

FCC Test Report

FCC ID : 2ALXJ-WBC100
Equipment : Whiteboard Owl
Model No. : WBC100
Brand Name : OWLLabs™
Applicant : Owl Labs Inc
Address : 33-1/2 Union Sq
Somerville US 02143 United States Of America
Standard : 47 CFR FCC Part 15.247
Received Date : Dec. 14, 2020
Tested Date : Jan. 21 ~ Jan. 26, 2021

We, International Certification Corp., would like to declare that the tested sample has been evaluated and in compliance with the requirement of the above standards. The test results contained in this report refer exclusively to the product. It may be duplicated completely for legal use with the approval of the applicant. It shall not be reproduced except in full without the written approval of our laboratory.

Reviewed by:



Along Chen / Assistant Manager

Approved by:



Gary Chang / Manager



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Release Record

Report No.	Version	Description	Issued Date
FR0D1401AC	Rev. 01	Initial issue	Feb. 08, 2021

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	Conducted Emissions	[dBuV]: 0.513MHz 42.92 (Margin -3.08dB) - AV	Pass
15.247(d) 15.209	Radiated Emissions	[dBuV/m at 3m]: 2483.50MHz 52.94 (Margin -1.06dB) - AV	Pass
15.247(b)(3)	Maximum Output Power	Max Power [dBm]: 25.48	Pass
15.247(a)(2)	6dB Bandwidth	Meet the requirement of limit	Pass
15.247(e)	Power Spectral Density	Meet the requirement of limit	Pass
15.203	Antenna Requirement	Meet the requirement of limit	Pass

Declaration of Conformity:

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

Comments and Explanations:

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

1 General Description

1.1 Information

1.1.1 Specification of the Equipment under Test (EUT)

RF General Information					
Frequency Range (MHz)	IEEE Std. 802.11	Ch. Freq. (MHz)	Channel Number	Transmit Chains (N _{TX})	Data Rate / MCS
2400-2483.5	b	2412-2462	1-11 [11]	2	1-11 Mbps
2400-2483.5	g	2412-2462	1-11 [11]	2	6-54 Mbps
2400-2483.5	n (HT20)	2412-2462	1-11 [11]	2	MCS 0-15
2400-2483.5	n (HT40)	2422-2452	3-9 [7]	2	MCS 0-15

Note 1: RF output power specifies that Maximum Peak Conducted Output Power.
 Note 2: 802.11b uses a combination of DSSS-DBPSK, DQPSK, CCK modulation.
 Note 3: 802.11g/n uses a combination of OFDM-BPSK, QPSK, 16QAM, 64QAM modulation.

1.1.2 Antenna Details

Ant. No.	Model	Type	Connector	Gain (dBi)	Remarks
1	WPANT101 40-S1 A	Metal	IPX/MHF	1.8	---

1.1.3 Power Supply Type of Equipment under Test (EUT)

Power Supply Type	12Vdc from adapter
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1.1.4 Accessories

Accessories		
No.	Equipment	Description
1	Adapter	Brand: APX Model: PS120I1000 Power Rating: I/P: 100-240Vac, 50/60Hz, 0.5A Max O/P: 12Vdc, 1.0A, 12W Power Line: 6.06m non-shielded without core
2	Meeting Owl Pro	Brand: OWLLabs™ Model: MTW200

1.1.5 Channel List

Frequency band (MHz)		2400~2483.5	
802.11 b / g / n HT20		802.11n HT40	
Channel	Frequency(MHz)	Channel	Frequency(MHz)
1	2412	3	2422
2	2417	4	2427
3	2422	5	2432
4	2427	6	2437
5	2432	7	2442
6	2437	8	2447
7	2442	9	2452
8	2447	---	---
9	2452	---	---
10	2457	---	---
11	2462	---	---

1.1.6 Test Tool and Duty Cycle

Test Tool	Qualcomm Radio Control Tool, Version: 4.0.00134.0		
Duty Cycle and Duty Factor	Mode	Duty Cycle (%)	Duty Factor (dB)
	11b	99.93%	0.00
	11g	99.52%	0.02
	HT20	99.49%	0.02
	HT40	96.10%	0.17

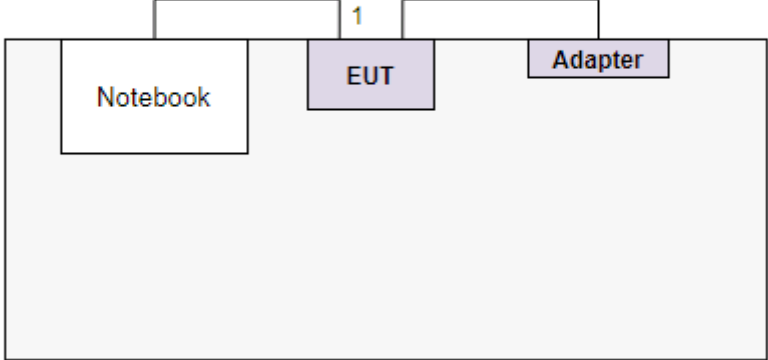
1.1.7 Power Index of Test Tool

Modulation Mode	Test Frequency (MHz)	Power Index
11b	2412	12
11b	2437	12
11b	2462	12
11g	2412	17
11g	2437	17.5
11g	2462	17
HT20	2412	17
HT20	2437	17.5
HT20	2462	17
HT40	2422	13.5
HT40	2437	15
HT40	2452	14.5

1.2 Local Support Equipment List

Support Equipment List					
No.	Equipment	Brand	Model	FCC ID	Remarks
1	Notebook	DELL	Latitude 5400	DoC	---

1.3 Test Setup Chart

Test Setup Diagram	
Kept in control area	
 <p>The diagram shows a large rectangular area labeled 'Kept in control area'. Inside this area, three boxes are arranged horizontally: 'Notebook' on the left, 'EUT' in the center, and 'Adapter' on the right. A line connects the top of the 'Notebook' box to the top of the 'EUT' box, and another line connects the top of the 'EUT' box to the top of the 'Adapter' box. A small box with the number '1' is positioned above the line connecting the 'EUT' and 'Adapter' boxes, indicating the signal cable.</p>	
No.	Signal cable / Length (m)
1	Type C, 1.8m non-shielded.

1.4 The Equipment List

Test Item	Conducted Emission				
Test Site	Conduction room 1 / (CO01-WS)				
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until
Receiver	R&S	ESR3	101657	Feb. 14, 2020	Feb. 13, 2021
LISN	R&S	ENV216	101579	Mar. 12, 2020	Mar. 11, 2021
RF Cable-CON	Woken	CFD200-NL	CFD200-NL-001	Oct. 21, 2020	Oct. 20, 2021
Measurement Software	AUDIX	e3	6.120210k	NA	NA

Note: Calibration Interval of instruments listed above is one year.

Test Item	Radiated Emission				
Test Site	966 chamber 3 / (03CH03-WS)				
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV40	101063	Apr. 30, 2020	Apr. 29, 2021
Receiver	R&S	ESR3	101657	Feb. 14, 2020	Feb. 13, 2021
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-685	Apr. 29, 2020	Apr. 28, 2021
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1206	Dec. 22, 2020	Dec. 21, 2021
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Nov. 06, 2020	Nov. 05, 2021
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 17, 2020	Nov. 16, 2021
Loop Antenna Cable	KOAX KABEL	101354-BW	101354-BW	Oct. 06, 2020	Oct. 05, 2021
Preamplifier	EMC	EMC02325	980187	Aug. 05, 2020	Aug. 04, 2021
Preamplifier	Agilent	83017A	MY39501309	Sep. 02, 2020	Sep. 01, 2021
Preamplifier	EMC	EMC184045B	980192	Jul. 21, 2020	Jul. 20, 2021
RF cable-3M	HUBER+SUHNER	SUCOFLEX104	MY22620/4	Sep. 26, 2020	Sep. 25, 2021
RF cable-8M	EMC	EMC104-SM-SM-8000	181107	Sep. 26, 2020	Sep. 25, 2021
RF cable-1M	HUBER+SUHNER	SUCOFLEX104	MY22624/4	Sep. 26, 2020	Sep. 25, 2021
LF cable-0.8M	EMC	EMC8D-NM-NM-800	EMC8D-NM-NM-800-001	Sep. 26, 2020	Sep. 25, 2021
LF cable-3M	EMC	EMC8D-NM-NM-3000	131103	Sep. 26, 2020	Sep. 25, 2021
LF cable-13M	EMC	EMC8D-NM-NM-13000	131104	Sep. 26, 2020	Sep. 25, 2021
Measurement Software	AUDIX	e3	6.120210g	NA	NA

Note: Calibration Interval of instruments listed above is one year.

Test Item	RF Conducted				
Test Site	(TH01-WS)				
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV40	101063	Apr. 30, 2020	Apr. 29, 2021
Power Meter	Anritsu	ML2495A	1241002	Nov. 04, 2020	Nov. 03, 2021
Power Sensor	Anritsu	MA2411B	1207366	Nov. 04, 2020	Nov. 03, 2021
AC POWER SOURCE	APC	AFC-500W	F312060012	Dec. 04, 2020	Dec. 03, 2021
Measurement Software	--	SENSE-15247_DTS	V5.10.7	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

1.5 Test Standards

47 CFR FCC Part 15.247

ANSI C63.10-2013

1.6 Reference Guidance

FCC KDB 558074 D01 15.247 Meas Guidance v05r02

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

1.7 Deviation from Test Standard and Measurement Procedure

None

1.8 Measurement Uncertainty

The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2)).

Measurement Uncertainty	
Parameters	Uncertainty
Bandwidth	±34.130 Hz
Conducted power	±0.808 dB
Power density	±0.583 dB
Conducted emission	±2.715 dB
AC conducted emission	±2.92 dB
Radiated emission ≤ 1GHz	±3.96 dB
Radiated emission > 1GHz	±4.51 dB

2 Test Configuration

2.1 Testing Facility

Test Laboratory	International Certification Corp.
Test Site	CO01-WS, TH01-WS
Address of Test Site	No. 3-1, Lane 6, Wen San 3rd St., Kwei Shan District, Tao Yuan City 333, Taiwan, R.O.C.
Test Site	03CH03-WS
Address of Test Site	No. 14-1, Lane 19, Wen San 3rd St., Kwei Shan District, Tao Yuan City 333, Taiwan, R.O.C.

- FCC Designation No.: TW0009
- FCC site registration No.: 207696
- ISED#: 10807A
- CAB identifier: TW2732

2.2 The Worst Test Modes and Channel Details

Test item	Modulation Mode	Test Frequency (MHz)	Data Rate	Test Configuration
Conducted Emissions	HT20	2462	MCS 0	---
Radiated Emissions ≤1GHz	HT20	2462	MCS 0	---
Radiated Emissions >1GHz	11b	2412 / 2437 / 2462	1 Mbps	---
Maximum Output Power	11g	2412 / 2437 / 2462	6 Mbps	
6dB bandwidth	HT20	2412 / 2437 / 2462	MCS 0	
Power spectral density	HT40	2422 / 2437 / 2452	MCS 0	

NOTE:

1. The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement – X, Y, and Z-plane. The **Y-plane** results were found as the worst case and were shown in this report.

3 Transmitter Test Results

3.1 Conducted Emissions

3.1.1 Limit of Conducted Emissions

Conducted Emissions Limit		
Frequency Emission (MHz)	Quasi-Peak	Average
0.15-0.5	66 - 56 *	56 - 46 *
0.5-5	56	46
5-30	60	50

Note 1: * Decreases with the logarithm of the frequency.

3.1.2 Test Procedures

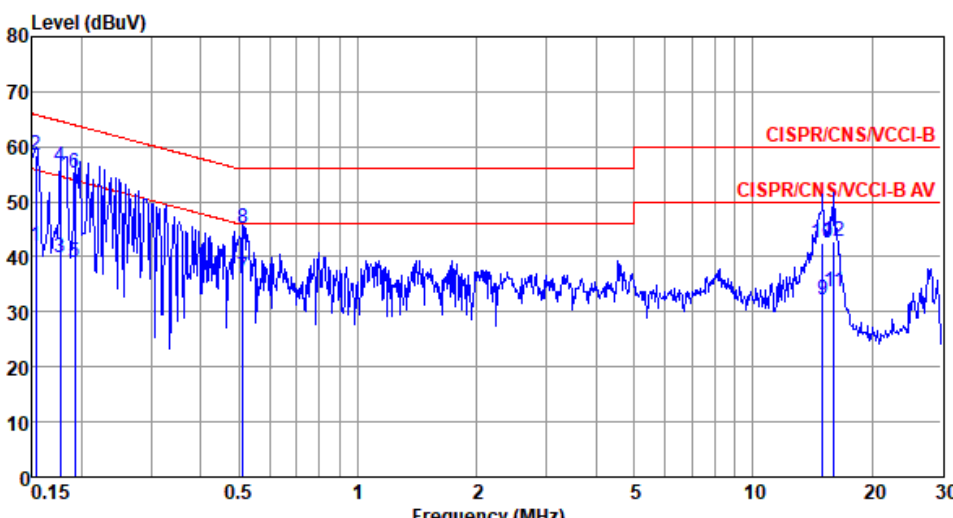
1. The device is placed on a test table, raised 80 cm above the reference ground plane. The vertical conducting plane is located 40 cm to the rear of the device.
2. The device is connected to line impedance stabilization network (LISN) and other accessories are connected to other LISN. Measured levels of AC power line conducted emission are across the 50 Ω LISN port.
3. AC conducted emission measurements is made over frequency range from 150 kHz to 30 MHz.
4. This measurement was performed with AC 120V / 60Hz.

3.1.3 Test Setup



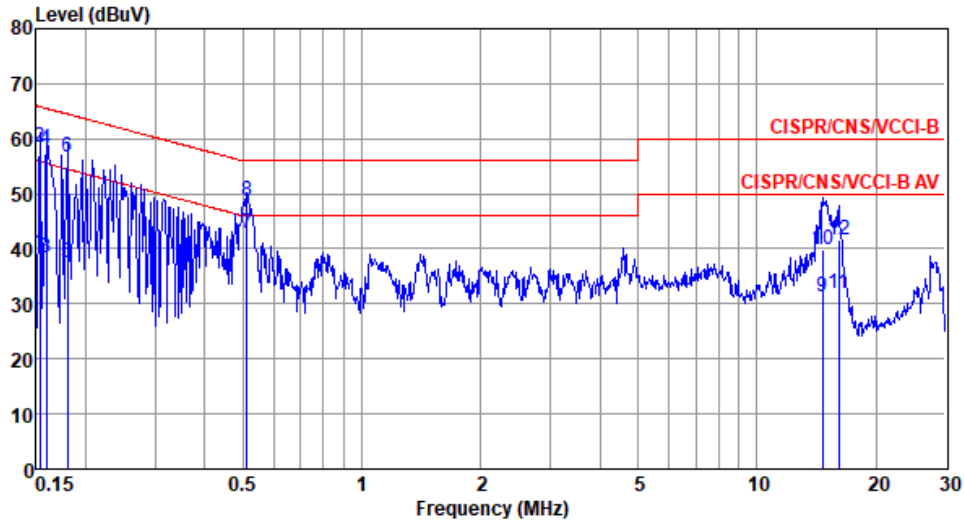
- Note: 1. Support units were connected to second LISN.
 2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

3.1.4 Test Result of Conducted Emissions

Modulation	HT20	Test Freq. (MHz)	2462																																																																																																																					
Power Phase	Line																																																																																																																							
<p>Test by : Alex Tsai Temperature: 22°C Humidity: 61%</p>																																																																																																																								
																																																																																																																								
<table border="1"> <thead> <tr> <th></th> <th>Freq MHz</th> <th>Level dBuV</th> <th>Limit Line dBuV</th> <th>Over Limit dB</th> <th>Read Level dBuV</th> <th>Factor dB</th> <th>Cable loss dB</th> <th>Remark</th> </tr> </thead> <tbody> <tr><td>1</td><td>0.153</td><td>41.85</td><td>55.82</td><td>-13.97</td><td>31.99</td><td>9.81</td><td>0.05</td><td>Average</td></tr> <tr><td>2*</td><td>0.153</td><td>58.47</td><td>65.82</td><td>-7.35</td><td>48.61</td><td>9.81</td><td>0.05</td><td>QP</td></tr> <tr><td>3</td><td>0.177</td><td>39.85</td><td>54.64</td><td>-14.79</td><td>29.97</td><td>9.82</td><td>0.06</td><td>Average</td></tr> <tr><td>4</td><td>0.177</td><td>56.53</td><td>64.64</td><td>-8.11</td><td>46.65</td><td>9.82</td><td>0.06</td><td>QP</td></tr> <tr><td>5</td><td>0.192</td><td>39.00</td><td>53.93</td><td>-14.93</td><td>29.12</td><td>9.82</td><td>0.06</td><td>Average</td></tr> <tr><td>6</td><td>0.192</td><td>55.32</td><td>63.93</td><td>-8.61</td><td>45.44</td><td>9.82</td><td>0.06</td><td>QP</td></tr> <tr><td>7</td><td>0.513</td><td>36.32</td><td>46.00</td><td>-9.68</td><td>26.33</td><td>9.90</td><td>0.09</td><td>Average</td></tr> <tr><td>8</td><td>0.513</td><td>45.07</td><td>56.00</td><td>-10.93</td><td>35.08</td><td>9.90</td><td>0.09</td><td>QP</td></tr> <tr><td>9</td><td>14.986</td><td>32.10</td><td>50.00</td><td>-17.90</td><td>21.31</td><td>10.19</td><td>0.60</td><td>Average</td></tr> <tr><td>10</td><td>14.986</td><td>42.56</td><td>60.00</td><td>-17.44</td><td>31.77</td><td>10.19</td><td>0.60</td><td>QP</td></tr> <tr><td>11</td><td>16.055</td><td>33.69</td><td>50.00</td><td>-16.31</td><td>22.85</td><td>10.22</td><td>0.62</td><td>Average</td></tr> <tr><td>12</td><td>16.055</td><td>42.77</td><td>60.00</td><td>-17.23</td><td>31.93</td><td>10.22</td><td>0.62</td><td>QP</td></tr> </tbody> </table>					Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	Factor dB	Cable loss dB	Remark	1	0.153	41.85	55.82	-13.97	31.99	9.81	0.05	Average	2*	0.153	58.47	65.82	-7.35	48.61	9.81	0.05	QP	3	0.177	39.85	54.64	-14.79	29.97	9.82	0.06	Average	4	0.177	56.53	64.64	-8.11	46.65	9.82	0.06	QP	5	0.192	39.00	53.93	-14.93	29.12	9.82	0.06	Average	6	0.192	55.32	63.93	-8.61	45.44	9.82	0.06	QP	7	0.513	36.32	46.00	-9.68	26.33	9.90	0.09	Average	8	0.513	45.07	56.00	-10.93	35.08	9.90	0.09	QP	9	14.986	32.10	50.00	-17.90	21.31	10.19	0.60	Average	10	14.986	42.56	60.00	-17.44	31.77	10.19	0.60	QP	11	16.055	33.69	50.00	-16.31	22.85	10.22	0.62	Average	12	16.055	42.77	60.00	-17.23	31.93	10.22	0.62	QP
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Modulation	HT20	Test Freq. (MHz)	2462
Power Phase	Neutral		

Test by : Alex Tsai Temperature: 22°C Humidity: 61%



	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	Factor dB	Cable loss dB	Remark
1	0.153	39.40	55.82	-16.42	29.56	9.79	0.05	Average
2	0.153	58.55	65.82	-7.27	48.71	9.79	0.05	QP
3	0.159	38.51	55.52	-17.01	28.67	9.79	0.05	Average
4	0.159	58.13	65.52	-7.39	48.29	9.79	0.05	QP
5	0.180	37.59	54.50	-16.91	27.73	9.80	0.06	Average
6	0.180	56.60	64.50	-7.90	46.74	9.80	0.06	QP
7*	0.513	42.92	46.00	-3.08	32.99	9.84	0.09	Average
8	0.513	48.65	56.00	-7.35	38.72	9.84	0.09	QP
9	14.672	31.38	50.00	-18.62	20.63	10.16	0.59	Average
10	14.672	39.93	60.00	-20.07	29.18	10.16	0.59	QP
11	16.140	31.97	50.00	-18.03	21.15	10.20	0.62	Average
12	16.140	41.50	60.00	-18.50	30.68	10.20	0.62	QP

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB).
 2: Over Limit (dB) = Level (dBuV) – Limit Line (dBuV).

3.2 6dB and Occupied Bandwidth

3.2.1 Limit of 6dB Bandwidth

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

3.2.2 Test Procedures

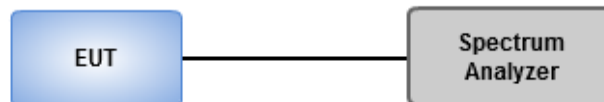
6dB Bandwidth

1. Set resolution bandwidth (RBW) = 100 kHz, Video bandwidth = 300 kHz.
2. Detector = Peak, Trace mode = max hold.
3. Sweep = auto couple, Allow the trace to stabilize.
4. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 6dB relative to the maximum level measured in the fundamental emission.

Occupied Bandwidth

1. Set resolution bandwidth (RBW) = 1% ~ 5 % of OBW, Video bandwidth = 3 x RBW
2. Detector = Sample, Trace mode = max hold.
3. Sweep = auto couple, Allow the trace to stabilize.
4. Use the OBW measurement function of spectrum analyzer to measure the occupied bandwidth.

3.2.3 Test Setup



3.2.4 Test Result of 6dB and Occupied Bandwidth

Ambient Condition	22°C / 63%	Tested By	Brad Wu
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Summary

Mode	Max-N dB (Hz)	Max-OBW (Hz)	ITU-Code	Min-N dB (Hz)	Min-OBW (Hz)
2.4-2.4835GHz	-	-	-	-	-
802.11b_Nss1,(1Mbps)_2TX	8.116M	13.965M	14M0G1D	7.609M	13.242M
802.11g_Nss1,(6Mbps)_2TX	16.014M	16.643M	16M6D1D	14.42M	16.353M
802.11n HT20_Nss1,(MCS0)_2TX	17.174M	17.8M	17M8D1D	13.841M	17.511M
802.11n HT40_Nss1,(MCS0)_2TX	36.377M	36.469M	36M5D1D	33.913M	36.035M

Max-N dB = Maximum 6dB down bandwidth; **Max-OBW** = Maximum 99% occupied bandwidth;
Min-N dB = Minimum 6dB down bandwidth; **Min-OBW** = Minimum 99% occupied bandwidth;

Result

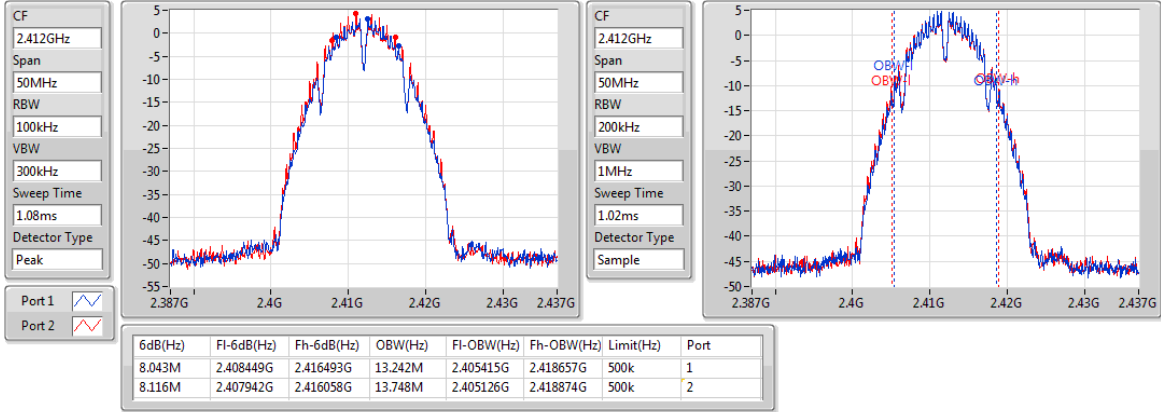
Mode	Result	Limit (Hz)	Port 1- N dB (Hz)	Port 1- OBW (Hz)	Port 2- N dB (Hz)	Port 2- OBW (Hz)
802.11b_Nss1,(1Mbps)_2TX	-	-	-	-	-	-
2412MHz	Pass	500k	8.043M	13.242M	8.116M	13.748M
2437MHz	Pass	500k	8.116M	13.965M	8.116M	13.965M
2462MHz	Pass	500k	8.116M	13.314M	7.609M	13.676M
802.11g_Nss1,(6Mbps)_2TX	-	-	-	-	-	-
2412MHz	Pass	500k	15.362M	16.353M	15.072M	16.353M
2437MHz	Pass	500k	15.652M	16.643M	16.014M	16.498M
2462MHz	Pass	500k	14.42M	16.353M	15.362M	16.425M
802.11n HT20_Nss1,(MCS0)_2TX	-	-	-	-	-	-
2412MHz	Pass	500k	13.841M	17.511M	16.377M	17.583M
2437MHz	Pass	500k	14.203M	17.8M	17.174M	17.728M
2462MHz	Pass	500k	16.014M	17.583M	16.304M	17.583M
802.11n HT40_Nss1,(MCS0)_2TX	-	-	-	-	-	-
2422MHz	Pass	500k	35.072M	36.035M	35.217M	36.179M
2437MHz	Pass	500k	36.377M	36.469M	36.377M	36.179M
2452MHz	Pass	500k	33.913M	36.035M	35.217M	36.179M

Port X-N dB = Port X 6dB down bandwidth; **Port X-OBW** = Port X 99% occupied bandwidth;

802.11b_Nss1,(1Mbps)_2TX

EBW

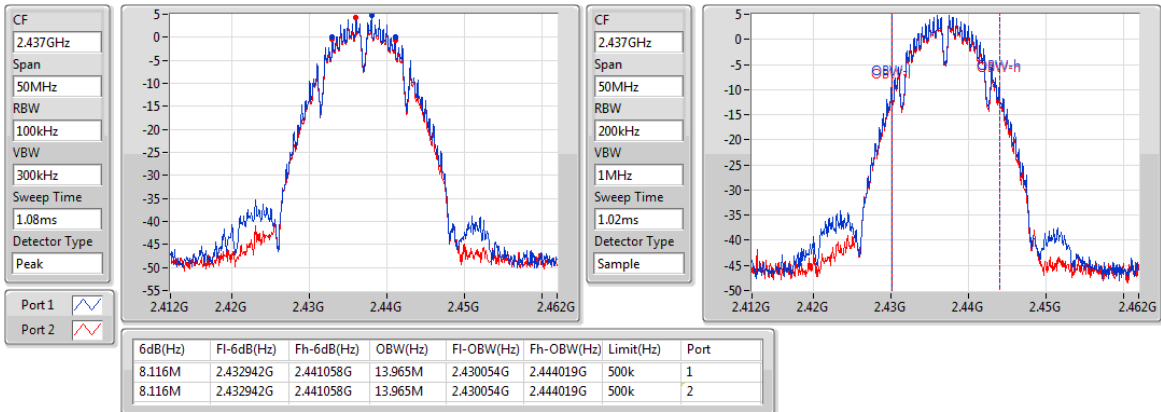
2412MHz



802.11b_Nss1,(1Mbps)_2TX

EBW

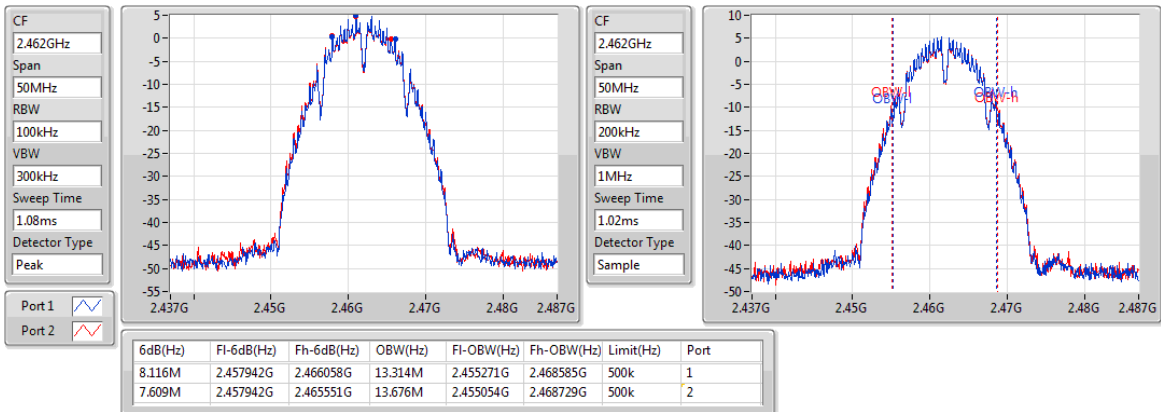
2437MHz



802.11b_Nss1,(1Mbps)_2TX

EBW

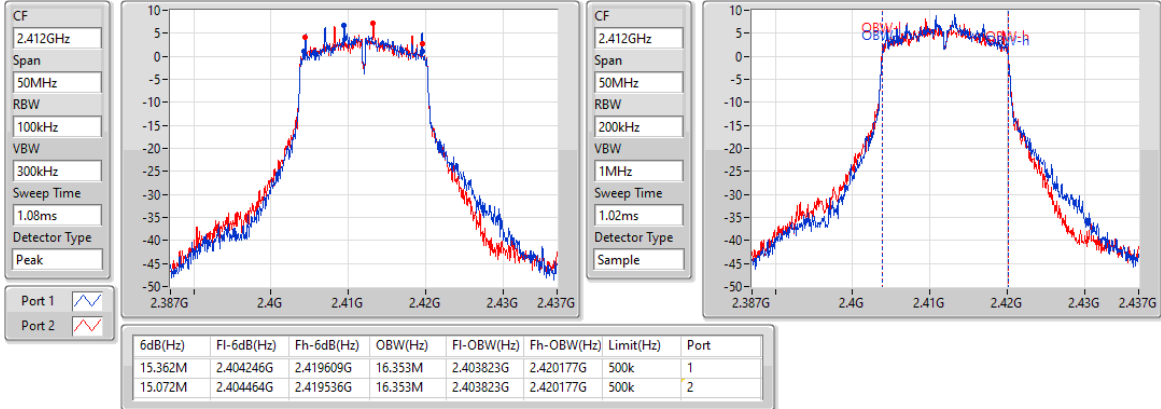
2462MHz



802.11g_Nss1,(6Mbps)_2TX

EBW

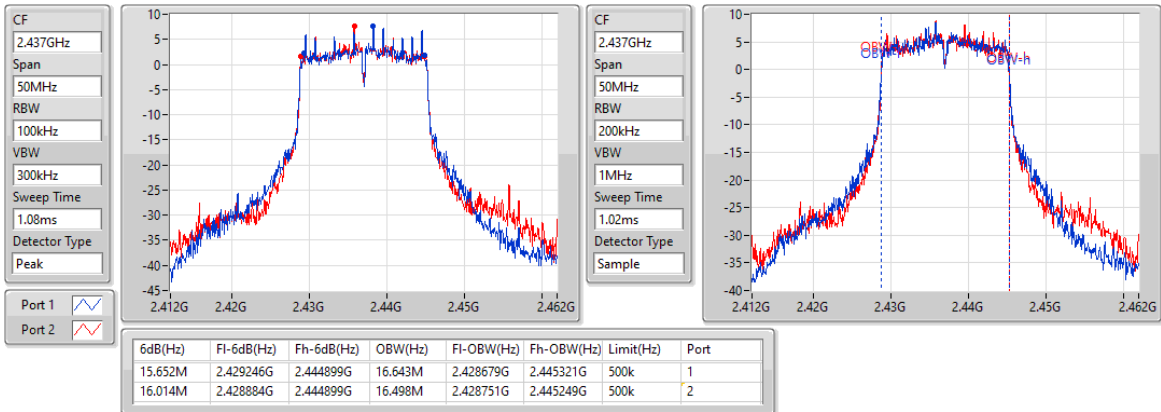
2412MHz



802.11g_Nss1,(6Mbps)_2TX

EBW

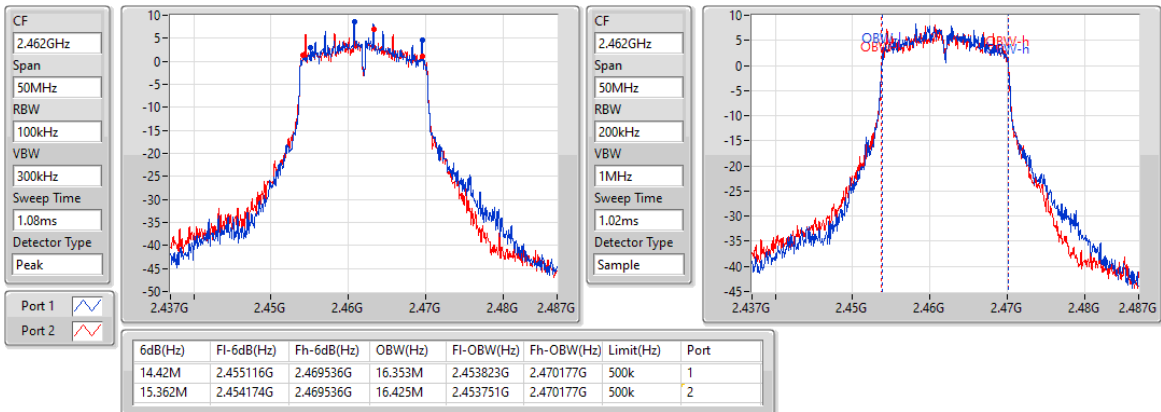
2437MHz



802.11g_Nss1,(6Mbps)_2TX

EBW

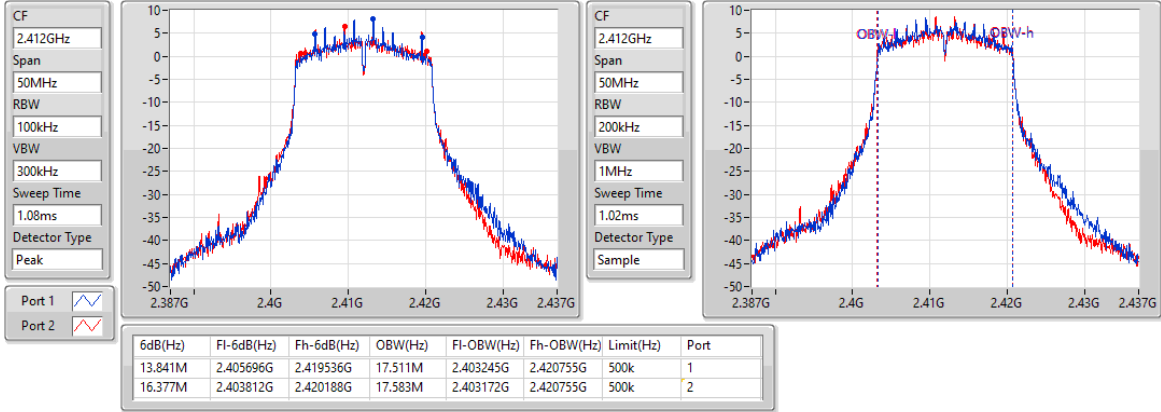
2462MHz



802.11n HT20_Nss1,(MCS0)_2TX

EBW

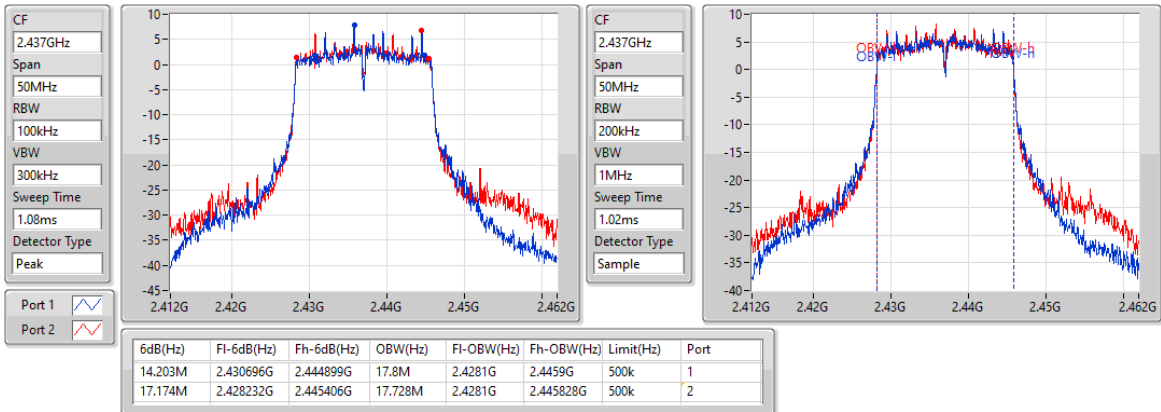
2412MHz



802.11n HT20_Nss1,(MCS0)_2TX

EBW

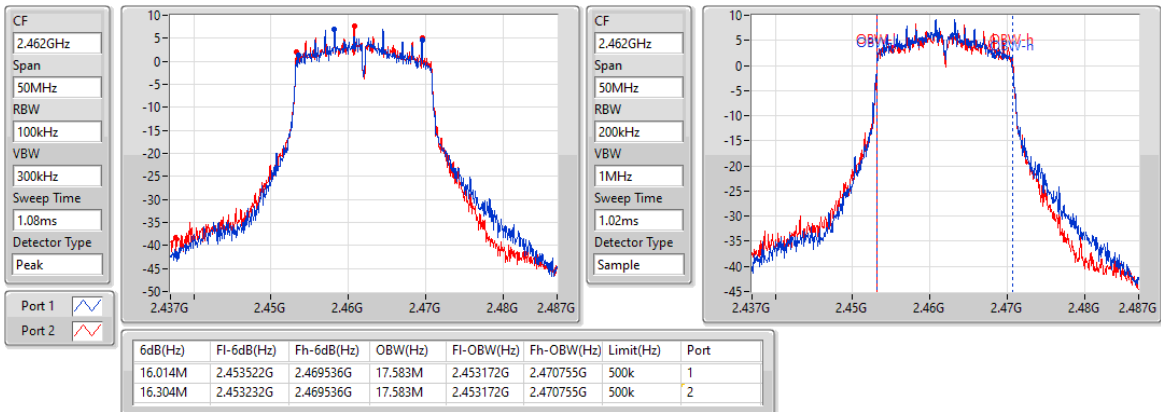
2437MHz



802.11n HT20_Nss1,(MCS0)_2TX

EBW

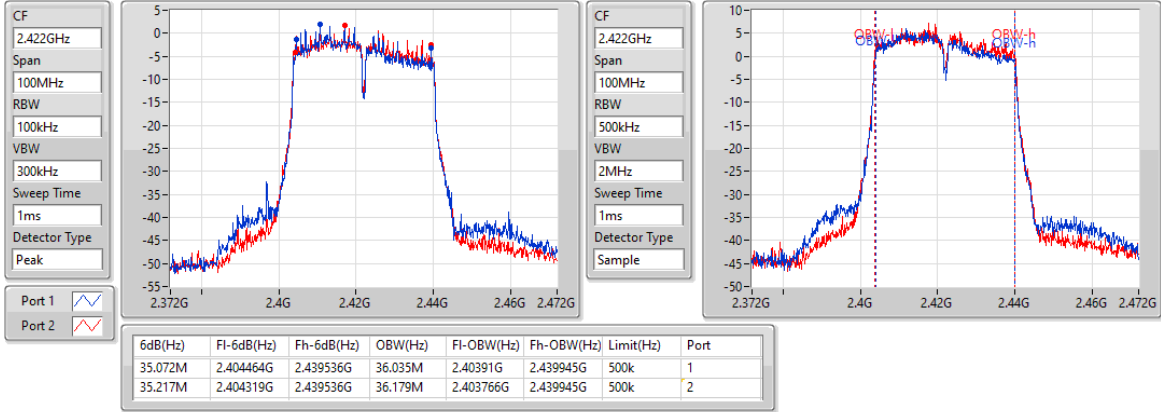
2462MHz



802.11n HT40_Nss1,(MCS0)_2TX

EBW

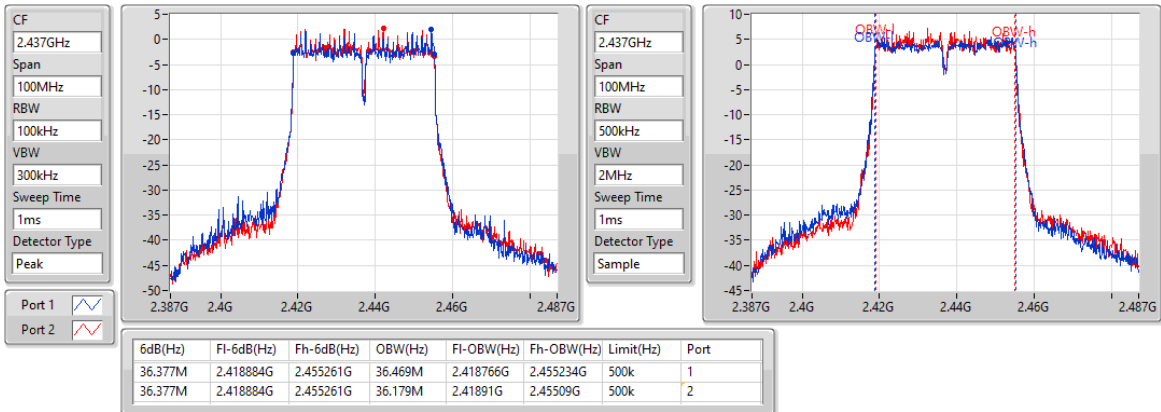
2422MHz



802.11n HT40_Nss1,(MCS0)_2TX

EBW

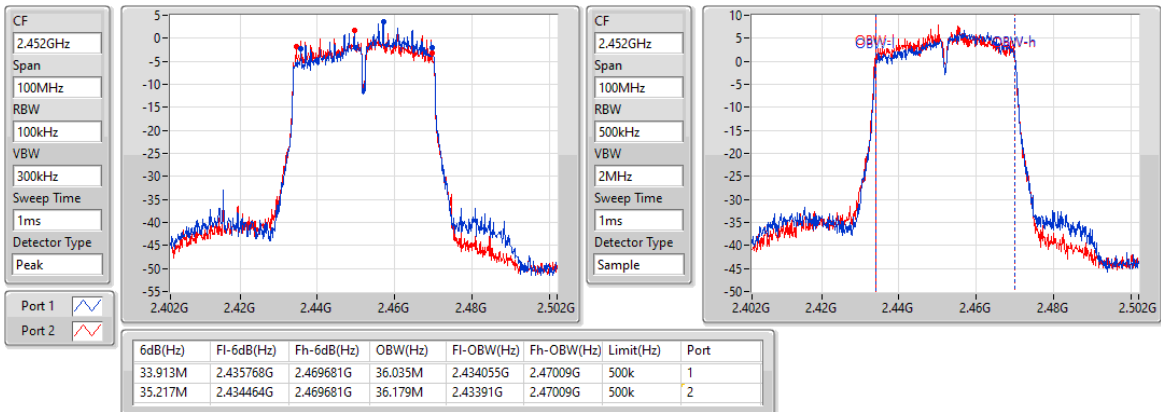
2437MHz



802.11n HT40_Nss1,(MCS0)_2TX

EBW

2452MHz



3.3 RF Output Power

3.3.1 Limit of RF Output Power

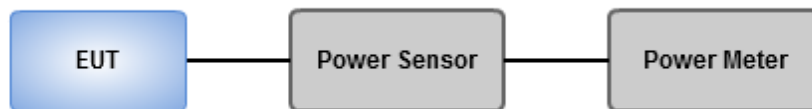
Conducted power shall not exceed 1Watt.

Antenna gain $\leq 6\text{dBi}$, no any corresponding reduction is in output power limit.

3.3.2 Test Procedures

A broadband RF power meter is used for output power measurement. The video bandwidth of power meter is greater than DTS bandwidth of EUT. If duty cycle of test signal is not 100 %, trigger and gating function of power meter will be enabled to capture transmission burst for measuring output power.

3.3.3 Test Setup



3.3.4 Test Result of Maximum Output Power

Ambient Condition	22°C / 63%	Tested By	Brad Wu
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Summary of Peak Conducted Output Power

Mode	Total Power (dBm)	Total Power (W)
2.4-2.4835GHz	-	-
802.11b_Nss1,(1Mbps)_2TX	18.29	0.06745
802.11g_Nss1,(6Mbps)_2TX	25.31	0.33963
802.11n HT20_Nss1,(MCS0)_2TX	25.48	0.35318
802.11n HT40_Nss1,(MCS0)_2TX	24.39	0.27479

Result

Mode	Result	DG (dBi)	Port 1 (dBm)	Port 2 (dBm)	Total Power (dBm)	Power Limit (dBm)	EIRP (dBm)	EIRP Limit (dBm)
802.11b_Nss1,(1Mbps)_2TX	-	-	-	-	-	-	-	-
2412MHz	Pass	1.80	15.13	15.03	18.09	30.00	19.89	36.00
2437MHz	Pass	1.80	15.31	14.78	18.06	30.00	19.86	36.00
2462MHz	Pass	1.80	15.41	15.14	18.29	30.00	20.09	36.00
802.11g_Nss1,(6Mbps)_2TX	-	-	-	-	-	-	-	-
2412MHz	Pass	1.80	22.08	21.86	24.98	30.00	26.78	36.00
2437MHz	Pass	1.80	22.12	22.44	25.29	30.00	27.09	36.00
2462MHz	Pass	1.80	22.41	22.18	25.31	30.00	27.11	36.00
802.11n HT20_Nss1,(MCS0)_2TX	-	-	-	-	-	-	-	-
2412MHz	Pass	1.80	22.47	22.13	25.31	30.00	27.11	36.00
2437MHz	Pass	1.80	22.39	22.42	25.42	30.00	27.22	36.00
2462MHz	Pass	1.80	22.45	22.48	25.48	30.00	27.28	36.00
802.11n HT40_Nss1,(MCS0)_2TX	-	-	-	-	-	-	-	-
2422MHz	Pass	1.80	20.86	20.73	23.81	30.00	25.61	36.00
2437MHz	Pass	1.80	21.25	21.48	24.38	30.00	26.18	36.00
2452MHz	Pass	1.80	21.67	21.06	24.39	30.00	26.19	36.00

DG = Directional Gain; **Port X** = Port X output power

Summary of Conducted (Average) Output Power

Mode	Total Power (dBm)	Total Power (W)
2.4-2.4835GHz	-	-
802.11b_Nss1,(1Mbps)_2TX	15.96	0.03945
802.11g_Nss1,(6Mbps)_2TX	20.36	0.10864
802.11n HT20_Nss1,(MCS0)_2TX	20.41	0.10990
802.11n HT40_Nss1,(MCS0)_2TX	18.44	0.06982

Result

Mode	Result	DG (dBi)	Port 1 (dBm)	Port 2 (dBm)	Total Power (dBm)	Power Limit (dBm)	EIRP (dBm)	EIRP Limit (dBm)
802.11b_Nss1,(1Mbps)_2TX	-	-	-	-	-	-	-	-
2412MHz	Pass	1.80	12.85	12.76	15.82	-	17.62	-
2437MHz	Pass	1.80	13.16	12.51	15.86	-	17.66	-
2462MHz	Pass	1.80	13.05	12.85	15.96	-	17.76	-
802.11g_Nss1,(6Mbps)_2TX	-	-	-	-	-	-	-	-
2412MHz	Pass	1.80	17.15	17.02	20.10	-	21.90	-
2437MHz	Pass	1.80	17.24	17.45	20.36	-	22.16	-
2462MHz	Pass	1.80	17.41	17.29	20.36	-	22.16	-
802.11n HT20_Nss1,(MCS0)_2TX	-	-	-	-	-	-	-	-
2412MHz	Pass	1.80	17.16	17.05	20.12	-	21.92	-
2437MHz	Pass	1.80	17.38	17.42	20.41	-	22.21	-
2462MHz	Pass	1.80	17.40	17.36	20.39	-	22.19	-
802.11n HT40_Nss1,(MCS0)_2TX	-	-	-	-	-	-	-	-
2422MHz	Pass	1.80	14.33	14.27	17.31	-	19.11	-
2437MHz	Pass	1.80	15.32	15.54	18.44	-	20.24	-
2452MHz	Pass	1.80	15.31	14.86	18.10	-	19.90	-

DG = Directional Gain; **Port X** = Port X output power

Note : Conducted average output power is for reference only

3.4 Power Spectral Density

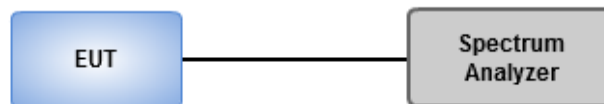
3.4.1 Limit of Power Spectral Density

Power spectral density shall not be greater than 8 dBm in any 3 kHz band.

3.4.2 Test Procedures

1. Set the RBW = 3 kHz, VBW = 10 kHz
2. Detector = Peak, Sweep time = auto couple.
3. Trace mode = max hold, allow trace to fully stabilize.
4. Use the peak marker function to determine the maximum amplitude level.

3.4.3 Test Setup



3.4.4 Test Result of Power Spectral Density

Ambient Condition	22°C / 63%	Tested By	Brad Wu
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Summary

Mode	PD (dBm/3kHz)
2.4-2.4835GHz	-
802.11b_Nss1,(1Mbps)_2TX	7.73
802.11g_Nss1,(6Mbps)_2TX	-6.78
802.11n HT20_Nss1,(MCS0)_2TX	-4.31
802.11n HT40_Nss1,(MCS0)_2TX	-9.60

Result

Mode	Result	DG (dBi)	Port 1 (dBm/3kHz)	Port 2 (dBm/3kHz)	PD (dBm/3kHz)	PD Limit (dBm/3kHz)
802.11b_Nss1,(1Mbps)_2TX	-	-	-	-	-	-
2412MHz	Pass	4.81	4.66	4.20	7.40	8.00
2437MHz	Pass	4.81	4.46	4.86	7.67	8.00
2462MHz	Pass	4.81	4.75	4.70	7.73	8.00
802.11g_Nss1,(6Mbps)_2TX	-	-	-	-	-	-
2412MHz	Pass	4.81	-8.96	-9.44	-6.78	8.00
2437MHz	Pass	4.81	-10.10	-9.89	-7.42	8.00
2462MHz	Pass	4.81	-9.32	-9.94	-7.31	8.00
802.11n HT20_Nss1,(MCS0)_2TX	-	-	-	-	-	-
2412MHz	Pass	4.81	-7.71	-8.36	-5.01	8.00
2437MHz	Pass	4.81	-8.10	-7.73	-5.65	8.00
2462MHz	Pass	4.81	-6.93	-7.32	-4.31	8.00
802.11n HT40_Nss1,(MCS0)_2TX	-	-	-	-	-	-
2422MHz	Pass	4.81	-12.79	-14.10	-10.89	8.00
2437MHz	Pass	4.81	-10.97	-12.46	-9.67	8.00
2452MHz	Pass	4.81	-12.06	-12.00	-9.60	8.00

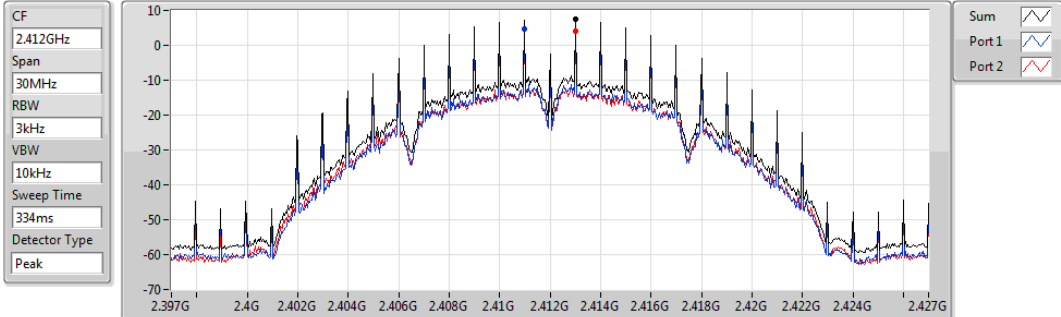
DG = Directional Gain= $1.8 + 10 * \log(2/1) = 4.81$ dBi;

PD = trace bin-by-bin of each transmits port summing can be performed maximum power density; **Port X** = Port X power density;

802.11b_Nss1,(1Mbps)_2TX

PSD

2412MHz

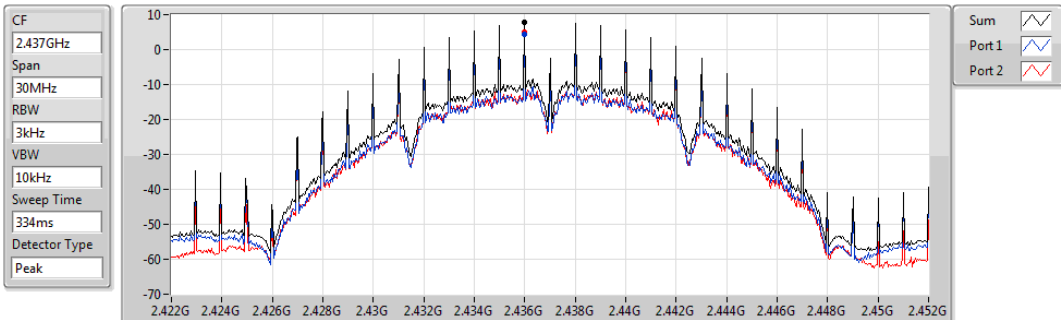


Sum	PD	Port 1	Port 2
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
7.40	7.40	4.66	4.20

802.11b_Nss1,(1Mbps)_2TX

PSD

2437MHz

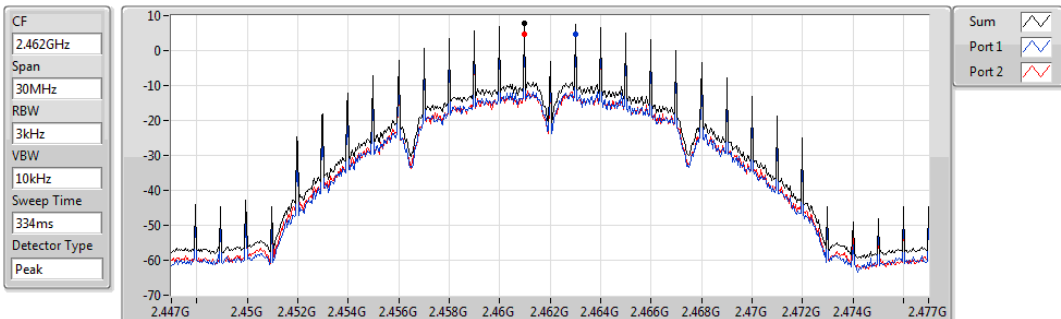


Sum	PD	Port 1	Port 2
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
7.67	7.67	4.46	4.86

802.11b_Nss1,(1Mbps)_2TX

PSD

2462MHz

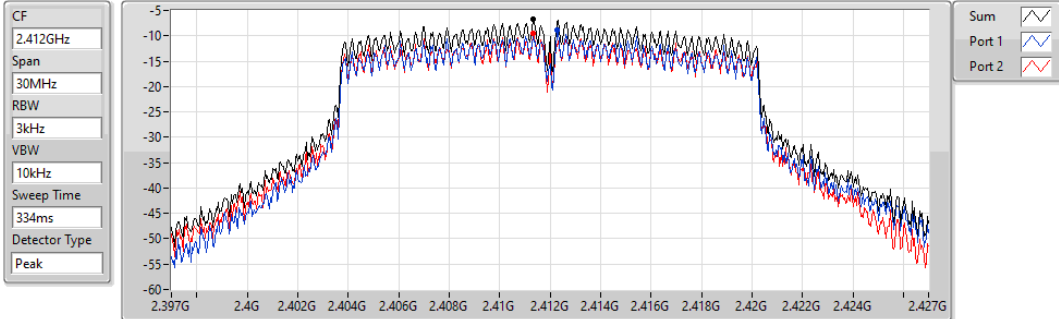


Sum	PD	Port 1	Port 2
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
7.73	7.73	4.75	4.70

802.11g_Nss1,(6Mbps)_2TX

PSD

2412MHz

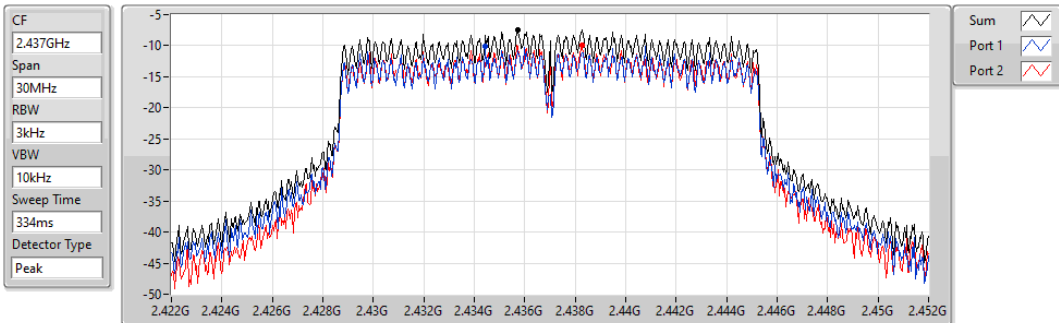


Sum	PD	Port 1	Port 2
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-6.78	-6.78	-8.96	-9.44

802.11g_Nss1,(6Mbps)_2TX

PSD

2437MHz

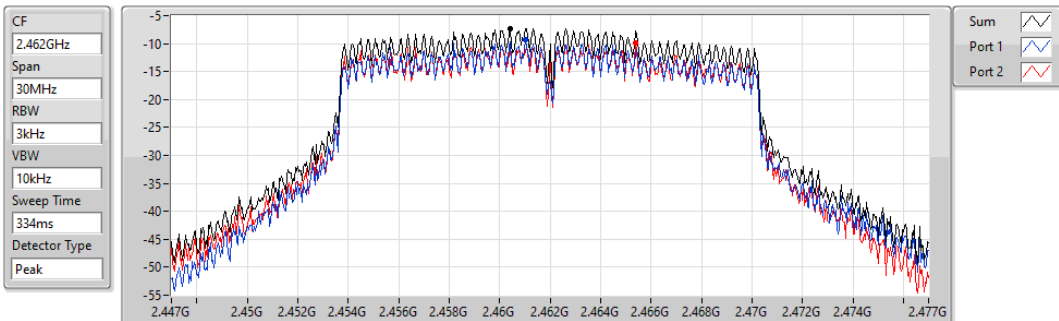


Sum	PD	Port 1	Port 2
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-7.42	-7.42	-10.10	-9.89

802.11g_Nss1,(6Mbps)_2TX

PSD

2462MHz

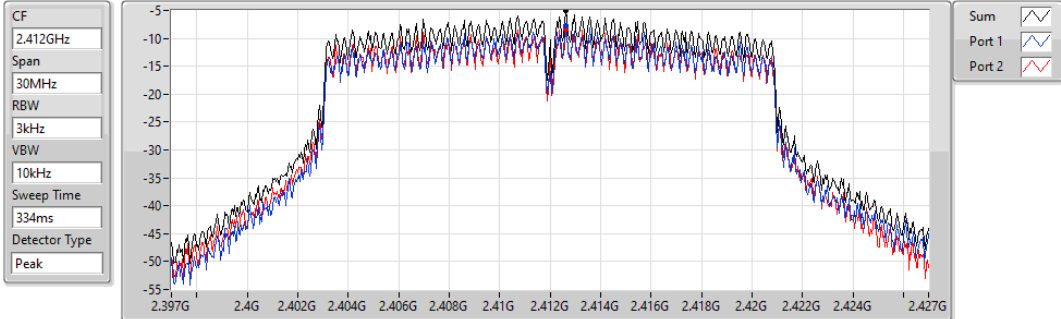


Sum	PD	Port 1	Port 2
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-7.31	-7.31	-9.32	-9.94

802.11n HT20_Nss1,(MCS0)_2TX

PSD

2412MHz

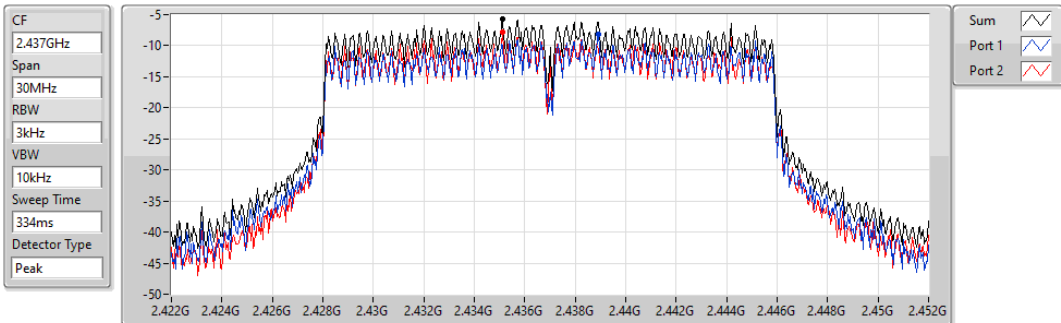


Sum	PD	Port 1	Port 2
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-5.01	-5.01	-7.71	-8.36

802.11n HT20_Nss1,(MCS0)_2TX

PSD

2437MHz

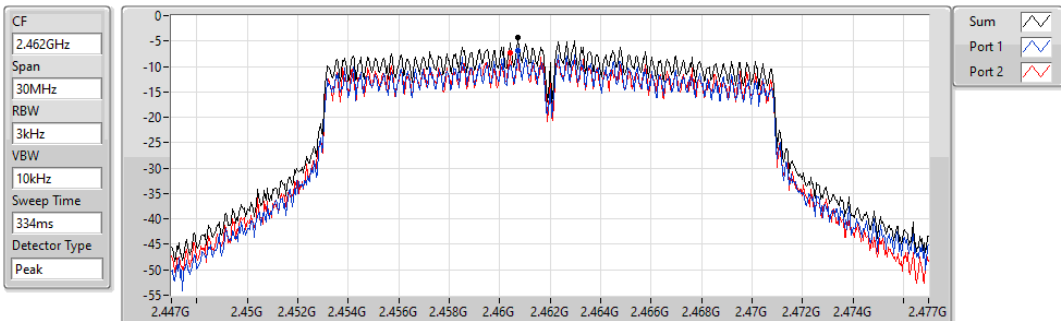


Sum	PD	Port 1	Port 2
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-5.65	-5.65	-8.10	-7.73

802.11n HT20_Nss1,(MCS0)_2TX

PSD

2462MHz

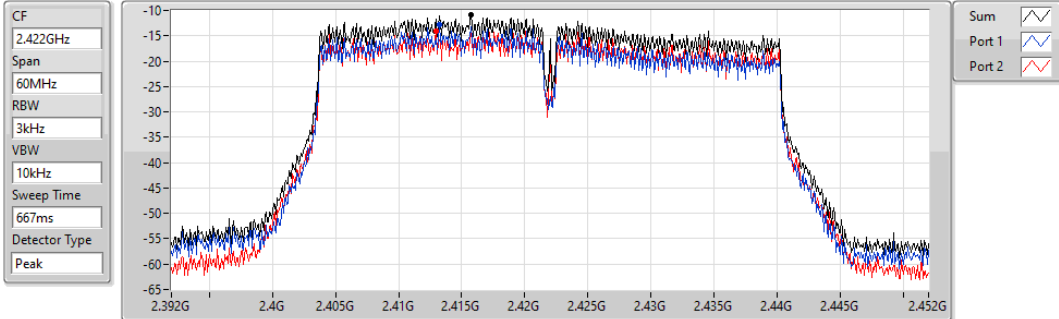


Sum	PD	Port 1	Port 2
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-4.31	-4.31	-6.93	-7.32

802.11n HT40_Nss1,(MCS0)_2TX

PSD

2422MHz

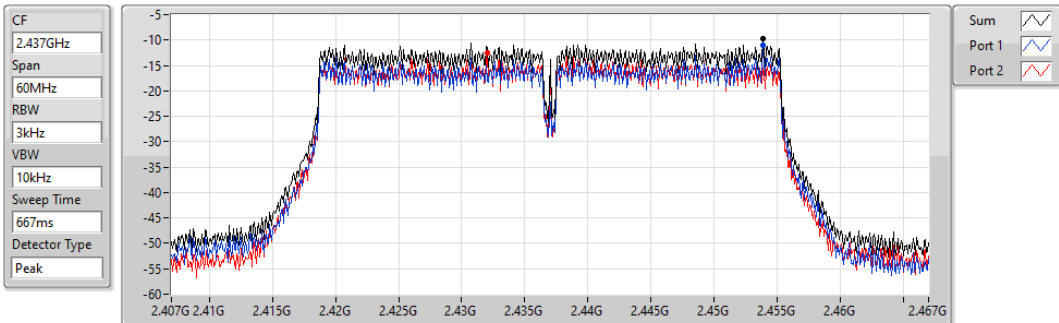


Sum	PD	Port 1	Port 2
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-10.89	-10.89	-12.79	-14.10

802.11n HT40_Nss1,(MCS0)_2TX

PSD

2437MHz

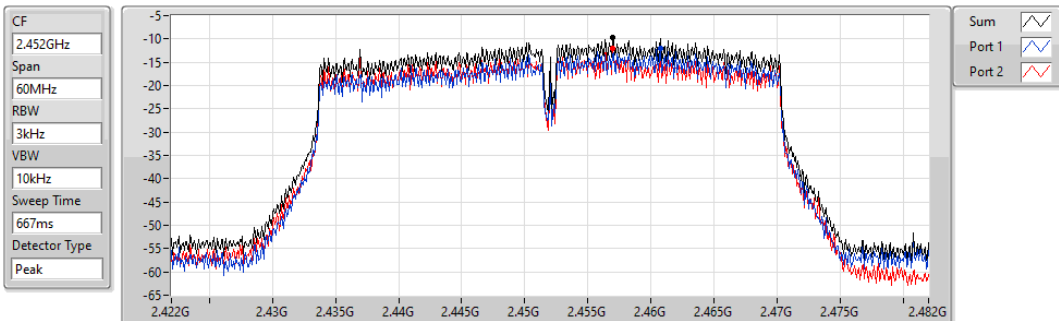


Sum	PD	Port 1	Port 2
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-9.67	-9.67	-10.97	-12.46

802.11n HT40_Nss1,(MCS0)_2TX

PSD

2452MHz



Sum	PD	Port 1	Port 2
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-9.60	-9.60	-12.06	-12.00

3.5 Unwanted Emissions into Restricted Frequency Bands

3.5.1 Limit of Unwanted Emissions into Restricted Frequency Bands

Restricted Band Emissions Limit			
Frequency Range (MHz)	Field Strength (uV/m)	Field Strength (dBuV/m)	Measure Distance (m)
0.009~0.490	2400/F(kHz)	48.5 - 13.8	300
0.490~1.705	24000/F(kHz)	33.8 - 23	30
1.705~30.0	30	29	30
30~88	100	40	3
88~216	150	43.5	3
216~960	200	46	3
Above 960	500	54	3

Note 1:
Quasi-Peak value is measured for frequency below 1GHz except for 9–90 kHz, 110–490 kHz frequency band. Peak and average value are measured for frequency above 1GHz. The limit on average radio frequency emission is as above table. The limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit

Note 2:
Measurements may be performed at a distance other than what is specified provided. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor as below, Frequency at or above 30 MHz: 20 dB/decade Frequency below 30 MHz: 40 dB/decade.

3.5.2 Test Procedures

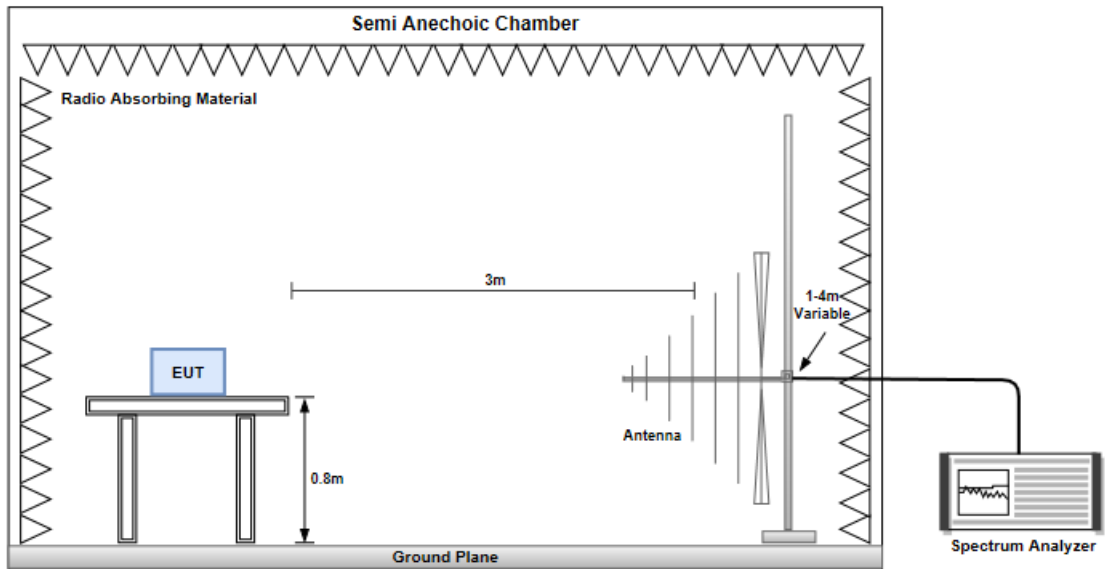
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission frequency. The EUT is placed at test table. For emissions testing at or below 1 GHz, the table height is 80 cm above the reference ground plane. For emission measurements above 1 GHz, the table height is 1.5 m
2. Measurement is made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna is varied in height (1m ~ 4m) above the reference ground plane to obtain the maximum signal strength. Distance between EUT and antenna is 3 m.
3. This investigation is performed with the EUT rotated 360°, the antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations.

Note:

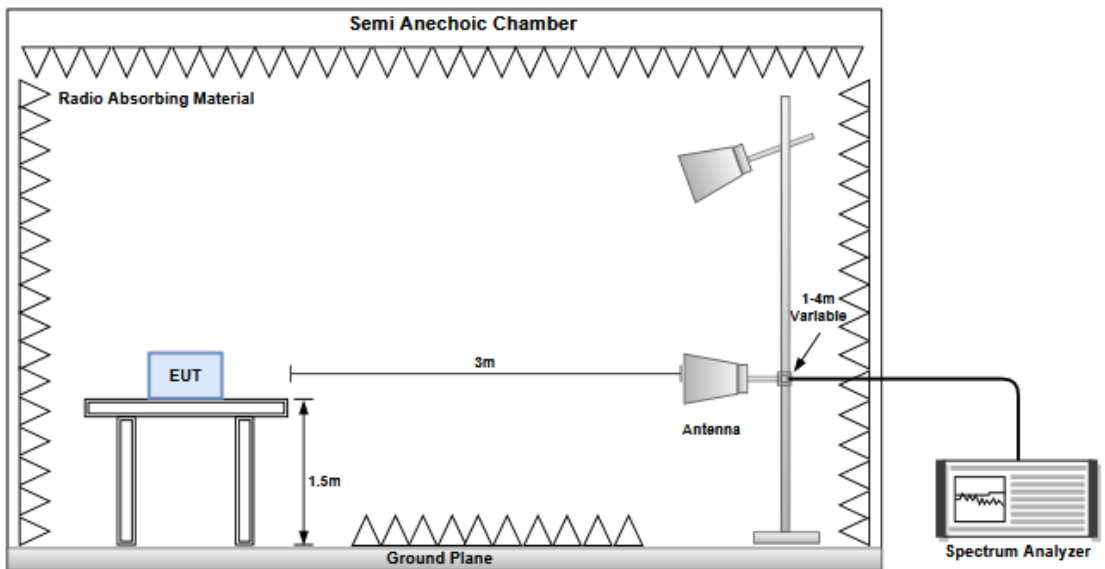
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
3. RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above 1GHz.

3.5.3 Test Setup

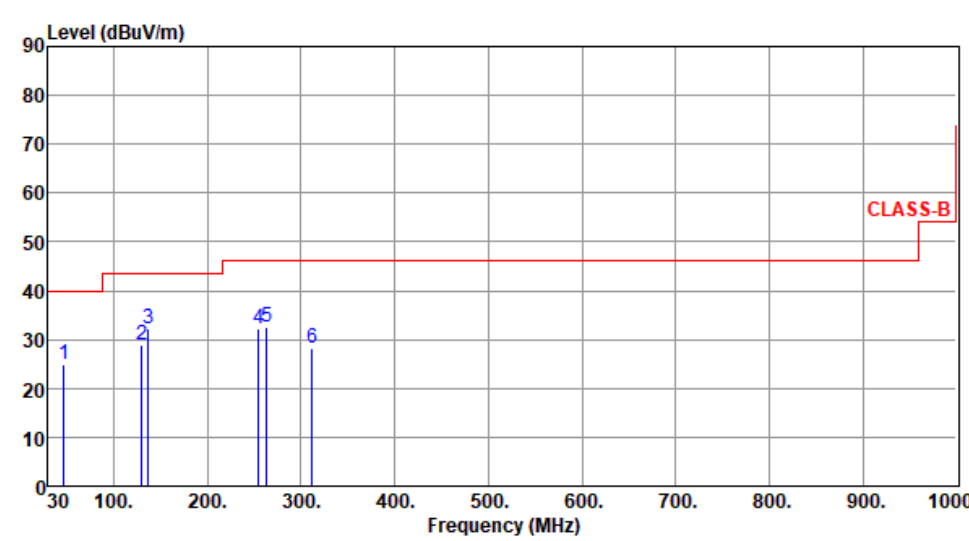
Radiated Emissions below 1 GHz



Radiated Emissions above 1 GHz



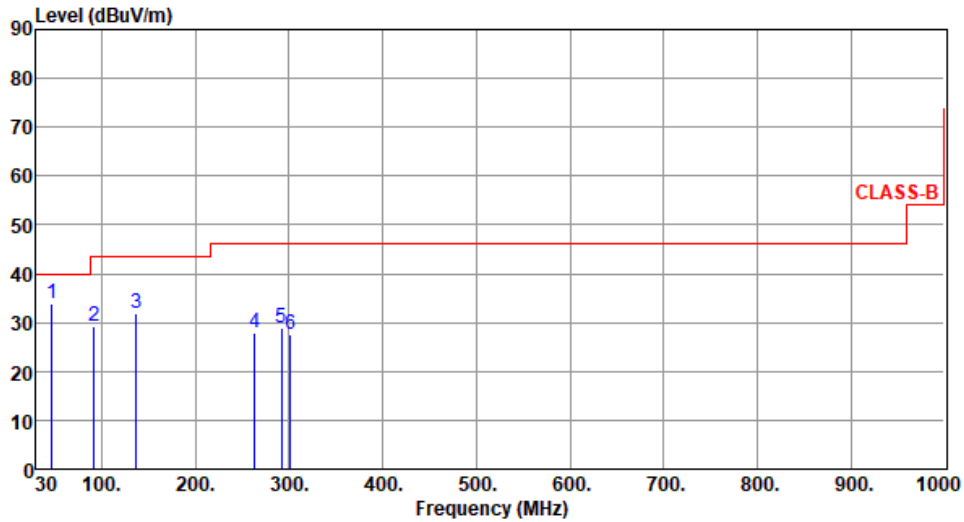
3.5.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)

Modulation	HT20	Test Freq. (MHz)	2462						
Polarization	Horizontal								
Test By : Roger Lu Temperature(°C):22 Humidity(%):68									
									
	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1	46.49	24.79	40.00	-15.21	33.54	-8.75	Peak	---	---
2	129.91	28.89	43.50	-14.61	39.02	-10.13	Peak	---	---
3	136.70	32.06	43.50	-11.44	41.54	-9.48	Peak	---	---
4	255.04	32.07	46.00	-13.93	42.13	-10.06	Peak	---	---
5	263.77	32.48	46.00	-13.52	42.28	-9.80	Peak	---	---
6	312.27	28.30	46.00	-17.70	36.51	-8.21	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
 *Factor includes antenna factor , cable loss and amplifier gain
 Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).
 Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

Modulation	HT20	Test Freq. (MHz)	2462
Polarization	Vertical		

Test By :Roger Lu Temperature(°C):22 Humidity(%):68



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	46.49	34.02	40.00	-5.98	42.77	-8.75	Peak	---	---
2	92.08	29.25	43.50	-14.25	44.08	-14.83	Peak	---	---
3	136.70	31.92	43.50	-11.58	41.40	-9.48	Peak	---	---
4	263.77	28.05	46.00	-17.95	37.85	-9.80	Peak	---	---
5	291.90	29.01	46.00	-16.99	37.78	-8.77	Peak	---	---
6	301.60	27.68	46.00	-18.32	36.25	-8.57	Peak	---	---

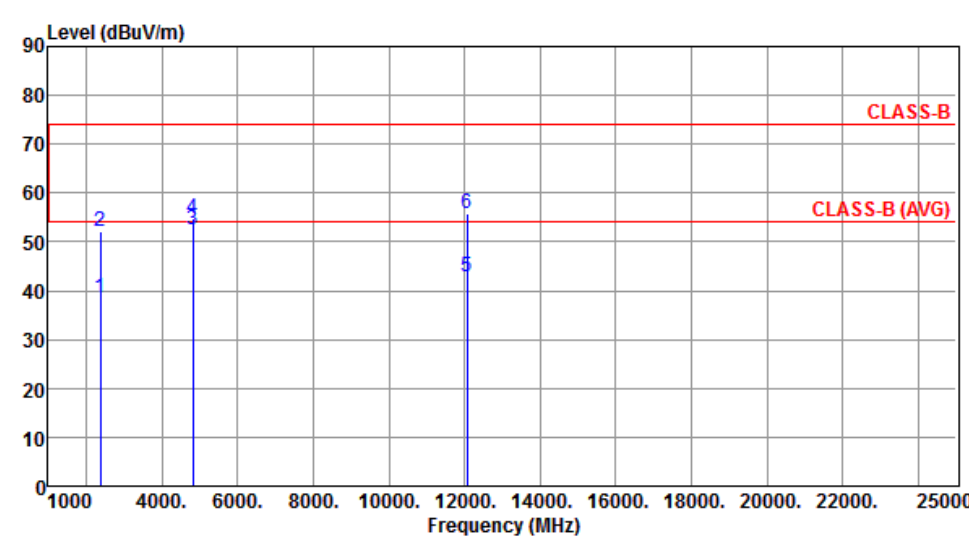
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

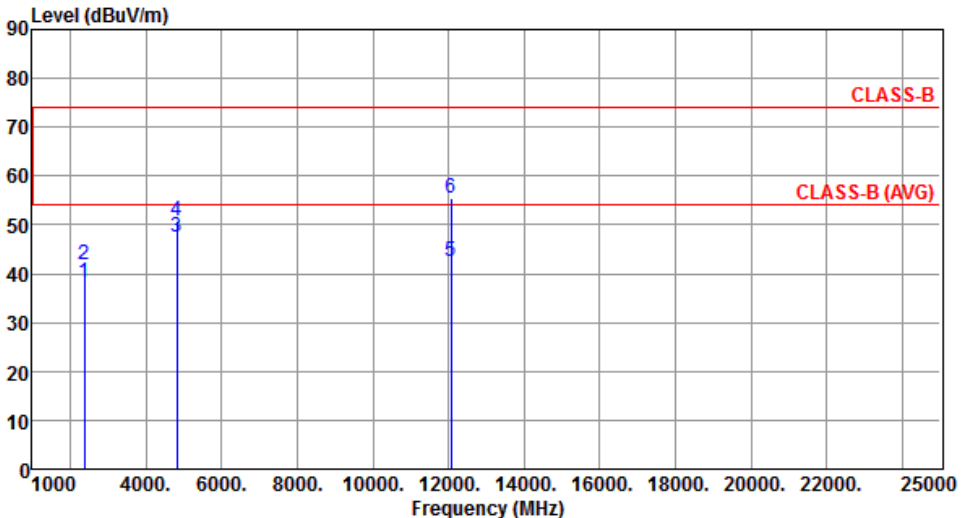
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

3.5.5 Transmitter Radiated Unwanted Emissions (Above 1GHz) for 11b

Modulation	11b	Test Freq. (MHz)	2412						
Polarization	Horizontal								
Test By : Roger Lu Temperature(°C):22 Humidity(%):64									
									
	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1	2390.00	38.38	54.00	-15.62	40.04	-1.66	Average	164	339
2	2390.00	51.99	74.00	-22.01	53.65	-1.66	Peak	164	339
3	4824.00	52.55	54.00	-1.45	47.52	5.03	Average	192	1
4	4824.00	54.63	74.00	-19.37	49.60	5.03	Peak	192	1
5	12060.00	42.81	54.00	-11.19	28.04	14.77	Average	100	80
6	12060.00	55.65	74.00	-18.35	40.88	14.77	Peak	100	80
<p>Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB) *Factor includes antenna factor , cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).</p>									

Modulation	11b	Test Freq. (MHz)	2412
Polarization	Vertical		
Test By : Roger Lu		Temperature(°C): 22	Humidity(%): 64



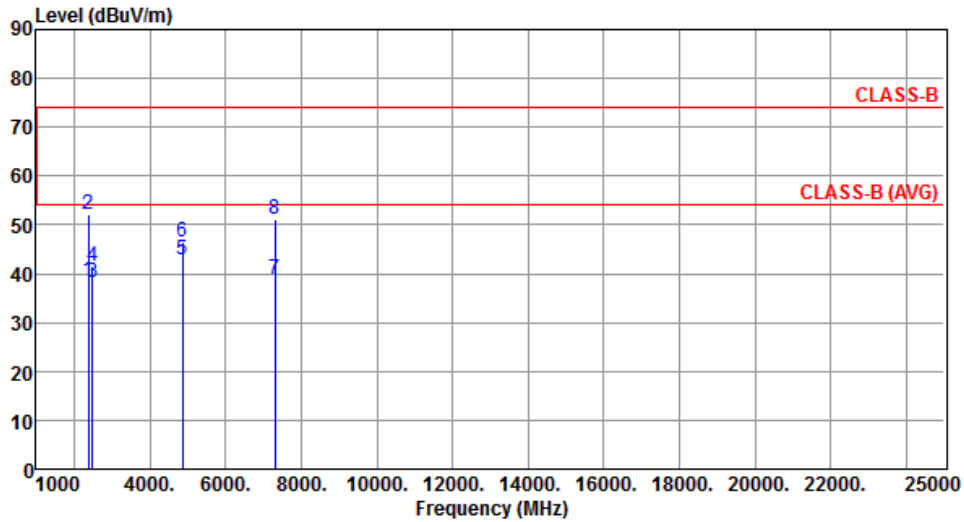
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	38.34	54.00	-15.66	40.00	-1.66	Average	110	181
2	2390.00	41.94	74.00	-32.06	43.60	-1.66	Peak	110	181
3	4824.00	47.53	54.00	-6.47	42.50	5.03	Average	299	2
4	4824.00	50.87	74.00	-23.13	45.84	5.03	Peak	299	2
5	12060.00	42.62	54.00	-11.38	27.85	14.77	Average	100	50
6	12060.00	55.47	74.00	-18.53	40.70	14.77	Peak	100	50

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
 *Factor includes antenna factor , cable loss and amplifier gain
 Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Modulation	11b	Test Freq. (MHz)	2437						
Polarization	Horizontal								
Test By :Roger Lu Temperature(°C):22 Humidity(%):64									
	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1	2390.00	38.38	54.00	-15.62	40.04	-1.66	Average	175	351
2	2390.00	52.10	74.00	-21.90	53.76	-1.66	Peak	175	351
3	2483.50	38.26	54.00	-15.74	40.12	-1.86	Average	175	351
4	2483.50	51.75	74.00	-22.25	53.61	-1.86	Peak	175	351
5	4874.00	48.63	54.00	-5.37	43.56	5.07	Average	260	35
6	4874.00	50.88	74.00	-23.12	45.81	5.07	Peak	260	35
7	7311.00	39.03	54.00	-14.97	28.65	10.38	Average	152	1
8	7311.00	51.83	74.00	-22.17	41.45	10.38	Peak	152	1
<p>Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB) *Factor includes antenna factor , cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).</p>									

Modulation	11b	Test Freq. (MHz)	2437
Polarization	Vertical		

Test By :Roger Lu Temperature(°C):22 Humidity(%):64

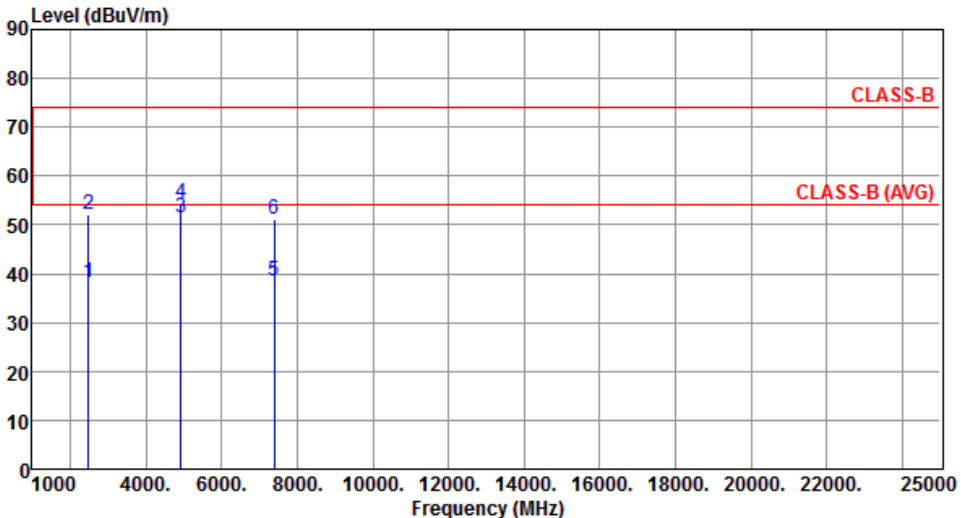


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	38.38	54.00	-15.62	40.04	-1.66	Average	109	179
2	2390.00	52.04	74.00	-21.96	53.70	-1.66	Peak	109	179
3	2483.50	38.26	54.00	-15.74	40.12	-1.86	Average	109	179
4	2483.50	41.62	74.00	-32.38	43.48	-1.86	Peak	109	179
5	4874.00	42.69	54.00	-11.31	37.62	5.07	Average	278	2
6	4874.00	46.62	74.00	-27.38	41.55	5.07	Peak	278	2
7	7311.00	38.95	54.00	-15.05	28.57	10.38	Average	257	28
8	7311.00	51.22	74.00	-22.78	40.84	10.38	Peak	257	28

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

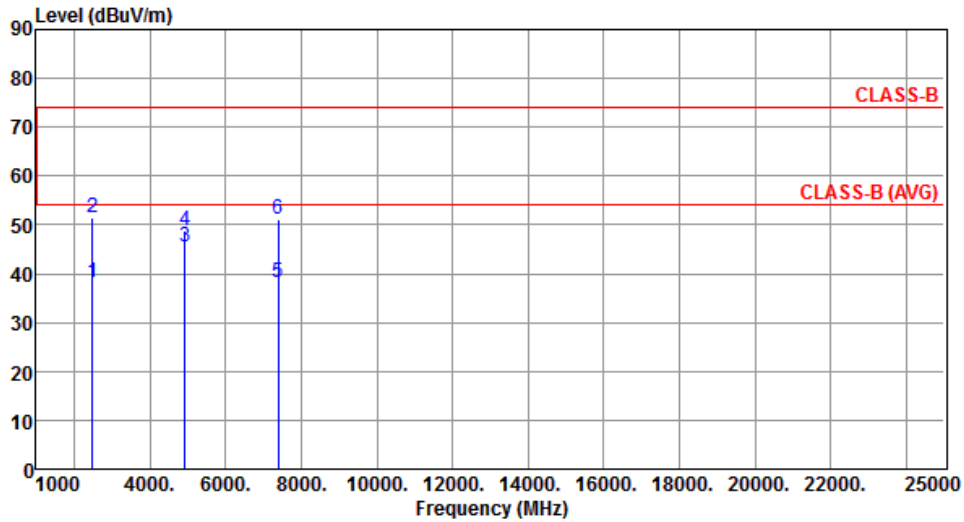
*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Modulation	11b	Test Freq. (MHz)	2462						
Polarization	Horizontal								
Test By :Roger Lu Temperature(°C):22 Humidity(%):64									
									
	Freq. MHz	Emission level dBUV/m	Limit dBUV/m	Margin dB	SA reading dBUV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2483.50	38.26	54.00	-15.74	40.12	-1.86	Average	177	350
2	2483.50	52.02	74.00	-21.98	53.88	-1.86	Peak	177	350
3	4924.00	51.38	54.00	-2.62	46.21	5.17	Average	301	41
4	4924.00	54.50	74.00	-19.50	49.33	5.17	Peak	301	41
5	7386.00	38.36	54.00	-15.64	28.28	10.08	Average	136	8
6	7386.00	51.07	74.00	-22.93	40.99	10.08	Peak	136	8
Note 1: Emission Level (dBUV/m) = SA Reading (dBUV/m) + Factor* (dB) *Factor includes antenna factor , cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBUV/m) – Limit (dBUV/m).									

Modulation	11b	Test Freq. (MHz)	2462
Polarization	Vertical		

Test By :Roger Lu Temperature(°C):22 Humidity(%):64



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2483.50	38.27	54.00	-15.73	40.13	-1.86	Average	110	178
2	2483.50	51.58	74.00	-22.42	53.44	-1.86	Peak	110	178
3	4924.00	45.48	54.00	-8.52	40.31	5.17	Average	258	1
4	4924.00	48.83	74.00	-25.17	43.66	5.17	Peak	258	1
5	7386.00	38.30	54.00	-15.70	28.22	10.08	Average	255	29
6	7386.00	51.01	74.00	-22.99	40.93	10.08	Peak	255	29

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

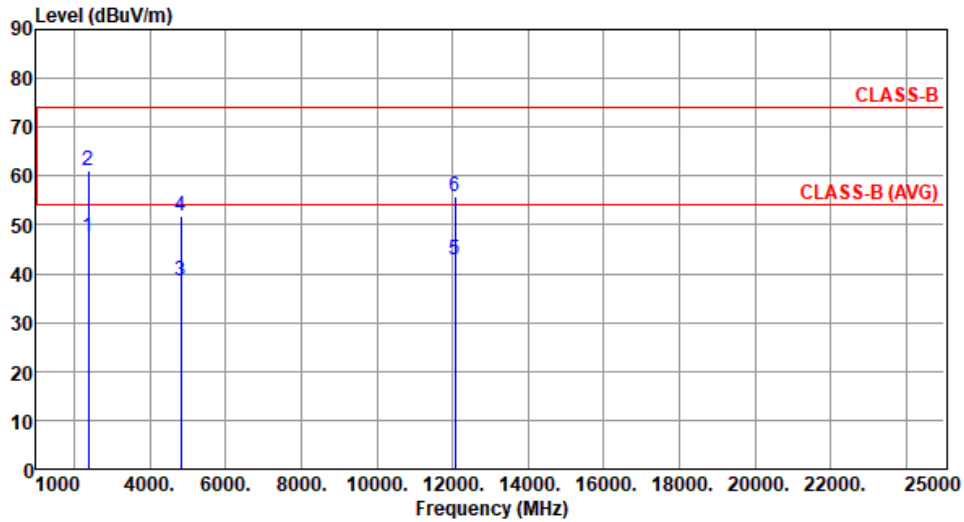
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

3.5.6 Transmitter Radiated Unwanted Emissions (Above 1GHz) for 11g

Modulation	11g	Test Freq. (MHz)	2412						
Polarization	Horizontal								
Test By : Roger Lu Temperature(°C):23 Humidity(%):62									
	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1	2390.00	52.75	54.00	-1.25	54.41	-1.66	Average	225	9
2	2390.00	66.21	74.00	-7.79	67.87	-1.66	Peak	225	9
3	4824.00	47.91	54.00	-6.09	42.88	5.03	Average	191	3
4	4824.00	60.90	74.00	-13.10	55.87	5.03	Peak	191	3
5	12060.00	42.91	54.00	-11.09	28.14	14.77	Average	100	50
6	12060.00	55.95	74.00	-18.05	41.18	14.77	Peak	100	50
<p>Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB) *Factor includes antenna factor , cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).</p>									

Modulation	11g	Test Freq. (MHz)	2412
Polarization	Vertical		

Test By :Roger Lu Temperature(°C):23 Humidity(%):62



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	47.64	54.00	-6.36	49.30	-1.66	Average	103	219
2	2390.00	60.98	74.00	-13.02	62.64	-1.66	Peak	103	219
3	4824.00	38.56	54.00	-15.44	33.53	5.03	Average	275	8
4	4824.00	51.94	74.00	-22.06	46.91	5.03	Peak	275	8
5	12060.00	42.84	54.00	-11.16	28.07	14.77	Average	100	61
6	12060.00	55.86	74.00	-18.14	41.09	14.77	Peak	100	61

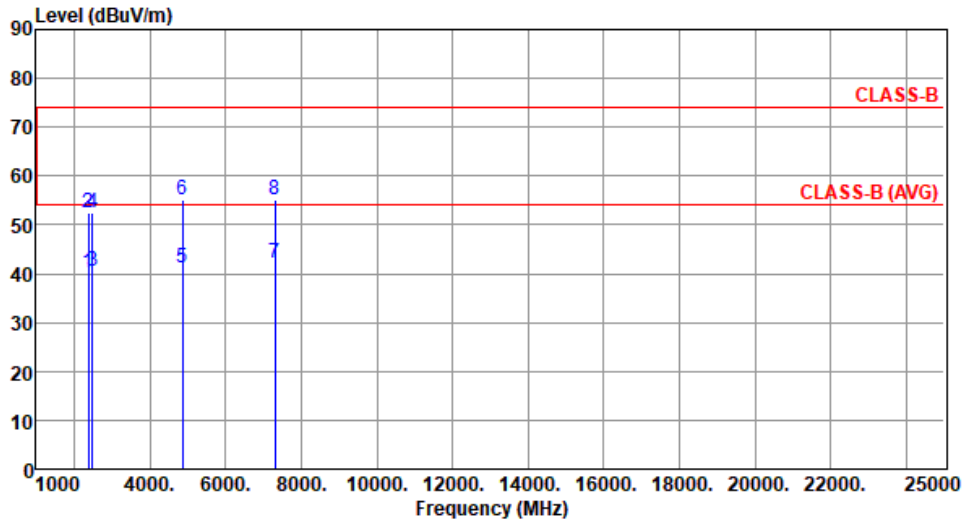
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Modulation	11g	Test Freq. (MHz)	2437
Polarization	Horizontal		

Test By :Roger Lu Temperature(°C):23 Humidity(%):62



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	40.26	54.00	-13.74	41.92	-1.66	Average	129	72
2	2390.00	52.45	74.00	-21.55	54.11	-1.66	Peak	129	72
3	2483.50	40.46	54.00	-13.54	42.32	-1.86	Average	129	72
4	2483.50	52.43	74.00	-21.57	54.29	-1.86	Peak	129	72
5	4874.00	41.12	54.00	-12.88	36.05	5.07	Average	261	24
6	4874.00	55.15	74.00	-18.85	50.08	5.07	Peak	261	24
7	7311.00	42.17	54.00	-11.83	31.79	10.38	Average	155	1
8	7311.00	55.28	74.00	-18.72	44.90	10.38	Peak	155	1

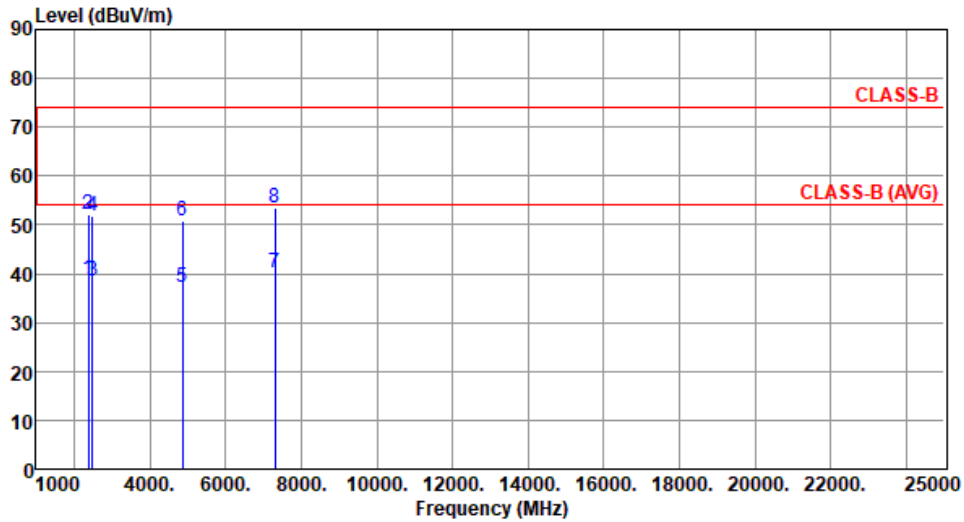
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Modulation	11g	Test Freq. (MHz)	2437
Polarization	Vertical		

Test By :Roger Lu Temperature(°C):23 Humidity(%):62



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	38.90	54.00	-15.10	40.56	-1.66	Average	101	218
2	2390.00	52.09	74.00	-21.91	53.75	-1.66	Peak	101	218
3	2483.50	38.61	54.00	-15.39	40.47	-1.86	Average	101	218
4	2483.50	51.81	74.00	-22.19	53.67	-1.86	Peak	101	218
5	4874.00	37.20	54.00	-16.80	32.13	5.07	Average	279	0
6	4874.00	50.65	74.00	-23.35	45.58	5.07	Peak	279	0
7	7311.00	40.25	54.00	-13.75	29.87	10.38	Average	255	30
8	7311.00	53.44	74.00	-20.56	43.06	10.38	Peak	255	30

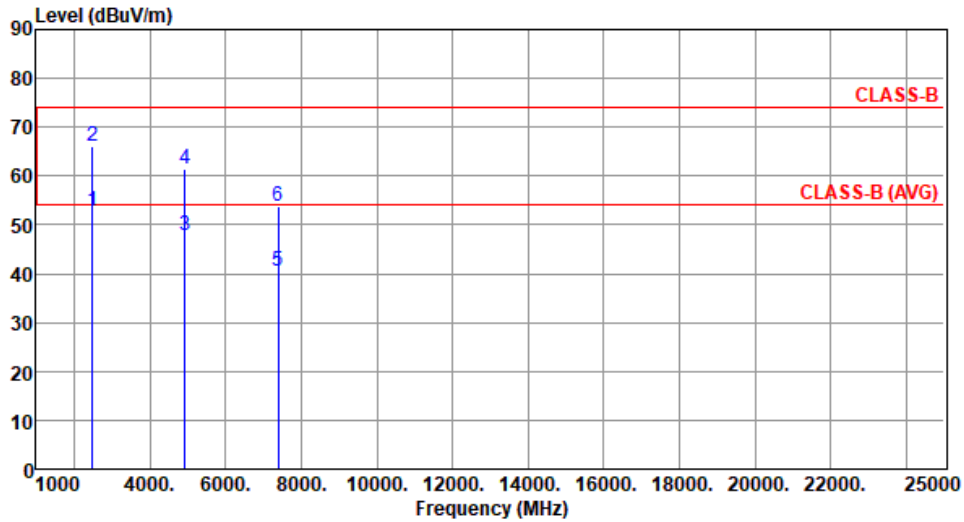
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Modulation	11g	Test Freq. (MHz)	2462
Polarization	Horizontal		

Test By :Roger Lu Temperature(°C):23 Humidity(%):62



	Freq. MHz	Emission level dBUV/m	Limit dBUV/m	Margin dB	SA reading dBUV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2483.50	52.94	54.00	-1.06	54.80	-1.86	Average	226	93
2	2483.50	66.13	74.00	-7.87	67.99	-1.86	Peak	226	93
3	4924.00	47.69	54.00	-6.31	42.52	5.17	Average	316	45
4	4924.00	61.45	74.00	-12.55	56.28	5.17	Peak	316	45
5	7386.00	40.53	54.00	-13.47	30.45	10.08	Average	140	5
6	7386.00	53.66	74.00	-20.34	43.58	10.08	Peak	140	5

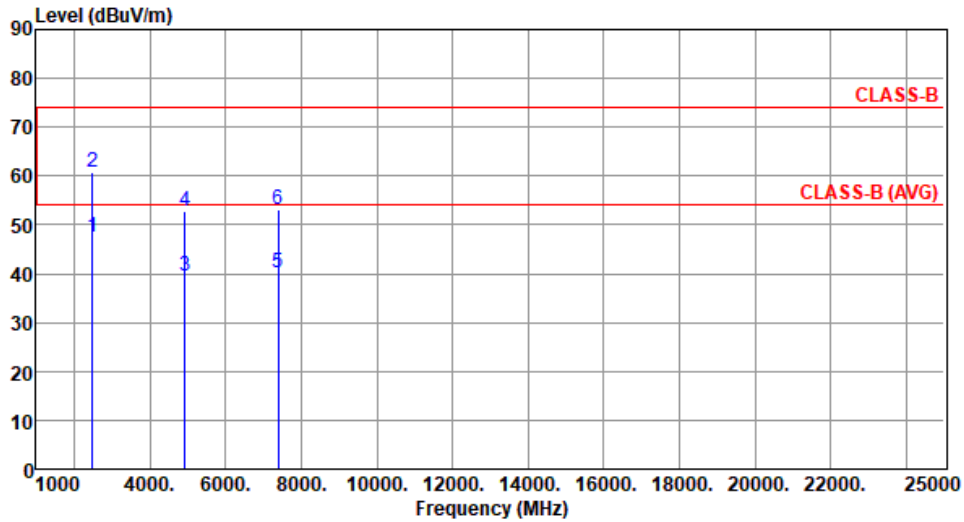
Note 1: Emission Level (dBUV/m) = SA Reading (dBUV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBUV/m) – Limit (dBUV/m).

Modulation	11g	Test Freq. (MHz)	2462
Polarization	Vertical		

Test By :Roger Lu Temperature(°C):23 Humidity(%):62



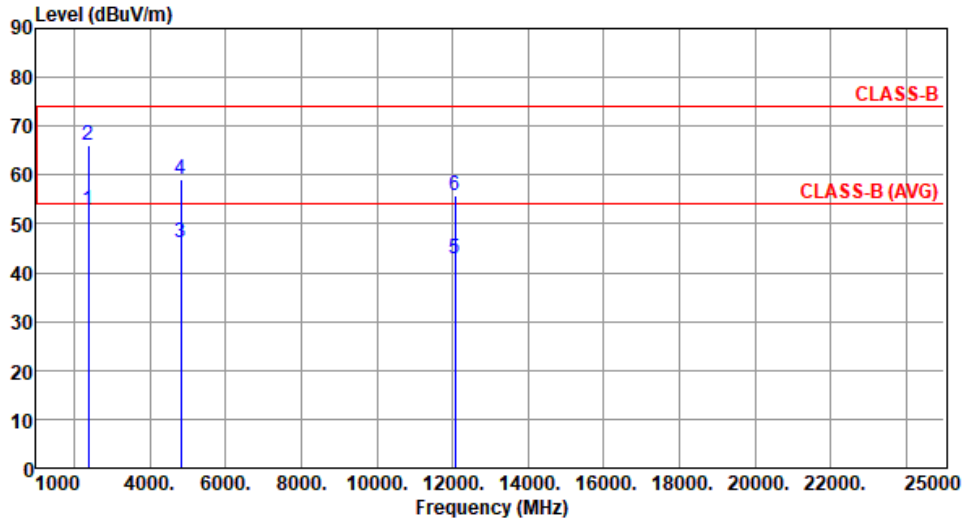
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2483.50	47.62	54.00	-6.38	49.48	-1.86	Average	104	219
2	2483.50	60.81	74.00	-13.19	62.67	-1.86	Peak	104	219
3	4924.00	39.41	54.00	-14.59	34.24	5.17	Average	281	3
4	4924.00	52.84	74.00	-21.16	47.67	5.17	Peak	281	3
5	7386.00	40.14	54.00	-13.86	30.06	10.08	Average	258	41
6	7386.00	53.22	74.00	-20.78	43.14	10.08	Peak	258	41

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

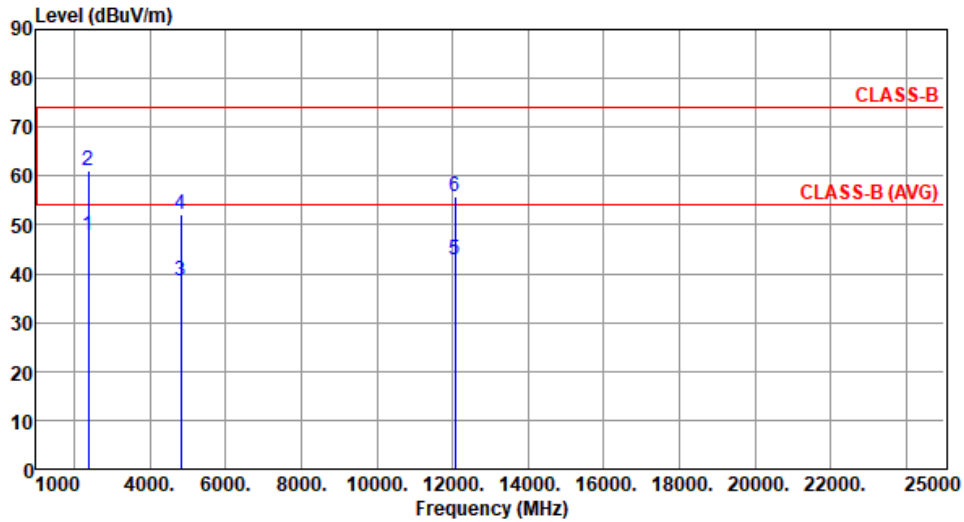
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

3.5.7 Transmitter Radiated Unwanted Emissions (Above 1GHz) for HT20

Modulation	HT20	Test Freq. (MHz)	2412						
Polarization	Horizontal								
Test By : Roger Lu Temperature(°C):24 Humidity(%):65									
									
	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1	2390.00	52.87	54.00	-1.13	54.53	-1.66	Average	260	21
2	2390.00	66.02	74.00	-7.98	67.68	-1.66	Peak	260	21
3	4824.00	46.28	54.00	-7.72	41.25	5.03	Average	188	5
4	4824.00	59.17	74.00	-14.83	54.14	5.03	Peak	188	5
5	12060.00	42.87	54.00	-11.13	28.10	14.77	Average	100	4
6	12060.00	55.87	74.00	-18.13	41.10	14.77	Peak	100	4
<p>Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB) *Factor includes antenna factor , cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).</p>									

Modulation	HT20	Test Freq. (MHz)	2412
Polarization	Vertical		

Test By :Roger Lu Temperature(°C):24 Humidity(%):65



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	47.85	54.00	-6.15	49.51	-1.66	Average	105	221
2	2390.00	61.19	74.00	-12.81	62.85	-1.66	Peak	105	221
3	4824.00	38.69	54.00	-15.31	33.66	5.03	Average	276	11
4	4824.00	52.11	74.00	-21.89	47.08	5.03	Peak	276	11
5	12060.00	42.93	54.00	-11.07	28.16	14.77	Average	100	45
6	12060.00	55.91	74.00	-18.09	41.14	14.77	Peak	100	45

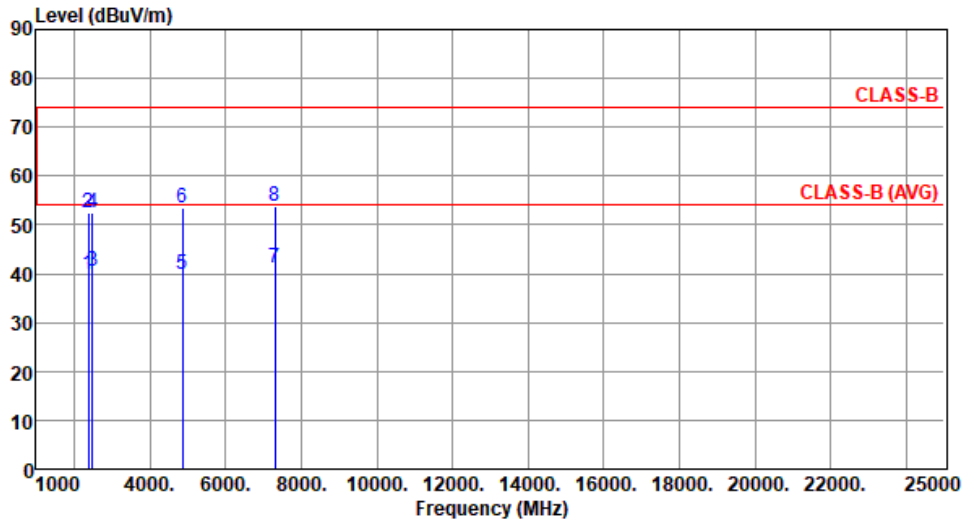
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Modulation	HT20	Test Freq. (MHz)	2437
Polarization	Horizontal		

Test By :Roger Lu Temperature(°C):24 Humidity(%):65



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	39.98	54.00	-14.02	41.64	-1.66	Average	267	36
2	2390.00	52.52	74.00	-21.48	54.18	-1.66	Peak	267	36
3	2483.50	40.46	54.00	-13.54	42.32	-1.86	Average	267	36
4	2483.50	52.64	74.00	-21.36	54.50	-1.86	Peak	267	36
5	4874.00	39.92	54.00	-14.08	34.85	5.07	Average	265	29
6	4874.00	53.56	74.00	-20.44	48.49	5.07	Peak	265	29
7	7311.00	41.04	54.00	-12.96	30.66	10.38	Average	149	5
8	7311.00	53.96	74.00	-20.04	43.58	10.38	Peak	149	5

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

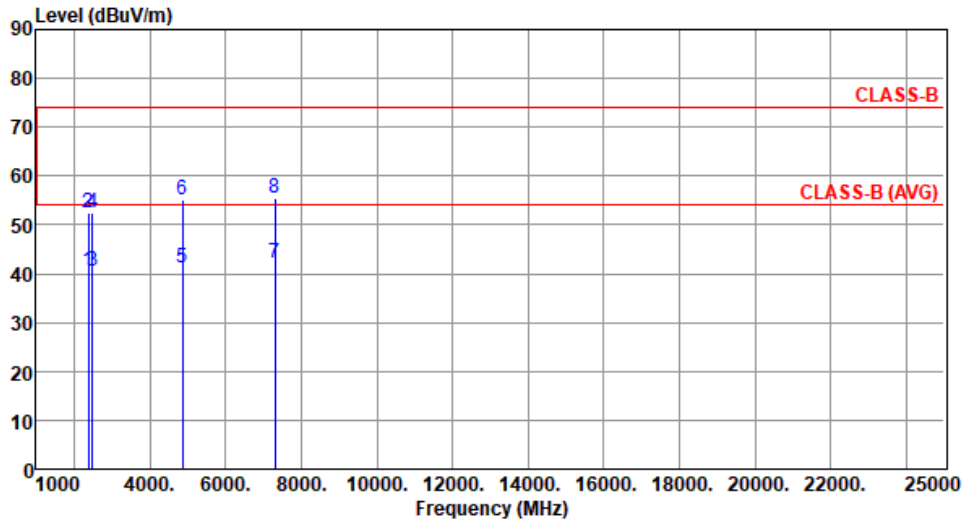
*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Modulation	HT20	Test Freq. (MHz)	2437
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Polarization	Vertical
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Test By :Roger Lu Temperature(°C):24 Humidity(%):65



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	40.38	54.00	-13.62	42.04	-1.66	Average	131	68
2	2390.00	52.56	74.00	-21.44	54.22	-1.66	Peak	131	68
3	2483.50	40.54	54.00	-13.46	42.40	-1.86	Average	131	68
4	2483.50	52.61	74.00	-21.39	54.47	-1.86	Peak	131	68
5	4874.00	41.24	54.00	-12.76	36.17	5.07	Average	266	31
6	4874.00	55.08	74.00	-18.92	50.01	5.07	Peak	266	31
7	7311.00	42.06	54.00	-11.94	31.68	10.38	Average	151	9
8	7311.00	55.45	74.00	-18.55	45.07	10.38	Peak	151	9

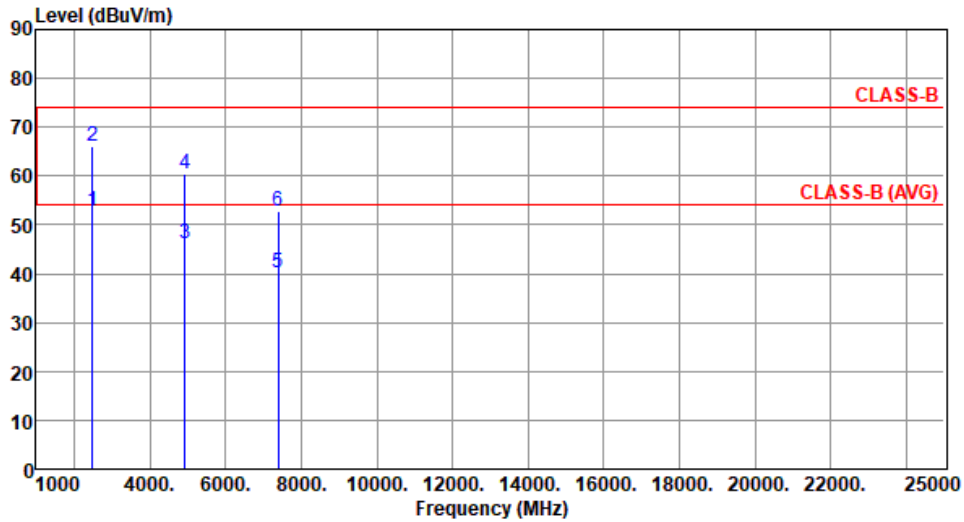
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Modulation	HT20	Test Freq. (MHz)	2462
Polarization	Horizontal		

Test By :Roger Lu Temperature(°C):24 Humidity(%):65



	Freq. MHz	Emission level dBUV/m	Limit dBUV/m	Margin dB	SA reading dBUV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2483.50	52.72	54.00	-1.28	54.58	-1.86	Average	221	4
2	2483.50	66.12	74.00	-7.88	67.98	-1.86	Peak	221	4
3	4924.00	46.32	54.00	-7.68	41.15	5.17	Average	311	41
4	4924.00	60.50	74.00	-13.50	55.33	5.17	Peak	311	41
5	7386.00	40.23	54.00	-13.77	30.15	10.08	Average	100	6
6	7386.00	52.76	74.00	-21.24	42.68	10.08	Peak	100	6

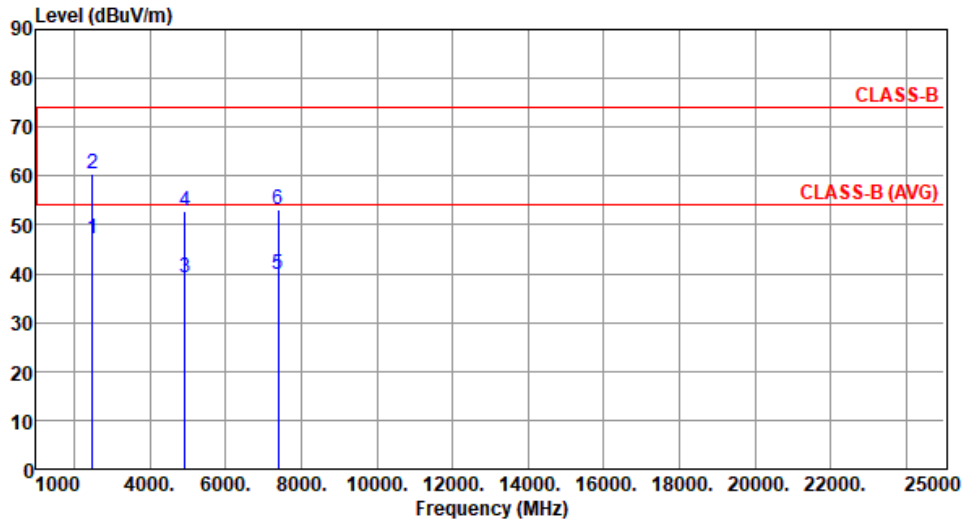
Note 1: Emission Level (dBUV/m) = SA Reading (dBUV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBUV/m) – Limit (dBUV/m).

Modulation	HT20	Test Freq. (MHz)	2462
Polarization	Vertical		

Test By :Roger Lu Temperature(°C):24 Humidity(%):65



	Freq. MHz	Emission level dBUV/m	Limit dBUV/m	Margin dB	SA reading dBUV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2483.50	47.28	54.00	-6.72	49.14	-1.86	Average	106	221
2	2483.50	60.54	74.00	-13.46	62.40	-1.86	Peak	106	221
3	4924.00	39.16	54.00	-14.84	33.99	5.17	Average	288	5
4	4924.00	52.68	74.00	-21.32	47.51	5.17	Peak	288	5
5	7386.00	39.86	54.00	-14.14	29.78	10.08	Average	261	45
6	7386.00	53.04	74.00	-20.96	42.96	10.08	Peak	261	45

Note 1: Emission Level (dBUV/m) = SA Reading (dBUV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

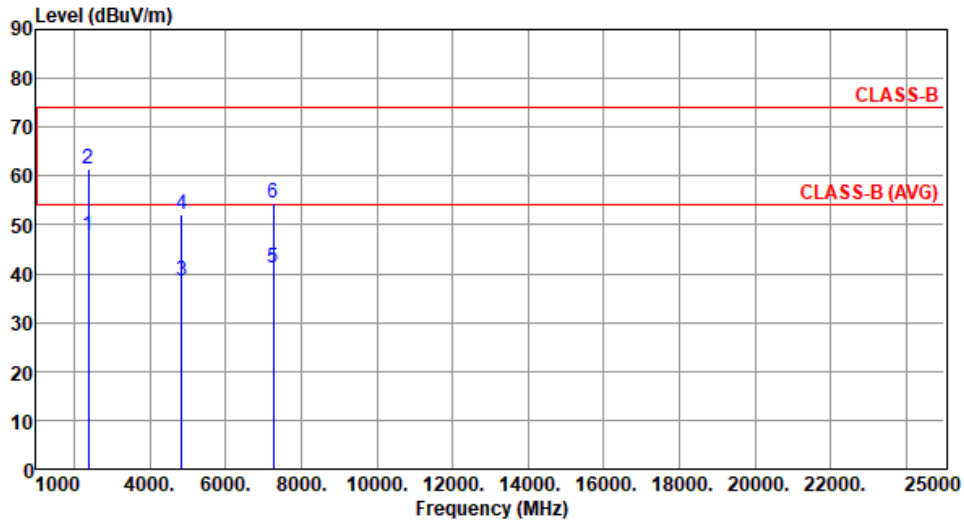
Note 2: Margin (dB) = Emission level (dBUV/m) – Limit (dBUV/m).

3.5.8 Transmitter Radiated Unwanted Emissions (Above 1GHz) for HT40

Modulation	HT40	Test Freq. (MHz)	2422						
Polarization	Horizontal								
Test By : Roger Lu Temperature(°C):24 Humidity(%):65									
	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1	2390.00	52.91	54.00	-1.09	54.57	-1.66	Average	212	85
2	2390.00	64.21	74.00	-9.79	65.87	-1.66	Peak	212	85
3	4844.00	44.15	54.00	-9.85	39.11	5.04	Average	184	9
4	4844.00	57.02	74.00	-16.98	51.98	5.04	Peak	184	9
5	7266.00	40.51	54.00	-13.49	30.02	10.49	Average	151	6
6	7266.00	53.58	74.00	-20.42	43.09	10.49	Peak	151	6
<p>Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB) *Factor includes antenna factor , cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).</p>									

Modulation	HT40	Test Freq. (MHz)	2422
Polarization	Vertical		

Test By :Roger Lu Temperature(°C):24 Humidity(%):65



	Freq. MHz	Emission level dBUV/m	Limit dBUV/m	Margin dB	SA reading dBUV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	47.95	54.00	-6.05	49.61	-1.66	Average	108	225
2	2390.00	61.34	74.00	-12.66	63.00	-1.66	Peak	108	225
3	4844.00	38.52	54.00	-15.48	33.48	5.04	Average	269	15
4	4844.00	52.06	74.00	-21.94	47.02	5.04	Peak	269	15
5	7266.00	41.14	54.00	-12.86	30.65	10.49	Average	156	14
6	7266.00	54.56	74.00	-19.44	44.07	10.49	Peak	156	14

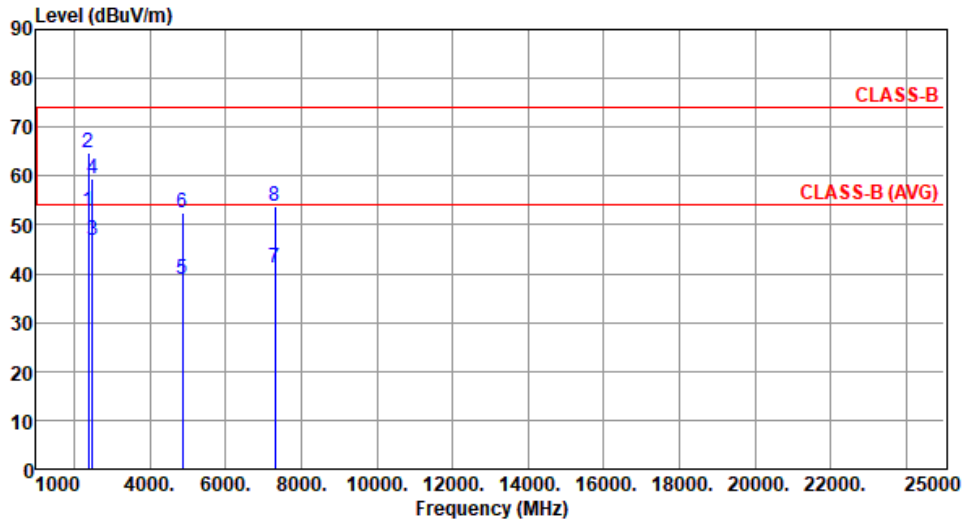
Note 1: Emission Level (dBUV/m) = SA Reading (dBUV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBUV/m) – Limit (dBUV/m).

Modulation	HT40	Test Freq. (MHz)	2437
Polarization	Horizontal		

Test By :Roger Lu Temperature(°C):24 Humidity(%):65



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	52.81	54.00	-1.19	54.47	-1.66	Average	214	70
2	2390.00	64.70	74.00	-9.30	66.36	-1.66	Peak	214	70
3	2483.50	46.69	54.00	-7.31	48.55	-1.86	Average	214	70
4	2483.50	59.42	74.00	-14.58	61.28	-1.86	Peak	214	70
5	4874.00	38.84	54.00	-15.16	33.77	5.07	Average	261	35
6	4874.00	52.49	74.00	-21.51	47.42	5.07	Peak	261	35
7	7311.00	41.22	54.00	-12.78	30.84	10.38	Average	155	16
8	7311.00	53.85	74.00	-20.15	43.47	10.38	Peak	155	16

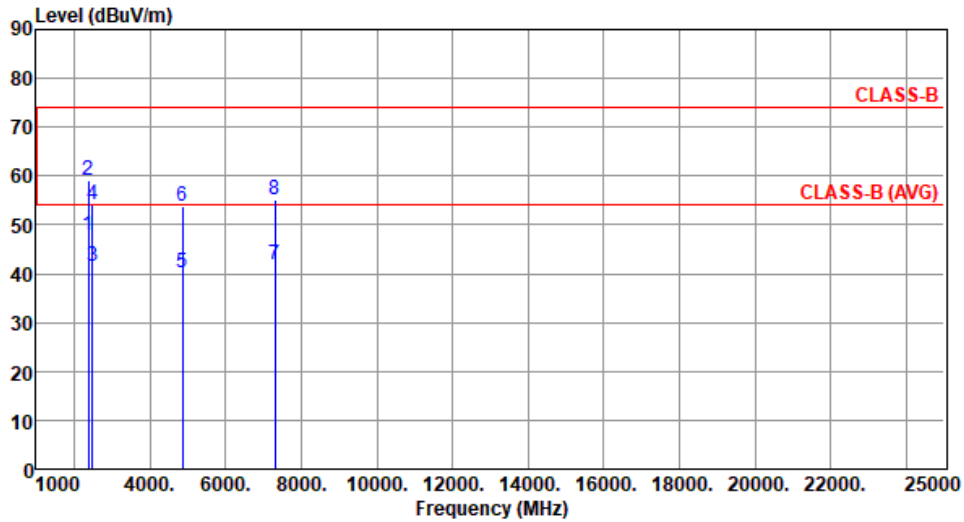
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Modulation	HT40	Test Freq. (MHz)	2437
Polarization	Vertical		

Test By :Roger Lu Temperature(°C):24 Humidity(%):65



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	47.66	54.00	-6.34	49.32	-1.66	Average	135	74
2	2390.00	59.21	74.00	-14.79	60.87	-1.66	Peak	135	74
3	2483.50	41.54	54.00	-12.46	43.40	-1.86	Average	135	74
4	2483.50	54.28	74.00	-19.72	56.14	-1.86	Peak	135	74
5	4874.00	40.06	54.00	-13.94	34.99	5.07	Average	261	18
6	4874.00	53.92	74.00	-20.08	48.85	5.07	Peak	261	18
7	7311.00	41.84	54.00	-12.16	31.46	10.38	Average	158	16
8	7311.00	55.29	74.00	-18.71	44.91	10.38	Peak	158	16

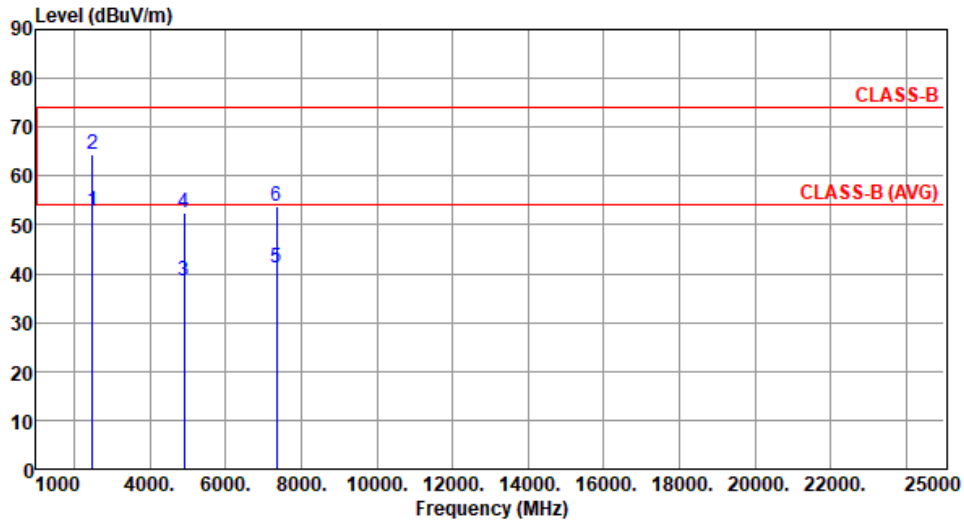
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Modulation	HT40	Test Freq. (MHz)	2452
Polarization	Horizontal		

Test By :Roger Lu Temperature(°C):24 Humidity(%):65



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2483.50	52.72	54.00	-1.28	54.58	-1.86	Average	224	68
2	2483.50	64.39	74.00	-9.61	66.25	-1.86	Peak	224	68
3	4904.00	38.69	54.00	-15.31	33.58	5.11	Average	259	42
4	4904.00	52.31	74.00	-21.69	47.20	5.11	Peak	259	42
5	7356.00	41.33	54.00	-12.67	30.97	10.36	Average	152	18
6	7356.00	53.95	74.00	-20.05	43.59	10.36	Peak	152	18

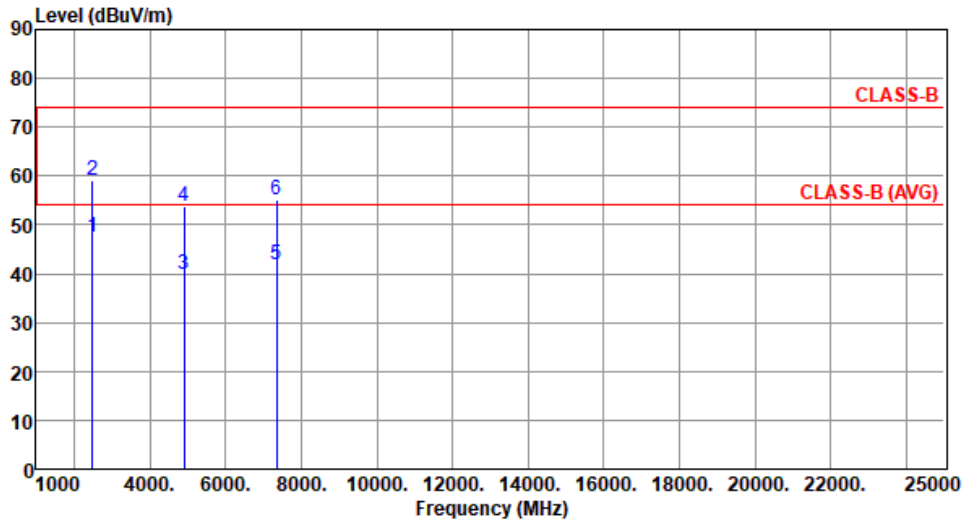
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Modulation	HT40	Test Freq. (MHz)	2452
Polarization	Vertical		

Test By :Roger Lu Temperature(°C):24 Humidity(%):65



	Freq. MHz	Emission level dBUV/m	Limit dBUV/m	Margin dB	SA reading dBUV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2483.50	47.61	54.00	-6.39	49.47	-1.86	Average	138	76
2	2483.50	59.22	74.00	-14.78	61.08	-1.86	Peak	138	76
3	4904.00	39.81	54.00	-14.19	34.70	5.11	Average	258	15
4	4904.00	53.84	74.00	-20.16	48.73	5.11	Peak	258	15
5	7356.00	41.68	54.00	-12.32	31.32	10.36	Average	155	21
6	7356.00	55.12	74.00	-18.88	44.76	10.36	Peak	155	21

Note 1: Emission Level (dBUV/m) = SA Reading (dBUV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBUV/m) – Limit (dBUV/m).

3.6 Emissions in Non-Restricted Frequency Bands

3.6.1 Emissions in Non-Restricted Frequency Bands Limit

Peak power in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz.

3.6.2 Test Procedures

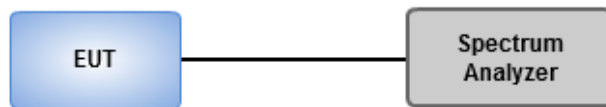
Reference level measurement

1. Set RBW=100kHz, VBW = 300kHz , Detector = Peak, Sweep time = Auto
2. Trace = max hold , Allow Trace to fully stabilize
3. Use the peak marker function to determine the maximum PSD level

Emission level measurement

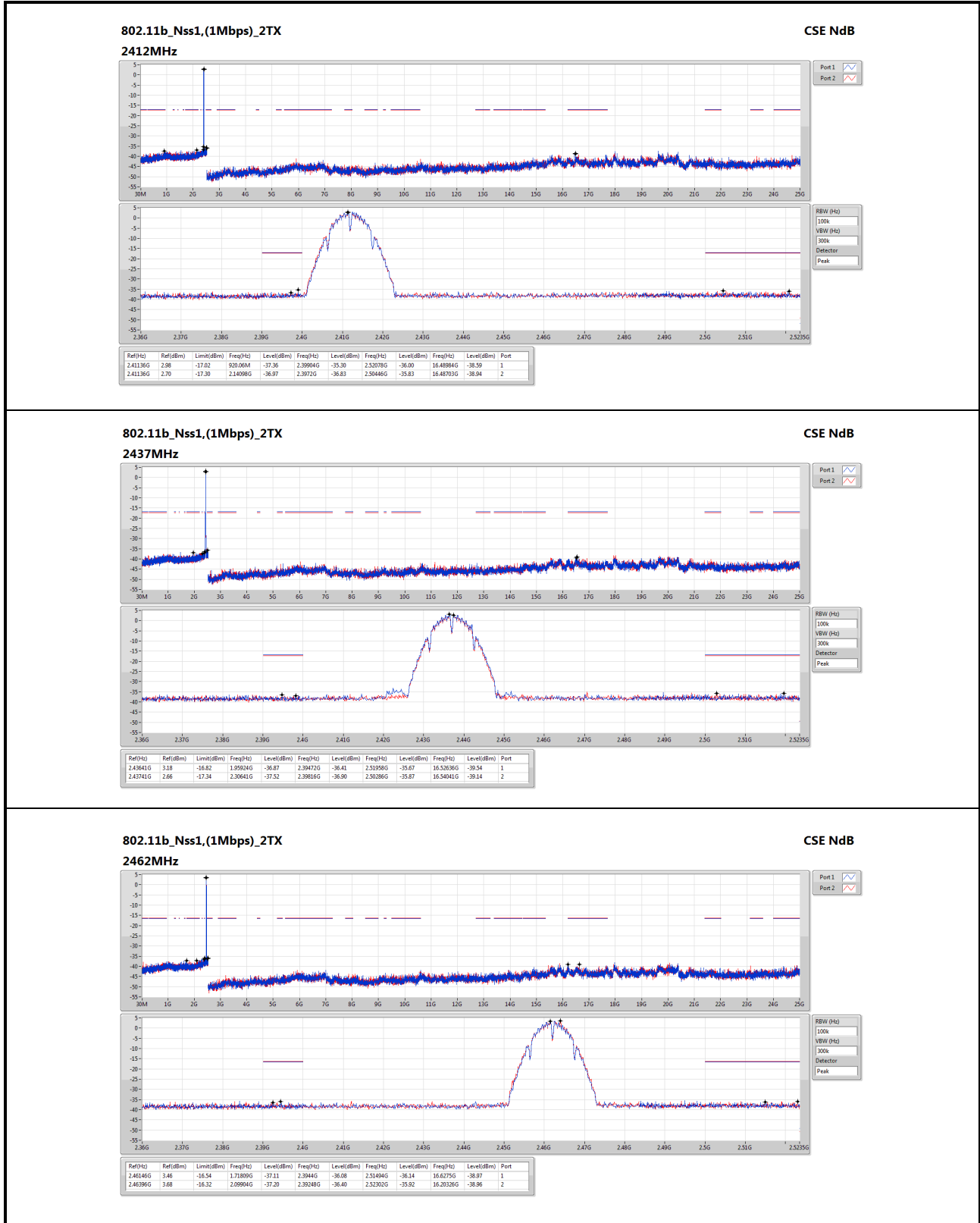
1. Set RBW=100kHz, VBW = 300kHz , Detector = Peak, Sweep time = Auto
2. Trace = max hold , Allow Trace to fully stabilize
3. Scan Frequency range is up to 25GHz
4. Use the peak marker function to determine the maximum amplitude level

3.6.3 Test Setup



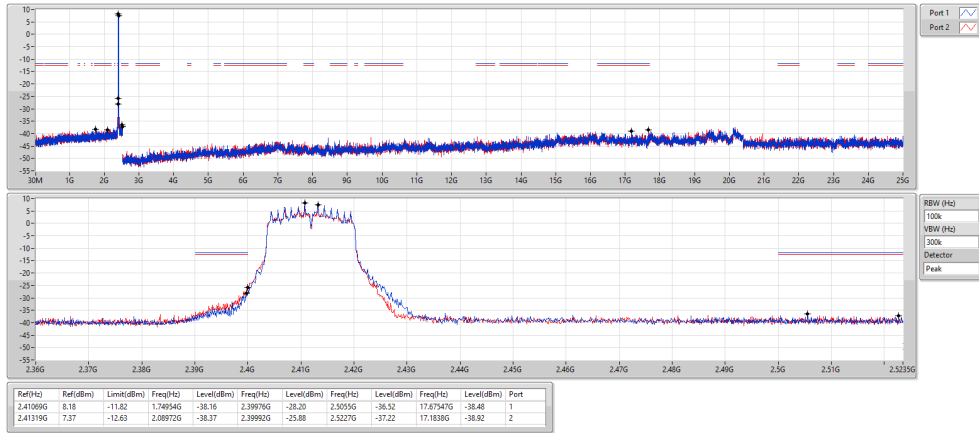
3.6.4 Unwanted Emissions into Non-Restricted Frequency Bands

Ambient Condition	22°C / 63%	Tested By	Brad Wu
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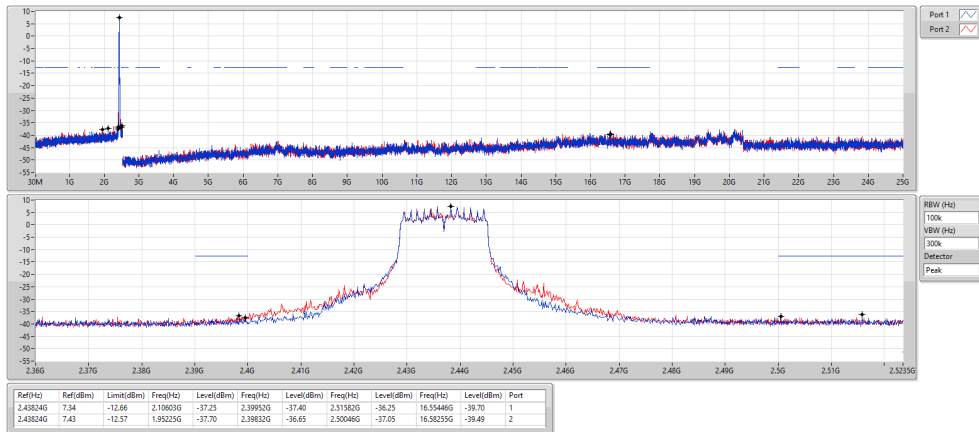
802.11g_Nss1,(6Mbps)_2TX
2412MHz

CSE NdB



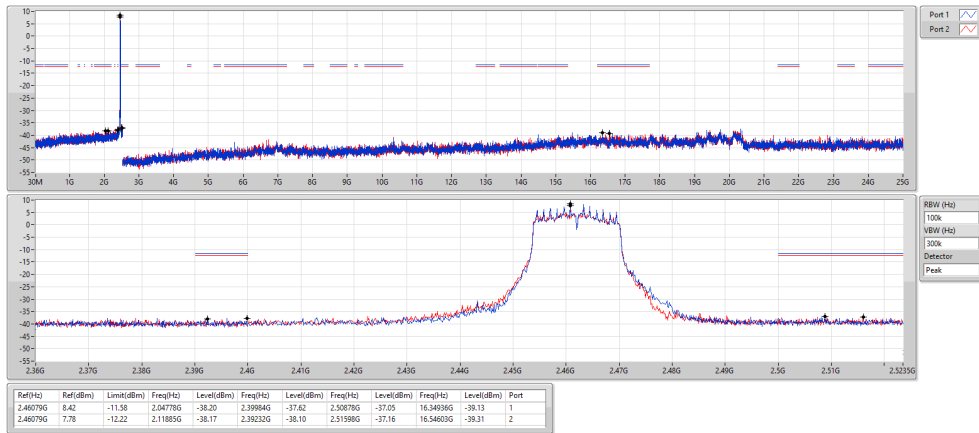
802.11g_Nss1,(6Mbps)_2TX
2437MHz

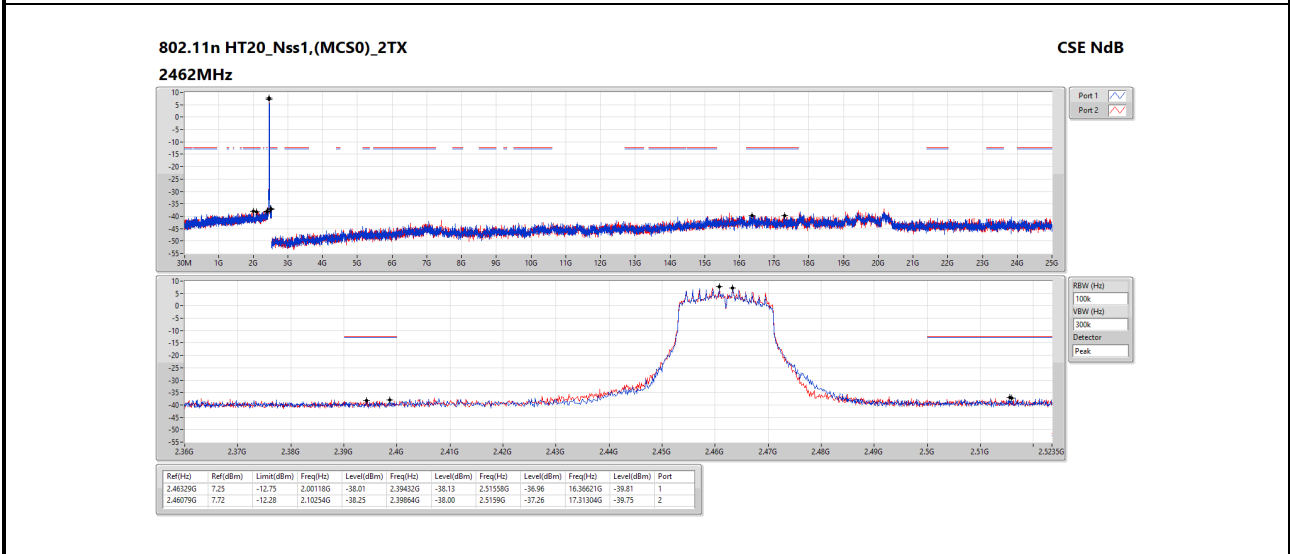
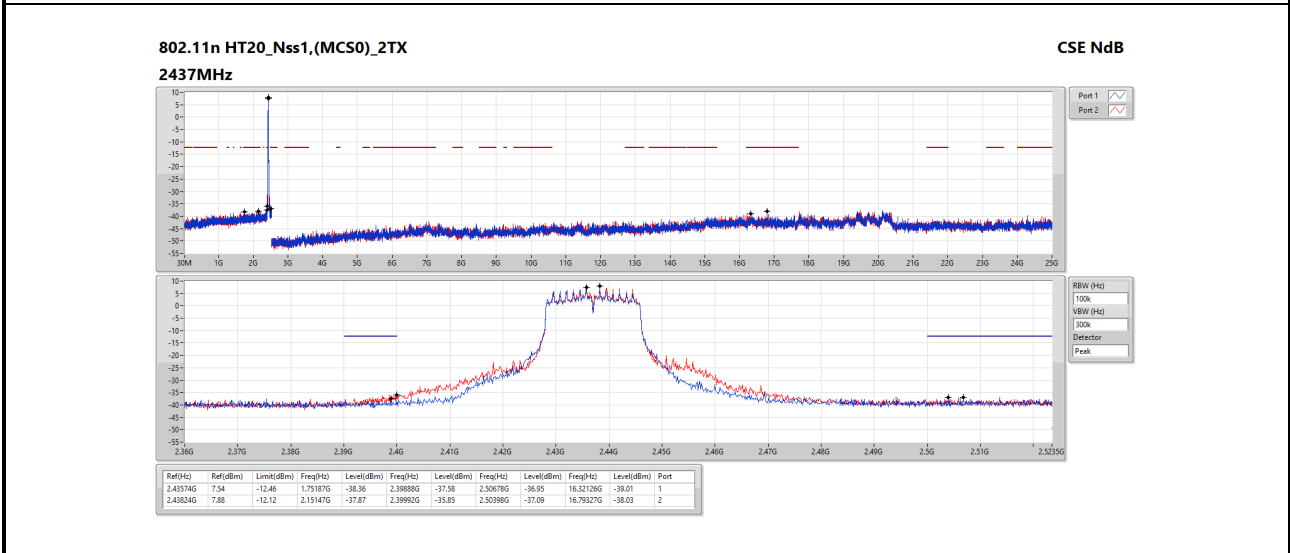
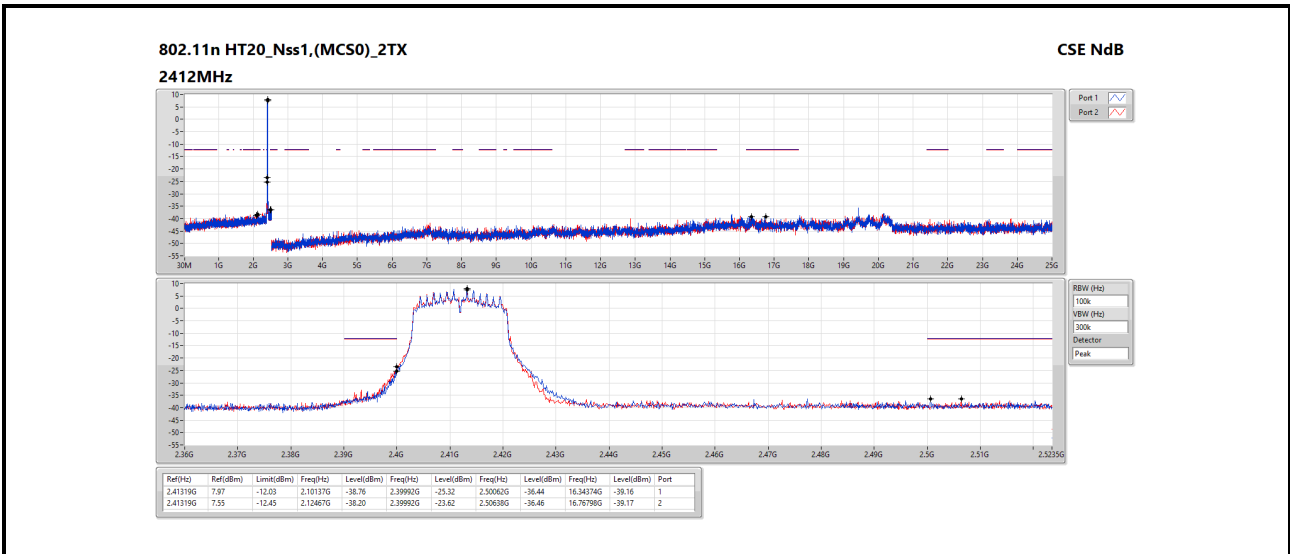
CSE NdB



802.11g_Nss1,(6Mbps)_2TX
2462MHz

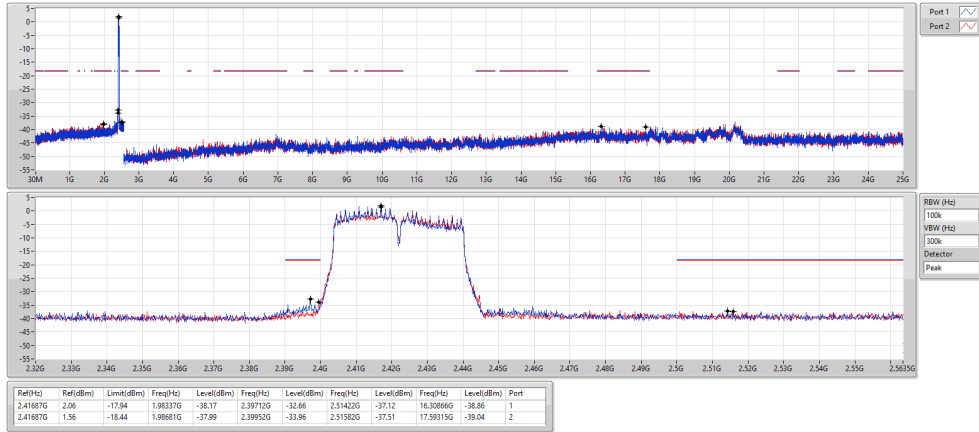
CSE NdB





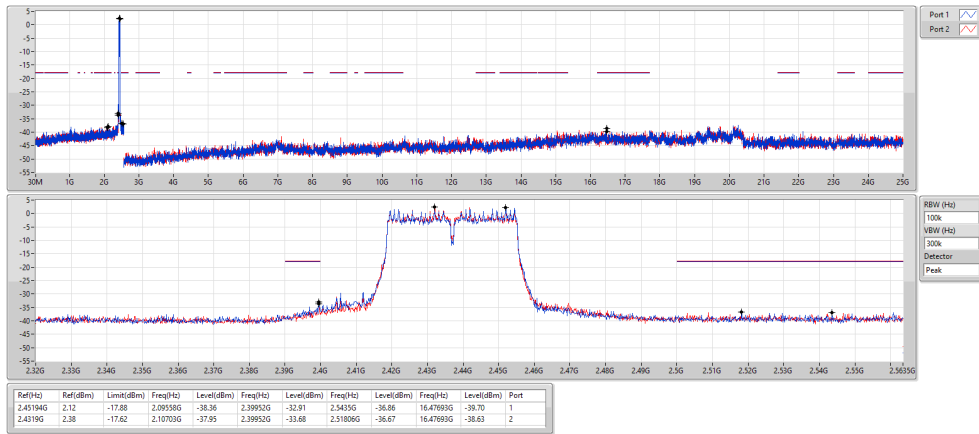
802.11n HT40_Nss1,(MCS0)_2TX
2422MHz

CSE NdB



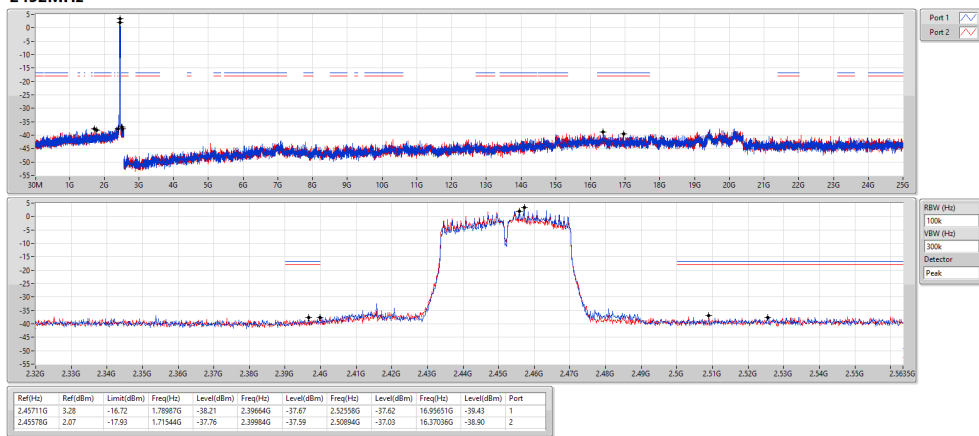
802.11n HT40_Nss1,(MCS0)_2TX
2437MHz

CSE NdB



802.11n HT40_Nss1,(MCS0)_2TX
2452MHz

CSE NdB



4 Test laboratory information

Established in 2012, ICC provides foremost EMC & RF Testing and advisory consultation services by our skilled engineers and technicians. Our services employ a wide variety of advanced edge test equipment and one of the widest certification extents in the business.

International Certification Corp (EMC and Wireless Communication Laboratory), it is our definitive objective is to institute long term, trust-based associations with our clients. The expectation we set up with our clients is based on outstanding service, practical expertise and devotion to a certified value structure. Our passion is to grant our clients with best EMC / RF services by oriented knowledgeable and accommodating staff.

Our Test sites are located at Linkou District and Kwei Shan District. Location map can be found on our website <http://www.icertifi.com.tw>.

Linkou

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Kou District, New Taipei City,
Taiwan, R.O.C.

Kwei Shan

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Kwei Shan District, Tao Yuan City
333, Taiwan, R.O.C.

Kwei Shan Site II

Tel: 886-3-271-8640

No. 14-1, Lane 19, Wen San 3rd
St., Kwei Shan District, Tao Yuan
City 333, Taiwan, R.O.C.

If you have any suggestion, please feel free to contact us as below information.

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Email: ICC_Service@icertifi.com.tw

==END==