

FCC Test Report

FCC ID : NKR-P68
Equipment : Wireless module
Model No. : DHUR-P68
Brand Name : Panasonic
Applicant : Wistron NeWeb Corporation
Address : 20 Park Avenue II, Hsinchu Science Park,
Hsinchu 308,Taiwan,R.O.C.
Standard : 47 CFR FCC Part 15.247
Received Date : Oct. 22, 2019
Tested Date : Oct. 26 ~ Oct. 31, 2019

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
FR9O2201AC	Rev. 01	Initial issue	Nov. 28, 2019

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	Conducted Emissions	[dBuV]: 0.647MHz 45.04 (Margin -10.96dB) - QP	Pass
15.247(d) 15.209	Radiated Emissions	[dBuV/m at 3m]: 2483.50MHz 53.48 (Margin -0.52dB) - AV	Pass
15.247(b)(3)	Maximum Output Power	Max Power [dBm]: 19.64	Pass
15.247(a)(2)	6dB Bandwidth	Meet the requirement of limit	Pass
15.247(e)	Power Spectral Density	Meet the requirement of limit	Pass
15.203	Antenna Requirement	Meet the requirement of limit	Pass

Declaration of Conformity:

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

Comments and Explanations:

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

1 General Description

1.1 Information

1.1.1 Specification of the Equipment under Test (EUT)

RF General Information					
Frequency Range (MHz)	IEEE Std. 802.11	Ch. Freq. (MHz)	Channel Number	Transmit Chains (N _{TX})	Data Rate / MCS
2400-2483.5	b	2412-2462	1-11 [11]	2	1-11 Mbps
2400-2483.5	g	2412-2462	1-11 [11]	2	6-54 Mbps
2400-2483.5	n (HT20)	2412-2462	1-11 [11]	2	MCS 0-15
2400-2483.5	n (HT40)	2422-2452	3-9 [7]	2	MCS 0-15
Note 1: RF output power specifies that Maximum 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	Gain (dBi)
1	ANT0	PIFA	NA	-0.08
2	ANT1	PIFA	NA	0.28

1.1.3 Power Supply Type of Equipment under Test (EUT)

Power Supply Type	5Vdc from host
Hardware Version	v1.0
Software Version	v1.0

1.1.4 Accessories

N/A

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	10	2457
9	2452	11	2462
10	2457	---	---
11	2462	---	---
12	2467	---	---
13	2472	---	---

1.1.6 Test Tool and Duty Cycle

Test Tool	MT7668 QA, Version: 0.0.1.98		
Duty Cycle and Duty Factor	Mode	Duty Cycle (%)	Duty Factor (dB)
	11b	100.00	0.00
	11g	98.48	0.07
	HT20	98.37	0.07
	HT40	96.19	0.17

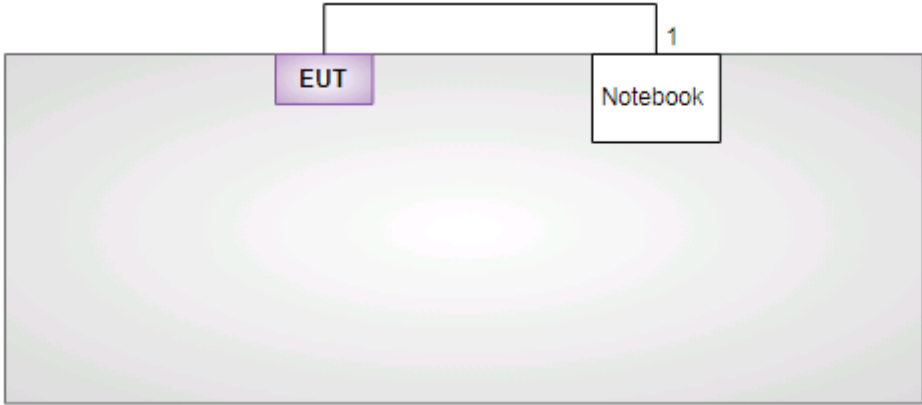
1.1.7 Power Index of Test Tool

Modulation Mode	Test Frequency (MHz)	Power Index
11b	2412	1B
11b	2437	1B
11b	2462	1B
11b	2467	1B
11b	2472	17
11g	2412	1F
11g	2437	1F
11g	2462	1E
11g	2467	17
11g	2472	14
HT20	2412	1F
HT20	2437	21
HT20	2462	1E
HT20	2467	17
HT20	2472	14
HT40	2422	18
HT40	2437	22
HT40	2452	19
HT40	2457	19
HT40	2462	19

1.2 Local Support Equipment List

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

1.3 Test Setup Chart

Test Setup Diagram	
	
No.	Signal cable / Length (m)
1	USB, 1m shielded.

1.4 The Equipment List

Test Item	Conducted Emission				
Test Site	Conduction room 1 / (CO01-WS)				
Tested Date	Oct. 31, 2019				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
Receiver	R&S	ESR3	101657	Jan. 08, 2019	Jan. 07, 2020
LISN	R&S	ENV216	101579	Mar. 08, 2019	Mar. 07, 2020
RF Cable-CON	Woken	CFD200-NL	CFD200-NL-001	Oct. 22, 2019	Oct. 21, 2020
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 chamber1 / (03CH01-WS)				
Tested Date	Oct. 26 ~ Oct. 28, 2019				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV40	101498	Dec. 27, 2018	Dec. 26, 2019
Receiver	R&S	ESR3	101658	Dec. 11, 2018	Dec. 10, 2019
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-522	Jul. 12, 2019	Jul. 11, 2020
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1096	Dec. 18, 2018	Dec. 17, 2019
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Nov. 15, 2018	Nov. 14, 2019
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 09, 2018	Nov. 08, 2019
Loop Antenna Cable	KOAX KABEL	101354-BW	101354-BW	Oct. 07, 2019	Oct. 06, 2020
Preamplifier	EMC	EMC02325	980225	Jul. 09, 2019	Jul. 08, 2020
Preamplifier	Agilent	83017A	MY39501308	Oct. 08, 2019	Oct. 07, 2020
Preamplifier	EMC	EMC184045B	980192	Aug. 01, 2019	Jul. 31, 2020
RF Cable	EMC	EMC104-SM-SM-8000	181106	Oct. 07, 2019	Oct. 06, 2020
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16019/4	Oct. 07, 2019	Oct. 06, 2020
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16014/4	Oct. 07, 2019	Oct. 06, 2020
LF cable 1M	EMC	EMCCFD400-NM-NM-1000	160502	Oct. 07, 2019	Oct. 06, 2020
LF cable 3M	Woken	CFD400NL-LW	CFD400NL-001	Oct. 07, 2019	Oct. 06, 2020
LF cable 10M	Woken	CFD400NL-LW	CFD400NL-002	Oct. 07, 2019	Oct. 06, 2020
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	Oct. 31, 2019				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV40	101063	Apr. 17, 2019	Apr. 16, 2020
Spectrum Analyzer	R&S	FSV40	101499	Jan. 07, 2019	Jan. 06, 2020
TEMP&HUMIDITY CHAMBER	GIANT FORCE	GCT-225-40-SP-SD	MAF1212-002	Dec. 05, 2018	Dec. 04, 2019
Power Meter	Anritsu	ML2495A	1241002	Oct. 23, 2019	Oct. 22, 2020
Power Sensor	Anritsu	MA2411B	1207366	Oct. 23, 2019	Oct. 22, 2020
DC POWER SOURCE	GW INSTEK	GPC-6030D	GES855395	Oct. 29, 2019	Oct. 28, 2020
Measurement Software	Sporton	Sporton_1	1.3.30	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

1.5 Test Standards

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 15.247 Meas Guidance v05r02

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

1.6 Deviation from Test Standard and Measurement Procedure

None

1.7 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	± 34.130 Hz
Conducted power	± 0.808 dB
Power density	± 0.583 dB
Conducted emission	± 2.715 dB
AC conducted emission	± 2.92 dB
Radiated emission ≤ 1 GHz	± 3.41 dB
Radiated emission > 1 GHz	± 4.59 dB

2 Test Configuration

2.1 Testing Condition

Test Item	Test Site	Ambient Condition	Tested By
AC Conduction	CO01-WS	22°C / 58%	Akun Chung
Radiated Emissions	03CH01-WS	24°C / 63%	Mike Shu
RF Conducted	TH01-WS	22°C / 64%	Brad Wu

- 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	Test Configuration
Conducted Emissions	11g	2412	6 Mbps	---
Radiated Emissions ≤1GHz	11g	2412	6 Mbps	---
Radiated Emissions >1GHz	11b	2412 / 2437 / 2462 / 2467 / 2472	1 Mbps	---
Maximum Output Power	11g	2412 / 2437 / 2462 / 2467 / 2472	6 Mbps	
6dB bandwidth	HT20	2412 / 2437 / 2462 / 2467 / 2472	MCS 0	
Power spectral density	HT40	2422 / 2437 / 2452 / 2457 / 2462	MCS 0	
NOTE:				
1. The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement – X, Y, and Z-plane. The Y-plane results were found as the worst case and were shown in this report.				

3 Transmitter Test Results

3.1 Conducted Emissions

3.1.1 Limit of Conducted Emissions

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

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

3.1.2 Test Procedures

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

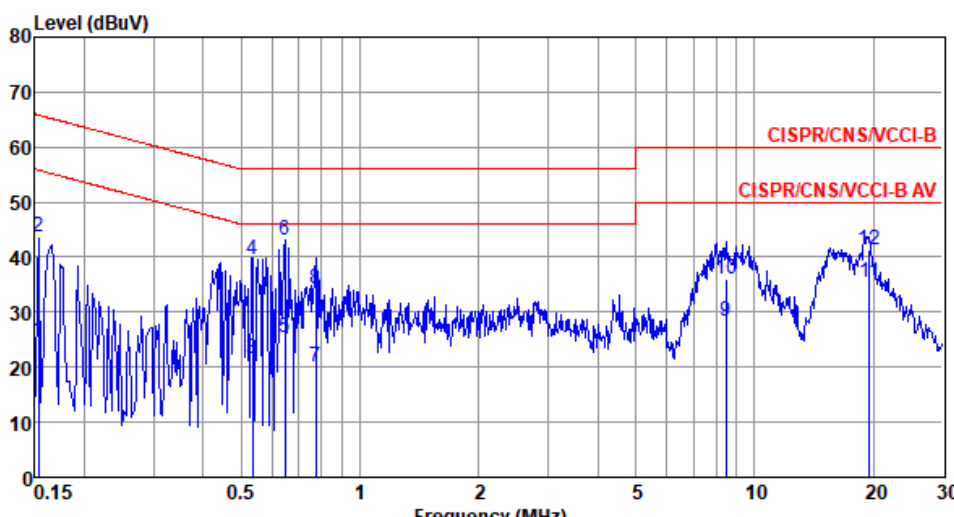
3.1.3 Test Setup



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

3.1.4 Test Result of Conducted Emissions

Modulation	11g	Test Freq. (MHz)	2412
Power Phase	Line		

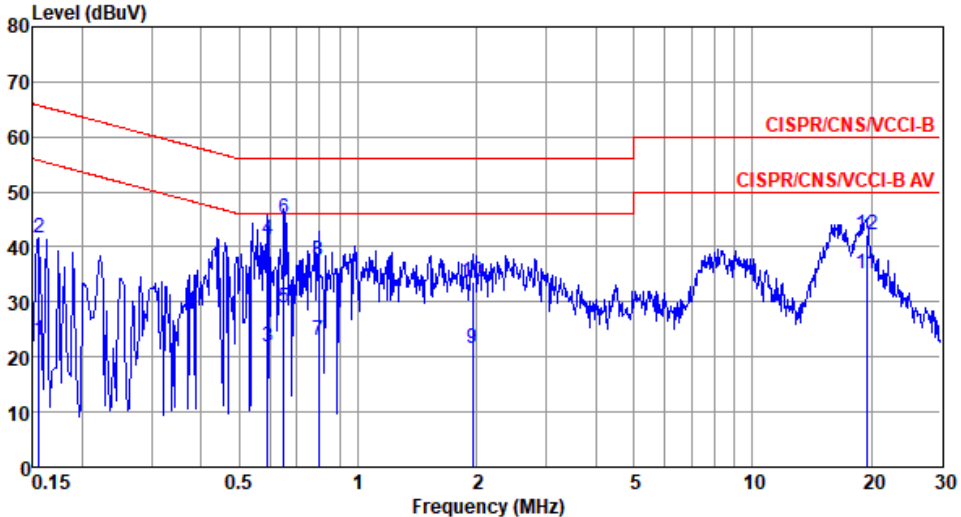


	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	LISN factor dB	cable loss dB	Remark
1	0.153	24.72	55.82	-31.10	15.14	9.53	0.05	Average
2	0.153	43.66	65.82	-22.16	34.08	9.53	0.05	QP
3	0.535	21.61	46.00	-24.39	11.94	9.58	0.09	Average
4	0.535	39.53	56.00	-16.47	29.86	9.58	0.09	QP
5	0.644	25.25	46.00	-20.75	15.56	9.59	0.10	Average
6*	0.644	43.14	56.00	-12.86	33.45	9.59	0.10	QP
7	0.771	19.99	46.00	-26.01	10.29	9.59	0.11	Average
8	0.771	34.27	56.00	-21.73	24.57	9.59	0.11	QP
9	8.456	28.27	50.00	-21.73	18.26	9.64	0.37	Average
10	8.456	36.07	60.00	-23.93	26.06	9.64	0.37	QP
11	19.532	35.57	50.00	-14.43	25.26	9.66	0.65	Average
12	19.532	41.22	60.00	-18.78	30.91	9.66	0.65	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)	2412
Power Phase	Neutral		



	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	LISN factor dB	cable loss dB	Remark
1	0.156	22.97	55.69	-32.72	13.35	9.57	0.05	Average
2	0.156	41.52	65.69	-24.17	31.90	9.57	0.05	QP
3	0.589	21.95	46.00	-24.05	12.23	9.62	0.10	Average
4	0.589	41.28	56.00	-14.72	31.56	9.62	0.10	QP
5	0.647	28.94	46.00	-17.06	19.21	9.63	0.10	Average
6*	0.647	45.04	56.00	-10.96	35.31	9.63	0.10	QP
7	0.796	22.88	46.00	-23.12	13.14	9.63	0.11	Average
8	0.796	37.37	56.00	-18.63	27.63	9.63	0.11	QP
9	1.949	21.63	46.00	-24.37	11.80	9.65	0.18	Average
10	1.949	33.71	56.00	-22.29	23.88	9.65	0.18	QP
11	19.428	35.21	50.00	-14.79	24.75	9.81	0.65	Average
12	19.428	42.24	60.00	-17.76	31.78	9.81	0.65	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

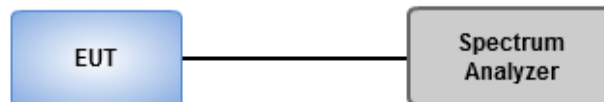
6dB Bandwidth

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	9.058M	13.821M	13M8G1D	8.551M	13.459M
802.11g_Nss1,(6Mbps)_2TX	16.304M	16.498M	16M5D1D	13.841M	16.353M
802.11n HT20_Nss1,(MCS0)_2TX	17.029M	17.656M	17M7D1D	12.899M	17.511M
802.11n HT40_Nss1,(MCS0)_2TX	35.362M	36.324M	36M3D1D	31.449M	36.035M

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

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

Result

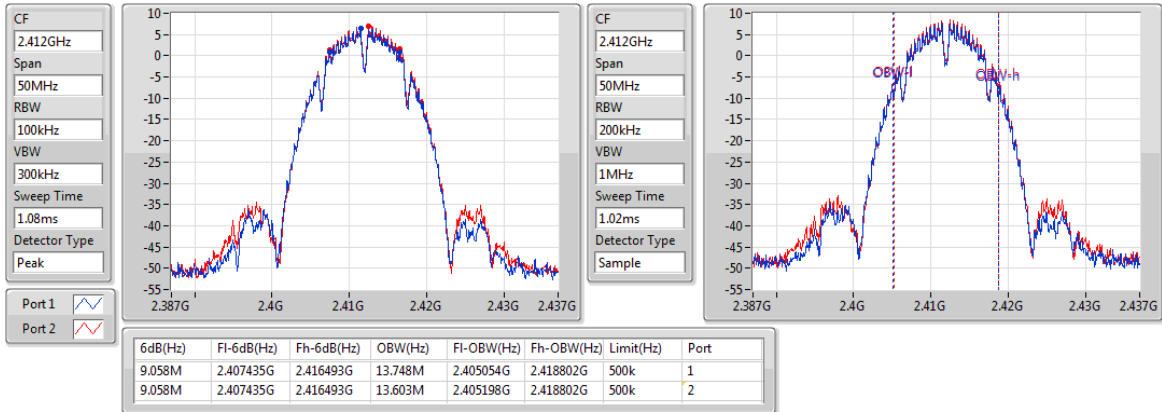
Mode	Result	Limit (Hz)	Port 1-N dB (Hz)	Port 1-OBW (Hz)	Port 2-N dB (Hz)	Port 2-OBW (Hz)
802.11b_Nss1,(1Mbps)_2TX	-	-	-	-	-	-
2412MHz	Pass	500k	9.058M	13.748M	9.058M	13.603M
2437MHz	Pass	500k	9.058M	13.748M	9.058M	13.676M
2462MHz	Pass	500k	8.551M	13.748M	9.058M	13.748M
2467MHz	Pass	500k	9.058M	13.821M	9.058M	13.748M
2472MHz	Pass	500k	9.058M	13.459M	9.058M	13.531M
802.11g_Nss1,(6Mbps)_2TX	-	-	-	-	-	-
2412MHz	Pass	500k	15.072M	16.498M	14.855M	16.353M
2437MHz	Pass	500k	15.217M	16.498M	15M	16.353M
2462MHz	Pass	500k	14.42M	16.498M	15.362M	16.353M
2467MHz	Pass	500k	13.841M	16.498M	15.072M	16.353M
2472MHz	Pass	500k	15.362M	16.425M	16.304M	16.353M
802.11n HT20_Nss1,(MCS0)_2TX	-	-	-	-	-	-
2412MHz	Pass	500k	15.362M	17.511M	15.652M	17.511M
2437MHz	Pass	500k	13.986M	17.656M	15.652M	17.511M
2462MHz	Pass	500k	15.072M	17.583M	16.522M	17.511M
2467MHz	Pass	500k	12.899M	17.511M	15.942M	17.511M
2472MHz	Pass	500k	14.203M	17.511M	17.029M	17.511M
802.11n HT40_Nss1,(MCS0)_2TX	-	-	-	-	-	-
2422MHz	Pass	500k	32.899M	36.035M	35.362M	36.035M
2437MHz	Pass	500k	31.449M	36.324M	34.493M	36.179M
2452MHz	Pass	500k	35.072M	36.035M	34.493M	36.179M
2457MHz	Pass	500k	33.913M	36.035M	35.072M	36.324M
2462MHz	Pass	500k	33.913M	36.035M	33.768M	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

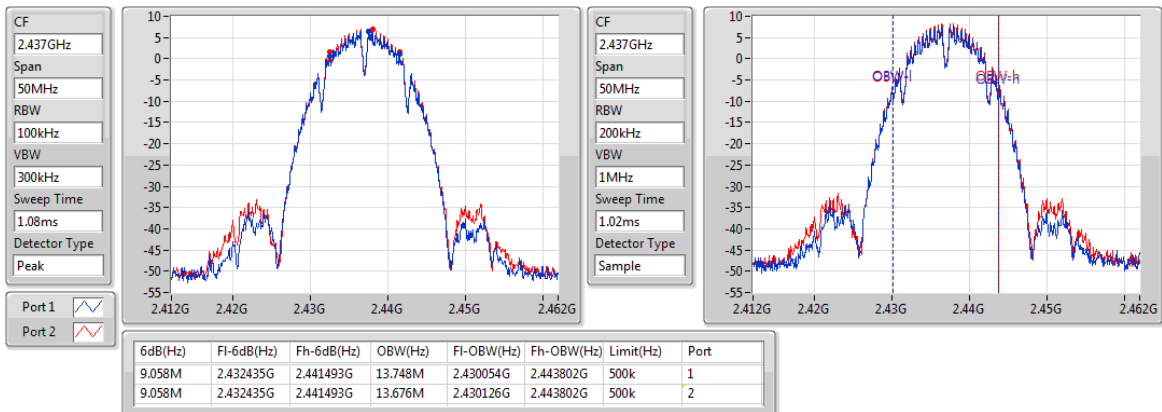
2412MHz



802.11b_Nss1,(1Mbps)_2TX

EBW

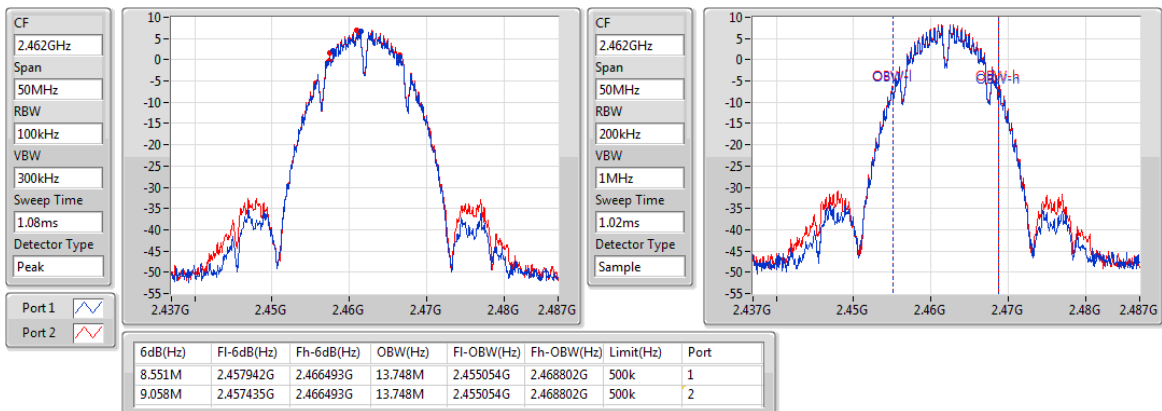
2437MHz



802.11b_Nss1,(1Mbps)_2TX

EBW

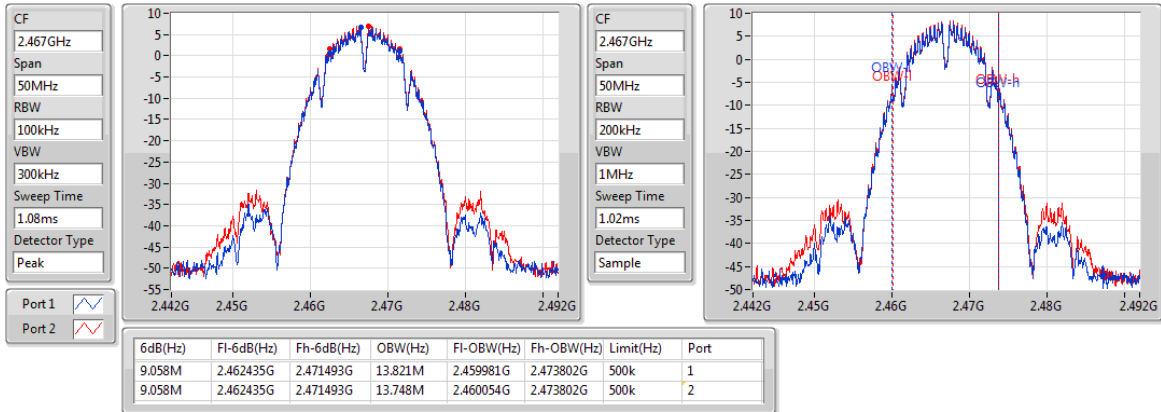
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802.11b_Nss1,(1Mbps)_2TX

EBW

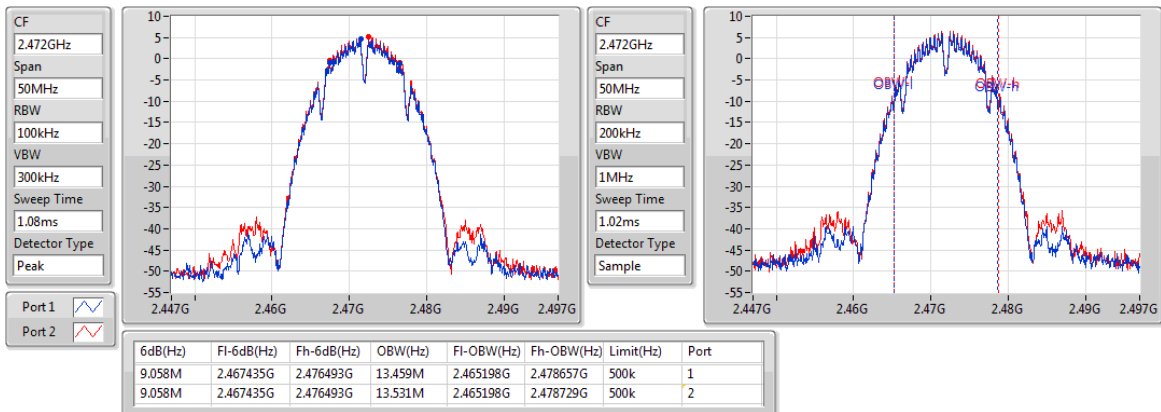
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802.11b_Nss1,(1Mbps)_2TX

EBW

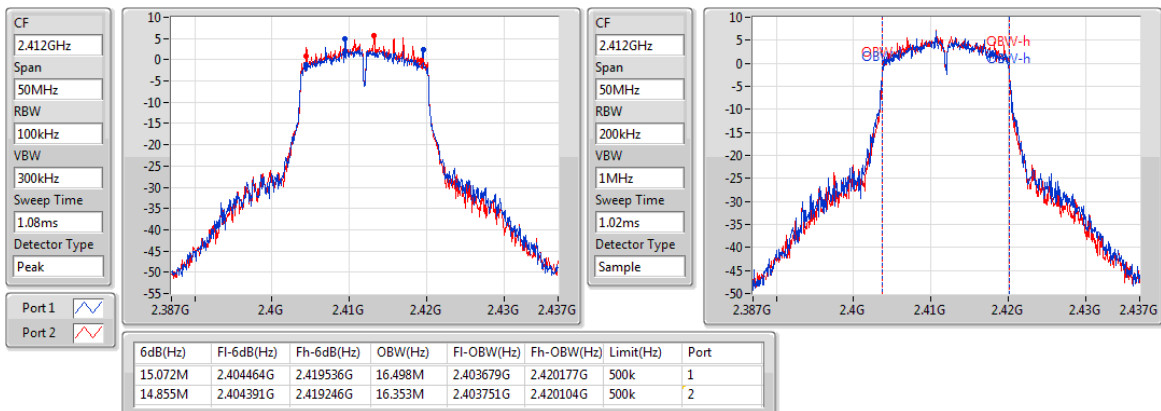
2472MHz



802.11g_Nss1,(6Mbps)_2TX

EBW

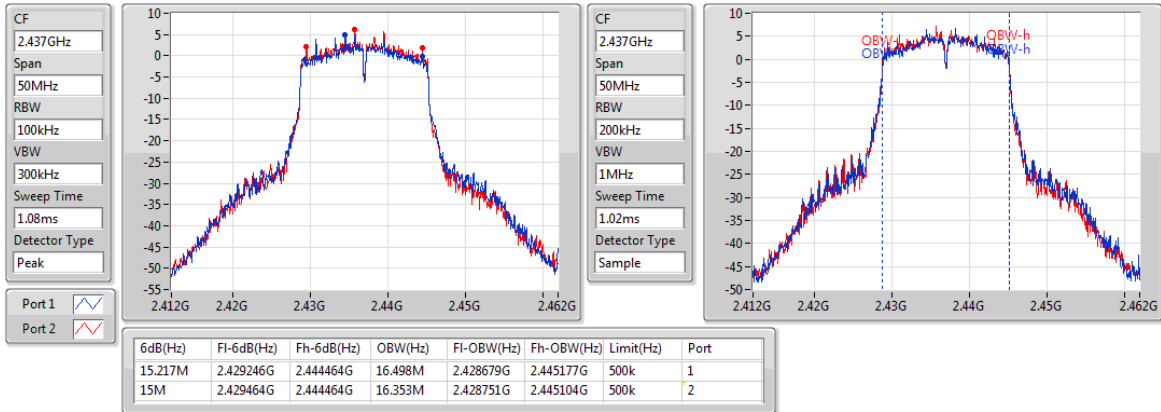
2412MHz



802.11g_Nss1,(6Mbps)_2TX

EBW

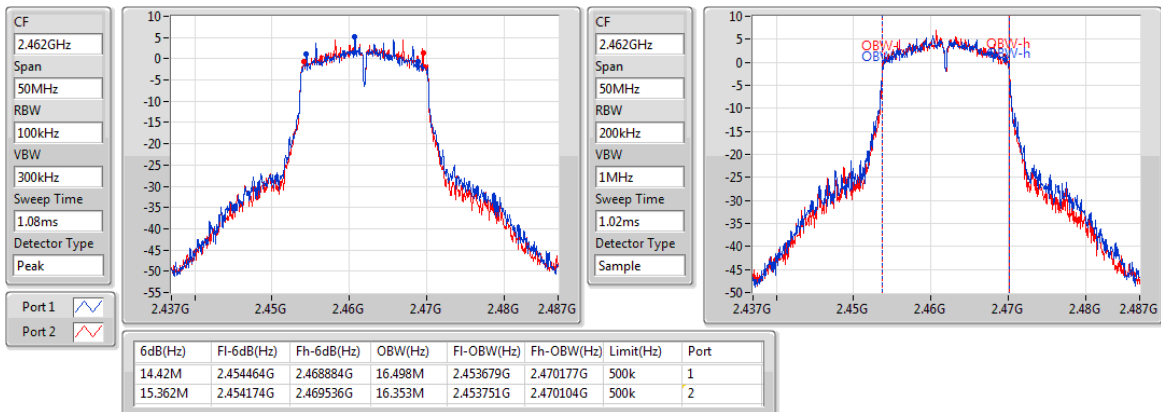
2437MHz



802.11g_Nss1,(6Mbps)_2TX

EBW

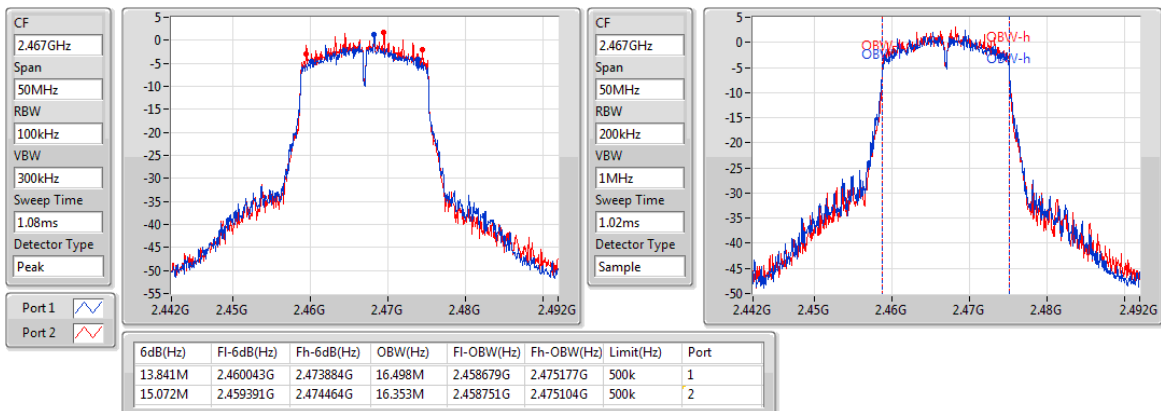
2462MHz



802.11g_Nss1,(6Mbps)_2TX

EBW

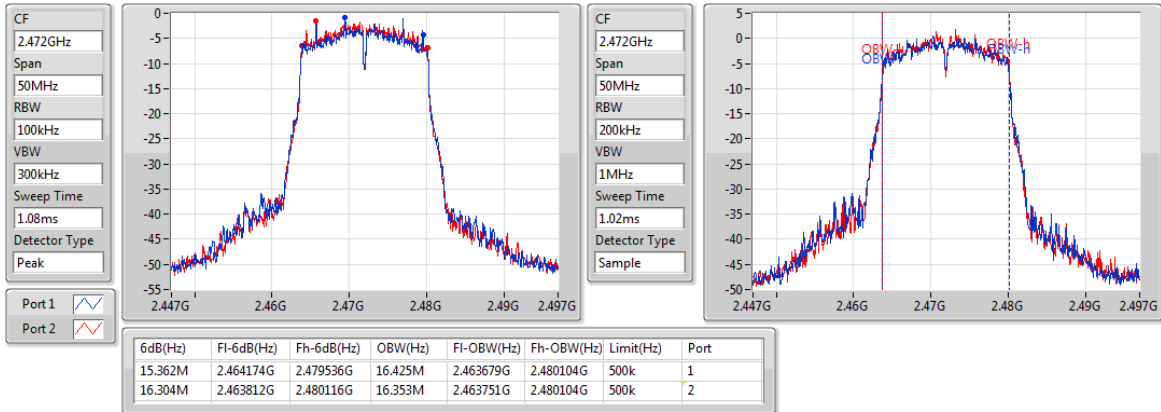
2467MHz



802.11g_Nss1,(6Mbps)_2TX

EBW

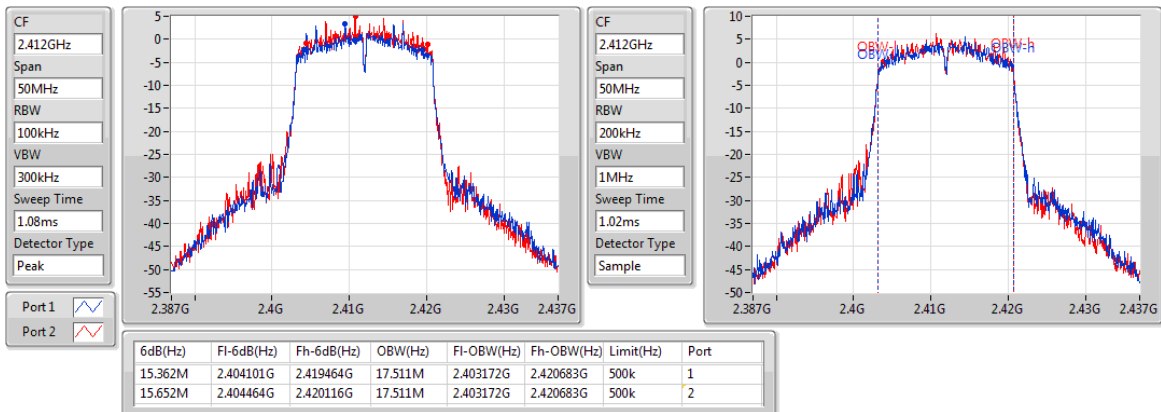
2472MHz



802.11n HT20_Nss1,(MCS0)_2TX

EBW

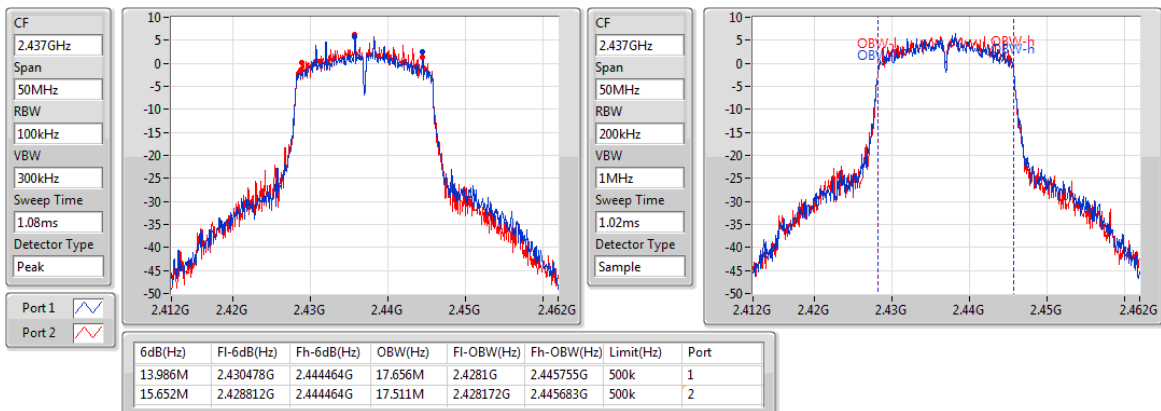
2412MHz



802.11n HT20_Nss1,(MCS0)_2TX

EBW

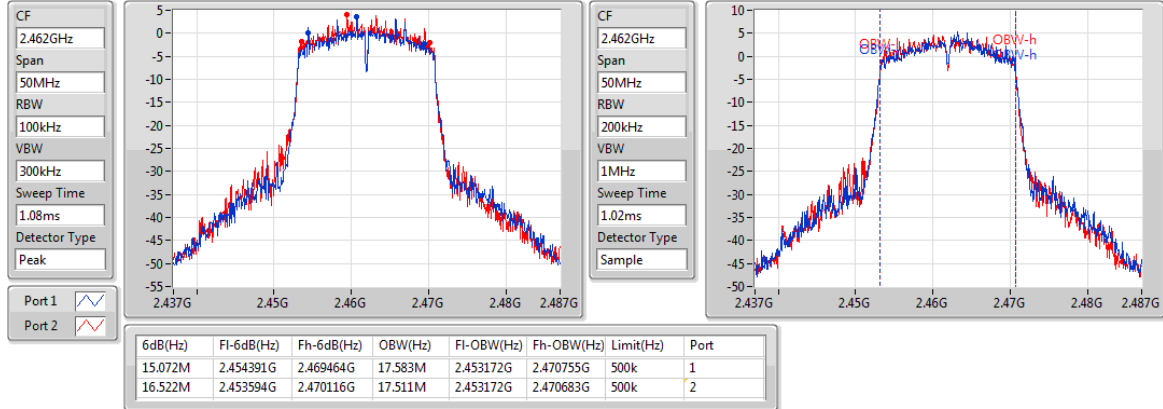
2437MHz



802.11n HT20_Nss1,(MCS0)_2TX

EBW

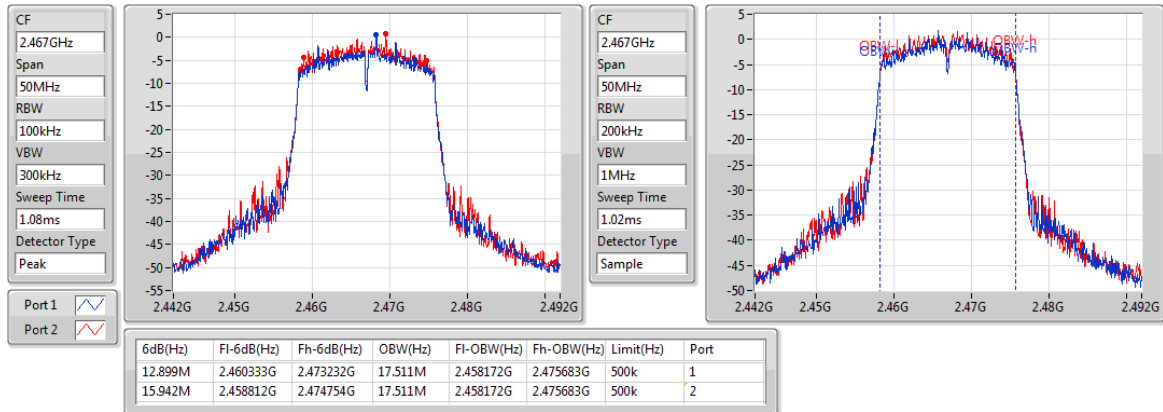
2462MHz



802.11n HT20_Nss1,(MCS0)_2TX

EBW

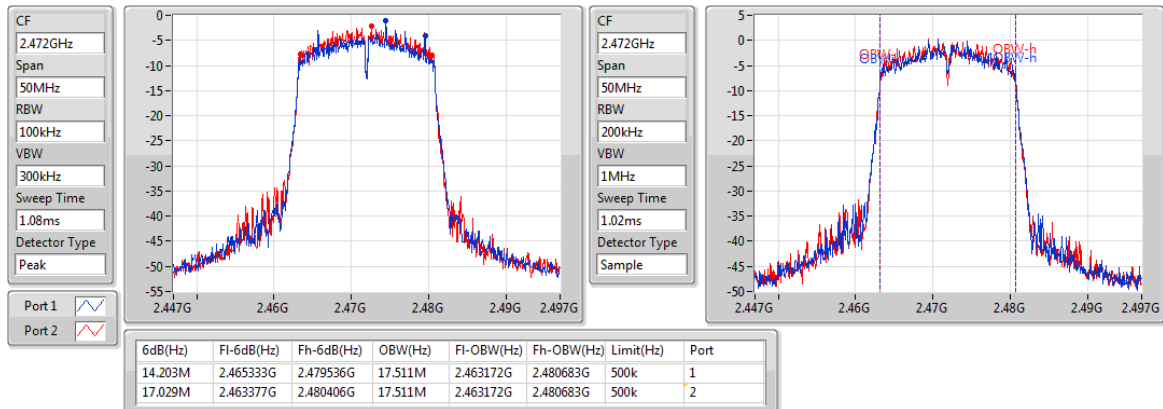
2467MHz



802.11n HT20_Nss1,(MCS0)_2TX

EBW

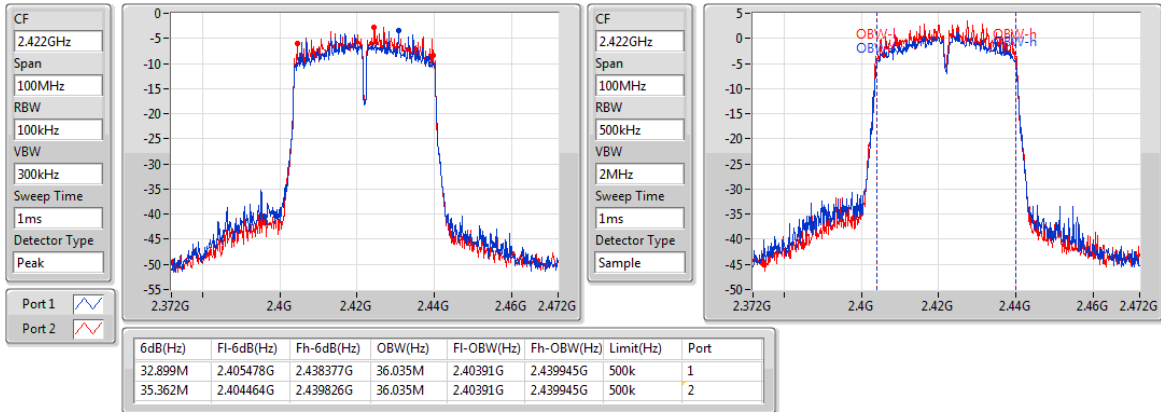
2472MHz



802.11n HT40_Nss1,(MCS0)_2TX

EBW

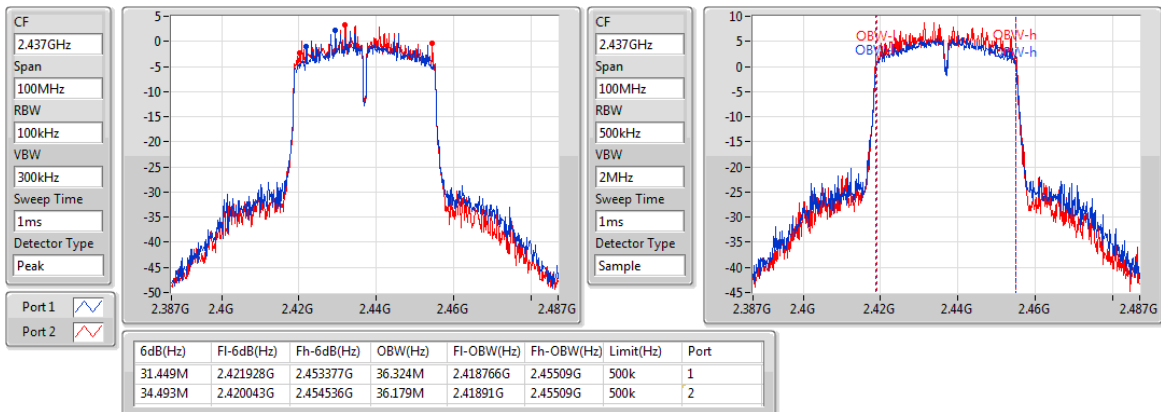
2422MHz



802.11n HT40_Nss1,(MCS0)_2TX

EBW

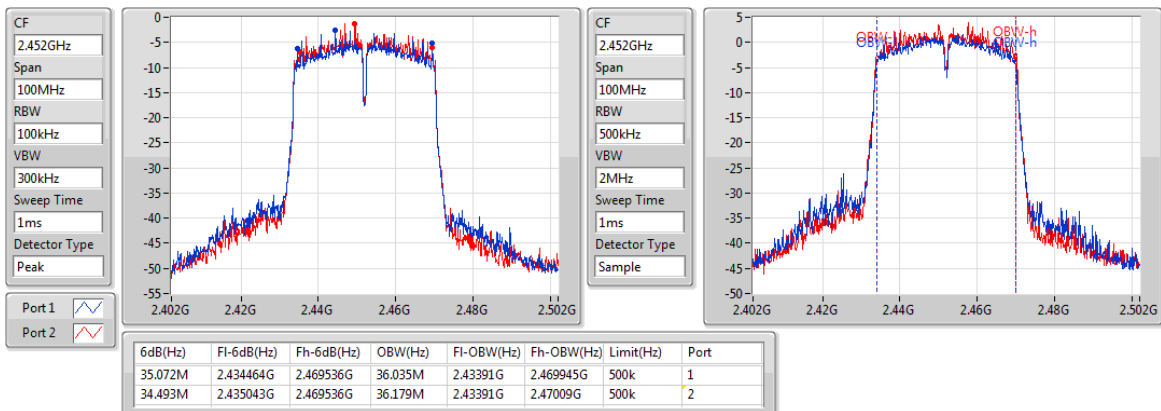
2437MHz



802.11n HT40_Nss1,(MCS0)_2TX

EBW

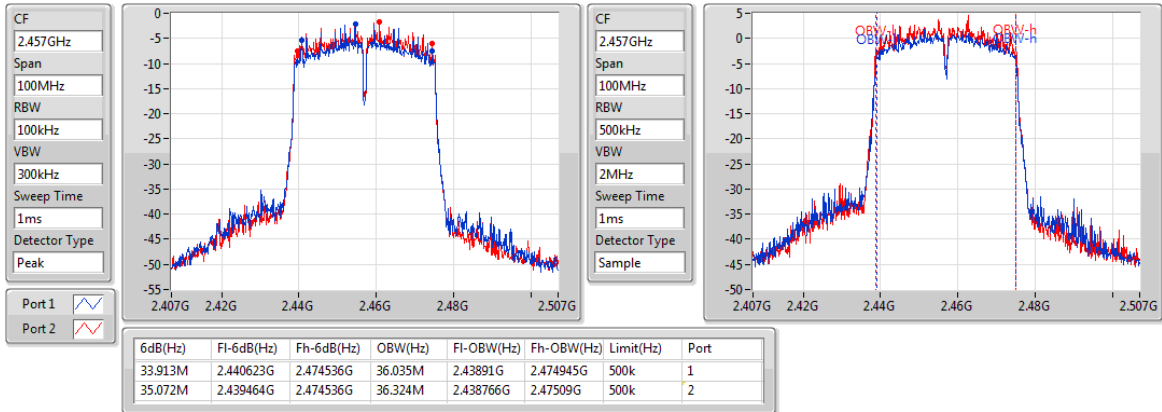
2452MHz



802.11n HT40_Nss1,(MCS0)_2TX

EBW

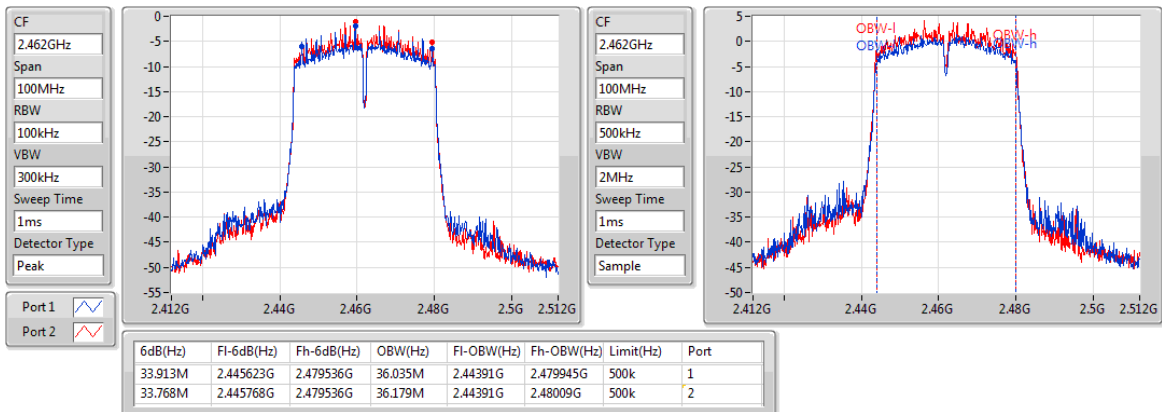
2457MHz



802.11n HT40_Nss1,(MCS0)_2TX

EBW

2462MHz



3.3 RF Output Power

3.3.1 Limit of RF Output Power

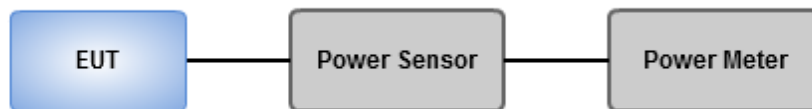
Conducted power shall not exceed 1Watt.

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

Summary

Mode	Total Power (dBm)	Total Power (W)
2.4-2.4835GHz	-	-
802.11b_Nss1,(1Mbps)_2TX	19.60	0.09120
802.11g_Nss1,(6Mbps)_2TX	19.64	0.09204
802.11n HT20_Nss1,(MCS0)_2TX	19.53	0.08974
802.11n HT40_Nss1,(MCS0)_2TX	19.42	0.08750

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	0.28	16.28	16.69	19.50	30.00	19.78	36.00
2437MHz	Pass	0.28	16.32	16.61	19.48	30.00	19.76	36.00
2462MHz	Pass	0.28	16.41	16.59	19.51	30.00	19.79	36.00
2467MHz	Pass	0.28	16.42	16.75	19.60	30.00	19.88	36.00
2472MHz	Pass	0.28	14.49	14.91	17.72	30.00	18.00	36.00
802.11g_Nss1,(6Mbps)_2TX	-	-	-	-	-	-	-	-
2412MHz	Pass	0.28	16.44	16.81	19.64	30.00	19.92	36.00
2437MHz	Pass	0.28	16.29	16.61	19.46	30.00	19.74	36.00
2462MHz	Pass	0.28	16.08	16.33	19.22	30.00	19.50	36.00
2467MHz	Pass	0.28	12.41	12.98	15.71	30.00	15.99	36.00
2472MHz	Pass	0.28	10.83	11.3	14.08	30.00	14.36	36.00
802.11n HT20_Nss1,(MCS0)_2TX	-	-	-	-	-	-	-	-
2412MHz	Pass	0.28	15.51	15.84	18.69	30.00	18.97	36.00
2437MHz	Pass	0.28	16.33	16.71	19.53	30.00	19.81	36.00
2462MHz	Pass	0.28	15.08	15.44	18.27	30.00	18.55	36.00
2467MHz	Pass	0.28	11.36	12.1	14.76	30.00	15.04	36.00
2472MHz	Pass	0.28	9.85	10.54	13.22	30.00	13.50	36.00
802.11n HT40_Nss1,(MCS0)_2TX	-	-	-	-	-	-	-	-
2422MHz	Pass	0.28	11.13	11.47	14.31	30.00	14.59	36.00
2437MHz	Pass	0.28	16.38	16.43	19.42	30.00	19.70	36.00
2452MHz	Pass	0.28	11.66	11.97	14.83	30.00	15.11	36.00
2457MHz	Pass	0.28	11.62	12.05	14.85	30.00	15.13	36.00
2462MHz	Pass	0.28	11.54	12.09	14.83	30.00	15.11	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

Peak PSD

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.

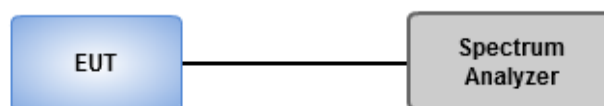
Average PSD, duty cycle $\geq 98\%$

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	-2.30
802.11g_Nss1,(6Mbps)_2TX	-3.89
802.11n HT20_Nss1,(MCS0)_2TX	-3.96
802.11n HT40_Nss1,(MCS0)_2TX	-8.19

Result

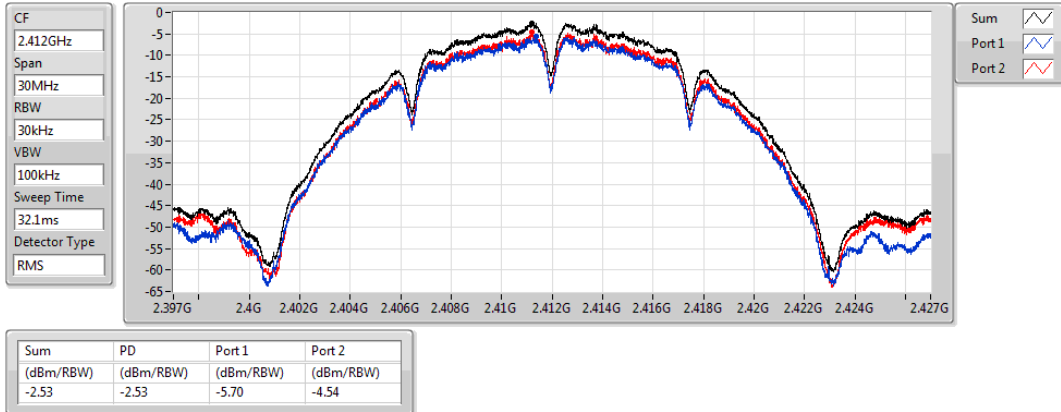
Mode	Result	DG (dBi)	Port 1 (dBm/RBW)	Port 2 (dBm/RBW)	PD (dBm/RBW)	PD Limit (dBm/RBW)
802.11b_Nss1,(1Mbps)_2TX	-	-	-	-	-	-
2412MHz	Pass	3.11	-5.70	-4.54	-2.53	8.00
2437MHz	Pass	3.11	-5.29	-4.81	-2.31	8.00
2462MHz	Pass	3.11	-5.39	-4.60	-2.30	8.00
2467MHz	Pass	3.11	-5.54	-4.61	-2.40	8.00
2472MHz	Pass	3.11	-7.43	-5.96	-4.04	8.00
802.11g_Nss1,(6Mbps)_2TX	-	-	-	-	-	-
2412MHz	Pass	3.11	-6.90	-6.98	-4.09	8.00
2437MHz	Pass	3.11	-6.90	-6.89	-4.33	8.00
2462MHz	Pass	3.11	-6.57	-6.92	-3.89	8.00
2467MHz	Pass	3.11	-10.74	-10.57	-7.93	8.00
2472MHz	Pass	3.11	-12.48	-11.57	-9.44	8.00
802.11n HT20_Nss1,(MCS0)_2TX	-	-	-	-	-	-
2412MHz	Pass	3.11	-8.24	-7.65	-5.14	8.00
2437MHz	Pass	3.11	-7.10	-6.29	-3.96	8.00
2462MHz	Pass	3.11	-8.42	-7.95	-5.71	8.00
2467MHz	Pass	3.11	-12.26	-11.17	-9.04	8.00
2472MHz	Pass	3.11	-13.95	-12.62	-10.62	8.00
802.11n HT40_Nss1,(MCS0)_2TX	-	-	-	-	-	-
2422MHz	Pass	3.11	-16.58	-15.93	-13.28	8.00
2437MHz	Pass	3.11	-11.36	-10.93	-8.19	8.00
2452MHz	Pass	3.11	-15.91	-15.35	-12.73	8.00
2457MHz	Pass	3.11	-15.80	-15.41	-12.72	8.00
2462MHz	Pass	3.11	-15.94	-15.47	-12.78	8.00

PD = trace bin-by-bin of each transmits port summing can be performed maximum power density; **Port X** = Port X power density;
 DG=Directional gain = $10 * \log((10^{-0.08/20} + 10^{0.28/20})^2 / 2) = 3.11$ dBi

802.11b_Nss1,(1Mbps)_2TX

PSD

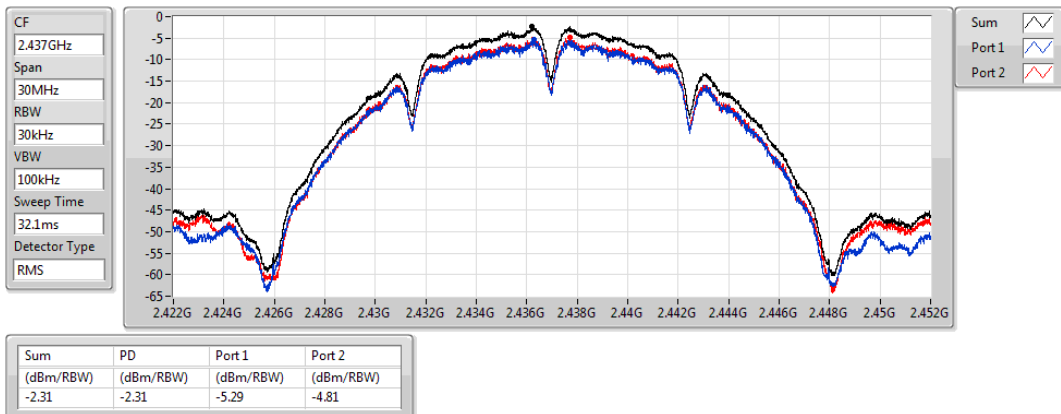
2412MHz



802.11b_Nss1,(1Mbps)_2TX

PSD

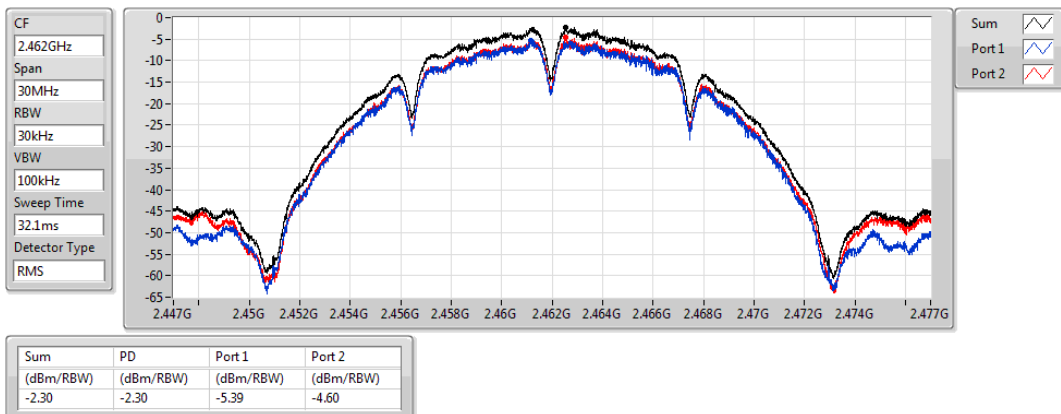
2437MHz



802.11b_Nss1,(1Mbps)_2TX

PSD

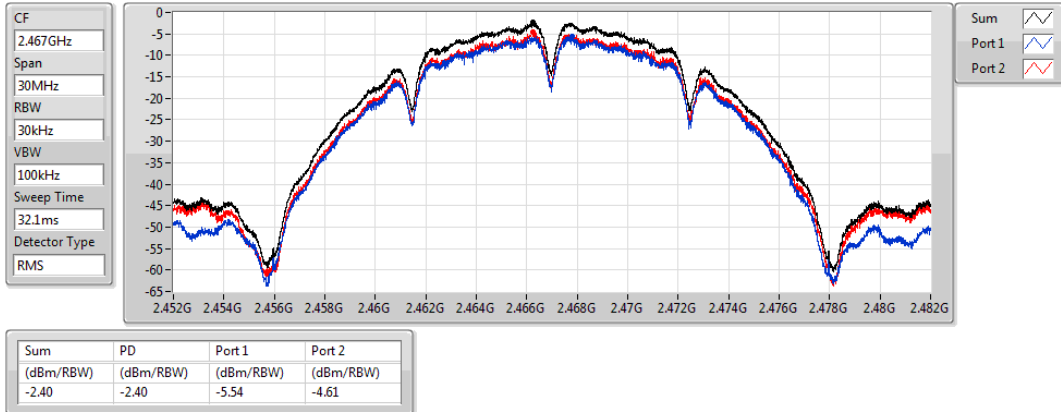
2462MHz



802.11b_Nss1,(1Mbps)_2TX

PSD

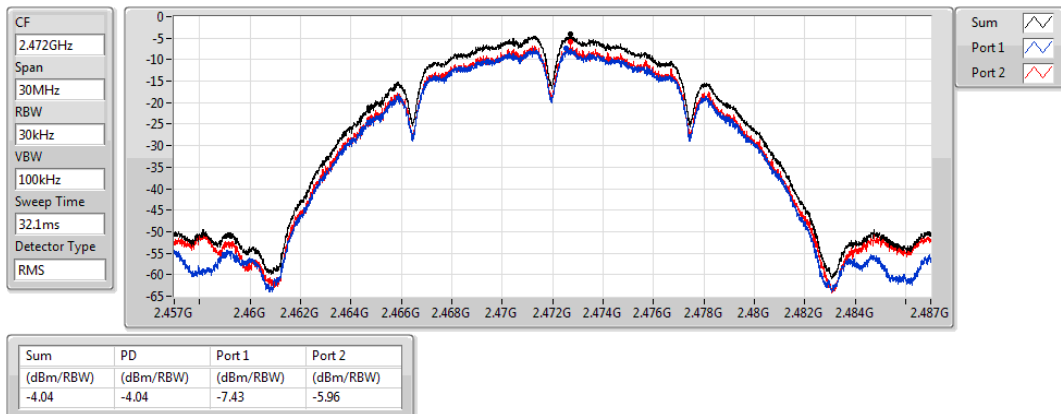
2467MHz



802.11b_Nss1,(1Mbps)_2TX

PSD

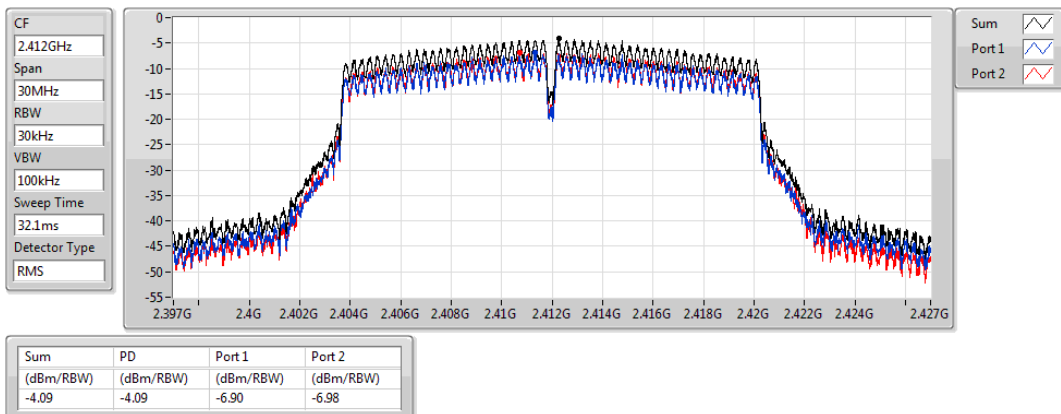
2472MHz



802.11g_Nss1,(6Mbps)_2TX

PSD

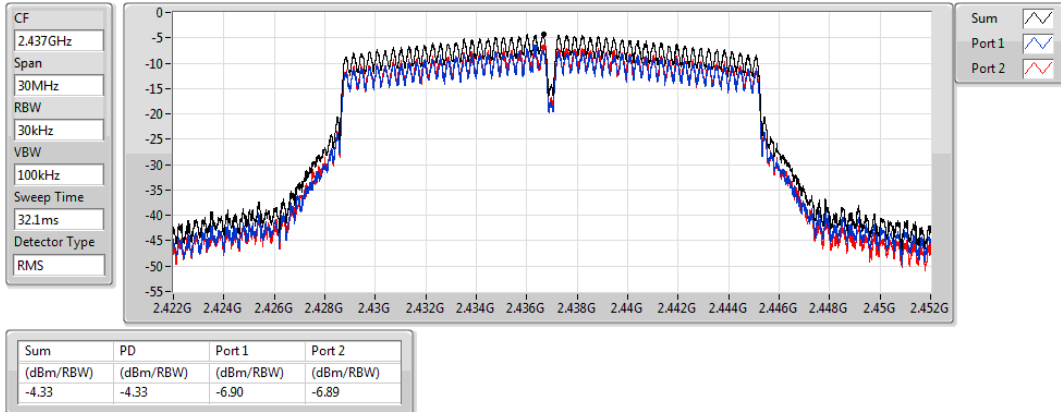
2412MHz



802.11g_Nss1,(6Mbps)_2TX

PSD

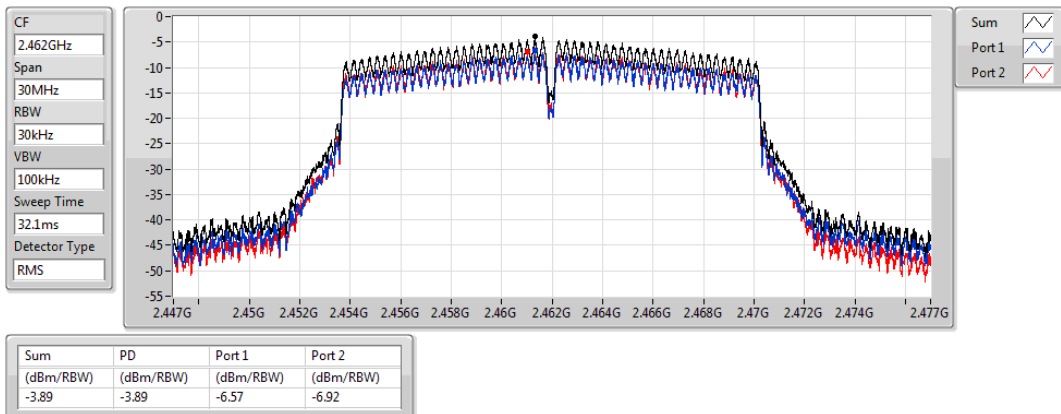
2437MHz



802.11g_Nss1,(6Mbps)_2TX

PSD

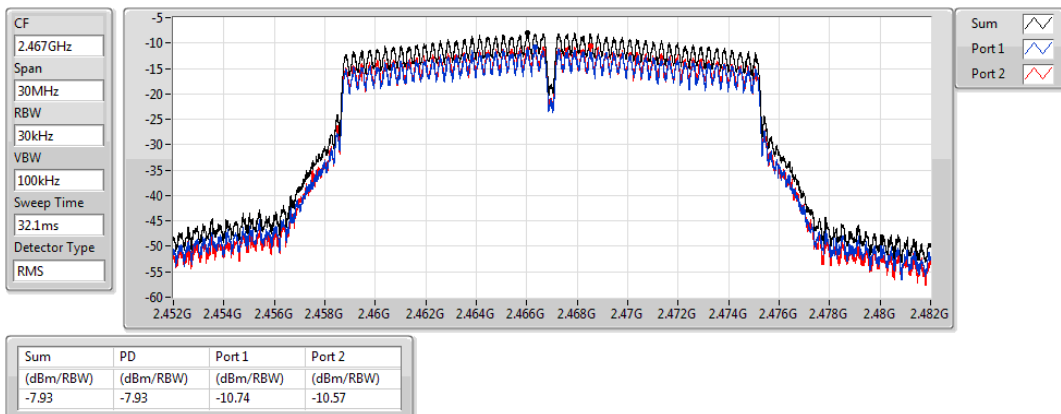
2462MHz



802.11g_Nss1,(6Mbps)_2TX

PSD

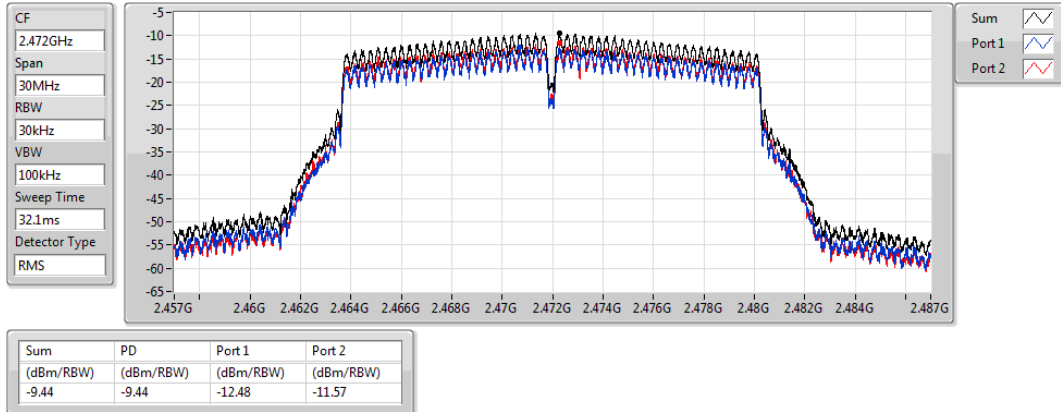
2467MHz



802.11g_Nss1,(6Mbps)_2TX

PSD

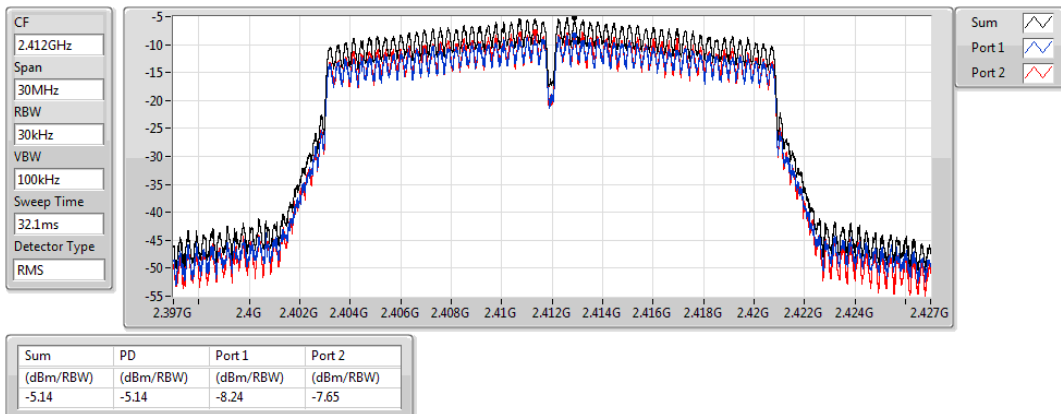
2472MHz



802.11n HT20_Nss1,(MCS0)_2TX

PSD

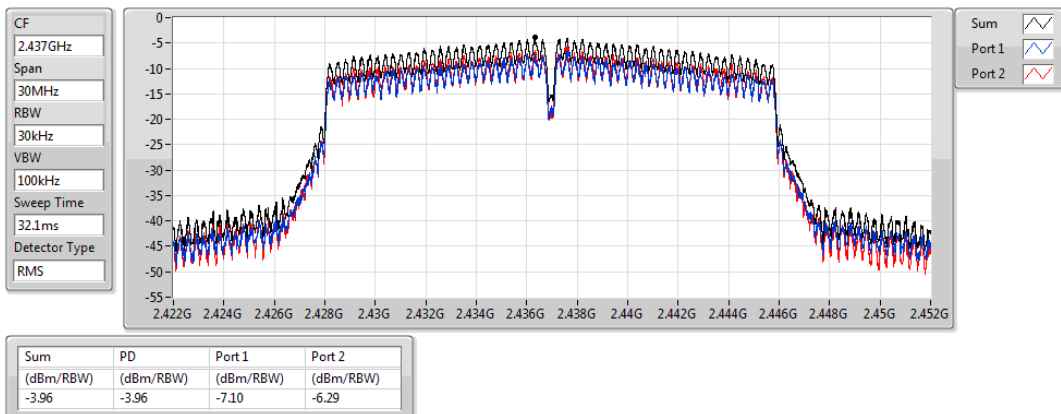
2412MHz



802.11n HT20_Nss1,(MCS0)_2TX

PSD

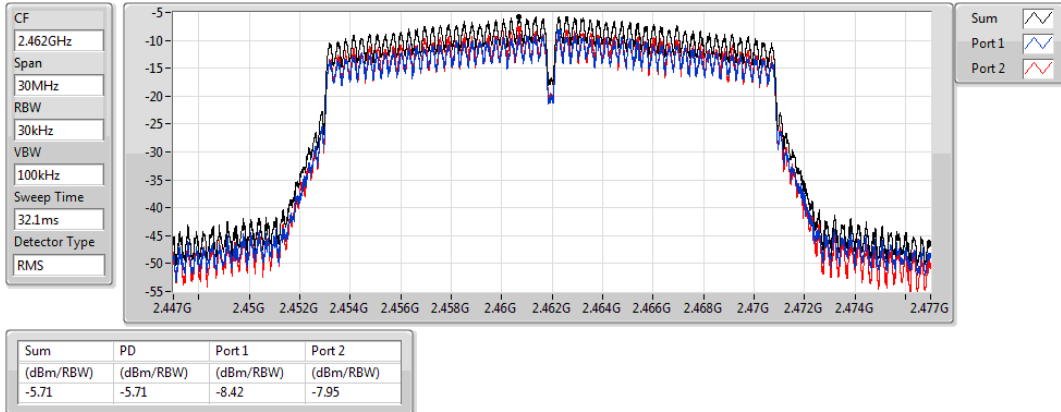
2437MHz



802.11n HT20_Nss1,(MCS0)_2TX

PSD

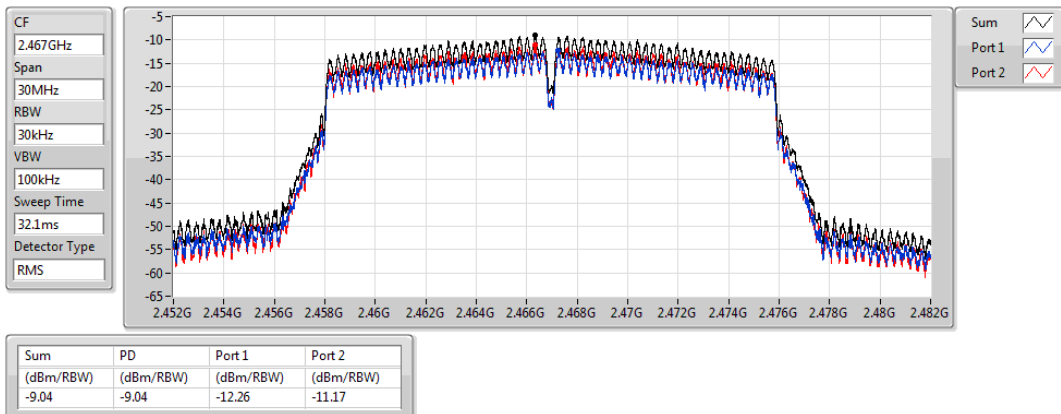
2462MHz



802.11n HT20_Nss1,(MCS0)_2TX

PSD

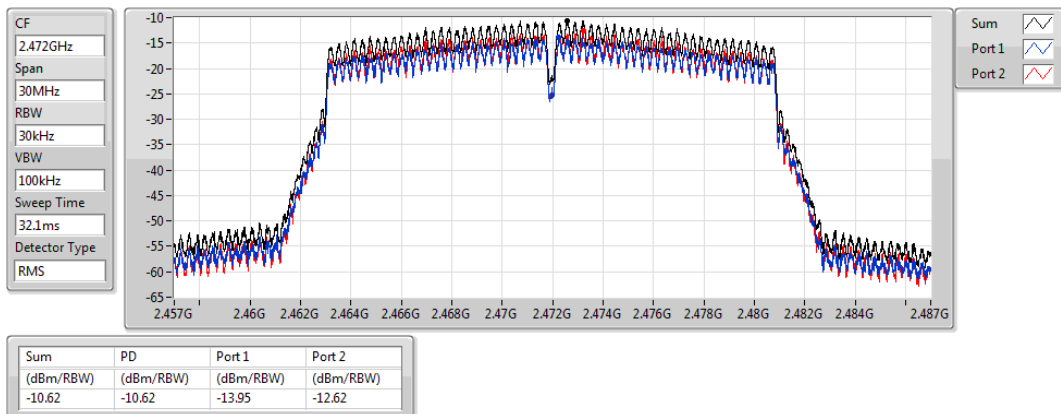
2467MHz



802.11n HT20_Nss1,(MCS0)_2TX

PSD

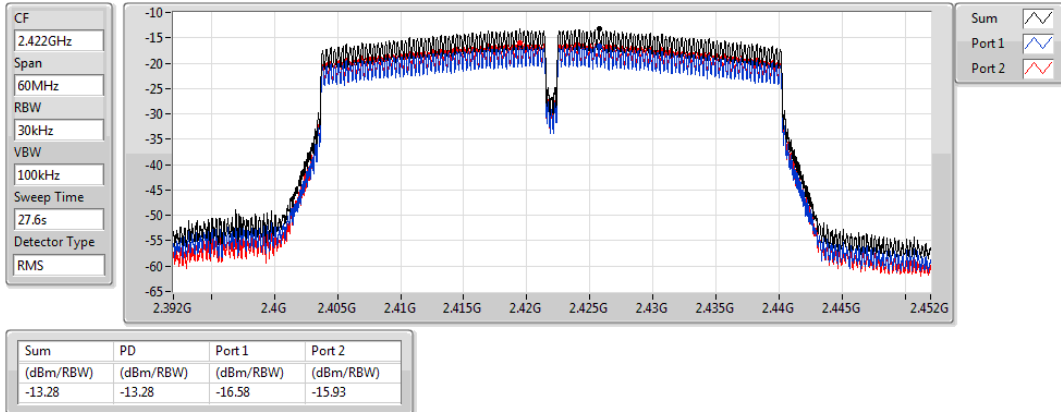
2472MHz



802.11n HT40_Nss1,(MCS0)_2TX

PSD

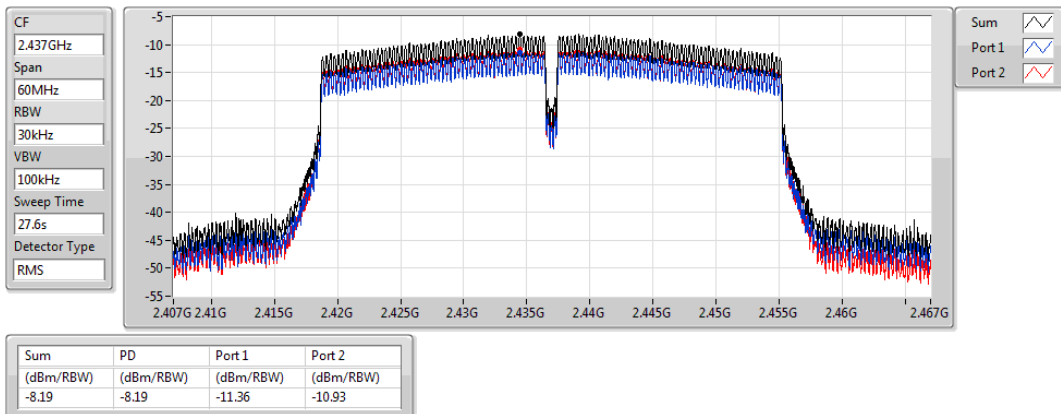
2422MHz



802.11n HT40_Nss1,(MCS0)_2TX

PSD

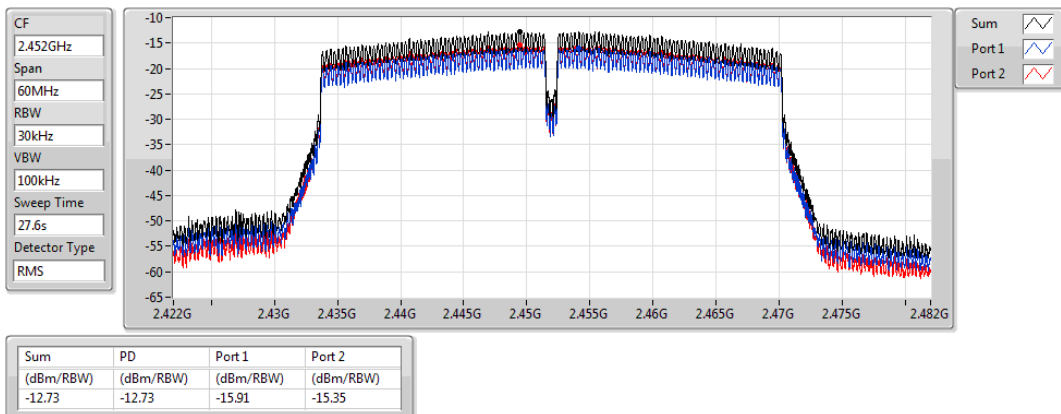
2437MHz



802.11n HT40_Nss1,(MCS0)_2TX

PSD

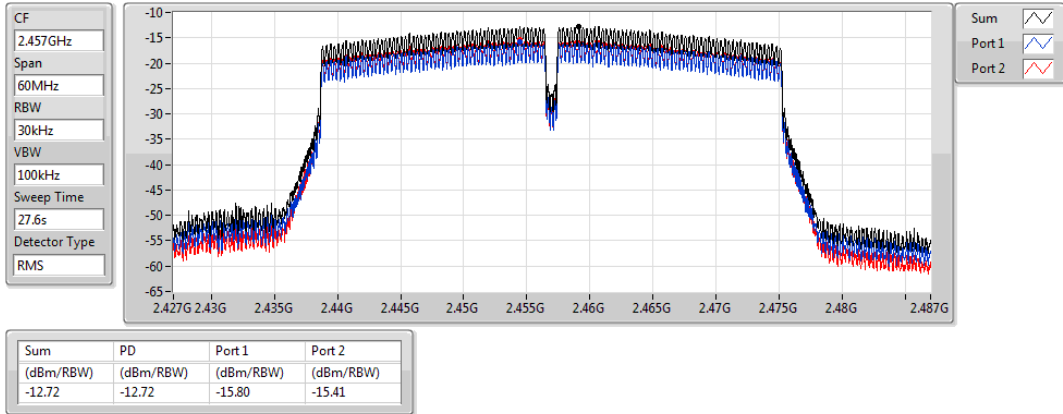
2452MHz



802.11n HT40_Nss1,(MCS0)_2TX

PSD

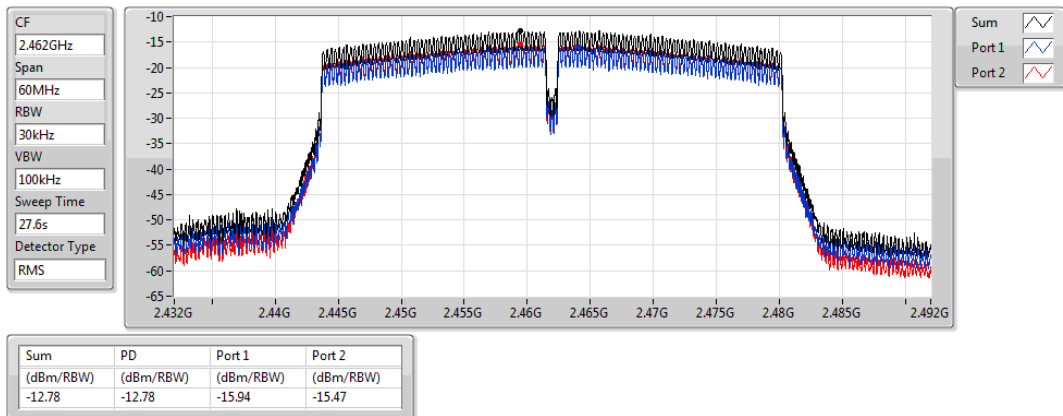
2457MHz



802.11n HT40_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:
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

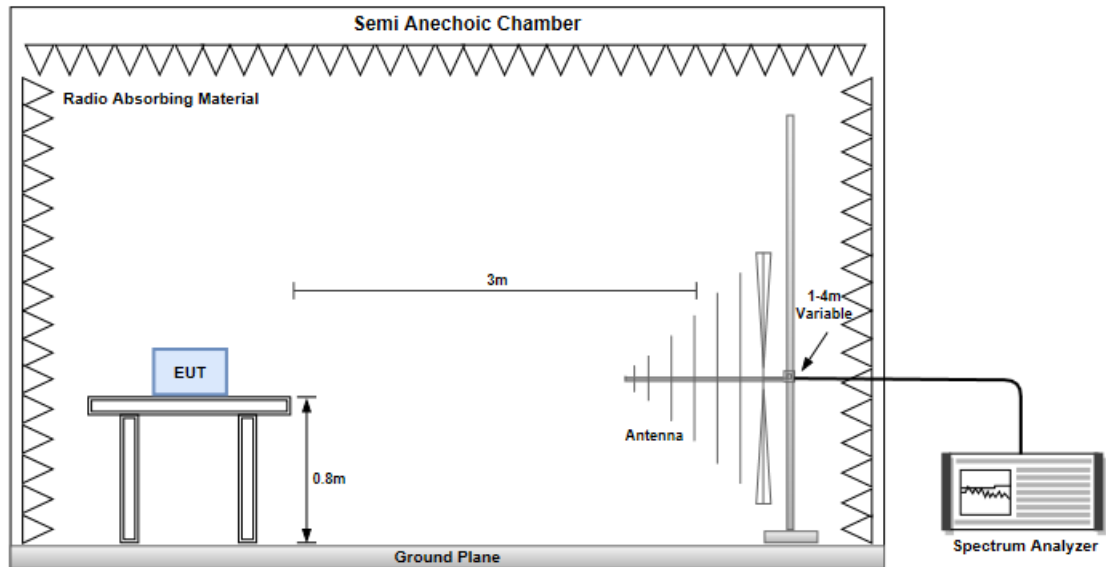
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission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

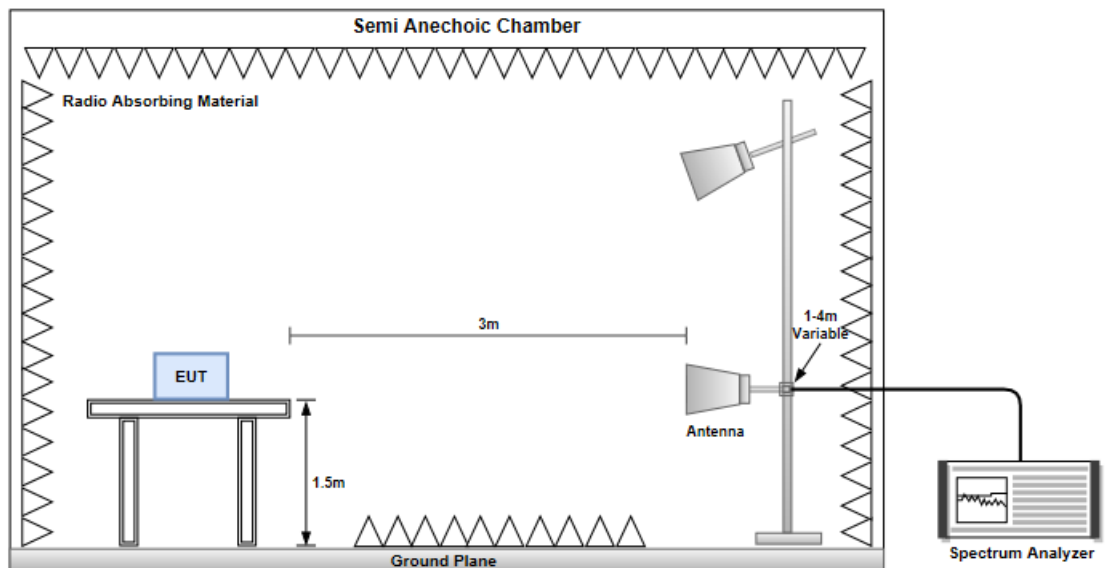
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
3. RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above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

3.5.3 Test Setup

Radiated Emissions below 1 GHz



Radiated Emissions above 1 GHz



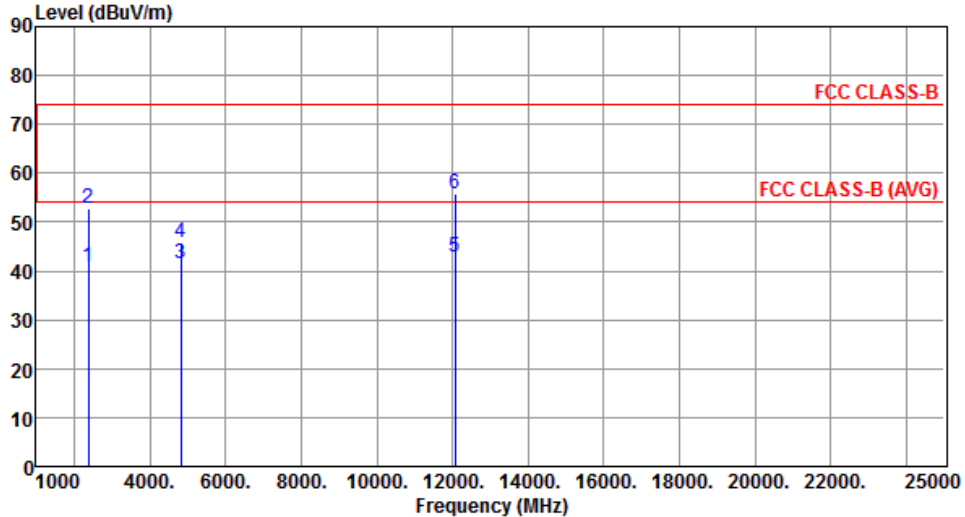
3.5.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)

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

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

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	40.81	54.00	-13.19	43.63	-2.82	Average	251	331
2	2390.00	52.82	74.00	-21.18	55.64	-2.82	Peak	251	331
3	4824.00	41.65	54.00	-12.35	38.10	3.55	Average	162	220
4	4824.00	45.89	74.00	-28.11	42.34	3.55	Peak	162	220
5	12060.00	42.84	54.00	-11.16	29.01	13.83	Average	100	221
6	12060.00	55.81	74.00	-18.19	41.98	13.83	Peak	100	221

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

Modulation	11b	Test Freq. (MHz)	2412
Polarization	Vertical		
Level (dBuV/m) </			

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

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

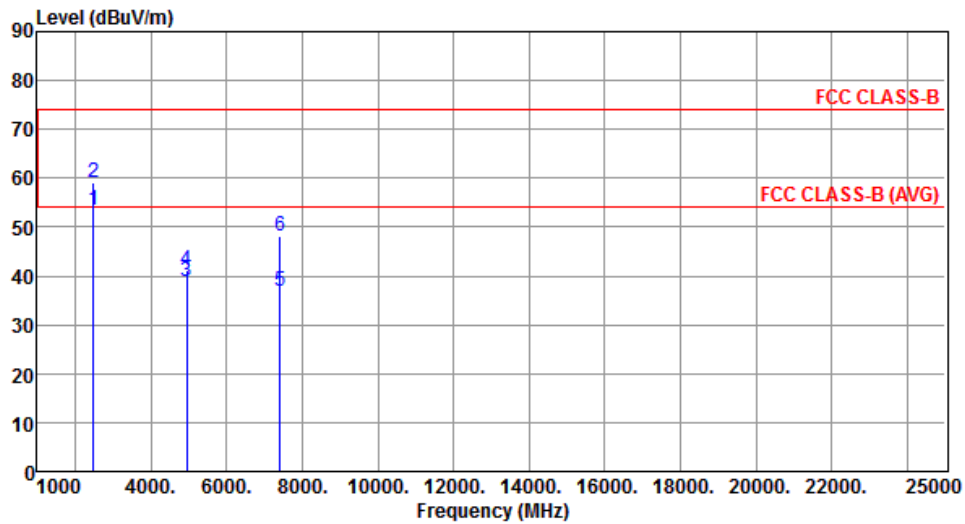
Modulation	11b	Test Freq. (MHz)	2462
Polarization	Horizontal		
Level (dBUV/m) </			

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

Modulation	11b	Test Freq. (MHz)	2467
Polarization	Horizontal		
Level (dBUV/m)			

Modulation	11b	Test Freq. (MHz)	2467
Polarization	Vertical		
Level (dBuV/m) </			

Modulation	11b	Test Freq. (MHz)	2472
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	2483.50	53.48	54.00	-0.52	56.44	-2.96	Average	251	312
2	2483.50	59.02	74.00	-14.98	61.98	-2.96	Peak	251	312
3	4944.00	38.76	54.00	-15.24	35.02	3.74	Average	163	203
4	4944.00	41.08	74.00	-32.92	37.34	3.74	Peak	163	203
5	7416.00	36.76	54.00	-17.24	27.87	8.89	Average	100	356
6	7416.00	48.18	74.00	-25.82	39.29	8.89	Peak	100	356

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

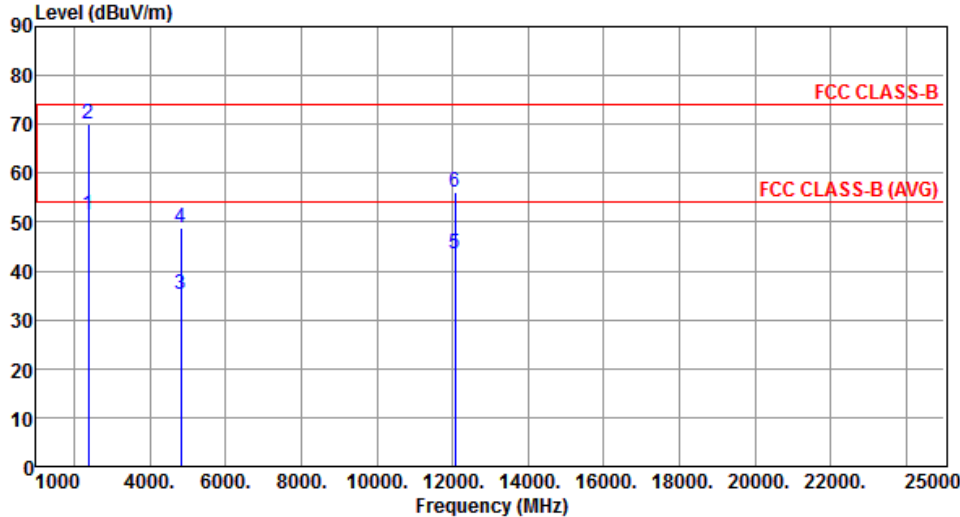
*Factor includes antenna factor , cable loss and amplifier gain

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

Modulation	11b	Test Freq. (MHz)	2472
Polarization	Vertical		
Level (dBuV/m) <			

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

Modulation	11g	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	51.54	54.00	-2.46	54.36	-2.82	Average	253	316
2	2390.00	70.06	74.00	-3.94	72.88	-2.82	Peak	253	316
3	4824.00	35.35	54.00	-18.65	31.80	3.55	Average	205	231
4	4824.00	48.79	74.00	-25.21	45.24	3.55	Peak	205	231
5	12060.00	43.34	54.00	-10.66	29.51	13.83	Average	100	233
6	12060.00	56.08	74.00	-17.92	42.25	13.83	Peak	100	233

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

Modulation	11g	Test Freq. (MHz)	2412
Polarization	Vertical		
Level (dBuV/m) <			

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

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

Modulation	11g	Test Freq. (MHz)	2462
Polarization	Horizontal		
Level (dBuV/m)			

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

Modulation	11g	Test Freq. (MHz)	2467
Polarization	Horizontal		
Level (dBuV/m)			

Modulation	11g	Test Freq. (MHz)	2467
Polarization	Vertical		
Level (dBuV/m)			

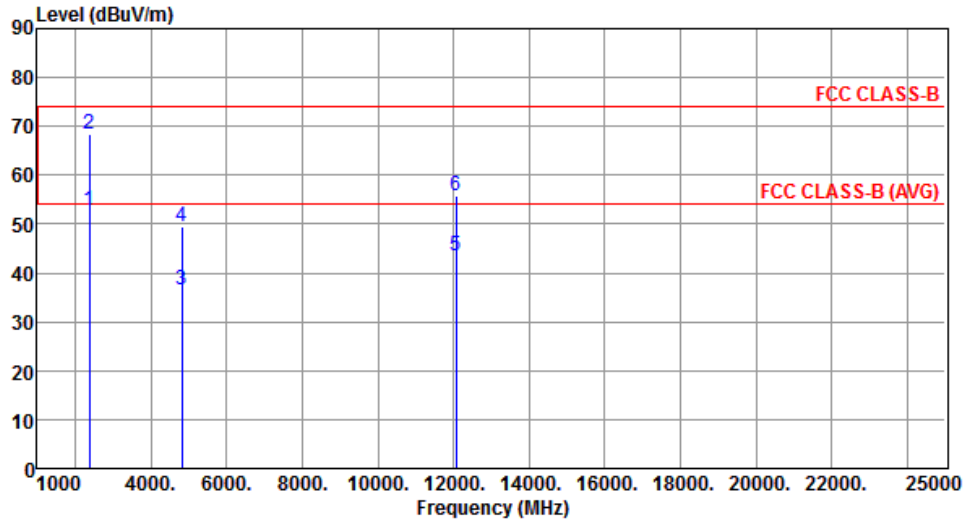
Modulation	11g	Test Freq. (MHz)	2472
Polarization	Horizontal		
Level (dBuV/m)			

Modulation	11g	Test Freq. (MHz)	2472
Polarization	Vertical		
Level (dBuV/m) </			

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

Modulation	HT20	Test Freq. (MHz)	2412
Polarization	Horizontal		
Level (dBuV/m)			

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	52.95	54.00	-1.05	55.77	-2.82	Average	100	23
2	2390.00	68.28	74.00	-5.72	71.10	-2.82	Peak	100	23
3	4824.00	36.50	54.00	-17.50	32.95	3.55	Average	126	93
4	4824.00	49.43	74.00	-24.57	45.88	3.55	Peak	126	93
5	12060.00	43.46	54.00	-10.54	29.63	13.83	Average	100	96
6	12060.00	55.93	74.00	-18.07	42.10	13.83	Peak	100	96

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

*Factor includes antenna factor , cable loss and amplifier gain

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

Modulation	HT20	Test Freq. (MHz)	2437
Polarization	Horizontal		
Level (dBUV/m) <			

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

Modulation	HT20	Test Freq. (MHz)	2462
Polarization	Horizontal		
Level (dBuV/m) <			

Modulation	HT20	Test Freq. (MHz)	2462
Polarization	Vertical		
Level (dBuV/m)			

Modulation	HT20	Test Freq. (MHz)	2467
Polarization	Horizontal		
Level (dBuV/m) </			

Modulation	HT20	Test Freq. (MHz)	2467
Polarization	Vertical		
Level (dBuV/m)			

Modulation	HT20	Test Freq. (MHz)	2472
Polarization	Horizontal		
Level (dBuV/m)			

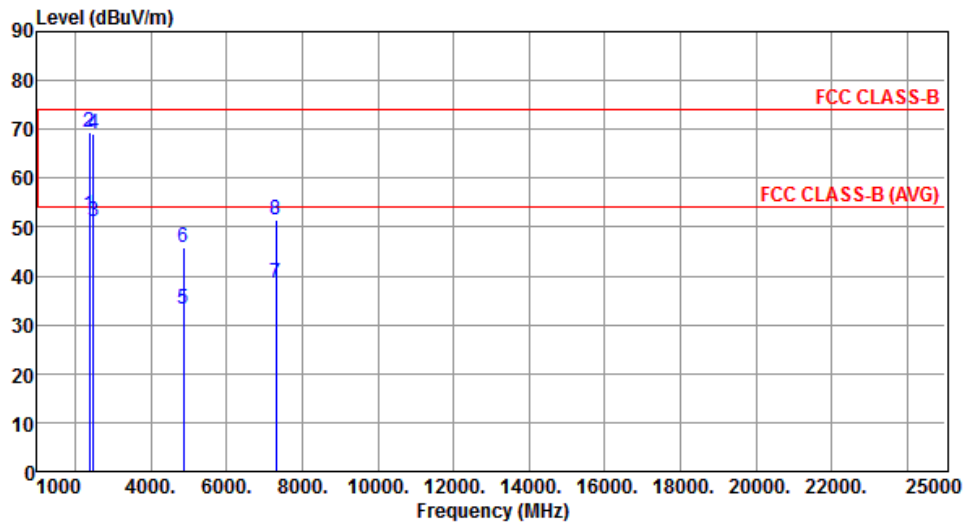
Modulation	HT20	Test Freq. (MHz)	2472
Polarization	Vertical		
Level (dBuV/m)			

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

Modulation	HT40	Test Freq. (MHz)	2422
Polarization	Horizontal		
Level (dBuV/m) </			

Modulation	HT40	Test Freq. (MHz)	2422
Polarization	Vertical		
Level (dBuV/m) <			

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	52.55	54.00	-1.45	55.37	-2.82	Average	111	323
2	2390.00	69.28	74.00	-4.72	72.10	-2.82	Peak	111	323
3	2483.50	51.26	54.00	-2.74	54.22	-2.96	Average	230	325
4	2483.50	68.92	74.00	-5.08	71.88	-2.96	Peak	230	325
5	4874.00	33.20	54.00	-20.80	29.61	3.59	Average	100	232
6	4874.00	45.73	74.00	-28.27	42.14	3.59	Peak	100	232
7	7311.00	38.48	54.00	-15.52	29.29	9.19	Average	100	225
8	7311.00	51.43	74.00	-22.57	42.24	9.19	Peak	100	225

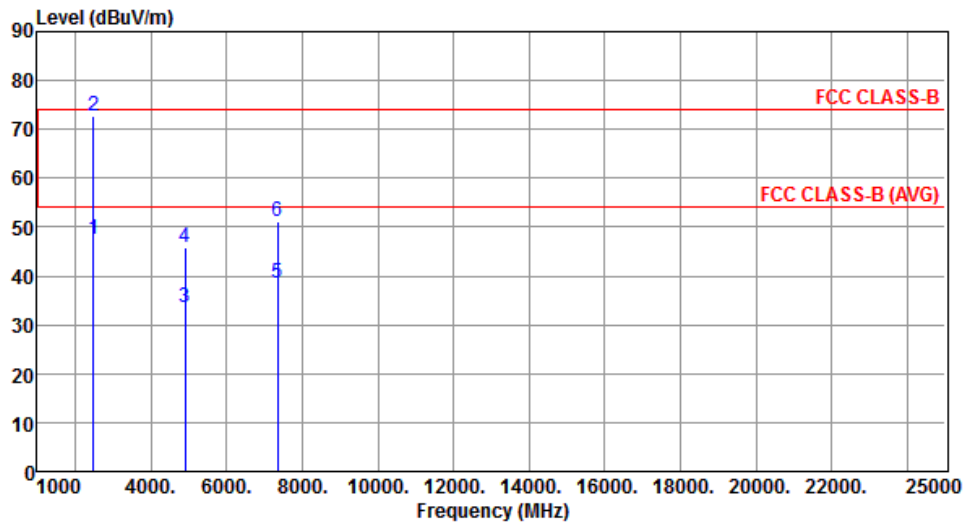
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

*Factor includes antenna factor, cable loss and amplifier gain

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

Modulation	HT40	Test Freq. (MHz)	2437
Polarization	Vertical		
Level (dBUV/m)			

Modulation	HT40	Test Freq. (MHz)	2452
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	2483.50	47.50	54.00	-6.50	50.46	-2.96	Average	100	327
2	2483.50	72.89	74.00	-1.11	75.85	-2.96	Peak	100	327
3	4904.00	33.61	54.00	-20.39	29.98	3.63	Average	100	231
4	4904.00	45.88	74.00	-28.12	42.25	3.63	Peak	100	231
5	7356.00	38.66	54.00	-15.34	29.60	9.06	Average	100	236
6	7356.00	51.26	74.00	-22.74	42.20	9.06	Peak	100	236

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

*Factor includes antenna factor , cable loss and amplifier gain

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

Modulation	HT40	Test Freq. (MHz)	2452
Polarization	Vertical		
Level (dBuV/m) <			

Modulation	HT40	Test Freq. (MHz)	2457
Polarization	Horizontal		
Level (dBuV/m) </			

Modulation	HT40	Test Freq. (MHz)	2457
Polarization	Vertical		
Level (dBuV/m) <			

Modulation	HT40	Test Freq. (MHz)	2462
Polarization	Horizontal		
Level (dBuV/m)			

Modulation	HT40	Test Freq. (MHz)	2462
Polarization	Vertical		
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 30 dB relative to the maximum in-band peak PSD level in 100 kHz.

3.6.2 Test Procedures

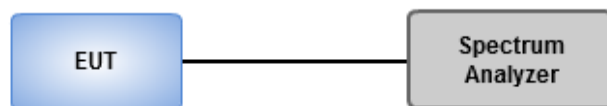
Reference level measurement

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

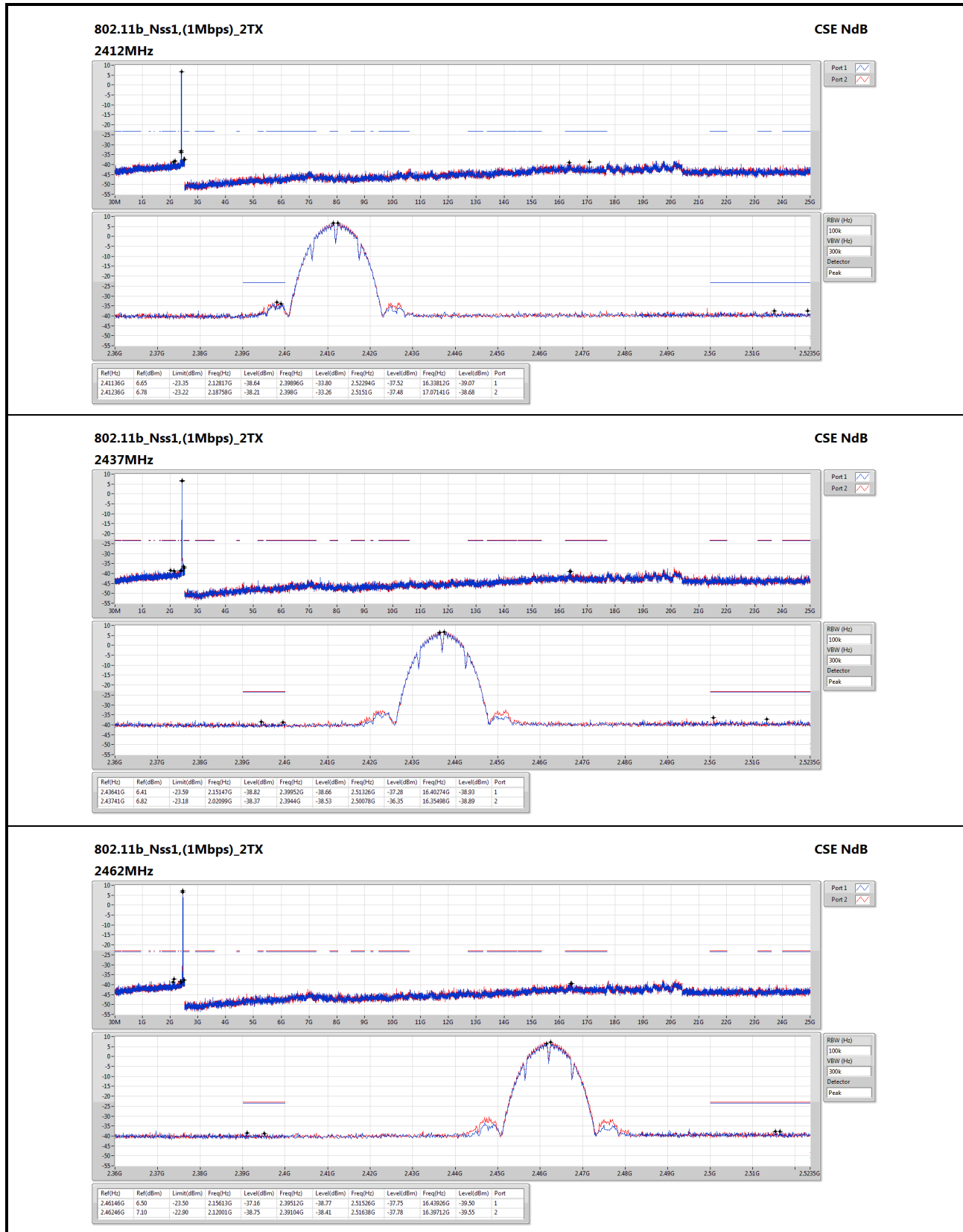
Emission level measurement

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

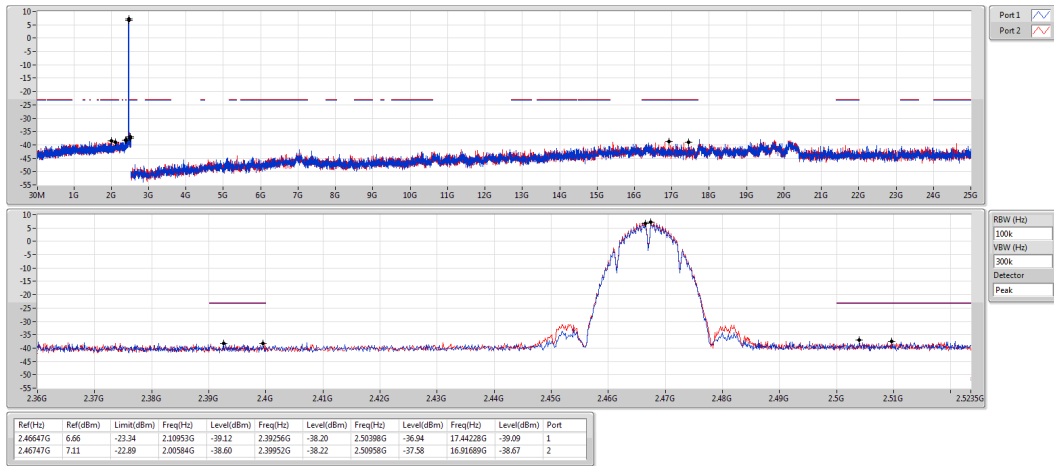


3.6.4 Unwanted Emissions into Non-Restricted Frequency Bands



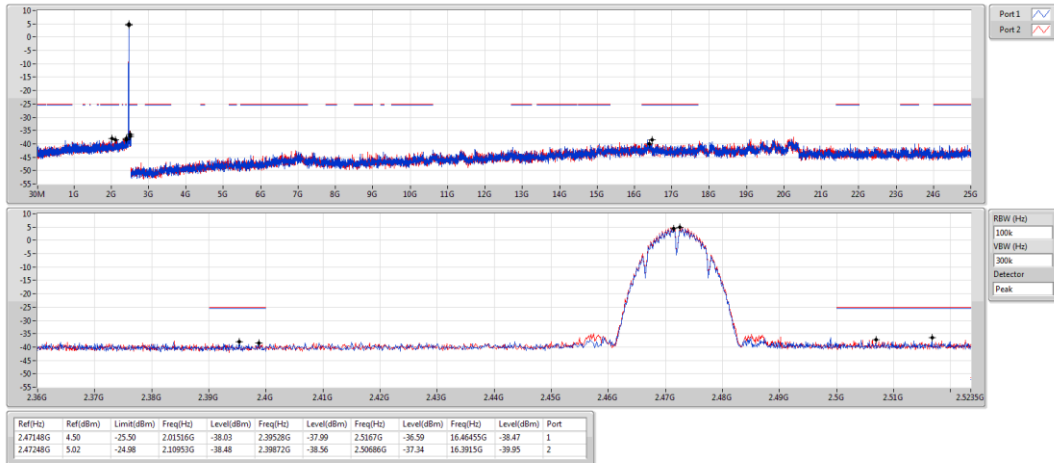
802.11b_Nss1,(1Mbps)_2TX
2467MHz

CSE NdB



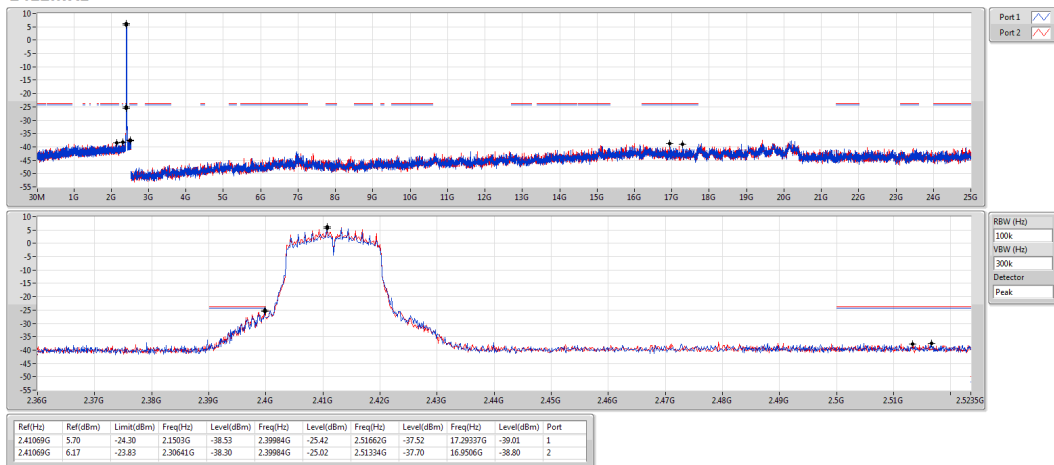
802.11b_Nss1,(1Mbps)_2TX
2472MHz

CSE NdB



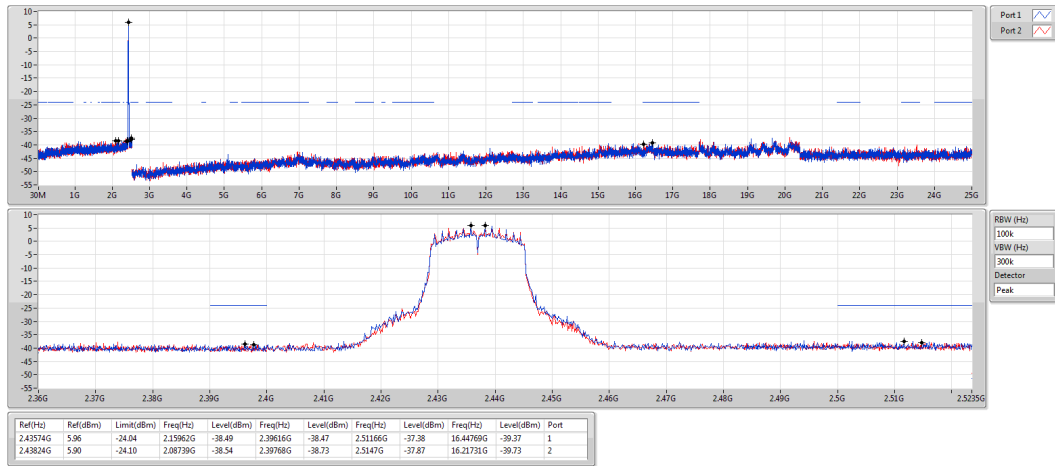
802.11g_Nss1,(6Mbps)_2TX
2412MHz

CSE NdB



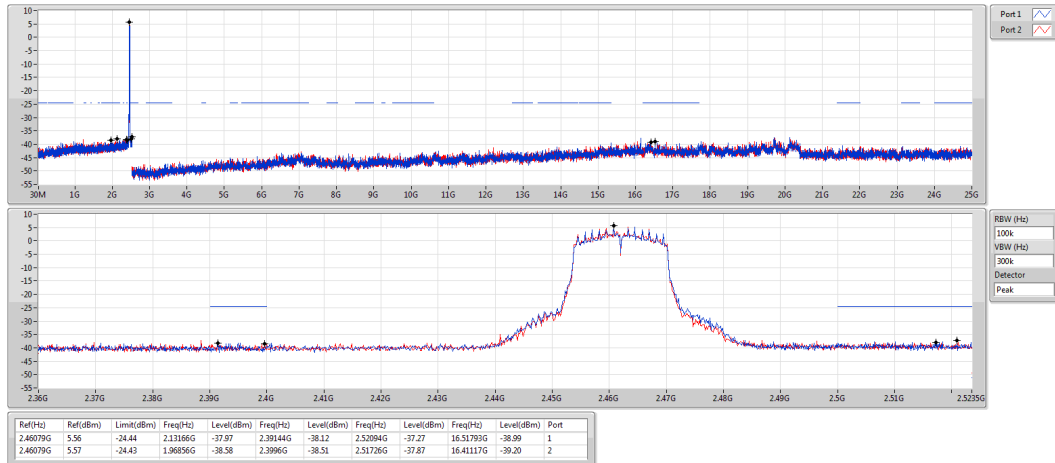
802.11g_Nss1,(6Mbps)_2TX
2437MHz

CSE NdB



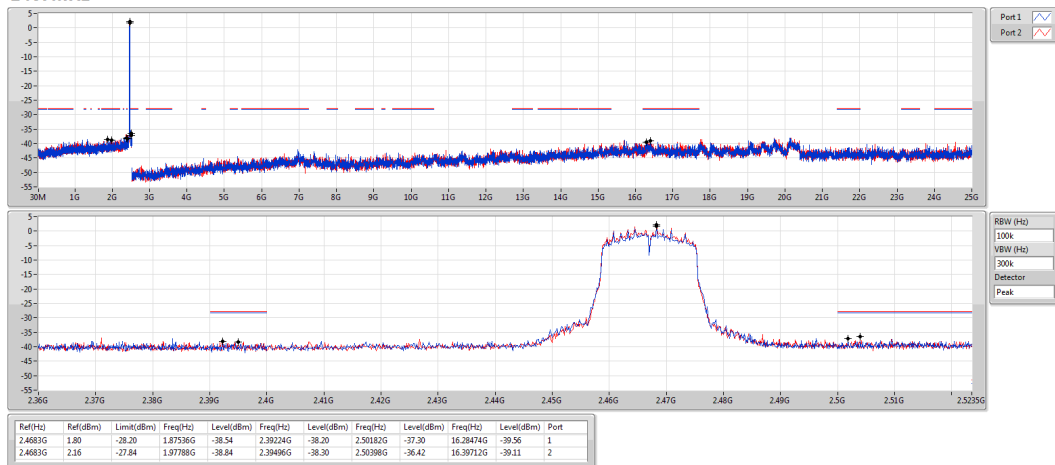
802.11g_Nss1,(6Mbps)_2TX
2462MHz

CSE NdB



802.11g_Nss1,(6Mbps)_2TX
2467MHz

CSE NdB



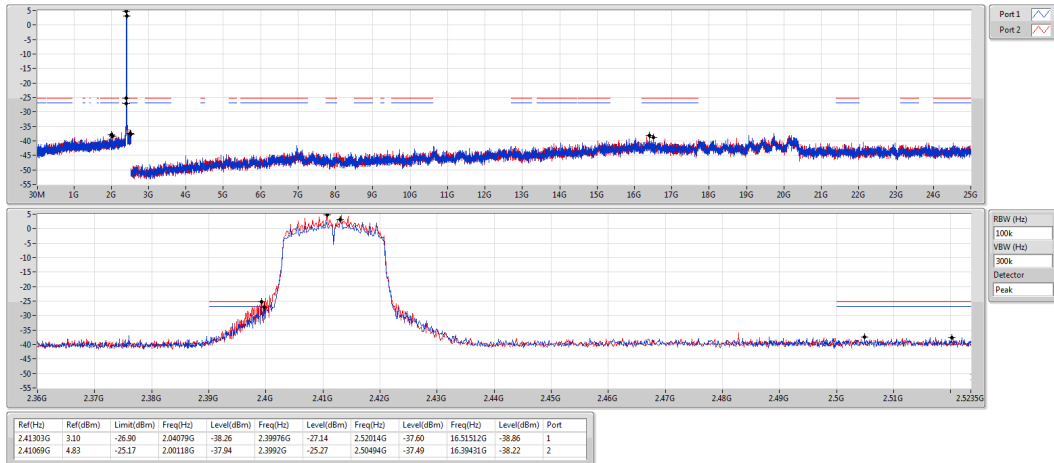
802.11g_Nss1,(6Mbps)_2TX
2472MHz

CSE NdB



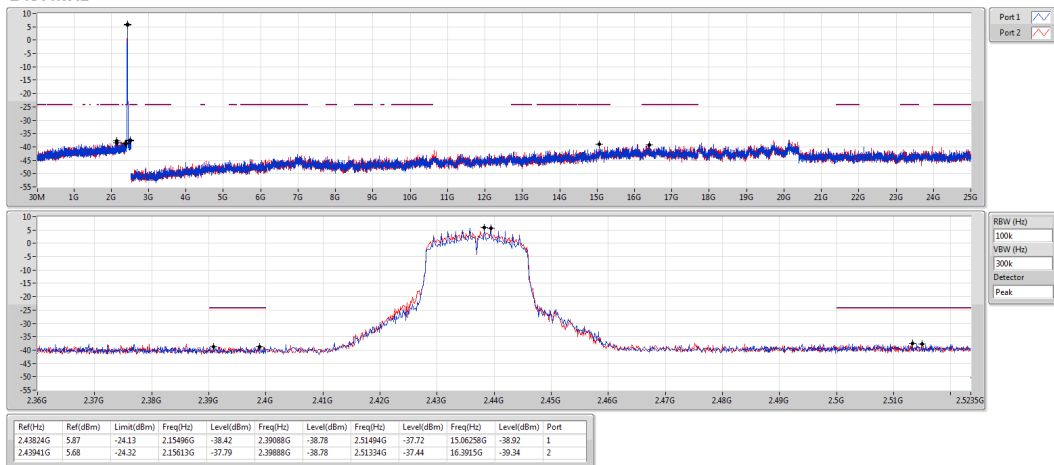
802.11n HT20_Nss1,(MCS0)_2TX
2412MHz

CSE NdB



802.11n HT20_Nss1,(MCS0)_2TX
2437MHz

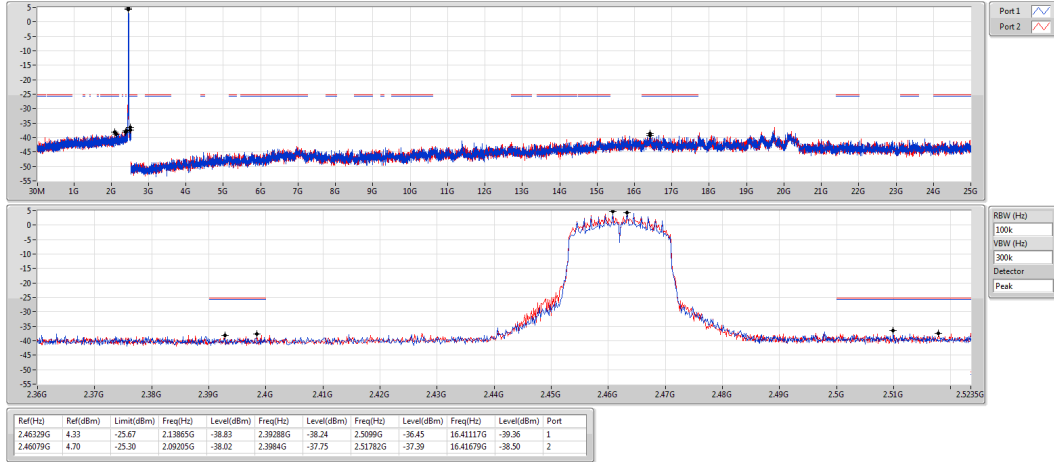
CSE NdB



802.11n HT20_Nss1,(MCS0)_2TX

CSE NdB

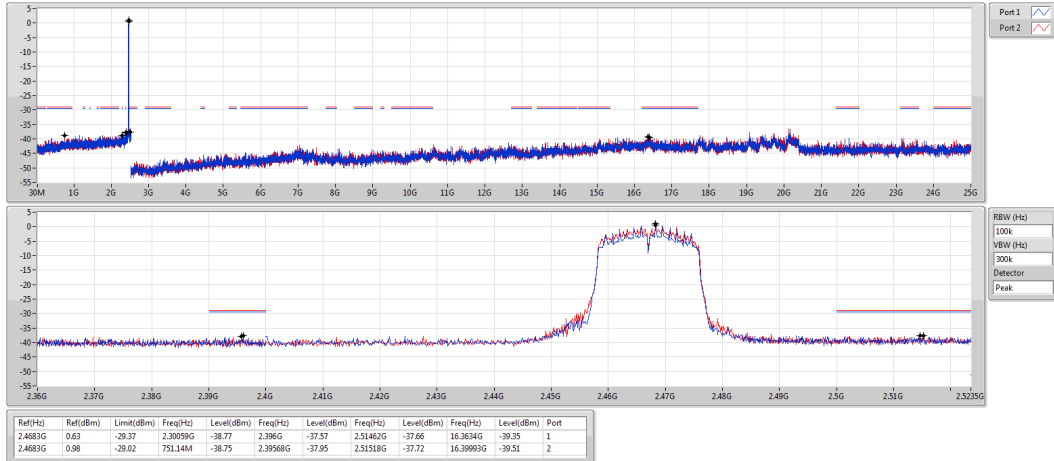
2462MHz



802.11n HT20_Nss1,(MCS0)_2TX

CSE NdB

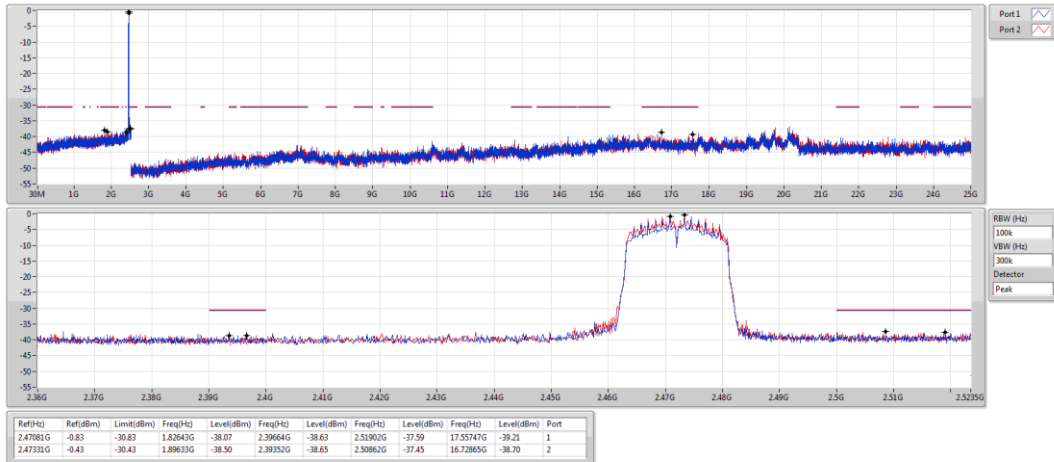
2467MHz



802.11n HT20_Nss1,(MCS0)_2TX

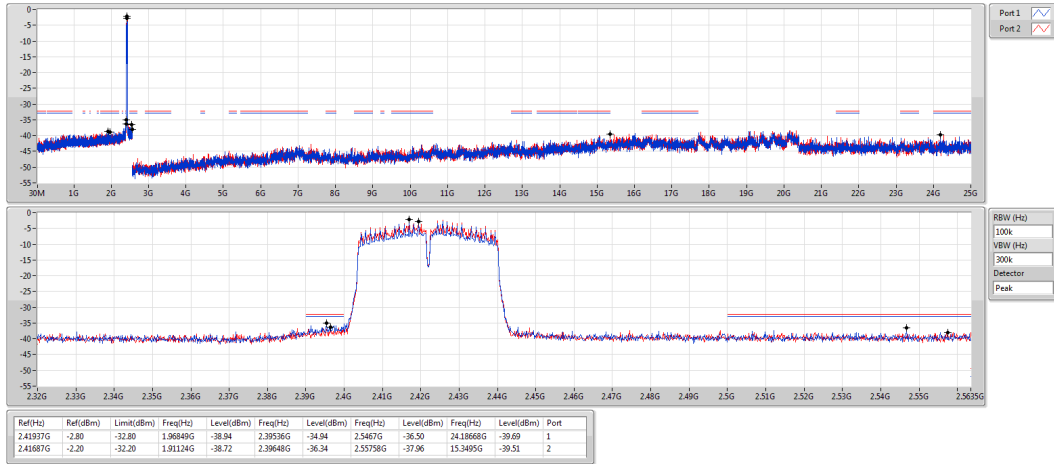
CSE NdB

2472MHz



802.11n HT40_Nss1,(MCS0)_2TX
2422MHz

CSE NdB



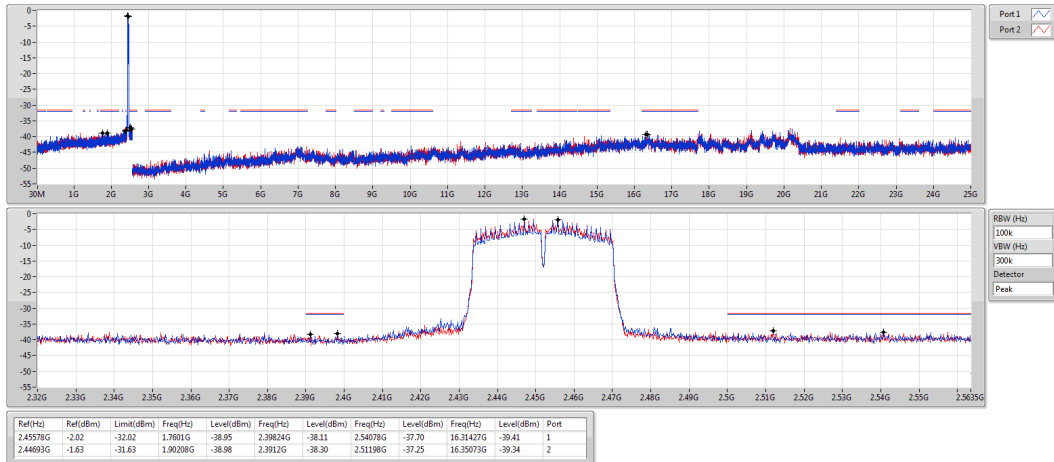
802.11n HT40_Nss1,(MCS0)_2TX
2437MHz

CSE NdB



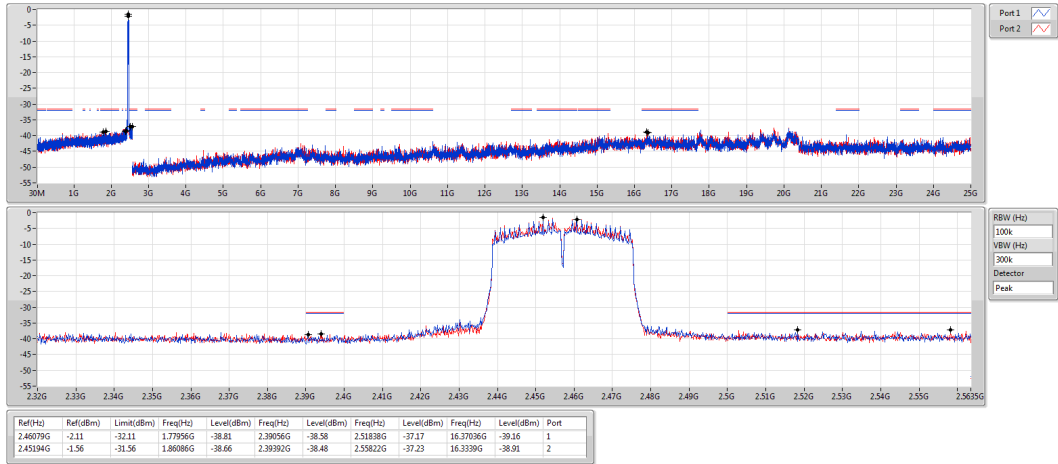
802.11n HT40_Nss1,(MCS0)_2TX
2452MHz

CSE NdB



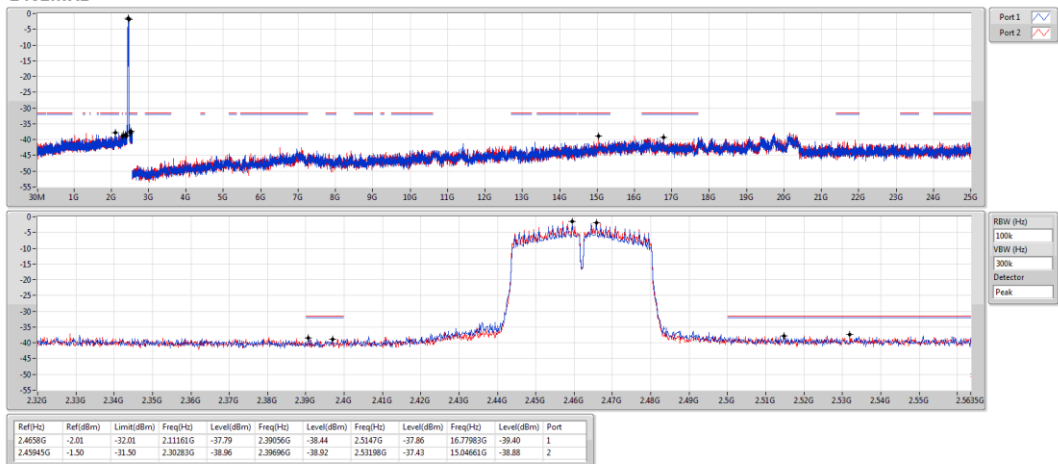
802.11n HT40_Nss1,(MCS0)_2TX
2457MHz

CSE NdB



802.11n HT40_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 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

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Email: ICC_Service@icertifi.com.tw

==END==