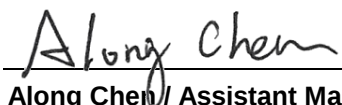


FCC Test Report

FCC ID : TKZAWV03SR3
Equipment : WiFi Router
Model No. : AWW03S-ATA R3
Brand Name : ASIARF
Applicant : AsiaRF Co., LTD.
Address : 3F, 215, Dehe Road, Yonghe Dist. New Taipei
City, Taiwan 234
Standard : 47 CFR FCC Part 15.247
Received Date : Jan. 07, 2020
Tested Date : Oct. 20 ~ Oct. 26, 2020

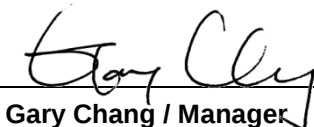
We, International Certification Corp., would like to declare that the tested sample has been evaluated and in compliance with the requirement of the above standards. The test results contained in this report refer exclusively to the product. It may be duplicated completely for legal use with the approval 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



Table of Contents

1	GENERAL DESCRIPTION	5
1.1	Information.....	5
1.2	Local Support Equipment List	8
1.3	Test Setup Chart	8
1.4	The Equipment List	9
1.5	Test Standards	10
1.6	Reference Guidance	10
1.7	Deviation from Test Standard and Measurement Procedure.....	10
1.8	Measurement Uncertainty	10
2	TEST CONFIGURATION	11
2.1	Testing Facility.....	11
2.2	The Worst Test Modes and Channel Details	11
3	TRANSMITTER TEST RESULTS.....	12
3.1	Conducted Emissions.....	12
3.2	6dB and Occupied Bandwidth	15
3.3	RF Output Power	21
3.4	Power Spectral Density	24
3.5	Unwanted Emissions into Restricted Frequency Bands	30
3.6	Emissions in Non-Restricted Frequency Bands.....	58
4	TEST LABORATORY INFORMATION	63

Release Record

Report No.	Version	Description	Issued Date
FR010702AC	Rev. 01	Initial issue	Nov. 10, 2020

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	Conducted Emissions	[dBuV]: 0.549MHz 30.37 (Margin -15.63dB) - AV	Pass
15.247(d) 15.209	Radiated Emissions	[dBuV/m at 3m]: 2483.50MHz 53.11 (Margin -0.89dB) - AV	Pass
15.247(b)(3)	Maximum Output Power	Max Power [dBm]: 27.23	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	Gain (dBi)	Connector	Remark
1	NA	PCB	2	NA	---

1.1.3 Power Supply Type of Equipment under Test (EUT)

Power Supply Type	12Vdc from adapter
-------------------	--------------------

1.1.4 Accessories

Accessories		
No.	Equipment	Description
1	AC adapter	Brand: ShenZhen Cenwell Technology Co., Ltd. Model: CW1204000 Power Rating: I/P: 100-240Vac, 50/60Hz, 1.2A Max O/P: 12Vdc=4000mA Power Line: 1.16m non-shielded without core

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	MT7620QA, Version: V1.0.6.0		
Duty Cycle and Duty Factor	Mode	Duty Cycle (%)	Duty Factor (dB)
	11b	100.00%	0.00
	11g	89.36%	0.49
	HT20	89.33%	0.49
	HT40	77.92%	1.08

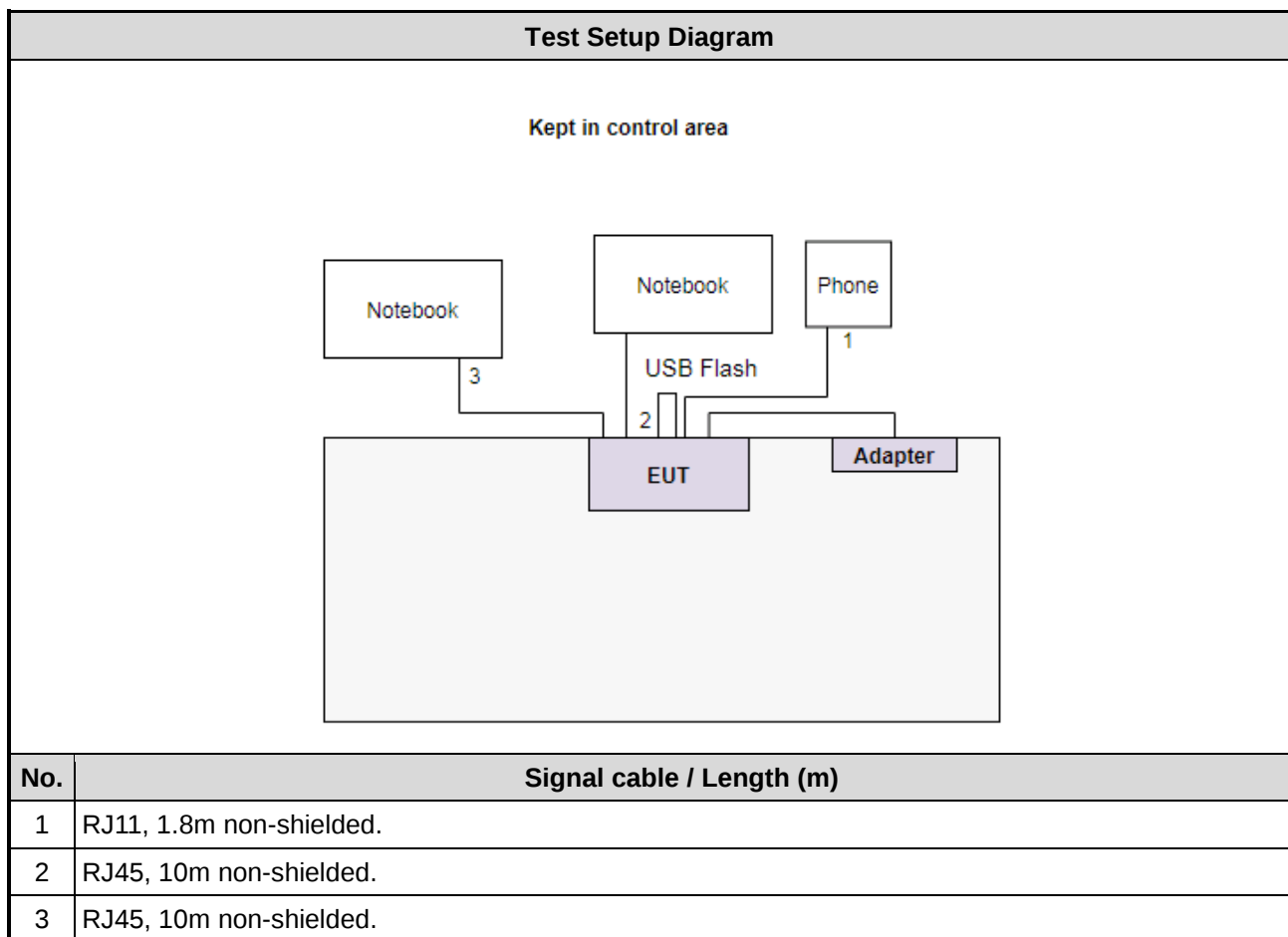
1.1.7 Power Index of Test Tool

Modulation Mode	Test Frequency (MHz)	Power Index
11b	2412	01/07
11b	2437	04/0A
11b	2462	06/0C
11g	2412	05/0B
11g	2437	09/0F
11g	2462	09/0E
HT20	2412	04/0A
HT20	2437	0A/10
HT20	2462	07/0B
HT40	2422	04/08
HT40	2437	0D/12
HT40	2452	06/0C

1.2 Local Support Equipment List

Support Equipment List					
No.	Equipment	Brand	Model	FCC ID	Remarks
1	Notebook	DELL	Latitude E5420	B6FS9T1	---
2	Notebook	DELL	Latitude E5470	3J5JVF2	---
3	USB Flash	Kingston	DTSE9	FXVJ0	---
4	Telephone with RJ11	HTT	HTT-806	119976	---
5	RJ45	ICC	RJ45-10m	04	---
6	RJ45	ICC	RJ45-10m	05	---

1.3 Test Setup Chart



1.4 The Equipment List

Test Item	Conducted Emission				
Test Site	Conduction room 1 / (CO01-WS)				
Test date	Oct. 26, 2020				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
Receiver	R&S	ESR3	101658	Dec. 12, 2019	Dec. 11, 2020
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)				
Test date	Oct. 20, 2020				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV40	101499	Jan. 09, 2020	Jan. 08, 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. 27, 2019	Dec. 26, 2020
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Nov. 15, 2019	Nov. 14, 2020
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 13, 2019	Nov. 12, 2020
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-8000	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)				
Test date	Oct. 23, 2020				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV40	101063	Apr. 30, 2020	Apr. 29, 2021
Power Meter	Anritsu	ML2495A	1241001	Jul. 21, 2020	Jul. 20, 2021
Power Sensor	Anritsu	MA2411B	1207362	Jul. 21, 2020	Jul. 20, 2021
AC POWER SOURCE	APC	AFC-500W	F312060012	Dec. 02, 2019	Dec. 01, 2020
Measurement Software	Sporton	Sporton_1	1.3.30	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 ≤ 1 GHz	± 3.96 dB
Radiated emission > 1 GHz	± 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	2437	MCS 0	---
Radiated Emissions ≤1GHz	HT20	2437	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

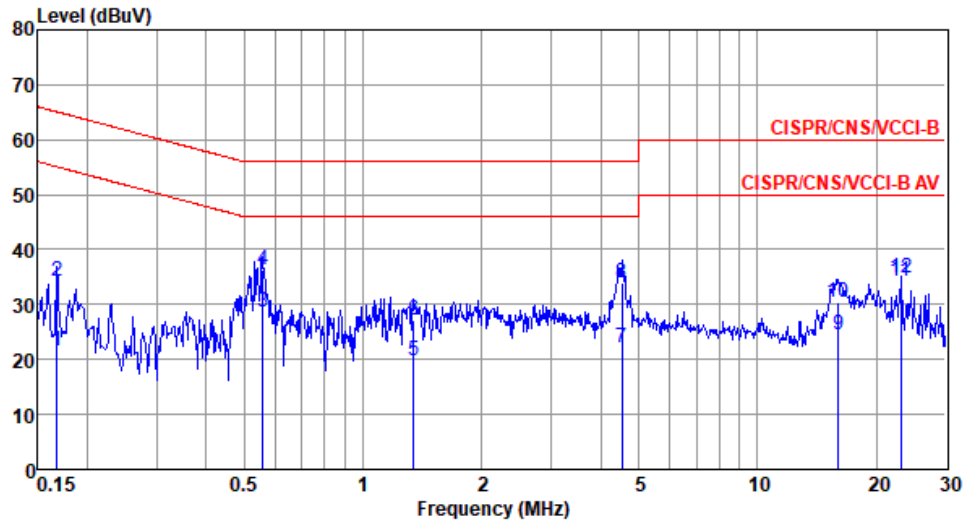
Modulation	HT20	Test Freq. (MHz)	2437																																																																																																																					
Power Phase	Line																																																																																																																							
Test by : Alex Tsai Temperature: 22°C Humidity: 60%																																																																																																																								
Level (dBuV) <table><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>LISN factor dB</th><th>cable loss dB</th><th>Remark</th></tr></thead><tbody><tr><td>1</td><td>0.150</td><td>21.09</td><td>56.00</td><td>-34.91</td><td>11.24</td><td>9.64</td><td>0.05</td><td>Average</td></tr><tr><td>2</td><td>0.150</td><td>36.77</td><td>66.00</td><td>-29.23</td><td>26.92</td><td>9.64</td><td>0.05</td><td>QP</td></tr><tr><td>3*</td><td>0.549</td><td>30.37</td><td>46.00</td><td>-15.63</td><td>20.38</td><td>9.63</td><td>0.09</td><td>Average</td></tr><tr><td>4</td><td>0.549</td><td>38.29</td><td>56.00</td><td>-17.71</td><td>28.30</td><td>9.63</td><td>0.09</td><td>QP</td></tr><tr><td>5</td><td>1.781</td><td>19.65</td><td>46.00</td><td>-26.35</td><td>9.50</td><td>9.64</td><td>0.17</td><td>Average</td></tr><tr><td>6</td><td>1.781</td><td>27.05</td><td>56.00</td><td>-28.95</td><td>16.90</td><td>9.64</td><td>0.17</td><td>QP</td></tr><tr><td>7</td><td>4.525</td><td>21.87</td><td>46.00</td><td>-24.13</td><td>11.54</td><td>9.66</td><td>0.30</td><td>Average</td></tr><tr><td>8</td><td>4.525</td><td>32.78</td><td>56.00</td><td>-23.22</td><td>22.45</td><td>9.66</td><td>0.30</td><td>QP</td></tr><tr><td>9</td><td>15.885</td><td>23.88</td><td>50.00</td><td>-26.12</td><td>13.05</td><td>9.71</td><td>0.61</td><td>Average</td></tr><tr><td>10</td><td>15.885</td><td>30.36</td><td>60.00</td><td>-29.64</td><td>19.53</td><td>9.71</td><td>0.61</td><td>QP</td></tr><tr><td>11</td><td>23.127</td><td>33.24</td><td>50.00</td><td>-16.76</td><td>22.20</td><td>9.68</td><td>0.69</td><td>Average</td></tr><tr><td>12</td><td>23.127</td><td>34.27</td><td>60.00</td><td>-25.73</td><td>23.23</td><td>9.68</td><td>0.69</td><td>QP</td></tr></tbody></table>					Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	LISN factor dB	cable loss dB	Remark	1	0.150	21.09	56.00	-34.91	11.24	9.64	0.05	Average	2	0.150	36.77	66.00	-29.23	26.92	9.64	0.05	QP	3*	0.549	30.37	46.00	-15.63	20.38	9.63	0.09	Average	4	0.549	38.29	56.00	-17.71	28.30	9.63	0.09	QP	5	1.781	19.65	46.00	-26.35	9.50	9.64	0.17	Average	6	1.781	27.05	56.00	-28.95	16.90	9.64	0.17	QP	7	4.525	21.87	46.00	-24.13	11.54	9.66	0.30	Average	8	4.525	32.78	56.00	-23.22	22.45	9.66	0.30	QP	9	15.885	23.88	50.00	-26.12	13.05	9.71	0.61	Average	10	15.885	30.36	60.00	-29.64	19.53	9.71	0.61	QP	11	23.127	33.24	50.00	-16.76	22.20	9.68	0.69	Average	12	23.127	34.27	60.00	-25.73	23.23	9.68	0.69	QP
	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	LISN factor dB	cable loss dB	Remark																																																																																																																
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Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB). 2: Over Limit (dB) = Level (dBuV) – Limit Line (dBuV).																																																																																																																								

Modulation	HT20	Test Freq. (MHz)	2437
Power Phase	Neutral		

Test by : Alex Tsai

Temperature: 22°C

Humidity: 60%



	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	LISN factor dB	cable loss dB	Remark
1	0.168	21.49	55.08	-33.59	11.65	9.66	0.05	Average
2	0.168	34.36	65.08	-30.72	24.52	9.66	0.05	QP
3	0.558	28.65	46.00	-17.35	18.73	9.65	0.09	Average
4	0.558	36.18	56.00	-19.82	26.26	9.65	0.09	QP
5	1.345	19.82	46.00	-26.18	9.79	9.65	0.15	Average
6	1.345	27.10	56.00	-28.90	17.07	9.65	0.15	QP
7	4.525	22.17	46.00	-23.83	11.92	9.68	0.30	Average
8	4.525	33.95	56.00	-22.05	23.70	9.68	0.30	QP
9	16.055	24.42	50.00	-25.58	13.59	9.81	0.61	Average
10	16.055	30.38	60.00	-29.62	19.55	9.81	0.61	QP
11*	23.128	34.25	50.00	-15.75	23.13	9.81	0.69	Average
12	23.128	34.94	60.00	-25.06	23.82	9.81	0.69	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

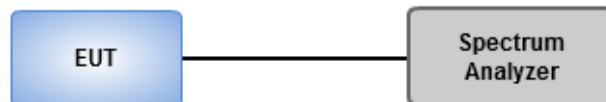
6dB Bandwidth

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
--------------------------	------------	------------------	---------

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	10.072M	12.388M	12M4G1D	10.072M	12.214M
802.11g_Nss1,(6Mbps)_2TX	16.377M	16.845M	16M8D1D	16.377M	16.671M
802.11n HT20_Nss1,(MCS0)_2TX	17.536M	17.829M	17M8D1D	16.957M	17.598M
802.11n HT40_Nss1,(MCS0)_2TX	36.377M	36.7M	36M7D1D	36.087M	36.353M

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

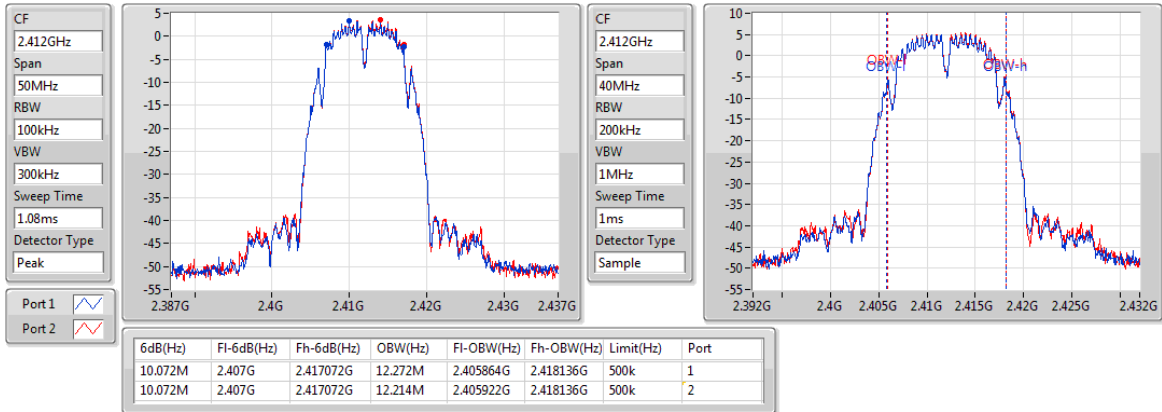
Mode	Result	Limit (Hz)	Port 1 -N dB (Hz)	Port 1 -OBW (Hz)	Port 2 -N dB (Hz)	Port 2 -OBW (Hz)
802.11b_Nss1,(1Mbps)_2TX	-	-	-	-	-	-
2412MHz	Pass	500k	10.072M	12.272M	10.072M	12.214M
2437MHz	Pass	500k	10.072M	12.272M	10.072M	12.33M
2462MHz	Pass	500k	10.072M	12.388M	10.072M	12.272M
802.11g_Nss1,(6Mbps)_2TX	-	-	-	-	-	-
2412MHz	Pass	500k	16.377M	16.729M	16.377M	16.671M
2437MHz	Pass	500k	16.377M	16.845M	16.377M	16.787M
2462MHz	Pass	500k	16.377M	16.845M	16.377M	16.671M
802.11n HT20_Nss1,(MCS0)_2TX	-	-	-	-	-	-
2412MHz	Pass	500k	17.029M	17.656M	16.957M	17.598M
2437MHz	Pass	500k	17.101M	17.829M	17.536M	17.771M
2462MHz	Pass	500k	17.101M	17.713M	17.536M	17.656M
802.11n HT40_Nss1,(MCS0)_2TX	-	-	-	-	-	-
2422MHz	Pass	500k	36.087M	36.469M	36.232M	36.353M
2437MHz	Pass	500k	36.087M	36.7M	36.377M	36.353M
2452MHz	Pass	500k	36.377M	36.353M	36.377M	36.353M

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

802.11b_Nss1,(1Mbps)_2TX

EBW

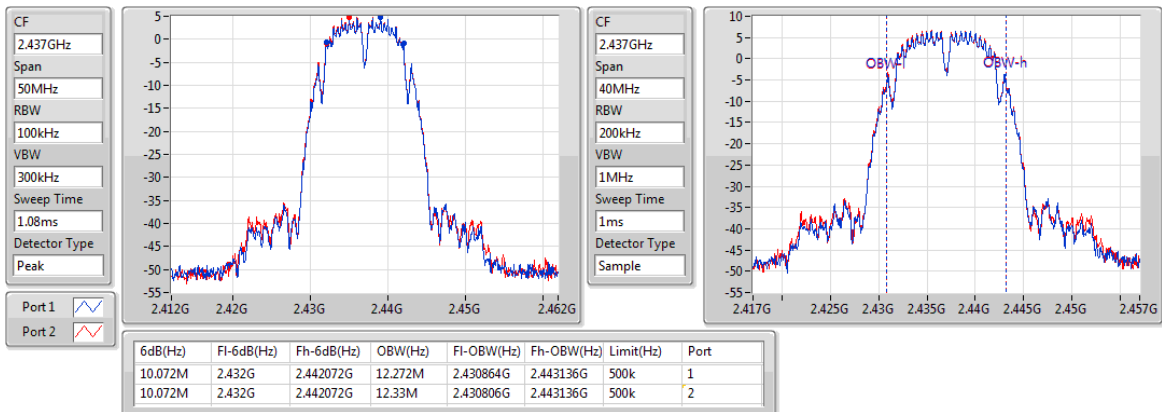
2412MHz



802.11b_Nss1,(1Mbps)_2TX

EBW

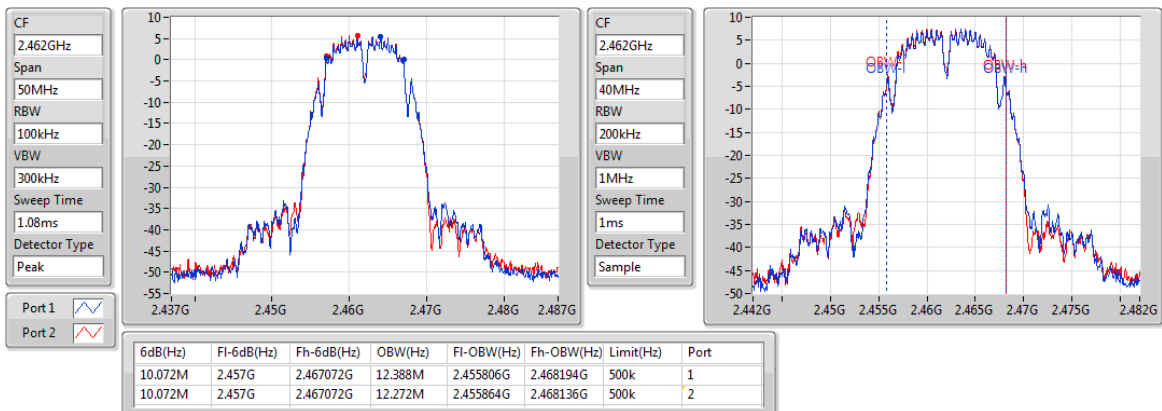
2437MHz



802.11b_Nss1,(1Mbps)_2TX

EBW

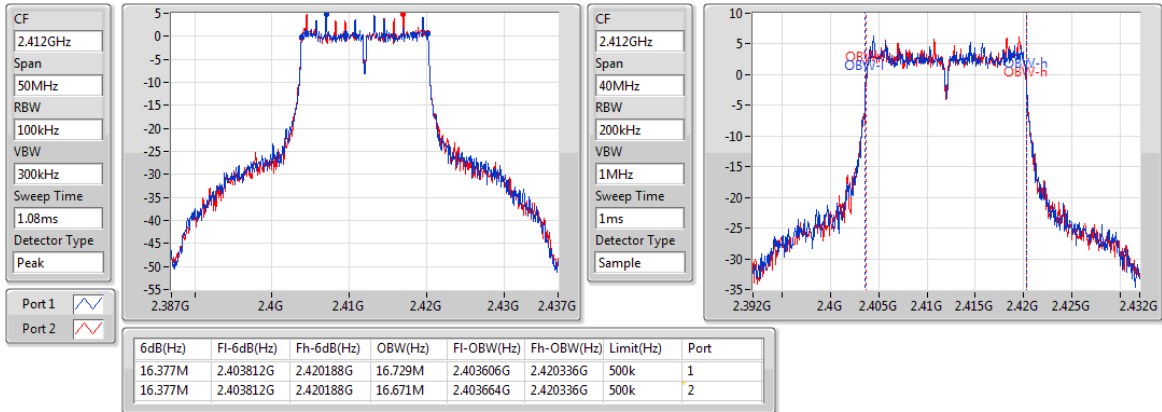
2462MHz



802.11g_Nss1,(6Mbps)_2TX

EBW

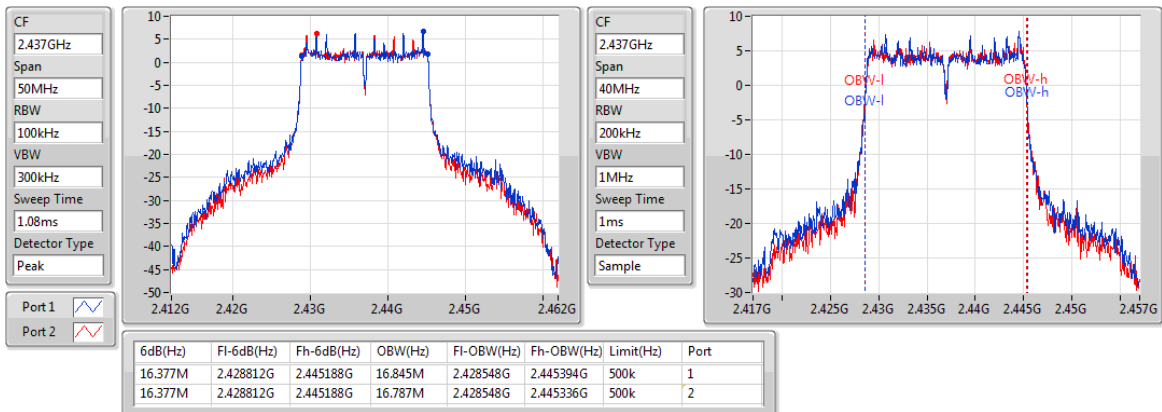
2412MHz



802.11g_Nss1,(6Mbps)_2TX

EBW

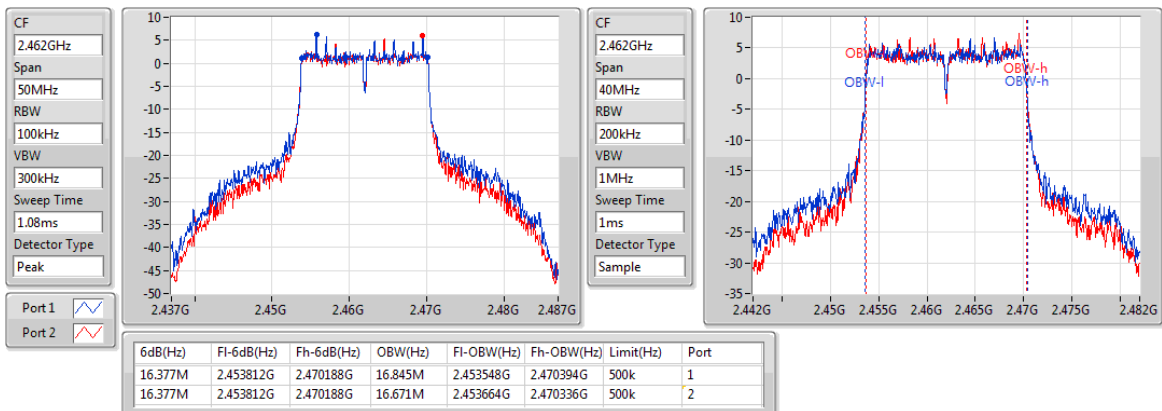
2437MHz



802.11g_Nss1,(6Mbps)_2TX

EBW

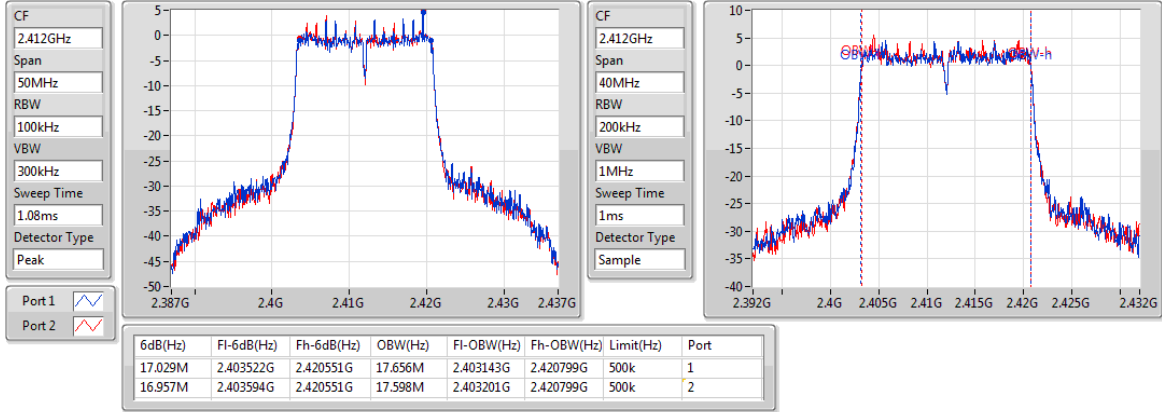
2462MHz



802.11n HT20_Nss1,(MCS0)_2TX

EBW

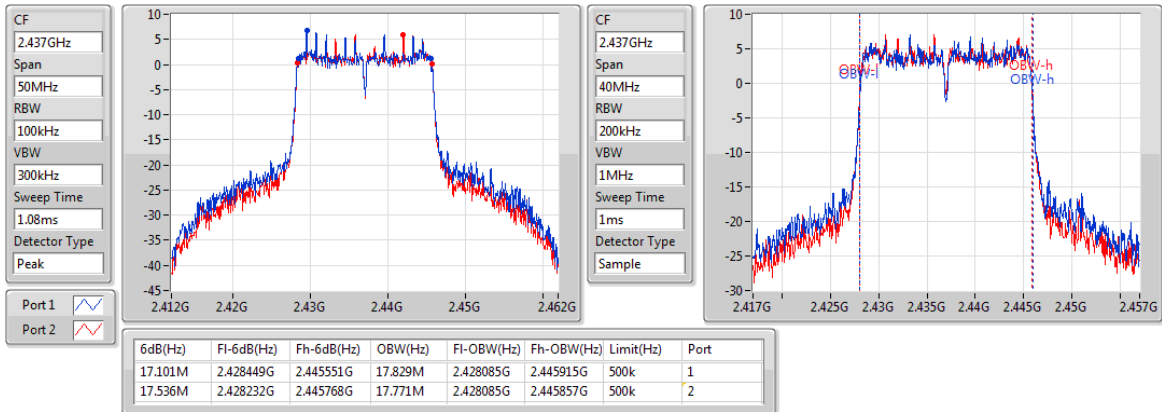
2412MHz



802.11n HT20_Nss1,(MCS0)_2TX

EBW

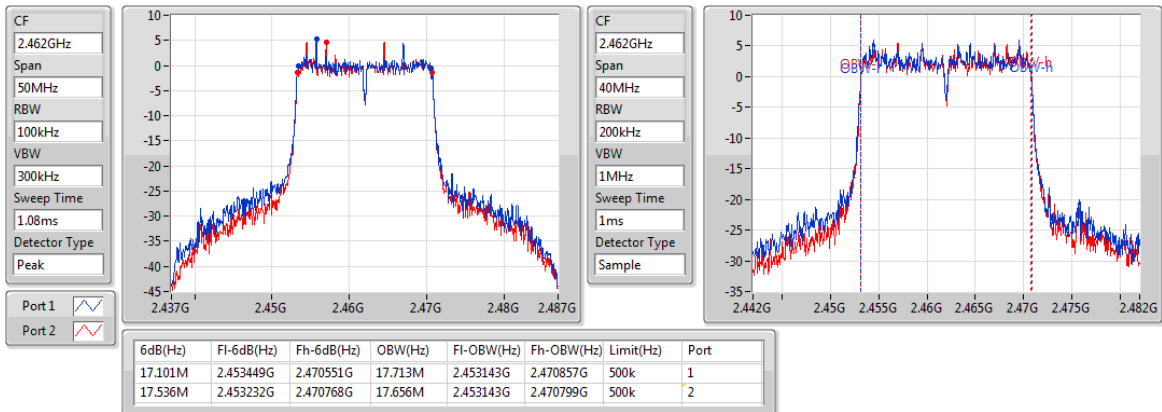
2437MHz



802.11n HT20_Nss1,(MCS0)_2TX

EBW

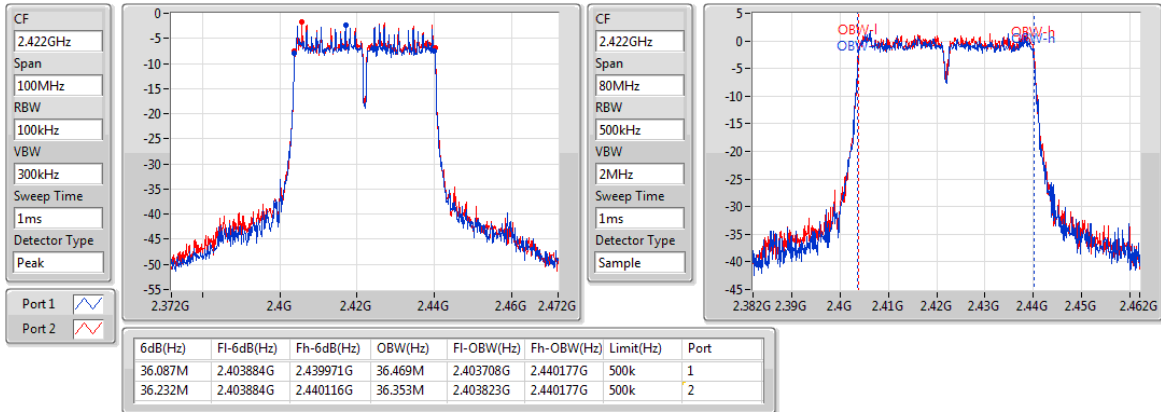
2462MHz



802.11n HT40_Nss1,(MCS0)_2TX

EBW

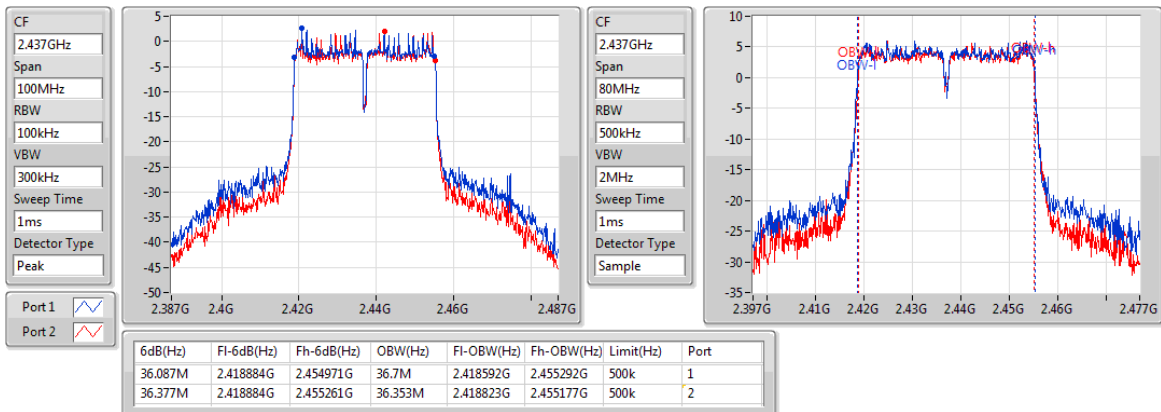
2422MHz



802.11n HT40_Nss1,(MCS0)_2TX

EBW

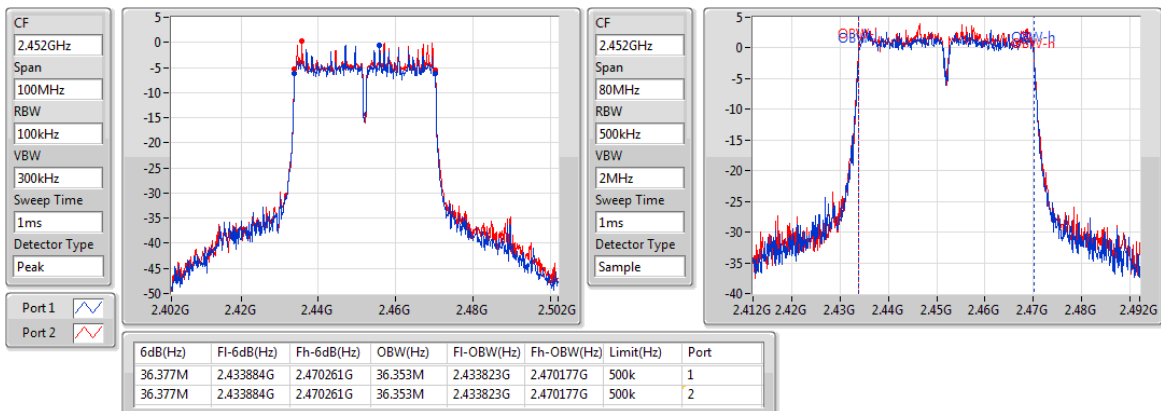
2437MHz



802.11n HT40_Nss1,(MCS0)_2TX

EBW

2452MHz



3.3 RF Output Power

3.3.1 Limit of RF Output Power

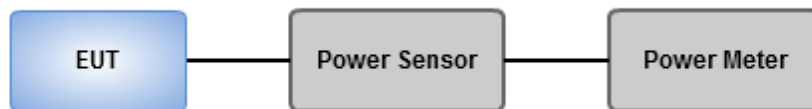
Conducted power shall not exceed 1Watt.

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	23.40	0.21878
802.11g_Nss1,(6Mbps)_2TX	27.18	0.52240
802.11n HT20_Nss1,(MCS0)_2TX	27.23	0.52845
802.11n HT40_Nss1,(MCS0)_2TX	26.59	0.45604

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	2.00	18.18	18.25	21.23	30.00	23.23	36.00
2437MHz	Pass	2.00	19.54	19.76	22.66	30.00	24.66	36.00
2462MHz	Pass	2.00	20.12	20.65	23.40	30.00	25.40	36.00
802.11g_Nss1,(6Mbps)_2TX	-	-	-	-	-	-	-	-
2412MHz	Pass	2.00	23.45	23.46	26.47	30.00	28.47	36.00
2437MHz	Pass	2.00	24.05	24.28	27.18	30.00	29.18	36.00
2462MHz	Pass	2.00	23.81	23.85	26.84	30.00	28.84	36.00
802.11n HT20_Nss1,(MCS0)_2TX	-	-	-	-	-	-	-	-
2412MHz	Pass	2.00	23.12	23.15	26.15	30.00	28.15	36.00
2437MHz	Pass	2.00	24.03	24.41	27.23	30.00	29.23	36.00
2462MHz	Pass	2.00	23.52	23.45	26.50	30.00	28.50	36.00
802.11n HT40_Nss1,(MCS0)_2TX	-	-	-	-	-	-	-	-
2422MHz	Pass	2.00	19.84	20.36	23.12	30.00	25.12	36.00
2437MHz	Pass	2.00	23.64	23.52	26.59	30.00	28.59	36.00
2452MHz	Pass	2.00	21.55	21.62	24.60	30.00	26.60	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	20.13	0.10304
802.11g_Nss1,(6Mbps)_2TX	21.44	0.13932
802.11n HT20_Nss1,(MCS0)_2TX	21.28	0.13428
802.11n HT40_Nss1,(MCS0)_2TX	20.07	0.10162

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	2.00	14.81	14.83	17.83	-	19.83	-
2437MHz	Pass	2.00	16.13	16.45	19.30	-	21.30	-
2462MHz	Pass	2.00	16.95	17.28	20.13	-	22.13	-
802.11g_Nss1,(6Mbps)_2TX	-	-	-	-	-	-	-	-
2412MHz	Pass	2.00	16.91	16.98	19.96	-	21.96	-
2437MHz	Pass	2.00	18.42	18.43	21.44	-	23.44	-
2462MHz	Pass	2.00	17.92	17.88	20.91	-	22.91	-
802.11n HT20_Nss1,(MCS0)_2TX	-	-	-	-	-	-	-	-
2412MHz	Pass	2.00	15.94	16.03	19.00	-	21.00	-
2437MHz	Pass	2.00	18.35	18.18	21.28	-	23.28	-
2462MHz	Pass	2.00	16.95	16.81	19.89	-	21.89	-
802.11n HT40_Nss1,(MCS0)_2TX	-	-	-	-	-	-	-	-
2422MHz	Pass	2.00	12.24	12.62	15.44	-	17.44	-
2437MHz	Pass	2.00	17.26	16.85	20.07	-	22.07	-
2452MHz	Pass	2.00	14.43	14.66	17.56	-	19.56	-

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

Note : Conducted average output power is for reference only

3.4 Power Spectral Density

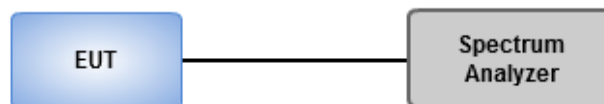
3.4.1 Limit of Power Spectral Density

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	-9.99
802.11g_Nss1,(6Mbps)_2TX	-7.41
802.11n HT20_Nss1,(MCS0)_2TX	-7.82
802.11n HT40_Nss1,(MCS0)_2TX	-10.41

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	5.01	-15.28	-14.93	-12.11	8.00
2437MHz	Pass	5.01	-13.91	-13.70	-10.82	8.00
2462MHz	Pass	5.01	-13.13	-12.83	-9.99	8.00
802.11g_Nss1,(6Mbps)_2TX	-	-	-	-	-	-
2412MHz	Pass	5.01	-11.87	-11.53	-9.08	8.00
2437MHz	Pass	5.01	-9.66	-9.67	-7.41	8.00
2462MHz	Pass	5.01	-10.91	-10.19	-8.09	8.00
802.11n HT20_Nss1,(MCS0)_2TX	-	-	-	-	-	-
2412MHz	Pass	5.01	-12.19	-12.23	-9.73	8.00
2437MHz	Pass	5.01	-10.53	-10.49	-7.82	8.00
2462MHz	Pass	5.01	-11.52	-11.79	-8.95	8.00
802.11n HT40_Nss1,(MCS0)_2TX	-	-	-	-	-	-
2422MHz	Pass	5.01	-18.61	-16.80	-15.21	8.00
2437MHz	Pass	5.01	-12.47	-13.47	-10.41	8.00
2452MHz	Pass	5.01	-16.75	-14.85	-13.42	8.00

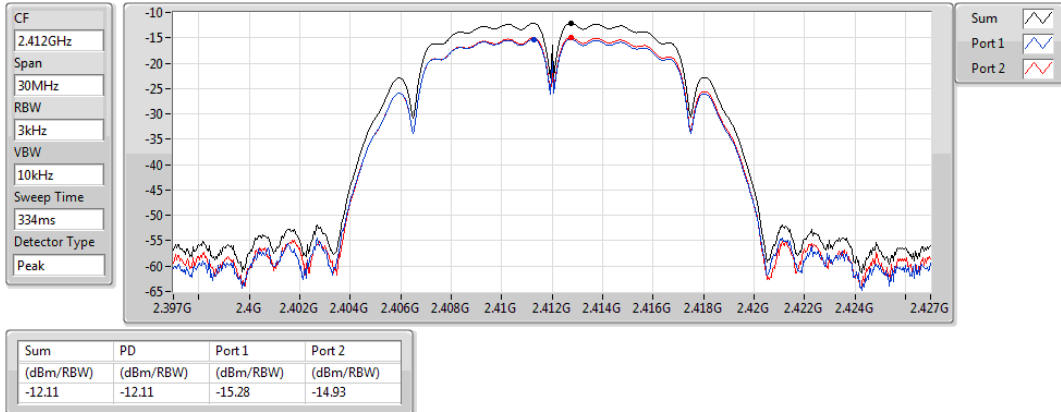
DG = Directional Gain = $2 + 10 \cdot \log(2/1) = 5.01$ dBi;

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

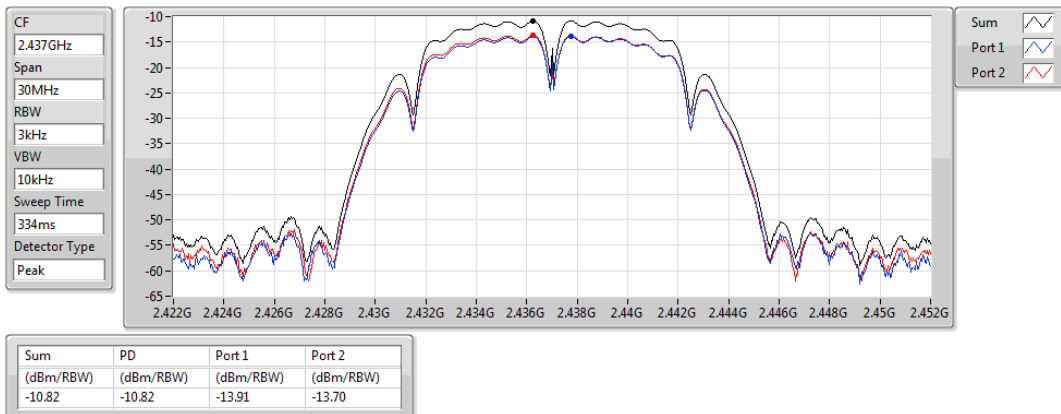
2412MHz



802.11b_Nss1,(1Mbps)_2TX

PSD

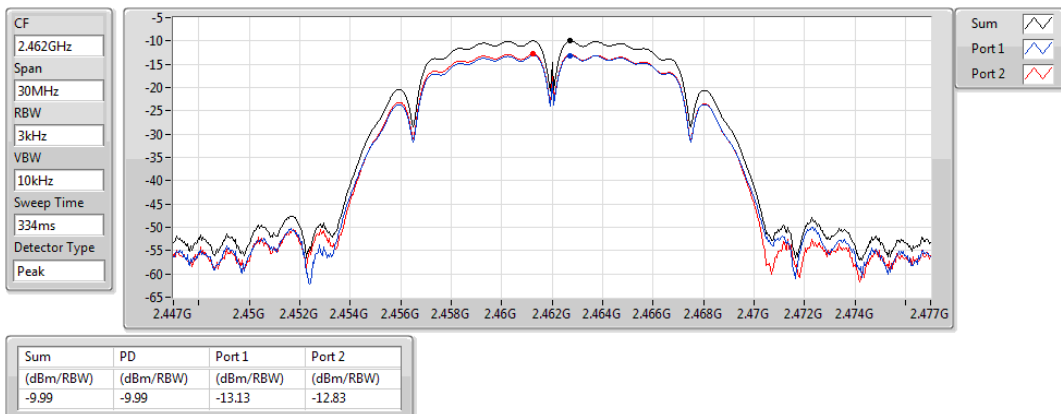
2437MHz



802.11b_Nss1,(1Mbps)_2TX

PSD

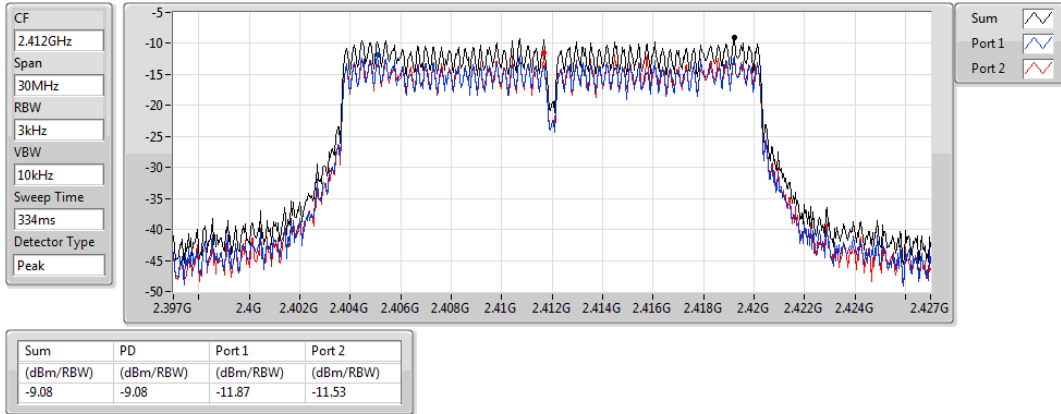
2462MHz



802.11g_Nss1,(6Mbps)_2TX

PSD

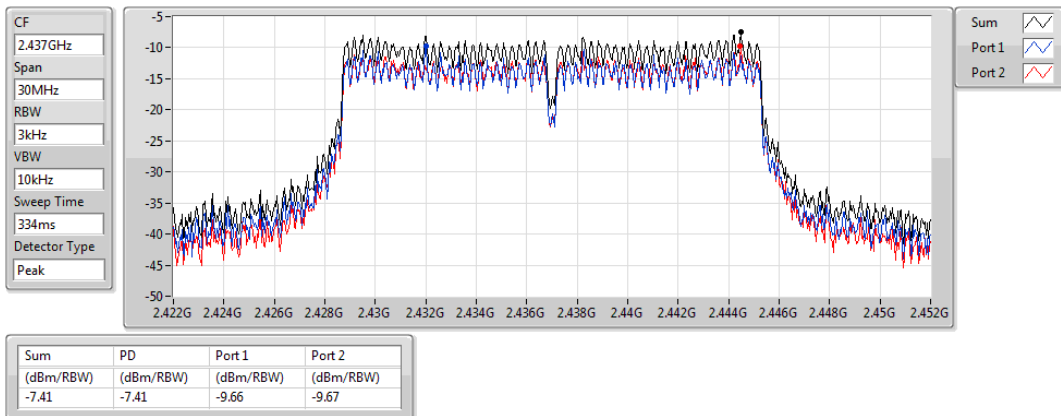
2412MHz



802.11g_Nss1,(6Mbps)_2TX

PSD

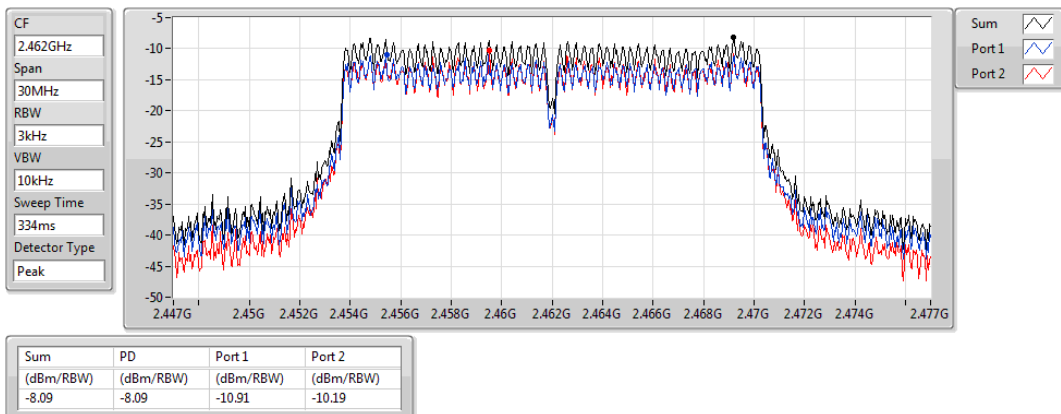
2437MHz



802.11g_Nss1,(6Mbps)_2TX

PSD

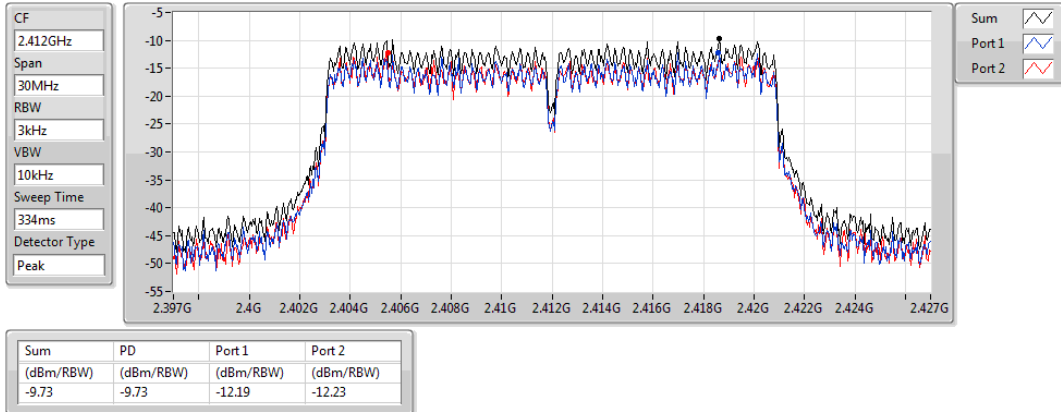
2462MHz



802.11n HT20_Nss1,(MCS0)_2TX

PSD

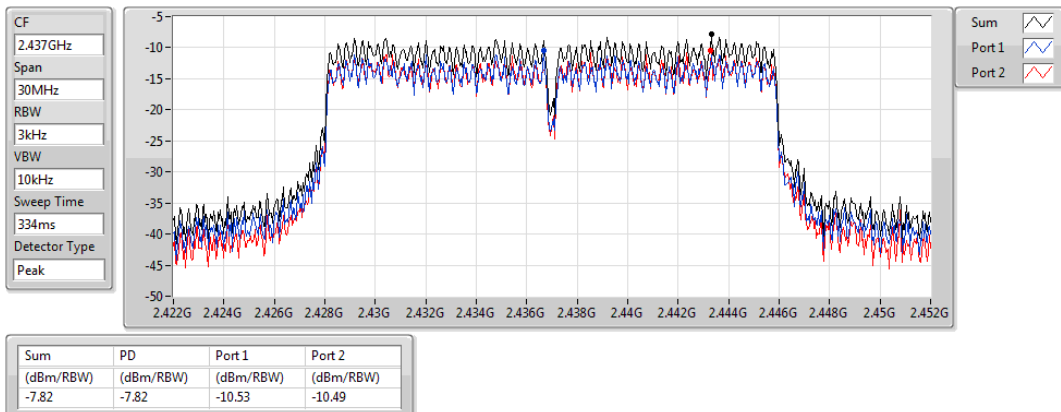
2412MHz



802.11n HT20_Nss1,(MCS0)_2TX

PSD

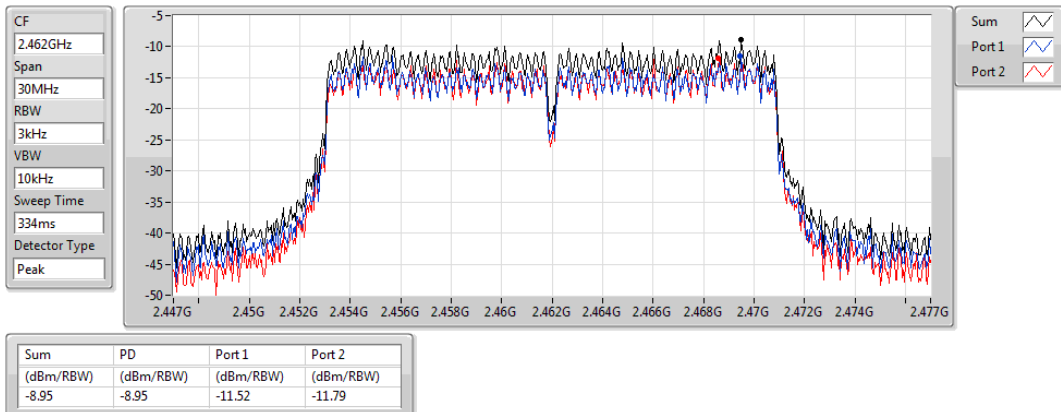
2437MHz



802.11n HT20_Nss1,(MCS0)_2TX

PSD

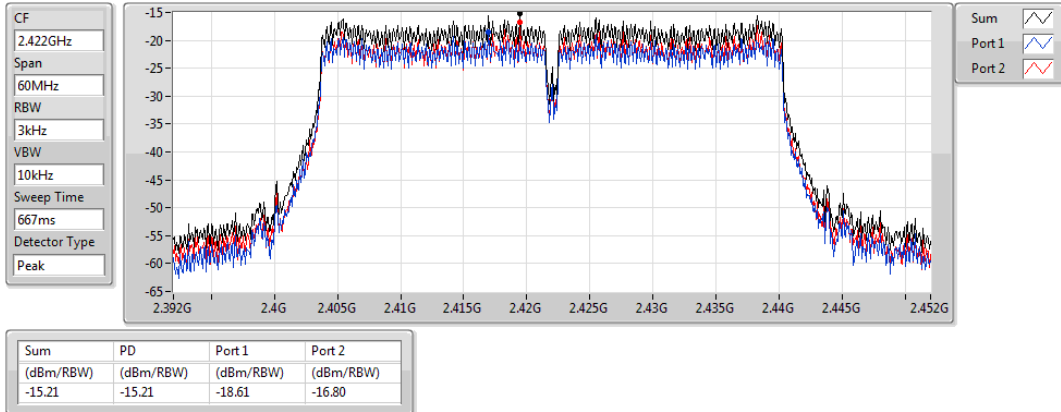
2462MHz



802.11n HT40_Nss1,(MCS0)_2TX

PSD

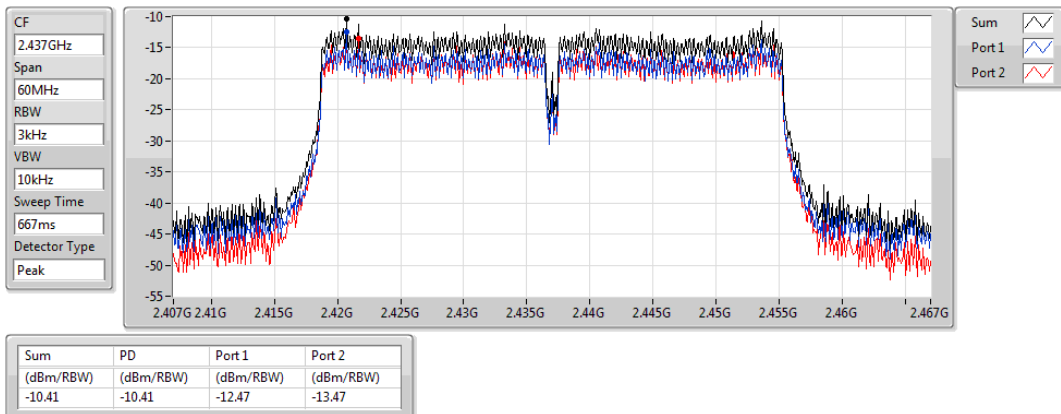
2422MHz



802.11n HT40_Nss1,(MCS0)_2TX

PSD

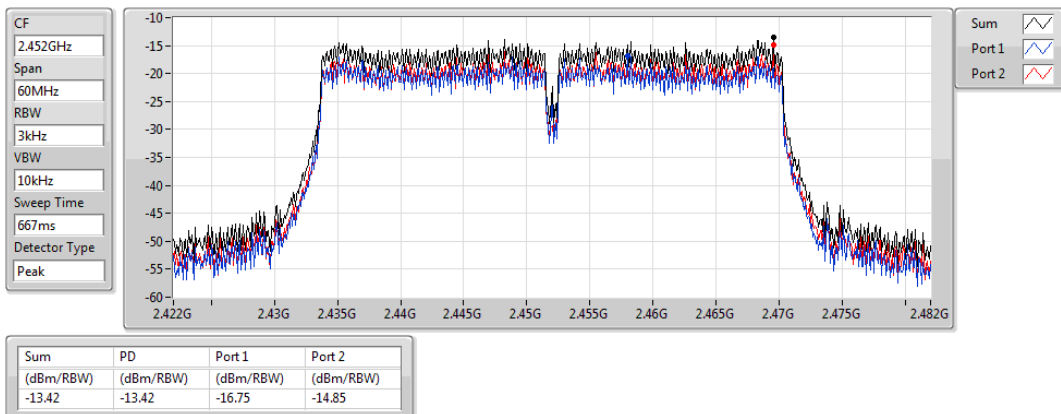
2437MHz



802.11n HT40_Nss1,(MCS0)_2TX

PSD

2452MHz



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

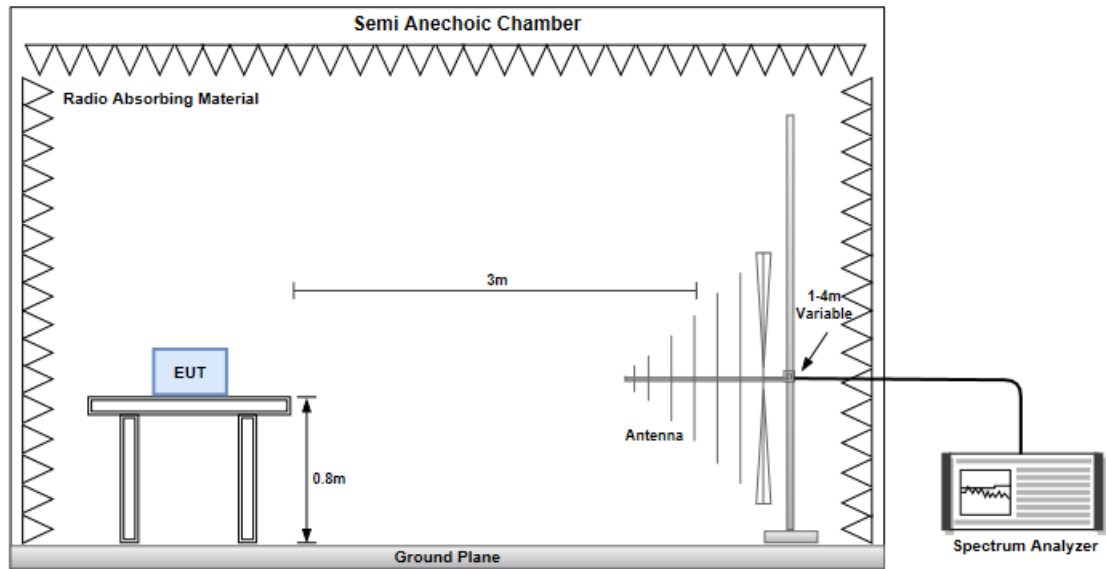
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission 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:

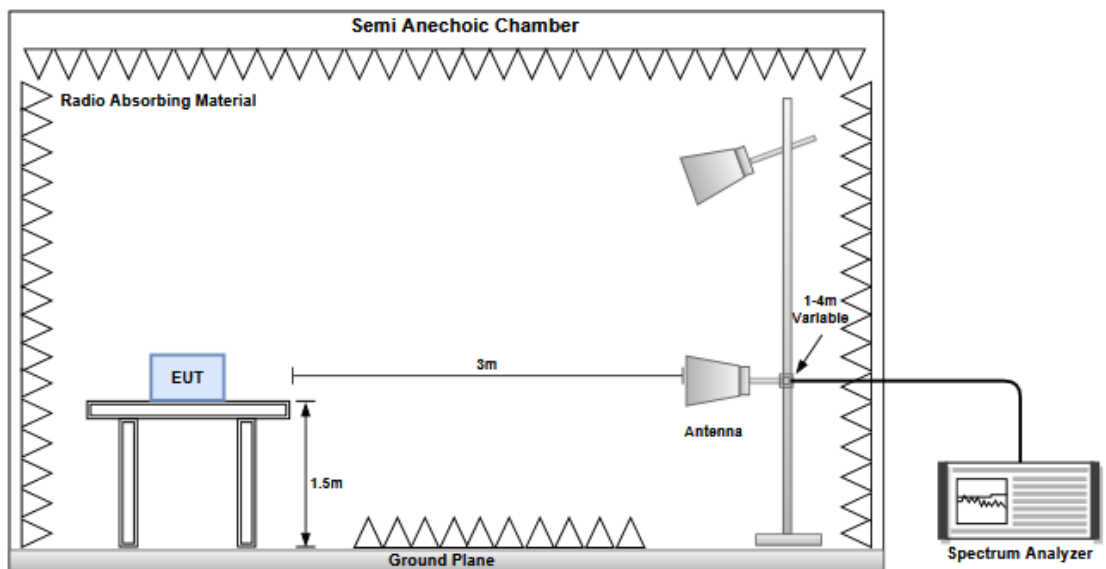
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
3. RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above 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)		2437	
Polarization	Horizontal					
Test By :Akun Chung Temperature(°C):22 Humidity(%):67						
Level (dBuV/m)						

Modulation	HT20	Test Freq. (MHz)	2437
Polarization	Vertical		
Test By :Akun Chung Temperature(°C):22 Humidity(%):67			
Level (dBUV/m) </			

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

Modulation	11b	Test Freq. (MHz)	2412
Polarization	Horizontal		
Test By :BRAD WU Temperature(°C):22 Humidity(%):67			
Level (dBUV/m) <			

Modulation	11b	Test Freq. (MHz)	2412
Polarization	Vertical		
Test By :BRAD WU Temperature(°C):22 Humidity(%):67			
Level (dBuV/m)			

Modulation	11b	Test Freq. (MHz)	2437
Polarization	Horizontal		
Test By :BRAD WU Temperature(°C):22 Humidity(%):67			
Level (dBUV/m)			

Modulation	11b	Test Freq. (MHz)	2437
Polarization	Vertical		
Test By :BRAD WU Temperature(°C):22 Humidity(%):67			
Level (dBUV/m)			

Modulation	11b	Test Freq. (MHz)	2462
Polarization	Horizontal		
Test By :BRAD WU Temperature(°C):22 Humidity(%):67			
Level (dBUV/m) <			

Modulation	11b	Test Freq. (MHz)	2462
Polarization	Vertical		
Test By :BRAD WU Temperature(°C):22 Humidity(%):67			
Level (dBUV/m)			

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

Modulation	11g	Test Freq. (MHz)	2412
Polarization	Horizontal		
Test By :BRAD WU Temperature(°C):22 Humidity(%):67			
Level (dBUV/m)			

Modulation	11g	Test Freq. (MHz)	2412
Polarization	Vertical		
Test By :BRAD WU Temperature(°C):22 Humidity(%):67			
Level (dBuV/m)			

Modulation	11g	Test Freq. (MHz)	2437
Polarization	Horizontal		
Test By :BRAD WU Temperature(°C):22 Humidity(%):67			
Level (dBUV/m)			

Modulation	11g	Test Freq. (MHz)	2437
Polarization	Vertical		
Test By :BRAD WU Temperature(°C):22 Humidity(%):67			
Level (dBUV/m)			

Modulation	11g	Test Freq. (MHz)	2462
Polarization	Horizontal		
Test By :BRAD WU Temperature(°C):22 Humidity(%):67			
Level (dBUV/m) <			

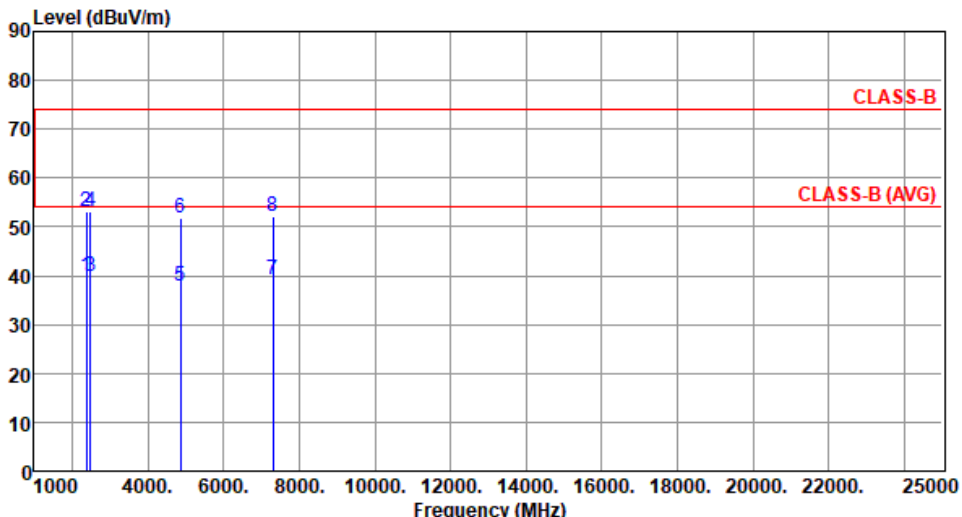
Modulation	11g	Test Freq. (MHz)	2462
Polarization	Vertical		
Test By :BRAD WU Temperature(°C):22 Humidity(%):67			
Level (dBUV/m)			

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

Modulation	HT20	Test Freq. (MHz)	2412
Polarization	Horizontal		
Test By :BRAD WU Temperature(°C):22 Humidity(%):67			
Level (dBuV/m)			

Modulation	HT20	Test Freq. (MHz)	2412
Polarization	Vertical		
Test By :BRAD WU Temperature(°C):22 Humidity(%):67			
Level (dBuV/m)			

Modulation	HT20	Test Freq. (MHz)	2437
Polarization	Horizontal		
Test By :BRAD WU Temperature(°C):22 Humidity(%):67			
Level (dBUV/m)			

Modulation	HT20	Test Freq. (MHz)	2437																																																																																										
Polarization	Vertical																																																																																												
Test By :BRAD WU Temperature(°C):22 Humidity(%):67																																																																																													
Level (dBUV/m)  <table><thead><tr><th></th><th>Freq. MHz</th><th>Emission level dBUV/m</th><th>Limit dBUV/m</th><th>Margin dB</th><th>SA reading dBUV</th><th>Factor dB</th><th>Remark</th><th>ANT High cm</th><th>Turn Table deg</th></tr></thead><tbody><tr><td>1</td><td>2390.00</td><td>39.80</td><td>54.00</td><td>-14.20</td><td>41.64</td><td>-1.84</td><td>Average</td><td>199</td><td>86</td></tr><tr><td>2</td><td>2390.00</td><td>53.00</td><td>74.00</td><td>-21.00</td><td>54.84</td><td>-1.84</td><td>Peak</td><td>199</td><td>86</td></tr><tr><td>3</td><td>2483.50</td><td>39.86</td><td>54.00</td><td>-14.14</td><td>41.66</td><td>-1.80</td><td>Average</td><td>199</td><td>86</td></tr><tr><td>4</td><td>2483.50</td><td>53.19</td><td>74.00</td><td>-20.81</td><td>54.99</td><td>-1.80</td><td>Peak</td><td>199</td><td>86</td></tr><tr><td>5</td><td>4874.00</td><td>37.94</td><td>54.00</td><td>-16.06</td><td>32.87</td><td>5.07</td><td>Average</td><td>152</td><td>3</td></tr><tr><td>6</td><td>4874.00</td><td>51.66</td><td>74.00</td><td>-22.34</td><td>46.59</td><td>5.07</td><td>Peak</td><td>152</td><td>3</td></tr><tr><td>7</td><td>7311.00</td><td>39.04</td><td>54.00</td><td>-14.96</td><td>28.76</td><td>10.28</td><td>Average</td><td>100</td><td>5</td></tr><tr><td>8</td><td>7311.00</td><td>52.17</td><td>74.00</td><td>-21.83</td><td>41.89</td><td>10.28</td><td>Peak</td><td>100</td><td>5</td></tr></tbody></table> 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).					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	39.80	54.00	-14.20	41.64	-1.84	Average	199	86	2	2390.00	53.00	74.00	-21.00	54.84	-1.84	Peak	199	86	3	2483.50	39.86	54.00	-14.14	41.66	-1.80	Average	199	86	4	2483.50	53.19	74.00	-20.81	54.99	-1.80	Peak	199	86	5	4874.00	37.94	54.00	-16.06	32.87	5.07	Average	152	3	6	4874.00	51.66	74.00	-22.34	46.59	5.07	Peak	152	3	7	7311.00	39.04	54.00	-14.96	28.76	10.28	Average	100	5	8	7311.00	52.17	74.00	-21.83	41.89	10.28	Peak	100	5
	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	39.80	54.00	-14.20	41.64	-1.84	Average	199	86																																																																																				
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8	7311.00	52.17	74.00	-21.83	41.89	10.28	Peak	100	5																																																																																				

Modulation	HT20	Test Freq. (MHz)	2462
Polarization	Horizontal		
Test By :BRAD WU Temperature(°C):22 Humidity(%):67			
Level (dBUV/m) </			

Modulation	HT20	Test Freq. (MHz)	2462
Polarization	Vertical		
Test By :BRAD WU Temperature(°C):22 Humidity(%):67			
Level (dBUV/m) <			

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

Modulation	HT40	Test Freq. (MHz)	2422
Polarization	Horizontal		
Test By :Akun Chung Temperature(°C):22 Humidity(%):67			
Level (dBuV/m)			

Modulation	HT40	Test Freq. (MHz)	2422
Polarization	Vertical		
Test By :Akun Chung Temperature(°C):22 Humidity(%):67			
Level (dBUV/m)			

Modulation	HT40	Test Freq. (MHz)	2437
Polarization	Horizontal		
Test By :BRAD WU Temperature(°C):22 Humidity(%):67			
Level (dBUV/m)			

Modulation	HT40	Test Freq. (MHz)	2437
Polarization	Vertical		
Test By :BRAD WU Temperature(°C):22 Humidity(%):67			
Level (dBuV/m) <			

Modulation	HT40	Test Freq. (MHz)	2452
Polarization	Horizontal		
Test By :Akun Chung Temperature(°C):22 Humidity(%):67			
Level (dBUV/m) </			

Modulation	HT40	Test Freq. (MHz)	2452
Polarization	Vertical		
Test By :Akun Chung Temperature(°C):22 Humidity(%):67			
Level (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

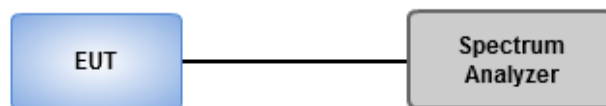
Reference level measurement

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

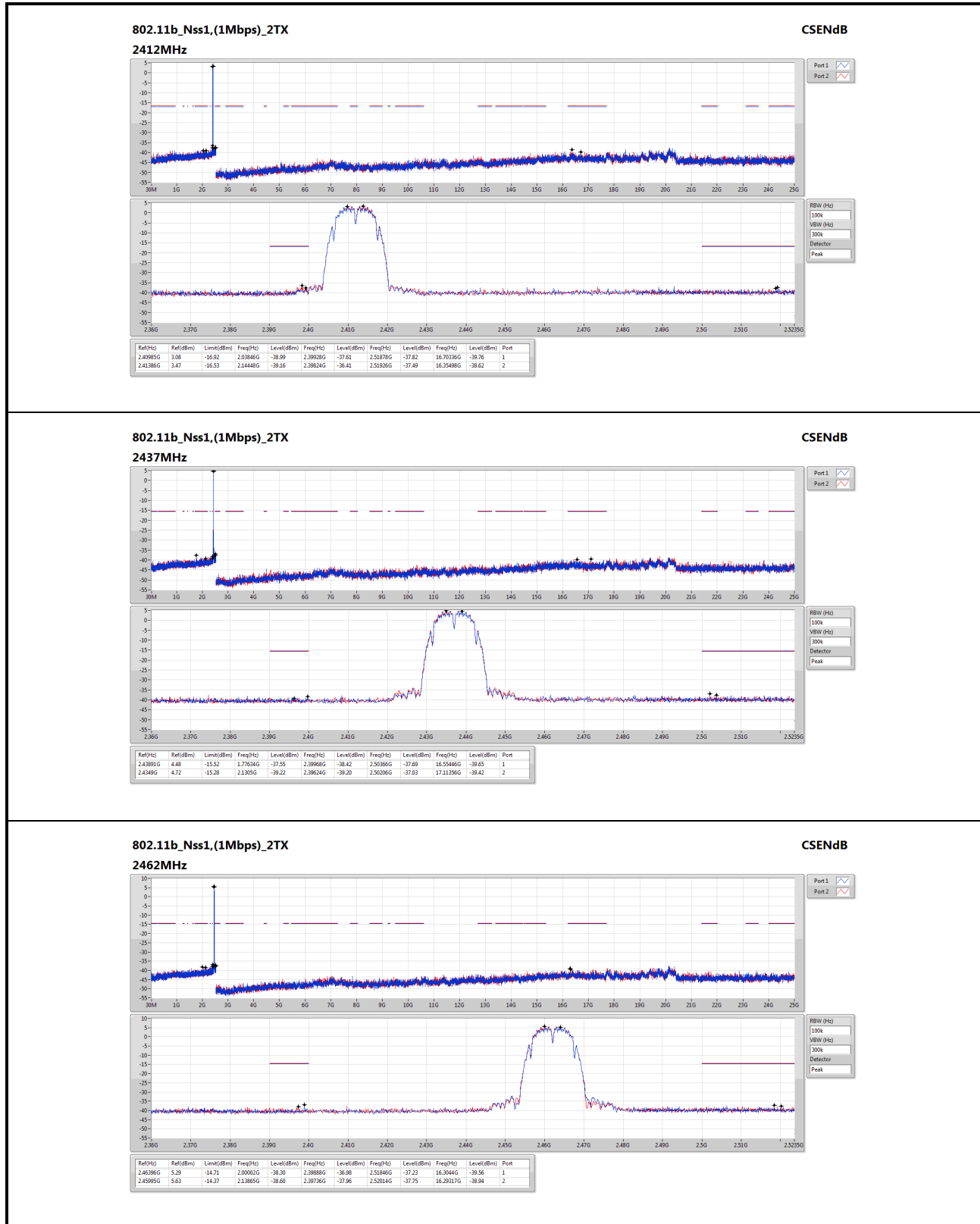
1. Set RBW=100kHz, VBW = 300kHz , Detector = Peak, Sweep time = Auto
2. Trace = max hold , Allow Trace to fully stabilize
3. Scan Frequency range is up to 25GHz
4. Use the peak marker function to determine the maximum amplitude level

3.6.3 Test Setup



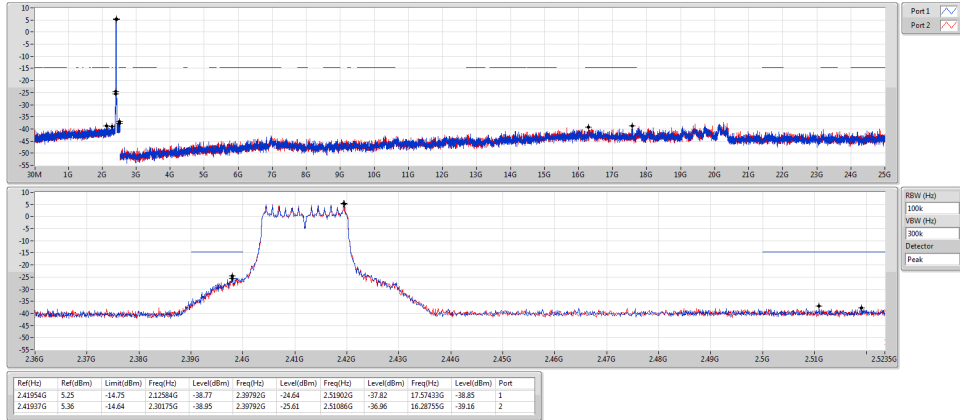
3.6.4 Unwanted Emissions into Non-Restricted Frequency Bands

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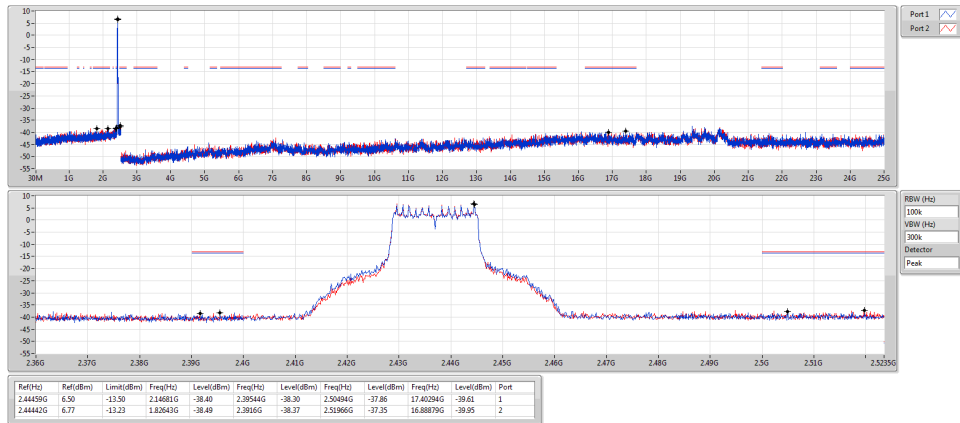
802.11g_Nss1,(6Mbps)_2TX
2412MHz

CSEndB



802.11g_Nss1,(6Mbps)_2TX
2437MHz

CSEndB



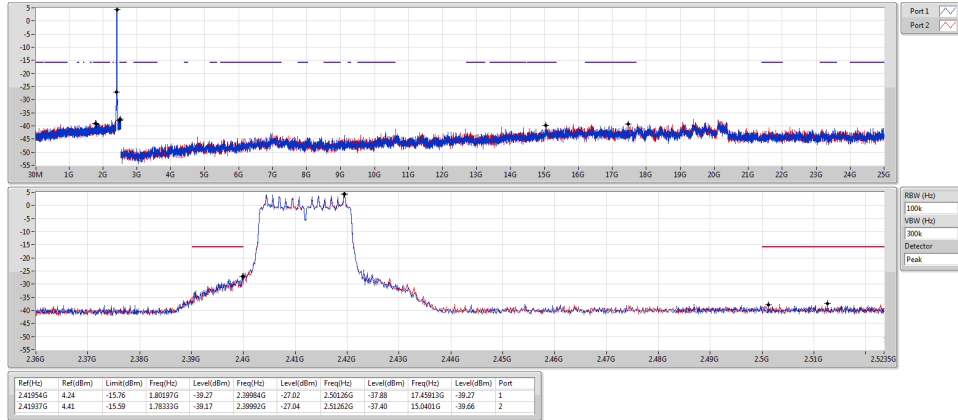
802.11g_Nss1,(6Mbps)_2TX
2462MHz

CSEndB



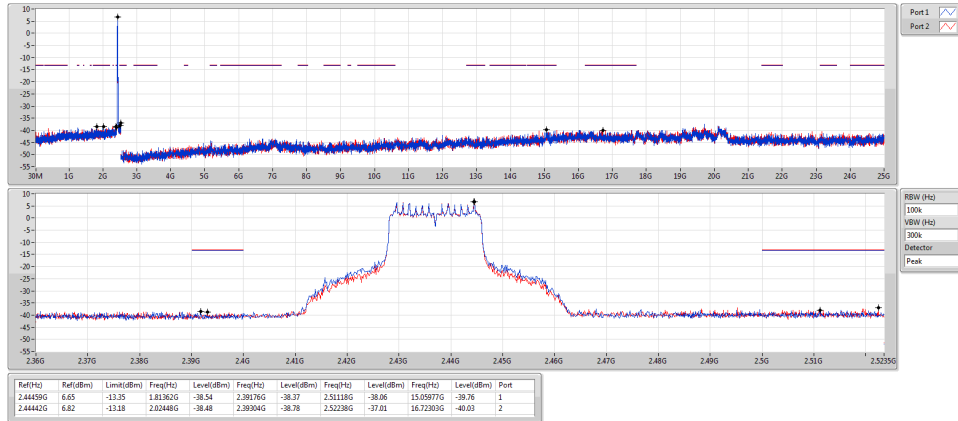
802.11n HT20_Nss1,(MCS0)_2TX
2412MHz

CSEndB



802.11n HT20_Nss1,(MCS0)_2TX
2437MHz

CSEndB



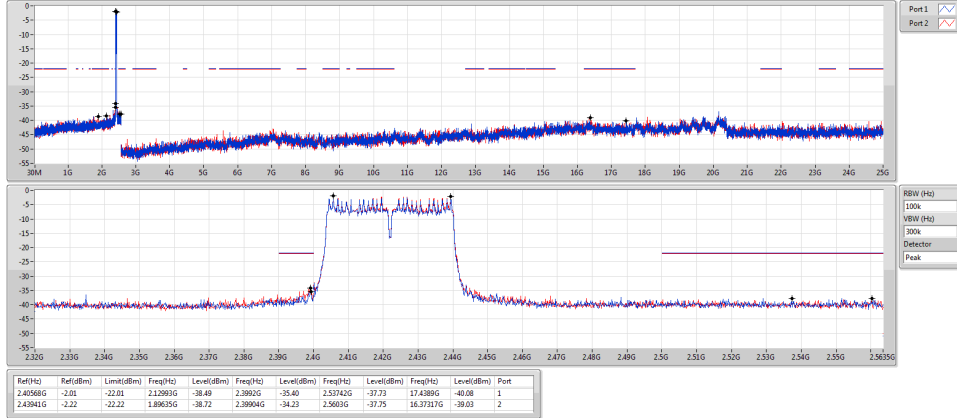
802.11n HT20_Nss1,(MCS0)_2TX
2462MHz

CSEndB



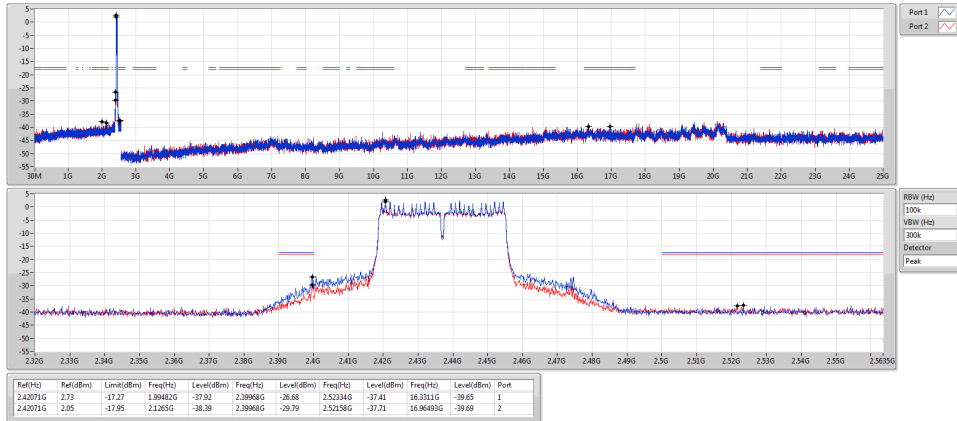
802.11n HT40_Nss1,(MCS0)_2TX
2422MHz

CSEndB



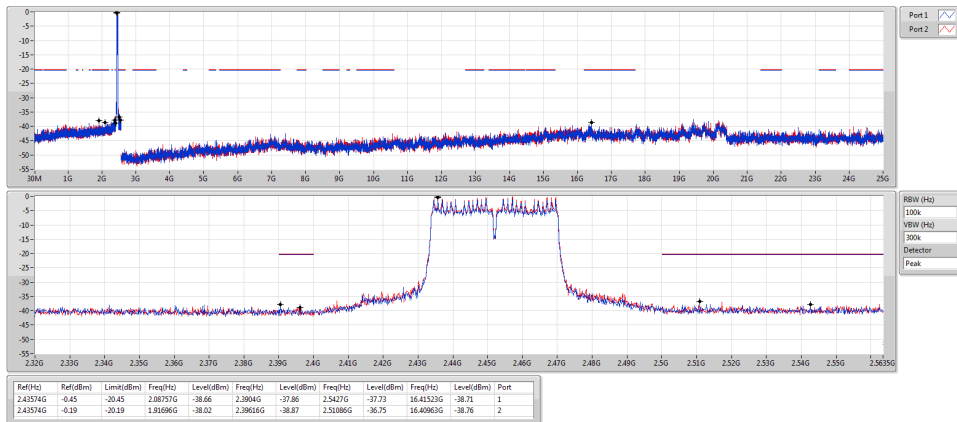
802.11n HT40_Nss1,(MCS0)_2TX
2437MHz

CSEndB



802.11n HT40_Nss1,(MCS0)_2TX
2452MHz

CSEndB



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

Tel: 886-2-2601-1640

No. 30-2, Ding Fwu Tsuen, Lin
Kou District, New Taipei City,
Taiwan, R.O.C.

Kwei Shan

Tel: 886-3-271-8666

No. 3-1, Lane 6, Wen San 3rd St.,
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.

Tel: 886-3-271-8666

Fax: 886-3-318-0155

Email: ICC_Service@icertifi.com.tw

==END==