

FCC C2PC Test Report

FCC ID : SQG-WB45NBT
Equipment : 45 Series WB module with Bluetooth
Model No. : WB45NBT
Brand Name : Laird
Applicant : Laird Connectivity
Address : W66N220 Commerce Court, Cedarburg,
Wisconsin 53012, USA
Standard : 47 CFR FCC Part 15.247
Received Date : Apr. 11, 2019
Tested Date : Apr. 12 ~ Apr. 13, 2019
Nov. 06 ~ Nov. 13, 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:

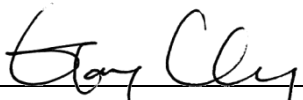

Gary Chang / Manager



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Release Record

Report No.	Version	Description	Issued Date
FR350301-07AC	Rev. 01	Initial issue	Feb. 11, 2020

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	Conducted Emissions	[dBuV]: 18.990MHz 41.15 (Margin -8.85dB) - AV	Pass
15.247(d) 15.209	Radiated Emissions	[dBuV/m at 3m]: 79.47MHz 35.87 (Margin -4.13dB) - PK	Pass
15.247(b)(3)	Maximum Output Power	Max Power [dBm]: 22.85	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

This report is prepared for FCC class II permissive change.

This report is issued as a supplementary report to original ICC report no. FR350301-01AC. The modification is concerned with following:

- ✧ PCB materials and Balun change of Wi-Fi function.
- ✧ Diplexer 2nd source change of Wi-Fi function..
- ✧ Applicant is changed.

In this report, all tests had been re-tested and presented in the following sections.

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]	1	1-11 Mbps
2400-2483.5	g	2412-2462	1-11 [11]	1	6-54 Mbps
2400-2483.5	n (HT20)	2412-2462	1-11 [11]	1	MCS 0-7

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

1.1.2 Antenna Details

Ant. No.	Brand /Model	Type	Connector	Operating Frequencies (MHz) / Antenna Gain (dBi)				
				2400~2483.5	5150~5250	5250~5350	5470~5725	5725~5850
1	MAG.LAYERS EDA-1513-25GR2-B2-CY	Dipole	SMA Jack Reverse	2	2	2	2	2
2	MAG.LAYERS PCA-4606-2G4C1-A13-CY	PCB Dipole	UFL	2.21	---	---	---	---
3	Larid NanoBlade-IP04	PCB Dipole	UFL	2	3.9	3.9	4	4
4	Larid MAF95310 Mini NanoBlade Flex	PCB Dipole	UFL	2.79	3.38	3.38	3.38	3.38
5	Larid NanoBlue-IP04	PCB Dipole	UFL	2	---	---	---	---
6	Ethertronics WLAN_1000146	PIFA	UFL	2.5	3.5	3.5	3.5	3.5
7	SAA MG7018-41-000-R	Dipole	UFL	1.87	0.85	0.6	0.94	0.92
8	SAA MG7324-41-000-R	Dipole	UFL	1.32	1.04	1.6	2.75	2.24

1.1.3 Power Supply Type of Equipment under Test (EUT)

Power Supply Type	3.3Vdc and 1.8Vdc
--------------------------	-------------------

1.1.4 Accessories

N/A

1.1.5 Channel List

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

1.1.6 Test Tool and Duty Cycle

Test Tool	Putty, Version: 0.60.0.0		
Duty Cycle and Duty Factor	Mode	Duty Cycle (%)	Duty Factor (dB)
	11b	100.00%	0.00
	11g	99.28%	0.03
	HT20	98.98%	0.04

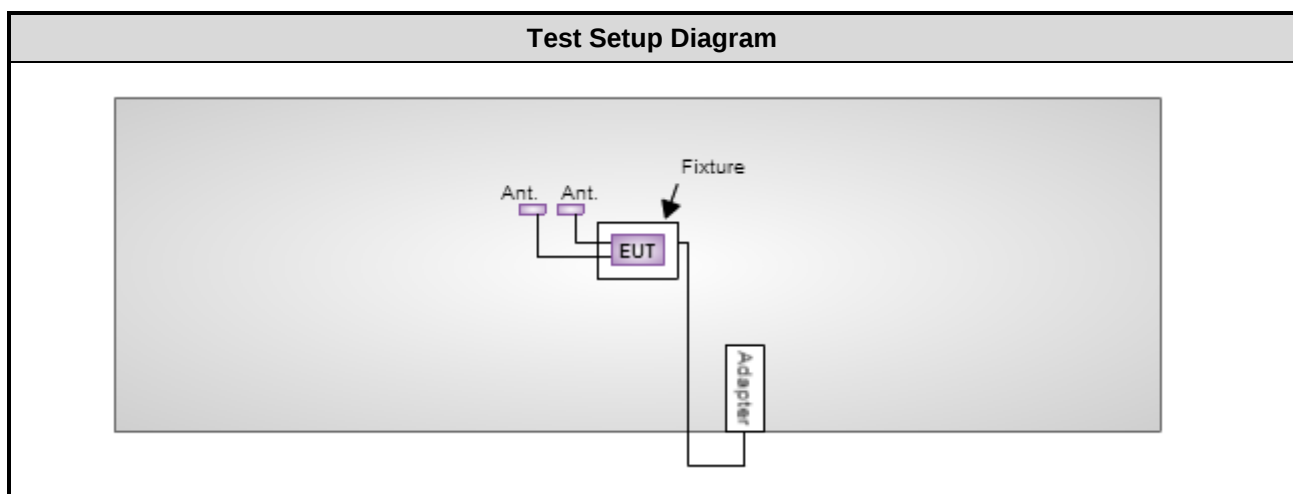
1.1.7 Power Index of Test Tool

Modulation Mode	Test Frequency (MHz)	Power Index
11b	2412	16
11b	2437	16.5
11b	2462	13.5
11g	2412	13
11g	2437	19
11g	2462	12
HT20	2412	13
HT20	2437	19.5
HT20	2462	12.5

1.2 Local Support Equipment List

Support Equipment List					
No.	Equipment	Brand	Model	FCC ID	Remarks
1	Notebook	DELL	Latitude E6430	DoC	---
2	Fixture	---	---	---	Provided by applicant.

1.3 Test Setup Chart



Note: The notebook is disconnected from EUT and removed from test table when EUT is set to transmit continuously.

1.4 The Equipment List

Test Item	Conducted Emission				
Test Site	Conduction room 1 / (CO01-WS)				
Test Date	Nov. 13, 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 chamber 3 / (03CH03-WS)				
Test Date	Apr. 12 ~ Apr. 13, 2019				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV40	101499	Jan. 07, 2019	Jan. 06, 2020
Receiver	R&S	ESR3	101658	Dec. 11, 2018	Dec. 10, 2019
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. 07, 2019	Jan. 06, 2020
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. 08, 2018	Oct. 07, 2019
Preamplifier	EMC	EMC02325	980187	Aug. 24, 2018	Aug. 23, 2019
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	Oct. 01, 2018	Sep. 30, 2019
RF cable-8M	EMC	EMC104-SM-SM-8000	181107	Oct. 01, 2018	Sep. 30, 2019
RF cable-1M	HUBER+SUHNER	SUCOFLEX104	MY22624/4	Oct. 01, 2018	Sep. 30, 2019
LF cable-0.8M	EMC	EMC8D-NM-NM-800	EMC8D-NM-NM-800-001	Oct. 01, 2018	Sep. 30, 2019
LF cable-3M	EMC	EMC8D-NM-NM-3000	131103	Oct. 01, 2018	Sep. 30, 2019
LF cable-13M	EMC	EMC8D-NM-NM-13000	131104	Oct. 01, 2018	Sep. 30, 2019
Measurement Software	AUDIX	e3	6.120210g	NA	NA

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

Test Item	RF Conducted				
Test Site	(TH01-WS)				
Test Date	Nov. 06, 2019				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV40	101063	Apr. 17, 2019	Apr. 16, 2020
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

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	± 3.96 dB
Radiated emission > 1 GHz	± 4.51 dB

2 Test Configuration

2.1 Testing Condition

Test Item	Test Site	Ambient Condition	Tested By
AC Conduction	CO01-WS	22°C / 67%	Akun Chung
Radiated Emissions	03CH03-WS	22-23°C / 66%	Roger Lu
RF Conducted	TH01-WS	22°C / 62%	Brad Wu

- FCC Designation No.: TW0009
- FCC site registration No.: 207696
- 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	HT20	2437	MCS 0	2
Radiated Emissions ≤1GHz	HT20	2437	MCS 0	1,2,3
Radiated Emissions >1GHz	11b 11g HT20	2412 / 2437 / 2462 2412 / 2437 / 2462 2412 / 2437 / 2462	1 Mbps 6 Mbps MCS 0	1,2,3
Maximum Output Power	11b	2412 / 2437 / 2462	1 Mbps	2
6dB bandwidth	11g	2412 / 2437 / 2462	6 Mbps	
Power spectral density	HT20	2412 / 2437 / 2462	MCS 0	

NOTE:

1. Test configurations are listed as below:
 - 1) Configuration 1: Dipole antenna (Antenna No.1), Y-plane.
 - 2) Configuration 2 : PCB Dipole antenna (Antenna No.4) , Y-plane
 - 3) Configuration 3 : PIFA antenna (Antenna No.6) , Y-plane

3 Transmitter Test Results

3.1 Conducted Emissions

3.1.1 Limit of Conducted Emissions

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

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

3.1.2 Test Procedures

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

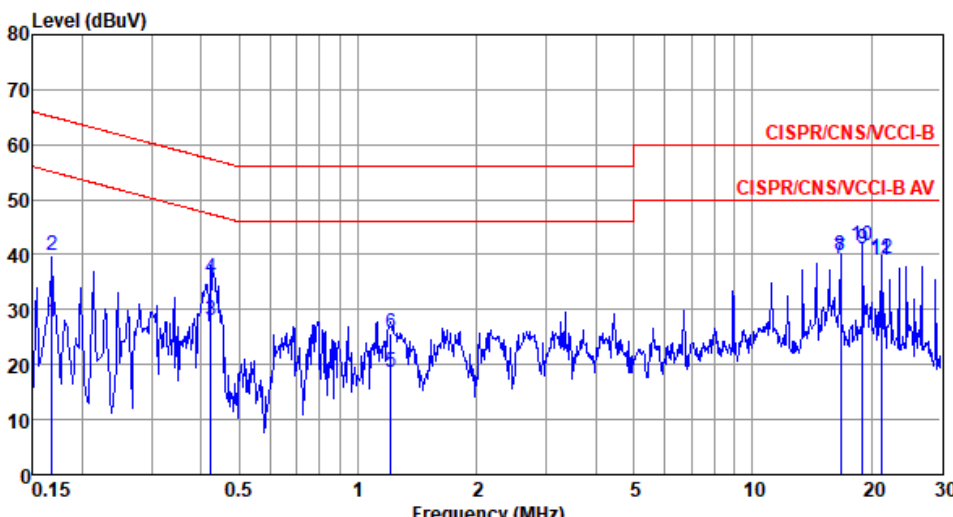
3.1.3 Test Setup



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

3.1.4 Test Result of Conducted Emissions

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



	Freq	Level	Limit	Over	Read	LISN	cable	
	MHz	dBuA	Line	Limit	Level	factor	loss	Remark
			dBuA	dB	dBuA	dB	dB	
1	0.168	27.73	55.08	-27.35	17.98	9.53	0.05	Average
2	0.168	39.97	65.08	-25.11	30.22	9.53	0.05	QP
3	0.424	28.13	47.37	-19.24	18.23	9.57	0.08	Average
4	0.424	35.84	57.37	-21.53	25.94	9.57	0.08	QP
5	1.210	18.72	46.00	-27.28	8.65	9.60	0.14	Average
6	1.210	25.65	56.00	-30.35	15.58	9.60	0.14	QP
7	16.756	39.21	50.00	-10.79	28.40	9.66	0.62	Average
8	16.756	39.83	60.00	-20.17	29.02	9.66	0.62	QP
9*	18.990	41.15	50.00	-8.85	30.25	9.66	0.65	Average
10	18.990	41.50	60.00	-18.50	30.60	9.66	0.65	QP
11	21.223	39.02	50.00	-10.98	28.07	9.65	0.67	Average
12	21.223	39.37	60.00	-20.63	28.42	9.65	0.67	QP

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

Modulation	HT20	Test Freq. (MHz)	2437																																																																																																																																							
Power Phase	Neutral																																																																																																																																									
Level (dBUV) <table><thead><tr><th></th><th>Freq</th><th>Level</th><th>Limit</th><th>Over</th><th>Read</th><th>LISN</th><th>cable</th><th>Remark</th></tr><tr><th></th><th>MHz</th><th>dBuA</th><th>Line</th><th>Limit</th><th>Level</th><th>factor</th><th>loss</th><th></th></tr><tr><th></th><th></th><th></th><th>dBuA</th><th>dB</th><th>dBuA</th><th>dB</th><th>dB</th><th></th></tr></thead><tbody><tr><td>1</td><td>0.426</td><td>28.40</td><td>47.33</td><td>-18.93</td><td>18.54</td><td>9.61</td><td>0.08</td><td>Average</td></tr><tr><td>2</td><td>0.426</td><td>35.74</td><td>57.33</td><td>-21.59</td><td>25.88</td><td>9.61</td><td>0.08</td><td>QP</td></tr><tr><td>3</td><td>0.641</td><td>13.49</td><td>46.00</td><td>-32.51</td><td>3.57</td><td>9.63</td><td>0.10</td><td>Average</td></tr><tr><td>4</td><td>0.641</td><td>22.14</td><td>56.00</td><td>-33.86</td><td>12.22</td><td>9.63</td><td>0.10</td><td>QP</td></tr><tr><td>5</td><td>11.170</td><td>33.82</td><td>50.00</td><td>-16.18</td><td>23.31</td><td>9.73</td><td>0.44</td><td>Average</td></tr><tr><td>6</td><td>11.170</td><td>35.28</td><td>60.00</td><td>-24.72</td><td>24.77</td><td>9.73</td><td>0.44</td><td>QP</td></tr><tr><td>7</td><td>16.756</td><td>38.33</td><td>50.00</td><td>-11.67</td><td>27.50</td><td>9.78</td><td>0.62</td><td>Average</td></tr><tr><td>8</td><td>16.756</td><td>38.80</td><td>60.00</td><td>-21.20</td><td>27.97</td><td>9.78</td><td>0.62</td><td>QP</td></tr><tr><td>9*</td><td>18.990</td><td>39.27</td><td>50.00</td><td>-10.73</td><td>28.33</td><td>9.80</td><td>0.65</td><td>Average</td></tr><tr><td>10</td><td>18.990</td><td>39.36</td><td>60.00</td><td>-20.64</td><td>28.42</td><td>9.80</td><td>0.65</td><td>QP</td></tr><tr><td>11</td><td>21.223</td><td>37.91</td><td>50.00</td><td>-12.09</td><td>26.87</td><td>9.81</td><td>0.67</td><td>Average</td></tr><tr><td>12</td><td>21.223</td><td>38.34</td><td>60.00</td><td>-21.66</td><td>27.30</td><td>9.81</td><td>0.67</td><td>QP</td></tr></tbody></table>					Freq	Level	Limit	Over	Read	LISN	cable	Remark		MHz	dBuA	Line	Limit	Level	factor	loss					dBuA	dB	dBuA	dB	dB		1	0.426	28.40	47.33	-18.93	18.54	9.61	0.08	Average	2	0.426	35.74	57.33	-21.59	25.88	9.61	0.08	QP	3	0.641	13.49	46.00	-32.51	3.57	9.63	0.10	Average	4	0.641	22.14	56.00	-33.86	12.22	9.63	0.10	QP	5	11.170	33.82	50.00	-16.18	23.31	9.73	0.44	Average	6	11.170	35.28	60.00	-24.72	24.77	9.73	0.44	QP	7	16.756	38.33	50.00	-11.67	27.50	9.78	0.62	Average	8	16.756	38.80	60.00	-21.20	27.97	9.78	0.62	QP	9*	18.990	39.27	50.00	-10.73	28.33	9.80	0.65	Average	10	18.990	39.36	60.00	-20.64	28.42	9.80	0.65	QP	11	21.223	37.91	50.00	-12.09	26.87	9.81	0.67	Average	12	21.223	38.34	60.00	-21.66	27.30	9.81	0.67	QP
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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)_1TX	7.101M	12.012M	12M0G1D	7.029M	11.65M
802.11g_Nss1,(6Mbps)_1TX	16.377M	17.511M	17M5D1D	16.377M	16.57M
802.11n HT20_Nss1,(MCS0)_1TX	17.246M	18.886M	18M9D1D	16.812M	17.728M

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

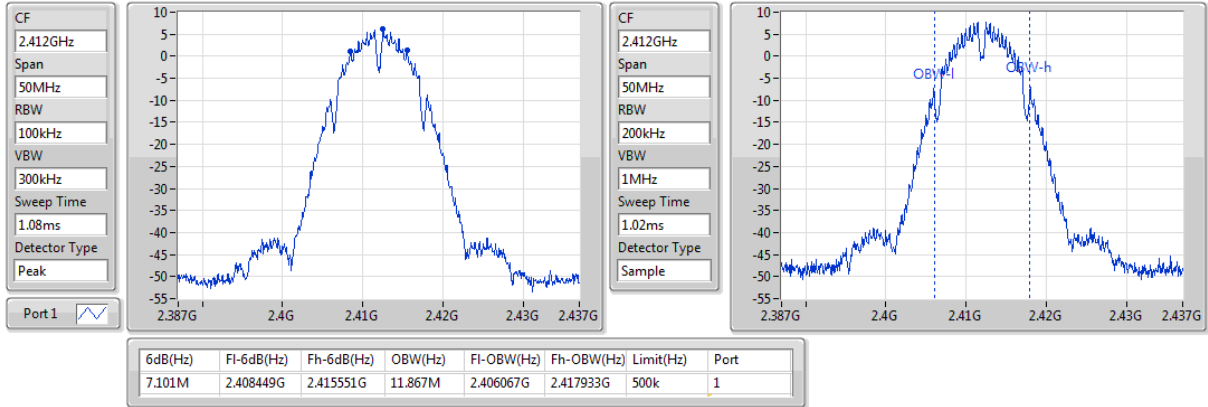
Mode	Result	Limit (Hz)	Port 1-N dB (Hz)	Port 1-OBW (Hz)
802.11b_Nss1,(1Mbps)_1TX	-	-	-	-
2412MHz	Pass	500k	7.101M	11.867M
2437MHz	Pass	500k	7.101M	12.012M
2462MHz	Pass	500k	7.029M	11.65M
802.11g_Nss1,(6Mbps)_1TX	-	-	-	-
2412MHz	Pass	500k	16.377M	16.57M
2437MHz	Pass	500k	16.377M	17.511M
2462MHz	Pass	500k	16.377M	16.57M
802.11n HT20_Nss1,(MCS0)_1TX	-	-	-	-
2412MHz	Pass	500k	17.246M	17.728M
2437MHz	Pass	500k	16.812M	18.886M
2462MHz	Pass	500k	16.812M	17.728M

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

802.11b_Nss1,(1Mbps)_1TX

EBW

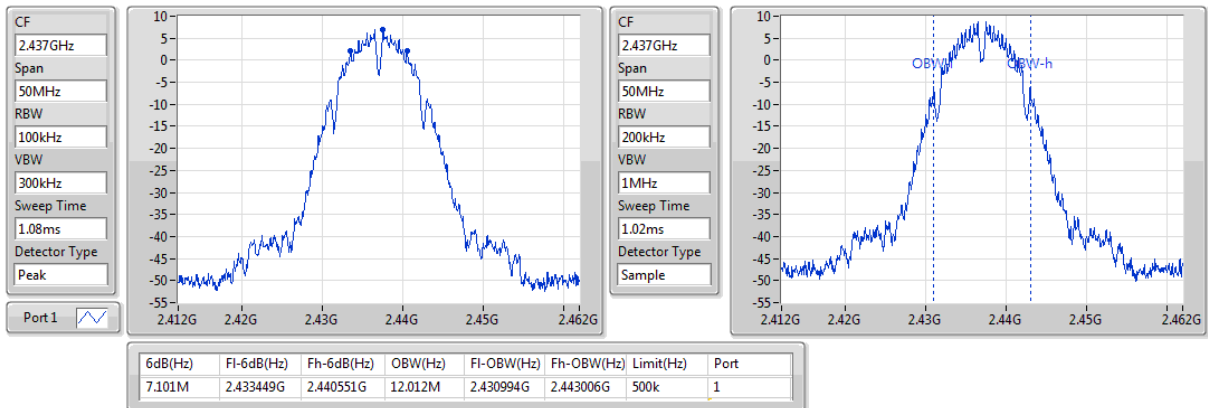
2412MHz



802.11b_Nss1,(1Mbps)_1TX

EBW

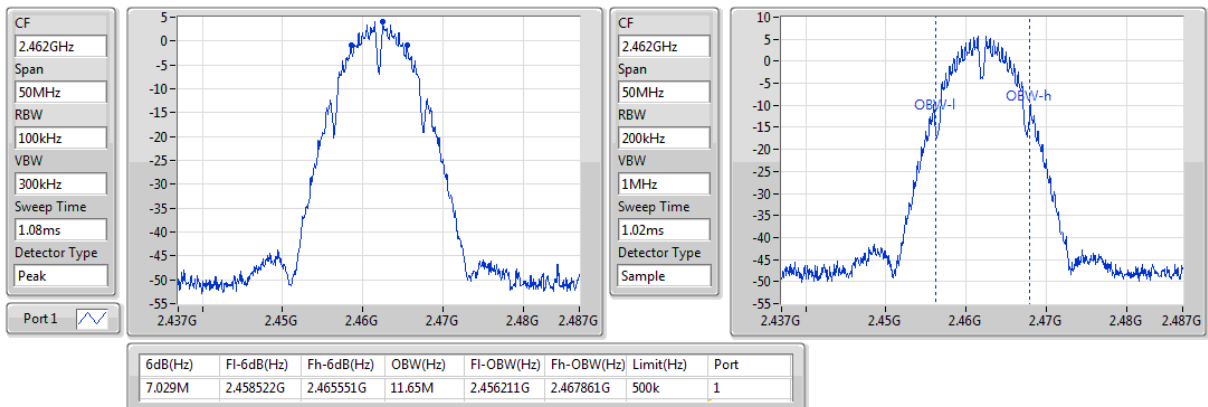
2437MHz



802.11b_Nss1,(1Mbps)_1TX

EBW

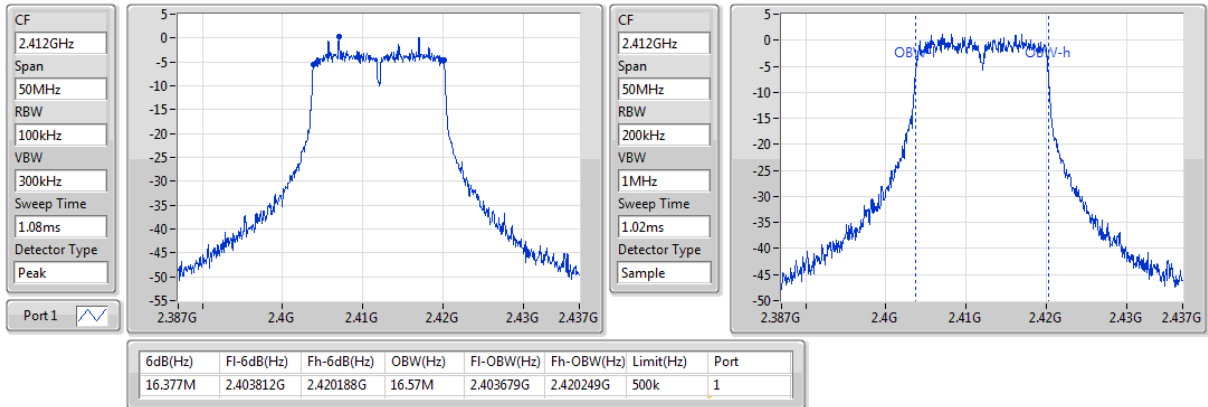
2462MHz



802.11g_Nss1,(6Mbps)_1TX

EBW

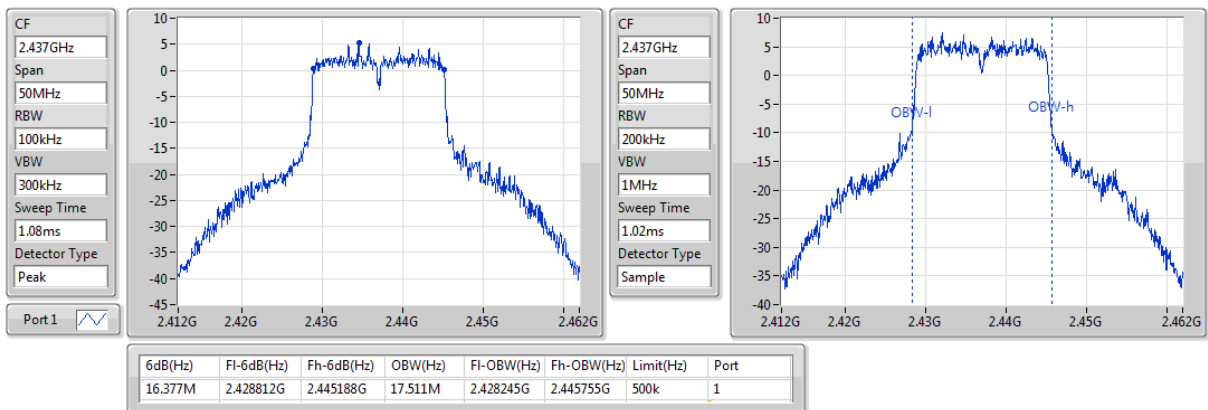
2412MHz



802.11g_Nss1,(6Mbps)_1TX

EBW

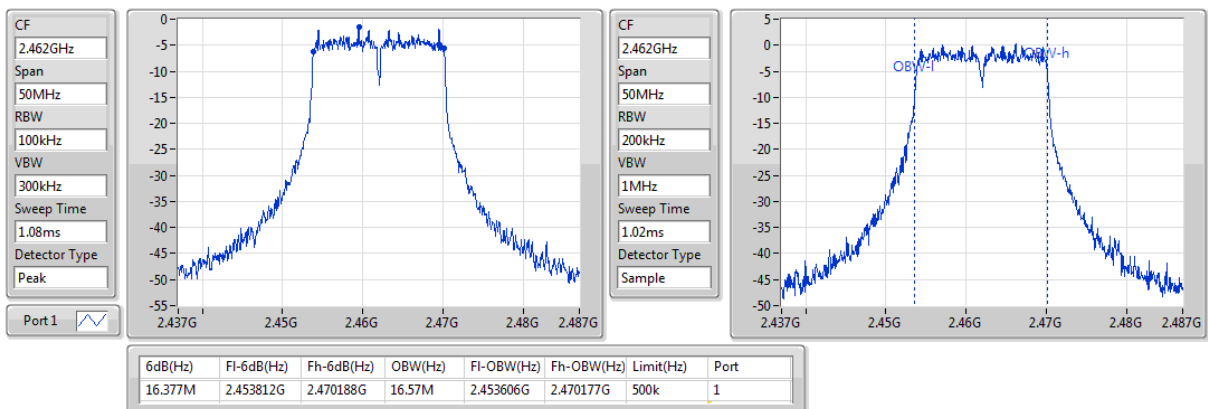
2437MHz



802.11g_Nss1,(6Mbps)_1TX

EBW

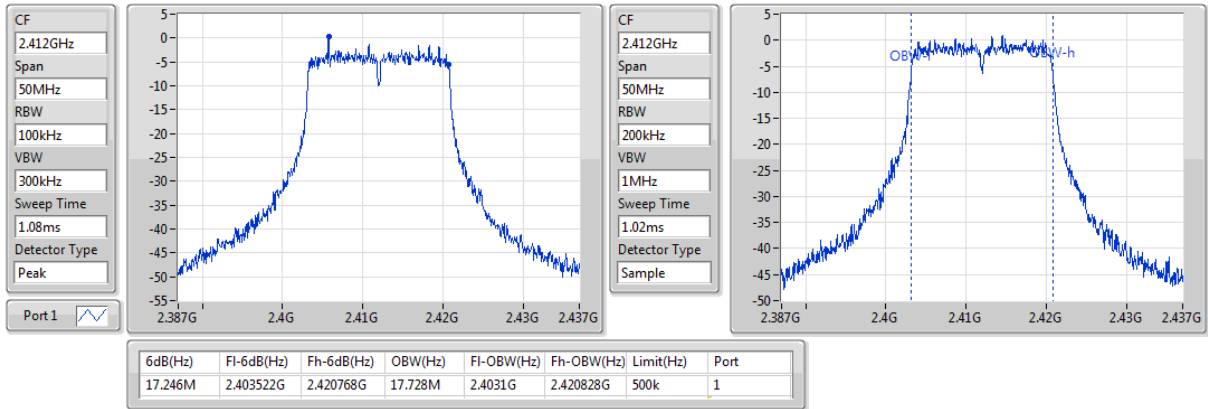
2462MHz



802.11n HT20_Nss1,(MCS0)_1TX

EBW

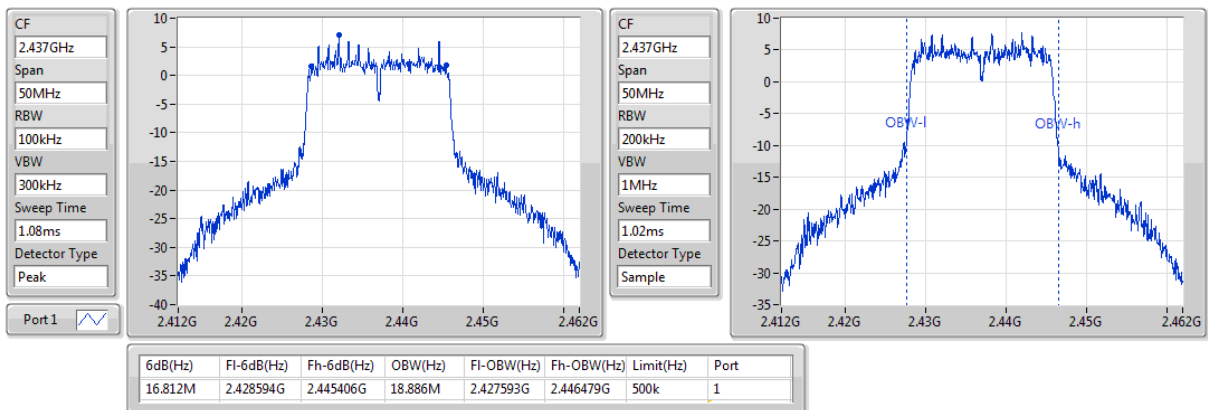
2412MHz



802.11n HT20_Nss1,(MCS0)_1TX

EBW

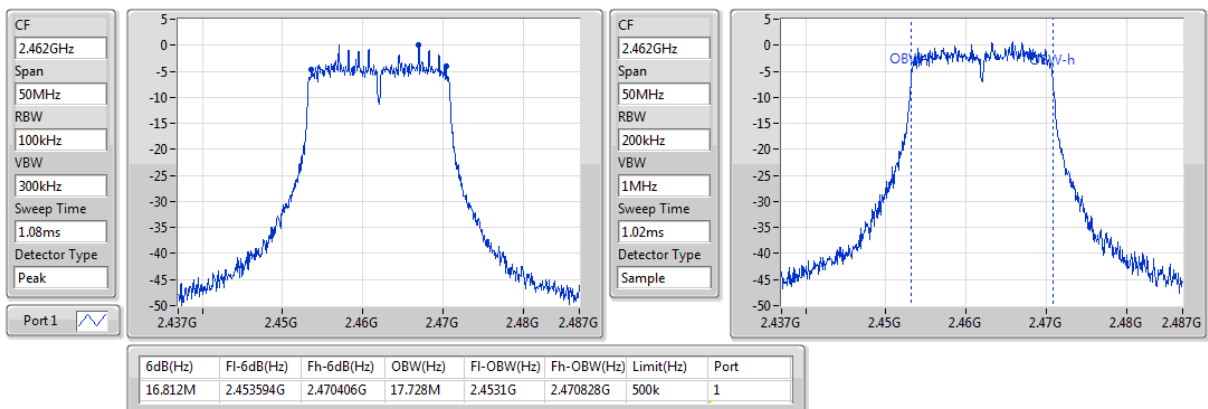
2437MHz



802.11n HT20_Nss1,(MCS0)_1TX

EBW

2462MHz



3.3 RF Output Power

3.3.1 Limit of RF Output Power

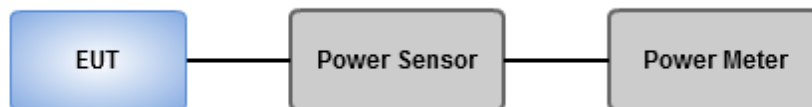
Conducted power shall not exceed 1Watt.

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 of Peak Conducted Output Power

Mode	Total Power (dBm)	Total Power (W)
2.4-2.4835GHz	-	-
802.11b_Nss1,(1Mbps)_1TX	18.77	0.07534
802.11g_Nss1,(6Mbps)_1TX	21.45	0.13964
802.11n HT20_Nss1,(MCS0)_1TX	22.85	0.19275

Result

Mode	Result	DG (dBi)	Port 1 (dBm)	Total Power (dBm)	Power Limit (dBm)	EIRP (dBm)	EIRP Limit (dBm)
802.11b_Nss1,(1Mbps)_1TX	-	-	-	-	-	-	-
2412MHz	Pass	2.79	17.86	17.86	30.00	20.65	36.00
2437MHz	Pass	2.79	18.77	18.77	30.00	21.56	36.00
2462MHz	Pass	2.79	15.43	15.43	30.00	18.22	36.00
802.11g_Nss1,(6Mbps)_1TX	-	-	-	-	-	-	-
2412MHz	Pass	2.79	20.78	20.78	30.00	23.57	36.00
2437MHz	Pass	2.79	21.45	21.45	30.00	24.24	36.00
2462MHz	Pass	2.79	18.32	18.32	30.00	21.11	36.00
802.11n HT20_Nss1,(MCS0)_1TX	-	-	-	-	-	-	-
2412MHz	Pass	2.79	20.43	20.43	30.00	23.22	36.00
2437MHz	Pass	2.79	22.85	22.85	30.00	25.64	36.00
2462MHz	Pass	2.79	18.72	18.72	30.00	21.51	36.00

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

Summary of Conducted (Average) Output Power

Mode	Total Power (dBm)	Total Power (W)
2.4-2.4835GHz	-	-
802.11b_Nss1,(1Mbps)_1TX	16.46	0.04426
802.11g_Nss1,(6Mbps)_1TX	18.14	0.06516
802.11n HT20_Nss1,(MCS0)_1TX	18.40	0.06918

Result

Mode	Result	DG (dBi)	Port 1 (dBm)	Total Power (dBm)	Power Limit (dBm)	EIRP (dBm)	EIRP Limit (dBm)
802.11b_Nss1,(1Mbps)_1TX	-	-	-	-	-	-	-
2412MHz	Pass	2.79	15.76	15.76	-	18.55	-
2437MHz	Pass	2.79	16.46	16.46	-	19.25	-
2462MHz	Pass	2.79	13.26	13.26	-	16.05	-
802.11g_Nss1,(6Mbps)_1TX	-	-	-	-	-	-	-
2412MHz	Pass	2.79	13.66	13.66	-	16.45	-
2437MHz	Pass	2.79	18.14	18.14	-	20.93	-
2462MHz	Pass	2.79	11.41	11.41	-	14.20	-
802.11n HT20_Nss1,(MCS0)_1TX	-	-	-	-	-	-	-
2412MHz	Pass	2.79	13.06	13.06	-	15.85	-
2437MHz	Pass	2.79	18.40	18.40	-	21.19	-
2462MHz	Pass	2.79	11.93	11.93	-	14.72	-

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

Note : Conducted average output power is for reference only

3.4 Power Spectral Density

3.4.1 Limit of Power Spectral Density

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

3.4.2 Test Procedures

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.

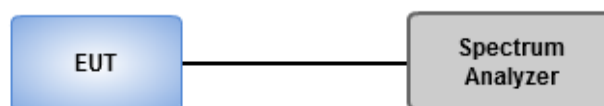
Average PSD, duty cycle $\geq 98\%$

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)_1TX	-8.90
802.11g_Nss1,(6Mbps)_1TX	-9.18
802.11n HT20_Nss1,(MCS0)_1TX	-7.22

Result

Mode	Result	DG (dBi)	Port 1 (dBm/RBW)	PD (dBm/RBW)	PD Limit (dBm/RBW)
802.11b_Nss1,(1Mbps)_1TX	-	-	-	-	-
2412MHz	Pass	2.79	-8.90	-8.90	8.00
2437MHz	Pass	2.79	-9.87	-9.87	8.00
2462MHz	Pass	2.79	-11.48	-11.48	8.00
802.11g_Nss1,(6Mbps)_1TX	-	-	-	-	-
2412MHz	Pass	2.79	-15.21	-15.21	8.00
2437MHz	Pass	2.79	-9.18	-9.18	8.00
2462MHz	Pass	2.79	-16.44	-16.44	8.00
802.11n HT20_Nss1,(MCS0)_1TX	-	-	-	-	-
2412MHz	Pass	2.79	-14.92	-14.92	8.00
2437MHz	Pass	2.79	-7.22	-7.22	8.00
2462MHz	Pass	2.79	-14.03	-14.03	8.00

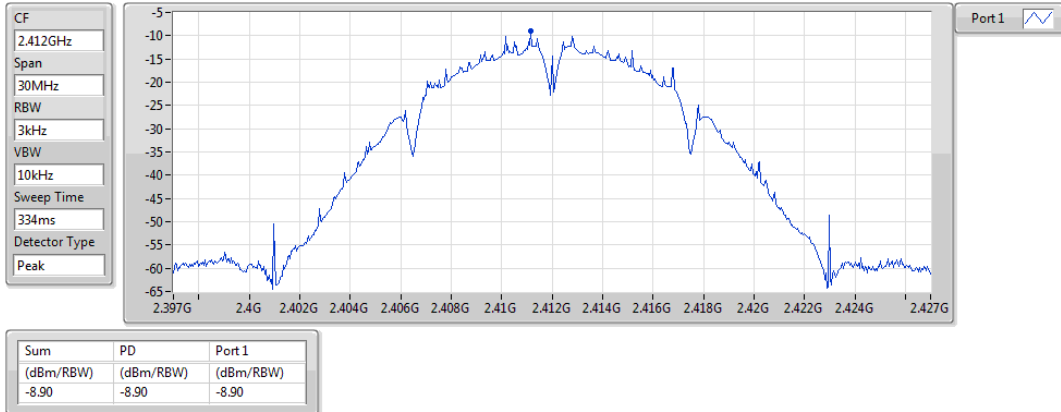
DG = Directional Gain;

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)_1TX

PSD

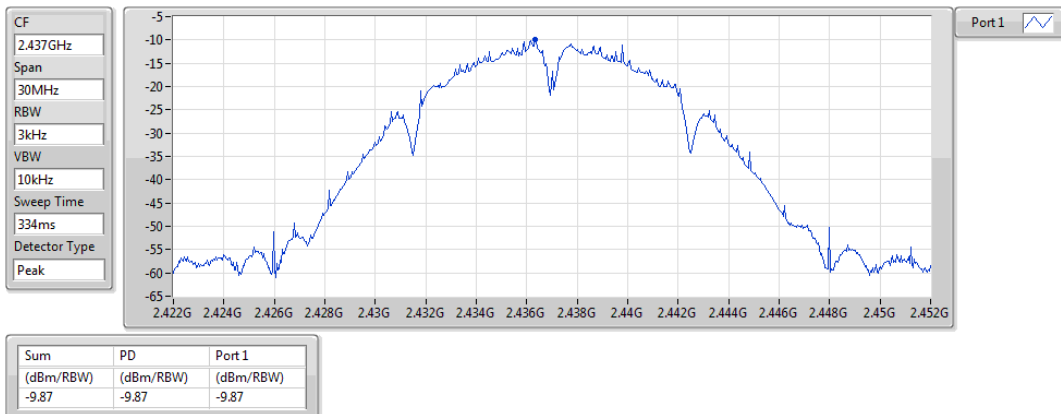
2412MHz



802.11b_Nss1,(1Mbps)_1TX

PSD

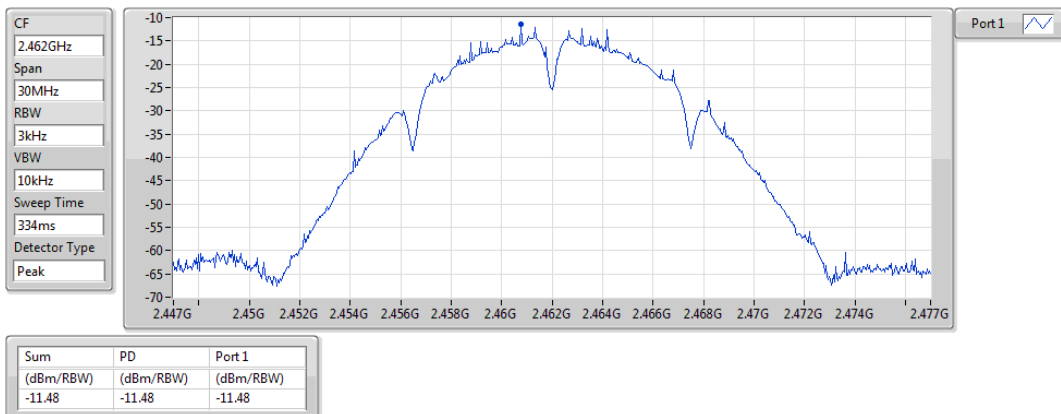
2437MHz



802.11b_Nss1,(1Mbps)_1TX

PSD

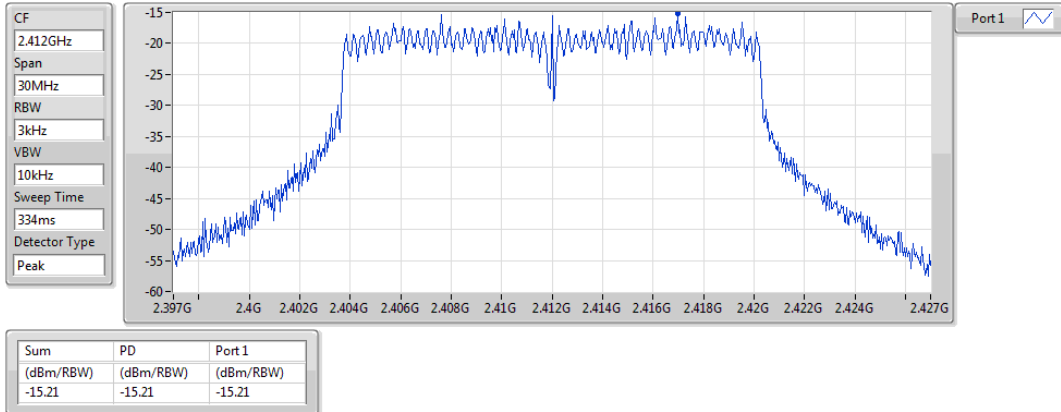
2462MHz



802.11g_Nss1,(6Mbps)_1TX

PSD

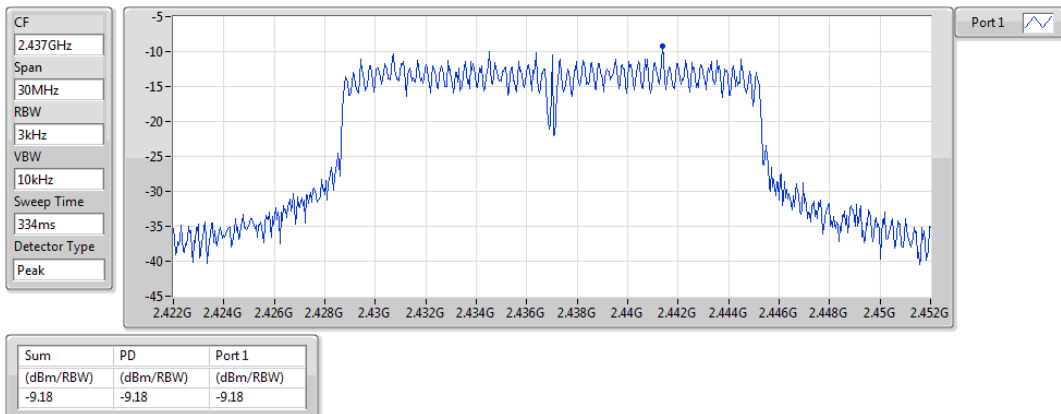
2412MHz



802.11g_Nss1,(6Mbps)_1TX

PSD

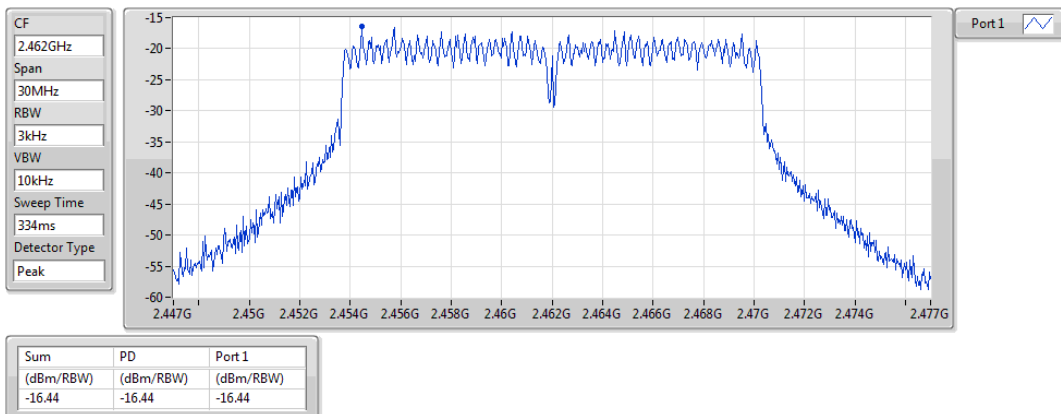
2437MHz



802.11g_Nss1,(6Mbps)_1TX

PSD

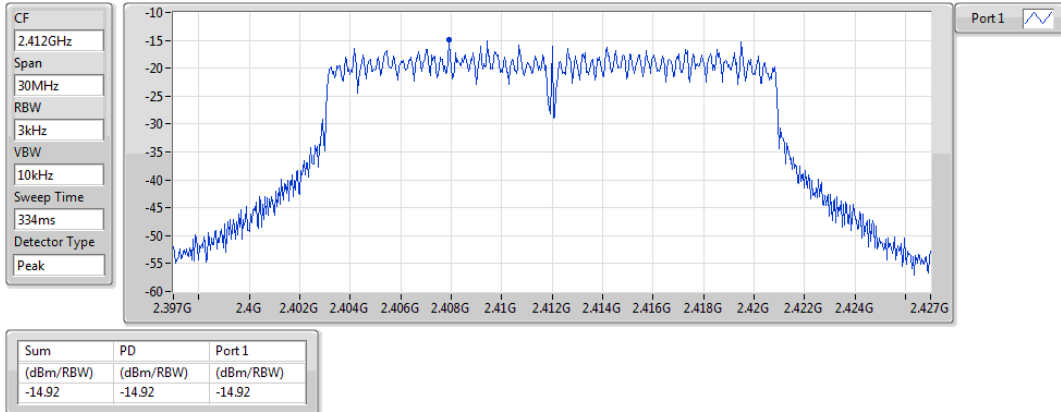
2462MHz



802.11n HT20_Nss1,(MCS0)_1TX

PSD

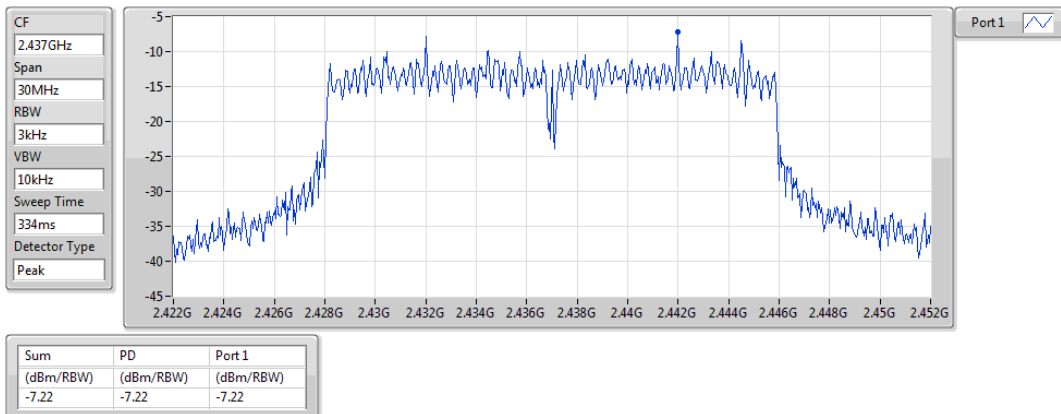
2412MHz



802.11n HT20_Nss1,(MCS0)_1TX

PSD

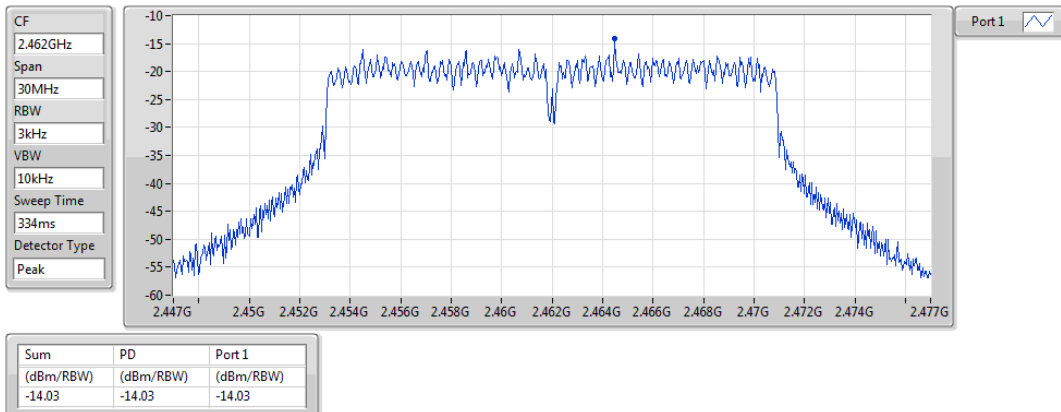
2437MHz



802.11n HT20_Nss1,(MCS0)_1TX

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

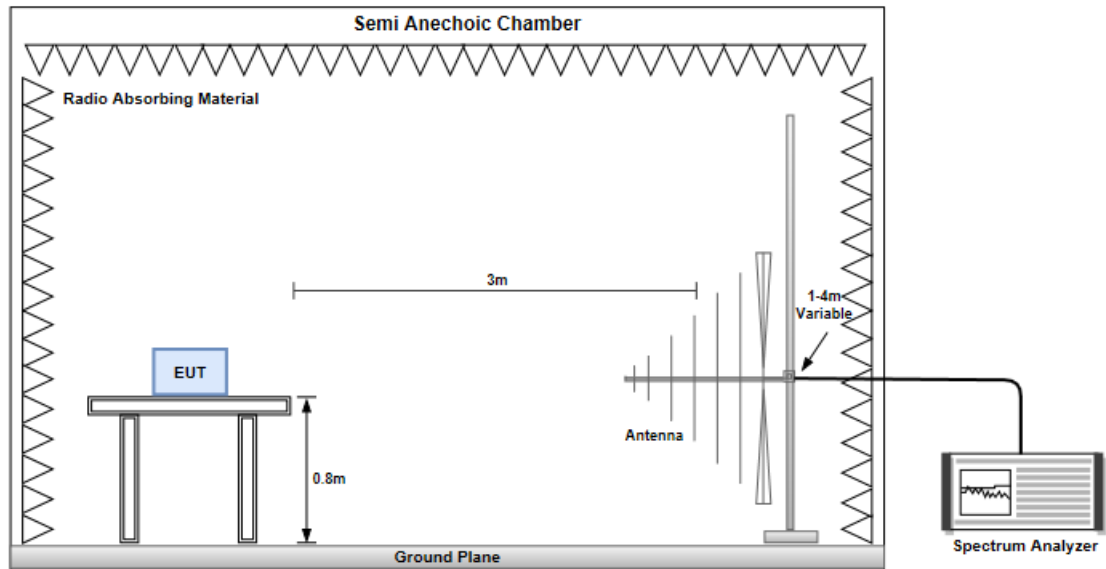
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission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

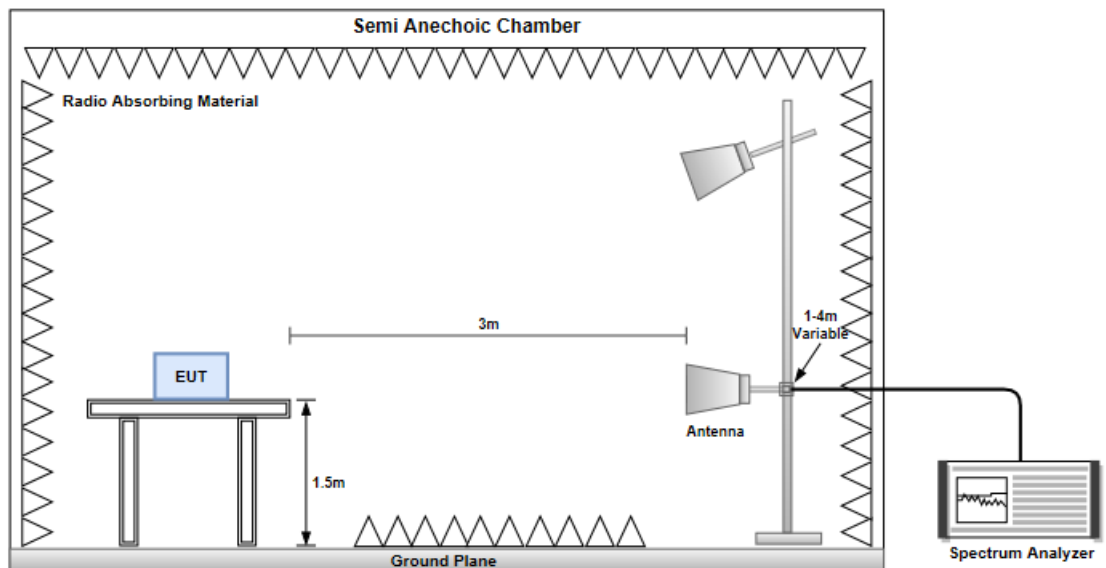
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
3. RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above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

3.5.3 Test Setup

Radiated Emissions below 1 GHz



Radiated Emissions above 1 GHz

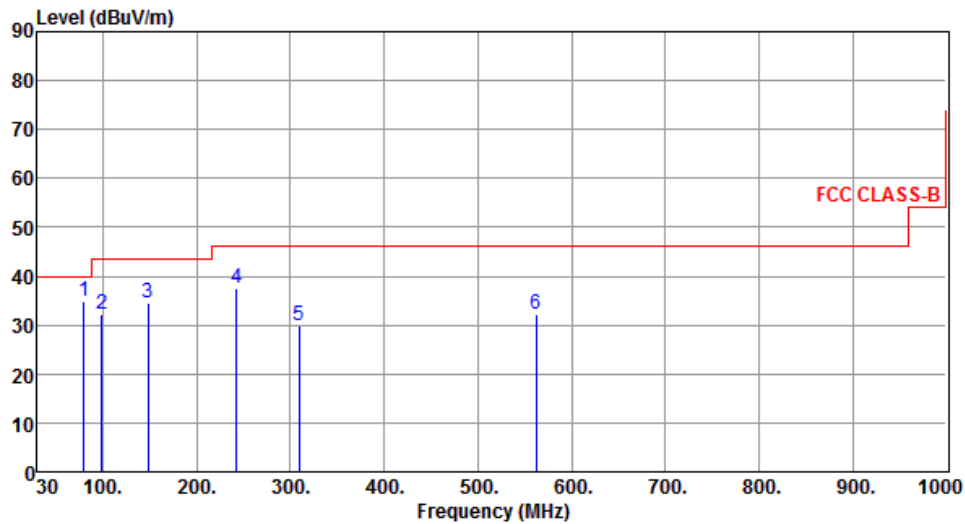


Configuration 1: Dipole antenna (Antenna No.1), Y-plane.

3.5.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)

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

Modulation	HT20	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	79.47	34.98	40.00	-5.02	47.68	-12.70	Peak	---	---
2	98.87	32.28	43.50	-11.22	45.95	-13.67	Peak	---	---
3	148.34	34.58	43.50	-8.92	42.98	-8.40	Peak	---	---
4	242.43	37.44	46.00	-8.56	46.89	-9.45	Peak	---	---
5	309.36	29.92	46.00	-16.08	37.33	-7.41	Peak	---	---
6	562.53	32.28	46.00	-13.72	33.70	-1.42	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

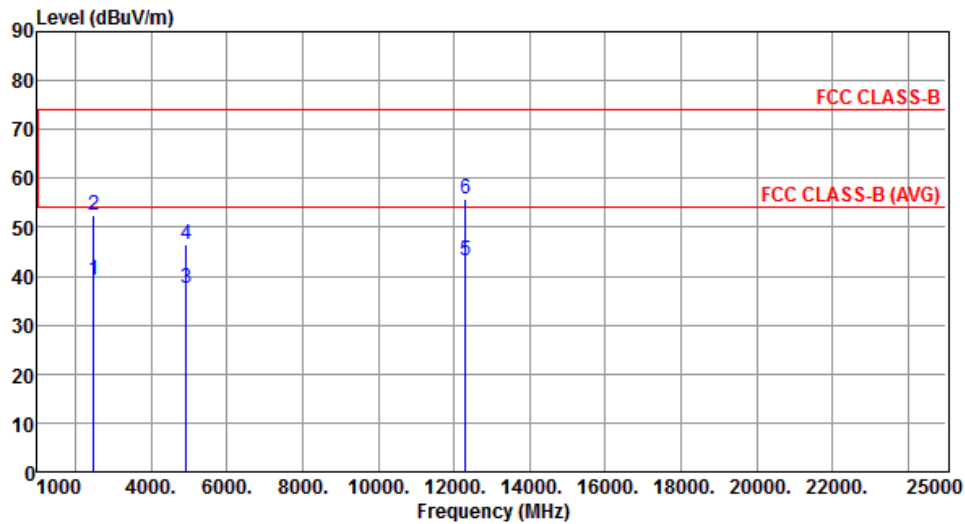
Modulation	11b	Test Freq. (MHz)	2412
Polarization	Horizontal		
Level (dBuV/m) </			

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		



	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	39.26	54.00	-14.74	40.38	-1.12	Average	235	333
2	2483.50	52.35	74.00	-21.65	53.47	-1.12	Peak	235	333
3	4924.00	37.69	54.00	-16.31	32.68	5.01	Average	100	224
4	4924.00	46.60	74.00	-27.40	41.59	5.01	Peak	100	224
5	12310.00	43.08	54.00	-10.92	28.45	14.63	Average	100	100
6	12310.00	55.84	74.00	-18.16	41.21	14.63	Peak	100	100

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

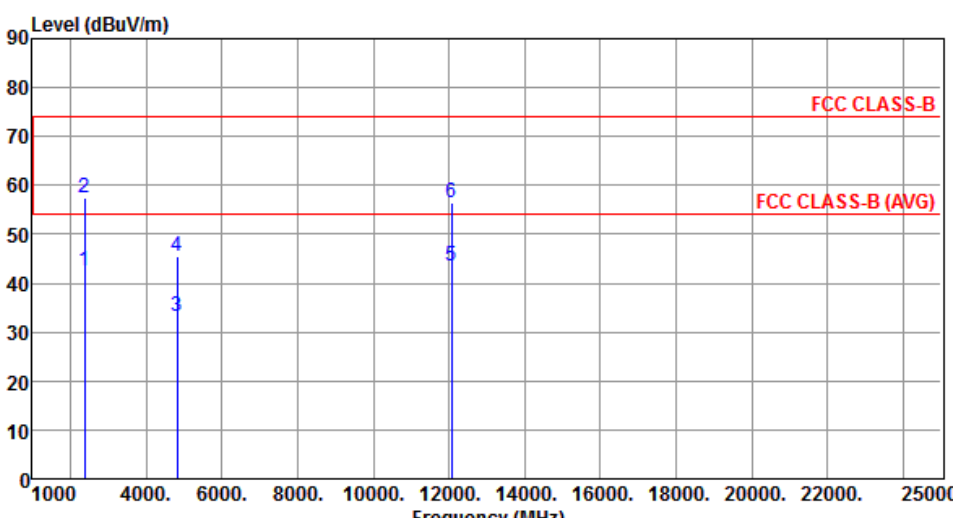
*Factor includes antenna factor , cable loss and amplifier gain

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

Modulation	11b	Test Freq. (MHz)	2462
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	42.55	54.00	-11.45	43.51	-0.96	Average	149	326
2	2390.00	57.45	74.00	-16.55	58.41	-0.96	Peak	149	326
3	4824.00	33.10	54.00	-20.90	28.23	4.87	Average	100	30
4	4824.00	45.33	74.00	-28.67	40.46	4.87	Peak	100	30
5	12060.00	43.49	54.00	-10.51	28.57	14.92	Average	100	100
6	12060.00	56.31	74.00	-17.69	41.39	14.92	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).

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) <			

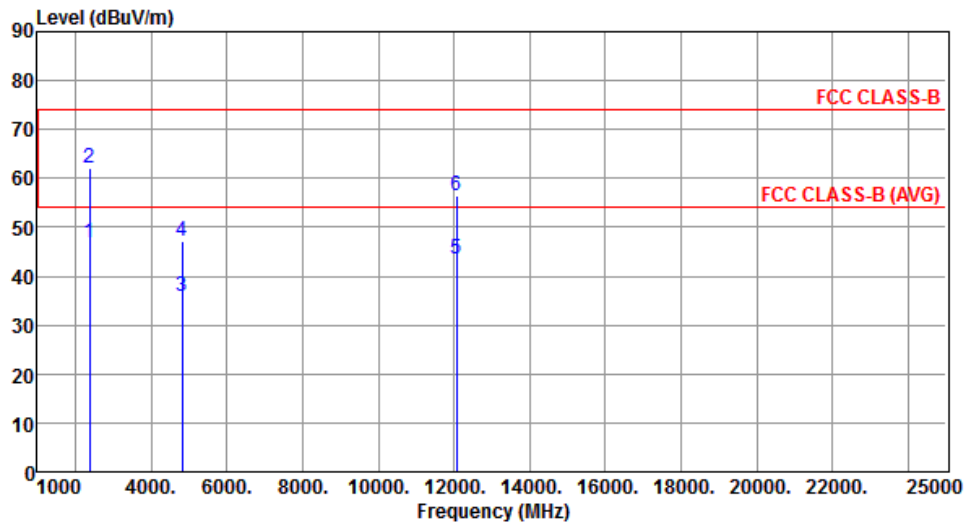
Modulation	11g	Test Freq. (MHz)	2462
Polarization	Horizontal		
Level (dBUV/m)			

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

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	46.75	54.00	-7.25	47.71	-0.96	Average	100	292
2	2390.00	62.18	74.00	-11.82	63.14	-0.96	Peak	100	292
3	4824.00	35.88	54.00	-18.12	31.01	4.87	Average	220	179
4	4824.00	47.10	74.00	-26.90	42.23	4.87	Peak	220	179
5	12060.00	43.49	54.00	-10.51	28.57	14.92	Average	100	60
6	12060.00	56.31	74.00	-17.69	41.39	14.92	Peak	100	60

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

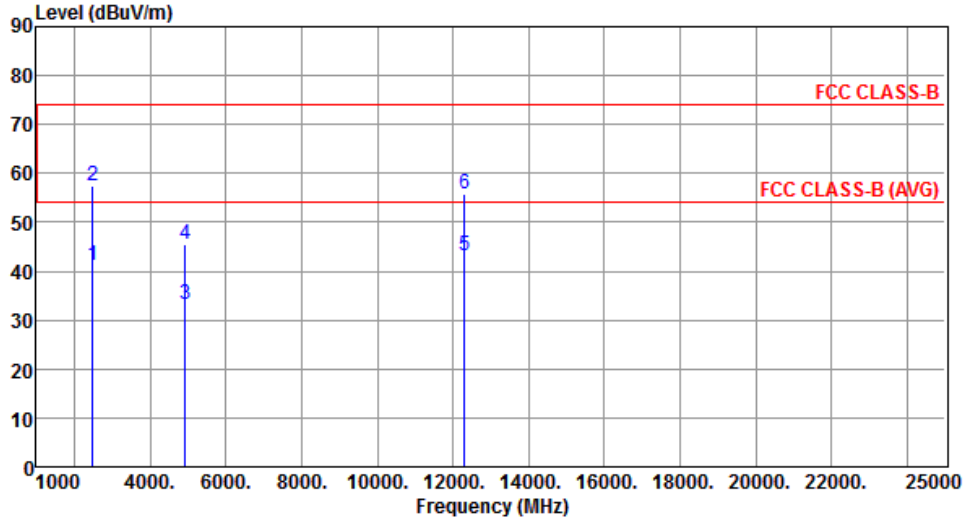
*Factor includes antenna factor , cable loss and amplifier gain

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

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		



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. Six data points are plotted as vertical blue lines with numerical labels 1 through 6. Points 1, 2, 3, and 4 are clustered between 2400 and 5000 MHz, while points 5 and 6 are at 12310 MHz.

	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	41.06	54.00	-12.94	42.18	-1.12	Average	146	329
2	2483.50	57.35	74.00	-16.65	58.47	-1.12	Peak	146	329
3	4924.00	33.25	54.00	-20.75	28.24	5.01	Average	100	60
4	4924.00	45.48	74.00	-28.52	40.47	5.01	Peak	100	60
5	12310.00	43.32	54.00	-10.68	28.69	14.63	Average	100	30
6	12310.00	55.88	74.00	-18.12	41.25	14.63	Peak	100	30

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

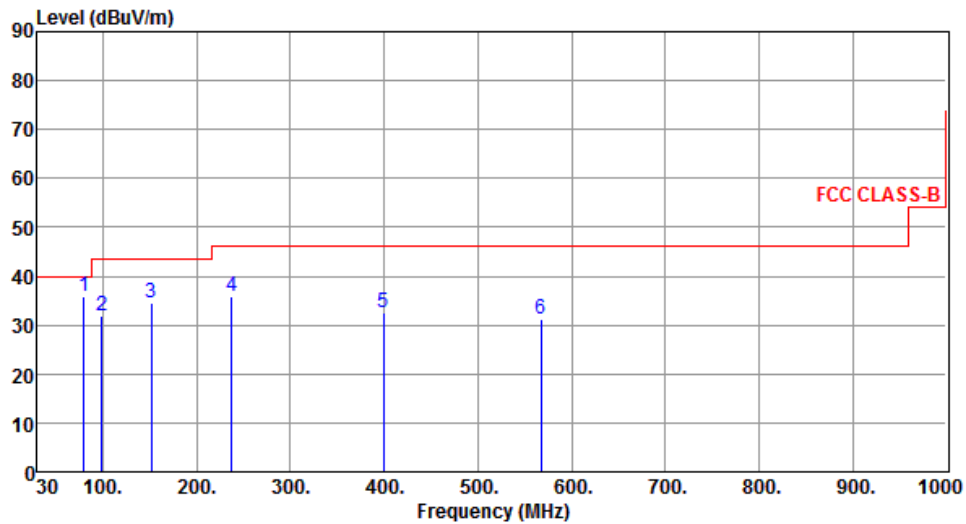
Modulation	HT20	Test Freq. (MHz)	2462
Polarization	Vertical		
Level (dBUV/m) </			

Configuration 2 : PCB Dipole antenna (Antenna No.4) , Y-plane

3.5.8 Transmitter Radiated Unwanted Emissions (Below 1GHz)

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

Modulation	HT20	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	79.47	35.87	40.00	-4.13	48.57	-12.70	Peak	---	---
2	98.87	31.95	43.50	-11.55	45.62	-13.67	Peak	---	---
3	151.25	34.61	43.50	-8.89	42.93	-8.32	Peak	---	---
4	237.58	36.01	46.00	-9.99	45.70	-9.69	Peak	---	---
5	399.57	32.66	46.00	-13.34	37.59	-4.93	Peak	---	---
6	567.38	31.18	46.00	-14.82	32.46	-1.28	Peak	---	---

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

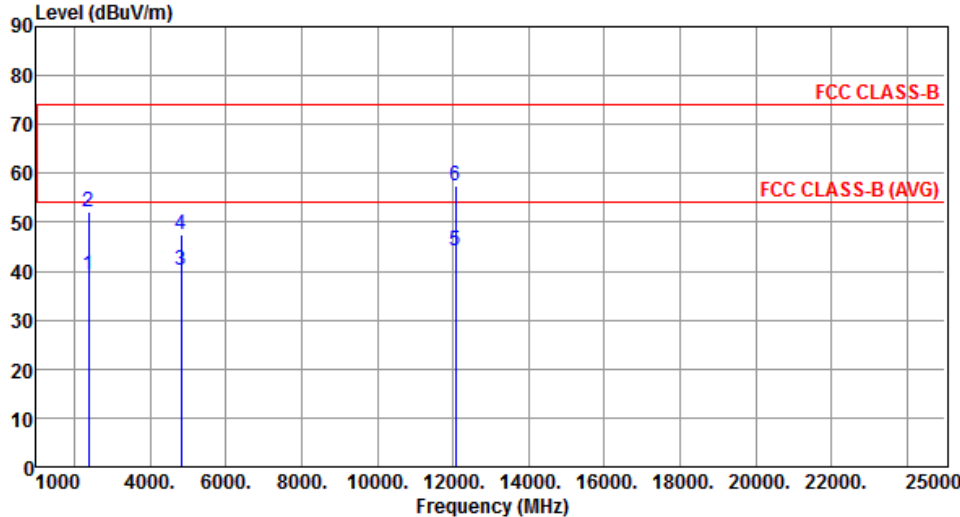
*Factor includes antenna factor , cable loss and amplifier gain

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.

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

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

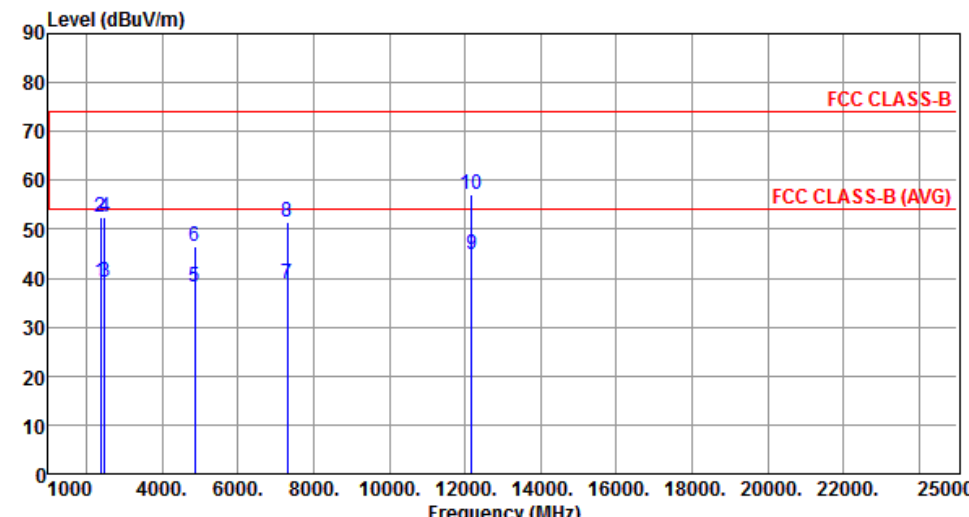


	Freq. MHz	Emission level dBUV/m	Limit dBUV/m	Margin dB	SA reading dBUV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	39.25	54.00	-14.75	40.21	-0.96	Average	100	305
2	2390.00	52.16	74.00	-21.84	53.12	-0.96	Peak	100	305
3	4824.00	40.02	54.00	-13.98	35.15	4.87	Average	100	59
4	4824.00	47.45	74.00	-26.55	42.58	4.87	Peak	100	59
5	12060.00	44.06	54.00	-9.94	29.14	14.92	Average	149	54
6	12060.00	57.30	74.00	-16.70	42.38	14.92	Peak	149	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).

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

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

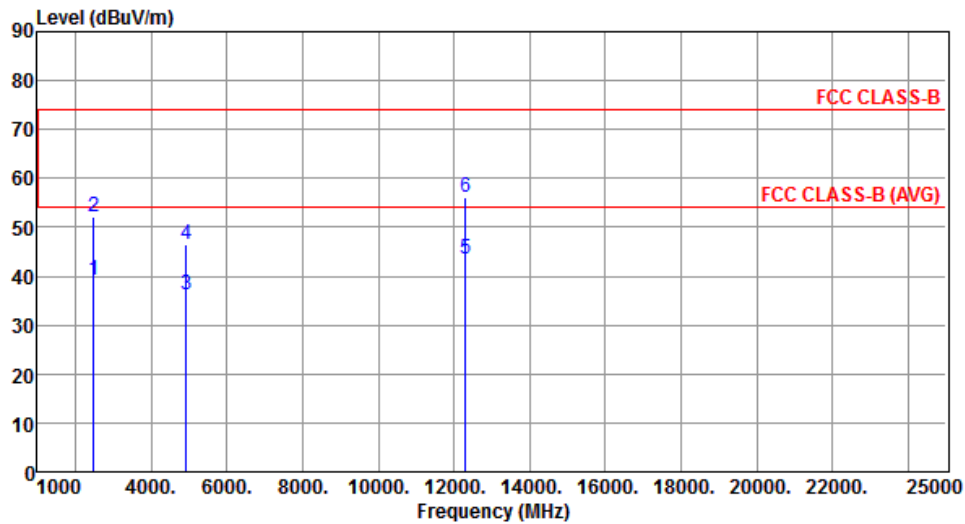


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	39.33	54.00	-14.67	40.29	-0.96	Average	107	304
2	2390.00	52.62	74.00	-21.38	53.58	-0.96	Peak	107	304
3	2483.50	39.15	54.00	-14.85	40.27	-1.12	Average	107	304
4	2483.50	52.50	74.00	-21.50	53.62	-1.12	Peak	107	304
5	4874.00	38.33	54.00	-15.67	33.42	4.91	Average	100	63
6	4874.00	46.35	74.00	-27.65	41.44	4.91	Peak	100	63
7	7311.00	38.87	54.00	-15.13	28.52	10.35	Average	100	50
8	7311.00	51.44	74.00	-22.56	41.09	10.35	Peak	100	50
9	12185.00	44.74	54.00	-9.26	29.88	14.86	Average	153	52
10	12185.00	57.14	74.00	-16.86	42.28	14.86	Peak	153	52

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

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

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	2483.50	39.13	54.00	-14.87	40.25	-1.12	Average	102	307
2	2483.50	52.05	74.00	-21.95	53.17	-1.12	Peak	102	307
3	4924.00	36.27	54.00	-17.73	31.26	5.01	Average	100	60
4	4924.00	46.59	74.00	-27.41	41.58	5.01	Peak	100	60
5	12310.00	43.48	54.00	-10.52	28.85	14.63	Average	100	60
6	12310.00	56.02	74.00	-17.98	41.39	14.63	Peak	100	60

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

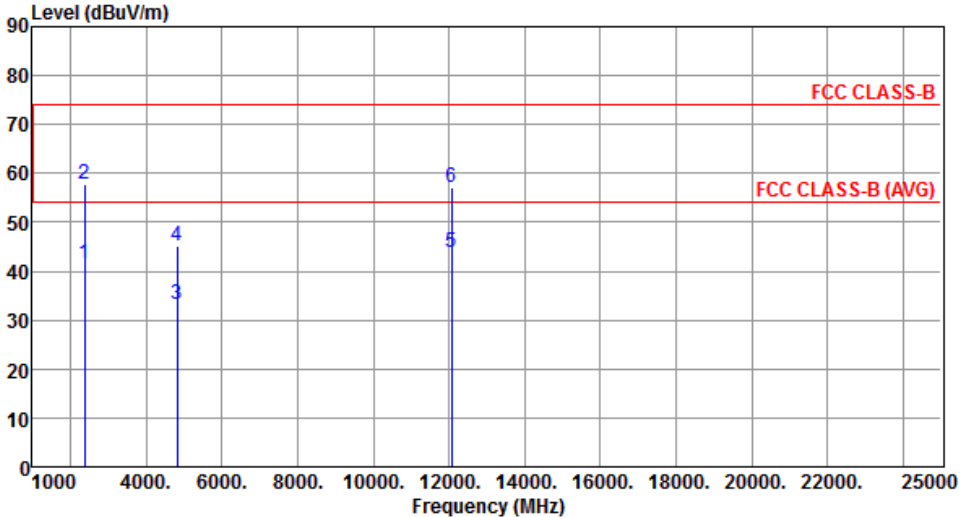
*Factor includes antenna factor , cable loss and amplifier gain

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

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

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

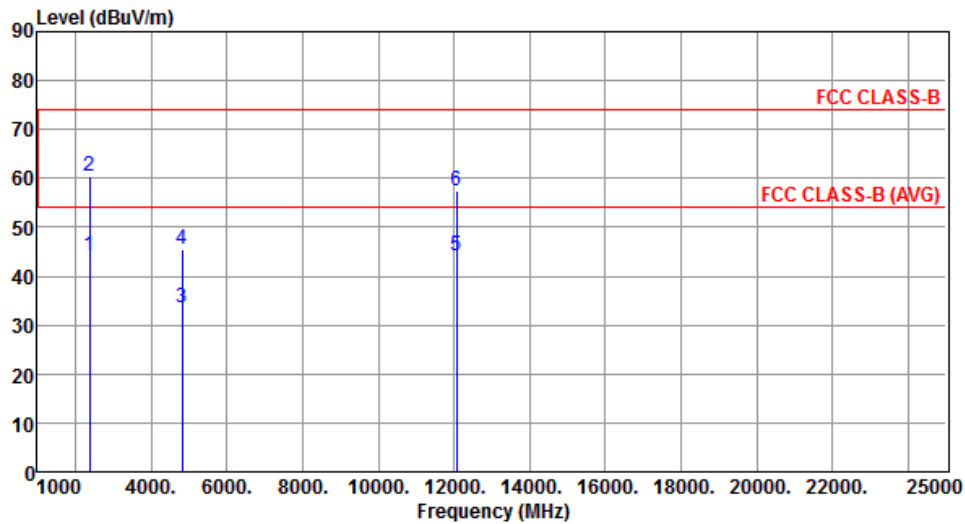
Modulation	11g	Test Freq. (MHz)	2412
Polarization	Horizontal		



	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	41.38	54.00	-12.62	42.34	-0.96	Average	115	307
2	2390.00	57.69	74.00	-16.31	58.65	-0.96	Peak	115	307
3	4824.00	33.31	54.00	-20.69	28.44	4.87	Average	100	100
4	4824.00	45.12	74.00	-28.88	40.25	4.87	Peak	100	100
5	12060.00	43.98	54.00	-10.02	29.06	14.92	Average	100	60
6	12060.00	57.25	74.00	-16.75	42.33	14.92	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).

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	44.24	54.00	-9.76	45.20	-0.96	Average	294	268
2	2390.00	60.41	74.00	-13.59	61.37	-0.96	Peak	294	268
3	4824.00	33.51	54.00	-20.49	28.64	4.87	Average	100	190
4	4824.00	45.55	74.00	-28.45	40.68	4.87	Peak	100	190
5	12060.00	44.07	54.00	-9.93	29.15	14.92	Average	100	120
6	12060.00	57.49	74.00	-16.51	42.57	14.92	Peak	100	120

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

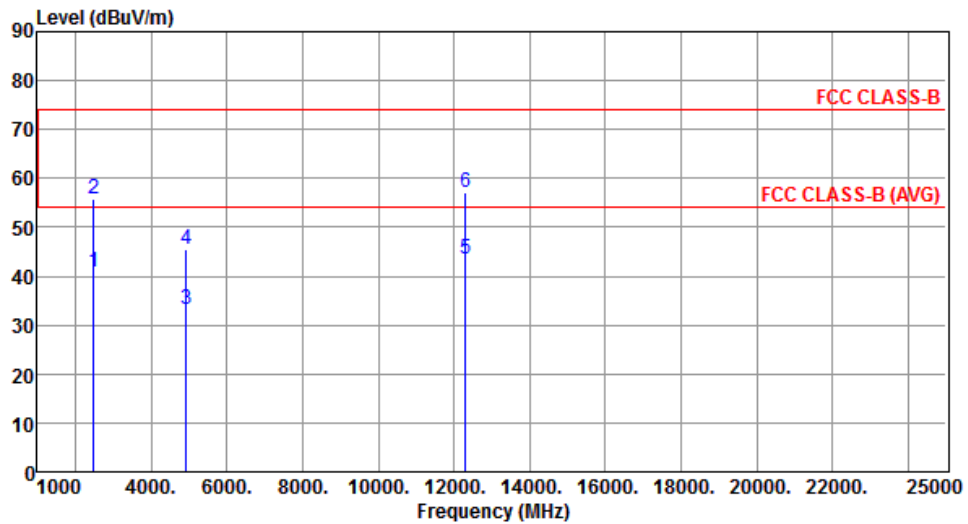
*Factor includes antenna factor , cable loss and amplifier gain

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

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

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

Modulation	11g	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	2483.50	40.93	54.00	-13.07	42.05	-1.12	Average	115	307
2	2483.50	55.77	74.00	-18.23	56.89	-1.12	Peak	115	307
3	4924.00	33.27	54.00	-20.73	28.26	5.01	Average	100	100
4	4924.00	45.40	74.00	-28.60	40.39	5.01	Peak	100	100
5	12310.00	43.37	54.00	-10.63	28.74	14.63	Average	100	30
6	12310.00	57.01	74.00	-16.99	42.38	14.63	Peak	100	30

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

*Factor includes antenna factor , cable loss and amplifier gain

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

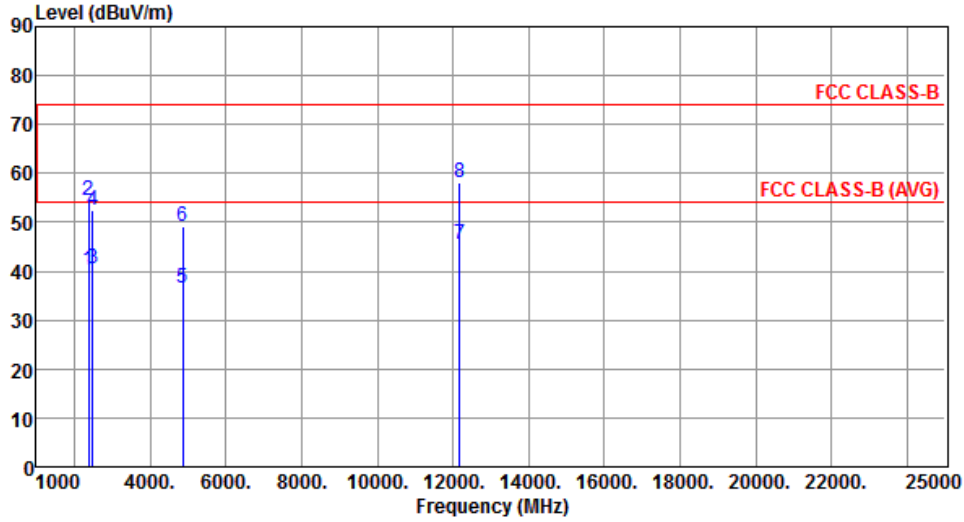
Modulation	11g	Test Freq. (MHz)	2462
Polarization	Vertical		
Level (dBUV/m) </			

3.5.11 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		
Level (dBUV/m) </			

Modulation	HT20	Test Freq. (MHz)	2437
Polarization	Horizontal		

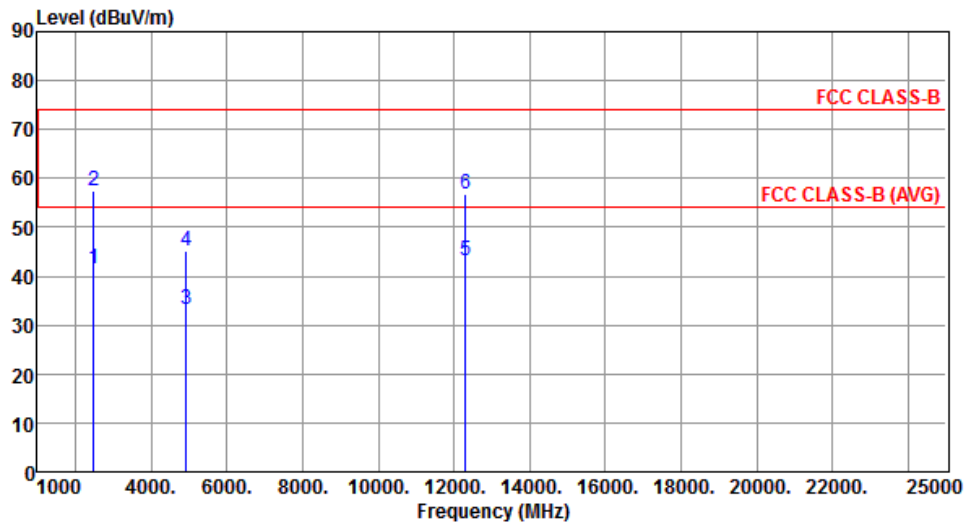


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	40.33	54.00	-13.67	41.29	-0.96	Average	100	309
2	2390.00	54.58	74.00	-19.42	55.54	-0.96	Peak	100	309
3	2483.50	40.56	54.00	-13.44	41.68	-1.12	Average	100	309
4	2483.50	52.45	74.00	-21.55	53.57	-1.12	Peak	100	309
5	4874.00	36.40	54.00	-17.60	31.49	4.91	Average	100	130
6	4874.00	49.17	74.00	-24.83	44.26	4.91	Peak	100	130
7	12185.00	45.51	54.00	-8.49	30.65	14.86	Average	100	45
8	12185.00	58.11	74.00	-15.89	43.25	14.86	Peak	100	45

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

Modulation	HT20	Test Freq. (MHz)	2437
Polarization	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	2483.50	41.47	54.00	-12.53	42.59	-1.12	Average	115	304
2	2483.50	57.33	74.00	-16.67	58.45	-1.12	Peak	115	304
3	4924.00	33.14	54.00	-20.86	28.13	5.01	Average	100	30
4	4924.00	45.29	74.00	-28.71	40.28	5.01	Peak	100	30
5	12310.00	43.32	54.00	-10.68	28.69	14.63	Average	100	90
6	12310.00	56.91	74.00	-17.09	42.28	14.63	Peak	100	90

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

*Factor includes antenna factor , cable loss and amplifier gain

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

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

Configuration 3 : PIFA antenna (Antenna No.6) , Y-plane

3.5.12 Transmitter Radiated Unwanted Emissions (Below 1GHz)

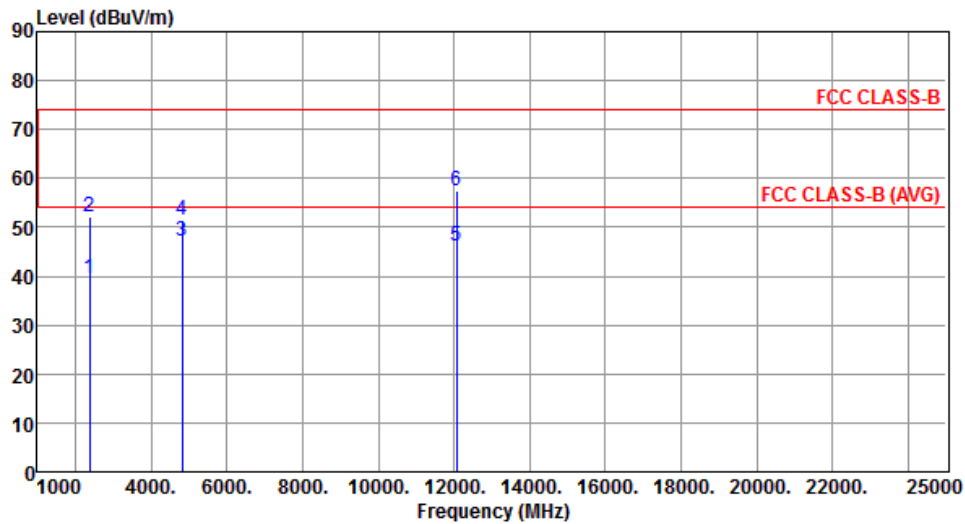
Modulation	HT20	Test Freq. (MHz)	2437
Polarization	Horizontal		
Level (dBuV/m) </			

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

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

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

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	39.40	54.00	-14.60	40.36	-0.96	Average	145	219
2	2390.00	52.18	74.00	-21.82	53.14	-0.96	Peak	145	219
3	4824.00	47.17	54.00	-6.83	42.30	4.87	Average	100	156
4	4824.00	51.44	74.00	-22.56	46.57	4.87	Peak	100	156
5	12060.00	46.07	54.00	-7.93	31.15	14.92	Average	100	135
6	12060.00	57.57	74.00	-16.43	42.65	14.92	Peak	100	135

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

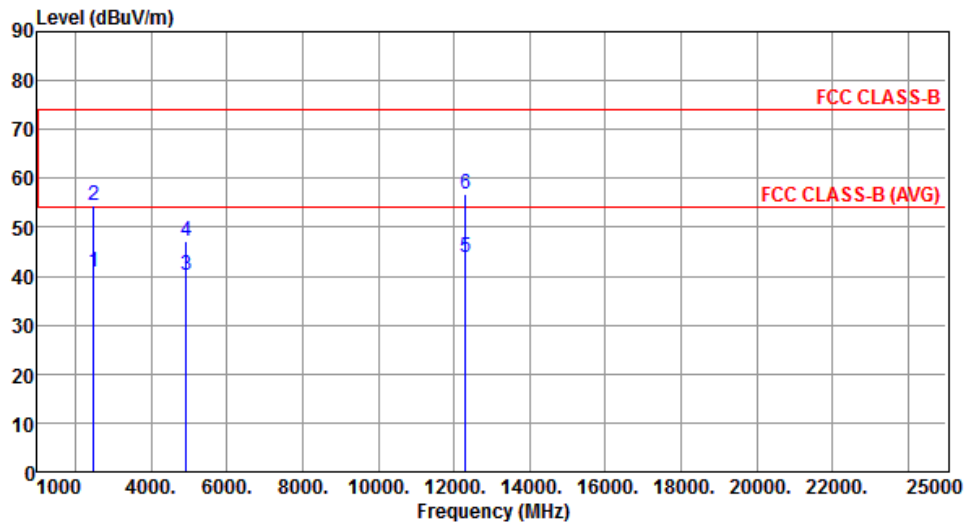
*Factor includes antenna factor , cable loss and amplifier gain

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

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

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

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	2483.50	40.85	54.00	-13.15	41.97	-1.12	Average	109	86
2	2483.50	54.37	74.00	-19.63	55.49	-1.12	Peak	109	86
3	4924.00	40.13	54.00	-13.87	35.12	5.01	Average	236	49
4	4924.00	47.18	74.00	-26.82	42.17	5.01	Peak	236	49
5	12310.00	43.77	54.00	-10.23	29.14	14.63	Average	100	30
6	12310.00	56.90	74.00	-17.10	42.27	14.63	Peak	100	30

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

*Factor includes antenna factor , cable loss and amplifier gain

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

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

3.5.14 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	46.35	54.00	-7.65	47.31	-0.96	Average	100	86
2	2390.00	60.62	74.00	-13.38	61.58	-0.96	Peak	100	86
3	4824.00	33.31	54.00	-20.69	28.44	4.87	Average	100	100
4	4824.00	44.98	74.00	-29.02	40.11	4.87	Peak	100	100
5	12060.00	43.67	54.00	-10.33	28.75	14.92	Average	100	20
6	12060.00	56.08	74.00	-17.92	41.16	14.92	Peak	100	20

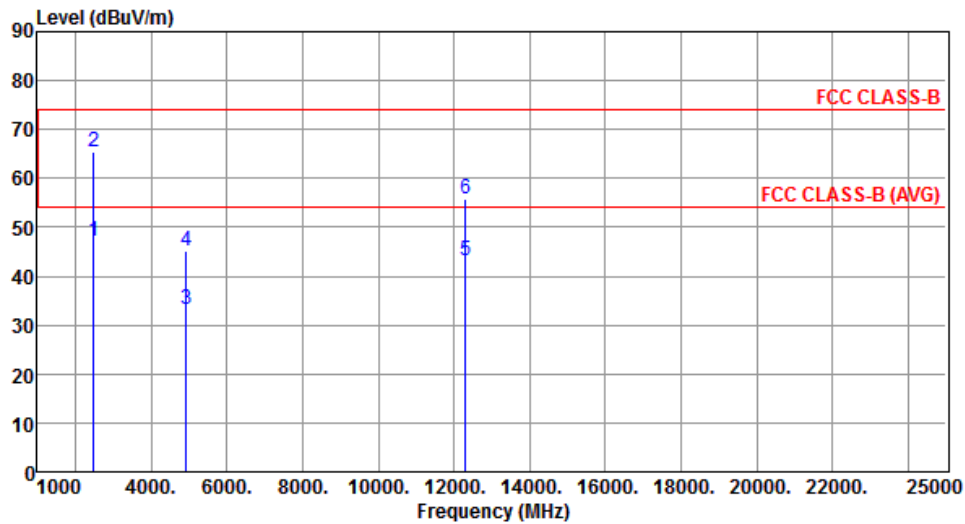
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

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) 90 80 70 60 50 40 30 20 10 0 1000 4000 6000 8000 10000 12000 14000 16000 18000 20000 22000 25000 Frequency (MHz) 4 3 6 5 8 7 10 9 FCC CLASS-B FCC CLASS-B (AVG) <table><tr><th></th><th>Freq. MHz</th><th>Emission level dBuV/m</th><th>Limit dBuV/m</th><th>Margin dB</th><th>SA reading dBuV</th><th>Factor dB</th><th>Remark</th><th>ANT High cm</th><th>Turn Table deg</th></tr><tr><td>1</td><td>2390.00</td><td>40.39</td><td>54.00</td><td>-13.61</td><td>41.35</td><td>-0.96</td><td>Average</td><td>131</td><td>213</td></tr><tr><td>2</td><td>2390.00</td><td>53.63</td><td>74.00</td><td>-20.37</td><td>54.59</td><td>-0.96</td><td>Peak</td><td>131</td><td>213</td></tr><tr><td>3</td><td>2483.50</td><td>40.61</td><td>54.00</td><td>-13.39</td><td>41.73</td><td>-1.12</td><td>Average</td><td>131</td><td>213</td></tr><tr><td>4</td><td>2483.50</td><td>55.07</td><td>74.00</td><td>-18.93</td><td>56.19</td><td>-1.12</td><td>Peak</td><td>131</td><td>213</td></tr><tr><td>5</td><td>4874.00</td><td>41.78</td><td>54.00</td><td>-12.22</td><td>36.87</td><td>4.91</td><td>Average</td><td>100</td><td>155</td></tr><tr><td>6</td><td>4874.00</td><td>49.49</td><td>74.00</td><td>-24.51</td><td>44.58</td><td>4.91</td><td>Peak</td><td>100</td><td>155</td></tr><tr><td>7</td><td>7311.00</td><td>38.80</td><td>54.00</td><td>-15.20</td><td>28.45</td><td>10.35</td><td>Average</td><td>100</td><td>200</td></tr><tr><td>8</td><td>7311.00</td><td>51.70</td><td>74.00</td><td>-22.30</td><td>41.35</td><td>10.35</td><td>Peak</td><td>100</td><td>200</td></tr><tr><td>9</td><td>12185.00</td><td>46.13</td><td>54.00</td><td>-7.87</td><td>31.27</td><td>14.86</td><td>Average</td><td>100</td><td>140</td></tr><tr><td>10</td><td>12185.00</td><td>59.44</td><td>74.00</td><td>-14.56</td><td>44.58</td><td>14.86</td><td>Peak</td><td>100</td><td>140</td></tr></table> Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB) *Factor includes antenna factor , cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).					Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg	1	2390.00	40.39	54.00	-13.61	41.35	-0.96	Average	131	213	2	2390.00	53.63	74.00	-20.37	54.59	-0.96	Peak	131	213	3	2483.50	40.61	54.00	-13.39	41.73	-1.12	Average	131	213	4	2483.50	55.07	74.00	-18.93	56.19	-1.12	Peak	131	213	5	4874.00	41.78	54.00	-12.22	36.87	4.91	Average	100	155	6	4874.00	49.49	74.00	-24.51	44.58	4.91	Peak	100	155	7	7311.00	38.80	54.00	-15.20	28.45	10.35	Average	100	200	8	7311.00	51.70	74.00	-22.30	41.35	10.35	Peak	100	200	9	12185.00	46.13	54.00	-7.87	31.27	14.86	Average	100	140	10	12185.00	59.44	74.00	-14.56	44.58	14.86	Peak	100	140
	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	40.39	54.00	-13.61	41.35	-0.96	Average	131	213																																																																																																								
2	2390.00	53.63	74.00	-20.37	54.59	-0.96	Peak	131	213																																																																																																								
3	2483.50	40.61	54.00	-13.39	41.73	-1.12	Average	131	213																																																																																																								
4	2483.50	55.07	74.00	-18.93	56.19	-1.12	Peak	131	213																																																																																																								
5	4874.00	41.78	54.00	-12.22	36.87	4.91	Average	100	155																																																																																																								
6	4874.00	49.49	74.00	-24.51	44.58	4.91	Peak	100	155																																																																																																								
7	7311.00	38.80	54.00	-15.20	28.45	10.35	Average	100	200																																																																																																								
8	7311.00	51.70	74.00	-22.30	41.35	10.35	Peak	100	200																																																																																																								
9	12185.00	46.13	54.00	-7.87	31.27	14.86	Average	100	140																																																																																																								
10	12185.00	59.44	74.00	-14.56	44.58	14.86	Peak	100	140																																																																																																								

Modulation	11g	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	2483.50	47.30	54.00	-6.70	48.42	-1.12	Average	100	85
2	2483.50	65.44	74.00	-8.56	66.56	-1.12	Peak	100	85
3	4924.00	33.12	54.00	-20.88	28.11	5.01	Average	100	30
4	4924.00	45.25	74.00	-28.75	40.24	5.01	Peak	100	30
5	12310.00	43.28	54.00	-10.72	28.65	14.63	Average	100	90
6	12310.00	55.86	74.00	-18.14	41.23	14.63	Peak	100	90

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

*Factor includes antenna factor , cable loss and amplifier gain

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

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

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

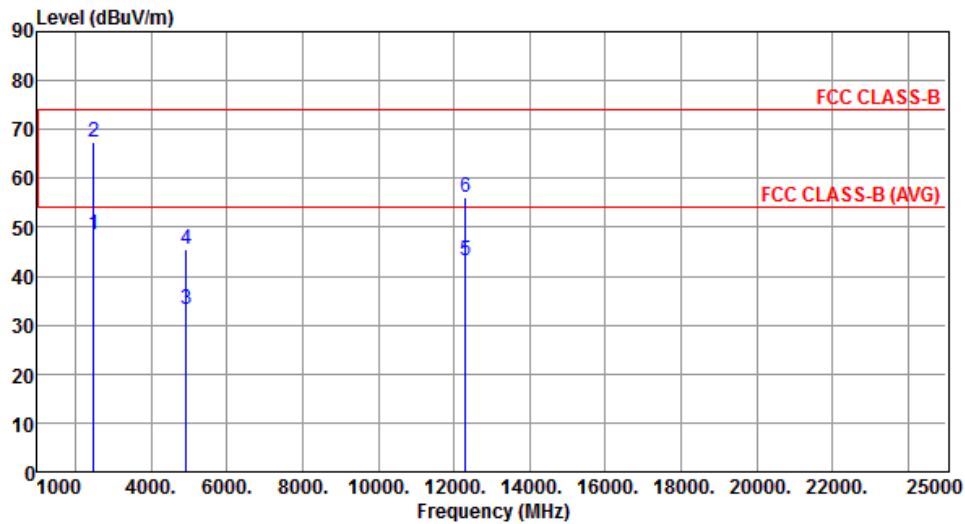
Modulation	HT20	Test Freq. (MHz)	2412
Polarization	Horizontal		
Level (dBuV/m) <			

Modulation	HT20	Test Freq. (MHz)	2412
Polarization	Vertical		
Level (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		



	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	48.44	54.00	-5.56	49.56	-1.12	Average	100	86
2	2483.50	67.49	74.00	-6.51	68.61	-1.12	Peak	100	86
3	4924.00	33.27	54.00	-20.73	28.26	5.01	Average	100	35
4	4924.00	45.59	74.00	-28.41	40.58	5.01	Peak	100	35
5	12310.00	43.20	54.00	-10.80	28.57	14.63	Average	100	80
6	12310.00	55.99	74.00	-18.01	41.36	14.63	Peak	100	80

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

*Factor includes antenna factor , cable loss and amplifier gain

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

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

3.6 Emissions in Non-Restricted Frequency Bands

3.6.1 Emissions in Non-Restricted Frequency Bands Limit

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

3.6.2 Test Procedures

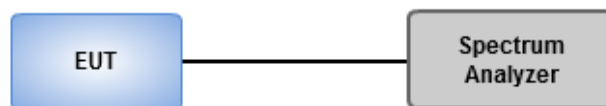
Reference level measurement

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

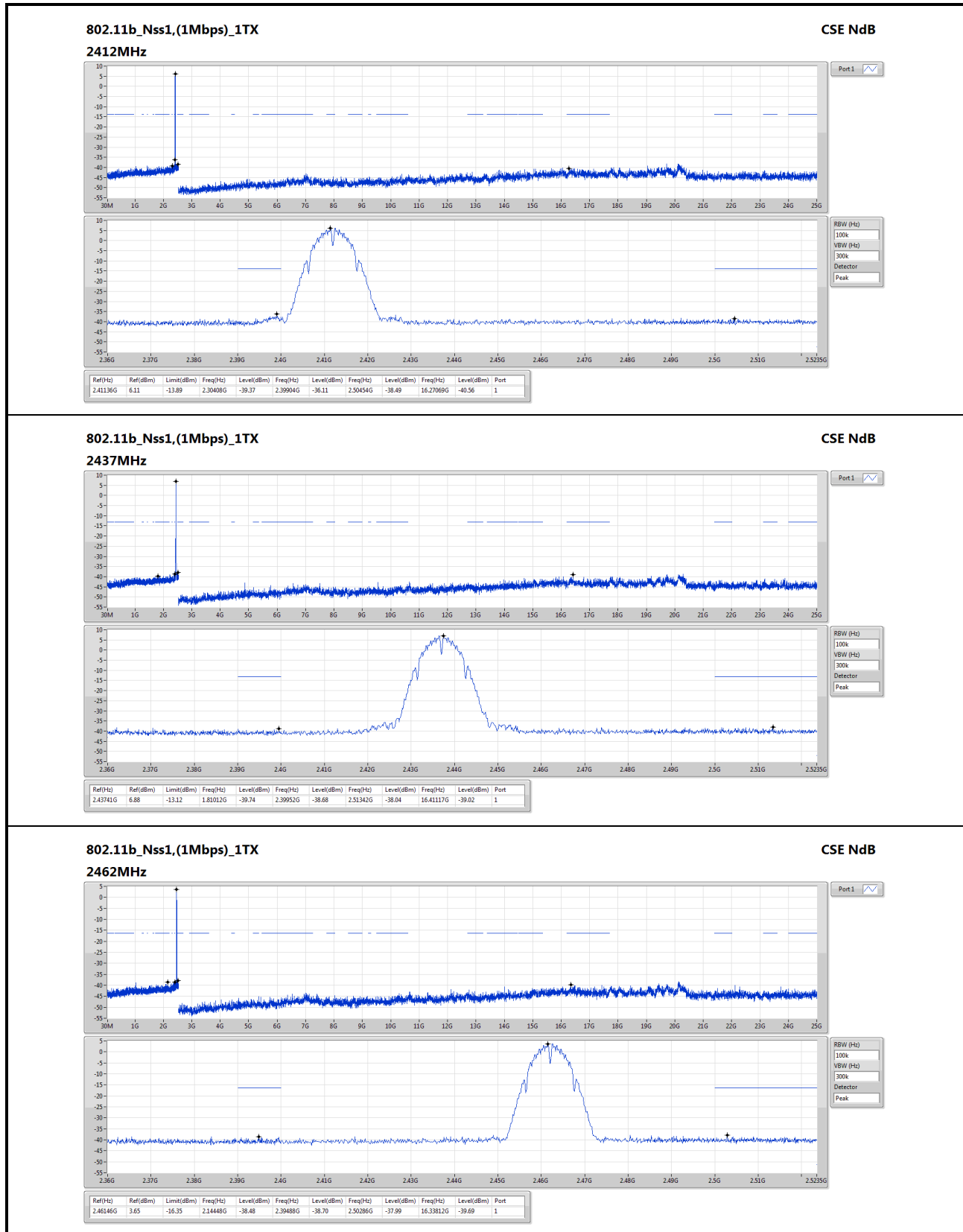
Emission level measurement

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

3.6.3 Test Setup



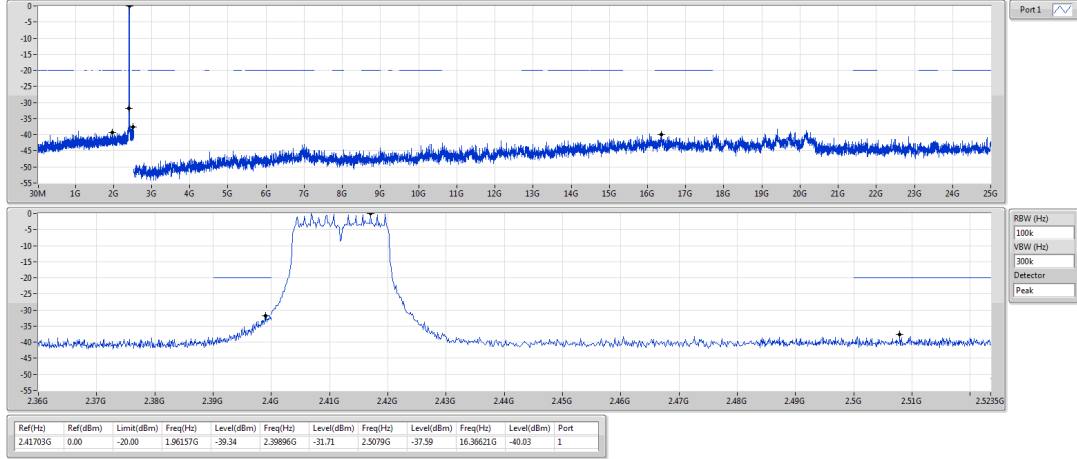
3.6.4 Unwanted Emissions into Non-Restricted Frequency Bands



802.11g_Nss1,(6Mbps)_1TX

CSE NdB

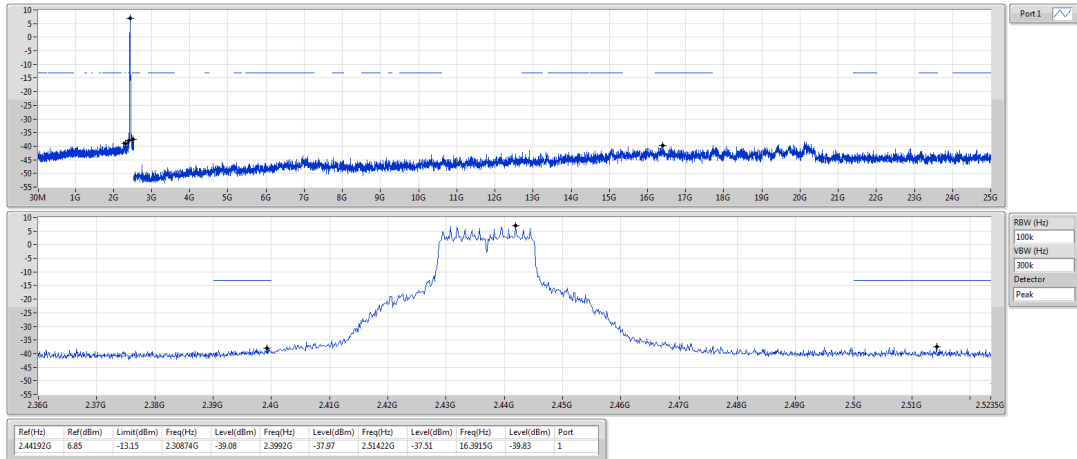
2412MHz



802.11g_Nss1,(6Mbps)_1TX

CSE NdB

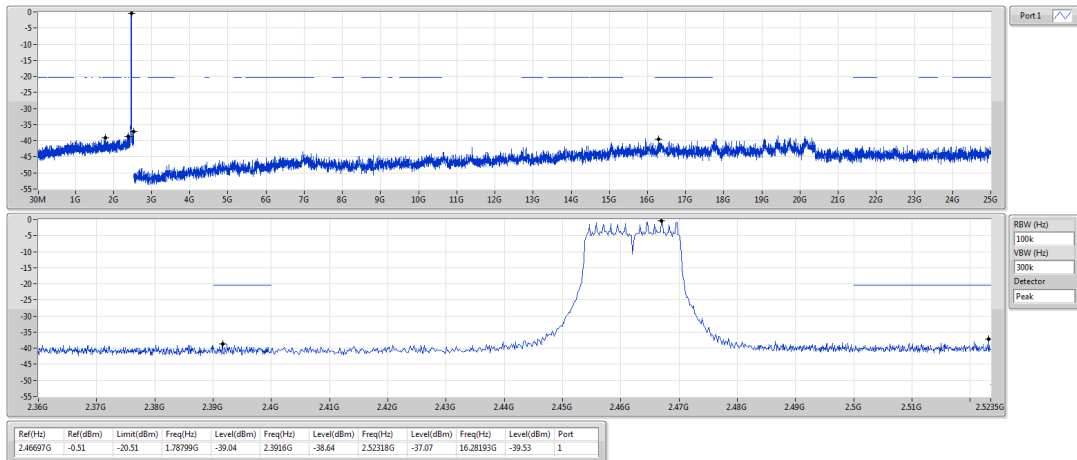
2437MHz



802.11g_Nss1,(6Mbps)_1TX

CSE NdB

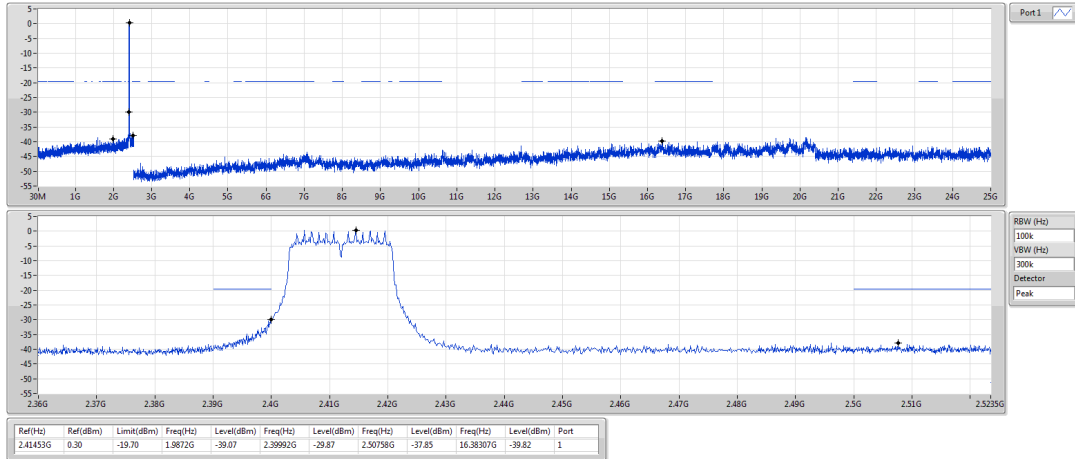
2462MHz



802.11n HT20_Nss1,(MCS0)_1TX

CSE NdB

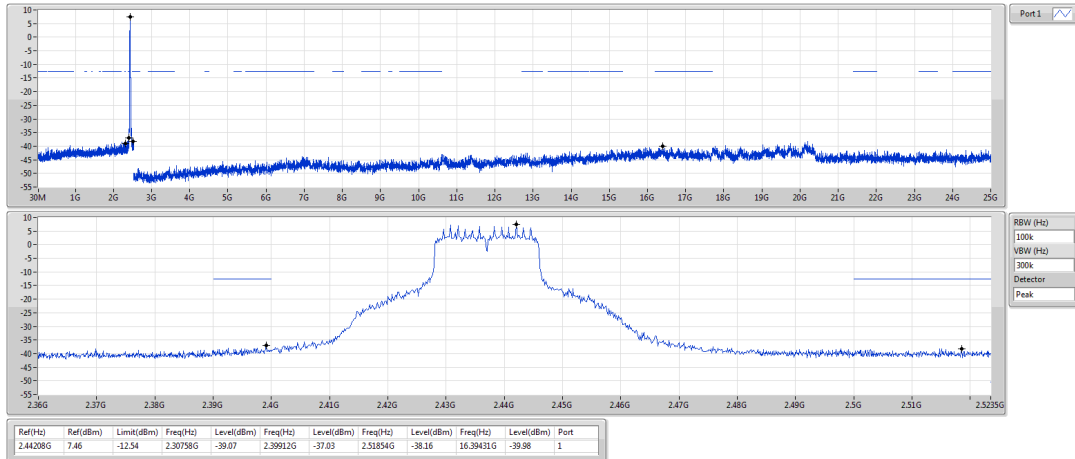
2412MHz



802.11n HT20_Nss1,(MCS0)_1TX

CSE NdB

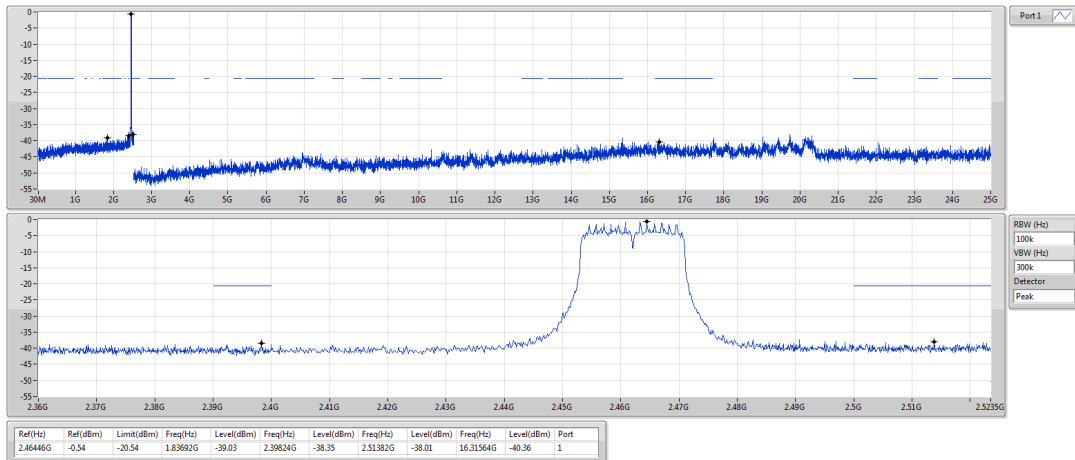
2437MHz



802.11n HT20_Nss1,(MCS0)_1TX

CSE NdB

2462MHz



4 Test laboratory information

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

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

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

Linkou

Tel: 886-2-2601-1640

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

Kwei Shan

Tel: 886-3-271-8666

No. 3-1, Lane 6, Wen San 3rd St.,
Kwei Shan District, Tao Yuan City
333, Taiwan, R.O.C.

Kwei Shan Site II

Tel: 886-3-271-8640

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

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

Tel: 886-3-271-8666

Fax: 886-3-318-0155

Email: ICC_Service@icertifi.com.tw

==END==