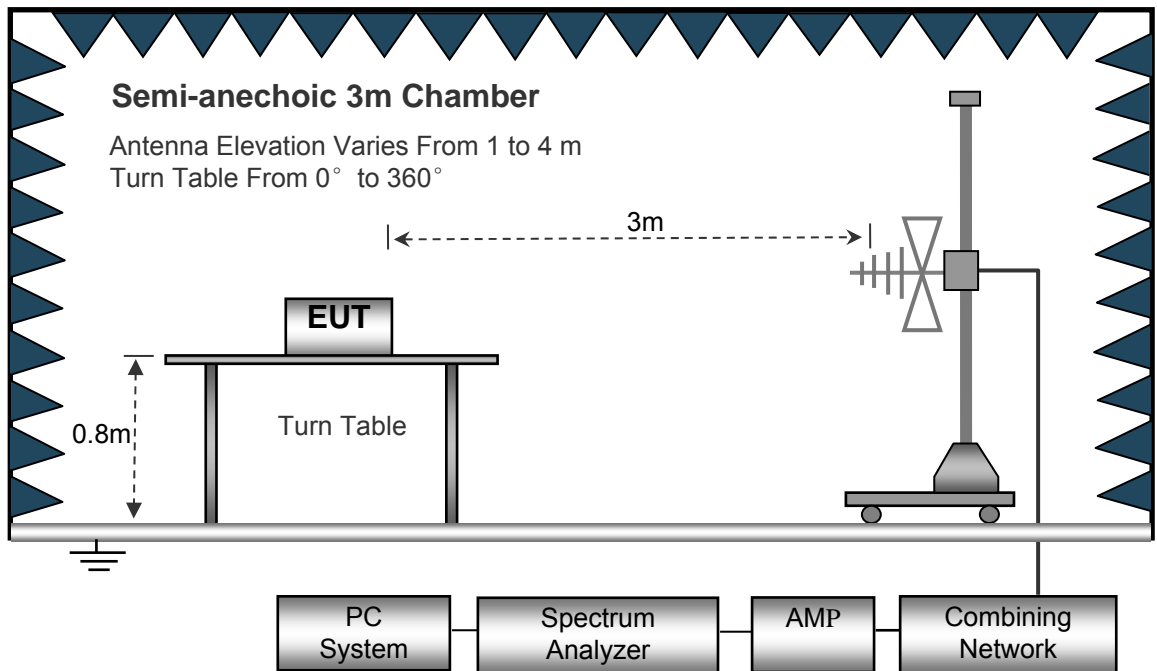
## 8.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.10: 2013.

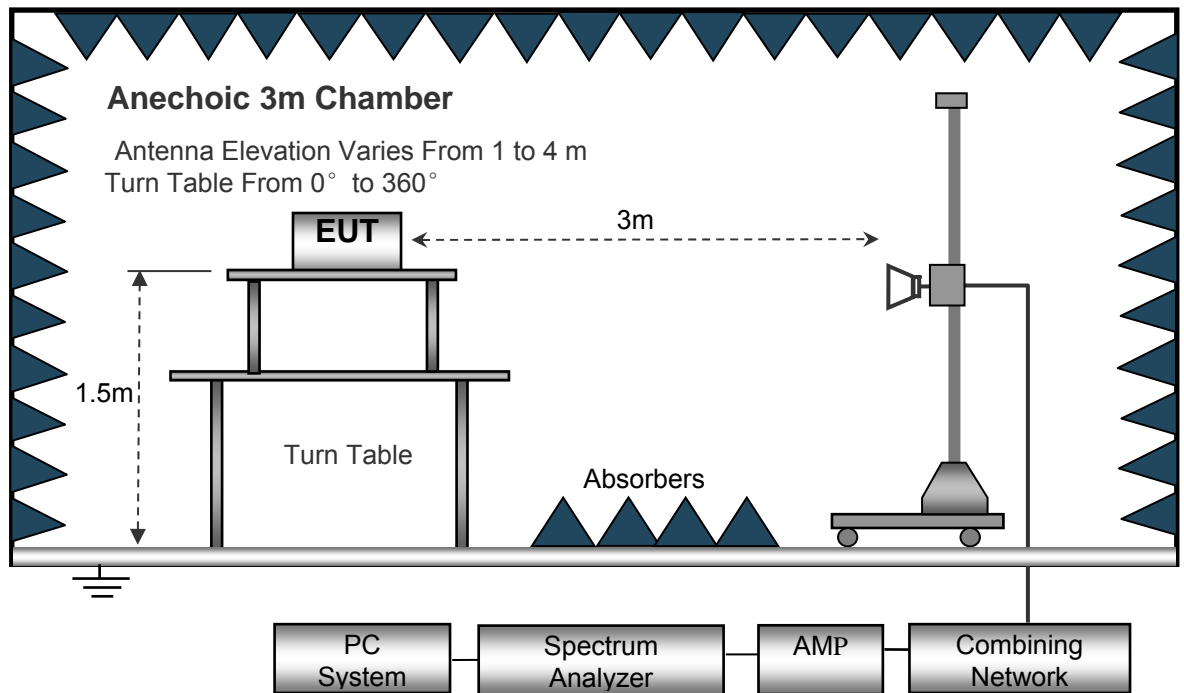
The test setup for emission measurement below 30MHz.



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



The test setup for emission measurement above 1 GHz.



### 8.3 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

## 8.4 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 X axis,so the worst data were shown as follow.
8. A 2.4GHz high –pass filter is used during radiated emissions above 1GHz measurement.

## 8.5 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:

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

### 8.6 Summary of Test Results

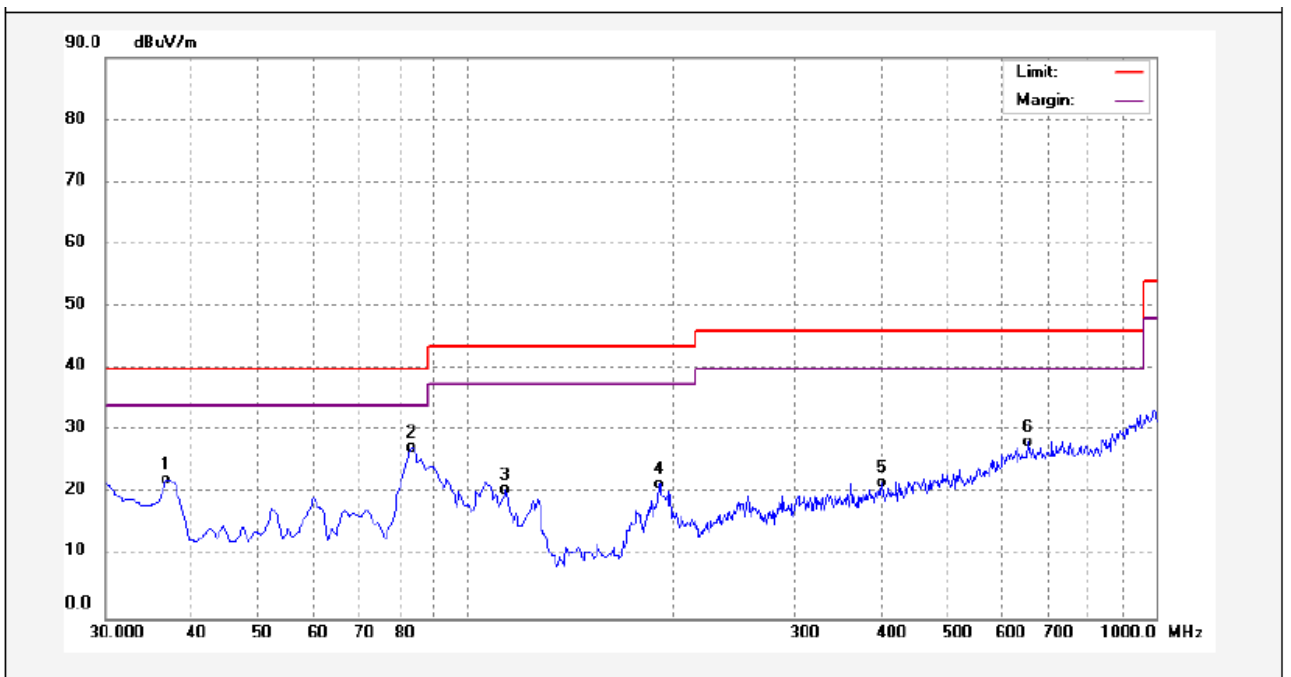
Remark: Both antenna 0 and antenna 1 are tested, The report shows only the worst data, U-NII-1 and antenna 0 is put in the report

**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)**

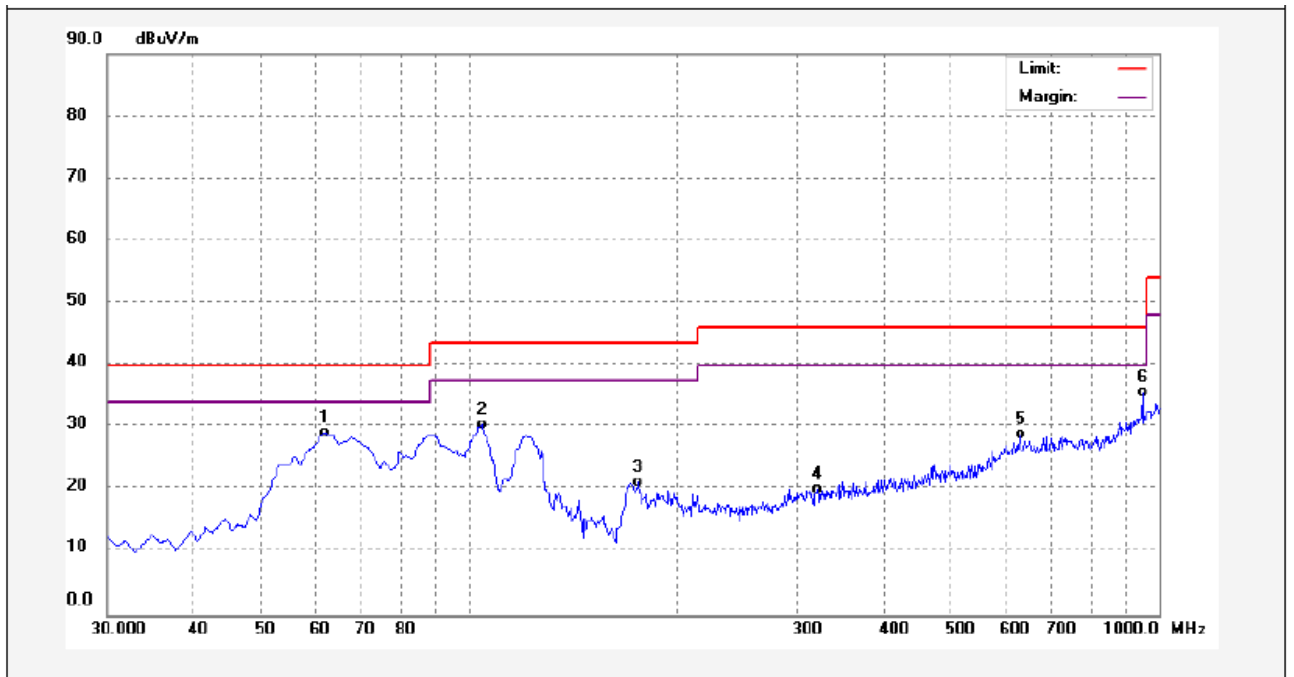
**802.11a: Low Channel 5180MHz (Vertical)**



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	36.7899	37.46	-15.28	22.18	40.00	-17.82	QP	
2	83.3499	43.74	-16.33	27.41	40.00	-12.59	QP	
3	114.3900	34.51	-13.90	20.61	43.50	-22.89	QP	
4	191.0200	34.58	-13.05	21.53	43.50	-21.97	QP	
5	400.5400	28.02	-6.39	21.63	46.00	-24.37	QP	
6	652.7400	28.87	-0.73	28.14	46.00	-17.86	QP	

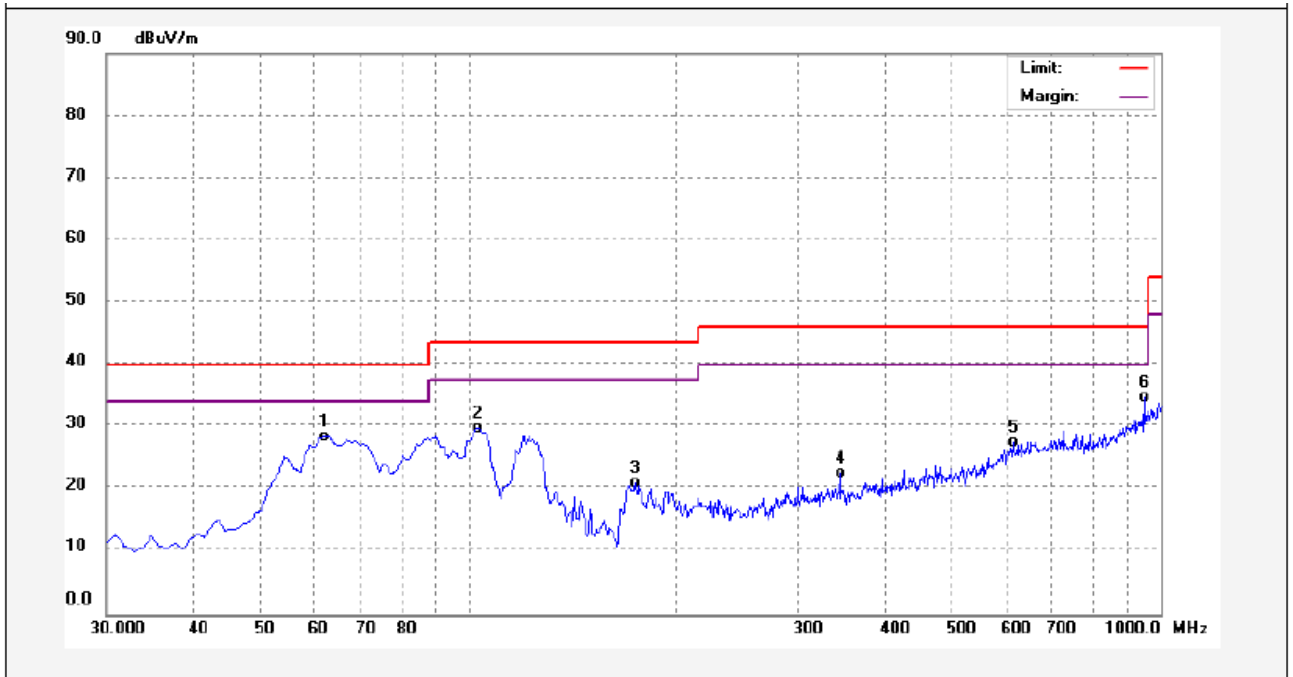


**802.11a: Low Channel 5180MHz (Horizontal)**



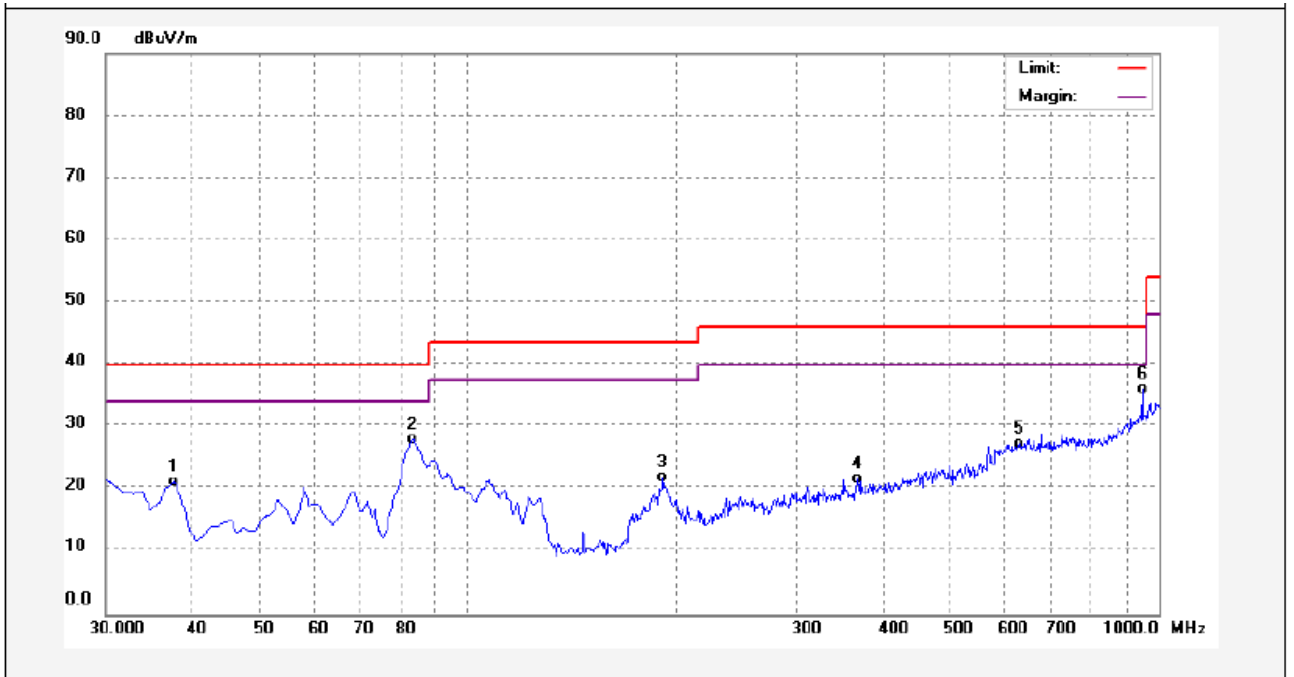
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	62.0099	43.07	-13.86	29.21	40.00	-10.79	QP	
2	104.6899	43.83	-13.27	30.56	43.50	-12.94	QP	
3	176.4699	36.06	-14.69	21.37	43.50	-22.13	QP	
4	320.0299	27.72	-7.60	20.12	46.00	-25.88	QP	
5	630.4299	29.78	-0.96	28.82	46.00	-17.18	QP	
6	948.5900	31.61	4.13	35.74	46.00	-10.26	QP	

**802.11n: Low Channel 5190MHz (Vertical)**



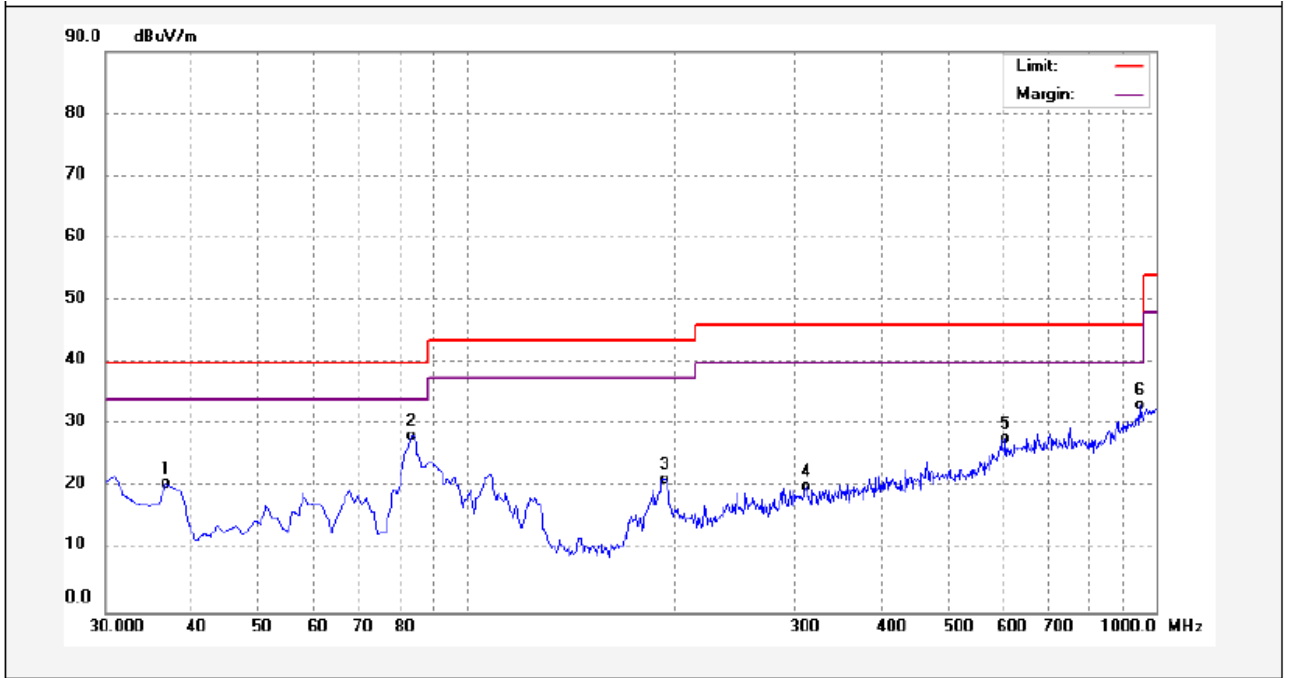
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	61.7779	42.17	-13.82	28.35	40.00	-11.65	QP	
2	103.7198	43.15	-13.24	29.91	43.50	-13.59	QP	
3	174.5300	35.96	-14.85	21.11	43.50	-22.39	QP	
4	345.2500	29.97	-7.35	22.62	46.00	-23.38	QP	
5	612.9699	28.67	-1.13	27.54	46.00	-18.46	QP	
6	948.5900	30.65	4.13	34.78	46.00	-11.22	QP	

**802.11n: Low Channel 5190MHz (Horizontal)**



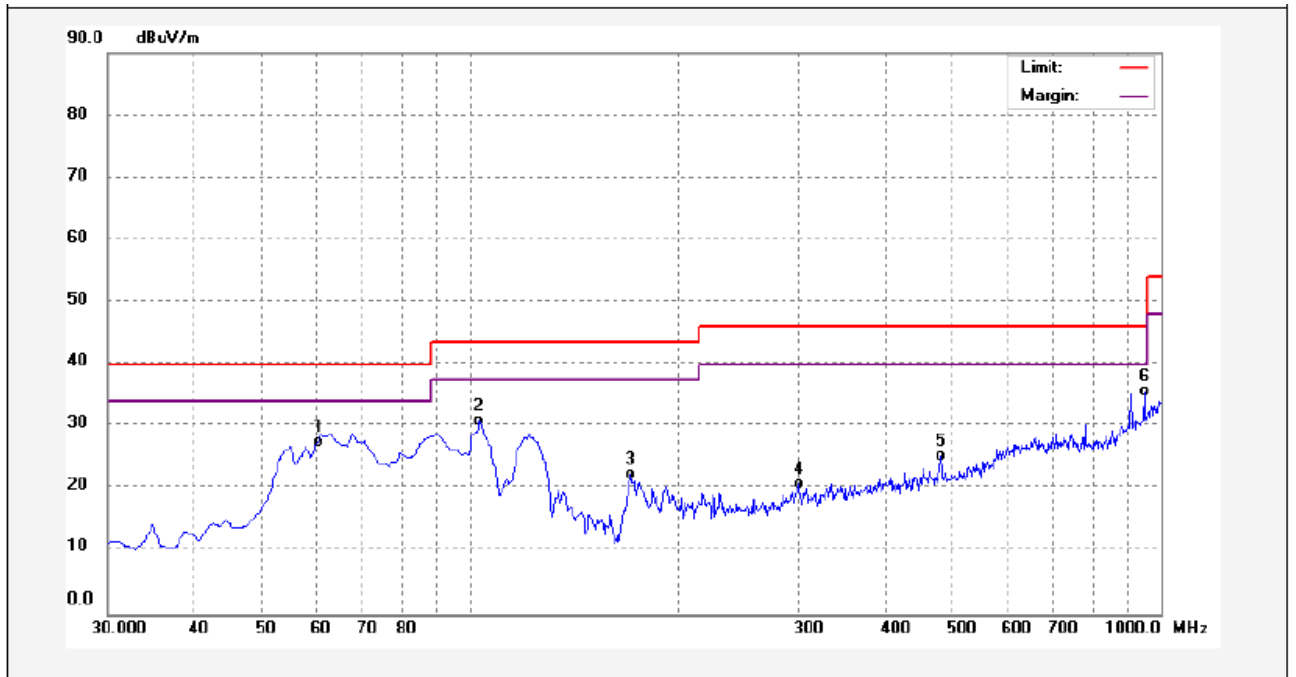
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	37.7599	36.24	-14.92	21.32	40.00	-18.68	QP	
2	83.3499	44.38	-16.33	28.05	40.00	-11.95	QP	
3	191.9900	34.80	-12.96	21.84	43.50	-21.66	QP	
4	387.5600	28.69	-6.98	21.71	46.00	-24.29	QP	
5	629.4600	28.39	-0.96	27.43	46.00	-18.57	QP	
6	948.5900	32.02	4.13	36.15	46.00	-9.85	QP	

**802.11ac: Low Channel 5210MHz (Vertical)**



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	36.7899	35.82	-15.28	20.54	40.00	-19.46	QP	
2	83.3499	44.57	-16.33	28.24	40.00	-11.76	QP	
3	193.9299	34.15	-12.80	21.35	43.50	-22.15	QP	
4	311.3000	27.90	-7.69	20.21	46.00	-25.79	QP	
5	606.1798	29.02	-1.20	27.82	46.00	-18.18	QP	
6	948.5900	29.10	4.13	33.23	46.00	-12.77	QP	

**802.11ac: Low Channel 5210MHz (Horizontal)**

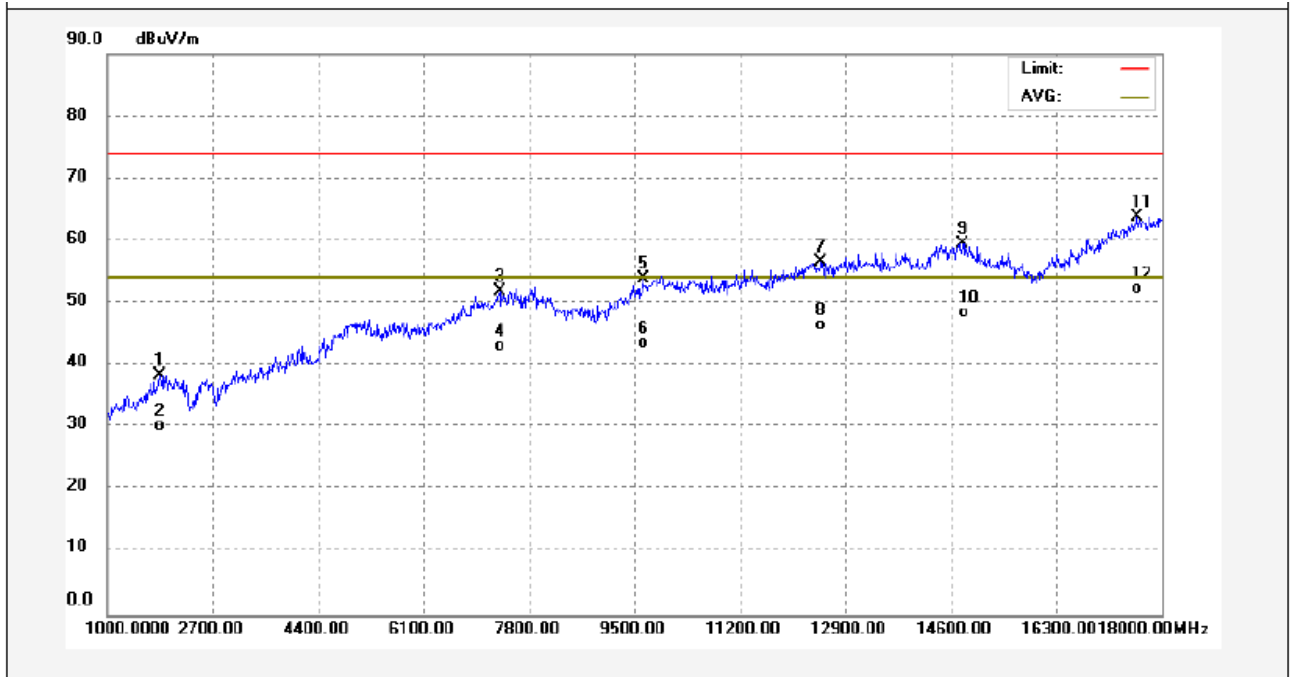


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	60.2800	41.08	-13.52	27.56	40.00	-12.44	QP	
2	103.7198	44.13	-13.24	30.89	43.50	-12.61	QP	
3	171.6200	37.41	-15.05	22.36	43.50	-21.14	QP	
4	299.6600	28.72	-7.82	20.90	46.00	-25.10	QP	
5	482.0199	30.59	-5.19	25.40	46.00	-20.60	QP	
6	948.5900	31.50	4.13	35.63	46.00	-10.37	QP	

Test Frequency : 1GHz ~ 18GHz

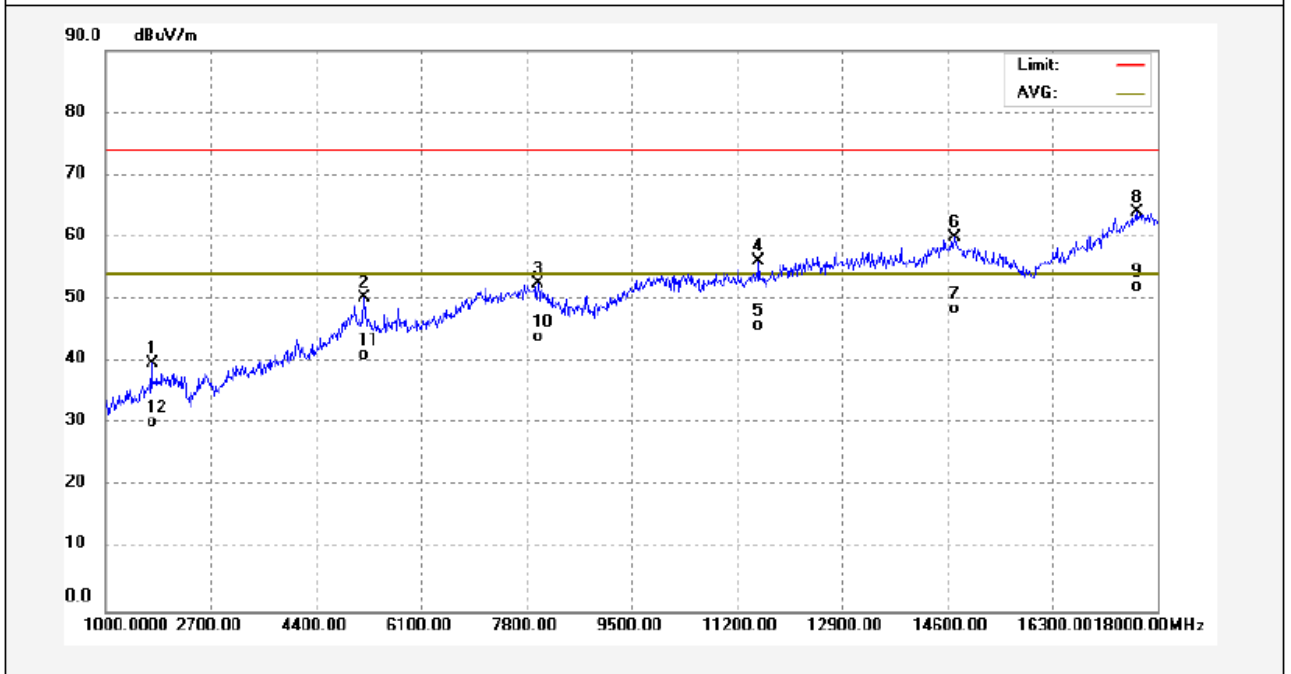
Remark: The current test plots doesn't have the fundamental signal, It's blocked by the filter

802.11a: Low Channel 5180MHz (Vertical)



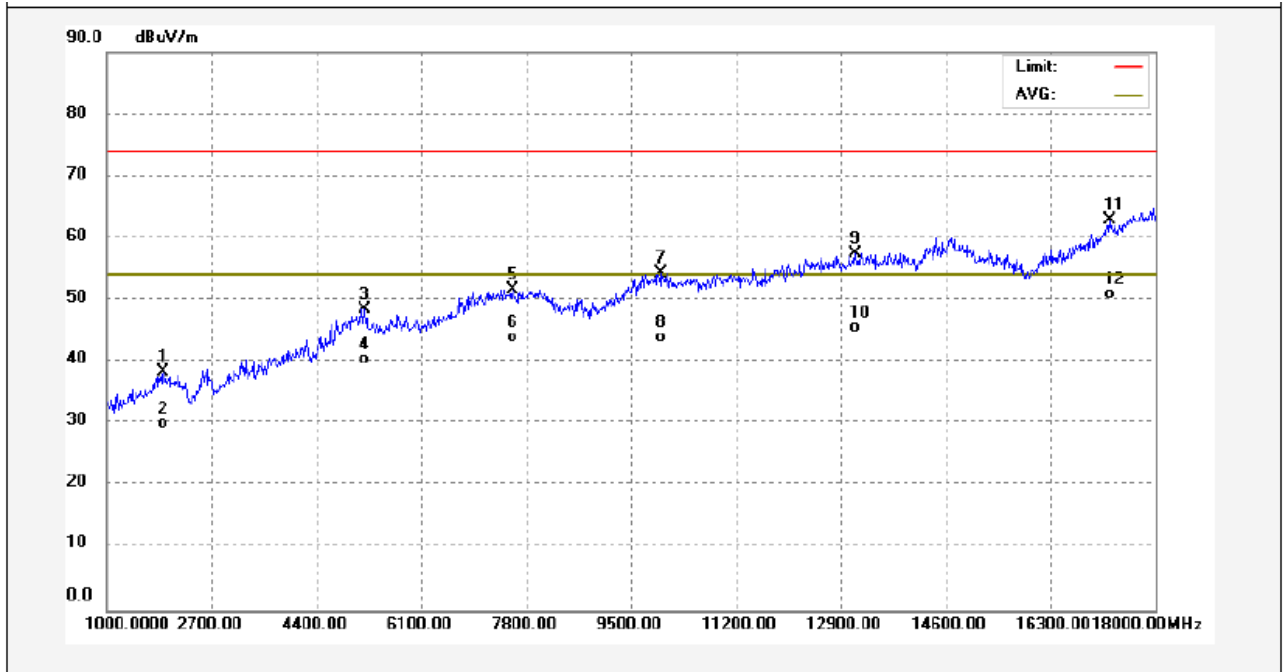
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	1850.000	47.85	-9.48	38.37	74.00	-35.63	peak	
2	1850.000	39.72	-9.48	30.24	54.00	-23.76	AVG	
3	7324.000	49.25	2.59	51.84	74.00	-22.16	peak	
4	7324.000	40.55	2.59	43.14	54.00	-10.86	AVG	
5	9636.000	49.42	4.50	53.92	74.00	-20.08	peak	
6	9636.000	39.05	4.50	43.55	54.00	-10.45	AVG	
7	12509.000	49.75	6.90	56.65	74.00	-17.35	peak	
8	12509.000	39.67	6.90	46.57	54.00	-7.43	AVG	
9	14787.000	50.50	9.00	59.50	74.00	-14.50	peak	
10	14804.000	39.58	8.95	48.53	54.00	-5.47	AVG	
11	17609.000	46.00	17.80	63.80	74.00	-10.20	peak	
12	17609.000	34.61	17.80	52.41	54.00	-1.59	AVG	

802.11a: Low Channel 5180MHz (Horizontal)



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	1748.000	49.80	-10.11	39.69	74.00	-34.31	peak	
2	5182.000	53.87	-3.66	50.21	74.00	-23.79	peak	
3	7987.000	49.60	2.85	52.45	74.00	-21.55	peak	
4	11557.000	49.61	6.63	56.24	74.00	-17.76	peak	
5	11557.000	39.05	6.63	45.68	54.00	-8.32	AVG	
6	14719.000	50.74	9.22	59.96	74.00	-14.04	peak	
7	14719.000	39.35	9.22	48.57	54.00	-5.43	AVG	
8	17660.000	46.16	17.91	64.07	74.00	-9.93	peak	
9	17660.000	34.23	17.91	52.14	54.00	-1.86	AVG	
10	7987.000	41.03	2.85	43.88	54.00	-10.12	AVG	
11	5182.000	44.76	-3.66	41.10	54.00	-12.90	AVG	
12	1748.000	40.33	-10.11	30.22	54.00	-23.78	AVG	

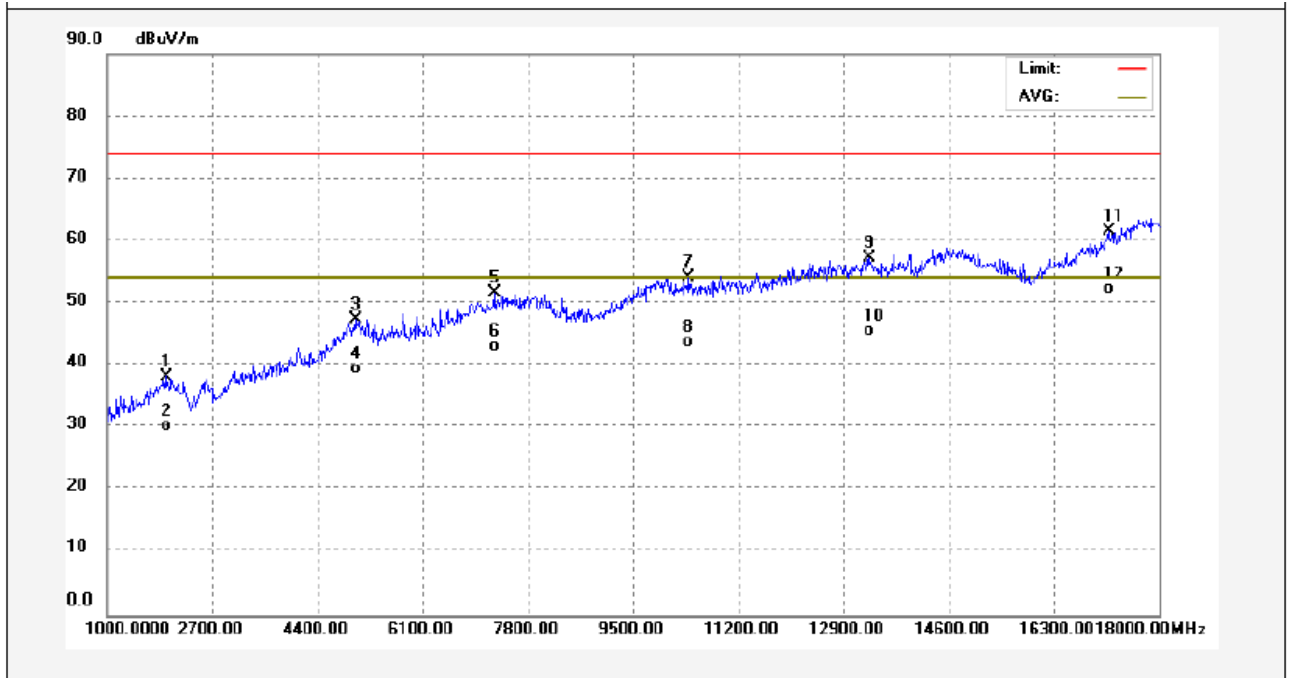
802.11n: Low Channel 5190MHz (Vertical)



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	1918.000	47.36	-9.08	38.28	74.00	-35.72	peak	
2	1918.000	39.13	-9.08	30.05	54.00	-23.95	AVG	
3	5182.000	52.11	-3.66	48.45	74.00	-25.55	peak	
4	5182.000	44.11	-3.66	40.45	54.00	-13.55	AVG	
5	7579.000	48.97	2.76	51.73	74.00	-22.27	peak	
6	7579.000	41.24	2.76	44.00	54.00	-10.00	AVG	
7	9993.000	49.25	5.06	54.31	74.00	-19.69	peak	
8	9993.000	38.82	5.06	43.88	54.00	-10.12	AVG	
9	13138.000	48.88	8.65	57.53	74.00	-16.47	peak	
10	13138.000	36.97	8.65	45.62	54.00	-8.38	AVG	
11	17252.000	47.18	15.67	62.85	74.00	-11.15	peak	
12	17252.000	35.30	15.67	50.97	54.00	-3.03	AVG	

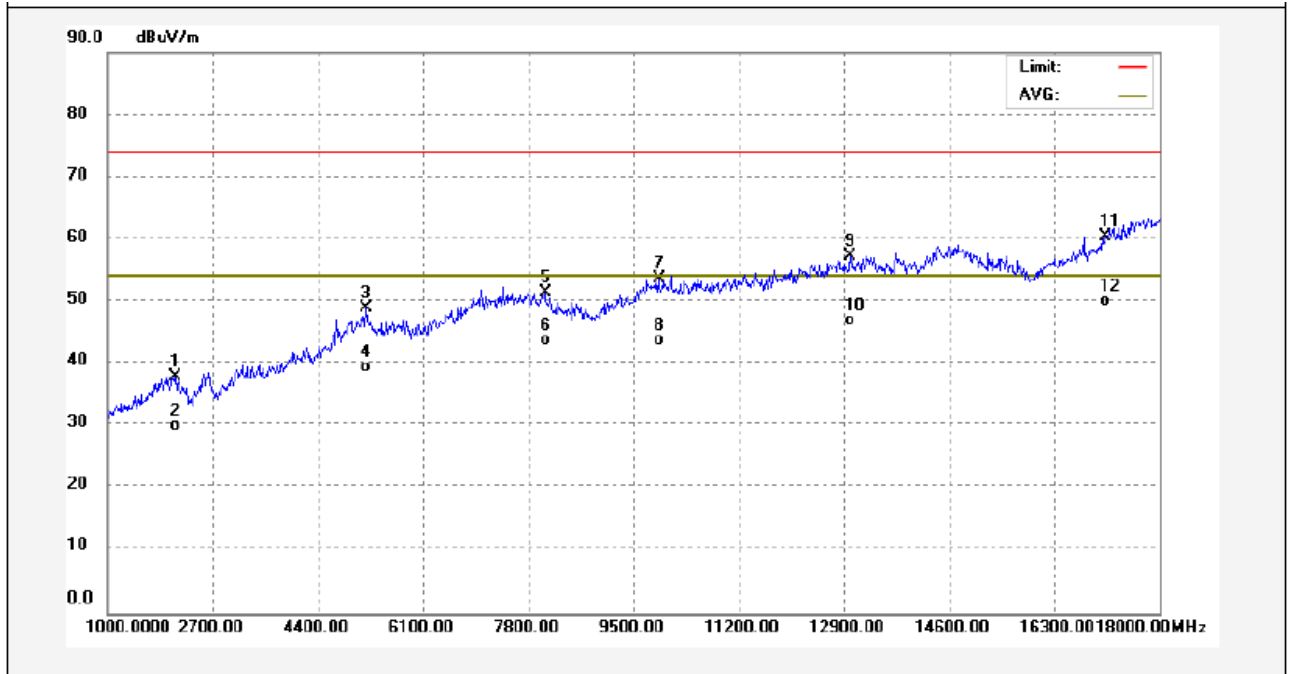


802.11n: Low Channel 5190MHz (Horizontal)



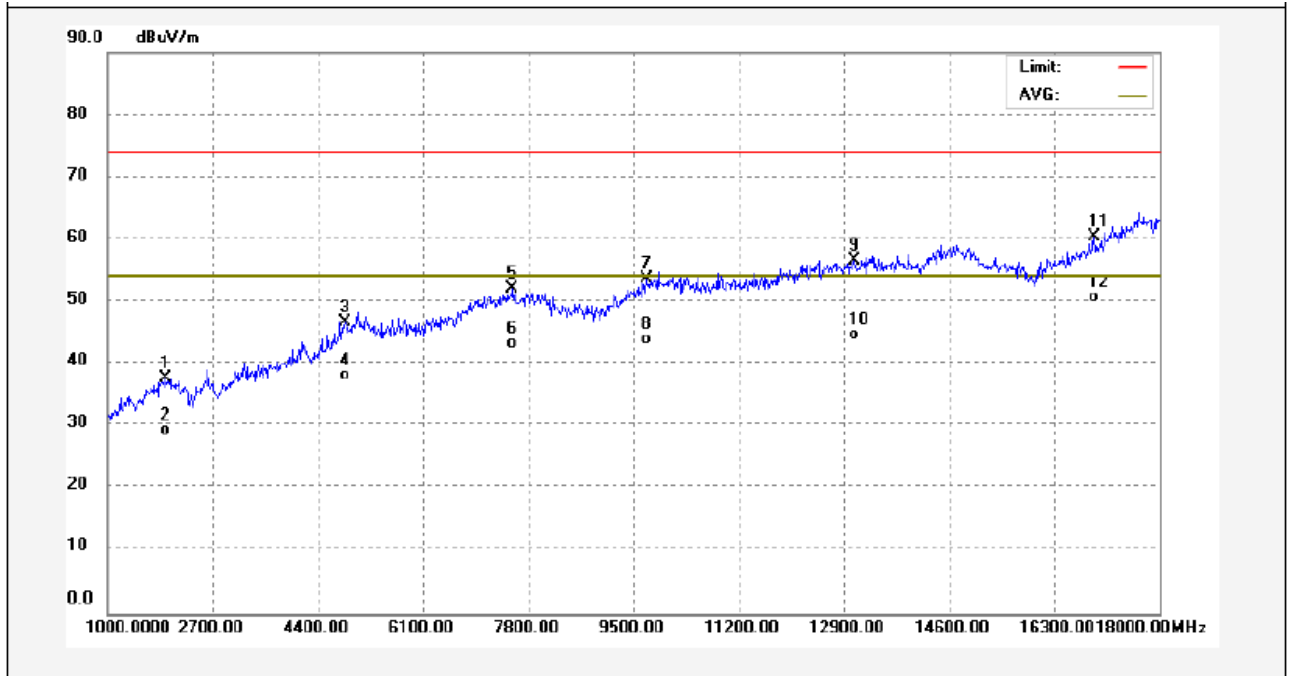
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	1952.000	48.94	-10.69	38.25	74.00	-35.75	peak	
2	1952.000	40.90	-10.69	30.21	54.00	-23.79	AVG	
3	5012.000	48.73	-1.39	47.34	74.00	-26.66	peak	
4	5012.000	40.98	-1.39	39.59	54.00	-14.41	AVG	
5	7256.000	49.40	2.27	51.67	74.00	-22.33	peak	
6	7256.000	40.85	2.27	43.12	54.00	-10.88	AVG	
7	10401.000	49.55	4.47	54.02	74.00	-19.98	peak	
8	10401.000	39.27	4.47	43.74	54.00	-10.26	AVG	
9	13308.000	48.09	9.12	57.21	74.00	-16.79	peak	
10	13308.000	36.51	9.12	45.63	54.00	-8.37	AVG	
11	17184.000	47.59	13.85	61.44	74.00	-12.56	peak	
12	17184.000	38.48	13.85	52.33	54.00	-1.67	AVG	

802.11ac: Low Channel 5210MHz (Vertical)



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2105.000	48.70	-10.76	37.94	74.00	-36.06	peak	
2	2105.000	40.76	-10.76	30.00	54.00	-24.00	AVG	
3	5182.000	50.84	-2.01	48.83	74.00	-25.17	peak	
4	5182.000	41.45	-2.01	39.44	54.00	-14.56	AVG	
5	8072.000	49.24	2.17	51.41	74.00	-22.59	peak	
6	8072.000	41.51	2.17	43.68	54.00	-10.32	AVG	
7	9908.000	49.83	3.80	53.63	74.00	-20.37	peak	
8	9908.000	39.96	3.80	43.76	54.00	-10.24	AVG	
9	13002.000	48.71	8.56	57.27	74.00	-16.73	peak	
10	13002.000	38.34	8.56	46.90	54.00	-7.10	AVG	
11	17133.000	46.84	13.66	60.50	74.00	-13.50	peak	
12	17133.000	36.51	13.66	50.17	54.00	-3.83	AVG	

**802.11ac: Low Channel 5210MHz (Horizontal)**



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	1935.000	48.50	-10.81	37.69	74.00	-36.31	peak	
2	1935.000	40.14	-10.81	29.33	54.00	-24.67	AVG	
3	4842.000	49.33	-2.59	46.74	74.00	-27.26	peak	
4	4842.000	40.84	-2.59	38.25	54.00	-15.75	AVG	
5	7545.000	50.08	1.96	52.04	74.00	-21.96	peak	
6	7545.000	41.31	1.96	43.27	54.00	-10.73	AVG	
7	9704.000	49.93	3.65	53.58	74.00	-20.42	peak	
8	9704.000	40.31	3.65	43.96	54.00	-10.04	AVG	
9	13070.000	47.79	8.69	56.48	74.00	-17.52	peak	
10	13070.000	35.87	8.69	44.56	54.00	-9.44	AVG	
11	16946.000	47.48	12.86	60.34	74.00	-13.66	peak	
12	16946.000	37.95	12.86	50.81	54.00	-3.19	AVG	

**Test Frequency: 18GHz~40GHz**

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

## 9 Duty cycle

Test Requirement:	47 CFR Part 15C 15.407 KDB789033 D02 General U-NII Test Procedures New Rules v02r01, Section (B)
Test Method:	ANSI C63.10: 2013
Test Limit:	N/A
Test Result:	PASS
Remark:	Through Pre-scan, The duty cycle set for channel low, middle and high are same, and the duty cycle test is performed at channel low only, The report only records the test data of antenna 0

## **9.1 Summary of Test Results**

Remark: Refer to Original report WTD21D01009766W003 V1

## 10 Band Edge

Test Requirement:	FCC CFR47 Part 15 Section 15.407
Test Method:	ANSI C63.10 2013
Test Limit:	(1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of $-27$ dBm/MHz. (2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of $-27$ dBm/MHz. (3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of $-27$ dBm/MHz. (4) For transmitters operating in the 5.725-5.85 GHz band: (i) All emissions shall be limited to a level of $-27$ dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge. (ii) Devices certified before March 2, 2017 with antenna gain greater than 10 dBi may demonstrate compliance with the emission limits in §15.247(d), but manufacturing, marketing and importing of devices certified under this alternative must cease by March 2, 2018. Devices certified before March 2, 2018 with antenna gain of 10 dBi or less may demonstrate compliance with the emission limits in §15.247(d), but manufacturing, marketing and importing of devices certified under this alternative must cease before March 2, 2020.
Test Result:	PASS

### 10.1 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 1000 kHz and VBW of spectrum analyzer to 3000 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.

## **10.2 Test Result**

Remark: Refer to Original report WTD21D01009766W003 V1

## 11 6 dB Bandwidth

Test Requirement:	FCC CFR47 Part 15 Section 15.407(e) KDB662911 D01 Multiple Transmitter Output v02r01
Test Method:	KDB789033 D02 General U-NII Test Procedures New Rules v02r01 Section C
Test Limit:	≥ 500 kHz
Test Result:	PASS

### 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 = 100kHz, VBW = 300kHz

### 11.2 Test Result:

Remark: Refer to Original report WTD21D01009766W003 V1



## 12 26 dB Bandwidth and 99% Occupied Bandwidth

Test Requirement:	47 CFR Part 15C Section 15.407 (a) KDB662911 D01 Multiple Transmitter Output v02r01
Test Method:	KDB789033 D02 General U-NII Test Procedures New Rules v02r01 Section D
Test Limit:	No restriction limits
Test Result:	PASS

### 12.1 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 = 1% to 5% of the OBW, VBW = 3x RBW

### 12.2 Test Result:

Remark: Refer to Original report WTD21D01009766W003 V1

## 13 Conducted Output Power

Test Requirement:	FCC CFR47 Part 15 Section 15.407(a) KDB662911 D01 Multiple Transmitter Output v02r01
Test Method:	KDB789033 D02 General U-NII Test Procedures New Rules v02r01 Section E
Test Limit:	U-NII-1 250mW(24dBm) U-NII-2A 250mW(24dBm) or 11 dBm + 10 log B U-NII-2C 250mW(24dBm) or 11 dBm + 10 log B U-NII-3 1W(30dBm)
Test Result:	PASS Conducted output power= measurement power+10log(1/x) X is duty cycle=1, so 10log(1/1)=0
Remark:	Conducted output power= measurement power where B is the 26 dB emission bandwidth in megahertz

### 13.1 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 = 1 MHz. VBW = 3 MHz. Sweep = auto; Detector Function = Peak, Set the span to fully encompass the DTS bandwidth.
3. Keep the EUT in transmitting at lowest, medium and highest channel individually. Record the max value.

### **13.2 Test Result :**

Remark: Refer to Original report WTD21D01009766W003 V1

## 14 Power Spectral density

Test Requirement:	FCC CFR47 Part 15 Section 15.407(a) KDB662911 D01 Multiple Transmitter Output v02r01
Test Method:	KDB789033 D02 General U-NII Test Procedures New Rules v02r01, Section F
Test Limit:	$\leq 11.00\text{dBm/MHz}$ for Operation in the U-NII-1(5150MHz-5250MHz)of mobile device $\leq 30.00\text{dBm/500KHz}$ for Operation in the U-NII-3(5725MHz- 5850MHz)of device
Test Result:	PASS

### 14.1 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:  
U-NII-1  
RBW = 1MHz, VBW  $\geq 3$ \* RBW Sweep = auto; Detector Function = Peak. Trace = Max hold.  
U-NII-3  
RBW = 510KHz, VBW  $\geq 3$ \* RBW 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.

## **14.2 Test Result:**

Remark: Refer to Original report WTD21D01009766W003 V1

## 15 Frequency Stability

Test Requirement:	FCC CFR47 Part 15 Section 15.407(g)
Test Method:	ANSI C63.10:2013
Test Limit:	Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the users manual or 20ppm.
Test Result:	PASS

## 16 Antenna Requirement

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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

This device uses of one antennas that uses a specified coupling to the intentional radiator. Antenna connectors complied with the requirement.

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

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

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