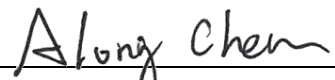


FCC Test Report

FCC ID : P27-XIONESCM2
Equipment : XiOne-SC (B)
Model No. : SCXIxxBEIxxCO; SCXIxxBEI
(Refer to item 1.1.1 for more details.)
Brand Name : Comcast Xfinity; Cox; Shaw
(Refer to item 1.1.1 for more details.)
Applicant : Sercomm Corporation
Address : 8F, 3-1, YuanQu St., NanKang, Taipei, 11503,
Taiwan
Standard : 47 CFR FCC Part 15.247
Received Date : Jun. 03, 2021
Tested Date : Jun. 12 ~ Jul. 05, 2021

We, International Certification Corporation, 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
FR161001AC	Rev. 01	Initial issue	Jul. 26, 2021

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	Conducted Emissions	[dBuV]: 6.056MHz 49.94 (Margin -10.06dB) - QP	Pass
15.247(d) 15.209	Radiated Emissions	[dBuV/m at 3m]: 2483.50MHz 73.70 (Margin -0.30dB) - PK	Pass
15.247(b)(3)	Maximum Output Power	Max Power [dBm]: 28.78	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 Product Details

The following models are provided to this EUT.

Brand Name	Model Name	Product Name	Description
Comcast Xfinity; Cox; Shaw	SCXIxxBEIxC0; SCXIxxBEI	XiOne-SC (B)	Where "x" may be any alphanumeric for External Body Color.
✦ All models are electrically identical, different model names are for marketing purpose. ✦ The above models, model SCXI11BEI was selected as a representative one for the final test and only its data was recorded in this report.			

1.1.2 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	ax (HE20)	2412-2462	1-11 [11]	2	MCS 0-15
Note 1: RF output power specifies that Maximum Conducted (Average) Output Power. Note 2: DSSS-DBPSK, DQPSK, CCK modulation OFDM/OFDMA- BPSK, QPSK, 16QAM, 64QAM, 256QAM and 1024QAM modulation. Note 3: 802.11ax supports beamforming function.					

1.1.3 Antenna Details

Ant. No.	Model	Type	Connector	Operating Frequencies (MHz) / Antenna Gain (dBi)				
				2400-2483.5	5150-5250	5250-5350	5470-5725	5725-5850
1	Ant0	PIFA	UFL	3.37	3.7	3.87	3.8	3.5
2	Ant1	PIFA	NA	3.81	3.83	3.85	3.85	3.92

1.1.4 Power Supply Type of Equipment under Test (EUT)

Power Supply Type	5.0Vdc from AC adapter
-------------------	------------------------

1.1.5 Accessories

Accessories		
No.	Equipment	Description
1	AC adapter	Brand: LEADER Model: ML08-7050150-A1 I/P: 100-120V~ 50/60Hz, 0.25A O/P: 5.0Vdc, 1.5A Power Line: 1.8m non-shielded without core
2	AC adapter	Brand: NetBit Model: NBC08A050150HU I/P: 100-120V~ 50/60Hz, 0.2A O/P: 5.0Vdc, 1.5A Power Line: 1.81m non-shielded without core
3	AC adapter	Brand: AcBel Model: WAK010 I/P: 100-120V~ 60Hz, 0.25A O/P: 5.0Vdc, 1.5A Power Line: 1.78m non-shielded without core

1.1.6 Channel List

Channel	Frequency(MHz)
1	2412
2	2417
3	2422
4	2427
5	2432
6	2437
7	2442
8	2447
9	2452
10	2457
11	2462

1.1.7 Test Tool and Duty Cycle

Test Tool	accessMtool, V3.1.0.2 ; Tera Term, V4.66		
Duty Cycle and Duty Factor	Mode	Duty Cycle (%)	Duty Factor (dB)
	11b	95.68%	0.19
	11g	96.26%	0.17
	ax HE20	98.96%	0.05

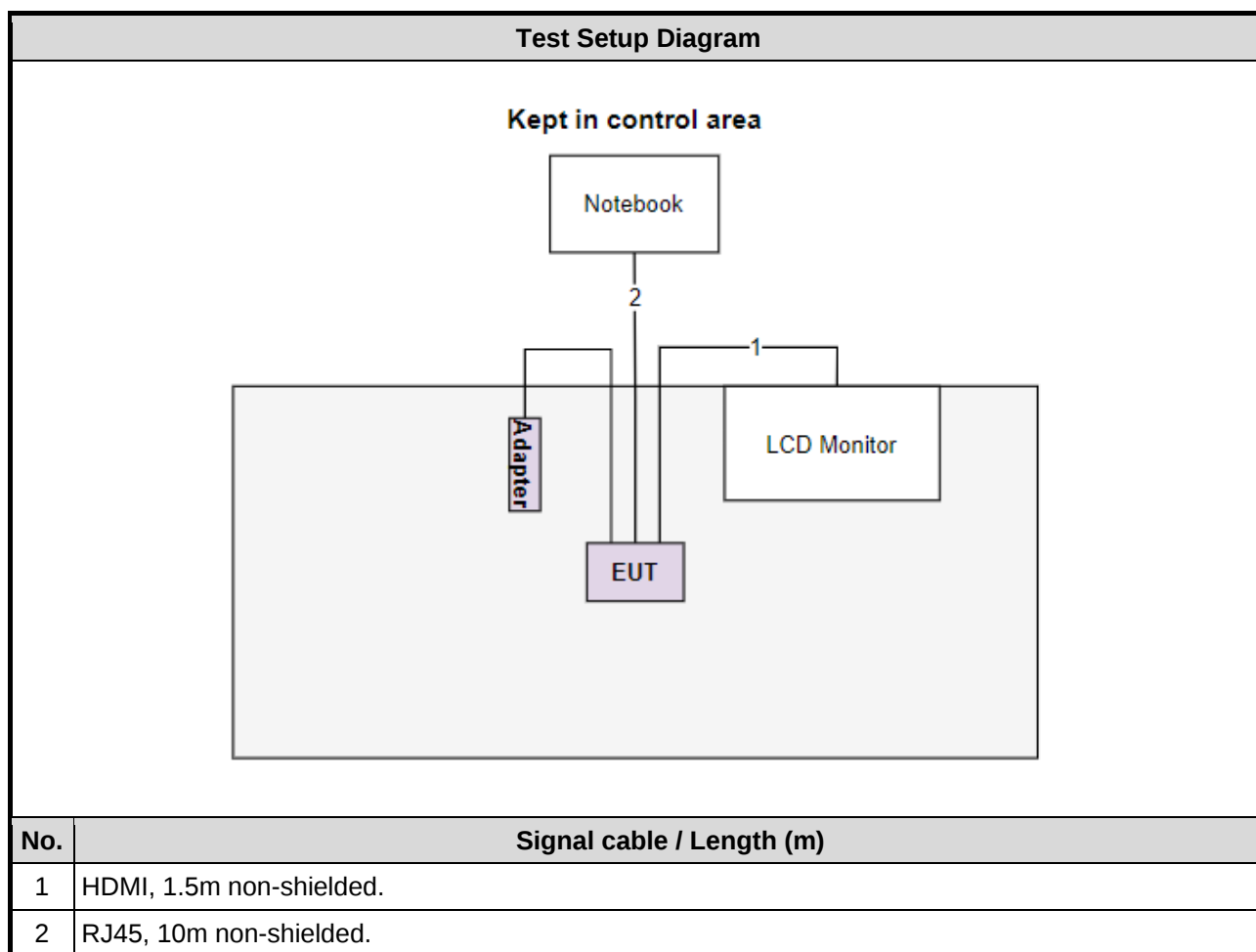
1.1.8 Power Index of Test Tool

Modulation Mode	Test Frequency (MHz)	Power Index
11b	2412	90
11b	2437	90
11b	2462	88
11g	2412	66
11g	2437	94
11g	2462	64
ax HE20	2412	56
ax HE20	2437	86
ax HE20	2462	60

1.2 Local Support Equipment List

Support Equipment List					
No.	Equipment	Brand	Model	FCC ID	Remarks
1	Notebook	DELL	Latitude E5470	DoC	---
2	LCD Monitor	DELL	S2817Q	---	---

1.3 Test Setup Chart



1.4 The Equipment List

Test Item	Conducted Emission				
Test Site	Conduction room 1 / (CO01-WS)				
Tested Date	Jun. 23, 2021				
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until
Receiver	R&S	ESR3	101658	Feb. 08, 2021	Feb. 07, 2022
LISN	R&S	ENV216	101579	Mar. 17, 2021	Mar. 16, 2022
LISN (Support Unit)	SCHWARZBECK	Schwarzbeck 8127	8127-666	Dec. 29, 2020	Dec. 28, 2021
RF Cable-CON	Woken	CFD200-NL	CFD200-NL-001	Oct. 21, 2020	Oct. 20, 2021
50 ohm terminal (Support Unit)	NA	50	04	May 25, 2021	May 24, 2022
Measurement Software	AUDIX	e3	6.120210k	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

Test Item	Radiated Emission below 1GHz				
Test Site	966 chamber1 / (03CH01-WS)				
Tested Date	Jun. 12 ~ Jun. 15, 2021				
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until
Receiver	R&S	ESR3	101658	Feb. 08, 2021	Feb. 07, 2022
Spectrum Analyzer	R&S	FSV40	101498	Dec. 04, 2020	Dec. 03, 2021
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 17, 2020	Nov. 16, 2021
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-522	Jul. 10, 2020	Jul. 09, 2021
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1096	Dec. 11, 2020	Dec. 10, 2021
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Nov. 06, 2020	Nov. 05, 2021
Preamplifier	EMC	EMC02325	980225	Jul. 03, 2020	Jul. 02, 2021
Preamplifier	Agilent	83017A	MY39501308	Sep. 26, 2020	Sep. 25, 2021
Preamplifier	EMC	EMC184045B	980192	Jul. 21, 2020	Jul. 20, 2021
Loop Antenna Cable	KOAX KABEL	101354-BW	101354-BW	Oct. 06, 2020	Oct. 05, 2021
LF cable 3M	Woken	CFD400NL-LW	CFD400NL-001	Oct. 06, 2020	Oct. 05, 2021
LF cable 11M	EMC	EMCCFD400-NW-N W-11000	200801	Oct. 06, 2020	Oct. 05, 2021
LF cable 1M	EMC	EMCCFD400-NM-N M-1000	160502	Oct. 06, 2020	Oct. 05, 2021
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16019/4	Oct. 06, 2020	Oct. 05, 2021
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16014/4	Oct. 06, 2020	Oct. 05, 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)				
Tested Date	Jun. 29 ~ Jul. 05, 2021				
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV40	101063	Apr. 19, 2021	Apr. 18, 2022
Power Meter	Anritsu	ML2495A	1241002	Nov. 04, 2020	Nov. 03, 2021
Power Sensor	Anritsu	MA2411B	1207366	Nov. 04, 2020	Nov. 03, 2021
Measurement Software	-	SENSE-15247_DTS	V5.10	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	±3.41 dB
Radiated emission > 1GHz	±4.59 dB

2 Test Configuration

2.1 Testing Facility

Test Laboratory	International Certification Corporation
Test Site	CO01-WS, 03CH01-WS, TH01-WS
Address of Test Site	No.3-1, Lane 6, Wen San 3rd St., Kwei Shan Dist., Tao Yuan City 33381, Taiwan (R.O.C.)

- FCC Designation No.: TW2732
- FCC site registration No.: 181692
- ISSED#: 10807A
- CAB identifier: TW2732

2.2 The Worst Test Modes and Channel Details

Test item	Modulation Mode	Test Frequency (MHz)	Data Rate (Mbps) / MCS	Test Configuration
Conducted Emissions	11g	2437	MCS 0	1
Radiated Emissions ≤1GHz	11g	2437	MCS 0	1
Radiated Emissions >1GHz				
Maximum Output Power	11b	2412 / 2437 / 2462	1 Mbps	1
6dB bandwidth	11g	2412 / 2437 / 2462	6 Mbps	
Power Spectral Density	ax HE20	2412 / 2437 / 2462	MCS 0	
Maximum Output Power	ax HE20	2412 / 2437 / 2462	MCS 0	2

NOTE:

- Three adapters (LEADER, NetBit & AcBel) had been covered during the pretest and found that **LEADER** adapter was the worst case and was selected for final testing.
- The EUT had been tested by following test configuration
Configuration 1: Non-Beamforming mode
Configuration 2: Beamforming mode

3 Transmitter Test Results

3.1 Conducted Emissions

3.1.1 Limit of Conducted Emissions

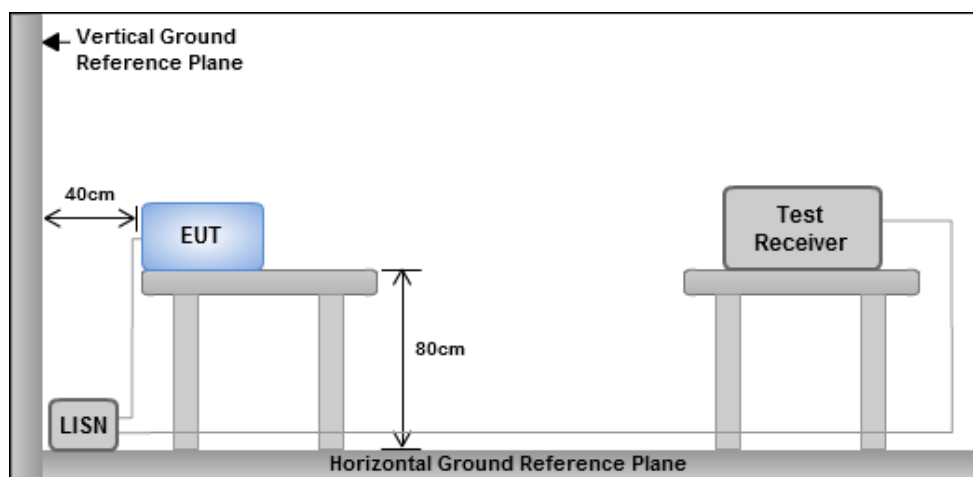
Conducted Emissions Limit		
Frequency Emission (MHz)	Quasi-Peak	Average
0.15-0.5	66 - 56 *	56 - 46 *
0.5-5	56	46
5-30	60	50

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.

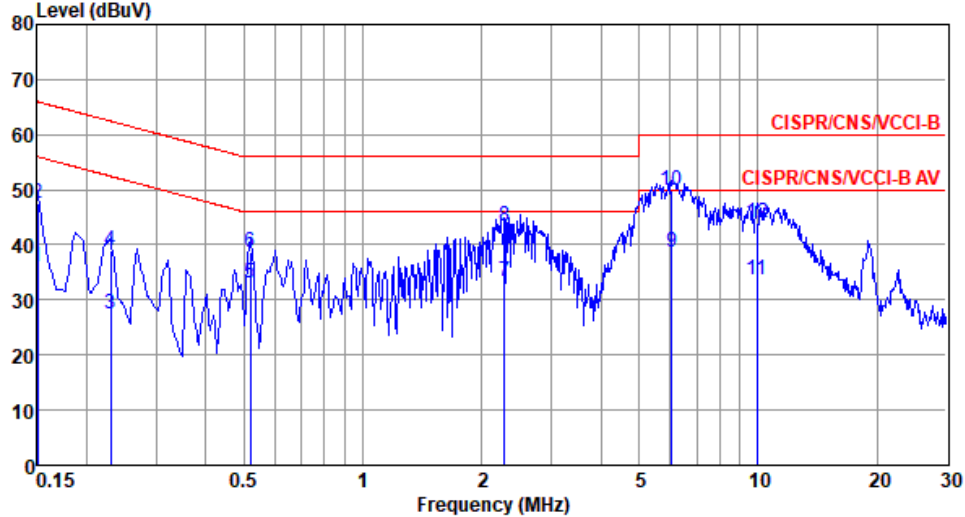
3.1.3 Test Setup



- 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	11g	Test Freq. (MHz)	2437																																																																																																																					
Power Phase	Line																																																																																																																							
Test by : Joe Liao Temperature: 24°C Humidity: 63%																																																																																																																								
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>Factor dB</th><th>Cable loss dB</th><th>Remark</th></tr></thead><tbody><tr><td>1</td><td>0.159</td><td>34.06</td><td>55.52</td><td>-21.46</td><td>24.18</td><td>9.83</td><td>0.05</td><td>Average</td></tr><tr><td>2</td><td>0.159</td><td>43.09</td><td>65.52</td><td>-22.43</td><td>33.21</td><td>9.83</td><td>0.05</td><td>QP</td></tr><tr><td>3</td><td>0.213</td><td>30.55</td><td>53.10</td><td>-22.55</td><td>20.65</td><td>9.84</td><td>0.06</td><td>Average</td></tr><tr><td>4</td><td>0.213</td><td>41.12</td><td>63.10</td><td>-21.98</td><td>31.22</td><td>9.84</td><td>0.06</td><td>QP</td></tr><tr><td>5</td><td>0.592</td><td>33.99</td><td>46.00</td><td>-12.01</td><td>23.96</td><td>9.93</td><td>0.10</td><td>Average</td></tr><tr><td>6*</td><td>0.592</td><td>44.38</td><td>56.00</td><td>-11.62</td><td>34.35</td><td>9.93</td><td>0.10</td><td>QP</td></tr><tr><td>7</td><td>5.993</td><td>31.00</td><td>50.00</td><td>-19.00</td><td>20.59</td><td>10.07</td><td>0.34</td><td>Average</td></tr><tr><td>8</td><td>5.993</td><td>43.58</td><td>60.00</td><td>-16.42</td><td>33.17</td><td>10.07</td><td>0.34</td><td>QP</td></tr><tr><td>9</td><td>11.498</td><td>24.82</td><td>50.00</td><td>-25.18</td><td>14.21</td><td>10.14</td><td>0.47</td><td>Average</td></tr><tr><td>10</td><td>11.498</td><td>34.80</td><td>60.00</td><td>-25.20</td><td>24.19</td><td>10.14</td><td>0.47</td><td>QP</td></tr><tr><td>11</td><td>19.224</td><td>21.06</td><td>50.00</td><td>-28.94</td><td>10.15</td><td>10.25</td><td>0.66</td><td>Average</td></tr><tr><td>12</td><td>19.224</td><td>26.92</td><td>60.00</td><td>-33.08</td><td>16.01</td><td>10.25</td><td>0.66</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	0.159	34.06	55.52	-21.46	24.18	9.83	0.05	Average	2	0.159	43.09	65.52	-22.43	33.21	9.83	0.05	QP	3	0.213	30.55	53.10	-22.55	20.65	9.84	0.06	Average	4	0.213	41.12	63.10	-21.98	31.22	9.84	0.06	QP	5	0.592	33.99	46.00	-12.01	23.96	9.93	0.10	Average	6*	0.592	44.38	56.00	-11.62	34.35	9.93	0.10	QP	7	5.993	31.00	50.00	-19.00	20.59	10.07	0.34	Average	8	5.993	43.58	60.00	-16.42	33.17	10.07	0.34	QP	9	11.498	24.82	50.00	-25.18	14.21	10.14	0.47	Average	10	11.498	34.80	60.00	-25.20	24.19	10.14	0.47	QP	11	19.224	21.06	50.00	-28.94	10.15	10.25	0.66	Average	12	19.224	26.92	60.00	-33.08	16.01	10.25	0.66	QP
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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).																																																																																																																								

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	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	Factor dB	Cable loss dB	Remark																																																																																																																
1	0.150	36.06	56.00	-19.94	26.19	9.82	0.05	Average																																																																																																																
2	0.150	47.48	66.00	-18.52	37.61	9.82	0.05	QP																																																																																																																
3	0.230	27.44	52.44	-25.00	17.55	9.83	0.06	Average																																																																																																																
4	0.230	39.05	62.44	-23.39	29.16	9.83	0.06	QP																																																																																																																
5	0.518	33.01	46.00	-12.99	23.06	9.86	0.09	Average																																																																																																																
6	0.518	38.59	56.00	-17.41	28.64	9.86	0.09	QP																																																																																																																
7	2.285	33.23	46.00	-12.77	23.08	9.95	0.20	Average																																																																																																																
8	2.285	43.46	56.00	-12.54	33.31	9.95	0.20	QP																																																																																																																
9	6.056	38.54	50.00	-11.46	28.18	10.02	0.34	Average																																																																																																																
10*	6.056	49.94	60.00	-10.06	39.58	10.02	0.34	QP																																																																																																																
11	9.966	33.58	50.00	-16.42	23.09	10.09	0.40	Average																																																																																																																
12	9.966	44.08	60.00	-15.92	33.59	10.09	0.40	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

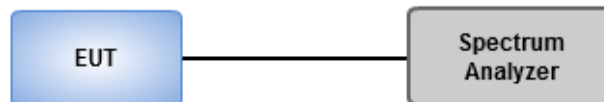
6dB Bandwidth

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	25-26°C / 64-67%	Tested By	Aska Huang
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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	9.058M	14.472M	14M5G1D	7.609M	13.459M
802.11g_Nss1,(6Mbps)_2TX	16.377M	29.884M	29M9D1D	16.087M	16.498M
11ax20_Nss1,(MCS0)_2TX	18.913M	23.082M	23M1D1D	18.261M	18.886M

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

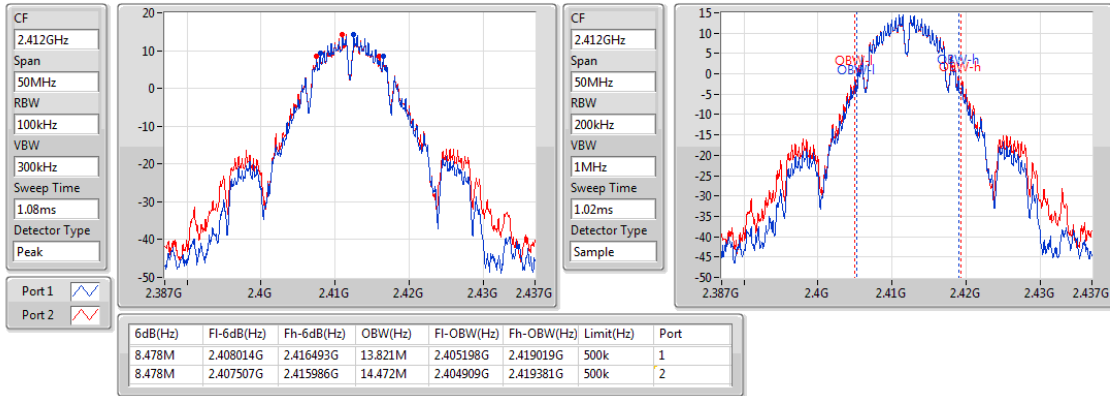
Mode	Result	Limit (Hz)	Port 1-N dB (Hz)	Port 1-OBW (Hz)	Port 2-N dB (Hz)	Port 2-OBW (Hz)
802.11b_Nss1,(1Mbps)_2TX	-	-	-	-	-	-
2412MHz	Pass	500k	8.478M	13.821M	8.478M	14.472M
2437MHz	Pass	500k	9.058M	14.327M	7.609M	14.182M
2462MHz	Pass	500k	7.609M	13.676M	8.551M	13.459M
802.11g_Nss1,(6Mbps)_2TX	-	-	-	-	-	-
2412MHz	Pass	500k	16.377M	16.57M	16.377M	16.498M
2437MHz	Pass	500k	16.377M	26.628M	16.377M	29.884M
2462MHz	Pass	500k	16.377M	16.57M	16.087M	16.498M
11ax20_Nss1,(MCS0)_2TX	-	-	-	-	-	-
2412MHz	Pass	500k	18.913M	18.886M	18.261M	18.886M
2437MHz	Pass	500k	18.623M	19.826M	18.623M	23.082M
2462MHz	Pass	500k	18.623M	18.886M	18.696M	18.958M

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

802.11b_Nss1,(1Mbps)_2TX

EBW

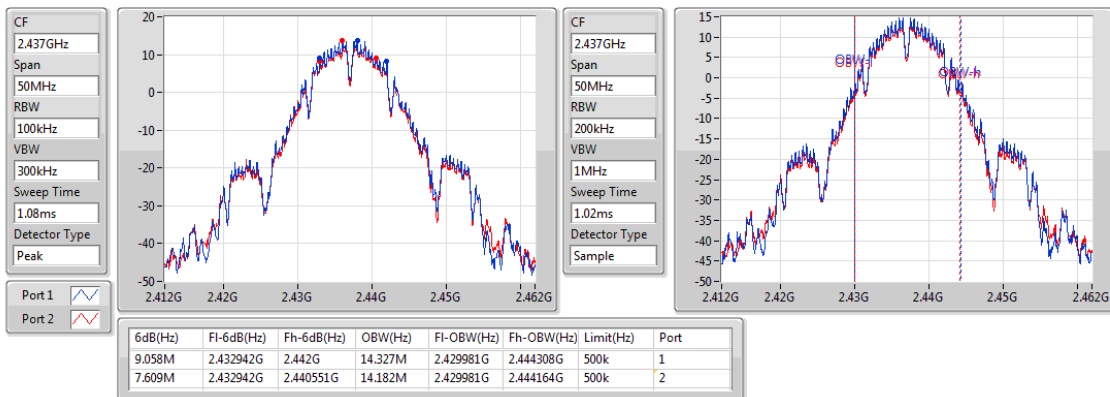
2412MHz



802.11b_Nss1,(1Mbps)_2TX

EBW

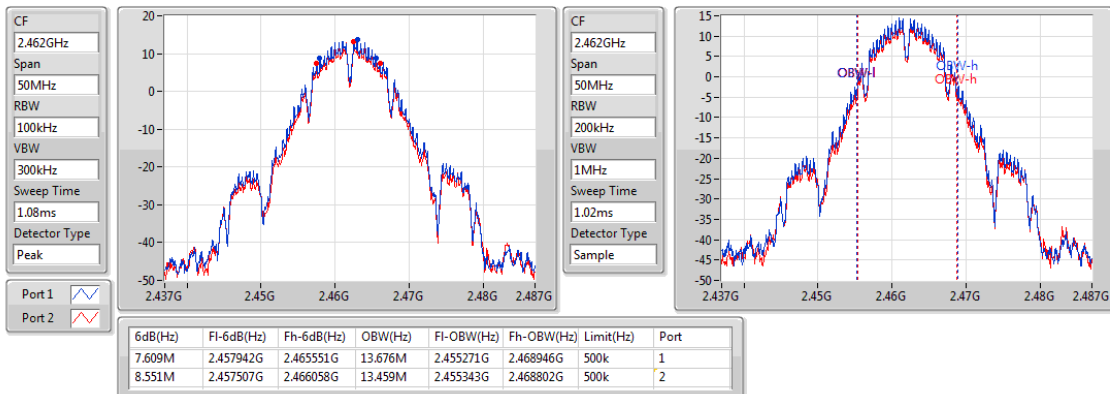
2437MHz



802.11b_Nss1,(1Mbps)_2TX

EBW

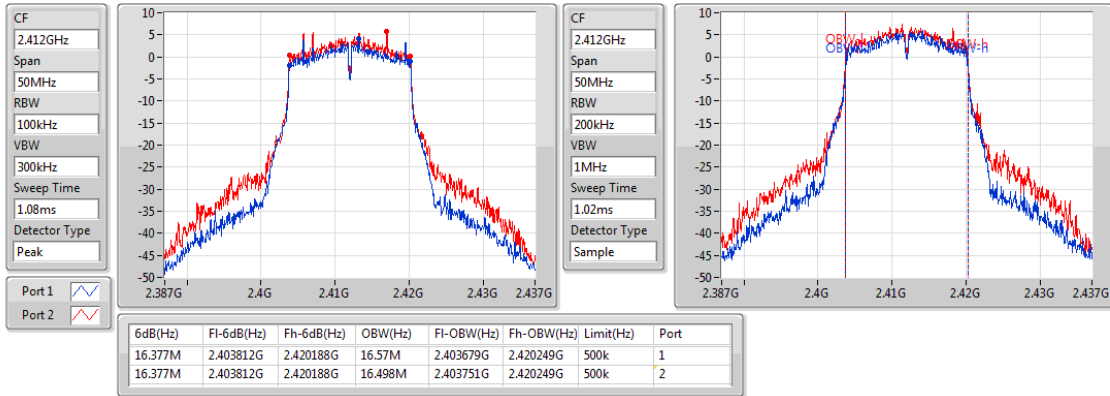
2462MHz



802.11g_Nss1,(6Mbps)_2TX

EBW

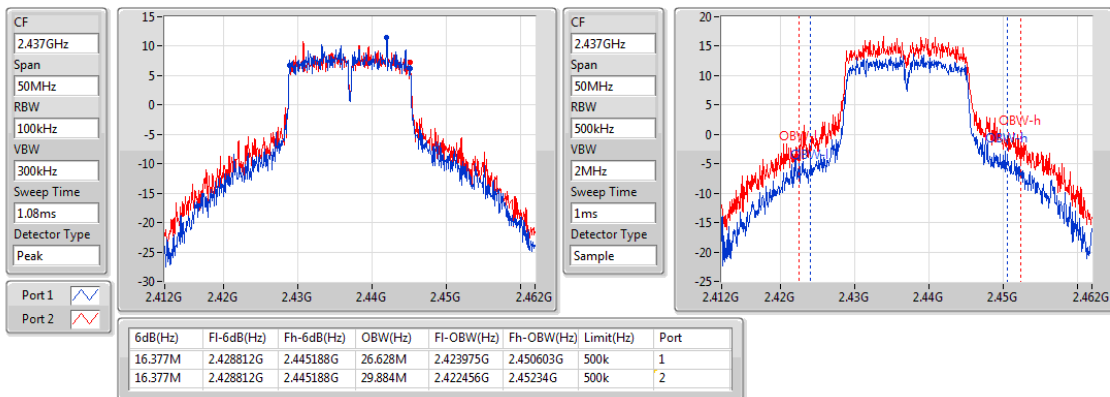
2412MHz



802.11g_Nss1,(6Mbps)_2TX

EBW

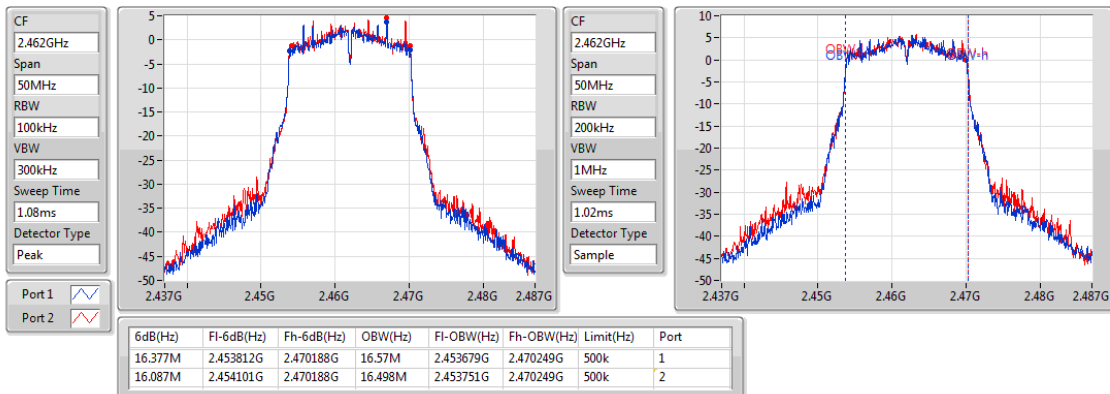
2437MHz



802.11g_Nss1,(6Mbps)_2TX

EBW

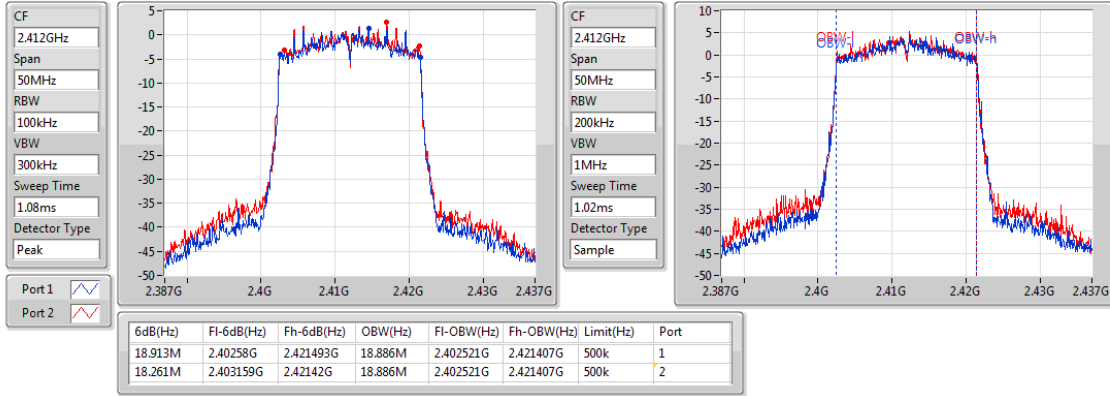
2462MHz



11ax20_Nss1,(MCS0)_2TX

EBW

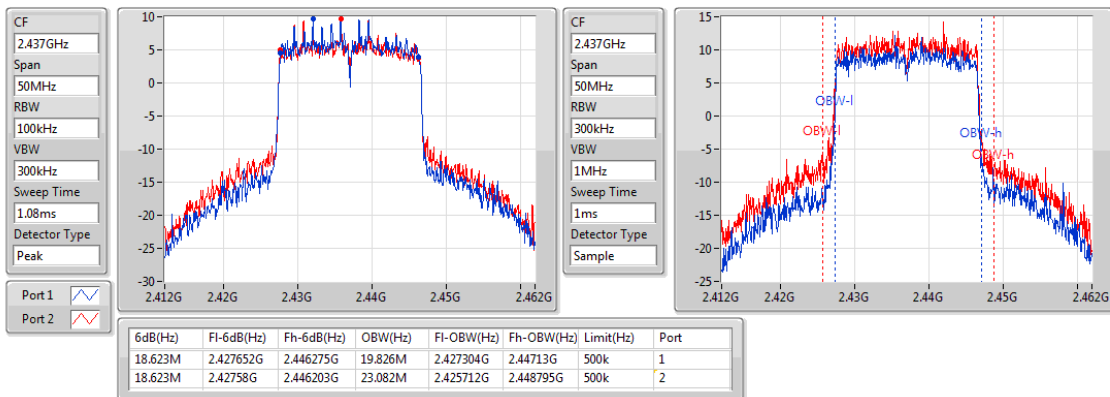
2412MHz



11ax20_Nss1,(MCS0)_2TX

EBW

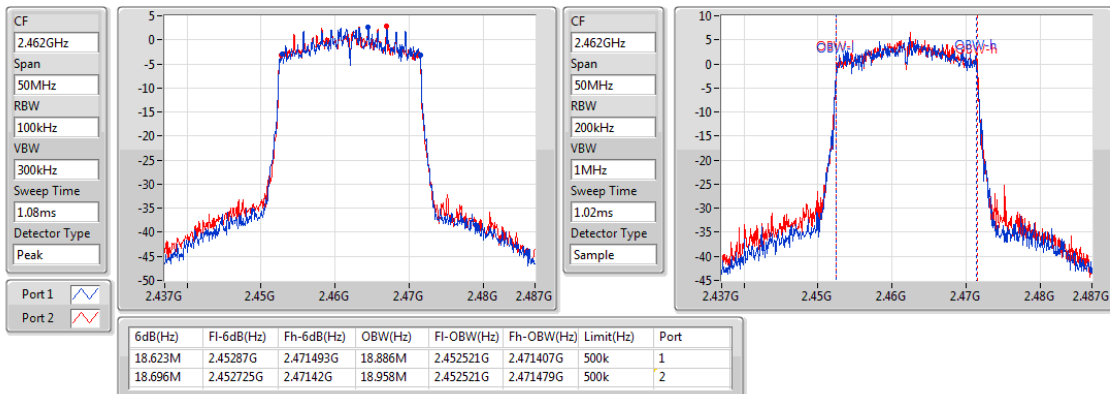
2437MHz



11ax20_Nss1,(MCS0)_2TX

EBW

2462MHz



3.3 RF Output Power

3.3.1 Limit of RF Output Power

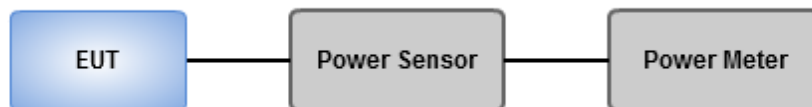
Conducted power shall not exceed 1Watt.

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	25-26°C / 64-67%	Tested By	Aska Huang
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Non-beamforming

Summary of Peak Conducted Output Power

Mode	Total Power (dBm)	Total Power (W)
2.4-2.4835GHz	-	-
802.11b_Nss1,(1Mbps)_2TX	27.93	0.62087
802.11g_Nss1,(6Mbps)_2TX	28.78	0.75509
11ax20_Nss1,(MCS0)_2TX	28.67	0.73621

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	3.81	25.1	24.74	27.93	30.00	31.74	36.00
2437MHz	Pass	3.81	25.19	24.53	27.88	30.00	31.69	36.00
2462MHz	Pass	3.81	24.85	23.72	27.33	30.00	31.14	36.00
802.11g_Nss1,(6Mbps)_2TX	-	-	-	-	-	-	-	-
2412MHz	Pass	3.81	25.43	24.67	28.08	30.00	31.89	36.00
2437MHz	Pass	3.81	26.12	25.39	28.78	30.00	32.59	36.00
2462MHz	Pass	3.81	25.13	23.78	27.52	30.00	31.33	36.00
11ax20_Nss1,(MCS0)_2TX	-	-	-	-	-	-	-	-
2412MHz	Pass	3.81	23.26	23.45	26.37	30.00	30.18	36.00
2437MHz	Pass	3.81	26.11	25.15	28.67	30.00	32.48	36.00
2462MHz	Pass	3.81	24.45	23.61	27.06	30.00	30.87	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	25.79	0.37931
802.11g_Nss1,(6Mbps)_2TX	25.83	0.38282
11ax20_Nss1,(MCS0)_2TX	24.42	0.27669

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	3.81	22.92	22.64	25.79	-	29.60	-
2437MHz	Pass	3.81	23.05	22.41	25.75	-	29.56	-
2462MHz	Pass	3.81	22.53	21.45	25.03	-	28.84	-
802.11g_Nss1,(6Mbps)_2TX	-	-	-	-	-	-	-	-
2412MHz	Pass	3.81	16.51	17.13	19.84	-	23.65	-
2437MHz	Pass	3.81	23.26	22.34	25.83	-	29.64	-
2462MHz	Pass	3.81	15.56	15.48	18.53	-	22.34	-
11ax20_Nss1,(MCS0)_2TX	-	-	-	-	-	-	-	-
2412MHz	Pass	3.81	13.96	14.09	17.04	-	20.85	-
2437MHz	Pass	3.81	21.76	21.03	24.42	-	28.23	-
2462MHz	Pass	3.81	14.87	14.63	17.76	-	21.57	-

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

Note : Conducted average output power is for reference only

Beamforming

Summary of Peak Conducted Output Power

Mode	Total Power (dBm)	Total Power (W)
2.4-2.4835GHz	-	-
11ax20,BF_Nss1,(MCS0)_2TX	25.66	0.36813

Result

Mode	Result	DG (dBi)	Port 1 (dBm)	Port 2 (dBm)	Total Power (dBm)	Power Limit (dBm)	EIRP (dBm)	EIRP Limit (dBm)
11ax20,BF_Nss1,(MCS0)_2TX	-	-	-	-	-	-	-	-
2412MHz	Pass	6.60	20.25	20.44	23.36	29.40	29.96	36.00
2437MHz	Pass	6.60	23.1	22.14	25.66	29.40	32.26	36.00
2462MHz	Pass	6.60	21.44	20.6	24.05	29.40	30.65	36.00

Port X = Port X output power

DG = Directional Gain = $10 * \log((10^{3.37/20} + 10^{3.81/20})^2 / 2) = 6.60$ dBi

Limit shall be reduced to 30 dBm – (6.60 dBi – 6 dBi) = 29.40 dBm

Summary of Conducted (Average) Output Power

Mode	Total Power (dBm)	Total Power (W)
2.4-2.4835GHz	-	-
11ax20,BF_Nss1,(MCS0)_2TX	21.41	0.13836

Result

Mode	Result	DG (dBi)	Port 1 (dBm)	Port 2 (dBm)	Total Power (dBm)	Power Limit (dBm)	EIRP (dBm)	EIRP Limit (dBm)
11ax20,BF_Nss1,(MCS0)_2TX	-	-	-	-	-	-	-	-
2412MHz	Pass	6.60	10.95	11.08	14.03	-	20.63	-
2437MHz	Pass	6.60	18.75	18.02	21.41	-	28.01	-
2462MHz	Pass	6.60	11.86	11.62	14.75	-	21.35	-

Port X = Port X output power

DG = Directional Gain = $10 * \log((10^{3.37/20} + 10^{3.81/20})^2 / 2) = 6.60$ dBi

Note : Conducted average output power is for reference only

3.4 Power Spectral Density

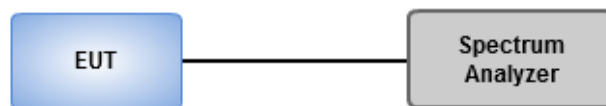
3.4.1 Limit of Power Spectral Density

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	25-26°C / 64-67%	Tested By	Aska Huang
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Summary

Mode	PD (dBm/3kHz)
2.4-2.4835GHz	-
802.11b_Nss1,(1Mbps)_2TX	2.68
802.11g_Nss1,(6Mbps)_2TX	-0.48
11ax20_Nss1,(MCS0)_2TX	-3.22

Result

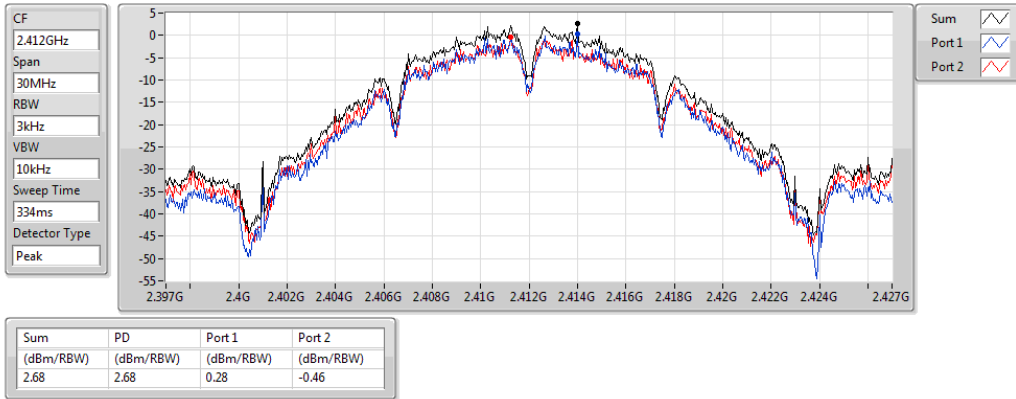
Mode	Result	DG (dBi)	Port 1 (dBm/3kHz)	Port 2 (dBm/3kHz)	PD (dBm/3kHz)	PD Limit (dBm/3kHz)
802.11b_Nss1,(1Mbps)_2TX	-	-	-	-	-	-
2412MHz	Pass	6.60	0.28	-0.46	2.68	7.40
2437MHz	Pass	6.60	0.57	-1.14	2.37	7.40
2462MHz	Pass	6.60	-0.67	-1.72	1.46	7.40
802.11g_Nss1,(6Mbps)_2TX	-	-	-	-	-	-
2412MHz	Pass	6.60	-7.52	-6.35	-5.00	7.40
2437MHz	Pass	6.60	-2.95	-2.91	-0.48	7.40
2462MHz	Pass	6.60	-9.36	-8.72	-6.17	7.40
11ax20_Nss1,(MCS0)_2TX	-	-	-	-	-	-
2412MHz	Pass	6.60	-10.86	-10.22	-8.68	7.40
2437MHz	Pass	6.60	-4.93	-5.31	-3.22	7.40
2462MHz	Pass	6.60	-11.33	-9.60	-8.03	7.40

DG = Directional Gain = $10 * \log((10^{3.37/20} + 10^{3.81/20})^2 / 2) = 6.60 \text{ dBi} > 6 \text{ dBi}$, limit shall be reduced to 8 dBm – (6.6 dBi – 6 dBi) = 7.4 dBm
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

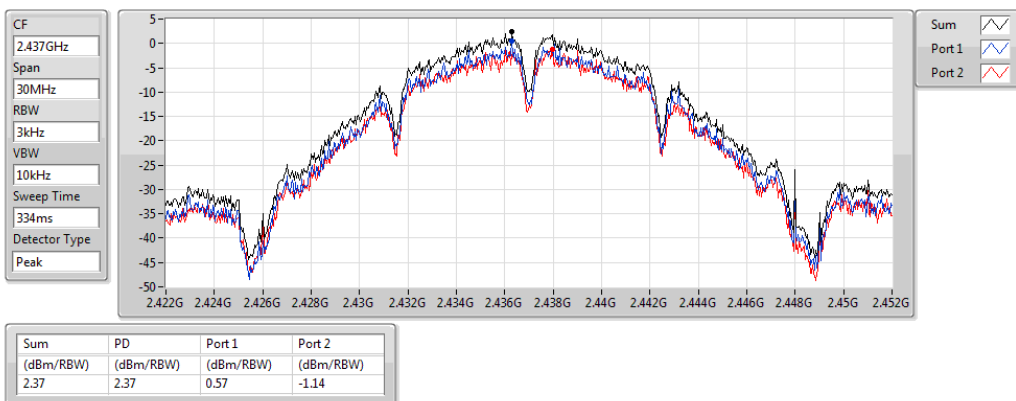
2412MHz



802.11b_Nss1,(1Mbps)_2TX

PSD

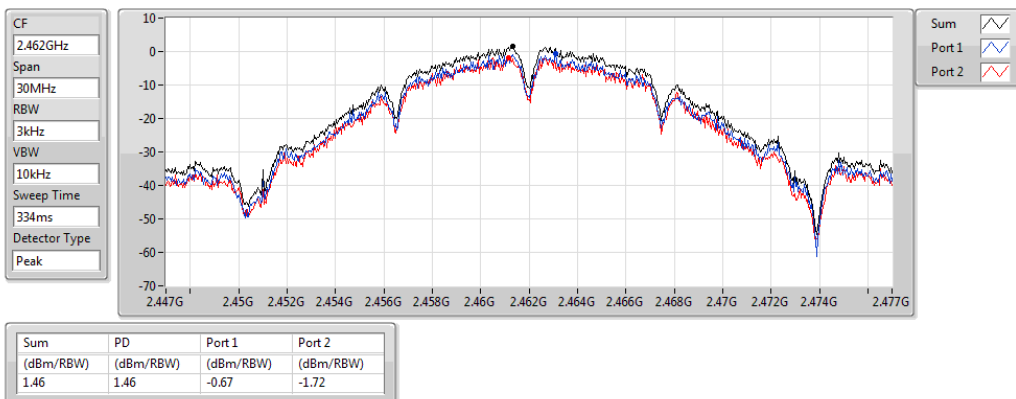
2437MHz



802.11b_Nss1,(1Mbps)_2TX

PSD

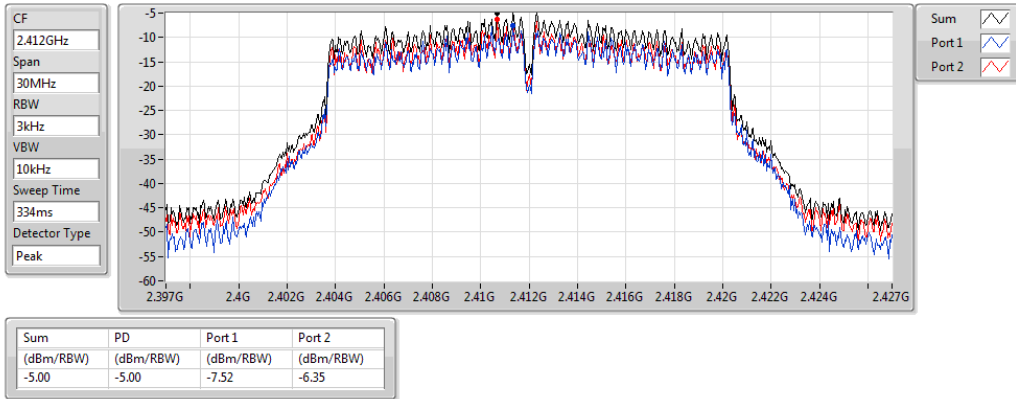
2462MHz



802.11g_Nss1,(6Mbps)_2TX

PSD

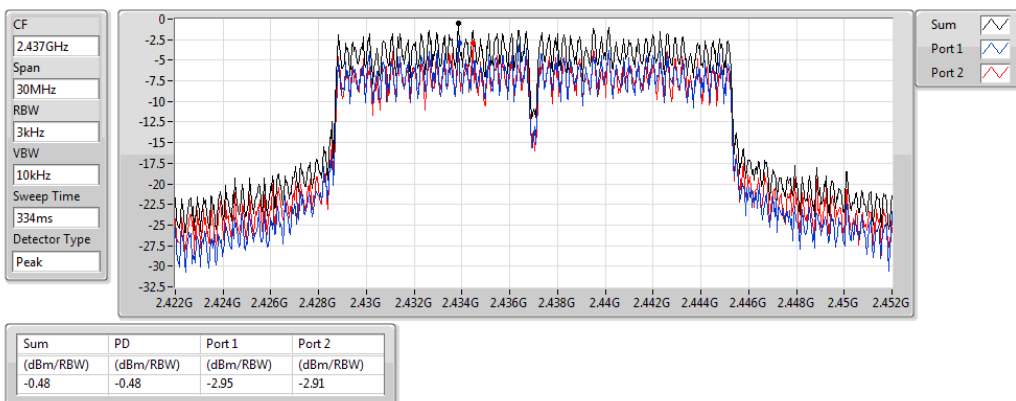
2412MHz



802.11g_Nss1,(6Mbps)_2TX

PSD

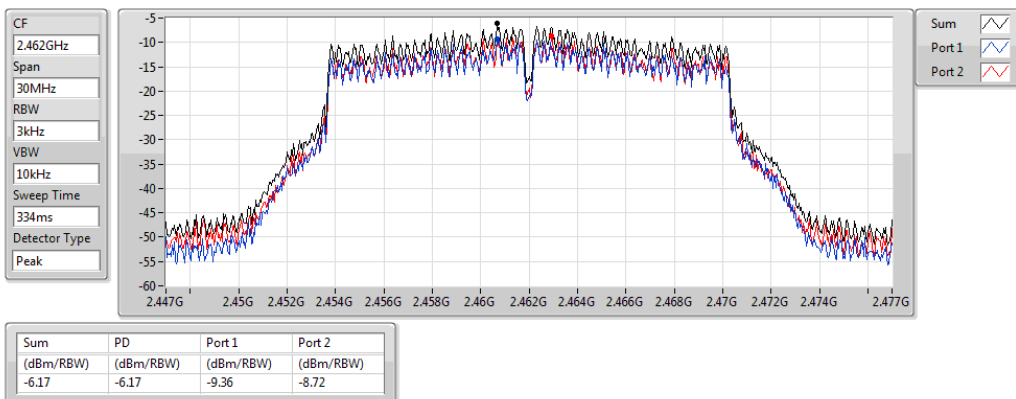
2437MHz



802.11g_Nss1,(6Mbps)_2TX

PSD

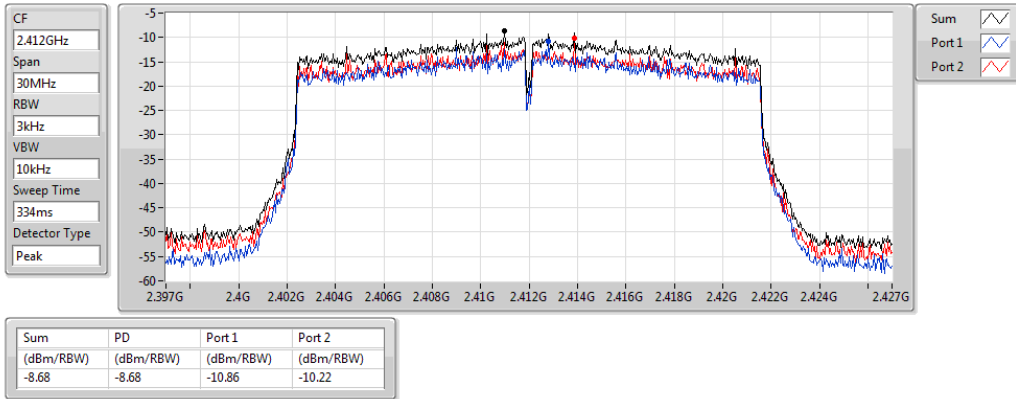
2462MHz



11ax20_Nss1,(MCS0)_2TX

PSD

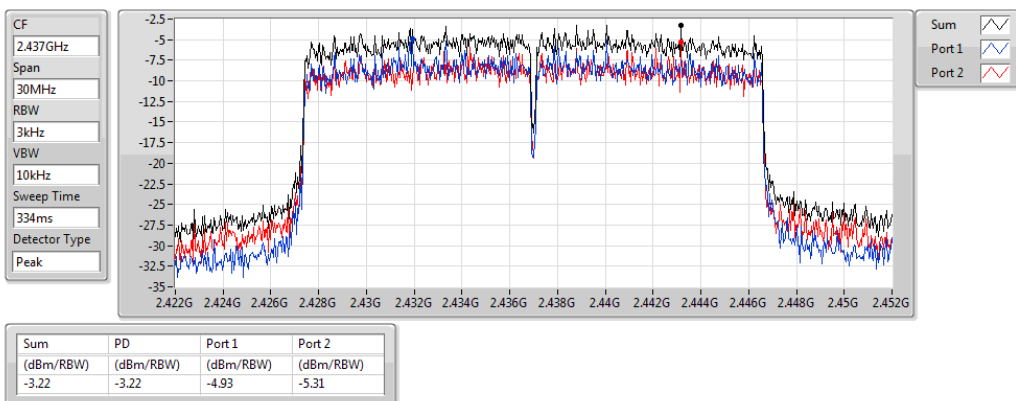
2412MHz



11ax20_Nss1,(MCS0)_2TX

PSD

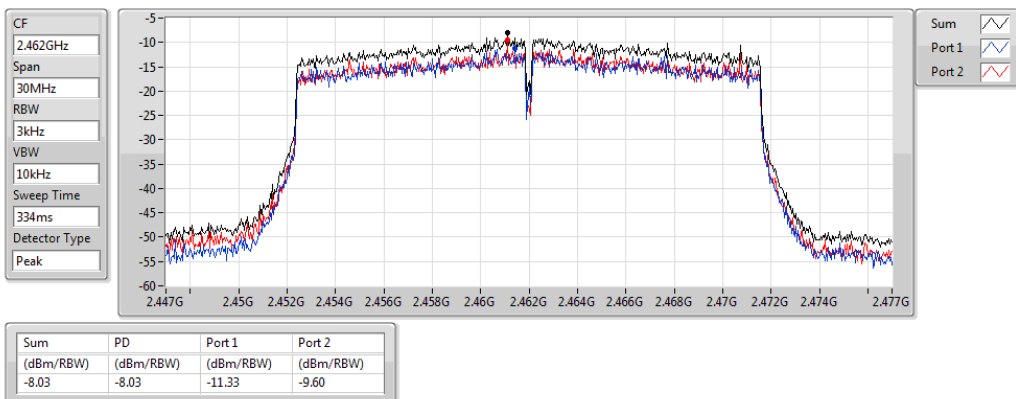
2437MHz



11ax20_Nss1,(MCS0)_2TX

PSD

2462MHz



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:
Qusai-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

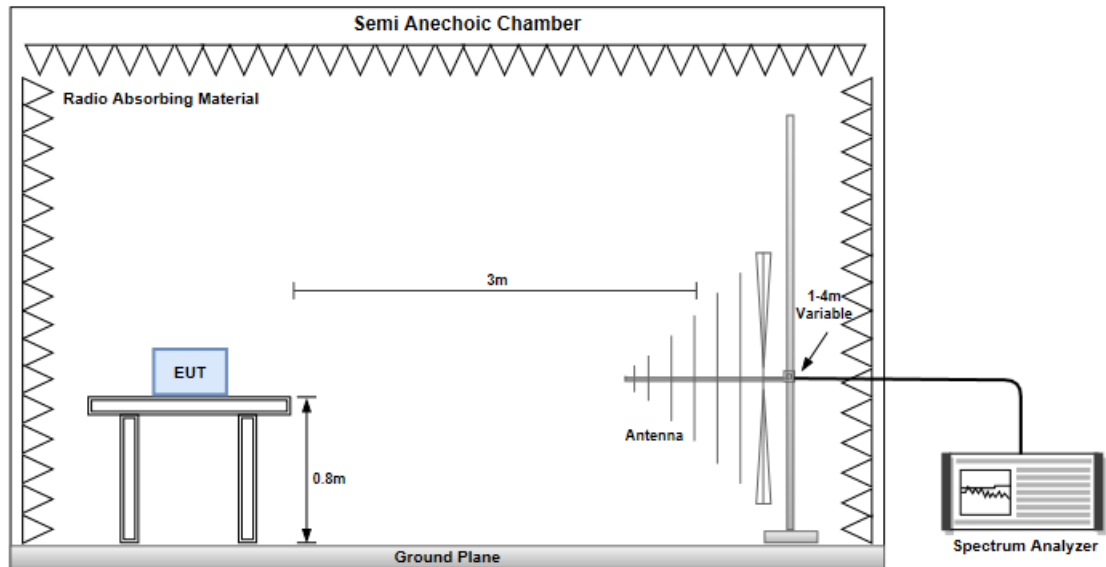
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission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

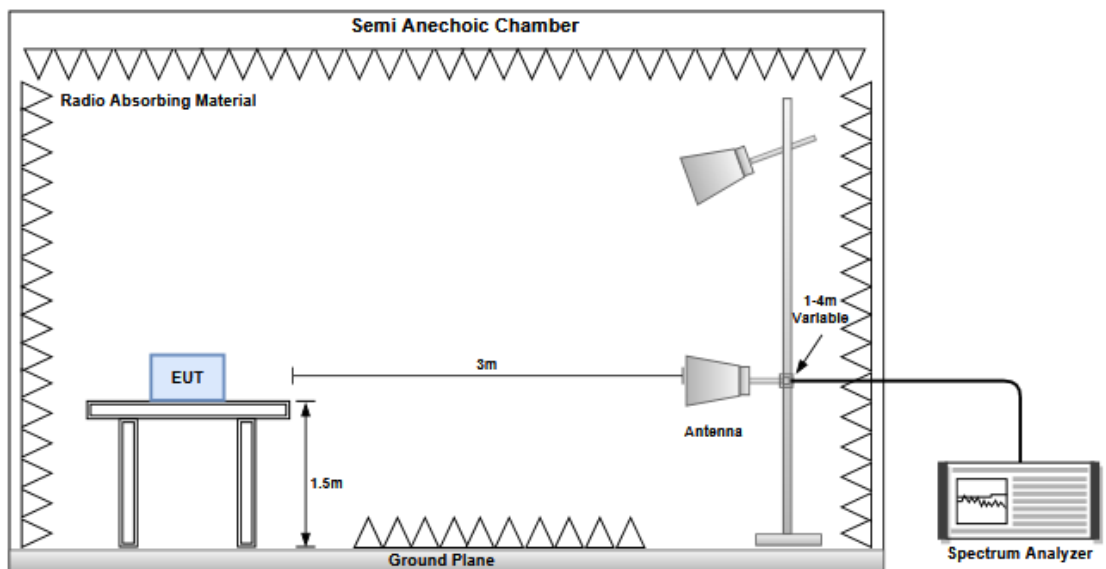
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
3. RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above 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	11g	Test Freq. (MHz)	2437
Polarization	Horizontal		
Test By :Roger Lu Temperature(°C):24 Humidity(%):68			
Level (dBuV/m) <			

Modulation	11g	Test Freq. (MHz)	2437
Polarization	Vertical		
Test By :Roger Lu Temperature(°C):24 Humidity(%):68			
Level (dBuV/m)			

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

Modulation	11b		Test Freq. (MHz)		2412	
Polarization	Horizontal					
Test By :Aska Huang Temperature(°C):23 Humidity(%):66						
Level (dBuV/m)						

Modulation	11b	Test Freq. (MHz)	2412
Polarization	Vertical		
Test By :Aska Huang Temperature(°C):23 Humidity(%):66			
Level (dBUV/m)			

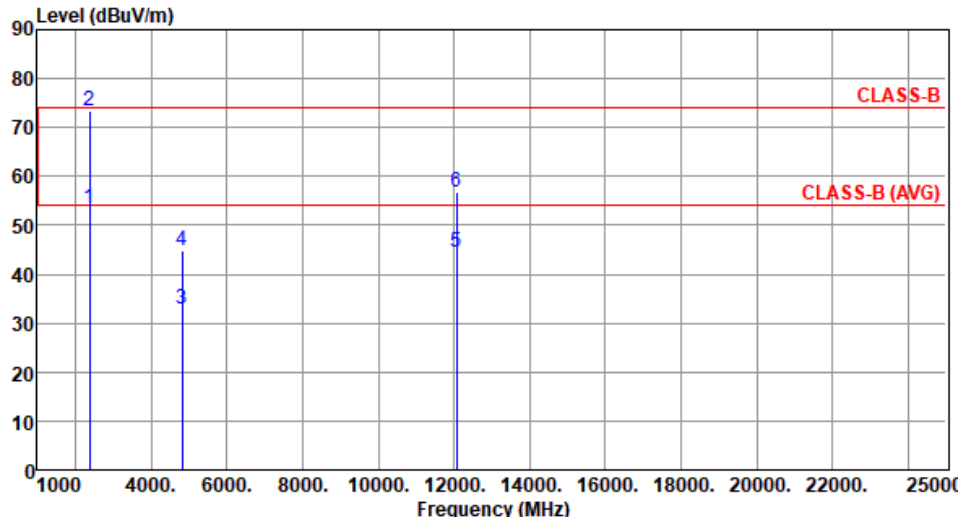
Modulation	11b	Test Freq. (MHz)	2437
Polarization	Horizontal		
Test By :Aska Huang Temperature(°C):23 Humidity(%):66			
Level (dBuV/m)			

Modulation	11b	Test Freq. (MHz)	2437
Polarization	Vertical		
Test By :Aska Huang Temperature(°C):23 Humidity(%):66			
Level (dBuV/m)			

Modulation	11b	Test Freq. (MHz)	2462
Polarization	Horizontal		
Test By :Aska Huang Temperature(°C):23 Humidity(%):66			
Level (dBuV/m) <			

Modulation	11b	Test Freq. (MHz)	2462
Polarization	Vertical		
Test By :Aska Huang Temperature(°C):23 Humidity(%):66			
Level (dBUV/m) <			

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

Modulation	11g		Test Freq. (MHz)		2412				
Polarization	Horizontal								
Test By :Aska Huang Temperature(°C):23 Humidity(%):66									
Level (dBuV/m)  Frequency (MHz)									
	Freq.	Emission	Limit	Margin	SA	Factor	Remark	ANT	Turn
	MHz	level			reading			High	Table
		dBuV/m	dBuV/m	dB	dBuV	dB/m		cm	deg
1	2390.00	53.50	54.00	-0.50	56.29	-2.79	Average	100	55
2	2390.00	73.42	74.00	-0.58	76.21	-2.79	Peak	100	55
3	4824.00	32.72	54.00	-21.28	29.25	3.47	Average	100	40
4	4824.00	44.73	74.00	-29.27	41.26	3.47	Peak	100	40
5	12060.00	44.47	54.00	-9.53	30.15	14.32	Average	100	60
6	12060.00	56.79	74.00	-17.21	42.47	14.32	Peak	100	60

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m)
*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)	2412
Polarization	Vertical		
Test By :Aska Huang Temperature(°C):23 Humidity(%):66			
Level (dBUV/m) <			

Modulation	11g	Test Freq. (MHz)	2437
Polarization	Horizontal		
Test By :Aska Huang Temperature(°C):23 Humidity(%):66			
Level (dBuV/m)			

Modulation	11g	Test Freq. (MHz)	2437
Polarization	Vertical		
Test By :Aska Huang Temperature(°C):23 Humidity(%):66			
Level (dBuV/m)			

Modulation	11g	Test Freq. (MHz)	2462
Polarization	Horizontal		
Test By :Aska Huang Temperature(°C):23 Humidity(%):66			
Level (dBuV/m)			

Modulation	11g	Test Freq. (MHz)	2462
Polarization	Vertical		
Test By :Aska Huang Temperature(°C):23 Humidity(%):66			
Level (dBuV/m)			

3.5.7 Transmitter Radiated Unwanted Emissions (Above 1GHz) for ax HE20

Modulation	ax HE20		Test Freq. (MHz)		2412	
Polarization	Horizontal					
Test By :Aska Huang Temperature(°C):23 Humidity(%):66						
Level (dBuV/m) <						

Modulation	ax HE20	Test Freq. (MHz)	2412
Polarization	Vertical		
Test By :Aska Huang Temperature(°C):23 Humidity(%):66			
Level (dBUV/m)			

Modulation	ax HE20		Test Freq. (MHz)		2437	
Polarization	Horizontal					
Test By :Aska Huang Temperature(°C):23 Humidity(%):66						
Level (dBuV/m)						

Modulation	ax HE20	Test Freq. (MHz)	2437
Polarization	Vertical		
Test By :Aska Huang Temperature(°C):23 Humidity(%):66			
Level (dBuV/m) <			

Modulation	ax HE20	Test Freq. (MHz)	2462
Polarization	Horizontal		
Test By :Aska Huang Temperature(°C):23 Humidity(%):66			
Level (dBuV/m)			

Modulation	ax HE20	Test Freq. (MHz)	2462
Polarization	Vertical		
Test By :Aska Huang Temperature(°C):23 Humidity(%):66			
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

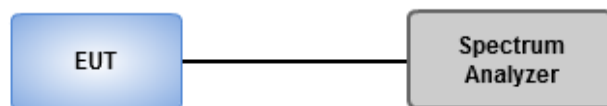
Reference level measurement

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

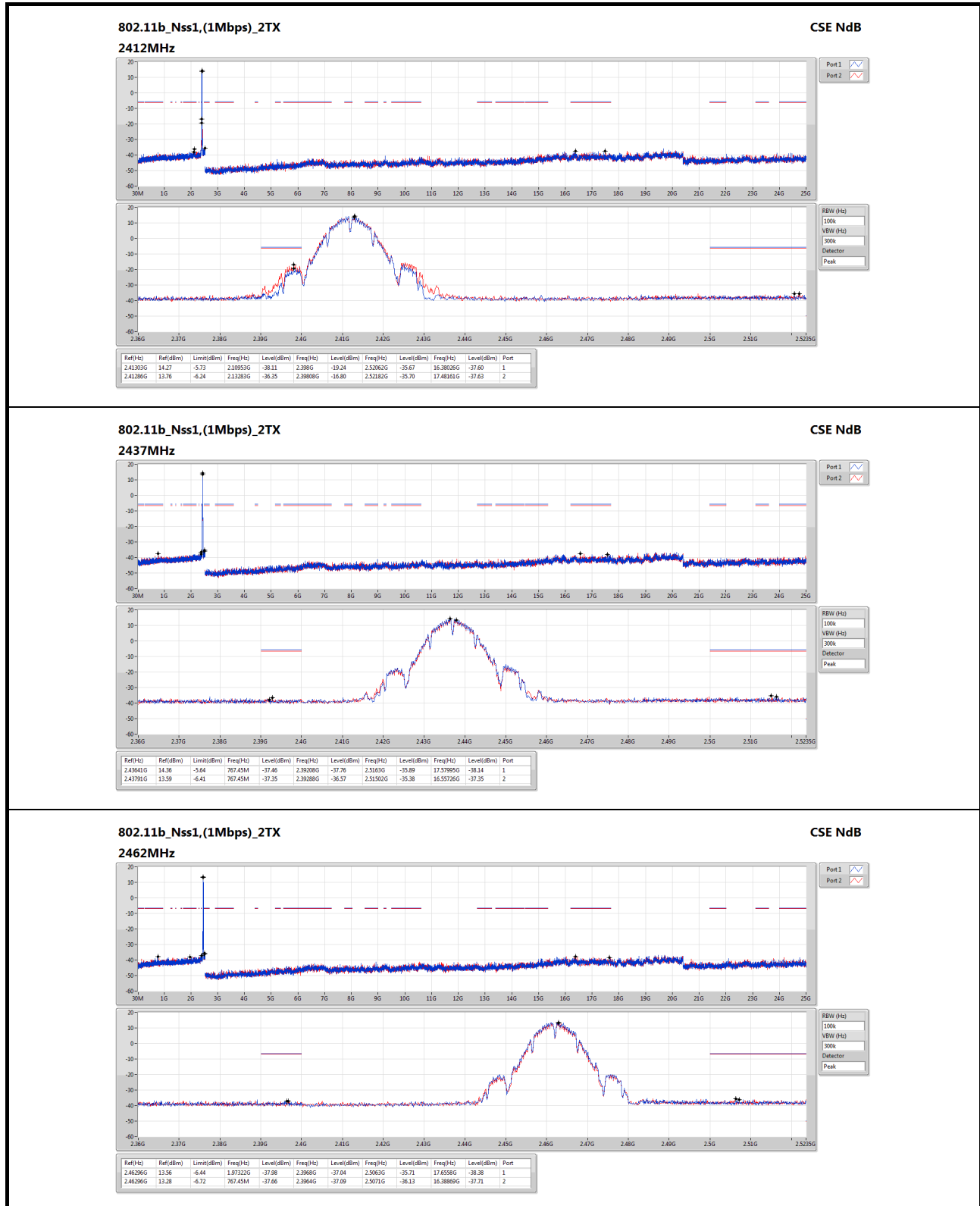
1. Set RBW=100kHz, VBW = 300kHz , Detector = Peak, Sweep time = Auto
2. Trace = max hold , Allow Trace to fully stabilize
3. Scan Frequency range is up to 25GHz
4. Use the peak marker function to determine the maximum amplitude level

3.6.3 Test Setup



3.6.4 Unwanted Emissions into Non-Restricted Frequency Bands

Ambient Condition	25-26°C / 64-67%	Tested By	Aska Huang
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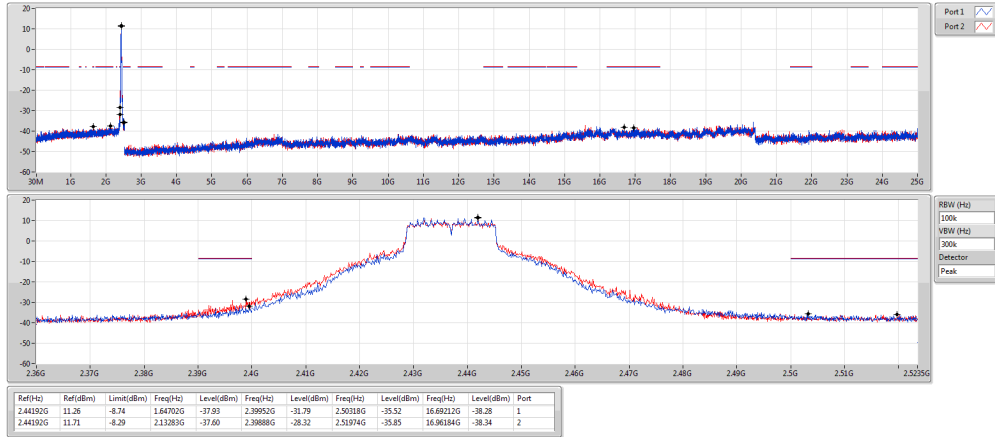
802.11g_Nss1,(6Mbps)_2TX
2412MHz

CSE NdB



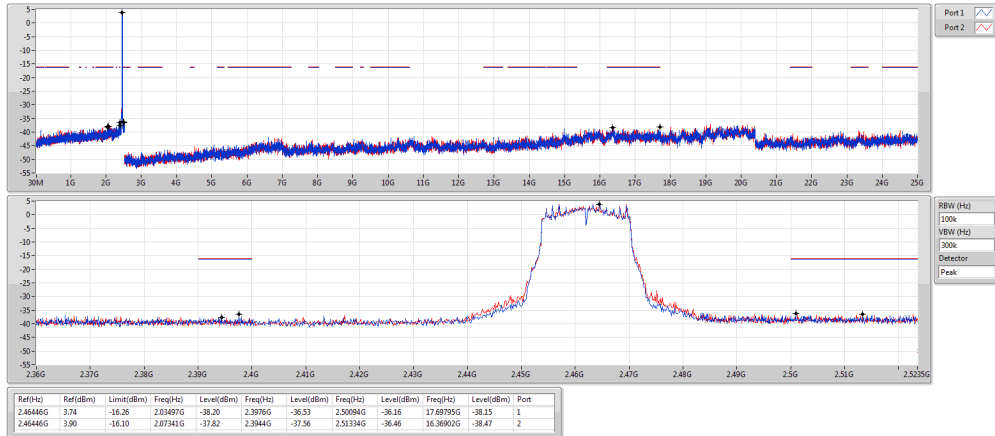
802.11g_Nss1,(6Mbps)_2TX
2437MHz

CSE NdB



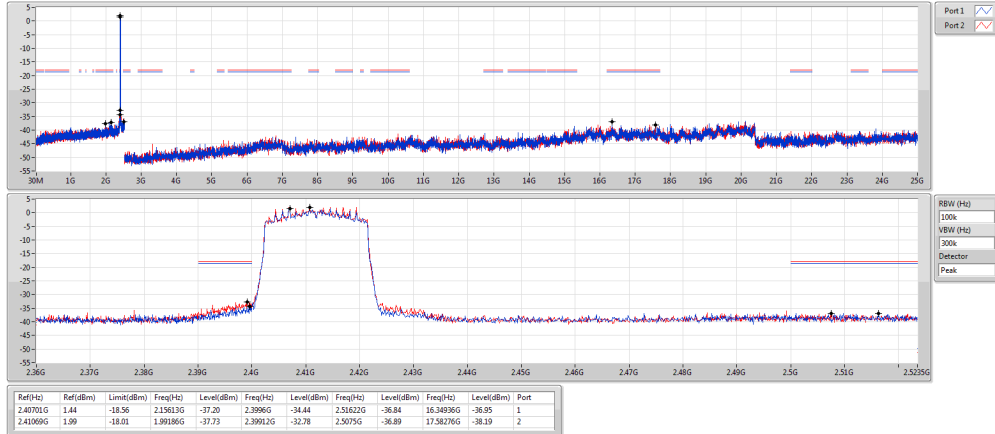
802.11g_Nss1,(6Mbps)_2TX
2462MHz

CSE NdB



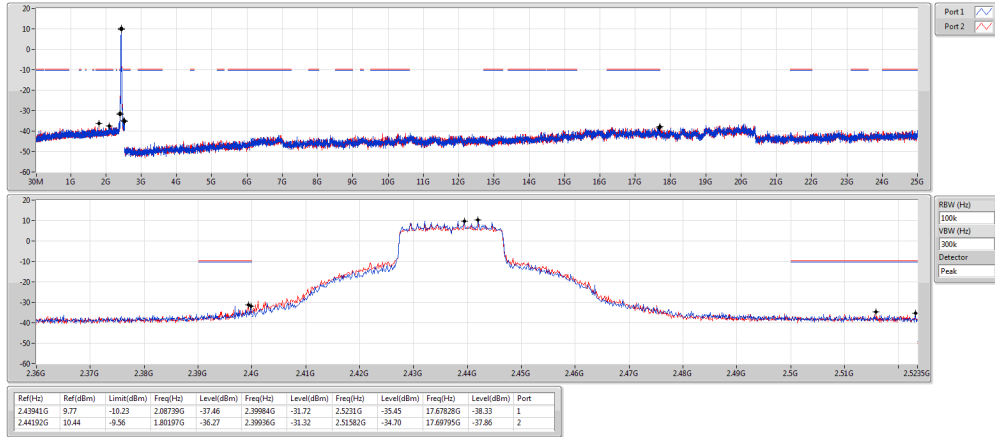
11ax20_Nss1,(MCS0)_2TX
2412MHz

CSE NdB



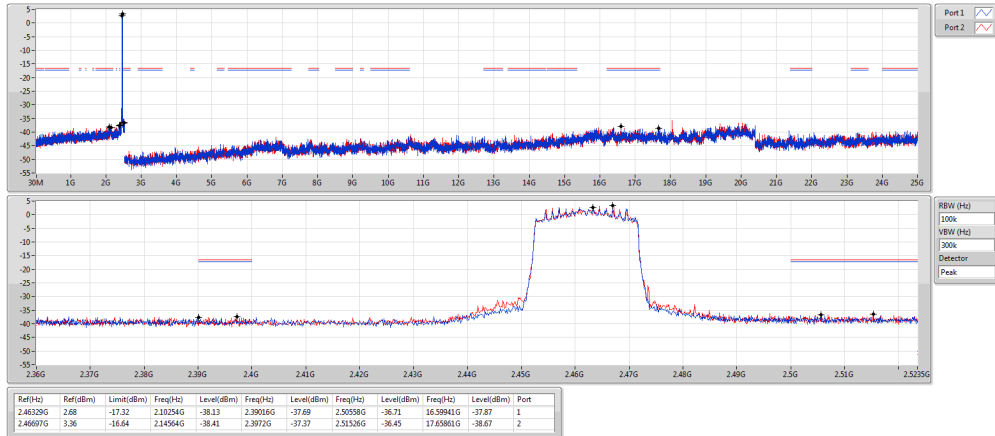
11ax20_Nss1,(MCS0)_2TX
2437MHz

CSE NdB



11ax20_Nss1,(MCS0)_2TX
2462MHz

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 Corporation (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 Dist., Tao Yuan
City 33381, Taiwan (R.O.C.)
No.2-1, Lane 6, Wen San 3rd
St., Kwei Shan Dist., Tao Yuan
City 33381, Taiwan (R.O.C.)

Kwei Shan Site II

Tel: 886-3-271-8640

No.14-1, Lane 19, Wen San 3rd
St., Kwei Shan Dist., 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: 886-3-318-0345

Email: ICC_Service@icertifi.com.tw

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