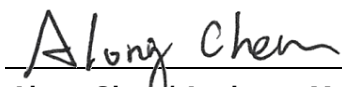


FCC Test Report

FCC ID : I88NBG7815
Equipment : AX6000 12-Stream Multi-Gigabit WiFi 6 Router
Model No. : NBG7815
Brand Name : ZYXEL
Applicant : Zyxel Communications Corporation
Address : No.2 Industry East RD. IX, Hsinchu Science Park,
Hsinchu 30075, Taiwan, R.O.C
Standard : 47 CFR FCC Part 15.247
Received Date : Jan. 08, 2020
Tested Date : Jan. 08 ~ Feb. 04, 2020

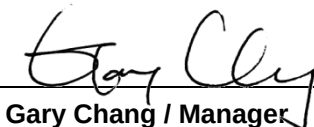
We, International Certification Corp., would like to declare that the tested sample has been evaluated and in compliance with the requirement of the above standards. The test results contained in this report refer exclusively to the product. It may be duplicated completely for legal use with the approval of the applicant. It shall not be reproduced except in full without the written approval of our laboratory.

Reviewed by:



Along Chen / Assistant Manager

Approved by:



Gary Chang / Manager



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Release Record

Report No.	Version	Description	Issued Date
FR020307AC	Rev. 01	Initial issue	Mar. 25, 2020

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	Conducted Emissions	[dBuV]: 9.059MHz 38.54 (Margin -11.46dB) - AV	Pass
15.247(d) 15.209	Radiated Emissions	[dBuV/m at 3m]: 2390.00MHz 53.88 (Margin -0.12dB) – AV	Pass
15.247(b)(3)	Maximum Output Power	Max Power [dBm]: <i>Non-beamforming mode</i> 29.64 <i>Beamforming mode</i> 21.95	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]	4	1-11 Mbps
2400-2483.5	g	2412-2462	1-11 [11]	4	6-54 Mbps
2400-2483.5	n (HT20)	2412-2462	1-11 [11]	4	MCS 0-31
2400-2483.5	n (HT40)	2422-2452	3-9 [7]	4	MCS 0-31
2400-2483.5	ax (HE20)	2412-2462	1-11 [11]	4	MCS 0-11
2400-2483.5	ax (HE40)	2422-2452	3-9 [7]	4	MCS 0-11

Note 1: RF output power specifies that Maximum Conducted (Average) Output Power.
 Note 2: Chip feature :
 DSSS-DBPSK, DQPSK, CCK modulation
 OFDM/OFDMA- BPSK, QPSK, 16QAM, 64QAM, 256QAM and 1024 QAM modulation.
 Note 3: Operating modes of this device are listed as above table.
 Note 4: 802.11ax supports beamforming function.

1.1.2 Radio Details

Radio	Function
1	Wi-Fi 2.4GHz, 4T4R
2	Wi-Fi 5GHz, 8T8R
3	Bluetooth LE only

1.1.3 Antenna Details

Ant. No.	Model	Type	Connector	Antenna Gain (dBi)
1	ALX19M-126AA2-B	PIFA	IPEX	0
2	ALX19M-126AA2-B	PIFA	IPEX	0
3	ALX19M-126AA2-B	PIFA	IPEX	0
4	ALX19M-126AA2-B	PIFA	IPEX	0

1.1.4 Power Supply Type of Equipment under Test (EUT)

Power Supply Type	12Vdc from adapter
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1.1.5 Accessories

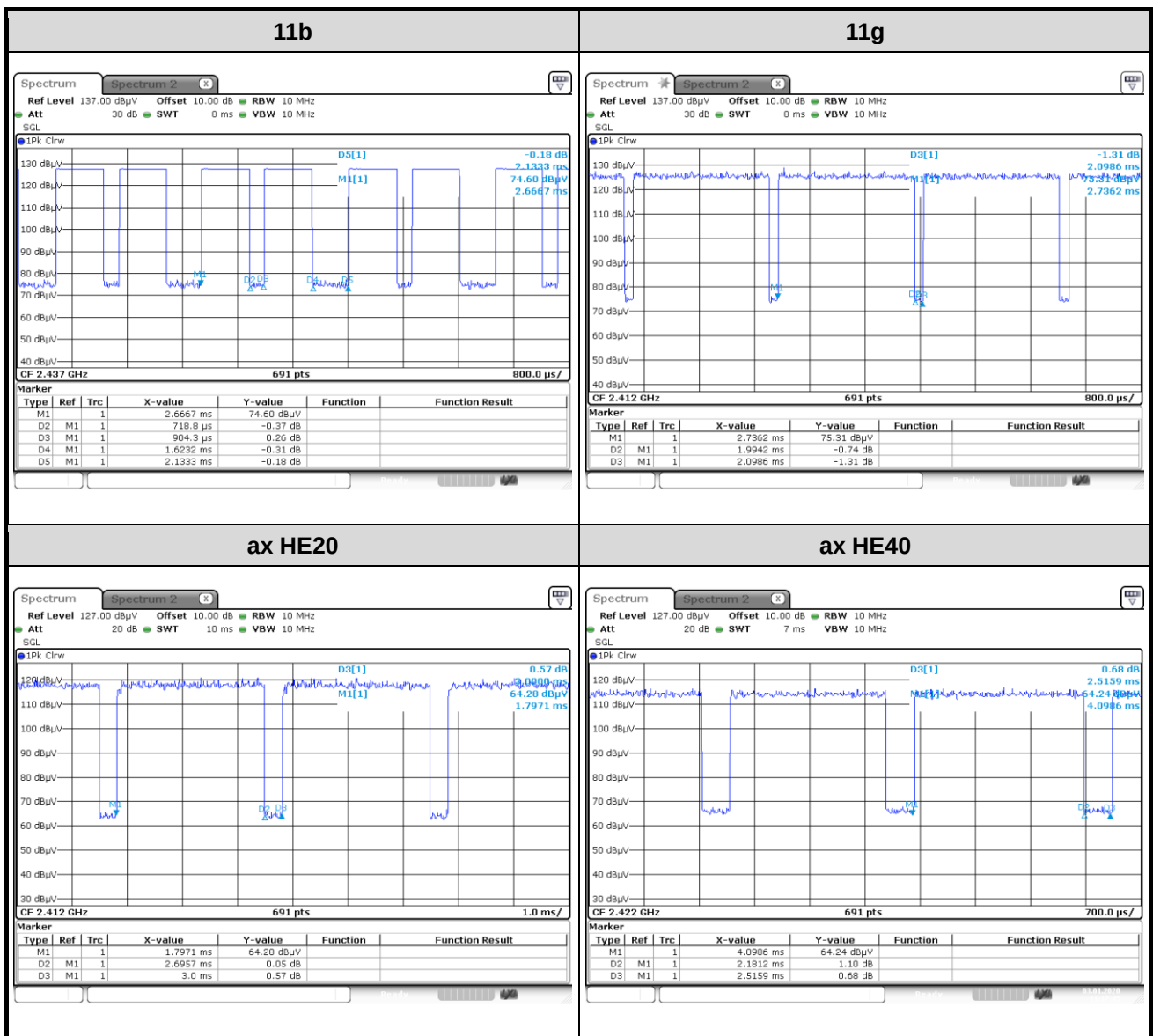
Accessories		
No.	Equipment	Description
1	Adapter	Brand: APD Model: WA-40E19R Power Rating: I/P: 100-240Vac, 50-60Hz, 1A Max O/P: 19Vdc, 2.1A Power Line: 1.5m non-shielded with one core
2	RJ45 cable	Brand: Nien-Yi Technology (Zhu Hai) CO., Model: NYS1315 Power Line: 1.5m non-shielded without core

1.1.6 Channel List

Frequency band (MHz)		2400~2483.5	
802.11a / n HT20 / ax HE20		802.11n HT40 / ax HE40	
Channel	Frequency(MHz)	Channel	Frequency(MHz)
1	2412	3	2422
2	2417	4	2427
3	2422	5	2432
4	2427	6	2437
5	2432	7	2442
6	2437	8	2447
7	2442	9	2452
8	2447	---	---
9	2452	---	---
10	2457	---	---
11	2462	---	---

1.1.7 Test Tool and Duty Cycle

Test Tool	QSPR, V5.0-00188		
Duty Cycle and Duty Factor	Mode	Duty cycle (%)	Duty factor (dB)
	11b	76.09%	1.19
	11g	95.03%	0.22
	ax (HE20)	89.86%	0.46
	ax (HE40)	86.70%	0.62



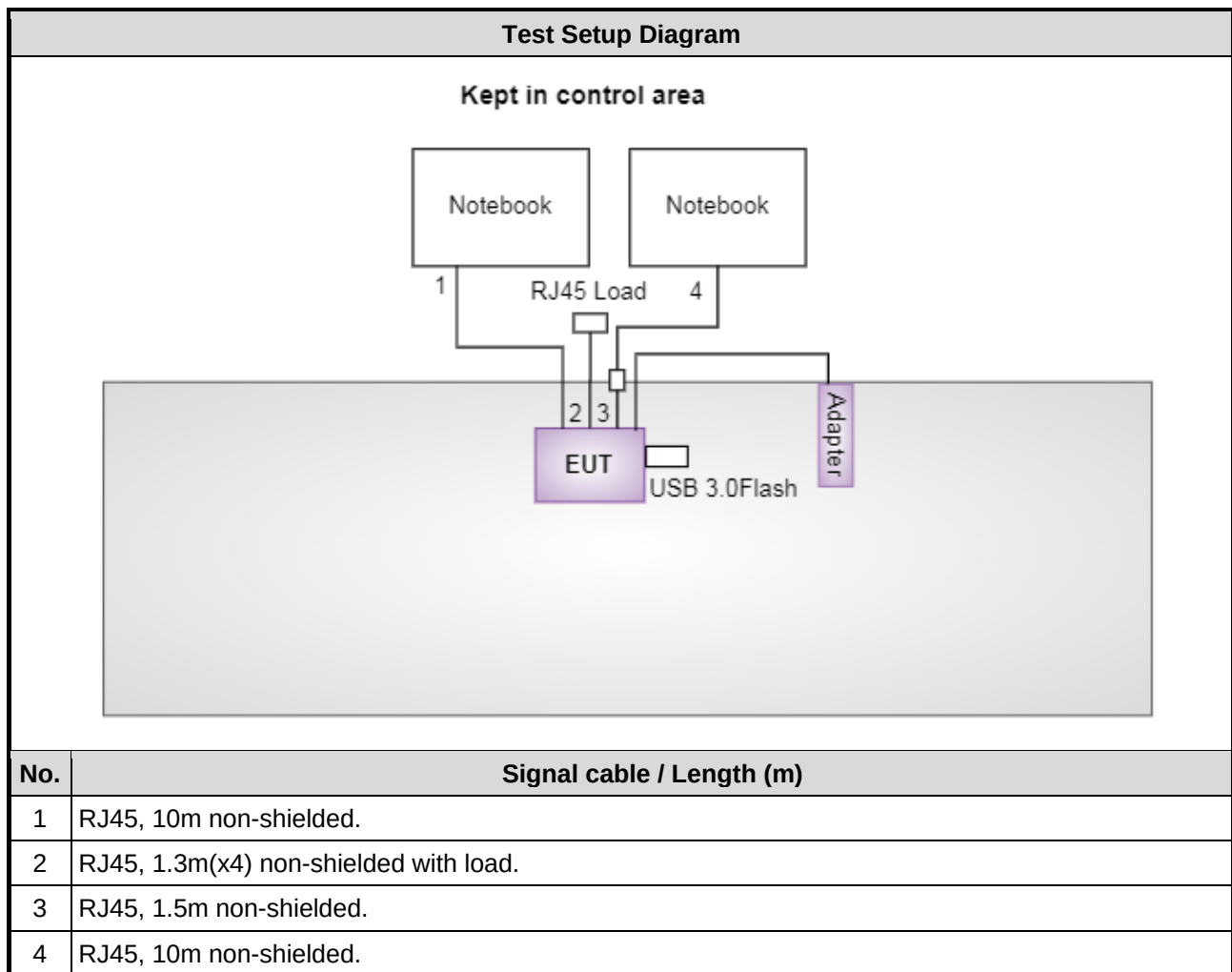
1.1.8 Power Index of Test Tool

Modulation Mode	Test Frequency (MHz)	Power Index
11b	2412	23.5
11b	2437	23.5
11b	2462	20.5
11g	2412	20.5
11g	2437	23.5
11g	2462	22
ax (HE20)	2412	16
ax (HE20)	2437	22
ax (HE20)	2462	17
ax (HE40)	2422	16
ax (HE40)	2437	18
ax (HE40)	2452	16.5

1.2 Local Support Equipment List

Support Equipment List					
No.	Equipment	Brand	Model	FCC ID	Remarks
1	USB 3.0 Flash	Transcend	JetFlash 700	--	---
2	Notebook	DELL	Latitude E6440	DoC	---
3	Notebook	DELL	Latitude E6430	DoC	---
4	RJ45 Load	ICC	--	--	---

1.3 Test Setup Chart



1.4 The Equipment List

Test Item	Conducted Emission				
Test Site	Conduction room 1 / (CO01-WS)				
Tested Date	Jan. 31, 2020				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV40	101498	Dec. 17, 2019	Dec. 16, 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)				
Tested Date	Jan. 08 ~ Jan. 31, 2020				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV40	101498	Dec. 17, 2019	Dec. 16, 2020
Receiver	R&S	ESR3	101658	Dec. 12, 2019	Dec. 10, 2020
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-685	Apr. 17, 2019	Apr. 16, 2020
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1206	Dec. 27, 2019	Dec. 26, 2020
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Nov. 15, 2019	Nov. 14, 2020
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 13, 2019	Nov. 12, 2020
Loop Antenna Cable	KOAX KABEL	101354-BW	101354-BW	Oct. 07, 2019	Oct. 06, 2020
Preamplifier	EMC	EMC02325	980187	Aug. 14, 2019	Aug. 13, 2020
Preamplifier	Agilent	83017A	MY53270014	Aug. 07, 2019	Aug. 06, 2020
Preamplifier	EMC	EMC184045B	980192	Aug. 01, 2019	Jul. 31, 2020
RF cable-3M	HUBER+SUHNER	SUCOFLEX104	MY22620/4	Sep. 27, 2019	Sep. 26, 2020
RF cable-8M	EMC	EMC104-SM-SM-8000	181107	Sep. 27, 2019	Sep. 26, 2020
RF cable-1M	HUBER+SUHNER	SUCOFLEX104	MY22624/4	Sep. 27, 2019	Sep. 26, 2020
LF cable-0.8M	EMC	EMC8D-NM-NM-800	EMC8D-NM-NM-800-001	Sep. 27, 2019	Sep. 26, 2020
LF cable-3M	EMC	EMC8D-NM-NM-3000	131103	Sep. 27, 2019	Sep. 26, 2020
LF cable-13M	EMC	EMC8D-NM-NM-13000	131104	Sep. 27, 2019	Sep. 26, 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	Feb. 04, 2020				
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
AC POWER SOURCE	APC	AFC-500W	F312060012	Dec. 02, 2019	Dec. 01, 2020
Measurement Software	Sporton	Sporton_1	1.3.30	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

1.5 Test Standards

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	± 3.96 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	23°C / 69%	Akun Chung
Radiated Emissions	03CH03-WS	20-24°C / 65-69%	Roger Lu Aska Huang
RF Conducted	TH01-WS	22°C / 64%	Roger Lu

- FCC Designation No.: TW0009
- FCC site registration No.: 207696
- ISSED#: 10807A
- CAB identifier: TW2732

2.2 The Worst Test Modes and Channel Details

Non-beamforming mode

Test item	Modulation Mode	Test Frequency (MHz)	Data Rate (Mbps) / MCS	Test Configuration
Conducted Emissions	11b	2412	1 Mbps	---
Radiated Emissions ≤1GHz	11b	2412	1 Mbps	---
Maximum Output Power	11b 11g ax HE20 ax HE40	2412 / 2437 / 2462 2412 / 2437 / 2462 2412 / 2437 / 2462 2422 / 2437 / 2452	1 Mbps 6 Mbps MCS 0 MCS 0	---
Radiated Emissions >1GHz 6dB bandwidth Power spectral density	11b 11g ax HE20 ax HE40	2412 / 2437 / 2462 2412 / 2437 / 2462 2412 / 2437 / 2462 2422 / 2437 / 2452	1 Mbps 6 Mbps MCS 0 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.				

Beamforming mode

Test item	Modulation Mode	Test Frequency (MHz)	Data Rate (Mbps) / MCS	Test Configuration
Maximum Output Power	ax HE20 ax HE40	2412 / 2437 / 2462 2422 / 2437 / 2452	MCS 0 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

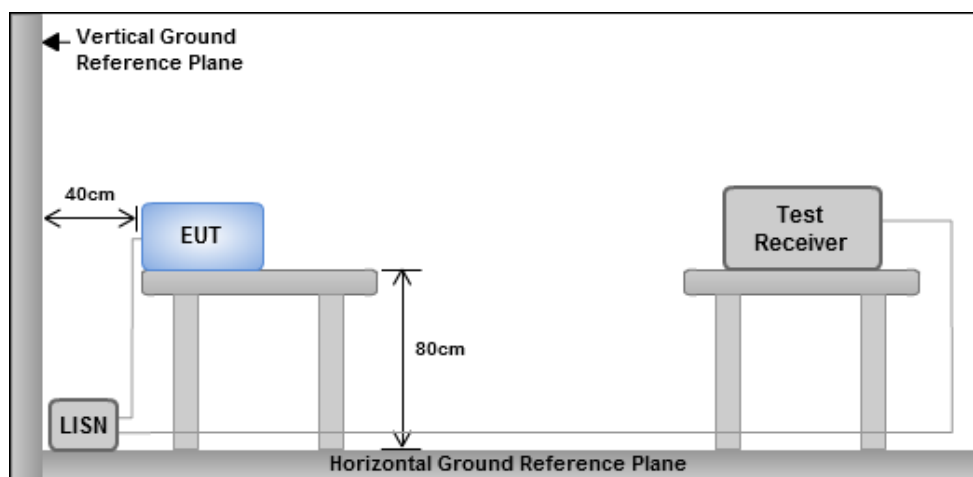
Conducted Emissions Limit		
Frequency Emission (MHz)	Quasi-Peak	Average
0.15-0.5	66 - 56 *	56 - 46 *
0.5-5	56	46
5-30	60	50

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.

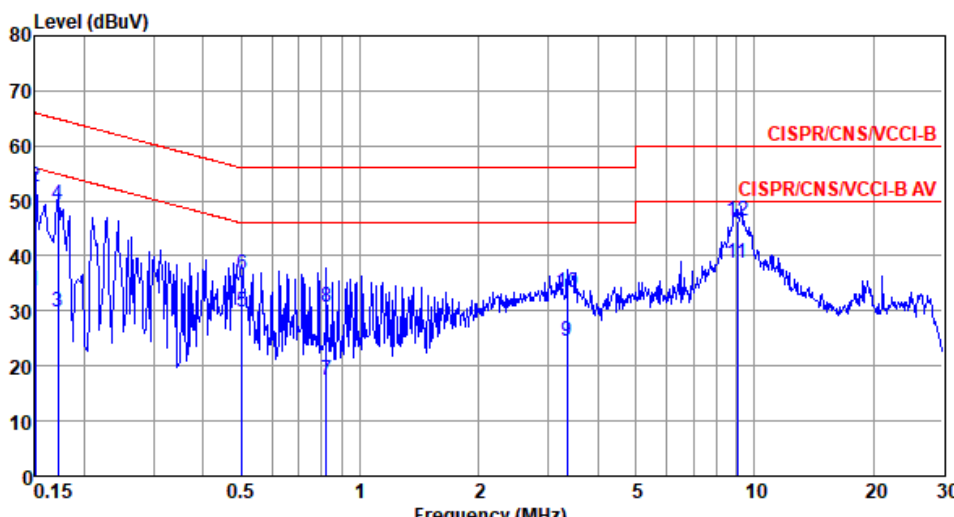
3.1.3 Test Setup



- 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	11b	Test Freq. (MHz)	2412
Power Phase	Line		

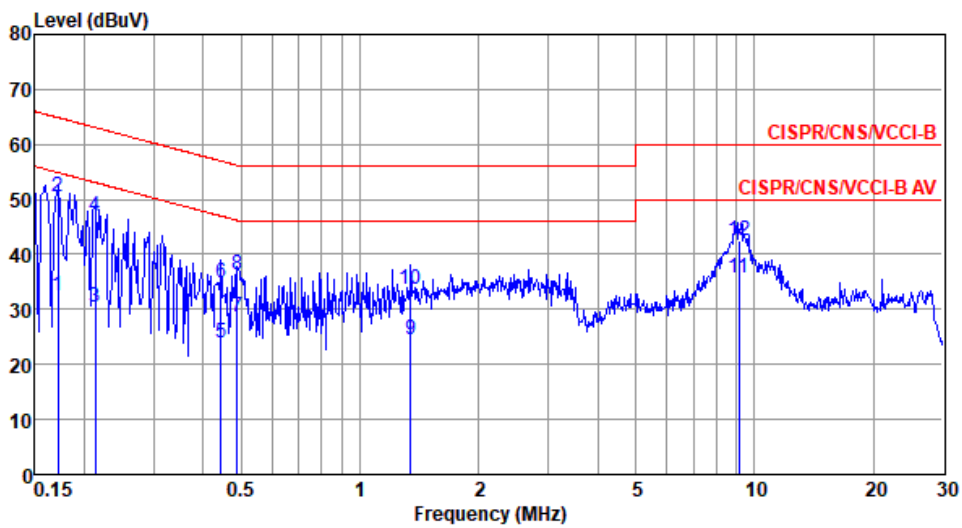


Freq	Level	Limit	Over	Read	LISN	cable	Remark	
MHz	dBuV	dBuV	dB	dBuV	dB	dB		
1	0.150	33.52	56.00	-22.48	23.78	9.53	0.05	Average
2	0.150	52.69	66.00	-13.31	42.95	9.53	0.05	QP
3	0.171	29.91	54.90	-24.99	20.16	9.53	0.05	Average
4	0.171	49.25	64.90	-15.65	39.50	9.53	0.05	QP
5	0.502	29.75	46.00	-16.25	19.81	9.58	0.09	Average
6	0.502	36.54	56.00	-19.46	26.60	9.58	0.09	QP
7	0.822	17.34	46.00	-28.66	7.34	9.59	0.11	Average
8	0.822	30.84	56.00	-25.16	20.84	9.59	0.11	QP
9	3.346	24.55	46.00	-21.45	14.32	9.61	0.26	Average
10	3.346	33.44	56.00	-22.56	23.21	9.61	0.26	QP
11*	9.059	38.54	50.00	-11.46	28.11	9.65	0.38	Average
12	9.059	46.45	60.00	-13.55	36.02	9.65	0.38	QP

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB).

2: Over Limit (dB) = Level (dBuV) – Limit Line (dBuV).

Modulation	11b	Test Freq. (MHz)	2412
Power Phase	Neutral		



The graph displays the measured level in dBUV across a frequency range from 0.15 MHz to 30 MHz. Two red limit lines are shown: CISPR/CNS/VCCI-B (upper) and CISPR/CNS/VCCI-B AV (lower). The blue trace represents the measured signal, which generally stays below the limits, with some peaks near 0.15 MHz and 9.115 MHz.

	Freq MHz	Level dBUV	Limit Line dBUV	Over Limit dB	Read Level dBUV	LISN factor dB	cable loss dB	Remark
1	0.171	32.57	54.90	-22.33	22.82	9.57	0.05	Average
2	0.171	50.37	64.90	-14.53	40.62	9.57	0.05	QP
3	0.213	30.51	53.10	-22.59	20.72	9.58	0.06	Average
4	0.213	46.97	63.10	-16.13	37.18	9.58	0.06	QP
5	0.444	24.04	46.98	-22.94	14.18	9.61	0.08	Average
6	0.444	34.83	56.98	-22.15	24.97	9.61	0.08	QP
7	0.489	28.67	46.19	-17.52	18.78	9.62	0.09	Average
8	0.489	36.33	56.19	-19.86	26.44	9.62	0.09	QP
9	1.345	24.36	46.00	-21.64	14.34	9.64	0.15	Average
10	1.345	33.63	56.00	-22.37	23.61	9.64	0.15	QP
11*	9.115	35.80	50.00	-14.20	25.40	9.70	0.38	Average
12	9.115	42.54	60.00	-17.46	32.14	9.70	0.38	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

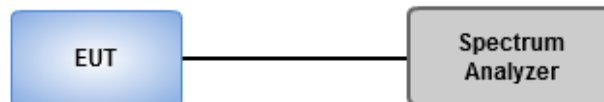
6dB Bandwidth

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)_4TX	8.116M	12.952M	13M0G1D	6.957M	12.88M
802.11g_Nss1,(6Mbps)_4TX	16.377M	16.425M	16M4D1D	15.652M	16.281M
802.11ax HEW20_Nss1,(MCS0)_4TX	18.986M	18.958M	19M0D1D	18.841M	18.886M
802.11ax HEW40_Nss1,(MCS0)_4TX	37.971M	37.916M	37M9D1D	37.971M	37.627M

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

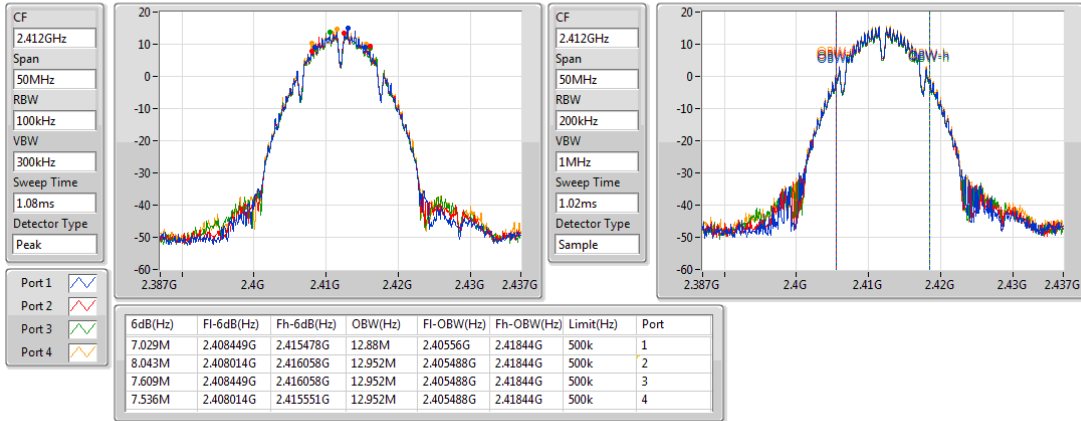
Mode	Result	Limit (Hz)	Port 1 -N dB (Hz)	Port 1 -OBW (Hz)	Port 2 -N dB (Hz)	Port 2 -OBW (Hz)	Port 3 -N dB (Hz)	Port 3 -OBW (Hz)	Port 4 -N dB (Hz)	Port 4 -OBW (Hz)
802.11b_Nss1, (1Mbps)_4TX	-	-	-	-	-	-	-	-	-	-
2412MHz	Pass	500k	7.029M	12.88M	8.043M	12.952M	7.609M	12.952M	7.536M	12.952M
2437MHz	Pass	500k	8.043M	12.952M	7.101M	12.952M	8.116M	12.952M	8.116M	12.952M
2462MHz	Pass	500k	6.957M	12.952M	7.609M	12.952M	7.536M	12.952M	7.536M	12.952M
802.11g_Nss1, (6Mbps)_4TX	-	-	-	-	-	-	-	-	-	-
2412MHz	Pass	500k	16.377M	16.353M	16.377M	16.425M	16.377M	16.353M	16.377M	16.353M
2437MHz	Pass	500k	16.377M	16.425M	15.652M	16.281M	16.232M	16.353M	16.377M	16.353M
2462MHz	Pass	500k	16.377M	16.425M	16.304M	16.353M	16.377M	16.353M	16.377M	16.353M
802.11ax HEW20_ Nss1,(MCS0)_4T X	-	-	-	-	-	-	-	-	-	-
2412MHz	Pass	500k	18.913M	18.886M	18.841M	18.958M	18.841M	18.886M	18.913M	18.886M
2437MHz	Pass	500k	18.841M	18.886M	18.913M	18.886M	18.986M	18.886M	18.986M	18.886M
2462MHz	Pass	500k	18.913M	18.958M	18.841M	18.958M	18.841M	18.886M	18.986M	18.886M
802.11ax HEW40_ Nss1,(MCS0)_4T X	-	-	-	-	-	-	-	-	-	-
2422MHz	Pass	500k	37.971M	37.916M	37.971M	37.771M	37.971M	37.771M	37.971M	37.916M
2437MHz	Pass	500k	37.971M	37.771M	37.971M	37.627M	37.971M	37.627M	37.971M	37.771M
2452MHz	Pass	500k	37.971M	37.771M	37.971M	37.771M	37.971M	37.916M	37.971M	37.916M

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

802.11b_Nss1,(1Mbps)_4TX

EBW

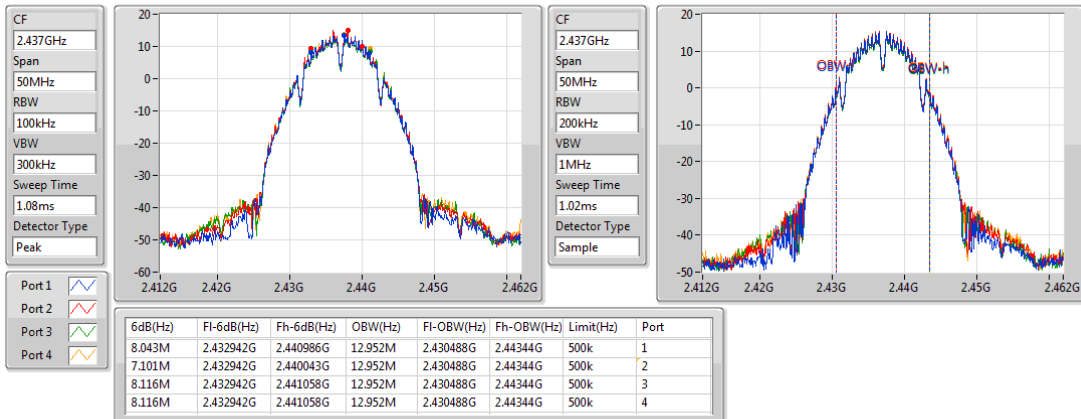
2412MHz



802.11b_Nss1,(1Mbps)_4TX

EBW

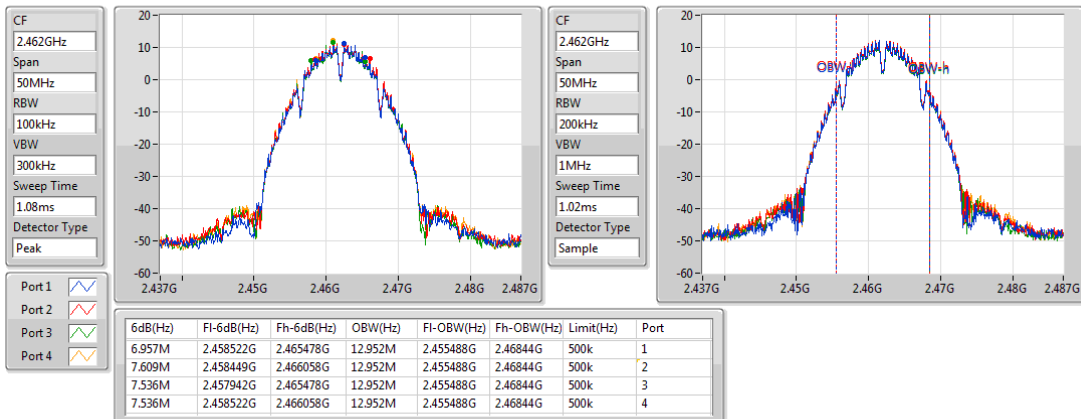
2437MHz



802.11b_Nss1,(1Mbps)_4TX

EBW

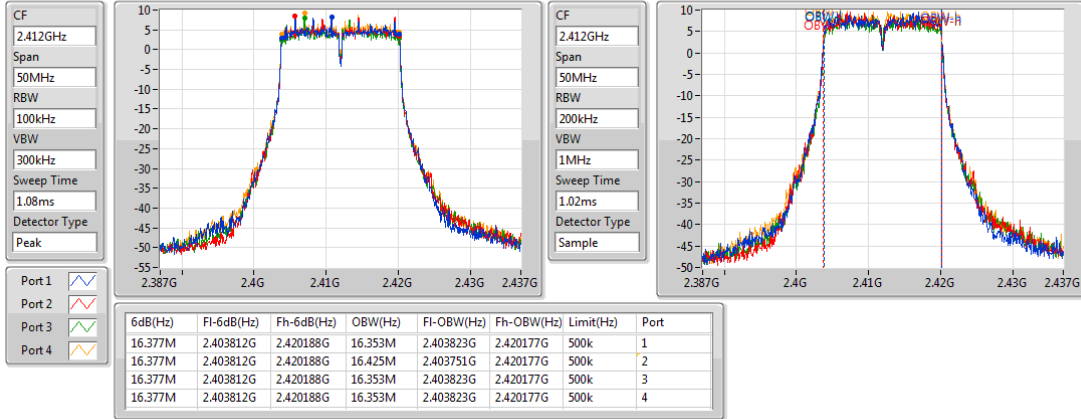
2462MHz



802.11g_Nss1,(6Mbps)_4TX

EBW

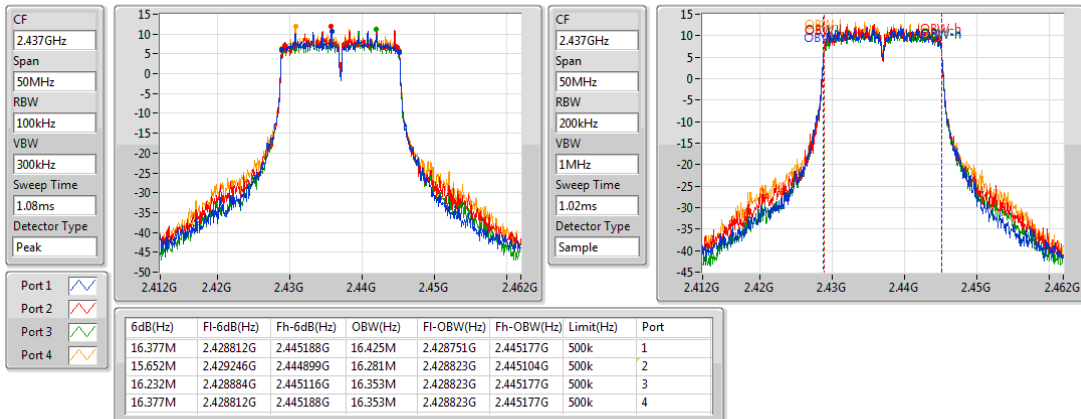
2412MHz



802.11g_Nss1,(6Mbps)_4TX

EBW

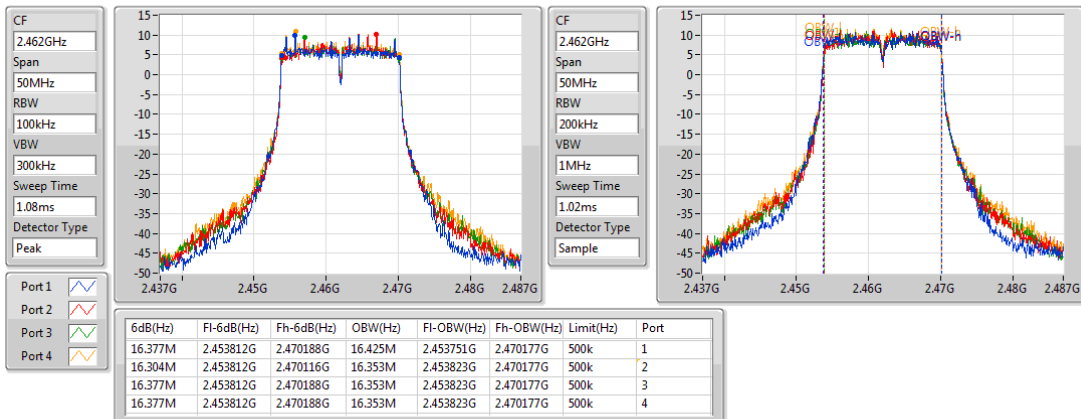
2437MHz



802.11g_Nss1,(6Mbps)_4TX

EBW

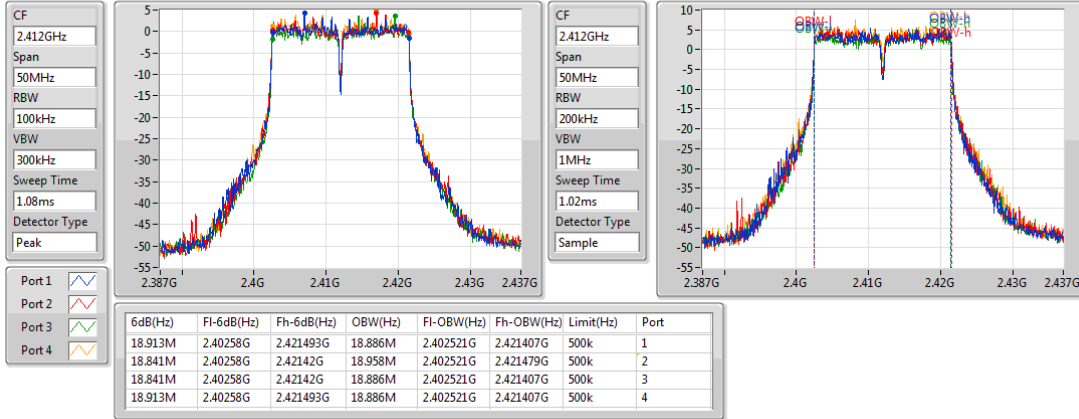
2462MHz



802.11ax HEW20_Nss1,(MCS0)_4TX

EBW

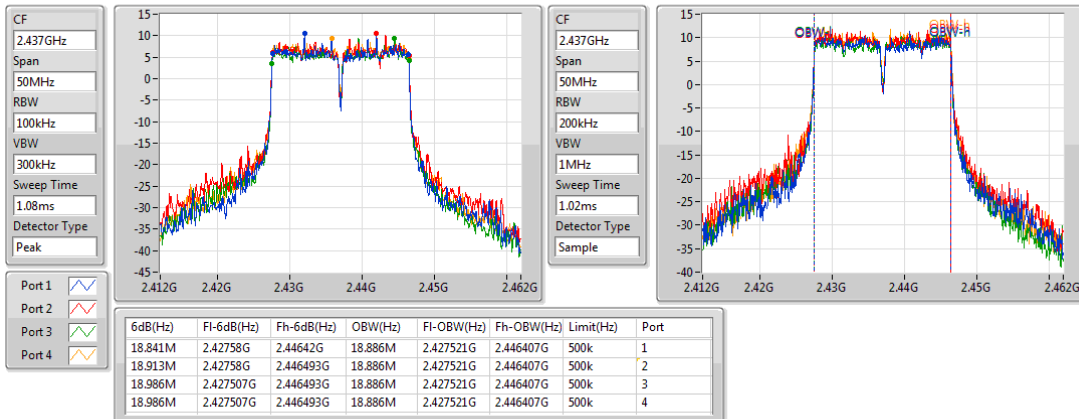
2412MHz



802.11ax HEW20_Nss1,(MCS0)_4TX

EBW

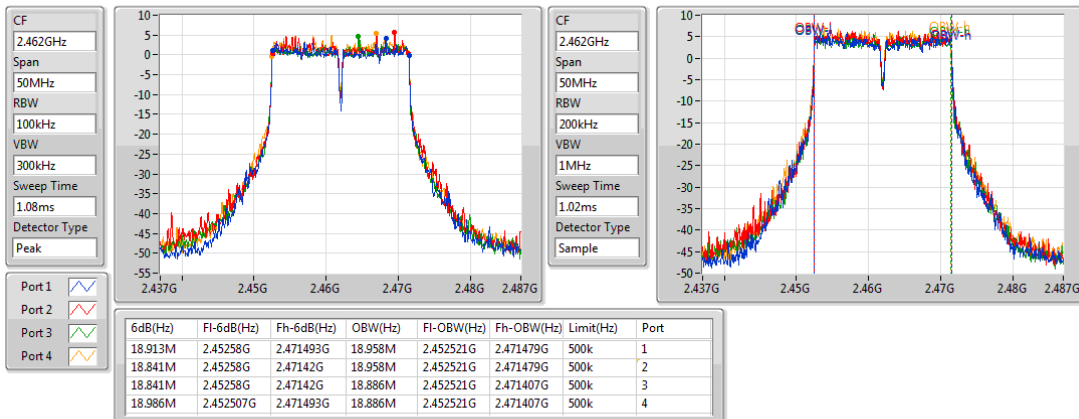
2437MHz



802.11ax HEW20_Nss1,(MCS0)_4TX

EBW

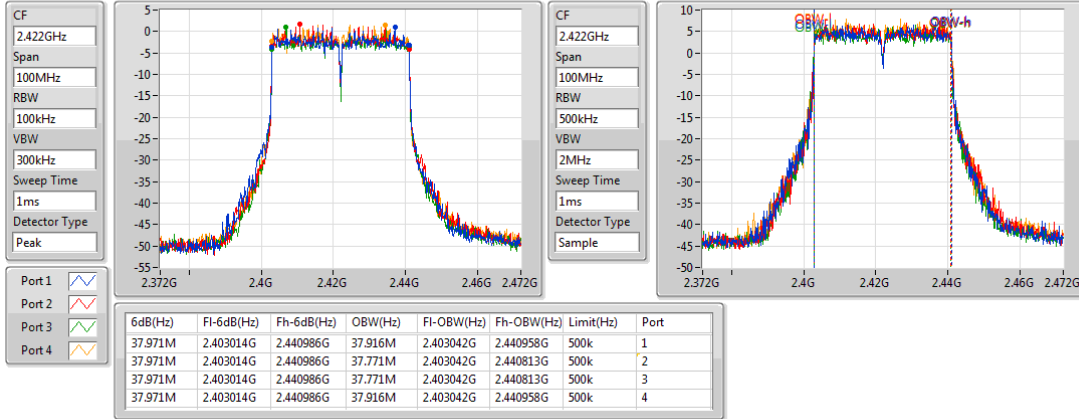
2462MHz



802.11ax HEW40_Nss1,(MCS0)_4TX

EBW

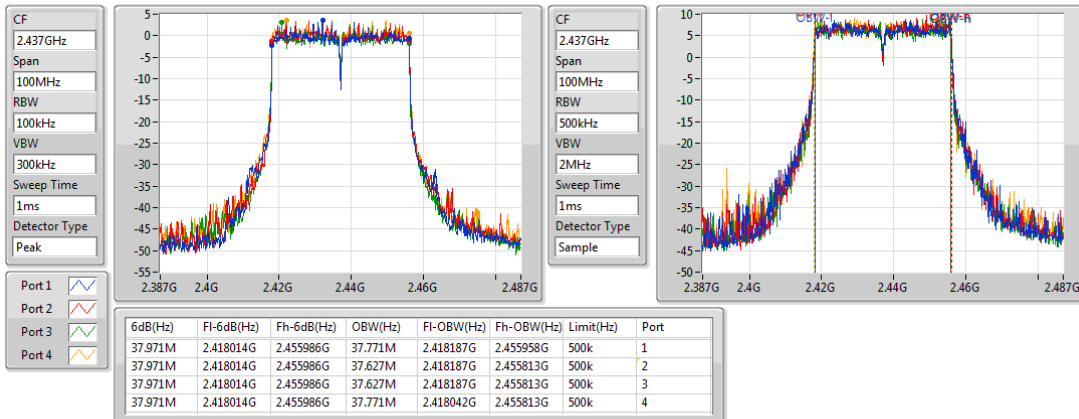
2422MHz



802.11ax HEW40_Nss1,(MCS0)_4TX

EBW

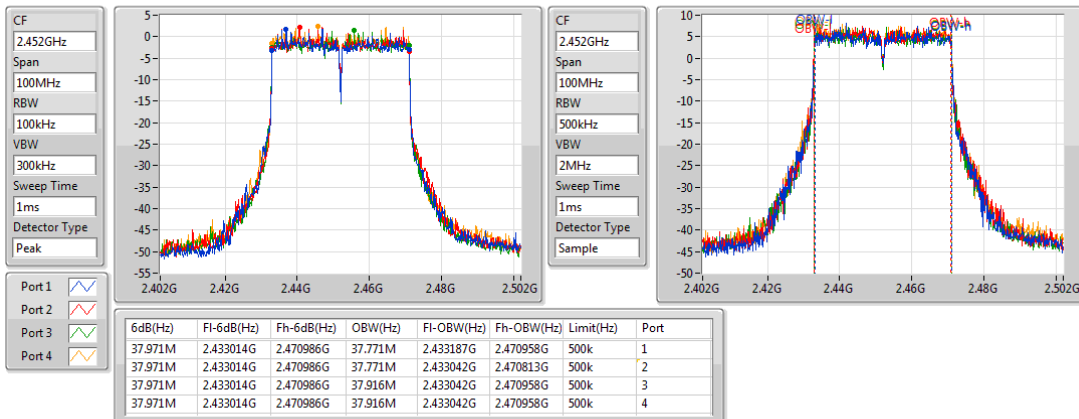
2437MHz



802.11ax HEW40_Nss1,(MCS0)_4TX

EBW

2452MHz



3.3 RF Output Power

3.3.1 Limit of RF Output Power

Conducted power shall not exceed 1Watt.

Antenna gain $\leq 6\text{dBi}$, no any corresponding reduction is in output power limit

Antenna gain $> 6\text{dBi}$

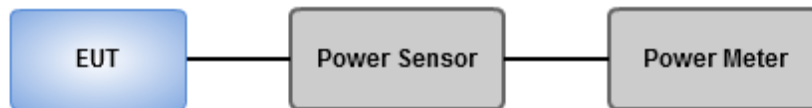
Non Fixed, point to point operations.

The conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dB

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

Non-beamforming mode

Summary

Mode	Total Power (dBm)	Total Power (W)
2.4-2.4835GHz	-	-
802.11b_Nss1,(1Mbps)_4TX	29.64	0.92045
802.11g_Nss1,(6Mbps)_4TX	29.36	0.86298
802.11ax HEW20_Nss1,(MCS0)_4TX	27.97	0.62661
802.11ax HEW40_Nss1,(MCS0)_4TX	24.17	0.26122

Result

Mode	Result	DG (dBi)	Port 1 (dBm)	Port 2 (dBm)	Port 3 (dBm)	Port 4 (dBm)	Total Power (dBm)	Power Limit (dBm)
802.11b_Nss1,(1Mbps)_4TX	-	-	-	-	-	-	-	-
2412MHz	Pass	0.00	23.65	23.54	23.13	24.12	29.64	30.00
2437MHz	Pass	0.00	23.55	23.62	23.01	23.79	29.52	30.00
2462MHz	Pass	0.00	20.51	20.53	20.28	21.06	26.63	30.00
802.11g_Nss1,(6Mbps)_4TX	-	-	-	-	-	-	-	-
2412MHz	Pass	0.00	20.62	20.56	20.14	21.16	26.66	30.00
2437MHz	Pass	0.00	23.24	23.41	22.83	23.81	29.36	30.00
2462MHz	Pass	0.00	21.69	22.06	21.65	22.41	27.98	30.00
802.11ax HEW20_Nss1,(MCS0)_4TX	-	-	-	-	-	-	-	-
2412MHz	Pass	0.00	15.98	16.15	15.63	16.74	22.16	30.00
2437MHz	Pass	0.00	21.58	22.26	21.54	22.35	27.97	30.00
2462MHz	Pass	0.00	16.86	17.28	16.83	17.58	23.17	30.00
802.11ax HEW40_Nss1,(MCS0)_4TX	-	-	-	-	-	-	-	-
2422MHz	Pass	0.00	15.66	16.11	15.59	16.72	22.06	30.00
2437MHz	Pass	0.00	17.91	18.23	17.81	18.62	24.17	30.00
2452MHz	Pass	0.00	16.34	17.02	16.65	17.41	22.89	30.00

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

Note : Conducted average output power is for reference only

Beamforming mode

Summary

Mode	Total Power (dBm)	Total Power (W)
2.4-2.4835GHz	-	-
802.11ax HEW20-BF_Nss1,(MCS0)_4TX	21.95	0.15668
802.11ax HEW40-BF_Nss1,(MCS0)_4TX	18.15	0.06531

Result

Mode	Result	DG (dBi)	Port 1 (dBm)	Port 2 (dBm)	Port 3 (dBm)	Port 4 (dBm)	Total Power (dBm)	Power Limit (dBm)
802.11ax HEW20-BF_Nss1,(MCS0)_4 TX	-	-	-	-	-	-	-	-
2412MHz	Pass	6.02	9.96	10.13	9.61	10.72	16.14	29.98
2437MHz	Pass	6.02	15.56	16.24	15.52	16.33	21.95	29.98
2462MHz	Pass	6.02	10.84	11.26	10.81	11.56	17.15	29.98
802.11ax HEW40-BF_Nss1,(MCS0)_4 TX	-	-	-	-	-	-	-	-
2422MHz	Pass	6.02	9.64	10.09	9.57	10.7	16.04	29.98
2437MHz	Pass	6.02	11.89	12.21	11.79	12.6	18.15	29.98
2452MHz	Pass	6.02	10.32	11	10.63	11.39	16.87	29.98

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

Directional gain = $0 + 10 \cdot \log(4/1) = 6.02 \text{ dBi} > 6 \text{ dBi}$.

Limit shall be reduced to 30 dBm – (6.02 dBi – 6 dBi) = 29.98 dBm.

3.4 Power Spectral Density

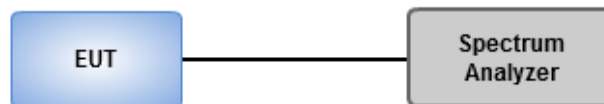
3.4.1 Limit of Power Spectral Density

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

3.4.2 Test Procedures

- 1 Set the RBW = 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)_4TX	7.65
802.11g_Nss1,(6Mbps)_4TX	3.78
802.11ax HEW20_Nss1,(MCS0)_4TX	1.42
802.11ax HEW40_Nss1,(MCS0)_4TX	-5.08

Result

Mode	Result	DG (dBi)	Port 1 (dBm/R BW)	Port 2 (dBm/R BW)	Port 3 (dBm/R BW)	Port 4 (dBm/R BW)	PD (dBm/R BW)	PD Limit (dBm/R BW)
802.11b_Nss1, (1Mbps)_4TX	-	-	-	-	-	-	-	-
2412MHz	Pass	6.02	1.77	1.71	1.17	2.07	7.65	7.98
2437MHz	Pass	6.02	1.61	1.76	0.90	1.96	7.58	7.98
2462MHz	Pass	6.02	-1.57	-1.28	-2.04	-1.22	4.50	7.98
802.11g_Nss1, (6Mbps)_4TX	-	-	-	-	-	-	-	-
2412MHz	Pass	6.02	-5.08	-5.05	-5.61	-4.35	0.82	7.98
2437MHz	Pass	6.02	-2.31	-1.54	-2.41	-1.52	3.78	7.98
2462MHz	Pass	6.02	-3.80	-3.07	-3.64	-2.98	2.39	7.98
802.11ax HEW20_Nss1, (MCS0)_4TX	-	-	-	-	-	-	-	-
2412MHz	Pass	6.02	-10.44	-10.15	-10.59	-9.49	-4.26	7.98
2437MHz	Pass	6.02	-4.70	-3.80	-4.72	-4.06	1.42	7.98
2462MHz	Pass	6.02	-9.58	-8.83	-9.48	-8.97	-3.46	7.98
802.11ax HEW40_Nss1, (MCS0)_4TX	-	-	-	-	-	-	-	-
2422MHz	Pass	6.02	-13.09	-12.82	-13.81	-12.40	-7.09	7.98
2437MHz	Pass	6.02	-11.32	-10.81	-11.66	-10.58	-5.08	7.98
2452MHz	Pass	6.02	-12.88	-12.18	-12.97	-12.16	-6.54	7.98

DG = Directional Gain

Directional gain = $0 + 10 \cdot \log(4/1) = 6.02 \text{ dBi} > 6 \text{ dBi}$.

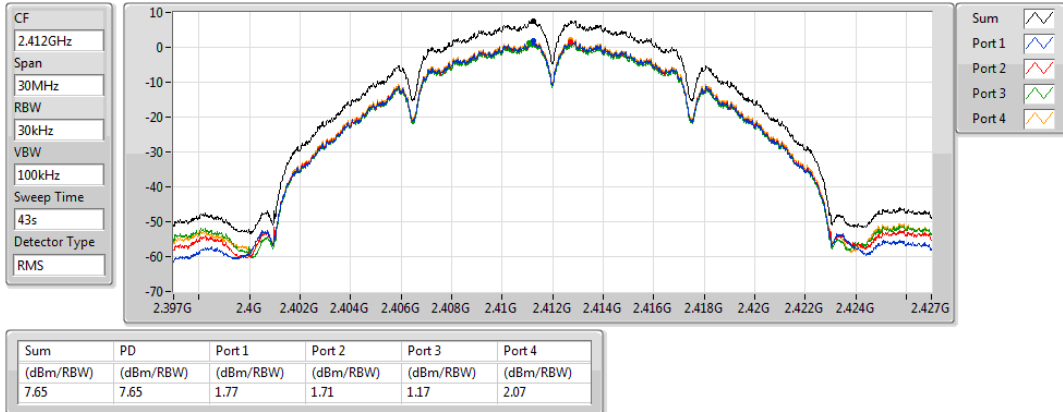
Limit shall be reduced to 8 dBm – (6.02 dBi – 6 dBi) = 7.98 dBm.

PD = trace bin-by-bin of each transmits port summing can be performed maximum power density; **Port X** = Port X power density;

802.11b_Nss1,(1Mbps)_4TX

PSD

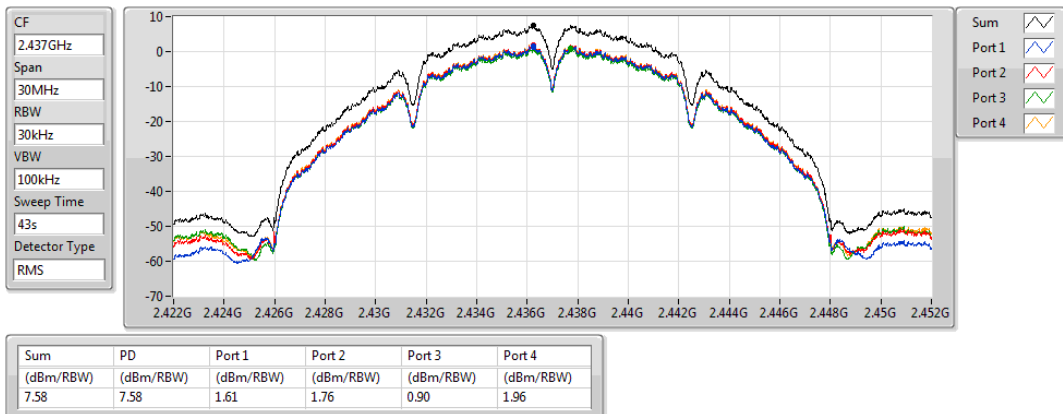
2412MHz



802.11b_Nss1,(1Mbps)_4TX

PSD

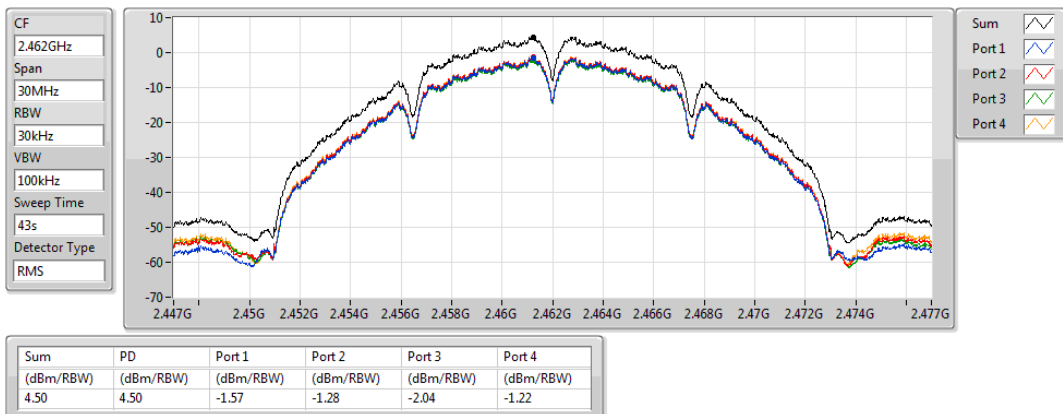
2437MHz



802.11b_Nss1,(1Mbps)_4TX

PSD

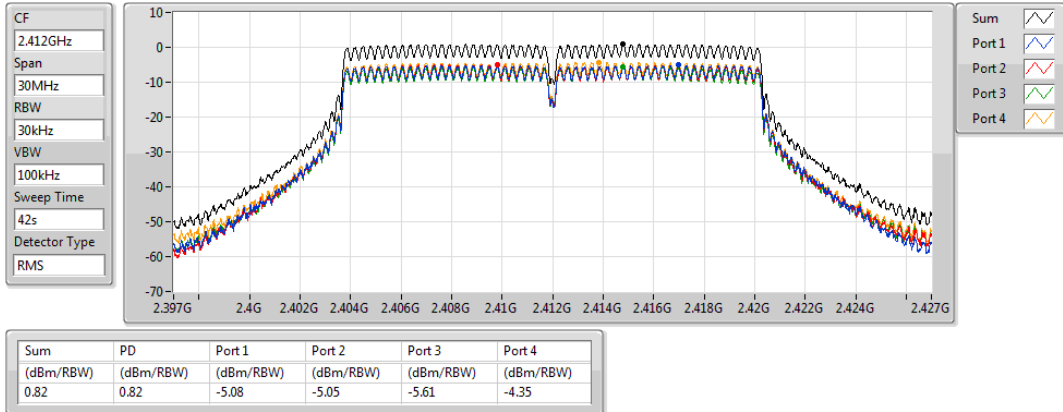
2462MHz



802.11g_Nss1,(6Mbps)_4TX

PSD

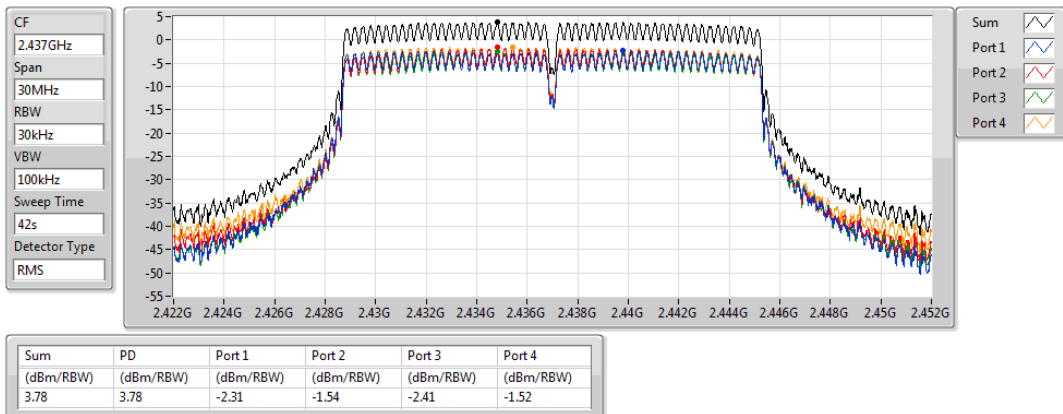
2412MHz



802.11g_Nss1,(6Mbps)_4TX

PSD

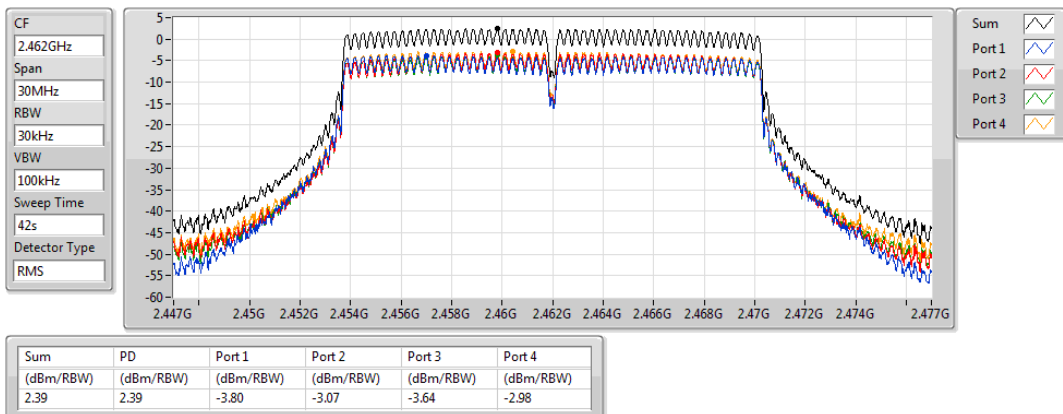
2437MHz



802.11g_Nss1,(6Mbps)_4TX

PSD

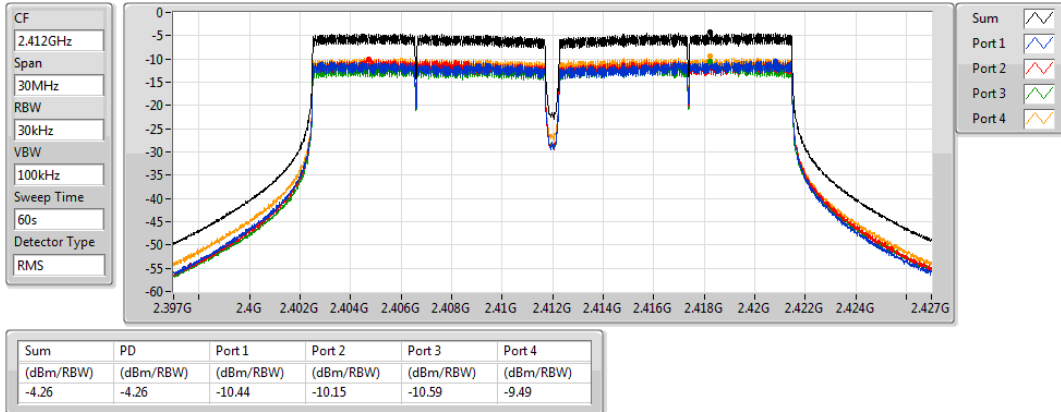
2462MHz



802.11ax HEW20_Nss1,(MCS0)_4TX

PSD

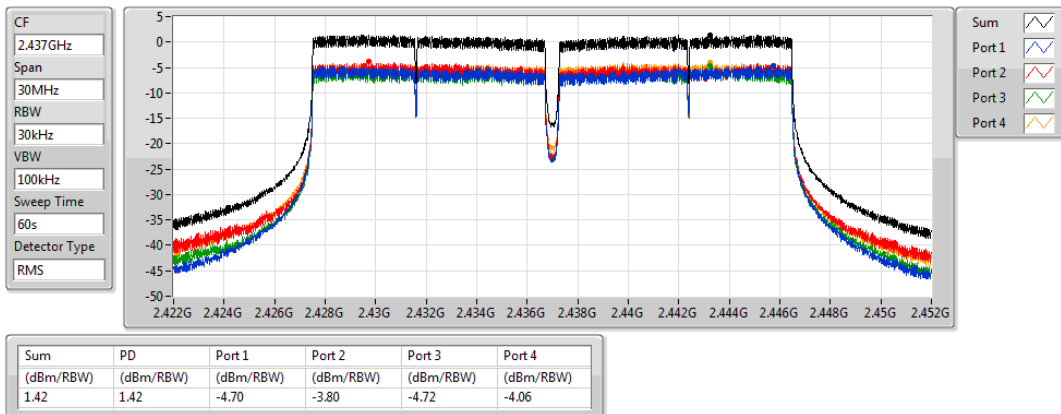
2412MHz



802.11ax HEW20_Nss1,(MCS0)_4TX

PSD

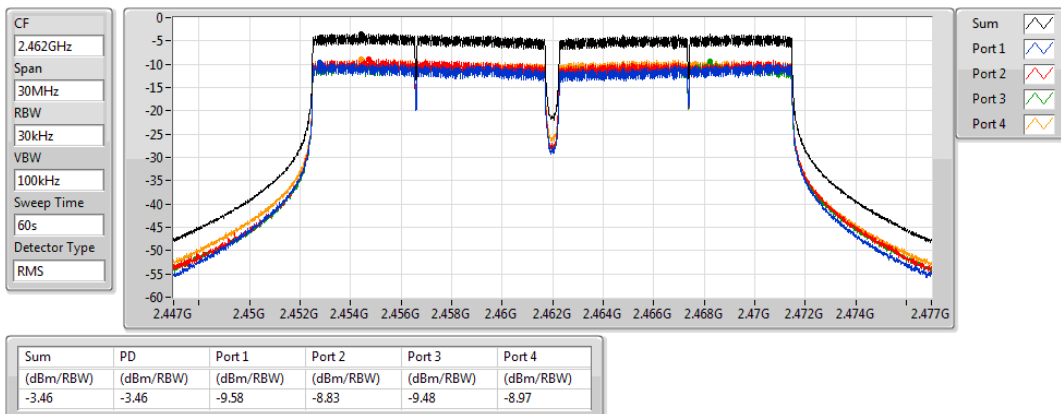
2437MHz



802.11ax HEW20_Nss1,(MCS0)_4TX

PSD

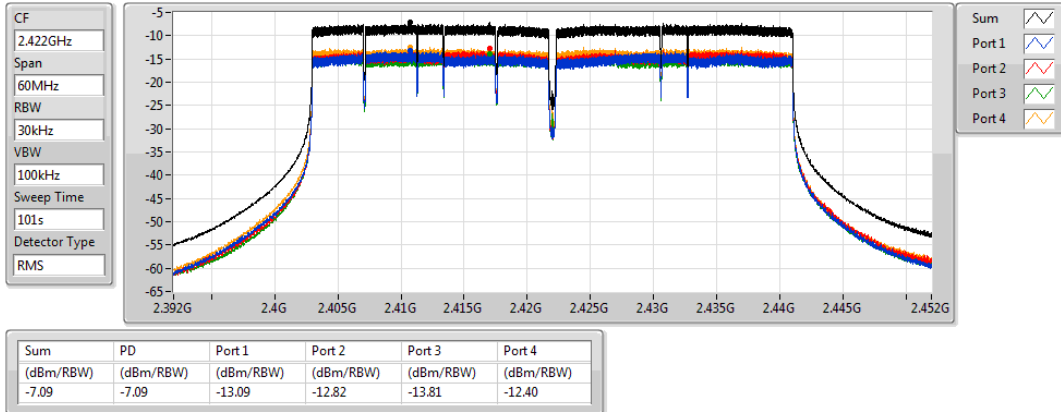
2462MHz



802.11ax HEW40_Nss1,(MCS0)_4TX

PSD

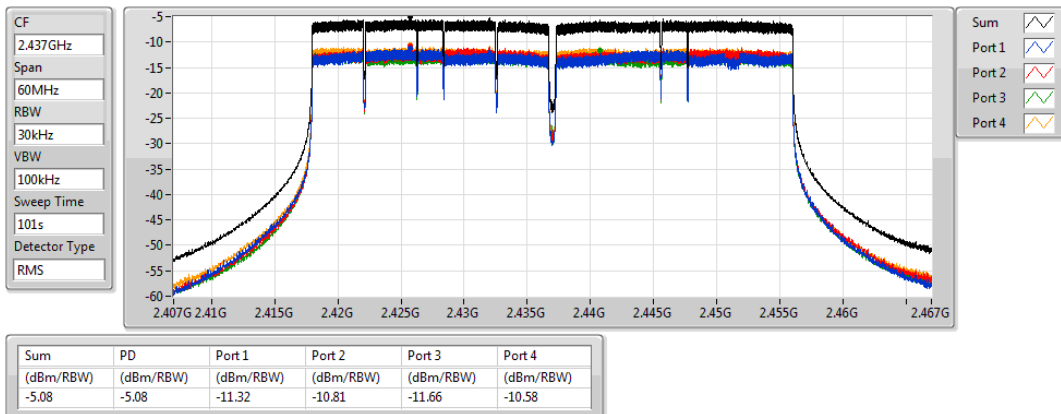
2422MHz



802.11ax HEW40_Nss1,(MCS0)_4TX

PSD

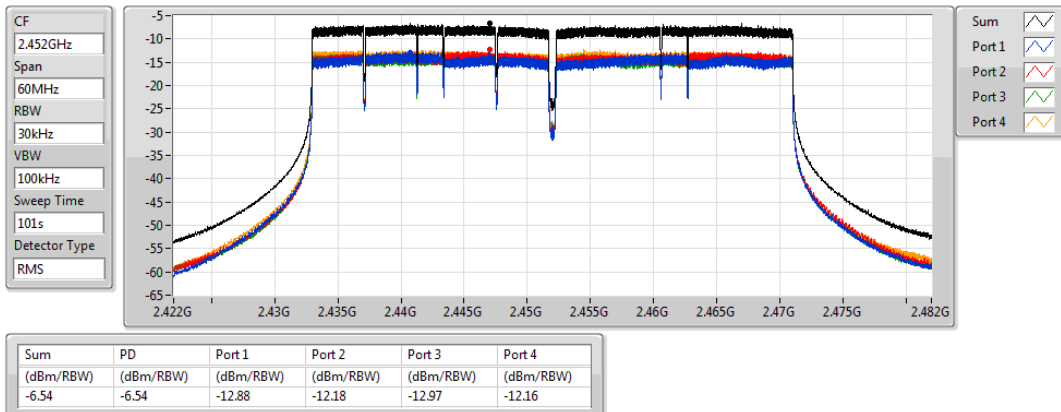
2437MHz



802.11ax HEW40_Nss1,(MCS0)_4TX

PSD

2452MHz



3.5 Unwanted Emissions into Restricted Frequency Bands

3.5.1 Limit of Unwanted Emissions into Restricted Frequency Bands

Restricted Band Emissions Limit			
Frequency Range (MHz)	Field Strength (uV/m)	Field Strength (dBuV/m)	Measure Distance (m)
0.009~0.490	2400/F(kHz)	48.5 - 13.8	300
0.490~1.705	24000/F(kHz)	33.8 - 23	30
1.705~30.0	30	29	30
30~88	100	40	3
88~216	150	43.5	3
216~960	200	46	3
Above 960	500	54	3

Note 1:
Qusai-Peak value is measured for frequency below 1GHz except for 9–90 kHz, 110–490 kHz frequency band. Peak and average value are measured for frequency above 1GHz. The limit on average radio frequency emission is as above table. The limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit

Note 2:
Measurements may be performed at a distance other than what is specified provided. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor as below, Frequency at or above 30 MHz: 20 dB/decade Frequency below 30 MHz: 40 dB/decade.

3.5.2 Test Procedures

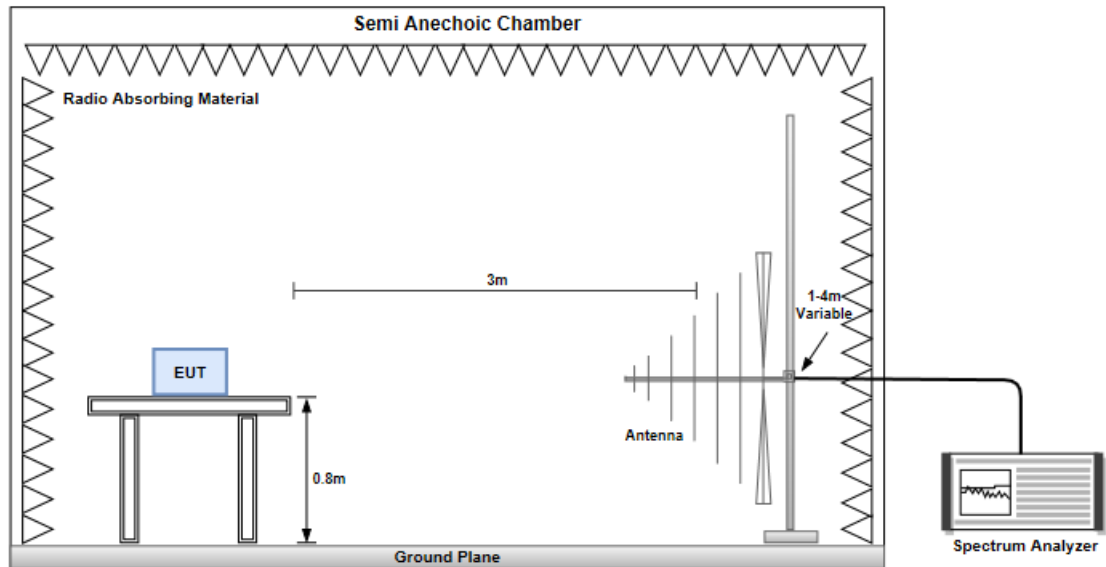
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission frequency. The EUT is placed at test table. For emissions testing at or below 1 GHz, the table height is 80 cm above the reference ground plane. For emission measurements above 1 GHz, the table height is 1.5 m
2. Measurement is made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna is varied in height (1m ~ 4m) above the reference ground plane to obtain the maximum signal strength. Distance between EUT and antenna is 3 m.
3. This investigation is performed with the EUT rotated 360°, the antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations.

Note:

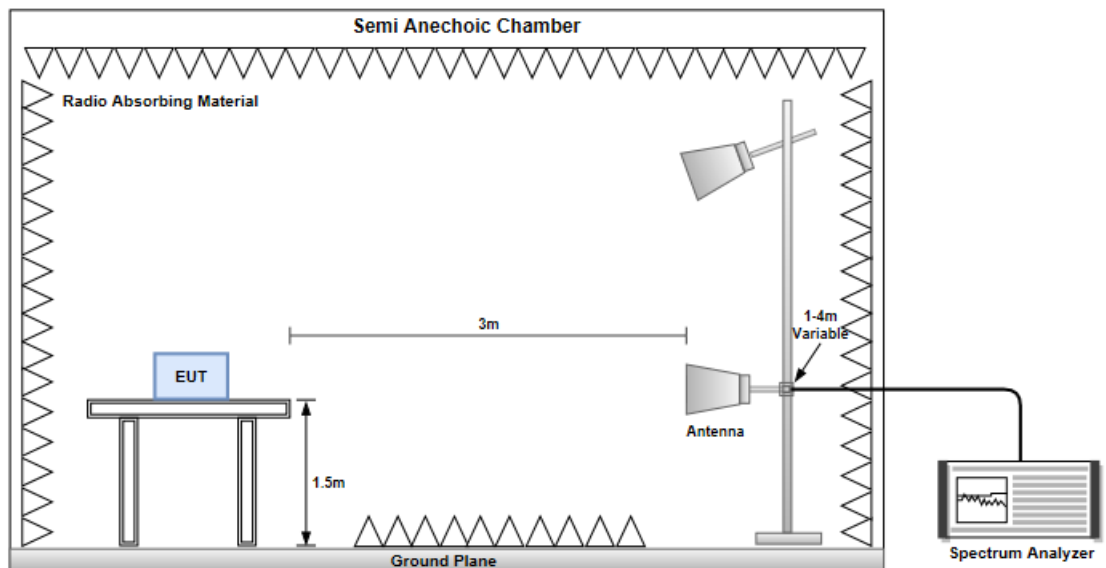
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
3. RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above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

3.5.3 Test Setup

Radiated Emissions below 1 GHz

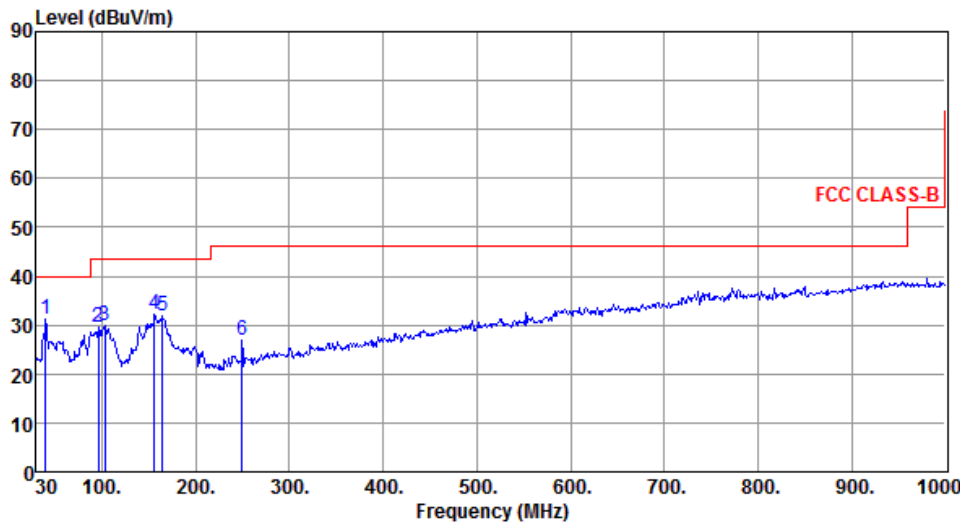


Radiated Emissions above 1 GHz



3.5.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)

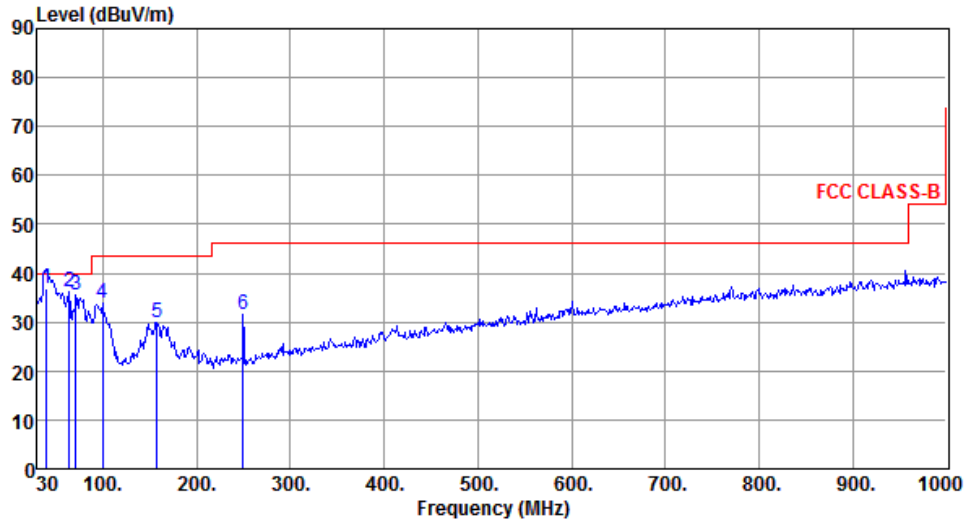
Modulation	11b	Test Freq. (MHz)	2412
Polarization	Horizontal		



	Freq. MHz	Emission level dBUV/m	Limit dBUV/m	Margin dB	SA reading dBUV	Factor dB	Remark	ANT High cm	Turn Table deg
1	39.70	31.37	40.00	-8.63	40.66	-9.29	Peak	---	---
2	95.96	29.69	43.50	-13.81	43.94	-14.25	Peak	---	---
3	102.75	30.05	43.50	-13.45	43.22	-13.17	Peak	---	---
4	156.10	32.35	43.50	-11.15	40.89	-8.54	Peak	---	---
5	164.83	31.83	43.50	-11.67	40.70	-8.87	Peak	---	---
6	249.22	26.77	46.00	-19.23	36.74	-9.97	Peak	---	---

Note 1: Emission Level (dBUV/m) = SA Reading (dBUV/m) + Factor* (dB)
 *Factor includes antenna factor , cable loss and amplifier gain
 Note 2: Margin (dB) = Emission level (dBUV/m) – Limit (dBUV/m).
 Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

Modulation	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	39.68	36.96	40.00	-3.04	46.25	-9.29	QP	100	188
2	63.95	36.24	40.00	-3.76	45.95	-9.71	Peak	---	---
3	70.74	35.48	40.00	-4.52	46.36	-10.88	Peak	---	---
4	99.84	34.03	43.50	-9.47	47.62	-13.59	Peak	---	---
5	158.04	29.92	43.50	-13.58	38.54	-8.62	Peak	---	---
6	249.22	31.68	46.00	-14.32	41.65	-9.97	Peak	---	---

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

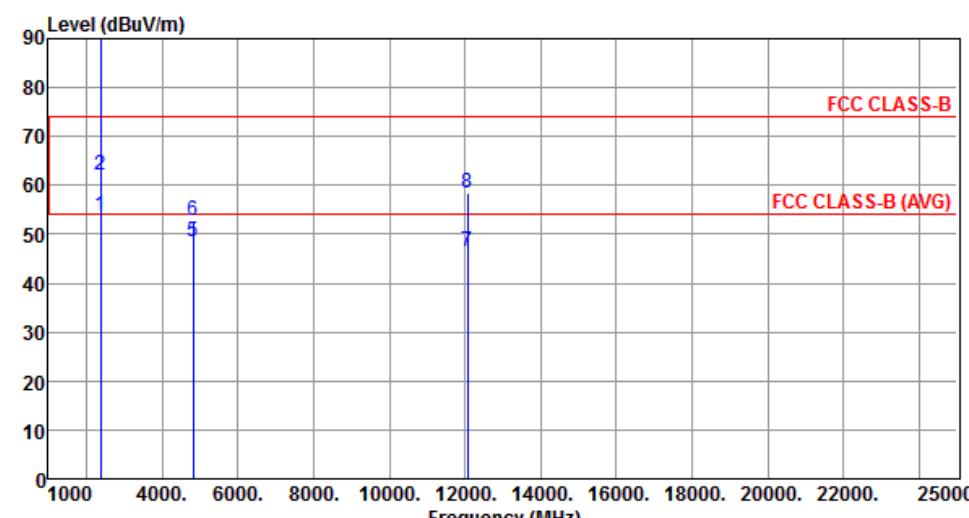
*Factor includes antenna factor , cable loss and amplifier gain

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

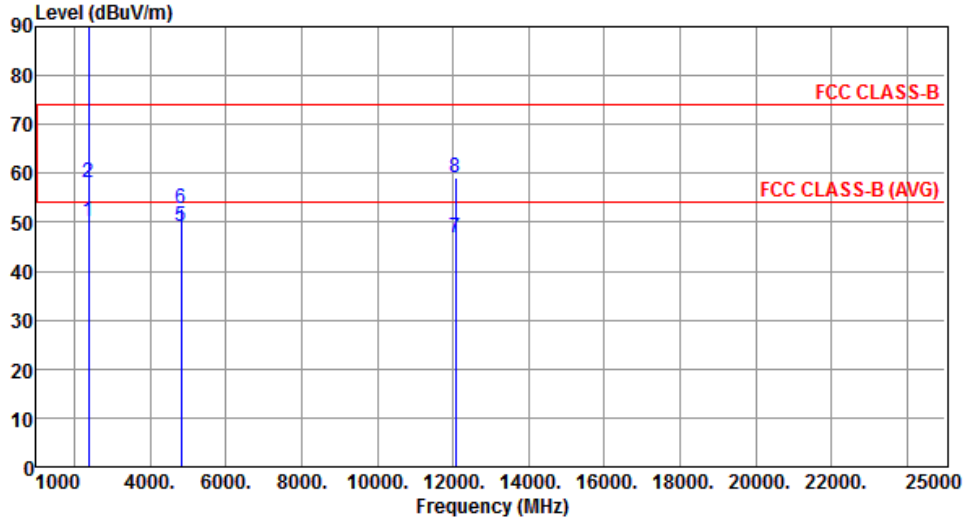
Modulation	11b	Test Freq. (MHz)	2412
Polarization	Horizontal		



	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	53.88	54.00	-0.12	53.64	0.24	Average	145	344
2	2390.00	62.04	74.00	-11.96	61.80	0.24	Peak	145	344
3 *	2412.00	119.13			118.90	0.23	Average	145	335
4 *	2412.00	121.35			121.12	0.23	Peak	145	335
5	4824.00	48.37	54.00	-5.63	41.87	6.50	Average	278	130
6	4824.00	52.97	74.00	-21.03	46.47	6.50	Peak	278	130
7	12060.00	46.52	54.00	-7.48	30.28	16.24	Average	100	117
8	12060.00	58.41	74.00	-15.59	42.17	16.24	Peak	100	117

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).

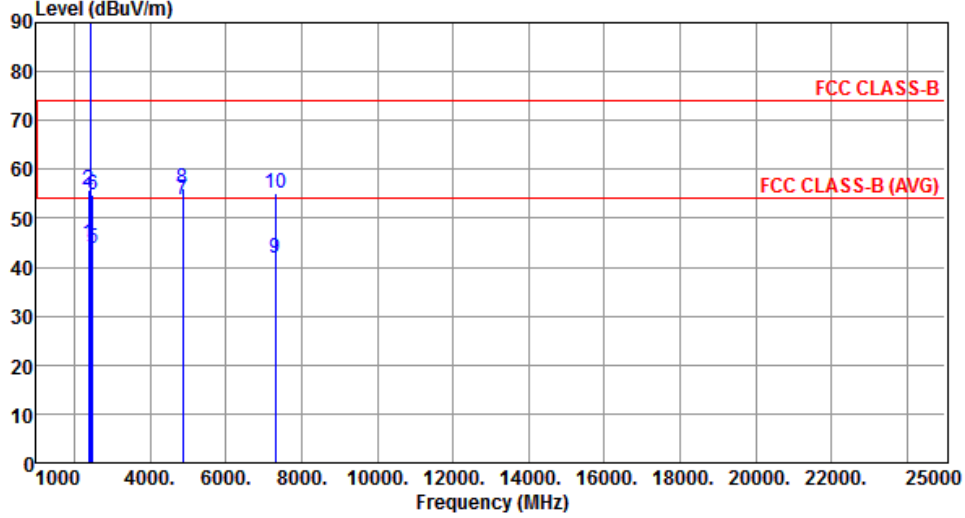
Modulation	11b	Test Freq. (MHz)	2412
Polarization	Vertical		



	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	50.13	54.00	-3.87	49.89	0.24	Average	100	38
2	2390.00	58.12	74.00	-15.88	57.88	0.24	Peak	100	38
3 *	2412.00	115.25			115.02	0.23	Average	100	38
4 *	2412.00	118.43			118.20	0.23	Peak	100	38
5	4824.00	49.08	54.00	-4.92	42.58	6.50	Average	272	11
6	4824.00	52.77	74.00	-21.23	46.27	6.50	Peak	272	11
7	12060.00	46.93	54.00	-7.07	30.69	16.24	Average	100	15
8	12060.00	59.20	74.00	-14.80	42.96	16.24	Peak	100	15

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).

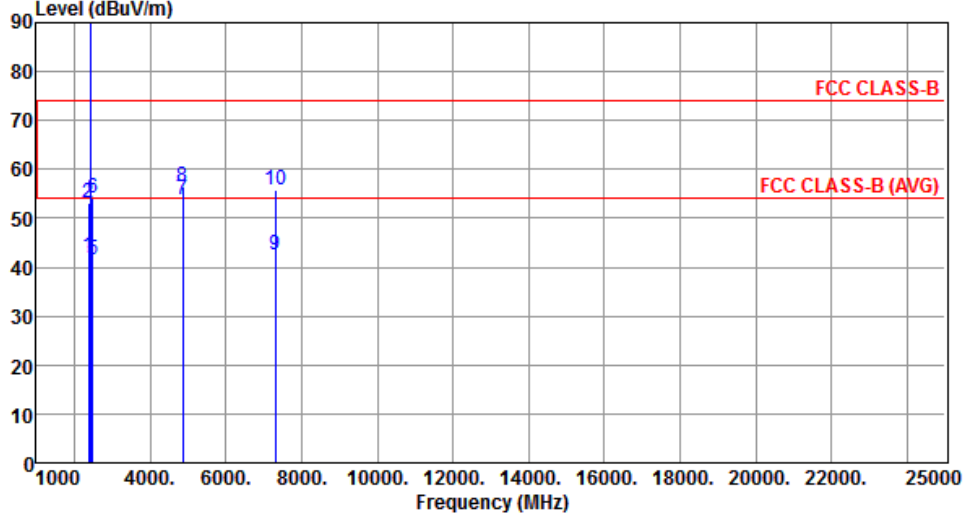
Modulation	11b	Test Freq. (MHz)	2437
Polarization	Horizontal		



	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	44.76	54.00	-9.24	44.52	0.24	Average	149	345
2	2390.00	55.82	74.00	-18.18	55.58	0.24	Peak	149	345
3 *	2437.00	118.36			118.10	0.26	Average	149	345
4 *	2437.00	120.75			120.49	0.26	Peak	149	345
5	2483.50	43.86	54.00	-10.14	43.61	0.25	Average	149	345
6	2483.50	54.65	74.00	-19.35	54.40	0.25	Peak	149	345
7	4874.00	53.81	54.00	-0.19	47.33	6.48	Average	297	179
8	4874.00	56.23	74.00	-17.77	49.75	6.48	Peak	297	179
9	7311.00	41.92	54.00	-12.08	30.16	11.76	Average	100	182
10	7311.00	55.03	74.00	-18.97	43.27	11.76	Peak	100	182

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).

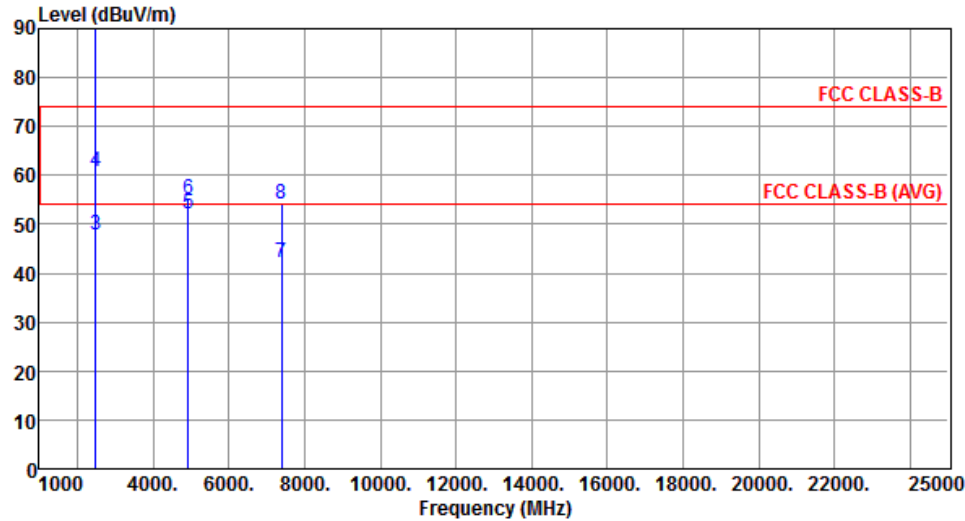
Modulation	11b	Test Freq. (MHz)	2437
Polarization	Vertical		



	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	42.09	54.00	-11.91	41.85	0.24	Average	100	35
2	2390.00	53.13	74.00	-20.87	52.89	0.24	Peak	100	35
3 *	2437.00	115.30			115.04	0.26	Average	100	35
4 *	2437.00	117.78			117.52	0.26	Peak	100	35
5	2483.50	41.51	54.00	-12.49	41.26	0.25	Average	100	35
6	2483.50	54.03	74.00	-19.97	53.78	0.25	Peak	100	35
7	4874.00	53.83	54.00	-0.17	47.35	6.48	Average	280	20
8	4874.00	56.60	74.00	-17.40	50.12	6.48	Peak	280	20
9	7311.00	42.43	54.00	-11.57	30.67	11.76	Average	100	11
10	7311.00	55.65	74.00	-18.35	43.89	11.76	Peak	100	11

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).

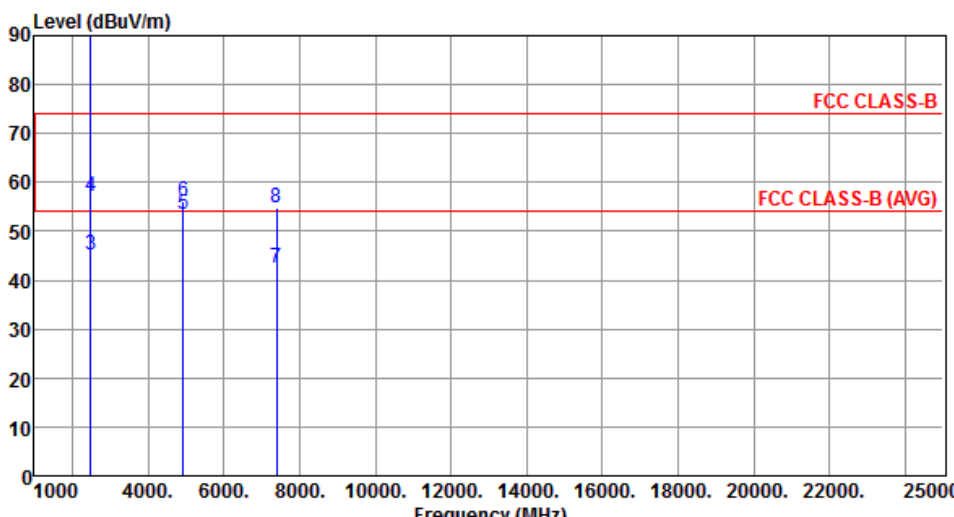
Modulation	11b	Test Freq. (MHz)	2462
Polarization	Horizontal		



		Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	*	2462.00	115.84			115.57	0.27	Average	201	17
2	*	2462.00	118.25			117.98	0.27	Peak	201	17
3		2483.50	47.84	54.00	-6.16	47.59	0.25	Average	201	17
4		2483.50	60.72	74.00	-13.28	60.47	0.25	Peak	201	17
5		4924.00	52.03	54.00	-1.97	45.52	6.51	Average	255	229
6		4924.00	55.29	74.00	-18.71	48.78	6.51	Peak	255	229
7		7386.00	42.06	54.00	-11.94	30.25	11.81	Average	100	186
8		7386.00	54.17	74.00	-19.83	42.36	11.81	Peak	100	186

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		

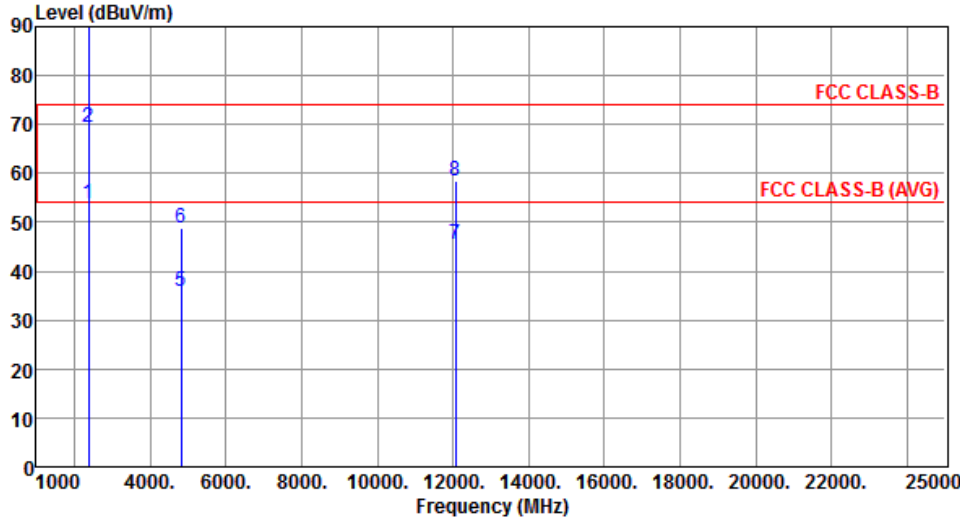


		Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	*	2462.00	112.80			112.53	0.27	Average	100	35
2	*	2462.00	115.12			114.85	0.27	Peak	100	35
3		2483.50	45.11	54.00	-8.89	44.86	0.25	Average	100	35
4		2483.50	57.11	74.00	-16.89	56.86	0.25	Peak	100	35
5		4924.00	53.50	54.00	-0.50	46.99	6.51	Average	283	19
6		4924.00	56.10	74.00	-17.90	49.59	6.51	Peak	283	19
7		7386.00	42.51	54.00	-11.49	30.70	11.81	Average	100	20
8		7386.00	54.77	74.00	-19.23	42.96	11.81	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).

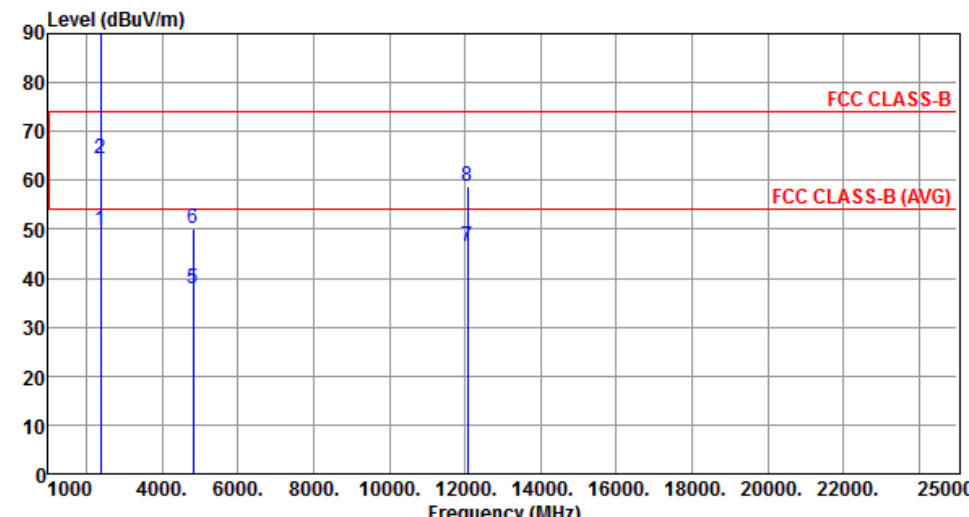
Modulation	11g	Test Freq. (MHz)	2412
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	53.85	54.00	-0.15	53.61	0.24	Average	107	358
2	2390.00	69.37	74.00	-4.63	69.13	0.24	Peak	107	358
3 *	2412.00	110.78			110.55	0.23	Average	102	358
4 *	2412.00	120.72			120.49	0.23	Peak	102	358
5	4824.00	35.90	54.00	-18.10	29.40	6.50	Average	299	180
6	4824.00	48.66	74.00	-25.34	42.16	6.50	Peak	299	180
7	12060.00	45.57	54.00	-8.43	29.33	16.24	Average	100	185
8	12060.00	58.57	74.00	-15.43	42.33	16.24	Peak	100	185

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).

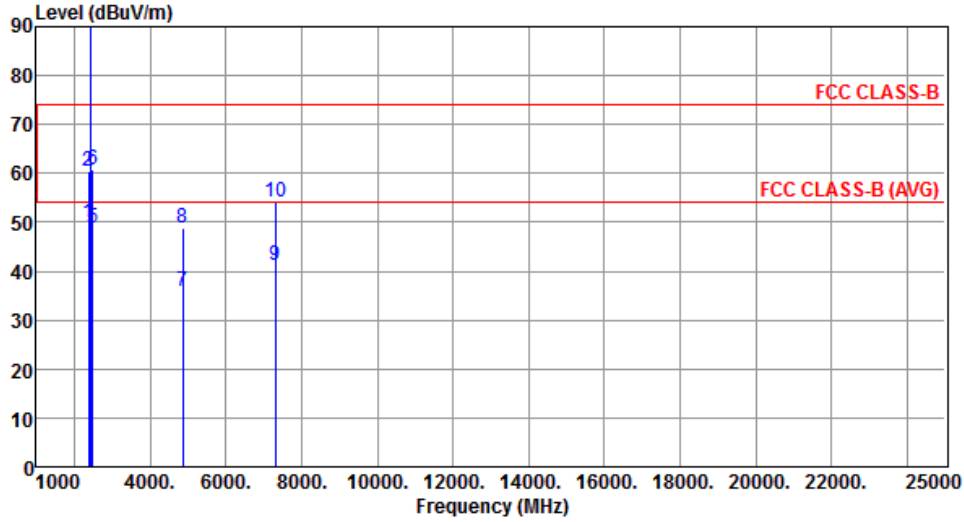
Modulation	11g	Test Freq. (MHz)	2412
Polarization	Vertical		



	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	49.80	54.00	-4.20	49.56	0.24	Average	100	35
2	2390.00	64.55	74.00	-9.45	64.31	0.24	Peak	100	35
3 *	2412.00	107.48			107.25	0.23	Average	100	35
4 *	2412.00	117.86			117.63	0.23	Peak	100	35
5	4824.00	37.73	54.00	-16.27	31.23	6.50	Average	272	198
6	4824.00	50.12	74.00	-23.88	43.62	6.50	Peak	272	198
7	12060.00	46.49	54.00	-7.51	30.25	16.24	Average	100	196
8	12060.00	58.93	74.00	-15.07	42.69	16.24	Peak	100	196

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).

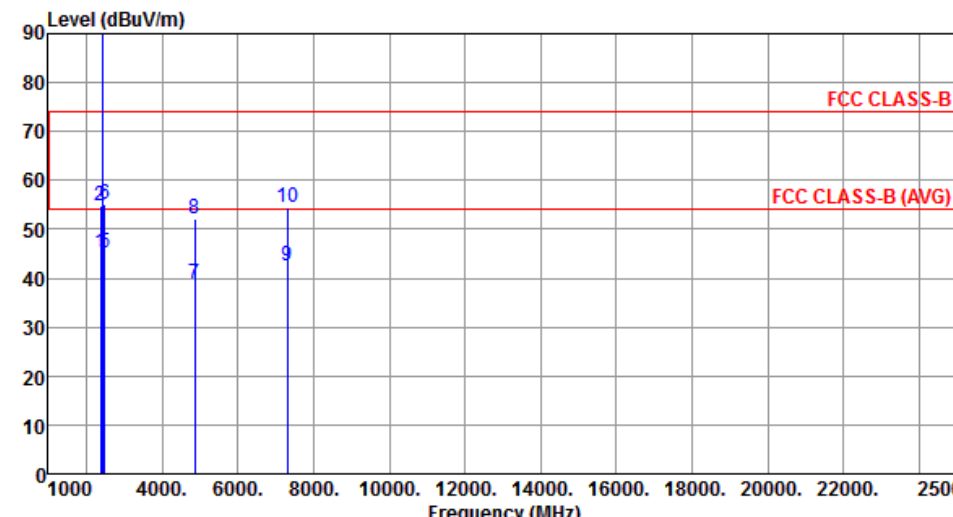
Modulation	11g	Test Freq. (MHz)	2437
Polarization	Horizontal		



	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	49.79	54.00	-4.21	49.55	0.24	Average	100	301
2	2390.00	60.46	74.00	-13.54	60.22	0.24	Peak	100	301
3 *	2437.00	113.85			113.59	0.26	Average	100	301
4 *	2437.00	124.18			123.92	0.26	Peak	100	301
5	2483.50	48.79	54.00	-5.21	48.54	0.25	Average	100	301
6	2483.50	60.79	74.00	-13.21	60.54	0.25	Peak	100	301
7	4874.00	35.92	54.00	-18.08	29.44	6.48	Average	292	181
8	4874.00	48.87	74.00	-25.13	42.39	6.48	Peak	292	181
9	7311.00	41.14	54.00	-12.86	29.38	11.76	Average	100	183
10	7311.00	54.23	74.00	-19.77	42.47	11.76	Peak	100	183

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).

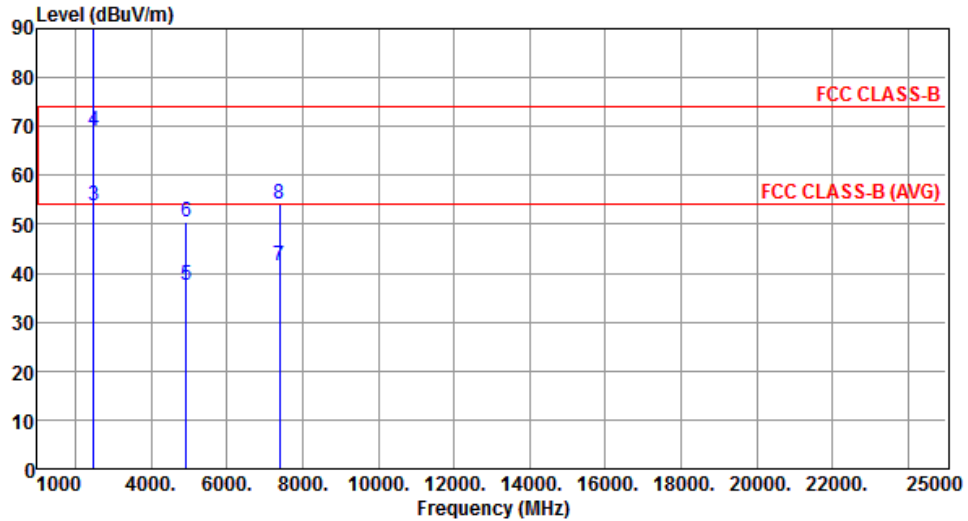
Modulation	11g	Test Freq. (MHz)	2437
Polarization	Vertical		



	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	45.12	54.00	-8.88	44.88	0.24	Average	100	32
2	2390.00	54.87	74.00	-19.13	54.63	0.24	Peak	100	32
3 *	2437.00	110.78			110.52	0.26	Average	100	32
4 *	2437.00	120.84			120.58	0.26	Peak	100	32
5	2483.50	45.21	54.00	-8.79	44.96	0.25	Average	100	32
6	2483.50	55.04	74.00	-18.96	54.79	0.25	Peak	100	32
7	4874.00	38.81	54.00	-15.19	32.33	6.48	Average	272	203
8	4874.00	52.00	74.00	-22.00	45.52	6.48	Peak	272	203
9	7311.00	42.46	54.00	-11.54	30.70	11.76	Average	100	208
10	7311.00	54.33	74.00	-19.67	42.57	11.76	Peak	100	208

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	Horizontal		



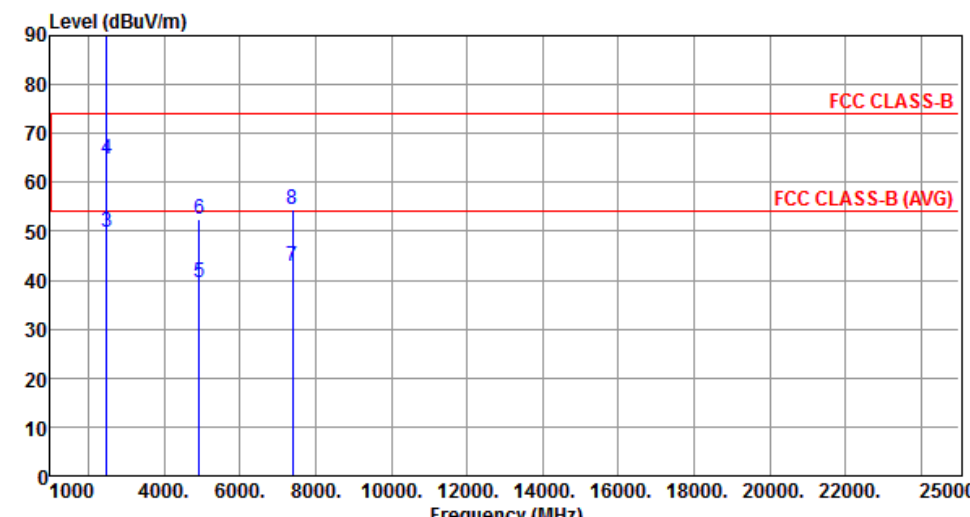
		Freq. MHz	Emission level dBUV/m	Limit dBUV/m	Margin dB	SA reading dBUV	Factor dB	Remark	ANT High cm	Turn Table deg
1	*	2462.00	112.30			112.03	0.27	Average	100	332
2	*	2462.00	122.63			122.36	0.27	Peak	100	332
3		2483.50	53.67	54.00	-0.33	53.42	0.25	Average	150	15
4		2483.50	69.23	74.00	-4.77	68.98	0.25	Peak	150	15
5		4924.00	37.51	54.00	-16.49	31.00	6.51	Average	296	185
6		4924.00	50.36	74.00	-23.64	43.85	6.51	Peak	296	185
7		7386.00	41.41	54.00	-12.59	29.60	11.81	Average	100	182
8		7386.00	54.22	74.00	-19.78	42.41	11.81	Peak	100	182

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).

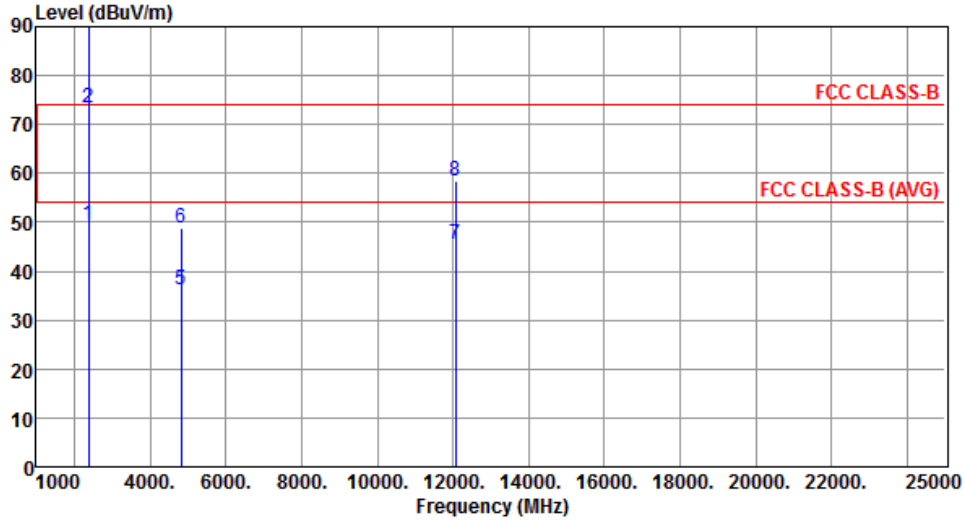
Modulation	11g	Test Freq. (MHz)	2462
Polarization	Vertical		



		Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	*	2462.00	109.44			109.17	0.27	Average	100	39
2	*	2462.00	119.62			119.35	0.27	Peak	100	39
3		2483.50	49.71	54.00	-4.29	49.46	0.25	Average	100	39
4		2483.50	64.74	74.00	-9.26	64.49	0.25	Peak	100	39
5		4924.00	39.68	54.00	-14.32	33.17	6.51	Average	283	210
6		4924.00	52.37	74.00	-21.63	45.86	6.51	Peak	283	210
7		7386.00	42.77	54.00	-11.23	30.96	11.81	Average	100	201
8		7386.00	54.37	74.00	-19.63	42.56	11.81	Peak	100	201

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).

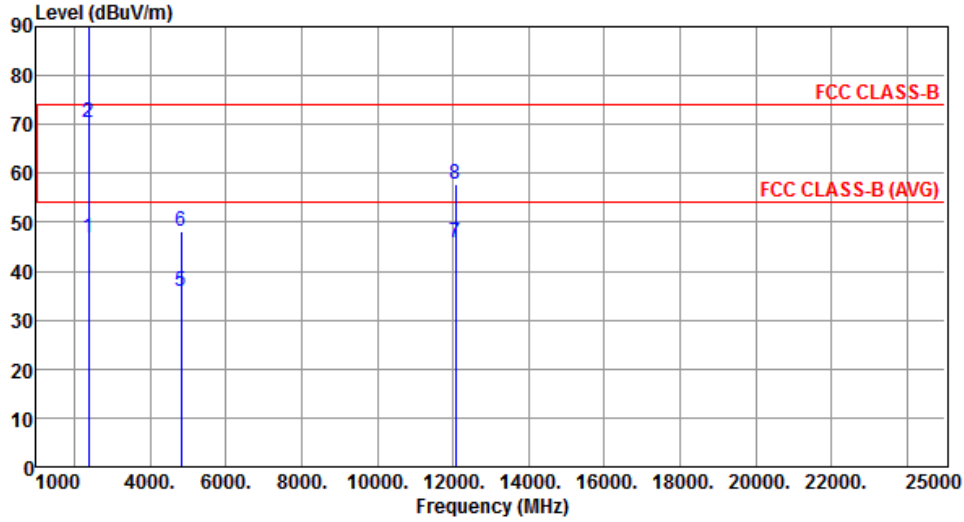
Modulation	ax HE20	Test Freq. (MHz)	2412
Polarization	Horizontal		



	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	49.37	54.00	-4.63	49.13	0.24	Average	146	358
2	2390.00	73.51	74.00	-0.49	73.27	0.24	Peak	146	358
3 *	2412.00	106.63			106.40	0.23	Average	146	16
4 *	2412.00	118.52			118.29	0.23	Peak	146	16
5	4824.00	36.15	54.00	-17.85	29.65	6.50	Average	291	183
6	4824.00	48.74	74.00	-25.26	42.24	6.50	Peak	291	183
7	12060.00	45.63	54.00	-8.37	29.39	16.24	Average	100	177
8	12060.00	58.59	74.00	-15.41	42.35	16.24	Peak	100	177

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).

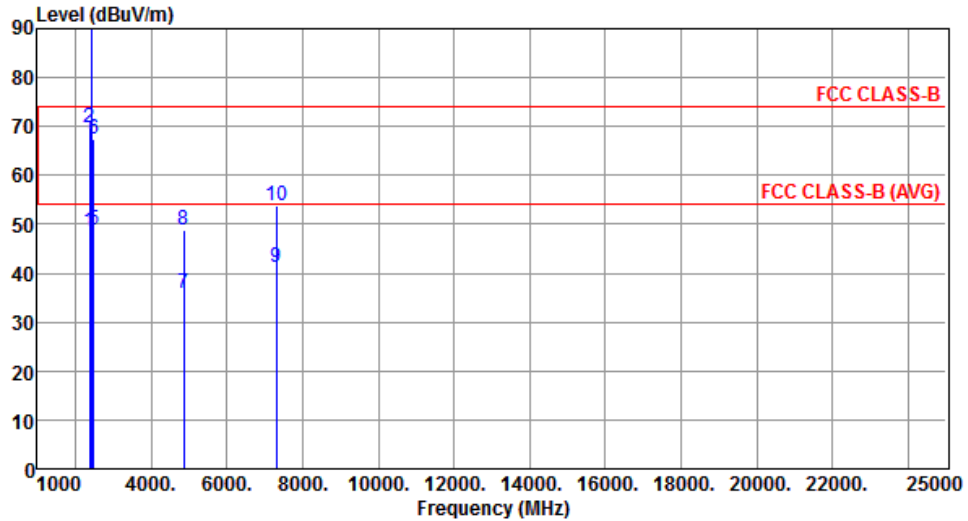
Modulation	ax HE20	Test Freq. (MHz)	2412
Polarization	Vertical		



	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	46.81	54.00	-7.19	46.57	0.24	Average	100	35
2	2390.00	70.35	74.00	-3.65	70.11	0.24	Peak	100	35
3 *	2412.00	103.43	---	---	103.20	0.23	Average	100	35
4 *	2412.00	116.05	---	---	115.82	0.23	Peak	100	35
5	4824.00	36.01	54.00	-17.99	29.51	6.50	Average	100	36
6	4824.00	48.01	74.00	-25.99	41.51	6.50	Peak	100	36
7	12060.00	45.90	54.00	-8.10	29.66	16.24	Average	100	39
8	12060.00	57.70	74.00	-16.30	41.46	16.24	Peak	100	39

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	ax HE20	Test Freq. (MHz)	2437
Polarization	Horizontal		



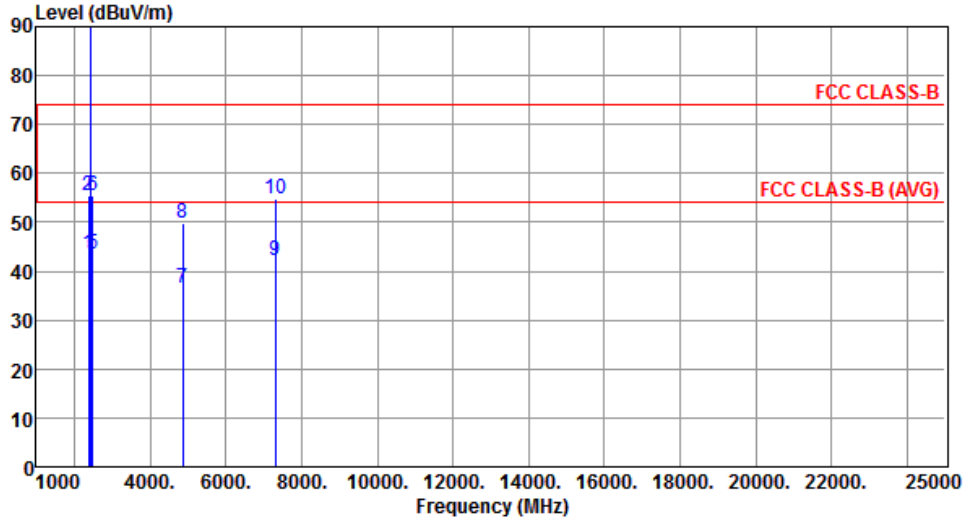
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	48.32	54.00	-5.68	48.08	0.24	Average	100	309
2	2390.00	69.69	74.00	-4.31	69.45	0.24	Peak	100	309
3 *	2437.00	111.24			110.98	0.26	Average	100	309
4 *	2437.00	122.24			121.98	0.26	Peak	100	309
5	2483.50	48.91	54.00	-5.09	48.66	0.25	Average	100	309
6	2483.50	67.56	74.00	-6.44	67.31	0.25	Peak	100	309
7	4874.00	35.96	54.00	-18.04	29.48	6.48	Average	300	180
8	4874.00	48.80	74.00	-25.20	42.32	6.48	Peak	300	180
9	7311.00	41.25	54.00	-12.75	29.49	11.76	Average	100	179
10	7311.00	53.95	74.00	-20.05	42.19	11.76	Peak	100	179

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	ax HE20	Test Freq. (MHz)	2437
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	43.41	54.00	-10.59	43.17	0.24	Average	100	39
2	2390.00	55.60	74.00	-18.40	55.36	0.24	Peak	100	39
3 *	2437.00	107.47			107.21	0.26	Average	100	39
4 *	2437.00	118.28			118.02	0.26	Peak	100	39
5	2483.50	43.56	54.00	-10.44	43.31	0.25	Average	100	39
6	2483.50	55.54	74.00	-18.46	55.29	0.25	Peak	100	39
7	4874.00	36.61	54.00	-17.39	30.13	6.48	Average	130	37
8	4874.00	49.96	74.00	-24.04	43.48	6.48	Peak	130	37
9	7311.00	42.27	54.00	-11.73	30.51	11.76	Average	100	45
10	7311.00	54.65	74.00	-19.35	42.89	11.76	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	ax HE20	Test Freq. (MHz)	2462
Polarization	Horizontal		

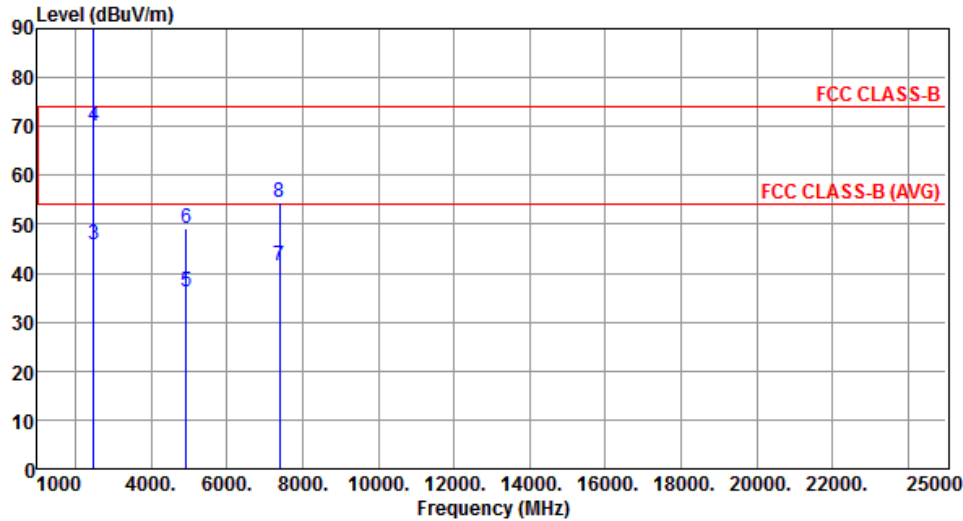
		Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	*	2462.00	108.16			107.89	0.27	Average	100	307
2	*	2462.00	119.60			119.33	0.27	Peak	100	307
3		2483.50	48.55	54.00	-5.45	48.30	0.25	Average	100	307
4		2483.50	73.50	74.00	-0.50	73.25	0.25	Peak	100	307
5		4924.00	37.76	54.00	-16.24	31.25	6.51	Average	295	178
6		4924.00	50.03	74.00	-23.97	43.52	6.51	Peak	295	178
7		7386.00	41.35	54.00	-12.65	29.54	11.81	Average	100	175
8		7386.00	54.00	74.00	-20.00	42.19	11.81	Peak	100	175

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	ax HE20	Test Freq. (MHz)	2462
Polarization	Vertical		



The graph displays the emission level in dBuV/m against frequency in MHz. Two horizontal red lines represent the FCC CLASS-B limits: one at 74 dBuV/m and another at 54 dBuV/m (labeled 'FCC CLASS-B (AVG)'). Vertical blue lines with markers indicate specific emission measurements at various frequencies: 2462 MHz (point 4 at ~72 dBuV/m, point 3 at ~48 dBuV/m), 4924 MHz (point 6 at ~52 dBuV/m, point 5 at ~38 dBuV/m), and 7386 MHz (point 8 at ~55 dBuV/m, point 7 at ~42 dBuV/m).

		Freq.	Emission	Limit	Margin	SA	Factor	Remark	ANT	Turn
		MHz	level			reading			High	Table
			dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1	*	2462.00	104.55			104.28	0.27	Average	100	36
2	*	2462.00	116.15			115.88	0.27	Peak	100	36
3		2483.50	45.88	54.00	-8.12	45.63	0.25	Average	100	36
4		2483.50	70.02	74.00	-3.98	69.77	0.25	Peak	100	36
5		4924.00	36.05	54.00	-17.95	29.54	6.51	Average	100	32
6		4924.00	49.03	74.00	-24.97	42.52	6.51	Peak	100	32
7		7386.00	41.44	54.00	-12.56	29.63	11.81	Average	100	39
8		7386.00	54.40	74.00	-19.60	42.59	11.81	Peak	100	39

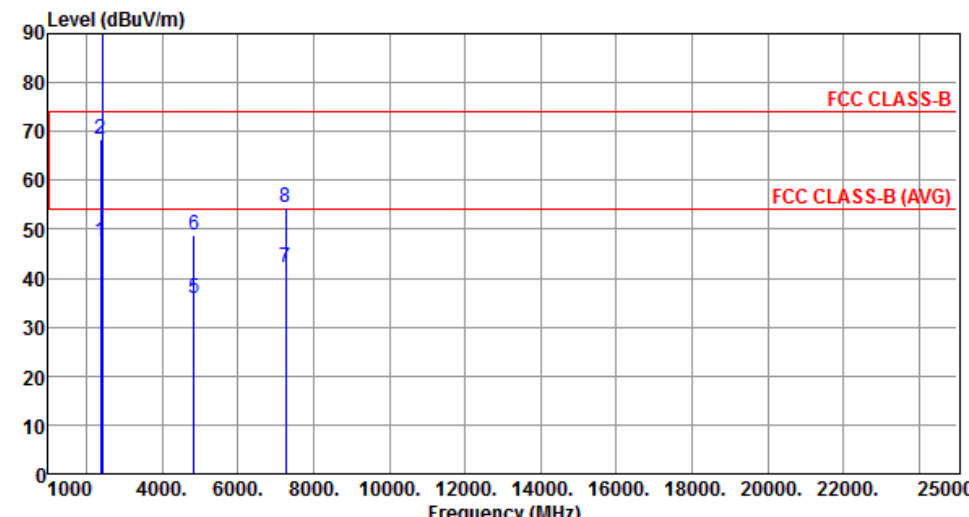
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

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

Modulation	ax HE40	Test Freq. (MHz)	2422
Polarization	Horizontal		
Level (dBUV/m)			

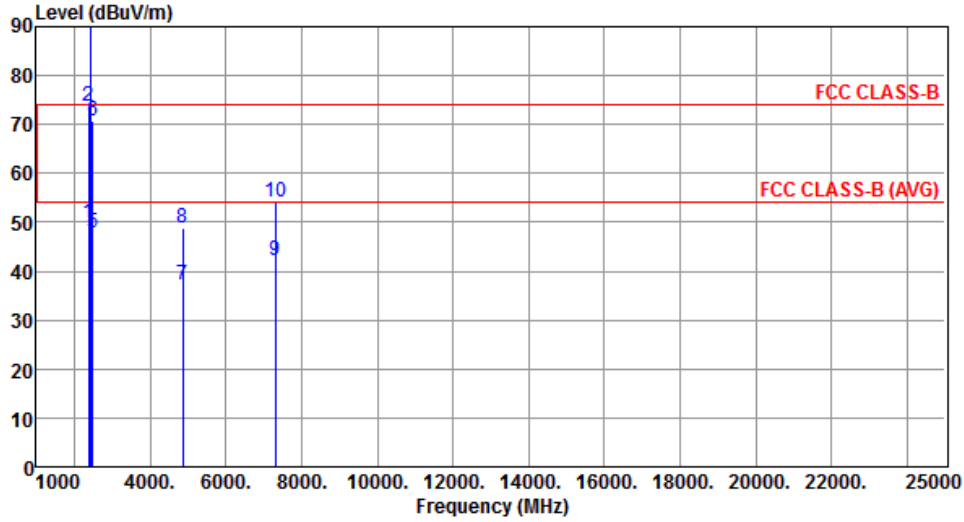
Modulation	ax HE40	Test Freq. (MHz)	2422
Polarization	Vertical		



	Freq. MHz	Emission level dBUV/m	Limit dBUV/m	Margin dB	SA reading dBUV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	47.53	54.00	-6.47	47.29	0.24	Average	100	94
2	2390.00	68.25	74.00	-5.75	68.01	0.24	Peak	100	94
3 *	2422.00	99.53			99.28	0.25	Average	100	32
4 *	2422.00	111.76			111.51	0.25	Peak	100	32
5	4844.00	35.96	54.00	-18.04	29.41	6.55	Average	100	35
6	4844.00	48.92	74.00	-25.08	42.37	6.55	Peak	100	35
7	7266.00	42.29	54.00	-11.71	30.68	11.61	Average	100	37
8	7266.00	54.34	74.00	-19.66	42.73	11.61	Peak	100	37

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).

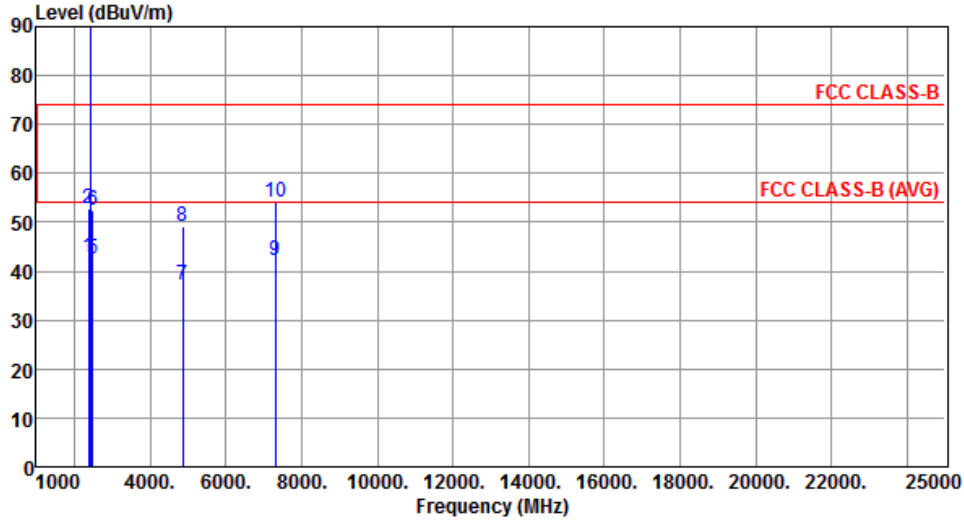
Modulation	ax HE40	Test Freq. (MHz)	2437
Polarization	Horizontal		



	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	49.87	54.00	-4.13	49.63	0.24	Average	100	359
2	2390.00	73.59	74.00	-0.41	73.35	0.24	Peak	100	359
3 *	2437.00	104.81			104.55	0.26	Average	100	359
4 *	2437.00	115.48			115.22	0.26	Peak	100	359
5	2483.50	47.79	54.00	-6.21	47.54	0.25	Average	100	359
6	2483.50	70.78	74.00	-3.22	70.53	0.25	Peak	100	359
7	4874.00	37.06	54.00	-16.94	30.58	6.48	Average	100	182
8	4874.00	48.97	74.00	-25.03	42.49	6.48	Peak	100	182
9	7311.00	42.02	54.00	-11.98	30.26	11.76	Average	100	186
10	7311.00	54.29	74.00	-19.71	42.53	11.76	Peak	100	186

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).

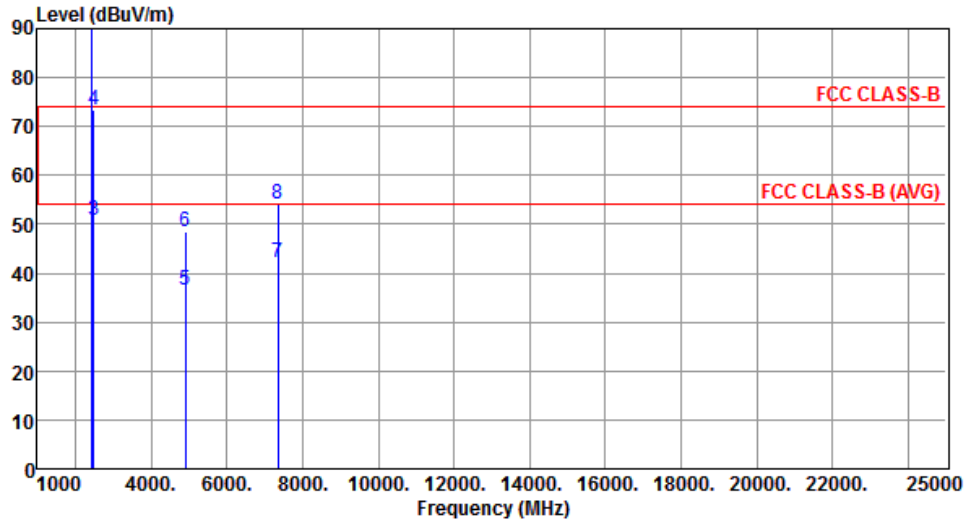
Modulation	ax HE40	Test Freq. (MHz)	2437
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	42.71	54.00	-11.29	42.47	0.24	Average	100	37
2	2390.00	52.71	74.00	-21.29	52.47	0.24	Peak	100	37
3 *	2437.00	101.51			101.25	0.26	Average	100	37
4 *	2437.00	112.84			112.58	0.26	Peak	100	37
5	2483.50	42.54	54.00	-11.46	42.29	0.25	Average	100	37
6	2483.50	52.64	74.00	-21.36	52.39	0.25	Peak	100	37
7	4874.00	37.08	54.00	-16.92	30.60	6.48	Average	100	39
8	4874.00	49.11	74.00	-24.89	42.63	6.48	Peak	100	39
9	7311.00	42.27	54.00	-11.73	30.51	11.76	Average	100	42
10	7311.00	54.22	74.00	-19.78	42.46	11.76	Peak	100	42

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

Modulation	ax HE40	Test Freq. (MHz)	2452
Polarization	Horizontal		



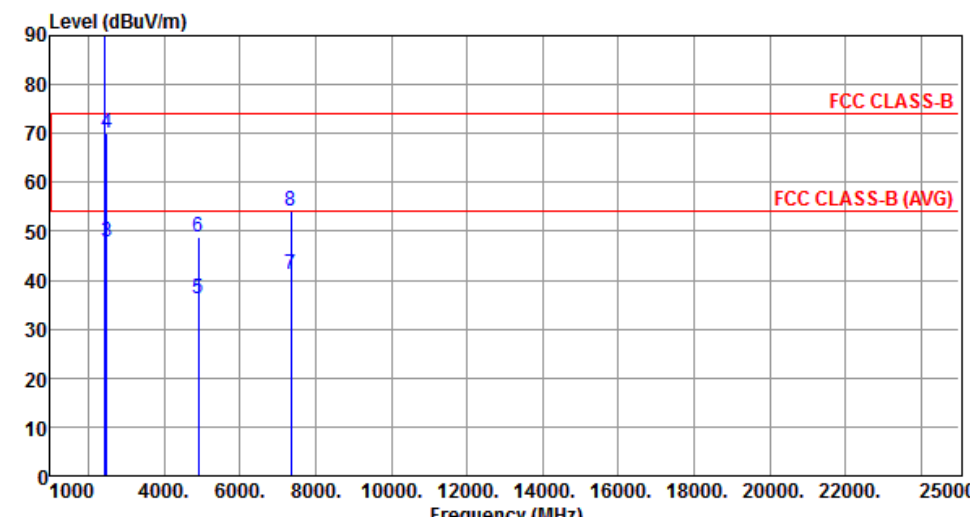
		Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	*	2452.00	102.90			102.62	0.28	Average	100	305
2	*	2452.00	116.31			116.03	0.28	Peak	100	305
3		2483.50	50.81	54.00	-3.19	50.56	0.25	Average	100	305
4		2483.50	73.52	74.00	-0.48	73.27	0.25	Peak	100	305
5		4904.00	36.59	54.00	-17.41	30.17	6.42	Average	100	187
6		4904.00	48.65	74.00	-25.35	42.23	6.42	Peak	100	187
7		7356.00	42.10	54.00	-11.90	30.28	11.82	Average	100	185
8		7356.00	54.02	74.00	-19.98	42.20	11.82	Peak	100	185

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		ax HE40			Test Freq. (MHz)		2452		
Polarization		Vertical							



		Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	*	2452.00	99.61			99.33	0.28	Average	100	38
2	*	2452.00	113.56			113.28	0.28	Peak	100	38
3		2483.50	47.85	54.00	-6.15	47.60	0.25	Average	100	38
4		2483.50	70.22	74.00	-3.78	69.97	0.25	Peak	100	38
5		4904.00	36.05	54.00	-17.95	29.63	6.42	Average	100	32
6		4904.00	48.70	74.00	-25.30	42.28	6.42	Peak	100	32
7		7356.00	41.26	54.00	-12.74	29.44	11.82	Average	100	33
8		7356.00	54.21	74.00	-19.79	42.39	11.82	Peak	100	33

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).

3.6 Emissions in Non-Restricted Frequency Bands

3.6.1 Emissions in Non-Restricted Frequency Bands Limit

Peak power in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum in-band peak PSD level in 100 kHz.

3.6.2 Test Procedures

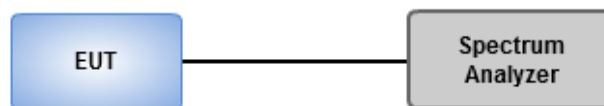
Reference level measurement

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

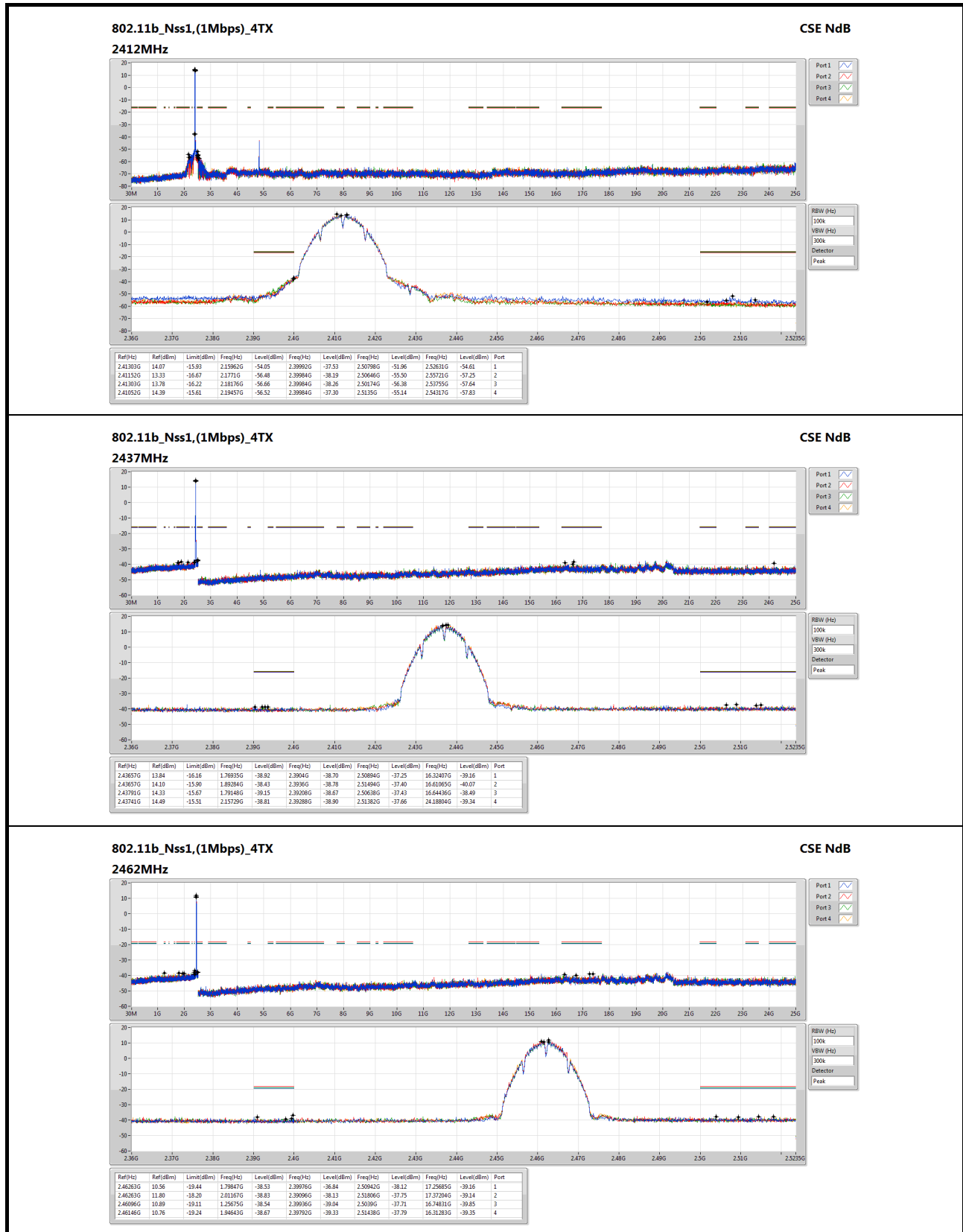
Emission level measurement

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

3.6.3 Test Setup



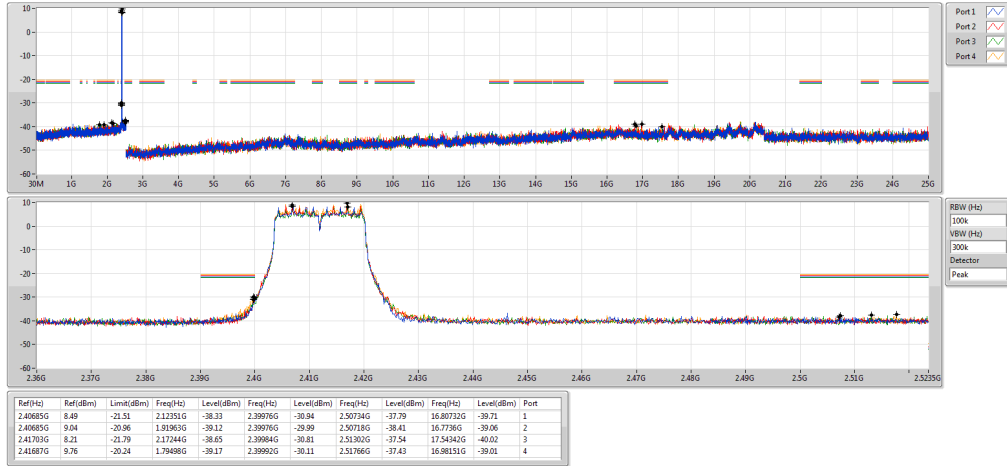
3.6.4 Unwanted Emissions into Non-Restricted Frequency Bands



802.11g_Nss1,(6Mbps)_4TX

CSE NdB

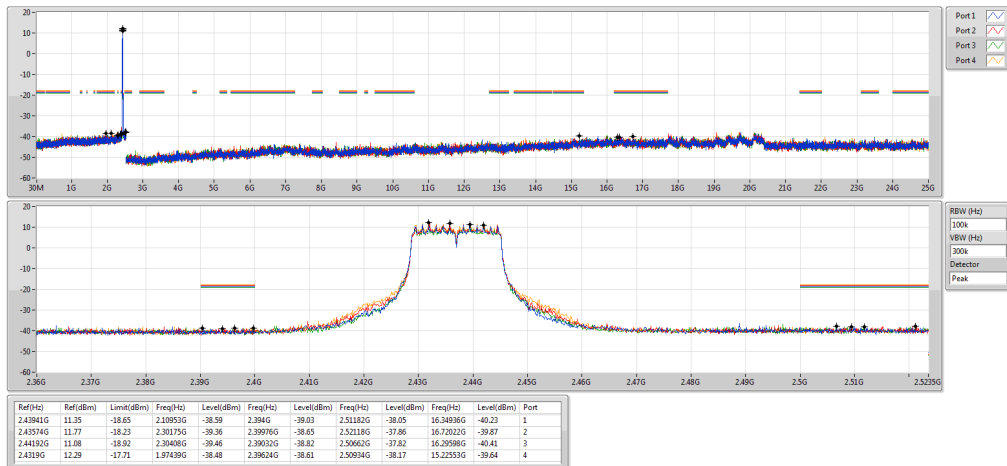
2412MHz



802.11g_Nss1,(6Mbps)_4TX

CSE NdB

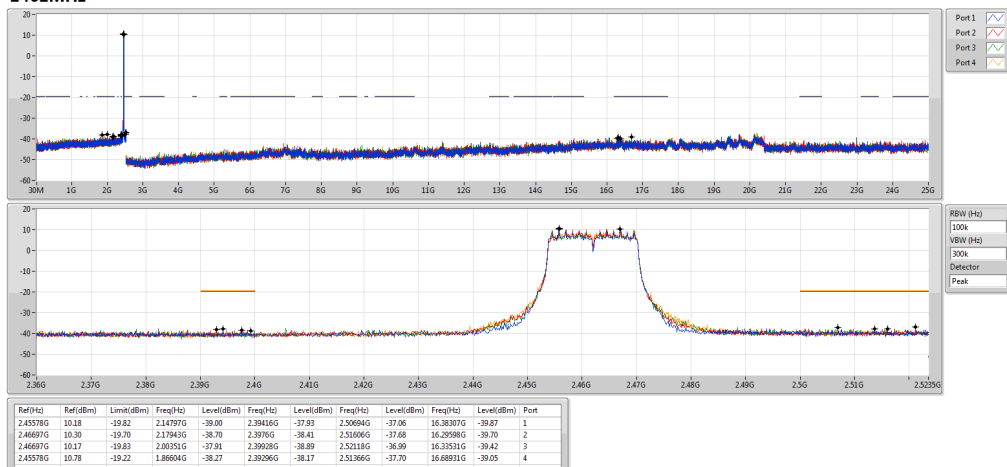
2437MHz



802.11g_Nss1,(6Mbps)_4TX

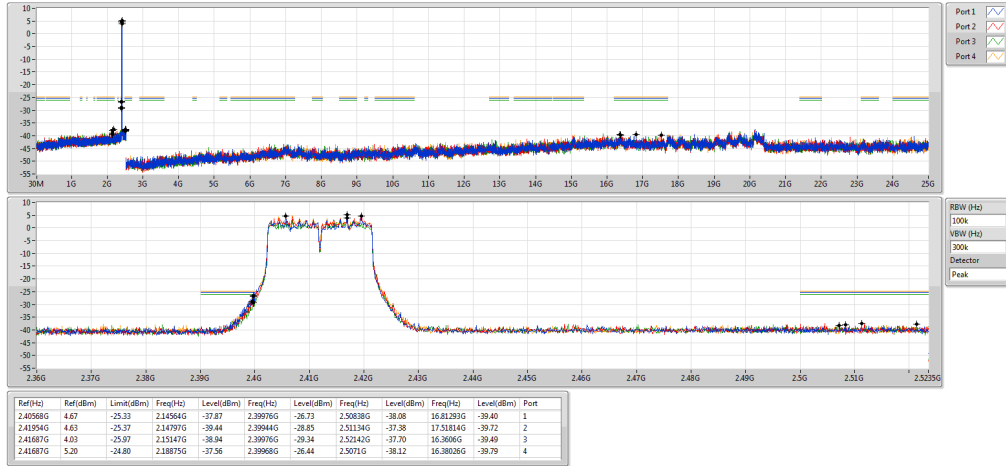
CSE NdB

2462MHz



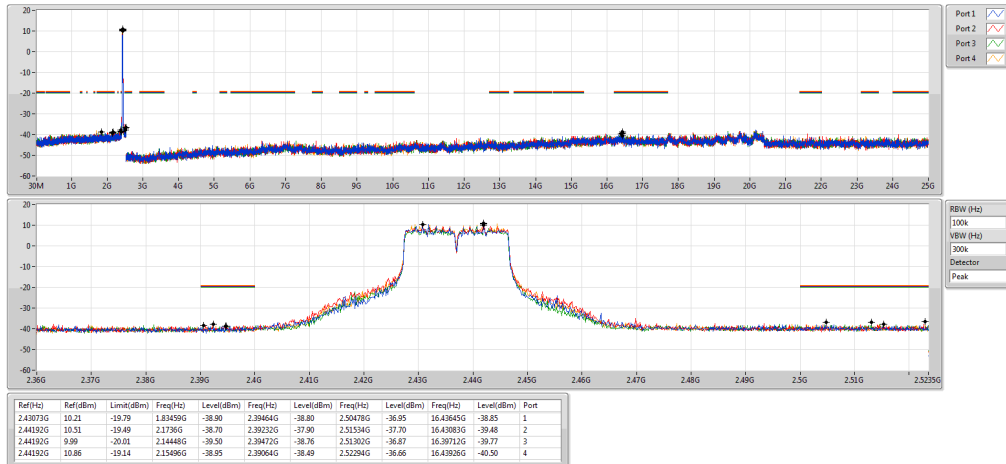
802.11ax HEW20_Nss1,(MCS0)_4TX
2412MHz

CSE NdB



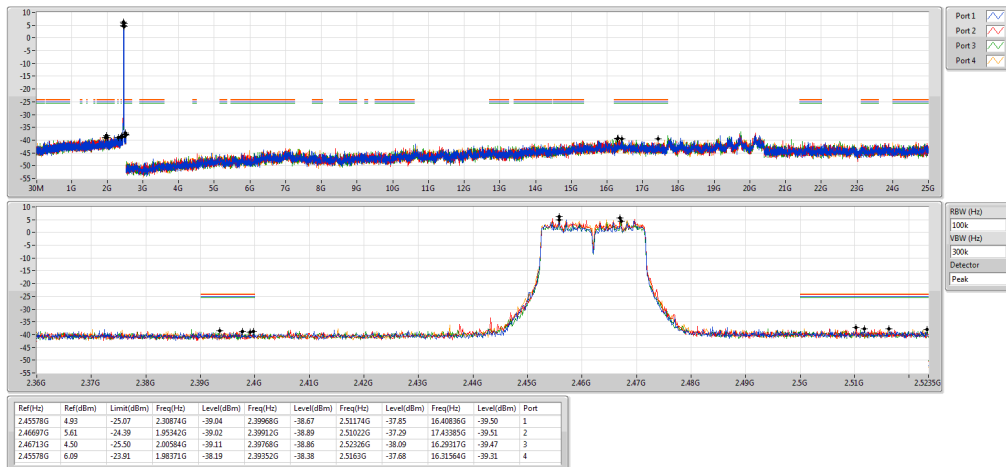
802.11ax HEW20_Nss1,(MCS0)_4TX
2437MHz

CSE NdB



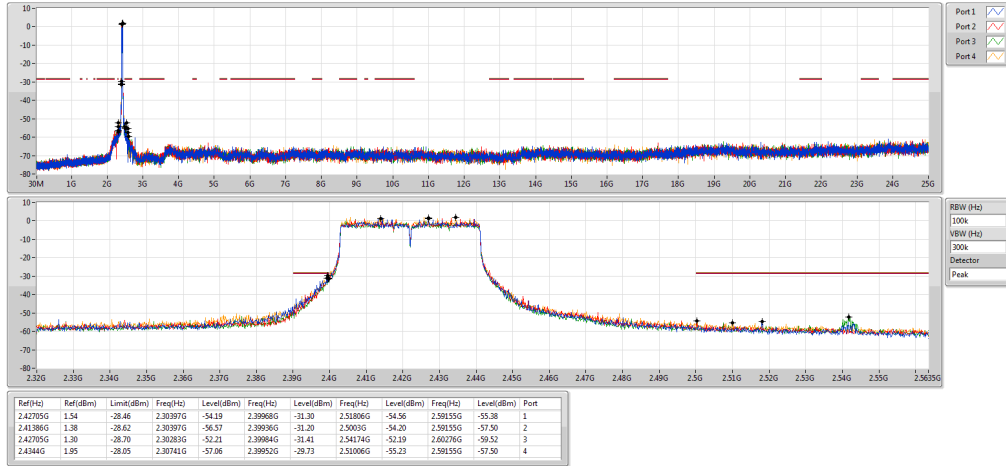
802.11ax HEW20_Nss1,(MCS0)_4TX
2462MHz

CSE NdB



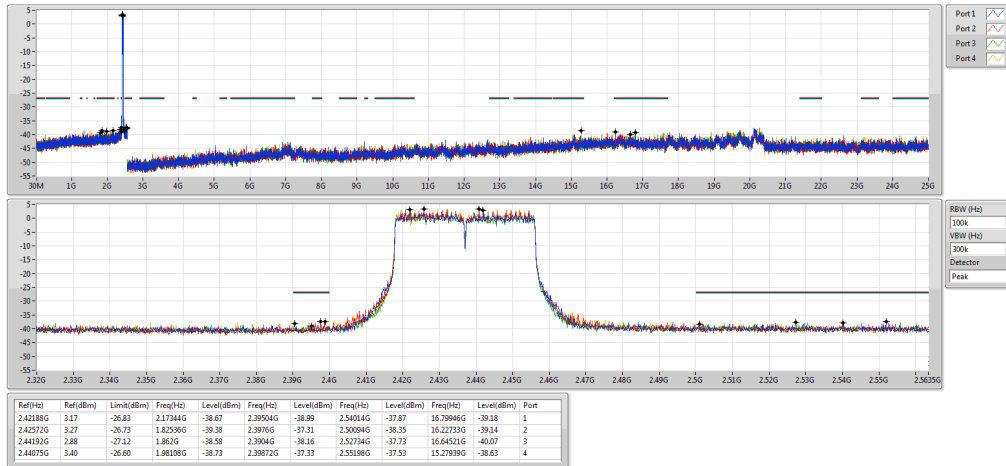
802.11ax HEW40_Nss1,(MCS0)_4TX
2422MHz

CSE NdB



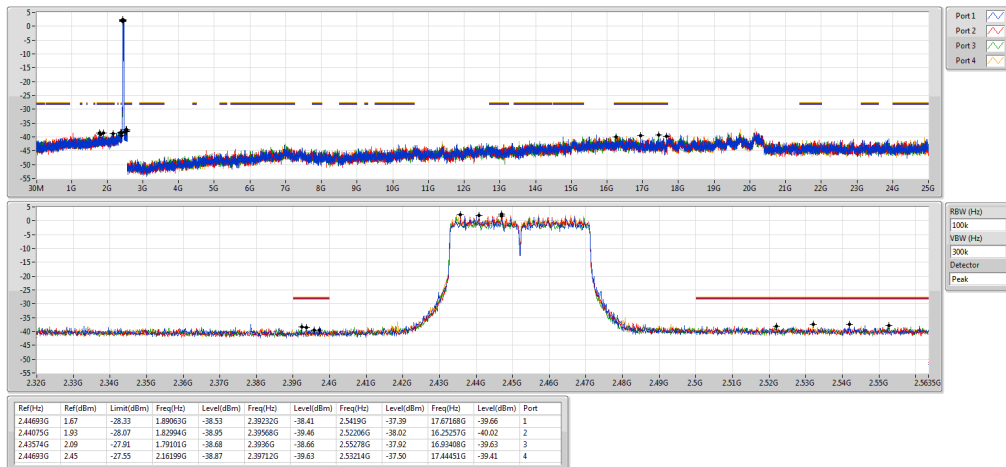
802.11ax HEW40_Nss1,(MCS0)_4TX
2437MHz

CSE NdB



802.11ax HEW40_Nss1,(MCS0)_4TX
2452MHz

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

Fax: 886-3-318-0155

Email: ICC_Service@icertifi.com.tw

==END==