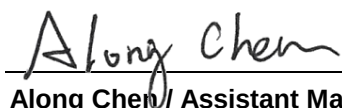


FCC Test Report

FCC ID : I88WSR30
Equipment : Multy U AC2100 Tri-Band WiFi System
Model No. : WSR30
Brand Name : ZYXEL
Applicant : Zyxel Communications Corporation
Address : No.2 Industry East RD. IX, Hsinchu Science
Park, Hsinchu 30075, Taiwan, R.O.C
Standard : 47 CFR FCC Part 15.247
Received Date : Aug. 01, 2018
Tested Date : Aug, 17 ~ Aug. 23, 2018

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
FR880101AC	Rev. 01	Initial issue	Oct. 24, 2018

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	Conducted Emissions	[dBuV]: 0.381MHz 34.86 (Margin -13.39dB) - AV	Pass
15.247(d) 15.209	Radiated Emissions	[dBuV/m at 3m]: 2390.00MHz 53.81 (Margin -0.19dB) - AV	Pass
15.247(b)(3)	Maximum Output Power	Max Power [dBm]: 24.81	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

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 Conducted (Average) 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	Operating Frequencies (MHz) / Antenna Gain (dBi)		
				2400~2483.5	5150~5250	5725~5850
1	RFA-05-AP638_L	PIFA	UFL/IPEX	---	0	0
2	RFA-05-AP638_H	PIFA	UFL/IPEX	---	0	0
3	RFA-25-AP638-L	PIFA	UFL/IPEX	0	0	0
4	RFA-25-AP679-H	PIFA	UFL/IPEX	0	0	0

1.1.3 Power Supply Type of Equipment under Test (EUT)

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

1.1.4 Accessories

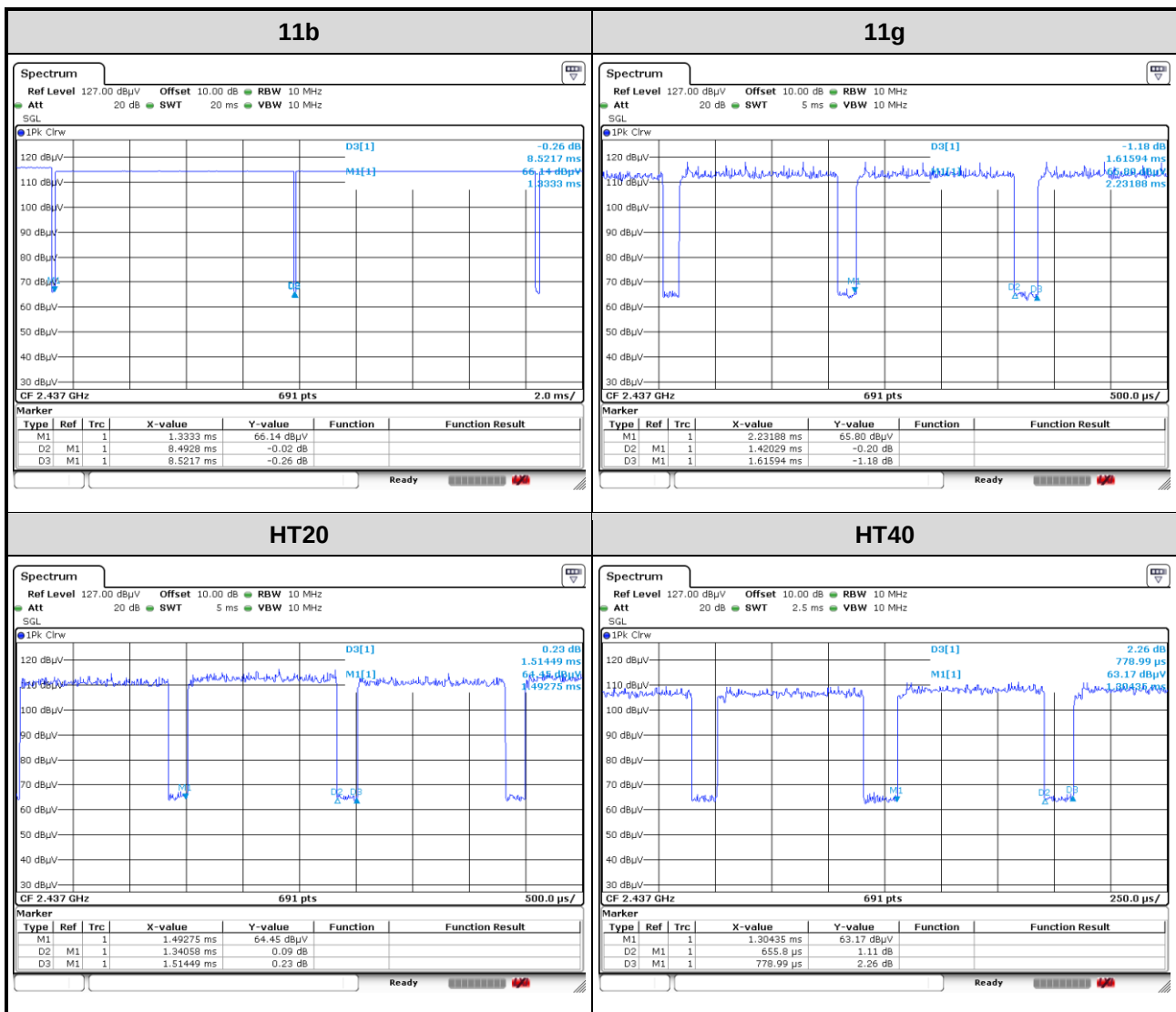
Accessories		
No.	Equipment	Description
1	AC Adapter	Brand Name: APD Model Name: WB-18R12R Power Rating: I/P: 100-240Vac, 50-60Hz, 0.6A Max O/P: 12Vdc, 1.5A Power Line: 1.8m non-shielded cable without core
2	RJ45 cable	2m non-shielded without core

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	MP_TEST, Version: RTL819X 3.5		
Duty Cycle and Duty Factor	Mode	Duty cycle (%)	Duty factor (dB)
	11b	99.66%	0.01
	11g	87.89%	0.56
	HT20	88.52%	0.53
	HT40	84.19%	0.75



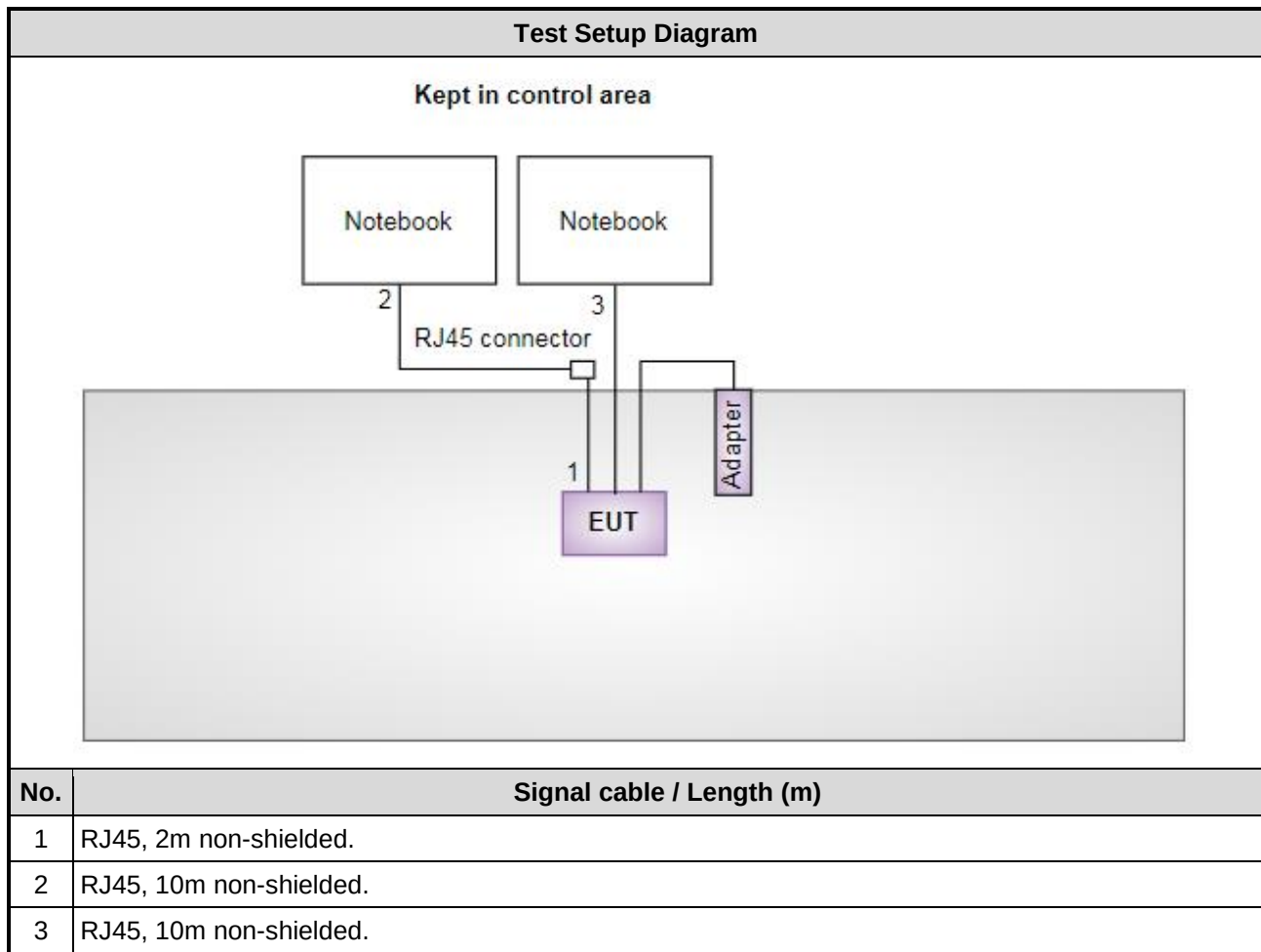
1.1.7 Power Setting

Modulation Mode	Test Frequency (MHz)	Power Set
11b	2412	38/34
11b	2437	43/39
11b	2462	39/36
11g	2412	44/38
11g	2437	56/51
11g	2462	49/44
HT20	2412	44/38
HT20	2437	56/51
HT20	2462	48/43
HT40	2422	37/31
HT40	2437	47/41
HT40	2452	40/34

1.2 Local Support Equipment List

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

1.3 Test Setup Chart



1.4 The Equipment List

Test Item	Conducted Emission				
Test Site	Conduction room 1 / (CO01-WS)				
Tested Date	Aug, 23, 2018				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
Receiver	Agilent	N9038A	MY53290044	Sep. 26, 2017	Sep. 25, 2018
LISN	R&S	ENV216	101579	Feb. 13, 2018	Feb. 12, 2019
RF Cable-CON	EMC	EMCCFD300-BM-B M-6000	50821	Dec. 18, 2017	Dec. 17, 2018
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)				
Tested Date	Aug, 17 ~ Aug. 20, 2018				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV40	101499	Jan. 03, 2018	Jan. 02, 2019
Receiver	R&S	ESR3	101658	Nov. 20, 2017	Nov. 19, 2018
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-685	Apr. 19, 2018	Apr. 18, 2019
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1206	Jan. 18, 2018	Jan. 17, 2019
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Nov. 23, 2017	Nov. 22, 2018
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 13, 2017	Nov. 12, 2018
Loop Antenna Cable	KOAX KABEL	101354-BW	101354-BW	Dec. 07, 2017	Dec. 06, 2018
Preamplifier	EMC	EMC02325	980187	Sep. 04, 2017	Sep. 03, 2018
Preamplifier	Agilent	83017A	MY53270014	Aug. 09, 2018	Aug. 08, 2019
Preamplifier	EMC	EMC184045B	980192	Aug. 09, 2018	Aug. 08, 2019
RF cable-3M	HUBER+SUHNER	SUCOFLEX104	MY22620/4	Nov. 27, 2017	Nov. 26, 2018
RF cable-8M	HUBER+SUHNER	SUCOFLEX104	MY32487/4	Nov. 27, 2017	Nov. 26, 2018
RF cable-1M	HUBER+SUHNER	SUCOFLEX104	MY22624/4	Nov. 27, 2017	Nov. 26, 2018
LF cable-0.8M	EMC	EMC8D-NM-NM-800	EMC8D-NM-NM-800 -001	Nov. 27, 2017	Nov. 26, 2018
LF cable-3M	EMC	EMC8D-NM-NM-300 0	131103	Nov. 27, 2017	Nov. 26, 2018
LF cable-13M	EMC	EMC8D-NM-NM-130 00	131104	Nov. 27, 2017	Nov. 26, 2018
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	Aug. 20 ~ Aug. 22, 2018.				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV40	101063	Apr. 16, 2018	Apr. 15, 2019
Power Meter	Anritsu	ML2495A	1241002	Oct. 16, 2017	Oct. 15, 2018
Power Sensor	Anritsu	MA2411B	1207366	Oct. 16, 2017	Oct. 15, 2018
Signal Generator	R&S	SMB100A	175727	Oct. 26, 2017	Oct. 25, 2018
AC POWER SOURCE	APC	AFC-500W	F312060012	Dec. 01, 2017	Nov. 30, 2018
Measurement Software	Sporton	Sporton_1	1.3.30	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

1.5 Test Standards

According to the specification of EUT, the EUT must comply with following standards and KDB documents.

47 CFR FCC Part 15.247

ANSI C63.10-2013

FCC KDB 558074 D01 DTS Meas Guidance v05

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

1.6 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2))

Measurement Uncertainty	
Parameters	Uncertainty
Bandwidth	±34.134 Hz
Conducted power	±0.808 dB
Power density	±0.463 dB
Conducted emission	±2.670 dB
AC conducted emission	±2.90 dB
Radiated emission ≤ 1GHz	±3.66 dB
Radiated emission > 1GHz	±5.37 dB

2 Test Configuration

2.1 Testing Condition

Test Item	Test Site	Ambient Condition	Tested By
AC Conduction	CO01-WS	23°C / 55%	Alex Huang
Radiated Emissions	03CH03-WS	25°C / 61-62%	Aska Huang Roger Lu
RF Conducted	TH01-WS	24°C / 66%	Aska Huang

- FCC Designation No.: TW0009
- FCC site registration No.: 207696
- IC site registration No.: 10807C-1

2.2 The Worst Test Modes and Channel Details

Test item	Modulation Mode	Test Frequency (MHz)	Data Rate	Test Configuration
Conducted Emissions	11g	2437	6 Mbps	---
Radiated Emissions ≤1GHz	11g	2437	6 Mbps	---
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	

3 Transmitter Test Results

3.1 Conducted Emissions

3.1.1 Limit of Conducted Emissions

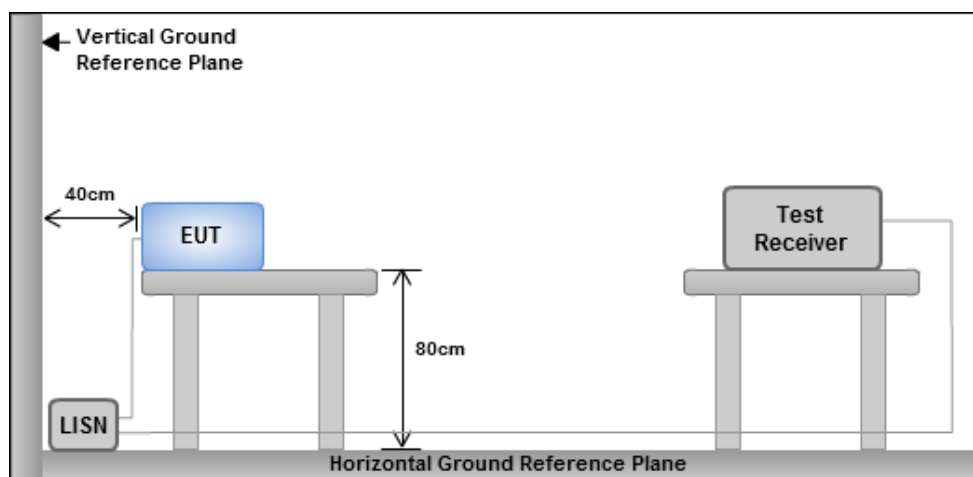
Conducted Emissions Limit		
Frequency Emission (MHz)	Quasi-Peak	Average
0.15-0.5	66 - 56 *	56 - 46 *
0.5-5	56	46
5-30	60	50

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.

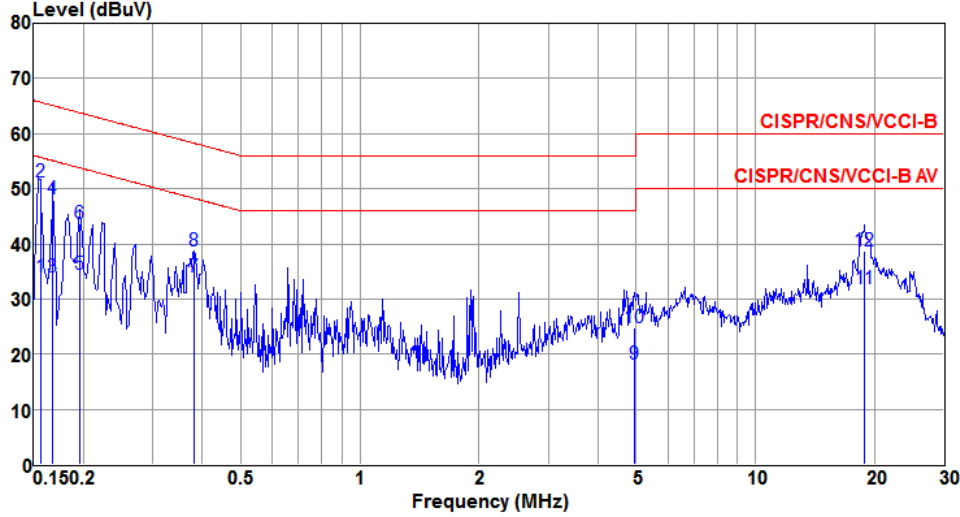
3.1.3 Test Setup



- 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

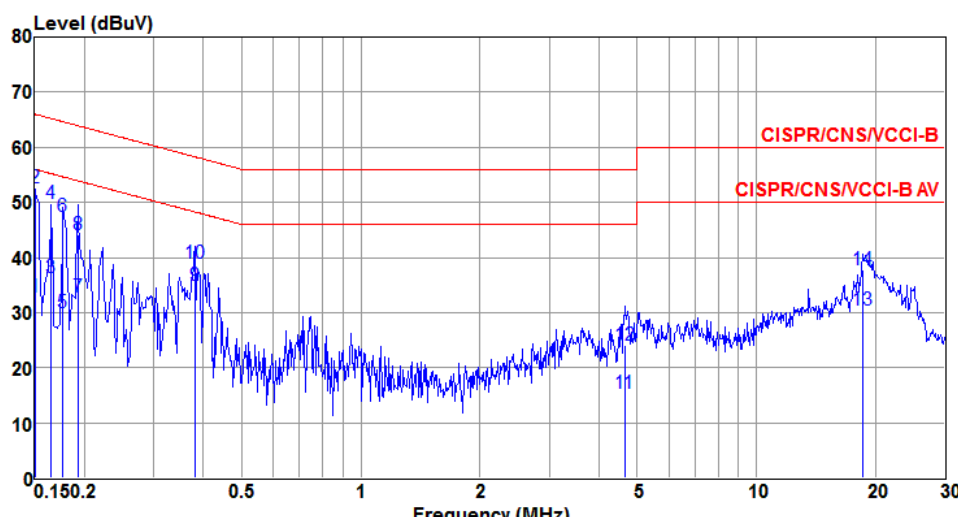
Modulation	11g	Test Freq. (MHz)	2437
Power Phase	Line		



	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	LISN factor dB	cable loss dB	Remark
1	0.156	34.09	55.69	-21.60	24.35	9.73	0.01	Average
2	0.156	51.21	65.69	-14.48	41.47	9.73	0.01	QP
3	0.168	33.98	55.08	-21.10	24.23	9.73	0.02	Average
4	0.168	48.16	65.08	-16.92	38.41	9.73	0.02	QP
5	0.195	34.39	53.80	-19.41	24.63	9.73	0.03	Average
6	0.195	43.59	63.80	-20.21	33.83	9.73	0.03	QP
7@	0.381	33.91	48.25	-14.34	24.16	9.73	0.02	Average
8	0.381	38.80	58.25	-19.45	29.05	9.73	0.02	QP
9	4.952	18.12	46.00	-27.88	8.12	9.76	0.24	Average
10	4.952	24.83	56.00	-31.17	14.83	9.76	0.24	QP
11	18.920	31.82	50.00	-18.18	21.76	9.72	0.34	Average
12	18.920	38.78	60.00	-21.22	28.72	9.72	0.34	QP

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

Modulation	11g	Test Freq. (MHz)	2437
Power Phase	Neutral		



Freq	Level	Limit	Over	Read	LISN	cable		
MHz	dBuV	dBuV	dB	dBuV	dB	dB	Remark	
1	0.150	32.89	56.00	-23.11	23.20	9.68	0.01	Average
2	0.150	52.59	66.00	-13.41	42.90	9.68	0.01	QP
3	0.165	36.46	55.21	-18.75	26.76	9.68	0.02	Average
4	0.165	49.72	65.21	-15.49	40.02	9.68	0.02	QP
5	0.177	29.96	54.64	-24.68	20.27	9.67	0.02	Average
6	0.177	47.36	64.64	-17.28	37.67	9.67	0.02	QP
7	0.192	32.70	53.93	-21.23	23.00	9.67	0.03	Average
8	0.192	44.18	63.93	-19.75	34.48	9.67	0.03	QP
9	0.381	34.86	48.25	-13.39	25.17	9.67	0.02	Average
10	0.381	39.03	58.25	-19.22	29.34	9.67	0.02	QP
11	4.647	15.34	46.00	-30.66	5.40	9.70	0.24	Average
12	4.647	23.97	56.00	-32.03	14.03	9.70	0.24	QP
13	18.524	30.52	50.00	-19.48	20.37	9.82	0.33	Average
14	18.524	37.79	60.00	-22.21	27.64	9.82	0.33	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

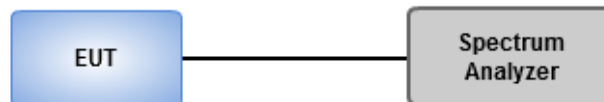
6dB Bandwidth

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

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	10M	15.195M	15M2G1D	9.13M	15.051M
802.11g_Nss1,(6Mbps)_2TX	16.377M	16.86M	16M9D1D	16.377M	16.643M
802.11n HT20_Nss1,(MCS0)_2TX	17.609M	18.017M	18M0D1D	17.536M	17.8M
802.11n HT40_Nss1,(MCS0)_2TX	35.797M	36.179M	36M2D1D	35.362M	36.179M

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

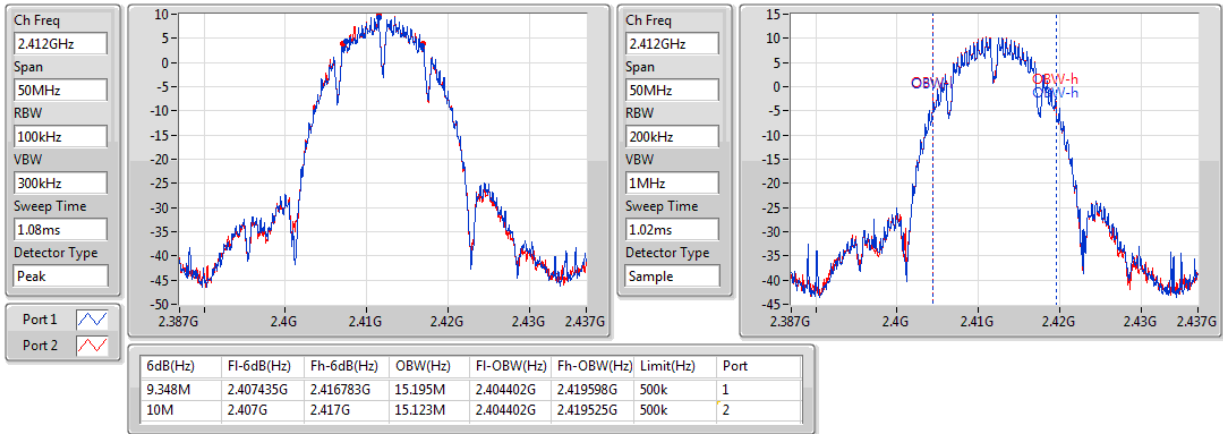
Mode	Result	Limit (Hz)	Port 1-N dB (Hz)	Port 1-OBW (Hz)	Port 2-N dB (Hz)	Port 2-OBW (Hz)
802.11b_Nss1,(1Mbps)_2TX	-	-	-	-	-	-
2412MHz	Pass	500k	9.348M	15.195M	10M	15.123M
2437MHz	Pass	500k	9.565M	15.123M	9.565M	15.051M
2462MHz	Pass	500k	9.13M	15.123M	9.13M	15.051M
802.11g_Nss1,(6Mbps)_2TX	-	-	-	-	-	-
2412MHz	Pass	500k	16.377M	16.643M	16.377M	16.643M
2437MHz	Pass	500k	16.377M	16.787M	16.377M	16.86M
2462MHz	Pass	500k	16.377M	16.715M	16.377M	16.643M
802.11n HT20_Nss1,(MCS0)_2TX	-	-	-	-	-	-
2412MHz	Pass	500k	17.609M	17.8M	17.536M	17.873M
2437MHz	Pass	500k	17.609M	18.017M	17.609M	18.017M
2462MHz	Pass	500k	17.609M	17.873M	17.609M	17.8M
802.11n HT40_Nss1,(MCS0)_2TX	-	-	-	-	-	-
2422MHz	Pass	500k	35.652M	36.179M	35.362M	36.179M
2437MHz	Pass	500k	35.797M	36.179M	35.797M	36.179M
2452MHz	Pass	500k	35.652M	36.179M	35.362M	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

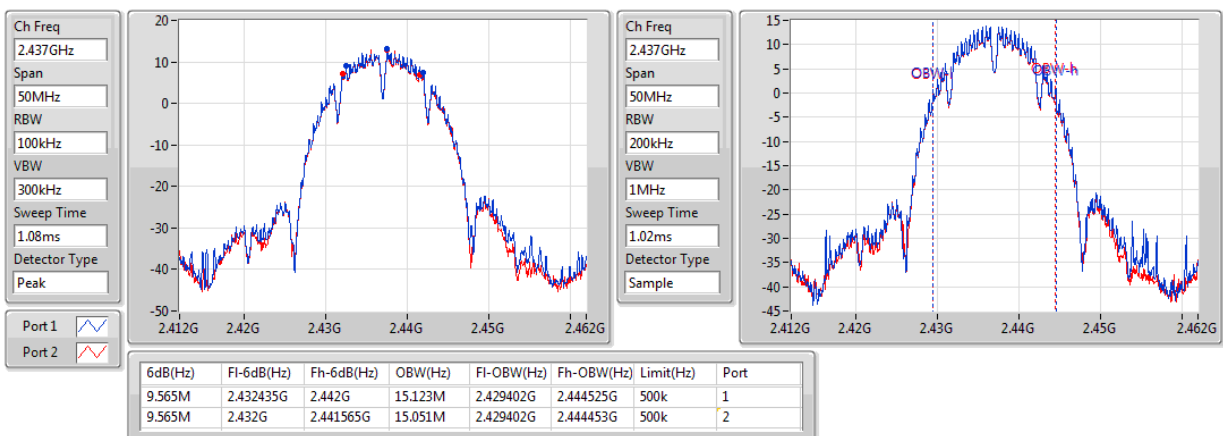
2412MHz



802.11b_Nss1,(1Mbps)_2TX

EBW

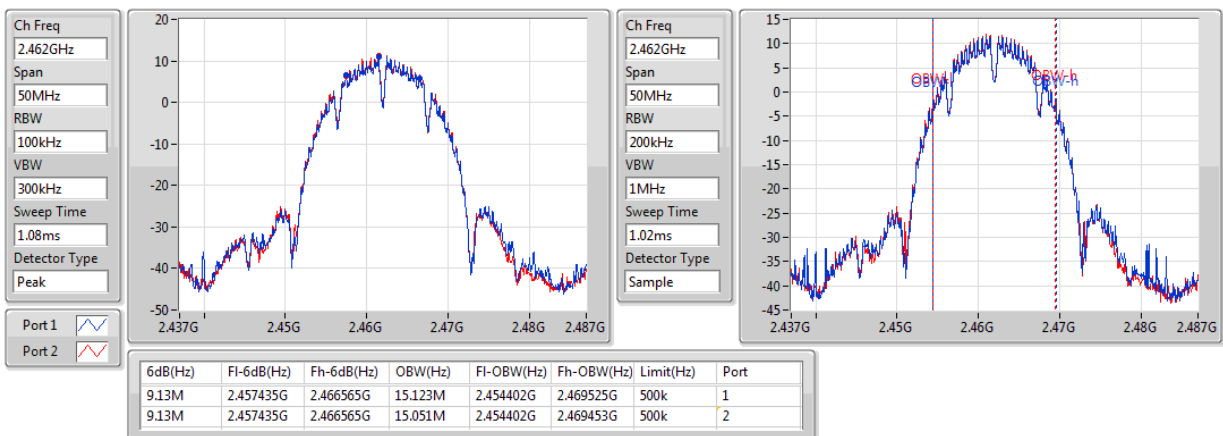
2437MHz



802.11b_Nss1,(1Mbps)_2TX

EBW

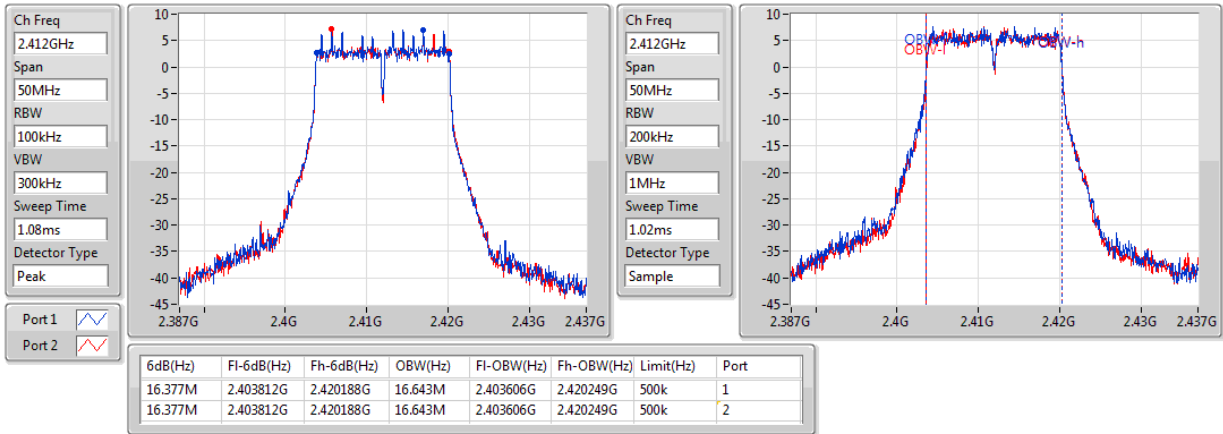
2462MHz



802.11g_Nss1,(6Mbps)_2TX

EBW

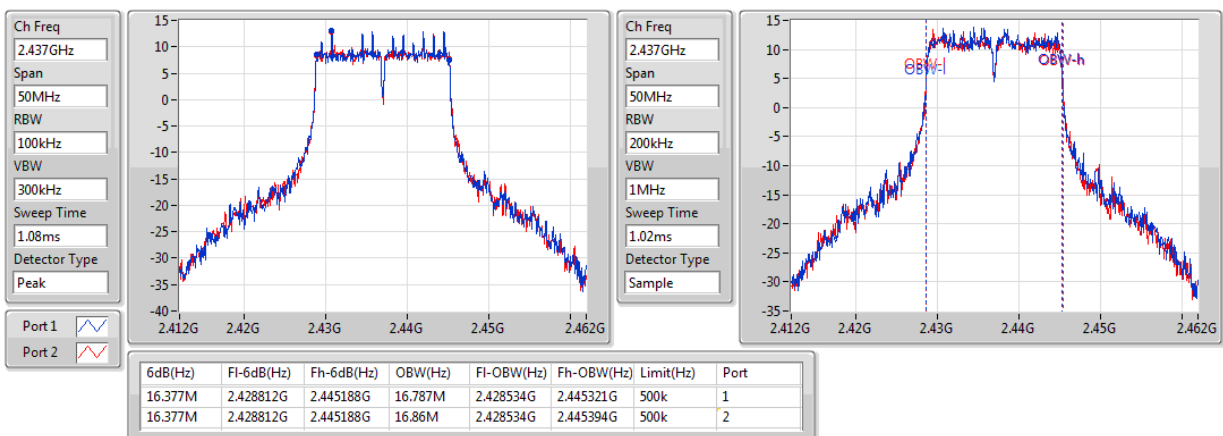
2412MHz



802.11g_Nss1,(6Mbps)_2TX

EBW

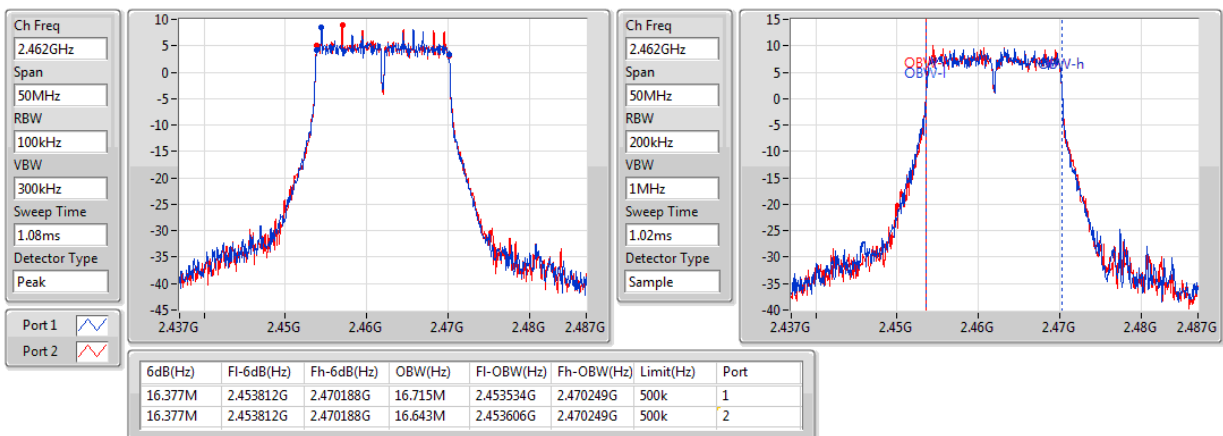
2437MHz



802.11g_Nss1,(6Mbps)_2TX

EBW

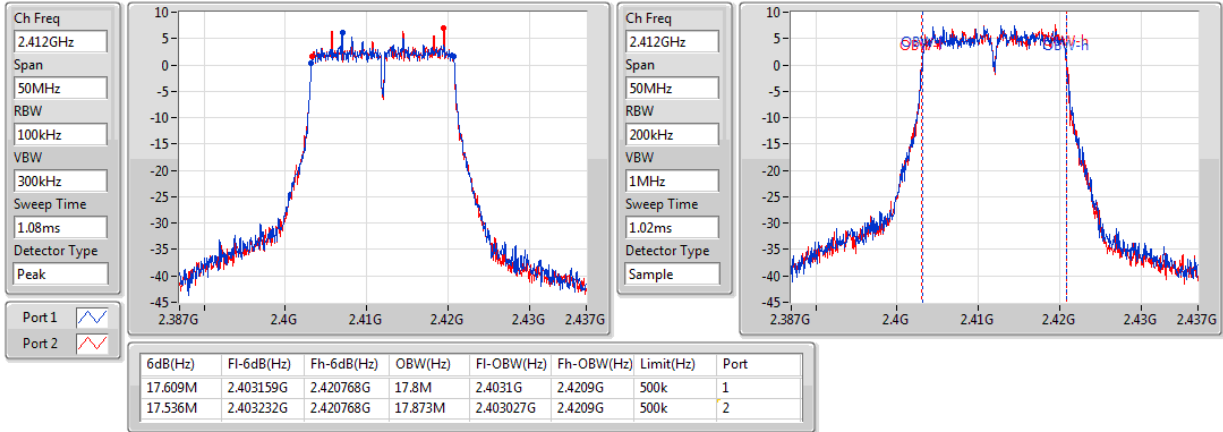
2462MHz



802.11n HT20_Nss1,(MCS0)_2TX

EBW

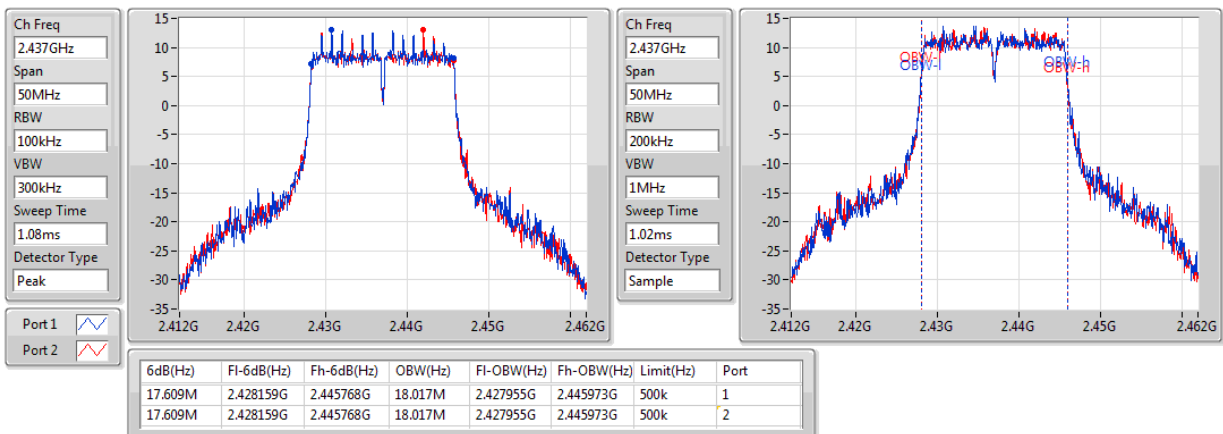
2412MHz



802.11n HT20_Nss1,(MCS0)_2TX

EBW

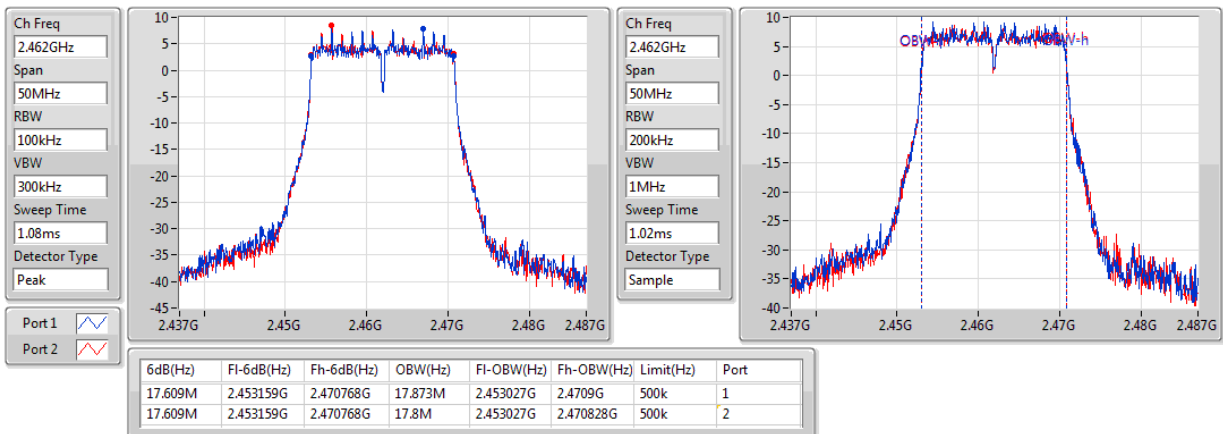
2437MHz



802.11n HT20_Nss1,(MCS0)_2TX

EBW

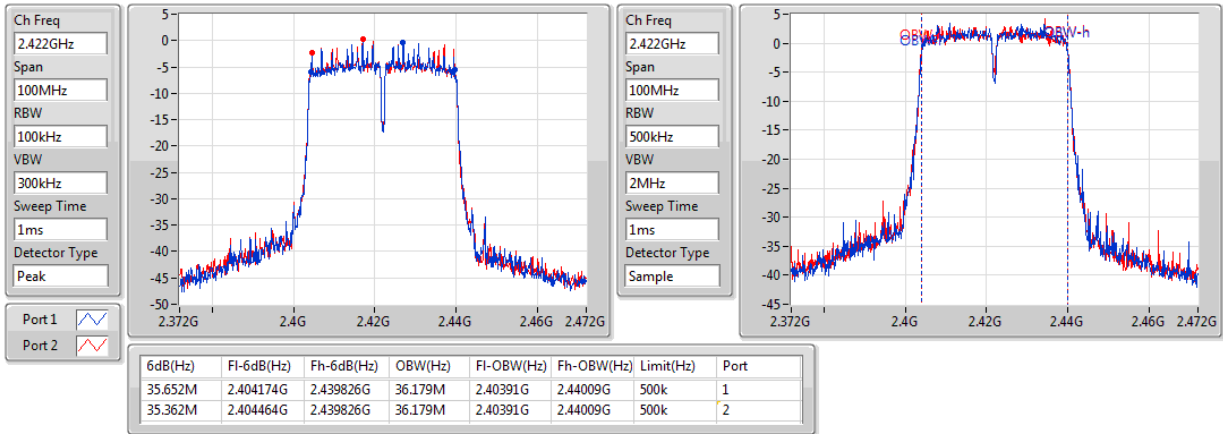
2462MHz



802.11n HT40_Nss1,(MCS0)_2TX

EBW

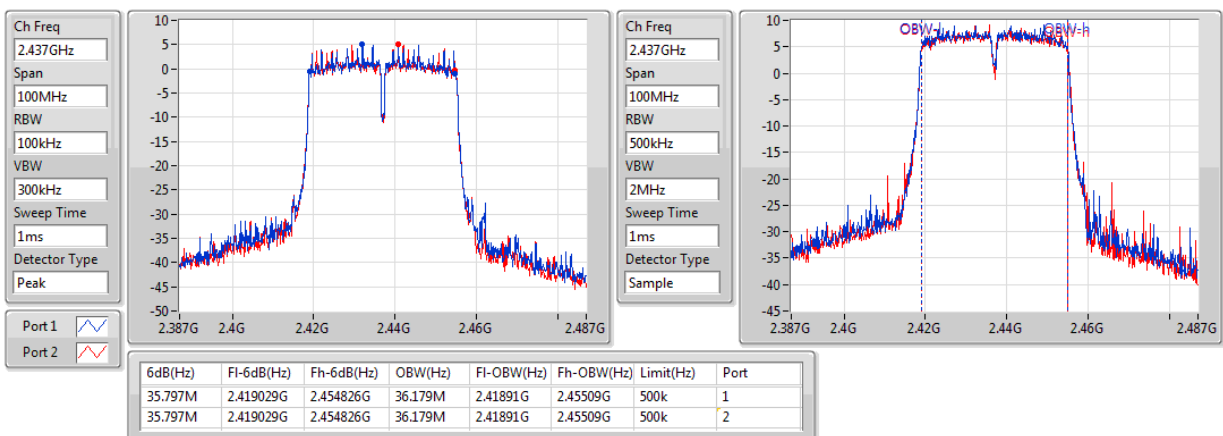
2422MHz



802.11n HT40_Nss1,(MCS0)_2TX

EBW

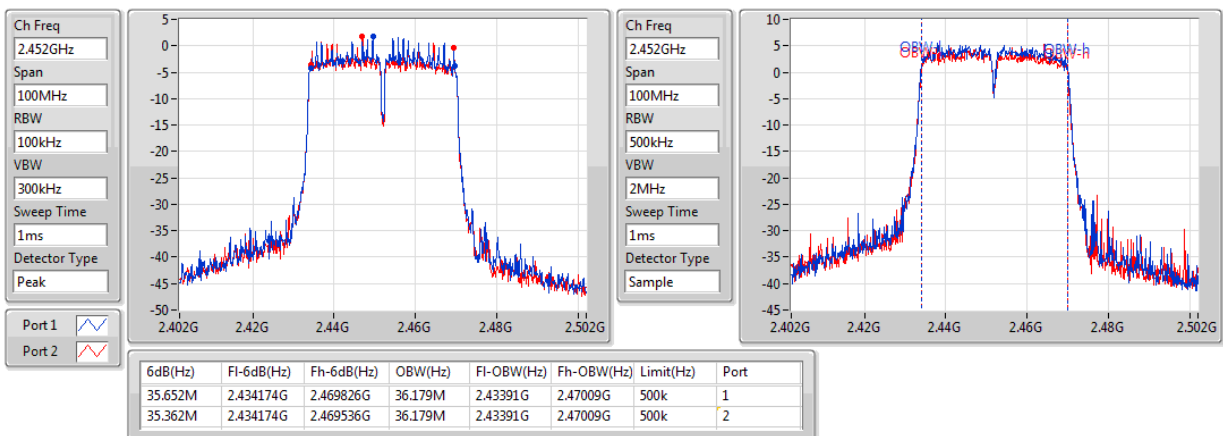
2437MHz



802.11n HT40_Nss1,(MCS0)_2TX

EBW

2452MHz



3.3 RF Output Power

3.3.1 Limit of RF Output Power

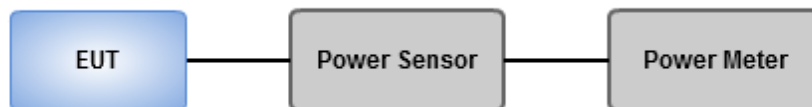
Conducted power shall not exceed 1Watt.

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

Summary

Mode	Total Power (dBm)	Total Power (W)
2.4-2.4835GHz	-	-
802.11b_Nss1,(1Mbps)_2TX	23.90	0.24547
802.11g_Nss1,(6Mbps)_2TX	24.81	0.30269
802.11n HT20_Nss1,(MCS0)_2TX	24.78	0.30061
802.11n HT40_Nss1,(MCS0)_2TX	19.51	0.08933

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	0.00	18.75	18.9	21.84	30.00	21.84	36.00
2437MHz	Pass	0.00	20.92	20.86	23.90	30.00	23.90	36.00
2462MHz	Pass	0.00	18.61	19.11	21.88	30.00	21.88	36.00
802.11g_Nss1,(6Mbps)_2TX	-	-	-	-	-	-	-	-
2412MHz	Pass	0.00	16.63	16.56	19.61	30.00	19.61	36.00
2437MHz	Pass	0.00	21.77	21.82	24.81	30.00	24.81	36.00
2462MHz	Pass	0.00	18.26	18.52	21.40	30.00	21.40	36.00
802.11n HT20_Nss1,(MCS0)_2TX	-	-	-	-	-	-	-	-
2412MHz	Pass	0.00	16.48	16.59	19.55	30.00	19.55	36.00
2437MHz	Pass	0.00	21.74	21.8	24.78	30.00	24.78	36.00
2462MHz	Pass	0.00	17.54	17.84	20.70	30.00	20.70	36.00
802.11n HT40_Nss1,(MCS0)_2TX	-	-	-	-	-	-	-	-
2422MHz	Pass	0.00	11.55	11.78	14.68	30.00	14.68	36.00
2437MHz	Pass	0.00	16.51	16.48	19.51	30.00	19.51	36.00
2452MHz	Pass	0.00	13.05	12.81	15.94	30.00	15.94	36.00

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

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

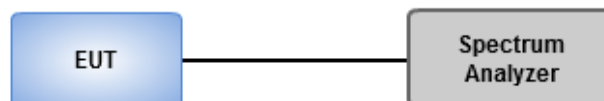
Average PSD, duty cycle $\geq 98\%$

1. Set the RBW = 30 kHz, VBW = 100 kHz.
2. Detector = RMS, Sweep time = auto couple.
3. Sweep time = auto couple.
4. Employ trace averaging (RMS) mode over a minimum of 100 traces.
5. Use the peak marker function to determine the maximum amplitude level.

Average PSD, duty cycle $< 98\%$

- 1 Set the RBW = 30 kHz, VBW = 100 kHz. Detector = RMS.
- 2 Set the sweep time to: ≥ 10 (number of measurement points in sweep) $\times$ (total on/off period of the transmitted signal).
- 3 Perform the measurement over a single sweep.
- 4 Use the peak marker function to determine the maximum amplitude level.
- 5 Add $10 \log (1/x)$, where x is the duty cycle.

3.4.3 Test Setup



3.4.4 Test Result of Power Spectral Density

Summary

Mode	PD (dBm/RBW)
2.4-2.4835GHz	-
802.11b_Nss1,(1Mbps)_2TX	3.16
802.11g_Nss1,(6Mbps)_2TX	2.46
802.11n HT20_Nss1,(MCS0)_2TX	1.98
802.11n HT40_Nss1,(MCS0)_2TX	-5.33

RBW=3kHz.

Result

Mode	Result	DG (dBi)	Port 1 (dBm/RBW)	Port 2 (dBm/RBW)	PD (dBm/RBW)	PD Limit (dBm/RBW)
802.11b_Nss1,(1Mbps)_2TX	-	-	-	-	-	-
2412MHz	Pass	3.01	-3.04	-2.70	-0.15	8.00
2437MHz	Pass	3.01	0.57	0.37	3.16	8.00
2462MHz	Pass	3.01	-1.47	-1.35	1.54	8.00
802.11g_Nss1,(6Mbps)_2TX	-	-	-	-	-	-
2412MHz	Pass	3.01	-6.20	-6.20	-3.19	8.00
2437MHz	Pass	3.01	-0.43	-0.59	2.46	8.00
2462MHz	Pass	3.01	-4.32	-4.28	-1.33	8.00
802.11n HT20_Nss1,(MCS0)_2TX	-	-	-	-	-	-
2412MHz	Pass	3.01	-6.60	-6.56	-3.65	8.00
2437MHz	Pass	3.01	-0.85	-0.97	1.98	8.00
2462MHz	Pass	3.01	-5.29	-5.01	-2.14	8.00
802.11n HT40_Nss1,(MCS0)_2TX	-	-	-	-	-	-
2422MHz	Pass	3.01	-13.27	-13.16	-10.23	8.00
2437MHz	Pass	3.01	-8.12	-8.48	-5.33	8.00
2452MHz	Pass	3.01	-11.67	-12.47	-9.13	8.00

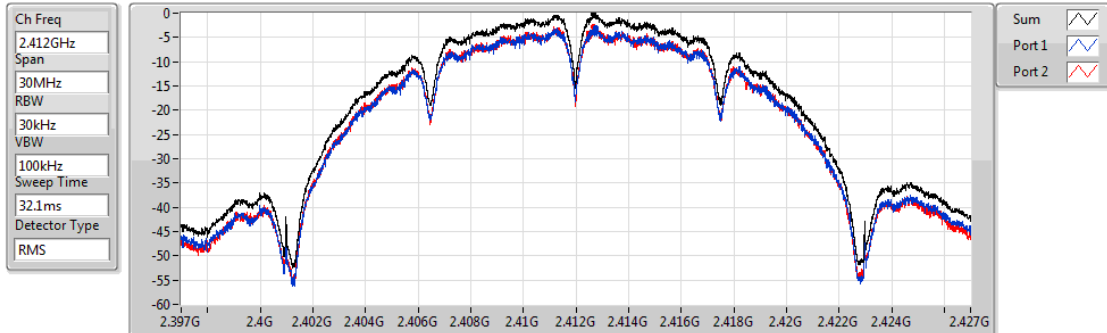
DG = Directional Gain;

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

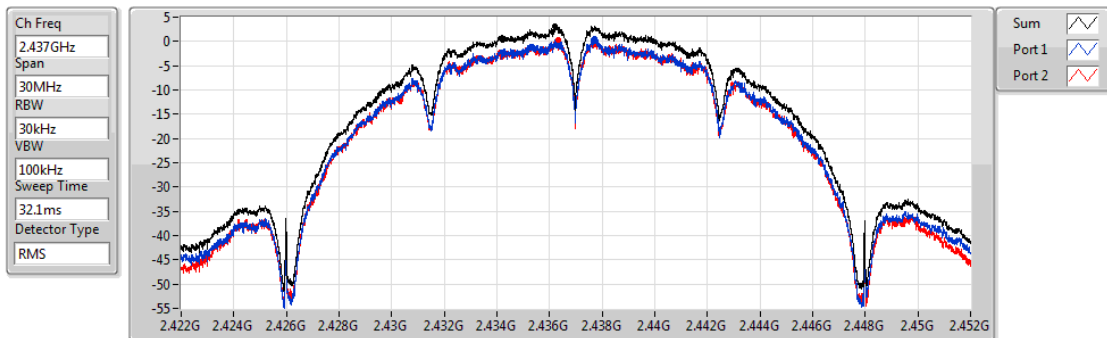


Sum	PD	Port 1	Port 2
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-0.15	-0.15	-3.04	-2.70

802.11b_Nss1,(1Mbps)_2TX

PSD

2437MHz

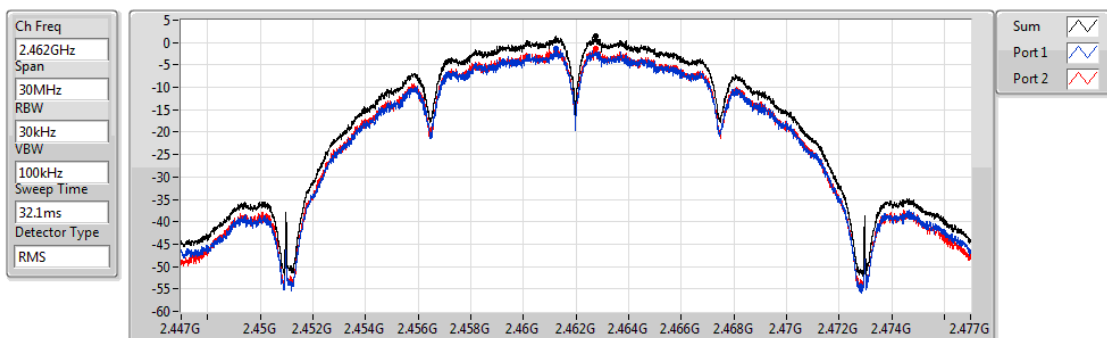


Sum	PD	Port 1	Port 2
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
3.16	3.16	0.57	0.37

802.11b_Nss1,(1Mbps)_2TX

PSD

2462MHz

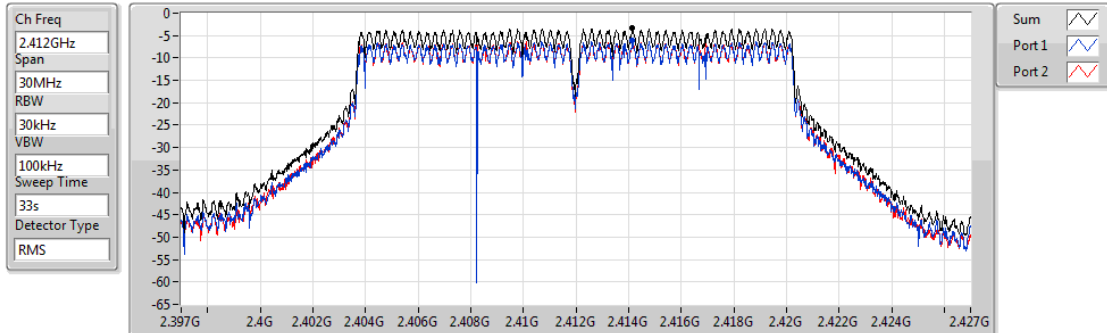


Sum	PD	Port 1	Port 2
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
1.54	1.54	-1.47	-1.35

802.11g_Nss1,(6Mbps)_2TX

PSD

2412MHz

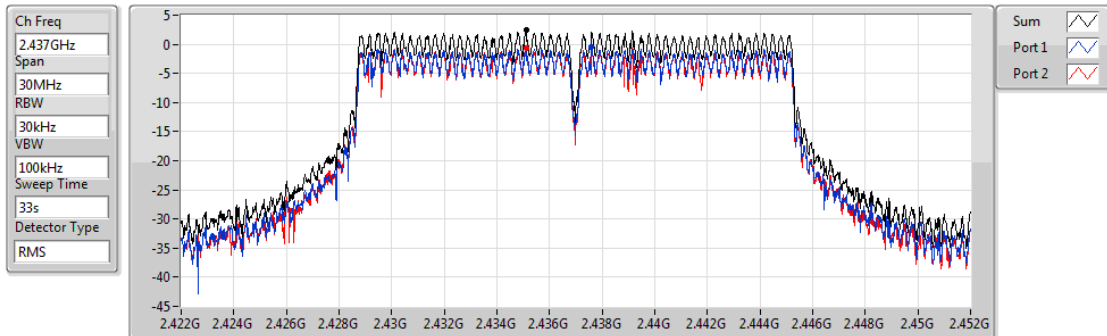


Sum	PD	Port 1	Port 2
(dBm/100kHz)	(dBm/100kHz)	(dBm/100kHz)	(dBm/100kHz)
-3.19	-3.19	-6.20	-6.20

802.11g_Nss1,(6Mbps)_2TX

PSD

2437MHz

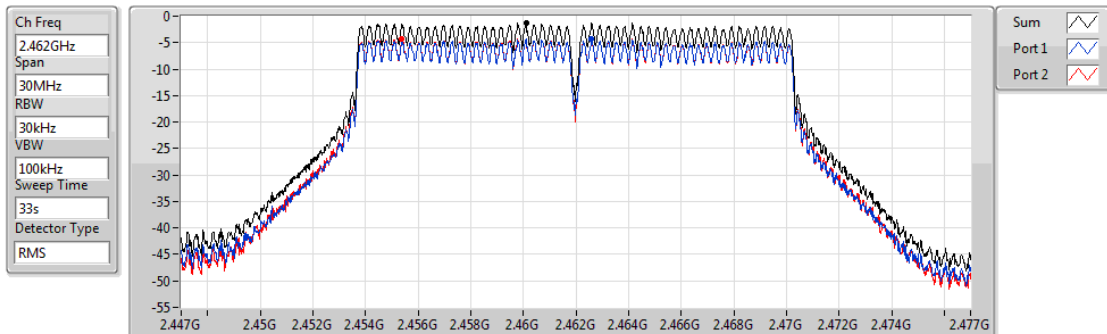


Sum	PD	Port 1	Port 2
(dBm/100kHz)	(dBm/100kHz)	(dBm/100kHz)	(dBm/100kHz)
2.46	2.46	-0.43	-0.59

802.11g_Nss1,(6Mbps)_2TX

PSD

2462MHz

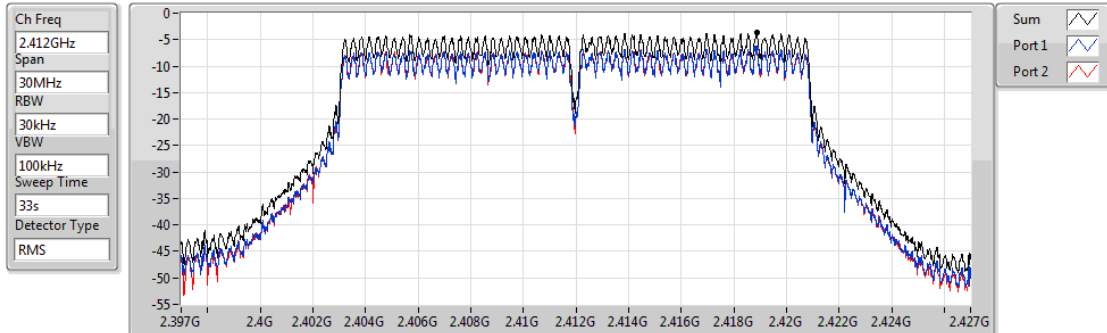


Sum	PD	Port 1	Port 2
(dBm/100kHz)	(dBm/100kHz)	(dBm/100kHz)	(dBm/100kHz)
-1.33	-1.33	-4.32	-4.28

802.11n HT20_Nss1,(MCS0)_2TX

PSD

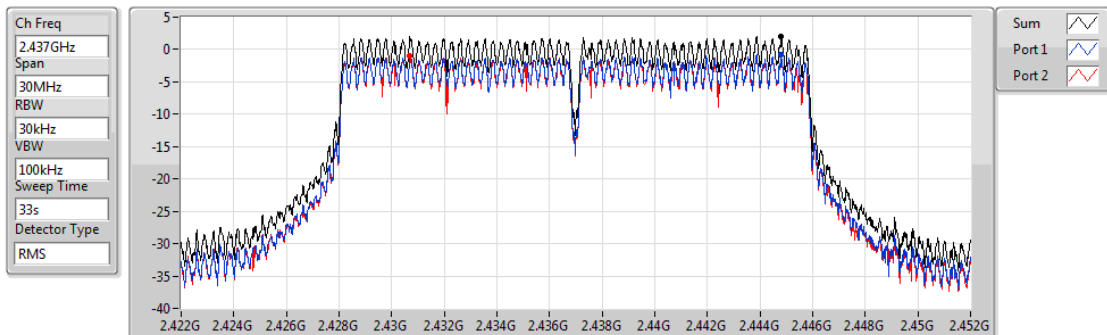
2412MHz



802.11n HT20_Nss1,(MCS0)_2TX

PSD

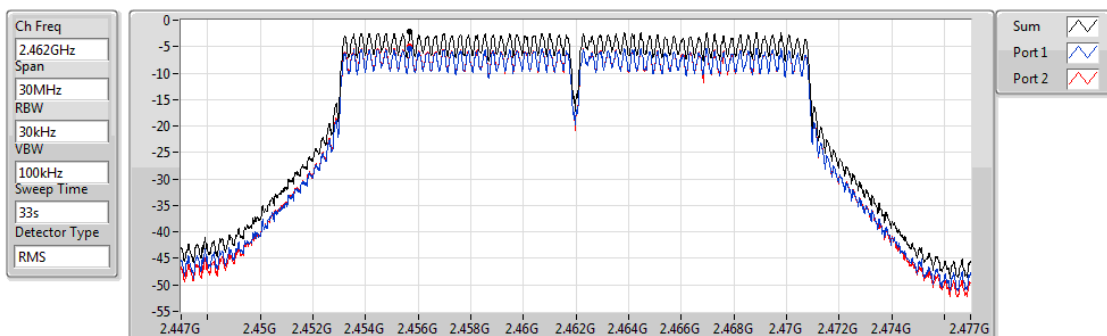
2437MHz



802.11n HT20_Nss1,(MCS0)_2TX

PSD

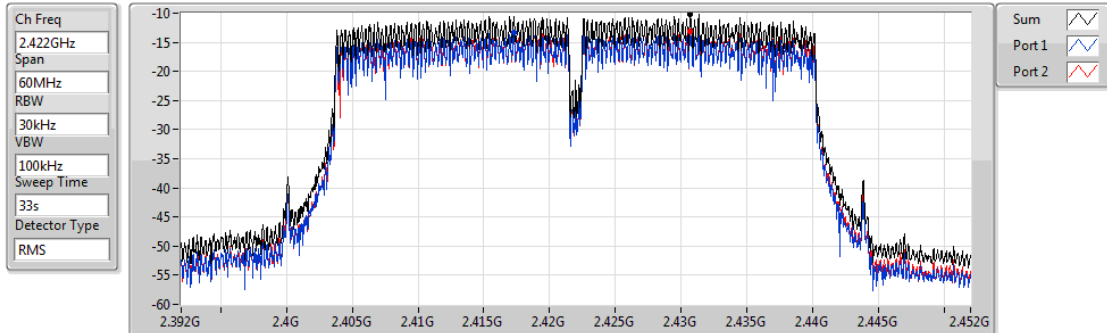
2462MHz



802.11n HT40_Nss1,(MCS0)_2TX

PSD

2422MHz

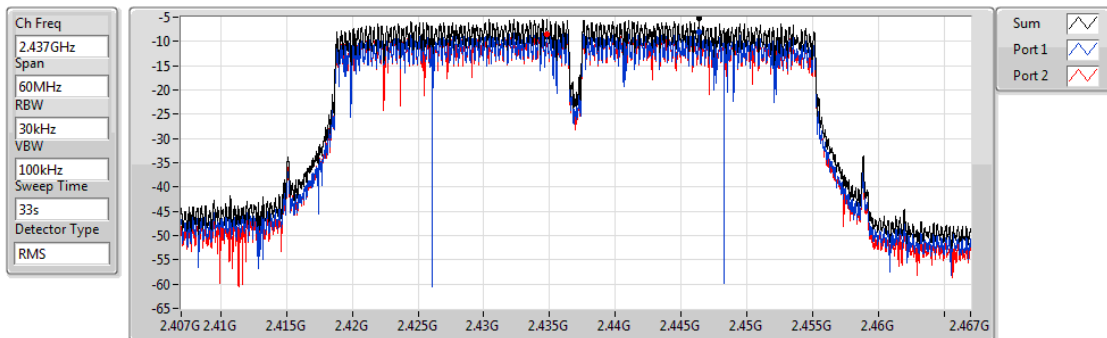


Sum	PD	Port 1	Port 2
(dBm/100kHz)	(dBm/100kHz)	(dBm/100kHz)	(dBm/100kHz)
-10.23	-10.23	-13.27	-13.16

802.11n HT40_Nss1,(MCS0)_2TX

PSD

2437MHz

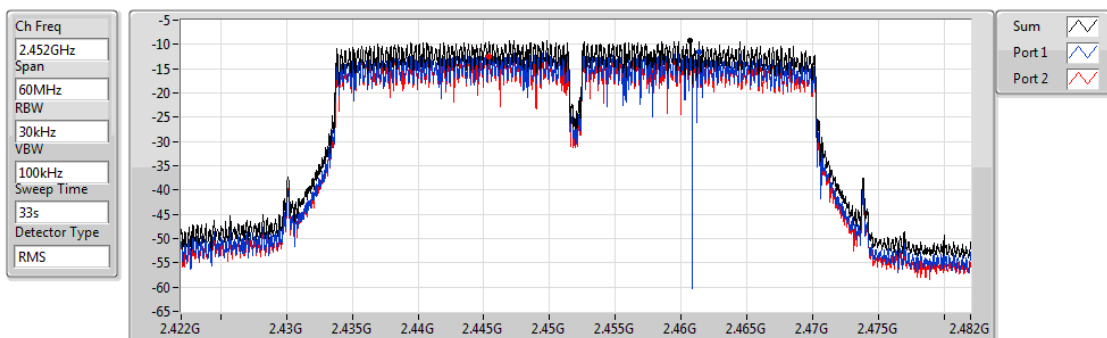


Sum	PD	Port 1	Port 2
(dBm/100kHz)	(dBm/100kHz)	(dBm/100kHz)	(dBm/100kHz)
-5.33	-5.33	-8.12	-8.48

802.11n HT40_Nss1,(MCS0)_2TX

PSD

2452MHz



Sum	PD	Port 1	Port 2
(dBm/100kHz)	(dBm/100kHz)	(dBm/100kHz)	(dBm/100kHz)
-9.13	-9.13	-11.67	-12.47

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

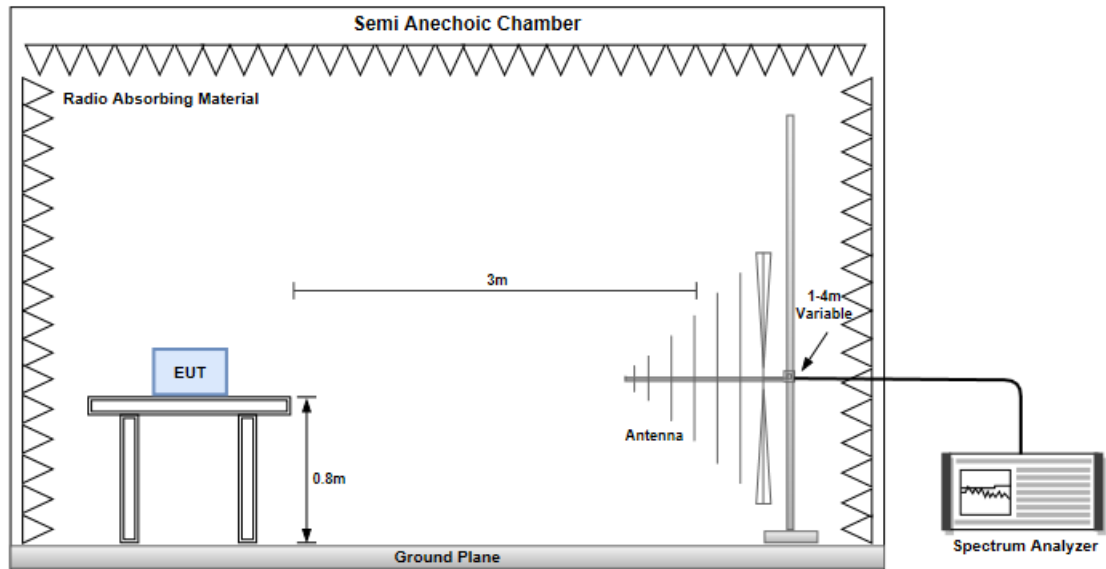
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission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

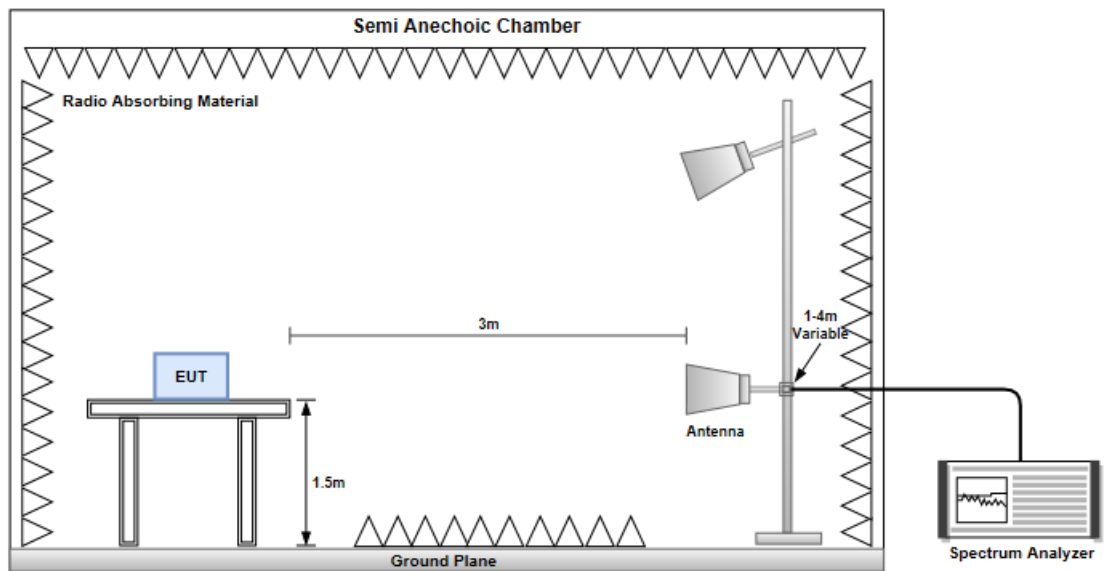
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
3. RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above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

3.5.3 Test Setup

Radiated Emissions below 1 GHz



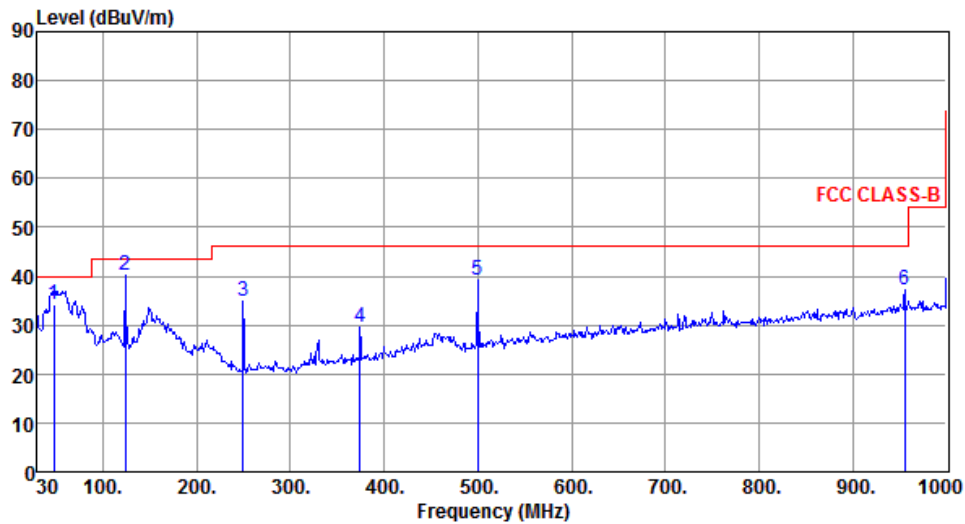
Radiated Emissions above 1 GHz



3.5.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)

Modulation	11g	Test Freq. (MHz)	2437																																																																																																
Polarization	Horizontal																																																																																																		
Level (dBuV/m) Frequency (MHz) <table><thead><tr><th></th><th>Freq.</th><th>Emission</th><th>Limit</th><th>Margin</th><th>SA</th><th>Factor</th><th>Remark</th><th>ANT</th><th>Turn</th></tr><tr><th></th><th>MHz</th><th>level</th><th></th><th></th><th>reading</th><th></th><th></th><th>High</th><th>Table</th></tr><tr><th></th><th></th><th>dBuV/m</th><th>dBuV/m</th><th>dB</th><th>dBuV</th><th>dB</th><th></th><th>cm</th><th>deg</th></tr></thead><tbody><tr><td>1</td><td>125.12</td><td>40.48</td><td>43.50</td><td>-3.02</td><td>50.61</td><td>-10.13</td><td>QP</td><td>144</td><td>102</td></tr><tr><td>2</td><td>249.22</td><td>36.23</td><td>46.00</td><td>-9.77</td><td>45.42</td><td>-9.19</td><td>Peak</td><td>---</td><td>---</td></tr><tr><td>3</td><td>374.35</td><td>28.80</td><td>46.00</td><td>-17.20</td><td>34.56</td><td>-5.76</td><td>Peak</td><td>---</td><td>---</td></tr><tr><td>4</td><td>499.48</td><td>36.86</td><td>46.00</td><td>-9.14</td><td>39.86</td><td>-3.00</td><td>Peak</td><td>---</td><td>---</td></tr><tr><td>5</td><td>630.43</td><td>32.88</td><td>46.00</td><td>-13.12</td><td>32.86</td><td>0.02</td><td>Peak</td><td>---</td><td>---</td></tr><tr><td>6</td><td>800.18</td><td>35.86</td><td>46.00</td><td>-10.14</td><td>32.96</td><td>2.90</td><td>Peak</td><td>---</td><td>---</td></tr></tbody></table>											Freq.	Emission	Limit	Margin	SA	Factor	Remark	ANT	Turn		MHz	level			reading			High	Table			dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg	1	125.12	40.48	43.50	-3.02	50.61	-10.13	QP	144	102	2	249.22	36.23	46.00	-9.77	45.42	-9.19	Peak	---	---	3	374.35	28.80	46.00	-17.20	34.56	-5.76	Peak	---	---	4	499.48	36.86	46.00	-9.14	39.86	-3.00	Peak	---	---	5	630.43	32.88	46.00	-13.12	32.86	0.02	Peak	---	---	6	800.18	35.86	46.00	-10.14	32.96	2.90	Peak	---	---
	Freq.	Emission	Limit	Margin	SA	Factor	Remark	ANT	Turn																																																																																										
	MHz	level			reading			High	Table																																																																																										
		dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg																																																																																										
1	125.12	40.48	43.50	-3.02	50.61	-10.13	QP	144	102																																																																																										
2	249.22	36.23	46.00	-9.77	45.42	-9.19	Peak	---	---																																																																																										
3	374.35	28.80	46.00	-17.20	34.56	-5.76	Peak	---	---																																																																																										
4	499.48	36.86	46.00	-9.14	39.86	-3.00	Peak	---	---																																																																																										
5	630.43	32.88	46.00	-13.12	32.86	0.02	Peak	---	---																																																																																										
6	800.18	35.86	46.00	-10.14	32.96	2.90	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	11g	Test Freq. (MHz)	2437
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	47.29	34.30	40.00	-5.70	42.40	-8.10	QP	100	2
2	124.09	40.04	43.50	-3.46	50.28	-10.24	Peak	---	---
3	249.22	35.02	46.00	-10.98	44.21	-9.19	Peak	---	---
4	374.35	29.71	46.00	-16.29	35.47	-5.76	Peak	---	---
5	499.48	39.19	46.00	-6.81	42.19	-3.00	Peak	---	---
6	955.38	37.24	46.00	-8.76	31.76	5.48	Peak	---	---

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

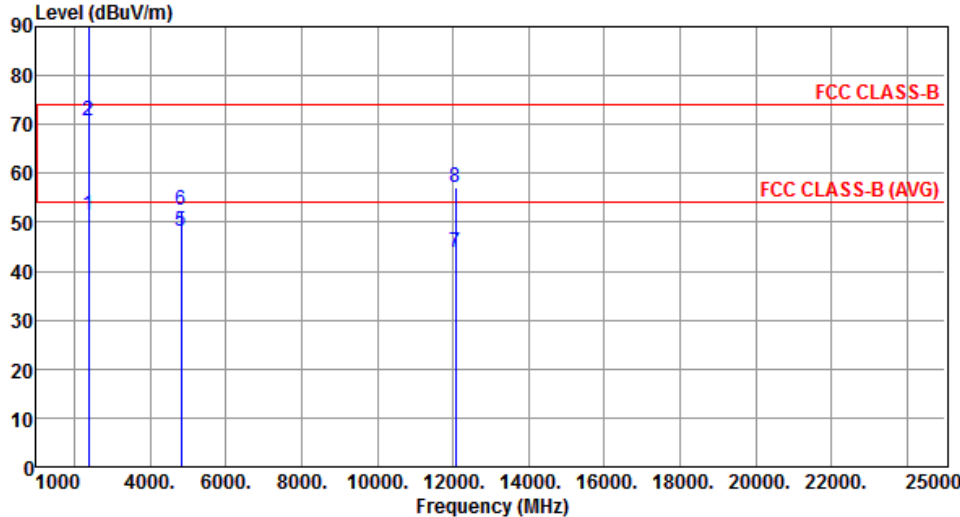
*Factor includes antenna factor , cable loss and amplifier gain

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

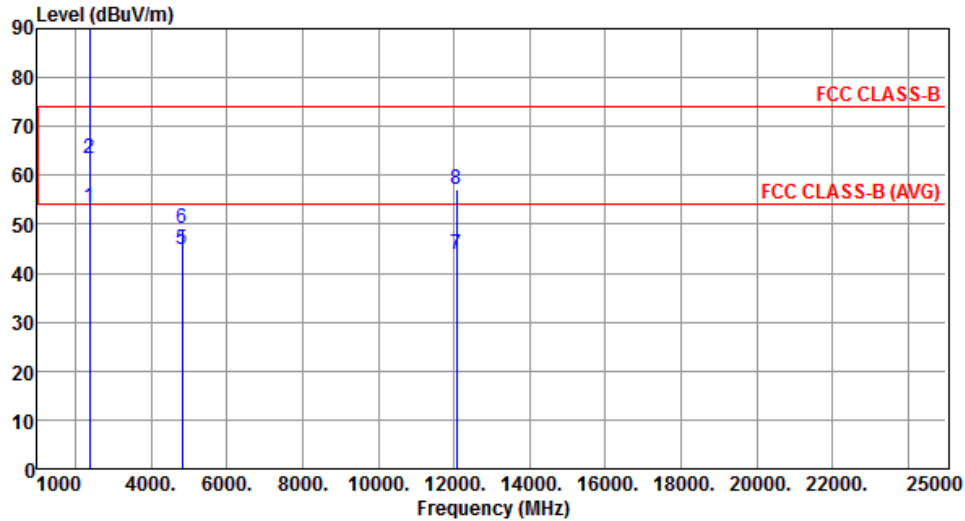
Modulation	11b	Test Freq. (MHz)	2412
Polarization	Horizontal		



	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	51.63	54.00	-2.37	52.84	-1.21	Average	244	334
2	2390.00	70.73	74.00	-3.27	71.94	-1.21	Peak	244	334
3 *	2412.00	103.10			104.22	-1.12	Average	244	334
4 *	2412.00	105.82			106.94	-1.12	Peak	244	334
5	4824.00	48.06	54.00	-5.94	42.39	5.67	Average	230	175
6	4824.00	52.39	74.00	-21.61	46.72	5.67	Peak	230	175
7	12060.00	43.74	54.00	-10.26	28.07	15.67	Average	100	351
8	12060.00	57.08	74.00	-16.92	41.41	15.67	Peak	100	351

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: "*" is Peak / Average value of fundamental frequency

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



	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	53.62	54.00	-0.38	54.83	-1.21	Average	100	156
2	2390.00	63.48	74.00	-10.52	64.69	-1.21	Peak	100	156
3 *	2412.00	104.26			105.38	-1.12	Average	104	210
4 *	2412.00	106.30			107.42	-1.12	Peak	104	210
5	4824.00	44.93	54.00	-9.07	39.26	5.67	Average	112	273
6	4824.00	49.26	74.00	-24.74	43.59	5.67	Peak	112	273
7	12060.00	43.73	54.00	-10.27	28.06	15.67	Average	100	50
8	12060.00	57.23	74.00	-16.77	41.56	15.67	Peak	100	50

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

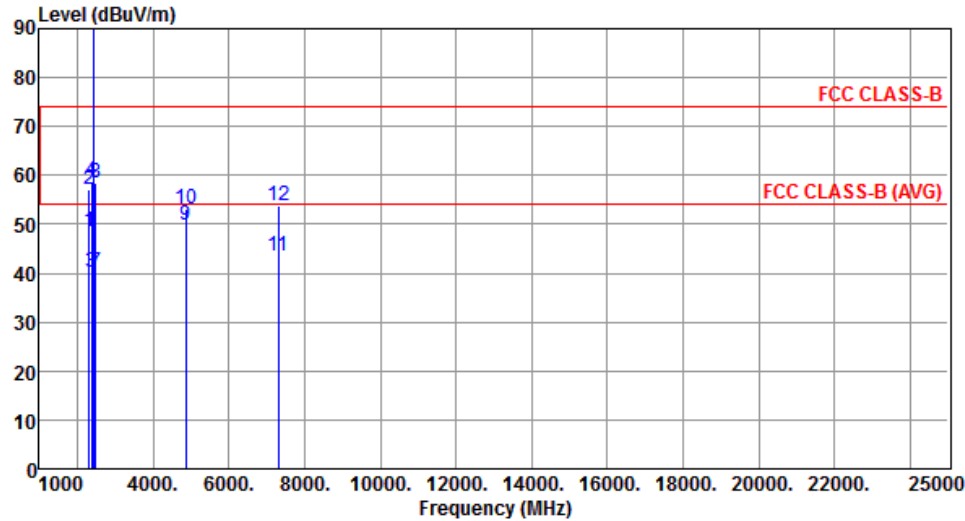
*Factor includes antenna factor , cable loss and amplifier gain

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

Note 3: "*" is Peak / Average value of fundamental frequency

Modulation	11b	Test Freq. (MHz)	2437
Polarization	Horizontal		
Level (dBuV/m) </			

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



Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table
MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1	2320.00	48.40	54.00	-5.60	49.89	-1.49	Average	100 15
2	2320.00	57.21	74.00	-16.79	58.70	-1.49	Peak	100 15
3	2390.00	40.04	54.00	-13.96	41.25	-1.21	Average	187 201
4	2390.00	58.89	74.00	-15.11	60.10	-1.21	Peak	187 201
5 *	2437.00	106.06			107.08	-1.02	Average	187 201
6 *	2437.00	109.03			110.05	-1.02	Peak	187 201
7	2483.50	40.11	54.00	-13.89	40.97	-0.86	Average	187 201
8	2483.50	58.44	74.00	-15.56	59.30	-0.86	Peak	187 201
9	4874.00	49.90	54.00	-4.10	44.09	5.81	Average	112 272
10	4874.00	53.27	74.00	-20.73	47.46	5.81	Peak	112 272
11	7311.00	43.48	54.00	-10.52	32.53	10.95	Average	100 111
12	7311.00	53.93	74.00	-20.07	42.98	10.95	Peak	100 111

	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1	2320.00	48.40	54.00	-5.60	49.89	-1.49	Average	100	15
2	2320.00	57.21	74.00	-16.79	58.70	-1.49	Peak	100	15
3	2390.00	40.04	54.00	-13.96	41.25	-1.21	Average	187	201
4	2390.00	58.89	74.00	-15.11	60.10	-1.21	Peak	187	201
5 *	2437.00	106.06			107.08	-1.02	Average	187	201
6 *	2437.00	109.03			110.05	-1.02	Peak	187	201
7	2483.50	40.11	54.00	-13.89	40.97	-0.86	Average	187	201
8	2483.50	58.44	74.00	-15.56	59.30	-0.86	Peak	187	201
9	4874.00	49.90	54.00	-4.10	44.09	5.81	Average	112	272
10	4874.00	53.27	74.00	-20.73	47.46	5.81	Peak	112	272
11	7311.00	43.48	54.00	-10.52	32.53	10.95	Average	100	111
12	7311.00	53.93	74.00	-20.07	42.98	10.95	Peak	100	111

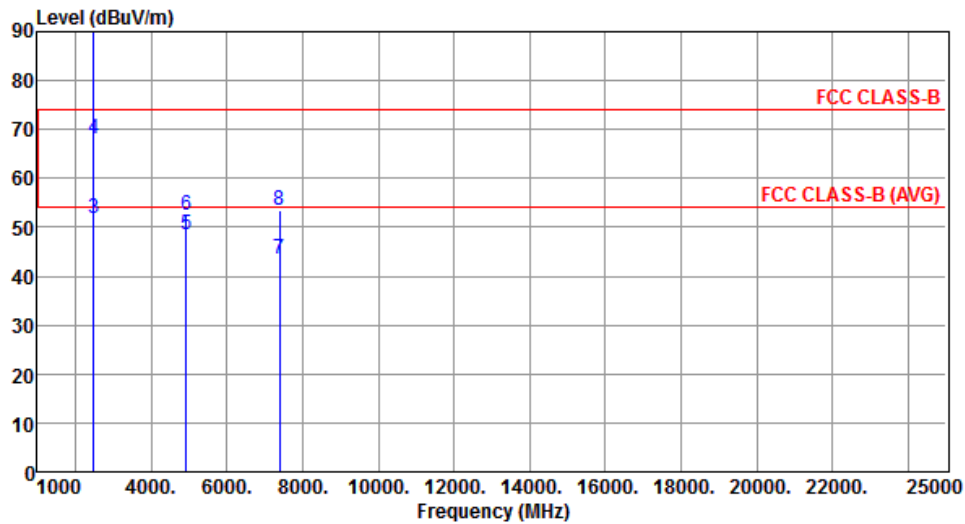
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

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

Note 3: "*" is Peak / Average value of fundamental frequency

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



		Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	*	2462.00	104.82			105.75	-0.93	Average	257	340
2	*	2462.00	107.49			108.42	-0.93	Peak	257	340
3		2483.50	51.86	54.00	-2.14	52.72	-0.86	Average	257	340
4		2483.50	67.93	74.00	-6.07	68.79	-0.86	Peak	257	340
5		4924.00	48.58	54.00	-5.42	42.63	5.95	Average	235	95
6		4924.00	52.54	74.00	-21.46	46.59	5.95	Peak	235	95
7		7386.00	43.55	54.00	-10.45	32.28	11.27	Average	100	42
8		7386.00	53.57	74.00	-20.43	42.30	11.27	Peak	100	42

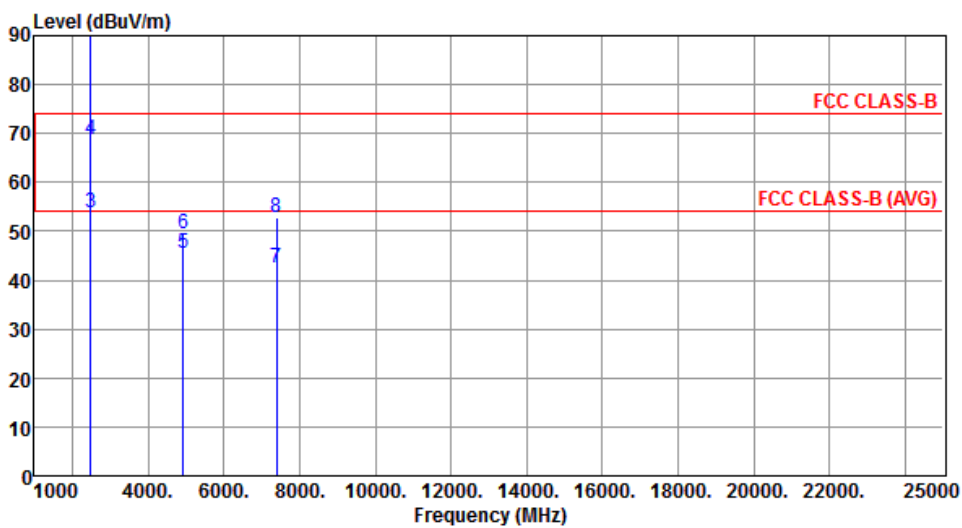
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

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

Note 3: "*" is Peak / Average value of fundamental frequency

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



		Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	*	2462.00	104.62			105.55	-0.93	Average	100	214
2	*	2462.00	107.45			108.38	-0.93	Peak	100	214
3		2483.50	53.65	54.00	-0.35	54.51	-0.86	Average	100	214
4		2483.50	68.84	74.00	-5.16	69.70	-0.86	Peak	100	214
5		4924.00	45.33	54.00	-8.67	39.38	5.95	Average	115	275
6		4924.00	49.33	74.00	-24.67	43.38	5.95	Peak	115	275
7		7386.00	42.52	54.00	-11.48	31.25	11.27	Average	100	115
8		7386.00	52.95	74.00	-21.05	41.68	11.27	Peak	100	115

Note 1: Emission Level (dBUV/m) = SA Reading (dBUV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain

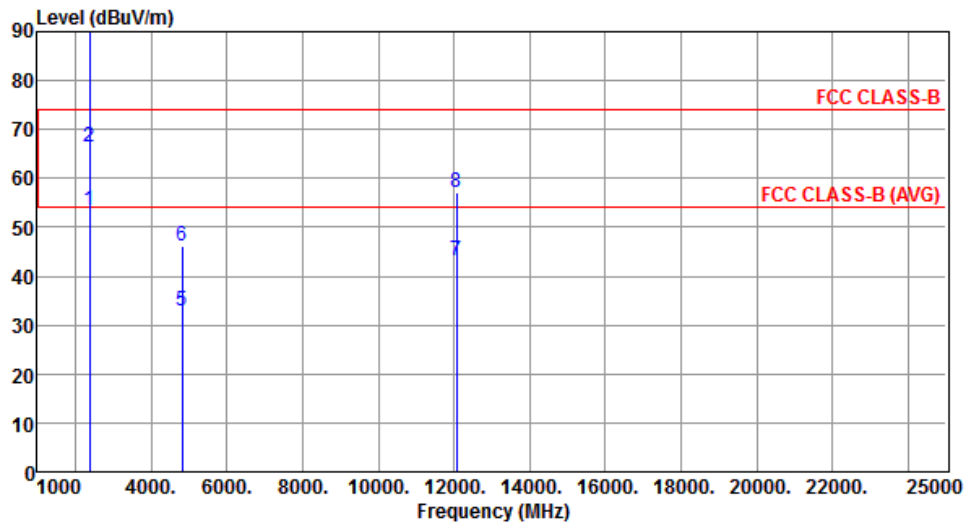
Note 2: Margin (dB) = Emission level (dBUV/m) – Limit (dBUV/m).

Note 3: "*" is Peak / Average value of fundamental frequency

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

Modulation	11g			Test Freq. (MHz)			2412		
Polarization	Horizontal								
Level (dBUV/m)									

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



	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	53.61	54.00	-0.39	54.82	-1.21	Average	169	204
2	2390.00	66.32	74.00	-7.68	67.53	-1.21	Peak	169	204
3 *	2412.00	97.05			98.17	-1.12	Average	169	204
4 *	2412.00	107.14			108.26	-1.12	Peak	169	204
5	4824.00	32.93	54.00	-21.07	27.26	5.67	Average	100	30
6	4824.00	46.26	74.00	-27.74	40.59	5.67	Peak	100	30
7	12060.00	43.05	54.00	-10.95	27.38	15.67	Average	100	50
8	12060.00	57.25	74.00	-16.75	41.58	15.67	Peak	100	50

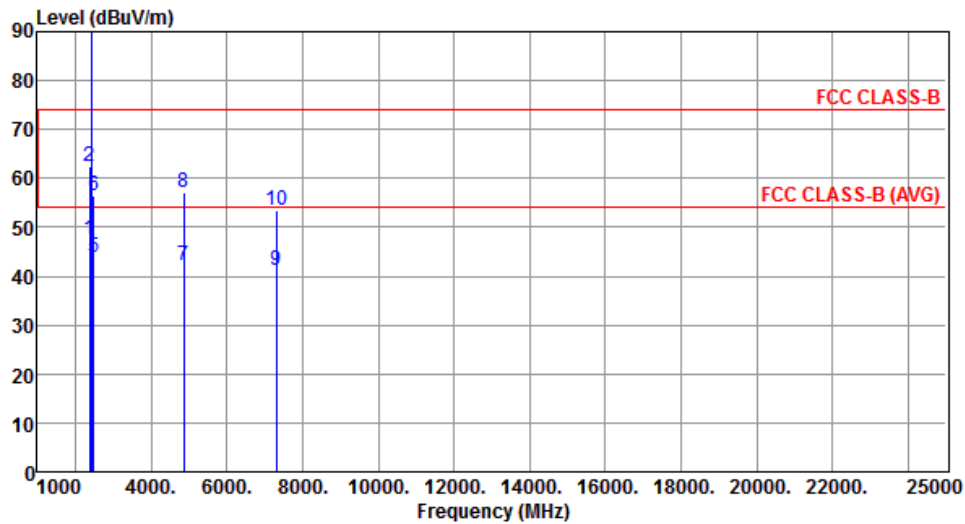
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

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

Note 3: "*" is Peak / Average value of fundamental frequency

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



	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	47.40	54.00	-6.60	48.61	-1.21	Average	217	337
2	2390.00	62.35	74.00	-11.65	63.56	-1.21	Peak	217	337
3 *	2437.00	103.46			104.48	-1.02	Average	240	336
4 *	2437.00	113.44			114.46	-1.02	Peak	240	336
5	2483.50	43.72	54.00	-10.28	44.58	-0.86	Average	240	336
6	2483.50	56.55	74.00	-17.45	57.41	-0.86	Peak	240	336
7	4874.00	42.12	54.00	-11.88	36.31	5.81	Average	247	95
8	4874.00	56.96	74.00	-17.04	51.15	5.81	Peak	247	95
9	7311.00	41.14	54.00	-12.86	30.19	10.95	Average	216	79
10	7311.00	53.54	74.00	-20.46	42.59	10.95	Peak	216	79

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

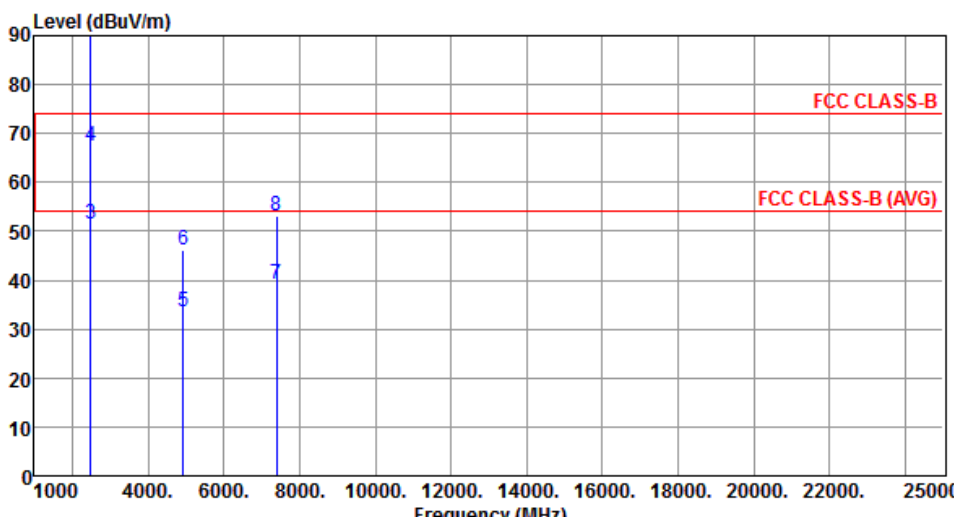
*Factor includes antenna factor , cable loss and amplifier gain

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

Note 3: "*" is Peak / Average value of fundamental frequency

Modulation	11g	Test Freq. (MHz)	2437
Polarization	Vertical		
Level (dBUV/m) </			

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



The graph displays the emission level in dBuV/m against frequency in MHz. Two horizontal red lines represent the FCC CLASS-B limit at approximately 75 dBuV/m and the FCC CLASS-B (AVG) limit at approximately 55 dBuV/m. Data points are plotted as vertical blue lines with numerical labels. Points 3 and 4 are at 2462 MHz, point 5 is at 4924 MHz, point 6 is at 4924 MHz, point 7 is at 7386 MHz, and point 8 is at 7386 MHz. The peak levels at 2462 MHz and 7386 MHz exceed the FCC CLASS-B limit.

		Freq.	Emission	Limit	Margin	SA	Factor	Remark	ANT	Turn
		MHz	level			reading			High	Table
			dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1	*	2462.00	100.14			101.07	-0.93	Average	258	338
2	*	2462.00	109.97			110.90	-0.93	Peak	258	338
3		2483.50	51.52	54.00	-2.48	52.38	-0.86	Average	258	338
4		2483.50	67.28	74.00	-6.72	68.14	-0.86	Peak	258	338
5		4924.00	33.49	54.00	-20.51	27.54	5.95	Average	100	90
6		4924.00	46.19	74.00	-27.81	40.24	5.95	Peak	100	90
7		7386.00	39.14	54.00	-14.86	27.87	11.27	Average	100	54
8		7386.00	53.09	74.00	-20.91	41.82	11.27	Peak	100	54

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

*Factor includes antenna factor , cable loss and amplifier gain

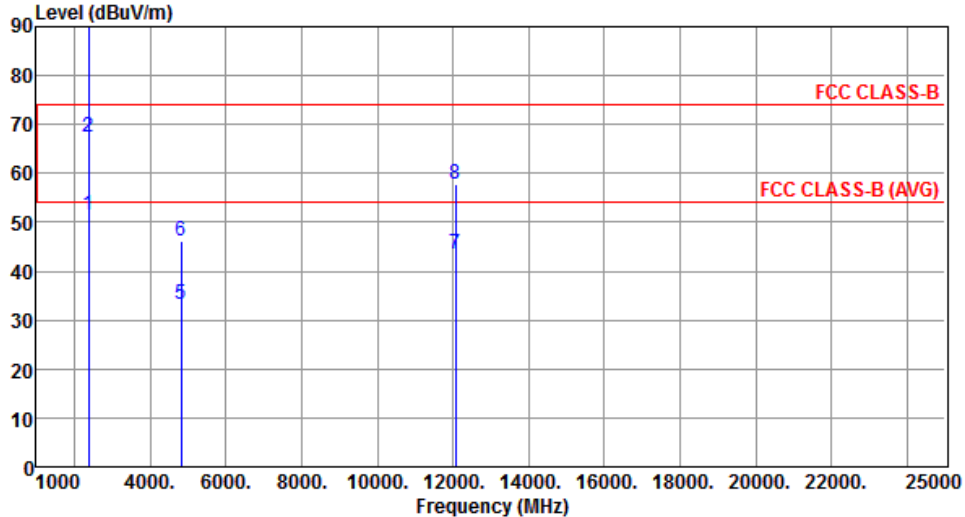
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Note 3: "*" is Peak / Average value of fundamental frequency

Modulation	11g	Test Freq. (MHz)		2462	
Polarization	Vertical				
Level (dBUV/m)					

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

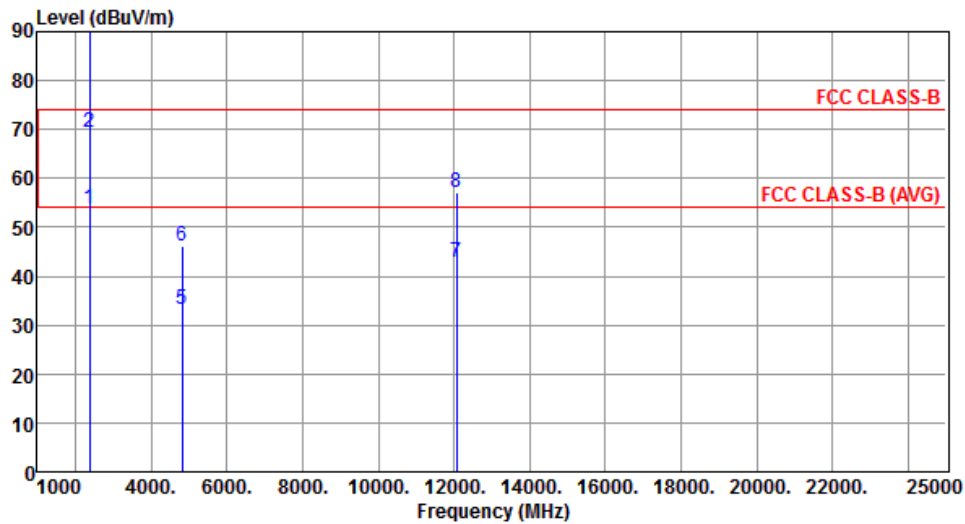
Modulation	HT20	Test Freq. (MHz)	2412
Polarization	Horizontal		



	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	51.57	54.00	-2.43	52.78	-1.21	Average	278	341
2	2390.00	67.33	74.00	-6.67	68.54	-1.21	Peak	278	341
3 *	2412.00	95.13			96.25	-1.12	Average	278	341
4 *	2412.00	105.23			106.35	-1.12	Peak	278	341
5	4824.00	33.23	54.00	-20.77	27.56	5.67	Average	100	99
6	4824.00	46.21	74.00	-27.79	40.54	5.67	Peak	100	99
7	12060.00	43.56	54.00	-10.44	27.89	15.67	Average	100	345
8	12060.00	57.76	74.00	-16.24	42.09	15.67	Peak	100	345

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: "*" is Peak / Average value of fundamental frequency

Modulation	HT20	Test Freq. (MHz)	2412
Polarization	Vertical		



	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	53.73	54.00	-0.27	54.94	-1.21	Average	169	205
2	2390.00	69.44	74.00	-4.56	70.65	-1.21	Peak	169	205
3 *	2412.00	95.47			96.59	-1.12	Average	169	205
4 *	2412.00	106.00			107.12	-1.12	Peak	169	205
5	4824.00	33.13	54.00	-20.87	27.46	5.67	Average	100	60
6	4824.00	46.20	74.00	-27.80	40.53	5.67	Peak	100	60
7	12060.00	42.91	54.00	-11.09	27.24	15.67	Average	100	60
8	12060.00	57.20	74.00	-16.80	41.53	15.67	Peak	100	60

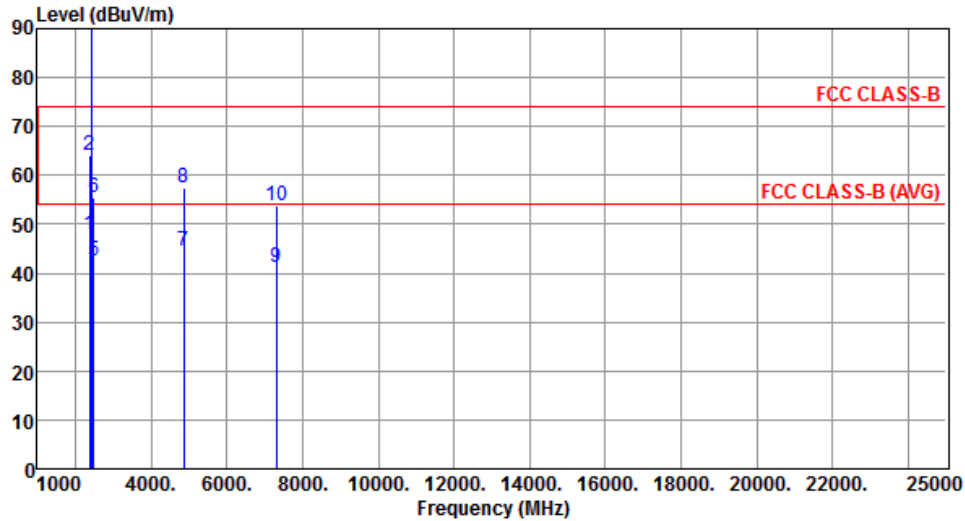
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

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

Note 3: "*" is Peak / Average value of fundamental frequency

Modulation	HT20	Test Freq. (MHz)	2437
Polarization	Horizontal		



	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	47.68	54.00	-6.32	48.89	-1.21	Average	245	339
2	2390.00	64.16	74.00	-9.84	65.37	-1.21	Peak	245	339
3 *	2437.00	100.38			101.40	-1.02	Average	245	339
4 *	2437.00	110.52			111.54	-1.02	Peak	245	339
5	2483.50	42.43	54.00	-11.57	43.29	-0.86	Average	245	339
6	2483.50	55.46	74.00	-18.54	56.32	-0.86	Peak	245	339
7	4874.00	44.64	54.00	-9.36	38.83	5.81	Average	245	93
8	4874.00	57.42	74.00	-16.58	51.61	5.81	Peak	245	93
9	7311.00	41.06	54.00	-12.94	30.11	10.95	Average	222	58
10	7311.00	53.72	74.00	-20.28	42.77	10.95	Peak	222	58

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: "*" is Peak / Average value of fundamental frequency

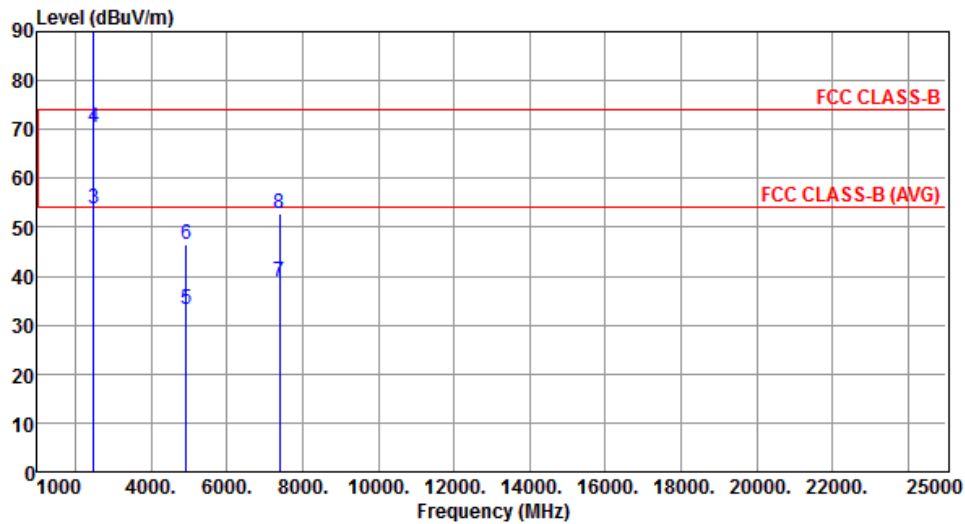
Modulation	HT20	Test Freq. (MHz)	2437
Polarization	Vertical		
Level (dBuV/m)			

Modulation	HT20	Test Freq. (MHz)	2462
Polarization	Horizontal		

		Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	*	2462.00	98.95	---	---	99.88	-0.93	Average	265	340
2	*	2462.00	109.39	---	---	110.32	-0.93	Peak	265	340
3		2483.50	49.14	54.00	-4.86	50.00	-0.86	Average	265	340
4		2483.50	65.67	74.00	-8.33	66.53	-0.86	Peak	265	340
5		4924.00	33.39	54.00	-20.61	27.44	5.95	Average	100	94
6		4924.00	46.36	74.00	-27.64	40.41	5.95	Peak	100	94
7		7386.00	38.95	54.00	-15.05	27.68	11.27	Average	100	49
8		7386.00	52.91	74.00	-21.09	41.64	11.27	Peak	100	49

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: "*" is Peak / Average value of fundamental frequency

Modulation	HT20	Test Freq. (MHz)	2462
Polarization	Vertical		



		Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	*	2462.00	100.72			101.65	-0.93	Average	100	215
2	*	2462.00	111.42			112.35	-0.93	Peak	100	215
3		2483.50	53.70	54.00	-0.30	54.56	-0.86	Average	100	215
4		2483.50	70.38	74.00	-3.62	71.24	-0.86	Peak	100	215
5		4924.00	33.27	54.00	-20.73	27.32	5.95	Average	100	80
6		4924.00	46.34	74.00	-27.66	40.39	5.95	Peak	100	80
7		7386.00	38.76	54.00	-15.24	27.49	11.27	Average	100	150
8		7386.00	52.85	74.00	-21.15	41.58	11.27	Peak	100	150

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

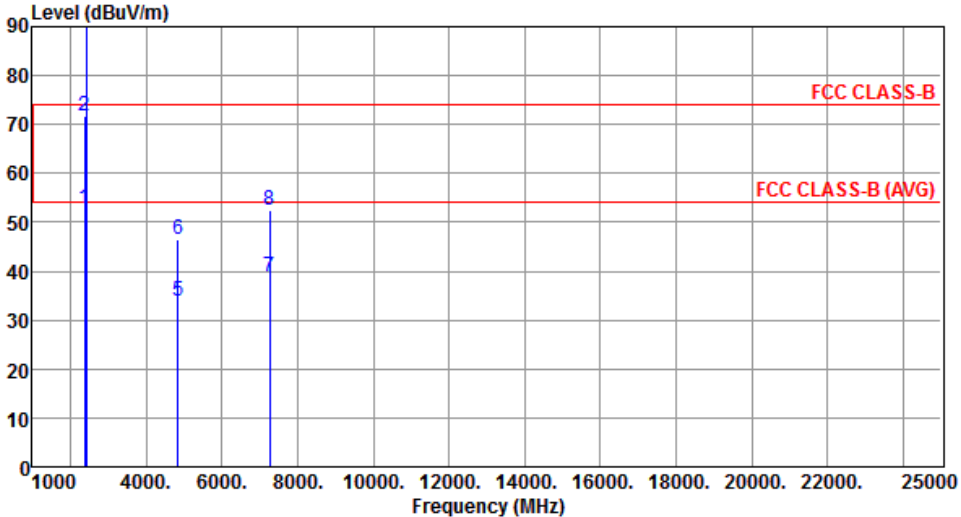
*Factor includes antenna factor , cable loss and amplifier gain

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

Note 3: "*" is Peak / Average value of fundamental frequency

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

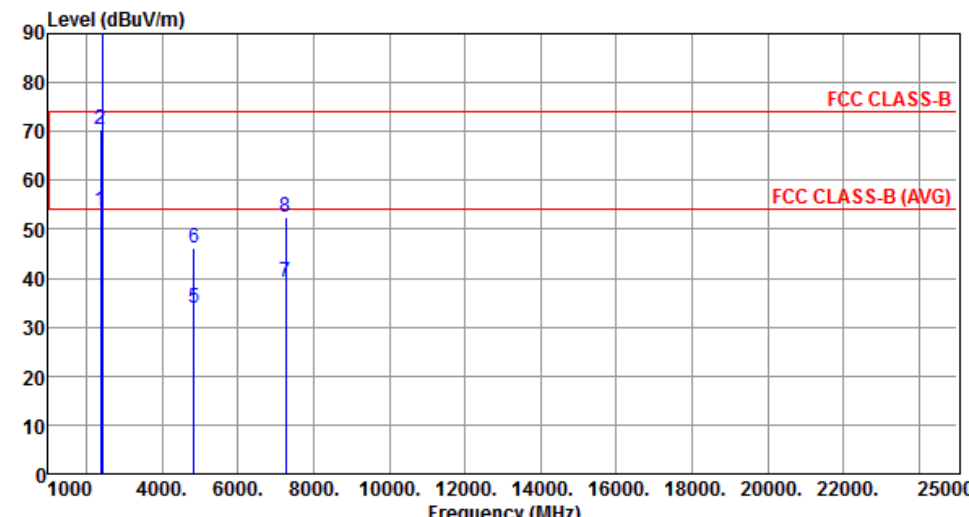
Modulation	HT40	Test Freq. (MHz)	2422
Polarization	Horizontal		



	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	52.72	54.00	-1.28	53.93	-1.21	Average	249	340
2	2390.00	71.77	74.00	-2.23	72.98	-1.21	Peak	249	340
3 *	2422.00	89.86			90.94	-1.08	Average	249	340
4 *	2422.00	100.24			101.32	-1.08	Peak	249	340
5	4844.00	33.90	54.00	-20.10	28.17	5.73	Average	100	102
6	4844.00	46.50	74.00	-27.50	40.77	5.73	Peak	100	102
7	7266.00	38.80	54.00	-15.20	28.05	10.75	Average	100	53
8	7266.00	52.59	74.00	-21.41	41.84	10.75	Peak	100	53

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: "*" is Peak / Average value of fundamental frequency

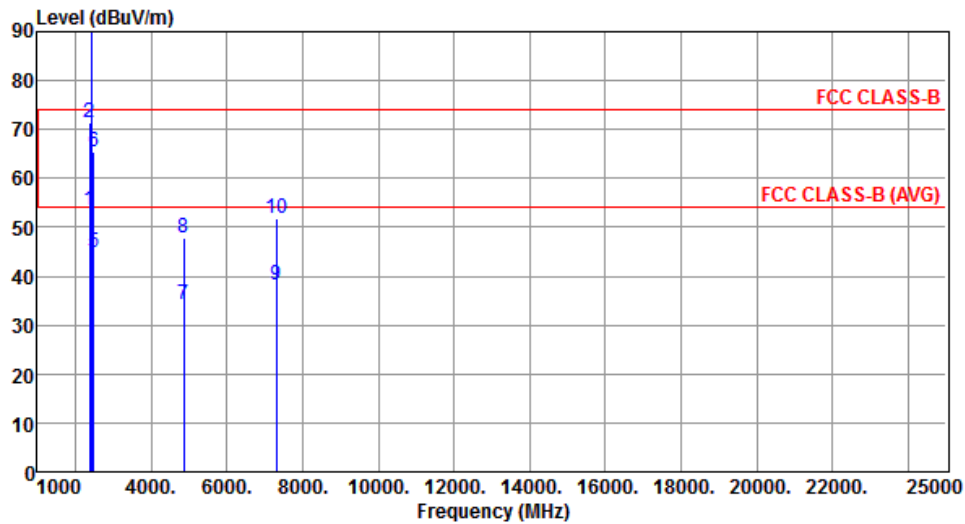
Modulation	HT40	Test Freq. (MHz)	2422
Polarization	Vertical		



	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	53.81	54.00	-0.19	55.02	-1.21	Average	102	156
2	2390.00	70.29	74.00	-3.71	71.50	-1.21	Peak	102	156
3 *	2422.00	90.84			91.92	-1.08	Average	102	156
4 *	2422.00	100.93			102.01	-1.08	Peak	102	156
5	4844.00	33.89	54.00	-20.11	28.16	5.73	Average	100	30
6	4844.00	46.32	74.00	-27.68	40.59	5.73	Peak	100	30
7	7266.00	39.10	54.00	-14.90	28.35	10.75	Average	100	60
8	7266.00	52.32	74.00	-21.68	41.57	10.75	Peak	100	60

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: "*" is Peak / Average value of fundamental frequency

Modulation	HT40	Test Freq. (MHz)	2437
Polarization	Horizontal		



	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	53.36	54.00	-0.64	54.57	-1.21	Average	244	338
2	2390.00	71.48	74.00	-2.52	72.69	-1.21	Peak	244	338
3 *	2437.00	94.85			95.87	-1.02	Average	244	338
4 *	2437.00	104.91			105.93	-1.02	Peak	244	338
5	2483.50	44.87	54.00	-9.13	45.73	-0.86	Average	244	338
6	2483.50	65.28	74.00	-8.72	66.14	-0.86	Peak	244	338
7	4874.00	34.28	54.00	-19.72	28.47	5.81	Average	100	99
8	4874.00	47.81	74.00	-26.19	42.00	5.81	Peak	100	99
9	7311.00	38.06	54.00	-15.94	27.11	10.95	Average	100	55
10	7311.00	51.73	74.00	-22.27	40.78	10.95	Peak	100	55

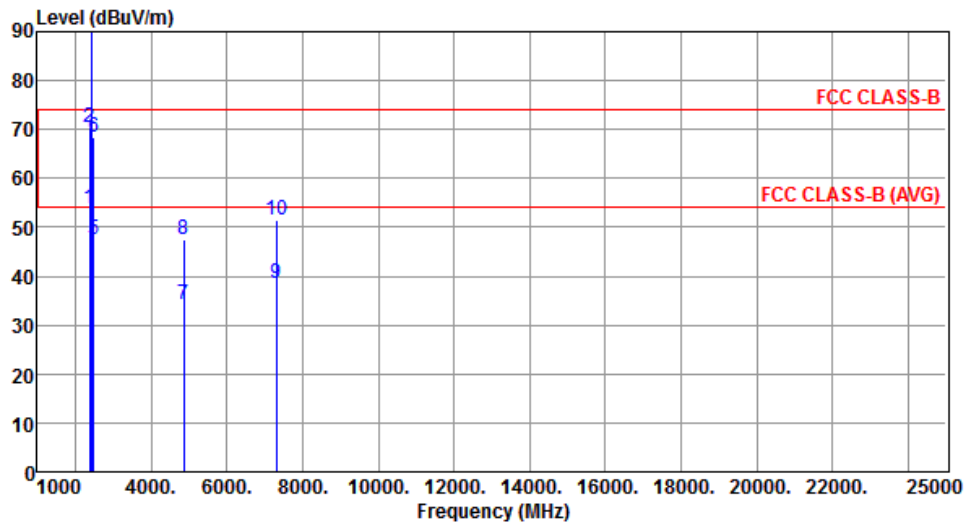
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

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

Note 3: "*" is Peak / Average value of fundamental frequency

Modulation	HT40	Test Freq. (MHz)	2437
Polarization	Vertical		



	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	53.68	54.00	-0.32	54.89	-1.21	Average	167	207
2	2390.00	70.51	74.00	-3.49	71.72	-1.21	Peak	167	207
3 *	2437.00	95.95			96.97	-1.02	Average	167	207
4 *	2437.00	106.15			107.17	-1.02	Peak	167	207
5	2483.50	47.47	54.00	-6.53	48.33	-0.86	Average	167	207
6	2483.50	68.52	74.00	-5.48	69.38	-0.86	Peak	167	207
7	4874.00	34.07	54.00	-19.93	28.26	5.81	Average	100	90
8	4874.00	47.37	74.00	-26.63	41.56	5.81	Peak	100	90
9	7311.00	38.40	54.00	-15.60	27.45	10.95	Average	100	100
10	7311.00	51.63	74.00	-22.37	40.68	10.95	Peak	100	100

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

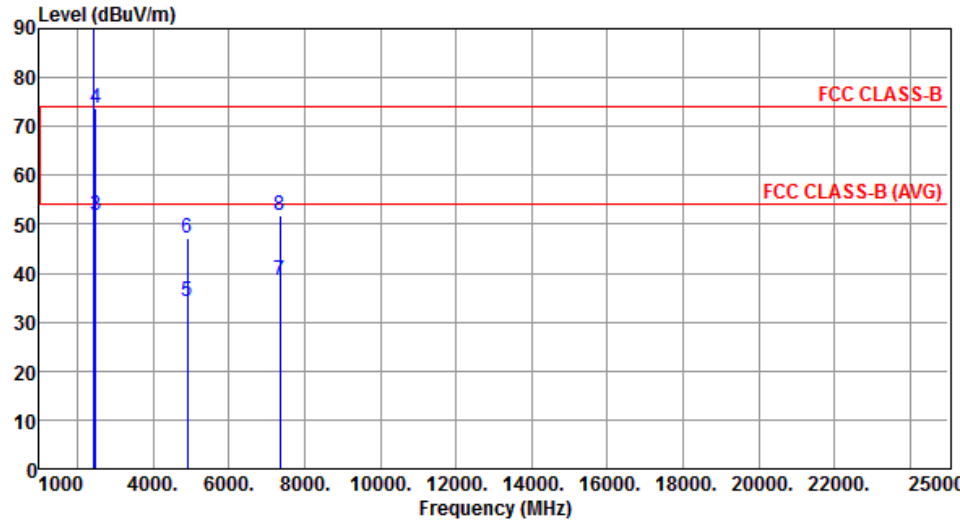
*Factor includes antenna factor , cable loss and amplifier gain

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

Note 3: "*" is Peak / Average value of fundamental frequency

Modulation		HT40			Test Freq. (MHz)		2452			
Polarization		Horizontal								
Level (dBUV/m)										

Modulation	HT40	Test Freq. (MHz)	2452
Polarization	Vertical		



		Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	*	2452.00	92.69			93.66	-0.97	Average	100	213
2	*	2452.00	102.82			103.79	-0.97	Peak	100	213
3		2483.50	51.80	54.00	-2.20	52.66	-0.86	Average	100	213
4		2483.50	73.70	74.00	-0.30	74.56	-0.86	Peak	100	213
5		4904.00	34.14	54.00	-19.86	28.24	5.90	Average	100	80
6		4904.00	47.19	74.00	-26.81	41.29	5.90	Peak	100	80
7		7356.00	38.63	54.00	-15.37	27.49	11.14	Average	100	50
8		7356.00	51.66	74.00	-22.34	40.52	11.14	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).

Note 3: "*" is Peak / Average value of fundamental frequency

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 30 dB relative to the maximum in-band peak PSD level in 100 kHz.

3.6.2 Test Procedures

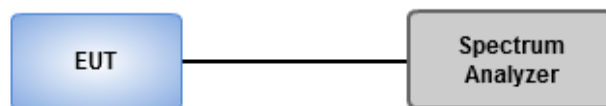
Reference level measurement

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

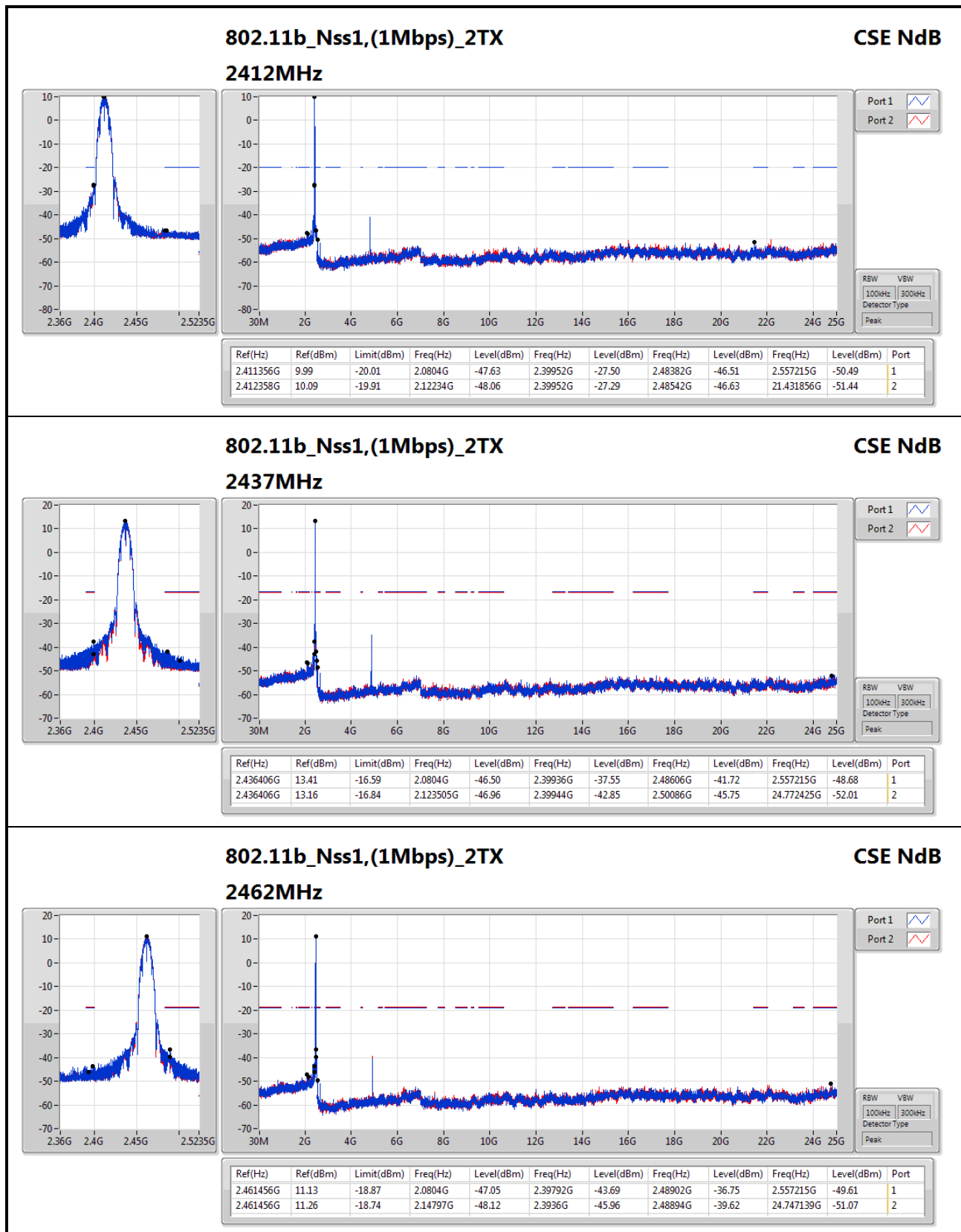
Emission level measurement

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



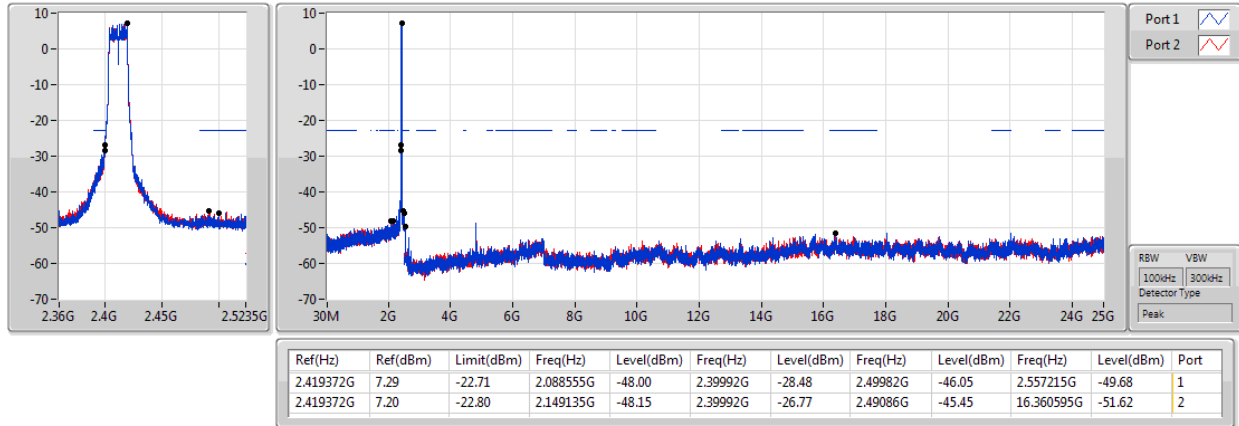
3.6.4 Unwanted Emissions into Non-Restricted Frequency Bands



802.11g_Nss1,(6Mbps)_2TX

CSE NdB

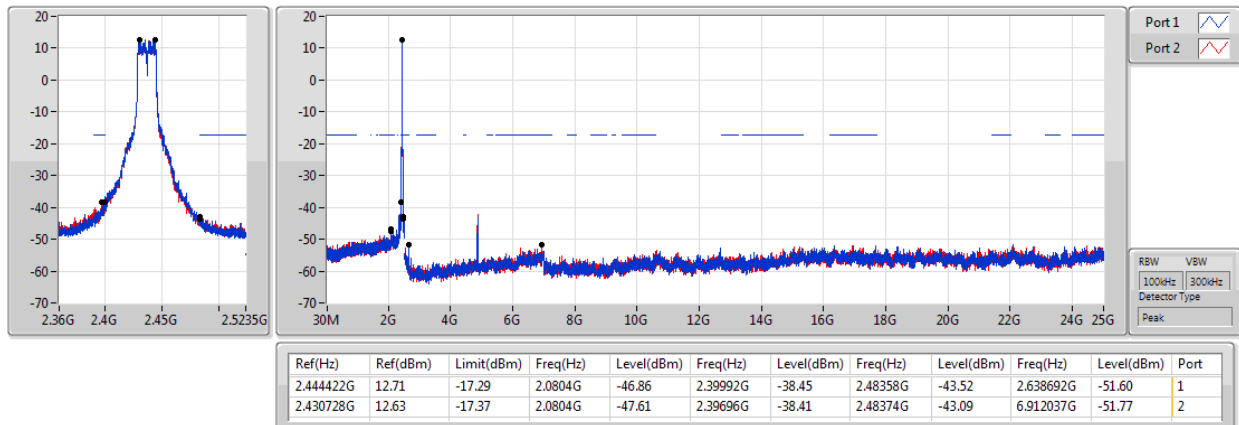
2412MHz



802.11g_Nss1,(6Mbps)_2TX

CSE NdB

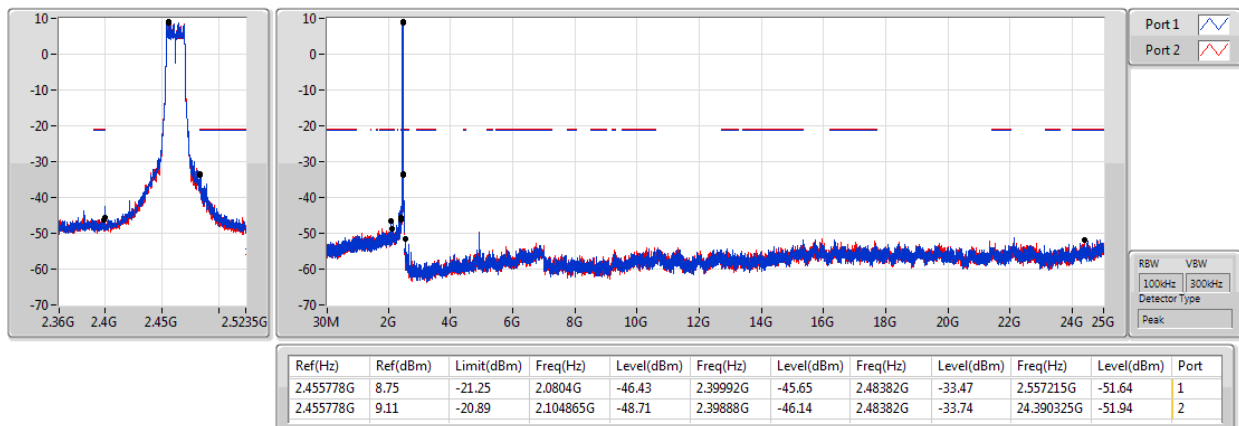
2437MHz



802.11g_Nss1,(6Mbps)_2TX

CSE NdB

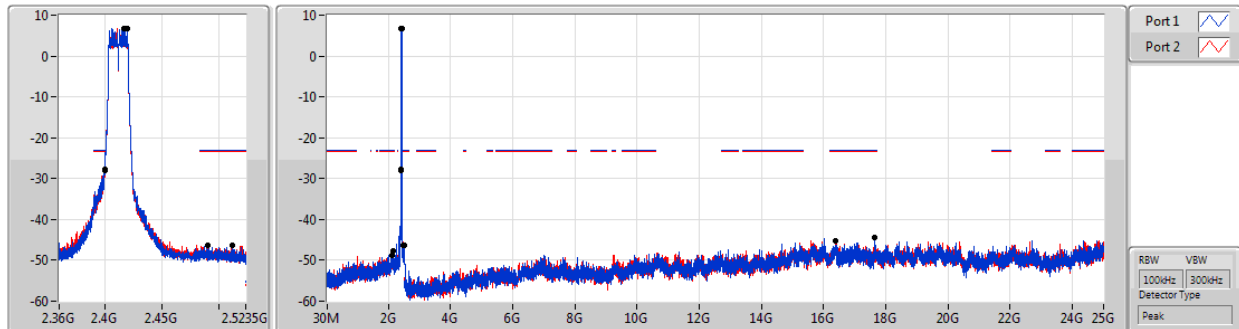
2462MHz



802.11n HT20_Nss1,(MCS0)_2TX

CSE NdB

2412MHz

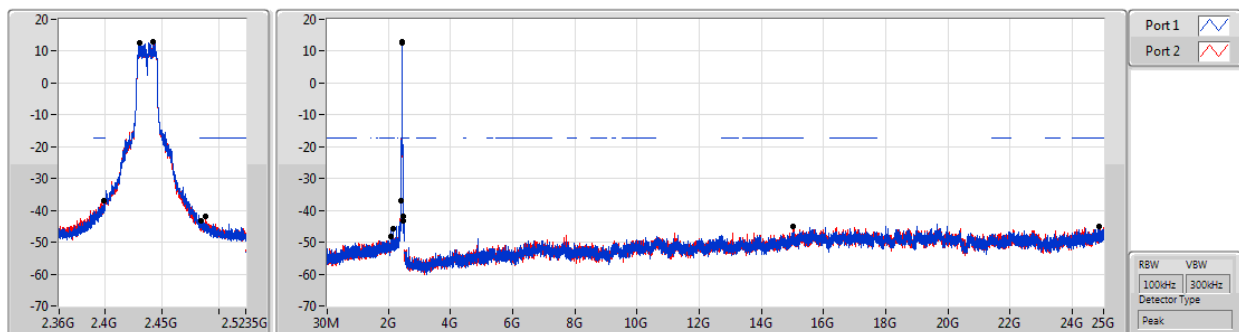


Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.419372G	6.80	-23.20	2.160785G	-47.57	2.39992G	-27.86	2.51206G	-46.26	17.650185G	-44.39	1
2.416867G	6.75	-23.25	2.1037G	-48.70	2.39976G	-28.04	2.49006G	-46.41	16.363405G	-45.23	2

802.11n HT20_Nss1,(MCS0)_2TX

CSE NdB

2437MHz

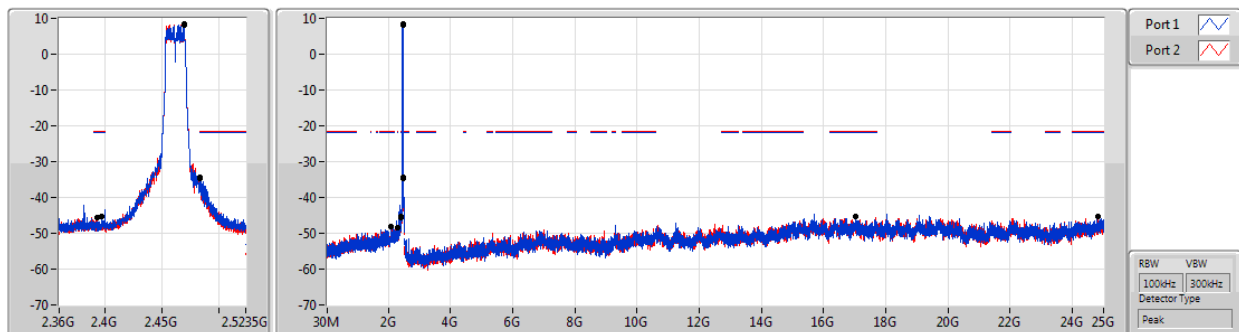


Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.430728G	12.70	-17.30	2.160785G	-45.67	2.3992G	-36.82	2.48478G	-43.26	24.87357G	-45.06	1
2.441917G	12.82	-17.18	2.095545G	-48.18	2.3992G	-37.09	2.48822G	-41.76	15.009196G	-45.07	2

802.11n HT20_Nss1,(MCS0)_2TX

CSE NdB

2462MHz

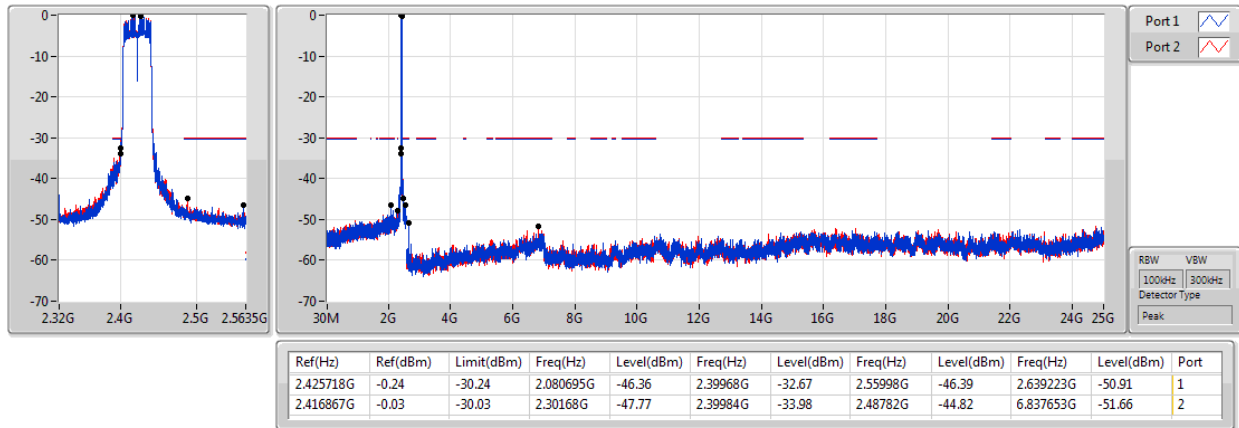


Ref(Hz)	Ref(dBm)	Limit(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Freq(Hz)	Level(dBm)	Port
2.469472G	8.27	-21.73	2.0804G	-48.18	2.39728G	-45.46	2.48382G	-34.25	17.020843G	-45.34	1
2.469472G	8.39	-21.61	2.30874G	-48.38	2.39296G	-45.74	2.48374G	-34.82	24.828617G	-45.37	2

802.11n HT40_Nss1,(MCS0)_2TX

CSE NdB

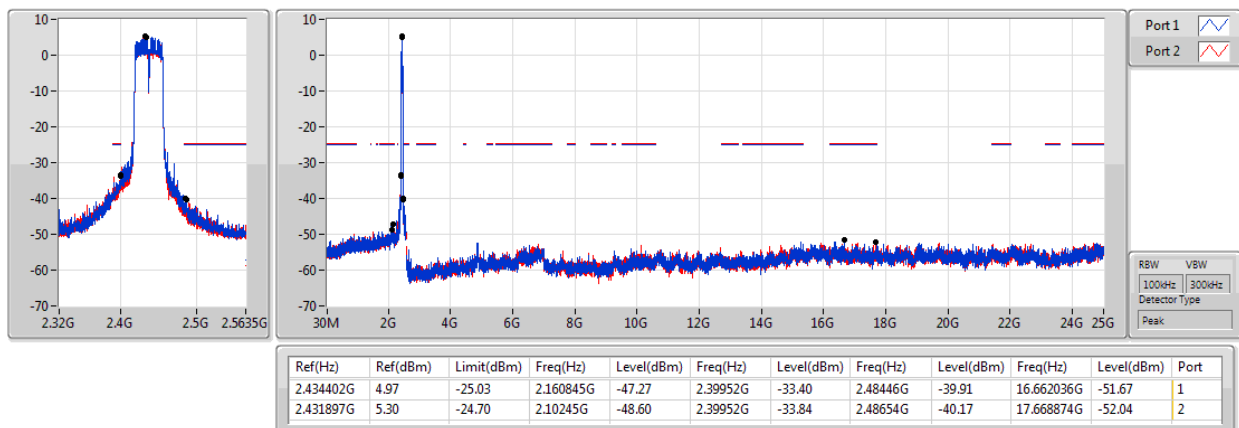
2422MHz



802.11n HT40_Nss1,(MCS0)_2TX

CSE NdB

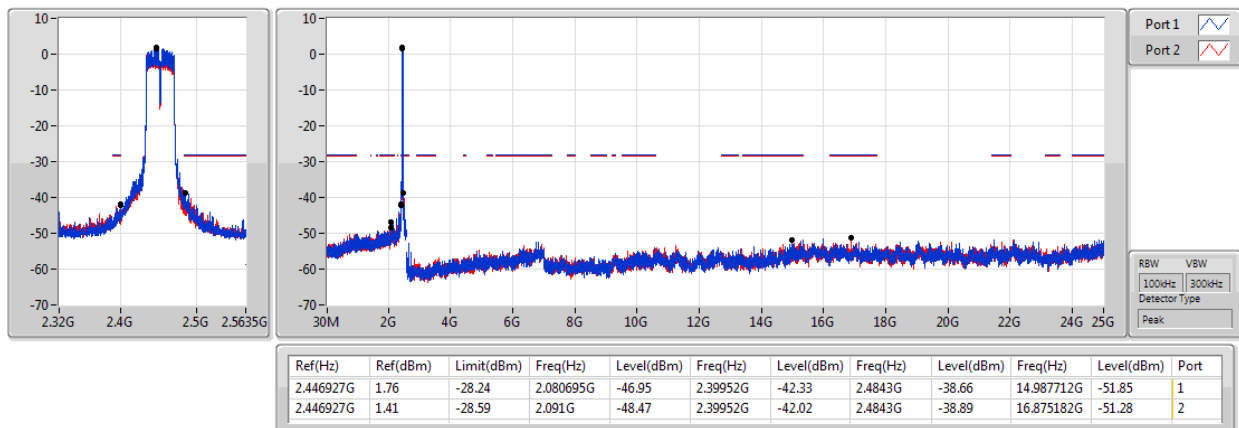
2437MHz



802.11n HT40_Nss1,(MCS0)_2TX

CSE NdB

2452MHz



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

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